

Document Title: Manufacturing Record Book

Document Number: 25472-101-V1A-JL10-Z0003

Revision Number: 01

PO Number: 4500257847

Material Requisition Number: KXL1399-CH2M-I-MR-0001

Tag Nos. : 125-BDLSS-B0-LSHH-0302, 126-FXVLY-B0-LSHH-0302



Contractor Name : Endress+Hauser Canada Ltd
 Contractor Address : 1075 Sutton Drive
 City, Province : Burlington, Ontario
 Country, Postal code : Canada L7L 5Z8
 Telephone Number : (905) 681-9292

Rev No.	Rev Date yyyy-mm-dd	Reason for Issue	Contractor Originator	Contractor Reviewer	Contractor Approver
01	2019-06-17	Issued For Review	A. Patil	A. Patil	C. Penney

CODE 1: Work may proceed.



Permission to proceed does not constitute acceptance or approval of design details, calculations, analyses, test methods or materials developed or selected by the supplier and does not relieve the supplier from full compliance with contractual obligations.

Name: JV040785

Date: 09/30/2019

Document Title: Manufacturing Record Book Indexes

Document Number: 25472-101-V1A-JL10-Z0002

Revision Number: 02

PO Number: 4500257847

Material Requisition Number: KXL1399-CH2M-I-MR-0001

Tag Nos. : 125-BDLSS-B0-LSHH-0302, 126-FXVLY-B0-LSHH-0302



Contractor Name : Endress+Hauser Canada Ltd
 Contractor Address : 1075 Sutton Drive
 City, Province : Burlington, Ontario
 Country, Postal code : Canada L7L 5Z8
 Telephone Number : (905) 681-9292

Rev No.	Rev Date yyyy-mm-dd	Reason for Issue	Contractor Originator	Contractor Reviewer	Contractor Approver
01	2019-06-17	Issued For Approval	A. Patil	A. Patil	C. Penney
02	2019-07-03	Re-Issued For Approval	A. Patil	A. Patil	C. Penney

CODE 1: Work may proceed.



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Name: JV040785

Date: 07/18/2019

TransCanada Keystone Pipeline, L.P.

Keystone XL Pipeline Canadian Pump Stations
Level Switch

PO#: 4500257847
E+H SO#: 3003333187

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TransCanada Keystone Pipeline, L.P.

Keystone XL Pipeline Canadian Pump Stations
Level Switch

PO#: 4500257847
E+H SO#: 3003333187

Tab	SDDR#	Description
1	EX	Interconnection & Wiring Diagrams

Endress+Hauser Canada Ltd
1075 Sutton Drive
Burlington, ON Canada L7L 5Z8
Phone +905-681-9292
Phone +1-800-668-3199
Fax +905-681-9444
info@ca.endress.com
www.ca.endress.com

Endress+Hauser Canada Ltée
6800 Côte de Liesse, #100
St. Laurent, QC Canada H4T 2A7
Tél +514-733-0254
Fax +514-733-2924

Endress+Hauser Canada Ltd
9045 - 22 Ave SW
Edmonton, AB Canada T6X 0J9
Phone +780-486-3222
Fax +888-918-5049

Endress+Hauser Canada Ltd
Suite 245, 7326 - 10th Street NE
Calgary, AB T2E 8W1
Phone + 403.777.2252
Fax + 403.777.2253

Document Title: Interconnection & Wiring Diagrams

Document Number: 25472-101-V1A-JL10-Z0001

Revision Number: 02

PO Number: 4500257847

Material Requisition Number: KXL1399-CH2M-I-MR-0001

Tag Nos. : 125-BDLSS-B0-LSHH-0302, 126-FXVLY-B0-LSHH-0302



Contractor Name : Endress+Hauser Canada Ltd
 Contractor Address : 1075 Sutton Drive
 City, Province : Burlington, Ontario
 Country, Postal code : Canada L7L 5Z8
 Telephone Number : (905) 681-9292

Rev No.	Rev Date yyyy-mm-dd	Reason for Issue	Contractor Originator	Contractor Reviewer	Contractor Approver
01	2019-06-17	Issued For Approval	M. Panchal	A. Patil	C. Penney
02	2019-07-09	Re-Issued For Approval	M. Panchal	A. Patil	C. Penney

CODE 1: Work may proceed.

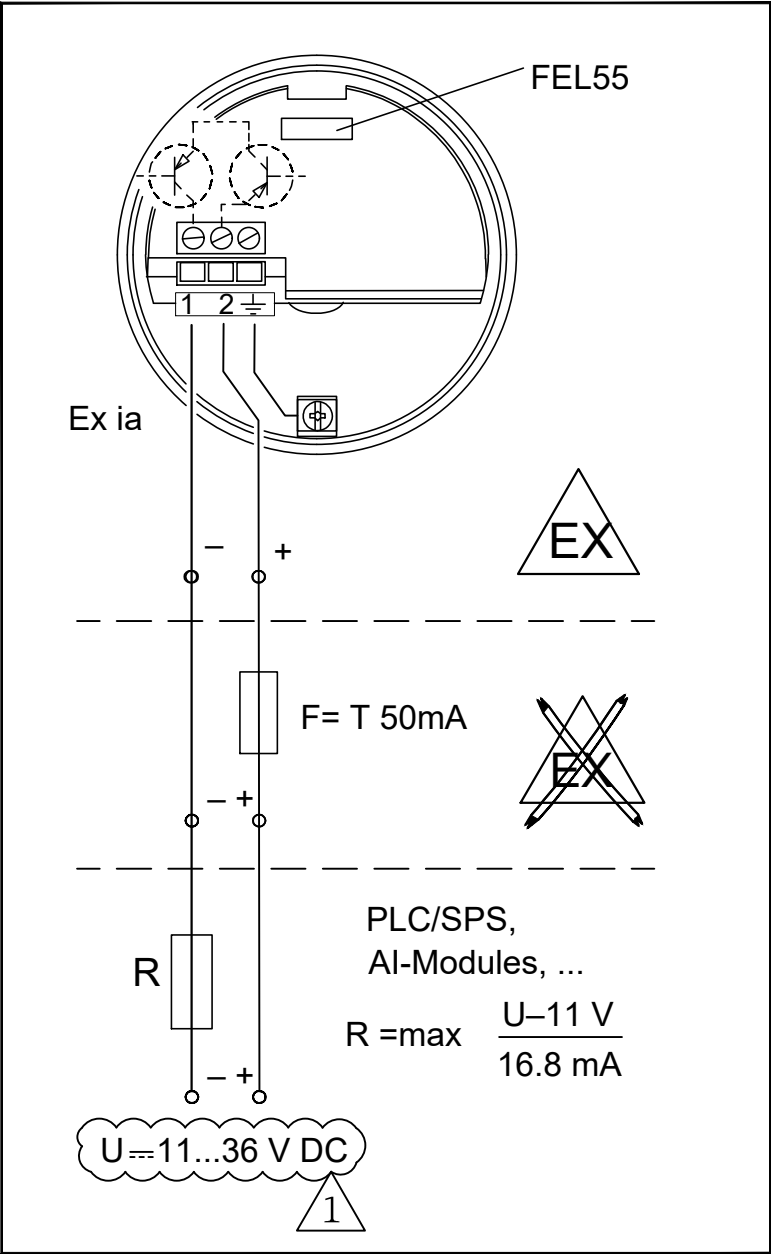


Permission to proceed does not constitute acceptance or approval of design details, calculations, analyses, test methods or materials developed or selected by the supplier and does not relieve the supplier from full compliance with contractual obligations.

Name: kloca

Date: 07/11/2019

Wiring Diagram



TAG LIST	
125-BDLSS-B0-	LSHH-0302
126-FXVLY-B0-	LSHH-0302

CUSTOMER		Endress+Hauser			
TransCanada Keystone Pipeline, L.P.		CANADA PROJECTS			
PROJECT NAME		TITLE			
-		Liquiphant M FTL51 Point Level Measurement Electronic insert FEL55 (8/16 mA)			
MODEL#		FTL51-TGM2BB5E5C+Z1			
PO#		SIZE	DWG NO	REV	
4500257847		B	L-FTL51-002	1	
PROJECT #		DRAWN BY	SCALE	DATE	SO#
-		M.Panchal	1 : 2.5	28/06/2019	3003333187

TransCanada Keystone Pipeline, L.P.

Keystone XL Pipeline Canadian Pump Stations
Level Switch

PO#: 4500257847
E+H SO#: 3003333187

Tab	SDDR#	Description
2	IC	Material Certificates

Endress+Hauser Canada Ltd
1075 Sutton Drive
Burlington, ON Canada L7L 5Z8
Phone +905-681-9292
Phone +1-800-668-3199
Fax +905-681-9444
info@ca.endress.com
www.ca.endress.com

Endress+Hauser Canada Ltée
6800 Côte de Liesse, #100
St. Laurent, QC Canada H4T 2A7
Tél +514-733-0254
Fax +514-733-2924

Endress+Hauser Canada Ltd
9045 - 22 Ave SW
Edmonton, AB Canada T6X 0J9
Phone +780-486-3222
Fax +888-918-5049

Endress+Hauser Canada Ltd
Suite 245, 7326 - 10th Street NE
Calgary, AB T2E 8W1
Phone + 403.777.2252
Fax + 403.777.2253

Document Title: Material Certificates / Functional Test Report

Document Number: 25472-101-V1A-JL10-Z0004

Revision Number: 01

PO Number: 4500257847

Material Requisition Number: KXL1399-CH2M-I-MR-0001

Tag Nos. : 125-BDLSS-B0-LSHH-0302, 126-FXVLY-B0-LSHH-0302



Contractor Name : Endress+Hauser Canada Ltd
 Contractor Address : 1075 Sutton Drive
 City, Province : Burlington, Ontario
 Country, Postal code : Canada L7L 5Z8
 Telephone Number : (905) 681-9292

Rev No.	Rev Date yyyy-mm-dd	Reason for Issue	Contractor Originator	Contractor Reviewer	Contractor Approver
01	2019-08-13	Issued For Review	A. Patil	A. Patil	C. Penney

CODE 1: Work may proceed.



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Name: JV040785

Date: 09/05/2019

Final Inspection Report

Order information

Customer name	TransCanada Keystone Pipeline Limited
Customer purchase order	4500257847
Sales order number / Item	3003333187/0020
Internal order number / Item	3019584155000020

Device information

Description	Liquiphant M FTL51
TAG	125-BDLSS-B0-, LSHH-0302
Serial number	P701C015027
Order code	FTL51-DU7D0/0
Extended order code	FTL51-TGM2BB5E5C+Z1

Additional information

Output type	FEL55; 8/16 mA, 11-36 V DC
Software version	01.00.01
Ambient temperature / - humidity / - pressure	23 °C ±5 °C / 60 % rel. ±40 % rel. / 990 mbar ±30 mbar
Probe length	1130 mm

Test result

Hereby we confirm that all tests according to the Quality plan (IP00017F) have been performed successfully.

Test	Procedure number	Test description
Contract review	TS00001F	As required in ISO 9001
Incoming goods inspection	TS00003F	Verification of conformance to the specified requirements
Printed circuit boards test	TS00009F	In-circuit test and functional test
Electronic insert test	TS00008F	Automatic test: high voltage and functional test of the electronic insert
High voltage test	TS00002F	The voltage used is chosen depending on operating voltage, terminals and approvals, in accordance to the valid national / international standards
Welding inspection	TS00010F	Quality and tightness of the welding seams
Leakage test	TS00004F	Tightness test with helium
Functional test of sensor	TS00034F	Measurement and adjustment of operating frequency and phase
Calibration of sensor	TS00036F	Verification of frequency and phase of the sensor
Final check of instrument	TS00035F	Verification of switching function
Outgoing visual check	TS00006F	Visual inspection of completeness and correctness of the instrument and the markings
Logistical verification	TS00005F	Automatic verification in the delivery phase via barcode that the instrument correspond to the order
Resonant Frequency uncovered		1066.18 Hz

Hereby we confirm that all measuring equipment used to assure the quality of the products has been calibrated and is traceable to national or international standards.

Execution

Greenwood, 2019-07-25, 155581

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Functional Safety (SIL)

Order information

Customer name	TransCanada Keystone Pipeline Limited
Customer purchase order	4500257847
Sales order number / Item	3003333187/0020
Internal order number / Item	3019584155000020

Device information

Description	Liquiphant M FTL51
TAG	125-BDLSS-B0-, LSHH-0302
Serial number	P701C015027
Order code	FTL51-DU7D0/0
Extended order code	FTL51-TGM2BB5E5C+Z1

Additional Information

Probe length	1130 mm
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Statement

Hereby we confirm that the device is suitable for the use in Safety Instrumented Systems according to IEC 61508. Further information is available in the Functional Safety Manuals SD167F (mode of operation MAX) and SD279F (mode of operation MIN).

Greenwood, 16.07.2019, Gerd Gritsch
Head of Division Quality Management

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Abnahmeprüfzeugnis nach EN 10204 - 3.1

Inspection certificate acc. to EN 10204 - 3.1

Zeugnis-Nr. / Certificate no. 3019584155/3003333187_20_1

Seite / page 1 / 2

Es wird bescheinigt, dass die gelieferten Erzeugnisse den Vereinbarungen bei der Bestellung entsprechen. Darüber hinaus wird bescheinigt, dass bei der Herstellung der nachstehend aufgeführten Erzeugnisse die vorgeschriebenen Prüfungen und / oder die zusätzlich aufgeführten Prüfungen nach den bestehenden Prüfvorgaben durchgeführt und die erforderlichen Freigaben erteilt wurden. Die unten aufgeführten Prüfungen wurden unter Aufsicht einer dazu autorisierten, unabhängigen Stelle durchgeführt.

It is certified that the products supplied are in compliance with the requirements of the order. Furthermore, it is confirmed that during the manufacturing of the subsequently listed products the specified inspections and / or the additionally ordered inspections have been performed according to the valid procedures and the necessary releases have been given. The subsequently listed inspections have been performed by especially authorized personnel.

Kunde / Customer: TransCanada
Keystone Pipeline Limited
450 - 1st Street SW
CA-T2P 5H1 Calgary

Kunden Bestell-Nr. / Customer order no.: 4500257847

E+H Auftrags-Nr. / E+H order no.: 3003333187

Pos / item	Menge / Qty	Produktbezeichnung / Description	
0020	1 ST / PC	FTL51-DU7D0/0 Liquiphant M FTL51	
		S/N P701C015027	TAG 125-BDLSS-B0- LSHH-0302
Kennzeichnung / Marking		0WYRM	
● Teil / Part		Adapter / adapter	
Hersteller / Manufacturer		UGITECH	
Zeugnis-Nr. / Certificate No.		84041655 000010	
Schmelze-Nr. / Heat No.		837623	
Kennzeichnung / Marking		051HF	
● Teil / Part		Gabel / fork	
Hersteller / Manufacturer		FEINGUSS BLANK	
Zeugnis-Nr. / Certificate No.		PZ10855	
Schmelze-Nr. / Heat No.		2110	

Abnahmeprüfzeugnis nach EN 10204 - 3.1

Inspection certificate acc. to EN 10204 - 3.1

Zeugnis-Nr. / Certificate no. 3019584155/3003333187_20_1
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Kennzeichnung / Marking

- Teil / Part
Hersteller / Manufacturer
Zeugnis-Nr. / Certificate No.
Schmelze-Nr. / Heat No.

0F3TN

Rohr / tube
Krystal Steel
KS/ST-316L/54/0918
1801-077

Kennzeichnung / Marking

- Teil / Part
Hersteller / Manufacturer
Zeugnis-Nr. / Certificate No.
Schmelze-Nr. / Heat No.

0T2M1

Rohr / tube
BUTTING
30 000 092 858 / 01
562577

25.07.2019

Endress+Hauser (USA)
Automation Instrumentation Inc.
US-46143 Greenwood

John Koktavy
- Abnahmebeauftragter -
- Inspector -

Dieses Zeugnis wurde elektronisch nach EN 10204 erstellt und ist ohne Unterschrift gültig.
Bei Rückfragen wenden Sie sich bitte an Ihre Endress+Hauser-Vertriebszentrale.
This document was generated electronically acc. to EN 10204 and is valid without signature.
If you have any queries, please contact your Endress+Hauser Sales Center.

Manufacturer Ugine Avenue Paul Girod - CS 90100 73403 Ugine Cedex France www.ugitech.com		INSPECTION CERTIFICATE 3.1 EN 10204 / 3.1			UGITECH Providing special steel solutions 							
Certificate : All UGITECH products were produced according to the certified quality system (at least ISO 9001) and according to customer requests on purchase orders, as per requirements in standards IATF 16949, EN 9100/EN9120, ISO 13485, code RCCM and/or ASME section III, PED 2014/68/EU, AD2000 W0. Chemical analysis and mechanical properties tests were performed by ISO/CEI 17025 accredited laboratories.				Supplier's mark : 								
Purchase : 42960 TW METALS		Purchase order reference : PO # M80238501 01D18		Order number : 881673 20								
Product : UGI 4435X4 BAR ROLLED DESCALED SOLUTION ANNEALED K13 ROUND 35,000MM LONG. 3,000M +100,000MM -0,000MM												
Melting process : EAF + AOD + CC		Batch : 1848WM4200		Heat n° : 837623								
Pieces Nbr : 40		Shape : round		Weight : 949 kg								
Dimension : 35,000 mm		Forging ratio : 39,1										
Standard : ASTM A484/A484M-18												
Standard : AD 2000 W2 ED 09.2016 1.4435 ASTM A479/A479M-18 TYPE 316L/316 NACE MR0175/ISO 15156-3:2015. 316/316L AD 2000 W10 ED 05.2016 1.4435			EN 10272 : 2016-11 1.4435 ASME SA479/479M-17 Sec.IIPartA TYPE 316L/316 NACE MR0103/ISO 17945:2015. 316/316L ASME SA182/182M-17 Sec.IIPartA F316L/F316									
Customer's specification : 410000144 EXCEPTED %S MINI X2CRNIMO18-14-3			Specification issue No G		Specification revision date 02.05.18							
Acceptation date 			Deviation 									
CHEMICAL ANALYSIS												
Test n° : GRWE												
%	C	Si	Mn	Ni	Cr	Mo	Cu	S	P	N		
Min				12,5000	17,0000	2,5000		0,0050				
Max	0,0300	1,0000	2,0000	14,0000	18,0000	3,0000		0,0200	0,0400	0,1000		
Heat	0,0160	0,6180	1,8180	12,6010	17,1860	2,5880	0,3180	0,0124	0,0256	0,0330		
Product												
MECHANICAL CHARACTERISTICS												
Result as delivered : ON-LINE SOLUTION ANNEALED TEMPERATURE OVER 1040°C AIR												
Tensile test												
T°C	Test N°	Marker n°	Yield strength	Yield strength	Tensile strength	Elongation	Elongation	Red. Area	HBW	Hv	HRb	HRc
°C		Direction	Rp 0,2% MPa	Rp 1% MPa	RM MPa	5D %	4D %	Z %	2,5/187,5	5		
		Min	200	235	500	40	30	50	215			22
		Max			700							
20	GRWE	1201 L	258	304	587	48	50	78	168			<22
Notch Toughness												
T°C	Test N°	Type	Direction	Min	Individual values	Average	Lateral Expansion	Crystallinity level				
°C				J	J	J	mm					
20	GRWE	KISOV	L	100	220 217 225	221						
METALLOGRAPHIC CHARACTERISTICS												
Test n° : GRWE												
Apparent grain size		Min - Max		Min		Max						
ASTM E112		> 4		Guarent.		Ferrit %						
ADDITIONAL INFORMATION												
Corrosion : INTERCRYSTALLINE CORROSION RESISTANT ACC.TO ISO 3651-2 PRACTICE A												
We declare that the mentioned product is in compliance with the requirements of the contract and that, after checks and tests, it meets in all respects the specified requirements and applicable standards and regulations, except reservations or exceptions as listed in this declaration of conformity (NF L 00-015 C); Document validated by electronic signature. Material manufactured in the REACH regulation respect.												
Ugine the 07.11.2018 The quality manager B. POLLET												
040001254866												

1 Manufacturer Ugine Avenue Paul Girod - CS 90100 73403 Ugine Cedex France www.ugitech.com	2 INSPECTION CERTIFICATE 3.1 EN 10204 / 3.1	3 UGITECH Providing special steel solutions 
Corrosion : INTERCRYSTALLINE CORROSION RESISTANCE ACCORDING TO ASTM A262 PRACTICE E : CONFORM 200		
Non destructive testing : SURFACE & DIMENSIONS ARE CONTROLLED ANTIMIXING TEST PERFORMED BY SPECTROSCOPIC METHOD : CONFORM 201		
Others : TÜV LETTER OF APPROVAL IN OUR POSSESSION. WE ABSTAIN OF A COUNTERSIGNATURE DFARS 252.225-7014 COMPLIANT EN 10278 COUNTRY OF MELT SOURCE : FRANCE MATERIAL IS FREE FROM MERCURY AND RADIOACTIVE CONTAMINATION AND WELDS OR WELD REPAIRS AT TIME OF SHIPMENT FREE FROM INTERNAL DEFECTS GUARANTEED BY THE PROCESS CONTROL FERRITE AS CAST SAMPLE (FUSED) = 3,95% 202		
32 We declare that the mentioned product is in compliance with the requirements of the contract and that, after checks and tests, it meets in all respects the specified requirements and applicable standards and regulations, except reservations or exceptions as listed in this declaration of conformity (NF L 00-015 C); Document validated by electronic signature. Material manufactured in the REACH regulation respect.	33 Ugine the 07.11.2018 The quality manager  B. POLLET 040001254866 Page 2/2	



RESTAMPING CERTIFICATE

Customer:

Endress + Hauser
2340 Endress Place
Greenwood, IN 46143

Re-stamped By:

TW Metals
235 Tubeway Dr.
Carol Stream, IL 60188

TW Metals is PED certified and the associate completing the re-stamping for the sales order and product listed below has been trained to TLB41000151 requirements.

Sales Order #: 80007251

Purchase Order#: 1017664773

Date	TW Item #	Endress+Hauser Part#	Part Description	# of Pieces Stamped	Endress+Hauser SAP/TAN ID	Original Mill Heat#
5/1	A5873	52006722	1.4435/316 BAR	27	0 F 3 X M	837623
✓	✓	✓	35 MM	✓	✓	✓

By signing below, I certify the re-stamping was done in accordance to Endress+Hauser requirements.

Re-Stamping
Associate Number:



Re-stamping Associate Signature:

Date:

5/6/19

Inside Sales
Verification Signature:

Date:

5/7/19

Endress + Hauser SE + Co. KG
Hauptstrasse 1 Wareneing.2
DE-79689 Maulburg

Abnahmeprüfzeugnis 3.1

Inspection certificate

nach/according to DIN EN 10204:2005
Prüf-Nr./Test-No.: PZ10855
BA-Nr.: 1171703
Ident-Nr.: 06748/05

Ihre Bestellung Nr./Your order No.:
117/1017578912

vom/dated:
05.12.2018

Gußstück-Bezeichnung/Part-description:
GABEL STANDARD

Zeichnungs-Nr./Drawing-No.:
210011044 (52006900)

Erstelldatum/Creation Date:

13.02.2019

Losmenge/Quantity:
1115

Werkstoff/Material:
(G)-X 2 Cr Ni Mo 18 14 3 (BN2)
1.4435

Erschmelzung/Melting process:
induktiv/inductive

Prüfergebnisse/Test results

Gußteile gezeichnet mit/Castings signed with:
B1 / 051HF

Chemische Analyse/Chemical analysis: Entspricht/Equivalent to 1.4435 / 316L

Soll/Nom	C	Si	Mn	P	S	Cr	Mo	Ni	N
min	0,000	0,00	0,00	0,000	0,000	17,00	2,50	12,50	0,000
max	0,030	1,00	2,00	0,045	0,030	18,00	3,00	15,00	0,100
Charge/Los/Lot No.									
2110	0,023	0,84	1,54	0,010	0,008	17,08	2,65	13,63	0,047
	0,024	0,84	1,58	0,010	0,009	17,21	2,70	13,76	0,048

Wärmebehandlung/Heat treatment:

lösungsgeglüht u. abgeschreckt max. 241 HB

Härteprüfung/Hardness test:

Testmethode/Tested with: HV 10

Nach Umwertung/Converted to: 153 - 159 HB (BHN) 30

Mechanische Prüfung/Mechanical testing at room temperature:

acc. to ASTM 316L

Soll/Nom	Rp 0,2 (N/mm ²)	Rm (N/mm ²)	A (Lo=50mm) (%)
min	200	485	30,00
max			
Charge/Los/Lot No.			
2110	215	486	38,00

Stichprobe Massprüfung durchgeführt, keine Abweichung festgestellt

100% Sichtprüfung durchgeführt, keine Abweichung festgestellt

Verwechslungsprüfung nach spectrometrischer Prüfung durchgeführt und i.O.

Härtewerte nach NACE MR 0175/ MR 0103

Hersteller zugelassen nach AD-WO/TRD 100

IK Test nach DIN EN ISO 3651-2 Verfahren A /ASTM A262 Practice E durchgeführt, ohne Befund.

Tüpfeltest i.O.

Die gestellten Anforderungen sind erfüllt/Requirements of order are compiled
Riedlingen, den 13.02.2019

FEINGUSS BLANK GmbH

Qualitätswesen: i.A. EIERS

Das Zeugnis wurde maschinell erstellt und ist gemäß EN 10204 ohne Unterschrift rechtsverbindlich.
This certificate was generated by data system, acc. to EN 10204, it need not to be signed for validity.

Seite 1 von 2

FEINGUSS BLANK GmbH
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E-Mail info@feinguss-blank.de
www.feinguss-blank.de

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Telefax +49 7371 18244-300
Telefax Vertrieb +49 7371 182-164
UST-IdNr. DE 146545590

Geschäftsführung
Dr. Wolfgang Blank ·
Ingo Bitzer · Hubert Deutsch
Sitz der Gesellschaft 88499 Riedlingen
Registergericht Ulm HRB 650359

Volksbank-Raiffeisenbank Riedlingen
IBAN DE06 6549 1510 0044 2980 05 BIC GENODE31VRR
Kreissparkasse Biberach
IBAN DE16 6545 0070 0000 4032 50 BIC SBCRDE66

Endress + Hauser SE + Co. KG
Hauptstrasse 1 Wareneing.2
DE-79689 Maulburg

Abnahmeprüfzeugnis 3.1

Inspection certificate

nach/according to DIN EN 10204:2005
Prüf-Nr./Test-No.: PZ10855
BA-Nr.: 1171703
Ident-Nr.: 06748/05

Ihre Bestellung Nr./Your order No.:
117/1017578912

vom/dated:
05.12.2018

Gußstück-Bezeichnung/Part-description:
GABEL STANDARD

Zeichnungs-Nr./Drawing-No.:
210011044 (52006900)

Prüfergebnisse/Test results

Dimension sampling test done, without deviation
100% visuel test done, without findings
Mistake examination after spectrometric examination and o.k.
Hardness according to NACE MR 0175/MR 0103
Manufacturer authorized according to AD-WO/TRD 100
Test about intercrystalline corosion acc. DIN EN ISO 3651-2 methode A / ASTM A262 Practice E done, without findings
Spot test ok.

Erstelldatum/Creation Date:
13.02.2019

Losmenge/Quantity:
1115

Werkstoff/Material:
(G)-X 2 Cr Ni Mo 18 14 3 (BN2)
1.4435

Erschmelzung/Melting process:
induktiv/inductive

Die gestellten Anforderungen sind erfüllt/Requirements of order are compiled
Riedlingen, den 13.02.2019

FEINGUSS BLANK GmbH
Qualitätswesen: i.A. EIERS

Das Zeugnis wurde maschinell erstellt und ist gemäß EN 10204 ohne Unterschrift rechtsverbindlich.
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Seite 2 von 2

FEINGUSS BLANK GmbH
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Telefax +49 7371 18244-300
Telefax Vertrieb +49 7371 182-164
UST-IdNr. DE 146545590

Geschäftsführung
Dr. Wolfgang Blank ·
Ingo Bitzer · Hubert Deutsch
Sitz der Gesellschaft 88499 Riedlingen
Registergericht Ulm, HRB 200000

Volksbank-Raiffeisenbank Riedlingen
IBAN DE06 6549 1510 0044 2980 05 BIC GENODES1VRR
Kreissparkasse Biberach
IBAN DE16 6545 0070 0000 4032 50 BIC SBCRDE66



Manufacturer & Exporter of Seamless Stainless, Duplex & Super Duplex & Nickel Alloy Tubes, Pipes & U -

Plot No # KV - 2, G.I.D.C (Savli), P.O - ManjusarTa : Savli; District - Vadodara - 391775

• (T): +91 2667 264777 • (E): export@krystalsteel.co.in & sales@krystalsteel.co.in • (W): www.krystalsteel.co.in

COMMERCIAL INVOICE

EXPORTER		IEC NO :	0307043321
KRYSTAL STEEL MANUFACTURING PVT. LTD.		CIN NO :	U27109MH2006PTC165777
Plot No # KV - 2, G.I.D.C (Savli), P.O - Manjusar		PAN No.	AACCK9332J
Ta : Savli; District - Vadodara - 391775 (Gujarat)		INCOTERMS :	DAP TW USA CAROL STREAM IL 60188
Phone No. +91 2667 264777		L.C. No.	
E-Mail export@krystalsteel.co.in & sales@krystalsteel.co.in		Payment Terms :	30 % Advance along with commercially cleared Purchase(PO), balance against Performa Invoice before dispatch from our site
Home Page www.krystalsteel.co.in			

PO NO :	M 49397512 DT :2/8/18	OA NO:	E-1819/00068 DT : 6/8/18	INVOICE NO :	KSMP/2018-19/168
				INVOICE DATE :	26/9/2018

CONSIGNEE BILLING ADDRESS	CONSIGNEE DELIVERY ADDRESS	NOTIFY PARTY & ADDRESS
TW METALS	TW METALS	TW METALS
235 Tubeway Drive Carol Stream, IL 60188 United States of America	235 Tubeway Drive, Carol Stream, IL 60188, United States of America United States of America	235 Tubeway Drive, Carol Stream, IL 60188, United States of America United States of America
Email : barb.kucia@twmetals.com Tel : 630-690-0110	Email : BARBKUCIA@TWMETALS.COM Tel : 610.458.1361	Email : BARBKUCIA@TWMETALS.COM Tel : 610.458.1361

PRE - CARRIAGE BY :	BY SEA	COUNTRY OF ORIGIN :	INDIA
VESSEL/FLIGHT NO :	NA	COUNTRY OF FINAL DESTINATION :	USA
PLACE OF CARRIAGE RECEIPT :	NA	SEAPORT OF LOADING :	Mhavsheva Port, Maharashtra, India
CONTAINER NO :	NA	SEAPORT OF DISCHARGE :	NEW YORK NY SEA PORT
SEAL NO :	NA	FINAL DESTINATION :	United States of America

MARKS & NOS :	TW METALS	H.S. Code : 73044100
	M 49397512 DT :2/8/18	

Sr. No.	Material Description		Size		PCS	MTR	Weight	USD/MTR	TOTAL AMOUNT USD
	Reference No./Heat No./Metallurgy	Specs	Grade	OD (MM/NB)	THK (MM)				
1	71338495/1801-077 Cold Finished Austenitic S.S. Seamless Tubes	ASTM A-269/ EN 10216-5	TP 316L/1.44 04	21.3	1.6	521	2101.01	1632.00	12.90
						521	2101.01	1632.00	
								Invoice USD	27,103.03
								Payable Amount	13.03

INVOICE VALUE (IN WORDS)	***** TWENTY SEVEN THOUSAND ONE HUNDRED THREE USD AND THREE ONLY
PAYABLE VALUE (IN WORDS)	***** THIRTEEN USD AND THREE ONLY

WE INTEND TO CLAIM REWARDS UNDER MERCHANDISE EXPORT FORM INDIA SCHEME(MES)

SHIPMENT UNDER ADVANCE AUTHORISATION LICENCE SCHEME			
LICENCE NO	LICENCE DATE :	GRADE & SUB-GRADE	EXPORTED QUANTITY EXEMPTED QUANTITY
			(MT) (MT)
34/21/040/00261/AM19	23/8/2018	TP 316L/1.4404	1.632 2.203

DECLARATION- WE DECLARE THAT GOODS ARE MANUFACTURED IN INDIA. MATERIAL SUPPLIED WITH ORIGINAL MILL TEST CERTIFICATE ARE AS PER PURCHASE ORDER & APPROVED ORDER ACCEPTANCE WARRANTED FOR SUITABLE APPLICABLE PERFORMANCE UNTIL 18 MONTHS FROM THE DATE OF DISPATCH OR 12 MONTHS FROM THE DATE OF USAGE WHICH EVER IS EARLIER SUBJECT TO GOOD ENGINEERING PRACTICES AND TECHNICALLY SUITABLE USAGE. HOWEVER OVERALL LIABILITY OF THE SUPPLIER (KSMP) IS LIMITED TO THE VALUE OF DEFECTIVE GOODS LIMITED TO MANUFACTURING DEFECTS ONLY.

BANK DETAILS: For USD A/C. No. 666 Bank of Baroda-EEE A/C (Mumbai Gamdevi Branch), A/C No. : 0394020000666, SWIFT CODE: BARBINBGAM
For EURO A/C. No. 667 Bank of Baroda-EEE A/C (Mumbai Gamdevi Branch), A/C No. : 0394020000667, SWIFT CODE: BARBINBGAM
Address : Bank Of Baroda, Gamdevi Branch Mumbal , Gita Building, Pandita Ramabhai Road, Gamdevi, Mumbai - 400 007 , MAHARASTRA.

Abbl	S.S - Stainless Steel	PREPARED BY	CHECKED BY MARKETING	AUTHORIZED BY FINANCE	QMS EMS OHSAS F.O.B & A.O 2018 Merkantil und Comptant Goverment Registerd Export House KRYSTALSTEEL.CO.IN



Manufacturer & Exporter of Seamless Stainless, Duplex & Super Duplex & Nickel Alloy Tubes, Pipes & U -

Plot No # KV - 2, G.I.D.C (Savli), P.O - ManjusrTa : Savli; District - Vadodara - 391775

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COMMERCIAL INVOICE

EXPORTER		IEC NO :	0307043321
KRYSTAL STEEL MANUFACTURING PVT. LTD.		CIN NO :	U27109MH2006PTC165777
Plot No # KV - 2, G.I.D.C (Savli), P.O - Manjusr		PAN No.	AACCK9332J
Ta : Savli; District - Vadodara - 391775 (Gujarat)		INCOTERMS :	DAP TW USA CAROL STREAM IL 60188
Phone No. +91 2667 264777		L.C. No.	
E-Mail export@krystalsteel.co.in & sales@krystalsteel.co.in		Payment Terms :	30 % Advance along with commercially cleared Purchase(PO), balance against Performa Invoice before dispatch frm our site
Home Page www.krystalsteel.co.in		INVOICE NO :	KSMP/2018-19/168
PO NO :	IM 49397512 DT :2/8/18	OA NO:	E-1819/00068 DT : 6/8/18
CONSIGNEE BILLING ADDRESS		CONSIGNEE DELIVERY ADDRESS	
TW METALS		TW METALS	
235 Tubeway Drive Carol Stream, IL 60188 United States of America		235 Tubeway Drive, Carol Stream, IL 60188, United States of America United States of America	
Email : barb.kucia@twmetals.com Tel : 630-690-0110		Email : BARB.KUCIA@TWMETALS.COM Tel : 610.458.1361	

PRE - CARRIAGE BY :	BY SEA	COUNTRY OF ORIGIN :	INDIA
VESSEL/FLIGHT NO :	NA	COUNTRY OF FINAL DESTINATION :	USA
PLACE OF CARRIAGE RECEIPT :	NA	SEAPORT OF LOADING :	Mhavasheva Port, Maharashtra, India
CONTAINER NO :	NA	SEAPORT OF DISCHARGE :	NEW YORK NY SEA PORT
SEAL NO :	NA	FINAL DESTINATION :	United States of America

MARKS & NOS :	TW METALS	H.S. Code : 73044100
	IM 49397512 DT :2/8/18	

Sr. No.	Material Description			Size		PCS	MTR	Weight	USD/MTR	TOTAL AMOUNT USD
	Reference No./Heat No./Metallurgy	Specs	Grade	OD (MM/NB)	THK (MM)					
1	71338495/1801-077 Cold finished Austenitic S.S.	ASTM A-269 / EN 10216-5	TP 316L/1.44 04	21.3	1.6	521	2101.01	1632.00	12.90	27,103.03
						521	2101.01	1632.00		

Invoice USD 27,103.03
Payable Amount 13.03

INVOICE VALUE (IN WORDS)	**** TWENTY SEVEN THOUSAND ONE HUNDRED THREE USD AND THREE ONLY
PAYABLE VALUE (IN WORDS)	**** THIRTEEN USD AND THREE ONLY

WE INTEND TO CLAIM REWARDS UNDER MERCHANDISE EXPORT FORM INDIA SCHEME(MES)

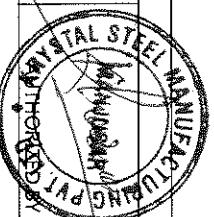
SHIPMENT UNDER ADVANCE AUTHORTISATION LICENCE SCHEME

LICENCE NO	LICENCE DATE :	GRADE & SUB-GRADE	EXPORTED QUANTITY (MT)	EXEMPTED QUANTITY (MT)
34/21/040/00261/AM19	23/8/2018	TP 316L/1.4404	1.632	2.203

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For EURO A/C: No. 667 Bank of Baroda-EEE A/C (Mumbai Gamdevi Branch), A/C No. : 03940200000667 , SWIFT CODE: BARBINBGAM
Address : Bank Of Baroda, Gamdevi Branch Mumbai , Gita Building, Pandita Ramabhai Road, Gamdevi, Mumbai - 400 007 , MAHARASTRA.

Abb	S.S.-Stainless Steel				
PREPARED BY	CHECKED BY MARKETING	AUTHORIZED BY FINANCE			





Manufacturer & Exporter of Seamless Stainless, Duplex & Super Duplex & Nickel Alloy Tubes, Pipes & U -

Plot No # KV - 2, G.I.D.C (Savli), P.O - ManjusarTa : Savli; District - Vadodara - 391775

• (T): +91 2667 264777 • (E): export@krystalsteel.co.in & sales@krystalsteel.co.in • (W): www.krystalsteel.co.in

COMMERCIAL INVOICE

EXPORTER		IEC NO :		0307043321	
KRYSTAL STEEL MANUFACTURING PVT. LTD.		CIN NO :		U27109MH2006PTC165777	
Plot No # KV - 2, G.I.D.C (Savli), P.O - Manjusar		PAN No.		AACCK9332J	
Ta : Savli; District - Vadodara - 391775 (Gujarat)		INCOTERMS :		DAP TW USA CAROL STREAM IL 60188	
Phone No. +91 2667 264777		L.C. No.			
E-Mail export@krystalsteel.co.in & sales@krystalsteel.co.in		Payment Terms :		30 % Advance along with commercially cleared Purchase(PO), balance against Performa Invoice before dispatch from our site	
Home Page www.krystalsteel.co.in		INVOICE NO :		KSMF/2018-19/168	
PO NO : M 49397512 DT :2/8/18		OA NO:		E-1819/00068 DT : 6/8/18	
CONSIGNEE BILLING ADDRESS		CONSIGNEE DELIVERY ADDRESS		INVOICE DATE : 26/9/2018	
TW METALS		TW METALS		NOTIFY PARTY & ADDRESS	
235 Tubeway Drive Carol Stream, IL 60188 United States of America		235 Tubeway Drive, Carol Stream, IL 60188, United States of America United States of America		235 Tubeway Drive, Carol Stream, IL 60188, United States of America United States of America	
Email : barb.kucia@twmetals.com Tel : 630-690-0110		Email : BARB.KUCIA@TWMETALS.COM Tel : 610.458.1361		Email : BARB.KUCIA@TWMETALS.COM Tel : 610.458.1361	
PRE - CARRIAGE BY :		BY SEA		COUNTRY OF ORIGIN : INDIA	
VESSEL/FLIGHT NO :		NA		COUNTRY OF FINAL DESTINATION : USA	
PLACE OF CARRIAGE RECEIPT :		NA		SEAPORT OF LOADING : Mnasheva Port, Maharashtra, India	
CONTAINER NO :		NA		SEAPORT OF DISCHARGE : NEW YORK NY SEA PORT	
SEAL NO :		NA		FINAL DESTINATION : United States of America	

MARKS & NOS :		TW METALS		H.S. Code : 73044100	
		M 49397512 DT :2/8/18			

Sr. No.	Material Description		Size		PCS	MTR	Weight	USD/MTR	TOTAL AMOUNT USD
	Reference No./Heat No./Metallurgy	Specs	Grade	OD (MM/IN)	THK (MM)	Length			
1	71338495/1801-077 Cold Finished Austenitic S.S. Seamless Tubes	ASTM A-269/ EN 10216-5	TP 316L/1.44 04	21.3	1.6	4,000.00	521	2101.01	1632.00
							521	2101.01	1632.00
								Invoice USD	27,103.03
								Payable Amount	13.03

INVOICE VALUE (IN WORDS)	**** TWENTY SEVEN THOUSAND ONE HUNDRED THREE USD AND THREE ONLY
PAYABLE VALUE (IN WORDS)	**** THIRTEEN USD AND THREE ONLY

WE INTEND TO CLAIM REWARDS UNDER MERCHANDISE EXPORT FORM INDIA SCHEME(MIES)

SHIPMENT UNDER ADVANCE AUTHORTISATION LICENCE SCHEME

LICENCE NO	LICENCE DATE :	GRADE & SUB-GRADE	EXPORTED QUANTITY (MT)	EXEMPTED QUANTITY (MT)
34/21/040/00261/AM19	23/8/2018	TP 316L/1.4404	1.632	2.203

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BANK DETAILS: For USD A/C. No. 666 Bank of Baroda-EEE A/C (Mumbai Gamdevi Branch), A/C No.: 03940200000666, SWIFT CODE: BARBINBGAM
For EURO A/C. No. 667 Bank of Baroda-EEE A/C (Mumbai Gamdevi Branch), A/C No.: 03940200000667, SWIFT CODE: BARBINBGAM
Address : Bank Of Baroda, Gamdevi Branch Mumbai , Gita Building, Pandita Ramabhai Road, Gamdevi, Mumbai - 400 007, MAHARASTRA.

Abb	S.S. - Stainless Steel				
PREPARED BY	CHECKED BY MARKETING	AUTHORIZED BY FINANCE			



KRYSTAL
S T E E L
Manufacturing Pvt. Ltd.

Manufacturer & Exporter of Seamless Stainless, Duplex & Super Duplex & Nickel Alloy Tubes, Pipes & U -

Plot No # KV - 2, G.I.D.C (Savli), P.O - Manjusr Ta : Savli, District - Vadodara - 391775

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COMMERCIAL INVOICE

EXPORTER		IEC NO :	0307043321
KRYSTAL STEEL MANUFACTURING PVT. LTD.		CIN NO :	U27109MH2006PTC165777
Plot No # KV - 2, G.I.D.C (Savli), P.O - Manjusr		PAN No.	AACCK9332J
Ta : Savli, District - Vadodara - 391775 (Gujarat)		INCOTERMS :	DAP TW USA CAROL STREAM IL 60188
		L.C. No.	
Phone No. +91 2667 264777		Payment Terms :	30 % Advance along with commercially cleared Purchase(PO), balance against Performa Invoice before dispatch frm our site
E-Mail export@krystalsteel.co.in & sales@krystalsteel.co.in		INVOICE NO :	KSMP/2018-19/168
Home Page www.krystalsteel.co.in		INVOICE DATE :	26/9/2018
PO NO : M 49397512 DT :2/8/18	OA NO:	E-1819/00068 DT : 6/8/18	
CONSIGNEE BILLING ADDRESS		CONSIGNEE DELIVERY ADDRESS	
TW METALS		TW METALS	
235 Tubeway Drive Carol Stream, IL 60188 United States of America		235 Tubeway Drive, Carol Stream, IL 60188, United States of America United States of America	
Email : barb.kucia@twmetals.com Tel : 630-690-0110		Email : BARB.KUCIA@TWMETALS.COM Tel : 610.458.1361	

PRE - CARRIAGE BY :	BY SEA	COUNTRY OF ORIGIN :	INDIA
VESSEL/FLIGHT NO :	NA	COUNTRY OF FINAL DESTINATION :	USA
PLACE OF CARRIAGE RECEIPT :	NA	SEAPORT OF LOADING :	Nhavasheva Port, Maharashtra, India
CONTAINER NO :	NA	SEAPORT OF DISCHARGE :	NEW YORK NY SEA PORT
SEAL NO :	NA	FINAL DESTINATION :	United States of America

MARKS & NOS :		H.S. Code : 73044100	
TW METALS			
M 49397512 DT :2/8/18			

Sr. No.	Material Description		Size		PCS	MTR	Weight	USD/MTR	TOTAL AMOUNT USD
	Reference No./Heat	Specs	Grade	OD (MM/NB)	THK (MM)				
1	71338495/1801-077 Cold Finished Austenitic S.S. Seamless Tubes	ASTM A-269/ EN 10216-5	TP 316L/1.44 04	21.3	1.6	521	2101.01	1632.00	12.90
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INVOICE VALUE (IN WORDS)	**** TWENTY SEVEN THOUSAND ONE HUNDRED THREE USD AND THREE ONLY	Invoice USD	27,103.03
PAYABLE VALUE (IN WORDS)	**** THIRTEEN USD AND THREE ONLY	Payable Amount	13.03

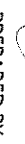
WE INTEND TO CLAIM REWARDS UNDER MERCHANDISE EXPORT FORM INDIA SCHEME(MES)

SHIPMENT UNDER ADVANCE AUTHORIZATION LICENCE SCHEME

LICENCE NO	LICENCE DATE :	GRADE & SUB-GRADE	EXPORTED QUANTITY (MT)	EXEMPTED QUANTITY (MT)
34/21/040/00261/AM19	23/8/2018	TP 316L/1.4404	1.632	2.203

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Address : Bank Of Baroda, Gandevi Branch Mumbai , Gila Building, Pandita Ramabhai Road, Gandevi, Mumbai - 400 007 , MAHARASTRA.

Abb	S.S. - Stainless Steel				
PREPARED BY	CHECKED BY MARKETING	AUTHORIZED BY FINANCE			
					
DMS EMS ORSAS P.E.D. & AD 2008 Merchant Vgo Consultant Government Recognized Export House					
 krystalsteel.co.in					



"Quality First..... Customer Always"

Manufacturer & Exporter of Seamless Stainless, Duplex & Super Duplex & Nickel Alloy Tubes, Pipes & U -

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COMMERCIAL INVOICE

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Ta : Savli, District - Vadodara - 391775 (Gujarat)		INCOTERMS:	DAP TW USA CAROL STREAM IL 60188
Phone No. +91 2667 264777		LC No.:	
E-Mail export@krystalsteel.co.in & sales@krystalsteel.co.in		Payment Terms:	30 % Advance along with commercially cleared Purchase(PO), balance against Performa Invoice before dispatch frm our site
Home Page www.krystalsteel.co.in		INVOICE NO.:	KSMP/2018-19/168
PO NO.:	M 49397512 DT :2/8/18	OA NO.:	E-1819/00068 DT : 6/8/18
CONSIGNEE BILLING ADDRESS		CONSIGNEE DELIVERY ADDRESS	
TW METALS		NOTIFY PARTY & ADDRESS	
235 Tubeway Drive Carol Stream, IL 60188 United States of America		235 Tubeway Drive, Carol Stream, IL 60188, United States of America United States of America	
Email : barb.kucia@twmetals.com Tel : 630-690-0110		Email : BARB.KUCIA@TWMETALS.COM Tel : 610.458.1361	

PRE - CARRIAGE BY:	BY SEA	COUNTRY OF ORIGIN:	INDIA
VESSEL/FLIGHT NO.:	NA	COUNTRY OF FINAL DESTINATION:	USA
PLACE OF CARRIAGE RECEIPT:	NA	SEAPORT OF LOADING:	Mhasheva Port, Maharashtra, India
CONTAINER NO.:	NA	SEAPORT OF DISCHARGE:	NEW YORK NY SEA PORT
SEAL NO.:	NA	FINAL DESTINATION:	United States of America

MARKS & NOS :		TW METALS	H.S. Code : 73044100
		M 49397512 DT :2/8/18	

Sr. No.	Material Description		Size		PCS	MTR	Weight	USD/MTR	TOTAL AMOUNT USD
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Address : Bank Of Baroda, Gamdevi Branch Mumbai , Gita Building, Pandita Ramabhai Road, Gamdevi, Mumbai - 400 007 , MAHARASTRA.

Abb	S.S. - Stainless Steel				
PREPARED BY	CHECKED BY MARKETING	AUTHORIZED BY FINANCE	AUTHORIZED BY	QMS EMS OHSAS F.E.O & AD 2000 Merckant Wro Compliant Government Recognized Export House krystalsteel.co.in	



Manufacturer & Exporter of Seamless Stainless, Duplex & Super Duplex & Nickel Alloy Tubes, Pipes & U -

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• (T): +91 2667 264777 • (E): export@krystalsteel.co.in & sales@krystalsteel.co.in • (W): www.krystalsteel.co.in

PACKING LIST

EXPORTER		IEC NO :		0307043321	
KRYSTAL STEEL MANUFACTURING PVT. LTD.		CIN NO :		U27109MH2006PTCL65777	
Plot No # KV - 2, G.I.D.C (Savli), P.O - Manjusar		PAN No.		AACCK9332J	
Ta : Savli, District - Vadodara - 391775 (Gujarat)		INCOTERMS :		DAP TW USA CAROL STREAM IL 60188	
Phone No. +91 2667 264777		L.C. No.		30 % Advance along with commercially cleared Purchase(PO), balance against Performa Invoice before dispatch from our site	
E-Mail export@krystalsteel.co.in & sales@krystalsteel.co.in		Payment Terms :			
Home Page www.krystalsteel.co.in					
PO NO :	M 49397512	OA NO:	E-1819/00068 DT : 6/8/18	INVOICE NO :	KSMP/2018-19/168
CONSIGNEE BILLING ADDRESS		CONSIGNEE DELIVERY ADDRESS		INVOICE DATE : 26/09/2018	
TW METALS		TW METALS		NOTIFY PARTY & ADDRESS	
235 Tubeway Drive Carol Stream, IL 60188 United States of America		235 Tubeway Drive, Carol Stream, IL 60188, United States of America United States of America		235 Tubeway Drive, Carol Stream, IL 60188, United States of America United States of America	
Email : barb.kucia@twmetals.com Tel : 630-690-0110		Email : BARB.KUCIA@TWMETALS.COM Tel : 610-458.1361		Email : BARB.KUCIA@TWMETALS.COM Tel : 610-458.1361	
PRE - CARRIAGE BY :		BY SEA		COUNTRY OF ORIGIN :	
VESSEL/FLIGHT NO :		NA		COUNTRY OF FINAL DESTINATION :	
PLACE OF CARRIAGE RECEIPT :		NA		SEAPORT OF LOADING :	
CONTAINER NO :		NA		SEAPORT OF DISCHARGE :	
SEAL NO :		NA		FINAL DESTINATION :	
				UNITED STATES OF AMERICA	

PRE - CARRIAGE BY :		BY SEA		COUNTRY OF ORIGIN :		INDIA							
VESSEL/FLIGHT NO :		NA		COUNTRY OF FINAL DESTINATION :		USA							
PLACE OF CARRIAGE RECEIPT :		NA		SEAPORT OF LOADING :		Nhaasheva Port, Maharashtra, India							
CONTAINER NO :		NA		SEAPORT OF DISCHARGE :		NEW YORK NY SEA PORT							
SEAL NO :		NA		FINAL DESTINATION :		UNITED STATES OF AMERICA							
MARKS & NOS :				TW METALS		Ship No.: SHIP/1819/00151							
				M 49397512		H.S. Code : 73044100							
ITEM	TYPE OF	EXTERNAL	DESCRIPTION OF THE GOODS				QUANTITY		WEIGHT				
SR NO.	PACKING	NO./Heat No.	MATERIAL	SPEC.	GRADE	OD (MM/NB)	THK (MM/SC H)	LENGHT	PCS /NOS	METERS	NET WEIGHT (KG)	BOX WEIGHT	GROSS WEIGHT
1	BOX NO 1 680(W) X 770(H) X 4310(L)	71338495 /1801-077	Cold Finished Austenitic S.S. Seamless Tubes	ASTM A- 269/ EN 10216-5	TP 316L/1.44 04	21.3	1.60	4.000	521.00	2,101.01	1,632.00	140.00	1,772.00
Total								521.00	2,101.01	1,632.00	140.00	1,772.00	

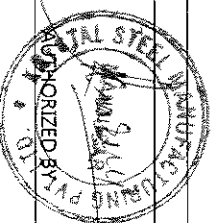
WE INTEND TO CLAIM REWARDS UNDER MERCHANDISE EXPORT FORM INDIA SCHEME(MEIS)

SHIPMENT UNDER ADVANCE AUTHORISATION LICENCE SCHEME

LICENCE NO	LICENCE DATE :	GRADE & SUB-GRADE	EXPORTED QUANTITY (MT)	EXEMPTED QUANTITY (MT)
34/21/040/00261/AM19	23/08/2018	TP 316L/1.4404	1.632	2.203

DECLARATION- WE DECLARE THAT GOODS ARE MANUFACTURED IN INDIA. MATERIAL SUPPLIED WITH ORIGINAL MILL TEST CERTIFICATE ARE AS PER PURCHASE ORDER & APPROVED ORDER TO ACCEPTANCE WARRANTED FOR SUITABLE PERFORMANCE UNTIL 18 MONTHS FROM THE DATE OF DISPATCH OR 12 MONTHS FROM THE DATE OF USAGE, WHICHEVER IS EARLIER SUBJECT TO GOOD ENGINEERING PRACTICES AND TECHNICALLY SUITABLE USAGE; HOWEVER OVERALL LIABILITY OF THE SUPPLIER (KSMP) IS LIMITED TO THE VALUE OF DEFECTIVE GOODS LIMITED TO MANUFACTURING DEFECTS ONLY.

Abb	S.S. - Stainless Steel						
PREPARED BY		CHECKED BY MARKETING	AUTHORIZED BY FINANCE				



QMS | EMS | OHSAS
ISO 9001 & ISO 14001 CERTIFIED EXPORT HOUSE
Government Recognized Export House
www.krystalsteel.co.in



KRYSTAL
S T E E L
Manufacturing Pvt. Ltd.

"Quality First Customer Always"

Manufacturer & Exporter of Seamless Stainless, Duplex & Super Duplex & Nickel Alloy Tubes, Pipes & U -

Plot No # KV - 2, G.I.D.C (Savli), P.O - Manjusar Ta : Savli, District - Vadodara - 391775

• (T): +91 2667 264777 • (E): export@krystalsteel.co.in & sales@krystalsteel.co.in • (W): www.krystalsteel.co.in

PACKING LIST

EXPORTER		IEC NO :		0307043321	
KRYSTAL STEEL MANUFACTURING PVT. LTD.		CIN NO :		U27109MH2006PTC165777	
Plot No # KV - 2, G.I.D.C (Savli), P.O - Manjusar		PAN No.:		AACCK9332J	
Ta : Savli, District - Vadodara - 391775 (Gujarat)		INCOTERMS :		DAP TW USA CAROL STREAM IL 60188	
Phone No. +91 2667 264777		L.C. No.		30 % Advance along with commercially cleared Purchase(PO), balance against Performa Invoice before dispatch frm our site	
E-Mail export@krystalsteel.co.in & sales@krystalsteel.co.in		Payment Terms :		INVOICE NO : KSM/2018-19/168	
Home Page www.krystalsteel.co.in		PO NO :		INVOICE DATE : 26/09/2018	
		M 49397512		OA NO:	
				E-1819/00068 DT : 6/8/18	
CONSIGNEE BILLING ADDRESS		CONSIGNEE DELIVERY ADDRESS		NOTIFY PARTY & ADDRESS	
TW METALS		TW METALS		TW METALS	
235 Tubeway Drive Carol Stream, IL 60188 United States of America		235 Tubeway Drive, Carol Stream, IL 60188, United States of America United States of America		235 Tubeway Drive, Carol Stream, IL 60188, United States of America United States of America	
Email : barb.kucia@twmetals.com Tel : 630-690-0110		Email : BARB.KUCIA@TWMETALS.COM Tel : 610.458.1361		Email : BARB.KUCIA@TWMETALS.COM Tel : 610.458.1361	
PRE - CARRIAGE BY :		BY SEA		COUNTRY OF ORIGIN :	
VESSEL/FLIGHT NO :		NA		INDIA	
PLACE OF CARRIAGE RECEIPT :		NA		COUNTRY OF FINAL DESTINATION :	
CONTAINER NO :		NA		USA	
SEAL NO :		NA		SEAPORT OF LOADING : Nhavashvea Port, Maharashtra, India	
				SEAPORT OF DISCHARGE : NEW YORK NY SEA PORT	
				FINAL DESTINATION : UNITED STATES OF AMERICA	

PRE - CARRIAGE BY :		BY SEA		COUNTRY OF ORIGIN :		INDIA							
VESSEL/FLIGHT NO :		NA		COUNTRY OF FINAL DESTINATION :		USA							
PLACE OF CARRIAGE RECEIPT :		NA		SEAPORT OF LOADING :		Mharasheya Port, Maharashtra, India							
CONTAINER NO :		NA		SEAPORT OF DISCHARGE :		NEW YORK NY SEA PORT							
SEAL NO :		NA		FINAL DESTINATION :		UNITED STATES OF AMERICA							
MARKS & NOS :				TW METALS		Ship No.: SHIP/1819/00151 H.S. Code : 73044100							
				IM 49397512									
ITEM	TYPE OF	DESCRIPTION OF THE GOODS						QUANTITY		WEIGHT			
SR NO.	PACKING	EXTERNAL NO./Heat No.	MATERIAL	SPEC.	GRADE	OD (MM/NB)	THK (MM/SC H)	LENGHT	PCS /NOS	METERS	NET WEIGHT (KG)	BOX WEIGHT	GROSS WEIGHT
1	BOX NO 1 680(W) X 770(H) X 4310(L)	71338495 /1801-077	Cold Finished Austenitic S.S. Seamless Tubes	ASTM A- 269/ EN 10216-5	TP 316/L/44 04	21.3	1.60	4.000	521.00	2,101.01	1,632.00	140.00	1,772.200
Total									521.00	2,101.01	1,632.00	140.00	1,772.00

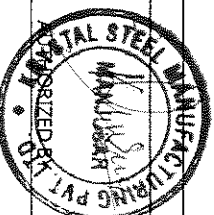
WE INTEND TO CLAIM REWARDS UNDER MERCHANDISE EXPORT FORM INDIA SCHEME(MEIS)

SHIPMENT UNDER ADVANCE AUTHORIZATION LICENCE SCHEME

LICENCE NO	LICENCE DATE :	GRADE & SUB-GRADE	EXPORTED QUANTITY (MT)	EXEMPTED QUANTITY (MT)
34/21/040/00261/AM19	23/08/2018	TP 316/L/4404	1.632	2.203

DECLARATION - WE DECLARE THAT GOODS ARE MANUFACTURED IN INDIA. MATERIAL SUPPLIED WITH ORIGINAL MILL TEST CERTIFICATE ARE AS PER PURCHASE ORDER & APPROVED ORDER ACCEPTANCE WARRANTY FOR SUITABLE APPLICABLE PERFORMANCE UNTIL 18 MONTHS FROM THE DATE OF DISPATCH OR 12 MONTHS FROM THE DATE OF USAGE WHICHEVER IS EARLIER SUBJECT TO GOOD ENGINEERING PRACTICES AND TECHNICALLY SUITABLE USAGE, HOWEVER OVERALL LIABILITY OF THE SUPPLIER (KSMPL) IS LIMITED TO THE VALUE OF DEFECTIVE GOODS LIMITED TO MANUFACTURING DEFECTS ONLY.

Abb	S.S. - Stainless Steel				
PREPARED BY		CHECKED BY MARKETING	AUTHORIZED BY FINANCE	QMS EMS ONSAS P.O. & NO 2009 Merchant Export Commission Government Recognized Export House krystalsteel.co.in	





Manufacturer & Exporter of Seamless Stainless, Duplex & Super Duplex & Nickel Alloy Tubes, Pipes & U -

Plot No # KV - 2, G.I.D.C (Savli), P.O - Manjusar Ta : Savli, District - Vadodara - 391775

• (T): +91 2667 264777 • (E): export@krystalsteel.co.in & sales@krystalsteel.co.in • (W): www.krystalsteel.co.in

PACKING LIST

EXPORTER		IEC NO :	
KRYSTAL STEEL MANUFACTURING PVT. LTD.		0307043321	
Plot No # KV - 2, G.I.D.C (Savli), P.O - Manjusar Ta : Savli, District - Vadodara - 391775		U27109MH2006PTC165777	
Phone No. +91 2667 264777		AACCK93321	
E-Mail export@krystalsteel.co.in & sales@krystalsteel.co.in		DAP TW USA CAROL STREAM IL 60188	
Home Page www.krystalsteel.co.in		30 % Advance along with commercially cleared Purchase(PO), balance against Performa Invoice before dispatch frm our site	
PO NO :		INVOICE NO :	KSMP/2018-19/168
M 49397512		INVOICE DATE :	26/09/2018
CONSIGNEE BILLING ADDRESS		NOTIFY PARTY & ADDRESS	
235 Tubeway Drive Carol Stream, IL 60188 United States of America		235 Tubeway Drive, Carol Stream, IL 60188, United States of America United States of America	
Email : barb.kucia@twmetals.com Tel : 630-690-0110		Email : BARB.KUCIA@TWMETALS.COM Tel : 610.458.1361	

PRE - CARRIAGE BY :	BY SEA	COUNTRY OF ORIGIN :	INDIA
VESSEL/FLIGHT NO :	NA	COUNTRY OF FINAL DESTINATION :	USA
PLACE OF CARRIAGE RECEIPT :	NA	SEAPORT OF LOADING :	Nhavesheva Port, Maharashtra, India
CONTAINER NO :	NA	SEAPORT OF DISCHARGE :	NEW YORK NY SEA PORT
SEAL NO :	NA	FINAL DESTINATION :	UNITED STATES OF AMERICA

MARKS & NOS :											TW METALS		Ship No.: SHIP/1819/00151	
M 49397512											H.S. Code : 73044100			
ITEM	TYPE OF	EXTERNAL	DESCRIPTION OF THE GOODS					QUANTITY			WEIGHT			
SR NO.	PACKING	NO./Heat No.	MATERIAL	SPEC.	GRADE	OD (MM/NB)	THK (MM/SC H)	LENGHT	PCS /NOS	METERS	NET WEIGHT (KG)	BOX WEIGHT	GROSS WEIGHT	
1	BOX NO 1 680(W) X 770(H) X 4310(L)	71338495 /1801-077	Cold Finished Austenitic S.S. Seamless Tubes	ASTM A- 269/ EN 10216-5	TP 316/L1,44 04	21.3	1.60	4.000	521.00	2.101.01	1.632.00	140.00	1,772.00	
Total									521.00	2.101.01	1,632.00	140.00	1,772.00	

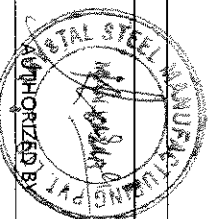
WE INTEND TO CLAIM REWARDS UNDER MERCHANDISE EXPORT FORM INDIA SCHEME(MES)

SHIPMENT UNDER ADVANCE AUTHORISATION LICENCE SCHEME

LICENCE NO	LICENCE DATE :	GRADE & SUB-GRADE	EXPORTED QUANTITY (MT)	EXEMPTED QUANTITY (MT)
34/21/040/00261/AM19	23/08/2018	TP 316/L4404	1.632	2.203

DECLARATION- WE DECLARE THAT GOODS ARE MANUFACTURED IN INDIA. MATERIAL SUPPLIED WITH ORIGINAL WILL TEST CERTIFICATE ARE AS PER PURCHASE ORDER & APPROVED ORDER ACCEPTANCE WARRANTED FOR SUITABLE APPLICABLE PERFORMANCE UNTIL 18 MONTHS FROM THE DATE OF DISPATCH OR 12 MONTHS FROM THE DATE OF USAGE WHICHEVER IS EARLIER SUBJECT TO GOOD ENGINEERING PRACTICES AND TECHNICALLY SUITABLE USAGE.HOWEVER OVERALL LIABILITY OF THE SUPPLIER (KSMP) IS LIMITED TO THE VALUE OF DEFECTIVE GOODS LIMITED TO MANUFACTURING DEFECTS ONLY.

Abb	S.S. - Stainless Steel				
PREPARED BY	CHECKED BY	MARKETING	AUTHORIZED BY	FINANCE	





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Plot No # KV - 2, G.I.D.C (Savli), P.O - Manjusar Ta : Savli, District - Vadodara - 391775

• (T): +91 2667 264777 • (F): export@krystalsteel.co.in & sales@krystalsteel.co.in • (W): www.krystalsteel.co.in

PACKING LIST

EXPORTER		IEC NO :		0307043321	
KRYSTAL STEEL MANUFACTURING PVT. LTD.		CIN NO :		U27109MH2006PTC165777	
Plot No # KV - 2, G.I.D.C (Savli), P.O - Manjusar Ta : Savli, District - Vadodara - 391775 (Gujarat)		PAN No.		AACCK9332J	
		INCOTERMS :		DAP TW USA CAROL STREAM IL 60188	
Phone No. +91 2667 264777		L.C. No.			
E-Mail export@krystalsteel.co.in & sales@krystalsteel.co.in		Payment Terms :		30 % Advance along with commercially cleared Purchase(PO), balance against Performa Invoice before dispatch frm our site	
Home Page www.krystalsteel.co.in		INVOICE NO :		KSMF/2018-19/168	
PO NO :		OA NO:		E-1819/00068 DT : 6/8/18	
M 49397512		INVOICE DATE :		26/09/2018	
CONSIGNEE BILLING ADDRESS		CONSIGNEE DELIVERY ADDRESS		NOTIFY PARTY & ADDRESS	
TW METALS		TW METALS		TW METALS	
235 Tubeway Drive Carol Stream, IL 60188 United States of America		235 Tubeway Drive, Carol Stream, IL 60188, United States of America United States of America		235 Tubeway Drive, Carol Stream, IL 60188, United States of America United States of America	
Email : barb.kucia@twmetals.com Tel : 630-690-0110		Email : BARB.KUCIA@TWMETALS.COM Tel : 610.458.1361		Email : BARB.KUCIA@TWMETALS.COM Tel : 610.458.1361	
PRE - CARRIAGE BY :		COUNTRY OF ORIGIN :		INDIA	
VESSEL/FLIGHT NO :		COUNTRY OF FINAL DESTINATION :		USA	
PLACE OF CARRIAGE RECEIPT :		SEAPORT OF LOADING :		Nhareshvea Port, Maharashtra, India	
CONTAINER NO :		SEAPORT OF DISCHARGE :		NEW YORK NY SEA PORT	
SEAL NO :		FINAL DESTINATION :		UNITED STATES OF AMERICA	

MARKS & NOS :		TW METALS		Ship No.: SHP/1819/00151	
M 49397512		H.S. Code : 73044100			
ITEM		DESCRIPTION OF THE GOODS		QUANTITY	
SR NO.		PACKING TYPE OF		NET WEIGHT	
EXTERNAL NO./Heat No.		MATERIAL		BOX WEIGHT	
SPEC.		GRADE		GROSS WEIGHT	
OD (MM/NB)		THK (MM/SC H)			
LENGHT		PCS /NOS			
METERS		WEIGHT (KG)			
BOX NO 1		680(W) X 770(H) X 4310(L)			
71338495		Cold Finished Austenitic S.S.			
/1801-077		ASTM A-269/ EN 10216-5			
Seamless Tubes		TP 316L/1.44 04			
		21.3			
		1.60			
		4.000			
		521.00			
		2.101.01			
		1,632.00			
		140.00			
		1,772.00			
Total		521.00		2,101.01	
		1,632.00		140.00	
		1,772.00			

WE INTEND TO CLAIM REWARDS UNDER MERCHANDISE EXPORT FORM INDIA SCHEME(MEIS)

SHIPMENT UNDER ADVANCE AUTHORISATION LICENCE SCHEME

LICENCE NO	LICENCE DATE :	GRADE & SUB-GRADE	EXPORTED QUANTITY (MT)	EXEMPTED QUANTITY (MT)
34/21/040/00261/AM19	23/08/2018	TP 316L/1.4404	1.632	2.203

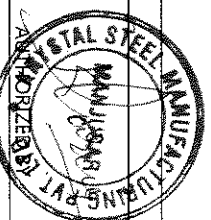
DECLARATION - WE DECLARE THAT GOODS ARE MANUFACTURED IN INDIA. MATERIAL SUPPLIED WITH ORIGINAL MILL TEST CERTIFICATE ARE AS PER PURCHASE ORDER & APPROVED ORDER TO ACCEPTANCE WARRANTED FOR SUITABLE APPLICABLE PERFORMANCE UNTIL 18 MONTHS FROM THE DATE OF DISPATCH OR 12 MONTHS FROM THE DATE OF USAGE WHICHEVER IS EARLIER SUBJECT TO GOOD ENGINEERING PRACTICES AND TECHNICALLY SUITABLE USAGE HOWEVER OVERALL LIABILITY OF THE SUPPLIER (KSMPL) IS LIMITED TO THE VALUE OF DEFECTIVE GOODS LIMITED TO MANUFACTURING DEFECTS ONLY.

