



***INSTALLATION USE AND MAINTENANCE AND DATA
HANDBOOK OF THE COMPRESSOR UNIT***

MOD. SW185F3-EM

SERIAL NUMBER: 42384

YEAR OF MANUFACTURE: 2015

PROJECT: MANITOWOC WISCONSIN

CLIENT: BROADWIND TOWERS, INC.

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	DOCUMENT No	MUM0000654R0
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2.1.1. 22F0008706 - ITEM

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2.1.1.2. 6904400 - PRESSURE GAUGE 0-400 BAR DN63

2.1.2. 22F0008989 - ITEM

2.1.2.1. 0SW95F3NW07 - ITEM

2.1.2.1.1. IGSW95F3NW06 - ITEM

2.1.2.1.1.1. 6910100 - PRESSURE INDICATOR WITH FLANGE 0-100 BAR

2.1.2.1.1.2. 6910250 - PRESSURE INDICATOR WITH FLANGE 0-250 BAR

2.1.2.1.1.3. 6910400 - PRESSURE INDICATOR WITH FLANGE 0-400 BAR

2.1.2.1.1.4. 22F0001658.R4 - VERTICAL OIL SEPARATOR 8.2 L. PED

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2.1.2.1.1.8. 830747400 - PRESSURE TRANSDUCER WIKA 400 BAR

2.1.2.1.1.9. 101141D - KIT TERMOS INTERST: -30 +200 A CONTA CSA

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2.1.2.1.2.4. 101142D - KIT TERMOSONDA -30+200°C L=70+POZZ CSA

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2.1.2.3. 22L0002485 - ITEM

2.1.2.3.1. 22LF.00002.R1 - STARBOX DEVISU WITH DISPLAY + SHEET MPI

2.1.2.4. 101141D - KIT TERMOS INTERST: -30 +200 A CONTA CSA

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2.1.2.6.2. 250B1050001 - KIT DIAMETRI SW C95 2° STADIO Ø105

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2.1.2.6.3. 250E0853501 - DIAMETERS KIT SW CC95 3/4° STAGE Ø85-35

2.1.2.6.3.1. 153226 - CONCENTRING GAS VALVE DC27/51 TAB9369

2.1.2.6.3.2. 15328060CPT02 - OUTLET GAS VALVE 60CPT4 Tab. 12039

2.1.2.6.3.3. 15328060CPT07 - GAS VALVE 60CPT4 TAB 13437

2. COMMESSA - Gas compression plants

2.1. IMP010163 - ITEM


FOGLIO DATI COMPRESSORE
COMPRESSOR DATA SHEET

MUM0000593.R0

IDENTIFICAZIONE COMMESSA JOB IDENTIFICATION										
COMMESSA JOB NUMBER		42384		CLIENTE CUSTOMER		Broadwind Towers, Inc.				
IDENTIFICAZIONE COMPRESSORE COMPRESSOR IDENTIFICATION										
COMPRESSORE MODELLO COMPRESSOR MODEL				SW185-F3-EM		CODICE CORPO COMPRESSORE COMPRESSOR BODY CODE			25034LLBH002 + 25034L012	
CARATTERISTICHE FUNZIONALI COMPRESSORE COMPRESSOR FUNCTIONAL FEATURES										
PREDISPOSIZIONE BOOSTER BOOSTER ARRANGEMENT				FUNZIONAMENTO CONTEMPORANEO BOOSTER BOOSTER CONTEMPORARY WORKING				CONFORMITA' PED PED CONFORMITY		
CARATTERISTICHE SISTEMA TRASMISSIONE TRANSMISSION FEATURES						POMPE IDRAULICHE INSTALLATE HYDRAULICS PUMPS				
TIPO MOTORE MOTOR TYPE		EM		TIPO DI GIUNTO COUPLING TYPE				IN ASSE ON AXIS	NON IN ASSE NOT ON AXIS	PORTATA [l/min] CAPACITY [l/min]
N° POLI / GIRI POLES / RPM		6/1200		ELASTICO ELASTIC				LUBRIFICAZIONE LUBRIFICATION	-	1
POTENZA [KW] POWER [KW]		185		LAMELLARE LAMELLAR				MANTENIMENTO MAINTENANCE	-	-
RAPPORTO DI TRASMISSIONE TRANSMISSION RATIO		1		CINGHIA BELT				LANCIO LAUNCH	-	-
VOLANO FLYWHEEL				LAMELLARE+LANTERNA LAMELLAR+LANTERN				LUB. CILINDRI CYLINDER LUB.	-	-
								MOTORI IDRAULICI HYDRAULIC MOTORS	-	-
CARATTERISTICHE DIMENSIONALI COMPRESSORE DIMENSIONAL COMPRESSOR FEATURES										
COMPENSAZIONE PRESA DALL'ASPIRAZIONE DEL STADIO # COMPENSATION FROM THE STAGE #						3		CORSA STROKE	95	CAMICIA H ₂ O POMPANTI H ₂ O GAS JACKET COOLING
STADIO # STAGE #	# CILINDRI CYLINDERS #	ALESAGGIO [mm] BORE [mm]	ANGOLO ANGLE	BOOSTER STADIO BOOSTER STAGE	TIPO POMPANTE PUMPING TYPE	CAMICIA INTEGRALE INTEGRAL GAS JACKET	TARATURA MAX VALVOLE DI SICUREZZA ASP - MAND [barg] MAX RELIEF VALVE SETTING SUC-DEL [barg]	ALZA VALVOLE VALVE LIFTER	SCAMBIATORE DI CALORE INTERSTADIO INTERSTAGE HEAT EXCHANGERS	
1	1	205	90	-	1		16 - 45		1	31
2	1	105	150	-	2		35 - 80		1	41
3	1	85	30	-	3/4		80 - 180		1	46
4		35		-			180 - 340		1	36
NOTA		Il campo ANGOLO indica la posizione angolare del pompante da fronte macchina nel verso antiorario a partire da ore tre. The ANGLE field indicates the angular disposition of the pumping viewing the compressor body front, counter-clockwise from three o'clock								
OPTIONAL SKID SKID OPTIONALS										
SCALDIGLIA OLIO OIL HEATER										
TRASDUTTORE DI VIBRAZIONI VIBRATIONS TRANSDUCER										
TRASDUTTORI DI TEMPERATURA INTERSTADIO INTERSTAGE TEMPERATURE TRANSDUCERS										

CARATTERISTICHE PRESTAZIONALI COMPRESSORE					
PRESTATIONAL COMPRESSOR FEATURES					
		SET TRASDUTTORI MIN-MAX TRANSDUCTORS SET MIN-MAX			
PRESSIONE ASPIRAZIONE INLET PRESSURE	barg	2.6 - 3.4	3		
PRESSIONE OUT 1°STADIO 1° STAGE OUT PRESSURE	barg	12.4 - 15.4	15		
PRESSIONE OUT 2°STADIO 2° STAGE OUT PRESSURE	barg	41.9 - 51.4	47		
PRESSIONE OUT 3°STADIO 3° STAGE OUT PRESSURE	barg	125 - 153	139		
PRESSIONE OUT 4°STADIO 4° STAGE OUT PRESSURE	barg	278.9 - 341.1	310		
TEMPERATURA IN/OUT 1°STADIO 1° STAGE IN/OUT TEMPERATURE	°C	150	15 / 115		
TEMPERATURA IN/OUT 2°STADIO 2° STAGE IN/OUT TEMPERATURE	°C	150	40 / 133		
TEMPERATURA IN/OUT 3°STADIO 3° STAGE IN/OUT TEMPERATURE	°C	150	40 / 130		
TEMPERATURA IN/OUT 4°STADIO 4° STAGE IN/OUT TEMPERATURE	°C	150	40 / 104		
PORTATA CAPACITY	Sm ³ /h		900		
POTENZA TERMODINAMICA THERMODYNAMICS POWER	KW		130.6		
POTENZA MECCANICA PERDUTA WASTED POWER	KW		54.3		
POTENZA POMPE AUSILIARIE AUXILIARY PUMPS POWER	KW		-		
POTENZA ALL'ASSE TOTALE AXIAL TOTAL POWER	KW		184.9		
CARATTERISTICHE PRESTAZIONALI BOOSTER					
PRESTATIONAL BOOSTER FEATURES					
		SET TRASDUTTORI MIN-MAX TRANSDUCTORS SET MIN-MAX			
PRESSIONE ASPIRAZIONE INLET PRESSURE	barg				
PRESSIONE OUT 1°STADIO 1° STAGE OUT PRESSURE	barg				
PRESSIONE OUT 2°STADIO 2° STAGE OUT PRESSURE	barg				
TEMPERATURA OUT 1°STADIO 1° STAGE OUT TEMPERATURE	°C				
TEMPERATURA OUT 2°STADIO 2° STAGE OUT TEMPERATURE	°C				
PORTATA CAPACITY	Sm ³ /h				
POTENZA TERMODINAMICA THERMODYNAMICS POWER	KW				
POTENZA MECCANICA PERDUTA WASTED POWER	KW				
POTENZA POMPE AUSILIARIE AUXILIARY PUMPS POWER	KW				
POTENZA ALL'ASSE TOTALE AXIAL TOTAL POWER	KW				
SPECIFICHE DI COLLAUDO PER COMMESSA					
JOB WORKSHOP TEST PROCEDURE					
SPECIFICHE DI COLLAUDO PER COMMESSA JOB WORKSHOP TEST PROCEDURE					
REVISIONE REVISION	DESCRIZIONE DESCRIPTION		DATA DATE	REDATTO UT TO DRAWN	APPROVATO DUT TOD APPROVAL
0	Emissione		24/02/15	Zago	Paganelli
1					

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COMPRESSORS MOD. SW e ST



***OPERATING INSTRUCTIONS AND
MAINTENANCE MANUAL
COMPRESSORS MODEL:
SW e ST***

UNI EN ISO 9001:2008 Certificate nr. IT232530

2	CONSUMPTION OIL UPDATED	J.Cammarata	J.Cammarata	D.Paganelli	14/01/2014
1	TRADE NAME MODIFIED	J.Cammarata	J.Cammarata	D.Paganelli	27/08/2012
0	FIRST ISSUE	J.Cammarata	J.Cammarata	D.Paganelli	24/04/2012
REV	DESCRIPTION	PREPARED	CHECKED	APPROVED	DATE
CUSTOMER		---			
PLANT LOCATION		---			
PLANT		---			
ITEM		COMPRESSORS MOD. SW e ST			

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JOB No

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Gas designed for you

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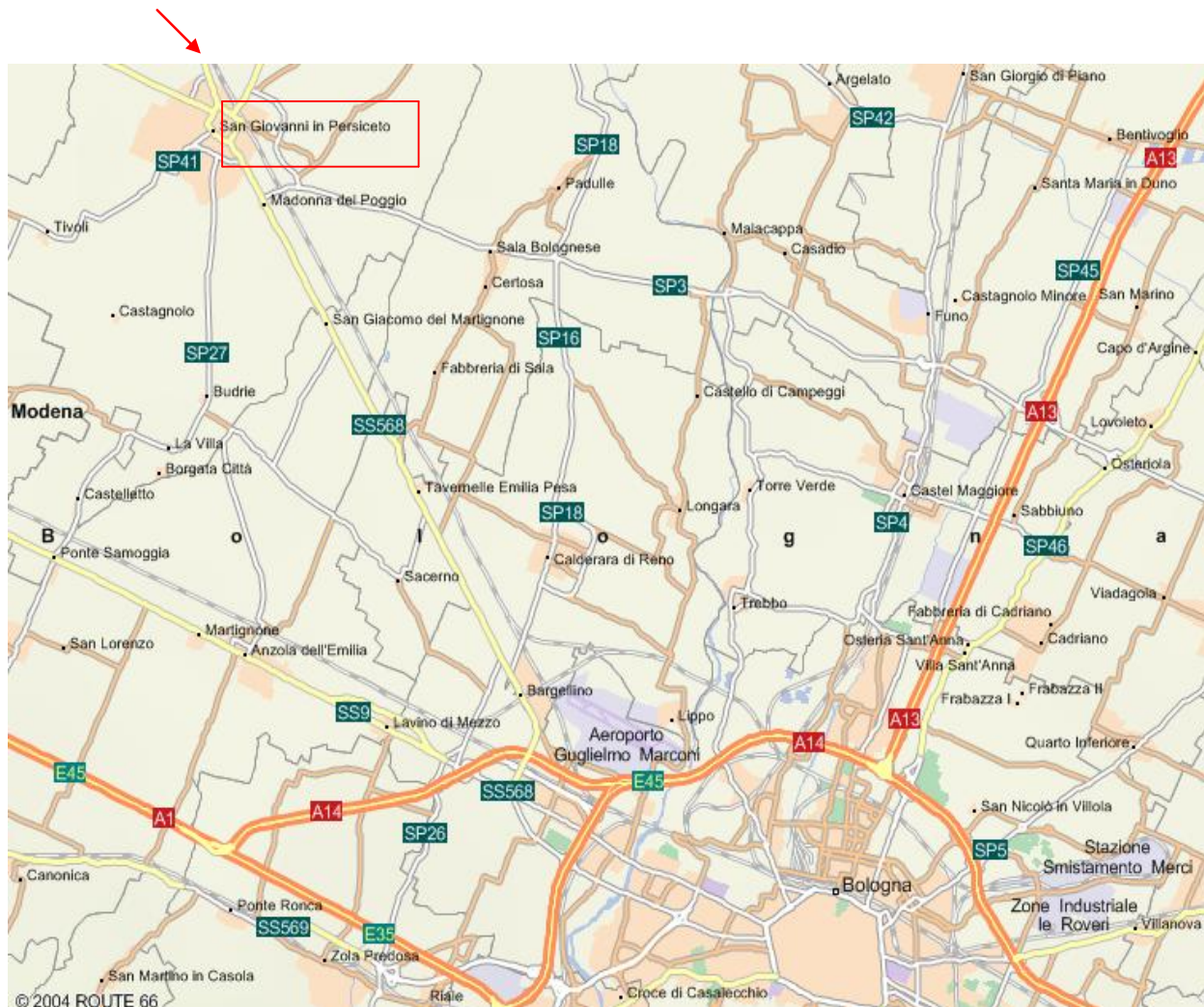
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COMPRESSORS MOD. SW e ST**Warning:**

**Before attempting to use or perform any maintenance jobs:
Carefully read and become familiar with the content of this manual.**

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COMPRESSORS MOD. SW e ST

1 GENERAL INFORMATION

1.1 MANUAL OVERVIEW

SAFE S.p.A. hopes that this manual provides all the information the customer needs to know.

The aim of this manual is to instruct the users, through the use of texts and figures, about machine performance and how to transport, handle, operate and maintain the machine in complete safety.

Be sure to read and familiarize yourself with the information in this manual carefully before attempting to use the machine.

Leave this manual in a dry protected area near the machine, out of direct sunlight and in any case in a place where it can be rapidly consulted at any time.

This manual must accompany the machine even when resold and must be kept in perfect condition throughout the entire service life of the machine until it is decommissioned.

The information and illustrations in this manual are given as examples to aid in understanding; therefore they are not binding.

The manual regards the technical state of the machine at the time it was sold and cannot be considered inadequate if the machine has been updated. SAFE S.p.A. reserves the right to update production and the relative manuals without having to update previous machines and manuals, except in special cases.

If in doubt, contact SAFE S.p.A. directly (Technical documentation office)

SAFE S.p.A. welcomes any suggestions or recommendations on how to improve the manual *and/or* machines.

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To help you better understand this manual, a number of terms found throughout this manual are explained below:

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COMPRESSORS MOD. SW e ST

-KEY TO THE SYMBOLS USED IN P&ID- DRAWINGS

See drawing given in this manual

-DANGER ZONE -

Any area inside and/or near a machine where a person risks injury or adverse health effects.

-EXPOSED PERSON-

Anyone found inside or near a danger zone.

-OPERATOR-

Anyone who operates or works on the machine.

- QUALIFIED TECHNICIAN -

Specialized person, specifically trained and authorized to carry out routine maintenance and special repairs that require full understanding of the machine, how it operates, the safety devices and all the operating modes.

Safe organizes training courses for its customers.

MACHINE OPERATORS:

The person assigned this task must be familiar with this sector, adequately trained and have carefully read and become familiar with the instructions given in this manual

Risks increase notably when more than one operator is present.

The employer must fully inform personnel on the risk of injury, the personal protective equipment to be worn, the risks encountered due to the airborne noise level and the essential requirements of European Directives and laws in force in the country the machine is installed in.

TESTING AND INSPECTION:

The machine was factory tested and inspected to assure trouble-free operation.

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Cap. soc. € 2.500.000,00 i.v.

C.C.I.A.A. di Bologna al n. 03224661201

C.F. - P.IVA 03224661201

COMPRESSORS MOD. SW e ST**WARRANTY:**

SAFE S.p.A. warrants its products to be free from defects in material and/or workmanship.

During this warranty period, the manufacturer shall repair any malfunctions and/or defects within the time required.

The warranty is to be drawn up and agreed upon with our Sales Office at the time of purchase.

The purchaser must not make any changes or repairs without first discussing and deciding the technical aspects with **SAFE's** technical assistance.

SPARE PARTS:

The customer must always purchase original spare parts.

Replacement parts are to be ordered directly from the manufacturer. Always quote the machine model, serial number and year of construction.

Always follow the instructions provided by the manufacturer when disassembling and assembling the machine.

REQUESTING TECHNICAL ASSISTANCE :

Contact the manufacturer directly (by phone or fax) to request technical assistance in the event of malfunctions or faults that need to be repaired by specialized technicians.

WARRANTY EXCLUSIONS

The machine was delivered to the user in the condition requested at the time of purchase.

The user must not tamper with or alter the machine under any circumstances.

Contact the manufacturer whenever faults or malfunctions arise.

Disassembling, altering or tampering with any machine part by the user or any other person not duly authorized will void the warranty and the manufacturer shall no longer be held responsible for any consequential property damage or personal injury.

The manufacturer declines all liability in the following cases.

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COMPRESSORS MOD. SW e ST**a** - incorrect installation;**b** - inappropriate use of the machine by personnel not adequately trained;**c** - use of the machine in a manner that does not comply with the standards in force in the country the machine is installed in;**d** - failure to perform scheduled maintenance or maintenance jobs carried out incorrectly;**e** - use of spare parts that are either not original or specific for the model;**f** - failure to comply totally or partly with the instructions provided;**g** - force majeure

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COMPRESSORS MOD. SW e ST**1.2 COMPRESSOR IDENTIFICATION**

Whenever contacting the manufacturer or dealer, always quote:

- A - Model
- B - Serial number
- C - Year of construction

See the example of a nameplate in the photograph below.

Specifying the exact “machine model” and “serial number” will help the manufacturer answer your questions, so that you are not given inexact or erroneous information.

Machine identification plate in accordance with the information given in the DECLARATION OF CONFORMITY (in compliance with MACHINERY DIRECTIVE 2006/42/CE)

The identification plate illustrated below is attached to the compressor. This plate contains the references and all the information needed for safe operation.

An example of an identification plate is shown below:

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COMPRESSORS MOD. SW e ST**A****B****C**

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 1370	 II 2G <i>EEx e d i b c k b II (CH4)</i>
COMPRESSORE PER GAS NATURALE CNG COMPRESSOR	
COMPRESSORE MODELLO: COMPRESSOR MODEL:	
N° DI MATRICOLA: SERIAL NUMBER:	
ANNO DI COSTRUZIONE: YEAR OF CONSTRUCTION:	
POTENZA ALL'ALBERO: BRAKE POWER:	
RPM ALBERO: SHAFT RPM:	
PORTATA: CAPACITY:	
MIN. PRESS. ASPIRAZIONE: MIN. INLET PRESSURE:	
MAX. PRESS. ASPIRAZIONE: MAX. INLET PRESSURE:	
MAX. PRESSIONE MANDATA: MAX. DELIVERY PRESSURE:	
PRESSIONE E DATA DI PROVA TEST PRESSURE & DATE	
ALIMENTAZIONE ELETTRICA MAINS	
PRESSIONI VALVOLE DI SICUREZZA PRESSURE SAFETY VALVE	
MASSA COMPLESSIVA TOTAL WEIGHT	
TEMPERATURA D'USO MIN. & MAX. MIN. & MAX. USE TEMPERATURE	

Figure 1 – Identification plate

All the information given on the identification plate must be completely legible at all times. Clean the plate on a regular basis.

If the plate can no longer be clearly read, obtain a replacement plate from the manufacturer.

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COMPRESSORS MOD. SW e ST**1.3 INTENDED, UNINTENDED AND ERRONEOUS USE**

This machine is designed and engineered to compress natural gas, or more generally, natural gas delivered from the mains, within the minimum and maximum inlet pressure, maximum delivery pressure and temperatures given on the identification plate attached to the compressor's panel.

This machine must not be used for other types of gases or operating conditions different from those indicated on the plate.

The construction specifications and sizes of all the delivery system components along with the installation mode must comply to all the applicable standards that regulate motor vehicle gas refueling in force in the country the machine is installed in.

In Italy Ministerial Decree of 17th April 2008: "Fire-prevention Safety Standards for the transportation, distribution, storage and use of natural gas of a density no greater than 0.8" and subsequent modifications and Ministerial Decree of 24th May 2002 and ratification of technical enclosure of 28th June 2002 "Fire-prevention Safety Standards for natural gas distribution systems for motor vehicles" must be complied.

The buildings and rooms where the compressors are installed must be designed to prevent gas accidentally released due to leaks or defective gaskets from recirculating or stagnating.

The upstream line must be constructed in material that is able to stand up to the maximum pressure for connection to the supply manifold (pipeline/storage/cylinder truck). In addition, a suitably set safety valve should be installed.

Compressors designed and constructed for use in countries that are not part of the European Economic Community may not be sold to countries that are members of the European Economic Community under any circumstances.

Do not operate the compressor outside the values given on the identification plate.

Do not operate the compressor in a manner that does not comply with the instructions given in the Operating Instructions manual.

Operating the compressor outside the conditions established in the sales contract will subject it to stress and deformation which it has not been designed for.

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COMPRESSORS MOD. SW e ST

Operating the compressor under these conditions is unintended and therefore must not be done for safety reasons.

It is severely forbidden to change, alter, adapt or remove any parts included in the system supplied by SAFE S.p.A. for maintenance or other purposes unless duly authorized by SAFE S.p.A. in advance. Any non-commercial parts removed and changed for maintenance purposes must be replaced with identical ones constructed and supplied by SAFE S.p.A.

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COMPRESSORS MOD. SW e ST



2 TECHNICAL SPECIFICATIONS AND MACHINE DESCRIPTION

2.1 MACHINE DESCRIPTION

THE COMPRESSION SYSTEMS MANUFACTURED BY SAFE S.p.A. ARE AVAILABLE IN A WIDE RANGE OF MODELS WITH DIFFERENT POWER OUTPUTS STARTING FROM 20 KW.

THE FOLLOWING MODELS OF ALTERNATIVE COMPRESSORS ARE AVAILABLE:

ST

SW

SVA

TYPE	ST alternative compressor
No. pumping cylinders	3 - 5
No. compression stages	1 – 4 (booster / additional booster)
Flow rate	110 – 1550 Sm ³ /h
Maximum delivery pressure	300 bar g

TYPE	SW alternative compressor
No. pumping cylinders	2 - 3
No. compression stages	2 - 4
Flow rate	230 – 9000 Sm ³ /h
Maximum delivery pressure	300 bar g

TYPE	SVA alternative compressor
No. pumping cylinders	2
No. compression stages	2 - 4
Flow rate	100 – 1220 Sm ³ /h
Booster flow rate	260 - 4200 Sm ³ /h
Maximum delivery pressure	300 bar g

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COMPRESSORS MOD. SW e ST**2.1.1 MAIN FEATURES**

The compression unit consists of an alternative volumetric compressor with cylinders.

SAFE alternative compressors reach high performance levels thanks to the use of technologically advanced materials, system control, automation, design and simulation methods.

The recent automation systems aid considerably in newly installed systems and in amortization of existing system for:

- Safety
- Ease of operation and control
- Compressor efficiency

The compressor's body contains an eccentric shaft and, depending on the type, the tie rod and cross head.

Dynamic seals prevent the gas and oil from coming into contact with each other. Vented bleeders also assure that, in the event of leaks, the natural gas does not get inside the body.

The gas intake-delivery valves, that automatically open, are equipped with a special "valve lift" device that allows the compressor to run dry at start up and shutdown.

The body, together with the cylinders, is bolted to the frame.

Power is transmitted, to the compressor, through an electric motor found on the same frame that sustains the compressor. Power is transmitted either through a flexible coupler or gearbox and flexible damping coupler.

Automation requirements

Compressor operation features the following:

- Start up and shutdown sequences
- Unit protected by alarm and shutdown systems
- Automatic adjustment of process variables
- Control system (pneumatic or electric) that triggers, as required by the valve lift, the shut off valves
- Instrumentation that protects the unit

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COMPRESSORS MOD. SW e ST

All the systems are suitable to assure the machine is in the safe configuration.

Control systems

The controls for the start up and shutdown sequences, parameters of the compressor and its auxiliary equipment are monitored by the control cabinets. The compressor start up and shutdown sequences are executed by a programmable logic controller.

(PLC programable - logic - controller).

The PLC controls operation of the auxiliary motors (cooling water, cooling tower lubrication pumps, opening/closing sequence of process valves that determine the loading stages).

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COMPRESSORS MOD. SW e ST**2.1.2 GAS CIRCUIT**

Natural gas is drawn in from the feed line, filtered, taken in and compressed in the first stage cylinder.

It is extremely important that the gas taken in is efficiently filtered as any small extraneous matter may wear down the gas sleeves, rods, dynamic cylinder and rod gaskets and adjustment and shut off valves. As a result, the customer must install one or more filters in order to assure a degree of filtration that is adequate and suitable to work at the maximum flow rate and maximum pressure of the line in which they are installed, i.e. with rated pressures greater than or equal to the setting of the safety valve that protects the line.

An exchanger that cools down the gas, a pressure transducer, a pressure gauge (PI) that reads the pressure and a safety valve are installed at the outlet of each stage.

The pressures are shown on the pressure gauges (PI).

Pressure transducer (PT) monitors the intake pressure. The latter shuts down the compressor if the value read is higher or lower than the set range. The pressure values read by the transducers and relative alarm settings are shown on the PLC display screen in the control cabinet.

Each compressor delivery line is monitored by a pressure transducer (PT-XX) so that the set value is not exceeded.

Gas intake line

- **Manual shut off valve**

As this is a lever-operated ball valve it must always be used when maintenance is carried out to shut off the gas sent to the compressor.

- **Gas filter**

The filter holds back any liquid and/or solid particles present in the gas fed to the compressor. The degree of filtration depends on the state of the gas.

- **Pneumatic shut off valve**

Ball valve with pneumatic actuator. Opening and closing of the valves are included in the sequence performed to start up, shut down and change the filling stage of the compressor. The actuators are started by solenoid valves that transmit the pneumatic impulse. When the

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COMPRESSORS MOD. SW e ST

pressure required for actuator operation is not present, the valve switches into the safety conditions (open or closed, depending on the function executed).

- **Pressure transmitters**

They are used to control the pressure for the operation, alarm and shutdown (PSD) signals.

Compressor

The compressor is driven by an electric motor. The alternative compressor compresses the gas and brings it to the physical conditions so that it can be delivered to the vehicles (maximum 220 bar r.) by up to three pressure lines (high, medium and low) according to the type of system. After each compression stage, the gas is cooled down by a gas-water heat exchanger connected to the closed loop cooling system. A safety valve is installed after each compression stage as a mechanical safety feature.

Gas delivery line

Thanks to the electro-pneumatic system provided, once compressed, the gas is conveyed to the low, medium or high pressure line for delivery after undergoing all the checks required by Ministerial Decree D.M. 28.6.02.

Manual shut off valve

As this is a lever-operated ball valve it must always be used when maintenance is carried out to shut off the gas sent to the compressor.

Pneumatic shut off valve

Ball valve with pneumatic actuator. Opening and closing of the valves are included in the sequence performed to start up, shut down and change the filling stage of the compressor. The actuators are started by solenoid valves that transmit the pneumatic impulse. When the pressure required for actuator operation is not present, the valve switches into the safety conditions (open or closed, depending on the function executed).

Pressure transmitters

They are used to control the pressure for the operation, alarm and shutdown (PSD) signals.

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COMPRESSORS MOD. SW e ST**2.1.3 HYDRAULIC AND LUBRICATION CIRCUIT****OIL CUP:**

The oil is collected in the lower section of the compressor's body in models SW and SV (in the reservoir in model ST). The level can be checked through the sight gauge provided where the minimum and maximum levels are indicated.

OIL PUMPS:

A gear pump with one or more stages is mounted in the front of the compressor's body. The pump is driven either directly by the main shaft or, depending on the configuration supplied, by an auxiliary electric motor.

SHAFT AND BUSH LUBRICATION CIRCUIT:

The oil, drawn in by the pump, is sent to the lubrication circuits. One or more pressure relief valves are installed in the circuit to keep the oil pressure within the set operating range.

OIL COOLING CIRCUIT:

All of the oil is cooled down by a suitably sized heat exchanger. Heat exchange takes place either with water in a closed loop circuit or with air, depending on the type of cooling system supplied.

SAFETY FEATURES:

The oil temperature is controlled by transmitters or thermostats while the oil level is monitored by a level meter. If the values read are not correct, the compressor signals an alarm.

- The oil level in the reservoir must be kept between the maximum and minimum levels given on sight gauge LGxx as shown in the specific drawing.

OIL FILTER:

One or more cartridge type oil filters are installed in the circuit after the gear pumps which interrupt the entire oil flow.

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COMPRESSORS MOD. SW e ST**2.1.4 PNEUMATIC CIRCUIT**

The machine is controlled through the pneumatic circuit according to a specific operating principle.

The pneumatic circuit is employed to drive all the actuators and valve lift cylinders through solenoid valves.

We recommend that the customer installs a filter-lubrication unit in the compressed air circuit that serves the compressor. Contact the manufacturer to obtain the specifications of this unit. SEE AIR COMPRESSOR MANUAL.

The lubrication tank must be filled with MINERAL oil with ISO 32 degree of viscosity and 1 shot should be provided every 60 seconds.

A pressure switch is installed in the compressor's compressed air line. If the operating pressure drops below the minimum value (6 bar) the pressure switch shuts down the compressor.

Safe S.p.A. suggests that the dew point is -5°C otherwise special filters need to be installed (contact Safe S.p.A. for more detailed technical information)

If the air compressor is far away from the actuators, install a tank near the compressor. The tank should have an adequate holding capacity and minimum rated pressure of 10 bar.



Warning: Periodically let out the condensate present in the pneumatic circuit with the manual valve provided.



Warning: Do not shut off power to the instrument air compressor at night and/or when the plant is closed.

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COMPRESSORS MOD. SW e ST**2.1.5 COMPRESSOR VALVES**

The valves are components that play a fundamental role in compressor operation and may effect performance therefore they should always be kept highly efficient.

In particular, the first stage valves effect the compressor's flow rate. In fact, if they malfunction it may be reduced while the power used remains constant. On the other hand, the interstage valves may alter the compression ratios causing hazardous overloads on the mechanisms and changing the pressure and temperature values.

Check the interstage gas pressures on a daily basis by reading the values shown on the pressure gauges. If the values shown differ from the rated operating value by more than 15% (indicated in the technical specifications of the compressor given in section 13 annexes) check the value.

Generally speaking, incorrect pressure in a generic stage is a sign of malfunctioning of the valve placed after it.

Brief description of gas valve operation

While the valve is operating, the disk performs a stroke that equals the distance the valve is raised. The speed at which it moves depends on the compressor's operating speed, valve springing, difference in pressure the valve is subject to and the disc stroke.

Extremely important factors that determine the service life of the disc are the speed at which it comes into contact with the counter-seat and gas cleanliness.

The types of valves used in SAFE compressors lengthens the maintenance intervals for the following reasons:

- Resistance to high temperatures
- High chemical resistance
- High mechanical characteristics
- Low expansion coefficient

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COMPRESSORS MOD. SW e ST**OUTLET VALVE****Figure 2 - Inlet valve****INLET VALVE****Figure 3 - Outlet valve**

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COMPRESSORS MOD. SW e ST

SAFE
as designed for you

The exploded drawing of a gas valve shown below is given for reference purposes only.

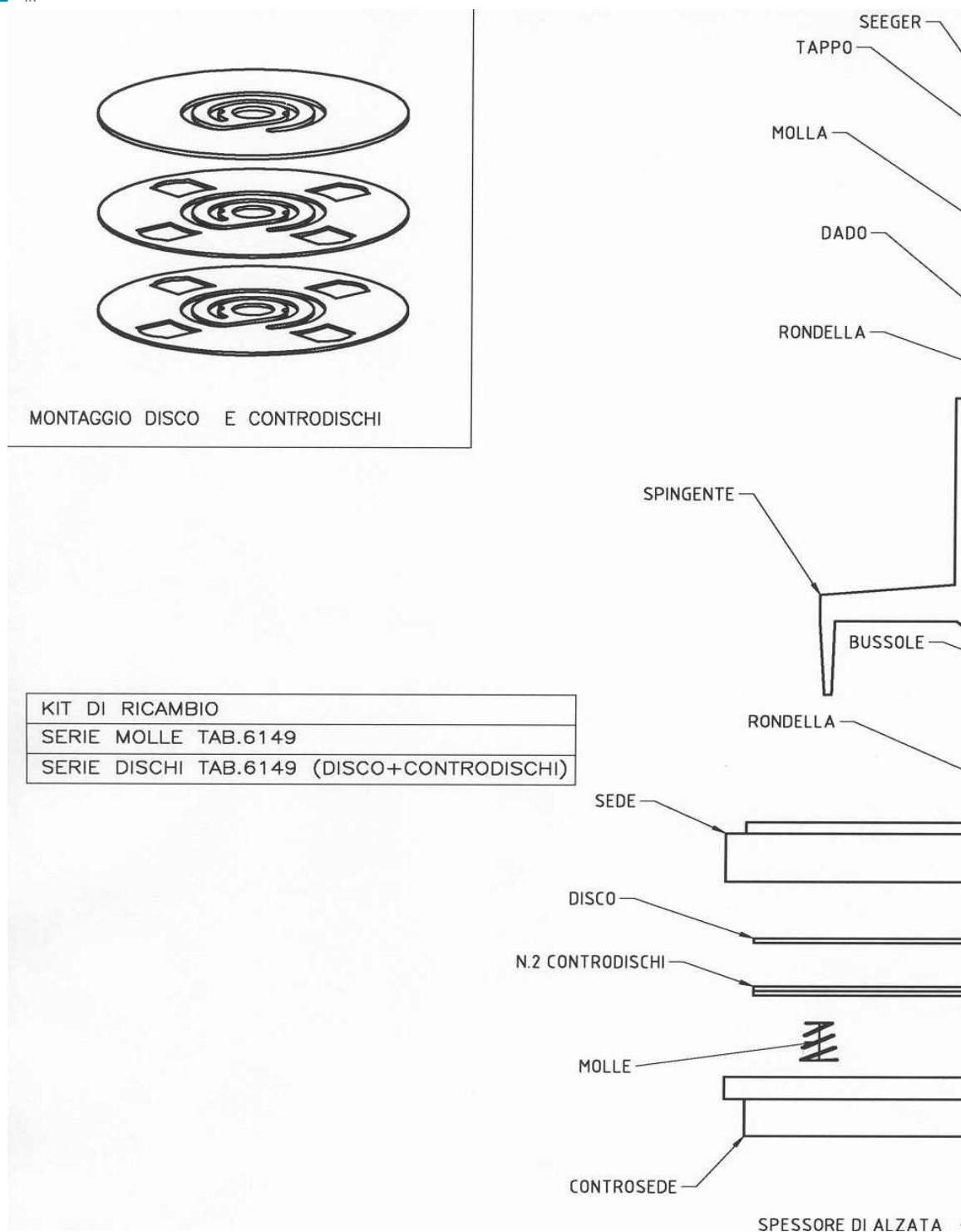


Figure 4 - Gas valve exploded drawing

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2.2 OPERATIONAL LIMITS

In order to assure top machine performance, it must be used in suitable environments protected against atmospheric agents.

Environmental limits:

Operating temperature: -10 ÷ +40°C

Maximum humidity: 85%

Recommended height: <1000 m

Lighting

To safely operate the machine, the room where it is installed must be adequately lit.

Observe the laws and regulations in force in the countries.

Vibrations

When operated in compliance to the instructions given, vibrations are limited.

If the unit vibrates excessively, the operator should immediately shut down the machine and contact the after sales service office (telephone number given in section 00).

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COMPRESSORS MOD. SW e ST**2.3 MACHINE DISPOSAL**

The compressor must be disassembled and disposed of by personnel specialized in the mechanical and electrical fields.

Operations

- 1- Shut off the upstream and downstream manual valves and let out all the gas under pressure, making sure all the pressure gauges read zero.
- 2- Disconnect the compressor from the hydraulic, pneumatic and electrical mains.
- 3- Unplug the electrical cables that run out of the power cabinet.
- 4- Unplug the electrical cables that run out of the control cabinet.
- 5- Disassemble the machine in all its main parts.
- 6- Sort the machine parts according to the type of material they are constructed in (metal, plastic, etc...).
- 7- Send the sorted parts to waste material collection centers.

**Warning:**

Carefully follow the procedures in force in the country the machine is installed in. All recovered liquids must be disposed of in accordance with local environmental protection regulations.

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COMPRESSORS MOD. SW e ST

3 SAFETY PRECAUTIONS AND GUIDELINES

3.1 SAFETY PRECAUTIONS

The employer is responsible for informing and instructing personnel about risks of injury, the devices provided to safeguard the operator, the risks linked to the airborne noise level and the safety precautions, rules and requirements dictated in all international Directives.

Before attempting to start work, the operator must verify that all machine components work efficiently.

Altering or replacing one or more parts without being duly authorized may cause personal injury and property damage which the manufacturer declines liability for.

This machine is designed to obtain the indicated performance levels under the safest possible conditions for the operator.

Before starting up the unit, the operator must make sure that no people and/or things are around the machine.

Failure to heed to the safety precautions and/or unintended use of the machine may cause injury to yourself or other persons.

Do not use the machine to perform tasks other than those it is specifically constructed for. The manufacturer declines liability for damage and injury caused by unintended, inappropriate and erroneous use.

Do not climb on the machine. It is not designed to hold up people or things.

Do not use the machine on uneven or inclined floors.

Turn the main switch to OFF whenever cleaning or performing routine maintenance.

Put a "MAINTENANCE IN PROGRESS" sign on the main switch before starting maintenance.

Only expert specially trained personnel can perform maintenance.

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The operator and maintenance workers must always keep the work area clear of any type of equipment and prevent entry by unauthorized people. Unauthorized personnel must keep out of the work area as they may interfere with freedom of movement.

Always clean the floor and outside surfaces of the machine to remove any oil and dust that may cause maintenance workers to slip and fall before starting up the machine.

The machine can be used only by operators who have attended the training course and have become familiar with the instructions contained in this manual.

Operators and maintenance workers must wear clothes that comply to the essential safety requirements in force in your country.

Special attention must be given to bracelets, watches, rings or necklaces that must not hang or interfere with operator movement.

In any case, we recommend that no objects are worn in order to obtain the highest degree of safety possible.

None of the moving parts can be started up unless the protective shields are installed.

Whenever the compressor is stopped and you suspect that the inside surfaces are hot, wait 60 minutes before starting to remove parts as a precautionary measure.

PLATES

Pay careful attention to the information given on the plates attached to the machine.

Keep all the plates legible.

If plates need to be replaced, contact SAFE S.p.A.

Send the written request to the technical documentation office (address and telephone numbers are given in section 00 of this manual).

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3.2 SAFETY GUIDELINES

BUILDINGS

The buildings and rooms the compressor, storage system, measurement booth and electrical cabinet are installed in must be suitably sized so that all the control devices, instrumentation and indicators on-board the machine can be easily, conveniently and safely reached.

MOTORS

All the electric motors and electrical connections must be installed in compliance with IEC standards, current accident prevention laws along with any other local standards and regulations.

SAFETY VALVES

Safety valves are installed in the compressor that keep the line pressure within the maximum allowable value.

Never install a shut off valve on the pipe that joins the cylinder to the safety valve.

Do not remove or alter any safety components.

If a safety valve is activated while the compressor is running, stop the unit and trace the problem.

The exhaust of the safety valves must be conveyed by piping and discharged in a safe area in the atmosphere. For this purpose, SAFE compressors are equipped with a manifold to be connected to the vent manifold that collects the exhaust from all the safety valves installed.

DETERGENTS

Do not use volatile and flammable liquids as detergents to clean the compressor components. Use only safe solvents and thoroughly dry all the surfaces before reinstalling.

Do not use trielene as a solvent. Make sure the ambient is adequately ventilated if halogenated solvents are used.

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COMPRESSORS MOD. SW e ST**PROTECTIVE AND SAFETY DEVICES**

A general description is given below that takes into consideration only the items given in the drawing.

PRESSURE TRANSMITTER

Electronic device that transmits the real pressure value to the electric cabinet to generate the alarm/shutdown signal when the set values (SET) are exceeded.

TEMPERATURE TRANSMITTER

Electronic device that transmits the real temperature value to the electric cabinet to generate the alarm/shutdown signal when the set values (SET) are exceeded.

PRESSURE SWITCHES

Electromechanical device that opens/closes an electric contact to generate the alarm/shutdown signal when the set pressure (SET) is exceeded.

THERMOSTATS

electromechanical device that opens/closes an electric contact to generate the alarm/shutdown signal when the set temperature (set) is exceeded.

LEVEL CONTROLS

Electromechanical device that opens/closes an electric contact to generate the alarm/shutdown signal when the set level (SET) is exceeded.

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3.3 PICTORIAL MARKINGS

The icons affine to the machine and packaging are listed and explained below. Use of pictorial markings is in accordance with Standards: UNI EN ISO 780, UNI EN 1012-1.

Symbol	Description	Location
	Points for lift truck forks on compressor base	Machine Packaging
	Provided amongst icons indicating lift points with forks, specifies a fork lift truck should be used.	Machine
	Points where lift hooks are to be attached on compressor base	Machine
	Fragile, handle with care.	Packaging
	This side up.	Packaging
	Keep package dry.	Packaging
	Do not stack. Do not place anything on package.	Packaging
	Sling here. Sling point.	Packaging

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	Danger of automatic or remote unit start up. To be affixed in compressor room by plant supervisor.	Machine
	Hot surfaces. To be affixed in compressor room by plant supervisor.	Machine
	Correct direction of rotation of main electric motor.	Machine

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Operator interface: safety and standard markings

Warning signs

No smoking

Do not smoke or
use open flames

No bypassers

Do not use
water to put
out firesNot drinking
water

Do not enter

No fork lift
trucksDo not
touch**Hazard markings**Hot or flammable
material

Explosive

Poisonous
substancesCorrosive
materialsRadioactive
Materials

Hanging loads



Fork lift trucks



High voltage



Danger



Risk of falling

Infectious
substancesLow
temperatureHazardous
substances

Laser rays

Combustible
materialNon-ionizing
radiationStrong
magnetic field

Risk of falling

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3.4 PLANT EMERGENCY SYSTEMS

The plant of compression and distribution of natural gas for transport is provided, as required by current legislation, with appropriate emergency systems and fire alarms.



PERIODICALLY MAKE SURE OF THE STATE OF GOOD FUNCTION OF THE BELOW SYSTEMS AND THAT THE SAME ARE AT ALL TIMES EASILY REACHABLE AND DULY NOTED BY SUITABLE PLATES OF IDENTIFICATION.

EMERGENCY SYSTEM

It is a system activated by buttons controlling the collapse of the electric power, of the whole compression and distribution plant, with the consequent closure of the automatic interception valves for the line of the gas supply to main compression groups and dispenser supply lines at the button of the buildup with a capacity exceeding 50 cubic meters.

The emergency buttons (red with mushroom shapes) must be at least No. 3 and located respectively:

- On the supply plant
- In the owner office
- Near the compression plant



Control the emergency system in case of fire or smoke, breakage with gas leakage or strong suspected noises.

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Figure 5 - Emergency button

Manual valves of interception and unloading

On the plant there are manually operated valves for the interception of the lines and disloading into the atmosphere to be used for depressurization in case of maintenance, among these there are the valves **required by DM 28-06-2002 to operate also in case of emergencies** that are identified by special labels:

- - Interception supply line compression groups
- - Drain supply line compression groups
- - Interception of gas adducting lines to distribution equipments
- - Drain of adducting lines to distribution equipment

In case of fire or smoke, breakage with gas leakage or suspicious strong noises in the technology offices or on the distribution place, **after** having pushed one of the emergency button intercept and download the lines manipulating the above valves .

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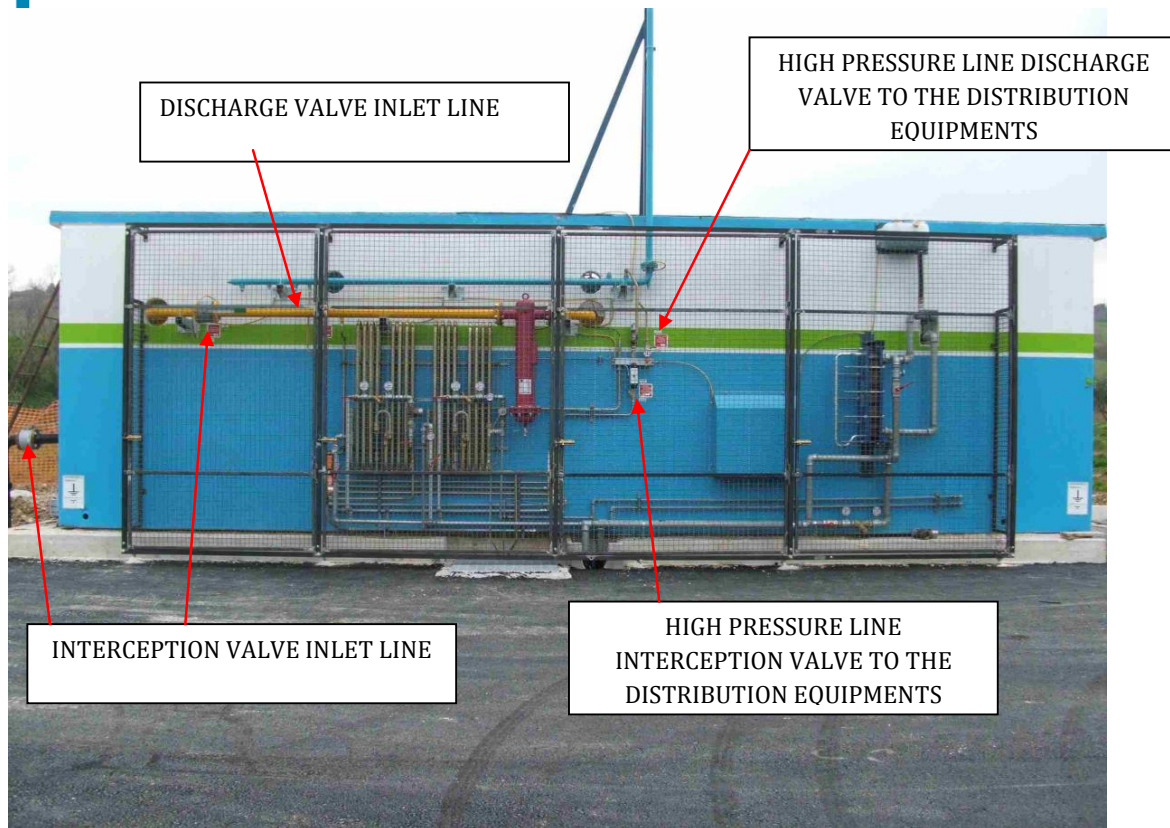
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Figure 6 - A- Interception and unloading manual valves

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HIGH PRESSURE LINE DISCHARGE
VALVE TO THE DISTRIBUTION
EQUIPMENTS

Figure 7 - B - Interception and unloading manual valves

HIGH PRESSURE LINE
INTERCEPTION VALVE TO THE
DISTRIBUTION EQUIPMENTS

**FIRE - FIGHTING EQUIPMENTS**

On the plant there must be adequate fire fighting equipment (portable fire extinguishers / trolley) in quantity and type as required by the project approved by the local command of the Fire Brigade. It must be always ensured the access to this equipment, and must be periodically checked the charge status on each of these apparatus.

These equipments should be used in case of beginning of fire if, the conditions, allow the intervention without risk of damage to health, if not, **immediately call the phone number of emergency fire VV.FF.**

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4 INSTALLATION

4.1 SHIPPING - HANDLING

Shipping means

The goods are packed in a way that allows them to be shipped either via sea or ground. In particular, the goods can be shipped in the manners indicated below.

- **Via sea:** packing for sea, stows or bridge in containers.
- **Via ground:** packing for truck, train in containers.

Follow the directions given below to keep the package and its content in good condition.

Environmental requirements for shipping and storage

Observe the environmental requirements given below:

- Temperature within range of -10 to 50 °C.
- Maximum humidity not higher than 85%.
- Do not let the package get wet.
- Do not shake or bang the package.

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4.2 PACKING

Packing in crates

The goods are packed in a wooden crate. The compressor, cooling tower and electrical cabinet can be packed in the same crate. The latter are closed in polyethylene bags to further protect them against dust and humidity. In addition, the electrical cabinet is wrapped in pluryboal to protect it against shaking.

Lift mode

The crate can be lifted either with commercial slings or a fork lift truck. The slings are to be attached to the bottom corners of the crate that are indicated by external icons. The points where the forks are to be inserted are also indicated by icons placed on the base of the crate. Observe the following safety precautions:

- Do not lift the crate in points other than those indicated.
- Use lift equipment whose capacity is suitable for the weight given on the outside of the crate.
- Avoid banging and shaking when lifting.

Unpacking

The crate is first opened by lifting up the top panel and then taking off the side panels. The content can now be taken off the base with slings or a fork lift truck. Once removed and placed on the floor, take the goods out of the polyethylene bags.

Packing in crates for shipment by sea

Wooden crates are used as described above. Bags of hygroscopic salt are placed in the crates along with the goods. These reduce moisture and the effects the sea salt has inside the crate.

Lifting the crate

The crate can be lifted either with commercial slings or a fork lift truck. The slings are to be attached to the bottom corners of the crate that are indicated by external icons. The points where the forks are to be inserted are also indicated by icons placed on the base of the crate. Observe the following safety precautions:

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- Do not lift the crate in points other than those indicated.
- Use lift equipment whose capacity is suitable for the weight given on the outside of the crate.
- Avoid banging and shaking when lifting.

Unpacking

The crate is first opened by lifting up the top panel and then taking off the side panels. The content can now be taken off the base with slings or a fork lift truck. Once removed and placed on the floor, take the goods out of the polyethylene bags being careful not to ruin the outside surfaces.

Packing in pallet

This type of packing is usually used for the electrical cabinet. Wrapped in polyfoam and then put in a polyethylene bag, the electrical cabinet is placed on the pallet and secured to it with retainers.

Lifting

lift the pallet with a fork lift truck. the forks are to be placed on the pallet. observe the following safety precautions:

- Do not lift the pallet in points other than those indicated.
- Use lift equipment whose capacity is suitable for the weight given on the outside of the crate.
- Avoid banging and shaking when lifting.

Packing

Take the sheets of polyethylene off the goods on the pallet. Be careful not to ruin the surfaces. Use slings or a fork lift truck to lift.

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COMPRESSORS MOD. SW e ST**4.3 HOISTING****Warning!**

The supplier declines all liability regarding the condition and adequacy of the lift equipment used.

The lift equipment's capacity must be suitable for the weight to be handled.

Personnel must never pass under or near the load under any circumstances.

The seller shall not be held liable for any consequential property damage or personal injury regarding this operation which must be performed only by personnel specially trained to handle machinery.

4.3.1 COMPRESSOR UNIT

The body of the compressor can be raised, after removing all the electrical and mechanical connections, anchoring the lifting gear (chains or belts) to the four holes at the ends of the base of the structure.

Use a fork lift truck to move the compressor. Lift from the skid base.

The points where the compressor is to be picked up and lifted are also indicated by icons placed on the base. Do not place the forks in other areas.

As an alternative, run slings through the lifting eyebolts found in the 4 corners of the base's frame, as illustrated in the photograph below. These points are also pointed out by icons placed on the base.

Be extremely careful that the slings do not damage the machine when lifting.

The compressor must never be lifted using slings or hooks outside the specified lifting eyebolts. Avoid banging and shaking when lifting.

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COMPRESSORS MOD. SW e ST**LIFTING EYEBOLT/HOISTING LUGS****Figure 8 - LIFTING EYEBOLT/HOISTING LUGS**

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4.3.2 COOLING BATTERY

The following images indicative of some batteries

(For specific information see the manual lifting operation and maintenance of supplier)



Figure 9 - Cooling battery



Figure 10 - Cooling battery V shape

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4.3.3 ELECTRICAL CABINET

Attach slings to the four commercial eyebolts shown in the photograph to lift the electrical cabinet. Screw the eyebolts completely in the threading present in the four corners at the top of the cabinet.

As an alternative, lift with a fork lift truck or hand truck, placing the electrical cabinet on a pallet.

Never lift in a manner different from that described above.

Avoid banging and shaking when lifting.

Below an image indicative of an electrical panel

(For specific information see the manual lifting operation and maintenance of supplier)



Figure 11 - Electrical panel

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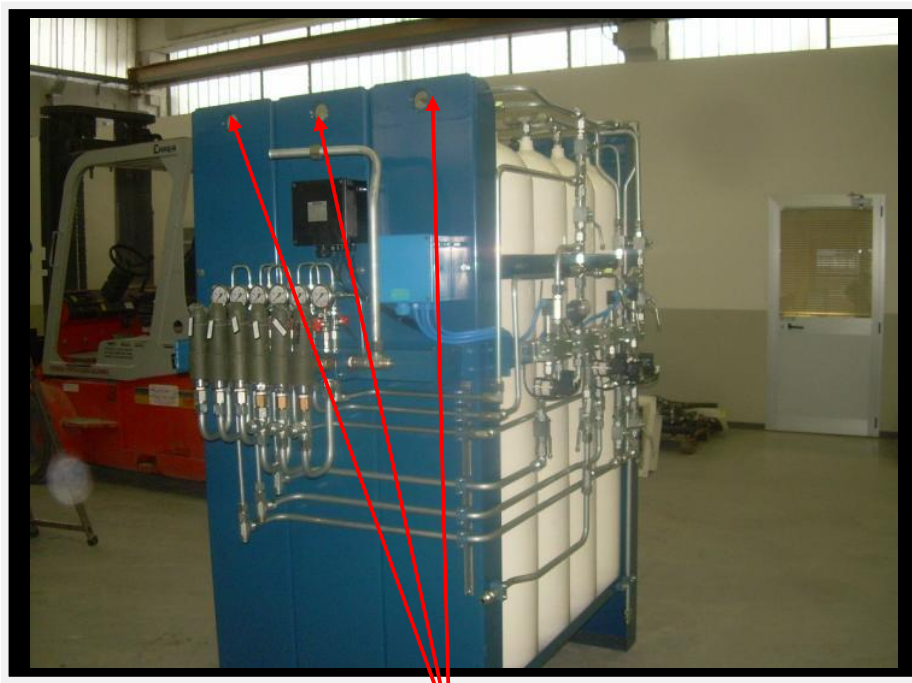
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COMPRESSORS MOD. SW e ST**4.3.4 STORAGE CYLINDERS**

If present, the storage unit.

Lift and handle the cylinder pack by fixing slings to the hoisting rings available on the 4 corners at the top of the metal casing, as shown.

Make sure not to damage the cylinder pack in the operation. It is not allowed to lift the cylinder pack by fixing slings or hooks to any part other than the specified rings. Avoid shocks and vibrations while lifting the cab.



Compressor Lifting eyebolts/ hoisting lugs

Figure 12 - Compressor Lifting eyebolts/ hoisting lugs

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4.3.5 CONTAINER

If present for specific information see the manual "COMPRESSION UNIT HOISTING, MOVING AND POSITIONING"

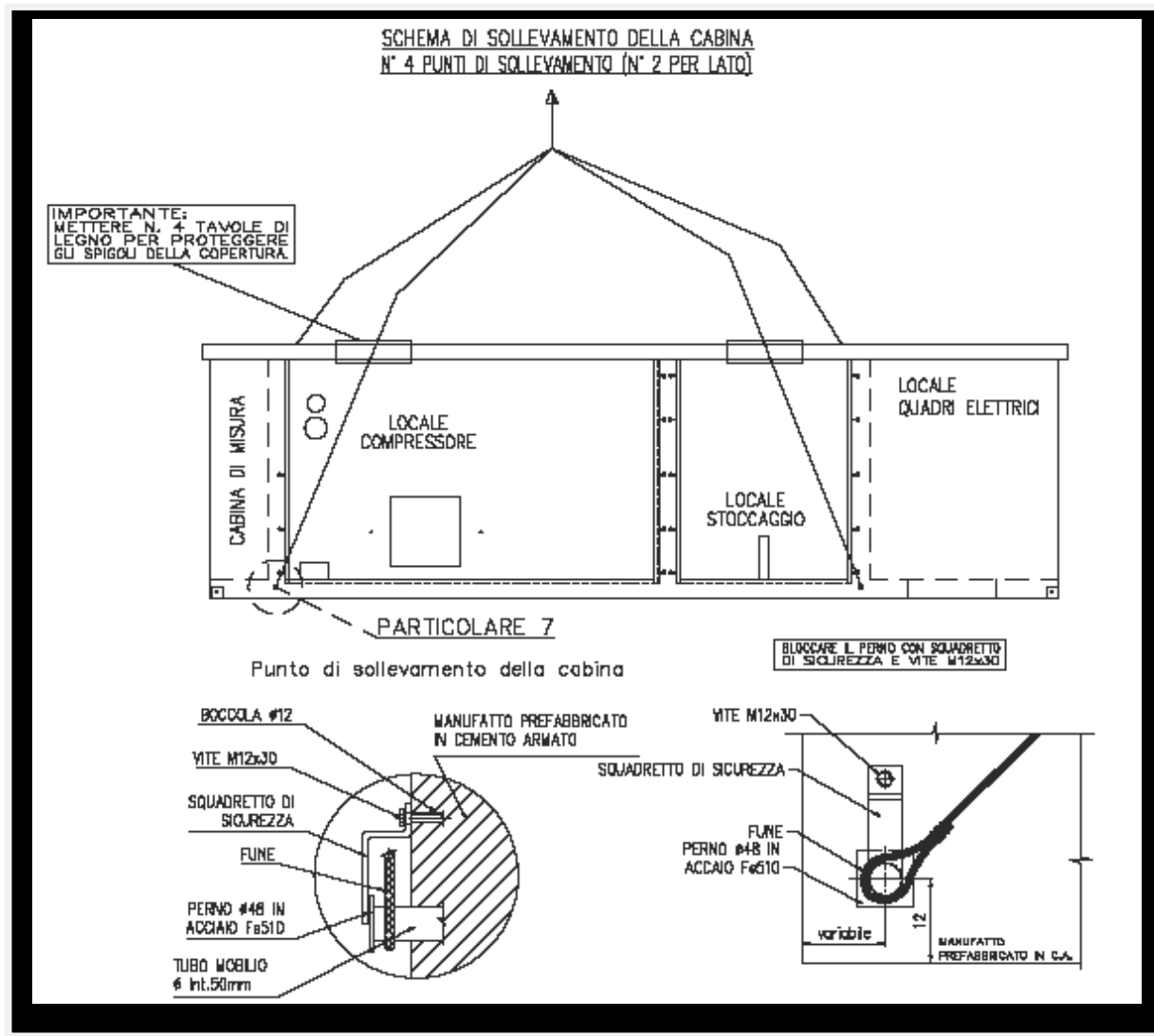


Figure 13 - Reinforced concrete container

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Here are some pictures indicative of lifting:



Figure 15 - Container hoisting example with forklift use



Figure 14 - Reinforced concrete hoisting example with crane



Figure 16 - Container hoisting and moving during delivery operation

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4.4 POSITIONING

4.4.1 COMPRESSION UNIT POSITIONING

See the instructions given in the specific manual **“HOISTING, MOVING AND POSITIONING THE COMPRESSION UNIT”**.

4.4.2 FOUNDATIONS SPECIFICATIONS

See the instructions given in the specific manual **“HOISTING, MOVING AND POSITIONING THE COMPRESSION UNIT”**.

4.4.3 COMPRESSOR POSITIONING

If not included in the supply order is recommended to place the compressor on No. 4 anti-vibration spring, that are located at the 4 corners of the compressor, in order to dissipate the vibrations generated by the machine itself, and arrange the use of flexible hoses for the connections of the compressor skid.

On the base plate of the vibration-mounting supports there are n ° 2 fixing holes of Ø 11, while the top plate is equipped with threaded holes M12. To fix the vibration-mounting supports to the base is recommended to use two hex head screws M8x30mm, and to secure the vibration-mounting supports to the compressor is recommended to use a hex screw M12x40mm.

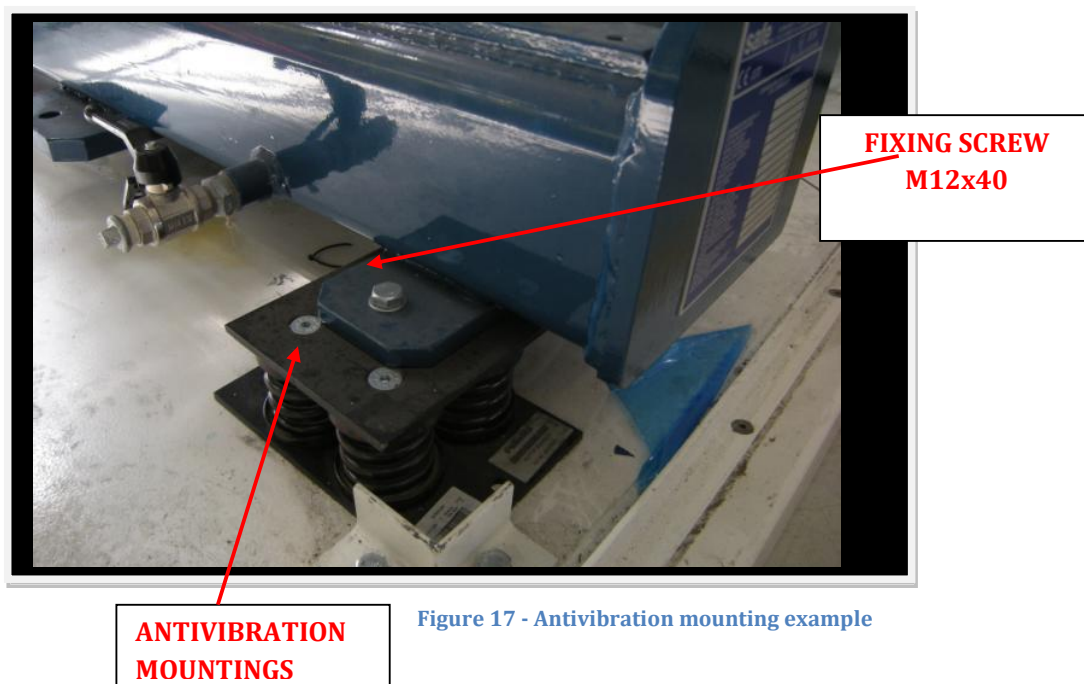


Figure 17 - Antivibration mounting example

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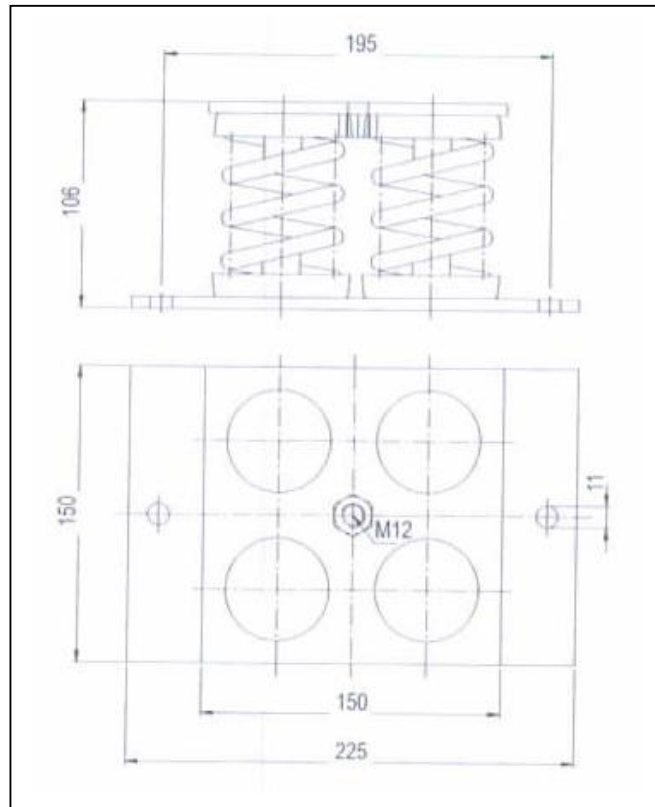
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Figure 18 - Antivibration mounting details

4.5 INSTALLING AND CONNECTING

4.5.1 COMPRESSOR UNIT

Connect by following the instructions given or reported in the specific LAYOUT of the compressor/plant.

Make sure to correctly tighten the connections for the water, hemp or teflon fittings with plumber paste in order to assure perfect sealing.

Note: The gas pipelines need to be flushed with gas before starting up the system. In addition, make sure the supply line has been efficiently bled.

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SEE DRAWINGS ATTACHED TO THE MANUAL as shown in the table below

CONNECTION	DRAWING
Gas intake	See GAS DRAWINGS
High line gas delivery	See GAS DRAWINGS
Medium line gas delivery	See GAS DRAWINGS
Low line gas delivery	See GAS DRAWINGS
Instrument air	See GAS DRAWINGS
Vent	See GAS DRAWING
Water inlet	See WATER DRAWING
Water outlet	See WATER DRAWING
Electric	See ELECTRICS DRAWING

* Here are some technical notes for the correct assembly of flexible metal hoses.

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TECHNICAL NOTES FOR THE CORRECT ASSEMBLY OF FLEXIBLE METAL HOSES

For proper installation is essential to avoid common mistakes. Here are some of the most common examples, provide a an alternative solution.

WRONG	CORRECT	WRONG	CORRECT

For the pipes that are moving during the compressor operation, observe the installation requirements, using where necessary fittings at 90 ° to avoid excessive loads in proximity of the weld to the fitting (connection) which become causes of breakage.

WRONG	CORRECT	WRONG	CORRECT

During the tightening of the fitting, lock the hose in order to prevent the torsion.

It is recommended to avoid twisting of the hose, during unrolling, but proceed as above indicated.

WRONG	CORRECT	WRONG	CORRECT

For proper installation, verify that the attachment points of the pipes do not have different inclinations, as it would create a tube twisting when under pressure.

Avoid bending angles that are too close, that prejudice the hose life. Check inside the catalog the minimum radius of curvature.

WRONG	CORRECT	WRONG	CORRECT

Other applications

Other applications

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4.6 HOOKING UP THE MACHINE PRIOR TO START UP

1. Connect to the mains air

**Warning:**

SEE AIR COMPRESSOR MANUAL.

**Warning:**

A qualified technician should perform this operation in compliance with the safety rules and standards currently in force.

The following operations need to be carried out to put the air circuit into operation:

The description given below refers to the drawings in the air compressor's manual.

Positioning.

Installation

Start up.

Safety devices.

Adjusting the operating pressure.

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2. Hooking up the machine to the mains

**Warning:**

The layouts of the electrical cabinet and push buttons are given in the control panel manual and in electric board scheme L-000XXXX.

**Warning:**

A qualified technician should perform this operation in compliance with current SAFETY STANDARDS.

Before hooking up to the mains MAKE SURE that:

- 1- The protective ground is efficient and effective.
- 2- The mains voltage (V) and frequency (Hz) correspond to those given on the manufacturer's nameplate.
- 3- Electrical power is shut off when the connections are made.

Hook up operations:

Instructions for installing the power panel are shown in the control panel manual and in his electric board scheme L-000XXXX.

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5 SET UP

5.1 INITIAL SET UP

The system has been factory tested. If damage, that may adversely effect correct operation, occurred during shipment, locate the damaged parts to avoid starting up the machines under irregular conditions.



Warning:

The machines can be started up the first time only by SAFE personnel or personnel duly authorized by SAFE.



Warning:

If parts have been altered or damaged, contact our after-sales service offices.

General information

If the operations listed up to this point have been completed, the machine is ready to be put into operation (start up).



Warning:

The operator must carefully read and become familiar with the instructions in order to properly operate the machine.

If in doubt, contact the offices in question.

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6 USE

6.1 LIST OF CONTROLS AND INSTRUMENTATION

The layout of the electrical cabinet and push buttons is given in the control panel manual.

**Warning:**

The operator running the machine must be duly qualified to do so.

**Warning:**

The operator must not perform any control or maintenance operations that need to be carried out by specialized personnel.

The operations to run the machine (start up – adjustment - shutdown) are performed from the electrical cabinet.

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6.2 START UP**6.2.1 FIRST START UP****Warning:**

The machine must be started up the first time only by **SAFE** personnel or personnel authorized by **SAFE**.

The following materials are needed for start-up of Safe compressors :

Required materials:

- Lubricating Oil (for the type of oil to be used see Maintenance section)
- Ethylene Glycol
- Water
- 8-10 bar compressed air supply
- Electrical power supply line with adequate power
- Pipeline natural gas supply connection and metering station
- Telephone line or GSM wireless network coverage for remote line assistance (optional)

**Warning:**

THE PRELIMINARY OPERATIONS DESCRIBED IN THIS CHAPTER SHALL BE PERFORMED WITH THE ELECTRICAL CONTROL PANEL TURNED **OFF** AND IN ABSENCE OF POWER SUPPLY OF ANY KIND.

1. Fill up the compressor body oil tank with the proper oil type (Shell Corena P68 or P100) up to the required level.
2. Open the air relief valves located right on top of the compressor in order to allow release of air from the compressor cooling circuit to the atmosphere upon filling up with fluid of the water cooling circuit.
3. Fill the compressor water cooling circuit by pouring a mix of demineralized water and ethylene glycol (antifreeze) into the plastic water tank located above the water-air cooling battery up till when the entire circuit is filled and water-glycol fluid is detected up to the level shown on the plastic water tank. A glycol percentage of 30% warrants protection from freezing in standard climate conditions. A glycol percentage of 50% warrants protection from freezing up to temperatures of -30°C (Celsius degrees). To a table specifies see the cooling manual.

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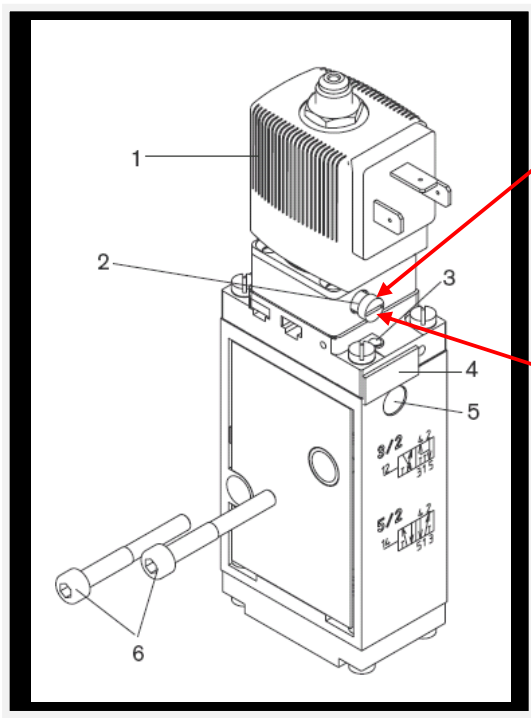
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4. Check that the water-glycol mix is up to the level shown on the plastic tank above the air cooling battery
5. Discharge the gas suction pipe by disconnecting it from the compressor body and releasing air into the atmosphere if necessary. Then reconnect the gas suction pipe to the compressor body.
6. Open VERY SLOWLY the gas supply line to the compressor and verify presence of eventual leaks on the first stage of the compressor body.
7. Open up the compressed air line so that compressed air flows to the pneumatic valves
8. Operate manually the solenoid valves on the compressor body by setting the red lever, located between the valve casing and the valve coil, in the upright position. Listen for the noise caused by gas flowing through the valves and when the noise ends switch the red lever back in the horizontal position.

**Figure 19 - Solenoid valve details**

9. Power up the electrical control panel by turning the panel switch to the ON position and wait till the PLC display is lightened up.

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- A. Press Reset and check on the PLC display if any alarm event has been triggered
- B. Upon appearance of alarms on the electrical control panel PLC display, check for the related causes and perform corrective actions as reported in the following tables (main alarm event list).

Alarm Event	Possible causes	Corrective action
Low suction pressure	A – low pressure in suction gas pipeline B – valves closed in inlet gas pipeline C – clogged filters in inlet gas pipeline D – Damaged gas pressure transducer E – Faulty gas pressure transducer electrical connection F – Faulty electrical panel analog barrier	A – Check gas pipeline inlet pressure B – Check proper operation of pneumatic actuators on the inlet gas line. Check that no manual valves on the inlet line are closed C – Check status of filters in the gas inlet line D – Verify that control panel reading is the same as the transducer one E – Verify that electrical connections are properly tightened F – Verify that the analog barrier is turned ON
High suction pressure	High pressure in suction gas pipeline	Check effective suction pressure on the gas pipeline
High 1 st stage pressure	A – Damaged inlet or outlet valves of the 2 nd stage B – Faulty electrical connection on the gas inlet line C – Faulty analog barrier inside the control panel D – Interstage valves not opening E – High inlet gas pressure	A – Check for presence of impurities or damage to valve plates B – Verify that electrical connections are properly tightened C – Verify that the analog barrier is turned ON D – Verify that interstage pneumatic actuators work properly E – Check pipeline inlet gas pressure
High 2 nd stage pressure	A – Damaged inlet or outlet valves of the 3 rd stage B – Faulty electrical connection on the transducer C – Faulty analog barrier inside the control panel D – Interstage valves not opening	A – Check for presence of impurities or damage to valve plates B – Verify that electrical connections are properly tightened C – Verify that the analog barrier is turned ON D – Verify that interstage pneumatic actuators work properly

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Alarm Event	Possible causes	Corrective action
High 3 rd stage pressure	A – Faulty analog barrier inside the control panel B – Interstage valves not opening	A – Verify that the analog barrier is turned ON B – Verify that interstage pneumatic actuators work properly
Low pressure Cooling water	A – presence of air inside the water circuit B – Lack of sufficient water inside the circuit C – Faulty water pressure transducer D – Faulty electrical connections on the inlet line pressure transducer E – Faulty electrical panel analog barrier F – Pump rotation in wrong direction G – insufficient pump speed (rpm) H – Water pump disconnected	A – Bleed air from proper air out valve on the compressor skid B – Verify fluid level inside the plastic water expansion tank (it should be around half tank level) C – Verify that the value shown on the control panel PLC display is equal to the one measured near the transducer D - Verify that electrical connections are properly tightened E – Verify that the analog barrier is turned ON F – Check rotation direction of pump motor G – check rpm, current absorption of pump electric motor and cable connection. H – Check water pump cabling connections
Low oil level	A – Lack of sufficient oil in the compressor crankcase B - Gauge failure C – Faulty electrical connections on the inlet line pressure transducer D – Faulty digital barrier inside the electrical control panel	A – Verify oil level B – Verify with tester that the gauge level works properly C – Verify that electrical connections are properly tightened D – Verify that the barrier is turned on
Low pressure instrument air	A – Low air pressure in the pneumatic circuit B – Faulty electrical connections of the inlet line pressure transducer C – Faulty digital barrier inside the electrical control panel D – Broken air pressure switch	A – Verify that air compressor is on and that no valves on the pneumatic line are closed B – Verify that electrical connections are properly tightened C – Verify that the digital barrier is turned ON D – Verify working status of pressure switch with tester

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Alarm Event	Possible causes	Corrective action
High oil temperature alarm	A – High oil temperature in the compressor crankcase B – Faulty oil temperature control thermocouple C – Faulty thermocouple electrical connection D – Faulty digital barrier inside the electrical control panel E – Clogged oil heat exchanger F – Possible mechanical problems on compressor body G – Faulty temperature switch for the fan motor	A – Verify oil temperature B – Verify that value appearing on control panel PLC display is equal to the one measured near the thermocouple C – Verify that electrical connections are properly tightened D – Verify that the digital barrier is turned ON E – Verify inlet and outlet oil and water heat exchanger temperatures F – Check that all parts in motion are properly moving G - Check if the temperature switch (position TSH31-Drawing I0000...) is working good and give the fan motor start on time.
High cooling fluid alarm	A – High cooling fluid temperature B – Faulty cooling fluid thermocouple C – Faulty electrical connections on cooling fluid thermocouple D – Faulty electrical panel analog barrier E – Clogged cooling fluid circuit F – Broken water-Air heat exchanger fan or wrong rotation direction of the same	A – Check cooling fluid temperature B – Verify that the value shown on the control panel PLC display is equal to the one measured near the thermocouple C - Verify that electrical connections are properly tightened D – Verify that the analog/digital barrier is turned ON E – Verify water-air heat exchanger inlet and outlet temperatures F – Verify that fan operates properly and rotates in the right direction
Auxiliary motor overload	A – Faulty motor B - Faulty motor electrical connections C – Faulty control panel motor starter D – Faulty control panel relay	A – Verify motor windings with tester B – Verify that electrical connections are properly tightened C – Verify motor starter for eventual damage D – Verify relay for eventual damage
Compressor motor overload	A – Faulty motor B - Faulty motor electrical connections C – Faulty control panel motor starter D – Faulty control panel relay	A – Verify motor windings with tester B – Verify that electrical connections are properly tightened C – Verify motor starter for eventual damage

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Alarm Event	Possible causes	Corrective action
Clogged Lubrication or Maintenance Oil filters	A – Presence of impurities inside filter B – Faulty electrical indicator C – Faulty indicator electrical connection D – Faulty analog barrier inside the electrical control panel	A – Verify oil filter B – Verify with tester that indicator works properly C – Verify that electrical connections are properly tightened D – Verify that the analog/digital barrier is turned ON
High 1-2-3 motor winding temperature alarm	A – Faulty motor B – Bad fixing of motor power electrical connections C – Faulty thermocouple electrical connection D – Faulty analog barrier inside the electrical control panel	A – Verify motor windings with tester B – Verify that electrical connections are properly tightened C – Verify that electrical connections are properly tightened D – Verify that the analog/digital barrier is turned ON
High DE-WDE (NDE) bearing temperature alarm	A – Damaged bearings B – Lack of greasing to motor bearings C – Faulty thermocouple electrical connection D – Faulty analog barrier inside the electrical control panel	A – Verify motor bearings B – Verify that bearings have been greased in accordance with motor manufacturer's instructions C – Verify that electrical connections are properly tightened D – Verify that the analog/digital barrier is turned ON
High pressure alarm	A – Closed pneumatic or manual valves on outlet lines B – Faulty transducer electrical connection C – Faulty analog barrier inside the electrical control panel	A – Verify presence of closed manual valves on outlet lines and verify that pneumatic valves operate correctly B – Verify that electrical connections are properly tightened C – Verify that the analog/digital barrier is turned ON
High first/second stage temperature	A – Damaged inlet/outlet valves of the subsequent stage B – Gas heat exchanger clogged C – Faulty thermocouple electrical connections D – Faulty analog barrier inside the electrical control panel	A – Verify presence of dirt on valve plates and absence of damage to the same B – Verify inlet and outlet heat exchanger temperatures C – Verify that electrical connections are properly tightened D – Verify that the analog/digital barrier is turned ON

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Alarm Event	Possible causes	Corrective action
Low lubrication oil pressure	A – Presence of dirt in the lubrication pressure regulating valve B – Damage to oil pump C – Broken motor-oil pump joint D – Faulty transducer electrical connections E – Faulty analog barrier inside the electrical control panel	A – Verify presence of dirt within regulating valve B – Check oil pump C – Verify motor rotation in absence of load D – Verify that electrical connections are properly tightened E – Verify that the analog/digital barrier is turned ON
Power supply voltage alarm	A – Bad tightening of electrical power connections B – Insufficient cable size for electrical control panel power supply C – Insufficient transformer size in station electrical substation D – Faulty grid voltage indicator E – Faulty digital barrier inside the electrical control panel	A – Verify that electrical connections are properly tightened B – Verify compressor adsorption current during operation cycle C – Verify compressor adsorption current during operation cycle D – Verify indicator operation with tester E – Verify that the analog/digital barrier is turned ON
Vibration alarm	A – Badly positioned/unbalanced compressor skid B – Faulty vibration sensor C – Faulty vibration sensor electrical connection D – Faulty analog barrier inside the electrical control panel	A – Verify pavement levelling and unevenness. Verify that all skid bolts/spring dampeners are properly in touch with the pavement B – Verify vibration sensor operation C – Verify that electrical connections are properly tightened D – Verify that the analog/digital barrier is turned ON
Anomaly softstart (only for softstart equipped compressors)	A – Faulty soft start electrical device B – Wrong compressor motor connections C – Insufficient cable size for electrical control panel power supply D – Insufficient transformer size in station electrical substation E – Faulty digital barrier inside the electrical control panel F – Faulty motor G – Compressor bypass valve lifters not working	A – Verify type of alarm on electrical control panel PLC display B – Verify that motor is delta connected C – Verify that grid voltage does not incur into significant drops upon compressor start D – Verify that grid voltage does not incur into significant drops upon compressor start E – Verify that the analog/digital barrier is turned ON F – Verify motor windings with tester G – Verify valve lifter operation with compressor stopped
Electric resistance overcharge alarm (Dryer)	A – Faulty electric heater resistance	A – Verify resistance and eliminate fault

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Alarm Event	Possible causes	Corrective action
Emergency alarm button pressed (Dryer)	A – Pressing of emergency alarm button	A – Verify causes for emergency alarm button pressing
Hydraulic compressor motor overheating (Dryer)	A – Compressor motor thermostat not enabled	A – Enable compressor motor thermostat
Hydraulic compressor oil overheating alarm (excessive temperature) (Dryer)	A – Oil overheating (oil temperature above threshold value)	A – Verify causes for oil overheating
Hydraulic compressor low oil level alarm (Dryer)	A – Low oil level	A – Alarm vanishes upon startup of hydraulic compressor indicating low oil level

- C. After identification of the alarm event and verification and solution of the same start up the compressor by pressing the ACK key on the PLC keyboard and then reset the alarm by pressing the ALARM RESET yellow key located on the electrical control panel front.

Upon performance of troubleshooting operations consider that all alarm contacts are CLOSED in standard operational conditions and therefore if only one wire is not properly tightened to its seat an alarm will be displayed by the PLC.

If no alarms have been triggered, press F2 (or F8 for three line compressors) on the PLC keyboard to enter the parameter display page. Press the DOWN arrow to scroll through the compressor parameters detected by the sensors installed on the compressor skid. Check that readings from all sensors are displayed. In case the display shows three asterisks (***) then verify immediately the sensor connection, remembering that being all analogue inputs polarized the plus (+) and minus (-) pole connections must be strictly respected.

Press F7 on the PLC keyboard to gain access to manual control of auxiliary motors. To manually start an auxiliary motor press MOD and using the DOWN arrow key change the relevant setting to ON. Press MOD again in order to change line.

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Perform the following checks :

- Oil pump rotation direction must be clockwise overlooking the motor from the fan located in the back
- Water pump rotation direction must be the same as the one reported by the arrow on the pump casing
- Rotation direction of radiator fans (The radiator fan thermostat contact **MUST BE CLOSED** and the rotation sense must be such as to **EXTRACT** air from the radiator)

Operate manually the water pump for all the time needed to bleed the air from the cooling circuit using the relief valves located on the compressor skid and pouring the cooling fluid (i.e. water-glycol mixture) in the plastic water tank located above the water-air radiator (heat exchanger) whenever needed to refill the circuit from air removed from the cooling circuit.

Upon stabilization of the cooling fluid pressure, check the pressure inside the cooling circuit by pressing F2 on the PLC keyboard on the parameter display page. The value read by the PLC display shall be higher than 1 bar. In case the value shown on the display is lower than 1 bar then it is necessary to choke the pressure by **PARTIALLY** shutting the compressor's cooling fluid **OUTLET** tap off until a water pressure value of 1,2 to 1,5 bar is shown on the PLC display.

Check and make sure that all manual valves located on the suction and delivery lines of the compressor are open.

Press **START** on the compressor and check the direction of rotation of the compressor (clockwise from the fan side of the motor).

**Warning:**

THE STARTUP PHASE IS THE MOST DELICATE PROCESS AND REQUIRES PRESENCE OF AT LEAST THREE PERSONS REQUIRED FOR PERFORMING CHECKS SIMULTANEOUSLY AND KEEPING A FINGER READY TO PRESS THE STOP PUSH BUTTON.

Press the start button on the compressor skid and check the compressor motor rotation direction which must be **COUNTERCLOCKWISE** overlooking the compressor motor from the motor fan side. An electrician shall be available at site in order to check proper cable connections and startup operation of the compressor motor which uses a Star/Delta motor starting connection.

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Upon startup of the compressor for the first time watch carefully the readings of manometers on inter-stage pressures and control that they do not rise suddenly. In case a sudden rise is detected check the opening of the air valves between the various compressor stages.

If no inconvenients have been detected during startup then simply proceed to set the pressures of the filling lines versus the storage and the dispensers on the PLC display. While the compressor is running check and set the temperatures, set the radiator fan thermostats and check the voltage and current values of the electric motors to verify operation within specifications.

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COMPRESSORS MOD. SW e ST**6.2.2 START UP DAILY**

1. Make sure the intake pressure matches the rated value.
2. Make certain the compressor is in the correct position and properly installed.
3. Make sure the compressor is aligned with the motor.
4. Before attempting to start up, check the oil level on the sight gauge
5. Before attempting to start up, check the water level in the cooling tower tank.
6. Before starting check that the compressor air is working.
7. Verify that all the safety devices are perfectly connected and operative.
8. Check operation of all of the lights electrical system.
9. Verify that all the indicator lights in the electric system work properly.
10. Press the Run command (START / CYCLE), placed on the dial on the machine. (Check the correct direction of rotation of electric motors, which when viewed from behind should turn counterclockwise.)

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COMPRESSORS MOD. SW e ST**6.2.3 MACHINE SHUTDOWN****Warning:**

Never suddenly turn the main switch to **OFF** during regular compressor operation.

The compressor may shutdown for the following reasons:

1. CYCLE STOPPED

The compressor automatically stops running when storage has reached the maximum filling pressure and no motor vehicles are connected to the dispenser.

The compressor automatically restarts if the pressure in the storage systems drops below the threshold for compressor start up (set via software).

2. SHUTDOWN ALARM (PSD)

The compressor automatically stops running when a trouble arises during operation for example “high gas temperature”, “low oil level” etc...

- Read the fault message shown on the electrical cabinet display.
- Remedy the fault and restore regular operating conditions (consult the specific manual that deals with the electric system).
- Press the “RESET” button located on the electrical cabinet to clear the fault message.
- Press the green “START” push button located on the panel on the skid side of the compressor.

The compressor can now restart.

3. EMERGENCY SHUTDOWN (ESD)

In the event of an emergency caused by dangerous situations that suddenly arose, press the red emergency stop button (“mushroom-head” that cuts off power to the auxiliary equipment) located on the electrical cabinet or, as an alternative, any push button that shuts off electrical power to the entire system.

- Remedy the fault and restore regular operating conditions.
- If the red emergency stop button on the electrical cabinet was pressed, pull it out to rearm so that electrical power is delivered to the entire compressor again.
- Press the “RESET” button.
- Press the green “START” push button located on the panel on the skid side of the compressor.

The compressor can now restart.

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Restarting

To restart the compressor after an emergency shutdown or shutdown due to an alarm, once the operations given at steps 2 and 3 above have been completed, go to the compressor room.

Make sure all the safety precautions listed in SECTION 03 of the manual are satisfied and that no one is in the room.

Press the start button located on the panel on-board the machine. The compressor has now been started up.

Close and lock the compressor room o,r in any case, make sure no one can enter it and give the keys to the plant supervisor.

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7 MAINTENANCE

7.1 FOREWORD

Maintenance includes all the jobs performed to keep the equipment efficient or restore correct operation. It is broken down into:

- routine (scheduled) : to be carried out by personnel in charge of the system including jobs performed according to a certain schedule;
- special : all other jobs that must always be performed by Safe qualified personnel or personnel duly authorized by Safe.

To assure top compressor performance, personnel responsible for machine operation and maintenance must carefully follow the recommended maintenance schedules and perform the jobs in the specified manners. If these instructions are followed, the machine's service life will comply to the essential requirements of Standard API 618.

The operators should be given maintenance records where they can write down the jobs done, the problems that caused them and the number of operating hours at which they occurred for all operations. This will allow us to understand how each machine part acts in greater detail helping use considerably in drawing up a preventative maintenance schedule.

The time intervals recommended in the Preventative Maintenance Schedule are approximate and may be changed based on the results obtained after inspecting parts and experience in machine operation.

It is of fundamental importance that the system user makes all the scheduled checks given in this chapter, performing the jobs required to bring the values within the allowable range.

The log should be used to record all the jobs done, indicating:

- Date of job
- Hours compressor has operated
- Jobs carried out and reason
- Remarks
- Signature of person who did the job

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7.2 GENERAL WARNING S

**Warning:**

Before attempting to perform any type of maintenance job:

1. Carefully read the operating instructions and sections contained in this manual.
2. Shut off the machine.
3. Carefully read all the safety signs provided in the plant.
4. Turn the electrical cabinet main switch to position OFF.
5. Post sign 'MAINTENANCE IN PROGRESS DO NOT ACTIVATE'.
6. Use original spare parts.
7. Use only suitable tools in good condition.
8. Keep the area thoroughly clean.
9. Keep dangerous flammable substances away from the plant.
10. Perform the checks and maintenance jobs at the specified intervals.
11. Carefully follow good work place practises.
12. If in doubt, contact our offices for further information.

**Warning:**

Do not perform any type of maintenance while the compressor is running.

1. Observe the safety precautions listed below whenever performing **routine maintenance and special repairs:**
 - a) Press the STOP' button
 - b) Shut off the electrical cabinets.
 - c) Lock the electrical cabinets. The maintenance worker must keep the keys. If doors are not provided, hang a clearly visible sign that says: "MAINTENANCE IN PROGRESS DO NOT ACTIVATE"(kit to be supplied)
 - d) Before attempting to start any kind of job, wait at least 30 minutes from when the compressor was shut off.
 - e) Close the valves on the intake and delivery lines.
 - f) Open the valves of the separators and other drain and gas vent valves (if present) to verify no pressurized gas is left in the compressor. Take all the necessary safety precautions to prevent the gas from accidentally being put under pressure again.

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- a) Check the pressure gauges and perform maintenance only if the pressure inside equals the atmospheric pressure.
2. To remove and assemble the various parts, refer to the relative drawings and pay attention to the numbers and letters stamped on the components and their position.

3. Be careful not to damage and scratch the machined parts, in particular moving parts: gaskets, pads, rods and pistons, jackets.

4. The compressor works with flammable gas. Before starting any maintenance, disconnect it from the process pipelines in a safe manner (using blind flanges or plugs or double shut off cocks, etc...).

5. Extremely dangerous situations may arise if the valves are incorrectly installed in a compressor cylinder. Carefully follow the recommendations given in the Operating Instructions manual when performing maintenance operations on the valves.

6. After each maintenance job performed on the compressor, carry out a complete cycle by working on the motor-compressor coupler manually to verify there are no mechanical obstructions.

7. After each emergency shutdown due to a fault or to carry out routine maintenance or special repairs, at start up make sure the main electric motor runs in the right direction, as indicated on the sticker attached to it.

8. The maintenance operations and procedures along with the basic safety rules and precautions must be reviewed with technical personnel and maintenance workers on a regular basis.

After completing each job, proceed as follows :

Before closing or putting panels, covers, guards or other parts of the system back in place, make certain no tools or spare parts have been left inside the machine.

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COMPRESSORS MOD. SW e ST**7.3 MAINTENANCE SCHEDULE****7.3.1 PREVENTATIVE MAINTENANCE SCHEDULE****1) DAILY CHECKS**

- a) Gas pressure (intake - interstage - delivery)
- b) Oil pressure
- c) Compressor lubricating oil level
- d) Compressor coolant level
- e) Check for gas and oil leaks
- f) Test operation of electrical cabinet indicator lights
- g) Empty "separators / dampers" present in the compressor discharge. Repeat the task even two or three times a day if the gas is very humid.

2) WEEKLY CHECKS

- a) Empty the "separators/dampers" present on the compressor delivery line making sure that no more than 8 liters of oil are used every 100 hours of operation.
- b) Let the condensate out of the air compressor tank.

3) MONTHLY CHECKS

- a) Verify the fittings in the entire circuit do not leak.
- b) Check efficiency of emergency shutdown function "ESD" (press the red button to cut off power to the entire compressor).
- c) Make sure the screws for the compressor's flexible coupler and covers of the pumping cylinders are tightened to the correct torque.
- d) The pressurized equipment must undergo the checks and inspections established by current local standards/regulations which the user must refer to. In addition to complying to these regulations, the operating conditions should be checked and visual checks should be made as additional safety measures.

4) QUARTERLY CHECKS

- a) Check vibration of the body and skid vibrato.
- b) Check vibration of the valve cover.
- c) Drive and electric motors.
- d) Verify belts are tight and check wear and tear (if present).

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- a) Check settings of instruments.
- b) Check accuracy of pressure gauges - make certain the pressure gauge and relative pressure transducer read the same pressure – (if no transducer reads the same pressure as the pressure gauge or the instruments read two different values, use a sample pressure gauge with lower divisions/graduated scale).
- c) Check accuracy of thermometers (use a sample thermometer).
- d) Check process shutdown sequence (PSD).
- e) Check actuators and valves.

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7.3.2 ROUTINE MAINTENANCE CHART COMPRESSOR ST E SW

The checks and operations that need to be performed periodically (**HOURS OF OPERATION**) on the compressor body and accessories are listed in the chart below:

N°	HOURS OF OPERATIONS	DESCRIPTION	MAINTENANCE JOB	PART TO BE CHANGED
5.a	100	Gas filter	* For the first 500 hours of CNG station operation check the presence of particulate inside the filter cartridge.	Eventually proceed with the gas filter cartridge replacement.
5.a	500	Gas filter	*Check the presence of particulate inside the filter cartridge. If is dirt proceed with the filter cartridge replacement.	Eventually proceed with the gas filter cartridge replacement.
5.a	500	<u>Lubrication:</u> Oil filter	* Check for metal particles in the oil filter	
10.a	1000	<u>Lubrication:</u> Oil filter	* Check for metal particles in the oil filter	
15.a	1500	<u>Lubrication:</u> Oil filter	* Check for metal particles in the oil filter	
20.a	2000	<u>Lubrication:</u> Oil filter	* Change the oil filter cartridge * Check for metal particles in the oil filter	Cartuccia olio Lubrication e mantenimento (if present)
20.b	2000	<u>Gas circuit:</u> Gas valves	* Remove all dirt present, including carbonaceous deposits * Check the seats, rings and springs	
25.a	2500	<u>Lubrication:</u> Oil filter	* Check for metal particles in the oil filter	
30.a	3000	<u>Lubrication:</u> Oil filter	* Check for metal particles in the oil filter	
30.a	3500	<u>Lubrication:</u> Oil filter	* Check for metal particles in the oil filter	

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40.a	4000	<u>Lubrication:</u> Oil	* Change lubricating oil	Lubricating oil
40.b	4000	<u>Lubrication:</u> Oil filter	* Change the oil filter cartridge * Check for metal particles in the oil filter	Holding and oil filter cartridge
40.c	4000	<u>Gas circuit:</u> Pneumatic valves	* Change the pneumatic valve gaskets	Gasket kit for each pneumatic valve
40.d	4000	Gas filter	* Change the interstage and intake gas filter (if present)	Gas filter
40.e	4000	Gas valves	* Remove all dirt present, including carbeneous deposits * Change the parts inside the gas valves (discs and springs) to assure top machine performance * Test sealing. If leaks are found, grind the seat (change the valve after grinding it 3 times)	Kit of discs and springs for each valve
40.f	4000	Dynamic seals	* Change the dynamic seals and check the rod diameter	Dynamic seals of pistons and rods
45.a	4500	<u>Lubrication:</u> Oil filter	* Check for metal particles in the oil filter	
55.a	5000	<u>Lubrication:</u> Oil filter	* Check for metal particles in the oil filter	
55.a	5500	<u>Lubrication:</u> Oil filter	* Check for metal particles in the oil filter	
60.a	6000	<u>Lubrication:</u> Oil filter	* Change the oil filter cartridge * Check for metal particles in the oil filter	Holding and oil filter cartridge (if present)
60.b	6000	<u>Gas circuit:</u> Valvole gas	* Remove all dirt present, including carbeneous deposits * Check the seats, rings and springs	
65.a	6500	<u>Lubrication:</u> Oil filter	* Check for metal particles in the oil filter	

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70.a	7000	<u>Lubrication:</u> Oil filter	* Check for metal particles in the oil filter	
75.a	7500	<u>Lubrication:</u> Oil filter	* Check for metal particles in the oil filter	
80.a	8000	<u>Lubrication:</u> Oil	* Change lubricating oil	Lubricating oil
80.b	8000	<u>Lubrication:</u> Oil filter	* Change oil filter * Check for metal particles in the oil filter	Holding and oil filter cartridge
80.c	8000	<u>Gas circuit:</u> Pneumatic valves	* Change the pneumatic valve seals	Kit of seals for each pneumatic valve
80.d	8000	Gas filter	* Change intake and interstage gas filter	Gas filter
80.e	8000	Gas valve	* Remove all dirt present, including carbonaceous deposits * Change parts inside gas valves to assure top machine performance * Test sealing. If leaks are found, grind the seat (change the valve after grinding it 3 times)	Kit of discs and springs for each valve
80.f	8000	Dynamic seals	* Change dynamic seals and check diameter of rods	Dynamic seals of pistons and rods
80.g	8000		* Check increased vibration rate	
80.h	8000	<u>Cooling circuit</u> Cooling system	* Clean cooling circuit with a scales remover	
85.a	8500	<u>Lubrication:</u> Oil filter	* Check for metal particles in the oil filter	
90.a	9000	<u>Lubrication:</u> Oil filter	* Check for metal particles in the oil filter	
95.a	9500	<u>Lubrication:</u>	* Check for metal particles in the oil filter	

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		Oil filter		
100.a	10000	<u>Lubrication:</u> Oil filter	*Change oil filter * Check for metal particles in the oil filter	Holding and oil filter cartridge
100.b	10000	<u>Gas circuit:</u> Gas valve	* Remove all dirt present, including carbeneous deposits * Check the seats, rings and springs	
105.a	10500	<u>Lubrication:</u> Oil filter	* Check for metal particles in the oil filter	
110.a	11000	<u>Lubrication:</u> Oil filter	* Check for metal particles in the oil filter	
115.a	11500	<u>Lubrication:</u> Oil filter	* Check for metal particles in the oil filter	
120.a	12000	<u>Lubrication:</u> olio	* Change lubricating oil	Lubricating oil
120.b	12000	Oil filter	* Change oil filter * Check for metal particles in the oil filter	Holding and oil filter cartridge
120.c	12000	<u>Gas circuit:</u> Pneumatic valves	* Pneumatic valve seals	Kit of seals for each pneumatic valve
120.d	12000	Gas filter	* Change the gas intake and interstage filter cartridge	Gas filter
120.e	12000	Gas valve	* Remove all dirt present, including carbeneous deposits * Change the parts inside the gas valves (discs and springs) to assure top machine performance * Test sealing. If leaks are found, grind the seat (change the valve after grinding it 3 times)	Kit of discs and springs for each valve
120.f	12000	Dynamic seals	* Change dynamic seals and check diameter of rods	Dynamic seals of pistons and rods

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125.a	12500	<u>Lubrication:</u> Oil filter	* Check for metal particles in the oil filter	
130.a	13000	<u>Lubrication:</u> Oil filter	* Check for metal particles in the oil filter	
135.a	13500	<u>Lubrication:</u> Oil filter	* Check for metal particles in the oil filter	
140.a	14000	<u>Lubrication:</u> Oil filter	* Check for metal particles in the oil filter	
140.b	14000	<u>Gas circuit:</u> Gas valves	* Remove all dirt present, including carbeneous deposits * Check the seats, rings and springs	
145.a	14500	<u>Lubrication:</u> Oil filter	* Check for metal particles in the oil filter	
150.a	15000	<u>Lubrication:</u> Oil filter	* Check for metal particles in the oil filter	
155.a	15500	<u>Lubrication:</u> Oil filter	* Check for metal particles in the oil filter	
160.a	16000	<u>Lubrication:</u> Oil	* Change lubricating oil	Lubricating oil
160.b	16000	Oil filter	* Change the oil filter cartridge * Check for metal particles in the oil filter	Holding and oil filter cartridge
160.c	16000	<u>Gas circuit:</u> Pneumatic valves	* Change pneumatic valve seals	Kit of seals for each pneumatic valve
160.d	16000	Gas filter	* Change intake and interstage gas filter	Gas filter

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160.e	16000	Gas valve	* Remove all dirt present, including carboneous deposits * Change parts inside gas valves to assure top machine performance * Test sealing. If leaks are found, grind the seat (change the valve after grinding it 3 times)	Kit of discs and springs for each valve
160.f	16000	Gas jacket	* Check the size of the gas jackets	Gas jacket
160.g	16000	Dynamic seals	* Change dynamic seals and check diameter of rods	Piston and rod seals
160.h	16000	Bearings	* Check the bench and crank bearings	
160.i	16000		* Verify why the rate of vibration has increased	
160.l	16000	Flexible coupler	* Change flexible coupler	Flexible coupler
160.m	16000	Cooling circuit Cooling system	* Clean cooling circuit with a scales remover	
160.n	16000	Heat exchanger	* Check and replace the seals	Seals
200.a	20000	Gas jacket	* Check the size of the gas jackets	Gas jacket
200.b	20000	Dynamic seals	* Change dynamic seals and check diameter of rods	Piston and rod seals
200.c	20000	Bearings	* Check the bench and crank bearings	Possible replacements
200.d	20000		* Verify why the rate of vibration has increased	
200.e	20000	Flexible coupler	* Change flexible coupler	Flexible coupler
200.f	20000	Cooling circuit Cooling system	* Clean cooling circuit with a scales remover	

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200.g	20000	Heat exchanger	* Check and repalce the seals	Seals
200.h	20000	Oil filter	* Change the oil filter cartridge * Check for metal particles in the oil filter	Holding and oil filter cartridge
200.i	20000	<u>Gas cicuit:</u> Pneumatic valves	* Change pneumatic valve seals	Kit of seals for each pneumatic valve
200.l	20000	<u>Gas filter</u>	* Change intake and interstage gas filter	Gas filter
200.m	20000	<u>Gas valve</u>	* Remove all dirt present, including carboneous deposits * Change parts inside gas valves to assure top machine performance * Test sealing. If leaks are found, grind the seat (change the valve after grinding it 3 times)	Kit of discs and springs for each valve

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7.4 VENTING GAS FROM COMPRESSOR PIPELINES

Follow the safety rules and precautions given in sections 07.01 and 07.02 in this manual.

- 1) Slowly open needle valves placed on each stage of the compressor.

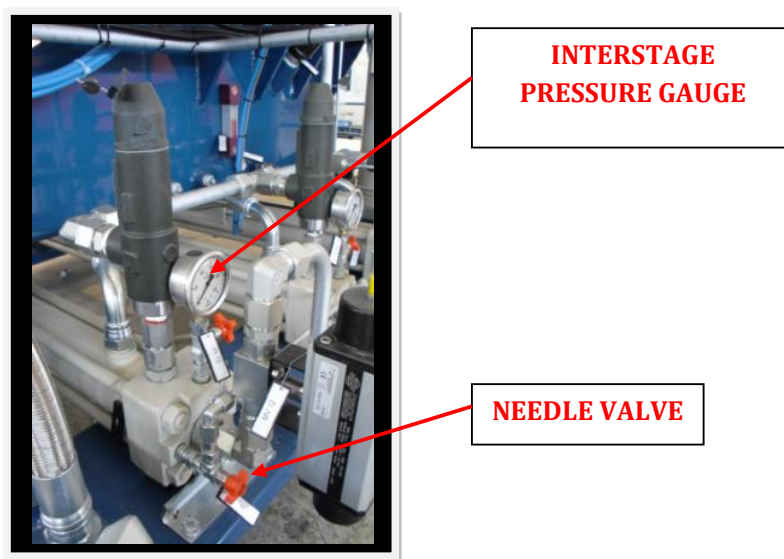


Figure 20 - Venting gas details

- 2) Make sure pressure gauges interstage read '0'.
- 3) Only after maintenance has been completed, close needle valves

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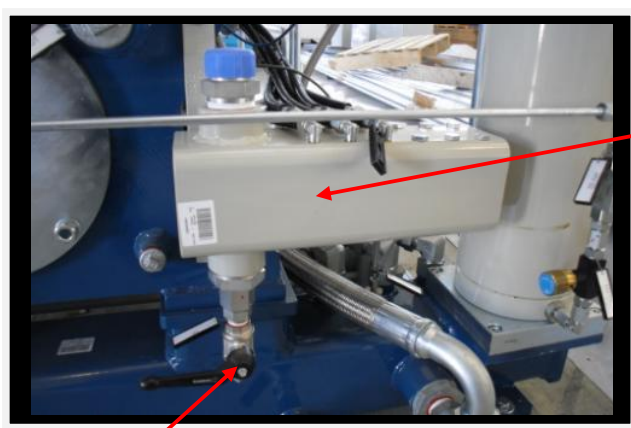
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7.5 DRAINING FLUIDS

7.5.1 DRAINING THE COMPRESSOR MODEL ST

Follow the safety rules and precautions given in sections 07.01 and 07.02 in this manual.

1. Place a container to collect the oil under manual valve.



OIL DRAIN TANK

**MANUAL
VALVE**

Figure 21 - Draining fluid details

2. Slowly open manual valve
3. Once all the oil has been drained, close valve
4. Dispose of the oil in accordance with local environmental protection regulations

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7.5.2 DRAINING THE COMPRESSOR MODEL SV-SW

Follow the safety rules and precautions given in sections 07.01 and 07.02 in this manual.

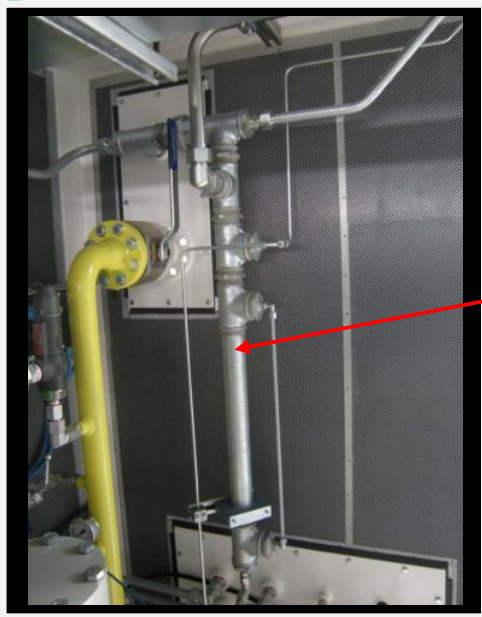
**DRAINAGE TANK**

Figure 22 - A -Draining fluid details -
Container installation

1. Place a receptacle of oil collection under the manual valve of the drainage tank.

**MANUAL VALVE**

Figure 23 - A -Draining fluid details - Container installation

2. Slowly open the manual valve.
3. Once all the oil has been drained, close valve
4. Dispose of the oil in accordance with local environmental protection regulations

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7.6 OIL CIRCUIT MAINTENANCE

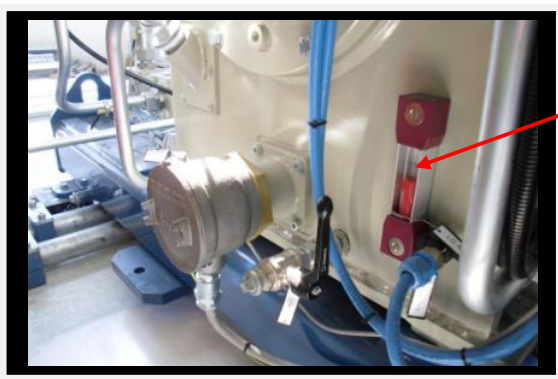
7.6.1 COMPRESSORS MOD. SW-SV

Filter:

A cartridge type filter is installed after the gear pump that cuts off the entire oil flow. Metal particles captured inside the filter are signs of overloading. For this purpose, pour the oil contained inside it into a see-thru container.

The oil cartridge should be checked and/or changed as specified in the scheduled maintenance chart in this section.

The oil level in the tank should be kept at the mid-way mark shown on gauge LG20.

**LEVEL GAUGE****Figure 24 - Oil level gauge**

- It's possible to use only synthetic oil **Pakelo Drive X TS HPA**.
- It's prohibited to use a different oil from that present in the presser for the topping (Fill up again)
- The maximum admitted operational temperature is 60°C.

**Warning:**

The absence of oil or the use of oil with different characteristics from the prescribed ones, are lethal for the compressor, therefore we recommend to rigorously respect how much prescribed in the compressor paragraph.

SAFE declines all liabilities with regard to possible damages caused by the use of a different oil to that prescribed or from the mixture of different oils.

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COMPRESSORS MOD. SW e ST

Synthetic oil Pakelo Drive X TS HPA, characteristics:

Viscosità ISO VG 100

REPLACE THE OIL EVERY 4000 HOURS OF COMPRESSOR USE

REPLACE THE OIL FILTER EVERY 2000 HOURS OF COMPRESSOR USE

The amount of oil necessary for lubrication and for the sealing system is roughly 25-30 litres approximately.

Filtration: filter at full flow rate with filtration degree of 25 µ.

N.B. Dispose of the oil in accordance with local environmental protection regulations

*** NOTE**

- Always get authorization from the manufacturer before using any kind of additive (anti-wear, anti-corrosion, rust preventative, viscosity improvement, detergents, anti-foam). It is strictly forbidden to put additives in synthetic oils.
- Do not mix synthetic oils with mineral oils.
- Use only the type of additive recommended by the manufacturer in this manual for the specific type of compressor.

Safety, health and environmental protection:

The lubricating oil does not pose any health or safety risks if used in the recommended applications and in compliance with good personal and industrial hygiene practises. Avoid skin contact. Exercise extreme caution when handling used oils.

Do not dispose of used oil in the environment.

NOTE: The oil must be disposed of in compliance with current local environmental protection laws and standards.

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Synthetic oil Pakelo Drive X TS HPA, characteristics:

Drive X TS HPA

ISO 32, 46, 68, 100, 150, 220, 320

Campi di applicazione

La serie dei PAKELO DRIVE X TS HPA può essere utilizzata in compressori per i quali il Costruttore raccomanda esplicitamente oli idraulici antiusura sintetici a base di esteri oppure in impianti idraulici ed in scatole ingranaggi operanti in condizioni non gravose.

PAKELO DRIVE X TS HPA è un prodotto per la lubrificazione di tutti i tipi di compressori e pompe del vuoto, sia alternativi, sia rotativi a palette e a viti, e nei compressori centrifughi, per la lubrificazione dei cuscinetti.

È particolarmente indicato nei compressori alternativi mono e multistadio anche a doppio effetto, sottoposti a carichi gravosi e dall'elevato rapporto di compressione. Per le severe condizioni termiche cui è sottoposto, il prodotto è idoneo per mantenere pulito il circuito ed in particolare le valvole.

PAKELO DRIVE-X TS HPA trova impiego anche in compressori rotativi ad iniezione di olio nei quali il lubrificante è intimamente miscelato con l'aria durante l'intera fase di compressione ed è soggetto ad elevate temperature di funzionamento.

Sebbene PAKELO DRIVE X TS HPA risulti totalmente compatibile con oli minerali, raccomandiamo di non miscelarlo per non ridurne le eccezionali prerogative.

Compatibilità con gli elastomeri

PAKELO DRIVE X TS HPA è compatibile con guarnizioni e tenute prodotte nei seguenti materiali: Idrocarburi fluorurati, silicone, fluorosilicone, polisolfuri, Viton, politetrafluoroetilene, gomma nitrilica (BUNA N-NBR con contenuto superiore al 36% di acrilonitrile).

Non sono raccomandati invece materiali come gomma nitrilica (BUNA N-NBR con contenuto inferiore al 36% di acrilonitrile), gomme naturali, butiliche, stirene/butadiene, polietilene clorosolfonato, Neoprene, poliacrilati.

Compatibilità con le vernici

PAKELO DRIVE X TS HPA è compatibile con le comuni vernici oleoresistenti, mentre non è raccomandato per vernici acriliche e viniliche tipo PVC.

Caratteristiche chimico/fisiche

PAKELO Drive X TS HPA	Metodo di analisi	Unità di misura	ISO 32	ISO 46	ISO 68	ISO 100	ISO 150	ISO 220	ISO 320
Peso Specifico a 15°C	ASTM D 1298	kg/l	0,940	0,942	0,946	0,960	0,965	0,965	0,970
Viscosità a 100°C	ASTM D 445	cSt	6,3	7,8	10,4	14,0	18,6	24,5	32,3
Viscosità a 40°C	ASTM D 445	cSt	32	46	68	100	150	220	320
Indice di Viscosità	ASTM D 2270	-	152	139	140	142	140	140	141
Punto di Infiammabilità (C.O.C.)	ASTM D 92	°C	> 225	> 235	> 240	> 240	> 240	> 250	> 250
Punto di Scorrimento	ASTM D 97	°C	< -40	-40	-35	-30	-30	-30	-30

I dati di cui sopra corrispondono a valori medi e non devono essere intesi come caratteristiche garantite.

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Figure 25 - Lubrication oil details

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COMPRESSORS MOD. SW e ST



Drive X TS HPA

ISO 32, 46, 68, 100, 150, 220, 320

Lubrificante interamente sintetico a base di esteri per compressori d'aria e per pompe del vuoto

PAKELO DRIVE X TS HPA è un lubrificante interamente sintetico a base di esteri, di elevata qualità, indicato sia per compressori rotativi sia per compressori alternativi (in particolare per quelli ad alto rapporto di compressione) che per pompe del vuoto.

L'utilizzo di un selezionato pacchetto prestazionale del tipo 'no-zinc' (senza zinco) conferisce al prodotto spiccate caratteristiche EP ed antiusura.

I vantaggi nell'utilizzo di basi sintetiche nei compressori e nelle pompe del vuoto, abbinati all'uso di uno specifico ed esclusivo pacchetto di additivi, sono da considerare con molta attenzione.

Tali benefici consistono in:

- **pressoché totale eliminazione di residui carboniosi** nei punti caldi del compressore, in particolare sulle valvole dei compressori alternativi: ciò comporta una incrementata efficienza del sistema e migliore controllo delle temperature di esercizio;
- **elevata resistenza all'ossidazione** ed alla formazione di depositi che assicurano prestazioni nettamente superiori agli oli a base minerale;
- **ottima protezione contro la corrosione, la ruggine, e l'usura** per una maggiore affidabilità e durata del compressore;

- **elevato Indice di Viscosità** che permette all'organo meccanico di funzionare in un ampio intervallo di temperature ambientali (da -25°C a +45 °C) consentendo facili avviamenti e quindi un rapido arrivo dell'olio agli organi da lubrificare anche a temperature molto basse;
- **ottima demulsività**; proprietà di separarsi velocemente dall'acqua formatasi dalla condensa dovuta all'umidità presente nell'aria aspirata o infiltratasi nella coppa dell'olio. Una buona demulsività comporta un ulteriore abbassamento del consumo d'olio ed una migliore qualità dell'aria compressa utilizzata;
- **naturale elevata biodegradabilità** delle basi utilizzate

Le eccezionali caratteristiche chimico/fisiche del PAKELLO DRIVE X TS HPA possono portare ad un sensibile aumento degli intervalli di sostituzione dei filtri e del separatore aria/olio, e consentono di prolungare considerevolmente gli intervalli di cambio d'olio rispetto a tradizionali prodotti a base minerale.

Vengono in tale modo abbattuti i costi di fermo macchina e di manodopera mentre al contempo è garantita l'affidabilità del compressore.

Figure 26 - Lubrication oil characteristics

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COMPRESSORS MOD. SW e ST**7.6.2 COMPRESSORS MODEL ST****Filter:**

A cartridge type filter is installed after the gear pump that cuts off the entire oil flow. Metal particles captured inside the filter are signs of overloading. For this purpose, pour the oil contained inside it into a see-thru container.

The oil cartridge should be checked and/or changed as specified in the scheduled maintenance chart in this section.

- The oil level in the tank should be kept at the mid-way mark shown on gauge LG

**LEVEL GAUGE****Figure 27 - Level gauge Compressor ST Model**

- Only supreme quality mineral synthetic oils should be used.
- The maximum admitted operational temperature is 60°C.

OIL SPECIFICATIONS *

RECOMMENDED OILS	SYNTHETIC OIL	MINERAL OIL
Degree of viscosity during cold season	ISO VG68	ISO VG68
Degree of viscosity during hot season	ISO VG100	ISO VG100
Flash point	> 250 °C	>250 °C
Pour point	< at lowest allowable room temperature	

Figure 28 - Oil specifications

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COMPRESSORS MOD. SW e ST

It is advisable to use Synthetic oil Pakelo Drive X TS HPA or alternatively SHELL Corena P68 oil in cold weather and P100 in hot weather (if the compressor runs continuously it is advisable to always use P100)

Their characteristics are the following:

CHARACTERISTICS	COLD WEATHER	HOT WEATHER
Kinematic viscosity at 40° C	68 cSt	100 Cst
Kinematic viscosity at 100° C	9 Cst	11,4 cSt
Viscosity index	106	100
Pouring point	-12° C	-12° C
Flash point	210° C	227° C

Figure 29 - Oil characteristics

Lubricants corresponding to **SHELL CORENA P 68:**

- AGIP DICREA 68
- CASTROL AIRCOL PD 68
- API CN 68

Lubricants corresponding to **SHELL CORENA P 100:**

- AGIP DICREA 100
- CASTROL AIRCOL PD 100
- API CN 100
- MOBIL RARUS 427

REPLACE THE OIL EVERY 4000 HOURS OF COMPRESSOR USE

REPLACE THE OIL FILTER EVERY 2000 HOURS OF COMPRESSOR USE

The amount of oil necessary for lubrication and for the sealing system is roughly 30 litres approximately.

Filtration: filter at full flow rate with filtration degree of 25 µ.

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COMPRESSORS MOD. SW e ST

**Warning:**

The absence of oil or the use of oil with different characteristics from the prescribed ones, are lethal for the compressor, therefore we recommend to rigorously respect how much prescribed in the compressor paragraph.

SAFE declines all liabilities with regard to possible damages caused by the use of a different oil to that prescribed.

N.B. Dispose of the oil in accordance with local environmental protection regulations*** NOTE**

- Always get authorization from the manufacturer before using any kind of additive (anti-wear, anti-corrosion, rust preventative, viscosity improvement, detergents, anti-foam). It is strictly forbidden to put additives in synthetic oils.
- Do not mix synthetic oils with mineral oils.
- Use only the type of additive recommended by the manufacturer in this manual for the specific type of compressor.

SAFE declines liability for any equipment damage caused by use of oils different from those specified herein.

Safety, health and environmental protection:

The lubricating oil does not pose any health or safety risks if used in the recommended applications and in compliance with good personal and industrial hygiene practises. Avoid skin contact. Exercise extreme caution when handling used oils.

Do not dispose of used oil in the environment.

NOTE: The oil must be disposed of in compliance with current local environmental protection laws and standards.

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COMPRESSORS MOD. SW e ST

7.7 ADDING OIL

7.7.1 LUBE OIL RESERVOIR FIRST FILLING PROCEDURE

7.7.1.1 COMPRESSOR WITH ELECTRIC OIL PUMP

- Unscrew the oil cap with the **machine shut off, and following the safety guidelines given in this manual.**
- Fill the oil tank until it reaches the maximum level reported on the visual indicator with the lubricant recommended by the manufacturer.
- Put the cap back on the tank and tighten it.
- Enabling the manual command inside the operator panel and put in operation the oil separate pump by pushing the "ON" option. The lubricating pump draws in oil from the tank and sends it to the lubrication circuit. NOTE (*)



Figure 30 - Manual command - example

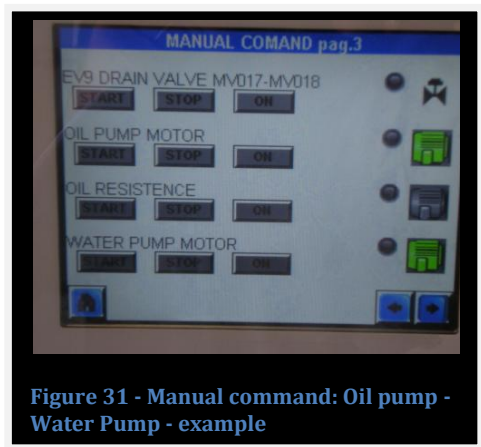


Figure 31 - Manual command: Oil pump - Water Pump - example

- Make sure the oil is at the set level. In any case, this amount is approximate and the gauge mid-way mark should be observed. The oil level in the tank must be kept in the middle (or little bit more) of the visual indicator.
- If this level is not reached add a small quantity of oil by repeating the steps from 1 to 5.
- According to the **Compressor OIL Piping & Instrumentation Diagram** make sure that the required oil pressure in the circuit is reached by reading the value on the pressure gauges.

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COMPRESSORS MOD. SW e ST

NOTE (*) Alternatively if the separate pump is not present (but is present the oil pump driven from the compressor shaft)

Press the compressor start button and subsequently the stop button, **alternatively** as indicate in the figure , operating in this manner the electric motor starts running and the lubricating pump draws in oil from the tank and sends it to the lubrication circuit step by step.

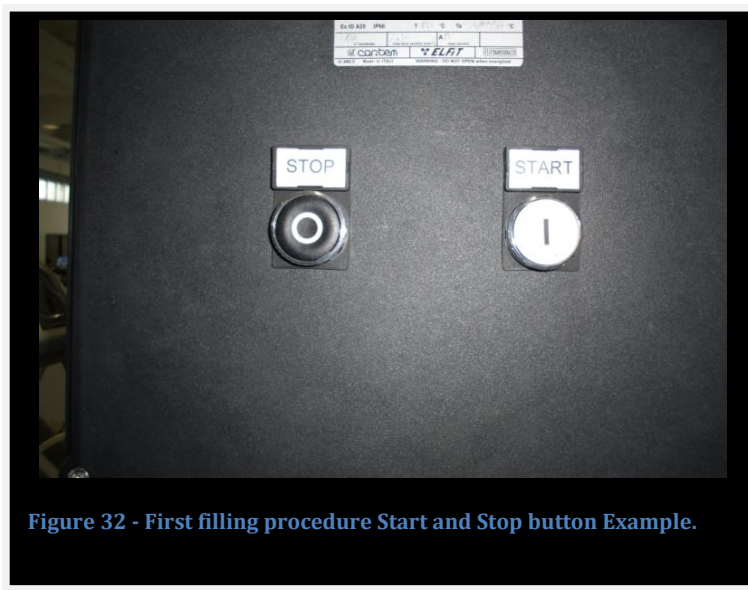


Figure 32 - First filling procedure Start and Stop button Example.

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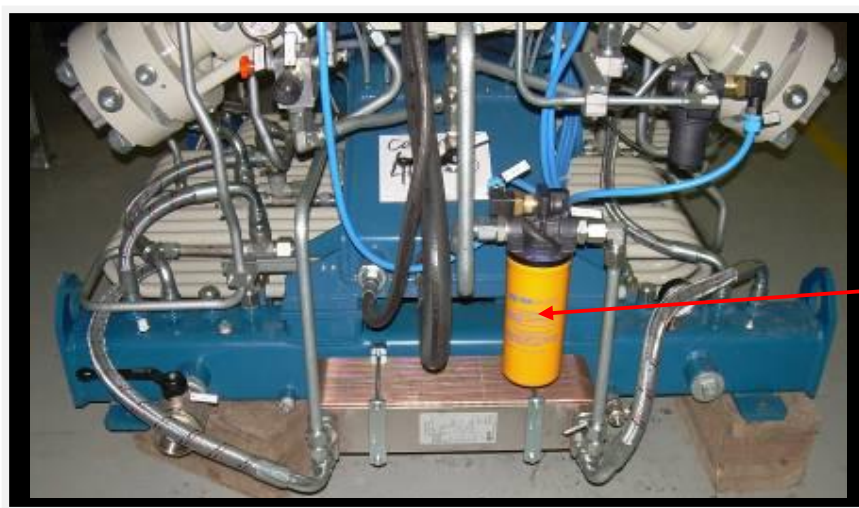
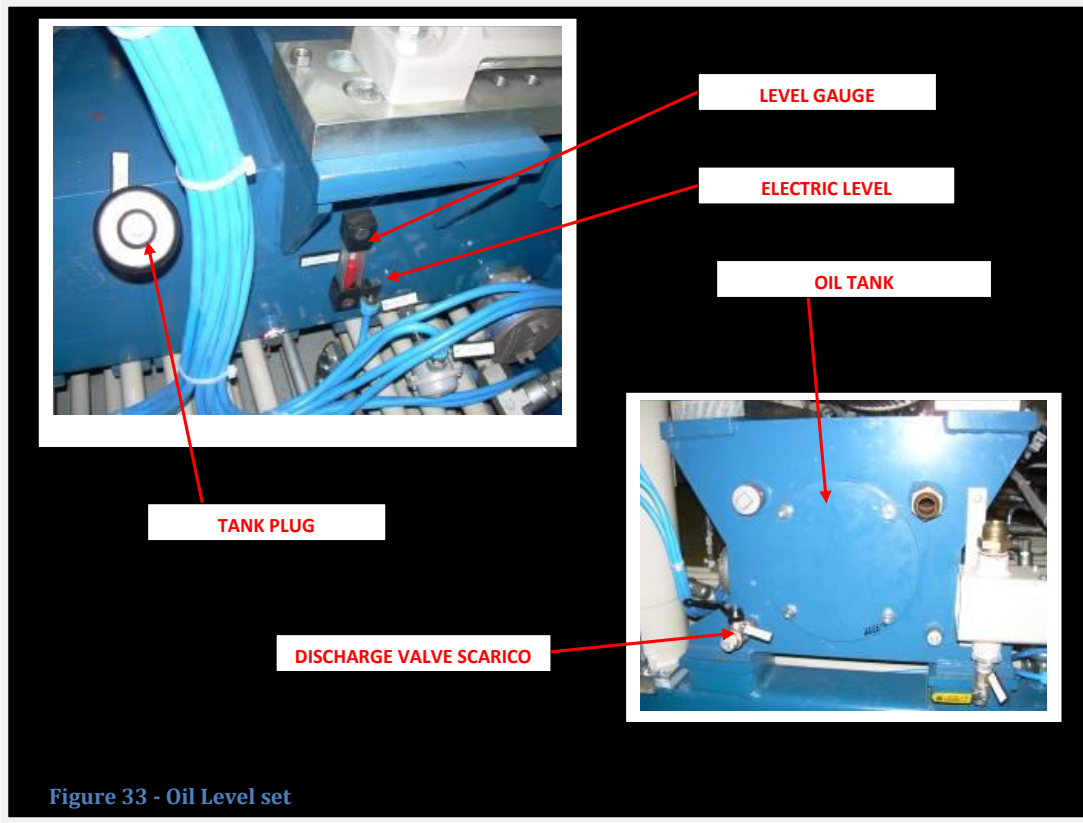
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COMPRESSORS TYPE ST**Figure 34 - Oil filter details**

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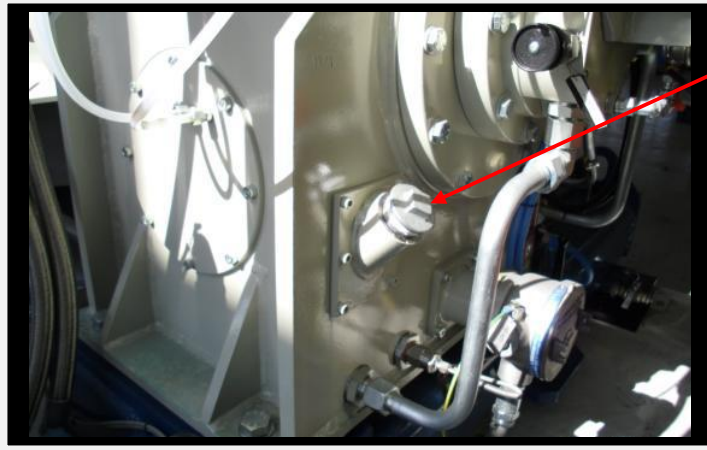
COMPRESSORS TYPE SW-SV**OIL FILLER CAP**

Figure 35 - Oil filter cap

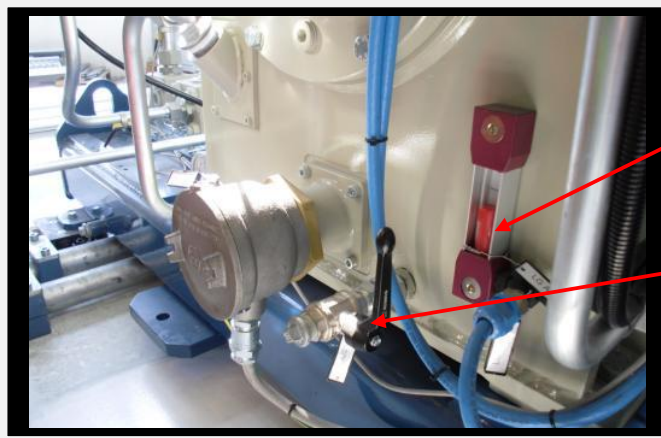
**LEVEL GAUGE****DRAIN VALVE**

Figure 36 - Oil drain valve

The sensor stops the compressor when the oil level drops below the minimum allowable level.

Under this condition :

- Take off the cap, fill the tank again and then put the cap back on (with the compressor shut- off).
- Repeat step 4.

The amount of oil necessary for lubrication and for the sealing system is roughly 25-30 litres approximately.

**WARNING**

SAFE declines all liabilities with regard to possible damages caused by the use of a different oil to that prescribed or from the mixture of different oils.

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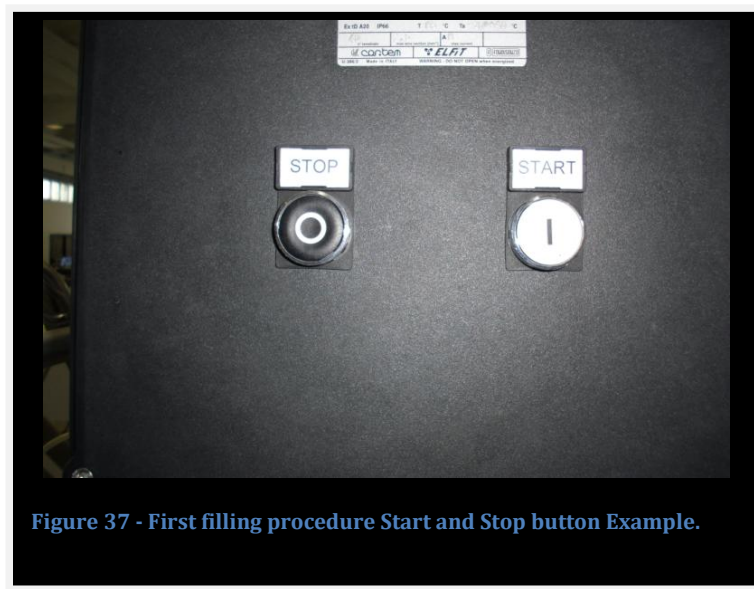
7.7.2 COMPRESSOR WITH OIL PUMP IN AXIS DRIVEN BY THE COMPRESSOR SHAFT

COMPRESSORS TYPE SW-SV

All the operations must be carried out with the machine shut off.

