

JARON WOLFF PROCESS CONTROLS LTD.
9535 - 42 AVENUE, EDMONTON, ALBERTA T6E 5R2

CERTIFICATE# 61100
FOR: VAPORTECH ENERGY SERVICES INC.
20711 - 107 AVENUE, EDMONTON, ALBERTA, T5S 1W5

ORDER NO.	PO 002676	AMBIENT TEMPERATURE	20C
SERIAL NUMBER	JW070824-1	DEADWEIGHT	SN# D1214H07
DIAL SIZE	4" MCDANIEL	TEST MEDIUM	AIR
PRESSURE RANGE	-7.5 KPA//+7.5 KPA	MAXIMUM ERROR	+29 KPA
SUB DIVISIONS	-1 KPA//+1 KPA	DATE	AUGUST 24, 2007
CONNECTION	1/2" NPT	LOCATION TESTED	9535 - 42 AVE
INSPECTOR	G.J.P. WOWK	EDMONTON, ALBERTA, T6E 5R2	

THIS GAUGE IS CERTIFIED TO MEET AND/OR EXCEED THE MANUFACTURERS SPECIFICATIONS, AS OUTLINED IN CUSTOMER STANDARD #023, DOCUMENT CS-023-1, LOW PRESSURE BELLOWS GAUGES, ACCURACY +/- 1.5%.

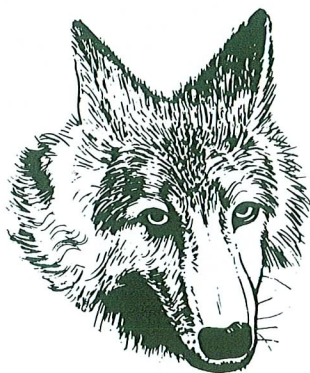
TESTED GAUGE		DEADWEIGHT		UPSCALE ERROR	
-7.50	KPA	-7.21	KPA	+29	KPA
-3.75	KPA	-3.63	KPA	+12	KPA
0		0		0	
3.75	KPA	3.70	KPA	+05	KPA
7.50	KPA	7.53	KPA	-.03	KPA

*RANGE: -16 OUNCES//+16 OUNCES
*RANGE: -7.5 KPA//+7.5 KPA
*VAPORTECH LOGO (BLUE)

TECHNICIAN:  Luke Fulton Q.C. Manager:  Georg J.P. Wowk

Invoice: PCL-61390 /DS

**ALL TEST EQUIPMENT IS TRACEABLE TO N.I.S.T. STANDARDS.
**CUSTOMER STANDARD DOCUMENT CS-023.



JARON WOLFF

PROCESS CONTROLS LTD.

9535 - 42 Avenue, Edmonton, Alberta, Canada T6E 5R2
Telephone (780) 463-9527 Fax (780) 450-2614

CERTIFICATE OF COMPLIANCE

FOR: VAPORTECH ENERGY SERVICES INC.
20711 - 107 AVE, EDMONTON ALBERTA, T5S 1W5

SUPPLIER:	MCDANIEL CONTROLS
EQUIPMENT:	PRESSURE GAUGE
TYPE:	MCDANIEL
MODEL:	C 60"-SPEC (RANGE: 0 - 60" WATER COLUMN)
MATERIAL:	SST TUBE & SOCKET
ACCURACY:	1.5% FULL SCALE
CUSTOM DIAL:	RANGE: -16 OUNCE//+16 OUNCE RANGE: -7.5 KPA// +7.5 KPA
SERIAL NUMBER:	JW070824-1
CERTIFICATE NUMBER:	61100
CUSTOMER STANDARD:	#023
OXYGEN CERTIFICATE:	N/A
CUSTOMER P.O.#	PO 002676
PURCHASE DATE:	AUGUST 24-2007
OUR REFERENCE:	PCL-61390
REFERENCED STANDARDS:	CERTIFICATE OF CONFORMITY (GERMANY)
CODES, SPECIFICATIONS:	DIN - ISO 9002 (CRN# S89405)
<u>STATEMENT OF COMPLIANCE:</u>	

WE HEREBY CERTIFY THAT THE ABOVE ITEMS/EQUIPMENT SUPPLIED BY US ARE IN COMPLIANCE WITH THE TERMS, CONDITIONS AND SPECIFICATIONS OF THE ABOVE PURCHASE ORDER AND THAT THESE ITEMS/EQUIPMENT WERE FABRICATED, INSPECTED AND TESTED IN ACCORDANCE WITH THE REFERENCED STANDARDS, CODES AND SPECIFICATIONS AND MEET THE RELEVANT ACCEPTANCE CRITERIA AND DESIGN REQUIREMENTS.

SIGNED: _____
ERIC TURCOTTE
SALES & Q.C. ADMINISTRATION

DATE: AUGUST 24-2007

FORM #COC-001

JARON WOLFF PROCESS CONTROLS LTD.

9535 - 42 AVENUE, EDMONTON, ALBERTA T6E 5R2

CERTIFICATE# 61101

FOR: VAPORTECH ENERGY SERVICES INC.
20711 - 107 AVENUE, EDMONTON, ALBERTA, T5S 1W5

ORDER NO.	PO 002676	AMBIENT TEMPERATURE	20C
SERIAL NUMBER	JW070824-2	DEADWEIGHT	SN# D1214H07
DIAL SIZE	4" MCDANIEL	TEST MEDIUM	AIR
PRESSURE RANGE	-7.5 KPA//+7.5 KPA	MAXIMUM ERROR	-.13 KPA
SUB DIVISIONS	-1 KPA//+1 KPA	DATE	AUGUST 24, 2007
CONNECTION	1/2" NPT	LOCATION TESTED	9535 - 42 AVE
INSPECTOR	G.J.P. WOWK	EDMONTON, ALBERTA, T6E 5R2	

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TESTED GAUGE		DEADWEIGHT		UPSCALE ERROR	
-7.50	KPA	-7.38	KPA	+1.12	KPA
-3.75	KPA	-3.73	KPA	+0.02	KPA
0		0		0	
3.75	KPA	3.78	KPA	-.03	KPA
7.50	KPA	7.63	KPA	-.13	KPA

*RANGE: -16 OUNCES//+16 OUNCES

*RANGE: -7.5 KPA//+7.5 KPA

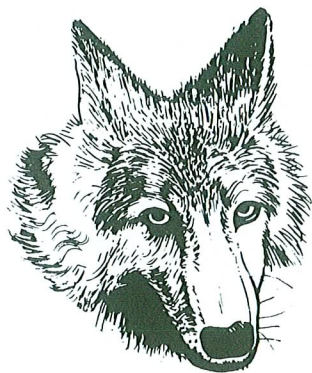
*VAPORTECH LOGO (BLUE)

TECHNICIAN:  Luke Fulton Q.C. Manager:  Georg J.P. Wowk

Invoice: PCL-61390 /DS

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**CUSTOMER STANDARD DOCUMENT CS-023.



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PROCESS CONTROLS LTD.

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Telephone (780) 463-9527 Fax (780) 450-2614

CERTIFICATE OF COMPLIANCE

FOR: VAPORTECH ENERGY SERVICES INC.
20711 - 107 AVE, EDMONTON ALBERTA, T5S 1W5

SUPPLIER:	MCDANIEL CONTROLS
EQUIPMENT:	PRESSURE GAUGE
TYPE:	MCDANIEL
MODEL:	C 60"-SPEC (RANGE: 0 - 60" WATER COLUMN)
MATERIAL:	SST TUBE & SOCKET
ACCURACY:	1.5% FULL SCALE
CUSTOM DIAL:	RANGE: -16 OUNCE//+16 OUNCE RANGE: -7.5 KPA// +7.5 KPA
SERIAL NUMBER:	JW070824-2
CERTIFICATE NUMBER:	61101
CUSTOMER STANDARD:	#023
OXYGEN CERTIFICATE:	N/A
CUSTOMER P.O.#	PO 002676
PURCHASE DATE:	AUGUST 24-2007
OUR REFERENCE:	PCL-61390
REFERENCED STANDARDS: CODES, SPECIFICATIONS: <u>STATEMENT OF COMPLIANCE:</u>	CERTIFICATE OF CONFORMITY (GERMANY) DIN - ISO 9002 (CRN# S89405)

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ERIC TURCOTTE
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DATE: AUGUST 24-2007
FORM #COC-001

JARON WOLFF PROCESS CONTROLS LTD.

9535 - 42 AVENUE, EDMONTON, ALBERTA T6E 5R2

CERTIFICATE# 61102

FOR: VAPORTECH ENERGY SERVICES INC.
20711 - 107 AVENUE, EDMONTON, ALBERTA, T5S 1W5

ORDER NO.	PO 002676	AMBIENT TEMPERATURE	20C
SERIAL NUMBER	JW070824-3	DEADWEIGHT	SN# D1214H07
DIAL SIZE	4" MCDANIEL	TEST MEDIUM	AIR
PRESSURE RANGE	-7.5 KPA//+7.5 KPA	MAXIMUM ERROR	+21 KPA
SUB DIVISIONS	-1 KPA//+1 KPA	DATE	AUGUST 24, 2007
CONNECTION	1/2" NPT	LOCATION TESTED	9535 - 42 AVE
INSPECTOR	G.J.P. WOWK	EDMONTON, ALBERTA, T6E 5R2	

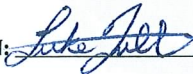
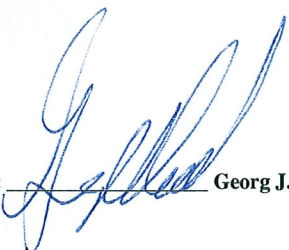
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TESTED GAUGE		DEADWEIGHT		UPSACLE ERROR	
-7.50	KPA	-7.29	KPA	+21	KPA
-3.75	KPA	-3.68	KPA	+07	KPA
0		0		0	
3.75	KPA	3.80	KPA	-.05	KPA
7.50	KPA	7.58	KPA	-.08	KPA

*RANGE: -16 OUNCES//+16 OUNCES

*RANGE: -7.5 KPA//+7.5 KPA

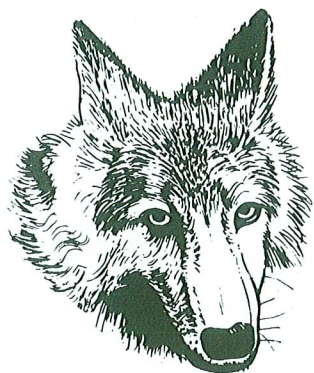
*VAPORTECH LOGO (BLUE)

TECHNICIAN:  Luke Fulton Q.C. Manager:  Georg J.P. Wowk

Invoice: PCL-61390 /DS

**ALL TEST EQUIPMENT IS TRACEABLE TO N.I.S.T. STANDARDS.

**CUSTOMER STANDARD DOCUMENT CS-023.



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PROCESS CONTROLS LTD.

9535 - 42 Avenue, Edmonton, Alberta, Canada T6E 5R2
Telephone (780) 463-9527 Fax (780) 450-2614

CERTIFICATE OF COMPLIANCE

FOR: VAPORTECH ENERGY SERVICES INC.
20711 - 107 AVE, EDMONTON ALBERTA, T5S 1W5

SUPPLIER:	MCDANIEL CONTROLS
EQUIPMENT:	PRESSURE GAUGE
TYPE:	MCDANIEL
MODEL:	C 60"-SPEC (RANGE: 0 - 60" WATER COLUMN)
MATERIAL:	SST TUBE & SOCKET
ACCURACY:	1.5% FULL SCALE
CUSTOM DIAL:	RANGE: -16 OUNCE//+16 OUNCE RANGE: -7.5 KPA// +7.5 KPA
SERIAL NUMBER:	JW070824-3
CERTIFICATE NUMBER:	61102
CUSTOMER STANDARD:	#023
OXYGEN CERTIFICATE:	N/A
CUSTOMER P.O.#	PO 002676
PURCHASE DATE:	AUGUST 24-2007
OUR REFERENCE:	PCL-61390
REFERENCED STANDARDS: CODES, SPECIFICATIONS: <u>STATEMENT OF COMPLIANCE:</u>	CERTIFICATE OF CONFORMITY (GERMANY) DIN - ISO 9002 (CRN# S89405)

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SIGNED: _____
ERIC TURCOTTE
SALES & Q.C. ADMINISTRATION

DATE: AUGUST 24-2007
FORM #COC-001

JARON WOLFF PROCESS CONTROLS LTD.

9535 - 42 AVENUE, EDMONTON, ALBERTA T6E 5R2

CERTIFICATE# 61103

FOR: VAPORTECH ENERGY SERVICES INC.
20711 - 107 AVENUE, EDMONTON, ALBERTA, T5S 1W5

ORDER NO.	PO 002676	AMBIENT TEMPERATURE	20C
SERIAL NUMBER	JW070824-4	DEADWEIGHT	SN# D1214H07
DIAL SIZE	4" MCDANIEL	TEST MEDIUM	AIR
PRESSURE RANGE	-7.5 KPA//+7.5 KPA	MAXIMUM ERROR	+15 KPA
SUB DIVISIONS	-1 KPA//+1 KPA	DATE	AUGUST 24, 2007
CONNECTION	1/2" NPT	LOCATION TESTED	9535 - 42 AVE
INSPECTOR	G.J.P. WOWK	EDMONTON, ALBERTA, T6E 5R2	

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TESTED GAUGE		DEADWEIGHT		UPSACLE ERROR	
-7.50	KPA	-7.35	KPA	+15	KPA
-3.75	KPA	-3.63	KPA	+12	KPA
0		0		0	
3.75	KPA	3.75	KPA	0	KPA
7.50	KPA	7.56	KPA	-.06	KPA

*RANGE: -16 OUNCES//+16 OUNCES

*RANGE: -7.5 KPA//+7.5 KPA

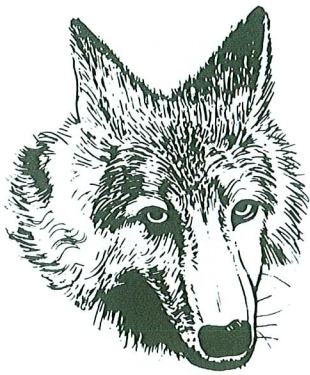
*VAPORTECH LOGO (BLUE)

TECHNICIAN: Luke Fulton Luke Fulton Q.C. Manager: Georg J.P. Wowk Georg J.P. Wowk

Invoice: PCL-61390 /DS

**ALL TEST EQUIPMENT IS TRACEABLE TO N.I.S.T. STANDARDS.

**CUSTOMER STANDARD DOCUMENT CS-023.



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PROCESS CONTROLS LTD.

9535 - 42 Avenue, Edmonton, Alberta, Canada T6E 5R2
Telephone (780) 463-9527 Fax (780) 450-2614

CERTIFICATE OF COMPLIANCE

FOR: VAPORTECH ENERGY SERVICES INC.
20711 - 107 AVE, EDMONTON ALBERTA, T5S 1W5

SUPPLIER:	MCDANIEL CONTROLS
EQUIPMENT:	PRESSURE GAUGE
TYPE:	MCDANIEL
MODEL:	C 60"-SPEC (RANGE: 0 - 60" WATER COLUMN)
MATERIAL:	SST TUBE & SOCKET
ACCURACY:	1.5% FULL SCALE
CUSTOM DIAL:	RANGE: -16 OUNCE//+16 OUNCE RANGE: -7.5 KPA// +7.5 KPA
SERIAL NUMBER:	JW070824-4
CERTIFICATE NUMBER:	61103
CUSTOMER STANDARD:	#023
OXYGEN CERTIFICATE:	N/A
CUSTOMER P.O.#	PO 002676
PURCHASE DATE:	AUGUST 24-2007
OUR REFERENCE:	PCL-61390
REFERENCED STANDARDS: CODES, SPECIFICATIONS: <u>STATEMENT OF COMPLIANCE:</u>	CERTIFICATE OF CONFORMITY (GERMANY) DIN - ISO 9002 (CRN# S89405)

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SIGNED: _____
ERIC TURCOTTE
SALES & Q.C. ADMINISTRATION

DATE: AUGUST 24-2007
FORM #COC-001

JARON WOLFF PROCESS CONTROLS LTD.

9535 - 42 AVENUE, EDMONTON, ALBERTA T6E 5R2

CERTIFICATE# 61104

FOR: VAPORTECH ENERGY SERVICES INC.
20711 - 107 AVENUE, EDMONTON, ALBERTA, T5S 1W5

ORDER NO.	PO 002676	AMBIENT TEMPERATURE	20C
SERIAL NUMBER	JW070824-5	DEADWEIGHT	SN# D1214H07
DIAL SIZE	4" MCDANIEL	TEST MEDIUM	AIR
PRESSURE RANGE	-7.5 KPA//+7.5 KPA	MAXIMUM ERROR	+0.21 KPA
SUB DIVISIONS	-1 KPA//+1 KPA	DATE	AUGUST 24, 2007
CONNECTION	1/2" NPT	LOCATION TESTED	9535 - 42 AVE
INSPECTOR	G.J.P. WOWK	EDMONTON, ALBERTA, T6E 5R2	

THIS GAUGE IS CERTIFIED TO MEET AND/OR EXCEED THE MANUFACTURERS SPECIFICATIONS, AS OUTLINED IN CUSTOMER STANDARD #023, DOCUMENT CS-023-1, LOW PRESSURE BELLOWS GAUGES, ACCURACY +/- 1.5%.

TESTED GAUGE		DEADWEIGHT		UPSACLE ERROR	
-7.50	KPA	-7.29	KPA	+0.21	KPA
-3.75	KPA	-3.68	KPA	+0.07	KPA
0		0		0	
3.75	KPA	3.80	KPA	-0.05	KPA
7.50	KPA	7.51	KPA	-0.01	KPA

*RANGE: -16 OUNCES//+16 OUNCES

*RANGE: -7.5 KPA//+7.5 KPA

*VAPORTECH LOGO (BLUE)

TECHNICIAN:  Luke Fulton Q.C. Manager:  Georg J.P. Wowk

Invoice: PCL-61390 /DS

**ALL TEST EQUIPMENT IS TRACEABLE TO N.I.S.T. STANDARDS.

**CUSTOMER STANDARD DOCUMENT CS-023.



JARON WOLFF

PROCESS CONTROLS LTD.

9535 - 42 Avenue, Edmonton, Alberta, Canada T6E 5R2
Telephone (780) 463-9527 Fax (780) 450-2614

CERTIFICATE OF COMPLIANCE

*FOR: VAPORTECH ENERGY SERVICES INC.
20711 - 107 AVE, EDMONTON ALBERTA, T5S 1W5*

SUPPLIER:	MCDANIEL CONTROLS
EQUIPMENT:	PRESSURE GAUGE
TYPE:	MCDANIEL
MODEL:	C 60"-SPEC (RANGE: 0 - 60" WATER COLUMN)
MATERIAL:	SST TUBE & SOCKET
ACCURACY:	1.5% FULL SCALE
CUSTOM DIAL:	RANGE: -16 OUNCE//+16 OUNCE RANGE: -7.5 KPA// +7.5 KPA
SERIAL NUMBER:	JW070824-5
CERTIFICATE NUMBER:	61104
CUSTOMER STANDARD:	#023
OXYGEN CERTIFICATE:	N/A
CUSTOMER P.O.#	PO 002676
PURCHASE DATE:	AUGUST 24-2007
OUR REFERENCE:	PCL-61390
REFERENCED STANDARDS: CODES, SPECIFICATIONS: <u>STATEMENT OF COMPLIANCE:</u>	CERTIFICATE OF CONFORMITY (GERMANY) DIN - ISO 9002 (CRN# S89405)

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SIGNED: _____
ERIC TURCOTTE
SALES & Q.C. ADMINISTRATION

DATE: AUGUST 24-2007
FORM #COC-001

JARON WOLFF PROCESS CONTROLS LTD.

9535 - 42 AVENUE, EDMONTON, ALBERTA T6E 5R2

CERTIFICATE# 61105

FOR: VAPORTECH ENERGY SERVICES INC.
20711 - 107 AVENUE, EDMONTON, ALBERTA, T5S 1W5

ORDER NO.	PO 002676	AMBIENT TEMPERATURE	20C
SERIAL NUMBER	JW070824-6	DEADWEIGHT	SN# D1214H07
DIAL SIZE	4" MCDANIEL	TEST MEDIUM	AIR
PRESSURE RANGE	-7.5 KPA//+7.5 KPA	MAXIMUM ERROR	+19 KPA
SUB DIVISIONS	-1 KPA//+1 KPA	DATE	AUGUST 24, 2007
CONNECTION	1/2" NPT	LOCATION TESTED	9535 - 42 AVE
INSPECTOR	G.J.P. WOWK	EDMONTON, ALBERTA, T6E 5R2	

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TESTED GAUGE		DEADWEIGHT		UPSCALE ERROR	
-7.50	KPA	-7.31	KPA	+19	KPA
-3.75	KPA	-3.70	KPA	+05	KPA
0		0		0	
3.75	KPA	3.90	KPA	-15	KPA
7.50	KPA	7.68	KPA	-18	KPA

*RANGE: -16 OUNCES//+16 OUNCES

*RANGE: -7.5 KPA//+7.5 KPA

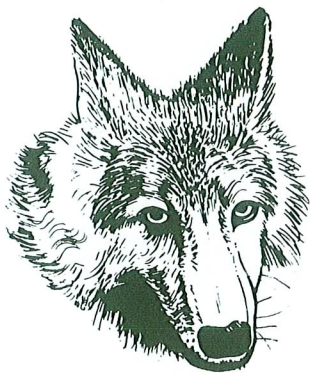
*VAPORTECH LOGO (BLUE)

TECHNICIAN: Luke Fulton Luke Fulton Q.C. Manager: Georg J.P. Wowk Georg J.P. Wowk

Invoice: PCL-61390 /DS

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**CUSTOMER STANDARD DOCUMENT CS-023.



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PROCESS CONTROLS LTD.

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CERTIFICATE OF COMPLIANCE

FOR: VAPORTECH ENERGY SERVICES INC.
20711 - 107 AVE, EDMONTON ALBERTA, T5S 1W5

SUPPLIER:	MCDANIEL CONTROLS
EQUIPMENT:	PRESSURE GAUGE
TYPE:	MCDANIEL
MODEL:	C 60"-SPEC (RANGE: 0 - 60" WATER COLUMN)
MATERIAL:	SST TUBE & SOCKET
ACCURACY:	1.5% FULL SCALE
CUSTOM DIAL:	RANGE: -16 OUNCE//+16 OUNCE RANGE: -7.5 KPA// +7.5 KPA
SERIAL NUMBER:	JW070824-6
CERTIFICATE NUMBER:	61105
CUSTOMER STANDARD:	#023
OXYGEN CERTIFICATE:	N/A
CUSTOMER P.O.#	PO 002676
PURCHASE DATE:	AUGUST 24-2007
OUR REFERENCE:	PCL-61390
REFERENCED STANDARDS: CODES, SPECIFICATIONS: <u>STATEMENT OF COMPLIANCE:</u>	CERTIFICATE OF CONFORMITY (GERMANY) DIN - ISO 9002 (CRN# S89405)

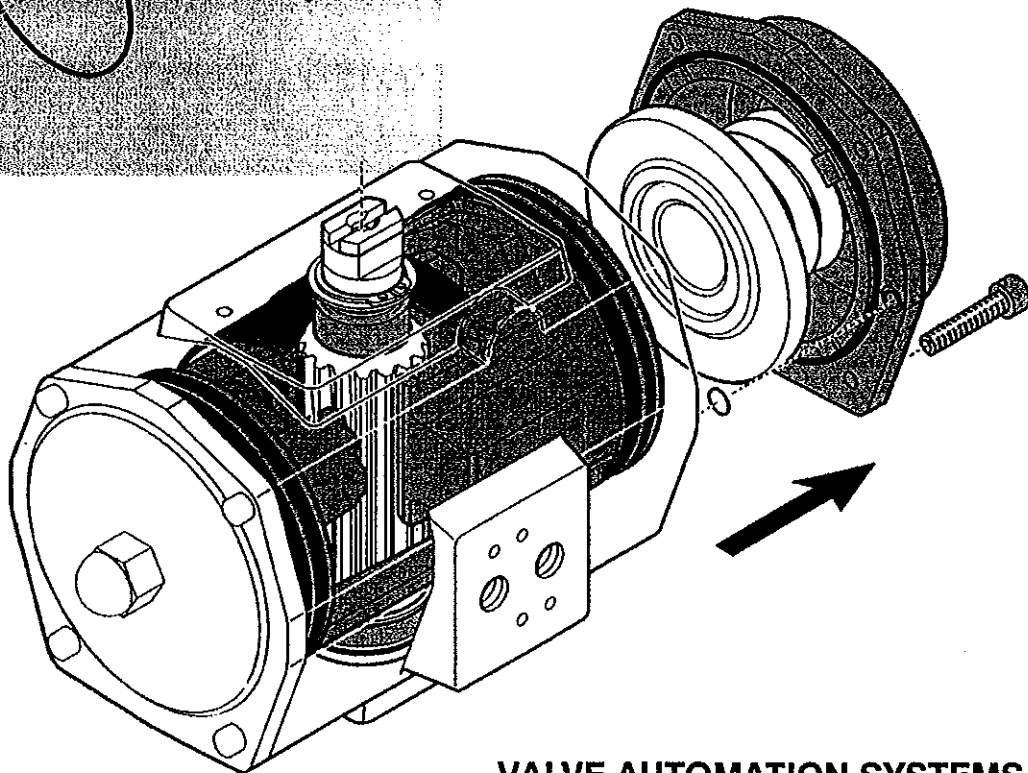
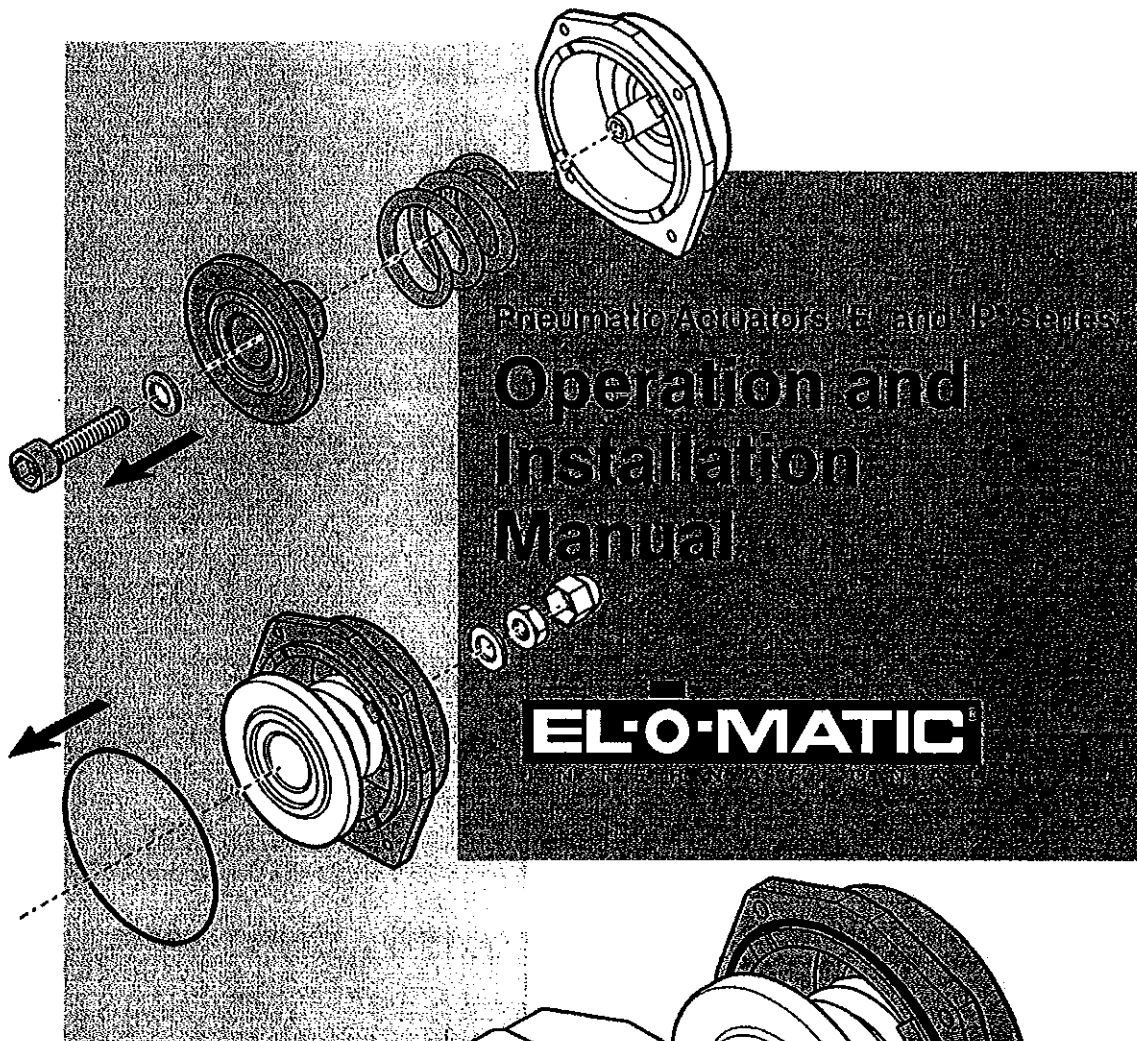
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SIGNED: _____
ERIC TURCOTTE
SALES & Q.C. ADMINISTRATION

DATE: AUGUST 24-2007

FORM #COC-001

Job 5252 A,B,C,D,E
PO 2065



VALVE AUTOMATION SYSTEMS

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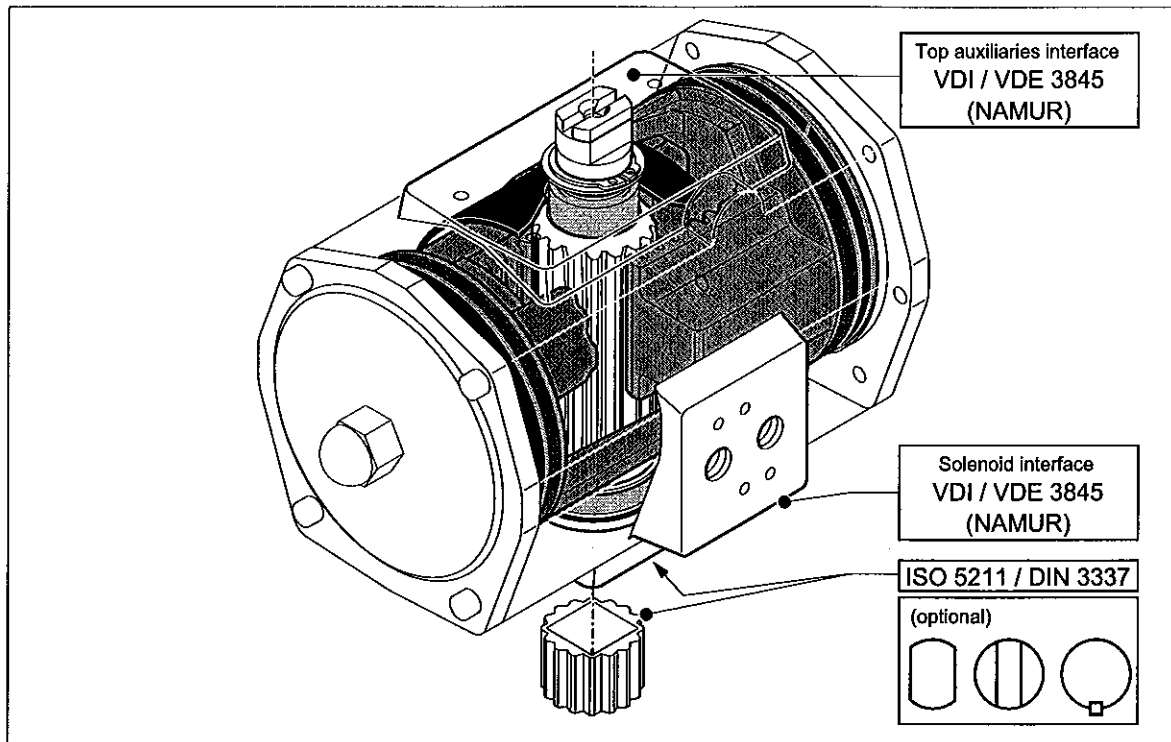
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1 INTRODUCTION / EINLEITUNG / INLEIDING

1.1 Identification / Unterscheidung / Identificatie

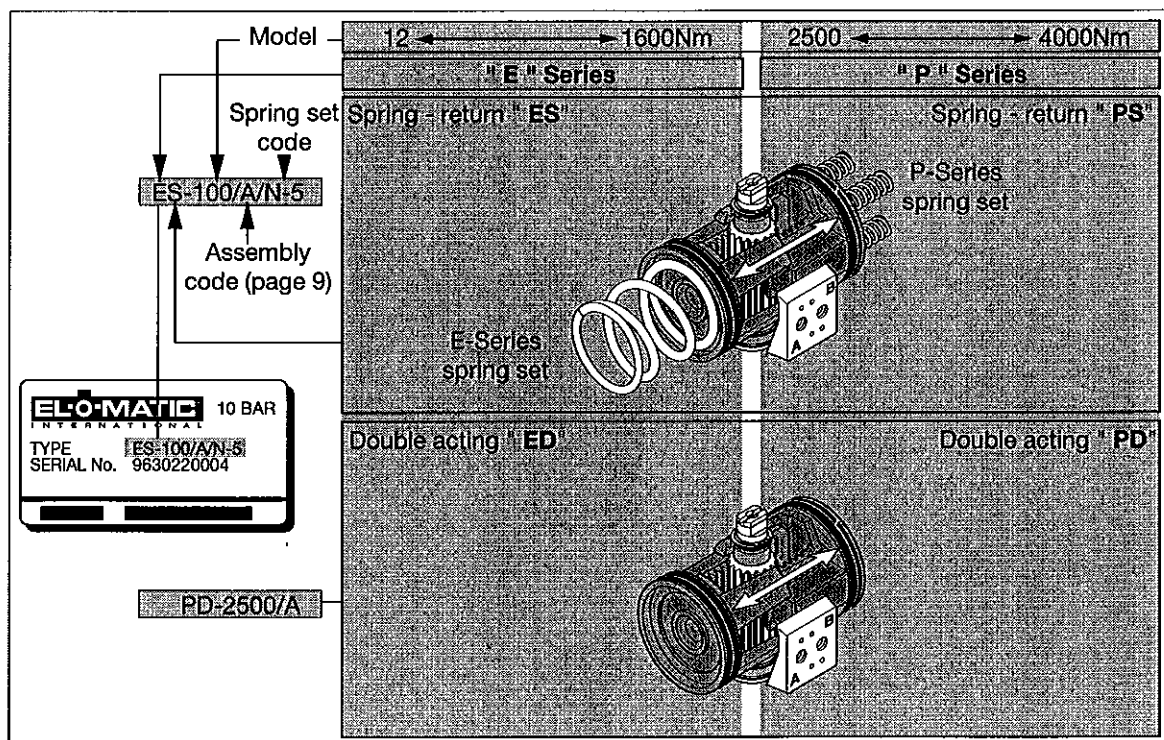


1.1

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.


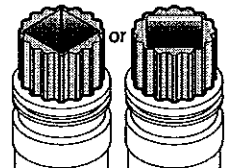

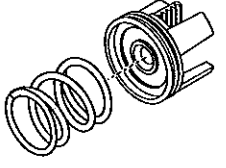
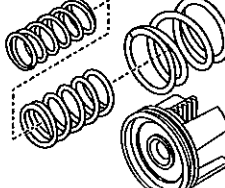
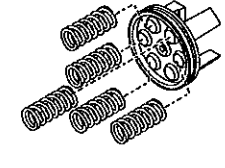
Waarschuwing! Aandrijving moet zowel pneumatisch als elektrisch afgekoppeld worden, voordat met (de)monteren begonnen kan worden. Raadpleeg de desbetreffende paragrafen van deze handleiding alvorens te (de)monteren of toebehoren te bevestigen.



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

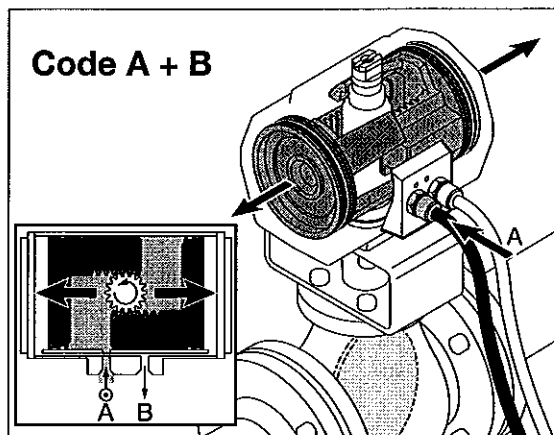
	" E " SERIES		" P " SERIES
MODEL Double acting	ED12	ED25 / ED40 / ED65 ED100 / ED200 / ED350 ED600 / ED950 / ED1600	PD2500 / PD4000
MODEL Spring return	ES12	ES25 / ES40 / ES65 ES100 / ES200 / ES350 ES600 / ES950 / ES1600	PS2500 / PS4000
Drive ISO or DIN	or 	with insert or 	or 
Spring return each piston			

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

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).

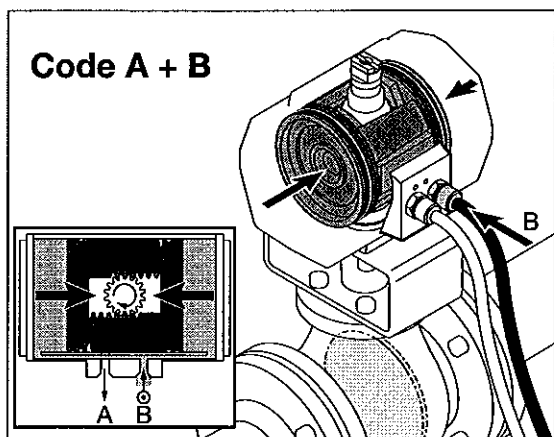
3.1.1

Air to port A: counterclockwise / open.

3.1.2

Air to port B: clockwise / close.

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



3.1.2

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).

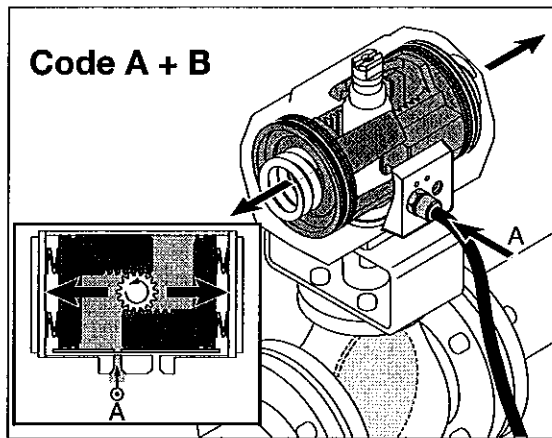
3.1.1

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

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 kontrollieren (siehe Seite 4). Bei Aufbaucode C und D die Luftzufuhr verwechseln (siehe Seite 9).

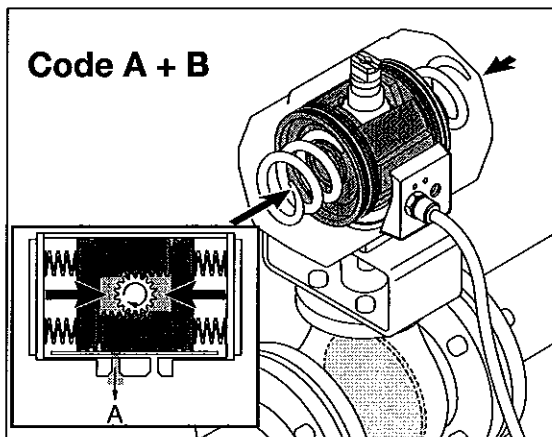
3.2.1

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

3.2.2

Federrückstellung: 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).



3.2.2

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.	Runs up to 1.2 mtr	Runs over 1.2 mtr.
Antriebstyp	Bis 1,20 m	Über 1,20 m
Aandrijving modelnr.	Tot 1,2 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

Air chamber	Model						
	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
- Air chamber

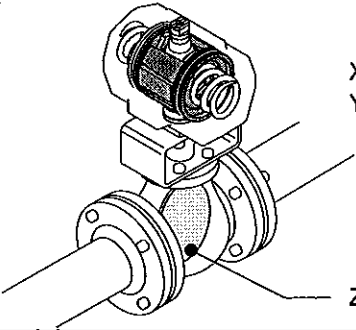
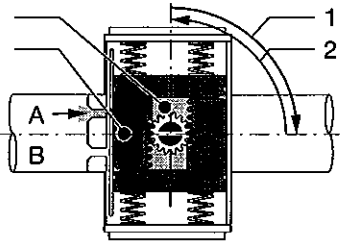
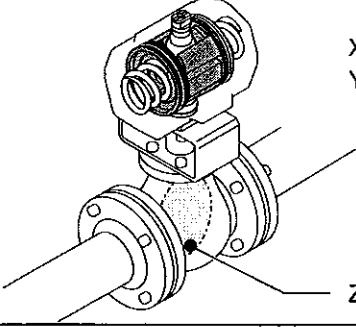
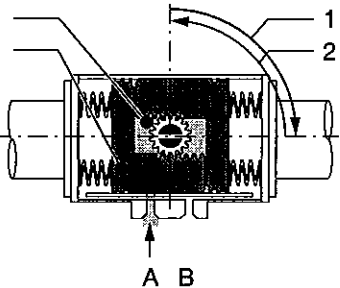
- Modell
- Luft-kammer

- Model
- Luchtkamer

4 ASSEMBLY CODES / AUFBAUCODE / MONTAGECODES

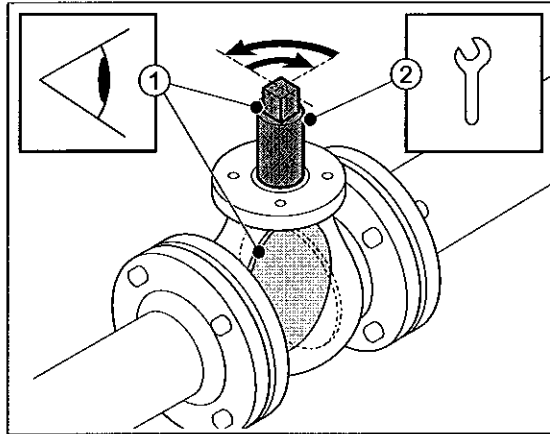
Spring to close		X=	Y=	Z=
		Shaft Welle As	Piston Kolben Zulger	Valve Armatur Afsluiter
<div> <div>Code A (standard)</div> </div>		Standard	Standard	Closed
<div> <div>Code B</div> </div>		+90°	Standard	Closed

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

Spring to open		X=	Y=	Z=
<div><div></div><div><div>Code C</div></div></div>		Standard	+180	Open
<div><div></div><div><div>Code D</div></div></div>		+90	+180	Open
		Shaft rotation	Wellen verdrehung	As verdraaiing
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.