Abb S.S. - Stainless Steel

PREPARED BY

CHECKED BY MARKETING

AUTHORIZED BY FINANCE



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P.E.D & A.O 2008 Merchant Wo. Compliant
Government Recognized Export House
krystalsteel.co.in



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Plot No # KV - 2, G.I.D.C (Savli), P.O - Manjusar Ta : Savli, District - Vadodara - 391775

• (T): +91 2667 264777 • (E): export@krystalsteel.co.in & sales@krystalsteel.co.in • (M): www.krystalsteel.co.in

PACKING LIST

EXPORTER		IEC NO :		0307043321	
KRYSTAL STEEL MANUFACTURING PVT. LTD.		CIN NO :		U27109MH2006PTC165777	
Plot No # KV - 2, G.I.D.C (Savli), P.O - Manjusar Ta : Savli, District - Vadodara - 391775 (Gujarat)		PAN NO.		AACCK9332J	
		INCOTERMS :		DAP TW USA CAROL STREAM IL 60188	
		L.C. No.			
Phone No. +91 2667 264777		Payment Terms :		30 % Advance along with commercially cleared Purchase(PO), balance against Performa Invoice before dispatch from our site	
E-Mail export@krystalsteel.co.in & sales@krystalsteel.co.in					
Home Page www.krystalsteel.co.in					
PO NO :	M 49397512	OA NO:	E-1819/00068 DT : 6/8/18	INVOICE NO :	KSMP/2018-19/168
				INVOICE DATE :	26/09/2018
CONSIGNEE BILLING ADDRESS		CONSIGNEE DELIVERY ADDRESS		NOTIFY PARTY & ADDRESS	
TW METALS		TW METALS		TW METALS	
235 Tubeway Drive Carol Stream, IL 60188 United States of America		235 Tubeway Drive, Carol Stream, IL 60188, United States of America United States of America		235 Tubeway Drive, Carol Stream, IL 60188, United States of America United States of America	
Email : barb.kucia@twmetals.com Tel : 630-690-0110		Email : BARB.KUCIA@TWMETALS.COM Tel : 610.458.1361		Email : BARB.KUCIA@TWMETALS.COM Tel : 610.458.1361	

PRE - CARRIAGE BY :	BY SEA	COUNTRY OF ORIGIN :	INDIA
VESSEL/FLIGHT NO :	NA	COUNTRY OF FINAL DESTINATION :	USA
PLACE OF CARRIAGE RECEIPT :	NA	SEAPORT OF LOADING :	Nhavasheva Port, Maharashtra, India
CONTAINER NO :	NA	SEAPORT OF DISCHARGE :	NEW YORK NY SEA PORT
SEAL NO :	NA	FINAL DESTINATION :	UNITED STATES OF AMERICA

MARKS & NOS :		TW METALS		Ship No.: SHIP/1819/00151									
		M 49397512		H.S. Code : 73044100									
ITEM	TYPE OF	EXTERNAL	DESCRIPTION OF THE GOODS				QUANTITY		WEIGHT				
SR NO.	PACKING	NO./Heat No.	MATERIAL	SPEC.	GRADE	OD (MM/NB)	THK (MM/SC H)	LENGHT	PCS /NOS	METERS	NET WEIGHT (KG)	BOX WEIGHT	GROSS WEIGHT
1	BOX NO 1 680(W) X 770(H) X 4310(L)	71338495 /1801-077	Cold Finished Austenitic S.S. Seamless Tubes	ASTM A- 269/ EN 10216-5	TP 316L/1.44 04	21.3	1.60	4.000	521.00	2,101.01	1,632.00	140.00	1,772.00
Total									521.00	2,101.01	1,632.00	140.00	1,772.00

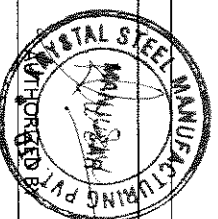
WE INTEND TO CLAIM REWARDS UNDER MERCHANDISE EXPORT FORM INDIA SCHEME(MIES)

SHIPMENT UNDER ADVANCE AUTHORIZATION LICENCE SCHEME

LICENCE NO	LICENCE DATE :	GRADE & SUB-GRADE	EXPORTED QUANTITY (MT)	EXEMPTED QUANTITY (MT)
34/21/040/00261/AM19	23/08/2018	TP 316L/1.4404	1.632	2.203

DECLARATION- WE DECLARE THAT GOODS ARE MANUFACTURED IN INDIA. MATERIAL SUPPLIED WITH ORIGINAL MILL TEST CERTIFICATE ARE AS PER PURCHASE ORDER & APPROVED ORDER ACCEPTANCE WARRANTED FOR SUITABLE APPLICABLE PERFORMANCE UNTIL 18 MONTHS FROM THE DATE OF DISPATCH OR 12 MONTHS FROM THE DATE OF USAGE WHICHEVER IS EARLIER SUBJECT TO GOOD ENGINEERING PRACTICES AND TECHNICALLY SUITABLE USAGE, HOWEVER OVERALL LIABILITY OF THE SUPPLIER (KSMP) IS LIMITED TO THE VALUE OF DEFECTIVE GOODS LIMITED TO MANUFACTURING DEFECTS ONLY.

Abb	S.S. - Stainless Steel				
PREPARED BY		CHECKED BY MARKETING	AUTHORIZED BY FINANCE		



QMS | EMS | OHSAS
P.E.D & AO 2009 Meritant We Compliant
Government Recognized Export House
krystalsteel.co.in

Plot KV # 2, GIDC Manjusar, Ta: Savli, Baroda - 391 775, Gujarat, INDIA. (t) - +91-2667-264777 / 778, (e) - marketing@krystalsteel.co.in (w) - www.krystalsteel.co.in		 KRYSTAL STEEL Manufacturers PVT. LTD. Creating Core Values		KRYSTAL STEEL MANUFACTURING PVT. LTD. Manufacturer & Exporter of Seamless Stainless, Duplex, Nickel Alloys Pipes, Tubes & U Tubes DIN EN ISO 9001:2008 , ISO 14001:2004, BS OHSAS 18001: 2007, PED 2014/68/EU & AD 2000 W0 Compliant Export House / An IBR & EIL Approved Manufacturer		Manufacturer's Mark  SPI / TPI Mark													
MILL TEST CERTIFICATE										FORMAT NO.-QR/QAC/16/REV.01									
Customer	M/s. TW METALS - CAROL STREAM							Customer PO No	M 49397512							Date	02/08/2018		
Short Address	235, TUBEWAY, CAROL STREAM, IL, 60188, USA							OA No	E-1819/00068							Date	06/08/2018		
MTC Type	EN 10204 Type 3.1 & PED							MTC No	KS/ST-316L/54/0918							Date	24/09/2018		
Project Details	NIL																		
Material Description	C.F.A SEAMLESS (AUSTENITIC) STAINLESS STEEL TUBES.							Specs & Grades	EN 10216-5 Ed 2014-03 , 1.4404/TP 316L/TC1 , ASTM A 269 Ed.2016 Add.15a										
Heat Treatment	BRIGHT ANNEALED AT 1040 - 1120°C & RAPIDLY COOLED .							Dimensions	EN ISO 1127 Ed. 1997-03, D4 T3, OD Tolerance : +/- 0.11 mm , THK. Tolerance: +/-0.2 mm, LENGTH Tolerance: +/-100 mm										
								Surface Condition	BRIGHT ANNEALED CONDITION.										
Approved acc. to AD 2000 Merkblatt W0 and certified as per PED (2014/68/EU) Annex.I, Sec.4.3 by certification body for Pressure Equipment of TUV NORD Systems (Reg. No.0045)																			
Chemical Composition in %																			
PO Item No	Heat No	OD	Thk	Length	No of Pcs	Mtrs.	LA / PA	C	Si	Mn	P	S	Cr	Ni	Mo	Ti	Cu	N	PMI & VDI Check 100%
							Min	-	-	-	-	-	16.50	10.00	2.00	-	-	-	-
							Max	0.030	1.00	2.00	0.040	0.015	18.50	13.00	2.50	-	-	0.10	-
71338495	1801-077	21.3 mm	1.6 mm	4000 mm	521	2101.01	P.A	0.023	0.380	0.790	0.031	0.002	16.770	10.010	2.070	-	-	0.064	OK
Mandatory & Supplementary Test Conformity																			
PO Item No	Heat No	OD	Thk	Tensile Strength MPa	Yield Strength 0.2% MPa	Yield Strength 1% MPa	%Elong. (GL=50 mm)	Hardness (HRB)	Flaring	Flattening	Impact Test	IGC Test	Micro	Grain Size / No	Macro	Hydro Test 100% (HOLDING TIME 5 SEC. Min.)	ECT 100% (As per ASTM E426)	DP Test	Mock up Test
				490-690	min.=190	min.=225	40% min.	90 HRB max			N.A								
71338495	1801-077	21.3 mm	1.6 mm	592.28	265.26	280.09	51	77,78,78	OK	OK	-	OK	-	-	-	70 BAR	OK	-	-
				596.16	268.46	282.42	52	76,76,77											
Remark / Spl. Note		CONFIRMATION OF IK (IGC) TEST METHOD "A" AS PER ISO 3651-2 & ASTM-A-262 Practice "E" : FOUND OK ,																	
		CONFIRMATION OF NACE MR 0175/ISO 15156-1 ED-2015 & MR 0103/ISO 17945 ED-2016 HARDNESS REQ. 22 HRC MAX (90 HRB Approx.): FOUND OK & AD 2000 Merkblatt W0 / W2 / W10																	
		CONFIRMATION OF STRAIGHTNESS FOUND ACCEPTABLE (< 2 mm Per Meter)																	
		E+H Batch No. : 0F3TN																	
		ROHS-CONFORM PRODUCT ACCORDING TO EUROPEAN DIRECTIVE 2011/65/EU AND THIS PRODUCT IS LEAD FREE(Pb FREE).																	
Marking		PRODUCT DOES NOT CONTAIN CONSTITUENT PARTS OF ANIMAL ORIGIN.																	
		CONFIRMATION OF OD & ID Cleaned and Free of Dust and Grease.																	
		METAL SOURCE OF COUNTRY : CHINA , COUNTRY OF MANUFACTURER : MADE IN INDIA																	
		CFA/21.3x1.6/EN 10216-5/1.4404/HT NO.1801-077/NJ5/0F3TN																	
L.A - LADLE ANALYSIS P.A - PRODUCT ANALYSIS Material Manufactured & Supplied against this original MTC is warrantied towards Manufacturing Defects / Failure for 18 months from the date of supply subject to utilisation within appropriate suitable applications and in accordance to GEP. Overall liability of KSMPL is limited to the value of the defective material supplied to proven evidence of manufacturing defects only & not application failure/misuse. Material Produced & Supplied is Free From any major Harmful Mercury or other Radioactive Contamination. Duplication / Forged Photocopy / Unauthorise Usage of any documentary property of Krystal is a punishable criminal act & subject to Law of Indian Jurisdiction.  Insist on Authentically Sealed Certificate (Photocopy invalid) We Certify that the Material Herein Described Have Been Manufactured & Tested In accordance to the above Specifications & the Results comply in accordance to the Requisite of the Order.  QC Manager / QC Incharge CRASHISH K. MURALIDHARAN																			



Metaltechnik GmbH . Fabrikstraße 1 . D-79650 Schopfheim

Endress + Hauser GmbH + Co.KG

Hauptstr. 1

79689 Maulburg

UMSTEMPELBESCHEINIGUNG

CERTIFICATE OF RE-STAMPING

KOMMISSIONS-NR: 190220-2
consignment no:

IHRE BESTELLUNG: 101-1017618024-00010-1951509577
your order:

Wir bestätigen, dass die gelieferten Produkte folgende Abmessungen aufweisen:
We confirm, that the supplied semi-finished products have the following dimensions:

Position item	Produkt product	Menge quantity	Dicke thickness	Durchmesser diameter	Breite width	Länge length
1	52027474 Piezorohr/piezo tube	876		Ø21,3 mm		48,5 mm

Position item	Aus Halbzeug der Abmessung out of semis of dimension	Schmelze heat-no.	Los-Probe-Blech-Nr. lot-sample-plate-no.	Hersteller manufacturer
1	Rohr/tube 1.4435	562577		Butting

ausgewiesen durch Abnahmeprüfzeugnis nach EN10204 gem. Anlage. Zeugnis-Nr. :
As evidenced by: Inspection certificate according to EN10204 as attached. No. Of cert.:

30 000 092 858 / 01

Die Stempelung ist übertragen worden. Die Fertigteile / Gebinde wurden wie folgt gekennzeichnet :
The marking has been transferred. The finished products / package are signed with No. :

1.4435 OT2M1

Zum Zeichen der ordnungsgemäßen Umstempelung wurden die Produkte / Gebinde mit folg. Zeichen versehen :
As proof of the legal re-stamping the finished products / package are signed with :

S1

BESICHTIGUNG UND MASSKONTROLLE: O.B.

Visual & dimensional inspection: o.k.

Das Umstempeln erfolgte mit Genehmigung des TÜV Industrie Service GmbH

The re-stamping was carried out with the approval of: TÜV Industrie Service GmbH

Datum : 20.02.2019
date :

Unterschrift :
signature :

Metaltechnik GmbH
Fabrikstraße 1
D-79650 Schopfheim
Geschäftsführer: Lars Schierhuber

Fon 0 76 22 / 6 67 00-0
Fax 0 76 22 / 6 67 00-19
info@metaltechnikgmbh.de
www.metaltechnikgmbh.de

Registergericht:
Amtsgericht Freiburg
Handelsregister HRB 670290
USt.-Id-Nr. DE811217999

VR-Bank eG Schopfheim-Maulburg
IBAN DE10 6839 1500 0070 5678 22
BIC GENODE61SPF

Sparkasse Staufen-Breisach
IBAN DE22 6805 2328 0001 2030 33
BIC SOLADES1STF

Abnahmeprüfzeugnis 3.1

EN10204/ISO10474-3.1



BUTTING

Dokument-Nr.:	30 000 092 858 / 01		
Besteller:	INOX-Stahlgesellschaft mbH 72622 Nürtingen		BUTTING Auftrags-Nr.: 72360 Pos.: 10
Bestell-Nr.:	2331/75201		Fertigungs-Auftrags-Nr.: 1145419
Kunden-Material-Nr.:			BUTTING Material-Nr.: 100113544
Prüfgegenstand:	längsnahtgeschweißte Rohre		
Abmessung:	21,30 x 2,00 mm	Menge:	3.177,720 m = 776 Stück
Werkstoff:	1.4435 / TP316L		

Anforderungen

AD2000-W2/W10
DIN EN 10217-7 TC2
AD2000-W10/TRB 100, Nace MR0175+0103
Ausnutzung der zulässigen Berechnungsspannung: 100 %.

Geliefert von	Lief.-Charge	Fertigungs-Auftrags-Nr.	Serial-Nr.
OUTOKUMPU	570940	1145419-	2-4;8-9;25-27;29-37;39-47;49-57;59-67;69-77;79-87;89-97;99-107; 109-117;119-123;126-128;130-138;140-148;150-158;160-164;167-169;171; 175-179;181-189;191-199;201-209;211-215;223-229;231-239;241-249; 251-259;261-269;271-279;281-284;291-299;301-308;312-320;322-330; 332-340;342-345;348-351;353-361;363-371;373-381;383-391;393-401; 403-411;413-421;423-431;433-441;443-451;453-459;466;468-476;478-486; 488-491;495-496;498-506;508-516;518-526;528-536;538-546;548-556; 558-566;568-576;578-586;588-596;598-606;608-616;618-626;628-633;636; 638-646;648;650;652-658;660-668;670-678;680-688;690;693-699;701-704; 708-709
OUTOKUMPU	562577	1151239-	4;6-14;16-24;26-34;36-39;42-44;46-53;55-63;65-73;75-83;85-93;95-103; 105-113;115-119;126-127;129-137;139-147;149-157;159-167;169-177; 179-187;189-197;199-205;207;209;211-219;221-226;228-229

Hergestellt unter Fertigungsauftragsnummer 1145419/ 1151239 aus Band mit Abnahmeprüfzeugnis nach EN 10204-3.1.

Schmelzanalyse

Ergebnisse gemäß Abnahmeprüfzeugnis des Stahlwerkes:

Geliefert von	Lief.-Charge	C (%)	Si (%)	Mn (%)	P (%)	S (%)	Cr (%)	Ni (%)	N (%)	Ti (%)	Mo (%)
OUTOKUMPU	562577	0,017	0,42	1,55	0,032	0,001	17,1	12,6	0,05	0,005	2,54
OUTOKUMPU	570940	0,018	0,46	1,57	0,028	0,001	17,1	12,6	0,06	0,005	2,54

Kennzeichnung



Serial no. Fabrication order no. EN 10217-7 TC2 W2Ab 21,3x2,0 1.4435/TP316L Heat no.





Dokument-Nr. 30 000 092 858 / 01

Materialkontrollen

Kontrolle Materialkennzeichnung: OK
Materialverwechslung: durchgeführt OK
Oberflächenkontrolle: außen 100 % OK
innen 100 % im Gegenlicht OK
Oberflächenbeschaffenheit entspricht: EN 10217-7 W2Ab gebeizt / passiviert
Ausführungsart entspricht: EN 10217-7 W2Ab gebeizt / passiviert
Wärmebehandlung durchgeführt mit: 1040 - 1090 °C, Abkühlung in Wasser
Maßkontrolle durchgeführt und entspricht: DIN EN ISO 1127 D4/T3 F1/S2

Ergebnisse der zerstörenden Prüfungen

Zugversuch(e)

Serial-Nr.	Lief.-Charge	Pr.-Lage	Temp. (°C)	a (mm)	D (mm)	Rp0.2 (MPa)	Rp1.0 (MPa)	Rm (MPa)	A (%)	B-Lage
5	562577	I	20	2,07	21,32	403	447	614	42,5	GW
227	562577	I	20	2,07	21,33	420	458	612	44,4	GW
10	570940	I	20	2,06	21,28	418	452	623	41,2	GW
250	570940	I	20	2,07	21,27	428	468	631	40,8	GW
527	570940	I	20	2,06	21,28	426	466	628	48,2	GW
706	570940	I	20	2,08	21,27	432	469	626	50,3	GW

Pr.-Lage = Probenlage, a = Dicke, b = Breite, d = Durchmesser, D = Rohrdurchmesser, G/GW = Grundwerkstoff, S/SN = Schweißnaht, WEZ = Wärmeeinflusszone, q = quer, l = längs, V1 = Rt0,5/Rm, B-Lage = Bruchlage, Z = Brucheinschnürung, W1 = Außenplattierung, W2 = Trägermaterial, W3 = Innenplattierung, CT = Kompression Test

Technologische Prüfungen

Benennung	Befund	Bemerkungen
Aufweitversuch gem. DIN EN ISO 8493	OK	

je Los und je Lieferantencharge durchgeführt

Korrosionstest(s)

Benennung	Befund	Bemerkungen
Interkristalliner Korrosionstest gem. DIN EN ISO 3651-2 Verfahren A	OK	

je Los und je Lieferantencharge durchgeführt

Metallografische Untersuchungen

Benennung	Befund	Lief.-Charge	Dokument-Nr.	Bemerkungen
Härteprüfung Schweißnaht gem. NACE	OK	562577	20000382381	
Härteprüfung Schweißnaht gem. NACE	OK	570940	20000382376	

Stückanalysen

Benennung	Befund	Lief.-Charge	Dokument-Nr.	Bemerkungen
Verwechslungsprüfung Grundwerkstoff (RFA)	OK	562577	20000383080	
Verwechslungsprüfung Schweißnaht (RFA)	OK	562577	20000383080	
Verwechslungsprüfung Grundwerkstoff (RFA)	OK	570940	20000383161	
Verwechslungsprüfung Schweißnaht (RFA)	OK	570940	20000383161	



Dokument-Nr. 30 000 092 858 / 01

Zerstörungsfreie Prüfungen

Benennung	Befund	Umfang	Bemerkungen
Dichtheitsprüfung - mit Wasser	OK	100 %	70 bar
Wirbelstromprüfung Längsnaht - außen DIN EN ISO 10893-2	OK	100 %	

Bemerkungen

"Überprüft nach AD2000-Merkblatt W0 und zertifiziert nach Richtlinie 2014/68/EU, Anhang I, Ziffer 4.3 durch die TÜV CERT-Zertifizierungsstelle für Druckgeräte der TÜV Nord Gruppe, Benannte Stelle, Kenn-Nr. 0045".

Rohre gekennzeichnet mit chloridfreier Tinte.

Fertigungs-Auftrags-Nr. 1145419 - Lief.-Ch. 570940 = 583 pipes = 2,387,385 m

Fertigungs-Auftrags-Nr. 1151239 - Lief.-Ch. 562577 = 193 pipes = 790,335 m

Abnahmeprüfzeugnis EN 10204-3.1 gemäß AD 2000-Merkblatt W2; Abs. 6.2.1; Zustimmungsschreiben der TÜV NORD Systems.
TÜV-Az.: 1326WL04780-1.

Das eingesetzte Schweiß- und Prüfpersonal erfüllt die Anforderungen der EN 10217-7.
Die Anforderungen sind erfüllt.

Dokument-Nr.:	20000382376/QLM/DE1/00	Abnahme-Nr.:	
Besteller:	INOX-Stahlgesellschaft mbH 72622 Nürtingen	Projekt:	
Bestell-Nr.:	2331/75201	BUTTING Auftrags-Nr.:	72360 Pos.: 10
Kunden-Material-Nr.:		Fertigungs-Auftrags-Nr.:	1145419
Prüfgegenstand:	längsnahtgeschweißte Rohre	BUTTING Material-Nr.:	100113544
Abmessung:	21,30 x 2,00 mm	Serial-Nr.:	1145419-00010
Werkstoff:	1.4435/TP316L	Probenidentifik.:	
		Lieferantencharge:	570940

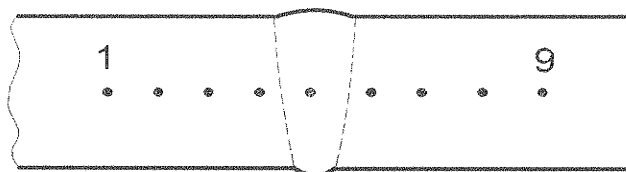
Prüfanforderungen

Härteprüfung Schweißnaht gem. NACE

Prüfanweisungen

Prüfnorm: DIN EN ISO 6507-1 (Vickers)
Prüfverfahren: HV10

Prüfbefunde



Abstand zwischen den Eindrücken: 1mm

Messpunkt	Härte
1	196,0
2	199,0
3	175,0
4	185,0
5	182,0
6	178,0
7	187,0
8	186,0
9	185,0

Bemerkungen

Die Härteanforderung nach NACE MR0103 / ISO 17945 / NACE MR0175 / ISO 15156 ist erfüllt.

Dokument-Nr.:	20000382381/QLM/DE1/00	Abnahme-Nr.:	
Besteller:	INOX-Stahlgesellschaft mbH 72622 Nürtingen	Projekt:	
Bestell-Nr.:	2331/75201	BUTTING Auftrags-Nr.:	72360 Pos.: 10
Kunden-Material-Nr.:		Fertigungs-Auftrags-Nr.:	1151239
		BUTTING Material-Nr.:	100113544
Prüfgegenstand:	längsnahtgeschweißte Rohre	Serial-Nr.:	1151239-00005
Abmessung:	21,30 x 2,00 mm	Probenidentifik.:	
Werkstoff:	1.4435/TP316L	Lieferantencharge:	562577

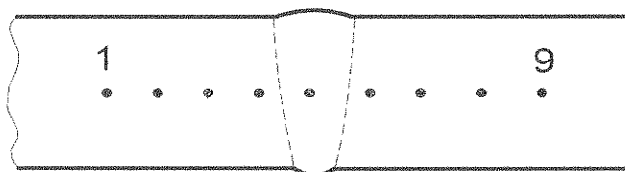
Prüfanforderungen

Härteprüfung Schweißnaht gem. NACE

Prüfanweisungen

Prüfnorm: DIN EN ISO 6507-1 (Vickers)
Prüfverfahren: HV10

Prüfbefunde



Abstand zwischen den Eindrücken: 1mm

Messpunkt	Härte
1	186,0
2	187,0
3	189,0
4	178,0
5	196,0
6	180,0
7	178,0
8	190,0
9	187,0

Bemerkungen

Die Härteanforderung nach NACE MR0103 / ISO 17945 / NACE MR0175 / ISO 15156 ist erfüllt.

Examination Record

Reference analysis



BUTTING

Document no.:	20000383080/QLA/EN1/00	Inspection no.:	
Customer:	INOX-Stahlgesellschaft mbH 72622 Nürtingen	Project:	
Purchase order no.:	2331/75201	BUTTING order no.:	72360 Pos.: 10
Customer material no.:		Fabrication order no.:	1151239
		BUTTING material no.:	100113544
Test object:	longitudinally welded pipes	Serial no.:	1151239-00115
Dimension:	21.30 x 2.00 mm	Sample identific.:	
Material grade:	1.4435/TP316L	Heat no.:	562577

Determination of chemical composition by means of x-ray fluorescence analysis.

Examination requirements

Positive material identification of base material by means of x-ray

Positive material identification of weld by means of x-ray

Examination instructions

Nominal values

Test loc.	Cr (%)		Mo (%)		Ni (%)	
	min	max	min	max	min	max
Bm	17.00	19.00	2.500	3.000	12.50	15.00
Weld	--	--	--	--	--	--

Examination results

Test loc.	Cr (%)	Mo (%)	Ni (%)
Bm	17.00	2.670	13.20
Weld	17.30	2.560	12.80

Bm = Base material

Remarks

none

Examination Record

Reference analysis



BUTTING

Document no.:	20000383161/QLA/EN1/00	Inspection no.:	
Customer:	INOX-Stahlgesellschaft mbH 72622 Nürtingen	Project:	
Purchase order no.:	2331/75201	BUTTING order no.:	72360 Pos.: 10
Customer material no.:		Fabrication order no.:	1145419
		BUTTING material no.:	100113544
Test object:	longitudinally welded pipes	Serial no.:	1145419-see exam. results
Dimension:	21.30 x 2.00 mm	Sample identific.:	see exam. results
Material grade:	1.4435/TP316L	Heat no.:	see exam. results

Determination of chemical composition by means of x-ray fluorescence analysis.

Examination requirements

Positive material identification of base material by means of x-ray

Positive material identification of weld by means of x-ray

Examination results

Serial no. + Sample identific.	Heat no.	Test loc.	Cr (%)	Mo (%)	Ni (%)
00079	570940	Bm	17.10	2.610	12.60
00079	570940	Weld	17.10	2.570	12.60
00491	570940	Bm	17.20	2.560	12.80
00491	570940	Weld	17.10	2.600	12.60

Bm = Base material

Remarks

none

Inspection certificate 3.1

EN10204/ISO10474-3.1



BUTTING

Document no.:	30 000 092 858 / 00		
Customer:	INOX-Stahlgesellschaft mbH 72622 Nürtingen		BUTTING order no.: 72360 Pos.: 10
Purchase order no.:	2331/75201	Fabrication order no.:	1145419
Customer material no.:		BUTTING material no.:	100113544
Test object:	longitudinally welded pipes		
Dimension:	21,30 x 2,00 mm	Quantity:	3.177,720 m = 776 Pieces
Material grade:	1.4435 / TP316L		

Requirements

AD2000-W2/W10
DIN EN 10217-7 TC2
AD2000-W10/TRB 100, Nace MR0175+0103
Weld seam efficiency: 100 %.

Delivered by	Heat no.	Fabrication order no.	Serial no.
OUTOKUMPU	570940	1145419-	2-4;8-9;25-27;29-37;39-47;49-57;59-67;69-77;79-87;89-97;99-107; 109-117;119-123;126-128;130-138;140-148;150-158;160-164;167-169;171; 175-179;181-189;191-199;201-209;211-215;223-229;231-239;241-249; 251-259;261-269;271-279;281-284;291-299;301-308;312-320;322-330; 332-340;342-345;348-351;353-361;363-371;373-381;383-391;393-401; 403-411;413-421;423-431;433-441;443-451;453-459;466;468-476;478-486; 488-491;495-496;498-506;508-516;518-526;528-536;538-546;548-556; 558-566;568-576;578-586;588-596;598-606;608-616;618-626;628-633;636; 638-646;648;650;652-658;660-668;670-678;680-688;690;693-699;701-704; 708-709
OUTOKUMPU	562577	1151239-	4;6-14;16-24;26-34;36-39;42-44;46-53;55-63;65-73;75-83;85-93;95-103; 105-113;115-119;126-127;129-137;139-147;149-157;159-167;169-177; 179-187;189-197;199-205;207;209;211-219;221-226;228-229

Produced with Works order-no. 1145419/ 1151239 of strip with Inspection certificate acc. EN 10204-3.1.

Heat analysis

Results of chem. Composition of Cast acc. to mill Inspection certificate:

Delivered by	Heat no.	C (%)	Si (%)	Mn (%)	P (%)	S (%)	Cr (%)	Ni (%)	N (%)	Ti (%)	Mo (%)
OUTOKUMPU	562577	0,017	0,42	1,55	0,032	0,001	17,1	12,6	0,05	0,005	2,54
OUTOKUMPU	570940	0,018	0,46	1,57	0,028	0,001	17,1	12,6	0,06	0,005	2,54

Marking



Serial no. Fabrication order no. EN 10217-7 TC2 W2Ab 21,3x2,0 1.4435/TP316L Heat no.

B
K 38

Document no. 30 000 092 858 / 00

Material inspection

Control of material marking:

Alloy verification (PMI):

Surface inspection:

Surface finish:

Delivery condition:

Heat treatment:

Dimensional control:

OK

carried out OK

outside 100 % OK

inside 100 % with light OK

EN 10217-7 W2Ab pickled / passivated

EN 10217-7 W2Ab pickled / passivated

1040 - 1090 °C, quenched in water

DIN EN ISO 1127 D4/T3 F1/S2

Results of destructive tests

Tensile test(s)

Tensile test(s)										
Serial no.	Heat no.	Test loc.	Temp. (°C)	a (mm)	D (mm)	Rp0.2 (MPa)	Rp1.0 (MPa)	Rm (MPa)	A (%)	Break
5	562577	I	20	2,07	21,32	403	447	614	42,5	GW
227	562577	I	20	2,07	21,33	420	458	612	44,4	GW
10	570940	I	20	2,06	21,28	418	452	623	41,2	GW
250	570940	I	20	2,07	21,27	428	468	631	40,8	GW
527	570940	I	20	2,06	21,28	426	466	628	48,2	GW
706	570940	I	20	2,08	21,27	432	469	626	50,3	GW

Test loc. = Test location, a = thickness, b = width, d = diameter, D = Pipe diameter, G/GW = Base material, S/SN = weld, WEZ = Heat affected zone, l = longitudinal, q = transverse, V1 = $Rt0.5/Rm$, Z = Area of reduction, W1 = outside cladding, W2 = backing steel, W3 = inside cladding, CT = Compression Test

Technological test(s)

Technological test(s)		
Description	Result	Remarks
Drift expanding test acc. to DIN EN ISO 8493	OK	

per lot and heat no. of suppliers

Corrosion test(s)

Corrosion test(s)		
Description	Result	Remarks
Intergranular corrosion test acc. to DIN EN ISO 3651-2 method A	OK	

per lot and heat no. of suppliers

Metallographic examination

Metallographic examination				
Description	Result	Heat no.	Document no.	Remarks
Hardness test of weld acc. to NACE	OK	562577	20000382381	
Hardness test of weld acc. to NACE	OK	570940	20000382376	

Exemplar analyse

Exemplar analysis				
Description	Result	Heat no.	Document no.	Remarks
Positive material identification of base material by means of x-ray	OK	562577	20000383080	
Positive material identification of weld by means of x-ray	OK	562577	20000383080	
Positive material identification of base material by means of x-ray	OK	570940	20000383161	
Positive material identification of weld by means of x-ray	OK	570940	20000383161	

Inspection certificate 3.1

EN10204/ISO10474-3.1



BUTTING

Document no. 30 000 092 858 / 00

Non destructive tests

Description	Result	Extent	Remarks
Eddy current test long. weld - outside DIN EN ISO 10893-2	OK	100 %	
Leak test - with water (hydrostatic)	OK	100 %	70 bar

Remarks

"Tested acc. to AD2000-Merkblatt W0 and certified acc. to Pressure Equipment Directive 2014/68/EU, Annex I, sec. 4.3 by TÜV CERT of the TÜV Nord Gruppe, Notified Body, Identification No. 0045".

The pipes have been marked with ink free of chlorid.

Fabrication order no. 1145419 - Heat no. 570940 = 583 pipes = 2,387,385 m

Fabrication order no. 1151239 - Heat no. 562577 = 193 pipes = 790,335 m

Inspection certificate EN 10204-3.1 acc. to AD 2000-Guideline W2; sec. 6.2.1; letter of agreement by TÜV NORD Systems.
TÜV-file 1326WL04780-1.

The assigned welding and test personnel fulfil the requirements of EN 10217-7.

The requirements are fulfilled.

Examination Record

Hardness test



BUTTING

Document no.:	20000382381/QLM/EN1/00	Inspection no.:	
Customer:	INOX-Stahlgesellschaft mbH 72622 Nürtingen	Project:	
Purchase order no.:	2331/75201	BUTTING order no.:	72360 Pos.: 10
Customer material no.:		Fabrication order no.:	1151239
		BUTTING material no.:	100113544
Test object:	longitudinally welded pipes	Serial no.:	1151239-00005
Dimension:	21.30 x 2.00 mm	Sample identific.:	
Material grade:	1.4435/TP316L	Heat no.:	562577

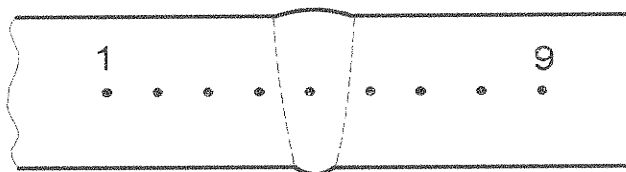
Examination requirements

Hardness test of weld acc. to NACE

Examination instructions

Test standard: DIN EN ISO 6507-1 (Vickers)
Test method: HV10

Examination results



Distance between indentations: 1mm

M-point	Hardness
1	186.0
2	187.0
3	189.0
4	178.0
5	196.0
6	180.0
7	178.0
8	190.0
9	187.0

Remarks

The hardness requirement acc. to NACE MR0103 / ISO 17945 / NACE MR0175 / ISO 15156 is fulfilled.

Examination Record

Hardness test



BUTTING

Document no.:	20000382376/QLM/EN1/00	Inspection no.:	
Customer:	INOX-Stahlgesellschaft mbH 72622 Nürtingen	Project:	
Purchase order no.:	2331/75201	BUTTING order no.:	72360 Pos.: 10
Customer material no.:		Fabrication order no.:	1145419
		BUTTING material no.:	100113544
Test object:	longitudinally welded pipes	Serial no.:	1145419-00010
Dimension:	21.30 x 2.00 mm	Sample identific.:	
Material grade:	1.4435/TP316L	Heat no.:	570940

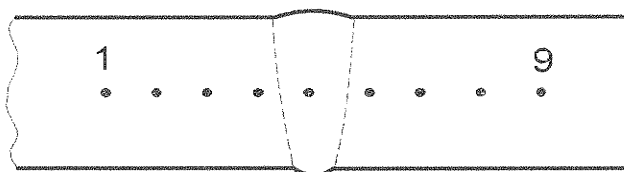
Examination requirements

Hardness test of weld acc. to NACE

Examination instructions

Test standard: DIN EN ISO 6507-1 (Vickers)
Test method: HV10

Examination results



Distance between indentations: 1mm

M-point	Hardness
1	196.0
2	199.0
3	175.0
4	185.0
5	182.0
6	178.0
7	187.0
8	186.0
9	185.0

Remarks

The hardness requirement acc. to NACE MR0103 / ISO 17945 / NACE MR0175 / ISO 15156 is fulfilled.

Examination Record

Reference analysis



BUTTING

Document no.:	20000383080/QLA/EN1/00	Inspection no.:	
Customer:	INOX-Stahlgesellschaft mbH 72622 Nürtingen	Project:	
Purchase order no.:	2331/75201	BUTTING order no.:	72360 Pos.: 10
Customer material no.:		Fabrication order no.:	1151239
		BUTTING material no.:	100113544
Test object:	longitudinally welded pipes	Serial no.:	1151239-00115
Dimension:	21.30 x 2.00 mm	Sample identific.:	
Material grade:	1.4435/TP316L	Heat no.:	562577

Determination of chemical composition by means of x-ray fluorescence analysis.

Examination requirements

Positive material identification of base material by means of x-ray

Positive material identification of weld by means of x-ray

Examination instructions

Nominal values

Test loc.	Cr (%)		Mo (%)		Ni (%)	
	min	max	min	max	min	max
Bm	17.00	19.00	2.500	3.000	12.50	15.00
Weld	--	--	--	--	--	--

Examination results

Test loc.	Cr (%)	Mo (%)	Ni (%)
Bm	17.00	2.670	13.20
Weld	17.30	2.560	12.80

Bm = Base material

Remarks

none

Examination Record

Reference analysis



BUTTING

Document no.:	20000383161/QLA/EN1/00	Inspection no.:	
Customer:	INOX-Stahlgesellschaft mbH 72622 Nürtingen	Project:	
Purchase order no.:	2331/75201	BUTTING order no.:	72360 Pos.: 10
Customer material no:		Fabrication order no.:	1145419
		BUTTING material no.:	100113544
Test object:	longitudinally welded pipes	Serial no.:	1145419-see exam. results
Dimension:	21.30 x 2.00 mm	Sample identific.:	see exam. results
Material grade:	1.4435/TP316L	Heat no.:	see exam. results

Determination of chemical composition by means of x-ray fluorescence analysis.

Examination requirements

Positive material identification of base material by means of x-ray

Positive material identification of weld by means of x-ray

Examination results

Serial no. + Sample identific.	Heat no.	Test loc.	Cr (%)	Mo (%)	Ni (%)
00079	570940	Bm	17.10	2.610	12.60
00079	570940	Weld	17.10	2.570	12.60
00491	570940	Bm	17.20	2.560	12.80
00491	570940	Weld	17.10	2.600	12.60

Bm = Base material

Remarks

none

Final Inspection Report

Order information

Customer name	TransCanada Keystone Pipeline Limited
Customer purchase order	4500257847
Sales order number / Item	3003333187/0020
Internal order number / Item	3019584155000020

Device information

Description	Liquiphant M FTL51
TAG	126-FXVLY-B0-, LSHH-0302
Serial number	P701C115027
Order code	FTL51-DU7D0/0
Extended order code	FTL51-TGM2BB5E5C+Z1

Additional information

Output type	FEL55; 8/16 mA, 11-36 V DC
Software version	01.00.01
Ambient temperature / - humidity / - pressure	23 °C ±5 °C / 60 % rel. ±40 % rel. / 990 mbar ±30 mbar
Probe length	1130 mm

Test result

Hereby we confirm that all tests according to the Quality plan (IP00017F) have been performed successfully.

Test	Procedure number	Test description
Contract review	TS00001F	As required in ISO 9001
Incoming goods inspection	TS00003F	Verification of conformance to the specified requirements
Printed circuit boards test	TS00009F	In-circuit test and functional test
Electronic insert test	TS00008F	Automatic test: high voltage and functional test of the electronic insert
High voltage test	TS00002F	The voltage used is chosen depending on operating voltage, terminals and approvals, in accordance to the valid national / international standards
Welding inspection	TS00010F	Quality and tightness of the welding seams
Leakage test	TS00004F	Tightness test with helium
Functional test of sensor	TS00034F	Measurement and adjustment of operating frequency and phase
Calibration of sensor	TS00036F	Verification of frequency and phase of the sensor
Final check of instrument	TS00035F	Verification of switching function
Outgoing visual check	TS00006F	Visual inspection of completeness and correctness of the instrument and the markings
Logistical verification	TS00005F	Automatic verification in the delivery phase via barcode that the instrument correspond to the order
Resonant Frequency uncovered		1064.71 Hz

Hereby we confirm that all measuring equipment used to assure the quality of the products has been calibrated and is traceable to national or international standards.

Execution

Greenwood, 2019-07-25, 155581

This document was generated electronically and is valid without signature.

Functional Safety (SIL)

Order information

Customer name	TransCanada Keystone Pipeline Limited
Customer purchase order	4500257847
Sales order number / Item	3003333187/0020
Internal order number / Item	3019584155000020

Device information

Description	Liquiphant M FTL51
TAG	126-FXVLY-B0-, LSHH-0302
Serial number	P701C115027
Order code	FTL51-DU7D0/0
Extended order code	FTL51-TGM2BB5E5C+Z1

Additional Information

Probe length	1130 mm
--------------	---------

Statement

Hereby we confirm that the device is suitable for the use in Safety Instrumented Systems according to IEC 61508. Further information is available in the Functional Safety Manuals SD167F (mode of operation MAX) and SD279F (mode of operation MIN).

Greenwood, 16.07.2019, Gerd Gritsch
Head of Division Quality Management

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Abnahmeprüfzeugnis nach EN 10204 - 3.1 Inspection certificate acc. to EN 10204 - 3.1

Zeugnis-Nr. / Certificate no. 3019584155/3003333187_20_2

Seite / page 1 / 2

Es wird bescheinigt, dass die gelieferten Erzeugnisse den Vereinbarungen bei der Bestellung entsprechen. Darüber hinaus wird bescheinigt, dass bei der Herstellung der nachstehend aufgeführten Erzeugnisse die vorgeschriebenen Prüfungen und / oder die zusätzlich aufgeführten Prüfungen nach den bestehenden Prüfvorgaben durchgeführt und die erforderlichen Freigaben erteilt wurden. Die unten aufgeführten Prüfungen wurden unter Aufsicht einer dazu autorisierten, unabhängigen Stelle durchgeführt.

It is certified that the products supplied are in compliance with the requirements of the order. Furthermore, it is confirmed that during the manufacturing of the subsequently listed products the specified inspections and / or the additionally ordered inspections have been performed according to the valid procedures and the necessary releases have been given. The subsequently listed inspections have been performed by especially authorized personnel.

Kunde / Customer: TransCanada
Keystone Pipeline Limited
450 - 1st Street SW
CA-T2P 5H1 Calgary

Kunden Bestell-Nr. / Customer order no.: 4500257847

E+H Auftrags-Nr. / E+H order no.: 3003333187

Pos / item	Menge / Qty	Produktbezeichnung / Description	
0020	1 ST / PC	FTL51-DU7D0/0 Liquiphant M FTL51	
		S/N P701C115027	TAG 126-FXVLY-B0- LSHH-0302
Kennzeichnung / Marking		0WYRM	
● Teil / Part		Adapter / adapter	
Hersteller / Manufacturer		UGITECH	
Zeugnis-Nr. / Certificate No.		84041655 000010	
Schmelze-Nr. / Heat No.		837623	
Kennzeichnung / Marking		051HF	
● Teil / Part		Gabel / fork	
Hersteller / Manufacturer		FEINGUSS BLANK	
Zeugnis-Nr. / Certificate No.		PZ10855	
Schmelze-Nr. / Heat No.		2110	

Abnahmeprüfzeugnis nach EN 10204 - 3.1

Inspection certificate acc. to EN 10204 - 3.1

Zeugnis-Nr. / Certificate no. 3019584155/3003333187_20_2

Seite / page 2 / 2

Kennzeichnung / Marking

- Teil / Part
Hersteller / Manufacturer
Zeugnis-Nr. / Certificate No.
Schmelze-Nr. / Heat No.

0F3TN

Rohr / tube
Krystal Steel
KS/ST-316L/54/0918
1801-077

Kennzeichnung / Marking

- Teil / Part
Hersteller / Manufacturer
Zeugnis-Nr. / Certificate No.
Schmelze-Nr. / Heat No.

0T2M1

Rohr / tube
BUTTING
30 000 092 858 / 01
562577

25.07.2019

Endress+Hauser (USA)
Automation Instrumentation Inc.
US-46143 Greenwood

John Koktavy
- Abnahmebeauftragter -
- Inspector -

Dieses Zeugnis wurde elektronisch nach EN 10204 erstellt und ist ohne Unterschrift gültig.
Bei Rückfragen wenden Sie sich bitte an Ihre Endress+Hauser-Vertriebszentrale.
This document was generated electronically acc. to EN 10204 and is valid without signature.
If you have any queries, please contact your Endress+Hauser Sales Center.

Manufacturer Ugine Avenue Paul Girod - CS 90100 73403 Ugine Cedex France www.ugitech.com		INSPECTION CERTIFICATE 3.1 EN 10204 / 3.1			UGITECH Providing special steel solutions 							
Certificate : All UGITECH products were produced according to the certified quality system (at least ISO 9001) and according to customer requests on purchase orders, as per requirements in standards IATF 16949, EN 9100/EN9120, ISO 13485, code RCCM and/or ASME section III, PED 2014/68/EU, AD2000 W0. Chemical analysis and mechanical properties tests were performed by ISO/CEI 17025 accredited laboratories.				Supplier's mark : 		Inspector's stamp : 						
Purchase : 42960 TW METALS		Purchase order reference : PO # M80238501 01D18		Order number : 881673 20		Certificate : 84041655 000010						
Product : UGI 4435X4 BAR ROLLED DESCALED SOLUTION ANNEALED K13 ROUND 35,000MM LONG. 3,000M +100,000MM -0,000MM												
Melting process : EAF + AOD + CC		Batch : 1848WM4200		Heat n° : 837623		Weight : 949 kg						
Pieces Nbr : 40		Shape : round		Dimension : 35,000 mm		Forging ratio : 39,1						
Standard : ASTM A484/A484M-18												
Standard : AD 2000 W2 ED 09.2016 1.4435 ASTM A479/A479M-18 TYPE 316L/316 NACE MR0175/ISO 15156-3:2015. 316/316L AD 2000 W10 ED 05.2016 1.4435				EN 10272 : 2016-11 1.4435 ASME SA479/479M-17 Sec.IIPartA TYPE 316L/316 NACE MR0103/ISO 17945:2015. 316/316L ASME SA182/182M-17 Sec.IIPartA F316L/F316								
Customer's specification : 410000144 EXCEPTED %S MINI X2CRNIMO18-14-3				Specification issue No G		Specification revision date 02.05.18						
CHEMICAL ANALYSIS				Test n° : GRWE								
%	C	Si	Mn	Ni	Cr	Mo	Cu	S	P	N		
Min				12,5000	17,0000	2,5000		0,0050				
Max	0,0300	1,0000	2,0000	14,0000	18,0000	3,0000		0,0200	0,0400	0,1000		
Heat	0,0160	0,6180	1,8180	12,6010	17,1860	2,5880	0,3180	0,0124	0,0256	0,0330		
Product												
MECHANICAL CHARACTERISTICS												
Result as delivered : ON-LINE SOLUTION ANNEALED TEMPERATURE OVER 1040°C AIR												
Tensile test									Hardness			
T°C	Test N°	Marker n°	Yield strength	Yield strength	Tensile strength	Elongation	Elongation	Red. Area	HBW	Hv	HRb	HRc
°C		Direction	Rp 0,2% MPa	Rp 1% MPa	RM MPa	5D %	4D %	Z %	2,5/187,5	5		
		Min Max	200	235	500 700	40	30	50	215			22
20	GRWE	1201 L	258	304	587	48	50	78	168			<22
Notch Toughness												
T°C	Test N°	Type	Direction	Min	Individual values		Average	Lateral Expansion		Crystallinity level		
°C				J	J		J	mm				
20	GRWE	KISOV	L	100	220 217 225		221					
METALLOGRAPHIC CHARACTERISTICS												
Test n° : GRWE												
Apparent grain size			Min - Max		Min			Max				
ASTM E112			> 4		Guarant.			Ferrit %		1,0		
ADDITIONAL INFORMATION												
Corrosion : INTERCRYSTALLINE CORROSION RESISTANT ACC.TO ISO 3651-2 PRACTICE A												
We declare that the mentioned product is in compliance with the requirements of the contract and that, after checks and tests, it meets in all respects the specified requirements and applicable standards and regulations, except reservations or exceptions as listed in this declaration of conformity (NF L 00-015 C); Document validated by electronic signature. Material manufactured in the REACH regulation respect.							Ugine the 07.11.2018 The quality manager B. POLLET					
							040001254866					

1 Manufacturer Ugine Avenue Paul Girod - CS 90100 73403 Ugine Cedex France www.ugitech.com	2 INSPECTION CERTIFICATE 3.1 EN 10204 / 3.1	3 UGITECH Providing special steel solutions 
Corrosion : INTERCRYSTALLINE CORROSION RESISTANCE ACCORDING TO ASTM A262 PRACTICE E : CONFORM		200
Non destructive testing : SURFACE & DIMENSIONS ARE CONTROLLED ANTIMIXING TEST PERFORMED BY SPECTROSCOPIC METHOD : CONFORM		201
Others : TÜV LETTER OF APPROVAL IN OUR POSSESSION. WE ABSTAIN OF A COUNTERSIGNATURE DFARS 252.225-7014 COMPLIANT EN 10278 COUNTRY OF MELT SOURCE : FRANCE MATERIAL IS FREE FROM MERCURY AND RADIOACTIVE CONTAMINATION AND WELDS OR WELD REPAIRS AT TIME OF SHIPMENT FREE FROM INTERNAL DEFECTS GUARANTEED BY THE PROCESS CONTROL FERRITE AS CAST SAMPLE (FUSED) = 3,95%		202
32 We declare that the mentioned product is in compliance with the requirements of the contract and that, after checks and tests, it meets in all respects the specified requirements and applicable standards and regulations, except reservations or exceptions as listed in this declaration of conformity (NF L 00-015 C); Document validated by electronic signature. Material manufactured in the REACH regulation respect.	33 Ugine the 07.11.2018 The quality manager  B. POLLET 040001254866 Page 2/2	



RESTAMPING CERTIFICATE

Customer:

Endress + Hauser
2340 Endress Place
Greenwood, IN 46143

Re-stamped By:

TW Metals
235 Tubeway Dr.
Carol Stream, IL 60188

TW Metals is PED certified and the associate completing the re-stamping for the sales order and product listed below has been trained to TLB41000151 requirements.

Sales Order #: 80007251

Purchase Order#: 1017664773

Date	TW Item #	Endress+Hauser Part#	Part Description	# of Pieces Stamped	Endress+Hauser SAP/TAN ID	Original Mill Heat#
5/1	A5873	52006722	1.4435/316 BAR	27	0 F 3 X M	837623
✓	✓	✓	35 MM	✓	✓	✓

By signing below, I certify the re-stamping was done in accordance to Endress+Hauser requirements.

Re-Stamping
Associate Number:



Re-stamping Associate Signature:

Date:

5/6/19

Inside Sales
Verification Signature:

Date:

5/7/19

Endress + Hauser SE + Co. KG
Hauptstrasse 1 Wareneing.2
DE-79689 Maulburg

Abnahmeprüfzeugnis 3.1

Inspection certificate

nach/according to DIN EN 10204:2005
Prüf-Nr./Test-No.: PZ10855
BA-Nr.: 1171703
Ident-Nr.: 06748/05

Ihre Bestellung Nr./Your order No.:
117/1017578912

vom/dated:
05.12.2018

Gußstück-Bezeichnung/Part-description:
GABEL STANDARD

Zeichnungs-Nr./Drawing-No.:
210011044 (52006900)

Erstelldatum/Creation Date:

13.02.2019

Losmenge/Quantity:
1115

Werkstoff/Material:
(G)-X 2 Cr Ni Mo 18 14 3 (BN2)
1.4435

Erschmelzung/Melting process:
induktiv/inductive

Prüfergebnisse/Test results

Gußteile gezeichnet mit/Castings signed with:
B1 / 051HF

Chemische Analyse/Chemical analysis: Entspricht/Equivalent to 1.4435 / 316L

Soll/Nom	C	Si	Mn	P	S	Cr	Mo	Ni	N
min	0,000	0,00	0,00	0,000	0,000	17,00	2,50	12,50	0,000
max	0,030	1,00	2,00	0,045	0,030	18,00	3,00	15,00	0,100
Charge/Los/Lot No.									
2110	0,023	0,84	1,54	0,010	0,008	17,08	2,65	13,63	0,047
	0,024	0,84	1,58	0,010	0,009	17,21	2,70	13,76	0,048

Wärmebehandlung/Heat treatment:

lösungsgeglüht u. abgeschreckt max. 241 HB

Härteprüfung/Hardness test:

Testmethode/Tested with: HV 10

Nach Umwertung/Converted to: 153 - 159 HB (BHN) 30

Mechanische Prüfung/Mechanical testing at room temperature:

acc. to ASTM 316L

Soll/Nom	Rp 0,2 (N/mm ²)	Rm (N/mm ²)	A (Lo=50mm) (%)
min	200	485	30,00
max			
Charge/Los/Lot No.			
2110	215	486	38,00

Stichprobe Massprüfung durchgeführt, keine Abweichung festgestellt

100% Sichtprüfung durchgeführt, keine Abweichung festgestellt

Verwechslungsprüfung nach spectrometrischer Prüfung durchgeführt und i.O.

Härtewerte nach NACE MR 0175/ MR 0103

Hersteller zugelassen nach AD-WO/TRD 100

IK Test nach DIN EN ISO 3651-2 Verfahren A /ASTM A262 Practice E durchgeführt, ohne Befund.

Tüpfeltest i.O.

Die gestellten Anforderungen sind erfüllt/Requirements of order are compiled
Riedlingen, den 13.02.2019

FEINGUSS BLANK GmbH

Qualitätswesen: i.A. EIERS

Das Zeugnis wurde maschinell erstellt und ist gemäß EN 10204 ohne Unterschrift rechtsverbindlich.
This certificate was generated by data system, acc. to EN 10204, it need not to be signed for validity.

Seite 1 von 2

FEINGUSS BLANK GmbH
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E-Mail info@feinguss-blank.de
www.feinguss-blank.de

Telefon +49 7371 182-0
Telefax +49 7371 18244-300
Telefax Vertrieb +49 7371 182-164
UST-IdNr. DE 146545590

Geschäftsführung
Dr. Wolfgang Blank ·
Ingo Bitzer · Hubert Deutsch
Sitz der Gesellschaft 88499 Riedlingen
Registergericht Ulm HRB 650359

Volksbank-Raiffeisenbank Riedlingen
IBAN DE06 6549 1510 0044 2980 05 BIC GENODE31VRR
Kreissparkasse Biberach
IBAN DE16 6545 0070 0000 4032 50 BIC SBCRDE66

Endress + Hauser SE + Co. KG
Hauptstrasse 1 Wareneing.2
DE-79689 Maulburg

Abnahmeprüfzeugnis 3.1

Inspection certificate

nach/according to DIN EN 10204:2005
Prüf-Nr./Test-No.: PZ10855
BA-Nr.: 1171703
Ident-Nr.: 06748/05

Ihre Bestellung Nr./Your order No.:
117/1017578912

vom/dated:
05.12.2018

Gußstück-Bezeichnung/Part-description:
GABEL STANDARD

Zeichnungs-Nr./Drawing-No.:
210011044 (52006900)

Prüfergebnisse/Test results

Dimension sampling test done, without deviation
100% visuel test done, without findings
Mistake examination after spectrometric examination and o.k.
Hardness according to NACE MR 0175/MR 0103
Manufacturer authorized according to AD-WO/TRD 100
Test about intercrystalline corosion acc. DIN EN ISO 3651-2 methode A / ASTM A262 Practice E done, without findings
Spot test ok.

Erstelldatum/Creation Date:
13.02.2019

Losmenge/Quantity:
1115

Werkstoff/Material:
(G)-X 2 Cr Ni Mo 18 14 3 (BN2)
1.4435

Erschmelzung/Melting process:
induktiv/inductive

Die gestellten Anforderungen sind erfüllt/Requirements of order are compiled
Riedlingen, den 13.02.2019

FEINGUSS BLANK GmbH
Qualitätswesen: i.A. EIERS

Das Zeugnis wurde maschinell erstellt und ist gemäß EN 10204 ohne Unterschrift rechtsverbindlich.
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Seite 2 von 2

FEINGUSS BLANK GmbH
Industriestraße 18 · 88499 Riedlingen
E-Mail info@feinguss-blank.de
www.feinguss-blank.de

Telefon +49 7371 182-0
Telefax +49 7371 18244-300
Telefax Vertrieb +49 7371 182-164
UST-IdNr. DE 146545590

Geschäftsführung
Dr. Wolfgang Blank ·
Ingo Bitzer · Hubert Deutsch
Sitz der Gesellschaft 88499 Riedlingen
Registergericht Ulm, HRB 200000

Volksbank-Raiffeisenbank Riedlingen
IBAN DE06 6549 1510 0044 2980 05 BIC GENODES1VRR
Kreissparkasse Biberach
IBAN DE16 6545 0070 0000 4032 50 BIC SBCRDE66



Manufacturer & Exporter of Seamless Stainless, Duplex & Super Duplex & Nickel Alloy Tubes, Pipes & U -

Plot No # KV - 2, G.I.D.C (Savli), P.O - ManjusarTa : Savli; District - Vadodara - 391775

• (T): +91 2667 264777 • (E): export@krystalsteel.co.in & sales@krystalsteel.co.in • (W): www.krystalsteel.co.in

COMMERCIAL INVOICE

EXPORTER		IEC NO :	0307043321
KRYSTAL STEEL MANUFACTURING PVT. LTD.		CIN NO :	U27109MH2006PTC165777
Plot No # KV - 2, G.I.D.C (Savli), P.O - Manjusar		PAN No.	AACCK9332J
Ta : Savli; District - Vadodara - 391775 (Gujarat)		INCOTERMS :	DAP TW USA CAROL STREAM IL 60188
Phone No. +91 2667 264777		L.C. No.	
E-Mail export@krystalsteel.co.in & sales@krystalsteel.co.in		Payment Terms :	30 % Advance along with commercially cleared Purchase(PO), balance against Performa Invoice before dispatch frm our site
Home Page www.krystalsteel.co.in			

PO NO :	M 49397512 DT :2/8/18	OA NO:	E-1819/00068 DT : 6/8/18	INVOICE NO :	KSMP/2018-19/168
				INVOICE DATE :	26/9/2018

CONSIGNEE BILLING ADDRESS	CONSIGNEE DELIVERY ADDRESS	NOTIFY PARTY & ADDRESS
TW METALS	TW METALS	TW METALS
235 Tubeway Drive Carol Stream, IL 60188 United States of America	235 Tubeway Drive, Carol Stream, IL 60188, United States of America United States of America	235 Tubeway Drive, Carol Stream, IL 60188, United States of America United States of America
Email : barb.kucia@twmetals.com Tel : 630-690-0110	Email : BARBKUCIA@TWMETALS.COM Tel : 610.458.1361	Email : BARBKUCIA@TWMETALS.COM Tel : 610.458.1361

PRE - CARRIAGE BY :	BY SEA	COUNTRY OF ORIGIN :	INDIA
VESSEL/FLIGHT NO :	NA	COUNTRY OF FINAL DESTINATION :	USA
PLACE OF CARRIAGE RECEIPT :	NA	SEAPORT OF LOADING :	Mhavsheva Port, Maharashtra, India
CONTAINER NO :	NA	SEAPORT OF DISCHARGE :	NEW YORK NY SEA PORT
SEAL NO :	NA	FINAL DESTINATION :	United States of America

MARKS & NOS :	TW METALS	H.S. Code : 73044100
	M 49397512 DT :2/8/18	

Sr. No.	Material Description		Size		PCS	MTR	Weight	USD/MTR	TOTAL AMOUNT USD
	Reference No./Heat No./Metallurgy	Specs	Grade	OD (MM)/NB	THK (MM)				
1	71338495/1801-077 Cold Finished Austenitic S.S. Seamless Tubes	ASTM A-269/ EN 10216-5	TP 316L/1.44 04	21.3	1.6	521	2101.01	1632.00	27,103.03
						521	2101.01	1632.00	
Invoice USD									27,103.03
Payable Amount									13.03

INVOICE VALUE (IN WORDS)	***** TWENTY SEVEN THOUSAND ONE HUNDRED THREE USD AND THREE ONLY
PAYABLE VALUE (IN WORDS)	***** THIRTEEN USD AND THREE ONLY

WE INTEND TO CLAIM REWARDS UNDER MERCHANDISE EXPORT FORM INDIA SCHEME(MES)

SHIPMENT UNDER ADVANCE AUTHORISATION LICENCE SCHEME

LICENCE NO	LICENCE DATE :	GRADE & SUB-GRADE	EXPORTED QUANTITY (MT)	EXEMPTED QUANTITY (MT)
34/21/040/00261/AM19	23/8/2018	TP 316L/1.4404	1.632	2.203

DECLARATION- WE DECLARE THAT GOODS ARE MANUFACTURED IN INDIA. MATERIAL SUPPLIED WITH ORIGINAL MILL TEST CERTIFICATE ARE AS PER PURCHASE ORDER & APPROVED ORDER ACCEPTANCE WARRANTED FOR SUITABLE APPLICABLE PERFORMANCE UNTIL 18 MONTHS FROM THE DATE OF DISPATCH OR 12 MONTHS FROM THE DATE OF USAGE WHICH EVER IS EARLIER SUBJECT TO GOOD ENGINEERING PRACTICES AND TECHNICALLY SUITABLE USAGE. HOWEVER OVERALL LIABILITY OF THE SUPPLIER (KSMP) IS LIMITED TO THE VALUE OF DEFECTIVE GOODS LIMITED TO MANUFACTURING DEFECTS ONLY.

BANK DETAILS: For USD A/C. No. 666 Bank of Baroda-EEE A/C (Mumbai Gamdevi Branch), A/C No. : 0394020000666, SWIFT CODE: BARBINBGAM
For EURO A/C. No. 667 Bank of Baroda-EEE A/C (Mumbai Gamdevi Branch), A/C No. : 0394020000667, SWIFT CODE: BARBINBGAM
Address : Bank Of Baroda, Gamdevi Branch Mumbai , Gita Building, Pandita Ramabhai Road, Gamdevi, Mumbai - 400 007 , MAHARASTRA.

Abbl	S.S - Stainless Steel	PREPARED BY	CHECKED BY MARKETING	AUTHORIZED BY FINANCE	QMS EMS OHSAS F.O.B & A.O 2018 Merkantil und Comptabil Gemeinsame Rückgängig Export Haus KrystalSteel.co.in



Manufacturer & Exporter of Seamless Stainless, Duplex & Super Duplex & Nickel Alloy Tubes, Pipes & U -

Plot No # KV - 2, G.I.D.C (Savli), P.O - ManjusrTa : Savli; District - Vadodara - 391775

• (T): +91 2667 264777 • (E): export@krystalsteel.co.in & sales@krystalsteel.co.in • (W): www.krystalsteel.co.in

COMMERCIAL INVOICE

EXPORTER		IEC NO :	0307043321
KRYSTAL STEEL MANUFACTURING PVT. LTD.		CIN NO :	U27109MH2006PTC165777
Plot No # KV - 2, G.I.D.C (Savli), P.O - Manjusr		PAN No.	AACCK9332J
Ta : Savli; District - Vadodara - 391775 (Gujarat)		INCOTERMS :	DAP TW USA CAROL STREAM IL 60188
Phone No. +91 2667 264777		L.C. No.	
E-Mail export@krystalsteel.co.in & sales@krystalsteel.co.in		Payment Terms :	30 % Advance along with commercially cleared Purchase(PO), balance against Performa Invoice before dispatch frm our site
Home Page www.krystalsteel.co.in		INVOICE NO :	KSMP/2018-19/168
PO NO :	M 49397512 DT :2/8/18	OA NO:	E-1819/00068 DT : 6/8/18
CONSIGNEE BILLING ADDRESS		CONSIGNEE DELIVERY ADDRESS	NOTIFY PARTY & ADDRESS
TW METALS		TW METALS	TW METALS
235 Tubeway Drive Carol Stream, IL 60188 United States of America		235 Tubeway Drive, Carol Stream, IL 60188, United States of America United States of America	235 Tubeway Drive, Carol Stream, IL 60188, United States of America United States of America
Email : barb.kucia@twmetals.com Tel : 630-690-0110		Email : BARB.KUCIA@TWMETALS.COM Tel : 610.458.1361	Email : BARB.KUCIA@TWMETALS.COM Tel : 610.458.1361

PRE - CARRIAGE BY :	BY SEA	COUNTRY OF ORIGIN :	INDIA
VESSEL/FLIGHT NO :	NA	COUNTRY OF FINAL DESTINATION :	USA
PLACE OF CARRIAGE RECEIPT :	NA	SEAPORT OF LOADING :	Mhavasheva Port, Maharashtra, India
CONTAINER NO :	NA	SEAPORT OF DISCHARGE :	NEW YORK NY SEA PORT
SEAL NO :	NA	FINAL DESTINATION :	United States of America

MARKS & NOS :	TW METALS	H.S. Code : 73044100
M 49397512 DT :2/8/18		

Sr. No.	Material Description		Size		PCS	MTR	Weight	USD/MTR	TOTAL AMOUNT USD
	Reference No./Heat No./Metallurgy	Specs	Grade	OD (MM/NB)	THK (MM)				
1	71338495/1801-077 Cold Finished Austenitic S.S.	ASTM A-269 / EN 10216-5	TP 316L/1.44 04	21.3	1.6	521	2101.01	1632.00	12.90
						521	2101.01	1632.00	
Invoice USD									27,103.03
Payable Amount									13.03

INVOICE VALUE (IN WORDS)	**** TWENTY SEVEN THOUSAND ONE HUNDRED THREE USD AND THREE ONLY
PAYABLE VALUE (IN WORDS)	**** THIRTEEN USD AND THREE ONLY

WE INTEND TO CLAIM REWARDS UNDER MERCHANDISE EXPORT FORM INDIA SCHEME(MES)

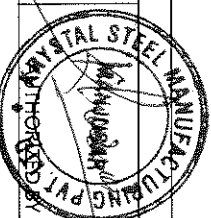
SHIPMENT UNDER ADVANCE AUTHORTISATION LICENCE SCHEME

LICENCE NO	LICENCE DATE :	GRADE & SUB-GRADE	EXPORTED QUANTITY (MT)	EXEMPTED QUANTITY (MT)
34/21/040/00261/AM19	23/8/2018	TP 316L/1.4404	1.632	2.203

DECLARATION - WE DECLARE THAT GOODS ARE MANUFACTURED IN INDIA. MATERIAL SUPPLIED WITH ORIGINAL MILL TEST CERTIFICATE ARE AS PER PURCHASE ORDER & APPROVED ORDER ACCEPTANCE WARRANTED FOR SUITABLE APPLICABLE PERFORMANCE UNTIL 18 MONTHS FROM THE DATE OF DISPATCH OR 12 MONTHS FROM THE DATE OF USAGE WHICHEVER IS EARLIER SUBJECT TO GOOD ENGINEERING PRACTICES AND TECHNICALLY SUITABLE USAGE, HOWEVER OVERALL LIABILITY OF THE SUPPLIER (KSMP) IS LIMITED TO THE VALUE OF DEFECTIVE GOODS LIMITED TO MANUFACTURING DEFECTS ONLY.

BANK DETAILS: For USD A/C: No. 666 Bank of Baroda-EEE A/C (Mumbai Gamdevi Branch), A/C No. : 03940200000666 , SWIFT CODE: BARBINBGAM
For EURO A/C: No. 667 Bank of Baroda-EEE A/C (Mumbai Gamdevi Branch), A/C No. : 03940200000667 , SWIFT CODE: BARBINBGAM
Address : Bank Of Baroda, Gamdevi Branch Mumbai , Gita Building, Pandita Ramabhai Road, Gamdevi, Mumbai - 400 007 , MAHARASTRA.

Abb	S.S.-Stainless Steel								
PREPARED BY	CHECKED BY MARKETING	AUTHORIZED BY FINANCE							





Manufacturer & Exporter of Seamless Stainless, Duplex & Super Duplex & Nickel Alloy Tubes, Pipes & U -

Plot No # KV - 2, G.I.D.C (Savli), P.O - ManjusarTa : Savli, District - Vadodara - 391775

• (T): +91 2667 264777 • (E): export@krystalsteel.co.in & sales@krystalsteel.co.in • (W): www.krystalsteel.co.in

COMMERCIAL INVOICE

EXPORTER		IEC NO :		0307043321	
KRYSTAL STEEL MANUFACTURING PVT. LTD.		CIN NO :		U27109MH2006PTC165777	
Plot No # KV - 2, G.I.D.C (Savli), P.O - Manjusar		PAN No.		AACCK9332J	
Ta : Savli, District - Vadodara - 391775 (Gujarat)		INCOTERMS :		DAP TW USA CAROL STREAM IL 60188	
Phone No. +91 2667 264777		L.C. No.			
E-Mail export@krystalsteel.co.in & sales@krystalsteel.co.in		Payment Terms :		30 % Advance along with commercially cleared Purchase(PO), balance against Performa Invoice before dispatch from our site	
Home Page www.krystalsteel.co.in		INVOICE NO :		KSMF/2018-19/168	
PO NO : M 49397512 DT :2/8/18		OA NO:		E-1819/00068 DT : 6/8/18	
CONSIGNEE BILLING ADDRESS		CONSIGNEE DELIVERY ADDRESS		INVOICE DATE : 26/9/2018	
TW METALS		TW METALS		NOTIFY PARTY & ADDRESS	
235 Tubeway Drive Carol Stream, IL 60188 United States of America		235 Tubeway Drive, Carol Stream, IL 60188, United States of America United States of America		235 Tubeway Drive, Carol Stream, IL 60188, United States of America United States of America	
Email : barb.kucia@twmetals.com Tel : 630-690-0110		Email : BARB.KUCIA@TWMETALS.COM Tel : 610.458.1361		Email : BARB.KUCIA@TWMETALS.COM Tel : 610.458.1361	

PRE - CARRIAGE BY :	BY SEA	COUNTRY OF ORIGIN :	INDIA
VESSEL/FLIGHT NO :	NA	COUNTRY OF FINAL DESTINATION :	USA
PLACE OF CARRIAGE RECEIPT :	NA	SEAPORT OF LOADING :	Navasheva Port, Maharashtra, India
CONTAINER NO :	NA	SEAPORT OF DISCHARGE :	NEW YORK NY SEA PORT
SEAL NO :	NA	FINAL DESTINATION :	United States of America

MARKS & NOS :	TW METALS	H.S. Code : 73044100
	M 49397512 DT :2/8/18	

Sr. No.	Material Description			Size		Length	PCS	MTR	Weight	USD/MTR	TOTAL AMOUNT USD
	Reference No./Heat No./Metallurgy	Specs	Grade	OD (MM/IN)	THK (MM)						
1	71338495/1801-077 Cold Finished Austenitic S.S. Seamless Tubes	ASTM A-269/ EN 10216-5	TP 316L/1.44 04	21.3	1.6	4,000.00	521	2101.01	1632.00	12.90	27,103.00

INVOICE VALUE (IN WORDS)	**** TWENTY SEVEN THOUSAND ONE HUNDRED THREE USD AND THREE ONLY
PAYABLE VALUE (IN WORDS)	**** THIRTEEN USD AND THREE ONLY
WE INTEND TO CLAIM REWARDS UNDER MERCHANDISE EXPORT FORM INDIA SCHEME(MIES)	

SHIPMENT UNDER ADVANCE AUTHORTISATION LICENCE SCHEME					
LICENCE NO	LICENCE DATE :	GRADE & SUB-GRADE	EXPORTED QUANTITY (MT)	EXEMPTED QUANTITY (MT)	
34/21/040/00261/AM19	23/8/2018	TP 316L/1.4404	1.632	2.203	

DECLARATION - WE DECLARE THAT GOODS ARE MANUFACTURED IN INDIA. MATERIAL SUPPLIED WITH ORIGINAL MILL TEST CERTIFICATE ARE AS PER PURCHASE ORDER & APPROVED ORDER ACCEPTANCE WARRANTED FOR SUITABLE PERFORMANCE UNTIL 18 MONTHS FROM THE DATE OF DISPATCH OR 12 MONTHS FROM THE DATE OF USAGE WHICHEVER IS EARLIER SUBJECT TO GOOD ENGINEERING PRACTICES AND TECHNICALLY SUITABLE USAGE, HOWEVER OVERALL LIABILITY OF THE SUPPLIER (KSMF) IS LIMITED TO THE VALUE OF DEFECTIVE GOODS LIMITED TO MANUFACTURING DEFECTS ONLY.

