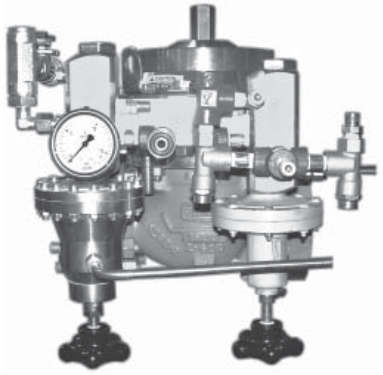
Francel Pilot Systems

SUMMARY



BSL 85 Pilot

Compact Pilot

Figure 1. *Francel Pilot Systems*

INTRODUCTION

Scope of Manual

This manual provides instructions for operation, startup, commissioning and spare parts ordering for the different Francel Pilot Systems.

Product Description

Two **Francel Pilot Systems** are available:

- **Compact Pilot (Distribution Applications)**

  The compact pilot is composed of a manometric pre-expansion box, a manometric pre-expansion pilot box, and a pilot body.

- **BSL 85 Pilot (Transmission Applications)**

  The BSL 85 pilot system is composed of a manometric pre-expansion box, a manometric pre-expansion pilot box and two pilot bodies. The BSL 85 permits all types of failure modes.

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

Different connections permits the pilot to be used on a wide range of EMERSON Pilot-Operated Regulators.

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

- **Pressure Reduction with Actuator and Plug:** Pilot system loading by modulated pressure
- **Pressure Reduction with Diaphragm-Plug:** Pilot system unloading by modulated pressure

By simply changing the BMP manometric box or spring the setpoint range can be modified. No dismantling tool is required for this operation except in the case of BMP DR, DA, MD or RJGI.

FRANCEL

EMERSON
Process Management

Standard Pilots

CHARACTERISTICS

OPERATING PRESSURE		
Obtainable inlet pressure	PSD	85 bar
Maximum obtainable pressure	Pumax	100 bar
Outlet pressure range	Pd	0.01 to 60 bar
OPERATING TEMPERATURE	TS	-20/60 °C

Material

Pilot body: Steel

Pilot Manometric Box BMP (spring case): Steel

Pilot Manometric Box BMP (cover): Steel or Aluminium

Bracket: Steel

Connections Styles

Pilot body: 1/4 NPT tapped

Manometer: M10x100 tapped

BMP connection: 1/4 NPT tapped

BMP vent: 1/4 NPT tapped

Regulators

Transmission applications: MPS, MP, EZH, BERTIN EZ, EZR

Distribution applications: K1000, K3000, EZR, CRONOS

Terms

Table 1. *Previous and Present Used Terms*

PREVIOUS	PRESENT
Nozzle	Nozzle
Pilot block	Nozzle
Relay body	Pilot body
MZC	Spring case
RGMH	Cover
ADGJ	Pre-expansion relay (071,114, ...)
RJGN	Pilot (071, 114, ...)
RJGF	BMP 114 MD
ADGD	BMP 114 DR
ADGC	BMP 114 DA
RHGD	BMP 114 LD

Table 2. *Setting Ranges for Manometric Boxes*

SIZE	SPRING		SETTING RANGE Wds*		PSD	PILOT SYSTEM	
	Wire ϕ (mm)	Reference	Min	Max		Pre-expansion	Pilot
162	2.0	113195	0.01	0.05	5		X
	3.0	113197	0.05	0.18			X
114	4.0	113199	0.16	0.77	10		X
	4.5	113200	0.25	1.20		X	X
	5.5	113202	0.50	2.40		X	X
	6.5	114139	1.00	4.80			X
71	4.5	113200	1.00	5.00	20	X	
	5.5	113202	2.00	10.50		X	X
	6.5	114139	4.00	18.00		X	X
236	4.5	113200	2.00	10.50	35	X	X
	5.5	113202	4.00	18.00		X	X
	6.5	114139	8.00	35.00		X	X
227	6.5	114139	12.00	47.00	47	X	X
222	6.5	114139	30.00	60.00	70	X	X
114 DR	5.5	113202	0.50	2.40	100	X	
	6.5	114139	1.20	4.80		X	
114 DA	4.0	116816	0.40	1.30		X	
114 MD	4.5	113200	0.25	1.20			X
	5.5	113202	0.50	2.40			X
	6.5	114139	1.20	4.80			X

DR: Differential can be set
DA: Differential can be adjusted
MD: Double Diaphragm

*Wds: Set range applicable to a regulator for every BMP size

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Other ranges available, please contact factory.