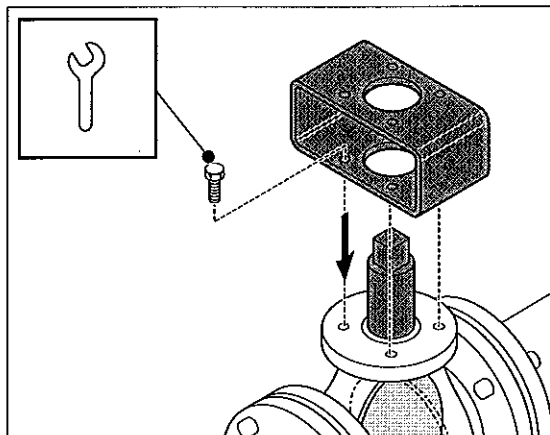


Achtung! Bei Montage nicht mit Hammer auf Wellenspitze schlagen.

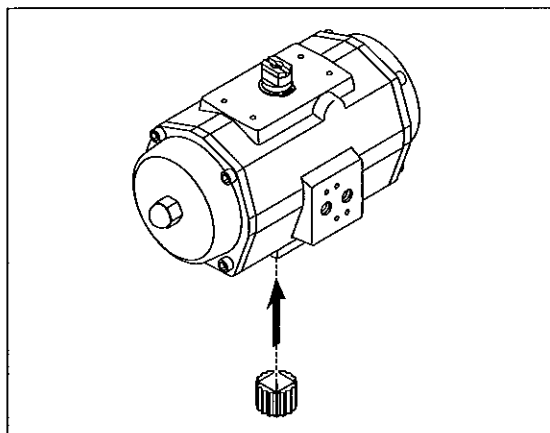
Verwijder indien nodig hendelmoer, hendel, veerring etc. van de afsluiter.



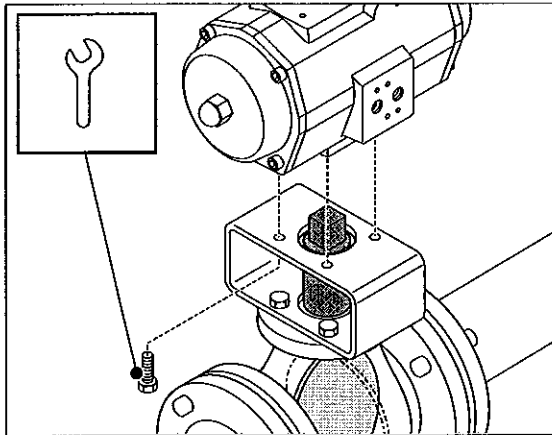
Voorzichtig! Bij montage niet met hammer op de astop slaan.



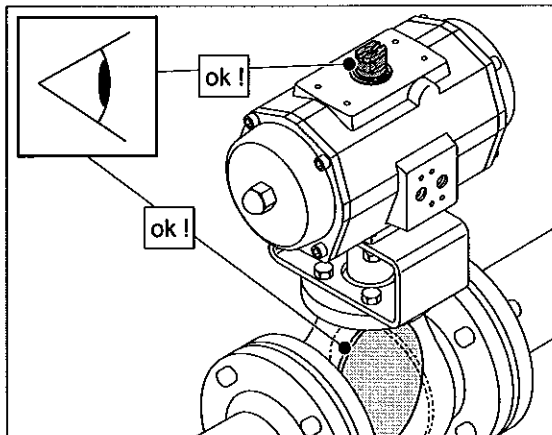
4.1.2



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.

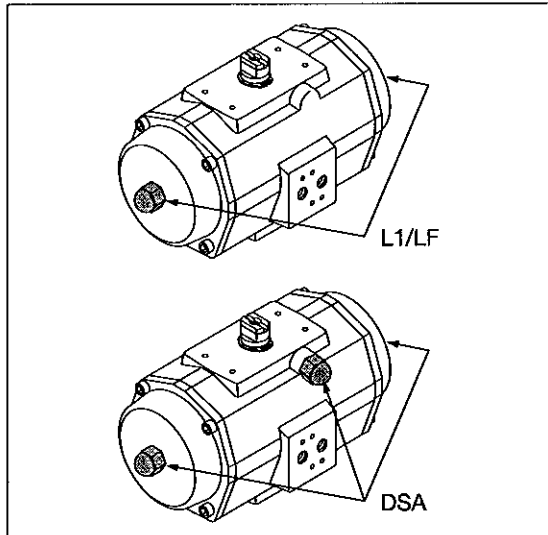


Die Armaturen sind so konstruiert, daß sie nur innerhalb eines 90°- Winkels wirksam sind. Der Antrieb sollte so montiert werden, daß eine Drehung gegen den Uhrzeigersinn die Armatur öffnet und daß eine Drehung im Uhrzeigersinn die Armatur schließt.



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:

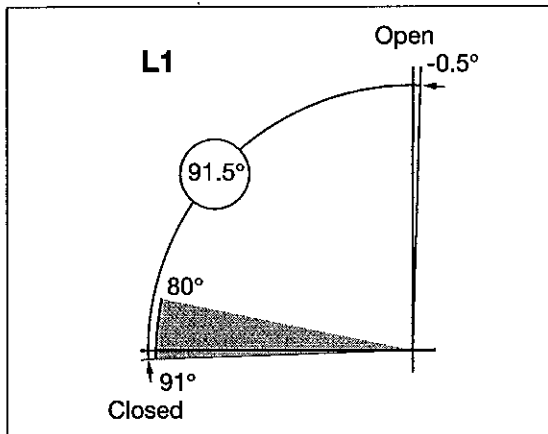
- 1- L1 One way limit stops (see fig. 4.2.1)
- 2- DSA Two way limit stops (see fig.4.2.1)

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:

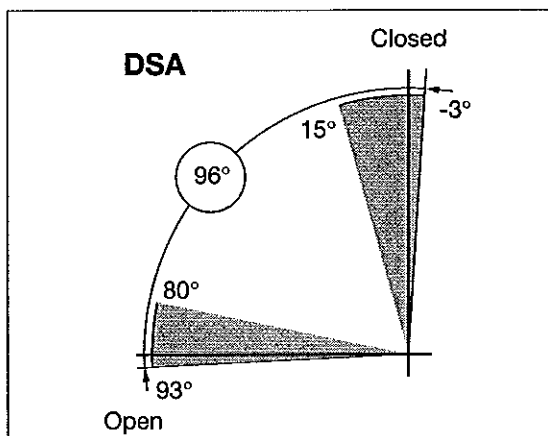
- 1- L1 Einfacher Hubbegrenzung (siehe Abb. 4.2.1)
- 2- DSA Doppelter Hubbegrenzung (siehe Abb. 4.2.1)



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.



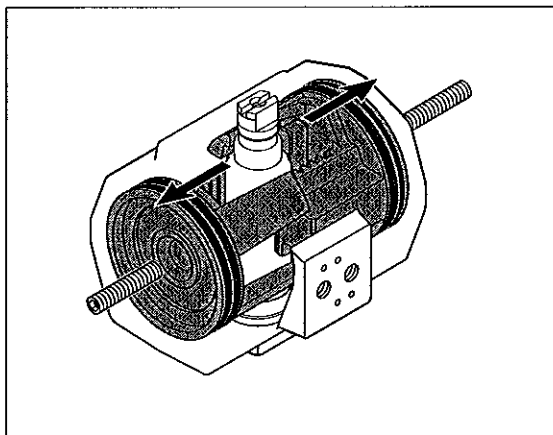
4.2.3

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)

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

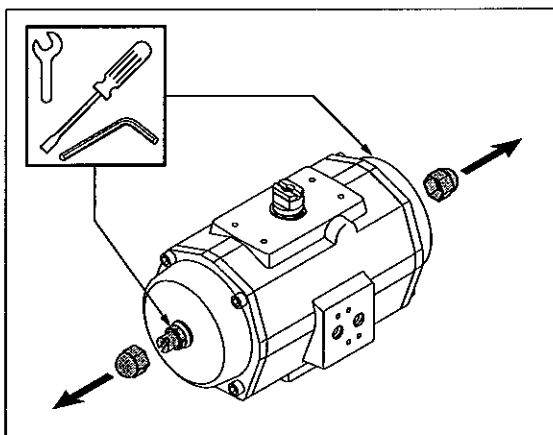


4.2.4

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).



4.2.5

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

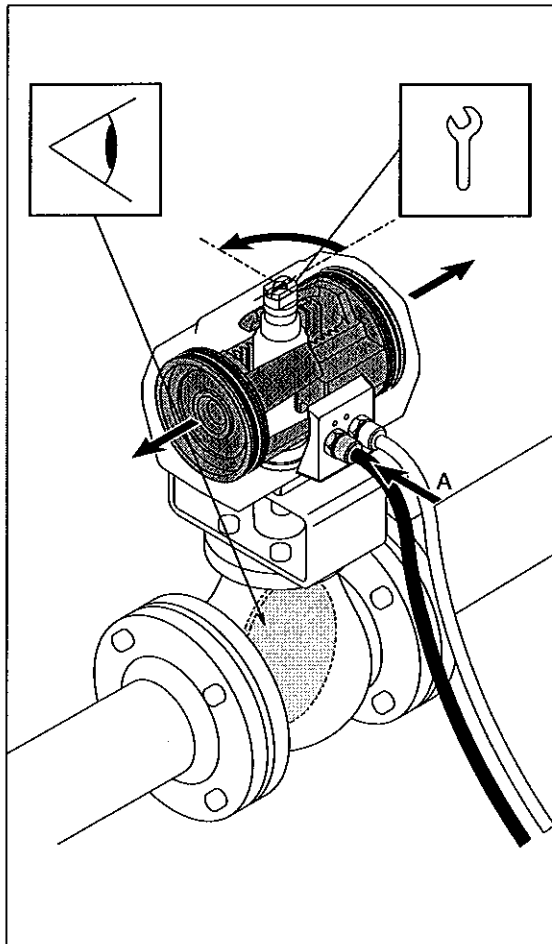
Verfahren:

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).

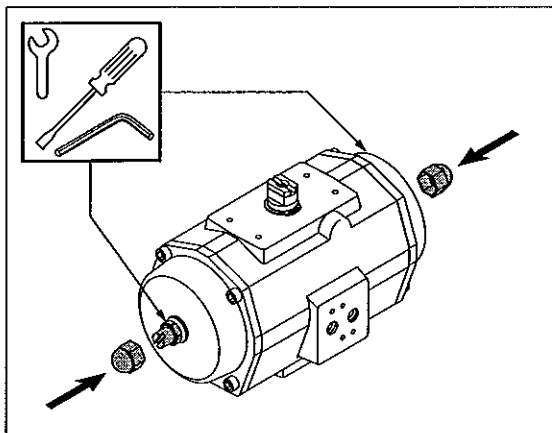
De L1-enkelzijdige slagbegrenzing begrenst de buitenwaartse beweging van de zuigers (zie afb. 4.2.4). De dubbel werkende en de enkel werkende aandrijvingen hebben beiden slagbegrenzingsbouten in de deksels.

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



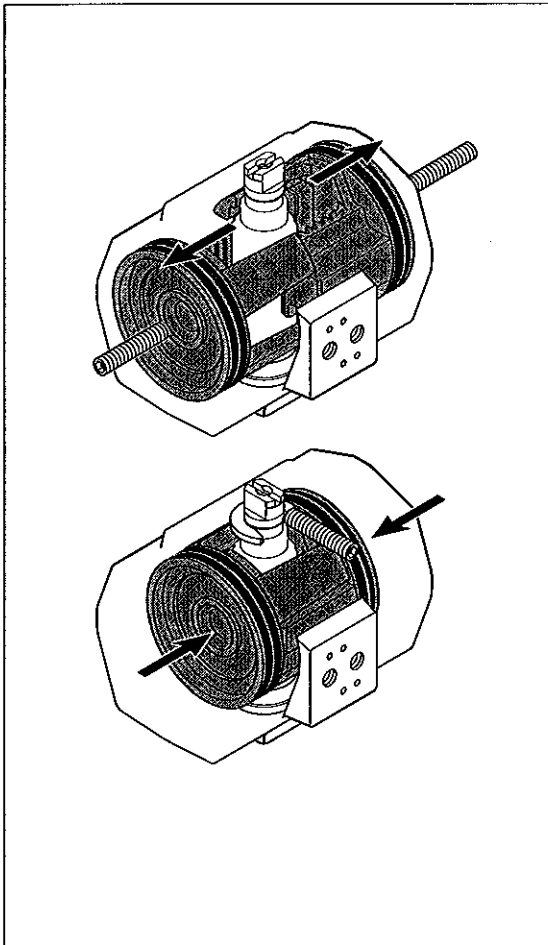
4.2.7

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

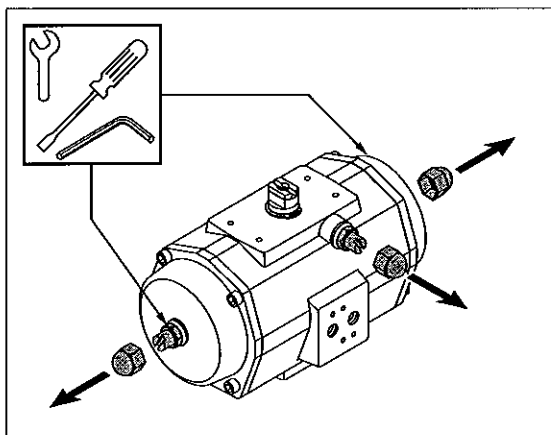
Verfahren:

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 dubbelwerkende 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.

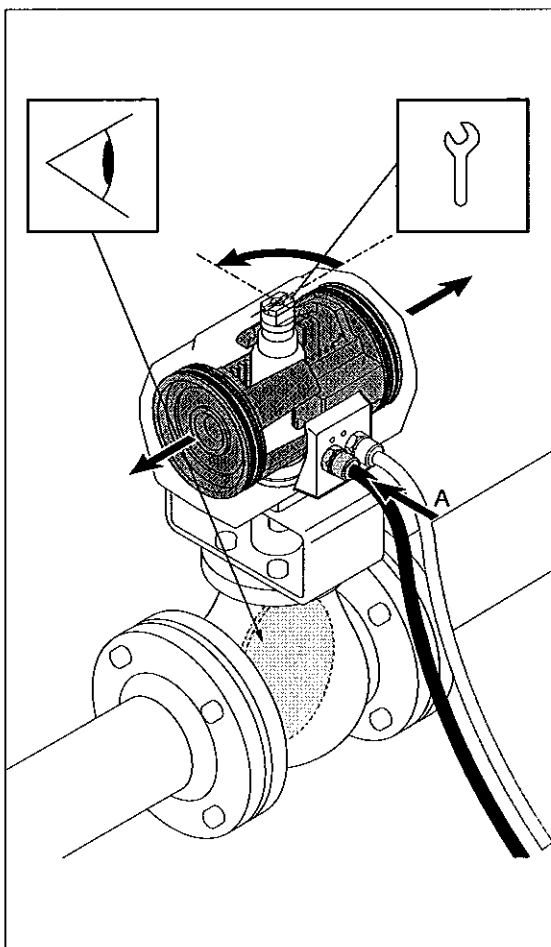
Handelwijze:

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



4.2.9

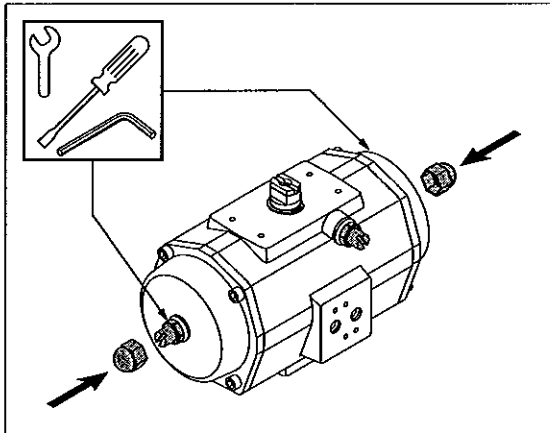
2. Remove nut covers, loosen the lock nuts and turn out the limit stop bolts 4 turns (see fig. 4.2.9).
3. Turn actuator shaft until the valve is in the desired position (see fig. 4.2.10). Use some pressure on the "A" port. Use a wrench for accurate positioning.



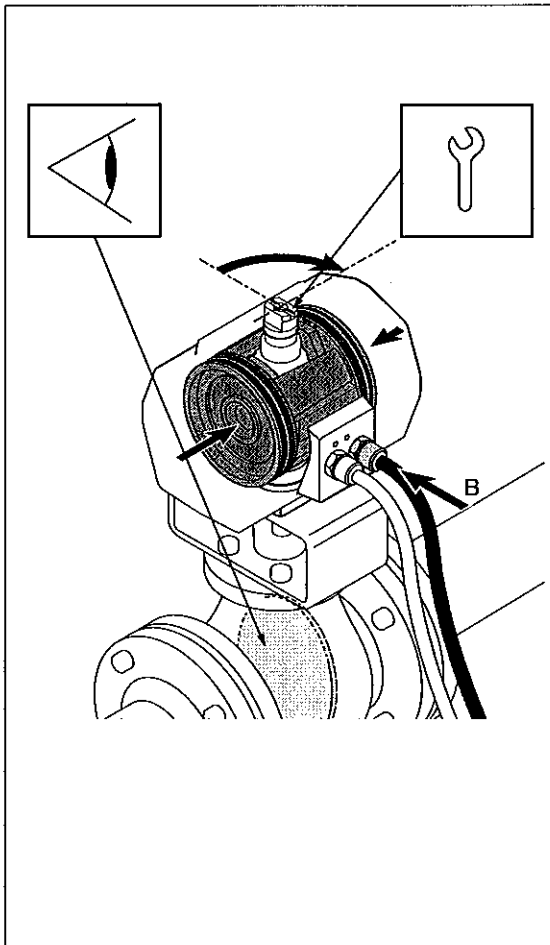
4.2.10

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.



4.2.11

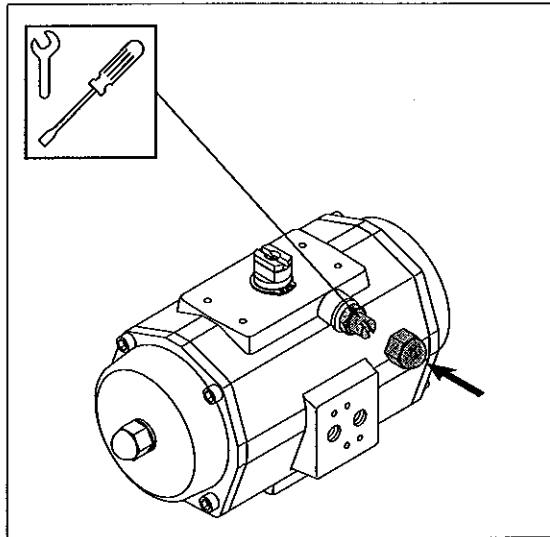


4.2.12

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.



4.2.13

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

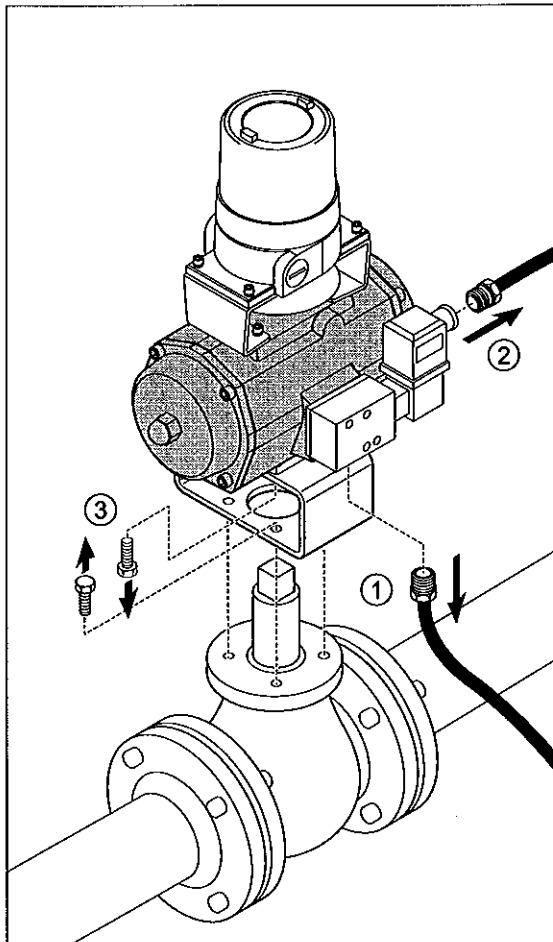
ES25 / 40	W 10 mm	SD 1.0x5.5 mm	ES600 / 950	W 24 mm	W 11 mm
ES65 / 100	W 13 mm	SD 1.0x5.5 mm	ES1600	W 30 mm	W 11 mm
ES200	W 17 mm	SD 1.2x8.0 mm	PS2500	W 46 mm	W 17 mm
ES350	W 19 mm	SD 1.2x8.0 mm	PS4000	W 46 mm	W 17 mm

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

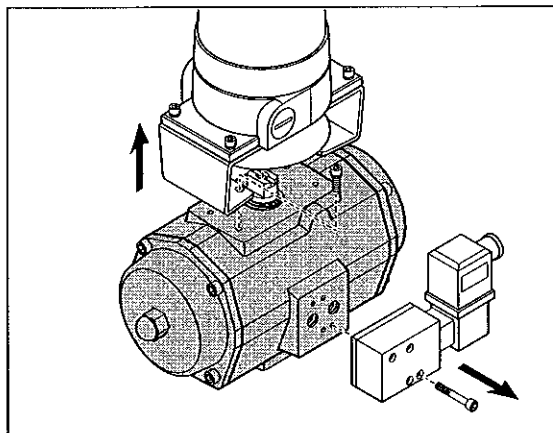
Limit stop bolt	: Hubbegrenzungsschraube	: Slagbegrenzingbout
Endcap	: Endkappe	: Deksel
Actuator type	: Antriebstyp	: Type aandrijving
Nut	: Mutter	: Moer
Bolt	: Schraube	: Schroef
AK = Allen key	: AK = Innensechskantschraube	: AK = Imbus sleutel
SD = Screwdriver	: SD = Schraubendreher	: SD = Schroevendraaier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

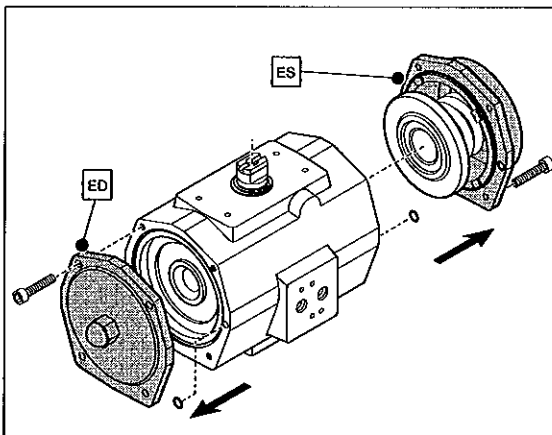
Achtung! Kugel- und K  nhen  he k  nnen das Druckmedium in der Kammer einschlie  en. Das Rohr system, in das das Stellglied eingebaut ist, ist drucklos zu machen, um den an der Armatur anliegenden Restdruck zu entspannen.



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

5.2.1 / 5.2.2 / 5.2.3

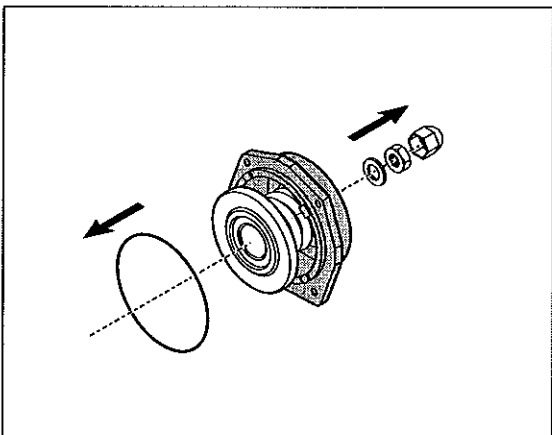
Be careful not to damage the endcap O-rings.



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.



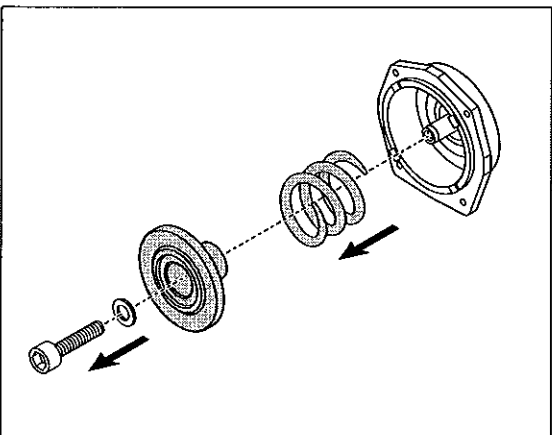
5.2.2



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.



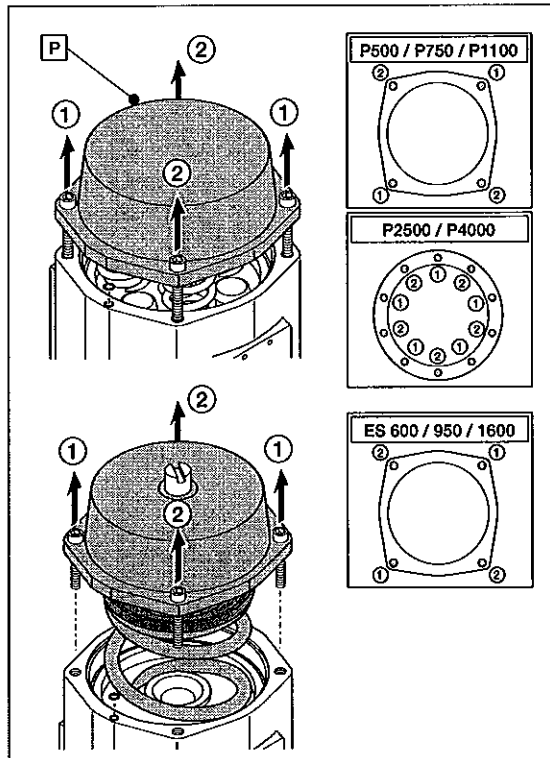
5.2.3



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

5.3.1 / 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.

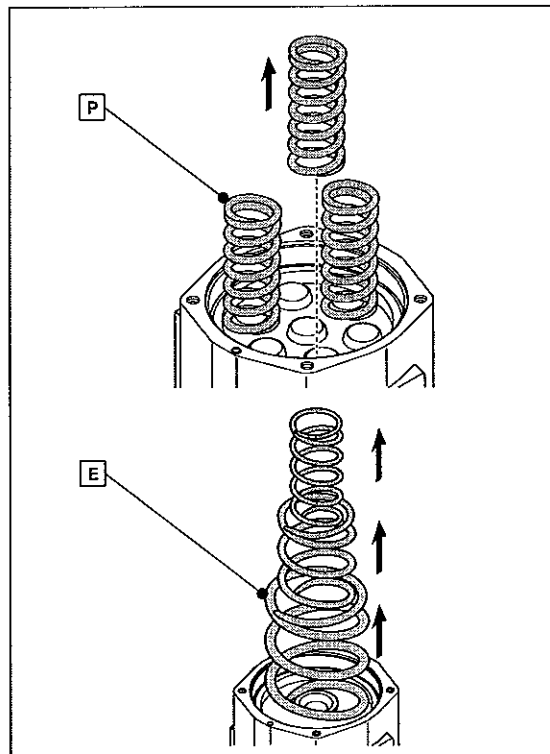


Achtung! Wenn es sich beim Antrieb um ein Typ mit Federrückstellung handelt, zuerst die Schrauben mit der Nummer 1 lösen, danach gleichmäßig alle Endkappenschrauben mit der Nummer 2 lösen. Dabei jeweils immer nur zwei bis drei Schraubendrehungen gleichzeitig und nacheinander, um die Vorspannung der Federn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



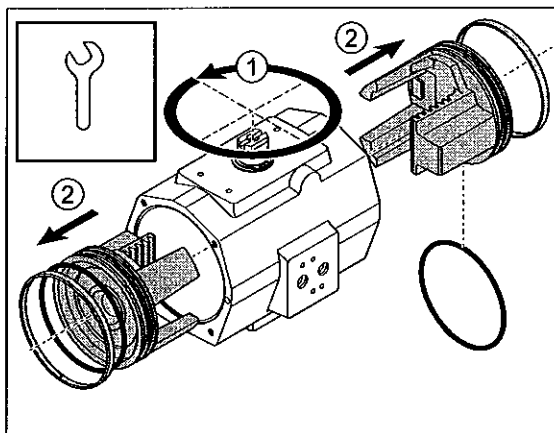
Voorzichtig! Als de aandrijving een "veerretour"-model is: draai eerst schroeven 1 los, draai vervolgens alle schroeven 2 van de deksels gelijkmatig los, twee tot drie slagen per keer en kruislings, om de voorspanning van de veren af te halen.

Wees bij alle aandrijvingen met veren voorzichtig bij het verwijderen van deksels.



5.3.2

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.

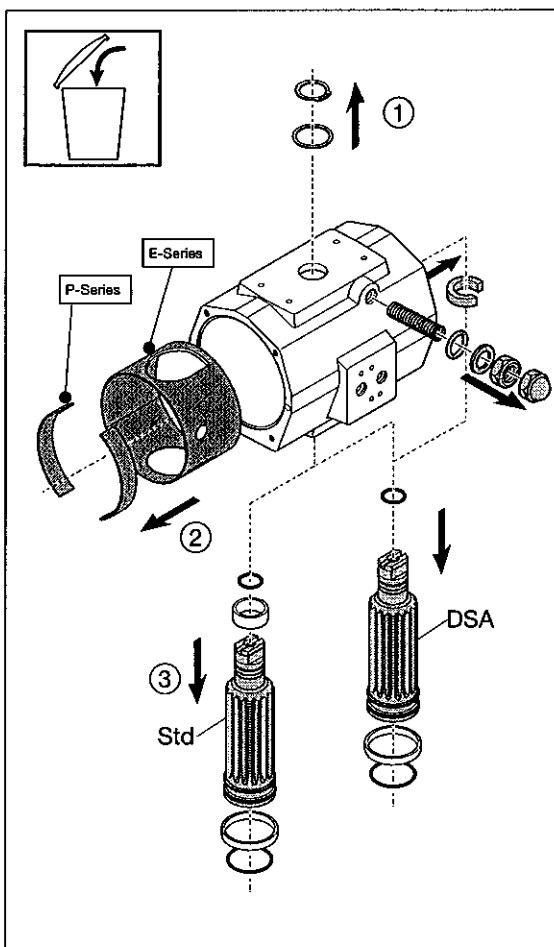
De twee zuigers kunnen nu verwijderd worden door de as van de stelaandrijving te draaien.

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.

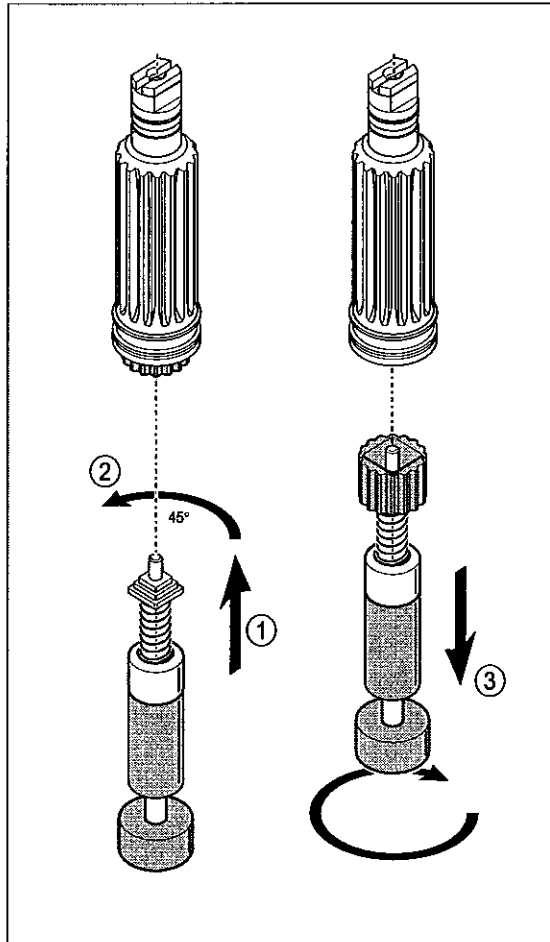
Bei einem DSA Antrieb zuerst den DSA-Nocken entfernen durch die Bohrung des Gehäuses. Dann die Welle ausnehmen.

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.



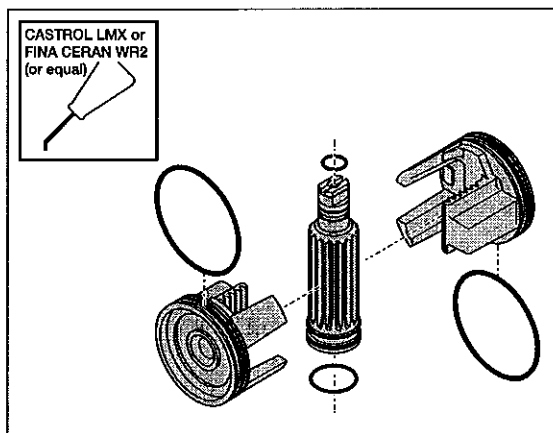
Für den Ausbau der Inserts benötigen Sie das Werkzeug Artikelnr. 590.00.001 für die Vierkantgrößen 11, 14 und 17.
Werkzeug Artikelnr. 590.00.002 wird für die Vierkantgrößen 19, 22 und 27 benötigt.



Om de insert te verwijderen moet u gebruik maken van de extractor art.nr. 590.00.001 voor vierkantaftmetingen 11, 14 en 17.
Art.nr. 590.00.002 wordt gebruikt voor vierkantaftmetingen 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.



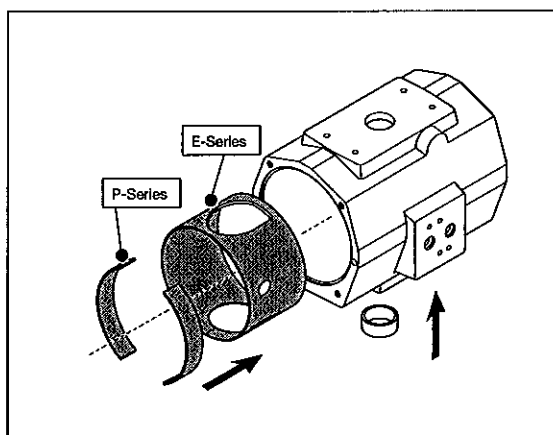
Kontrollier vor dem Zusammenbau der gewünschte aufbaucode (siehe Kapitel 4).

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.



6.1.2



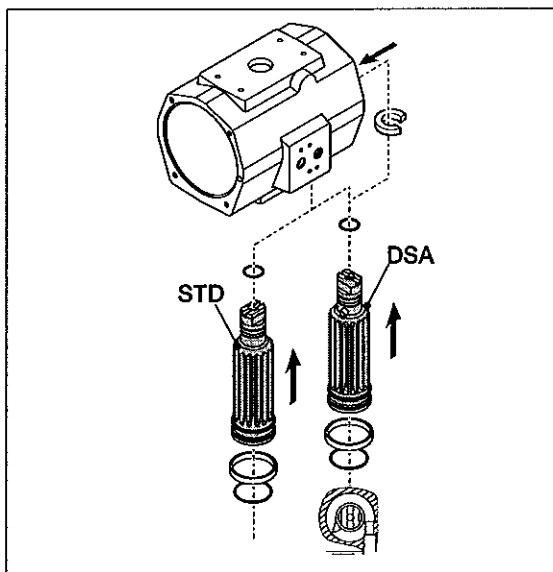
Kontroleer voor het opnieuw monteren de gewenste montagecode (zie hoofdstuk 4).

6.1.1

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

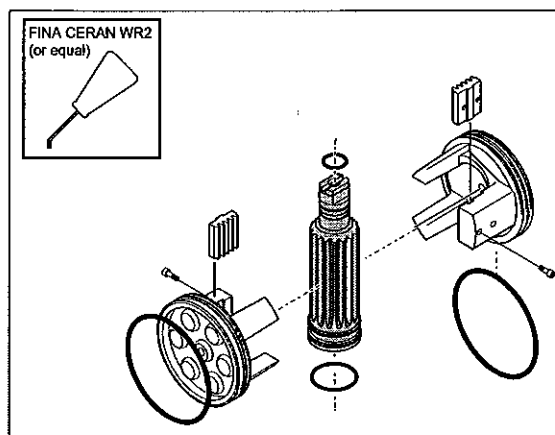
6.1.3

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



6.1.3

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



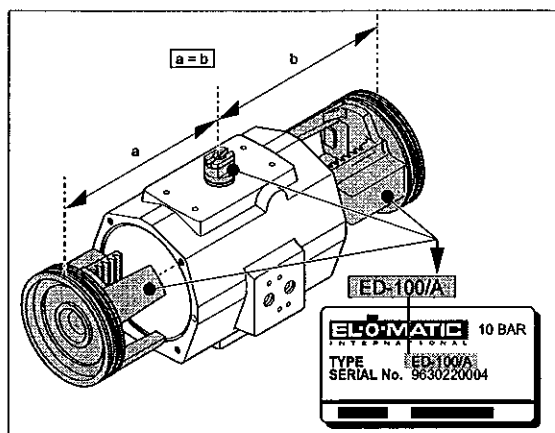
6.2.1

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.



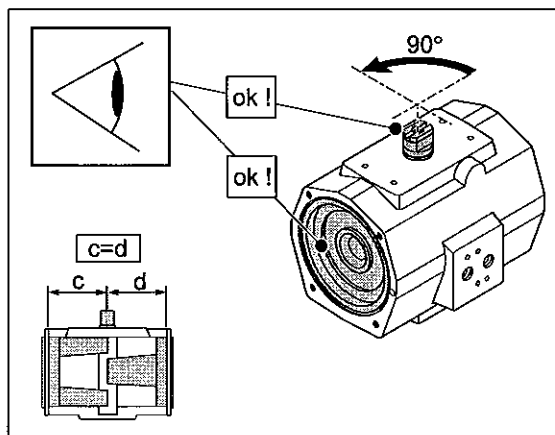
6.2.2

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 Aufbau-code, 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

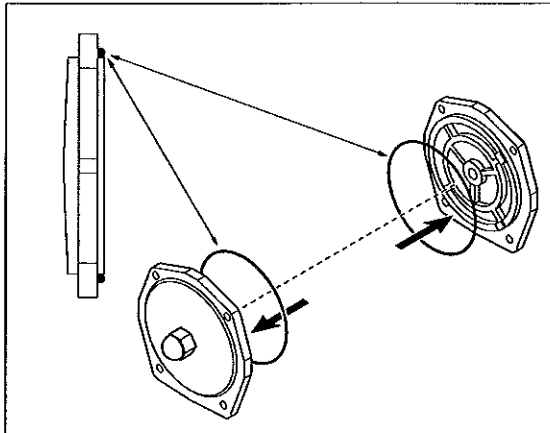
6.2.1

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 doppelwirkende Antriebe / Opnieuw monteren deksels van dubbelwerkende aandrijvingen



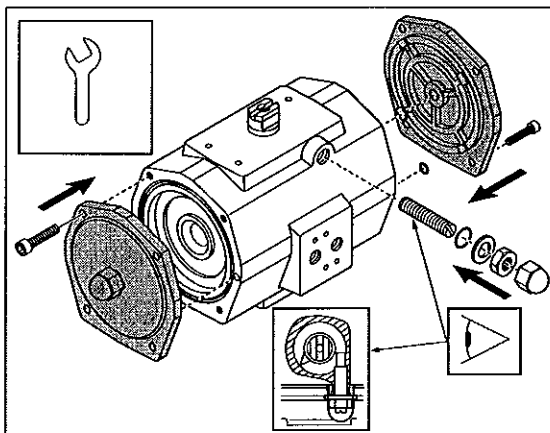
6.3.1

6.3.2

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

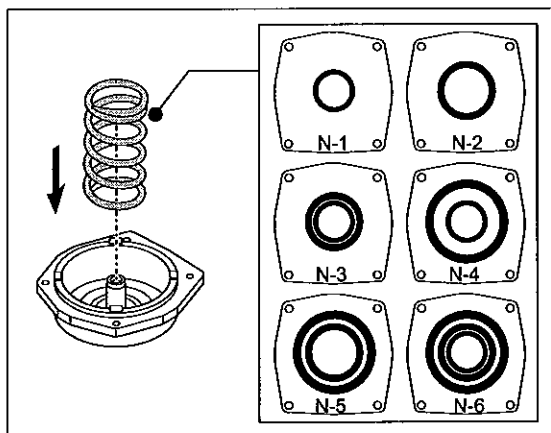
Beachten Sie, daß die O-Ringe in Endkappen und Luftzufuhröffnungen auf beiden Seiten eingesetzt werden.

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

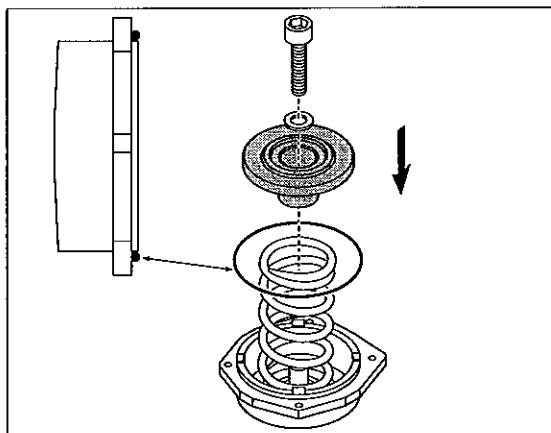
Beachten Sie, daß die O-Ringe der Endkappen und Luftzufuhröffnungen auf beiden Seiten eingesetzt werden.

6.4.1

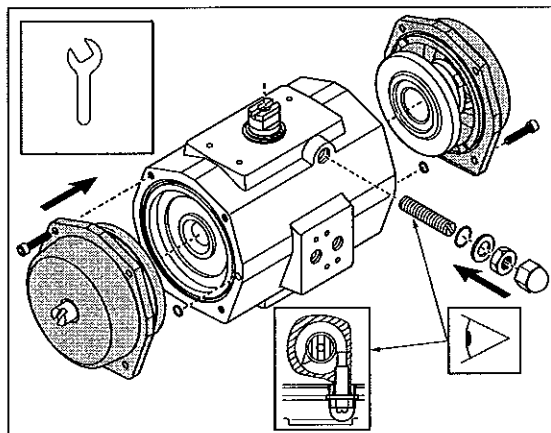
Zorg er bij het vervangen van veren in een veerretour-aandrijving voor dat de veren op exact dezelfde plaats in het verenpakket worden geplaatst, waar ze zijn verwijderd.