BANK DETAILS: For USD A/C. No. 666 Bank of Baroda-EEE A/C (Mumbai Gamdevi Branch), A/C No. : 03940200000666, SWIFT CODE: BARBINBGAM
For EURO A/C. No. 667 Bank of Baroda-EEE A/C (Mumbai Gamdevi Branch), A/C No. : 03940200000667, SWIFT CODE: BARBINBGAM

Address : Bank Of Baroda, Gamdevi Branch Mumbai , Gita Building, Pandita Ramabhai Road, Gamdevi, Mumbai - 400 007 , MAHARASTRA.

Abb	S.S. - Stainless Steel		
PREPARED BY		CHECKED BY MARKETING	
AUTHORIZED BY FINANCE			
QMS EMS OHSAS P.C.O. & AD 2006 Meritplant Wd Compliant Government Recognized Export House  krystalsteel.co.in			



KRYSTAL
S T E E L
Manufacturing Pvt. Ltd.

Manufacturer & Exporter of Seamless Stainless, Duplex & Super Duplex & Nickel Alloy Tubes, Pipes & U -

Plot No # KV - 2, G.I.D.C (Savli), P.O - Manjusr Ta : Savli, District - Vadodara - 391775

• (T): +91 2667 264777 • (E): export@krystalsteel.co.in & sales@krystalsteel.co.in • (W): www.krystalsteel.co.in

COMMERCIAL INVOICE

EXPORTER		IEC NO :	0307043321
KRYSTAL STEEL MANUFACTURING PVT. LTD.		CIN NO :	U27109MH2006PTC165777
Plot No # KV - 2, G.I.D.C (Savli), P.O - Manjusr		PAN No.	AACCK9332J
Ta : Savli, District - Vadodara - 391775 (Gujarat)		INCOTERMS :	DAP TW USA CAROL STREAM IL 60188
		L.C. No.	
Phone No. +91 2667 264777		Payment Terms :	30 % Advance along with commercially cleared Purchase(PO), balance against Performa Invoice before dispatch frm our site
E-Mail export@krystalsteel.co.in & sales@krystalsteel.co.in		INVOICE NO :	KSMP/2018-19/168
Home Page www.krystalsteel.co.in		INVOICE DATE :	26/9/2018
PO NO : M 49397512 DT :2/8/18	OA NO:	E-1819/00068 DT : 6/8/18	
CONSIGNEE BILLING ADDRESS		CONSIGNEE DELIVERY ADDRESS	
TW METALS		TW METALS	
235 Tubeway Drive Carol Stream, IL 60188 United States of America		235 Tubeway Drive, Carol Stream, IL 60188, United States of America United States of America	
Email : barb.kucia@twmetals.com Tel : 630-690-0110		Email : BARB.KUCIA@TWMETALS.COM Tel : 610.458.1361	

PRE - CARRIAGE BY :	BY SEA	COUNTRY OF ORIGIN :	INDIA
VESSEL/FLIGHT NO :	NA	COUNTRY OF FINAL DESTINATION :	USA
PLACE OF CARRIAGE RECEIPT :	NA	SEAPORT OF LOADING :	Nhavasheva Port, Maharashtra, India
CONTAINER NO :	NA	SEAPORT OF DISCHARGE :	NEW YORK NY SEA PORT
SEAL NO :	NA	FINAL DESTINATION :	United States of America

MARKS & NOS :		H.S. Code : 73044100	
TW METALS			
M 49397512 DT :2/8/18			

Sr. No.	Material Description			Size		PCS	MTR	Weight	USD/MTR	TOTAL AMOUNT USD
	Reference No./Heat No./Metalurgy	Specs	Grade	OD (MM/NB)	THK (MM)					
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						521	2101.01	1632.00		

INVOICE VALUE (IN WORDS)	**** TWENTY SEVEN THOUSAND ONE HUNDRED THREE USD AND THREE ONLY	Invoice USD	27,103.03
PAYABLE VALUE (IN WORDS)	**** THIRTEEN USD AND THREE ONLY	Payable Amount	13.03

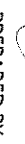
WE INTEND TO CLAIM REWARDS UNDER MERCHANDISE EXPORT FORM INDIA SCHEME(MES)

SHIPMENT UNDER ADVANCE AUTHORIZATION LICENCE SCHEME

LICENCE NO	LICENCE DATE :	GRADE & SUB-GRADE	EXPORTED QUANTITY (MT)	EXEMPTED QUANTITY (MT)
34/21/040/00261/AM19	23/8/2018	TP 316L/1.4404	1.632	2.203

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Address : Bank Of Baroda, Gamdevi Branch Mumbai , Gila Building, Pandita Ramabhai Road, Gamdevi, Mumbai - 400 007 , MAHARASTRA.

Abb	S.S. - Stainless Steel				
PREPARED BY	CHECKED BY MARKETING	AUTHORIZED BY FINANCE			
					
DMS EMS ORSAS P.E.D. & AD 2008 Merchant W/O Consultant Government Recognized Export House					
 krystalsteel.co.in					



"Quality First..... Customer Always"

Manufacturer & Exporter of Seamless Stainless, Duplex & Super Duplex & Nickel Alloy Tubes, Pipes & U -

Plot No # KV - 2, G.I.D.C (Savli), P.O - ManjusrTa : Savli, District - Vadodara - 391775

• (T): +91 2667 264777 • (E): export@krystalsteel.co.in & sales@krystalsteel.co.in • (W): www.krystalsteel.co.in

COMMERCIAL INVOICE

EXPORTER		IEC NO.:	0307043321
KRYSTAL STEEL MANUFACTURING PVT. LTD.		CIN NO.:	U27109MH2006PTC165777
Plot No # KV - 2, G.I.D.C (Savli), P.O - Manjusr		PAN No.:	AACCK9332J
Ta : Savli, District - Vadodara - 391775 (Gujarat)		INCOTERMS:	DAP TW USA CAROL STREAM IL 60188
Phone No. +91 2667 264777		LC No.:	
E-Mail export@krystalsteel.co.in & sales@krystalsteel.co.in		Payment Terms:	30 % Advance along with commercially cleared Purchase(PO), balance against Performa Invoice before dispatch frm our site
Home Page www.krystalsteel.co.in		INVOICE NO.:	KSMP/2018-19/168
PO NO.:	M 49397512 DT :2/8/18	OA NO.:	E-1819/00068 DT : 6/8/18
CONSIGNEE BILLING ADDRESS		CONSIGNEE DELIVERY ADDRESS	
TW METALS		TW METALS	
235 Tubeway Drive Carol Stream, IL 60188 United States of America		235 Tubeway Drive, Carol Stream, IL 60188, United States of America United States of America	
Email : barb.kucia@twmetals.com Tel : 630-690-0110		Email : BARB.KUCIA@TWMETALS.COM Tel : 610.458.1361	
PRE - CARRIAGE BY:		COUNTRY OF ORIGIN:	INDIA
VESSEL/FLIGHT NO.:		COUNTRY OF FINAL DESTINATION:	USA
PLACE OF CARRIAGE RECEIPT:		SEAPORT OF LOADING:	Mhvasheva Port, Maharashtra, India
CONTAINER NO.:		SEAPORT OF DISCHARGE:	NEW YORK NY SEA PORT
SEAL NO.:		FINAL DESTINATION:	United States of America

MARKS & NOS.:		TW METALS	H.S. Code : 73044100
M 49397512 DT :2/8/18			

Sr. No.	Material Description		Size		PCS	MTR	Weight	USD/MTR	TOTAL AMOUNT USD
	Reference No./Heat No./Metallurgy	Specs	Grade	OD (MM/IN)	THK (MM)	Length			
1	71338495/1801-077 Cold Finished Austenitic S.S. Seamless Tubes	ASTM A-269/ EN 10216-5	TP 316L/1.44 04	21.3	1.6	4,000.00	521	2101.01	1632.00
								521	2101.01
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								27,103.03	
								Invoice USD	27,103.03
								Payable Amount	13.03

INVOICE VALUE (IN WORDS)	***** TWENTY SEVEN THOUSAND ONE HUNDRED THREE USD AND THREE ONLY
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WE INTEND TO CLAIM REWARDS UNDER MERCHANDISE EXPORT FORM INDIA SCHEME(MES)

SHIPMENT UNDER ADVANCE AUTHORIZATION LICENCE SCHEME

LICENCE NO	LICENCE DATE :	GRADE & SUB-GRADE	EXPORTED QUANTITY (MT)	EXEMPTED QUANTITY (MT)
34/21/040/00261/AM19	23/8/2018	TP 316L/1.4404	1.632	2.203

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BANK DETAILS: For USD A/C. No. 666 Bank of Baroda-EEE A/C (Mumbai Gamdevi Branch), A/C No. : 03940200000666 , SWIFT CODE: BARBINBGAM
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Address : Bank Of Baroda, Gamdevi Branch Mumbai , Gita Building, Pandita Ramabhai Road, Gamdevi, Mumbai - 400 007 , MAHARASTRA.

Abb	S.S. - Stainless Steel				
PREPARED BY	CHECKED BY MARKETING	AUTHORIZED BY FINANCE	AUTHORIZED BY	QMS EMS OHSAS F.E.O & AD 2000 Merckant Wro Compliant Government Recognized Export House krystalsteel.co.in	



Manufacturer & Exporter of Seamless Stainless, Duplex & Super Duplex & Nickel Alloy Tubes, Pipes & U -

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• (T): +91 2667 264777 • (E): export@krystalsteel.co.in & sales@krystalsteel.co.in • (W): www.krystalsteel.co.in

PACKING LIST

EXPORTER		IEC NO :		0307043321	
KRYSTAL STEEL MANUFACTURING PVT. LTD.		CIN NO :		U27109MH2006PTCL65777	
Plot No # KV - 2, G.I.D.C (Savli), P.O - Manjusar		PAN No.		AACCK9332J	
Ta : Savli, District - Vadodara - 391775 (Gujarat)		INCOTERMS :		DAP TW USA CAROL STREAM IL 60188	
Phone No. +91 2667 264777		L.C. No.		30 % Advance along with commercially cleared Purchase(PO), balance against Performa Invoice before dispatch from our site	
E-Mail export@krystalsteel.co.in & sales@krystalsteel.co.in		Payment Terms :			
Home Page www.krystalsteel.co.in					
PO NO :	M 49397512	OA NO:	E-1819/00068 DT : 6/8/18	INVOICE NO :	KSMP/2018-19/168
CONSIGNEE BILLING ADDRESS		CONSIGNEE DELIVERY ADDRESS		INVOICE DATE : 26/09/2018	
TW METALS		TW METALS		NOTIFY PARTY & ADDRESS	
235 Tubeway Drive Carol Stream, IL 60188 United States of America		235 Tubeway Drive, Carol Stream, IL 60188, United States of America United States of America		235 Tubeway Drive, Carol Stream, IL 60188, United States of America United States of America	
Email : barb.kucia@twmetals.com Tel : 630-690-0110		Email : BARB.KUCIA@TWMETALS.COM Tel : 610-458.1361		Email : BARB.KUCIA@TWMETALS.COM Tel : 610-458.1361	
PRE - CARRIAGE BY :		BY SEA		COUNTRY OF ORIGIN : INDIA	
VESSEL/FLIGHT NO :		NA		COUNTRY OF FINAL DESTINATION : USA	
PLACE OF CARRIAGE RECEIPT :		NA		SEAPORT OF LOADING : Nhasaveha Port, Maharashtra, India	
CONTAINER NO :		NA		SEAPORT OF DISCHARGE : NEW YORK NY SEA PORT	
SEAL NO :		NA		FINAL DESTINATION : UNITED STATES OF AMERICA	

PRE - CARRIAGE BY :		BY SEA		COUNTRY OF ORIGIN :		INDIA							
VESSEL/FLIGHT NO :		NA		COUNTRY OF FINAL DESTINATION :		USA							
PLACE OF CARRIAGE RECEIPT :		NA		SEAPORT OF LOADING :		Nharasheva Port, Maharashtra, India							
CONTAINER NO :		NA		SEAPORT OF DISCHARGE :		NEW YORK NY SEA PORT							
SEAL NO :		NA		FINAL DESTINATION :		UNITED STATES OF AMERICA							
MARKS & NOS :				TW METALS		Ship No.: SHIP/1819/00151							
				M 49397512		H.S. Code : 73044100							
ITEM	TYPE OF	DESCRIPTION OF THE GOODS						QUANTITY		WEIGHT			
SR NO.	PACKING	EXTERNAL NO./Heat No.	MATERIAL	SPEC.	GRADE	OD (MM/NB)	THK (MM/SC H)	LENGHT	PCS /NOS	METERS	NET WEIGHT (KG)	BOX WEIGHT	GROSS WEIGHT
1	BOX NO 1 680(W) X 770(H) X 4310(L)	71338495 /1801-077	Cold Finished Austenitic S.S. Seamless Tubes	ASTM A- 269/ EN 10216-5	TP 316L/1.44 04	21.3	1.60	4.000	521.00	2,101.01	1,632.00	140.00	1,772.00
Total								521.00	2,101.01	1,632.00	140.00	1,772.00	

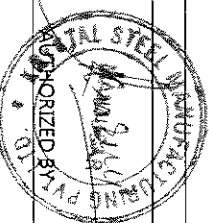
WE INTEND TO CLAIM REWARDS UNDER MERCHANDISE EXPORT FORM INDIA SCHEME(MEIS)

SHIPMENT UNDER ADVANCE AUTHORISATION LICENCE SCHEME

LICENCE NO	LICENCE DATE :	GRADE & SUB-GRADE	EXPORTED QUANTITY (MT)	EXEMPTED QUANTITY (MT)
34/21/040/00261/AM19	23/08/2018	TP 316L/1.4404	1.632	2.203

DECLARATION- WE DECLARE THAT GOODS ARE MANUFACTURED IN INDIA. MATERIAL SUPPLIED WITH ORIGINAL MILL TEST CERTIFICATE ARE AS PER PURCHASE ORDER & APPROVED ORDER TO ACCEPTANCE WARRANTED FOR SUITABLE PERFORMANCE UNTIL 18 MONTHS FROM THE DATE OF DISPATCH OR 12 MONTHS FROM THE DATE OF USAGE, WHICHEVER IS EARLIER SUBJECT TO GOOD ENGINEERING PRACTICES AND TECHNICALLY SUITABLE USAGE. HOWEVER OVERALL LIABILITY OF THE SUPPLIER (KSMP) IS LIMITED TO THE VALUE OF DEFECTIVE GOODS LIMITED TO MANUFACTURING DEFECTS ONLY.

Abb	S.S. - Stainless Steel						
PREPARED BY		CHECKED BY MARKETING	AUTHORIZED BY FINANCE				



QMS | EMS | OHSAS
7.E.D & AEO 2006 Merchant Export House
Government Recognized Export House
krystalsteel.co.in



KRYSTAL
S T E E L
Manufacturing Pvt. Ltd.

"Quality First Customer Always"

Manufacturer & Exporter of Seamless Stainless, Duplex & Super Duplex & Nickel Alloy Tubes, Pipes & U -

Plot No # KV - 2, G.I.D.C (Savli), P.O - Manjusar Ta : Savli, District - Vadodara - 391775

• (T): +91 2667 264777 • (E): export@krystalsteel.co.in & sales@krystalsteel.co.in • (W): www.krystalsteel.co.in

PACKING LIST

EXPORTER		IEC NO :		0307043321	
KRYSTAL STEEL MANUFACTURING PVT. LTD.		CIN NO :		U27109MH2006PTC165777	
Plot No # KV - 2, G.I.D.C (Savli), P.O - Manjusar Ta : Savli, District - Vadodara - 391775 (Gujarat)		PAN No.:		AACCK9332J	
Phone No. +91 2667 264777		INCOTERMS :		DAP TW USA CAROL STREAM IL 60188	
E-Mail export@krystalsteel.co.in & sales@krystalsteel.co.in		L.C. No.			
Home Page www.krystalsteel.co.in		Payment Terms :		30 % Advance along with commercially cleared Purchase(PO), balance against Performa Invoice before dispatch frm our site	
PO NO :	M 49397512	OA NO:	E-1819/00068 DT : 6/8/18	INVOICE NO :	KSMP/2018-19/168
CONSIGNEE BILLING ADDRESS		CONSIGNEE DELIVERY ADDRESS		INVOICE DATE : 26/09/2018	
TW METALS		TW METALS		NOTIFY PARTY & ADDRESS	
235 Tubeway Drive Carol Stream, IL 60188 United States of America		235 Tubeway Drive, Carol Stream, IL 60188, United States of America United States of America		235 Tubeway Drive, Carol Stream, IL 60188, United States of America United States of America	
Email : barb.kucia@twmetals.com Tel : 630-690-0110		Email : BARB.KUCIA@TWMETALS.COM Tel : 610.458.1361		Email : BARB.KUCIA@TWMETALS.COM Tel : 610.458.1361	
PRE - CARRIAGE BY :		BY SEA		COUNTRY OF ORIGIN :	
VESSEL/FLIGHT NO :		NA		COUNTRY OF FINAL DESTINATION :	
PLACE OF CARRIAGE RECEIPT :		NA		SEAPORT OF LOADING :	
CONTAINER NO :		NA		SEAPORT OF DISCHARGE :	
SEAL NO :		NA		FINAL DESTINATION :	
				UNITED STATES OF AMERICA	

MARKS & NOS :		TW METALS		Ship No.: SHIP/1819/00151	
		IM 49397512		H.S. Code : 73044100	

MARKS & NOS :										TW METALS		Ship No.: SHIP/1819/00151 H.S. Code : 73044100	
ITEM SR NO.	TYPE OF PACKING	EXTERNAL NO./Heat No.	MATERIAL	DESCRIPTION OF THE GOODS					QUANTITY		WEIGHT		
				SPEC.	GRADE	OD (MM/NB)	THK (MM/SC H)	LENGHT	PCS /NOS	METERS	NET WEIGHT (KG)	BOX WEIGHT	GROSS WEIGHT
1	BOX NO 1 680(W) X 770(H) X 4310(L)	71338495 /1801-077	Cold Finished Austenitic S.S. Seamless Tubes	ASTM A- 269/ EN 10216-5	TP 316L/1.44 04	21.3	1.60	4.000	521.00	2,101.01	1,632.00	140.00	1,772.00
Total									521.00	2,101.01	1,632.00	140.00	1,772.00

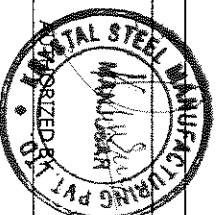
WE INTEND TO CLAIM REWARDS UNDER MERCHANDISE EXPORT FORM INDIA SCHEME(MEIS)

SHIPMENT UNDER ADVANCE AUTHORIZATION LICENCE SCHEME

LICENCE NO	LICENCE DATE :	GRADE & SUB-GRADE	EXPORTED QUANTITY (MT)	EXEMPTED QUANTITY (MT)
34/21/040/00261/AM19	23/08/2018	TP 316L/1.4404	1.632	2.203

DECLARATION - WE DECLARE THAT GOODS ARE MANUFACTURED IN INDIA. MATERIAL SUPPLIED WITH ORIGINAL MILL TEST CERTIFICATE ARE AS PER PURCHASE ORDER & APPROVED ORDER
TO ACCEPTANCE WARRANTY FOR SUITABLE APPLICABLE PERFORMANCE UNTIL 18 MONTHS FROM THE DATE OF DISPATCH OR 12 MONTHS FROM THE DATE OF USAGE WHICHEVER IS EARLIER SUBJECT
TO GOOD ENGINEERING PRACTICES AND TECHNICALLY SUITABLE USAGE, HOWEVER OVERALL LIABILITY OF THE SUPPLIER (KSMP) IS LIMITED TO THE VALUE OF DEFECTIVE GOODS LIMITED TO
MANUFACTURING DEFECTS ONLY.

Abb	S.S. - Stainless Steel				
PREPARED BY		CHECKED BY MARKETING	AUTHORIZED BY FINANCE	QMS EMS OHSAS P.E.D & A.O 2009 Merchant Export Consultant Government Recognized Export House krystalsteel.co.in	





Manufacturer & Exporter of Seamless Stainless, Duplex & Super Duplex & Nickel Alloy Tubes, Pipes & U -

Plot No # KV - 2, G.I.D.C (Savli), P.O - Manjusar Ta : Savli, District - Vadodara - 391775

• (T): +91 2667 264777 • (E): export@krystalsteel.co.in & sales@krystalsteel.co.in • (W): www.krystalsteel.co.in

PACKING LIST

EXPORTER		IEC NO :	
KRYSTAL STEEL MANUFACTURING PVT. LTD.		0307043321	
Plot No # KV - 2, G.I.D.C (Savli), P.O - Manjusar Ta : Savli, District - Vadodara - 391775		U27109MH2006PTC165777	
Phone No. +91 2667 264777		AACCK93321	
E-Mail export@krystalsteel.co.in & sales@krystalsteel.co.in		DAP TW USA CAROL STREAM IL 60188	
Home Page www.krystalsteel.co.in		30 % Advance along with commercially cleared Purchase(PO), balance against Performa Invoice before dispatch frm our site	
PO NO :		INVOICE NO :	KSMP/2018-19/168
M 49397512		INVOICE DATE :	26/09/2018
CONSIGNEE BILLING ADDRESS		NOTIFY PARTY & ADDRESS	
235 Tubeway Drive Carol Stream, IL 60188 United States of America		235 Tubeway Drive, Carol Stream, IL 60188, United States of America United States of America	
Email : barb.kucia@twmetals.com Tel : 630-690-0110		Email : BARB.KUCIA@TWMETALS.COM Tel : 610.458.1361	

PRE - CARRIAGE BY :	BY SEA	COUNTRY OF ORIGIN :	INDIA
VESSEL/FLIGHT NO :	NA	COUNTRY OF FINAL DESTINATION :	USA
PLACE OF CARRIAGE RECEIPT :	NA	SEAPORT OF LOADING :	NhavaSheva Port, Maharashtra, India
CONTAINER NO :	NA	SEAPORT OF DISCHARGE :	NEW YORK NY SEA PORT
SEAL NO :	NA	FINAL DESTINATION :	UNITED STATES OF AMERICA

MARKS & NOS :											TW METALS		Ship No.: SHIP/1819/00151	
M 49397512											H.S. Code : 73044100			
ITEM	TYPE OF	EXTERNAL	DESCRIPTION OF THE GOODS					QUANTITY			WEIGHT			
SR NO.	PACKING	NO./Heat No.	MATERIAL	SPEC.	GRADE	OD (MM/NB)	THK (MM/SC H)	LENGHT	PCS /NOS	METERS	NET WEIGHT (KG)	BOX WEIGHT	GROSS WEIGHT	
1	BOX NO 1 680(W) X 770(H) X 4310(L)	71338495 /1801-077	Cold Finished Austenitic S.S. Seamless Tubes	ASTM A- 269/ EN 10216-5	TP 316/L1.44 04	21.3	1.60	4.000	521.00	2.101.01	1.632.00	140.00	1.772.00	
Total									521.00	2.101.01	1.632.00	140.00	1.772.00	

WE INTEND TO CLAIM REWARDS UNDER MERCHANDISE EXPORT FORM INDIA SCHEME(MES)

SHIPMENT UNDER ADVANCE AUTHORISATION LICENCE SCHEME

LICENCE NO	LICENCE DATE :	GRADE & SUB-GRADE	EXPORTED QUANTITY (MT)	EXEMPTED QUANTITY (MT)
34/21/040/00261/AM19	23/08/2018	TP 316/L 4404	1.632	2.203

DECLARATION- WE DECLARE THAT GOODS ARE MANUFACTURED IN INDIA. MATERIAL SUPPLIED WITH ORIGINAL WILL TEST CERTIFICATE ARE AS PER PURCHASE ORDER & APPROVED ORDER ACCEPTANCE WARRANTED FOR SUITABLE APPLICABLE PERFORMANCE UNTIL 18 MONTHS FROM THE DATE OF DISPATCH OR 12 MONTHS FROM THE DATE OF USAGE WHICHEVER IS EARLIER SUBJECT TO GOOD ENGINEERING PRACTICES AND TECHNICALLY SUITABLE USAGE.HOWEVER OVERALL LIABILITY OF THE SUPPLIER (KSMP) IS LIMITED TO THE VALUE OF DEFECTIVE GOODS LIMITED TO MANUFACTURING DEFECTS ONLY.

Abb	S.S. - Stainless Steel				
PREPARED BY		CHECKED BY	MARKETING	AUTHORIZED BY	FINANCE
				QMS EMS DHSAS P.E.D & A.D 2009 Merchant w/o Compliant Government Recognized Export House krystalsteel.co.in	



"Quality First Customer Always"

Manufacturer & Exporter of Seamless Stainless, Duplex & Super Duplex & Nickel Alloy Tubes, Pipes & U -

Plot No # KV - 2, G.I.D.C (Savli), P.O - Manjusar Ta : Savli, District - Vadodara - 391775

• (T): +91 2667 264777 • (E): export@krystalsteel.co.in & sales@krystalsteel.co.in • (W): www.krystalsteel.co.in

PACKING LIST

EXPORTER KRYSTAL STEEL MANUFACTURING PVT. LTD.		IEC NO :	0307043321
Plot No # KV - 2, G.I.D.C (Savli), P.O - Manjusar Ta : Savli, District - Vadodara - 391775 (Gujarat)		CIN NO :	U27109MH2006PTC165777
Phone No. +91 2667 264777		PAN No.	AACCK9332J
E-Mail export@krystalsteel.co.in & sales@krystalsteel.co.in		INCOTERMS :	DAP TW USA CAROL STREAM IL 60188
Home Page www.krystalsteel.co.in		L.C. No.	
		Payment Terms :	30 % Advance along with commercially cleared Purchase(PO), balance against Performa Invoice before dispatch frm our site
PO NO :	M 49397512	OA NO:	E-1819/00068 DT : 6/8/18
CONSIGNEE BILLING ADDRESS		CONSIGNEE DELIVERY ADDRESS	
TW METALS 235 Tubeway Drive Carol Stream, IL 60188 United States of America		TW METALS 235 Tubeway Drive, Carol Stream, IL 60188, United States of America United States of America	
Email : barb.kucia@twmetals.com Tel : 630-690-0110		Email : BARB.KUCIA@TWMETALS.COM Tel : 610.458.1361	

PRE - CARRIAGE BY :	BY SEA	COUNTRY OF ORIGIN :	INDIA
VESSEL/FLIGHT NO :	NA	COUNTRY OF FINAL DESTINATION :	USA
PLACE OF CARRIAGE RECEIPT :	NA	SEAPORT OF LOADING :	Nhavesheva Port, Maharashtra, India
CONTAINER NO :	NA	SEAPORT OF DISCHARGE :	NEW YORK NY SEA PORT
SEAL NO :	NA	FINAL DESTINATION :	UNITED STATES OF AMERICA

MARKS & NOS :	TW METALS		Ship No.: SHIP/1819/00151			
	M 49397512		H.S. Code : 73044100			

ITEM SR NO.	TYPE OF PACKING	EXTERNAL NO./Heat No.	DESCRIPTION OF THE GOODS				QUANTITY				WEIGHT		
			MATERIAL	SPEC.	GRADE	OD (MM/NB)	THK (MM/SC H)	LENGHT	PCS /NOS	METERS	NET WEIGHT (KG)	BOX WEIGHT	GROSS WEIGHT
1	BOX NO 1 680(W) X 770(H) X 4310(L)	71338495 /1801-077	Cold Finished Austenitic S.S. Seamless Tubes	ASTM A- 269/ EN 10216-5	TP 316L/1.44 04	21.3	1.60	4.000	521.00	2,101.01	1,632.00	140.00	1,772.00
Total									521.00	2,101.01	1,632.00	140.00	1,772.00

WE INTEND TO CLAIM REWARDS UNDER MERCHANDISE EXPORT FORM INDIA SCHEME(MEIS)

SHIPMENT UNDER ADVANCE AUTHORISATION LICENCE SCHEME

LICENCE NO	LICENCE DATE :	GRADE & SUB-GRADE	EXPORTED QUANTITY (MT)	EXEMPTED QUANTITY (MT)
34/21/040/00261/AM19	23/08/2018	TP 316L/1.4404	1.632	2.203

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Abb	S.S. - Stainless Steel	CHECKED BY MARKETING	AUTHORIZED BY FINANCE	OMS EMS DHSAS P.E.D & A.O 2008 Merchant W/o Complaint Government Recognized Export House krystalsteel.co.in
PREPARED BY				



KRYSTAL
S T E E L
Manufacturing Pvt. Ltd.

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Manufacturer & Exporter of Seamless Stainless, Duplex & Super Duplex & Nickel Alloy Tubes, Pipes & U -

Plot No # KV - 2, G.I.D.C (Savli), P.O - Manjusar Ta : Savli, District - Vadodara - 391775

• (T): +91 2667 264777 • (E): export@krystalsteel.co.in & sales@krystalsteel.co.in • (M): www.krystalsteel.co.in

PACKING LIST

EXPORTER		IEC NO :		0307043321	
KRYSTAL STEEL MANUFACTURING PVT. LTD.		CIN NO :		U27109MH2006PTC165777	
Plot No # KV - 2, G.I.D.C (Savli), P.O - Manjusar Ta : Savli, District - Vadodara - 391775 (Gujarat)		PAN NO.		AACCK9332J	
		INCOTERMS :		DAP TW USA CAROL STREAM IL 60188	
		L.C. No.			
Phone No. +91 2667 264777		Payment Terms :		30 % Advance along with commercially cleared Purchase(PO), balance against Performa Invoice before dispatch from our site	
E-Mail export@krystalsteel.co.in & sales@krystalsteel.co.in					
Home Page www.krystalsteel.co.in					
PO NO :	M 49397512	OA NO:	E-1819/00068 DT : 6/8/18	INVOICE NO :	KSMP/2018-19/168
CONSIGNEE BILLING ADDRESS		CONSIGNEE DELIVERY ADDRESS		INVOICE DATE : 26/09/2018	
TW METALS		TW METALS		NOTIFY PARTY & ADDRESS	
235 Tubeway Drive Carol Stream, IL 60188 United States of America		235 Tubeway Drive, Carol Stream, IL 60188, United States of America United States of America		235 Tubeway Drive, Carol Stream, IL 60188, United States of America United States of America	
Email : barb.kucia@twmetals.com Tel : 630-690-0110		Email : BARB.KUCIA@TWMETALS.COM Tel : 610.458.1361		Email : BARB.KUCIA@TWMETALS.COM Tel : 610.458.1361	

PRE - CARRIAGE BY :	BY SEA	COUNTRY OF ORIGIN :	INDIA
VESSEL/FLIGHT NO :	NA	COUNTRY OF FINAL DESTINATION :	USA
PLACE OF CARRIAGE RECEIPT :	NA	SEAPORT OF LOADING :	Nhavsheva Port, Maharashtra, India
CONTAINER NO :	NA	SEAPORT OF DISCHARGE :	NEW YORK NY SEA PORT
SEAL NO :	NA	FINAL DESTINATION :	UNITED STATES OF AMERICA

MARKS & NOS : **TW METALS** **Ship No.: SHIP/1819/00151**
M 49397512 **H.S. Code : 73044100**

ITEM SR NO.	TYPE OF PACKING	EXTERNAL NO./Heat No.	DESCRIPTION OF THE GOODS						QUANTITY			WEIGHT	
			MATERIAL	SPEC.	GRADE	OD (MM/NB)	THK (MM/SC H)	LENGTH	PCS /NOS	METERS	NET WEIGHT (KG)	BOX WEIGHT	GROSS WEIGHT
1	BOX NO 1 680(W) X 770(H) X 4310(L)	71338495 /1801-077	Cold Finished Austenitic S.S. Seamless Tubes	ASTM A- 269/ EN 10216-5	TP 316L/1.44 04	21.3	1.60	4.000	521.00	2,101.01	1,632.00	140.00	1,772.00
Total									521.00	2,101.01	1,632.00	140.00	1,772.00

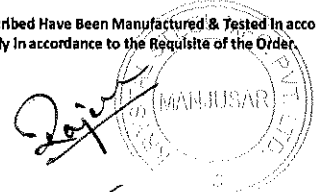
WE INTEND TO CLAIM REWARDS UNDER MERCHANDISE EXPORT FORM INDIA SCHEME(MIES)

SHIPMENT UNDER ADVANCE AUTHORIZATION LICENCE SCHEME

LICENCE NO	LICENCE DATE :	GRADE & SUB-GRADE	EXPORTED QUANTITY (MT)	EXEMPTED QUANTITY (MT)
34/21/040/00261/AM19	23/08/2018	TP 316L/1.4404	1.632	2.203

DECLARATION- WE DECLARE THAT GOODS ARE MANUFACTURED IN INDIA. MATERIAL SUPPLIED WITH ORIGINAL MILL TEST CERTIFICATE ARE AS PER PURCHASE ORDER & APPROVED ORDER ACCEPTANCE WARRANTED FOR SUITABLE APPLICABLE PERFORMANCE UNTIL 18 MONTHS FROM THE DATE OF DISPATCH OR 12 MONTHS FROM THE DATE OF USAGE WHICHEVER IS EARLIER SUBJECT TO GOOD ENGINEERING PRACTICES AND TECHNICALLY SUITABLE USAGE, HOWEVER OVERALL LIABILITY OF THE SUPPLIER (KSMP) IS LIMITED TO THE VALUE OF DEFECTIVE GOODS LIMITED TO MANUFACTURING DEFECTS ONLY.

Abb	S.S. - Stainless Steel				
PREPARED BY	CHECKED BY MARKETING	AUTHORIZED BY FINANCE			
					
QMS EMS OHSAS P.E.D & AO 2009 Merkant We Compliant Government Recognized Export House  krystalsteel.co.in					

Plot KV # 2, GIDC Manjusar, Ta: Savli, Baroda - 391 775, Gujarat, INDIA. (t) - +91-2667-264777 / 778, (e) - marketing@krystalsteel.co.in (w) - www.krystalsteel.co.in		 KRYSTAL STEEL Manufacturers PVT. LTD. Creating Core Values		KRYSTAL STEEL MANUFACTURING PVT. LTD. Manufacturer & Exporter of Seamless Stainless, Duplex, Nickel Alloys Pipes, Tubes & U Tubes DIN EN ISO 9001:2008 , ISO 14001:2004, BS OHSAS 18001: 2007, PED 2014/68/EU & AD 2000 W0 Compliant Export House / An IBR & EIL Approved Manufacturer		Manufacturer's Mark  SPI / TPI Mark													
MILL TEST CERTIFICATE				FORMAT NO.-QR/QAC/16/REV.01															
Customer	M/s. TW METALS - CAROL STREAM			Customer PO No	M 49397512														
Short Address	235, TUBEWAY, CAROL STREAM, IL, 60188, USA			OA No	E-1819/00068														
MTC Type	EN 10204 Type 3.1 & PED			MTC No	KS/ST-316L/54/0918														
Project Details	NIL			Date	02/08/2018														
Material Description	C.F.A SEAMLESS (AUSTENITIC) STAINLESS STEEL TUBES.			Specs & Grades	EN 10216-5 Ed 2014-03 , 1.4404/TP 316L/TC1 , ASTM A 269 Ed.2016 Add.15a														
Heat Treatment	BRIGHT ANNEALED AT 1040 - 1120°C & RAPIDLY COOLED .			Dimensions	EN ISO 1127 Ed. 1997-03, D4 T3, OD Tolerance : +/- 0.11 mm , THK. Tolerance: +/-0.2 mm, LENGTH Tolerance: +/-100 mm														
				Surface Condition	BRIGHT ANNEALED CONDITION.														
Approved acc. to AD 2000 Merkblatt W0 and certified as per PED (2014/68/EU) Annex.I, Sec.4.3 by certification body for Pressure Equipment of TUV NORD Systems (Reg. No.0045)																			
Chemical Composition in %																			
PO Item No	Heat No	OD	Thk	Length	No of Pcs	Mtrs.	LA / PA	C	Si	Mn	P	S	Cr	Ni	Mo	Ti	Cu	N	PMI & VDI Check 100%
							Min	-	-	-	-	-	16.50	10.00	2.00	-	-	-	-
							Max	0.030	1.00	2.00	0.040	0.015	18.50	13.00	2.50	-	-	0.10	-
71338495	1801-077	21.3 mm	1.6 mm	4000 mm	521	2101.01	P.A	0.023	0.380	0.790	0.031	0.002	16.770	10.010	2.070	-	-	0.064	OK
Mandatory & Supplementary Test Conformity																			
PO Item No	Heat No	OD	Thk	Tensile Strength MPa	Yield Strength 0.2% MPa	Yield Strength 1% MPa	%Elong. (GL=50 mm)	Hardness (HRB)	Flaring	Flattening	Impact Test	IGC Test	Micro	Grain Size / No	Macro	Hydro Test 100% (HOLDING TIME 5 SEC. Min.)	ECT 100% (As per ASTM E426)	DP Test	Mock up Test
				490-690	min.=190	min.=225	40% min.	90 HRB max			N.A								
71338495	1801-077	21.3 mm	1.6 mm	592.28	265.26	280.09	51	77,78,78	OK	OK	-	OK	-	-	-	70 BAR	OK	-	-
				596.16	268.46	282.42	52	76,76,77											
Remark / Spl. Note				CONFIRMATION OF IK (IGC) TEST METHOD "A" AS PER ISO 3651-2 & ASTM-A-262 Practice "E" : FOUND OK ,															
				CONFIRMATION OF NACE MR 0175/ISO 15156-1 ED-2015 & MR 0103/ISO 17945 ED-2016 HARDNESS REQ. 22 HRC MAX (90 HRB Approx.): FOUND OK & AD 2000 Merkblatt W0 / W2 / W10															
				CONFIRMATION OF STRAIGHTNESS FOUND ACCEPTABLE (< 2 mm Per Meter)															
				E+H Batch No. : 0F3TN															
				ROHS-CONFORM PRODUCT ACCORDING TO EUROPEAN DIRECTIVE 2011/65/EU AND THIS PRODUCT IS LEAD FREE(Pb FREE).															
Marking				PRODUCT DOES NOT CONTAIN CONSTITUENT PARTS OF ANIMAL ORIGIN.															
				CONFIRMATION OF OD & ID Cleaned and Free of Dust and Grease.															
				METAL SOURCE OF COUNTRY : CHINA , COUNTRY OF MANUFACTURER : MADE IN INDIA															
				CFA/21.3x1.6/EN 10216-5/1.4404/HT NO.1801-077/NJ5/0F3TN															
L.A - LADLE ANALYSIS P.A - PRODUCT ANALYSIS Material Manufactured & Supplied against this original MTC is warranted towards Manufacturing Defects / Failure for 18 months from the date of supply subject to utilisation within appropriate suitable applications and in accordance to GEP. Overall liability of KSMPL is limited to the value of the defective material supplied to proven evidence of manufacturing defects only & not application failure/misuse. Material Produced & Supplied is Free From any major Harmful Mercury or other Radioactive Contamination. Duplication / Forged Photocopy / Unauthorise Usage of any documentary property of Krystal is a punishable criminal act & subject to Law of Indian Jurisdiction.																			
 Insist on Authentically Sealed Certificate (Photocopy invalid)										We Certify that the Material Herein Described Have Been Manufactured & Tested In accordance to the above Specifications & the Results comply in accordance to the Requisite of the Order.  QC Manager / QC Incharge CRASHISH K. MURALIDHARAN									



Metaltechnik GmbH . Fabrikstraße 1 . D-79650 Schopfheim

Endress + Hauser GmbH + Co.KG

Hauptstr. 1

79689 Maulburg

UMSTEMPELBESCHEINIGUNG

CERTIFICATE OF RE-STAMPING

KOMMISSIONS-NR: 190220-2
consignment no:

IHRE BESTELLUNG: 101-1017618024-00010-1951509577
your order:

Wir bestätigen, dass die gelieferten Produkte folgende Abmessungen aufweisen:
We confirm, that the supplied semi-finished products have the following dimensions:

Position item	Produkt product	Menge quantity	Dicke thickness	Durchmesser diameter	Breite width	Länge length
1	52027474 Piezorohr/piezo tube	876		Ø21,3 mm		48,5 mm

Position item	Aus Halbzeug der Abmessung out of semis of dimension	Schmelze heat-no.	Los-Probe-Blech-Nr. lot-sample-plate-no.	Hersteller manufacturer
1	Rohr/tube 1.4435	562577		Butting

ausgewiesen durch Abnahmeprüfzeugnis nach EN10204 gem. Anlage. Zeugnis-Nr. :
As evidenced by: Inspection certificate according to EN10204 as attached. No. Of cert.:

30 000 092 858 / 01

Die Stempelung ist übertragen worden. Die Fertigteile / Gebinde wurden wie folgt gekennzeichnet :
The marking has been transferred. The finished products / package are signed with No. :

1.4435 OT2M1

Zum Zeichen der ordnungsgemäßen Umstempelung wurden die Produkte / Gebinde mit folg. Zeichen versehen :
As proof of the legal re-stamping the finished products / package are signed with :

S1

BESICHTIGUNG UND MASSKONTROLLE: O.B.

Visual & dimensional inspection: o.k.

Das Umstempeln erfolgte mit Genehmigung des TÜV Industrie Service GmbH

The re-stamping was carried out with the approval of: TÜV Industrie Service GmbH

Datum : 20.02.2019
date :

Unterschrift :
signature :

Metaltechnik GmbH
Fabrikstraße 1
D-79650 Schopfheim
Geschäftsführer: Lars Schierhuber

Fon 0 76 22 / 6 67 00-0
Fax 0 76 22 / 6 67 00-19
info@metaltechnikgmbh.de
www.metaltechnikgmbh.de

Registergericht:
Amtsgericht Freiburg
Handelsregister HRB 670290
USt.-Id-Nr. DE811217999

VR-Bank eG Schopfheim-Maulburg
IBAN DE10 6839 1500 0070 5678 22
BIC GENODE61SPF

Sparkasse Staufen-Breisach
IBAN DE22 6805 2328 0001 2030 33
BIC SOLADES1STF

Abnahmeprüfzeugnis 3.1

EN10204/ISO10474-3.1



BUTTING

Dokument-Nr.:	30 000 092 858 / 01		
Besteller:	INOX-Stahlgesellschaft mbH 72622 Nürtingen		BUTTING Auftrags-Nr.: 72360 Pos.: 10
Bestell-Nr.:	2331/75201		Fertigungs-Auftrags-Nr.: 1145419
Kunden-Material-Nr.:			BUTTING Material-Nr.: 100113544
Prüfgegenstand:	längsnahtgeschweißte Rohre		
Abmessung:	21,30 x 2,00 mm	Menge:	3.177,720 m = 776 Stück
Werkstoff:	1.4435 / TP316L		

Anforderungen

AD2000-W2/W10
DIN EN 10217-7 TC2
AD2000-W10/TRB 100, Nace MR0175+0103
Ausnutzung der zulässigen Berechnungsspannung: 100 %.

Geliefert von	Lief.-Charge	Fertigungs-Auftrags-Nr.	Serial-Nr.
OUTOKUMPU	570940	1145419-	2-4;8-9;25-27;29-37;39-47;49-57;59-67;69-77;79-87;89-97;99-107; 109-117;119-123;126-128;130-138;140-148;150-158;160-164;167-169;171; 175-179;181-189;191-199;201-209;211-215;223-229;231-239;241-249; 251-259;261-269;271-279;281-284;291-299;301-308;312-320;322-330; 332-340;342-345;348-351;353-361;363-371;373-381;383-391;393-401; 403-411;413-421;423-431;433-441;443-451;453-459;466;468-476;478-486; 488-491;495-496;498-506;508-516;518-526;528-536;538-546;548-556; 558-566;568-576;578-586;588-596;598-606;608-616;618-626;628-633;636; 638-646;648;650;652-658;660-668;670-678;680-688;690;693-699;701-704; 708-709
OUTOKUMPU	562577	1151239-	4;6-14;16-24;26-34;36-39;42-44;46-53;55-63;65-73;75-83;85-93;95-103; 105-113;115-119;126-127;129-137;139-147;149-157;159-167;169-177; 179-187;189-197;199-205;207;209;211-219;221-226;228-229

Hergestellt unter Fertigungsauftragsnummer 1145419/ 1151239 aus Band mit Abnahmeprüfzeugnis nach EN 10204-3.1.

Schmelzanalyse

Ergebnisse gemäß Abnahmeprüfzeugnis des Stahlwerkes:

Geliefert von	Lief.-Charge	C (%)	Si (%)	Mn (%)	P (%)	S (%)	Cr (%)	Ni (%)	N (%)	Ti (%)	Mo (%)
OUTOKUMPU	562577	0,017	0,42	1,55	0,032	0,001	17,1	12,6	0,05	0,005	2,54
OUTOKUMPU	570940	0,018	0,46	1,57	0,028	0,001	17,1	12,6	0,06	0,005	2,54

Kennzeichnung



Serial no. Fabrication order no. EN 10217-7 TC2 W2Ab 21,3x2,0 1.4435/TP316L Heat no.





Dokument-Nr. 30 000 092 858 / 01

Materialkontrollen

Kontrolle Materialkennzeichnung: OK
Materialverwechslung: durchgeführt OK
Oberflächenkontrolle: außen 100 % OK
innen 100 % im Gegenlicht OK
Oberflächenbeschaffenheit entspricht: EN 10217-7 W2Ab gebeizt / passiviert
Ausführungsart entspricht: EN 10217-7 W2Ab gebeizt / passiviert
Wärmebehandlung durchgeführt mit: 1040 - 1090 °C, Abkühlung in Wasser
Maßkontrolle durchgeführt und entspricht: DIN EN ISO 1127 D4/T3 F1/S2

Ergebnisse der zerstörenden Prüfungen

Zugversuch(e)

Serial-Nr.	Lief.-Charge	Pr.-Lage	Temp. (°C)	a (mm)	D (mm)	Rp0.2 (MPa)	Rp1.0 (MPa)	Rm (MPa)	A (%)	B-Lage
5	562577	I	20	2,07	21,32	403	447	614	42,5	GW
227	562577	I	20	2,07	21,33	420	458	612	44,4	GW
10	570940	I	20	2,06	21,28	418	452	623	41,2	GW
250	570940	I	20	2,07	21,27	428	468	631	40,8	GW
527	570940	I	20	2,06	21,28	426	466	628	48,2	GW
706	570940	I	20	2,08	21,27	432	469	626	50,3	GW

Pr.-Lage = Probenlage, a = Dicke, b = Breite, d = Durchmesser, D = Rohrdurchmesser, G/GW = Grundwerkstoff, S/SN = Schweißnaht, WEZ = Wärmeeinflusszone, q = quer, l = längs, V1 = Rt0,5/Rm, B-Lage = Bruchlage, Z = Brucheinschnürung, W1 = Außenplattierung, W2 = Trägermaterial, W3 = Innenplattierung, CT = Kompression Test

Technologische Prüfungen

Benennung	Befund	Bemerkungen
Aufweitversuch gem. DIN EN ISO 8493	OK	

je Los und je Lieferantencharge durchgeführt

Korrosionstest(s)

Benennung	Befund	Bemerkungen
Interkristalliner Korrosionstest gem. DIN EN ISO 3651-2 Verfahren A	OK	

je Los und je Lieferantencharge durchgeführt

Metallografische Untersuchungen

Benennung	Befund	Lief.-Charge	Dokument-Nr.	Bemerkungen
Härteprüfung Schweißnaht gem. NACE	OK	562577	20000382381	
Härteprüfung Schweißnaht gem. NACE	OK	570940	20000382376	

Stückanalysen

Benennung	Befund	Lief.-Charge	Dokument-Nr.	Bemerkungen
Verwechslungsprüfung Grundwerkstoff (RFA)	OK	562577	20000383080	
Verwechslungsprüfung Schweißnaht (RFA)	OK	562577	20000383080	
Verwechslungsprüfung Grundwerkstoff (RFA)	OK	570940	20000383161	
Verwechslungsprüfung Schweißnaht (RFA)	OK	570940	20000383161	



Dokument-Nr. 30 000 092 858 / 01

Zerstörungsfreie Prüfungen

Benennung	Befund	Umfang	Bemerkungen
Dichtheitsprüfung - mit Wasser	OK	100 %	70 bar
Wirbelstromprüfung Längsnaht - außen DIN EN ISO 10893-2	OK	100 %	

Bemerkungen

"Überprüft nach AD2000-Merkblatt W0 und zertifiziert nach Richtlinie 2014/68/EU, Anhang I, Ziffer 4.3 durch die TÜV CERT-Zertifizierungsstelle für Druckgeräte der TÜV Nord Gruppe, Benannte Stelle, Kenn-Nr. 0045".

Rohre gekennzeichnet mit chloridfreier Tinte.

Fertigungs-Auftrags-Nr. 1145419 - Lief.-Ch. 570940 = 583 pipes = 2,387,385 m

Fertigungs-Auftrags-Nr. 1151239 - Lief.-Ch. 562577 = 193 pipes = 790,335 m

Abnahmeprüfzeugnis EN 10204-3.1 gemäß AD 2000-Merkblatt W2; Abs. 6.2.1; Zustimmungsschreiben der TÜV NORD Systems.
TÜV-Az.: 1326WL04780-1.

Das eingesetzte Schweiß- und Prüfpersonal erfüllt die Anforderungen der EN 10217-7.
Die Anforderungen sind erfüllt.

Dokument-Nr.:	20000382376/QLM/DE1/00	Abnahme-Nr.:	
Besteller:	INOX-Stahlgesellschaft mbH 72622 Nürtingen	Projekt:	
Bestell-Nr.:	2331/75201	BUTTING Auftrags-Nr.:	72360 Pos.: 10
Kunden-Material-Nr.:		Fertigungs-Auftrags-Nr.:	1145419
Prüfgegenstand:	längsnahtgeschweißte Rohre	BUTTING Material-Nr.:	100113544
Abmessung:	21,30 x 2,00 mm	Serial-Nr.:	1145419-00010
Werkstoff:	1.4435/TP316L	Probenidentifik.:	
		Lieferantencharge:	570940

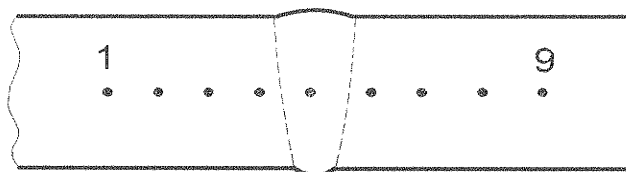
Prüfanforderungen

Härteprüfung Schweißnaht gem. NACE

Prüfanweisungen

Prüfnorm: DIN EN ISO 6507-1 (Vickers)
Prüfverfahren: HV10

Prüfbefunde



Abstand zwischen den Eindrücken: 1mm

Messpunkt	Härte
1	196,0
2	199,0
3	175,0
4	185,0
5	182,0
6	178,0
7	187,0
8	186,0
9	185,0

Bemerkungen

Die Härteanforderung nach NACE MR0103 / ISO 17945 / NACE MR0175 / ISO 15156 ist erfüllt.

Dokument-Nr.:	20000382381/QLM/DE1/00	Abnahme-Nr.:	
Besteller:	INOX-Stahlgesellschaft mbH 72622 Nürtingen	Projekt:	
Bestell-Nr.:	2331/75201	BUTTING Auftrags-Nr.:	72360 Pos.: 10
Kunden-Material-Nr.:		Fertigungs-Auftrags-Nr.:	1151239
Prüfgegenstand:	längsnahtgeschweißte Rohre	BUTTING Material-Nr.:	100113544
Abmessung:	21,30 x 2,00 mm	Serial-Nr.:	1151239-00005
Werkstoff:	1.4435/TP316L	Probenidentifik.:	
		Lieferantencharge:	562577

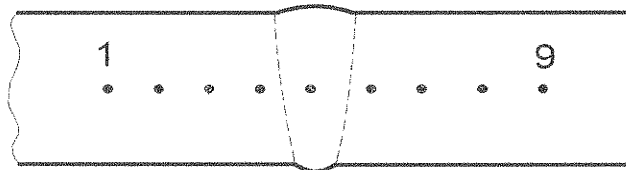
Prüfanforderungen

Härteprüfung Schweißnaht gem. NACE

Prüfanweisungen

Prüfnorm: DIN EN ISO 6507-1 (Vickers)
Prüfverfahren: HV10

Prüfbefunde



Abstand zwischen den Eindrücken: 1mm

Messpunkt	Härte
1	186,0
2	187,0
3	189,0
4	178,0
5	196,0
6	180,0
7	178,0
8	190,0
9	187,0

Bemerkungen

Die Härteanforderung nach NACE MR0103 / ISO 17945 / NACE MR0175 / ISO 15156 ist erfüllt.

Examination Record

Reference analysis



BUTTING

Document no.:	20000383080/QLA/EN1/00	Inspection no.:	
Customer:	INOX-Stahlgesellschaft mbH 72622 Nürtingen	Project:	
Purchase order no.:	2331/75201	BUTTING order no.:	72360 Pos.: 10
Customer material no.:		Fabrication order no.:	1151239
		BUTTING material no.:	100113544
Test object:	longitudinally welded pipes	Serial no.:	1151239-00115
Dimension:	21.30 x 2.00 mm	Sample identific.:	
Material grade:	1.4435/TP316L	Heat no.:	562577

Determination of chemical composition by means of x-ray fluorescence analysis.

Examination requirements

Positive material identification of base material by means of x-ray
Positive material identification of weld by means of x-ray

Examination instructions

Nominal values

Test loc.	Cr (%)		Mo (%)		Ni (%)	
	min	max	min	max	min	max
Bm	17.00	19.00	2.500	3.000	12.50	15.00
Weld	--	--	--	--	--	--

Examination results

Test loc.	Cr (%)	Mo (%)	Ni (%)
Bm	17.00	2.670	13.20
Weld	17.30	2.560	12.80

Bm = Base material

Remarks

none

Examination Record

Reference analysis



BUTTING

Document no.:	20000383161/QLA/EN1/00	Inspection no.:	
Customer:	INOX-Stahlgesellschaft mbH 72622 Nürtingen	Project:	
Purchase order no.:	2331/75201	BUTTING order no.:	72360 Pos.: 10
Customer material no.:		Fabrication order no.:	1145419
		BUTTING material no.:	100113544
Test object:	longitudinally welded pipes	Serial no.:	1145419-see exam. results
Dimension:	21.30 x 2.00 mm	Sample identific.:	see exam. results
Material grade:	1.4435/TP316L	Heat no.:	see exam. results

Determination of chemical composition by means of x-ray fluorescence analysis.

Examination requirements

Positive material identification of base material by means of x-ray

Positive material identification of weld by means of x-ray

Examination results

Serial no. + Sample identific.	Heat no.	Test loc.	Cr (%)	Mo (%)	Ni (%)
00079	570940	Bm	17.10	2.610	12.60
00079	570940	Weld	17.10	2.570	12.60
00491	570940	Bm	17.20	2.560	12.80
00491	570940	Weld	17.10	2.600	12.60

Bm = Base material

Remarks

none

Inspection certificate 3.1

EN10204/ISO10474-3.1



BUTTING

Document no.:	30 000 092 858 / 00		
Customer:	INOX-Stahlgesellschaft mbH 72622 Nürtingen		BUTTING order no.: 72360 Pos.: 10
Purchase order no.:	2331/75201	Fabrication order no.:	1145419
Customer material no.:		BUTTING material no.:	100113544
Test object:	longitudinally welded pipes		
Dimension:	21,30 x 2,00 mm	Quantity:	3.177,720 m = 776 Pieces
Material grade:	1.4435 / TP316L		

Requirements

AD2000-W2/W10
DIN EN 10217-7 TC2
AD2000-W10/TRB 100, Nace MR0175+0103
Weld seam efficiency: 100 %.

Delivered by	Heat no.	Fabrication order no.	Serial no.
OUTOKUMPU	570940	1145419-	2-4;8-9;25-27;29-37;39-47;49-57;59-67;69-77;79-87;89-97;99-107; 109-117;119-123;126-128;130-138;140-148;150-158;160-164;167-169;171; 175-179;181-189;191-199;201-209;211-215;223-229;231-239;241-249; 251-259;261-269;271-279;281-284;291-299;301-308;312-320;322-330; 332-340;342-345;348-351;353-361;363-371;373-381;383-391;393-401; 403-411;413-421;423-431;433-441;443-451;453-459;466;468-476;478-486; 488-491;495-496;498-506;508-516;518-526;528-536;538-546;548-556; 558-566;568-576;578-586;588-596;598-606;608-616;618-626;628-633;636; 638-646;648;650;652-658;660-668;670-678;680-688;690;693-699;701-704; 708-709
OUTOKUMPU	562577	1151239-	4;6-14;16-24;26-34;36-39;42-44;46-53;55-63;65-73;75-83;85-93;95-103; 105-113;115-119;126-127;129-137;139-147;149-157;159-167;169-177; 179-187;189-197;199-205;207;209;211-219;221-226;228-229

Produced with Works order-no. 1145419/ 1151239 of strip with Inspection certificate acc. EN 10204-3.1.

Heat analysis

Results of chem. Composition of Cast acc. to mill Inspection certificate:

Delivered by	Heat no.	C (%)	Si (%)	Mn (%)	P (%)	S (%)	Cr (%)	Ni (%)	N (%)	Ti (%)	Mo (%)
OUTOKUMPU	562577	0,017	0,42	1,55	0,032	0,001	17,1	12,6	0,05	0,005	2,54
OUTOKUMPU	570940	0,018	0,46	1,57	0,028	0,001	17,1	12,6	0,06	0,005	2,54

Marking



Serial no. Fabrication order no. EN 10217-7 TC2 W2Ab 21,3x2,0 1.4435/TP316L Heat no.

B
K 38



Document no. 30 000 092 858 / 00

Material inspection

Control of material marking: OK
 Alloy verification (PMI): carried out OK
 Surface inspection: outside 100 % OK
 inside 100 % with light OK
 Surface finish: EN 10217-7 W2Ab pickled / passivated
 Delivery condition: EN 10217-7 W2Ab pickled / passivated
 Heat treatment: 1040 - 1090 °C, quenched in water
 Dimensional control: DIN EN ISO 1127 D4/T3 F1/S2

Results of destructive tests

Tensile test(s)

Serial no.	Heat no.	Test loc.	Temp. (°C)	a (mm)	D (mm)	Rp0.2 (MPa)	Rp1.0 (MPa)	Rm (MPa)	A (%)	Break
5	562577	I	20	2,07	21,32	403	447	614	42,5	GW
227	562577	I	20	2,07	21,33	420	458	612	44,4	GW
10	570940	I	20	2,06	21,28	418	452	623	41,2	GW
250	570940	I	20	2,07	21,27	428	468	631	40,8	GW
527	570940	I	20	2,06	21,28	426	466	628	48,2	GW
706	570940	I	20	2,08	21,27	432	469	626	50,3	GW

Test loc. = Test location, a = thickness, b = width, d = diameter, D = Pipe diameter, G/GW = Base material, S/SN = weld, WEZ = Heat affected zone, l = longitudinal, q = transverse, V1 = Rt0,5/Rm, Z = Area of reduction, W1 = outside cladding, W2 = backing steel, W3 = inside cladding, CT = Compression Test

Technological test(s)

Description	Result	Remarks
Drift expanding test acc. to DIN EN ISO 8493	OK	per lot and heat no. of suppliers

Corrosion test(s)

Description	Result	Remarks
Intergranular corrosion test acc. to DIN EN ISO 3651-2 method A	OK	per lot and heat no. of suppliers

Metallographic examination

Description	Result	Heat no.	Document no.	Remarks
Hardness test of weld acc. to NACE	OK	562577	20000382381	
Hardness test of weld acc. to NACE	OK	570940	20000382376	

Exemplar analyse

Description	Result	Heat no.	Document no.	Remarks
Positive material identification of base material by means of x-ray	OK	562577	20000383080	
Positive material identification of weld by means of x-ray	OK	562577	20000383080	
Positive material identification of base material by means of x-ray	OK	570940	20000383161	
Positive material identification of weld by means of x-ray	OK	570940	20000383161	

Inspection certificate 3.1

EN10204/ISO10474-3.1



BUTTING

Document no. 30 000 092 858 / 00

Non destructive tests

Description	Result	Extent	Remarks
Eddy current test long. weld - outside DIN EN ISO 10893-2	OK	100 %	
Leak test - with water (hydrostatic)	OK	100 %	70 bar

Remarks

"Tested acc. to AD2000-Merkblatt W0 and certified acc. to Pressure Equipment Directive 2014/68/EU, Annex I, sec. 4.3 by TÜV CERT of the TÜV Nord Gruppe, Notified Body, Identification No. 0045".

The pipes have been marked with ink free of chlorid.

Fabrication order no. 1145419 - Heat no. 570940 = 583 pipes = 2,387,385 m

Fabrication order no. 1151239 - Heat no. 562577 = 193 pipes = 790,335 m

Inspection certificate EN 10204-3.1 acc. to AD 2000-Guideline W2; sec. 6.2.1; letter of agreement by TÜV NORD Systems.
TÜV-file 1326WL04780-1.

The assigned welding and test personnel fulfil the requirements of EN 10217-7.

The requirements are fulfilled.

Examination Record

Hardness test



BUTTING

Document no.:	20000382381/QLM/EN1/00	Inspection no.:	
Customer:	INOX-Stahlgesellschaft mbH 72622 Nürtingen	Project:	
Purchase order no.:	2331/75201	BUTTING order no.:	72360 Pos.: 10
Customer material no.:		Fabrication order no.:	1151239
		BUTTING material no.:	100113544
Test object:	longitudinally welded pipes	Serial no.:	1151239-00005
Dimension:	21.30 x 2.00 mm	Sample identific.:	
Material grade:	1.4435/TP316L	Heat no.:	562577

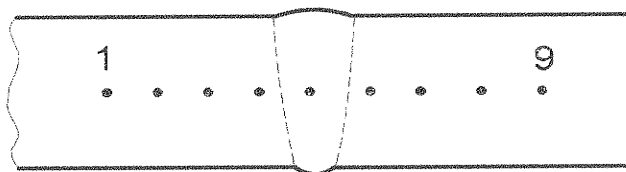
Examination requirements

Hardness test of weld acc. to NACE

Examination instructions

Test standard: DIN EN ISO 6507-1 (Vickers)
Test method: HV10

Examination results



Distance between indentations: 1mm

M-point	Hardness
1	186.0
2	187.0
3	189.0
4	178.0
5	196.0
6	180.0
7	178.0
8	190.0
9	187.0

Remarks

The hardness requirement acc. to NACE MR0103 / ISO 17945 / NACE MR0175 / ISO 15156 is fulfilled.

Examination Record

Hardness test



BUTTING

Document no.:	20000382376/QLM/EN1/00	Inspection no.:	
Customer:	INOX-Stahlgesellschaft mbH 72622 Nürtingen	Project:	
Purchase order no.:	2331/75201	BUTTING order no.:	72360 Pos.: 10
Customer material no.:		Fabrication order no.:	1145419
		BUTTING material no.:	100113544
Test object:	longitudinally welded pipes	Serial no.:	1145419-00010
Dimension:	21.30 x 2.00 mm	Sample identific.:	
Material grade:	1.4435/TP316L	Heat no.:	570940

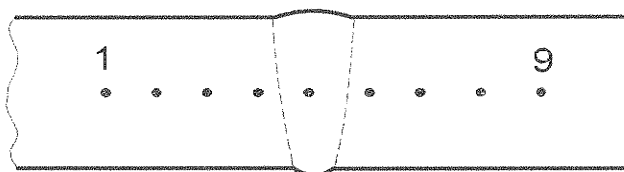
Examination requirements

Hardness test of weld acc. to NACE

Examination instructions

Test standard: DIN EN ISO 6507-1 (Vickers)
Test method: HV10

Examination results



Distance between indentations: 1mm

M-point	Hardness
1	196.0
2	199.0
3	175.0
4	185.0
5	182.0
6	178.0
7	187.0
8	186.0
9	185.0

Remarks

The hardness requirement acc. to NACE MR0103 / ISO 17945 / NACE MR0175 / ISO 15156 is fulfilled.

Examination Record

Reference analysis



BUTTING

Document no.:	20000383080/QLA/EN1/00	Inspection no.:	
Customer:	INOX-Stahlgesellschaft mbH 72622 Nürtingen	Project:	
Purchase order no.:	2331/75201	BUTTING order no.:	72360 Pos.: 10
Customer material no.:		Fabrication order no.:	1151239
		BUTTING material no.:	100113544
Test object:	longitudinally welded pipes	Serial no.:	1151239-00115
Dimension:	21.30 x 2.00 mm	Sample identific.:	
Material grade:	1.4435/TP316L	Heat no.:	562577

Determination of chemical composition by means of x-ray fluorescence analysis.

Examination requirements

Positive material identification of base material by means of x-ray

Positive material identification of weld by means of x-ray

Examination instructions

Nominal values

Test loc.	Cr (%)		Mo (%)		Ni (%)	
	min	max	min	max	min	max
Bm	17.00	19.00	2.500	3.000	12.50	15.00
Weld	--	--	--	--	--	--

Examination results

Test loc.	Cr (%)	Mo (%)	Ni (%)
Bm	17.00	2.670	13.20
Weld	17.30	2.560	12.80

Bm = Base material

Remarks

none

Examination Record

Reference analysis



BUTTING

Document no.:	20000383161/QLA/EN1/00	Inspection no.:	
Customer:	INOX-Stahlgesellschaft mbH 72622 Nürtingen	Project:	
Purchase order no.:	2331/75201	BUTTING order no.:	72360 Pos.: 10
Customer material no:		Fabrication order no.:	1145419
		BUTTING material no.:	100113544
Test object:	longitudinally welded pipes	Serial no.:	1145419-see exam. results
Dimension:	21.30 x 2.00 mm	Sample identific.:	see exam. results
Material grade:	1.4435/TP316L	Heat no.:	see exam. results

Determination of chemical composition by means of x-ray fluorescence analysis.

Examination requirements

Positive material identification of base material by means of x-ray

Positive material identification of weld by means of x-ray

Examination results

Serial no. + Sample identific.	Heat no.	Test loc.	Cr (%)	Mo (%)	Ni (%)
00079	570940	Bm	17.10	2.610	12.60
00079	570940	Weld	17.10	2.570	12.60
00491	570940	Bm	17.20	2.560	12.80
00491	570940	Weld	17.10	2.600	12.60

Bm = Base material

Remarks

none



VIRAJ PROFILES LIMITED (Forgings Div)
 Survey No-140/1 & G-75 MIDC, Tarapur Ind.Area, Boisar, Dist.Palghar,Maharashtra-401506,INDIA
 Email-vflqc@viraj.com,web.www.viraj.com(A01)

(A02) INSPECTION CERTIFICATE & MILL TEST REPORT - EN 10204 3.1

(A06)CUSTOMER : PINACLE STAINLESS STEEL 455 AMBASSADOR DRIVE MISSISSAUGA,ONTARIO L5T 2J3	Manufacturer's Symbol (A04) 	(A03)MTR NO.	12/1047453/6
		(Z02) DATE	22.01.2019
		MATERIAL SPEC.	ASTM A182 / A182M-18/ ASME SA182/SA182M-17
		(B02) GRADE	F304/304L
		DIMENSIONAL SPEC.	ASME B16.5-2017

(B01) : STAINLESS STEEL FORGED FLANGES

(B04) DELIVERY CONDITION :

ISO 9001:2015-TUV NORD REG.No-04100011170 EXPIRY DATE: 21.01.2019 & APPROVED ACCORDING TO AD 2000 MERKBLATT W0 & CERTIFIED ACCORDING TO PED (2014/68/EU) BY CERTIFICATION BODY FOR PRESSURE EQUIPMENT OF TUV NORD SYSTEMS (NOTIFIED BODY REGISTRATION NO. -0045)
 CRN REGISTRATION NOS. FOR FLANGES: OB-0686-98 -NOVA SCOTIA,OB-0686-9T -NORTHWEST TERRITORIES,OB-0686-9Y -YUKON. OB-0686-9 -PRINCE EDWARD ISLAND,OB-0686-90 -LABRADOR,OB-0686-90 -NEWFOUNDLAND,OB-0686-92 -ALBERTA,OB-0686-95 -ONTARIO, OB-0686-951 -BRITISH COLUMBIA,CSA.OB-0686-96 -MANITOBA,CSA.OB-0686-96 -QUEBEC,CSA.OB-0686-96

(A07)ORDER NO: 100370

(A08)Sales Order No. 30094530/000080

Article No:304LFABFFF6

(B09-B11)ITEM DESCRIPTION	QUANTITY(PIECES)	HEAT NUMBER
6" BL FLAT FACE 150# .	46	52159

(C71-C92) CHEMICAL ANALYSIS

ELEMENT	%C	%Mn	%Si	%S	%P	%Cr	%Ni	%Mo	%Ti	%N						
MIN						18.00	8.00									
MAX	0.030	2.00	1.00	0.030	0.045	20.00	11.00									
HEAT	0.022	1.53	0.29	0.030	0.038	18.08	8.05	0.34	0.002	0.0820						
PROD.																