LABELLING

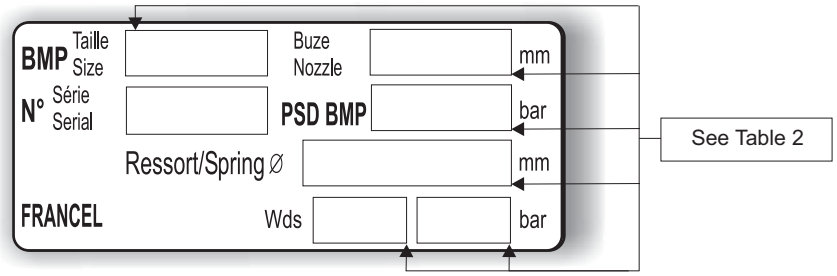


Figure 2. *Type BMP Label*

DESCRIPTION

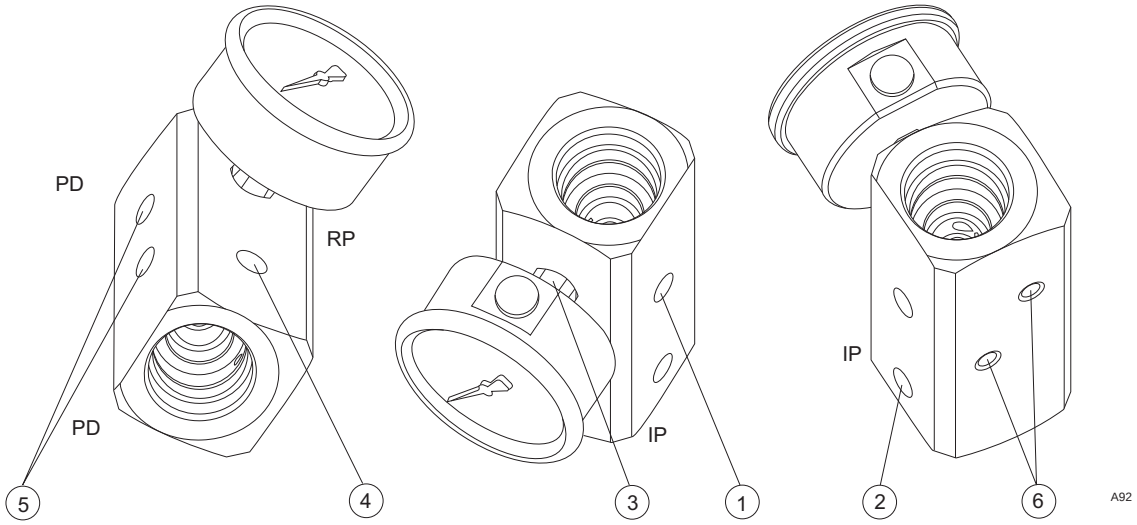


Figure 3. *Body Labelling*

Body Description (Figure 3)

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

Hard Trim Pilot System (Figures 4, 5 & 6) and Boot Trim Pilot System (Figure 7)

1 - Pilot Assembly

10. Pilot body
11. Pre-expansion nozzle
12. Pre-expansion setting spring
13. Pre-expansion manometric box
14. Pilot nozzle
15. Pilot setting spring
16. Pilot manometric box

2 - Connecting parts (Figure 7)

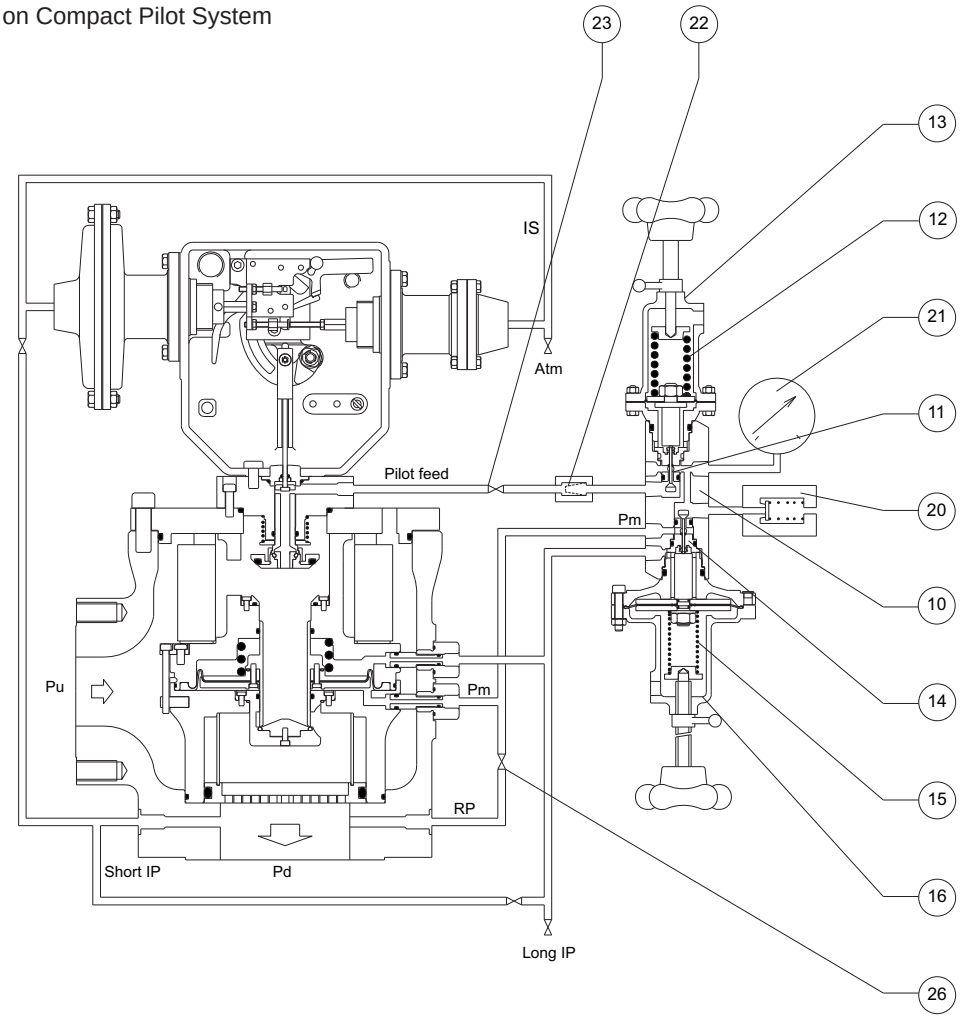
20. Pre-expansion relief valve
21. Pre-expansion manometer
22. Fitted filter
23. Feed tap
24. Slam-shut bypass tap (if not incorporated)
25. Modulated pressure tap(1)
26. Reject tap(1)
27. Restriction tap(2)