6.4.3

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

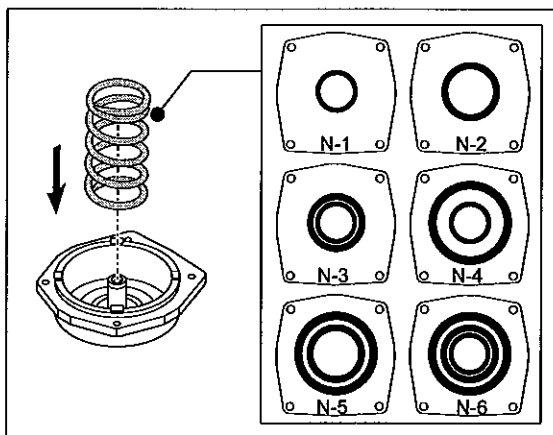


6.4.2



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

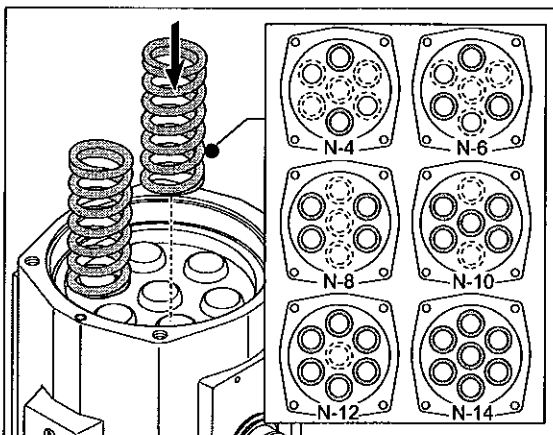


6.5.1

6.5.1 / 6.5.2 / 6.5.3

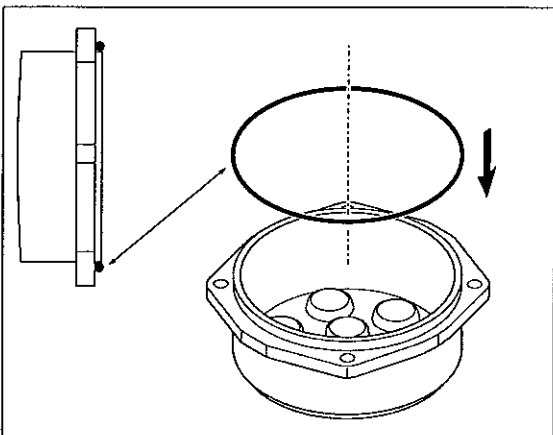
When replacing springs in a spring return actuator, ensure that the springs are replaced in their identical position in the endcap from where they were removed. Before assembling the springs and endcaps, make sure that the pistons are inwards.

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.

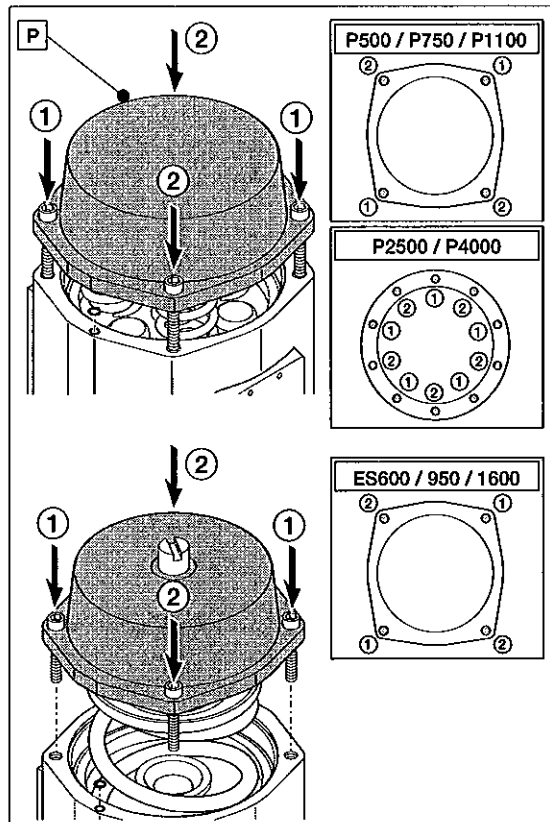


6.5.2

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.



6.5.3



6.5.4

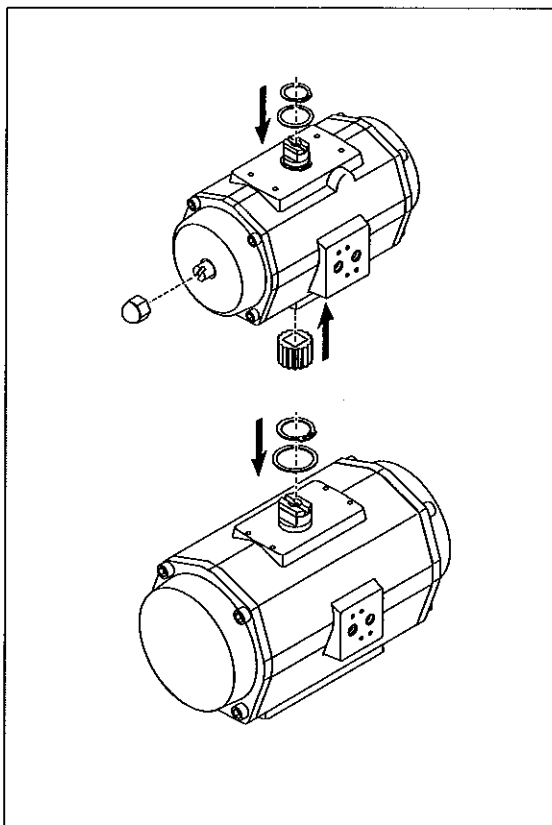
6.5.4

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

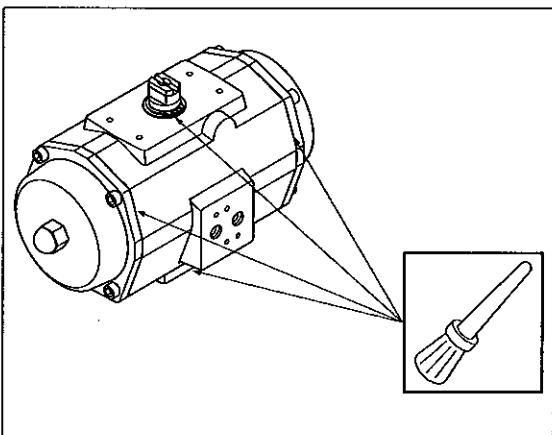


Der neuen Sicherungsring auf die dafür vorgesehene Rille am oberen Wellenende montieren.

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 Kontrolle der Luftdichtigkeit. Luftzufuhr zur Anschluß B anschliessen und verwende Seifenwasser rund Endkappen zur Kontrolle der Luftdichtigkeit.



6.6.2

6.6.1

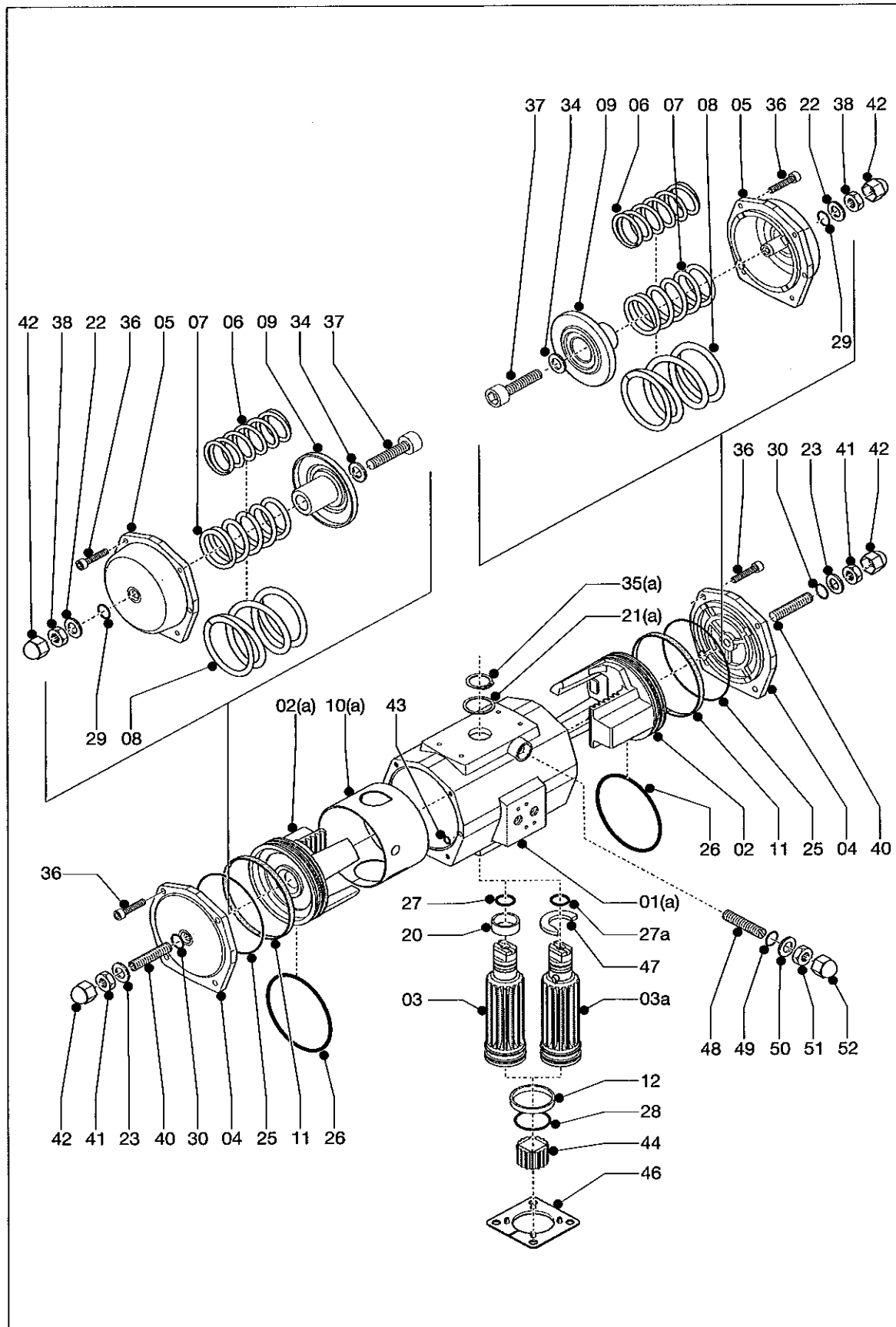


Installeer de nieuwe veerklem in de corresponderende groef op de as-top.

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 zeep-sop rond as-top en as-einde voor controle van de luchtdichtheid. Zet luchtdruk op de B-poort en gebruik zeepsop rond de deksels voor controle van de luchtdichtheid.



7 PARTS LIST / STÜCKLISTE / STUKLIJSTEN

Pos.	Qty. St.Z. Aant.	Description	Bezeichnung	Benaming	Specification Spezifikation Specificatie
1	1	Body	Gehäuse	Behuizing	GAISI10Mg, DIN 1725/2
1a	1	Body DSA	Gehäuse DSA	Behuizing DSA	GAISI10Mg, DIN 1725/2
2	1	Piston	Kolben	Zuiger	GAISI7Mg, DIN 1725/2
2a	1	Piston DSA	Kolben DSA	Zuiger DSA	GAISI7Mg, 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	GDAISI9Cu3, DIN1725/2
5	2	End Cap ES	Endkappe ES	Deksel ES	GDAISI9Cu3, 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)	Centreeerplaat (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).

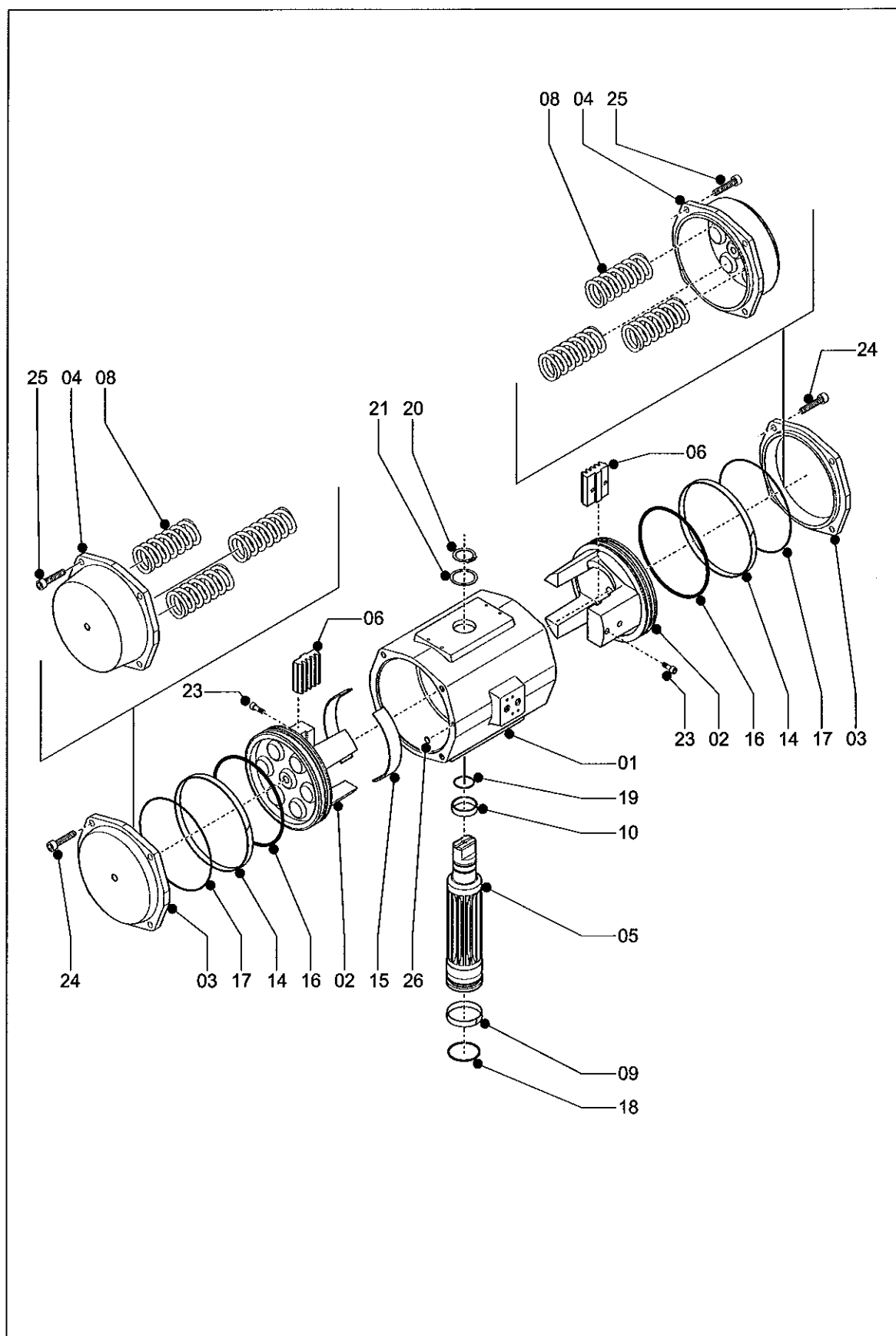
* **Empfohlene Ersatzteile (Teil des Reparatursatzes oder Reparatursatz für DSA).**

* *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".*



Pos.	Qty. St.Z. Aant.	Description	Bezeichnung	Benaming	Specification Spezifikation Specificatie
1	1	Body	Gehäuse	Behuizing	GAISI10Mg, DIN 1725/2
2	2	Piston	Kolben	Zuiger	GAISI7Mg, DIN 1725/2
3	2	End Cap PD	Endkappe PD	Deksel PD	GAISI10Mg, DIN 1725/2
4	2	End Cap PE	Endkappe PE	Deksel PE	GAISI10Mg, DIN 1725/2
5	1	Central drive shaft	Antriebswelle	Aandrijf-as	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	Sprengkring	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).*

Type i2P-100 Electro-Pneumatic Transducers

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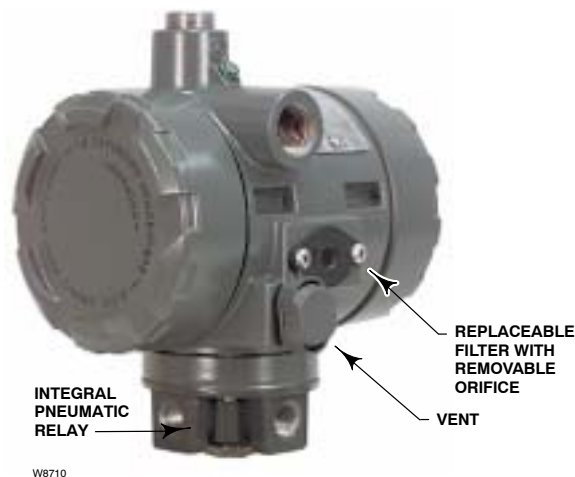


Figure 1. Type i2P-100 Electro-Pneumatic Transducer

information for the Type i2P-100 transducer (see figure 1). Refer to separate manuals for instructions covering equipment used with the transducer.

No person may install, operate or maintain a Type i2P-100 electro-pneumatic transducer without first • being fully trained and qualified in valve, actuator and accessory installation, operation and maintenance, and • carefully reading and understanding the contents of this manual. If you have any questions about these instructions, contact your Emerson Process Management™ sales office.

Introduction

Scope of Manual

This instruction manual provides installation, operation, maintenance, and parts ordering

Description

The transducer, shown in figure 3, receives a 4 to 20 milliamper dc input signal and transmits a proportional user field-configurable pneumatic output pressure to a final control element. The pneumatic



Table 1. Specifications

Input Signal⁽¹⁾

Available as standard with 4–20 mA.
User configurable by dip switch for split ranging,
see table below.

Output Signal^(1,6)

Available as standard 0.2 to 1.0 bar (3 to 15 psig)
or 0.4 to 2.0 bar (6 to 30 psig). User configurable
by dip switch selection and zero and span
potentiometer adjustment, see table below.

INPUT SIGNAL	OUTPUT PRESSURE	
	BAR	PSIG
4 to 20 mA dc	0.2 to 1.0	3 to 15
	0.4 to 2.0	6 to 30
4 to 12 mA dc	0.2 to 1.0	3 to 15
12 to 20 mA dc	0.2 to 1.0	3 to 15

Equivalent Circuit

The Type i2P-100 equivalent circuit is a series circuit consisting of a constant voltage drop (battery) of approximately 4 V dc and a total resistance of 40 ohms. Input is shunted by two 6.8 V zener diodes (see figure 9).

Supply Pressure^(1,5)

Recommended: 0.3 bar (5 psi) higher than upper range limit of output signal

Maximum: 3.4 bar (50 psig)

Medium: Air or Natural Gas⁽⁴⁾

Average Steady State Flow Rate^(1,2)

OUTPUT RANGE							
0.2 to 1.0 bar (3–15 psig)				0.4 to 2.0 bar (6–30 psig)			
SUPPLY PRESSURE							
1.5 bar (20 psig)				2.4 bar (35 psig)			
OUTPUT		FLOW RATE		OUTPUT		FLOW RATE	
Bar	Psig	Normal m³/h	Scfh	Bar	Psig	Normal m³/h	Scfh
0.2	3	0.08	3.0	0.4	6	0.09	3.6
0.6	9	0.12	4.5	1.2	18	0.19	7.0
1.0	15	0.17	6.3	2.1	30	0.27	10.2

Maximum Output Air Capacity⁽²⁾

8.0 m³/hr (5.0 scfm) at 1.4 bar (20 psig) supply pressure

Performance⁽³⁾

Reference Accuracy: $\pm 1.0\%$ of full scale output span; includes combined effects of hysteresis, linearity, and deadband

Independent Linearity⁽¹⁾: $\pm 0.75\%$ of full scale output span

Hysteresis⁽¹⁾: 0.4% of full scale output span

Frequency Response⁽¹⁾: Gain is attenuated 3 dB at 6 Hz with transducer output signal piped to a typical instrument input

Temperature Effect: $\pm 0.14\%$ per degrees Celsius ($\pm 0.75\%$ per degrees Fahrenheit) of span

Supply Pressure Effect: 0.2% of full scale output span per bar supply pressure change (0.2% of full scale output span per psi supply pressure change)

Vibration Effect: Less than 1% of full scale output span when tested to ISA S75.13

Electromagnetic Interference (EMI)⁽¹⁾: Tested per IEC 61326-1 (Edition 1.1). Conforms to the European EMC Directive. Meets emission levels for Class A equipment (industrial locations) and Class B equipment (domestic locations). Meets immunity requirements for industrial locations (Table A.1 in the IEC specification document). Immunity performance shown in table 2.

Operating Ambient Temperature Limits⁽⁵⁾

–40 to 85°C (–40 to +180°F)

Electrical Classification**Hazardous Area:**

Explosion proof, Dust-Ignition proof,
Intrinsic Safety



Explosion proof, Non-incendive,
Dust-Ignition proof, Intrinsic Safety

ATEX

Intrinsic Safety, Type n and Flameproof

IECEX

Intrinsic Safety, Type n and Flameproof

Refer to Special Instructions for Safe-Use and Installation in Hazardous Locations, tables 3 and 4, and figures 15, 16, 17, and 18 for specific approval information.

Approved for use with natural gas⁽⁴⁾

(continued)

Instruction Manual

Form 5777

December 2005

i2P-100 Transducer

Table 1. Specifications (continued)

<p>Electrical Housing:</p> <p>NEMA 4X, CSA enclosure 4X & IP66 when remote vented, otherwise</p> <p>NEMA 3, CSA enclosure 3 & IP64</p> <p>Connections</p> <p>Supply and Output Pressure: 1/4-inch NPT female connection</p> <p>Vent: 1/4-inch NPT female</p> <p>Electrical: Standard 1/2-inch NPT</p> <p>Wire Size: 18 to 22 AWG</p> <p>Adjustments⁽⁶⁾</p> <p>Zero and Span: Trim potentiometers (20 turn) for zero and span adjustments are located under the housing cap (see figure 10).</p> <p>Switch: Allows input signal split range and user-configurable 0.2 to 2 bar (3 to 30 psig) output.</p>	<p>Mounting Position</p> <p>■ Actuator ■ pipestand or ■ surface</p> <p>Approximate Weight (Transducer Only)</p> <p>2.5 kg (5.5 lbs)</p> <p>Actuator Stroking Time</p> <p>See figure 2</p> <p>Declaration of SEP</p> <p>Fisher Controls International LLC declares this product to be in compliance with Article 3 paragraph 3 of the Pressure Equipment Directive (PED) 97 / 23 / EC. It was designed and manufactured in accordance with Sound Engineering Practice (SEP) and cannot bear the CE marking related to PED compliance.</p> <p>However, the product <i>may</i> bear the CE marking to indicate compliance with <i>other</i> applicable EC Directives.</p>
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1. These terms are defined in ISA Standard S51.1.

2. Normal m³/hr—Normal cubic meters per hour (0°C and 1.01325 bar, absolute). Scfh—Standard cubic feet per hour (60°F and 14.7 psia).

3. Performance values are obtained using a transducer with a 4 to 20 mA dc input signal and a 0.2 to 1.0 bar (3 to 15 psig) output signal at an ambient temperature of 24°C (75°F).

4. This product is approved for use with Natural Gas. Natural gas to contain no more than 20 ppm of hydrogen sulphide.

5. The pressure and temperature limits in this document and any applicable standard or code limitation should not be exceeded.

6. For other ranges, zero and span adjustments are needed.

Table 2. Immunity Performance

Port	Phenomenon	Basic Standard	Performance Criteria ⁽¹⁾
Enclosure	Electrostatic discharge (ESD)	IEC 61000-4-2	A
	Radiated EM field	IEC 61000-4-3	A
	Rated power frequency magnetic field	IEC 61000-4-8	A
I/O signal/control	Burst (fast transients)	IEC 61000-4-4	A
	Surge	IEC 61000-4-5	A
	Conducted RF	IEC 61000-4-6	A

Specification limit = ±1% of span
 1. A=No degradation during testing. B = Temporary degradation during testing, but is self-recovering.

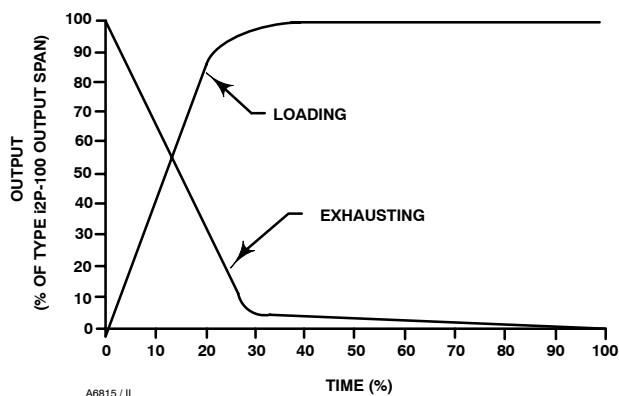


Figure 2. Output-Time Relationships for Type i2P-100 Transducer

output ranges are typically 0.2 to 1.0 bar (3 to 15 psig) and 0.4 to 2.0 bar (6 to 30 psig). A typical application is in electronic control loops where the final control element is a control valve assembly that is pneumatically operated. The input signal and output pressure range of the transducer is indicated on the nameplate, attached to the housing.

CAUTION

Dropping or rough handling of the transducer can cause damage to the converter module resulting in a shifted output or a minimum output.

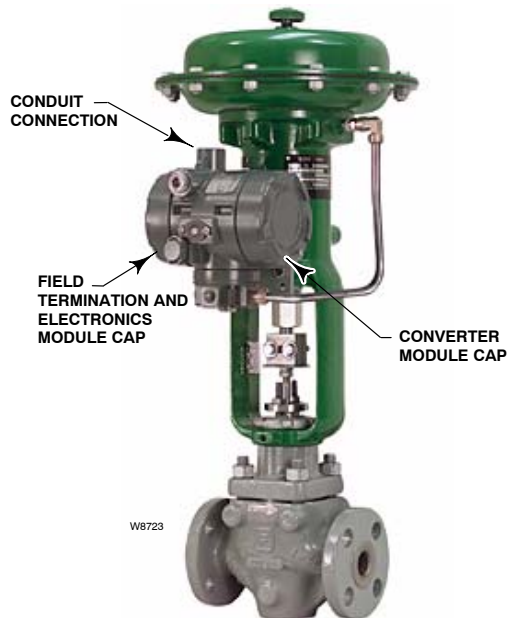


Figure 3. Type i2P-100 Electro-Pneumatic Transducer Mounted on a Size 30 667 Sliding-Stem Actuator

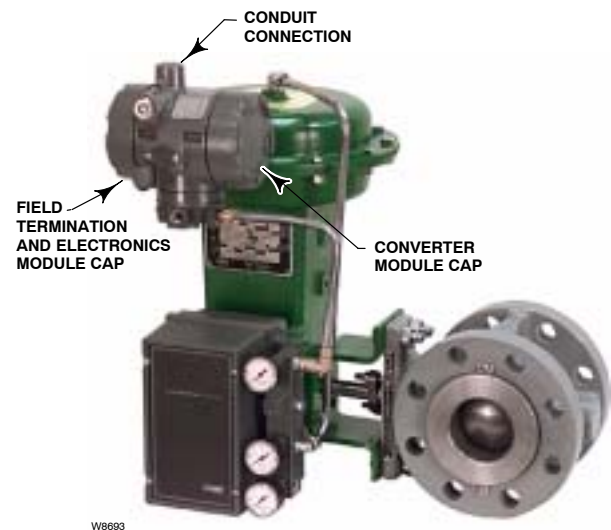


Figure 4. Type i2P-100 Electro-Pneumatic Transducer Mounted on a Size 33 1052 Rotary Actuator, 3610J Positioner and V300B Rotary Valve.

Specifications

Specifications for the Type i2P-100 transducer are listed in table 1.



WARNING

This product is intended for a specific current range, temperature range and other application specifications. Applying different current, temperature and other service conditions could result in malfunction of the product, property damage or personal injury.

Educational Services

For information on available courses for the Type i2P-100 electro-pneumatic transducer, as well as a variety of other products, contact:

Emerson Process Management
Educational Services, Registration
P.O. Box 190; 301 S. 1st Ave.
Marshalltown, IA 50158-2823
Phone: 800-338-8158 or
Phone: 641-754-3771
FAX: 641-754-3431
e-mail: education@emersonprocess.com

Note

Neither Emerson®, Emerson Process Management, Fisher®, nor any of their affiliated entities assumes responsibility for the selection, use and maintenance of any product. Responsibility for the selection, use and maintenance of any product remains with the purchaser and end-user.

Installation

The i2P-100 transducer has been designed and approved for use with either air or natural gas as the supply medium. If using natural gas as the pneumatic supply medium, natural gas will be used in the pneumatic output connections of the transducer to any connected equipment. In normal operation the unit will vent the supply medium into the surrounding atmosphere unless it is remotely vented. When using natural gas as the supply medium, in a non-hazardous location in a confined area, remote venting of the unit is required. Failure to do so could result in personal injury, property damage, and area re-classification. For hazardous locations remote venting of the unit may be required,

depending upon the area classification, and as specified by the requirements of local, regional, and federal codes, rules and regulations. Failure to do so when necessary could result in personal injury, property damage, and area re-classification.

Additional information for installation and safe-use in hazardous locations can be found in Special Instructions for Safe-Use and Installation in Hazardous Locations.



WARNING

To avoid personal injury or property damage from the sudden release of pressure, air, or natural gas:

- Always wear protective clothing, gloves, and eyewear when performing any installation operations.
- If installing into an existing application, also refer to the **WARNING** at the beginning of the Maintenance section of this instruction manual.
- Check with your process or safety engineer for any additional measures that must be taken to protect against process media.



WARNING

This unit vents the supply medium into the surrounding atmosphere. When installing this unit in a non-hazardous (non-classified) location in a confined area, with natural gas as the supply medium, you must remotely vent this unit to a safe location. Failure to do so could result in personal injury or property damage from fire or explosion, and area re-classification.

When installing this unit in a hazardous (classified) location remote venting of the unit may be required, depending upon the area classification, and as specified by the requirements of local, regional, and federal codes, rules and regulations.

Failure to do so when necessary could result in personal injury or property damage from fire or explosion, and area re-classification.

Vent line piping should comply with local and regional codes and should be as short as possible with adequate inside diameter and few bends to reduce case pressure buildup.

When received from the factory, the set screws (key 8), which provide a locking feature for the housing caps (key 2), are backed off approximately 1 turn. When using the i2P-100 transducer in explosive atmospheres these set screws must be fully engaged.



WARNING

When using this unit in explosive atmospheres, the set screws (key 8) must be fully engaged to lock/secure the housing caps. Failure to fully engage these set screws could result in unauthorized opening of the unit, which may result in personal injury or property damage caused by fire or explosion.

Special Instructions for Safe-Use and Installation in Hazardous Locations

Certain nameplates may carry more than one approval, and each approval may have unique installation requirements and/or conditions of safe-use. Special instructions are listed by agency/approval below.

After reading and understanding these special conditions of use, proceed with standard installation procedures.



WARNING

Failure to follow these conditions of safe-use could result in personal injury or property damage from fire or explosion, and area re-classification.

Table 3. Hazardous Area Classifications for North America (CSA and FM Approvals)

CERTIFICATION BODY	CERTIFICATION OBTAINED	ENTITY RATING	TEMPERATURE CODE	ENCLOSURE RATING
CSA	(Intrinsic Safety) Zone •Ex ia IIC T3/T4/T5 per drawing GE07471 Class/Division •Class I, II, III Division 1 GP A, B, C, D, E, F, G per drawing GE07471	$V_{max} = 30 \text{ Vdc}$ $I_{max} = 150 \text{ mA}$ $P_i = 1.0 \text{ W}$ $C_i = 5 \text{ nF}$ $L_i = 0 \text{ mH}$	T3 ($T_{amb} \leq 85^{\circ}\text{C}$) T4 ($T_{amb} \leq 81^{\circ}\text{C}$) T5 ($T_{amb} \leq 46^{\circ}\text{C}$)	4X*
	(Explosion Proof) Zone •Ex d IIC T5/T6 Class/Division •Class I, Division 1 GP, A, B, C, D	---	T5 ($T_{amb} \leq 85^{\circ}\text{C}$) T6 ($T_{amb} \leq 75^{\circ}\text{C}$)	4X*
	(Type n) Zone •Ex nC IIC T5/T6	---	T5 ($T_{amb} \leq 85^{\circ}\text{C}$) T6 ($T_{amb} \leq 75^{\circ}\text{C}$)	4X*
	Class I, Division 2, GP A, B, C, D Class II, Division 1, GP E, F, G Class III, Division 2 GP F, G Class III	---	T5 ($T_{amb} \leq 85^{\circ}\text{C}$) T6 ($T_{amb} \leq 75^{\circ}\text{C}$)	4X*
FM	(Intrinsic Safety) Zone •Class I Zone 0 AEx ia IIC T3/T4/T5 per drawing GE07470 Class/Division •Class I, II, III Division 1 GP A, B, C, D, E, F, G per drawing GE07470	$V_{max} = 30 \text{ Vdc}$ $I_{max} = 150 \text{ mA}$ $P_i = 1.0 \text{ W}$ $C_i = 0 \text{ nF}$ $L_i = 0 \text{ mH}$	T3 ($T_{amb} \leq 85^{\circ}\text{C}$) T4 ($T_{amb} \leq 81^{\circ}\text{C}$) T5 ($T_{amb} \leq 46^{\circ}\text{C}$)	4X*
	(Explosion Proof) Zone •Class I Zone 1 AEx d IIC T5/T6 Class/Division •Class I, Division 1, GP A, B, C, D	---	T5 ($T_{amb} \leq 85^{\circ}\text{C}$) T6 ($T_{amb} \leq 75^{\circ}\text{C}$)	4X*
	(Type n) Zone •Class I Zone 2 AEx nC IIC T5/T6	---	T5 ($T_{amb} \leq 85^{\circ}\text{C}$) T6 ($T_{amb} \leq 75^{\circ}\text{C}$)	4X*
	Class I, Division 2, GP A, B, C, D Class II, Division 1, GP E, F, G Class II, Division 2, GP F, G Class III	---	T5 ($T_{amb} \leq 85^{\circ}\text{C}$) T6 ($T_{amb} \leq 75^{\circ}\text{C}$)	4X*

* When remotely vented.

CSA

Special Conditions of Use

None stated.

Refer to table 3 for additional information, figure 15 for the CSA loop schematic and figure 16 for the CSA and FM approvals nameplate.

FM

Special Conditions of Use

1. When product is used with natural gas as the pneumatic medium, the maximum working pressure of the natural gas supply is limited to 50 psi.
2. When product is used with natural gas as the pneumatic medium the product shall be provided




with the proper remote venting, as described on page 10 of this instruction manual.

Refer to table 3 for additional information, figure 17 for the FM loop schematic, and figure 16 for the CSA and FM approvals nameplate.

ATEX All Approvals

All ATEX approved units come with a combined nameplate which carries multiple approvals (intrinsic safety and dust, flameproof and dust, and Type n and dust), as shown in figure 18. During installation, only one type of protection method is allowed. The unit shall be marked as to which protection method it was installed as and shall not be changed or utilized in any other manner than was originally marked by the end-user.

Table 4. Hazardous Area Classifications for ATEX and IECEx Approvals

CERTIFICATE	CERTIFICATION OBTAINED	ENTITY RATING	TEMPERATURE CODE	ENCLOSURE RATING
ATEX	 II 1 GD Gas •EEx ia IIC T3/T4/T5 —Intrinsic Safety Dust •T95°C ($T_{amb} \leq 85^{\circ}\text{C}$)	$U_i = 30 \text{ Vdc}$ $I_i = 150 \text{ mA}$ $P_i = 1.0 \text{ W}$ $C_i = 0 \text{ nF}$ $L_i = 0 \text{ mH}$	T3 ($T_{amb} \leq 85^{\circ}\text{C}$) T4 ($T_{amb} \leq 81^{\circ}\text{C}$) T5 ($T_{amb} \leq 46^{\circ}\text{C}$)	IP66*
	 II 2 GD Gas •EEx d IIC T5/T6 —Flameproof Dust •T95°C ($T_{amb} \leq 85^{\circ}\text{C}$)	---	T5 ($T_{amb} \leq 85^{\circ}\text{C}$) T6 ($T_{amb} \leq 75^{\circ}\text{C}$)	IP66*
	 II 3 GD Gas •EEx nC II T5/T6 —Type n Dust •T95°C ($T_{amb} \leq 85^{\circ}\text{C}$)	---	T5 ($T_{amb} \leq 85^{\circ}\text{C}$) T6 ($T_{amb} \leq 75^{\circ}\text{C}$)	IP66*
IECEx	Gas •Ex ia IIC T3/T4/T5 —Intrinsic Safety	$U_i = 30 \text{ Vdc}$ $I_i = 150 \text{ mA}$ $P_i = 1.0 \text{ W}$ $C_i = 0 \text{ nF}$ $L_i = 0 \text{ mH}$	T3 ($T_{amb} \leq 85^{\circ}\text{C}$) T4 ($T_{amb} \leq 81^{\circ}\text{C}$) T5 ($T_{amb} \leq 46^{\circ}\text{C}$)	IP66*
	Gas •Ex d IIC T5/T6 —Flameproof	---	T5 ($T_{amb} \leq 85^{\circ}\text{C}$) T6 ($T_{amb} \leq 75^{\circ}\text{C}$)	IP66*
	Gas •Ex nC IIC T5/T6 —Type n	---	T5 ($T_{amb} \leq 85^{\circ}\text{C}$) T6 ($T_{amb} \leq 75^{\circ}\text{C}$)	IP66*

* When remotely vented.



WARNING

For ATEX approvals only, end-user must select and mark only one protection method upon installation. Once marked it shall not be changed. Failure to follow these instructions will jeopardize the explosion safety of the transducer, and may result in personal injury or property damage.

ATEX Intrinsic Safety

Special Conditions for Safe-Use

1. Before putting in service, the user shall permanently cross out the areas on the nameplate with the types of protection that are not applicable (EEx ia IIC T3... T5, KEMA 05ATEX1109 X or EEx nA II T5/T6, KEMA 05ATEX1119) or mark the selected type of protection. Once determined the type of protection may not be changed.

2. Because the enclosure of the Type i2P-100 transducer is made of aluminum, if it is mounted in

an area where the use of category 1 G apparatus is required, it must be installed such, that, even in the event of rare incidents, ignition sources due to impact and friction sparks are excluded.

3. Ambient temperature range:

–40°C – + 46°C for temperature class T5
 –40°C – + 81°C for temperature class T4
 –40°C – + 85°C for temperature class T3

Electrical data:

Unit must be installed with appropriate I.S barrier with maximum entity ratings as follows:

$U_i = 30 \text{ V}$
 $I_i = 150 \text{ mA}$ (resistively limited)
 $P_i = 1 \text{ W}$
 $C_i = 0 \text{ nF}$
 $L_i = 0 \text{ mH}$

Refer to table 4 for additional information and figure 18 for the ATEX and IECEx approvals nameplate.

i2P-100 Transducer

ATEX Flameproof

Special Conditions for Safe-Use

1. Before putting in service, the user shall permanently cross out the areas on the nameplate with the types of protection that are not applicable (EEx ia IIC T3... T5, KEMA 05ATEX1109 X or EEx nA II T5/T6, KEMA 05ATEX1119) or mark the selected type of protection. Once determined the type of protection may not be changed.

2. Electrical connections are typically made using either cable or conduit.

- If using a cable connection, the cable entry and closing devices shall be certified in type of protection flameproof enclosure "d", suitable for the conditions of use and correctly installed. For ambient temperatures over 70°C, suitable heat resistant cables and cable glands shall be used.

- If using a rigid conduit connection, a certified sealing device in type of protection flameproof enclosure "d", such as a conduit seal with setting compound shall be provided immediately to the entrance of the valve housing. For ambient temperature over 70°C, suitable heat resistant wiring and setting compound for the conduit seal shall be used.

Refer to table 4 for additional information and figure 18 for the ATEX and IECEx approvals nameplate.

ATEX Type n

Special Conditions for Safe-Use

1. Before putting in service, the user shall permanently cross out the areas on the nameplate with the types of protection that are not applicable (EEx ia IIC T3... T5, KEMA 05ATEX1109 X or EEx nA II T5/T6, KEMA 05ATEX1119) or mark the selected type of protection. Once determined the type of protection may not be changed.

Refer to table 4 for additional information and figure 18 for the ATEX and IECEx approvals nameplate.

IECEx Intrinsic Safety, Type n, Flameproof

Conditions of Certification

The Intrinsically Safe version has the following Entity Parameters:

$U_i = 30 \text{ V}$
 $I_i = 150 \text{ mA}$
 $P_i = 1.0 \text{ W}$
 $C_i = 0 \text{ uF}$
 $L_i = 0 \text{ uH}$

Refer to table 4 for additional information and figure 18 for the ATEX and IECEx approvals nameplate.

Mounting

When a transducer is ordered as part of a control valve assembly, the factory mounts the transducer on the actuator and connects the necessary tubing, then adjusts the transducer as specified on the order. See figures 3 and 4 for typical mounting configurations.

Transducers also can be ordered separately for mounting on a control valve assembly already in service, or for mounting on a 2-inch diameter pipestand, or a flat surface. The transducer may be ordered either with or without mounting parts.

Mounting parts include a mounting plate and bolts and, if ordered for pipestand mounting, a pipe clamp. Tubing is not included if the transducer is not factory mounted. Use 3/8-inch diameter tubing for all input and output connections. The length of tubing between the transducer output and the final control element should be as short as possible. Transducer overall dimensions are shown in figure 5. If weatherproofing is required, mount the transducer so that the vent can drain. Do not allow moisture or condensate to collect in the vent.

CAUTION

Do not mount the vent in a downward position, as the vent will not drain properly, and may become blocked with ice or debris, resulting in process instability.