Referring to the illustration given below, perform the following operations:

1. Take the cap off the tank with the machine shut off.
2. Fill the oil tank until it reaches the maximum level reported on the visual indicator with the lubricant recommended by the manufacturer.
3. Put the cap back on the tank and tighten it.
4. Press the compressor start button and subsequently the stop button, alternatively as indicated in the figure, operating in this manner the electric motor starts running and the lubricating pump draws in oil from the tank and sends it to the lubrication circuit step by step. Make sure the oil is at the set level. In any case, this amount is approximate and the gauge mid-way mark should be observed. The sensor stops the compressor when the oil level drops below the minimum allowable level.



Under this condition :

5. Take off the cap, fill the tank again and then put the cap back on.
6. Repeat step 4.

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COMPRESSORS MOD. SW e ST**WARNING**

SAFE declines all liabilities with regard to possible damages caused by the use of a different oil to that prescribed or from the mixture of different oils.

COMPRESSORS TYPE ST

All the operations must be carried out with the machine shut off.

Referring to the illustration given below, perform the following operations:

1. Take the plug off the tank with the machine shut off.
2. Fill the oil tank until it reaches the maximum level reported on the visual indicator with the lubricant recommended by the manufacturer.
3. Put the cap back on the tank and tighten it.
4. Press the compressor start button and subsequently the stop button, **alternatively** as indicate in the figure , operating in this manner the electric motor starts running and the lubricating pump draws in oil from the tank and sends it to the lubrication circuit step by step.

Make sure the oil is at the set level. In any case, this amount is approximate and the gauge mid-way mark should be observed. The sensor stops the compressor when the oil level drops below the minimum allowable level.

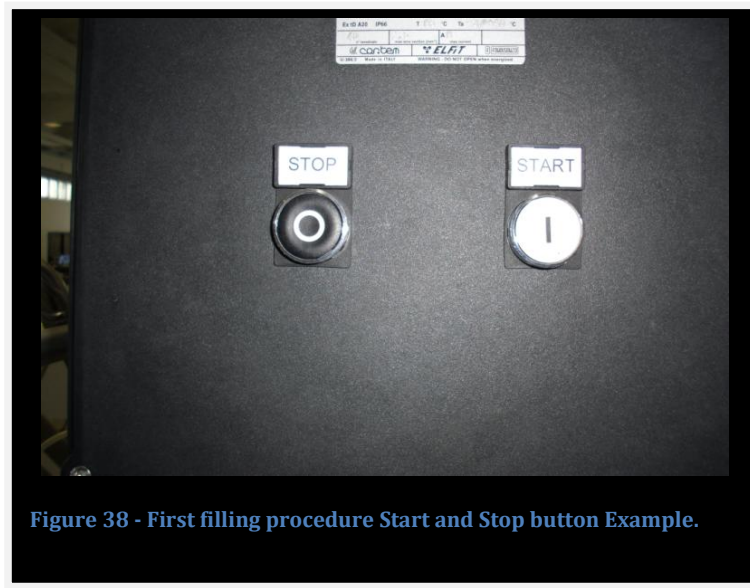


Figure 38 - First filling procedure Start and Stop button Example.

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Under this condition :

5. Take off the cap, fill the tank again and then put the cap back on.
6. Repeat step 4.

**WARNING**

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7.8 DRAINING OIL

Where there is a need to totally change the oil used, open the discharge valve by putting first below an appropriate container and follow the instructions:

All operations must be carried out with the machine off

1. Place a container of suitable capacity below the discharge valve and open it.
2. Wait a few minutes so that all oil is out, then close the discharge valve.

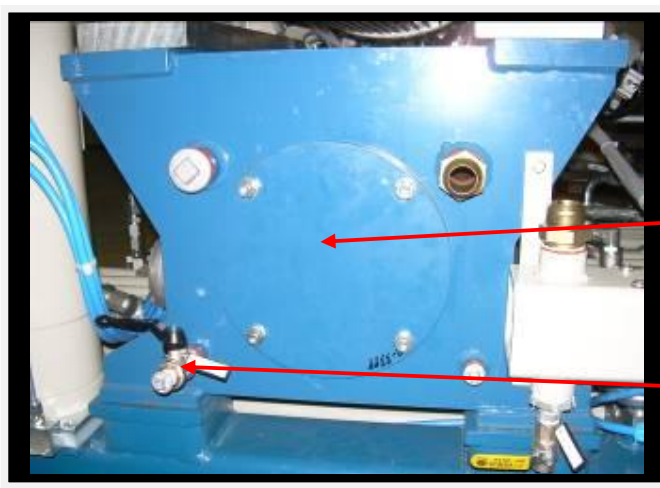


Figure 39 - Oil draining detail ST compressor model



Figure 40 - Oil drain valve example

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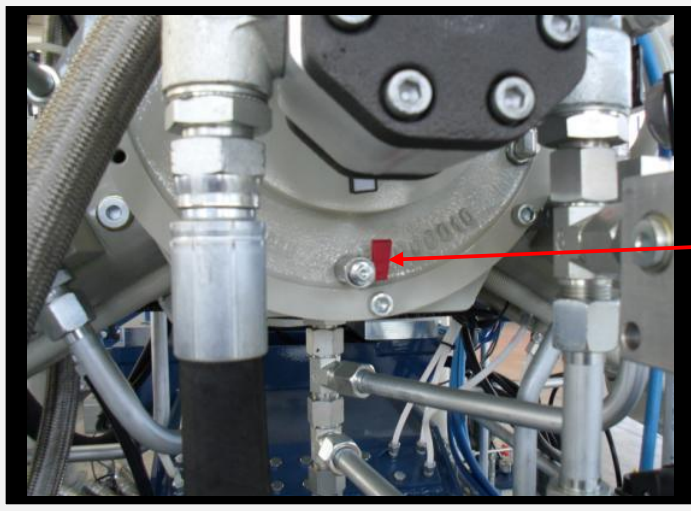
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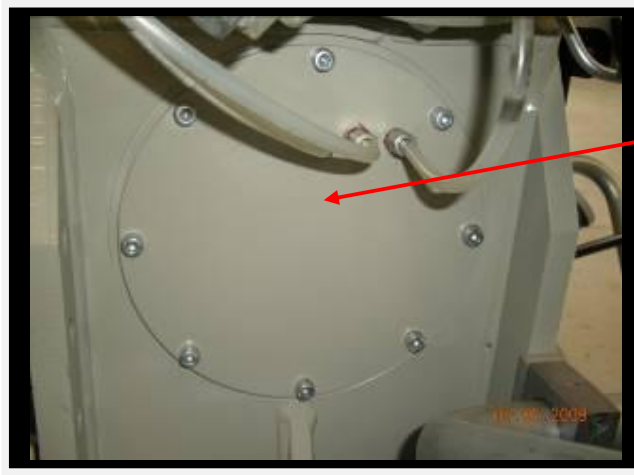
3. Clean all pipes that carry the oil to the compressor body from any residues of old oil, by loosening the fittings and allowing the oil to flow out from the pipes.
4. Place a container of suitable capacity under the discharge valve of the compressor body and open the valve flow leaving the oil. (ONLY FOR MODEL "ST") **See photo**



**OIL DISCHARGE
COMPRESSOR BODY
VALVE**

Figure 41 - OIL DISCHARGE COMPRESSOR BODY VALVE

5. Wait a few minutes so that all oil is out, then close the drain valve.
6. open the oil tank and clean it from the old oil residue with suitable degreasers.



**OIL
TANK/RESERVOIR**

Figure 42 - Oil tank/reservoir

7. reclose the oil tank.

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8. Carefully dismantle and clean the oil heat exchanger from the old oil residue by unscrewing the nuts on the bracket that block it to the compressor skid and by loosening with a tool the fittings connections to the inlet / outlet oil and water pipes oil heat exchanger.
9. reassemble oil heat Exchange

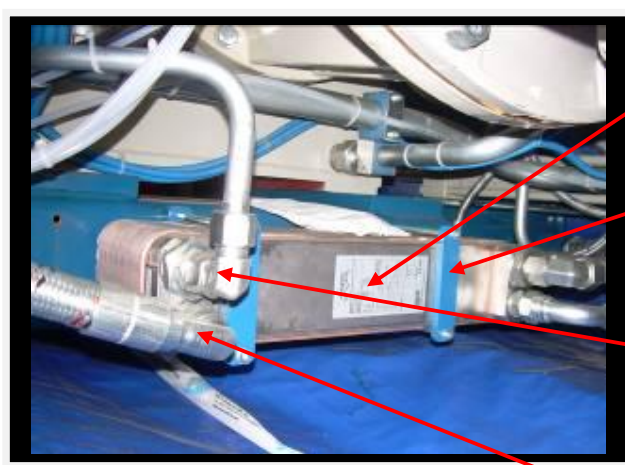


Figure 43 - Oil heat exchanger details

**HEAT EXCHANGER
OIL**

**BRACKETS TO
UNCREW**

OIL FITTING PIPES

**WATER FITTING
PIPES**

10. Introduce the new oil following the instructions: 07.07.01 Oil filling according to the compressor model in your possession.

To facilitate the discharge oil procedure is good to work with hot oil.

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COMPRESSORS MOD. SW e ST**7.8.1 OIL CONSUMPTION MEASUREMENT**

Oil consumption must be recorded as “liters of oil / 100 working hours”

For a correct measurement of oil consumption on Safe compressor:

- 1) fill the oil tank and restore the oil level until the the oil level gauge is $\frac{3}{4}$ full (the oil filling must be done when machine is stop for minimum half hour)
- 2) mark exactly the oil level on the oil level gauge and record the compressor working hours
- 3) make the compressor working for some time
- 4) when you detect oil level reduction or you detect oil level alarm, stop the machine
- 5) record the compressor working hours at this time and fill again with oil the oil tank until oil level reach the same mark that you signed at point 2
- 6) check how many oil you exactly refill into the compressor
- 7) so you have exactly the “liters of oil / number of working hours”. The number of working hours is obviously the difference between total w.h. recorded at point 5 and number of total w.h. recorded at point 2.

The oil consumptions reported in the table are indicative. Oil consumptions may vary with the service of the machine, the wear of the rod seals, and the gas quality. However, consumptions significantly higher than the ones reported in the table are to be considered abnormal, and may be a sign of excessive rod seal wear.

RECOMMENDATIONS:

- A. If the oil level in the tank is too much, the oil consumption increases a lot. Sometimes, some customers refill more oil than the prescribed quantity because they think it will assure no shut-downs of the machine for “low oil level” alarm. But it brings the compressor to a higher oil consumption and consequently it brings the customer to exceed with oil re-filling. Please, be sure the oil level is right. **The oil level must not exceed the MAX level marked on the visual indicator, with compressor stopped for half hour. The optimum should be the oil level at $\frac{3}{4}$ of the MAX level of the visual indicator.** Pay attention to this.
- B. Follow the right procedure to record correctly the oil consumption (see the aforementioned procedure in this document)
- C. Please, specify if the oil consumption you have estimated is the quantity of oil that decreases from the oil tank. Or if it is the quantity of oil that decreases from the oil tank minus the quantity of oil that is recovered from the final stage oil separator.

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D. In any case, check how much oil is drained from the separator. If the oil consumption is high, it's necessary to drain very often the separator and check the separator cartridge very frequently (more than manual indication, as the manual indication refer to a normal condition of working). As reference for periodical draining consider that: if you drain more than 0.8 – 1 lt. you have to increase the periodicity of draining operation. If you drain little quantity, such as 0.1 – 0.2 lt. you can decrease the periodicity of draining operation.

For clarification or additional information, please, contact us.

7.8.2 TABLE OIL CONSUMPTION

COMPRESSOR MOD.	STROKE	RPM	OIL CONSUMPTION EXPECTED
SW	95 (SE)*	1000	2-3 l / 100 H
SW	95 (DE)*	1500	4-6 l / 100 H
SW	95 (DE)	1000	3 l / 100 H
SW	110 (DE)	1000	4-6 l / 100 H
SW	110 (DE)	1500	15-20 l / 100 H
ST	30	1000-1500	1-2 l / 100 H
ST	60	1000-1200	3-4 l / 100 H
ST	50	1000-1500	3-4 l / 100 H
S7-S9	72-95	1500	2 l / 100 H

*SE= Simple effect *DE= Double effect

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COMPRESSORS MOD. SW e ST**7.9 INLET GAS FILTER MAINTENANCE**

If not provided, the customer must install a filter with a degree of filtration not higher than 0,01 microns that is a size suitable for the maximum line PRESSURE and DELIVERY RATE.

Safe S.p.A. declines all liability for any property damage that may result if different degrees of filtration are used.

General information

The intake filter is installed to filter solid particles, oil and condensate contained in the gas drawn into the compressor.

Operations

The “dirty” fluid is conveyed to the filter element from the outside towards the inside. The filter holds back any solid particles thanks to inertia whereas coalescence filtration captures condensate and oil droplets. Thanks to the force of gravity, the liquid droplets captured through filtration accumulate in the lower filter tank and are either automatically or manually recovered.

Maintenance

As soon as the differential pressure reaches >50 KPa (>0.5 bar), the filter element has to be changed (the filter element should be changed as indicated in the maintenance chart given in section 07.03.02. and in any case, it must be changed after a year of service).

Check operation on a weekly basis by starting automatic condensate drainage manually.

If the filter does not have the automatic condensate drain function, the condensate needs to be removed by opening the manual filter drain. This operation should be performed a number of times a day, depending on the amount of condensate produced.

Replacing the filter element**Danger!**

Dirty filter elements should be replaced only after the pressure has been relieved from the filter.

Follow the directions given below to remove the filter:

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- Remove the lower part of the head filter.
- Release the filter element and remove it.
- Put in the new filter element and o-ring; be extremely careful to put the o-ring back into the right position.
- Reinstall the filter.
- Series V elements can be used several times, cleaning them with compressed air.

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7.10 GAS VALVE MAINTENANCE

The valves play a fundamental role in compressor operation and may affect performance therefore they must be kept highly efficient.

Valve malfunctions are shown by changes in interstage pressures and compressed gas temperatures accompanied by unusual noise. In these cases, immediate inspection is required.

Check the interstage gas pressures daily by reading the relative pressure gauges. If the gauges read values that differ from the rated operating value by more than 15% (see technical specifications of the compressor given in section 13 annexes), check the valve.

Generally speaking, irregular pressure in a generic stage is a sign of downstream valve malfunctioning.

If parts of components (springs, metal fragments, etc...) are found to be missing during inspection make sure they are not stuck inside the cylinder as they may damage other parts if they are not removed.

In any case, the valves should be disassembled every six months to verify there are no air leaks. If leaks are found, replace the gaskets and springs.

After the gaskets have been replaced three times, change the entire valve, **SEE THE SPARE PARTS INSIDE THE DOCUMENT NAMED "SPIR00000XX"**



WARNING :

Whenever maintenance is performed on the gas valves, observe all the safety precautions and in particular:

Before removing the gas valves, the pressurized gas has to be released from the compressor SEE SECTION 7.4

If the gas valve is stuck, do not tap directly on the valves with steel hammers but use soft steel tools.

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GAS VALVE MAINTENANCE PROCEDURES

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COMPRESSORS MOD. SW e ST**1. PURPOSE**

Purpose of the present document is to help and aid the maintenance people to carry out overhaul on suction and delivery valves for reciprocating compressors.

2. VALVE MAINTENANCE PERIODS

Valve maintenance periods depend on the compressor operating cycle. We recommend to follow the compressor manufacturer instructions.

3. ADVISED EQUIPMENT AND MACHINE TOOLS FOR VALVE MAINTENANCE

- Work bench equipped with vice and possibly a self-centring chuck, to assemble and disassemble the valves;
- Torque wrench and series of collets to lock the valve nuts;
- Metal part washing machine;
- Lathe;
- Surface plate in spheroidal graphite cast iron.

4. VALVE DISMANTLING FROM THE COMPRESSOR

When removing the valve from the compressor or from the pipe, scrupulously follow the operating and safety instructions indicated by the compressor manufacturer.

5. VALVE DISASSEMBLY

If you do not have an available chuck, lock the valve in a vice with two pins (Figure 1), one end of the latter is locked in the vice and the other end is plugged in the suction guard slots or in the discharge seat slots, thus avoiding the valve rotation while unscrewing the nut. Never tighten the valve directly in the vice (Figure 3 and Figure 4).



Figure 1



Figure 2

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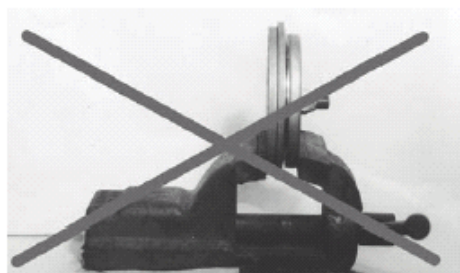


Figure 3

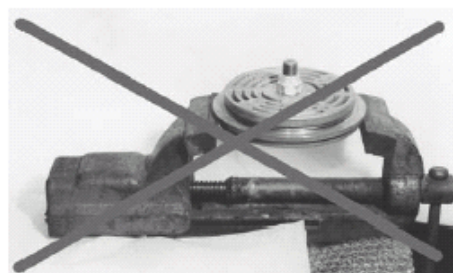


Figure 4

Unscrew the valve nut using, if necessary, a product suitable to facilitate the unscrewing. Absolutely avoid loosening the nut by beating on the wrench with any object. Hold the discharge seat and the suction guard to prevent the valve fixing pins from bending, while loosening or tightening the nut. (Figure 2)

6. PARTS CLEANING

Pull the helicoidal springs out from the guard and the pins from the seat and from the guard. Carefully clean all internal valve parts (except for the helicoidal springs, the plates, the rings, the spring cups and the spring washers) with appropriate detergents.

Clean the parts in hot water and degreaser.

If a deeper cleaning is necessary, pay attention not to use metallic brushes or hard tools or with sharp edges ones to clean the seat sealing surfaces and plates.

7. RESTORING OR EXCHANGING WORN PARTS

Check the wear condition of each valve and plunger part.

Replace all those that cannot be restored, using only Cozzani original spare parts. Particularly:

7.1. Springs, Shutters, Locking Nut, Spring Cups, Spring Washers

The valves helicoidal springs, the plates or the rings, the damper plate, the spring cups and the spring washers must be replaced at each planned valve maintenance.

At each overhaul, the locking nut (Figure 5) must be changed, while if a nut with Nord-Lock® washers (Figure 6) is used, the Nord-Lock® washers must be changed.

If the valve is for oxygen use, remove the glue between the Nord-Lock® washers.

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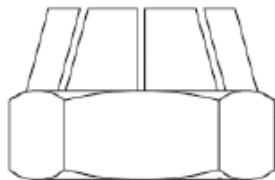
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Figure 5

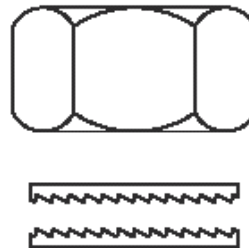


Figure 6

The Nord-Lock® washers must be assembled in pairs cam face to cam face from the side with a greater rise than the pitch of the bolt. The faces with radial teeth must be in contact with the nut and with the seat or the guard, as shown in Figure 7.

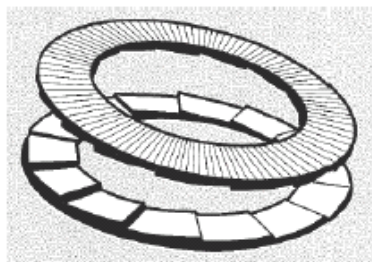


Figure 7

If anomalous functions cause premature wear or deep gashes on the plates or damper plates, they must be changed before scheduled time.

7.2. Seat

To restore the perfect flatness of the sealing surfaces, manually lap the seat with a suitable flat spheroidal graphite cast iron and silicon carbon lubricated paste and clean the parts in hot water and degreaser.

If the sealing surfaces are very damaged and cannot be restored by lapping, mechanical turning or grinding are necessary.

Frontal turning is done by removing a small part at each cut and with cut parameters in order to guarantee a good surface finish. When the desired surface restoration level has been reached, the sharp corners, which were made by the frontal turning, must be removed. This is carried out by chamfering with a lathe or with a fine grain emery cloth.

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After having carried out these operations, if the removal is above 0,3 mm it is necessary to restore the shallow recesses of the sealing surfaces by turning with a form tool.

The minimum thickness between the seat surface and the milling head must be 2 mm as shown in Figure 8.

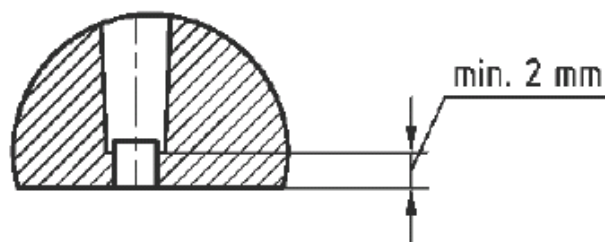


Figure 8

After this operation, manually lap the seat with graphite cast iron, as specified above.

Once the pins have been put back into place, make sure that they don't compromise the right valve assembly. Otherwise deepen the hole where the pin is free.

In the suction valves with plunger, this one can be in contact with the seat surface and there is no contact between the plate and the guard (Case 1) or the plate can be stopped by the guard (Case 2).

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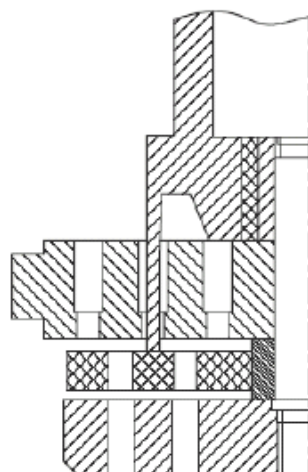
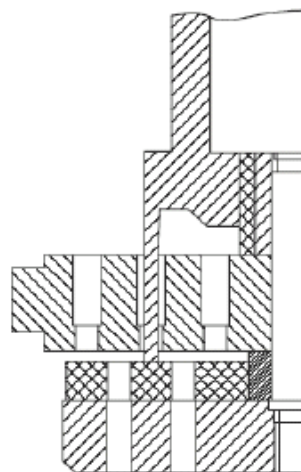
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COMPRESSORS MOD. SW e ST**Case 1****Case 2****Case 1:**

If due to the restoration, the seat lowers more than 0,2 mm, the plunger fingers must be shortened of exactly the same amount as the seats thickness. In this case it is necessary to verify that, once the valve has been reassembled with lowered plunger, its cover does not touch the stud, otherwise the stud must be shortened exactly the same amount as the seat thickness.

Case 2:

The plunger must not be changed.

Check a possible anomalous consumption of the plunger in the beat zone of the shutter. In this case substitute the plunger.

7.3. Guard

Check the presence of excessive worn in the springs slots and in the shutter guides. In this case change the guard.

7.4. Stud

Visually check the stud integrity (Figure 9) on the threading and on the turned part and the perfect block on the respective component. Check that the wear of the smooth part of the stud doesn't create excessive gap between the seat and the guard.

If the stud threats are damaged, it is necessary to substitute them, following the below listed points:

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- 1) Completely eliminate the locating pin (Figure 10) by drilling with a slightly bigger diameter than the pin itself.
- 2) Unscrew the bold by keeping it fixed in the vice and rotate the seat.
- 3) Tighten the new stud until it makes contact, closing it with an adequate load.
- 4) Level out the studs excess lower part with a lathe and turn its smooth part, keeping into account the f9 tolerance measurement.
- 5) Make the new hole for the locating pins, placing them at a radial distance of at least 90° from the original hole, using a point with the same diameter as the pins. The hole must be deeper than the pins length by at least 1 mm and it must be done in this way to allow the pin to enter into the stud by half of its diameter and, by the other half, into the seat or guard.
- 6) The pin must be entirely inserted into the hole and the hole head must be riveted with a punch, suitable for this operation.



Figure 9



Figure 10

7.5. Plungers bush replacement (only for suction valves)**Peek bush**

The peek bush of the plunger must be changed at each overhaul.

Steel bush

The steel bush, if it's not damaged, cannot be substituted during the overhauls.

Teflon and steel bush

If the bush is made in teflon, two anomalies can be found:

- 1) the bush comes out of the plunger.
- 2) The internal diameter of the bush is worn and the clearance with the steel bush is more than 0,3 mm.

In these cases it is opportune to change the teflon bush, following the below listed points:

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- 1) manually remove the old bush.
- 2) With an appropriate tool push the new bush into the plunger.
- 3) Bring to size bushes inner diameter , which must be the same as the external diameter of a steel bush clearance 0,15/0,20 mm. This operation must be carried out by turning, locking the plunger cylindrical part (internal circlip (seeger) side) by the self centring chuck. Flatten both sides of the teflon bushes, removing 0,2 mm from each side so that the teflon bush has enough space for the axial dilatation.

7.6. Pins

The valve pins must always be changed.

To take out the pin, lock it horizontally with a vice and, with the help of a rubber hammer, knock on the seat, if it is a suction seat, or on the stud, if it is a discharge seat. In order to insert a new pin, knock on it with a steel hammer until it reaches the bottom of its slot.

7.7. Reusable parts

After the cleaning check the good conditions of the reusable parts (cover, internal circlip (seeger), plunger spring, lift washer, washers, bushes).

8. VALVE ASSEMBLY

Clean the guard before inserting the springs in their slots.

Conical springs must be inserted with the largest diameter in the springs slot (Figure 11).

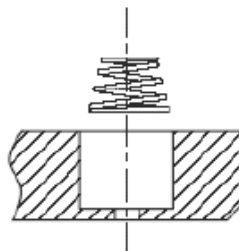


Figure 11

Figure 12, Figure 13 and Figure 14 show the assembly scheme for valves with spring cups and spring washers.

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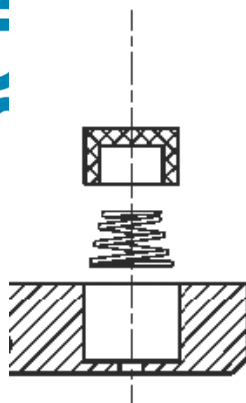


Figure 12

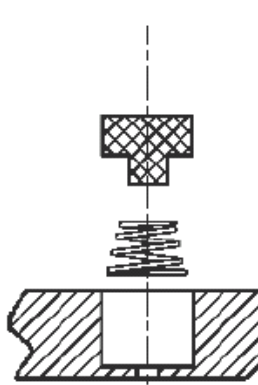


Figure 13

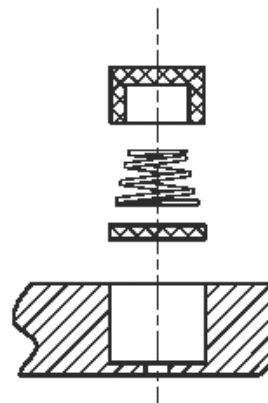


Figure 14

Spring cup

Spring

Spring
washerGuard
spring slot

If the valve has not spring cups, the spring must internally be locked with a small metallic rounded point rod, whose diameter must be bigger than the springs internal diameter and smaller than the diameter of the slot where the spring will be inserted.

To lock the spring, it is necessary to push it into the slot with the rod, by gently rotating anticlockwise the rod and making sure that the spring is straight into its slot (see Figure 15).

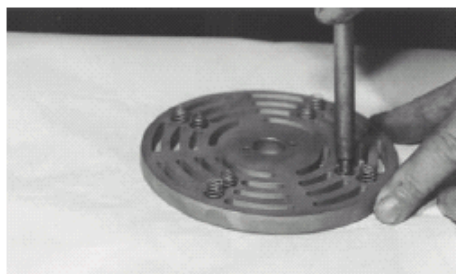


Figure 15

After cleaning again the seat and the plunger and checking the seat dimensions, assemble the valve, by assembling the various components in the correct order. If the valve has steel plates

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and damper plates, particular attention must be paid to their correct positioning, following the enclosed drawings.

Tighten the locking nut with a torque wrench according to the tightening values shown in Tab.1.

If a locking nut is used, the stud must be greased before tightening the nut. If a nut with Nord-Lock® washers is used, the stud has not to be greased.

Never use oil or grease on the valves used for oxygen compressors.

Threads	Tightening values for locking nuts	Tightening values for nut with Nord-Lock® washers
M 6	10 N m	--
M 8	19 N m	19 N m
M 10	25 N m	40 N m
M 10 x 1	35 N m	40 N m
M 12 x 1,5	45 N m	90 N m
M 12	--	90 N m
M 14 x 1,5	80 N m	120 N m
M 16	110 N m	--
M 16 x 1,5	130 N m	190 N m
M 20 x 1,5	215 N m	300 N m
M 24 x 1,5	370 N m	425 N m
M 30 x 1,5	720 N m	715 N m

Tab. 1

Once the valve is assembled, check by a gauge that the A dimension indicated in Figure 16 and Figure 17 is the same on all the external circumference. Otherwise dismantle the valve and check that the pins have been correctly inserted into the slots, both into the seat and into the guard.

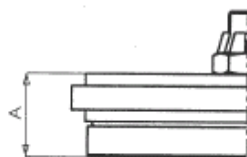


Figure 16



Figure 17

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Check the free movement of the plate or the rings, by pressing them towards the guard, through the seats gas passing areas, with an appropriate tool, not to damage the plate.

NOTE: for oxygen compressors the valve must be completely free from any trace of oil or grease. Check again the valve before installing it. Failure to do properly this procedure may cause explosions.

9. PROTECTION

Stored Valves , if they aren't in stainless steel, must be protected with anti-rust oil before being used, . Valves for oxygen or other dangerous gasses compressors must strictly never be oiled or greased. To such aim, we strongly advise to follow the compressor manufacturer safety and operating instructions.

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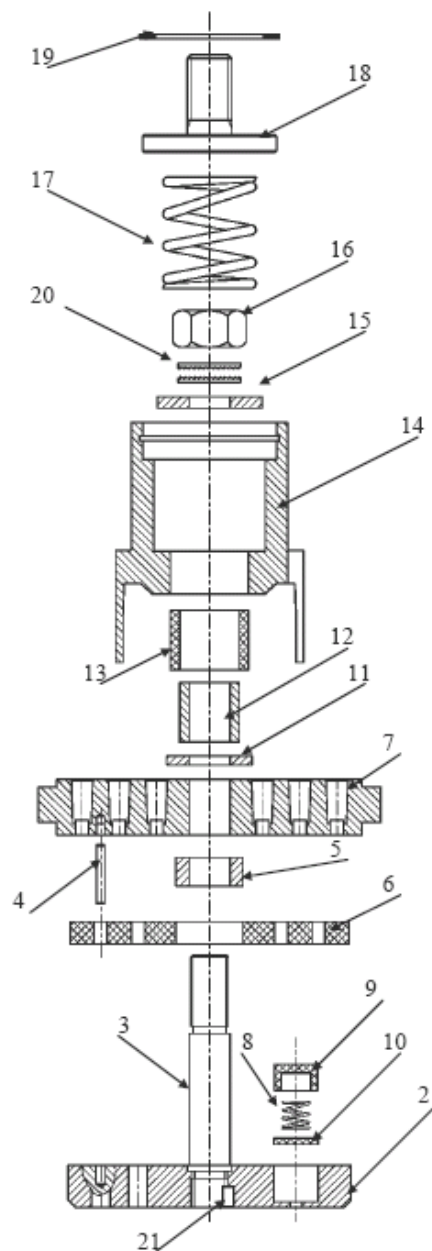
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COMPRESSORS MOD. SW e ST

10. ASSEMBLING DRAWING FOR SUCTION VALVE WITH PEEK PLATE, SPRING CUPS AND UNLOADER



21	LOCATING PIN	7.4
20	NORD-LOCK® WASHER	7.1
19	INTERNAL CIRCLIP (SEEGER)	7.7
18	COVER	7.7
17	PLUNGER SPRING	7.7
16	NUT	7.1
15	WASHER	7.7
14	PLUNGER	7.2
13	PLASTIC BUSH	7.5
12	METALLIC BUSH	7.5
11	WASHER	7.7
10	SPRING WASHER	7.1, 8
9	SPRING CUP	7.1, 8
8	SPRING	7.1, 8
7	SEAT	7.2
6	PLATE	7.1
5	LIFT WASHER	7.7
4	PIN	7.6
3	STUD	7.4
2	GUARD	7.3
1	GUARD WITH STUD	
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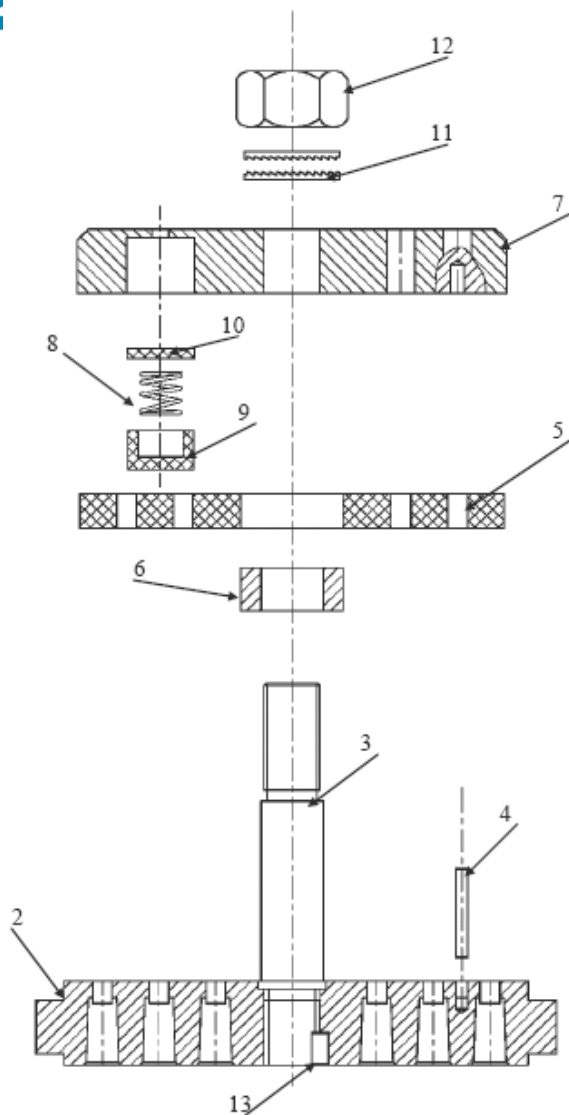
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COMPRESSORS MOD. SW e ST**11. ASSEMBLING DRAWING FOR DISCHARGE VALVE WITH PEEK PLATE AND SPRING CUPS**

13	LOCATING PIN	7.4
12	NUT	7.1
11	NORD-LOCK® WASHER	7.1
10	SPRING WASHER	7.1, 8
9	SPRING CUP	7.1, 8
8	SPRING	7.1, 8
7	GUARD	7.3
6	LIFT WASHER	7.7
5	PLATE	7.1
4	PIN	7.6
3	STUD	7.4
2	SEAT	7.2
1	SEAT WITH STUD	
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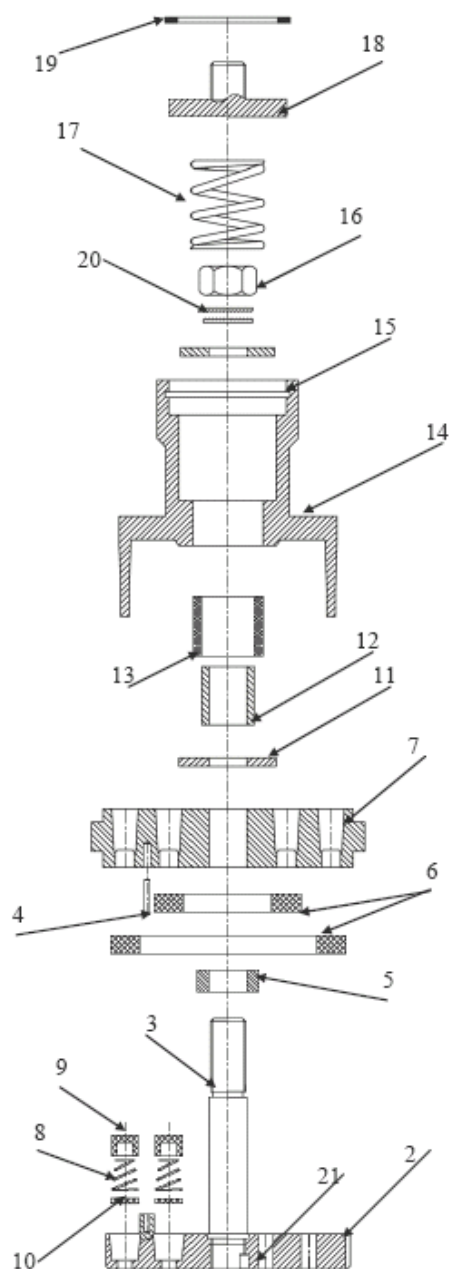
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12. ASSEMBLING DRAWING FOR SUCTION VALVE WITH PEEK RINGS, SPRING CUPS AND UNLOADER

21	LOCATING PIN	7.4
20	NORD-LOCK® WASHER	7.1
19	INTERNAL CIRCLIP (SEEGER)	7.7
18	COVER	7.7
17	PLUNGER SPRING	7.7
16	NUT	7.1
15	WASHER	7.7
14	PLUNGER	7.2
13	PLASTIC BUSH	7.5
12	METALLIC BUSH	7.5
11	WASHER	7.7
10	SPRING WASHER	7.1, 8
9	SPRING CUP	7.1, 8
8	SPRING	7.1, 8
7	SEAT	7.2
6	RING	7.1
5	LIFT WASHER	7.7
4	PIN	7.6
3	STUD	7.4
2	GUARD	7.3
1	GUARD WITH STUD	
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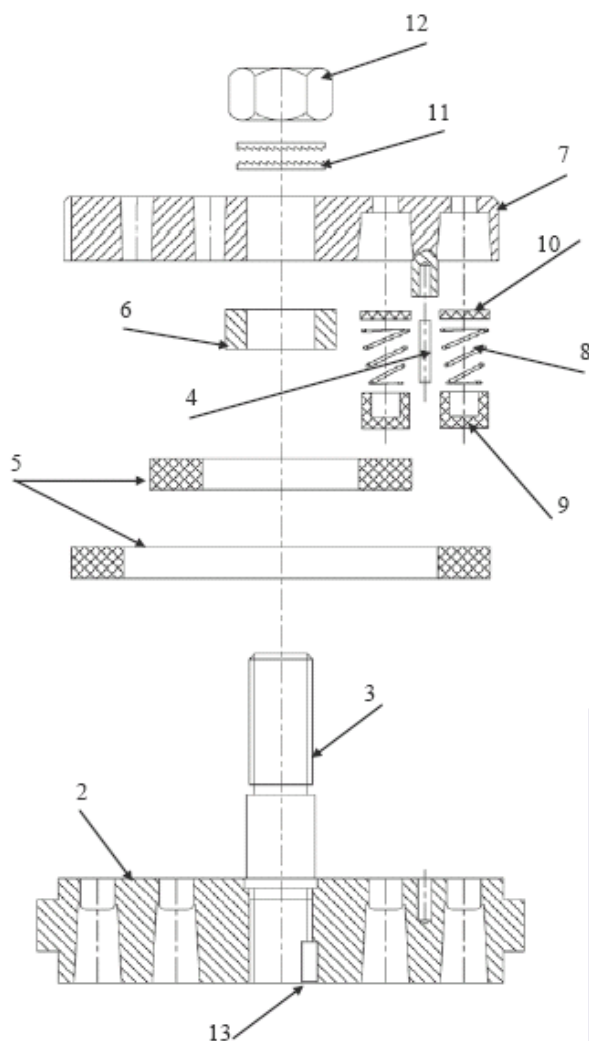
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COMPRESSORS MOD. SW e ST

13. ASSEMBLING DRAWING FOR DISCHARGE VALVE WITH PEEK RINGS AND SPRING CUPS



13	LOCATING PIN	7.4
12	NUT	7.1
11	NORD-LOCK® WASHER	7.1
10	SPRING WASHER	7.1, 8
9	SPRING CUP	7.1, 8
8	SPRING	7.1, 8
7	GUARD	7.3
6	LIFT WASHER	7.7
5	RING	7.1
4	PIN	7.6
3	STUD	7.4
2	SEAT	7.2
1	SEAT CON STUD	
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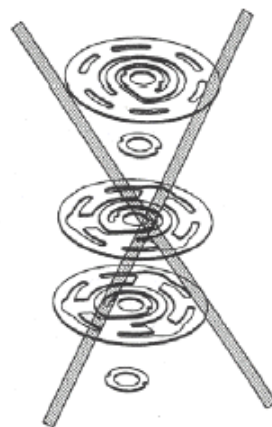
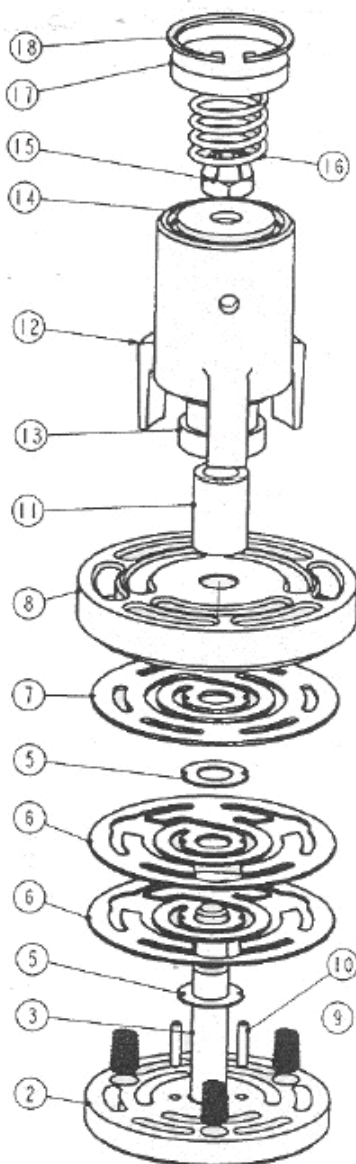
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COMPRESSORS MOD. SW e ST**14. ASSEMBLING DRAWING FOR SUCTION VALVE WITH STEEL PLATE AND UNLOADER**

18	INTERNAL CIRCLIP (SEEGER)	7.7
17	COVER	7.7
16	PLUNGER SPRING	7.7
15	NUT	7.1
14	WASHER	7.7
13	PLASTIC BUSH	7.5
12	PLUNGER	7.2
11	METALLIC BUSH	7.5
10	PIN	7.6
9	SPRING	7.1, 8
8	SEAT	7.2
7	PLATE	7.1
6	DUMPER PLATE	7.1
5	LIFT WASHER	7.7
4	PIN	7.6
3	STUD	7.4
2	GUARD	7.3
1	GUARD WITH STUD	
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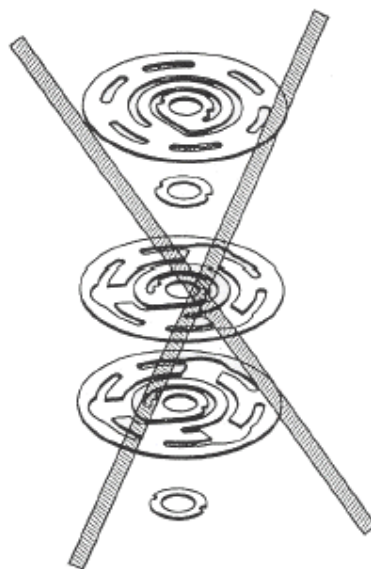
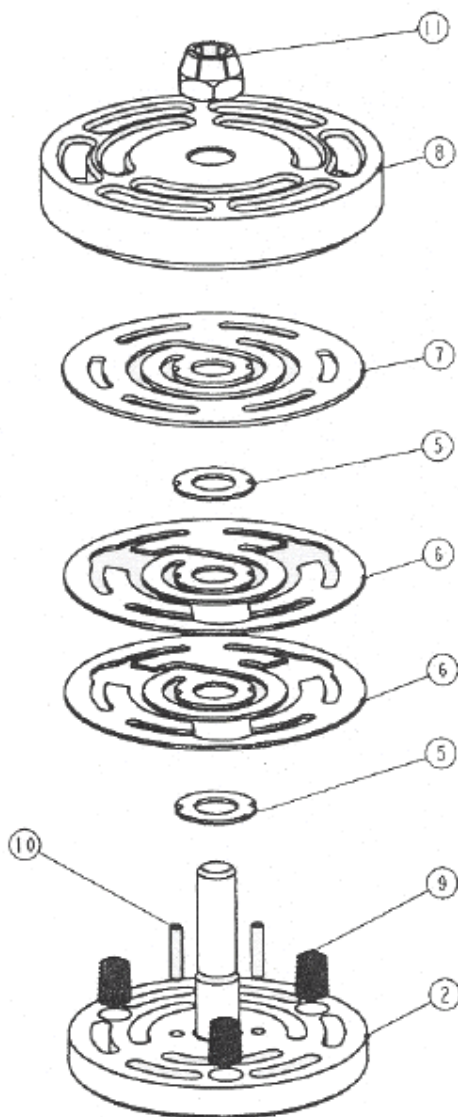
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**15. ASSEMBLING DRAWING FOR SUCTION VALVE WITH STEEL PLATE**

11	NUT	7.1
10	PIN	7.6
9	SPRING	7.1, 8
8	SEAT	7.2
7	PLATE	7.1
6	DAMPER PLATE	7.1
5	LIFT WASHER	7.7
4	PIN	7.6
3	STUD	7.4
2	GUARD	7.3
1	GUARD WITH STUD	
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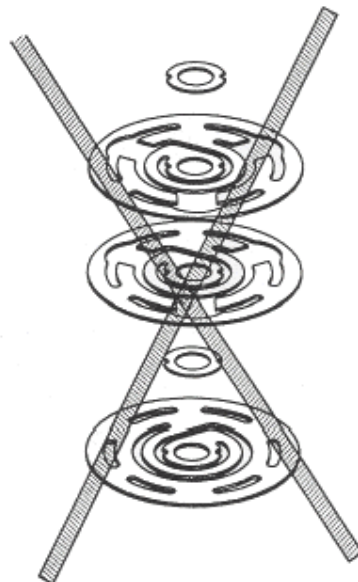
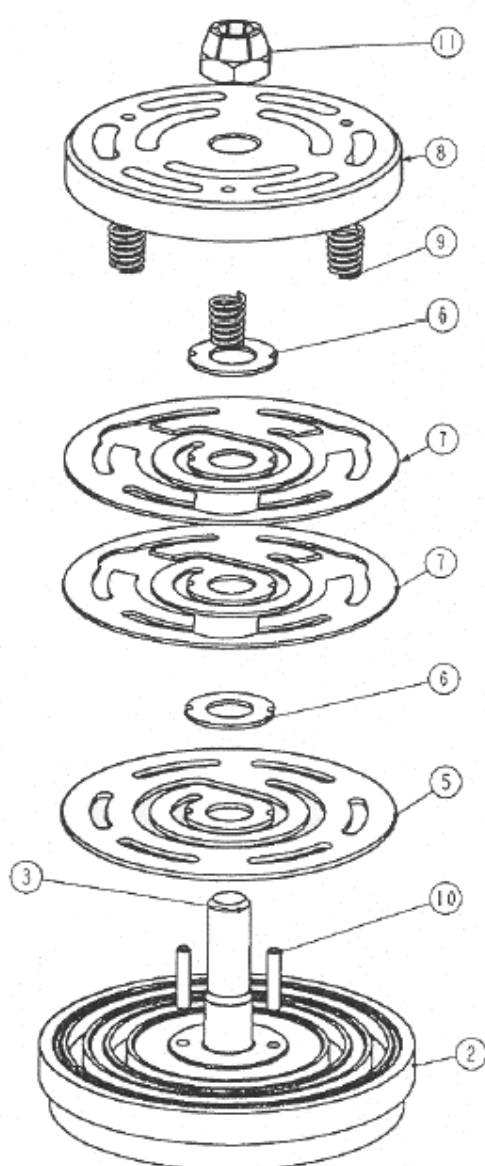
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16. ASSEMBLING DRAWING FOR DISCHARGE VALVE WITH STEEL PLATE

11	NUT	7.1
10	PIN	7.6
9	SPRING	7.1, 8
8	GUARD	7.3
7	DAMPER PLATE	7.1
6	LIFT WASHER	7.7
5	PLATE	7.1
4	PIN	7.6
3	STUD	7.4
2	SEAT	7.2
1	SEAT WITH STUD	
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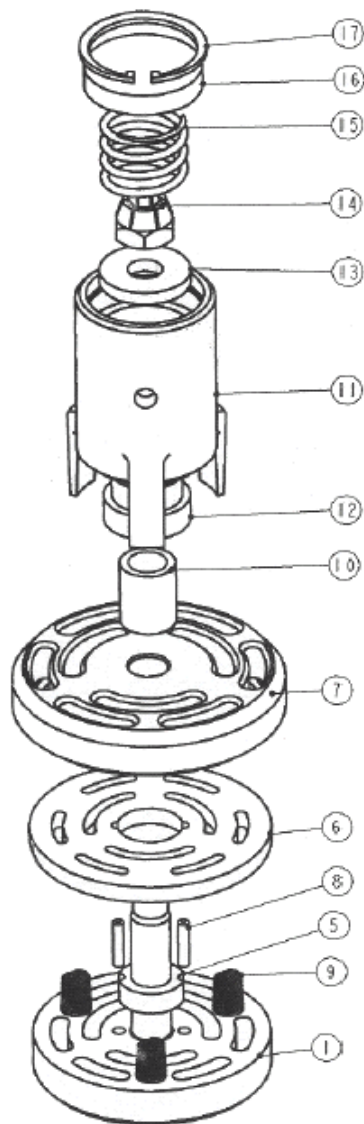
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17. ASSEMBLING DRAWING FOR SUCTION VALVE WITH PEEK PLATE AND UNLOADER

17	INTERNAL CIRCLIP (SEEGER)	7.7
16	COVER	7.7
15	PLUNGER SPRING	7.7
14	NUT	7.1
13	WASHER	7.7
12	PLASTIC BUSH	7.5
11	PLUNGER	7.2
10	METALLIC BUSH	7.5
9	SPRING	7.1, 8
8	PIN	7.6
7	SEAT	7.2
6	PLATE	7.1
5	LIFT WASHER	7.7
4	PIN	7.6
3	STUD	7.4
2	GUARD	7.3
1	GUARD WITH STUD	
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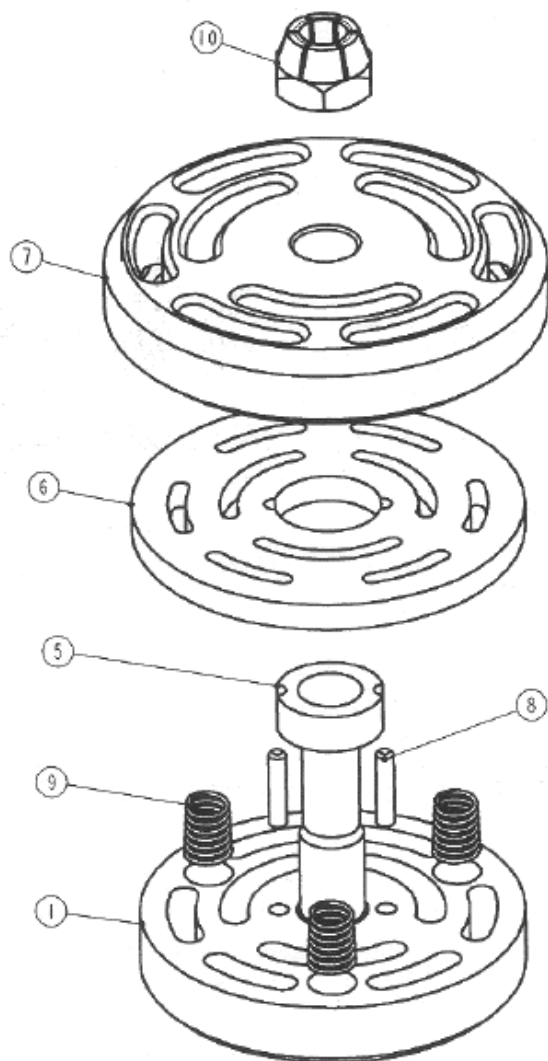
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COMPRESSORS MOD. SW e ST**18. ASSEMBLING DRAWING FOR SUCTION VALVE WITH PEEK PLATE**

10	NUT	7.1
9	SPRING	7.1, 8
8	PIN	7.6
7	SEAT	7.2
6	PLATE	7.1
5	LIFT WASHER	7.7
4	PIN	7.6
3	STUD	7.4
2	GUARD	7.3
1	GUARD WITH STUD	
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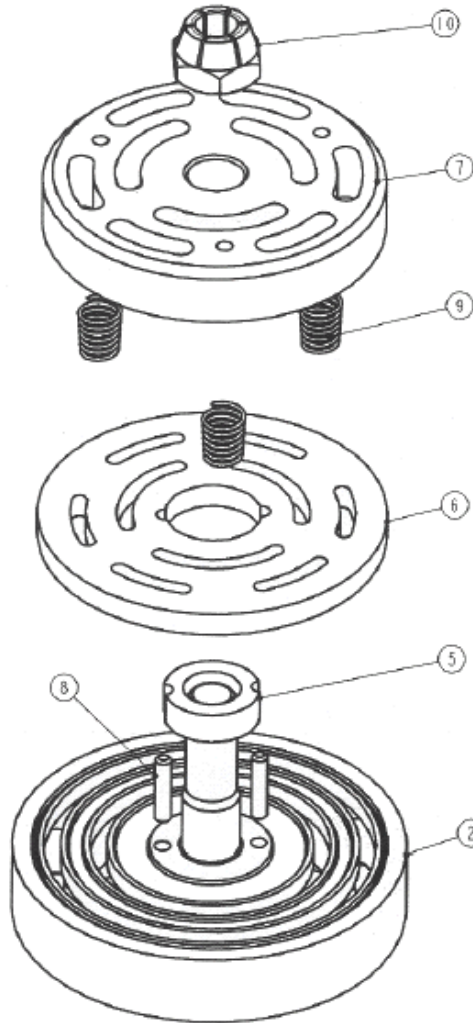
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19. ASSEMBLING DRAWING FOR DISCHARGE VALVE WITH PEEK PLATE

10	NUT	7.1
9	SPRING	7.1, 8
8	PIN	7.6
7	GUARD	7.3
6	PLATE	7.1
5	LIFT WASHER	7.7
4	PIN	7.6
3	STUD	7.4
2	SEAT	7.2
1	SEAT WITH STUD	
REF	DESCRIPTION	REFERENCE PARAGRAPH

Checks to be made on the valves after reinstalling

Whenever checks or maintenance operations are carried out, the following checks need to be performed:

- Verify the valve bodies are tight.
- Check that the valve is able to move freely; if it is not, remove the valve, locate the problem and remedy. When the valve is reinstalled, repeat the checks mentioned above.
- Verify the valve is sealed tight with a specific liquid (diluent).

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COMPRESSORS MOD. SW e ST**7.11 MAINTENANCE OF OTHER COMPRESSOR COMPONENTS**

The table below contains the components and relative references when supplied.

For the maintenance of them see the individual user manuals and maintenance of the various components attached to this manual

Nr.	Component	Manual reference
1	AIR COMPRESSOR	See manufacturer's manual
2	COLING TOWER	See manufacturer's manual
3	CHILLER	See manufacturer's manual
4	CONTROL PANEL	See manufacturer's manual
5	MAIN ELECTRIC MOTOR	See manufacturer's manual
6	ELECTRIC MOTOR DRIVEN PUMP	See manufacturer's manual
7	OIL PUMP MOTOR	See manufacturer's manual
8	INLET FILTER	See manufacturer's manual
9	SAFETY VALVE	See manufacturer's manual
10	GAS SENSOR	See manufacturer's manual

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COMPRESSORS MOD. SW e ST**7.12 LIST OF SPECIAL TOOLS****COMPRESSORS TYPE ST STROKE CC30:**

Component Code	Quantity	Description
22V0000024	2	ROD-BUSHING PULLER
22V0000046	1	BEARING PULLER HOUSING
22V0000047	1	BEARING PULLER HOUSING – PUMP SIDE
22V0000048	1	THICK BEARING PULLER
22V0000049	1	THICK BEARING PULLER
22V0000050	2	BEARING PULLER TOOTH – PUMP SIDE
22V0000051	2	BEARING PULLER TOOTH
22V0000102	1	BEARING PULLER TIE
22V0000069	1	PULLER M6
88002020100A	1	V.T.E. UNI 5739 M 20 L= 100 ZINCATA
22V0000068	2	PULLER M10
		INTRODUTTORE GUARNIZIONI ASTA ST 22
22A0000250	1	ROD PACKING INTRODUCER
		INTRODUTTORE GUARNIZIONI ASTA ST 30/ ROD PACKING
22A0000249	1	INTRODUCER
88003012035B	4	SCREW V.T.C.C.E. UNI 5931 M12 L= 35 ZINC.

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COMPRESSORS MOD. SW e ST**COMPRESSORS TYPE ST STROKE CC50:**

Component Code	Quantity	Description
22V0000025	1	ELASTIC PIN INTRODUCER
22A0000249	1	ROD PACKING INTRODUCER
22V0000013	2	BEARING PULLER TOOTH – PUMP SIDE
22V0000014	1	STUD BEARING PULLER – PUMP SIDE
22V0000016	1	BEARING PULLER TIE
22V0000017	2	BEARING PULLER TOOTH – MOTOR SIDE
22V0000026	2	COUNTERWEIGHTS PULLER M12
22V0000015	1	BEARING PULLER HOUSING
22V0000046	1	BEARING PULLER HOUSING
22V0000068	2	PULLER M10
22V0000069	2	PULLER M6
88002020100A	2	SCREW V.T.E. UNI 5739 M 20 L= 100 ZINCATA
97990012	1	DINAMOMETRIC WRENCH 70-350 Nm
		CONNECTION WRENCH - SLEEVE F1/2"-M3/4" FACOM
97990013	1	S.232A
97990017	1	SLEEVE ELONGATED S.32 LA
97990019	1	KEY SLEEVE ELONGATED K 41 LA
97990020	1	ALLEN KEY HEXAGONAL 8 ST.8

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COMPRESSORS MOD. SW e ST**COMPRESSORS TYPE ST STROKE CC60:**

Component Code	Quantity	Description
22V0000013	2	BEARING PULLER TOOTH – PUMP SIDE
22V0000014	1	STUD BEARING PULLER – PUMP SIDE
22V0000015	1	BEARING PULLER HOUSING
22V0000016	1	BEARING PULLER TIE
22V0000017	2	BEARING PULLER TOOTH – MOTOR SIDE
22V0000018	1	BEARING PULLER HOUSING
22V0000024	2	ROD-BUSHING PULLER M5
22V0000025	1	ELASTIC PIN INTRODUCER
22V0000026	2	COUNTERWEIGHTS PULLER M12
22A0000334	1	ROD PACKING INTRODUCER A-288
88003016050B	8	SCREW V.T.C.C.E. UNI 5931 M16 L= 50 ZINC.

COMPRESSORS TYPE SW STROKE CORSA CC110:

Component Code	Quantity	Description
22V0000069	2	PULLER M6
22V0000124	1	UNIVERSAL GAS JACKET EXTRACTOR V-0000124.R1
97990090	1	DINAMOMETRIC WRENCH 50-400 Nm CONNECTION WRENCH - SLEEVE F1/2"-M3/4"
97990013	1	FACOM S.232A
97990014	1	SLEEVE S.17H
97990015	1	SLEEVE S.19H
97990016	1	SLEEVE ELONGATED S.30 LA
97990017	1	SLEEVE ELONGATED S.32 LA
97990018	1	KEY SLEEVE ELONGATED K.36 LA
97990019	1	KEY SLEEVE ELONGATED K.41 LA
97990020	1	ALLEN KEY HEXAGONAL 8 ST.8
97990021	1	EXTENSION K.210 B
97990022	1	FORK INSERTING TOOL 11.30
22V0000129	1	ROD PACKING INTRODUCER SW
97990022	1	FORK INSERTING TOOL 11.30
22V0000317	1	WRENCH 27 SPECIAL LOCKING LAMELLAR JOINT

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COMPRESSORS MOD. SW e ST**COMPRESSORS TYPE SW-SV STROKE CC95:**

Component Code	Quantity	Description
22V0000069	1	PULLER M6
22V0000124	1	UNIVERSAL GAS JACKET EXTRACTOR V-0000124.R1
22V0000178	1	SPECIAL TOOL
22V0000179	1	ROD PACKING INTRODUCER TOOL SW-DEV-0000179
880608	2	EXAGONAL NUT UNI 5588 M8
880606	2	EXAGONAL NUT UNI 5588 M6
880506	2	EXAGONAL NUT UNI 5587 M6 ZINCATO
882706	1	WASHER 4 x M 6 ZINCATA
22A0003032	1	PULLER GAS JACKET PLATE
97990012	1	DYNAMOMETRIC WRENCH
		CONNECTION WRENCH - SLEEVE F1/2"-M3/4" FACOM
97990013	1	S.232A
97990014	1	SLEEVE S.17H
97990015	1	SLEEVE S.19H
97990016	1	ELONGATED SLEEVE S.30 LA
97990017	1	ELONGATED SLEEVE S.32 LA
97990018	1	ELONGATED SLEEVE KEY K.36 LA
97990019	1	ELONGATED SLEEVE KEY K.41 LA
97990020	1	ALEEN KEY HEXAGONAL 8 ST.8
97990021	1	EXTENSION K.210 B
97990022	1	FORK INSERTING TOOL 11.30
880906	1	THREATED ROD MT.1 M 6 ZINCATA
97990056	1	SLEEVE S.24H
97990055	1	SLEEVE S.30H
97990024	1	SLEEVE S.13H
97990036	1	SLEEVE 3/4" CH. 41 FACOM K.41HA

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240000SAF6368	1	PIN PULLER 536 S6
97990043	1	DYNAMOMETRIC WRENCH 20-100 Nm
22V0000318	1	WRENCH 24 SPECIAL LOCKING LAMELLAR JOINT
97990049	1	FORK INSERTING TOOL (14x18) 11.24
9799001017	1	FORK INSERTING TOOL (att.9x12, ch.17)
97990059	1	EXTENSION S.206 L=52.5 1/2
97990060	1	SCREW DRIVER SLEEVE ST.6
97990062	1	SCREW DRIVER SLEEVE 1/2" CH.10

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7.13 TIGHTENING SEQUENCE

- 1) cross sequence at 50% of the Ms value according the vendor catalog

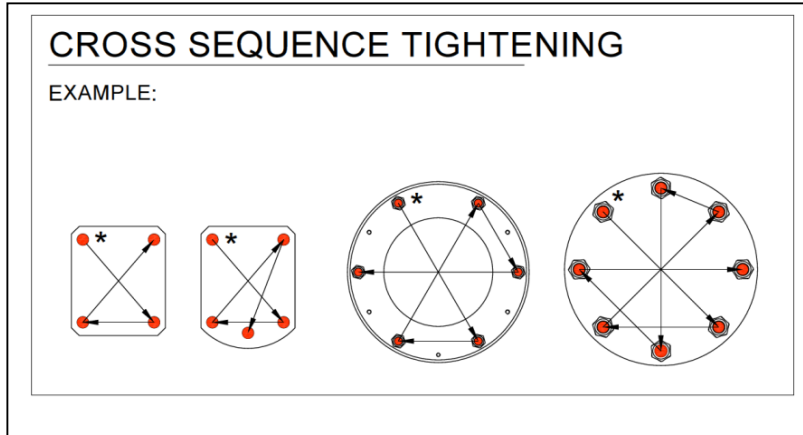


Figure 44 - Cross sequence tightening

- 2) uniform sequence at 50% of the Ms value according the vendor catalog

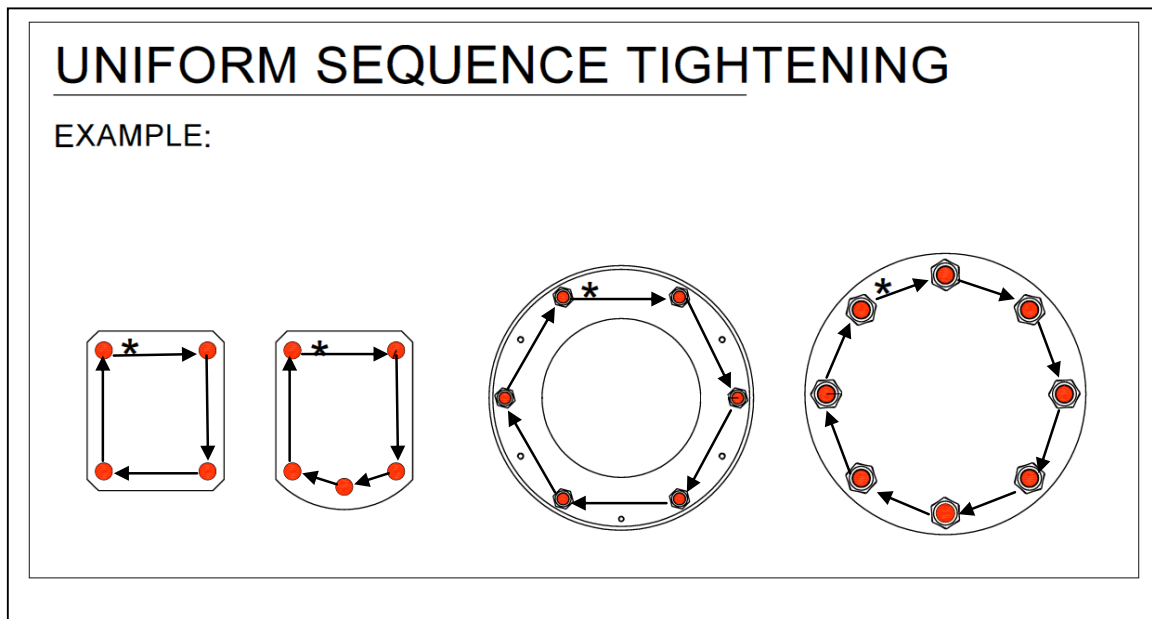


Figure 45 - Uniform sequence tightening

- 3) repeat the cross sequence at the 100% Ms torque value according the vendor catalog
- 4) repeat the uniform sequence at the 100% Ms torque value according the vendor catalog
- 5) repeat as a last operation the uniform sequence at 50% of the Ms value according the vendor catalog

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COMPRESSORS MOD. SW e ST**7.13.1 PUMPING UNIT TIGHTENING TORQUE**

COMPRESSORE TIPO SW CORSA 95 / CCOMPRESSOR TYPE SW STROKE 95			
DESCRIZIONE	DESCRIPTION	COPPIA SERRAGGIO/TORQUE VALUE	NOTE/NOTES
POMPANTE 1° STADIO	1° STAGE PUMPING UNIT		
PRIGIONIERO COPERCHIO POMPANTE (TIRANTE)	PUMPING UNIT TIE-BEAM (STUD BOLT)	70Nm	
DADO BASSO E DADO ALTO COPERCHIO POMPANTE	PUMPING UNIT COVER NUTS (BOTH)	120 Nm	
SERRAGGIO DADO PISTONE	PISTON NUT	200 Nm	
VITI BUSSOLA GUIDA STELO	ROD BUSHING SCREWS	25Nm	
VITI CAPPELLOTTO TESTA CROCE	CROSSHEAD COVER SCREWS	60 Nm	
DADI CAMICIA TESTA CROCE	CROSSHEAD JACKET NUTS	100 Nm	
POMPANTE 2° STADIO	2° STAGE PUMPING UNIT		
PRIGIONIERO COPERCHIO POMPANTE (TIRANTE)	PUMPING UNIT TIE-BEAM	70 Nm	
DADO BASSO E DADO ALTO COPERCHIO POMPANTE	PUMPING UNIT COVER NUTS (BOTH)	120 Nm	
SERRAGGIO DADO PISTONE	PISTON NUT	200 Nm	
VITI CAPPELLOTTO TESTA CROCE	CROSSHEAD COVER SCREWS	60 Nm	
DADI CAMICIA TESTA CROCE	CROSSHEAD COVER SCREWS	100 Nm	
POMPANTE 3°/4° STADIO	3°/4° STAGE PUMPING UNIT		
PRIGIONIERO COPERCHIO POMPANTE (TIRANTE)	PUMPING UNIT TIE-BEAM	70 Nm	
DADO BASSO E DADO ALTO COPERCHIO POMPANTE	PUMPING UNIT COVER NUTS (BOTH)	120 Nm	
SERRAGGIO PISTONE	THREADED PISTON	200 Nm	
VITI CAPPELLOTTO TESTA CROCE	CROSSHEAD COVER SCREWS	60 Nm	
DADI CAMICIA TESTA CROCE	CROSSHEAD COVER SCREWS	130 Nm	
MANOVELLISMO	CRANKSHAFT MECHANISM		
VITI CAPPELLOTTO BIELLA	CONNECTING ROD COVER SCREWS	250 Nm	loctite blu 242
VITI FISSAGGIO CONTRAPPESI	COUNTERWEIGHTS SCREWS	180 Nm	loctite blu 242
TUTTI LE VITI M12	M12 SCREWS	80 Nm	
VITI COPERCHIO LATO MOTORE	CRANK MECHANISM COVER MOTOR SIDE	60 Nm	

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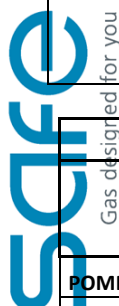
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COMPRESSORS MOD. SW e ST**COMPRESSORE TIPO SW CORSA 110/CCOMPRESSOR TYPE SW STROKE 110**

DESCRIZIONE	DESCRIPTION	COPPIA SERRAGGIO/TORQUE VALUE	NOTE/NOTES
POMPAnte 1° STADIO	1° STAGE PUMPING UNIT		
PRIGIONIERO COPERCHIO POMPAnte (TIRANTE)	PUMPING UNIT TIE-BEAM (STUD BOLT)	100 Nm	
DADO BASSO E DADO ALTO COPERCHIO POMPAnte	PUMPING UNIT COVER NUTS (BOTH)	200 Nm	
SERRAGGIO DADO PISTONE	PISTON NUT	350 Nm	
VITE BLOCCAGGIO SPINOTTO TESTA CROCE	CROSSHEAD GUDGEON PIN SCREW	60 Nm	
BULLONE FISSAGGIO CILINDRO/CAMICIA TESTA CROCE	CROSSHEAD COVER SCREWS	170 Nm	
BOCCOLA GUARNIZIONI TENUTA ASTA	CROSSHEAD JACKET NUTS	30 Nm	
POMPAnte 2° STADIO	2° STAGE PUMPING UNIT		
PRIGIONIERO COPERCHIO POMPAnte (TIRANTE)	PUMPING UNIT TIE-BEAM (STUD BOLT)	70 Nm	
DADO BASSO E DADO ALTO COPERCHIO POMPAnte	PUMPING UNIT COVER NUTS (BOTH)	200 Nm	
SERRAGGIO DADO PISTONE	PISTON NUT	350 Nm	
VITE BLOCCAGGIO SPINOTTO TESTA CROCE	CROSSHEAD GUDGEON PIN SCREW	60 Nm	
BULLONE FISSAGGIO CILINDRO/CAMICIA TESTA CROCE	CROSSHEAD COVER SCREWS	170 Nm	
VITE FISSAGGIO BOCCOLA GUARNIZIONI TENUTA ASTA	CROSSHEAD JACKET NUTS	30 Nm	
POMPAnte 3°/4° STADIO	3°/4° STAGE PUMPING UNIT		
PRIGIONIERO COPERCHIO POMPAnte (TIRANTE)	PUMPING UNIT TIE-BEAM (STUD BOLT)	70 Nm	
DADO BASSO E DADO ALTO COPERCHIO POMPAnte	PUMPING UNIT COVER NUTS (BOTH)	200 Nm	
SERRAGGIO PISTONE	THREADED PISTON	350 Nm	
VITE BLOCCAGGIO SPINOTTO TESTA CROCE	CROSSHEAD GUDGEON PIN SCREW	60 Nm	
BULLONE FISSAGGIO CILINDRO/CAMICIA TESTA CROCE	CROSSHEAD COVER SCREWS	170 Nm	
VITE FISSAGGIO BOCCOLA GUARNIZIONI TENUTA ASTA	CROSSHEAD JACKET NUTS	30 Nm	
MANOVELLISMO	CRANKSHAFT MECHANISM		
VITI CAPPELOTTO BIELLA	CONNECTING ROD COVER SCREWS	250 Nm	loctite blu 242
VITI FISSAGGIO CONTRAPPESI	COUNTERWEIGHTS SCREWS	180 Nm	loctite blu 242
TUTTI I DADI M12	M12 SCREWS	80 Nm	
VITI COPERCHIO LATO MOTORE	CRANK MECHANISM COVER MOTOR SIDE	80 Nm	

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COMPRESSORS MOD. SW e ST**COMPRESSORE TIPO ST CORSA 50/COMPRESSOR TYPE ST STROKE 50**

Title	Components and operation description	Torque value	Pos.
Tie rods Tightening		70 Nm	116,216,218,316,416,418
Piston fastening			
	Tighten the Cylindrical screw (A-721.R2):	120 Nm	232,233,234,235,331,332,433,434
	Tighten the Screw mushroom head (A-722.R3):	200 Nm	432,433,434,435
	Piston monoblock:	120 Nm	129,229,231,329,429,430,431,432
Tightening lower nuts cover	Tighten the lower nuts cover in a cross way with at least 2 steps.	160 Nm	125,225,227,325,331,425,427
Tightening the 4 nuts cover	Tighten the 4 nuts cover in a cross way with at least 2 steps.	160 Nm	126,226,228,326,332,426,428

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COMPRESSORS MOD. SW e ST

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COMPRESSORE TIPO ST CORSA 60/CCOMPRESSOR TYPE ST STROKE 60

Title	Components and operation description	Torque value	Pos.
Tie rods Tightening		70 Nm	116,117,216,316,416,516
Piston fastening			
	Tighten the Cylindrical screw (A-721.R2):	120 Nm	129,130,131,132,230,328,329,431,432
	Tighten the Screw mushroom head (A-722.R3):	200 Nm	230,231,329,330,432,433,532,533
	Piston monoblock:	120 Nm	125,128,225,325,428,431,530
Tightening lower nuts cover	Tighten the lower nuts cover in a cross way with at least 2 steps.	200 Nm	122,124,223,224,323,425,525
Tightening the 4 nuts cover	Tighten the 4 nuts cover in a cross way with at least 2 steps.	200 Nm	123,125,224,324,426,526

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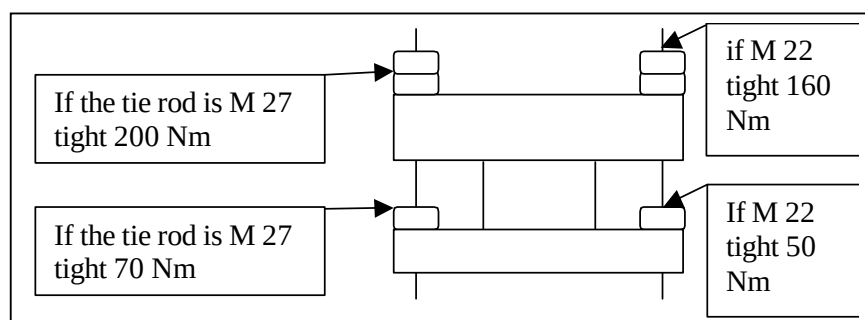
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COMPRESSORS MOD. SW e ST**COMPRESSORS TYPE ST**

- Here the value of the torque wrench, please notice to screw in a cross line.
Bolt for the pistons (M 18, it is similar to a mushroom) torque 200 Nm. It is used for piston diameter bigger than 100 mm.
Bolt for the pistons (M 18, it is similar to a normal bolt) torque 120 Nm. It is used for piston diameter bigger than 50 mm and less than 95 mm.
Piston bolt in thread (M 18, it is a piston with a bolt all together) torque 120 Nm. It is used for piston diameter less than 50 mm.
- The two nut of the tie rod M 27 must tight at torque of a 200 Nm instead of the one under the white head must tight at a torque of a 70 Nm.**
- The two nut of the tie rod M 22 must tight at a torque of a 160 Nm instead of the one under the white head must tight at a torque of a 50 Nm.**



- Please be attention for the small compressor because they don't use the bolts to connect the rod to the piston, but the piston is directly screw to the rod at 70 Nm torque.

DESCRIPTION	PISTON DIAMETER	TORQUE VALUE Nm
BOLT of the PISTON (M18)	Diameter bigger than 100 mm	200
	It is similar to a mushroom	
BOLT of the PISTON (M18)	Diameter bigger than 50 mm and less than 95 mm	120
BOLT of the PISTON (M18)	Diameter less than 50 mm	120
PISTON DIRECTLY SCREWED TO THE ROD	For the small compressor stroke 30 mm, and rod 20 mm	70
TIE ROD NUTS M27		200 Nm the two upper nut, and 70 Nm the other one
TIE ROD NUTS M22		160 Nm the two upper nut, and 50 Nm the other one

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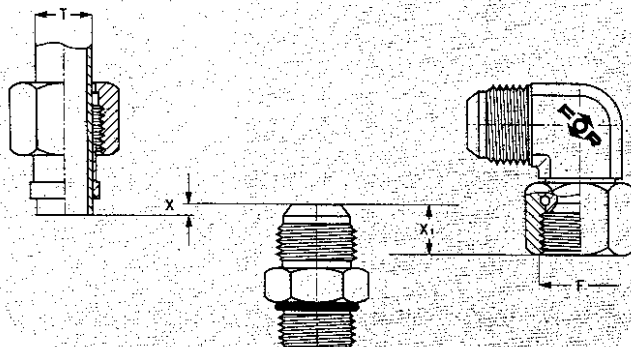
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7.13.2 TIGHTENING TORQUE FOR PIPE FITTINGS**DATI GENERALI
GENERAL DATA**

La tabella sottoindicata riassume dati di utilità generale richiesti nelle fasi di progettazione e montaggio dei raccordi.

For design purposes and tube to-connector assembly refer to advice data on table below.

T Ø ESTERNO TUBO TUBE O.D		SPESORE TUBO MAX MAX TUBE THICKNESS	F FILETTATURA THREAD	X RIF.	X1 RIF.	COPPIA DI SERRAGGIO ASSEMBLY TORQUE	PRESSIONE DI ESERCIZIO WORKING PRESSURE	
MM.	IN.	MM.		MM.	MM.	N.M	MPA	BAR
6	1/4	1,5	7/16-20	2	10	13-15	45,0	450
8	5/16	1,5	1/2-20	2	11	18-25	41,6	416
10	3/8	1,5	9/16-18	2	11,5	24-31	35,0	350
12	1/2	2,0	3/4-16	3	13	45-52	35,0	350
14		2,0					33,0	330
15		2,0	7/8-14	3,5	15,5	65-72	31,0	310
16	5/8	2,5					35,0	350
18	3/4	2,5	1"1/16-12	3,5	17,5	92-100	32,0	320
20		2,5					30,0	300
22	7/8	3,0	1"3/16-12	3,5	18	118-130	31,5	315
25	1"	3,0	1"5/16-12	3,5	18,5	127-145	29,0	290
30		3,0	1"5/8-12	5	20,5	175-190	25,0	250
32	1"1/4	3,0					24,0	240
38	1"1/2	4,0	1"7/8-12	5	23	215-240	25,0	250

Figure 46 - Fitting torque value

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7.14 PUMPING UNIT MAINTENANCE

7.14.1 HOW TO INSTALL THE INNER/OUTER GLYD RINGS

- Installing the glyd ring in open grooves.

No tools are needed to for installation in a groove.

Both the gasket and stuffing box should be cleaned and oiled before being installed.

In addition, set the gasket before mounting it on the rod.

This operation can be carried out either with an instrument or with the rod itself.

Turn the gauging tool back and forth once put in to aid in setting.

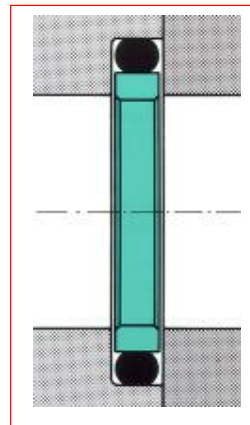


Figure 47 - A - Glyd ring installation

- Installing the glyd ring in closed grooves

The glyd rings can be installed in closed grooves if their diameter, cross-section and composite materials fall within a certain range.

Information about tools to install smaller rings is available on request.

Clean all the components before installing.

Stay clear of sharp corners and do not use worn tools.

All the components must be lubricated.

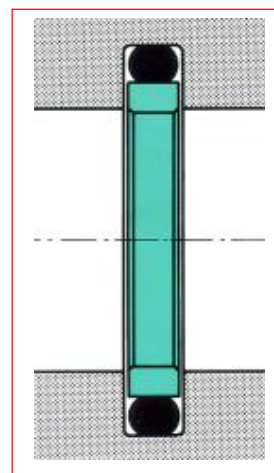


Figure 48 - B - Glyd ring installation

The o-ring should be bent and placed in the groove, being careful not to twist it.

The o-ring should be bent, being careful to stay clear of sharp corners that may permanently damage it. Once bent, use two fingers to place the ring in the groove.

Once released, the ring will expand partly inside the groove.

Using your fingers only, even out any wrinkles that formed while the gasket was being bent.

Do not use tools that may damage the surface of the gasket for this purpose.

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Once installed, set the gasket using a chuck or piston mating rod.

While setting, the end of the piston rod should be beveled to obtain the same surface finish and shape as the chuck. The rod also needs to be lubricated, covering the threading and bores. Turn the chuck or rod to aid in inserting. Once set, the piston rod can be inserted.

The tape that covers the threading should be taken off only after inserting the piston rod through the gasket.

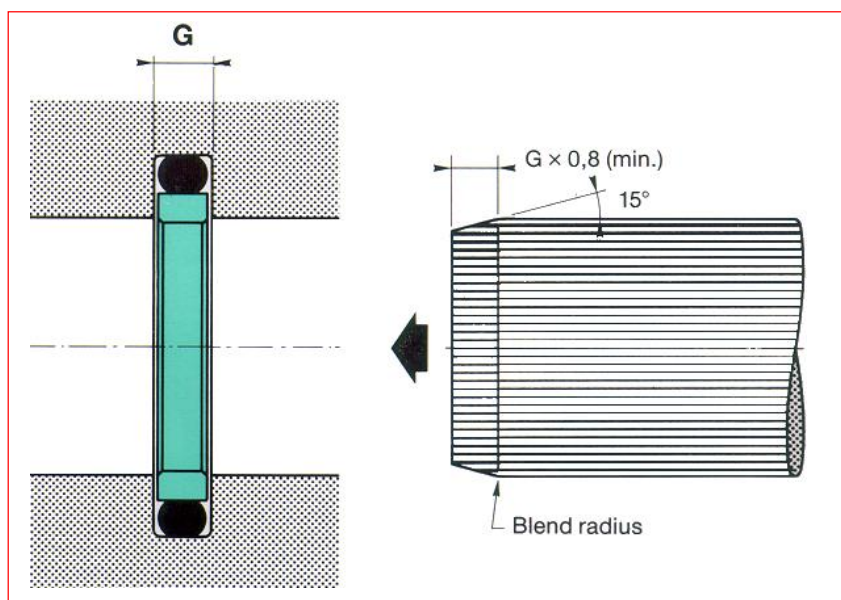


Figure 49 - C - Glyd ring installation

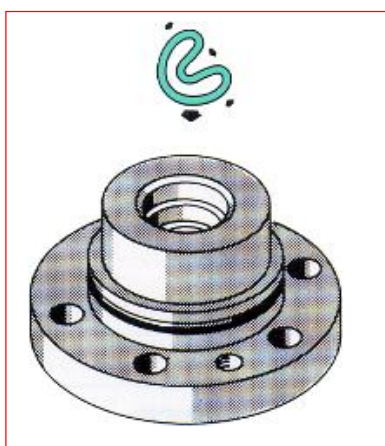


Figure 50 - D - Glyd ring installation

7.14.2 HOW TO INSTALL THE GLYD RINGS FOR OUTER SEALING

- **Installing the glyd rings in open grooves.**

No tools are needed to for installation in an open groove.

Both the gasket and stuffing box should be cleaned and oiled before being installed.

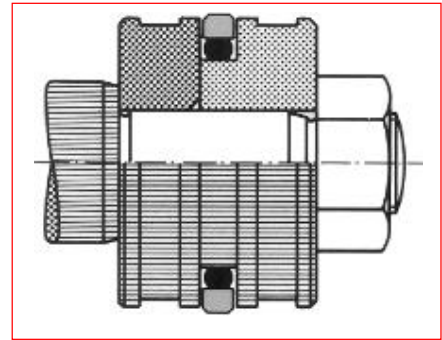


Figure 51 - E - Glyd ring installation

- **Installing the glyd rings in closed grooves.**

The glyd rings can be installed in closed grooves if their diameter, cross-section and composite materials fall within a certain range.

However, smaller diameters, special shapes and some materials have to be installed in closed grooves.

Determine if the glyd ring can be installed in a closed groove.

To install without using tools, for example on site, the glyd ring can be supplied with a Z opening, i.e. a special opening that enlargens the ring and allows it to be directly installed in the groove without expanding on the piston.

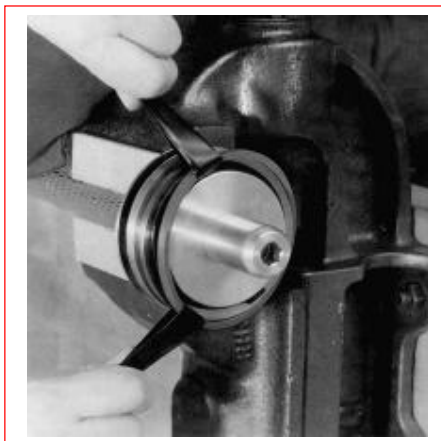


Figure 53 - G - Glyd ring installation

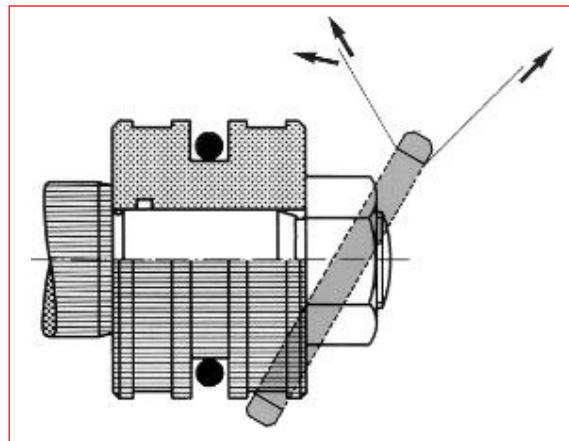


Figure 52 - F - Glyd ring installation

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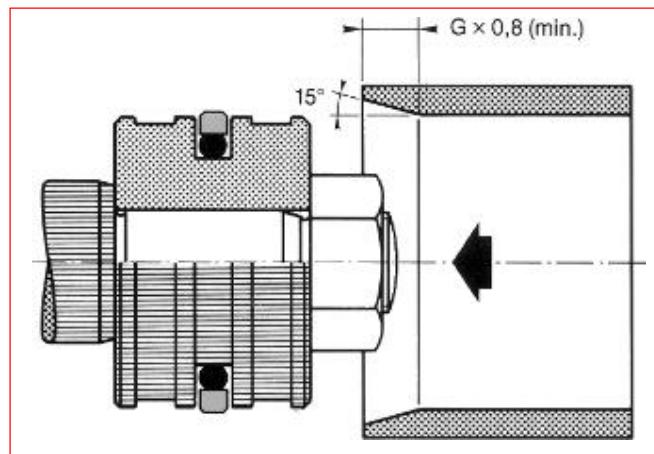
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COMPRESSORS MOD. SW e ST**Figure 54 - Glyd ring installation**

Clean all the components before installing.

Stay clear of sharp corners and do not use worn tools.

The o-ring has to expand on the piston and should be placed at the end of the groove, making sure it is not twisted.

Dental floss may be useful in installing the o-ring.

Pass the floss through the o-ring, mounting the ring in the groove.

The floss can then be pulled along the inside margin of the o-ring until the latter enlargens inside the groove without wrinkling. To aid in installing, the gasket can be heated up (max. 200°C) in an oven or in oil and water.

This operation is particularly important for series S-55042 for heavy duty applications.

NOTE Composite materials 80 and 451 can be heated up only to +80°C.

The Glyd Ring should be evenly layed on the piston and placed over the o-ring.

This operation may be made easier by using synthetic guide strips.

The glyd ring can also be installed by using a simple chuck. In this case, place it on the piston then push the glyd ring onto the chuck by hand until it reaches its seat in the groove.

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Once installed, the gasket will be a little bit too big and its original diameter should be restored using a gauge or the cylinder itself.

In both cases, it is extremely important that the opening for the cylinder or gauge is correct and does not have any burrs or sharp corners.

- **Installation using auxiliary tools**

Installation tools should be used to ease installation of glyd rings whose diameter is up to approximately 150 mm.

To install cross-sections that are much larger than the diameter, contact your local dealer for more detailed information.

Determine if a standard glyd ring can be installed in a closed groove.

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COMPRESSORS MOD. SW e ST**7.15 PROLONGED INACTIVITY****NITROGEN FLUSHING PROCEDURE FOR A PROPER STORAGE OF THE RECIPROCATING COMPRESSORS GAS CIRCUIT**

PURPOSE: Store the gas circuit of the compressor in an inert atmosphere preventing any risk of corrosion.

APPLICATION: All reciprocating compressors manufacturing Safe.

Activity to perform :

1. Inject nitrogen into the gas circuit of the compressor and let it flow inside the circuit and discharge into the open ambient for 2 minutes approximately.
2. Close the vent valves and then increase the pressure of the nitrogen inside the gas circuit to the value of 1.5 bar.
3. Close the supplying compressor valve (inlet valve) so as to maintain constant at 1.5 bar the nitrogen pressure inside the gas circuit, close the cylinder valve of nitrogen, and then detach the hose for feeding nitrogen to the compressor.

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This section contains the specifications of the various products mentioned in the instructions provided to perform the recommended operations to protect the compressor when it remains inoperative.

Protective lubricating oil

ISO VG68 (SAE 20) and ISO VG100 (SAE 30) oils are recommended. These oils have exceptional anti-corrosion and anti-rust properties capable of protecting metal surfaces during long periods of inactivity. No special procedures are required to drain the oil. Simply drain and change the oil with lubricating oil as specified in **chapter 07.06.01**

Protective oil**Description and applications:**

Oil that protects against rust particularly suitable for long-term protection of machined surfaces, spare parts, machinery, instruments and bearings.

Properties and specifications:

Highly efficient rust preventative MIL-C-16173 D

.Protective oil with specifications MIL-C-16173 is recommended. This rust preventative oil needs to be diluted in solvent before being used. Once the solvent has evaporated, a thin clear coat of oil remains on the treated surface that provides good protection against rust. It can either be sprayed on or applied with a paint brush at room temperature. To remove, simply use a common petroleum-derived solvent (diesel fuel is recommended),

Protective grease

Use of protective grease is recommended. It is a grease that appears creamy and slightly sticky that makes it perfect to protect the surfaces it is applied on for moisture. To remove, simply use a common petroleum-derived solvent (diesel fuel is recommended),

Dehydrator

A substance such as silica-gel is recommended. Verify that the dehydrator is effective. If it is running the sticker changes color.

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If the compressor and relative system remain inoperative for more than 5 months, take the following precautions:

- a) Drain the lubricating oil from the compressor.
- b) Empty the cooling water circuit and allow water emulsified in oil to circulate for about 30 minutes. Drain the circuit again.
- c) Spray oil that meets the specifications given below on the inside walls, mechanisms, cylinders, gas chambers and valves of the oil compressor:
 - Protective, rust preventative thinned with solvent. Evaporated solvent leaves a thin semi-transparent greasy coat on the surfaces that assures efficient long term protection against rust in humid and salty atmospheres.
 - Easy application at room temperature with a paint brush, by being dipped or by being sprayed on.
 - Easily removable with every day solvents, steam degreasers or alkaline solutions.
 - Apply grease on the outside of the compressor shaft and all external unpainted parts. The grease should be as specified below:
 - Be calcic based and creamy with lubricating and protective properties.
 - Have anti-corrosion properties suitable to protect the surfaces of the mechanical parts it is applied on against humidity and salty ambients.
 - Be water-proof so that it can come into contact with water without causing any problems.
- d) Cover the connections of the instrumentation and the instrumentation itself with grease that is as specified above and close them in air tight plastic bags putting in bags of dehydrators. Contact the supplier to find out the exact amount of dehydrator to be used.
- e) Clean all the pipelines and cylinders with nitrogen.
- f) Place bags of dehydrator inside the electrical cabinet.
- g) Turn the compressor shaft a few turns manually every 30 days. Do not allow the compressor shaft to stop in the starting position.
- h) Verify that the dehydrator is still effective on a regular basis as instructed by the manufacturer. In any case, change the bags of dehydrator approximately every 3 months.
- i) Do not allow the dehydrator to come into direct contact with mechanical parts.

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7.16 OPERATIONS AFTER INACTIVITY

Perform the operations given below before starting up the unit:

- A. Thoroughly clean all the parts, removing the protective coat of oil with solvent.
- B. Thoroughly clean the oil bowl.
- C. Make sure no bags of dehydrator have been left inside the components.
- D. Pickle the pipelines if rust is found.

Observe the safety rules and precautions given in chapter 03 in the Operating instructions and maintenance manual.



ATTENTION! Whenever components are removed, check wear and tear before reinstalling.

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8 TROUBLESHOOTING GUIDE

8.1 TROUBLESHOOTING LIST

Proper machine operation and observing the routine maintenance schedule prevent many troubles from arising.

Personnel responsible for operation and maintenance of the compressor and relative system must be adequately instructed and trained.

First of all, become familiar with the information given in this chapter.

For any problems or information about compressor operation SAFE has a *Technical Support* service available for its customers. (The telephone numbers are given in section 00).

NUMBER	DESCRIPTION	CORRECTIVE ACTION
1	Excessive load loss during intake	Check gas pipeline and relative control equipment
2	Intake filter clogged	Clean filter and change if no longer efficient
3	Final compressor pressure higher than operating value	Check efficiency of equipment placed after compressor
4	Instruments defective	Correct operation and replace any defective instruments

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5	Too much condensate let into gas	Check operation of separators. Increase rate at which separated liquids are drained. Add drain cocks in points of gas lines where liquid may accumulate. Restore gas temperatures and operating pressures to values established for compressor.
6	Solid particles get into gas	Blow off gas pipelines and relative equipment. Check operation of system found before compressor. .
7	Piping not properly secured	Check stability of retainers used, make them stronger or add additional ones.
8	Mechanisms not adequately lubricated	Use oil that meets required specifications. Restore oil level in reservoir. Verify there are no leaks. Check pump efficiency.

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9	Oil pressure in hydraulic and lubrication circuit below set value	Check operation of pressure gauge. Check setting of oil circuit safety valve. Use oil that meets required specifications. Restore oil level in reservoir. Eliminate any circuit leaks. Increase oil cooler efficiency. Clean or change filter. Check lubrication pump efficiency. Verify if oil temperature is too low.
10	Gas leaks from gaskets	- Replace damaged gaskets. - Restore condition of surfaces that mat with gaskets.
11	Cooling insufficient	- Increase cooling system capacity and clean heat exchanger walls. - Use coolant that produces fewer deposits.

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12	Corrosions	-Eliminate corrosive agent. -Keep pressure and temperature at specified values. -Prevent corrosive agent from coming into contact with parts. -Apply anticorrosion treatment on parts that get damaged. -Improve separation of condensates. -Verify if random electric currents are present and eliminate.
13	Excessive pressure pulses	- Restore compressor operating conditions established during design stage. - Change size or path of system lines or insert dampers.
14	Delivery pressure of a stage higher than normal value	- Fault in gas delivery valves or intake valves of next stage. Restore operating conditions of valves.

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COMPRESSORS MOD. SW e ST**8.1.1 ALARM TROUBLESHOOTING**

Press Reset and check on the PLC display if any alarm event has been triggered

Upon appearance of alarms on the electrical control panel PLC display, check for the related causes and perform corrective actions as reported in the following tables (main alarm event list)

Alarm Event	Possible causes	Corrective action
Low suction pressure	A – low pressure in suction gas pipeline B – valves closed in inlet gas pipeline C – clogged filters in inlet gas pipeline D – Damaged gas pressure transducer E – Faulty gas pressure transducer electrical connection F – Faulty electrical panel analog barrier	A – Check gas pipeline inlet pressure B – Check proper operation of pneumatic actuators on the inlet gas line. Check that no manual valves on the inlet line are closed C – Check status of filters in the gas inlet line D – Verify that control panel reading is the same as the transducer one E – Verify that electrical connections are properly tightened F – Verify that the analog barrier is turned ON
High suction pressure	High pressure in suction gas pipeline	Check effective suction pressure on the gas pipeline
High 1 st stage pressure	A – Damaged inlet or outlet valves of the 2 nd stage B – Faulty electrical connection on the gas inlet line C – Faulty analog barrier inside the control panel D – Interstage valves not opening E – High inlet gas pressure	A – Check for presence of impurities or damage to valve plates B – Verify that electrical connections are properly tightened C – Verify that the analog barrier is turned ON D – Verify that interstage pneumatic actuators work properly E – Check pipeline inlet gas pressure
High 2 nd stage pressure	A – Damaged inlet or outlet valves of the 3 rd stage B – Faulty electrical connection on the transducer C – Faulty analog barrier inside the control panel D – Interstage valves not opening	A – Check for presence of impurities or damage to valve plates B – Verify that electrical connections are properly tightened C – Verify that the analog barrier is turned ON D – Verify that interstage pneumatic actuators work properly

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Alarm Event	Possible causes	Corrective action
High 3 rd stage pressure	A – Faulty analog barrier inside the control panel B – Interstage valves not opening	A – Verify that the analog barrier is turned ON B – Verify that interstage pneumatic actuators work properly
Low pressure Cooling water	A – presence of air inside the water circuit B – Lack of sufficient water inside the circuit C – Faulty water pressure transducer D – Faulty electrical connections on the inlet line pressure transducer E – Faulty electrical panel analog barrier F – Pump rotation in wrong direction G – insufficient pump speed (rpm) H – Water pump disconnected	A – Bleed air from proper air out valve on the compressor skid B – Verify fluid level inside the plastic water expansion tank (it should be around half tank level) C – Verify that the value shown on the control panel PLC display is equal to the one measured near the transducer D - Verify that electrical connections are properly tightened E – Verify that the analog barrier is turned ON F – Check rotation direction of pump motor G – check rpm, current absorption of pump electric motor and cable connection. H – Check water pump cabling connections
Low oil level	A – Lack of sufficient oil in the compressor crankcase B - Gauge failure C – Faulty electrical connections on the inlet line pressure transducer D – Faulty digital barrier inside the electrical control panel	A – Verify oil level B – Verify with tester that the gauge level works properly C – Verify that electrical connections are properly tightened D – Verify that the barrier is turned on
Low pressure instrument air	A – Low air pressure in the pneumatic circuit B – Faulty electrical connections of the inlet line pressure transducer C – Faulty digital barrier inside the electrical control panel D – Broken air pressure switch	A – Verify that air compressor is on and that no valves on the pneumatic line are closed B – Verify that electrical connections are properly tightened C – Verify that the digital barrier is turned ON D – Verify working status of pressure switch with tester

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Alarm Event	Possible causes	Corrective action
High oil temperature alarm	A – High oil temperature in the compressor crankcase B – Faulty oil temperature control thermocouple C – Faulty thermocouple electrical connection D – Faulty digital barrier inside the electrical control panel E – Clogged oil heat exchanger F – Possible mechanical problems on compressor body G – Faulty temperature switch for the fan motor	A – Verify oil temperature B – Verify that value appearing on control panel PLC display is equal to the one measured near the thermocouple C – Verify that electrical connections are properly tightened D – Verify that the digital barrier is turned ON E – Verify inlet and outlet oil and water heat exchanger temperatures F – Check that all parts in motion are properly moving G - Check if the temperature switch (position TSH31-Drawing I0000...) is working good and give the fan motor start on time.
High cooling fluid alarm	A – High cooling fluid temperature B – Faulty cooling fluid thermocouple C – Faulty electrical connections on cooling fluid thermocouple D – Faulty electrical panel analog barrier E – Clogged cooling fluid circuit F – Broken water-Air heat exchanger fan or wrong rotation direction of the same	A – Check cooling fluid temperature B – Verify that the value shown on the control panel PLC display is equal to the one measured near the thermocouple C - Verify that electrical connections are properly tightened D – Verify that the analog/digital barrier is turned ON E – Verify water-air heat exchanger inlet and outlet temperatures F – Verify that fan operates properly and rotates in the right direction
Auxiliary motor overload	A – Faulty motor B - Faulty motor electrical connections C – Faulty control panel motor starter D – Faulty control panel relay	A – Verify motor windings with tester B – Verify that electrical connections are properly tightened C – Verify motor starter for eventual damage D – Verify relay for eventual damage
Compressor motor overload	A – Faulty motor B - Faulty motor electrical connections C – Faulty control panel motor starter D – Faulty control panel relay	A – Verify motor windings with tester B – Verify that electrical connections are properly tightened C – Verify motor starter for eventual damage D – Verify relay for eventual

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Alarm Event	Possible causes	damage Corrective action
Clogged Lubrication or Maintenance Oil filters	A – Presence of impurities inside filter B – Faulty electrical indicator C – Faulty indicator electrical connection D – Faulty analog barrier inside the electrical control panel	A – Verify oil filter B – Verify with tester that indicator works properly C – Verify that electrical connections are properly tightened D – Verify that the analog/digital barrier is turned ON
High 1-2-3 motor winding temperature alarm	A – Faulty motor B – Bad fixing of motor power electrical connections C – Faulty thermocouple electrical connection D – Faulty analog barrier inside the electrical control panel	A – Verify motor windings with tester B – Verify that electrical connections are properly tightened C – Verify that electrical connections are properly tightened D – Verify that the analog/digital barrier is turned ON
High DE-WDE (NDE) bearing temperature alarm	A – Damaged bearings B – Lack of greasing to motor bearings C – Faulty thermocouple electrical connection D – Faulty analog barrier inside the electrical control panel	A – Verify motor bearings B – Verify that bearings have been greased in accordance with motor manufacturer's instructions C – Verify that electrical connections are properly tightened D – Verify that the analog/digital barrier is turned ON
High pressure alarm	A – Closed pneumatic or manual valves on outlet lines B – Faulty transducer electrical connection C – Faulty analog barrier inside the electrical control panel	A – Verify presence of closed manual valves on outlet lines and verify that pneumatic valves operate correctly B – Verify that electrical connections are properly tightened C – Verify that the analog/digital barrier is turned ON
High first/second stage temperature	A – Damaged inlet/outlet valves of the following stage B – Clogged gas heat exchanger C – Faulty thermocouple electrical connections D – Faulty analog barrier inside the electrical control panel	A – Verify presence of dirt on valve plates and absence of damage to the same B – Verify inlet and outlet heat exchanger temperatures C – Verify that electrical connections are properly tightened D – Verify that the analog/digital barrier is turned ON

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C.C.I.A.A. di Bologna al n. 03224661201

C.F. - P.IVA 03224661201

COMPRESSORS MOD. SW e ST

Alarm Event	Possible causes	Corrective action
Low lubrication oil pressure	A – Presence of dirt in the lubrication pressure regulating valve B – Damage to oil pump C – Broken motor-oil pump joint D – Faulty transducer electrical connections E – Faulty analog barrier inside the electrical control panel	A – Verify presence of dirt within regulating valve B – Check oil pump C – Verify motor rotation in absence of load D – Verify that electrical connections are properly tightened E – Verify that the analog/digital barrier is turned ON
Power supply voltage alarm	A – Bad tightening of electrical power connections B – Insufficient cable size for electrical control panel power supply C – Insufficient transformer size in station electrical substation D – Faulty grid voltage indicator E – Faulty digital barrier inside the electrical control panel	A – Verify that electrical connections are properly tightened B – Verify compressor adsorption current during operation cycle C – Verify compressor adsorption current during operation cycle D – Verify indicator operation with tester E – Verify that the analog/digital barrier is turned ON
Vibration alarm	A – Badly positioned/unbalanced compressor skid B – Faulty vibration sensor C – Faulty vibration sensor electrical connection D – Faulty analog barrier inside the electrical control panel	A – Verify pavement levelling and unevenness. Verify that all skid bolts/spring dampeners are properly in touch with the pavement B – Verify vibration sensor operation C – Verify that electrical connections are properly tightened D – Verify that the analog/digital barrier is turned ON
Anomaly softstart (only for softstart equipped compressors)	A – Faulty soft start electrical device B – Wrong compressor motor connections C – Insufficient cable size for electrical control panel power supply D – Insufficient transformer size in station electrical substation E – Faulty digital barrier inside the electrical control panel F – Faulty motor G – Compressor bypass valve lifters not working	A – Verify type of alarm on electrical control panel PLC display B – Verify that motor is delta connected C – Verify that grid voltage does not incur into significant drops upon compressor start D – Verify that grid voltage does not incur into significant drops upon compressor start E – Verify that the analog/digital barrier is turned ON F – Verify motor windings with tester G – Verify valve lifter operation with compressor stopped
Electric resistance overcharge alarm (Dryer)	A – Faulty electric heater resistance	A – Verify resistance and eliminate fault

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COMPRESSORS MOD. SW e ST

Alarm Event	Possible causes	Corrective action
Emergency alarm button pressed (Dryer)	A – Pressing of emergency alarm button	A – Verify causes for emergency alarm button pressing
Hydraulic compressor motor overheating (Dryer)	A – Compressor motor thermostat not enabled	A – Enable compressor motor thermostat
Hydraulic compressor oil overheating alarm (excessive temperature) (Dryer)	A – Oil overheating (oil temperature above threshold value)	A – Verify causes for oil overheating
Hydraulic compressor low oil level alarm (Dryer)	A – Low oil level	A – Alarm vanishes upon startup of hydraulic compressor indicating low oil level

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8.2 MOST COMMONLY ENCOUNTERED MALFUNCTIONS

EFFECT	CAUSE	CORRECTIVE ACTION
1) Interstage pressures increase	Probable leak in next stage: a: gas valve b : valve upper and lower gaskets c : cylinder gaskets	Check valve sealing. Change upper and lower valve gaskets. Replace cylinder gaskets.
2) Lubrication oil pressure low, holding oil pressure low (separate circuit, where provided)	Probable trouble in holding circuit, mating surfaces between rod and pad do not adhere allowing oil to leak out.	Clean pressure control valves. Make sure oil pump works correctly.
3) Holding oil pressure high (separate circuit, where provided) lubrication oil pressure low	Rod tie tod most likely broken, when rod-pad surfaces mat, pressure increases, when surfaces are detached, pressure drops.	Open covers, turn compressor shaft by hand verifying cylinders move alternately. Locate damaged tie rod and replace.

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COMPRESSORS MOD. SW e ST



9 JOB RECORD

- Date

Write the date the job was performed

- Hours of operation

Hours compressor has operated up to date given above

- Description of job performed

Write all jobs performed and the reasons of why they were done.

Give a brief concise description of te jobs.

- Note

Write any problems encountered.

- Signature of person who performed jobs

Used to identify the qualified technician who performed that particular maintenance operation.

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COMPRESSORS MOD. SW e ST**JOB RECORD**

DATE:

HOURS OF OPERATION:

DESCRIPTION OF JOBS PERFORMED:

NOTE:

SIGNATURE:

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UNI EN ISO 9001:2008 Certificate nr. IT232530

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C.F. - P.IVA 03224661201**COMPRESSORS MOD. SW e ST****COMPRESSOR DATA SHEET**

Client and place	Project number (machine S/N)		Compressor Type
N. of working hours	working hours per day	N. of start per hour	R.P.M. compressor

Operation:**on warranty****Start-up****out of warranty****Ambient temperature**

Celsius degree

Suction gas pressure

Bar

(left / right) refers to machines with double 2nd-3rd stage pumping groups

	1 Stage	2 Stage	3 Stage	4 Stage
Outlet gas pressure (bar g)				
Inlet gas temperature (°C)				
Outlet gas temperature (°C)				
Temperature on heads (°C)				
Temp. on pumping group body (°C)				
Water temp. IN exchanger (°C)				
Water temp. OUT exchanger (°C)				

Water pressure (bar g)

	☐ Axial oil pump	☐ pump + Electric motor driven pump	☐ Electric motor driven pump
LUBRICATION SYSTEM (*)			
Oil pressure [bar]			
Oil temperature IN exchanger [°C]			
Oil temperature OUT exchanger [°C]			
Oil temperature in crankcase [°C]			
Oil consumption	nr. Liters / 100 hours		

* fill the parameters in the column related to the lube system

Oil cooling system:	☐ Air - Gas heat exchanger	☐ exchanger braze weldind	☐ other
----------------------------	---	--	--------------------------------

Compensation circuit on 3rd-4th pumping group type (if applicable)**Right side****Left side****inlet gas temperature**

Celsius degree

outlet gas temperature

Celsius degree

water jacket temperature

Celsius degree

Power Absorption main E.M.

Ampere

U =

V =

W =

Volt

Compressor CapacitySm³/h

	1st stage	2nd stage	3rd-4th stage
Status of big-end bearings and small-end bush of connecting rods			
Oil level checking	Q.TY added	Time	date
YES..... - NO			

Figure 55 - Compressor data sheet collection

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COMPRESSORS MOD. SW e ST

COMPRESSOR DATA SHEET

<i>Last 10 alarms on display:</i>	<i>Panel hours</i>	<i>Time</i>	<i>date</i>

NOTES:**TECHNICIAN:****DATE:**

2.1.1.1.1. 830747400 - PRESSURE TRANSDUCER WIKA 400 BAR

Current terms and conditions apply.
Details are available on ...

Es gelten unsere aktuellen Verkaufs-
und Lieferbedingungen siehe unter ...

Toute commande est assujettie à nos
conditions de ventes et de fournitures
dans leur dernière version en vigueur, voir
sous ...

Se aplican nuestras condiciones actuales
de venta y de suministro, que se pueden
consultar en ...

www.wika.de

Operating instructions
Betriebsanleitung
Mode d'emploi
Manual de instrucciones

IS-20-S, IS-21-S
IS-20-F, IS-21-F
IS-20-H

Pressure transmitter /
Druckmessumformer /
Transmetteur de pression /
Transmisor de presión



IS-21-S



IS-20-F



IS-20-H

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WIKAL

 Part of your business

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Page 83+84 Permissible temperature ranges depending on electrical connections

1. Important details for your information

GB

1. Important details for your information

Read these operating instructions before installing and starting the pressure transmitter. Keep the operating instructions in a place that is accessible to all users at any time.

The following installation and operating instructions have been compiled by us with great care but it is not feasible to take all possible applications into consideration. These installation and operation instructions should meet the needs of most pressure measurement applications. If questions remain regarding a specific application, you can obtain further information:

- Via our Internet address www.wika.de / www.wika.com
- The product data sheet is designated as PE 81.50, PE 81.51, PE 81.52
- Contact WIKA for additional technical support (+49) 9372 / 132-295

If the serial number on the product label and/or the 2D code on the hexagon gets illegible (e.g. by mechanical damage or repainting), the retraceability of the instrument is not possible any more.

WIKA pressure transmitters are carefully designed and manufactured using state-of-the-art technology. Every component undergoes strict quality and environmental inspection before assembly and each instrument is fully tested prior to shipment. Our environmental management system is certified to DIN EN ISO 14001.

Use of the product in accordance with the intended use IS-2X-S, IS-2X-F, IS-20-H:

Use the intrinsically safe pressure transmitter to transform the pressure into an electrical signal in hazardous areas.

Certificate ATEX:

Pressure transmitter for operation in hazardous areas in compliance with the respective certificate (see attached EC-type examination certificate BVS 04 ATEX E 068 X).

ATEX Approval ratings:

Gases and mist: Mounting to Zone 0; Installation in Zone 0, Zone 1 and Zone 2.

Dust: Mounting to Zone 20; Installation in Zone 20, Zone 21 and Zone 22.

Mining Category M1, M2.

Certificate FM/CSA:

Pressure transmitter for operation in hazardous areas in compliance with the respective certificate (see Control drawing No. 2323880).

1. Important details for your information / 2. A quick overview for you / 3. Abbreviations, signs

GB

FM / CSA Approval ratings:

Intrinsically Safe with entity approval for Class I, II and III Division 1, Groups A, B, C, D, E, F, G and Class I, Zone 0, AEx ia IIC

Dust-ignitionproof for Class II and III, Division 1, Groups E, F, and G.

Non-incendive for Class I Division 2 Groups A, B, C and D

Knowledge required

Install and start the pressure transmitter only if you are familiar with the relevant regulations and directives of your country and if you have the qualification required. You have to be acquainted with the rules and regulations on hazardous areas, measurement and control technology and electric circuits. Depending on the operating conditions of your application you have to have the corresponding knowledge, e.g. of aggressive media or high pressures.

2. A quick overview for you

If you want to get a quick overview, read **Chapters 3, 5, 7 and 11**. There you will get some short safety instructions and important information on your product and its starting. **Read these chapters in any case.**

3. Signs, symbols and abbreviations

	Potential danger of life or of severe injuries.		Potential danger of life or of severe injuries due to catapulting parts.
	Instructions for hazardous areas: Potential danger of life or of severe injuries.		Potential danger of burns due to hot surfaces.
	Notice, important information, malfunction.		The product complies with the applicable European directives.
	ATEX European guideline for explosion protection (Atmosphère=AT, Explosible=EX). The product complies with the requirements of the European directive 94/9/EC (ATEX) on explosion protection.		

3. Signs, symbols and abbreviations / 4. Function

GB



FM

Factory Mutual

The product was tested and certified by FM Approvals. It complies with the applicable US-American standards on safety (including explosion protection).



CSA

Canadian Standard Association

The product was tested and certified by CSA International. It complies with the applicable Canadian and US-American standards on safety (including explosion protection).



GL

Germanischer Lloyd

The product was tested and certified by GL. It complies with the requirements of the GL Type Approval system.

2-wire Two connection lines are intended for the voltage supply.

The supply current is the measurement signal.

U+ Positive supply connection

U- Negative supply connection

4. Function

IS-20: Pressure connection (intrinsically safe) with internal diaphragm (standard version).

IS-21: Pressure connection with flush diaphragm (intrinsically safe) for highly viscous or solids entrained media which might clog the pressure port.

IS-2X-S: Pressure transmitter (intrinsically safe), version with electrical connector or flying leads.

IS-2X-F: Pressure transmitter (intrinsically safe), field case version.

IS-20-H: Pressure transmitter (intrinsically safe), highest pressure connection.

Function: The pressure prevailing within the application is transformed into a standardised electrical signal through the deflection of the diaphragm, which acts on the sensor element with the power supply fed to the transmitter. This electric signal changes in proportion to the pressure and can be evaluated correspondingly

5. For your safety

GB

5. For your safety



Warning

- Select the appropriate pressure transmitter with regard to scale range, performance and specific measurement conditions prior to installing and starting the instrument.
- Observe the relevant national regulations (e.g.: IEC 60079-14, NEC, CEC) and observe the applicable standards and directives for special applications (e.g. with dangerous media such as acetylene, flammable gases or liquids and toxic gases or liquids and with refrigeration plants or compressors).

If you do not observe the appropriate regulations, serious injuries and/or damage can occur!

- **Open pressure connections only after the system is without pressure!**
- Please make sure that the pressure transmitter is only used within the overload threshold limit all the time!
- Observe the ambient and working conditions outlined in section 7 „Technical data“.
- Ensure that the pressure transmitter is only operated in accordance with the provisions i.e. as described in the following instructions.
- Do not interfere with or change the pressure transmitter in any other way than described in these operating instructions.
- Remove the pressure transmitter from service and mark it to prevent it from being used again accidentally, if it becomes damaged or unsafe for operation
- **Take precautions with regard to remaining media in removed pressure transmitter. Remaining media in the pressure port may be hazardous or toxic!**
- Have repairs performed by the manufacturer only.

Information about material consistency against corrosion and diffusion can be found in our WIKA-Handbook, 'Pressure and Temperature Measurement'.



Warning

Consider the details given in the EC-type examination certificate as well as the respective country specific regulations for installation and operation in hazardous areas (e.g.: IEC 60079-14, NEC, CEC). If you do not observe these stipulations, serious injuries and/or damage can occur.

6. Packaging / 7. Starting, operation

GB

6. Packaging

Has everything been supplied?



Check the scope of supply:

- Completely assembled pressure transmitters; with flush version IS-21 including pre-assembled sealings and protection cap.
- EC-type examination certificate and Control Drawing (FM, CSA)
- Inspect the pressure transmitter for possible damage during transportation. Should there be any obvious damage, inform the transport company and WIKA without delay.
- Keep the packaging, as it offers optimal protection during transportation (e.g. changing installation location, shipment for repair).
- Ensure that the pressure connection thread and the connection contacts will not be damaged.

In order to protect the diaphragm, the pressure connection of the instrument IS-21-S, -F is provided with a special protection cap.



- Remove this protection cap only just before installing the pressure transmitter in order to prevent any damage to the diaphragm or the thread.
- Keep the protection cap of the pressure connection thread and the diaphragm for later storage or transport.
- Mount the protection cap when removing and transporting the instrument.

7. Starting, operation



Required tools: wrench (flats 27 or flats 41), screw driver

Diaphragm test for your safety

It is necessary that before starting the pressure transmitter you test the diaphragm visually, as this is a **safety-relevant component**.



Warning

- Pay attention to any liquid leaking out, for this points to a diaphragm damage (not necessary for IS-20-H).
- Check the diaphragm visually for any damage (IS-21-S, -F).
- Use the pressure transmitter only if the diaphragm is undamaged.
- Use the pressure transmitter only if it is in a faultless condition as far as the safety-relevant features are concerned.

7. Starting, operation

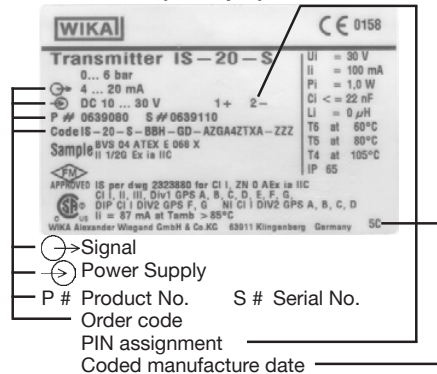
GB

Mechanical connection



Generally the serial number on the product label applies. If there is no serial number on the product label, the number on the hexagon will apply.

Product label (example)



- Remove the protection cap only just before installation and absolutely avoid any damage to the diaphragm during installation as well (IS-21-S, -F).
- For Model IS-20-S, -F you have to provide for a sealing element; exceptions are instruments with self-sealing threads (e.g. NPT thread). For Model IS-21-S, -F the sealing ring is included in delivery.
- Please refer to our data sheet "Pressure gauge sealing washers AC 09.08" in Wika's product catalog Pressure and Temperature Measurement or our website www.wika.de for details about sealing washers.
- When mounting the instrument, ensure that the sealing faces of the instrument and the measuring point are clean and undamaged.
- Screw in or unscrew the instrument only via the flats using a suitable tool and the prescribed torque. The appropriate torque depends on the dimension of the pressure connection and on the sealing element used (form/material). Do not use the case as working surface for screwing in or unscrewing the instrument.
- When screwing the transmitter in, ensure that the threads are not jammed.

7. Starting, operation

GB



- For tapped holes and welding sockets please see Technical Information IN 00.14 for download at www.wika.de



Warning

- Protect the diaphragm against any contact with abrasive substances and pressure peaks and do not touch it with tools. If you damage the diaphragm, no intrinsic safety can be guaranteed (ATEX, FM, CSA)!
- Ensure that under hazardous dust environment the pressure transmitter is mounted in a shielded section and protect it against shocks.
- Observe the technical data for the use of the pressure transmitter in connection with aggressive/corrosive media and for the avoidance of mechanical hazards.

Installation in / mounting to zone 0 and zone 20 (zone 20 not with IS-20-H)

(In general Zone 0 is given when the pressure transmitter is surrounded by a mixture of explosive gases more than 1.000 hours per year = continuous hazard).



Warning

- When installing the pressure transmitter or the cable gland into areas which require category 1G equipment, ensure that ingress protection IP67 according to IEC 60 529 is guaranteed.
- When installing the pressure transmitter or the cable gland into areas which require category 1D equipment, ensure that ingress protection IP 6X according to IEC 60 529 is guaranteed.

Measurement of process media with higher temperatures than the media temperature ranges specified in the tables of the EC-type examination certificate under item 15.1.2 is permissible, if special cooling elements are used (not for IS-20-H).



Warning

- Observe the permissible surface temperature applicable for this range according to the defined temperature classes.
- Observe the maximum temperature value (of the temperature range defined under item 15.1.2 in the EC-type examination certificate) at the hexagon of the tubular case.
- Ensure an unhindered air circulation at the cooling element.
- Protect the pressure transmitter against touching or affix a warning notice.
- Insulate heat sources thermally from the pressure transmitter (e.g. pipes or tanks).

7. Starting, operation

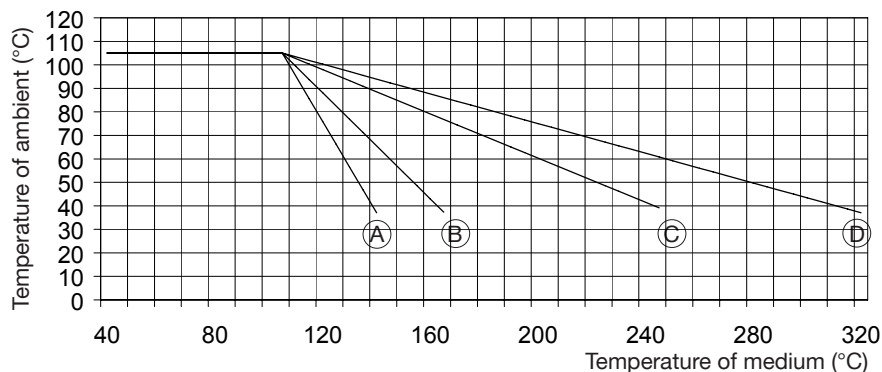
GB



Advertencia

Ensure that, particularly in the dust hazardous area, the cooling elements will not be contaminated and that no dust can be deposited on them, because otherwise the cooling effect cannot be guaranteed.

Relation of medium temperature to ambient temperature



Model	IS-20-H	IS-2X-S /-F			
Version	(A)	(B)	(C)	(D)	
Cooling fin	-	2	3	5	
Constant K	0.34	0.47	0.68	0.76	

Calculation of cooling element:

$$T_B = T_{med} - (T_{med} - T_{amb}) \times K$$

T_B = Operation temperature of transmitter
 T_{med} = max. temperature of process medium
 T_{amb} = max. temperature of ambience
 K = Constant of cooling element

Calculation of max. temperature of ambience:

$$T_{amb} = T_{med} + (T_B - T_{med}) / K$$

7. Starting, operation

GB

Electrical connection



Warning

Earth the housing, through the process connection, against electromagnetic fields and electrostatic discharge.



Warning

- Ground the cable screen at one end, preferably in the safe, thus non-Ex, area (EN 60079-14). For devices with flying leads, the screen is connected to the housing. The simultaneous connection of housing and cable screen to ground is only permitted if ground loop problems between the screen connection (e.g. at the power supply) and housing can be excluded (see EN 60079-14).
- Supply the pressure transmitter from an intrinsically safe current circuit (Ex ia).
- Consider both the internal capacitance and inductance.
- Cover flying leads with fine wires by an end splice (cable preparation).
- The bayonet-connector is made of light metal, a material which is not permissible for group I applications (mining).
- Consider that cables for use in **zones 1 and 2** must be checked with a test voltage between conductor/earth, conductor/screen, screen/earth of more than 500V (AC).



- Operate the pressure transmitter with a shielded cable and earth the shield at least on one side of the cable, if the cable is longer than 30 m or if it is run outside of the building.
- Ingress protection per IEC 60529 (The ingress protection classes specified only apply while the pressure transmitter is connected with female connectors that provide the corresponding ingress protection).
- Ensure that the cable diameter you select fits to the cable gland of the connector. Ensure that the cable gland of the mounted connector is positioned correctly and that the sealings are available and undamaged. Tighten the threaded connection and check the correct position of the sealings in order to ensure the ingress protection.
- Please make sure that the ends of cables with flying leads do not allow any ingress of moisture.

7. Starting, operation

GB



With a line transformer you realise the mandatory galvanic isolation of the voltage and current supply between hazardous and non-hazardous areas and ensure the safety connection data.

Wiring details

	L-Connector DIN 175301-803 A	Circular connector M12x1, 4-pin	Flying leads, 1.5 m
2-wire	U+ = 1 U- = 2	U+ = 1 U- = 3	U+ = brown U- = green
Cable screen			PUR-cable: grey FEP-cable: twisted and tinned
Wire gauge	up to max. 1.5 mm ²	-	0.5 mm ² (AWG 20)
Diameter of cable	6 to 8 mm ship approval: 10 to 14 mm	-	6.8 mm (Code DL / EM) 7.5 mm (Code DM)
Ingress Protection per IEC 60 529	IP 65	IP 67	IP 67 - Order code: DL IP 68 zero/span not adjustable- Order code: EM / DM
The ingress protection classes specified only apply while the pressure transmitter is connected with female connectors that provide the corresponding ingress protection.			

7. Starting, operation

GB

Wiring details

	Bayonet connector, 6-pin	Field case (with internal spring clip terminals)
2-wire	U+ = A U- = B	U+ = 1 U- = 2 Test+ = 3 Test- = 4 Screen = 5
Ingress Protection per IEC 60 529	IP 65 (NEMA 4)	IP 67
The ingress protection classes specified only apply while the pressure transmitter is connected with female connectors that provide the corresponding ingress protection.		

Model IS-20-F, IS-21-F, IS-20-H with field case:

Cable connection in the spring clip terminal

- Cover the stripped wire ends with end splices.
- Unscrew the case cover.
- Loosen the cable gland using an open-end wrench, wrench size 24.
- Lead the cable through the cable gland into the opened case head.
- Press the corresponding plastic lever at the spring clip terminal down using a screw driver, so that the clamped contact will be released.
- Lead the prepared flying lead into the opening and let go of the plastic lever, so that the flying lead will be squeezed inside the spring clip terminal.
- After connecting the individual wires, tighten the cable gland and screw down the case over.

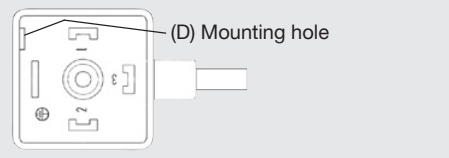
Function of the test circuit for 2-wire:

By means of the test circuit the current can be metered during normal operation without having to disconnect the instrument. For that purpose you have to connect an ammeter (for applications in hazardous areas; internal resistance < 15 Ohm) to the test +/- terminals.

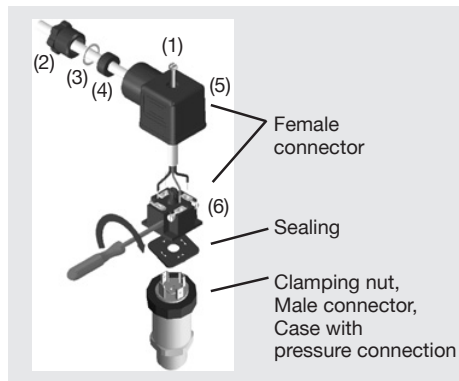
7. Starting, operation

GB

Assembly of L-connector DIN EN 175301-803



1. Loosen the screw (1).
2. Loosen the cable gland (2).
3. Pull the angle housing (5), with the terminal block (6) inside, away from the instrument.
4. Using the head of a small screwdriver in the mounting hole (D), lever the terminal block (6) out of the angle housing (5).
In order not to damage the sealing of the angle housing, do not try to push the terminal block (6) out using the screw hole (1) or the cable gland (2).
5. Ensure that the conductor outer diameter you select is matched to the angle housing's cable gland. Slide the cable through the cable gland nut (2), washer (3), gland seal (4) and angle housing (5).
6. Connect the flying leads to the screw terminals on the terminal block (6) in accordance with the pin-assignment drawing.
7. Press the terminal block (6) back into the angle housing (5).
8. Tighten the cable gland (2) around the cable. Make sure that the sealing isn't damaged and that the cable gland and seals are assembled correctly in order to ensure ingress protection.
9. Place the flat, square gasket over the connection pins on the top of the instrument housing.
10. Slide the terminal block (6) onto the connection pins.
11. Secure the angle housing (5) and terminal block (6) to the instrument with the screw (1).



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7. Starting, operation

GB

Specifications

Model IS-20-S, IS-21-S, IS-20-F, IS-21-F, IS-20-H

Pressure ranges ^{*)} IS-2X-S, IS-2X-F	bar	0.1	0.16	0.25	0.4	0.6	1	1.6	2.5	4	6	10	16
Over pressure safety IS-2X-S, IS-2X-F	bar	1	1.5	2	2	4	5	10	10	17	35	35	80
Burst pressure IS-2X-S, IS-2X-F	bar	2	2	2.4	2.4	4.8	6	12	12	20.5	42	42	96
Pressure ranges ^{*)} IS-2X-S, IS-2X-F	bar	25	40	60	100	160	250	400		600		1000 ¹⁾	
Over pressure safety IS-2X-S, IS-2X-F	bar	50	80	120	200	320	500	800		1200		1500	
Burst pressure IS-2X-S, IS-2X-F	bar	96	400	550	800	1000	1200	1700 ²⁾		2400 ²⁾		3000	

Pressure ranges for IS-20-H see additional operating instructions 11126418 High pressure

{Vacuum, gauge pressure, compound range, absolute pressure are available}

¹⁾ Only Model IS-20-S, IS-20-F.

²⁾ For model IS-21-S, IS-21-F: the value specified in the table applies only when sealing is realised with the sealing ring underneath the hex. Otherwise max. 1500 bar applies.

Materials

■ Wetted parts

» Model IS-20-S, IS-20-F, IS-20-H ^{*)}

Stainless steel

» Model IS-21-S, IS-21-F

Stainless steel

O-ring: NBR {FPM/FKM or EPDM}

■ Case

Stainless steel

Internal transmission fluid ³⁾

Synthetic oil {Halocarbon oil for oxygen applications}

³⁾ Not for IS-20-S, IS-20-F with pressure ranges > 25 bar and IS-20-H.

