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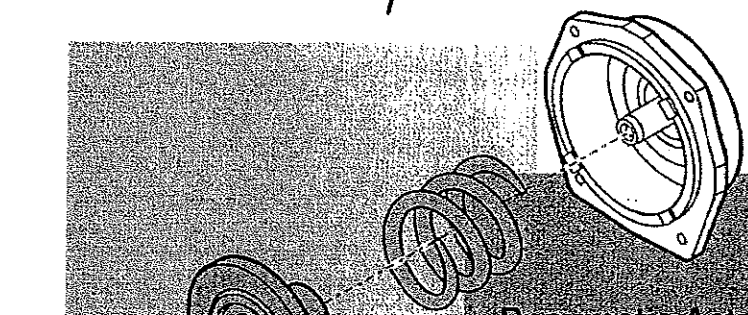
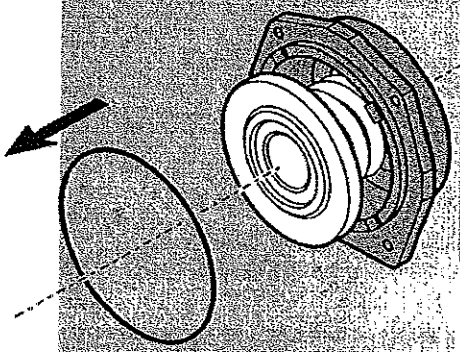


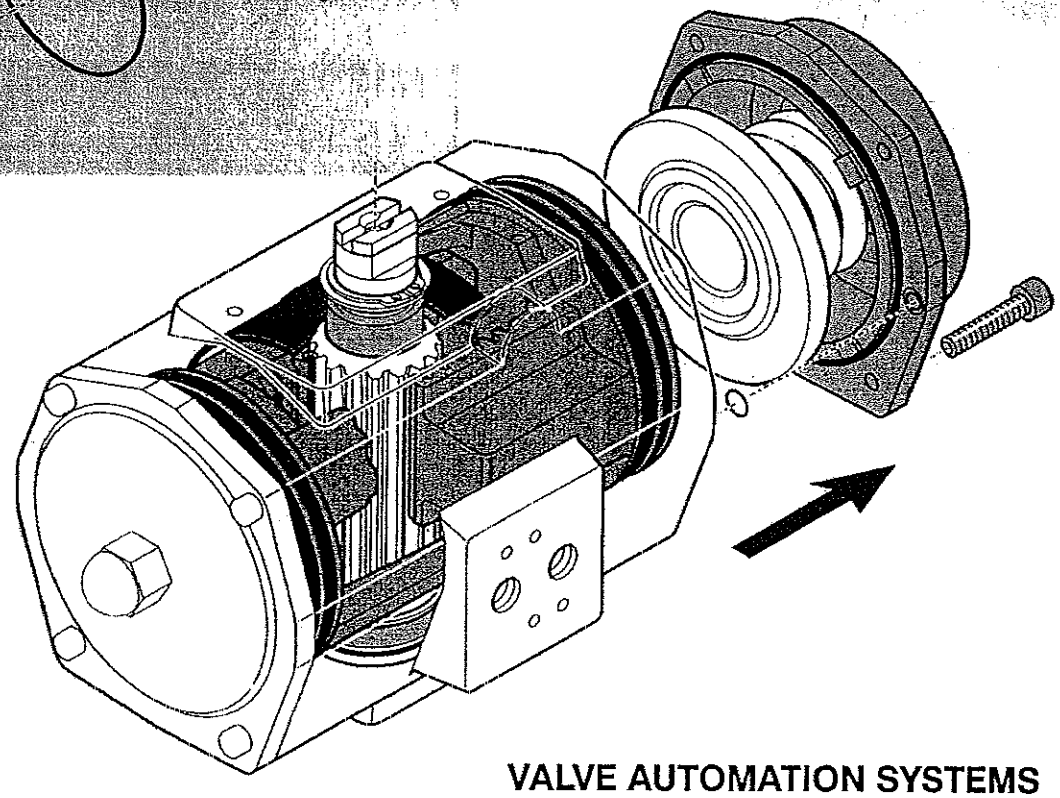
Pneumatic Actuators "E" and "P" Series

Operation and Installation Manual



EL-O-MATIC®

INTERNATIONAL

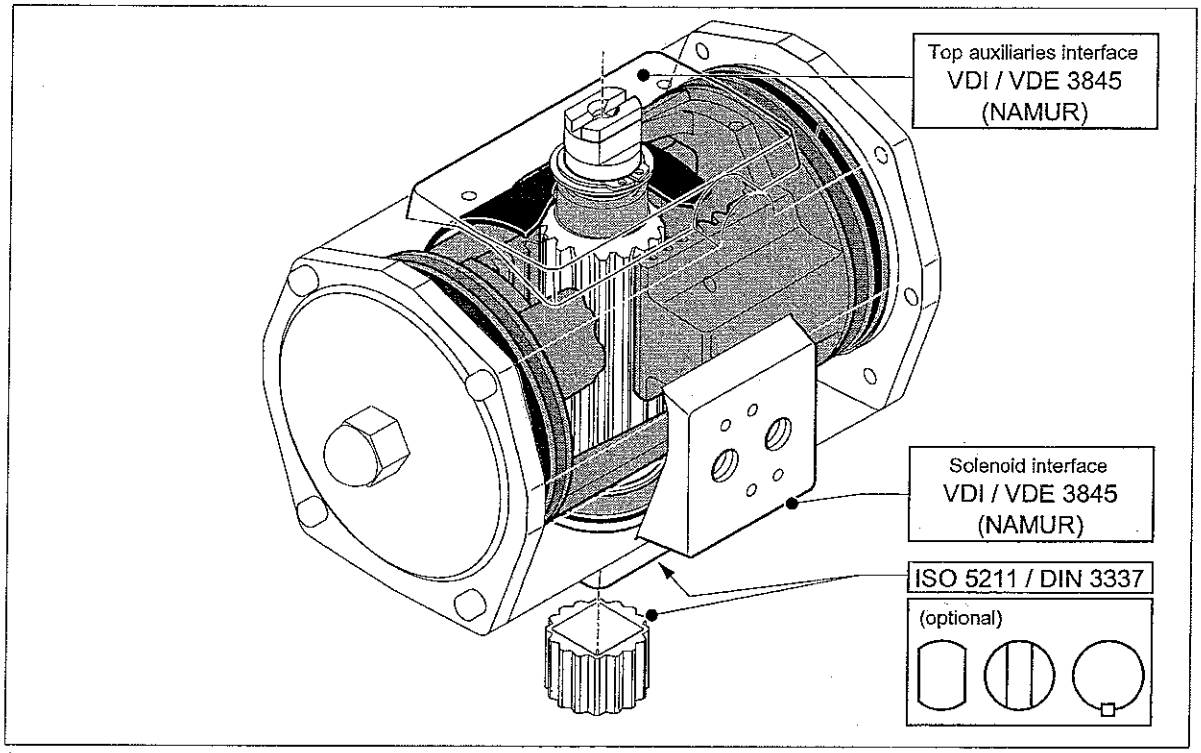


VALVE AUTOMATION SYSTEMS

CONTENTS / INHALT / *INHOUD*

1 INTRODUCTION / EINLEITUNG / *INLEIDING*

1.1 Identification / Unterscheidung / *Identificatie*

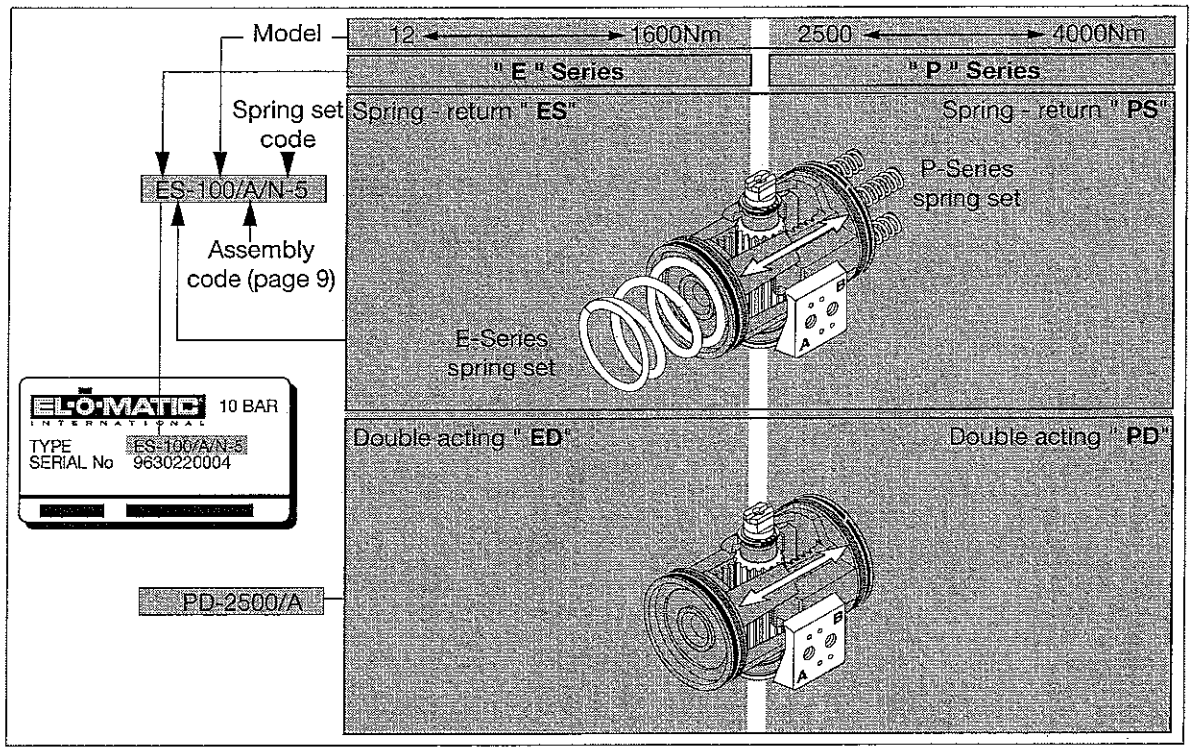


1 1

Warning! Actuator must be isolated both pneumatically and electrically before any (dis)assembly is begun. Before mounting or (dis)assembling the actuator consult the relevant sections of this manual.

Achtung! Das Antrieb muß vor jedem Ausbau sowohl pneumatisch, als elektrisch von allen Anschlüssen abgekoppelt werden. Lesen Sie vor dem Einbau oder Ausbau des Antriebs die entsprechenden Kapitel dieses Handbuchs aufmerksam durch.

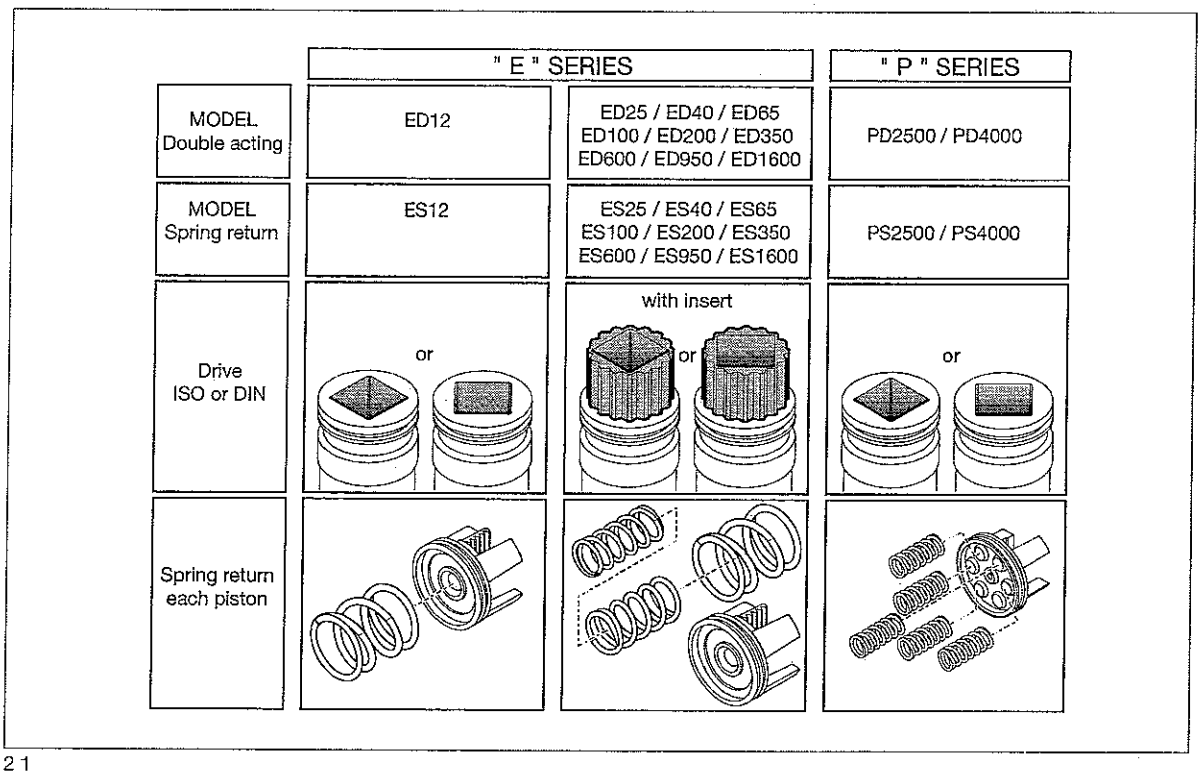
Waarschuwing! *Aandrijving moet zowel pneumatisch als elektrisch afgekoppeld worden, voordat met (de)monteren begonnen kan worden. Raadpleeg de desbetreffende paragrafen van deze handleiding alvorens te (de)monteren of toebehoren te bevestigen.*



1 2

Model	-	Typ	-	*model*
Spring set code	-	Federsatzcodnummer	-	*code verenset*
Assembly code (page 9)	-	Bezeichnung der Drehrichtung (s. 9)	-	*montagecode (pag 9)*
'E"- Series	-	' E' -Serie	-	*'E'-serie*
'P' - Series	-	"P"-Serie	-	*'P'-serie*
Spring return	-	Federrückstellend	-	*veerretour*
P-Series spring set	-	Federsatz der P-Serie	-	*verenset P-serie*
E-Series spring set	-	Federsatz der E-Serie	-	*verenset E-serie*
Double acting ED	-	doppeltwirkend ED	-	*dubbelwerkend ED*
Double acting PD	-	doppeltwirkend PD	-	*dubbelwerkend PD*

2 CONSTRUCTION DETAILS / KONSTRUKTIVE EINZELHEITEN / *CONSTRUCTIEDETAILS*

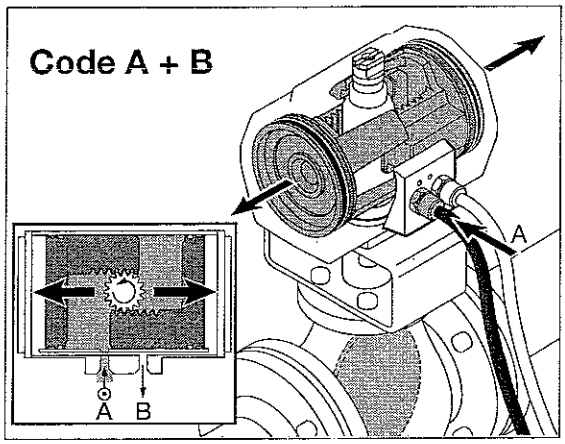


2 1

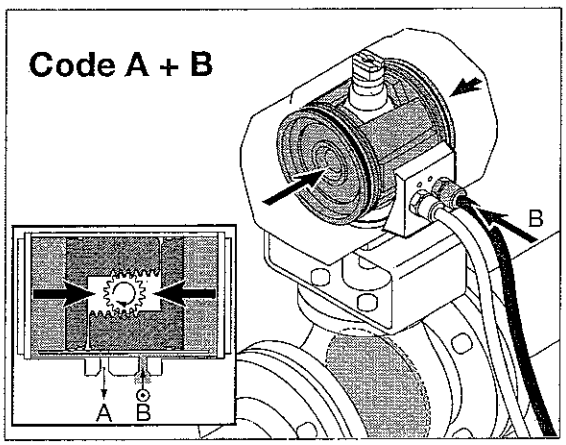
"E" Series	-	"E"-SERIE	-	*"E"-serie*
"P" Series	-	"P"-SERIE	-	*"P"-serie*
MODEL double acting	-	doppeltwirkender TYP	-	*MODEL dubbelwerkend*
MODEL spring return	-	TYP mit Federrückstellung	-	*MODEL veerretour*
Drive ISO or DIN	-	Antrieb gemäß ISO oder DIN	-	*Aandrijving ISO of DIN*
Spring return each piston	-	beideseits Federrückstellung	-	*Veerset per zuiger*
or	-	oder	-	*of*
with insert	-	mit Insert		*met insert*

3 PRINCIPLES OF OPERATION / LUFTANSCHLÜSSE DOPPELTWIRKEND / *BEDIENING*

3.1 Air connections double acting / Doppeltwirkende Luftanschlüsse / *Luchtaansluitingen, dubbelwerkend*



3 1 1



3 1 2

Check the assembly code before connecting air supply (see page 4). Reverse air supply in case of assembly codes C and D (see page 9).

3.1.1
Air to port A: counterclockwise / open

3.1.2
Air to port B: clockwise / close

Vor dem anschließen des Zufuhrluft die Aufbau code kontrolieren (siehe Seite 4). Bei Aufbaucode C und D die Luftzufuhr verwechseln (siehe Seite 9).

3.1.1
Luft zufuhr zur Öffnung A: gegen den Uhrzeigersinn / offen.

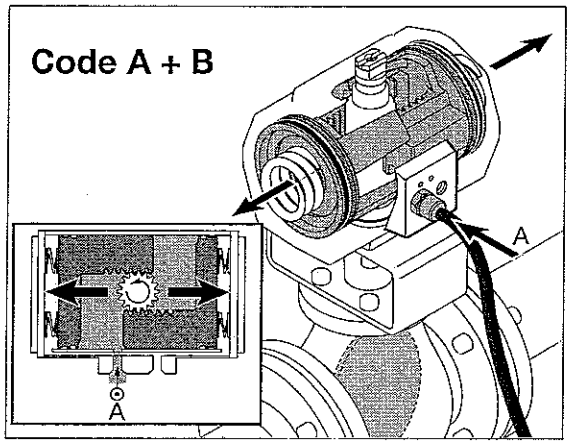
3.1.2
Luft zufuhr zur Öffnung B: im Uhrzeigersinn / geschlossen.

Controleer de montagecode voor het aansluiten van de luchttoevoer (zie pagina 4). Verwissel de luchttoevoer in geval van montagecodes C en D (zie pagina 9).

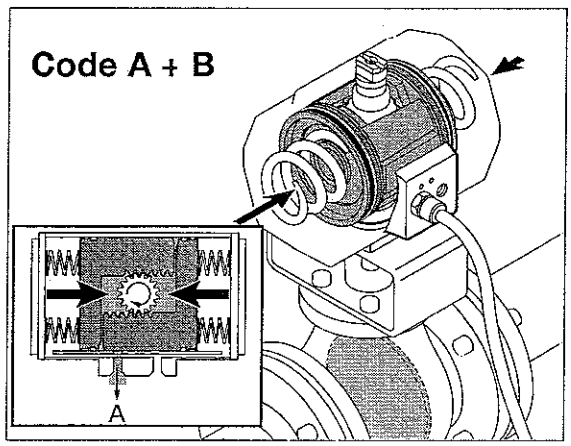
3.1.1
Lucht naar poort A: tegen de wijzers van de klok in / open

3.1.2
Lucht naar poort B: met de wijzers van de klok mee / dicht

3.2 Air connections spring return / Luftanschlüsse mit Federrückstellung / *Luchtaansluitingen, veerretour*



3 2 1



3 2 2

Check the assembly code before connecting air supply (see page 4) Reverse air supply in case of assembly codes C and D (see page 9).

3.2.1
Air to port A: counterclockwise / open.

3.2.2
Spring return: clockwise / close.

Vor dem anschließen des Zufuhrluft die Aufbau code kontrolieren (siehe Seite 4). Bei Aufbaucode C und D die Luftzufuhr verwechseln (siehe Seite 9).

3.2.1
Luft zufuhr zur Öffnung A: gegen den Uhrzeigersinn / offen.

3.2.2
Federruckstellung: im Uhrzeigersinn / geschlossen.

Controleer de montagecode voor het aansluiten van de luchttoevoer (zie pagina 4). Verwissel de luchttoevoer in geval van montagecodes C en D (zie pagina 9).

3.2.1
Lucht naar poort A: tegen de wijzers van de klok in / open

3.2.2
Veerretour: met de wijzers van de klok mee / dicht.

3.3 Recommended tubing sizes / Empfohlene Rohrabmessungen / *Aanbevolen buisafmetingen*

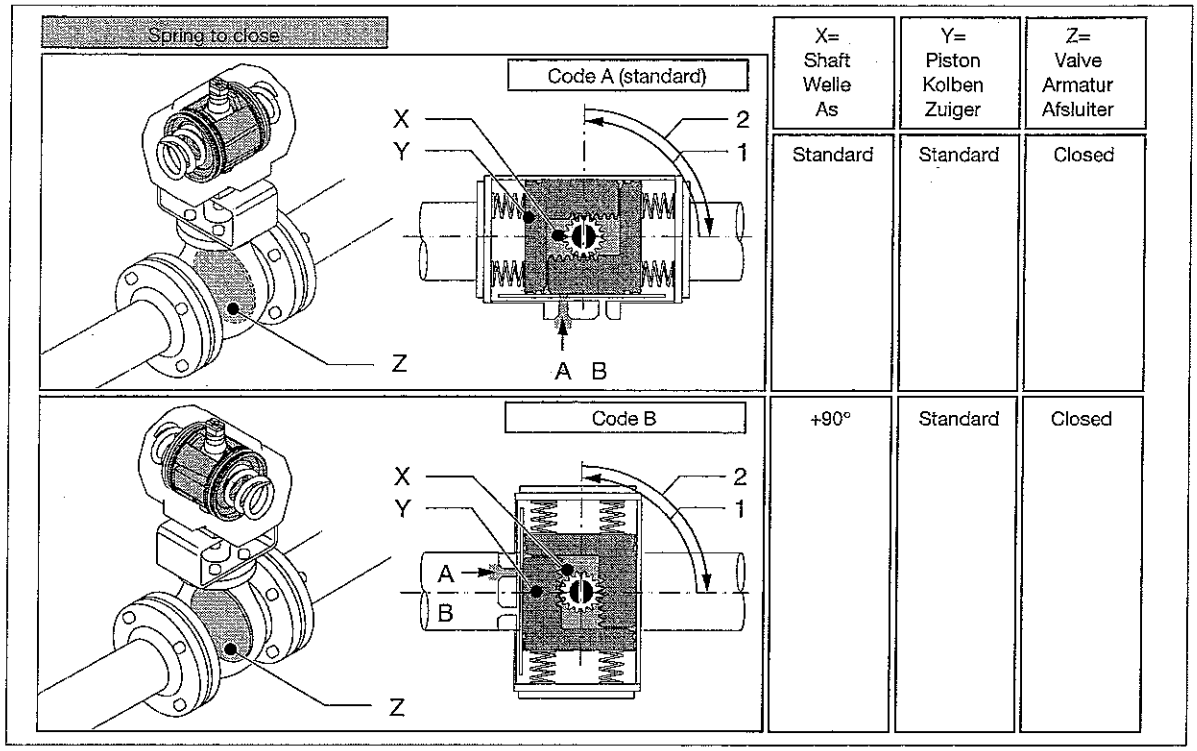
Actuator Model no. Antriebstyp *Aandrijving modelnr.*	Runs up to 1.2 mtr. Bis 1,20 m *Tot 1,2 m*	Runs over 1.2 mtr. Über 1,20 m *Meer dan 1,2 m*
E-12, 25, 40, 65	6 mm	6 mm
E-100, 200, 350, 600, 950	6 mm	8 mm
E1600 / P-2500, 4000	6 mm	10 mm

3.4 Air consumption litre/stroke at atmospheric pressure / Luftverbrauch (Ltr./Hub) bei Atmosphärendruck / *Luchtverbruik liter/slag bij atmosferische druk*

	Model						
Air chamber	E12	E25	E40	E65	E100	E200	E350
A	0.05	0.1	0.16	0.22	0.35	0 8	1.2
B	0.06	0.11	0.22	0.36	0.49	1	1.8
Air chamber	E600	E950	E1600	P2500	P4000		
A	2.9	4.7	7.3	8	13.5		
B	3 1	4.9	8.0	9.3	17.5		

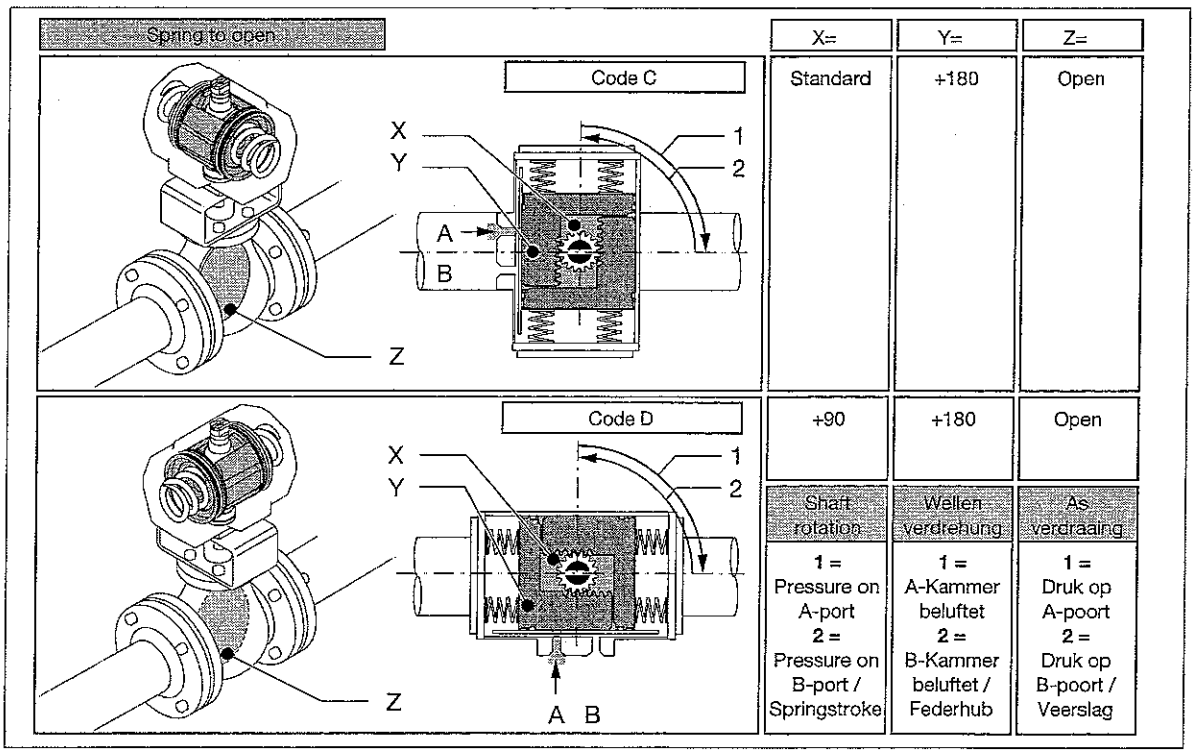
- Model - Modell - Model
- Air chamber - Luft-kammer - Luchtkamer

4 ASSEMBLY CODES / AUFBAUCODE / *MONTAGECODES*



	X= Shaft Welle As	Y= Piston Kolben Zuiger	Z= Valve Armatur Afsluiter
Code A (standard)	Standard	Standard	Closed
Code B	+90°	Standard	Closed

4 1 Spring to close (rotation CW, topview) / **Schließfeder (Drehung im Uhrzeigersinn, Obenansicht)** / *Veersluitend (rotatie met de wijzers van de klok mee, bovenaanzicht)*

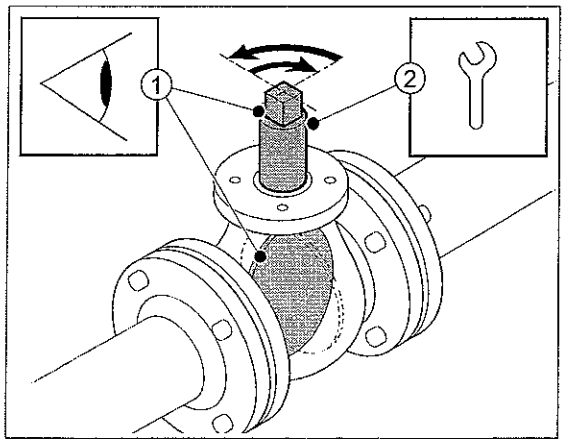


	X=	Y=	Z=
Code C	Standard	+180	Open
Code D	+90	+180	Open

Shaft rotation	Wellen verdrehung	As verdraaing
1 = Pressure on A-port **2 =** Pressure on B-port / Springstroke	**1 =** A-Kammer beluftet **2 =** B-Kammer beluftet / Federhub	**1 =** Druk op A-poort **2 =** Druk op B-poort / Veerslag

4 2 Spring to open (rotation CCW) / **Federkraftöffnend (Drehung gegen den Uhrzeigersinn)** / *Veeropenend (rotatie tegen de wijzers van de klok in)*

4.1 Installation / Aufbau / *Installatie*



4 1 1

4.1 1
Remove handle nut, handle, lockwasher, etc. from valve if required.