MECHANICAL PROPERTIES

Test Specification ASTM - A370

Sample location : Mid thick-forging		Test Temp : RT	Test Direction : Tr	Sample Shape Round		ASTM E10				
Test Values	(C12) Tensile Strength	(C11) Yield Strength		(C13)	Reduction of Area	(C32) Hardness	Charpy V-Notch 10x10x55mm (Values in Joules) & (Shear%)			
		Rp=0.2%	Rp = 1%	Elongation%			(C42) Single values			(C43)
	Mpa	Mpa	Mpa	Lo=4D		%	BHN	1	2	3
Req.	515 Min	205 MIN		30 MIN	50 MIN					
T	549.36	281.87	325.88	60.60	69.94	157	205	209	215	210

Other applicable Specifications :: NACE MR 0175 / ISO 15156-2015 & NACE MR 0103-2015 & MATERIAL CONFORMS TO W2/W9/W10

Melting Process : Electrical induction furnace & Argon Oxygen decarburization(IRS) Concast

Heat Treatment	: Solution Annealed at 1080°C and water Quenched
Dimension	: Conform with the specification (100% inspected)
Surfacequality	: Satisfactory
PMI Test	: No objection (100% tested with mobile spectro)
Corrosion Test	: Passed IGC test in accordance with ASTM A262 practice E
Micro Observation	: No carbide precipitation observed on grain boundaries
Radioactivity Test	: We here by certify that all the material is free from radioactive contamination
Mercury Contamination	: Free from mercury contamination
Remarks	: No weld repair was performed & all the items are free of weld repair



we certify that the above material has been inspected and tested and complies with the order/contract and is of Indian origin



(Z03)Inspector's Stamp

VIJAY KUMAR PILLAI (GM, QAD)

TransCanada Keystone Pipeline, L.P.

Keystone XL Pipeline Canadian Pump Stations
Level Switch

PO#: 4500257847
E+H SO#: 3003333187

Tab	SDDR#	Description
3	IE	Code / Standard / Compliance / Certificates

Endress+Hauser Canada Ltd
1075 Sutton Drive
Burlington, ON Canada L7L 5Z8
Phone +905-681-9292
Phone +1-800-668-3199
Fax +905-681-9444
info@ca.endress.com
www.ca.endress.com

Endress+Hauser Canada Ltée
6800 Côte de Liesse, #100
St. Laurent, QC Canada H4T 2A7
Tél +514-733-0254
Fax +514-733-2924

Endress+Hauser Canada Ltd
9045 - 22 Ave SW
Edmonton, AB Canada T6X 0J9
Phone +780-486-3222
Fax +888-918-5049

Endress+Hauser Canada Ltd
Suite 245, 7326 - 10th Street NE
Calgary, AB T2E 8W1
Phone + 403.777.2252
Fax + 403.777.2253

Document Title: Code / Standard / Compliance / Certificates

Document Number: 25472-101-V1A-JL10-Z0005

Revision Number: 01

PO Number: 4500257847

Material Requisition Number: KXL1399-CH2M-I-MR-0001

Tag Nos. : 125-BDLSS-B0-LSHH-0302, 126-FXVLY-B0-LSHH-0302



Contractor Name : Endress+Hauser Canada Ltd
 Contractor Address : 1075 Sutton Drive
 City, Province : Burlington, Ontario
 Country, Postal code : Canada L7L 5Z8
 Telephone Number : (905) 681-9292

Rev No.	Rev Date yyyy-mm-dd	Reason for Issue	Contractor Originator	Contractor Reviewer	Contractor Approver
01	2019-06-17	Issued For Inforamtion	A. Patil	A. Patil	C. Penney

CODE 1: Work may proceed.



Permission to proceed does not constitute acceptance or approval of design details, calculations, analyses, test methods or materials developed or selected by the supplier and does not relieve the supplier from full compliance with contractual obligations.

Name: kloca

Date: 06/25/2019



Certificate of Compliance

Certificate: 1046905

Master Contract: 151079

Project: 70123140

Date Issued: 2017-04-17

Issued to: Endress + Hauser GmbH + Co. KG
Hauptstrasse 1
Maulburg, Baden-Württemberg 79690
GERMANY
Attention: Burkhard Lutterbeck

The products listed below are eligible to bear the CSA Mark shown with adjacent indicators 'C' and 'US' for Canada and US or with adjacent indicator 'US' for US only or without either indicator for Canada only.



Issued by: Anil Sodhi
Anil Sodhi

PRODUCTS

CLASS 2258 02 - PROCESS CONTROL EQUIPMENT - For Hazardous Locations
CLASS 2258 82 - PROCESS CONTROL EQUIPMENT - For Hazardous Locations – Certified to U.S. Standards

Class I, Division 1, Groups A, B, C and D; Class II, Groups E, F and G, Class III; Type 4X; IP66/67/68:

LIQUIPHANT M and LIQUIPHANT S, Level Limit Switch, Types FTL50(H)-Tbcdef, FTL51(H)-Tbcdef, FTL51C-Tbcdefg, FTL70-Tbcdefg and FTL71-Tbcdefg; rated as follows: with FEL50A Insert Profibus PA/Foundation Fieldbus: 9-32VDC with FEL50D insert, 21-26 Vdc, 10 mA, connected only to E+H transmitter Type FML621; with FEL51 insert, 19-250VAC, 350 mA, with FEL52 insert, 10-55 VDC, 1.5 W, with FEL54 insert, 19-250 VAC or 19-55VDC, 1.8 W, with FEL54DC insert 10-15 VDC, 1.2 W, with FEL55 insert, 11-36VDC, 4-20 mA, with FEL56 insert, 6.5-9.8 Vdc, NAMUR, with FEL57 insert, 11-16.7VDC, 150 mA, with FEL58 insert, 6.5-9.8 Vdc, NAMUR; Ambient: -50 Deg. C to + 70 Deg. C; Single Seal;

MWP 1450 psi (100 bar) -50 Deg. C ≤ Process Temp. ≤ +300°C (Types FTL70 & FTL71);

MWP 1450 psi (100 bar) -50 Deg. C ≤ Process Temp. ≤ +150°C (Types FTL51(H), FTL51C);

MWP 928 psi (64 bar) -50 Deg. C ≤ Process Temp. ≤ +150°C (Type FTL50(H)).



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Date Issued: 2017-04-17

Class I, Division 2, Groups A, B, C and D; Class II, Division 2, Groups E, F and G, Class III; Type 4X; IP66/67/68:

LIQUIPHANT M and LIQUIPHANT S, Level Limit Switch, Types FTL50(H)-abcdef, FTL51(H)-abcdef, FTL51C-abcdefg, FTL70-abcdefg and FTL71-abcdefg; rated as follows: with FEL50A Insert Profibus PA/Foundation Fieldbus: 9-32VDC with FEL50D insert, 21-26 Vdc, 10 mA, connected only to E+H transmitter Type FML621; with FEL51 insert, 19-250VAC, 350 mA, with FEL52 insert, 10-55 VDC, 1.5 W, with FEL54 insert, 19-250 VAC or 19-55VDC, 1.8 W, with FEL54DC insert 10-15 VDC, 1.2 W, with FEL55 insert, 11-36VDC, 4-20 mA, with FEL56 insert, 6.5-9.8Vdc, NAMUR, with FEL57 insert, 11-16.7 VDC, 150 mA, with FEL58 insert, 6.5-9.8 Vdc, NAMUR; Ambient: -50 Deg. C to + 70 Deg. C; Single Seal;

MWP 1450 psi (100 bar) -50 Deg. C $\leq$ Process Temp. $\leq$ +300°C (Types FTL70 & FTL71);

MWP 1450 psi (100 bar) -50 Deg. C $\leq$ Process Temp. $\leq$ +150°C (Types FTL51(H), FTL51C);

MWP 928 psi (64 bar) -50 Deg. C $\leq$ Process Temp. $\leq$ +150°C (Type FTL50(H)).

CLASS 2258 03 - PROCESS CONTROL EQUIPMENT - Intrinsically Safe and Non-Incendive Systems - For Hazardous Locations

CLASS 2258 83 - PROCESS CONTROL EQUIPMENT - Intrinsically Safe and Non-Incendive Systems - For Hazardous Locations – Certified to U.S. Standards

Class I, Zone 0; Ex ia IIC:

Class I, Zone 0; AEx ia IIC:

Class I, Division 1, Groups A, B, C and D; Class II, Groups E, F and G; Class III; Type 4X; IP66/67/68:

LIQUIPHANT M and LIQUIPHANT S, Level Limit Switch, Types FTL50(H)-Sbdef, FTL51(H)-Sbdef, FTL51C-Sbdefg, FTL70-Sbdefg and FTL71-Sbdefg; input rated as follows: with FEL50A Insert Profibus PA/Foundation Fieldbus: 9-32VDC with FEL50D insert, 21-26 Vdc, 10 mA, connected only to E+H transmitter Type FML621; with FEL55 insert, 11-36VDC, 4-20 mA; with FEL56 insert, 6.5-9.8 Vdc NAMUR; with FEL57 insert, 11-16.7 Vdc, 150 mA; with FEL58 insert, 6.5-9.8 Vdc, NAMUR; intrinsically safe when connected per installation drawing no. 960392-2060 960009587(FEL50A); Ambient: -50 Deg. C to + 70 Deg. C Single Seal;

MWP 1450 psi (100 bar) -50 Deg. C $\leq$ Process Temp. $\leq$ +300°C (Types FTL70 & FTL71);

MWP 1450 psi (100 bar) -50 Deg. C $\leq$ Process Temp. $\leq$ +150°C (Types FTL51(H), FTL51C);

MWP 928 psi (64 bar) -50 Deg. C $\leq$ Process Temp. $\leq$ +150°C (Type FTL50(H)).

Note: In model code where e = enclosure = E4=F16plastic (FTL50) and (FTL51), device is suitable for Ex ia IIC; Class I, Zone 0; Class I, Groups A, B, C and D; Class II, Group G and Coal Dust; Class III hazardous locations.



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Project: 70123140

Master Contract: 151079
Date Issued: 2017-04-17

- CLASS 2258 04** - PROCESS CONTROL EQUIPMENT - Intrinsically Safe Entity – For Hazardous Locations
CLASS 2258 84 - PROCESS CONTROL EQUIPMENT - Intrinsically Safe Entity - For Hazardous Locations – Certified to U.S. Standards

Class I, Zone 0; Ex ia IIC:

Class I, Zone 0; AEx ia IIC:

Class I, Division 1, Groups A, B, C and D; Class II, Groups E, F and G; Class III; Type 4X; IP66/67/68:

LIQUIPHANT M and LIQUIPHANT S, Level Limit Switch, Types FTL50(H)-Sbdef, FTL51(H)-Sbdef, FTL51C-Sbdefg, FTL70-Sbdefg and FTL71-Sbdefg; input rated as follows: with FEL50A Insert Profibus PA/Foundation Fieldbus: 9-32VDC with FEL50D insert, 21-26 Vdc, 10 mA, connected only to E+H transmitter Type FML621; with FEL55 insert, 11-36VDC, 4-20 mA; with FEL56 insert, 6.5-9.8 Vdc, NAMUR; with FEL57 insert, 11-16.7 Vdc, 150 mA; with FEL58 insert, 6.5-9.8 Vdc, NAMUR; intrinsically safe, with Entity Parameters as listed below, when connected per installation drawing no. 960392-2060; 960009587 (FEL50A); Ambient: -50 Deg. C to + 70 Deg. C; -50 Deg. C to + 60 Deg. C (FEL50A and FEL50D for T6), Single Seal;

MWP 1450 psi (100 bar) -50 Deg. C $\leq$ Process Temp. $\leq$ +300°C (Types FTL70 & FTL71);

MWP 1450 psi (100 bar) -50 Deg. C $\leq$ Process Temp. $\leq$ +150°C (Types FTL51(H), FTL51C);

MWP 928 psi (64 bar) -50 Deg. C $\leq$ Process Temp. $\leq$ +150°C (Type FTL50(H)).

FEL50A insert, Profibus PA/Foundation Fieldbus, $V_{max}/U_i=24$ VDC, $I_{max}/I_i=250$ mA, $P_{max}/P_i \leq 1.2$ W, $C_i \leq 5$ nF, $L_i \leq 10$ uH

FEL50A insert, Profibus PA/Foundation Fieldbus FISCO parameters, $V_{max}/U_i=17.5$ VDC, $I_{max}/I_i=500$ mA, $P_{max}/P_i \leq 5.5$ W, $C_i \leq 5$ nF, $L_i \leq 10$ uH

FEL50D insert, $V_{max}/U_i=27.6$ VDC, $I_{max}/I_i=93$ mA, $P_{max}/P_i=640$ mW, $C_i=2$ nF, $L_i=0.133$ mH

FEL55 insert: $V_{max}/U_i=36$ Vdc, $I_{max}/I_i=100$ mA, $P_{max}/P_i=1$ W, $C_i=0$ nF, $L_i=0$ mH

FEL56 and 58 inserts: $V_{max}/U_i=16$ Vdc, $I_{max}/I_i=52$ mA, $P_{max}/P_i=169$ mW, $C_i=30$ nF, $L_i=0$ mH

FEL57 insert: $V_{max}/U_i=16.7$ VDC, $I_{max}/I_i=150$ mA, $P_{max}/P_i=1.0$ W, $C_i=0$ nF, $L_i=0$ mH

Note: In model code where e = enclosure = E4=F16 plastic (FTL50) and (FTL51), device is suitable for Ex ia IIC; Class I, Zone 0; Class I, Groups A, B, C and D; Class II, Group G and Coal Dust; Class III hazardous locations.

CLASS 2252 06 - PROCESS CONTROL EQUIPMENT

CLASS 2252 86 - PROCESS CONTROL EQUIPMENT (Certified to U.S. Standards)

LIQUIPHANT M and LIQUIPHANT S, Level Limit Switch, Types FTL50(H)-Ubcdef, FTL51(H)-Uabcdef, FTL51C-Ubcdefg, FTL70-Ubcdefg and FTL71-Ubcdefg; rated as follows: with FEL50A Insert Profibus PA/Foundation Fieldbus: 9-32VDC with FEL50D insert, 21-26 Vdc, 10 mA, connected only to E+H transmitter Type FML621; with FEL51 insert, 19-250VAC, 350 mA, with FEL52 insert, 10-55 VDC, 1.5 W, with FEL54 insert, 19-250 VAC or 19-55VDC, 1.8 W, with FEL55 insert, 11-36VDC, 4-20 mA, with FEL56 insert, 6.5-9.8 Vdc, NAMUR, with FEL57 insert, 11-16.7 VDC, 150 mA, with FEL58 insert, 6.5-9.8 Vdc, NAMUR; Ambient: - 50 Deg. C to + 70 Deg. C;



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MWP 1450 psi (100 bar) -50 Deg. C $\leq$ Process Temp. $\leq$ +300°C (Types FTL70 & FTL71);
MWP 1450 psi (100 bar) -50 Deg. C $\leq$ Process Temp. $\leq$ +150°C (Types FTL51(H), FTL51C);
MWP 928 psi (64 bar) -50 Deg. C $\leq$ Process Temp. $\leq$ +150°C (Type FTL50(H)).

APPLICABLE REQUIREMENTS

C22.2 No. 0-10	General Requirements – Canadian Electrical Code, Part II
C22.2 No. 25-1966	Enclosures for Use in Class II, Groups E, F and G Hazardous Locations
C22.2 No. 30-M1986	Explosion-Proof Enclosures for Use in Class I Hazardous Locations
CAN/CSA-C22.2 No. 94-M91	Special Purpose Enclosures
CAN/CSA C22.2 No. 61010-1-12	Safety Requirements for Electrical Equipment for Measuring, Control and Laboratory Use – Part 1 : General Requirements
CAN/CSA-C22.2 No. 157-92	Intrinsically Safe and Non-Incendive Equipment for Use in Hazardous Locations
C22.2 No. 213-M1987	Non-Incendive Electrical Equipment for Use in Class I, Division 2 Hazardous Locations
CAN/CSA-C22.2 No. 60079-0: 15	Electrical apparatus for explosive gas atmospheres - Part 0: General requirements
CAN/CSA-C22.2 No. 60079-11: 14	Electrical apparatus for explosive gas atmospheres - Part 11: Intrinsic Safety "i"
IEC 60079-27 Ed.2:2008	Fieldbus intrinsically safe concept (FISCO)
CAN/CSA-C22.2 No. 60529:05	Degrees of protection provided by enclosures (IP Code)
ANSI/ISA 12.27.01-2011	Requirements for Process Sealing Between Electrical Systems and Flammable or Combustible Process Fluids
ANSI/ISA-61010-1 3rd Edition	Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use - Part 1: General Requirements - Third Edition
FMRC 3600 – 1998	Electrical Equipment for Use in Hazardous (Classified) Locations, General Requirements
FMRC 3610 – 1999	Intrinsically Safe Apparatus for Use in Class I, II & III, Division 1, and Class I, Zone 0 & 1 Hazardous (Classified) Locations
FMRC 3611 – 1999	Nonincendive Electrical Equipment for Use in Class I and Class II, Division 2, and Class III, Division 1 and 2 Hazardous (Classified) Locations
FMRC 3615 – 2006	Explosionproof Electrical Equipment, General Requirements
FMRC 3810 – 1995	Electrical and Electronic Test, Measuring, and Process Control Equipment
ANSI/NEMA 250 – 1991	Enclosures for Electrical Equipment
ANSI/IEC 60529:2004	Degrees of Protection Provided by Enclosures (IP Code)



Supplement to Certificate of Compliance

Certificate: 1046905

Master Contract: 151079

***The products listed, including the latest revision described below,
are eligible to be marked in accordance with the referenced Certificate.***

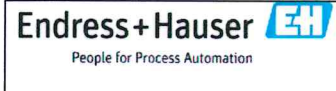
Product Certification History

Project	Date	Description
70123140	2017-04-17	Update Report 1046905 to include minor modifications to the PCB. Update ordinary location standard 61010-1 and other applicable standards to the latest edition. Update documentation.
70008383	2014-07-21	Update to include a new module (FEL54DC) and revisions to several certification drawings.
2408998	2011-04-27	Update of report 1046905 to cover addition of F27 enclosure; addition of IP ratings for all enclosures; addition of Single Seal rating and related drawings.
2039942	2008-11-21	Update to cover addition of c CSA us coverage, to cover revisions to marking and control drawings, addition of alternative adhesive nameplate types and addition of MWP ratings.
2225271	Nov. 17, 2009	Update to cover addition of new electrostatic insert FEL50A and modifications to FEL58 layout and components
1961325	Nov. 24, 2007	Update to cover addition of a new electronic insert FEL50D and minor modifications.
1510224	Dec. 15, 2003	Update to cover the addition of new models (housing compact).
1305204	Apr. 16, 2002	Extension of sensor "tube" length to 6000 mm maximum.
1200846	May 2, 2001	Addition of Liquiphant S, types FTL70 and FTL71.
1165969	Jan 25, 2001	Addition of T13 enclosure, coated version with new piezo-drive FTL51C-, new electronic insert FEL58, revised entity parameters for FEL56 insert.
1046905	Jan. 13, 2000	Addition of F16 plastic enclosure. Originally issued as 2500007487.
LR53988-136C	Aug. 16, 1999	Original Certification.



the pressure equipment safety authority

**STATUTORY DECLARATION
Registration of Fittings**



I, Michael Frei,

Quality Manager, responsible for the Integrated Quality Management System
(company title, e.g. vice president, plant manager, chief engineer) (must be in a position of authority)

of Endress+Hauser GmbH+Co.KG, Germany; E+H (Suzhou) Automation Instr. Co.Ltd; E+H (India) Automation Instr. Pvt. Ltd.;
Endress+Hauser (USA) Automation Instr Inc. (name of manufacturer)

located at DE-79689 Maulburg, Germany; 215021 Suzhou (P.R. China); Aurangabad-431136 (India);
Greenwood, IN, 46143, USA (plant address)

do solemnly declare that the fittings listed hereunder, which are subject to the Safety Codes Act
(check one)

- ☒ comply with the requirements of ASME B31.3-2014; B31.1-2014ED which specifies the dimensions,
(title of recognized North American Standard)
materials of construction, pressure/temperature ratings and identification marking of the fittings, or
- ☐ are not covered by the provisions of a recognized North American standard and are therefore manufactured to
comply with _____ as supported by the attached data which identifies the dimensions,
materials of construction, pressure/temperature ratings and the basis for such ratings, and the marking of the fittings
for identification.

I further declare that the manufacture of these fittings is controlled by a quality control program which has been verified by the
following authority, IQNet and SQS as being suitable for the manufacture of these fittings to the
stated standard. The fittings covered by this declaration, for which I seek registration, are Level switch metering devices

In support of this application, the following information, calculations and/or test data are attached:

Liquiphant FTL41, FTL43, FTL50, FTL50H, FTL51, FTL51C, FTL51H, FTL61, FTL62, FTL63, FTL70, FTL71, FTL74, FTL80, FTL81, FTL85;

Drawings, Scope of Registration 960017747 Rev 07

DECLARED before me at _____ in the _____ of _____

this _____ day of _____, _____
(Month) (Year)

(print) _____

(sign) _____

(A Commissioner for Oaths)


(Signature of Applicant)

For Office Use Only

To the best of my knowledge and belief, the application meets the requirements of the Safety Codes Act and CSA Standard
B51, Clause 4.2, and is accepted for registration in Category F

Registration Number: 0 F 1 5 8 9 9 . 2

Date Registered: FEB 09 2017


(For the Administrator/Chief Inspector of Alberta)
Expiry Date: Jul 8, 2025

The information you provide is necessary only for the administration of the programs as required by the Alberta Safety Codes Act and Regulations in the Boiler Discipline.



the pressure equipment safety authority

9410 - 20 Ave N.W.
Edmonton, Alberta, Canada T6N 0A4
Tel: (780) 437-9100 / Fax: (780) 437-7787

February 09, 2017

Attention: Catherine Diplock
PRESSURE VESSEL ENGINEERING INC
120 RANDALL DRIVE SUITE B
WATERLOO, ON N2V 1C6

Email: cmd@pveng.com

The design submission, tracking number 2017-00385, originally received on January 23, 2017 was surveyed and accepted for registration as follows:

CRN : 0F15899.2

Accepted on: February 09, 2017

Reg Type: Addition to Acc. Fitting

Expiry Date: July 08, 2025

Drawing No. : (960017747 SCOPE OF REGISTRATION) DWG. 960018669 As Noted

Fitting type: LEVEL SWITCH METERING DEVICES

Design registered in the name of : ENDRESS + HAUSER GMBH & CO KG

The registration is conditional on your compliance with the following notes:

- This registration only includes a change to the new fork material, per drawing 960018669, all other components are as per original registration.

As indicated on AB-41 Statutory Declaration form and submitted documentation, the code of construction are ASME B31.1 and ASME B31.3.

This registration is valid only for fittings fabricated at the location(s) covered by the QC certificate attached to the accepted AB-41 Statutory Declaration form.

This registration is valid only until the indicated expiry date and only if the Manufacturer maintains a valid quality management system approved by an acceptable third-party agency until that date.

Should the approval of the quality management system lapse before the expiry date indicated above, this registration shall become void.

An invoice covering survey and registration fees will be forwarded from our Revenue Accounts.

Enclosed are stamped prints for your reference.

Sincerely,

RADISAVLJEVIC, ZANA, R.E.T.

SOR Scope of I#960017747		People for Process Automation										
Supplement to CRN 0F15899.2C: the modifications are marked in red ink												
Product: Liquiphant Types: FTL41, FTL43, FTL50, FTL50H, FTL51, FTL51C, FTL51H, FTL61, FTL62, FTL63, FTL70, FTL71, FTL64, FTL80, FTL81, FTL85												
Code of Construction ASME B31.3-2014ED & ASME B31.1 2014ED; ISA 82.03; IEC 61010-1 2010												
Rev07	19/Jan/2017											
Process Connection		Materials of Construction	Maximum Design Pressure (bar) and Temperature (°C)	Top Level drawing	Shop Level drawing	witnessed proof tests	Approved Types	New Types	Comments	Manufacturing Locations:		
Design	Pressure Components											
ASME B16.5-2013 Flange ANSI	Flange Class: 150, 300, 400 600 900 1500 2500 Size: 1", 1 1/4", 1 1/2", 2", 2 1/2", 3", 3 1/2", 4", 6", 8"	Group 2.2, UNS S31600, SA-182, (F316, 1.4436, 1.4401) Group 2.2, UNS S31600, SA-240, (316, 1.4436, 1.4401) Group 2.3, UNS S31603, SA-182, (F316L, 1.4404) Group 2.3, UNS S31603, SA-240, (316L, 1.4435,) Group 3.8, UNS N06022, SB-574, B575 (C22, 2.4602) Group 3.8, UNS N06455, SB-574, B575 (C4, 2.4610) Group 1.17, UNS S31803, A182, (F51, 1.4462) Flange clad (plated) with Alloy C4 or C22 Group 3.8 UNS N10276, SB-574, B575 (C276, 2.4819)	by Flange Class, max. 64 bar with bimorph piezo-drive max. 90 bar with stack piezo-drive -50°C up to 150°C	960017020- -2 960017023 - -3	960017131- -2 960017132- -3 960017136- -2 960017149- -2 960017150- -2 960017144- -2 960017145- -3 960017153- -2		Liquiphant M FTL50/51 Liquiphant M FTL50H/51H	FTL80/81/41/61/ 43/63		Endress+Hauser GmbH+Co.KG DE-79689 Maulburg Germany		
			by Flange Class, max. 100 bar -60°C up to 260°C max. 64 bar +261°C up to 280°C	960017028 - -1	960017148- -2 960017151- -2 960017152- -2 960017133- -2 960017153- -2		Liquiphant S FTL70	FTL80/64	with stack piezo- drive	Endress+Hauser Suzhou Automation Instrumentation Co. Ltd. 215021 Suzhou P.R. China		
			by Flange Class, max. 90 bar -60°C up to 150°C max. 80 bar +151°C up to 260°C max. 64 bar +261°C up to 280°C	960017030 - -4	960017148- -2 960017151- -2 960017152- -2 960017133- -2 960017153- -2 960017146- -2		Liquiphant S FTL71	FTL81/64	with stack piezo- drive	Endress+Hauser (USA) Automation Instrumentation Inc. Greenwood, Indiana 46143, USA		
		ECTFE coated Group 2.2, UNS S31600, SA-182, (F316, 1.4436) Group 2.2, UNS S31600, SA-240, (316, 1.4436) Group 2.3, UNS S31603, SA-182, (F316L, 1.4404) Group 2.3, UNS S31603, SA-240, (316L, 1.4435)	by Flange Class, max. 40 bar -50°C up to 120°C	960017023 - -3	960017131- -2 960017132- -3 960017136- -2 960017149- -2 960017150- -2		Liquiphant M FTL51C	FTL85/62	with stack piezo- drive	Endress+Hauser (India) Automation Instrumentation Pvt. Ltd. Aurangabad-431136 India		
		PFA coated Group 2.2, UNS S31600, SA-182, (F316, 1.4436) Group 2.2, UNS S31600, SA-240, (316, 1.4436) Group 2.3, UNS S31603, SA-182, (F316L, 1.4404) Group 2.3, UNS S31603, SA-240, (316L, 1.4435)	by Flange Class, max. 40 bar -50°C up to 150°C	960017023 - -3	960017144- -2 960017145- -3 960017153- -2		Liquiphant M FTL51C	FTL85/62	with stack piezo- drive			
		with Enamel Group 55, UNS N01800, SA-516, 1.0487	by Flange Class, max. 25 bar -50°C up to 150°C	960017023 - -3	960017135- -2		Liquiphant M FTL51C	FTL85/62	with stack piezo- drive			
ASME B1.20.1- 2013 NPT Thread	MNPT 3/4", 1", 1 1/2", 2"	UNS S31603, SA-479, (316L, 1.4435, 1.4404) UNS S31600, SA-479 (316, 1.4436) UNS N06022, SB-574, (C22, 2.4602) UNS N06455 SB-574, (C4, 2.4610)	max. 64 bar -50°C up to 150°c	960017019 - -2 960017022 - -3	960017131- -2 960017138- -2 960017154- -2 960017140- -2 960017143- -2 960014308- A		Liquiphant M FTL50/51 Liquiphant M FTL50H/51H	FTL80/81/41/61/ 43/63	with bimorph piezo-drive			
			max. 90 bar -50°C up to 150°C	960017022- -3	960017131- -2 960017132- -3 960017144- -2 960017145- -3 960017138- -2 960017154- -2 960017140- -2 960017143- -2 960014308- A		Liquiphant M FTL51/ 51H	FTL81/41/61/43/ 63	with stack piezo- drive			
			max. 100 bar -60°C up to 260°C max. 64 bar +261°C up to 280°C	960017027 - -3	960017133- -2 960017139- -2 960017155- -2 960017142- -2		Liquiphant S FTL70	FTL80/64	with stack piezo- drive			

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Process Connection		Materials of Construction	Maximum Design Pressure (bar) and Temperature (°C)	Top connection drawing	Shop Level drawing	witnessed proof tests	Approved Types	New Types	Comments	Manufacturing Locations:		
Design	Pressure Components											
			max. 90 bar -60 up to 150°C max. 80 bar +151°C up to 260°C max. 64 bar +261°C up to 280°C	960017029 - -4	960017133- -2 960017146- -2 960017139- -2 960017155- -2 960017142- -2		Liquiphant S FTL71	FTL81/64	with stack piezo- drive			
ISO 228 Thread	Thread: G1", G1 1/2", G2"	UNS S31603, SA-479, (316L, 1.4435, 1.4404) UNS S31600, SA-479 (316, 1.4436) UNS N06022, SB-574, (C22, 2.4602) UNS N06455 SB-574, (C4, 2.4610)	max. 64 bar -50°C up to 150°C	960017019 - -2 960017022 - -3	960017131- -2 960017138- -2 960017154- -2 960017140- -2 960017143- -2 960014308- A		Liquiphant M FTL50/51 Liquiphant M FTL50H/51H	FTL80/81/41/61/43/63	with bimorph piezo-drive			
			max. 90 bar -50°C up to 150°C	960017022 - -3	960017131- -2 960017132- -3 960017144- -2 960017145- -3 960017138- -2 960017154- -2 960017140- -2 960017143- -2 960014308- A	970004991 970004993	Liquiphant M FTL51 Liquiphant M FTL51H	FTL81/41/61/43/63	with stack piezo- drive			
			max. 100 bar -60°C up to 260°C max. 64 bar +261°C up to 280°C	960017027 - -3	960017133- -2 960017139- -2 960017155- -2 960017142- -2		Liquiphant S FTL70	FTL80/64	with stack piezo- drive			
			max. 90 bar -60°C up to 150°C max. 80 bar +151°C up to 260°C max. 64 bar +261°C up to 280°C	960017029 - -4	960017133- -2 960017146- -2 960017139- -2 960017155- -2 960017142- -2	970004992 970004994	Liquiphant S FTL71	FTL81/64	with stack piezo- drive			
		UNS S31603, SA-479, (316L, 1.4435, 1.4404) UNS S31600, SA-479 (316, 1.4436) UNS N06022, SB-574, (C22, 2.4602) UNS N06455 SB-574, (C4, 2.4610)	max. 64 bar -50°C up to 150°C	960017019 - -2 960017022 - -3	960017131- -2 960017138- -2 960017154- -2 960017140- -2 960017143- -2 960014308- A		Liquiphant M FTL50/51 Liquiphant M FTL50H/51H	FTL80/81/41/61/43/63	hygiene version			
			by installing with welding boss max. 40 bar -50°C up to 100°C max. 25 bar +101°C up to 150°C	960017019 - -2 960017022 - -3			Liquiphant M FTL50/51 Liquiphant M FTL50H/51H	FTL80/81/41/61/43/63	hygiene version in use with welding boss			
ISO 228 Thread	Welding boss G1"	UNS S31603, SA-479, (316L, 1.4435, 1.4404) UNS S31600, SA-479 (316, 1.4436) UNS N06022, SB-574, (C22, 2.4602) UNS N06455 SB-574, (C4, 2.4610)	max. 40 bar -50°C up to 100°C max. 25 bar +101°C up to 150°C	960017019 - -2 960017022 - -3	960017133- -2 960017146- -2 960017139- -2 960017155- -2 960017142- -2		Liquiphant M FTL50/51 Liquiphant M FTL50H/51H	FTL80/81/41/61/43/63	Accessory part			

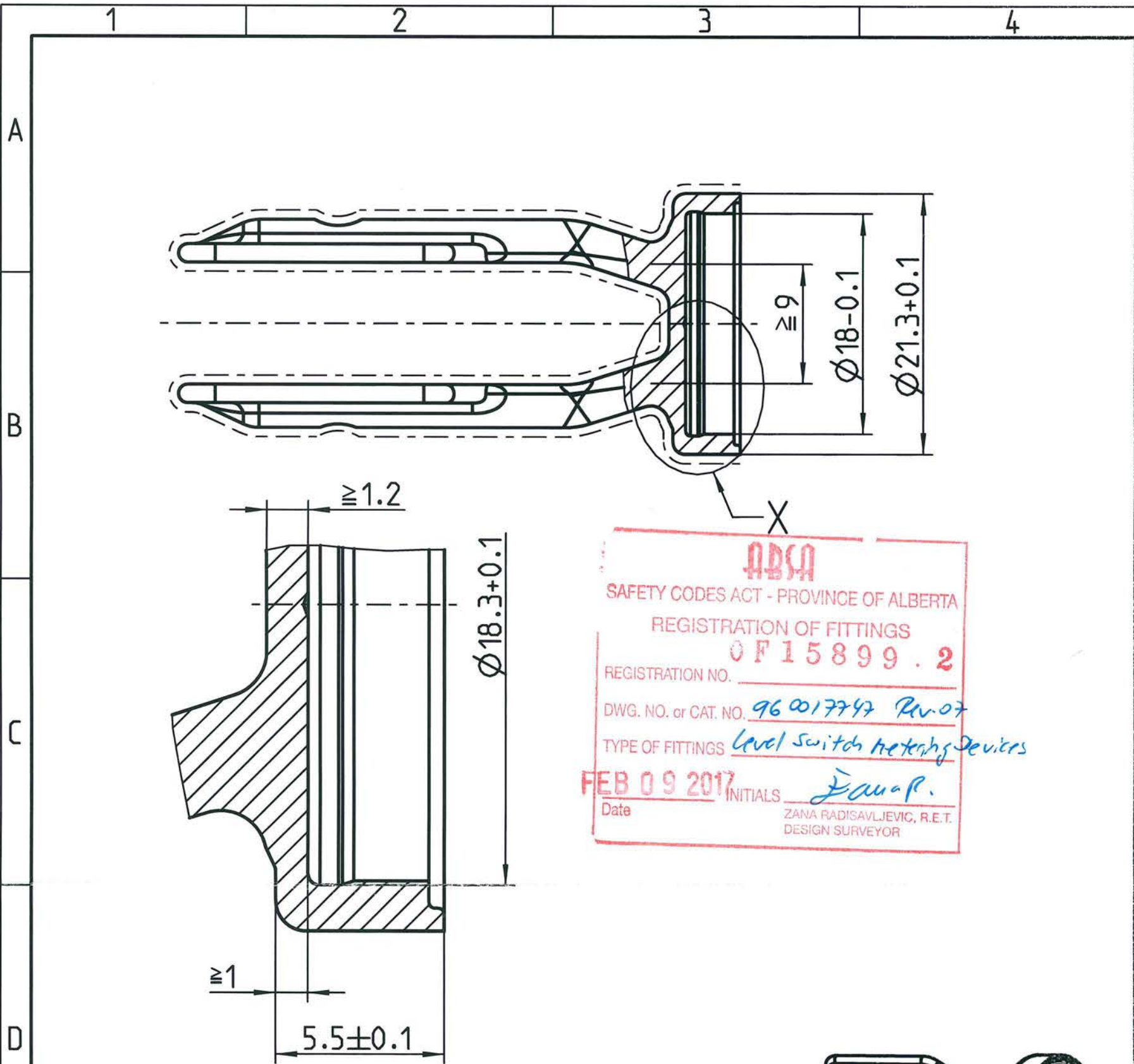
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Process Connection		Materials of Construction	Maximum Design Pressure (bar) and Temperature (°C)	Process Approval drawing	Shop Level drawing	witnessed proof tests	Approved Types	New Types	Comments	Manufacturing Locations:		
Design	Pressure Components											
ISO 2852 one-piece-sanitary	Sanitary 1"-1 1/2", 2", 2 1/2", 3", 3 1/2", 4"	UNS S31603, SA-479, (316L, 1.4435) UNS N06022, SB-574, (C22, 2.4602)	max. 25 bar -50°C up to 150°C	960017021 --2 960017024 --2	960017131- -2 960017144- -2	970004988 970004989 970004995 970004996 970004997 970004998	Liquiphant M FTL50/51 Liquiphant M FTL50H/51H	FTL41/61/43/63	By temp./pressure specification for the seals and clips used at customers site			
one-piece-sanitary	Varivent N DN65-162	UNS S31603, SA-479, (316L, 1.4435)	max. 25 bar -50°C up to 150°C	960017021 --2 960017024 --2		970004990	Liquiphant M FTL50H/51H	FTL43/63	By temp./pressure specification for the seals and clips used at customers site			
Extension tube		UNS S31603, SA-312, (TP316L, 1.4435, 1.4404) UNS S31600, SA-312, (TP316, 1.4436) UNS N06022, SB-626, (C22, 2.4602) UNS N06455 SB-626, (C4, 2.4610) UNS N10276, B619, B622, B626 (C276, 2.4819) Group 1.17, UNS S31803, A182 (F51, 1.4462)	by Flange class max. 64 bar -50°C to 150°C	960017022 --3 960017024 --2 960017023 --3		970004991	Liquiphant M FTL51 Liquiphant M FTL51H	FTL81/41/61/43/63				
			by Flange class max. 90 bar -50°C to 150°C	960017022 --3 960017023 --3		970004991	Liquiphant M FTL51 Liquiphant M FTL51H	FTL81/41/61/43/63				
			by Flange class max. 90 bar -60°C up to 150°C max. 80 bar +151°C up to 260°C max. 64 bar +261°C up to 280°C	960017029 --4 960017030 --4		970004992	Liquiphant S FTL71	FTL81/64				
		ECTFE coated UNS S31603, SA-312, (TP316L, 1.4435, 1.4404) UNS S31600, SA-312, (TP316, 1.4436)	by Flange Class, max. 40 bar -50°C up to 120°C	960017023 --3			Liquiphant M FTL51C	FTL85/62				
		PFA coated UNS S31603, SA-312, (TP316L, 1.4435, 1.4404) UNS S31600, SA-312, (TP316, 1.4436)	by Flange Class, max. 40 bar -50°C up to 150°C	960017023 --3			Liquiphant M FTL51C	FTL85/62				
		with Enamel UNS N06022, SB-626, (C22, 2.4602) UNS N06455 SB-626, (C4, 2.4610)	by Flange Class, max. 25 bar -50°C up to 150°C	960017023 --3			Liquiphant M FTL51C	FTL85/62				
Piezo tube		UNS S31603, SA-312, (TP316L, 1.4435, 1.4404) UNS S31600, SA-312, (TP316, 1.4436) UNS N06022, SB-626, (C22, 2.4602) UNS N06455 SB-626, (C4, 2.4610) UNS N10276, B619, B622, B626 (C276, 2.4819) Group 1.17, UNS S31803, A182 (F51, 1.4462)	by Flange class, max. 64 bar -50°C to 150°C	960017022 --3 960017023 --3 960017024 --2	960017144- -2		Liquiphant M FTL51 Liquiphant M FTL51H	FTL81/41/61/43/63	with bimorph piezo-drive			
			by Flange class, max. 90 bar -50°C to 150°C	960017022 --3 960017023 --3	960017145- -3		Liquiphant M FTL51 Liquiphant M FTL51H	FTL81/41/61/43/63	with stack piezo- drive			
			by Flange class, max. 90 bar -60°C up to 150°C max. 80 bar +151°C up to 260°C max. 64 bar +261°C up to 280°C	960017029 --4 960017030 --4	960017146- -2		Liquiphant S FTL71	FTL81/64	with stack piezo- drive			
		ECTFE coated UNS S31603, SA-312, (TP316L, 1.4435, 1.4404) UNS S31600, SA-312, (TP316, 1.4436)	by Flange Class, max. 40 bar -50°C up to 120°C	960017023 --3	960017145- -3		Liquiphant M FTL51C	FTL85/62	with stack piezo- drive			
		PFA coated UNS S31603, SA-312, (TP316L, 1.4435, 1.4404) UNS S31600, SA-312, (TP316, 1.4436)	by Flange Class, max. 40 bar -50°C up to 150°C	960017023 --3	960017145- -3		Liquiphant M FTL51C	FTL85/62	with stack piezo- drive			
		with Enamel UNS N06022, SB-626, (C22, 2.4602) UNS N06455 SB-626, (C4, 2.4610)	by Flange Class, max. 25 bar -50°C up to 150°C	960017023 --3	960017145- -3		Liquiphant M FTL51C	FTL85/62	with stack piezo- drive			
		UNS J92800, SA-351, (CF3M, 316L alloy) UNS N26022, SA-494, (CX2MW, 2.4602, C22 alloy) UNS N26455, SA-494, (CW2M, 2.4610, C4 alloy) UNS J92205, SA-995, (Gr.CD3MN, 1.4462)	by Flange class, max. 64 bar -50°C to 150°C	960017019 --2 960017020 --2 960017021 --2 960017022 --3 960017023 --3 960017024 --2	960017131- -2		Liquiphant M FTL50/51 Liquiphant M FTL50H/51H	FTL80/81/41/61/43/63	with bimorph piezo-drive			
		UNS J92800, SA-351, (CF3M, 316L alloy modified)	max. 40 bar -50°C to 150°C		960018669- -							
		UNS J92800, SA-351, (CF3M, 316L alloy) UNS N26022, SA-494, (CX2MW, 2.4602, C22 alloy) UNS N26455, SA-494, (CW2M, 2.4610, C4 alloy) UNS J92205, SA-995, (Gr.CD3MN, 1.4462)	by Flange class, max. 90 bar -50°C to 150°C	960017022 --3 960017023 --3	960017132- -3		Liquiphant M FTL51 Liquiphant M FTL51H	FTL81/41/61/43/63	with stack piezo- drive			

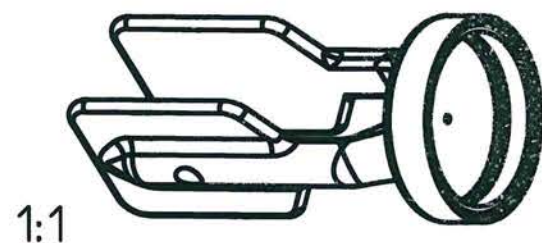
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Process Connection		Materials of Construction	Maximum Design Pressure (bar) and Temperature (°C)	Process Approval drawing	Shop Level drawing	witnessed proof tests	Approved Types	New Types	Comments	Manufacturing Locations:		
Design	Pressure Components											
	Fork	UNS N26022, SA-494, (CX2MW, 2.4602, C22 alloy) UNS N26455, SA-494, (CW2M, 2.4610, C4 alloy) UNS J92205, SA-995, (Gr.CD3MN, 1.4462)	by Flange class, max. 100 bar -60°C up to 260°C max. 64 bar +261°C up to 280°C	960017027 - -3 960017028 - -1	960017133- -2		Liquiphant S FTL70	FTL80/64	with stack piezo- drive			
			by Flange class, max. 90 bar -60°C up to 150°C max. 80 bar +151°C up to 260°C max. 64 bar +261°C up to 280°C	960017029 - -4 960017030 - -4			Liquiphant S FTL71	FTL81/64	with stack piezo- drive			
		ECTFE coated UNS J92800, SA-351 (CF3M, 316L alloy)	by Flange Class, max. 40 bar -50°C up to 120°C	960017023 - -3	960017132- -3		Liquiphant M FTL51C	FTL85/62	with stack piezo- drive			
		PFA coated UNS J92800, SA-351, (CF3M, 316L alloy)	by Flange Class, max. 40 bar -50°C up to 150°C	960017023 - -3			Liquiphant M FTL51C	FTL85/62	with stack piezo- drive			
		with Enamel UNS N26022, SA-494, (C22, 2.4602) UNS N26455, SA-494, (C4, 2.4610)	by Flange Class, max. 25 bar -50°C up to 150°C	960017023 - -3	960017135- -2		Liquiphant M FTL51C	FTL85/62	with stack piezo- drive			
ASME B1.20.1- 2013 NPT Thread	High pressure sliding sleeve MNPT 1", 1 1/2"	UNS S31603, SA-479, (316L, 1.4435, 1.4404) UNS S31600, SA-479 (316, 1.4436) UNS N06022, SB-574, (C22, 2.4602) UNS N06455, SB-574, (C4, 2.4610)	max.64 bar -50°C up to 150°C	960017048 - -2 960014309-A	960014312-A1 960014313-A1 960014314-A1 960014311-A1 960014310-A1		Liquiphant M FTL51/51H	FTL81/41/61/43/ 63	Accessory part			
			max.90 bar -60°C up to 150°C max.80 bar +151°C up to 260°C max.63 bar +261°C up to 280°C	960017048 - -2 960014309-A			Liquiphant S FTL71	FTL81/64	Accessory part			
ISO 228 Thread	High pressure sliding sleeve Thread G1, G1 1/2"	UNS S31603, SA-479, (316L, 1.4435, 1.4404) UNS S31600, SA-479 (316, 1.4436) UNS N06022, SB-574, (C22, 2.4602) UNS N06455, SB-574, (C4, 2.4610)	max.64 bar -50°C up to 150°C	960017048 - -2 960014309-A	960007219 - A 960017048 - -2 960014309-A		Liquiphant M FTL51/51H	FTL81/41/61/43/ 63	Accessory part			
			max.90 bar -60°C up to 150°C max.80 bar +151°C up to 260°C max.63 bar +261°C up to 280°C	960007219 - A 960017048 - -2 960014309-A			Liquiphant S FTL71	FTL81/64	Accessory part			

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Agency controlled drawing.
No changes without prior
Agency approval.



450		170	316L modified	
Tensile strength min. MPa modified		Yield strength min. MPa ASTM A 182 / A 182 M		Material/Werkstoff
Endress+Hauser Endress+Hauser GmbH+Co. KG D-79689 Maulburg Germany	Schutzvermerk ISO 16016 beachten	Refer to protection notice ISO 16016	Toleranz / tolerance -	
	Benennung / title		Erzeuger-Sys. creator sys.	letzt.Bearbei. last editor
	Gabel (Fertigteil) CRN max. 40bar, bis zu 150 °C fork (precast part) CRN max. 40bar, up to 150 °C		Format format	geprüft approved
			Maßstab / scale 2:1	gezeichnet drawn
			entworfen designed	
Material / material see above		Dokument-Nr. / no. of document 960018669 - -		Doku-Nr. alt / docu no. old
		SAP-Material-Nr. / SAP material no. N/A		Änderung / changes -
				kommt vor / appears



TECHNICAL STANDARDS &
SAFETY AUTHORITY
14th Floor, Centre Tower
3300 Bloor Street West
Toronto, Ontario
Canada M8X 2X4

Endress+Hauser



People for Process Automation

STATUTORY DECLARATION

Registration of Fittings

I, Michael Frei, Quality Manager responsible for the Integrated Management System

(Name and Position, e.g. President, Plant Manager, Chief Engineer)

of Endress+Hauser GmbH+Co.KG; Endress+Hauser (Souzhou) Automation Instr. Co. Ltd.; E+H (India) Automation Instr. Pvt.Ltd.
Endress+Hauser (USA) Automation Instr. Inc.

(Name of Manufacturer)

Located at DE-79689 Maulburg, Germany; 215021 Suzhou (P.R. China); +49-7622-28 2672

(Plant Address)

(Telephone No.)

(Fax No.)

Aurangabad-431136, India; Greenwood, IN 46143, USA



do solemnly declare that the fittings listed hereunder, which are subject to the **Technical Standards and Safety Act**, Boilers and Pressure Vessels Regulation, comply with all of the requirements of

ASME B31.3-2014ED, ASME B31.1-2014ED

(Title of recognized North American Standard)

which specifies the dimensions, materials of construction, pressure/temperature ratings, identification marking the fittings and service;



or are not covered by the provisions of a recognized North American standard and are therefore manufactured to comply with _____ as supported by the attached data which identifies the dimensions, material of construction, pressure/temperature ratings and the basis for such ratings, the marking of the fitting for identification and service.

I further declare that the manufacture of these fittings is controlled by a quality system meeting the requirements of ISO 9001:2015 which has been verified by the following authority, IQNet and SQS.

The items covered by this declaration, for which I seek registration, are category F type fittings. In support of this application, the following information and/or test data are attached as follows:

Drawing 960018669 and Scope of Registration 960017747 Rev07 for Liquiphant FTL4x, 5x, 6x, 7x, 8x

(drawings, calculations, test reports, etc.)

Declared before me at _____ in the _____ of _____

the _____ day of _____ AD 20 _____.

Commissioner for Oaths:

(Printed name)

(Signature)

(Signature of Declarer)

FOR OFFICE USE ONLY

To the best of my knowledge and belief, the application meets the requirements of the **Technical Standards and Safety Act**, Boilers and Pressure Vessels Regulation, and CSA Standard B51 and is accepted for registration in Category F.

CRN:

Registered by:

Dated:

NOTE: This registration expires on:

Technical
Standards
and Safety
Authority

Boilers and
Pressure Vessels
Safety Program

REGISTERED

C.R.N.

Signed:

Date:

PV 09352 (11/12)

Certification overleaf



345 Carlingview Drive
Toronto, Ontario M9W 6N9
Tel.: 416.734.3300
Fax: 416.231.1626
Toll Free: 1.877.682.8772

www.tssa.org

March 06, 2017

CATHERINE DIPLOCK
PRESSURE VESSEL ENGINEERING LTD.
120 RANDALL DR SUITE B
WATERLOO ON N2V 1C6
CA

Service Request Type: BPV-Fitting Registration

Service Request No.: 2034430

Your Reference No.: PVE-7095

Registered to: ENDRESS + HAUSER GMBH + CO KG

Dear CATHERINE DIPLOCK,

Technical Standards and Safety Authority (TSSA) is pleased to inform you that your submission has been reviewed and registered as follows:

CRN No.: 0F15899.25ADD1

Main Design No.: ADD1: CRN addition Dwg. No. 960018669 (see attachment to the SD Form for the scope of registration # 960017747- new material added.)

Expiry Date: 08-Jul-2025

Please be advised that a valid quality control system must be maintained for the fitting registration to remain valid until the expiry date.

The stamped copy of the approved registration and the invoice are mailed separately. Should you have any questions or require further assistance, please contact a Customer Service Advisor at 1.877.682.TSSA (8772) or e-mail customerservices@tssa.org. We will be happy to assist you. When contacting TSSA regarding this file, please refer to the Service Request number provided above.

Yours truly,

Mark Valcic P. Eng.
Engineer Specialist BPV
Tel.: 416-734-3494
Fax: 416-231-1626
Email: mvalcic@tssa.org

SOR Scope of I#960017747		People for Process Automation									
Supplement to CRN 0F15899.2C: the modifications are marked in red ink											
Product: Liquiphant Types: FTL41, FTL43, FTL50, FTL50H, FTL51, FTL51C, FTL51H, FTL61, FTL62, FTL63, FTL70, FTL71, FTL64, FTL80, FTL81, FTL85											
Code of Construction ASME B31.3-2014ED & ASME B31.1 2014ED; ISA 82.03; IEC 61010-1 2010											
Rev07		19/Jan/2017									
Process Connection		Materials of Construction	Maximum Design Pressure (bar) and Temperature (°C)	Top Level drawing	Shop Level drawing	witnessed proof tests	Approved Types	New Types	Comments	Manufacturing Locations:	
Design	Pressure Components										
ASME B16.5-2013 Flange ANSI	Flange Class: 150, 300, 400 600 900 1500 2500 Size: 1", 1 1/4", 1 1/2", 2", 2 1/2", 3", 3 1/2", 4", 6", 8"	Group 2.2, UNS S31600, SA-182, (F316, 1.4436, 1.4401) Group 2.2, UNS S31600, SA-240, (316, 1.4436, 1.4401) Group 2.3, UNS S31603, SA-182, (F316L, 1.4404) Group 2.3, UNS S31603, SA-240, (316L, 1.4435,) Group 3.8, UNS N06022, SB-574, B575 (C22, 2.4602) Group 3.8, UNS N06455, SB-574, B575 (C4, 2.4610) Group 1.17, UNS S31803, A182, (F51, 1.4462)	by Flange Class, max. 64 bar with bimorph piezo-drive max. 90 bar with stack piezo-drive -50°C up to 150°C	960017020 - -2 960017023 - -3	960017131- -2 960017132- -3 960017136- -2 960017149- -2 960017150- -2 960017144- -2 960017145- -3 960017153- -2		Liquiphant M FTL50/51 Liquiphant M FTL50H/51H	FTL80/81/41/61/ 43/63		Endress+Hauser GmbH+Co.KG DE-79689 Maulburg Germany	
		Flange clad (plated) with Alloy C4 or C22 Group 3.8 UNS N10276, SB-574, B575 (C276, 2.4819)	by Flange Class, max. 100 bar -60°C up to 260°C max. 64 bar +261°C up to 280°C	960017028 - -1	960017148- -2 960017151- -2 960017152- -2 960017133- -2 960017153- -2		Liquiphant S FTL70	FTL80/64	with stack piezo- drive	Endress+Hauser Suzhou Automation Instrumentation Co. Ltd. 215021 Suzhou P.R. China	
		ECTFE coated Group 2.2, UNS S31600, SA-182, (F316, 1.4436) Group 2.2, UNS S31600, SA-240, (316, 1.4436) Group 2.3, UNS S31603, SA-182, (F316L, 1.4404) Group 2.3, UNS S31603, SA-240, (316L, 1.4435)	by Flange Class, max. 90 bar -60°C up to 150°C max. 80 bar +151°C up to 260°C max. 64 bar +261°C up to 280°C	960017030 - -4	960017148- -2 960017151- -2 960017152- -2 960017133- -2 960017153- -2 960017146- -2		Liquiphant S FTL71	FTL81/64	with stack piezo- drive	Endress+Hauser (USA) Automation Instrumentation Inc. Greenwood, Indiana 46143, USA	
		PFA coated Group 2.2, UNS S31600, SA-182, (F316, 1.4436) Group 2.2, UNS S31600, SA-240, (316, 1.4436) Group 2.3, UNS S31603, SA-182, (F316L, 1.4404) Group 2.3, UNS S31603, SA-240, (316L, 1.4435)	by Flange Class, max. 40 bar -50°C up to 120°C	960017023 - -3	960017131- -2 960017132- -3 960017136- -2 960017149- -2 960017150- -2 960017144- -2 960017145- -3 960017153- -2		Liquiphant M FTL51C	FTL85/62	with stack piezo- drive	Endress+Hauser (India) Automation Instrumentation Pvt. Ltd. Aurangabad-431136 India	
		with Enamel Group 55, UNS N01800, SA-516, 1.0487	by Flange Class, max. 25 bar -50°C up to 150°C	960017023 - -3	960017135- -2		Liquiphant M FTL51C	FTL85/62	with stack piezo- drive		
ASME B1.20.1- 2013 NPT Thread	MNPT 3/4", 1", 1 1/2", 2"	UNS S31603, SA-479, (316L, 1.4435, 1.4404) UNS S31600, SA-479 (316, 1.4436) UNS N06022, SB-574, (C22, 2.4602) UNS N06455 SB-574, (C4, 2.4610)	max. 64 bar -50°C up to 150°C	960017019 - -2 960017022 - -3	960017131- -2 960017138- -2 960017154- -2 960017140- -2 960017143- -2 960014308- A		Liquiphant M FTL50/51 Liquiphant M FTL50H/51H	FTL80/81/41/61/ 43/63	with bimorph piezo-drive		
			max. 90 bar -50°C up to 150°C	960017022- -3	960017131- -2 960017132- -3 960017144- -2 960017145- -3 960017138- -2 960017154- -2 960017140- -2 960017143- -2 960014308- A		Liquiphant M FTL51/ 51H	FTL81/41/61/43/ 63	with stack piezo- drive		
			max. 100 bar -80°C up to 260°C max. 64 bar +261°C up to 280°C	960017027 - -3	960017133- -2 960017139- -2 960017155- -2 960017142- -2		Liquiphant S FTL70	FTL80/64	with stack piezo- drive		

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Boilers & Pressure Vessels
Safety Program

Handwritten signature and date: 19/Jan/17

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Process Connection		Materials of Construction	Maximum Design Pressure and Temperature (°C)	Process Approval drawing	Shop Level drawing	witnessed proof tests	Approved Types	New Types	Comments	Manufacturing Locations:		
Design	Pressure Components											
			max. 90 bar max. 80 bar max. 64 bar	-60 up to 150°C +151°C up to 280°C +281°C up to 280°C	960017029 - -4	960017133- -2 960017146- -2 960017139- -2 960017155- -2 960017142- -2	Liquiphant S FTL71	FTL81/64	with stack piezo- drive			
ISO 228 Thread	Thread: G1", G1 1/2", G2"	UNS S31603, SA-479, (316L, 1.4435, 1.4404) UNS S31600, SA-479 (316, 1.4436) UNS N06022, SB-574, (C22, 2.4602) UNS N06455 SB-574, (C4, 2.4610)	max. 64 bar	-50°C up to 150°C	960017019 - -2 960017022 - -3	960017131- -2 960017138- -2 960017154- -2 960017140- -2 960017143- -2 960014308- A	Liquiphant M FTL50/51 Liquiphant M FTL50H/51H	FTL80/81/41/61/43/63	with bimorph piezo- drive			
			max. 90 bar -50°C up to 150°C	960017022 - -3	960017131- -2 960017132- -3 960017144- -2 960017145- -3 960017138- -2 960017154- -2 960017140- -2 960017143- -2 960014308- A	970004991 970004993	Liquiphant M FTL51 Liquiphant M FTL51H	FTL81/41/61/43/63	with stack piezo- drive			
			max. 100 bar max. 64 bar	-60°C up to 280°C +281°C up to 280°C	960017027 - -3	960017133- -2 960017138- -2 960017155- -2 960017142- -2	Liquiphant S FTL70	FTL80/64	with stack piezo- drive			
			max. 90 bar max. 80 bar max. 64 bar	-60°C up to 150°C +151°C up to 280°C +281°C up to 280°C	960017029 - -4	960017133- -2 960017146- -2 960017139- -2 960017155- -2 960017142- -2	Liquiphant S FTL71	FTL81/64	with stack piezo- drive			
		UNS S31603, SA-479, (316L, 1.4435, 1.4404) UNS S31600, SA-479 (316, 1.4436) UNS N06022, SB-574, (C22, 2.4602) UNS N06455 SB-574, (C4, 2.4610)	max. 64 bar -50°C up to 150°C	960017019 - -2 960017022 - -3	960017131- -2		Liquiphant M FTL50/51 Liquiphant M FTL50H/51H	FTL80/81/41/61/43/63	hygiene version			
			by installing with welding boss max. 40 bar max. 25 bar	-50°C up to 100°C +101°C up to 150°C	960017019 - -2 960017022 - -3	960017138- -2 960017154- -2 960017140- -2	Liquiphant M FTL50/51 Liquiphant M FTL50H/51H	FTL80/81/41/61/43/63	hygiene version in use with welding boss			
ISO 228 Thread	Welding boss G1"	UNS S31603, SA-479, (316L, 1.4435, 1.4404) UNS S31600, SA-479 (316, 1.4436) UNS N06022, SB-574, (C22, 2.4602) UNS N06455 SB-574, (C4, 2.4610)	max. 40 bar max. 25 bar	-50°C up to 100°C +101°C up to 150°C	960017019 - -2 960017022 - -3	960017143- -2 960014308- A	Liquiphant M FTL50/51 Liquiphant M FTL50H/51H	FTL80/81/41/61/43/63	Accessory part			

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Process Connection		Materials of Construction	Maximum Design Pressure and Temperature (°C)	Reference Process Approval drawing	Shop Level drawing	witnessed proof tests	Approved Types	New Types	Comments	Manufacturing Locations:		
Design	Pressure Components											
ISO 2852 one-piece-sanitary	Sanitary 1"-11/2", 2", 2 1/2", 3", 3 1/2", 4"	UNS S31603, SA-479, (316L, 1.4435) UNS N06022, SB-574, (C22, 2.4602)	max. 25 bar -50°C up to 150°C	960017021 - -2 960017024 - -2	960017131- -2 960017144- -2	970004988 970004989 970004995 970004996 970004997 970004998	Liquiphant M FTL50/51 Liquiphant M FTL50H/51H	FTL41/61/43/63	By temp./pressure specification for the seals and clips used at customers site			
one-piece-sanitary	Varivent N DN65-162	UNS S31603, SA-479, (316L, 1.4435)	max. 25 bar -50°C up to 150°C	960017021 - -2 960017024 - -2		970004990	Liquiphant M FTL50H/51H	FTL43/63	By temp./pressure specification for the seals and clips used at customers site			
Extension tube		UNS S31603, SA-312, (TP316L, 1.4435, 1.4404) UNS S31600, SA-312, (TP316, 1.4436) UNS N06022, SB-626, (C22, 2.4602) UNS N06455 SB-626, (C4, 2.4610) UNS N10276, B619, B622, B626 (C276, 2.4819) Group 1.17, UNS S31603, A182 (F51, 1.4462)	by Flange class max. 64 bar -50°C to 150°C	960017022 - -3 960017024 - -2 960017023 - -3		970004991	Liquiphant M FTL51 Liquiphant M FTL51H	FTL81/41/61/43/63				
			by Flange class max. 90 bar -50°C to 150°C	960017022 - -3 960017023 - -3		970004991	Liquiphant M FTL51 Liquiphant M FTL51H	FTL81/41/61/43/63				
			by Flange class max. 90 bar -60°C up to 150°C max. 80 bar +151°C up to 280°C max. 64 bar +261°C up to 280°C	960017029 - -4 960017030 - -4		970004992	Liquiphant S FTL71	FTL81/64				
		ECTFE coated UNS S31603, SA-312, (TP316L, 1.4435, 1.4404) UNS S31600, SA-312, (TP316, 1.4436)	by Flange Class, max. 40 bar -50°C up to 120°C	960017023 - -3			Liquiphant M FTL51C	FTL85/62				
		PFA coated UNS S31603, SA-312, (TP316L, 1.4435, 1.4404) UNS S31600, SA-312, (TP316, 1.4436)	by Flange Class, max. 40 bar -50°C up to 150°C	960017023 - -3			Liquiphant M FTL51C	FTL85/62				
		with Enamel UNS N06022, SB-626, (C22, 2.4602) UNS N06455 SB-626, (C4, 2.4610)	by Flange Class, max. 25 bar -50°C up to 150°C	960017023 - -3			Liquiphant M FTL51C	FTL85/62				
Piezo tube		UNS S31603, SA-312, (TP316L, 1.4435, 1.4404) UNS S31600, SA-312, (TP316, 1.4436) UNS N06022, SB-626, (C22, 2.4602) UNS N06455 SB-626, (C4, 2.4610) UNS N10276, B619, B622, B626 (C276, 2.4819) Group 1.17, UNS S31603, A182 (F51, 1.4462)	by Flange class, max. 64 bar -50°C to 150°C	960017022 - -3 960017023 - -3 960017024 - -2	960017144- -2		Liquiphant M FTL51 Liquiphant M FTL51H	FTL81/41/61/43/63	with bimorph piezo-drive			
			by Flange class, max. 90 bar -50°C to 150°C	960017022 - -3 960017023 - -3	960017145- -3		Liquiphant M FTL51 Liquiphant M FTL51H	FTL81/41/61/43/63	with stack piezo- drive			
			by Flange class, max. 90 bar -60°C up to 150°C max. 80 bar +151°C up to 280°C max. 64 bar +261°C up to 280°C	960017029 - -4 960017030 - -4	960017146- -2		Liquiphant S FTL71	FTL81/64	with stack piezo- drive			
		ECTFE coated UNS S31603, SA-312, (TP316L, 1.4435, 1.4404) UNS S31600, SA-312, (TP316, 1.4436)	by Flange Class, max. 40 bar -50°C up to 120°C	960017023 - -3	960017145- -3		Liquiphant M FTL51C	FTL85/62	with stack piezo- drive			
		PFA coated UNS S31603, SA-312, (TP316L, 1.4435, 1.4404) UNS S31600, SA-312, (TP316, 1.4436)	by Flange Class, max. 40 bar -50°C up to 150°C	960017023 - -3	960017145- -3		Liquiphant M FTL51C	FTL85/62	with stack piezo- drive			
		with Enamel UNS N06022, SB-626, (C22, 2.4602) UNS N06455 SB-626, (C4, 2.4610)	by Flange Class, max. 25 bar -50°C up to 150°C	960017023 - -3	960017145- -3		Liquiphant M FTL51C	FTL85/62	with stack piezo- drive			
		UNS J92800, SA-351, (CF3M, 316L alloy) UNS N26022, SA-494, (CX2MV, 2.4602, C22 alloy) UNS N26455, SA-494, (CW2M, 2.4610, C4 alloy) UNS J92205, SA-995, (Gr.CD3MN, 1.4462)	by Flange class, max. 64 bar -50°C to 150°C	960017019 - -2 960017020 - -2 960017021 - -2 960017022 - -3 960017023 - -3 960017024 - -2	960017131- -2		Liquiphant M FTL50/51 Liquiphant M FTL50H/51H	FTL80/61/41/61/43/63	with bimorph piezo-drive			
		UNS J92800, SA-351, (CF3M, 316L alloy modified) UNS J92800, SA-351, (CF3M, 316L alloy) UNS N26022, SA-494, (CX2MV, 2.4602, C22 alloy) UNS N26455, SA-494, (CW2M, 2.4610, C4 alloy) UNS J92205, SA-995, (Gr.CD3MN, 1.4462)	max. 40 bar -50°C to 150°C		960018669- -		Liquiphant M FTL51 Liquiphant M FTL51H	FTL81/41/61/43/63	with stack piezo- drive			

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Process Connection		Materials of Construction	Maximum Design Pressure and Temperature (°C)	Process Approval drawing	Shop Level drawing	witnessed proof tests	Approved Types	New Types	Comments	Manufacturing Locations:		
Design	Pressure Components											
Fork		UNS N26022, SA-494, (CX2MW, 2.4602, C22 alloy)	by Flange class, max. 100 bar -60°C up to 280°C	960017027 - -3	960017133- -2		Liquiphant S FTL70	FTL80/64	with stack piezo- drive			
		UNS N26455, SA-494, (CW2M, 2.4610, C4 alloy)	max. 64 bar +261°C up to 280°C	960017028 - -1								
		UNS J92205, SA-995, (Gr.CD3MN, 1.4462)	by Flange class, max. 90 bar -60°C up to 150°C	960017029 - -4			Liquiphant S FTL71	FTL81/64	with stack piezo- drive			
			max. 80 bar +151°C up to 260°C	960017030 - -4								
			max. 64 bar +261°C up to 280°C									
		ECTFE coated	by Flange Class, max. 40 bar -50°C up to 120°C	960017023 - -3			Liquiphant M FTL51C	FTL85/62	with stack piezo- drive			
ASME B1.20.1-2013 NPT Thread	High pressure sliding sleeve MNPT 1", 1 1/2"	UNS J92800, SA-351 (CF3M, 316L alloy)	by Flange Class, max. 40 bar -50°C up to 150°C	960017023 - -3	960017132- -3		Liquiphant M FTL51C	FTL85/62	with stack piezo- drive			
		PFA coated	by Flange Class, max. 40 bar -50°C up to 150°C	960017023 - -3								
		UNS J92800, SA-351, (CF3M, 316L alloy)	by Flange Class, max. 40 bar -50°C up to 150°C	960017023 - -3								
		with Enamel	by Flange Class, max. 25 bar -50°C up to 150°C	960017023 - -3			Liquiphant M FTL51C	FTL85/62	with stack piezo- drive			
		UNS N26022, SA-494, (C22, 2.4602)		960017023 - -3								
		UNS N26455, SA-494, (C4, 2.4610)										
ISO 228 Thread	High pressure sliding sleeve Thread G1, G1 1/2"	UNS S31603, SA-479, (316L, 1.4435, 1.4404)	max. 64 bar -50°C up to 150°C	960017048 - -2	960014312-A1		Liquiphant M FTL51/51H	FTL81/41/61/43/63	Accessory part			
		UNS S31600, SA-479 (316, 1.4436)	max. 90 bar -60°C up to 150°C	960014309-A								
		UNS N06022, SB-574, (C22, 2.4602)	max. 80 bar +151°C up to 260°C	960017048 - -2			Liquiphant S FTL71	FTL81/64	Accessory part			
		UNS N06455, SB-574, (C4, 2.4610)	max. 63 bar +261°C up to 280°C	960014309-A								
			max. 64 bar -50°C up to 150°C	960017048 - -2			Liquiphant M FTL51/51H	FTL81/41/61/43/63	Accessory part			
			max. 90 bar -60°C up to 150°C	960014309-A								
			max. 80 bar +151°C up to 260°C	960007219 - A	960014311-A1							
			max. 63 bar +261°C up to 280°C	960017048 - -2			Liquiphant S FTL71	FTL81/64	Accessory part			
				960014309-A								

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Safety Program
Ubal March 6/17

TransCanada Keystone Pipeline, L.P.