(1) Hard trim pilot system only (2) Boot trim pilot system only

PRINCIPLE OF OPERATION

Hard Trim Pilot Systems

Principle of Operation based on Compact Pilot System



Pu: Inlet pressure
Pd: Outlet pressure
Pm: Modulated pressure
RP: Pilot Reject
IP: Pilot Impulse
IS: Slam-Shut Impulse

Figure 4. *Principle of Operation with Compact Pilot System - Type K1000/K3000 and EZR Regulators*

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.

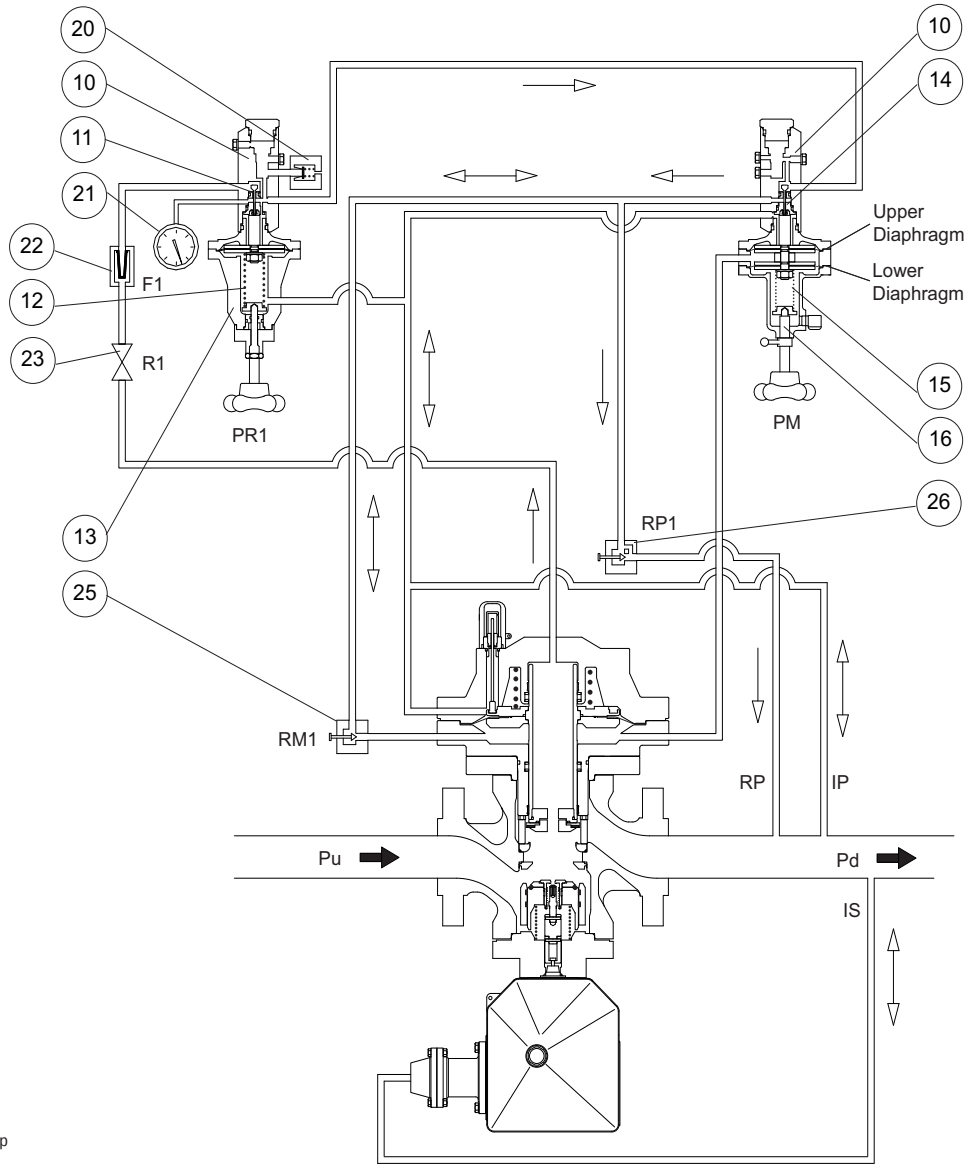
The modulated pressure (Pm) bleeds through the reject pilot (RP).

The regulator CLOSES.