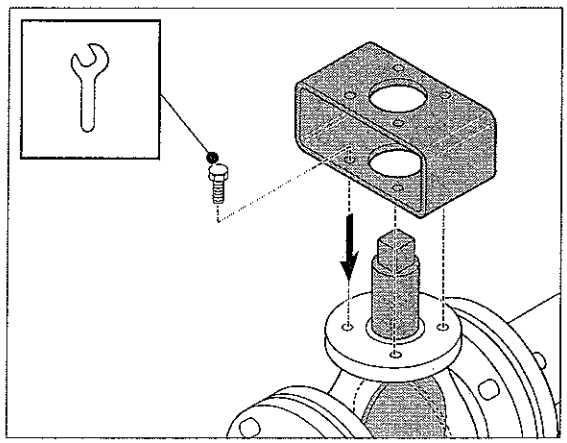
Caution! When mounting do not hit with hammer on shafttop.

Mutter der Handbetätigung, Handbetätigung, Sicherungsscheibe usw., falls erforderlich, von der Armatur entfernen.

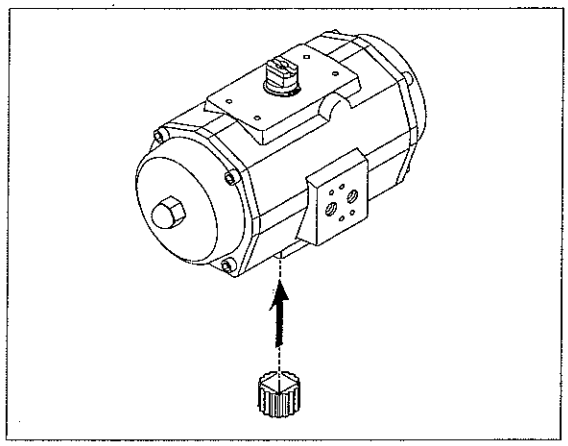
Achtung! Bei Montage nicht mit Hammer auf Wellenspitze schlagen.

Verwijder indien nodig hendelmoer, hendel, veerring etc. van de afsluiter.

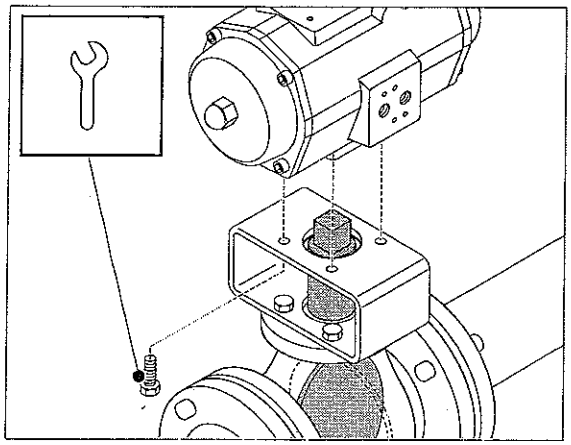
Voorzichtig! *Bij montage niet met hammer op de astop slaan.*



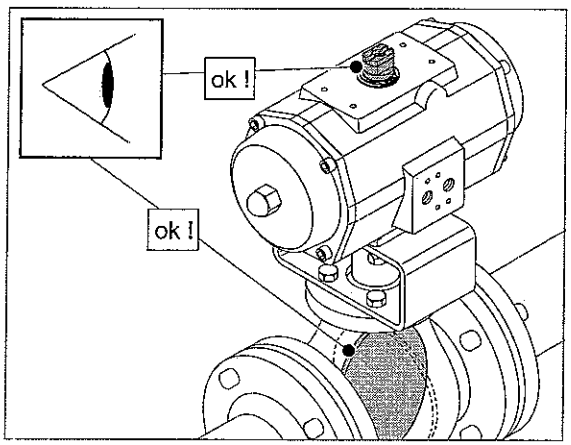
4 1 2



4 1 3



4.1.4



4.1.5

4.1.4 / 4.1.5.

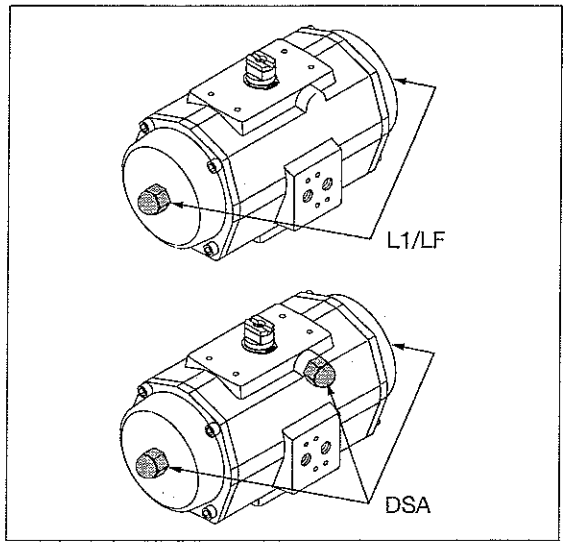
Valves are manufactured so that they operate in only one 90 degree segment The actuator should be mounted for counterclock-wise rotation to open and clockwise to close the valve

---

Die Armaturen sind so konstruiert, daß sie nur innerhalb eines 90°- Winkels wirksam sind. Der Antrieb sollte so montiert werden, daß eine Drehung gegen den Uhrzeigersinn die Armatur öffnet und daß eine Drehung im Uhrzeigersinn die Armatur schließt.

Afsluiters zijn zodanig geconstrueerd dat deze alleen in een segment van 90 graden werken. Bevestig de aandrijving zo dat bij rotatie tegen de wijzers van de klok in de afsluiter wordt geopend en bij rotatie met de wijzers van de klok mee de afsluiter wordt gesloten.

4.2 Stroke adjustment / Hubbegrenzung / *Slagbegrenzing*

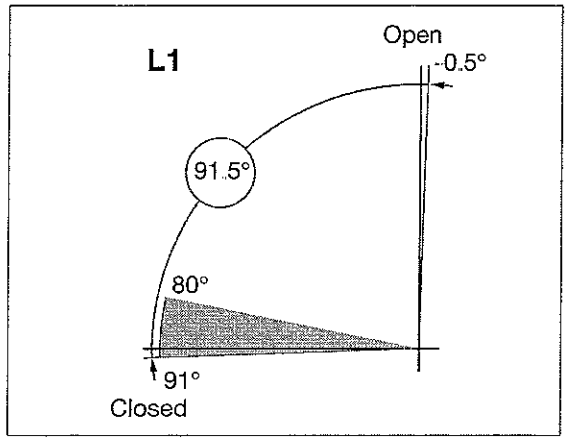


4 2 1

To achieve stroke adjustment, there are two actuator executions:
1- L1 One way limit stops (see fig. 4.2.1)
2- DSA Two way limit stops (see fig.4 2.1)

For maximum stroke and adjustable stroke range of the L1 execution see fig. 4.2 2
For maximum stroke and adjustable stroke range of the DSA execution see fig. 4 2.3

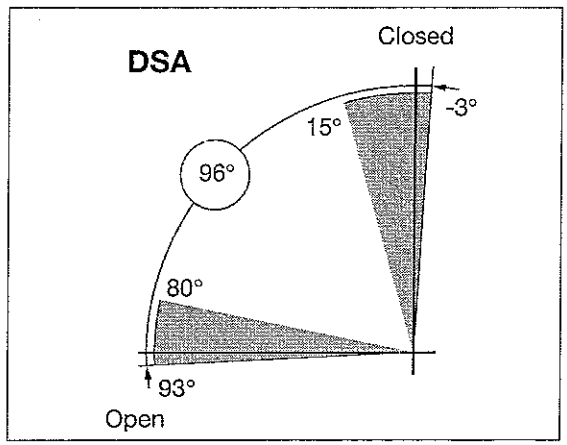
Für die Hubbegrenzung gibt es zwei Antriebsausführungen:
1- L1 **Einfacher Hubbegrenzung (siehe Abb. 4.2.1)**
2- DSA **Doppelter Hubbegrenzung (siehe Abb. 4.2.1)**



4 2 2

Der Bereich des maximalen Hubs und des verstellbaren Hubs für die L1-Ausführung ist Abbildung 4.2.2 zu entnehmen.
Der Bereich des maximalen Hubs und des verstellbaren Hubs für die DSA-Ausführung ist Abbildung 4.2.3 zu entnehmen.

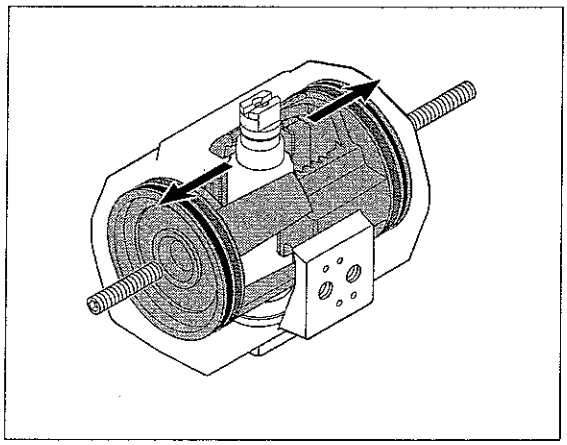
Ten behoeve van de slaginstelling bestaan er twee uitvoeringen van de aandrijvingen:
1- L1 enkelzijdige slagbegrenzing (zie afb. 4.2.1)
2- DSA dubbelzijdige slagbegrenzing (zie afb 4 2.1)



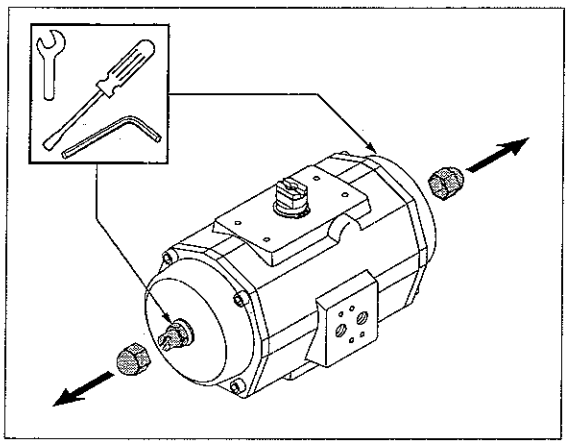
4 2 3

Voor maximale slag en het bereik van de in te stellen slag van de L1-uitvoering zie afb. 4.2 2.
Voor maximale slag en het bereik van de in te stellen slag van de DSA-uitvoering zie afb 4.2.3.

4.2.1 L1 one way stroke adjustment / Einstellen der einfacher Hubbegrenzung L1 / *Instellen van enkelzijdige slagbegrenzing L1*



4 2 4



4 2 5

The L1 one way stroke adjustment limits the outward movement of the pistons (see fig. 4 2 4). The double acting and the single acting actuators both have limit stop bolts in the end caps.

Procedure:

1. Mount the actuator on the valve (see chapter 4).
2. Remove nut covers, loosen the lock nuts and turn out the limit stop bolts 4 turns (see fig. 4.2.5). Select tool from table (see page 19).

Die Einstellung der einfacher Hubbegrenzung L1 begrenzt die Bewegung der Kolben beim Ausfahren (siehe Abb. 4.2.4). Die Begrenzungsschrauben für den doppeltwirkenden und den einfachwirkenden Antrieb befinden sich jeweils in den Endkappen.

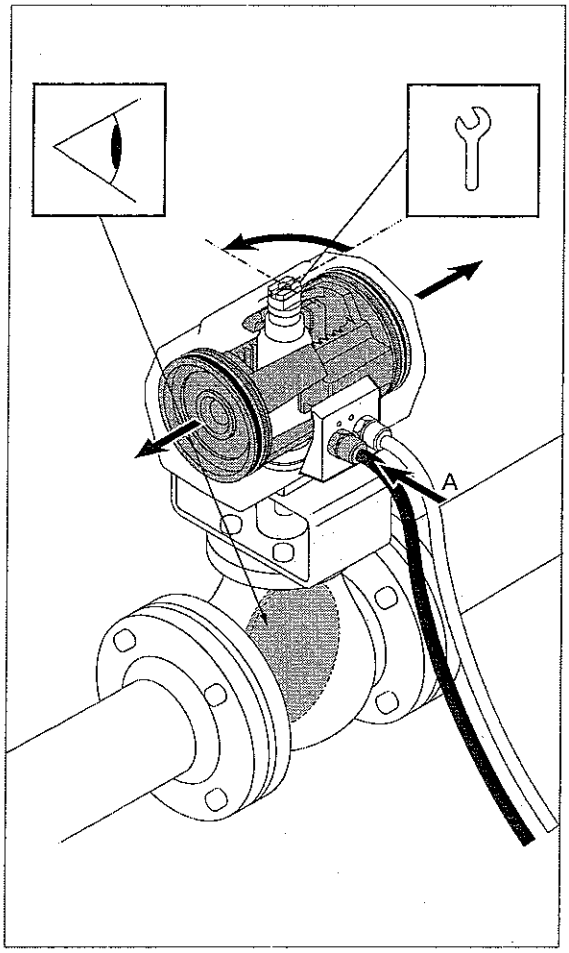
Verfahren:

1. **Montieren Sie den Antrieb auf das Ventil (siehe Kapitel 4).**
2. **Entfernen Sie die Schutzkappen, lockern Sie die Verriegelungsschrauben und drehen Sie die Begrenzungsschrauben 4 Umdrehungen heraus (siehe Abb. 4.2.5). Wählen Sie das geeignete Werkzeug aus der Tabelle (siehe Seite 19).**

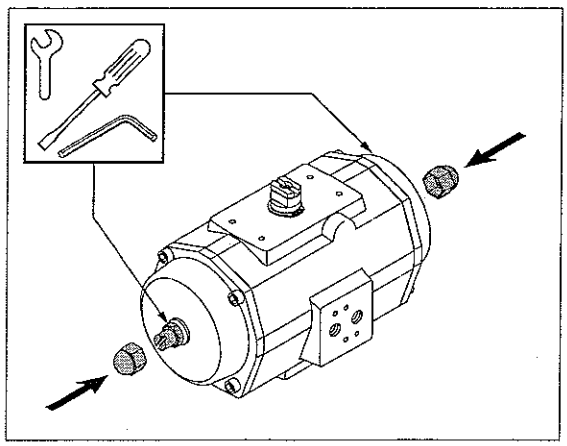
De L1-enkelzijdige slagbegrenzing begrenst de buitenwaartse beweging van de zuigers (zie afb 4.2.4). De dubbel werkende en de enkel werkende aandrijvingen hebben beiden slagbegrenzingsbouten in de deksels.

Handelwijze:

1. *Bevestig de aandrijving op de afsluiter (zie hoofdstuk 4).*
2. *Verwijder de moerbeschermkappen, draai de borgmoeren los en draai de slagbegrenzingsbouten 4 omwentelingen naar buiten (zie afb 4 2 5) Kies het gereedschap uit de tabel (zie pagina 19).*



4 2 6



4 2 7

3. Turn actuator shaft until the valve is in the desired position (see fig. 4 2.6)
   Use some pressure on the "A" port.
   Use a wrench for accurate positioning
4. Turn in both the limit stop bolts until an obstruction is felt (do not force) and lock the lock nut and place the nut covers (see fig. 4.2.7). Select tool from table (see page 19).

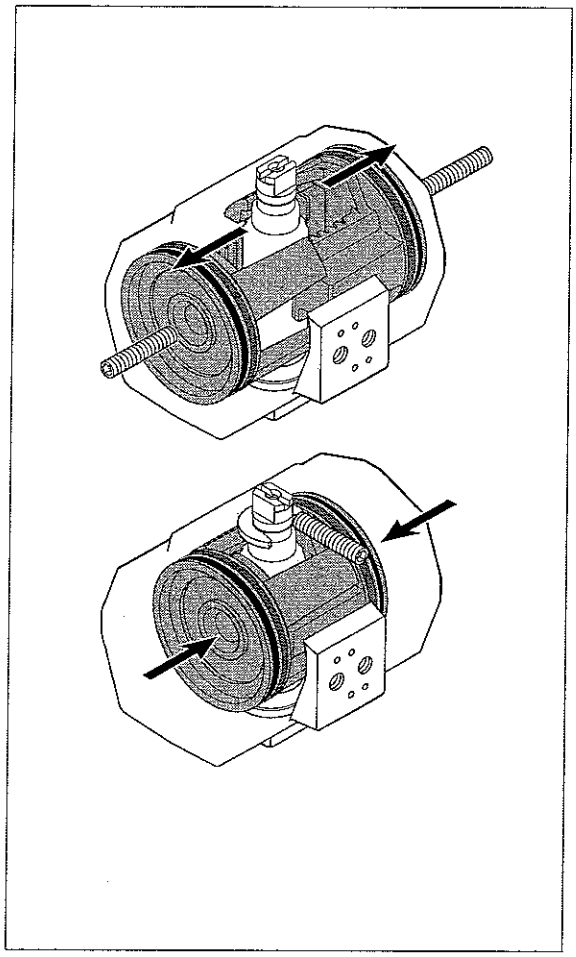
---

3. **Drehen Sie die Antriebswelle, bis sich das Ventil in der gewünschten Position befindet (siehe Abb. 4.2.6). Üben Sie einen gewissen Druck auf Anschluß "A" aus. Verwenden Sie zur genauen Positionierung einen Gabelschlüssel.**
4. **Drehen Sie die beiden Begrenzungsschrauben hinein, bis Sie einen gewissen Widerstand verspüren (keine übermäßige Kraft aufwenden), verriegeln Sie die Sicherungsmutter und setzen Sie die Schutzkappen wieder auf (siehe Abb. 4.2.7). Wählen Sie das geeignete Werkzeug aus der Tabelle (siehe Seite 19).**

---

3. *Draai de aandrijvingsas, totdat de afsluiter op de gewenste positie staat (zie afb. 4.2.6). Zet een beetje druk op de "A"-poort. Gebruik een steeksleutel voor nauwkeurige positionering*
4. *Draai de beide slagbegrenzingsbouten naar binnen, totdat u weerstand voelt (gebruik geen kracht), zet de borgmoer vast en plaats de moerbeschermkappen (zie afb. 4.2.7) Kies het gereedschap uit de tabel (zie pagina 19).*

4.2.2 DSA two way stroke adjustment / Einstellen der doppelter Hubbegrenzung DSA / *Instellen van dubbelzijdige slagbegrenzing DSA*



4.2.8

The DSA two way stroke adjustment limits the outward and the inward movement of the pistons (see fig. 4.2.8). The double acting and the single acting actuators both have limit stop bolts in the end caps to limit the outward stroke. The bolt above the air connection interface limits the inward stroke.

Procedure:

1. Mount the actuator on the valve (see chapter 4).

Die Einstellung der doppelter Hubbegrenzung DSA begrenzt die Bewegung der Kolben beim Aus- und Einfahren (siehe Abb. 4.2.8). Die Begrenzungsschrauben für den doppeltwirkenden und den einfachwirkenden Antrieb, die den Ausgangshub begrenzen, befinden sich jeweils in den Endkappen. Die Schraube über der Luftanschlußanpassung begrenzt den Eingangshub.

