Standard Pilot Systems

CONTENTS

INTRODUCTION

Scope of Manual

This manual provides instructions for operation, startup and commissioning for Types BSL85/1, BSL85/2 and BSL85/3 pilot systems.

Product Description

Two standard type of pilot systems are available:

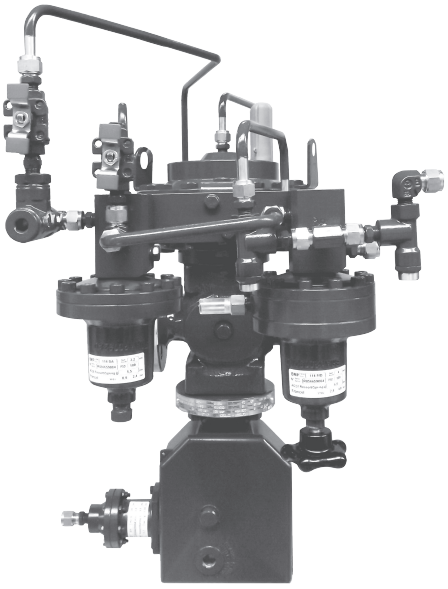
- **Type BSL85/1 (Distribution Applications)**
- **Types BSL85/2 and BSL85/3 (Transmission Applications)**

  The Type BSL85/1 pilot is composed of a manometric pre-expansion box, a manometric pre-expansion pilot box, and a pilot body.

  The Types BSL85/2 and BSL85/3 pilots are composed of a manometric pre-expansion box, a manometric pre-expansion pilot box and two pilot bodies. The Types BSL85/2 and BSL85/3 permits all types of failure modes. Type BSL85/3 offer compact mounting method and standardization of the BMP.

- The BMP pilots with standard diaphragm are “FO”
- The BMP pilots with double diaphragm are “FC”
- The bellows are flattened in the case of overpressure but with no leak to the outside.

Different connection types permit these pilots to be used on a wide range of Emerson Pilot-Operated Regulators.



TYPE BSL85/2 PILOT

TYPE BSL85/1 PILOT

Figure 1. *Fisher™ Pilots*

Two functional types of pressure reduction are available, Hard Trim or Boot Trim Pilot System:

- Pressure Reduction with Actuator and Plug: Pilot system loaded by modulated pressure
- Pressure Reduction with Diaphragm-Plug: Pilot system unloaded by modulated pressure

The setpoint range can be modified by simply changing the BMP manometric box or spring.

CHARACTERISTICS

OPERATING PRESSURE		
Maximum allowable pressure	PS	100 bar
Maximum inlet pressure(1)	Pu	85 bar
Outlet pressure range	Pd	0.01 to 60 bar

(1) In extreme conditions (isopropanol, methanol)

Material

Pilot body: Steel
BMP (Spring case): Steel
BMP (Cover): Steel or Aluminium
Bracket: Steel

Connection Styles

Pilot body: 1/4 NPT tapped
Manometer: *Type BSL85/1* M10x1 tapped
Type BSL85/2 1/4 NPT tap
BMP connection: 1/4 NPT tapped
BMP vent: 1/4 NPT tapped

Regulators

Distribution applications (Type BSL85/1):
Types CRONOS-FR, FL-FR, EZR

Transmission applications (Types BSL85/2 and BSL85/3):
Types EZH, EZHSO, EZHFO, FL-FR, EZR

Options

ADGE 1 in. (Pre-expansion Exchanger)

The ADGE 1 in. replaces the standard pre-expansion relay. It permits the gas to be reheated beyond pre-expansion without using external energy sources.

Mass volume corrector
Flow limiter
Remote control setting
} Contact Factory

RPE (Electric Heater)

The RPE is used for reheating gas supplying pressure reducing regulator pilots. It avoids the inconveniences caused by freezing which occur during large pressure drops. (See instruction manual D103694X012).

RJGI (Accelerator) Figure 2

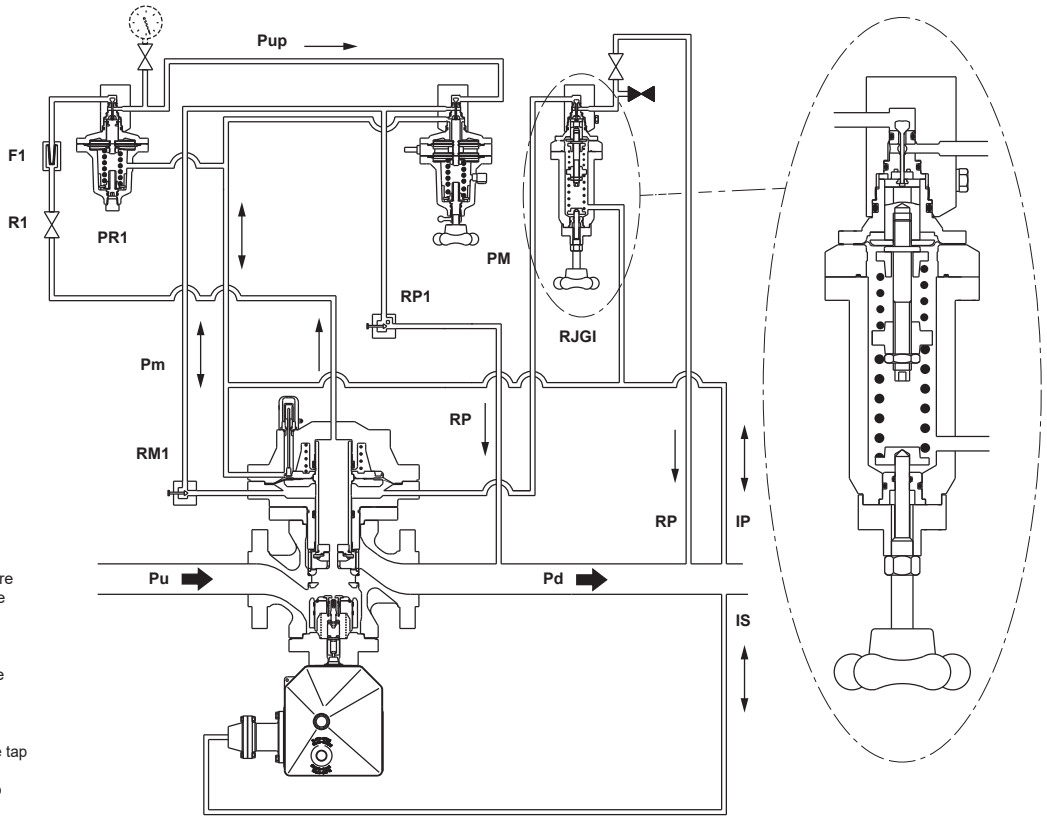
In the case of a monitor or working monitor configuration the RJGI accelerates the recovery of the monitor in case of failure of the active regulator. The RJGI vents to the atmosphere or downstream of the modulated pressure modulated in the case of downstream overpressure.

The RJGI can be used on a single device powering a fast-break process thus limiting the value of the closing overpressure.

Table 1. *Setting Ranges for RJGI Option*

SIZE	RJGI SETTING RANGE, bar	RJGI SUB-ASSEMBLY REFERENCE	TYPE	MAX. RANGE DIAPHRAGM / BELLOWS, bar	SET AND FIXED SPRING	
					ϕ wire. mm	Reference
071	1 to 3	ERAA26110A0	Diaphragm	ΔP maxi 18 bar	3.5 and 4	FA115012X12 and FA113199X12
	3 to 6	ERAA26081A0			3.5 and 4.5	FA113198X12 and FA113200X12
	6 to 12	ERAA26084A0			4.5 and 5.5	FA113202X12 and FA120904X12
236	12 to 20	ERAA26087A0	Bellows	35	4.5 and 5.5	FA113200X12 and FA120904X12
	20 to 35	ERAA26088A0			5.5 and 6.5	FA113202X12 and FA117967X12
222	35 to 50	ERAA26089A0		70	4 and 5.5	FA116816X12 and FA113202X12
	50 to 70	ERAA26113A0			4.5 and 5.5	FA113200X12 and FA120904X12

Note: The RJGI setting is generally 5% superior to the setting of the monitor pilot PM.



Pu: Inlet pressure
Pd: Outlet pressure
Pm: Modulated pressure
Pup: Pilot feed pressure

RP: Pilot Reject
IP: Pilot Impulse
IS: Slam-shut Impulse

R1: Pilot feed tap
F1: Filter
RM1: Motorized pressure tap
RP1: Pilot reject tap
PR1: Pre-expansion tap
PM: Monitor pilot

Figure 2. *Principle of Operation - Type EZH OS2 Regulator, DN 25-50-80 with 114DA, 114MD and RJGI*

LABELLING

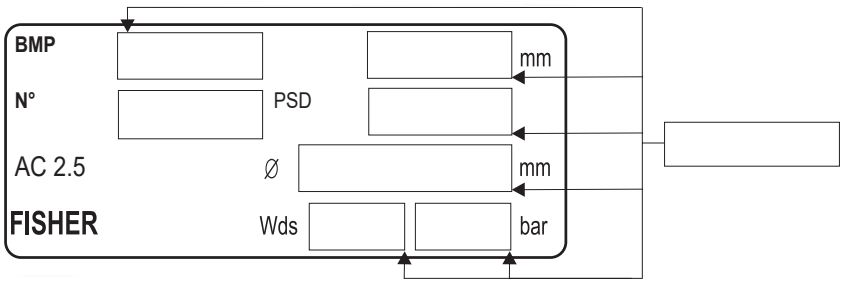


Figure 3. *BMP Nameplate*

Table 2. *Setting Ranges for Manometric Boxes*

BMP SIZE	SPRING		WDS SETTING RANGE *		PSD BMP	AC
	ϕwire (mm)	Reference	Mini	Maxi		
162	2	FA113195X12	0.01	0.05	5	2.5
	3	FA113197X12	0.05	0.18		
114	4	FA113199X12	0.16	0.77	10	
	4.5	FA113200X12	0.25	1.2		
	5.5	FA113202X12	0.50	2.4		
	6.5	FA114139X12	1.0	4.8		
114DA	5.5	FA113202X12	Pd + 0.5	Pd + 2.4	100	
	6.5	FA114139X12	Pd + 1.2	Pd + 4.8		
114E 114MD	5.5	FA113202X12	0.5	2.4		
	6.5	FA114139X12	1.2	4.8		
071DA	4	FA113199X12	Pd + 0.2	Pd + 2.8		
	4.5	FA113200X12	Pd + 1.0	Pd + 5.0		
071E 071MD	4.5	FA113200X12	1.0	5.0		
	5.5	FA113202X12	2.0	10.5		
	6.5	FA114139X12	4.0	18		
236	6.5	FA114139X12	8.0	35		
227	6.5	FA114139X12	12	47		
222	6.5	FA114139X12	30	60		
DA : Adjustable Differential, MD: Double Diaphragm, E: Vent, Wds setting range depending on spring size						