Hard Trim Pilot Systems (continued)

Principle of operation based on BSL 85 Pilot System

"Fail to Close" Version



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
RP1: Pilot Reject tap
PR1: Pre-expansion Relay
PM: Monitor Pilot

Figure 5. *Type EZH Regulator with Type BSL 85 Pilot System*

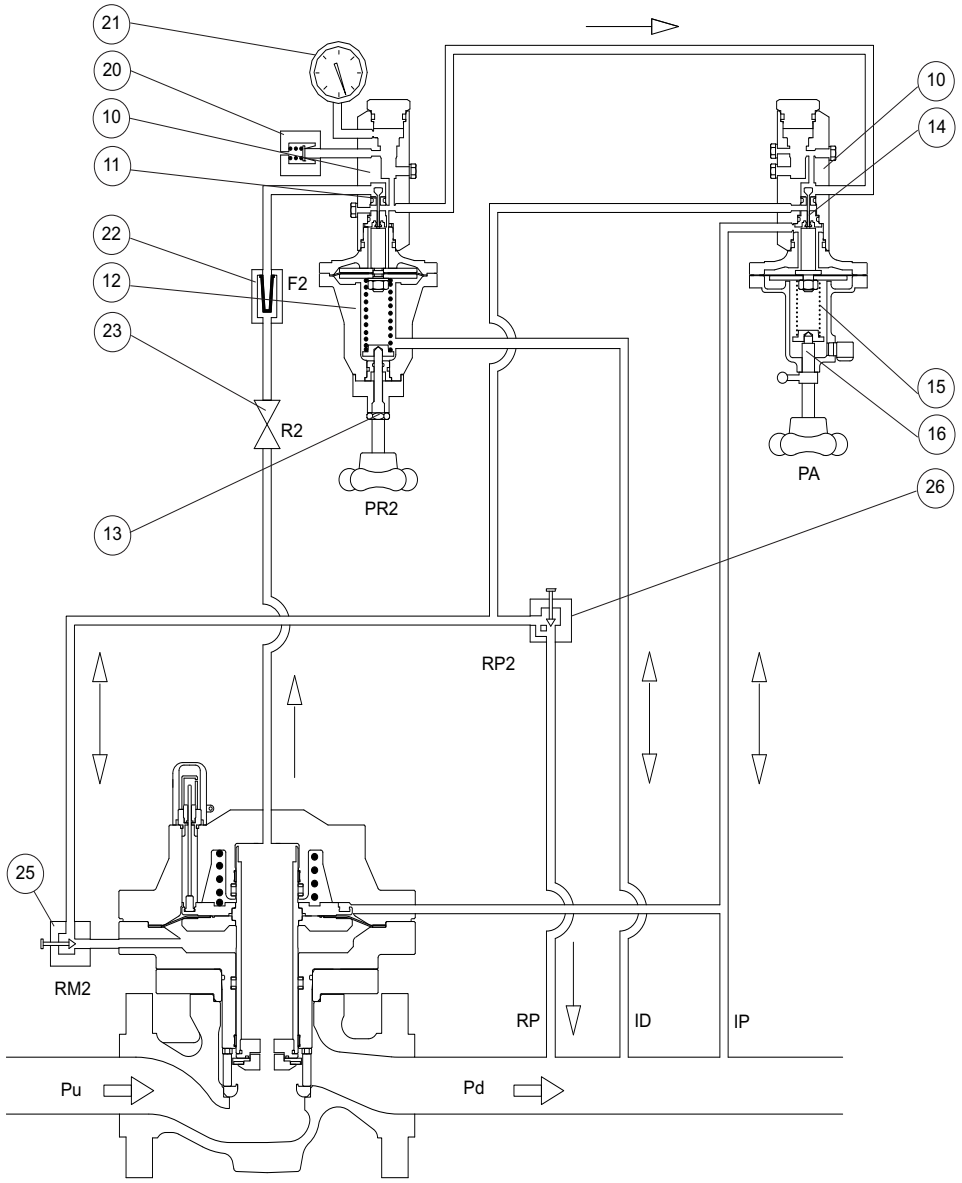
Hard Trim Pilot Systems (continued)

Principle of operation based on BSL 85 Pilot System

"Fail to Open" Version

In this case, it is still possible to choose two types of regulators depending on their reaction in the case of failure mode.

Figure 6a: the regulator spring tries to close, the "Fail to Open" mode is managed by the appropriate pilot.