Power supply U+

DC V

» Model IS-2X-S, IS-20-H

10 ... 30

» Model IS-2X-F, IS-20-H with field case

11 ... 30

Signal output and

RA in Ohm

4 ... 20 mA, 2-wire

maximum ohmic load RA

■ Model IS-2X-S

$RA \leq (U+ - 10 V) / 0.02 A$ - (length of flying leads in m x 0.14 Ohm)

7. Starting, operation **GB****Specifications** **Model IS-20-S, IS-21-S, IS-20-F, IS-21-F, IS-20-H**

■ Model IS-2X-F, IS-20-H with field case		RA ≤ (U+ - 11 V) / 0.02 A	
Test circuit signal and maximum load		RA ≤ 15 (only model IS-2X-F, IS-20-H with field case)	
Adjustability zero/span	%	± 5 using potentiometers inside the instrument	
Response time (10 ... 90 %)	ms	≤ 1 ⁴⁾	
		⁴⁾ Response time IS-20-S/-F: ≤ 10 ms at medium temp. below < -30 °C for pressure ranges up to 25 bar. Response time IS-21: ≤ 10 ms at medium temp. below < -30 °C (-22 °F).	
Power Pi	W	1 (750 mW with approval for Category 1D)	
Insulation voltage		Insulation complies with EN 60079-11	
Accuracy	% of span	≤ 0.5 ⁶⁾ {0.25} ⁵⁾ ⁶⁾	
		⁵⁾ Accuracy { } for pressure ranges ≥ 0.25 bar, not for IS-20-H	
		⁶⁾ Including non-linearity, hysteresis, zero point and full scale error (corresponds to error of measurement per IEC 61298-2). Adjusted in vertical mounting position with lower pressure connection.	
Non-linearity	% of span	≤ 0.2 (BFSL) according to IEC 61298-2	
Non-repeatability	% of span	≤ 0.1	
1-year stability	% of span	≤ 0.2 (at reference conditions)	
Permissible temperature of			
■ Medium ^{8) 4)}		-20 ... +80 °C ⁷⁾	-4 ... +176 °F ⁷⁾
		(Extended temperature ranges see chapter 7 „Relation of medium temperature to ambience temperature“ ⁷⁾)	
■ Ambience ⁸⁾		-20 ... +80 °C ⁷⁾	-4 ... +176 °F ⁷⁾
■ Storage		-30 ... +105 °C	-22 ... +221 °F
		⁷⁾ Other temperature ranges are possible, depending on the electrical connection; see EC-type examination certificate, e.g. -30 ... +105 °C / -22 ... +221 °F and table page 83 and 84	
Rated temperature range		0 ... +80 °C	32 ... +176 °F
Temperature coefficients within rated temperature range			

7. Starting, operation **GB****Specifications** **Model IS-20-S, IS-21-S, IS-20-F, IS-21-F, IS-20-H**

■ Mean TC of zero	% of span	≤ 0.2 / 10 K (< 0.4 for pressure range ≤ 250 mbar)
■ Mean TC of range	% of span	≤ 0.2 / 10 K
Installation position	mbar	< 2 at +/- 30° tilted position with model IS-21-S and IS-21-F
CE- conformity		
■ Pressure equipment directive		97/23/EC
■ EMC directive		2004/108/EC, EN 61 326 Emission (Group 1, Class B) and Immunity (industrial locations)
■ Directive ATEX of equipment intended for use in potentially explosive atmospheres		94/9/EC
Ex-protection	ATEX	Category ⁸⁾ 1G, 1/2G, 2G, 1D ⁸⁾ , 1/2D ⁸⁾ , 2D ⁸⁾ , M1, M2
Ignition protection type		Ex ia I/II C T4, Ex ia I/II C T5, Ex ia I/II C T6
		⁸⁾ Read the operating conditions and safety-relevant data in the EC-type examination certificate in any case (BVS 04 ATEX E 068 X)
		⁹⁾ Not for IS-20-H
Ex-protection	FM, CSA	Class I, II and III
Ignition protection type		Intrinsic safe Class I, II, III Division 1, Group A, B, C, D, E, F, G and Class I, Zone 0 AEx ia II C
Approval German Lloyd GL		Environmental Category D, F, EMC 1
RF-immunity	V/m	10
Burst	kV	2
Shock resistance » Model IS-2X-S	g	1000 ¹⁰⁾ according to IEC 60068-2-27 (mechanical shock)
» Model IS-2X-F	g	600 ¹⁰⁾ according to IEC 60068-2-27 (mechanical shock)
		¹⁰⁾ not with ship approval
Vibration resistance » IS-2X-S	g	20 ¹¹⁾ according to IEC 60068-2-6 (vibration under resonance)
» IS-2X-F	g	10 ¹¹⁾ according to IEC 60068-2-6 (vibration under resonance)
		¹¹⁾ with ship approval: Category H, up to 2KHz
Wiring protection		
■ Reverse polarity protection		U+ towards U-

7. Starting, operation / 8. Adjustment of zero point / span

GB

Specifications **Model IS-20-S, IS-21-S, IS-20-F, IS-21-F, IS-20-H**

Weight	» Model IS-2X-S/F	kg	Model IS-2X-S: Approx. 0.2	Model IS-2X-F: Approx. 0.35
	» Model IS-20-H	kg	Approx. 0.3 (approx. 0.45 with version field case)	

^{*)} In an oxygen version model IS-21 is not available. In an oxygen version model IS-20 is only available in gauge pressure ranges ≥ 0.25 bar with media temperatures between $-4 \dots +140$ °F / $-20 \dots +60$ °C and using stainless steel or Elgiloy® wetted parts.

{ } Items in curved brackets are optional extras for additional price.



When designing your plant, take into account that the stated values (e.g. burst pressure, over pressure safety) apply depending on the material, thread and sealing element used.

Functional test

The output signal must be proportional to the pressure. If not, this might point to a damage of the diaphragm. In that case refer to chapter 10 „Troubleshooting“.



- Open pressure connections only after the system is without pressure!
- Observe the ambient and working conditions outlined in section 7 „Technical data.“
- Please make sure that the pressure transmitter is only used within the over load threshold limit at all times!



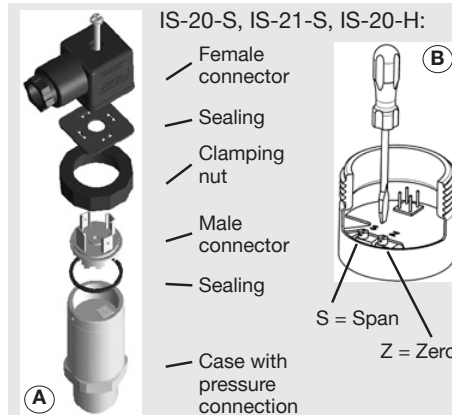
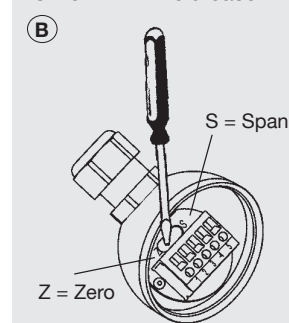
When touching the pressure transmitter, keep in mind that the surfaces of the instrument components might get hot during operation.

8. Adjustment of zero point / span (only for pressure transmitter with clamping nut)

We do not recommend to adjust the span potentiometer. It is used for adjustment ex factory and should not be adjusted by you unless you have adequate calibration equipment at your disposal (at least three times more accurate than the instrument being tested).

8. Adjustment of zero point / span

GB

**IS-20-F, IS-21-F, IS-20-H with field case:**

- Make sure wires are not cut or pinched during disassembly and reassembly of the connector.
- IS-2X-S, IS-20-H: Remove the female connector. Open the pressure transmitter by detaching the clamping nut (see Fig. (A)). Carefully remove the male connector from the case.
- IS-2X-F, IS-20-H with field case: Open the pressure transmitter by twisting off the field case over.
- Adjust the zero point (Z) (see Fig. (B)) by generating the lower limit of the pressure range.
- Adjust the span (S) by generating the higher limit of the pressure range.
- Check the zero point. ■ If the zero point is incorrect, repeat procedure as required.
- Reassemble the instrument carefully.
- Make sure all sealings and o-rings are not damaged and correctly installed to assure the rated moisture ingress protection.

Recommended recalibration cycle: 1 year



For further information (+49) 9372/132-295

9. Maintenance, accessories

- WIKA pressure transmitters require no maintenance.
- Have repairs performed by the manufacturer only.

9. Maintenance, accessories / 10. Trouble shooting

GB

Accessories: For details about the accessories (e. g. connectors), please refer to WIKA's price list, WIKA's product catalog on CD or or contact our sales department.

10. Trouble shooting



Warning

Open pressure connections only after the system is without pressure!



Warning

- Take precautions with regard to remaining media in removed pressure transmitters. Remaining media in the pressure port may be hazardous or toxic!
- Remove the pressure transmitter from service and mark it to prevent it from being used again accidentally, if it becomes damaged or unsafe for operation.
- Have repairs performed by the manufacturer only.



Do not insert any pointed or hard objects into the pressure port for cleaning to prevent damage to the diaphragm of the pressure connection.

Please verify in advance if pressure is being applied (valves/ ball valve etc. open) and if the right voltage supply and the right type of wiring (2-wire) has been chosen?

Failure	Possible cause	Procedure
Output signal unchanged after change in pressure	Mechanical overload through over-pressure	Replace instrument; if failure reoccurs, consult the manufacturer *)
No output signal	No/incorrect voltage supply or current spike	Adjust the voltage supply to correspond with the Operating Instructions *)
	Cable break	Check connections and cable
No/False output signal	Incorrectly wired	Follow pin assignment (see Instrument Label / Operating Instructions)
Abnormal output signal	Span incorrectly adjusted	Use appropriate reference
Abnormal zero point signal	Overload limits exceeded	Ensure permissible overload limits are observed (see Operating Instructions); correct the zero point through the potentiometer *)

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10. Trouble shooting

GB

Failure	Possible cause	Procedure
Abnormal zero point signal	Diaphragm is damaged, e.g. through impact, abrasive/aggressive media; corrosion of diaphragm/pressure connector.	Replace instrument
Signal span dropping off/too small	Diaphragm is damaged, e.g. through impact, abrasive/aggressive media; corrosion of diaphragm/pressure connector; transmission fluid missing.	Contact the manufacturer and replace the instrument
Signal span drops off	Seal/Sealing face damaged/contaminated, seal mounted incorrectly, threads crossed.	Clean the seal/sealing face, possibly replace the seal.
Signal span too small	Mechanical overload through over-pressure	Re-calibrate the instrument *)
Signal span erratic	Violent fluctuations in the process media pressure	Damping; consult with manufacturer

In case of unjustified reclamation we charge the reclamation handling expenses.

*) Make sure that after the setting the unit is working properly. In case the error continues to exist send in the instrument for reparation (or replace the unit).

If the problem persists, contact our sales department.

USA, Canada: If the problem continues, contact WIKA or an authorized agent for assistance. If the pressure transmitter must be returned obtain an RMA (return material authorization) number and shipping instructions from the place of purchase. Be sure to include detailed information about the problem. Pressure transmitters received by WIKA without a valid RMA number will not be accepted.

Process material certificate (Contamination declaration for returned goods)

Purge / clean dismantled instruments before returning them in order to protect our employees and the environment from any hazard caused by adherent remaining media.

Service of instruments can only take place safely when a Product Return Form has been submitted and fully filled-in. This Return Form contains information on all materials with which the instrument has come into contact, either through installation, test purposes, or cleaning.

You can find the Product Return Form on our internet site (www.wika.de / www.wika.com).

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11. Storage, disposal

GB

11. Storage, disposal**Warning**

When storing or disposing of the pressure transmitter, take precautions with regard to remaining media in removed pressure transmitters. We recommend cleaning the transmitter properly and carefully. Remaining media in the pressure port may be hazardous or toxic!

Storage

Mount the protection cap when storing the pressure transmitter in order to prevent any damage to the diaphragm (IS-21-S, IS-21-F).

Disposal

Dispose of instrument components and packaging materials in accordance with the respective waste treatment and disposal regulations of the region or country to which the instrument is supplied.

WIKA reserves the right to alter these technical specifications.

1. Wichtiges zu Ihrer Information

D

1. Wichtiges zu Ihrer Information

Lesen Sie diese Betriebsanleitung vor Montage und Inbetriebnahme des Druckmessgerätes. Bewahren Sie die Betriebsanleitung an einem für alle Benutzer jederzeit zugänglichen Ort auf. Die nachfolgenden Einbau- und Betriebshinweise haben wir mit Sorgfalt zusammengestellt. Es ist jedoch nicht möglich, alle erdenklichen Anwendungsfälle zu berücksichtigen. Sollten Sie Hinweise für Ihre spezielle Aufgabenstellung vermissen, können Sie hier weitere Informationen finden:

- Über unsere Internet-Adresse www.wika.de / www.wika.com
- Die Bezeichnung des zugehörigen Datenblattes ist PE 81.50, PE 81.51, PE 81.52
- Anwendungsberater: (+49) 9372/132-295

Wird die Seriennummer auf dem Typenschild und/oder der 2D-Code auf dem Sechskant unleserlich (z. B. durch mechanische Beschädigung oder Übermalen), ist eine Rückverfolgbarkeit nicht mehr möglich.

Die in der Betriebsanleitung beschriebenen WIKA-Druckmessgeräte werden nach den neuesten Erkenntnissen konstruiert und gefertigt. Alle Komponenten unterliegen während der Fertigung strengen Qualitäts- und Umweltkriterien. Unser Umweltmanagementsystem ist nach DIN EN ISO 14001 zertifiziert.

Bestimmungsgemäße Produktverwendung IS-2X-S, IS-2X-F, IS-20-H:

Verwenden Sie den eigensicheren Druckmessumformer, um in explosionsgefährdeten Bereichen Druck in ein elektrisches Signal zu wandeln.

Zulassung ATEX:

Druckmessgerät zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen (siehe beiliegende EG-Baumusterprüfbescheinigung BVS 04 ATEX E 068 X).

ATEX Zulassungseigenschaften:

für Gase und Nebel: Anbau an Zone 0; Einbau in Zone 0, Zone 1 und Zone 2

Stäube: Anbau an Zone 20; Einbau in Zone 20, Zone 21 und Zone 22 (nicht für IS-20-H).

Bergbau: Kategorie M1, M2.

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1. Wichtiges zu Ihrer Information/ 2. Schneller Überblick / 3. Zeichenerklärungen, Abkürzungen

D

Zulassung FM/CSA:

Druckmessgerät zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen (siehe Control drawing Nr. 2323880)

FM / CSA Zulassungseigenschaften:

Intrinsically Safe mit Gerätezulassung für Class I, II und III Division 1, Gruppe A, B, C, D, E, F, G und Class I, Zone 0, AEx ia IIC.

Dust-ignitionproof für Class II und III, Division 1, Gruppe E, F und G.

Non-incendive für Class I Division 2 Gruppe A, B, C und D

Ihre erforderlichen Kenntnisse

Montieren und nehmen Sie das Druckmessgerät nur in Betrieb, wenn Sie mit den zutreffenden landesspezifischen Richtlinien vertraut sind und die entsprechende Qualifikation besitzen. Sie müssen mit den Vorschriften und Kenntnissen für explosionsgefährdete Bereiche, Mess- und Regeltechnik sowie elektrische Stromkreise vertraut sein. Je nach Einsatzbedingung müssen Sie über entsprechendes Wissen verfügen, z. B. über aggressive Medien bzw. hohe Drücke.

2. Der schnelle Überblick für Sie

Wollen Sie sich einen schnellen Überblick verschaffen, **lesen Sie Kapitel 3, 5, 7 und 11**. Dort erhalten Sie kurze Hinweise zu Ihrer Sicherheit und wichtige Informationen über Ihr Produkt und zur Inbetriebnahme. **Lesen Sie diese unbedingt.**

3. Zeichenerklärungen, Abkürzungen**Warnung**

Mögliche Gefahr für Ihr Leben oder schwerer Verletzungen.

**Warnung**

Ex-Hinweise:
Mögliche Gefahr für Ihr Leben oder schwerer Verletzungen.



Hinweis, wichtige Information, Funktionsstörung.

**Warnung**

Mögliche Gefahr für Ihr Leben oder schwerer Verletzungen durch wegschleudernde Teile.

**Vorsicht**

Mögliche Gefahr von Verbrennungen durch heiße Oberflächen.



Das Produkt stimmt mit den zutreffenden europäischen Richtlinien überein.

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3. Zeichenerklärungen, Abkürzungen / 4. Funktion

D



ATEX Europäische Explosionsschutz-Richtlinie (Atmosphère=AT, Explosible=EX)
Das Produkt stimmt überein mit den Anforderungen der europäischen Richtlinie 94/9/EG (ATEX) zum Explosionsschutz.



FM
Factory Mutual
Das Produkt wurde von FM Approvals geprüft und zertifiziert. Es stimmt überein mit den anwendbaren US-amerikanischen Normen zur Sicherheit (einschließlich Explosionsschutz).



CSA
Canadian Standard Association
Das Produkt wurde durch CSA International geprüft und zertifiziert. Es stimmt überein mit den anwendbaren kanadischen und US-amerikanischen Normen zur Sicherheit (einschließlich Explosionsschutz).



GL, Germanischer Lloyd
Das Produkt wurde von GL geprüft und zertifiziert.
Es stimmt überein mit den Anforderungen des GL Type Approval Systems.

2-Leiter Zwei Anschlussleitungen dienen zur Spannungsversorgung.
Der Speisestrom ist das Mess-Signal.

U+ Positiver Versorgungsanschluss

U- Negativer Versorgungsanschluss

4. Funktion

IS-20: Druckanschluss (eigensicher) mit innenliegender Membran (Standardausführung)

IS-21: Druckanschluss (eigensicher) mit frontbündiger Membrane für hochviskose oder kristallisierende Medien, die die Bohrung des Druckanschlusses zusetzen können.

IS-2X-S: Druckmessgerät (eigensicher) Ausführung mit Stecker- bzw. Kabelanschluss

IS-2X-F: Druckmessgerät (eigensicher) Ausführung Feldgehäuse

IS-20-H: Druckmessgerät (eigensicher) Ausführung Höchstdruck

Funktion: Mittels Sensorelement und unter Zuführung von Hilfsenergie wird über die Verformung einer Membran der anstehende Druck in Ihrer Anwendung in ein verstärktes standardisiertes elektrisches Signal umgewandelt. Dieses elektrische Signal verändert sich proportional zum Druck und kann entsprechend ausgewertet werden.

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5. Zu Ihrer Sicherheit

D

5. Zu Ihrer Sicherheit



Warnung

- Wählen Sie das richtige Druckmessgerät hinsichtlich Messbereich, Ausführung und spezifischen Messbedingungen vor Montage oder Inbetriebnahme.
- Halten Sie die entsprechenden landesspezifischen Vorschriften ein (z. B.: IEC 60079-14, NEC, CEC) und beachten Sie bei speziellen Anwendungen die geltenden Normen und Richtlinien (z. B. bei gefährlichen Messstoffen wie Acetylen, brennbaren oder giftigen Stoffen sowie bei Kälteanlagen und Kompressoren).

Wenn Sie die entsprechenden Vorschriften nicht beachten, können schwere Körperverletzungen und Sachschäden entstehen!

- **Öffnen Sie Anschlüsse nur im drucklosen Zustand!**
- Betreiben Sie das Druckmessgerät immer innerhalb des Überlastgrenzbereiches!
- Beachten Sie die Betriebsparameter gemäß Punkt 7 „Technische Daten“.
- Stellen Sie sicher, dass das Druckmessgerät nur bestimmungsgemäß -also wie in der folgenden Anleitung beschrieben- betrieben wird.
- Unterlassen Sie unzulässige Eingriffe und Änderungen am Druckmessgerät, welche nicht in dieser Betriebsanleitung beschrieben sind.
- Setzen Sie das Druckmessgerät außer Betrieb und schützen Sie es gegen versehentliche Inbetriebnahme, wenn Sie Störungen nicht beseitigen können.
- **Ergreifen Sie Vorsichtsmaßnahmen für Messstoffreste in ausgebauten Druckmessgeräten. Messstoffreste können zur Gefährdung von Menschen, Umwelt und Einrichtung führen!**
- Lassen Sie Reparaturen nur vom Hersteller durchführen

Angaben zu Korrosions- bzw. Diffusionsbeständigkeit der Gerätewerkstoffe entnehmen Sie bitte unserem WIKA-Handbuch zur Druck- und Temperaturmesstechnik.



Warnung

Beachten Sie die Angaben der geltenden Baumusterprüfbescheinigung sowie die jeweiligen landesspezifischen Vorschriften zur Installation und Einsatz in explosionsgefährdeten Bereichen (z.B.: IEC 60079-14, NEC, CEC). Wenn Sie diese nicht beachten, können schwere Körperverletzungen und Sachschäden entstehen.

6. Verpackung / 7. Inbetriebnahme, Betrieb

D

6. Verpackung

Wurde alles geliefert?



Überprüfen Sie den Lieferumfang:

- Komplette montierte Druckmessgeräte; bei frontbündiger Ausführung IS-21-S, -F mit vormontierten Dichtungen und Schutzkappe.
- Baumusterprüfbescheinigung und Control Drawing (FM, CSA).
- Untersuchen Sie das Druckmessgerät auf eventuell entstandene Transportschäden. Sind offensichtlich Schäden vorhanden, teilen Sie dies dem Transportunternehmen und WIKA unverzüglich mit.
- Bewahren Sie die Verpackung auf, denn diese bietet bei einem Transport einen optimalen Schutz (z. B. wechselnder Einbauort, Reparatursendung).
- Achten Sie darauf, dass das Druckanschluss-Gewinde und die Anschlusskontakte nicht beschädigt werden.

Zum Schutz der Membran ist der Druckanschluss des Gerätes IS-21-S, -F mit einer speziellen Schutzkappe versehen.



- Entfernen Sie diese Schutzkappe erst kurz vor dem Einbau, damit die Membran bzw. das Druckanschluss-Gewinde nicht beschädigt wird.
- Bewahren Sie die Schutzkappe des Druckanschluss-Gewindes und der Membran zur späteren Lagerung oder Transport auf.
- Montieren Sie die Schutzkappe bei Ausbau und Transport des Gerätes.

7. Inbetriebnahme, Betrieb



Benötigtes Werkzeug: Maulschlüssel SW 27 oder SW 41, Schraubendreher

Membran-Prüfung zu Ihrer Sicherheit

Es ist erforderlich, dass Sie vor Inbetriebnahme des Druckmessgerätes die Membran optisch prüfen, denn sie ist ein **sicherheitsrelevantes Teil**.



Warnung

- Achten Sie auf auslaufende Flüssigkeit, denn sie ist ein Hinweis auf eine Membranbeschädigung (nicht nötig bei IS-20-H).
- Prüfen Sie die Membran optisch auf Beschädigung (IS-21-S, -F).
- Setzen Sie das Druckmessgerät nur ein, wenn die Membran unbeschädigt ist.
- Setzen Sie das Druckmessgerät nur in sicherheitstechnisch einwandfreiem Zustand ein.

7. Inbetriebnahme, Betrieb

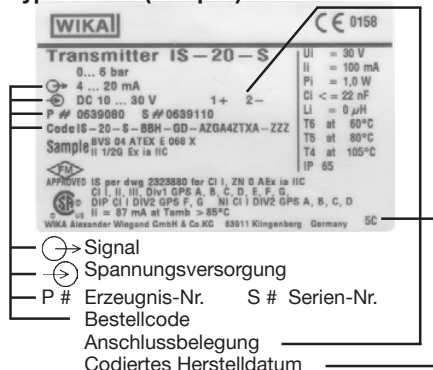
D

Montage mechanischer Anschluss



Es gilt grundsätzlich die Seriennummer auf dem Typenschild. Befindet sich keine Seriennummer auf dem Typenschild, so gilt die Nummer auf dem Sechskant.

Typenschild (Beispiel)



- Entfernen Sie die Schutzkappe erst kurz vor dem Einbau und achten Sie unbedingt darauf, dass die Membran auch während des Einbaus nicht beschädigt wird (IS-21-S, -F).
- Bei Typ IS-20-S, -F müssen Sie eine Dichtung vorsehen; Ausnahme sind Geräte mit selbst dichtendem Gewinde (z. B. NPT-Gewinde). Bei Typ IS-21-S, -F ist der Dichtring im Lieferumfang enthalten.
- Hinweise zu Dichtungen entnehmen Sie bitte unserer Information "Zubehör Dichtungen AC 09.08" im Gesamtkatalog Druck- und Temperaturmesstechnik oder unserer Internet-Seite unter www.wika.de.
- Achten Sie bei der Montage auf saubere und unbeschädigte Dichtflächen am Gerät und Messstelle.
- Schrauben Sie das Gerät nur über die Schlüsselflächen mit einem geeigneten Werkzeug und dem vorgeschriebenen Drehmoment ein bzw. aus. Das richtige Drehmoment ist abhängig von der Dimension des Druckanschlusses sowie der verwendeten Dichtung (Form/Werkstoff). Verwenden Sie zum Ein- bzw. Ausschrauben nicht das Gehäuse als Angriffsfläche.

7. Inbetriebnahme, Betrieb

D



- Beachten Sie beim Einschrauben, dass die Gewindegänge nicht verkantet werden.
- Angaben zu Einschraubblöchern und Einschweißstutzen entnehmen Sie bitte unserer Technischen Information IN 00.14 unter www.wika.de



Warnung

- Schützen Sie die Membran vor Kontakt mit abrasiven Medien und gegen Schläge. Wenn Sie die Membran beschädigen, ist kein Explosionsschutz gewährleistet (ATEX, FM, CSA)!
- Sorgen Sie in Staub-Ex-Bereichen für eine geschützte Anordnung des Druckmessgerätes und schützen Sie es vor Schlägen.
- Beachten Sie die Technischen Daten zur Verwendung des Druckmessgerätes in Verbindung mit aggressiven/korrosiven Medien und zur Vermeidung von mechanischen Gefährdungen.

Ein- und Anbau an Zone 0 und Zone 20 (Zone 20 nicht bei IS-20-H)

(Zone 0 bedeutet, dass explosionsfähiges Gasgemisch >1000 Stunden pro Jahr am Druckmessgerät vorliegt).



Warnung

- Bauen Sie das Druckmessgerät oder die Kabeldurchführung so in die Wand von Bereichen, die Kategorie 1G Betriebsmittel erfordern, dass die Schutzart IP 67 gemäß IEC 60 529 gewährleistet ist.
- Bauen Sie das Druckmessgerät oder die Kabeldurchführung so in die Wand von Bereichen, die Kategorie 1D Betriebsmittel erfordern, dass die Schutzart IP 6X gemäß IEC 60 529 gewährleistet ist.

Die Messung von Prozessmedien mit höheren Temperaturen als der in den Tabellen der EG-Baumusterprüfbescheinigung unter Punkt 15.1.2 beschriebenen Medientemperaturbereichen ist mit speziellen Kühlstrecken zulässig (nicht für IS-20-H).



Warnung

- Halten Sie die zulässigen Oberflächentemperaturen ein, die für diesen Bereich auf Grund der festgelegten Temperaturklassen gelten.
- Halten Sie den maximalen Temperaturwert (des unter Punkt 15.1.2 in der EG-Baumusterprüfbescheinigung festgelegten Temperaturbereichs) am Sechskant des rohrförmigen Gehäuses ein.

7. Inbetriebnahme, Betrieb

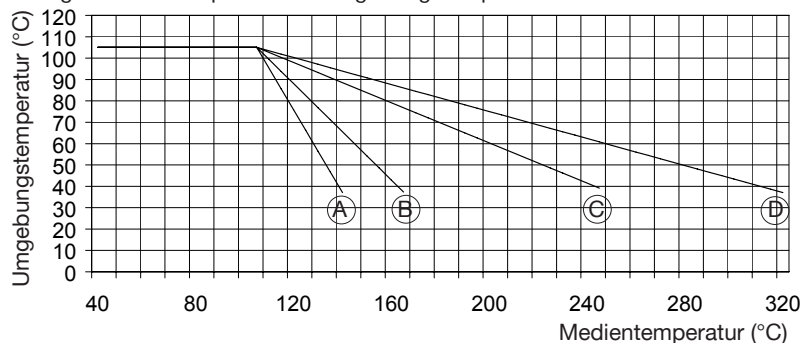
D



Warnung

- Stellen Sie durch waagrechte Montage eine ungehinderte Luftzirkulation am Kühlelement sicher.
- Schützen Sie das Gerät vor Berührungen oder bringen Sie einen Warnhinweis an.
- Isolieren Sie Wärmequellen thermisch gegenüber dem Druckmessumformer (z.B. Rohre oder Tanks).
- Stellen Sie insbesondere im Staub-Ex-Bereich sicher, dass die Kühlstrecken nicht verschmutzen und sich kein Staub auf ihnen ablagert, da sonst die Kühlwirkung nicht sichergestellt ist.

Bezug Mediumtemperatur zu Umgebungstemperatur



Typ	IS-20-H	IS-2X-S / -F			
Ausführ.	(A)	(B)	(C)	(D)	
Kühlrippen	-	2	3	5	
Konstante K	0,34	0,47	0,68	0,76	

Berechnung der Kühlstrecke:

$$T_B = T_{med} - (T_{med} - T_{amb}) \times K$$

T_B = Betriebstemperatur Messumformer
 T_{med} = max. Temperatur Prozessmedium
 T_{amb} = max. Temperatur Umgebung
 K = Kühlstrecken-Konstante

Max. zulässige Umgebungstemperatur:

$$T_{amb} = T_{med} + (T_B - T_{med}) / K$$

7. Inbetriebnahme, Betrieb

D

Montage elektrischer Anschluss



Warnung

Erden Sie das Gehäuse über den Prozessanschluss gegen elektromagnetische Felder und elektrostatische Aufladungen.



Warnung

- Erden Sie den Kabelschirm einseitig und bevorzugt im sicheren, also Nicht-Ex-Bereich (EN 60079-14). Bei Geräten mit Kabelausgang ist der Schirm mit dem Gehäuse verbunden. Der gleichzeitige Anschluss von Gehäuse und Kabelschirm an Erde ist nur dann zulässig, wenn eine Potentialverschleppung zwischen Schirmanschluss (z.B. am Speisegerät) und Gehäuse ausgeschlossen werden kann (siehe EN 60079-14).
- Versorgen Sie den Druckmessumformer aus einem eigensicheren Stromkreis (Ex ia).
- Beachten Sie die innere wirksame Kapazität und Induktivität.
- Versehen Sie feindrahtige Leiterenden mit Aderendhülsen (Kabelkonfektionierung).
- Der Bajonett-Rundsteckverbinder ist aus Leichtmetall-Werkstoff, welcher nicht für Gruppe I-Anwendungen (Bergbau) zugelassen ist.
- Beachten Sie, dass bei Kabeln für den Einsatz in **Zone 1 und 2** die Prüfspannung Leiter/Erde, Leiter/Schirm, Schirm/Erde > 500V Wechselspannung betragen muss.
-  Betreiben Sie den Druckmessumformer mit geschirmter Leitung und erden Sie den Schirm auf mindestens einer Leitungsseite, wenn die Leitungen länger als 30m sind oder das Gebäude verlassen.
- Schutzart IP nach IEC 60 529 (Die angegebenen Schutzarten gelten nur im gesteckten Zustand mit Leitungsteckern (Buchsen) entsprechender Schutzart).
- Wählen Sie den Kabeldurchmesser passend zur Kabeldurchführung des Steckers. Achten Sie darauf, dass die Kabelverschraubung des montierten Steckers korrekt sitzt und dass die Dichtungen vorhanden und nicht beschädigt sind. Ziehen Sie die Verschraubung fest und überprüfen Sie den korrekten Sitz der Dichtungen, um die Schutzart zu gewährleisten.
- Stellen Sie bei Kabelausgängen sicher, dass am Ende des Kabels keine Feuchtigkeit eintritt.

7. Inbetriebnahme, Betrieb

D



Mit einem Speisetrenner realisieren Sie die zwingend nötige galvanische Trennung der Spannungs- und Stromversorgung zwischen Ex- und Nicht-Ex-Bereich und stellen die sicherheitstechnischen Anschlussdaten sicher.

Elektrische Anschlüsse

	Winkeldose DIN 175301-803 A	Rundsteckverbinder M12x1, 4-polig	Kabelausgang, 1,5 m
2-Leiter	U+ = 1 0V = 2	U+ = 1 0V = 3	U+ = braun U- = grün
Kabelschirm			PUR-Kabel: grau FEP-Kabel: verdreht und verzinkt
Aderquerschnitt	bis max. 1,5 mm ²	-	0,5 mm ² (AWG 20)
Kabeldurchmesser	6-8 mm Schiffszulassung: 10-14 mm	-	6,8 mm (Code DL und EM) 7,5 mm (Code DM)
Schutzart nach IEC 60 529	IP 65	IP 67	IP 67 - Bestellcode: DL IP 68 ohne Zugang zu Nullpunkt und Spanne-Potentiometer - Bestellcode: EM oder DM
	Die angegebenen Schutzarten gelten nur im gesteckten Zustand mit Leitungssteckern entsprechender Schutzart.		

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7. Inbetriebnahme, Betrieb

D

Elektrische Anschlüsse

	Bajonett-Rundsteckverbinder, 6-polig	Feldgehäuse (innenliegende Federklemmen)
2-Leiter	U+ = A U- = B	U+ = 1 U- = 2 Test+ = 3 Test- = 4 Schirm = 5
Schutzart nach IEC 60 529	IP 65 (NEMA 4)	IP 67
	Die angegebenen Schutzarten gelten nur im gesteckten Zustand mit Leitungssteckern entsprechender Schutzart.	

Typen IS-2X-F, IS-20-H mit Feldgehäuse

Kabelanschluss im Federklemmblock

- Konfektionieren Sie die abgemantelten Aderenden mit Aderendhülsen.
- Schrauben Sie den Gehäusedeckel auf.
- Lösen Sie mit einem Maulschlüssel SW24 die Kabelverschraubung.
- Führen Sie das Kabel durch die Kabelverschraubung in den geöffneten Gehäusekopf.
- Drücken Sie den entsprechenden Kunststoffhebel am Federklemmblock mit einem Schraubendreher herunter, damit sich der Klemmkontakt öffnet.
- Führen Sie das konfektionierte Kabelende in die Öffnung ein und lassen den Kunststoffhebel los, so dass das Kabelende im Federklemmblock eingeklemmt wird.
- Nach Anschließen der einzelnen Adern ziehen Sie die Kabelverschraubung fest und verschrauben den Gehäusedeckel.

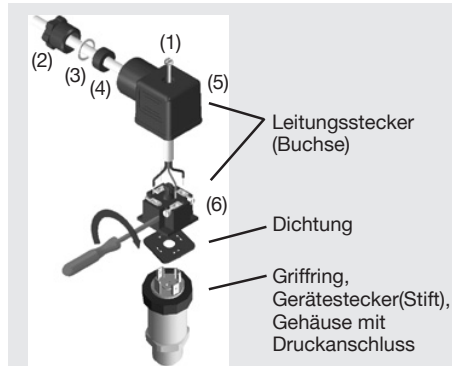
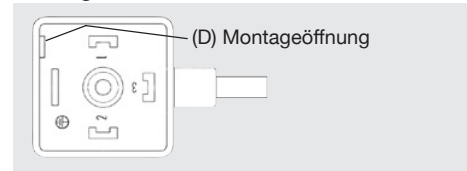
Funktion des Testkreises für 2-Leiter

Anhand des Testkreises ist es möglich, während des normalen Betriebes eine Strommessung durchzuführen ohne das Gerät abzuklemmen. Sie müssen hierzu ein Ampere-meter (für Ex-Anwendungen; Innenwiderstand < 15 Ohm) an die Klemmen Test +/- anschließen.

7. Inbetriebnahme, Betrieb

D

Montage des Winkelsteckverbinder nach DIN EN 175301-803



1. Lösen Sie die Schraube (1).
2. Lösen Sie die Kabelverschraubung (2).
3. Ziehen Sie Winkelgehäuse (5) mit Klemmblock (6) vom Gerät ab.
4. Hebeln Sie mit dem Schraubendreher in die Montageöffnung (D), so dass Sie den Klemmblock (6) aus dem Winkelgehäuse (5) herausdrücken. Drücken Sie nicht den Klemmblock (6) durch die Schraubenöffnung (1) bzw. Kabelverschraubung (2) heraus, sonst beschädigen Sie die Dichtungen des Winkelgehäuses.
5. Wählen Sie den Leitungsaußendurchmesser passend zur Kabeldurchführung des Winkelgehäuses. Schieben Sie das Kabel durch Kabelverschraubung (2), Ring (3), Dichtung (4) und Winkelgehäuse (5).
6. Schließen Sie die Kabelenden entsprechend der Belegungszeichnung in den Anschluß klemmen des Klemmblocks (6) an.
7. Drücken Sie das Winkelgehäuse (5) auf den Klemmblock (6).
8. Verschrauben Sie das Kabel mit der Kabelverschraubung (2). Achten Sie darauf, dass die Dichtungen unbeschädigt sind und Kabelverschraubung und Dichtungen korrekt sitzen, um die Schutzart zu gewährleisten.
9. Legen Sie die quadratische Flachdichtung über die Anschlußpins im Gehäuse.
10. Schieben Sie den Klemmblock (6) auf die Anschlußpins im Gehäuse.
11. Verschrauben Sie mit der Schraube (1) das Winkelgehäuse (5) mit dem Klemmblock (6) im Gerät.

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7. Inbetriebnahme, Betrieb

D

Technische Daten

Typ IS-20-S, IS-21-S, IS-20-F, IS-21-F, IS-20-H

Messbereich ¹⁾	IS-2X-S, IS-2X-F	bar	0,1	0,16	0,25	0,4	0,6	1	1,6	2,5	4	6	10	16
Überlastgrenze	IS-2X-S, IS-2X-F	bar	1	1,5	2	2	4	5	10	10	17	35	35	80
Berstdruck	IS-2X-S, IS-2X-F	bar	2	2	2,4	2,4	4,8	6	12	12	20,5	42	42	96
Messbereich ¹⁾	IS-2X-S, IS-2X-F	bar	25	40	60	100	160	250	400		600		1000 ¹⁾	
Überlastgrenze	IS-2X-S, IS-2X-F	bar	50	80	120	200	320	500	800		1200		1500	
Berstdruck	IS-2X-S, IS-2X-F	bar	96	400	550	800	1000	1200	1700 ²⁾		2400 ²⁾		3000	

Druckbereiche für IS-20-H siehe Zusatz-Betriebsanleitung 11126418 Höchstdruck.

{Unterdruck, Überdruck, +/- , sowie Absolutdruck erhältlich}

¹⁾ Nur für Typ IS-20-S, IS-20-F gültig.²⁾ Bei Typ IS-21-S, IS-21-F: Der Tabellenwert gilt ausschließlich bei Abdichtung mittels Dichtring unterhalb vom Sechskant. Andernfalls gilt max. 1500 bar.

Werkstoff		
■ Messstoffberührte Teile		
» Typ IS-20-S, IS-20-F, IS-20-H ^{*)}		CrNi-Stahl
» Typ IS-21-S, IS-21-F		CrNi-Stahl
		O-Ring: NBR {FPM/FKM oder EPDM}
■ Gehäuse		CrNi-Stahl
Interne Übertragungsflüssigkeit ³⁾		Synthetisches Öl {Halocarbonöl für Sauerstoff-Ausführungen}
		³⁾ Nicht vorhanden bei Typ IS-20-S, IS-20-F für Messbereiche > 25 bar und IS-20-H.
Hilfsenergie U+	DC V	
» Typen IS-2X-S, IS-20-H		10 ... 30
» Typen IS-2X-F, IS-20-H mit Feldgehäuse		11 ... 30
Ausgangssignal und zulässige		4 ... 20 mA, 2-Leiter
max. ohmsche Bürde RA	RA in Ohm	
» Typen IS-2X-S, IS-20-H		$RA \leq (U_+ - 10 V) / 0,02 A$ - (Länge der Kabelführung in m x 0,14 Ohm)
» Typen IS-2X-F, IS-20-H mit Feldgehäuse		$RA \leq (U_+ - 11 V) / 0,02 A$
Testkreissignal und zulässige Bürde		$RA \leq 15$ (nur bei Typen IS-2X-F, IS-20-H mit Feldgehäuse)

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7. Inbetriebnahme, Betrieb		D
Technische Daten		Typ IS-20-S, IS-21-S, IS-20-F, IS-21-F, IS-20-H
Einstellbarkeit Nullpunkt/Spanne	%	± 5 durch Potentiometer im Gerät
Einstellzeit (10 ... 90 %)	ms	≤ 1 ⁴⁾
		⁴⁾ Einstellzeit bei IS-20-S/-F: ≤ 10 bei Messstofftemp. < -30 °C für Messbereiche bis 25 bar. Einstellzeit bei IS-21-S/-F: ≤ 10 bei Messstofftemp. < -30 °C.
Leistung P _i	W	1 (750 mW mit Zulassung für Kategorie 1D)
Isolationsspannung		Isolierung entspricht EN 60079-11
Genaugkeit	% d. Spanne	≤ 0,5 ⁶⁾ {0,25} ^{5) 6)}
		⁵⁾ Genauigkeit { } für Messbereiche ≥ 0,25 bar. Nicht möglich bei IS-20-H.
		⁶⁾ Einschließlich Nichtlinearität, Hysterese, Nullpunkt- und Endwertabweichung (entspricht Messabweichung nach IEC 61298-2). Kalibriert bei senkrechter Einbaulage Druckanschluss nach unten.
Nichtlinearität	% d. Spanne	≤ 0,2 (BFSL) nach IEC 61298-2
Nichtwiederholbarkeit	% d. Spanne	≤ 0,1
Stabilität pro Jahr	% d. Spanne	≤ 0,2 (bei Referenzbedingungen)
Zulässige Temperaturbereiche		
■ Messstoff ⁸⁾	°C	-20 ... +80 ⁷⁾ (Erweiterte Temperaturbereiche siehe unter Punkt 7. Inbetriebnahme, Betrieb: "Bezug Medientemperatur zu Umgebungstemperatur") ⁷⁾
■ Umgebung ⁸⁾	°C	-20 ... +80 ⁷⁾
■ Lagerung	°C	-30 ... +105
		⁷⁾ Weitere Temperaturbereiche in Abhängigkeit der elektrischen Anschlüsse, siehe EG-Baumusterprüfbescheinigung, z.B. -30 ... +105 °C und Tabelle Seite 83 + 84
Nenntemperaturbereich	°C	0 ... +80
Temperaturkoeffizienten im Nenntemperaturbereich		
■ Mittlerer TK des Nullpunktes	% d. Spanne	≤ 0,2 / 10 K (< 0,4 für Messbereiche ≤ 250 mbar)
■ Mittlerer TK der Spanne	% d. Spanne	≤ 0,2 / 10 K
Einbaulage	mbar	< 2 bei +/- 30° Schräglage bei Typ IS-21-S/-F mit Schiffszulassung
CE- Kennzeichen		
■ Druckgeräterichtlinie		97/23/EG
36 WIKA Operating instructions/Betriebsanleitung/Mode d'emploi/Instrucciones de servicio		IS-2X

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7. Inbetriebnahme, Betrieb			D
Technische Daten		Typ IS-20-S, IS-21-S, IS-20-F, IS-21-F, IS-20-H	
■ EMV-Richtlinie		2004/108/EG, EN 61326 Emission (Gruppe 1, Klasse B) und Störfestigkeit (industrieller Bereich)	
■ ATEX-Richtlinie für Geräte zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen		94/9/EG	
Ex - Schutz	ATEX	Kategorie ⁸⁾ 1G, 1/2G , 2G, 1D ⁹⁾ , 1/2D ⁹⁾ , 2D ⁹⁾ , M1, M2	
Zündschutzart		Ex ia I/II C T4, Ex ia I/II C T5, Ex ia I/II C T6	
		⁸⁾ Lesen Sie unbedingt die Einsatzbedingungen und sicherheitstechnischen Daten in der EG Baumusterprüfbescheinigung nach (BVS 04 ATEX E068 X).	
		⁹⁾ Nicht für IS-20-H.	
Ex - Schutz	FM, CSA	Class I, II und III	
		Eigensicher Class I, II, II Division 1,	
		Groups A, B, C, D, E, F, G und Class I, Zone 0 AEx ia II C	
Zulassung German Lloyd GL		Environmental Category D, F, EMC 1	
HF-Immunität	V/m	10	
Burst	kV	2	
Schockbelastbarkeit » Typ IS-2X-S	g	1000 ¹⁰⁾ nach IEC 60068-2-27 (Schock mechanisch)	
» Typ IS-2X-F	g	600 ¹⁰⁾ nach IEC 60068-2-27 (Schock mechanisch)	
		¹⁰⁾ nicht gültig mit Schiffszulassung	
Vibrationsbelastbarkeit » IS-2X-S	g	20 ¹¹⁾ nach IEC 60068-2-6 (Vibration bei Resonanz)	
» IS-2X-F	g	10 ¹¹⁾ nach IEC 60068-2-6 (Vibration bei Resonanz)	
		¹¹⁾ bei Schiffbau: Category H, bis 2KHz	
Elektrische Schutzarten			
■ Verpolenschutz		U+ gegen U-	
Gewicht » Typ IS-2X-S	kg	Ca. 0,2	
» Typ IS-2X-F	kg	Ca. 0,35	
» Typ IS-20-H	kg	Ca. 0,3 (ca. 0,45 in Ausführung Feldgehäuse)	

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7. Inbetriebnahme, Betrieb / 8. Einstellung Nullpunkt/Spanne

D

*¹) In Sauerstoff-Ausführung ist Typ IS-21 nicht erhältlich. In Sauerstoff-Ausführung ist Typ IS-20 nur möglich mit Überdruck-Messbereich $\geq 0,25$ bar, Messstofftemperatur $-20 \dots +60$ °C und messstoffberührte Teile in CrNi-Stahl oder Elgiloy®.

{ } Angaben in geschweiften Klammern beschreiben gegen Mehrpreis lieferbare Sonderheiten.

i Beachten Sie bei der Auslegung Ihrer Anlage, dass die angegebenen Werte (z. B. Berstdruck, Überlastgrenze) in Abhängigkeit vom verwendeten Material, Gewinde und Dichtung gelten.

Funktionsprüfung

i Das Ausgangssignal muss sich dem anstehenden Druck proportional verhalten. Wenn dies nicht so ist, kann das ein Hinweis auf eine Beschädigung der Membran sein. Lesen Sie in diesem Fall in Kapitel 10 „Störbeseitigung“ nach.



Warnung

- Öffnen Sie Anschlüsse nur im drucklosen Zustand!
- Beachten Sie die Betriebsparameter gemäß Punkt 7 „Technische Daten“.
- Betreiben Sie das Druckmessgerät immer innerhalb des Überlastgrenzbereichs!



Vorsicht

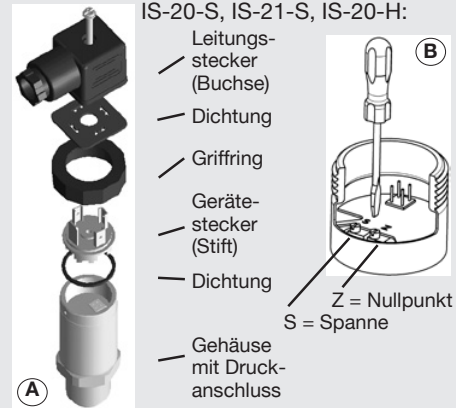
Beachten Sie beim Berühren des Druckmessgerätes, dass die Oberflächen der Gerätekomponenten während des Betriebes heiß werden können.

8. Einstellung Nullpunkt / Spanne (nur bei Geräten mit Griffing)

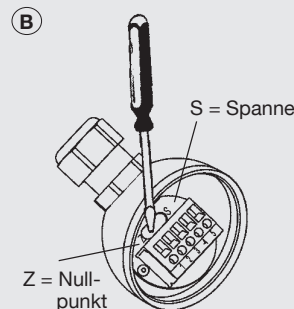
i Wir empfehlen Ihnen, das Spannepotentiometer nicht zu verstellen. Es dient zur werkseitigen Justage und sollte nur von Ihnen verstellt werden, wenn Sie über die ausreichende Kalibrierungsausstattung (mindestens 3x genauer als die angegebene Genauigkeit) verfügen.

8. Einstellung Nullpunkt / Spanne

D



IS-20-F, IS-21-F, IS-20-H mit Feldgehäuse:



- Achten Sie bei der Steckerdemontage /-montage darauf, dass keine Litzen abgerissen bzw. eingquetscht werden.
- IS-2X-S, IS-20-H: Ziehen Sie den Leitungstecker (Buchse) ab. Öffnen Sie das Druckmessgerät, indem Sie den Griffing lösen (siehe Abbildung (A)). Ziehen Sie vorsichtig den Gerätestecker (Stift) aus dem Gehäuse.
- IS-2X-F, IS-20-H mit Feldgehäuse: Öffnen Sie das Druckmessgerät, indem Sie den Deckel des Feldgehäuses aufschrauben.
- Stellen Sie den Nullpunkt (Z) ein (siehe Abbildung (B)), indem Sie den Druckanfangswert anfahren.
- Stellen Sie die Spanne (S) ein, indem Sie den Druckendwert anfahren.
- Überprüfen Sie den Nullpunkt. ■ Wenn der Nullpunkt nicht stimmt ggf. Prozedur wiederholen.
- Schließen Sie das Druckmessgerät wieder sorgfältig. Achten Sie darauf, dass die Dichtungen unbeschädigt und sauber sind und auf die korrekte Lage der Dichtungen, um die Schutzart zu gewährleisten.

Empfohlener Nachkalibrier-Zyklus: 1 Jahr



Bei Rückfragen (+49) 9372/132-295

9. Wartung, Zubehör



- WIKA Druckmessgeräte sind wartungsfrei.
- Lassen Sie Reparaturen nur vom Hersteller durchführen.

Zubehör

Entnehmen Sie bitte Zubehörangeben (z. B. Stecker) unserer aktuellen Standardpreisliste, dem CD-Katalog oder setzen Sie sich mit unserem Vertriebsmitarbeiter in Verbindung.

10. Störbeseitigung



Warnung

Öffnen Sie Anschlüsse nur im drucklosen Zustand!



Warnung

- Ergreifen Sie Vorsichtsmaßnahmen für Messstoffreste in ausgebauten Druckmessgeräten. Messstoffreste können zur Gefährdung von Menschen, Umwelt und Einrichtung führen!
- Setzen Sie das Druckmessgerät außer Betrieb und schützen Sie es gegen versehentliche Inbetriebnahme, wenn Sie Störungen nicht beseitigen können.
- Lassen Sie Reparaturen nur vom Hersteller durchführen.



Verwenden Sie keine spitzen bzw. harten Gegenstände zur Reinigung, denn die Membran des Druckanschlusses darf nicht beschädigt werden.

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Prüfen Sie bitte vorab, ob Druck ansteht (Ventile/Kugelhahn usw. offen) und ob Sie die richtige Spannungsversorgung und die richtige Verdrahtungsart (2-Leiter) gewählt haben.

Störung	Mögliche Ursache	Maßnahme
Gleichbleibendes Ausgangssignal bei Druckänderung	Mechanische Überlastung durch Überdruck	Gerät austauschen; bei wiederholtem Ausfall Rücksprache mit Hersteller *)
	Falsche Versorgungsspannung oder Stromstoß	Gerät austauschen
Kein Ausgangssignal	Keine/Falsche Versorgungsspannung oder Stromstoß	Versorgungsspannung gemäß Betriebsanleitung korrigieren *)
	Leitungsbruch	Durchgang überprüfen
Kein/Falsches Ausgangssignal	Verdrahtungsfehler	Verdrahtungsfehler (z. B. 2-Leiter als 3-Leiter verdrahtet)
Abweichendes Ausgangssignal	Bei Justage Spanne verstellt	Geeignete Referenz benutzen
Abweichendes Nullpunkt-Signal	Überlastgrenze überschritten	Zulässige Überlastgrenze einhalten (siehe Betriebsanleitung); Nullpunkt mittels Potentiometer korrigieren; *)
	Membranbeschädigung, z. B. durch Schläge, abrasives/aggressives Medium; Korrosion an Membran/Druckanschluss	Gerät austauschen
Signalspanne fällt/ab/zu klein	Membranbeschädigung, z. B. durch Schläge, abrasives/aggressives Medium; Korrosion an Membran/Druckanschluss; Übertragungsmedium fehlt	Hersteller kontaktieren und Gerät austauschen
Signalspanne fällt ab	Dichtung/Dichtfläche beschädigt/verschmutzt, Dichtung sitzt unkorrekt, Gewindegänge verkantet	Dichtung-/Fläche säubern, evtl. Dichtung austauschen
Signalspanne zu klein	Mechanische Überlastung durch Überdruck	Gerät neu kalibrieren *)
	Versorgungsspannung zu hoch/niedrig	Versorgungsspannung gemäß Betriebsanleitung korrigieren
Signalspanne schwankend	Stark schwankender Druck des Prozessmediums	Dämpfung; Beratung durch Hersteller

Im unberechtigtem Reklamationsfall berechnen wir die Reklamationsbearbeitungs-Kosten.

*) Überprüfen Sie nach dem Justieren die korrekte Arbeitsweise des Systems. Besteht der Fehler weiterhin, senden Sie das Gerät zur Reparatur ein (oder tauschen Sie das Gerät aus).

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10. Störbeseitigung / 11. Lagerung, Entsorgung

D

Wenn das Problem bestehen bleibt, setzen Sie sich mit unserem Vertriebsmitarbeiter in Verbindung.

Prozess Material Zertifikat (Kontaminationserklärung im Servicefall)

Spülen bzw. säubern Sie ausgebaute Geräte vor der Rücksendung, um unsere Mitarbeiter und die Umwelt vor Gefährdung durch anhaftende Messstoffreste zu schützen.

Eine Überprüfung ausgefallener Geräte kann nur sicher erfolgen, wenn das vollständig ausgefüllte Rücksendeformular vorliegt. Eine solche Erklärung beinhaltet alle Materialien, welche mit dem Gerät in Berührung kamen, auch solche, die zu Testzwecken, zum Betrieb oder zur Reinigung eingesetzt wurden. Das Rücksendeformular ist über unsere Internet-Adresse (www.wika.de / www.wika.com) verfügbar.

11. Lagerung, Entsorgung**Warnung**

Ergreifen Sie bei Lagerung und Entsorgung Vorsichtsmaßnahmen für Messstoffreste in ausgebauten Druckmessgeräten. Wir empfehlen eine geeignete und sorgfältige Reinigung. Messstoffreste können zur Gefährdung von Menschen, Umwelt und Einrichtung führen!

Lagerung

Montieren Sie die Schutzkappe bei Lagerung des Druckmessgerätes, damit die Membran nicht beschädigt wird (IS-21-S, -F).

Entsorgung

Entsorgen Sie Gerätekomponenten und Verpackungsmaterialien entsprechend den einschlägigen landesspezifischen Abfallbehandlungs- und Entsorgungsvorschriften des Anliefergebietes.

Technische Änderungen vorbehalten.

1. Informations importantes

F

1. Informations importantes

Veuillez lire ce mode d'emploi avant le montage et la mise en service de transmetteur de pression. Conservez ce mode d'emploi dans un endroit accessible en tout temps pour tous les utilisateurs. Les instructions de montage et de service présentées ci-après ont été établies avec grand soin. Il reste toutefois impossible d'envisager tous les cas d'applications possibles. Dans le cas où vous constateriez des lacunes dans ces instructions pour les tâches spéciales qu'il vous faut exécuter, vous avez la possibilité de recevoir des compléments d'informations:

- Sous notre adresse internet www.wika.de / www.wika.com
- La fiche technique de ce produit a la désignation PE 81.50, PE 81.51, PE 81.52.
- Par contact direct avec notre conseiller applications (+49) 9372/132-295

Si le numéro de série sur la plaque de fabrication et/ou la codification 2D sur l'hexagone du raccord n'est (ne sont) plus lisible (s) (par exemple par endommagement mécanique ou si le numéro est recouvert de peinture), la traçabilité n'est plus assurée.

La conception et la fabrication des transmetteurs de mesure WIKA, tels que décrits dans les instructions de service, satisfont aux toutes dernières règles de l'art. Tous les composants sont soumis à un contrôle strict des critères de qualité et d'environnement en cours de fabrication. Notre système de gestion de l'environnement est certifié selon DIN EN ISO 14001.

Définition conforme d'utilisation du produit IS-2X-S, IS-2X-F, IS-20-H

Utilisez le transmetteur de pression à sécurité intrinsèque afin de transformer le signal de pression en signal électrique dans les zones sous danger d'explosion.

Homologation ATEX:

Ces transmetteurs de pression sont certifiés pour utilisation dans un environnement explosible conforme à la directive correspondante (voir certificat d'examen CE de type ici inclus BVS 04 ATEX E 068 X).

ATEX homologation:

gazes et brumes: montage rapporté à la Zone 0; incorporation à la Zone 0, Zone 1 et Zone 2.
Poussières: montage rapporté à la Zone 20; incorporation à la Zone 20, Zone 21 et Zone 22.
Industrie minière Catégorie M1, M2.

FM/CSA: Ces transmetteurs de pression sont certifiés pour utilisation dans un environnement explosible conforme à la directive correspondante (voir Control drawing No: 2323880).

1. Informations importantes / 2. Aperçu rapide / 3. Explication des symboles, abréviations

F

FM / CSA Propriétés de l'homologation:

Sécurité intrinsèque avec approbation de l'appareil pour class I, II et III division 1, groupes A, B, C, D, E, F, G et class I, Zone 0, AEx ia IIC.

Mesures de protection contre les explosions dues à la présence de poussières pour class II et III, division 1, groupes E, F, et G.

Sans danger d'inflammation pour class I, division 2, groupes A, B, C et D.

Vos connaissances nécessaires

N'installez et ne mettez en service le transmetteur de pression que si vous avez les connaissances exactes des directives spécifiques nationales et si vous êtes en possession de la qualification en rapport. Vous devez posséder des connaissances des prescriptions pour les zones sous danger d'explosion ainsi que de la technique de mesure et régulation et des circuits électriques étant donné. Suivant les conditions d'utilisation vous devez disposer de connaissances parti-culières, par exemple sur les fluides agressifs ou les hautes pression.

2. Aperçu rapide

Si vous voulez vous procurer un résumé rapide, veuillez lire les chapitres 3, 5, 7 et 11. Là vous trouverez des indications concernant votre sécurité et des informations importantes sur votre produit et sa mise en service. Veuillez absolument en prendre connaissance.

3. Explication des symboles, abréviations



Avertissement

Risque de danger de mort ou de blessures graves.



Avertissement

Consignes spéciales pour la sécurité intrinsèque:
Risque de danger de mort ou de blessures graves.



Remarques, informations importantes, dérangement de fonction.



Avertissement

Risque de danger de mort ou de blessures graves par des pièces éjectées.



Attention

Possibilité de danger de brûlures par surfaces brûlantes.



Ce produit est conforme aux directives européennes correspondantes.

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3. Explication des symboles, abréviations/ 4. Fonction

F



ATEX

Directive européen pour atmosphères explosibles (Atmosphère=AT, Explosible=EX)
Ce produit est conforme aux exigences selon la directive 94/9/CE (ATEX) protection contre les explosions.



FM

Factory Mutual

Ce produit a été contrôlé et certifié par "FM Approvals". Il est en accord avec les normes utilisables aux USA sur la sécurité (protection contre les explosions incluse).



CSA

Canadian Standard Association
Ce produit a été contrôlé et certifié par "CSA International". Il est en accord avec les normes utilisables au Canada et aux USA sur la sécurité (protection contre les explosions incluse).



GL

Germanischer Lloyd

Ce produit a été contrôlé et certifié par "FM Approvals". Il est en accord avec la réquisition "GL Type Approval System".

2-fils

Deux conducteurs servent à l'alimentation.

Le courant de l'alimentation est le signal de mesure.

U+

Alimentation positive raccord

U-

Alimentation négative raccord

4. Fonction

IS-20: Raccord pression (sécurité intrinsèque) avec membrane intérieure (exécution standard).

IS-21: Raccord de pression avec membrane affleurante (sécurité intrinsèque) pour fluides hautement visqueux ou cristallisants pouvant obstruer le trou du raccord de pression standard.

IS-2X-S: Transmetteur de pression (sécurité intrinsèque) avec connecteur ou sortie câble

IS-2X-F: Transmetteur de pression (sécurité intrinsèque) exécution série robuste

IS-20-H: Transmetteur de pression (sécurité intrinsèque) exécution à très haute pression

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4. Fonction / 5. Pour votre sécurité

F

Fonction: A l'aide d'un capteur et sous alimentation électrique, on obtient la transformation en un signal amplifié, normalisé et électrique de la pression appliquée, par la déformation d'une membrane. Ce signal électrique varie proportionnellement par rapport à la pression et peut être exploité en rapport.

5. Pour votre sécurité



Avertissement

- Choisissez le transmetteur de pression adéquat, avant le montage et la mise en service, en rapport à l'étendue de mesure, l'exécution et les conditions de mesure spécifiques.
- Respectez les prescriptions de sécurité nationales (comme par exemple: IEC 60079-14, NEC, CEC) et observez lors d'applications spéciales les normes et règlements en vigueur (par exemple pour fluides dangereux tels que : acétylène, fluides combustibles ou toxiques ainsi que les installations frigorifiques et compresseurs). **Si vous ne respectez pas les prescriptions correspondantes, de graves lésions corporelles et dégâts matériels peuvent en résulter!**
- **N'ouvrez les raccords que hors pression!**
- N'utilisez le transmetteur de pression qu'à l'intérieur de la zone limite!
- Prenez en considération les paramètres de service selon le chapitre 7 „Caractéristiques techniques”.
- Assurez-vous que le transmetteur de pression ne soit utilisé qu'en accord avec le règlement, c'est-à-dire comme décrit dans la directive suivante.
- Abstenez-vous d'effectuer des empiétements et changements inadmissibles sur le transmetteur de pression n'étant pas décrits dans le mode d'emploi.
- Si vous ne pouvez pas éliminer des dérangements sur le transmetteur de pression, mettez celui-ci hors service et protégez le contre une remise en service par inadvertance.
- **Prenez des mesures de sécurité pour les restes de fluides se trouvant dans les transmetteurs de pression démontés. Ces restes de fluides peuvent mettre en danger les personnes, l'environnement ainsi que l'installation!**
- Ne faites effectuer les réparations que par le fabricant.

Les données relatives à la résistance à la corrosion et diffusion des instruments se trouvent dans le manuel WIKA sur la mesure des pressions et des températures.

5. Pour votre sécurité / 6. Emballage / 7. Mise en service, exploitation

F



Avertissement

Prenez en considération les indications du certificat d'examen CE de types en vigueur ainsi que les prescriptions nationales respectives concernant l'utilisation en zone sous danger d'explosion (par exemple: IEC 60079-14, NEC, CEC). Si vous ne respectez pas celles-ci, de graves lésions corporelles et des dégâts matériels peuvent en résulter.

6. Emballage

Est-ce que la livraison est complète ?



Contrôlez le volume de la livraison:

- Transmetteurs de pression complets; pour l'exécution à membrane affleurante IS-21-S, -F avec le joint prémonté et le capuchon de protection.
- La liste selon homologation CE des types et Control Drawing (FM, CSA)
- Examinez le transmetteur de pression en vue de dommages éventuels résultant du transport. Si des dommages sont évidents, veuillez en informer immédiatement l'entreprise de transport et WIKA.
- Conservez l'emballage, celui-ci offre lors d'un transport une protection optimale (par exemple changement du lieu d'utilisation, renvoi pour réparation).
- Veillez à ce que le filetage du raccord pression ainsi que les contacts de branchement ne soient pas détériorés.

Afin de protéger la membrane, le raccord pression de l'appareil IS-21-S, -F est muni d'un capuchon de protection.



- N'enlevez ce capuchon que juste avant le montage afin que la membrane ne soit pas endommagée.
- Conservez le capuchon de protection du filetage du raccord pression et la membrane pour un stockage ou pour un transport futur.
- Remontez le capuchon de protection lors du démontage ou transport de transmetteur de pression.

7. Mise en service, exploitation



Outils nécessaires: clé à fourche de 27 ou 41, tournevis

7. Mise en service, exploitation

F

Pour votre sécurité contrôler la membrane

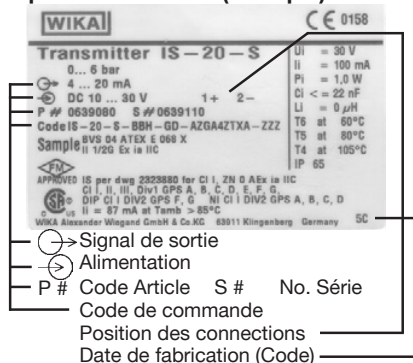
Il est nécessaire que, avant la mise en service de transmetteur de pression, vous contrôlez visuellement la membrane, car celle-ci est une **pièce élémentaire de sécurité**.

**Avertissement**

- Surveillez les fuites de liquide, celles-ci pouvant indiquer une membrane endommagée.
- Contrôlez visuellement si la membrane est endommagée (IS-21-S, -F).
- N'utilisez le transmetteur de pression que si la membrane est intacte.
- Utilisez le transmetteur de pression uniquement s'il est dans un état parfait quant à la sécurité technique.

Montage du raccord

Fondamentalement est valable le numéro de série sur la plaque de fabrication. S'il n'y a pas de numéro de série sur la plaque de fabrication, le numéro sur l'hexagone est valable.

Plaque de fabrication (exemple)

- N'enlevez le capuchon de protection que juste avant le montage et faites absolument attention à ne pas endommager la membrane lors du montage (IS-21-S, -F).
- Pour le type IS-20-S, -F veuillez prévoir un joint; à l'exception des appareils avec filetage autoétanchéifiant (par exemple filetage NPT).
- Pour le type IS-21-S, -F le joint fait partie de la livraison.
- Les renseignements concernant les joints figurent dans notre information "accessoires joints AC 09.08" dans le Catalogue Général Mesure de Pression et Température ou sur notre site internet www.wika.de

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7. Mise en service, exploitation

F



- Veuillez faire attention lors du montage à ce que les surfaces d'étanchéité de l'appareil et du point de mesure ne soient pas détériorées ou malpropres.
- Serrez ou desserrez l'appareil uniquement par l'intermédiaire des surfaces pour clés à l'aide d'un outil approprié en respectant le couple de serrage. Le couple de serrage correct dépend de la dimension du raccord de pression ainsi que du joint utilisé (forme / matière). Pour visser ou dévisser l'appareil, n'utilisez pas le boîtier en tant que surface d'attaque.
- Prenez garde lors du vissage de l'appareil, que le pas de vis ne se coince pas.
- Pour les taraudages et les embases à souder voir Information Technique IN 00.14 sous www.wika.de

**Avertissement**

- Protégez la membrane du contact avec des fluides abrasifs et contre les coups. Si vous endommagez la membrane, la protection contre les risques d'explosion n'est plus garantie (ATEX, FM, CSA)!
- Dans les environnements explosibles en raison de la présence de poussières, veillez à ce que la disposition de transmetteur de pression soit protégée également contre les coups.
- Prenez en considération les données techniques pour l'utilisation de transmetteur de pression liaison avec des fluides agressifs/corrosifs et pour éviter des mises en danger mécaniques.

Incorporation en zone 0 et zone 20 et montage rapporté à la zone 0 et à la zone 20

(Zone 20 ne pas pur IS-20-H)

(Rappel: Zone 0 implique que l'instrument est soumis à un environnement explosif où le risque dépasse 1.000 heures par an).

**Avertissement**

- Montez le transmetteur de pression ou la traversée de câble dans la paroi d'environnement demandant des moyens électriques de catégorie 1G, de façon à ce que l'indice de protection IP 67 selon IEC 60 529 soit assuré.
- Montez le transmetteur de pression ou la traversée de câble dans la paroi d'environnement demandant des moyens électriques de catégorie 1D, de façon à ce que l'indice de protection IP 6X selon IEC 60 529 soit assuré.

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7. Mise en service, exploitation

F

Les mesures de fluides ayant des températures plus élevées que citées dans les tableaux de procédure d'attestation de la certificat d'examen CE de type sous le point 15.1.2, plages de mesure des températures de fluides, sont admissibles en utilisant un parcours de refroidissement (ne pas pour IS-20-H).

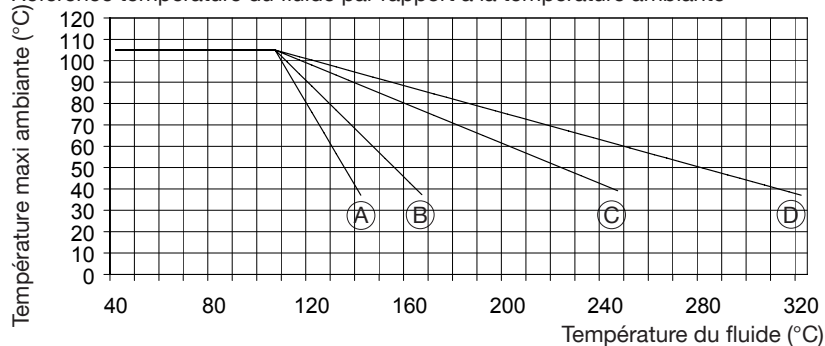


Avertissement

- Respectez la température de surface admissible ayant été déterminée pour ce domaine dans les classes de température.
- Respectez la valeur de température maximale (comme déterminé dans la procédure d'attestation de la certificat d'examen CE de type sous le point 15.1.2, plages de mesure) sur l'hexagonal se trouvant sous le boîtier tubulaire.

- Assurez, par un montage horizontal, une libre circulation d'air sur l'élément de refroidissement.
- Protégez l'appareil contre des contacts ou fixez un panneau indicateur de danger.
- Découplez thermiquement la source de chaleur de transmetteur de pression (par exemple par tuyauterie ou récipient).
- Assurez-vous que, spécialement dans la zone ex poussières, les trajets de refroidissement ne s'encrassent pas et qu'il n'y ait pas de dépôt de poussière, étant donné que, dans ce cas, l'effet de refroidissement n'est pas garanti.

Référence température du fluide par rapport à la température ambiante



7. Mise en service, exploitation

F

Type	IS-20-H		IS-2X-S / -F	
Exécution	(A)	(B)	(C)	(D)
Ailettes de refroidissement	-	2	3	5
Constante K	0,34	0,47	0,68	0,76

Calcul Température maxi ambiante:

$$T_{amb} = T_{med} + (T_B - T_{med}) / K$$

Calcul du élément de refroidissement:

$$T_B = T_{med} - (T_{med} - T_{amb}) \times K$$

T_B = Température de fonctionnement du transducteur

T_{med} = Température maxi du fluide du processus

T_{amb} = Température maxi ambiante

K = Constante du parcours de refroidissement

Montage branchement électrique



Avertissement

Mettez le boîtier à la terre contre des champs électromagnétiques et des charges électrostatiques par le raccord au processus.



Avertissement

- Mettez le blindage à la terre d'un seul côté et de préférence en zone de sécurité, donc en zone sans danger d'explosion (EN 60079-14). Dans les instruments avec sortie de câble, le blindage est relié au boîtier. Le raccord simultané du boîtier et du blindage à la terre n'est admissible que si une transmission de potentiel peut être exclue entre le raccord de blindage (par ex. à l'alimentation) et le boîtier (voir EN 60079-14).

- Alimentez le transducteur de pression avec un circuit sécurité intrinsèque (Ex ia).
- Observez la capacité et inductivité efficace interne.
- Veuillez munir les embouts avec brins de câble tenus de cosses tubulaires (confection de câbles).
- La matière du connecteur baionnette est en alliage léger, laquelle n'est pas homologuée pour les utilisations du groupe I (mines).
- Considérez que pour l'utilisation avec câble en **zone 1 et 2** la tension de test entre conducteur / terre, conducteur / blindage et blindage / terre doit être de > 500V.

7. Mise en service, exploitation

F



- Utilisez le transducteur de pression avec un câble blindé et mettez-le à la terre au moins d'un côté si la longueur du câble dépasse 30 m ou si vous sortez le câble d'un bâtiment.
- Protection IP selon IEC 60 529 (les degrés de protection indiqués ne sont valables que pour les connecteurs enfichés avec connecteurs femelles possédant l'indice de protection correspondant).
- Choisissez le diamètre du câble en rapport au presse étoupe du connecteur. Faites attention à ce que le serre-câble du connecteur assemblé soit bien positionné et que les joints soient tous présents et non endommagés. Serrez les raccords à fond et contrôlez la position correcte des joints afin d'assurer l'indice de protection.
- En cas d'utilisation de sorties par câble, veuillez vous assurer qu'aucune humidité ne puisse entrer à la sortie du câble.



Avec une alimentation isolateur galvanique vous réaliserez la séparation galvanique impérativement nécessaire pour l'alimentation en courant et tension entre atmosphère explosible et non-explosible et assurer les caractéristiques de sécurité technique.

7. Mise en service, exploitation

F

Branchement électrique

	Connecteur coudé DIN 175301-803 A	Connecteur M12x1, 4-pôles	Sortie câble, 1,5 m
			
2-fils	U+ = 1 U- = 2	U+ = 1 U- = 3	U+ = brun U- = vert
Gaine de câble			câble PUR: gris câble FEP: torsadé et étamé
Section de conducteur	up to max. 1,5 mm ²	-	0,5 mm ² (AWG 20)
Diamètre de câble	6-8 mm homologation construc- tion navale: 10-14 mm	-	6,8 mm (Code DL / EM) 7,5 mm (Code DM)
Protection selon IEC 60 529	IP 65	IP 67	IP 67 - Code de commande: DL IP 68 sans réglage zéro/gain - Code: EM / DM
Les degrés de protection indiqués ne sont valables que pour les connecteurs enfichés avec connecteurs femelles possédant l'indice de protection correspondant.			

Branchement électrique

	Connecteur bajonnette, 6-pôles	Série robuste (bornes à ressort à l'intérieur)
		
2-fils	U+ = A U- = B	U+ = 1 U- = 2 Test+ = 3 Test- = 4 Blindage = 5
Protection selon IEC 60 529	IP 65 (NEMA 4)	IP 67
Les degrés de protection indiqués ne sont valables que pour les connecteurs enfichés avec connecteurs femelles possédant l'indice de protection correspondant.		

7. Mise en service, exploitation

F

Type IS-20-F, IS-21-F, IS-20-H Série robuste

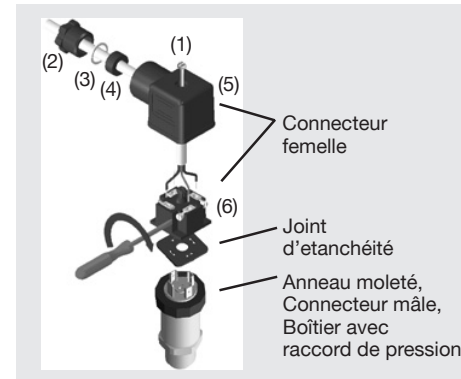
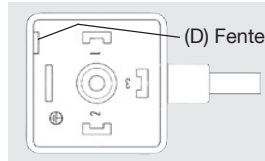
Branchement du câble sur le bloc de bornes à ressort

- Pourvoyez les bouts de fils dénudés de cosse d'embouts.
- Revissez le couvercle du boîtier.
- Desserrez le passe-câble avec une clé à fourche de 24.
- Introduisez le câble dans la tête du boîtier ouvert en passant par le passe-câble.
- Appuyez à l'aide d'un tournevis sur le levier en plastique correspondant du bloc de bornes à ressort, de façon que la borne à ressort s'ouvre.
- Introduisez le bout du fil confectionné dans l'ouverture et lâchez le levier en plastique de façon que l'embout du fil soit bloqué dans la borne à ressort.
- Après avoir connecté tous les fils, reserrez le passe-câble et revissez le couvercle du boîtier.

Fonction du circuit de test pour 2-fils
Par l'utilisation du circuit de test il est possible, pendant le fonctionnement normal, d'effectuer une mesure de courant sans devoir débrancher l'appareil. Pour ce faire, vous devez brancher un ampèremètre (pour applications dans la zone explosives; résistance interne < 15 Ohm) aux bornes de test +/-.

7. Mise en service, exploitation

F

Montage de Connecteur soudé DIN EN 175301-803

1. Desserrez la vis (1).
2. Desserrez le presse-étoupe (2).
3. Retirez le connecteur femelle (5) de l'appareil y compris le porte-contact (6).
4. A l'aide d'un tournevis introduit dans la fente (D), dégagez le porte-contact du boîtier du connecteur. N'essayez pas de dégager le porte-contact (6) en introduisant le tournevis dans le trou de la vis (1) ou dans le presse-étoupe (2), vous endommageriez les joints du boîtier.
5. Choisissez le diamètre du câble par rapport au presse-étoupe du boîtier. Introduisez le câble dans le presse-étoupe (2), l'anneau (3), le joint (4) et le boîtier (5).
6. Branchez les conducteurs conformément au plan de câblage sur les bornes de branchement du porte-contact (6).
7. Pressez le porte-contact (6) dans le boîtier (5).
8. Vissez le presse-étoupe (2) avec le câble. Afin de garantir le degré de protection, veillez à ce que les joints ne soient pas endommagés et que ceux-ci et le presse-étoupe soient correctement positionnés.
9. Enfilez le joint carré plat sur les contacts du boîtier.
10. Connectez le porte-contact (6) sur l'embase mâle du boîtier.
11. A l'aide de la vis (1), vissez le boîtier (5) avec le porte-contact (6) sur l'appareil.

7. Mise en service, exploitation													F
Données techniques		Type IS-20-S, IS-21-S, IS-20-F, IS-21-F, IS-20-H											
Etendue de mesure *) IS-2X-S, IS-2X-F	bar	0,1	0,16	0,25	0,4	0,6	1	1,6	2,5	4	6	10	16
Limites de surcharge IS-2X-S, IS-2X-F	bar	1	1,5	2	2	4	5	10	10	17	35	35	80
Pression de destruction IS-2X-S,IS-2X-F	bar	2	2	2,4	2,4	4,8	6	12	12	20,5	42	42	96
Etendue de mesure *) IS-2X-S, IS-2X-F	bar	25	40	60	100	160	250	400	600		1000 ¹⁾		
Limites de surcharge IS-2X-S, IS-2X-F	bar	50	80	120	200	320	500	800	1200		1500		
Pression de destruction IS-2X-S,IS-2X-F	bar	96	400	550	800	1000	1200	1700 ²⁾	2400 ²⁾		3000		
Etendues de mesure pour IS-20-H voir additionnel mode d'emploi 11126418 Hautes pressions													
{Livrable pour le vide, la pression, pression positive/négative, la pression absolue}													
¹⁾ Seulement type IS-20-S, IS-20-F.													
²⁾ Pour le type IS-21-S, IS-21-F: La valeur du tableau est uniquement valable en utilisant le joint plat en-dessous de l'hexagone pour étancher l'appareil. Autrement, la valeur maxi est de 1500 bar.													
Matériaux													
■ Parties en contact avec le fluide													
» Type IS-20-S, IS-20-F, IS-20-H *)		Acier inox											
» Type IS-21-S, IS-21-F		Acier inox											
		Joint torique: NBR {FPM/FKM ou EPDM}											
■ Boîtier		Acier inox											
Liquide interne de transmission de pression ³⁾		Huile synthétique {Halocarbène pour exécution oxygène}											
		³⁾ Non existant avec type IS-20-S, -F pour des étendues de mesure > 25 bar et IS-20-H.											
Alimentation U+													
» Type IS-2X-S, IS-20-H		DC V	10 ... 30										
» Type IS-2X-F, IS-20-H série robuste		DC V	11 ... 30										
Signal de sortie et charge ohmique max autorisée RA		RA en Ohm	4 ... 20 mA, 2-fils										
» Type IS-2X-S, IS-20-H			$RA \leq (U+ - 10 V) / 0,02 A - (0,14 \text{ Ohm} \times \text{cable en m})$										
56		WIKA Operating instructions/Betriebsanleitung/Mode d'emploi/Instrucciones de servicio											IS-2X

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Données techniques			Type IS-20-S, IS-21-S, IS-20-F, IS-21-F, IS-20-H	
» Type IS-2X-F, IS-20-H série robuste			RA ≤ (U+ - 11 V) / 0,02 A	
Signal de circuit de test			RA ≤ 15 (seulement avec Type IS-2X-F, IS-20-H série robuste)	
Réglage: point zero, gain	%		± 5 par potentiomètres dans l'instrument	
Temps de transmission (10 ... 90 %)	ms		≤ 1 ⁴⁾	
			⁴⁾ Temps de transmission IS-20-S/-F: ≤ 10 avec temp. de fluide < -30 °C pour des étendue de mesure à 25 bar. Temps de transmission IS-21-S/-F: ≤ 10 avec temp. de fluide < -30 °C	
Puissance Pi	W		1 (750 mW avec homologation pour catégorie 1D)	
Tension d'isolement			L'isolation correspond à EN 60079-11	
Précision	% du gain		≤ 0,5 ⁶⁾ {0,25} ^{5) 6)}	
			⁶⁾ Inclusif non-linéarité, hystérésis, zéro et déviation de l'étendue de mesure (correspond à l'erreur de mesure selon IEC 61298-2). Calibré en position verticale, raccord de pression vers le bas.	
Non-linéarité	% du gain		≤ 0,2 (BFSL) selon IEC 61298-2	
Non-répétabilité	% du gain		≤ 0,1	
Stabilité sur un an	% du gain		≤ 0,2 (pour les conditions de référence)	
Température autorisée				
■ Du fluide ^{8) 7)}	°C		-20 ... +80 ⁷⁾ (Plages de température élargies voir chapitre 7, „température du fluide par rapport à la température ambiante“) ⁷⁾	
■ De l'environnement ⁸⁾	°C		-20 ... +80 ⁷⁾	
■ De stockage	°C		-30 ... +105	
			⁷⁾ Autres températures en fonction de raccords électriques voir certificat d'examen CE de type, e.g. -30 ... +105 °C et table page 83+84.	
Plage de température nominale	°C		0 ... +80	
Coefficient de température sur plage température nominale:				
■ Coef. de temp. moy. du point 0	% du gain		≤ 0,2 / 10 K (< 0,4 pour étendue de mesure ≤ 250 mbar)	
■ Coef. de temp. moy.	% du gain		≤ 0,2 / 10 K	
Position de montage	mbar		< 2 à +/- 30° position oblique pour Type IS-21-S et IS-21-F	
WIKA Operating instructions/Betriebsanleitung/Mode d'emploi/Instrucciones de servicio			IS-2X 57	

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7. Mise en service, exploitation		F
Données techniques Type IS-20-S, IS-21-S, IS-20-F, IS-21-F, IS-20-H		
Conformité - CE		
■ Directive Equipements sous Pression		97/23/CE
■ CEM Directive		2004/108/CE, Emission de perturbations (group 1, classe B) et résistance aux perturbations
■ Directive ATEX pour les appareils à être utilisés en atmosphères explosibles		94/9/CE
Ex - Protection	ATEX	Catégorie [®] 1G, 1/2G , 2G, 1D [®] , 1/2D [®] , M1, M2
Homologation		Ex ia I/II C T4, Ex ia I/II C T5, Ex ia I/II C T6
		[®] Veuillez absolument lire les conditions d'utilisation et les données techniques de sécurité dans la procédure d'attestation de la liste selon homologation CE des types (BVS 04 ATEX E068 X)
		[®] Ne pas pour IS-20-H.
Ex - Protection	FM, CSA	Class I, II et III
Homologation		Sécurité intrinsèque Class I, II, III Division 1,
		Groups A, B, C, D, E, F, G et Class I, Zone 0 AEx ia II C
Homologation German Lloyd GL		Environmental Category D, F, EMC 1
RF-Immunité	V/m	10
Burst	KV	2
Résistance aux chocs » Type IS-2X-S	g	1000 ¹⁰⁾ selon IEC 60068-2-27 (chock mécanique)
» Type IS-2X-F	g	600 ¹⁰⁾ selon IEC 60068-2-27 (chock mécanique)
		¹⁰⁾ pas pour homologation German Lloyd
Résistance aux vibrations » IS-2X-S	g	20 ¹¹⁾ selon IEC 60068-2-6 (vibration en cas de résonance)
» Type IS-2X-F	g	10 ¹¹⁾ selon IEC 60068-2-6 (vibration en cas de résonance)
		¹¹⁾ pour homologation German Lloyd: Category H, jusqu'à 2KHz
Protection électrique		
■ Protection fausse polarité		U+ contre U-
Poids » Type IS-2X-S	kg	Environ 0,2
» Type IS-2X-F	kg	Environ 0,35
58 WIKA Operating instructions/Betriebsanleitung/Mode d'emploi/Instrucciones de servicio		IS-2X

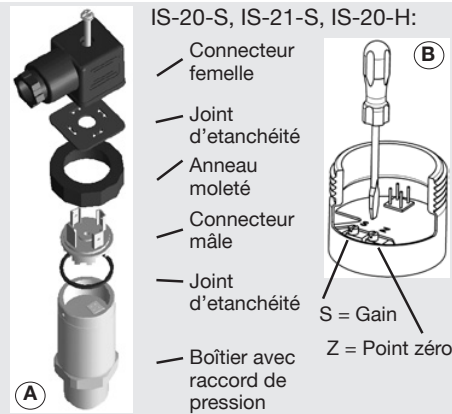
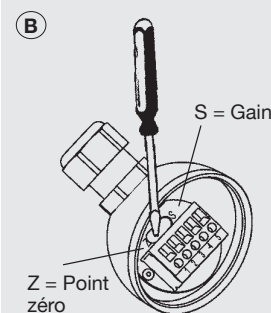
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7. Mise en service, exploitation / 8. Réglage du zéro/gain		F
Données techniques Type IS-20-S, IS-21-S, IS-20-F, IS-21-F, IS-20-H		
» Type IS-20-H kg		Environ 0,3 (environ 0,45 avec série robuste)
^{*)} En exécution oxygène le modèle IS-21 n'est pas livrable. En exécution oxygène le modèle IS-20 n'est possible que pour les étendues de mesure de $\geq 0,25$ bar, température du fluide de -20 ... +60 °C et avec les pièces en contact avec le fluide en acier inox ou Elgiloy®. { } Les données entre accolades précisent les options disponibles contre supplément de prix.		
i Veuillez prendre en considération lors de la conception de votre installation, que les valeurs indiquées (par exemple pression d'éclatement, limite de surcharge) dépendent de la matière utilisée, du filetage et du joint utilisé.		
Vérification du fonctionnement i Le signal de sortie doit se comporter proportionnellement à la pression présente. Si ce n'est pas le cas, ceci peut être une indication que la membrane est endommagée. Dans ce cas veuillez lire "élimination de perturbations" dans le chapitre 10.		
Avertissement  N'ouvrez les raccords que hors pression! ■ Prenez en considération les paramètres de service selon le chapitre 7 "Caractéristiques techniques". ■ N'utilisez le transmetteur de pression qu'à l'intérieur de la zone limite de surcharge!		
Attention  Considérez que quand vous touchez le transmetteur de pression en fonctionnement, la surface des composants des appareils peut être brûlante.		
8. Réglage du zéro / gain (uniquement pour appareils à anneau moleté) i Nous vous recommandons de ne pas dérégler le potentiomètre de gain. Il sert au réglage d'usine et ne devrait être réajusté de votre part que si vous disposez d'un équipement de calibration suffisant (au minimum 3x plus précis que la précision donnée).		
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8. Réglage du zéro / gain

F

IS-20-F, IS-21-F,
IS-20-H série robuste:

- Veillez lors du montage et démontage du connecteur à ce qu'aucun fil ne soit arraché ou pincé.
- IS-2X-S, IS-20-H: Débranchez le connecteur femelle. Ouvrez l'appareil de mesure de pression (voir image (A)) en dévissant l'anneau moleté. Retirez le connecteur mâle du boîtier avec précaution.
- IS-2X-F, IS-20-H série robuste: Ouvrez l'appareil de mesure de pression en dévissez le couvercle du série robuste.
- Réglez le zéro (Z) (voir image (B)) en appliquant la valeur de pression de départ.
- Réglez le gain (S) en appliquant la valeur de pression finale.
- Contrôlez le zéro.
- Au cas où le zéro n'est pas correct, répéter la procédure.
- Refermez soigneusement l'appareil de mesure de pression. Faites attention à ce que les joints ne soient pas endommagés et à leur position correcte afin d'assurer l'indice de protection.

Il est recommandé de procéder à un réétalonnage tous les ans.

En cas de problèmes (+49) 9372/132-295



9. Entretien, accessoires / 10. Elimination de perturbations

F

9. Entretien, accessoires



- Les transmetteurs WIKA ne demandent aucune maintenance.
- Ne faites effectuer les réparations que par le fabricant.

Accessoires: Les renseignements concernant les accessoires (par exemple connecteurs) figurent dans le tarif de stock actuel, le "Product Catalog" en CD-Rom ou veuillez prendre contact avec notre département commercial.

10. Elimination de perturbations



Avertissement

N'ouvrez les raccords que hors pression!



Avertissement

- Prenez des mesures de sécurité pour les restes de fluides se trouvant dans les transmetteurs de pression démontés. Ces restes de fluides peuvent mettre en danger les personnes, l'environnement ainsi que l'installation !
- Si vous ne pouvez pas éliminer des dérangements sur le transmetteur de pression, mettez celui-ci hors service et protégez le contre une remise en service par inadvertance.
- Ne faites effectuer les réparations que par le fabricant.



N'utilisez aucun objet pointu ou dur pour le nettoyage, car la membrane du raccord pression ne doit en aucun cas être endommagée.

Veillez contrôler au préalable si la pression est présente (vannes / robinets à boisseau sphérique, etc. ouvert) et si vous avez choisi la tension d'alimentation correcte et le système de câblage correspondant (2 fils).

Perturbations	Cause	Mesures à prendre
Lors d'une variation de pression le signal de sortie reste constant	Surcharge mécanique par pression excessive	Remplacer l'appareil; en cas de panne répétitive consulter le fabricant *)
Pas de signal de sortie	Tension d'alimentation manquante / fausse ou pointe de surtension	Corriger la tension d'alimentation selon le mode d'emploi *)
	Rupture de conducteur	Contrôler le passage du courant

10. Elimination de perturbations

F

Perturbations	Cause	Mesures à prendre
Zéro du signal diverge	Limite de surcharge dépassée	Respecter la limite de surcharge (voir le mode d'emploi); Corriger le zéro a l'aide du potentiometre *)
	Endommagement de la membrane, par ex. par des coups, des fluides abrasifs / agressifs; corrosion sur la membrane / sur les raccords de pression	Remplacer l'appareil
Gains du signal tombe / est trop faible	Endommagement de la membrane, par ex. par des coups, des fluides abrasifs / agressifs; corrosion sur la membrane / sur les raccords de pression; liquide de transmission manque	Prendre contact avec le fabricant et remplacer l'appareil
Gain du signal tombe	Joint / surface d'étanchéité endommagé / souillé, le joint n'est pas monté correctement, pas de vis coincé	Nettoyer le joint / la surface d'étanchéité, éventuellement remplacer le joint
Gain du signal trop faible	Surcharge mécanique par pression excessive	Recalibrer l'appareil *)
Gain du signal fluctuant	Pression du fluide de processus soumise a de fortes fluctuations	Amortissement; conseils par le fabricant

En cas de réclamation non justifiée, nous mettrons en facture les coûts de traitement de celle-ci.

*) Contrôlez après le réglage le fonctionnement correct du système. Au cas où l'erreur persiste, renvoyez l'appareil pour réparation (ou remplacez l'appareil).

Si un problème reste présent, veuillez prendre contact avec notre département commercial.

Certificat de matière de processus (déclaration de contamination en cas de réparation)

Veuillez laver ou nettoyer les appareils démontés avant de les renvoyer afin de protéger nos employés et l'environnement des risques présentés par les résidus de fluide adhérents. Un contrôle des appareils en panne ne peut être effectué de façon sûre que si la déclaration de contamination est complète. Cette déclaration comporte toutes les matières ayant été en contact avec l'appareil, également celles ayant été utilisées lors d'essais, en service ou lors du nettoyage. La "Product Return Form" peut être téléchargée de notre adresse Internet (www.wika.de / www.wika.com)

11. Stockage, mise au rebut

F

11. Stockage, mise au rebut



Avertissement

Veuillez prendre les précautions de sécurité pour la mise au rebut et pour le stockage des fluides se trouvant dans les transmetteurs de pression démontés. Nous recommandons un nettoyage approprié et méticuleux. Ces restes de fluides peuvent mettre en danger les personnes, environnement ainsi que l'installation !

Stockage



Remontez le capuchon de protection lors du stockage de l'appareil afin d'éviter que la membrane ne soit endommagée (IS-21-S, -F).

Mise au rebut



Mettez les composants des appareils et les emballages au rebut en respectant les prescriptions nationales pour le traitement et la mise au rebut des régions de livraison.

WIKA se réserve le droit de modifier les présentes spécifications.

1. Detalles importantes para su información

E

1. Detalles importantes para su información

Lea estas instrucciones de servicio antes del montaje y puesta en servicio del transmisor de presión. Guarde las instrucciones de servicio en un lugar accesible a cualquier usuario en cualquier momento.

Las siguientes instrucciones de montaje y de servicio han sido redactadas cuidadosamente. Pero a pesar de ello no es posible tener en cuenta todos los casos de aplicación. Si echara en falta informaciones para su problemática específica, podrá obtener más información:

- A través de nuestra dirección de Internet www.wika.de / www.wika.com
- La designación de la ficha técnica correspondiente PE 81.50
- Asesores de utilización (+49) 9372/132-295

Si el número de serie en el placa de identificación y/o el código 2D en el hexágono se vuelve ilegible (p. ej. por daños mecánicos o sobrepintado) ya no es posible la posibilidad de seguimiento.

Los transmisores de presión WIKA descritos en las instrucciones de servicio son diseñados y fabricados conforme a los conocimientos más recientes. Todos los componentes están sometidos a unos estrictos criterios de calidad y medioambientales durante la fabricación. Nuestro sistema de gestión medioambiental posee la certificación según la norma DIN EN ISO 14001.

Utilización del producto según el uso de destinación IS-2X-S, IS-2X-F, IS-20-H

Utilice el transmisor de presión de seguridad intrínseca para convertir la presión en una señal eléctrica en áreas con riesgo de explosión.

Aprobación ATEX:

El transmisor de presión para el uso previsto en áreas de riesgo de explosión (véase el certificado de comprobación de modelo de construcción CE: BVS 04 ATEX E 068 X).

Características de la aprobación ATEX:

Para gases y niebla: montaje adosado en zona 0; incorporación en zona 0, zona 1 y zona 2. Polvos: montaje adosado en zona 20; incorporación en zona 20, zona 21 y zona 22.

Minería: categoría M1, M2.

Aprobación FM/CSA:

El transmisor de presión para el uso previsto en áreas de riesgo de explosión (véase Control drawing Nr. 2323880).

1. Detalles importantes para su información / 2. Resumen rápido para usted / 3. Abreviaciones

E

Características de la aprobación FM / CSA:

Seguridad intrínseca con aprobación de aparatos para clase I, II y III Division 1, grupo A, B, C, D, E, F, G y clase I, Zone 0, AEx ia IIC.

Dust-ignitionproof para clase II y III, Division 1, grupo E, F y G.

Non-incendive para Class I Division 2 grupo A, B, C y D

Conocimientos requeridos

Instale y ponga en servicio el transmisor de presión sólo si está familiarizado con las regulaciones y directivas relevantes de su país y si posee la cualificación necesaria. Debe estar familiarizado con las reglas y las regulaciones de las áreas de riesgo de explosión, de la tecnología de medición y control y los circuitos eléctricos. Según las condiciones de aplicación, debe poseer los conocimientos correspondientes de, p.ej. medios agresivos respectivamente altas presiones.

2. Resumen rápido para usted

Si quiere un resumen rápido, léase las **secciones 3, 5, 7 y 11**. Allí, encontrará instrucciones para su seguridad y importantes informaciones sobre su producto y la puesta en funcionamiento. **Es imprescindible leerlas.**

3. Signos, símbolos y abreviaciones

Advertencia

Peligro potencial para su vida o lesiones graves.



Advertencia

Indicaciones para Ex:
Peligro potencial para su vida o lesiones graves.



Nota, información importante, falla de funcionamiento.



ATEX: Directiva europea de protección contra explosiones (Atmosphère=AT, Explosible=EX); El producto cumple los requisitos de la directiva europea de protección contra explosiones 94/9/EG.



Advertencia

Peligro potencial para su vida o lesiones graves por componentes proyectados.



Advertencia

Peligro potencial de quemaduras por superficies calientes.



El producto cumple con las directivas europeas respectivas.

3. Signos, símbolos y abrevaciones / 4. Función

E



FM
Factory Mutual
El producto ha sido probado y certificado por parte de FM Approvals. Cumple las normas norteamericanas aplicables de seguridad (incluido protección contra explosiones).



CSA
Canadian Standard Association
El producto ha sido probado y certificado por parte de CSA International. Cumple las normas aplicables de seguridad de Canadá y Estados Unidos (incluido protección contra explosiones).



GL Germanischer Lloyd
El producto ha sido probado y certificado por parte de GL. Cumple el requerimiento "GL Type Approval System".

- 2 hilos Dos conexiones sirven para la energía auxiliar.
El corriente de alimentación es el señal de medición.
- U+ Conexión de alimentación positiva
U- Conexión de alimentación negativa

4. Función

IS-20: Conexión de presión (Seguridad intrínseca) with internal diaphragm (versión estándar).

IS-21: Conexión de presión (Seguridad intrínseca) con membrana enrasada para medios altamente viscosos o cristalizantes pudiendo embotar el agujero de la conexión de presión.

IS-2X-S: transmisor (de seguridad intrínseca), versión con conexión de enchufe /conexión de cable

IS-2X-F: transmisor (de seguridad intrínseca), versión caja de campo

IS-20-H: transmisor (de seguridad intrínseca), versión presión máxima

Función: Mediante un elemento sensor y el suministro de energía auxiliar, la presión existente en su aplicación se convertirá en una señal eléctrica reforzada, estandarizada, a través de la deformación de una membrana. Esta señal eléctrica cambia de forma proporcional respecto de la presión y puede ser evaluada respectivamente.

5. Para su seguridad

E

5. Para su seguridad



Advertencia

- Seleccione el transmisor de presión adecuado con respecto al rango de medición, versión, condiciones de medición específicas antes de instalar o poner en servicio el instrumento.
- Observe el reglamento nacional relevante (p.ej. IEC 60079-14, NEC, CEC) y, para aplicaciones especiales, tenga en cuenta las normas y directivas vigentes (p.ej. en medios de medición peligrosos tales, materias inflamables o tóxicas así como en instalaciones de refrigeración y compresores). **Si no se observan las prescripciones de seguridad, ¡eso puede tener consecuencias graves como lesiones físicas graves y daños materiales!**
- ¡Abrir las conexiones de presión sólo en estado sin presión!
- Hay que respetar los límites de sobrecarga del rango de medición correspondiente.
- Observe los parámetros de servicio según sección 7 „Datos técnicos“.
- Asegúrese de que se utilicen los instrumentos de acuerdo con su destino, como descrito en las siguientes instrucciones.
- Abstenerse de intervenciones y modificaciones en el transmisor de presión no descritas en estas instrucciones de servicio.
- Ponga fuera de servicio el instrumento y protéjalo contra la puesta en servicio por error, si no puede eliminar las perturbaciones.
- **¡Tome medidas de precaución en cuanto a residuos de medios de medición en transmisores de presión desmontados. Medios residuales pueden causar daños en personas, medio ambiente y equipo!**
- Sólo el fabricante puede efectuar reparaciones.

Las especificaciones respecto a resistencia a la corrosión y indifusibilidad de los materiales de los instrumentos las encuentra en nuestro manual WIKA Medición de presión y de temperatura.



Avertissement

Observe las especificaciones del certificado de ensayo de tipo en vigor, así como el reglamento específico del país respecto a la instalación y la utilización en zonas explosibles (p.ej. IEC 60079-14, NEC, CEC). En caso de no observar esas especificaciones pueden resultar lesiones graves y daños materiales.

6. Embalaje / 7. Puesta en servicio, funcionamiento

E

6. Embalaje

¿Se entregó todo?



Verifique el volumen del suministro:

- Transmisores de presión completos; en versión frontalmente enrasada IS-21-S, -F con juntas premontadas y capuchón de protección.
- Declaración de conformidad CE y Control Drawing (FM, CSA)
- Rogamos revisen los equipos por eventuales daños que se hayan producido durante el transporte. Si detectara daños visibles, debe comunicarlo inmediatamente al transportista y a WIKA.
- Guárdese el embalaje ya que éste ofrece una protección ideal durante el transporte (p.ej. lugar de instalación cambiante, envío para revisión).
- Procure que la rosca de conexión de presión y los contactos de unión no resulten dañados.

Para proteger la membrana, hemos provisto la conexión de presión del instrumento IS-21-S, -F de un capuchón protector especial.



- Saque este capuchón solamente justo antes de la instalación para evitar una avería de la membrana.
- Guárdese la tapa de protección de la rosca y del diafragma para almacenaje o transporte posterior.
- Reinstale el capuchón protector al desmontaje y transporte del instrumento.

7. Puesta en servicio, funcionamiento



Herramienta necesaria: llave de boca SW 27 ó SW 41, destornillador

Control de la membrana para su seguridad

Es necesario que controle visual la membrana antes de la puesta en servicio del transmisor de presión, puesto que **es un componente relevante de seguridad**.



Advertencia

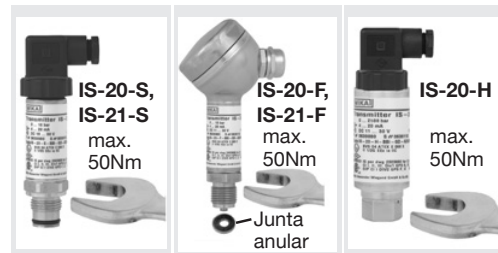
- Asegúrese de que no se escape líquido siendo eso un indicio de un defecto de la membrana (No para IS-20-H).
- Haga un control visual de la membrana para deterioro (IS-21-S, -F).
- Utilice el transmisor de presión sólo si la membrana es indemne.
- Utilice el transmisor de presión sólo si está en un estado impecable en razón de la seguridad.

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7. Puesta en servicio, funcionamiento

E

Montaje de la conexión mecánica



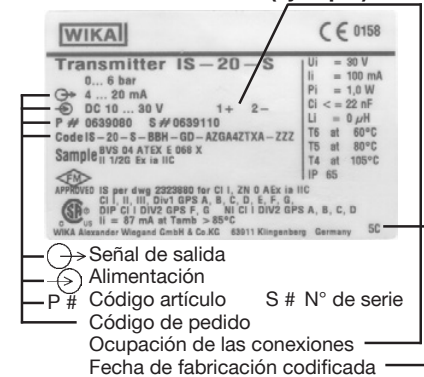
En principio es válido el número de identificación en la placa de identificación. Si no se encuentra ningún número de serie en la placa de identificación, se tomará el número del hexágono.



- Saque este capuchón solamente justo antes de la instalación para evitar una avería de la membrana también durante de la instalación (IS-21-S, -F).
- Para el tipo IS-20-S, -F hay que prever una junta; a excepción de instrumentos con filete autosellador (p. ej. filete NPT). Para el modelo IS-21-S, -F la junta anular está incluido en la entrega.
- Indicaciones para juntas encontrarán en nuestra hoja de datos „Accesorios para juntas AC 09.08“ en nuestro catálogo general Técnica de medición de presión y de temperatura o en nuestra página web www.wika.de.
- Asegúrese, al montaje, de que las superficies de estanqueidad del instrumento y de los puntos de medición queden limpias y intactas.
- Atornille o destornille el instrumento sólo a través de las superficies de llave utilizando una herramienta apropiada y el momento de torsión prescrito. El momento de torsión prescrito depende de la dimensión de la conexión de presión y de la junta utilizada (forma/material). No utilice la caja del instrumento para atornillar o destornillarlo.
- Al atornillar, asegúrese de que las vueltas de rosca no resulten ladeadas.
- Orificios de roscado y racor de soldar, ver hoja de información técnica IN 00.14 bajo www.wika.de

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Placa de identificación (ejemplo)



7. Puesta en servicio, funcionamiento

E

**Advertencia**

- Proteja la membrana frente al contacto con sustancias abrasivas y golpes. Si se daña la membrana, no se garantiza la protección contra explosiones (ATEX, FM, CSA).
- Procure que el instrumento se coloque en un lugar protegido en las áreas Ex de polvos y protéjalo de los golpes.
- Tenga en cuenta los datos técnicos para la utilización del manómetro en contacto con fluidos agresivos/corrosivos y para prevenir posibles peligros mecánicos.

Incorporación y montaje adosado en zona 0 y zona 20 (Zona 20 no para IS-20-H)

(Zona 0 significa que una mezcla de gases explosivos está presente en el instrumento más de 1.000 horas al año).

**Advertencia**

- Monte el instrumento o el paso de cable en la pared de las áreas que requieran medios de producción de la categoría 1G, de forma que se garantice el tipo de protección IP 67 según IEC 60 529.
- Monte el instrumento o el prensaestopas para cables en la pared de las áreas que requieran medios de producción de la categoría 1D, de forma que se garantice el tipo de protección IP 6X según IEC 60 529.

Se permite la medición de medios de proceso con temperaturas más altas que los rangos de temperatura media especificados en las tablas del certificado de comprobación de modelo de construcción CE en el punto 15.1.2 si se utilizan secciones de enfriamiento especiales (no para IS-20-H).

**Advertencia**

- Tenga en cuenta las temperaturas de superficie permitidas que son válidas para este rango según las clases de temperatura determinadas
- Tenga en cuenta el valor máximo de temperatura (del rango de temperatura determinado en el certificado de comprobación de modelo de construcción CE en el punto 15.1.2) en el hexágono de la carcasa tubular.
- Asegure una circulación de aire sin obstáculos en el elemento de enfriamiento mediante un montaje horizontal.
- Proteja el aparato de cualquier contacto o coloque una nota de advertencia.
- Aísle térmicamente el convertidor de medición de presión de fuentes de calor (por ejemplo, tubos o depósitos).

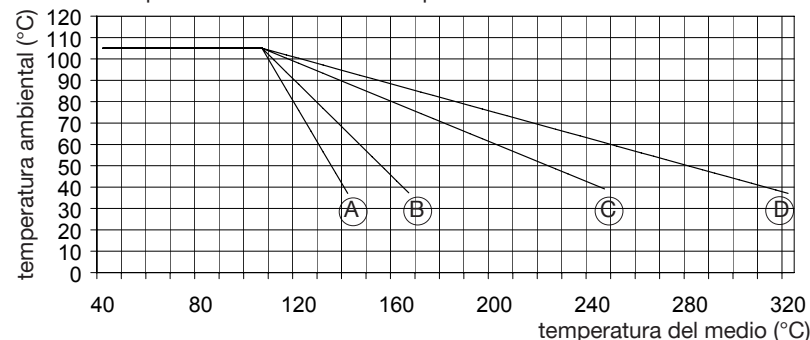
7. Puesta en servicio, funcionamiento

E

**Advertencia**

- Asegúrese, especialmente en el área Ex polvo que los trayectos de enfriamiento no se ensucien y no haya depósito de polvo encima, ya que no se garantiza el efecto refrigerante.

Relación temperatura del medio a la temperatura ambiental



Tipo	IS-20-H	IS-2X-S /-F			
versión	(A)	(B)	(C)	(D)	
aletas refrigeradoras	-	2	3	5	
constante K	0,34	0,47	0,68	0,76	

temperatura ambiental máx. admisible:

$$T_{amb} = T_{med} + (T_B - T_{med}) / K$$

Cálculo del trayecto de enfriamiento:

$$T_B = T_{med} - (T_{med} - T_{amb}) \times K$$

T_B = temperatura de trabajo del transductor

T_{med} = temperatura máx. medio de proceso

T_{amb} = temperatura máx. del ambiente

K = constante del trayecto de enfriamiento

Montaje de la conexión eléctrica**Advertencia**

Ponga a tierra la caja vía el racor de proceso para evitar campos electromagnéticos y cargas electroestáticas.

7. Puesta en servicio, funcionamiento

E



Advertencia

■ Ponga a tierra el blindaje de cable de un lado, de preferencia en zona segura, o sea en zona antiexplosiva (EN 60079-14). En instrumentos con salida de cable está conectado el blindaje a la caja. La conexión simultánea de la caja y el blindaje de cables a la tierra sólo es admisible si se excluye una transmisión de potencial entre la conexión de blindaje (p. ej. en el alimentador) y la caja (ver EN 60079-14).

- Alimente el transmisor de presión con un circuito de corriente seguridad intrínseca (Ex ia).
- Tenga en cuenta la capacidad e inductividad de efecto interior.
- Provea los extremos de los cables de hilo fino de virolas de cable (preparación de cables).
- El conector circular de bayoneta está fabricado a partir de metal ligero, el cual no es válido para las aplicaciones del grupo I (minería).
- Tenga en cuenta que la tensión de prueba para los cables utilizados en las **zonas 1 y 2** entre conductor/tierra, conductor/pantalla y pantalla/tierra debe ser una tensión alterna superior a 500V.



- Utilice el transmisor de presión con un cable blindado y ponga a tierra el blindaje, como mínimo en un lado del cable, cuando los cables tengan una longitud superior a 30 m o salgan al exterior del edificio.
- Modo de protección IP según IEC 60 529 (las clases de protección indicadas se aplican sólo cuando el transmisor de presión esté conectado a unas hembrillas procurando el modo de protección correspondiente).
- Escoja el diámetro de cable de forma que sea apropiado para la boquilla de paso de la clavija. Asegúrese de que el racor de cable de la clavija ensamblada sea posicionado correctamente y que existan juntas no deterioradas. Apriete el racordaje y verifique la posición correcta de las juntas para asegurar el modo de protección.
- Asegúrese de que en las salidas de cables no entre ninguna humedad a la extremidad del cable.
- Con un separador de alimentación, lleve a cabo el aislamiento galvánico imprescindible de la fuente de tensión y alimentación entre el área Ex y no Ex, y asegure los datos de conexión de seguridad técnica.

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7. Puesta en servicio, funcionamiento

E

Conexión eléctrica

	Conector con salida lateral DIN 175301-803 A	Conector M12x1, 4-polar	Salida de cable, 1,5 m
Sistema 2 hilos	U+ = 1 U- = 2	U+ = 1 U- = 3	U+ = marrón U- = verde
Cable apantallado			cable PUR: gris cable FEP: trenzado y estañado
Sección del conductor	hasta máx. 1,5 mm ²	-	0,5 mm ² (AWG 20)
Diámetro del cable	6-8 mm Homologación: 10-14 mm	-	6,8 mm (Código: DL / EM) 7,5 mm (Código: DM)
Modo de protección según IEC 60 529	IP 65	IP 67	IP 67 - Código de pedido: DL IP 68 sin acceso al potenciómetro de punto cero y de rango - Código de pedido: EM / DM
Las clases de protección indicadas se aplican sólo cuando el transmisor de presión esté conectado a unas hembrillas procurando el modo de protección correspondiente).			

Conexión eléctrica

	Conector circular de bayoneta, 6-polar	Caja de campo (con terminales de conexión tipo clip)
Sistema 2 hilos	U+ = A U- = B	U+ = 1 U- = 2 Test+ = 3 Test- = 4 Blindaje = 5
Modo de protección según IEC 60 529	IP 65 (NEMA 4)	IP 67
Las clases de protección indicadas se aplican sólo cuando el transmisor de presión esté conectado a unas hembrillas procurando el modo de protección correspondiente).		

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7. Puesta en servicio, funcionamiento

E

Tipo IS-20-F, IS-21-F, IS-20-H con caja de campo:

Conexión de cable en el conector terminal

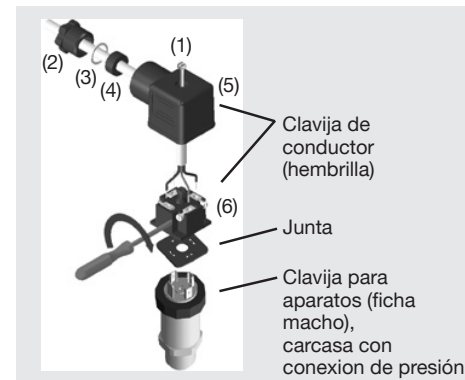
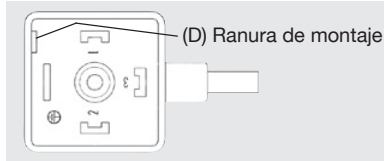
- Complete las extremidades de conductor peladas con puntas de cable.
- Enrosque la tapa de la caja.
- Destornille el racor para cables con una llave de boca SW24.
- Pase el cable a través del racor de cable en la cabeza de caja abierta.
- Apriete hacia abajo la palanca de plástico respectiva en el conector terminal con un destornillador para que se abra el contacto de apriete.
- Introduzca la extremidad de cable completada en la abertura y suelte la palanca de plástico para que la extremidad sea apretada en el conector terminal.
- Después de conectar los diferentes conductores apriete el racor atornillado para cables y atornille la tapa de la caja.

Función del círculo de prueba para 2 hilos

El círculo de prueba permite una medición del corriente durante el funcionamiento normal sin desconectar el instrumento. Para ello, debe conectar un amperímetro (para aplicaciones en zonas explosibles; resistencia interior < 15 ohmios) a los bornes prueba +/-.

7. Puesta en servicio, funcionamiento

E

Conexión eléctrica DIN EN 175301-803

1. Destornille el tornillo central (1).
2. Abre el prensaestopas (2).
3. Estire el conector angular (5) con el bloque de terminales (6) en su interior, del instrumento.
4. Saque el bloque de terminales (6) del conector angular (5), usando un destornillador pequeño como palanca en la ranura de montaje (D). Para no dañar la junta del conector angular, por favor no trate de expulsar el bloque de terminales (6) a través del prensaestopas (2) o del tornillo central (1).
5. Asegúrese que el diametro exterior del cable usado es adecuado para el prensaestopas del conector angular. Pase el cable a través de la rosca (2), de la junta metálica (3), de la junta de goma (4) y del conector angular (5).
6. Conecte los conductores a los terminales del bloque (6) según el dibujo de asignación.
7. Monte el bloque de terminales (6) a presión adentro del conector angular (5).
8. Cierre el prensaestopas (2). Asegúrese que la junta de goma no este dañada y que todas las juntas estén montadas de forma correcta para asegurar la protección IP.
9. Ponga la junta plana cuadrada por encima de los conectores en el tope de la caja del instrumento.
10. Enchufe el bloque de terminales (6) a los conectores.
11. Monte el conector angular (5) y el bloque de conectores (6) al instrumento atornillando el tornillo central (1).

7. Puesta en servicio, funcionamiento **E**

Datos técnicos Tipo IS-20-S, IS-21-S, IS-20-F, IS-21-F, IS-20-H

Rango de medición ^{*)}	IS-2X-S, -F	bar	0,1	0,16	0,25	0,4	0,6	1	1,6	2,5	4	6	10	16
Límite de sobrecarga	IS-2X-S, -F	bar	1	1,5	2	2	4	5	10	10	17	35	35	80
Presión de rotura	IS-2X-S, -F	bar	2	2	2,4	2,4	4,8	6	12	12	20,5	42	42	96
Rango de medición ^{*)}	IS-2X-S, -F	bar	25	40	60	100	160	250	400		600		1000 ¹⁾	
Límite de sobrecarga	IS-2X-S, -F	bar	50	80	120	200	320	500	800		1200		1500	
Presión de rotura	IS-2X-S, -F	bar	96	400	550	800	1000	1200	1700 ²⁾		2400 ²⁾		3000	

Gamas de presiones para IS-20-H, véase instrucciones de empleo adicionales 11126418 presión máxima

{Vacío, presiones positivas,escalas compuestas, presión absoluta disponibles}

¹⁾ Solamente en el modelo IS-20-S, IS-20-F.

²⁾ Para el modelo IS-21-S, IS-21-F: el valor especificado en la tabla solo se aplica cuando la estanqueidad se realiza con la junta anular debajo de la hexagonal. Si no aplica max 1500 bar.

Material		
■ Piezas en contacto con el medio		
» Tipo IS-20-S, IS-20-F, IS-20-H ^{*)}		Acero CrNi
» Tipo IS-21-S, IS-21-F		Acero CrNi
		Junta tórica: NBR {FPM/FKM o EPDM}
■ Carcasa		Acero CrNi
Líquido interno de transmisión ³⁾		Aceite sintético {Aceite carbónico halogenado para versiones de oxígeno}
		³⁾ No existe en el tipo IS-20-S, IS-20-F para rangos de medición > 25 bar y IS-20-H con caja de campo
Energía auxiliar U+		DC V
» Tipo IS-2X-S, IS-20-H		10 ... 30
» Tipo IS-2X-F, IS-20-H con caja de campo		11 ... 30
Señal de salida y carga óhmica máx. admisible RA		4 ... 20 mA, sistema 2 hilos
		RA en Ohm

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7. Puesta en servicio, funcionamiento **E**

Datos técnicos Tipo IS-20-S, IS-21-S, IS-20-F, IS-21-F, IS-20-H

» Tipo IS-2X-S, IS-20-H		RA ≤ (U+ -10 V) / 0,02 A - (longitud de cable en m x 0,14)
» Tipo IS-2X-F, IS-20-H con caja de campo		RA ≤ (U+ -11 V) / 0,02 A
Señal de circuito de prueba y carga permitida		RA ≤ 15 (solamente en el modelo IS-2X-F, IS-20-H con caja de campo)
Posibilidad de ajuste punto cero/rango	%	± 5 mediante potenciómetro dentro del equipo
Tiempo de respuesta (10 ... 90 %)	ms	≤ 1 ⁴⁾

⁴⁾ Tiempo de respuesta con IS-20-S/-F: ≤ 10 con temperaturas del material de medición < -30°C para rangos de medición de hasta 25 bar. Tiempo de respuesta con IS-21: ≤ 10 con temperaturas del material de medición < -30°C

Potencia Pi	W	1 (750 mW para homologación Category 1D)
Tensión de aislamiento		Aislamiento corresponde a EN 60079-11
Precisión	% del rango	≤ 0,5 ⁵⁾ {0,25} ⁵⁾ ⁶⁾

⁵⁾ Deviación de característica { } para rangos de medición ≥0,25 bar, no para IS-20-H

⁶⁾ No-Linealidad, histéresis y error de punto cero y span incluidas (correspondiente al error de medición según IEC 61298-2). Ajuste con posición vertical de instalación, conexión de presión hacia abajo.

No-Linealidad	% del rango	≤ 0,2 (BFSL) conforme a IEC 61298-2
No-repetibilidad	% del rango	≤ 0,1
Estabilidad al año	% del rango	≤ 0,2 (con condiciones de referencia)

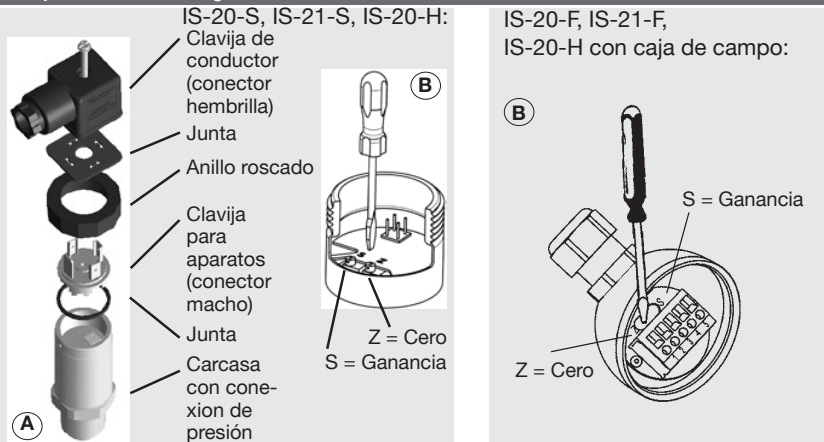
Rangos de temperatura admisibles		
■ Medio ^{*)}	°C	-20 ... +80 °C ⁷⁾ (Rangos de temperatura ampliados, véase punto 7. Puesta en servicio, funcionamiento: Relación de temperatura media con temperatura ambiente) ⁷⁾
■ Entorno ^{*)}	°C	-20 ... +80 °C ⁷⁾
■ Almacenamiento	°C	-30 ... +105 °C
		⁷⁾ Más gamas de temperatura según las conexiones eléctricas, véase certificado del examen CE de tipo, p.ej. -30 ... +105 °C y tabla en página 83+84

Rango de temperatura nominal	°C	0 ... +80
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8. Ajuste de cero / margen / 9. Mantenimiento, accesorios

E



- Asegúrese al desmontaje / montaje de la clavija de que no se rompan o compriman ningún conductor.
 - IS-2X-S, IS-20-H: Desmonta el conector hembra. Abrir transmisor de presión, desmontando el anillo roscado (ver (A)). Desmonta el conector macho del la carcasa con cuidado.
 - IS-2X-F, IS-20-H con caja de campo: Abrir el transductor de presión destornillando la tapa de la caja de campo.
 - Ajustar el cero (Z) (ver (B)), generando el límite inferior del rango de presión.
 - Ajuste el margen (S) y generando el límite superior del rango de presión
 - Controle el cero. ■ Si el cero es erróneo, repetir el procedimiento.
 - Cierre el transmisor de presión cuidadosamente. Asegúrese de que las juntas no estén deterioradas y verifique su posición correcta para asegurar el modo de protección.
- Recomendamos realizar una recalibración cada año.



Para más información (+49) 9372/132-295

9. Mantenimiento, accesorios

- ¡Los transmisores WIKA están libres de mantenimiento!
- Sólo el fabricante puede efectuar reparaciones.

9. Mantenimiento, accesorios / 10. Eliminación de perturbaciones

E

Accesorios: Detalles para los accesorios (p. ej. conectores) encontrará en la lista de precios WIKA, catálogo de productos WIKA sobre CD-Rom o póngase en contacto con nuestro departamento de venta.

10. Eliminación de perturbaciones

¡Abrir las conexiones de presión sólo en estado sin presión!



Advertencia



Advertencia

- ¡Tome medidas de precaución en cuanto a residuos de medios de medición en transmisores de presión desmontados. Medios residuales pueden causar daños en personas, medio ambiente y equipo!
- Ponga fuera de servicio el instrumento y protéjalo contra la puesta en servicio por error, si no puede eliminar perturbaciones.
- Sólo el fabricante es autorizado para efectuar reparaciones.



Para no dañar las membranas de la conexión de presión, no utilizar para la limpieza objetos puntiagudos ni duros.

Compruebe previamente si hay presión (válvulas/llave esférica, etc. abiertas), y si ha elegido la fuente de tensión correcta y el tipo de cableado correspondiente (2 hilos).

Avería	Posible causa	Medida
Señal de salida constante en caso de cambio de presión	Sobrecarga mecánica por presión excesiva	Cambiar el instrumento; en caso de fallo repetido, consultar con el fabricante *)
	Falsa tensión de alimentación o golpe de corriente	Cambiar el instrumento
Sin señal de salida	Sin o falsa tensión de alimentación o golpe de corriente	Corregir tensión de alimentación según instrucciones de servicio *)
	Ruptura de línea	Comprobar continuidad
Sin o falsa señal de salida	Error de cableado	Observar empleo de los conductores (ver placa indicad. de tipo / instrucciones de uso)
Señal de salida distinta	Desajuste del alcance	Utilizar referencia adecuada
Desviación de la señal del cero	Límite de sobrecarga sobrepasado	Observar límite de sobrecarga (ver instrucciones de uso); corregir cero por potenciómetro *)
	Deterioro de la membrana, p.ej. por golpes, medios abrasivo/agresivo; corrosión en membrana/racor de presión	Cambiar el aparato

10. Eliminación de perturbaciones / 11. Almacenaje, eliminación de desechos			E
Avería	Posible causa	Medida	
Señal cae o demasiado baja	Deterioro de membrana, p. ej. por golpes, medio abrasivo/agresivo; corrosión en membrana/racor de presión ; falta el medio de transmisión	Contactar con el fabricante y cambiar el instrumento	
Alcance de la señal cae	Junta/superficie de obturación deteriorada/ ensuciada, posición incorrecta de la junta, espiras bloqueadas	Limpiar junta/superficie de junta, eventualmente cambiar junta	
Alcance de la señal demasiado pequeño	Sobrecarga mecánica por sobrepresión	Recalibrar el instrumento *)	

En caso de reclamación sin justificación alguna, tendrá que abonar los costes de tramitación de la reclamación.

*) Tras el ajuste, compruebe el funcionamiento correcto del sistema. Si el error persiste, envíe el aparato a reparar (o reemplácelo).

Si el problema perdura, póngase en contacto con nuestro departamento de venta.

Certificado de process material (declaración de contaminación en caso de asistencia técnica)

Fregue / limpie los instrumentos desmontados antes de la devolución a la fábrica, con el fin de proteger a nuestros empleados y al medio ambiente de los peligros ocasionado por los residuos de medios de medición adheridos. Una revisión de instrumentos con avería sólo se puede efectuar seguramente, si se ha presentado una declaración de contaminación completamente llenada. Tal declaración contiene informaciones sobre todos materiales en contacto con el instrumento hasta los que se utilizaban por fines de prueba, funcionamiento o limpieza. La declaración de contaminación es disponible a través de nuestra página web www.wika.com

11. Almacenaje, eliminación de desechos



Advertencia

Al almacenar los instrumentos o eliminar los desechos tome medidas de precaución en cuanto a residuos de medios de medición en transmisores de presión desmontados. Recomendamos que la limpieza se realice de forma adecuada y cuidadosa.

Medios residuales pueden causar daños en personas, medio ambiente y equipo.

Almacenaje

 Al almacenaje del transmisor de presión hay que montar el capuchón de protección para no deteriorar la membrana (IS-21-S /-F).

Eliminación de los desechos

 Elimine los desechos de componentes de instrumentos y materiales de embalaje según el reglamento respectivo del tratamiento de residuos y eliminación de desechos de la región o del país donde el instrumento se ha suministrado.

WIKA se reserva el derecho de modificar las especificaciones detalladas.

Permissible temperature ranges depending on electrical connections		
Zulässige Temperaturbereiche in Abhängigkeit des elektrischen Anschlusses / Permissible temperature ranges depending on electrical connections / Domaines de températures admissibles en fonction du raccordement électrique / Gamas de temperaturas admisibles en función de la conexión eléctrica		
Electrical connection / Elektrischer Anschluss / Branchement électrique / Conexiones eléctrica	Order code Bestellcode / Code de commande / Código de pedido	Ambience-/ Medium temperature range / Umgebungs-/Medien-temperaturbereich / Température du fluide / ambiante / Rango de temperatura entorno / medio

IS-20-S, IS-21-S, IS-20-F, IS-21-F

DIN 175301-803 A L-Connector / Winkeldose / Connecteur coudé / Conector con salida lateral	A4	1/2 G (IIC)	-40 ... +60 °C (T6) -40 ... +80 °C (T5) -40 ... +105 °C (T4)
		M1	-40 ... +105 °C
M 12x1 Circular connector / Rundsteckverbinder / Connecteur / Conector circular	M4	1/2 G (IIC)	-25 ... +60 °C (T6) -25 ... +80 °C (T5) -25 ... +90 °C (T4)
		M1	-25 ... +90 °C
Flying leads / Kabelausgang / sortie câble / salida de cable	DL	1/2 G (IIC)	-20 ... +60 °C (T6) -20 ... +80 °C (T5) -20 ... +80 °C (T4)
		M1	-20 ... +60 °C
Bajonett-Rundsteckverbinder, (nicht für Bergbau) / Bayonet connector (not with mining) / Connecteur bajonette (pas pour l'exploitation dan les mines) / Conector circular de bayoneta (no para la minería)	C6	1/2 G (IIC)	-50 ... +60 °C (T6) -50 ... +80 °C (T5) -50 ... +105 °C (T4)
Kabelausgang ohne Zugang zu Nullpunkt und Spanne-Potentiometer / Flying leads zero/span not adjustable	EM	1/2 G (IIC)	-20 ... +60 °C (T6) -20 ... +80 °C (T5) -20 ... +80 °C (T4)
		M1	-20 ... +80 °C
Field case / Feldgehäuse / série robuste / con caja de campo	FH, FC	1/2 G (IIC)	-50 ... +60 °C (T6) -50 ... +80 °C (T5) -50 ... +105 °C (T4)
		M1	-50 ... +105 °C (T4)

Permissible temperature ranges depending on electrical connections			
Electrical connection / Elektrischer Anschluss / Branchement électrique / Conexiones eléctrica	Order code Bestellcode Code de commande Código de pedido	Category / Kategorie / Catégorie / Categoría	Ambience-/ Medium temperature range / Umgebungs-/Medien- temperaturbereich / Température du fluide / ambiente / Rango de temperatura entorno / medio
Kabelausgang, PUR, ohne Zugang zu Nullpunkt- und Spanne-Potentiometer / flying leads, PUR, zero/span not adjustable / sortie câble, PUR, sans réglage zéro/gain / salida de cable, PUR, sin acceso al potenciómetro de punto cero y de rango	DM	1 G (IIA), 1/2 G (IIC)	-10 ... +60 °C (T6) -10 ... +60 °C (T5) -10 ... +60 °C (T4)
		1D, M1	-10 ... +60 °C
Kabelausgang FEP, ohne Zugang zu Nullpunkt- und Spanne-Potentiometer / flying leads, FEP, zero/span not adjustable / sortie câble, FEP, sans réglage zéro/gain / salida de cable, FEP, sin acceso al potenciómetro de punto cero y de rango	DM	1 G (IIA), 1/2 G (IIC)	-30 ... +60 °C (T6) -30 ... +80 °C (T5) -30 ... +105 °C (T4)
		1D	-30 ... +60 °C
		M1	-30 ... +105 °C

IS-20-H

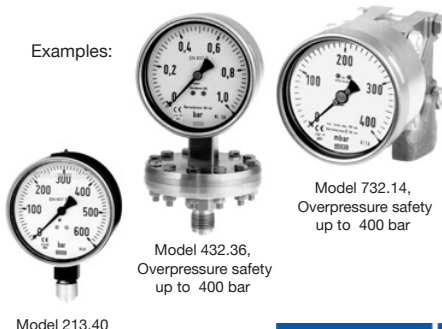
DIN 175301-803 A L-Connector / Winkeldose / Connecteur coudé / Conector con salida lateral	A4	1/2 G (IIC)	-40 ... +60 °C (T6) -40 ... +80 °C (T5) -40 ... +105 °C (T4)
		M1	-40 ... +105 °C
M 12x1 Circular connector / Rundsteckverbinder / Connecteur / Conector circular	M4	1/2 G (IIC)	-25 ... +60 °C (T6) -25 ... +80 °C (T5) -25 ... +90 °C (T4)
		M1	-25 ... +90 °C
Flying leads / Kabelausgang / sortie câble / salida de cable	DL	1/2 G (IIC)	-20 ... +60 °C (T6) -20 ... +80 °C (T5) -20 ... +80 °C (T4)
		M1	-20 ... +60 °C
Field case / Feldgehäuse / série robuste / con caja de campo	FH, FC	1/2 G (IIC)	-50 ... +60 °C (T6) -50 ... +80 °C (T5) -50 ... +105 °C (T4)
		M1	-50 ... +105 °C (T4)

2.1.1.2. 6904400 - PRESSURE GAUGE 0-400 BAR DN63

Operating
Instructions GB

Pressure Gauges

Examples:



Part of your business

Notes in accordance with Pressure Equipment
Directive 97/23/EC

- The pressure gauges are "pressure accessories" in accordance with Article 1, Paragraph 2.1.4
- The volume of the pressure bearing housings of WIKA pressure gauges is < 0.1 L
- The pressure gauges carry CE marking for Fluid Group 1G in accordance with Annex 2, Table 1 when their permissible working pressure exceeds 200 bar

Pressure gauges that do not carry the CE mark are manufactured in accordance with Article 3, Paragraph 3 "Sound engineering practice".

Applied standards

- EN 837-1 Bourdon tube pressure gauges, dimensions, metrology, requirements and testing
- EN 837-2 Selection and installation recommendations for pressure gauges
- EN 837-3 Diaphragm and capsule pressure gauges, dimensions, metrology, requirements and testing

Specifications: see data sheet on www.wika.de
Subject to technical modifications.

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2408976.03 02/2010

1. Safety



WARNING!

Before installation, commissioning and operation, ensure that the appropriate pressure gauge has been selected in terms of measuring range, design and suitable wetted material (corrosion) for the specific measuring conditions. In order to guarantee the measuring accuracy and long-term stability specified, the corresponding load limits must be observed.

Only qualified persons authorised by the plant manager are permitted to install, maintain and service the pressure gauges.

For hazardous media such as oxygen, acetylene, flammable or toxic gases or liquids, and refrigeration plants, compressors, etc., in addition to all standard regulations, the appropriate existing codes or regulations must also be followed.

After an external fire, pressure media can leak out, particularly at soft solder joints. All gauges must be checked and, if necessary, replaced before recommissioning the plant.

Non-observance of the respective regulations can result in serious injury and/or damage to equipment.

2. Mechanical connection

In accordance with the general technical regulations for pressure gauges (e.g. EN 837-2). When screwing the gauges in the force required for this must not be applied through the case or terminal box, rather only through the spanner flats provided for this purpose (using a suitable tool).



Mounting with
spanner

Correct sealing of pressure gauge connections with parallel threads ① must be made using suitable sealing rings, sealing washers or WIKA profile seals. The sealing of tapered threads (e.g. NPT threads) is made by providing the thread ② with additional sealing material such as, for example, PTFE tape (EN 837-2).



The torque depends on the seal used. Connecting the gauge using a clamp socket or a union nut is recommended, so that it is easier to orientate the gauge correctly. When a blow-out

device is fitted to a pressure gauge, it must be protected against being blocked by debris and dirt. With safety pressure gauges (see dial symbol Ⓢ) it must be ensured that the free space behind the blow-out back is at least 15 mm.