DESCRIPTION

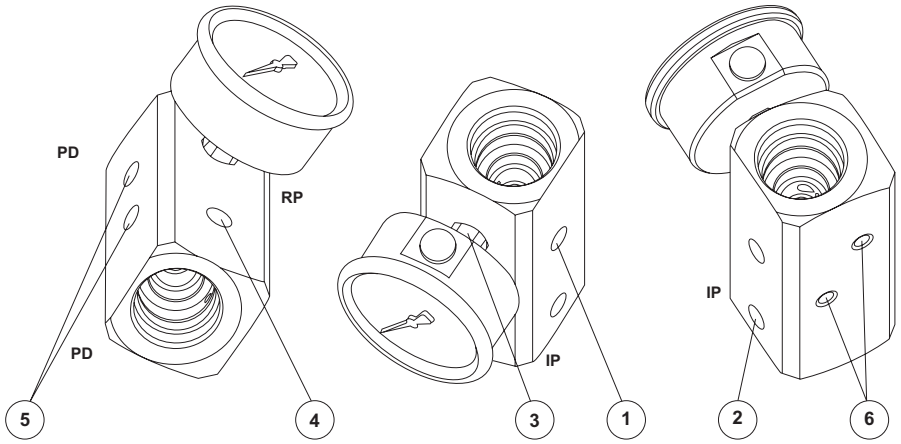


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Figure 4. *Type BSL85/1 Body Marking*

Body Description (Figure 4)

1. Pilot feed
2. Pilot impulse line (IP)
3. Pre-expansion manometer
4. Pilot reject (RP)
5. Exterior manometer (PD)
6. Mounting M8

Type BSL85 pilot exists in two types of operational modes:

- Hard trim (Figures 2, 5, 6, 7, 8)
- Boot trim (Figure 9)

Each mode requires an adapted connection pipeline

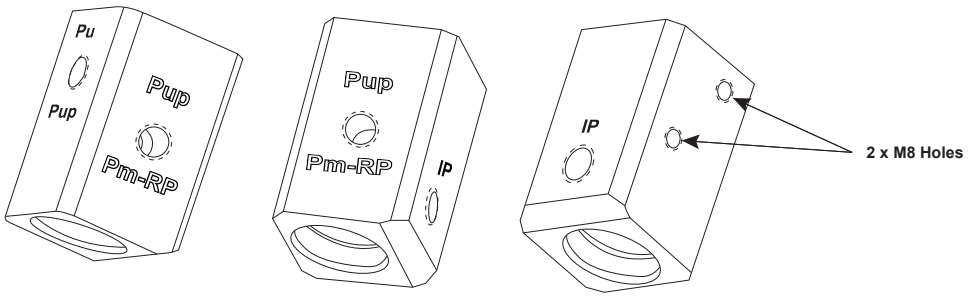


Figure 4 bis. *Type BSL85/2 Body Marking*

PRINCIPLE OF OPERATION

Hard Trim Pilot Systems

Type BSL85/1 hard trim principle of operation schematic

The regulator opens due to the increase (loading) of the modulated pressure (Pm).

Opening

The flow demand increases, the decrease in outlet pressure (Pd) is registered by the pilot-sensing element.

Forced by the action of the control springs, the pilot, then the pre-expansion relay, open.

The pre-expansion pressure (Pup) feeds the pilot.

The modulated pressure (Pm) is fed to the pilot through the actuator diaphragm.

The regulator OPENS.

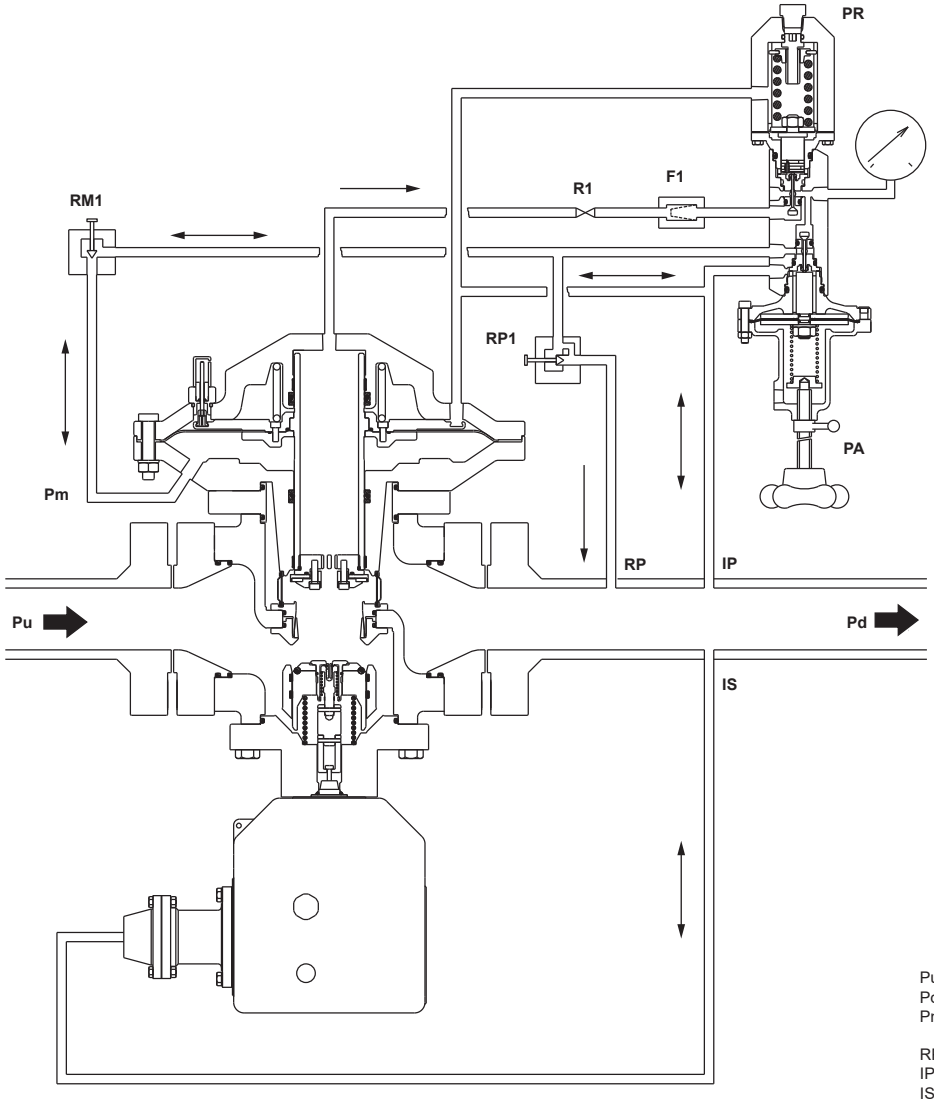
Closing

The flow demand decreases, the increase of the outlet pressure (Pd) is registered by the pilot-sensing element.

The increased outlet pressure overcomes the force of the control spring, the pilot, then the pre-expansion relay, close.

The modulated pressure (Pm) bleeds through the reject pilot (RP).

The regulator CLOSES.