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

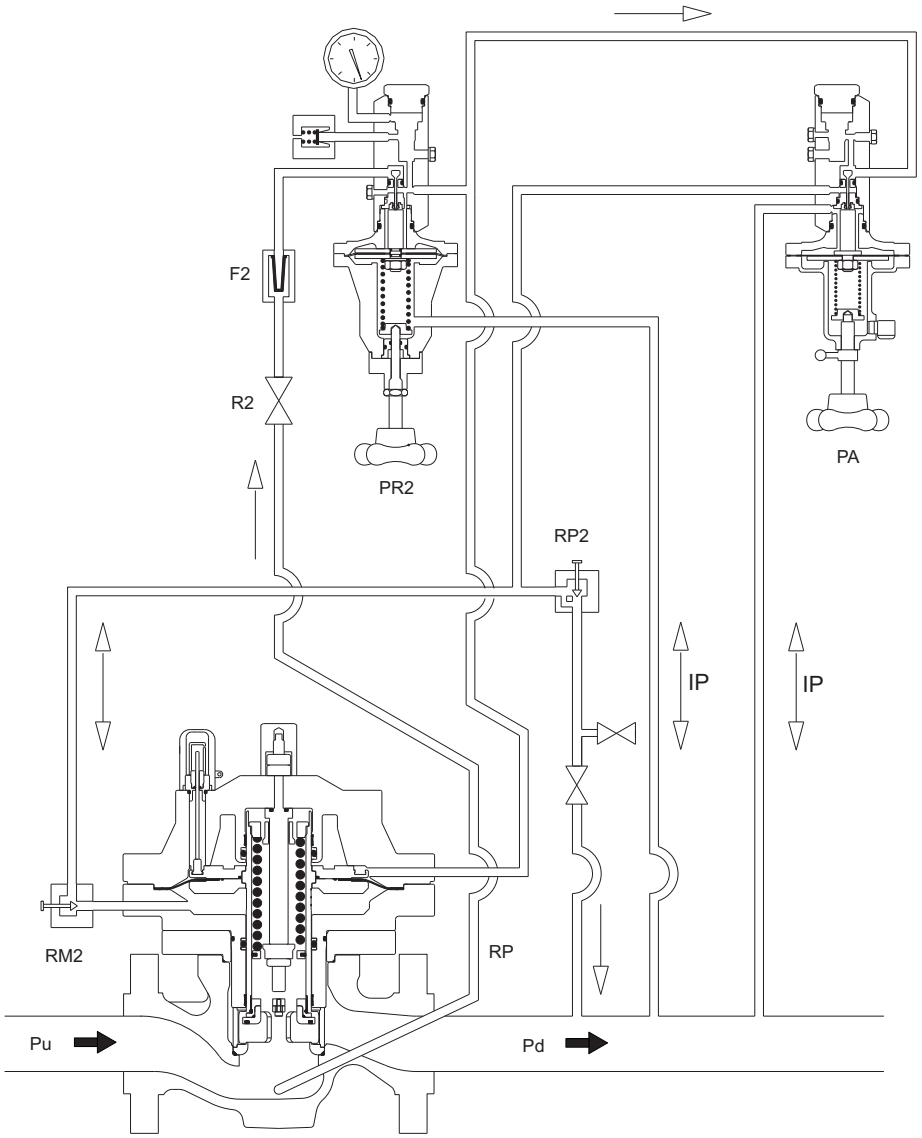
RP: Pilot Reject
IP: Pilot Impulse
IS: Slam-Shut Impulse
ID: Differential Impulse

R2: Pilot Feed tap
F2: Filter
RM2: Motorized Pressure tap
RP2: Pilot Reject tap
PR2: Pre-expansion Relay
PA: Active Pilot

Figure 6a. *Type EZHFO Regulator with Type BSL 85 Pilot System*

Hard Trim Pilot Systems (continued)

Figure 6b: the regulator spring tries to open, the “Fail to Open” mode is also managed by the regulator spring.



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

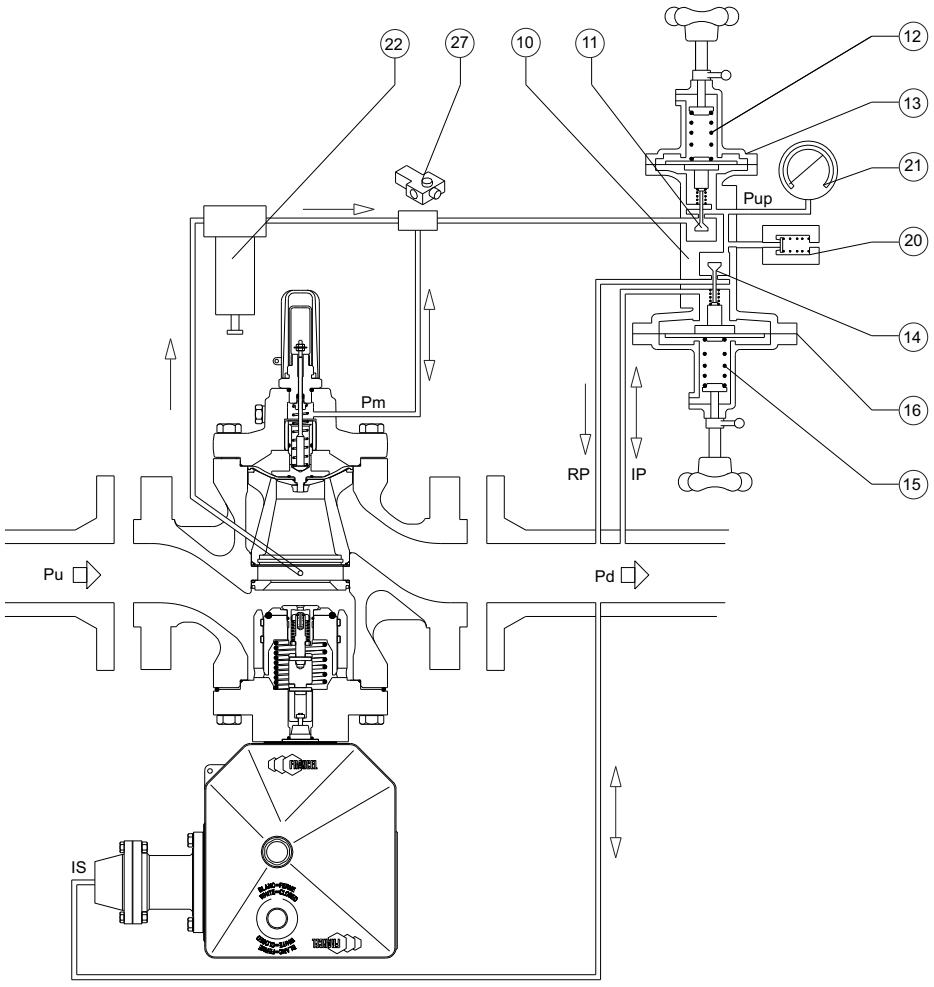
RP: Pilot Reject
IP: Pilot Impulse
IS: Slam-Shut Impulse