After mounting, set the compensating valve (if available) from CLOSE to OPEN.

With models 4 and 7, do not open the flange mounting screws.

Requirements for the installation point

If the line to the gauge is not sufficiently rigid for vibration-free mounting, a pipe-support bracket should be used to secure it (possibly via a flexible capillary). If vibration cannot be prevented through suitable installation, liquid-filled gauges should be used. The instruments should be protected against coarse dirt and wide fluctuations in ambient temperature.

3. Permissible ambient and operating
temperatures

When mounting the pressure gauge it must be ensured that, taking into consideration the influence of convection and heat radiation, no deviation above or below the permissible ambient and medium temperatures can occur. The influence of temperature on the display accuracy must be observed.

4. Storage

The pressure gauge should be kept in its original packing until installation. The gauge should be protected from external damage during storage. Storage temperature range: -40 ... +70 °C. Protect the gauges from humidity and dust.

5. Maintenance / Repairs

The instruments are maintenance-free. Checks should be carried out on a regular basis to ensure the measuring accuracy of the pressure gauge. The checks or recalibrations must be carried out by qualified skilled personnel with the appropriate equipment. When dismantling, close the compensating valve (if available).



WARNING!

Residual media in dismantled pressure gauges can result in a risk to personnel, the environment and equipment. Take sufficient precautionary measures.

Operating instructions GB

Pressure gauge models 1 and 213 per directive 94/9/EC (ATEX)



II 2 GD c TX



Part of your business

31014275.01 08/2011 GB/D

Contents

1. Safety
2. Description
3. Specifications and intended use
4. Commissioning
5. Maintenance and cleaning

Appendix 1: Declaration of conformity for models 111.xx, 113.53, 213.40 and 213.53

Declarations of conformity see www.wika.com
 Specifications: see data sheet on www.wika.com
 Subject to technical modifications.

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www.wika.de

1. Safety



WARNING!

Before installation, commissioning and operation, ensure that the appropriate pressure gauge has been selected in terms of measuring range, design and specific measuring conditions.

- Check the compatibility with the medium of the materials subjected to pressure!
- In order to guarantee the measuring accuracy and long-term stability specified, the corresponding load limits must be observed.
- Non-observance can result in serious injury and/or damage to the equipment.
- Only qualified persons authorised by the plant manager are permitted to install, maintain and service the pressure gauges.

2. Description

- Nominal sizes

Model 111.10:	NS 40, 50, 63, 80, 100, 160	Model 113.53:	NS 40, 80, 100
Model 111.11/16:	NS 40, 50, 63	Model 213.40:	NS 63, 80
Model 111.12:	NS 40, 50, 63, 80, 100	Model 213.53:	NS 50, 63
- The instruments measure the pressure by means of resilient Bourdon tube pressure elements
- The measuring characteristics are in accordance with the EN 837-1 standard

3. Specifications and intended use

Pressure limitation

Steady: 3/4 x full scale value
 Fluctuating: 2/3 x full scale value
 Short time: Full scale value

Mechanical connection

In accordance with the general technical regulations for pressure gauges (e.g. EN 837-2 "Selection and installation recommendations for pressure gauges").

When screwing gauges in, the force required for this must not be applied through the case, but rather through the spanner flats (using a suitable tool) provided for this purpose on the square shaft of standard connections.

Installation with open-ended spanner



Correct sealing of pressure gauge connections with parallel threads ① must be made using suitable flat gaskets, sealing rings or WIKA profile sealings. The sealing of tapered threads (e.g. NPT threads) is made by providing the thread ② with additional sealing material such as, for example, PTFE tape (EN 837-2).



The torque depends on the seal used. Connecting the gauge using a clamp socket or a union nut is recommended, so that it is easier to orientate the gauge correctly.

When a blow-out device is fitted to a pressure gauge, it must be protected against being blocked by debris and dirt.

After mounting, set the compensating valve (if available) from CLOSE to OPEN.



Temperature effect

When the temperature of the measuring system deviates from the reference temperature (+20 °C):

max. $\pm 0.4\%/10\text{ K}$ of full scale value

Ingress protection per EN 60529 / IEC 529

Model 111.xx: IP 42

Models 113.53, 213.40 and 213.53: IP 65

Permissible temperatures

Ambient:

Model 111.xx: -40 ... +60 °C

Models 113.53, 213.40 and 213.53: -20 ... +60 °C

Medium: max. +60 °C

Attention! With gaseous substances, the temperature may increase as a result of compression warming. In these cases it may be necessary to throttle the rate of change of pressure or reduce the permissible medium temperature.

The effective maximum surface temperature is not only dependant upon these instruments, but mainly on the respective medium temperature!

Materials

Wetted parts: Cu-alloy

Movement: Cu-alloy

Dial: NS 40, 50, 63: Plastic
NS 80, 100, 160: Aluminium

Pointer: Plastic (NS 160: Aluminium)

Case: Models 111.10, 111.12, 111.16: Plastic
Model 111.11: Steel
Models 113.53, 213.53: Stainless steel
Model 213.40: Forged brass

Window: Plastic (NS 160: Instrument glass)

Installation

- Nominal position per EN 837-1 / 9.6.7 Figure 9: 90° (⊥)
- Process connection lower mount (LM) or back mount (BM)
- In order to avoid any additional heating, the instruments must not be exposed to direct solar irradiation while in operation!
- Pressure gauges must be earthed via the process connection!

Permissible ambient and operating temperatures

When mounting the pressure gauge it must be ensured that, taking into consideration the influence of convection and heat radiation, no deviation above or below the permissible ambient and medium temperatures can occur. The influence of temperature on the indication accuracy must be observed.

Permissible vibration load at the installation site

- The instruments should always be installed in locations free from vibration.
- If necessary, it is possible to isolate the instrument from the mounting point by installing a flexible connection line between the measuring point and the pressure gauge and mounting the instrument on a suitable bracket.
- If this is not possible, the following limit values must not be exceeded:

Dry gauges: Frequency range < 150 Hz
(Model 111) Acceleration < 0.7 g (7 m/s²)

Liquid-filled gauges: Frequency range < 150 Hz
(Model 113, 213) Acceleration < 4 g (40 m/s²)

The liquid filling must be checked on a regular basis.

The liquid level must not drop below 75 % of the gauge diameter.

4. Commissioning

During the commissioning process pressure surges must be avoided at all costs. Open the shut-off valves slowly.

5. Maintenance and cleaning

- The instruments are maintenance-free.
- The indicator should be checked once or twice every year. For this the instrument must be disconnected from the process to check with a pressure testing device.
- Clean the pressure gauge with a moist cloth.
- Repairs must only be carried out by the manufacturer or appropriately qualified skilled personnel.
- When dismantling, close the compensating valve (if available).

**WARNING!**

Residual media in dismantled pressure gauges can result in a risk to persons, the environment and equipment.

Take sufficient precautionary measures.

Appendix 1: Declaration of conformity

WIK-Alexander Wiegand SE & Co. KG • PF 1180 • 63908 Klingenberg • Germany																			
Druck- und Temperaturmesstechnik Pressure and Temperature Measurement																			
Konformitätserklärung Richtlinie 94 / 9 / EG (ATEX)		Declaration of Conformity Directive 94 / 9 / EC (ATEX)																	
Wir erklären in alleiniger Verantwortung, dass nachstehend genannte Produkte, Druckmessgeräte mit Rohrfeder, gemäß gültigem Typenblatt mit der Richtlinie übereinstimmen und dem Konformitätsbewertungsverfahren		We declare under our sole responsibility that the products mentioned below, i.e. bourdon tube pressure gauges, according to the current data sheet correspond with the directive and were subjected to the conformity assessment procedure																	
'Interne Fertigungskontrolle' unterzogen wurden.		'Internal Control of Production'																	
<table border="0"> <tr> <th>WIK-A-Typ / WIK-A model</th> <th>Typenblatt / data sheet</th> </tr> <tr> <td>111.10</td> <td>PM 01.01</td> </tr> <tr> <td>111.11</td> <td>PM 01.03</td> </tr> <tr> <td>111.12</td> <td>PM 01.09</td> </tr> <tr> <td>111.16</td> <td>PM 01.10</td> </tr> <tr> <td>113.53</td> <td>PM 01.08</td> </tr> <tr> <td>213.53</td> <td>PM 02.12</td> </tr> <tr> <td>213.40</td> <td>PM 02.06</td> </tr> </table>		WIK-A-Typ / WIK-A model	Typenblatt / data sheet	111.10	PM 01.01	111.11	PM 01.03	111.12	PM 01.09	111.16	PM 01.10	113.53	PM 01.08	213.53	PM 02.12	213.40	PM 02.06		
WIK-A-Typ / WIK-A model	Typenblatt / data sheet																		
111.10	PM 01.01																		
111.11	PM 01.03																		
111.12	PM 01.09																		
111.16	PM 01.10																		
113.53	PM 01.08																		
213.53	PM 02.12																		
213.40	PM 02.06																		
Die Unterlagen werden aufbewahrt unter der Aktennummer 8000382966 bei der benannten Stelle Nr. 0044 TÜV NORD CERT GmbH Am TÜV 1 D-30519 Hannover		The dossier is retained under file nr. 8000382966 at the notified body No. 0044 TÜV NORD CERT GmbH Am TÜV 1 D-30519 Hannover																	
Die Geräte werden gekennzeichnet mit   II 2 GD c TX		The gauges are marked with   II 2 GD c TX																	
Angewandte Normen: EN 13463-1 Nicht-elektrische Geräte für den Einsatz in explosionsgefährdeten Bereichen - Grundlagen und Anforderungen EN 13463-5 - Schutz durch Konstruktive Sicherheit 'c'		Applied standards: EN 13463-1 'Non electrical equipment for potentially explosive atmospheres - Basic method and requirements' EN 13463-5 - Protection by constructional safety 'c'																	
WIK-A Alexander Wiegand SE & Co. KG Geschäftsbereich Mechanische Anzeigen / Division Analog Instruments Klingenberg, 18.02.2010  Franz-Josef Vogel Leiter Technik / Technical Manager																			
 Daniel Kotlewski Leiter Qualitätssicherung / Quality Assurance Manager																			

2.1.2. 22F0008989 - ITEM

2.1.2.1. 0SW95F3NW07 - ITEM

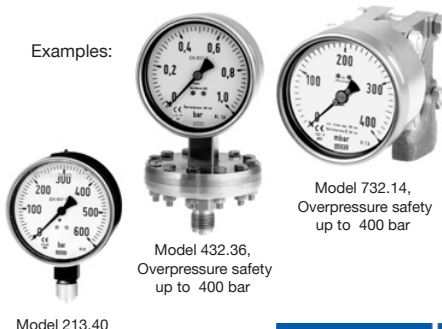
2.1.2.1.1. IGSW95F3NW06 - ITEM

2.1.2.1.1.1. 6910100 - PRESSURE INDICATOR WITH FLANGE 0-100 BAR

Operating
Instructions GB

Pressure Gauges

Examples:



Part of your business

Notes in accordance with Pressure Equipment
Directive 97/23/EC

- The pressure gauges are "pressure accessories" in accordance with Article 1, Paragraph 2.1.4
- The volume of the pressure bearing housings of WIKA pressure gauges is < 0.1 L
- The pressure gauges carry CE marking for Fluid Group 1G in accordance with Annex 2, Table 1 when their permissible working pressure exceeds 200 bar

Pressure gauges that do not carry the CE mark are manufactured in accordance with Article 3, Paragraph 3 "Sound engineering practice".

Applied standards

- EN 837-1 Bourdon tube pressure gauges, dimensions, metrology, requirements and testing
- EN 837-2 Selection and installation recommendations for pressure gauges
- EN 837-3 Diaphragm and capsule pressure gauges, dimensions, metrology, requirements and testing

Specifications: see data sheet on www.wika.de
Subject to technical modifications.

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2408976.03 02/2010

1. Safety



WARNING!

Before installation, commissioning and operation, ensure that the appropriate pressure gauge has been selected in terms of measuring range, design and suitable wetted material (corrosion) for the specific measuring conditions. In order to guarantee the measuring accuracy and long-term stability specified, the corresponding load limits must be observed.

Only qualified persons authorised by the plant manager are permitted to install, maintain and service the pressure gauges.

For hazardous media such as oxygen, acetylene, flammable or toxic gases or liquids, and refrigeration plants, compressors, etc., in addition to all standard regulations, the appropriate existing codes or regulations must also be followed.

After an external fire, pressure media can leak out, particularly at soft solder joints. All gauges must be checked and, if necessary, replaced before recommissioning the plant.

Non-observance of the respective regulations can result in serious injury and/or damage to equipment.

2. Mechanical connection

In accordance with the general technical regulations for pressure gauges (e.g. EN 837-2). When screwing the gauges in the force required for this must not be applied through the case or terminal box, rather only through the spanner flats provided for this purpose (using a suitable tool).



Mounting with
spanner

Correct sealing of pressure gauge connections with parallel threads ① must be made using suitable sealing rings, sealing washers or WIKA profile seals. The sealing of tapered threads (e.g. NPT threads) is made by providing the thread ② with additional sealing material such as, for example, PTFE tape (EN 837-2).



The torque depends on the seal used. Connecting the gauge using a clamp socket or a union nut is recommended, so that it is easier to orientate the gauge correctly. When a blow-out

device is fitted to a pressure gauge, it must be protected against being blocked by debris and dirt. With safety pressure gauges (see dial symbol Ⓢ) it must be ensured that the free space behind the blow-out back is at least 15 mm.



After mounting, set the compensating valve (if available) from CLOSE to OPEN.

With models 4 and 7, do not open the flange mounting screws.

Requirements for the installation point

If the line to the gauge is not sufficiently rigid for vibration-free mounting, a pipe-support bracket should be used to secure it (possibly via a flexible capillary). If vibration cannot be prevented through suitable installation, liquid-filled gauges should be used. The instruments should be protected against coarse dirt and wide fluctuations in ambient temperature.

3. Permissible ambient and operating
temperatures

When mounting the pressure gauge it must be ensured that, taking into consideration the influence of convection and heat radiation, no deviation above or below the permissible ambient and medium temperatures can occur. The influence of temperature on the display accuracy must be observed.

4. Storage

The pressure gauge should be kept in its original packing until installation. The gauge should be protected from external damage during storage. Storage temperature range: -40 ... +70 °C. Protect the gauges from humidity and dust.

5. Maintenance / Repairs

The instruments are maintenance-free. Checks should be carried out on a regular basis to ensure the measuring accuracy of the pressure gauge. The checks or recalibrations must be carried out by qualified skilled personnel with the appropriate equipment. When dismantling, close the compensating valve (if available).



WARNING!

Residual media in dismantled pressure gauges can result in a risk to personnel, the environment and equipment. Take sufficient precautionary measures.

2.1.2.1.1.2. 6910250 - PRESSURE INDICATOR WITH FLANGE 0-250 BAR

ref. [2.1.2.1.1.1: MUMC691040001R0.pdf](#)

2.1.2.1.1.3. 6910400 - PRESSURE INDICATOR WITH FLANGE 0-400 BAR

ref. [2.1.2.1.1.1: MUMC691040001R0.pdf](#)

2.1.2.1.1.4. 22F0001658.R4 - VERTICAL OIL SEPARATOR 8.2 L. PED

safe S.p.A.	LIQUID SEPARATOR
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USE AND MAINTENANCE MANUAL**LIQUID SEPARATOR**

0	FIRST ISSUE	J.Cammarata	J.Cammarata	D.Paganelli	04/04/2012
REV	DESCRIPTION	PREPARED	CHECKED	APPROVED	DATE
CUSTOMER		---			
PLANT LOCATION		---			
PLANT		---			
ITEM		LIQUID SEPARATOR			

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	DOCUMENT No	MUM0000182R0
	PAGE No	1 OF 15

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1 FOREWORD

In case of elaborate plants, BEFORE TO START THE SYSTEM, please read carefully ALL others use and maintenance manuals (or technical documentation) of auxiliary equipments, also (e.g.: motor, cooling system, etc.).

INTENDED, UNINTENDED AND ERRONEOUS USE

This equipment is engineered to natural gas within the minimum and maximum inlet pressure, maximum delivery pressure and temperatures given on the identification plate attached to the separator-damper.

This machine must not be used for other types of gases or operating conditions different from those indicated on the plate.

In Italy Ministerial Decree of 17th April 2008: "Fire-prevention Safety Standards for the transportation, distribution, storage and use of natural gas of a density no greater than 0.8" and subsequent modifications and Ministerial Decree of 24th May 2002 and ratification of technical enclosure of 28th June 2002 "Fire-prevention Safety Standards for natural gas distribution systems for motor vehicles" must be complied.

Do not use the separator-damper over nominal parameters: flow, velocity, pressure, temperature. Do not operate the compressor in a manner that does not comply with the instructions given in the Operating Instructions manual.

Operating the compressor outside the conditions established in the sales contract will subject it to stress and deformation which it has not been designed for. Operating the separator-damper under these conditions is unintended and therefore must not be done for safety reasons.

Piping and tubing above 70°C, that could touch by persons, should be properly insulated and covered.

The buildings and rooms where the compressors are installed must be designed to prevent gas accidentally released due to leaks or defective gaskets from recirculating or stagnating.

Separator-damper should be installed in gas circuit provided with relief valves to reduce the pressure at a maximum safety value.

Relief valves setting should be checked at least once a year using certify test equipment (see relative relief valve manual).

Do not remove or tamper any safety component.

During plant operation, if a relief valve could work, stop the unit and find the cause.

Discharge lines have to collected in appropriate piping to atmosphere, in safety area.

Proceed with an accurate cleaning of floor and all external machine surfaces to remove oil could cause maintenance operator slipping.

Do not use volatile liquids and flammable chemicals to clean a component separator-damper. Use only secure solvents and dry completely before reassembling.

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Do not use trichlorethylene as a solvent. Ensure adequate ventilation when using halogenated solvents.

Whenever the separator-damper of the system is stopped for maintenance operations must be taken appropriate action in order to prevent it from being inadvertently restarted. In addition, on the control panel of the system must be applied a sign bearing the words "WORK IN PROGRESS-DO NOT OPERATE" or similar phrases.

At each plant stoppage for a internal overheated surface it's prudential to wait 60 minutes before to start dismounting operations.

An early opening of overheated surfaces could prime dangerous explosions.

Do not dismounting the separator-damper or any pressure parts without to depressurize completely the unit and to use appropriate worldly wisdom to avoid accidental re-pressurizations in.

The maintenance operations and procedures, such as the basic safety rules, have to re-examine at regular time schedule with technician and maintenance operators.

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1.1 FOREWORD

This instruction manual has been prepared to help the installation responsible persons of conduct and maintenance of the separator-damper.

It contains information and recommended methods for the use and maintenance. It also contains material list of separator-damper.

1.2 GENERAL ADVICES

Separator-damper is secure and it do not get risks for the operator safety, if correctly used it. Each reasonable precaution is take in care during engineering and manufacturing.

The following precautions should be taken during use:

- Maintenance procedures must be followed carefully to avoid injury to personnel or material.
- During warranty only Safe S.p.A. (and our authorized personnel) may intervene on separator-damper. It therefore forbidden to third parties to perform any type of intervention prior void the warranty.
- In warranty expired customers will make the interventions of maintenance, in strict accordance with their descriptions and in case of doubts or inconsistencies should immediately contact our customer service department. Safe S.p.A. disclaims any liability for damages to persons due to incorrect operation or operations performed by third parties.
- To be able to perform proper maintenance, no special tools are required.
- Before carrying out any maintenance is necessary to check the temperatures of the various components also refer to the chapter "SEPARATOR MAINTENANCE SCHEDULE".
- The installation room must have adequate illumination so as to be able to distinguish the various components installed therein and the related identification tags.
- Must not be approached flammable material to the separator-damper.
- Keep clean the close unit area.
- **In order to all operations that require disassembly of any part in contact with the gas it is necessary:**
 - Refer to the manual of use and maintenance of system and follow the discharge plant instructions
 - open the drain valves of purging, to discharge completely gas.
- Gas compressed in place is dangerous.
- Implement all safety precautions necessary.

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2 SEPARATOR-DAMPER GENERAL CHARACTERISTICS

This cylinder is a damping-separator filter it serves to dampen pulsations caused by gas compression and filter all the impurities present in it.

Rated load loss with new filter:	0.05 bar
Percentage of particles captured:	99.99% for 0,01 micron particles
Maximum operating pressure:	275 bar
Maximum operating temperature:	60°C
Minimum operating temperature:	-20°C

 Via Biancolina, 4 40017 San Giovanni in Persiceto (BO)-ITALY Tel. +39-0516875211 Fax +39-051822521 web site: www.safe-ita.com	
 1370	
SEPARATORE PER GAS NATURALE CNG SEPARATOR	
SEPARATORE MODELLO: SEPARATOR MODEL:	
N° DI MATRICOLA: SERIAL NUMBER:	
ANNO DI FABBRICAZIONE: YEAR OF CONSTRUCTION:	
PORTATA: CAPACITY:	
PRESS. MIN. AMMISSIBILE: ALL. MIN. PRESSURE:	
PRESS. MAX. AMMISSIBILE: ALL. MAX. PRESSURE:	
PRESSIONE E DATA DI PROVA: TEST PRESSURE & DATE:	
TEMP. D'USO MIN. / MAX.: MIN. / MAX. USE TEMPERATURE:	
VOLUME INTERNO: INTERNAL VOLUME:	
MASSA COMPLESSIVA: TOTAL WEIGHT:	

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2.1 INSTALLATION:

At the time of installation

In order to assure top performance of the separator-damper, the safety devices listed below must be installed in the filter inlet gas circuit:

1. Safety valve set to a pressure that is not higher than the maximum pressure indicated on the separator's nameplate;
2. Pressure transducer that stops the circuit it is installed in when the set maximum pressure is exceeded.
3. Pressure gauge to verify visual actual pressure in separator-damper.

The separator must be equipped with manual needle and ball valves on the drain line whose rated pressure is greater than or equal to the separator's pressure.

In addition, verify that the inlet gas temperature does not go over 60°C.

Where PLC controls compressors, if the temperature is higher than 70°C an alarm is provided to signal the gas temperature is high.

CONDENSATION DISCHARGE CIRCUIT

All gas impurities have to channel to in appropriate drain tank provided in the plant the separator-damper installed in.

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2.2 CONNECTIONS

To execute the connections, proceed as indicated in attachment drawing.

Tight carefully the connections correctly to obtain a perfect sealing.

CONNECTION	F-1658	F-1709	F-455	F-936	F-1163	F-1842
Gas suction	1" BSP	1"1/2 BSP	1" BSP	1" BSP	1" NPT	1" BSP
Gas discharge	1" BSP	1"1/2 BSP	1" BSP	1" BSP	1" NPT	1" BSP
Liquid drain discharge	1/4" BSP	1/4" BSP	1" BSP	1/4" BSP	1/4" NPT	1/4" BSP
CONNECTION	F-6459	F-6442	F-6417	F-6415	F-6414	F-6211
Gas suction	1" BSP	1" BSP	1" BSP	1" BSP	1" 1/2 NPT	1" BSP
Gas discharge	1" BSP	1" BSP	1" BSP	1" BSP	1" 1/2 NPT	1" BSP
Liquid drain discharge	3/8" BSP	3/8" BSP	3/8" BSP	3/8" BSP	3/8" BSP	3/8" BSP

3 SEPARATOR MAINTENANCE SCHEDULE

All gas impurities have to channel to in appropriate drain tank provided in the plant the separator-damper installed in.

Overview

In order to keep the separator-damper as efficient as possible, personnel in charge of maintenance and operation must take good care of them and carefully follow the maintenance schedule provided. Each machine is furnished with apposite sheets where to note the interventions; the cause has determinate them, type of intervention executed and number of working hours that happened them. This procedure allows to understand fully the behaviour of each machine equipment and it helps the creation of a maintenance schedule provided.

The time intervals recommended in the Preventative Maintenance Schedule are approximate and may be changed based on the results obtained after inspecting parts and experience in machine operation.

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General remarks

- As regards operations which require that components are disassembled, check the pressure gauges and remove the parts only if the pressure inside equals the atmospheric.
- To remove and assemble the various parts, refer to the enclosed drawings.
- Be careful not to damage and scratch the machined parts, in particular Gaskets and threads

Perform the operations listed below before starting up the unit:

- Thoroughly clean all the parts, removing the protective coat of oil with a solvent.
- Make sure the ducts are not obstructed in any way.

ATTENTION! After removing the components, check wear and tear if they are going to be reinstalled.

3.1 CHECKS AND PREVENTATIVE MAINTENANCE

1) DAILY CHECKS

- Discharge any fluids that have deposited in the “separator-damper”. Repeat the operation 2 or 3 times a day if gas is very wet.

2) WEEKLY CHECKS

- Discharge the “separators/dampers” in compressor discharge line, check the oil consumption not exceeds 6 L each 100 working hours.

3) MONTHLY CHECKS

- Verify the fittings in the entire circuit do not leak.

4) YEARLY CHECKS

- Check the safety valve provided in the intake circuit (or as directed in the manual provided by the safety valve manufacturer).
- Check operation of the temperature transducer present in the intake circuit.
- Check operation of the pressure transducer.
- Check the setting and efficiency of the pressure gauge.

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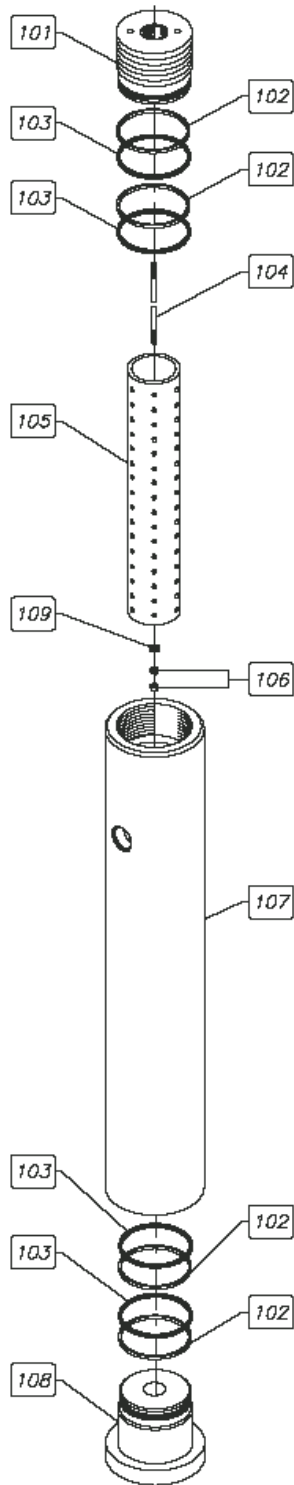
3.2 SEPARATOR SCHEDULED MAINTENANCE CHART

Ref. Separator exploded drawing

DRAWING ITEM	HOURS	CODE	DESCRIPTION	MAINTENANCE SERVICE	REPLACE PARTS
	Monthly		Connections	Check for leaks and replace seals, if necessary	Seals
105	Yearly	22V0000044	Filter cartridge	Check filter cartridge wear and tear and replace, if necessary	Filter cartridge
103		89310246	O-ring	Replace seal elements	O-ring
102		89320246	anti-extrusion ring	Replace seal elements	anti-extrusion ring

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safe s.r.l.	Tav	SEPARATORE LIQUIDI
	A	LIQUID SEPARATOR

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3.3 DRAINING SEPARATOR DRAIN OF COMPRESSOR MODEL ST AND SW

See referring scheme of compressor gas circuit

Before to start maintenance operation is strictly important to depressurize the compressor.

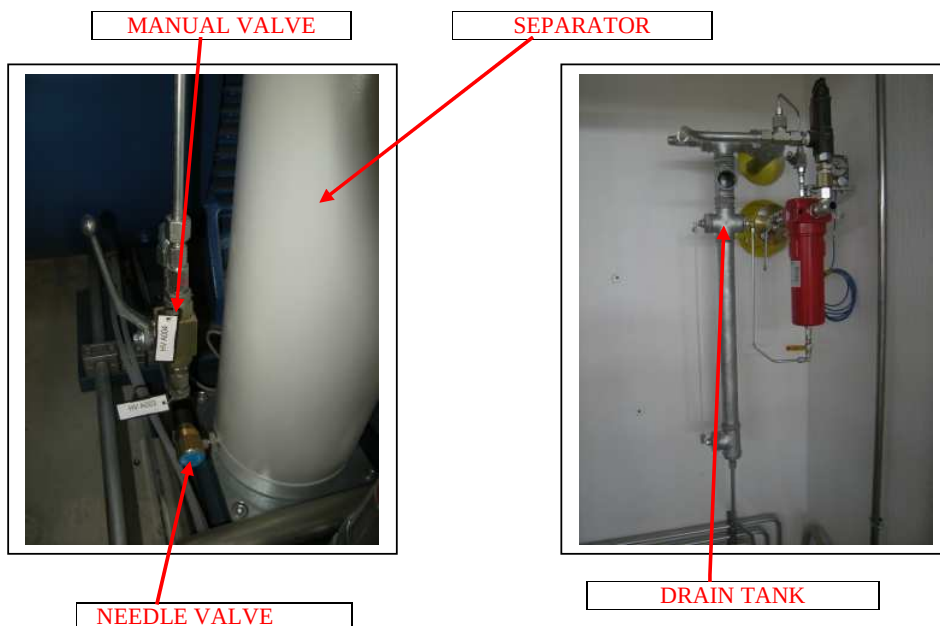
Push the “stop” button to stop the compressor installed on apposite rack on the skid side.

Wait until pressure gauges on the skid side indicate 0 bar in all pressure stages.

Occurred depressurization of the machine can perform scheduled maintenance on pumping. perform the follow instructions:

Follow the safety rules and precautions given in this manual.

1. Ensure that manual needle valves and ball valves, will always remain closed even during operation of the compressor.
2. If the drains are not automatically conveyed into a appropriate tank, put a collection tank under the ball valve.
3. Open the manual valve.
4. Open slowly the needle valve.
5. When oil has been drained, close both valves.
6. Dispose of the oil in accordance with local environmental protection regulations.



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3.4 DRAINING SEPARATOR DRAIN OF COMPRESSOR MODEL S7/S9

3.4.1 DRAINED OIL RECOVERY

Automatic drained oil recovery system reclaims from separator through actuated valve into collection vessel with temporized logic control and then to compressor crankcase.

It has been provided in the compressor control panel the option to disable this automatism, in this case, the recovery can be done manually by opening the ball valve below the separator which conveys outside the compressor room where will have to be collected in a tank.

Attention!

The first start should leave excluded the automatic system to verify, manually recovering the oil, the quality thereof and in particular that there is no presence of water that would damage the compressor if sent back to crankcase.

Verify the hourly quantity separated to calibrate the intervention time of the discharge valve automatically, whereas the separator may contain 2,5 liters (so for example, if it separates 0,5 liters / hour the operation should be set to 5 hours. max.)

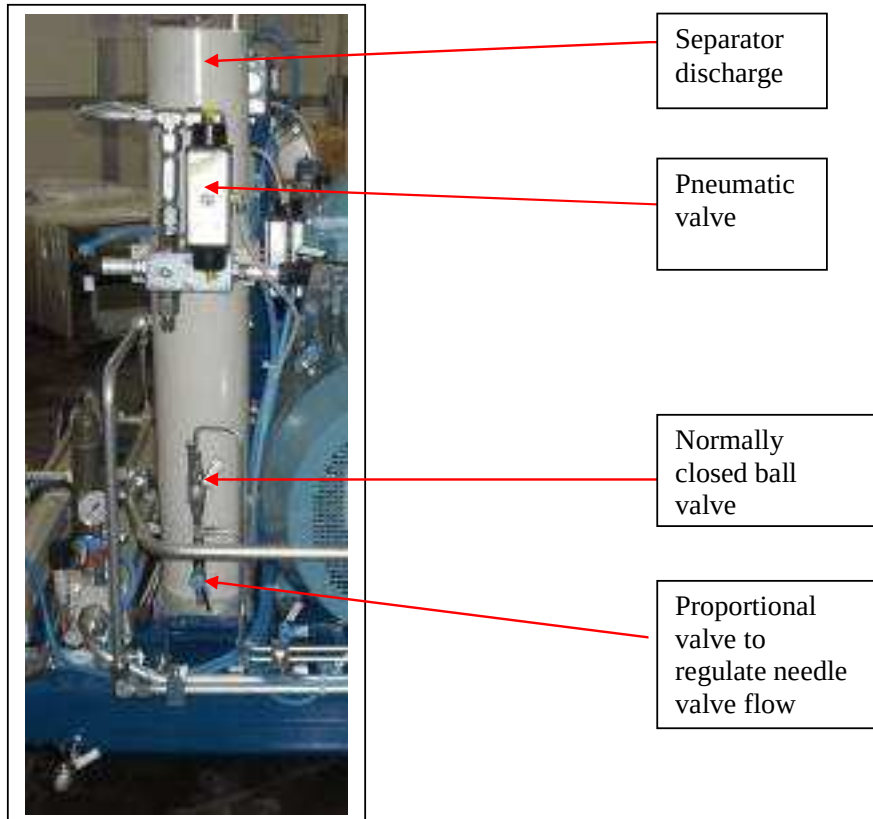
Only after checking that the quality of the oil is such as to be refill into crankcase, activate automatic recovery, if this do not occur during the first start up due to the presence of the test fluid in plant piping, it is necessary to keep the system manually.

When the recovered oil appears with acceptable quality, activate the automatic system.

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3.5 TROUBLESHOOTING GUIDE

Good machine function and periodic maintenance schedule observation prevent many inconvenient.

For any problems or information about compressor operation **SAFE** has a Technical Support service available for its customers.

INDEX	DESCRIPTION	CORRECTIVE ACTION
1	Final compressor pressure higher than operating value	Check efficiency of equipment placed after compressor
2	Instruments defective	Correct operation and replace any defective instruments
3	Eccessivo trascinamento di Condensati nel gas	Check operation of separators. Increase rate at which separated liquids are drained. Add drain cocks in points of gas lines where liquid may accumulate. Restore gas temperatures and operating pressures to values established for compressor.
4	Piping not properly secured	Check stability of retainers used, make them stronger or add additional ones.
5	Gas leaks from gaskets	- Replace damaged gaskets. - Restore condition of surfaces that mat with gaskets.
6	Corrosions	-Eliminate corrosive agent. -Keep pressure and temperature at specified values. -Prevent corrosive agent from coming into contact with parts. -Apply anticorrosion treatment on parts that get damaged. -Improve separation of condensates. -Verify if random electric currents are present and eliminate.
7	Excessive pressure pulses	- Restore compressor operating conditions established during design stage. - Change size or path of system lines or insert dampers.

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2.1.2.1.1.5. 6910025 - PRESSURE INDICATOR WITH FLANGE 0-25 BAR

ref. [2.1.2.1.1.1: MUMC691040001R0.pdf](#)

2.1.2.1.1.6. 830747100 - PRESSURE TRANSDUCER WIKA 100 BAR

ref. [2.1.1.1: MUMC830747100C02R0.pdf](#)

2.1.2.1.1.7. 830747250 - PRESSURE TRANSDUCER WIKA 250 BAR

ref. [2.1.1.1: MUMC830747100C02R0.pdf](#)

2.1.2.1.1.8. 830747400 - PRESSURE TRANSDUCER WIKA 400 BAR

ref. [2.1.1.1: MUMC830747100C02R0.pdf](#)

2.1.2.1.1.9. 101141D - KIT TERMOS INTERST: -30 +200 A CONTA CSA



Displays Programmable displays with a wide selection of inputs and outputs for display of temperature, volume and weight, etc. Feature linearisation, scaling, and difference measurement functions for programming via PReset software.



Ex interfaces Interfaces for analogue and digital signals as well as HART® signals between sensors / I/P converters / frequency signals and control systems in Ex zone 0, 1 & 2 and for some modules in zone 20, 21 & 22.



Isolation Galvanic isolators for analogue and digital signals as well as HART® signals. A wide product range with both loop-powered and universal isolators featuring linearisation, inversion, and scaling of output signals.



Temperature A wide selection of transmitters for DIN form B mounting and DIN rail modules with analogue and digital bus communication ranging from application-specific to universal transmitters.



Universal PC or front programmable modules with universal options for input, output and supply. This range offers a number of advanced features such as process calibration, linearisation and auto-diagnostics.



DK Side 1

UK Page 13

FR Page 25

DE Seite 37

5 3 3 3

2-Wire Programmable Transmitter

No. 5333V110-IN (1008)
From ser. no. 080629052



SIGNALS THE BEST

2-TRÅDS PROGRAMMERBAR TRANSMITTER

PRetop 5333

Indholdsfortegnelse

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CSA Installation Drawing No. 533XQC03	63

EF-OVERENSSTEMMELSESERKLÆRING

Som producent erklærer

PR electronics A/S
Lerbakken 10
DK-8410 Rønde

hermed at følgende produkt:

Type: 5333

Navn: 2-Tråds programmerbar transmitter

er i overensstemmelse med følgende direktiver og standarder:

EMC-direktivet 2004/108/EF og senere tilføjelser

EN 61326-1 : 2006

For specifikation af det acceptable EMC-niveau henvises til modulets elektriske specifikationer.

ATEX-direktivet 94/9/EF og senere tilføjelser

EN 60079-0 : 2006, EN 60079-11 : 2007,

EN 60079-15 : 2005 og EN 60079-26 : 2007

EN 61241-0 : 2006 og EN 61241-11 : 2006

ATEX-certifikat: KEMA 10ATEX0003 X (5333A)

ATEX-certifikat: KEMA 03ATEX1535 (5333D)

Bemyndiget organ

KEMA Quality B.V. (0344)
Utrechtseweg 310, 6812 AR Arnhem
P.O. Box 5185, 6802 ED Arnhem
The Netherlands

Rønde, 10. februar 2010



Kim Rasmussen
Producentens underskrift

2-TRÅDS PROGRAMMERBAR TRANSMITTER PRetop 5333

- *Indgang for RTD eller Ohm*
- *Høj målenøjagtighed*
- *3-leder tilslutning*
- *Programmerbar følerfejlsværdi*
- *Kan monteres i DIN form B følerhoved*

Anvendelse

- Temperaturlineariseret måling med Pt100...Pt1000 eller Ni100...Ni1000 føler.
- Omsætning af lineær modstandsændring til standard analogt strømsignal, f.eks. fra ventiler eller ohmske niveaustave.

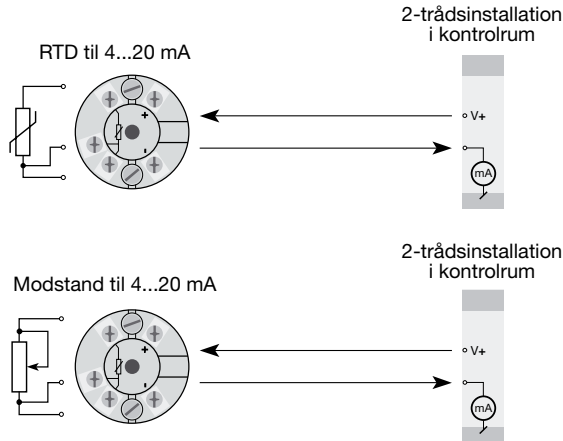
Teknisk karakteristik

- PR5333 kan af brugeren i løbet af få sekunder programmeres til at måle inden for alle normerede RTD-temperaturområder.
- RTD- og modstandsindgangen har kabelkompensering for 3-leder tilslutning.

Montage / installation

- Kan monteres i DIN form B følerhoved. I ikke-eksplosionsfarlige områder kan 5333 monteres på en DIN-skinne med et specielt beslag.
- **NB:** Som Ex-barriere for 5333D anbefaler vi 5104B, 5114B eller 5116B.

APPLIKATIONER



Bestillingsskema: 5333

Type	Version
5333	Standard : A CSA, FM & ATEX : D

Elektriske specifikationer

Specifikationsområde:

-40°C til +85°C

Fælles specifikationer:

Forsyningsspænding DC

Standard.....	8...35 V
CSA, FM & ATEX.....	8...30 V
Egetforbrug.....	25 mW...0,8 W
Spændingsdrop.....	8 VDC
Opvarmningstid.....	5 min.
Kommunikationsinterface.....	Loop Link
Signal- / støjforhold.....	Min. 60 dB
Reaktionstid (programmerbar).....	0,33...60 s
Signaldynamik, indgang.....	19 bit
Signaldynamik, udgang.....	16 bit
Kalibreringstemperatur.....	20...28°C

Nøjagtighed, størst af generelle og basisværdier:

Generelle værdier		
Indgangstype	Absolut nøjagtighed	Temperaturkoefficient
Alle	$\leq \pm 0,1\%$ af span	$\leq \pm 0,01\%$ af span / °C

Basisværdier		
Indgangstype	Basis-nøjagtighed	Temperaturkoefficient
RTD	$\leq \pm 0,3^\circ\text{C}$	$\leq \pm 0,01^\circ\text{C}/^\circ\text{C}$
Lin. R	$\leq \pm 0,2 \Omega$	$\leq \pm 20 \text{ m}\Omega / ^\circ\text{C}$

EMC-immunitetspåvirkning.....	$< \pm 0,5\%$ af span
-------------------------------	-----------------------

Virkning af forsyningsspændingsændring	≤ 0,005% af span / VDC
Vibration	IEC 60068-2-6 Test FC
Lloyd's specifikation nr. 1	4 g / 2...100 Hz
Max. ledningskvadrat	1 x 1,5 mm ² flerkoret ledning
Luftfugtighed	< 95% RH (ikke kond.)
Mål	Ø 44 x 20,2 mm
Kapslingsklasse (hus / klemme)	IP68 / IP00
Vægt	50 g

Elektriske specifikationer indgang:**RTD- og lineær modstandsindgang:**

RTD-type	Min. værdi	Max. værdi	Min. span	Standard
Pt100	-200°C	+850°C	25°C	IEC 60751
Ni100	-60°C	+250°C	25°C	DIN 43760
Lin. R	0 Ω	10000 Ω	30 Ω	----

Max. nulpunktsforskydning (offset)	50% af valgt max. værdi
Kabelmodstand pr. leder (max.)	10 Ω
Følerstrøm	> 0,2 mA, < 0,4 mA
Virkning af følerkabelmodstand (3-leder)	< 0,002 Ω / Ω
Følerfejlsdetektering	Ja

Udgang:**Strømodgang:**

Signalområde	4...20 mA
Min. signalområde	16 mA
Opdateringstid	135 ms
Belastningsmodstand	≤ ($V_{\text{forsyn}} - 8$) / 0,023 [Ω]
Belastningsstabilitet	< ±0,01% af span / 100 Ω

Følerfejlsdetektering:

Programmerbar	3,5...23 mA
NAMUR NE43 Upscale	23 mA
NAMUR NE43 Downscale	3,5 mA

Af span = Af det aktuelt valgte område

Ex-godkendelse - 5333A:

KEMA 10ATEX0003 X	II 3 GD Ex nA [nL] IIC T4...T6 eller II 3 GD Ex nL IIC T4...T6 eller II 3 GD Ex nA [ic] IIC T4...T6 eller II 3 GD Ex ic IIC T4...T6
ATEX Installation Drawing No.	5333QA02

Ex- / I.S.-godkendelse - 5333D:

KEMA 03ATEX1535	II 1 G Ex ia IIC T4 eller T6 II 1 D Ex iaD
Max. omgivelsestemp. for T4	85°C
Max. omgivelsestemp. for T6	60°C
ATEX, må anvendes i zone	0, 1, 2, 20, 21 eller 22
ATEX Installation Drawing No.	5333QA01
FM, må anvendes i	IS, Class I, Div. 1, Group A, B, C, D IS, Class I, Zone 0, AEx ia IIC
FM Installation Drawing No.	5300Q502
CSA, må anvendes i	IS, Class I, Div. 1, Group A, B, C, D, Ex ia IIC
CSA Installation Drawing No.	IS, Class I, Zone 0, AEx ia IIC 5333XQC03

Marine-godkendelse:

Det Norske Veritas, Ships & Offshore	Standard for Certification No. 2.4
--	------------------------------------

GOST R godkendelse:

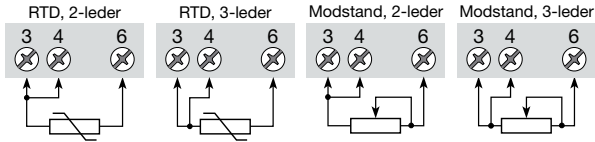
VNIIM & VNIIFTRI, Cert. no.	Se www.preelectronics.dk
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Overholdte myndighedskrav:

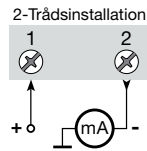
EMC 2004/108/EF	Standard:
ATEX 94/9/EF	EN 61326-1
FM	EN 60079-0, EN 60079-11, EN 60079-15, EN 60079-26, EN 61241-0, EN 61241-11
CSA, CAN / CSA	3600, 3611, 3610 C22.2 No. 157, E60079-11, UL 913

TILSLUTNINGER

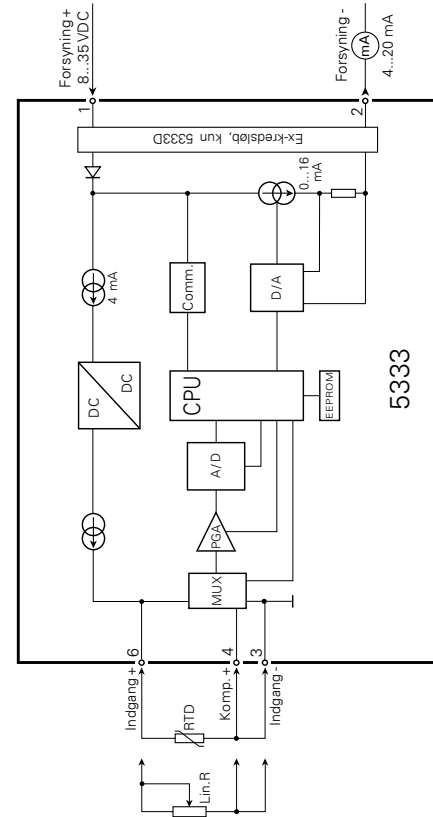
Indgang:



Udgang:



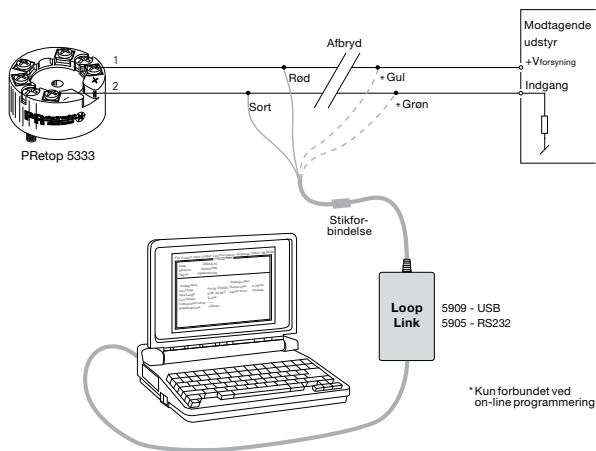
BLOKDIAGRAM



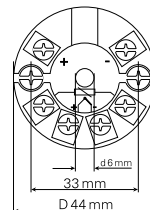
PROGRAMMERING

- Loop Link er et batteridrevet kommunikationsinterface, der er nødvendigt for programmering af PRetop 5333.
- Ved programmering henvises til tegningen nedenfor og hjælpefunktionen i PReset programmet.
- Loop Link må ikke benyttes til kommunikation med moduler installeret i Ex-område.

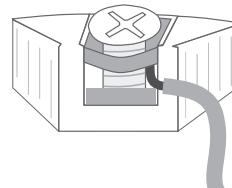
Bestilling: Loop Link



Mekaniske specifikationer



Montering af følerledninger



Ledninger monteres mellem metalpladerne

2-WIRE PROGRAMMABLE TRANSMITTER

PRetop 5333

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CSA Installation Drawing No. 533XQC03	63

EC DECLARATION OF CONFORMITY

As manufacturer

PR electronics A/S
Lerbakken 10
DK-8410 Rønde

hererby declares that the following product:

Type: 5333

Name: 2-Wire programmable transmitter

is in conformity with the following directives and standards:

The EMC Directive 2004/108/EC and later amendments

EN 61326-1 : 2006

For specification of the acceptable EMC performance level, refer to the electrical specifications for the module.

The ATEX Directive 94/9/EC and later amendments

EN 60079-0 : 2006, EN 60079-11 : 2007,

EN 60079-15 : 2005 and EN 60079-26 : 2007

EN 61241-0 : 2006 and EN 61241-11 : 2006

ATEX certificate: KEMA 10ATEX0003 X (5333A)

ATEX certificate: KEMA 03ATEX1535 (5333D)

Notified body

KEMA Quality B.V. (0344)
Utrechtseweg 310, 6812 AR Arnhem
P.O. Box 5185, 6802 ED Arnhem
The Netherlands

Rønde, 10 February 2010



Kim Rasmussen
Manufacturer's signature

2-WIRE PROGRAMMABLE TRANSMITTER PRetop 5333

- *RTD or Ohm input*
- *High measurement accuracy*
- *3-wire connection*
- *Programmable sensor error value*
- *For DIN form B sensor head mounting*

Application

- Linearised temperature measurement with Pt100...Pt1000 or Ni100...Ni1000 sensor.
- Conversion of linear resistance variation to a standard analogue current signal, for instance from valves or Ohmic level sensors.

Technical characteristics

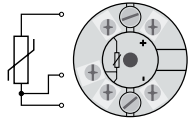
- Within a few seconds the user can program PR5333 to measure temperatures within all RTD ranges defined by the norms.
- The RTD and resistance inputs have cable compensation for 3-wire connection.

Mounting / installation

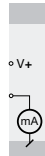
- For DIN form B sensor head mounting. In non-hazardous areas the 5333 can be mounted on a DIN rail with a special fitting.
- **NB:** As Ex barrier for 5333D we recommend 5104B, 5114B, or 5116B.

APPLICATIONS

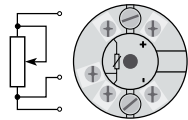
RTD to 4...20 mA



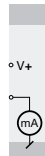
2-wire installation
in control room



Resistance to 4...20 mA



2-wire installation
in control room



Order: 5333

Type	Version
53333	Standard : A CSA, FM & ATEX : D

Electrical specifications

Specifications range:

-40°C to +85°C

Common specifications:

Supply voltage, DC

Standard.....	8...35 V
CSA, FM & ATEX.....	8...30 V
Internal consumption	25 mW...0.8 W
Voltage drop	8 VDC
Warm-up time.....	5 min.
Communications interface	Loop Link
Signal / noise ratio	Min. 60 dB
Response time (programmable).....	0.33...60 s
Signal dynamics, input.....	19 bit
Signal dynamics, output.....	16 bit
Calibration temperature.....	20...28°C

Accuracy, the greater of general and basic values:

General values		
Input type	Absolute accuracy	Temperature coefficient
All	$\leq \pm 0.1\%$ of span	$\leq \pm 0.01\%$ of span / °C

Basic values		
Input type	Basic accuracy	Temperature coefficient
RTD	$\leq \pm 0.3^\circ\text{C}$	$\leq \pm 0.01^\circ\text{C}/^\circ\text{C}$
Lin. R	$\leq \pm 0.2 \Omega$	$\leq \pm 20 \text{ m}\Omega / ^\circ\text{C}$

EMC immunity influence	$< \pm 0.5\%$ of span
------------------------------	-----------------------

Effect of supply voltage variation.....	≤ 0,005% of span / VDC
Vibration	IEC 60068-2-6 Test FC
Lloyd's specification no. 1.....	4 g / 2...100 Hz
Max. wire size.....	1 x 1.5 mm ² stranded wire
Humidity	< 95% RH (non-cond.)
Dimensions.....	Ø 44 x 20.2 mm
Protection degree (enclosure / terminal).....	IP68 / IP00
Weight	50 g

Electrical specifications, input:**RTD and linear resistance input:**

RTD type	Min. value	Max. value	Min. span	Standard
Pt100	-200°C	+850°C	25°C	IEC 60751
Ni100	-60°C	+250°C	25°C	DIN 43760
Lin. R	0 Ω	10000 Ω	30 Ω	-----

Max. offset.....	50% of selec. max. value
Cable resistance per wire (max.).....	10 Ω
Sensor current.....	> 0.2 mA, < 0.4 mA
Effect of sensor cable resistance (3-wire).....	< 0.002 Ω / Ω
Sensor error detection	Yes

Output:**Current output:**

Signal range	4...20 mA
Min. signal range.....	16 mA
Updating time.....	135 ms
Load resistance.....	≤ (V _{supply} - 8) / 0.023 [Ω]
Load stability.....	< ±0.01% of span / 100 Ω

Sensor error detection:

Programmable.....	3.5...23 mA
NAMUR NE43 Upscale.....	23 mA
NAMUR NE43 Downscale.....	3.5 mA

Of span = Of the presently selected range

Ex approval - 5333A:

KEMA 10ATEX0003 X.....	 II 3 GD Ex nA [nL] IIC T4...T6 or II 3 GD Ex nL IIC T4...T6 or II 3 GD Ex nA [ic] IIC T4...T6 or II 3 GD Ex ic IIC T4...T6
ATEX Installation Drawing No.....	5333QA02

Ex / I.S. approval - 5333D:

KEMA 03ATEX1535.....	 II 1 G Ex ia IIC T4 or T6 II 1 D Ex iaD
Max. amb. temperature for T4	85°C
Max. amb. temperature for T6	60°C
ATEX, applicable in zone.....	0, 1, 2, 20, 21 or 22
ATEX Installation Drawing No.	5333QA01
FM, applicable in.....	IS, Class I, Div. 1, Group A, B, C, D IS, Class I, Zone 0, AEx ia IIC
FM Installation Drawing No.....	5300Q502
CSA, applicable in.....	IS, Class I, Div. 1, Group A, B, C, D, Ex ia IIC
CSA Installation Drawing No.	IS, Class I, Zone 0, AEx ia IIC 5333XQC03

Marine approval:

Det Norske Veritas, Ships & Offshore	Standard for Certification No. 2.4
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GOST R approval:

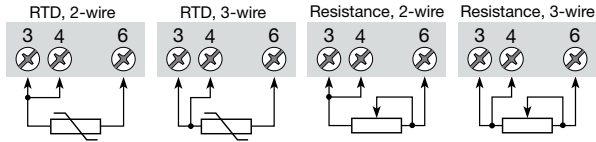
VNIIM & VNIIFTRI, Cert. no.....	See www.prelectronics.com
---------------------------------	--

Observed authority requirements:

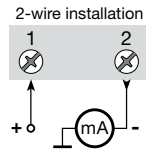
EMC 2004/108/EC	Standard:
ATEX 94/9/EC.....	EN 61326-1
FM	EN 60079-0, EN 60079-11, EN 60079-15, EN 60079-26, EN 61241-0, EN 61241-11
CSA, CAN / CSA.....	3600, 3611, 3610 C22.2 No. 157, E60079-11, UL 913

CONNECTIONS

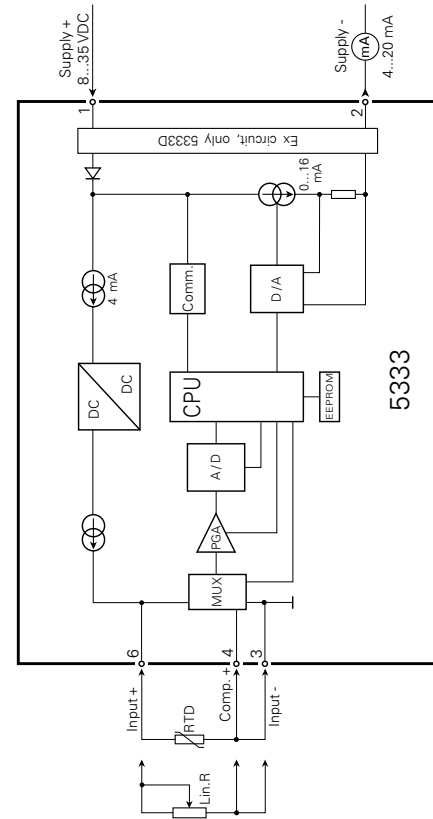
Input:



Output:



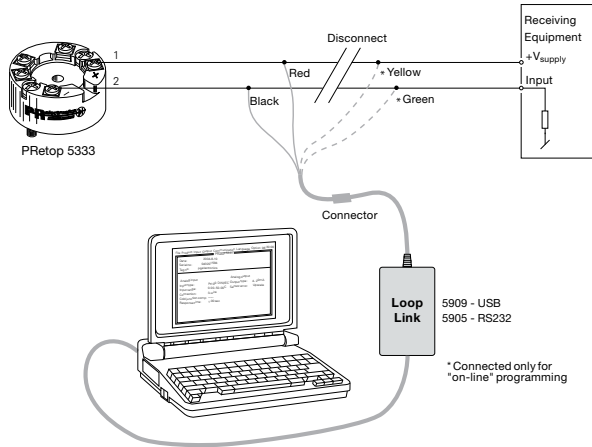
BLOCK DIAGRAM



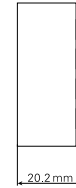
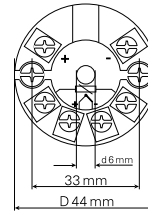
PROGRAMMING

- Loop Link is a communications interface that is needed for programming PRetop 5333.
- For programming please refer to the drawing below and the help functions in PReset.
- Loop Link is not approved for communication with modules installed in hazardous (Ex) areas.

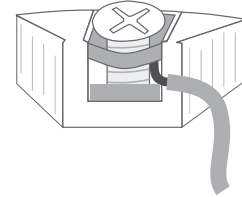
Order: Loop Link



Mechanical specifications



Mounting of sensor wires



Wires must be mounted between the metal plates.

TRANSMETTEUR 2-FILS PROGRAMMABLE (Pt100)

PRetop 5333

Sommaire

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CSA Installation Drawing No. 533XQC03	63

DECLARATION DE CONFORMITE CE

En tant que fabricant

PR electronics A/S
Lerbakken 10
DK-8410 Rønde

déclare que le produit suivant :

Type : 5333

Nom : Transmetteur 2-fils programmable

correspond aux directives et normes suivantes :

La directive CEM (EMC) 2004/108/CE et les modifications subséquentes

EN 61326-1 : 2006

Pour une spécification du niveau de rendement acceptable CEM (EMC)
renvoyer aux spécifications électriques du module.

La directive ATEX 94/9/CE et les modifications subséquentes

EN 60079-0 : 2006, EN 60079-11 : 2007,

EN 60079-15 : 2005 et EN 60079-26 : 2007

EN 61241-0 : 2006 et EN 61241-11 : 2006

Certificat ATEX : KEMA 10ATEX0003 X (5333A)

Certificat ATEX : KEMA 03ATEX1535 (5333D)

Organisme notifié

KEMA Quality B.V. (0344)
Utrechtseweg 310, 6812 AR Arnhem
P.O. Box 5185, 6802 ED Arnhem
The Netherlands

Rønde, le 10 février 2010



Kim Rasmussen
Signature du fabricant

TRANSMETTEUR 2-FILS PROGRAMMABLE (Pt100) PRetop 5333

- *Entrée RTD ou résistance*
- *Grande précision de mesure*
- *Connexion aux sondes à 3 fils*
- *Sécurité programmable*
- *Pour tête de sonde DIN B*

Application

- Mesure linéarisée de la température avec un capteur Pt100...Pt1000 ou Ni100...Ni1000.
- Conversion d'une résistance linéaire en un signal courant standard analogique pour mesurer par exemple le niveau ou la position d'une vanne.

Caractéristiques techniques

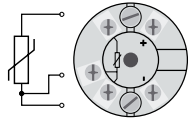
- Le PR5333 peut être programmé de manière simple et rapide.
- Compensation de ligne pour des entrées RTD et résistance avec un raccordement à 3 fils.

Montage / installation

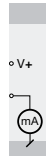
- Pour tête de sonde DIN B. En zone non-dangereuse le 5333 peut être monté sur rail DIN avec un support spécifique.
- **N.B.** : Comme barrière S.I. pour le 5333D nous recommandons le PR5104B, 5114B ou 5116B.

APPLICATIONS

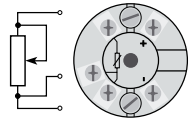
RTD en 4...20 mA



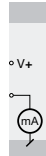
Installation 2-fils
en salle de contrôle



Résistance en 4...20 mA



Installation 2-fils
en salle de contrôle



Référence : 5333

Type	Version
5333	Standard : A CSA, FM & ATEX : D

Spécifications

Plage de température:

-40°C à +85°C

Spécifications communes:

Tension d'alimentation cc

Standard.....	8...35 V
CSA, FM & ATEX.....	8...30 V
Consommation interne.....	25 mW...0,8 W
Chute de tension.....	8 Vcc
Temps de chauffe.....	5 min.
Kit de programmation	Loop Link
Rapport signal / bruit	Min. 60 dB
Temps de réponse (programmable).....	0,33...60 s
Dynamique du signal d'entrée	19 bit
Dynamique du signal de sortie	16 bit
Température d'étalonnage	20...28°C

Précision, la plus grande des valeurs générales et de base:

Valeurs générales		
Type d'entrée	Précision absolue	Coefficient de température
Tous	$\leq \pm 0,1\%$ de l'EC	$\leq \pm 0,01\%$ de l'EC / °C

Valeurs de base		
Type d'entrée	Précision de base	Coefficient de température
RTD	$\leq \pm 0,3^\circ\text{C}$	$\leq \pm 0,01^\circ\text{C}/^\circ\text{C}$
Résist. linéaire	$\leq \pm 0,2 \Omega$	$\leq \pm 20 \text{ m}\Omega / ^\circ\text{C}$

Immunité CEM.....	$< \pm 0,5\%$ de l'EC
-------------------	-----------------------

Effet d'une variation de la tension d'alimentation	≤ 0,005% de l'EC / Vcc
Vibration	IEC 60068-2-6 Test FC
Lloyd, spécification no 1	4 g / 2...100 Hz
Taille max. des fils	1 x 1,5 mm ² fil multibrins
Humidité	< 95% HR (sans cond.)
Dimensions	Ø 44 x 20,2 mm
Degré de protection (boîtier / bornier)	IP68 / IP00
Poids	50 g

Spécifications électriques, entrée :**Entrée RTD et entrée résistance linéaire :**

Type RTD	Valeur min.	Valeur max.	Plage min.	Standard
Pt100	-200°C	+850°C	25°C	IEC 60751
Ni100	-60°C	+250°C	25°C	DIN 43760
R lin.	0 Ω	10000 Ω	30 Ω	----

Décalage max.....	50% de la valeur max. sélectionnée
Résistance de ligne max. par fil.....	10 Ω
Courant de sonde	> 0,2 mA, < 0,4 mA
Effet de la résistance de ligne (3-fils)	< 0,002 Ω / Ω
Détection de rupture sonde	Oui

Sortie :**Sortie courant :**

Gamme de mesure.....	4...20 mA
Plage de mesure min.	16 mA
Temps de scrutation.....	135 ms
Résistance de charge.....	≤ (V _{alim.} - 8) / 0,023 [Ω]
Stabilité de charge	< ±0,01% de l'EC / 100 Ω

Détection de rupture de sonde :

Programmable.....	3,5...23 mA
NAMUR NE43 Haut d'échelle	23 mA
NAMUR NE43 Bas d'échelle.....	3,5 mA

EC = Echelle configurée

Approbation Ex - 5333A :

KEMA 10ATEX0003 X.....	II 3 GD Ex nA [nL] IIC T4...T6 ou II 3 GD Ex nL IIC T4...T6 ou II 3 GD Ex nA [ic] IIC T4...T6 ou II 3 GD Ex ic IIC T4...T6
ATEX Installation Drawing No.....	5333QA02

Approbation Ex / S.I. - 5333D :

KEMA 03ATEX1535	II 1 G Ex ia IIC T4 ou T6 II 1 D Ex iaD
Température ambiante max. (T4)	85°C
Température ambiante max. (T6)	60°C
ATEX, applicable en zone.....	0, 1, 2, 20, 21 ou 22
ATEX Installation Drawing No.	5333QA01
FM, applicable en.....	IS, Class I, Div. 1, Group A, B, C, D IS, Class I, Zone 0, AEx ia IIC
FM Installation Drawing No.....	5300Q502
CSA, applicable en.....	IS, Class I, Div. 1, Group A, B, C, D, Ex ia IIC
CSA Installation Drawing No.	IS, Class I, Zone 0, AEx ia IIC 5333QC03

Approbation marine :

Det Norske Veritas, Ships & Offshore	Standard for Certification No. 2.4
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Approbation GOST R :

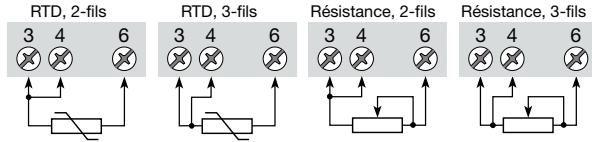
VNIIM & VNIIFTRI, Cert. no.....	Voir www.prelectronics.fr
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Agréments et homologations :

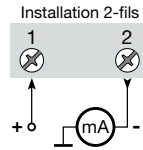
CEM 2004/108/CE	Standard :
ATEX 94/9/CE.....	EN 61326-1
FM	EN 60079-0, EN 60079-11, EN 60079-15, EN 60079-26, EN 61241-0, EN 61241-11
CSA, CAN / CSA.....	3600, 3611, 3610 C22.2 No. 157, E60079-11, UL 913

CONNEXIONS

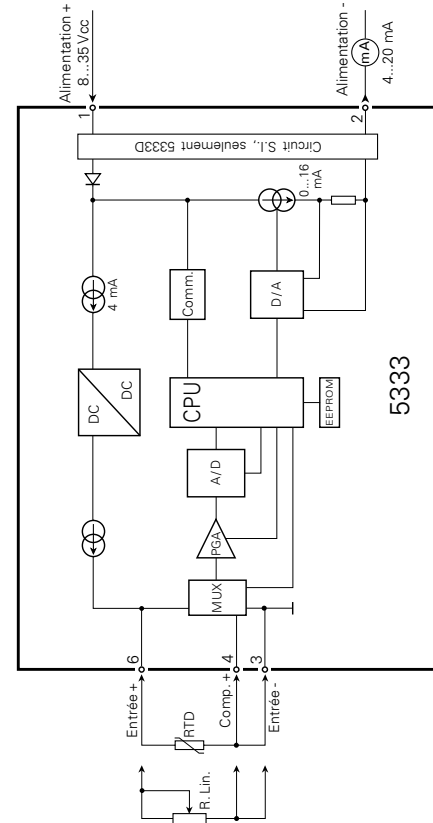
Entrée :



Sortie :



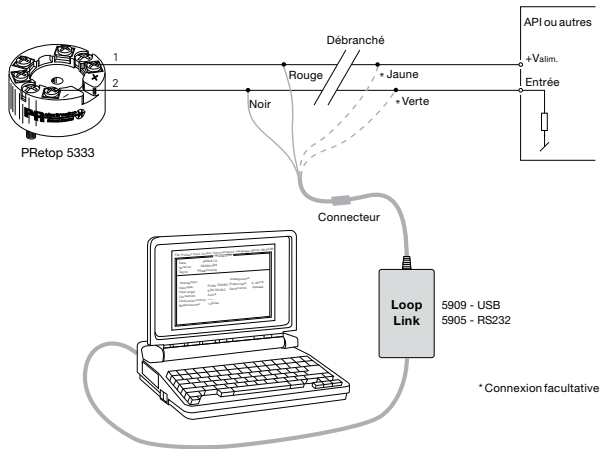
SCHEMA DE PRINCIPE



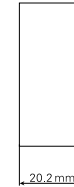
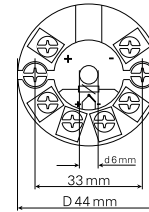
PROGRAMMATION

- Loop Link est un kit de programmation permettant de programmer le PRetop 5333.
- Pour le raccordement du Loop Link, veuillez vous reporter au schéma ci-dessous et à l'aide en ligne du logiciel PReset.
- Loop Link ne doit pas être utilisé pour communication avec des modules installés en zone dangereuse.

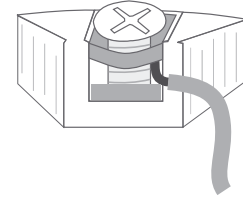
Numéro de référence : Loop Link



Dimensions mécaniques



Montage des fils du capteur



Les fils doivent être montés entre les plaques métalliques.

2-DRAHT PROGRAMMIERBARER MESSUMFORMER

PRetop 5333

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CSA Installation Drawing No. 533XQC03	63

EG-KONFORMITÄTSERKLÄRUNG

Als Hersteller bescheinigt

PR electronics A/S
Lerbakken 10
DK-8410 Rønde

hiermit für das folgende Produkt:

Typ: 5333

Name: 2-Draht programmierbarer Messumformer

die Konformität mit folgenden Richtlinien und Normen:

Die EMV Richtlinien 2004/108/EG und nachfolgende Änderungen

EN 61326-1 : 2006

Zur Spezifikation des zulässigen Erfüllungsgrades, siehe die Elektrische Daten des Moduls.

Die ATEX Richtlinien 94/9/EG und nachfolgende Änderungen

EN 60079-0 : 2006, EN 60079-11 : 2007,

EN 60079-15 : 2005 und EN 60079-26 : 2007

EN 61241-0 : 2006 und EN 61241-11 : 2006

ATEX-Zertifikat: KEMA 10ATEX0003 X (5333A)

ATEX-Zertifikat: KEMA 03ATEX1535 (5333D)

Zulassungsstelle

KEMA Quality B.V. (0344)
Utrechtseweg 310, 6812 AR Arnhem
P.O. Box 5185, 6802 ED Arnhem
The Netherlands



Rønde, 10. Februar 2010

Kim Rasmussen
 Unterschrift des Herstellers

2-DRAHT PROGRAMMIERBARER MESSUMFORMER PRetop 5333

- *Eingang für WTH oder Ω*
- *Hohe Messgenauigkeit*
- *3-Leiter-Anschluss*
- *Programmierbare Sensorfehlanzeige*
- *Für Einbau in Anschlusskopf DIN Form B*

Verwendung

- Linearisierte Temperaturmessung mit Pt100...Pt1000, Ni100...Ni1000 Sensor.
- Umwandlung von linearer Widerstandsänderung in ein analoges Standard-Stromsignal, z.B. von Ventilen oder Niveau-Messwertgeber.

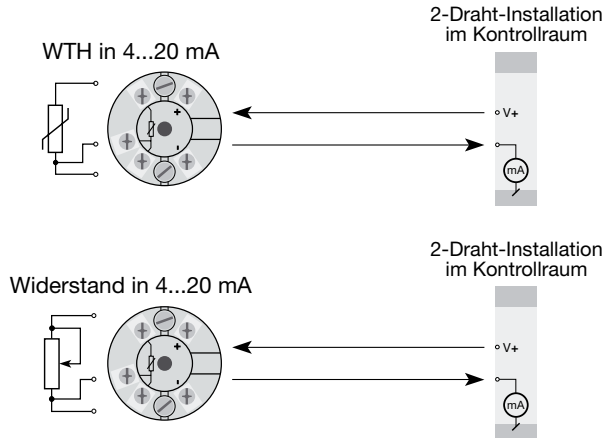
Technische Merkmale

- PR5333 kann vom Benutzer innerhalb von wenigen Sekunden zur Messung in allen genormten WTH-Temperaturbereiche programmiert werden.
- Der WTH- und Widerstandseingang haben Leitungskompensation bei 3-Leiter-Anschluss.

Montage / Installation

- Für DIN Form B Sensorkopf Montage. Im sicheren Bereich kann der 5333 auf einer DIN-Schiene mittels einer spezieller Armatur montiert werden.
- **NB:** Als Ex-Sicherheitsbarriere für 5333D empfehlen wir 5104B, 5114B oder 5116B.

ANWENDUNGEN



Bestellangaben: 5333

Typ	Version
5333	Standard : A CSA, FM & ATEX : D

Elektrische Daten:

Spezifikationsbereich:

-40°C bis +85°C

Gemeinsame Daten:

Versorgungsspannung DC

Standard.....	8...35 V
CSA, FM & ATEX.....	8...30 V
Eigenverbrauch	25 mW...0,8 W
Spannungsabfall.....	8 VDC
Aufwärmzeit.....	5 Min.
Kommunikationsschnittstelle	Loop Link
Signal- / Rauschverhältnis	Min. 60 dB
Ansprechzeit (programmierbar).....	0,33...60 s
Signaldynamik, Eingang	19 Bit
Signaldynamik, Ausgang.....	16 Bit
Kalibrierungstemperatur	20...28 °C

Genauigkeit, höherer Wert von allgemeinen und Grundwerten:

Allgemeine Werte		
Eingangsart	Absolute Genauigkeit	Temperaturkoeffizient
Alle	$\leq \pm 0,1\%$ d. Messsp.	$\leq \pm 0,01\%$ d. Messsp./°C

Grundwerte		
Eingangsart	Grund-Genauigkeit	Temperaturkoeffizient
WTH	$\leq \pm 0,3^\circ\text{C}$	$\leq \pm 0,01^\circ\text{C}/^\circ\text{C}$
Lin. R	$\leq \pm 0,2 \Omega$	$\leq \pm 20 \text{ m}\Omega / ^\circ\text{C}$

EMV-Immunitätseinwirkung.....	$< \pm 0,5\%$ d. Messsp.
-------------------------------	--------------------------

Einfluss von Änderung der Versorgungsspannung.....	≤ 0,005% d. Messsp. / VDC
Vibration	IEC 60068-2-6 Test FC
Lloyd's Spezifikation Nr. 1	4 g / 2...100 Hz
Max. Leitungsquerschnitt.....	1 x 1,5 mm ² Litzendraht
Luftfeuchtigkeit.....	< 95% RF (nicht kond.)
Maß	Ø 44 x 20,2 mm
Schutzart (Gehäuse / Anschluss).....	IP68 / IP00
Gewicht	50 g

Elektrische Daten, Eingang:**WTH- und linearer Widerstandseingang:**

WTH-Typ	Min. Wert	Max. Wert	Min. Spanne	Norm
Pt100	-200°C	+850°C	25°C	IEC 60751
Ni100	-60°C	+250°C	25°C	DIN 43760
Lin. R	0 Ω	10000 Ω	30 Ω	-----

Max. Nullpunktverschiebung (Offset)	50% des gewählten Max.-Wertes
Leitungswiderstand pro Leiter (Max.).....	10 Ω
Fühlerstrom	> 0,2 mA, < 0,4 mA
Wirkung des Fühlerkabelwiderstandes (3-Leiter)	< 0,002 Ω / Ω
Fühlerfehlererkennung.....	Ja

Ausgang:**Stromausgang:**

Signalbereich.....	4...20 mA
Min. Signalbereich.....	16 mA
Aktualisierungszeit.....	135 ms
Belastungswiderstand	≤ (U _{Vers.} - 8) / 0,023 [Ω]
Belastungsstabilität	< ±0,01% d. Messsp. / 100 Ω

Fühlerfehlererkennung:

Programmierbar.....	3,5...23 mA
NAMUR NE43 aufsteuernd	23 mA
NAMUR NE43 zusteuern.....	3,5 mA

d. Messspanne = der gewählten Messspanne

Ex-Zulassung - 5333A:

KEMA 10ATEX0003 X.....	II 3 GD Ex nA [nL] IIC T4...T6 oder II 3 GD Ex nL IIC T4...T6 oder II 3 GD Ex nA [ic] IIC T4...T6 oder II 3 GD Ex ic IIC T4...T6
ATEX Installation Drawing No.....	5333QA02

Ex- / I.S.-Zulassung - 5333D:

KEMA 03ATEX1535	II 1 G Ex ia IIC T4 oder T6 II 1 D Ex iaD
Max. Umgebungstemp. für T4	85°C
Max. Umgebungstemp. für T6	60°C
ATEX, für Anwendung in Zone	0, 1, 2, 20, 21 oder 22
ATEX Installation Drawing No.	5333QA01
FM, für Anwendung in.....	IS, Class I, Div. 1, Group A, B, C, D IS, Class I, Zone 0, AEx ia IIC
FM Installation Drawing No.....	5300Q502
CSA, für Anwendung in.....	IS, Class I, Div. 1, Group A, B, C, D, Ex ia IIC
CSA Installation Drawing No.	IS, Class I, Zone 0, AEx ia IIC 5333XQC03

Marine-Zulassung:

Det Norske Veritas, Ships & Offshore	Standard for Certification No. 2.4
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GOST R Zulassung:

VNIIM & VNIIFTRI, Cert. no.	Siehe www.prelectronics.de
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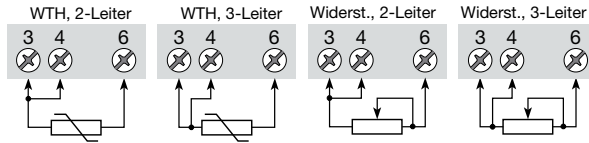
Eingehaltene Richtlinien:

EMV 2004/108/EG.....	EN 61326-1
ATEX 94/9/EG.....	EN 60079-0, EN 60079-11, EN 60079-15, EN 60079-26, EN 61241-0, EN 61241-11
FM	3600, 3611, 3610
CSA, CAN / CSA.....	C22.2 No. 157, E60079-11, UL 913

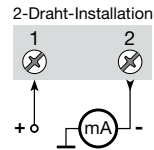
Norm:

ANSCHLÜSSE

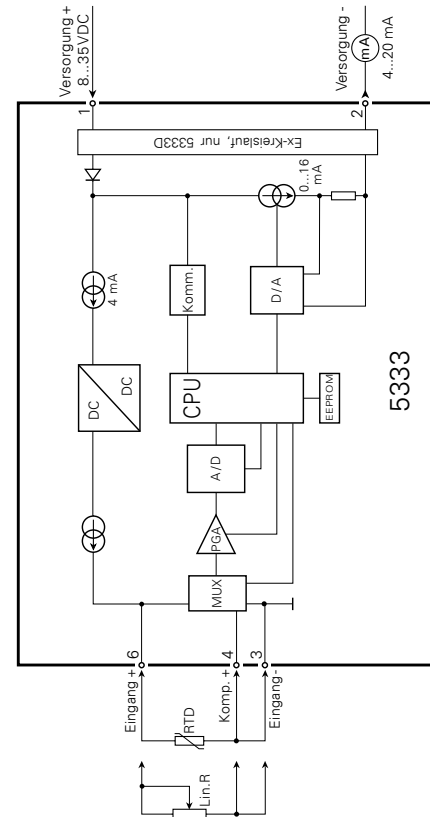
Eingang:



Ausgang:



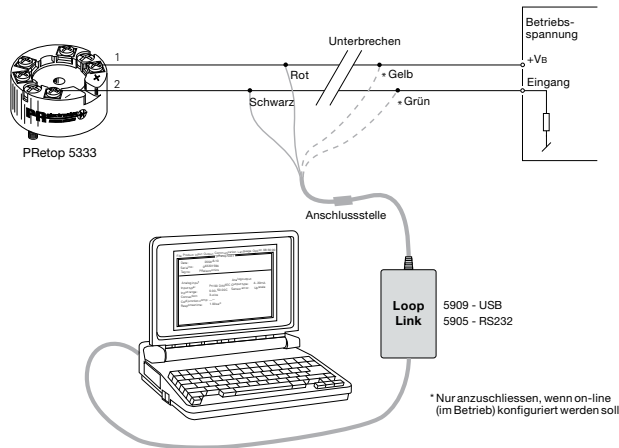
BLOCKDIAGRAMM



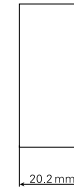
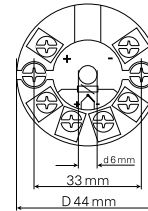
PROGRAMMIERUNG

- Loop Link ist eine batteriegespeiste Schnittstelle zur Programmierung des PRetop 5333.
- Bezüglich Programmierung verweisen wir auf die nachfolgende Zeichnung und die "Hilfe"-Funktion im PReset-Programm.
- Loop Link darf nicht zur Kommunikation mit Modulen, die in Ex-gefährdeten Bereichen installiert sind, benutzt werden.

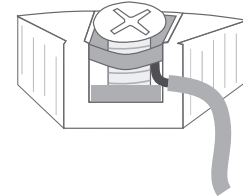
Bestellangaben: Loop Link



Abmessungen



Montage von Fühlerleitungen:



Die Leitungen müssen zwischen den Metallplatten montiert werden.

APPENDIX

ATEX INSTALLATION DRAWINGS - 5333A UK, FR, DE, DK

ATEX INSTALLATION DRAWINGS - 5333D UK, FR, DE, DK

FM INSTALLATION DRAWING NO. 5300Q502

CSA INSTALLATION DRAWING NO. 533XQC03



5333QA02

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ATEX Installation drawing

For safe installation of 5333A the following must be observed. The module shall only be installed by qualified personnel who are familiar with the national and international laws, directives and standards that apply to this area.

Year of manufacture can be taken from the first two digits in the serial number.

ATEX Certificate KEMA 10ATEX0003 X

Marking



II 3 GD Ex nA [nL] IIC T6...T4
II 3 GD Ex nL IIC T6...T4

II 3 GD Ex nA [ic] IIC T6...T4
II 3 GD Ex ic IIC T6...T4

Standards

EN 60079-0 : 2006, EN 60079-11 : 2007, EN 60079-15 : 2005

T4: $-40 \leq T_a \leq 85^{\circ}\text{C}$
T6: $-40 \leq T_a \leq 60^{\circ}\text{C}$

Terminal: 3,4,6
Ex nA [nL]

Uo: 27 V
Io: 7.0 mA
Po: 45 mW
Lo: 35 mH
Co: 90 nF

Terminal: 1,2
Ex nA

U $\leq$ 35 VDC
I = 4 - 20 mA

Terminal: 1,2
Ex nL or Ex ic

Ui = 35 VDC
Li = 10 μH
Ci = 1.0 nF

Special conditions for safe use

For use in a potentially explosive atmosphere of flammable gasses, vapours or mists, the transmitter shall be mounted in an enclosure providing a degree of protection of at least IP54 in accordance to EN60529.

For use in the presence of combustible dusts the transmitter shall be mounted in an enclosure providing a degree of protection of at least IP6X in accordance with EN60529. The surface temperature of the enclosure shall be determined after installation of the transmitter.

For an ambient temperature $\geq 60^{\circ}\text{C}$, heat resistant cables shall be used with a rating of at least 20 K above the ambient temperature.

Revision date:
2009-11-17

Version Revision
V1R0

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5333QA02

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Schéma d'installation ATEX

Pour une installation sûre du 5333A vous devez observer ce qui suit. Le module sera seulement installé par un personnel qualifié qui est informé des lois, des directives et des normes nationales et internationales qui s'appliquent à ce secteur.
L'année de la fabrication est indiquée dans les deux premiers chiffres dans le numéro de série.

Certificat ATEX KEMA 10ATEX 0003 X

Marquage  II 3 GD Ex nA [nL] IIC T6...T4
II 3 GD Ex nL IIC T6...T4
II 3 GD Ex nA [ic] IIC T6...T4
II 3 GD Ex ic IIC T6...T4

Standards EN 60079-0 : 2006, EN 60079-11 : 2007, EN 60079-15 : 2005

T4: $-40 \leq T_a \leq 85^\circ\text{C}$
T6: $-40 \leq T_a \leq 60^\circ\text{C}$

Bornes : 3,4,6
Ex nA [nL]

Uo: 27 V
Io: 7,0 mA
Po: 45 mW
Lo: 35 mH
Co: 90 nF

Bornes : 1,2
Ex nA

U $\leq$ 35 Vcc
I = 4 - 20 mA

Bornes : 1,2
Ex nL ou Ex ic

Ui = 35 Vcc
Li = 10 μH
Ci = 1,0 nF

Conditions spécifiques à l'utilisation sûre :

Pour utilisation dans les atmosphères potentiellement explosibles dû à la présence de gaz, vapeurs ou brumes inflammables, le transmetteur doit être installé dans un boîtier de protection assurant un degré d'étanchéité d'au moins IP54 conformément à l'EN 60529.

Pour utilisation dans la présence de poussières combustibles, le transmetteur doit être installé dans un boîtier de protection assurant un degré d'étanchéité d'au moins IP6X conformément à l'EN 60529. La température de surface du boîtier doit être déterminée après l'installation des unités.

Pour une température ambiante $\geq 60^\circ\text{C}$, il faut utiliser des câbles résistant aux températures élevées avec une capacité nominale d'au moins 20 K au dessus de la température ambiante.



5333QA02

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ATEX Installationszeichnung

Für die sichere Installation von 5333A ist Folgendes zu beachten: Das Gerät darf nur von qualifiziertem Personal eingebaut werden, das mit den nationalen und internationalen Gesetzen, Richtlinien und Standards auf diesem Gebiet vertraut ist.
Das Baujahr kann aus den ersten beiden Ziffern der Seriennummer ersehen werden.

ATEX-Zertifikat KEMA 10ATEX 0003 X

Markierung  II 3 GD Ex nA [nL] IIC T6...T4
II 3 GD Ex nL IIC T6...T4
II 3 GD Ex nA [ic] IIC T6...T4
II 3 GD Ex ic IIC T6...T4

Richtlinien EN 60079-0 : 2006, EN 60079-11 : 2007, EN 60079-15 : 2005

T4: $-40 \leq T_a \leq 85^\circ\text{C}$
T6: $-40 \leq T_a \leq 60^\circ\text{C}$

Klemme: 3,4,6
Ex nA [nL]

Uo: 27 V
Io: 7,0 mA
Po: 45 mW
Lo: 35 mH
Co: 90 nF

Klemme: 1,2
Ex nA

U $\leq$ 35 VDC
I = 4 - 20 mA

Klemme: 1,2
Ex nL oder Ex ic

Ui = 35 VDC
Li = 10 μH
Ci = 1,0 nF

Sonderbedingungen für sichere Anwendung:

Für Anwendung in einer potentiellen explosiven Atmosphäre - basierend auf entflammaren Gas, Dämpfen, Nebeln - muss der Messumformer in einem Gehäuse, welcher einen Schutzgrad von mindestens IP 54 gemäß EN 60529 besitzt, eingebaut werden.

Für Anwendung in die Präsenz von entflammaren Staub, muss der Messumformer in einem Gehäuse, welcher einen Schutzgrad von mindestens IP 6X gemäß EN 60529 besitzt, eingebaut werden. Die Oberflächentemperatur des Gehäuses muss nach der Installation der Einheiten festgestellt werden.

Bei einer Umgebungstemperatur $\geq 60^\circ\text{C}$ müssen hitzebeständige Leitungen eingesetzt werden, welche für eine mindestens 20 K höhere Umgebungstemperatur zugelassen sind.

**5333QA02**

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ATEX Installationstegning

For sikker installation af 5333A skal følgende overholdes: Modulet kan kun installeres af kvalificerede personer, som er bekendt med national og international lovgivning, direktiver og standarder i det land, hvor modulet skal installeres.

Produktionsår fremgår af de to første cifre i serienummeret.

ATEX-certifikat KEMA 10ATEX 0003 X

Mærkning

II 3 GD Ex nA [nL] IIC T6...T4
II 3 GD Ex nL IIC T6...T4II 3 GD Ex nA [ic] IIC T6...T4
II 3 GD Ex ic IIC T6...T4

Standarder EN 60079-0 : 2006, EN 60079-11 : 2007, EN 60079-15 : 2005

T4: $-40 \leq T_a \leq 85^\circ\text{C}$
T6: $-40 \leq T_a \leq 60^\circ\text{C}$ **Klemme: 3,4,6**
Ex nA [nL]**Klemme: 1,2**
Ex nAU: ≤ 35 VDC
I = 4 - 20 mA**Klemme: 1,2**
Ex nL eller Ex IcUi = 35 VDC
Li = 10 μH
Ci = 1,0 nFUo: 27 V
Io: 7,0 mA
Po: 45 mW
Lo: 35 mH
Co: 90 nF

Særlige betingelser for sikker anvendelse:

Ved installationer i eksplosive atmosfærer forårsaget af gasser, dampe eller tåger, skal transmittoren monteres i et hus med en tæthedegrad på mindst IP54 i overensstemmelse med EN 60529.

Ved installationer i områder med potentiel eksplosionsfare på grund af brændbart støv, skal transmittoren monteres i et hus med en tæthedegrad på mindst IP6X i overensstemmelse med EN 60529. Husets overfladetemperatur bestemmes efter installation af enhederne.

Hvis omgivelsestemperaturen $\geq 60^\circ\text{C}$, skal der bruges varmebestandige kabler med specifikationer på mindst 20K over omgivelsestemperaturen.

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5333V110

**5333QA01**

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ATEX Installation drawing

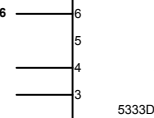
**5333**

For safe installation of 5333D the following must be observed. The module shall only be installed by qualified personnel who are familiar with the national and international laws, directives and standards that apply to this area.

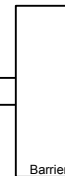
Year of manufacture can be taken from the first two digits in the serial number.

ATEX Certificate KEMA 03ATEX 1535

Marking

II 1 G Ex ia IIC T6...T4
II 1 D Ex iaDStandards EN 60079-0 : 2006, EN 60079-11 : 2007, EN 60079-26 : 2007,
EN 61241-0 : 2006, EN 61241-11 : 2006Hazardous area
Zone 0, 1, 2, 20, 21, 22T4: $-40 \leq T_a \leq 85^\circ\text{C}$ T105 $^\circ\text{C}$
T6: $-40 \leq T_a \leq 60^\circ\text{C}$ T80 $^\circ\text{C}$ **Terminal: 3,4,6**Uo: 27 VDC
Io: 7 mA
Po: 45 mW
Lo: 35 mH
Co: 90 nF**Terminal: 1,2**Ui: 30 VDC
Ii: 120 mA
Pi: 0.84 W
Li: 10 μH
Ci: 1.0 nF

Non Hazardous Area

Revision date:
2009-09-22Version Revision
V1R0Page:
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5333V110



5333QA01

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Installation notes:

In a potentially explosive gas atmosphere, the transmitter shall be mounted in an enclosure in order to provide a degree of protection of at least IP20 according to EN60529.

If the transmitter is installed in an explosive atmosphere requiring the use of equipment of category 1G and if the enclosure is made of aluminium, it must be installed such, that even in the event of rare incidents, ignition sources due to impact and friction, sparks are excluded; if the enclosure is made of non-metallic materials, electrostatic charging shall be avoided.

For installation in a potentially explosive dust atmosphere, the following instructions apply:

The transmitter shall be mounted in a metal enclosure form B according to DIN43729 that is providing a degree of protection of at least IP6X according to EN60529 that is suitable for the application and correctly installed.

Cable entries and blanking elements shall be used that are suitable for the application and correctly installed.

For an ambient temperature $\geq 60^{\circ}\text{C}$, heat resistant cables shall be used with a rating of at least 20 K above the ambient temperature.

The surface temperature of the enclosure is equal to the ambient temperature plus 20 K, for a dust layer with a thickness up to 5 mm



5333QA01

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Schéma d'installation ATEX**5333**

Pour une installation sûre du 5333D vous devez observer ce qui suit. Le module sera seulement installé par un personnel qualifié qui est informé des lois, des directives et des normes nationales et internationales qui s'appliquent à ce secteur.
L'année de la fabrication est indiquée dans les deux premiers chiffres dans le numéro de série.

Certificat ATEX KEMA 03ATEX 1535

Marquage II 1 G Ex ia IIC T6..T4
II 1 D Ex iaD

Standards EN 60079-0 : 2006, EN 60079-11 : 2007, EN 60079-26 : 2007,
EN 61241-0 : 2006, EN 61241-11 : 2006

Zone dangereuse

Zone 0, 1, 2, 20, 21, 22

Zone non dangereuse

T4: $-40 \leq T_a \leq 85^{\circ}\text{C}$ T105 $^{\circ}\text{C}$ T6: $-40 \leq T_a \leq 60^{\circ}\text{C}$ T80 $^{\circ}\text{C}$ **Bornes: 3,4,6**

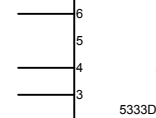
Uo: 27 Vcc

Io: 7 mA

Po: 45 mW

Lo: 35 mH

Co: 90 nF

**Bornes: 1,2**

Ui: 30 Vcc

Ii: 120 mA

Pi: 0,84 W

Li: 10 μH

Ci: 1,0 nF



5333QA01

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Notes d'installation:

Dans les atmosphères potentiellement explosibles dû à la présence de gaz, le transmetteur doit être installé dans un boîtier de protection assurant un degré d'étanchéité d'au moins IP20 conformément à l'EN 60529.

Pour les installations dans les atmosphères explosibles exigeant des appareils de catégorie 1G, et dans le cas où le boîtier est fait d'aluminium, le boîtier doit être installé dans une telle manière que, même dans le cas d'incidents rares, les sources d'inflammation dues aux impacts et aux étincelles de friction ne peuvent se produire; dans le cas où le boîtier est fait de matériaux non métalliques, les décharges électrostatiques sur le boîtier du transmetteur doivent être évitées.

Pour les installations dans les atmosphères potentiellement explosibles dû à la présence de poussières combustibles on doit observer ce qui suit :

Le transmetteur monté dans un boîtier métallique DIN B conformément à DIN 43729. Ce boîtier doit assurer un degré d'étanchéité d'au moins IP 6X conformément à l'EN 60529 et il doit convenir à l'application et être correctement installé.

Seulement des raccords de câble et des bouchons convenant à l'application et correctement installés doivent être utilisés.

Pour une température ambiante $\geq 60^{\circ}\text{C}$, il faut utiliser des câbles résistant aux températures élevées avec une capacité nominale d'au moins 20 K au dessus de la température ambiante.

La température superficielle du boîtier égale la température ambiante plus 20K, pour une couche de poussière d'une épaisseur jusqu'à 5 mm.



5333QA01

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ATEX Installationszeichnung



5333

Für die sichere Installation von 5333D ist Folgendes zu beachten: Das Gerät darf nur von qualifiziertem Personal eingebaut werden, das mit den nationalen und internationalen Gesetzen, Richtlinien und Standards auf diesem Gebiet vertraut ist.

Das Baujahr kann aus den ersten beiden Ziffern der Seriennummer ersehen werden.

ATEX-Zertifikat KEMA 03ATEX 1535

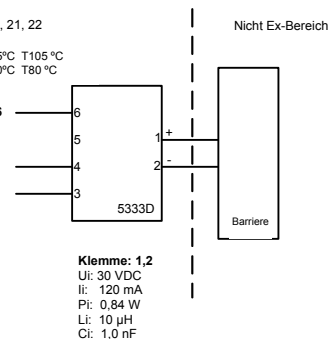
Markierung  II 1 G Ex ia IIC T6..T4
II 1 D Ex iaD

Richtlinien EN 60079-0 : 2006, EN 60079-11 : 2007, EN 60079-26 : 2007,
EN 61241-0 : 2006, EN 61241-11 : 2006

Ex-Bereich
Zone 0, 1, 2, 20, 21, 22

T4: $-40 \leq T_a \leq 85^{\circ}\text{C}$ T105 $^{\circ}\text{C}$
T6: $-40 \leq T_a \leq 60^{\circ}\text{C}$ T80 $^{\circ}\text{C}$

Klemme: 3,4,6
Uo: 27 VDC
Io: 7 mA
Po: 45 mW
Lo: 35 mH
Co: 90 nF





5333QA01

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Installationsvorschriften:

Für Anwendung in einer potentiellen explosiven Atmosphäre - basierend auf entflammbaren Gas - muss der Messumformer in einem Gehäuse, welcher einen Schutzgrad von mindestens IP20 gemäß EN 60529 besitzt, eingebaut werden.

Für Applikationen in explosiver Atmosphäre, wo Kategorie 1G Geräte vorgeschrieben sind, und wenn das Gehäuse aus Aluminium ist, ist das Gehäuse so zu montieren, dass Zündquellen (Stöße und Reibungsfunken) selbst bei selten auftretenden Störungen vermieden werden; wenn das Gehäuse aus nichtmetallischen Bestandteile ist, muss die elektrostatische Ladung der Gehäuse vermieden werden.

Für Anwendung in einer potentiellen explosiven Atmosphäre - basierend auf entflammbaren Staub - ist Folgendes zu beachten:

Der Messumformer muss in einem Metallkopf Form B gemäß DIN 43729 montiert werden. Das Gehäuse muss einen Schutzgrad von mindestens IP 6X gemäß EN 60529 besitzen und für den dementsprechenden Einsatz zugelassen werden.

Es dürfen nur Kabeleinführungen und Abdeckungen eingesetzt werden, welche für die jeweilige Anwendung zugelassen sind.

Bei einer Umgebungstemperatur $\geq 60^\circ\text{C}$ müssen hitzebeständige Leitungen eingesetzt werden, welche für eine mindestens 20 K höhere Umgebungstemperatur zugelassen sind.

Die Umgebungstemperatur der Gehäuse entspricht der Umgebungstemperatur plus 20K für eine Staubschicht mit einer Dicke von bis zu 5 mm.



5333QA01

LERBAKKEN 10, 8410 RØNDE DENMARK. WWW.PRELECTRONICS.COM

ATEX Installationstegning**5333**

For sikker installation af 5333D skal følgende overholdes: Modulet må kun installeres af kvalificerede personer, som er bekendt med national og international lovgivning, direktiver og standarder i det land, hvor modulet skal installeres. Produktionsår fremgår af de to første cifre i serienummeret.

ATEX-certifikat KEMA 03ATEX 1535

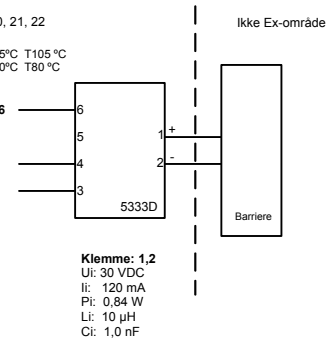
Mærkning


 II 1 G Ex ia IIC T6..T4
 II 1 D Ex iaD

 Standarder EN 60079-0 : 2006, EN 60079-11 : 2007, EN 60079-26 : 2007,
 EN 61241-0 : 2006, EN 61241-11 : 2006

 Ex-område
 Zone 0, 1, 2, 20, 21, 22

 T4: $-40 \leq T_a \leq 85^\circ\text{C}$ T105 °C
 T6: $-40 \leq T_a \leq 60^\circ\text{C}$ T80 °C

Klemme: 3,4,6
 Uo: 27 VDC
 Io: 7 mA
 Po: 45 mW
 Lo: 35 mH
 Co: 90 nF




5333QA01

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Installationsforskrifter:

I områder med potential eksplosionsfare på grund af brændbar gas skal transmitteren installeres i et hus med en kapslingsklasse på mindst IP20 i overensstemmelse med EN60529.

Hvis transmitteren installeres i eksplosive atmosfærer, hvor kategori 1G udstyr er krævet, og hvis huset er lavet af aluminium, skal det installeres således, at der selv ved sjældent opstående hændelser ikke er risiko for antændelse på grund af stød og friktionsgnister; hvis huset er lavet af ikke-metallisk materiale, skal elektrostatiske ladninger på transmitters hus undgås.

For installation i områder med potentiel eksplosionsfare på grund af brændbart støv skal følgende overholdes:

Transmitteren skal monteres i et form B metalhus i overensstemmelse med DIN 43729. Huset skal have en tæthedsgrad på mindst IP 6X i overensstemmelse med EN 60529 og skal være egnet til den pågældende applikation samt være installeret korrekt.

Der må kun anvendes kabelforskrninger og blindstik, som egner sig til den pågældende applikation og som installeres korrekt.

Hvis omgivelsestemperaturen $\geq 60^{\circ}\text{C}$, skal der bruges varmebestandige kabler med specifikationer på mindst 20K over omgivelsestemperaturen.

Husets overfladetemperatur er lig med den maksimale omgivelsestemperatur plus 20 K for støvlag med en tykkelse på op til 5 mm.

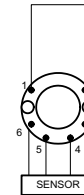
Installation Drawing 5300Q502.**Model 5331C, 5331D, 5333C and
Hazardous (Classified) Location**

Class I, Division 1, Groups, A, B, C, D
Class II Division 1 Groups E, F, G or
Class I, Zone 0, IIC

Ambient temperature limits
T4: -40 to +85 deg. Celsius
T6: -40 to +60 deg. Celsius

Terminal 1, 2
Vmax or Ui: 30 V
Imax or Ii: 120 mA
Pmax or Pi: 0.84 W
Ci: 1 nF
Li: 10 uH

Terminal 3, 4, 5, 6
Only passive, or non-energy
storing devices such as RTD's
and Thermocouples may be
connected.

**5333D
Non Hazardous Location**

Associated Apparatus
or Barrier
with
entity Parameters:

$UM \leq 250V$
 $Voc \text{ or } Uo \leq Vmax \text{ or } Ui$
 $Isc \text{ or } Io \leq Imax \text{ or } Ii$
 $Po \leq Pi$
 $Ca \text{ or } Co \geq Ci + Ccable$
 $La \text{ or } Lo \geq Li + Lcable$

This device must not be
connected to any associated
apparatus which uses or
generates more than 250 VRMS

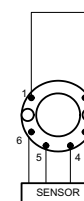
Model 5335C, 5335D.**Hazardous (Classified) Location**

Class I, Division 1, Groups, A, B, C, D
Class II Division 1 Groups E, F, G or
Class I, Zone 0, IIC

Ambient temperature limits
T4: -40 to +85 deg. Celsius
T6: -40 to +60 deg. Celsius

Terminal 1, 2
Vmax or Ui: 30 V
Imax or Ii: 120 mA
Pmax or Pi: 0.84 W
Ci: 1 nF
Li: 10 uH

Terminal 3, 4, 5, 6
Vi or Uo: 9.6 V
Ii or Io: 28 mA
Pi or Po: 67.2 mW
Ca or Co: 3.5 uF
La or Lo: 35 mH

**Non Hazardous Location**

Associated Apparatus
or Barrier
with
entity Parameters:

$UM \leq 250V$
 $Voc \text{ or } Uo \leq Vmax \text{ or } Ui$
 $Isc \text{ or } Io \leq Imax \text{ or } Ii$
 $Po \leq Pi$
 $Ca \text{ or } Co \geq Ci + Ccable$
 $La \text{ or } Lo \geq Li + Lcable$

This device must not be
connected to any associated
apparatus which uses or
generates more than 250 VRMS

The entity concept.

The Transmitter must be installed according to National Electrical Code (ANSI-NFPA 70).

When installed in Class II locations the Transmitter shall be installed in an enclosure with a specified ingress protections of IP6X according to IEC60529 and Dust-tight conduit seals must be used.

Equipment that is FM-approved for intrinsic safety may be connected to barriers based on the ENTITY CONCEPT. This concept permits interconnection of approved transmitters, meters and other devices in combinations which have not been specifically examined by FM, provided that the agency's criteria are met. The combination is then intrinsically safe, if the entity concept is acceptable to the authority having jurisdiction over the installation.

The entity concept criteria are as follows:

The intrinsically safe devices, other than barriers, must not be a source of power. The maximum voltage $U_i(V_{MAX})$, and current $I_i(I_{MAX})$, and maximum power $P_i(P_{MAX})$, which the device can receive and remain intrinsically safe, must be equal to or greater than the voltage (U_o or V_o or V_i) and current (I_o or I_{SC} or I_i) and the power P_o which can be delivered by the barrier.

The sum of the maximum unprotected capacitance (C) for each intrinsically device and the interconnecting wiring must be less than the capacitance (C-) which can be safely connected to the barrier.

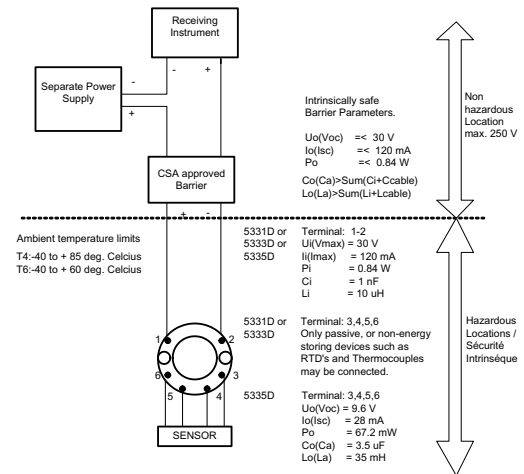
The sum of the maximum unprotected inductance (L) for each intrinsically device and the interconnecting wiring must be less than the inductance (L-) which can be safely connected to the barrier.

The entity parameters U_o, V_o or V_i and I_o, I_{SC} or I_i , and C_- and L_- for barriers are provided by the barrier manufacturer.

CSA Installation Drawing 533XQC03.

5331D, 5333D and 5335D transmitters are intrinsically safe in Zone 0 Group IIC or Class I, Division1, Group A,B,C,D when installed according to Installation Drawing.

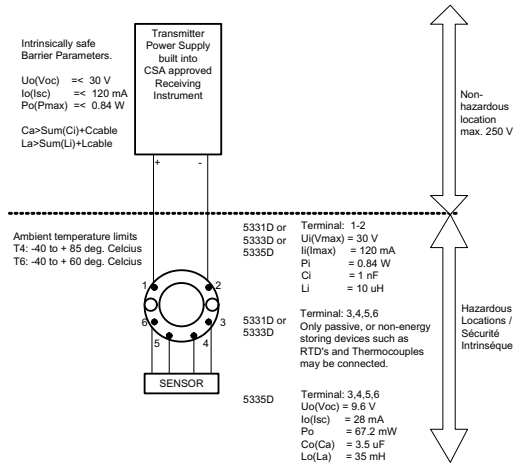
1. Connections with separate power supply and receiver.
Output: Standard 4 – 20 mA loop

**Warning:**

Substitution of components may impair intrinsic safety.

The transmitters must be installed in a suitable enclosure to meet installation codes stipulated in the Canadian Electrical Code (CEC).

2. Connection with power supply and barrier built into receiver.
Output: Standard 4 - 20 mA loop



Warning:
 Substitution of components may impair intrinsic safety.

The Transmitters must be installed in a suitable enclosure to meet installation codes stipulated in the Canadian Electrical Code (CEC).

DK ▶ PR electronics A/S tilbyder et bredt program af analoge og digitale signalbehandlingsmoduler til industriel automation. Programmet består af Isolatorer, Displays, Ex-barrierer, Temperaturtransmittere, Universaltransmittere mfl. Vi har modulerne, du kan stole på i selv barske miljøer med elektrisk støj, vibrationer og temperaturudsving, og alle produkter opfylder de strengeste internationale standarder. Vores motto »Signals the Best« er indbegrebet af denne filosofi – og din garanti for kvalitet.

UK ▶ PR electronics A/S offers a wide range of analogue and digital signal conditioning modules for industrial automation. The product range includes Isolators, Displays, Ex Interfaces, Temperature Transmitters, and Universal Modules. You can trust our products in the most extreme environments with electrical noise, vibrations and temperature fluctuations, and all products comply with the most exacting international standards. »Signals the Best« is the epitome of our philosophy – and your guarantee for quality.

FR ▶ PR electronics A/S offre une large gamme de produits pour le traitement des signaux analogiques et numériques dans tous les domaines industriels. La gamme de produits s'étend des transmetteurs de température aux afficheurs, des isolateurs aux interfaces SI, jusqu'aux modules universels. Vous pouvez compter sur nos produits même dans les conditions d'utilisation sévères, p.ex. bruit électrique, vibrations et fluctuations de température. Tous nos produits sont conformes aux normes internationales les plus strictes. Notre devise »SIGNALS the BEST« c'est notre ligne de conduite - et pour vous l'assurance de la meilleure qualité.

DE ▶ PR electronics A/S verfügt über ein breites Produktprogramm an analogen und digitalen Signalverarbeitungsmodulen für die industrielle Automatisierung. Dieses Programm umfasst Displays, Temperaturtransmitter, Ex- und galvanische Signalrenner, und Universalgeräte. Sie können unsere Geräte auch unter extremen Einsatzbedingungen wie elektrisches Rauschen, Erschütterungen und Temperaturschwingungen vertrauen, und alle Produkte von PR electronics werden in Übereinstimmung mit den strengsten internationalen Normen produziert. »Signals the Best« ist Ihre Garantie für Qualität!

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DK**ADVARSEL**

Følgende operationer bør kun udføres på modulet i spændingsløs tilstand og under ESD-sikre forhold. Installation, ledningsmontage og -demontage. Fejlfinding på modulet. Reparation af modulet må kun foretages af PR electronics A/S.

**ADVARSEL**

PR Loop Link programmeringsenheden må ikke benyttes til kommunikation med moduler installeret i Ex-område. Enhederne skal installeres i henhold til den tilhørende installationsvejledning ved montering i eksplosionsfarligt område.

**SIKKERHEDSREGLER****Montagelse og udpakning**

Udpak modulet uden at beskadige det. Kontrollér ved modtagelsen, at modultypen svarer til den bestilte. Indpakningen bør følge modulet, indtil dette er monteret på blivende plads.

Miljøforhold

Undgå direkte sollys, kraftigt støv eller varme, mekaniske rystelser og stød, og udsæt ikke modulet for regn eller kraftig fugt. Om nødvendigt skal opvarmning, ud over de opgivne grænser for omgivelsestemperatur, forhindres ved hjælp af ventilation.

Installation

Modulet må kun tilsluttes af kvalificerede teknikere, som er bekendte med de tekniske udtryk, advarsler og instruktioner i installationsvejledningen, og som vil følge disse.

Hvis der er tvivl om modulets rette håndtering, skal der rettes henvendelse til den lokale forhandler eller alternativt direkte til **PR electronics A/S**. Installation og tilslutning af modulet skal følge landets gældende regler for installation af elektrisk materiel bl.a. med hensyn til ledningsværnsnit, for-sikring og placering. Beskrivelse af indgang / udgang og forsyningsforbindelser findes i produktmanualen og på sideskiltet.

Kalibrering og justering

Under kalibrering og justering skal måling og tilslutning af eksterne spændinger udføres i henhold til denne installationsvejledning, og teknikeren skal benytte sikkerhedsmæssigt korrekte værktøjer og instrumenter.

Rengøring

Modulet må, i spændingsløs tilstand, rengøres med en klud let fugtet med destilleret vand.

UK**WARNING**

The following operations should only be carried out on a disconnected device and under ESD safe conditions: General mounting, connection and disconnection of wires. Troubleshooting the device. Repair of the device must be done by PR electronics A/S only.

**WARNING**

Do not use the Loop Link programming interface to program the units in Ex area. For installation in classified area the modules must be installed according to the appropriate installation drawings.

**SAFETY INSTRUCTIONS****Receipt and unpacking**

Unpack the device without damaging it. The packing should always follow the device until this has been permanently mounted. Check at the receipt of the device whether the type corresponds to the one ordered.

Environment

Avoid direct sunlight, dust, high temperatures, mechanical vibrations and shock, as well as rain and heavy moisture. If necessary, heating in excess of the stated limits for ambient temperatures should be avoided by way of ventilation.

Mounting

Only qualified technicians who are familiar with the technical terms, warnings, and instructions in this installation guide and who are able to follow these should connect the device. Should there be any doubt as to the correct handling of the device, please contact your local distributor or, alternatively, **PR electronics A/S**. Mounting and connection of the device should comply with national legislation for mounting of electric materials, i.e. wire cross section, protective fuse, and location. Descriptions of input / output and supply connections are shown in the product manual and on the side label.

Calibration and adjustment

During calibration and adjustment, the measuring and connection of external voltages must be carried out according to the specifications of this installation guide. The technician must use tools and instruments that are safe to use.

Cleaning

When disconnected, the device may be cleaned with a cloth moistened with distilled water.

FR**AVERTISSEMENT**

Les opérations suivantes doivent être effectuées avec le module débranché et dans un environnement exempt de décharges électrostatiques (ESD): montage général, raccordement et débranchement de fils et recherche de pannes sur le module. Seule PR electronics SARL est autorisée à réparer le module.

**AVERTISSEMENT**

Ne pas utiliser le kit de programmation "Loop Link" en zone classée dangereuse Ex. Pour des installations en zone classée, les modules doivent être montés conformément aux plans appropriés.

**CONSIGNES DE SECURITE****Réception et déballage**

Déballer le module sans l'endommager. Il est recommandé de conserver l'emballage du module tant que ce dernier n'est pas définitivement monté. A la réception du module, vérifiez que le type de module reçu correspond à celui que vous avez commandé.

Environnement

N'exposez pas votre module aux rayons directs du soleil et choisissez un endroit à humidité modérée et à l'abri de la poussière, des températures élevées, des chocs et des vibrations mécaniques et de la pluie. Le cas échéant, des systèmes de ventilation permettent d'éviter qu'une pièce soit chauffée au-delà des limites prescrites pour les températures ambiantes.

Montage

Il est conseillé de réserver le raccordement du module aux techniciens qualifiés qui connaissent les termes techniques, les avertissements et les instructions de ce guide et qui sont capables d'appliquer ces dernières. Si vous avez un doute quelconque quant à la manipulation du module, veuillez contacter votre distributeur local. Vous pouvez également vous adresser à **PR electronics SARL**.

Le montage et le raccordement du module doivent être conformes à la législation nationale en vigueur pour le montage de matériaux électriques, par exemple, diamètres des fils, fusibles de protection et implantation des modules. Les connexions des alimentations et des entrées / sorties sont décrites dans le manuel du produit et sur l'étiquette de la face latérale du module.

Etalonnage et réglage

Lors des opérations d'étalonnage et de réglage, il convient d'effectuer les mesures et les connexions des tensions externes en respectant les spécifications mentionnées dans ce guide. Les techniciens doivent utiliser des outils et des instruments pouvant être manipulés en toute sécurité.

Maintenance et entretien

Une fois le module hors tension, prenez un chiffon imbibé d'eau distillée pour le nettoyer.

DE**WARNUNG**

Følgende Maßnahmen sollten nur in spannungslosem Zustand des Gerätes und unter ESD-sicheren Verhältnisse durchgeführt werden: Installation, Montage und Demontage von Leitungen. Fehlersuche im Gerät. Reparaturen des Gerätes dürfen nur von PR electronics A/S vorgenommen werden.

**WARNUNG**

Benutzen Sie die Programmierschnittstelle Loop Link nicht im Ex Bereich. Zur Montage in klassifizierten Zonen müssen die Geräte nach den dazugehörigen Einbauezeichnungen installiert werden.

**SICHERHEITSREGELN****Empfang und Auspacken**

Packen Sie das Gerät aus, ohne es zu beschädigen, und kontrollieren Sie beim Empfang, ob der Gerätetyp Ihrer Bestellung entspricht. Die Verpackung sollte beim Gerät bleiben, bis dieses am endgültigen Platz montiert ist.

Umgebungsbedingungen

Direkte Sonneneinstrahlung, starke Staubentwicklung oder Hitze, mechanische Erschütterungen und Stöße sind zu vermeiden; das Gerät darf nicht Regen oder starker Feuchtigkeit ausgesetzt werden. Bei Bedarf muss eine Erwärmung, welche die angegebenen Grenzen für die Umgebungstemperatur überschreitet, mit Hilfe eines Kühlgebäuses verhindert werden.

Installation

Das Gerät darf nur von qualifizierten Technikern angeschlossen werden, die mit den technischen Ausdrücken, Warnungen und Anweisungen in dieser Installationsanleitung vertraut sind und diese befolgen. Sollten Zweifel bezüglich der richtigen Handhabung des Gerätes bestehen, sollte man mit dem Händler vor Ort Kontakt aufnehmen. Sie können aber auch direkt mit **PR electronics GmbH** Kontakt aufnehmen.

Die Installation und der Anschluss des Gerätes haben in Übereinstimmung mit den geltenden Regeln des jeweiligen Landes bez. der Installation elektrischer Apparaturen zu erfolgen, u.a. bezüglich Leitungsquerschnitt, (elektrischer) Vor-Abseicherung und Positionierung. Eine Beschreibung von Eingangs- / Ausgangs- und Versorgungsanschlüssen befindet sich im Produktmanual und auf dem Typenschild.

Kalibrierung und Justierung

Während der Kalibrierung und Justierung sind die Messung und der Anschluss externer Spannungen entsprechend dieser Installationsanleitung auszuführen, und der Techniker muss hierbei sicherheitsmäßig einwandfreie Werkzeuge und Instrumente benutzen.

Reinigung

Das Gerät darf in spannungslosem Zustand mit einem Lappen gereinigt werden, der mit destilliertem Wasser leicht angefeuchtet ist.

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www.prelectronics.com

DK Installationsvejledningen for teknikere omfatter følgende produkter:

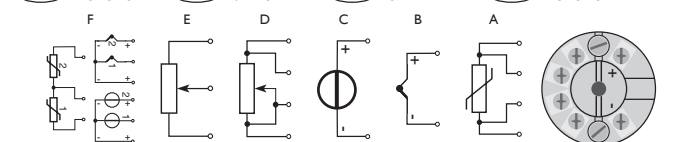
UK This installation guide for technical personnel covers the following products:

FR Ce guide d'installation pour le personnel qualifié couvre les produits suivants:

DE Diese Installationsanleitung für Techniker umfasst die folgenden Produkte:

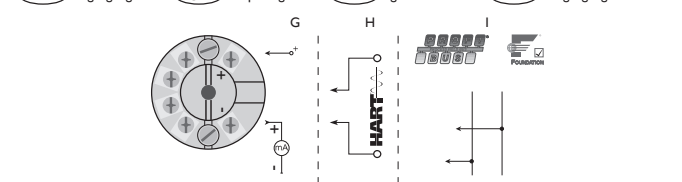
5331A/D	5337A/D
5333A/D	5343A/B
5334A/B	5350A/B
5335A/D	

DK Indgangssignaler **UK** Input signals **FR** Signaux d'entrée **DE** Eingangssignale

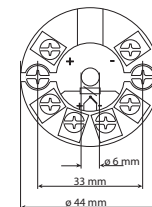


	DK	UK	FR	DE	5331	5333	5334	5335	5337	5343	5350
A	RTD	RTD	RTD	WTH	x	x		x	x		x
B	TC	TC	TC	TE	x		x	x	x		x
C	Spænding	Voltage	Tension	Spannung	x		x	x	x		x
D	Lin R	Lin R	Lin R	Lin R	x	x		x	x	x	x
E	Pot. meter	Pot. meter	Pot. meter	Pot. meter						x	x
F	Differens eller middel; RTD, TC eller mV	Difference, redundancy or average; RTD, TC or mV	Difference, redundancy or average; RTD, TC or mV	Difference, Redundancy or Mittel; WTH, TE oder mV				x	x		x

DK Udgangssignaler **UK** Output signals **FR** Signaux de sortie **DE** Ausgangssignale



	DK	UK	FR	DE	5331	5333	5334	5335	5337	5343	5350
G	Strom	Current	Courant	Strom	x	x	x		x	x	
H	HART	HART	HART	HART				x	x		
I	PROFIBUS eller FOUNDATION FIELDBUS	PROFIBUS or FOUNDATION FIELDBUS	PROFIBUS ou FOUNDATION FIELDBUS	PROFIBUS oder FOUNDATION FIELDBUS							x

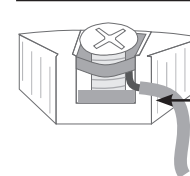


DK Mekaniske specifikationer.

UK Mechanical specifications.

FR Dimensions mécaniques.

DE Abmessungen.



DK **Montering af følerledninger**
Ledninger monteres mellem metalpladerne. Ledningskvadrat (max.) 1 x 1,5 mm² flertrådet ledning. Klemmekræft/spændingsmoment 0,4 Nm.

UK **Mounting of sensor wires**
Wires must be mounted between the metal plates. Max. wire size 1 x 1.5 mm² stranded wire. Screw terminal torque 0.4 Nm.

FR **Montage des fils du capteur**
Les fils doivent être montés entre les plaques métalliques. Taille max. des fils 1 x 1,5 mm² fils multibrins. Pression max. avant déformation de la vis 0,4 Nm.

DE **Montage von Fühlerleitungen**
Die Leitungen müssen zwischen den Metallplatten montiert werden. Leitungsquerschnitt (max.) 1 x 1,5 mm² Litzenstrahl. Klemmschraubenanzugsmoment 0,4 Nm.

DK**PC-programmering af SYSTEM 5300**

Modul et konfigureres til den aktuelle opgave ved hjælp af en PC og PR electronics A/S' communications interface Loop Link. Det er muligt at konfigurere modulet både med og uden tilsluttet forsyningsspænding, idet kommunikationsinterface leverer nødvendig forsyning til opsettningen. Kommunikationsinterface er galvanisk isoleret, så PC'en port er optimalt beskyttet. Kommunikationen er 2-vejs, så modulets opsætning kan hentes ind i PC'en, og opsettningen i PC'en kan sendes ind til modulet. For de brugere, der ikke selv vil foretage opstilling, kan modulet leveres konfigureret efter oplyst specifikation: indgangstype, måleområde, felerfejlsdetektering og udgangssignal.

Elektriske specifikationer

Spektationsområde	-40°C til +85°C
Forsyningsspænding, 5331 & 5334	7,2...30 VDC
Forsyningsspænding, 5333, 5335, 5337 & 5343	8,0...30 VDC
Forsyningsspænding, 5350	9,0...32 VDC
Isolationsspænding, test / oper.	1,5 kVAC / 50 VAC
Kalibreringstemperatur	20...28°C
Relativ fugtighed	< 95% RH (ikke kond.)
Mål	Ø44 x 20,2 mm
Kapslingsklasse (hus/klemme) ...	IP68 / IP00

Indgang for RTD-type:

Pt100 & Ni100

Indgang for TC-type:

B, E, J, K, L, N, R, S, T, U, W3, W5, Lr

Lin R:

Ohm & KOhm

Spændingsindgang:

mV

Strømodgang:

Signalområde	4...20 mA
Min. signalområde	16 mA
Belastningsmodstand, Ω	≤ (Vforsyn.-7,2V)/0,023

Direktiver:

EMC	2004/108/EF
ATEX	94/9/EF

DK

Dokumentation, godkendelser og yderligere information findes på internettet på www.prelectronics.dk

UK

Documentation, permits and other information can be found on the internet at www.prelectronics.com

UK**PC programming of SYSTEM 5300**

The device is configured to the present task by way of a PC and PR electronics A/S' communications interface Loop Link. The device can be configured with or without a connected supply voltage as the communications interface supplies the necessary voltage to the set-up. The communications interface is galvanically isolated to protect the PC port. Communication is 2-way to allow the retrieval of the device set-up into the PC and to allow the transmission of the PC set-up to the device. For users who do not wish to do the set-up themselves, the device can be delivered configured according to customer specifications: input type, measurement range, sensor error detection, and output signal.

Electrical specifications

Specifications range	-40°C to +85°C
Supply voltage, 5331 & 5334	7.2...30 VDC
Supply voltage, 5333, 5335, 5337 & 5343	8.0...30 VDC
Supply voltage, 5350	9.0...32 VDC
Isolation voltage, test / oper.	1.5 kVAC / 50 VAC
Calibration temperature	20...28°C
Relative humidity	< 95% RH (non-cond.)
Dimensions	Ø44 x 20.2 mm
Protection degree (encl./terminal)	IP68 / IP00

Input for RTD types:

Pt100 & Ni100

Input for TC types:

B, E, J, K, L, N, R, S, T, U, W3, W5, Lr

Lin R:

Ohm & KOhm

Voltage input:

mV

Current output:

Signal range	4...20 mA
Min. signal range	16 mA
Load resistance, Ω	≤ (Vsupply-7.2V)/0.023

Directives:

EMC	2004/108/EC
ATEX	94/9/EC

FR

La documentation et toute autre information peuvent être trouvées sur l'Internet sur notre site: www.prelectronics.fr

DE

Dokumentationen, Zulassungen und andere Informationen können auf unserer Internet-Seite unter www.prelectronics.de gefunden und abgerufen werden.

FR**Programmation par PC du SYSTEME 5300**

Le module peut être programmé en fonction d'une application donnée à partir d'un PC et le kit de programmation Loop Link de PR electronics A/S. Le module peut être programmé sans être alimenté car l'interface de communication fournit l'alimentation nécessaire pour la configuration. L'interface de communication est dotée d'une isolation galvanique pour protéger le port du PC. La communication est bidirectionnelle. Cela permet non seulement la programmation du module mais également la récupération d'une configuration existante ainsi que la lecture du numéro de série et du repère. Le module peut être livré déjà programmé, si l'utilisateur le souhaite.

Spécifications

Plage de température	-40°C à +85°C
Tension d'alimentation, 5331 & 5334	7,2...30 Vcc
Tension d'alimentation, 5333, 5335, 5337 & 5343	8,0...30 Vcc
Tension d'alimentation, 5350	9,0...32 Vcc
Tension d'isolation test / opér.	1,5 kVca / 50 Vca
Température d'étalonnage	20...28°C
Humidité relative	< 95% HR (sans cond.)
Dimensions	Ø44 x 20,2 mm
Degré de protection (boîtier/bornier)	IP68 / IP00

Entrée pour types RTD:

Pt100 & Ni100

Entrée pour types TC:

B, E, J, K, L, N, R, S, T, U, W3, W5, Lr

Lin R:

Ohm & KOhm

Entrée tension:

mV

Sortie courant:

Gamme de signal	4...20 mA
Plage de signal min.	16 mA
Résistance de charge, Ω	≤ (Valim.-7,2V)/0,023

Directives:

CEM	2004/108/CE
ATEX	94/9/CE

BR

Documentações, licenças e outras informações podem ser encontradas no site www.prelectronics.com

DE**PC-Programmierung des Systems 5300**

Das Gerät wird für die jeweilige Aufgabe mit Hilfe eines PCs und PR electronics A/S Kommunikationsschnittstelle Loop Link konfiguriert. Es ist möglich, das Gerät sowohl mit als auch ohne angeschlossene Versorgungsspannung zu konfigurieren, da die Kommunikationsschnittstelle die notwendige Versorgung für die Einstellung liefert. Die Kommunikationsschnittstelle ist galvanisch isoliert, sodass der Anschluss des PCs optimal geschützt ist. Die Kommunikation erfolgt in beiden Richtungen, sodass die Einstellung des Gerätes in den PC geholt, und die Einstellung im PC an das Gerät gesandt werden kann. Für diejenigen Anwender, welche die Einstellung nicht selbst vornehmen wollen, kann das Gerät nach folgenden Kundenspezifikationen konfiguriert geliefert werden: Eingangstyp, Messbereich, Fehlerfehlererkennung und Ausgangssignal.

Elektrische Daten

Spezifikationsbereich	-40°C bis +85°C
Versorgungsspannung, 5331 & 5334	7,2...30 VDC
Versorgungsspannung, 5333, 5335, 5337 & 5343	8,0...30 VDC
Versorgungsspannung, 5350	9,0...32 VDC
Isolationsspannung, Test / Betrieb	1,5 kVAC / 50 VAC
Kalibrierungstemperatur	20...28°C
Luftfeuchtigkeit	< 95% RF (nicht kond.)
Maß	Ø44 x 20,2 mm
Schutzart (Gehäuse / Anschluss)	IP68 / IP00

Eingang für WTH-Typen:

Pt100 & Ni100

Eingang für TE-Typen:

B, E, J, K, L, N, R, S, T, U, W3, W5, Lr

Lin R:

Ohm & KOhm

Spannungseingang:

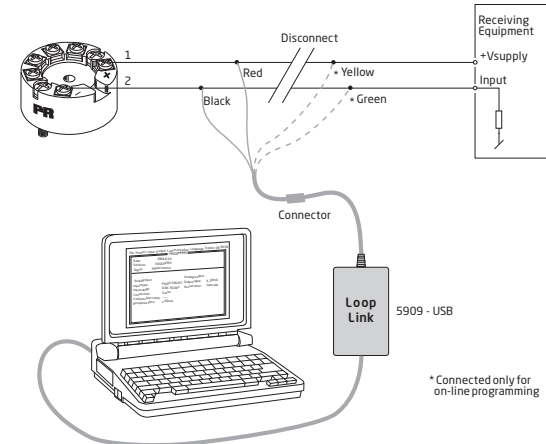
mV

Stromausgang:

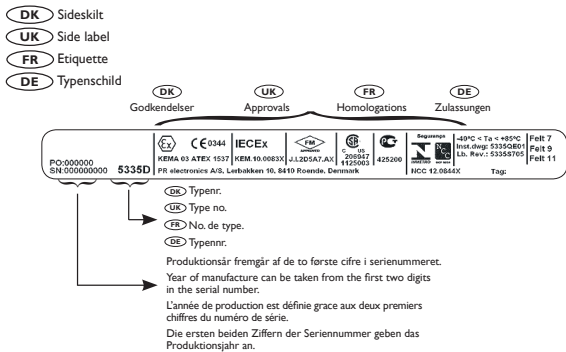
Signalbereich	4...20 mA
Min. Signalbereich	16 mA
Belastungswiderstand, Ω	≤ (Vversorg.-7,2V)/0,023

Richtlinien:

EMV	2004/108/EG
ATEX	94/9/EG



- DK** Loop Link er et kommunikationsinterface, der er nødvendigt for programmering af PRetop 53xx. Loop Link må ikke benyttes til kommunikation med moduler installeret i Ex-område.
- UK** Loop Link is a communications interface that is needed for programming PRetop 53xx. Loop link is not approved for communication with devices installed in hazardous (Ex) areas.
- FR** Loop Link est un kit de programmation permettant de programmer le PRetop 53xx. Loop Link ne doit pas être utilisé pour communication avec des modules installés en zone dangereuse.
- DE** Loop Link ist eine Schnittstelle zur Programmierung des PRetop 53xx. Loop Link darf nicht zur Kommunikation mit Geräten, die in Ex-gefährdeten Bereichen installiert sind, benutzt werden.