Pu: Inlet pressure
Pd: Outlet pressure
Pm: Modulated pressure

RP: Pilot Reject
IP: Pilot Impulse
IS: Slam-shut Impulse

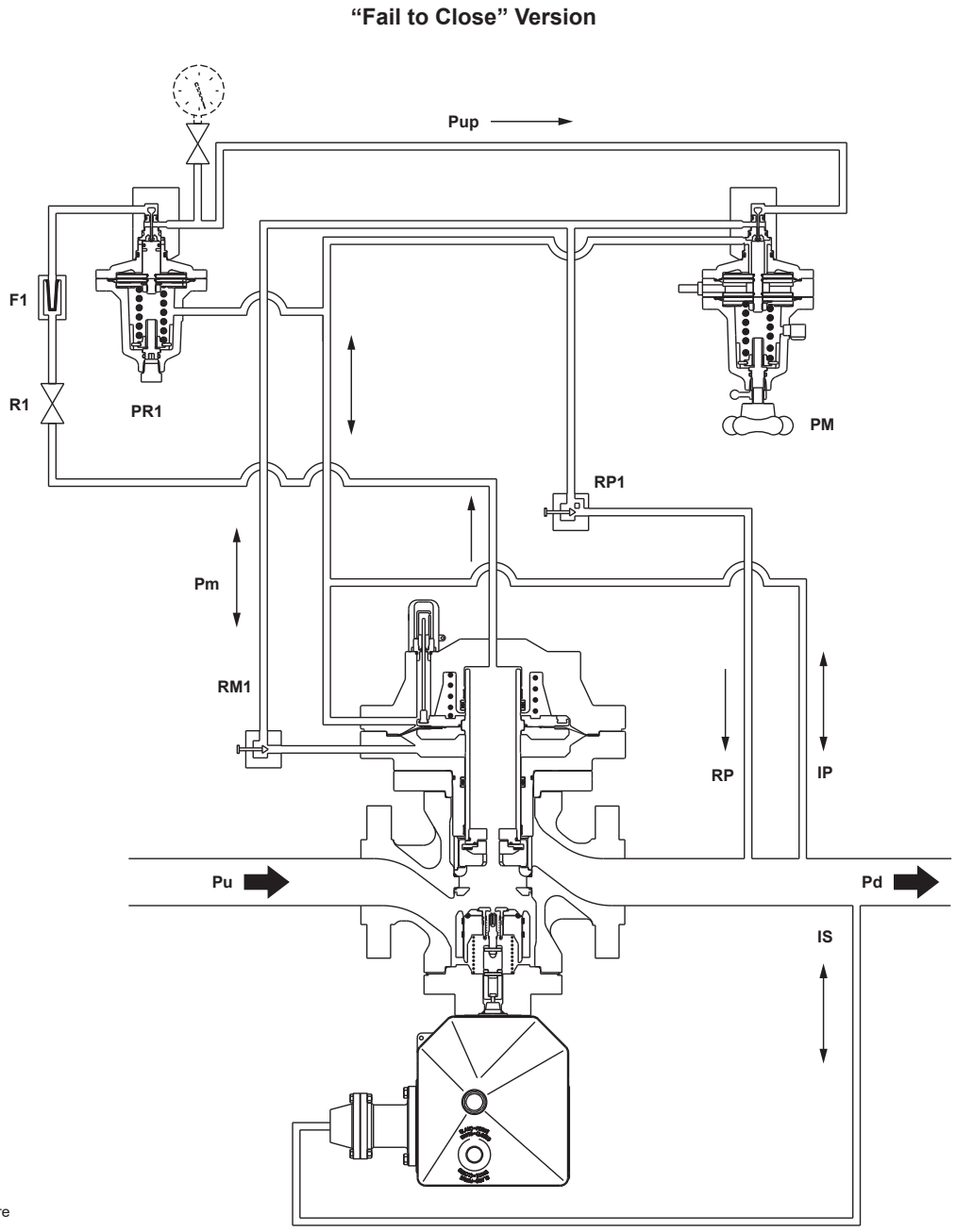
R1: Pilot feed tap
F1: Filter
RM1: Motorized pressure tap
PR: Pre-expansion relay
PA: Active Pilot

Note: For outlet pressures < 0.77 bar the pre-expansion relay is not differential.

Figure 5. *Principle of Operation - Type CRONOS-FR Regulator with Type BSL85/1 Pilot*

Hard Trim Pilot Systems

Type BSL85/2 hard trim principle of operation schematic



Pu: Inlet pressure
Pd: Outlet pressure
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Pup: Pilot feeding pressure

RP: Pilot Reject
IP: Pilot Impulse
IS: Slam-shut Impulse

R1: Pilot feed tap
F1: Filter
RM1: Motorized pressure tap
RP1: Pilot reject tap
PR1: Pre-expansion relay
PM: Monitor Pilot

Figure 6. *Principle of Operation - Type EZH Regulator with Type BSL85/2 and BSL85/3 Pilots*

Hard Trim Pilot Systems (continued)

Type BSL85/2 hard trim principle of operation schematic

In this case, it is possible to choose between two types of regulators depending on how they react in “Fail to Open” situation.

Figure 7: The regulator spring tries to close, the “Fail to Open” mode is managed by the appropriate pilot.

“Fail to Open” Version

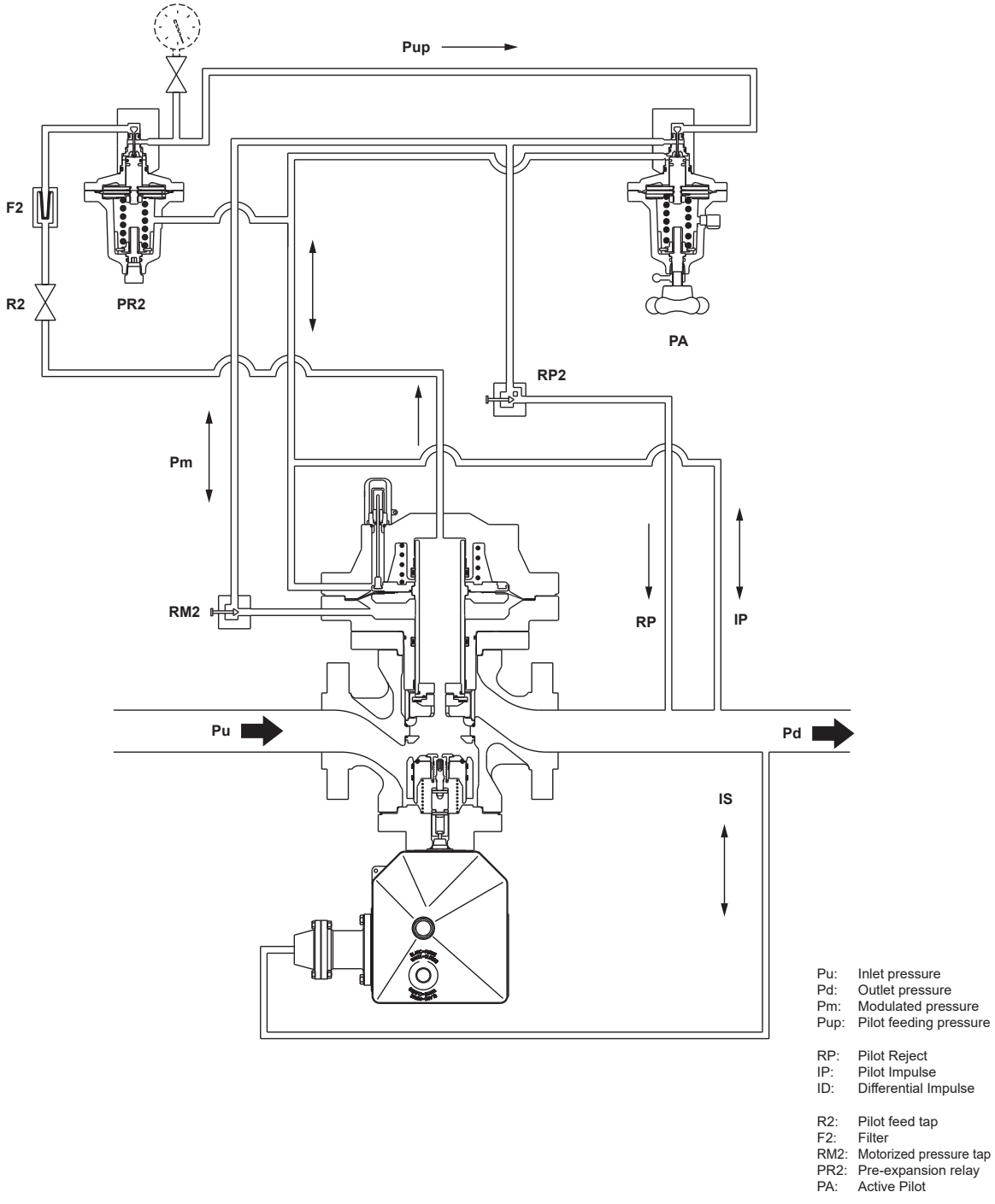


Figure 7. *Principle of Operation - Type EZHFO Regulator with Types BSL85/2 and BSL85/3 Pilots*

Hard Trim Pilot Systems (continued)

Figure 8: The regulator spring tries to open, the
“Fail to Open” mode is managed by the regulator spring.