Keystone XL Pipeline Canadian Pump Stations
Level Switch

PO#: 4500257847
E+H SO#: 3003333187

Tab	SDDR#	Description
4	JE	Instrument Outline Drawings

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1075 Sutton Drive
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Document Title: Instrument Outline Drawings

Document Number: 25472-101-V1A-JL10-Z0006

Revision Number: 02

PO Number: 4500257847

Material Requisition Number: KXL1399-CH2M-I-MR-0001

Tag Nos. : 125-BDLSS-B0-LSHH-0302, 126-FXVLY-B0-LSHH-0302



Contractor Name : Endress+Hauser Canada Ltd
 Contractor Address : 1075 Sutton Drive
 City, Province : Burlington, Ontario
 Country, Postal code : Canada L7L 5Z8
 Telephone Number : (905) 681-9292

Rev No.	Rev Date yyyy-mm-dd	Reason for Issue	Contractor Originator	Contractor Reviewer	Contractor Approver
01	2019-06-17	Issued For Approval	M. Panchal	A. Patil	C. Penney
02	2019-07-11	Issued For Approval	M. Panchal	A. Patil	C. Penney

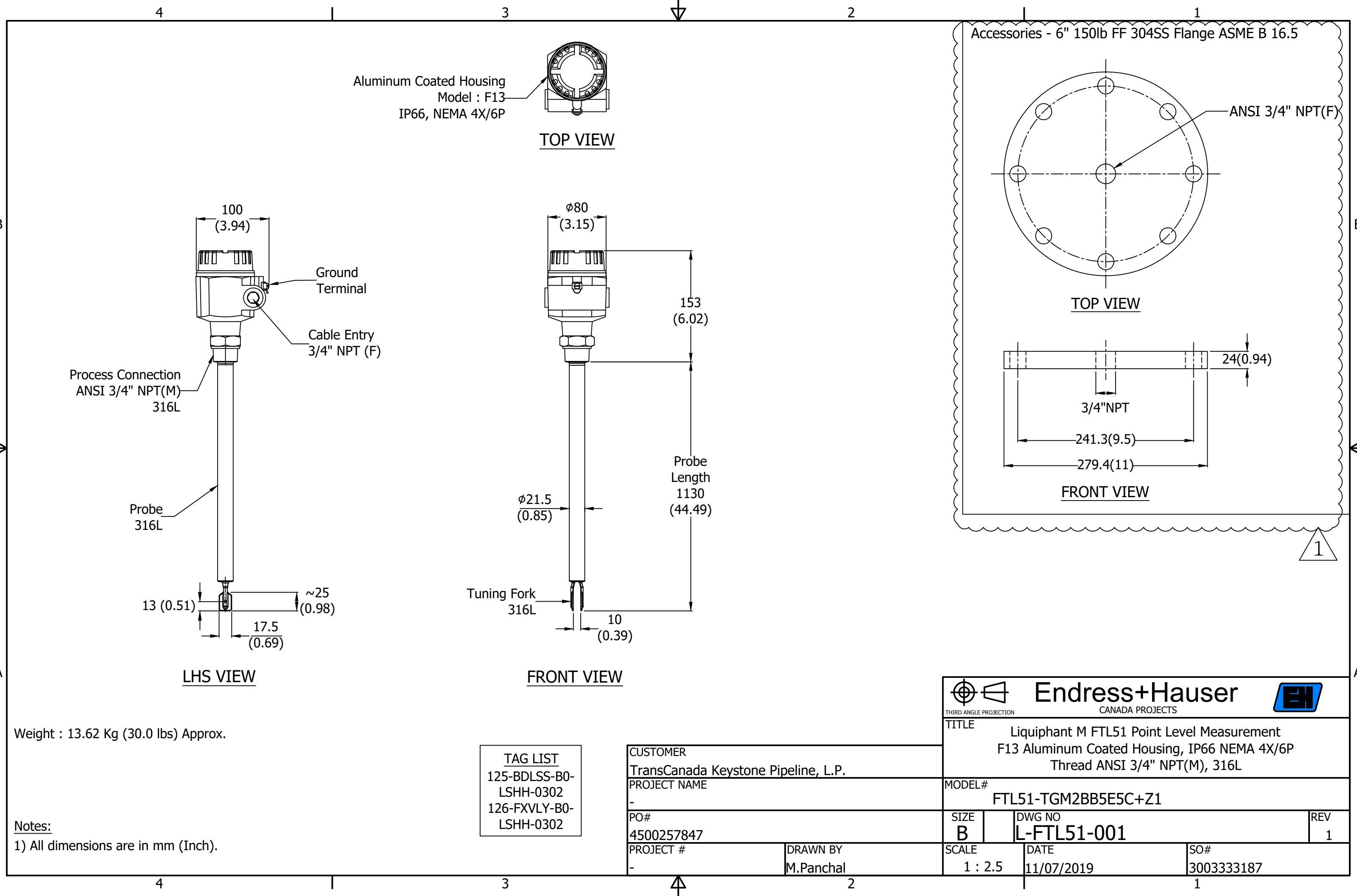
CODE 1: Work may proceed.



Permission to proceed does not constitute acceptance or approval of design details, calculations, analyses, test methods or materials developed or selected by the supplier and does not relieve the supplier from full compliance with contractual obligations.

Name: JV040785

Date: 07/19/2019



TransCanada Keystone Pipeline, L.P.

Keystone XL Pipeline Canadian Pump Stations
Level Switch

PO#: 4500257847
E+H SO#: 3003333187

Tab	SDDR#	Description
5	LF	Equipment Data Sheets and Design Specifications

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Document Title: Equipment Data Sheets and Design Specifications

Document Number: 25472-101-V1A-JL10-Z0007

Revision Number: 01

PO Number: 4500257847

Material Requisition Number: KXL1399-CH2M-I-MR-0001

Tag Nos. : 125-BDLSS-B0-LSHH-0302, 126-FXVLY-B0-LSHH-0302



Contractor Name : Endress+Hauser Canada Ltd
Contractor Address : 1075 Sutton Drive
City, Province : Burlington, Ontario
Country, Postal code : Canada L7L 5Z8
Telephone Number : (905) 681-9292

Rev No.	Rev Date yyyy-mm-dd	Reason for Issue	Contractor Originator	Contractor Reviewer	Contractor Approver
01	2019-06-17	Issued For Approval	A. Patil	A. Patil	C. Penney

CODE 1: Work may proceed.



Permission to proceed does not constitute acceptance or approval of design details, calculations, analyses, test methods or materials developed or selected by the supplier and does not relieve the supplier from full compliance with contractual obligations.

Name: kloca

Date: 06/25/2019



PROJECT: Keystone XL Pipeline
Canadian Pump Stations
INSTRUMENT DATA SHEET

LEVEL SWITCH

REV	BY	DATE	REVISION
A	AK	27-Apr-18	Issued for Review
B	AK	10-May-18	Issued for Review
C	SW	29-May-18	Issued for Quote
0	BY	19-Sep-18	Issued for Purchase

DATASHEET No.	
KXL1399-CH2M-I-DS-0008	
JOB NUMBER:	
M.000837	
REQUISITION No.	
25472-101-MRA-JL10-Z0001	
BY	CHK'D
SW	AK

GENERAL	1	Tag Number				See Attached List (SHT 2 of 2)			
	2	Service Description				Sump Tank B0-OST-01 High-High Level Switch			
	3	P & ID Number				See Attached List (SHT 2 of 2)			
	4	Line / Equipment Number				See Attached List (SHT 2 of 2)			
PROCESS	5	Process Fluid	Fluid State			Diluted Bitumen / Synthetic Crude Oil		Liquid	
	6	Fluid Condition				Dirty			
	7	Specific Gravity at operating temperature				0.748 - 0.942			
	8	Viscosity at operating temperature				1.13 cSt to 920 cSt			
	9	Dielectric constant				N/A			
	10	Unusual Conditions				Oil Sump Tank / Tank Installed Above Grade			
	11	% solids				None			
	12	Pressure	Min.	Normal	Max.	-0.7kPag (-0.10 psig)	Atm.		7 kPag (1.0 psig)
	13	Temperature	Min.	Normal	Max.	0 °C (32 °F)			65 °C (149 °F)
TRANSMITTER	14	Type of Measurement				Vibration (Tuning Fork style)			
	15	Location				Top of Nozzle of Sump Tank			
	16	Range				Point Measurement (Note 6)			
	17	Calibration Range				N/A			
	18	Face/Process Connection Material				316L SS			
	19	Blind or Indicating				N/A			
	20	Mounting				Direct Mounted			
	21	Housing Material				Aluminum			
	22	Power Supply				24V DC (Loop Power)			
	23	Electrical Area Classification				CSA Class I, Zone 1, Gr.IIA			
	24	Enclosure Type: Integral / Remote				Integral			
	25	Conduit Connection Size				3/4" NPT			
	26	Enclosure Rating				NEMA 4X			
	27	Output				Analog, 8/16 mA (Note 4)			
	28	Signal Lights				Yes: Green / Red (Note 6)			
	29	Accuracy	Repeatability			N/A		N/A	
TRANSDUCER	30								
	31	Fail-Safe				Yes			
	32	Model Number				FTL51-C8KL4/0 / FTL-TGM2BB5E5C+Z1			
	33	Material	Body			316L SS			
	34		Flange			NPS 6 - PN20 FF, 304SS, c/w NPT 3/4" Center Tap			
	35								
	36	Vessel I.D.	Vessel Length			1600 mm (63") - Note 10		6170 mm (243")	
	37	Insertion Length				1130 mm (44.5") (Note 5)			
	38	Inactive Length				Nozzle + Riser = 830 mm (33")			
	39	Gland Size & Material							
	40	Process Connection	Size			NPT 3/4"			
	41		Type			Threaded, 316LSS			
	42		Rating			PN 20			
	43		Face			FF			
	44	Transducer Temperature Rating				-50°C to 150 °C (-58 °F to 302 °F)			
	45	Vibration Resistance				10 to 55 Hz (0.01",100 cycles)			
46	Orientation				Vertical Mounted				
PURCHASE	47	Manufacturer				Endress + Hauser			
	48	Transmitter Model No.				FTL-TGM2BB5E5C+Z1 + 4201804 (NPS 6 PN20 FF Flange)			
	49								

Notes:

1. Supply 316SS Tag, nameplate containing tag number, model/serial number, body ratings, operating conditions/limitations.
2. Sump Tank dimensions: Tank = 1629 mm (64") OD. FSHH Nozzle to Tank CL 1630mm (64.1")
3. Ambient Temperature: -40 °C to 40 °C (-40 °F to 104 °F). Design Temperature 65 °C (149 °F).
4. Level switch with output signal of 8mA or 16 mA. Output signal on power failure or in the event of damage sensor is <3.6 mA.
5. Switch to actuate at "High-High Alarm". High-High is 1300 mm from bottom of the sump tank and the signal output is 8mA
6. The LSHH to have 2 switches for fault and level/density change. Green LED to indicate operational status, Red LED to indicate switching status, flashes in the event of corrosion damage on sensor or if the electronic are defective.

[illegible]

TransCanada Keystone Pipeline, L.P.

Keystone XL Pipeline Canadian Pump Stations
Level Switch

PO#: 4500257847
E+H SO#: 3003333187

Tab	SDDR#	Description
6	OF	Operating & Maintenance Manuals

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Document Title: Operating & Maintenance Manuals

Document Number: 25472-101-V1A-JL10-Z0008

Revision Number: 01

PO Number: 4500257847

Material Requisition Number: KXL1399-CH2M-I-MR-0001

Tag Nos. : 125-BDLSS-B0-LSHH-0302, 126-FXVLY-B0-LSHH-0302



Contractor Name : Endress+Hauser Canada Ltd
Contractor Address : 1075 Sutton Drive
City, Province : Burlington, Ontario
Country, Postal code : Canada L7L 5Z8
Telephone Number : (905) 681-9292

Rev No.	Rev Date yyyy-mm-dd	Reason for Issue	Contractor Originator	Contractor Reviewer	Contractor Approver
01	2019-06-17	Issued For Information	A. Patil	A. Patil	C. Penney

CODE 1: Work may proceed.



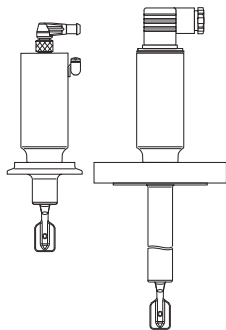
Permission to proceed does not constitute acceptance or approval of design details, calculations, analyses, test methods or materials developed or selected by the supplier and does not relieve the supplier from full compliance with contractual obligations.

Name: kloca

Date: 06/25/2019

Operating Instructions

Liquiphant M FTL5x (H)-# ### # # #3



DE- Grenzscharter mit Kompaktgehäuse

EN- Point Level Switch with compact housing

FR- Détecteur de niveau en boîtier compact

ES- Detector de nivel con cabezal compacto

IT- Interruttore di livello con testa compatta

NL- Niveauschakelaar met compacte behuizing

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Achtung!

= verboten;
führt zu fehlerhaftem Betrieb
oder Zerstörung.



Caution!

= forbidden;
leads to incorrect operation
or destruction.



Attention!

= interdit; peut provoquer
des dysfonctionnements
ou la destruction.

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Atención!

= Prohibido; peligro
de mal funcionamiento
o de destrucción.



Attenzione!

= Vietato; pericolo
di malfunzionamento
o di distruzione.



Opgelet!

= verboden;
leidt tot foutieve werking
of storing.

DE- Sicherheitshinweise

Der Liquiphant M FTL50, FTL51, FTL 50H, FTL51H mit Kompaktgehäuse darf nur als Füllstandgrenzschalter für Flüssigkeiten verwendet werden.

Bei unsachgemäßem Einsatz können Gefahren von ihm ausgehen.

Das Gerät darf **nur von qualifiziertem und autorisiertem Fachpersonal**

unter strenger Beachtung dieser Betriebsanleitung, der einschlägigen Normen, der gesetzlichen Vorschriften und der Zertifikate (je nach Anwendung) eingebaut, angeschlossen, in Betrieb genommen und gewartet werden.

In der Gebäudeinstallation ist ein Netzschalter für das Gerät leicht erreichbar in dessen Nähe zu installieren.

Er ist als Trennvorrichtung für das Gerät zu kennzeichnen.

EN- Notes on Safety

The Liquiphant M FTL50, FTL51, FTL50H, FTL51H with compact housing is designed for level limit detection in liquids.

If used incorrectly it is possible that application-related dangers may arise.

The device may be installed, connected, commissioned, operated and maintained **by qualified and authorised personnel only**, under strict observance of these operating instructions, any relevant standards, legal requirements, and, where appropriate, the certificates. Install an easily accessible power switch in the proximity of the device.

Mark the power switch as a disconnecter for the device.

FR- Conseils de sécurité

Le Liquiphant M FTL50, FTL51, FTL50H, FTL51H en boîtier compact doit être exclusivement utilisé comme détecteur de niveau pour liquides.

Il peut être source de danger en cas d'utilisation non conforme aux prescriptions.

L'appareil ne doit être installé, raccordé, mis en service et entretenu **que par un personnel qualifié et autorisé**, qui tiendra compte des indications contenues dans les instructions de service présentes, des normes en vigueur et des certificats disponibles (selon l'application).

Installer un commutateur réseau à proximité immédiate de l'appareil, en veillant à ce qu'il soit facilement accessible.

Repérer ce commutateur comme sectionneur de l'appareil.

ES - Notas sobre seguridad

El detector de nivel Liquiphant M FTL50, FTL51, FTL50H, FTL51H con cabezal compacto sólo debe utilizarse para la detección de límite en fluidos.

Su empleo inapropiado puede resultar peligroso.

El equipo deberá ser montado, conectado, instalado y mantenido **única y exclusivamente por personal cualificado y autorizado**,

bajo rigurosa observación de las presentes instrucciones de servicio, de las normativas y legislaciones vigentes, así como de los certificados (dependiendo de la aplicación). Instalar un interruptor de fácil acceso en las proximidades del equipo.

Este interruptor se utilizará para desconectar el equipo.

IT - Note sulla sicurezza

Il Liquiphant M FTL50, FTL51, FTL50H, FTL51H con testa compatta è particolarmente studiato per l'impiego come soglia di livello in liquidi.

Un'installazione non corretta può determinare pericolo.

Lo strumento può essere montato **solamente da personale qualificato ed autorizzato**.

Il montaggio, il collegamento, la messa in esercizio e la manutenzione devono rispettare le presenti istruzioni, le norme vigenti e i certificati (a seconda dell'applicazione). Installare un interruttore di alimentazione di facile accesso nelle vicinanze dello strumento.

Contrassegnare l'interruttore di alimentazione come interruttore di disattivazione dello strumento.

NL- Veiligheidsinstructies

Gebruik de Liquiphant M FTL50, FTL51, FTL50H, FTL51H met compacte behuizing alleen als niveauschakelaar voor vloeistoffen. Indien niet correct gebruikt kunnen gevaarlijke situaties ontstaan.

Het instrument **alleen door gekwalificeerd en geautoriseerd personeel** laten inbouwen, aansluiten, in bedrijf nemen en onderhouden. Neem de instructies in deze Inbedrijfstellingsvoorschriften, de desbetreffende normen, de wettelijke voorschriften en eventuele certificaten in acht. Installeer een makkelijk bereikbare voedingschakelaar in de nabijheid van het instrument. Kenmerk de voedingschakelaar specifiek voor het instrument.

DE- Geräte-Identifikation

FTL50, FTL51

EN- Device Identification

FTL50, FTL51

FR- Dénomination

FTL50, FTL51

ES- Identificación del equipo

FTL50, FTL51

IT - Identificazione

FTL50, FTL51

NL- Instrument-identificatie

FTL50, FTL51



ENDRESS+HAUSER
LIQUIPHANT M

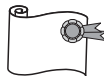
Order Code

FTL5#-#####



A D C F G H J M P R S U Y

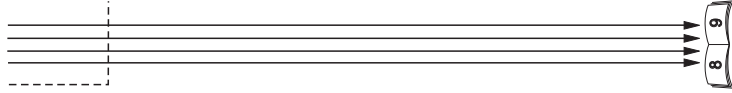
*¹ WHG
ATEX II 3 G EEx nA II T6, WHG
ATEX II 3 D T85°C, *₃
ATEX II 1/2 G EEx Ia IIC T6, WHG
ATEX II 1/2 D T80°C, *₃
ATEX II 1/2 G EEx Ia IIC T6
ATEX II 1/2 D T80°C, *₃
ATEX II 1 G EEx Ia IIC T6
ATEX II 1 G EEx Ia IIC T6, WHG
NEPSI Ex Ia IIC T6
FM, IS, Cl. I, II, III, Div. 1, Gr. A-G
FM, NI, Cl. I, Div. 2, Gr. A-D
CSA, IS, Cl. I, II, Div. 1, Gr. A-G
CSA, General purpose
*²



A##
B##
C##
D##
F##
K##
N##



10 11



GE2 R ¾, DIN 2999, 316L
 GE5 R ¾, DIN 2999, AlloyC4
 GF2 R 1, DIN 2999, 316L
 GF5 R 1, DIN 2999, AlloyC4
 GM2 NPT ¾, ANSI, 316L
 GM5 NPT ¾, ANSI, AlloyC4
 GN2 NPT 1, ANSI, 316L
 GN5 NPT 1, ANSI, AlloyC4
 GQ2 G ¾, ISO 228, 316L
 GQ5 G ¾, ISO 228, AlloyC4
 GR2 G 1, ISO 228, 316L
 GR5 G 1, ISO 228, AlloyC4



max. 100 bar, 150 °C



max. 100 bar, 150 °C



max. 40 bar, 100 °C
 max. 25 bar, 160 °C



max. 16 bar, 120 °C
 max. 2 bar, 150 °C

GW2 G 1, ISO 228, 316L

TC2 DN 25-38 (1...1½"), ISO 2852, 316L

Tri-Clamp

TE2 DN 40-51 (2"), ISO 2852, 316L

Tri-Clamp

YY9 #2

*1

ohne / without / sans / sin / senza / zonder

*2

andere / others / autres / otros / altri / andere

*3

nicht gültig für PBT / not valid for PBT / non valable pour PBT /
 no es válido para PBT / non valido per PBT / niet geldig voor PBT



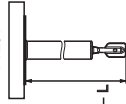
ENDRESS+HAUSER
LIQUIPHANT M

Order Code

FTL5#-#####

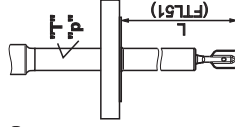
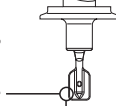
mm
in

FTL51



AA	#2	Ra < 3.2 µm/80 grit (FTL50)
BB	 mm, 316L,	Ra < 3.2 µm/80 grit
BE	 mm, AlloyC4,	Ra < 3.2 µm/80 grit
CB	 in, 316L,	Ra < 3.2 µm/80 grit
CE	 in, AlloyC4,	Ra < 3.2 µm/80 grit
DB	"L II", 316L,	Ra < 3.2 µm/80 grit
DE	"L II", AlloyC4,	Ra < 3.2 µm/80 grit

< 3.2 µm (80 grit)



IA	#2	+ "T" (FTL50)
JB	 mm, 316L	+ "T"
JE	 mm, AlloyC4	+ "T"
KB	 in, 316L	+ "T"
KE	 in, AlloyC4	+ "T"
LB	"L II", 316L	+ "T"
LE	"L II", AlloyC4	+ "T"
QA	#2	+ "p" (FTL50)
RB	 mm, 316L	+ "p"
RE	 mm, AlloyC4	+ "p"
SB	 in, 316L	+ "p"
SE	 in, AlloyC4	+ "p"
TB	"L II", 316L	+ "p"
TE	"L II", AlloyC4	+ "p"
YY	#2	

FEL51, 19...253 V AC
 FEL52, 10... 55 V DC, PNP
 FEL58, NAMUR, H-L
 *2

316L, IP66/68, 5 m
 316L, IP65, Pg11, ISO 4400
 316L, NEMA 4x, NPT 1/4, ISO 4400
 316L, IP66/68, M12
 *2

*1
 EN 10204-3.1, 316L
 EN 10204-3.1, NACE MR0175, 316L
 100 bar (FTL51)
 100 bar; EN 10204-3.1, NACE MR0175 (FTL51)
 GL/ABS marine certificate (FTL51: max. 1600 mm)
 *2

*1 ohne / without / sans / sin / senza / zonder
 *2 andere / others / autres / otros / altri / andere

"L II" Schaltpunkt / Switchpoint / Point de commutation /
 Punto de conmutación / Punto di commutazione / Schakelpunt
 Liquiphant II FTL360/365, FDL30/35

"T" Temperaturstanzstück / Temperature spacer /
 Élément de refroidissement / Tramo dissipador de temperatura /
 Distanziale per temperatura / Temperatuurreductiestuk

"p" Druckdichte Durchführung / Pressure sealed bushing /
 Entrée résistante à la pression / Extensión resistente a la presión /
 Passacavo a tenuta di pressione / Gasdichte doorvoering

DE- Flansche

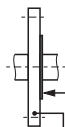
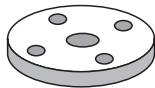
EN- Flanges

FR- Brides

ES- Brida

IT - Flangia

NL- Flens



ANSI B 16.5

AA2	1 1/4"	150 lbs, RF, 316/316L
AB2	1 1/2"	300 lbs, RF, 316/316L (FTL51)
AC2	1 1/2"	150 lbs, RF, 316/316L
AD2	1 1/2"	300 lbs, RF, 316/316L (FTL51)
AE2	2"	150 lbs, RF, 316/316L
AE5	2"	150 lbs, Alloy C4 > 316/316L
AF2	2"	300 lbs, RF, 316/316L
AG2	2"	600 lbs, RF, 316/316L (FTL51)
AJ2	2 1/2"	300 lbs, RF, 316/316L (FTL51)
AL2	3"	150 lbs, RF, 316/316L
AM2	3"	300 lbs, RF, 316/316L (FTL51)
AN2	3"	600 lbs, RF, 316/316L (FTL51)
AP2	4"	150 lbs, RF, 316/316L
AQ2	4"	300 lbs, RF, 316/316L (FTL51)
AR2	4"	600 lbs, RF, 316/316L (FTL51)
AS2	1"	150 lbs, RF, 316/316L

EN 1092-1

BA2	DN32,	PN6 A,	316L
BB2	DN32,	PN25/40 A,	316L
BC2	DN40,	PN6 A,	316L
BD2	DN40,	PN25/40 A,	316L
BE2	DN50,	PN6 A,	316L
BG2	DN50,	PN25/40 A,	316L
BH2	DN65,	PN6 A,	316L
BJ2	DN50,	PN100 A,	316L (FTL51)
BK2	DN65,	PN25/40 A,	316L
BL2	DN80,	PN10/16 A,	316L
BN2	DN80,	PN25/40 A,	316L
BO2	DN100,	PN10/16 A,	316L
BR2	DN100,	PN25/40 A,	316L
B12	DN80,	PN100 A,	316L (FTL51)
B82	DN25,	PN25/40 A,	316L

CA2	DN32,	PN6 B1,	316L
CA5	DN32,	PN6,	AlloyC4 >316L
CE2	DN50,	PN6 B1,	316L
CE5	DN50,	PN6,	AlloyC4 >316L
CG2	DN50,	PN25/40 B1,	316L
CG5	DN50,	PN25/40,	AlloyC4 >316L
CJ2	DN50,	PN100 B2,	316L (FTL51)
CN2	DN80,	PN25/40 B1,	316L
CN5	DN80,	PN25/40,	AlloyC4 >316L
CQ2	DN100,	PN10/16 B1,	316L
CQ5	DN100,	PN10/16,	AlloyC4 >316L
C12	DN80,	PN100 B2,	316L (FTL51)
C85	DN25,	PN25/40 B1,	316L
C85	DN25,	PN25/40,	AlloyC4 >316L
DG2	DN50,	PN40 B1,	316L
DN2	DN80,	PN40 B1,	316L
D82	DN25,	PN40 B1,	316L
FG2	DN50,	PN40 C,	316L
NG2	DN50,	PN40 D,	316L

JIS B2220

KA2	10K 25,	RF,	316L
KC2	10K 40,	RF,	316L
KE2	10K 50,	RF,	316L
KE5	10K 50,		AlloyC4 >316L
KL2	10K 80,	RF,	316L
KP2	10K 100,	RF,	316L

DE- Geräte-Identifikation

FTL50H, FTL51H

EN- Device Identification

FTL50H, FTL51H

FR- Dénomination

FTL50H, FTL51H

ES- Identificación del equipo

FTL50H, FTL51H

IT - Identificazione

FTL50H, FTL51H

NL- Instrument-identificatie

FTL50H, FTL51H



ENDRESS+HAUSER
LIQUIPHANT M

Order Code

FTL5#H-#####



A D C F G H J M P R S U Y

*¹ WHG
ATEX II 3 G EEx nA II T6, WHG
ATEX II 3 D T85°C, *³
ATEX II 1/2 G EEx ia IIC T6, WHG
ATEX II 1/2 D T80°C, *³
ATEX II 1/2 G EEx ia IIC T6
ATEX II 1/2 D T80°C, *³
ATEX II 1 G EEx ia IIC T6
ATEX II 1 G EEx ia IIC T6, WHG
NEPSI Ex ia IIC T6
FM, IS, Cl. I, II, III, Div. 1, Gr. A-G
FM, NI, Cl. I, Div. 2, Gr. A-D
CSA, IS, Cl. I, II, III, Div. 1, Gr. A-G
CSA, General purpose
*²



A##
B##
C##
K##



16 17

EE2	1", 316L		max. 40 bar, 100 °C max. 25 bar, 150 °C
GQ2	G ¾, ISO 228, 316L (FTL50H)		max. 100 bar, 150 °C
GW2	G 1, ISO 228, 316L		max. 40 bar, 100 °C max. 25 bar, 150 °C
HE2	DIN 11864-1 A, DN50, 316L		max. 25 bar, 140 °C
MA2	DIN 11851, DN32 PN25, 316L		DN32/40: max. 40 bar, 100 °C DN32/40, DN50: max. 25 bar, 140 °C
MC2	DIN 11851, DN40 PN25, 316L		
ME2	DIN 11851, DN50 PN25, 316L		
PE2	DRD, 65 mm, 316L		max. 40 bar, 100 °C max. 25 bar, 150 °C
TC2	DN25-38 (1...1½"), ISO 2852, 316L Tri-Clamp		max. 16 bar, 120 °C max. 2 bar, 150 °C
TE2	DN40-51 (2"), ISO 2852, 316L Tri-Clamp		
UE2	SMS 2", PN25, 316L		max. 25 bar, 140 °C
WE2	Varivent®, DN65-162 PN10, 316L		max. 64 bar, 150 °C
YY9	*2		

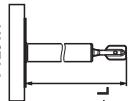
- *¹ ohne / without / sans / sin / senza / zonder
 *² andere / others / autres / otros / altri / andere
 *³ nicht gültig für PBT / not valid for PBT / non valable pour PBT /
 no es válido para PBT / non valido per PBT / niet geldig voor PBT



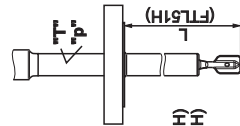
ENDRESS+HAUSER
LIQUIPHANT M

Order Code

FTL51H



FTL5#H-##### mm
in



Ra < 1.5 µm/120 grit (FTL50H)
Ra < 0.3 µm/320 grit 3A (FTL50H)

#2 mm, Ra < 1.5 µm/120 grit

..... in, Ra < 0.3 µm/320 grit 3A

..... in, Ra < 1.5 µm/120 grit

..... in, Ra < 0.3 µm/320 grit 3A

"L II", Ra < 1.5 µm/120 grit

"L II", Ra < 0.3 µm/320 grit 3A

Ra < 1.5 µm/120 grit + "T" (FTL50H)

Ra < 0.3 µm/320 grit 3A + "T" (FTL50H)

#2 mm, Ra < 1.5 µm/120 grit

..... in, Ra < 0.3 µm/320 grit

..... in, Ra < 1.5 µm/120 grit

..... in, Ra < 0.3 µm/320 grit

"L II", Ra < 1.5 µm/120 grit

"L II", Ra < 0.3 µm/320 grit

Ra < 1.5 µm/120 grit + "p" (FTL50H)

Ra < 0.3 µm/320 grit 3A + "p" (FTL50H)

#2 mm, Ra < 1.5 µm/120 grit

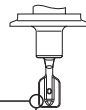
..... in, Ra < 0.3 µm/320 grit

..... in, Ra < 1.5 µm/120 grit

..... in, Ra < 0.3 µm/320 grit

"L II", Ra < 1.5 µm/120 grit

"L II", Ra < 0.3 µm/320 grit



< 1.5 µm (120 grit)
< 0.3 µm (320 grit)

YY #2

FEL51, 19...253 V AC
FEL52, 10... 55 V DC, PNP
FEL58, NAMUR, H-L
*2

316L, IP66/68, 5 m
316L, IP65, Pg11, ISO 4400
316L, NEMA 4x, NPT 1/4, ISO 4400
316L, IP66/68, M12
*2

*1
EN 10204-3.1, CoC
EN 10204-3.1, 316L
GL/ABS marine certificate (FTL51H: max. 1600 mm)
*2

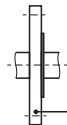
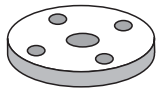
*1 ohne / without / sans / sin / senza / zonder
*2 andere / others / autres / otros / altri / andere

"L II" Schaltpunkt / Switchpoint / Point de commutation /
Punto de conmutación / Punto di commutazione / Schakelpunt
Liquiphant II FTL360/365, FDL30/35

"T" Temperaturdistanzstück / Temperature spacer /
Élément de refroidissement / Tramo disipador temperatura /
Distanziale per temperatura / Temperatuurreductiestuk

"p" Druckdichte Durchführung / Pressure sealed bushing /
Entrée résistante à la pression / Extensión resistente a la presión /
Passacavo a tenuta di pressione / Gasdichte doorvoering

DE- Prozessanschlüsse
EN- Process connections
FR- Raccords process
ES- Conexiones a proceso
IT- Attacchi al processo
NL- Procesaansluiting



ANSI B 16.5

AA2 1 1/4", 150 lbs, RF, 316/316L
 AC2 1 1/2", 150 lbs, RF, 316/316L
 AE2 2", 150 lbs, RF, 316/316L
 AF2 2", 300 lbs, RF, 316/316L
 AJ2 2 1/2", 300 lbs, RF, 316/316L (FTL51H)
 AL2 3", 150 lbs, RF, 316/316L
 AM2 3", 300 lbs, RF, 316/316L (FTL51H)
 AP2 4", 150 lbs, RF, 316/316L
 AQ2 4", 300 lbs, RF, 316/316L (FTL51H)
 A82 1", 150 lbs, RF, 316/316L

EN 1092-1

BA2 DN32, PN6 A, 316L
 BB2 DN32, PN25/40 A, 316L
 BC2 DN40, PN6 A, 316L
 BD2 DN40, PN25/40 A, 316L
 BE2 DN50, PN6 A, 316L
 BG2 DN50, PN25/40 A, 316L
 BH2 DN65, PN6 A, 316L
 BK2 DN65, PN25/40 A, 316L
 BM2 DN80, PN10/16 A, 316L
 BN2 DN80, PN25/40 A, 316L
 BQ2 DN100, PN10/16 A, 316L
 BR2 DN100, PN25/40 A, 316L
 BG2 DN25, PN25/40 A, 316L
 CG2 DN50, PN25/40 B1, 316L
 CN2 DN80, PN25/40 B1, 316L
 CQ2 DN100, PN10/16 B1, 316L

JIS B2220

KA2 10K 25, RF,
KC2 10K 40, RF,
KE2 10K 50, RF,
KL2 10K 80, RF,
KP2 10K 100, RF,

316L
316L
316L
316L
316L

DE- Behandlung

Am Gehäuse, Flansch oder
Verlängerungsrohr anfassen

EN- Handling

Hold by housing, flange or
extension tube

FR- Manipulation

Tenir par le boîtier, la bride ou
le tube prolongateur

ES - Modo de empleo

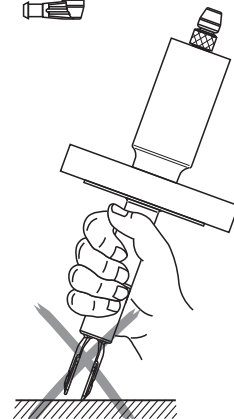
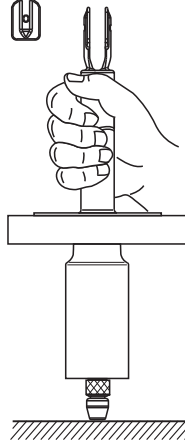
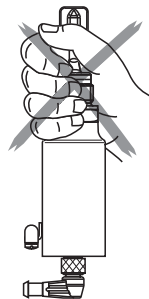
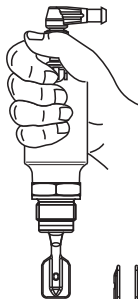
Coger por el cabezal, brida o
tubo de extensión

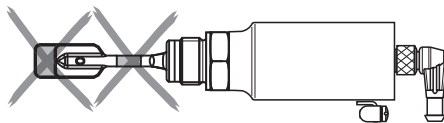
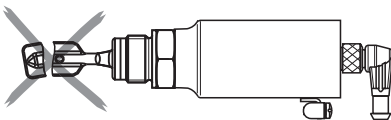
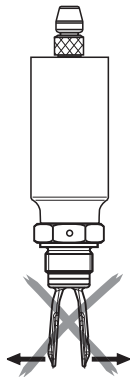
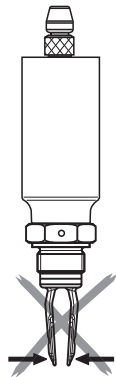
IT - Come maneggiare

Afferrare la custodia,
per la flangia o
per il tubo di estensione

NL- Behandeling

Vastpakken via behuizing,
flens of verlengbuis





DE- Nicht verbiegen
Nicht kürzen
Nicht verlängern

EN- Do not bend
Do **not** shorten
Do **not** lengthen

FR- Ne pas déformer
Ne pas raccourcir
Ne pas rallonger

ES- No torcer
No acortar
No alargar

IT - Non stringere o allargare
Non accorciare o allungare
Non piegare

NL- Niet verbuigen
Niet inkorten
Niet verlengen

DE- Verwendung

Grenzstanddetektion in
Flüssigkeiten

EN- Application

Point level detection in fluids

FR- Utilisation

Détection de niveau dans les
liquids

ES - Aplicación

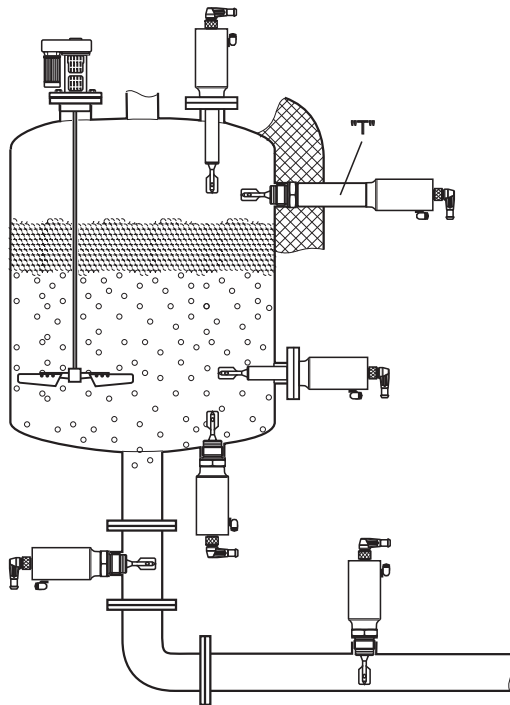
Detección de nivel en líquidos agua

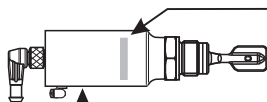
IT - Applicazione

Controllo livello nei liquidi

NL- Toepassing

Niveaudetectie in vloeistoffen

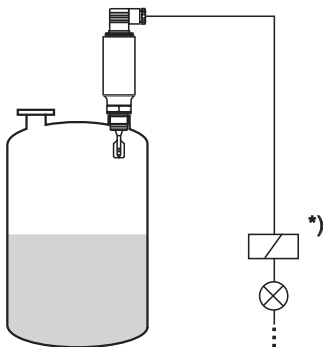




Order code:
FTL5#(H) - # ### # # # #

Elektronik
Electronic
Electronique
Electrónica
Elektronici
Elektronica

FEL51
FEL52
FEL58



*) Externe Last
External load
Charge externe
Carga externa
Carico esterno
Externe belasting

DE- Messeinrichtung
für direkten Anschluss

EN- Measuring system
for direct connection

**FR- Ensemble de détection
de niveau**
pour raccordement direct

ES- Sistema de medida
para conexión directa

IT - Sistema di misura
per connessione diretta

NL- Meetopstelling
voor directe aansluiting

DE- Messeinrichtung

für Anschluss über Schaltgerät

EN- Measuring system

for connection via switching unit

**FR- Ensemble de détection
de niveau**

pour raccordement via détecteur

ES - Sistema de medida

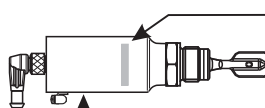
para conexión vía interruptores

IT - Sistema di misura

per connessione mediante
unità di commutazione

NL- Meetopstelling

voor aansluiting aan een
schakelversterker



Order code:

FTL5#(H) - # ### # # # #

Elektronik
Electronic
Electronique
Electrónica
Elettronici
Elektronika

FEL58

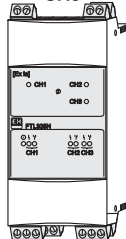
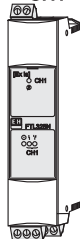


FTL325N

FTL375N

CH1

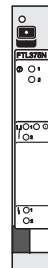
CH3

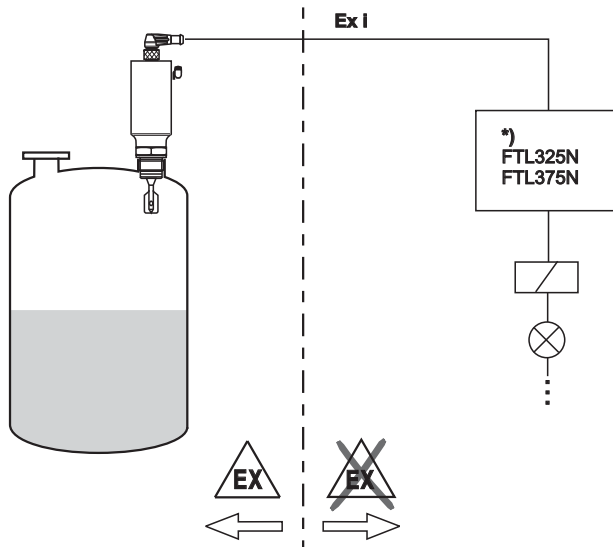


CH1

CH2

CH3





*) Schaltgerät, SPS, Trennverstärker
Switching unit, PLC, isolating amplifier
Décteur, API, convertisseur/séparateur
Interruptor, PLC, amplificador aislado
Unità di commutazione, PLC, barriera di separazione
Schakelverstärker, PLC, scheidingsverstärker

DE- Einbau

Schaltpunkt in Abhängigkeit
vom Einbau

EN- Installation

Switchpoint depends
on mounting position

FR- Montage

Point de commutation
en fonction de l'implantation

ES- Montaje

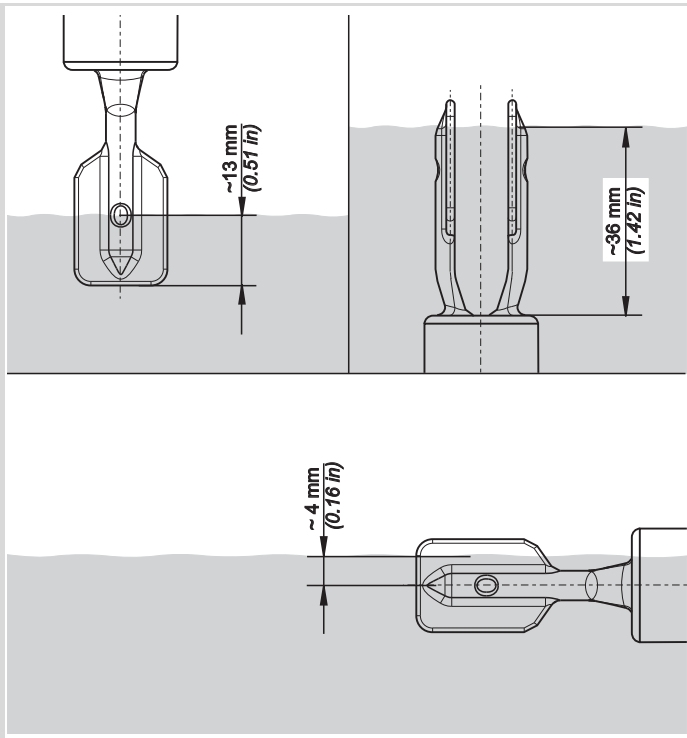
Punto de conmutación
dependiendo de la posición
de montaje

IT - Montaggio

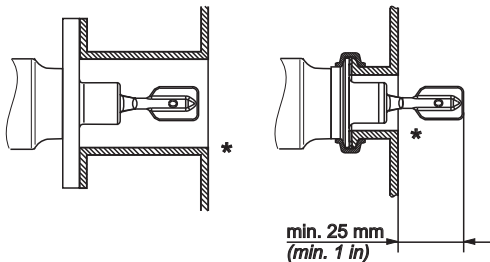
Punto di commutazione
in funzione della posizione
di montaggio

NL- Inbouw

Schakelpunt afhankelijk
van inbouw

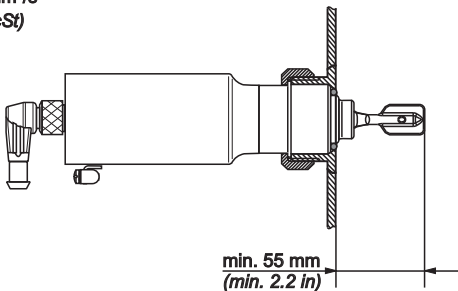


$v = 0 \dots 2000 \text{ mm}^2/\text{s}$
 $(v = 0 \dots 2000 \text{ cSt})$



* entgraten / deburr / ébarber / libre / sbavare / ontbramen

$v = 0 \dots 10000 \text{ mm}^2/\text{s}$
 $(v = 0 \dots 10000 \text{ cSt})$



DE - Einbaubeispiele
in Abhängigkeit von der
Viskosität v der Flüssigkeit

EN - Mounting examples
as a function of liquid viscosity v

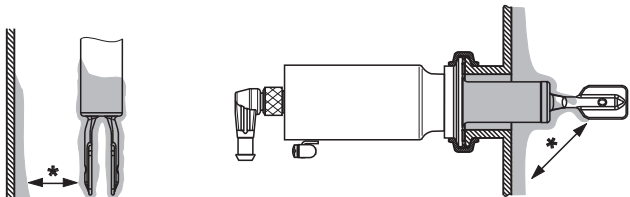
FR - Exemples d'implantation
dépendant de la viscosité v
du liquide

ES - Ejemplos de montaje
dependiendo de la viscosidad v
del líquido

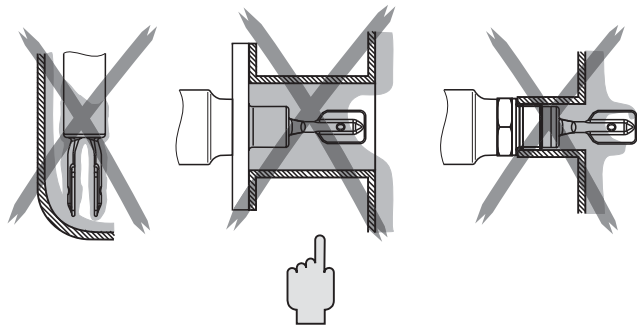
IT - Esempi di montaggio
come funzione di viscosità v
del liquido

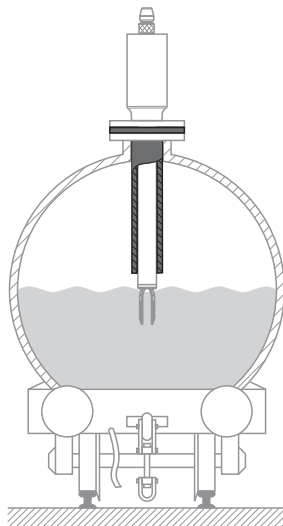
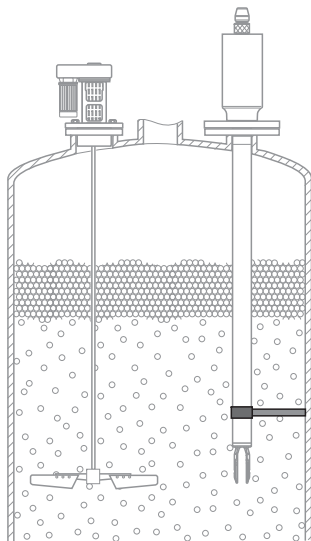
NL - Inbouwvoorbeelden
afhankelijk van de viscositeit v
van de vloeistof

- DE-** Ansatzbildung berücksichtigen.
Schwinggabel darf Ansatz nicht berühren
- EN-** Consider build-up.
Fork may not contact the build-up
- FR-** Tenir compte du colmatage.
Fourche ne doit pas entrer en contact avec le dépôt
- ES-** Tener en cuenta las adherencias.
Las horquillas no deben estar en contacto con las adherencias
- IT-** Tenere conto dei depositi.
La forcella non deve entrare in contatto con i depositi
- NL-** Rekening houden met aangroei.
Trilvork mag de aangroei niet aanraken



*** Abstand! / Distance! / Distance! / ¡Distancia! / Distanza! / Afstand!**





DE- Bei dynamischer Belastung abstützen

EN- In cases of dynamic forces support

FR- En cas de contraintes dynamiques, étayer le tube

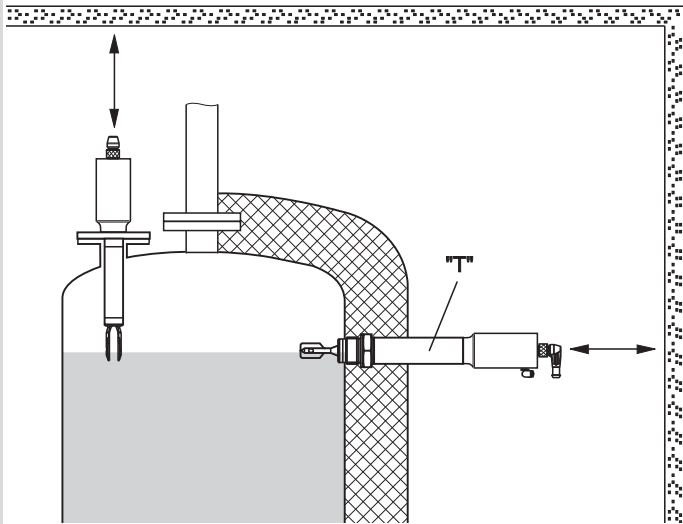
ES- En caso de cargas dinámicas altas debe ser apoyado

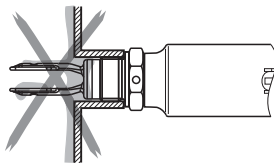
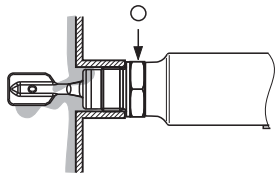
IT - In caso di carichi dinamici, rinforzare con un supporto meccanico

NL- Bij mechanische belasting verstevigen

DE- Freiraum vorsehen
EN- Allow clearance
FR- Prévoir un espace libre
ES- Prever espacio
IT- Lasciare spazio per estrazione
NL- Ruimte vrijhouden

"T" = mit Temperaturdistanzstück für isolierten Tank
"T" = with temperature spacer for insulated tanks
"T" = avec élément de refroidissement pour réservoir isolé
"T" = con tramo dissipador de temperatura para tanques aislados
"T" = con distanziale di temperatura per serbatoi isolati
"T" = met temperatuurreductiestuk voor geïsoleerde tanks





DE- Schwinggabel ausrichten:
Markierung oben oder unten
Ausrichten in Rohrleitungen:
Markierung in Fließrichtung

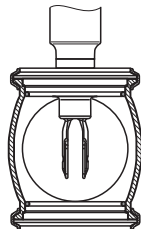
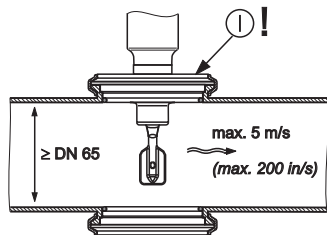
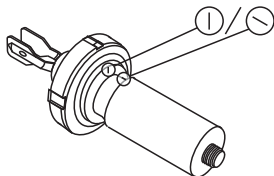
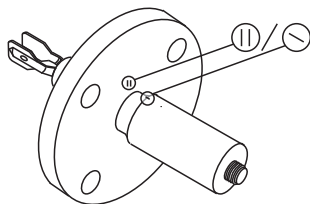
EN- Orientation of fork tines:
Marking above or below
Orientation in pipes:
Marking in direction of flow

FR- Orientation des lames vibrantes:
Repères en haut ou en bas
Orientation dans une conduite:
Dans le sens de l'écoulement

ES- Orientación de la horquilla:
Marca arriba o abajo
Orientación dentro de tuberías:
Marca en dirección del caudal

IT - Allineamento della forcella:
Marcatura in alto o in basso
Allineamento in tubazioni:
Nella direzione del flusso

NL- Vork uitrichten:
Markering boven of onder
Opstelling in leidingen:
stroomrichting



DE- Liquiphant einschrauben.
Nicht am Gehäuse drehen.

EN- Screw Liquiphant into
process connection.
Don't use housing to turn.

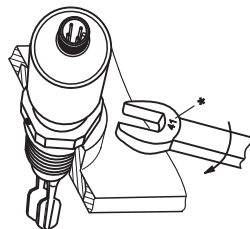
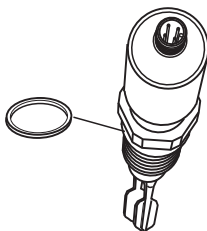
FR- Visser le Liquiphant.
Ne pas se servir du boîtier.

ES- Roscar el Liquiphant a la conexión
a proceso.
No girar el cabezal.

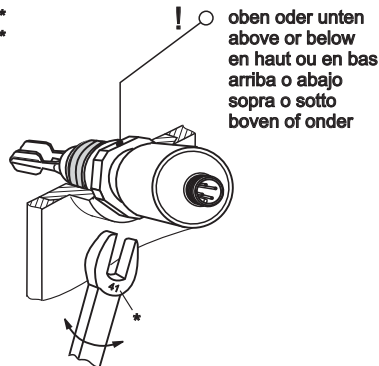
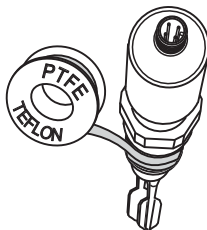
IT- Avvitare il Liquiphant all'attacco
di processo.
Allo scopo **non** utilizzare la
custodia.

NL- Schroef de Liquiphant in
de procesaansluiting.
Draai hierbij **niet** aan de behuizing.

G ¾, 32 mm (1¼")*
G 1, 41 mm (1⅝")*



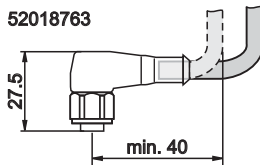
NPT ¾, R ¾, G ¾, 32 mm (1¼")*
NPT 1, R 1, G 1, 41 mm (1⅝")*



de - Nummer = Farbe
 en - Number = Colour
 fr - Numéro = Couleur

es - Número = Color
 it - Numero = Colore
 nl - Nummer = Kleur

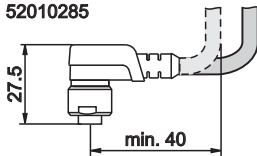
52018763



- 1 = BN
- 2 = WT
- 3 = BU
- 4 = BK

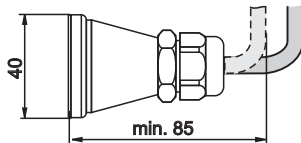
FTL5#(H) #####N3# (M12x1)

52010285



- 1 = BN
- 2 = WT
- 3 = BU
- 4 = BK

FTL5#(H) - #####C3#



- 1 = BU
- 2 = BK
- 3 = BN
- 4 = GNYE

DE- Anschluss

Abmessungen in mm

EN- Connections

Dimensions in mm

FR- Raccordement

Dimensions en mm

ES- Conexiones

Dimensiones en mm

IT - Collegamenti elettrici

Dimensioni in mm

NL- Aansluiting

Afmetingen in mm

FTL5#(H)-#####D3# (PG11)
 FTL5#(H)-#####E3# (NPT1/2")



-30°C ≤ TA ≤ +70°C

100 mm = 3.94 in

DE- Anschluss M12x1
FEL52 DC-PNP

EN- Connections M12x1
FEL52 DC-PNP

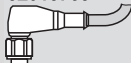
FR- Raccordement M12x1
FEL52 DC-PNP

ES- Conexiones M12x1
FEL52 DC-PNP

IT- Collegamenti elettrici M12x1
FEL52 DC-PNP

NL- Aansluiting M12x1
FEL52 DC-PNP

52018763



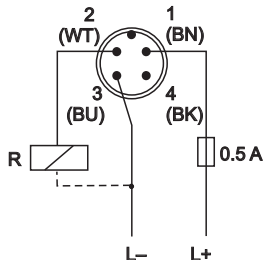
FTL5#(H)-#####N3# (M12x1)

52010285

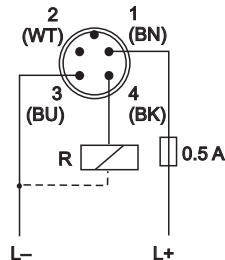


FTL5#(H)-#####N3# (M12x1)

MAX



MIN



R = externe Last / external load /
charge externe / carga exterior /
carico esterno / externe belasting

I_{max} 350 mA
U = 10...55 V

Speisegerät mit galvanischer Trennung, z.B. nach EN 61558-1

Power supply with galvanic isolation acc. to e.g. EN 61558-1

Alimentation avec séparation galvanique, par ex. selon EN 61558-1

Fuente de alimentación con aislamiento galvanico de acuerdo con el ejemplo EN 61558-1

Alimentazione con isolamento galvanico in accordo a EN 61558-1

Voedingsunit met galvanische scheiding, bijv. conform EN 61558-1

	MAX		MIN		L	U
					Störung Fault Défaut Fallo Guasto Storing	
U= (DC)						
 (PNP)						

DE- Funktion
FEL52 DC-PNP

EN- Function
FEL52 DC-PNP

FR- Fonction
FEL52 DC-PNP

ES- Funcionamiento
FEL52 DC-PNP

IT - Funzione
FEL52 DC-PNP

NL- Functie
FEL52 DC-PNP

leuchtet / lights up /
allumé / iluminado /
acceso / aan

blinkt / flashes /
clignote / parpadea /
lampeggia / knippert

aus / off /
éteint / apagado /
spento / uit

DE- Anschluss M12x1
FEL58 NAMUR

EN- Connections M12x1
FEL58 NAMUR

FR- Raccordement M12x1
FEL58 NAMUR

ES- Conexiones M12x1
FEL58 NAMUR

IT- Collegamenti elettrici M12x1
FEL58 NAMUR

NL- Aansluiting M12x1
FEL58 NAMUR

Power supply

DC: 8.2 V +/- 20%

~~52018763~~



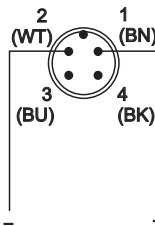
~~FTL5#(H)-#####N3# (M12x1)~~

52010285

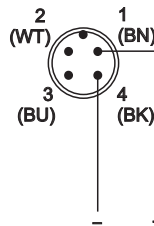


FTL5#(H)-#####N3# (M12x1)

MAX



MIN



H 2.2...3.5 mA

L 0.6...1.0 mA



z. B. / e. g. / p. e. / por ej. / p. e. / bijv.
FXN421, FXN422, SIN100, SIN110,
FTL325N, FTL375N

Multiplexer: Taktzeit min. 3 s
Multiplexer: duty pulse cycle min. 3 s
Multiplexeur: cycle d'impulsions min. 3 s
Multiplexer: ciclo de impulso mín. 3 s
Multiplexer: tempo di ciclo min. 3 s
Multiplexer: pulstijd min. 3 s

Trennverstärker nach
NAMUR (IEC 60947-5-6)

Isolating amplifier to
NAMUR (IEC 60947-5-6)

Convertisseur / séparateur
selon NAMUR (IEC 60947-5-6)

Amplificador aislado según
NAMUR (IEC 60947-5-6)

Barriera di separazione
secondo NAMUR (IEC 60947-5-6)

Scheidingsverstärker
conform NAMUR (IEC 60947-5-6)

	MAX		MIN		⚡	✕
					Störung Fault Défaut Fallo Guasto Storing	
NAMUR	H 2.2...3.5		H 2.2...3.5			
		0.6...1.0 L		0.6...1.0 L	< 1.0	
= leuchtet / lights up / allumé / iluminado / acceso / aan = blinkt / flashes / clignote / parpadea / lampeggia / knippert = aus / off / éteint / apagado / spento / uit						

DE- Funktion
FEL58 NAMUR

EN- Function
FEL58 NAMUR

FR- Fonction
FEL58 NAMUR

ES- Funcionamiento
FEL58 NAMUR

IT - Funzione
FEL58 NAMUR

NL- Functie
FEL58 NAMUR

DE- Anschluss Ventilstecker
FEL51 AC

EN- Connection valve plug
FEL51 AC

FR- Raccordement connecteur EV
FEL51 AC

ES- Terminal de conexiones
FEL51 AC

IT - Collegamento connettore valvola
FEL51 AC

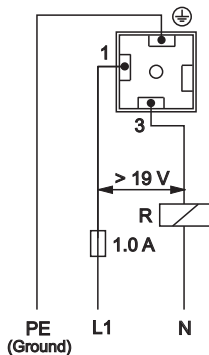
NL- Connector aansluiting
FEL51 AC

FTL5#(H)-#####D3# (PG11)
FTL5#(H)-#####E3# (NPT1/2")



$-30^{\circ}\text{C} \leq T_A \leq +70^{\circ}\text{C}$

MAX

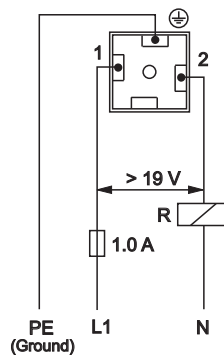


R = externe Last / external load /
charge externe / carga exterior /
carico esterno / externe belasting

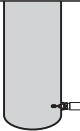
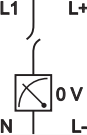
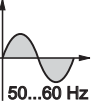
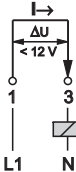
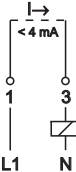
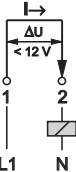
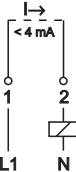
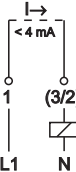
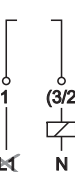
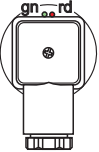
min. 2.5 VA / 253 V (10 mA)

min. 0.5 VA / 24 V (20 mA)

MIN



I max. 350 mA
U $\approx$ 19...253 V AC

	MAX		MIN		⚡	
					Störung Fault Défaut Fallo Guasto Storing	L1 L+ 
U~ (AC)  50...60 Hz						
						
	 ●	 	 ●	 	 	● ●
	 = leuchtet / lights up / allumé / iluminado / acceso / aan  = blinkt / flashes / clignote / parpadea / lampeggia / knippert ● = aus / off / éteint / apagado / spento / uit					

DE- Funktion
FEL51 AC

EN- Function
FEL51 AC

FR- Fonction
FEL51 AC

ES- Funcionamiento
FEL51 AC

IT - Funzione
FEL51 AC

NL- Functie
FEL51 AC

DE- Anschluss Ventilstecker
FEL52 DC-PNP

EN- Connection valve plug
FEL52 DC-PNP

FR- Raccordement connecteur EV
FEL52 DC-PNP

ES- Terminal de conexiones
FEL52 DC-PNP

IT - Collegamento connettore valvola
FEL52 DC-PNP

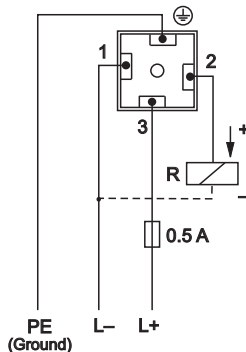
NL- Connector aansluiting
FEL52 DC-PNP

FTL5#(H)-#####D3# (PG11)
FTL5#(H)-#####E3# (NPT1/2")



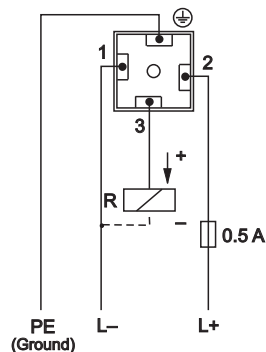
$-30^{\circ}\text{C} \leq T_A \leq +70^{\circ}\text{C}$

MAX



R = externe Last / external load /
charge externe / carga exterior /
carico esterno / externe belasting

MIN



$I_{\text{max.}} 350 \text{ mA}$
 $U = 10 \dots 55 \text{ V}$

	MAX		MIN			
					Störung Fault Défaut Fallo Guasto Storing	L1
U_{-} (DC)						
(PNP)						

- = leuchtet / lights up / allumé / iluminado / acceso / aan
 = blinkt / flashes / clignote / parpadea / lampeggia / knippert
 = aus / off / éteint / apagado / spento / uit

DE- Funktion
FEL52 DC-PNP

EN- Function
FEL52 DC-PNP

FR- Fonction
FEL52 DC-PNP

ES - Funcionamiento
FEL52 DC-PNP

IT - Funzione
FEL52 DC-PNP

NL- Functie
FEL52 DC-PNP

DE- Anschluss Ventilstecker
FEL58 NAMUR

EN- Connection valve plug
FEL58 NAMUR

FR- Raccordement connecteur EV
FEL58 NAMUR

ES- Terminal de conexiones
FEL58 NAMUR

IT- Collegamento connettore valvola
FEL58 NAMUR

NL- Connector aansluiting
FEL58 NAMUR

Power supply

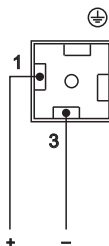
DC: 8.2 V +/- 20%

FTL5#(H)#####D3# (PG11)
FTL5#(H)#####E3# (NPT1/2")

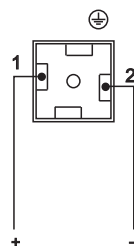


$-30^{\circ}\text{C} \leq \text{TA} \leq +70^{\circ}\text{C}$

MAX



MIN



H 2.2...3.5 mA

L 0.6...1.0 mA



z. B. / e. g. / p. e. / por ej. / p. e. / bijv.
FXN421, FXN422, SIN100, SIN110,
FTL325N, FTL375N

Multiplexer: Taktzeit min. 3 s
Multiplexer: duty pulse cycle min. 3 s
Multiplexeur: cycle d'impulsions min. 3 s
Multiplexer: ciclo de impulso mín. 3 s
Multiplexer: tempo di ciclo min. 3 s
Multiplexer: pulstijd min. 3 s

Trennverstärker nach
NAMUR (IEC 60947-5-6)

Isolating amplifier to
NAMUR (IEC 60947-5-6)

Convertisseur / séparateur
selon NAMUR (IEC 60947-5-6)

Amplificador aislado según
NAMUR (IEC 60947-5-6)

Barriera di separazione
secondo NAMUR (IEC 60947-5-6)

Scheidingsverstärker
conform NAMUR (IEC 60947-5-6)

	MAX		MIN		⚡	U
					Störung Fault Défaut Fallo Guasto Storing	
NAMUR	H 2.2...3.5		H 2.2...3.5			
		0.6...1.0 L		0.6...1.0 L	< 1.0	
	1.0 Hz	1.0 Hz	1.0 Hz	1.0 Hz	0.3 Hz	
	= leuchtet / lights up / allumé / iluminado / acceso / aan = blinkt / flashes / clignote / parpadea / lampeggia / knippert = aus / off / éteint / apagado / spento / uit					

DE- Funktion
FEL58 NAMUR

EN- Function
FEL58 NAMUR

FR- Fonction
FEL58 NAMUR

ES- Funcionamiento
FEL58 NAMUR

IT - Funzione
FEL58 NAMUR

NL- Functie
FEL58 NAMUR

DE- Anschluss Kabelschwanz
FEL51 AC

EN- Connection
unconnected cable end
FEL51 AC

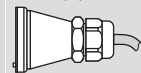
FR- Raccordement extrémité de câble
FEL51 AC

ES- Conexión del cable integrado
FEL51 AC

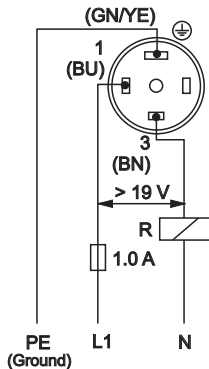
IT- Collegamento
cavo senza connettore
FEL51 AC

NL- Kabel/wartel aansluiting
FEL51 AC

FTL5#(H)-#####C3#



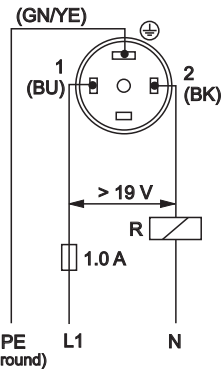
MAX



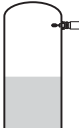
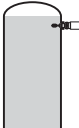
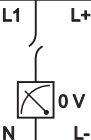
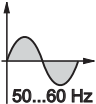
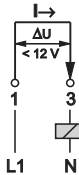
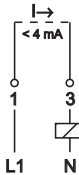
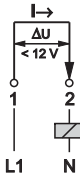
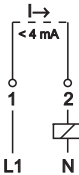
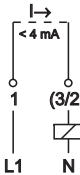
R = externe Last / external load /
charge externe / carga exterior /
carico esterno / externe belasting

min. 2.5 VA / 253 V (10 mA)
min. 0.5 VA / 24 V (20 mA)

MIN



I_{max} 350 mA
U ≈ 19...253 V AC

	MAX		MIN			
					Störung Fault Défaut Fallo Guasto Storing	L1 L+ 
U~ (AC)  50...60 Hz						
						
	 ●	 	 ●	 	 	● ●
	 = leuchtet / lights up / allumé / iluminado / acceso / aan  = blinkt / flashes / clignote / parpadea / lampeggia / knippert ● = aus / off / éteint / apagado / spento / uit					

DE- Funktion
FEL51 AC

EN- Function
FEL51 AC

FR- Fonction
FEL51 AC

ES- Funcionamiento
FEL51 AC

IT - Funzione
FEL51 AC

NL- Functie
FEL51 AC

DE- Anschluss Kabelschwanz
FEL52 DC-PNP

EN- Connection
unconnected cable end
FEL52 DC-PNP

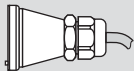
FR- Raccordement extrémité de câble
FEL52 DC-PNP

ES- Conexión del cable integrado
FEL52 DC-PNP

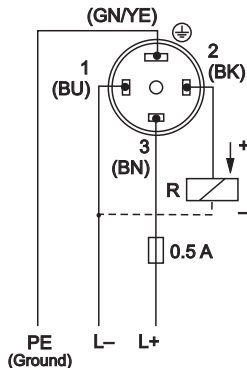
IT- Collegamento
cavo senza connettore
FEL52 DC-PNP