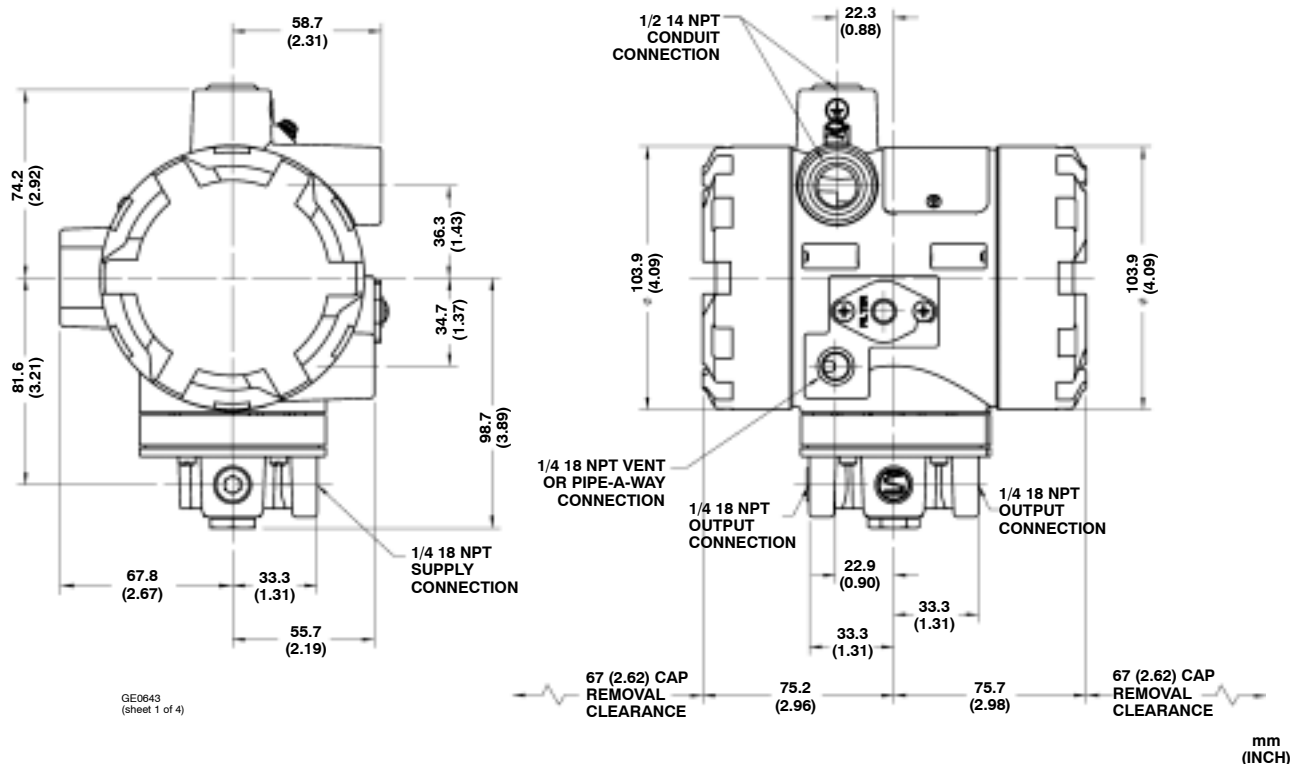


Figure 5. Dimensions and Connections

Pneumatic Connections

As shown in figure 5, all pressure connections on the transducer are 1/4-inch NPT female connections. Use 3/8-inch tubing for all pressure connections. Refer to the vent subsection below for remote vent connections.

Supply Pressure Requirements



WARNING

Severe personal injury or property damage could result from an unstable process if the instrument supply medium is not clean, dry, oil-free and noncorrosive. While use and regular maintenance of a filter that removes particles larger than 40 microns in diameter will suffice in most applications, check with a Fisher Field

office and Industry Instrument air quality standards for use with corrosive air or if you are unsure about the proper amount or method of air filtration or filter maintenance.

Supply pressure must be clean, dry air or noncorrosive gas. Use a Fisher Type 67CFR Filter Regulator, or equivalent, to filter and regulate supply air. The filter regulator can be mounted on a bracket with the transducer as shown in figure 6 or mounted on the actuator mounting boss. An output pressure gauge may be installed on the regulator to indicate the supply pressure to the transducer. Also, as an aid for calibration, a second gauge may be installed on the transducer to indicate transducer output pressure.

Connect the nearest suitable supply source to the 1/4-inch NPT IN connection on the filter regulator (if furnished) or to the 1/4-inch NPT SUPPLY connection on the transducer case (if the filter regulator is not attached).

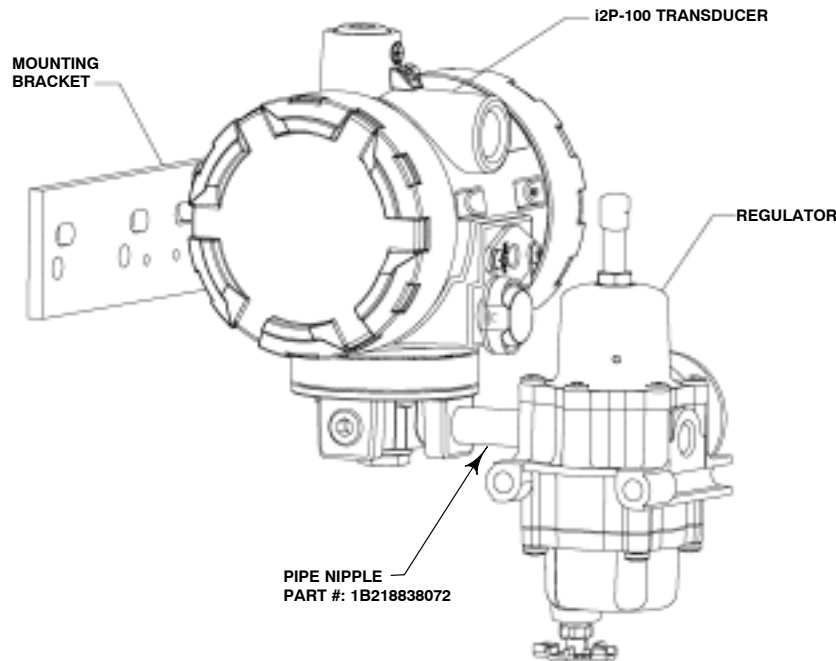


Figure 6. Typical Type i2P-100 Mounting With Type 67CFR Filter Regulator

Diagnostic Connections

To support diagnostic testing of valve/actuator/positioner packages, special connectors and hardware are available. Typical connector installations are shown in figure 7. The hardware used includes a 1/4-inch NPT pipe nipple and pipe tee with a 1/8-inch NPT pipe bushing for the connector. The connector consists of a 1/8-inch NPT body and body protector.

Note

If the Type i2P-100 transducer is used in a valve assembly with a positioner, no hook-up for diagnostic testing is required for the Type i2P-100. The hook-up for diagnostic testing should be installed at the positioner.

Install the connectors and hardware between the Type i2P-100 transducer and the actuator.

1. Before assembling the pipe nipple, pipe tee, pipe bushings, actuator piping, and connector body, apply sealant to all threads.

2. Turn the pipe tee to position the connector body and body protector for easy access when doing diagnostic testing.

Vent

When using natural gas as the supply medium ensure that the following warnings are read and understood. Contact your Emerson Process Management sales office if you have any questions regarding the information contained in this section.



This unit vents the supply medium into the surrounding atmosphere. When installing this unit in a non-hazardous (non-classified) location in a confined area, with natural gas as the supply medium, you must remotely vent this unit to a safe location. Failure to do so

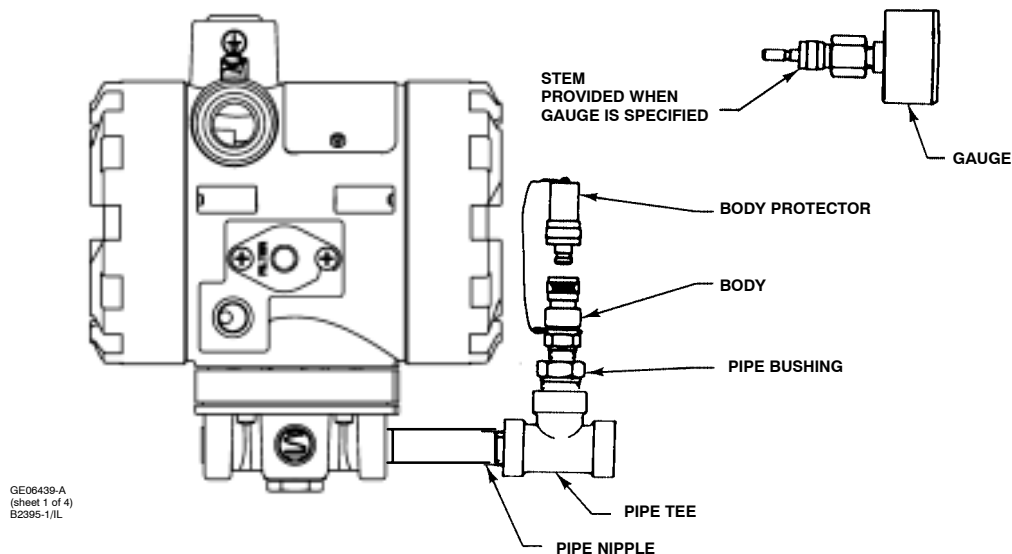


Figure 7. Diagnostics Hookup for Type i2P-100 Transducer

could result in personal injury or property damage from fire or explosion, and area re-classification.

When installing this unit in a hazardous (classified) location remote venting of the unit may be required, depending upon the area classification, and as specified by the requirements of local, regional, and federal codes, rules and regulations. Failure to do so when necessary could result in personal injury or property damage from fire or explosion, and area re-classification.

Vent line piping should comply with local and regional codes and should be as short as possible with adequate inside diameter and few bends to reduce case pressure buildup.

If a remote vent is required, the vent line must be as short as possible with a minimum number of bends and elbows. To connect a remote vent, remove the plastic vent (key 71, figure 13). The vent connection is 1/4-inch NPT female. Use 3/8-inch tubing to provide a remote vent.

Electrical Connections

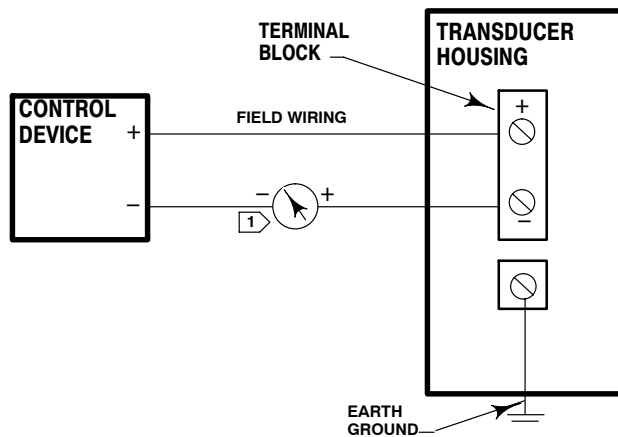
WARNING

For explosion-proof applications, or when using natural gas as the supply medium, disconnect power before removing the housing cap. Personal injury or property damage from fire or explosion may result if power is not disconnected before removing the cap.

For intrinsically safe installations, refer to the nameplate or to instructions provided by the barrier manufacturer, for proper wiring and installation.

Note

For North American explosion-proof applications in the Class/Division system, the i2P-100 has been designed such that a conduit seal is not required. For all other applications install the product as per local, regional, or national code, rules, and regulations.



NOTE:
1 FOR TROUBLESHOOTING OR MONITORING OPERATION,
AN INDICATING DEVICE CAN BE A VOLTMETER ACROSS
A 250 OHM RESISTOR OR A CURRENT METER.
A3875/IL

Figure 8. Typical Field Wiring Diagram

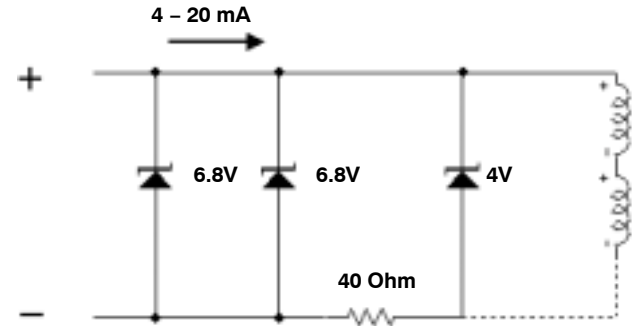


Figure 9. Equivalent Circuit

Calibration



WARNING

Select wiring and/or cable glands that are rated for the environment of use (hazardous location, ingress protection, and temperature). Failure to use properly rated wiring and/or cable glands can result in personal injury or property damage from fire or explosion.

Use the 1/2-inch NPT conduit connection, shown in figure 5, for installation of field wiring.

Refer to figures 8, 9, and 10 when connecting field wiring from the control device to the transducer. Connect the positive wire from the control device to the transducer “+” terminal and, the negative wire from the control device to the transducer “-” terminal. Do not overtighten the terminal screws. Maximum torque is 0.45 N•m (4 lbf•in.). Connect the transducer grounding terminal to earth ground.

Grounding terminals are provided both inside and outside the transducer housing.

Operating Information

During normal operation, the output of the Type i2P-100 transducer is connected to the final control element.



WARNING

On explosion-proof instruments, or when using natural gas as the supply medium, remove electrical power before removing either of the the housing caps in a hazardous area. Personal injury or property damage may result from fire or explosion if power is applied to the transducer with the cap removed in a hazardous area.

For intrinsically safe areas, current monitoring during operation must be with a meter approved for use in hazardous areas.

Equipment Required

Choose a current or voltage source that is capable, without switching ranges, of driving the transducer through its entire input range. Switching ranges on a current or voltage source will produce spikes or mid-scale reverses in the input signal presented to the transducer, causing errors. The current source should be capable of delivering 30 mA with 30 V dc maximum compliance voltage.

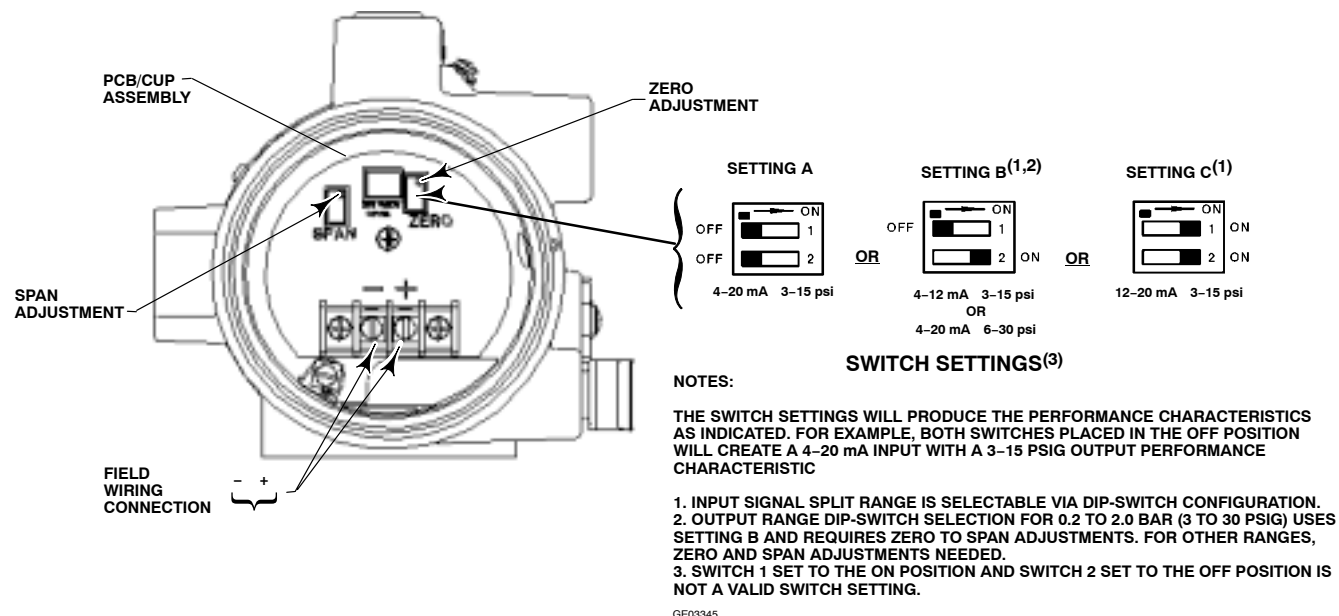


Figure 10. Zero and Span Adjustments and Switch Settings

Calibration Procedure

WARNING

To avoid personal injury or property damage due to an uncontrolled process provide some temporary means of process control before beginning the calibration procedure.

Refer to figure 10 for adjustment locations.

Note

The following steps are for a 4-20 mA, 0.2 to 1.0 bar (3 to 15 psig) configured unit. The same procedure is used for other configurations.

1. Remove electronics module cover (cover adjacent to conduit entry, see figure 3 and 4).

CAUTION

Do not attempt to remove either of the housing caps if the locking set screws (key 8) are engaged. Removing

housing caps without disengaging the set screws can cause damage to the housing caps.

2. Input and output ranges are selectable by dip switch selection. Refer to figure 10 for dip switch settings. Adjust dip switch settings and zero and span as necessary to achieve the desired input/output range.
3. If a current source other than the control device is used as the input source, disconnect the control device and connect the current source positive terminal to the transducer "+" terminal and the current source negative terminal to the transducer "-" terminal.

If an external meter is used, connect the current source positive terminal to the transducer "+" terminal. Connect the meter positive terminal to the transducer "-" terminal and the meter negative terminal to the current source negative terminal as shown in figure 8.

4. Check the supply pressure to ensure it is at the recommended pressure. Refer to table 1, the Specifications table, for supply pressure recommendations.

5. Adjust the input current to the low milliamperes dc.

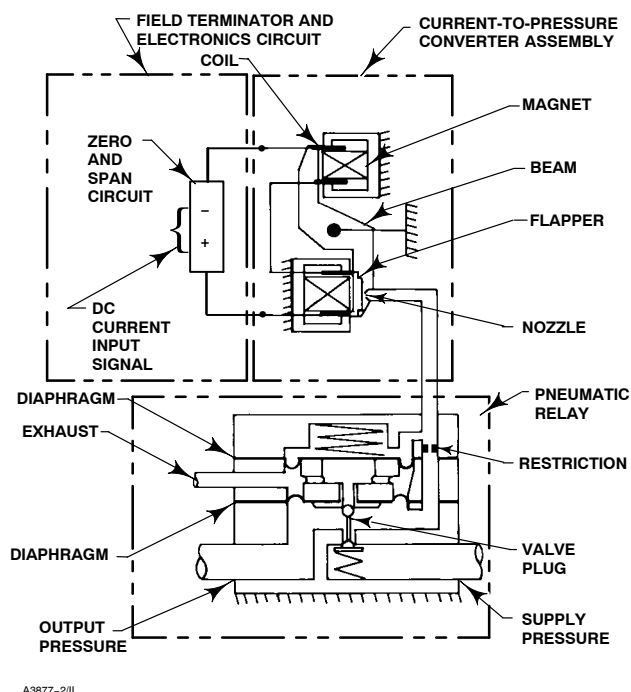


Figure 11. Type i2P-100 Transducer Schematic

6. The output pressure should be 0.2 bar (3 psig). If not, adjust the ZERO potentiometer until the output pressure is 0.2 bar (3 psig).
7. Adjust the input current to the high milliamperes dc.
8. The output pressure should be 1.0 bar (15 psig). If not, adjust the SPAN potentiometer until the output pressure is 0.8 bar (15 psig).
9. Repeat steps 5 through 8 until the output pressure is within the referenced accuracy requirements without further adjustment.
10. If a current source other than the control device was used, disconnect the current source and reconnect the control device.

Principle of Operation

The converter module receives a standard dc current input signal from a control device to operate coils in a force balanced beam system which in turn, controls bleed air through an integral nozzle/flapper arrangement. The nozzle pressure provides the input signal to operate the relay as shown in figure 11. Relay output pressure is applied, through tubing, directly to the final control element or valve/actuator assembly.

Maintenance

Due to normal wear or damage from external sources such as debris in the supply medium, periodic maintenance or repair of the transducer may be necessary. Maintenance of the transducer consists of troubleshooting, removal for inspection, and replacement of component parts, as well as removal and inspection of the external removable filter/restriction and cleaning or replacing as necessary (see figure 1).



WARNING

To avoid personal injury or property damage from the sudden release of pressure, air or natural gas:

- Always wear protective clothing, gloves, and eyewear when performing any maintenance operations.
- Disconnect any operating lines providing air pressure, electric power, or a control signal to the actuator. Be sure the actuator cannot suddenly open or close the valve.
- Use bypass valves or completely shut off the process to isolate the valve from process pressure. Relieve process pressure on both sides of the valve.
- Use lock-out procedures to be sure that the above measures stay in effect while you work on the equipment.
- Check with your process or safety engineer for any additional measures that must be taken to protect against process media.



WARNING

When using natural gas as the supply medium, or for explosion proof applications, the following warnings also apply:

- Remove electrical power before removing either housing cap. Personal injury or property damage from fire or explosion may result if power is not disconnected before removing either cap.
- Remove electrical power before disconnecting any of the pneumatic

connections or removing the external removeable filter/restriction.

When disconnecting any of the pneumatic connections or the external removeable filter/restriction, natural gas will seep from the unit and any connected equipment into the surrounding atmosphere. Personal injury or property damage may result from fire or explosion if preventative measures are not taken, such as adequate ventilation and the removal of any nearby ignition sources.

CAUTION

Do not attempt to remove either of the housing caps if the locking set screws (key 8) are engaged. Removing housing caps without disengaging the set screws can cause damage to the housing caps.

CAUTION

When replacing components, use only components specified by the factory. Always use proper component replacement techniques, as presented in this manual. Improper techniques or component selection may invalidate the approvals and the product specifications, as indicated in table 1. It may also impair operations and the intended function of the device

The converter module and the electronics module are non-repairable. If troubleshooting or alignment attempts indicate a faulty converter or electronics module, replace the module or return the transducer to your Emerson Process Management sales office for repair.

Troubleshooting



WARNING

Refer to the **WARNING** at the beginning of this section.

Electrical

The following procedures require taking the control valve/actuator assembly out of service. Provide some temporary means of process control before taking the control valve out of service.

1. Ensure terminal lug connections from the control device to the transducer are of the correct polarity (refer to the electrical connection procedures in the Installation section of this manual).
2. At the transducer, ensure that the milliamper dc signal is applied, and ensure that it is within the 4 to 20 milliamper range.
3. Check switches and ensure that they are properly set. Refer to figure 10.
4. If the problem has not been resolved, see Electronics Module Replacement in this manual.

Pneumatic

Provide a 4 to 30 milliamper dc current source, supply pressure, and a gauge to monitor the output pressure when checking transducer operation. Refer to figure 13 for key number locations.

1. Ensure that supply pressure to the transducer meets your requirements [0.3 bar (5 psi) higher than upper range limit of output signal, with a maximum of 3.4 bar (50 psi)].
2. Ensure that the filter (key 11) and restrictor (key 10) are open and clean. Remove the two screws (key 14), the filter cap (key 13) and the O-ring (key 12) to access the filter and restrictor.
3. If a filter/regulator is used, ensure that it is working correctly. If not, ensure the dripwell is not plugged because of excessive moisture accumulation. If necessary, drain off any moisture, and clean or replace the filter element.
4. Force the converter module to maximum output pressure with a 30 milliamper dc signal. Output pressure should build up to the approximate value of the supply pressure [maximum of 3.4 bar (50 psi)].
5. When the input current is removed, the transducer output pressure should drop to less than 0.14 bar (2 psig). If it does not, check to ensure the vent and exhaust air passageway is free from foreign material.
6. To inspect the relay assembly, refer to the Relay Maintenance procedures in this manual.
7. If the problem has not been resolved, see Converter Module Replacement in this manual.

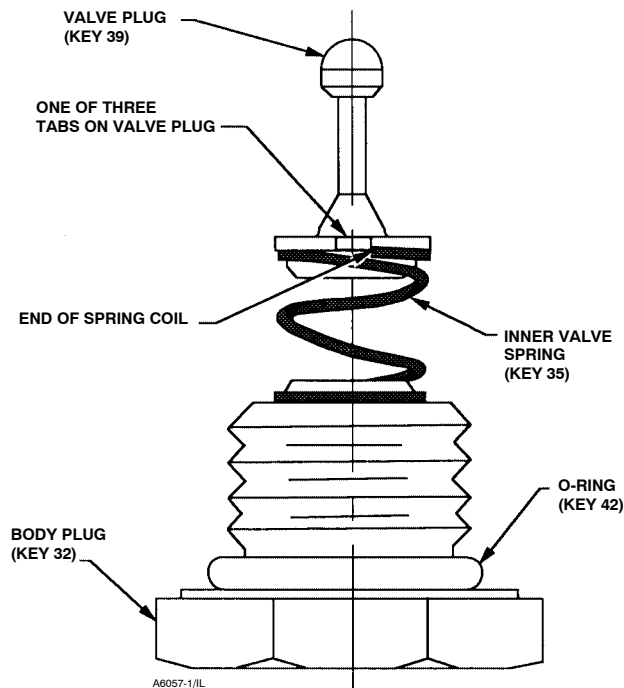


Figure 12. Valve Plug, Inner Valve Spring and Body Plug Assembly

Converter Module Replacement

WARNING

Refer to the **WARNING** at the beginning of this section.

Removal

Refer to figure 13 for key number locations.

1. Remove the housing cap (key 2) (the cap farthest away from the conduit). Note that the set screw associated with this housing cap (key 8) needs to be loosened to remove the cap.
2. Unscrew the two captive screws (key 52) and remove the converter module from the housing.
3. Inspect the O-ring (key 55) and replace if necessary.

Replacement

1. Lubricate the O-ring (key 55) with a silicone sealant before replacing the converter module in the housing.

2. Insert the converter module into position in the housing (key 1). Replace the two screws (key 52) and tighten them.
3. Replace the housing cap (key 2), making sure to re-tighten the set screw (key 8).
4. Electrically calibrate the unit using the procedure in the Calibration section of this manual.

Electronics Module Replacement

WARNING

Refer to the **WARNING** at the beginning of this section.

Removal

Refer to figure 13 for key number locations.

1. Remove the housing cap (key 2) (the cap closest to the conduit). Note that the set screw (key 8) associated with this housing cap needs to be loosened to remove the cap.
2. Note the location of the wires, then remove the electrical wiring from the terminal block.
3. Remove the three screws (key 26) and remove the electronics module from the housing.

Replacement

1. Insert the electronics module into position in the housing (key 1). Replace the three screws (key 26) and tighten them.
2. Replace the electrical wiring removed in step 1 of the removal procedures. Do not overtighten the terminal screws. Maximum torque is 0.45 N•m (4 lbf•in).
3. Electrically calibrate the unit using the procedure in the Calibration section of this manual.
4. Replace the housing cap (key 2), making sure to re-tighten the set screw (key 8).

Relay Maintenance

WARNING

Refer to the **WARNING** at the beginning of this section.

Refer to figures 12 and 14 for key number locations.

Removal

1. Remove the four mounting screws (key 36, shown in figure 14) and remove the relay from the transducer. Be careful not to lose the bias spring (key 34) and input diaphragm (key 38).
2. Remove the body plug (key 32) that holds the inner valve spring (key 35) and valve plug (key 39) in place from the relay body assembly.
3. Remove the exhaust port assembly (key 33) from the relay assembly.
4. Inspect the springs, exhaust seat, valve plug, and other parts for wear or damage; replace as necessary. Note: the valve plug supply seat is an insert in the relay body (key 41). If this insert is bad, replace the relay body.
5. Make sure all parts of the relay are clean and that all passages are clear of foreign matter.

Assembly

1. Assemble the inner valve spring (key 35) onto the body plug (key 32) and fit the valve plug (key 39) onto the inner valve spring as shown in figure 12. To assure best alignment between the valve plug, inner valve spring, and body plug; fit the valve plug onto the inner valve spring so that one of the three tabs at the base of the valve plug sets at the end of the last coil of the inner valve spring.
2. Lubricate the O-ring (key 42) with a silicone sealant (key 37). Insert the assembled valve plug, inner valve spring, and body plug into the relay body (key 41). Compress the spring and thread the body plug (key 5) into place. Then, tighten the body plug.
3. Insert two of the mounting screws (key 36) into two opposite holes of the relay body (key 41). Hold the screws in place while assembling the following parts on the relay body. The screws serve as studs to align the parts as they are being assembled.
4. When replacing the exhaust port assembly (key 33), make sure all passages and screw holes are aligned and that the hole in the center of the exhaust port assembly fits over the valve plug (key 39). Place the exhaust port assembly on the relay body (key 41). Hold assembled parts in place.
5. Make sure the tabs on the body block (key 40) align with the tabs on the relay body (key 41) and that the side with 5 holes faces the relay body. Place the body block on the assembled parts. Hold assembled parts in place.
6. When replacing the input diaphragm (key 38), make sure all passages and screw holes are

aligned. Place the input diaphragm on the body block (key 40). Hold assembled parts in place.

7. Install the bias spring (key 34) into the transducer housing assembly (key 1). Make sure the tabs on the body block and relay body align with the tab on the transducer housing assembly. Place the assembled parts onto the transducer housing assembly. Thread the two mounting screws (key 36) into the transducer housing assembly. Install the remaining two mounting screws. Tighten all mounting screws to 2 N•m (20 lbf•in).

8. Perform the procedure in the Calibration section of this manual.

Parts Ordering

A serial number is assigned to each transducer and stamped on the nameplate. Always refer to this serial number when corresponding with your Emerson Process Management sales office regarding spare parts or technical information. When ordering replacement part, also specify the complete 11-character part number from the Parts list.

Note

Use only genuine Fisher replacement parts. Components that are not supplied by Emerson Process Management should not, under any circumstances, be used in any Fisher instrument. Use of components not supplied by Emerson Process Management will void your warranty, might adversely affect the performance of the instrument, and might jeopardize worker and workplace safety.

Note

Neither Emerson, Emerson Process Management, nor Fisher, nor any of their affiliated entities assumes responsibility for the selection, use and maintenance of any product. Responsibility for the selection, use and maintenance of any product remains with the purchaser and end-user.

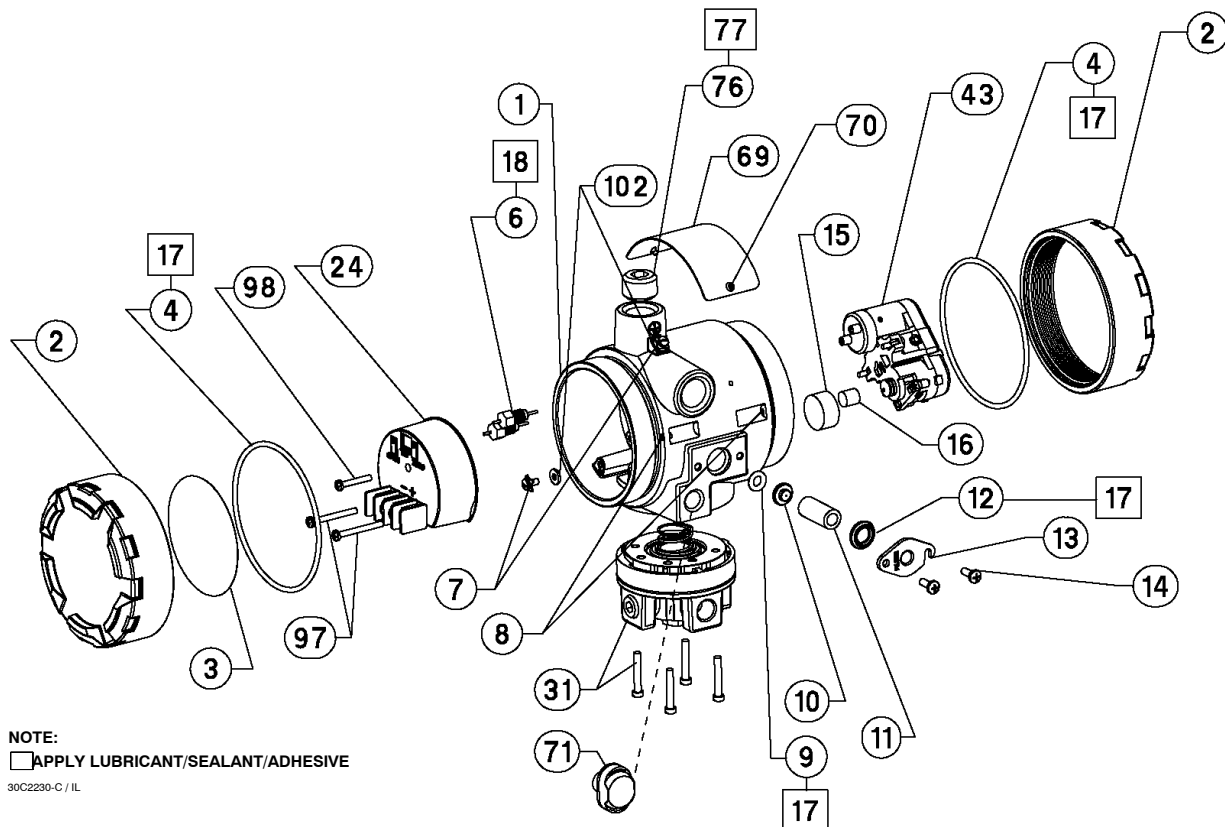


Figure 13. Type i2P-100 Transducer Assembly

Parts Kits

Description	Part Number
Repair Kit for Type i2P-100 electro-pneumatic transducer Contains O-rings (keys 4, 9, 12, and 55) and Filter (key 11)	R2P100X0012

Key	Description	Part Number
8	Set Screw (2 req'd)	1B4556X0012
9*	O-Ring ⁽¹⁾	
10	Restrictor, Primary	10C2233X012
11*	Filter ⁽¹⁾	
12*	O-Ring ⁽¹⁾	
13	Filter Cap	GB0122X0012
14	Machine Screw (2 req'd)	19B0821X012
15	Flame Arrestor	GE06959X012
16	Flame Arrestor	GE02963X012
17	Lubricant, silicone sealant (not furnished with transducer)	
18	Thread locking adhesive, high strength (not furnished with transducer)	
55	O-Ring ⁽¹⁾	
69	Nameplate, aluminum	---
70	Screw (2 req'd)	1P426928982
71	Vent Assembly	GE06162X012
76	Pipe Plug	1H5137X0012
102	Washer	1C332928982

Parts List (see figure 13)

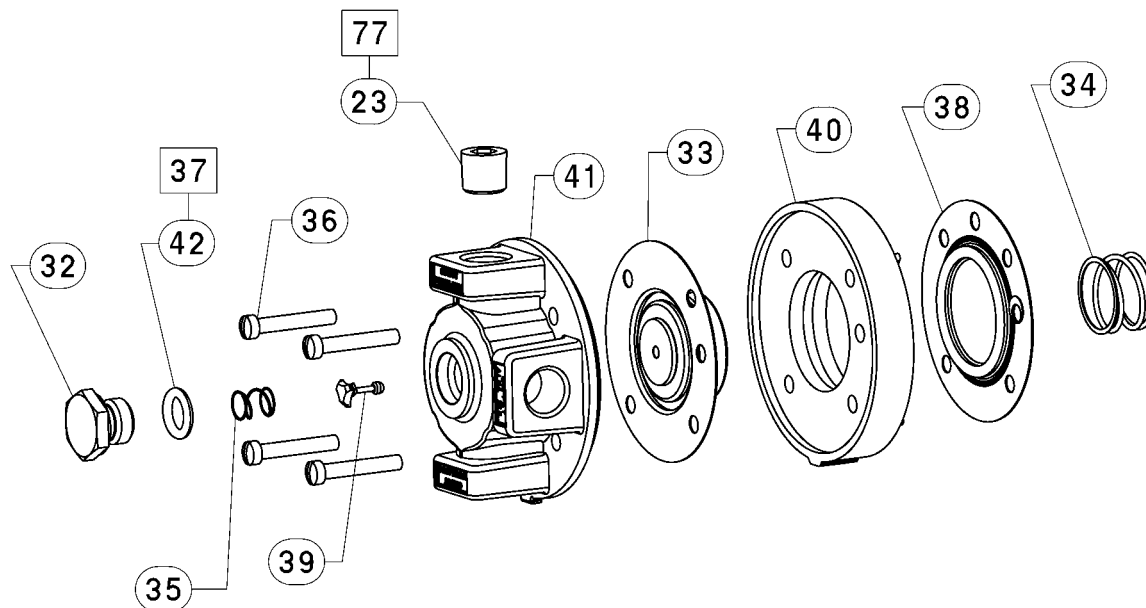
Housing

Key	Description	Part Number
1	Housing, Aluminum	
2	Cover (2 req'd)	48B6515X022
3	Configuration Label	GE03345X012
4*	O-Ring ⁽¹⁾ (2 req'd)	
6	Feed Thru (2 req'd)	
7	Wire Retainer (2 req'd)	16A2821X012

PWB/Cup Assembly

24*	PWB/Cup Assembly	GE10168X012
97	Machine Screw (2 req'd)	GE11776X012
98	Machine Screw	GE11777X012

*Recommended spare parts
 1. Available in the Repair Kit



NOTE:

☐ APPLY LUBRICANT/SEALANT/ADHESIVE

30C2258-B/IL

Figure 14. Type i2P-100 Relay Assembly

Key	Description	Part Number	Key	Description	Part Number
Relay Assembly (see figure 14)					
41	Relay / Body Assembly	GE03512X012	Diagnostic Connections		
42	O-Ring	1E5477X0062			
36	Machine Screw, fill hd (4 req'd)	1H1581X0012			
32	Body Plug	11B2363X012			
33	Exhaust Port Assembly	11B2364X012			
35	Spring	11B2369X012			
37	Lubricant, silicone sealant (not furnished with relay)	11B6843X012			
38	Upper Diaphragm	21B2362X012			
39	Valve Plug	21B2370X012			
40	Body Block	31B2356X012			
77	Anti-Seize Sealant (not furnished with relay)		Note		

FlowScanner™ diagnostic system hook-up

Includes pipe tee, pipe nipple, pipe bushings, connector body, and body protector. See figure 7 for part identification. Also, part number provides correct quantities of each item.

I/P Converter Assembly

43*	I/P Converter Assembly	30C2218X012
-----	------------------------	-------------

Gauge/Pipe Plug

23	Pipe plug, use when gauge is not specified (not shown)	
	Alloy steel pl	1C333528992
	Stainless steel	1C3335X0032
23	Gauge, (not shown)	
	0–30 psig/0–0.2 MPa/0–2 bar	11B8579X022
	0–60 psig/0–0.4 MPa/0–4 bar	11B8579X032

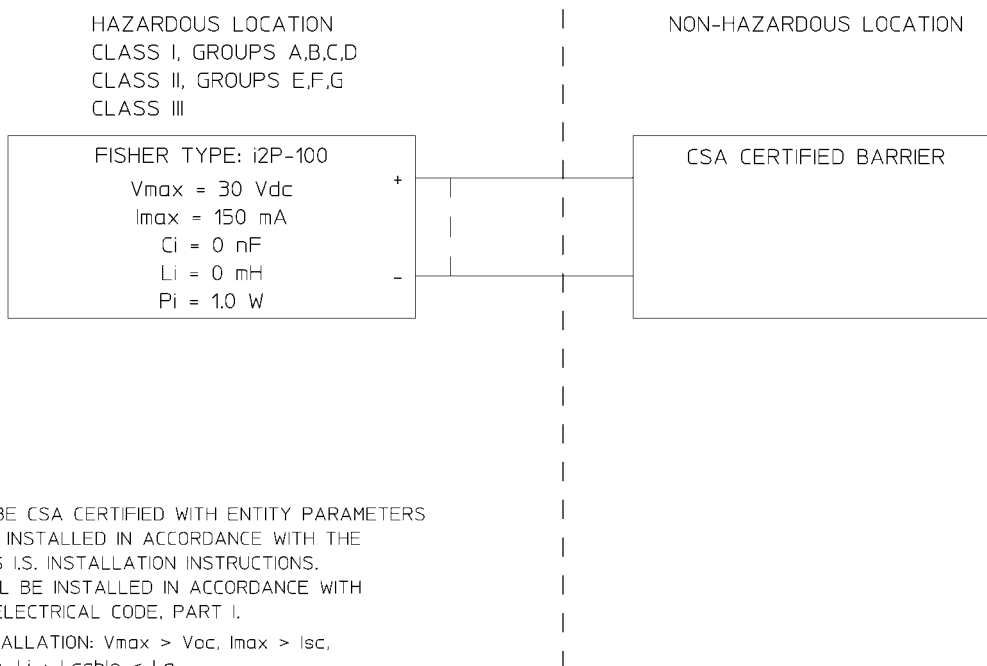
Side Output

For units with gauges	
SST fittings	12B8040X052
Brass fittings	12B8040X062
For units without gauges	
SST fittings	12B8040X072
Brass fittings	12B8040X082

Key	Description	Part Number	Key	Description	Part Number
Mounting Parts			Casing Mounting		
Yoke Mounting			Type 657 and 667 size 30, 34, 40, 45, 50 and 60		
Type 470 size 23 through 64			80	Mounting Bracket, steel	1F401225072
80	Mounting Bracket, steel	3P426825022	81	Washer, steel pl (2 req'd)	1B865928982
81	Washer, steel pl (4 req'd)	1B865928982	82	Cap Screw, steel pl (2 req'd)	1A381624052
82	Cap Screw, steel pl (4 req'd)	1A381624052	83	Screw (req'd)	1A582824052
480 Series actuator boss			Type 657 and 667 size 70		
80	Mounting Bracket, steel	3P426825022	80	Mounting Bracket, steel	1F401225072
81	Washer, steel pl (4 req'd)	1B865928982	81	Washer, steel pl (2 req'd)	1B865928982
82	Cap Screw, steel pl (4 req'd)	1A381624052	82	Cap Screw, steel pl (2 req'd)	1A381624052
83	Screw, steel pl (2 req'd)	1C5958X0022	83	Screw (2 req'd)	1A368324052
85	Mounting Bracket, Steel	3L276725092	Type 1051 and 1052 size 20, 33, 40, 60 and 70		
86	Hex Nut, steel pl (2 req'd)	1A352724122	80	Mounting Bracket, steel	1F401225072
Type 585C size 25 and 50			81	Washer, steel pl (2 req'd)	1B865928982
80	Mounting Bracket, steel	3P426825022	82	Cap Screw, steel pl (2 req'd)	1A381624052
81	Washer, steel pl (4 req'd)	1B865928982	83	Screw (req'd)	1A582824052
82	Cap Screw, steel pl (4 req'd)	1A381624052	Type 1250 and 1250R all sizes		
83	Screw, steel pl (2 req'd)	1A352624052	80	Mounting Bracket, steel	30B1265X022
Type 585C (470) size 60, 68, 100, and 130 ; Type 657 and 667 size 30, 34, 40, 45, 50, 60, 70, 80 & 87; Type 1051 and 1052 size 40, 60 and 70; Type 1061 all sizes			81	Washer, steel pl (2 req'd)	1B865928982
80	Mounting Bracket, steel	3P426825022	82	Cap Screw, steel pl (2 req'd)	1A381624052
81	Washer, steel pl (4 req'd)	1B865928982	87	Washer	10B6610X012
82	Cap Screw, steel pl (4 req'd)	1A381624052	91	U-Bolt (2 req'd)	19A7930X012
83	Screw, steel pl (2 req'd)	1C870224052	92	Hex Nut (req'd)	19A4838X012
84	Spacer	1K766824092	Pipestand Mounting		
			80	Mounting Bracket, steel	3P426825022
			81	Washer, steel pl (4 req'd)	1B865928982
			82	Cap Screw, steel pl (2 req'd)	1A381624052
			88	Pipe Clamp, steel pl	1P427028982
			Surface Mounting		
			80	Mounting Bracket, Steel	GE07077X012
			82	Cap Screw	1B6098X0012

Loop Schematics/Nameplates

CSA ENTITY INSTALLATION DRAWING



NOTES:

1. BARRIERS MUST BE CSA CERTIFIED WITH ENTITY PARAMETERS AND ARE TO BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURERS I.S. INSTALLATION INSTRUCTIONS.
2. EQUIPMENT SHALL BE INSTALLED IN ACCORDANCE WITH THE CANADIAN ELECTRICAL CODE, PART I.
3. FOR ENTITY INSTALLATION: Vmax > Voc, Imax > Isc, Ci + Ccable < Ca, Li + Lcable < La.