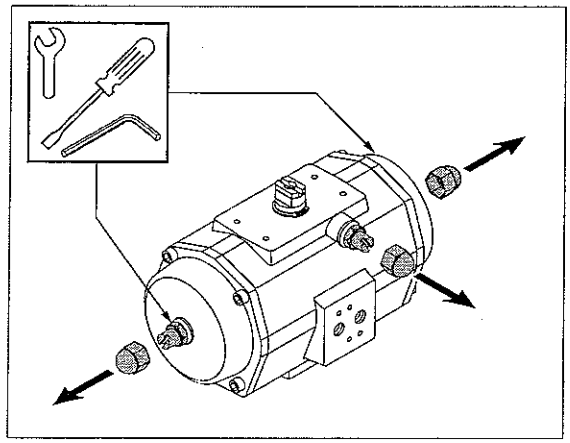
Verfahren:

1. **Montieren Sie den Antrieb auf das Ventil (siehe Kapitel 4).**

De DSA-dubbelzijdige slagbegrenzing begrenst de buitenwaartse en de binnenwaartse beweging van de zuigers (zie afb. 4.2.8). De dubbel werkende en de enkel werkende aandrijvingen hebben beiden slagbegrenzingsbouten in de deksels ter begrenzing van de buitenwaartse slag. De bout boven het luchtaansluitvlak begrenst de binnenwaartse slag

Handelwijze:

1. *Bevestig de aandrijving op de afsluiter (zie hoofdstuk 4).*



4.2.9

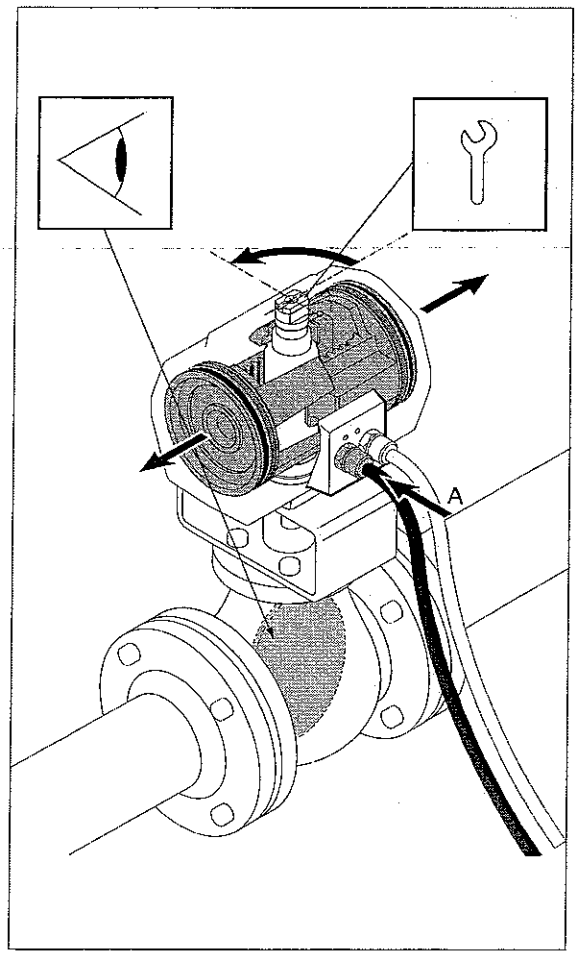
2. Remove nut covers, loosen the lock nuts and turn out the limit stop bolts 4 turns (see fig. 4.2.9).
3. Turn actuator shaft until the valve is in the desired position (see fig. 4 2 10).
   Use some pressure on the "A" port.
   Use a wrench for accurate positioning

---

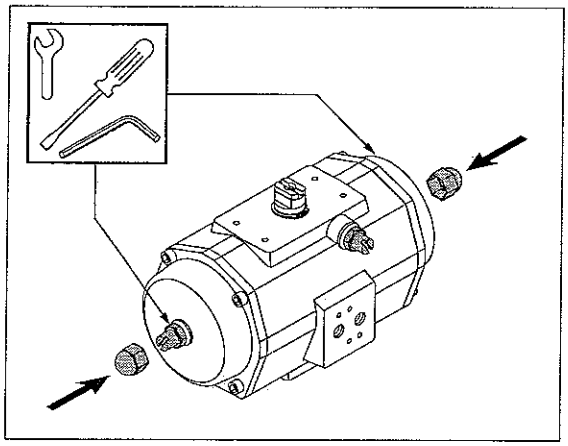
2. **Entfernen Sie die Schutzkappen, lockern Sie die Verriegelungsschrauben und drehen Sie die Begrenzungsschrauben 4 Umdrehungen heraus (siehe Abb. 4.2.9).**
3. **Drehen Sie die Antriebswelle, bis sich das Ventil in der gewünschten Position befindet (siehe Abb. 4.2.10). Üben Sie einen gewissen Druck auf Anschluß "A" aus. Verwenden Sie zur genauen Positionierung einen Gabelschlüssel.**

---

2. *Verwijder de moerbeschermkappen, draai de borgmoeren los en draai de slagbegrenzingsbouten 4 omwentelingen naar buiten (zie afb. 4 2 9).*
3. *Draai de aandrijvingsas, totdat de afsluiter op de gewenste positie staat (zie afb. 4.2.10). Zet een beetje druk op de "A"-poort. Gebruik een steeksleutel voor nauwkeurige positionering.*



4 2 10



4.2.11

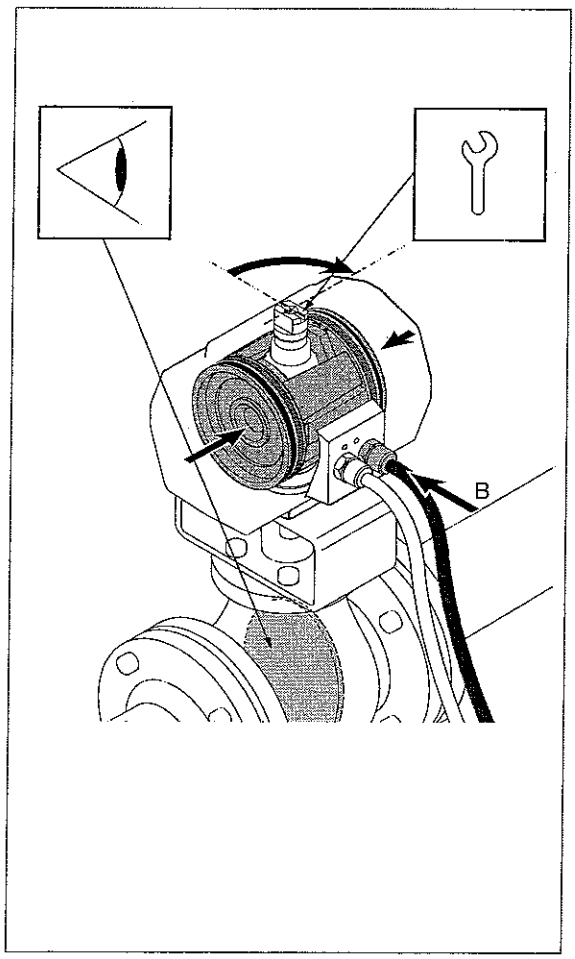
4. Turn in both the limit stop bolts until an obstruction is felt (do not force) and lock the lock nut and place the nut covers (see fig 4.2.11). The outward stroke is now set.
5. Turn actuator shaft until the valve is in the desired position (see fig. 4 2 12).
   Use some pressure on the "B" port
   Use a wrench for accurate positioning.

---

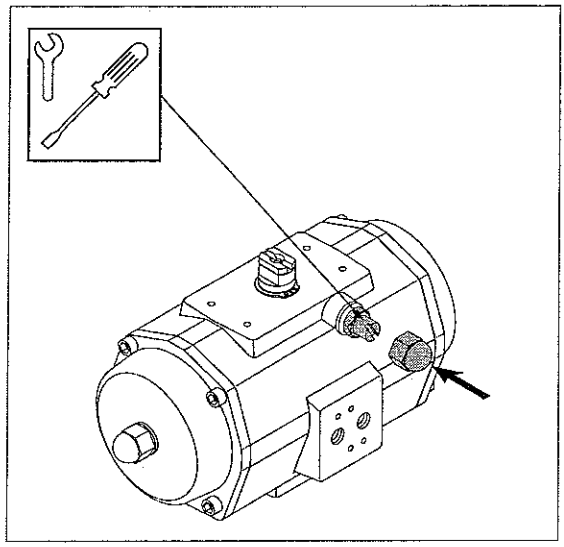
4. **Drehen Sie die beiden Begrenzungsschrauben hinein, bis Sie einen gewissen Widerstand verspüren (keine übermäßige Kraft aufwenden), verriegeln Sie die Sicherungsmutter und setzen Sie die Schutzkappen wieder auf (siehe Abb. 4.2.11). Jetzt ist der Ausgangshub eingestellt.**
5. **Drehen Sie die Antriebswelle, bis sich das Ventil in der gewünschten Position befindet (siehe Abb. 4.2.12). Üben Sie einen gewissen Druck auf Anschluß "B" aus. Verwenden Sie zur genauen Positionierung einen Gabelschlüssel.**

---

4. *Draai de beide slagbegrenzingsbouten naar binnen, totdat u weerstand voelt (gebruik geen kracht), zet de borgmoer vast en plaats de moerbeschermkappen (zie afb. 4.2.11). De buitenwaartse slag is nu ingesteld*
5. *Draai de aandrijvingsas, totdat de afsluiter op de gewenste positie staat (zie afb. 4 2.12). Zet een beetje druk op de "B"-poort. Gebruik een steeksleutel voor nauwkeurige positionering*



4.2.12



4.2.13

6 Turn in the limit stop bolt until an obstruction is felt (do not force), lock the lock nut and place the nut covers (see fig 4.2.13). The inward stroke is now set

---

6. **Drehen Sie die Begrenzungsschraube hinein, bis Sie einen gewissen Widerstand verspüren (keine übermäßige Kraft aufwenden), verriegeln Sie die Sicherungsmutter und setzen Sie die Schutzkappe wieder auf (siehe Abb. 4.2.13). Jetzt ist der Eingangshub eingestellt.**

---

6 *Draai de slagbegrenzingsbout naar binnen, totdat u weerstand voelt (gebruik geen kracht), zet de borgmoer vast en plaats de moerbeschermkap (zie afb. 4.2.13) De binnenwaartse slag is nu ingesteld.*

Tool / Werkzeugtabelle / *Gereedschapstabel*

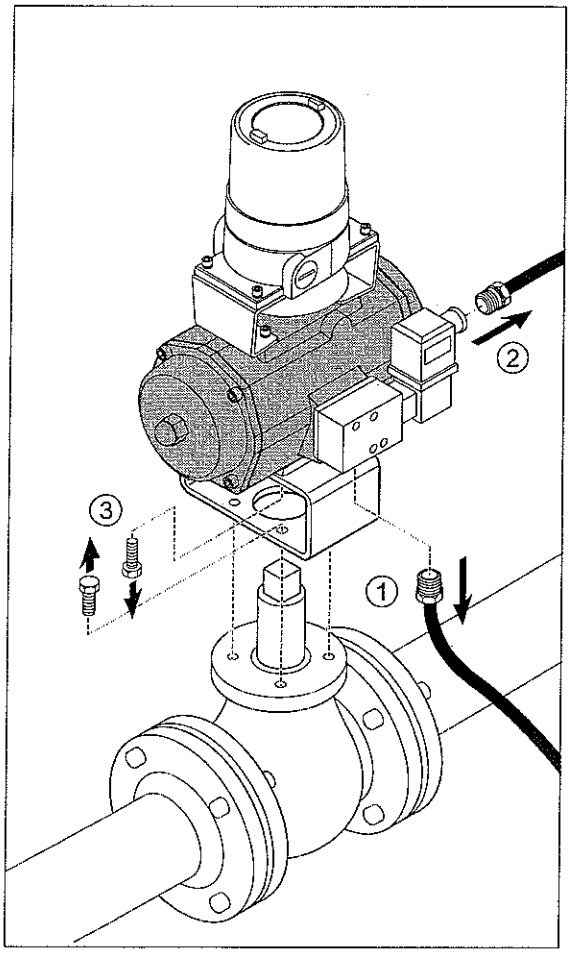
L1 limit stop bolts (in endcaps)					
Actuator type	Nut	Bolt	Actuator type	Nut	Bolt
ED25	W 10 mm	AK 3 mm	ED600 / 950	W 24 mm	W 11 mm
ED40 / 65	W 13 mm	AK 4 mm	ED1600	W 30 mm	W 11 mm
ED100 / 200	W 17 mm	AK 5 mm	PD2500	W 46 mm	W 17 mm
ED350	W 19 mm	AK 6 mm	PD4000	W 46 mm	W 17 mm
ES25 / 40	W 10 mm	SD 1.0x5.5 mm	ES600 / 950	W 24 mm	W 11 mm
ES65 / 100	W 13 mm	SD 1.0x5.5 mm	ES1600	W 30 mm	W 11 mm
ES200	W 17 mm	SD 1.2x8.0 mm	PS2500	W 46 mm	W 17 mm
ES350	W 19 mm	SD 1.2x8.0 mm	PS4000	W 46 mm	W 17 mm

DSA Limit stop bolt (above air connection interface)					
Actuator type	Nut	Bolt	Actuator type	Nut	Bolt
E25	W 10 mm	SD 1.0x5.5 mm	E200 / 350	W 19 mm	SD 1.2x8.0 mm
E40 / 65	W 13 mm	SD 1.0x5.5 mm	E600 / 950	W 24 mm	W 11 mm
E100	W 17 mm	SD 1.2x8.0 mm	E1600	W 30 mm	W 11 mm

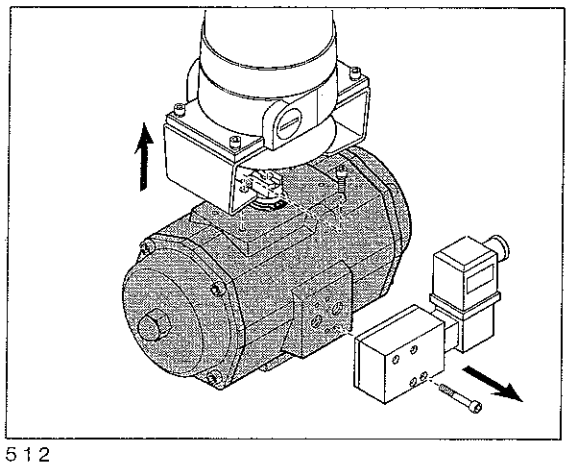
Limit stop bolt	: Hubbegrenzungsschraube	: Slagbegrenzingbout
Endcap	: Endkappe	: Deksel
Actuator type	: Antriebstyp	: Type aandrijving
Nut	: Mutter	: Moer
Bolt	: Schraube	: Schroef
AK = Allen key	: AK = Innensechskantschraube	: AK = Imbus sleutel
SD = Screwdriver	: SD = Schraubendreher	: SD = Schroevendraaier
W = Wrench	: W = Schlüssel	: W = Sleutel

5 DISASSEMBLY / DEMONTAGE / *DEMONTEREN*

5.1 Before starting / Vor der Demontage / *Alvorens te beginnen*



5 1 1



5 1 2

5.1.1

Caution! Never disassemble a valve that is under pressure!

Caution! Ball valves and plug valves can trap pressurized media in the cavity. Isolate the piping system in which the actuator valve assembly is mounted and relieve any pressure on the valve.

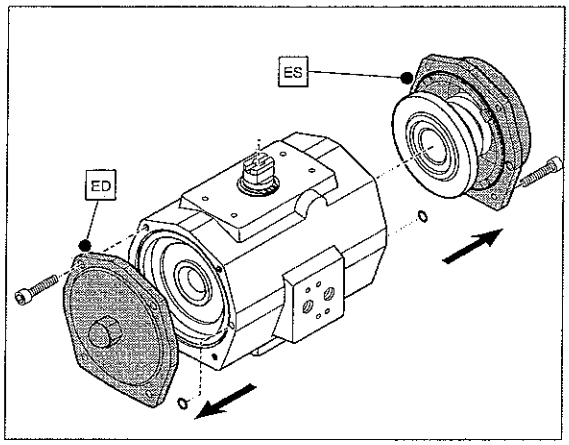
Achtung! Niemals eine unter Druck stehende Armatur demontieren!

Achtung! Kugel- und Kükenhähne können das Druckmedium in der Kammer einschließen. Das Rohr system, in das das Stellglied eingebaut ist, ist drucklos zu machen, um den an der Armatur anliegenden Restdruck zu entspannen.

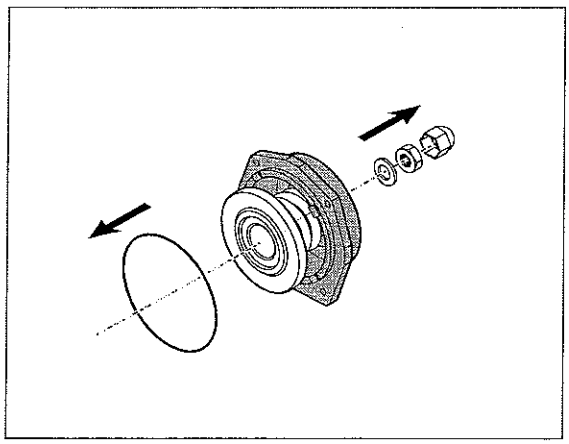
Voorzichtig! *Demonteer nooit een afsluiter die onder druk staat!*

Voorzichtig! *Kogelafsluiters en plugafsluiters kunnen drukmedia in de kamer vasthouden. Isoleer het buizenstelsel, waarin de aandrijving en afsluiter zijn gemonteerd, en haal de druk van de afsluiter.*

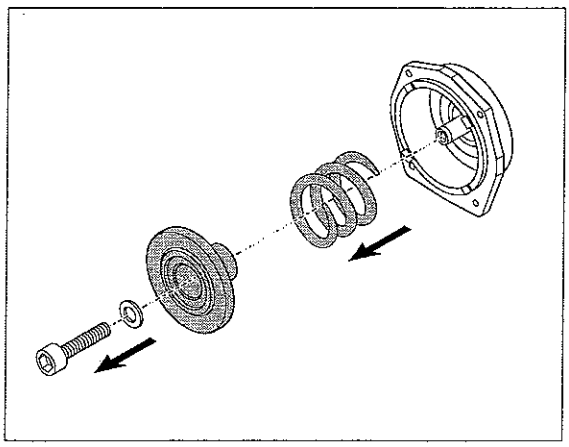
5.2 Removing endcaps type ES/ED 25 to 350 / Endkappen Typ ES/ED 25 bis 350 ausbauen / *Deksels verwijderen type ES/ED 25 tot 350*



5 2 1



5 2 2



5 2 3

5.2.1 / 5.2.2 / 5.2.3
Be careful not to damage the endcap O-rings.

⚠ **Caution!** If the actuator is a "spring return" model, uniformly loosen all endcaps screws, two to three turns at a time, in sequence, to relieve pre-load of the springs.
On all actuators with springs use caution when removing endcaps.

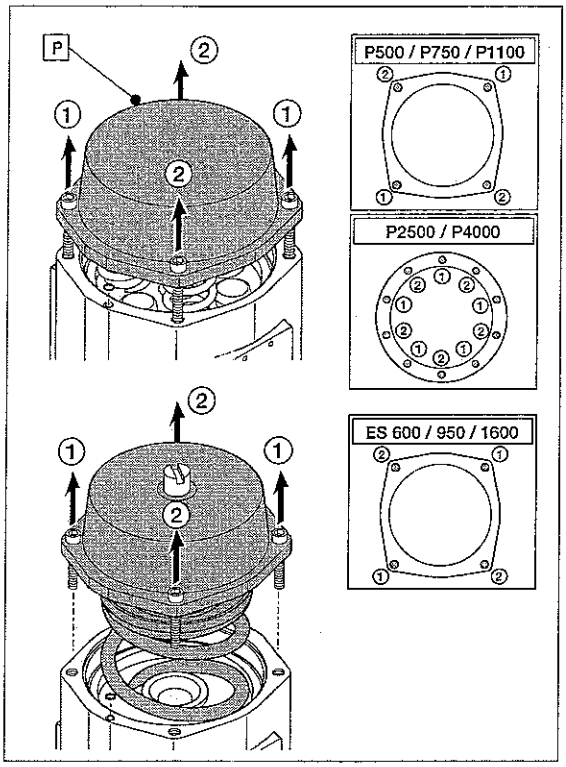
Beim Ausbauen darauf achten, daß die O-Ringe der Endkappen nicht beschädigt werden.

⚠ **Achtung!** **Wenn es sich beim Antrieb um ein Typ mit Federrückstellung handelt, alle Endkappenschrauben gleichmäßig lösen. Jeweils immer nur zwei bis drei Schraubendrehungen gleichzeitig und nacheinander, um die Vorspannung der Federn zu senken.**
Seien Sie bei federrückstellenden Antrieben während der Demontage der Endkappen besonders vorsichtig.

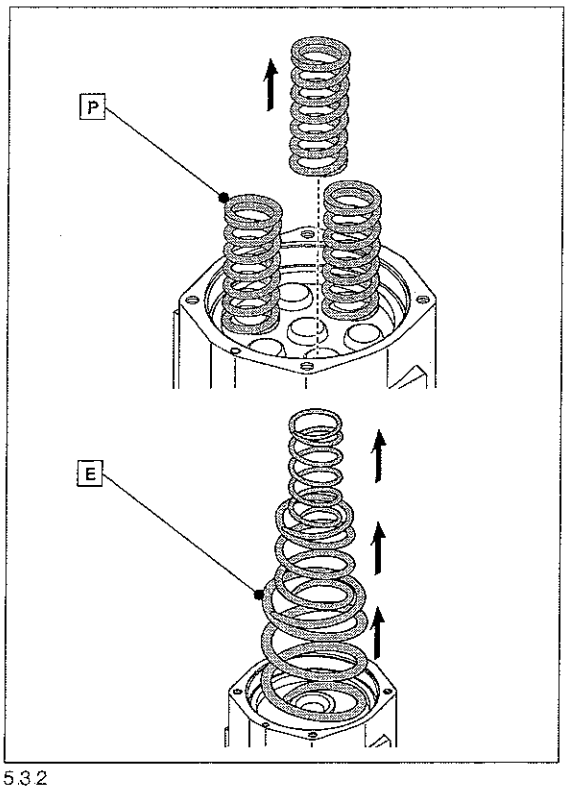
Let erop dat u de O-ringen van de sluitkap niet beschadigt.

⚠ ***Voorzichtig!*** *Als de aandrijving een "veerretour"-model is: draai alle schroeven van de deksels gelijkmatig los, twee tot drie slagen per keer en kruislings, om de voorspanning van de veren af te halen*
Wees bij alle aandrijvingen met veren voorzichtig bij het verwijderen van deksels.

5.3 Removing endcaps type PE/PS and ES 600 to 1600 / Endkappen Typ PE/PS und ES 600 bis 1600 ausbauen / *Deksels verwijderen type PE/PS en ES 600 tot 1600*



5.3.1



5.3.2

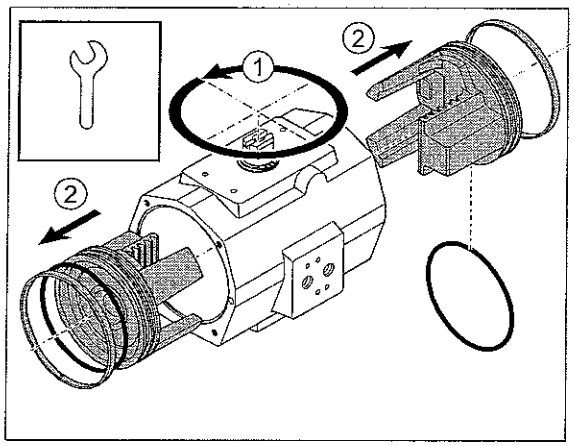
5.3.1 / 5.3.2

Caution! If the actuator is a "spring return" model, first loosen screws 1, then uniformly loosen all endcap screws 2, two to three turns at a time, in sequence, to relieve pre-load of the springs.
On all actuators with springs use caution when removing endcaps

Achtung! Wenn es sich beim Antrieb um ein Typ mit Federrückstellung handelt, zuerst die Schrauben mit der Nummer 1 lösen, danach gleichmäßig alle Endkappenschrauben mit der Nummer 2 lösen. Dabei jeweils immer nur zwei bis drei Schraubendrehungen gleichzeitig und nacheinander, um die Vorspannung der Federn zu senken. Seien Sie bei federrückstellenden Antrieben während der Demontage der Endkappen besonders vorsichtig.

Voorzichtig! *Als de aandrijving een "veerretour"-model is: draai eerst schroeven 1 los, draai vervolgens alle schroeven 2 van de deksels gelijkmatig los, twee tot drie slagen per keer en kruislings, om de voorspanning van de veren af te halen*
Wees bij alle aandrijvingen met veren voorzichtig bij het verwijderen van deksels

5.4 Removing Pistons/Spindle, E- and P-series / Kolben/Wellen, E- und P-Serie, ausbauen / *Zuigers/spindel verwijderen, E- en P-serie*



5.4.1

5.4.1

The two pistons can now be removed by rotating the actuator shaft.

Die beiden Kolben werden nun durch Drehen der Antriebswelle ausgebaut.

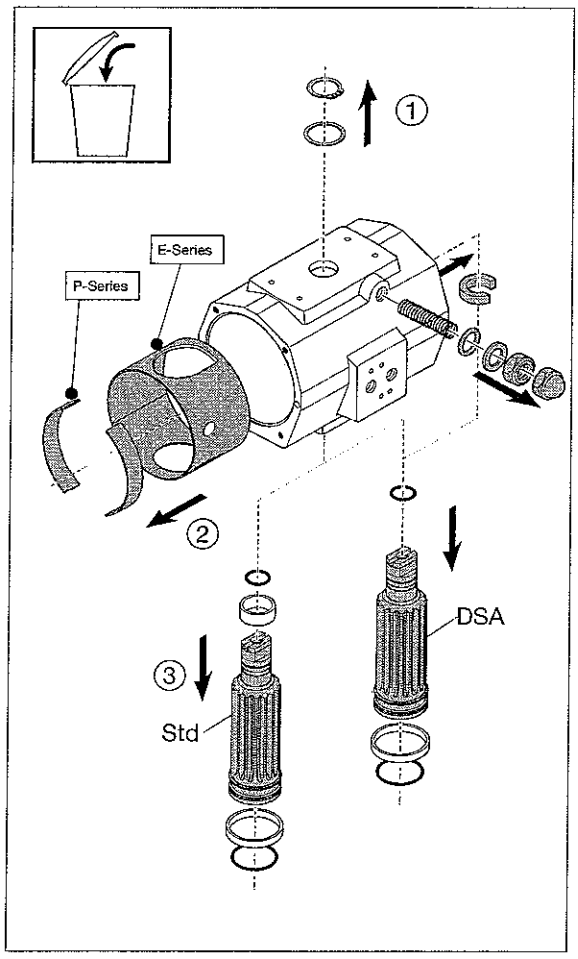
De twee zuigers kunnen nu verwijderd worden door de as van de stelaandrijving te draaien.

5.4.2

In case of a DSA actuator first remove the DSA-cam through the bore of the housing
Then take out the shaft

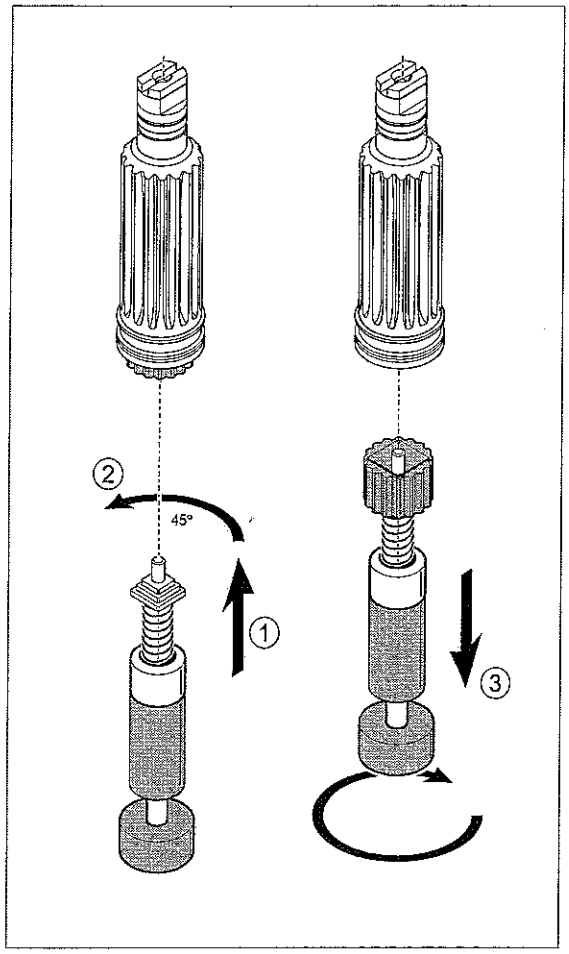
Bei einem DSA Antrieb zuerst den DSA-Nocken entfernen durch die Bohrung des Gehäuses. Dann die Welle ausnehmen.