“Fail to Open” Version

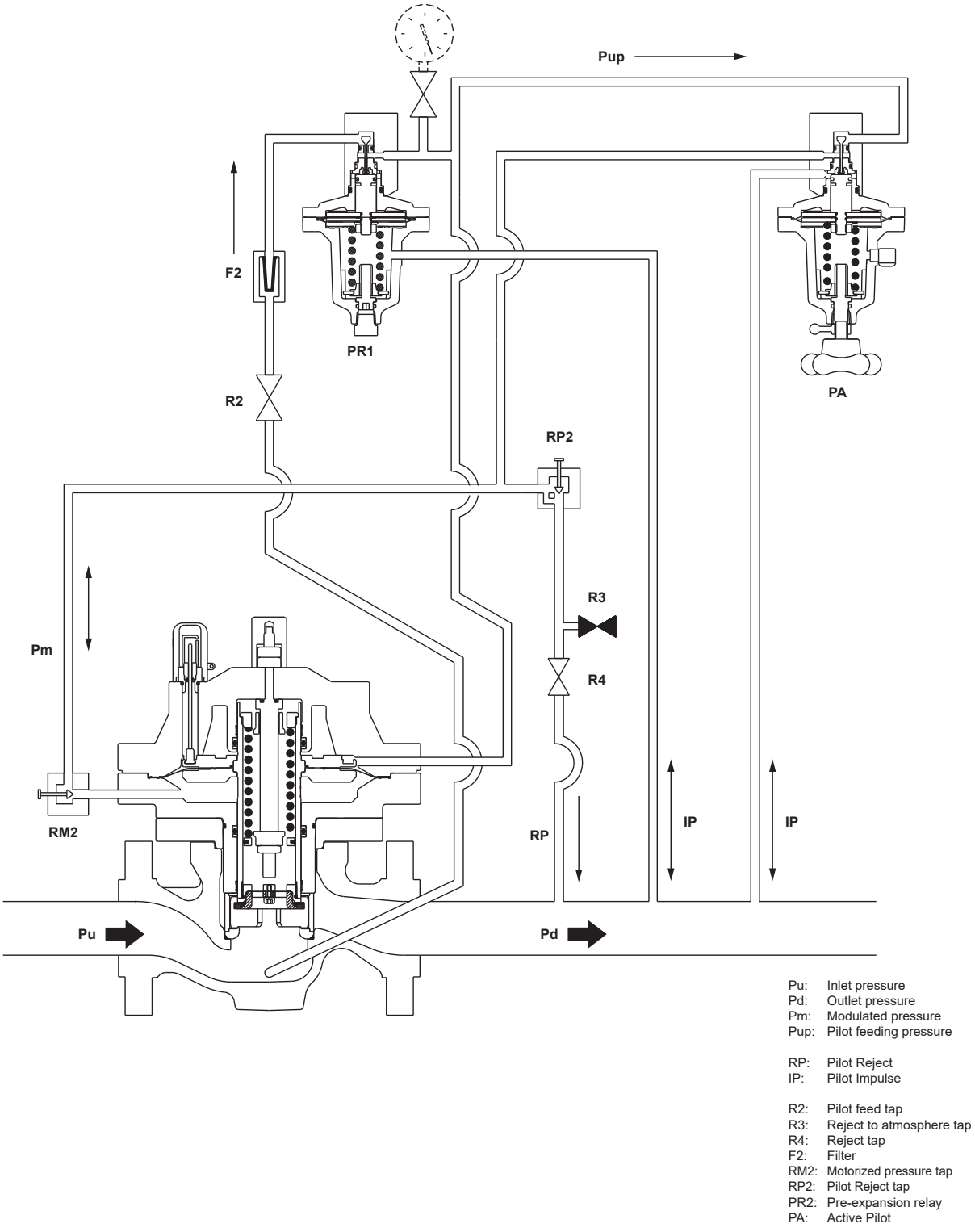


Figure 8. *Principle of Operation - Type EZHSO Regulator with Types BSL85/2 Pilot and BSL85/3 Pilots*

Boot Trim Pilot Systems

Principle of operation of boot trim pilot systems based on Compact Pilot System

The regulator opens with a decrease (unloading) of the modulated pressure (Pm).

Opening

The flow demand increases, the decrease in the outlet pressure (Pd) is registered by the pilot-sensing element.

Forced by the action of the control springs, the pilot, then the pre-expansion relay, open.

The pilot flow increases and becomes superior to that of the restriction tap (R2).

The modulated pressure (Pm) bleeds to the outlet side through the reject pilot (RP).

The regulator OPENS.

Closing

The flow demand decreases, the increase in the outlet pressure (Pd) is registered by the pilot-sensing element.

The force applied on the pilot impulse is overcome by that of the control spring, the pilot, then the pre-expansion relay closes.

The pilot flow decreases and becomes inferior to that of the restriction tap (R2).

The modulated pressure (Pm) increases.

The regulator CLOSES.

Type BSL85/2 Boot Trim Principle of Operation Schematic

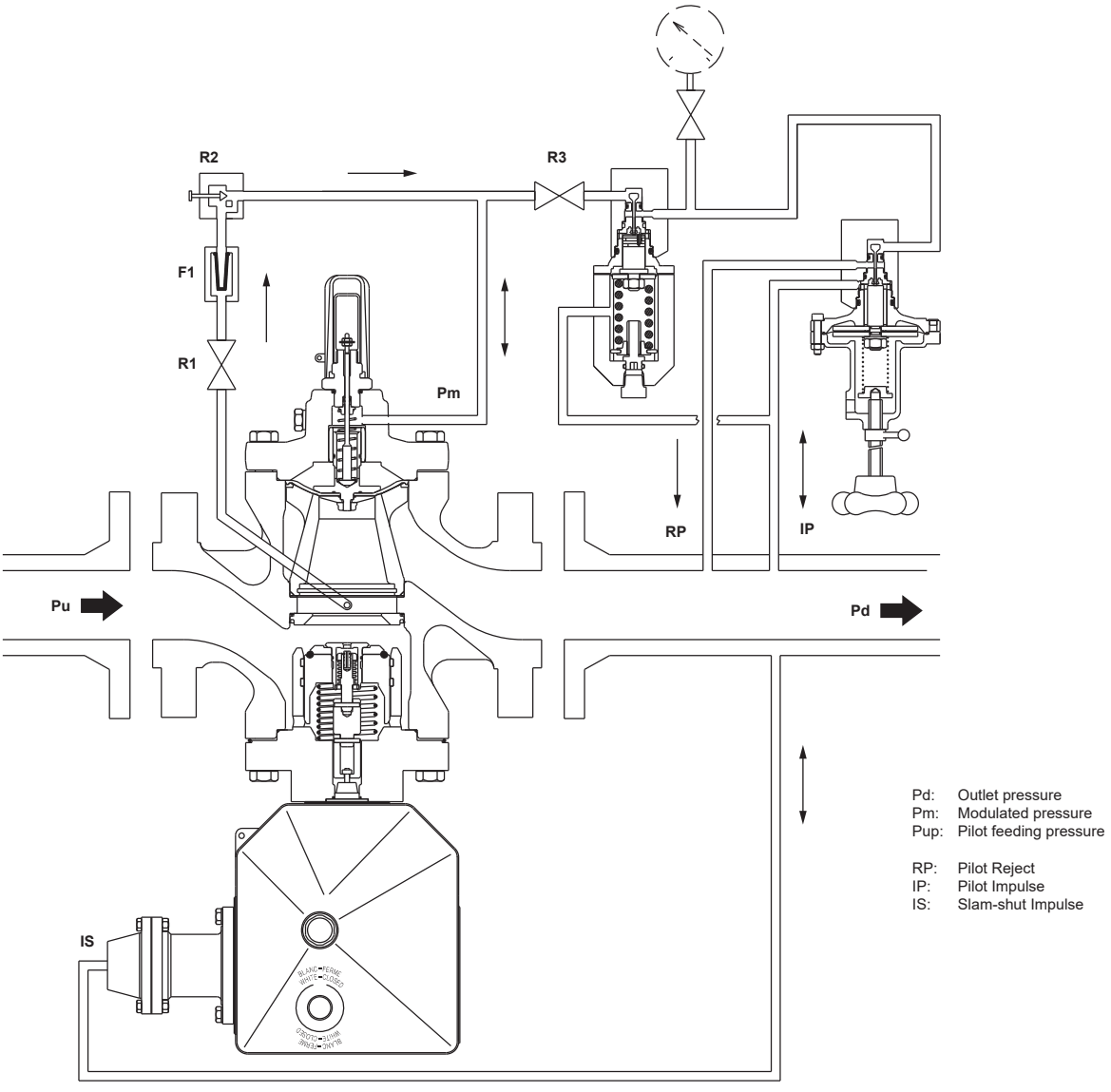
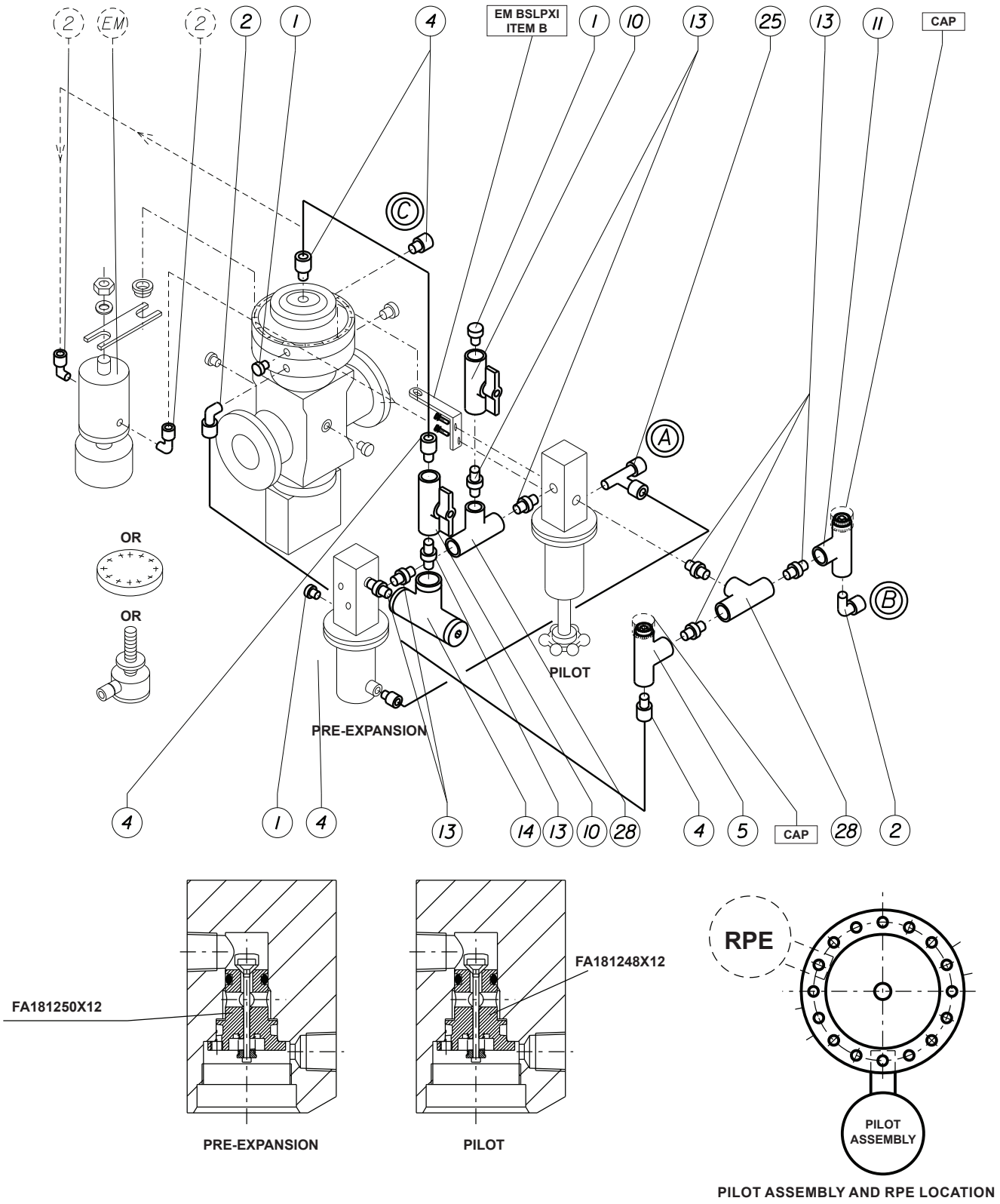