GE07471

Figure 15. CSA Loop Schematic




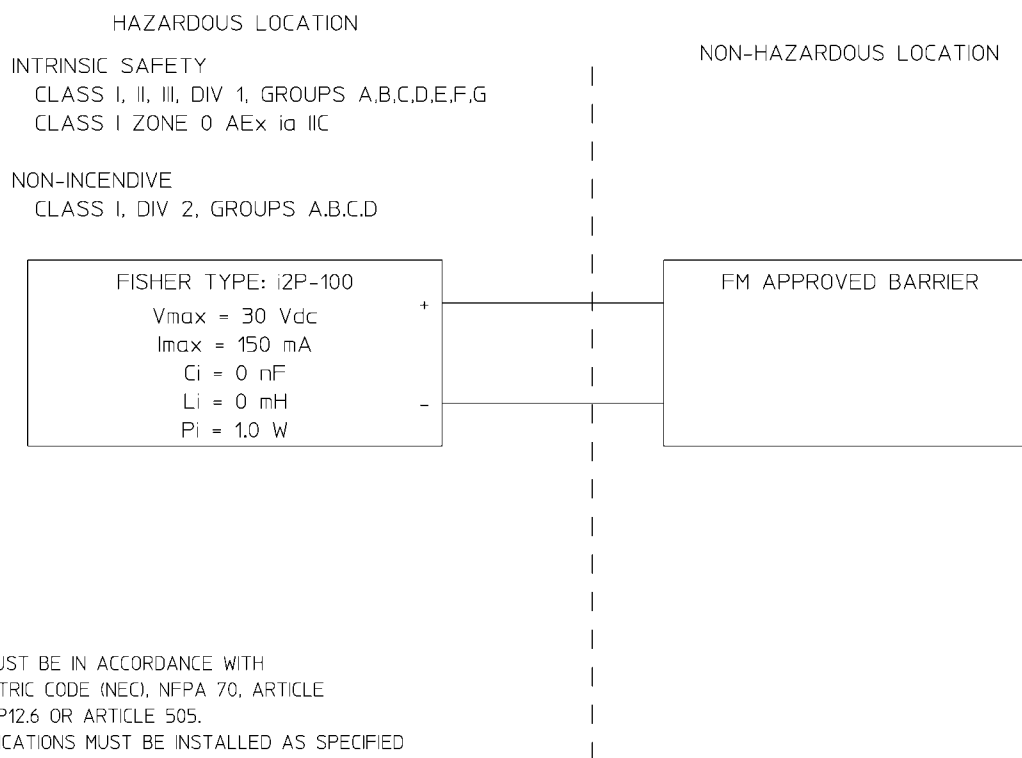
TYPE i2P-100		20 mADC == MAX, 30 VDC == MAX, 50 PSI MAX AMB. TEMP: -40 TO 85°C	APPROVED FOR NATURAL GAS AS SUPPLY MEDIUM. CSA ENCLOSURE 3, NEMA 3	FISHER CONTROLS INTL LLC MARSHALLTOWN, IOWA, USA MFG LOCATION
SERIAL NO. <input type="text"/>	FACTORY CALIBRATED AS: INPUT: 4-20 mADC == OUTPUT: 3-15 PSI <input type="checkbox"/> 6-30 PSI <input type="checkbox"/> FIELD CALIBRATED AS: INPUT: _____ mA OUTPUT: _____ PSI			
 <p>SEAL NOT REQUIRED. CL I DIV 1 GP ABCD T5; CL I DIV 2 GP ABCD T5 CL II DIV 1 GP EFG T5; CL II DIV 2 GP FG T5 Ex ia INTRINSICALLY SAFE CL I,II,III DIV 1 GP ABCDEFG T3(Tamb≤85°C)/T4(Tamb≤81°C)/T5(Tamb≤46°C) WHEN INSTALLED PER DRAWING GE07471 Ex ia IIC T3(Tamb≤85°C)/T4(Tamb≤81°C)/T5(Tamb≤46°C) Ui,Vmax=30V Ii,Imax=150mA Pi=1.0W Ci=0nF Li=0uH Ex d IIC T5(Tamb≤85°C)/T6(Tamb≤75°C) Ex nC IIC T5(Tamb≤85°C)/T6(Tamb≤75°C) US PATENTS - 4836011 - 4595029 OTHER PATENTS PENDING</p>			<p>SEAL NOT REQUIRED IS: CL I,II,III DIV 1,2 GP ABCDEFG T3(Tamb≤85°C)/T4(Tamb≤81°C)/ T5(Tamb≤46°C) WHEN INSTALLED PER DWG GE07470 XP: CL I DIV 1 GP ABCD T5(Tamb≤85°C)/T6(Tamb≤75°C) NI: CL I DIV 2 GP ABCD T5(Tamb≤85°C)/T6(Tamb≤75°C) DIP: CL II DIV 1 GP EFG T5(Tamb≤85°C)/T6(Tamb≤75°C) S: CL II DIV 2 GP FG T5(Tamb≤85°C)/T6(Tamb≤75°C) CLASS I ZONE 0 AEx ia IIC T3(Tamb≤85°C)/T4(Tamb≤81°C)/ T5(Tamb≤46°C) Ui,Vmax=30V Ii,Imax=150mA Pi=1.0W Ci=0nF Li=0mH CLASS I ZONE 1 AEx d IIC T5(Tamb≤85°C)/T6(Tamb≤75°C) CLASS I ZONE 2 AEx nC IIC T5(Tamb≤85°C)/T6(Tamb≤75°C)</p>	
<p>WARNING: SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY. OPEN CIRCUIT BEFORE REMOVING COVER. WHEN OPERATING OVER 70°C USE SUITABLE CABLING/WIRING.</p>				
				
			GE13955	

Figure 16. CSA and FM Approvals Nameplate



NOTES:

1. THE INSTALLATION MUST BE IN ACCORDANCE WITH THE NATIONAL ELECTRIC CODE (NEC), NFPA 70, ARTICLE 504 AND ANSI/ISA RP12.6 OR ARTICLE 505.
2. CLASS 1, DIV 2 APPLICATIONS MUST BE INSTALLED AS SPECIFIED IN NEC ARTICLE 501-4(B). EQUIPMENT AND FIELD WIRING IS NON-INCENDIVE WHEN CONNECTED TO APPROVED BARRIERS WITH ENTITY PARAMETERS.
3. LOOPS MUST BE CONNECTED ACCORDING TO THE BARRIER MANUFACTURER'S INSTRUCTIONS.
4. MAXIMUM SAFE AREA VOLTAGE SHOULD NOT EXCEED 250 Vrms.
5. RESISTANCE BETWEEN BARRIER GROUND AND EARTH GROUND MUST BE LESS THAN ONE OHM.
6. NORMAL OPERATING CONDITIONS 30 Vdc 20 mADC.
7. FOR ENTITY INSTALLATION (U.S. AND N.I.):
 $V_{max} > V_{oc}, \text{ or } V_t$ $C_i + C_{cable} < C_a$
 $I_{max} > I_{sc}, \text{ or } I_t$ $L_i + L_{cable} < L_a$
 $P_i > P_o, \text{ or } P_t$

GE07470

Figure 17. FM Loop Schematic

ATEX INTRINSIC SAFETY APPROVAL INFORMATION

ATEX FLAMEPROOF APPROVAL INFORMATION

ATEX TYPE n APPROVAL INFORMATION


IECEx APPROVAL INFORMATION


TYPE i2P-100 US PATENTS - 4836011 - 4595029 20 mADC == MAX, 30 VDC == MAX, 50 PSI MAX
OTHER PATENTS PENDING AMB TEMP: -40 TO 85°C, IP64
APPROVED FOR NATURAL GAS AS SUPPLY MEDIUM


FISHER CONTROLS INTL LLC
MARSHALLTOWN, IOWA, USA
MFG LOCATION:

SERIAL NO
SERIE NO
SERIEV NO

FACTORY CALIBRATED AS:
INPUT: 4-20 mADC == OUTPUT: 3-15 PSI 6-30 PSI
FIELD CALIBRATED AS: INPUT mADC == OUTPUT

☐ KEMA 05 ATEX 1109X  II 1 G D
EEx ia IIC T3(Tamb≤85°C)
T4(Tamb≤81°C) T5(Tamb≤46°C)
Ui = 30V li = 150mA Pi = 1.0W
Ci = 0F Li = 0H
USE ONLY WITH A LINEAR BARRIER
MAXIMUM ENCLOSURE SURFACE TEMPERATURE
T95°C(Tamb≤85°C)

☐ KEMA 05 ATEX 2099X  II 2 G D
EEx d IIC T5(Tamb≤85°C)
T6(Tamb≤75°C)

☐ KEMA 05 ATEX 1119
 11 3 GD EEx nC II
T5(Tamb≤85°C) T6(Tamb≤75°C)

MAXIMUM ENCLOSURE SURFACE TEMPERATURE
T95°C(Tamb≤85°C)

MAXIMUM ENCLOSURE SURFACE TEMPERATURE
T95°C(Tamb≤85°C)

MAXIMUM ENCLOSURE SURFACE TEMPERATURE
T95°C(Tamb≤85°C)

IECEx CSA 05.0010X
Ex ia IIC T3(Tamb≤85°C) T4(Tamb≤81°C) T5(Tamb≤46°C)
Ui=30V li=150mA Pi=1.0W Ci=0F Li=0H
Ex d IIC T5(Tamb≤85°C) T6(Tamb≤75°)
Ex nC IIC T5(Tamb≤85°C) T6(Tamb≤75°C)

CAUTION/WARNINGS:
• ELECTROSTATIC CHARGE HAZARD - DO NOT RUB OR CLEAN WITH SOLVENTS. TO DO SO COULD RESULT IN AN EXPLOSION.
• WHEN OPERATING OVER 70°C, USE SUITABLE CABLING/WIRING.
• FOR ATEX APPROVALS ONLY - USER MUST SELECT AND MARK ONLY ONE PROTECTION METHOD UPON INSTALLATION. ONCE MARKED IT SHALL NOT BE CHANGED. NOT FOLLOWING THESE INSTRUCTIONS WILL JEOPARDIZE THE EXPLOSION SAFETY.

CE 1180

FISHER

GE06337

Figure 18. ATEX and IECEx Approvals Nameplate

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Fisher

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Cernay 68700 France
Sao Paulo 05424 Brazil
Singapore 128461

www.Fisher.com



PENBERTHY

material specifications

Section 2000
Material Specification 2606.1
Issued 09/05
Replaces 07/02

For: RM and TM GAGES

Ref. No.	Description	STANDARD MATERIALS					Optional Materials
		Carbon Steel to -20°F	STS Wetted to -20°F	STS Construction to -325°F	Sour Gas Service to -20°F	Low-Temp Steel to -50°F	
1	Cover	size 1 & 2	ASTM A216 (cast) Carbon Steel Gr. WCB	ASTM A351 316/316L STS (cast) Gr. CF3M	ASTM A216 Gr. WCB (cast) Carbon Steel	ASTM A216 Gr. WCB Austenitized Carbon Steel	ASTM A351 304/304L STS Gr. CF3 ASTM A182 Gr. F51 Duplex 2205 STS ASTM A494 Hastelloy B® Gr. N-12MV ASTM A352 Carbon Steel Gr. LCC ASTM A743 Alloy 20 Gr. CN7M ASTM B564 Monel® 400 N04400 ASTM A494 Hastelloy C® Gr. CW12MW ASTM A123 Galvanized Steel
		size 3 - 9	ASTM A105 (forged) Carbon Steel		ASTM A105 (forged) Carbon Steel	ASTM A350 (forged) Carbon Steel Gr. LF2 Cl. 1	
2	Chamber	ASTM A105 (forged) Carbon Steel	ASTM A276 316/316L STS		ASTM A105 (forged) Carbon Steel per NACE MR0175 &/OR MR0103	ASTM A516 Carbon Steel Gr. 70/S5 -50°F	ASTM A276 304/304L STS ASTM A276 Duplex 2205 STS ASTM B164 Monel® 400 ASTM B473 Alloy 20 (CARP 20 Cb3)® ASTM B335 Hastelloy B® ASTM B575 Hastelloy C® 276 ASTM A123 Galvanized Steel
4	Nut	ASTM A194 Carbon Steel Gr. 2 or 2H		ASTM A194 316 STS Gr. 8M	ASTM A194 Carbon Steel Gr. 2 or 2H	ASTM A194 316 STS Gr. 8M	ASTM A153 Galvanized Steel
7	Gasket	Grafoil® Gr. GHP w/polyester (Mylar) insert					Nobestos® D7301 Garlock® 3000,3100,3200,3300,5500 PCTFE (replaces Kel-F®) Gylon® 3500, 3504, 3510 Teflon® (25% glass filled, virgin) Grafoil® Gr. GHR w/316 STS insert Buna-N Neoprene® Viton® consult factory for others
8	Cushion						
9	Shield ^A	None					ASTM D351 Mica Gr. V-4 PCTFE (replaces Kel-F®)
48	Glass	Reflex or Transparent Style Tempered Borosilicate					Aluminosilicate (Transparent only)
100	Cap Screw or U-Bolt	AISI 4140 or 4142 Alloy Steel per ASTM A193 Gr. B7		ASTM A193 316 STS Gr. B8M Cl. 2	AISI 4140 or 4142 Alloy Steel per ASTM A193 Gr. B7	ASTM A320 Alloy Steel Gr. L7	ASTM A153 Galvanized Steel
125	Washer	ASTM B633 Zinc Plated Carbon Steel		18-8 STS (302-304 STS)	ASTM B633 Zinc Plated Carbon Steel	18-8 STS (302-304 STS)	None
331	Band	Rubber					None

^A under no circumstances should shields be used in reflex style gages. Installation of shields in reflex style gages will keep the fluid from coming in contact with the reflective prisms, thereby prohibiting visibility of the liquid level in the gage.

PENBERTHY

material specifications

Section 2000
Material Specification 2606.2
Issued 09/05
Replaces 07/02

For: RMR and TMR GAGES

Ref. No.	Description	STANDARD MATERIALS					Optional Materials
		Carbon Steel to -20°F	STS Wetted to -20°F	STS Construction to -325°F	Sour Gas Service to -20°F	Low-Temp Steel to -50°F	
1	Cover	size 1 - 3	ASTM A695 Carbon Steel Gr. 45	ASTM A240 316L STS	ASTM A695 Carbon Steel Gr. 45	ASTM A695 Gr. 45 Austenitized Carbon Steel	ASTM A351 304/304L STS Gr. CF3 ASTM A182 Gr. F51 Duplex 2205 STS ASTM A494 Hastelloy B® Gr. N-12MV ASTM A352 Carbon Steel Gr. LCC ASTM A743 Alloy 20 Gr. CN7M ASTM B564 Monel® 400 N04400 ASTM A494 Hastelloy C® Gr. CW12MW ASTM A123 Galvanized Steel
		size 4 - 9	ASTM A105 (forged) Carbon Steel	ASTM A351 316/316L STS (cast) Gr. CF3M	ASTM A105 (forged) Carbon Steel	ASTM A350 (forged) Carbon Steel Gr. LF2 Cl. 1	
2	Chamber	ASTM A105 (forged) Carbon Steel	ASTM A276 316/316L STS		ASTM A105 (forged) Carbon Steel per NACE MR0175 &/OR MR0103	ASTM A516 Carbon Steel Gr. 70/S5 -50°F	ASTM A276 304/304L STS ASTM A276 Duplex 2205 STS ASTM B164 Monel® 400 ASTM B473 Alloy 20 (CARP 20 Cb3)® ASTM B335 Hastelloy B® ASTM B575 Hastelloy C® 276 ASTM A123 Galvanized Steel
4	Nut	ASTM A194 Carbon Steel Gr. 2 or 2H		ASTM A194 316 STS Gr. 8M	ASTM A194 Carbon Steel Gr. 2 or 2H	ASTM A194 316 STS Gr. 8M	ASTM A153 Galvanized Steel
7	Gasket	Grafoil® Gr. GHP w/polyester (Mylar) insert					Nobestos® D7301 Garlock® 3000, 3100, 3200, 3300, 5500 PCTFE (replaces Kel-F®) Gylon® 3500, 3504, 3510 Teflon® (25% glass filled, virgin) Grafoil® Gr. GHR w/316 STS insert Buna-N Neoprene® Viton® consult factory for others
8	Cushion						
9	Shield ^A	None					ASTM D351 Mica Gr. V-4 PCTFE (replaces Kel-F®)
48	Glass	Reflex or Transparent Style Tempered Borosilicate					Aluminosilicate (Transparent only)
100	Cap Screw or U-Bolt	AISI 4140 or 4142 Alloy Steel per ASTM A193 Gr. B7	ASTM A193 316 STS Gr. B8M Cl. 2	AISI 4140 or 4142 Alloy Steel per ASTM A193 Gr. B7	ASTM A320 Alloy Steel Gr. L7		ASTM A153 Galvanized Steel
125	Washer	ASTM B633 Zinc Plated Carbon Steel	18-8 STS (302-304 STS)	ASTM B633 Zinc Plated Carbon Steel	18-8 STS (302-304 STS)		None
331	Band	Rubber					None

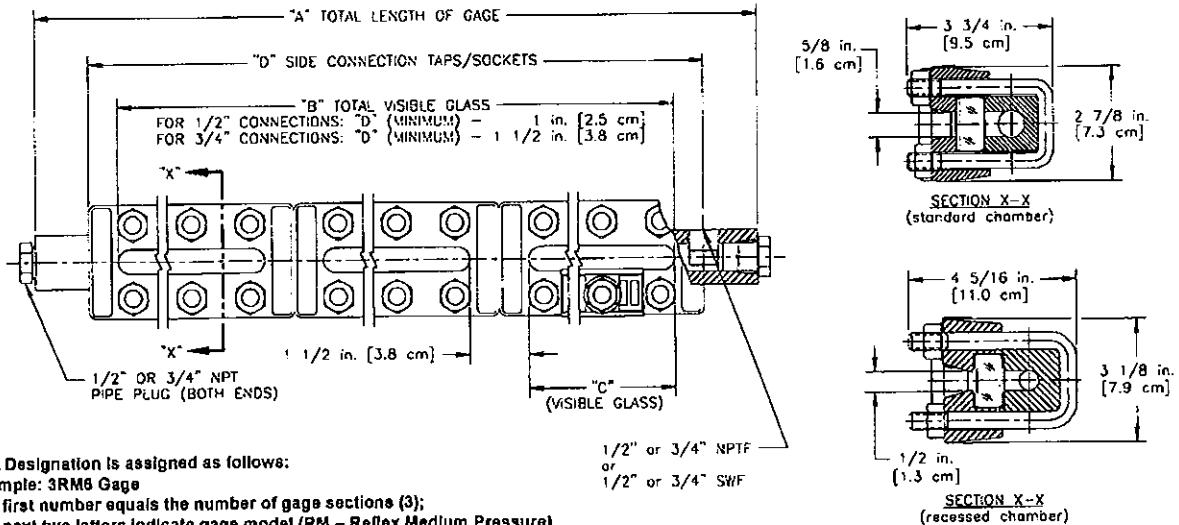
^A under no circumstances should shields be used in reflex style gages. Installation of shields in reflex style gages will keep the fluid from coming in contact with the reflective prisms, thereby prohibiting visibility of the liquid level in the gage.

PENBERTHY

dimensions

Section 2000
Dimensions 2721.1
Issued 07/05
Replaces 04/97

For: **MODEL RM AND RMR GAGE – Side Connected**



Glass Size		Minimum and Maximum Dimension "D" in Inches [cm] for 1/2" NPT/Socketweld Connections Centers Available in 1/8" [0.3 cm] Increments Between Minimum and Maximum Standard Side Connection is to the Right of the Gage Vision									
		Number of Sections									
		1	2	3	4	5	6	7	8	9	10
1	Min	4 3/4 [12.1]									
	Max	7 5/8 [19.4]									
2	Min	5 3/4 [14.6]									
	Max	8 5/8 [21.9]									
3	Min	6 3/4 [17.1]									
	Max	9 5/8 [24.4]									
4	Min	7 3/4 [19.7]	18 [40.8]								
	Max	10 3/4 [27.3]	20 1/8 [51.1]								
5	Min	8 7/8 [22.5]	18 1/4 [46.4]								
	Max	12 [30.5]	22 5/8 [57.5]								
6	Min	10 1/8 [25.7]	20 3/4 [52.7]	31 3/8 [79.7]							
	Max	13 1/8 [33.3]	24 7/8 [63.2]	36 5/8 [93.0]							
7	Min	11 1/4 [28.6]	23 [58.4]	34 3/4 [88.3]	46 1/2 [118.1]	58 1/4 [149.0]					
	Max	14 3/4 [37.5]	28 1/8 [71.4]	41 1/4 [104.8]	54 7/8 [139.4]	68 1/4 [173.4]					
8	Min	12 7/8 [32.7]	28 1/4 [68.7]	39 5/8 [100.8]	53 [134.6]	66 3/8 [168.6]	79 3/4 [202.6]	93 1/8 [236.5]	106 1/2 [270.5]	119 7/8 [304.5]	133 1/4 [338.5]
	Max	15 1/2 [39.4]	29 5/8 [75.2]	43 3/4 [111.1]	57 7/8 [147.0]	72 [182.9]	84 1/8 [213.7]	98 1/4 [249.6]	112 3/8 [285.4]	126 1/2 [321.3]	140 5/8 [357.2]
9	Min	13 5/8 [34.6]	27 3/4 [70.5]	41 7/8 [106.4]	56 [142.2]	70 1/8 [178.1]	84 1/4 [214.0]	98 3/8 [249.8]	112 1/2 [285.8]	126 5/8 [321.6]	140 3/4 [357.5]
	Max	17 7/8 [45.4]	33 1/4 [84.5]	48 3/8 [122.9]	60 1/8 [152.7]	81 5/8 [207.3]	93 [238.2]	106 3/8 [270.2]	119 3/4 [304.2]	133 1/8 [338.1]	148 1/2 [372.1]

NOTE:
For minimum 3/4" NPT/socketweld connections - Add 1/2" [1.3 cm] to dimension "D" shown below
For maximum 3/4" NPT/socketweld connections - Subtract 3/4" [1.9 cm] from dimension "D" shown below

CONSULT FACTORY FOR MINIMUM FRONT OR BACK CONNECTIONS

Glass Size	Dim. "C" In inches [cm]	Dimension "A" in Inches [cm] 1/2" and 3/4" NPT/Socketweld Connections *** Formula Applies to ALL RMR series gages for Dimension "A"										Quantity Per Section		
		Number of Sections										Bolt	Nut	
		1	2	3	4	5	6	7	8	9	10			
1	3 3/4 [9.5]	10 3/8 [26.4]	NOTE: *** For 1/2" NPT or socketweld connections: Dimension "D" + 2 3/4" [7.0 cm] *** For 3/4" NPT or socketweld connections: Dimension "D" + 3 1/2" [8.9 cm]										3	6
2	4 3/4 [12.1]	11 3/8 [28.9]											3	6
3	5 3/4 [14.6]	12 3/8 [31.4]											4	8
4	6 3/4 [17.1]	13 1/2 [34.3]											4	8
5	7 7/8 [20.0]	14 3/4 [37.5]	22 7/8 [58.1]	25 3/8 [64.5]								5	10	
6	9 1/8 [23.2]	15 7/8 [40.3]	27 5/8 [70.2]	39 3/8 [100.0]								6	12	
7	10 1/4 [26.0]	17 1/2 [44.5]	30 7/8 [78.4]	44 1/4 [112.4]	57 5/8 [148.4]	71 [180.3]					6	12		
8	11 7/8 [30.2]	18 1/4 [46.4]	32 3/8 [82.2]	46 1/2 [118.1]	60 5/8 [154.0]	74 3/4 [189.9]	***	***	***	***	***	7	14	
9	12 5/8 [32.1]	20 5/8 [52.4]	36 [91.5]	51 1/8 [129.9]	62 7/8 [159.7]	84 3/8 [214.3]	***	***	***	***	***	7	14	

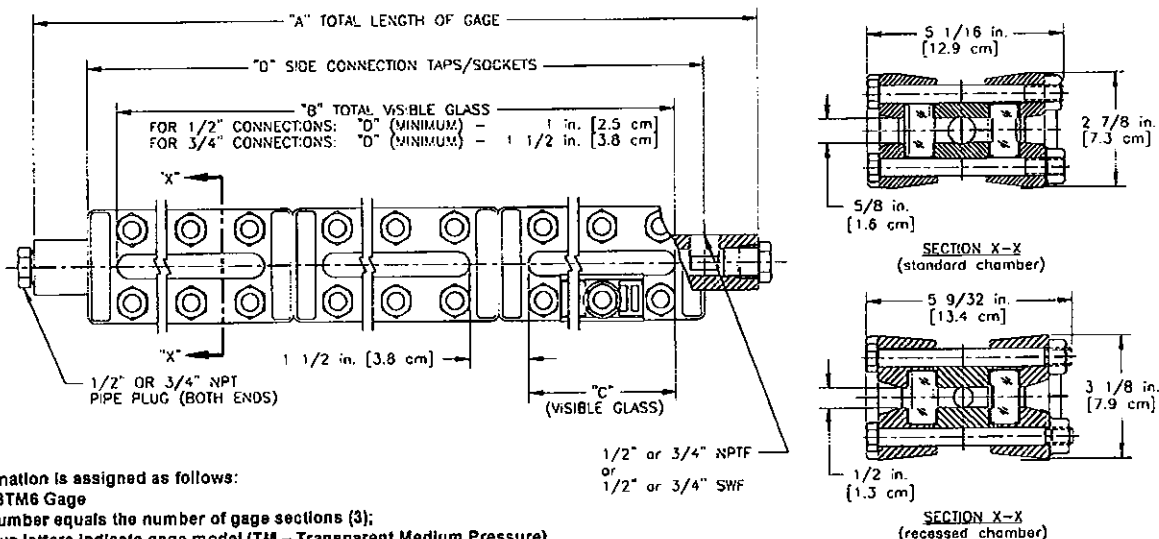
NOTE:
*** For 1/2" NPT or socketweld connections: Dimension "D" + 2 3/4" [7.0 cm]
*** For 3/4" NPT or socketweld connections: Dimension "D" + 3 1/2" [8.9 cm]

PENBERTHY

dimensions

Section 2000
Dimensions 2721.2
Issued 07/05
Replaces 04/97

For: **MODEL TM AND TMR GAGE – Side Connected**



Unit Designation is assigned as follows:

Example: 3TM6 Gage

The first number equals the number of gage sections (3);

The next two letters indicate gage model (TM – Transparent Medium Pressure)

The last number denotes the glass size (6).

Glass Size	Minimum and Maximum Dimension "D" in Inches [cm] for 1/2" NPT/Socketweld Connections Centers Available in 1/8" [0.3cm] Increments Between Minimum and Maximum Standard Side Connection is to the Right of the Gage Vision									
	Number of Sections									
	1	2	3	4	5	6	7	8	9	10
1	Min	4 3/4 [12.1]	NOTE: For minimum 3/4" NPT/socketweld connections - Add 1/2" [1.3 cm] to dimension "D" shown below For maximum 3/4" NPT/socketweld connections - Subtract 3/4" [1.9 cm] from dimension "D" shown below CONSULT FACTORY FOR MINIMUM FRONT OR BACK CONNECTIONS							
	Max	7 5/8 [19.4]								
2	Min	5 3/4 [14.6]								
	Max	8 5/8 [21.9]								
3	Min	6 3/4 [17.1]								
	Max	9 5/8 [24.4]								
4	Min	7 3/4 [19.7]	16 [40.6]							
	Max	10 3/4 [27.3]	20 1/8 [51.1]							
5	Min	8 7/8 [22.5]	18 1/4 [48.4]							
	Max	12 [30.5]	22 5/8 [57.5]							
6	Min	10 1/8 [25.7]	20 3/4 [52.7]	31 3/8 [79.7]						
	Max	13 1/8 [33.3]	24 7/8 [63.2]	36 5/8 [93.0]						
7	Min	11 1/4 [28.6]	23 [58.4]	34 3/4 [88.3]	46 1/2 [118.1]	58 1/4 [148.0]				
	Max	14 3/4 [37.5]	26 1/8 [71.4]	41 1/4 [104.8]	54 7/8 [139.4]	68 1/4 [173.4]				
8	Min	12 7/8 [32.7]	28 1/4 [65.7]	39 5/8 [100.6]	53 [134.6]	66 3/8 [168.6]	79 3/4 [202.8]	93 1/8 [236.5]	106 1/2 [270.5]	119 7/8 [304.5]
	Max	15 1/2 [39.4]	29 5/8 [75.2]	43 3/4 [111.1]	57 7/8 [147.0]	72 [182.9]	84 1/8 [213.7]	98 1/4 [249.6]	112 3/8 [285.4]	126 1/2 [321.3]
9	Min	13 5/8 [34.8]	27 3/4 [70.5]	41 7/8 [106.4]	56 [142.2]	70 1/8 [178.1]	84 1/4 [214.0]	98 3/8 [249.9]	112 1/2 [285.8]	126 5/8 [321.6]
	Max	17 7/8 [45.4]	33 1/4 [84.5]	48 3/8 [122.9]	60 1/8 [152.7]	81 5/8 [207.3]	93 [238.2]	106 3/8 [270.2]	119 3/4 [304.2]	133 1/8 [338.1]
									146 1/2 [372.1]	

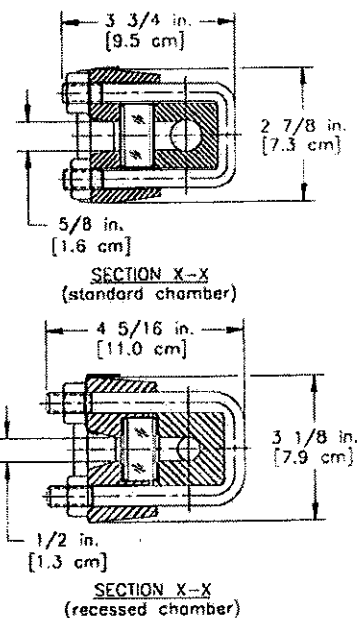
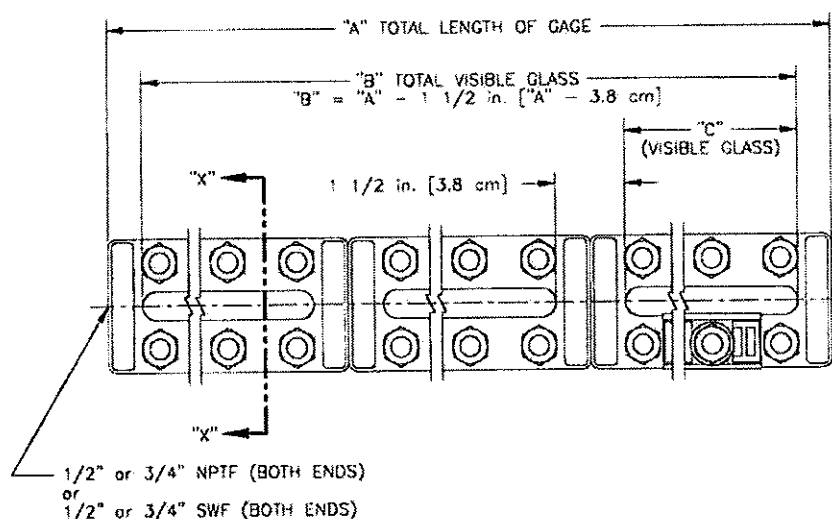
Glass Size	Dim. "C" in Inches [cm]	Dimension "A" in Inches [cm] 1/2" and 3/4" NPT/socketweld Connections *** Formula Applies to ALL TMR series gages for Dimension "A"										Quantity Per Section		
		Number of Sections										Bolt	Nut	
		1	2	3	4	5	6	7	8	9	10			
1	3 3/4 [9.5]	10 3/8 [26.4]	NOTE: *** For 1/2" NPT or socketweld connections: Dimension "D" + 2 3/4" [7.0 cm] *** For 3/4" NPT or socketweld connections: Dimension "D" + 3 1/2" [8.9 cm]								6	6		
2	4 3/4 [12.1]	11 3/8 [28.9]									6	6		
3	5 3/4 [14.6]	12 3/8 [31.4]									8	8		
4	6 3/4 [17.1]	13 1/2 [34.3]	22 7/8 [58.1]	NOTE: *** For 1/2" NPT or socketweld connections: Dimension "D" + 2 3/4" [7.0 cm] *** For 3/4" NPT or socketweld connections: Dimension "D" + 3 1/2" [8.9 cm]								8	8	
5	7 7/8 [20.0]	14 3/4 [37.5]	25 3/8 [64.5]									10	10	
6	9 1/8 [23.2]	15 7/8 [40.3]	27 5/8 [70.2]	39 3/8 [100.0]	NOTE: *** For 1/2" NPT or socketweld connections: Dimension "D" + 2 3/4" [7.0 cm] *** For 3/4" NPT or socketweld connections: Dimension "D" + 3 1/2" [8.9 cm]						12	12		
7	10 1/4 [26.0]	17 1/2 [44.5]	30 7/8 [78.4]	44 1/4 [112.4]							57 5/8 [146.4]	71 [180.3]	12	12
8	11 7/8 [30.2]	18 1/4 [46.4]	32 3/8 [82.2]	46 1/2 [118.1]							60 5/8 [154.0]	74 3/4 [189.9]	14	14
9	12 5/8 [32.1]	20 5/8 [52.4]	36 [91.5]	51 1/8 [129.9]	62 7/8 [159.7]	84 3/8 [214.3]	14	14						

PENBERTHY

dimensions

Section 2000
Dimensions 2711.1
Issued 07/05
Replaces 04/97

For: **MODEL RM AND RMR GAGE – END CONNECTED**



Unit designation is assigned as follows:

Example: 3RM6 Gage

The first number equals the number of gage sections (3);
the next two letters indicate gage model (RM – Reflex Medium Pressure);
the last number denotes the glass size (6).

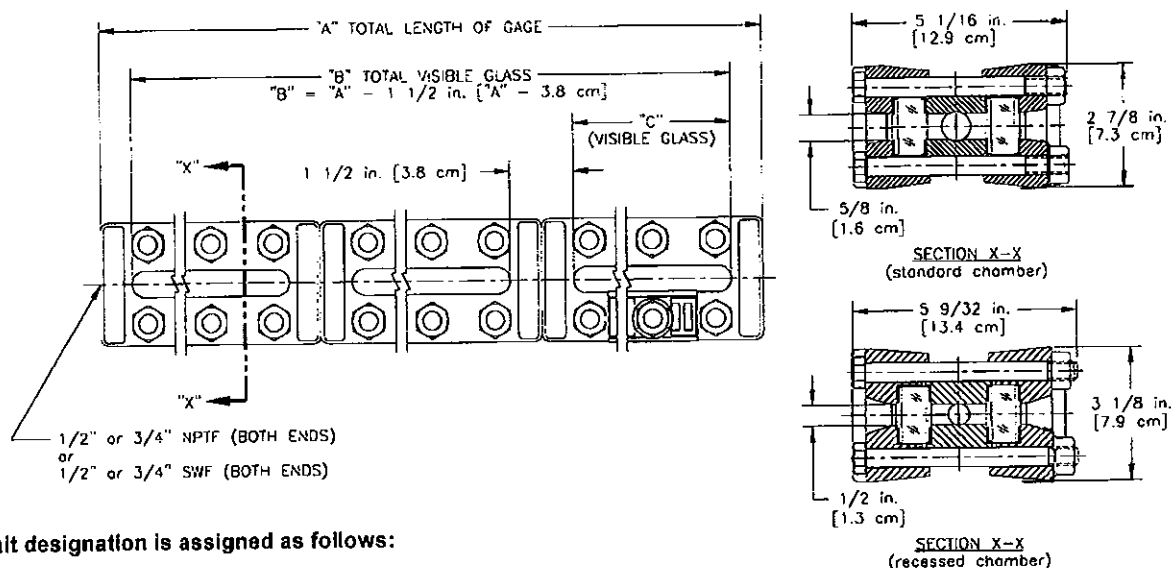
Glass Size	Dim "C" In Inches & [cm]	Dimension "A" In Inches [cm]										Quantity Per Section	
		Number of Sections										Bolt	Nut
		1	2	3	4	5	6	7	8	9	10		
1	3 3/4 [9.5]	5 1/4 [13.3]										3	6
2	4 3/4 [12.1]	6 1/4 [15.9]										3	6
3	5 3/4 [14.6]	7 1/4 [18.4]										4	8
4	6 3/4 [17.1]	8 1/4 [21.0]	16 1/2 [41.9]									4	8
5	7 7/8 [20.0]	9 3/8 [23.8]	18 3/4 [47.6]									5	10
6	9 1/8 [23.2]	10 5/8 [27.0]	21 1/4 [54.0]	31 7/8 [81.0]								6	12
7	10 1/4 [26.0]	11 3/4 [29.8]	23 1/2 [59.7]	35 1/4 [89.5]	47 [119.4]	58 3/4 [149.2]						6	12
8	11 7/8 [30.2]	13 3/8 [34.0]	26 3/4 [67.9]	40 1/8 [101.9]	53 1/2 [135.9]	66 7/8 [169.9]	80 1/4 [203.8]	93 5/8 [237.8]	107 [271.8]	120 3/8 [305.8]	133 3/4 [339.7]	7	14
9	12 5/8 [32.1]	14 1/8 [35.9]	28 1/4 [71.8]	42 3/8 [107.6]	56 1/2 [143.5]	70 5/8 [179.4]	84 3/4 [215.3]	98 7/8 [251.1]	113 [287.0]	127 1/8 [322.9]	141 1/4 [358.8]	7	14

PENBERTHY

dimensions

Section 2000
 Dimensions 2711.2
 Issued 07/05
 Replaces 04/97

For: **MODEL TM AND TMR GAGE – END CONNECTED**



Unit designation is assigned as follows:

Example: 3TM6 Gage

The first number equals the number of gage sections (3);
 the next two letters indicate gage model (TM – Transparent Medium Pressure);
 the last number denotes the glass size (6).

Glass Size	Dim "C" In Inches & [cm]	Dimension "A" In Inches [cm]										Quantity Per Section	
		Number of Sections										Bolt	Nut
		1	2	3	4	5	6	7	8	9	10		
1	3 3/4 [9.5]	5 1/4 [13.3]										6	6
2	4 3/4 [12.1]	6 1/4 [15.9]										6	6
3	5 3/4 [14.6]	7 1/4 [18.4]										8	8
4	6 3/4 [17.1]	8 1/4 [21.0]	16 1/2 [41.9]									8	8
5	7 7/8 [20.0]	9 3/8 [23.8]	18 3/4 [47.6]									10	10
6	9 1/8 [23.2]	10 5/8 [27.0]	21 1/4 [54.0]	31 7/8 [81.0]								12	12
7	10 1/4 [26.0]	11 3/4 [29.8]	23 1/2 [59.7]	35 1/4 [89.5]	47 [119.4]	58 3/4 [149.2]						12	12
8	11 7/8 [30.2]	13 3/8 [34.0]	26 3/4 [67.9]	40 1/8 [101.9]	53 1/2 [135.9]	66 7/8 [169.9]	80 1/4 [203.8]	93 5/8 [237.8]	107 [271.8]	120 3/8 [305.8]	133 3/4 [339.7]	14	14
9	12 5/8 [32.1]	14 1/8 [35.9]	28 1/4 [71.8]	42 3/8 [107.6]	56 1/2 [143.5]	70 5/8 [179.4]	84 3/4 [215.3]	98 7/8 [251.1]	113 [287.0]	127 1/8 [322.9]	141 1/4 [358.8]	14	14

PENBERTHY

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Straight Pattern Flat Glass Gagecocks

Series 100

Series 200



130



230

1500 lb. ANSI rating
Pressures to 4000 psi @ +100°F [27600 kPa @ +38°C]
Temperature Ranges from -300°F to +750°F [-184°C to +399°C]

Design Features

The 100 and 200 series includes models 120J/220P and 130J/230P with these standard features:

- Straight pattern
- Integral bonnet (100 series) / Union bonnet (200 series)
- Union vessel connection
- Gage connection: Model 120J/220P Union / Model 130J/230P Rigid
- Ball check shutoff
- Integral seat (100 series) / Threaded renewable seat (200 series)

A variety of optional features are available when specified.

Optional materials can be specified for the Gagecock body and trim. (Trim consists of the stem, stem packing retainer and ball check.) Standard and optional materials conform to AISI or ASTM Specifications.

ASME Boiler Code

Series 100 and 200 Gagecocks that are acceptable for ASME Boiler Code are supplied with ball check shut-offs omitted.

Offset Pattern Flat Glass Gagecocks

Series 300

1500 lb. ANSI rating -- Pressures to 4000 psi @ +100°F [27600 kPa @ +38°C]
Temperature Ranges from -300°F to +750°F [-184°C to +399°C]



330

Design Features

The 300 and 400 series includes models 320J/420P and 330J/430P with these standard features:

- Offset pattern
- Integral bonnet (300 series) / Union bonnet (400 series)
- Union vessel connection
- Gage connection: Model 320J/420P Union / Model 330J/430P Rigid
- Ball check shutoff
- Integral seat (300 series) / Threaded renewable seat (400 series)

A variety of optional features are available when specified.

Optional materials can be specified for the Gagecock body and trim. (Trim consists of the stem, stem packing retainer and ball check.) Standard and optional materials conform to AISI or ASTM Specifications.