In geval van een DSA aandrijving eerst de DSA-nok verwijderen door de boring van het huis. Dan de as verwijderen.



5.4.2

5.5 Removing insert / Insert ausbauen / *Insert verwijderen*



5 5 1

5.5.1

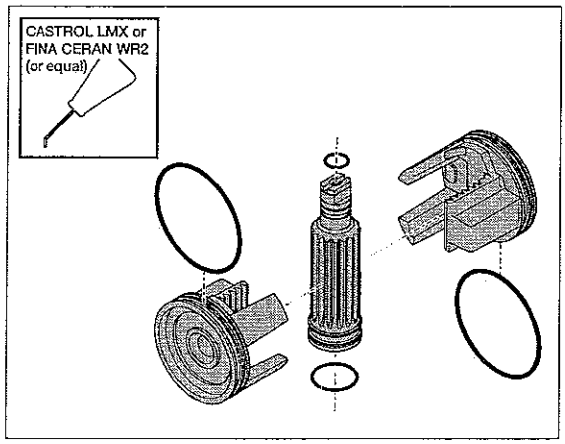
Insert removal requires the use of the extractor part No. 590.00.001 for square sizes 11, 14 and 17.
Part No 590 00.002 is used for square sizes 19, 22 and 27

Für den Ausbau der Inserts benötigen Sie das Werkzeug Artikelnr. 590.00.001 für die Vierkantgrößen 11, 14 und 17.
Werkzeug Artikelnr. 590.00.002 wird für die Vierkantgrößen 19, 22 und 27 benötigt.

Om de insert te verwijderen moet u gebruik maken van de extractor art.nr. 590.00 001 voor vierkantafmetingen 11, 14 en 17.
Art.nr. 590.00 002 wordt gebruikt voor vierkantafmetingen 19, 22 en 27.

6 REASSEMBLY / ZUSAMMENBAU / *OPNIEUW MONTEREN*

6.1 Reassembly guide band and shaft / Zusammenbau von Führungsband und Antriebswelle / *Opnieuw monteren van geleideband en as*

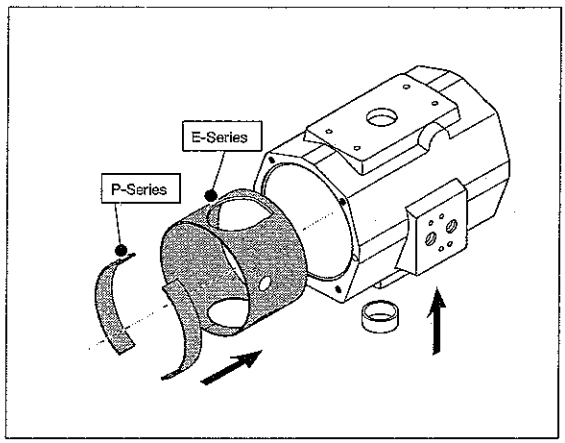


6 1 1

⚠ Before reassembly check the requested assembly code (see chapter 4).

6.1.1
Apply a light film of grease to all O-Rings and on the gear teeth

6.1.3
In case of a DSA actuator mount the DSA-cam through the bore of the housing on top of the shaft.

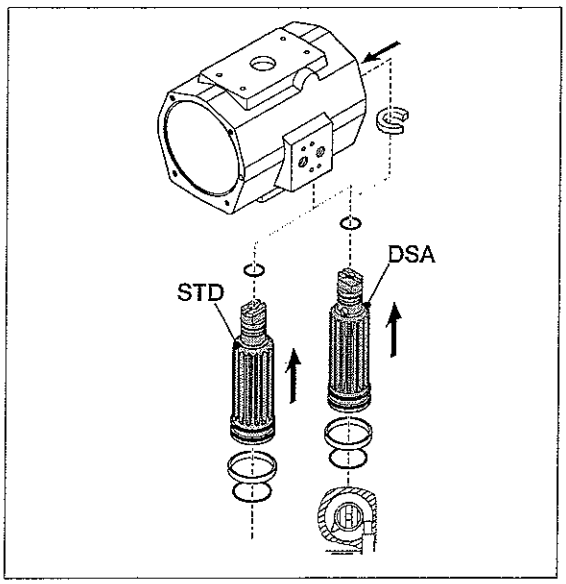


6 1 2

⚠ **Kontrollier vor dem Zusammenbau der gewünschte aufbaucode (siehe Kapitel 4).**

6.1.1
Alle O-Ringe und Verzahnungen einfetten.

6.1.3
Bei einem DSA Antrieb den DSA-Nocken durch die Bohrung des Gehäuses auf die Welle montieren.



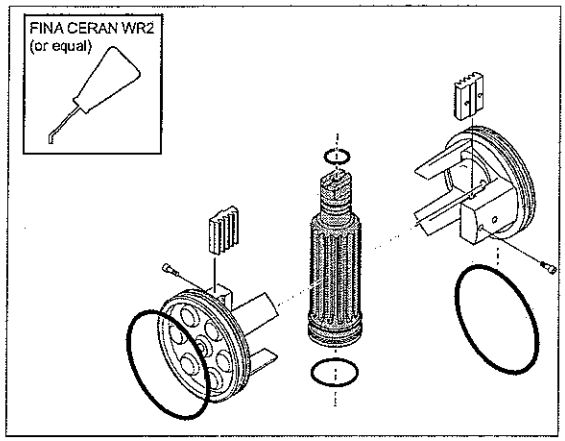
6 1 3

⚠ *Kontroleer voor het opnieuw monteren de gewenste montagecode (zie hoofdstuk 4).*

6.1.1
Breng op alle O-ringen en de tanden van de overbrenging een dunne laag smeervet aan

6.1.3
In geval van een DSA aandrijving de DSA-nok door de boring van het huis op de as monteren.

6.2 Reassembly pistons / Zusammenbau von Kolben / *Opnieuw monteren van zuigers*



6 2 1

6.2.1
Align the pinion gear so that the teeth on the center gear will "pick-up" the pistons assembly's rack teeth when turning the top extension of the center gear clockwise (CW) or counter clockwise (CCW) according assembly code (see page 9).

6.2.3
Ensure that smooth movement and 90 degree operation can occur without moving the pistons out of the actuator body

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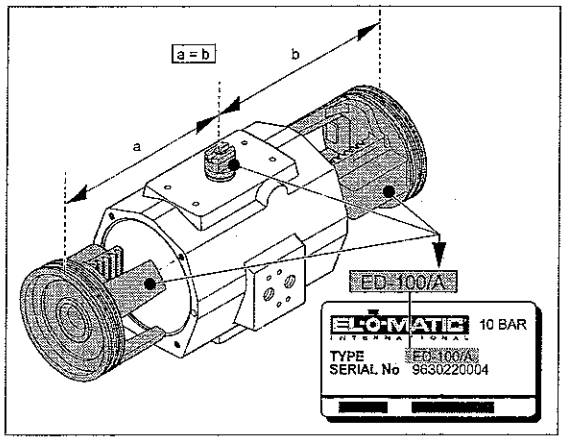
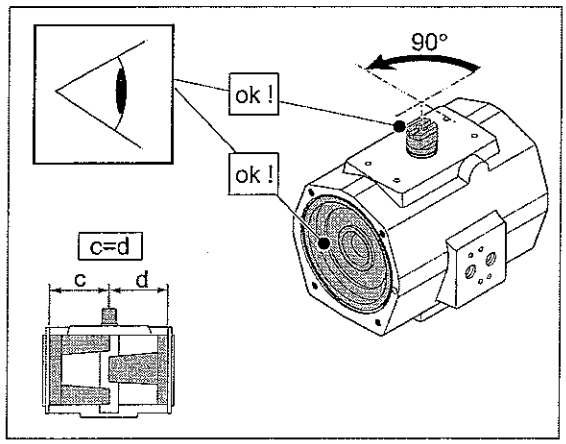


6 2 2

6.2.1
Die verzahnte Welle so ausrichten, daß die Zähne die Innenverzahnung der beiden Kolben erfaßt. Wobei das obere Wellenende entweder im Uhrzeigersinn oder gegen den Uhrzeigersinn (je nach Aufbaucode, siehe Seite 9) gedreht wird. Beachten Sie bitte, daß die Schlüsselfläche bzw. Nut am oberen Wellenende entweder parallel oder um 90° versetzt um Antrieb steht.

6.2.3
Beachten Sie, daß eine reibungslose Bewegung im 90°-Winkel möglich ist, ohne, daß dabei die Kolben aus dem Antriebsgehäuse herausragen.

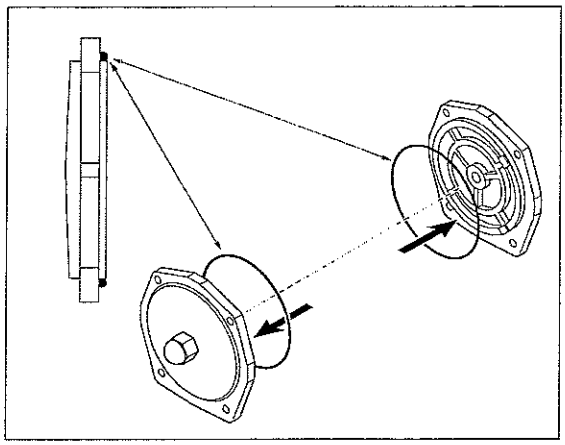


6 2 3

6.2.1
Richt de tandoverbrenging zodanig uit dat de tanden op de as de heugeltanden van de zuiger zullen "oppakken", als het bovenstuk van de as met de wijzers van de klok mee of tegen de klok in wordt gedraaid naar gelang de montage code (zie pagina 9).

6.2.3
Controleer op een soepele beweging en een verdraaiing van 90 graden, zonder dat de zuigers uit de behuizing van de aandrijving naar buiten komen

6.3 Reassembly endcaps double acting actuators / Zusammenbau Endkappen doppeltwirkende Antriebe / *Opnieuw monteren deksels van dubbelwerkende aandrijvingen*

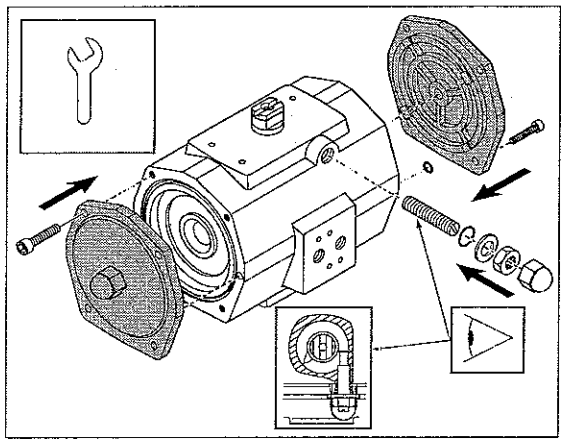


6.3.1

6.3.2
Ensure that endcap O-rings and airport O-rings are in place on both sides.

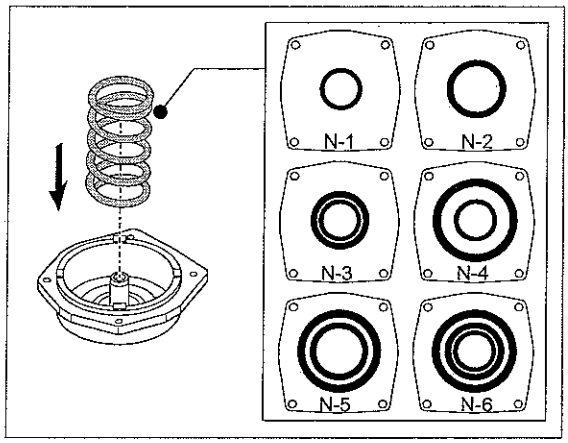
Beachten Sie, daß die O-Ringe in Endkappen und Luftzufuhröffnungen auf beiden Seiten eingesetzt werden.

Plaats de O-ringen van de deksels en de O-ringen van de luchtpoorten aan beide zijden.



6.3.2

6.4 Reassembly endcaps single acting actuators ES25 - ES350 / Zusammenbau Endkappen einfachwirkende Antriebe ES25 - ES350 / *Opnieuw monteren deksels van enkelwerkende aandrijvingen ES25 - ES350*



6 4 1

6.4.1
When replacing springs in a spring return actuator, ensure that the springs are replaced in their identical position in the spring pack from where they were removed.

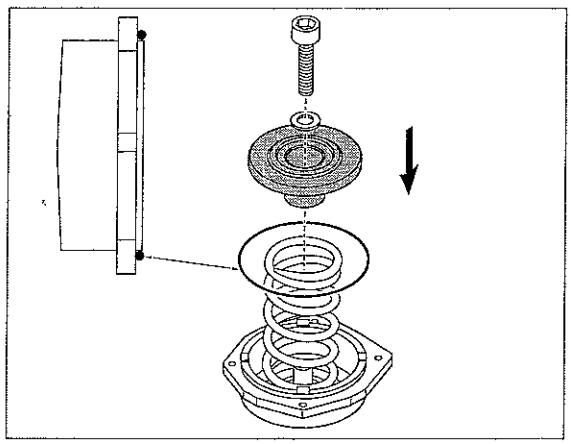
6.4.3
Ensure that endcap O-rings and airport O-rings are in place on both sides.

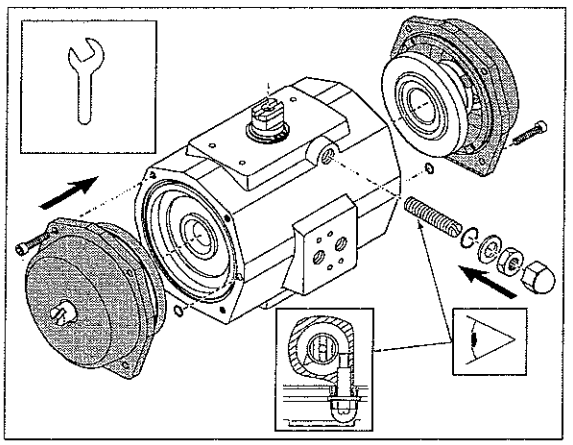
6.4.1
Beachten Sie beim Wechseln der Federn im Antrieb mit Federrückstellung, daß die Federn an ihrem ursprünglichen Platz eingebaut werden.

6.4.3
Beachten Sie, daß die O-Ringe der Endkappen und Luftzufuhröffnungen auf beiden Seiten eingesetzt werden.

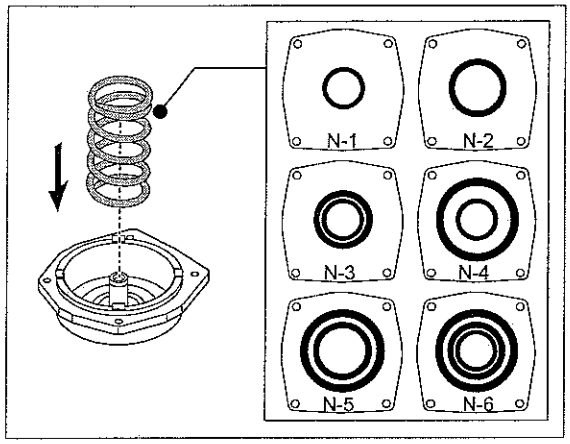
6.4.1
Zorg er bij het vervangen van veren in een veerretour-aandrijving voor dat de veren op exact dezelfde plaats in het verenpakket worden geplaatst, waar ze zijn verwijderd

6.4.3
Plaats de O-ringen van de deksels en de O-ringen van de luchtpoorten aan beide zijden.

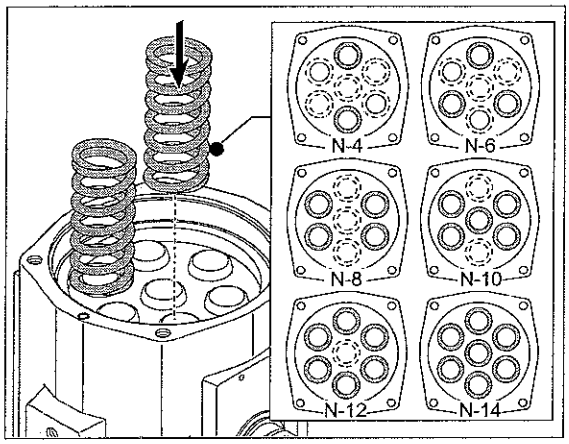

6 4 2


6 4 3

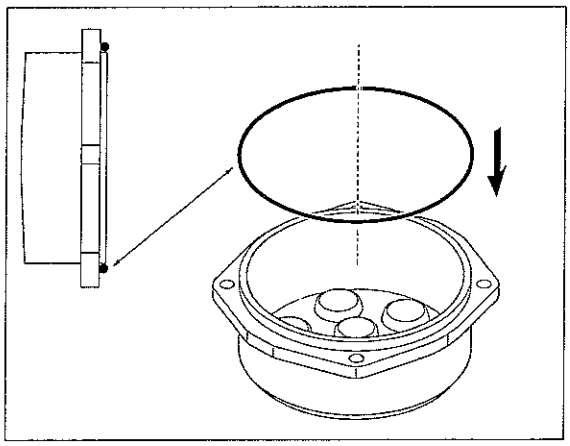
6.5 Reassembly endcaps single acting actuators ES600 - PS4000 / Zusammenbau Endkappen einfachwirkende Antriebe ES600 - PS4000 / *Opnieuw monteren deksels van enkelwerkende aandrijvingen ES600 - PS4000*



6 5 1



6 5 2



6 5 3

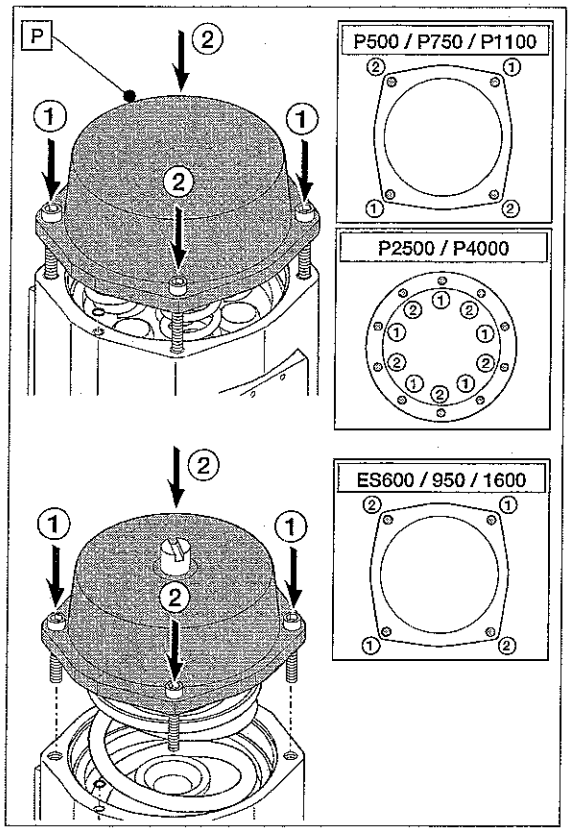
6.5.1 / 6.5.2 / 6.5.3

When replacing springs in a spring return actuator, ensure that the springs are replaced in their identical position in the endcap from where they were removed. Before assembling the springs and endcaps, make sure that the pistons are inwards

---

Beachten Sie, beim Ausbau der Federn im Stellglied mit Federrückstellung, daß die Federn an ihrem ursprünglichen Platz in der Endkappe eingebaut werden. Beachten Sie beim Wechseln der Federn im Antrieb mit Federrückstellung, daß die Federn an ihrem ursprünglichen Platz eingebaut werden.

Zorg er bij het vervangen van veren in een veerretour-aandrijving voor dat de veren op exact dezelfde plaats in de deksel worden geplaatst, waar ze zijn verwijderd. Zorg ervoor dat de zuigers naar binnen zijn, voordat u de veren en deksels monteert.



6 5 4

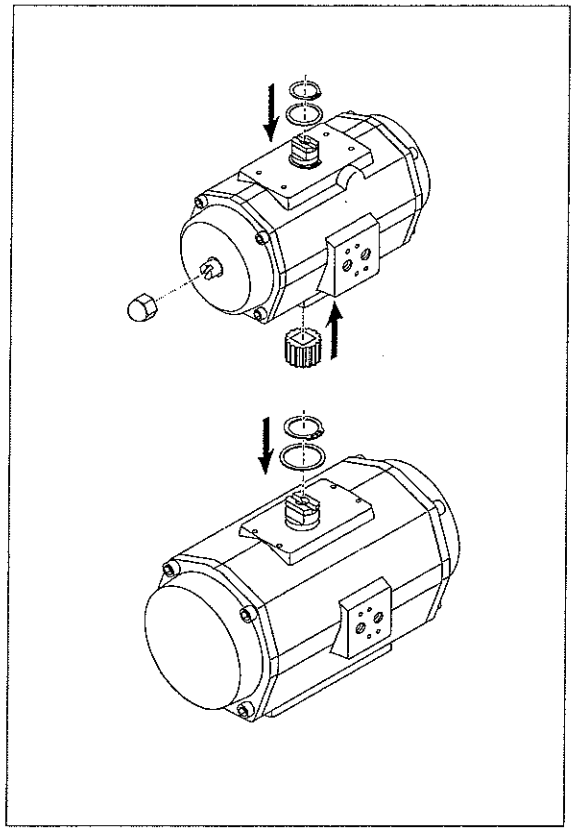
6.5.4

Engage the bolts with the tapped holes in the actuator body by forcing down slightly on the cap. Tighten each bolt in small and equal turns.

Die Schrauben mit leichtem Druck auf die Endkappe in die Gewindelöcher des Antriebsgehäuses einführen. Jede Schraube mit kurzen und gleichen Schraubendrehungen abwechselnd festschrauben.

Plaats de bouten in de schroefgaten in de behuizing van de aandrijving door de kap lichtjes naar beneden te drukken. Draai elke bout met kleine en gelijkmatige bewegingen vast.

6.6 Reassembly of springclip and insert / Zusammenbau von Seegerring und Insert / *Opnieuw monteren van Seegerring en insert*



6 6 1

6.6.1

Install the new shaft spring clip onto its mating groove on the top shaft extension.

Check proper functioning by applying pressure to the A-port or B-port (see chapter 3).

6.6.2

Apply pressure to the A-port and use some soapsuds around shaft top and shaft bottom to check for air leakage. Apply pressure to the B-port and use some soapsuds around the endcaps to check for air leakage.

6.6.1

Der neuen Sicherungsring auf die dafür vorgesehene Rille am oberen Wellenende montieren.

Kontrollier die richtige Funktion des Antriebs durch anschliessen von Luftdruck zur Anschluß A oder B (siehe Kapitel 3).

6.6.2

Luftzufuhr zur Anschluß A anschliessen und verwende Seifenwasser rund Wellenoberseite und Wellenunterseite zur Kontrole der Luftdichtigkeit. Luftzufuhr zur Anschluß B anschliessen und verwende Seifenwasser rund Endkappen zur Kontrole der Luftdichtigkeit.

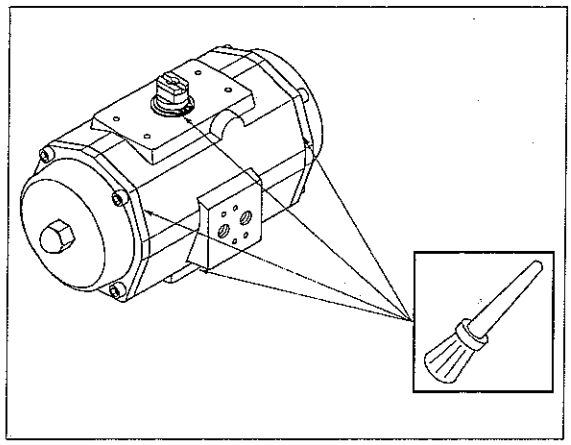
6.6.1

Installeer de nieuwe veerklem in de corresponderende groef op de astop.

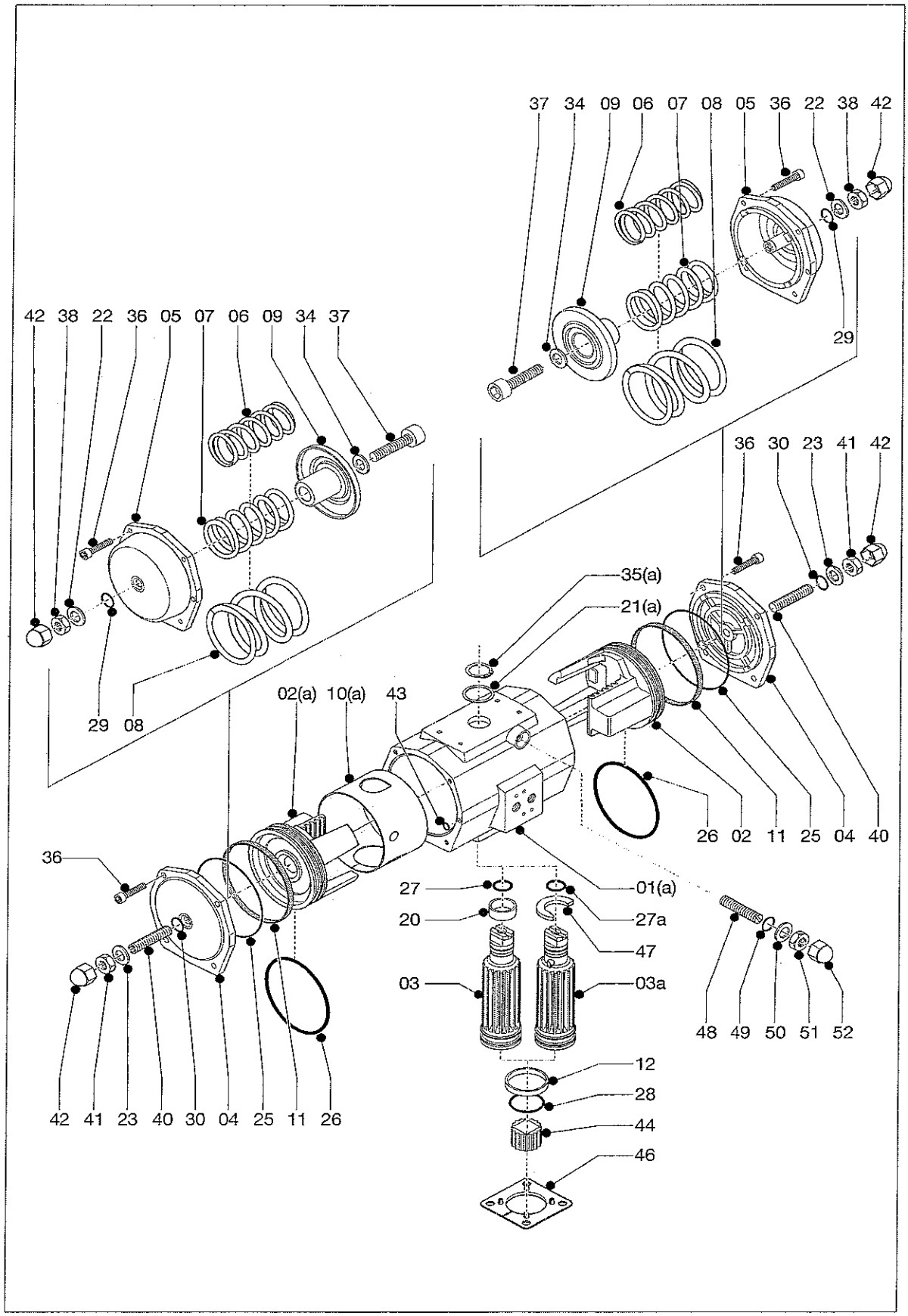
Kontroleer het juist functioneren door luchtdruk aan te sluiten op de A-poort of de B-poort (zie hoofdstuk 3).