DK Godkendelser **UK** Approvals **FR** Approbations **DE** Zulassungen **BR** Aprovações

	ATEX	Area / Zone	Installation drawing	IECEX	Area / Zone	Installation drawing	FM	Zone / Div.	Installation drawing	CSA	Zone / Div.	Installation drawing	INMETRO	Area	Installation drawing	NEPSI	DNV	GOST R / Ex
5331A & 5334A	KEMA 10ATEX0002 X	2, 22	5331QA02	DEK 13.0035X	2, 22	5331QI02							DEKRA 13.0001 X	2, 22	5331QB02		Standard No. 2.4	GOST R
5333A	KEMA 10ATEX0003 X	2, 22	5333QA02	DEK 13.0036X	2, 22	5333QI02							DEKRA 13.0002 X	2, 22	5333QB02		Standard No. 2.4	GOST R
5335A & 5337A	KEMA 03ATEX1508 X	2, 22	5335QA02	KEM 10.0083X	2, 22	5335QI02							NCC 12.0844X	2, 22	5335QE01		Standard No. 2.4	GOST R
5343A	KEMA 10ATEX0004 X	2, 22	5343QA02	DEK 13.0036X	2, 22	5333QI02							DEKRA 13.0002 X	2, 22	5333QB02		Standard No. 2.4	GOST R
5350A	KEMA 03ATEX1011 X	2, 22	5350QE01				3015609	2 / Div 2	5350QE01	1418937	2 / Div 2	5350QE01				GYJ091289U		GOST R
5331D	KEMA 06ATEX0062 X	0, 1, 2, 20, 21, 22	5331QA01	DEK 13.0035X	0, 1, 2, 20, 21, 22, M	5331QI01	2D5A7.AX	0, 1, 2 / Div 1, 2	5300Q502	1125003	0, 1, 2 / Div 1, 2	533XQC03	DEKRA 13.0001 X	0, 1, 2, 20, 21, 22	5333QB01		Standard No. 2.4	GOST Ex
5333D	KEMA 03ATEX1535 X	0, 1, 2, 20, 21, 22	5333QA01	DEK 13.0036X	0, 1, 2, 20, 21, 22, M	5333QI01	2D5A7.AX	0, 1, 2 / Div 1, 2	5300Q502	1125003	0, 1, 2 / Div 1, 2	533XQC03	DEKRA 13.0002 X	0, 1, 2, 20, 21, 22	5333QB01		Standard No. 2.4	GOST Ex
5334B	KEMA 06ATEX0062 X	0, 1, 2, 20, 21, 22	5331QA01	DEK 13.0035X	0, 1, 2, 20, 21, 22, M	5331QI01							DEKRA 13.0001 X	0, 1, 2, 20, 21, 22	5331QB01		Standard No. 2.4	GOST Ex
5335D & 5337D	KEMA 03ATEX1537 X	0, 1, 2, 20, 21, 22, M	5335QE01	KEM 10.0083X	0, 1, 2, 20, 21, 22, M	5335QE01	2D5A7.AX	0, 1, 2 / Div 1, 2	5300Q502	1125003	0, 1, 2 / Div 1, 2	533XQC03	NCC 12.0844X	0, 1, 2, 20, 21, 22, M	5335QE01		Standard No. 2.4	GOST Ex
5343B	KEMA 03ATEX1538 X	0, 1, 2, 20, 21, 22	5343QA01	DEK 13.0036X	0, 1, 2, 20, 21, 22, M	5333QI01							DEKRA 13.0002 X	0, 1, 2, 20, 21, 22	5333QB01		Standard No. 2.4	GOST Ex
5350B	KEMA 02ATEX1318 X	0, 1, 2, 20, 21, 22	5350QE01	BVS 12.0035X	0, 1, 2, 20, 21, 22, M	5350QE01	3015609	0, 1, 2 / Div 1, 2	5350QE01	1418937	0, 1, 2 / Div 1, 2	5350QE01	NCC 12.1009 X	0, 1, 2, 20, 21, 22, M	5350QE01	GYJ091290X		GOST Ex

2.1.2.1.1.10. 830747025 - PRESSURE TRANSDUCER WIKA 25 BAR

ref. [2.1.1.1: MUMC830747100C02R0.pdf](#)

2.1.2.1.2. IRSW95F3W04 - ITEM

2.1.2.1.2.1. 72505260 - HEAT EXCHANGER BRAZE WELDING DOC 52-60

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NL	Installatiehandleiding Alfa Laval warmtewisselaars met hardgesoldeerde platen	23
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ZH	安裝手冊 Alfa Laval 釐焊板式熱換器	103

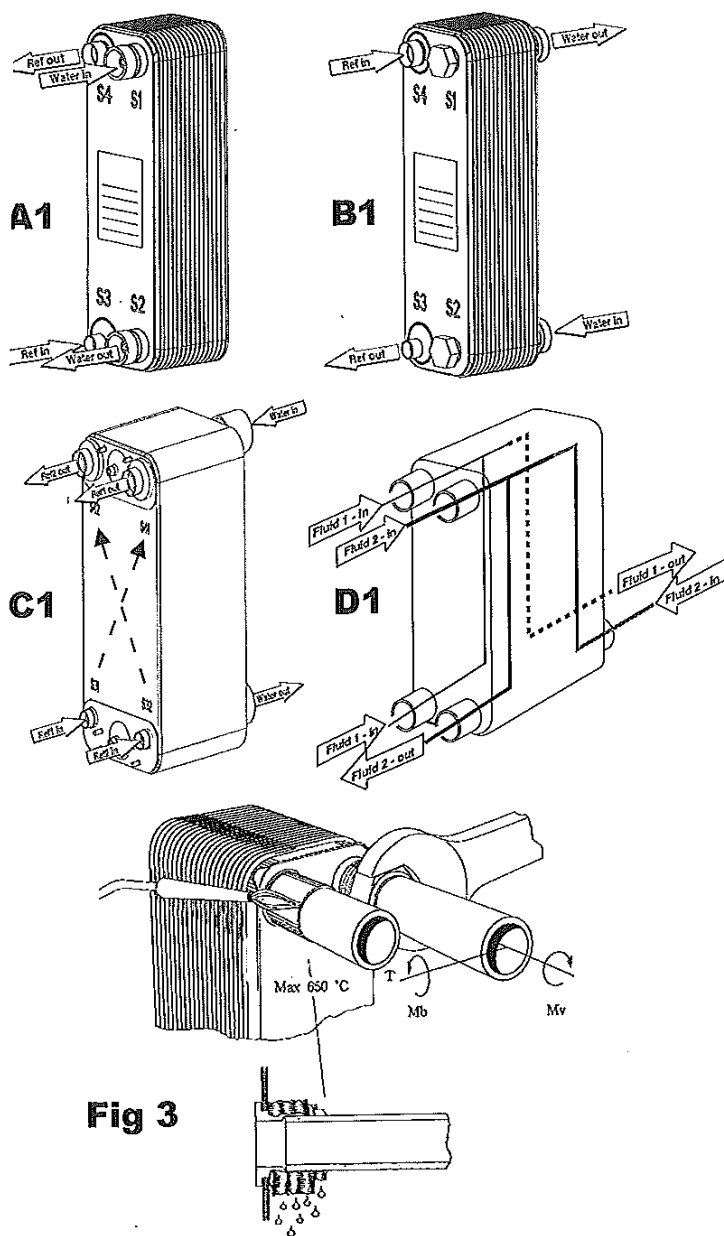


Fig 3

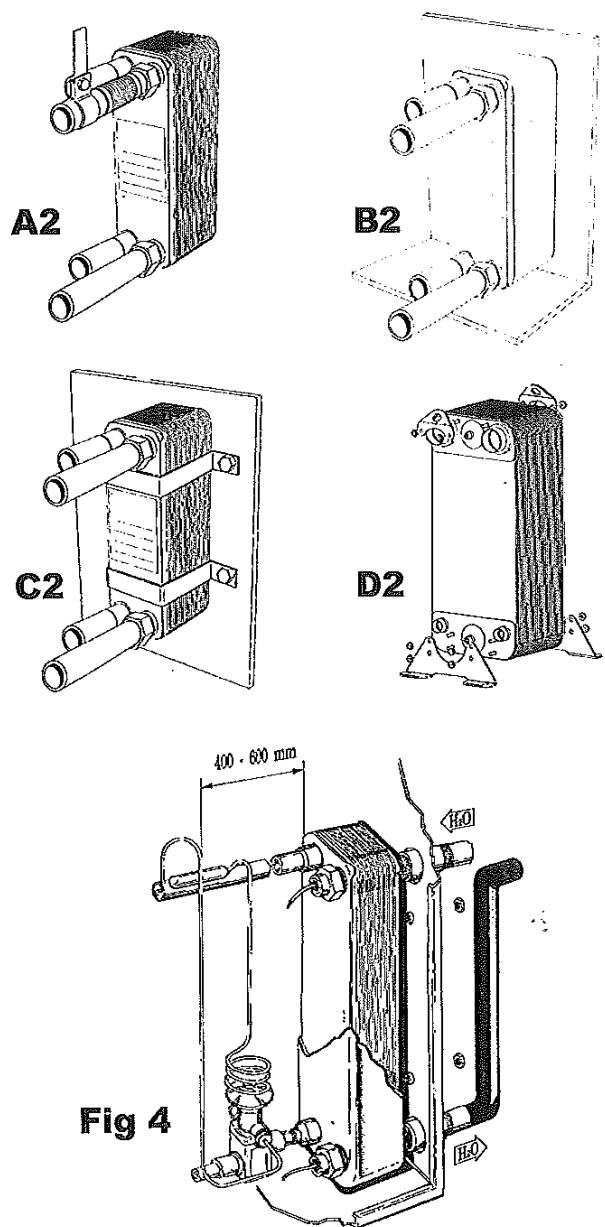


Fig 4

Limits for Connection loads

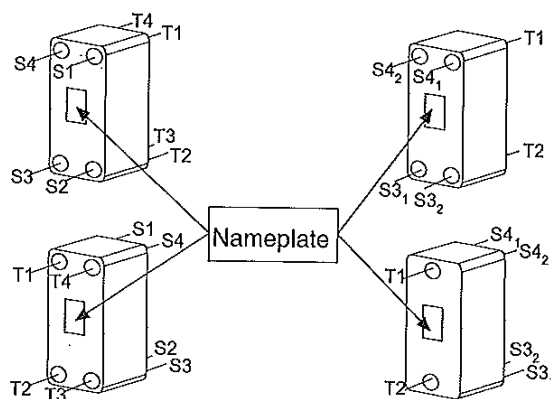
Outside dia mm	F (kN)	F (lb)	Mv (Nm)	Mv (lB *ft)	Mb (Nm)	Mb (lB *ft)
10-20 (0.4-0.8")	5	1120	70	52	36	27
20-30 (0.8-1.2")	6	1350	160	118	61	45
30-50 (1.2-2")	10	2250	500	370	300	220
50-80 (2-3.1")	15	3370	800	590	750	550
80-110 (3.1-4.3")	20	4500	1000	740	915	675

Two nameplates, type 1 and type 2, exist depending on the type of pressure vessel approval.

Nameplate type 1 shows:

1. Space for logotype.
2. Manufacturer's name.
3. Article number.
4. Type.
5. Manufacturing number.
6. Date of manufacture.
7. Locations of connections for each fluid.
8. Max. permissible operating temperatures.
9. Max. permissible operating pressures.
10. Test pressure.
11. Volume of each space.
12. Permissible operating temperatures and pressures.
13. Operating area.
14. Description of each space.
15. Fluid group.
16. Information unique to the customer.
17. *Possible locations of connections.
18. Bar code information.
19. Space for mark of approval.
 - CE-409 BHE Manufacturing, Ronneby, Sweden
 - CE-036 Alfa Laval (Jiangyin) Manufacturing Co., Ltd, Jiangyin City, PRC
 - CE-0948 Alfa Laval S.p.A. Alonte, Italy.

Sketch on nameplate showing possible locations of connections depending on heat exchanger execution.



Nameplate type 2 shows:

1. Space for logotype.
2. Manufacturer's name.
3. Article number.
4. Type.
5. Manufacturing number.
6. Date of manufacture.
7. Locations of connections for each fluid.
8. Max. permissible operating temperatures.
9. Max. permissible operating pressures.
10. Test pressure.
11. Volume of each space.

12. Fluid group.
13. Information unique to the customer.
14. *Possible locations of connections.
15. Bar code information.
16. Space for mark of approval
 - CE-409 BHE Manufacturing, Ronneby, Sweden
 - CE-036 Alfa Laval (Jiangyin) Manufacturing Co., Ltd, Jiangyin City, PRC
 - CE-0948 Alfa Laval S.p.A. Alonte, Italy.

*) Sketch on nameplate showing possible locations of connections depending on heat exchanger execution.



Caution: The heat exchanger must be installed and operated in such a manner that no risk of injury to personnel and damage to property will be incurred.

Note: Unless otherwise specified, product data for normal refrigerants, i.e. HFC and HCFC, are applicable to refrigeration applications. The manufacturer must be specifically consulted before the heat exchanger is used for flammable, toxic or dangerous liquids (e.g. hydrocarbons). The use must follow the relevant safety rules for handling such liquids. For further information, please refer to the Internet site of the supplier.

Installation

The installation must be provided with equipment that protects the heat exchanger against pressures and temperatures outside the approved minimum and maximum values shown on the nameplate.

For best possible heat transfer performance, the heat exchanger should be connected so that the media flow through the heat exchanger in opposite directions (in counter-flow). Take into account the risk of fire during the installation work, i.e. bear in mind the distance to flammable substances.

For refrigeration applications – Figure A1 shows the installation of an evaporator, for which the connections may be either on the front or on the rear. Figure B1 shows a condenser.

Figure C1 shows a double-circuit unit having one water circuit and two independent refrigerant circuits. Unless otherwise specified, the refrigerant circuits have diagonal flow. Connect the refrigerant to the side with the brazed connections (or Rotalock), with the inlet at the bottom for an evaporator. The expansion valve should be located at least 150–200 mm from the connection at S3. Pipe elbows between the expansion valve and the connection should be avoided. Order the heat exchanger with the connection position for the liquid (water) side that is best suited for the installation, i.e. (S1, S2) or (T1, T2). Figure D1 shows a pre/post heater.

Mounting

In a rigid pipe system, small heat exchangers (weighing 1–6 kg) can be suspended directly in the pipe-work (Figure A2). Larger heat exchangers should be secured with

support mountings (Figure D2) intended for a specific heat exchanger (accessory), or be secured with straps (Figure C2) or by means of mounting bolts (Figure B2). To special order, mounting bolts can be welded to the front or rear. The tightening torque for M8 bolts is 10–12 Nm, and for M10 bolts 22–25 Nm.



If there is risk of vibrations, use anti-vibration mountings as shown in Figure A2. Heat exchangers with refrigerant distributors should be mounted with the distributor at the bottom.

Feet and lifting lugs are available for larger units. These components should be mounted as shown in Figure D2.

N.B. The pipe-work should be well anchored and must not apply loads to the heat exchanger connections.

N.B. In evaporator applications and in applications in which a phase change of the media occurs, the heat exchanger should be installed vertically.

Connections (Figure 3)

Threaded connections – Use a torque wrench when connecting the pipe and observe the specified limits. Some models are supplied with connections type Victaulic.

Brazed connections – Clean by rubbing down and degreasing the various surfaces. Use a brazing metal grade that is suitable for the materials being brazed, and use the correct brazing temperature.

Welded connections – TIG or MIG welding. Grind inside and outside of the pipe and, if bevelled, also the bevelled edge at least 25 mm from the pipe edge and inward. This should be done to avoid contamination of copper in the welded area, which might cause the weld to crack.

N.B. Protect the heat exchanger against overheating by wrapping a piece of wet cloth around the connection whenever any brazing or welding is being done. Excessive heating could melt the internal brazing metal inside the heat exchanger.



Risk of freezing

Bear in mind the risk of freezing at low temperatures. Heat exchangers that are not in operation should be emptied and blown dry whenever there is risk of freezing.

N.B. To avoid damage due to freezing, the medium used must include an anti-freeze agent at operating conditions below its freezing point.

N.B. Use a filter as protection against the possible occurrence of foreign particles. If you have any doubt concerning the maximum particle size, consult your nearest representative of the supplier or look under Product information at the supplier's Internet site.

N.B. When used as an evaporator (Figure 4)

- Use an anti-freeze thermostat and flow monitor to ensure a constant water flow before, during and after the compressor has been running.

- Avoid "pump-down", i.e. emptying the evaporator by running the compressor after shutdown until a preset refrigerant pressure is reached. The temperature could then drop below the brine freezing point, which could damage the evaporator.
- Use a flow switch and a low-pressure switch.



Control and operation

The following should be borne in mind to ensure that the heat exchanger will operate satisfactorily and have the longest possible useful life.

- Locate the temperature sensor as close as possible to the outlet from the heat exchanger.
- Sudden temperature and pressure changes could cause fatigue damage to the heat exchanger. To ensure longest possible lifetime for the BHE, it is important to dimension and choose valves and regulation equipment which give stable temperatures in the unit. With stable regulation and temperatures, the lifetime will not be limited due to fatigue.
- To avoid water hammer, do not use quick-closing valves. On/Off control by pressure pulses through the heat exchanger should not be employed.
- Do not use the heat exchanger for media (e.g. de-ionized water)/installations (e.g. galvanized pipes) that (chemically/electrochemically) could affect or be affected by the plates (Stainless steel) and the brazing material (Copper). The AlfaNova heat exchanger is manufactured in 100 % stainless steel.

Insulation

Specially designed insulation is available as an accessory. Airtight insulation is recommended and is necessary if the heat exchanger is used as an evaporator at low temperatures.

Troubleshooting

To ensure correct performance of the heat exchanger, check that:

- the connection has been correctly made as shown in this manual
- the heat exchanger is perfectly clean and free from deposits. Particles and fibers could clog the heat exchanger. An increase in pressure drop or a drop in thermal efficiency indicates that the heat exchanger is fouled.
- the control circuit is correctly preset and no freezing occurs.

Cleaning

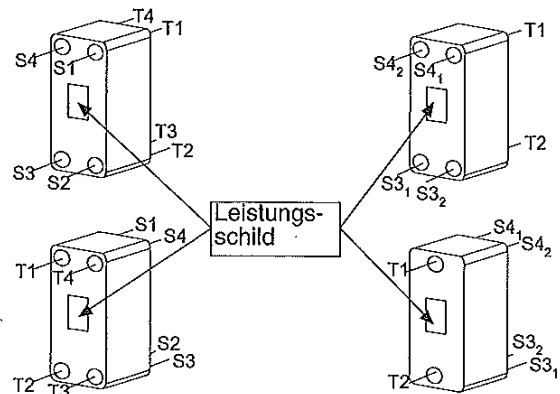
The equipment is suitable for cleaning in place. For advice on suitable cleaning processes, consult the representative of the supplier or visit the Internet site of the supplier. The person responsible for operation should ensure that the correct cleaning method is used and should decide on suitable cleaning intervals.

Es gibt zwei Leistungsschilder, Typ 1 und Typ 2, je nach Zulassung des Druckbehälters.

Angaben auf dem Leistungsschild Typ 1:

1. Platz für Logotype.
2. Name des Herstellers.
3. Artikelnummer.
4. Typ.
5. Fertigungsnummer.
6. Datum der Herstellung.
7. Positionen der Anschlüsse für jede Flüssigkeit.
8. Höchstzulässige Betriebstemperaturen.
9. Höchstzulässige Betriebsdrücke.
10. Testdruck.
11. Volumen jedes Raums.
12. Zulässige Betriebstemperaturen und Betriebsdrücke.
13. Betriebsbereich.
14. Beschreibung jedes Raums.
15. Flüssigkeitsgruppe.
16. Kundenspezifische Informationen.
17. *Mögliche Positionen von Anschlüssen.
18. Streifencode-Informationen.
19. Platz für CE-Markierung oder andere Zulassung.
 - CE-409 BHE Manufacturing, Ronneby, Schweden
 - CE-036 Alfa Laval (Jiangyin) Manufacturing Co., Ltd, Jiangyin City, Volksrepublik China
 - CE-0948 Alfa Laval S.p.A. Alonte, Italien.

*) Die Zeichnung auf dem Leistungsschild zeigt mögliche Positionen von Anschlüssen abhängig von der Ausführung des Wärmeübertragers..



Angaben auf dem Leistungsschild Typ 2:

1. Platz für Logotype.
2. Name des Herstellers.
3. Artikelnummer.
4. Typ.
5. Fertigungsnummer.
6. Datum der Herstellung.
7. Positionen der Anschlüsse für jede Flüssigkeit.
8. Höchstzulässige Betriebstemperaturen.
9. Höchstzulässige Betriebsdrücke.
10. Testdruck.
11. Volumen jedes Raums.
12. Flüssigkeitsgruppe.
13. Kundenspezifische Informationen.
14. *Mögliche Positionen von Anschlüssen.
15. Streifencode-Informationen.
16. Platz für CE-Markierung oder andere Zulassung.

safe S.p.A.	Shell and tube exchanger use and maintenance manual for gas/liquid heat exchange
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Shell and tube exchanger use and maintenance manual for gas/liquid heat exchange

0	Issue	Paganelli	Cammarata	Paganelli	04/05/2012
REV	DESCRIPTION	PREPARED	CHECKED	APPROVED	DATE

© 2012 SAFE S.p.A, all rights reserved	JOB No	
	DOCUMENT No	MUM0000183R0
	PAGE No	1 OF 11

safe S.p.A.	Shell and tube exchanger use and maintenance manual for gas/liquid heat exchange
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	DOCUMENT No	MUM0000183R0
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	Shell and tube exchanger use and maintenance manual for gas/liquid heat exchange
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1 FOREWORD

This use and maintenance manual is a tool available to personnel installing, operating, and maintenance to avoid any defect of operation and maintenance. exceeding the limits set by the project, and on the rating plate of each type of heat exchanger, even temporarily, should be avoided completely as it can damage the heat exchanger and compromise the safety of personnel.

Safe s.r.l. is not considered responsible for any damage or injury caused by failure to follow operating instructions described here.

Use and installation are allow only to an expert technical operators.

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	DOCUMENT No	MUM0000183R0
	PAGE No	3 OF 11

safe S.p.A.	Shell and tube exchanger use and maintenance manual for gas/liquid heat exchange
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2 APPLICABILITY

This manual is applicable to follow SAFE components:

CODE	CONNECTIONS	MAX ALLOWABLE PRESSURE
22F0006900.R1	1-1/2"G	50
22F0007603	1-1/2"G	200
22F0005490	1-1/2"G	200
22F0002941.R6	1-1/2"G	200
22F0002131P.R10	1-1/2"G	340
22F0005483	1-1/2"G	340
22F0005010	1-1/2"G	340
22F0005491	1-1/2"G	340
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22F0005489.R1	2" flanged	85
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22F0005024	3" flanged	40
22F0004672	4" flanged	90
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3 HAZARD IDENTIFICATION

- The internal part of the heat exchanger during use is filled with compressed gas, highly flammable, it is therefore necessary to use extreme care in order to minimize any risk of explosion and fire, in particular attention is paid to the identification of losses from gas circuit to water circuit.
- The metallic surface of the hot side of the heat exchanger can be very warm (150 ° C), then there is the risk of to receive burns, in the event that is touched without the aid of special insulating protection (eg gloves). It 'also need to cool the heat exchanger before performing maintenance: in the case in which stops the machine, the water contained inside the heat exchanger can reach high temperatures, which can cause burns.
- The water cooling circuit of the heat exchanger is usually full of water containing antifreeze additives. These fluids are generally toxic and irritating to the eyes. Be sure to turn off the pump and drain the water before removing pipes, so as to limit the risk of producing sketches, which may accidentally come into contact with eyes or mucous membranes. In the event that occurs, consult a physician immediately. Particular care must be taken during the purge from the air: the nozzle of the drain valve should be directed away from people.
- Be care particular to water and gas connection operations. Gas should has always connected to opposite heat exchanger connections, and the water to the cylindrical shell side. Never to connect gas to shell, because it's not designed to gas pressure, so could explode.
- The only codes completely realized in stainless steel are as follows:

22F0006900.R1

22F0007603

22F0007604

This heat exchangers could work also in case of H2S or CO2 and liquid water.

Other models could work only in case of H2S and CO2 max values in agree at Italian network code, in case of condensed liquids, such as 3% in volume of CO2, and 6.6mg/SMC of H2S. In the absence of liquid water, the heat exchanger is able to manage any CO2 content, and up to 10000ppmv of H2S.

All heat exchangers can also be used with inert gases (such as nitrogen, helium) or any mixture of hydrocarbons, also liquids. Are to be avoided in any case all other acid gases (eg

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hydrochloric acid, sulfuric ...), which would lead in a short time to damage the heat exchanger.

If in doubt, contact SAFE srl.

- In the case wherein to cool humid hydrocarbons high pressure is necessary to consider the risk of formation of hydrates solids which may occlude the tube bundle. Hydrates are solid ice-like crystals compose of water and hydrocarbons. Unlike the ice formed by water alone, however, are very stable at temperatures above 0 ° C. For example, to 250bar is likely the formation of hydrates solids even at temperatures of 20-25 ° C. If it is necessary to cool gases of this type, is well to provide the injection of cooling liquids in the gas stream, such as methanol, ethanol, or glycols.
- The gas flowing in the heat exchangers must be filtered with a filtration rating of at least 1 micron, in order to prevent clogging of the bundle pipes. It 'also recommended not to use heat exchangers with gas containing paraffin or waxy substances which may condense during the cooling and occlude the heat exchanger during operation.

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4 INSTALLATION

The heat exchangers are normally supplied as part of complete plants, in this case do not require any installation activities. In the case wherein the heat exchanger is supplied as a spare, are described below the required operations of installation.

4.1 HANDLING AND UNPACKING

Heat exchangers covered in this manual are heavy items, weighing between 50 and 150kg in relation to dimension. It is therefore necessary to use special handling equipment, taking care to ensure that the weight of the heat exchanger, indicated on the label, is always lower than the maximum weight portable by the equipment. Sling the heat exchanger with two bands at the ends for lifting, taking care that the sling is stable and can not slide. If the heat exchanger is affected by shocks during transport or handling, you must ask the change. Check for damage when unpacking.

The heat exchanger is usually supplied packed. Before installation, carefully remove the packaging, taking care not to scratch or damage the heat exchanger. Remove plugs of gas and water connections.

4.2 INSTALLATION

Fix to skid frame the heat exchanger to install it.

Connect the water pipes to external shell and gas pipes to opposite connection. During installation, to be care to the follow points:

- 1) Verify that the same line upon which is positioned the heat exchanger has been installed a safety valve, with a relief pressure not higher than the maximum operating pressure of the heat exchanger. The operating pressure of each heat exchanger, and the relief valve pressure are always indicated on the labels of its components. If this is not verified, the heat exchanger is not suitable for the application.
- 2) The operation of the exchanger is provided in counterflow, is well then verify that the flow of water and gas are carried out in the opposite direction, at the end of the pipe connection.

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4.3 START-UP

Once installed, perform the following steps to start up the heat exchanger:

- 1) Refill the cooling circuit with water mixed with antifreeze fluids for industrial applications glycol base. The proportion of the mixture is generally a function of the minimum temperature to operate, and is generally indicated in the instruction sheet of each product. In case it is sure that the temperature never falls below 0 ° C, is however not recommended the use of pure water without additives. Always add at least anti-corrosion additives, and which prevent limescale deposits, which are usually already included in the normal antifreeze fluids. It is also advisable the use of distilled water, to completely eliminate the risk of introduction of impurities, or the formation of calcareous deposits over time.
- 2) Manually start the pump and purge the air cooling circuit.
- 3) Fill gradually gas pipes: in case of high pressure heat exchangers, the sudden opening of the line can cause water hammer which can damage the heat exchanger.
- 4) Start-up the plant.

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5 PREVENTIVE MAINTENANCE

The heat exchanger normally requires no special maintenance routines. Perform only the following checks:

- 1) Monthly check that there are no gas leaks in the water circuit, checking the possible presence of bubbles in the expansion tank machine is running (Please check each month).
- 2) Monthly verify that there are no significant variations in heat exchange efficiency of the heat exchanger, checking the temperature of the gas discharge of the heat exchanger is not higher than about 10° C to ambient temperature. The check may be done with a optical thermometer, or qualitatively by placing the hand on the cold gas pipes.
- 3) Annually inspect shell and tube, disconnecting the gas and water pipes, and verifying that there are no deposits or signs of corrosion.

Approximately once every 1-2 years is also advisable to carry out a cycle of descaling with special fluids, such as IRCIS Sequio 600 and Sequio 200.

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6 CORRECTIVE MAINTENANCE

In case you detect failures, it is necessary to take action on the heat exchanger, in order to restore proper operating. The following are described the main failures, and methods of detection.

- 1) In the case wherein gas bubbles are detected in the expansion tank of the circuit, it is necessary to check the gas seal of each heat exchanger. To do this, must stop the machine and keep pressurized to the maximum pressure. By-pass the compressor, and empty the water circuit, in order to disconnect the water pipes from each exchanger. If the loss is intense, already occurs in these conditions the abnormal leakage of gas from the heat exchanger which loses, if no stopper with balloons can be both water connections of each heat exchanger: after a few minutes will swell the balloons of the heat exchanger which loses . If the loss is particularly small, and it is not possible to keep pressurized heat exchanger with the machine stopped, it can perform the check pressurizing the heat exchanger at the maximum allowable pressure with inert gas (eg nitrogen for welding). If leakage is detected with a heat exchanger, replaced it with a new one.
- 2) If it is observed an excessive temperature of the gas in discharge of a single heat exchanger, and has checked the correct connection of the tubes, it is likely that the deposits inside the exchangers restrict their exchange efficiency or the flow of water. It is possible to solve the problem by washing with descaling fluid. If the problem persists, replace the heat exchanger.

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7 INACTIVITY PERIOD STORAGE

If the heat exchanger is installed on the machine, follow the instructions of the machine. In general if the machine working is stopped for a short period (approximately one month), the heat exchanger can be kept full of cooling liquid, which will preserve in perfect condition.

If the cooling circuit should be empty, drain the water into the heat exchanger, disconnect the water pipes, dry the heat exchanger water side with compressed air, and spray into anticorrosive oil, to reduce the probable corrosion.

Such treatment is also recommended before storing it for long periods, in case the heat exchanger is not installed on a machine. In this case it is also necessary to close with specially designed plastic all holes connection, and store in a covered and dry location.

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2.1.2.1.2.3. 22F0005490.R1 - HEAT EXCHANGER PS 340 (PED)52 INOX PIPES
ref. [2.1.2.1.2.2: MUM0000183R0.PDF](#)

2.1.2.1.2.4. 101142D - KIT TERMOSONDA -30+200°C L=70+POZZ CSA

2.1.2.1.2.4.1. 69D6D020 - programmable transmitter 5333D for PT100

ref. [2.1.2.1.1.9.1: MUMC10114101R0.PDF](#)

ref. [2.1.2.1.1.9.1: MUMC69D6D02001R0.pdf](#)

2.1.2.1.2.5. 830747004 - PRESSURE TRANSDUCER WIKA 4 BAR

ref. [2.1.1.1: MUMC830747100C02R0.pdf](#)

2.1.2.1.3. ILSW95F3W03 - ITEM

2.1.2.1.3.1. 101141D - KIT TERMOS INTERST: -30 +200 A CONTA CSA

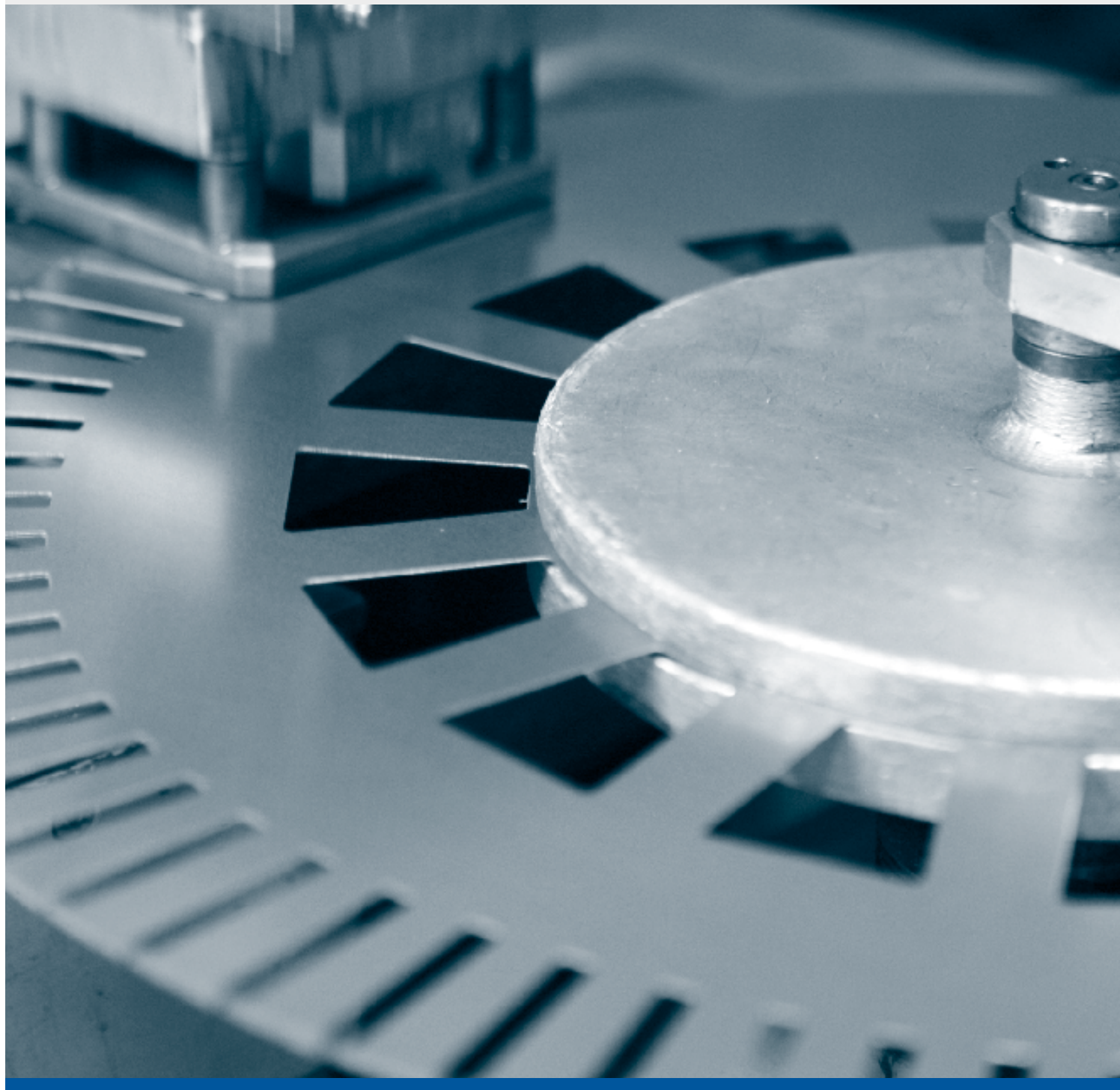
2.1.2.1.3.1.1. 69D6D020 - programmable transmitter 5333D for PT100

ref. [2.1.2.1.1.9.1: MUMC10114101R0.PDF](#)

ref. [2.1.2.1.1.9.1: MUMC69D6D02001R0.pdf](#)

2.1.2.1.3.2. 830747100 - PRESSURE TRANSDUCER WIKA 100 BAR

ref. [2.1.1.1: MUMC830747100C02R0.pdf](#)

www.weg.net**Português****2****English****64****Español****126**



Installation, Operation and Maintenance Manual of Electric Motors for Use in Explosive Atmospheres

This manual provides information about WEG induction motors fitted with squirrel cage, permanent magnet or hybrid rotors, low, medium and high voltage, in frame size IEC 56 to 630 and NEMA 42 to 9606/10 for use in explosive atmospheres with the following types of protection:

- Equipment protection by increased safety – “Ex e”
- Equipment protection by type of protection “n” – “Ex n”
- Equipment protection by flameproof enclosures – “Ex d” and “Ex de”
- Equipment dust ignition protection by enclosure – “Ex t” and “Ex td”
- Equipment protection for use in Class I, Division 1
- Equipment protection for use in Class I, Division 2

These motors meet the following standards, if applicable:

- NBR 17094-1 (2008): Máquinas Elétricas Girantes - Motores de Indução - Parte 1: Trifásicos
- NBR 17094-2 (2008): Máquinas Elétricas Girantes - Motores de Indução - Parte 2: Monofásicos
- IEC 60034-1 (2010): Rotating Electrical Machines - Part 1: Rating and Performance
- NEMA MG 1 (2009): Motors and Generators
- EN / IEC 60079-0 (2007): Explosive Atmospheres – Part 0: Equipment - General Requirements
- NBR IEC 60079-0 (2008): Atmosferas Explosivas - Equipamentos - Requisitos Gerais
- EN / IEC 60079-1 (2007): Explosive Atmospheres – Part 1: Equipment protection by flameproof enclosures “d”
- NBR IEC 60079-1 (2009): Proteção de Equipamento por Invólucro à Prova de Explosão “d”
- EN / IEC 60079-7 (2006): Explosive Atmospheres – Part 7: Equipment protection by increased safety “e”
- NBR IEC 60079-7 (2008): Proteção de Equipamentos por Segurança Aumentada “e”
- EN / IEC 60079-15 (2010): Explosive Atmospheres – Part 15: Equipment protection by type of protection “n”
- NBR IEC 60079-15 (2007): Construção, Ensaio e Marcação de Equipamentos Elétricos com Tipo de Proteção “n”
- EN / IEC 60079-31 (2008): Explosive Atmospheres – Part 31: Equipment dust ignition protection by enclosure “t”
- IEC 61241-0 (2004): Electrical apparatus for use in the presence of combustible dust - Part 0: General requirements
- NBR IEC 61241-0 (2006): Equipamentos Elétricos para Utilização em Presença de Poeira Combustível - Parte 0: Requisitos Gerais
- NBR IEC 61241-1 (2007): Equipamentos Elétricos para Utilização em Presença de Poeira Combustível - Parte 1: Proteção por Invólucros “td”
- UL 674 (2010) – Electric Motors and Generators for Use in Division 1 Hazardous (Classified) Locations
- CSA C22.2 N°145 (1986) – Motors and Generators for Use in Hazardous Locations
- CSA C22.2 N°30 (1986) - Explosion-Proof Enclosures for Use in Class I Hazardous Locations
- CSA C22.2 N°213 (1987) - Non-Incendive Electrical Equipment for Use in Class I, Division 2 Hazardous Locations

Information about classification of areas and safety requirements to be considered during equipment repair, overhaul and reclamation, when applicable, can be found in the following standards:

- EN / IEC 60079-10-1 (2008): Classification of areas - Explosive gas atmospheres
- ABNT NBR IEC 60079-10-1 (2009): Classificação de áreas - Atmosferas explosivas de gás
- EN / IEC 60079-10-2 (2009): Classification of areas - Combustible dust atmospheres
- EN / IEC 60079-14 (2007): Electrical installations design, selection and erection
- NBR IEC 60079-14 (2009): Projeto, Seleção e Montagem de Instalações Elétricas
- EN / IEC 60079-17 (2007): Electrical installations inspection and maintenance
- NBR IEC 60079-17 (2009): Inspeção e Manutenção de Instalações Elétricas
- EN / IEC 60079-19 (2006): Equipment repair, overhaul and reclamation
- NBR IEC 60079-19 (2008): Reparo, Revisão e Recuperação de Equipamentos

If you have any questions regarding this manual, please contact WEG branch.



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1. TERMINOLOGY

Balancing: the procedure by which the mass distribution of a rotor is checked and, if necessary, adjusted to ensure that the residual unbalance or the vibration of the journals and/or forces on the bearings at a frequency corresponding to service speed are within specified limits in International Standards.

[ISO 1925:2001, definition 4.1]

Balance quality grade: indicates the peak velocity amplitude of vibration, given in mm/s, of a rotor running free-in-space and it is the product of a specific unbalance and the angular velocity of the rotor at maximum operating speed.

Hazardous area: area in which an explosive atmosphere is present, or may be expected to be present, in quantities such as to require special precautions for the construction, installation and use of electrical apparatus.

[IEC 60050 IEV number 426-03-01]

Non-hazardous area: area in which an explosive atmosphere is not expected to be present in quantities such as to require special precautions for the construction, installation and use of electrical apparatus.

[IEC 60050 IEV number 426-03-02]

Explosive atmosphere: mixture with air, under atmospheric conditions, of flammable substances in the form of gas, vapour, dust, fibres, or flyings which, after ignition, permits self-sustaining propagation.

[IEC 60050 IEV number 426-01-06]

Temperature class: maximum surface temperature of the equipment. Following temperature classes are defined:

Temperature Class		Maximum surface temperature (°C)
IEC	NEC	
T1	T1	450
T2	T2	300
-	T2A	280
-	T2B	260
-	T2C	230
-	T2D	215
T3	T3	200
-	T3A	180
-	T3B	165
-	T3C	160
T4	T4	135
-	T4A	120
-	T5	100
-	T6	85

[IEC 60050 IEV number 426-01-05]

Simple apparatus: electrical component or combination of components of simple construction with well-defined electrical parameters which is compatible with the intrinsic safety of the circuit in which it is used.

[IEC 60050 IEV number 426-11-09]

Flameproof enclosure "d" (Ex d): type of protection in which the parts capable of igniting an explosive gas atmosphere are provided with an enclosure which can withstand the pressure developed during an internal explosion of an explosive mixture, and which prevents the transmission of the explosion to the explosive gas atmosphere surrounding the enclosure



[IEC 60050 IEV number 426-06-01]

Increased safety "e" (Ex e): type of protection applied to electrical apparatus in which additional measures are applied so as to give increased security against the possibility of excessive temperatures and of the occurrence of arcs and sparks in normal service or under specified abnormal conditions.

[IEC 60050 IEV number 426-08-01]

Type of protection "n" (Ex n): type of protection applied to electrical apparatus such that, in normal operation and in certain specified abnormal conditions, it is not capable of igniting a surrounding explosive gas atmosphere.

[IEC 60050 IEV number 426-13-01]

Dust ignition protection by enclosure "t" (Ex t): type of protection for explosive dust atmosphere where electrical equipment is provided with an enclosure providing dust ingress protection and a means to limit surface temperatures.

[IEC 60079-31 item 3.1]

Gas groups: are subdivided according to the nature of the explosive atmosphere for which they are intended:

- Group I: coal mines susceptible to firedamp (methane).
- Group II: areas not susceptible to firedamp. This group is subdivided into:
 - Group IIA (IEC) / D (NEC): propane, acetone, butane, combustible gas, gasoline, ethyl alcohol, methyl alcohol, benzene, etc.
 - Group IIB (IEC) / C (NEC): ethylene, cyclopropane, butadiene 1-3, etc.
 - Group IIC (IEC): hydrogen, acetylene, etc.
 - Group B (NEC): hydrogen.
 - Group A (NEC): acetylene.

Dust groups: are subdivided into (excepting mines susceptible to firedamp (methane)):

- Group IIIA (IEC): combustible fibers / combustible flyings – solid particles, including fibers larger than 500 µm
- Group IIIB (IEC): electrically nonconductive dusts – solid particles smaller than 500 µm, with electrical resistivity $\leq 10^3 \Omega.m$
- Group IIIC (IEC): electrically conductive dusts - solid particles smaller than 500 µm, with electrical resistivity $> 10^3 \Omega.m$
- Group E (NEC): combustible metallic powders, for example: aluminum, magnesium and their commercial alloys.
- Group F (NEC): combustible carbonaceous dusts that have more than 8% total entrapped volatiles.
- Group G (NEC): atmospheres containing dusts not included in Group E and F, including flour, grain wood, plastic, chemicals, etc.

Flameproof joint: place where the corresponding surfaces of two parts of an enclosure, or the conjunction of enclosures, come together, and which prevents the transmission of an internal explosion to the explosive gas atmosphere surrounding the enclosure.

[IEC 60050 IEV number 426-06-02]

Symbol "X": symbol used to denote special conditions for safe use.

[IEC 60050 IEV number 426-04-32]

Equipment Protection Level - EPL: level of protection assigned to equipment based on its likelihood of becoming a source of ignition and distinguishing the differences between explosive gas atmospheres, explosive dust atmospheres, and the explosive atmospheres in mines susceptible to firedamp. These EPLs are classified into:

- EPL Ga: equipment for explosive gas atmospheres, having a "very high" level of protection, which is not a source of ignition in normal operation, during expected malfunctions or during rare malfunctions.
- EPL Gb: equipment for explosive gas atmospheres, having a "high" level of protection, which is not a source of ignition in normal operation, during expected malfunctions.
- EPL Gc: equipment for explosive gas atmosphere, having a "enhanced" level of protection, which is not a source of ignition in normal operation and which may have some additional protection to ensure that it remains inactive as an ignition source in case of regular expected occurrences (for example failure of a lamp).

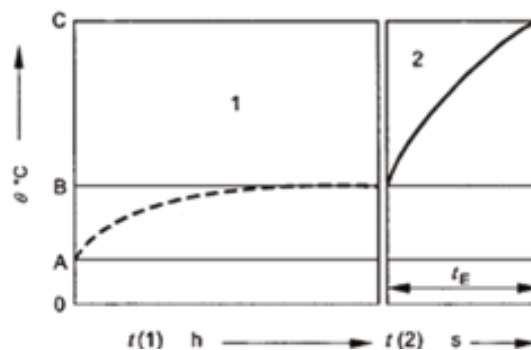
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- EPL Da: equipment for explosive dust atmospheres, having a “very high” level of protection, which is not a source of ignition in normal operation, during expected malfunctions, or during rare malfunctions.
- EPL Db: equipment for explosive dust atmospheres, having a “high” level of protection, which is not a source of ignition in normal operation or during expected malfunctions
- EPL Dc: equipment for explosive dust atmospheres, having a “enhanced” level of protection, which is not a source of ignition in normal operation and which may have some additional protection to ensure that it remains inactive as an ignition source in the case of regular expected occurrences (for example failure of a lamp).
- EPL Ma: equipment for installation in a mine susceptible to firedamp, having a “very high” level of protection, which has sufficient security that it is unlikely to become an ignition source in normal operation, during expected malfunctions or during rare malfunctions, even when left energized in the presence of an outbreak of gas.
- EPL Mb: equipment for installation in a mine susceptible to firedamp, having a “high” level of protection, which has sufficient security that it is unlikely to become a source of ignition in normal operation or during expected malfunctions in the time span between there being an outbreak of gas and the equipment being de-energized.

[IEC 60079-0 item 3.18]

Time “ t_E ”: time taken for an a.c. rotor or stator winding, when carrying the initial starting current I_A , to be heated up to the limiting temperature from the temperature reached in rated service at the maximum ambient temperature. See Figure 1-1.



Symbols

- θ - temperature
- A – maximum allowed ambient temperature
- B – service temperature
- C – limiting temperature
- t - time
- 1 – temperature rise in rated service
- 2 – Temperature rise during locked rotor test

Figure 1.1: Time “ t_E ”



[IEC 60050 IEV number 426-08-03]

Type of protection: set of specific measures applied to electrical apparatus to avoid ignition of a surrounding explosive atmosphere by such apparatus.

[IEC 60050 IEV number 426-01-02]

Zones: hazardous areas are classified in terms of zones on the basis of the frequency and duration of the occurrence of an explosive atmosphere.

Zone 0 (IEC) / Class I Div 1 (NEC): area in which an explosive gas atmosphere is present continuously, or for long periods or frequently.

[IEC 60050 IEV number 426-03-03]

Zone 1 (IEC) / Class I, Div 1 (NEC): area in which an explosive gas atmosphere is likely to occur in normal operation occasionally.

[IEC 60050 IEV number 426-03-04]

Zone 2 (IEC) / Class I, Div 2 (NEC): area in which an explosive gas atmosphere is not likely to occur in normal operation, but if it does occur, will persist for a short period only.

[IEC 60050 IEV number 426-03-05]

Zone 20 (IEC) / Class II, Div 1 (NEC): area in which an explosive atmosphere in the form of a cloud of combustible dust in air is present continuously, or for long periods or frequently.

[IEC 60050 IEV number 426-03-23]

Zone 21 (IEC) / Class II, Div 1 (NEC): area in which an explosive atmosphere in the form of a cloud of combustible dust in air is likely to occur, occasionally, in normal operation.

[IEC 60050 IEV number 426-03-24]

Zone 22 (IEC) / Class II, Div 2 (NEC): area in which an explosive atmosphere in the form of a cloud of combustible dust in air is not likely to occur in normal operation but, if it does occur, will persist for a short period only.

[IEC 60050 IEV number 426-03-25]

Grounded Part: metallic part connected to the grounding system.

Live Part: Conductor or conductive part intended to be energized in normal operation, including a neutral conductor.

Authorized personnel: employee who has formal approval of the company.

Qualified personnel: employee who meets the following conditions simultaneously:

- receives training under the guidance and responsibility of a qualified and authorized professional;
- works under the responsibility of a qualified and approved professional.

Note: The qualification is only valid for the company that trained the employee in the conditions set out by the authorized and qualified professional responsible for training.

2. INITIAL RECOMMENDATIONS



Motors for hazardous areas are specially designed to meet the government regulations regarding the environment in which they are installed. Misapplication, incorrect connection or other changes although small, may jeopardize product reliability.

Electric motors have energized circuits, exposed rotating parts and hot surfaces that may cause serious injury to people during normal operation. Therefore, it is recommended that transportation, storage, installation, operation and maintenance services are always performed by qualified personnel.

Also the applicable procedures and relevant standards of the country where the machine will be installed must be considered.

Noncompliance with the recommended procedures in this manual may cause severe personal injuries and/or substantial property damage and may void the product warranty.

For practical reasons, it is not possible to include in this Manual detailed information that covers all construction variables nor covering all possible assembly, operation or maintenance alternatives. This Manual contains only the required information that allows qualified and trained personnel to carry out their services. The product images are shown for illustrative purpose only and the type of protection is not represented.

The type of protection and the Equipment Protection Level (EPL) indicated on the motor nameplate must be respected considering the explosive atmosphere where the motor will be installed.

Components added to the motor by the user, such as cable-glands, threaded plugs, encoder, etc. must meet the type of protection, the Equipment Protection Level (EPL) in accordance with the standards indicated on the product certificate.

The symbol "X" added to the certificate number, informed on the motor nameplate, denotes that motor requires special conditions for installation, use and/or maintenance, as described in the certificate.

Failure to follow these requirements may affect the product and installation safety.

For *Smoke Extraction Motors*, please refer to the additional instruction manual 50026367 available on the website www.weg.net.

For brake motors, please refer to the information contained in WEG 50006742 / 50021973 brake motor manual available on the website www.weg.net.

For information about permissible radial and axial shaft loads, please check the product technical catalogue.



The user is responsible for the correct classification of the area for the motor installation, for the definition of environment conditions and application characteristics.



During the warranty period, all repair, overhaul and reclamation services must be carried out by WEG authorized Service Centers for explosive atmospheres to maintain validity of the warranty.

2.1. WARNING SYMBOL



Warning about safety and warranty.

2.2. RECEIVING INSPECTION

All motors are tested during the manufacturing process.

The motor must be checked when received for any damage that may have occurred during the transportation.

All damages must be reported in writing to the transportation company, to the insurance company and to WEG. Failure to comply with such procedures will void the product warranty.

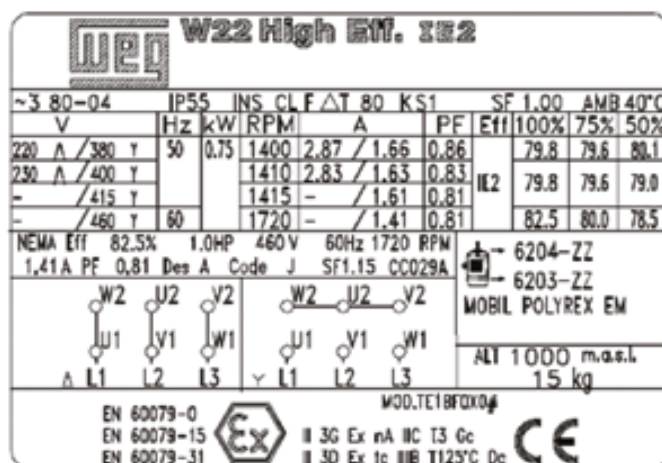
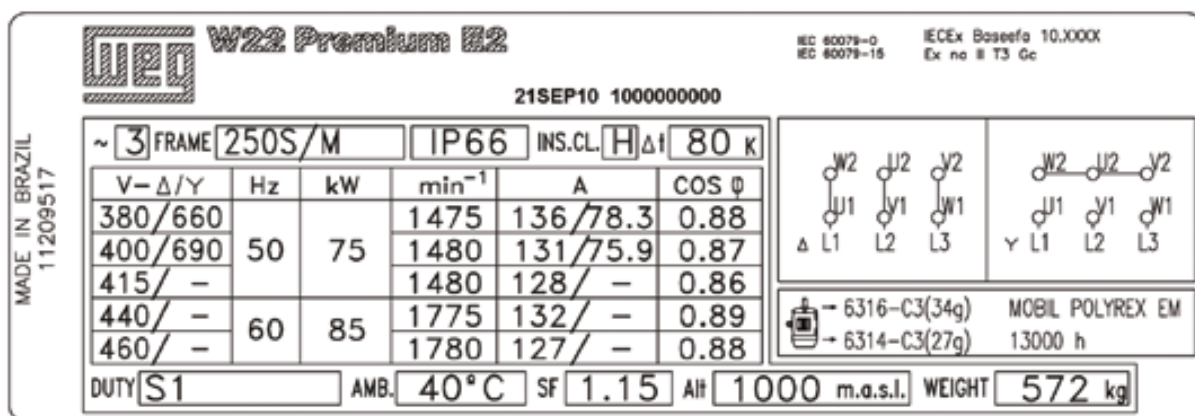
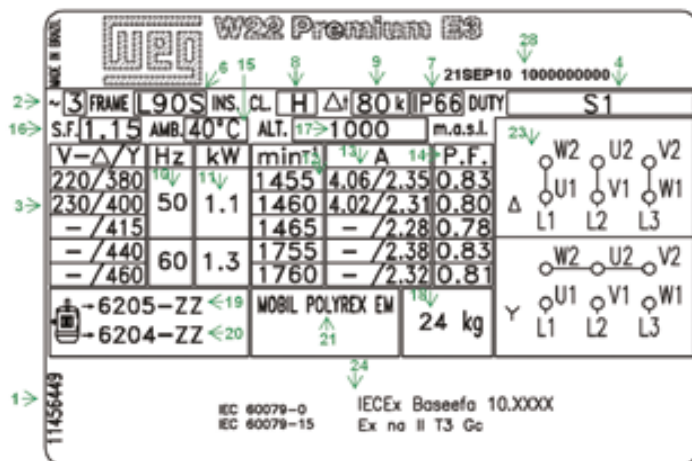
You must inspect the product:

- Check if nameplate data complies with the purchase order.
 - Special attention should be given to the type of protection and/or to the Equipment Protection Level.
 - Remove the shaft locking device (if any) and rotate the shaft by hand to ensure that it rotates freely.
 - Check that the motor has not been exposed to excessive dust and moisture during the transportation.
- Do not remove the protective grease from the shaft, or the plugs from the cable entries. These protections must remain in place until the installation has been completed.



2.3. NAMEPLATES

The nameplate contains information that describes the construction characteristics and the performance of the motor. Figure 2-1, Figure 2-2, Figure 2-3 and Figure 2-4 show nameplate layout examples.



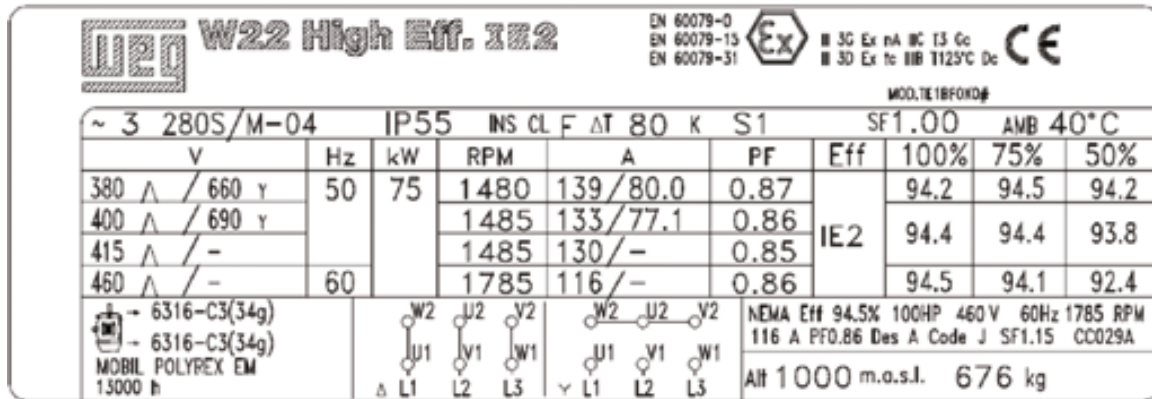


Figure 2.1 - IEC motor nameplate.

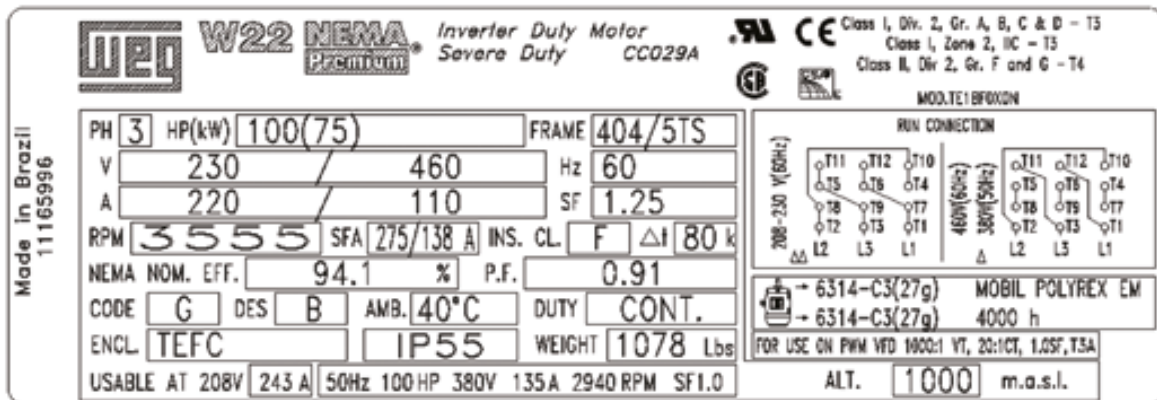
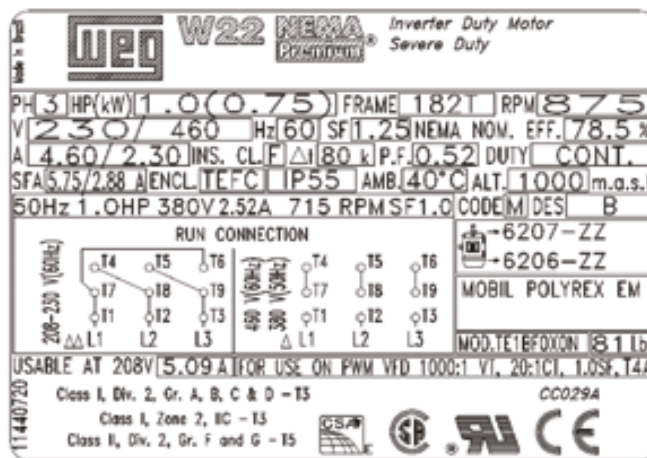


Figure 2.2 - NEMA motor nameplate.



Figure 2.3 - Nameplate of fuel pump motor.

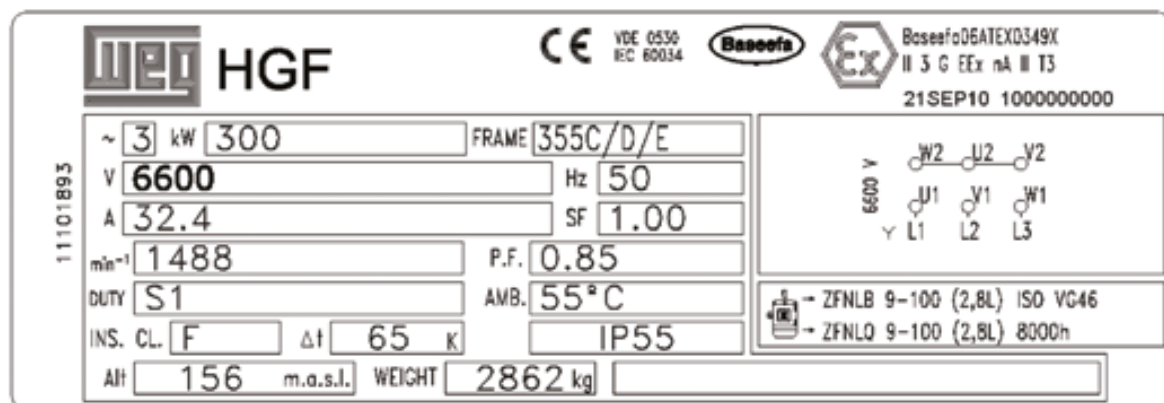


Figure 2.4 - HGF motor nameplate.

Number	Symbol	Features
1		Motor code (SAP material)
2	~	Number of phases
3	V	Rated voltage (V)
4	REG. / DUTY	Duty
5	REND. / NOM. EFF. / EFF.	Efficiency (%)
6	CARC. / FRAME	Frame
7	IP	Degree of protection
8	ISOL. / INSL. / INS.CL.	Insulation class
9	ΔT	Temperature rise (K)
10	Hz	Frequency (Hz)
11	kW (HP-cv) / kW / HP	Output (kW / HP / cv)
12	RPM / min ⁻¹	Revolution per minute (RPM)
13	A	Rated current (A)
14	F.P / P.F	Power factor
15	AMB.	Ambient Temperature (°C)
16	F.S. / S.F.	Service factor
17	ALT.	Altitude (m.a.s.l.)
18	kg / lb / WEIGHT	Weight (kg / lb)
19		DE bearing specification and amount of grease
20		NDE bearing specification and amount of grease
21		Grease type used for bearing lubrication
22		Lubrication interval (h)
23		Connection diagram
24		Hazardous areas / Type of protection / Certificate ¹⁾
25	I _A / I _N / I _P / I _N	Starting current / rated current relationship
26	CAT. / DES.	Design
27	I.F.S. / S.F.A.	Service factor amps (A)
28		Serial number

The product certificates can be obtained from WEG. Please contact WEG nearest Office.

Motor marking intended for use in hazardous areas: the marking system is indicated according to the standards applicable for each type of protection:

Marking according to IEC				
Ex equipment	Type of protection	Apparatus grouping for gas or dust	Temperature Class	Equipment Protection Level EPL
Ex	nA	II	T3	Gc
	e	II	T3	Gb
	d	IIB	T4	
		IIC		
	de	IIB		
		IIC		
	tc	IIIB	T125 °C	Dc
	tb	IIIC		Db
d	I	T4	Mb	

Marking according to NEC			
Class	Division or Zone	Apparatus grouping for gas or dust	Temperature class
Class I	Div. 1	Gr. C and D	T4
Class II	Div. 1	Gr. E, F and G	T4
Class I	Zona 1	IIB	T4
Class II	Zona 21	IIIC	T125 °C
Class II	Zona 22	IIIB	T125 °C
Class I	Div. 2	Gr. A, B, C and D	T3

* Other temperature classes are available upon request.

Marking according to ATEX							
Apparatus grouping	Equipment category	Gas, dust or mine	Ex equipment	Type of protection	Apparatus grouping for gas or dust	Temperature class	Equipment Protection Level (EPL)
II	3	G	Ex	nA	II	T3	Gc
	2			e	II	T3	Gb
				d	IIB	T4	
					IIC		
				de	IIB		
		IIC					
	3	D		tc	IIIB	T125 °C	Dc
	2			tb	IIIC		Db
I	2	M	d	I	T4	Mb	

* Other temperature classes are available upon request.



3. SAFETY INSTRUCTIONS



The motor must be disconnected from the power supply and be completely stopped before conducting any installation or maintenance procedures. Additional measures should be taken to avoid accidental motor starting.



Professionals working with electrical installations, either in the assembly, operation or maintenance, should use proper tools and be instructed on the application of standards and safety requirements, including the use of Personal Protective Equipment (PPE) that must be carefully observed in order to reduce risk of personal injury during these services.



Electric motors have energized circuits, exposed rotating parts and hot surfaces that may cause serious injury to people during normal operation. It is recommended that transportation, storage, installation, operation and maintenance services are always performed by qualified personnel.

Always follow the safety, installation, maintenance and inspection instructions in accordance with the applicable standards in each country.

4. HANDLING AND TRANSPORT

Individually packaged motors should never be lifted by the shaft or by the packaging. They must be lifted only by means of the eyebolts, when supplied. Use always suitable lifting devices to lift the motor. Eyebolts on the frame are designed for lifting the machine weight only as indicated on the motor nameplate. Motors supplied on pallets must be lifted by the pallet base with lifting devices fully supporting the motor weight.

The package should never be dropped. Handle it carefully to avoid bearing damage.



Eybolls provided on the frame are designed for lifting the machine only. Do not use these eyebolls for lifting the motor with coupled equipment such as bases, pulleys, pumps, reducers, etc.

Never use damaged, bent or cracked eyebolls. Always check the eyeboll condition before lifting the motor.

Eybolls mounted on components, such as on end shields, forced ventilation kits, etc. must be used for lifting these components only. Do not use them for lifting the complete machine set.

Handle the motor carefully without sudden impacts to avoid bearing damage and prevent excessive mechanical stresses on the eyebolls resulting in its rupture.



To move or transport motors with cylindrical roller bearings or angular contact ball bearings, use always the shaft locking device provided with the motor.

All HGF motors, regardless of bearing type, must be transported with shaft locking device fitted.

4.1. LIFTING



Before lifting the motor ensure that all eyebolls are tightened properly and the eyeboll shoulders are in contact with the base to be lifted, as shown in Figure 4.1. Figure 4.2 shows an incorrect tightening of the eyeboll.

Ensure that lifting machine has the required lifting capacity for the weight indicated on the motor nameplate.



Figure 4.1 – Correct tightening of the eyeboll



Figure 4.2 – Incorrect tightening of the eyeboll.



The center-of-gravity may change depending on motor design and accessories. During the lifting procedures the maximum allowed angle of inclination should never be exceeded as specified below.

4.1.1. Horizontal motors with one eyeboll

For horizontal motors fitted with only one eyeboll, the maximum allowed angle-of-inclination during the lifting process should not exceed 30° in relation to the vertical axis, as shown in Figure 4.3.

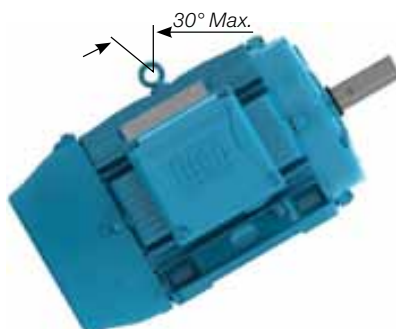


Figure 4.3 – Maximum allowed angle-of-inclination for motor with one eyeboll.



4.1.2. Horizontal motor with two eyebolts

When motors are fitted with two or more eyebolts, all supplied eyebolts must be used simultaneously for the lifting procedure.

There are two possible eyebolt arrangements (vertical and inclined), as shown below:

- For motors with vertical lifting eyebolts, as shown in Figure 4.4, the maximum allowed lifting angle should not exceed 45° in relation to the vertical axis. We recommend to use a spreader bar for maintaining the lifting elements (chain or rope) in vertical position and thus preventing damage to the motor surface.



Figure 4.4 – Maximum resulting angle for motors with two or more lifting eyebolts.

- For HGF motors, as shown in Figure 4.5, the maximum resulting angle should not exceed 30° in relation to the vertical axis.

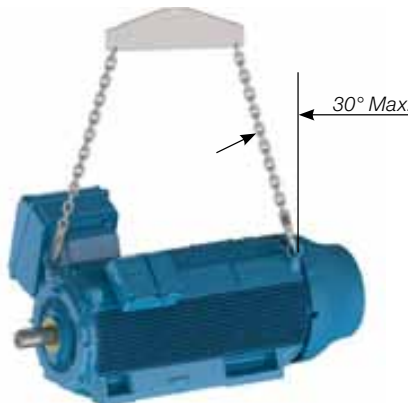


Figure 4.5 – Maximum resulting angle for horizontal HGF motors

- For motors fitted with inclined eyebolts, as shown in Figure 4.6, the use of a spreader bar is required for maintaining the lifting elements (chain or rope) in vertical position and thus preventing damage to the motor surface.



Figure 4.6 – Use of a spreader bar for lifting.

4.1.3. Vertical Motors

For vertical mounted motors, as shown in Figure 4.7, the use of a spreader bar is required for maintaining the lifting element (chain or rope) in vertical position and thus preventing damage to the motor surface.



Figure 4.7 – Lifting of vertical mounted motors.



Always use the eyebolts mounted on the top side of the motor, diametrically opposite, considering the mounting position. See Figure 4.8.



Figure 4.8 – Lifting of HGF motors.

4.1.3.1. Procedures to place W22 motors in the vertical position

For safety reasons during the transport, vertical mounted Motors are usually packed and supplied in horizontal position.

To place W22 motors fitted with eyebolts (see Figure 4.6), to the vertical position, proceed as follows:

1. Ensure that the eyebolts are tightened properly, as shown in Figure 4.1;
2. Remove the motor from the packaging, using the top mounted eyebolts, as shown in Figure 4.9;



Figure 4.9 – Removing the motor from the packaging.



3. Install a second pair of eyebolts, as shown in Figure 4.10;



Figure 4.10 – Installation of the second pair of eyebolts.

4. Reduce the load on the first pair of eyebolts to start the motor rotation, as shown in Figure 4.11. This procedure must be carried out slowly and carefully.



Figure 4.11 – End result: motor placed in vertical position.

These procedures will help you to move motors designed for vertical mounting. These procedures are also used to place the motor from the horizontal position into the vertical position and vertical to horizontal.

4.1.3.2. Procedures to place HGF motors in the vertical position

HGF motors are fitted with eight lifting points: four at drive end and four at non-drive end. The HGF motors are usually transported in horizontal position, however for the installation they must be placed in the vertical position.

To place an HGF motor in the vertical position, proceed as follows:

1. Lift the motor by using the four lateral eyebolts and two hoists, see Figure 4.12;



Figure 4.12 – Lifting HGF motor with two hoists.

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2. Lower the hoist fixed to motor drive end while lifting the hoist fixed to motor non-drive end until the motor reaches its equilibrium, see Figure 4.13.



Figure 4.13 – Placing HGF motor in vertical position

3. Remove the hoist hooks from the drive end eyebolts and rotate the motor 180° to fix the removed hooks into the two eyebolts at the motor non-drive end, see Figure 4.14.



Figure 4.14 – Lifting HGF motors by the eyebolts at the non-drive end.

4. Fix the removed hoist hooks in the other two eyebolts at the non-drive end and lift the motor until the vertical position is reached, see Figure 4.15.



Figure 4.15 – HGF motor in the vertical position

These procedures will help you to move motors designed for vertical mounting. These procedures are also used to place the motor from the horizontal position into the vertical position and vertical to horizontal.

4.2 Procedures to place W22 vertical mount motors in horizontal position

To place W22 vertical mount motor in horizontal position, proceed as follows:



1. Ensure that all eyebolts are tightened properly, as shown in Figure 4.1;
2. Install the first pair of eyebolts and lift the motor as shown in Figure 4.16;



Figure 4.16 – Install the first pair of eyebolts

3. Install the second pair of eyebolts, as shown in Figure 4.17;



Figure 4.17 – Install the second pair of eyebolts

4. Reduce the load on the first pair of eyebolts for rotating the motor, as shown in Figure 4.18. This procedure must be carried out slowly and carefully.



Figure 4.18 – Motor is being rotated to horizontal position

5. Remove the first pair of eyebolts, as shown in Figure 4.19.



Figure 4.19 – Final result: motor placed in horizontal position

5. STORAGE

If the motor is not installed immediately, it must be stored in a dry and clean environment, with relative humidity not exceeding 60%, with an ambient temperature between 5 °C and 40 °C, without sudden temperature changes, free of dust, vibrations, gases or corrosive agents. The motor must be stored in horizontal position, unless specifically designed for vertical operation, without placing objects on it. Do not remove the protection grease from shaft end to prevent rust.

If the motor are fitted with space heaters, they must always be turned on during the storage period or when the installed motor is out of operation. Space heaters will prevent water condensation inside the motor and keep the winding insulation resistance within acceptable levels. Store the motor in such position that the condensed water can be easily drained. If fitted, remove pulleys or couplings from the shaft end (more information are given on item 6).



The space heaters should never be energized when the motor is in operation. For the use of space heaters in motors that are stored in hazardous area, adopt the same cable inlet and connection requirements described in item 6.

5.1. EXPOSED MACHINED SURFACES

All exposed machined surfaces (like shaft end and flange) are factory-protected with temporary rust inhibitor. A protective film must be reapplied periodically (at least every six months), or when it has been removed and/or damaged.

5.2. STORAGE

The stacking height of the motor packaging during the storage period should not exceed 5 m, always considering the criteria indicated in Table 5.1:

Table 5.1 – Max. recommended stacking height

Packaging Type	Frame sizes	Maximum stacking quantity
Cardboard box	IEC 63 to 132 NEMA 143 to 215	Indicated on the top side of the cardboard box
Wood crate	IEC 63 to 315 NEMA 48 to 504/5	06
	IEC 355 NEMA 586/7 and 588/9	03
	HGF IEC 315 to 630 HGF NEMA 5000 to 9600	Indicated on the packaging

Notes:

- 1) Never stack larger packaging onto smaller packaging.
- 2) Align the packaging correctly (see Figure 5.1 and Figure 5.2).



Figure 5.1 – Correct stacking



Figure 5.2 – Incorrect stacking



3) The feet of the crates above should always be supported by suitable wood battens (Figure 5.3) and never stand on the steel tape or without support (Figure 5.4).



Figure 5.3 – Correct stacking



Figure 5.4 – Incorrect stacking

4) When stacking smaller crates onto longer crates, always ensure that suitable wooden supports are provided to withstand the weight (see Figure 5.5). This condition usually occurs with motor packaging above IEC 225S/M (NEMA 364/5T) frame sizes.



Figure 5.5 – Use of additional battens for stacking

5.3 BEARINGS

5.3.1 Grease lubricated bearings

We recommend rotating the motor shaft at least once a month (by hand, at least five revolutions, stopping the shaft at a different position from the original one). If the motor is fitted with shaft locking device, remove it before rotating the shaft and install it again before performing any handling procedure. Vertical motors may be stored in the vertical or in horizontal position. If motors with open bearings are stored longer than six months, the bearings must be relubricated according to Item 8.2 before commissioning of the motor.

If the motor is stored for longer than 2 years, the bearings must be replaced or removed, washed, inspected and relubricated according to Item 8.2.

5.3.2 Oil Lubricated bearings

The motor must be stored in its original operating position and with oil in the bearings. Correct oil level must be ensured. It should be in the center of the sight glass.

During the storage period, remove the shaft locking device and rotate the shaft by hand every month, at least five revolutions, thus achieving an even oil distribution inside the bearing and maintaining the bearing in good operating conditions. Reinstall the shaft locking device every time the motor has to be moved.

If the motor is stored for a period of over six months, the bearings must be relubricated according to Item 8.2 before starting the operation. If the motor is stored for a period of over two years, the bearings must be replaced or removed, washed according to manufacturer instructions, checked and relubricated according to Item 8.2. The oil of vertical mounted motors that are transported in horizontal position is removed to prevent oils leaks during the transport. These motors must be stored in vertical position after receiving and the bearing must be lubricated.

5.3.3 Oil Mist lubricated bearings

The motor must be stored in horizontal position. Lubricate the bearings with ISO VG 68 mineral oil in the amount indicated in the Table 5.2 (this is also valid for bearings with equivalent dimensions). After filling with oil, rotate the shaft by hand, at least five revolutions)

During the storage period, remove the shaft locking device (if any) and rotate the shaft by hand every week, at least five revolutions, stopping it at a different position from the original one. Reinstall the shaft locking device every time the motor has to be moved. If the motor is stored for a period of over two years, the bearings must be replaced or removed, washed according to manufacturer instructions, checked and relubricated according to item 8.2.

Table 5.2 – Amount of oil per bearing

Bearing Size	Amount of Oil (ml)	Bearing Size	Amount of Oil (ml)
6201	15	6309	65
6202	15	6311	90
6203	15	6312	105
6204	25	6314	150
6205	25	6315	200
6206	35	6316	250
6207	35	6317	300
6208	40	6319	350
6209	40	6320	400
6211	45	6322	550
6212	50	6324	600
6307	45	6326	650
6308	55	6328	700

The oil must always be removed when the motor has to be handled. If the oil mist system is not operating after installation, fill the bearings with oil to prevent bearing rusting. During the storage period, rotate the shaft by hand, at least five revolutions, stopping it at a different position from the original one. Before starting the motor, all bearing protection oil must be drained from the bearing and the oil mist system must be switched ON.

5.3.4 Sleeve Bearing

The motor must be stored in its original operating position and with oil in the bearings. Correct oil level must be ensured. It should be in the middle of the sight glass. During the storage period, remove the shaft locking device and rotate the shaft by hand every month, at least five revolutions (and at 30 rpm), thus achieving an even oil distribution inside the bearing and maintaining the bearing in good operating conditions. Reinstall the shaft locking device every time the motor has to be moved.

If the motor is stored for a period of over six months, the bearings must be relubricated according to the Item 8.2 before starting the operation.

If the motor is stored for a period longer than the oil change interval, or if it is not possible to rotate the motor shaft by hand, the oil must be drained and a corrosion protection and dehumidifiers must be applied.

5.4. INSULATION RESISTANCE

We recommend measuring the winding insulation resistance at regular intervals to follow-up and evaluate its electrical operating conditions. If any reduction in the insulation resistance values are recorded, the storage conditions should be evaluated and corrected, where necessary.

5.4.1. Insulation resistance measurement

We recommend measuring the winding insulation resistance at regular intervals to follow-up and evaluate its electrical operating conditions. If any reduction in the insulation resistance values are recorded, the storage conditions should be evaluated and corrected, where necessary.



The insulation resistance must be measured in a safe environment.



The insulation resistance must be measured with a megohmmeter. The machine must be in cold state and disconnected from the power supply.



To prevent the risk of an electrical shock, ground the terminals before and after each measurement. Ground the capacitor (if any) to ensure that it is fully discharged before the measurement is taken.

It is recommended to insulate and test each phase separately. This procedure allows the comparison of the insulation resistance between each phase. During the test of one phase, the other phases must be grounded. The test of all phases simultaneously evaluates the insulation resistance to ground only but does not evaluate the insulation resistance between the phases.

The power supply cables, switches, capacitors and other external devices connected to the motor may considerably influence the insulation resistance measurement. Thus all external devices must be disconnected and grounded during the insulation resistance measurement.

Measure the insulation resistance one minute after the voltage has been applied to the winding. The applied voltage should be as shown in Table 5.3.

Table 5.3 – Voltage for the insulation resistance

Winding rated voltage (V)	Testing voltage for measuring the insulation resistance (V)
< 1000V	500
1000 - 2500	500 - 1000
2501 - 5000	1000 - 2500
5001 - 12000	2500 - 5000
> 12000	5000 - 10000

The reading of the insulation resistance must be corrected to 40 °C as shown in the Table 5.4.

Table 5.4 – Correction Factor for the Insulation Resistance corrected to 40 °C

Measuring temperature of the insulation resistance (°C)	Correction factor of the insulation resistance corrected to 40 °C	Measuring temperature of the insulation resistance (°C)	Correction factor of the insulation resistance corrected to 40 °C
10	0.125	30	0.500
11	0.134	31	0.536
12	0.144	32	0.574
13	0.154	33	0.616
14	0.165	34	0.660
15	0.177	35	0.707
16	0.189	36	0.758
17	0.203	37	0.812
18	0.218	38	0.871
19	0.233	39	0.933
20	0.250	40	1.000
21	0.268	41	1.072
22	0.287	42	1.149
23	0.308	43	1.231
24	0.330	44	1.320
25	0.354	45	1.414
26	0.379	46	1.516
27	0.406	47	1.625
28	0.435	48	1.741
29	0.467	49	1.866
30	0.500	50	2.000

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The motor insulation condition must be evaluated by comparing the measured value with the values indicated in Table 5.5 (corrected to 40 °C):

Table 5.5 – Evaluation of the insulation system

Limit value for rated voltage up to 1.1 kV (MΩ)	Limit value for rated voltage above 1.1 kV (MΩ)	Situation
Up to 5	Up to 100	Dangerous. The motor can not be operated in this condition
5 to 100	100 to 500	Regular
100 to 500	Higher than 500	Good
Higher than 500	Higher than 1000	Excellent

The values indicated in the table should be considered only as reference values. It is advisable to log all measured values to provide a quick and easy overview on the machine insulation resistance. If the insulation resistance is low, moisture may be present in the stator windings. In this case the motor should be removed and transported to a WEG authorized Service Center for proper evaluation and repair (This service is not covered by the warranty). To improve the insulation resistance through the drying process, see section 8.4.





6. INSTALLATION



The installation of electric motors in hazardous areas must be always performed by qualified personnel with knowledge on relevant standards and safety rules.

Check some aspects before proceeding with the installation:

1. Insulation resistance: must be within the acceptable limits. See item 5.4.
2. Bearings:
 - a. Rolling bearings: oxidized bearings must be replaced. If no oxidation is detected, lubricate the bearings as described in Item 8.2. If the motor is stored for a period of over two years, the bearings must be replaced before starting the motor.
 - b. Sleeve bearing: if sleeve bearing motors are stored longer than the recommended oil change interval, the oil must be changed before machine starting. Don't forget to remove the dehumidifiers when you drain the oil from the motor and to fill it again with new oil before starting the machine. For more details, see item 8.2.
3. Operating conditions of the start capacitors: If single-phase motors are stored for a period of over two years, it is recommended to change the start capacitors before motor starting since they lose their operating characteristics.
4. Terminal box:
 - a. the inside of the terminal box must be clean and dry.
 - b. the contacts must be correctly connected and corrosion free. See 6.9 and 6.10.
 - c. the cable entries must be correctly sealed and the terminal box cover properly mounted in order to ensure the degree of protection indicated on the motor nameplate.
5. Cooling: the cooling fins, air inlet and outlet openings must be clean and unobstructed. The distance between the air inlet openings and the wall should not be shorter than $\frac{1}{4}$ (one quarter) of the diameter of the air inlet. Ensure sufficient space to perform the cleaning services. See item 7.
6. Coupling: remove the shaft locking device (where fitted) and the corrosion protection grease from the shaft end and flange just before installing the motor. See item 6.4.
7. Drain hole: the motor must always be positioned so the drain hole is at the lowest position (If there is any indication arrow on the drain, the drain must be so installed that the arrow points downwards).
Motors supplied with rubber drain plugs leave the factory in the closed position and must be opened periodically to allow the exit of condensed water. For environments with high water condensation levels and motor with degree of protection IP55, the drain plugs can be mounted in open position (see Figure 6.1). For motors with degree of protection IP56, IP65 or IP66, the drain plugs must remain at closed position (see Figure 6.1), being opened only during the motor maintenance procedures.
The drain system of motors with Oil Mist lubrication system must be connected to a specific collection system (see Figure 6.12).

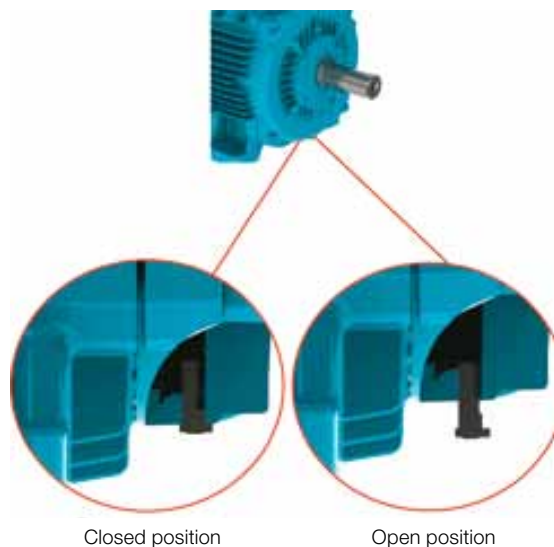


Figure 6.1 – Detail of the rubber drain plug mounted in closed and open position.

8. Additional recommendations:

- Check the direction of motor rotation, starting the motor at no-load before coupling it to the load.
- Vertical mounted motors with shaft end down must be fitted with drip cover to protect them from liquids or solids that may drop onto the motors.
- Vertical mounted motors with shaft end up must be fitted with water slinger ring to prevent water penetration inside the motor.



Remove or fix the shaft key before starting the motor.

6.1. FOUNDATIONS

The foundation is the structure, structural element, natural or prepared base, designed to withstand the stresses produced by the installed equipment, ensuring safe and stable performance during operation. The foundation design should consider the adjacent structures to avoid the influences of other installed equipment and no vibration is transferred through the structure.

The foundation must be flat and its selection and design must consider the following characteristics:

- The features of the machine to be installed on the foundation, the driven loads, application, maximum allowed deformations and vibration levels (for instance, motors with reduced vibration levels, foot flatness, flange concentricity, axial and radial loads, etc. lower than the values specified for standard motors).
- Adjacent buildings, conservation status, maximum applied load estimation, type of foundation and fixation and vibrations transmitted by these constructions.

If the motor is supplied with leveling/alignment bolts, this must be considered in the base design.



Please consider for the foundation dimensioning all stresses that are generated during the operation of the driven load.

The user is responsible for the foundation designing and construction.

The foundation stresses can be calculated by using the following equations (see Figure 6.2):

$$F_1 = 0,5 * g * m - (4 * T_b / A)$$

$$F_2 = 0,5 * g * m + (4 * T_b / A)$$

Where:

F_1 and F_2 = lateral stresses (N);

g = gravitational acceleration (9,8 m/s²);

m = motor weight (kg);

T_b = breakdown torque (Nm);

A = distance between centerlines of mounting holes in feet or base of the machine (end view) (m).

The motors may be mounted on:

- Concrete bases: are most used for large-size motors (see Figure 6.2);
- Metallic bases: are generally used for small-size motors (see Figure 6.3).

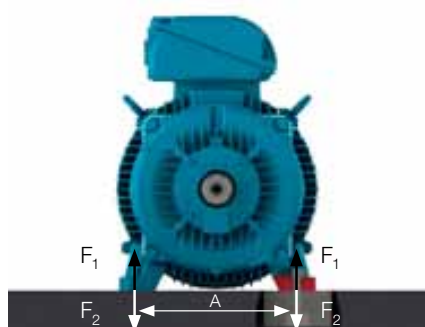


Figure 6.2 – Motor installed on concrete base



Figure 6.3 – Motor installed on metallic base



The metallic and concrete bases may be fitted with sliding system. These types of foundations are generally used where the power transmission is achieved by belts and pulleys. This power transmission system is easier to assemble/disassemble and allows the belt tension adjustment. Other important aspect of this foundation type is the location of the base locking screws that must be diagonally opposite. The rail nearest the drive pulley is placed in such a way that the positioning bolt is between the motor and the driven machine. The other rail must be placed with the bolt on the opposite side (diagonally opposite), as shown in Figure 6.4 .

To facilitate assembly, the bases may have the following features:

- shoulders and/or recesses;
- anchor bolts with loose plates;
- bolts cast in the concrete;
- leveling screws;
- positioning screws;
- steel & cast iron blocks, plates with flat surfaces.

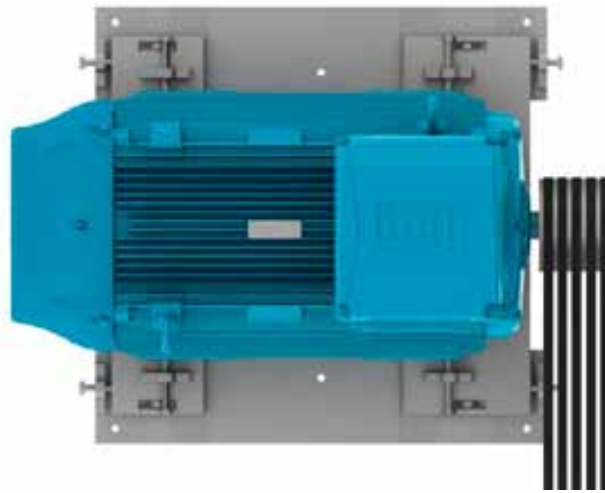


Figure 6.4 – Motor installed on sliding base

After completing the installation, it is recommended that all exposed machined surfaces are coated with suitable rust inhibitor.

6.2. MOTOR MOUNTING



Footless motors supplied with transportation devices, according to Figure 6.5, must have their devices removed before starting the motor installation.

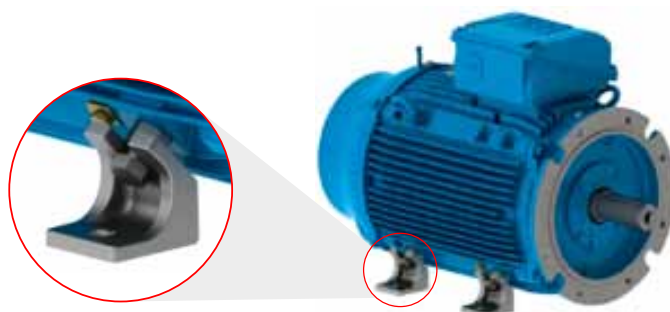


Figure 6.5 - Detail of the transportation devices for footless motors.

6.2.1. Foot mounted motors

The drawings of the mounting hole dimensions for NEMA or IEC motors can be checked in the respective technical catalogue.

The motor must be correctly aligned and leveled with the driven machine. Incorrect alignment and leveling may result in bearing damage, generate excessive vibration and even shaft distortion/breakage.

For more details, see section 6.5 and 6.6. The thread engagement length of the mounting bolt should be at least 1.5 times the bolt diameter. This thread engagement length should be evaluated in more severe applications and increased accordingly.

Figure 6.6 shows the mounting system of a foot mounted motor indicating the minimum required thread engagement length.

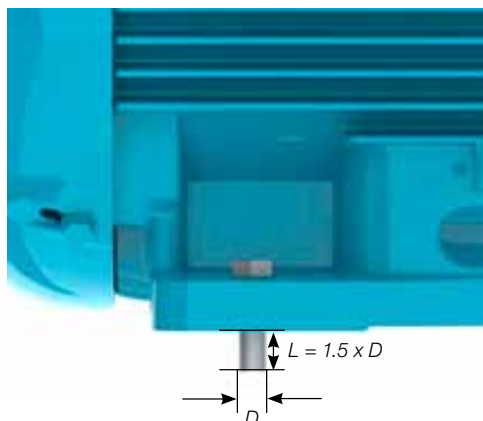


Figure 6.6 – Mounting system of a foot mounted motor

6.2.2. Flange mounted motors

The drawings of the flange mounting dimensions, IEC and NEMA flanges, can be checked in the technical catalogue.

The coupling of the driven equipment to the motor flange must be properly dimensioned to ensure the required concentricity of the assembly.

Depending on the flange type, the mounting can be performed from the motor to the driven equipment flange (flange FF (IEC) or D (NEMA)) or from the driven equipment flange to the motor (flange C (DIN or NEMA)).

For the mounting process from the driven equipment flange to the motor, you must consider the bolt length, flange thickness and the thread depth of the motor flange.



If the motor flange has tapped through-holes, the length of the mounting bolts must not exceed the tapped through-hole length of the motor flange, thus preventing damage to the winding head.

For flange mounting the thread engagement length of the mounting bolt should be at least 1.5 times the bolt diameter. In severe applications, longer thread engagement length may be required.

In severe applications or if large motors are flange mounted, a foot or pad mounting may be required in addition to the flange mounting (Figure 6.7). The motor must never be supported on its cooling fins.



Figure 6.7 - Mounting method of flange mounted motors with frame base support

Note:

When liquid (for example oil) is likely to come into contact with the shaft seal, please contact your local WEG representative.



6.2.3. Pad mounted motors

Typically, this method of mounting is used in axial fans. The motor is fixed by tapped holes in the frame. The dimensions of these tapped holes can be checked in the respective product catalogue. The selection of the motor mounting rods/bolts must consider the dimensions of the fan case, the installation base and the thread depth in the motor frame.

The mounting rods and the fan case wall must be sufficiently stiff to prevent the transmission of excessive vibration to the machine set (motor & fan). Figure 6.8 shows the pad mounting system.

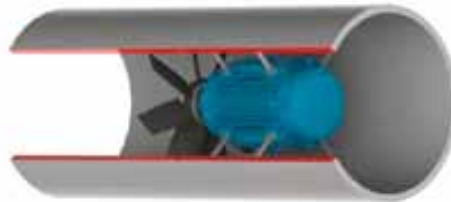


Figure 6.8 – Mounting of the motor inside the cooling duct

6.3. BALANCING

Unbalanced machines generate vibration which can result in damage to the motor. WEG motors are dynamically balanced with “half key” and without load (uncoupled). Special balancing quality level must be stated in the Purchase Order.



The transmission elements, such as pulleys, couplings, etc., must be balanced with “half key” before they are mounted on the motor shaft.

The balance quality grade meets the applicable standards for each product line.

The maximum balancing deviation must be recorded in the installation report

6.4. COUPLINGS

Couplings are used to transmit the torque from the motor shaft to the shaft of the driven machine. The following aspects must be considered when couplings are installed:

- Use proper tools for coupling assembly & disassembly to avoid damages to the motor and bearings.
- Whenever possible, use flexible couplings, since they can absorb eventual residual misalignments during the machine operation.
- The maximum loads and speed limits informed in the coupling and motor manufacturer catalogues cannot be exceeded.
- Level and align the motor as specified in sections 6.5 and 6.6, respectively.



Remove or fix the shaft key firmly when the motor is operated without coupling in order to prevent accidents.

6.4.1. Direct coupling

Direct coupling is characterized when the Motor shaft is directly coupled to the shaft of the driven machine without transmission elements. Whenever possible, use direct coupling due to lower cost, less space required for installation and more safety against accidents.



Do not use roller bearings for direct coupling unless sufficient radial load is expected.

6.4.2. Gearbox coupling

Gearbox coupling is typically used where speed reduction is required.

Make sure that shafts are perfectly aligned and strictly parallel (in case of straight spur gears) and in the right meshing angle (in case of bevel and helical gears).

6.4.3. Pulley and belt coupling

Pulleys and belts are used when speed increase or reduction between motor shaft and driven load is required.



Excessive belt tension will damage the bearings and cause unexpected accidents such as breakage of the motor shaft.



To prevent the buildup of static electricity in the belt drive system, use only properly grounded belts in conductive construction.

6.4.4. Coupling of sleeve bearing motors



Motors designed with sleeve bearings must be operated with direct coupling to the driven machine or a gearbox. Pulley and belts can not be applied for sleeve bearing motors.

Motors designed with sleeve bearings have 3 (three) marks on the shaft end. The center mark is the indication of the magnetic center and the 2 (two) outside marks indicate the allowed limits of the rotor axial movement, as shown in Figure 6.9.

The motor must be so coupled that during operation the arrow on the frame is placed over the central mark indicating the rotor magnetic center. During start-up, or even during operation, the rotor may freely move between the two outside marks when the driven machine exerts an axial load on the motor shaft. However, under no circumstance, the motor can operate continuously with axial forces on the bearing.

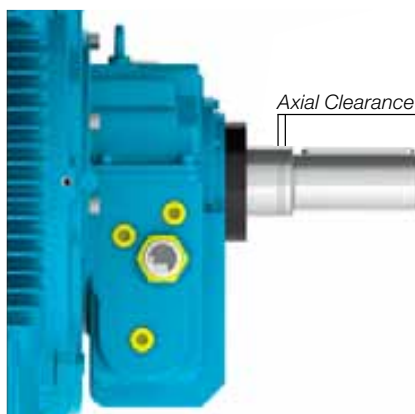


Figure 6.9 - Axial clearance of motor designed with sleeve bearing



For coupling evaluation consider the maximum axial bearing clearance as shown in Table 6.1. The axial clearance of the driven machine and coupling influence the maximum bearing clearance.

Table 6.1 – Clearance used for sleeve bearings

Bearing size	Total axial clearance (mm)
9*	$3 + 3 = 6$
11*	$4 + 4 = 8$
14*	$5 + 5 = 10$
18	$7,5 + 7,5 = 15$

* For Motors in accordance with API 541, the total axial clearance is 12.7 mm

The sleeve bearings used by WEG were not designed to support axial load continuously. Under no circumstance must the motor be operated continuously at its axial clearance limits.



6.5. LEVELING

The motor must be leveled to correct any deviations in flatness arising from the manufacturing process and the material structure rearrangement. The leveling can be carried out by a leveling screw fixed on the motor foot or on the flange or by means of thin compensation shims. After the leveling process, the leveling height between the motor mounting base and the motor cannot exceed 0.1 mm.

If a metallic base is used to level the height of the motor shaft end and the shaft end of the driven machine, level only the metallic base relating to the concrete base.

Record the maximum leveling deviations in the installation report.

6.6. ALIGNMENT

The correct alignment between the motor and the driven machine is one of the most important variables that extends the useful service life of the motor. Incorrect coupling alignment generates high loads and vibrations reducing the useful life of the bearings and even resulting in shaft breakages. Figure 6.10 illustrates the misalignment between the motor and the driven machine.

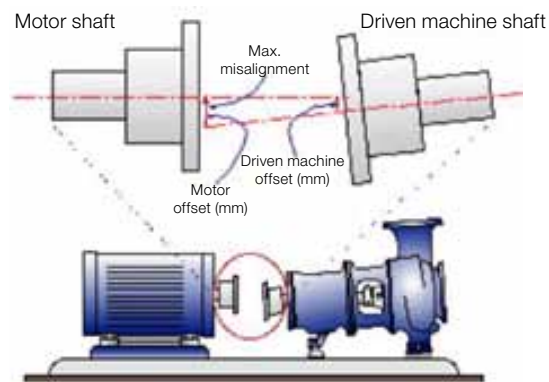


Figure 6.10 – Typical misalignment condition

Alignment procedures must be carried out using suitable tools and devices, such as dial gauge, laser alignment instruments, etc. The motor shaft must be aligned axially and radially with the driven machine shaft.

The maximum allowed eccentricity for a complete shaft turn should not exceed 0.03 mm, when alignment is made with dial gauges, as shown in Figure 6.11. Ensure a gap between couplings to compensate the thermal expansion between the shafts as specified by the coupling manufacturer.

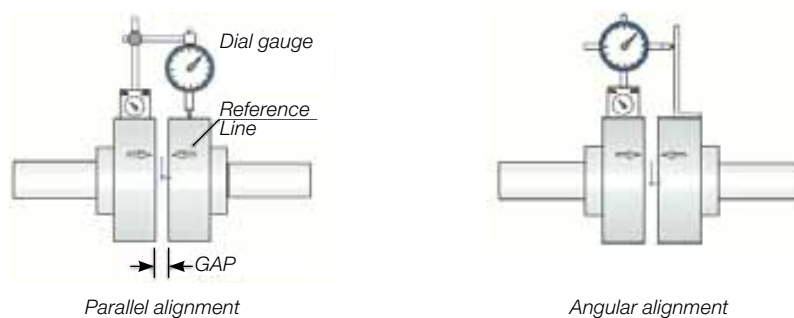


Figure 6.11 – Alignment with dial gauge.

If alignment is made by a laser instrument, please consider the instructions and recommendations provided by the laser instrument manufacturer.

The alignment should be checked at ambient temperature with machine at operating temperature.



The coupling alignment must be checked periodically

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Pulley and belt couplings must be so aligned that the driver pulley center lies in the same plane of the driven pulley center and the motor shaft and the shaft of the driven machine are perfectly parallel. After completing the alignment procedures, ensure that mounting devices do not change the motor and machine alignment and leveling resulting into machine damage during operation.

It is recommended to record the maximum alignment deviation in the Installation Report.

6.7. CONNECTION OF OIL LUBRICATED OR OIL MIST LUBRICATED MOTORS

When oil lubricated or oil mist lubricated motors are installed, connect the existing lubricant tubes (oil inlet and oil outlet tubes and motor drain tube), as shown in Figure 6.12. The lubrication system must ensure continuous oil flow through the bearings as specified by the manufacturer of the installed lubrication system.

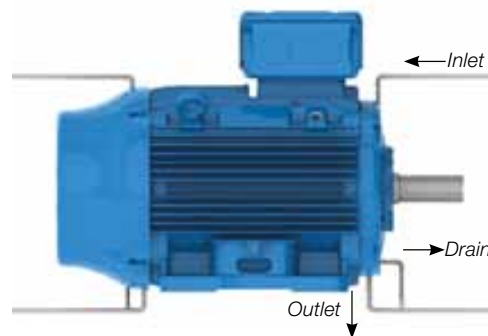


Figure 6.12 – Oil supply and drain system of oil lubricated or oil mist lubricated motors

6.8. CONNECTION OF THE COOLING WATER SYSTEM

When water cooled motors are installed, connect the water inlet and outlet tubes to ensure proper motor cooling. According to item 7.2, ensure correct cooling water flow rate and water temperature in the motor cooling system.

6.9. ELECTRICAL CONNECTION

Consider the rated motor current, service factor, starting current, environmental and installation conditions, maximum voltage drop, etc. to select appropriate power supply cables and switching and protection devices. All motors must be installed with overload protection systems. Three-phase motors should be fitted with phase fault protection systems.



Before connecting the motor, check if the power supply voltage and the frequency comply with the motor nameplate data. All wiring must be made according to the connection diagram on the motor nameplate. Please consider the connection diagrams in the Table 6.2 as reference value.

To prevent accidents, check if motor has been solidly grounded in accordance with the applicable standards.



Table 6.2 - Typical connection diagram for three-phase motors.

Configuration	Quantity of Leads	Type of connection	Connection diagram																						
Single Speed	3	-																							
	6	Δ - Y																							
	9	YY - Y																							
		$\Delta\Delta$ - Δ																							
	12	$\Delta\Delta$ - YY - Δ - Y																							
		Δ - PWS Part-winding start	<table><thead><tr><th colspan="3">PART-WINDING</th><th colspan="3">WYE-DELTA</th></tr><tr><th>START</th><th>RUN</th><th></th><th>START</th><th>RUN</th><th></th></tr></thead><tbody><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>L1 L2 L3</td><td>L1 L2 L3</td><td></td><td>L1 L2 L3</td><td>L1 L2 L3</td><td></td></tr></tbody></table>	PART-WINDING			WYE-DELTA			START	RUN		START	RUN								L1 L2 L3	L1 L2 L3		L1 L2 L3
PART-WINDING			WYE-DELTA																						
START	RUN		START	RUN																					
L1 L2 L3	L1 L2 L3		L1 L2 L3	L1 L2 L3																					
Double Speed Dahlander	6	YY - Y Variable Torque																							
		Δ - YY Constant Torque																							
		YY - Δ Constant Output																							
	9	Δ - Y - YY																							
Double Speed Double Winding	6	-																							

Equivalent table for lead identification													
Lead identification on the wiring diagram		1	2	3	4	5	6	7	8	9	10	11	12
Single Speed	NEMA MG 1 Part 2	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12
	IEC 60034-8	U1	V1	W1	U2	V2	W2	U3	V3	W3	U4	V4	W4
	JIS (JEC 2137) - up to 6 terminals	U	V	W	X	Y	Z						
	JIS (JEC 2137) - above 6 terminals	U1	V1	W1	U2	V2	W2	U5	V5	W5	U6	V6	W6
Double Speed (Dahlander / Double Winding)	NEMA MG 1 Part 2 ¹⁾	1U	1V	1W	2U	2V	2W	3U	3V	3W	4U	4V	4W
	IEC 60034-8	1U	1V	1W	2U	2V	2W	3U	3V	3W	4U	4V	4W
	JIS (JEC 2137)	1U	1V	1W	2U	2V	2W	3U	3V	3W	4U	4V	4W

1) NEMA MG 1 Part 2 defines T1 to T12 for two or more winding, however WEG adopts 1U to 4W.

Connect the motor properly to the power supply by means of safe and permanent contacts.

The grounding connectors are provided inside the terminal box and on the motor frame. Upon request, grounding terminals may be also provided on the motor feet. According to IEC 60079-0, the grounding cable must have a cross-section area of at least 4 mm².



When connectors are used, all wires of the stranded cable must be properly inserted and fixed inside the connector.

If motors are supplied without terminal blocks, insulate the cable terminals with suitable insulation material that meets the power supply voltage and the insulation class indicated on the motor nameplate. The connection must be made outside the hazardous area or protected by a standardized type of protection.

Ensure correct tightening torque for the power cable and grounding connections as specified in Table 8-8.

The clearance distance (see Figure 6.13) between non-insulated live parts with each other and between grounded parts must be as indicated in Table 6.3.

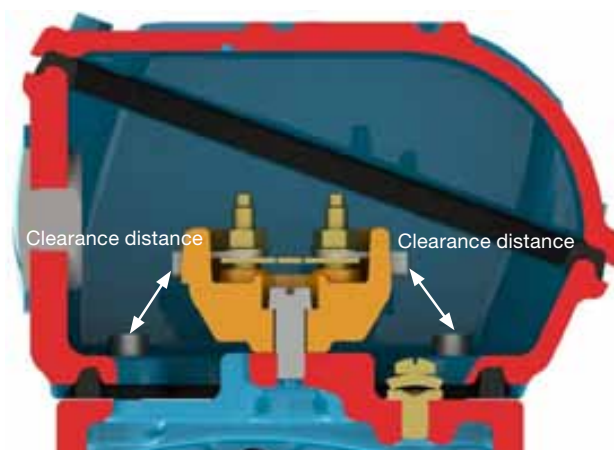
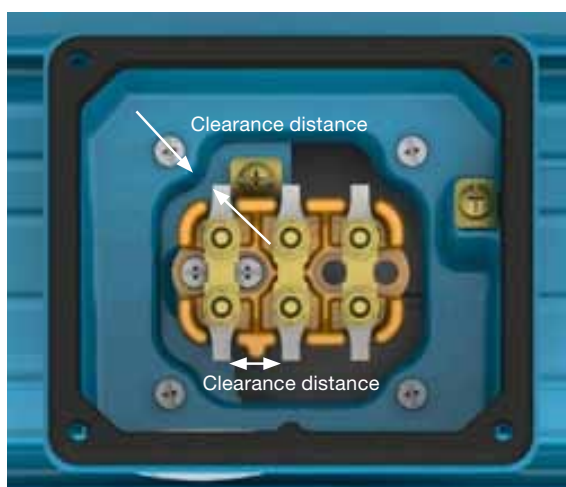


Figure 6.13 - Clearance distance representation

Table 6.3 - Minimum clearance distance (mm) x supply voltage.

Voltage	Minimum clearance distance (mm) x type of protection	
	Ex e Ex de	Ex n Ex d Ex t
$U \leq 440 \text{ V}$	6	4
$440 < U \leq 690 \text{ V}$	10	5.5
$690 < U \leq 1000 \text{ V}$	14	8
$1000 < U \leq 6900 \text{ V}$	60	45
$6900 < U \leq 11000 \text{ V}$	100	70
$11000 < U \leq 16500 \text{ V}$	-	105



Even when the motor is off, dangerous voltages may be present inside the terminal box used for the space heater supply or winding energization when the winding is used as heating element. Motor capacitors will hold a charge even after the power has been cut off. Do not touch the capacitors and/or motor terminals, before discharging the capacitors completely.



After the motor connection has been completed, ensure that no tool or foreign body has been left inside the terminal box.



The thread types and sizes for cable inlet are specified in Table 6.4 and Table 6.5.

Tabela 6.4 - Thread dimensions for inlet power cables.

Frame		Threads for power cables		
IEC	NEMA	Pg	NPT/Rp/Gk	Metric
-	EX61G	-	1/2"	-
63 71 80 90 100	143/5	Pg11 Pg13.5 Pg16	1/4" 1/2" 3/4"	M20 M25
112 132	182/4 213/5	Pg11 Pg13.5 Pg16 Pg21	1/2" 3/4" 1"	M20 M25 M32
160 180 200	254/6 284/6 324/6	Pg11 Pg13.5 Pg16 Pg21 Pg29 Pg36	1/2" 3/4" 1" 1 1/2"	M20 M25 M32 M40 M50
225 250 280 315 355 400 450 500 560 630	364/5 404/5 444/5 445/7 447/9 L447/9 504/5 5008 586/7 588/9 5800 6800 7000 8000 8800 9600	Pg29 Pg36 Pg42 Pg48	1" 1 1/2" 2" 2 1/2" 3" 4"	M32 M40 M50 M63 M72 M75 M80

Note: explosion-proof motors are supplied with Metric or NPT threads only.

Tabela 6.5 - Thread dimensions for accessory cable inlet.

Frame		Threads for accessory cables		
IEC	NEMA	Pg	NPT/Rp/Gk	Metric
All	All	Pg11	1/4"	M20
		Pg13.5	1/2"	M25
		Pg16	3/4"	M32
		Pg21	1"	M40

Note: explosion-proof motors are supplied with Metric or NPT threads only.



Unused cable entry holes in the terminal box must be properly closed to ensure the type of protection, the degree of protection and the Equipment Protection Level (EPL) indicated on the motor nameplate. Cable entry holes used by the user for the motor and accessory connection must be fitted with components (such as, cable glands and conduits) that meet the applicable standards and regulations in each country. For "Ex d" motors, conduit entries are permitted only for electrical equipment of group II. All terminal box holes must be properly closed/protected to ensure the degree of protection, the Equipment Protection Level (EPL) and the type of protection of the enclosure indicated on the motor nameplate.



If the motor is fitted with accessories, such as brakes and forced cooling systems, these devices must be connected to the power supply according to the information provided on their nameplates and with special care as indicated above.

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All protection devices, including overcurrent protection, must be set according to the rated machine conditions. These protection devices must protect the machine against short circuit, phase fault or locked rotor condition.

The motor protection devices intended for use in hazardous areas must be set according to the applicable standards.

Delta connected motors must be protected against phase fault. To do that, connect the overload relay in series to the winding phases and set it to 0.58 times the rated current.

Check the direction of rotation of the motor shaft. If there is no limitation for the use of unidirectional fans, the shaft rotation direction can be changed by reversing any two of the phase connections. For single-phase motor, check the connection diagram indicated on the motor nameplate.

6.10. CONNECTION OF THE THERMAL PROTECTION DEVICES

If the motor is supplied with temperature monitoring devices, such as, thermostat, thermistors, automatic thermal protectors, Pt-100 (RTD), etc., they must be connected to the corresponding control devices as specified on the accessory nameplates. The non-compliance with this procedure may void the product warranty and cause serious material damages.

All thermal protections (RTDs, bimetal thermal protectors and thermistors for stator protection) used in the motor protection circuit must be connected as a simple equipment in and intrinsically safe circuit.



Motors driven by frequency inverters must have their winding thermal protections connected. For other starting methods, the use of the thermal protections is optional.



Do not apply test voltage above 2.5 V on thermistors and current above 1 mA on RTDs (Pt-100) according to IEC 60751 standard.

Figure 6.14 and Figure 6.15 show the connection diagram of the bimetal thermal protector (thermostats) and thermistors, respectively.

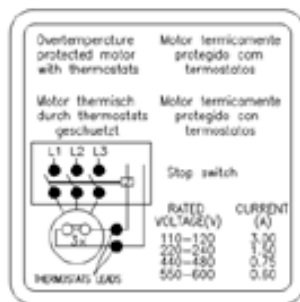


Figure 6.14 - Connection of the bimetal thermal protectors (thermostats)

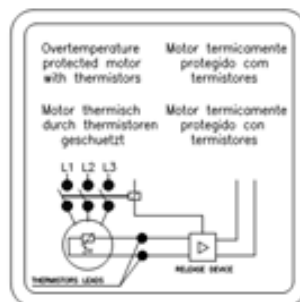


Figure 6.15 – Thermistor connection

In applications with protection by increased safety “Ex e”, the protection device, in case of overload or locked rotor, must trip with time delay based on the current along with monitoring the three external leads. The time-“ t_E ” indicated on the motor nameplate should not be exceeded.

If motors with protection by increased safety “Ex e” are submitted to acceleration time $> 1.7 \times \text{time-“}t_E\text{”}$, they must be protected by protection devices against overcurrent.



Table 6.6 - Maximum activation temperature of the thermal protections.

Component	Marking for hazardous area on the motor nameplate	Hazardous area where the equipment will be installed	Max. operating temperature (°C)	
			Alarm	Tripping
Winding	Ex d	Ex d	130	150
	Ex n	Ex n	130	155
	Ex t	Ex t	120	140
	Ex e	Ex e	-	110
	Ex n + Ex t	Ex n	140	155
		Ex t	-	140
	Ex d + Ex t	Ex d	140	150
		Ex t	-	140
	Class I Div. 1	Class I Div. 1	130	150
Bearing	Class I Div. 2	Class I Div. 2	130	155
	Class II Div. 1	Class II Div. 1	120	140
	All	All	110	120

Notes:

- 1) The number and type of the installed protection devices are stated on the accessory nameplate of the motor.
- 2) If the motor is supplied with calibrated resistance, (for example, Pt-100), the motor monitoring system must be set according to the operating temperatures indicated in Table 6.6

The non-isolated part of the accessory cables should not exceed 1 mm up to the connector as shown in Figure 6.16.

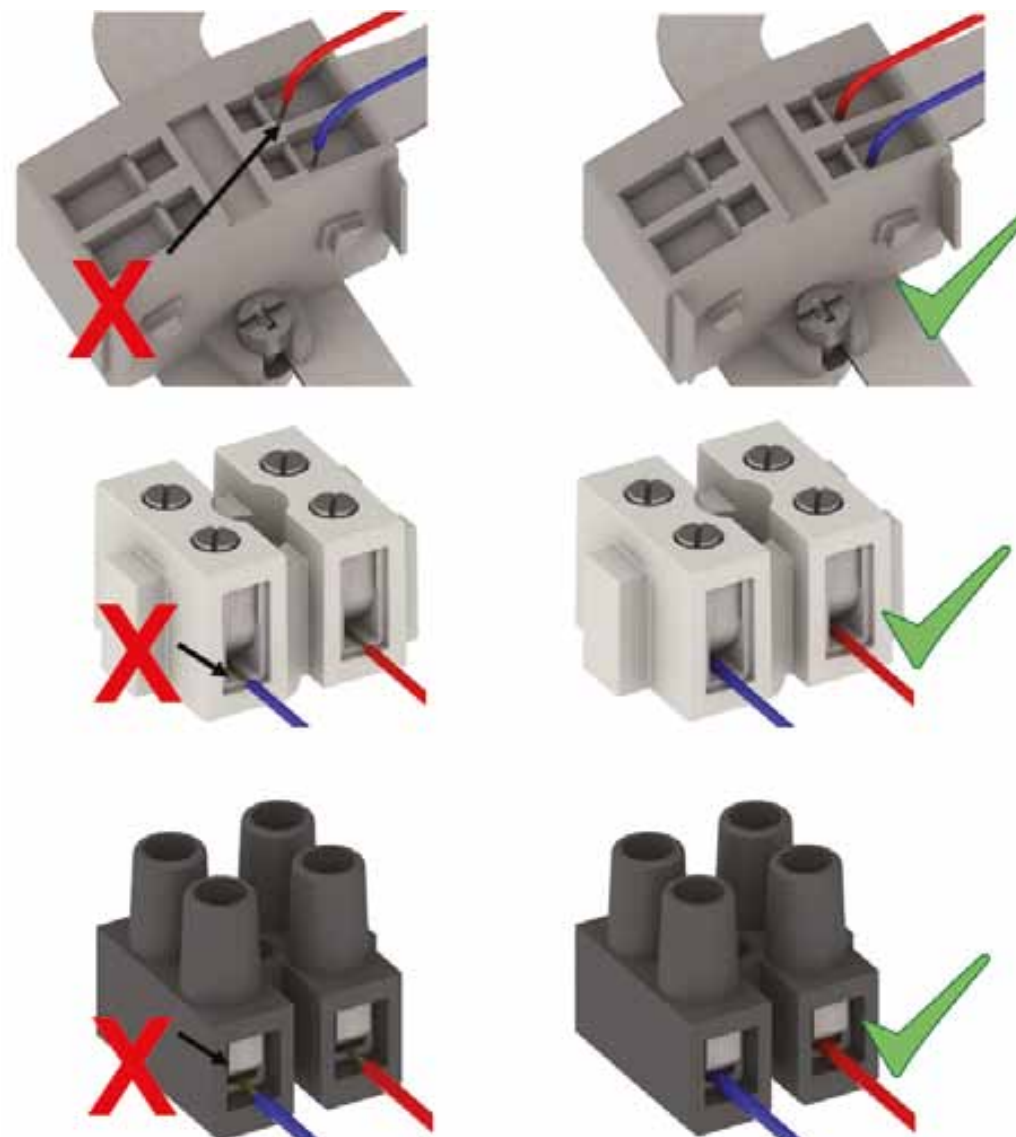


Figure 6.16 - Connection of the accessory cables to the connector.

6.11. RESISTANCE TEMPERATURE DETECTORS (Pt-100)

The RTDs (Pt-100) are made of materials, whose resistance depends on the temperature variation, intrinsic property of some materials (usually platinum, nickel or copper), calibrated resistance. Its operation is based on the principle that the electric resistance of a metallic conductor varies linearly with the temperature, thus allowing a continuous monitoring of the motor warm-up through the controller display ensuring a high level of precision and answer stability. These devices are widely used for measuring temperatures in various industry sectors.

In general these devices are used in installations where precise temperature control is required, for example, in installation for irregular or intermittent duty.

The same detector may be used for alarm and tripping purposes.

Table 6.7 and Figure 6.17 show the equivalence between the Pt-100 resistance and the temperature.

Table 6.7 – Equivalence between the Pt-100 resistance and the temperature.

°C	Ω	°C	Ω	°C	Ω	°C	Ω	°C	Ω
-29	88.617	17	106.627	63	124.390	109	141.908	155	159.180
-28	89.011	18	107.016	64	124.774	110	142.286	156	159.553
-27	89.405	19	107.404	65	125.157	111	142.664	157	159.926
-26	89.799	20	107.793	66	125.540	112	143.042	158	160.298
-25	90.193	21	108.181	67	125.923	113	143.420	159	160.671
-24	90.587	22	108.570	68	126.306	114	143.797	160	161.043
-23	90.980	23	108.958	69	126.689	115	144.175	161	161.415
-22	91.374	24	109.346	70	127.072	116	144.552	162	161.787
-21	91.767	25	109.734	71	127.454	117	144.930	163	162.159
-20	92.160	26	110.122	72	127.837	118	145.307	164	162.531
-19	92.553	27	110.509	73	128.219	119	145.684	165	162.903
-18	92.946	28	110.897	74	128.602	120	146.061	166	163.274
-17	93.339	29	111.284	75	128.984	121	146.438	167	163.646
-16	93.732	30	111.672	76	129.366	122	146.814	168	164.017
-15	94.125	31	112.059	77	129.748	123	147.191	169	164.388
-14	94.517	32	112.446	78	130.130	124	147.567	170	164.760
-13	94.910	33	112.833	79	130.511	125	147.944	171	165.131
-12	95.302	34	113.220	80	130.893	126	148.320	172	165.501
-11	95.694	35	113.607	81	131.274	127	148.696	173	165.872
-10	96.086	36	113.994	82	131.656	128	149.072	174	166.243
-9	96.478	37	114.380	83	132.037	129	149.448	175	166.613
-8	96.870	38	114.767	84	132.418	130	149.824	176	166.984
-7	97.262	39	115.153	85	132.799	131	150.199	177	167.354
-6	97.653	40	115.539	86	133.180	132	150.575	178	167.724
-5	98.045	41	115.925	87	133.561	133	150.950	179	168.095
-4	98.436	42	116.311	88	133.941	134	151.326	180	168.465
-3	98.827	43	116.697	89	134.322	135	151.701	181	168.834
-2	99.218	44	117.083	90	134.702	136	152.076	182	169.204
-1	99.609	45	117.469	91	135.083	137	152.451	183	169.574
0	100.000	46	117.854	92	135.463	138	152.826	184	169.943
1	100.391	47	118.240	93	135.843	139	153.200	185	170.313
2	100.781	48	118.625	94	136.223	140	153.575	186	170.682
3	101.172	49	119.010	95	136.603	141	153.950	187	171.051
4	101.562	50	119.395	96	136.982	142	154.324	188	171.420
5	101.953	51	119.780	97	137.362	143	154.698	189	171.789
6	102.343	52	120.165	98	137.741	144	155.072	190	172.158
7	102.733	53	120.550	99	138.121	145	155.446	191	172.527
8	103.123	54	120.934	100	138.500	146	155.820	192	172.895
9	103.513	55	121.319	101	138.879	147	156.194	193	173.264
10	103.902	56	121.703	102	139.258	148	156.568	194	173.632
11	104.292	57	122.087	103	139.637	149	156.941	195	174.000
12	104.681	58	122.471	104	140.016	150	157.315	196	174.368
13	105.071	59	122.855	105	140.395	151	157.688	197	174.736
14	105.460	60	123.239	106	140.773	152	158.061	198	175.104
15	105.849	61	123.623	107	141.152	153	158.435	199	175.472
16	106.238	62	124.007	108	141.530	154	158.808	200	175.840

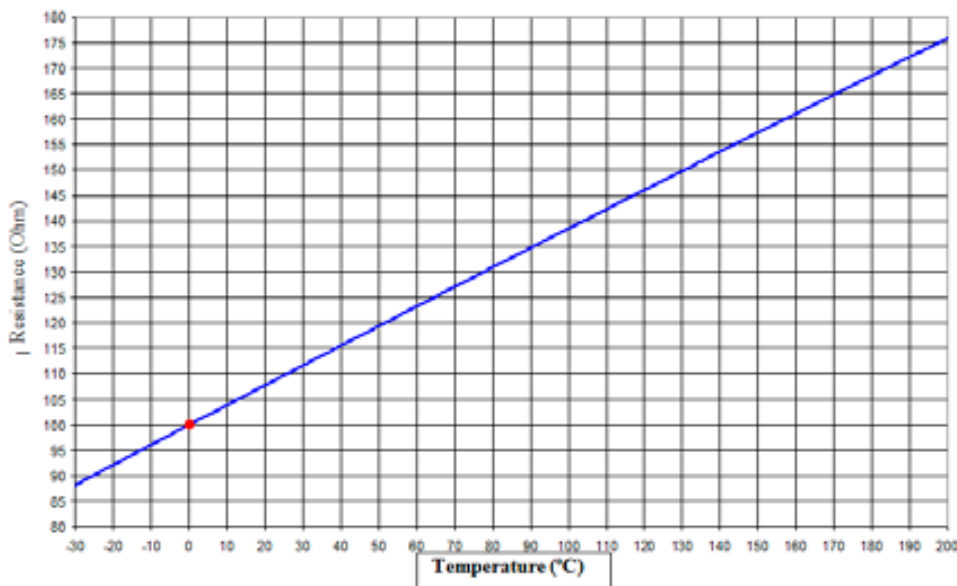


Figure 6.17 - Ohmic resistance of the Pt-100 x temperature

6.12. CONNECTION OF THE SPACE HEATERS

Before switching ON the space heaters, check if the space heaters connection have been made according to the connection diagram shown on the space heater nameplate. For motors supplied with dual voltage space heaters (110-127/220-240 V), see Figure 6.18.

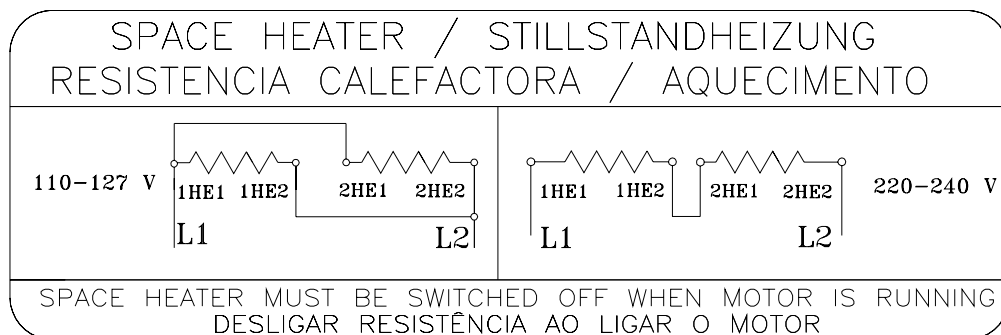


Figure 6.18 - Dual voltage space heater connection.



The space heaters should never be energized when the motor is in operation.

6.13. STARTING METHODS

Whenever possible, the motor starting must be Direct On Line (DOL) at rated voltage. This is the most simple and feasible starting method. However, it must only be applied when the starting current does not affect the power supply. Please consider the local electric utility regulations when installing a motor.

High inrush current may result in:

- a) high voltage drop in the power supply line creating unacceptable line disturbance on the distribution system;
- b) requiring oversized protection system (cables and contactor) increasing the installation costs.

If DOL starting is not allowed due to the reasons mentioned above, an indirect starting method compatible with the load and motor voltage to reduce the starting current may be used.

If reduced voltage starters are used for starting, the motor starting torque will also be reduced.

Table 6.8 shows the possible indirect starting methods that can be used depending on the number of the motor leads.

Table 6.8 - Starting method x number of motor leads.

Number of leads	Possible starting methods
3 leads	Autotransformer Soft-starter
6 leads	Star-Delta Autotransformer Soft-Starter
9 leads	Star-Delta Series/Parallel Part Winding Autotransformer Soft-Starter
12 leads	Star-Delta Series/Parallel Part Winding Autotransformer Soft-Starter

Table 6.9 shows examples of possible indirect starting methods to be used according to the voltage indicated on the motor nameplate and the power supply voltage.

Table 6.9 – Starting methods x voltage

Nameplate voltage	Operating voltage	Star-delta	Autotransformer Starting	Part Winding Starting	Starting by series/parallel switch	Starting by soft-starter
220/380 V	220 V 380 V	YES NO	YES YES	NO NO	NO NO	YES YES
220/440 V	220 V 440 V	NO NO	YES YES	YES NO	YES NO	YES YES
230/460 V	230 V 460 V	NO NO	YES YES	YES NO	YES NO	YES YES
380/660 V	380 V	YES	YES	NO	NO	YES
220/380/440 V	220 V 380 V 440 V	YES NO YES	YES YES YES	YES YES NO	YES YES NO	YES YES YES



The WQuattro line motors must be started direct on-line (DOL) or driven by a frequency inverter in scalar mode.

The starting by frequency inverter may be another starting method to avoid overloading the power supply line. For more information about the motor control by frequency inverter, see item 6.14.

6.14. MOTORS DRIVEN BY FREQUENCY INVERTER



The operation with frequency inverter must be stated in the Purchase Order since this drive type may require some changes of the motor design.



Motors driven by frequency inverters must have their winding thermal protections connected.



Wmagnet Motors must only be driven by WEG frequency inverter.

The frequency inverter used to drive motors up to 690 V must be fitted with Pulse With Modulation (PWM) with vector control.

Motors driven by frequency inverters have an additional nameplate fixed on the motor frame indicating the Service Factor, inverter type, frame size, and/or load type (constant or variable torque) as function of the speed range and motor torque.

When a motor is driven by a frequency inverter at lower frequencies than the rated frequency, you must reduce the motor torque to prevent motor overheating. The torque reduction (derating torque) can be found in the item 6.4 of the “Technical Guidelines for Induction Motors driven by PWM Frequency inverters” available on the site www.weg.net.



If the motor is operated above the rated frequency, please note:

- That the motor must be operated at constant output;
- That the motor can supply max. 95% of its rated output;
- Do not exceed the maximum speed and please consider:
 - max. operating frequency informed on the additional nameplate;
 - mechanical speed limitation of the motor.

The “Ex n” motor line driven by frequency inverter (used in Zone 2 – presence of gas) can be operated up to the limit of the Temperature Class T3 (200 °C).

The “Ex t” motor line driven by frequency inverter (used in Zone 22 and Zone 21 - in the presence of combustible dust) can be operated up to the temperature limit of 125 °C.

Information on the selection of the power cables between the frequency inverter and the motor can be found in the item 6.8 of the “Technical Guidelines for Induction Motors driven by PWM Frequency inverters” available at www.weg.net.

6.14.1. Use of dV/dt filter

6.14.1.1. Motor with enameled round wire

Motors designed for rated voltages up to 690 V, when driven by frequency inverter, do not require the use of dV/dT filters, provided that following criteria are considered.

Criteria for the selection of motors with round enameled wire when driven by frequency inverter ¹				
Motor rated voltage ²	Peak voltage at the motor terminals (max)	dV/dt inverter output (max)	Inverter Rise Time ³ (min.)	MTBP ³ Time between pulses (min)
$V_{nom} \leq 460 \text{ V}$	$\leq 1600 \text{ V}$	$\leq 5200 \text{ V}/\mu\text{s}$	$\geq 0,1 \mu\text{s}$	$\geq 6 \mu\text{s}$
$460 < V_{nom} \leq 575 \text{ V}$	$\leq 1800 \text{ V}$	$\leq 6500 \text{ V}/\mu\text{s}$		
$575 < V_{nom} \leq 690 \text{ V}^4$	$\leq 1600 \text{ V}$	$\leq 5200 \text{ V}/\mu\text{s}$		
$575 < V_{nom} \leq 690 \text{ V}^5$	$\leq 2200 \text{ V}$	$\leq 7800 \text{ V}/\mu\text{s}$		

Notes:

1. For the application of motors with round enameled wires designed for $690 < V_{nom} \leq 1100 \text{ V}$, please contact WEG.
2. For the application of dual voltage motors, example 380/660 V, consider the lower voltage (380 V).
3. Information supplied by the inverter manufacturer.
4. When not stated in the Purchase Order that the motor will be driven by frequency inverter.
5. When stated in the Purchase Order that the motor will be driven by frequency inverter.

6.14.1.2. Motor with prewound coils

Motors with prewound coils (medium and high voltage motors regardless of frame sizes, and low voltage motors from IEC 500 / NEMA 800 frame on), designed for the use with frequency inverters, do not require the use of filters, provided they comply with the criteria in Table 6.10.

Table 6.10 - Criteria to be considered when using motor with prewound coils to be drive by frequency inverters

Motor rated voltage	Type of modulation	Turn to turn insulation (phase-phase)		Phase-ground insulation	
		Peak voltage at the motor terminals	dV/dt at the motor terminals	Peak voltage at the motor terminals	dV/dt at the motor terminals
$690 < V_{nom} \leq 4160 \text{ V}$	Sinusoidal	$\leq 5900 \text{ V}$	$\leq 500 \text{ V}/\mu\text{s}$	$\leq 3400 \text{ V}$	$\leq 500 \text{ V}/\mu\text{s}$
	PWM	$\leq 9300 \text{ V}$	$\leq 2700 \text{ V}/\mu\text{s}$	$\leq 5400 \text{ V}$	$\leq 2700 \text{ V}/\mu\text{s}$
$4160 < V_{nom} \leq 6600 \text{ V}$	Sinusoidal	$\leq 9300 \text{ V}$	$\leq 500 \text{ V}/\mu\text{s}$	$\leq 5400 \text{ V}$	$\leq 500 \text{ V}/\mu\text{s}$
	PWM	$\leq 14000 \text{ V}$	$\leq 1500 \text{ V}/\mu\text{s}$	$\leq 8000 \text{ V}$	$\leq 1500 \text{ V}/\mu\text{s}$

6.14.2. Bearing insulation

Only the motors in IEC frame size 400 (NEMA 680) and larger are supplied, as standard, with insulated bearing. If motor must be driven by frequency inverter, insulate the bearing according to Table 6.11.

Table 6.11 – Recommendation on the bearing insulation for inverter driven motors

Frame size	Recommendation
IEC 315 and 355 NEMA L447/9, 504/5, 5006/7/8, 5009/10/11, 586/7, 5807/8/9, 5810/11/12 and 588/9	One bearing is isolated
IEC 400 and higher NEMA 680 and higher	NDE-bearing is isolated



The shaft grounding system for explosion-proof motors can be used only inside the enclosure. For other types of protection the shaft grounding system is not allowed.

6.14.3. Switching Frequency

The minimum inverter switching frequency must not be lower than 2.5 kHz and should not exceed 5 kHz.



The non-compliance with the criteria and recommendations indicated in this manual may void the product warranty.



The use of sparking components, such as grounding brushes, is not allowed in explosive atmospheres.

6.14.4. Mechanical speed limitation

Table 6.12 shows the maximum speeds allowed for motors driven by frequency inverter.

Table 6.12 – Maximum motor speed (in rpm).

Frame size		DE-bearing	Maximum speed for standard motors
IEC	NEMA		
63-90	143/5	6201 6202 6203 6204 6205	10400
100	-	6206	8800
112	182/4	6207 6307	7600 6800
132	213/5	6308	6000
160	254/6	6309	5300
180	284/6	6311	4400
200	324/6	6312	4200
225-630	364/5-9610	6314	3600
		6315	3600
		6316	3200
		6319	3000
		6220	3600
		6320	2200
		6322	1900
		6324	1800
		6328	1800
		6330	1800

Note:

To select the maximum allowed motor speed, consider the motor torque derating curve.

For more information on the application of frequency inverters, contact WEG or check the “Technical Guidelines for Induction Motors driven by PWM Frequency inverters” available at www.weg.net.