ASME Boiler Code

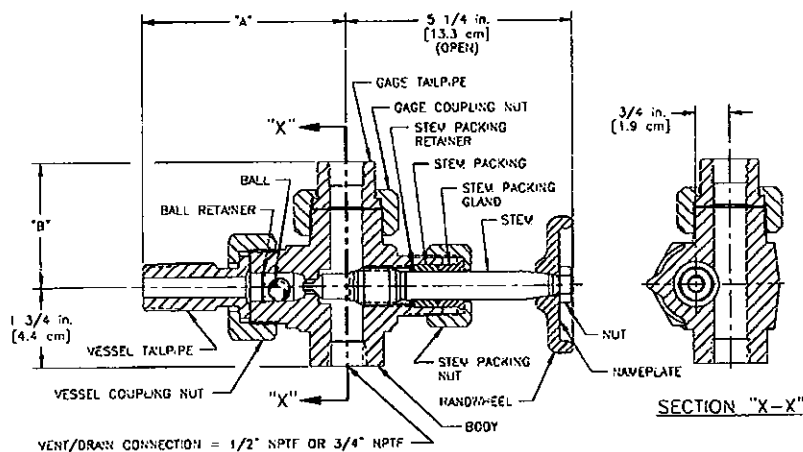
Series 300 and 400 Gagecock that are acceptable for ASME Boiler Code are available as an option. Model 320J/ 420P Gagecocks with this option can be supplied either with ball check shutoffs or with them omitted. Model 330J/430P Gagecocks with this option have the ball check shutoffs omitted.

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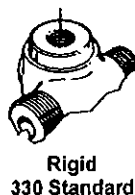
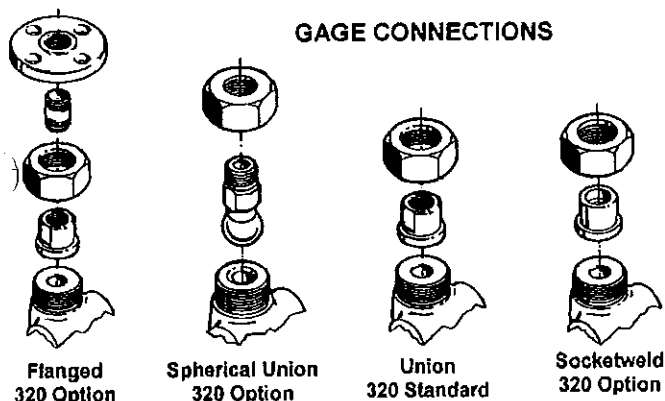
PENBERTHY dimensions

Section 2000
Dimensions 2731.1
Issued 07/05
Replaces 02/05

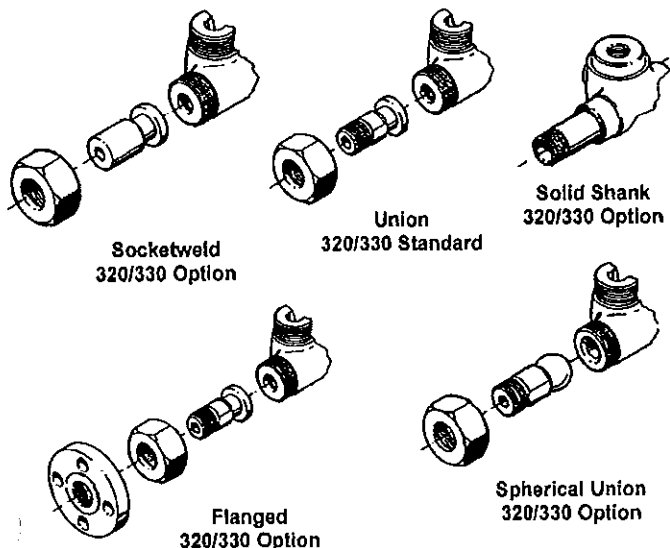
For: **SERIES 300 GAGECOCKS**



Connection	Dimension "A" Inches [cm]	Dimension "B" Inches [cm]	
		Standard	320 Option Side Connect
UNION			
1/2" NPTF	3 3/16 [8.1]	2 3/4 [7.0]	
1/2" NPTM	4 3/8 [11.1]	3 3/8 [8.6]	4 1/16 [10.3]
3/4" NPTF	3 3/16 [8.1]	2 3/4 [7.0]	
3/4" NPTM	4 1/2 [11.4]	3 3/8 [8.6]	4 1/16 [10.3]
1" NPTM	4 5/8 [11.7]		
RIGID			
1/2" NPTF		1 1/4 [3.2]	
3/4" NPTF		1 1/4 [3.2]	
SOLID SHANK			
1/2" NPTM	4 [10.2]		
3/4" NPTM	4 [10.2]		
1" NPTM	4 [10.2]		
SOCKETWELD			
1/2" Female Union		2 3/4 [7.0]	
1/2" Female Rigid		1 1/4 [3.2]	
1/2" Male Union	4 3/8 [11.1]	3 3/8 [8.6]	4 1/16 [10.3]
3/4" Female Rigid		1 1/4 [3.2]	
3/4" Male Union	4 1/2 [11.4]	3 3/8 [8.6]	4 1/16 [10.3]
1" Male Union	4 5/8 [11.7]		
SPHERICAL UNION			
1/2" NPTF	4 9/16 [11.6]	4 1/8 [10.5]	
1/2" NPTM	4 9/16 [11.6]	4 1/8 [10.5]	
3/4" NPTM	4 9/16 [11.6]	4 1/8 [10.5]	



VESSEL CONNECTIONS



Flanged Connection	Dimension "A" Inches [cm]		Dimension "B" Inches [cm]	
	RF Threaded	RF Slip On	RF Threaded	RF Slip On
1/2" - 150# (F) Union			3 11/16 [9.4]	3 13/16 [9.7]
1/2" - 300# (F) Union			3 15/16 [10.0]	3 15/16 [10.0]
1/2" - 600# (F) Union			4 3/16 [10.6]	4 3/16 [10.6]
1/2" - 1500# (F) Union			4 13/16 [12.2]	4 3/4 [12.1]
1/2" - 150# (M) Union	4 1/2 [11.4]	4 5/8 [11.7]	3 11/16 [9.4]	3 5/8 [9.2]
1/2" - 300# (M) Union	4 1/2 [11.4]	4 5/8 [11.7]	3 3/4 [9.5]	3 3/4 [9.5]
1/2" - 600# (M) Union	4 3/4 [12.1]	4 5/8 [11.7]	4 1/16 [10.3]	4 1/16 [10.3]
1/2" - 1500# (M) Union	5 [12.7]	4 5/8 [11.7]	4 3/4 [12.1]	4 3/4 [12.1]
3/4" - 150# (F) Union			3 15/16 [10.0]	
3/4" - 300# (F) Union			4 3/16 [10.6]	
3/4" - 600# (F) Union			4 7/16 [11.3]	
3/4" - 1500# (F) Union			4 15/16 [12.5]	
3/4" - 150# (M) Union	4 5/8 [11.7]	4 3/4 [12.1]	3 3/4 [9.5]	3 3/4 [9.5]
3/4" - 300# (M) Union	4 5/8 [11.7]	4 3/4 [12.1]	4 1/8 [10.5]	4 1/16 [10.3]
3/4" - 600# (M) Union	5 [12.7]	4 3/4 [12.1]	4 3/8 [11.1]	4 5/16 [11.0]
3/4" - 1500# (M) Union	5 1/4 [13.3]	4 3/4 [12.1]	4 7/8 [12.4]	4 7/8 [12.4]
3/4" - 150# (F) Rigid			2 15/16 [7.5]	2 7/8 [7.3]
3/4" - 300# (F) Rigid			3 3/16 [8.1]	3 3/16 [8.1]
3/4" - 600# (F) Rigid			3 7/16 [8.7]	3 7/16 [8.7]
3/4" - 1500# (F) Rigid			4 1/16 [10.3]	4 [10.2]
1" - 150# (M) Union	4 11/16 [11.9]	4 7/8 [12.4]	3 3/4 [9.5]	3 3/4 [9.5]
1" - 300# (M) Union	4 11/16 [11.9]	4 7/8 [12.4]	4 1/8 [10.5]	4 1/16 [10.3]
1" - 600# (M) Union	5 1/16 [12.9]	4 7/8 [12.4]	4 3/8 [11.1]	4 5/16 [11.0]
1" - 1500# (M) Union	5 3/8 [13.7]	4 7/8 [12.4]		

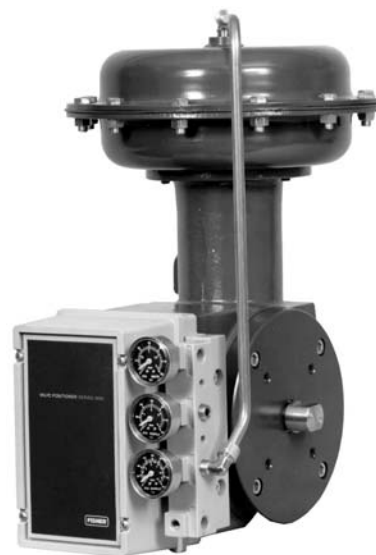
Types 1051 and 1052 Sizes 40, 60 and 70 Styles H and J Rotary Actuators

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Note

Neither Emerson, Emerson Process Management, nor any of their affiliated entities assumes responsibility for the selection, use and maintenance of any product. Responsibility for the selection, use, and maintenance of any product remains with the purchaser and end-user.



W4252 / IL

Figure 1. Type 1051 Actuator with H Mounting Adaptation and Type 3610J Positioner



W4139-1 / IL

Figure 2. Type 1052 Actuator with J Mounting Adaptation



Table 1. Type 1051 and 1052 Actuator Specifications

<p>Operation</p> <p>Direct Acting: Increasing loading pressure extends the diaphragm rod out of the spring barrel</p> <p>Service:</p> <p><i>Type 1051:</i> For on-off or throttling service with positioner</p> <p><i>Type 1052:</i> For on-off or throttling service with or without a positioner</p> <p>Actuator Sizes</p> <p>Type 1051: 40, and 60</p> <p>Type 1052: 40, 60, and 70</p> <p>Maximum Diaphragm Sizing Pressure⁽²⁾⁽³⁾</p> <p>Size 40: 4.5 bar (65 psig)</p> <p>Size 60: 2.8 bar (40 psig)</p> <p>Size 70: 3.8 bar (55 psig)</p> <p>Maximum Diaphragm Casing Pressure⁽²⁾⁽³⁾</p> <p>Size 40: 5.2 bar (75 psig)</p> <p>Size 60: 3.4 bar (50 psig)</p> <p>Size 70: 4.5 bar (65 psig)</p> <p>Maximum Valve Shaft Rotation</p> <p>90, 75, or 60 deg with optional stops</p> <p>Torque Limits (mm)⁽⁴⁾</p> <p>Limited by maximum diaphragm sizing pressure or tables 2 and 3, whichever is less</p>	<p>Stroking Time</p> <p>Dependent on actuator size, rotation, spring rate, initial spring compression, and supply pressure. If stroking time is critical, consult your Emerson Process Management™ sales office</p> <p>Material Temperature Capabilities⁽³⁾</p> <p>Nitrile Diaphragm or O-Rings⁽¹⁾: –40 to 82°C (–40 to 180°F)</p> <p>Silicone Diaphragm: –40 to 149°C (–40 to 300°F)</p> <p>Travel Indication</p> <p>Graduated disc and pointer combination located on actuator end of valve shaft</p> <p>Pressure Connections</p> <p>1/4 in. NPT female</p> <p>Mounting Positions</p> <p>See figure 10</p> <p>Approximate Weights</p> <p>See table 7</p> <p>Additional Specifications</p> <p>For casing pressure ranges and for material identification of the parts, see the Parts List</p>
--	---

1. Nitrile O-rings are used in optional top-mounted handwheel, adjustable down travel stop, and adjustable up travel stop assemblies.

2. Use this value to determine the maximum torque output allowed.

3. The pressure / temperature limits in this manual and any applicable standard or code limitation for valve should not be exceeded.

4. Exceeding any torque requirements could damage the actuator and impair safe operation.

Table 2. Output Shaft Diameters and Torque Limits for Actuators With H Mounting

ACTUATOR SIZE	OUTPUT SHAFT DIAMETER		TORQUE LIMIT FOR H MOUNTING	
	mm	Inches	N•m	Inch-Pounds
40	22.2	7/8	240	2120
	28.6	1-1/8	468	4140
	38.1	1-1/2	1110	9815
60	28.6	1-1/8	468	4140
	38.1	1-1/2	1210	10,680
70 ⁽¹⁾	38.1	1-1/2	1210	10,680

1. Type 1052 actuator only.

Table 3. Acceptable Shaft Diameters and Torque Limits for Actuators With J Mounting

ACTUATOR SIZE	COUPLING AVAILABILITY BY KEYED SHAFT DIAMETER		TORQUE LIMIT FOR J MOUNTING	
	mm	Inches	N•m	Inch-Pounds
40	9.5	3/8	52	460
	12.7	1/2	69	610
	15.9	5/8	114	1010
	19.1	3/4	207	1830
	25.4	1	468	4140
60	19.1	3/4	207	1830
	25.4	1	468	4140
	31.8	1-1/4	1030	9110
	38.1	1-1/2	1360	12,000
	50.8	2	2650	23,430
70 ⁽¹⁾	31.8	1-1/4	1030	9110
	38.1	1-1/2	1360	12,000
	50.8	2 ⁽²⁾	2650	23,430

1. Type 1052 actuator only.
2. Coupling supplied for mating with either 44.5 or 50.8 mm (1-3/4 or 2-inch) keyed shaft.

Introduction

Scope of Manual

This manual provides installation, adjustment, operation, maintenance, and parts ordering information for the Type 1051 (sizes 40 and 60) and Type 1052 (sizes 40, 60, and 70) diaphragm rotary actuators with H and J mounting adaptations (see figures 1 and 2). Also, this instruction manual provides information for the optional top-mounted handwheel, and both the optional up and down travel stops. Instructions for the control valve body, the positioner, accessories, and other sizes or constructions of this actuator are covered in separate manuals.

Do not install, operate, or maintain a Type 1051 or 1052 actuator without first • being fully trained and qualified in valve, actuator, and accessory installation, operation, and maintenance, and • carefully reading and understanding the contents of this manual. If you have any questions about these instructions, contact your Emerson Process Management sales office before proceeding.

Description

The Type 1051 and 1052 diaphragm rotary actuators are pneumatic spring-return actuators for use with rotary-control valves and other equipment. The Type 1051 actuator can be used for on-off service, or it can be used for throttling service when equipped with a valve positioner. The Type 1052 actuator can be used for on-off service, or it can be used for throttling service when equipped with or without a

valve positioner. The Type 1052 actuator spring is adjustable.

The **H mounting adaptation** permits the actuator to be used with **equipment other than Fisher® valve bodies**. The mounting brackets and couplings for rotary actuation are user-provided. This mounting adaptation includes a flat-surface mounting plate that is drilled and tapped for attaching the user-provided bracket. Cap screws for attaching the bracket are provided. H mounting also includes an output shaft (with milled flats) to provide the Double D rotary output either directly or through a user-provided coupling. Output shaft diameters and torque limits are listed in table 2. Dimensional information for the mounting plate and output shaft are shown in figures 4, 5, and 6.

The **J mounting adaptation** permits the actuator to be used for rotary actuation of **Fisher keyed-shaft butterfly valve bodies and other keyed-shaft equipment**. This mounting adaptation uses the standard butterfly valve mounting bracket and provides an output shaft with an attached coupling for keyed equipment shafts. Coupling sizes and torque limits are listed in table 3. Dimensional information for the mounting bracket and stub shaft coupling is shown in figures 4, 5, and 7.

Additionally, a top-mounted handwheel can be applied for infrequent service as a manual handwheel actuator. For more frequent manual operation, a side-mounted handwheel actuator is available. Also, an adjustable up travel stop can be added to limit the actuator stroke in the upward direction, or an adjustable down travel stop can be added to limit actuator stroke in the downward direction.

Specifications

Specifications are shown in table 1 for Type 1051 and 1052 actuators. Specifications for a given Type 1051 or 1052 actuator as it originally comes from the factory are stamped on a nameplate attached to the actuator.

Principle of Operation

The diaphragm rod moves down as loading pressure is increased on top of the diaphragm. As the loading pressure is decreased, the spring forces the diaphragm rod upward.

The spring and diaphragm have been selected to meet the requirements of the application and, in service, the actuator should produce full travel of the valve or other operated equipment with the diaphragm pressure as indicated on the nameplate.

Consult the separate positioner instruction manual for actuator principle of operation with positioner.

Top Mounted Handwheel

ACTUATOR SIZE	H _c		J _c	
	mm	Inch	mm	Inch
40	281	11.06	356	14.00
60	359	14.12	432	17.00
70 ⁽¹⁾	335	13.62	356	14.00

1. Size 70 available in Type 1052 only.

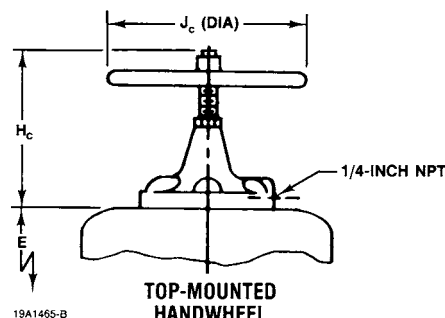


Figure 3. Top Mounted Handwheel

Installation

WARNING

Always wear protective gloves, clothing, and eyewear when performing any maintenance operations to avoid personal injury.

To avoid personal injury or property damage caused by bursting of pressure retaining parts, be certain the service conditions do not exceed the limits given in table 1. Use pressure limiting or pressure relieving devices to prevent the diaphragm sizing pressure from exceeding the maximum allowable diaphragm sizing pressure.

Check with your process or safety engineer for any additional measures that must be taken to protect against process media.

If installing into an existing application, also refer to the WARNING at the beginning of the Maintenance section in this instruction manual.

WARNING

To avoid personal injury or parts damage, do not use an operating pressure that exceeds the Maximum Diaphragm Casing Pressure (table 1) or produces a torque greater than the Maximum Allowable Valve Shaft Torque (see Catalog 14). Use pressure-limiting or pressure-relieving devices to prevent the diaphragm casing pressure from exceeding its limit.

Actuator Mounting

Use the following steps to connect the actuator to a valve body or other equipment. Unless otherwise specified, key numbers are shown in figures 12 and 13. Mounting dimensions are shown in figures 4, 5, 6, and 7.

Note

For an actuator with an H mounting adaptation and a 22.2 through 38.1 mm (7/8 through 1-1/2 inch) output shaft, find dimensions and center of gravity information in figures 3, 4, 5, 6, and 9,

**and approximate weights in table 7.
This information is required for proper
fabrication of the user-provided
bracket and coupling.**

1. For an actuator with an H mounting adaptation, attach an appropriate mounting bracket (not provided) to the mounting plate (key 22) with the cap screws (key 78). See figures 4, 5, and 6 for mounting dimensions on the mounting plate. Tighten the cap screws to the bolt torques listed in table 10.
2. Consult figure 10 for available mounting styles and positions. The actuator is normally positioned vertically with the valve body or other equipment in a horizontal pipeline.

Note

If the milled flats or the coupling on the end of the actuator output shaft (key 87) are oriented such that the output shaft cannot accommodate the operated equipment shaft, refer to the Changing Positions portion of the Changing Actuator Mounting section. This procedure describes how the output shaft can be repositioned to accommodate the operated equipment shaft.

3. If using an actuator with a J mounting adaptation, note that the valve shaft coupling (key 90) is furnished with two keyways lettered A and B as shown in figure 8 and 12 (letters C and D on the coupling are not used and can be disregarded). Align the appropriate keyway with the keyway in the operated equipment shaft. If using a Fisher butterfly valve, align the appropriate keyway on the coupling with the valve shaft keyway indicated in table 8. Then install the woodruff key (key 91) in the shaft keyseat, and slide the coupling onto the shaft. It is

helpful to apply a light coat of grease to the inside of the coupling before sliding it onto the shaft.

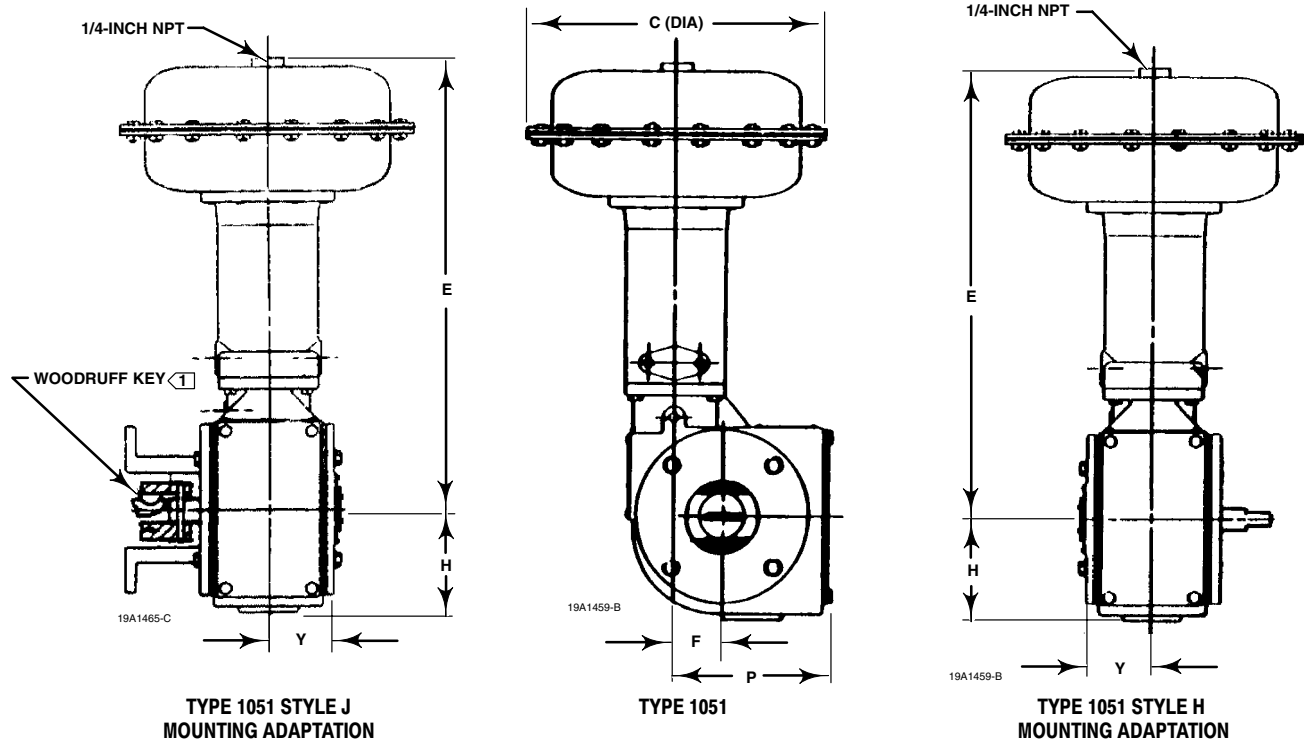
4. For an actuator with an **H mounting** adaptation, slide the actuator (with the user-provided mounting bracket attached) into the user-provided coupling on the operated shaft. Then, secure the actuator to the operated equipment in the desired mounting position with the appropriate fasteners, such as mounting cap screws. See figures 4, 5 and 6 for output shaft dimensions.
5. For an actuator with a **J mounting** adaptation, secure the mounting bracket (key 22) to the valve body with the cap screws (key 78, not shown). Tighten the cap screws to the bolt torques in table 10. For 31.8 and 38.1 mm (1-1/4 and 1-1/2 inch) valve shafts, also place the two spacers (key 92, not shown) between the mounting bracket and valve body during this step.
6. For an actuator with a **J mounting** adaptation and a **50.8 mm (2-inch) output shaft** (key 87, figure 14), note that the valve shaft coupling (key 90, figure 14) is furnished with two keyways lettered A and B as shown in figure 8 (letters C and D on the coupling are not used and can be disregarded). Align the appropriate keyway with the keyway in the operated equipment shaft. Then, install the woodruff key (key 91, not shown in figure 14) in the shaft keyseat, and slide the coupling onto the shaft using the appropriate coupling keyway (see table 8 and figure 8). It is helpful to apply a light coat of grease to the inside of the coupling before sliding it onto the shaft. Secure the actuator (user-provided mounting bracket) to the operated equipment in the desired mounting position with the appropriate fasteners, such as mounting cap screws.
7. Follow the instructions given in the Turnbuckle Adjustment section before proceeding to the Loading Connection portion of this section.

1051 & 1052 H & J

Table 4. Style H or J Mounting Dimensions

ACTUATOR SIZE	C	E		F	H	P	Y
		Type 1051	Type 1052				
mm							
40	333	505	607	54	114	175	73
60	473	749	876	64	121	186	76
70 ⁽¹⁾	536	---	849	64	121	186	76
Inch							
40	13.12	19.88	23.88	2.12	4.50	6.88	2.88
60	18.62	29.50	34.50	2.50	4.75	7.31	3.00
70 ⁽¹⁾	21.12	---	33.44	2.50	4.75	7.31	3.00
1. Size 70 available in Type 1052 only.							

1. Size 70 available in Type 1052 only.

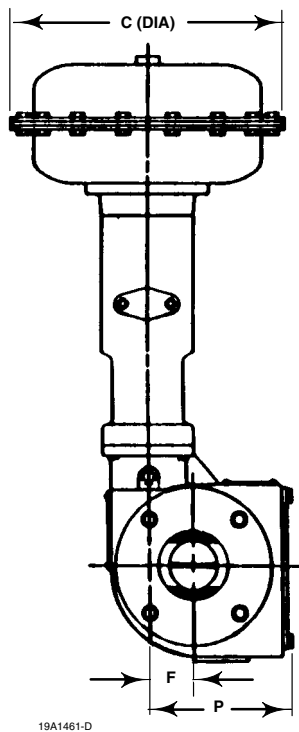


NOTE:

1 SEE PARTS LIST FOR WOODRUFF KEY NUMBERS

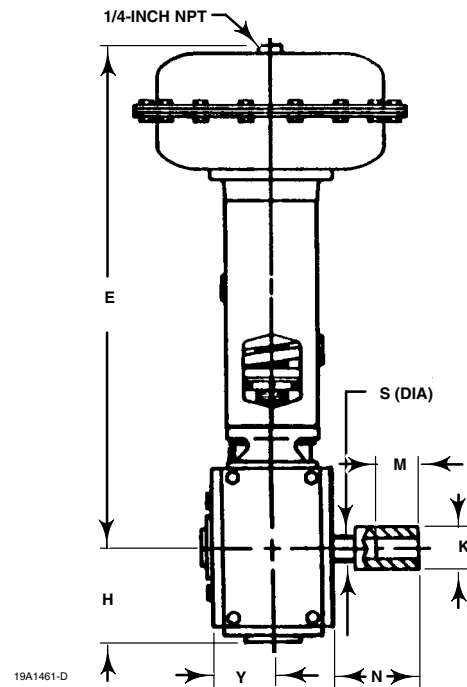
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Figure 4. Type 1051 Mounting Dimensions (refer to table 4)



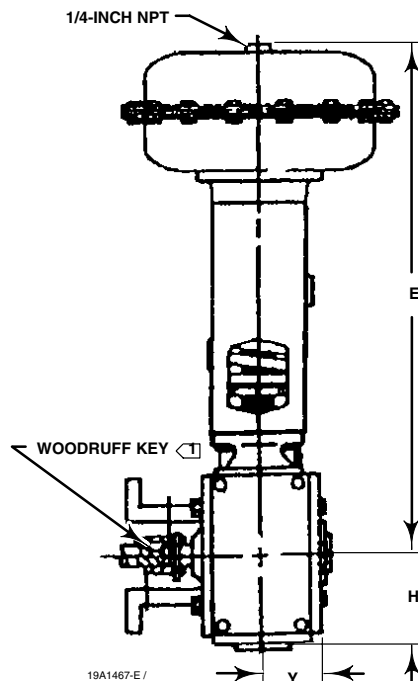
19A1461-D

TYPE 1052



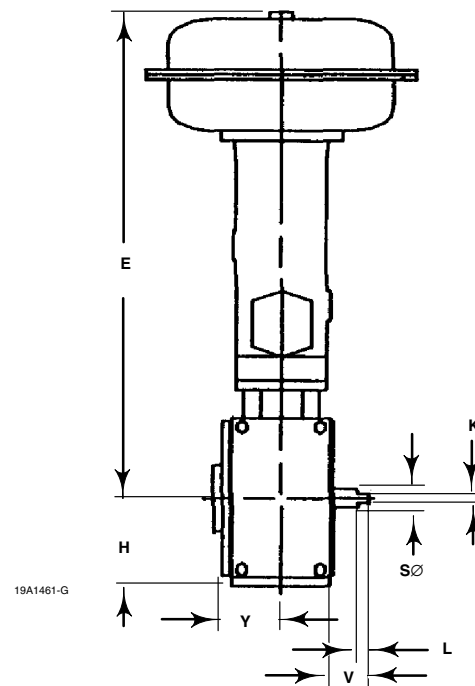
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TYPE 1052 STYLE J MOUNTING ADAPTATION
FOR 44.5 AND 50.8 mm (1-3/4 AND 2-INCH)
KEYED EQUIPMENT SHAFT



19A1467-E/

TYPE 1052 STYLE J ADAPTATION
9.5 THRU 38.1 mm (3/8 THRU 1-1/2-INCH)
OUTPUT SHAFTS



19A1461-G

TYPE 1052 STYLE H ADAPTATION
12.7 THRU 38.1 mm (1/2 THRU 1-1/2-INCH)
OUTPUT SHAFTS

NOTE:

1 SEE PARTS LIST FOR WOODRUFF KEY NUMBERS

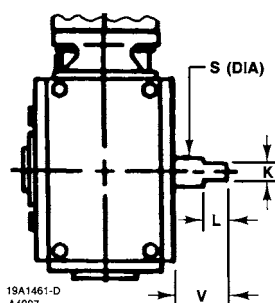
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Figure 5. Type 1052 Mounting Dimensions (refer to table 4)

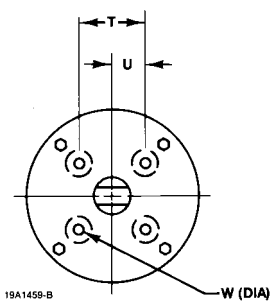
Table 5. Style H Mounting Dimensions

ACTUATOR R SIZE 1051	ACTUATOR R SIZE 1052	S ACTUATOR OUTPUT SHAFT DIAMETER		V		L		K ⁽¹⁾		T		U		W
		mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	
40	40	22.2	7/8	26.2	1.03	19.1	0.75	<u>15.75</u> 15.62	<u>0.620</u> 0.615	57.2	2.25	28.4	1.12	5/16-18 UNC
40 & 60	40 & 60	28.6	1-1/8	26.2	1.03	19.1	0.75	<u>22.10</u> 21.97	<u>0.870</u> 0.865	76.2	3.00	38.1	1.50	3/8-16 UNC
	40, 60 & 70	38.1	1-1/2	28.4	1.50	28.4	1.12	<u>28.45</u> 28.32	<u>1.120</u> 1.115	88.9	3.50	44.5	1.75	1/2-13 UNC

1. Tolerance for the K dimension is indicated by showing maximum and minimum dimensions.



22.2 THRU 38.1 mm
(7/8 THRU 1-1/2 INCH)
OUTPUT SHAFTS WITH
STYLE H MOUNTING



22.2 THRU 38.1 mm
(7/8 THRU 1-1/2 INCH)
OUTPUT SHAFTS WITH
STYLE H MOUNTING

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Figure 6. Type 1051 and 1052 Style H Mounting Dimensions (refer to table 5)

Table 6. Style J Mounting Dimensions

ACTUATOR SIZE 1051 & 1052	VALVE SHAFT DIAMETER		COUPLING ⁽¹⁾ INNER DIAMETER		V		L ⁽²⁾		K		T		U		W	
	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch	mm	Inch
40	9.5	3/8	<u>9.53</u> 9.58	<u>0.375</u> 0.377	137	5.38	39.6	1.56	15.7	0.62	117	4.62	---	---	11.2	0.44
	12.7	1/2	<u>12.70</u> 12.75	<u>0.500</u> 0.502	137	5.38	39.6	1.56	15.7	0.62	117	4.62	---	---	11.2	0.44
	15.9	5/8	<u>15.90</u> 15.95	<u>0.626</u> 0.628	160	6.31	49.3	1.94	25.4	1.00	146	5.75	31.8	1.25	11.2	0.44
40 & 60	19.1	3/4	<u>19.05</u> 19.10	<u>0.750</u> 0.752	160	6.31	47.8	1.88	20.6	0.81	146	5.75	31.8	1.25	11.2	0.44
	25.4	1	<u>25.43</u> 25.48	<u>1.0010</u> 1.0025	160	6.31	47.8	1.88	17.5	0.69	146	5.75	31.8	1.25	11.2	0.44
60 & 70 ⁽³⁾	31.8	1-1/4	<u>31.75</u> 31.80	<u>1.250</u> 1.252	148	5.81	68.3	2.69	30.2	1.19	210	8.25	50.8	2.00	17.5	0.69
	38.1	1-1/2	<u>38.13</u> 38.18	<u>1.501</u> 1.503	148	5.81	68.3	2.69	23.9	0.94	210	8.25	50.8	2.00	17.5	0.69
60 & 70 ⁽³⁾	50.8	1-3/4 & 2	<u>44.45</u> 44.50	<u>1.750</u> 1.752	123	4.84	69.9	2.75	---	---	88.9	3.50	44.5	1.75	1/2-13 UNC	1/2-13 UNC
	50.8	2	<u>50.83</u> 50.90	<u>2.001</u> 2.004	123	4.84	69.9	2.75	---	---	88.9	3.50	44.5	1.75	1/2-13 UNC	1/2-13 UNC

1. Tolerance for the Coupling Inner diameter is indicated by showing maximum and minimum dimensions.

2. The L dimension is the matchline to the end of the actuator shaft.

3. Size 70 is only available for the Type 1052.

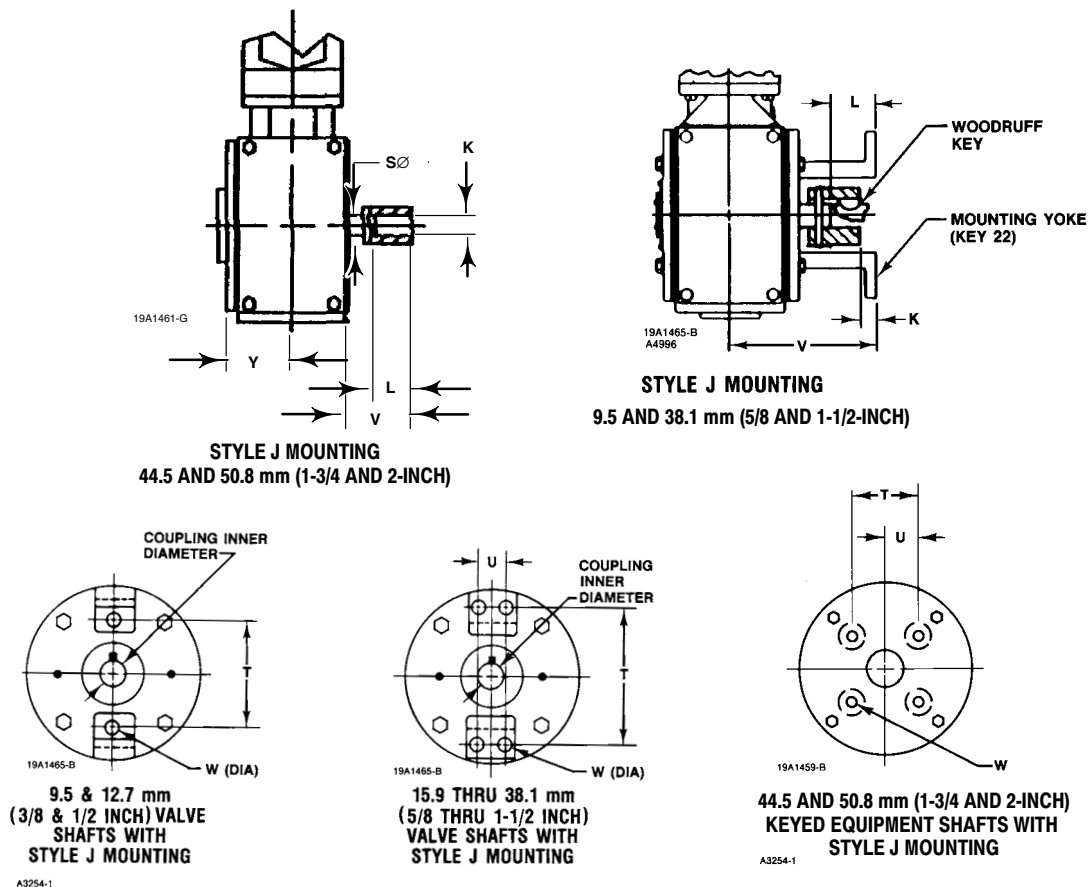


Figure 7. Type 1051 and 1052 Style J Mounting Dimensions (refer to table 6)

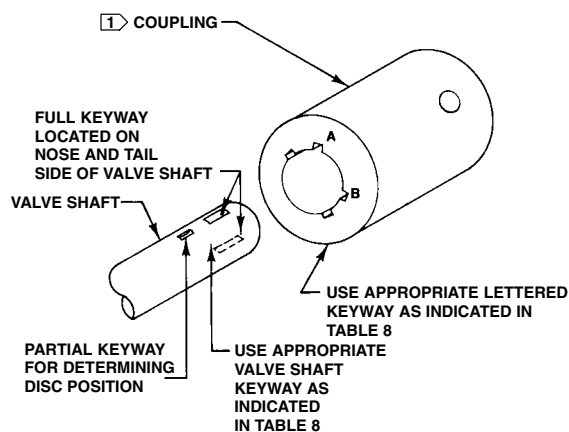
Table 7. Approximate Actuator Weights

SIZE	TYPE 1051		TYPE 1052		TOP-MOUNTED HANDWHEEL	
	Kg	Lb	Kg	Lb	Kg	Lb
40	43	94	45	99	7.3	16
60	89	197	92	203	11	24
70	---	---	123	272	21.3	47

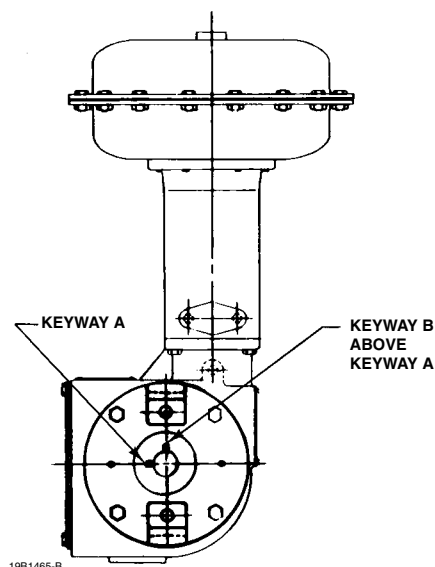
Table 8. Keyway Alignment Information⁽¹⁾

DESIRED ACTUATOR ACTION	DESIRED SHAFT ROTATION, DEGREES	ACTUATOR MOUNTING POSITION	COUPLING KEYWAY TO USE ⁽³⁾	VALVE SHAFT KEYWAY TO USE FOR FISHTAIL® DISC VALVE BODIES ⁽²⁾ (SEE FIGURE 10)			
				Clockwise to Close Valve Action ⁽⁴⁾		Counterclockwise to Close Valve Action ⁽⁴⁾	
				Flow Left to Right ⁽⁴⁾	Flow Right to Left ⁽⁴⁾	Flow Left to Right ⁽⁴⁾	Flow Right to Left ⁽⁴⁾
Push Down to Open (PDTO)	60 or 90	1	B	Nose	Tail	Tail	Nose
		2	A	Tail	Nose	Nose	Tail
		3	B	Tail	Nose	Nose	Tail
		4	A	Nose	Tail	Tail	Nose
Push Down to Close (PDTC)	60 ⁽⁵⁾ or 90	1	A	Tail	Nose	Tail	Nose
		2	B	Tail	Nose	Tail	Nose
		3	A	Nose	Tail	Nose	Tail
		4	B	Nose	Tail	Nose	Tail

1. For actuators with J mounting.
 2. For conventional disc valve bodies, use either valve shaft keyway.
 3. See figure 10 for reference coupling orientation to use with this table.
 4. When viewed from actuator side of valve body.
 5. For 60-degree rotation with PDTC action, the coupling and actuator output shaft assembly will be offset 30 degrees clockwise (for actuator housing construction style B) or counterclockwise (for actuator housing construction style A) in the lever when viewed from the splined end of the actuator shaft. 30 degrees is one spline tooth for 9.5, 12.7, and 15.9 mm (3/8, 1/2, and 5/8-inch) valve shafts and two spline teeth for 19.1 through 38.1 mm (3/4 through 1-1/2 inch) valve shafts.



EXPLODED VIEW OF VALVE SHAFT AND COUPLING



REFERENCE COUPLING ORIENTATION FOR TABLE 8

NOTE:

1 FOR USE WITH J MOUNTING ADAPTATION (UP TO 50.8 mm (2-INCH) KEYED SHAFT DIAMETERS.

A3253-1

Figure 8. Valve Shaft Coupling

Center of Gravity Dimensions

ACTUATOR TYPE	ACTUATOR SIZE	X		Y	
		mm	Inch	mm	Inch
1051	40	15	0.6	191	7.5
	60	10	0.4	361	14.2
1052	40	15	0.6	241	9.5
	60	10	0.4	432	17.0
	70	23	0.9	488	19.2

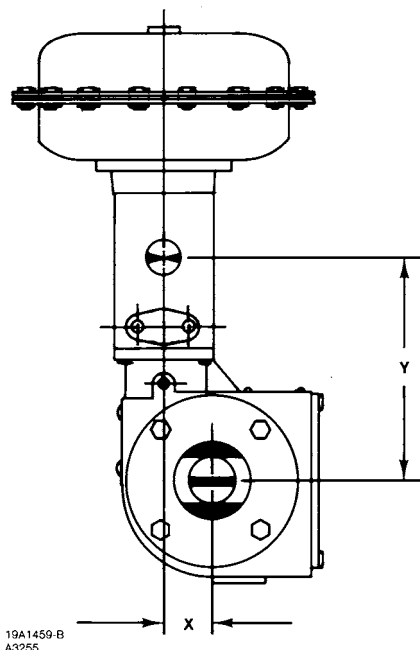


Figure 9. Center of Gravity Dimensions

Loading Connection

1. Connect the loading pressure piping to the pressure connection in the top of the diaphragm casing.

For size 40 through 60 actuators, run either 1/4-inch pipe or 3/8-inch tubing between the 1/4-inch pressure connection and the positioner or automatic controller.

For size 70 actuators, run either pipe or tubing between the pressure connection and the positioner or automatic controller. If necessary, remove the 1/4-inch bushing in the pressure connection to increase connection size.

2. Keep the length of pipe or tubing as short as possible to avoid transmission lag in the control signal. If an accessory (such as a volume booster or a positioner) is used, be sure that the accessory is properly connected to the actuator. If a positioner is

part of the assembly, the pressure connection to the actuator will normally be made at the factory.