6.6.2

Zet luchtdruk op de A-poort en gebruik zeepsop rond as-top en as-einde voor kontrole van de luchtdichtheid. Zet luchtdruk op de B-poort en gebruik zeepsop rond de deksels voor kontrole van de luchtdichtheid.



6 6 2


37 34 09 06 07 08 05 36 22 38 42
29
42 38 22 36 05 07 06 09 34 37
29 08
36 30 23 41 42
35(a)
21(a)
02(a) 10(a) 43
26 02 11 25 04 40
36
27
20
03
01(a)
27a
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03a
48 49 50 51 52
12
28
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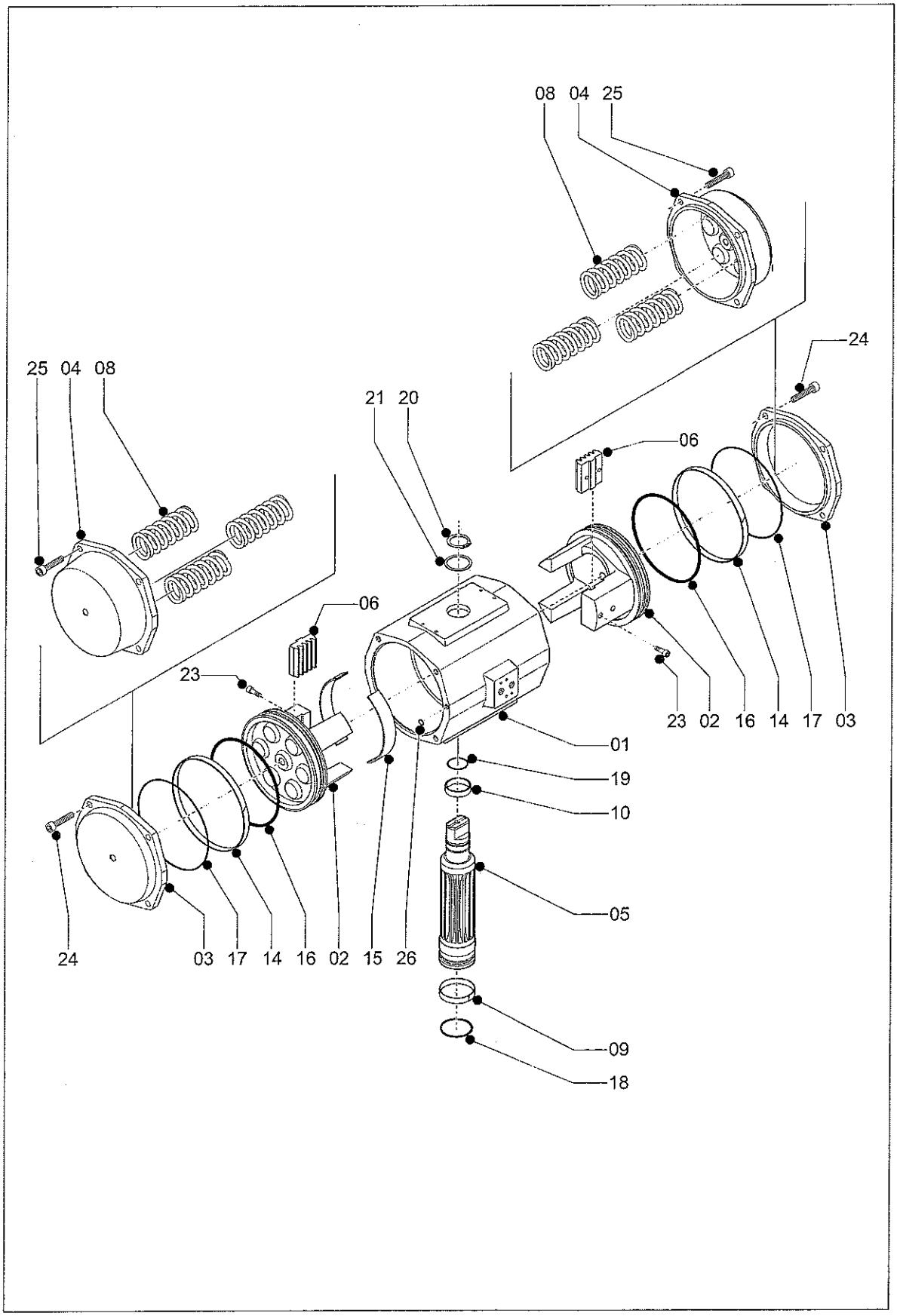
46
42 41 23 40 30 04 25 11 26

7 PARTS LIST / STÜCKLISTE / *STUKLIJSTEN*

Pos.	Qty. St.Z. *Aant.*	Description	Bezeichnung	*Benaming*	Specification Spezifikation *Specificatie*
1	1	Body	Gehäuse	*Behuizing*	GAlSi10Mg, DIN 1725/2
1a	1	Body DSA	Gehäuse DSA	*Behuizing DSA*	GAlSi10Mg, DIN 1725/2
2	1	Piston	Kolben	*Zuiger*	GAlSi7Mg, DIN 1725/2
2a	1	Piston DSA	Kolben DSA	*Zuiger DSA*	GAlSi7Mg, DIN 1725/2
3	1	Drive Shaft	Antriebswelle	*Aandrijfas*	AlZnMGCu1 5, DIN 1725/1
3a	1	Drive Shaft DSA	Antriebswelle DSA	*Aandrijfas DSA*	AlZnMGCu1 5, DIN 1725/1
4	2	End Cap ED	Endkappe ED	*Deksel ED*	GDAlSi9Cu3, DIN1725/2
5	2	End Cap ES	Endkappe ES	*Deksel ES*	GDAlSi9Cu3, DIN 725/2
6	2	Spring-inner	Innenfeder	*Veer binnen*	Class C DIN 17223
7	2	Spring-mid	Mittelfeder	*Veer midden*	Class C, DIN 17223
8	2	Spring-outer	Außenfeder	*Veer buiten*	Class C, DIN 17223
9	2	Spring Holder	Federhalter	*Veerhouder*	C45, DIN 17200
10*	1	Guide Band	Führungsband	*Geleideband*	PA66 + MoS2
10a*	1	Guide Band DSA	Führungsband DSA	*Geleideband DSA*	PA66 + MoS2
11*	2	Guide Band	Führungsband	*Geleideband*	PTFE + 2596 C
12*	1	Bearing Bush	Lagerbuchse	*Lagerbus*	PA66 + MoS2
20*	1	Bearing Bush	Lagerbuchse	*Lagerbus*	POM
21*	1	Washer	Unterlegscheibe	*Afdichtring*	POM
21a*	1	Washer DSA	Unterlegscheibe DSA	*Afdichtring DSA*	POM
22*	2	Washer ES	Unterlegscheibe ES	*Sluitplaat ES*	PA6
23*	2	Washer ED	Unterlegscheibe ED	*Sluitplaat ED*	PA6
25*	2	O-Ring	O-Ring	*O-ring*	Buna N
26*	2	O-Ring	O-Ring	*O-ring*	Buna N
27*	1	O-Ring	O-Ring	*O-ring*	Buna N
27a*	1	O-Ring DSA	O-Ring DSA	*O-ring DSA*	Buna N
28*	1	O-Ring	O-Ring	*O-ring*	Buna N
29*	4	O-Ring	O-Ring	*O-ring*	Buna N
30*	2	O-Ring	O-Ring	*O-ring*	Buna N
34	2	Washer ES	Unterlegscheibe ES	*Afdichtring ES*	C35
35*	1	Spring Clip	Seegerring	*Seegerring*	Ck75, DIN 17222
35a*	1	Spring Clip DSA	Seegerring DSA	*Seegerring DSA*	Ck75, DIN 17222
36	8	End Cap bolt ED/ES	Endkappenschraube ED/ES	*Bout deksel ED/ES*	AISI 304
37	2	Limit Stop Bolt ES	Begrenzungsschraube ES	*Bout slagbegrenzing ES*	AISI 304
38	2	Nut	Mutter	*Moer*	AISI 304
40	2	Limit Stop bolt ED	Begrenzungsschraube ED	*Bout slagbegrenzing ED*	AISI 304
41	2	Nut	Mutter	*Moer*	AISI 304
42	2	Nut cover	Schutzkappe	*Moerbeschermkap*	PE
43*	2	O-Ring	O-Ring	*O-ring*	Buna N
44	1	Insert	Insert	*Inzetstuk*	AlMgSi 1
46	1	Centre-plate (option for DIN3337 actuators)	Zentrierplatte (Option für DIN3337 Antriebe	*Centreerplaat (optie voor DIN3337)*	PA6 + 25% Glass
47	1	Cam for stroke adj DSA	Hubbegrenzungsnocken DSA	*Slagbegrenzingsnok DSA*	AISI 304
48	1	Limit Stop bolt DSA	Begrenzungsschraube DSA	*Bout slagbegrenzing DSA*	AISI 304
49*	1	O-Ring DSA	O-Ring DSA	*O-ring DSA*	Buna N
50*	1	Washer DSA	Unterlegscheibe DSA	*Sluitplaat DSA*	PA6
51	1	Nut DSA	Mutter DSA	*Moer DSA*	AISI 304
52	1	Nut cover DSA	Schutzkappe DSA	*Moerbeschermkap DSA*	PE

* Recommended Spare Parts (contained in Repair Kit or Repair Kit DSA).
* **Empfohlene Ersatzteile (Teil des Reparatursatzes oder Reparatursats für DSA).**
* *Aanbevolen reserve-onderdelen (opgenomen in reparatiepakket of reparatiepakket DSA)*

* The extra or specific parts of a DSA actuator are marked "DSA"
* **Die zusätzlichen oder spezifischen Teile eines DSA-Antriebs sind mit der Kennzeichnung "DSA" angegeben.**
* *De extra of specifieke delen van een DSA aandrijving zijn gemerkt met "DSA".*


08 04 25
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25 04 08
21 20
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06
23
23 02 16 14 17 03
01
19
10
05
24 03 17 14 16 02 15 26
09
18

Pos. St.Z. *Aant.*	Qty. St.Z. *Aant.*	Description	Bezeichnung	*Benaming*	Specification Spezifikation *Specificatie*
1	1	Body	Gehäuse	*Behuizing*	GAlSi10Mg, DIN 1725/2
2	2	Piston	Kolben	*Zuiger*	GAlSi7Mg, DIN 1725/2
3	2	End Cap PD	Endkappe PD	*Deksel PD*	GAlSi10Mg, DIN 1725/2
4	2	End Cap PE	Endkappe PE	*Deksel PE*	GAlSi10Mg, DIN 1725/2
5	1	Central drive shaft	Antriebswelle	*Aandrijfas*	AlZnMGCu1 5, DIN 1725/1
6	2	Gear Rack	Zahnstange	*Tandheugel*	C45, DIN 17200
8	14	Spring	Feder	*Veer*	Class C, DIN 17223
9*	1	Bearing bush	Lagerbuchse	*Lagerbus*	PA66 + MoS2
10*	1	Bearing bush	Lagerbuchse	*Lagerbus*	POM
14*	2	Guide band	Führungsband	*Geleideband*	PTFE + 25% C
15*	2	Guide band	Führungsband	*Geleideband*	PTFE + 25% C
16*	2	O-ring	O-Ring	*O-ring*	Buna N
17*	2	O-ring	O-Ring	*O-ring*	Buna N
18*	1	O-ring	O-Ring	*O-ring*	Buna N
19*	1	O-ring	O-Ring	*O-ring*	Buna N
20*	1	Spring Clip	Sprengring	*Seegerring*	Ck75, DIN17222
21*	1	Thrust Washer	Sicherungsscheibe	*Drukschijf*	POM
23	2/4	Bolt	Schraube	*Bout*	12 9 DIN912
24	8/20	Endcap Bolt PD	Endkappenschraube PD	*Bout sluitkap PD*	AISI 304
25	8/20	Endcap Bolt PE	Endkappenschraube PE	*Bout sluitkap PE*	AISI 304
26*	2	O-ring	O-Ring	*O-ring*	Buna N

* Recommended Spare Parts (contained in Repair Kit)

* Empfohlene Ersatzteile (Teil des Reparatursatzes)

* *Aanbevolen reserve-onderdelen (opgenomen in reparatiepakket)*

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Trim Options

Bettis offers three trim options for Pressurematic pilot process components.

Option "C"

- Standard construction carbon steel body treated with Impreglon 218 and ENC stainless steel T316 piston
- The Impreglon process, surface fluoropolymer impregnation, reduces frictional wear and provides a corrosion resistant barrier

Option "S"

- Stainless steel body and piston virtually eliminate external corrosion
- Suitable for salt water or saline well service
- Suitable for low temperature service below –50°F (–46°C)

Option "B"

- Features Inconel 718 bellows surrounding a stainless steel piston
- Corrosion protected for harsh environments, including asphaltines and other solids in suspension which adhere to and obstruct moving parts
- Typical medias include: sulfur lines, high salt content liquid lines, gas or liquid lines containing asphaltines or paraffin wax
- Available on 2000 Series Pressurematics, with maximum working pressure of 2500 psig

ISO – Test Valve IB Series

Description

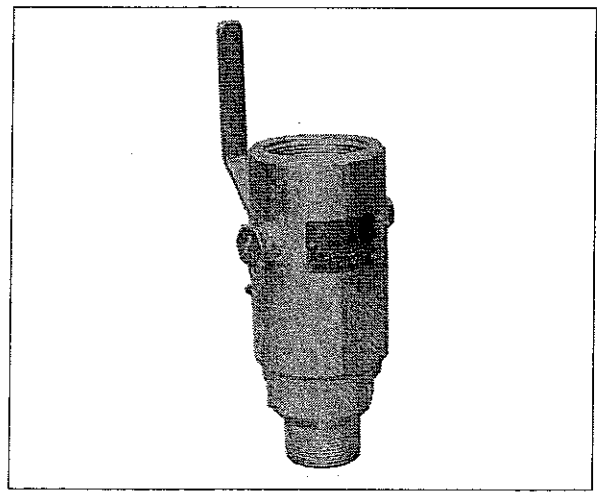
The Isolation Test Valve, when used with our Pressurematic pressure sensing device, enables calibration of the pressure pilot or pressure switch without shutting down the flow line.

Features

- Flats on body for easy installation.
- Quarter-turn operation, handle indicates position.
- Handle allows padlocking in either the open or closed position.
- Compact, safe, blow-out proof stem. Cannot be removed when valve is under pressure.
- Spring loaded stem seal automatically compensates for normal wear as well as seal expansion and contraction due to temperature fluctuations.
- Slotted seats relieve upstream pressure, decreasing operating torque and extending service life.
- Resilient seat sealing lip floats with load enabling low pressure sealing and support at high pressure, while minimizing operating torque.
- Alberta Boiler Branch registration CRN 0C0082.2

Options

- Side Needle Valve (CS or SS)
- Side Pressure Gauge (Phenolic or SS)
- Flanged Process Connection (A105 or LF2)
- Stainless Steel body and cap
- Sour Service (NACE MR-01-75)
- Other Pressure and Temperature Ranges
- NPS 2 Process Connection
- ½" or 1" NPT Reduced Process Connection



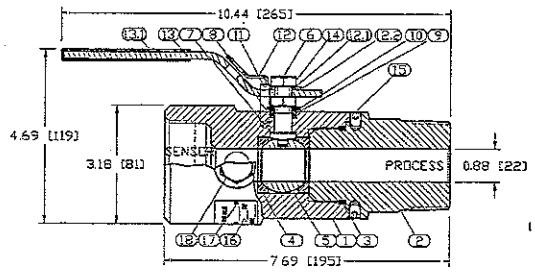
Specifications Model IB-2,5,6 Low-Temp CS Body

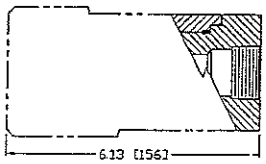
Maximum Working Pressure	3,000 PSIG	[20,680 kPa]
Minimum Temperature	–50°F	[–46°C]
Maximum Temperature	150°F	[65°C]
Sensor Connection	2 NPT Female	
Process Connection IB-2	1½ NPT Male	
IB-5	2 NPT Male	
IB-6	1 NPT Female	
Side Connections	Two ½ NPT Female	

Specifications Model IB-7 Low-Temp CS Body

Maximum Working Pressure	6,000 PSIG	[41,370 kPa]
Minimum Temperature	–50°F	[–46°C]
Maximum Temperature	150°F	[65°C]
Sensor Connection	2 NPT Female	
Process Connection	1½ NPT Male	
Side Connections	Two ½ NPT Female	

ISO-Test Valve Assembly

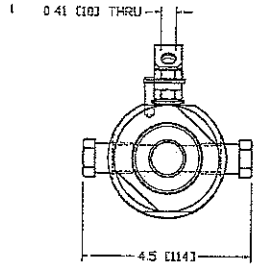




SPECIFICATIONS:
PORTS: PROCESS 1-1/2 NPT; SENSOR 2 NPT
GAUGE 1/2 NPT 2 PLACES
SERVICE: OIL, WATER, SWEET/SOUR GAS
TEMP. RATING: -50°C THRU 65°C
MASS: 11.6 LBm [5.3 kg]
MAX. WORKING PRESSURE: 3000 PSIG
Cv=10 THRU 1/2 NPT; Cv=40 THRU 2 NPT

NOTE:
- (A) OPTIONAL
- (Y) REPAIR KIT NO. SPRK-ISO-20

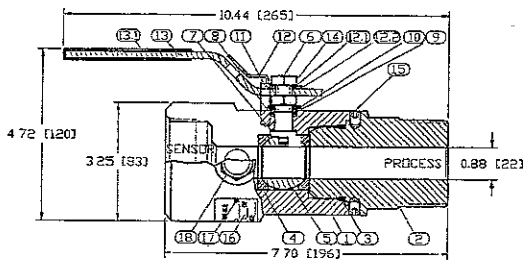
FASTENERS AND SERVICE TOOLS: ARE ANSI/INCH SIZE

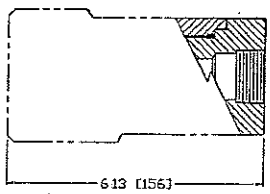


ITEM	DESCRIPTION	MATERIAL	QTY	NOTE
1	BODY	A350-LF2 ZN.PL	1	
2	CAP	A350-LF2 ZN.PL	1	
3	O-RING, BODY SEAL	VITON	1	(Y)
4	SEATS	DELRIN	2	(Y)
5	BALL	SS 316	1	
6	STEM	17-4 PH H1150M	1	
7	THRUST WASHER	DELRIN AF	1	(Y)
8	STEM PACKING	15% GFT	1	(Y)
9	PACKING FOLLOWER	SS 304 OR 316	1	
10	BELLEVILLE WASHER	SS 302	2	
11	STOP PIN	SS 420	1	
12	LOCK PLATE	SS 304/../316	1	
12.1	SPACER	SS 304/../316	1	
12.2	SPRING WASHER	SS 302	1	
13	HANDLE	A366 ZN.PL	1	
13.1	HANDLE COVER	VINYL	1	(Y)
14	STEM NUT	SS 304	2	
15	SETSCREW	SS 304	2	(A)
16	NAMEPLATE	SS 304	1	
17	DRIVE SCREW	SS 304 OR 301	2	
18	PLUG (TEST, SHIP)	A105 ZN.PL	2	

ISO-TEST VALVE SERIES IB-2
2 X 1-1/2 X 1/2 X 1/2 NPT 3000
CWP ASSEMBLY, DIMENSIONS
AND SPECIFICATIONS

IB-2

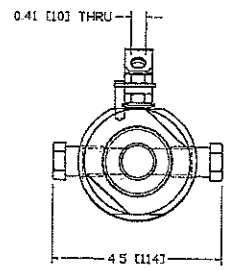




SPECIFICATIONS:
PORTS: PROCESS 1-1/2 NPT; SENSOR 2 NPT
GAUGE 1/2 NPT 2 PLACES
SERVICE: OIL, WATER, SWEET/SOUR GAS
TEMP. RATING: -50°C THRU 65°C
MASS: 12.1 LBm [5.5 kg]
MAX. WORKING PRESSURE: 6000 PSIG
Cv=10 THRU 1/2 NPT; Cv=40 THRU 2 NPT

NOTE:
- (A) OPTIONAL
- (Y) REPAIR KIT NO. SPRK-ISO-60

FASTENERS AND SERVICE TOOLS: ARE ANSI/INCH SIZE



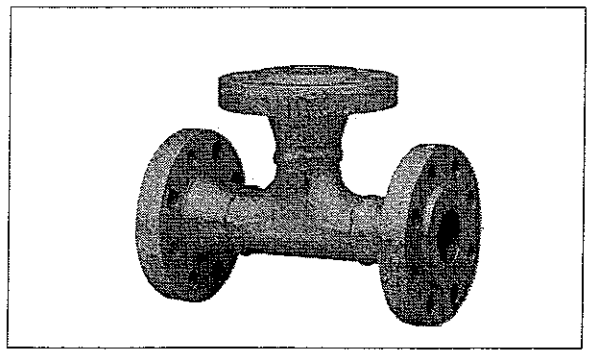
ITEM	DESCRIPTION	MATERIAL	QTY	NOTE
1	BODY	A350-LF2 ZN.PL	1	
2	CAP	A350-LF2 ZN.PL	1	
3	O-RING, BODY SEAL	VITON	1	(Y)
4	SEATS	DELRIN	2	(Y)
5	BALL	SS 316	1	
6	STEM	17-4 PH H1150M	1	
7	THRUST WASHER	DELRIN AF	1	(Y)
8	STEM PACKING	15% GFT	1	(Y)
9	PACKING FOLLOWER	SS 304 OR 316	1	
10	BELLEVILLE WASHER	SS 302	2	
11	STOP PIN	SS 420	1	
12	LOCK PLATE	SS 304/../316	1	
12.1	SPACER	SS 304/../316	1	
12.2	SPRING WASHER	SS 302	1	
13	HANDLE	A366 ZN.PL	1	
13.1	HANDLE COVER	VINYL	1	(Y)
14	STEM NUT	SS 304	2	
15	SETSCREW	SS 304	2	(A)
16	NAMEPLATE	SS 304	1	
17	DRIVE SCREW	SS 304 OR 301	2	
18	PLUG (TEST, SHIP)	A105 ZN.PL	2	

ISO-TEST VALVE SERIES IB-7
2 X 1-1/2 X 1/2 X 1/2 NPT 6000
CWP ASSEMBLY, DIMENSIONS
AND SPECIFICATIONS

IB-7

Flow Tee

- For use with ISO Test Valve and/or Pressurematic
- Pressure rated for designated service
- Available in a variety of materials
- Threaded NPT configuration available



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VEE-2000 FULL PORT END-ENTRY GENERAL PURPOSE BALL VALVE

¼ – 2" (8 – 50 mm)