NL- Kabel/wartel aansluiting
FEL52 DC-PNP

FTL5#(H)-#####C3#

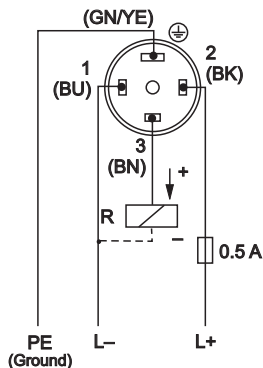


MAX



R = externe Last / external load /
charge externe / carga exterior /
carico esterno / externe belasting

MIN



I_{max} 350 mA
U = 10...55 V

DE- Anschluss Kabelschwanz
FEL58 NAMUR

EN- Connection
unconnected cable end
FEL58 NAMUR

FR- Raccordement extrémité de câble
FEL58 NAMUR

ES- Conexión del cable integrado
FEL58 NAMUR

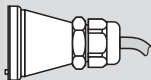
IT - Collegamento
cavo senza connettore
FEL58 NAMUR

NL- Kabel/wartel aansluiting
FEL58 NAMUR

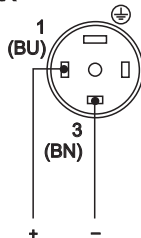
Power supply

DC: 8.2 V +/- 20%

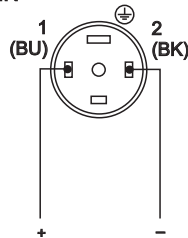
FTL5#(H) #####C3#



MAX



MIN



H 2.2...3.5 mA

L 0.6...1.0 mA



z. B. / e. g. / p. e. / por ej. / p. e. / bijv.
FXN421, FXN422, SIN100, SIN110,
FTL325N, FTL375N

Multiplexer: Taktzeit min. 3 s
Multiplexer: duty pulse cycle min. 3 s
Multiplexeur: cycle d'impulsions min. 3 s
Multiplexer: ciclo de impulso mín. 3 s
Multiplexer: tempo di ciclo min. 3 s
Multiplexer: pulstijd min. 3 s

Trennverstärker nach
NAMUR (IEC 60947-5-6)

Isolating amplifier to
NAMUR (IEC 60947-5-6)

Convertisseur / séparateur
selon NAMUR (IEC 60947-5-6)

Amplificador aislado según
NAMUR (IEC 60947-5-6)

Barriera di separazione
secondo NAMUR (IEC 60947-5-6)

Scheidingsverstërker
conform NAMUR (IEC 60947-5-6)

	MAX		MIN		⚡	
					Störung Fault Défaut Fallo Guasto Storing	
NAMUR	H 2.2...3.5	H 2.2...3.5	H 2.2...3.5	H 2.2...3.5		
		0.6...1.0 L		0.6...1.0 L	< 1.0	
= leuchtet / lights up / allumé / iluminado / acceso / aan = blinkt / flashes / clignote / parpadea / lampeggia / knippert = aus / off / éteint / apagado / spento / uit						

DE- Funktion
FEL58 NAMUR

EN- Function
FEL58 NAMUR

FR- Fonction
FEL58 NAMUR

ES- Funcionamiento
FEL58 NAMUR

IT - Funzione
FEL58 NAMUR

NL- Functie
FEL58 NAMUR

DE- Test mit Prüfmagnet
 EN- Test with test magnet
 FR- Test avec aimant de contrôle
 ES- Test con imán de control
 IT - Test con magnete di prova
 NL- Test met testmagneet



Sie müssen sicherstellen, dass keine gefährlichen Prozesse an der Anlage ausgelöst werden /

You must ensure that no hazardous processes on the system are triggered /

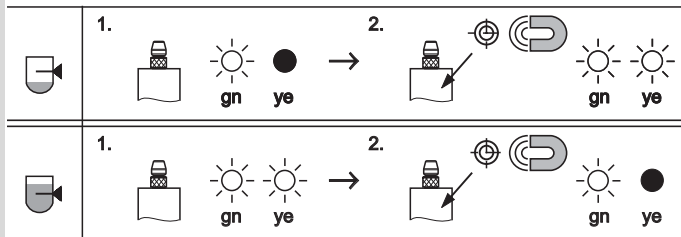
Vous devez vous assurer qu'aucun processus dangereux n'est déclenché sur l'installation /

Deberá asegurarse de que no pueda activarse ningún proceso peligroso en la instalación /

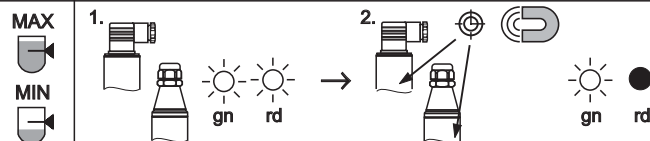
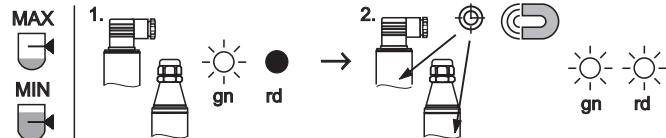
Assicurarsi che non si generino processi pericolosi nell'impianto /

Zorg ervoor dat er geen gevaarlijke processen in de installatie worden gestart

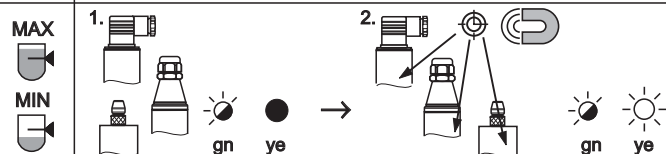
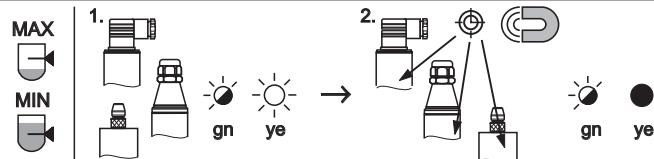
DC-PNP + M12x1



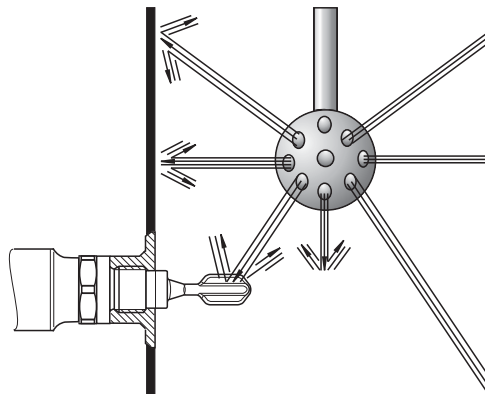
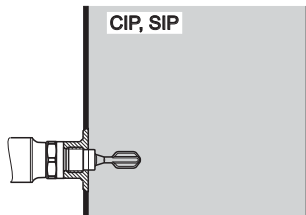
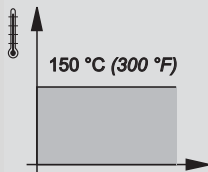
AC + DC-PNP

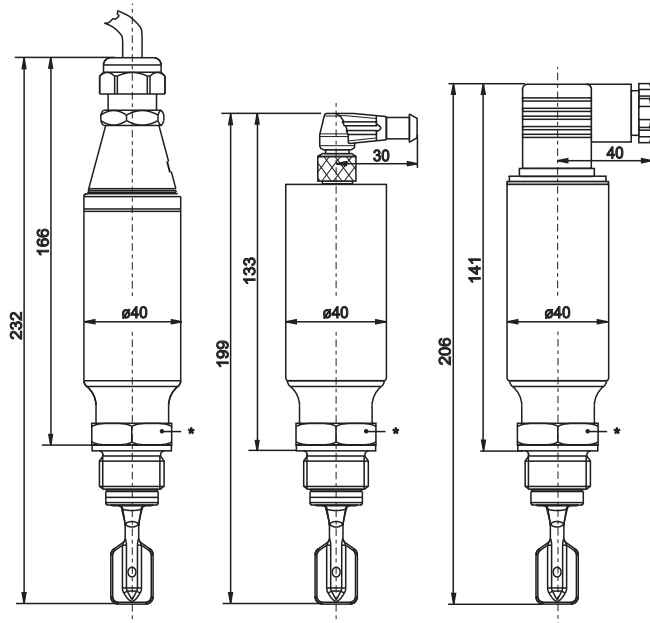


NAMUR



DE- Reinigung
EN- Cleaning
FR - Nettoyage
ES - Limpieza
IT - Pulizia
NL- Reiniging





* SW 32 / 32 AF

DE- Technische Daten

Abmessungen in mm

EN- Technical Data

Dimensions in mm

FR- Caractéristiques techniques

Dimensions en mm

ES- Datos técnicos

Dimensiones en mm

IT - Dati tecnici

Dimensioni in mm

NL- Technische gegevens

Afmetingen in mm

100 mm = 3.94 in

DE- Umgebungstemperatur T_a
Prozesstemperatur T_p

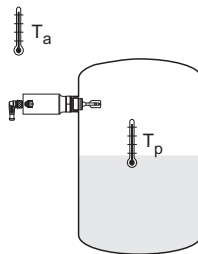
EN- Ambient temperature T_a
Process temperature T_p

FR- Température ambiante T_a
Température de process T_p

ES- Temperatura ambiente T_a
Temperatura del proceso T_p

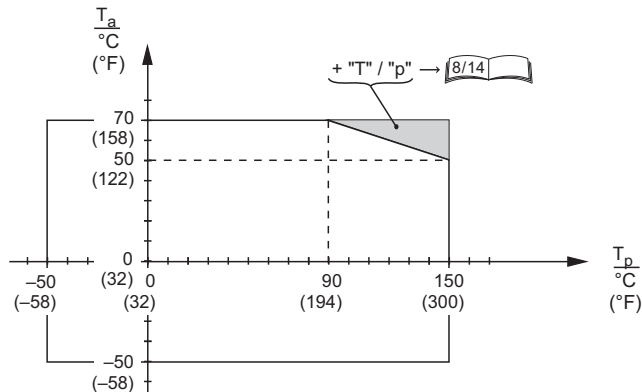
IT- Temperatura ambiente T_a
Temperatura di processo T_p

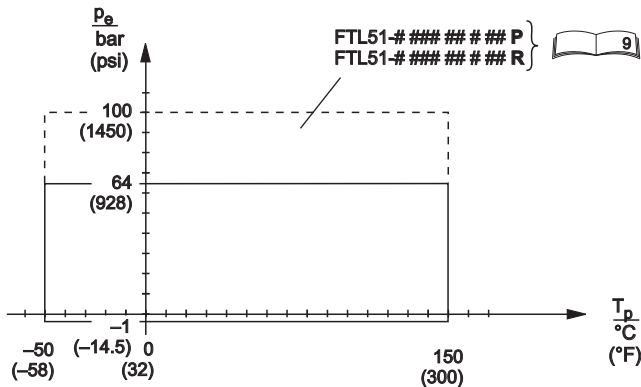
NL- Omgevingstemperatuur T_a
Procestemperatuur T_p



FTL5#(H)-#####D3# (PG11)
FTL5#(H)-#####E3# (NPT1/2")

$-30^{\circ}\text{C} \leq T_a \leq +70^{\circ}\text{C}$





DE- Prozessdruck p_e
 Prozesstemperatur T_p

EN- Process pressure p_e
 Process temperature T_p

FR- Pression de process p_e
 Température de process T_p

ES- Presión del proceso p_e
 Temperatura del proceso T_p

IT- Pressione di processo p_e
 Temperatura di processo T_p

NL- Procesdruk p_e
 Procestemperatuur T_p

DE- Zubehör, Ersatzteile

Abmessungen in mm

EN- Accessories, Spare parts

Dimensions in mm

**FR- Accessoires,
Pièces de rechange**

Dimensions en mm

ES - Accesorios, Repuestos

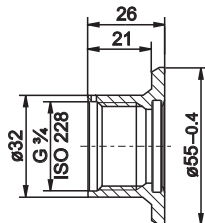
Dimensiones en mm

IT - Accessori, Pezzi di ricambio

Dimensioni in mm

**NL- Toebehoren,
Reserve-onderdelen**

Afmetingen in mm

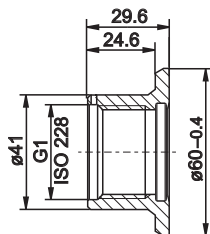


G 3/4

52001052

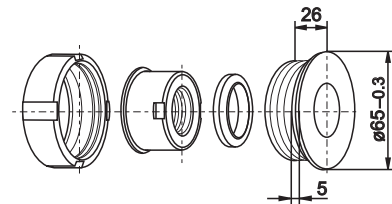


Einschweißmuffe
Weld-in socket
Manchon à souder
Manguito soldado
Attacco a saldare
Inlassok



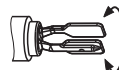
G 1

52001051

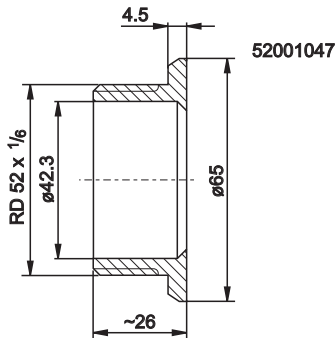


G 1

52001221



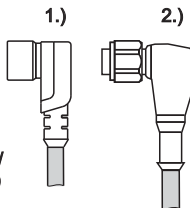
100 mm = 3.94 in



Einschweißadapter
Weld-in adapter
Adaptateur à souder
Adaptor soldado
Adattatore a saldare
Inlasadapter

Kabel / Cable / Câble / Cable / Cavo / Kabel
4 x 0.34

- 1.) M12 gewinkelt / M12, angled / M12 coudé / M12, acodado / ad angolo M12 / M12 haaks 52010285
- 2.) mit Dose M12 (+LED) / with M12 socket (+LED) / avec boîtier M12 (+ LED) / con caja M12 (+LED) / con attacco M12 (+LED) / met aansluiting (+LED) 52018763



DE- Abmessungen in mm
EN- Dimensions in mm
FR- Dimensions en mm
ES- Dimensiones en mm
IT- Dimensioni in mm
NL- Afmetingen in mm

- 1.)
 Cable fixed in position:
 -25...+70 °C (-13 to +158 °F)
 - Cable flexible:
 -5...+70 °C (23 to +158 °F)
- Not for Ex nA application!

100 mm = 3. 94 in

DE- Zubehör, Ersatzteile
für Montage und Test

EN- Accessories, Spare parts
for mounting and test

FR- Accessoires,
Pièces de rechange
pour montage et test

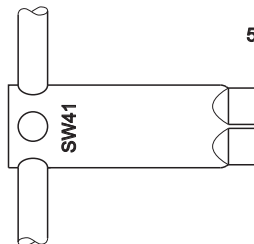
ES - Accesorios, Repuestos
para montaje y comprobación

IT - Accessori, Pezzi di ricambio
di montaggio e verifica

NL- Toebehoren,
Reserve-onderdelen
voor montage en test

Steckschlüssel SW 41 für Prozessanschluss
Socket spanner 41 AF for process connection
Clé de 41 pour raccord process
Llave de fijación SW 41 para conexión a proceso
Chiave a tubo 41 per attacco al processo
Pijpsleutel SW 41 voor procesaansluiting

52010156



52013204



Prüfmagnet
Test magnet
Aimant de contrôle
Imán de control
Magnete di prova
Testmagneet

Varianten AC- und DC-PNP mit Ventilstecker

Fehlfunktion	Ursache	Maßnahme
Grünes Licht leuchtet nicht	Keine Spannungsversorgung	Stecker, Kabel und Spannungsversorgung prüfen
Rotes Licht blinkt	Überlast oder Kurzschluss im Laststromkreis	Kurzschluss beheben Maximalen Laststrom auf unter 350 mA reduzieren
	Interner Sensorfehler oder Sensor korrodiert	Gerät austauschen

DC-PNP mit M12x1 Stecker

Fehlfunktion	Ursache	Maßnahme
Rotes Licht leuchtet (DC-PNP)	Überlast oder Kurzschluss im Laststromkreis	Kurzschluss beheben Maximalen Laststrom auf unter 250 mA reduzieren
Grünes Licht leuchtet nicht	Keine Spannungsversorgung	Stecker, Kabel und Spannungsversorgung prüfen
Rotes Licht blinkt (2 Hz)	Interner Sensorfehler oder Sensor korrodiert	Gerät austauschen

NAMUR

Fehlfunktion	Ursache	Maßnahme
Grünes Licht blinkt nicht	Keine Spannungsversorgung vom Trennschaltverstärker	Stecker, Kabel und Spannungsversorgung prüfen
Rotes Licht blinkt mit 0.3 Hz	Interner Sensorfehler oder Sensor korrodiert	Gerät austauschen

AC and DC-PNP versions with valve plug

Malfunction	Cause	Measure
Green light does not light up	No voltage supply	Check plug, cable and voltage supply
Red light flashes	Overload or short-circuit in the load-current circuit	Rectify short-circuit
		Reduce maximum load current to under 350 mA
	Internal sensor error or sensor corroded	Replace device

DC-PNP versions with M12x1 plug

Malfunction	Cause	Measure
Red light lights up (DC-PNP)	Overload or short-circuit in the load-current circuit	Rectify short-circuit
		Reduce maximum load current to under 250 mA
Green light does not light up	No voltage supply	Check plug, cable and voltage supply
Red light flashes (2 Hz)	Internal sensor error or sensor corroded	Replace device

NAMUR

Malfunction	Cause	Measure
Green light is not flashing	No voltage supply from switching amplifier	Check plug, cable and voltage supply
Red light flashes (0.3 Hz)	Internal sensor error or sensor corroded	Replace device

Variantes AC et DC-PNP avec connecteur EV

Dysfonctionnement	Cause	Mesure
Le témoin vert n'est pas allumé	Pas de tension d'alimentation	Vérifier la prise, le câble et l'alimentation en tension
Le témoin rouge clignote	Surcharge ou court-circuit dans le circuit de courant de charge	Éliminer le court-circuit
		Réduire le courant de charge maximal à moins de 350 mA
	Défaut interne de capteur ou capteur corrodé	Remplacer l'appareil

DC-PNP avec prise M12x1

Dysfonctionnement	Cause	Mesure
Le témoin rouge est allumé (DC-PNP)	Surcharge ou court-circuit dans le circuit de courant de charge	Éliminer le court-circuit
		Réduire le courant de charge maximal à moins de 250 mA
Le témoin vert n'est pas allumé	Pas de tension d'alimentation	Vérifier la prise, le câble et l'alimentation en tension
Le témoin rouge clignote (2 Hz)	Défaut interne de capteur ou capteur corrodé	Remplacer l'appareil

NAMUR

Dysfonctionnement	Cause	Mesure
Témoin vert ne clignote pas	Pas d'alimentation	Vérifier la prise, le câble et l'alimentation en tension
Le témoin rouge clignote (0.3 Hz)	Défaut interne de capteur ou capteur corrodé	Remplacer l'appareil

Variantes AC y DC-PNP con terminal de conexión

Fallo	Causa	Medidas
La luz verde no se enciende	No hay suministro de tensión	Comprobar terminales, cable y suministro de tensión
La luz roja parpadea	Sobrecarga o cortocircuito en la corriente de carga	Subsanar el cortocircuito
		Reducir la corriente de carga por debajo de 350 mA
	Error interno del sensor o sensor corroído	Sustituir el aparato

DC-PNP con terminal M12x1

Fallo	Causa	Medidas
La luz roja se enciende (DC-PNP)	Sobrecarga o cortocircuito en la corriente de carga	Subsanar el cortocircuito
		Reducir la corriente de carga por debajo de 250 mA
La luz verde no se enciende	No hay suministro de tensión	Comprobar terminales, cable y suministro de tensión
La luz roja parpadea (2 Hz)	Error interno del sensor o sensor corroído	Sustituir el aparato

NAMUR

Fallo	Causa	Medidas
La luz verde no se enciende	No hay suministro de tensión	Comprobar terminales, cable y suministro de tensión
La luz roja parpadea (0.3 Hz)	Error interno del sensor o sensor corroído	Sustituir el aparato

Varianti CA e CC-PNP con connettore valvola

Anomalia	Causa	Rimedio
La luce verde non si accende	Nessuna alimentazione	Controllare le spine, i cavi e l'alimentazione
La luce rossa lampeggia	Sovraccarico o cortocircuito nel circuito della corrente di carico	Eliminare il cortocircuito
		Ridurre la corrente di carico massimo al di sotto di 350 mA
	Guasto interno al sensore o corrosione del sensore	Sostituire lo strumento

DC-PNP con spina M12x1

Anomalia	Causa	Rimedio
La luce rossa è accesa (CC-PNP)	Sovraccarico o cortocircuito nel circuito della corrente di carico	Eliminare il cortocircuito
		Ridurre la corrente di carico massimo al di sotto di 250 mA
La luce verde non si accende	Nessuna alimentazione	Controllare le spine, i cavi e l'alimentazione
La luce rossa lampeggia (2 Hz)	Guasto interno al sensore o corrosione del sensore	Sostituire lo strumento

NAMUR

Anomalia	Causa	Rimedio
La luce verde non si accende	Nessuna alimentazione	Controllare le spine, i cavi e l'alimentazione
La luce rossa lampeggia (0.3 Hz)	Guasto interno al sensore o corrosione del sensore	Sostituire lo strumento

Varianten AC- en DC-PNP met connector

Storingsfunctie	Oorzaak	Maatregelen
Groene lampje brandt niet	Geen voedingsspanning	Steker, kabel en voedingsspanning controleren
Rode lampje knippert	Overbelasting of kortsluiting in laststroomkring	Kortsluiting opheffen Maximale belastingsstroom reduceren tot onder 350 mA
	Interne sensorstoring of sensor gecorrodeerd	Instrument vervangen

DC-PNP mit M12x1 Stecker

Storingsfunctie	Oorzaak	Maatregelen
Rode lampje gaat aan (DC-PNP)	Overbelasting of kortsluiting in laststroomkring	Kortsluiting opheffen Maximale belastingsstroom reduceren tot onder 250 mA
Groene lampje brandt niet	Geen voedingsspanning	Steker, kabel en voedingsspanning controleren
Rode lampje knippert (2 Hz)	Interne sensorstoring of sensor gecorrodeerd	Instrument vervangen

NAMUR

Storingsfunctie	Oorzaak	Maatregelen
Groene lampje knippert niet	Geen voeding van de schakelversterker	Steker, kabel en voedingsspanning controleren
Rode lampje knippert (0.3 Hz)	Interne sensorstoring of sensor gecorrodeerd	Instrument vervangen

Technische Information / Technical Information / Information technique /
Información técnica / Informazioni tecniche / Technische Informatie

TI00328F Liquiphant FTL50, FTL50H, FTL51, FTL51H

Betriebsanleitung / Operating Instruction / Mise en service /
Instrucciones de funcionamiento / Istruzioni operative / Inbedrijfstellingsvoorschrift

BA00141F FEL50A, PROFIBUS PA

Sicherheitshinweise / Notes on Safety / Conseils de sécurité /
Notas sobre seguridad / Note sulla sicurezza / Veiligheidsinstructies

XA00031F	CE Ex	II 1/2 G,	Ex d	IIC/IIB
XA00063F	CE Ex	II 1/2 G,	Ex ia/ib	IIC/IIB
XA00064F	CE Ex	II 1 G,	Ex ia	IIC/IIB
XA00154F	CE Ex	II 1/2 G/D,	Ex ia/ib	IIC/IIB
XA00159F	CE Ex	II 1 G,	Ex ia	IIC/IIB

**DE- Ergänzende
Dokumentation**

**EN- Supplementary
Documentation**

**FR- Documentation
complémentaire**

**ES - Documentación
adicional**

**IT - Documentazione
supplementare**

**NL- Aanvullende
documentatie**



71310296

www.endress.com/worldwide

Technical Information

Liquiphant M

FTL50, FTL51, FTL50H, FTL51H

Vibronic

Point level switch for all kinds of liquids



Application

- Process temperatures from $-50\text{ }^{\circ}\text{C}$ to $150\text{ }^{\circ}\text{C}$ (-58 to $302\text{ }^{\circ}\text{F}$)
- Pressures up to 100 bar (1450 psi)
- Viscosities up to $10,000\text{ mm}^2/\text{s}$ (cSt)
- For liquids with densities $\geq 0.5\text{ g/cm}^3$ (SGU)

FTL50: Compact design

FTL51: Extension pipe up to 3 m (9.8 ft) and up to 6 m (20 ft) on request

FTL50H, FTL51H: Certified for the food and pharmaceutical industries

Ideal substitute for float switches, as reliable function not affected by flow, turbulence, bubbles, foam, vibration, solids content or buildup.

Your benefits

- Recommended for safety systems requiring functional safety to SIL2/SIL3 as per IEC 61508/IEC 61511-1
- Design in accordance with ASME B31.3
- Recommended for use in sterile applications in the life science industry (design in accordance with ASME BPE)
- No adjustment: quick, low-cost startup
- No mechanically moving parts: no maintenance, no wear, long operating life
- Functional safety: Monitoring of tuning fork for damage
- Compact stainless steel housing (optional): the IP69 protection rating guarantees that the unit remains impermeable, even in the event of intensive cleaning or flooding for several hours

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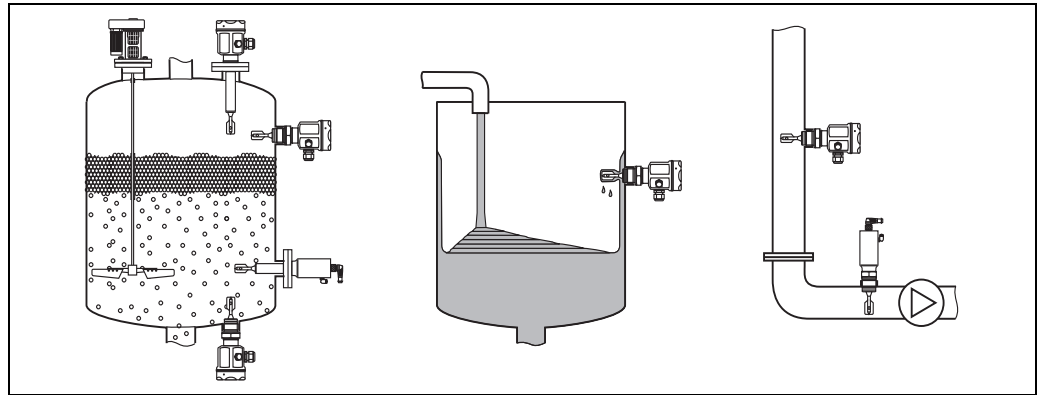
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Application

Point level detection

Maximum or minimum detection in tanks or pipes containing all kinds of liquids, including use in hazardous areas, food and pharmaceuticals.



L00-FTL5xxxx-11-05-xx-xx-000

Function and system design

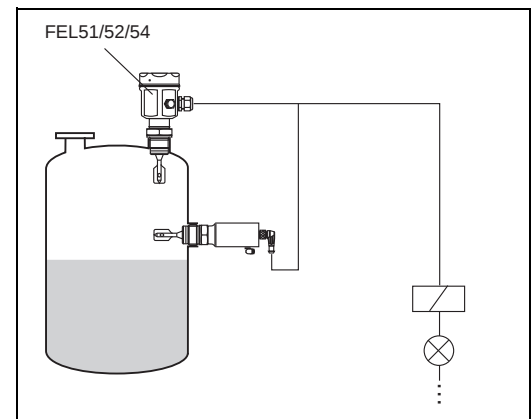
Measuring principle

The sensor's fork vibrates at its intrinsic frequency. This frequency is reduced when covered with liquid. This change in frequency causes the point level switch to switch.

Modularity

Point level switch

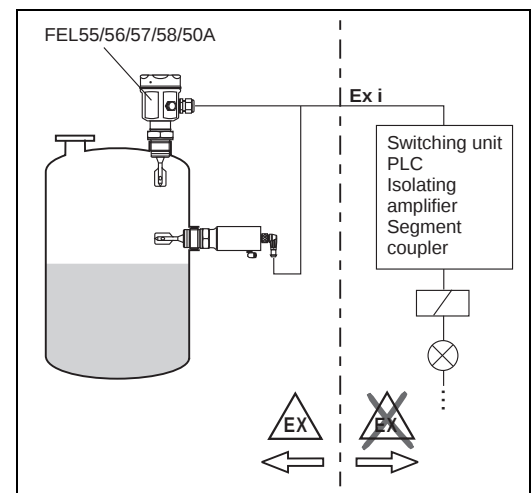
Liquiphant M FTL with electronic versions
FEL51, FEL52, FEL54



L00-FTL5xxxx-15-05-xx-xx-000

Point level switch

Liquiphant M FTL with electronic versions
FEL55, FEL56, FEL57, FEL58
for connecting to a separate switching unit
or an isolating amplifier FEL50A
for connecting to a PROFIBUS PA segment



L00-FTL5xxxx-15-05-xx-en-000

Electronic versions	FEL51: Two-wire AC version; Switches the load directly into the power supply circuit via an electronic switch. FEL52: Three-wire DC version; Switches the load via the transistor (PNP) and separate connection e.g. in conjunction with programmable logic controllers (PLCs), DI modules as per EN 61131-2. FEL54: Universal current version with relay output; Switches the loads via 2 floating change-over contacts. FEL55: Signal transmission 16/8 mA on two-wire cabling e.g. in conjunction with programmable logic controllers (PLCs), AI modules 4 to 20 mA as per EN 61131-2. FEL56: For separate switching unit; signal transmission L-H edge 0.6 to 1.0 / 2.2 to 2.8 mA to EN 50227 (NAMUR) on two-wire cabling. FEL58: For separate switching unit; signal transmission H-L edge 2.2 to 3.5 / 0.6 to 1.0 mA to EN 50227 (NAMUR) on two-wire cabling. Checking of connecting cabling and other devices by pressing a key on the electronic insert. FEL57: For separate switching unit; PFM signal transmission; Current pulses superposed on the power supply along the two-wire cabling. Proof test from the switching unit without changing levels. FEL50A: For connecting to PROFIBUS PA; Cyclic and acyclic data exchange acc. to PROFIBUS-PA Profile 3.0 Discrete Input
----------------------------	--

Electronics for continuous density measurement	FEL50D: For connecting to Density Computer FML621
---	--

Galvanic isolation	FEL51, FEL52, FEL50A: between sensor and power supply FEL54: between sensor and power supply and load FEL55, FEL56, FEL57, FEL58, FEL50D: see connected switching unit
---------------------------	---

Design	FTL50: Compact FTL51: With extension pipe FTL50H: Compact, with polished tuning fork and hygienic process connections FTL51H: With extension pipe, polished tuning fork and hygienic process connections
---------------	--

Input

Measured variable	Level (limit value)
Measuring range (detection range)	FTL50: dependent on mounting point FTL51: dependent on mounting point and the extension pipe ordered. Standard extension pipe up to 3 m (9.8 ft) and up to 6 m (20 ft) on request.
Density	Setting on the electronic insert > 0.5 g/cm ³ (SGU) or > 0.7 g/cm ³ (SGU) (others on request)

Electronic insert FEL51 (AC 2-wire)

Power supply

Supply voltage: AC 19 to 253 V
 Power consumption: < 0.83 W
 Residual current consumption: < 3.8 mA
 Short-circuit protection
 Overvoltage protection FEL51: overvoltage category III

Electrical connection

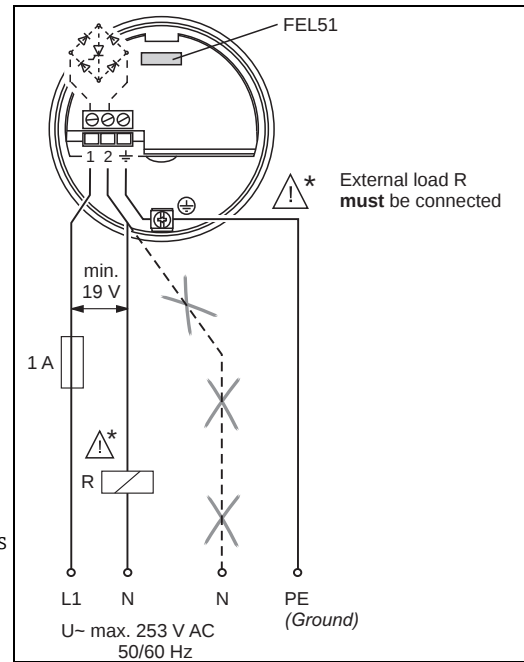
Two-wire AC connection

Switches the load directly into the power supply circuit via an electronic switch.

Always connect in series with a load!

Check the following:

- The residual current in blocked state (up to 3.8 mA)
- That for low voltage
 - the voltage drop across the load is such that the minimum terminal voltage at the electronic insert (19 V) when blocked is not undershot.
 - the voltage drop across the electronics when switched through is observed (up to 12 V)
- That a relay cannot de-energize with holding power below 3.8 mA.
 If this is the case, a resistor should be connected parallel to the relay. An RC module is available under the part number: 71107226
- When selecting the relay, pay attention to the holding power / rated power (see "Connectable load")



L00-FTL5xxxx-04-05-xx-en-007

Output signal

I_L = load current (switched through)

< 3.8 mA = residual current (blocked)



= lit



= unlit

L00-FTL2xxxx-07-05-xx-xx-000

Safety mode	Level	Output signal	LEDs green	LEDs red
MAX		1 $\xrightarrow{I_L}$ 2		
		1 $\xrightarrow{< 3.8 \text{ mA}}$ 2		
MIN		1 $\xrightarrow{I_L}$ 2		
		1 $\xrightarrow{< 3.8 \text{ mA}}$ 2		

L00-FTL5xxxx-04-05-xx-xx-003

Signal on alarm

Output signal on power failure or in the event of damaged sensor: < 3.8 mA

Connectable load

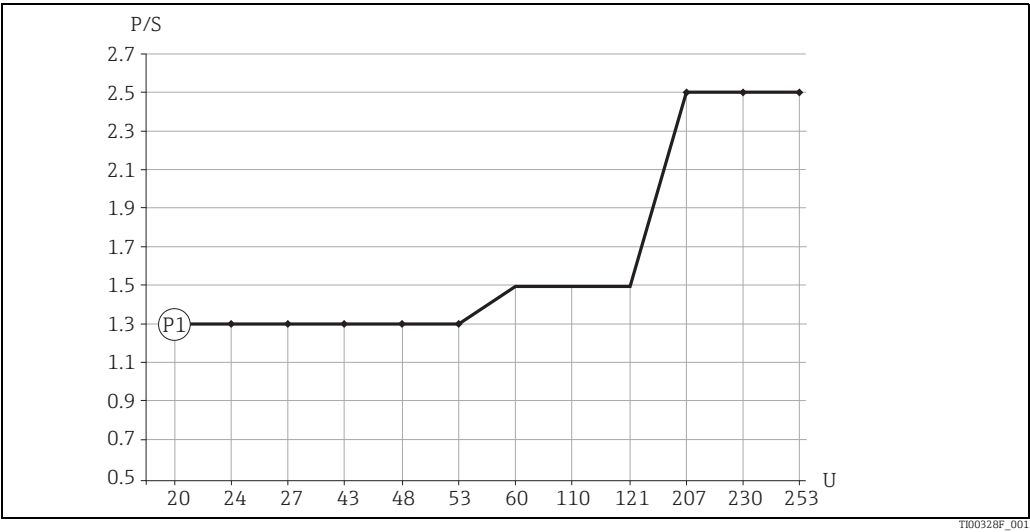
- Voltage drop via FEL51 $\leq 12 \text{ V}$
- Residual current if electrical switch is blocked: $\leq 3.8 \text{ mA}$
- Load switched directly into the power supply circuit via the thyristor.
 Transient (40 ms) $\leq 1.5 \text{ A}$, $\leq 375 \text{ VA}$ at 253 V or $\leq 36 \text{ VA}$ at 24 V (not short-circuit-proof)

The load is switched via an electronic switch directly in the power circuit.

Always connect in series with a load!

Not suitable for connection to low-voltage PLC inputs!

Selection guide for relays



Minimum nominal power of load
P/S nominal power in [W] / [VA]
U operating voltage in [V]

Position	Operating voltage	Nominal power	
		min.	max.
P1 AC operation	24 V	> 1.3 VA	< 8.4 VA
	110 V	> 1.5 VA	< 38.5 VA
	230 V	> 2.5 VA	< 80.5 VA

Relays with less nominal power can be operated via an RC module connected in parallel (optional).

Electronics FEL51 (AC, in compact housing)

Power supply

Supply voltage: AC 19 to 253 V
 Power consumption: < 0.83 W
 Residual current consumption: < 3.8 mA
 Short-circuit protection
 Overvoltage protection FEL51: overvoltage category III

Electrical connection

Two-wire AC connection

	Connector	MAX	MIN
Switches the load directly into the power supply circuit via an electronic switch. Always connect in series with a load! Check the following: ■ The residual current in blocked state (up to 3.8 mA) ■ That for low connection voltage – the voltage drop across the load is such that the minimum terminal voltage at the electronic insert (19 V) when blocked is not undershot. – the voltage drop across the electronics when switched through is observed (up to 12 V)	FTL5#(H)- #####C3#		
	FTL5#(H)- #####D3# (Pg11) oder FTL5#(H)- #####E3# (NPT 1/2") -30°C ≤ TA ≤ +70°C -22° F ≤ TA ≤ +158°F		

L00-FTL5xxxx-04-05-xx-xx-012

■ That a relay cannot de-energize with holding power below 3.8 mA.
 If this is the case, a resistor should be connected parallel to the relay (e.g. RC module: part number 71107226).

■ When using in conjunction with a cable end (FTL5#(H)- #####C3#), the compact housing should only be used in enclosed areas.

Output signal

	Safety mode	Level	Output signal	LEDs	
				green	red
I_L = load current (switched through) < 3.8 mA = residual current (blocked)	MAX		$1 \xrightarrow{I_L} 3$		
			$1 \xrightarrow{< 3.8 \text{ mA}} 3$		
= lit = unlit	MIN		$1 \xrightarrow{I_L} 2$		
			$1 \xrightarrow{< 3.8 \text{ mA}} 2$		

L00-FTL5xxxx-04-05-xx-xx-001

Signal on alarm

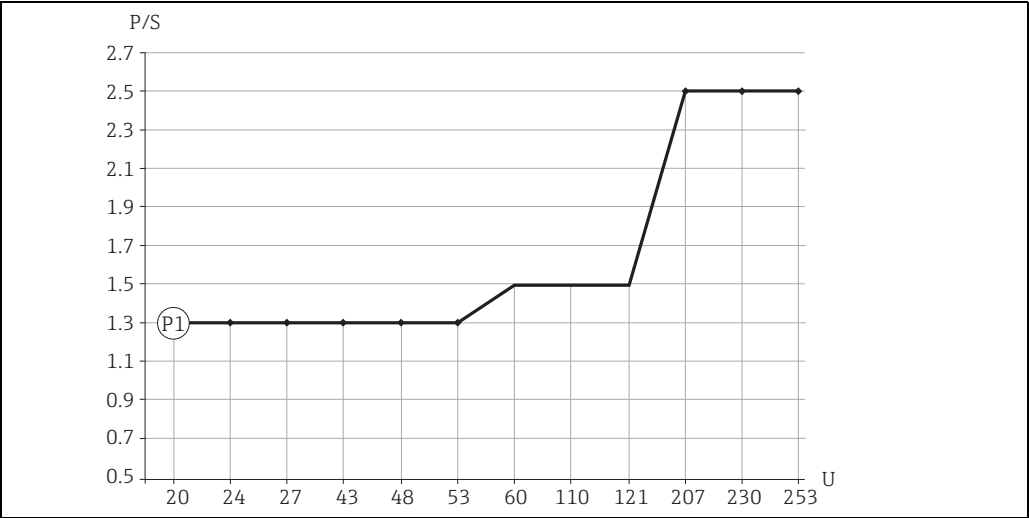
Output signal on power failure or in the event of damaged sensor: < 3.8 mA

Connectable load

- Voltage drop via FEL51 $\leq 12\text{ V}$
- Residual current if electrical switch is blocked: $\leq 3.8\text{ mA}$
- Load switched directly into the power supply circuit via the thyristor.
Transient (40 ms) $\leq 1.5\text{ A}$, $\leq 375\text{ VA}$ at 253 V or $\leq 36\text{ VA}$ at 24 V (not short-circuit-proof)

The load is switched via an electronic switch directly in the power circuit.
Always connect in series with a load!
Not suitable for connection to low-voltage PLC inputs!

Selection guide for relays



Minimum nominal power of load
P/S nominal power in [W] / [VA]
U operating voltage in [V]

Position	Operating voltage	Nominal power	
		min.	max.
P1 AC operation	24 V	> 1.3 VA	< 8.4 VA
	110 V	> 1.5 VA	< 38.5 VA
	230 V	> 2.5 VA	< 80.5 VA

Relays with less nominal power can be operated via an RC module connected in parallel (optional).

Electronic insert FEL52 (DC PNP)

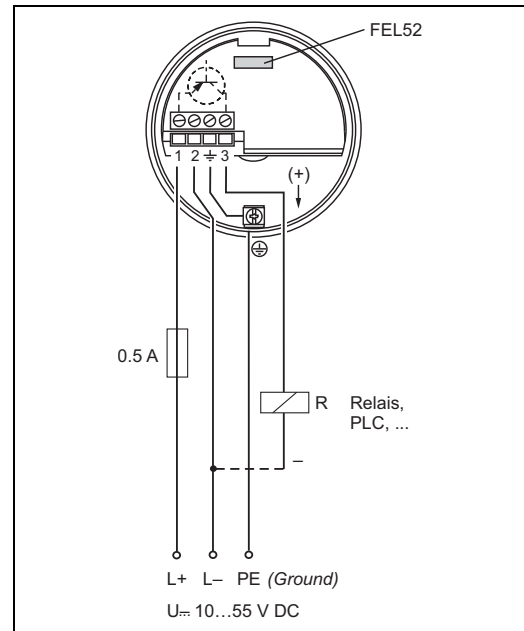
Power supply

Supply voltage: DC 10 to 55 V
 Ripple: ≤ 1.7 V, 0 to 400 Hz
 Current consumption: ≤ 15 mA
 Power consumption: ≤ 0.83 W
 Reverse polarity protection
 Overvoltage protection FEL52: overvoltage category III

Electrical connection

Three-wire DC connection

Switches the load via the transistor (PNP) and separate connection.
 Preferably used with programmable logic controllers (PLC),
 DI modules as per EN 61131-2.
 Positive signal at switching output of the electronics (PNP); Output blocked on reaching point level.



L00-FTL5xxxx-04-05-xx-xx-030

Output signal

I_L = load current
(switched through)

$< 100 \mu\text{A}$ = residual current
(blocked)



= lit



= unlit

L00-FTL2xxxx-07-05-xx-xx-000

Safety mode	Level	Output signal	LEDs green	red
MAX		$L+ \xrightarrow{I_L} +$ 1 → 3		
		$< 100 \mu\text{A}$ 1 ---→ 3		
MIN		$L+ \xrightarrow{I_L} +$ 1 → 3		
		$< 100 \mu\text{A}$ 1 ---→ 3		

L00-FTL5xxxx-04-05-xx-xx-004

Signal on alarm

Output signal on power failure or in the event of damaged sensor: $< 100 \mu\text{A}$

Connectable load

- Load switched via the transistor and separate PNP connection, $\leq$ DC 55 V
- Load current ≤ 350 mA (pulsed overload and short-circuit protection)
- Residual current $< 100 \mu\text{A}$ (with transistor blocked).
- Capacitance load $\leq 0.5 \mu\text{F}$ at 55 V, $\leq 1.0 \mu\text{F}$ at 24 V
- Residual voltage < 3 V (with transistor switched through);

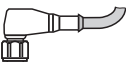
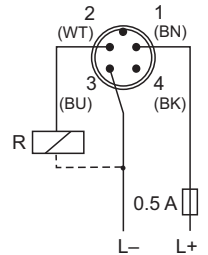
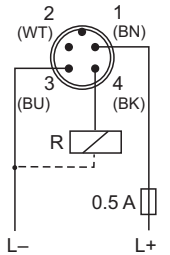
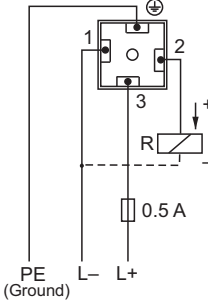
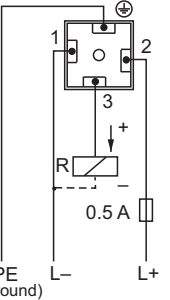
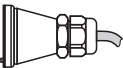
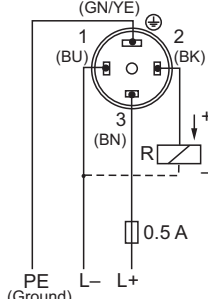
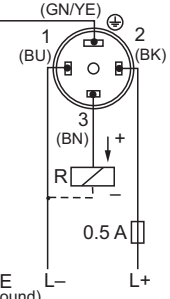
Electronics FEL52 (DC PNP, in compact housing)

Power supply

Supply voltage: DC 10 to 55 V
 Ripple: ≤ 1.7 V, 0 to 400 Hz
 Current consumption: ≤ 15 mA
 Power consumption: ≤ 0.83 W
 Reverse polarity protection
 Overvoltage protection FEL52: overvoltage category III

Electrical connection

Three-wire DC connection

	Connector	MAX	MIN
Preferably used with programmable logic controllers (PLC), DI module as per EN 61131-2. Positive signal at switching output of the electronics (PNP); Output blocked on reaching point level. Note! When using in conjunction with a cable end (FTL5#(H)-#####C3#), the compact housing should only be used in enclosed areas.	FTL5#(H)- #####N3# (M12x1) 52018763  FTL5#(H)- #####N3# (M12x1) 52010285 / 52024216 		
	FTL5#(H)- #####D3# (Pg11) oder FTL5#(H)- #####E3# (NPT 1/2")  -30°C $\leq$ TA $\leq$ +70°C -22°C $\leq$ TA $\leq$ +158°C		
	FTL5#(H)- #####C3# 		

L00-FTL5xxxx-04-05-xx-xx-014

Output signal

With valve connector or cable tail

I_L = load current
(switched through)

$< 100 \mu\text{A}$ = residual current
(blocked)



= lit



= unlit

L00-FTL2xxxx-07-05-xx-xx-000

Safety mode	Level	Output signal	LEDs	
			green	red
MAX		$L^+ \xrightarrow{I_L} 2$ 3		
		$L^+ \xrightarrow{< 100 \mu\text{A}} 2$ 3		
MIN		$L^+ \xrightarrow{I_L} 3$ 2		
		$L^+ \xrightarrow{< 100 \mu\text{A}} 3$ 2		

L00-FTL5xxxx-04-05-xx-xx-004

With M12x1 connector 52010285 / 52024216 (without LEDs)L00-FTL5xxxx-16-05-
xx-xx-002
 I_L = load current
(switched through)

 $< 100 \mu A$ = residual current
(blocked)


= lit

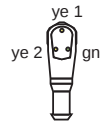


= unlit

L00-FTL2xxxx-07-05-
xx-xx-000

Safety mode	Level	Output signal	LEDs
MAX		$L^+ \xrightarrow{I_L} -$ 1 2	
		$L^+ < 100 \mu A \xrightarrow{-} -$ 1 2	
MIN		$L^+ \xrightarrow{I_L} -$ 1 4	
		$L^+ < 100 \mu A \xrightarrow{-} -$ 1 4	

L00-FTL5xxxx-04-05-xx-xx-010

With M12x1 connector 52018763 (with LEDs)L00-FTL5xxxx-16-05-
xx-xx-001
 I_L = load current
(switched through)

 $< 100 \mu A$ = residual current
(blocked)


= lit



= unlit

L00-FTL2xxxx-07-05-
xx-xx-000

Safety mode	Level	Output signal	LEDs
MAX		$L^+ \xrightarrow{I_L} -$ 1 2	
		$L^+ < 100 \mu A \xrightarrow{-} -$ 1 2	
MIN		$L^+ \xrightarrow{I_L} -$ 1 4	
		$L^+ < 100 \mu A \xrightarrow{-} -$ 1 4	

L00-FTL5xxxx-04-05-xx-xx-011

Signal on alarmOutput signal on power failure or in the event of damaged sensor: $< 100 \mu A$ **Connectable load**

- Load switched via the transistor and separate PNP connection, $\leq DC 55 V$
- Load current $\leq 350 mA$ (pulsed overload and short-circuit protection)
- Residual current $< 100 \mu A$ (with transistor blocked).
- Capacitance load $\leq 0.5 \mu F$ at $55 V$, $\leq 1.0 \mu F$ at $24 V$
- Residual voltage $< 3 V$ (with transistor switched through);

Electronic insert FEL54 (AC/DC with relay output)

Power supply	Supply voltage: AC 19 to 253 V, 50/60 Hz or DC 19 to 55 V Power consumption: ≤ 1.3 W Reverse polarity protection Overvoltage protection FEL54: overvoltage category III																							
Electrical connection	Universal current connection with relay output Power supply: Please note the different voltage ranges for AC and DC. AC. Output: When connecting an instrument with high inductance, provide a spark arrester to protect the relay contact. A fine-wire fuse (depending on the load connected) protects the relay contact on short-circuiting. Both relay contacts switch simultaneously. * When jumpered, the relay output works with NPN logic. ** See "Connectable load"																							
Output signal	= relay energized = relay de-energized = lit = unlit L00-FTL2xxxx-07-05-xx-xx-001 <table> <tr> <th>Safety mode</th><th>Level</th><th>Output signal</th><th>LEDs green</th><th>red</th></tr> <tr> <td rowspan="2">MAX</td><td></td><td></td><td></td><td></td></tr> <tr> <td></td><td></td><td></td><td></td></tr> <tr> <td rowspan="2">MIN</td><td></td><td></td><td></td><td></td></tr> <tr> <td></td><td></td><td></td><td></td></tr> </table> L00-FTL5xxxx-04-05-xx-xx-003	Safety mode	Level	Output signal	LEDs green	red	MAX									MIN								
Safety mode	Level	Output signal	LEDs green	red																				
MAX																								
MIN																								
Signal on alarm	Output signal on power failure or in the event of damaged sensor: relay de-energized																							
Connectable load	- Loads switched via 2 floating change-over contacts (DPDT). $I_{\sim} \leq 6\text{ A}$ (Ex de 4 A), $U_{\sim} \leq \text{AC } 253\text{ V}$; $P_{\sim} \leq 1500\text{ VA}$, $\cos \varphi = 1$, $P_{\sim} \leq 750\text{ VA}$, $\cos \varphi > 0.7$ $I_{=}$ ≤ 6 A (Ex de 4 A) to DC 30 V , $I_{=}$ ≤ 0.2 A to 125 V - When connecting a low-voltage circuit with double insulation according to IEC 1010, the following applies: the sum of the voltages of the relay output and power supply is ≤ 300 V - The electronic insert FEL52 DC-PNP is preferred for low DC load currents (e.g. when connecting to a PLC) - Relay contact material: silver/nickel AgNi 90/10																							

Electronic insert FEL55 (8/16 mA)

Power supply

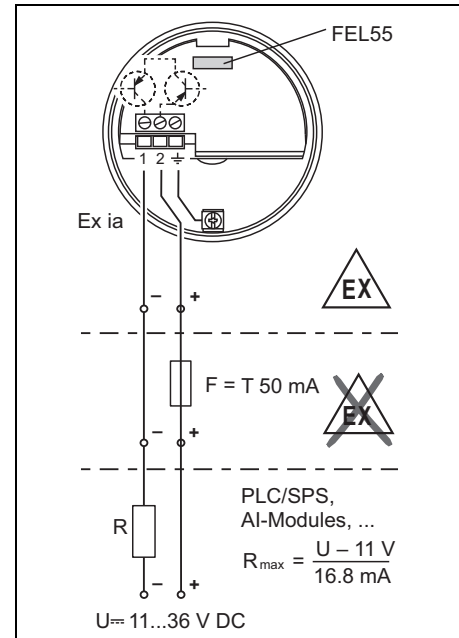
Supply voltage: DC 11 to 36 V
 Power consumption: < 600 mW
 Reverse polarity protection
 Overvoltage protection FEL55: overvoltage category III

Electrical connection

Two-wire connection for separate switching unit

For separate switching unit.
 Signal transmission 16/8 mA on two-wire cabling.
 For connection to programmable logic controllers (PLC) for example, AI modules 4 to 20 mA to EN 61131-2.
 Output signal jump from high to low current on point level.

Fuse required for non-Ex applications!
 Only use power units with safe galvanic isolation (e.g. SELV).



L00-FTL5xxxx-04-05-xx-en-000

Output signal

$$\sim 16 \text{ mA} = 16 \text{ mA} \pm 5 \%$$

$$\sim 8 \text{ mA} = 8 \text{ mA} \pm 6 \%$$



= lit



= unlit

L00-FTL2xxxx-07-05-xx-xx-000

Safety mode	Level	Output signal	LEDs	
			green	red
MAX		+ 2 $\xrightarrow{\sim 16 \text{ mA}}$ 1		
		+ 2 $\xrightarrow{\sim 8 \text{ mA}}$ 1		
MIN		+ 2 $\xrightarrow{\sim 16 \text{ mA}}$ 1		
		+ 2 $\xrightarrow{\sim 8 \text{ mA}}$ 1		

L00-FTL5xxxx-04-05-xx-xx-000

Signal on alarm

Output signal on power failure or in the event of damaged sensor: < 3.6 mA

Connectable load

- $R = (U - 11 \text{ V}) : 16.8 \text{ mA}$
- U = connection voltage: DC 11 to 36 V (in wet environments DC 11 to 35 V)

Example: PLC with 250 Ω with 2-wire version

$$250 \Omega = (U - 11 \text{ V}) / 16.8 \text{ mA}$$

$$4.2 [\Omega / \text{A}] = U - 11 \text{ V}$$

$$U = 15.2 \text{ V}$$

Electronic insert FEL56 (NAMUR L-H edge)

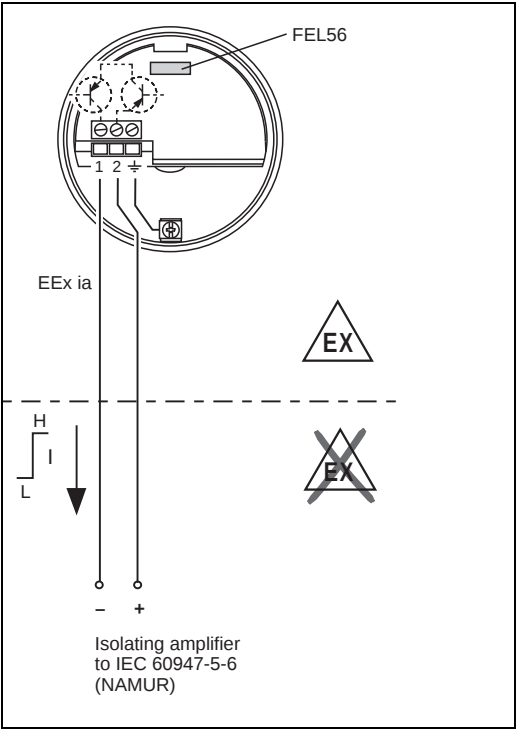
Power supply	Supply voltage: DC 8.2 V $\pm$ 20 % Power consumption: < 6 mW at I < 1 mA; < 38 mW at I = 2.8 mA Connection data interface: IEC 60947-5-6
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Electrical connection	Two-wire connection for separate switching unit
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For connecting to isolating amplifiers acc. to NAMUR (IEC 60947-5-6), e.g. FTL325N, FTL375N from Endress+Hauser.
Output signal jump from low to high current on point level.

(L-H edge)

Connecting to multiplexer:
Set clock time to min. 2 s.



L00-FTL5xxxx-04-05-xx-en-004

Output signal

 = lit
 = flashes
 = unlit

L00-FTL5xxxx-07-05-xx-xx-002

Safety mode	Level	Output signal	LEDs	
			green	red
MAX		$\begin{matrix} + & 0.6 \dots & 1.0 \text{ mA} \\ 2 & \xrightarrow{\hspace{1cm}} & 1 \end{matrix}$		
		$\begin{matrix} + & 2.2 \dots & 2.8 \text{ mA} \\ 2 & \xrightarrow{\hspace{1cm}} & 1 \end{matrix}$		
MIN		$\begin{matrix} + & 0.6 \dots & 1.0 \text{ mA} \\ 2 & \xrightarrow{\hspace{1cm}} & 1 \end{matrix}$		
		$\begin{matrix} + & 2.2 \dots & 2.8 \text{ mA} \\ 2 & \xrightarrow{\hspace{1cm}} & 1 \end{matrix}$		

L00-FTL5xxxx-04-05-xx-xx-003

Signal on alarm	Output signal in the event of damaged sensor: > 2.2 mA
-----------------	--

Connectable load	■ See Technical Data of the isolating amplifier connected according to IEC 60947-5-6 (NAMUR)
------------------	--

Electronic insert FEL58 (NAMUR H-L edge)

Power supply

Supply voltage: DC 8.2 V $\pm$ 20 %
 Power consumption: < 6 mW at I < 1 mA; < 38 mW at I = 3.5 mA
 Connection data interface: IEC 60947-5-6

Electrical connection

Two-wire connection for separate switching unit

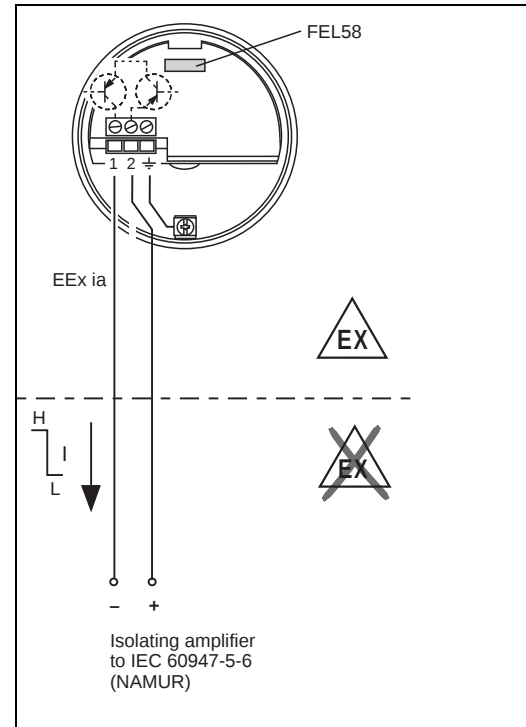
For connecting to isolating amplifiers as per NAMUR (IEC 60947-5-6), e.g. FTL325N, FTL375N from Endress+Hauser.
 Output signal jump from high to low current on point level.

(H-L edge)

Additional function:
 Test key on the electronic insert.
 Pressing the key breaks the connection to the isolating amplifier.

 **Note!**
 In Ex-d applications, the additional function can only be used if the housing is not exposed to an explosive atmosphere.

Connecting to multiplexer:
 Set clock time to min. 2 s.

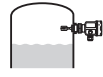
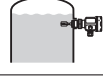
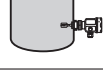


L00-FTL5xxxx-04-05-xx-en-002

Output signal

 = lit
 = flashes
 = unlit

L00-FTL5xxxx-07-05-xx-xx-002

Safety mode	Level	Output signal	LEDs green yellow
MAX		+ 2.2 ... 3.5 mA 2 → 1	 
		+ 0.6 ... 1.0 mA 2 → 1	 
MIN		+ 2.2 ... 3.5 mA 2 → 1	 
		+ 0.6 ... 1.0 mA 2 → 1	 

L00-FTL5xxxx-04-05-xx-xx-007

Signal on alarm

Output signal in the event of damaged sensor: < 1.0 mA

Connectable load

- See Technical Data of the isolating amplifier connected according to IEC 60947-5-6 (NAMUR)
- Connection also to isolating amplifiers which have special safety circuits (I > 3.0 mA)

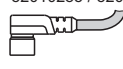
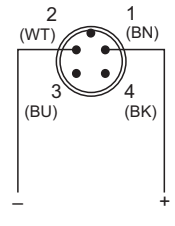
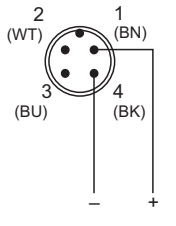
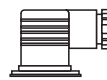
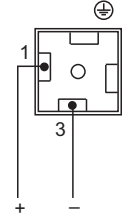
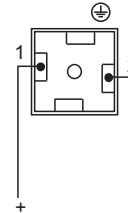
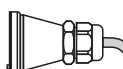
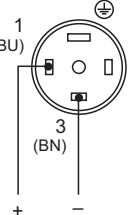
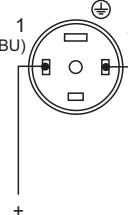
Electronics FEL58 (NAMUR H-L edge, compact housing)

Power supply

Supply voltage: DC 8.2 V $\pm$ 20 %
 Power consumption: < 6 mW at I < 1 mA; < 38 mW at I = 3.5 mA
 Connection data interface: IEC 60947-5-6

Electrical connection

Two-wire connection for separate switching unit

	Connector	MAX	MIN
For connecting to isolating amplifiers acc. to NAMUR (IEC 60947-5-6), e.g. FTL325N, FTL375N from Endress+Hauser. Output signal jump from high to low current on point level. (H-L edge) Additional function: If the test magnet is held against the marking on the nameplate, the output signal is inverted. Connecting to multiplexer: Set clock time to min. 3 s. The NAMUR interface has a defined power consumption rate. Thus, it is not possible to use the M12 connector with an integrated LED (52018763).	FTL5#(H)- #####N3# (M12x1) 52018763  FTL5#(H)- #####N3# (M12x1) 52010285 / 52024216 		
	FTL5#(H)- #####D3# (Pg11) FTL5#(H)- #####E3# (NPT 1/2")  -30°C ≤ TA ≤ +70°C -22° F ≤ TA ≤ +158°F		
	FTL5#(H)- #####C3# 		

L00-FTL5xxxx-04-05-xx-xx-013

Output signal

Safety mode	Level	Output signal	LEDs green yellow
MAX		2.2... 3.5 mA + 1 → - 3	 
		0.6... 1.0 mA + 1 → - 3	 
MIN		2.2... 3.5 mA + 1 → - 2	 
		0.6... 1.0 mA + 1 → - 2	 

 = lit
 = flashes
 = unlit

L00-FTL5xxxx-07-05-xx-xx-002

L00-FTL5xxxx-04-05-xx-xx-007a



Note!

The light emitting diodes are not readable on the version FTL5x(H)-## ## ## #C 3# (compact IP66/68 316L with a 5 m cable).

Signal on alarm

Output signal in the event of damaged sensor: < 1.0 mA

Connectable load

- See Technical Data of the isolating amplifier according to IEC 60947-5-6 (NAMUR)
- Connection also to isolating amplifiers which have special safety circuits (I > 3.0 mA)

Electronic insert FEL57 (PFM)

Power supply

Supply voltage: DC 9.5 to 12.5 V
 Current consumption: 10 to 13 mA
 Power consumption: < 150 mW
 Reverse polarity protection

Electrical connection

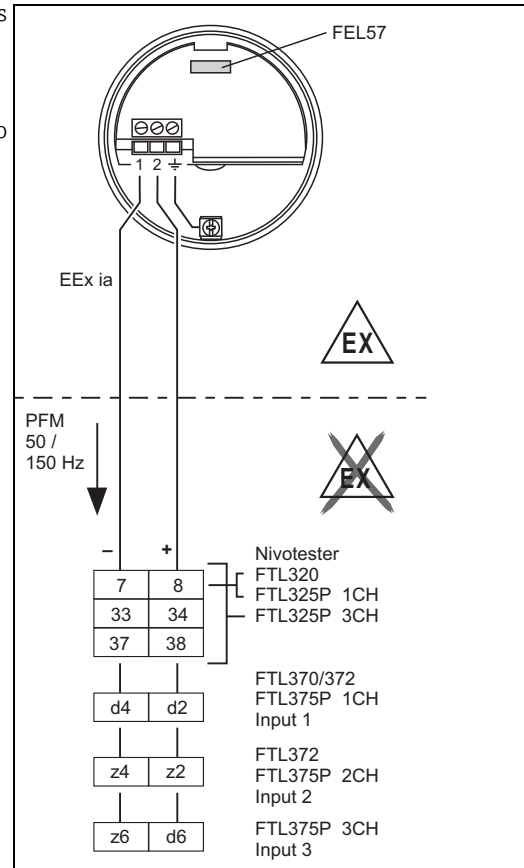
Two-wire connection for separate switching unit

For connecting to Endress+Hauser switching units Nivotester FTL320, FTL325P, FTL370, FTL372, FTL375P (also with proof test).

Output signal jump of the PFM signal from high to low frequency when sensor is covered. Switching between minimum/maximum safety in the Nivotester.

Additional function "proof test":
 After interruption of the power supply, a test cycle is activated which checks the sensor and electronics without any change in level.
 Approved for overfill protection acc. to WHG (German Water Resources Act).
 The following can be switched at the electronic insert:

- **Standard (STD):**
 Corrosion of the fork unlikely;
 simulation approx. 8 s
 tuning fork exposed – covered – exposed.
 For proof testing, the Nivotester tests the sensor's level notification function.
- **Extended (EXT):**
 Corrosion of the fork possible;
 Simulation approx. 41 s: tuning fork exposed – covered – corroded – exposed.
 For proof testing, the Nivotester tests the sensor's level notification function and fault notification (alarm) function.



L00-FTL5xxxx-04-05-xx-en-003

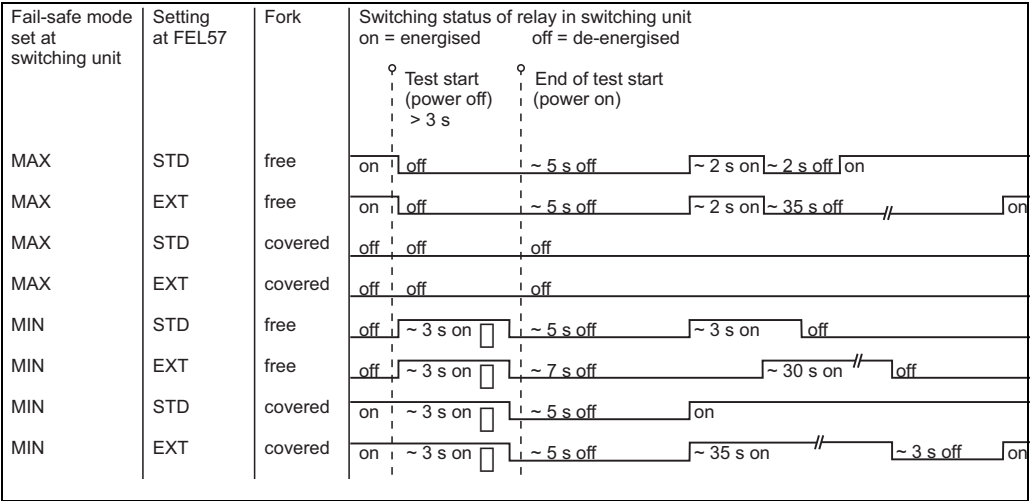
The check is activated and monitored at the switching unit.

The twin-core connecting cable (instrument cable) with a cable resistance of $\leq 25 \Omega$ per core is connected to the screw terminals (conductor cross-sections 0.5 to 2.5 mm / 0.02 to 0.1 in) in the connection compartment. Protective circuits against reverse polarity, HF influences and overvoltage peaks are installed.

Maximum cable length up to 1000 m (3281 ft).

A shielded connecting cable is recommended in the event of strong electromagnetic interference. Here the shielding must be connected to the sensor and the power supply.

Switching behavior of the connected device:

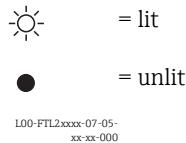


L00-FTL5xxxx-05-05-xx-en-000

* De-energized on power supply failure

Please note this switching response and function of the plant especially when replacing a Liquiphant incorporating electronic insert EL17Z or FEL37 with a Liquiphant M incorporating electronic insert FEL57.

Output signal



Safety mode	Level	Output signal (PFM)	LEDs green yellow
		150 Hz 	
		50 Hz 	

L00-FTL5xxxx-04-05-xx-xx-008

Signal on alarm

Output signal on power failure or in the event of damaged sensor: 0 Hz

Connectable load

- Floating relay contacts in the connected switching unit Nivotester FTL325P, FTL375P
- For contact load, see the Technical Data of the switching unit.