3. When the actuator is completely installed and connected to the instrument, check for correct action (air-to-open or air-to-close) to match the controlling instrument. For successful operation, the actuator stem and operating shaft must move freely in response to the loading pressure change on the diaphragm.

Adjustment



WARNING

Before performing any adjustment steps, follow the steps in the **WARNING** at the beginning of the Maintenance section.

Type 1051 and 1052 Turnbuckle Adjustment

Correct turnbuckle adjustment ensures that the valve body or other operated equipment is correctly closed when the actuator is against its travel stops. The turnbuckle adjustment is the only adjustment necessary on the Type 1051 actuator. Key numbers used in this procedure are shown in figure 12 for Type 1051 actuators and in figure 13 for Type 1052 actuators.

For accurate adjustment, remove the valve body or other operated equipment from the pipeline.

A regulated air supply will be required to stroke the actuator. Consult table 9 for the sizes of the three open end wrenches required for this procedure.

1. Remove the access plate (key 59). Also remove the machine screws (key 60), if present.

Note

For the most accurate adjustment of the actuator, do not remove the cover (key 33) during this procedure.

2. Loosen the lower locknut (key 16).

1051 & 1052 H & J

Table 9. Wrench Sizes Required for Turnbuckle Adjustment, Inches

ACTUATOR		TURN-BUCKLE (KEY 57)	LOWER LOCKNUT (KEY 16)	UPPER LOCKNUT (KEY 58)
Type	Size			
1051 & 1052	40	1-1/8	3/4	1-1/8
	60	1-5/16	15/16	1-5/16
1052	70	1-5/16	1-1/8	1-5/16

3. Make sure the actuator housing (key 20) is clear of any tools or other instruments that could obstruct the actuator stroke path. Pressure the diaphragm casing enough to stroke the actuator down so that the left-hand threaded upper locknut (key 58) is accessible through the access opening. Loosen the locknut.

4. Use one of the following:

a. **For push-down-to-close action**—Slowly stroke the actuator to the down travel stop. Consult the appropriate instruction manual for determining the closed position of the valve body or other operated equipment. Adjust the turnbuckle (key 57) until the closed position is reached. Lock this adjustment with the left-hand threaded locknut (key 58). Stroke the actuator to the mid-travel position, and tighten the locknut (key 16). Tighten each locknut to the appropriate torque value listed in table 10.



WARNING

Exceeding any torque requirements could damage the actuator and impair safe operation.

b. **For push-down-to-open action**—Consult the appropriate instruction manual for determining the closed position of the valve or other operated equipment. Release all pressure from the diaphragm casing, making sure the diaphragm is against its up travel stop. Be sure that the optional handwheel is adjusted to its topmost position so that the closed position of the actuator and valve body or other operated equipment can be reached simultaneously. Check the position of the valve body or other operated equipment with respect to its properly closed position. Stroke the actuator so the turnbuckle (key 57) is accessible through the access opening. Adjust the linkage. Release pressure to the actuator, and check the new adjustment. Continue this procedure until the operated equipment is in the closed position

when the actuator is resting on its up travel stop. Tighten locknut (key 16). Stroke the actuator, and tighten the left-hand threaded locknut (key 58). Tighten each locknut to the appropriate torque value listed in table 10.



WARNING

Exceeding any torque requirements could damage the actuator and impair safe operation.

5. Replace the access plate (key 59). Also, replace the machine screws (key 60), if present.

6. Loosen the self-tapping screws (key 38), and adjust the travel indicator (key 37). Retighten the self-tapping screws.

Type 1052 Spring Adjustment

Initial Compression

The Type 1052 nameplate specifies a spring set, which is the initial compression adjusted into the actuator spring. Initial compression is the casing pressure at which the diaphragm and diaphragm rod begin to move away from the up travel stop with the actuator disconnected from the valve body or other operated equipment. (With the actuator connected and pressure applied to the valve body or other operated equipment, a higher casing pressure will be required to start actuator travel). The initial compression was selected (based upon the service conditions specified when the actuator was ordered) so that when the actuator and valve body or other operated equipment are in service, the operated equipment will close properly and full travel will be obtained within a diaphragm casing pressure range of 0 to 1.2, 0 to 2.3, 0 to 2.8 or 0 to 3.8 bar (0 to 18, 0 to 33, 0 to 40, or 0 to 55 psig) depending on specific actuator size and construction.

If the actuator has been disassembled or if the spring adjustment was changed, and it is desired to match the initial compression stated on the nameplate, make sure the rod end bearing (key 17, figure 13) has been disconnected from the lever (key 27, figure 13). Adjust the spring so that the diaphragm rod just starts to travel at the spring set pressure specified on the nameplate. Be sure the rod end bearing does not hit the lever as the diaphragm and diaphragm rod move away from the up travel stop.

Table 10. Recommended Bolting Torques⁽¹⁾

KEY NUMBER	ACTUATOR SIZE					
	40		60		70	
	N•m	lbf•ft	N•m	lbf•ft	N•m	lbf•ft
6	27	20	27	20	27	20
7 & 8	41	30	41	30	102	75
9	34	25	102	75	102	75
16	34	25	61	45	102	75
18	81	60	163	120	271	200
21	23	17	68	50	68	50
23	34	25	81	60	81	60
28	81	60	163	120	271	200
34	34	25	81	60	81	60
40	9	7	9	7	9	7
54 handwheel	34	25	34	25	34	25
54 down stop	27	20	66	49	69	51
58	102	75	163	120	163	120
141	41	30	41	30	81	60

1. Exceeding any torque requirements could damage the actuator and impair safe operation.

To adjust the spring, insert a round rod into one of the slots in the lower bearing seat (key 73, figure 13). Slot diameter is 9.5 mm (3/8-inch) for size 40 actuators, 15.9 mm (5/8-inch) for size 60 actuators, and 19.1 mm (3/4-inch) for size 70 actuators.

Rotate the bearing seat to move it toward the casings (keys 1 and 2, figure 13) to increase initial compression or away from the casings to decrease initial compression.

Stroking Range

The initial spring set listed on the nameplate has been determined to be the optimum setting, and it is not recommended to make spring adjustments that will cause this value to change or be exceeded. For push-down-to-open (PDTO) action, the initial spring set is normally the maximum allowable to provide the maximum spring closing force. Any increase of this setting could over-stress the spring at full travel. For push-down-to-close (PDTC) action, the initial spring set has been determined to be the optimum balance between the air to close and the spring to open breakout torque.

If the Type 1052 actuator is to be changed from one action to another (i.e., from PDTC to PDTO), first refer to the initial spring compression values listed in the table for keys 11 and 13 in the Parts List section. Then adjust the unit according to the procedures in the Initial Compression portion of this section.

Maintenance

Actuator parts are subject to normal wear and must be inspected and replaced as necessary. The frequency of inspection and replacement depends upon the severity of service conditions. Instructions are given below for disassembly and assembly of parts. Key numbers referenced in the following steps are shown in figure 12 for Type 1051 actuators and in figure 13 for Type 1052 actuators unless otherwise specified.

WARNING

Avoid personal injury or property damage from sudden release of process pressure or uncontrolled movement of parts. Before performing any maintenance operations:

- Always wear protective gloves, clothing, and eyewear when performing any maintenance operations to avoid personal injury.
- Disconnect any operating lines providing air pressure, electric power, or a control signal to the actuator. Be sure the actuator cannot suddenly open or close the valve.
- Use bypass valves or completely shut off the process to isolate the valve from process pressure. Relieve process pressure from both sides of the valve. Drain the process media from both sides of the valve.
- Vent the power actuator loading pressure and relieve any actuator spring precompression.
- Use lock-out procedures to be sure that the above measures stay in effect while you work on the equipment.
- The valve packing box may contain process fluids that are pressurized, even when the valve has been removed from the pipeline. Process fluids may spray out under pressure when removing the packing hardware or packing rings, or when loosening the packing box pipe plug.
- Check with your process or safety engineer for any additional measures that must be taken to protect against process media.

Disassembly

The following procedure describes how the actuator can be completely disassembled. When inspection or repairs are required, perform only those steps necessary to accomplish the procedure. Do not under ordinary circumstances remove the cap screws (keys 7, 8, and 21).

CAUTION

Cap screw (key 18) must be disengaged from the lever (key 27) before removing the diaphragm casing (key 1). Failure to do so will allow the spring precompression to rotate the valve body or other operated equipment beyond its fully open or closed position. This could cause damage to the operated equipment.

1. Bypass the valve or other operated equipment. Relieve all actuator loading pressure, and remove the tubing or pipe from the top of the actuator.
2. Remove the positioner, if one is used.
3. Mark the orientation of the travel indicator (key 37) with respect to the travel indicator scale (key 35). Then, unscrew the cap screws and washers (keys 34 and 63), and remove the cover (key 33).
4. Remove the retaining ring (key 30), and then remove the hub (key 29) from the cover.
5. Check the condition of the bearing (key 31). If replacement of the bearing is necessary, the travel indicator scale (key 35) must first be removed by removing the self-tapping screws (key 36). Mark the orientation of the travel indicator scale on the cover before removing it.

CAUTION

When removing the actuator from the valve body, do not use a hammer or similar tool to drive the lever (key 27) or actuator off the output shaft (key 87). Driving the lever or actuator could damage operated equipment. For valves, driving the lever (key 27) could move the valve disc and bearings away from the centered position causing subsequent damage to valve parts.

If necessary, use a wheel puller to remove the lever. It is permissible to tap the wheel puller screw lightly to loosen the lever, but hitting the screw with excessive force could also damage operated parts or disrupt the centered position of a valve disc or other equipment.

6. For an actuator with an H mounting adaptation and a 22.2 through 38.1 mm (7/8 through 1-1/2 inch) output shaft, unscrew the cap screws (key 78) and remove the actuator from the operated equipment. Mark the orientation of the lever (key 27) with respect to the output shaft (key 87). This marking is used during reassembly to allow for proper lever/output shaft positioning.

Then, loosen the cap screw (key 28) so that the output shaft is free to slide off the lever. With the lever and output shaft properly marked, unscrew the cap screws (key 23) and remove the mounting plate (key 22) and output shaft (key 87) assembly from the actuator housing (key 20). If necessary, remove the retaining ring (key 88) and separate the output shaft from the mounting plate.

7. For an actuator with a J mounting adaptation (see figures 12 and 13) with a 50.8 mm (2-inch) output shaft (see figure 14) and proceed as follows:

- a. Remove the cap screws (key 78, not shown in figures 12 and 13) and remove the actuator from the operated equipment. For an actuator with J mounting and a 31.8 or 38.1 mm (1-1/4 or 1-1/2 inch) valve shaft diameter, two spacers (key 92, not shown in figures 12 and 13) are also removed with the cap screws (key 78).

- b. When separating the output shaft (key 87) and coupling (key 90) from the operated shaft, remember to remove the woodruff key (key 91, not shown in figure 14) from the operated shaft keyway.

- c. Mark the orientation of the lever (key 27, figures 12 and 13) with respect to the output shaft (key 87). This marking is used during reassembly to allow for proper lever/output shaft positioning,

- d. Loosen the cap screw (key 28, figures 12 and 13) so that the output shaft is free to slide off the lever.

- e. With the lever and output shaft properly marked, unscrew the cap screws (key 23) and remove either the mounting bracket (key 22, figures 12 and 13 for J mounting) or the mounting plate (key 22, figure 14 for H mounting) plus the

attached output shaft (key 87) from the actuator housing (key 20).

f. If necessary, remove the retaining ring (key 88) and slide the mounting bracket or mounting plate off the output shaft.

8. Check the bearing (key 67) in the mounting bracket or mounting plate (key 22). Press out and replace the bearing if necessary.

9. Heat the hex nut (key 19) to 177°C (350°F) long enough for the thread-locking adhesive (high strength) (key 77) to lose its holding strength. Then, remove the cap screw and hex nut (keys 18 and 19), and remove the lever (key 27) from the housing.

10. Rotate the handwheel (if one is used) counter-clockwise until the handwheel is not compressing the spring (key 11).



WARNING

To avoid personal injury from precompressed spring force suddenly thrusting the upper diaphragm casing (key 1) away from the actuator, relieve Type 1052 spring compression, or carefully remove Type 1051 casing cap screws by following the instructions presented in the next two steps before proceeding further.

11. To relieve Type 1052 spring compression, insert a round rod into one of the slots in the lower bearing seat (key 73). Slot diameter is 9.5 mm (3/8 inch) for size 40 actuators, 15.9 mm (5/8 inch) for size 60 actuators, and 19.1 mm (3/4 inch) for size 70 actuators. Use the rod to rotate the lower bearing seat, and move it away from the actuator casings. Continue rotating the lower bearing seat until spring compression is completely removed.

12. Loosen, but do not remove, all casing cap screws (key 5). Make sure there is no spring force on the Type 1051 upper diaphragm casing. Unscrew and remove the cap screws and hex nuts (keys 5 and 6), and then remove the upper diaphragm casing and the diaphragm (key 3).

13. Proceed as appropriate:

For Type 1051 actuators,

a. Read and follow the warning printed on the nameplate (key 56) located on the diaphragm plate (key 4).

b. Pull the diaphragm plate (key 4) and attached parts out of the actuator. The spring (key 11), diaphragm rod (key 10), cap screw (key 9), spring seat (key 13), hex nut (key 58), turnbuckle (key 57), hex nut (key 16), and rod end bearing (key 17) will be attached to the diaphragm head.



WARNING

For Type 1051 actuators, the diaphragm plate (key 4) may be wedged against the diaphragm rod (key 10), thereby preventing the spring compression from being relieved as the cap screw (key 9) is loosened. Dislodge the diaphragm head from the diaphragm rod by loosening the cap screw (key 9) one full turn and tapping the underside of the diaphragm head until it follows the cap screw disassembly. Failure to check for this situation before removing the cap screw (key 9) could cause personal injury due to the sudden release of spring compression as the cap screw is disengaged.

c. Slowly remove the cap screw (key 9) while making sure that the diaphragm head is following the cap screw removal. Note that spring load will be zero before the cap screw is completely removed. Then separate the remaining parts of the assembly.

For Type 1052 actuators,

a. Remove the rod end bearing (key 17), the hex nut (key 16), the turnbuckle (key 57), and the hex nut (key 58) from the diaphragm rod (key 10).

b. Pull the diaphragm plate (key 4) and attached parts out of the actuator. Then remove the cap screw (key 9) to separate the diaphragm plate and the diaphragm rod.

c. Proceed as appropriate:

- For actuator designs **without a set screw** in the spring barrel (key 12), remove the actuator spring (key 11) from the actuator. If it is necessary to remove the adjuster (key 74) from the spring barrel during this procedure, heat the base of the adjuster to 177°C (350°F) long enough for the thread locking adhesive (high strength) (key 77) to lose its holding strength. Then, unscrew the adjuster from the spring barrel. If the spring seat and the lower bearing seat

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(key 13 and 73) are to be replaced, unscrew the lower bearing seat from the adjuster, and then remove the thrust bearing and the bearing races (keys 71 and 72) from the lower bearing seat.

- For actuator designs **with a set screw** (key 75), remove the actuator spring (key 11) from the actuator. If the spring seat and the lower bearing seat (keys 13 and 73) are to be replaced, unscrew the lower bearing seat from the adjuster, and then remove the thrust bearing and the bearing races (keys 71 and 72) from the lower bearing seat. If it is necessary to remove the spring adjustment parts, heat the set screw (key 75) to 177°C (350°F) long enough for the thread-locking adhesive (high strength) (key 77) to lose its holding strength, and then loosen the set screw (key 75). Unscrew the spring adjuster (key 74) from the spring barrel (key 12).

Assembly

This procedure assumes that the actuator is completely disassembled. If the actuator is not completely disassembled, start these instructions at the appropriate step. Key numbers used are shown in figure 12 to Type 1051 actuators and in figure 13 for Type 1052 actuators.

1. If the Type 1052 spring barrel (key 12) was removed from the housing (key 10), align the spring barrel to the housing as described below to ensure that the offset hole in the base of the spring barrel is located properly.

For size 40 and 60 actuators, note that one of the accessory mounting bosses on the spring barrel is closer to the diaphragm end of the spring barrel. Place the spring barrel on the housing with the upper boss (the one closer to the diaphragm end) on the same side as the boss located on the housing (see figure 13). This ensures proper positioning of the offset hole. Secure the spring barrel with the cap screws (key 21).

For size 70 actuators, the spring barrel need not be aligned in any particular position when placing it on the housing.

Note

**Refer to table 10 for bolting torques for actuator bolts and cap screws.
Exceeding any torque requirement may impair the safe operation of the actuator.**

2. Proceed as appropriate:

For Type 1051 actuators,

- a. Coat the thread of the cap screw (key 9) and the tapered end of the diaphragm rod (key 10) with lithium grease (key 76).
- b. Assemble the diaphragm rod, spring seat (key 13), spring (key 11), and diaphragm plate (key 4), and secure with the cap screw (key 9). Tightening the cap screw will compress the spring. Be certain the tapered end of the diaphragm rod is seated in the corresponding hole in the diaphragm plate, that the spring is seated in the spring seat, and that the cap screw is tightened to the torque specified in table 10.
- c. Install the hex nut (key 58), turnbuckle (key 57), hex nut (key 16), and rod end bearing (key 17) onto the diaphragm rod.
- d. Be certain the travel stops (key 8) are located as shown in figure 11.
- e. Install the diaphragm plate and attached parts into the actuator.
- f. Be sure the warning nameplate (key 56) is in place. Install the diaphragm (key 3) and the upper diaphragm casing (key 1). Install the cap screws and hex nuts (keys 5 and 6). Tighten the cap screws evenly in a crisscross pattern to compress the spring and secure the upper diaphragm casing. Tighten these cap screws to the torques shown in table 10.

For Type 1052 actuators,

- a. Proceed as appropriate:
 - For actuator designs **without a set screw** in the spring barrel (key 12), if the adjuster and attached parts were removed, first clean and then lubricate the upper threads of the adjuster (key 74) with lithium grease (key 76) as shown in figure 13. Install the lower bearing seat (key 73), the thrust bearing (key 71), the thrust bearing races (key 72), and the spring seat (key 13) onto the adjuster. Then, first clean and then coat the lower end of the adjuster with thread-locking adhesive (high strength) (key 77) as shown in figure 13, and install the entire assembly into the spring barrel (key 12). Let the adjuster stand undisturbed for at least two hours after installation to allow the thread-locking compound to cure.

CAUTION

When applying lubricant to the upper threads and thread-locking compound

to the lower threads of the adjustor, do not overlap the coat of lubricant with the coat of thread-locking compound since this will adversely affect the performance quality of both substances.

- For actuator designs **with a set screw** (key 75), if the adjustor (key 74) and attached parts were removed, lubricate the threads of the adjustor with lithium grease (key 76). Install the lower bearing seat (key 73), the thrust bearing (key 71), the thrust bearing races (key 72), and the spring seat (key 13) onto the adjustor. Install this assembly into the spring barrel (key 12). After first cleaning and then coating the set screw (key 75) with thread-locking adhesive (high strength) (key 77), secure the adjustor with the set screw (key 75).

- b. Coat the tapered end of the diaphragm rod (key 10) and the threads of the cap screw (key 9) with lithium grease (key 76). Bolt the diaphragm plate (key 4) to the diaphragm rod with the cap screw (key 9). Tighten the cap screw to the torque value listed in table 10.

- c. Be certain the travel stops (key 8) are located as shown in figure 11.

- d. Install the spring (key 11) into the spring barrel. Install the diaphragm plate and diaphragm rod into the actuator. Attach the hex nut (key 58), turnbuckle (key 57), hex nut (key 16), and rod end bearing (key 17) to the diaphragm rod.

- e. Install the diaphragm (key 3).

- f. Place the upper diaphragm casing (key 1) on the lower diaphragm casing (key 2). If necessary, rotate the lower bearing seat (key 73) so that the upper diaphragm casing travel stop will not contact the diaphragm when the casing cap screws (key 5) are tightened. Secure the upper diaphragm casing with the cap screws and hex nuts (keys 5 and 6) in a criss-cross pattern to the torques shown in table 10. Be sure the warning nameplate is in place on the casing.

3. If the bearing (key 67) was removed, press in the new bearing. The end of the bearing should be flush

with the outside of the mounting bracket or mounting plate (key 22).

4. For an actuator with an **H mounting** adaptation, install the output shaft (key 87) through the mounting plate (key 22) and secure it with the retaining ring (key 88). Then, attach the mounting plate and output shaft assembly to the actuator housing (key 20) with the cap screws (key 23). Tighten the cap screws to the appropriate torque value listed in table 10.

5. For an actuator with a **J mounting** adaptation, refer to figures 12 and 13. Install the output shaft (key 87) with attached coupling (key 90) through the mounting bracket (key 22) and secure it with the retaining ring (key 88). Attach the mounting bracket and output shaft assembly to the actuator housing (key 20) with the cap screws (key 23). Tighten the cap screws to the appropriate torque value listed in table 10.

6. For an actuator with a **J mounting** adaptation and a **50.8 mm (2-inch) output shaft**, refer to figure 14. Install the output shaft (key 87) with attached coupling (key 90) through the mounting plate (key 22) and secure it with the retaining ring (key 88). Attach the mounting plate and output shaft assembly to the actuator housing with the cap screws (key 23). Tighten the cap screws to the appropriate torque value listed in table 10.

7. Apply lithium grease (key 76) to the output shaft splines. Then, align the lever (key 27) and output shaft so that the marking that was made in step 6 or 7 of the Disassembly procedure is oriented correctly. Slide the lever into place. When installing the lever, align the bolt holes in the lever as close as possible with the hole in the rod end bearing (key 17). Temporarily rotate the lever and output shaft until the rod end bearing no longer interferes with further installation of the lever. Then, slide the lever as far as it can go onto the output shaft.

8. Clamp the lever to the output shaft with the cap screw (key 28). Tighten the cap screw to the torque value listed in table 10.

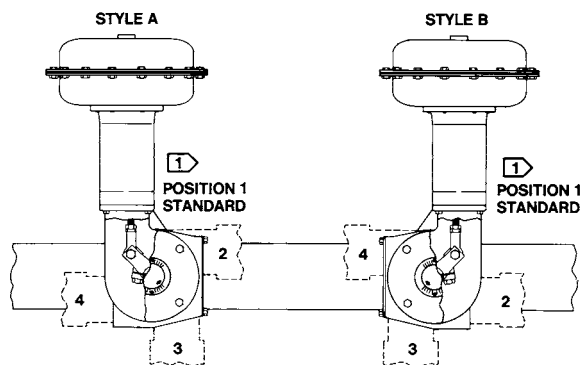
9. For Type 1052 actuators, complete the Initial Compression portion of the Adjustment section before proceeding.

10. Rotate the lever (key 27) to align with the rod end bearing (key 17). This connection can be aided by stroking the actuator off its up travel stop with a regulated air source.

1051 & 1052 H & J

DESIRED ACTION OF		HOUSING CONSTRUCTION TO SPECIFY
Actuator	Operated Equipment	
Push Down to Open ⁽¹⁾ (PDTO)	Clockwise to Close ⁽³⁾	Style A
	Counterclockwise to Close ⁽³⁾	Style B
Push Down to Close ⁽²⁾ (PDTC)	Clockwise to Close ⁽³⁾	Style B
	Counterclockwise to Close ⁽³⁾	Style A

1. This action uses the spring to close the valve body or other equipment.
2. This action uses the spring to open the valve body or other equipment.
3. When viewed from actuator side of valve body or other equipment.



NOTE:
1 DOTTED LINES INDICATE ALTERNATE MOUNTING POSITIONS 2, 3, AND 4.
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A1578-3

Figure 10. Actuator Housing Construction Styles and Mounting Positions

11. Apply thread-locking adhesive (high strength) (key 77) to the threads of the cap screw (key 18).

12. Connect the lever (key 27) and the rod end bearing (key 17) with the cap screw and hex nut (keys 18 and 19). Tighten the cap screw to the torque value listed in table 10.

13. If a positioner is to be used, consult the separate positioner instruction manual for proper positioner installation.

14. Coat the bearing surfaces of the hub (key 29) and cover (key 33) with lithium grease (key 76). Install the bearing (key 31) and hub into the cover. Secure with the retaining ring (key 30).

15. Install the travel indicator scale (key 35) so that the markings on the scale and cover that were made in step 5 of the Disassembly procedure are oriented correctly. Secure the travel indicator scale to the cover with the self-tapping screws (key 36). Then install the travel indicator (key 37), and secure it with the self-tapping screws (key 38).

16. Position the travel indicator (key 37) so that the markings on the travel indicator and travel indicator scale that were made in step 3 of the Disassembly procedure are oriented correctly. Then, replace the cover (key 33), and secure it with the cap screws and washers (keys 34 and 63). If the holes in the cover and housing (key 20) do not align, use a regulated air source to move the actuator slightly off the up travel stop. If hole alignment cannot be obtained in this manner, temporarily loosen the cap screws (key 23), and shift the housing slightly. Do not stroke the actuator while the cover is off. Tighten the cap screws to the torque value listed in table 10.

17. Follow the instructions in the Actuator Mounting section for correct actuator mounting and adjustment. Remember to replace the access plate (key 59) when performing this procedure.

Changing Actuator Mounting

The actuator is normally positioned vertically in a horizontal pipeline. However, each style can be mounted in two possible mounting styles and four possible positions (see figure 10).

Note

Due to its weight, the Type 1052, size 70 actuator must be externally supported if mounted in the horizontal position.

WARNING

Before performing any Actuator Mounting steps, follow the steps in the WARNING at the beginning of the Maintenance section.

Use the following procedures along with figures 12 and 13 for key number references to convert from style A to style B or vice versa or to change the mounting position.

Changing Styles

1. Unscrew the cap screws and washers (keys 34 and 63), and remove the cover (key 33).
2. Heat the hex nut (key 19) to 177°C (350°F) long enough for the thread-locking adhesive (high strength) (key 77) to lose its holding strength. Then, remove the cap screw and hex nut (keys 18 and 19).

3. Loosen the cap screw (key 28).

CAUTION

If necessary, use a wheel puller to remove the lever (key 27) from the output shaft (key 87). It is permissible to tap the wheel puller screw lightly to loosen the lever, but hitting the screw with excessive force could damage the operated equipment.

4. Mark the side of the lever (key 27) that is nearest to the end of the output shaft (key 87). This marking is used during reassembly to determine which side of the lever should be inserted into the actuator housing first. When the lever is marked, remove the lever.

5. For an actuator with a J mounting adaptation,

a. Unscrew the cap screws (key 23), and remove the actuator housing (key 20) from the mounting bracket (key 22).

b. Rotate the actuator housing 180 degrees, maintaining the appropriate position (1, 2, 3, or 4), and place the actuator onto the mounting bracket (key 22).

c. Secure the actuator housing to the mounting bracket with the cap screws (key 23). Tighten the cap screws to the torque value listed in table 10.

6. For an actuator with an H mounting adaptation,

a. Unscrew the cap screws (key 78) and remove the actuator assembly from its mounting bracket.

b. Unscrew the cap screws (key 23) and remove the mounting plate (key 22) and output shaft (key 87) assembly from the actuator housing. Remount the assembly on the opposite side of the actuator, and secure it to the housing with the cap screws (key 23). Tighten the cap screws to the torque value listed in table 10.

c. Rotate the actuator housing 180 degrees, maintaining the appropriate position (1, 2, 3, or 4) and secure the actuator housing to the mounting bracket with the cap screws (key 78). Tighten the cap screws to the torque value listed in table 10.

7. Install the lever (key 27) as follows:

a. For push-down-to-open action, rotate the operated equipment to the fully closed position.

b. For push-down-to-close action, rotate the operated equipment to the fully open position.

c. With the operated equipment oriented correctly, slide the lever onto the output shaft (key 87) with the end marked in step 4 inserted first. When installing the lever, align the bolt holes in the lever as close as possible with the hole in the rod end bearing (key 17).

d. Temporarily rotate the lever and output shaft until the rod end bearing no longer interferes with further installation of the lever. Then, slide the lever as far as it can go onto the output shaft. Clamp the lever to the output shaft with the cap screw (key 28). Tighten the cap screw to the torque value listed in table 10.

e. Rotate the lever and output shaft back to the original position (i.e., operated equipment fully closed for push-down-to-open action or operated equipment fully open for push-down-to-close action). Then, adjust the rod end bearing so that it can be attached to the lever.

8. Apply thread-locking adhesive (high strength) (key 77) to the threads of the cap screw (key 18).

9. Connect the lever (key 27) and the rod end bearing (key 17) with the cap screw and hex nut (keys 18 and 19). This connection can be aided by stroking the actuator from its up travel stop with a regulated air source. Tighten the cap screw to the torque value listed in table 10.

10. Note the position of the valve body or other operated equipment and direction of rotation. Position the travel indicator (key 37) accordingly. Replace the cover (key 33), and secure it with the cap screws and washers (keys 34 and 63). If the holes in the cover and housing (key 20) do not align, use a regulated air source to move the actuator slightly off the up travel stop. If hole alignment cannot be obtained in this manner, temporarily loosen the cap screws (key 23), and shift the housing slightly. Do not stroke the actuator while the cover is off. Tighten both sets of cap screws to the torque values listed in table 10.

11. Follow the instructions in the Turnbuckle Adjustment section.

Changing Positions

1. Unscrew the cap screws and washers (keys 34 and 63), and remove the cover (key 33).

2. Mark the orientation of the lever (key 27) with respect to the output shaft (key 87). This marking is used during reassembly to allow for proper lever/output shaft positioning. When the lever and output shaft are properly marked, heat the hex nut (key 19) to 177°C (350°F) long enough for the thread-locking adhesive (high strength) (key 77) to lose its holding strength. Then, remove the cap screw and hex nut (keys 18 and 19).

CAUTION

If necessary, use a wheel puller to remove the lever (key 27) from the output shaft (key 87). You may tap the wheel puller screw lightly to loosen the lever, but hitting the screw with excessive force could damage the operated equipment.

3. Loosen the cap screw (key 28) and remove the lever (key 27) from the output shaft (key 87).

4. For an actuator with a J mounting adaptation.

a. Unscrew the cap screws (key 23), and remove the actuator housing (key 20) from the mounting bracket (key 22).

b. Rotate the actuator housing to the new position (1, 2, 3, or 4).

c. Secure the actuator housing to the mounting bracket with the cap screws (key 23). Tighten the cap screws to the torque value listed in table 10.

5. For an actuator with an H mounting adaptation.

a. Unscrew the cap screws (key 78) and loosen the actuator assembly from its mounting bracket.

b. Rotate the actuator housing to the new position (1, 2, 3, or 4).

c. Secure the actuator housing to the mounting bracket with the cap screws (key 78). Tighten the cap screws to the torque value listed in table 10.

6. Referring to the alignment marks that were made in step 2, install the lever (key 27) onto the output shaft (key 87) as follows:

a. If the new actuator position is 90 degrees clockwise from the previous actuator position, install the lever so that its orientation mark is located 90 degrees clockwise from the mark on the output shaft.

b. If the new actuator position is 90 degrees or 180 degrees counterclockwise from the previous position, install the lever so that its orientation mark is located either 90 degrees (for 90 degrees) or 180 degrees (for 180 degrees) counterclockwise (respectively) from the mark on the output shaft.

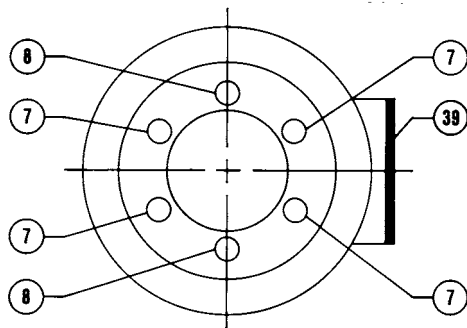
c. Slide the lever onto the output shaft with the bolt holes in the lever aligned as closely as possible with the hole in the rod end bearing (key 17). Then, temporarily rotate the lever and output shaft until the rod end bearing no longer interferes with further installation of the lever, and slide the lever as far as it can go onto the output shaft. Clamp the lever to the output shaft with the cap screw (key 28). Tighten the cap screw to the torque value listed in table 10.

d. Rotate the lever and output shaft back to the original position, and then adjust the rod end bearing so that it can be attached to the lever.

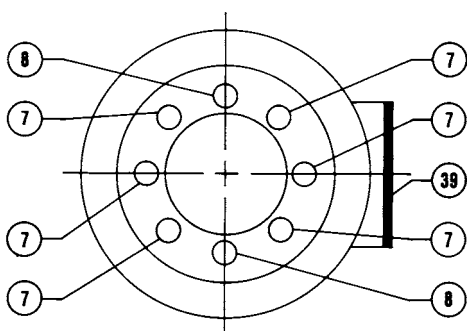
7. Apply thread-locking adhesive (high strength) (key 77) to the threads of the cap screw (key 18).

8. Connect the lever (key 27) and the rod end bearing (key 17) with the cap screw and hex nut (keys 18 and 19). This connection can be aided by stroking the actuator from its up travel stop with a regulated air source. Tighten the cap screw to the torque value listed in table 10.

9. Note the position of the valve body or other operated equipment and direction of rotation. Position the travel indicator (key 37) accordingly. Replace the cover (key 33), and secure it with the cap screws and washers (keys 34 and 63). If the holes in the cover and housing (key 20) do not align, use a regulated air source to move the actuator slightly off the up travel stop. If hole alignment cannot be obtained in this manner, temporarily loosen the cap screws (key 23), and shift the housing slightly. Do not stroke the actuator while the cover is off. Then, tighten both sets of cap screws to the torque values listed in table 10.



SIZES 30 AND 40



SIZES 60 AND 70

A2534-1

Figure 11. Travel Stop Orientation

10. Follow the instructions in the Turnbuckle Adjustment section.

Top-Mounted Handwheels and Adjustable Travel Stops

Handwheel and Travel Stop Operation

Note

If repeated or daily manual operation is expected or desired, the unit should be equipped with a manual handwheel actuator. Refer to the separate manual

handwheel actuator instruction manual for mounting instructions.

The top-mounted handwheel assembly is attached to a special upper diaphragm casing (key 1, figures 12 and 13) with cap screws (key 141, figure 15). A hex nut (key 137, figure 15) locks the handwheel in position.

Turning the handwheel (key 51, figure 15) clockwise into the upper diaphragm casing forces the pusher (key 135, figure 15) against the diaphragm and diaphragm plate (keys 3 and 4, figures 12 and 13) to compress the spring (key 11, figures 12 and 13) and move the diaphragm rod downward. Turning the handwheel counterclockwise allows the actuator spring to move the diaphragm rod upward. If the action is push-down-to-close, full opening can be restricted by positioning the handwheel at the desired position. If the action is push-down-to-open, full closing can be restricted by use of the handwheel.

The adjustable up travel stop (figure 16) limits the actuator stroke in the upward direction. To make adjustments, first relieve actuator loading pressure before removing the closing cap (key 187) as it is a pressure retaining part. Also, for size 70 actuators, the hex nut (key 137) must be loosened.

Turning the stem (key 133) clockwise into the diaphragm case moves the actuator stem downward or counterclockwise to allow the spring to move the actuator stem upward. If the action is push-down-to-close, full opening can be restricted; or if the action is push-down-to-open full closing can be restricted by the position of the adjustable travel stop.

The adjustable down travel stop (figure 17) limits the actuator stroke in the downward direction. To make adjustments, first relieve actuator loading pressure before removing the closing cap (key 187) as it is a pressure retaining part. After removing the closing cap loosen the hex jam nut (key 189) and either turn the hex nut (key 63 for size 40, and 70 actuators; or key 54 for size 60 actuators) down on the stem (key 133) to limit travel, or up on the stem to allow more travel. Lock the jam nut against the hex nut, and replace the closing cap after the adjustment has been made. For size 70, tighten the hex nut and replace the closing cap after adjustment.

Handwheel and Travel Stop Maintenance



WARNING

Avoid personal injury or property damage from sudden release of process pressure or uncontrolled movement of parts. Before performing any maintenance operations:

- Always wear protective gloves, clothing, and eyewear when performing any maintenance operations to avoid personal injury.
- Disconnect any operating lines providing air pressure, electric power, or a control signal to the actuator. Be sure the actuator cannot suddenly open or close the valve.
- Use bypass valves or completely shut off the process to isolate the valve from process pressure. Relieve process pressure from both sides of the valve. Drain the process media from both sides of the valve.
- Vent the power actuator loading pressure and relieve any actuator spring precompression.
- Use lock-out procedures to be sure that the above measures stay in effect while you work on the equipment.
- The valve packing box may contain process fluids that are pressurized, *even when the valve has been removed from the pipeline.* Process fluids may spray out under pressure when removing the packing hardware or packing rings, or when loosening the packing box pipe plug.
- Check with your process or safety engineer for any additional measures that must be taken to protect against process media.

If loading pressure seems to be leaking from either the handwheel or adjustable up stop, the O-rings (key 138 and 139, figures 15 and 16) may need replacement. If the adjustable down stop leaks, the O-ring (key 139, figure 17) may need replacement or possibly the closing cap, (key 187, figure 17) is not

tight. To tighten the closing cap, apply a good grade of thread sealant to the closing cap threads.

For ease of operation, the stem (key 133, figures 15, 16, and 17) threads may need an occasional application of lithium grease. A grease fitting (key 169, figures 15 and 16) is provided for this purpose in the size 70. The size 70 may also need to have the thrust bearing (key 175, figures 15 and 16) packed with lithium grease. Travel stops for the smaller casings can be lubricated between the stem and pusher (key 135, figures 15 and 16) with lithium grease.

1. Bypass the control valve, reduce loading pressure to atmospheric, and remove the tubing or pipe from the body (key 142, figures 15, 16, and 17).



WARNING

To avoid personal injury from the precompressed spring force thrusting the upper diaphragm casing (key 1, figures 12 and 13) away from the actuator, either relieve Type 1052 spring compression, or carefully remove Type 1051 casing cap screws by following the instructions that are referenced in the steps below before removing the casing.

2. Relieve all actuator spring compression by following the procedures presented in the Disassembly portion of the Maintenance section. Then, rotate either the handwheel (key 51, figure 15) or the travel stop stem (key 133, figures 16 and 17) counterclockwise until the handwheel or travel stop assembly is no longer compressing the spring.
3. Proceed as appropriate:

For Top-Mounted Handwheels and Adjustable Up Travel Stops

- a. Remove the upper diaphragm casing (key 1, figures 12 and 13) by following steps 1, 3, 6, 7, 9, 11, and 12 of the Disassembly portion of the Maintenance section.
- b. Remove the cap screws (key 141, figures 15 and 16, and separate the assembly from the upper casing.
- c. Loosen the locknut (key 137, figure 15) or remove the closing cap (key 187, figure 16).
- d. Turn the stem (key 133, figures 15 and 16) clockwise out of the body. On handwheel

assemblies, the cotter pin and slotted nut (keys 247 and 54, figure 15) will have to be removed so that the handwheel (key 51, figure 15) and locknut can be taken off the stem first.

e. Remove and inspect the O-rings (keys 138 and 139, figures 15 and 16); replace them if necessary.

f. To complete disassembly for sizes 40 and 60, drive out the groove pin (key 140, figures 15 and 16), and slide the pusher (key 135, figures 15 and 16) off the stem. The pusher of a size 70 unit is held to the stem by a retaining screw (key 174, figures 15 and 16). Removing the retaining screw and pusher exposes the thrust bearing (key 175, figures 15 and 16) for inspection.

For Adjustable Down Travel Stops

Refer to figure 17 for appropriate key numbers unless otherwise stated.

a. Remove the closing cap (key 187), and unscrew the jam nut and hex nut (keys 189 and 63 for sizes 40, and 70 actuators; or keys 189 and 54 for size 60 actuators) off the stem (key 133).

b. Remove the upper diaphragm casing (key 1, figures 12 and 13) and travel stop body (key 142) by following steps 1, 3, 6, 7, 9, 11, and 12 of the Disassembly portion of the Maintenance section.

c. Unscrew cap screws (key 141), and remove the body from the diaphragm case.

d. Check the condition of the O-ring (key 139), and replace it if necessary.

e. Loosen the hex nut (key 54), and then unscrew the travel stop stem (key 133) out of the actuator stem. The lower diaphragm plate (key 82) can now be removed and the rest of the actuator disassembled.

4. Reassemble by reversing the order of the steps you took to disassemble, being sure to apply

lubricant as previously mentioned and as shown by the lubrication boxes (key 241) in figures 15 and 16. For size 70 handwheels or up travel stop assemblies, coat the threads of the retaining screws (key 174, figures 15 and 16) with thread-locking adhesive (high strength) (key 242).

5. Adjust the spring to obtain the appropriate travel stop restriction by following the procedures presented in the introductory portion of this section, and then return the unit to operation.

Parts Ordering

When corresponding with your Emerson Process Management sales office about this equipment, refer to the serial number found on the actuator nameplate (key 41, figure 12). Also, specify the complete 11-character part number from the following parts list when ordering replacement parts.



WARNING

Use only genuine Fisher replacement parts. Components that are not supplied by Emerson Process Management should not, under any circumstances, be used in any Fisher valve, because they will void your warranty, might adversely affect the performance of the valve, and could give rise to personal injury and property damage.

Note

Neither Emerson, Emerson Process Management, nor any of their affiliated entities assumes responsibility for the selection, use and maintenance of any product. Responsibility for the selection, use, and maintenance of any product remains with the purchaser and end-user.

Parts List

Retrofit Kits

Kit provides parts to add a top-mounted handwheel. Kit number 1 includes the handwheel assembly only. Kit number 2 includes Kit number 1 and a new upper case (key 1) that is required to mount the handwheel assembly.