CARBON OR STAINLESS STEEL BODY, RPTFE SEATS

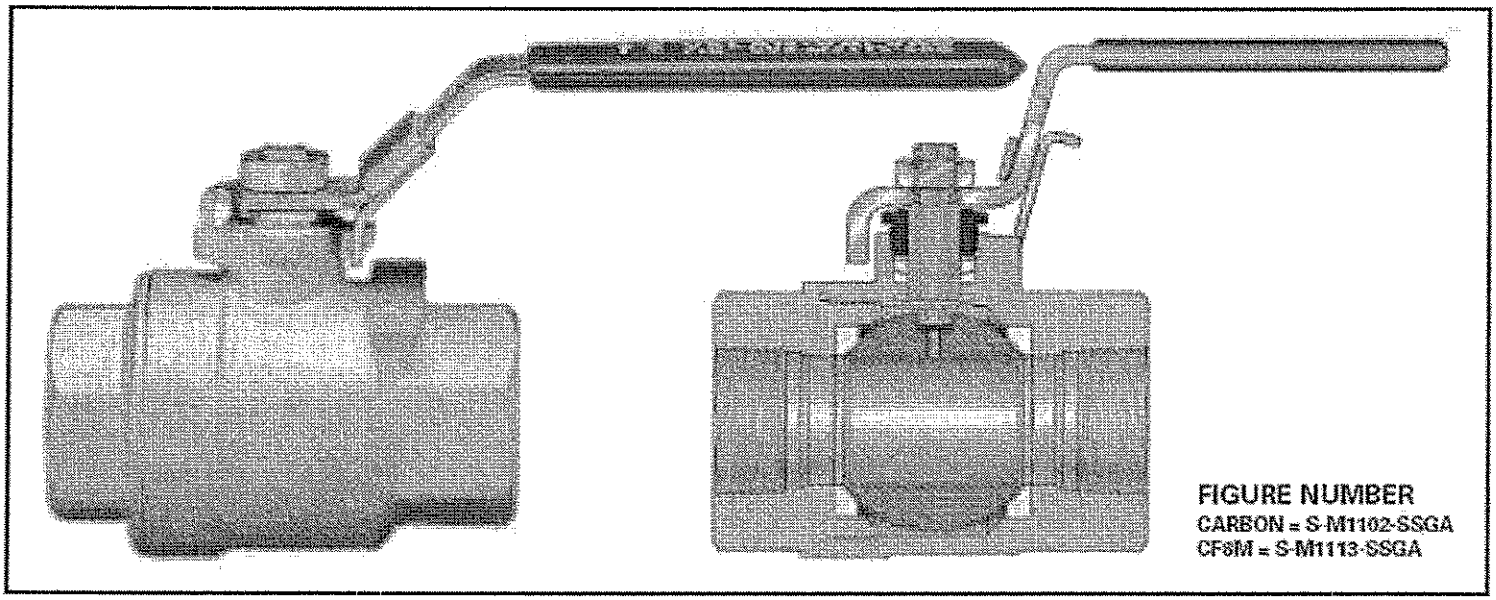
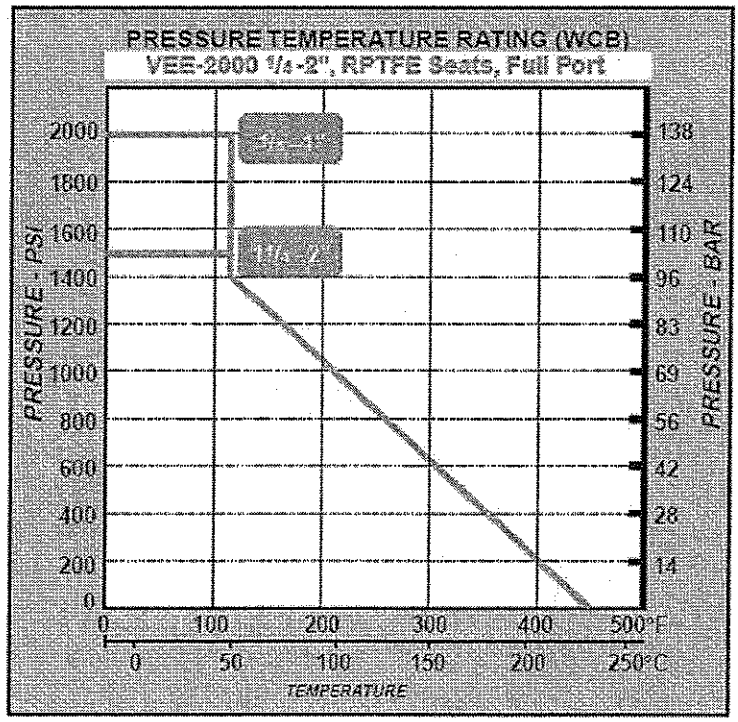


FIGURE NUMBER
CARBON = S-M1102-SSGA
CF8M = S-M1113-SSGA

STANDARD MATERIALS

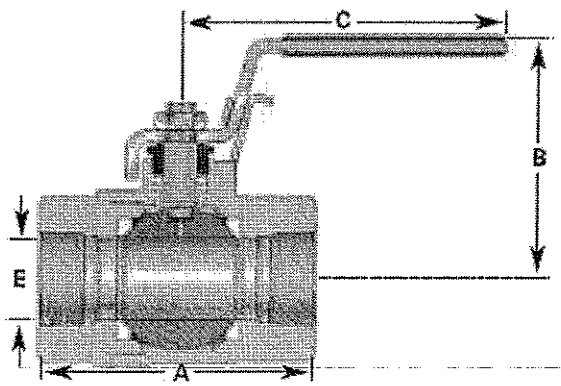
PART	STAINLESS STEEL	CARBON STEEL[1]
Body	CF8M	WCB
End cap	CF8M	WCB
Seat	RPTFE	RPTFE
Ball	SS 316	SS 316
Stem	SS 316	SS 316
Thrust washer	RPTFE	RPTFE
Body seal	PTFE	PTFE
Packing ring	PTFE or RPTFE	PTFE or RPTFE
Packing nut	SS 304	SS 304
Handle	SS 304	SS 304
Handle / latch	SS 304	SS 304
Handle nut	SS 304	SS 304

(1) ¼" and ⅜" sizes available only in SS body.



DIMENSIONS AND WEIGHTS

SIZE in / mm	VEE-2000F MANUAL A	B	C	E	Cv Value	WEIGHT lb/kg
¼ / 8	2.17 / 56	2.28 / 53.3	4.65 / 116	0.44 / 11.1	8	0.66 / 0.30
⅜ / 10	2.17 / 56	2.28 / 53.3	4.65 / 116	0.44 / 11.1	10	0.62 / 0.28
½ / 15	2.38 / 60.5	2.40 / 61	4.65 / 118	0.50 / 12.7	13	0.62 / 0.30
¾ / 20	3.01 / 76.5	2.76 / 70	5.87 / 149	0.81 / 20.7	50	1.41 / 0.64
1 / 25	3.62 / 92	2.99 / 76	5.87 / 149	1.00 / 25.4	93	2.27 / 1.03
1¼ / 32	3.98 / 101	3.58 / 91	8.27 / 210	1.26 / 32.0	170	3.73 / 1.69
1½ / 40	4.37 / 111	3.74 / 95	8.27 / 210	1.50 / 38.1	250	4.87 / 2.21
2 / 50	4.96 / 126	4.09 / 104	8.27 / 210	2.00 / 50.8	450	7.59 / 3.44



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PRESSUREMATIC

CUSTOMER: _____

P.O.#: _____

W.O.#: _____

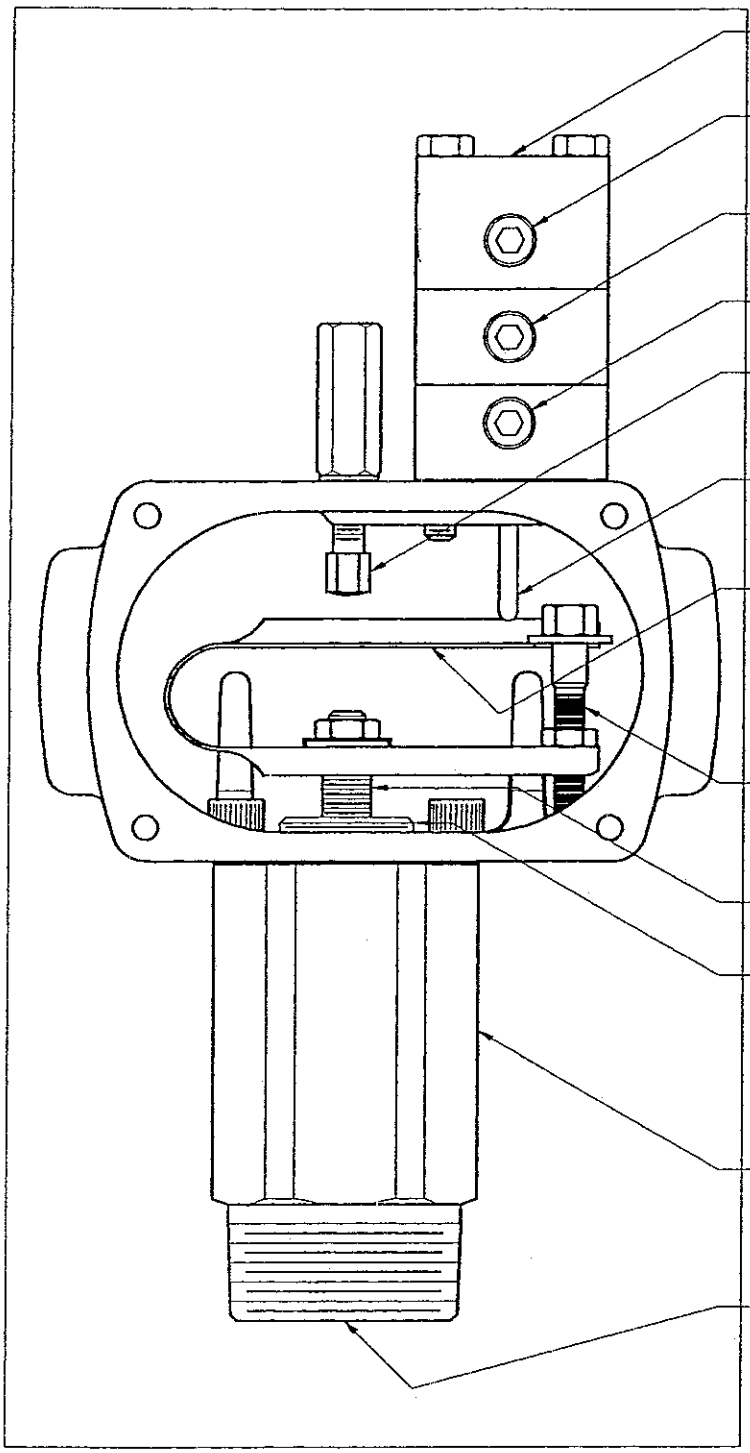
TAG: _____

DATE: _____

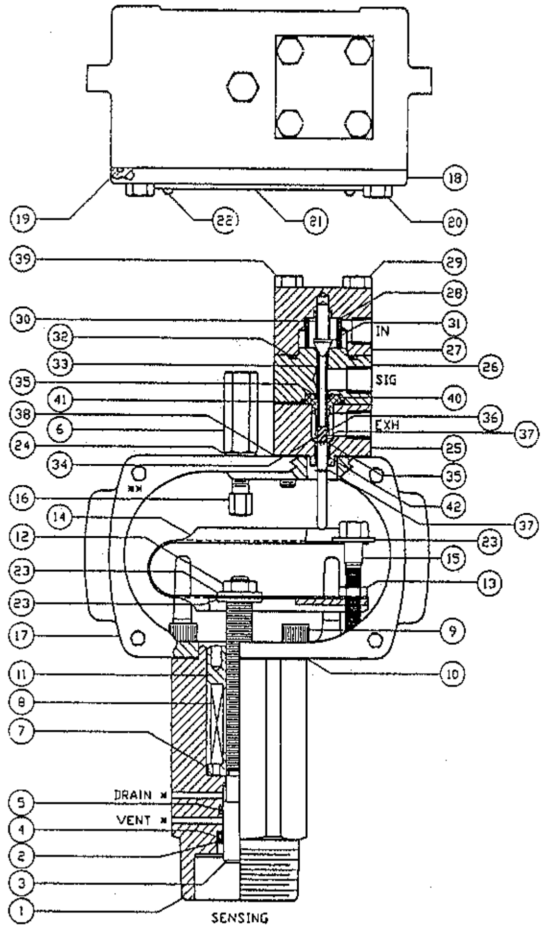
APPLIES TO PRESSUREMATIC OPERATOR MODEL:

_____

OPERATION AND ADJUSTMENTS



C-0098--.DWG ORIG MAR-10-92
SCALE 1:2 REV 1- AUG-16-96



ITEM	DESCRIPTION	MATERIAL	QTY	NOTE
1	BODY	C1018	1	
2	RETAINING RING, BODY	SS 304	1	
3	PISTON	SS 316	1	
4	SEAL #1, PISTON	TFE	1	(Y)
5	SEAL #2, PISTON	NITRILE	1	(Y)
6	HIGH TRIP BLIND NUT	AL 2011-T3	1	
7	SPRING SEAT	CS PL	1	
8	RANGE SPRING	CR-V ALLOY	1	(V)
9	BOLT, BODY	SS 304	2	
10	GASKET, BODY	PLANT FIBRE	1	(Y)
11	RANGE SCREW	SS 416	1	
12	JAM NUT, TRIP SPRING	SS 304	1	
13	JAM NUT, LOW TRIP BOLT	SS 304	1	
14	TRIP SPRING ASSEMBLY	SS 301	1	
15	LOW TRIP ADJUSTMENT BOLT	AL 6061-T6	1	
16	HIGH TRIP BOLT	SS 316	1	
17	HOUSING	AL CAST	1	
18	COVER PLATE	AL CAST	1	
19	O-RING, COVER	NITRILE	1	(Y)
20	BOLT, COVER	SS 304	4	
21	NAMEPLATE	SS 304	1	
22	DRIVE SCREW, NAMEPLATE	SS 18-8	4	
23	WASHER, TRIP SPRING	SS 304	3	
24	STAT-O-SEAL	CS/NITRILE	1	(Y)
25	LOWER BODY, PILOT	AL 6061-T6	1	
26	UPPER BODY, PILOT	AL 6061-T6	1	
27	END CAP, PILOT	AL 6061-T6	1	
28	FILTER ELEMENT, PILOT	CELLULOSE/RESIN	1	(Y)
29	CAPSCREW, END CAP	SS 304	2	
30	SPRING, POPPET	SS 302	1	
31	POPPET, PILOT	TFE	1	(Y)
32	O-RING, UPPER BODY	NITRILE	1	(Y)
33	SPOOL, PILOT	SS 304	1	
34	RETAINING RING, SEAL	SS 304	1	(Y)
35	O-RING, SPOOL	NITRILE	2	(Y)
36	SPRING, SPOOL	SS 302	1	
37	RETAINING RING, SPOOL	SS 304	2	
38	GASKET, PILOT	PLANT FIBRE	1	(Y)
39	CAPSCREW, PILOT MOUNTING	SS 304	2	
40	SLEEVE, PILOT	DELRIN	1	(Y)
41	O-RING, SLEEVE	NITRILE	1	(Y)
42	BUSHING, SPOOL	TFE	1	

NOTE: (Y) RECOMMENDED SPARE PARTS/REPAIR KIT, (V) TO BE SPECIFIED
FASTENERS AND MAINTENANCE TOOLS ARE ANSI/INCH SIZE
* VENT AND DRAIN SHOWN ~30° FROM TRUE POSITION
** SHOWN WITH COVER REMOVED

UNLESS SPECIFIED OTHERWISE
ALL DIMENSIONS INCHES (mm)

UPDT HOUSING "17", BOLTS WERE CS
4 RS-1996-08-14 @ SALES REQ
UPDT STDS
3 RS-1995-12-13 @ SALES REQ
UPDT SPOOL, TFE POPPET
2 DY-1993-03-24 @ 9248
+TRIP SPRING NUT, WASHER
1 DY-1991-12-02 @ 8980
REV BY-DATE+REF

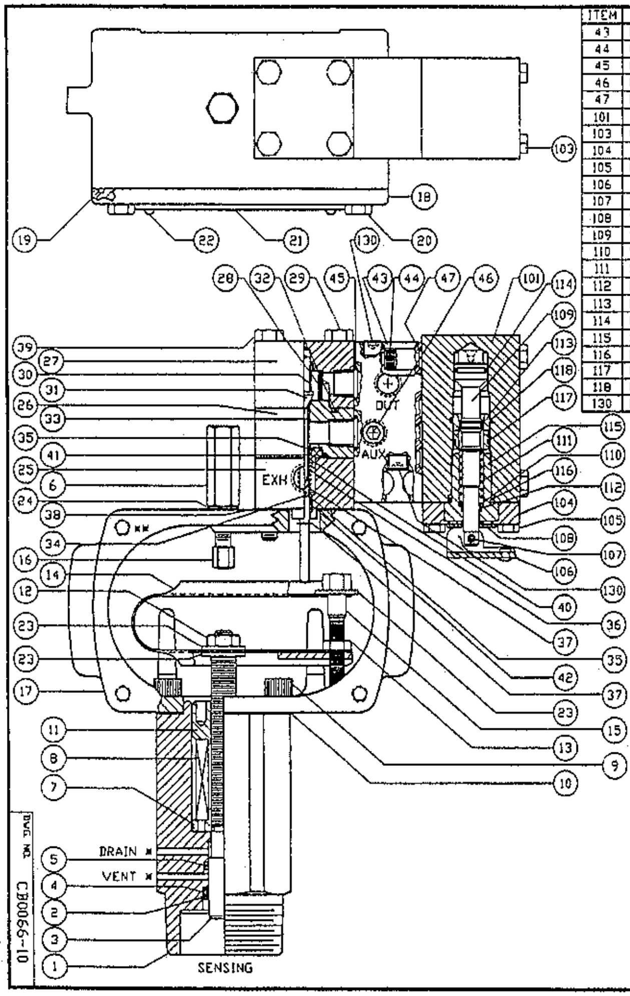
TOLERANCES
XXX ±0.5 [±10]
XX ±0.2 [±5]
X ±0.1 [±2]

BETTIS BETTIS CANADA LTD.
Actuators & Controls

PRESSUREMATIC ASSEMBLY
(P~AR2000 TYPICAL, CS BODY, STD TRIM)

AP0570--.DVG_VIEW_00 DEC-18-96		WEIGHT	11.0 LB
SCALE 1:2	BY DY	CHK	DATE OCT-21-91
V.O. 8980-R&D	DWG. NO. AP80570		REV 4-

DWG. NO. AP80570



ITEM	DESCRIPTION	MATERIAL	QTY	NOTE
1	BODY	ASTM A108 GR C1018	1	
2	RETAINING RING, BODY	SS 304	1	
3	PISTON	SS 316	1	
4	SEAL #1, PISTON	TFE	1	(Y)
5	SEAL #2, PISTON	NITRILE	1	(Y)
6	HIGH TRIP BLIND NUT	AL 2011-T3	1	
7	SPRING SEAT	AISI C12L14 ZN PL	1	
8	RANGE SPRING	CR-V ALLOY	1	(V)
9	BOLT, BODY	SS 304	2	
10	GASKET, BODY	PLANT FIBRE	1	(Y)
11	RANGE SCREW	SS 416	1	
12	JAM NUT, TRIP SPRING	SS 304	1	
13	JAM NUT, LOW TRIP BOLT	SS 304	1	
14	TRIP SPRING ASSY	SS 301	1	
15	LOW TRIP ADJ BOLT	AL 6061-T6	1	
16	HIGH TRIP BOLT	SS 316	1	
17	HOUSING	TENZALLOY	1	
18	COVER PLATE	AL CAST	1	
19	O-RING, COVER	NITRILE	1	(Y)
20	BOLT, COVER	SS 304	4	
21	NAMEPLATE, COVER	SS 304	1	
22	DRIVE SCREW, NAMEPLATE	SS 304	4	
23	FLATWASHER	SS 304	3	
24	STAT-O-SEAL	CS RET/NITRILE SEAL	1	(Y)
25	LOWER BODY, PILOT	AL 6061-T6	1	
26	UPPER BODY, PILOT	AL 6061-T6	1	
27	END CAP, PILOT	AL 6061-T6	1	
28	FILTER ELEMENT, PILOT	CELLULOSE/RESIN	1	(Y)
29	CAPSCREW, END CAP	SS 304	2	
30	SPRING, POPPET	SS 302	1	
31	POPPET, PILOT	TFE	1	(Y)
32	O-RING, UPPER BODY	NITRILE	1	(Y)
33	SPOOL, PILOT	SS 304	1	
34	RETAINING RING, SEAL	SS 304	1	(Y)
35	O-RING, SPOOL	NITRILE	2	(Y)
36	SPRING, SPOOL	SS 302	1	
37	RETAINING RING, SPOOL	SS 304	2	
38	GASKET, PILOT	PLANT FIBRE	1	(Y)
39	CAPSCREW, PILOT MOUNTING	SS 304	2	
40	SLEEVE, PILOT	DELRIN	1	(Y)
41	O-RING, UPPER BODY	NITRILE	1	(Y)
42	BUSHING, SPOOL	TFE	1	
43	MANIFOLD, RESET VALVE	AL 6061-T6	1	(1)
44	CAPSCREW, MANIFOLD	SS 304	2	
45	O-RING, MANIFOLD	NITRILE	2	(Y)
46	PLUG, MANIFOLD	SS 304	1	
47	O-RING, MANIFOLD	NITRILE	4	(Y)
101	BODY, RESET VALVE	AL 6061-T6	1	
103	CAPSCREW, RESET VALVE	SS 304	3	
104	SLEEVE RETAINER	AL 6061-T6	1	
105	CAPSCREW, SLEEVE RET	SS 304	2	
106	TOGGLE ASSEMBLY	AL 6061-T6/SS 301	1	
107	SLOTTED SPRING PIN	SS 420	1	
108	WASHER TOGGLE	NYLON	1	(Y)
109	SPOOL, RESET VALVE	AL 6061-T6	1	
110	WASHER, SPRING	AL 6061-T6	1	
111	SPRING, RESET VALVE	SS 302	1	
112	O-RING, SLEEVE STEM	NITRILE	1	(Y)
113	O-RING, SPOOL	NITRILE	1	(Y)
114	O-RING, SPOOL PISTON	NITRILE	1	(Y)
115	SLEEVE, RESET VALVE	TEFLON	1	
116	O-RING, SLEEVE HEAD	NITRILE	1	(Y)
117	O-RING, SLEEVE	NITRILE	1	(Y)
118	O-RING, RESET VALVE	NITRILE	1	(Y)
130	PLUG, MANIFOLD	SS 304	2	

NOTE: (1) MANIFOLD MUST BE ASSEMBLED WITH PLUGS, ITEM "130"
(Y) RECOMMENDED SPARE PARTS/REPAIR KIT. (V) TO BE SPECIFIED
FASTENERS AND MAINTENANCE TOOLS ARE ANSI/INCH SIZE
* VENT AND DRAIN SHOWN -30° FROM TRUE POSITION
** SHOWN WITH COVER REMOVED

UNLESS SPECIFIED OTHERWISE ALL DIMENSIONS INCHES (mm)

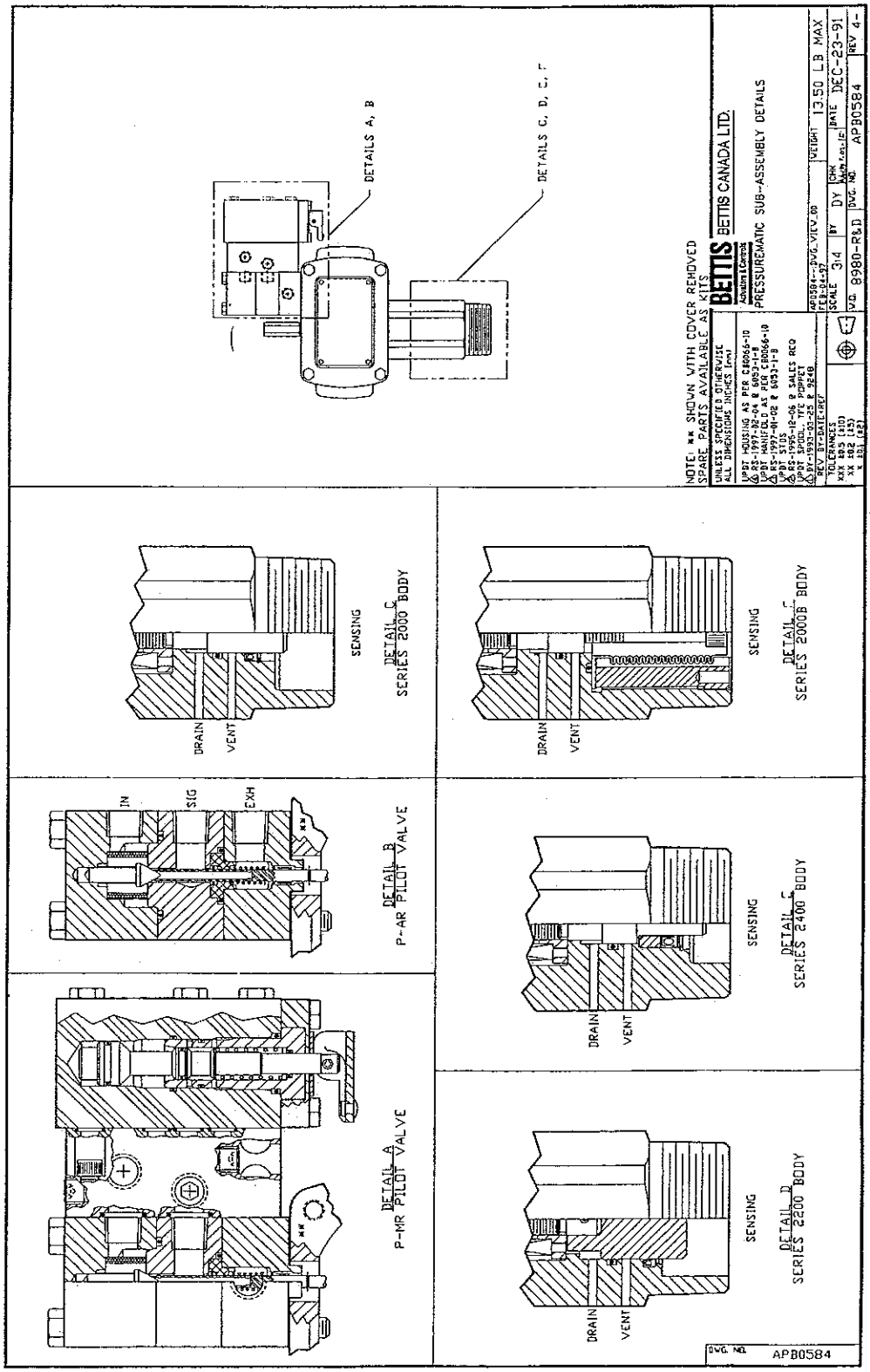
BETTIS Actuators & Controls — BETTIS CANADA LTD.