7. COMMISSIONING

7.1. INITIAL START-UP

After finishing the installation procedures and before starting the motor for the first time or after a long period without operation, the following items must be checked:

- If the nameplate data (voltage, current, connection diagram, degree of protection, type of protection, cooling system, service factor, etc.) meet the application requirements.
- If the machine set (motor + driven machine) has been mounted and aligned correctly.
- If the motor driving system ensures that the motor speed does not exceed the max. allowed speed indicated in Table 6.12.
- Measure the winding insulation resistance, making sure it complies with the specified values in item 5.4.
- Check the motor rotation direction.
- Inspect the motor terminal box for damage and ensure that it is clean and dry and all contacts are rust-free, the seals are in perfect operating conditions and all unused threaded holes are properly closed thus ensuring the degree of protection and the type of protection of the motor indicated on the motor nameplate.
- Check if the motor wiring connections, including grounding and auxiliary equipment connection, have been carried out properly and are in accordance with the recommendations in item 6.9.
- Check the operating conditions of the installed auxiliary devices (brake, encoder, thermal protection device, forced cooling system, etc.).
- Check bearing operating conditions. If signs of oxidation are detected, replace the bearings. If no sign of oxidation is detected, relubricate the bearings as described in item 8.2. If the motors are stored for more than two years, the bearings must be replaced before starting the motor.
- When motors are fitted with sleeve bearings, ensure:
 - correct oil level for the sleeve bearing. The oil level should be in the center of the sight glass (see Figure 6.8);
 - that the motor is not started or operated with axial or radial loads;
 - that if the motor is stored for a period equal or longer than the oil change interval, the oil must be changed before starting the motor.
- Inspect the capacitor operating condition, if any. If motors are installed for more than two years, but were never commissioned, it is recommended to change the start capacitors since they lose their operating characteristics.
- Ensure that the air inlet and outlet opening are not blocked. The minimum clearance to the nearest wall (L) should be at least $\frac{1}{4}$ of the fan cover diameter (D), see Figure 7.1. The intake air temperature must be at ambient temperature.

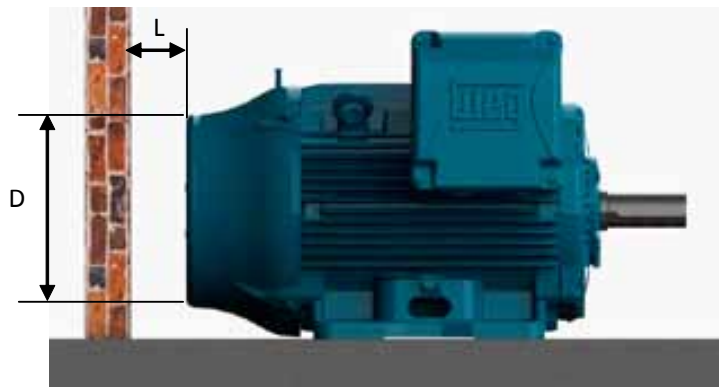


Figure 7.1- Minimum clearance to the wall

Please consider the minimum distances shown in the Table 7.1 as reference value

Table 7.1 – Minimum distance between the fan cover and wall

Frame size		Distance between the fan cover and the wall (L)	
IEC	NEMA	mm	inches
63	-	25	0.96
71	-	26	1.02
80	-	30	1.18
90	143/5	33	1.30
100	-	36	1.43
112	182/4	41	1.61
132	213/5	50	1.98
160	254/6	65	2.56
180	284/6	68	2.66
200	324/6	78	3.08
225	364/5	85	3.35
250	404/5		
280	444/5 445/7 447/9	108	4.23
315	L447/9 504/5 5006/7/8 5009/10/11	122	4.80
355	586/7 588/9 5807/8/9 5810/11/12	136	5.35
400	6806/7/8 6809/10/11	147	5.79
450	7006/10	159	6.26
500	8006/10	171	6.73
560	8806/10	185	7.28
630	9606/10	200	7.87

- ensure correct water flow rate and water temperature when water cooled motors are used. See item 7.2.
- ensure that all rotating parts, such as pulleys, couplings, external fans, shaft, etc. are protected against accidental contact.

Other tests and inspections not included in the manual may be required, depending on the specific installation, application and/or motor characteristics.

After all previous inspections have been carried out, proceed as follows to start the motor:

- Start the motor on no-load (if possible) and check the motor direction of rotation. Check for the presence of any abnormal noise, vibration or other abnormal operating conditions.
- Ensure the motor starts smoothly. If any abnormal operating condition is noticed, switch off the motor, check the assembly system and connections before the motor is started again.
- If excessive vibrations are noticed, check if the motor mounting bolts are well tightened or if the vibrations are not generated and transmitted from adjacent installed equipment. Check the motor vibration periodically and ensure that the vibration limits are as specified in item 7.2.1.
- Start the motor at rated load during a short time and compare the operating current with the rated current indicated on the nameplate.
- Continue to measure the following motor variables until thermal equilibrium is reached: current, voltage, bearing and motor frame temperature, vibration and noise levels.
- Record the measured current and voltage values on the Installation Report for future comparisons.

As induction motors have high inrush currents during start-up, the acceleration of high inertia load requires an extended starting time to reach full speed resulting in fast motor temperature rise. Successive starts within short intervals will result in winding temperature increases and can lead to physical insulation damage reducing the useful life of the insulation system. If the duty S1 is specified on the motor nameplate, this means that the motor has been designed for:

- two successive starts: first start from cold condition, i. e., the motor windings are at room temperature and the second start immediately after the motor stops.
- one start from hot condition, i. e., the motor windings are at rated temperature.

The Troubleshooting Chart in section 10 provides a basic list of unusual cases that may occur during motor operation with the respective corrective actions



7.2. OPERATING CONDITIONS

Unless otherwise stated in the Purchase Order, electric motors are designed and built to be operated at altitudes up to 1000 meters above sea level and in a temperature range from -20 °C to +40 °C. Any deviation from the normal condition of motor operation must be stated on the motor nameplate. Some components must be changed if the ambient temperature is different from the specified one. Please contact WEG to check the required special features.

For operating temperatures and altitudes differing from those above, the factors indicated in Table 7.2 must be applied to the nominal motor power rating in order to determine the derated available output ($P_{max} = P_{nom} \times$ correction factor).

Table 7.2 - Correction factors for altitude and ambient temperature.

T (°C)	Altitude (m)								
	1000	1500	2000	2500	3000	3500	4000	4500	5000
10							0.97	0.92	0.88
15						0.98	0.94	0.90	0.86
20					1.00	0.95	0.91	0.87	0.83
25				1.00	0.95	0.93	0.89	0.85	0.81
30			1.00	0.96	0.92	0.90	0.86	0.82	0.78
35		1.00	0.95	0.93	0.90	0.88	0.84	0.80	0.75
40	1.00	0.97	0.94	0.90	0.86	0.82	0.80	0.76	0.71
45	0.95	0.92	0.90	0.88	0.85	0.81	0.78	0.74	0.69
50	0.92	0.90	0.87	0.85	0.82	0.80	0.77	0.72	0.67
55	0.88	0.85	0.83	0.81	0.78	0.76	0.73	0.70	0.65
60	0.83	0.82	0.80	0.77	0.75	0.73	0.70	0.67	0.62
65	0.79	0.76	0.74	0.72	0.70	0.68	0.66	0.62	0.58
70	0.74	0.71	0.69	0.67	0.66	0.64	0.62	0.58	0.53
75	0.70	0.68	0.66	0.64	0.62	0.60	0.58	0.53	0.49
80	0.65	0.64	0.62	0.60	0.58	0.56	0.55	0.48	0.44

Motors installed inside enclosures (cubicles) must be ensured an air renewal rate in the order of one cubic meter per second for each 100 kW installed power or fraction of installed power. Totally Enclosed Air Over motors - TEAO (fan and exhaust / smoke extraction) are supplied without cooling fan and the manufacturer of the driven machine is responsible for sufficient motor cooling. If no minimum required air speed between motor fins is indicated on the motor nameplate, ensure the air speed indicated in the table 7.3 is provided. The values shown in Table 7.3 are valid for 60 Hz motors. To obtain the minimum air speed for 50 Hz motors, multiply the values in the table by 0.83.

Table 7.3 – Minimum required air speed between motor fins (metres/second).

Frame		Poles			
IEC	NEMA	2	4	6	8
63 to 90	143/5	14	7	5	4
100 to 132	182/4 to 213/5	18	10	8	6
160 to 200	254/6 to 324/6	20	20	12	7
225 to 280	364/5 to 444/5	22	22	18	12
315 to 355	445/7 to 588/9	25	25	20	15

The voltage and frequency variations may affect the performance characteristics and the electromagnetic compatibility of the motor. The power supply variations should not exceed the values specified in the applicable standards. Examples:

- ABNT NBR 17094 - Parts 1 and 2. The motor has been designed to supply the rated torque for a combined variation in voltage and frequency:
 - Zone A: $\pm 5\%$ of the rated voltage and $\pm 2\%$ of the rated frequency.
 - Zone B: $\pm 10\%$ of the rated voltage and $+3\%$ -5% of the rated frequency.

When operated continuously in Zone A or B, the motor may show performance variations and the operating temperature may increase considerably. These performance variations will be higher in Zone B. Thus it is not recommended to operate the motor in Zone B during extended periods.

- IEC 60034-1. The motor has been designed to supply the rated torque for combined variation in voltage and frequency:
 - Zone A: $\pm 5\%$ of the rated voltage and $\pm 2\%$ of the rated frequency.
 - Zone B: $\pm 10\%$ of the rated voltage and $+3\%$ -5% of the rated frequency.

When operated continuously in Zone A or B, the motor may show performance variations and the operating temperature may increase considerably. These performance variations will be higher in Zone B. Thus it is not recommended to operate the motor in Zone B during extended periods. For multivoltage motors (example 380-415/660 V), a $\pm 5\%$ voltage variation from the rated voltage is allowed.

- NEMA MG 1 Part 12. The motor has been designed to be operated in one of the following variations:
 - $\pm 10\%$ of the rated voltage, with rated frequency;
 - $\pm 5\%$ of the rated frequency, with rated voltage;
 - A combined variation in voltage and frequency of $\pm 10\%$, provided the frequency variation does not exceed $\pm 5\%$.

“Ex e” motors are designed to be operated only in Zone A – voltage and frequency variation.

If the motor is cooled by ambient air, clean the air inlet and outlet openings and cooling fins at regular intervals to ensure a free airflow over the frame surface. The hot air should never be returned to the motor. The cooling air must be at room temperature limited to the temperature range indicated on the motor nameplate (if no room temperature is specified, please consider a temperature range between $-20\text{ }^{\circ}\text{C}$ and $+40\text{ }^{\circ}\text{C}$).

Table 7.4 shows the minimum required water flow for water cooled motors considering the different frame sizes and the maximum allowed temperature rise of the cooling water after circulating through the motor. The inlet water temperature should not exceed $40\text{ }^{\circ}\text{C}$.

Table 7.4 – Minimum required water flow and the maximum allowed temperature rise of the cooling water after circulating through the motor

Frame size		Flow rate (litres/minute)	Maximum allowed water temperature rise ($^{\circ}\text{C}$)
IEC	NEMA		
180	284/6	12	5
200	324/6	12	5
225	364/5	12	5
250	404/5	12	5
280	444/5	15	6
	445/7		
	447/9		
315	504/5	16	6
355	586/7	25	6
	588/9		

Motors fitted with oil mist lubrication systems can be operated continuously for a maximum of one hour after the failure of the oil pumping system.

Considering the sun's heat increases the operating temperature, externally mounted motors should always be protected from direct sunlight exposure.

Each and every deviation from the normal operating condition (tripping of the thermal protection, noise and vibration level increase, temperature and current rise) should be investigated and corrected by WEG Authorized Service Centers for explosive atmospheres.



Motors fitted with cylindrical roller bearings require a minimum radial load to ensure a normal operation. For information regarding the radial preload, please contact WEG.

7.2.1.Limits of vibration

The vibration severity is the maximum vibration value measured at all positions and in all directions as recommended in the standard IEC 60034-14. Table 7.5 specifies the limits of the maximum vibrations magnitudes according to standard IEC 60034-14 for shaft heights IEC 56 to 400, for vibrations grades A and B. The vibration severity limits in Table 7.5 are given as RMS values (Root Mean Square values or effective values) of the vibration speed in mm/s measured in free suspension condition.

Table 7.5 - Limits of maximum vibration magnitude according to standard IEC 60034-14

Shaft height [mm]	$56 \leq H \leq 132$	$132 \leq H \leq 280$	$H > 280$
Vibration Grade	Vibration severity on elastic base [mm/s RMS]		
A	1.6	2.2	2.8
B	0.7	1.1	1.8

Notes:

- 1 – The values in Table 7.5 are valid for measurements carried out with decoupled machines (without load) operated at rated voltage and frequency.
- 2 – The values in Table 7.5 are valid regardless of the direction of rotation of the machine.
- 3 – The values in Table 7.5 are not applicable to single-phase motors, three-phase motors powered by a single-phase system or to machines mounted in situ or coupled with inertia flywheels or to loads.

According to NEMA MG 1, the allowed vibration limit for standard motors is 0.15 in/s (peak vibration in in/s).

Note:

For the load operation condition, the use of the standard ISO 10816-3 is recommended for evaluating the motor vibration limits. In the load condition the motor vibration will be influenced by several factors, such as, type of the coupled load, condition of the motor fixation, alignment condition under load, structure or base vibration due to other equipments, etc.



8. MAINTENANCE

The purpose of the maintenance is to extend the useful life of the equipment. The non-compliance with one of these previous items can cause unexpected machine failures.

If motors with cylindrical roller or angular contact bearings are to be transported during the maintenance procedures, the shaft locking device must always be fitted. All HGF motors, regardless of the bearing type, must always be transported with the shaft locking device fitted.

All repairs, disassembly and assembly related services must be carried out only by qualified and well-trained personnel by using proper tools and techniques. Make sure that the machine has stopped and it is disconnected from the power supply, including the accessory devices (space heater, brake, etc.), before any servicing is undertaken.

The company does not assume any responsibility or liability for repair services or maintenance operations to motor for use in hazardous areas executed by non-authorized Service Centers or by non qualified service personnel. The company shall have no obligation or liability whatsoever to the buyer for any indirect, special, consequential or incidental loss or damage caused or arising from the company's proven negligence.

Repairs to motor for use in hazardous areas must be executed in accordance with the applicable standards.

8.1. GENERAL INSPECTION

The inspection intervals depend on the motor type, application and installation conditions. Proceed as follows during inspection:

- Visually inspect the motor and coupling. Check if abnormal noises, vibrations, excessive heating, wear signs, misalignment or damaged parts are noticed. Replace the damaged parts as required.
- Measure the insulation resistance according to the item 5.4.
Clean the motor enclosure. Remove oil spills and dust accumulation from the motor frame surface to ensure a better heat transfer to the surrounding ambient. Motors with potential risk for electrostatic charge accumulation, duly identified, must be cleaned carefully by using a damp cloth to prevent electrostatic discharge during maintenance interventions.
- Check cooling fan condition and clean the air inlet & outlet openings to ensure a free air flow over the motor.
- Investigate the actual condition of the seals and replace them, if required.
- Drain the condensed water from inside the motor. After draining, reinstall the drain plugs to ensure the degree of protection as indicated on the motor nameplate. The motor must always be positioned so the drain hole is at the lowest position (see item 6).
- Check the connections of the power supply cables, ensuring the correct clearance distance between live and grounded parts, as specified in Table 6-2.
- Check if the tightening torque of the bolted connections and mounting bolts meets the tightening torque specified in Table 8 8.
- Check the status of the cable passages, the cable gland seals and the seals inside the terminal box and replace them, if required.
- Check the bearing operating conditions. Check for the presence of any abnormal noise, vibration or other abnormal operating conditions, like motor temperature rise. Check the oil level, the lube oil condition and compare the workings hours with the informed life time.
- For explosion-proof motors check if the gap between the components is according to the Table 8-7. The tolerance class of the metric threads for the cable inlet must be 6H or better.
- Record and file all changes performed on the motor.



Do not reuse damaged or worn parts. Damaged or worn parts must be replaced by parts supplied by the manufacturer and must be installed as if they were the original parts.

8.2. LUBRICATION

Proper lubrication plays a vital role in the motor performance. Only use the grease or oil types, amounts and lubrication intervals recommended for the bearings. This information is available on the motor nameplate and the lubrication procedures must be carried out according to the type of lubricant (oil or grease).

When the motor is fitted with thermal protection devices for bearing temperature control, consider the operating temperature limits shown in Table 6.3.

The maximum operating temperature of motors used in special applications may differ from those shown in Table 6.3. The grease and oil disposal should be made in compliance with applicable laws in each country



Please contact WEG when motors are to be installed in special environments or used for special applications.

8.2.1. Grease lubricated rolling bearings



Excess grease causes bearing overheating, resulting in bearing failure.

The lubrication intervals specified in Table 8.1, Table 8.2, Table 8.3 and Table 8.4 consider an absolute temperature on the bearing of 70 °C (up to frame size IEC 200 / NEMA 324/6) and 85 °C (for frame size IEC 225 / NEMA 364/5 and above) the motor running at rated speed, a motor mounted in horizontal position, greased with Mobil Polyrex EM grease. Any variation of the parameters listed above must be evaluated.

Table 8.1 - Lubrication intervals for deep groove ball bearings.

Frame		Poles	Bearing designation	Amount of grease (g)	Lubrication intervals (hours)			
					W21 TEFC (Totally Enclosed Fan Cooled)		W22 TEFC (Totally Enclosed Fan Cooled)	
IEC	NEMA				50 Hz	60 Hz	50 Hz	60 Hz
90	143/5	2	6205	4	20000	20000	25000	25000
		4						
		6						
		8						
100	-	2	6206	5	20000	20000	25000	25000
		4						
		6						
		8						
112	182/4	2	6207/ 6307	9	20000	20000	25000	25000
		4						
		6						
		8						
132	213/5	2	6308	11	20000	18400	25000	23200
		4			20000	20000	25000	25000
		6						
		8						
160	254/6	2	6309	13	18100	15700	22000	20000
		4			20000	20000	25000	25000
		6						
		8						
180	284/6	2	6311	18	13700	11500	17000	14000
		4			20000	20000	25000	25000
		6						
		8						
200	324/6	2	6312	21	11900	9800	15000	12000
		4			20000	20000	25000	25000
		6						
		8						
225 250 280 315 355	364/5 404/5 444/5 445/7 447/9 L447/9 504/5 5008 5010/11 586/7 588/9	2	6314	27	4500	3600	5000	4000
		4			11600	9700	14000	12000
		6			16400	14200	20000	17000
		8			19700	17300	24000	20000
		2	6316	34	3500	*Upon request	4000	*Upon request
		4			10400	8500	13000	10000
		6			14900	12800	18000	16000
		8			18700	15900	20000	20000
		2	6319	45	2400	*Upon request	3000	*Upon request
		4			9000	7000	11000	8000
		6			13000	11000	16000	13000
		8			17400	14000	20000	17000
		4	6322	60	7200	5100	9000	6000
		6			10800	9200	13000	11000
		8			15100	11800	19000	14000
		8						



Table 8.2 - Lubrication intervals for cylindrical roller bearings

Frame		Poles	Bearing designation	Amount of grease (g)	Lubrication intervals (hours)				
					W21 TEFC (Totally Enclosed Fan Cooled)		W22 TEFC (Totally Enclosed Fan Cooled)		
IEC	NEMA				50 Hz	60 Hz	50 Hz	60 Hz	
160	254/6	2	NU309	13	13300	9800	16000	12000	
		4			20000	20000	25000	25000	
		6							
		8							
180	284/6	2	NU311	18	9200	6400	11000	8000	
		4			20000	19100	25000	25000	
		6				20000			
		8							
200	324/6	2	NU312	21	7600	5100	9000	6000	
		4			20000	17200	25000	21000	
		6				20000		25000	25000
		8							
225 250 280 315 355	364/5 404/5 444/5 445/7 447/9 L447/9 504/5 5008 5010/11 586/7 588/9	4	NU314	27	8900	7100	11000	9000	
		6			13100	11000	16000	13000	
		8			16900	15100	20000	19000	
		4	NU316	34	7600	6000	9000	7000	
		6			11600	9500	14000	12000	
		8			15500	13800	19000	17000	
		4	NU319	45	6000	4700	7000	5000	
		6			9800	7600	12000	9000	
		8			13700	12200	17000	15000	
		4	NU322	60	4400	3300	5000	4000	
		6			7800	5900	9000	7000	
		8			11500	10700	14000	13000	

Table 8.3 - Lubrication intervals for deep groove ball bearings – HGF line.

Frame		Poles	Bearing designation	Amount of grease (g)	Lubrication intervals (hours)	
					50 Hz	60 Hz
315L/A/B and 315C/D/E	5006/7/8T and 5009/10/11T	2	6314	27	3100	2100
		4 – 8	6320	50	4500	4500
			6316	34	4500	4500
355L/A/B and 355C/D/E	5807/8/9T and 5810/11/12T	2	6314	27	3100	2100
		4 – 8	6322	60	4500	4500
			6319	45	4500	4500
400L/A/B and 400 C/D/E	6806/7/8T and 6809/10/11T	2	6315	30	2700	1800
		4 – 8	6324	72	4500	4500
			6319	45	4500	4500
450	7006/10	2	6220	31	2500	1400
		4	6328	93	4500	3300
			6322	60	4500	4500
		6 – 8	6328	93	4500	4500
			6322	60	4500	4500
500	8006/10	4	6330	104	4200	2800
			6324	72	4500	4500
		6 – 8	6330	104	4500	4500
			6324	72	4500	4500
500	8006/10	4	6330	104	4200	2800
			6324	72	4500	4500
		6 – 8	6330	104	4500	4500
			6324	72	4500	4500
560	8806/10	4 - 8	*Upon request			
630	9606/10	4 - 8				

Table 8.4 - Lubrication intervals for cylindrical roller bearings – HGF line

Frame		Poles	Bearing designation	Amount of grease (g)	Lubrication intervals (hours)	
IEC	NEMA				50 Hz	60 Hz
315L/A/B and 315C/D/E	5006/7/8 and 5009/10/11	4	NU320	50	4300	2900
		6 - 8			4500	4500
355L/A/B and 355C/D/E	5807/8/9 and 5810/11/12	4	NU322	60	3500	2200
		6 - 8			4500	4500
400L/A/B and 400C/D/E	6806/7/8 and 6809/10/11	4	NU324	72	2900	1800
		6 - 8			4500	4500
450	7006/10	4	NU328	93	2000	1400
		6			4500	3200
		8			4500	4500
500	8006/10	4	NU330	104	1700	1000
		6			4100	2900
		8			4500	4500
560	8806/10	4	NU228 + 6228	75	2600	1600
		6 - 8		106	4500	4500
630	9606/10	4	NU232 + 6232	92	1800	1000
		6		120	4300	3100
		8		140	4500	4500

For each increment of 15 °C above the room temperature, the relubrication intervals given in the Table must be halved. The relubrication interval of motors designed by the manufacturer for mounting in horizontal position, but installed in vertical position (with WEG authorization), must be halved.

For special applications, such as: high and low temperatures, aggressive environments, driven by frequency inverter (VFD – frequency inverter), etc., please contact WEG about the required amount of grease and the relubrication intervals.

8.2.1.1. Motor without grease fitting

Motors without grease fittings must be lubricated in accordance with the existing Maintenance Plan. Motor disassembly must be carried out as specified in Item 8.3. If motors are fitted with shielded bearings (for example, ZZ, DDU, 2RS, VV), these bearings must be replaced at the end of the grease service life.

8.2.1.2. Motor with grease fitting

To lubricate the bearings with the motor stopped, proceed as follows:

Motors with grease fittings must be stopped to be lubricated. Proceed as follows:

- Before lubricating, clean the grease nipple and immediate vicinity thoroughly;
- Lift grease inlet protection;
- Remove the grease outlet plug;
- Pump in approximately half of the total grease indicated on the motor nameplate and run the motor for about 1 (one) minute at rated speed;
- Switch-off the motor and pump in the remaining grease;
- Lower again the grease inlet protection and reinstall the grease outlet protection.

To grease the motor while running, proceed as follows:

- Before lubricating, clean the grease nipple and immediate vicinity thoroughly;
- Pump the total grease indicated on the motor nameplate;
- Lower again the grease inlet protection.



For lubrication, use only manual grease gun.

If Motors are provided with a spring device for grease removal, the grease excess must be removed by pulling the rod and cleaning the spring until the spring does not remove more grease.

8.2.1.3. Compatibility of the Mobil Polyrex EM grease with other greases

The Mobil Polyrex EM grease has a polyurea thickener and a mineral oil thus being compatible with greases that contain:

- Lithium based thickener, lithium-based complex thickener, polyurea thickener and refined mineral oil;
- The used grease must have in its formulation corrosion and oxidation inhibitors.

In general terms, greases with the same type of soap are compatible to each other. However, depending on the proportion of the mixture there may be incompatibility. In such a case, it is not recommended to mix different types of greases without contacting the supplier or WEG beforehand.



8.2.2. Oil lubricated bearings

To change the oil of oil lubricated motor proceed as follows:

- switch-off the motor;
- remove threaded oil drain plug;
- open the valve and drain the oil;
- close the drain vale again;
- reinstall the threaded oil drain plug;
- fill-up with the type and amount of oil as specified on the nameplate;
- check oil level. The oil level is OK when the lubricant can be viewed approximately in the center of the sight glass;
- reinstall oil inlet plug;
- check for oil leaks and ensure that all not used threaded plugs are closed with plugs.

The bearing lubricating oil must be replaced as specified on the nameplate or whenever changes in the oil properties are noticed. The oil viscosity and pH must be checked periodically. The oil level must be checked every day and must be kept in the center of the sight glass.

Please contact WEG, when oils with different viscosities should be used.

Note:

The HGF vertical mounted motors with high axial thrust are supplied with grease lubricated DE-bearings and with oil lubricated NDE-bearings. The DE-bearings must be lubricated according to recommendations in item 8.2.1. Table 8.5 specifies the oil type and the amount of oil required for this motor lubrication.

Table 8.5 – Oil properties for HGF vertical mounted motors with high axial thrust

Mounting - High axial thrust	Frame		Poles	Bearing designation	Oil (liters)	Interval (h)	Lubricant	Lubricant specification
	IEC	NEMA						
	315L/A/B e 315C/D/E	5006/7/8T e 5009/10/11T	4 - 8	29320	20	8000	Renolin DTA 40 / SHC 629	ISO VG150 mineral oil with antifoam and antioxidant additives
	355L/A/B e 355C/D/E	5807/8/9T e 5810/11/12T	4 - 8	29320	26			
	400L/A/B e 400C/D/E	6806/7/8T e 6809/10/11T	4 - 8	29320	37			
	450	7006/10	4 - 8	29320	45			

8.2.3. Oil mist lubricated bearings

Check the service conditions of the seals and if replacement is required use only original components. Clean the seal components before assembly (bearing caps, end shields, etc.).

Apply joint sealant between the bearing caps and end shields. The joint sealant must be compatible with the used lubricating oil. Connect the oil lubricant tubes (oil inlet and oil outlet tubes and motor drain tube), as shown in Figure 6.12.

8.2.4. Sleeve bearings

The lubricating oil of sleeve bearings must be changed at the intervals specified in Table 8.6. To replace the oil, proceed as follows:

- NDE-bearing: remove the protection plate from the fan cover;
- Drain the oil through the drain hole located at the bottom of the bearing (see Figure 8.1);
- Close the oil drain hole;
- Remove the oil inlet plug;
- Fill the sleeve bearing with the specified oil and with the amount of oil specified in;
- Check the oil level and ensure it is kept close to the center of the sight glass;
- Install the oil inlet plug;
- Check for oil leaks.



Figure 8.1 – Sleeve bearing

Table 8.6 – Oil properties for sleeve bearings.

Frame		Poles	Bearing designation	Oil (liters)	Interval (h)	Lubricant	Lubricant Specification
IEC	NEMA						
315L/A/B and 315C/D/E	5006/7/8T and 5009/10/11T	2	9-80	2.8	8000	Renolin DTA 10	ISO VG32 mineral oil with antifoam and antioxidant additives
355L/A/B and 355C/D/E	5807/8/9T and 5810/11/12T						
400L/A/B and 400C/D/E	6806/7/8 and 6809/10/11T						
450	7006/10						
315L/A/B and 315C/D/E	5006/7/8T and 5009/10/11T	4 - 8	9-90	2.8	8000	Renolin DTA 15	ISO VG46 mineral oil with antifoam and antioxidant additives
355L/A/B and 355C/D/E	5807/8/9T and 5810/11/12T		9-100				
400L/A/B and 400C/D/E	6806/7/8 and 6809/10/11T		11-110	4.7			
450	7006/10		11-125				
500	8006/10						

The lubricating oil must be replaced as specified on the nameplate or whenever changes on the oil properties are noticed. The oil viscosity and pH must be checked periodically. The oil level must be checked every day and kept in the center of the sight glass.

Please contact WEG, when oils with different viscosities are to be used.

8.3. MOTOR ASSEMBLY AND DISASSEMBLY



All repair services on motors for use in hazardous areas should be always performed by qualified personnel and in accordance with the applicable laws and regulations in each country. Always use proper tools and devices for motor disassembly and assembly.



Disassembly and assembly services can be carried out only after the motor has been disconnected from the power supply and is completely stopped.

Dangerous voltages may be present at the motor terminals inside the terminal box since capacitors can retain electrical charge for long periods of time even when they are not connected directly to a power source or when space heaters are connected to the motor or when the motor windings are used as space heaters. Dangerous voltages may be present at the motor terminals when they are driven by frequency inverter even when they are completely stopped.



For explosion-proof motors and protection by enclosure motors, open the terminal box and/or disassemble the motor only after the enclosure surface temperature has cooled down up to ambient temperature.

Record the installation conditions such as terminal connection diagram, alignment / leveling conditions before starting the disassembly procedures. These records should be considered for later assembly.

Disassemble the motor carefully without causing scratches on machined surfaces or damaging the threads.

Assemble the motor on a flat surface ensuring a good support base. Footless motors must be fixed/locked on the base to prevent accidents.

Handle the motor carefully to not damage the insulated components such as windings, insulated rolling bearings, power cables etc.

Seal elements, such as joint seals and bearing seals should always be replaced when wear or damage is noticed.

Motors with degree of protection higher than IP55, the machined joints are protected at factory by a suitable rust inhibitor. Thus all machined surfaces (for example, covers of the terminal boxes of explosion-proof motors) must be carefully cleaned before assembly and provided again by a thin coat of rust inhibitor as shown in Figure 8.2.



For explosion-proof motors, the joints can be coated only with the following products:

- Lumomoly PT/4 (Lumobras);
- Molykote DC 33 (Dow Corning).

For other types of protection, apply Loctite 5923 (Henkel) on the joints.



Apply rust inhibitor on all machined surfaces of the motors with degree of protection higher than IP55.

Figure 8.2 - Machined surface of the terminal box of explosion-proof Motors.

For explosion-proof motors special care should be taken with the machined surfaces of the flame path. These surfaces must be free of burrs, scratches, etc. that reduce the flame path length and increase the gap. The gaps between terminal boxes and the respective terminal box covers should not exceed the values specified in Table 8.7.

Table 8.7 - Maximum gap between terminal box and terminal box cover for explosion-proof enclosures.

Frame size	Flat joint Cylindrical joint		
	W21	W22X	W22X
IEC 71 to 355 NEMA 143 to 586/7	0.05 mm	0.076 mm	0.158 mm

8.3.1. Terminal box

Proceed as follows to remove the terminal box cover and to disconnect/connect the power supply cables and the cables of the accessory devices:

- Ensure that during the screw removal the terminal box cover does not damage the components installed inside the terminal box.
- If the terminal box cover is fitted with lifting eyebolt, lift the terminal box cover always by its lift eyebolt.
- If motors are supplied with terminal blocks, ensure the correct tightening torque on the motor terminals as specified in Table 8.7.
- Ensure that the cables do not contact sharp edges.
- Ensure that the original IP degree of protection is not changed and is maintained as indicate on the motor nameplate. The power supply cables and the control cables must always be fitted with components (cable glands, conduits) that meet the applicable standards and regulations of each country.
- Ensure that the pressure relief device is in perfect operating condition, if provided. The seals in the terminal box must be in perfect condition for reuse and must be reinstalled correctly to ensure the specified degree of protection.
- Ensure the correct tightening torque for the securing bolts of the terminal box cover as specified in Table 8.8.

Table 8.8 – Tightening torque for the securing bolts [Nm]

Screw type and seal	M4	M5	M6	M8	M10	M12	M16	M20
Hex bolt/hex socket bolt (without seal)	-	4 to 7	7 to 12	16 to 30	30 to 50	55 to 85	120 to 180	230 to 360
Combined slotted screw (without seal)	-	3 to 5	5 to 10	10 to 18	-	-	-	-
Hex bolt/hex socket bolt (with seal with metallic stop/cord)	-	-	-	13 to 20	25 to 37	40 to 55	50 to 65	-
Combined slotted screw (with flat seal and/or mettalic stop/cord)	-	3 to 5	4 to 8	8 to 15	-	-	-	-
Hex bolt/hex socket bolt (with flat seal)	-	-	-	8 to 15	18 to 30	25 to 40	35 to 50	-
Terminal blocks	1 to 1,5	1,5 to 4	3 to 6,5	6 to 9	10 to 18	15,5 to 30	30 to 50	-
Grounding terminals	-	3 to 5	5 to 10	10 to 18	30 to 50	55 to 85	120 to 180	-
Terminal box cover	Explosio-proof motors	-	-	35 to 41	69 to 83	120 to 145	295 to 355	580 to 690
	Other types of protection	-	3 to 5	4 to 8	8 to 15	25 to 37	40 to 55	50 to 65

8.4. DRYING THE STATOR WINDING INSULATION

Dismantle the motor completely. Remove the end shields, the rotor with the shaft, the fan cover, the fan and the terminal box before the wound stator with the frame is transferred to the oven for the drying process. Place the wound stator in the oven heated to max. 120 °C for two hours. For larger motors a longer drying time may be required. After the drying process has been concluded, allow the stator to cool to room temperature. Measure the insulation resistance again as described in item 5.4. Repeat the stator drying process if the required insulation resistance does not meet the values specified in Table 5.3. If the insulation resistance does not improve despite several drying processes, evaluate the causes of the insulation resistance drop carefully and an eventual replacement of the motor winding may be required. If in doubt contact WEG.



To prevent electrical shock, discharge the motor terminals immediately before, and after each measurement. If the motor is equipped with capacitors, these must be discharged before beginning any repair.

8.5. SPARE PARTS

When ordering spare parts, always provide complete motor designation, indicating the motor type, the code number and the serial number, which are stated on the motor nameplate.

Spare parts must always be purchased from WEG authorized Service Centers. The use of non-original spare parts can cause motor failure, performance drop and void the product warranty.

The spare parts must be stored in a clean, dry and properly ventilated room, with relative air humidity not exceeding 60%, with ambient temperature between 5 °C and 40 °C, free of dust, vibrations, gases, corrosive smokes and at constant temperature. The spare parts must be stored in their normal mounting position without placing other components onto them.

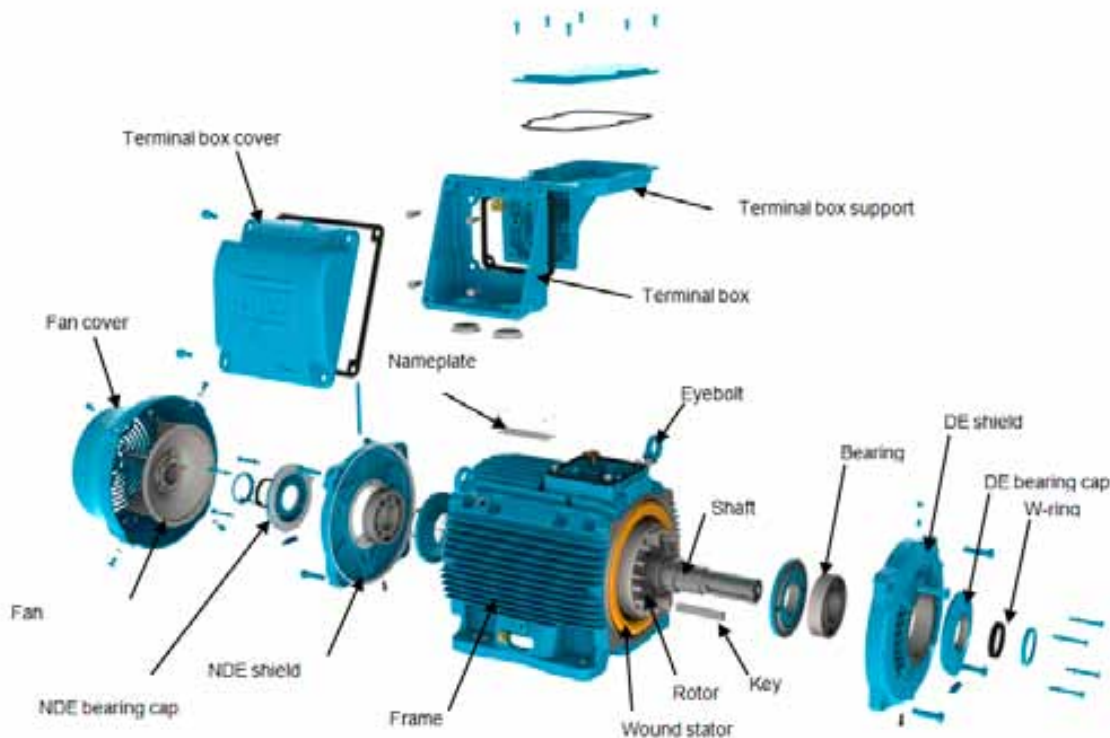


Figure 8.3 - Exploded view of the components of a motor with type of protection "n".



9. ENVIRONMENTAL INFORMATION

9.1. PACKAGING

WEG electric motors are supplied in cardboard, plastic or wooden packaging. These materials can be recycled and must be disposed according to the applicable laws and regulations in each country. All wood used in the packaging of WEG motors come from the company reforestation program and is not submitted to any chemical conservation treatment.

9.2. PRODUCT

Electric motors consist mainly of ferrous metals (steel plates and cast iron), non ferrous metals (copper and aluminum) and plastic materials.

In general, electric motors have relatively long service live. However when they must be discarded, WEG recommends to dismantle the motor, sort the different materials and send them for recycling.

No-recyclable materials should be disposed of at industrial landfills according to the applicable environmental laws and regulations in each country, or co-processed in cement kilns or incinerated.

The recycling service providers, the disposal in industrial landfills, the waste co-processing or the incineration process must be properly authorized by the state environment agency to carry out these activities.



10. TROUBLESHOOTING CHART X SOLUTIONS

This troubleshooting chart provides a basic list of problems that may occur during motor operation, possible causes and recommended corrective actions. In case of doubts, please contact WEG Service Center.

Problem	Possible cause	Corrective action
Motor does not start, neither coupled nor decoupled	Power cables are interrupted.	Check the control panel and the motor power supply cables.
	Blown fuses.	Replace blown fuses.
	Wrong motor connection.	Correct the motor connection according to connection diagram.
	Locked rotor.	Check motor shaft to ensure that it rotates freely.
The motor starts at no-load, but fails when load is applied. It starts very slowly and does not reach the rated speed.	Load torque is too high during start-up.	Do not start the motor on load.
	Too high voltage drop in the power cables	Check the installation dimensioning (transformer, cable cross section, relays, circuit breakers, etc.)
Abnormal / excessive noise	Defective transmission component or defective driven machine.	Check the transmission force, the coupling and the alignment.
	Misaligned / unlevelled base.	Align / level the motor with the driven machine
	Unbalanced components or unbalanced driven machine	Balance the machine set again
	Different balancing methods used for motor and coupling balancing (halve key, full key)	Balance the motor again
	Wrong motor direction of rotation	Reverse the direction of rotation
	Loose bolts	Retighten the bolts
	Foundation resonance	Check the foundation design
	Damaged bearings	Replace the bearings
Motor overheating	Insufficient cooling	Clean air inlet and outlet and cooling fins
		Check the minimum required distance between the fan cover and nearest walls. See item 7
		Check air temperature at inlet
	Overload	Measure motor current, evaluate motor application and if required, reduce the load
	Number of starts per hour is too high or the load inertia moment is too high	Reduce the number of starts per hour
	Power supply voltage too high	Check the motor power supply voltage. Power supply voltage must not exceed the tolerance specified in item 7.2
	Power supply voltage too low	Check the motor power supply voltage and the voltage drop. Power supply voltage must not exceed the tolerance specified in item 7.2
	Interrupted power supply	Check the connection of the power cables
	Voltage unbalance at the motor terminals	Check for blown fuses, wrong commands, voltage unbalance in the power line, phase fault or interrupted power cables
	Direction of rotation is not compatible with the unidirectional fan	Check if the direction of rotation matches the rotation arrow indicated on end shield
Bearing overheating	Excessive grease / oil	Clean the bearing and lubricate it according to the provided recommendations
	Grease / oil aging	
	The used grease / oil does not matches the specified one	
	Lack of grease / oil	Lubricate the bearing according to the provided recommendations
	Excessive axial or radial forces due to the belt tension	Reduce the belt tension
		Reduce the load applied to the motor



11. WARRANTY TERM

WEG Equipamentos Elétricos S/A, Motor Unit, offers warranty against defects in workmanship and materials for their products for a period of 18 months from the invoice issue date by factory or distributor / dealer, limited to 24 months from date of manufacture. Motors of the HGF Line are covered for a period of 12 months from the invoice issue date by the factory or distributor / dealer, limited to 18 months from the date of manufacture.

The paragraph above contains the legal warranty periods. If a warranty period is defined in a different way in the commercial, technical proposal of a particular sale, that will override the time limits set out above.

The periods above are independent of installation date and provided that the following requirements are met: proper transportation, handling and storage; correct installation in specified environmental conditions free of aggressive agents; operation within the capacity limits and observation of the Installation, Operation and Maintenance Manual; execution of regular preventive maintenance; execution of repairs and/or changes only by personnel with WEG's written authorization; in the occurrence of an anomaly, the product must be available to the supplier for the minimum period necessary to identify the cause of the anomaly and to repair it properly; the buyer must immediately notify WEG of any defects occurred and they must be later confirmed as manufacturing defects by WEG. The warranty does not include assembly and disassembly services at the buyer's premises, costs of product transportation, as well as travel, lodging and meals expenses for the technical assistance staff when requested by the customer. The warranty service will be provided exclusively at a WEG authorized Technical Assistance or at the plant.

Components, parts and materials whose useful life is usually less than 12 (twelve) months are not covered by the warranty.

Under no circumstance will warranty services extend the warranty period of the equipment. However, new warranty equivalent to the original one will be due only to the components repaired or replaced by WEG.

The present warranty is limited to the product supplied. WEG will not be liable for damages to people, third parties, other equipment and facilities, loss of profits or other incidental or consequential damages.



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12. EC DECLARATION OF CONFORMITY

WEG Equipamentos Elétricos S/A
Av. Prefeito Waldemar Grubba, 3000
89256-900 - Jaraguá do Sul - SC - Brazil,

and its authorised representative established in the European Community,
WEGeuro - Industria Electrica SA
Rua Eng Frederico Ulrich, Apartado 6074
4476-908 - Maia - Porto - Portugal

hereby declare that the products:

WEG induction motors and components for using in these motors, with types of protection:

Flameproof Enclosure “d”

IEC frames 90 to 355 (three-phase) and NEMA frame 56 to 61 (single and three-phase)

Increased Safety “e”

IEC frames 63 to 630 (three-phase)

type of protection “n”

IEC frames 63 to 630 and NEMA frames 143 to 9610 (three-phase)

and dust protection by enclosure “t” or “tD”

IEC frames 63 to 630 and NEMA frames 143 to 9610 (three-phase)

when installed, maintained and used in applications for which they were designed, and in compliance with the relevant installation standards and manufacturer's instructions, comply with the requirements of the following European Directives and applicable standards:

Directives:

ATEX Directive 94/9/EC

EMC Directive 2004/108/EC (inductions motors are considered inherently benign in terms of electromagnetic compatibility)

Standards:

**EN 60079-0, EN 60079-1, EN 60079-7, EN 60079-15, EN 60079-31,
EN 61241-0, EN 61241-1 and EN 60204-1**

From 29/12/2009 on low voltage electric motors are no longer considered under the scope of the current Machinery Directive 2006/42/EC.

CE marking in: 1996

Milton Oscar Castella
Engineering Director

Jaraguá do Sul, April 15th, 2011.

A list of the EC-Type Examination Certificates covered by the Declaration of Conformity is shown in chapter 13.



13. CERTIFICATES

A list of the motors for each Type of Protection, their certificates and markings is shown below:

IECEx Certificates:

Model	Marking	Certificate N°
Flameproof Enclosure "d"		
Frame sizes 132 - 160, three-phase	Ex d IIB T3 or T4	IECEx CES 09.0004
Type of protection "n" and dust protection by enclosure "t"		
Frame sizes 63-355, three-phase (W21)	Ex nA IIC T3 Gc	IECEx BAS 10.0045X
Frame sizes 63-355, three-phase (W21)	Ex tc IIB T125 °C Dc	IECEx BAS 10.0045X
Frame sizes 63-355, three-phase (W21)	Ex tb IIC T125 °C Db	IECEx BAS 10.0045X
Frame sizes 63-355, three-phase (W22)	Ex nA IIC T3 Gc	IECEx BAS 10.0099X
Frame sizes 63-355, three-phase (W22)	Ex tc IIB T125 °C Dc	IECEx BAS 10.0099X
Frame sizes 63-355, three-phase (W22)	Ex tb IIC T12 °C Db	IECEx BAS 10.0099X
Frame sizes 315-630, three-phase (HGF)	Ex nA IIC T3 Gc	IECEx BAS 10.0104X
Frame sizes 315-630, three-phase (HGF)	Ex tc IIB T125 °C Dc	IECEx BAS 10.0104X
Frame sizes 315-630, three-phase (HGF)	Ex tb IIC T125 °C Db	IECEx BAS 10.0104X

INMETRO Certificates:

Model	Marking	Certificate N°
Flameproof Enclosure "d"		
Frame sizes 56 - 61, three-phase/single phase	Ex d IIA T4 Gb	CEPEL 00.0055
Frame sizes 90 - 355, three-phase (W21)	Ex d IIB T3 or T4 Gb	CEPEL 97.0042
Frame sizes 90 - 355, three-phase (W21)	Ex d IIB T3 or T4 Gb Ex de IIB T3 or T4 Gb	TÜV 12.0603 X
Frame sizes 90 - 200, three-phase, with brake	Ex d IIB T3 or T4 Gb	TÜV 12.0603 X
Type of protection "n"		
Frame sizes 90 - 355, three-phase (W21)	Ex nA IIC T3 Gc Ex nC IIB T3 Gc	CEPEL 97.0044 X
Frame sizes 63 - 355, three-phase (W21)	Ex nA IIC T3 Gc	TÜV 12.0602 X
Frame sizes 315-630, three-phase (HGF)	Ex nA IIB/IIC T3 Gc	CEPEL 04.0333 X
Frame sizes 63 - 355, three-phase (W22)	Ex nA IIC T3 Gc	TÜV 11.0340 X
Increased Safety "e"		
Frame sizes 63 - 315, three-phase (W21)	Ex e IIC T1/T2/T3 Gb	CEPEL 06.1252 X
Protection by enclosure "t"		
Frame sizes 63 - 355, three-phase (W21)	Ex tc IIB T125 °C Dc Ex tc IIB T160 °C Dc	TÜV 12.0602 X
Frame sizes 63 - 355, three-phase (W22)	Ex tc IIB T125 °C Dc Ex tc IIB T125 °C Dc	TÜV 11.0340 X
Frame sizes 63 - 355, three-phase (W21)	Ex tb IIC T125 °C Db Ex tb IIC T160 °C Db	TÜV 12.0602 X
Frame sizes 63 - 355, three-phase (W22)	Ex tb IIC T125 °C Db Ex tb IIC T160 °C Db	TÜV 11.0340 X

ANZEx Certificates:

Model	Marking	Certificate N°
Flameproof Enclosure "d"		
Frame sizes 90 - 355, three-phase	Ex d IIB T3, T4 or T5 Ex d I 150 °C	ANZEx 04.3006X
Type of protection "n"		
Frame sizes 63 - 355, three-phase (W21)	Ex n IIC T3	ANZEx 04.3002X
Frame sizes 315-630, three-phase (HGF)	Ex n IIC T3 or T4	ANZEx 04.3003X

GOST-R Certificates:

Model	Marking	Certificate N°
Flameproof Enclosure "d"		
Frame sizes 90 - 355, three-phase	Ex d IIB T3 or T4 Ex de IIB T3 or T4	POCC BR.ГБ05.B03486
Type of protection "n" and dust protection by enclosure "t"		
Frame sizes 63-355, three-phase (W21)	Ex nA II T3	POCC BR.ГБ05.B03486
Frame sizes 63-355, three-phase (W21)	Ex tD A22 T _A T4	POCC BR.ГБ05.B03486
Frame sizes 315-630, three-phase (HGF)	Ex nA II T3 or T4	POCC BR.ГБ05.B03486

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**CCOE Certificates:**

Model	Marking	Certificate N°
Flameproof enclosure “d”		
Frame sizes 90 - 355, three-phase	Ex d IIB T3 or T4	A/P/HQ/MH/104/2411(P271133)
Type of protection “n”		
Frame sizes 63-355, three-phase (W21)	Ex nA II T3	A/P/HQ/MH/104/2327(P268215)
Frame sizes 315-630, three-phase (W21)	Ex nA II T3 or T4	
Increased safety “e”		
Frame sizes 63-315, three-phase (W21)	Ex e II T1/T2/T3/T4	A/P/HQ/MH/104/1416(P200902)

CQST Certificates:

Model	Marking	Certificate N°
Flameproof Enclosure "d"		
Frame size 90, three-phase	Ex d IIB T4 Gb	CNEx11.3177X
	Ex de IIB T4 Gb	
Frame size 100, three-phase	Ex d IIB T4 Gb	CNEx11.3178X
	Ex de IIB T4 Gb	
Frame size 112, three-phase	Ex d IIB T4 Gb	CNEx11.3179X
	Ex de IIB T4 Gb	
Frame size 132, three-phase	Ex d IIB T4 Gb	CNEx11.2439X
	Ex de IIB T4 Gb	
Frame size 160, three-phase	Ex d IIB T4 Gb	CNEx10.2665X
	Ex de IIB T4 Gb	
Frame size 180, three-phase	Ex d IIB T4 Gb	CNEx10.2666X
	Ex de IIB T4 Gb	
Frame size 200, three-phase	Ex d IIB T4 Gb	CNEx10.2667X
	Ex de IIB T4 Gb	
Frame size 225, three-phase	Ex d IIB T4 Gb	CNEx12.0483X
	Ex de IIB T4 Gb	
Frame size 250, three-phase	Ex d IIB T4 Gb	CNEx12.0484X
	Ex de IIB T4 Gb	
Frame size 280, three-phase	Ex d IIB T4 Gb	CNEx12.0485X
	Ex de IIB T4 Gb	
Frame size 315, three-phase	Ex d IIB T4 Gb	CNEx12.0486X
	Ex de IIB T4 Gb	
Frame size 355, three-phase	Ex d IIB T4 Gb	CNEx12.0487X
	Ex de IIB T4 Gb	

NEC Certificates:

Model	Marking	Certificate N°
Div 1 - Hazardous Location		
Frame sizes 143 - 326, three-phase	Class I, Div I, Groups C and D, T4	File E104590 - Sec 1
	Class II, Div I, Groups F and G, T4	
Frame sizes 364 - 587, three-phase	Class I, Div I, Groups C and D, T3C	File E104590 - Sec 2
	Class II, Div I, Groups F and G, T3C	
Frame size 61, three-phase/single phase	Class I, Div I, Group D, T3B	File E104590 - Sec 3
Frame size 61, three-phase/single phase	Class I, Div I, Group D, T3C	File E104590 - Sec 4

CEC Certificates:

Model	Marking	Certificate N°
Div 1 - Hazardous Location		
Frame sizes 143 - 587, three-phase	Class I, Div I, Groups C and D, T3C	1629892
	Class II, Div I, Groups F and G, T3C	
Frame size 56, three-phase/single-phase	Class I, Div I, Groups C and D, T3C	File LR 50962
	Class II, Div I, Groups F and G, T3C	
Frame sizes 56 - 61, three-phase/single phase	Class I, Div I, Groups D, T3C	
Div 2 - Hazardous Location		
Frame sizes 56, 143-587 three-phase (W21)	Class I, Div 2, Groups A, B, C and D, T4 - T2D	1619832
	Class II, Div 2, Groups F and G, T4 - T2D	
Frame sizes 143 -589 , three-phase (W22)	Class I, Div 2, Groups A, B, C and D, T5 - T2B	2156668
	Class II, Div 2, Groups F and G, T6 - T3C	
Frame sizes 5006-9610, three-phase (HGF)	Class I, Div 2, Groups A, B, C and D, T3	1959652
	Class II, Div 2, Groups F and G, T3C	
Frame sizes 447-589, three-phase (W22 Medium voltage)	Class I, Div 2, Groups A, B, C and D, T3B-T2D	
	Class II, Div 2, Groups F and G, T5-T4A	



ATEX Certificates:

Model	Marking	Certificate N°	NB/N°
Flameproof Enclosure “d”			
Frame size EX61G, single and three-phase	II 2 G Ex d IIA T4	CESI 07 ATEX 037X	CESI/0722
Frame sizes 90-100, three-phase	II 2 G Ex d IIB T4 II 2 G Ex de IIB T4	CESI 01 ATEX 096	CESI/0722
Frame sizes 112-132, three-phase	II 2 G Ex d IIB T4 II 2 G Ex de IIB T4	CESI 01 ATEX 097	CESI/0722
Frame sizes 160-200, three-phase	II 2 G Ex d IIB T4 II 2 G Ex de IIB T4	CESI 01 ATEX 098	CESI/0722
Frame sizes 225-250, three-phase	II 2 G Ex d IIB T4 II 2 G Ex de IIB T4	CESI 01 ATEX 099	CESI/0722
Frame sizes 280-315, three-phase	II 2 G Ex d IIB T4 II 2 G Ex de IIB T4	CESI 01 ATEX 100	CESI/0722
Frame size 355, three-phase	II 2 G Ex d IIB T4 II 2 G Ex de IIB T4	CESI 01 ATEX 101	CESI/0722
Increased Safety “e”			
Frame size 63, three-phase	II 2 G Ex e IIC T1/T2/T3/T4 Gb	PTB 01 ATEX 3204	PTB/0102
Frame size 71, three-phase	II 2 G Ex e IIC T1/T2/T3/T4 Gb	PTB 01 ATEX 3205	PTB/0102
Frame size 80, three-phase	II 2 G Ex e IIC T1/T2/T3/T4 Gb	PTB 01 ATEX 3206	PTB/0102
Frame size 80, three-phase	II 2 G Ex e IIC T1/T2/T3/T4 Gb	PTB 01 ATEX 3303	PTB/0102
Frame size 90, three-phase	II 2 G Ex e IIC T1/T2/T3/T4 Gb	PTB 01 ATEX 3207	PTB/0102
Frame size 100, three-phase	II 2 G Ex e IIC T1/T2/T3/T4 Gb	PTB 01 ATEX 3208	PTB/0102
Frame size 112, three-phase	II 2 G Ex e IIC T1/T2/T3/T4 Gb	PTB 01 ATEX 3209	PTB/0102
Frame size 132, three-phase	II 2 G Ex e IIC T1/T2/T3/T4 Gb	PTB 01 ATEX 3210	PTB/0102
Frame size 160, three-phase	II 2 G Ex e IIC T1/T2/T3/T4 Gb	PTB 03 ATEX 3006	PTB/0102
Frame size 180, three-phase	II 2 G Ex e IIC T1/T2/T3/T4 Gb	PTB 04 ATEX 3036	PTB/0102
Frame size 200, three-phase	II 2 G Ex e IIC T1/T2/T3/T4 Gb	PTB 04 ATEX 3017	PTB/0102
Frame size 225, three-phase	II 2 G Ex e IIC T1/T2/T3/T4 Gb	PTB 04 ATEX 3001	PTB/0102
Frame size 250, three-phase	II 2 G Ex e IIC T1/T2/T3/T4 Gb	PTB 04 ATEX 3018	PTB/0102
Frame size 280, three-phase	II 2 G Ex e IIC T1/T2/T3/T4 Gb	PTB 04 ATEX 3015	PTB/0102
Frame size 315, three-phase	II 2 G Ex e IIC T1/T2/T3/T4 Gb	PTB 04 ATEX 3002	PTB/0102
Frame sizes 315-630, three-phase	II 2 G Ex e IIC Gb	Baseefa 12 ATEX 0063U	Baseefa/1180
Dust protection by enclosure “tD” or “t” for Zone 21			
Frame sizes 63-90, three-phase	II 2 D Ex tD A21 T125 °C	CESI 06 ATEX 038X	CESI/0722
Frame sizes 100-132, three-phase	II 2 D Ex tD A21 T125 °C	CESI 06 ATEX 041X	CESI/0722
Frame sizes 160-200, three-phase	II 2 D Ex tD A21 T125 °C	CESI 06 ATEX 042X	CESI/0722
Frame sizes 225-315, three-phase	II 2 D Ex tD A21 T125 °C	CESI 06 ATEX 044X	CESI/0722
Frame size 355, three-phase	II 2 D Ex tD A21 T125 °C	CESI 06 ATEX 045X	CESI/0722
Frame sizes 63-355, three-phase	II 2 D Ex tb IIIC T125 °C Db	Baseefa 10 ATEX 0124X	Baseefa/1180
Frame sizes 63-355, three-phase	II 2 D Ex tb IIIC T125 °C Db	Baseefa 10 ATEX 0193X	Baseefa/1180
Frame sizes 315-630, three-phase	II 2 D Ex tb IIIC T125 °C Db	Baseefa 10 ATEX 0205X	Baseefa/1180
Type of protection “n” and dust protection by enclosure “t” for Zone 22			
Frame sizes 63-355, three-phase	II 3 G Ex nA IIC T3 Gc II 3 D Ex tc IIIB T125 °C Dc	Baseefa 07 ATEX 0148X*	Baseefa/1180
Frame sizes 63-355, three-phase	II 3 G Ex nA IIC T3 Gc II 3 D Ex tc IIIB T125 °C Dc	Baseefa 10 ATEX 0192X*	Baseefa/1180
Frame sizes 315-630, three-phase	II 3 G Ex nA IIC T3 Gc II 3 D Ex tc IIIB T125 °C Dc	Baseefa 06 ATEX 0349X*	Baseefa/1180

* Voluntary Certification for Category 3 electrical equipment

Address of the Notified Bodies (NB):

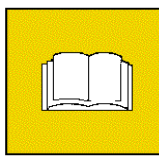
1. CESI: Via R. Rubattino 54 - 20134 - Milano - Italy

2. PTB: Bundesallee 100 - D-38116 - Braunschweig - Germany

3. Baseefa: Rockhead Business Park, Staden Lane, Buxton, Derbyshire SK17 9RZ – United Kingdom

		Righi Elettroservizi S.p.a. Via Leonardo Da Vinci, 1 CAP 47025 Bora M. Saraceno (FC) - Italia Tel. (039) 0547-323336 fax: (039) 0547-323360 posta elettronica: elettroservizi@righinet.com
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Version: ENG_2.1

	Operator instructions Electric Board	
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COMPRESSOR TYPE

- ☐ ST
- ☐ SW
- ☐ SV
- ☐ S7
- ☐ SH
- ☐ GEMINI

Serial Number



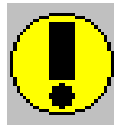
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Chapter 1**PREMISES****MANUAL PURPOSES**

This manual has been written with the intention of giving a clear explanation about the functioning of a compressor type SV,SW,ST,SH,S7,GEMINI. (refers to the manual front page to know specifically which compressor system). As you could easily notice, any operator panel includes all the possible instruments and functions even if are not present in your system; anyhow all instruments are related to a value or an activation button or similar that are not visible on the screen in case these utilities are not physically installed.

Please take into consideration that also the alarm list is complete of any optional, but we will eventually display only the ones referred to your system on the operator panel.

SYMBOLS LEGEND**“WARNING”**

The symbol “WARNING” is used whenever is necessary to specify important note on the machine, instruments or operative instructions act by the operators.

**“NOTICE”**

The symbol “NOTICE” is used whenever is necessary to specify important note on the machine functioning overview.

ELECTRICAL CABINET INFORMATION

The compressor electrical cabinet is suitable to be installed in a safe area at a height that allows easy access to commands and to the operator panel.

In order to prevent any damages to electrical and electronic equipments, keep the electrical cabinet door shut any times, particularly is recommended to avoid condensation due to possible high temperature range, especially when the electric panel is not switched on for a long period.

The installation must be done in a dry and ventilated place to facilitate the air circulation.

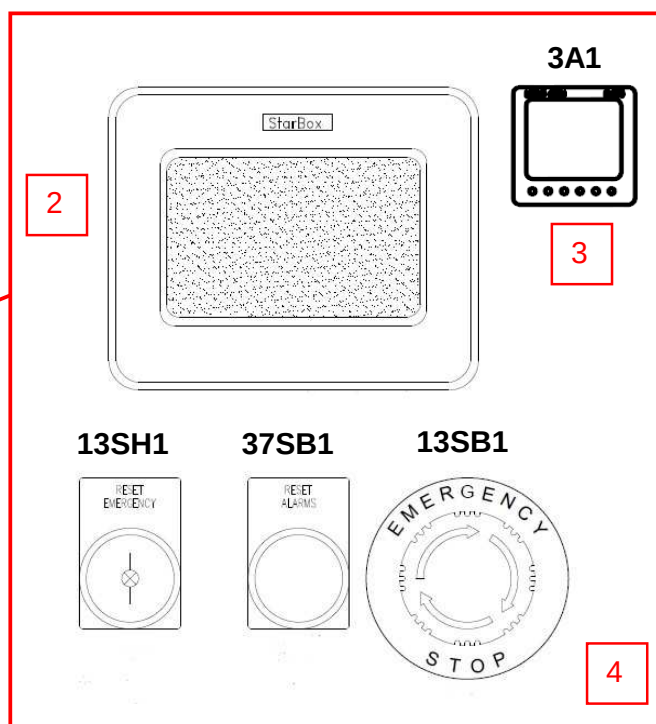
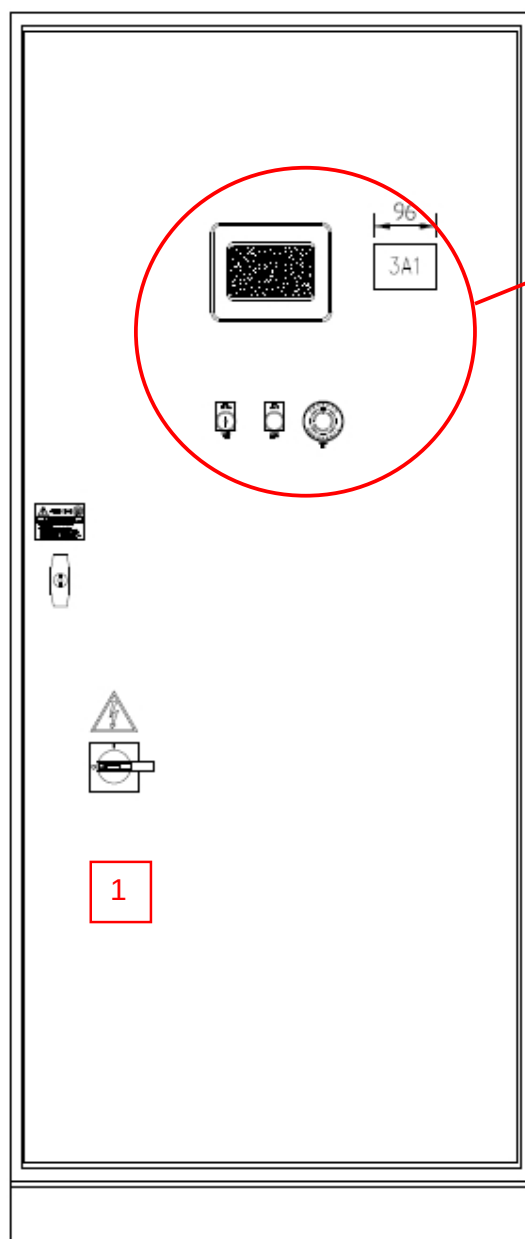
In case the external temperature reaches low values (5°C – 41 °F) the cabinet must be switched on all time to keep the internal heating circuit active.

The electrical power supply cables entry, together with the ones used for controlling and commanding the compressor system, must be placed in the bottom part of the electrical cabinet through appropriate materials with the right degrees of isolation.

To know which electrical cables are needed on the system consult the electrical project, referring to the cables and dimension table on the specific electrical schemes.



In order to prevent condensation, due to a long inactivity of the compressor system, it's recommended to insert special envelopes filled by "silica desiccant gel". The amount of silica gel should be about 1250 g for electrical cabinets driving compressors up to 55kW and 2600 g for any powerful system.

FRONT PANEL OVERVIEW

1 : Main power switch.

2 : Operator panel

3 : Power supply . (3A1)

4 : Buttons and Lamps

13SH1 : Reset emergency
 37SB1 : Alarm reset
 13SB1 : Emergency stop button

(for further details see next page).

Chapter 2

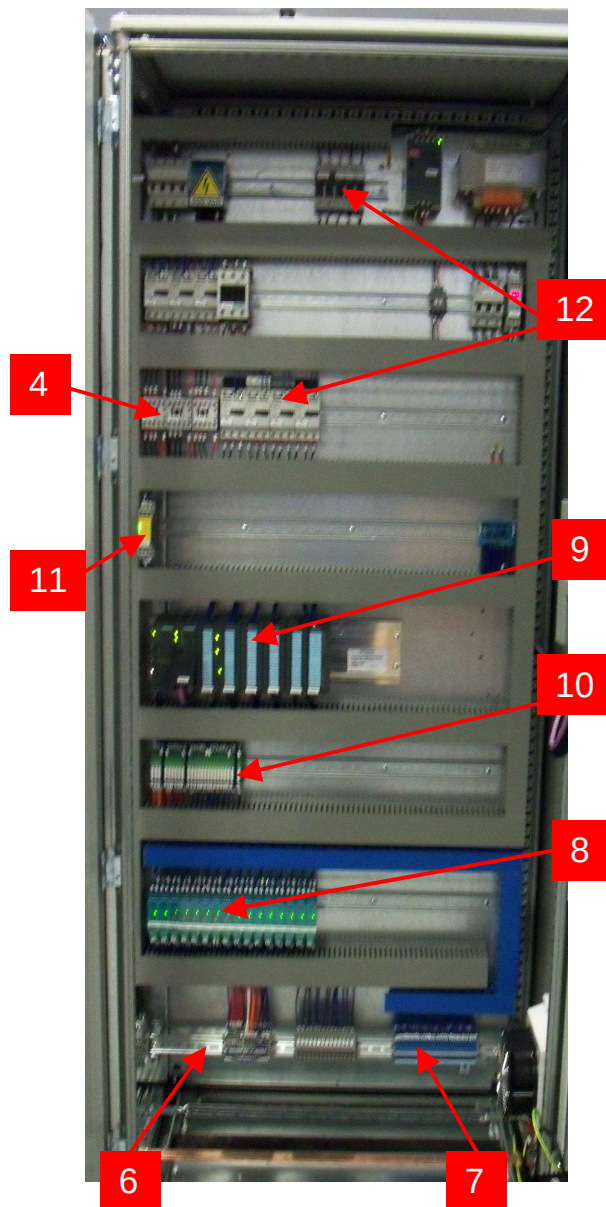
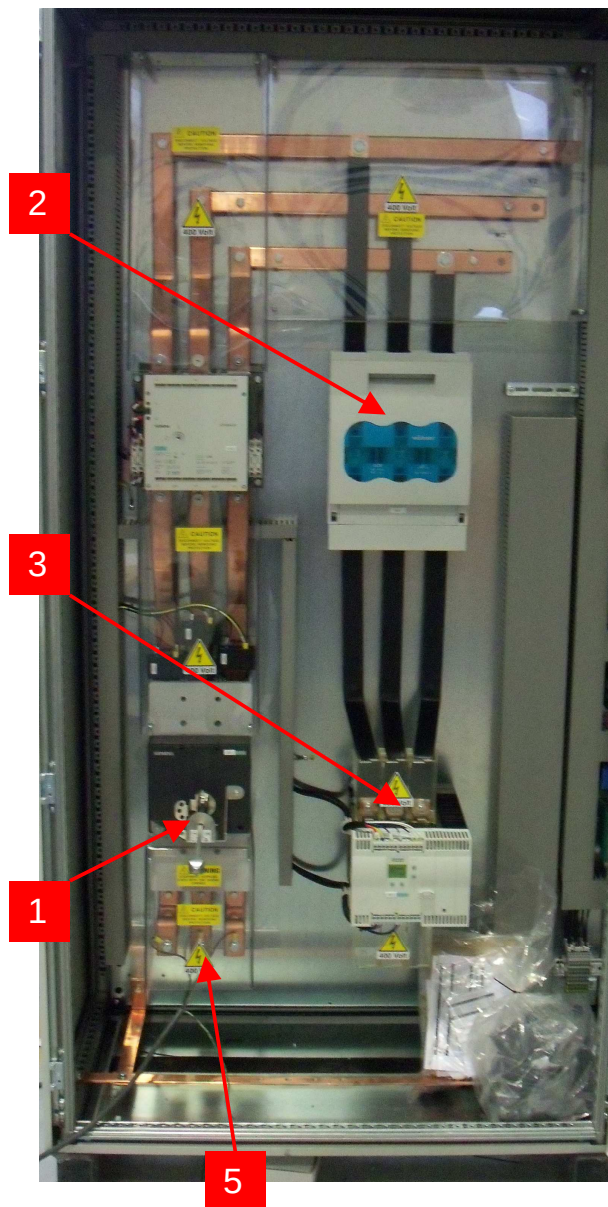


Figure 1



Some compressor electrical cabinet has instruments little differences from one to another due to specific needs generated by the systems themselves;
For this reasons lamps and buttons could have different tag numbers. To avoid this problem lamps and buttons here described will have generical tags.

COMPONENTE	TARGHETTA	DESCRIZIONE
13SH1	RESET EMERGENCY	Blue button (reset emergency). This button if pressed reset the emergency device present inside the electrical cabinet and used to manage the insertion of all power supplies. The insertion of tension will be marked by the white lamp. The resetting of the emergency device is possible only if the emergency button (n°1 front panel + n°1 delivery area) are released.
37SB1	RESET ALARM	Yellow button (reset alarm). Pressing the button all inactive alarms are deleted.
13SB1	EMERGENCY STOP	Red button (emergency stop). Shut-down the all cabinet in emergency. All power supplies are switched off. To restore the machine functioning, restore all the push buttons present on the system and press the button "Reset Emergency".

CABINET PARTS OVERVIEW

1. Main power switch.
2. Main fuses holder.
3. Compressor start-up group with Sofstarter (see next page.)
4. Contactor for auxiliary motor circuits (lubrification, fun, etc...)
5. Power supply terminals.
6. Users terminals.
7. Isolated terminals.
8. Galvanic isolated barriers
9. Plc.
10. Interface relays.
11. Emergency device.
12. Auxiliary circuit fuses.

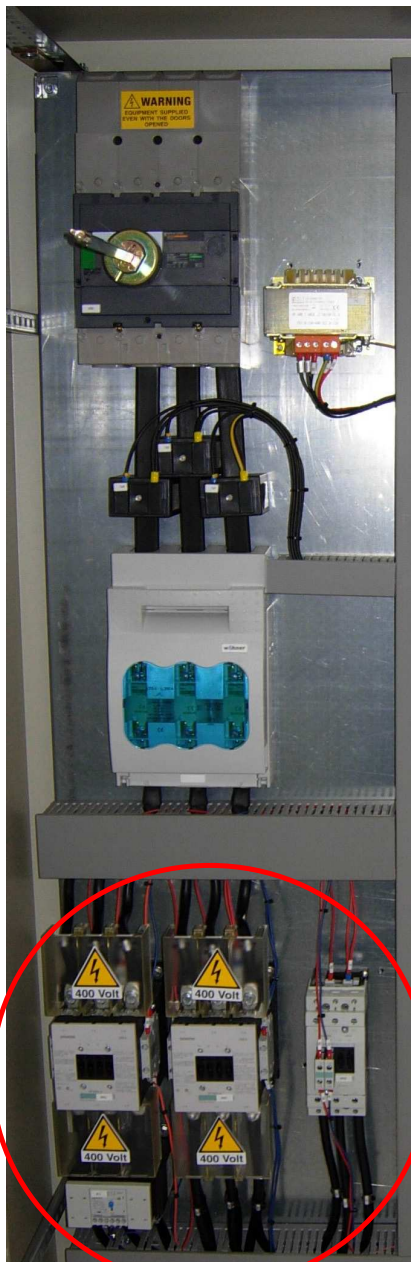


Figure 1



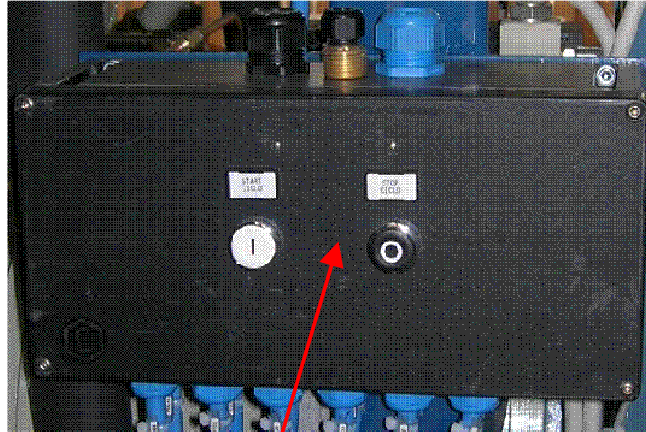
Figure 2

A

Concerning the third point of the cabinet part list, there are different ways to manage the compressor start-up.

Figure 1 shows an example of start-up group with star-delta system; figure 2 shows an inverter.



Machine start-up

Local START / STOP



The control cabinet receives the following commands from local:

- START : white button (contact normally open).
- STOP : black button (contact normally closed).
- ESD : emergency button (contact normally closed).

The control cabinet receives the following commands from remote:

- EXTERNAL ENABLING : free contact, start when closed.
- ESD : free contact, system switch-off when opened.
- PSD : free contact, system stops when opened.

The compressor receives a START/STOP command, concerning the motor start-up, with two buttons placed directly on the machine. If no alarms are presents the compressor will enter a free rotation first step (no compression active), followed by the compression step if there is any gas request from any of the storage/lines. Together with the pression request, the compressor receives from remote an external enabling; In case this signal is missing the operator panel will shows the message "MISSING ENABLE SIGNAL FROM SECURITY MANAGEMENT PANEL".

After verifying the presence of voltage on the control cabinet the operator must perform the following steps:

- verify that the emergency buttons on the cabinet and dispencer area shall not be pressed,
- restore safety by pressing the blue button RESET EMERGENCY (the white light Line 24Vdc must off otherwise it means that at least one emergency stop button is pressed e and then the emergency device is not working),
- Switch in "ON" position local and remote selector or press the white button "START CYCLE", at this point the machine begins automatically according to the work phase in call.

To stop the cycle switch in "OFF" position local or remote selector or press the black button "STOP CYCLE".

FINAL NOTE

ELECTRONIC CONTROL CABINET MAINTENANCE



All maintenance acts must be performed by an authorized technician. If there are electrical or electronic equipments damaged, replace immediately with identical components after cabinet complete switch-off.

If the components are not on the market, to evaluate the purchase of materials with equivalent characteristics, and install them only after receiving written authorization from the electric panel manufacturer.

It's recommended, 2 months after the first installation, perform programmed maintenance including check of all terminals tightness. Repeat this every 12 months.

In the eventuality that some components or cables have been damaged by overheating we strongly recommend to replace them.

We also suggest to clean all cabinet air filter and fans every week and check for signs of condensation



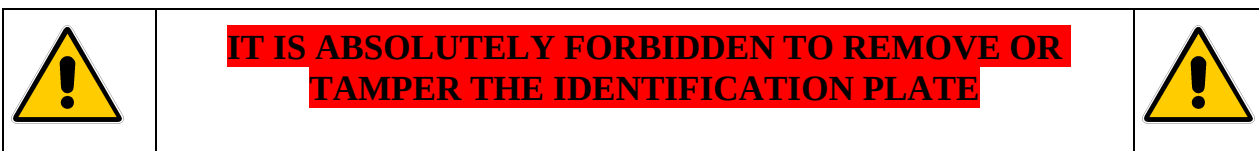
It is absolutely forbidden to clean inside the electric panel with compressed air; but it is admissible to use a vacuum cleaner to remove dirt and dust. If the metal panels present some rusted area, treat them with appropriate products.

In order to help the extraordinary maintenance leave a copy of the updated wiring diagram inside the pocket present on the cabinet door, placed inside the electric panel.

MARKING AND IDENTIFICATION

The identification plate is affixed on electric panel front door, (or eventually inside).

Through the data of recognition written on it will have an immediate identification that will allow to retrace all the documents between a manufacturer and end user.



Chapter 3**INSTRUCTIONS**

- Keep all machine documentation duplicated in a safe place.
- In case the electrical cabinet is not installed immediately after delivery store it in a dry and dust free place. (eventually leave packed).
- The operations of connection and starting up must be performed by trained and qualified staff.
- Never act any change unless authorized by the manufacturer.
- Never replace components with different electrical characteristics from those on the project.
- Every 3 months control the power contacts screws tightening.
- Every 6 months clean inside the electrical panel, run devices emergency tests and alarm and control aeration devices.
- Every 12 months perform a total control of all connections tightness.
- Working temperature is accepted from 10 ° C to 40 ° C unless otherwise specified on the electric scheme.

PROHIBITIONS

- It's forbidden the management of the electrical cabinet and panel display by unauthorized staff.
- It 's obligatory to use personal protective equipment (PPE) appropriate to the type of operation and maintenance.
- It's forbidden to inhibit the safety devices.
- It's forbidden to use the control cabinet in a different way from the original project.
- It's forbidden to work on the electrical cabinet under the influence of alcohol, psychotropic or drugs.
- while performing routine maintenance, do not wear rings, chains or metal components to facilitate any electrocution

	IN CASE OF NON RESPECT OF THE ABOVE THE COMPANY RIGHI ELETTROSERVIZI WILL NOT BE RESPONSIBLE FOR DAMAGE TO THINGS / PEOPLE OR ANIMALS	
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SAFETY

The user must comply with general accident prevention regulations and use personal protective equipment to ensure its safety.

MOVEMENT

DIRECTIVES

- Before to move the control panel, to protect all fragile parts using protective packaging of adequate strength.
- To lift the control cabinet using the appropriate hooks arranged on top of control cabinet
- To assure the electric panel against a possible rollover through the attachment to the pallet below with appropriate accessories (rope or strapping)
- To assure the electric panel against a possible rollover through the attachment to the mean of transport
- To use ropes and fixings of a suitable capacity

The eventual disposal of the materials used in the control cabinet must be performed as indicated by regional authorities in charge.

	IN CASE OF NON RESPECT OF THE ABOVE THE COMPANY RIGHI ELETTROSERVIZI WILL NOT BE RESPONSIBLE FOR DAMAGE TO THINGS / PEOPLE OR ANIMALS	
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INSTALLATION

INSTALLATION DIRECTIVES

The installation of the control panel must be undertaken in full compliance with the regulations and by qualified and authorized staff. To use accessories and fittings in accordance with the degree of protection of the electric panel and to install in an environment suited to the characteristics of the same.

It also required the connection of the ground wire and the magnetic and differential protection of adequate value, on the supply line of the electrical panel.

	IN CASE OF NON RESPECT OF THE ABOVE THE COMPANY RIGHI ELETTROSERVIZI WILL NOT BE RESPONSIBLE FOR DAMAGE TO THINGS / PEOPLE OR ANIMALS	
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MAINTENANCE

MAINTENANCE DIRECTIVES

All maintenance operations must be performed in the complete absence of tension and carried out by qualified personnel. Must be used the personal protective equipments (PPE) that allow the maintainer to work with confidence. All the power tightening should be checked quarterly and should be performed weekly tests on differentials, emergency devices, warning devices and visual. During the first year (during which the guarantee is in place) are not permitted changes to the electrical panel or tampering by unauthorized personnel or external, penalty of forfeiture of the guarantee.

Chapter 3**USE OF ELECTRIC PANEL****DIRECTIVES**

The panel has been designed according to specifications of the client and is suitable to operations and work environments that have generated the electric diagram. All operations of use other than those prescribed are not authorized in any way and they drop the warranty.

ANNEXES**DIRECTIVES**

The electric panel is always sent and accompanied by the following documentation:

- electric scheme
- Declaration of conformity
- Certificate of inspection

If the client does not receive this documentation is obliged to request it directly to the technical office of the RIGHI GROUP within 10 days of receipt of goods.

WARRANTY

The guaranty on the product is extended to twelve months from the date of delivery. The guaranty does not refer only to the good functioning, but also to the materials and components, and then all repairs and replacements shall be borne by the supplier, that will replace the abnormal or defective components, after the client has them delivered at the headquarters of RIGHI GROUP.

Is fundamental, for the warranty, follow the programs of commissioning and preventive maintenance, as indicated in the installation and maintenance manual supplied with the electric panel. For this purpose, according to the concept of maintenance expressed by the UNI 9910 (CEI 56-50), was created our manual, that directs the installer first, and after the maintainer, to perform commissioning and maintenance operations. The warranty excludes:

- Glass parts
- Warning lights of incandescent or led types
- Aeration systems
- Fuses
- All electrical components that work at temperatures higher than indicated on the diagram.
- All electrical components that work in humid conditions higher than indicated on the diagram.
- Terms of use improper compared with designed
- Extension of plant parts (the warranty is valid only on the first installation)
- Any tampering or damage caused by actions of external staff not authorized by RIGHI GROUP
- Any damage caused by a failure respect of the requirements regarding the use and maintenance

Safe s.p.A.	Human Machine Interface – User Manual
--------------------	---------------------------------------

HUMAN MACHINE INTERFACE –USER MANUAL

0	FIRST ISSUE	Paganelli	Cammarata	Paganelli	02/10/2013
REV	DESCRIPTION	PREPARED	CHECKED	APPROVED	DATE

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Safe s.p.A.	Human Machine Interface – User Manual
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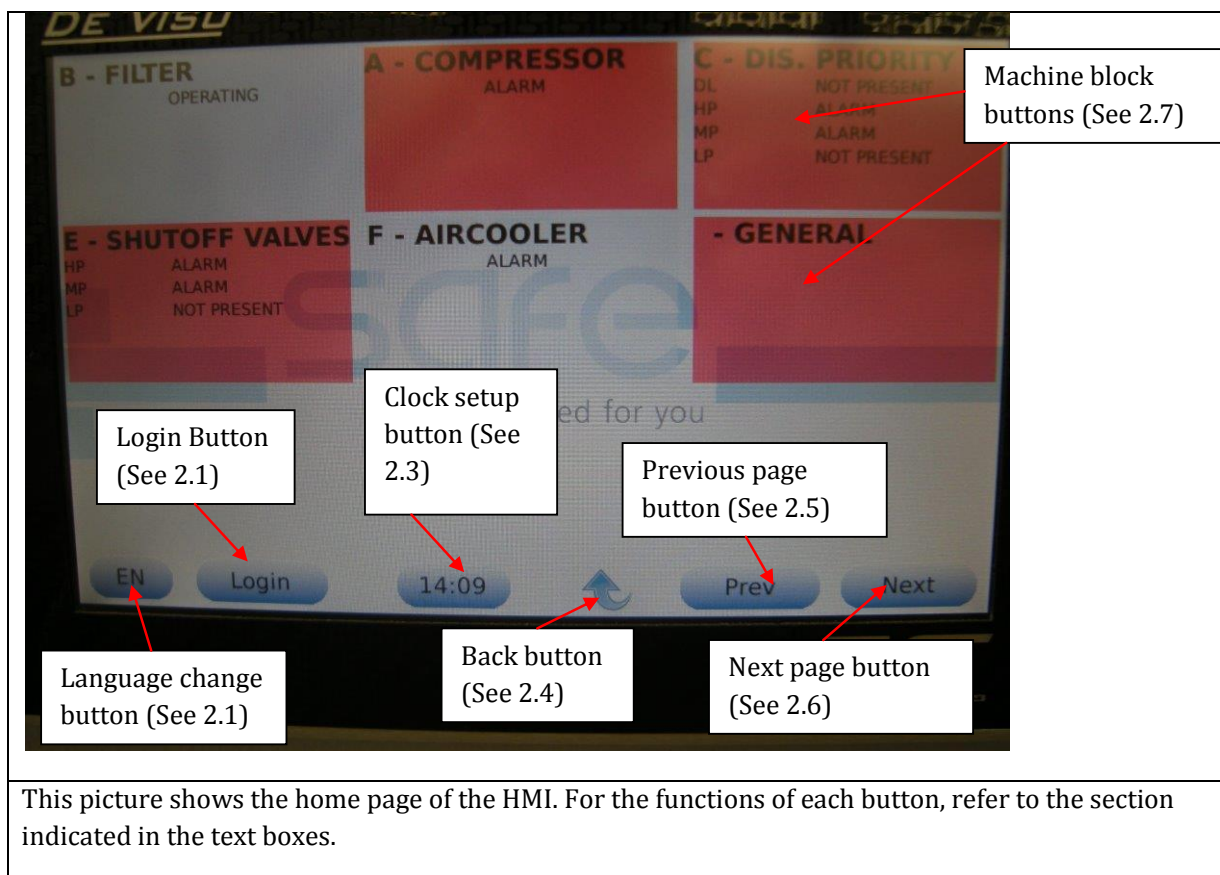
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1 INTRODUCTION

This manual describes the use of the HMI of any of SAFE standard control panels.

2 HOME PAGE

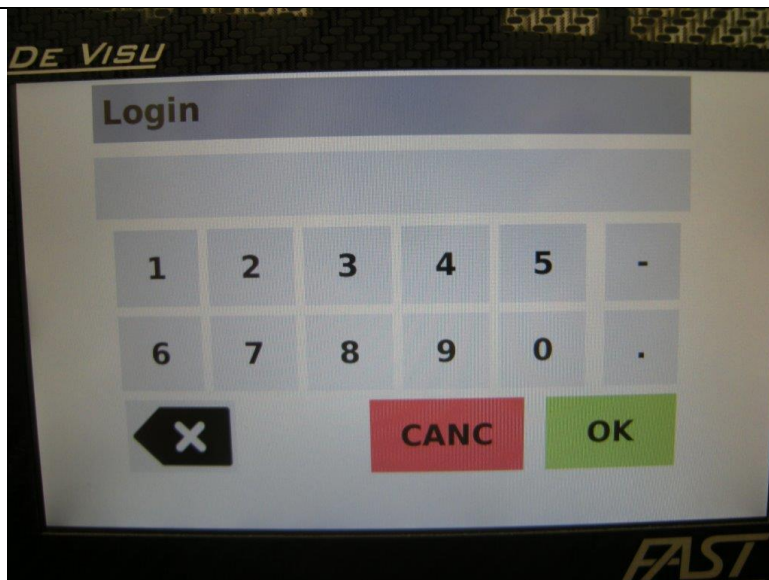


2.1 LANGUAGE

Each HMI can be set in two different language. To switch language, touch the button on the lower left edge of the screen. Two letters in the button icon will indicate the language to which the HMI is actually set (e.g. EN for English, IT for Italian).

2.2 LOGIN

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Login page: digit the password number to login.

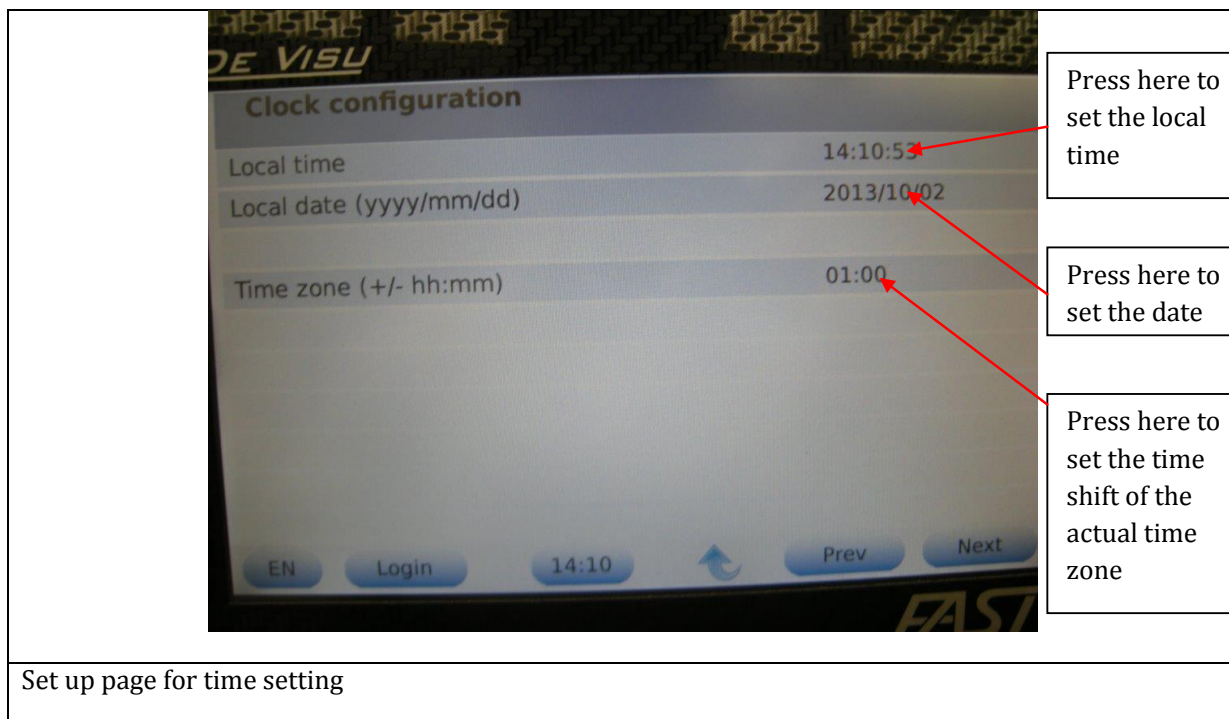
In order to change any parameter, it is necessary to be logged in with a specific password. Two levels of password are available:

Level 1 password: this password enables the user to change all parameters that cannot harm the compressor. This password is 1810, unless differently specified by the user. In this case, contact SAFE to get the actual level 1 password.

Level 2 password: this password enables the user to change all parameters in the machine. **WARNING:** changing parameters protected by level 2 password may be dangerous for machine safety, only skilled personnel is enabled to change these parameters. If you do not know level 2 password, contact SAFE headquarters.

2.3 CLOCK SETUP BUTTON

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By pressing on the button showing the time, it is possible to open the setup page for the time displayed by the HMI. This page displays three fields, that can be updated by simply pressing on them:

1) The local time. This field can be used to set up the time displayed by the HMI. The time must be written in the following form:

hh:mm:ss

where:

hh are the hours, **mm** are the minutes and **ss** are the seconds.

Attention must be paid to the following feature:

- When the HMI is connected to the remote supervision server, it will be impossible to change the local time. The supervisor will transmit to the HMI the Greenwich time, and the local time will be obtained by adding the time shift. In this way, the logging of all variable and alarms will be made according to the real time and date, and there is no risk of shifting due to an error in setting the time on the HMI.

2) The date. This field is used to set up the current date. Attention must be paid to the following features:

- When the HMI is connected to the remote supervision server, it will be impossible to change the date. The supervisor will transmit to the HMI the current date. In this way, the logging of all variable and

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alarms will be made according to the real time and date, and there is no risk of shifting due to an error in setting the time on the HMI.

-The supervisor will refuse to connect to an HMI, if the date is different. Therefore, before connecting to the supervisor, it is necessary to make sure that the date is correct, and manually set it if it is not.

3) The time zone shift. This parameter is used to display the correct local time. The system will log all variables according to the Greenwich time, and display them taking into account the local time shift. This parameter can be used at any time to adjust the correct local time displayed.

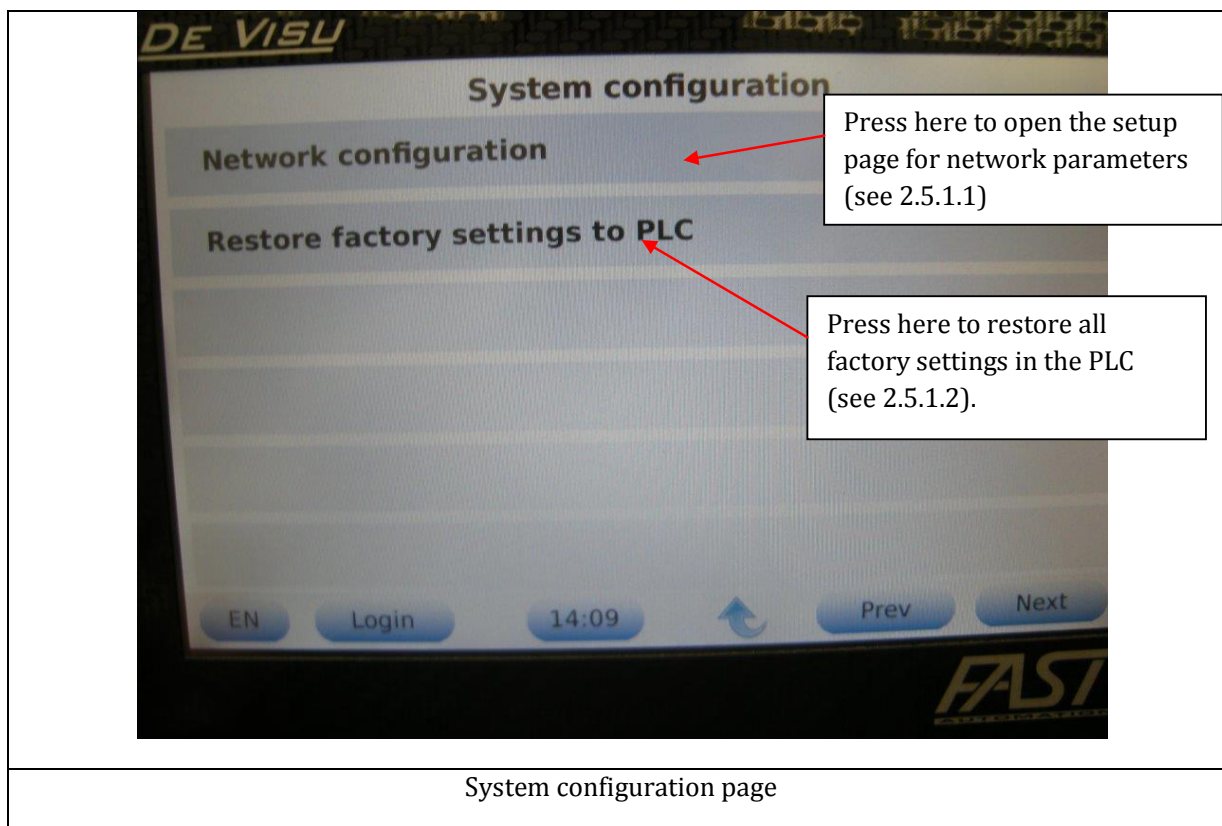
2.4 BACK BUTTON

This button is used to go back to the previous menu. Keep this button pressed for some seconds, in order to go back directly to the home page.

2.5 PREVIOUS PAGE BUTTON

This button is used to shift back to the previous page of a menu, in case the menu contains more than one page. If this button is pressed on the home page, the system configuration page is opened (see 2.5.1)

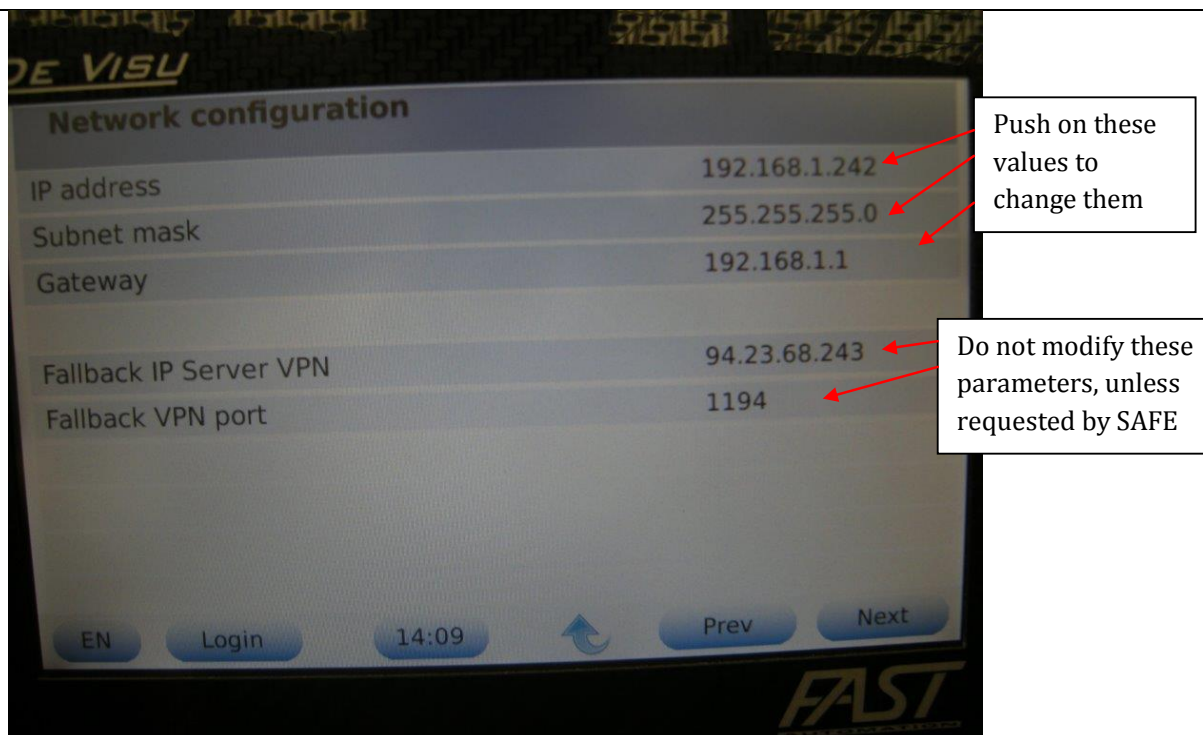
2.5.1 SYSTEM CONFIGURATION PAGE



System configuration page

2.5.1.1 Network configuration page

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Network configuration page

This page contains all the settings for the HMI to connect with the remote supervision system. In detail:

- IP address: it is the IP address of the HMI in the local area network to which it is connected. A different static IP address must be assigned to any HMI in the network.
- Subnet mask: it is the subnet mask of the network to which the HMI is connected.
- Gateway: it is the address of the gateway used by the HMI to connect to the internet. If any firewall is present on the network, it must be set in such a way that the IP address assigned to the HMI is allowed to connect to the internet.

The remaining two parameters, should not be changed unless specifically requested by SAFE.

2.5.1.2 Restore factory settings to PLC button

This page enables the user to restore all parameters at the factory value. This button should be used any time the user is uncertain of the real configuration of the control panel, or unskilled users have modified operating parameters of the compressor.

Pressing on this button, the following events will happen:

- 1) if the user is not logged, a login is requested. After the user has logged in, it is necessary to press a second time on the button, in order to startup PLC reconfiguration.

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2) a timer will appear, showing a countdown of 60seconds. During this time, the HMI will attempt to write all factory settings in the PLC. **WARNING:** The PLC will not accept any reconfiguration if machine is in cycle. Therefore, before restoring factory settings it is always necessary to push the STOP button on the machine.

2.6 NEXT PAGE BUTTON

This button is used to display the next page of a menu. In case it is pressed from the home page, system configurations are displayed (see 2.5.1).

2.7 MACHINE BLOCK BUTTONS

Each machine is divided in different blocks, named with a letter. These letters are the same reported on the main P&ID of the system, that is usually named with a code beginning with letter Q.

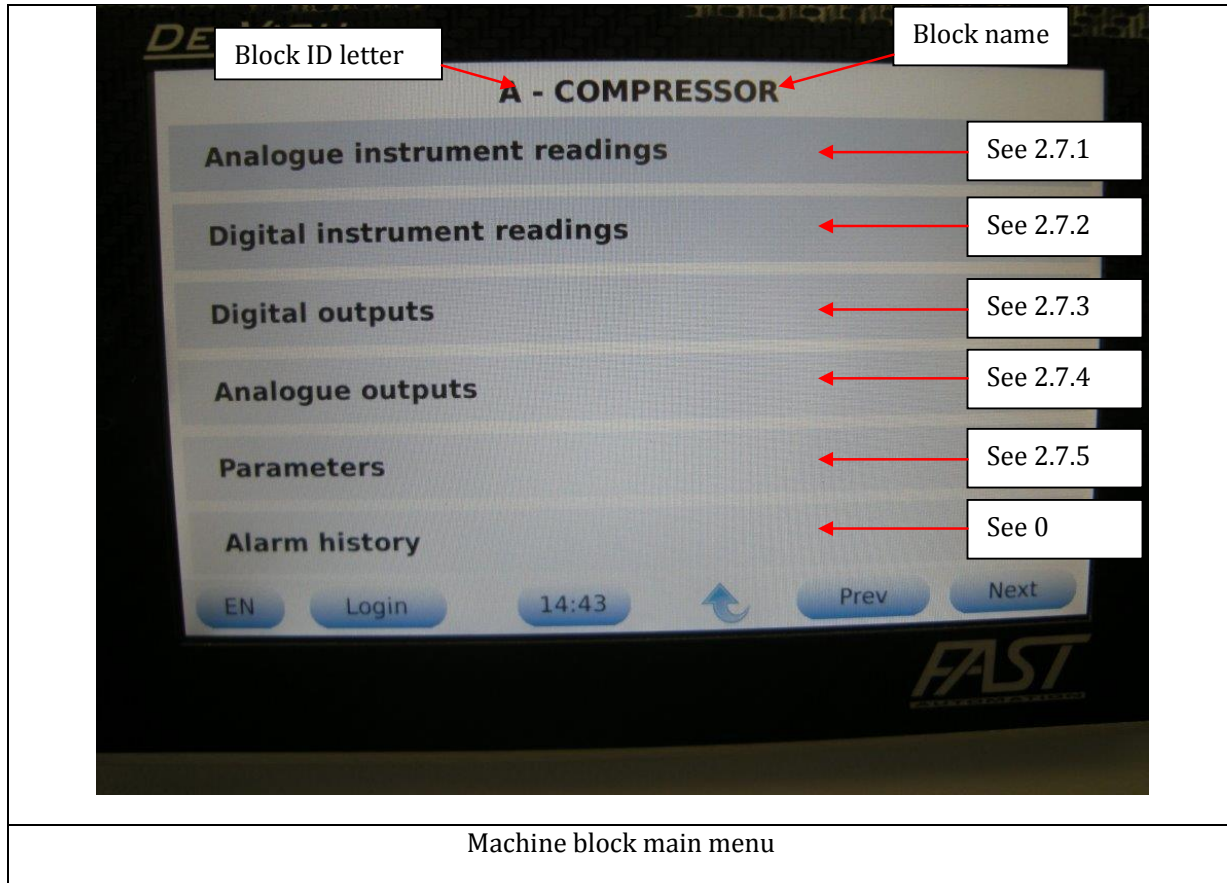
On each machine block the status of the different parts of this block is reported. For example, in the priority panel block there is a string for each line, showing if the line is calling, filling, full, disabled, or in alarm. Each status is also repeated in the “Analogue instrument readings” page.

The color of the block determines the status of the alarms generated by the block, namely:

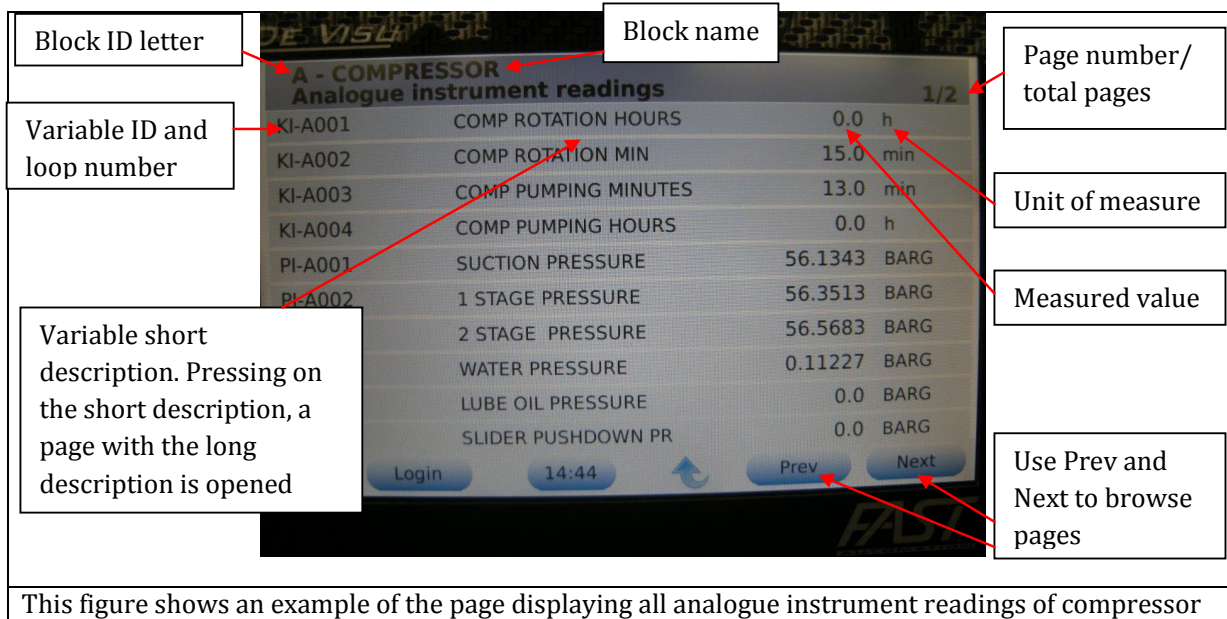
- 1) **Light gray:** in this case the block has not generated any alarm. The status may be alarm, if the machine block has been tripped by an alarm generated by some other block, but the block itself has not generated any alarm.
- 2) **Red:** this color is displayed when the block has generated at least one active alarm, that tripped the machine, or some of its functions.
- 3) **Yellow:** this color is displayed when the block has generated at least one active warning, that does not trip the machine, but warns the user that some malfunction is occurring and action is needed (like filter clogging).

Pressing on each block button, the block menu is opened, which is shown in the following figure.

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2.7.1 ANALOGUE INSTRUMENT READING BUTTON

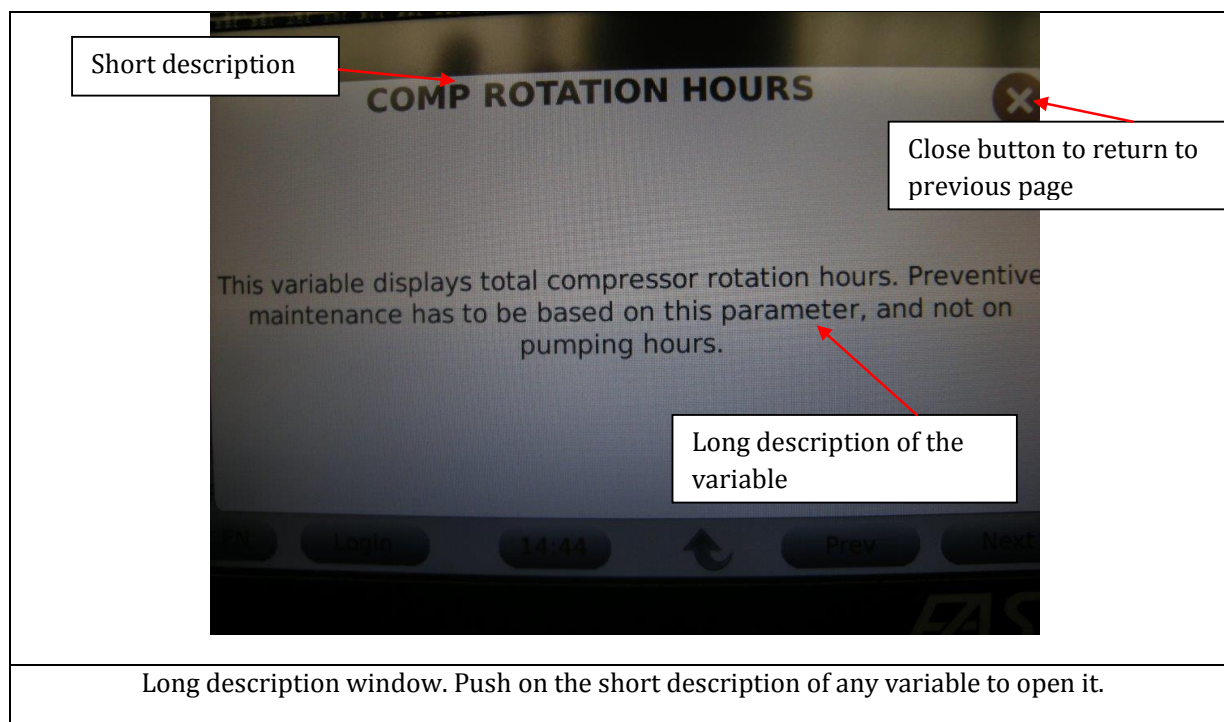


block

The analogue instrument readings page shows all continuous readings related to this machine blocks. Readings may be of real instruments (like pressure, temperature or vibration), or of fake instruments, located in the PLC logics (like the timer counting the pumping hours of a compressor).

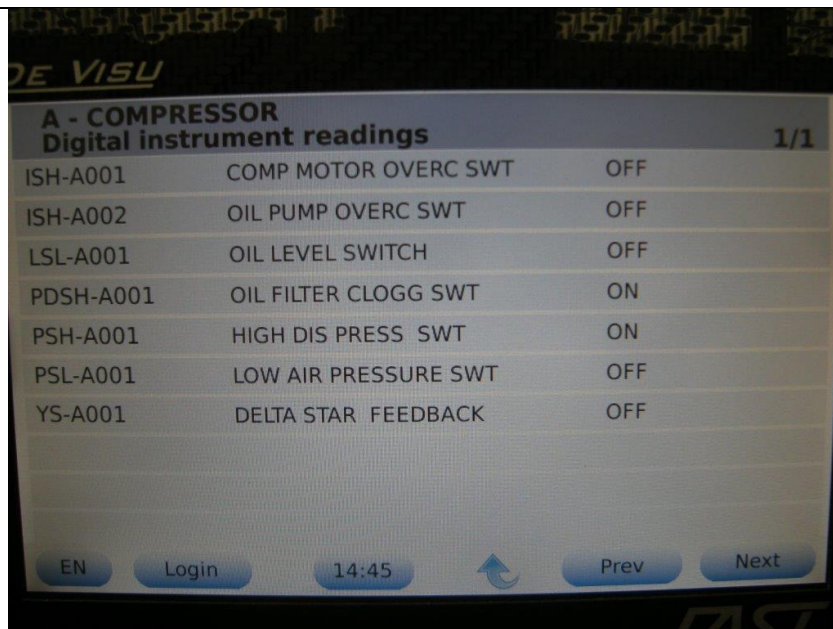
Each input variable is displayed on a row, containing (from left to right):

- 1) ID and loop numbers of the variable, defined according to ISA. If the machine block is assigned an ID letter, all loop numbers of this machine block will begin with the same letter. For example, if compressor block is assigned letter A, all its pressure transmitters will be named PT-A001, PT-A002,
- 2) a short description of the variable. Short description may be too short to be easy to understand, therefore, by touching the short description of each variable, a window with a longer description will appear (see picture below).
- 3) The current value of the variable.
- 4) The unit of measure of the value.



2.7.2 DIGITAL INSTRUMENT READING BUTTON

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Digital instrument reading page

The digital instrument reading page has the same structure as described in section 2.7. This page displays the status of all on/off devices connected to the PLC, like motor overload switches, discharge over pressure switch, or low instrument air switch. The displayed status is “ON” if the contact to the PLC is closed, “OFF” if it is open.

2.7.3 DIGITAL OUTPUT BUTTON

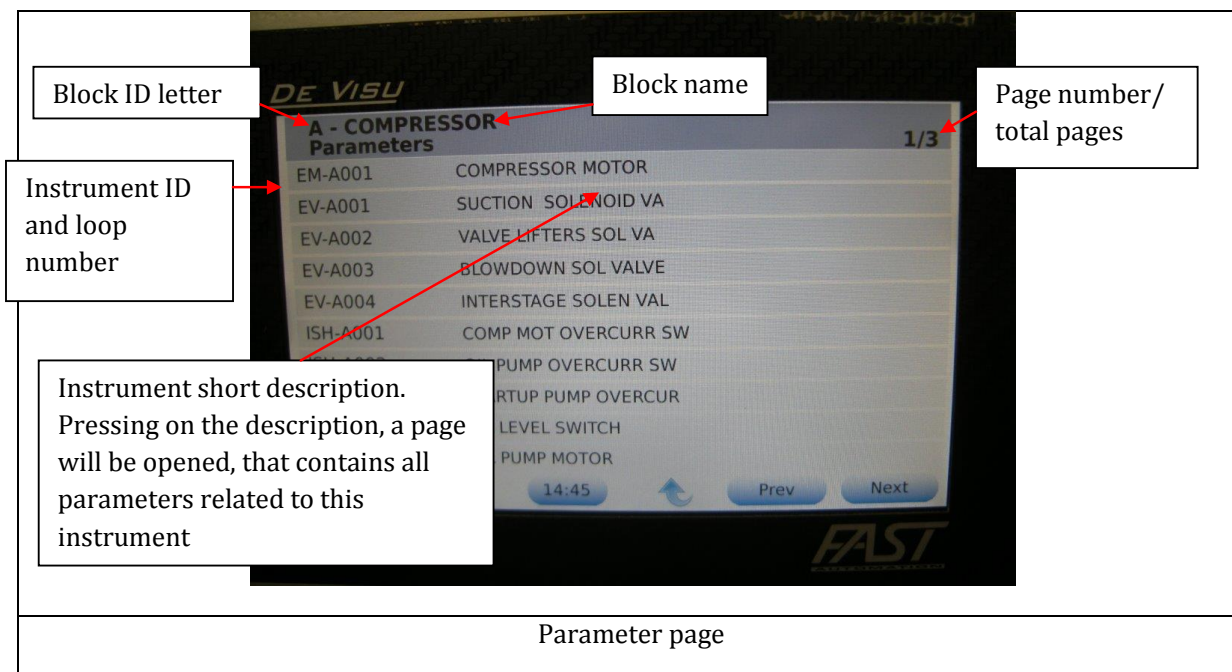


Digital output page

The digital output page has the same structure as described in section 2.7. This page displays the status of all on/off devices actuated by PLC, like solenoid valve, or motor contactors. The displayed status is “ON” if the device is powered, “OFF” if it is not powered.

2.7.4 ANALOGUE OUTPUTS

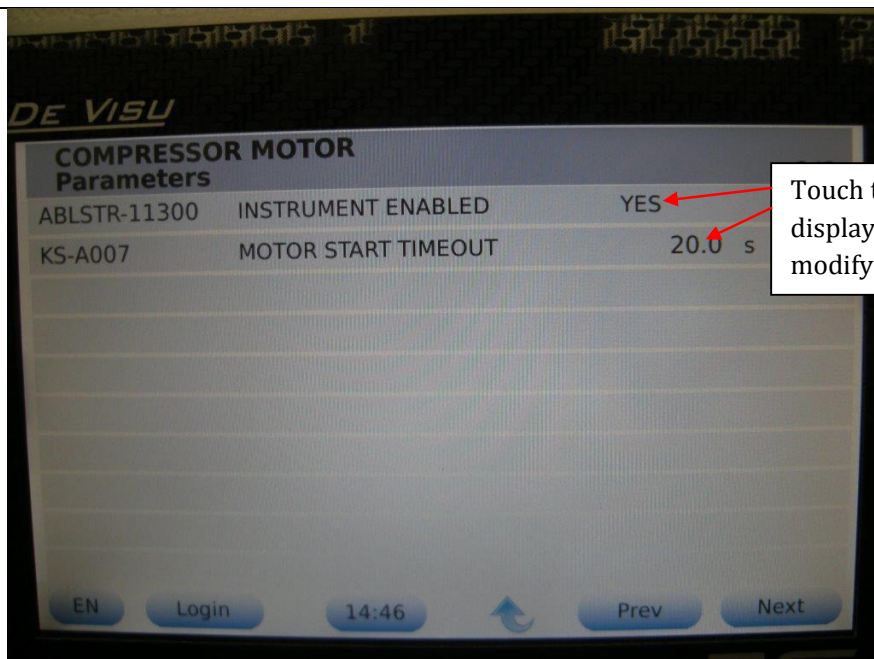
The analogue output page has the same structure as described in section 2.7. This page displays the status of all continuous devices actuated by PLC, like variable frequency drives, or control valves.

2.7.5 PARAMETER BUTTON

Parameter page

The parameter page contains all operating parameter that define the behavior of the machine. First, a window appears, containing a row for each instrument. Each row contains, from left to right, the tag and loop number of each instrument, that corresponds to the one shown on the P&ID. Pressing on the description, a window will open, containing all parameters related to the instrument.

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Instrument parameter page

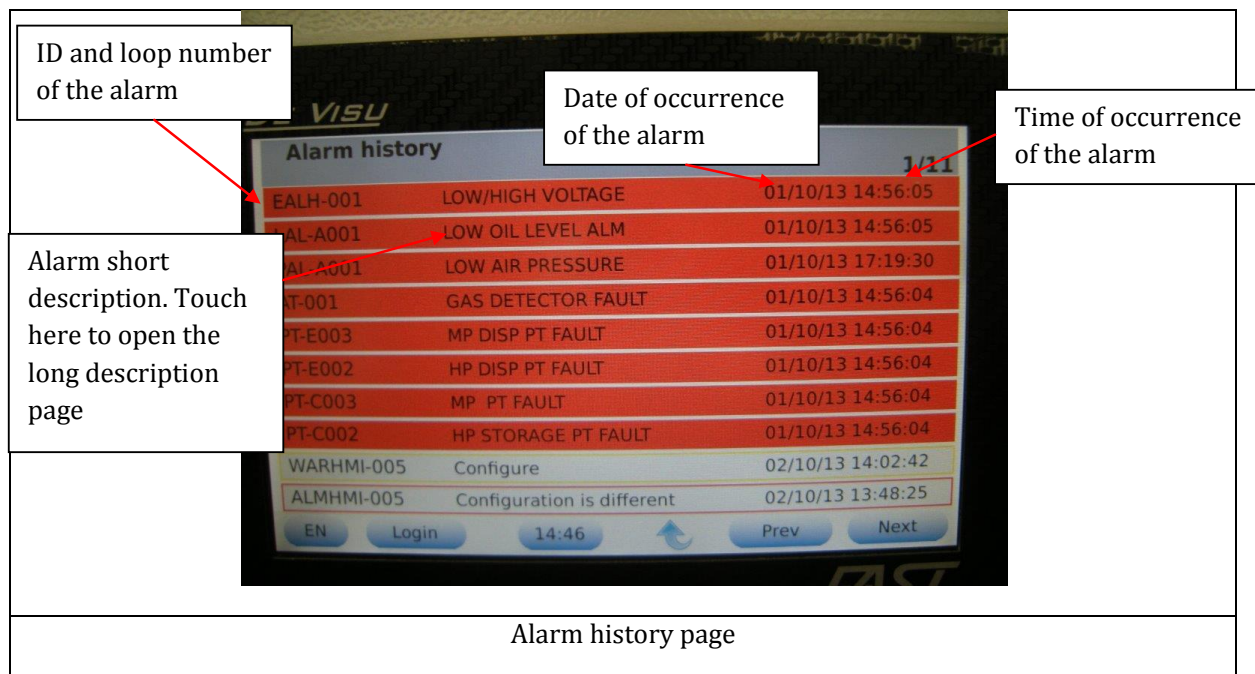
For each instrument, there is always an “instrument enable” parameter, that permits to disable the instrument in case of malfunction. Only skilled personnel shall disable instruments, because it may be dangerous for machine safety and operation.

The structure on the instrument parameter page is the same as described in section 2.7. Pressing on the value of each variable, it is possible to open a window that enables the user to modify the value of the variable. Level 1 or 2 of password may be requested, in case the parameter to be modified is a critical one.

At the end of the instrument list, there is always a last row, named “OTHERS”. Touching on this rows, all remaining variables are displayed, that are not related to any instrument.

2.7.6 ALARM HISTORY BUTTON

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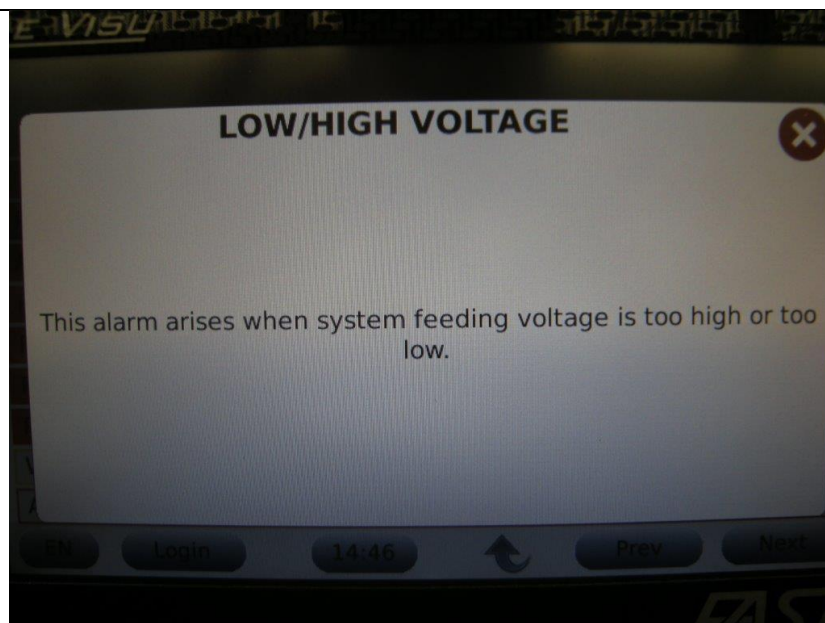
Pressing of the Alarm history button of any machine block, the Alarm history page is opened, which is common to all machine blocks.

The first rows in the alarm history blocks are always all active alarms or warnings. Active alarms will be displayed in full red background, while active warnings in full yellow background.

After all active alarms and warnings, the HMI will display the history of all alarms and warnings occurred on the machine in the past, that have been restored by the users. Restored alarms will be displayed as grey rows bordered in red, while restored warnings as grey rows bordered in yellow.

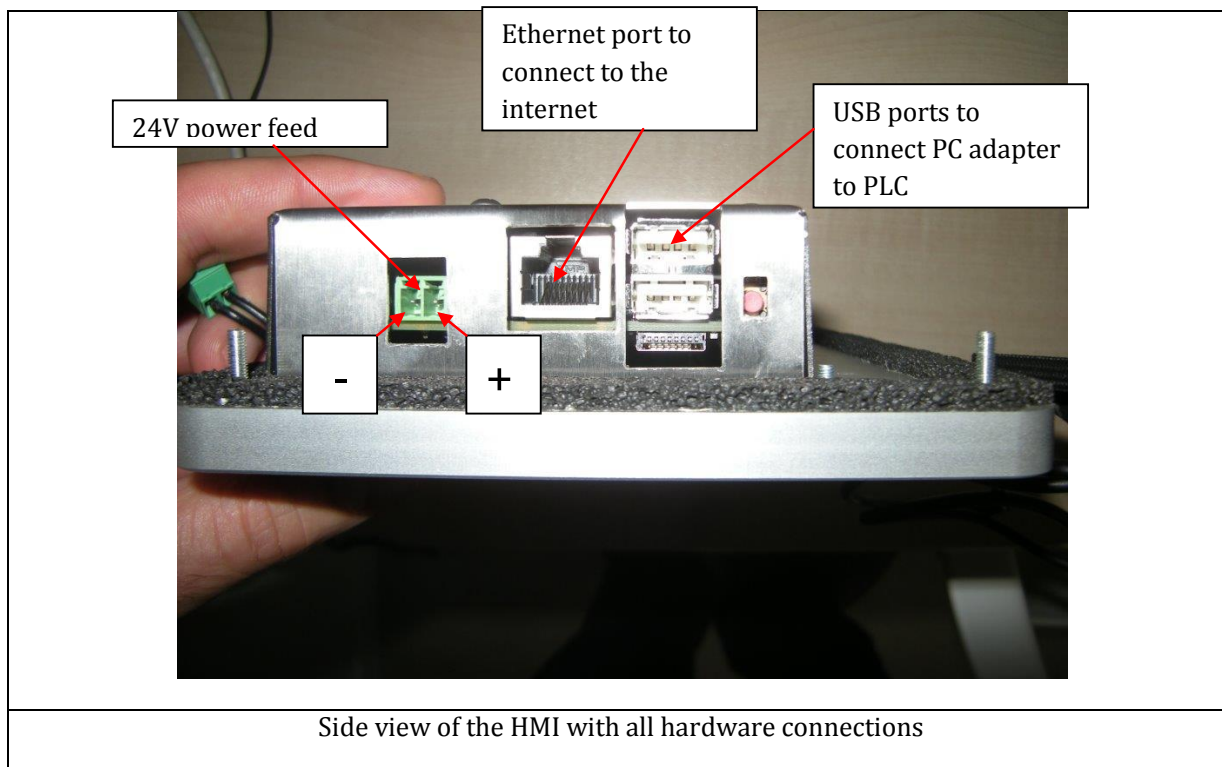
Each row will contain, from left to right:

- 1) ID and loop numbers defined according to ISA standard.
- 2) Alarm short description. By pressing on the short description, it is possible to open a long description page, containing more details about the occurred alarm, and its related troubleshooting.
- 3) Date and hour of occurrence of the alarm.

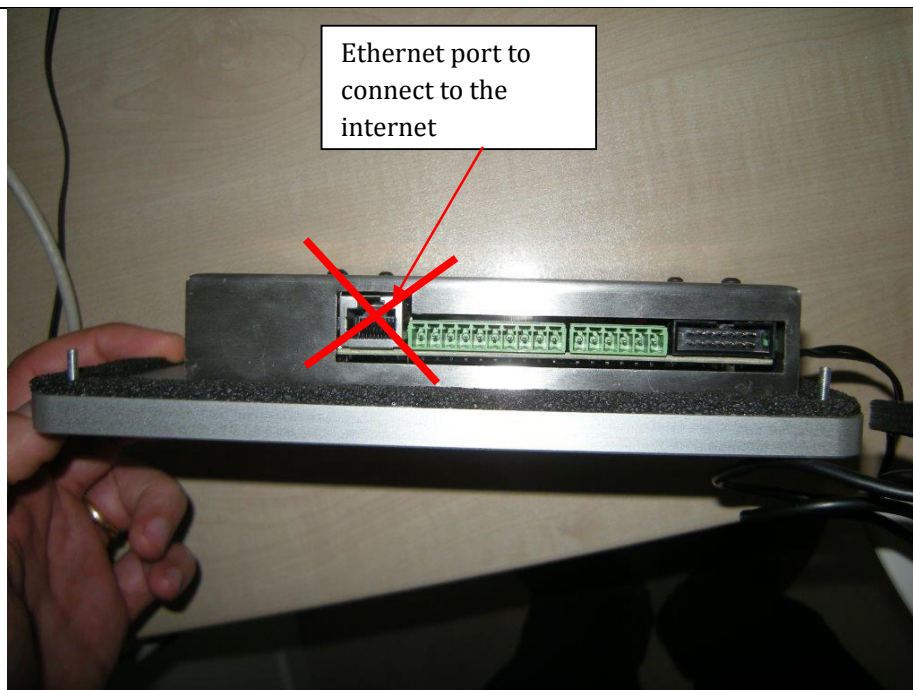


Alarm long description page

3 HARDWARE CONNECTIONS



Side view of the HMI with all hardware connections



Bottom view: NO wires must be connected here, in particular Ethernet plug for internet connection.

2.1.2.4. 101141D - KIT TERMOS INTERST: -30 +200 A CONTA CSA

2.1.2.4.1. 69D6D020 - programmable transmitter 5333D for PT100

ref. [2.1.2.1.1.9.1: MUMC10114101R0.PDF](#)

ref. [2.1.2.1.1.9.1: MUMC69D6D02001R0.pdf](#)

2.1.2.5. 101142D - KIT TERMOSONDA -30+200°C L=70+POZZ CSA

2.1.2.5.1. 69D6D020 - programmable transmitter 5333D for PT100

ref. [2.1.2.1.1.9.1: MUMC10114101R0.PDF](#)

ref. [2.1.2.1.1.9.1: MUMC69D6D02001R0.pdf](#)

2.1.2.6. 25034L012 - ITEM

2.1.2.6.1. 250A2050001 - KIT DIAMETRI SW C95 1° STADIO Ø205



COMPRESSOR VALVES

Quality System certified according to ISO 9001 since 1996

INSTRUCTIONS FOR VALVES USE AND MAINTENANCE

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English	pag.25
Castellano	pag.47
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РУССКИЙ	pag.91
中国	pag.113

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VALVOLE PER COMPRESSORI
Sistema Qualità certificato ISO 9001 dal 1996

ISTRUZIONI PER LA MANUTENZIONE DI VALVOLE

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1. SCOPO

Lo scopo del presente documento è quello di aiutare e guidare i manutentori ad effettuare l'attività di revisione di valvole di aspirazione e di mandata per compressori alternativi.

2. FREQUENZA DEGLI INTERVENTI

La frequenza degli interventi di manutenzione delle valvole dipende dalle condizioni di esercizio e raccomandiamo pertanto di attenersi alle indicazioni del costruttore del compressore.

3. ATTREZZATURE E MACCHINARI CONSIGLIATI PER LA REVISIONE DELLE VALVOLE

- Banco di lavoro attrezzato con morsa o con un mandrino, possibilmente autocentrante, per lo smontaggio e il montaggio delle valvole;
- Chiavi dinamometriche e relative serie di bussole per il serraggio dei dadi autobloccanti;
- Macchina per il lavaggio dei metalli;
- Tornio parallelo;
- Piano di lappatura in ghisa sferoidale;

4. RIMOZIONE DELLA VALVOLA DAL COMPRESSORE

Durante l'attività di rimozione delle valvole dal compressore o dalla tubazione attenersi scrupolosamente alle istruzioni operative e di sicurezza indicate dal costruttore del compressore.

5. SMONTAGGIO DELLA VALVOLA

Se non si ha a disposizione un mandrino, bloccare la valvola in una morsa mediante due pernetti (Figura 1), un'estremità dei quali viene stretta nella morsa e l'altra estremità inserita nelle asole della controsede aspirante o in quelle della sede premente, impedendo in tal modo che la valvola ruoti durante lo svitamento del dado. Non bloccare mai la valvola direttamente nella morsa (Figura 3 e Figura 4).



Figura 1



Figura 2

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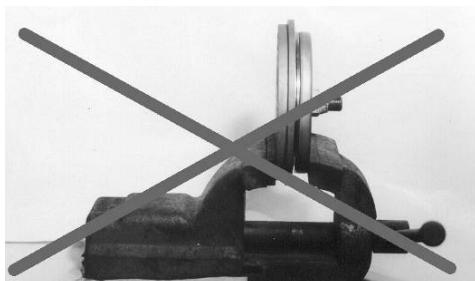


Figura 3

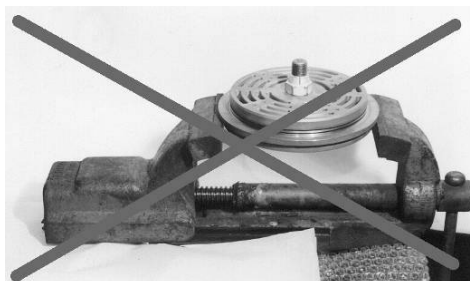


Figura 4

Svitare il dado di bloccaggio della valvola utilizzando se necessario un prodotto autosbloccante. Evitare assolutamente di allentare il dado battendo con qualsiasi oggetto sulla chiave. Per non piegare le spine della valvola durante lo svitamento o l'avvitamento del dado, la sede aspirante o la controsede premene non devono ruotare (Figura 2).

6. PULIZIA DEI PARTICOLARI

Estrarre le molle elicoidali dalla controsede e le spine dalla sede e dalla controsede.

Pulire accuratamente tutte le parti della valvola (escluse le molle elicoidali, i dischi, gli anelli, i cappucci guidamolla e le rondelle sottomolla) utilizzando detergenti appropriati.