Key	Description	Part Number
	Type 1052 Actuator	
	Kit Number 1	
	Size 40	38A1213X032
	Size 60, Push-Down-to-Close	38A1213X062
	Size 60, Push-Down-to-Open	38A1213X052
	Kit Number 2	
	Size 40	38A1213X072
	Size 60, Push-Down-to-Close	38A1213X022
	Size 60, Push-Down-to-Open	38A1213X042
	Type 1052 Actuator	
	Kit Number 1	
	Size 40	38A1213X032
	Size 60, Push-Down-to-Close	38A1213X062
	Size 60, Push-Down-to-Open	38A1213X052
	Size 70	CV8010X0012
	Kit Number 2	
	Size 40	38A1213X072
	Size 60, Push-Down-to-Close	38A1213X022
	Size 60, Push-Down-to-Open	38A1213X042
	Size 70	CV8010X0022

Common Parts (figures 12 and 13)

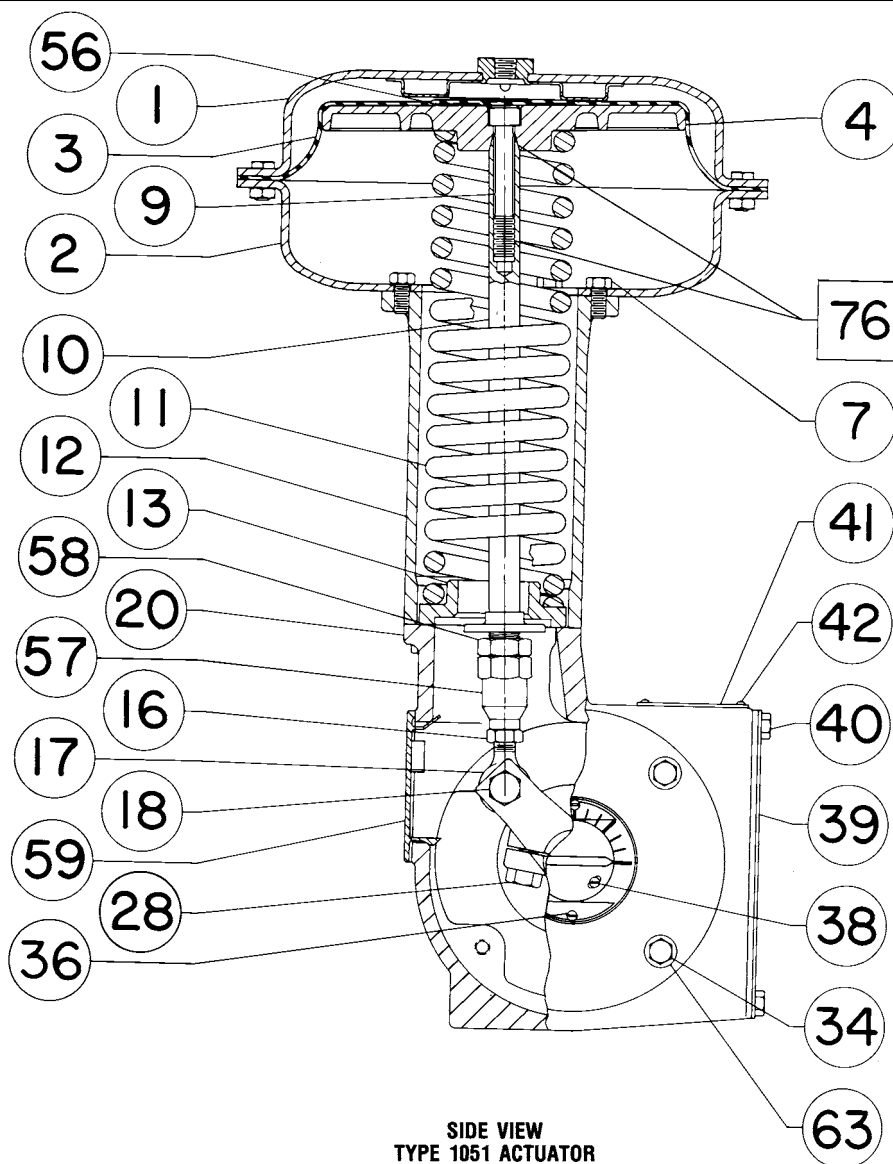
Note

Part numbers are shown for recommended spares only. For part numbers not shown, contact your Emerson Process Management sales office.

Note

The size 70 actuator is available only in Type 1052 actuators.

Key	Description	Part Number
1	Casing, upper	
2	Diaphragm Casing, Lower	
3*	Diaphragm	
	Molded Nitrile/Nylon	
	Std, w/handwheel, or w/adj up stop	
	Size 40	2E670002202
	Size 60	2E859702202
	Size 70	2N126902202
	w/adj down stop	
	Size 40	2E669902202
	Size 60	2E859802202
	Size 70	2N130902202
	Molded Silicone/Polyester	
	Std, w/handwheel, or w/up stop	
	Size 40	2E6700X0012
	Size 60	2E8597X0032
	Size 70	2N1269X0012
	w/down stop	
	Size 40	2E6699X0042
	Size 60	2E8598X0012
	Size 70	2N1309X0012
4	Diaphragm Head	
5	Screw, Cap, Hex hd	
	Size 40 (16 req'd)	
	Size 60 (24 req'd)	
	Size 70 (28 req'd)	



**SIDE VIEW
TYPE 1051 ACTUATOR**

NOTES:
1. KEYS 12 & 21 ARE NOT REQUIRED FOR SIZE 30 ACTUATORS.
2. KEYS 56, 62, 78, & 92 ARE NOT SHOWN.
□ APPLY LUBRICANT/SEALANT

D0299-1/IL

Figure 12. Type 1051 Actuator with Typical H and J Mounting Adaptations

Key	Description	Part Number	Key	Description	Part Number
6	Nut, hex		11	Spring	See following table
	Size 40 (16 req'd)		12	Spring barrel	
	Size 60 (24 req'd)		13	Spring seat	See following table
	Size 70 (28 req'd)		16	Nut, hex	
7	Screw, cap, Hex hd		17	Bearing, Rod End	
	Size 40 (4 req'd)		18	Screw, cap, Hex hd	
	Size 60 (6 req'd)		19	Nut, Hex, Jam	
	Size 70 (10 req'd)		20	Housing	
8	Travel Stop (2 req'd)		21	Screw, Cap, Hex Hd (4 req'd)	
9	Screw, cap, Hex socket		22	Plate, mounting	
10	Diaphragm Rod		23	Screw, Cap, Hex socket (4 req'd)	

1051 & 1052 H & J

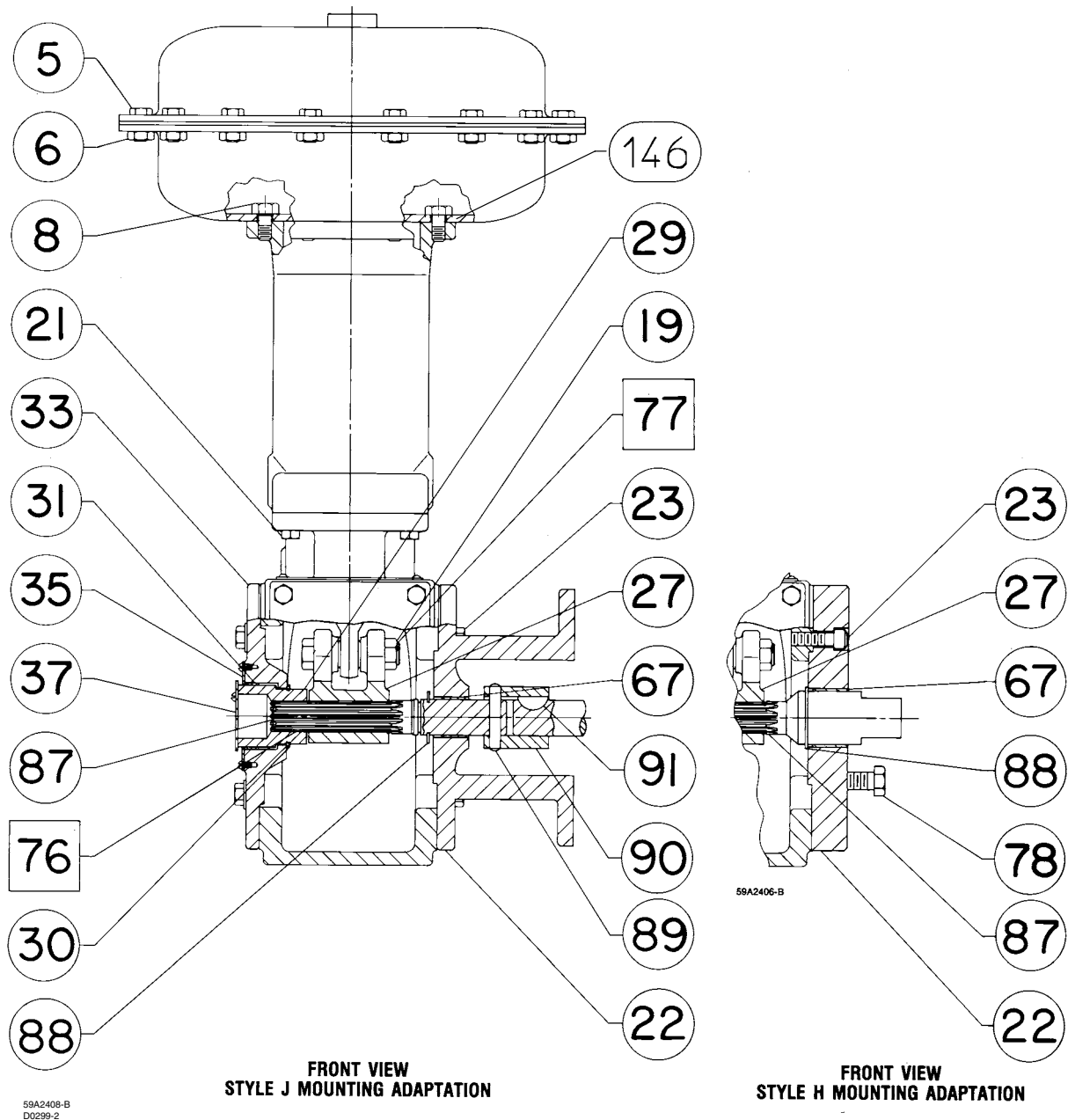
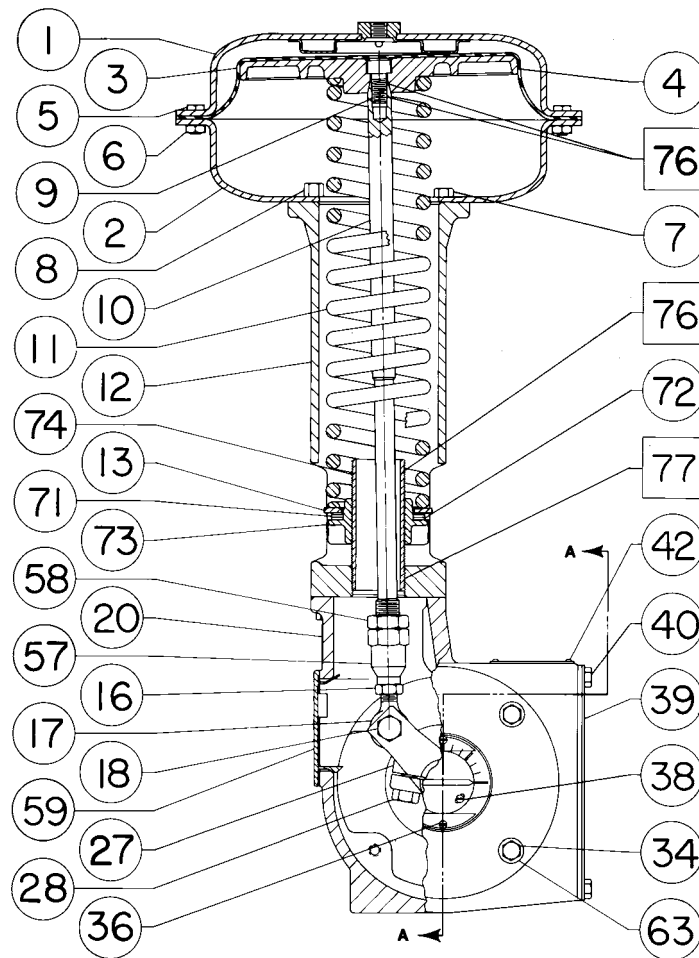


Figure 12. Type 1051 Actuator with Typical H and J Mounting Adaptations (continued)



59A2420-A
D0300-1/IL

**SIDE VIEW
TYPE 1052 ACTUATOR**

NOTES:

1. KEYS 56, 82, 78, & 92 ARE NOT SHOWN.

□ APPLY LUBRICANT/SEALANT

Figure 13. Type 1052 Actuator with Typical H and J Mounting Adaptations

1051 & 1052 H & J

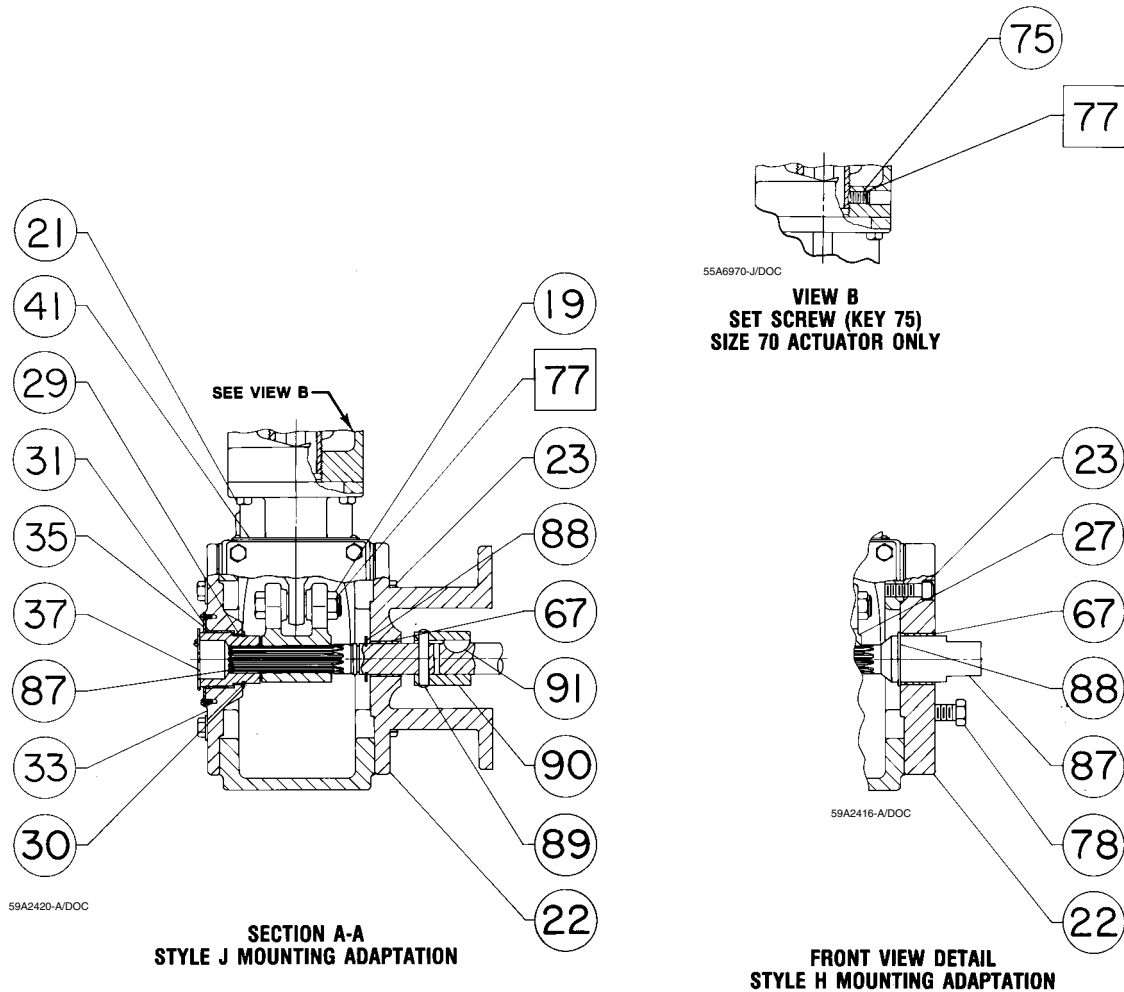


Figure 13. Type 1052 Actuator with Typical H and J Mounting Adaptations (continued)

Key	Description	Part Number	Key	Description	Part Number
27	Lever		34	Stud post, Steel (not shown)(w/Type 3555T)(4 req'd)	
28	Screw cap, Hex Hd		35	Scale, Indicator (w/out handwheel or w/Type 3555T)	
29	Hub		36	Screw, Self Tap (2 req'd)	
30	Retaining Ring, Ext		37	Travel Indicator	
31*	Bushing (2 req'd)		38	Self-Tapping Screw (2 req'd)	
	Size 40	12A9373X012	38	Machine Screw (2 req'd)	
	Sizes 60 & 70	12A9374X012			
33	Cover				
34	Screw, Cap, Hex Hd				

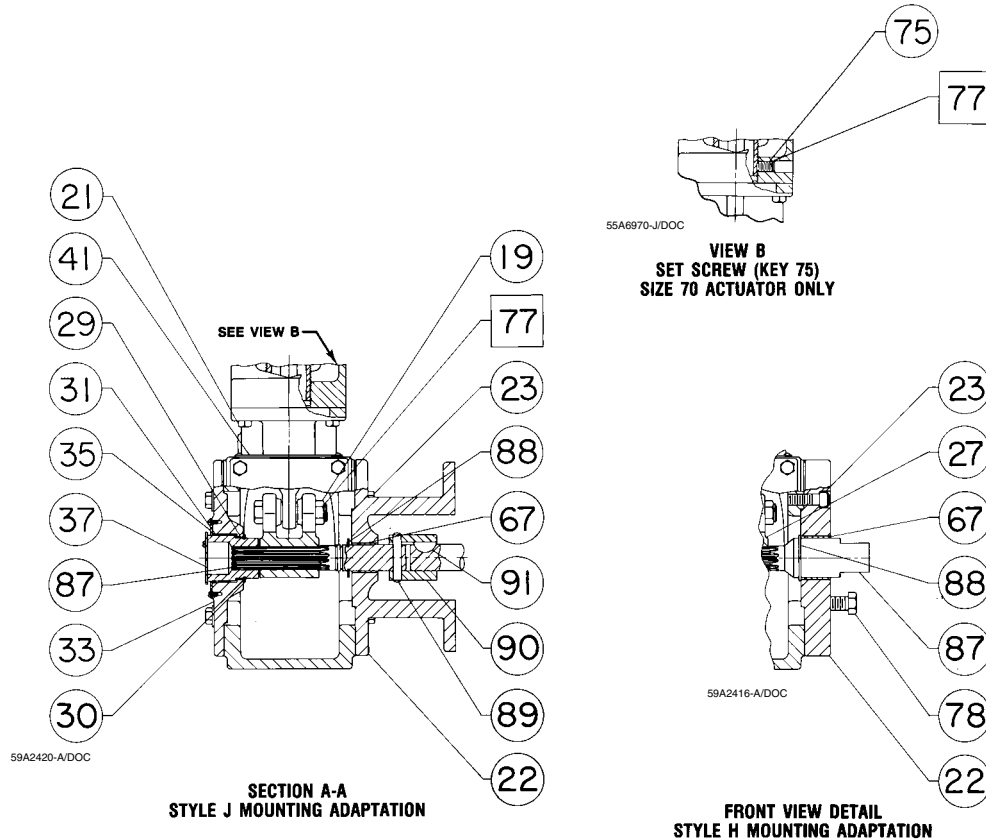


Figure 13. Type 1052 Actuator with Typical H and J Mounting Adaptations (Continued)

Key	Description	Part Number	Key	Description	Part Number
39	Plate, Cover w/o Type 3610J/3620J Positioner		67*	Bushing, PTFE (continued) Style J Mounting Size 40 w/9.5 & 12.7 mm (3/8 & 1/2-inch) Actuator output shaft	12A9555X012
40	Screw, Cap, Hex hd w/o Type 3610J/3620J Positioner (4 req'd)			w/15.9 mm (5/8-inch) output shaft	12A9555X012
41	Nameplate			Sizes 40 & 60 w/19.1 & 25.4 mm (3/4 & 1-inch) Actuator output shaft	12A9775X012
42	Screw, Drive (4 req'd)			Sizes 60 & 70 w/31.8 & 38.1 mm (1-1/4 & 1-1/2 inch) Actuator output shaft	12A9559X012
56	Nameplate			w/50.4 mm (2-inch) Actuator output shaft	12A9715X012
57	Turnbuckle				
58	Nut, Hex, Jam		71	Bearing, Thrust, Steel (Type 1052)	
59	Plate, Access		72	Bearing race, Steel (Type 1052) (2 req'd)	
63	Washer, Plain Type 1051 w/Type 304 or Type 4200 Size 40 (4 req'd) Sizes 60 & 70 (2 req'd)		73	Bearing Seat (Type 1052, Sizes 60 & 70)	
64	Ind, Travel (not shown)(w/Type 3555T)		74	Screw, adjusting (Type 1052)	
65	Screw, Mach, Fill hd (w/Type 3555T)		75	Set Screw, Hex Socket (Type 1052, Size 70)	
66	Disc, Travel Indicator (w/Type 3555T) (not shown)		76	Lithium Grease (not furnished w/actuator)	
67*	Bushing, PTFE Style H Mounting w/22.2 mm (7/8-inch) Actuator output shaft	12A9557X012	77	Thread Locking Adhesive (High Strength) (not furnished w/actuator)	
	w/28.6 mm (1-1/8 inch) Actuator output shaft	12A9775X012			
	w/38.1 mm (1-1/2 inch) Actuator output shaft	12A9559X012			

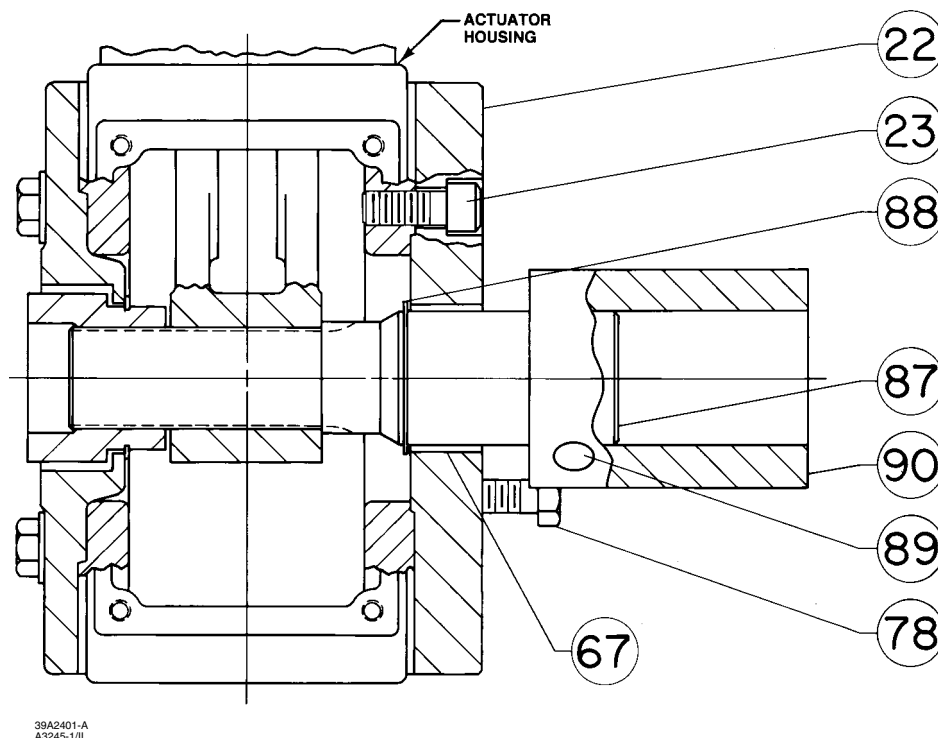
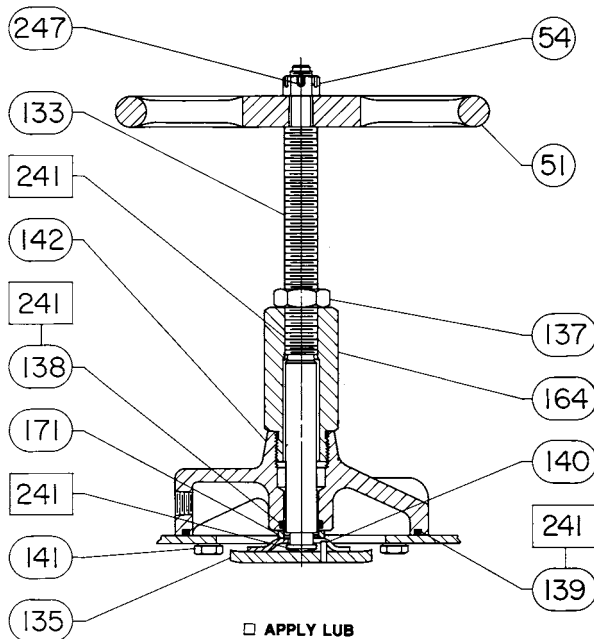


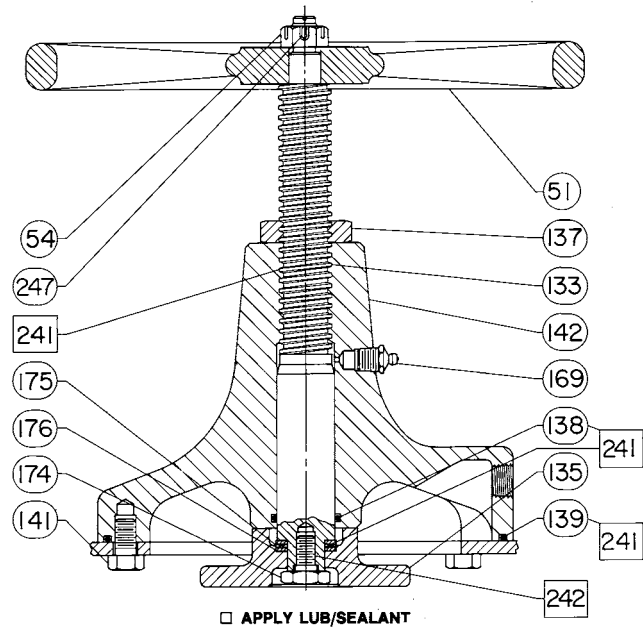
Figure 14. H Mounting for 44.5 or 50.8 mm (1-3/4 or 2-Inch)
Keyed Equipment Shafts

Key	Description	Part Number	Key	Description	Part Number
78	Cap Screw, Hex Hd Style H Size 40 w/22.2 mm (7/8-inch) actuator output shaft (4 req'd) w/28.6 mm (1-1/8 inch) actuator output shaft (4 req'd) w/38.1 mm (1-1/2 inch) actuator output shaft (4 req'd) Size 60 w/28.6 mm (1-1/8 inch) actuator output shaft (4 req'd) w/38.1 mm (1-1/2 inch) actuator output shaft (4 req'd) Style J Size 30/40 w/9.5 mm (3/8-inch) actuator output shaft (2 req'd) w/12.7 mm (1/2-inch) actuator output shaft (2 req'd) w/15.9 mm (5/8-inch) actuator output shaft (4 req'd) Size 40 w/19.1 mm (3/4-inch) actuator output shaft (4 req'd) w/25.4 mm (1-inch) actuator output shaft (4 req'd) Size 60 w/19.1 mm (3/4-inch) actuator output shaft (4 req'd) w/25.4 mm (1-inch) actuator output shaft (4 req'd) w/31.8 mm (1-1/4 inch) actuator output shaft (4 req'd) w/38.1 mm (1-1/2 inch) actuator output shaft (4 req'd) w/50.4 mm (2-inch) actuator output shaft for 44.5 mm (1-3/4 inch) keyed equipment shaft (1 req'd) for 50.4 mm (2-inch) keyed equipment shaft (1 req'd)		82	Diaphragm head, lower (Type 1051 w/adj down stop)	
			83	Plug, protective polyethylene (Type 1052 Size 70)	
			87	Actuator Output Shaft	
			88	Retaining Ring	
			89*	Pin, Groove, Steel Alloy Style J Size 40 w/9.5 mm (3/8-inch) actuator output shaft w/12.7 mm (1/2-inch) actuator output shaft w/15.9 mm (5/8-inch) actuator output shaft w/19.1 mm (3/4-inch) actuator output shaft w/25.4 mm (1-inch) actuator output shaft Size 60 w/19.1 mm (3/4-inch) actuator output shaft w/25.4 mm (1-inch) actuator output shaft	19A1658X012 19A1658X012 19A1658X012 G1232232992 G1232232992 G1232232992 G1232232992



38A1213-B/DOC

**TOP-MOUNTED HANDWHEEL ASSEMBLY FOR
SIZE 30, 40, AND 60 ACTUATORS**



CV8010-E/DOC

**TOP-MOUNTED HANDWHEEL ASSEMBLY FOR
SIZE 70 ACTUATORS**

Figure 15. Top-Mounted Handwheel Assemblies

Key	Description	Part Number
89*	Pin, Groove, Steel Alloy (continued) Style J Size 60 w/38.1 mm (1-1/2 inch) Actuator Output Shaft Sizes 60 & 70 w/50.4 mm (2-inch) actuator output shaft for 44.5 mm (1-3/4 inch) keyed equipment shaft for 50.4 mm (2-inch) keyed equipment shaft	G1232332992 H1361632992 H1361632992
90	Coupling	
91*	Key, Woodruff	See following table
92	Spacer, steel (not shown) (2 req'd) Sizes 60 & 70 Style J w/38.1 mm (1-1/2 inch) actuator output shaft w/31.8 mm (1-1/4 inch) actuator output shaft	
---	Bushing, Pipe (not shown) (Type 1052 Size 70)	
146	Spacer (1 req'd)	

Top-Mounted Handwheel (figure 15)

51	Handwheel	
54	Hex Nut, Slotted	
133	Stem	
135	Plate, Pusher	
137	Hex Nut, Jam, Steel	
138*	O-Ring, Nitrile Size 40 Size 60 Size 70	1D237506992 1B885506992 1C415706992

Key	Description	Part Number
139*	O-Ring, Nitrile Size 40 Size 60 Size 70	1D267306992 1D547106992 1D269106992
140	Groove Pin (Sizes 40 & 60)	
141	Cap Screw, Hex hd Size 40 (6 req'd) Size 60 (8 req'd) Size 70 (12 req'd)	
142	Body	
164	Body Extension (Sizes 40 & 60)	
169	Grease Fitting (Size 70)	
171	Spacer (Size 60)	
174	Retaining Screw (Size 70)	
175	Thrust Bearing (Size 70)	
241	Lithium Grease (not furnished w/travel stop)	
242	Thread Locking Adhesive (High Strength) (not furnished w/travel stop) (Type 1052 Size 70 only)	
246	Spacer (Sizes 60 & 70)	
247	Pin, Cotter, Stainless Steel	

Adjustable Up Travel Stop (figure 16)

133	Stem	
135	Plate, Pusher	
137	Nut, Travel Stop (Size 70)	
138*	O-Ring, Nitrile Size 40 Size 60 Size 70	1D237506992 1B885506992 1C415706992

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Key	Description	Part Number
139*	O-Ring, Nitrile	
	Size 40	1D267306992
	Size 60	1D547106992
	Size 70	1D269106992
140*	Groove Pin	
	Size 40	1F118028992
	Size 60	1B627035072
141	Cap Screw, Hex Hd, Steel	
	Size 40 (6 req'd)	
	Size 60 (8 req'd)	
	Size 70 (12 req'd)	
142	Body	
164	Body Extension (Sizes 40 & 60)	
169	Grease Fitting, Steel (Size 70)	
171	Spacer (Size 60)	
174	Retaining Screw, Steel (Size 70)	
175	Thrust Bearing	
176	Bearing Race, Thrust (Type 1052, Size 70) (2 req'd)	
187	Travel stop cap (Size 70)	
241	Lithium Grease (not furnished w/travel stop)	
242	Thread Locking Adhesive (High Strength)	
	(not furnished w/travel stop)	
	(Type 1052 Size 70 only)	

Key	Description	Part Number
-----	-------------	-------------

Adjustable Down Travel Stop (figure 17)

54	Hex Nut	
	Type 1051	
	Size 40 (1 req'd)	
	Size 60 (2 req'd)	
	Type 1052	
	Size 40 (1 req'd)	
	Sizes 60 & 70 (2 req'd)	
63	Flange Nut (Sizes 40 & 70)	
133	Travel Stop Stem	
134	Washer, Plain	
139*	O-Ring, Nitrile	
	Size 40	1D267306992
	Size 60	1D547106992
	Size 70	1D269106992
141	Cap Screw, Hex hd	
	Size 40 (6 req'd)	
	Size 60 (8 req'd)	
	Size 70 (12 req'd)	
142	Travel Stop Body	
187	Travel Stop Cap	
189	Hex Nut, Jam	
	Sizes 40 & 60 (1 req'd)	
	Size 70 (2 req'd)	
241	Lithium Grease (not furnished w/travel stop)	

Instruction Manual

Form 5587
November 2006

1051 & 1052 H & J

Key 11 Spring⁽¹⁾, steel (for Type 1052 actuator only)

CASING PRESSURE		ACTUATOR SIZE	INITIAL SPRING COMPRESSION				KEY 11 SPRING PART NUMBER
			Push-Down-to-Open		Push-Down-to-Close		
Bar	Psig		Bar	Psig	Bar	Psig	
0 to 1.2	0 to 18	30	0.2	2.7	0.2	2.7	1F361627032
			0.2	3.1	0.2	3.0	1K509827032
			0.3	4.3	0.2	3.0	1N751527032
		40	0.2	3.0	0.2	3.0	1L217427042
			0.3	4.3	0.2	3.0	1P637127082
		60	0.3	3.7	0.2	3.0	1K162727082
			0.2	3.5	0.2	3.0	1N937327082
0 to 2.3	0 to 33	30	0.3	4.3	0.3	4.2	1N751527032
			0.3	3.7	0.2	3.0	1F177027092
			0.3	3.9	0.2	3.0	1F177127092
			0.2	3.1	0.2	3.0	1F177227092
		40	0.3	4.3	0.3	4.3	1P637127082
			0.4	6.0	0.2	3.0	1L217327042
			0.3	4.4	0.2	3.0	1N844027082
		60	0.2	3.5	0.2	3.5	1N937327082
			0.5	7.0	0.2	3.0	1K162827082
			0.5	6.8	0.2	3.0	1P270227042
		70	0.7	10.1	0.2	3.0	1R676027042
		0 to 2.8	0 to 40	30	0.3	3.7	0.3
0.3	3.9				0.2	3.0	1F171127092
---	---				0.2	3.0	1F177227092
40	0.3			4.4	0.2	3.0	1N844027082
	0.4			6.0	0.2	3.0	1L217327042
60	0.5			6.8	0.2	3.0	1P270227042
	0.5			7.0	0.2	3.1	1K16287082
70	0.7			10.1	0.2	3.3	1R676027082
0 to 3.8	0 to 55	30	0.2	3.1	0.2	3.1	1F177227092
		40	0.3	4.4	0.2	3.5	1N844027082
		70	0.7	10.1	0.7	10.1	1R676027082
0.2 to 1.0	3 to 15	30	---	---	0.2	3.0	1K509827032
		40	---	---	0.2	3.0	1L217427042
		60	0.3	3.7	0.2	3.0	1K16272082
0.2 to 2.1	3 to 30	30	---	---	0.2	3.1	1F177027092
			---	---	0.2	3.0	1F177127092
			---	---	0.2	3.0	1F177227092
			0.3	4.3	0.3	4.2	1N751527032
		40	0.3	4.3	0.3	4.3	1P637127082
			0.4	6.0	0.2	3.0	1L217327042
			---	---	0.2	3.0	1N844027082
		60	0.2	3.5	0.2	3.5	1N937327082
			0.5	7.0	0.2	3.0	1K162827082
			---	---	0.2	3.0	1P270227042
		70	0.7	10.1	0.2	3.0	1R676027082
		1. For more detailed ordering information concerning proper spring selection to obtain the torque required by the valve, consult your Emerson Process Management sales office.					

1. For more detailed ordering information concerning proper spring selection to obtain the torque required by the valve, consult your Emerson Process Management sales office.

1051 & 1052 H & J

Key 11 Spring⁽¹⁾, steel (for Type 1051 actuator only)

Key 13 Spring Seat⁽¹⁾, steel (for Type 1051 actuator only)

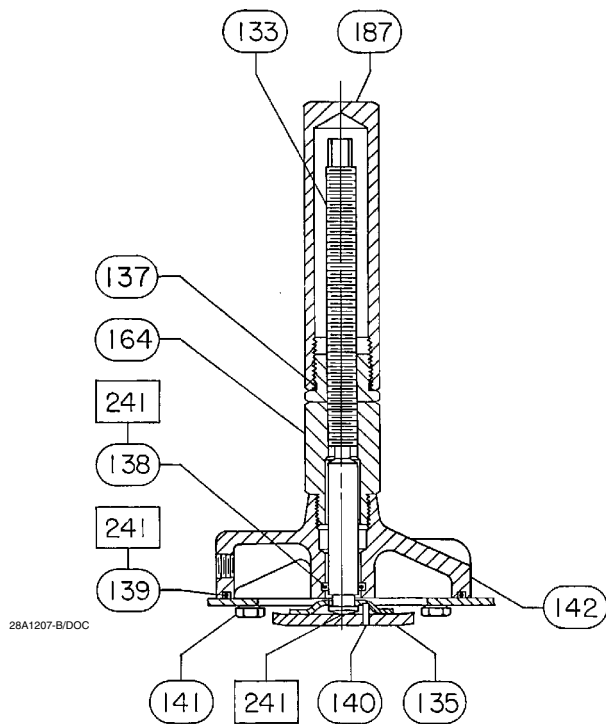
CASING PRESSURE		ACTUATOR SIZE	KEY 11 SPRING PART NUMBER	KEY 13 SPRING SEAT PART NUMBER
Bar	Psig			
0 to 1.2	0 to 18	30	1K509827032 1F361627032	12A9445X012 12A9445X012
		40	1L217427042	12A9447X012
		60	1K162727082 1N937327082 1N937327082	12A9450X012 12A9448X012 12A9449X012
0 to 2.3	0 to 33	30	1N751527032	12A9445X012
		40	1L217327042 1P637127082	12A9446X012 12A9447X012
		60	1K162827082 1K162827082 1N937327082 1N937327082	12A9448X012 12A9449X012 12A9448X012 12A9449X012
0 to 2.8	0 to 40	40	1L217327042	12A9446X012
		60	1K162827082 1K162827082	12A9448X012 12A9449X012
0 to 3.8	0 to 55	40	1L217327042	12A9446X012
0.2 to 1.0	3 to 15	60	1K162727082	12A9450X012
0.2 to 2.1	3 to 30	30	1N751527032	12A9445X012
		40	1L217327042 1P637127082	12A9446X012 12A9447X012
		60	1K612827082 1N937327082	12A9449X012 12A9449X012

1. For more detailed ordering information concerning proper spring and spring seat selection to obtain the torque required by the valve, contact your Emerson Process Management sales office.

Key 91*. Woodruff Key for Actuator with J Mounting Adaptation, Alloy Steel

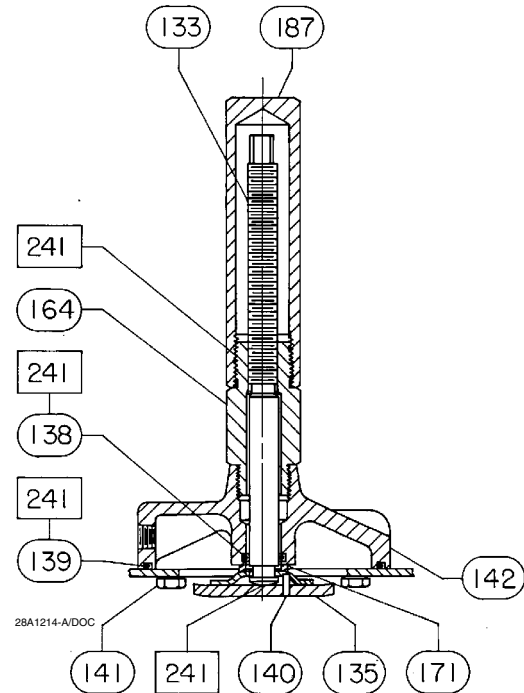
ACTUATOR SIZE	KEYED SHAFT COUPLING DIAMETER		WOODRUFF KEY NUMBER	PART NUMBER
	mm	Inches		
40	9.5	3/8	304	F1357631252
	12.7	1/2	304	F1357631252
	15.9	5/8	404	F1357731252
40 & 60	19.1	3/4	406	F1357831252
	25.4	1	607	F1357931252
60 & 70 ⁽¹⁾	31.8	1-1/4	809	F1358031252
	38.1	1-1/2	811	F1358131252
60 & 70 ⁽¹⁾	44.5	1-3/4	1211	F1358231252
	50.8	2	1022-1	F1366131252

1. Size 70 for Type 1052 actuator only.



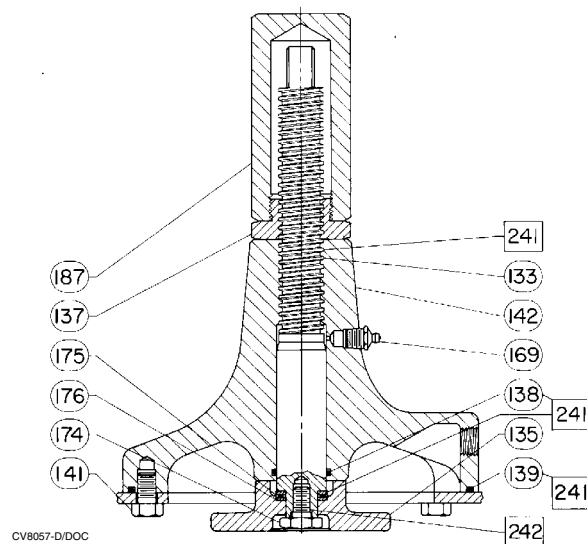
□ APPLY LUB

**ADJUSTABLE UP TRAVEL STOP FOR
SIZE 30 AND 40 ACTUATORS**



□ APPLY LUB

**ADJUSTABLE UP TRAVEL STOP FOR
SIZE 60 ACTUATORS**



□ APPLY LUB/SEALANT

**ADJUSTABLE UP TRAVEL STOP FOR SIZE 70
TYPE 1052 ACTUATORS**

Figure 16. Adjustable Up Travel Stops

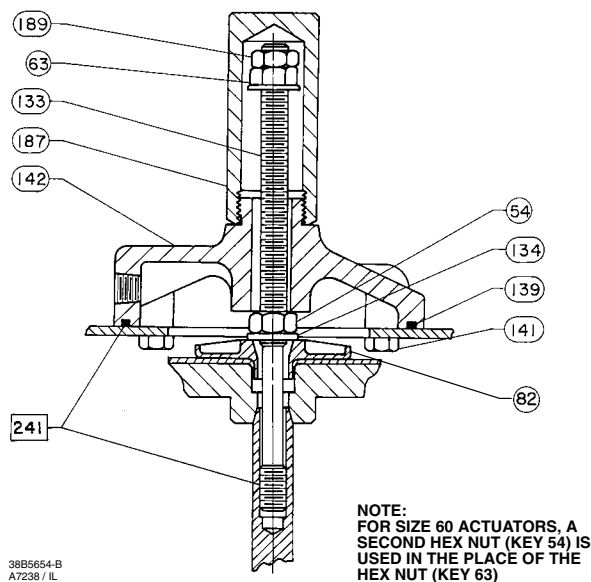


Figure 17. Adjustable Down Travel Stop

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Emerson Process Management

Marshalltown, Iowa 50158 USA

Cernay 68700 France

Sao Paulo 05424 Brazil

Singapore 128461

www.Fisher.com