PRESSUREMATIC ASSEMBLY (P-MR2000 TYPICAL) WITH O-RINGS

UPDT HOUSING, REVISE ITEM LIST
AS-1996-11-30 E6031-B
REV BY-DATE-REF

C-0066--DWG_VIEW_10 DEC-18-96
TOLERANCES XXX ±0.5 (±10) XX ±0.2 (±5) X ±0.1 (±2)

WEIGHT 12.5 LB
SCALE 1:2 BY RS CHK DATE JUN-19-96
V.O. 09233-3-R DWG. NO. CB0066-10 REV 1-


DETAILS A, B
DETAILS C, D, E, F
NOTE: ** SHOWN WITH COVER REMOVED
SPARE PARTS AVAILABLE AS KITS
UNLESS SPECIFIED OTHERWISE
ALL DIMENSIONS INCHES [mm]
BETTIS CANADA LTD.
PRESSUREMATIC SUB-ASSEMBLY DETAILS
WEIGHT 13.50 LB MAX
DATE DEC-23-91
SCALE 3:4
DWG. NO. APB0584
REV 4-
DETAIL A
P-MR PILOT VALVE
DETAIL B
P-AR PILOT VALVE
DETAIL C
SERIES 2000 BODY
DETAIL D
SERIES 2200 BODY
DETAIL E
SERIES 2400 BODY
DETAIL F
SERIES 2000B BODY
SENSING
DRAIN
VENT
IN
SIG
EXH
DWG. NO. APB0584

I MODEL AND SPRING SELECTION

1) Scope

This procedure describes the model and spring selection of Pressurematic Series 2000, 2200 and 2400. Set point adjustment (Section II) may be done in the field.

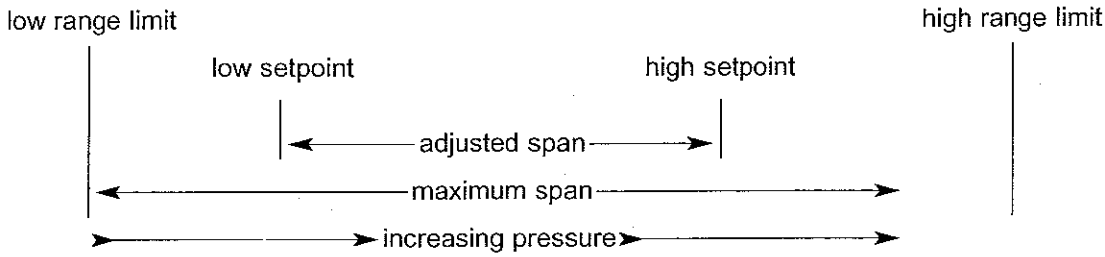
2) Reference Drawings

a) APB0570 Pressurematic Assembly (P-AR 2000)

b) APB0579, page 1 of 2, Range Table for Pressurematic P-AR/MR 2200/2000/2400

c) APB0579, page 2 of 2, Range Graph for Pressurematic P-AR/MR 2200/2000/2400

3) Schematic diagram of adjustments



Based on data tabulated in the Range Table APB0579, select a Pressurematic series and spring combination to meet the requirements for range limits, span, and/or deadband. Use the largest piston and softest spring which will satisfy these requirements. This will minimize deadband.

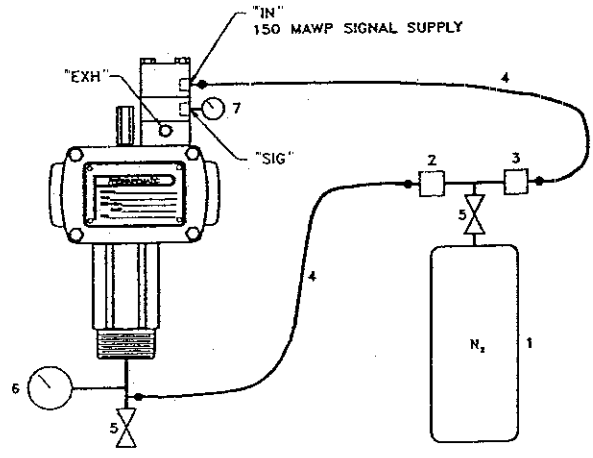
II ADJUSTMENT PROCEDURE

1) Set Point Adjustment

Field/bench Setpoint Verification

Calibration Equipment:

1. N_2 bottle
2. HP regulator
3. LP regulator
4. hose
5. block and bleed valve
6. test gauge, 0-1500 psi range (recommended or range as required)
7. test gauge, 0-150 psi range



2) Range Screw Adjustment

The objective is to set the range screw such that the adjusted span will be approximately centered between the range limits. In the case of high or low set point only, the set point is to be approximately centered between the range limits.

This is done with housing and trip spring removed and with a dial indicator to indicate piston position. Adjust the range screw to give 0.020 inch piston travel at the low range limit pressure. The low range limit may be specified by the customer, but if not, it can be determined as follows:

a) For cases with low and high set points:

$$\textit{Low Range Limit} = \textit{(low set point)} - \left\{\frac{\textit{(maximum span)} - \textit{(high set point)} + \textit{(low set point)}}{2}\right\}$$

where "maximum span" is from Range Table APB0579 for zero range screw turns. If the calculated low range limit is below that shown in the Range Table for zero range screw turns, then use the Range table value.

b) For cases with low set point only:

$$\textit{Low Range Limit} = \textit{(set point)} - \left\{\frac{\textit{maximum span}}{2}\right\}$$

where "maximum span" is from Range Table for maximum range screw turns. If the calculated low range limit is below that shown in the Range Table for zero range screw turns then use the Range table value.

c) For cases with high set point only:

$$\textit{Low Range Limit} = \textit{(set point)} - \left\{\frac{\textit{maximum span}}{2}\right\} - 100$$

where "maximum span" is from Range Table for maximum range screw turns. If the calculated low range limit is below that shown in the Range Table for zero range screw turns then use the Range table value.

III PRESSUREMATIC SET POINT ADJUSTMENT

Set point adjustment for Series 2000, 2200, 2400:

NOTE: Refer to Pressurematic assembly drawing APB0570

This is done with the assembly complete and supply air on the pilot valve for P-AR and P-MR models.

NOTE: In the field this requires a calibration kit with the ability to supply high and low setpoint pressures (eg. nitrogen bottle with block & bleed valve).

1) Cases with low and high set points:

   NOTE: The low set point must be adjusted first. It will not be affected by the high set point adjustment but the high set point is affected when the low set point is adjusted.

   a) Set the high trip bolt fully away from the trip spring.

   b) Repeatedly adjust the low trip bolt and decrease pressure through the low set point until the low trip occurs consistently at the low set point. Tighten the lock nut and recheck. Check that there is at least 0 02 inch piston travel from low trip to bottom stop.

      NOTE: When adjusting the low trip bolt, the upper arm of the trip spring must be pushed down. This unloads the bolt and allows it to be turned by hand.

   c) Repeatedly adjust the high trip bolt and increase pressure through the high set point until the high trip occurs consistently at the high set point. Tighten the lock nut and recheck.

2) Cases with low set point only:

   a) Set high trip bolt fully away from the trip spring.

   b) Adjust the low set point as described in 1.b) above.

   c) To disable high trip, increase pressure until piston is at upper stop. Adjust high trip bolt downward until high trip occurs then retract 1/2 turn. Check that high trip does not occur when piston travels to upper stop. This high trip bolt adjustment is to prevent the trip spring from placing unnecessary force on the spool.

3) Cases with high set point only:

   a) To disable low trip, adjust low trip bolt until trip occurs when piston is within 0.020 inch of bottom stop. Then adjust 3 turns upward (ccw viewed from above). Tighten locknut and check that low trip does not occur when piston travels to bottom stop.

   b) Adjust the high set point as described in 1.c) above

IV RANGE SCREW ADJUSTMENT

This procedure describes the method of changing the range/span from the factory set range/span of the Hi Lo Pressurematic Pilot

TOOLS: Range screw adjusting tool
Trip spring retainer
2 SAE wrenches/spanners – 1/2" and 9/16"
hex key – 3/16" short modified
SAE wrench/spanner – 1-1/4"

NOTE: To make a change in the operating range/span values the trip spring (14) must be removed from the housing.

PROCEDURE:

1) To prevent VALVE OPERATOR travel, DISARM and DEPRESSURIZE the system or place selector in MANUAL MODE.

2) Depressurize "SENSE/PROCESS LINE(S)" to the pilot.

3) Remove the four cover bolts (20) and cover (21).

4) Install trip spring retainer onto the trip spring (14) near LP adjusting bolt (15). This is done by hooking one end of the trip spring retainer under the bottom arm of the trip spring and prying down on the top arm to close the trip spring, then sliding the other end of the trip spring retainer over it. The spring can be compressed by hand if this retainer tool is not available. Refer to drawing I-0221.

5) Remove trip spring jam nut (12) and upper washer (23). Insert 3/16 hax key in the top of the piston to lock it while loosening the jam nut.

6) It may be necessary to engage the HIGH TRIP BOLT (16) all the way up into the HOUSING (17) before the trip spring can be removed.

7) Remove the trip spring assembly by holding the trip spring retainer compressed by hand or by using the trip spring retainer as described in step 4 above.

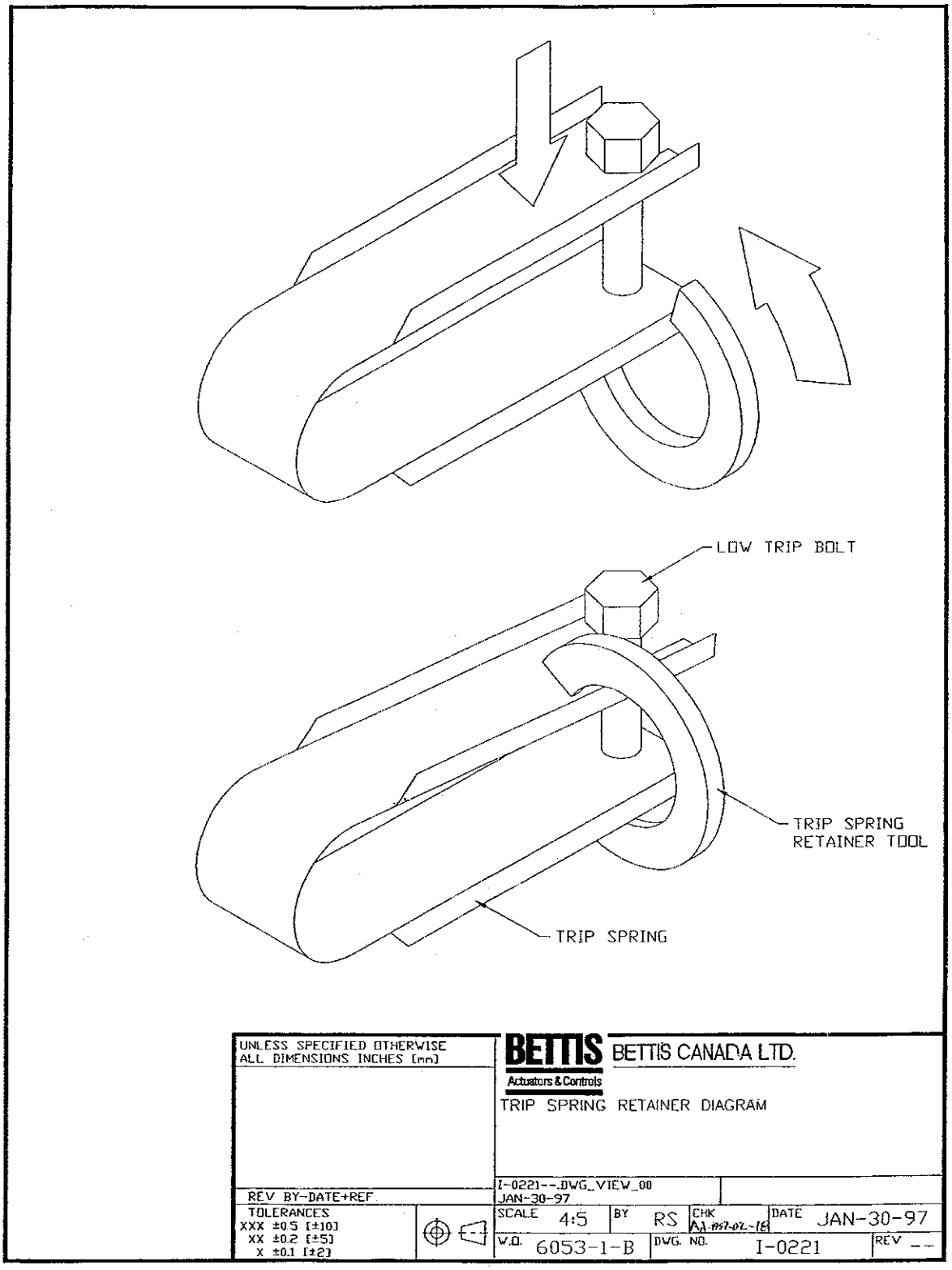
NOTE: Take care not to bend the upper pilot spool (33) during trip spring (14) removal and replacement.

8) Remove trip spring lower washer (23) from the top of the piston (3).

9) Install range screw adjusting tool in range screw (11).

10) With use of 1-1/4 wrench/spanner turn the range screw clockwise to increase/raise the range value or counterclockwise to decrease/lower range value.

NOTE: If changing range spring (8) then remove range screw (11). Removal of old spring is done by means of a small wire hook to pull up on the spring. Install new spring and range screw. With use of the adjusting, tool adjust range screw one turn beyond hand tight. Proceed to the following range verification section.



UNLESS SPECIFIED OTHERWISE ALL DIMENSIONS INCHES [mm]	BETTIS Actuators & Controls	BETTIS CANADA LTD.
	TRIP SPRING RETAINER DIAGRAM	
REV BY-DATE+REF	I-0221--.DWG_VIEW_00 JAN-30-97	
TOLERANCES XXX ±0.5 [±10] XX ±0.2 [±5] X ±0.1 [±2]	SCALE 4:5 BY RS CHK AJ 97-02-18 DATE JAN-30-97	
	W.O. 6053-1-B DWG. NO. I-0221 REV --	

V RANGE VERIFICATION PROCEDURE

Refer to calibration drawing APB0579.

NOTE: Total piston travel range is approximately 0.250 to 0.300 inches.

1) Connect a complete block and bleed valve test assembly with a gauge of suitable range to the sense/process port at the bottom of the pilot body (1).

2) Place a ruler or piece of paper behind the piston (3) to help observe the travel. Mark paper or note measurement at O psi.

3) Slowly increase the test pressure to the pilot body while observing the piston for signs of movement and watching gauge pressure. When upward movement begins, note gauge pressure reading to determine lower range limit.

4) Continue increasing pressure until piston travel ends, not gauge reading. This step determines the upper range limit.

5) Adjust the range screw as necessary to obtain an operating range/span with final gauge values outside the setpoints by 100 psi (700 kPA).

NOTE: If unable to obtain required range/span value, consult spring chart on the Range Table APB0579. If a more accurate range setting is required, a dial gauge will be needed to obtain a more precise reading of travel.

VI REASSEMBLY

1) Re-install trip spring assembly (14) onto the piston with a washer on each side of the trip spring.

2) Install jam nut on piston. Use 3/16 hex key to hold the piston stationary while tightening the jam nut.

3) Pry down on trip spring upper arm to allow removal of trip spring retainer.

4) Center trip spring in the housing. Spacing from guides of housing should be the same on left and right.

5) Go to Section I.6. for set point adjustment.

VII MODIFYING PRESSUREMATIC ASSEMBLY TYPE

Refer to drawings APB0570 and CB0066-10.

NOTE: To prevent VALVE OPERATOR travel, DISARM and DEPRESSURIZE the system or place selector in MANUAL MODE. Depressurize "Sense/Process Line(s)" to the pilot.

1) Changing from P-AR to P-MR:

   The conversion from the automatic reset to manual reset requires complete replacement of the three pilot body components. They must be machined to accept the manual reset manifold assembly. Contact BETTIS for more information.

2) Changing from P-MR to P-AR:

   To change from manual reset to automatic reset, disconnect all tubing. Remove the bolts (103) from the reset valve body (101) and then remove the bolts (44) from the reset valve manifold (43). Reconnect all tubing to the ports on the remaining pilot bodies.

SERIES	SPRING	RANGE SCREW TURNS	SPAN (PSIG)		RANGE LIMIT (PSIG)		DEADBAND (PSIG)	
			MIN	MAX	LOW	HIGH	MIN	MAX
NOTE 2.		NOTE 4, 5.	NOTE 6.	NOTE 7.	NOTE 8.	NOTE 9.	NOTE 10.	NOTE 11.
2200	BLUE 2' (-1)	0	55	80	20	(100)	25	--
		7-1/4	65	115	(190)	305	--	40
	RED 2' (-4)	0	90	180	20	(200)	25	--
		5-1/2	95	200	(270)	470	--	65
	BRONZE 2' (-7)	0	95	295	20	(315)	30	--
		4	145	340	(385)	725	--	90
	GREEN 2' (-10)	0	130	395	20	(415)	35	--
		3	160	430	(390)	820	--	95
2000	BLUE 2' (-1)	0	185	320	80	(400)	55	--
		7-1/4	235	455	(745)	1200	--	130
	RED 2' (-4)	0	280	680	80	(760)	75	--
		5-1/2	320	770	(1060)	1830	--	185
	BRONZE 2' (-7)	0	410	1190	80	(1270)	85	--
		4	460	1310	(1550)	2860	--	255
	GREEN 2' (-10)	0	450	1480	140	(1620)	120	--
		3	500	1670	(1580)	3250	--	265
2400	BLUE 2' (-1)	0	550	1015	85	(1100)	160	--
		7-1/4	775	1270	(2050)	3320	--	425
	RED 2' (-4)	0	720	1880	130	(2010)	195	--
		5-1/2	950	2150	(3000)	5150 *	--	550
	BRONZE 2' (-7)	0	1000	3220	230	(3450)	270	--
		4	1400	3600	(4400)	8000 *	--	750
	GREEN 2' (-10)	0	1100	4100	400	(4500)	360	--
		3	1650	4450	(4400)	8850 *	--	775

NOTE:

1. DATA BASED ON 110 PSIG AIR SUPPLY, ROOM TEMPERATURE AND .020'/.250' PISTON TRAVEL.
2. SPECIFICATIONS: SERIES 2200, 1-1/4' PISTON DIA (MAWP 2800 PSI); SERIES 2000, 5/8' PISTON DIA (MAWP 3500 PSI); SERIES 2400, 3/8' PISTON DIA (MAWP 4500 PSI).
3. ALLOW FOR DEVIATION FROM TABULATED VALUES OF ±10% DUE TO SPRING TOLERANCES AND OTHER VARIABLES. REPEATABILITY FOR A PARTICULAR SET-UP : ±2% OF SET POINT (5 PSI MIN).
4. RANGE SCREW TURNS ARE COUNTED FROM A ZERO TURN REFERENCE POSITION. THIS IS WHERE THE RANGE SCREW FIRST MAKES CONTACT WITH THE SPRING WITH THE PISTON FULLY DOWN AND SENSED PRESSURE AT ZERO.
5. THE RANGE SCREW MAY BE ADJUSTED AND VALUES INTERPOLATED BETWEEN EXTREMES GIVEN.
6. MIN. SPAN IS THE MINIMUM DIFFERENCE BETWEEN HIGH AND LOW SET POINTS AT GIVEN RANGE SCREW SETTING.
7. MAX. SPAN IS THE MAXIMUM DIFFERENCE BETWEEN HIGH AND LOW SET POINTS AT GIVEN RANGE SCREW SETTING.
8. LOW RANGE LIMIT IS THE MINIMUM LOW SET POINT ATTAINABLE AT GIVEN RANGE SCREW SETTING AT OPTIMUM CONDITIONS OF TEMPERATURE AND FLUID VISCOSITY. VALUES IN PARENTHESES ARE DERIVED FROM MAXIMUM SPAN AT GIVEN RANGE SCREW SETTING.
9. HIGH RANGE LIMIT IS THE MAXIMUM HIGH SET POINT ATTAINABLE AT GIVEN RANGE SCREW SETTING. VALUES IN PARENTHESES ARE DERIVED FROM MAXIMUM SPAN AT GIVEN RANGE SCREW SETTING.
10. MIN. DEADBAND IS THE DIFFERENCE BETWEEN SET AND RESET POINTS NEAR LOW RANGE LIMIT.
11. MAX. DEADBAND IS THE DIFFERENCE BETWEEN SET AND RESET POINTS NEAR HIGH RANGE LIMIT.
12. REFER TO SHEET 2 OF 2 FOR A GRAPHICAL REPRESENTATION OF THE VALUES TABULATED HERE.
13. '*' DENOTES MAXIMUM SPRING SETTING ONLY, ACTUAL SET POINT SHOULD NOT EXCEED MAWP OF PILOT
14. FOR SETTING LOWER THAN PUBLISHED VALUE, PLEASE CONSULT FACTORY

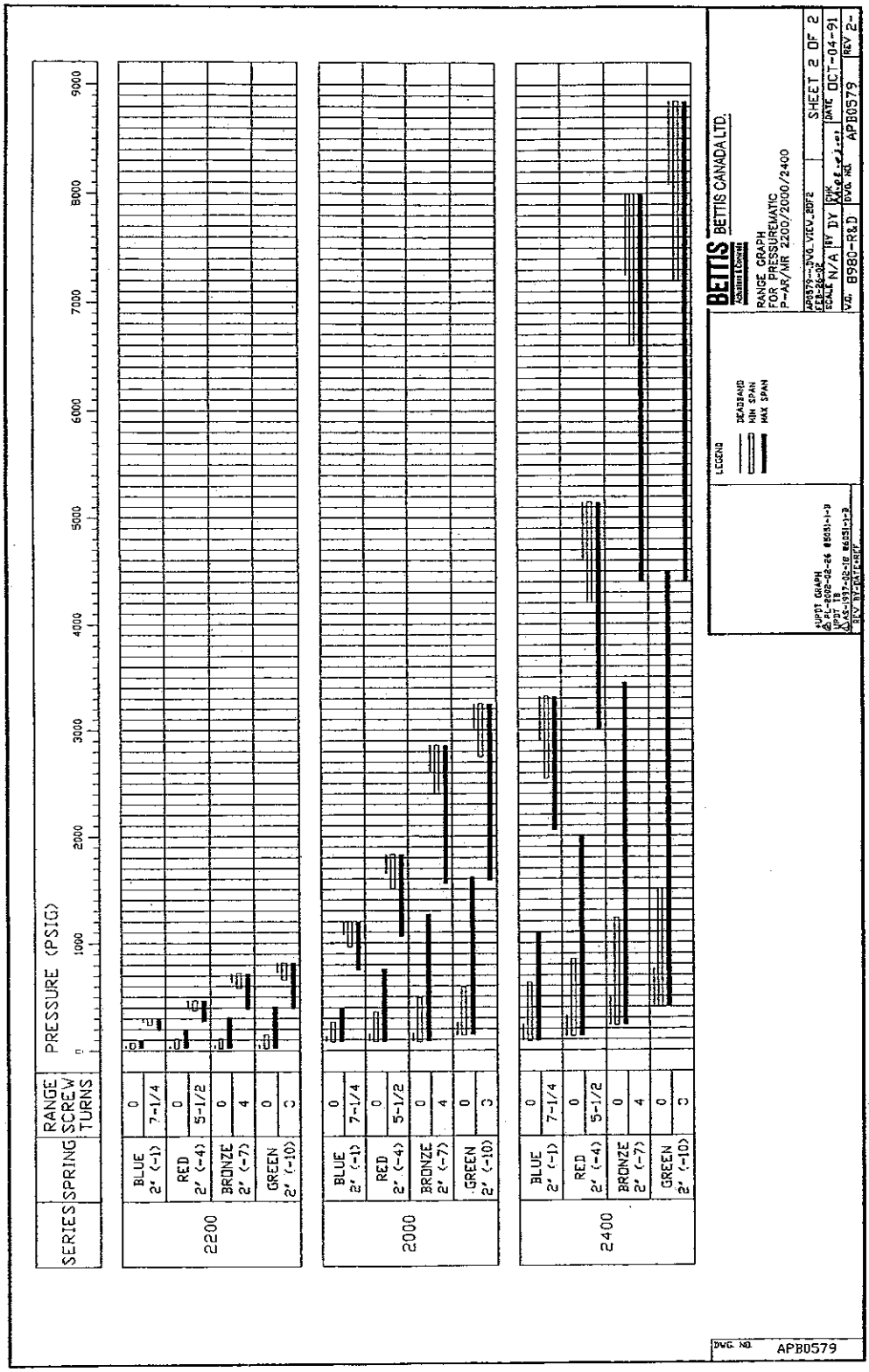
BETTIS Actuators & Controls — BETTIS CANADA LTD.

RANGE TABLE
FOR PRESSUREMATIC
P-AR/MR 2200/2000/2400

*NOTE 13 & 14; UPDT TABLE VALUES
△ PL-2002-02-26 #5051-1-B
UPDT TB
△ AS-1997-02-18 #6051-1-B
REV BY-DATE+REF

APØ579--.DVG, VIEW_1OF2 FEB-28-02		SHEET 1 OF 2	
SCALE N/A	BY DY	CHK [illegible]	DATE OCT-04-91
V.O. 8980-R&D	DWG. NO. APB0579		REV 2-

DWG. NO. APB0579


PRESSURE (PSIG)
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
SERIES
SPRING
RANGE SCREW TURNS
2200
BLUE 2' (-1) 0 7-1/4
RED 2' (-4) 0 5-1/2
BRONZE 2' (-7) 0 4
GREEN 2' (-10) 0 3
2000
BLUE 2' (-1) 0 7-1/4
RED 2' (-4) 0 5-1/2
BRONZE 2' (-7) 0 4
GREEN 2' (-10) 0 3
2400
BLUE 2' (-1) 0 7-1/4
RED 2' (-4) 0 5-1/2
BRONZE 2' (-7) 0 4
GREEN 2' (-10) 0 3
LEGEND
DEADBAND
MIN SPAN
MAX SPAN
BETTIS BETTIS CANADA LTD.
RANGE GRAPH
FOR PRESSUREMATIC
P-AR/MR 2200/2000/2400
SHEET 2 OF 2
DATE OCT-04-91
DWG NO. APB0579
REV 2-
DWG. NO. APB0579

VIII PRESSUREMATIC NOTES

831016-50

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MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT & COMPANY IDENTIFICATION

24-Hour Emergency Phone Number: 989-636-4400

Product:LUBRICANT SULLUBE

Product Code: 42836

Effective Date: 11/17/98 Date Printed: 06/16/04 MSD: 005126

The Dow Chemical Company, Midland, MI 48674

Customer Information Center: 800-258-2436

2. COMPOSITION/INFORMATION ON INGREDIENTS

Proprietary blend containing a polyoxyalkylene glycol, a pentaerythritol ester, and other components.