Figure 9. *Principle of Operation - Type EZR Regulator with Type BSL85/2 Pilot.*



A = Prise d' impulsion à relier à la tuyauterie aval (Tube D10) / ***Sensing line to linked to outlet pipe.***
B = Rejet à relier à la tuyauterie aval (Tube D10) / ***Bleed to be linked to outlet pipe.***
C = Prise d' impulsion à relier à la tuyauterie aval (Tube D10) / ***Sensing line to linked to outlet pipe.***
Note: La définition des repères EM se trouve dans l'EM BSL85X1 / *The find number EM definition is given by EM BSL85X1*

Figure 10. *Principle of Operation - Type EZH Regulator with Type BSL85/3 Pilot.*

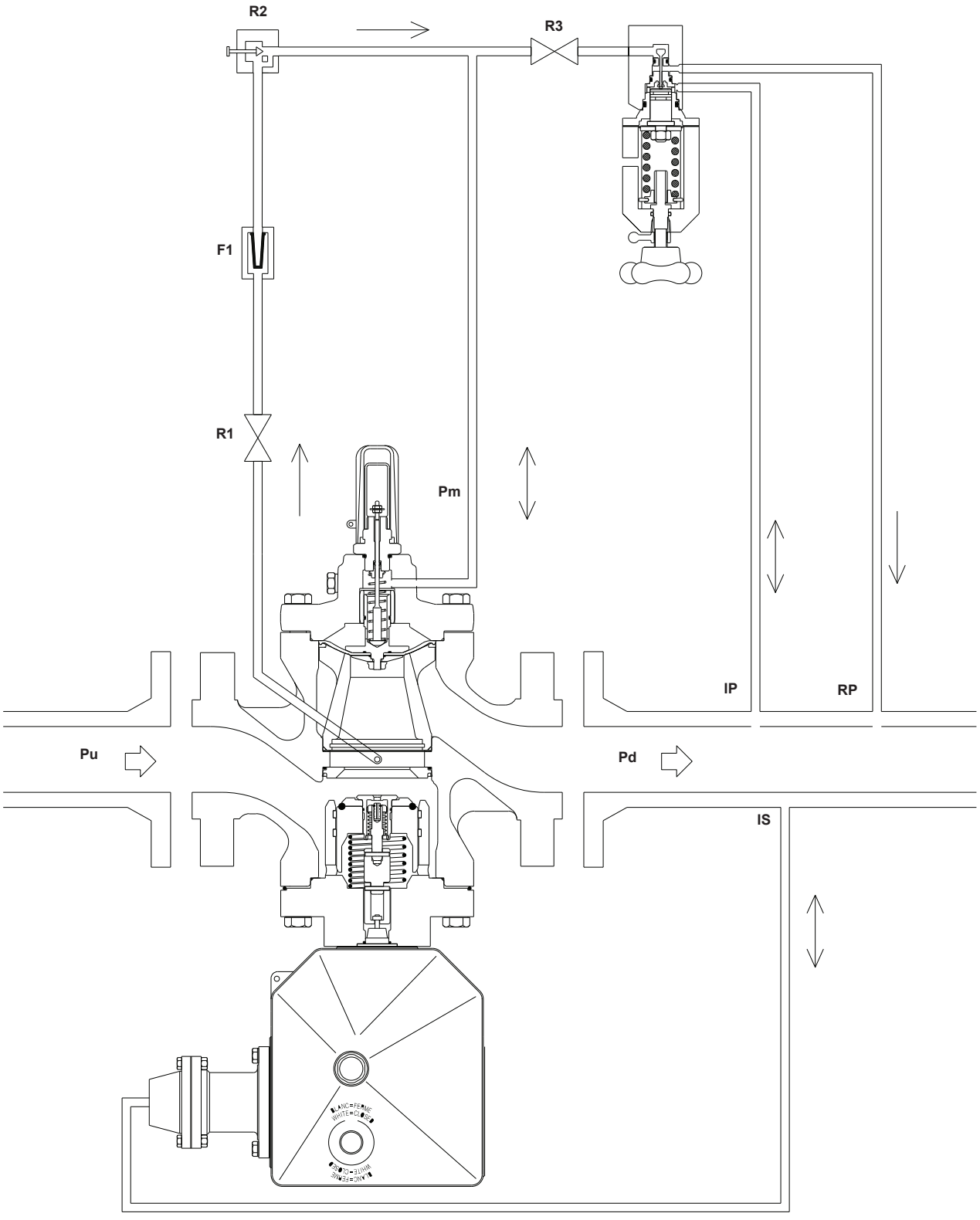


Figure 11. *Principle of Operation - Type EZR Regulator with Type BSL85/3 Pilot.*

STARTUP

Respect the instructions given in the instruction manual of each regulator.

⚠ WARNING

Only qualified personnel through training or experience are authorised to install, service or maintain equipment.

Installation according to EN 12186 is recommended.

No modification should be made to the structure of the equipment (drilling, grinding, soldering...).

The equipment should not receive any type of shock.

The user should verify or carry out a protection adapted to the environment.

Personal injury or equipment damage due to bursting of pressure-containing parts may occur. To avoid such injury or damage, provide pressure relieving or pressure-limiting devices to prevent service conditions from exceeding those limits.

Physical damage to the regulator can break the pilot off the main valve, causing personal injury and property damage due to bursting of pressure-containing parts. To avoid such injury and damage, install the regulator in a safe location.

COMMISSIONING

Disassembly

Check the absence of pressure between inlet and outlet valves.

Every year:

- Disassemble the manometric boxes and nozzles.
- Control immediate spare parts.
- Change the fritted filter.

Tools:

Flat spanners 8, 11, 13, 14, 19; Six-sided spanners 5, 6, 10; FRANCEL square spanner; Flat screwdriver and screw M4.

Manometric Box (BM) (Figure 10)

- Unscrew knob (key 1) to remove the BM
- Unscrew screw H or CHC (key 2)*
- Remove impulse (key 3)
  - Check impulse element
  - Control tightshut joints

NOTE

When reassembling manometric boxes 071DA , 071MD, 071E or 114DA, 114MD, 114E, make sure that the two pins on the spring centering device are always placed correctly in the grooves of the spring housing (anti-rotation of the centering device).

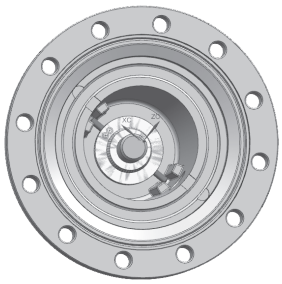


Figure 10. *Pins position*

Pilot Body (Figure 13)

- Remove nozzle(s) (pilot block(s)) (key 4)
  - Screw M4
    - Clean valve and seat
    - Control tighshut joints

Filter (Figure 11)

- Unscrew cap (key 8)
  - 6-sided spanner no. 10
- Remove filter (key 9)
  - Change the filter every year

Adjustment Tap (Figure 12)

- Unscrew stop point (key 10)
  - Flat spanner no. 22
- Unscrew needle (key 11)
  - Square spanner
    - Control the seating of the seat and the needle
    - Control the tighshut joint

NOTE

Install a cap, or fill the point (key 10) with grease, for protection against aggression from the exterior.

Reassembly

Complet the above operations in reverse order.

Lightly grease all rings (silicone grease recommended).

Lightly grease all threads (molycot grease).

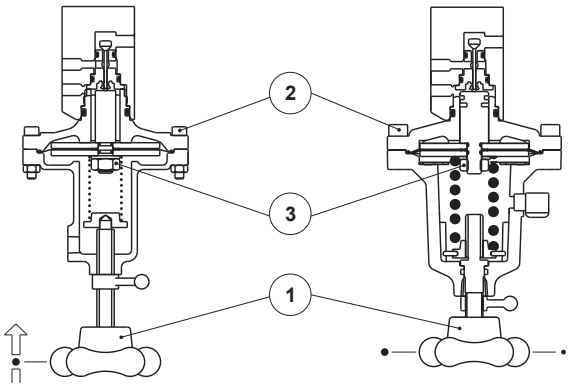


Figure 12. *Manometric Box Setting*

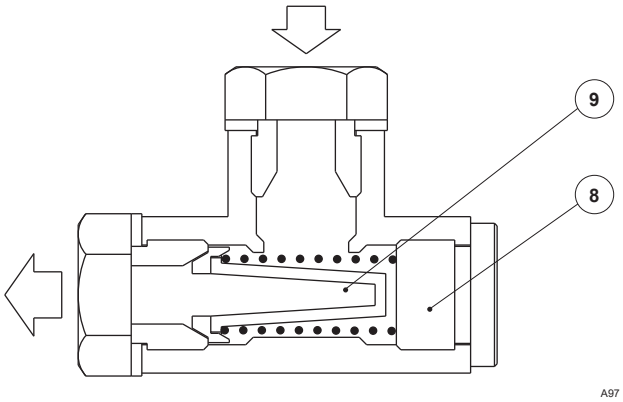


Figure 13. *Filter*

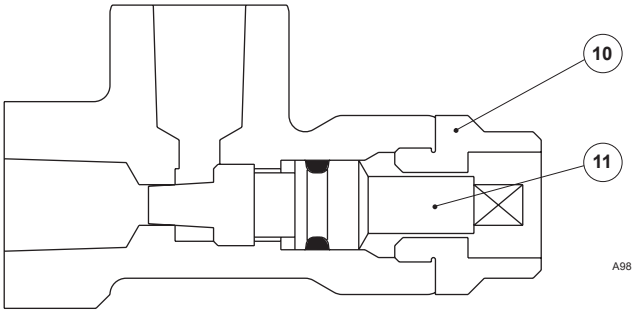


Figure 14. *Setting Tap*

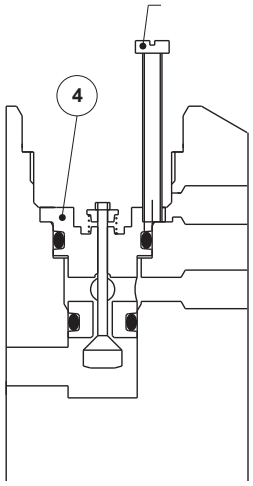


Figure 15. *M4 screw for removing Nozzle*

Variable Pressure Metering (CPV)

Elements

- **Pilot System**: - One pre-expansion relay with adjustable differential (BMP 114 DR)
  - One standard pilot
- **Meter**
- **Port Plate**

Principle

A port plate causes loss in the load, which causes flow increase. The pressure between the regulator and the port plate increases with the flow. The meter allows the flow to increase (in $m^3/h(N)$) as the pressure increases when the flow is high.