R2: Pilot Feed tap
F2: Filter
RM2: Motorized Pressure tap
RP2: Pilot Reject tap
PR2: Pre-expansion Relay
PA: Active Pilot

Figure 6a. *Type EZHSO Regulator with Type BSL 85 Pilot System*

Boot Trim Pilot Systems

Principle of operation based on Compact Pilot System



Pu : Inlet pressure
Pd : Outlet pressure
Pm : Modulated pressure
RP : Pilot Reject
IP : Pilot Impulse
IS : Slam-Shut Impulse

Figure 7. *Type EZR Regulator with Type 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 (key 27).

The modulated pressure (Pm) bleeds to the oulet 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 close.

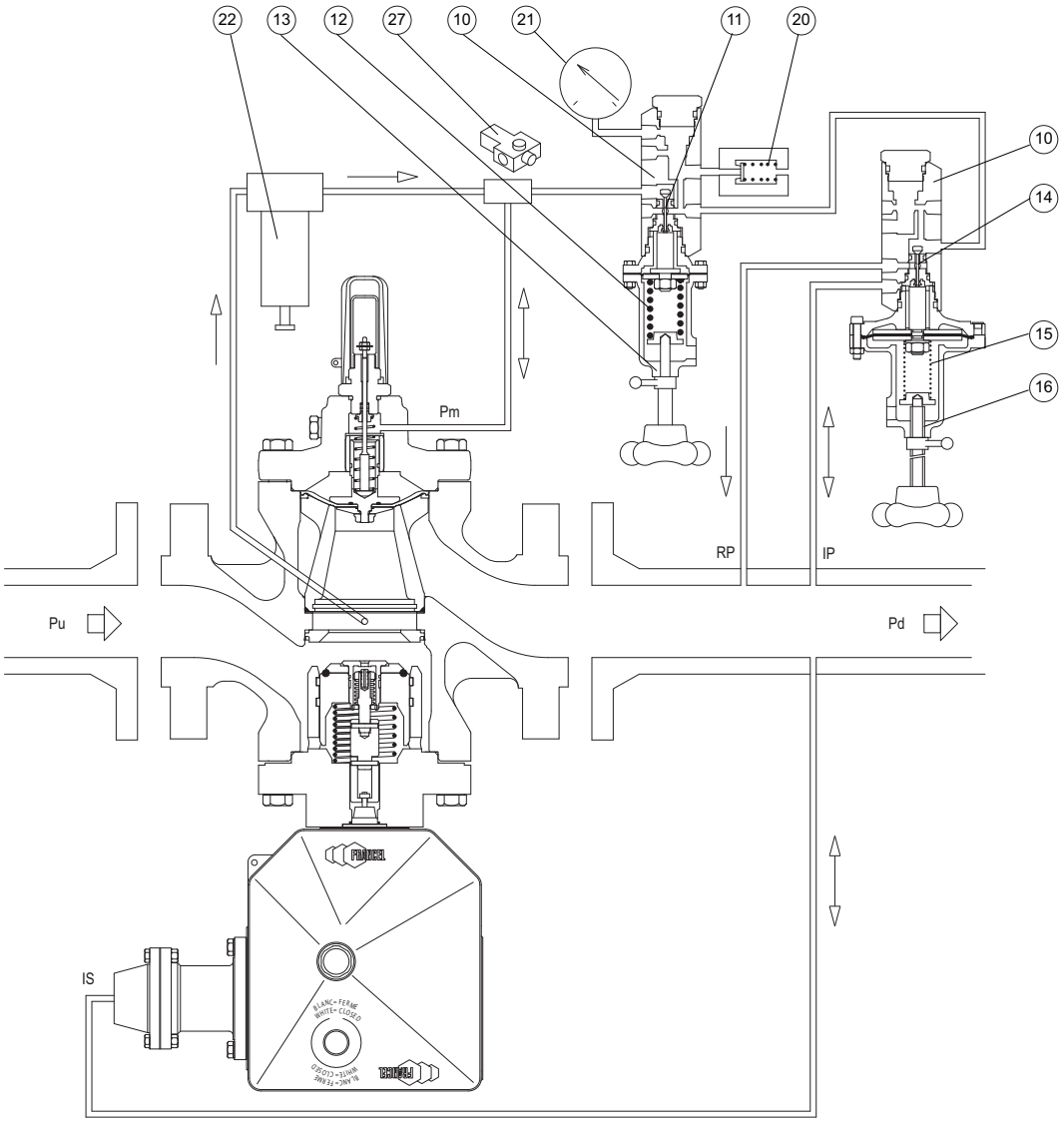
The pilot flow decreases and becomes inferior to that of the restriction tap (key 27).