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

****
* Green viscous liquid. Low odor. No significant immediate hazards *
* for emergency response are known. *
* *
****

POTENTIAL HEALTH EFFECTS (See Section 11 for toxicological data.)

EYE: Essentially nonirritating to eyes.

SKIN: Short single exposure may cause slight skin irritation. Prolonged or repeated exposure may cause slight skin irritation. Material may be handled at elevated temperatures; contact with heated material may cause thermal burns. A single prolonged exposure is not likely to result in the material being absorbed through skin in harmful amounts.

INGESTION: Single dose oral toxicity is considered to be low. Small amounts swallowed incidental to normal handling operations are not likely to cause injury; swallowing amounts larger than that may cause injury.

INHALATION: At room temperature, vapors are minimal due to physical properties; a single exposure is not likely to be hazardous. If material is heated or mist is produced,

(Continued on page 2 , over)

concentrations may be attained that are sufficient to cause irritation and other effects.

SUBCHRONIC: For the major component, in animals, effects have been reported on the following organs: kidney and liver.

4. FIRST AID

EYE: Flush eyes with plenty of water.

SKIN: Wash off in flowing water or shower.

INGESTION: If swallowed seek medical attention. Do not induce vomiting unless directed to do so by medical personnel.

INHALATION: Remove to fresh air if effects occur. Consult a physician.

NOTE TO PHYSICIAN: If burn is present, treat as any thermal burn, after decontamination. No specific antidote. Supportive care. Treatment based on judgment of the physician in response to reactions of the patient.

5. FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES
FLASH POINT: 410F, 210C; 520F, 271C
METHOD USED: PMCC, COC
AUTOIGNITION TEMPERATURE: Not determined.

FLAMMABILITY LIMITS
LEL: Not determined
UEL: Not determined

HAZARDOUS COMBUSTION PRODUCTS: During a fire, smoke may contain the original material in addition to unidentified toxic and/or irritating compounds.

OTHER FLAMMABILITY INFORMATION: Violent steam generation or eruption may occur upon application of direct water stream to hot liquids. Spills of these organic liquids on hot fibrous insulations may lead to lowering of the autoignition temperatures possibly resulting in spontaneous combustion.

EXTINGUISHING MEDIA: Water fog or fine spray. Carbon dioxide, dry chemical, foam. Alcohol resistant foams (ATC type) pre-

(Continued on page 3)

ferred if available. General purpose synthetic foams (including AFFF) or protein foams may function, but much less effectively. Do not use direct water stream. May spread fire.

FIRE FIGHTING INSTRUCTIONS: Keep people away. Isolate fire area and deny unnecessary entry. Burning liquids may be moved by flushing with water to protect personnel and minimize property damage. Burning liquids may be extinguished by dilution with water. Do not use direct water stream. May spread fire.

PROTECTIVE EQUIPMENT FOR FIRE FIGHTERS: Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, pants, boots, and gloves). If protective equipment is not available or not used, fight fire from a protected location or safe distance.

6. ACCIDENTAL RELEASE MEASURES (See Section 15 for Regulatory Information)

PROTECT PEOPLE: Isolate area. May be a slipping hazard.

PROTECT THE ENVIRONMENT: Contain liquid to prevent contamination of soil, surface water or ground water.

CLEANUP: Contain spill if possible.

7. HANDLING AND STORAGE

HANDLING: Product on surfaces can cause slippery conditions.

STORAGE: Keep containers tightly closed when not in use. Store in stainless steel, polypropylene, polyethylene lined containers, Teflon, glass-lined container, aluminum, Plasite 3066 lined containers, Plasite 3070 lined containers, or 316 stainless steel.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS: Good general ventilation should be sufficient for most conditions. Local exhaust ventilation may be necessary for some operations.

PERSONAL PROTECTIVE EQUIPMENT
EYE/FACE PROTECTION: Use safety glasses.

SKIN PROTECTION: Use gloves impervious to this material. Use

(Continued on page 4 , over)

gloves with insulation for thermal protection, when needed.

RESPIRATORY PROTECTION: For most conditions, no respiratory protection should be needed; however, if material is heated or sprayed, use an approved air-purifying respirator.

EXPOSURE GUIDELINES: None established.

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE/PHYSICAL STATE: Green viscous liquid.
ODOR: Low odor.
VAPOR PRESSURE: <0.01 mmHg @ 20C
VAPOR DENSITY: Not determined.
BOILING POINT: Not applicable.
SOLUBILITY IN WATER/MISCIBILITY: <1 gm/100 gm
SPECIFIC GRAVITY OR DENSITY: 0.9827 @ 25/25C

10. STABILITY AND REACTIVITY

CHEMICAL STABILITY: Stable under recommended storage conditions. See storage section.

CONDITIONS TO AVOID: Product can oxidize at elevated temperatures. Product can decompose at elevated temperatures.

INCOMPATIBILITY WITH OTHER MATERIALS: Avoid contact with oxidizing materials. Avoid unintended contact with isocyanates. The reaction of polyols and isocyanates generates heat. Avoid contact with strong acids.

HAZARDOUS DECOMPOSITION PRODUCTS: Hazardous decomposition products depend upon temperature, air supply, and the presence of other materials. Hazardous decomposition products may include and are not limited to: aldehydes, ketones, organic acids and polymer fragments.

HAZARDOUS POLYMERIZATION: Will not occur by itself.

11. TOXICOLOGICAL INFORMATION (See Section 3 for Potential Health Effects. For detailed toxicological data, write or call the address or non-emergency number shown in Section 1)

ACUTE
SKIN: The LD50 for skin absorption in rabbits is greater than 2000 mg/kg. Did not cause allergic skin reaction when tested

(Continued on page 5)

in guinea pigs.

INGESTION: The oral LD50 for male rats is greater than 5000 mg/kg.

12. ECOLOGICAL INFORMATION (For detailed Ecological data, write or call the address or non-emergency number shown in Section 1)

ENVIRONMENTAL FATE:
MOVEMENT & PARTITIONING: No relevant information.

DEGRADATION & TRANSFORMATION: Material is ultimately biodegradable. Reaches more than 70% mineralization in OECD test(s) for inherent biodegradability. Biodegradation reached in Modified Zahn-Wellens/EMPA Test (OECD Test No. 302B) after 28 days: 86%.

ECOTOXICOLOGY: Material is moderately toxic to aquatic organisms on an acute basis (LC50 between 1 and 10 mg/L in most sensitive species). Acute LC50 for fathead minnow (Pimephales promelas) is 51 ppm. Acute LC50 for water flea Daphnia pulex is 2.8 ppm.

13. DISPOSAL CONSIDERATIONS (See Section 15 for Regulatory Information)

DISPOSAL: DO NOT DUMP INTO ANY SEWERS, ON THE GROUND, OR INTO ANY BODY OF WATER. All disposal methods must be in compliance with all Federal, State/Provincial and local laws and regulations. Regulations may vary in different locations. Waste characterizations and compliance with applicable laws are the responsibility solely of the waste generator. THE DOW CHEMICAL COMPANY HAS NO CONTROL OVER THE MANAGEMENT PRACTICES OR MANUFACTURING PROCESSES OF PARTIES HANDLING OR USING THIS MATERIAL. THE INFORMATION PRESENTED HERE PERTAINS ONLY TO THE PRODUCT AS SHIPPED IN ITS INTENDED CONDITION AS DESCRIBED IN MSDS SECTION 2 (Composition/Information On Ingredients).

FOR UNUSED & UNCONTAMINATED PRODUCT, the preferred options include sending to a licensed, permitted: recycler, reclaimer, incinerator or other thermal destruction device.

As a service to its customers, Dow can provide names of information resources to help identify waste management companies and other facilities which recycle, reprocess or manage chemicals or plastics, and that manage used drums. Telephone Dow's Customer Information Center at 800-258-2436 or 989-832-1556 for further details.

14. TRANSPORT INFORMATION

(Continued on page 6 , over)

DEPARTMENT OF TRANSPORTATION (D.O.T.):

This product is not regulated by D.O.T. when shipped domestically by land.

CANADIAN TDG INFORMATION:
For TDG regulatory information, if required, consult transportation regulations, product shipping papers, or your Dow representative.

15. REGULATORY INFORMATION (Not meant to be all-inclusive--selected regulations represented)

NOTICE: The information herein is presented in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied is given. Regulatory requirements are subject to change and may differ from one location to another; it is the buyer's responsibility to ensure that its activities comply with federal, state or provincial, and local laws. The following specific information is made for the purpose of complying with numerous federal, state or provincial, and local laws and regulations. See other sections for health and safety information.

U.S. REGULATIONS

SARA 313 INFORMATION: To the best of our knowledge, this product contains no chemical subject to SARA Title III Section 313 supplier notification requirements.

SARA HAZARD CATEGORY: This product has been reviewed according to the EPA "Hazard Categories" promulgated under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following categories:

Not to have met any hazard category

TOXIC SUBSTANCES CONTROL ACT (TSCA):

All ingredients are on the TSCA inventory or are not required to be

(Continued on page 7)

REGULATORY INFORMATION (CONTINUED)

listed on the TSCA inventory.

STATE RIGHT-TO-KNOW: This product is not known to contain any substances subject to the disclosure requirements of

New Jersey
Pennsylvania

OSHA HAZARD COMMUNICATION STANDARD:

This product is not a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

CANADIAN REGULATIONS

WHMIS INFORMATION: The Canadian Workplace Hazardous Materials Information System (WHMIS) Classification for this product is:

This product is not a "Controlled Product" under WHMIS.

16. OTHER INFORMATION

REVISION INDICATOR: Revised Section 13, Disposal.

ACTIVATED ALUMINA (GRADES A, D & P)
Material Safety Data Sheet Date Prepared: Jul/17/2000 Supersedes Date: Oct/22/97

1. CHEMICAL PRODUCT AND COMPANY DESCRIPTION

XEBEC INC
730 Boul. Industriel,
Blainville, Québec, Canada, J7C 3V4

Emergency Phone numbers:
FOR EMERGENCIES INVOLVING A SPILL, LEAK , FIRE, EXPOSURE OR ACCIDENT
CONTACT: (514) 848-1454

For Product Information:
Tel: (450) 979-8700
Fax: (450) 979-7869

Product Use:
DRYING AGENT, CATALYST SUPPORT, GAS PURIFICATION

Chemical Name or Synonym:
ACTIVATED ALUMINA (GRADES A, D & P)

Molecular Formula:
Al_2O_3

2. COMPOSITION / INFORMATION ON INGREDIENTS

Component	CAS Reg. Number	WHMIS Hazard	Percentage
ALUMINA	1344-28-1	Y	> 93
WATER	7732-18-5	N	Balance

3. HAZARDS IDENTIFICATION

A. EMERGENCY OVERVIEW:

Continued on Next Page

3. HAZARDS IDENTIFICATION (Continued)

Physical Appearance and Odour:
White powder solid, odourless

Warning Statements:
DUSTS IN HIGH CONCENTRATIONS MAY CAUSE SKIN, EYE AND RESPIRATORY TRACT IRRITATION.

B. POTENTIAL HEALTH EFFECTS:

Acute Eye:
Causes foreign body irritation only.

Acute Skin:
Non-irritating. Skin absorption not likely

Acute Inhalation:
Low acute inhalation toxicity. May cause lung irritation, shortness of breath, chest pain.

Acute Ingestion:
Low acute oral toxicity. May cause constipation.

Chronic Effects:
This product does not contain any ingredient designated by IARC, NTP, ACGIH or OSHA as probable or suspected human carcinogens.

4. FIRST AID MEASURES

FIRST AID MEASURES FOR ACCIDENTAL:
Eye Exposure:
Hold eyelids open and flush with a steady, gentle stream of water for at least 15 minutes. Seek medical attention if irritation develops or persists or if visual changes occur.

Skin Exposure:
In case of contact, wash with plenty of soap and water. Seek medical attention if irritation develops or persists.

Inhalation:
If respiratory irritation or distress occurs remove victim to fresh air. Seek medical attention if

Continued on Next Page

respiratory irritation or distress continues.

Continued on Next Page

4. FIRST AID MEASURES (Continued)

Ingestion:
No harmful affects expected. If appreciable quantities are swallowed, call a physician or poison control center. Do not leave victim unattended.

MEDICAL CONDITIONS POSSIBLY AGGRAVATED BY EXPOSURE:
Inhalation of product may aggravate existing chronic respiratory problems such as asthma, emphysema or bronchitis. Skin contact may aggravate existing skin disease.

NOTES TO PHYSICIAN
All treatments should be based on observed signs and symptoms of distress in the patient. Consideration should be given to the possibility that overexposure to materials other than this product may have occurred.

Treat symptomatically. No specific antidote available.

5 FIRE FIGHTING MEASURES

FIRE HAZARD DATA:

Flash Point:
Not Applicable

Extinguishing Media:
Not combustible. Us extinguishing method suitable for surrounding fire.

Special Fire Fighting Procedures:
Firefighters should wear NIOSH/MSHA approved self-contained breathing apparatus and full protective clothing.

Unusual Fire and Explosion Hazards:
Not combustible.

Hazardous Decomposition Materials (Under Fire Conditions):
None known

Continued on Next Page

6. ACCIDENTAL RELEASE MEASURES

Evacuation Procedures and Safety:
Containment of Spill:
Follow procedure described below under Cleanup and Disposal of Spill.

Cleanup and Disposal of Spill:
Scrape up and place in appropriate closed container (see Section 7: Handling and Storage)

Environmental and Regulatory Reporting:
Do not flush to drain

7. HANDLING AND STORAGE

Minimum/Maximum Storage Temperatures:
Not available

Handling:
Avoid direct or prolonged contact with skin and eyes. Avoid breathing dusts.

Dry powders can build static electricity charges when subjected to the friction of conveying, mixing or sliding. Provide adequate precautions, such as electrical grounding, or inert atmospheres when material is used in the presence of flammable materials to prevent ignition.

Storage:
Store in an area that is clean, dry, store in tightly closed containers. Store in original container.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Introductory Remarks:
These recommendations provide general guidance for handling this product. Because specific work environments and material handling practices vary, safety procedures should be developed for each intended application. While developing safe handling procedures, do not overlook the need to clean equipment and piping systems for maintenance and repairs. Waste resulting from these procedures should be handled in accordance with Section 13: Disposal Considerations.

Continued on Next Page

8. EXPOSURE CONTROLS / PERSONAL PROTECTION (Continued)

Introductory Remarks: (continued)

Assistance with selection, use and maintenance of worker protection equipment is generally available from equipment manufacturers.

Exposure Guidelines:
Exposure limits represent regulated or recommended worker breathing zone concentrations measured by validated sampling and analytical methods, meeting the regulatory requirements. The following limits apply to this material, where, if indicated, S= skin and C= ceiling limit:

ALUMINA

	Notes	TWA	STEL
ACGIH		10 mg/cu. m	

Engineering Controls:
Where engineering controls are indicated by use conditions or a potential for excessive exposure exists, the following traditional exposure control techniques may be used to effectively minimize employee exposures: general area dilution/exhaust ventilation, local exhaust ventilation at the point of generation.

Respiratory Protection:
When respirators are required, select NIOSH/MSHA approved equipment based on actual or potential airborne concentrations and in accordance with the appropriate regulatory standards and/or industrial recommendations.

Under normal conditions, in the absence of other airborne contaminants, the following devices should provide protection from this material up to the conditions specified by the appropriate OSHA, WHMIS or ANSI standard(s): Air-purifying (half-mask/full-face) respirator with cartridges/canister approved for use against dusts, mists and fumes.

Eye/Face Protection
Eye and face protection requirements will vary dependent upon work environment conditions and material handling practices. Appropriate ANSI Z87 approved equipment should be selected for the particular use intended for this material.

It is generally regarded as good practice to wear a minimum of safety glasses with side shields when working in industrial environments.

Continued on Next Page

8. EXPOSURE CONTROLS / PERSONAL PROTECTION (Continued)

Skin Protection
Skin contact should be minimized through use of gloves and suitable long-sleeved clothing (i.e. shirts and pants). Consideration must be given both to durability as well as permeation resistance.

Work Practice Controls:
Personal hygiene is an important work practice exposure control measure and the following general measures should be taken when working with or handling this material:

(1) Do not store, use, and/or consume foods, beverages, tobacco products, or cosmetics in areas where this material is stored.
(2) Wash hands and face carefully before eating, drinking, using tobacco, applying cosmetics or using the toilet.
(3) Wash exposed skin promptly to remove accidental splashes of contact with this material.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical and chemical properties here represent typical properties of this product. Contact the business area using the Product Information phone number in Section 1 for its exact specifications.

Physical Appearance:
White powder solid

Odour:
Odourless

pH:
Not Applicable

Specific Gravity:
Not Available

Density:
3.3 g/ml at 25°C (77°F).

Continued on Next Page

9. PHYSICAL AND CHEMICAL PROPERTIES Continued)

Water Solubility:
Insoluble

Melting Point Range:
2050°C (3722°F)

Boiling Point Range:
Not Available

Vapor Pressure:
1 mmHg at 2158°C (3916°F)

Vapor Density:
Not Available

Molecular Weight:
101.96

10. STABILITY AND REACTIVITY

Chemical Stability:
This material is stable under normal handling and storage conditions described in Section 7.

Conditions to be Avoided:
Dusting conditions

Materials/Chemicals to be Avoided:
Strong bases
Strong acids

The Following Hazardous Decomposition Products Might Be Expected:
Decomposition Type: thermal
none known

Hazardous Polymerization Will Not Occur.
Avoid the Following to Inhibit Hazardous Polymerization:

Continued on Next Page

not applicable

Continued on Next Page

11. TOXICOLOGICAL INFORMATION

Acute Eye Irritation:
No test data found for product.

Acute Skin Irritation:
No test data found for product.

Acute Dermal Toxicity:
No test data found for product.

Acute Respiratory Irritation:
No test data found for product.

Acute Inhalation Toxicity:
No test data found for product.

Acute Oral Toxicity:
No test data found for product.

Chronic Toxicity:
This product does not contain any substances that are considered by OSHA, NTP, IARC, or ACGIH to be "probable" or "suspected" human carcinogens.

No additional test data found for product.

12. ECOLOGICAL INFORMATION

Ecotoxicological Information:
No data found for product.

Chemical Fate Information:
No data found for product.

13. DISPOSAL CONSIDERATIONS

Waste Disposal Method:

Continued on Next Page

13. DISPOSAL CONSIDERATIONS (Continued)

Waste Management options should first consider possible re-use or recycling opportunities. Some provinces have active "Waste Exchange" networks for re-use and recycling of wastes. Contact your local waste management companies to explore available options. All waste management activities must obey local, provincial and federal regulations. Possible disposal methods include the following:

Stabilize and solidify this material with compatible binders. Then place in a secure landfill

Container Handling and Disposal:
Rinse containers before disposal.

14. TRANSPORTATION INFORMATION

Transportation Status:
The listed Transportation Classification does not address regulatory variations due to changes in package size, mode of shipment or other regulatory descriptors.

TDG Status:
Shipping Name : NON DANGEROUS

IMO Status:
Shipping Name: NOT REGULATED

IATA Status:
Shipping Name: NOT REGULATED

15. REGULATORY INFORMATION

Inventory Status

Inventory	Status
CANADA (DSL)	Y

Continued on Next Page

15. REGULATORY INFORMATION

WHMIS Classification:
NOT CONTROLLED

This product has been classified in accordance with the hazard criteria of the CPR (Controlled Products Regulations) and the MSDS contains all the information required by the CPR.

16. OTHER INFORMATION

National Fire Protection Association Hazard Ratings - NFPA (R):

0 Health Hazard Rating -- Minimal
0 Flammability Rating -- Minimal
0 Reactivity Rating -- Minimal

National Paint & Coating Hazardous Materials Identification System - HMIS (R):

0 Health Hazard Rating -- Minimal
0 Flammability Rating -- Minimal
0 Reactivity Rating -- Minimal

Key Legend Information:

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
TLV - Threshold Limit Value
PEL - Permissable Exposure Limit
TWA - Time Weighted Average
STEL - Short Term Exposure Limit
NTP - National Toxicology Program
IARC - International Agency for Research on Cancer

Disclaimer:

The information herein is given in good faith but no warranty, expressed or implied, is made.

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Taylor Valve Technology, Inc

6300 Southwest 8th Street
Oklahoma City, Oklahoma
telephone: 405.787.0145 facsimile: 405.789.8198
email: info@taylorvalve.com

Serial Number : 33522-89
OG1316.2C

Certificate Number: 39288.6034

Customer : **CHAMCO INDUSTRIES LTD**
2907 16TH STREET NE
CALGARY, ALBERTA
T4S 2L4

Date : **25-Jul-07**

Sales Order # : 33522
Customer P.O. # : P1014859-19

Safety Relief Valve Certification

Taylor Valve Technology, Inc. Safety Relief Valves are designed, manufactured and tested in accordance with the provisions of the ASME Boiler and Pressure Vessel Code, Section VIII. This Valve is certified to relieve within plus or minus 2 psi of the set pressure 70 psig or below, and plus or minus 3% of set point for pressures above 70 psig, as allowed for within the provisions of ASME. The published relieving capacities have been certified by the National Board of Boiler and Pressure Vessel Inspectors.

Valve Specifications

Model Number :	Taylor Model 8200 Soft Seat	Orifice :	D
Body Size :	1 Inch	Orifice Diameter :	0.404 Inches
Part Number :	82D3341331	Orifice Area :	0.128 In^2
Body Configuration :	1" MNPT X 1" FNPT	Operating Temperature :	70 °F
		Spring Range :	101-215 PSI
		Set Pressure	150 PSIG

Materials

Body :	WCB Carbon Steel	Spring :	17.7 PH Stainless Steel
Seat Frame :	Carbon Steel	Guide :	304 Stainless Steel
Seat Housing :	17.4 PH H900 Stainless Steel	Adjustment Screw :	Carbon Steel with EN Plating
Trim :	Standard	Options :	Packed Lift Lever
Seat :	FKM 90d		

Set Pressure Specifications

	Customer Units		ASME Units	
Set Pressure :	150 psig		Set Pressure :	150 psig
ASME High Set Limit :	155 psig		ASME High Set Limit :	155 psig
ASME Low Set Limit :	146 psig		ASME Low Set Limit :	146 psig

ASME (90%) rated capacity at set pressure for indicated fluid, specific gravity and temperature.

Certifying Fluid : Air 354 SCFM Spec Gravity : 1.00 Temp : 60 oF

API 520 (100%) calculated capacity at set pressure for indicated fluid, specific gravity and temperature.

Test Fluid : Air 369 SCFM Spec Gravity : 1.00 Temp : 60 oF

Prepared by : **JASON KING**

Department : **Customer Service** *Signed* JASON KING

Approved by : **JASON KING**

Department : **Quality** *Signed* JASON KING

Taylor Valve Technology, Inc.
Valve Specification Sheet

Prepared By: Jason King
For: scott
Date: June 15, 2007

General:	Valve Model #	8200-1-D
	Description	
	Line or Equip #	
	Reference	
	Tag #	
	Nozzle	Semi-Full
	Design Type	Closed
	Bonnet Type	Screwed
	Inlet Size	1.0"
	Inlet Class	FNPT
	Outlet Size	1.0"
	Outlet Class	FNPT
	Discharge Coefficient	0.838
	Valve Orifice Area	0.128 sq in
Material:	Body	Carbon Steel
	Seat and Disk	Carbon Steel
	Guide	S/S
	Spring	Carbon Steel
	Resilient Seat Seal	Viton
	Lever	yes
Service Conditions:	Fluid and State	Air
	Atmospheric Pressure	14.7 psi
	Gas Flow	225 scfm
	Set Pressure	175 psig
	Operating Pressure	150 psig
	Back Pressure	0 psig
	Accumulation	10%
	Flowing Temperature	60 deg C
	Specific Heat Ratio	1.40
	Specific Gravity	0.9997
	Mole Weight	28.97
	Density	0.0763
	Gas Constant	356
	Compressibility Factor	1 (Z)
Calculated:	Required Orifice Area	0.0758 sq in
	Maximum Flow	379.3725 scfm
Other:	Basis of Selections	ASME Section VIII Div 1

TAYLOR VALVE TECHNOLOGY, INC

8300 SW 8th Street
Oklahoma City, Oklahoma 73128

Conventional Safety Relief Valve

1	Valve Series	Taylor Model 8200 Soft Seat	
2	Valve Body Size	1 Inch	
3	Orifice Size	D	
4	Body Material	WCB Carbon Steel	
5	Seat Frame Material	Carbon Steel	
6	Seat Material	FKM 90d	
7	Trim Material	Standard	
8	Spring Material	17.7 PH Stainless Steel	
9	Optional	Packed Lift Lever	
10	Body Configuration	1" MNPT X 1" FNPT	
11			
12			
13			
14			
15	Certifying Fluid		Air
16	Set Pressure	175	psig
17	Operating Temperature	70	oF
18			

Service	Standard		
ASME Code	UV NB		
Set pressure	175	PSIG	
Capacity	408	SCFM	
Temperature Class	Standard		
Operating Temperature	70	°F	

Spring	Range	Color	Dia In
Standard	101-215	Yellow	0.105

PART NUMBER

82D3341331