Lavare i pezzi in acqua calda con detersivo sgrassante.

In caso sia necessaria una pulizia più profonda porre attenzione a non utilizzare spazzole metalliche o utensili duri o con spigoli vivi per pulire le superfici di tenuta della sede.

7. RIPRISTINO O SOSTITUZIONE DEI PARTICOLARI USURATI

Verificare lo stato di usura dei singoli componenti della valvola e dello spingente.

Sostituire le parti non più ripristinabili, utilizzando esclusivamente ricambi originali Cozzani. In particolare:

7.1 Molle, Otturatori, Dado di bloccaggio, Cappucci guidamolla, Rondella sottomolla.

Le molle elicoidali, i dischi o gli anelli, i controdismi, i cappucci guidamolla e le rondelle sottomolla della valvola devono essere sempre sostituiti ad ogni manutenzione programmata della valvola.

Ad ogni revisione deve essere sostituito il dado di bloccaggio qualunque sia la sua tipologia (autobloccante come in Figura 5 o non autobloccante come in Figura 6). Nel caso sia stato utilizzato un dado di bloccaggio con le rondelle Nord-Lock® (Figura 7), sia il dado che le rosette bloccanti andranno sostituite.

Se valvola è per uso ossigeno rimuovere la colla presente tra le rondelle di sicurezza del dado Nord-Lock®.

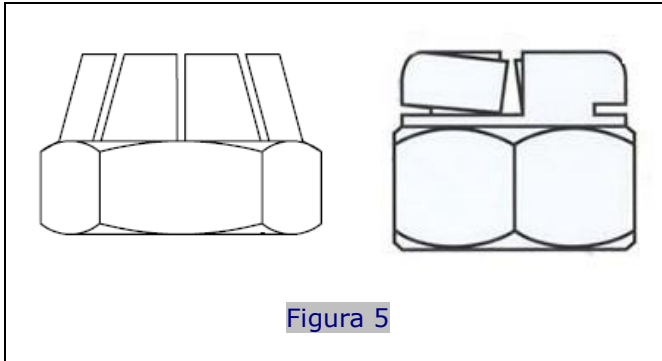


Figura 5

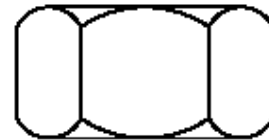


Figura 6

Le rondelle Nord-Lock® devono essere montate in coppia piano contro piano dal lato dei piani inclinati con un passo superiore alla filettatura. I piani con dentatura radiale devono rimare a contatto con il dado e con la sede o la controsede, come mostrato in Figura 8.

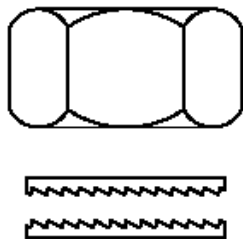


Figura 7

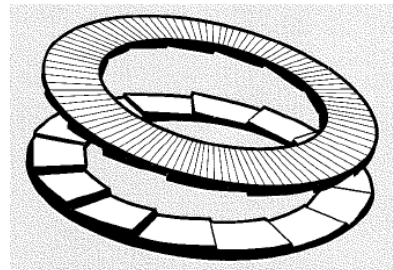


Figura 8

Qualora, a causa di qualche funzionamento anomalo, venga riscontrata un'usura prematura dei dischi o dei controdismi o degli anelli o delle profonde incisioni sulla superficie degli stessi, essi devono essere sostituiti prima di quando programmato.

7.2 Sede

Per ripristinare la perfetta planarità dei seggi di tenuta, lappare a mano la sede tramite apposito piattello in ghisa sferoidale con pasta lubrificata al carburo di silicio e successivamente lavare il pezzo in acqua calda con detersivo sgrassante.

Qualora i seggi di tenuta siano molto danneggiati, quindi non in condizione da potere essere ripristinati con una lappatura, si deve procedere con una lavorazione meccanica di tornitura o di rettifica.

Si inizia la lavorazione di spianatura con piccole asportazioni per ogni passata e con parametri di taglio tali da garantire una buona finitura superficiale. Quando si è raggiunto l'obiettivo del ripristino dei seggi, si devono eliminare gli spigoli vivi creatisi con la spianatura mediante una lavorazione di smussatura con il tornio oppure con tela abrasiva di grana fine.

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Dopo queste operazioni se l'asportazione è stata superiore ai 0,3 mm si devono ripristinare i bassofondi dei seggi di tenuta mediante lavorazione di tornitura con utensile di forma.

Lo spessore minimo tra il piano della sede e la testa della fresa deve essere di 2 mm come si vede in Figura 9.

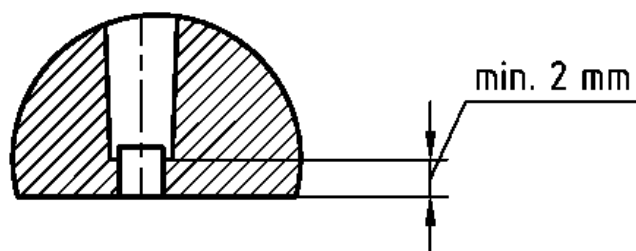
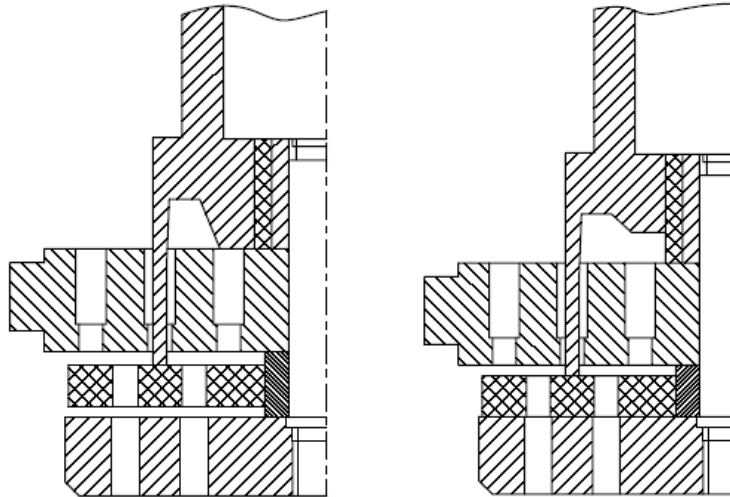


Figura 9

Dopo questa lavorazione lappare a mano la sede tramite apposito piattello in ghisa, come sopra descritto.

Dopo il rimontaggio delle eventuali spine, accertarsi che non compromettano il corretto assemblaggio della valvola. In caso contrario approfondire il foro dove la spina è libera.

Nelle valvole di aspirazione con dispositivo spingente, quest'ultimo può andare a battuta sulla sede (Caso 1) oppure sull'otturatore (Caso 2).



Caso 1

Caso 2

Caso 1:

se a causa del ripristino, si abbassa la sede per più di 0,2 mm, le zampe dello spingente devono essere accorciate esattamente di quanto è stato ridotto lo spessore della sede. In questo caso occorre verificare che, a valvola assemblata e con spingente abbassato, il coperchio dello stesso non vada a contatto con il prigioniero, altrimenti anche il prigioniero deve essere accorciato esattamente di quanto è stato ridotto lo spessore della sede.

Caso 2:

lo spingente non deve essere modificato.

Verificare un eventuale consumo anomalo dello spingente nella zona di battuta dell'otturatore. In caso questo si verifichi provvedere alla sostituzione dello spingente.

7.3 Controsede

Verificare la presenza di usure eccessive nelle cave delle molle e nelle guide degli otturatori. In tal caso sostituire la controsede.

7.4 Prigioniero

Controllare visivamente l'integrità del prigioniero (Figura 10) sulla filettatura e sulla parte tornita ed il perfetto bloccaggio sul rispettivo componente. Controllare che l'eventuale usura della parte liscia del prigioniero non crei eccessivi giochi tra sede e controsede.

In caso di danneggiamento della filettatura del prigioniero, occorre procedere alla sua sostituzione, eseguendo le seguenti operazioni:

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- 1) Eliminare completamente la spina di fermo (Figura 11) forando con una punta di diametro leggermente superiore alla spina stessa.
- 2) Svitare il prigioniero tenendolo serrato in morsa e ruotando la sede.
- 3) Avvitare il nuovo prigioniero fino a battuta, serrandolo con un carico adeguato.
- 4) Spianare al tornio la parte inferiore eccedente del prigioniero e tornire la parte liscia dello stesso rispettando la misura in tolleranza f9.
- 5) Eseguire il nuovo foro per l'alloggio della spina di fermo posizionandolo ad una distanza radiale di almeno 90° rispetto al foro originale, utilizzando una punta di diametro uguale alla spina. Il foro deve avere una profondità superiore alla lunghezza della spina di almeno 1 mm e deve essere eseguito in modo che la spina entri per metà del suo diametro nel prigioniero e per l'altra metà nella sede o controsede.
- 6) Introdurre interamente la spina nel foro e ribadire la testa del foro con un punzone idoneo all'operazione.



Figura 10



Figura 11

7.5 Sostituzione della boccola dello spingente (solo per valvole di aspirazione)

Boccola in peek

La boccola dello spingente in materiale peek deve essere sostituita ad ogni riparazione.

Boccola in acciaio

La boccola in acciaio, se non danneggiata, può non essere sostituita durante le riparazioni.

Boccola in teflon ed acciaio

Nel caso di boccola in teflon, si possono presentare due tipi di anomalie:

- 1) La boccola si sfilava dallo spingente.
- 2) Il diametro interno della boccola è usurato ed il gioco con la boccola di acciaio è superiore a 0,3 mm.

In questi casi è opportuno sostituire tutto lo spingente, oppure in alternativa si procede alla sostituzione della boccola in teflon, operando in questo modo:

- 1) Eliminare manualmente la vecchia boccola.

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- 2) Spingere con un attrezzo idoneo a forza all'interno dello spingente la nuova boccola.
- 3) Portare a misura il diametro interno della boccola, il quale deve essere uguale al diametro esterno della boccola in acciaio più il gioco stabilito che è di $0,15 \div 0,20$ mm. Questa operazione deve essere eseguita con la tornitura, serrando sul mandrino autocentrante lo spingente dalla parte cilindrica (lato seeger) e procedendo con l'operazione di spianatura della boccola in teflon da entrambi i lati, asportando 0,2 mm per lato in modo che la boccola in teflon abbia spazio per la dilatazione assiale.

7.6 Spine

Le spine devono essere sempre sostituite.

Per estrarre la spina, bloccarla orizzontalmente in una morsa e, aiutandosi con un martello di gomma, battere nel senso di estrazione sulla sede nel caso di sedi aspiranti o sul prigioniero nel caso di sedi prementi. Per inserire una nuova spina, battere sulla stessa con un martello di acciaio affinché essa raggiunga il fondo del proprio foro.

7.7 Componenti riutilizzabili

Dopo la pulizia controllare il buono stato dei componenti riutilizzabili (tappo, seeger, molla alzaspingente, spessore di alzata, rosetta di spallamento, bussole).

8. ASSEMBLAGGIO VALVOLA

Lavare la controsede prima di inserire le molle nelle relative cave.

Le molle elicoidali coniche devono essere inserite con il diametro maggiore nell'alloggio della molla (Figura 12).

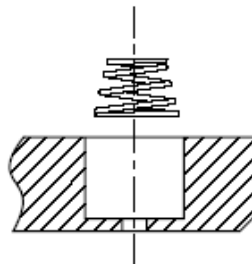


Figura 12

In Figura 13, Figura 14, Figura 15 sono rappresentati gli schemi di montaggio in caso la molla presenti cappucci guidamolla e rondelle sottomolla.

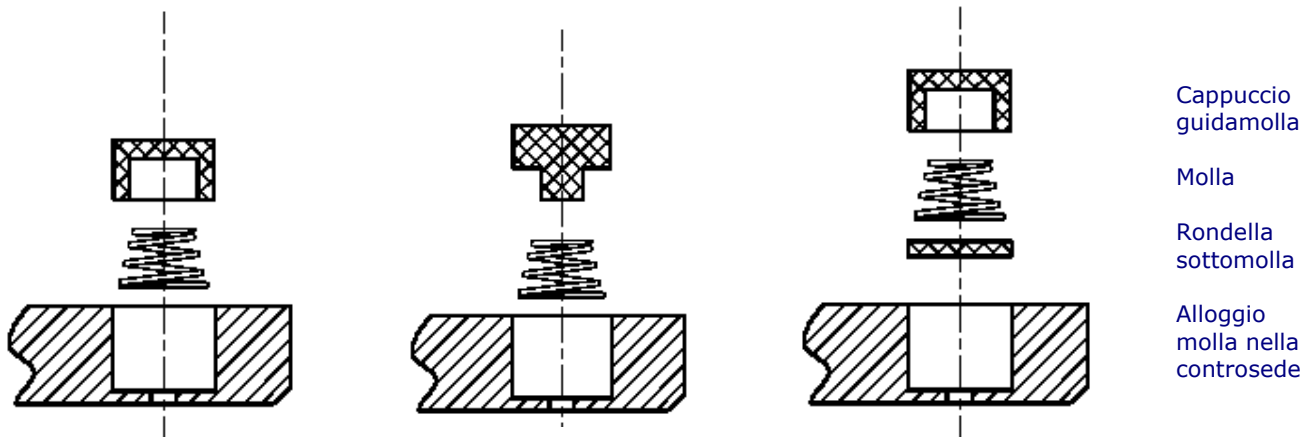


Figura 13

Figura 14

Figura 15

Nel caso la valvola non presenti cappucci guidamolla le molle devono essere bloccate all'interno dell'alloggio utilizzando una piccola asta metallica con punta arrotondata, il cui diametro deve essere maggiore del diametro interno della molla e minore del diametro della cava in cui la molla deve essere alloggiata.

Per bloccare la molla è sufficiente spingere con l'asta la molla nella propria cava, ruotando leggermente l'asta in senso antiorario e assicurandosi che la molla sia in asse nella propria cava, (vedere Figura 16).

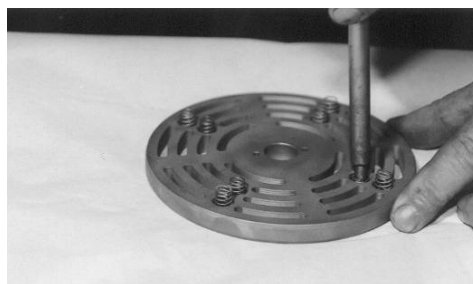


Figura 16

Dopo aver lavato nuovamente la sede e lo spingente ed aver effettuato la verifica dimensionale della sede, rimontare la valvola, assemblando i vari componenti nel giusto ordine. In particolare nel

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caso di valvola con dischi e controdischi in acciaio fare attenzione alla loro corretta posizione seguendo lo schema allegato.

Serrare il dado di bloccaggio con chiave dinamometrica, rispettando le coppie di serraggio indicate in Tab. 1 **se non diversamente indicato nel disegno di riferimento della valvola in oggetto.**

Nel caso di utilizzo di dado autobloccante il prigioniero deve sempre essere lubrificato prima di serrare il dado. Se invece si usa un dado con rondelle Nord-Lock® il prigioniero non deve essere lubrificato.

Non usare mai olio o lubrificante per le valvole usate sui compressori per ossigeno.

Filettatura	Coppia di serraggio per qualunque tipo di dado autobloccante in uso (Figura 5)	Coppia di serraggio per dado classe 8.8 (Figura 6)	Coppia di serraggio per dado con rondelle Nord-Lock® (Figura 7)
M 6	10 N m	10 N m	--
M 8	19 N m	25 N m	19 N m
M 10	25 N m	50 N m	40 N m
M 10 x 1	35 N m	35 N m	40 N m
M 12 x 1,5	45 N m	70 N m	90 N m
M 12	50 N m	85 N m	90 N m
M 14 x 1,5	80 N m	95 N m	120 N m
M 16	130 N m	205 N m	--
M 16 x 1,5	110 N m	150 N m	190 N m
M 20 x 1,5	215 N m	240 N m	300 N m
M 24 x 1,5	370 N m	--	425 N m
M 30 x 1,5	720 N m	--	715 N m

Tab. 1

A valvola assemblata verificare con un calibro che la quota A indicata in Figura 17 e Figura 18 sia uniforme su tutta la circonferenza esterna della stessa. In caso contrario smontare la valvola e verificare che le spine siano correttamente inserite nei propri fori, sia della sede che della controsede.

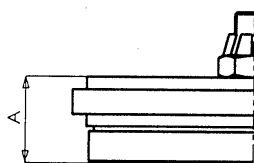


Figura 17

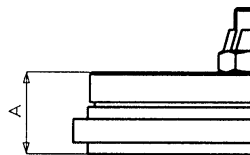


Figura 18

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Verificare il libero movimento del disco o degli anelli premendoli verso la controsede, agendo attraverso le zone di passaggio gas della sede con opportuno attrezzo che non danneggi il disco o gli anelli.

NOTA: per i compressori per ossigeno la valvola deve essere completamente libera da olio e lubrificante. Controllare nuovamente la valvola prima dell'installazione. Il non corretto svolgimento di questa procedura potrebbe causare esplosioni.

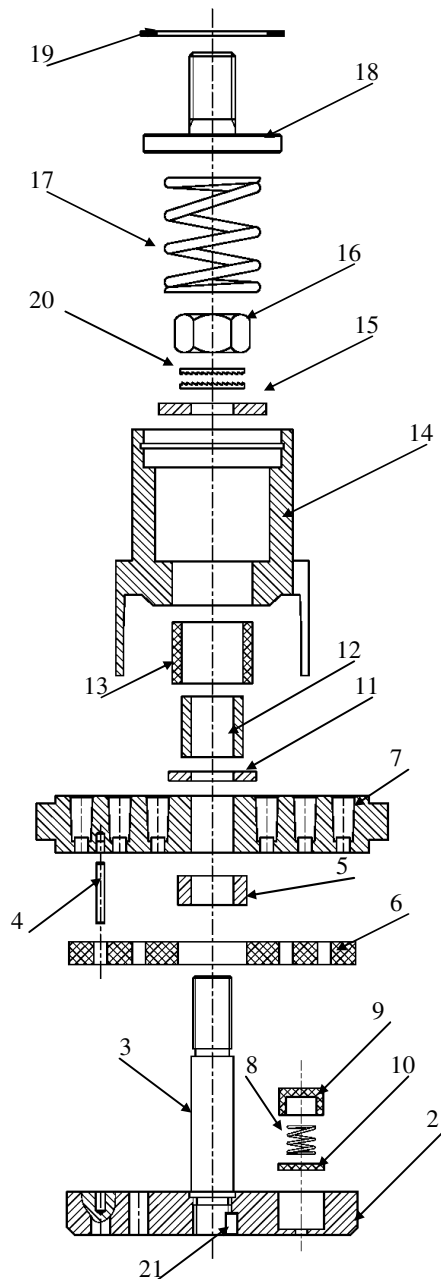
9. PROTEZIONE

Le valvole che devono essere stoccate a magazzino, prima del loro riutilizzo, devono essere protette con olio antiruggine se sono in acciaio non inossidabile. Le valvole per compressori ad ossigeno o altri gas pericolosi non devono assolutamente essere oliate o ingrassate. A tale scopo consigliamo di attenersi scrupolosamente alle istruzioni operative e di sicurezza indicate dal costruttore del compressore.

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10.DISEGNO DI MONTAGGIO PER VALVOLE ASPIRANTI CON DISCO IN PEEK, CAPPUCCI GUIDAMOLLA E ALZAVALVOLA

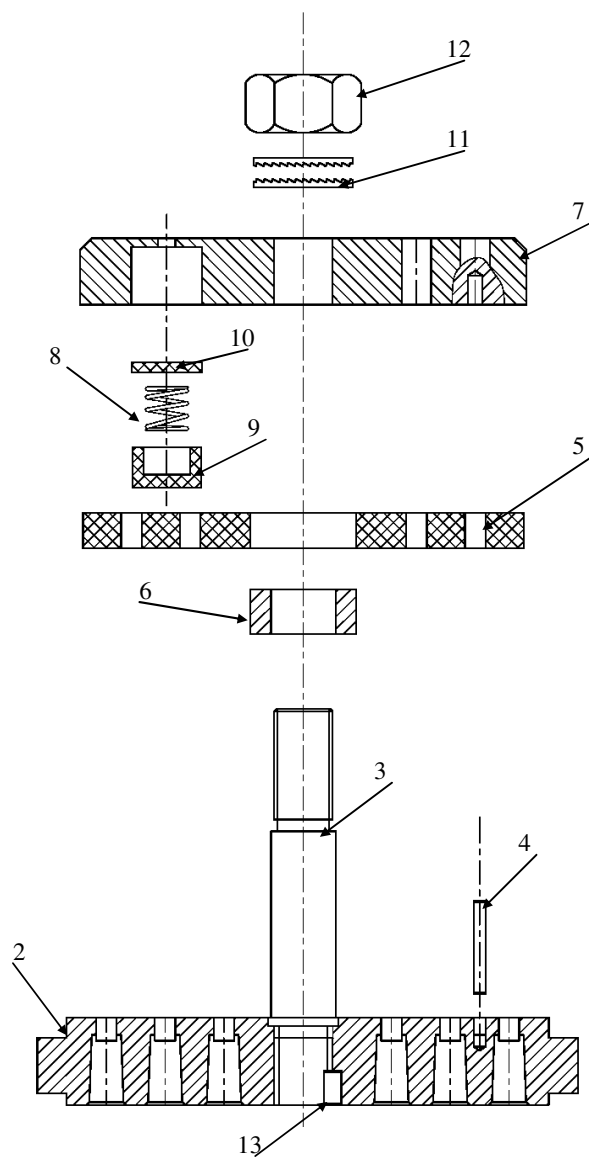


21	SPINA DI FERMO	7.4
20	RONDELLE NORD-LOCK®	7.1
19	SEGER	7.7
18	TAPPO ALZAVALVOLA	7.7
17	MOLLA ALZAVALVOLA	7.7
16	DADO	7.1
15	RONDELLA	7.7
14	ALZAVALVOLA	7.2
13	BUSSOLA IN PLASTICA	7.5
12	BUSSOLA IN METALLO	7.5
11	RONDELLA	7.7
10	RONDELLA SOTTOMOLLA	7.1, 8
9	CAPPUCCIO GUIDAMOLLA	7.1, 8
8	MOLLA DI LAVORO	7.1, 8
7	SEDE	7.2
6	DISCO	7.1
5	SPESSORE DI ALZATA	7.7
4	SPINA	7.6
3	PRIGIONIERO	7.4
2	CONTROSEDE	7.3
1	CONTROSEDE CON PRIGIONIERO	
RIF	DESCRIZIONE	PARAGRAFO DI RIFERIMENTO

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11.DISEGNO DI MONTAGGIO PER VALVOLE PREMENTI CON DISCO IN PEEK E CAPPUCCI GUIDAMOLLA

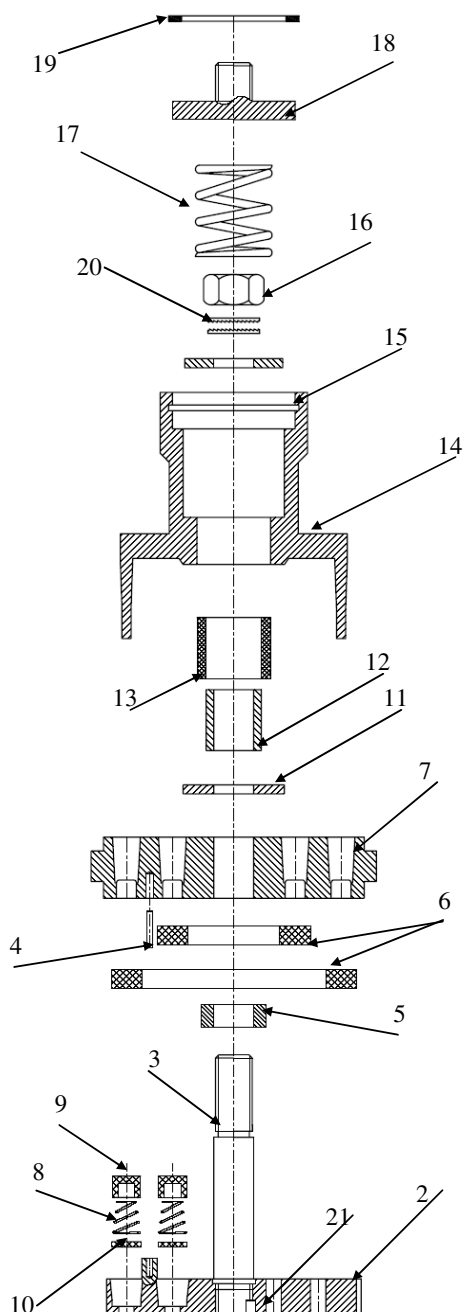


13	SPINA DI FERMO	7.4
12	DADO	7.1
11	RONDELLA NORD-LOCK®	7.1
10	RONDELLA SOTTOMOLLA	7.1, 8
9	CAPPUCCIO GUIDAMOLLA	7.1, 8
8	MOLLA DI LAVORO	7.1, 8
7	CONTROSEDE	7.3
6	SPESSORE DI ALZATA	7.7
5	DISCO	7.1
4	SPINA	7.6
3	PRIGIONIERO	7.4
2	SEDE	7.2
1	SEDE CON PRIGIONIERO	
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12.DISEGNO DI MONTAGGIO PER VALVOLE ASPIRANTI CON ANELLI IN PEEK E CAPPUCCI GUIDAMOLLA

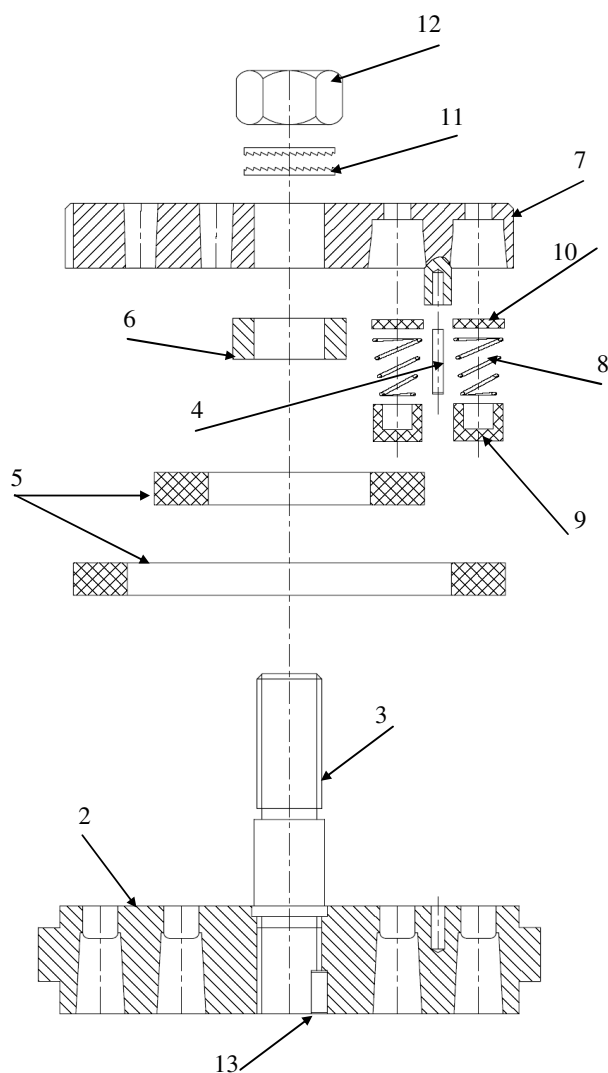


21	SPINA DI FERMO	7.4
20	RONDELLE NORD-LOCK®	7.1
19	SEGER	7.7
18	TAPPO ALZAVALVOLA	7.7
17	MOLLA ALZAVALVOLA	7.7
16	DADO	7.1
15	RONDELLA	7.7
14	ALZAVALVOLA	7.2
13	BUSSOLA IN PLASTICA	7.5
12	BUSSOLA IN METALLO	7.5
11	RONDELLA	7.7
10	RONDELLA SOTTOMOLLA	7.1, 8
9	CAPPUCCIO GUIDAMOLLA	7.1, 8
8	MOLLA DI LAVORO	7.1, 8
7	SEDE	7.2
6	ANELLO	7.1
5	SPESSORE DI ALZATA	7.7
4	SPINA	7.6
3	PRIGIONIERO	7.4
2	CONTROSEDE	7.3
1	CONTROSEDE CON PRIGIONIERO	
RIF	DESCRIZIONE	PARAGRAFO DI RIFERIMENTO

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13. DISEGNO DI MONTAGGIO PER VALVOLE PREMENTI CON ANELLI IN PEEK E CAPPUCCI GUIDAMOLLA

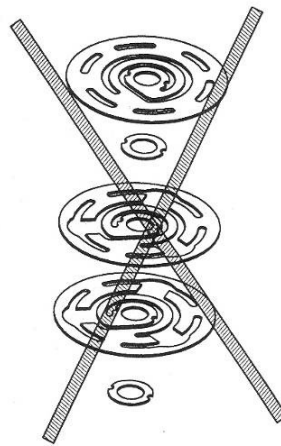
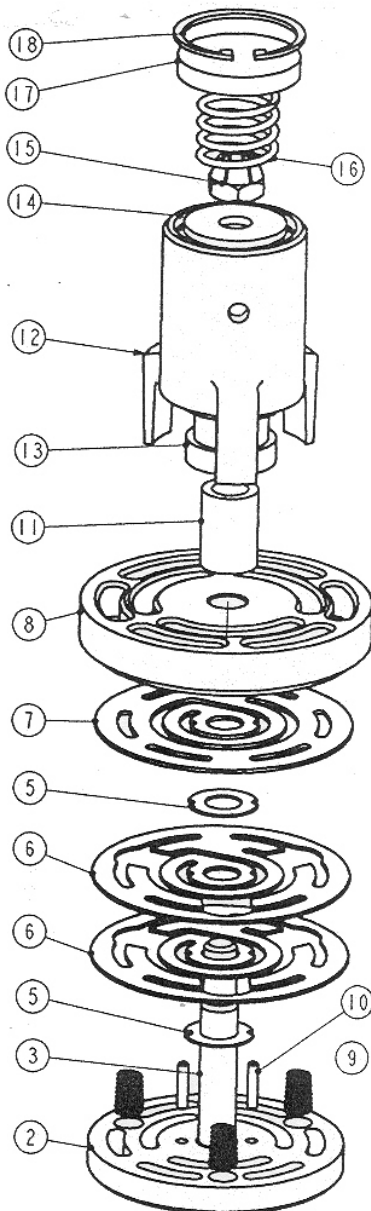


13	SPINA DI FERMO	7.4
12	DADO	7.1
11	RONDELLA NORD-LOCK®	7.1
10	RONDELLA SOTTOMOLLA	7.1, 8
9	CAPPUCCIO GUIDAMOLLA	7.1, 8
8	MOLLA DI LAVORO	7.1, 8
7	CONTROSEDE	7.3
6	SPESSORE DI ALZATA	7.7
5	ANELLI	7.1
4	SPINA	7.6
3	PRIGIONIERO	7.4
2	SEDE	7.2
1	SEDE CON PRIGIONIERO	
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14.DISEGNO DI MONTAGGIO PER VALVOLE ASPIRANTI CON DISCO IN ACCIAIO E ALZAVALVOLA

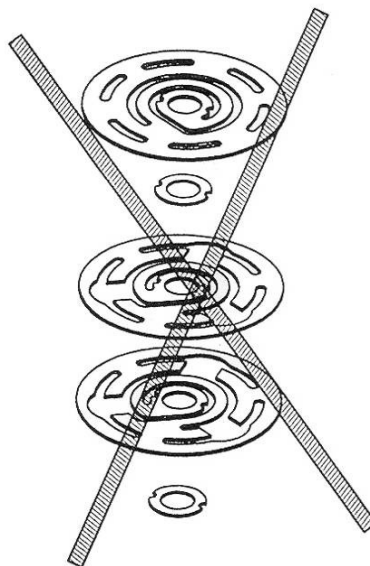
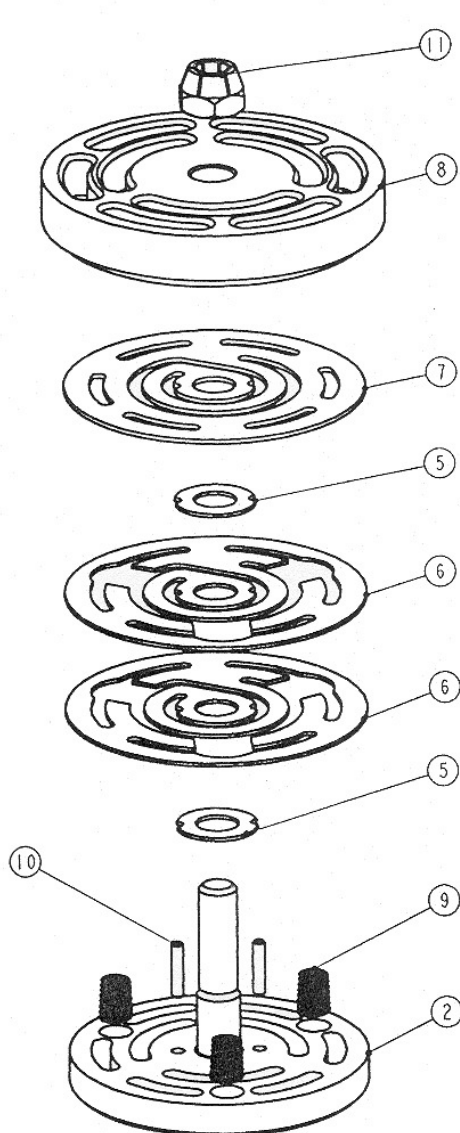


18	SEGER	7.7
17	TAPPO ALZAVALVOLA	7.7
16	MOLLA ALZAVALVOLA	7.7
15	DADO	7.1
14	RONDELLA	7.7
13	BUSSOLA IN PLASTICA	7.5
12	ALZAVALVOLA	7.2
11	BUSSOLA IN METALLO	7.5
10	SPINA	7.6
9	MOLLA DI LAVORO	7.1, 8
8	SEDE	7.2
7	DISCO	7.1
6	CONTRODISCO	7.1
5	SPESSORE DI ALZATA	7.7
4	SPINA	7.6
3	PRIGIONIERO	7.4
2	CONTROSEDE	7.3
1	CONTROSEDE CON PRIGIONIERO	
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15.DISEGNO DI MONTAGGIO PER VALVOLE ASPIRANTI CON DISCO IN ACCIAIO

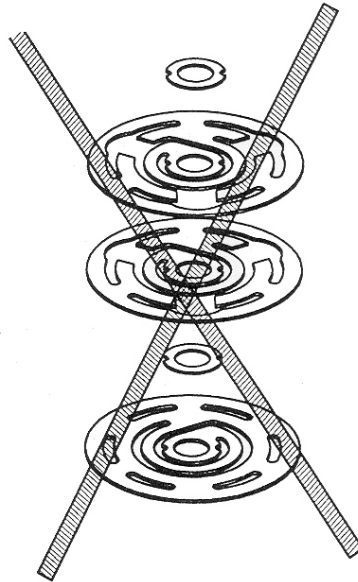
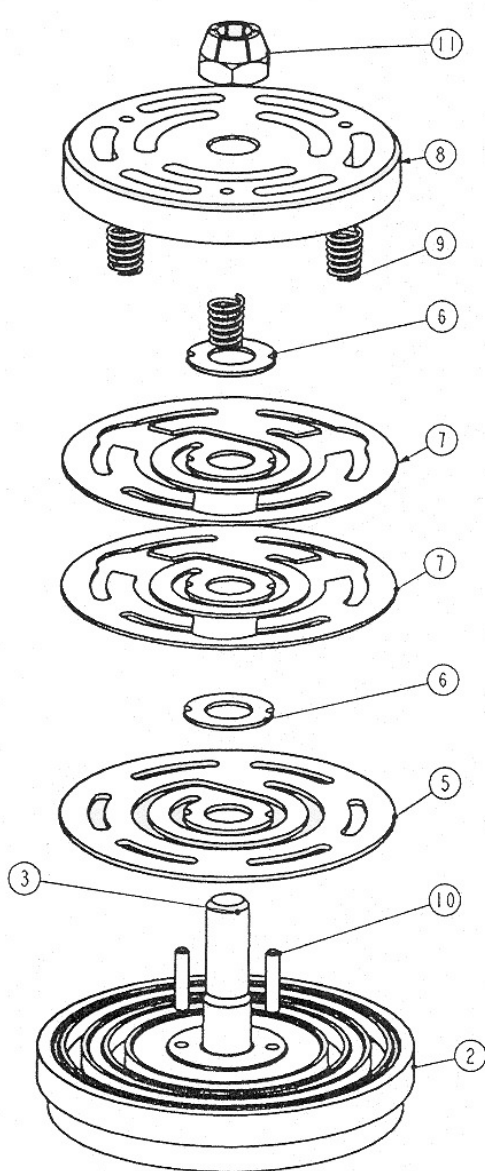


11	DADO	7.1
10	SPINA	7.6
9	MOLLA DI LAVORO	7.1, 8
8	SEDE	7.2
7	DISCO	7.1
6	CONTRODISCO	7.1
5	SPESSORE DI ALZATA	7.7
4	SPINA	7.6
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16.DISEGNO DI MONTAGGIO PER VALVOLE PREMENTI CON DISCO IN ACCIAIO

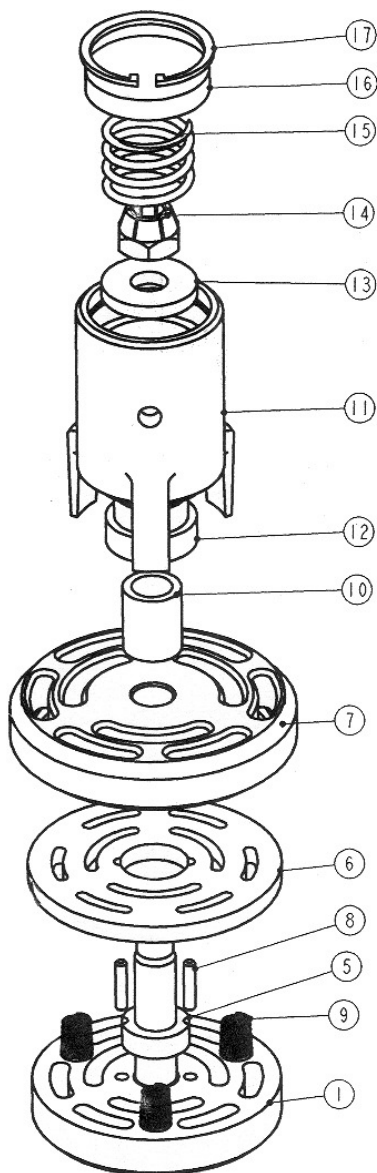


11	DADO	7.1
10	SPINA	7.6
9	MOLLA DI LAVORO	7.1, 8
8	CONTROSEDE	7.3
7	CONTRODISCO	7.1
6	SPESSORE DI ALZATA	7.7
5	DISCO	7.1
4	SPINA	7.6
3	PRIGIONIERO	7.4
2	SEDE	7.2
1	SEDE CON PRIGIONIERO	
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17.DISEGNO DI MONTAGGIO PER VALVOLE ASPIRANTI CON DISCO IN PLASTICA E ALZAVALVOLA

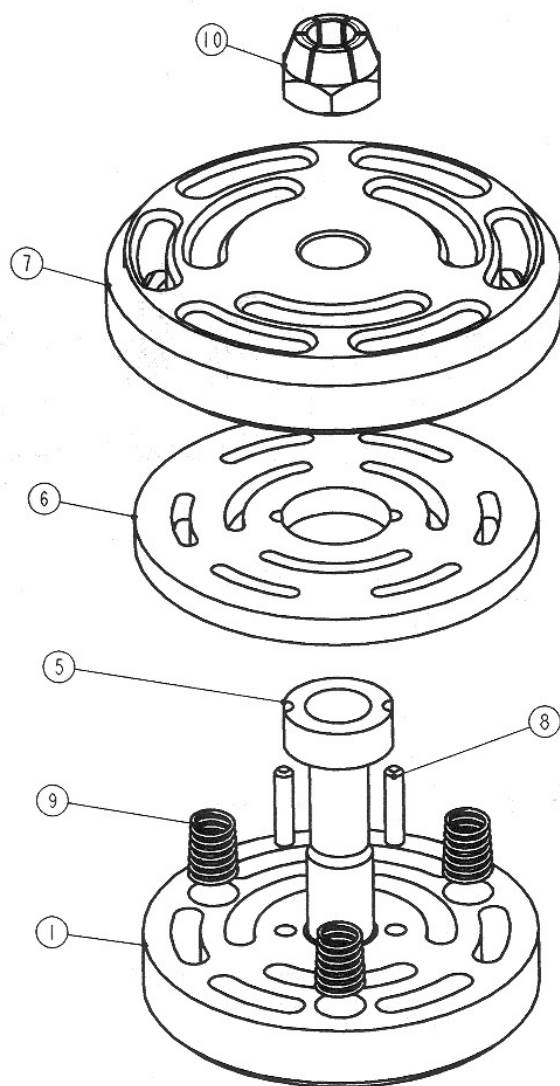


17	SEEGER	7.7
16	TAPPO ALZAVALVOLA	7.7
15	MOLLA ALZAVALVOLA	7.7
14	DADO	7.1
13	RONDELLA	7.7
12	BUSSOLA IN PLASTICA	7.5
11	ALZAVALVOLA	7.2
10	BUSSOLA IN METALLO	7.5
9	MOLLA DI LAVORO	7.1, 8
8	SPINA	7.6
7	SEDE	7.2
6	DISCO	7.1
5	SPESSORE DI ALZATA	7.7
4	SPINA	7.6
3	PRIGIONIERO	7.4
2	CONTROSEDE	7.3
1	CONTROSEDE CON PRIGIONIERO	
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18.DISEGNO DI MONTAGGIO PER VALVOLE ASPIRANTI CON DISCO IN PLASTICA

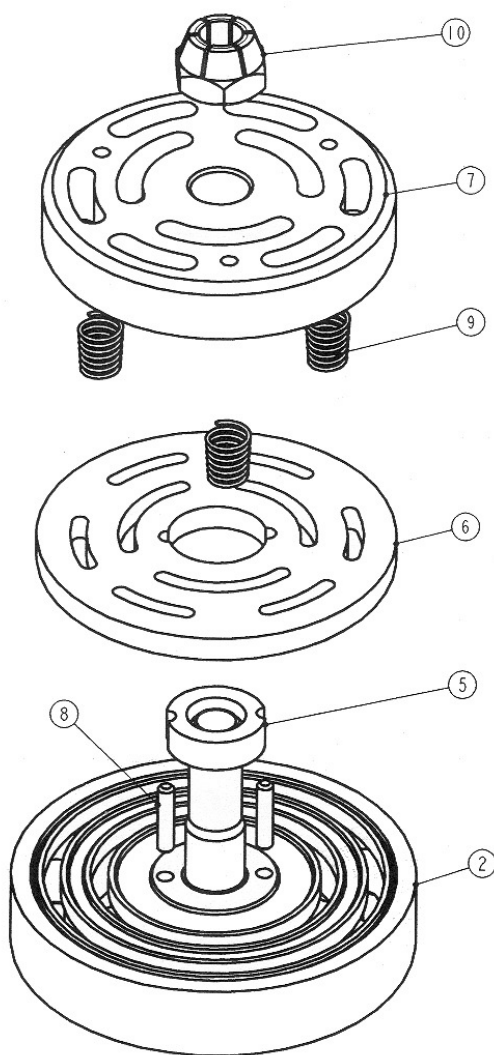


10	DADO	7.1
9	MOLLA DI LAVORO	7.1, 8
8	SPINA	7.6
7	SEDE	7.2
6	DISCO	7.1
5	SPESSORE DI ALZATA	7.7
4	SPINA	7.6
3	PRIGIONIERO	7.4
2	CONTROSEDE	7.3
1	CONTROSEDE CON PRIGIONIERO	
RIF	DESCRIZIONE	PARAGRAFO DI RIFERIMENTO

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19.DISEGNO DI MONTAGGIO PER VALVOLE PREMENTI CON DISCO IN PLASTICA



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4	SPINA	7.6
3	PRIGIONIERO	7.4
2	SEDE	7.2
1	SEDE CON PRIGIONIERO	
RIF	DESCRIZIONE	PARAGRAFO DI RIFERIMENTO

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COMPRESSOR VALVES

Quality System certified according to ISO 9001 since 1996

ENGLISH

SERVICE GUIDE FOR VALVES MAINTENANCE

NOTE: The translation is carried out with respect and with the best interpretation of terms. Should a conflict arise in the interpretation, the Italian version is the commanding one.

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1. PURPOSE

Purpose of the present document is to help and aid the maintenance people to carry out overhaul on suction and delivery valves for reciprocating compressors.

2. VALVE MAINTENANCE PERIODS

Valve maintenance periods depend on the compressor operating cycle. We recommend to follow the compressor manufacturer instructions.

3. RECOMMENDED EQUIPMENT AND MACHINE TOOLS FOR VALVE MAINTENANCE

- Work bench equipped with vice and possibly a self-centring chuck, to assemble and disassemble the valves;
- Torque wrench and series of collets to lock the valve nuts;
- Metal part washing machine;
- Lathe;
- Surface plate in spheroidal graphite cast iron.

4. VALVE DISMANTLING FROM THE COMPRESSOR

When removing the valve from the compressor or from the pipe, scrupulously follow the operating and safety instructions indicated by the compressor manufacturer.

5. VALVE DISASSEMBLY

If you do not have an available chuck, lock the valve in a vice with two pins (Figure 1), one end of the latter is locked in the vice and the other end is plugged in the suction guard slots or in the discharge seat slots, thus avoiding the valve rotation while unscrewing the nut. Never tighten the valve directly in the vice (Figure 3 and Figure 4).

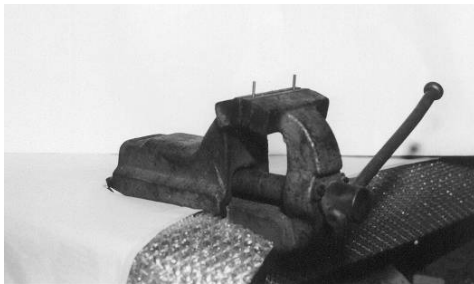


Figure 1



Figure 2

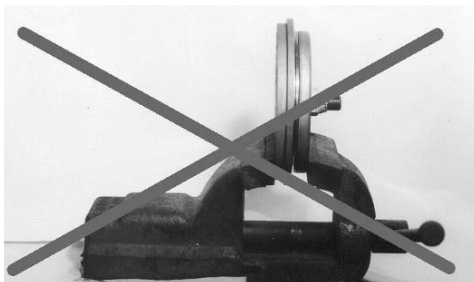


Figure 3

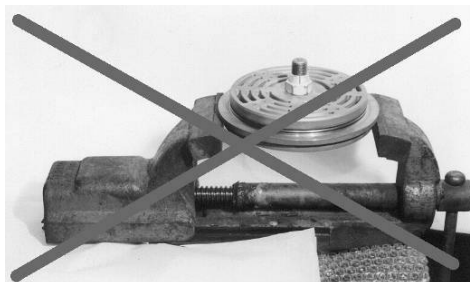


Figure 4

Unscrew the valve nut using, if necessary, a product suitable to facilitate the unscrewing. Absolutely avoid loosening the nut by beating on the wrench with any object. Hold the discharge seat and the suction guard to prevent the valve fixing pins from bending, while loosening or tightening the nut. (Figure 2)

6. PARTS CLEANING

Pull the helicoidal springs out from the guard and the pins from the seat and from the guard. Carefully clean all internal valve parts (except for the helicoidal springs, the plates, the rings, the spring cups and the spring washers) with appropriate detergents. Clean the parts in hot water and degreaser.

If a deeper cleaning is necessary, pay attention not to use metallic brushes or hard tools or with sharp edges ones to clean the seat sealing surfaces and plates.

7. RECONDITIONING OR REPLACEMENT OF WORN PARTS

Check the wear condition of each valve and plunger part.

Replace all those that cannot be restored, using only Cozzani original spare parts. Particularly:

7.1. Springs, Shutters, Locking Nut, Spring Cups, Spring Washers

The valves helicoidal springs, the plates or the rings, the damper plate, the spring cups and the spring washers must be replaced at each planned valve maintenance.

At each overhaul the locking nut must be replaced whatever type (self-locking as in Figure 5 or non self-locking nut as in Figure 6). In case locking nuts with Nord-Lock® washers (Figure 7) are used both the locking nut and the safety washers shall be replaced.

If the valve is for oxygen use, remove the glue between the Nord-Lock® washers.

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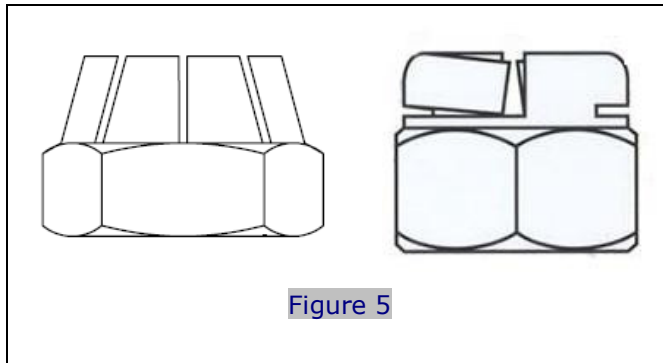


Figure 5

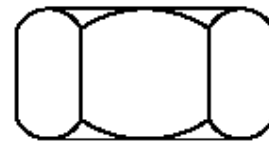


Figure 6

The Nord-Lock® washers must be assembled in pairs cam face to cam face from the side with a greater rise than the pitch of the bolt. The faces with radial teeth must be in contact with the nut and with the seat or the guard, as shown in Figure 8.

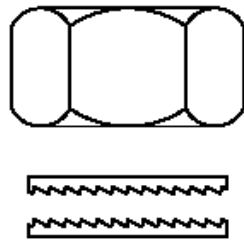


Figure 7

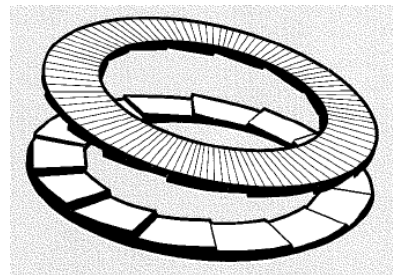


Figure 8

If anomalous functions cause premature wear or deep gashes on the plates or damper plates, they must be changed before scheduled time.

7.2. Seat

To restore the perfect flatness of the sealing surfaces, manually lap the seat with a suitable flat spheroidal graphite cast iron and silicon carbon lubricated paste and clean the parts in hot water and degreaser.

If the sealing surfaces are very damaged and cannot be restored by lapping, mechanical turning or grinding are necessary.

Frontal turning is done by removing a small part at each cut and with cut parameters in order to guarantee a good surface finish. When the desired surface restoration level has been



reached, the sharp corners, which were made by the frontal turning, must be removed. This is carried out by chamfering with a lathe or with a fine grain emery cloth. After having carried out these operations, if the removal is above 0,3 mm it is necessary to restore the shallow recesses of the sealing surfaces by turning with a form tool. The minimum thickness between the seat surface and the milling head must be 2 mm as shown in Figure 9.

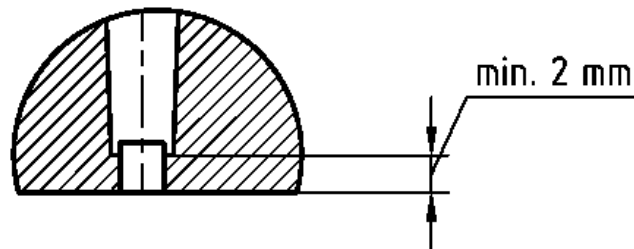
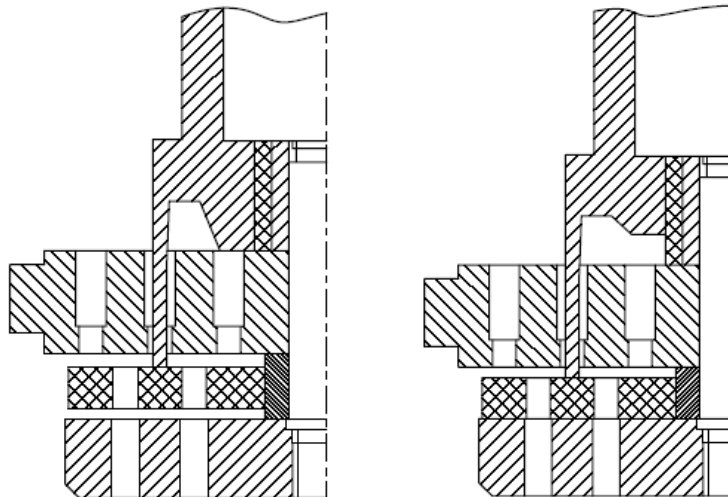


Figure 9

After this operation, manually lap the seat with graphite cast iron, as specified above.

Once the pins have been put back into place, make sure that they don't compromise the right valve assembly. Otherwise deepen the hole where the pin is free.

In the suction valves with plunger, this one can be in contact with the seat surface and there is no contact between the plate and the guard (Case 1) or the plate can be stopped by the guard (Case 2).



Case 1

Case 2

Case 1:

If due to the restoration, the seat lowers more than 0,2 mm, the plunger fingers must be shortened of exactly the same amount as the seats thickness. In this case it is necessary to verify that, once the valve has been reassembled with lowered plunger, its cover does not touch the stud, otherwise the stud must be shortened exactly the same amount as the seat thickness.

Case 2:

The plunger must not be changed.

Check a possible anomalous consumption of the plunger in the beat zone of the shutter. In this case substitute the plunger.

7.3. Guard

Check the presence of excessive worn in the springs slots and in the shutter guides. In this case change the guard.

7.4. Stud

Visually check the stud integrity (Figure 10) on the threading and on the turned part and the perfect block on the respective component. Check that the wear of the smooth part of the stud doesn't create excessive gap between the seat and the guard.

If the stud threats are damaged, it is necessary to substitute them, following the below listed points:

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- 1) Completely eliminate the locating pin (Figure 11) by drilling with a slightly bigger diameter than the pin itself.
- 2) Unscrew the bold by keeping it fixed in the vice and rotate the seat.
- 3) Tighten the new stud until it makes contact, closing it with an adequate load.
- 4) Level out the studs excess lower part with a lathe and turn its smooth part, keeping into account the f9 tolerance measurement.
- 5) Make the new hole for the locating pins, placing them at a radial distance of at least 90° from the original hole, using a point with the same diameter as the pins. The hole must be deeper than the pins length by at least 1 mm and it must be done in this way to allow the pin to enter into the stud by half of its diameter and, by the other half, into the seat or guard.
- 6) The pin must be entirely inserted into the hole and the hole head must be riveted with a punch, suitable for this operation.



Figure 10



Figure 11

7.5. Plungers bush replacement (only for suction valves)

Peek bush

The peek bush of the plunger must be changed at each overhaul.

Steel bush

The steel bush, if it's not damaged, cannot be substituted during the overhauls.

Teflon and steel bush

If the bush is made in teflon, two anomalies can be found:

- 1) the bush comes out of the plunger.
- 2) The internal diameter of the bush is worn and the clearance with the steel bush is more than 0,3 mm.

In these cases it is opportune to change the teflon bush, following the below listed points:

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- 1) manually remove the old bush.
- 2) With an appropriate tool push the new bush into the plunger.
- 3) Bring to size bushes inner diameter , which must be the same as the external diameter of a steel bush clearance 0,15/0,20 mm. This operation must be carried out by turning, locking the plunger cylindrical part (internal circlip (seeger) side) by the self centring chuck. Flatten both sides of the teflon bushes, removing 0,2 mm from each side so that the teflon bush has enough space for the axial dilatation.

7.6. Pins

The valve pins must always be changed.

To take out the pin, lock it horizontally with a vice and, with the help of a rubber hammer, knock on the seat, if it is a suction seat, or on the stud, if it is a discharge seat. In order to insert a new pin, knock on it with a steel hammer until it reaches the bottom of its slot.

7.7. Reusable parts

After the cleaning check the good conditions of the reusable parts (cover, internal circlip (seeger), plunger spring, lift washer, washers, bushes).

8. VALVE ASSEMBLY

Clean the guard before inserting the springs in their slots.

Conical springs must be inserted with the largest diameter in the springs slot (Figure 12).

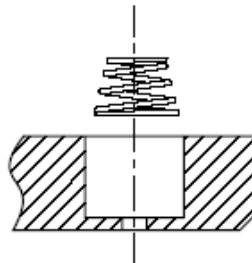


Figure 12

Figure 13, Figure 14 and Figure 15 show the assembly scheme for valves with spring cups and spring washers.

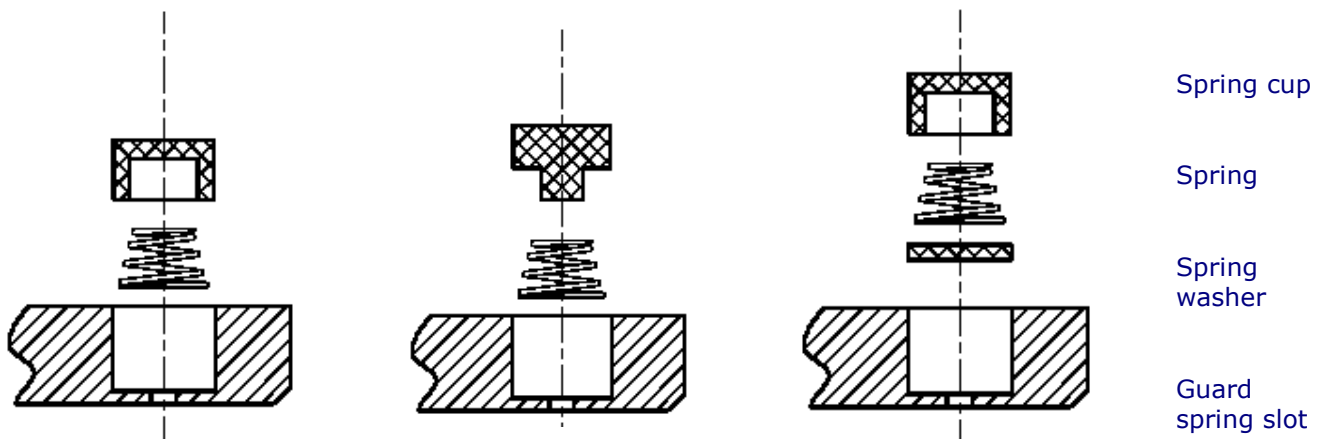


Figure 13

Figure 14

Figure 15

If the valve has not spring cups, the spring must internally be locked with a small metallic rounded point rod, whose diameter must be bigger than the springs internal diameter and smaller than the diameter of the slot where the spring will be inserted.

To lock the spring, it is necessary to push it into the slot with the rod, by gently rotating anticlockwise the rod and making sure that the spring is straight into its slot (see Figure 16).

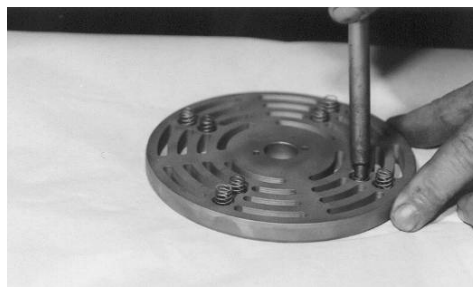


Figure 16

After cleaning again the seat and the plunger and checking the seat dimensions, assemble the valve, by assembling the various components in the correct order. If the valve has steel plates

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and damper plates, particular attention must be paid to their correct positioning, following the enclosed drawings.

Tighten the locking nut with a torque wrench according to the tightening values shown in Tab.1. unless otherwise specified in the reference valve drawing.

If a self-locking nut is used, the stud must be greased before tightening the nut. If a nut with Nord-Lock® washers is used, the stud has not to be greased.

Never use oil or grease on the valves used for oxygen compressors.

ENGLISH

Threads	Tightening values for any kind of self-locking nut in use (Errore. L'origine riferimento non è stata trovata.)	Tightening values for 8.8 class nut (Figure 6)	Tightening values for nut with Nord-Lock® washers (Errore. L'origine riferimento non è stata trovata.)
M 6	10 N m	10 N m	--
M 8	19 N m	25 N m	19 N m
M 10	25 N m	50 N m	40 N m
M 10 x 1	35 N m	35 N m	40 N m
M 12 x 1,5	45 N m	70 N m	90 N m
M 12	50 N m	85 N m	90 N m
M 14 x 1,5	80 N m	95 N m	120 N m
M 16	130 N m	205 N m	--
M 16 x 1,5	110 N m	150 N m	190 N m
M 20 x 1,5	215 N m	240 N m	300 N m
M 24 x 1,5	370 N m	--	425 N m
M 30 x 1,5	720 N m	--	715 N m

Tab. 1

Once the valve is assembled, check by a gauge that the A dimension indicated in Figure 17 and Figure 18 is the same on all the external circumference. Otherwise dismantle the valve and check that the pins have been correctly inserted into the slots, both into the seat and into the guard.

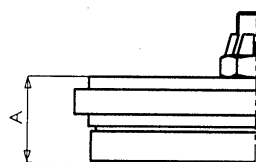


Figure 17

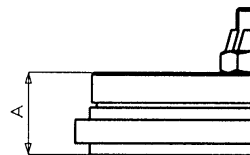


Figure 18

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Check the free movement of the plate or the rings, by pressing them towards the guard, through the seats gas passing areas, with an appropriate tool, not to damage the plate.

NOTE: for oxygen compressors the valve must be completely free from any trace of oil or grease. Check again the valve before installing it. Failure to do properly this procedure may cause explosions.

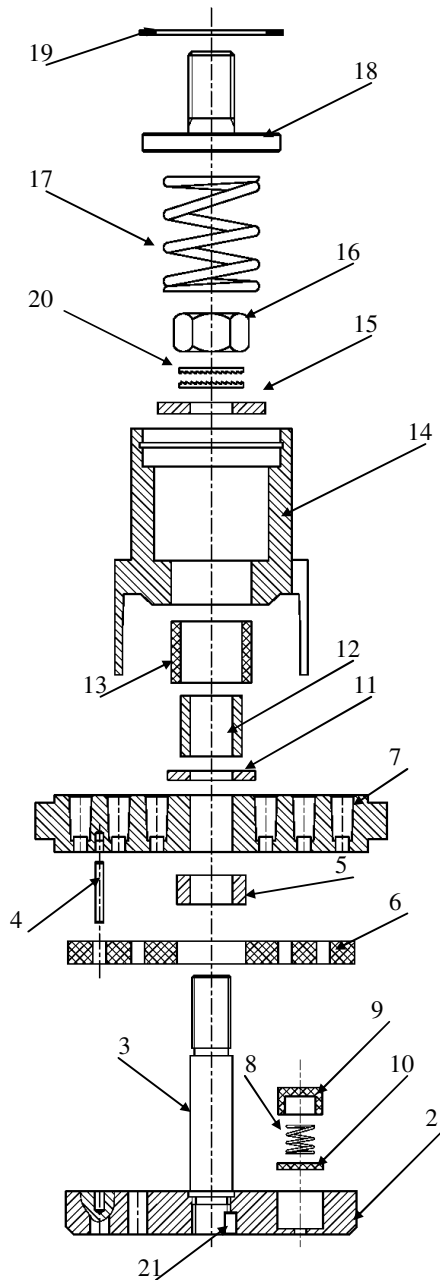
9. PROTECTION

Stored Valves , if they aren't in stainless steel, must be protected with anti-rust oil before being used, . Valves for oxygen or other dangerous gasses compressors must strictly never be oiled or greased. To such aim, we strongly advise to follow the compressor manufacturer safety and operating instructions.

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10. ASSEMBLING DRAWING FOR SUCTION VALVE WITH PEEK PLATE, SPRING CUPS AND UNLOADER

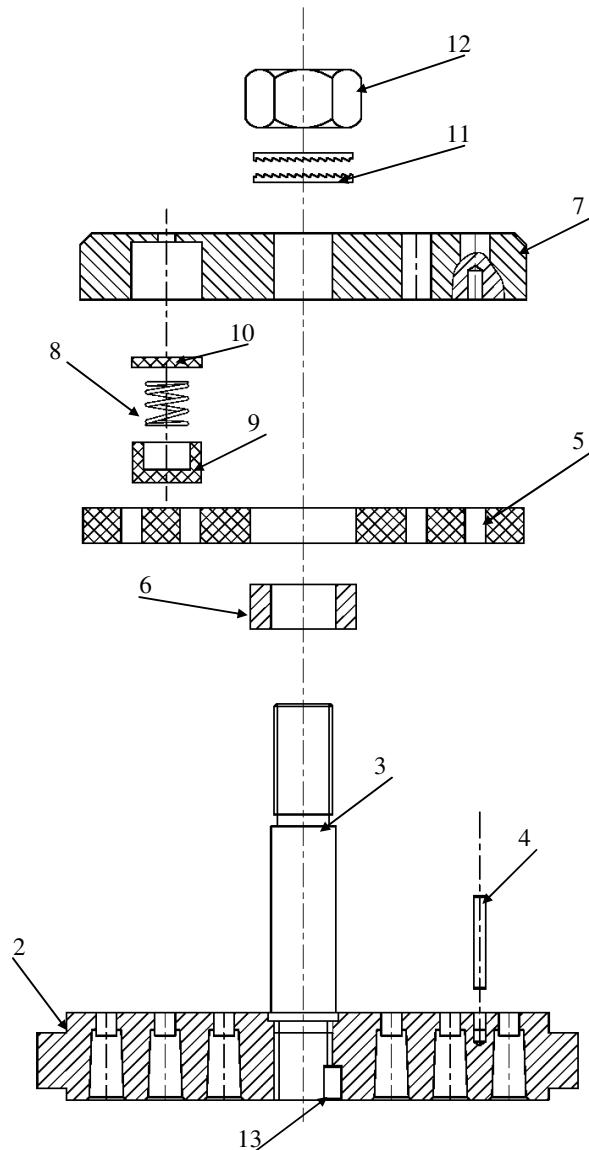


21	LOCATING PIN	7.4
20	NORD-LOCK® WASHER	7.1
19	INTERNAL CIRCLIP (SEEGER)	7.7
18	COVER	7.7
17	PLUNGER SPRING	7.7
16	NUT	7.1
15	WASHER	7.7
14	PLUNGER	7.2
13	PLASTIC BUSH	7.5
12	METALLIC BUSH	7.5
11	WASHER	7.7
10	SPRING WASHER	7.1, 8
9	SPRING CUP	7.1, 8
8	SPRING	7.1, 8
7	SEAT	7.2
6	PLATE	7.1
5	LIFT WASHER	7.7
4	PIN	7.6
3	STUD	7.4
2	GUARD	7.3
1	GUARD WITH STUD	
REF	DESCRIPTION	REFERENCE PARAGRAPH

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11. ASSEMBLING DRAWING FOR DISCHARGE VALVE WITH PEEK PLATE AND SPRING CUPS

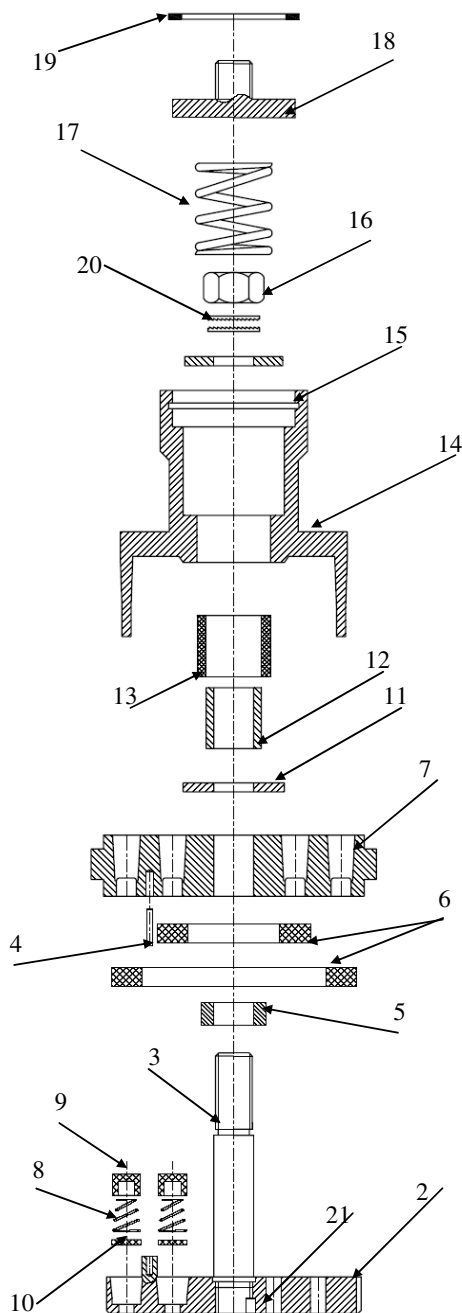


13	LOCATING PIN	7.4
12	NUT	7.1
11	NORD-LOCK® WASHER	7.1
10	SPRING WASHER	7.1, 8
9	SPRING CUP	7.1, 8
8	SPRING	7.1, 8
7	GUARD	7.3
6	LIFT WASHER	7.7
5	PLATE	7.1
4	PIN	7.6
3	STUD	7.4
2	SEAT	7.2
1	SEAT WITH STUD	
REF	DESCRIPTION	REFERENCE PARAGRAPH

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12. ASSEMBLING DRAWING FOR SUCTION VALVE WITH PEEK RINGS, SPRING CUPS AND UNLOADER



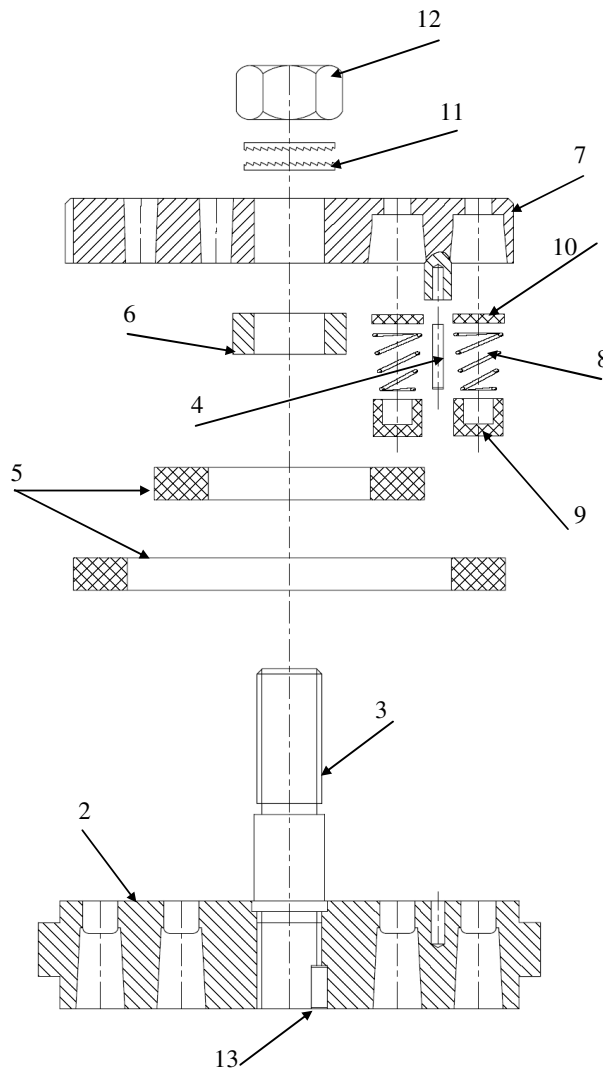
21	LOCATING PIN	7.4
20	NORD-LOCK® WASHER	7.1
19	INTERNAL CIRCLIP (SEEGER)	7.7
18	COVER	7.7
17	PLUNGER SPRING	7.7
16	NUT	7.1
15	WASHER	7.7
14	PLUNGER	7.2
13	PLASTIC BUSH	7.5
12	METALLIC BUSH	7.5
11	WASHER	7.7
10	SPRING WASHER	7.1, 8
9	SPRING CUP	7.1, 8
8	SPRING	7.1, 8
7	SEAT	7.2
6	RING	7.1
5	LIFT WASHER	7.7
4	PIN	7.6
3	STUD	7.4
2	GUARD	7.3
1	GUARD WITH STUD	
REF	DESCRIPTION	REFERENCE PARAGRAPH

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13. ASSEMBLING DRAWING FOR DISCHARGE VALVE WITH PEEK RINGS AND SPRING CUPS

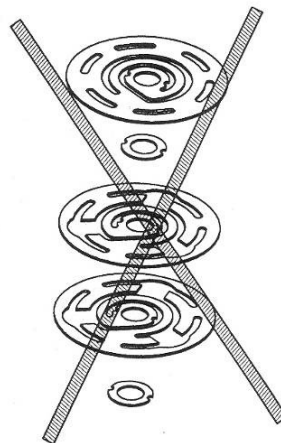
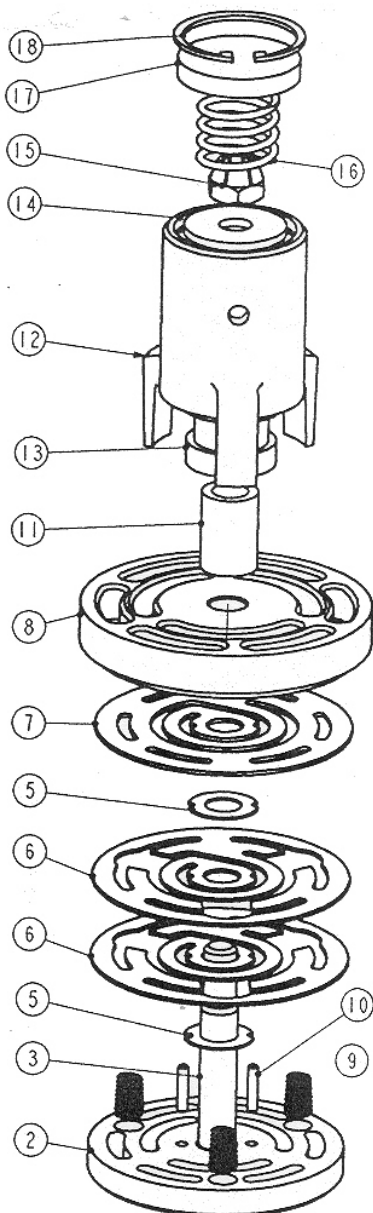


13	LOCATING PIN	7.4
12	NUT	7.1
11	NORD-LOCK® WASHER	7.1
10	SPRING WASHER	7.1, 8
9	SPRING CUP	7.1, 8
8	SPRING	7.1, 8
7	GUARD	7.3
6	LIFT WASHER	7.7
5	RING	7.1
4	PIN	7.6
3	STUD	7.4
2	SEAT	7.2
1	SEAT CON STUD	
REF	DESCRIPTION	REFERENCE PARAGRAPH

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14. ASSEMBLING DRAWING FOR SUCTION VALVE WITH STEEL PLATE AND UNLOADER



18	INTERNAL CIRCLIP (SEEGER)	7.7
17	COVER	7.7
16	PLUNGER SPRING	7.7
15	NUT	7.1
14	WASHER	7.7
13	PLASTIC BUSH	7.5
12	PLUNGER	7.2
11	METALLIC BUSH	7.5
10	PIN	7.6
9	SPRING	7.1, 8
8	SEAT	7.2
7	PLATE	7.1
6	DUMPER PLATE	7.1
5	LIFT WASHER	7.7
4	PIN	7.6
3	STUD	7.4
2	GUARD	7.3
1	GUARD WITH STUD	
REF	DESCRIPTION	REFERENCE PARAGRAPH

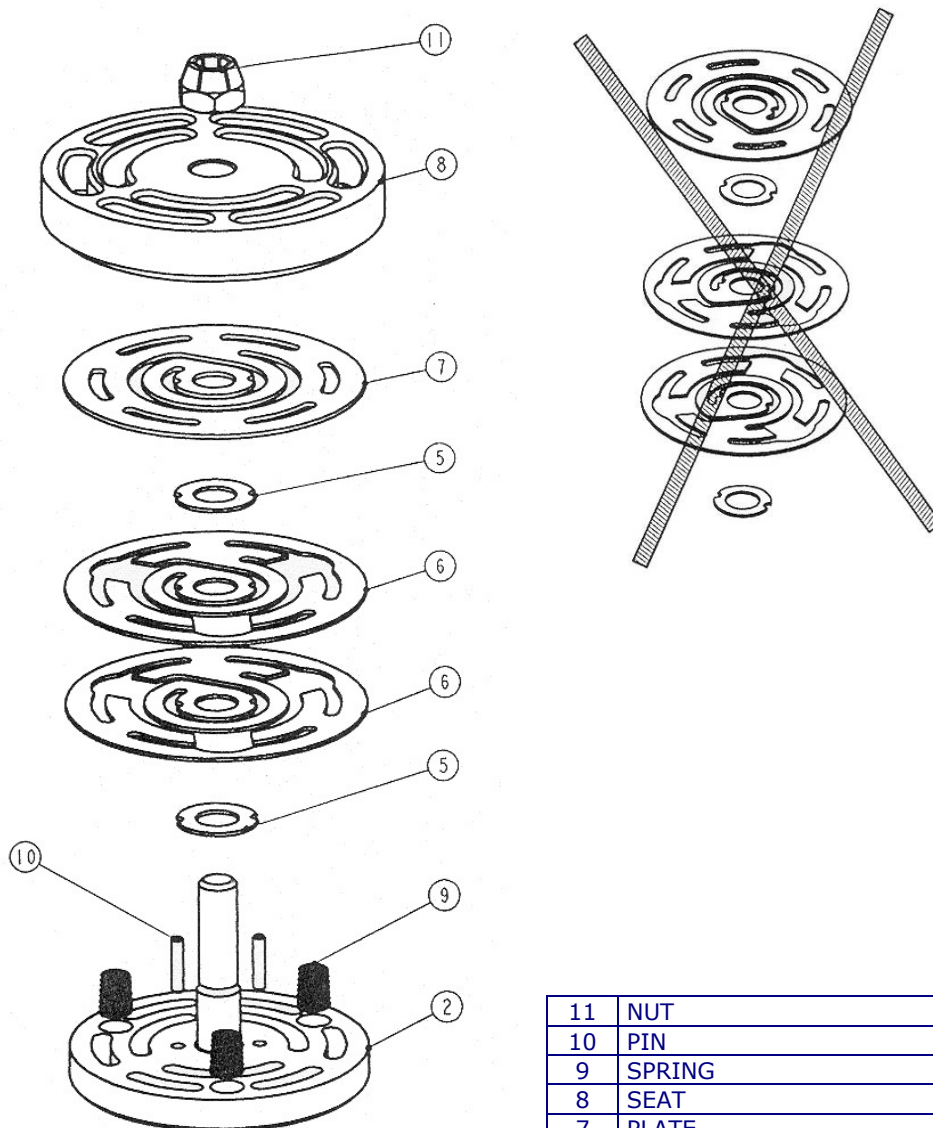
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15. ASSEMBLING DRAWING FOR SUCTION VALVE WITH STEEL PLATE

ENGLISH

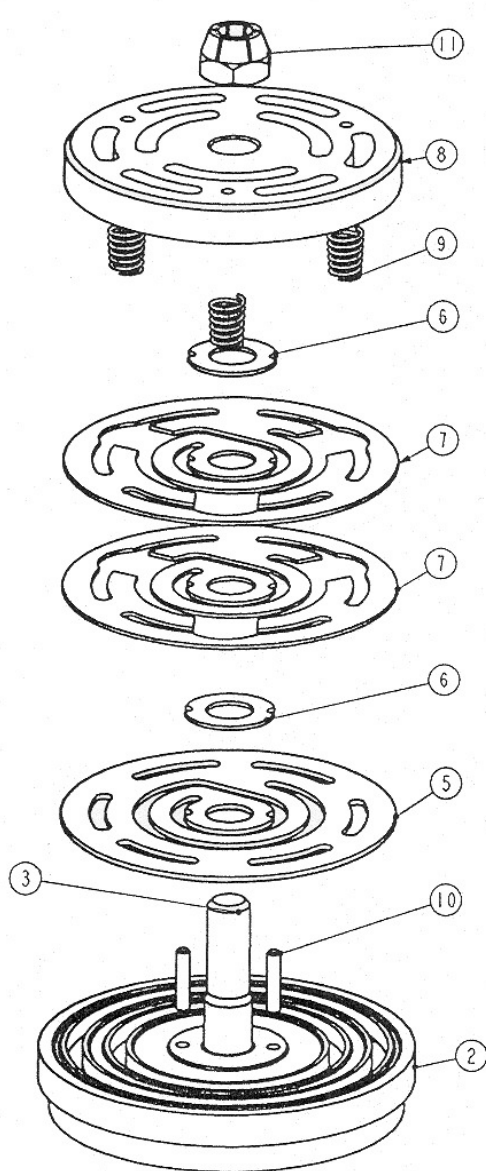


11	NUT	7.1
10	PIN	7.6
9	SPRING	7.1, 8
8	SEAT	7.2
7	PLATE	7.1
6	DAMPER PLATE	7.1
5	LIFT WASHER	7.7
4	PIN	7.6
3	STUD	7.4
2	GUARD	7.3
1	GUARD WITH STUD	
REF	DESCRIPTION	REFERENCE PARAGRAPH

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16. ASSEMBLING DRAWING FOR DISCHARGE VALVE WITH STEEL PLATE



11	NUT	7.1
10	PIN	7.6
9	SPRING	7.1, 8
8	GUARD	7.3
7	DAMPER PLATE	7.1
6	LIFT WASHER	7.7
5	PLATE	7.1
4	PIN	7.6
3	STUD	7.4
2	SEAT	7.2
1	SEAT WITH STUD	
REF	DESCRIPTION	REFERENCE PARAGRAPH

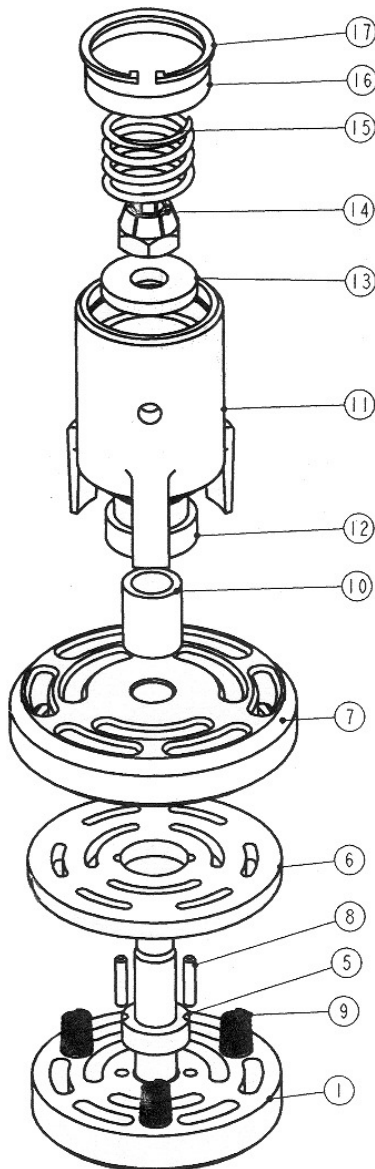
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17. ASSEMBLING DRAWING FOR SUCTION VALVE WITH PEEK PLATE AND UNLOADER

ENGLISH

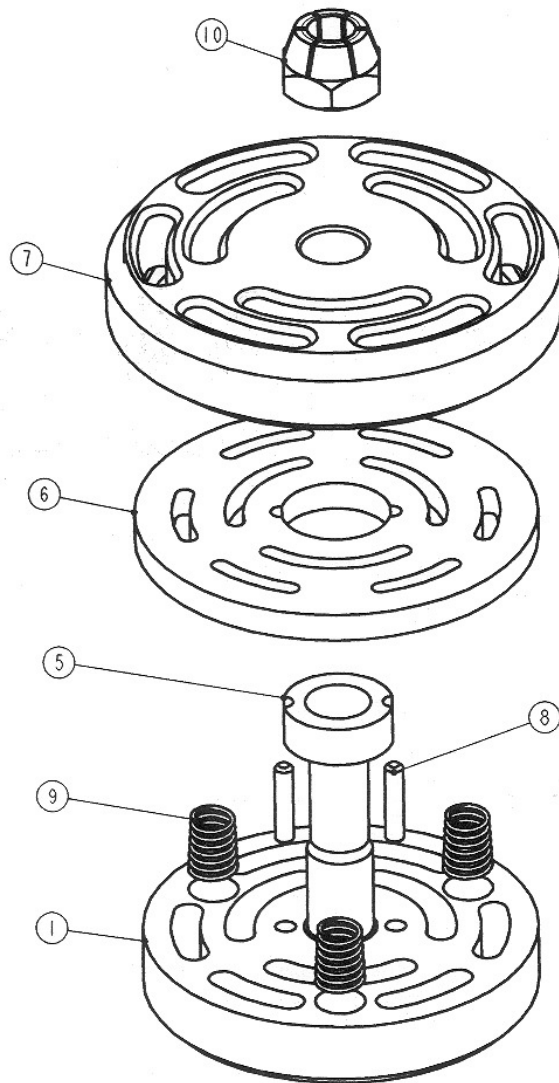


17	INTERNAL CIRCLIP (SEEGER)	7.7
16	COVER	7.7
15	PLUNGER SPRING	7.7
14	NUT	7.1
13	WASHER	7.7
12	PLASTIC BUSH	7.5
11	PLUNGER	7.2
10	METALLIC BUSH	7.5
9	SPRING	7.1, 8
8	PIN	7.6
7	SEAT	7.2
6	PLATE	7.1
5	LIFT WASHER	7.7
4	PIN	7.6
3	STUD	7.4
2	GUARD	7.3
1	GUARD WITH STUD	
REF	DESCRIPTION	REFERENCE PARAGRAPH

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18. ASSEMBLING DRAWING FOR SUCTION VALVE WITH PEEK PLATE



10	NUT	7.1
9	SPRING	7.1, 8
8	PIN	7.6
7	SEAT	7.2
6	PLATE	7.1
5	LIFT WASHER	7.7
4	PIN	7.6
3	STUD	7.4
2	GUARD	7.3
1	GUARD WITH STUD	
REF	DESCRIPTION	REFERENCE PARAGRAPH

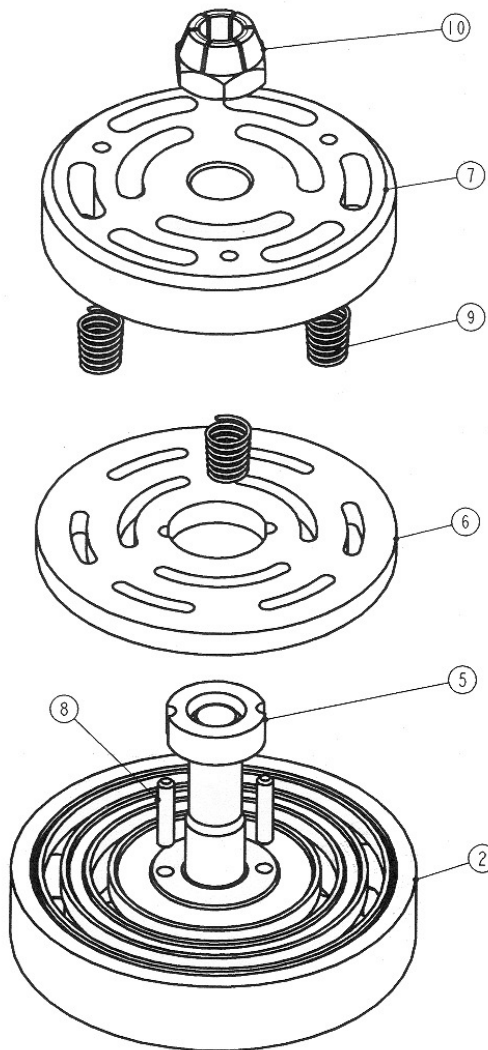
ENGLISH

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19. ASSEMBLING DRAWING FOR DISCHARGE VALVE WITH PEEK PLATE

ENGLISH



10	NUT	7.1
9	SPRING	7.1, 8
8	PIN	7.6
7	GUARD	7.3
6	PLATE	7.1
5	LIFT WASHER	7.7
4	PIN	7.6
3	STUD	7.4
2	SEAT	7.2
1	SEAT WITH STUD	
REF	DESCRIPTION	REFERENCE PARAGRAPH

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VÁLVULAS PARA COMPRESORES
Sistema de calidad certificado ISO 9001 desde 1996

Castellano

INSTRUCCIONES PARA EL MANTENIMIENTO DE VÁLVULAS

NOTA: La traducción se realiza con respecto y con la mejor interpretación de términos. Si un conflicto se presenta en la interpretación, la versión italiana es la referencia.

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1. FINALIDAD

Este documento está destinado a los técnicos de mantenimiento y constituye una guía para la revisión de válvulas de aspiración y descarga para compresores alternativos.

2. FRECUENCIA DE INTERVENCIÓN

La frecuencia de mantenimiento de las válvulas depende de las condiciones de uso, por lo cual se recomienda atenerse a las indicaciones del fabricante del compresor.

3. MÁQUINAS Y HERRAMIENTAS ACONSEJADAS PARA LA REVISIÓN DE LAS VÁLVULAS

Banco de trabajo equipado con un tornillo de banco o un mandril, preferiblemente autocentrante, para desmontar y montar las válvulas

Llaves dinámométricas y juego de bocas para apretar las tuercas autobloqueantes

Máquina para lavar metales

Torno paralelo

Plato de esmerilar de fundición esferoidal

4. EXTRACCIÓN DE LA VÁLVULA DEL COMPRESOR

Durante la extracción de las válvulas del compresor o de las tuberías, respete estrictamente las indicaciones operativas y de seguridad del fabricante del compresor.

5. DESMONTAJE DE LA VÁLVULA

Si no dispone de un mandril, sujete la válvula en un tornillo de banco con ayuda de dos pernos (Figura 1). Sujete un extremo de los pernos con el tornillo de banco e inserte el otro extremo en las ranuras de la tapa de la válvula de aspiración o del asiento de la válvula de escape, a fin de evitar que la válvula gire cuando se desenrosque la tuerca. No bloquee nunca la válvula directamente en el tornillo de banco (Figura 3 y Figura 4).

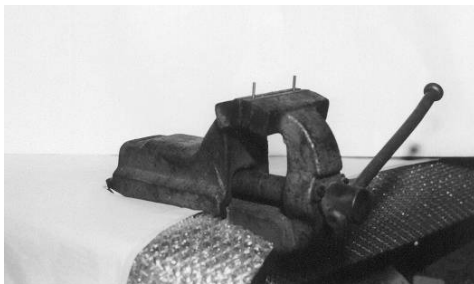


Figura 1



Figura 2

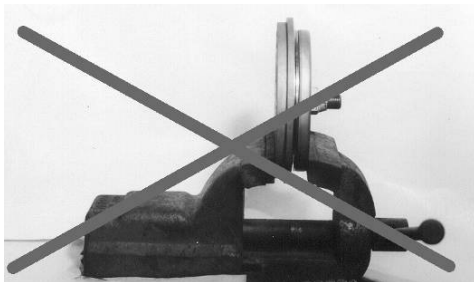


Figura 3

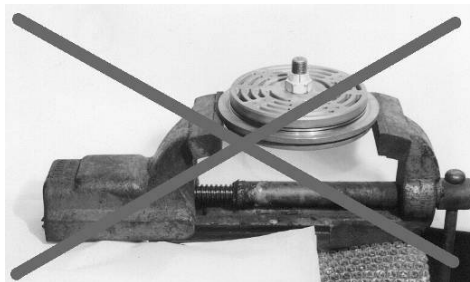


Figura 4

Desenrosque la tuerca de bloqueo de la válvula, aplicando si es necesario un producto específico para aflojar roscas. No golpee la llave con ningún objeto. Para evitar que los pasadores de la válvula se doblen mientras se desenrosca o se enrosca la tuerca, sujete con la mano el asiento de la válvula de aspiración o la tapa de la válvula de escape para evitar que giren (Figura 2).

6. LIMPIEZA DE LOS COMPONENTES

Extraiga los resortes helicoidales de la tapa y los pernos del asiento y de la tapa.

Limpié cuidadosamente todos los componentes internos de la válvula (a excepción de los resortes helicoidales, de las placas, de los anillos, de los capuchones del resorte y de las arandelas de resorte) con un detergente apropiado.

Lave los componentes en agua caliente con un desengrasante.

Si una limpieza más profunda es necesaria, no utilizar cepillos metálicos o herramientas duras o con los bordes agudos para limpiar las superficies de lacre del asiento.

7. REPARACIÓN O SUSTITUCIÓN DE LOS COMPONENTES DESGASTADOS

Controle el desgaste de todos los componentes de la válvula y sustituya los que no puedan repararse. Utilice exclusivamente repuestos originales Cozzani, en particular:

7.1 Resortes, obturadores y tuerca de bloqueo, capuchones y arandelas de resorte

Los resortes helicoidales, las placas y amortiguadores o los anillos, los capuchones del resorte y las arandelas de resorte de la válvula se deben sustituir en cada mantenimiento previsto de la válvula.

En cada revisión la tuerca de bloqueo debe ser reemplazada, ya sea tuerca de tipo autoblocante (como en la figura 5) o tuerca de tipo no autoblocante (como en la figura 6). En el caso que se haya utilizado una tuerca de bloqueo con arandelas Nord-Lock® (Figura 7) se deben sustituir la tuerca y las arandelas.

Si la válvula es para el uso del oxígeno, quite el pegamento entre las arandelas Nord-Lock®.

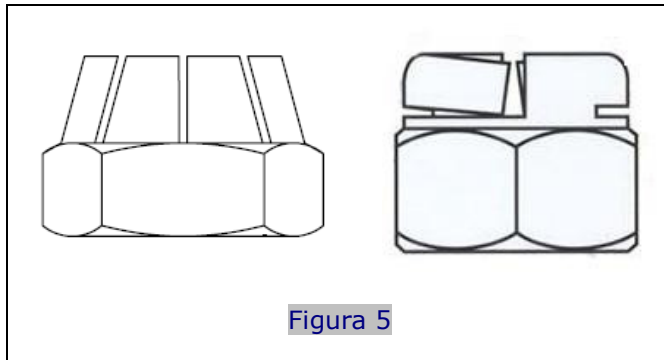


Figura 5

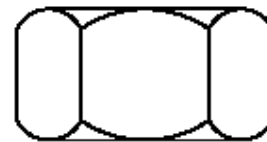


Figura 6

Las arandelas de Nord-Lock® se deben montar en pareja por la cara con los dientes mayores. Las caras con los dientes radiales deben estar en contacto con la tuerca y con el asiento o el protector, según lo demostrado en la Figura 8

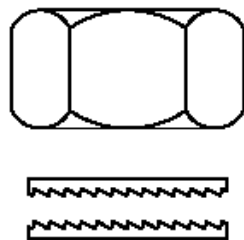


Figura 7

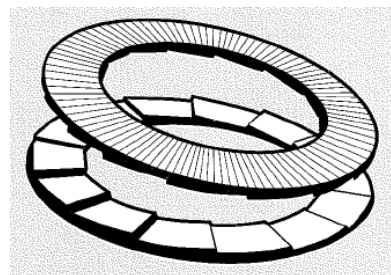


Figura 8

Si alguna anomalía de funcionamiento provoca un desgaste prematuro de las placas o de los amortiguadores, o incisiones profundas en la superficie de los mismos, sustitúyalos antes de lo programado.

7.2 Asiento

Para restablecer la perfecta planitud de los asientos, esmerile a mano el asiento con un plato de fundición esferoidal y pasta lubricada con carburo de silicio. A continuación, lave el componente en agua caliente con un desengrasante.

Si los asientos están muy dañados y el esmerilado no basta para repararlos, es preciso mecanizarlos con un torno o rectificarlos.

Antes de comenzar la operación, quite los pasadores de referencia insertados en el asiento. Efectúe el refrentado con muy poca eliminación de material en cada pasada y con características del corte tales que garanticen un buen acabado superficial. Cuando los asientos estén planos y lisos, elimine los cantos vivos dejados por el mecanizado pasándolos por el torno o lijándolos con tela abrasiva de grano fino.

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Si con estas operaciones se ha eliminado más de 0,3 mm de material, es preciso reparar el fondo de los asientos mediante un torneado con herramienta de forma.

El grueso mínimo entre la superficie de asiento y la punta de la muela debe ser 2 milímetros según lo demostrado en la Figura 9.

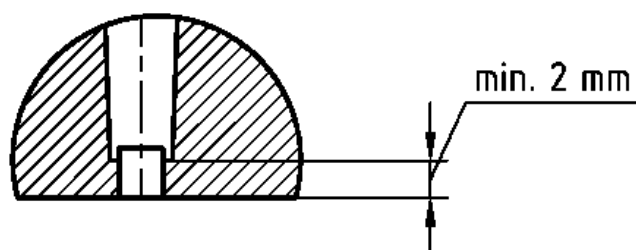
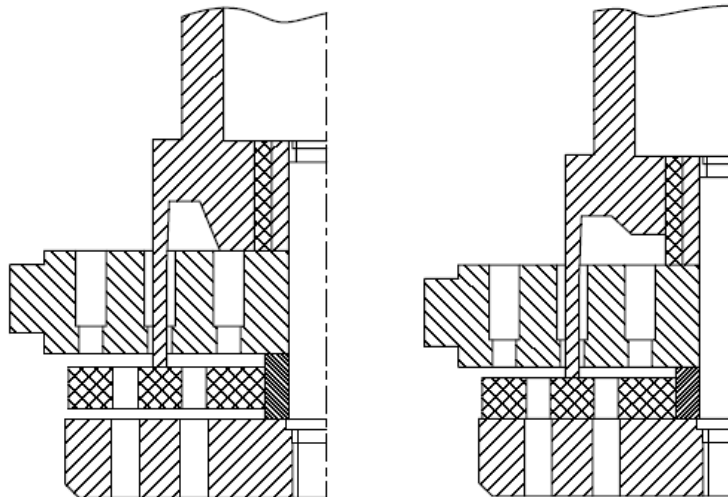


Figura 9

Después de esta operación, esmerile el asiento a mano con el plato de fundición como se indicó anteriormente.

Después de montar otra vez las posibles pasadores, cerciórese de que la parte de ellas que sobresale del asiento tenga la misma longitud que antes de efectuar la reparación; de lo contrario, acorte los pasadores.

En las válvulas de aspiración con descargador, éste puede estar en contacto con la superficie de asiento sin haber contacto entre la tapa y el placa (Caso 1) o el placa puede pararse por la tapa (Caso 2).



Caso 1

Caso 2

Caso 1:

Si, debido a la revisión, el asiento baja más de 0.2 milímetros, las patas del descargador se deben acortar exactamente de la misma cantidad que el grueso de lo asiento. En este caso es necesario verificar que, una vez que la válvula se haya vuelto a montar con el descargador bajado, su tapón no toca el perno prisionero, si no el perno prisionero se debe acortar exactamente la misma cantidad que el grueso del asiento.

Caso 2:

El descargador no debe ser cambiado.

Compruebe una consumición anómala posible del descargador en la zona del golpe del obturador. En este caso substituya el descargador.

7.3 Tapa

Compruebe la presencia de excesivo desgaste en los alojamientos de los resortes y en las guías del obturador. En este caso cambie a la tapa.

7.4 Perno prisionero

Compruebe visualmente la integridad del perno prisionero (Figura 10) en el roscar y en la parte dada vuelta y el bloque perfecto en el componente respectivo. Compruebe que el desgaste eventual del componente liso del perno prisionero no cree un boquete excesivo entre el asiento y el protector.

Si se ha dañado la rosca del perno prisionero, cámbielo del siguiente modo:

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- 1) Elimine completamente el pasador de retención (Figura 11), perforando con una broca de diámetro ligeramente superior al de el pasador.
- 2) Sujete el perno prisionero en un tornillo de banco y gire el asiento para desenroscar el perno prisionero.
- 3) Enrosque el nuevo perno prisionero a tope y apriételo con un par adecuado.
- 4) Elimine con el torno la parte inferior excedente del perno prisionero y torneé la parte lisa del mismo respetando la medida con tolerancia f9.
- 5) Taladre el nuevo orificio para el pasador de retención con una broca de diámetro igual al de el pasador, a una distancia radial de 90° como mínimo respecto al orificio original. El orificio debe tener una profundidad al menos 1 mm mayor que la longitud de el pasador y ha de realizarse de modo que una mitad del diámetro de el pasador se inserte en el perno prisionero y la otra mitad en el asiento o en la tapa.
- 6) Introduzca toda el pasador en el orificio y recalque la cabeza con un punzón adecuado.



Figura 10



Figura 11

7.5 Sustitución del casquillo del descargador (sólo para válvulas de aspiración)

Casquillo de peek

El casquillo de peek del descargador se debe cambiar en cada revisión.

Casquillo de acero

El casquillo de acero, si no se daña, puede no esser substituido durante los revisión.

Casquillo de teflón y acero

En el caso de casquillos de teflón, pueden presentarse dos anomalías:

- 1) El casquillo se sale del descargador.
- 2) El diámetro interior del casquillo está desgastado y la holgura respecto al casquillo de acero es superior a 0,3 mm.

En este caso conviene cambiar todo el descargador o, como alternativa, sustituir el casquillo de teflón del siguiente modo:

- 1) Quite manualmente el casquillo antiguo.
- 2) Inserte con una herramienta resistente el nuevo casquillo dentro del descargador.

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- 3) Ajuste el diámetro interior del casquillo de teflón, que debe ser igual al diámetro exterior del casquillo de acero más la holgura prefijada de $0,15 \div 0,20$ mm. Para realizar esta operación, sujete la parte cilíndrica del descargador en un mandril autocentrante (del lado del anillo elastico de seguridad) y torne el casquillo de teflón, eliminando 0,2 mm de cada lado a fin de que tenga espacio para la dilatación axial.

7.6 Pasadores

Es preciso sustituir los pasadores de referencia de la válvula a cada revisión.

Para extraigar los pasadores, sujetela horizontalmente en un tornillo de banco y golpee con un martillo de goma el asiento en el caso de una válvula de aspiración o el perno prisionero si la válvula es de escape. Para montar el nuevo pasador, golpéela con un martillo de acero hasta que llegue al fondo del agujero.

7.7 Componentes reutilizables

Después de la limpieza controle las buenas condiciones de los componentes reutilizables (tapón, anillo elastico de seguridad, resorte del descargador, arandela de elevación, arandelas, pasadores).

8. ENSAMBLAJE DE LA VÁLVULA

Limpie la tapa antes de insertar los resortes en sus ranuras. Los resortes cónicos se deben insertar con el diámetro más grande en la ranura de los resortes (Figura 12).

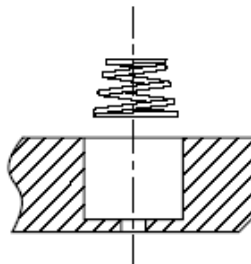


Figura 12

Figura 13, Figura 14 y Figura 15 explican el esquema de la asamblea para las válvulas con el resorte ahueca y las arandelas de resorte.



Castellano

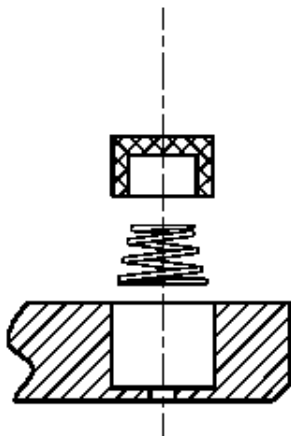


Figura 13

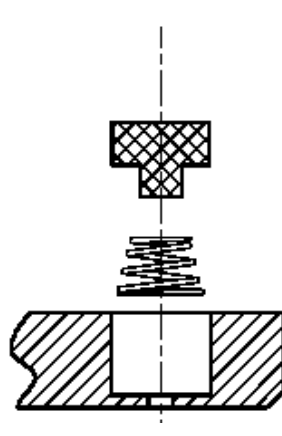


Figura 14

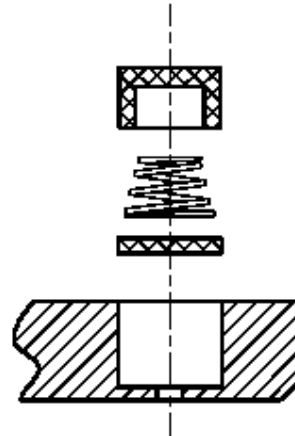


Figura 15

Capuchon
del resorte

Resorte

Arandela
de resorte

Alojamiento
del resorte
en la tapa

Si la válvula no tiene capuchones del resorte, el resorte se debe internamente trabar con una barra redondeada metálica pequeña del punto, cuyo diámetro debe ser más grande que el diámetro interno de los resortes y más pequeño que el diámetro de la ranura donde el resorte será insertado. Para bloquear el resorte es suficiente empujarlo dentro de su ranura con ayuda de la varilla, girando ésta ligeramente en el sentido contrario al de las agujas del reloj. Controle que el resorte quede bien asentado y nivelado en la ranura (Figura 16).

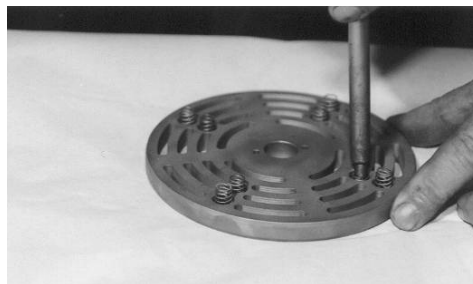


Figura 16

Después de haber limpiado otra vez el asiento y el descargador y de haber comprobado las dimensiones del asiento, monte la válvula, montando los varios componentes en el orden correcto.

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Si la válvula tiene placas y amortiguadores de acero, atención particular se debe prestar a su colocación correcta, siguiendo los dibujos incluidos.

Apriete la tuerca de bloqueo con una llave dinamométrica respetando los pares indicados en la Tabla 1. **a menos que en el dibujo de la válvula de referencia sea especificado contrariamente.**

Si se utiliza una tuerca de bloqueo, el perno prisionero debe ser engrasado antes de ajustar la tuerca. Si una tuerca con las arandelas de Nord-Lock® se utiliza, el perno prisionero no tiene que ser engrasado. Nunca utilice el aceite o la grasa en válvulas usadas para los compresores del oxígeno.

Rosca	Par de ajuste para cualquier tipo de tuerca autoblocante en uso. (Figura 5)	Par de ajuste para tuerca de clase 8.8 (Figura 6)	Par de ajuste para tuerca con arandelas Nord-Lock® (Figura 7)
M 6	10 N m	10 N m	--
M 8	19 N m	25 N m	19 N m
M 10	25 N m	50 N m	40 N m
M 10 x 1	35 N m	35 N m	40 N m
M 12 x 1,5	45 N m	70 N m	90 N m
M 12	50 N m	85 N m	90 N m
M 14 x 1,5	80 N m	95 N m	120 N m
M 16	130 N m	205 N m	--
M 16 x 1,5	110 N m	150 N m	190 N m
M 20 x 1,5	215 N m	240 N m	300 N m
M 24 x 1,5	370 N m	--	425 N m
M 30 x 1,5	720 N m	--	715 N m

Tabla 1

Una vez concluido el ensamblaje, controle con un calibre que la cota A indicada en Figura 17 y Figura 18 sea uniforme en toda la circunferencia exterior de la válvula. Si no es así, desmonte la válvula y controle que los pasadores estén bien introducidos en los orificios del asiento y de la tapa.

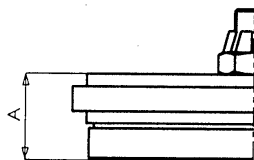


Figura 17

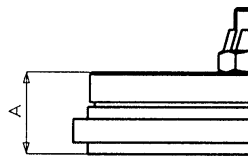


Figura 18



Compruebe que la placa o los anillos se muevan libremente, presionándolos hacia la tapa con una herramienta introducida en las aberturas de paso del gas del asiento, con cuidado de no dañar la placa.

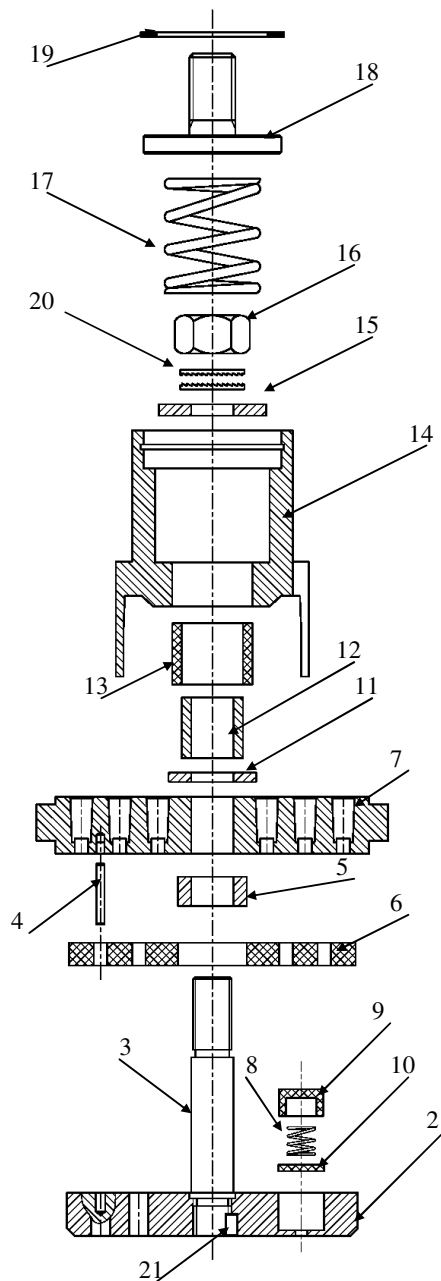
NOTA: para los compresores de oxígeno la válvula debe estar totalmente libre de cualquier rastro del aceite o de la grasa. Compruebe otra vez la válvula antes de instalarla. La falta de hacer correctamente este procedimiento puede causar explosiones.

9. PROTECCIÓN

Las válvulas de acero oxidable, antes de almacenarlas, deben protegerse con aceite antioxidante. Las válvulas para compresores de oxígeno o de otros gases peligrosos no deben aceitarse ni engrasarse en ningún caso. Respete las instrucciones operativas y de seguridad del fabricante del compresor.



10. ESQUEMA DE MONTAJE PARA VÁLVULAS DE ASPIRACIÓN CON PLACA DE PEEK, CAPUCHONES DEL RESORTE Y DESCARGADOR

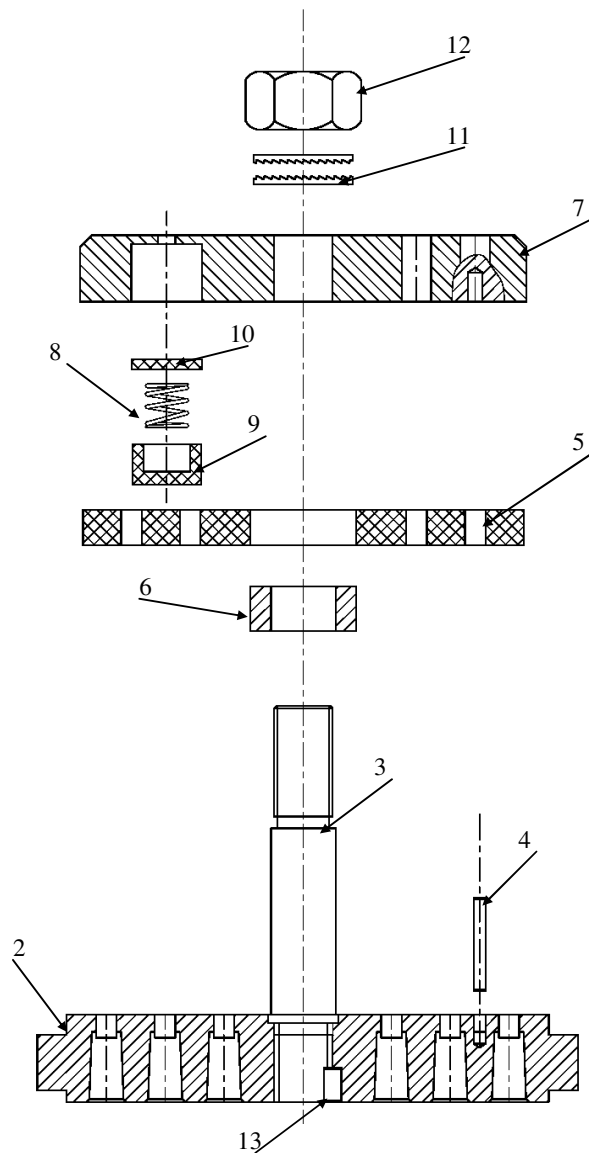


21	PASADOR DE RETENCIÓN	7.4
20	ARANDELAS NORD-LOCK®	7.1
19	ANILLO ELASTICO DE SEGURIDAD	7.7
18	TAPÓN DESCARGADOR	7.7
17	RESORTE DESCARGADOR	7.7
16	TUERCA	7.1
15	ARANDELA	7.7
14	DESCARGADOR	7.2
13	CASQUILLO DE PEEK	7.5
12	CASQUILLO DE METAL	7.5
11	ARANDELA	7.7
10	ARANDELA DE RESORTE	7.1, 8
9	CAPUCHON DE RESORTE	7.1, 8
8	RESORTE	7.1, 8
7	ASIENTO	7.2
6	PLACA	7.1
5	ARENDELA DISTANCIADORA	7.7
4	PASADOR	7.6
3	PERNO PRISIONERO	7.4
2	TAPA	7.3
1	TAPA CON PERNO PRISIONERO	
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11. ESQUEMA DE MONTAJE PARA VÁLVULAS DE ESCAPE CON PLACA DE PEEK Y CAPUCHONES DEL RESORTE

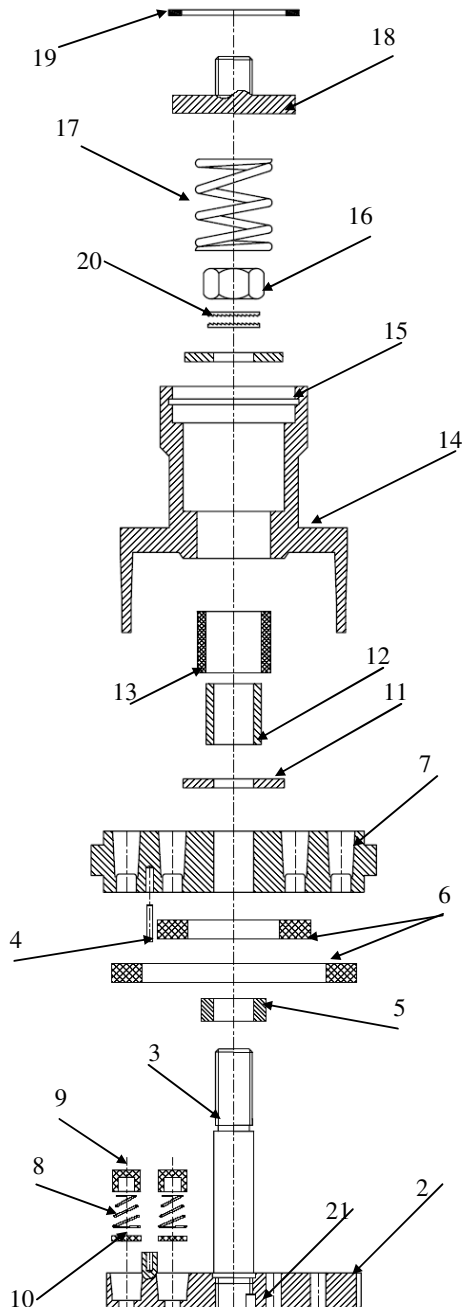


13	PASADOR DE RETENCIÓN	7.4
12	TUERCA	7.1
11	ARANDELAS NORD-LOCK®	7.1
10	ARANDELA DE RESORTE	7.1, 8
9	CAPUCHON DE RESORTE	7.1, 8
8	RESORTE	7.1, 8
7	TAPA	7.3
6	ARENDELA DISTANCIADORA	7.7
5	PLACA	7.1
4	PASADOR	7.6
3	PERNO PRISIONERO	7.4
2	ASIENTO	7.2
1	ASIENTO CON PERNO PRISIONERO	
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12. ESQUEMA DE MONTAJE PARA VÁLVULAS DE ASPIRACIÓN CON ANILLOS DE PEEK, CAPUCHONES DEL RESORTE Y DESCARGADOR



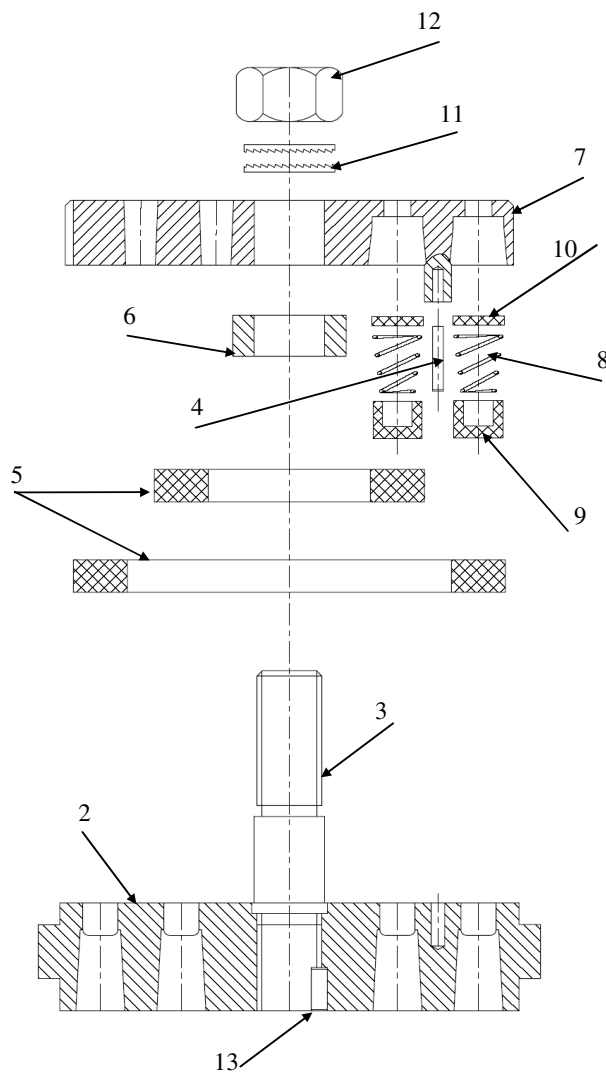
21	PASADOR DE RETENCIÓN	7.4
20	ARANDELAS NORD-LOCK®	7.1
19	ANILLO ELASTICO DE SEGURIDAD	7.7
18	TAPÓN DESCARGADOR	7.7
17	RESORTE DESCARGADOR	7.7
16	TUERCA	7.1
15	ARANDELAS	7.7
14	DESCARGADOR	7.2
13	CASQUILLO DE PEEK	7.5
12	CASQUILLO DE METAL	7.5
11	ARANDELA	7.7
10	ARANDELA DE RESORTE	7.1, 8
9	CAPUCHON DE RESORTE	7.1, 8
8	RESORTE	7.1, 8
7	ASIENTO	7.2
6	ANILLO	7.1
5	ARENDELA DISTANCIADORA	7.7
4	PASADOR	7.6
3	PERNO PRISIONERO	7.4
2	TAPA	7.3
1	TAPA CON PERNO PRISIONERO	
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13. ESQUEMA DE MONTAJE PARA VÁLVULAS DE ESCAPE CON ANILLOS DE ACERO Y CAPUCHONES DEL RESORTE

Castellano

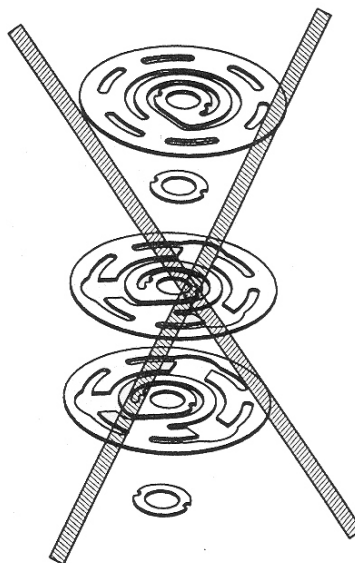
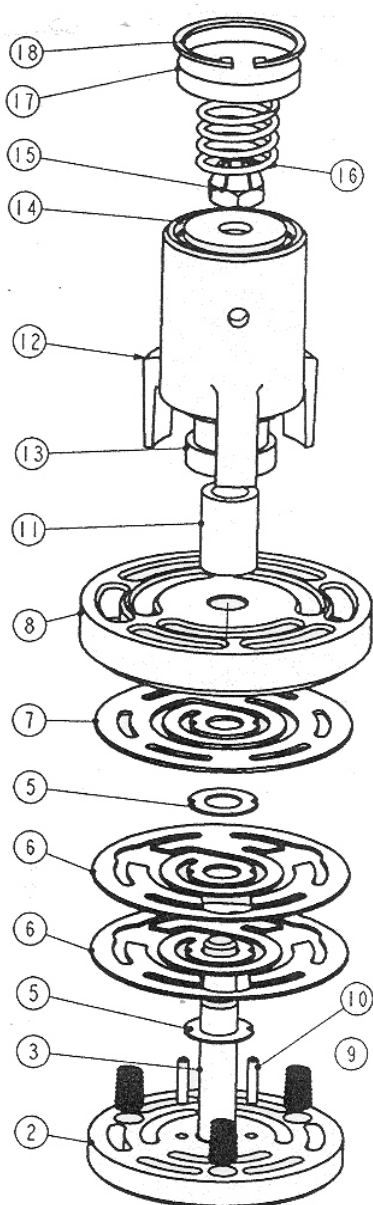


13	PASADOR DE RETENCIÓN	7.4
12	TUERCA	7.1
11	ARANDELAS NORD-LOCK®	7.1
10	ARANDELA DE RESORTE	7.1, 8
9	CAPUCHON DE RESORTE	7.1, 8
8	RESORTE	7.1, 8
7	TAPA	7.3
6	ARENDELA DISTANCIADORA	7.7
5	ANILLO	7.1
4	PASADOR	7.6
3	PERNO PRISIONERO	7.4
2	ASIENTO	7.2
1	ASIENTO CON PERNO PRISIONERO	
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14. ESQUEMA DE MONTAJE PARA VÁLVULAS DE ASPIRACIÓN CON PLACA DE ACERO Y DESCARGADOR



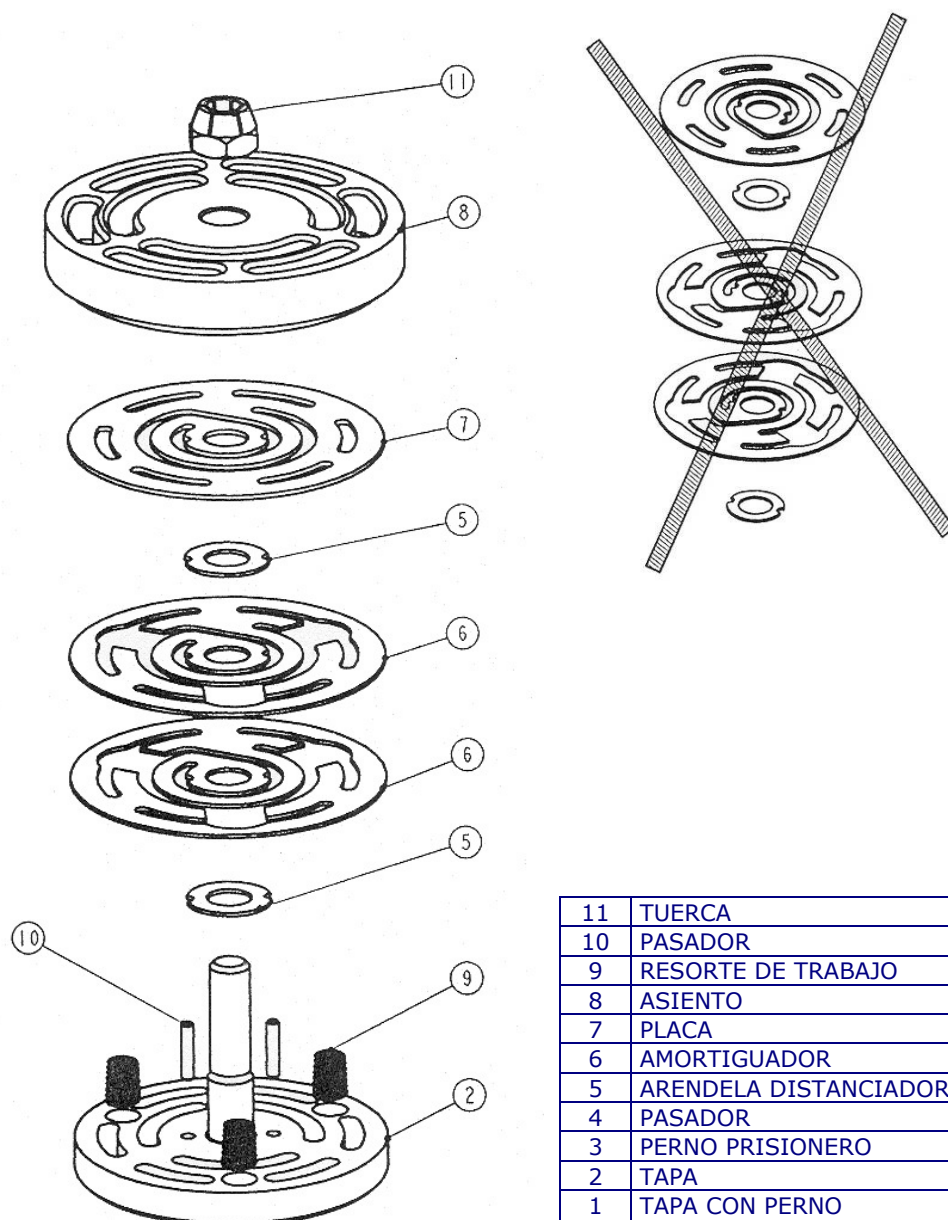
18	ANILLO ELASTICO DE SEGURIDAD	7.7
17	TAPÓN DESCARGADOR	7.7
16	RESORTE DESCARGADOR	7.7
15	TUERCA	7.1
14	ARANDELA	7.7
13	CASQUILLO DE PLÁSTICO	7.5
12	DESCARGADOR	7.2
11	CASQUILLO DE METAL	7.5
10	PASADOR	7.6
9	RESORTE DE TRABAJO	7.1, 8
8	ASIENTO	7.2
7	PLACA	7.1
6	AMORTIGUADOR	7.1
5	ARENDELA DISTANCIADORA	7.7
4	PASADOR	7.6
3	PERNO PRISIONERO	7.4
2	TAPA	7.3
1	TAPA CON PERNO PRISIONERO	
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15. ESQUEMA DE MONTAJE PARA VÁLVULAS DE ASPIRACIÓN CON PLACA DE ACERO

Castellano

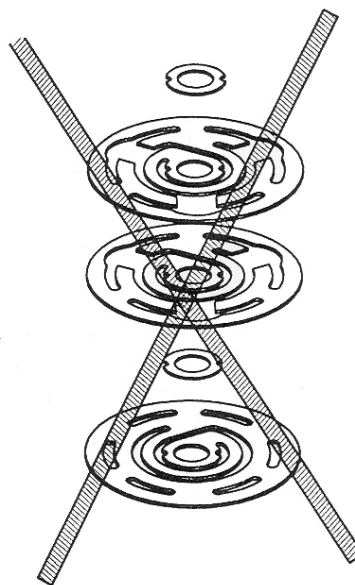
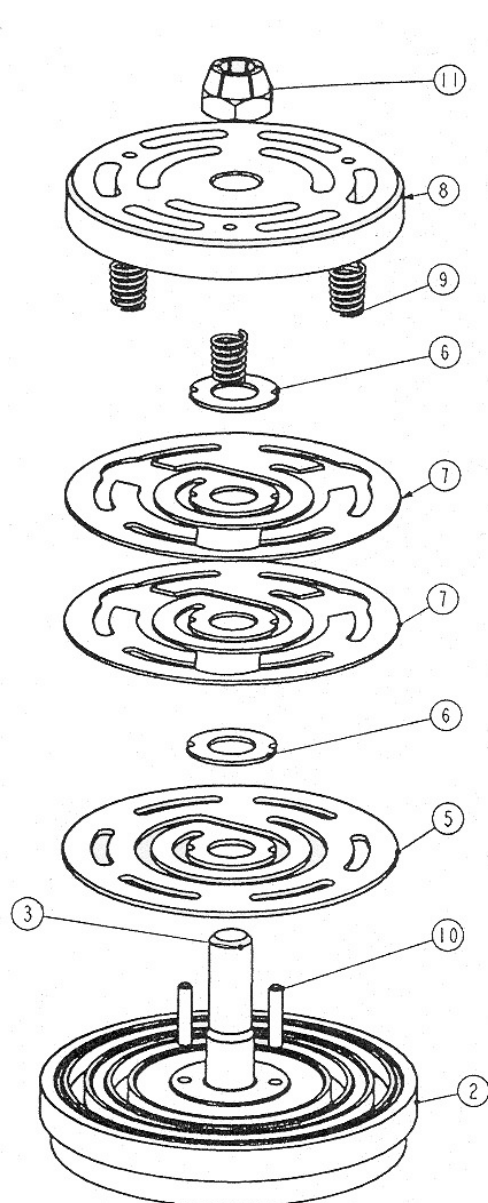


11	TUERCA	7.1
10	PASADOR	7.6
9	RESORTE DE TRABAJO	7.1, 8
8	ASIENTO	7.2
7	PLACA	7.1
6	AMORTIGUADOR	7.1
5	ARENDELA DISTANCIADORA	7.7
4	PASADOR	7.6
3	PERNO PRISIONERO	7.4
2	TAPA	7.3
1	TAPA CON PERNO PRISIONERO	
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16. ESQUEMA DE MONTAJE PARA VÁLVULAS DE ESCAPE CON PLACA DE ACERO



11	TUERCA	7.1
10	PASADOR	7.6
9	RESORTE DE TRABAJO	7.1, 8
8	TAPA	7.3
7	AMORTIGUADOR	7.1
6	ARENDELA DISTANCIADORA	7.7
5	PLACA	7.1
4	PASADOR	7.6
3	PERNO PRISIONERO	7.4
2	ASIENTO	7.2
1	ASIENTO CON PERNO PRISIONERO	
REF	DESCRIPCIÓN	PÁRRAFO DE REFERENCIA

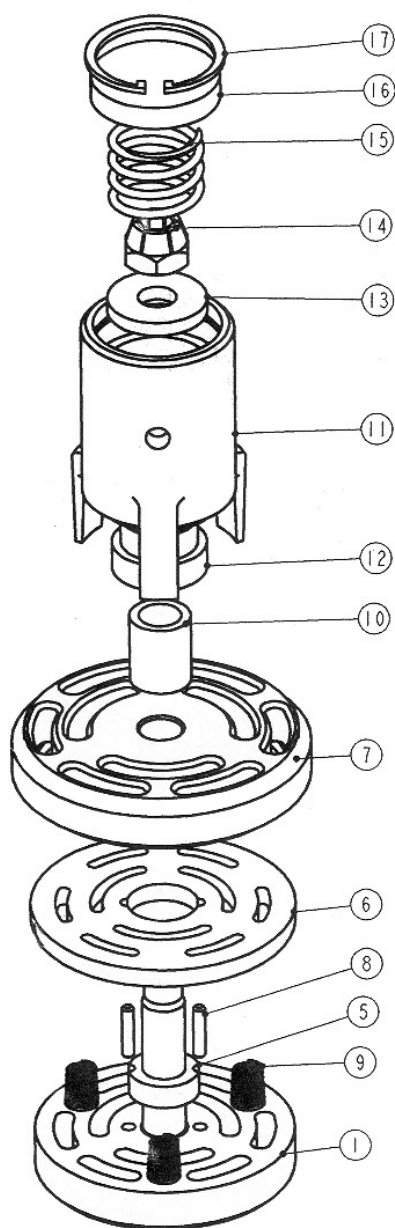
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17. ESQUEMA DE MONTAJE PARA VÁLVULAS DE ASPIRACIÓN CON PLACA DE PLÁSTICO Y DESCARGADOR

Castellano

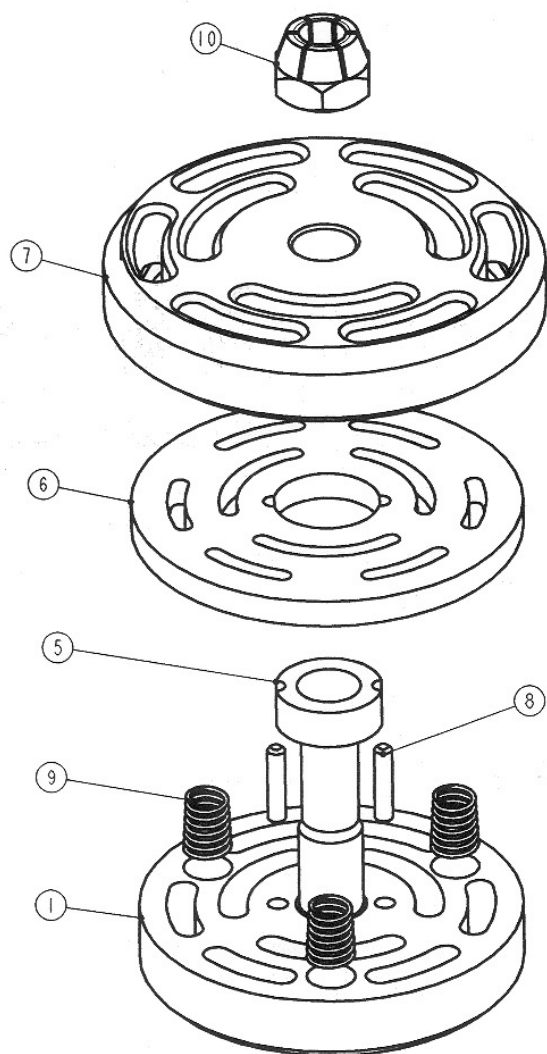


17	ANILLO ELASTICO DE SEGURIDAD	7.7
16	TAPÓN DESCARGADOR	7.7
15	MUELLE DESCARGADOR	7.7
14	TUERCA	7.1
13	ARANDELA	7.7
12	CASQUILLO DE PLÁSTICO	7.5
11	DESCARGADOR	7.2
10	CASQUILLO DE METAL	7.5
9	RESORTE DE TRABAJO	7.1, 8
8	PASADOR	7.6
7	ASIENTO	7.2
6	PLACA	7.1
5	ARENDELA DISTANCIADORA	7.7
4	PASADOR	7.6
3	PERNO PRISIONERO	7.4
2	TAPA	7.3
1	TAPA CON PERNO PRISIONERO	
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18. ESQUEMA DE MONTAJE PARA VÁLVULAS DE ASPIRACIÓN CON PLACA DE PLÁSTICO



10	TUERCA	7.1
9	RESORTE DE TRABAJO	7.1, 8
8	PASADOR	7.6
7	ASIENTO	7.2
6	PLACA	7.1
5	ARENDELA DISTANCIADORA	7.7
4	PASADOR	7.6
3	PERNO PRISIONERO	7.4
2	TAPA	7.3
1	TAPA CON PERNO PRISIONERO	
REF	DESCRIPCIÓN	PÁRRAFO DE REFERENCIA

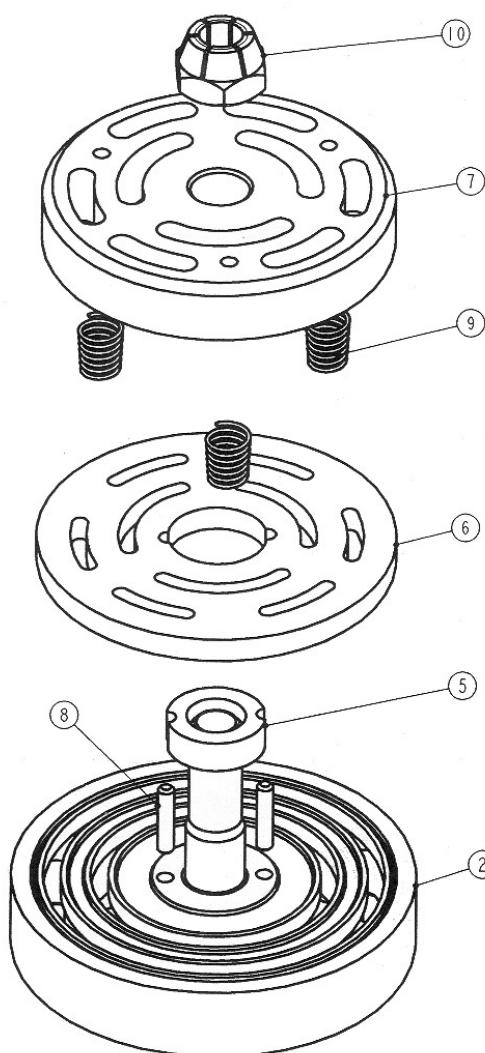
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19. ESQUEMA DE MONTAJE PARA VÁLVULAS DE ESCAPE CON PLACA DE PLÁSTICO

Castellano



10	TUERCA	7.1
9	RESORTE DE TRABAJO	7.1, 8
8	PASADOR	7.6
7	TAPA	7.3
6	PLACA	7.1
5	ARENDELA DISTANCIADORA	7.7
4	PASADOR	7.6
3	PERNO PRISIONERO	7.4
2	ASIENTO	7.2
1	ASIENTO CON PERNO PRISIONERO	
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SOUPAPES POUR COMPRESSEURS
Système Qualité certifié ISO 9001 depuis 1996

INSTRUCTIONS POUR L'UTILISATION ET L'ENTRETIEN DES SOUPAPES

NOTE: La traduction est effectuée avec respect et avec la meilleure interprétation des termes. En cas de conflit interprétatif entre les versions en langue, la langue italienne prévaut.