The modulated pressure (Pm) increases.

The regulator CLOSES.

Boot Trim Pilot Systems (continued)

Principle of operation based on BSL 85 Pilot System



Pu : Inlet pressure
Pd : Outlet pressure
Pm : Modulated pressure
RP : Pilot Reject
IP : Pilot Impulse
IS : Slam-Shut Impulse

Figure 8. *Type EZR Regulator with Type BSL 85 PIlot System*

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 ne 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, 10; FRANCEL square spanner; Flat screwdriver and screw M4.

Manometric Box (BM) (Figure 9)

- Unscrew knob (key 1)
  - Manually
- Unscrew screw (key 2)
  - Spanner*
- Remove impulse (key 3)
  - Check impulse element
  - Control tightshut joints

Pilot Body (Figure 13)

- Remove nozzle(s) (pilot block(s)) (key 4)
  - Screw M4
    - Clean valve and seat
    - Control tighshut joints
- Unscrew manometer (key 5)
  - Flat spanner no. 14
- Remove flat ring (key 6)
- Unscrew relief valve (key 7)
  - Flat spanner no. 19

Filter (Figure 10)

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

Adjustment Tap (Figure 11)

- 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.

Relief Valve (depending on version) (Figure 12)

- Unscrew screw (key 12)
  - Flat screwdriver
- Remove valve-plug (key 13)
  - Check seat and valve-plug

Reassembly

Complet the above operations in reverse order.

Lightly grease all rings (silicone grease recommended).

Lightly grease all threads (molycot grease).

*Flat spanner N° 11 for BMP 162 - N° 8 for BMP 114 and 071
6-sided spanner N° 5 for bellows BMP

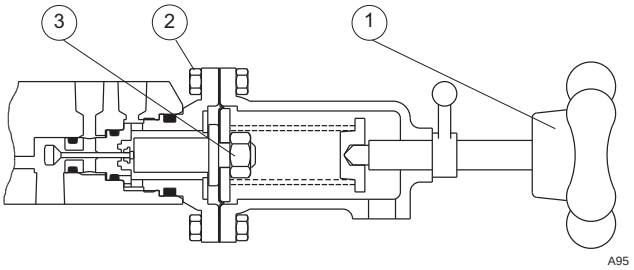
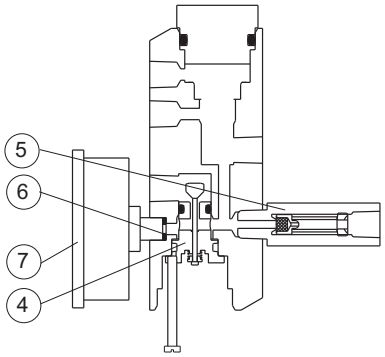


Figure 9. *Manometric Box*



BSL 85 Pre-expansion Body

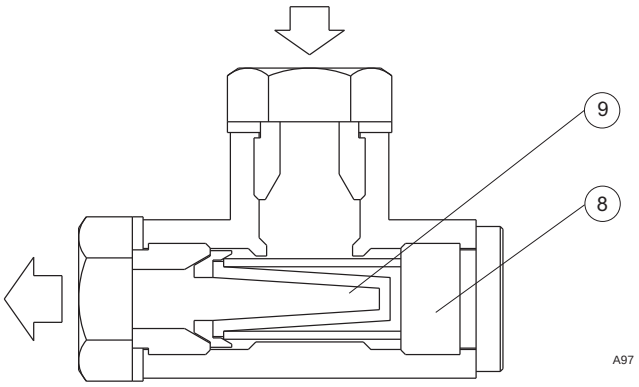
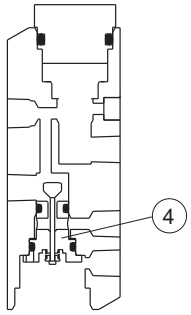


Figure 10. *Filter*



BSL 85 Pilot Body

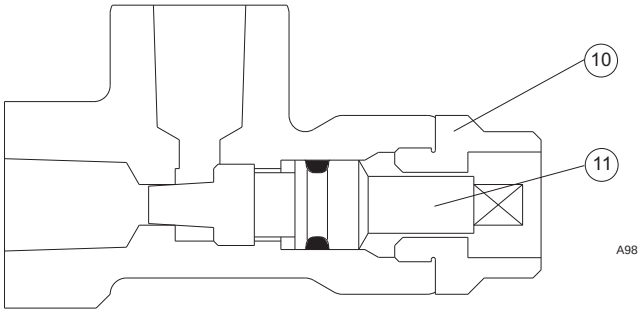
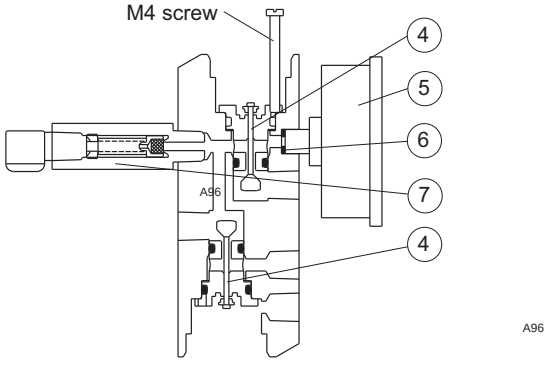