Goal: Increase meter dynamics

Determination of Characteristics

Contact factory.

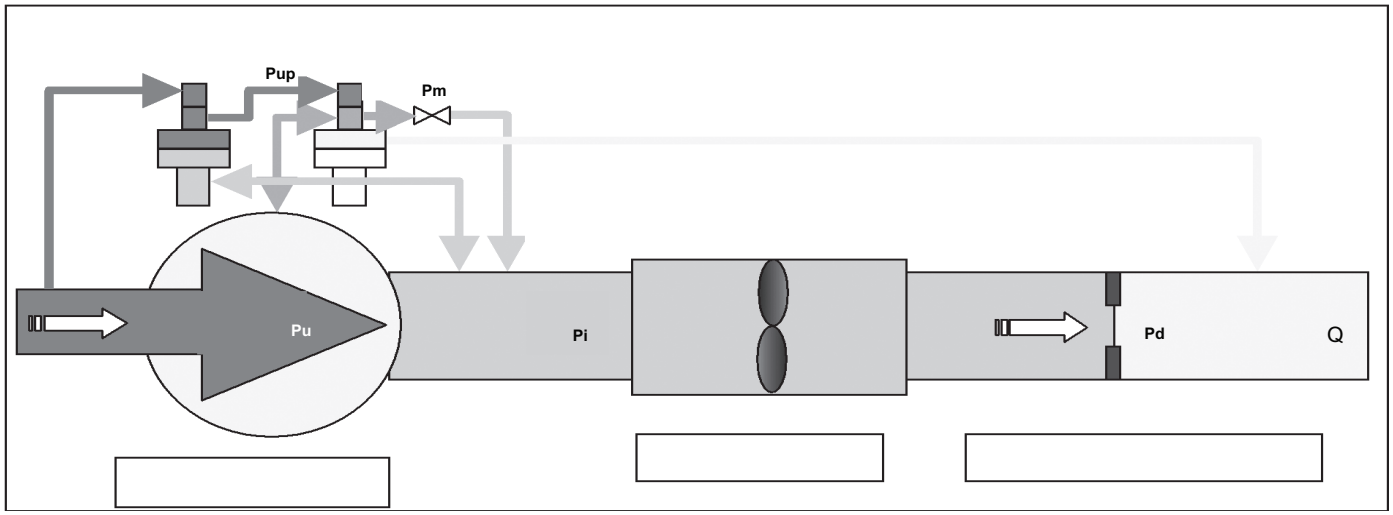


Figure 16. *Port Plate*

TERMS

Failure Modes

FO: Fail to Open

Regulator opens in the case of failure mode

The regulator tends to automatically open in the case of failure of the main diaphragm or when there is an interruption of the energy required for the displacement of the regulation unit.

FC: Fail to Close

Regulator closes in the case of failure mode

The regulator tends to automatically close in the case of failure of the main diaphragm or when there is an interruption of the energy required for the displacement of the regulation unit.

Equipment:

- **FO design: EZHFO - EZHSO**
- **FC design: EZH - CRONOS-FR - FL-FR**

Types BMP 071MD & 114MD Double-Diaphragm Pilot (Detail 5, Fig. 16 or 20)

The manometric box is equipped with two integral diaphragms. The volume between these two diaphragms is related to the travel indicator (key 5).

In the case of failure of the upper diaphragm, the travel indicator stem is visible indicating the failure, the lower diaphragm maintains the functionality and responds to the fault modes described in EN 334.

PRE-EXPANSION DETERMINATION

Table 3. *Pre-expansion Settings*

REGULATOR	RECOMMENDED SETTINGS(1), bar	AVAILABLE SETTINGS DEPENDING ON REQUIREMENTS, bar
EZH or EZHFO DN 25/50/80	Pd + 2	Pd + 1.5 à 2.4
EZH or EZHFO DN 100	Pd + 4	Pd + 3.2 à 4.8
EZHSO DN 25/50/80/100	Pd + 4	Pd + 3.2 à 4.8
CRONOS-FR. FL-FR	Pd + 0.4	Pd + 0.2 à 0.6
EZR	Pd + 0.8	Pd + 0.5 à 1.5
1. Factory setting for pre-expansion differential 071DA or 114DA.		

Operating Instructions and Regulation Optimization

Table 4. *Operating Instructions and Regulation Optimization*

	UNIT OR PARAMETER	INDICATIONS	INSTABILITY	SLOW REACTION	LACK OF PRECISION
Hard Trim Pilot System (Figures 2, 5, 6, 7 and 8)	Modulated pressure valve	Open 2 turns. All setting available except completely closed	Progressively close, without completely closing	Wide open	No incidence
	Reject tap	Open 1/2 turn. All setting available	Open by successive fractions	Close by successive fractions	
	Pre-expansion relay	See table 3	Decrease the pre-expansion by successive fractions	Increase the pre-expansion by successive fractions	
Boot Trim Pilot System (Figure 9)	Pilot vent valve (BMP 162)	Open 1/2 turn. All settings available except completely closed	Look for the best position between a 1/4 and 2 turns	Open progressively	No incidence
	Feeding tap	Open 1/2 turn. All settings available	Open by successive fractions	Close by successive fractions	
	Pre-expansion relay	See table 3	Decrease the pre-expansion by successive fractions	Increase the pre-expansion by successive fractions	

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PILOT SETTINGS

Table 5. Distribution Applications and Type EZR

PILOT SYSTEM TYPE BSL85/1 / Pu max 25 bar FOR DISTRIBUTION APPLICATIONS											
REGULATORS	Pd, bar		PRE-EXPANSION RELAY				PILOT				Range, bar
			NOZZLE 4 mm				NOZZLE 4 mm				
	NOMINAL Pd	RANGE	TYPE	SIZE	MAX. RANGE, bar DIAPHRAGM	ϕ WIRE, mm	TYPE	SIZE	MAX. RANGE, bar DIAPHRAGM	ϕ WIRE, mm	
CRONOS-FR FL-BP-FR	0.02	0.01 to 0.05	Diaphragm	071 DA	ΔP max 18	4	Diaphragm	162	5	2	0-6
	0.1	0.05 to 0.18								3	
	0.3	0.18 to 0.77						114	10	4	
	1	0.77 to 1.20								4.5	
	2	1.20 to 2.40								5.5	0-25
	4	2.40 to 4.80								6.5	
	8	4.80 to 10.5						071E	ΔP max 18	5.5	
	16	10.5 to 18.00								6.5	
Note: in the case of a change in operating conditions it is imperative to have a manometer compatible with the upstream pressure (mano range > upstream pressure)											

PILOT FOR TYPE EZR											
REGULATORS	Pd. bar		PRE-EXPANSION RELAY				PILOT				Range. bar
			ϕ NOZZLE 4 mm(1)				ϕ NOZZLE 4 mm				
	NOMINAL Pd	RANGE	TYPE	SIZE	MAX. RANGE,. bar DIAPHRAGM, BELLOWS	ϕ WIRE. mm	TYPE	SIZE	MAX. RANGE,. bar DIAPHRAGM, BELLOWS	ϕ WIRE. mm	
BSL85/1 (Pu Max 6 bar)	0.02	0.01 to 0.05	Diaphragm	114	10	4.5	Diaphargm	162	5	2	0-6
	0.1	0.05 to 0.18								3	
	0.3	0.18 to 0.77				5.5		071E	ΔP max 18	4	
BSL85/2 (Pu Max 72 bar)	1	0.77 to 1.20		- - - -	- - - -	4				4.5	
	2	1.20 to 2.40								5.5	
	4	2.40 to 4.80								6.5	
	8	4.80 to 10.5								6.5	
	16	10.5 to 18.00								6.5	
	25	18 to 35	Bellows	227	47	6.5	Belllows	236	35	6.5	
BSL85/3 (Pu Max 72 bar)	2	0.7 to 2.4	- - - -	- - - -	- - - -	- - - -	Diaphragm	71E	100b ΔP max 18	4.5	
	4	2.4 to 4.8				- - - -				5.5	
	10	4.8 to 18				- - - -				6.5	
	25	18 to 35				- - - -	Bellows	236	35	6.5	

(1) Nozzle D 3.2 if Pu > 70 bar.