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1. BUT

Le but du présent document est celui d'aider et guider le client à effectuer le reconditionnement des soupapes aspiration et refoulement pour compresseurs alternatifs.

2. FREQUENCE DES INTERVENTIONS

La fréquence des interventions d'entretien de la soupape dépend des conditions de service, donc on recommande de suivre les indications du constructeur du compresseur.

3. EQUIPEMENTS ET MACHINES CONSEILLES POUR LA REVISION DE LA SOUPAPE

- Banc de travail équipé avec un étau ou un mandrin, si possible à centrage automatique, pour le démontage et montage des soupapes;
- Clés dynamométriques avec bagues pour le serrage des écrous autobloquants;
- Machine pour le nettoyage des métaux;
- Tour parallèle;
- Plan de rodage en fonte sphéroïdale;

4. ENLEVEMENT DE LA SOUPAPE DU COMPRESSEUR

Pendant l'enlèvement de la soupape du compresseur ou de la tuyauterie suivre attentivement les instructions opérationnelles et de sécurité indiquées par le constructeur du compresseur.

5. DEMONTAGE DE LA SOUPAPE

S'il n'y a pas à disposition un mandrin, bloquer la soupape dans l'étau avec deux petits goujons (Figure 1), dont une extrémité est serrée dans l'étau et l'autre extrémité est insérée dans les trous de passage du bouchon ou dans ceux du siège de la soupape, de manière à empêcher que la soupape tourne pendant le dévissage de l'écrou. Ne jamais bloquer la soupape directement dans l'étau (Figure 3 et Figure 4).



Figure 1



Figure 2

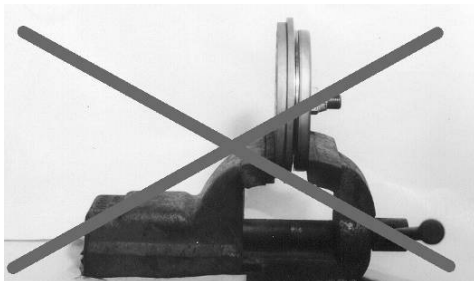


Figure 3

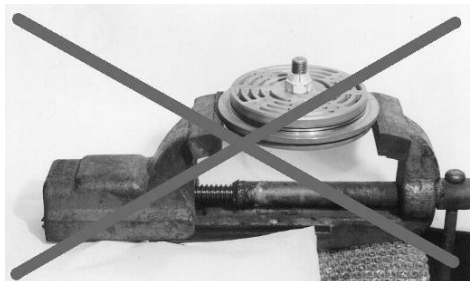


Figure 4

Dévisser l'écrou de sûreté de la soupape en utilisant si nécessaire un produit autodévisant. Ne jamais desserrer l'écrou en frappant avec des outils sur la clé. Pour ne pas plier les goupilles de la soupape pendant le dévissage ou le serrage de l'écrou, le siège aspiration ou le butoir refoulement ne doivent pas tourner (Figure 2).

6. NETTOYAGE DES PIÈCES

Enlever les ressorts hélicoïdaux et les goupilles du siège et du butoir.

Nettoyer avec soin toutes les pièces de la soupape (à exception de: ressorts hélicoïdaux, disques, anneaux, capots des ressorts et boutons des ressorts) en utilisant détergents appropriés.

Laver les pièces dans l'eau chaude avec un produit dégraissant.

S'il est nécessaire un nettoyage soigné, faire attention à ne pas utiliser des brosses métalliques ou des outils durs, ou avec angles vifs, pour nettoyer les surfaces d'étanchéité du siège.

7. RECONDITIONNEMENT OU REMPLACEMENT DES PIÈCES USURES

Vérifier l'état d'usure de chaque partie de la soupape ou de la fourche.

Remplacer les pièces qui ne sont plus reconditionnables en utilisant uniquement les rechanges originaux Cozzani. En particulier:

7.1 Ressorts, clapets, ecrou de sureté, capots du ressort, bouton du ressort.

Les ressorts hélicoïdaux, les disques ou les anneaux, les plaques, les capots du ressort et les boutons du ressort de la soupape doivent être toujours remplacés à chaque entretien programmé de la soupape.

A chaque révision l'écrou de blocage doit être remplacé n'importe quel type (écrou autobloquant comme figure 5 ou écrou non autobloquant comme figure 6). En cas un contre-écrou avec rondelles Nord-Lock® (Figure 7) a été utilisé, soit le écrou, soit les rondelles de verrouillage doivent être remplacés.

Si on a une soupape pour compresseurs oxygène, enlever la colle présente entre les rondelles de sûreté de l'écrou Nord-Lock®.

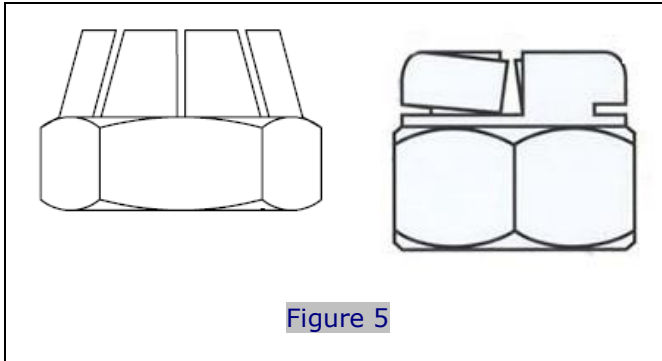


Figure 5

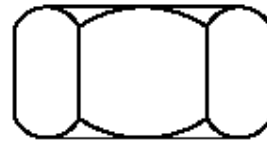


Figure 6

Les rondelles Nord-Lock® doivent être assemblées à couple, plan contre plan, sur le côté des plans inclinés avec un pas supérieur au filetage. Les plans avec denture radiale doivent rester en contact avec l'écrou et avec le siège ou le butoir, comme dans la Figure 8

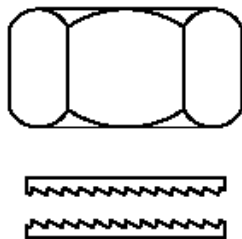


Figure 7

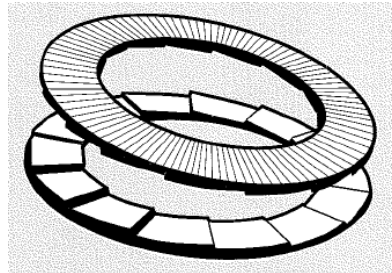


Figure 8

En cas d'usure prématurée des disques, des plaques ou des anneaux et en cas de gravures profondes sur leurs surfaces provoqués par un fonctionnement anormal, il faut les remplacer avant la maintenance programmée.

7.2 Siège

Pour reconditionner la planéité des sièges d'étanchéité, roder à main le siège en utilisant une table en fonte sphéroïdale avec de la pâte lubrifiante en carbure de silicium et, ensuite, laver la pièce à l'eau chaude avec un détergent dégraissant.

Si les sièges d'étanchéité sont très endommagés, donc s'il n'est pas suffisant les roder, il faut procéder avec un usinage mécanique au tour avec rectification.

On commence l'usinage de planage en enlevant la matière un peu à la fois et avec des paramètres de coup pour assurer une bonne finissage de la surface. Quand on a reconditionné les sièges, il faut



éliminer les angles vifs créés par le planage en chanfreinant au tour ou bien avec de la toile émeri grain fin.

Si après ces opérations on a éliminé plus de 3 mm de matière, il faut reconditionner les bas-fonds des sièges d'étanchéité en les usinant au tour avec un outil de forme.

L'épaisseur minimum entre le plan du siège et la tête de la fraise doit être 2 mm, comme indique la Figure 9.

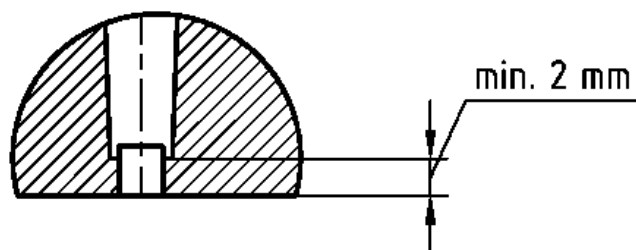
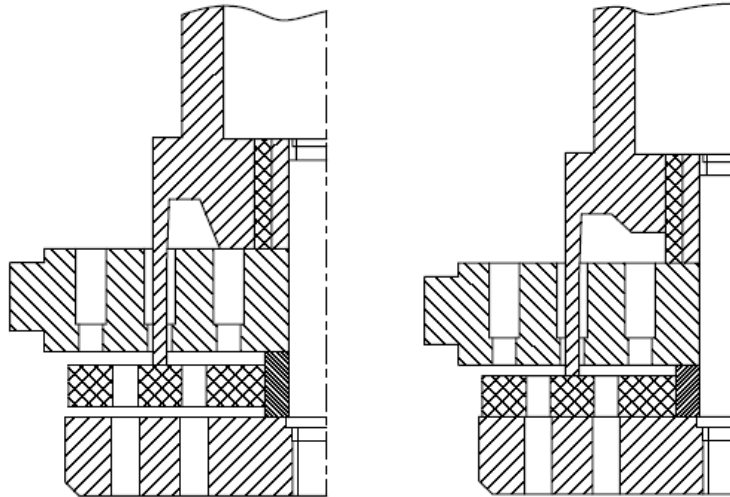


Figure 9

Après cet usinage il faut roder à main le siège en utilisant une table en fonte, comme on décrit ci-dessus.

Après le montage des goupilles, il faut s'assurer qu'elles ne compromettent pas l'assemblage correct de la soupape. Au cas contraire, il faut approfondir le trou où la goupille est logée.

Dans les soupapes aspiration, la course de la fourche peut terminer contre le siège (Cas 1) ou contre le clapet (Cas 2).



Cas 1

Cas 2

Cas 1:

Si pendant le reconditionnement on a réduit l'épaisseur du siège de plus de 0,2 mm, il faut couper les doigts de la fourche autant qu'on a réduit l'épaisseur du siège. Dans ce cas il faut vérifier que quand la soupape est assemblée et avec la fourche abaissée, son couvercle ne soit pas en contact avec le goujon ; au cas contraire, on doit couper le goujon aussi autant qu'on a réduit l'épaisseur du siège.

Cas 2:

La fourche ne doit pas être modifiée.

Vérifier s'il y a une usure anormale de la fourche dans la zone d'appui du clapet ; dans ce cas, il faut remplacer la fourche.

7.3 Butoir

Vérifier si il y a des usures excessives dans le logement des ressorts et dans les guidages des clapets. Dans ce cas remplacer le butoir.

7.4 Goujon

Contrôler l'intégrité du goujon (Figure 10) sur le filetage et sur la partie tournée et le parfait blocage sur le composant. Si la partie filetée du goujon présente une usure, vérifier qu'elle ne provoque pas des excessifs jeux entre le siège et le butoir.

Si le filetage du goujon est endommagé il faut le remplacer en exécutant les opérations suivantes:

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- 1) Détruire complètement la goupille de sûreté (Figure 11) en perçant avec une pointe de diamètre un peu plus grand de la goupille même.
- 2) Dévisser le goujon en le bloquant dans l'étou et en tournant le siège.
- 3) Visser le nouveau goujon jusqu'au coup, en le serrant avec un charge approprié.
- 4) Aplanir dans le tour la partie inférieure exédante du goujon et tourner sa partie lisse en respectant la mesure en tolérance f9.
- 5) Faire le nouveau trou pour le logement de la goupille de sûreté en le positionnant à une distance radiale d'au moins 90° par rapport au trou original, en utilisant une pointe de diamètre égal à la goupille. Le trou doit avoir une profondeur supérieure à la longueur de la goupille tout au moins 1 mm et d'une façon que la goupille soit positionnée par moitié de son diamètre dans le goujon et par l'autre moitié dans le siège ou butoir.
- 6) Introduire toute la goupille dans le trou et la river avec un poinçon approprié à l'opération.



Figure 10



Figure 11

7.5 Remplacement de la bague de guidage de la fourche (seulement pour soupapes aspiration)

Bague en peek

La bague de guidage en peek doit être remplacée pendant chaque reconditionnement.

Bague en acier

Si la bague en acier n'est pas endommagée, il n'est pas nécessaire de la remplacer pendant le reconditionnement .

Bague en téflon et acier

En cas de bague en téflon, on pourrait avoir deux types d'anomalies:

- 1) La bague se défile de la fourche.
- 2) Le diamètre intérieur de la bague est usuré et le jeu avec la boucle d'acier est supérieur à 0,3 mm.

Dans ces cas, il est nécessaire de remplacer la fourche, ou remplacer la bague en téflon, en observant les instructions suivantes:

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- 1) Enlever l'ancienne bague.
- 2) Pousser avec un outil approprié la nouvelle boucle dans la fourche.
- 3) Usiner le diamètre intérieur de la bague plastique, qui doit être égal au diamètre extérieur de la boucle en acier plus le jeu établi de $0,15 \div 0,20$ mm. Il faut effectuer cette opération au tour, en serrant sur le mandrin à centrage automatique la fourche de la partie cylindrique (côté seeger) et en dépliant la boucle en téflon sur les deux côtés, en enlevant 0,2 mm de chaque côté pour obtenir une bonne dilatation axiale de la boucle en téflon.

7.6 Goupilles

Les goupilles doivent être toujours remplacées.

Pour extraire la goupille, la bloquer horizontalement dans un étau et, en s'aidant avec un marteau de gomme, frapper en direction du sens d'extraction sur le siège en cas de soupape aspiration ou sur le goujon en cas de soupape refoulement. Pour insérer une nouvelle goupille, battre sur celle-ci avec un marteau d'acier afin qu'elle gagne le fond de son trou.

7.7 Composants à récupérer

Après le nettoyage vérifier le bon état des composants réutilisables (couvercle, seeger, ressort du déclencheur, épaisseur de levée, rondelle, bagues).

8. ASSEMBLAGE DE LA SOUPAPE

Laver le butoir avant d'insérer les ressorts dans leurs logements.

Le ressort hélicoïdal conique doit être inséré avec le diamètre plus grand dans son logement (Figure 12).

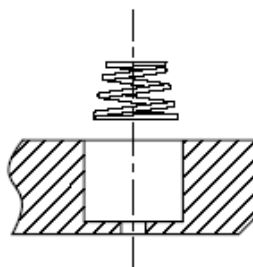


Figure 12

Les Figure 13, 13 et 14 montrent les plans d'assemblage quand le ressort est équipé avec capot et bouton plastique.

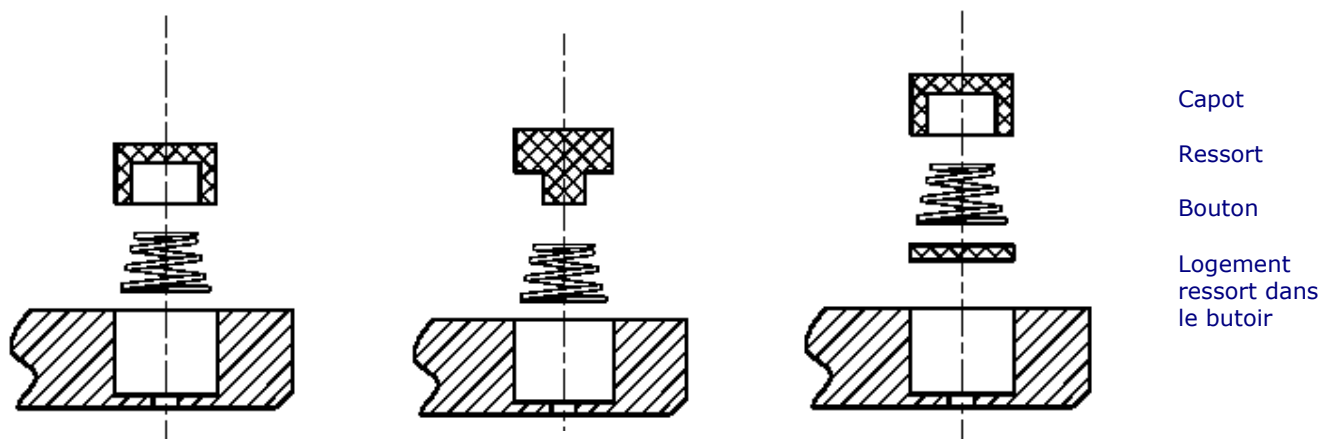


Figure 13

Figure 14

Figure 15

En cas de soupape sans capots du ressort, les ressorts doivent être bloqués à l'intérieur du logement en utilisant une petite tige métallique ayant une pointe ronde; cette tige a un diamètre supérieur au diamètre intérieur du ressort et inférieur au diamètre du logement où on va insérer le ressort.

Pour bloquer le ressort il est suffisant de pousser avec la tige le ressort dans son logement, en tournant légèrement la tige en sens inverse d'horloge; s'assurer que le ressort soit en axe dans son logement (Figure 16).



Figure 16

Après le nettoyage du siège et de la fourche et après avoir vérifié les dimensions du siège, remonter la soupape selon les plans annexes. Si la soupape est équipée avec des disques et des

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plaques en acier, il faut faire attention à leur position correcte en suivant le plan ci-joint, afin que le bras de chaque pièce ait la même orientation.

Serrer l'écrou de sûreté avec une clé dynamométrique, en respectant les couples de serrage du Tableau. 1 **sauf indication contraire dans le plan de la soupape de référence.**

Au cas où on utilise un écrou autobloquant le goujon doit être toujours lubrifié avant le serrage de l'écrou. Si on utilise un écrou avec des rondelles Nord-Lock® le goujon ne doit pas être lubrifié.

Ne jamais utiliser de l'huile ou du lubrifiant pour les soupapes à installer sur les compresseurs oxygène.

Filetage	valeurs de serrage pour chaque type d'écrou de verrouillage utilisé (Figure 5)	Valeurs de serrage pour écrou des classe 8.8 (Figure 6)	Valeurs de serrage pour écrou avec rondelles Nord-Lock® (Errore. L'origine riferimento non è stata trovata.)
M 6	10 N m	10 N m	--
M 8	19 N m	25 N m	19 N m
M 10	25 N m	50 N m	40 N m
M 10 x 1	35 N m	35 N m	40 N m
M 12 x 1,5	45 N m	70 N m	90 N m
M 12	50 N m	85 N m	90 N m
M 14 x 1,5	80 N m	95 N m	120 N m
M 16	130 N m	205 N m	--
M 16 x 1,5	110 N m	150 N m	190 N m
M 20 x 1,5	215 N m	240 N m	300 N m
M 24 x 1,5	370 N m	--	425 N m
M 30 x 1,5	720 N m	--	715 N m

Tableau 1

Quand on a assemblé la soupape, vérifier avec un calibre que la cote A indiquée dans la Figure 17 et Figure 18 soit uniforme sur toute la circonférence extérieure de celle-ci. Au cas contraire démonter la soupape et vérifier que les goupilles soient insérées correctement dans leurs trous, soit du siège, soit du butoir.

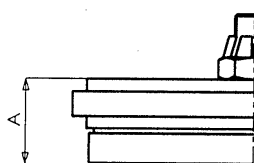


Figure 17

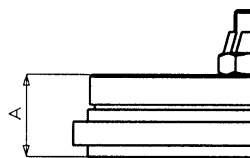


Figure 18

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Vérifier que le disque et les anneaux se bougent librement en les poussant vers le butoir, à travers les zones de passage gaz du siège avec un outil approprié qui n'endommage pas le disque ou les anneaux.

NOTE: la soupape pour compresseurs hoxigène ne doit pas avoir des traces d'huile et de lubrifiant. Contrôler encore la soupape avant l'installation. Si on ne respecte pas cette procédure, on pourrait causer des explosions.

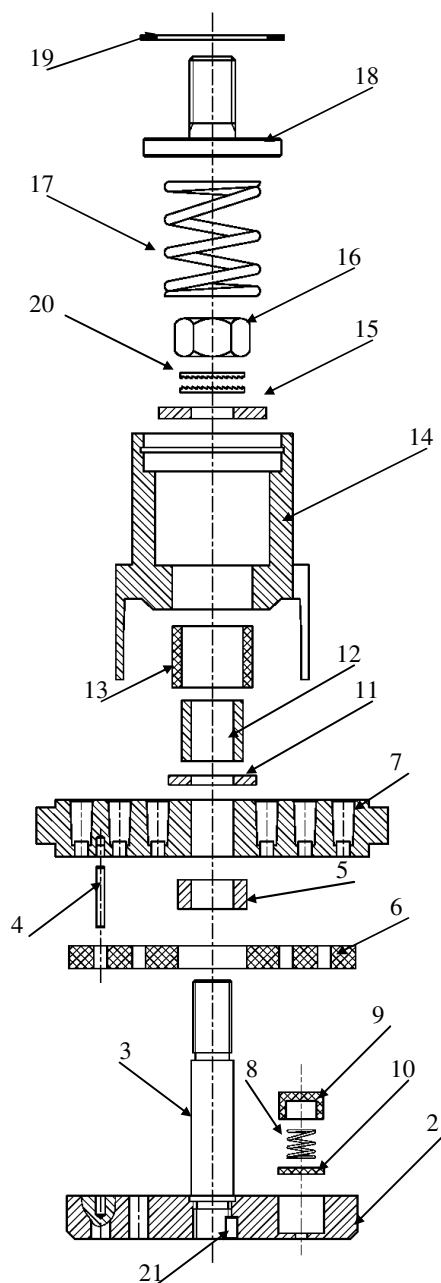
9. PROTECTION

Si les soupapes qui seront mises en stock ne sont pas en acier inoxydable, elles doivent être protégées par huile antirouille avant leur utilisation. Les soupapes pour les compresseurs en oxygène ou pour des autres gaz dangereux ne doivent être huilées ou graissées. A ce propos veuillez respecter les indications opérationnelles et de sécurité indiquées par le constructeur du compresseur.

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10. PLAN D'ASSEMBLAGE POUR LES SOUPAPES ASPIRATION AVEC DISQUE EN PEEK, CAPOTS DU RESSORT ET FOURCHE.

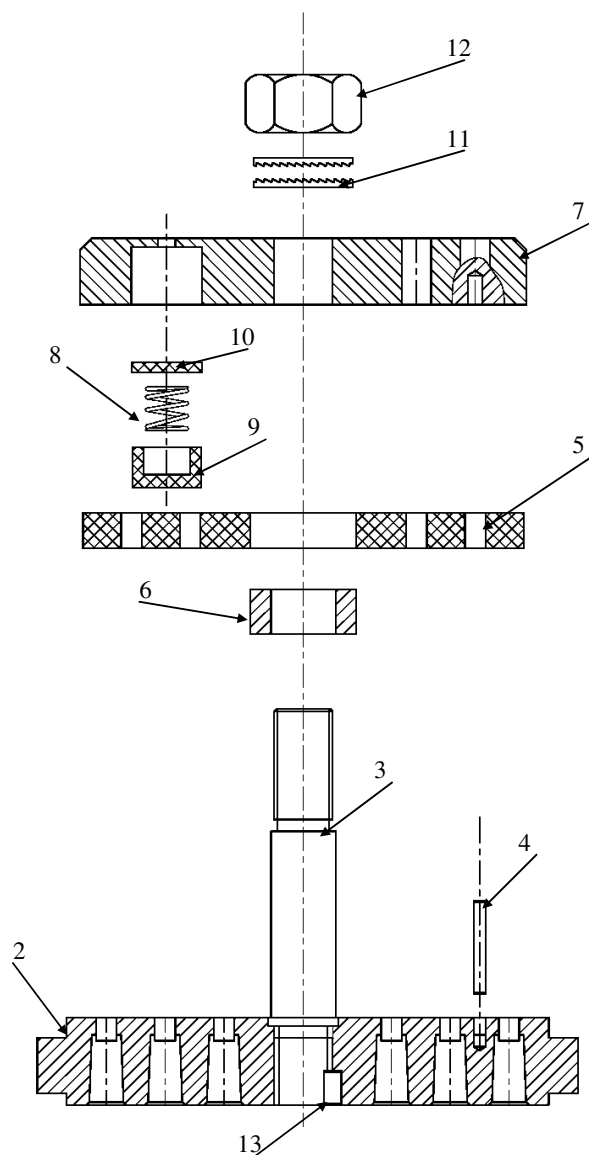


21	GOUPILLE DE FIXAGE	7.4
20	RONDELLE NORD-LOCK®	7.1
19	SEEGER	7.7
18	COUVERCLE	7.7
17	RESSORT DU DECLENCHEUR	7.7
16	ECROU	7.1
15	RONDELLE	7.7
14	FOURCHE	7.2
13	BAGUE EN PLASTIQUE	7.5
12	BAGUE EN METAL	7.5
11	RONDELLE	7.7
10	BOUTON DU RESSORT	7.1, 8
9	CAPOT DU RESSORT	7.1, 8
8	RESSORT	7.1, 8
7	SIEGE	7.2
6	DISQUE	7.1
5	EPAISSEUR DE LEVEE	7.7
4	GOUPILLE	7.6
3	GOUJON	7.4
2	BUTOIR	7.3
1	BUTOIR AVEC GOUJON	
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11. PLAN D'ASSEMBLAGE POUR SOUPAPES REFOULEMENT AVEC DISQUES EN PEEK ET CAPOTS DU RESSORT

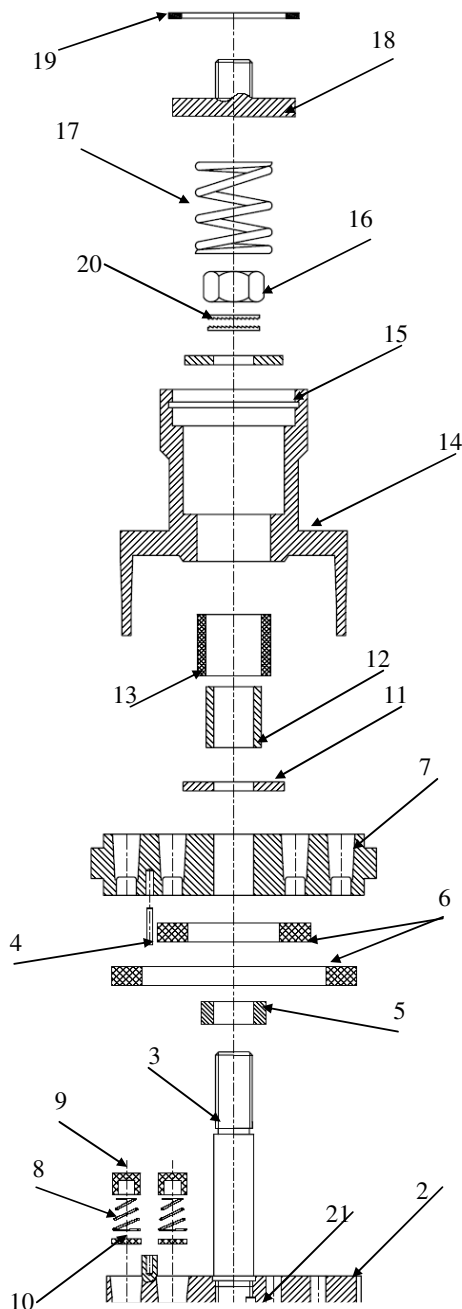


13	GOUPILLE DE FIXAGE	7.4
12	ECROU	7.1
11	RESSORT NORD-LOCK®	7.1
10	BOUTON DU RESSORT	7.1, 8
9	CAPOT DU RESSORT	0, 8
8	RESSORT	0, 8
7	BUTOIR	0
6	EPAISSEUR DE LEEVE	0
5	DISQUE	0
4	GOUPILLE	0
3	GOUJON	7.4
2	SIEGE	7.2
1	SIEGE AVEC GOUJON	
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12. PLAN DE MONTAGE POUR SOUPAPES ASPIRATION AVEC ANNEAUX EN PEEK ET CAPOTS DU RESSORT

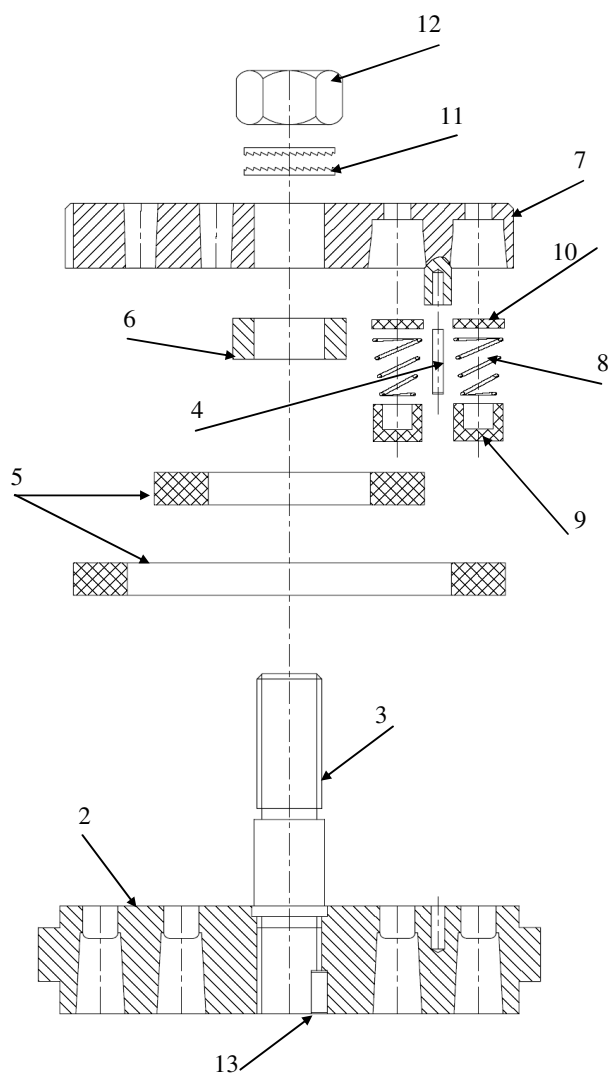


21	GOUPILLE DE FIXAGE	7.4
20	RONDELLE NORD-LOCK®	7.1
19	SEEGER	7.7
18	COUVERCLE	7.7
17	RESSORT DU DECLENCHEUR	0.7
16	ECROU	7.1
15	RONDELLE	7.7
14	FOURCHE	7.2
13	BAGUE EN PLASTIQUE	7.5
12	BAGUE EN METAL	7.5
11	RONDELLE	7.7
10	BOUTON DU RESSORT	7.1, 8
9	CAPOT DU RESSORT	7.1, 8
8	RESSORT	7.1, 8
7	SIEGE	7.2
6	ANNEAU	7.1
5	EPAISSEUR DE LEVEE	7.7
4	GOUPILLE	7.6
3	GOUJON	7.4
2	BUTOIR	7.3
1	BUTOIR AVEC GOUJON	
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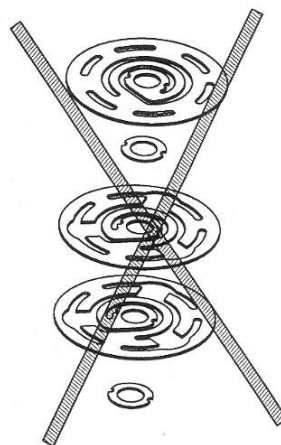
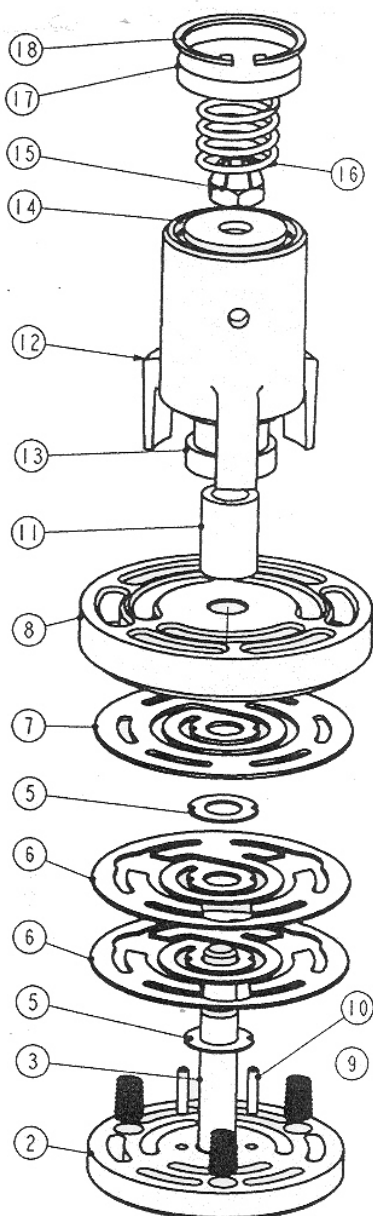


13.PLAN DE MONTAGE POUR SOUPAPES REFOULEMENT AVEC ANNEAUX EN PEEK ET CAPOTS DU RESSORT



13	GOUPILLE DE FIXAGE	7.4
12	ECROU	7.1
11	RONDELLE NORD-LOCK®	7.1
10	BOUTON DU RESSORT	7.1, 8
9	CAPOT DU RESSORT	7.1, 8
8	RESSORT	7.1, 8
7	BUTOIR	7.3
6	EPAISSEUR DE LEVEE	7.7
5	ANNEAUX	7.1
4	GOUPILLE	7.6
3	GOUJON	7.4
2	SIEGE	7.2
1	SIEGE AVEC GOUJON	
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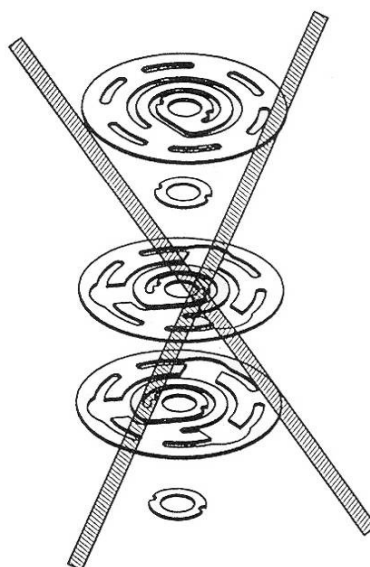
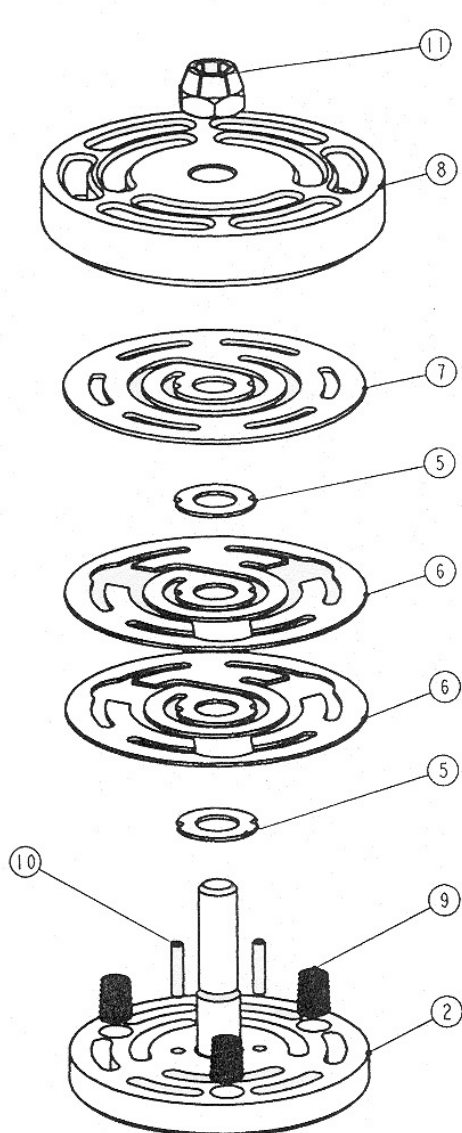


18	SEEGER	7.7
17	COUVERCLE	7.7
16	RESSORT DU DECLENCHEUR	7.7
15	ECROU	7.1
14	RONDELLE	7.7
13	BAGUE PLASTIQUE	7.5
12	FOURCHE	7.2
11	BAGUE EN METAL	7.5
10	GOUPILLE	7.6
9	RESSORT	7.1, 8
8	SIEGE	7.2
7	DISQUE	7.1
6	PLAQUE	7.1
5	EPAISSEUR DE LEVEE	7.7
4	GOUPILLE	7.6
3	GOUJON	7.4
2	BUTOIR	7.3
1	BUTOIR AVEC GOUJON	
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15.PLAN DE MONTAGE POUR SOUPAPES ASPIRATION AVEC DISQUE EN ACIER

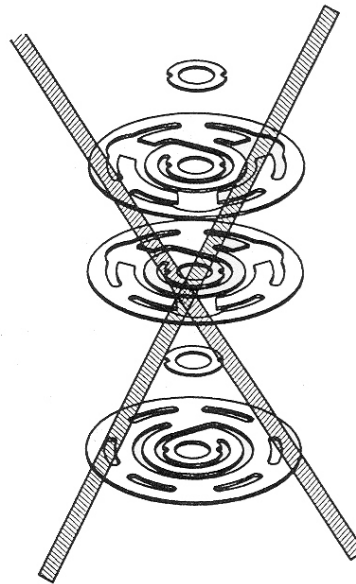
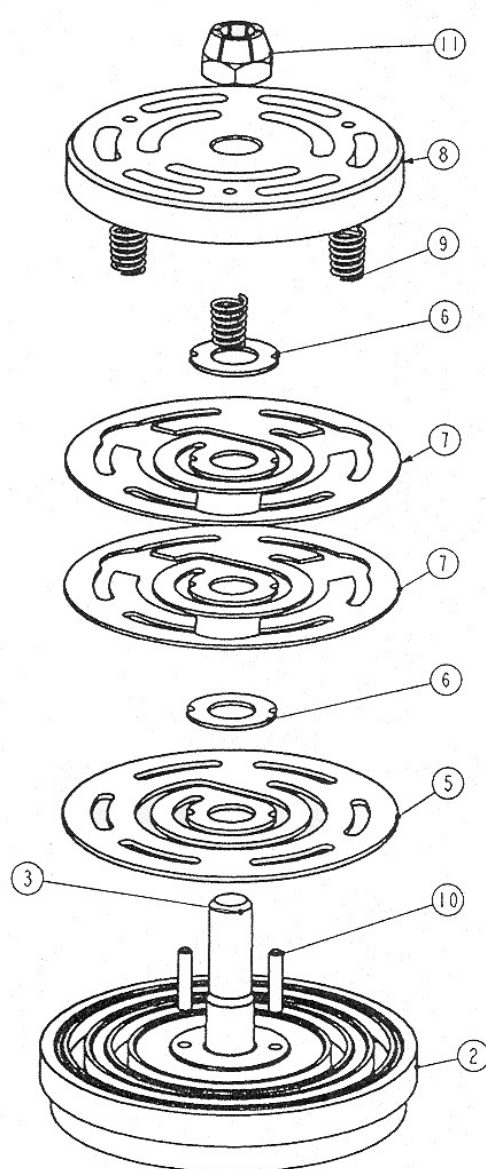


11	ECROU	7.1
10	GOUPILLE	7.6
9	RESSORT	7.1, 8
8	SIEGE	7.2
7	DISQUE	7.1
6	PLAQUE	7.1
5	EPAISSEUR DE LEVEE	7.7
4	GOUPILLE	7.6
3	GOUJON	7.4
2	BUTOIR	7.3
1	BUTOIR AVEC GOUJON	
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16. PLAN D'ASSEMBLAGE POUR SOUPAPES REFOULEMENT AVEC DISQUE EN ACIER

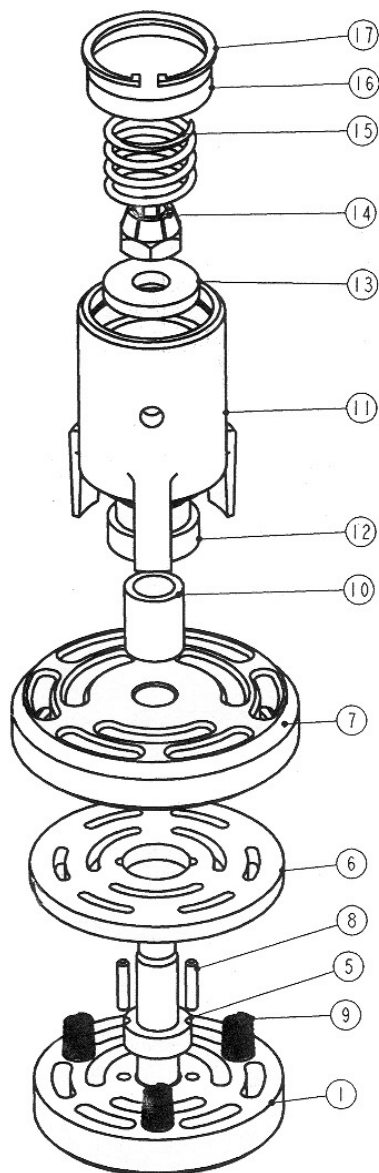


11	ECROU	7.1
10	GOUPILLE	7.6
9	RESSORT	7.1, 8
8	BUTOIR	7.3
7	PLAQUE	7.1
6	EPAISSEUR DE LEVEE	7.7
5	DISQUE	7.1
4	GOUPILLE	7.6
3	GOUJON	7.4
2	SIEGE	7.2
1	SIEGE AVEC GOUJON	
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17.PLAN DE MONTAGE POUR SOUPAPES ASPIRATION AVEC DISQUE PLASTIQUE ET FOURCHE

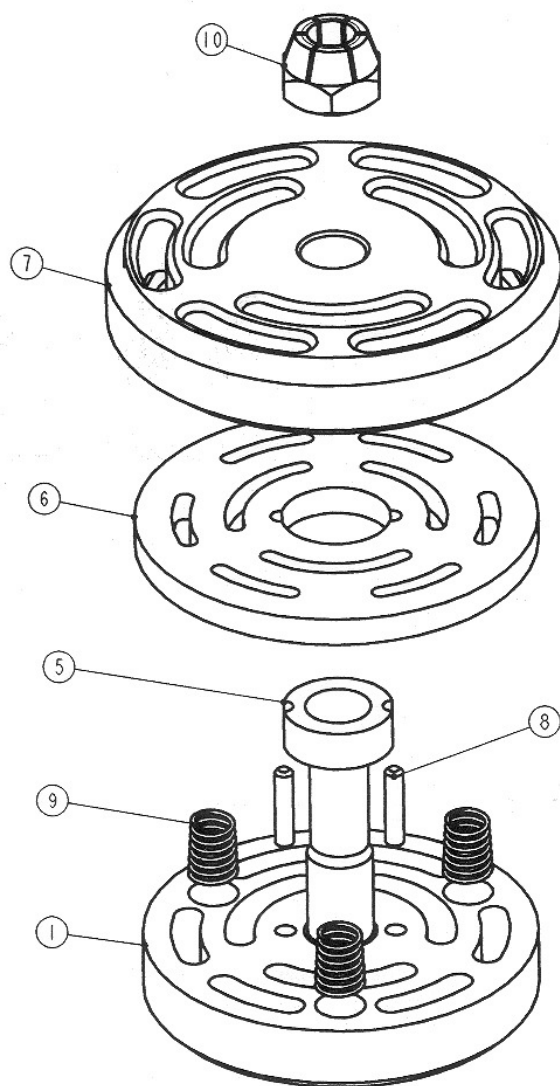


17	SEEGER	7.7
16	COUVERCLE	7.7
15	RESSORT DU DECLENCHEUR	7.7
14	ECROU	7.1
13	RONDELLE	7.7
12	BAGUE PLASTIQUE	7.5
11	FOURCHE	7.2
10	BAGUE EN METAL	7.5
9	RESSORT	7.1, 8
8	GOUPILLE	7.6
7	SIEGE	7.2
6	DISQUE	7.1
5	EPAISSEUR DE LEVEE	7.7
4	GOUPILLE	7.6
3	GOUJON	7.4
2	BUTOIR	7.3
1	BUTOIR AVEC GUIJON	
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18.PLAN DE MONTAGE POUR SOUPAPES ASPIRATION AVEC DISQUE PLASTIQUE

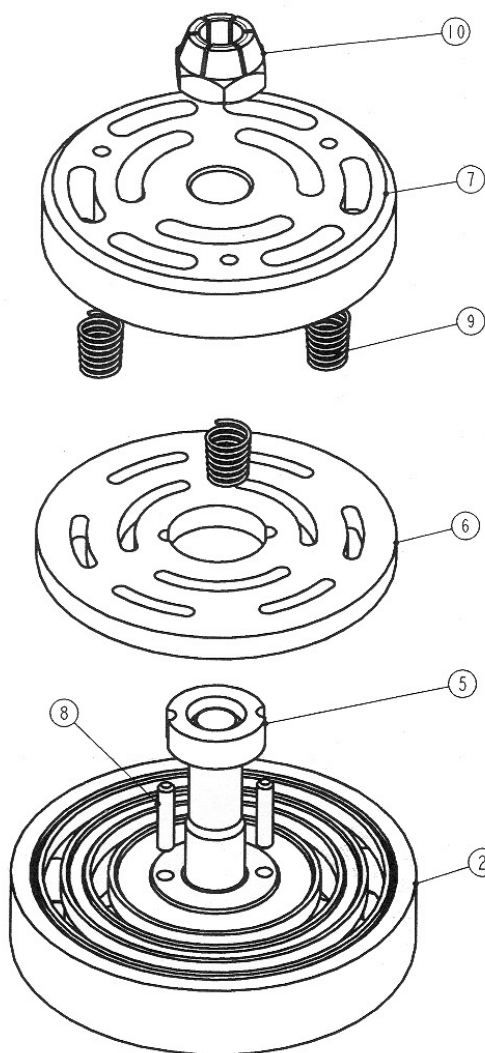


10	ECROU	7.1
9	RESSORT	7.1, 8
8	GOUPILLE	7.6
7	SIEGE	7.2
6	DISQUE	7.1
5	EPAISSEUR DE LEVEE	7.7
4	GOUPILLE	7.6
3	GOUJON	7.4
2	BUTOIR	7.3
1	BUTOIR AVEC GOUJON	
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19. PLAN DE MONTAGE POUR SOUPAPES REFOULEMENT AVEC DISQUE PLASTIQUE



10	ECROU	7.1
9	RESSORT	7.1, 8
8	GOUPILLE	7.6
7	BUTOIR	7.3
6	DISQUE	7.1
5	EPAISSEUR DE LEVEE	7.7
4	GOUPILLE	7.6
3	GOUJON	7.4
2	SIEGE	7.2
1	SIEGE AVEC GOUJON	
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Система качества сертифицирована согласно норме ISO 9001 с 1996 г.

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Примечание: перевод осуществляется с уважением и с наилучшими толкование терминов.
В случае возникает конфликт в интерпретации, итальянская версия командир один.

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<http://www.cozzani.com>

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1. НАЗНАЧЕНИЕ

Данный документ служит в качестве помощи и руководства для специалистов по техническому обслуживанию, выполняющих проверку всасывающих и нагнетательных клапанов для поршневых компрессоров.

2. ЧАСТОТА ВЫПОЛНЕНИЯ ОПЕРАЦИЙ

Частота выполнения операций по техническому обслуживанию клапанов зависит от условий эксплуатации, поэтому рекомендуем руководствоваться указаниями производителя компрессора.

3. РЕКОМЕНДУЕМЫЕ ИНСТРУМЕНТЫ И ОБОРУДОВАНИЕ ДЛЯ ПРОВЕРКИ КЛАПАНОВ

- Верстак с тисками или патроном (по возможности самоцентрирующимся) для разборки и сборки клапанов;
- Динамометрические ключи и соответствующий набор торцовых ключей для затягивания самоконтрящихся гаек;
- Машина для мойки металлов;
- Центровой токарный станок;
- притирочная плита из высокопрочного чугуна;

4. СНЯТИЕ КЛАПАНА С КОМПРЕССОРА

Во время процедуры снятия клапанов с компрессора или с трубопровода строго соблюдайте инструкции по эксплуатации и технике безопасности, предоставленные производителем компрессора.

5. РАЗБОРКА КЛАПАНА

При отсутствии патрона заблокируйте клапан в тисках с помощью двух штырьков (Рисунок 1), один конец которых зажимается в тисках, а другой вставляется в отверстия всасывающего контрседла или в отверстия нагнетательного седла, не допуская, таким образом, вращения клапана при откручивании гайки. Запрещено блокировать сам клапан в тисках (Рисунок 3 и Рисунок 4).

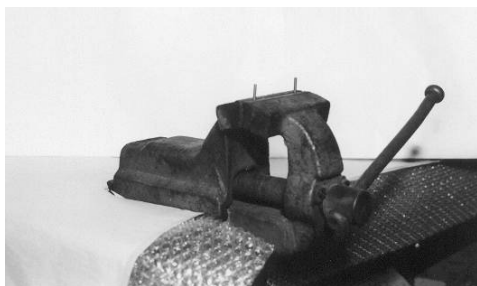


Рисунок 1



Рисунок 2

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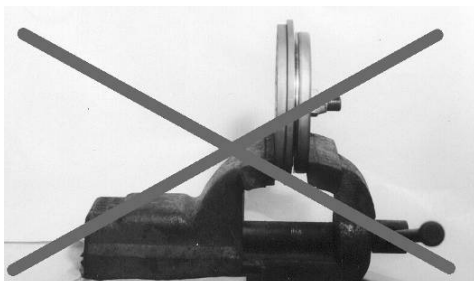


Рисунок 3

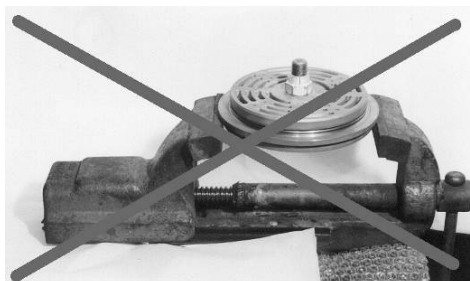


Рисунок 4

Открутите стопорную гайку клапана, при необходимости используйте средство для ослабления затяжки. Строго запрещено для откручивания гайки каким-либо предметом бить по ключу. Чтобы не погнуть стержни клапана во время откручивания или закручивания гайки, всасывающее седло или нагнетательное контрседло не должны поворачиваться (Рисунок 2).

6. ЧИСТКА ДЕТАЛЕЙ

Выньте спиральные пружины из контрседла и стержни с седла и контрседла.

Аккуратно почистите соответствующими средствами все детали клапана (за исключением спиральных пружин, пластин, колец, направляющих колпачков пружин и шайб под пружины).

Промойте детали горячей водой с обезжиривающим средством.

Если требуется более тщательная чистка, не используйте металлические щетки, твердые инструменты или инструменты с острыми краями для чистки уплотняющих поверхностей седла.

7. ВОССТАНОВЛЕНИЕ ИЛИ ЗАМЕНА ИЗНОШЕННЫХ ДЕТАЛЕЙ

Проверяйте степень износа отдельных компонентов клапана и толкателя.

Не подлежащие восстановлению детали заменяйте только оригинальными запчастями Cozzani. В частности:

7.1. Пружины, затворы, стопорная гайка, направляющие колпачки пружины, шайба под пружину.

Спиральные пружины, пластины или кольца, контрпластины, направляющие колпачки пружин и шайбы под пружины клапана всегда меняйте при каждом плановом техобслуживании клапана.

В каждом капитальном ремонте контргайка должны быть заменены независимо от типа (самоконтрящаяся гайка см. рисунок 5 или нет самоблокирующимся гайки как рисунке 6). В случае блокировки гайку с Nord-Lock® шайбы (рис. 7) используются оба болта или гайки и безопасности шайбы должны быть заменены.

Если клапан предназначен для работы с кислородом, удалите клей между предохранительными шайбами гайки Nord-Lock®.

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Рисунок 5

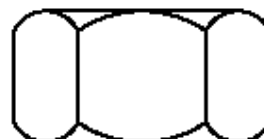


Рисунок 6

Шайбы Nord-Lock® нужно устанавливать попарно стык в стык стороной с наклонными плоскостями с шагом, превышающим резьбу. Поверхности с радиальным зубчатым венцом должны контактировать с гайкой, седлом или контрседлом, как показано на Рисунок 8

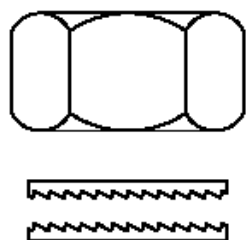


Рисунок 7

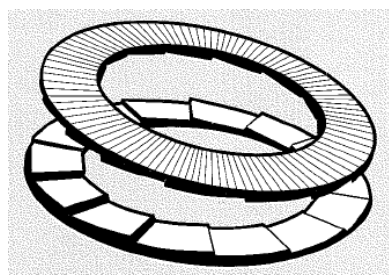


Рисунок 8

В случае образования по причине какой-либо неисправности преждевременного износа пластин, контрпластин или колец, либо нанесения глубоких надрезов на их поверхность, их нужно заменить раньше, чем предусмотрено.

7.2. Седло

Для восстановления абсолютной ровности уплотнительных сёдел, вручную притрите седло специальным дисковым притиром из высокопрочного чугуна с использованием пасты из карбида кремния, затем промойте деталь горячей водой с обезжиривающим средством.

Если уплотнительные седла сильно повреждены, т.е., не подлежат восстановлению путем притирки, требуется механическая обработка путем обточки или шлифования.

Правку начинайте малыми съёмами при каждом проходе и с использованием таких параметров резки, которые бы гарантировали хорошую обработку поверхности. После достижения цели

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восстановления седел, удалите образовавшиеся в ходе правки острые кромки путем снятия фаски на токарном станке или мелкозернистым наждачным полотном.

Если после данных операций оказалось, что было снято более 0,3 мм, нужно восстановить дно уплотнительных седел путем токарной обработки фасонным инструментом.

Минимальная толщина между плоскостью седла и головкой фрезы должна составлять 2 мм, как показано на Рисунок 9.

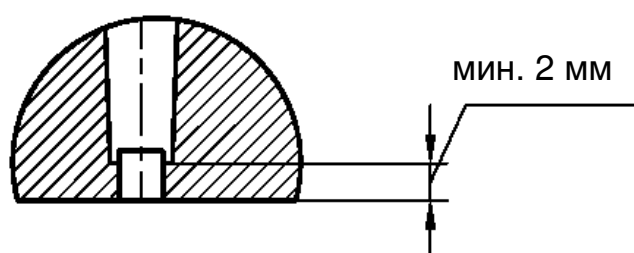
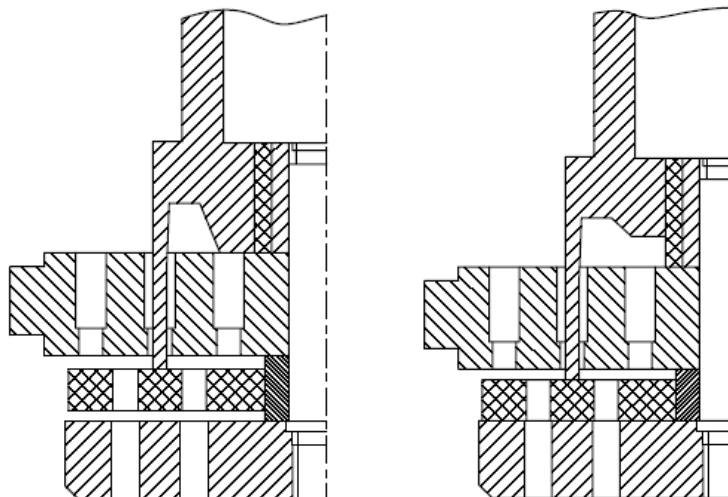


Рисунок 9

После данной обработки притрите вручную седло с помощью специального чугунного дискового притира, как описано выше.

Установив обратно стержни (при наличии), убедитесь, что они не мешают правильной сборке клапана. В противном случае углубите отверстие, в котором стержень находится свободно.

Во всасывающих клапанах с толкателем последний может начать ударяться о седло (Случай 1) или о затвор (Случай 2).



Случай 1

Случай 2

Случай 1:

Если в результате восстановления седло станет ниже более чем на 0,2 мм, нужно укоротить лапы толкателя ровно настолько, насколько уменьшилась толщина седла. В этом случае, когда клапан будет собран и толкатель опущен, нужно проверить, что крышка толкателя не соприкасается со шпилькой, иначе нужно укоротить и шпильку ровно настолько, насколько уменьшилась толщина седла.

Случай 2:

В толкателе не должно быть изменений.

Проверьте наличие нехарактерного износа толкателя в области удара затвора. Если это подтвердится, замените толкатель.

7.3. Контрседло

Проверьте наличие чрезмерного износа в пазах пружин и в направляющих затворов. В этом случае замените контрседло.

7.4. Шпилька

Визуально осмотрите целостность шпильки (Рисунок 10) на резьбе и на обточенном участке, а также проверьте отличную блокировку на соответствующем компоненте. При наличии износа на гладком участке шпильки проверьте, не создает ли он чрезмерного зазора между седлом и контрседлом.

В случае повреждения резьбы шпильки необходимо выполнить замену в следующем порядке:

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- 1) Полностью удалите стопорный стержень (Рисунок 11), просверлив сверлом, диаметр которого немного больше самого стержня.
- 2) Открутите шпильку, зажав ее в тисках и поворачивая седло.
- 3) Закрутите новую шпильку до упора, зафиксировав ее соответствующим образом.
- 4) Выровняйте на токарном станке нижнюю выступающую часть шпильки и обточите ее гладкий участок, соблюдая размеры в пределах допуска f9.
- 5) Просверлите новое отверстие для установки стопорного стержня, который нужно разместить на расстоянии под углом не менее 90° от первоначального отверстия, используя при этом сверло, диаметр которого равен диаметру стержня. Глубина отверстия должна быть, как минимум, на 1 мм больше длины стержня; его нужно выполнить таким образом, чтобы стержень наполовину диаметра входил в шпильку и второй половиной - в седло или контрседло.
- 6) Полностью введите стержень в отверстие и вбейте головку отверстия подходящим керном.



Рисунок 10



Рисунок 11

7.5. Замена втулки толкателя (только для всасывающих клапанов)

Втулка из полиэфирэфиркетона (ПЭЭК)

Втулку толкателя из материала ПЭЭК нужно заменять при каждом ремонте.

Стальная втулка

Если стальная втулка не имеет повреждений, ее можно не заменять в ходе ремонта.

Втулка из тефлона и стали

В случае тефлоновой втулки возможны два вида неисправностей:

- 1) Втулка снимается с толкателя.
- 2) Износ втулки по внутреннему диаметру, зазор со стальной втулкой превышает 0,3 мм.

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В этих случаях следует заменить весь толкатель, либо в качестве альтернативы выполнить замену тефлоновой втулки следующим образом:

- 1) Вручную снимите старую втулку.
- 2) Задвиньте новую втулку в толкатель подходящим инструментом с усилием.
- 3) Выполните подгонку внутреннего диаметра втулки до размера, равного сумме наружного диаметра стальной втулки и установленного зазора $0,15 \div 0,20$ мм. Данную операцию нужно выполнять на токарном станке: зажмите цилиндрическую сторону толкателя (со стороны стопорного кольца) в самоцентрирующемся патроне и произведите правку тефлоновой втулки с обеих сторон, снимая по 0,2 мм с каждой стороны, чтобы обеспечить пространство для осевого расширения тефлоновой втулки.

7.6. Стержни

Стержни нужно всегда заменять.

Для того чтобы снять стержень, заблокируйте его тисками в горизонтальном положении и резиновым молотком производите удары в направлении снятия по седлу в случае всасывающих сёдел или по шпильке в случае нагнетательных сёдел. Для того чтобы вставить новый стержень, забивайте его стальным молотком в отверстие до упора.

7.7. Повторно используемые компоненты

После чистки проверьте надлежащее состояние повторно используемых компонентов (колпачка, стопорного кольца, пружины подъема толкателя, подъемной прокладки, упорной шайбы, гильз).

8. СБОРКА КЛАПАНА

Промойте контрседло перед тем, как вставлять пружины в соответствующие пазы.

Конические спиральные пружины нужно вставлять в гнездо стороной с большим диаметром (Рисунок 12).

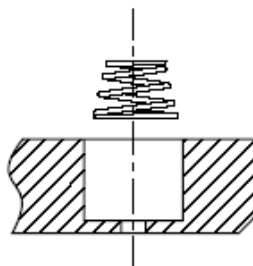


Рисунок 12

На Рисунок 13, Рисунок 14, Рисунок 15 показано схематическое изображение сборки в случае, если пружина имеет направляющие колпачки или подпружинные шайбы.

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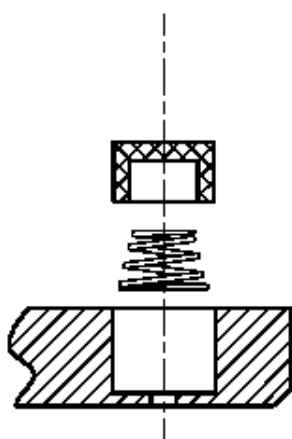


Рисунок 13

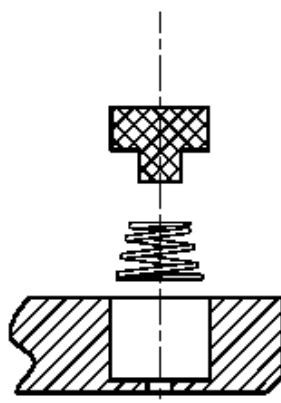


Рисунок 14

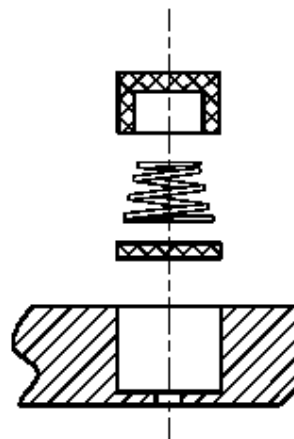


Рисунок 15

Направляющий колпачок пружины

Пружина

Шайба под пружину

Гнездо пружины в контрседле

Если клапан не имеет направляющих колпачков, пружины нужно зафиксировать в гнезде с помощью небольшого металлического штока с закругленным концом, диаметр которого должен быть больше внутреннего диаметра пружины и меньше диаметра паза, в который помещается пружина.

Для того чтобы заблокировать пружину достаточно задвинуть ее в паз штоком, слегка поворачивая его против часовой стрелки и следя за тем, чтобы пружина была выровнена по оси в пазе (см. Рисунок 16).



Рисунок 16

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Снова промойте седло и толкатель, проверьте размеры седла, затем соберите обратно клапан, устанавливая различные компоненты в правильном порядке. В частности, если клапан имеет стальные пластины и контрпластины, обратите внимание на их правильное расположение в соответствии с прилагаемой схемой.

Затяните стопорную гайку динамометрическим ключом, соблюдая моменты затяжки, указанные в таблице 1. если иное не указано в чертеже ссылка клапана.

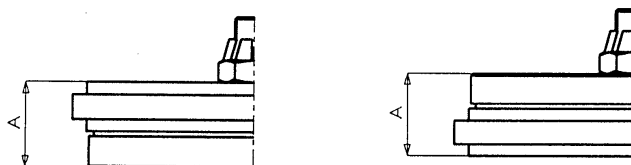
В случае применения самоконтрящейся гайки шпильку нужно всегда смазывать перед тем, как затягивать гайку. Если же используется гайка с шайбами Nord-Lock®, шпильку смазывать не нужно.

Запрещено применять масло или смазку для клапанов, используемых на кислородных компрессорах.

Резьба	Момент значения для каждого вида самозамыкающимся шайбами в использовании. (Рис. 5)	Моменты значения для nutg 8,8 классов (Рис. 6)	Момент затяжки гайки с шайбами Nord-Lock® (Рис. 7)
M 6	10 Н·м	10 Н·м	--
M 8	19 Н·м	25 Н·м	19 Н·м
M 10	25 Н·м	50 Н·м	40 Н·м
M 10 x 1	35 Н·м	35 Н·м	40 Н·м
M 12 x 1,5	45 Н·м	70 Н·м	90 Н·м
M 12	50 Н·м	85 Н·м	90 Н·м
M 14 x 1,5	80 Н·м	95 Н·м	120 Н·м
M 16	130 Н·м	205 Н·м	--
M 16 x 1,5	110 Н·м	150 Н·м	190 Н·м
M 20 x 1,5	215 Н·м	240 Н·м	300 Н·м
M 24 x 1,5	370 Н·м	--	425 Н·м
M 30 x 1,5	720 Н·м	--	715 Н·м

Таблица 1

Когда клапан будет собран, проверьте штангенинструментом равномерность указанного на Рисунок 17 и Рисунок 18 размера А по всей внешней окружности клапана. В противном случае разберите клапан и проверьте, правильно ли вставлены стержни в отверстия седла и контрседла.



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Рисунок 17

Рисунок 18

Проверьте свободное движение пластины или колец, нажав на них в сторону контрседла через участки прохода газа в седле с помощью подходящего инструмента, не способного повредить пластину или кольца.

Примечание. В случае применения в кислородных компрессорах, в клапане не должно быть никакого масла или смазки. Снова проверьте клапан перед тем, как устанавливать. Неправильное выполнение данной процедуры может вызвать взрыв.

9. ЗАЩИТА

В случае хранения клапанов на складе перед началом использования, их нужно защитить антикоррозионным маслом, если они сделаны не из нержавеющей стали. Запрещено смазывать маслом или консистентной смазкой клапаны для компрессоров, предназначенных для кислорода или других опасных газов. В этом случае рекомендуется строго соблюдать инструкции по эксплуатации и технике безопасности производителя компрессора.

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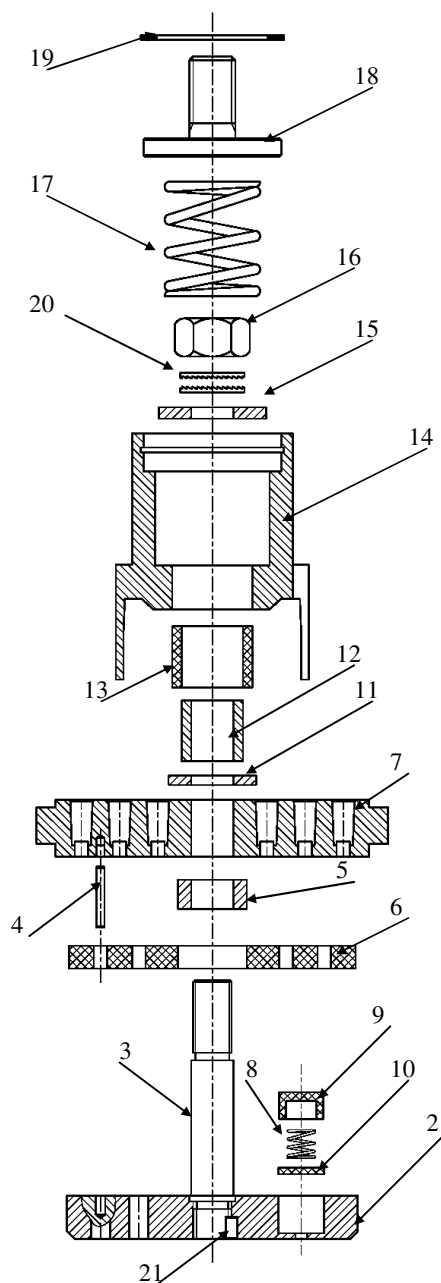
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Стр. 102
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10.СБОРОЧНЫЙ ЧЕРТЕЖ ВСАСЫВАЮЩИХ КЛАПАНОВ С ПЛАСТИНОЙ ИЗ ПЭЭК, НАПРАВЛЯЮЩИМИ КОЛПАЧКАМИ ПРУЖИН И ТОЛКАТЕЛЕМ КЛАПАНА

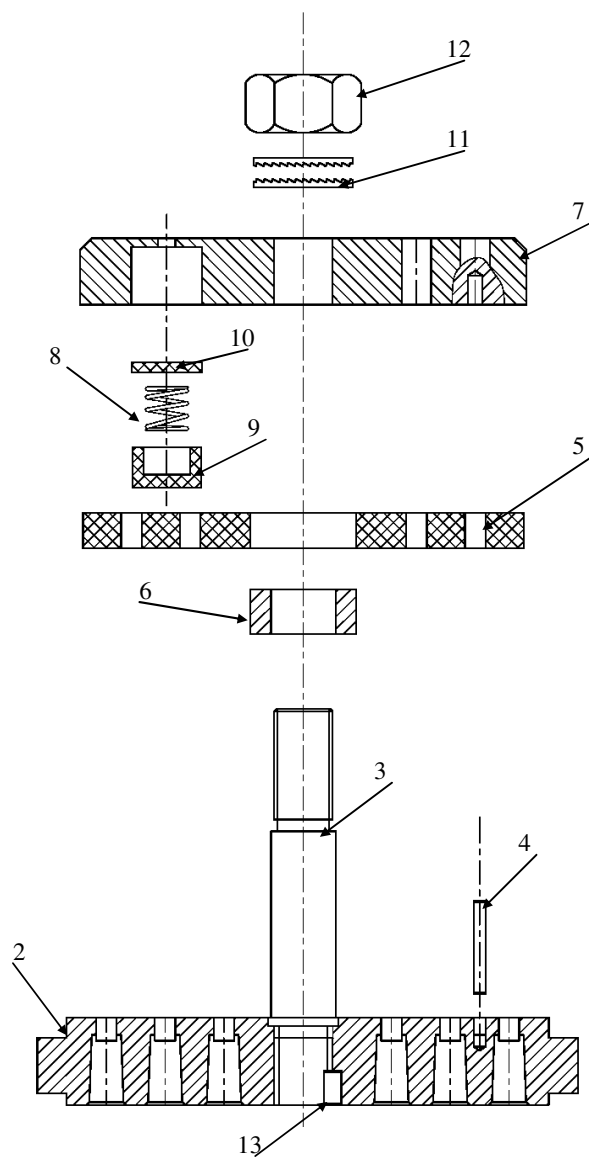


21	СТОПОРНЫЙ СТЕРЖЕНЬ	7.4
20	ШАЙБЫ NORD-LOCK®	7.1
19	СТОПОРНОЕ КОЛЬЦО	7.7
18	КРЫШКА ТОЛКАТЕЛЯ КЛАПАНА	7.7
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14	ТОЛКАТЕЛЬ КЛАПАНА	7.2
13	ПЛАСТМАССОВАЯ ГИЛЬЗА	7.5
12	МЕТАЛЛИЧЕСКАЯ ГИЛЬЗА	7.5
11	ШАЙБА	7.7
10	ШАЙБА ПОД ПРУЖИНУ	7.1, 8
9	НАПРАВЛЯЮЩИЙ КОЛПАЧОК ПРУЖИНЫ	7.1, 8
8	РАБОЧАЯ ПРУЖИНА	7.1, 8
7	СЕДЛО	7.2
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5	ПОДЪЕМНАЯ ПРОКЛАДКА	7.7
4	СТЕРЖЕНЬ	7.6
3	ШПИЛЬКА	7.4
2	КОНТРСЕДЛО	7.3
1	КОНТРСЕДЛО СО ШПИЛЬКОЙ	
№	ОПИСАНИЕ	ГЛАВА, В КОТОРОЙ ОПИСЫВАЕТСЯ

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11.СБОРОЧНЫЙ ЧЕРТЕЖ НАГНЕТАТЕЛЬНЫХ КЛАПАНОВ С ПЛАСТИНОЙ ИЗ ПЭЭК И НАПРАВЛЯЮЩИМИ КОЛПАЧКАМИ ПРУЖИНЫ

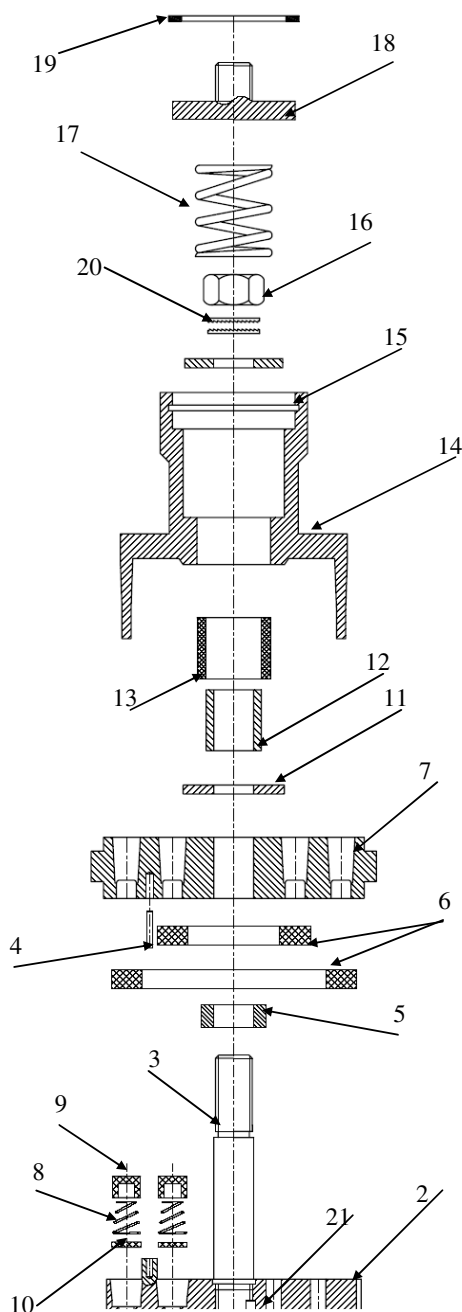


13	СТОПОРНЫЙ СТЕРЖЕНЬ	7.4
12	ГАЙКА	7.1
11	ШАЙБА NORD-LOCK®	7.1
10	ШАЙБА ПОД ПРУЖИНУ	7.1, 8
9	НАПРАВЛЯЮЩИЙ КОЛПАЧОК ПРУЖИНЫ	7.1, 8
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3	ШПИЛЬКА	7.4
2	СЕДЛО	7.2
1	СЕДЛО СО ШПИЛЬКОЙ	
№	ОПИСАНИЕ	ГЛАВА, В КОТОРОЙ ОПИСЫВАЕТСЯ

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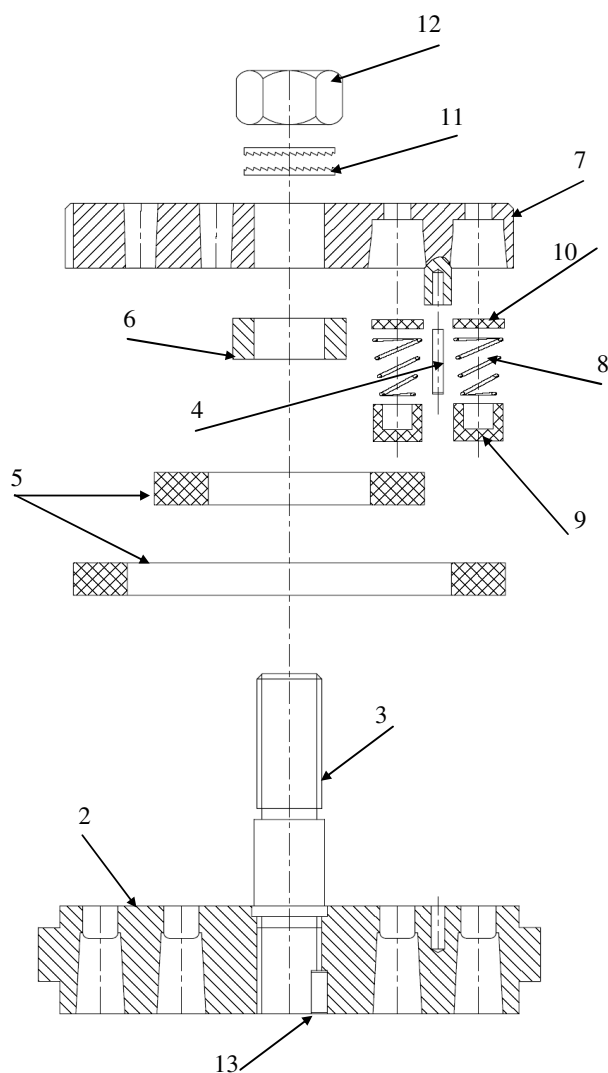


21	СТОПОРНЫЙ СТЕРЖЕНЬ	7.4
20	ШАЙБЫ NORD-LOCK®	7.1
19	СТОПОРНОЕ КОЛЬЦО	7.7
18	КРЫШКА ТОЛКАТЕЛЯ КЛАПАНА	7.7
17	ПРУЖИНА ТОЛКАТЕЛЯ КЛАПАНА	7.7
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14	ТОЛКАТЕЛЬ КЛАПАНА	7.2
13	ПЛАСТМАССОВАЯ ГИЛЬЗА	7.5
12	МЕТАЛЛИЧЕСКАЯ ГИЛЬЗА	7.5
11	ШАЙБА	7.7
10	ШАЙБА ПОД ПРУЖИНУ	7.1, 8
9	НАПРАВЛЯЮЩИЙ КОЛПАЧОК ПРУЖИНЫ	7.1, 8
8	РАБОЧАЯ ПРУЖИНА	7.1, 8
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6	КОЛЬЦО	7.1
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4	СТЕРЖЕНЬ	7.6
3	ШПИЛЬКА	7.4
2	КОНТРСЕДЛО	7.3
1	КОНТРСЕДЛО СО ШПИЛЬКОЙ	
№	ОПИСАНИЕ	ГЛАВА, В КОТОРОЙ ОПИСЫВАЕТСЯ

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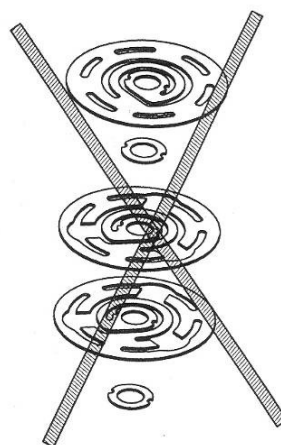
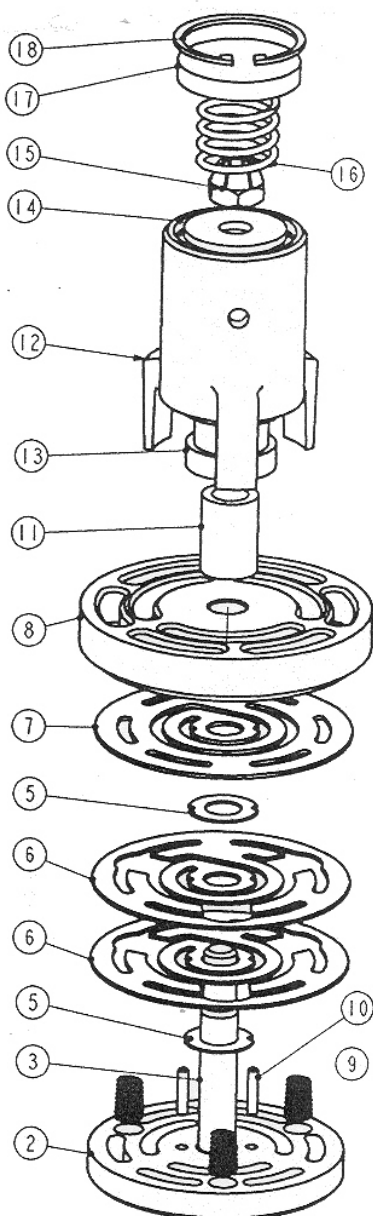


13	СТОПОРНЫЙ СТЕРЖЕНЬ	7.4
12	ГАЙКА	7.1
11	ШАЙБА NORD-LOCK®	7.1
10	ШАЙБА ПОД ПРУЖИНУ	7.1, 8
9	НАПРАВЛЯЮЩИЙ КОЛПАЧОК ПРУЖИНЫ	7.1, 8
8	РАБОЧАЯ ПРУЖИНА	7.1, 8
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6	ПОДЪЕМНАЯ ПРОКЛАДКА	7.7
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4	СТЕРЖЕНЬ	7.6
3	ШПИЛЬКА	7.4
2	СЕДЛО	7.2
1	СЕДЛО СО ШПИЛЬКОЙ	
№	ОПИСАНИЕ	ГЛАВА, В КОТОРОЙ ОПИСЫВАЕТСЯ

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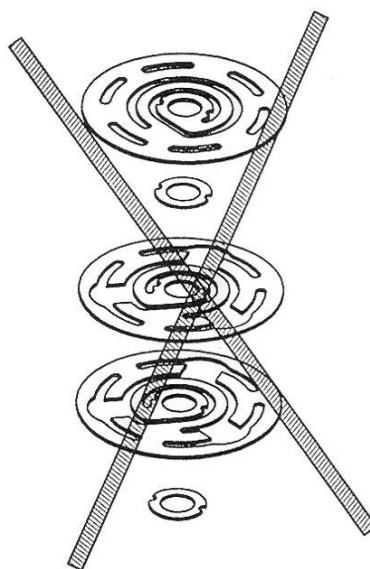
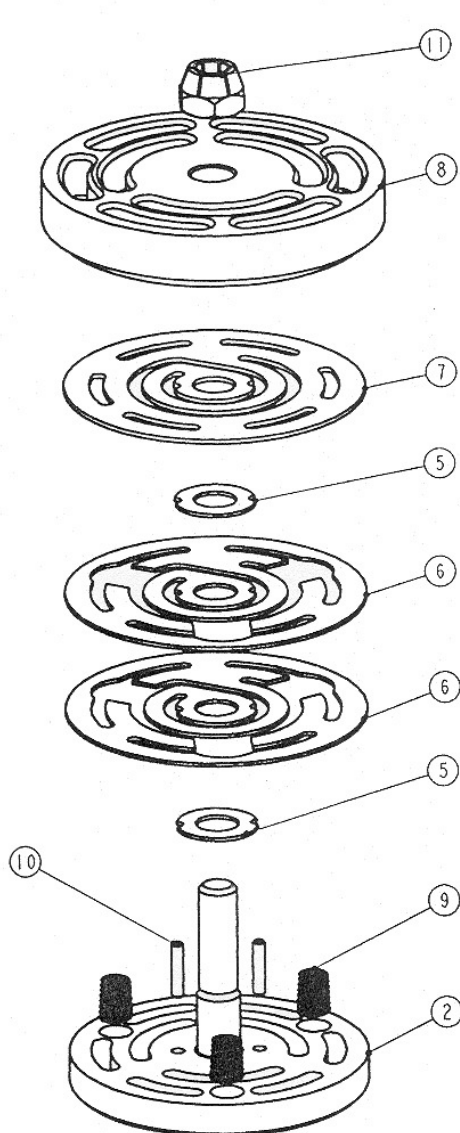


18	СТОПОРНОЕ КОЛЬЦО	7.7
17	КРЫШКА ТОЛКАТЕЛЯ КЛАПАНА	7.7
16	ПРУЖИНА ТОЛКАТЕЛЯ КЛАПАНА	7.7
15	ГАЙКА	7.1
14	ШАЙБА	7.7
13	ПЛАСТМАССОВАЯ ГИЛЬЗА	7.5
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11	МЕТАЛЛИЧЕСКАЯ ГИЛЬЗА	7.5
10	СТЕРЖЕНЬ	7.6
9	РАБОЧАЯ ПРУЖИНА	7.1, 8
8	СЕДЛО	7.2
7	ПЛАСТИНА	7.1
6	КОНТРПЛАСТИНА	7.1
5	ПОДЪЕМНАЯ ПРОКЛАДКА	7.7
4	СТЕРЖЕНЬ	7.6
3	ШПИЛЬКА	7.4
2	КОНТРСЕДЛО	7.3
1	КОНТРСЕДЛО СО ШПИЛЬКОЙ	
№	ОПИСАНИЕ	ГЛАВА, В КОТОРОЙ ОПИСЫВАЕТСЯ

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11	ГАЙКА	7.1
10	СТЕРЖЕНЬ	7.6
9	РАБОЧАЯ ПРУЖИНА	7.1, 8
8	СЕДЛО	7.2
7	ПЛАСТИНА	7.1
6	КОНТРПЛАСТИНА	7.1
5	ПОДЪЕМНАЯ ПРОКЛАДКА	7.7
4	СТЕРЖЕНЬ	7.6
3	ШПИЛЬКА	7.4
2	КОНТРСЕДЛО	7.3
1	КОНТРСЕДЛО СО ШПИЛЬКОЙ	
№	ОПИСАНИЕ	ГЛАВА, В КОТОРОЙ ОПИСЫВАЕТСЯ

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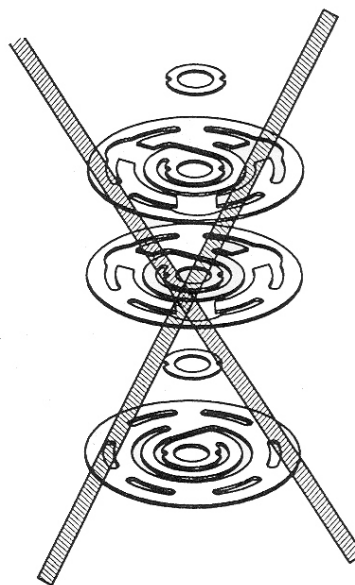
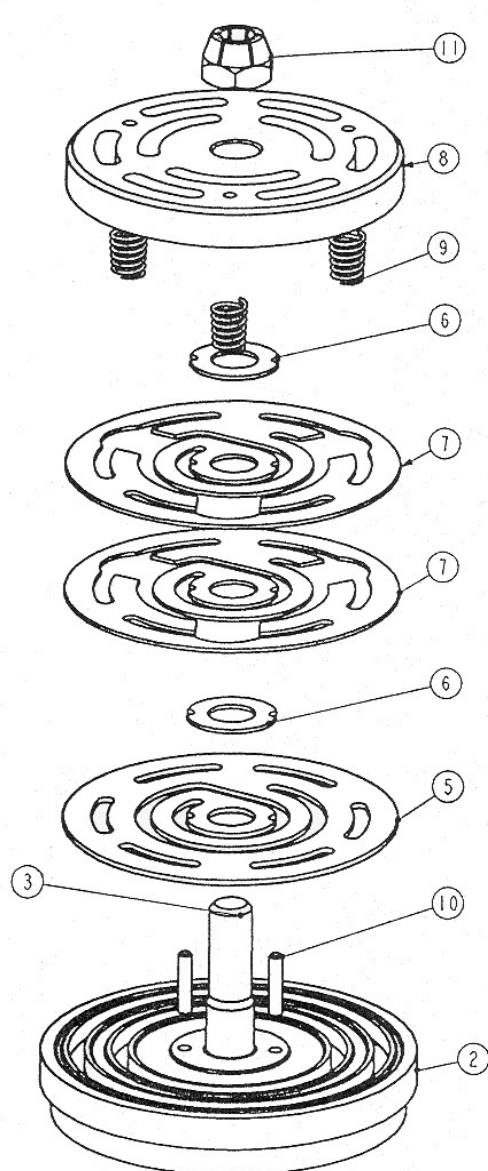
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16.СБОРОЧНЫЙ ЧЕРТЕЖ НАГНЕТАТЕЛЬНЫХ КЛАПАНОВ СО СТАЛЬНОЙ ПЛАСТИНОЙ

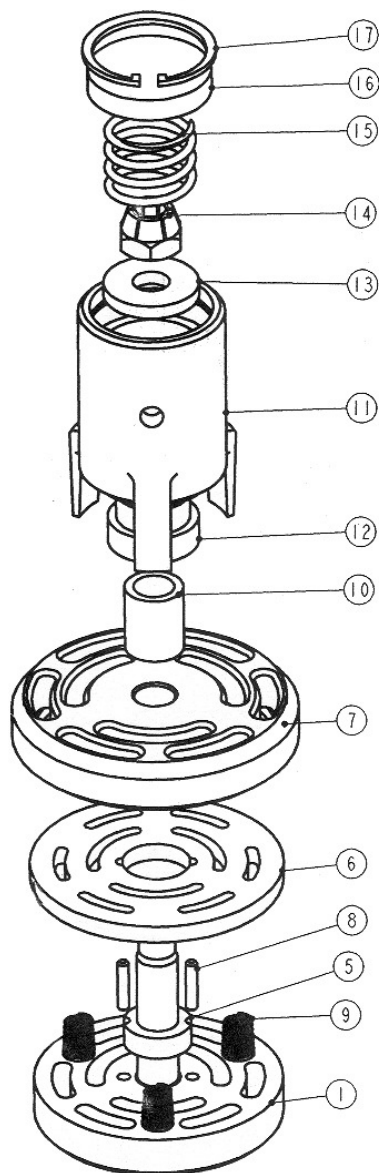


11	ГАЙКА	7.1
10	СТЕРЖЕНЬ	7.6
9	РАБОЧАЯ ПРУЖИНА	7.1, 8
8	КОНТРСЕДЛО	7.3
7	КОНТРПЛАСТИНА	7.1
6	ПОДЪЕМНАЯ ПРОКЛАДКА	7.7
5	ПЛАСТИНА	7.1
4	СТЕРЖЕНЬ	7.6
3	ШПИЛЬКА	7.4
2	СЕДЛО	7.2
1	СЕДЛО СО ШПИЛЬКОЙ	
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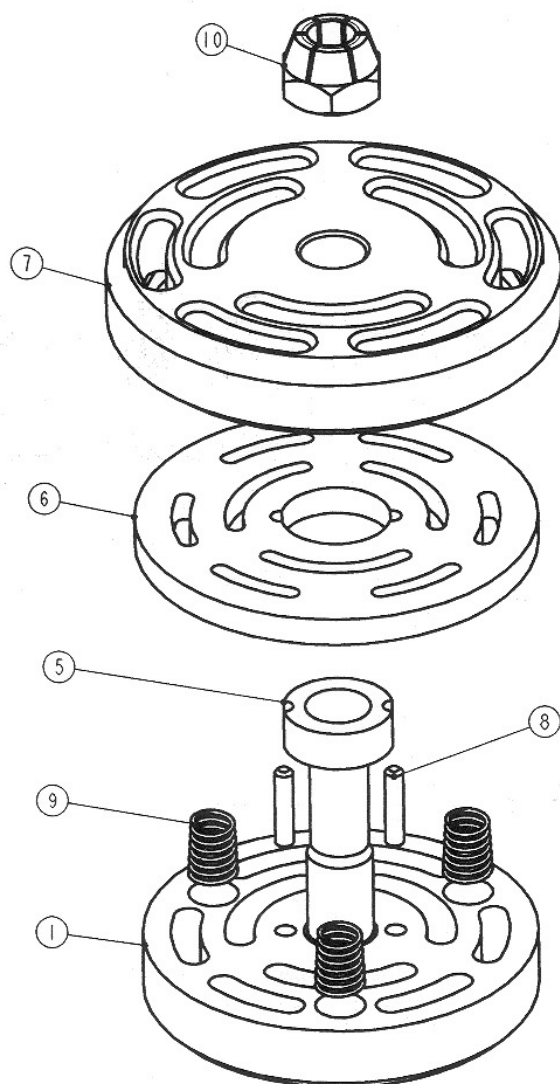


17	СТОПОРНОЕ КОЛЬЦО	7.7
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15	ПРУЖИНА ТОЛКАТЕЛЯ КЛАПАНА	7.7
14	ГАЙКА	7.1
13	ШАЙБА	7.7
12	ПЛАСТМАССОВАЯ ГИЛЬЗА	7.5
11	ТОЛКАТЕЛЬ КЛАПАНА	7.2
10	МЕТАЛЛИЧЕСКАЯ ГИЛЬЗА	7.5
9	РАБОЧАЯ ПРУЖИНА	7.1, 8
8	СТЕРЖЕНЬ	7.6
7	СЕДЛО	7.2
6	ПЛАСТИНА	7.1
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2	КОНТРСЕДЛО	7.3
1	КОНТРСЕДЛО СО ШПИЛЬКОЙ	
№	ОПИСАНИЕ	ГЛАВА, В КОТОРОЙ ОПИСЫВАЕТСЯ

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10	ГАЙКА	7.1
9	РАБОЧАЯ ПРУЖИНА	7.1, 8
8	СТЕРЖЕНЬ	7.6
7	СЕДЛО	7.2
6	ПЛАСТИНА	7.1
5	ПОДЪЕМНАЯ ПРОКЛАДКА	7.7
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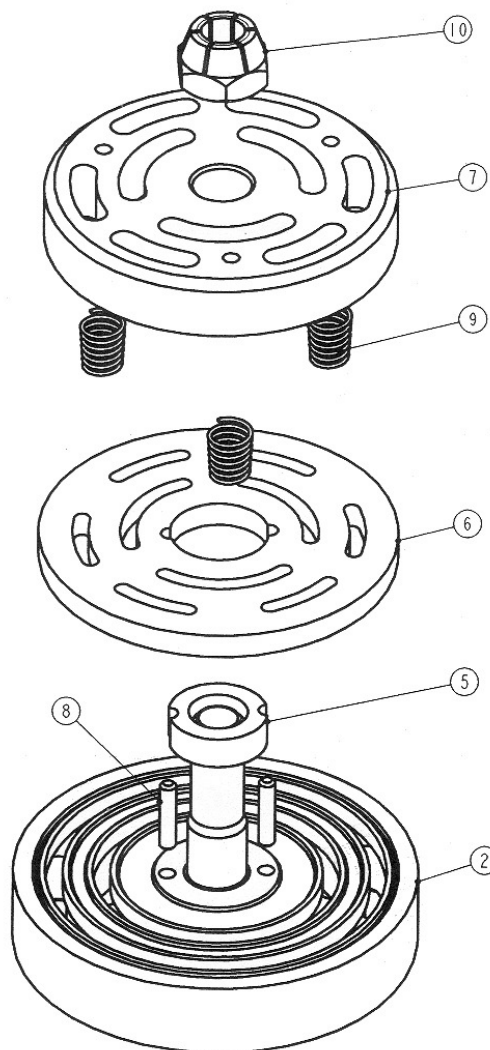
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19.СБОРОЧНЫЙ ЧЕРТЕЖ НАГНЕТАТЕЛЬНЫХ КЛАПАНОВ С ПЛАСТМАССОВОЙ ПЛАСТИНОЙ



10	ГАЙКА	7.1
9	РАБОЧАЯ ПРУЖИНА	7.1, 8
8	СТЕРЖЕНЬ	7.6
7	КОНТРСЕДЛО	7.3
6	ПЛАСТИНА	7.1
5	ПОДЪЕМНАЯ ПРОКЛАДКА	7.7
4	СТЕРЖЕНЬ	7.6
3	ШПИЛЬКА	7.4
2	СЕДЛО	7.2
1	СЕДЛО СО ШПИЛЬКОЙ	
№	ОПИСАНИЕ	ГЛАВА, В КОТОРОЙ ОПИСЫВАЕТСЯ

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压缩机气阀

1996 年通过 ISO9001 国际质量认证体系

图
母

气阀维修指导手册

注意：本资料翻译尽量遵循行业术语，如有疑问，以意大利语为准

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1. 目的

这一手册的目的是帮助和辅助操作人员来维修往复式压缩机上使用的吸入阀和排气阀。

2. 气阀维修周期

气阀的维修周期由压缩机运行的周期来决定。我们建议遵循压缩机制造商提供的使用说明。

3. 用于气阀维修的设备和工具

- 安装有老虎钳的工作台和自动对准中心的卡盘，用来安装和拆卸气阀
- 扭矩扳手和各种大小的套筒来固定气阀螺母
- 金属零部件的清洗机器
- 车床
- 球墨铸铁的研磨板

4. 从压缩机上拆卸气阀

当从压缩机货者管道上拆卸气阀时，一定要小心谨慎的遵循压缩机制造商提供的操作和安全说明。

5. 气阀的分解

如果没有可使用的卡盘，可以用带 2 个销子的老虎钳来固定气阀（图 1），销子的一端被固定在老虎钳上，另一端被插进吸气阀阀盖或排气阀阀座的槽缝里，从而避免旋松螺母是气阀转动。不要直接在老虎钳上上固定气阀（图 3 和图 4）。

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图 1



图 2

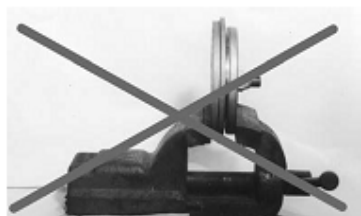


图 3



图 4

如果需要拧松气阀螺母，必要时可以使用适当的工具来辅助。绝对禁止通过物体来敲打扳手从而旋松螺母。当拧松或拧紧螺母时，握住排气阀阀座或吸气阀阀盖，以防止固定气阀的销子变弯曲（图 2）。

6. 零件的清洁

把弹簧从阀盖上拉下来，把销子从阀盖或阀座上拔下来。用适当的清洗剂仔细清洁所有气阀内部零件（除弹簧、阀片、阀环、弹簧帽、弹簧垫片以外）。

用热水或去污剂清洁零部件。

如果需要深度清洁，请注意：不要用金属制的刷子或硬的工具或带有利刃的工具来清洁阀座密封表面和阀片。

7. 修复或更换损坏零部件

检查每个气阀和卸载器零部件的磨损情况。

用柯赞尼自己的备用零部件来替换所有不能修复的零部件，具体如下：

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7.1. 弹簧、垫片、固定螺母、弹簧帽、弹簧垫片

在每次有计划地气阀维修中，气阀的弹簧、阀片或环、减震片、弹簧帽和弹簧垫片都必须换掉。

在每次的大修中，任何形式的固定螺母（图 5 中的自锁螺母或者图 6 中的非自锁型螺母）一定要被换掉。如果被换掉的螺母带有闹得牢垫圈（图 7），那么闹得牢垫圈也一定要被换掉。

如果气阀用于氧气环境下，清除闹得牢垫圈之间的胶。

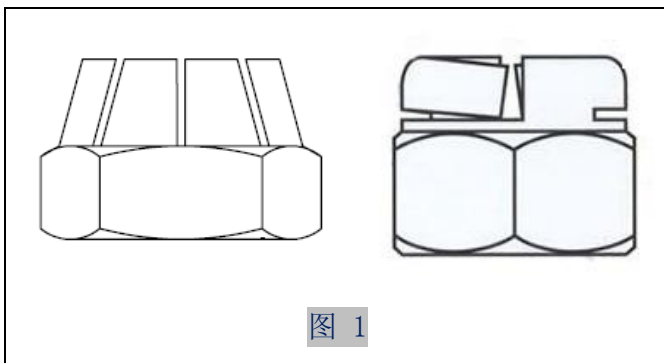


图 1

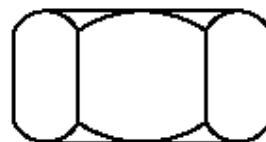


图 2

闹得牢垫圈应成对的装配，而且应是有凸起的面相对。两圈之间的距离应大于螺钉上的螺距。带有放射状齿纹的面必须与螺母和阀盖或阀座相接触，就如图 8 所示。

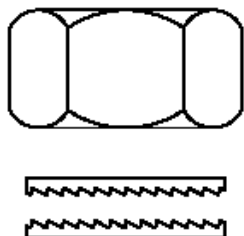


图 7

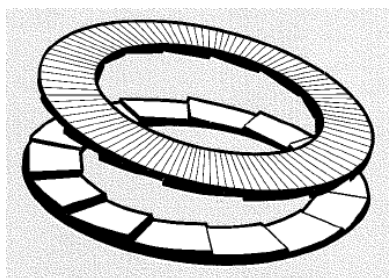


图 8

如果由于不正常的运转引起阀片或减震片过早的损坏或有深度伤口，一定要

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在既定的维修时间前换掉损坏的零部件。

7.2. 阀座

修复标准平面的密封表面，要用适当的平面球墨铸铁占上硅碳润滑膏来手动研磨，并且用热水或去污剂清洁。

如果密封表面损坏严重而不能通过研磨修复，就应该用机械研磨。

端面的车削就是每一刀都削去很小一部分，而车削系数是为了保证很好的表面加工。当表面的修复达到要求的水平时，由车削端面而制造出的尖锐冷棱角应该被去除。用车床或好的纱布来倒角。

经过这样一系列的操作后，如果车削的部分超过 0.3mm，有必要对密封表面的潜凹槽部分用成型车刀来车。

阀座表面和铣槽底部之间的最小厚度不得少于 2mm，如图 8 所示。

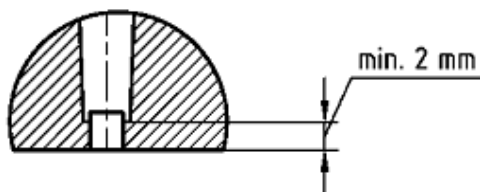
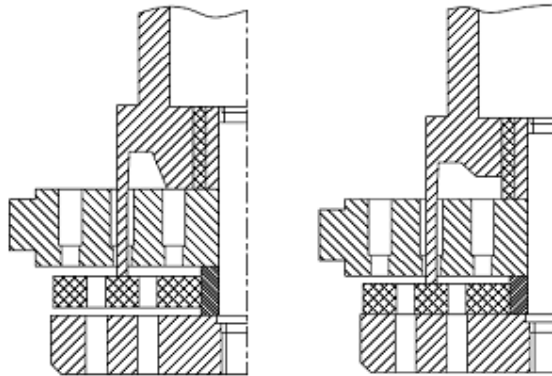


图 9

经过这个操作，用球墨铸铁来手工研磨阀座，如上文所提到的一样。

一旦销子被放回原处，要确认它们不影响气阀的正确安装，另外，如果销子松动了，就加深销孔。

带有卸载器的吸气阀，爪可以接触阀座表面，但是阀片和阀盖是不接触的（案例 1）或者阀片被阀盖所阻止，不能运动（案例 2）。



案例 1

案例 2

案例 1:

如果因为修复而使阀座的加工量多于 0.2mm, 那么卸载器的爪也必须精确的减少和阀座一样的加工量。在这种情况下, 一旦要重新安装被削减的卸载器的爪, 有必要检查一下, 卸载器的盖不能接触到螺杆, 否则就要削减螺杆的厚度, 和阀座减少的一样。

案例 2:

一般情况下, 卸载器的爪不被换掉。

检查卸载器的爪在垫片撞击位置的异常磨损情况, 在这种情况下, 换掉爪。

7.3. 阀盖

检查弹簧槽和阀片导轨存在的过度磨损情况, 如果损坏过大就换掉阀盖。

7.4. 螺杆

目测检查有螺纹部分和没有螺纹部分的完整性 (图 9), 以及各个部件的完美固定。检查螺杆平滑部分磨损, 看看在阀座与阀盖之间有没有过大的缝隙。

如果螺杆螺纹破坏了, 按照下列要求换掉它们:

- 1) 用比销稍大一点的钻头完全钻掉原销孔里的定位销 (图 10)。
- 2) 用老虎钳固定住螺杆, 旋转阀座, 把螺杆卸下来。

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- 3) 装上新螺杆，用足够的载荷拧紧。
- 4) 车掉螺杆在另一端凸出来的部分。注意 f9 公差。
- 5) 钻新定位孔，和原孔相差至少 90 度，用和销子同样直径的钻头。孔深必须比销长至少 1mm，且其截面必须一般在螺杆里，一般在阀座里。
- 6) 销子必须整个插入孔中，必须用一个合适的冲头冲一下以铆住孔口。



图 10



图 11

7.5. 卸载器衬套的更换（指针对吸入阀）

PEEK 衬套：在每次的大修中，卸载器的 PEEK 衬套都必须被换掉。

钢衬套：在大修过程中，如果金属衬套没被损坏，就不需要换掉它。

特氟纶和钢衬套：如果衬套是特氟纶材质的，有两种异常情况会发生：1) 衬套滑出了卸载器的爪；2) 衬套直径被损坏，与钢衬套之间的缝隙大于 0.3mm。

在这种情况下，按照以下要求换掉特氟纶衬套：

- 1) 手动移走旧的衬套。
- 2) 用适当工具推新的衬套进入卸载器。
- 3) 衬套内径加工到得尺寸，应比钢衬套的外径大 0.15—0.20mm，这操作在车床上进行，用卡盘夹住爪的圆柱部分，车特氟纶衬套的端面，两端各车 0.2mm，使特氟纶衬套有轴向膨胀的空间。

7.6. 销子

气阀的销子应该经常换。

取销子，用老虎钳水平的固定住它，用橡胶锤帮忙，如果是吸气阀座，就敲



击阀座；如果是排气阀座，就敲击螺杆。为了嵌入新的销子，用一个钢锤敲击它，直到它达到销孔的底部。

7.7. 可再用得零部件

清洁后，检查情况较好的可再用得零部件（阀盖、内部卡簧）、卸载器弹簧、定距垫圈、垫片和衬套。

8. 气阀的组装

在把弹簧嵌入弹簧槽之前，清洁阀盖。

锥形弹簧直径大的一头应该被嵌入弹簧槽里（图 11）。

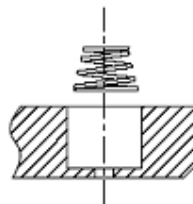


图 12

图 12、图 13 和图 14 展示了弹簧帽和弹簧垫片的安装图解。

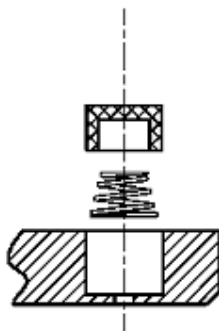


图 13

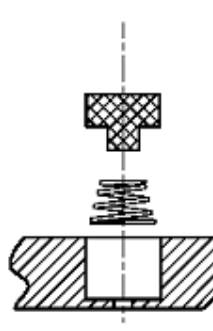


图 14

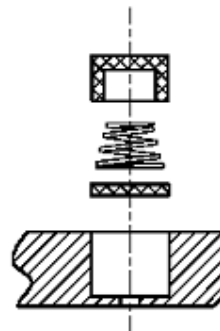


图 15

如果气阀没有弹簧帽，要用一个略大于弹簧内部直径但略小于弹簧槽直径圆头金属杆来把弹簧固定在它槽里。

固定弹簧，如果比必要就用金属杆轻轻地逆时针旋转把弹簧压进槽里，来保

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证弹簧直直的嵌入它的槽里（图 15）。



图 16

再次清洁阀座和卸载器，并检查阀座尺寸后，通过正确的方法来组装各种零部件，从而组装成气阀。如果气阀带有金属阀片和减震片，应特别注意他们的位置，根据后面文章中的组装图。

用扭矩扳手来拧紧固定螺母，要根据固定气阀说明表 1 来操作，如图纸中另有说明则除外。

如果用固定螺母，在拧紧螺母前，螺杆必须经过润滑。如果带有闹得牢垫圈的螺母，螺杆不需要被润滑。

用于氧气压缩机的气阀，不得用油或润滑剂润滑。

螺纹	紧固现有的任何自锁型螺母 力矩	紧固 8.8 级螺母力矩 (图 6)	紧固装有 Nord-Lock® 垫 片的力矩
M 6	10 N m	10 N m	--
M 8	19 N m	25 N m	19 N m
M 10	25 N m	50 N m	40 N m
M 10 x 1	35 N m	35 N m	40 N m
M 12 x 1,5	45 N m	70 N m	90 N m
M 12	50 N m	85 N m	90 N m
M 14 x 1,5	80 N m	95 N m	120 N m
M 16	130 N m	205 N m	--
M 16 x 1,5	110 N m	150 N m	190 N m
M 20 x 1,5	215 N m	240 N m	300 N m
M 24 x 1,5	370 N m	--	425 N m
M 30 x 1,5	720 N m	--	715 N m

表 1

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一旦气阀组装完毕，要用一个卡尺来检查，如图 16 和图 17 所示。否则，就要拆开气阀，检查销子是否被正确的嵌入销孔里，销子既要在阀座里又要在阀盖里。



图 17

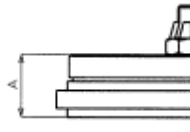


图 18

检查阀片和弹簧的自由移动情况。用一个适当的工具，这个工具不能破坏到阀片，穿过阀座的气孔，向着阀盖的方向按压它们。

注意：用于氧气压缩机的气阀，要没有任何诱惑润滑油存在！安装之前要再次检查气阀。如果没有做好这一工作，可能会引起爆炸！

9. 气阀的保存

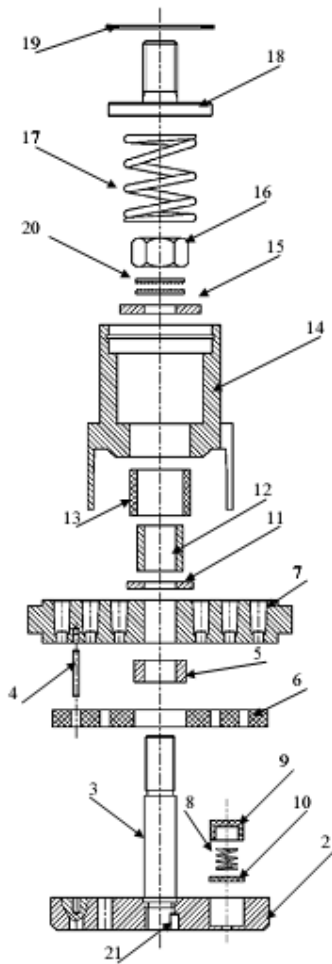
如果存储的气阀不是不锈钢的，在被使用之前一定要涂上防锈油来防止生锈。用于氧气或者其他危险气体的压缩机气阀，一定不能用油或润滑剂。为了达到这个目的，我公司强烈的建议要遵循压缩机制造商提供的安全和操作说明。

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图
母

10. 有 peek 阀片、弹簧帽和卸载执行器的吸入阀的组装图

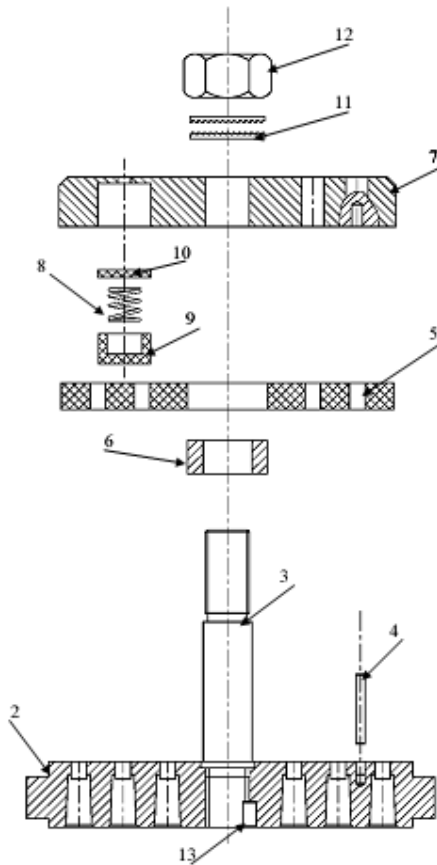


21	定位销	7. 4
20	闹得牢垫圈	7. 1
19	内部卡簧	7. 7
18	卸载器盖子	7. 7
17	卸载器弹簧	7. 7
16	螺母	7. 1
15	垫片	7. 7
14	卸载器（爪）	7. 2
13	塑料衬套	7. 5
12	金属衬套	7. 5
11	垫片	7. 7
10	弹簧垫片	7. 1, 8
9	弹簧帽	7. 1, 8
8	弹簧	7. 1, 8
7	阀座	7. 2
6	阀片	7. 1
5	定距垫圈	7. 7
4	销子	7. 6
3	螺杆	7. 4
2	阀盖	7. 3
1	带有螺杆的阀盖	
参数	描述	参考段落

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11. 有 peek 阀片、弹簧帽的排气阀的组装图



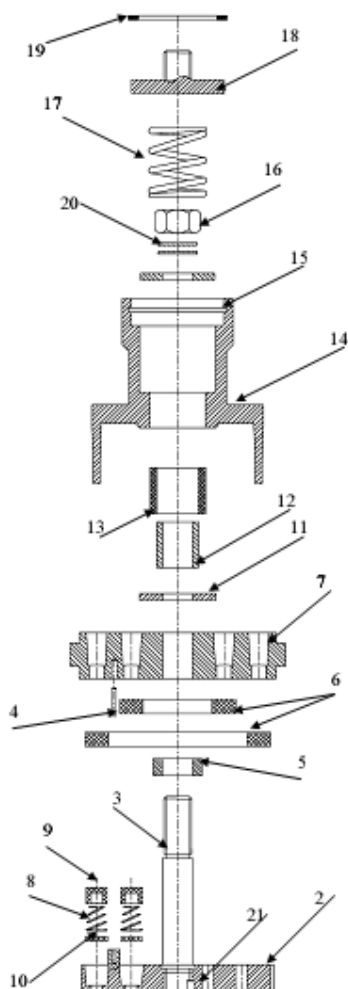
13	定位销	7. 4
12	螺母	7. 1
11	闹得牢垫圈	7. 1
10	弹簧垫片	7. 1, 8
9	弹簧帽	7. 1, 8
8	弹簧	7. 1, 8
7	阀盖	7. 3
6	定距垫圈	7. 7
5	阀片	7. 1
4	销子	7. 6
3	螺杆	7. 4
2	阀座	7. 2
1	带有螺杆的阀座	
参数	描述	参考段落

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图
号

12. 有 peek 阀环、弹簧帽和卸载执行器的吸入阀的组装图

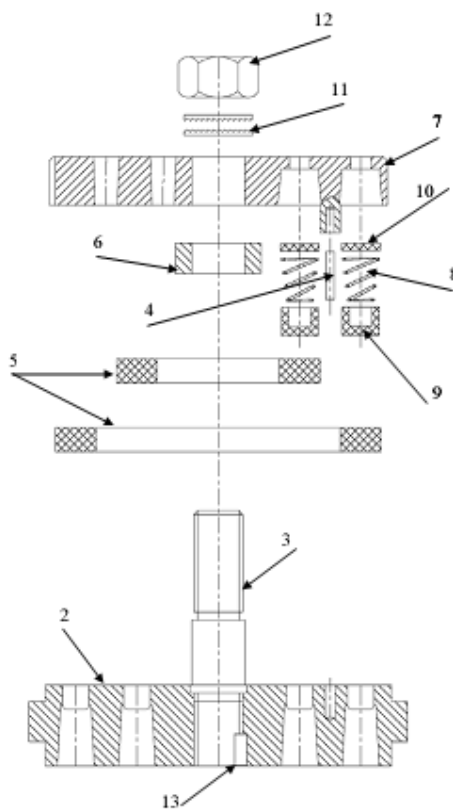


21	定位销	7.4
20	闹得牢垫圈	7.1
19	内部卡簧	7.7
18	卸载器盖子	7.7
17	卸载器弹簧	7.7
16	螺母	7.1
15	垫片	7.7
14	卸载器（爪）	7.2
13	塑料衬套	7.5
12	金属衬套	7.5
11	垫片	7.7
10	弹簧垫片	7.1, 8
9	弹簧帽	7.1, 8
8	弹簧	7.1, 8
7	阀座	7.2
6	阀环	7.1
5	定距垫圈	7.7
4	销子	7.6
3	螺杆	7.4
2	阀盖	7.3
1	带有螺杆的阀盖	
参数	描述	参考段落

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13. 有 peek 阀环、弹簧帽的排气阀的组装图

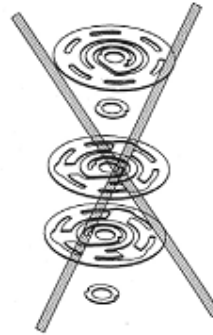
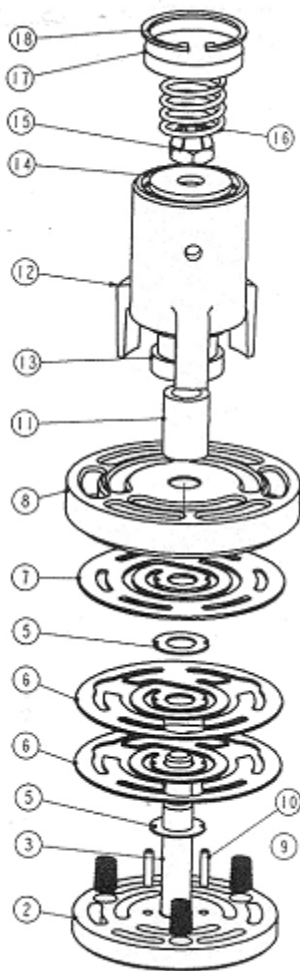


13	定位销	7.4
12	螺母	7.1
11	闹得牢垫圈	7.1
10	弹簧垫片	7.1, 8
9	弹簧帽	7.1, 8
8	弹簧	7.1, 8
7	阀盖	7.3
6	定距垫圈	7.7
5	阀环	7.1
4	销子	7.6
3	螺杆	7.4
2	阀座	7.2
1	带有螺杆的阀座	
参数	描述	参考段落

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14. 有金属阀片和卸载执行器的吸入阀的组装图

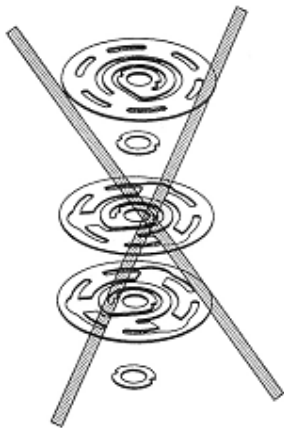
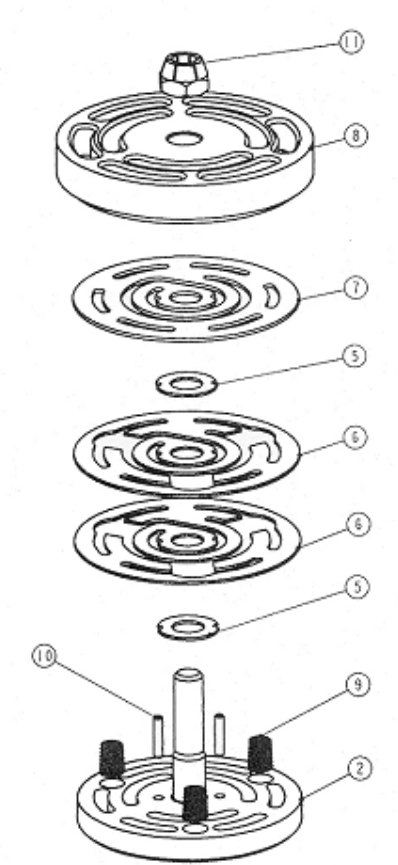


18	内部卡簧	7.7
17	卸载器盖子	7.7
16	卸载器弹簧	7.7
15	螺母	7.1
14	垫片	7.7
13	塑料衬套	7.5
12	卸载器	7.2
11	金属衬套	7.5
10	销子	7.6
9	弹簧	7.1, 8
8	阀座	7.2
7	阀片	7.1
6	减震片	7.1
5	定距垫片	7.7
4	销子	7.6
3	螺杆	7.4
2	阀盖	7.3
1	带有螺杆的阀盖	
参数	描述	参考段落

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15. 有金属阀片的吸入阀的组装图

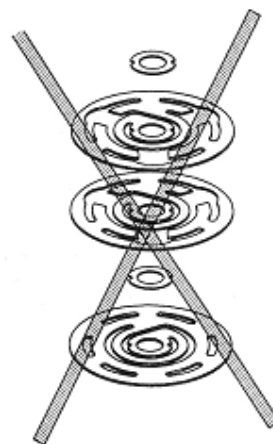
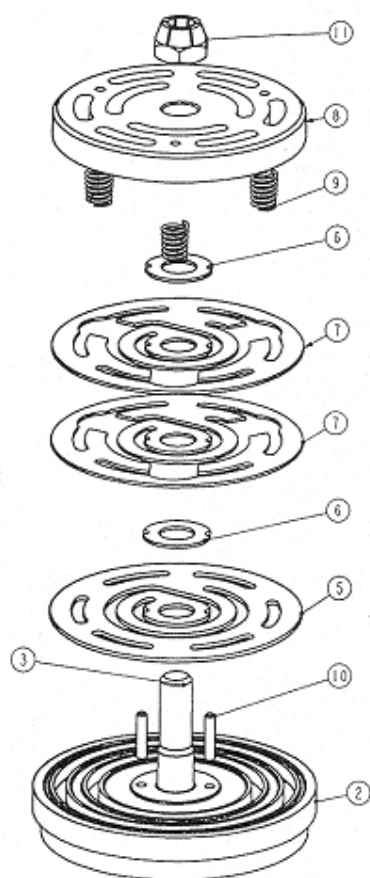


11	螺母	7. 1
10	销子	7. 6
9	弹簧	7. 1, 8
8	阀座	7. 2
7	阀片	7. 1
6	减震片	7. 1
5	定距垫圈	7. 7
4	销子	7. 6
3	螺杆	7. 4
2	阀盖	7. 3
1	带有螺杆的阀盖	
参数	描述	参考段落

图
母



16. 有金属阀片的排气阀的组装图

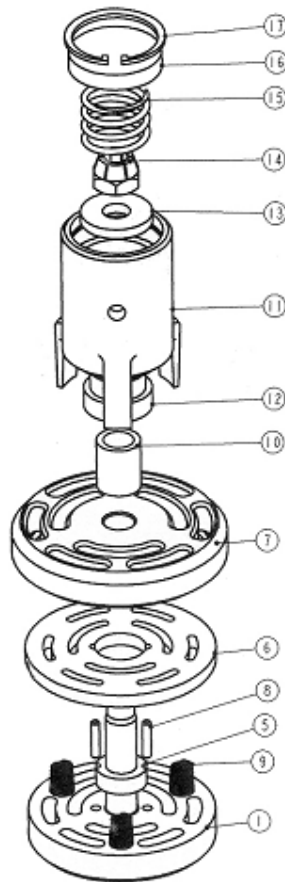


11	螺母	7.1
10	销子	7.6
9	弹簧	7.1, 8
8	阀盖	7.3
7	减震片	7.1
6	定距垫圈	7.7
5	阀片	7.1
4	销子	7.6
3	螺杆	7.4
2	阀座	7.2
1	带有螺杆的阀座	
参数	描述	参考段落

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17. 有 peek 阀片和卸载执行器的吸入阀的组装图



17	内部卡簧	7.7
16	卸载器盖子	7.7
15	卸载器弹簧	7.7
14	螺母	7.1
13	垫片	7.7
12	塑料衬套	7.5
11	卸载器	7.2
10	金属衬套	7.5
9	弹簧	7.1, 8
8	销子	7.6
7	阀座	7.2
6	阀片	7.1
5	定距垫圈	7.7
4	销子	7.6
3	螺杆	7.4
2	阀盖	7.3
1	带有螺杆的阀盖	
参数	描述	参考段落

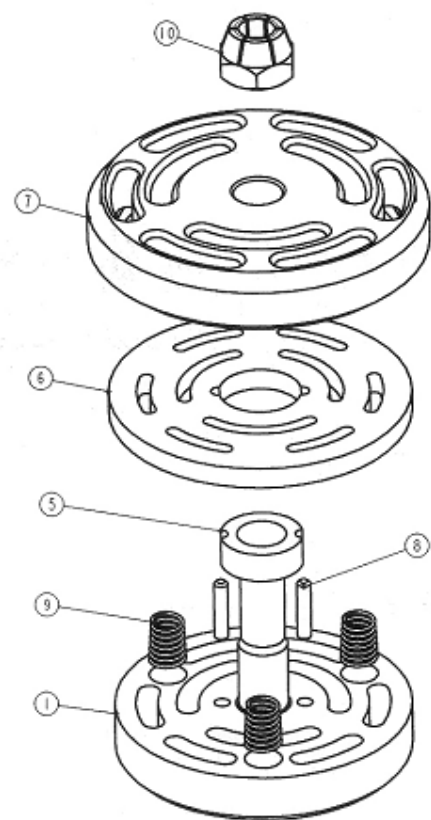
图
号

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图
号

18. 有 peek 阀片的吸入阀的组装图

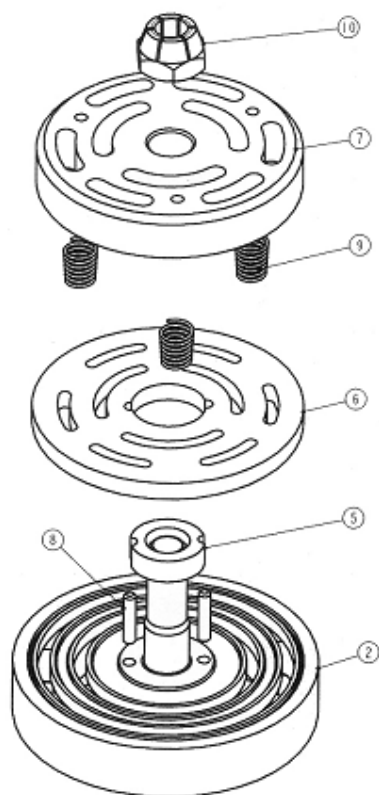


10	螺母	7.1
9	弹簧	7.1, 8
8	销子	7.6
7	阀座	7.2
6	阀片	7.1
5	定距垫圈	7.7
4	销子	7.6
3	螺杆	7.4
2	阀盖	7.3
1	带有螺杆的阀盖	
参数	描述	参考段落

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19. 有 peek 阀片的排气阀的组装图



10	螺母	7. 1
9	弹簧	7. 1, 8
8	销子	7. 6
7	阀盖	7. 3
6	阀片	7. 1
5	定距垫圈	7. 7
4	销子	7. 6
3	螺杆	7. 4
2	阀座	7. 3
1	带有螺杆的阀盖	
参数	描述	参考段落



2.1.2.6.1.2. 15328011701 - OUTLET VALVE 117DEA8 TAB.6055

ref. [2.1.2.6.1.1: Instruction and maintenance.pdf](#)

2.1.2.6.2. 250B1050001 - KIT DIAMETRI SW C95 2° STADIO Ø105

2.1.2.6.2.1. 15328007202 - INLET VALVE 72DEA4+AV T.6099

ref. [2.1.2.6.1.1: Instruction and maintenance.pdf](#)

2.1.2.6.2.2. 15328007203 - OUTLET VALVE 72DEA4 TAB.6100

ref. [2.1.2.6.1.1: Instruction and maintenance.pdf](#)

2.1.2.6.3. 250E0853501 - DIAMETERS KIT SW CC95 3/4° STAGE Ø85-35

2.1.2.6.3.1. 153226 - CONCENTRING GAS VALVE DC27/51 TAB9369

ref. [2.1.2.6.1.1: Instruction and maintenance.pdf](#)

2.1.2.6.3.2. 15328060CPT02 - OUTLET GAS VALVE 60CPT4 Tab. 12039

ref. [2.1.2.6.1.1: Instruction and maintenance.pdf](#)

2.1.2.6.3.3. 15328060CPT07 - GAS VALVE 60CPT4 TAB 13437

ref. [2.1.2.6.1.1: Instruction and maintenance.pdf](#)