Electronic insert FEL50A (PROFIBUS PA)

Power supply

Bus voltage: DC 9 to 32 V

Bus current:

- 12.5 mA $\pm$ 1.0
mA (software version: 01.03.00, hardware version: 02.00)
- 10.5 mA $\pm$ 1.0
mA (software version: 01.03.00, hardware version: 01.00)

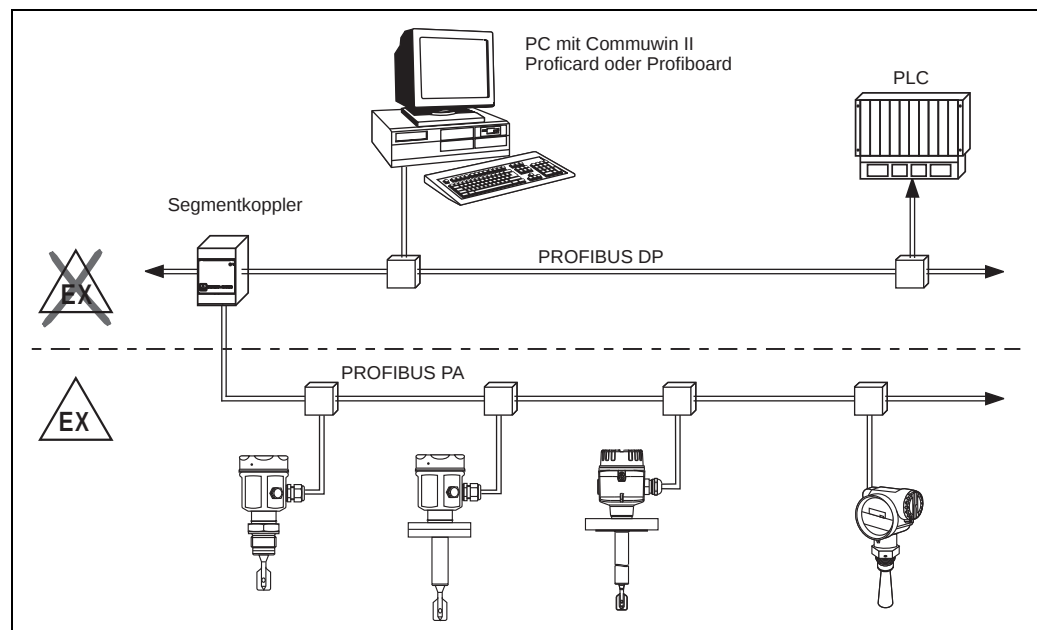
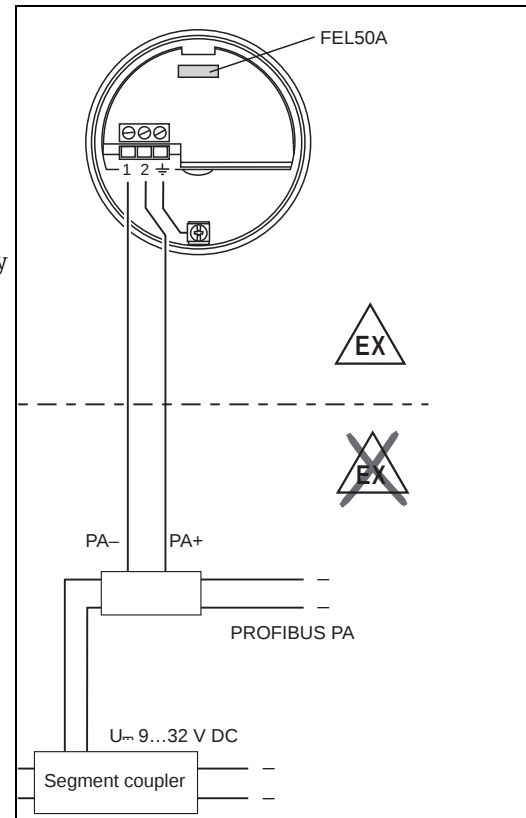
Electrical connection

Two-wire connection for power supply and data transfer

For connecting to PROFIBUS PA

Additional functions:

- Digital communication enables the representation, reading and editing of the following parameters:
Fork frequency, switch-on frequency, switch-off frequency, switch-on time and switch-off time, status, measured value, density switch.
- Matrix locking possible
- Switch to WHG mode possible (WHG approval)
- For a detailed description, see BA00198F



Output signal

 = lit

 = unlit

L00-FTL2xxxx-07-05-
xx-xx-000

Setting	Level	LEDs		FEL50A
		green	yellow	
not inverted				OUT_D = 0 PA bus signal
				OUT_D = 1 PA bus signal
inverted				OUT_D = 0 PA bus signal
				OUT_D = 1 PA bus signal

L00-FTL5xxxx-04-05-xx-xx-000

Signal on alarm

- Failure information can be opened using the following interfaces:
Yellow LED flashing, status code, diagnostic code; see BA00198F

Electronic insert FEL50D (density)

Power supply

Frequency range: 300 to 1500 Hz
 Signal level: 4 mA
 Pulse height: 16 mA
 Pulse width: 20 μ S

Electrical connection

Two-wire connection at Density Computer FML621

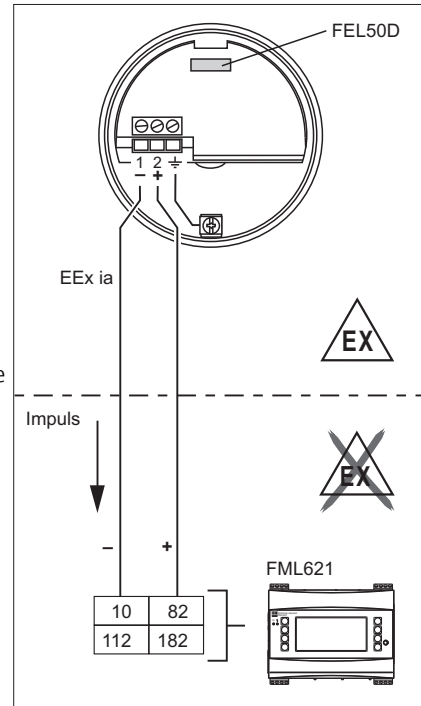
For connecting to the density and concentration computer FML621.

The output signal is based on pulse technology.
 With the aid of this signal, the fork frequency is constantly forwarded to the switching unit.



Caution!
 Operation with other switching units,
 such as FTL325P, is not permitted.

This electronic insert cannot be installed in devices that were



TI420Fen004

Signal on alarm

Output signal on power failure or in the event of damaged sensor: 0 Hz

Adjustment

In the Liquiphant M modular system, the option of an adjustment is also provided in addition to the electronics (see feature 60: "Accessories").

There are three types of adjustment:

Standard adjustment (see ordering information for additional option, basic version A)

- Here, two fork parameters are determined to describe the sensor characteristics, indicated in the adjustment report and provided with the product. These parameters must be transmitted to the Density Computer FML621.

Special adjustment (see ordering information for additional option, special adjustment, density H₂O (K) or special adjustment, density H₂O with 3.1 certificate (L))

- Here, three fork parameters are determined to describe the sensor characteristics, indicated in the adjustment report and provided with the product. These parameters must be transmitted to the Density Computer FML621. Greater accuracy is achieved with this type of adjustment (see also "Performance characteristics").

Field Adjustment

- During field adjustment, a density value actually determined by the customer is entered and the system is automatically adjusted to this value (wet adjustment).

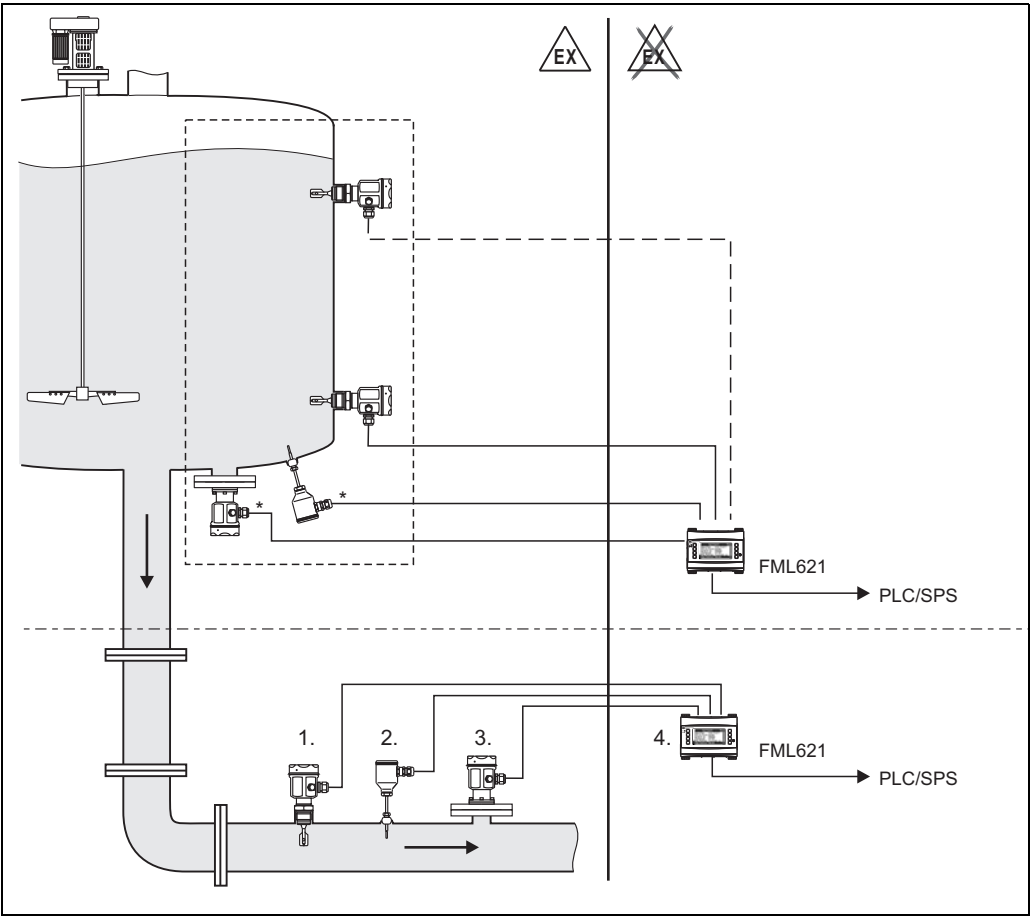


Note!

More information on Liquiphant M Density is available in Technical Information TI00420F. This can be downloaded from www.endress.com => Download.

Operating principle

Measuring the density of a liquid medium in pipes and tanks. Also suitable for use in hazardous areas, and preferably for applications in the chemical and food industry.



- * Pressure and temperature information required depending on the application.
1. Liquiphant M sensor with electronic insert FEL50D (pulse output);
 2. Temperature sensor (e.g. 4 to 20 mA output);
 3. Pressure transmitter (4 to 20 mA output);
 4. Liquiphant density and concentration computer FML621 with display and operating unit

Light signals

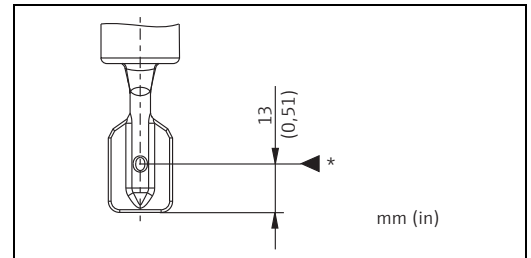
LED	Symbol	Information
Yellow		Measurement valid
		Unstable process situation
		Maintenance required
Green		Power on
		Power off
Red		No fault
		Maintenance required
		Device failure

Connection and function

Connecting cables	■ Electronic inserts: cross-section $\leq 2.5 \text{ mm}^2$ (14 AWG); strand in ferrule as per DIN 46228 ■ Protective ground in housing: cross-section $\leq 2.5 \text{ mm}^2$ (14 AWG) ■ External equipotential bonding connection on housing: cross-section $\leq 4 \text{ mm}^2$ (12 AWG)
Safety mode	Minimum/maximum residual current safety selectable on electronic insert. (with FEL57 on Nivotester only) MAX = maximum safety: The output switches to the power fail response when the fork is covered For use with overfill protection for example MIN = minimum safety: The output switches to the power fail response when the fork is exposed For use with dry running protection for example
Switching time	When fork is covered: approx. 0.5 s When fork is exposed: approx. 1.0 s Additionally configurable for PROFIBUS PA: 0.5-60 s Other switching times available on request.
Switch-on behavior	When switching on the power supply, the output assumes the alarm signal. After $\leq 3 \text{ s}$ it assumes the correct switching mode (exception: FEL57)

Performance characteristics

Reference operating conditions	Ambient temperature: 23°C (73°F) Medium temperature: 23°C (73°F) Medium density (water): 1 g/cm^3 (SGU) Medium viscosity: $1 \text{ mm}^2/\text{s}$ (cSt) Medium pressure p_e: 0 bar (0 psi) Sensor mounting: vertical from above Density switch: to $> 0.7 \text{ g/cm}^3$ (SGU)
---------------------------------------	---



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* Switch point under reference operating conditions

Maximum measured error	Under reference operating conditions: max. $\pm 1 \text{ mm}$ (0.04 in)
Repeatability	0.1 mm (0.004 in)
Hysteresis	approx. 2 mm (0.08 in)
Influence of medium temperature	max. $+1.8$ to -2.8 mm (-50 to $+150^\circ\text{C}$ / -58 to 302°F)
Influence of medium density	max. $+4.8$ to -3.5 mm (0.5 to 1.5 g/cm^3 (SGU)) max. $+0.19$ to -0.14 in
Influence of medium pressure	max. 0 to -2.5 mm (-1 to 64 bar (-14.5 to 928 psi)) max. 0 to -0.1 in

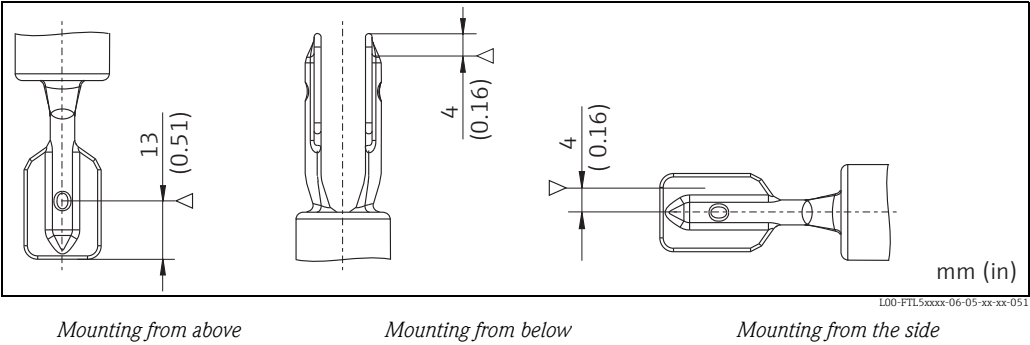
Switching delay	■ When fork is covered: 0.5 s ■ When fork is exposed: 1.0 s ■ Available on request: 0.2 s; 1.5 s or 5 s (when the tuning fork is covered or exposed)
------------------------	--

Operating conditions

Installation

Installation instructions

Switch points L_{sw} on the sensor depend on the mounting position, with reference to water, Density 1 g/cm³ (SGU), 23 °C (73 °F), p_e 0 bar (0 psi).



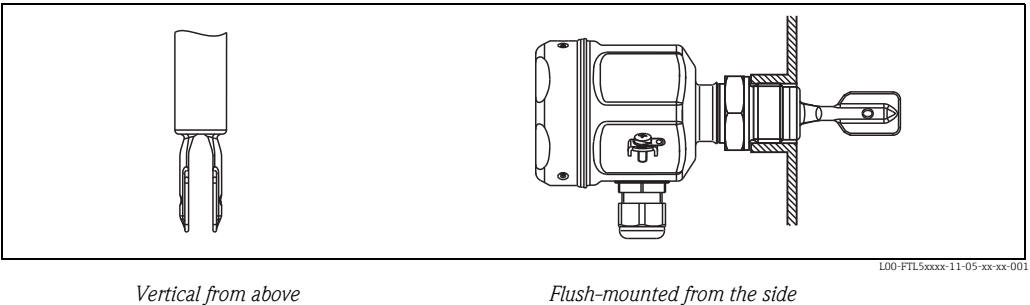
- Note!
- The switch points of the Liquiphant **M** are at other positions to those of the previous version Liquiphant **II**.
 - Minimum distance between the tip of the fork and the tank wall or pipe wall: 10 mm

Examples of mounting

Examples of mounting with regard to the viscosity ν of the liquid and the tendency to form buildup

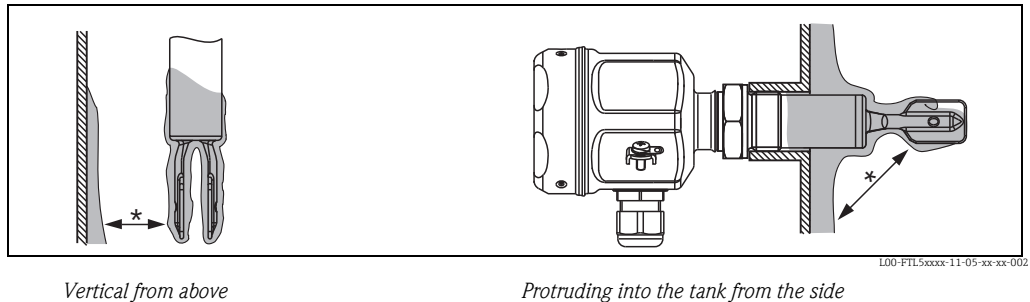
Optimum mounting, without problem even with high viscosity:

Position the fork so that the narrow edge of the tines is vertical to ensure that the liquid can run off easily.



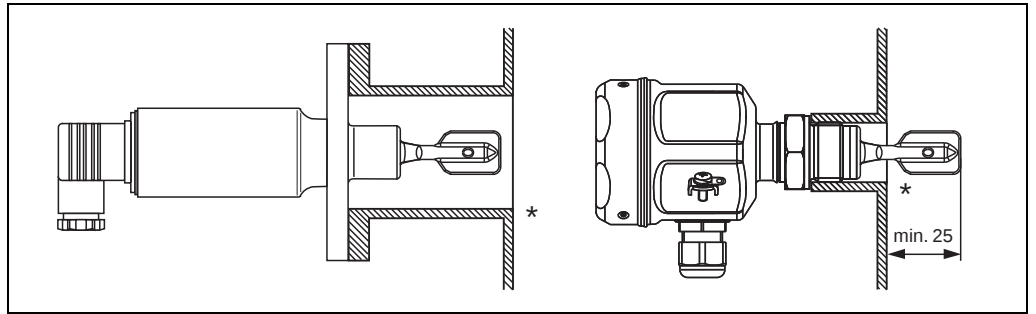
With buildup on the tank walls:

* Ensure that there is sufficient distance between the buildup expected on the tank wall and the fork.



Mounting positions in the case of low viscosity up to $2000 \text{ mm}^2/\text{s}$ (cSt):

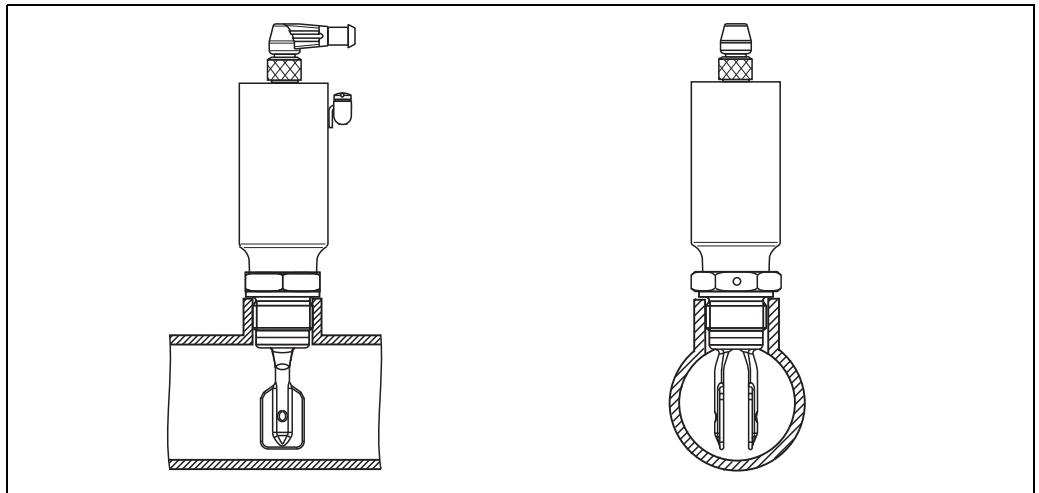
* Deburr the nozzle surfaces



L00-FTL5xxxx-11-05-xx-xx-en-003

Mounting in piping from 2"

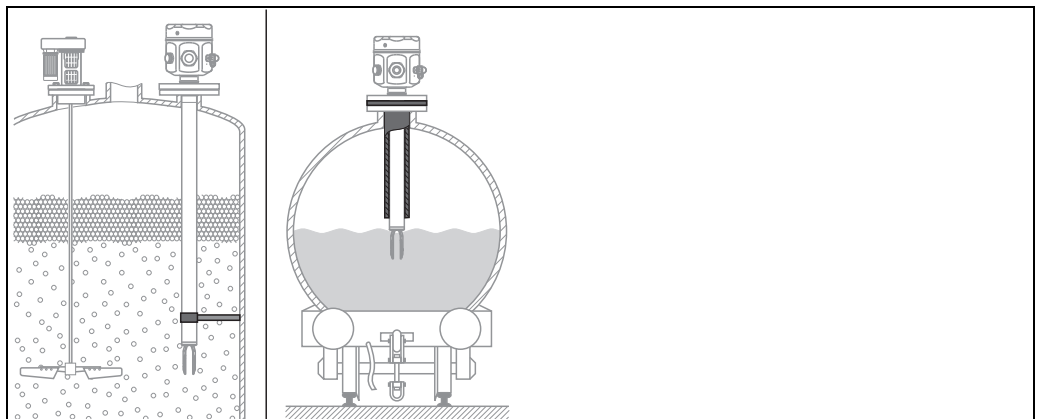
Flow velocities up to 5 m/s for viscosity of $1 \text{ mm}^2/\text{s}$ (cSt) and density 1 g/cm^3 (SGU).
(Check the function for other medium conditions.)



L00-FTL5xxxx-11-05-xx-xx-en-004

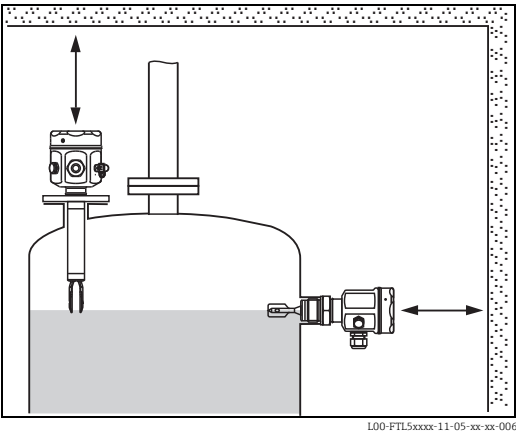
Dynamic load

Support the Liquiphant M FTL51(H) in the event of a severe dynamic load.



L00-FTL5xxxx-11-05-xx-xx-en-005

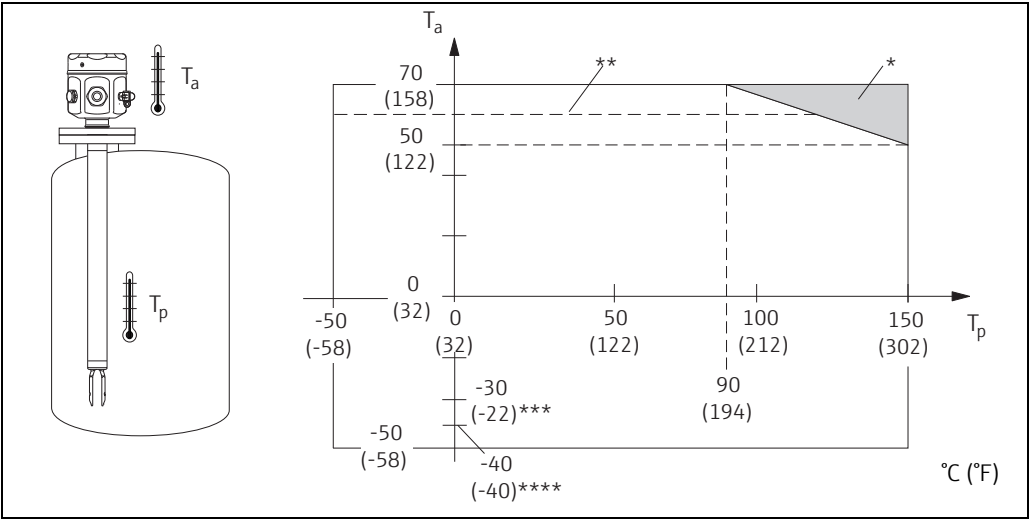
Ensure adequate space outside the tank for mounting, connection and configuration.



- Orientation**
- FTL50(H) and FTL51(H) with short pipe up to approx. 500 mm (19.7 in): any position
 - FTL51(H) with long pipe: vertical

Environment

Ambient temperature range Permitted ambient temperature T_a at the housing depending on the medium temperature T_p in the tank:



- * Additional temperature range for devices with a temperature spacer or pressure-tight feedthrough.
- ** Maximum ambient temperature with FEL50D/FEL50A in hazardous areas.
- *** The following applies for devices with a compact housing according to version D3, E3: $-30\text{ °C} \leq T_a \leq +70\text{ °C}$
- **** The following applies for the F16 housing: $-40\text{ °C} \leq T_a \leq +70\text{ °C}$

Storage temperature	-50 to +80 °C (-58 to 176 °F)
Installation height as per IEC61010-1 Ed.3	Up to 2000 m (6600 ft) above sea level. Can be extended up to 3000 m (9800 ft) above sea level if overvoltage protection is used, for example HAW562 or HAW569.
Climate class	Climate protection to IEC 68, Part 2-38, Fig. 2a

Degree of protection

Types of housing	IP65	IP66*	IP67*	IP68*	IP69	NEMA type**
Compact housing with valve connector Pg11/NPT ½	X	–	–	–	–	–
Compact housing with 5 m (16 ft) cable tail	–	X	–	X	–	–
Compact housing with M12x1 connector (52010285) 316L (metal)	–	X	–	X	–	–
Compact housing with elbowed connector (52024216) / L= 5 m (16 ft), without integrated LEDs	–	X	–	X	X	–
Compact housing with elbowed connector (52018763) / L= 5 m (16 ft), with integrated LEDs	–	X	–	X	X	–
Polyester housing F16	–	X	X	–	–	4X
Stainless steel housing F15	–	X	X	–	–	4X
Aluminum housing F17	–	X	X	–	–	4X
Aluminum housing F13****	–	X	–	X***	–	4X/6P
Stainless steel housing F27	–	X	–	X	–	4X/6P
Aluminum housing T13 with separate connection compartment (Ex d)	–	X	–	X***	–	4X/6P

* As per EN60529

** As per NEMA 250

*** only with M20 cable entry or G1/2 thread

**** F13 housing only in conjunction with XP or Ex d approval

Vibration resistance

As per IEC 68, parts 2-6 (10 to 55 Hz, 0.15 mm (0.01 in), 100 cycles)

In the event of increased vibrations, the following additional option is recommended: feature "060" version "P" 100 bar (1450 psi) process pressure.

Electromagnetic compatibility

Interference emission to EN 61326, Electrical Equipment Class B

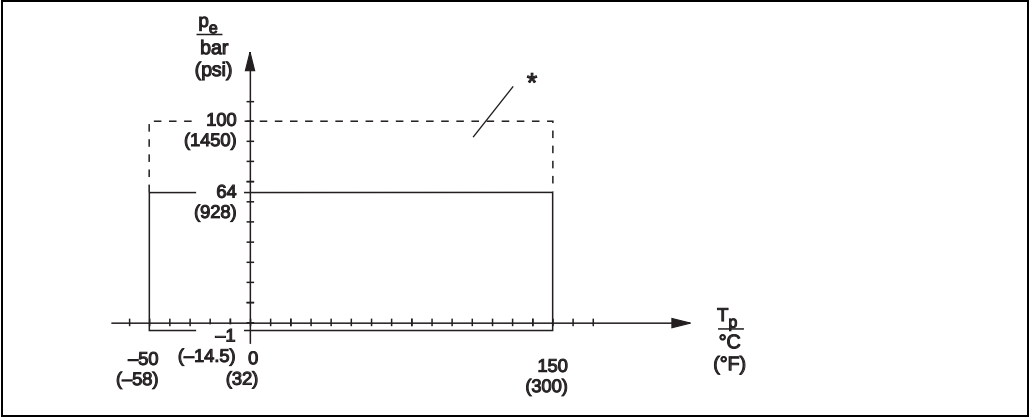
Interference immunity to EN 61326; Annex A (Industrial) and NAMUR Recommendation NE 21 (EMC)

Medium conditions

Medium temperature -50 to +150 °C (-58 to 302 °F); for exceptions, see "Process connections"

Thermal shock ≤ 120 °C/s (248 °F/s)

Medium pressure p_e



* Permitted pressure rating when the "100 bar (1450 psi)" option is selected (see "Product structure FTL51", feature 060, from → 43).
See "Process connections" → 33 for exceptions.
Canadian CRN approval: Additional details on maximum pressure values are available in the download area of the product page at "www.endress.com".

- Please refer to the standards listed for the permitted pressure values of the flanges at higher temperatures:
- pR EN 1092-1: 2005
With regard to their stability-temperature property, the materials 1.4435 and 1.4404 are identical and are grouped together in EN 1092-1 Tab. 18 under 13E0. The chemical composition of the two materials can be identical.
 - ASME B 16.5 - 2013 Tab. 2-2.2 F316
 - ASME B 16.5 - 2013 Tab. 2-3.8 N10276
 - JIS B 2220

The lowest value from the derating curves of the device and selected flange applies in each case.

Test pressure

- $p_e = 64$ bar (928 psi):
- ≤ 100 bar (1450 psi) or 1.5 times the medium pressure p_e
 - Sensor burst pressure at 200 bar (2900 psi)
- $p_e = 100$ bar (1450 psi):
- ≤ 150 bar (2175 psi) or 1.5 times the medium pressure p_e
 - Sensor burst pressure at 400 bar (5800 psi)



Note!
The device function is restricted during pressure testing.

State of aggregation Liquid

Density 0.7 g/cm³ (SGU) = delivery status
0.5 g/cm³* (SGU) can be adjusted via switches
* Density settings for the compact housing on request

Viscosity ≤ 10,000 mm²/s (cSt)

Solids content ≤ ø5 mm (0.2 in)

Lateral loading capacity ≤ 75 Nm

Mechanical construction



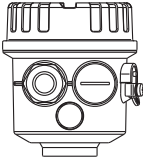
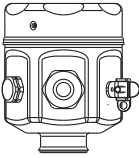
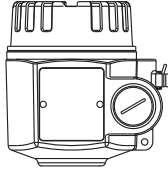
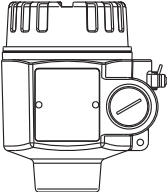
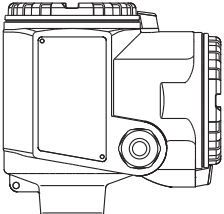
Note!

2D and 3D drawings containing individual dimensions can be generated and downloaded in the Configurator on the product pages of the Liquiphant FTL5x at www.endress.com.

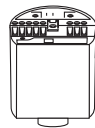
Design

Summary of all electrical and mechanical versions

Housing

					
L00-FTL5xxxx-03-05-xx-xx-019	L00-FTL5xxxx-03-05-xx-xx-001	L00-FTL5xxxx-03-05-xx-xx-002	L00-FTL5xxxx-03-05-xx-xx-031	L00-FTL5xxxx-03-05-xx-xx-033	L00-FTL5xxxx-03-05-xx-xx-004
Compact Pipe housing (316L)	F16 Polyester (PBT)	F15 Stainless steel (316L)	F17 Aluminum Housing coated	F27 Stainless steel (316L) F13 Aluminum (also for Ex d/XP), housing coated	T13 Aluminum with separate connection compartment (also Ex de and Ex d), housing coated

Plug-in electronic inserts to mount in the housing



L00-FTL5xxxx-03-05-xx-xx-000

FEL51*:	Two-wire AC connection
FEL52*:	Three-wire DC connection PNP
FEL54:	Universal current connection, 2 relay outputs
FEL55:	Output 16/8 mA for separate switching unit
FEL56:	Output 0.6 to 1.0 / 2.2 to 2.8 mA for separate switching unit (NAMUR)
FEL58*:	Output 2.2 to 3.5 / 0.6 to 1.0 mA for separate switching unit (NAMUR)
FEL57:	Output 150/50 Hz, PFM, for separate switching unit (Nivotester)
FEL50A:	Digital communication PROFIBUS PA
FEL50D:	Pulse output for Density Computer FML621

* Electronics also available as compact housing. The electronics cannot be exchanged!

If the housing is ordered with a cable gland: the cable gland is ready-mounted upon delivery. A second cable gland is included in conjunction with FEL54.

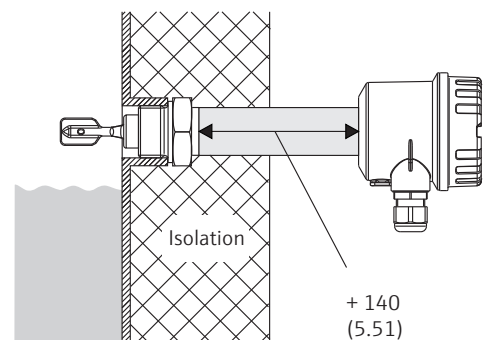
Temperature spacer and pressure-tight feedthrough

Temperature spacer (optional)

Provides sealed insulation for the vessel and normal ambient temperatures for the housing.

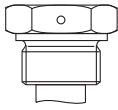
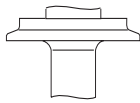
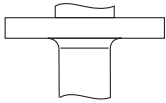
Pressure-tight feedthrough (optional)

Protects the housing from pressures up to 100 bar (1450 psi) if the sensor is damaged. Provides sealed insulation for the vessel and normal ambient temperatures for the housing.

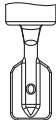
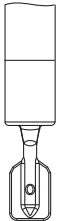


L00-FTL5xxxx-06-05-xx-xx-091

Process connections

			
L00-FTL5xxxx-03-05-xx-xx-006	L00-FTL5xxxx-03-05-xx-xx-007	L00-FTL5xxxx-03-05-xx-xx-008	L00-FTL5xxxx-03-05-xx-xx-009
G 3/4, DIN ISO 228/I R 3/4, EN10226 NPT 3/4, ASME B 1.20.1 (AF 32)	G 1, DIN ISO 228/I R 1, EN10226 NPT 1, ASME B 1.20.1 (AF 41)	Diverse hygienic and aseptic connections	Flanges as per DIN, ASME, JIS from DN 25 / 1"

Sensors

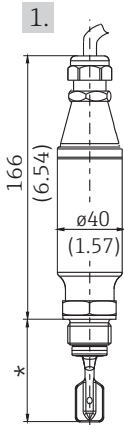
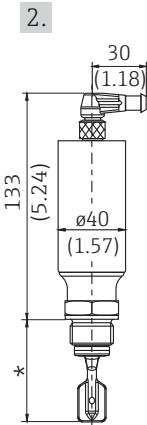
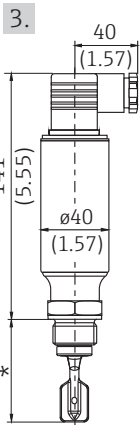
Compact, with extension pipe up to 3 m (up to 6 m on request) or special "length L II" (see → 33ff.)	Compact	Length L	Length L II
			
			L00-FTL5xxxx-03-05-xx-xx-018
p _e = bar/psi	64/928	64/928 100/1450	64/928 100/1450

Dimensions

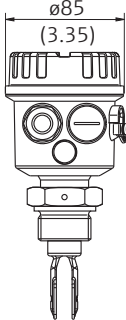
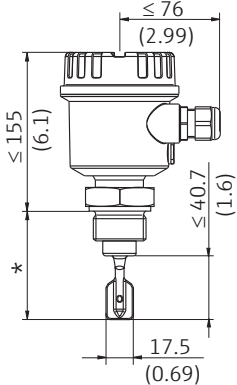
Dimensions in mm (in)!

Housing FTL50(H), FTL51(H) with sensor FTL50(H)

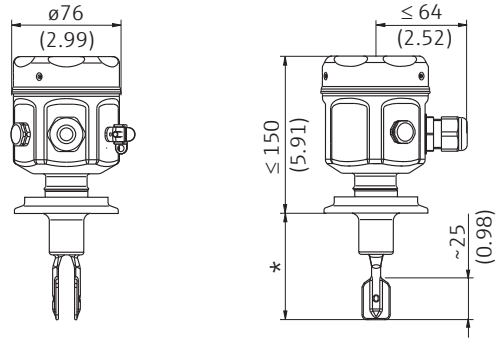
Compact housing, primarily for
hygiene applications

			
1. 5 m cable			
2. M12 connector			
3. Pg11/NPT 1/2 connector			
			L00-FTL5xxxx-06-05-xx-xx-085

Polyester housing F16

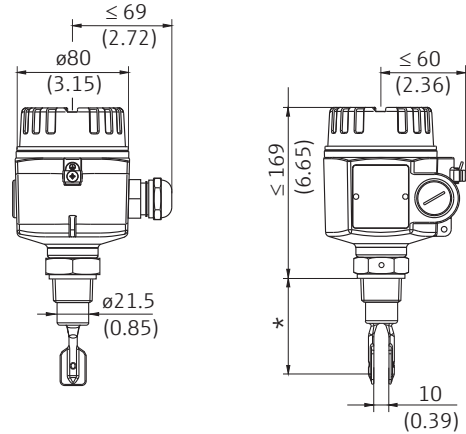
	
	L00-FTL5xxxx-06-05-xx-xx-086

F15 stainless steel housing primarily for hygiene applications



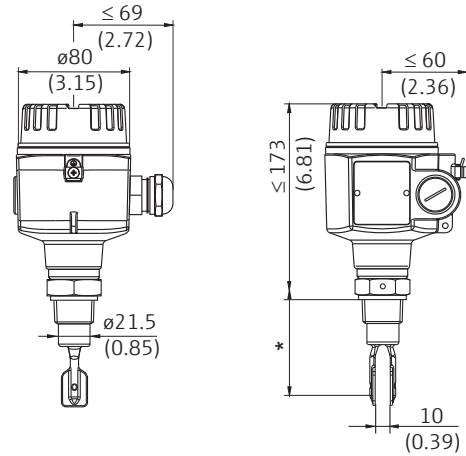
L00-FTL5xxxx-06-05-xx-xx-087

Aluminum housing F17



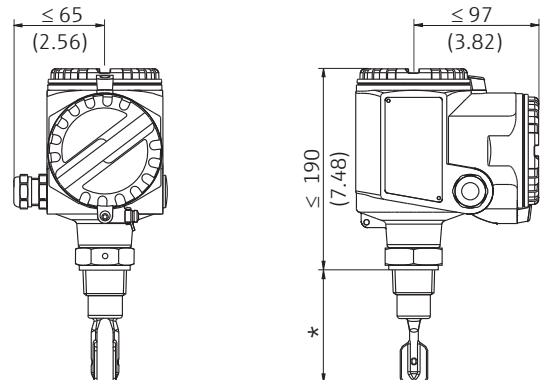
L00-FTL5xxxx-06-05-xx-xx-088

*Stainless steel housing (316L) F27
Aluminum housing F13*



L00-FTL5xxxx-06-05-xx-xx-089

*Aluminum housing T13
with separate connection compartment*



L00-FTL5xxxx-06-05-xx-xx-090

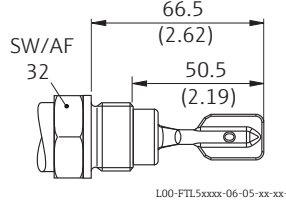
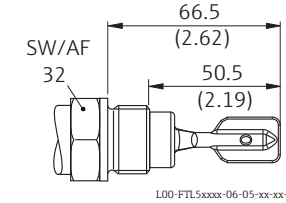
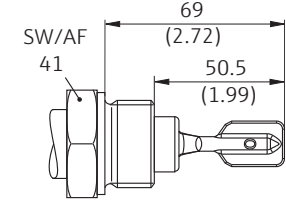
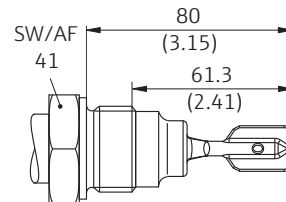
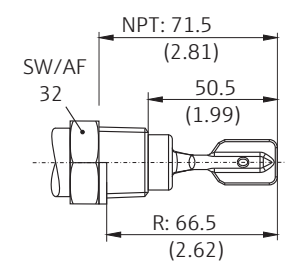
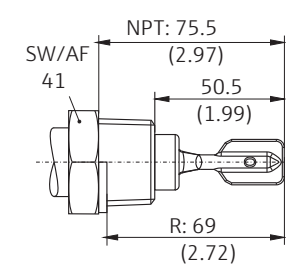
* See "Process connections"

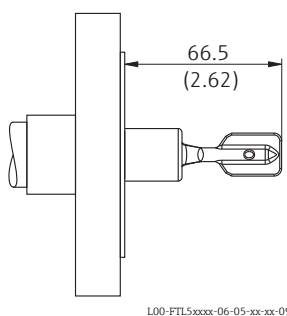
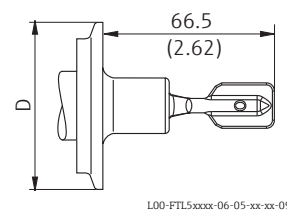
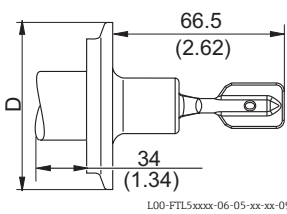
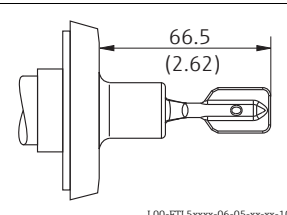
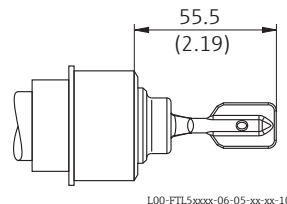


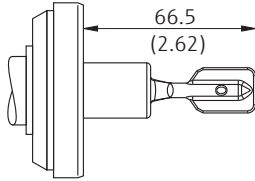
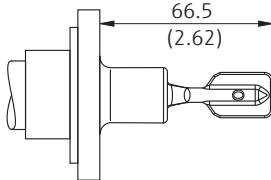
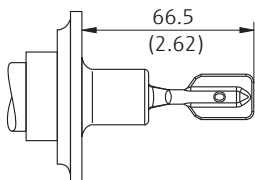
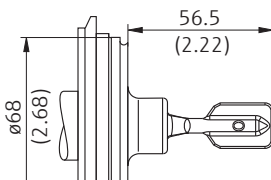
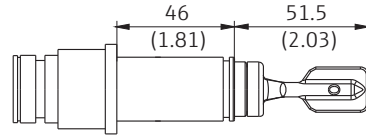
Note!

The switch points of the LiquiphantM are at other positions to those of the previous version LiquiphantII.

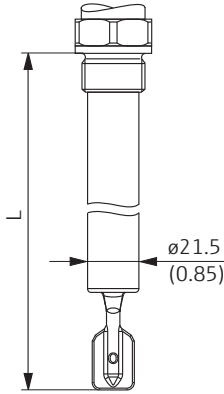
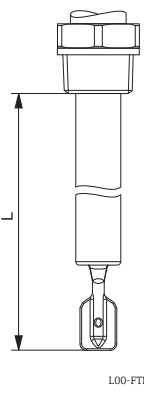
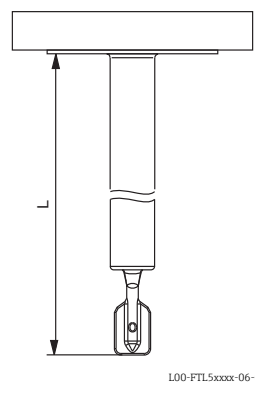
Process connections for FTL50(H) and FTL51(H)

Process connection		Dimensions	Accessories	Pressure Temperature
G 3/4 DIN ISO 228/1 with defined thread start; Flat seal to DIN 7603: supplied	GQ2 GQ6			≤ 100 bar / only FTL51 (≤ 1450 psi) ≤ 150 °C (302 °F)
G 3/4 DIN ISO 228/1 with defined thread start for flush-mounted installation in weld-in adapter	GQ2 GQ6		Weld-in adapter (with defined thread start) with silicone O- ring only FTL50, FTL50H See "Accessories" In conformity with FDA*	≤ 25 bar (363 psi) ≤ 150 °C (302 °F) ≤ 40 bar (580 psi) ≤ 100 °C (212 °F)
G 1 DIN ISO 228/1 Flat seal to DIN 7603: supplied	GR2 GR6			≤ 100 bar / only FTL51 (1450 psi) ≤ 150 °C (302 °F)
G 1 DIN ISO 228/1 with defined thread start With seal surface for flush-mounted installation in weld-in adapter	GW2		Weld-in adapter (with defined thread start) with silicone O- ring See "Accessories" In conformity with FDA*	≤ 25 bar (363 psi) ≤ 150 °C (302 °F) ≤ 40 bar (580 psi) ≤ 100 °C (212 °F)
NPT 3/4 ASME B 1.20.1 or R 3/4 DIN/EN 10226	GM2 GM6 GE2 GE6			≤ 100 bar / only FTL51 (1450 psi) ≤ 150 °C (302 °F)
NPT 1 ASME B 1.20.1 or R 1 DIN/EN 10226	GN2 GN6 GF2 GF6			≤ 100 bar / only FTL51 (1450 psi) ≤ 150 °C (302 °F)

Process connection		Dimensions	Accessories	Pressure Temperature
* FDA-compliant material in accordance with 21 CFR Part 177.2600 (silicone)				
Flanges ASME B 16.5 EN 1092-1 (DIN 2527 B) JIS B2220	A## B## C## F## N## K##		Seal depending on design installed on site	See nominal pressure of flange, however ≤ 100 bar (1450 psi) (only FTL51) ≤ 150 °C (302 °F)
For higher chemical-resistance, AlloyC22-plated flanges are available. The flange carrier material is made of 316L and is welded with a 2 to 3 mm (0.08 to 0.12 in) thick AlloyC22 disk.				
Tri-Clamp ISO 2852 DN25-38 (1 to 1 ½") DIN 32676 DN25-40 ø D = 50.5 mm (1.99 in) ISO 2852 DN40-51 (2") DIN 32676 DN50 ø D = 64.0 mm (2.52 in)	TC2 TE2		Clamping ring and front seal installed on site**	≤ 25 bar (363 psi) ≤ 150 °C (302 °F)
TE2: Mounting with NA connector only in conjunction with housing T13, F13 and compact housing. TC2: Mounting with NA connector only in conjunction with compact housing.				
Tri-Clamp NA Connect only for FTL50H, FTL51H ISO 2852 DN25-38 (1 to 1 ½") DIN 32676 DN25-40 ø D = 50.5 mm (1.99 in) ISO 2852 DN40-51 (2") DIN 32676 DN50 ø D = 64.0 mm (2.52 in)	TD2 TF2		Clamping ring and front seal installed on site**	≤ 25 bar (363 psi) ≤ 150 °C (302 °F)
TD2, TF2: Mounting with NA connector only in conjunction with housing F15, F16 and F17.				
Threaded pipe joint DN 32 DN 40 DN 50 DIN 11851 with thread adapter nut	MA2 MC2 ME2		Sealing ring with collar, installed on site**	DN 32, DN 40: ≤ 40 bar (580 psi) up to 100 °C (212 °F) ≤ 25 bar (363 psi) up to 140 °C (284 °F)
				DN 50: ≤ 25 bar (363 psi) ≤ 140 °C (284 °F)
Flush-mounted for weld-in adapter Factory standard Endress+Hauser with silicone seal and thread adapter nut: supplied	EE2		Weld-in adapter (fork can be positioned)	≤ 40 bar (580 psi) ≤ 100 °C (212 °F)
			See "Accessories" In conformity with FDA*	≤ 25 bar (363 psi) ≤ 150 °C (302 °F)

Process connection		Dimensions	Accessories	Pressure Temperature
Aseptic DN 50 DIN 11864-1 Form A for pipe DIN 11850 with thread adapter nut	HE2	 L00-FTL5xxxx-06-05-xx-xx-102	sealing ring installed on site**	≤ 25 bar (363 psi) ≤ 140 °C (284 °F)
DRD With clamped flange	PE2	 L00-FTL5xxxx-06-05-xx-xx-103	Welding flange with PTFE flat seal (fork can be positioned) See "Accessories" (or installed on site)** In conformity with FDA*	≤ 40 bar (580 psi) ≤ 100 °C (212 °F) ≤ 25 bar (363 psi) ≤ 150 °C (302 °F)
* FDA-compliant material in accordance with 21 CFR Part 177/2600 (silicone), 21 CFR Part 177.1550 (PTFE) ** The maximum temperature and the maximum pressure are dependent on the clamping ring used and the seal used. The lowest value applies in each case.				
SMS 2" (DN 51) with thread adapter nut	UE2	 L00-FTL5xxxx-06-05-xx-xx-104	sealing ring installed on site**	≤ 25 bar (363 psi) ≤ 140 °C (284 °F)
Varivent for piping ≥ DN 65 ≥ O.D. 3" ≥ I.P.S. 3"	WE2	 L00-FTL5xxxx-06-05-xx-xx-105	Clamping ring and O-ring seal, installed on site**	However, see specification as per Tuchenhagen VARIVENT-Inline housing: ≤ 25 bar (363 psi) ≤ 150 °C (302 °F)
Ingold fitting DN 25 Fitting length 46 mm (2.52 in) Thread adapter nut G 1 1/4 with O-ring seal, EPDM (FDA- compliant, USP Class VI*)	TT2	 L00-FTL5xxxx-06-05-xx-xx-106		≤ 16 bar (232 psi) ≤ 150 °C (302 °F)
* FDA-compliant material in accordance with 21 CFR Part 177/2600 (EPDM) ** The maximum temperature and the maximum pressure are dependent on the clamping ring used and the seal used. The lowest value applies in each case.				

Sensor length L for FTL51 and FTL51H, depending on process connection

Thread: G ¾ G 1	Thread: NPT ¾ NPT1 R ¾ R 1	Flanges and flange-like process connections
 L00-FTL5xxxx-06-05-xx-xx-107 From seal surface of thread adapter	 L00-FTL5xxxx-06-05-xx-xx-017 From lower edge of thread	 L00-FTL5xxxx-06-05-xx-xx-018
Customized length L: ■ 148 mm to 3000 mm (6 to 115 in); special version (TSP) on request up to 6000 mm (235 in) ■ Length tolerances L: < 1 m (-5 mm), 1 to 3 m (-10 mm) / < 3.3 ft (-0.2 in), 3.3 to 9.8 ft (-0.39 in)		



Note!

The switch points of the Liquiphant**M** are at other positions to those of the previous version Liquiphant**II**.

Special length "L II":

With vertical mounting from above approximately the same switch point as for the Liquiphant II FTL360, FTL365, FDL30, FDL35

"L II" depends on process connection:

L = 115 mm (4.53 in) for flanges and flange-like process connections such as Clamp, DRD...

L = 99 mm (3.9 in) for threads NPT and R (BSPT)

L = 118 mm (4.65 in) for threads G1 (BSP 1)

L = 115 mm (4.53 in) for threads G ¾ (BSP ¾)

L = 104 mm (4.09 in) for flush-mounted 1" (G1" Endress+Hauser welding bosses)

Weights

See "Ordering information" → 43ff

Materials and surfaces

Material specifications as per AISI and DIN-EN.

Parts in contact with process

- Process connection and extension pipe:
 - FTL5x → 316L (1.4404 or 1.4435) optional 2.4602 (AlloyC22)
 - FTL5xH → 316L (1.4435)
- Tuning fork: 316L (1.4435) optional 2.4602 (AlloyC22)
- Flanges:
 - ASME: 316/316L
 - EN: 316L (1.4404)
 - JIS: 316L (1.4404)
- Flange plating: AlloyC22 (2.4602)
- Flat seal for process connection G ¾ or G 1: elastomer fiber, asbestos-free

Surface roughness

Choice of mechanically polished surface roughness (version → probe length → type):

- Ra < 1.5 µm (59.1 µin), with EHEDG approval



- Ra < 0.3 µm (11.8 µin), 3-A and EHEDG approval and CoC-ASME-BPE

Note!

The surface is electropolished if the additional option "B"

(CoC - ASME BPE) is selected in addition to surface roughness quality Ra < 0.3 µm (11.8 µin). The surface roughness is then: Ra < 0.38 µm (15.0 µin).

With this combination, the wetted parts are made of 316L (1.4435) in accordance with BN2 (delta-ferrite content < 1 %).

Parts with no process contact

- Tuning fork/housing seal: EPDM
- Temperature spacer: 316 L (1.4435)
- Pressure-tight feedthrough: 316L (1.4435)
- Ground terminal on housing (external): 316L (1.4404)
- Cable glands
 - Housing F13, F15, F16, F17: polyamide (PA)
 - With B or C approval (→ 43 ordering information): nickel-plated brass
 - Housing F27: polyamide PA, with approval "B" or "C" 316L (1.4435)
 - Housing T13: nickel-plated brass
- Polyester housing F16: PBT-FR with PBT-FR cover or with PA12 transparent cover
 - Cover seal: EPDM
 - Nameplate glued: polyester film (PET)
 - Pressure compensation filter: PBT-GF20
- Stainless steel housing F15: 316L (1.4404)
 - Cover seal: silicone
 - Safety claw: 304 (1.4301)
 - Pressure compensation filter: PBT-GF20, PA
- Aluminum housing F17/F13: EN-AC-ALSi10Mg, plastic-coated
 - Nameplate: aluminum, anodized
 - Cover seal: EPDM
 - Safety claw: nickel-plated brass
 - Pressure compensation filter: silicone
- Stainless steel housing F27: 316L
 - Nameplate: 316L (1.4404)
 - Cover seal: FVMQ (optional: EPDM seal available as spare part)
 - Safety claw: 316L (1.4435)
- Aluminum housing T13: EN-AC-ALSi10Mg, plastic-coated,
 - Nameplate: aluminum, anodized
 - Cover seal: EPDM
 - Safety claw: nickel-plated brass
- Compact housing (valve connector or M12 connector): 316L (1.4435)

Process connections

- Parallel thread G ¾, G 1 to DIN ISO 228/I with flat seal to DIN 7603
- Tapered thread R ¾, R 1 to EN10226
- Tapered thread ¾ - 14 NPT, 1 - 1½ NPT as per ASME B 1.20.1
- Flush-mounted installation with weld-in adapter to factory standard Endress+Hauser (G ¾, G 1)
- Flush-mounted installation with weld-in adapter to factory standard Endress+Hauser (1"), sensor can be positioned
- Tri-Clamp 1½", 2" to ISO 2852
- Threaded pipe joint DN 32, 40, 50 to DIN 11851
- Aseptic connection DN 50 to DIN 11864-1
Form A for pipe DIN 11850
- SMS connection 2" (DN 51)
- DRD flange
- Varivent® DN 50 (50/40) to factory standard Tuchenhausen
- Flanges: as per EN/DIN 1092-1 from DN 25, as per ASME B 16.5 from 1", as per JIS B2220 (RF)
- Ingold DN25 fitting length 46 mm (1.81 in) with thread adapter nut G1 ¼

Further details at Ordering information → 43.

Human interface

Electronic inserts

With FEL51, FEL52, FEL54, FEL55:

- 2 switches for safety mode and density change
- green LED to indicate operational status
- red LED to indicate the switching status, flashes in the event of corrosion damage on sensor or if the electronics are defective

With FEL56:

- 2 switches for safety mode and density change
- green LED flashes to indicate operational status
- red LED to indicate the switching status, flashes in the event of corrosion damage on sensor or if the electronics are defective

With FEL57:

- 2 switches for density change and Testing
- green LED to indicate operational status
- yellow LED to indicate the covered status, flashes in the event of corrosion damage on sensor or if the electronics are defective

With FEL58:

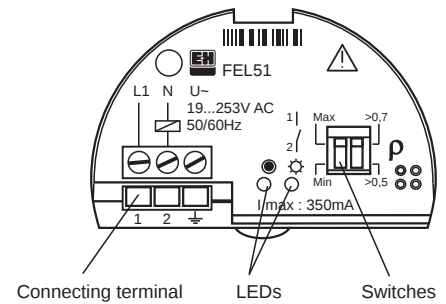
- 2 switches for safety mode and density change
- green LED
 - flashes quickly to indicate operational status,
 - flashes slowly in the event of corrosion damage to the sensor or if the electronics are defective
- yellow LED to indicate the switching status, Test key – breaks the cable connection

With FEL50A:

- 8 switches for configuring the device address
- green LED to indicate operational status, pulsing to indicate communication;
- yellow LED to indicate the switching status, flashes in the event of corrosion damage on sensor or if the electronics are defective

With FEL50D:

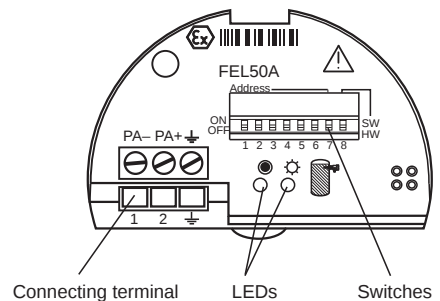
- yellow LED: to indicate the validation of the measurement
- green LED: to indicate the operational status
- red LED: to indicate faults



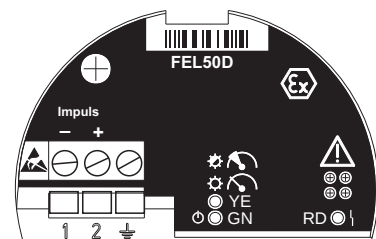
L00-FTL5xxxx-03-05-xx-en-001



L00-FTL5xxxx-03-05-xx-en-013



L00-FTL5xxxx-03-05-xx-en-002



TI328Fox004

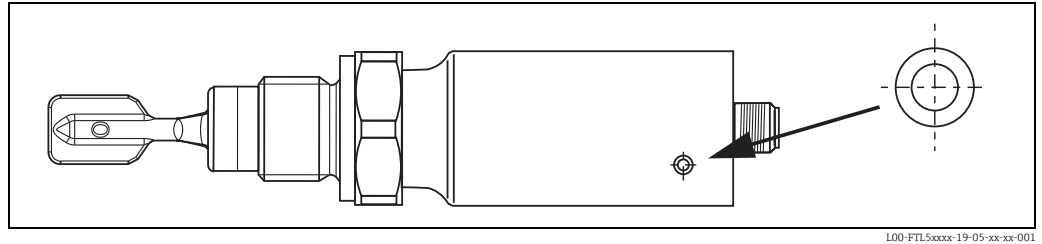
Compact housing

Function test with test magnet

Versions AC, DC-PNP and NAMUR:

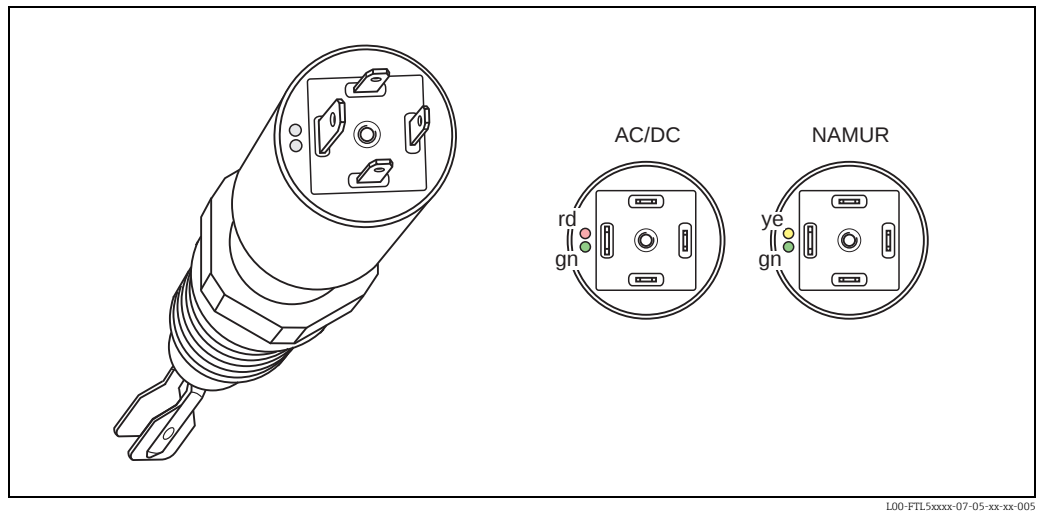
During the test, the current state of the electronic switch is reversed.

Hold the test magnet against the marking on the nameplate: The switching status is changed.



Light signals

Versions AC and DC-PNP with valve connector or cable tail



Green light (gn) lights up (AC/DC):

Liquiphant M is connected to the power supply and is operational.

Green light (gn) flashing (NAMUR):

Liquiphant M is connected to the power supply and is operational.

Red light (rd) lights up (AC/DC):

MAX application mode (overflow protection): sensor is immersed in liquid.

MIN application mode (dry running protection): sensor is not immersed in liquid.

Yellow light (ye) lights up (NAMUR):

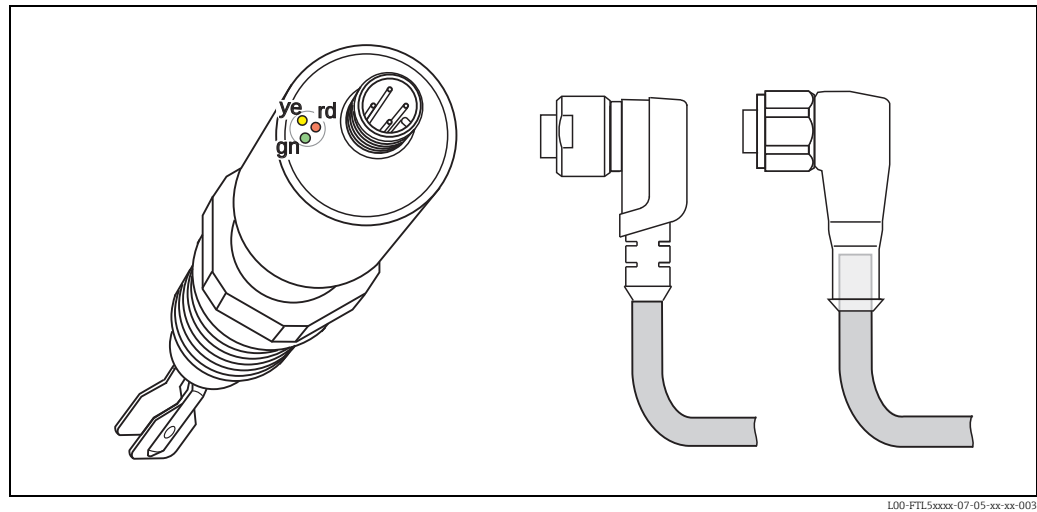
MAX application mode (overflow protection): sensor is not immersed in liquid.

MIN application mode (dry running protection): sensor is immersed in liquid.

Red light (rd) flashing (AC/DC):

Liquiphant M has detected a fault.

Version NAMUR and DC-PNP with M12x1 round connector 316L



L00-FTL50xxx-07-05-xx-xx-003

Green light (gn) lights up (DC-PNP):

Liquiphant M is connected to the power supply and is operational.

Green light (gn) flashing with 1 Hz (NAMUR):

Liquiphant M is connected to the power supply and is operational.

Yellow light (ye) lights up (DC-PNP):

Sensor is immersed in liquid.

Yellow light (ye) lights up (NAMUR):

MAX application mode (overflow protection): sensor is not immersed in liquid.

MIN application mode (dry running protection): sensor is immersed in liquid.

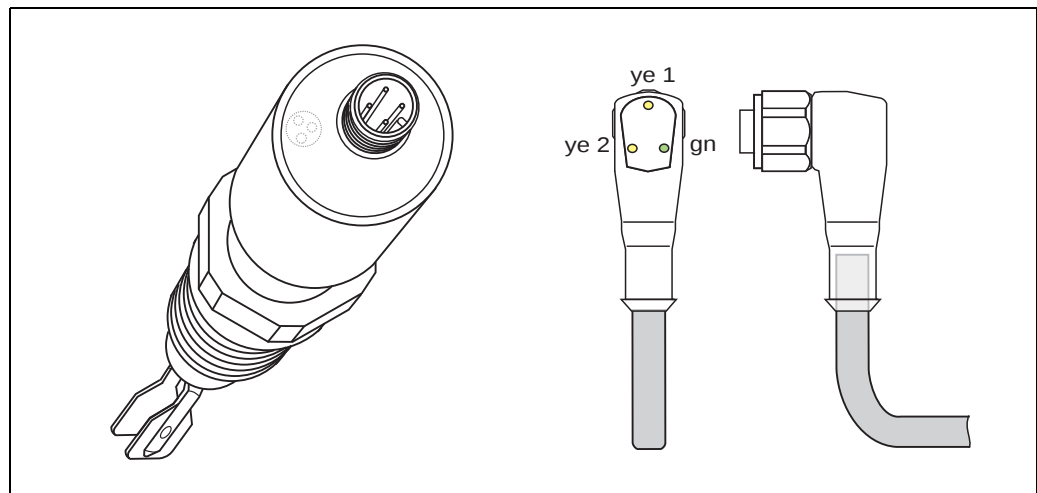
Red light (rd) flashing (DC-PNP):

Liquiphant M has detected a fault.

Green light (gn) flashing with 0.3 Hz (NAMUR):

Liquiphant M has detected a fault.

Version DC-PNP with M12x1 round connector 316L



L00-FTL50xxx-07-05-xx-xx-004

Green light (gn) lights up:

Liquiphant M is connected to the power supply and is operational.

Yellow light (ye 1) lights up:

MAX application mode (overflow protection): sensor is not immersed in liquid.

MIN application mode (dry running protection): sensor is not immersed in liquid.

Yellow light (ye 2) lights up:

MAX application mode (overflow protection): sensor is immersed in liquid.

MIN application mode (dry running protection): sensor is immersed in liquid.

Green light (gn) lights up, both yellow lights (ye 1+2) do not light up:

Liquiphant M has detected a fault.

Operating concept

Onsite configuration

Certificates and approvals

CE mark

The measuring system meets the legal requirements of the applicable EC Directives. These are listed in the corresponding EC Declaration of Conformity along with the standards applied.

Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.

RoHS

The measuring system complies with the substance restrictions of the EU Directive on the restriction of the use of certain hazardous substances 2011/65/EU (RoHS 2).

RCM-tick mark

The product or measuring system supplied complies with the regulations of the Australian Communications and Media Authority (ACMA) for network integrity, performance characteristics and health and safety requirements. The specifications for electromagnetic compatibility, in particular, are observed. The products bear the RCM-tick mark on their nameplate.



A0029561

EAC conformity

The measuring system meets the legal requirements of the applicable EAC Directives.

These are listed in the corresponding EAC Declaration of Conformity along with the standards applied.

Endress+Hauser confirms successful testing of the device by affixing to it the EAC mark.

CRN approval

Versions with a CRN approval (Canadian Registration Number) are marked with a "*" in ordering information feature 20 "process connection" (s. Seite 43 ff.). CRN-approved devices are assigned the registration number CRN: 0F10904.5CADD1 on the nameplate.

Pressure Equipment Directive 2014/68/EU (PED)**Pressure instruments with permitted pressure ≤ 200 bar (2 900 psi)**

Pressure instruments with permitted pressure ≤ 200 bar (2 900 psi) Pressure instruments with a flange and threaded boss that do not have a pressure-bearing housing do not fall within the scope of the Pressure Equipment Directive, irrespective of the maximum permitted pressure.

Reason:

According to Article 2, point 5 of EU Directive 2014/68/EU, pressure accessories are defined as "devices with an operational function and having pressure-bearing housings".

If a pressure instrument does not have a pressure-bearing housing (no identifiable pressure chamber of its own), there is no pressure accessory present within the meaning of the Directive.

Note:

A separate analysis must be performed for pressure instruments that are part of safety equipment designed to protect a pipe or vessel from exceeding allowable limits (safety accessory in accordance with Pressure Equipment Directive 2014/68/EU, Article 2, point 4).

Process seal according to ANSI/ISA 12.27.01

Practice in North America for the installation of process seals
Endress+Hauser devices are designed as either single seal or dual seal devices with an alarm in accordance with ANSI/ISA 12.27.01. This means that the user does need to install for an external secondary process seal in the thermowell which is required in ANSI/NFPA 70 (NEC) and CSA 22.1 (CEC). These devices comply with installation practice in North America and enable very safe, low-cost installation in pressurized applications with hazardous media.
Further information is provided in the Safety Instructions (XA) for the specific device → 58 ff.

Product	Type	Max. process pressure	Marking	Listing
Liquiphant M	FTL50-S/T##...	64 bar (928 psi)	Single Seal	CSA/FM
	FTL50-P/Q/R##...			
	FTL51-S/T##...	64/100 bar	Single Seal	CSA/FM
	FTL51-P/Q/R##...	(928/1450 psi)		
	FTL50H-S/T##...	64 bar (928 psi)	Single Seal	CSA/FM
	FTL50H-P/Q/R##...			
	FTL51H-S/T##...	64 bar (928 psi)	Single Seal	CSA/FM
	FTL51H-P/Q/R##...			

General approvals

The following approvals are available for Liquiphant M FTL50H, FTL51H:

- EHEDG: certification (from TNO, The Netherlands), Report No. V99.394:
- 3A: 3A certificate (USA), Authorization no. 459: 74-06 Sensors and Sensor Fittings and Connections
- Certificate of Compliance as per ASME BPE-2012. (Order code: additional option = B)

Process connections	Order code	 + 		ASME BPE + CoC		
				Ra (µm)		
				<0.3	< 0.38	< 1.5
Thread ISO228 G3/4, 316L, installation Thread ISO228 G1, 316L, installation Accessories: weld-in adapter	GQ2 GW2	X	X	–	X	
Tri-Clamp ISO2852 DN25-38 (1 to 1-1/2"), 316L Tri-Clamp ISO2852 DN40-51 (2"), 316L	TC2 TE2	X	X	X	X	
DIN11851 DN32 PN25 slotted nut, 316L DIN11851 DN40 PN25 slotted nut, 316L DIN11851 DN50 PN25 slotted nut, 316L	MA2 MC2 ME2	X	X	X	X	
Flush-mounted, 316L, installation Accessories, weld-in adapter	EE2	X	X	X	X	
DIN11864-1 A DN50 pipe DIN11850, Slotted nut, 316L	HE2	X	X	X	X	
DRD 65mm, 316L	PE2	X	–	–	X	
SMS 2" PN25, 316L	UE2	X	X	X	X	
Varivent N pipe DN65-162 PN10, 316L	WE2	X	X	X	X	
Ingold fitting 25x46mm, 316L	TT2	–	–	X	–	

**Warning!**

To avoid risk of contamination, install according to the "Hygienic Equipment Design Criteria (HDC)" as stated in the Subgroup Design Principles of the EHEDG, Doc. 8, July 1993.

The flow of liquid during cleaning is important and should be in compliance with the HDC.

**Note!**

- For CIP (Clean in Place) and SIP (Sterilize in Place) processes the pressure and temperature specifications of the process connections must be observed.

- Suitable fittings and seals must be used to ensure hygiene-compliant design according to 3A, EHEDG, ASME BPE etc.
- Surfaces with ASME-BPE option: $R_a < 0.38 \mu\text{m}$ ($< 15 \mu\text{in}$) electropolished and passivated or $R_a < 1.5 \mu\text{m}$ ($59 \mu\text{in}$) mechanically polished.