PILOT SETTINGS (continued)

Table 6. *Transmission Applications*

PILOT SYSTEM TYPE BSL85/2 / Pu max 85 bar FOR TRANSMISSION APPLICATIONS										
REGULATORS	Pd, bar		PRE-EXPANSION RELAY				PILOT			
			ϕ NOZZLE 3.2. mm				ϕ NOZZLE 4 mm(1)			
	NOMINAL Pd	RANGE	TYPE	SIZE	MAX. RANGE, bar	ϕ WIRE. mm	TYPE	SIZE	MAX. RANGE, bar DIAPHRAGM, BELLOWS	ϕ WIRE. mm
EZH	2	1 to 2.4	Diaphragm	071DA	100	4.5	Diaphragm	114 MD	100	5.5
	4	2.4 to 4.8								6.5
	8	4.8 to 10.5						071 MD	ΔP max 18	5.5
	16	10.5 to 18								6.5
	32	18 to 35		114DA		5.5 (DN 25/50/80) 6.5 (DN 100)	Bellows	236	35	6.5
	40	35 to 47						227	47	
	50	47 to 60						222	70	
EZHFO EZHSO	2	1 to 2.4	Diaphragm	114DA	100	EZHFO DN 25/50/80: 5.5 EZHFO DN 100: 6.5 EZHSO: 6.5	Diaphragm	114E	100	5.5
	4	2.4 to 4.8								6.5
	8	4.8 to 10.5						071E	ΔP max 18	5.5
	16	10.5 to 18								6.5
	32	18 to 35					Bellows	236	35	6.5
	40	35 to 47						227	47	
	50	47 to 60						222	70	
EZH	4	1 to 5	Diaphragm	71DA	100 DP Max 18b	4.5	Diaphragm	71 MD	100 DP Max 18b	4.5
Following ranges are the same with BSL-2, but always with a 71DA wire 4.5 mm for the pre-expansion.										
EZH FO EZH SO	4	1 to 5	Diaphragm	71 DA	100 DP Max 18b	4.5	Diaphragm	71 E	100 DP Max 18b	4.5
Following ranges are the same with BSL-2, but always with a 71DA wire 4.5 mm for the pre-expansion.										

(1) Working monitor assembly : Shock-tail nozzle on additional Pilot only.

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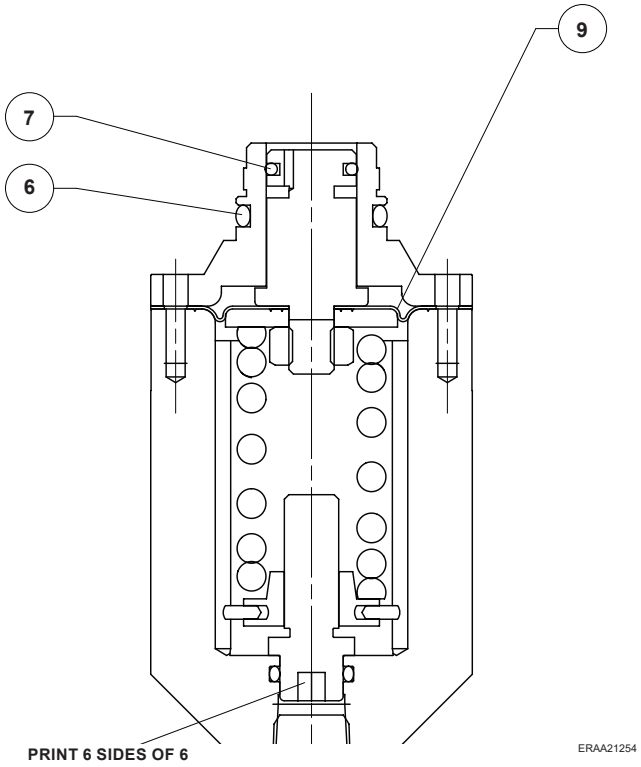


Figure 17. *Pre-expansion Relay 071DA*

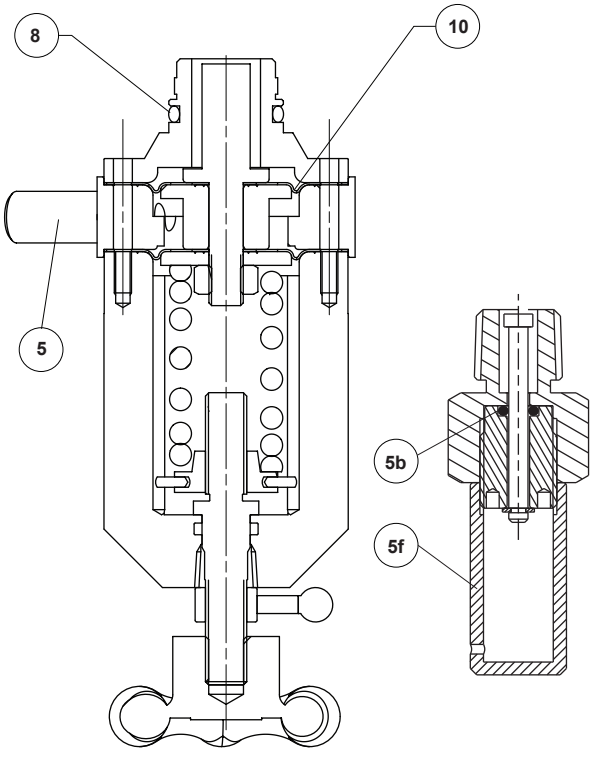


Figure 18. *Pilot 071MD*

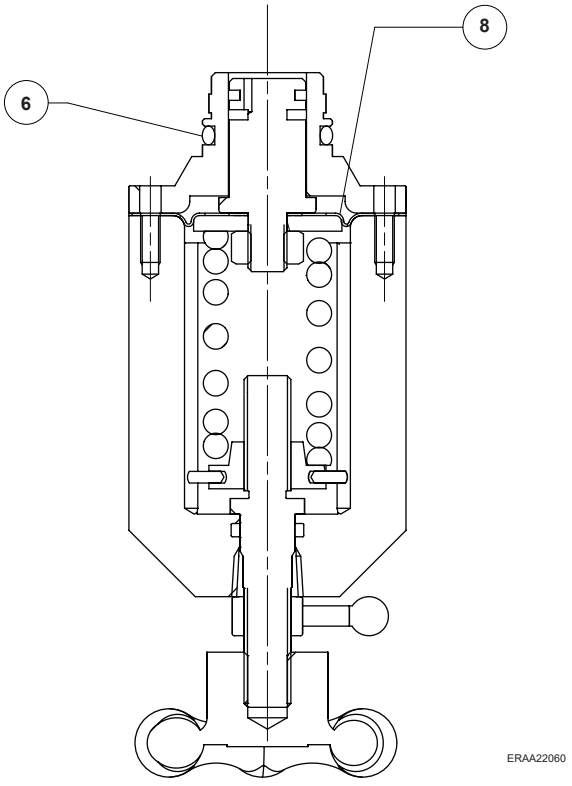


Figure 19. *Pilot 071 E*

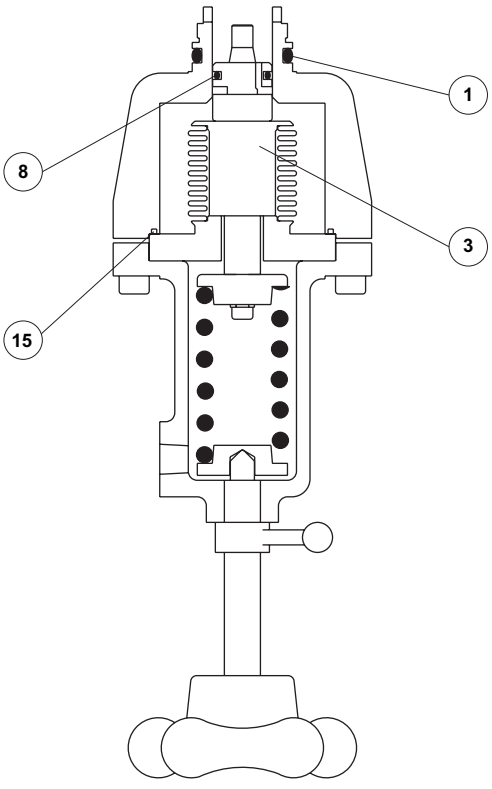


Figure 20. *Pilot 236, 227, 222*

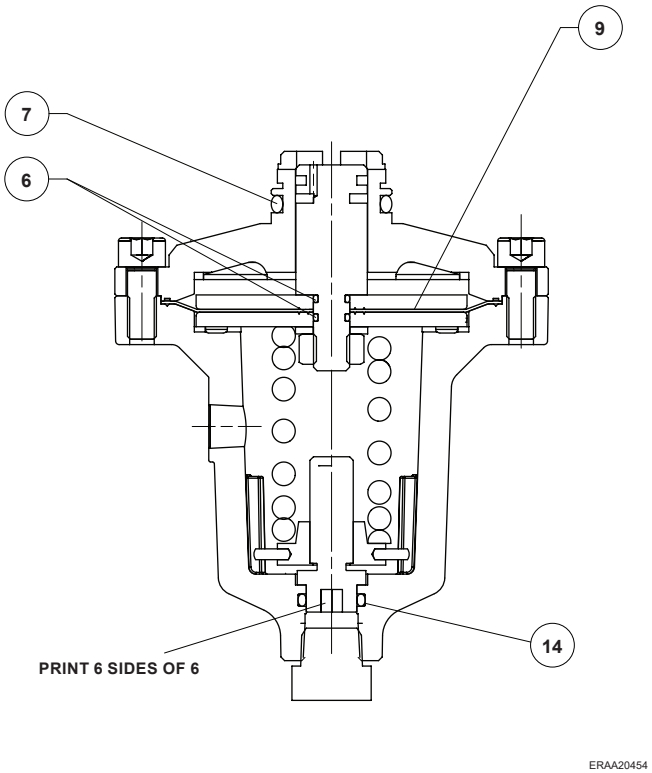


Figure 21. *Pre-expansion relay 114DA*

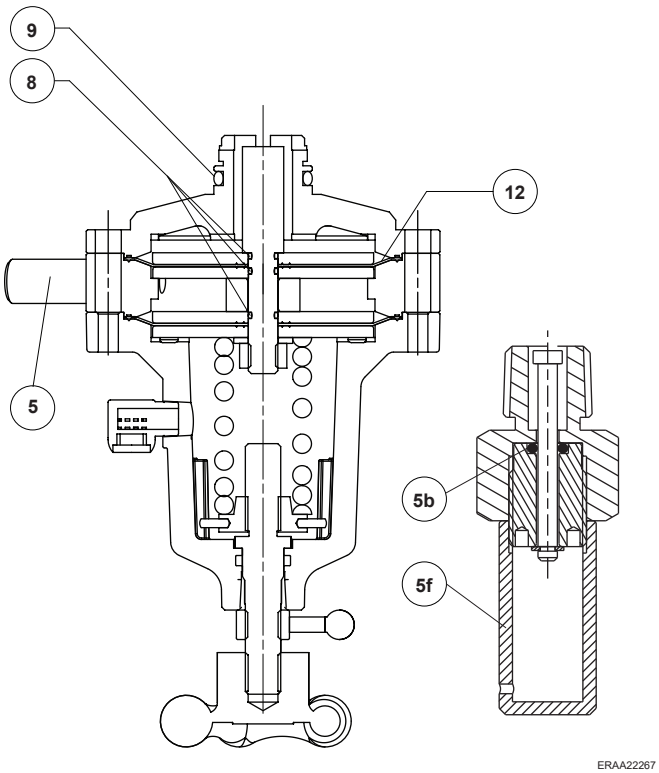


Figure 22. *Pilot 114MD*

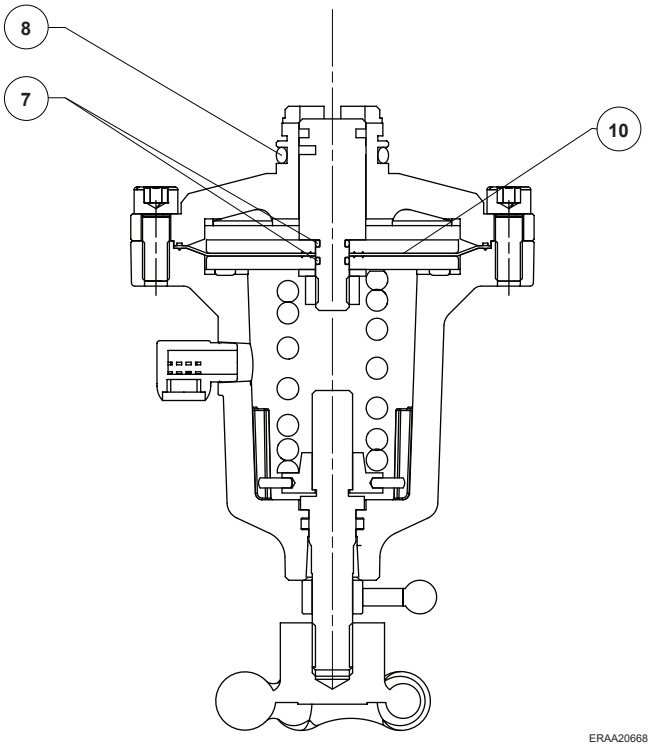


Figure 23. *Pilot 114 E*

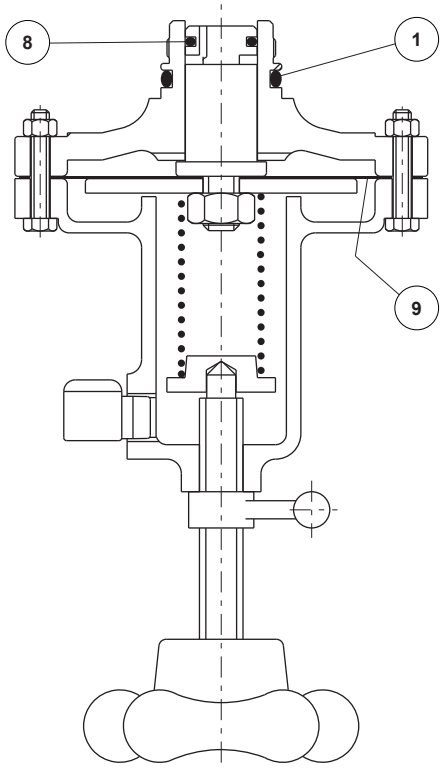


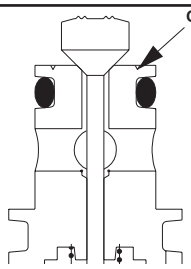
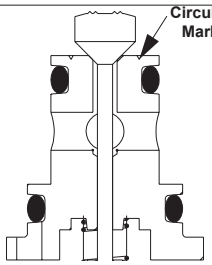
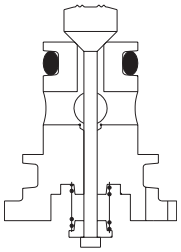
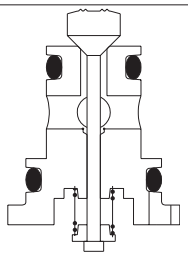
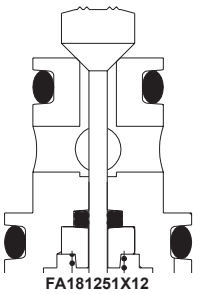
Figure 24. *BMP 114, 162*

Manometric Boxes Spare Parts

Table 7. *Spare Parts (Figures 15 to 22)*

KEY	DESCRIPTION	BMP DIAPHRAGM SIZE								BMP BELLOWS SIZE		
		071DA Figure 15	**071MD Figure 16**	**071E Figure 17**	**114 Figure 22**	**114DA Figure 19**	**114MD Figure 20**	**114E Figure 21**	**162 Figure 22**	**236 Figure 18**	**227 Figure 18**	**222 Figure 18**
	Pre-expansion BMP	ERAA21254A0			FA198743X12	ERAA20454A0					FA198751X12	
	Pilot BMP		ERAA22336A0	ERAA22060A0	FA195373X12		ERAA22267A0	ERAA20668A0	FA195606X12	FA196580X12	FA196576X12	FA196574X12
1	O-ring				FA400520X12				FA400520X12	FA400520X12	FA400520X12	FA400520X12
3	Impulse element									FA180922X12	FA180924X12	FA180971X12
5	Indicator assemble		ERAA03181A0				ERAA03181A0					
5b	O-ring		M6020066X12				M6020066X12					
5f	Tube		M0196770X12				M0196770X12					
6	O-ring	FA400520X12		FA400520X12		FA400220X12						
7	O-ring	FA400512X12				FA400520X12		FA400220X12				
8	O-ring		FA400520X12		FA400512X12		FA400220X12	FA400520X12		FA400512X12	FA400512X12	FA400512X12
8	Diaphragm			FA145249X32								
9	O-ring						FA400520X12	FA400520X12				
9	Diaphragm	FA142549X32			FA117562X12	FA144910X12			FA121368X12			
10	Diaphragm		FA142549X32					FA144910X12				
12	Diaphragm						FA144910X12					
14	O-ring					FA400511X12						
15	O-ring									FA400068X12	FA400068X12	FA400068X12

Table 8. *Nozzle Spare Parts*

NOZZLE TYPE	PRE-EXPANSION RELAY	PILOTS
ϕ3.2 (1 ring) Transmission applications 85 bar	 **FA181250X12**	
ϕ3.2 ADGE (2 rings)	 **FA181292X12**	
ϕ4 (1 pre-expansion ring) Distribution applications from 0 to 70 bar (2 rings for pilot)	 **FA181249X12**	 **FA181248X12**
ϕ4 E (3 rings)		 **FA181251X12**
Note: Contact factory for nozzles prior to 2004		

Spare Parts (continued)

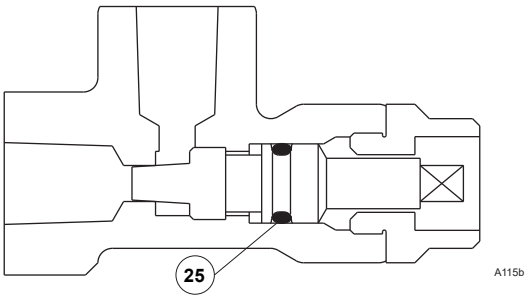


Figure 25. *Setting Valve*

Table 9. *Setting Valve Spare Parts*

KEY	DESCRIPTION	REFERENCE
25	O-ring	FA400506X12

Spare Parts (continued)

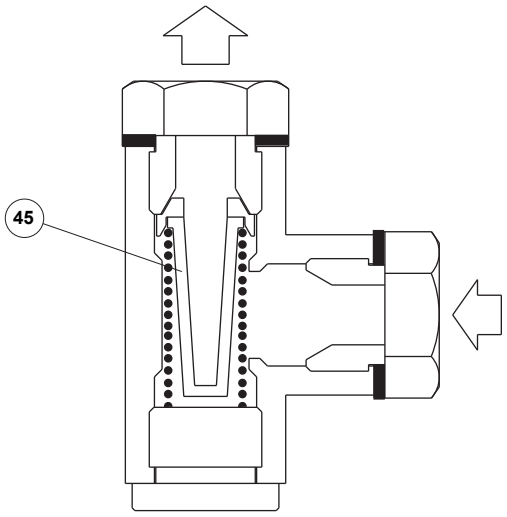


Figure 26. *Filter*

Table 10. *Filter Spare Parts*

KEY	DESCRIPTION	REFERENCE
45	Filter	FA118926X12

Table 11. *Manometer References (Rare Socket)*

READING RANGE bar	RELIEF VALVE REFERENCE
0 - 6	FA460381X12
0 - 25	ERAA26485A0

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