Other certificates

- Material certificate as per EN 10204/3.1 for all wetted parts NACE MR0175/MR0103, AD2000
- Leak detection system in conjunction with WHG approval
Approval number: Z-65.40-446 (see also "Ordering information" s. Seite 43 ff.)
- TSE Certificate of Suitability
The following applies to wetted device components:
 - They do not contain any materials derived from animals.
 - No additives or operating materials derived from animals are used in production or processing.



Note!

Wetted device components are listed in the "Mechanical construction" (→ 30 ff.) and "Ordering information" (→ 43 ff.) sections.

Manufacturer declarations

The following documents can be ordered together with the document, depending on the desired device configuration:

- FDA conformity
- TSE-free: Materials not derived from animals
- Regulation (EC) no. 2023/2006 (GMP)
- Regulation (EC) No. 1935/2004 materials in contact with food

The applicable European guidelines and standards can be found in the relevant EU Declarations of Conformity.

Regulation (EU) No. 10/2011: The regulation on plastic materials does not apply to the Liquiphant FTL5x, as the wetted materials are made exclusively of stainless steel.

The silicone seals supplied comply with BFR recommendation XV (commodities based on silicones from the Federal Institute for Risk Assessment - BFR), and the EPDM seals provided comply with BFR recommendation XXI (commodities based on natural and synthetic rubber).

Use in hazardous zones

Pay particular attention to the information provided in the documentation: Safety Instructions, Control Drawings etc. → 58

ASME B 31.3

Design and materials in accordance with ASME B31.3 The welding seals are through-penetration welded and comply with ASME Boiler and Pressure Vessel Code Section IX and EN ISO 15614-1.

Pressure equipment directive

The Pressure Equipment Directive 97/23/EC does not apply to the Liquiphant FTL5x, as it does not have a pressurized housing in accordance with Article 1, Paragraph 2.1.4 of the directive.

Ordering information

Detailed ordering information is available from the following sources:

- In the Product Configurator on the Endress+Hauser website: www.endress.com → Click "Corporate" → Select your country → Click "Products" → Select the product using the filters and search mask → Open the product page → The "Configuration" button to the right of the product image opens the Product Configurator.
- From your Endress+Hauser Sales Center: www.addresses.endress.com



Note!

Product Configurator - the tool for individual product configuration

- Up-to-the-minute configuration data
- Depending on the device: direct input of information specific to measuring point, such as measuring range or operating language
- Automatic verification of exclusion criteria
- Automatic creation of the order code and its breakdown in PDF or Excel output format
- Ability to order directly from the Endress+Hauser online shop



Note!

Versions that are mutually exclusive are not indicated in this table.

**Product structure for
Liquiphant M FTL50, FTL51**

Design		Basic weight	
FTL50	Compact		0.6 kg
FTL51	With extension pipe		0.6 kg
10	Approval:		
	A Non-hazardous area B ATEX II 3G Ex nC IIC T6, WHG, ATEX II 3D Ex tc IIIC T85°C, NEPSI II 3G Ex nC IIC T6 C ATEX II 3G Ex nA IIC T6, WHG, ATEX II 3D Ex tc IIIC T85°C, NEPSI II 3G Ex nA IIC T6 D Non-hazardous area, WHG E ATEX II 1/2G Ex de IIC T6, WHG F ATEX II 1/2GD Ex ia IIC T6, WHG/IECEx G ATEX II 1/2GD Ex ia IIC T6/IECEx Zone0/1 H ATEX II 1G Ex ia IIC T6 I ATEX II 1/2G Ex de IIC T6/IECEx Zone0/1 J ATEX II 1G Ex ia IIC T6, WHG K ATEX II 1/2G Ex d IIC T6/IECEx Zone0/1 L ATEX II 1/2G Ex d IIC T6, WHG M NEPSI Ex ia IIC T6 N NEPSI Ex d IIC T6 P FM IS Cl.I,II,III Div.1 Gr.A-G, Zone 0,1,2,20,21,22 Q FM XP Cl.I,II,III Div.1 Gr.B-G, Gr.A-G if E5 housing selected, Zone 1,2 R FM NI Cl.I Div.2 Gr.A-D, Zone 0,1,2,20,21,22 S CSA C/US IS Cl I,II,III Div.1 Gr.A-G, Zone 0,1,2 T CSA C/US XP Cl I,II,III Div.1 Gr.A-G, Zone 1,2 U CSA C/US General Purpose V TIIS Ex ia IIC T3 W TIIS Ex d IIB T3 7 TIIS Ex d IIC T3 8 TIIS Ex d IIC T6 1 INMETRO Ex ia IIC T6 Ga/Gb 2 INMETRO Ex d IIC T6 Ga/Gb 3 INMETRO Ex de IIC T6 Ga/Gb Y Special version, TSP-No. to be spec.		
20	Process connection:		
	Note! For 100 bar (1450 psi) process pressure, select the appropriate option under "Additional option"		
	GQ2	G ¾ 316L	Thread ISO 228
	Installation > accessories: weld-in adapter		
	GQ6	G ¾ AlloyC22	Thread ISO 228
	GR2	G 1 316L	Thread ISO 228
	GR6	G 1 AlloyC22	Thread ISO 228
	GW2*	G 1 316L	Thread ISO 228
	Installation > accessories: weld-in adapter		
	GM2*	NPT ¾ 316L	Thread ASME
	GM6	NPT ¾ AlloyC22	Thread ASME
	GN2*	NPT1 316L	Thread ASME
	GN6	NPT1 AlloyC22	Thread ASME
	GE2	R ¾ 316L	Thread EN10226
	GE6	R ¾ AlloyC22	Thread EN10226
	GF2	R 1 316L	Thread EN10226
	GF6	R 1 AlloyC22	Thread EN10226
	BA2	DN32 PN6 A 316L	Flange EN 1092-1 (DIN 2527 B)
	BB2	DN32 PN25/40 A 316L	Flange EN 1092-1 (DIN 2527 B)
	BC2	DN40 PN6 A 316L	Flange EN 1092-1 (DIN 2527 B)
	BD2	DN40 PN25/40 A 316L	Flange EN 1092-1 (DIN 2527 B)
	BE2	DN50 PN6 A 316L	Flange EN 1092-1 (DIN 2527 B)
	BG2	DN50 PN25/40 A 316L	Flange EN 1092-1 (DIN 2527 B)
	BH2	DN65 PN6 A 316L	Flange EN 1092-1 (DIN 2527 B)
	BJ2	DN50 PN100 A 316L (FTL51)	Flange EN 1092-1 (DIN 2527 B)

20	Process connection:					Additional weight
	BK2	DN65	PN25/40 A	316L	Flange EN 1092-1 (DIN 2527 B)	4.3 kg
	BM2	DN80	PN10/16 A	316L	Flange EN 1092-1 (DIN 2527 B)	4.8 kg
	BN2	DN80	PN25/40 A	316L	Flange EN 1092-1 (DIN 2527 B)	5.9 kg
	BQ2	DN100	PN10/16 A	316L	Flange EN 1092-1 (DIN 2527 B)	5.6 kg
	BR2	DN100	PN25/40 A	316L	Flange EN 1092-1 (DIN 2527 B)	7.5 kg
	B12	DN80	PN100 A	316L (FTL51)	Flange EN 1092-1 (DIN 2527 B)	
	B82	DN25	PN25/40 A	316L	Flange EN 1092-1 (DIN 2527 B)	1.4 kg
	CA2	DN32	PN6 B1	316L	Flange EN 1092-1 (DIN 2527 C)	1.1 kg
	CA6	DN32	PN6 B1	AlloyC22 >316L	Flange EN 1092-1 (DIN 2527)	1.1 kg
	CE2	DN50	PN6 B1	316L	Flange EN 1092-1 (DIN 2527 C)	1.5 kg
	CE6	DN50	PN6 B1	AlloyC22 >316L	Flange EN 1092-1 (DIN 2527)	1.5 kg
	CG2	DN50	PN25/40 B1	316L	Flange EN 1092-1 (DIN 2527 C)	2.9 kg
	CG6	DN50	PN25/40 B1	AlloyC22 >316L	Flange EN 1092-1 (DIN 2527)	2.9 kg
	CJ2	DN50	PN100 B2	316L (FTL51)	Flange EN 1092-1 (DIN 2527)	
	CN2	DN80	PN25/40 B1	316L	Flange EN 1092-1 (DIN 2527 C)	5.2 kg
	CN6	DN80	PN25/40 B1	AlloyC22 >316L	Flange EN 1092-1 (DIN 2527)	5.2 kg
	CQ2	DN100	PN10/16 B1	316L	Flange EN 1092-1 (DIN 2527 C)	5.3 kg
	CQ6	DN100	PN10/16 B1	AlloyC22 >316L	Flange EN 1092-1 (DIN 2527)	5.3 kg
	C12	DN80	PN100 B2	316L (FTL51)	Flange EN 1092-1 (DIN 2527)	
	C82	DN25	PN25/40 B1	316L	Flange EN 1092-1 (DIN 2527 C)	1.3 kg
	C86	DN25	PN25/40 B1	AlloyC22 >316L	Flange EN 1092-1 (DIN 2527)	1.3 kg
	DG2	DN50	PN40 B1	316L	Flange EN 1092-1 (DIN 2526 D)	
	DN2	DN80	PN40 B1	316L	Flange EN 1092-1 (DIN 2526 D)	
	D82	DN25	PN40 B1	316L	Flange EN 1092-1 (DIN 2526 D)	
	EG2	DN50	PN25/40 E	316L	Flange EN 1092-1	2.6 kg
	FG2	DN50	PN40 C	316L	Flange EN 1092-1 (DIN 2512 F)	2.6 kg
	NG2	DN50	PN40 D	316L	Flange EN 1092-1 (DIN 2512 N)	2.9 kg
	AA2*	1¼"	150 lbs	RF 316/316L	Flange ASME B16.5	1.2 kg
	AB2*	1¼"	300 lbs	RF 316/316L (FTL51)	Flange ASME B16.5	2.0 kg
	AC2*	1½"	150 lbs	RF 316/316L	Flange ASME B16.5	1.5 kg
	AD2*	1½"	300 lbs	RF 316/316L (FTL51)	Flange ASME B16.5	2.7 kg
	AE2*	2"	150 lbs	RF 316/316L	Flange ASME B16.5	2.4 kg
	AE6	2"	150 lbs	RF AlloyC22 >316/316L	Flange ASME B16.5	2.4 kg
	AF2*	2"	300 lbs	RF 316/316L	Flange ASME B16.5	3.2 kg
	AG2*	2"	600 lbs	RF 316/316L (FTL51)	Flange ASME B16.5	4.2 kg
	AJ2*	2½"	300 lbs	RF 316/316L (FTL51)	Flange ASME B16.5	4.8 kg
	AL2*	3"	150 lbs	RF 316/316L	Flange ASME B16.5	4.9 kg
	AM2*	3"	300 lbs	RF 316/316L (FTL51)	Flange ASME B16.5	6.8 kg
	AM6	3"	300 lbs	RF AlloyC22 >316/316L	Flange ASME B16.5	6.8 kg
	AN2*	3"	600 lbs	RF 316/316L (FTL51)	Flange ASME B16.5	
	AP2*	4"	150 lbs	RF 316/316L	Flange ASME B16.5	7.0 kg
	AQ2*	4"	300 lbs	RF 316/316L (FTL51)	Flange ASME B16.5	11.5 kg
	AQ6	4"	300 lbs	RF AlloyC22 >316/316L	Flange ASME B16.5	11.5 kg
	AR2*	4"	600 lbs	RF 316/316L (FTL51)	Flange ASME B16.5	17.3 kg
	A82*	1"	150 lbs	RF 316/316L	Flange ASME B16.5	1.0 kg
	KA2	10 K 25 A		RF 316L	Flange JIS B2220	
	KC2	10 K 40 A		RF 316L	Flange JIS B2220	

20	Process connection:					Additional weight
	KE2	10 K 50 A	RF	316L	Flange JIS B2220	1.7 kg
	KE6	10 K 50 A	RF	AlloyC22 >316L	Flange JIS B2220	1.7 kg
	KL2	10 K 80 A	RF	316L	Flange JIS B2220	
	KP2	10 K 100 A	RF	316L	Flange JIS B2220	
	TC2*	DN25-38 (1 to 1½")		316L	Tri-Clamp ISO 2852	0.1 kg
	TE2*	DN40-51 (2")		316L	Tri-Clamp ISO 2852	0.1 kg
	YY9	Special version				
		* With CRN approval.				
30	Probe length; Type:					
	FTL50					
	AA	Compact;		Ra <3.2 µm/126 µin		
	IA	Compact;		Temperature spacer		0.6 kg
	QA	Compact;		Pressure-tight feedthrough		0.7 kg
	FTL51					
	BB	 mm;	316L**	Ra <3.2 µm/126 µin		
	BE	 mm;	Alloy**	Ra <3.2 µm/126 µin		
	CB	 inch;	316L**	Ra <3.2 µm/126 µin		
	CE	 inch;	Alloy**	Ra <3.2 µm/126 µin		2.3 kg/100 in
	DB	Length: type II*;	316L	Ra <3.2 µm/126 µin		0.1 kg
	DE	Length: type II*;	Alloy	Ra <3.2 µm/126 µin		0.1 kg
	JB	 mm;	316L**	+ Temperature spacer		0.9 kg/m +0.6 kg
	JE	 mm;	Alloy**	+ Temperature spacer		0.9 kg/m +0.6 kg
	KB	 inch;	316L**	+ Temperature spacer		2.3 kg/100 in +0.6 kg
	KE	 inch;	Alloy**	+ Temperature spacer		2.3 kg/100 in +0.6 kg
	LB	Length: type II*;	316L	+ Temperature spacer		0.1 kg +0.6 kg
	LE	Length: type II*;	Alloy	+ Temperature spacer		0.1 kg +0.6 kg
	RB	 mm;	316L**	+ Pressure-tight feedthrough		0.9 kg/m +0.7 kg
	RE	 mm;	Alloy**	+ Pressure-tight feedthrough		0.9 kg/m +0.7 kg
	SB	 inch;	316L**	+ Pressure-tight feedthrough		2.3 kg/100 in +0.7 kg
	SE	 inch;	Alloy**	+ Pressure-tight feedthrough		2.3 kg/100 in +0.7 kg
	TB	Length: type II*;	316L	+ Pressure-tight feedthrough		0.1 kg +0.7 kg
	TE	Length: type II*;	Alloy	+ Pressure-tight feedthrough		0.1 kg +0.7 kg
	YY	Special version				
		*) If replacing devices: when vertically mounting a Liquiphant M FTL51 with length II the switch point is at the same height as for a Liquiphant II FTL360, FTL365, FDL30, FDL35. See also Seite 36 "L II" depends on process connection.				
		**) Order 3001 to 6000 mm (116 to 235 in) via yy				
40	Electronics; output:					
	A	FEL50A	PROFIBUS PA			
	D	FEL50D	Density/concentration without WHG approval (Germany)			
	1	FEL51*	2-wire,	AC 19 to 253 V		
	2	FEL52*	3-wire PNP,	DC 10 to 55 V		
	4	FEL54	Relay DPDT,	AC 19 to 253 V, DC 19 to 55 V		
	5	FEL55	8/16 mA,	DC 11 to 36 V		
	6	FEL56	NAMUR (L-H signal)			
	7	FEL57	2-wire PFM			
	8	FEL58*	NAMUR + test keys (H-L signal)			
	9	Special version				
		*) Also available in compact housing				
50	Housing; cable entry:					
	C3	Compact 316L	IP66/68;	Cable 5 m		
	D3	Compact 316L	IP65;	Plug Pg11	ISO4400	
	E1	F27 316L	NEMA 4X/6P;	Thread NPT ¾		



The basic weight includes the compact sensor, thread adapter G 3/4, electronic insert, polyester housing

**Product structure for
Liquiphant M FTL50H,
FTL51H**

Design		Basic weight	
FTL50H	Compact	0.7 kg	
FTL51H	With extension pipe	0.7 kg	
10	Approval:		
	A Non-hazardous area		
	B ATEX II 3G Ex nC IIC T6, WHG, ATEX II 3D Ex tc IIIC T85°C, NEPSI II 3G Ex nC IIC T6		
	C ATEX II 3G Ex nA IIC T6, WHG, ATEX II 3D Ex tc IIIC T85°C, NEPSI II 3G Ex nA IIC T6		
	D Non-hazardous area, WHG		
	E ATEX II 1/2G Ex de IIC T6, WHG		
	F ATEX II 1/2GD Ex ia IIC T6, WHG/IECEx		
	G ATEX II 1/2GD Ex ia IIC T6/IECEx Zone0/1		
	H ATEX II 1G Ex ia IIC T6		
	I ATEX II 1/2G Ex de IIC T6/IECEx Zone0/1		
	J ATEX II 1G Ex ia IIC T6, WHG		
	K ATEX II 1/2G Ex d IIC T6/IECEx Zone0/1		
	L ATEX II 1/2G Ex d IIC T6, WHG		
	M NEPSI Ex ia IIC T6		
	N NEPSI Ex d IIC T6		
	P FM IS Cl.I,II,III Div.1 Gr.A-G, Zone 0,1,2,20,21,22		
	Q FM XP Cl.I,II,III Div.1 Gr.B-G, Gr.A-G if E5 housing selected, Zone 1,2		
	R FM NI Cl.I Div.2 Gr.A-D, Zone 0,1,2,20,21,22		
	S CSA C/US IS Cl I,I,II,III Div.1 Gr.A-G, Zone 0,1,2		
	T CSA C/US XP Cl I,I,II,III Div.1 Gr.A-G, Zone 1,2		
	U CSA C/US General Purpose		
	V TIIS Ex ia IIC T3		
	W TIIS Ex d IIB T3		
	7 TIIS Ex d IIC T3		
	8 TIIS Ex d IIC T6		
	1 INMETRO Ex ia IIC T6 Ga/Gb		
	2 INMETRO Ex d IIC T6 Ga/Gb		
	3 INMETRO Ex de IIC T6 Ga/Gb		
	Y Special version, TSP-No. to be spec.		
20	Process connection:		Additional weight
	GQ2	G ¾ 316L (FTL50H) Thread ISO 228	
	Installation > accessories: weld-in adapter		
	GW2*	G 1 316L Thread ISO 228	0.2 kg
	Installation > accessories: weld-in adapter		
	BA2	DN32 PN6 A 316L Flange EN 1092-1 (DIN 2527 B)	1.2 kg
	BB2	DN32 PN25/40 A 316L Flange EN 1092-1 (DIN 2527 B)	2.0 kg
	BC2	DN40 PN6 A 316L Flange EN 1092-1 (DIN 2527 B)	1.4 kg
	BD2	DN40 PN25/40 A 316L Flange EN 1092-1 (DIN 2527 B)	2.4 kg
	BE2	DN50 PN6 A 316L Flange EN 1092-1 (DIN 2527 B)	1.6 kg
	BG2	DN50 PN25/40 A 316L Flange EN 1092-1 (DIN 2527 B)	3.2 kg
	BH2	DN65 PN6 A 316L Flange EN 1092-1 (DIN 2527 B)	2.4 kg
	BK2	DN65 PN25/40 A 316L Flange EN 1092-1 (DIN 2527 B)	4.3 kg
	BM2	DN80 PN10/16 A 316L Flange EN 1092-1 (DIN 2527 B)	4.8 kg
	BN2	DN80 PN25/40 A 316L Flange EN 1092-1 (DIN 2527 B)	5.9 kg
	BQ2	DN100 PN10/16 A 316L Flange EN 1092-1 (DIN 2527 B)	5.6 kg
	BR2	DN100 PN25/40 A 316L Flange EN 1092-1 (DIN 2527 B)	7.5 kg
	B82	DN25 PN25/40 A 316L Flange EN 1092-1 (DIN 2527 B)	1.4 kg
	CG2	DN50 PN25/40 B1 316L Flange EN 1092-1 (DIN 2527 C)	3.2 kg
	CN2	DN80 PN25/40 B1 316L Flange EN 1092-1 (DIN 2527 C)	5.9 kg
	CQ2	DN100 PN10/16 B1 316L Flange EN 1092-1 (DIN 2527 C)	5.6 kg

20	Process connection:						Additional weight
	EE2	1" flush-mounted (52001047)		316L		0.3 kg	
	Installation > accessories: weld-in adapter						
	HE2	DN50	Pipe DIN 11850 slotted nut	316L		DIN 11864-1 A	0.3 kg
	AA2*	1¼"	150 lbs	RF	316/316L	Flange ASME B16.5	1.2 kg
	AC2*	1½"	150 lbs	RF	316/316L	Flange ASME B16.5	1.5 kg
	AE2*	2"	150 lbs	RF	316/316L	Flange ASME B16.5	2.4 kg
	AF2*	2"	300 lbs	RF	316/316L	Flange ASME B16.5	3.2 kg
	AJ2*	2½"	300 lbs	RF	316/316L (FTL51H)	Flange ASME B16.5	4.8 kg
	AL2*	3"	150 lbs	RF	316/316L	Flange ASME B16.5	4.9 kg
	AM2	3"	300 lbs	RF	316/316L (FTL51H)	Flange ASME B16.5	6.8 kg
	AP2*	4"	150 lbs	RF	316/316L	Flange ASME B16.5	7.0 kg
	AQ2*	4"	300 lbs	RF	316/316L (FTL51H)	Flange ASME B16.5	11.5 kg
	A82*	1"	150 lbs	RF	316/316L	Flange ASME B16.5	1.0 kg
	KA2	10 K 25		RF	316L	Flange JIS B2220	
	KC2	10 K 40		RF	316L	Flange JIS B2220	
	KE2	10 K 50		RF	316L	Flange JIS B2220	1.7 kg
	KL2	10 K 80		RF	316L	Flange JIS B2220	
	KP2	10 K 100		RF	316L	Flange JIS B2220	
	MA2	DN32	PN25		316L	DIN 11851	0.1 kg
	MC2	DN40	PN25		316L	DIN 11851	0.2 kg
	ME2	DN50	PN25		316L	DIN 11851	0.3 kg
	PE2	DRD	65 mm		316L		0.3 kg
	TC2*	DN25-38 (1 to 1½")			316L	Tri-Clamp ISO 2852	0.1 kg
	TF2*	DN25-38 (1 to 1½")			316L	Tri-Clamp NA-Connector ISO 2852	0.1 kg
	TE2*	DN40-51 (2")			316L	Tri-Clamp ISO 2852	0.1 kg
	TF2*	DN40-51 (2")			316L	Tri-Clamp NA-Connector ISO 2852	0.1 kg
	TT2	Ingold fitting 25x46mm			316L		
	UE2	SMS 2"	PN25		316L		0.2 kg
	WE2*	DN65-162 PN10			316L	Varivent N pipe	0.5 kg
	YY9	Special version					
		* CRN approval					

30	Probe length; Type:					
	FTL50H					
	AC	Compact;	Ra <1.5 µm/59 µin			
	AD	Compact;	Ra <0.3 µm/12 µin			
	IC	Compact;	Ra <1.5 µm/59 µin + temperature spacer			0.6 kg
	ID	Compact;	Ra <0.3 µm/12 µin / A3 + temperature spacer			0.6 kg
	QC	Compact;	Ra <1.5 µm/59 µin + pressure-tight feedthrough			0.7 kg
	QD	Compact;	Ra <0.3 µm/12 µin / A3 + pressure-tight feedthrough			0.7 kg
	FTL51H					
	BC	 mm;	Ra <1.5 µm/59 µin			0.9 kg/m
	BD	 mm;	Ra <0.3 µm/12 µin / A3			0.9 kg/m
	BF	mm;	Ra<0.76 µm/30 µin			0.9 kg/m
	CC	 inch;	Ra <1.5 µm/59 µin			2.3 kg/100 in
	CD	 inch;	Ra <0.3 µm/12 µin / A3			2.3 kg/100 in
	DC	Length: type II*;	Ra <1.5 µm/59 µin			0.1 kg
	DD	Length: type II*;	Ra <0.3 µm/12 µin / A3			0.1 kg
	JC	 mm;	Ra <1.5 µm/59 µin + Temperature spacer			0.9 kg/m +0.6 kg
	JD	 mm;	Ra <0.3 µm/12 µin + Temperature spacer			0.9 kg/m +0.6 kg
	KC	 inch;	Ra <1.5 µm/59 µin + Temperature spacer			2.3 kg/100 in +0.6 kg
	KD	 inch;	Ra <0.3 µm/12 µin + Temperature spacer			2.3 kg/100 in +0.6 kg
	LC	Length: type II*;	Ra <1.5 µm/59 µin + Temperature spacer			0.1 kg +0.6 kg
	LD	Length: type II*;	Ra <0.3 µm/12 µin + Temperature spacer,			0.1 kg +0.6 kg
	RC	 mm;	Ra <1.5 µm/59 µin + Pressure-tight feedthrough			0.9 kg/m +0.7 kg
	RD	 mm;	Ra <0.3 µm/12 µin + Pressure-tight feedthrough			0.9 kg/m +0.7 kg
	SC	 inch;	Ra <1.5 µm/59 µin + Pressure-tight feedthrough			2.3 kg/100 in +0.7 kg

30				Probe length; Type:			
			SD	 inch;	Ra <0.3 µm/12 µin + Pressure-tight feedthrough	2.3 kg/100 in +0.7 kg	
			TC	Length: type II*;	Ra <1.5 µm/59 µin + Pressure-tight feed through,	0.1 kg +0.7 kg	
			TD	Length: type II*;	Ra <0.3 µm/12 µin + Pressure-tight feed through,	0.1 kg +0.7 kg	
			YY	Special version *) If replacing devices: when vertically mounting a Liquiphant M FTL51H with length II the switch point is at the same height as for a Liquiphant II FTL360, FTL365, FDL30, FDL35. See also Seite 36 "L II" depends on process connection.			
40				Electronics; output:			
			A	FEL50A	PROFIBUS PA		
			D	FEL50D	Density/concentration without WHG approval (Germany)		
			1	FEL51*	2-wire, AC 19 to 253 V		
			2	FEL52*	3-wire PNP, DC 10 to 55 V		
			4	FEL54	Relay DPDT, AC 19 to 253 V, DC 19 to 55 V		
			5	FEL55	8/16 mA, DC 11 to 36 V		
			6	FEL56	NAMUR (L-H signal)		
			7	FEL57	2-wire PFM		
			8	FEL58*	NAMUR + test keys (H-L signal)		
			9	Special version *) Also available in compact housing			
50				Housing; cable entry:			
			C3	Compact 316L	IP66/68; Cable 5 m		
			D3	Compact 316L	IP65; Plug Pg11	ISO4400	
			E3	Compact 316L	NEMA4X; Plug NPT ½	ISO4400	
				Hygiene			
			N3	Compact 316L	IP66/68; M12 connector		
				Hygiene			
			E4	F16 Polyester	NEMA4X; Thread NPT ½		
			E5	F13 Alu	NEMA4X/6P; Thread NPT ¾		0.5 kg
				F17 Alu	NEMA4X		
			E6	F15 316L	NEMA4X; Thread NPT ½		0.1 kg
				Hygiene			
			E7	T13 Alu	NEMA4X/6P; Thread NPT ¾		0.9 kg
				Separate connection compartment			
			F4	F16 Polyester	IP66/67; Thread G ½		
			F5	F13 Alu	IP66/68; Thread G ½		0.5 kg
				F17 Alu	IP66/67;		
			F6	F15 316L hygiene	IP66/67; Thread G ½		0.1 kg
			F7	T13 Alu	coated IP66/68; thread G ½		0.9 kg
				Separate connection compartment			
				Ex d > M20 thread			
			G4	F16 Polyester	IP66/67; M20 threaded joint		
			G5	F13 Alu	IP66/68; M20 threaded joint		0.5 kg
				F17 Alu	IP66/67;		
					Ex d > thread M20		
			G6	F15 316L	IP66/67; M20 threaded joint		0.1 kg
				Hygiene			
			G7	T13 Alu	coated IP66/68; M20 threaded joint		0.9 kg
				Separate connection compartment			
				Ex d > thread M20			
			N4	F16 Polyester	IP66/67; M12 connector		
			N5	F13 Alu	IP66/68; M12 connector		
				F17 Alu	IP66/67;		
			N6	F15 316L hygiene	IP66/67; M12 connector		
			Y9	Special version			
60				Additional option			
			A	Basic version			
			B	CoC-ASME BPE, EN10204-3.1 material (316L wetted) Inspection certificate			
			C	EN 10204 - 3.1 material (316L wetted), Inspection certificate			
			D	EN10204-3.1 AD2000 material, wetted, apart from cast parts, inspection certificate			
			K	Special adjustment, density H2O			
			L	Special adjustment, density H2O, EN10204-3.1 (316L wetted) inspection certificate			
			S	GL/ABS marine approval for FTL51H: ≤ 1600 mm (63 in)			
			Y	Special version			

FTL5#H - Complete product designation



Note!

Basic weight = compact sensor, thread adapter G 3/4, electronic insert, stainless steel housing

Accessories

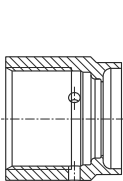
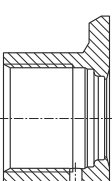
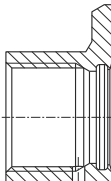
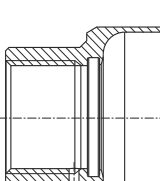
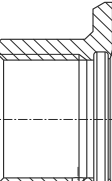
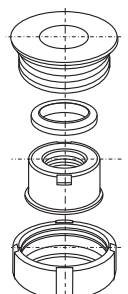


Note!

- All dimensions in mm (in)!
- For additional information on weld-in adapters, refer to TI00426F.
- The tolerance of the thread start between the weld-in adapter and sensor is $\pm 15^\circ$.

Weld-in adapter

Overview

							
		a0008246	a0008251	a0008256	a0011924	a0008248	a0008253
		G3/4, d=29 (1.14) without flange	G3/4, d=50 (1.97) with flange	G3/4, d=55 (2.17) with flange	G1, d=53 (2.09) without flange	G1, d=60 (2.36) with flange	G1 can be positioned
Material roughness μm (μin)		316L 1.5 (59.1)	316L 0.8 (31.5)	316L 0.8 (31.5)	316L 0.8 (31.5)	316L 0.8 (31.5)	316L 0.8 (31.5)
Without inspection certificate EN10204-3.1 material		71258357	71258355	52001052 ³⁾	71258358	52001051 ^{1), 3)}	52001221 ^{2), 3)}
With inspection certificate EN10204-3.1 material		52028295 ³⁾	52018765 ³⁾	52011897 ³⁾	71093129 ^{1), 3)}	52011896 ^{1), 3)}	52011898 ^{2), 3)}
Seal (replacement part: set of 5)		Silicone O-ring 52021717	Silicone O-ring 52021717	Silicone O-ring 52014473	Silicone O-ring 52014472	Silicone O-ring 52014472	Silicone profile gasket 52014424)
Weld-in dummy		–	–	71168889	71166879	71166879	71181945
Liquiphant M	Feature	Version					
FTL50	020			GQ2			
FTL5x					GW2	GW2	GW2
FTL50H				GQ2			
FTL5xH					GW2	GW2	GW2

1) This weld-in adapter replaces the weld-in adapter with the order number 917969-1000.

2) This weld-in adapter replaces the weld-in adapter with the order number 215159-0000.

3) A seal is included in the delivery.

		
	RD52	DRD DN50 65 (2.56) (welding flange)
Material roughness μm (μin), process side	316L 0.8 (31.5)	316L/304 0.8 (31.5)
Without inspection certificate EN10204-3.1 material	52001047 ^{1), 2)}	52002041 ²⁾ / 916743-0000
With inspection certificate EN10204-3.1 material	52006909 ^{1), 2)}	52011899 ²⁾ / –
Seal (replacement part: set of 5)	Silicone profile gasket 52014424	PTFE flat seal 52024228
Weld-in dummy	M40167	–
Device	Feature	Version
Liquiphant M		
FTL5xH	020	EE2 PE2

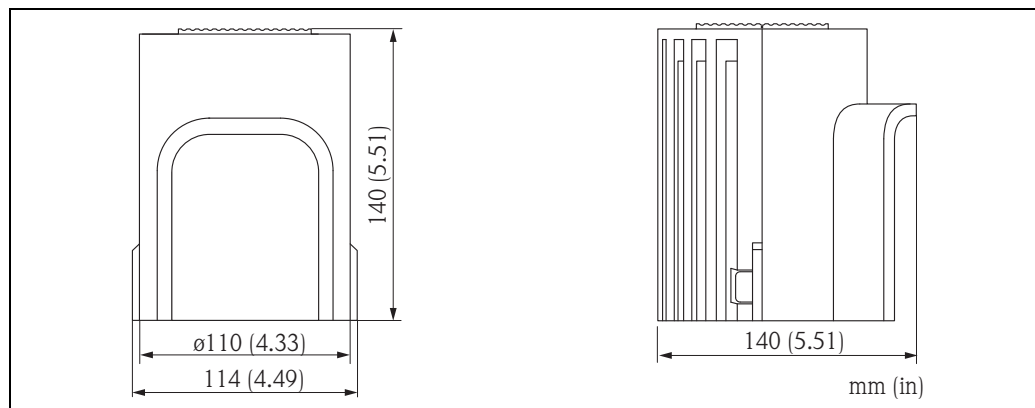
- 1) This weld-in adapter replaces the weld-in adapter with the order number 942329-0001.
2) A seal is included in the delivery.



Note!
All the weld-in adapters available are described in document TI00426F.
www.endress.com --> Download --> Advanced--> Documentation code --> TI00426F.

Weather protection cover

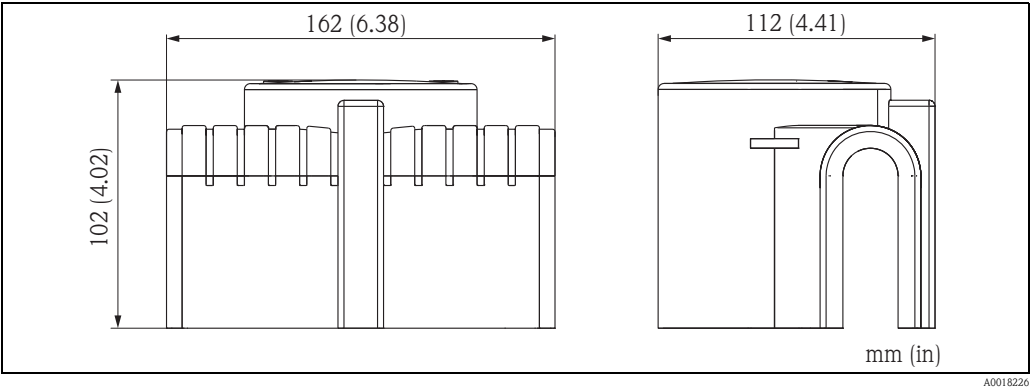
For F16 housing



A0018225

Material	Order No.	Weight
PBT, gray	71127760	240 g (8.46 oz)

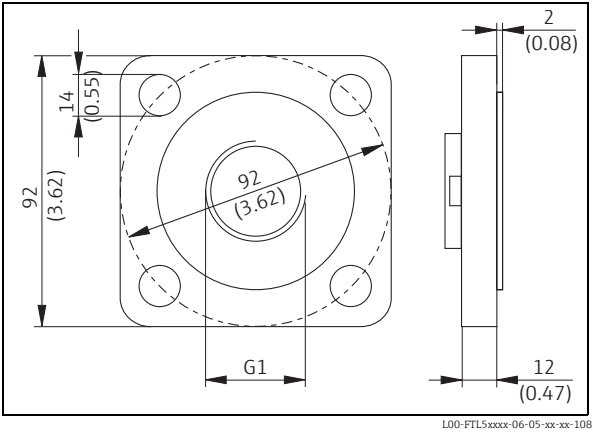
For F13, F17 and F27 housing



Material	Order No.	Weight
PA6, gray	71040497	300 g (10.58 oz)

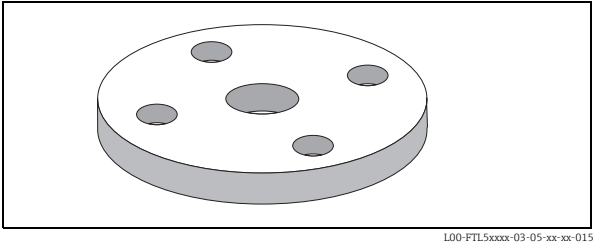
Lap joint flange

Order number: 918158-0000
With G 1 thread for mounting
a Liquiphant FTL50, FTL51
with process connection GR2
Pressure up to 40 bar (580 psi)
Material: corrosion-resistant steel
1.4301 (AISI 304)
Weight: 0.54 kg (1.19 lbs)



Lap joint flanges

With G 1 thread for mounting
a Liquiphant FTL50, FTL51
with process connection GR2
Material: corrosion-resistant steel
1.4571 (AISI 316Ti)
– Order number: 918143-0000
Flange DN50 PN40, EN 1092-1
Weight: 3.11 kg (6.86 lbs)
– Order number: 918144-0000
Flange ASME 2", 150 psi, RF
Weight: 2.38 kg (5.25 lbs)



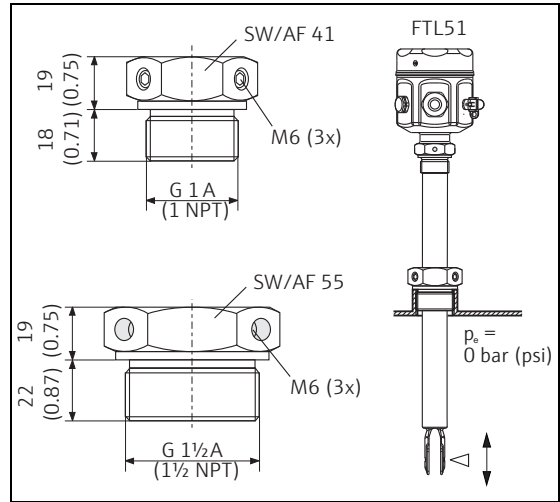
Sliding sleeves for unpressurized operation

Switch point infinitely variable for
Liquiphant MFTL51

Material: corrosion-resistant steel
1.4435 (AISI 316 L)

Weight for G 1, NPT 1: 0.21 kg (0.46 lbs)

Weight for G 1½, NPT 1½: 0.54 kg (1.19 lbs)



L00-FTL5xxxx-06-05-xx-xx-109

Thread	Standard	Material	Order number	Approval
G 1	DIN ISO 228/1	1.4435 (AISI 316 L)	52003978	
G 1	DIN ISO 228/1	1.4435 (AISI 316 L)	52011888	With inspection certificate EN 10204 - 3.1 material
NPT1	ASME B 1.20.1	1.4435 (AISI 316 L)	52003979	
NPT1	ASME B 1.20.1	1.4435 (AISI 316 L)	52011889	With inspection certificate EN 10204 - 3.1 material
G 1½	DIN ISO 228/1	1.4435 (AISI 316 L)	52003980	
G 1½	DIN ISO 228/1	1.4435 (AISI 316 L)	52011890	With inspection certificate EN 10204 - 3.1 material
NPT1½	ASME B 1.20.1	1.4435 (AISI 316 L)	52003981	
NPT1½	ASME B 1.20.1	1.4435 (AISI 316 L)	52011891	With inspection certificate EN 10204 - 3.1 material

High pressure sliding sleeves

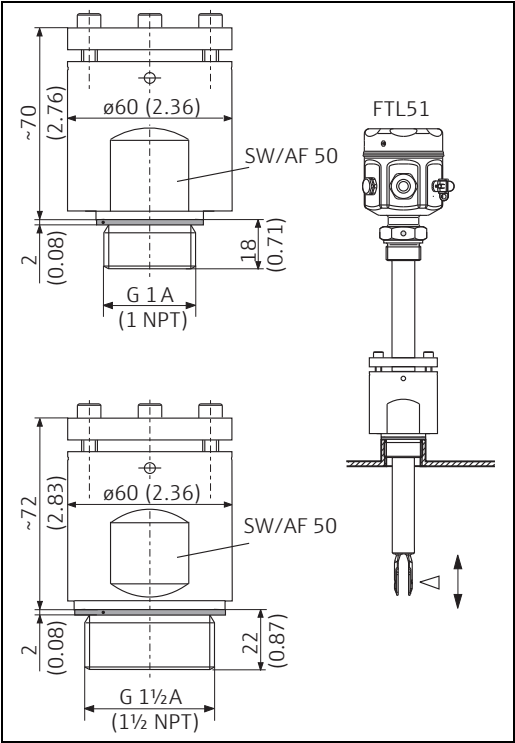
For continuous adjustment of the switch point of a Liquiphant M FTL51.
Also for use in hazardous areas. Additional information → 58ff. (ATEX, NEPSI).

Material: corrosion-resistant steel
1.4435 (AISI 316L) or AlloyC22

Weight for G 1, NPT 1: 1.13 kg (2.49 lbs)
Weight for G 1½, NPT 1½: 1.32 kg (2.91 lbs)

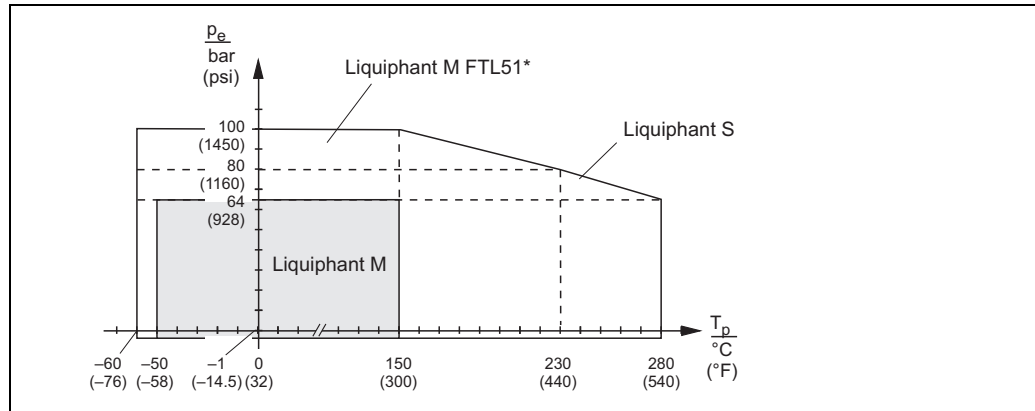
Seal package made of graphite.

For G1, G 1½:
Seal is included in the delivery.



L00-FTL5xxxx-06-05-xx-xx-110

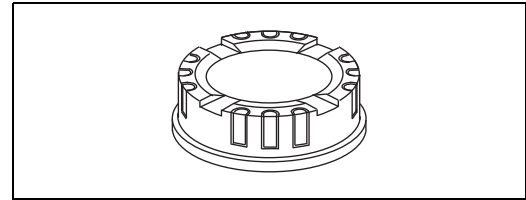
Thread	Standard	Material	Order number	Approval
G 1	DIN ISO 228/1	1.4435 (AISI 316 L)	52003663	
G 1	DIN ISO 228/1	1.4435 (AISI 316 L)	52011880	With inspection certificate EN 10204 - 3.1 material
G 1	DIN ISO 228/1	AlloyC22	71118691	With inspection certificate EN 10204 - 3.1 material
NPT1	ASME B 1.20.1	1.4435 (AISI 316 L)	52003667	
NPT1	ASME B 1.20.1	1.4435 (AISI 316 L)	52011881	With inspection certificate EN 10204 - 3.1 material
NPT1	ASME B 1.20.1	AlloyC22	71118694	With inspection certificate EN 10204 - 3.1 material
G 1½	DIN ISO 228/1	1.4435 (AISI 316 L)	52003665	
G 1½	DIN ISO 228/1	1.4435 (AISI 316 L)	52011882	With inspection certificate EN 10204 - 3.1 material
G 1½	DIN ISO 228/1	AlloyC22	71118693	With inspection certificate EN 10204 - 3.1 material
NPT1½	ASME B 1.20.1	1.4435 (AISI 316 L)	52003669	
NPT1½	ASME B 1.20.1	1.4435 (AISI 316 L)	52011883	With inspection certificate EN 10204 - 3.1 material
NPT1½	ASME B 1.20.1	AlloyC22	71118695	With inspection certificate EN 10204 - 3.1 material



* FTL51 with high-pressure sliding sleeve (100 bar (1450 psi)). See "Additional option" Seite 44 ff. option "P" or "R".l

Cover with sight glass

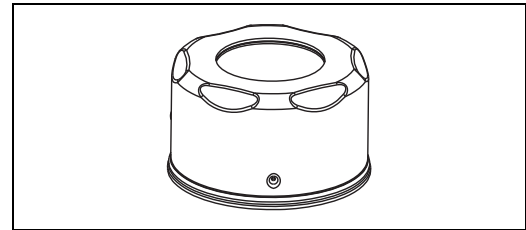
Order number: 943461-0001
for polyester housing F16
Material: PA 12
Weight: 0.04 kg (0.09 lbs)



L00-FTL5xxxx-03-05-xx-xx-016

Cover with sight glass

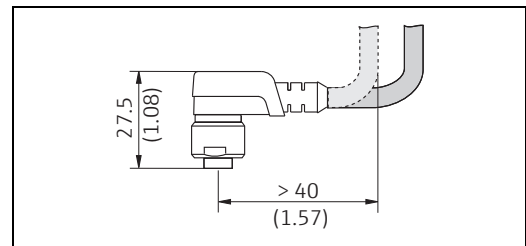
For stainless steel housing F15
Material: AISI 316L
Weight: 0.16 kg (0.35 lbs)
– Order number: 52027002
With glass sight glass
– Order number: 52028207
With PC sight glass
(Not for CSA, General Purpose)



L00-FTL5xxxx-03-05-xx-xx-017

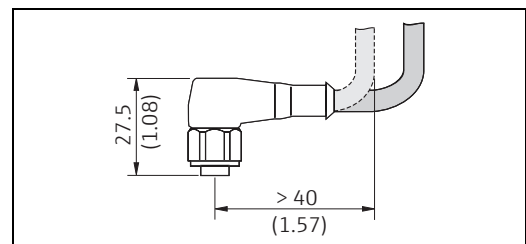
Circular connector

Order number: 52010285
4x0.34 M12 socket
Cable: PVC (gray) 5 m (16 ft)
Body: PUR (blue)
Thread adapter nut: Cu Sn/Ni
Degree of protection: IP67
Temperature range with fixed cable:
–25 to +70 °C (–13 to +158 °F)
Temperature range with flexible cable:
–5 to +70 °C (23 to +158 °F)



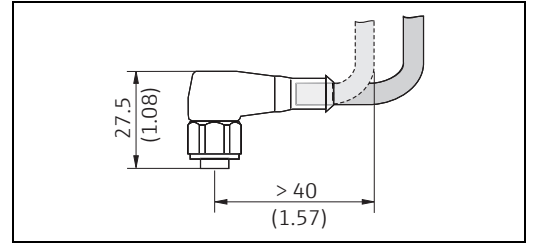
L00-FTL5xxxx-06-05-xx-xx-111

Order number: 52024216
4x0.34 M12 socket
Cable: PVC (orange) 5 m (16 ft)
Body: PVC (orange)
Thread adapter nut: 316L
Degree of protection: IP69 (fully locked)
Temperature range: –25 to +70 °C (–13 to +158 °F)



L00-FTL5xxxx-06-05-xx-xx-112

Order number: 52018763
4x0.34 M12 socket with integrated LEDs
Cable: PVC (orange) 5 m (16 ft)
Body: PVC (transparent)
Thread adapter nut: 316L
Degree of protection: IP69IP69 (fully locked)
Temperature range: -25 to +70 °C (-13 to +158 °F)



Documentation



Note!

You can find supplementary documentation on the product pages at www.endress.com

Operating Instructions

Electronic insert FEL50A for Liquiphant M, PROFIBUS PA
BA00141F

Liquiphant M Density, density computer FML621
BA00335F

Liquiphant M FTL50, FTL51
KA00143F

Liquiphant M FTL50(H), FTL51(H)
KA00144F

Liquiphant M FTL51C
KA00162F

Liquiphant M FTL50-##### # 7 #, FTL51-##### # 7 #
KA00163F

Liquiphant M FTL50H-##### 7 #, FTL51H-##### 7 #
KA00164F

Liquiphant M FTL51C-##### 7 ##
KA00165F

Liquiphant M FTL5#-# ### ## #3 #, FTL5#H-# ### ## #3 #
KA00220F

Electronic insert FEL50D for Liquiphant M Density FTL50, FTL51
KA00284F

Electronic insert FEL50D for Liquiphant M Density FTL50H, FTL51H
KA00285F

Electronic insert: FEL50D for Liquiphant M Density FTL51C
KA00286F

Liquiphant M sliding sleeve for FTL51, G 1, NPT 1
KA00151F

Liquiphant M sliding sleeve for FTL51, G 1½, NPT 1½
KA00152F

Liquiphant M high-pressure sliding sleeve for FTL51, G 1, NPT 1
KA00153F

Liquiphant M high-pressure sliding sleeve for FTL51, G 1½, NPT 1½
KA00154F

Technical Information	General instructions for electromagnetic compatibility (Test procedure, installation recommendation) TI00241F
	Liquiphant M FTL51C, wetted parts with highly corrosion-resistant coating ECTFE, PFA or enamel coating TI00347F
	Isolating amplifier FTL325P, 1- or 3-channel switching units for top-hat rail mounting for Liquiphant M with electronic insert FEL57 TI00350F
	Isolating amplifier FTL325N, 1- or 3-channel switching units for top-hat rail mounting for Liquiphant M with electronic insert FEL56, FEL58 TI00353F
	Liquiphant S FTL70/71, for medium temperatures up to 280 °C (536 °F) TI00354F
	Isolating amplifier FTL375P, 1 to 3-channel switching units for top-hat rail mounting for Liquiphant M with electronic insert FEL57 TI00360F
	Liquiphant M Density, density computer FML621 TI00420F
	Weld-in adapter, TI00426F

Functional safety (SIL)	Liquiphant M with electronic insert FEL51 (MAX) SD00164F
	Liquiphant M with electronic insert FEL51 (MIN) SD00185F
	Liquiphant M with electronic insert FEL52 (MAX) SD00163F
	Liquiphant M with electronic insert FEL52 (MIN) SD00186F
	Liquiphant M with electronic insert FEL54 (MAX) SD00162F
	Liquiphant M with electronic insert FEL54 (MIN) SD00187F
	Liquiphant M with electronic insert FEL55 (MAX) SD00167F
	Liquiphant M with electronic insert FEL55 (MIN) SD00279F
	Liquiphant M with electronic insert FEL57 + Nivotester FTL325P SD01508F (MAX + MIN)
	Liquiphant M with electronic insert FEL56 + Nivotester FTL325N SD01521F (MAX + MIN)
	Liquiphant M with electronic insert FEL58 + Nivotester FTL325N SD01522F (MAX + MIN)

Safety Instructions	ATEX
	DEKRA 15 ATEX 0088 ■ Ex d, Ex de XA00115F, XA00114F, XA00108F, XA00031F
	KEMA 99 ATEX 0523 X ■ Ex d, Ex de XA00113F, XA00064F, XA00063F

EG 01 007 X

- Ex nA
XA00182F

IEC Ex

IECEX DEK 15.0060

- Ex d, Ex de
XA01371F, XA00114F, XA00108F, XA00031F

KEMA 99 ATEX 0523 X; IECEX DEK 15.0028X

- Ex d, Ex de
XA00113F, XA00064F, XA00063F

Safety Instructions (NEPSI)

Ex d IIC/IIB T3-T6 , Ex d IIC T2-T6
(NEPSI GYJ06424)
XA00401F/00/B2

Ex ia IIC T2-T6, Ex ia IIB T3-T6
(NEPSI GYJ05556, NEPSI GYJ06464),
XC00009F/00/b2

Ex nA II T3-T6, Ex nC/nL IIC T3-T6
(NEPSI GYJ04360, NEPSI GYJ071414)
XC00010F/00/b2

Control Drawings

Liquiphant M (IS and NI) Current output PFM, NAMUR Entity installation
Class I, Div. 1, 2, Groups A, B, C, D
Class I, Zone 0
Class II, Div. 1, 2, Groups E, F, G
Class III
ZD00041F

Liquiphant M, Liquiphant S (cCSAus / IS)
Class I, Div. 1, Groups A, B, C, D Ex ia IIC T6
Class II, Div. 1, Groups E, F, G
Class III
ZD00042F

Liquiphant M (NI), FTL50(H), FTL51(H), FTL51C, FTL70, FTL71
Class I, Div. 2, Groups A, B, C, D
Class II, Div. 2, Groups F, G
Class III
ZD00043F

Liquiphant M, Liquiphant S (cCSAus / XP)
Class I, Groups A, B, C, D
Class II, Groups E, F, G
Class III
ZD00240F

Liquiphant M (IS and NI) PROFIBUS PA, FOUNDATION Fieldbus
Class I, Zone 0, IIC
Class I, Division 1, 2, Groups A, B, C, D
Class II, Division 1, 2, Groups E, F, G
Class III
ZD00244F

System information

Liquiphant M
SI00040F



71379381

www.addresses.endress.com

TransCanada Keystone Pipeline, L.P.

Keystone XL Pipeline Canadian Pump Stations
Level Switch

PO#: 4500257847
E+H SO#: 3003333187

Tab	SDDR#	Description
7	XB	Packing, Shipping, Handling, Storage and Preservation Procedures

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Calgary, AB T2E 8W1
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Fax + 403.777.2253

Document Title: Packing, Shipping, Handling, Storage & Preservation Procedures

Document Number: 25472-101-V1A-JL10-Z0009

Revision Number: 01

PO Number: 4500257847

Material Requisition Number: KXL1399-CH2M-I-MR-0001

Tag Nos. : 125-BDLSS-B0-LSHH-0302, 126-FXVLY-B0-LSHH-0302



Contractor Name : Endress+Hauser Canada Ltd
 Contractor Address : 1075 Sutton Drive
 City, Province : Burlington, Ontario
 Country, Postal code : Canada L7L 5Z8
 Telephone Number : (905) 681-9292

Rev No.	Rev Date yyyy-mm-dd	Reason for Issue	Contractor Originator	Contractor Reviewer	Contractor Approver
01	2019-06-17	Issued For Information	A. Patil	A. Patil	C. Penney

CODE 1: Work may proceed.



Permission to proceed does not constitute acceptance or approval of design details, calculations, analyses, test methods or materials developed or selected by the supplier and does not relieve the supplier from full compliance with contractual obligations.

Name: kloca

Date: 06/25/2019

Endress + Hauser Shipping, Storage and Preservation Procedures

Table of contents

1.1 Introduction.....	3
2.0 Products.....	4
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Storage and Preservation Procedures

1.1 Introduction

FOR: E+H Customers

DISTRIBUTION: Sales/Projects/Logistics

IMPLEMENTED BY: Projects/Service

General Guidelines:

E+H SC Canada Ltd. has produced these general guidelines to describe how handling of our products should be done to eliminate potential damage during field installation, shipping and storage of E+H equipment.

Our goal is to provide adequate information in advance to avoid environmental conditions that can damage and protect equipment from possible mishandling or misuse.

2.0 Products

2.1 Flow Meters

Transportation

The following instructions apply to unpacking and to transporting the device to its final location:

- Transport the devices in the containers in which they are delivered.
- Do not remove the protective plates or caps on the process connections until the device is ready to install. This is particularly important in the case of sensors with PTFE linings.
- In the event that a forklift is used to move the meter, lift the unit from the bottom of the box/crate and ensure that the forks do not puncture the box/crate as this may damage the unit.
- Do not stack boxes on top of the unit.

Incoming acceptance

- Check the packaging and the contents for damage.
- Check the shipment, make sure nothing is missing and that the scope of supply matches your order.
- Check that Installation operation and maintenance manual is provided in Box.
- If Documentation was ordered (IE: Material test reports, Hydro Test, etc) ensure that the documents are inside the Box.
- Once the unit is removed from the packaging, an inspection of the covers is recommended to ensure a tight seal. In the event that the cover is loose then turn clockwise until the cover can not rotate any further.

NOTE: Leave Instruments in protective Box until installation is required. This will protect the unit from damage.

Storage

Note the following points:

- Pack the measuring device in such a way as to protect it reliably against impact for storage (and transportation). The original packaging provides optimum protection.
- The storage temperature is $-40...+80\text{ °C}$ (preferably $+20\text{ °C}$).
- The measuring device must be protected against direct sunlight during storage in order to avoid unacceptably high surface temperatures.

- Choose a storage location where moisture does not collect in the measuring device. This will help prevent fungus and bacteria infestation which can damage the liner.
- Do not remove the protective plates or caps on the process connections until you are ready to install the device. This is particularly important in the case of sensors with PTFE linings.
- Do not remove covers of the transmitters as moisture can be captured inside the electronics

NOTE: If covers of the instrumentation housing are taken off, insure the covers are put on properly to avoid cross threading, or weather (moisture) penetrating into the housing.

Special notes:

- The wooden covers mounted on the flanges before the device leaves the factory protect the linings on the flanges during storage and transportation. Do not remove these covers until immediately before the device is installed in the pipe.
- Do not lift flanged devices by the transmitter housing, or the connection housing in the case of the remote version.
- Use webbing slings slung round the two process connections. Do not use chains, as they could damage the housing.
- The storage temperature corresponds to the ambient temperature range of the measuring transmitter and the relevant measuring sensors and the corresponding sensor cables.
- In the event that a plastic plug is installed in any conduit entry point and the unit will be exposed to the environments for a long period of time. The conduit will require a SS plug to be installed for adequate moisture protection.
- In the event that a plastic plug is installed in any conduit entry point and the unit will be exposed to the environments for a long period of time. The conduit will require a SS plug to be installed for adequate moisture protection.
- This information is used for a general guide line if more information is required refer to model number specific TI (Technical Information) document for more detailed information.

2.2 Pressure Meters

Transportation

The following instructions apply to unpacking and to transporting the device to its final location:

- Transport the devices in the containers in which they are delivered.
- Do not remove Protective Caps and covers that are installed on the units until installation of the equipment is required.
- Units with Diaphragm Seals - do not remove the protection of the process isolating diaphragm protection until shortly before installation.
- Do not stack boxes on top of the unit.

Incoming acceptance

- Check the packaging and the contents for damage.
- Check the shipment, make sure nothing is missing and that the scope of supply matches your order.
- Check that Installation operation and maintenance manual is provided in Box.
- If Documentation (IE: Material test reports, Hydro Test, etc) are ordered with the shipment ensure that the documentation is inside the Box.
- Once the unit is removed from the packaging, an inspection of the covers is recommended to ensure a tight seal. In the event that the cover is loose then turn clockwise until the cover can not rotate any further.
- Once the unit is removed from the packaging, an inspection of the covers is recommended to ensure a tight seal. In the event that the cover is loose then turn clockwise until the cover can not rotate any further.

NOTE: Leave Instruments in protective Box until installation is required. This will protect the unit from damage.

Storage

Note the following points:

- Pack the measuring device in such a way as to protect it reliably against impact for storage (and transportation). The original packaging provides optimum protection.
- Typical ambient storage temperatures for a Ceramic Diaphragm are (-20 to +60°C) and for Metallic Diaphragm (-40...+60 °C). This will be dependant on the fill fluid utilized in the instrument. Please make note of this prior to

storage as the information will be provided on the name plate of the instrument.

- The measuring device must be protected against direct sunlight during storage in order to avoid unacceptably high surface temperatures.
- Choose a storage location where moisture does not collect in the measuring device. This will help prevent fungus and bacteria infestation which can damage the liner.
- Do not remove the protective covers on the process connections until you are ready to install the device.
- Do not remove covers of the transmitters as moisture can be captured inside the electronics.

NOTE: If covers of the instrumentation housing are taken off, please insure the covers are put on properly to avoid cross threading and/or weather (moisture) penetrating into the housing.

Special notes:

- Do not lift flanged devices by the transmitter housing, or the connection housing in the case of the remote version.
- The diaphragm seal, together with the pressure transmitter, forms a closed, calibrated system, which is filled through openings in the diaphragm seal and in the measurement system of the pressure transmitter. These openings are sealed and must not be opened.
- In the event that a plastic plug is installed in any conduit entry point and the unit will be exposed to the environments for a long period of time. The conduit will require a SS plug to be installed for adequate moisture protection.
- This information is used for a general guide line if more information is required refer to model number specific TI (Technical Information) document for more detailed information.

2.3 Level Transmitter

Transportation

The following instructions apply to unpacking and to transporting the device to its final location:

- Transport the devices in the containers in which they are delivered.
- Do not remove Protective covers that are installed on the units until installation of the equipment is required.
- Do not stack boxes on top of the unit.

Incoming acceptance

- Check the packaging and the contents for damage.
- Check the shipment, make sure nothing is missing and that the scope of supply matches your order.
- Check that Installation operation and maintenance manual is provided in Box.
- If Documentation (IE: Material test reports, Pressure test, etc) are ordered with the shipment ensure that the documentation is inside the Box.
- Once the unit is removed from the packaging, an inspection of the covers is recommended to ensure a tight seal. In the event that the cover is loose then turn clockwise until the cover can not rotate any further.

NOTE: Leave Instruments in protective Box until installation is required. This will protect the unit from damage.

Storage

Note the following points:

- Pack the measuring device in such a way as to protect it reliably against impact for storage (and transportation). The original packaging provides optimum protection.
- The ambient storage temperature ($-40...+80\text{ }^{\circ}\text{C}$) - preferably $+20\text{ }^{\circ}\text{C}$.
- The measuring device must be protected against direct sunlight during storage in order to avoid unacceptably high surface temperatures.
- Choose a storage location where moisture does not collect in the measuring device. This will help prevent fungus and bacteria infestation which can damage the liner.
- Do not remove the protective covers on the process connections until you are ready to install the device.

- Do not remove covers of the transmitters as moisture can be captured inside the electronics.

NOTE: If covers of the instrumentation housing are taken off, please insure the covers are put on properly to avoid cross threading, and/or weather (moisture) penetrating into the housing.

Special notes:

- Do not lift flanged devices by the transmitter housing, or the connection housing in the case of the remote version.
- This information is used for a general guide line if more information is required refer to model number specific TI (Technical Information) document for more detailed information.
- In the event that a plastic plug is installed in any conduit entry point and the unit will be exposed to the environments for a long period of time. The conduit will require a SS plug to be installed for adequate moisture protection.

2.4 Temperature Transmitters

Transportation

The following instructions apply to unpacking and to transporting the device to its final location:

- Transport the devices in the containers in which they are delivered.
- Do not remove Protective bubble wrap that are installed on the units until installation of the equipment is required.
- Do not stack boxes on top of the unit.

Incoming acceptance

- Check the packaging and the contents for damage.
- Check the shipment, make sure nothing is missing and that the scope of supply matches your order.
- Check that Installation operation and maintenance manual CD, and safety notes are provided in Box.
- If Documentation (IE: Material test reports, Calibration reports, ect) are ordered with the shipment ensure that the documentation is inside the Box.
- Once the unit is removed from the packaging, an inspection of the covers is recommended to ensure a tight seal. In the event that the cover is loose then turn clockwise until the cover can not rotate any further.

NOTE: Leave Instruments in protective Box until installation is required. This will protect the unit from damage.

Storage

Note the following points:

- Pack the measuring device in such a way as to protect it reliably against impact for storage (and transportation). The original packaging provides optimum protection.
- The ambient storage temperature ($-40...+80\text{ }^{\circ}\text{C}$) - preferably $+20\text{ }^{\circ}\text{C}$.
- The measuring device must be protected against direct sunlight during storage in order to avoid unacceptably high surface temperatures.
- Choose a storage location where moisture does not collect in the measuring device. This will help prevent fungus and bacteria infestation which can damage the liner.
- Do not remove the protective bubble wrap on the process connections until you are ready to install the device.

- Do not remove covers of the transmitters as moisture can be captured inside the electronics.

NOTE: If covers of the instrumentation housing are taken off, please insure the covers are put on properly to avoid cross threading, and/or weather (moisture) penetrating into the housing.

Special notes:

- This information is used for a general guide line if more information is required refer to model number specific TI (Technical Information) document for more detailed information.
- In the event that a plastic plug is installed in any conduit entry point and the unit will be exposed to the environments for a long period of time. The conduit will require a SS plug to be installed for adequate moisture protection.
- When Thermowells are installed and the RTD is not inserted for a long period of time. It is recommended that entry point of the Thermowell be plugged with a SS plug to avoid water build up inside the well.

2.5 Analytical Sensors

Transportation

The following instructions apply to unpacking and to transporting the device to its final location:

- Transport the devices in the containers in which they are delivered.
- Do not remove Protective wrap that are installed on the units until installation of the equipment is required.
- Do not stack boxes on top of the unit.

Incoming acceptance

- Check the packaging and the contents for damage.
- Check the shipment, make sure nothing is missing and that the scope of supply matches your order.
- Check that Installation operation and maintenance manual CD, and safety notes are provided in Box.
- If Documentation (IE: Material test reports, Calibration reports, ect) are ordered with the shipment ensure that the documentation is inside the Box.

NOTE: Leave Instruments in protective Box until installation is required. This will protect the unit from damage.

Storage

Note the following points:

- Pack the measuring device in such a way as to protect it reliably against impact for storage (and transportation). The original packaging provides optimum protection.
- Turbidity sensors :
 - -20+60 Deg.C
 - Humidity 5 to 95 %
- pH/ORP sensors:
 - Storage temperature 0 to 50°C / 32 to 122°F
 - Store the pH /ORP electrode in its storage solution (3.8 M KCl or pH buffer 4).

NOTE: The sensor should be stored in upright position. If the electrode is inadvertently stored dry (we don't recommend this!), immerse the unit in soaking solution for a minimum of eight hours prior to service.

- Chlorine Sensors:
 - Filled with electrolyte: 41 to 122°F (5 to 50°C)
 - Without electrolyte: -4 to 140°F (-20 to 60°C)
- DO Sensors:
 - ANALOG
 - Storage temperature
 - With Electrolyte: -5 to +50°C (23 to 120°F)
 - Without Electrolyte: -20 to +60°C (-4 to 140°F)
 - DIGITAL
 - Storage temperature -10 to +60°C (10 to 140°F) at 95% relative air humidity, not condensing

CAUTION! Danger of drying out

Only store the sensor with the electrode protection cap (filled with 0.02 n NaOH).

- Wedgewood analytical Optical Sensors and Transmitters:
 - Operating environment: Temperature, 32 to 131°F (0 to 55°C)
 - Relative humidity 0 to 90%.

Special notes:

- This information is used for a general guide line if more information is required refer to model number specific TI (Technical Information) document for more detailed information.

TransCanada Keystone Pipeline, L.P.

Keystone XL Pipeline Canadian Pump Stations
Level Switch

PO#: 4500257847
E+H SO#: 3003333187

Tab	SDDR#	Description
8	YA	Inspection and Test Plan

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Document Title: Inspection and Test Plan

Document Number: 25472-101-V1A-JL10-Z0010

Revision Number: 01

PO Number: 4500257847

Material Requisition Number: KXL1399-CH2M-I-MR-0001

Tag Nos. : 125-BDLSS-B0-LSHH-0302, 126-FXVLY-B0-LSHH-0302



Contractor Name : Endress+Hauser Canada Ltd
Contractor Address : 1075 Sutton Drive
City, Province : Burlington, Ontario
Country, Postal code : Canada L7L 5Z8
Telephone Number : (905) 681-9292

Rev No.	Rev Date yyyy-mm-dd	Reason for Issue	Contractor Originator	Contractor Reviewer	Contractor Approver
01	2019-06-17	Issued For Information	A. Patil	A. Patil	C. Penney

CODE 1: Work may proceed.



Permission to proceed does not constitute acceptance or approval of design details, calculations, analyses, test methods or materials developed or selected by the supplier and does not relieve the supplier from full compliance with contractual obligations.

Name: kloca

Date: 06/25/2019

Liquiphant FailSafe FTL80/81/85

Liquiphant M FTL50/50H/51/51C/51H

Vibronic Limit Switches for liquids

Liquiphant S FTL70/71

Liquiphant FTL31/33, FTL41, FTL51B

Step	Activity	Test description	Test criteria	Frequency of testing
1	Contract review	Internal test specification TS00001F/00/EN	As required in ISO 9001	100%
2	Incoming goods inspection	Internal test specification TS00003F/00/EN	Verification of conformance to the specified requirements	Dynamic sample rate according to Computer aided Quality System (CAQ)
3	Printed circuit boards test	Internal test specification TS00009F/00/EN	In-circuit test and functional test	100%
4	Electronic insert test	Internal test specification TS00008F/00/EN	Automatic test: high voltage and functional test of the electronic insert	100%
5	High voltage test	Internal test specification TS00002F/00/EN	The voltage used is chosen depending on operating voltage, terminals and approvals, in accordance to the valid national / international standards	100%, except explosion proof versions with Ex-barrier or over-voltage protected or FTL31/33 with DC-PNP output
6	Welding inspection	Internal test specification TS00010F/00/EN	Quality and tightness of the welding seams	100%
7	Leakage test	Internal test specification TS00004F/00/EN	Tightness test with helium	100%
8	Functional test of sensor	Internal test specification for Liquiphant and Soliphant TS00034F/00/EN	Measurement and adjustment of operating frequency and phase	100%
9	Calibration of sensor	Internal test specification for Liquiphant density TS00036F/00/EN	Verification of frequency and phase of the sensor	100% only for density version, according to the order code
10	Final check of instrument	Internal test specification for Liquiphant and Soliphant TS00035F/00/EN	Verification of switching function	100%
11	Outgoing visual check	Internal test specification TS00006F/00/EN	Visual inspection that markings are complete and correct, accessories and correct packaging	Partial inspection
12	Logistical verification	Internal test specification TS00005F/00/EN	Automatic verification in the delivery phase via barcode that the instrument correspond to the order	100%

TransCanada Keystone Pipeline, L.P.

Keystone XL Pipeline Canadian Pump Stations
Level Switch

PO#: 4500257847
E+H SO#: 3003333187

Tab	SDDR#	Description
9	YE	Supplier Deviation Disposition Request (Not Applicable)

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