Figure 11. *Setting Tap*



Compact Pilot Body

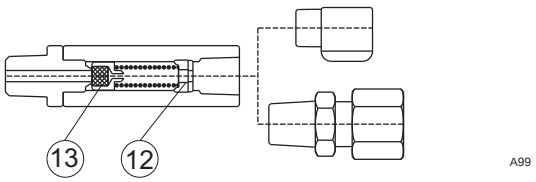


Figure 12. *Relief Valve*

Figure 13. *Pilot System Body Types*

Standard Connections

Table 3. *Standard Connections*

REGULATORS		BERTIN EZ NO MPNO EZHFO, EZHSO	BERTIN EZ MP EZH	MPS	K3000 K1000 EZR
Assembly Type	Stand-alone	X	X	X	X
	Monitor	X	X	X	
	Working Monitor	X	X		
	Active	X	X	X	
ADGE Version	Stand-alone	X	X	X	
	Monitor	X	X	X	
	Working Monitor	X	X		
	Active	X	X	X	
Variable Pressure Meter Version	Stand-alone	Contact factory	X	X	
	Monitor				
	Working Monitor				
	Active				

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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.

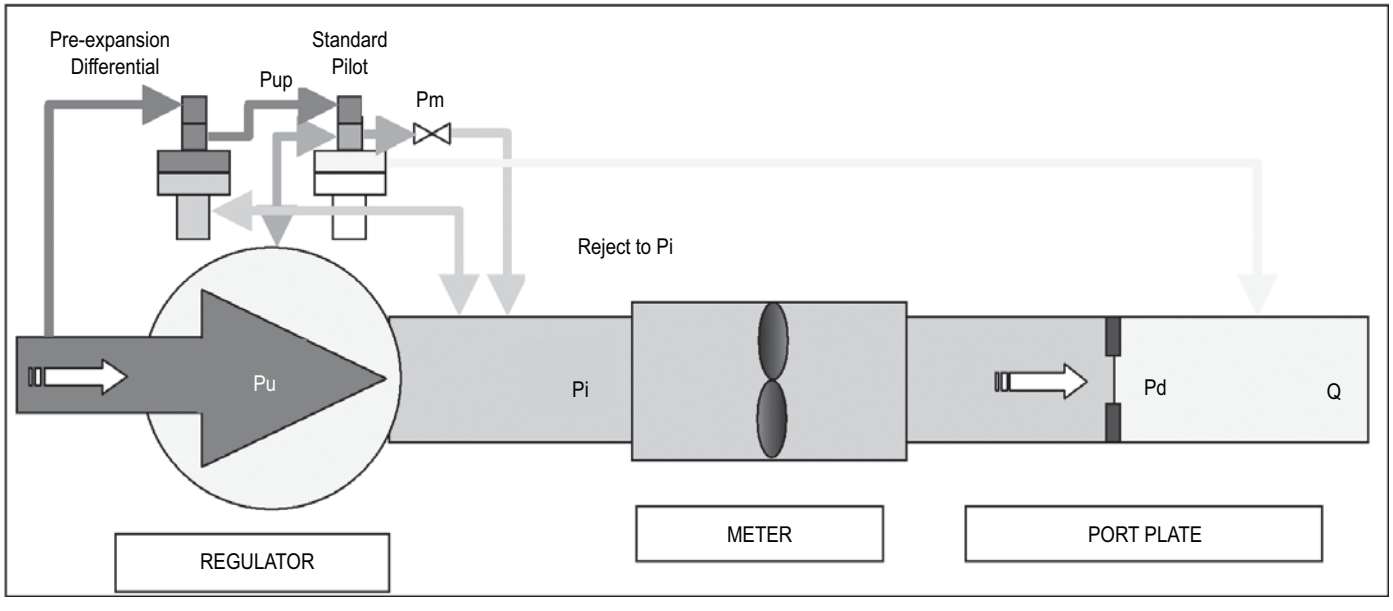

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Figure 14. *Port Plate*

OPTIONS

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 NTARPE).

ADGE 1” (Pre-expansion Exchanger)

The ADGE 1” replaces the standard pre-expansion relay. It permits the gas to be reheated beyond pre-expansion without using external energy sources. (See instruction manual NTAADGE1). See table 3 for standard configurations.

Mass volume corrector
Flow limiter
Remote control setting
} Contact factory

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 - BERTIN EZ NO MPNO
- FC design: EZH - BERTIN EZ - MPNF

Type BMP 114 MD Double-Diaphragm Pilot (Figure 5)

The manometric box is equipped with two integral diaphragms. The volume between these two diaphragms is related to the driving pressure of the actuator.

Failure of the upper diaphragm will cause balance between the driving pressure and the outlet pressure. Failure of the lower diaphragm will cause evacuation the driving pressure to the atmosphere.

In both cases the equipment tends to close due to lack of driving pressure (Fail to Close).

PRE-EXPANSION DETERMINATION

Table 4. *Pre-expansion per Regulator (bar) (Superior to downstream pressure (Pd))*

	MIN	NOMINAL	MAX
EZR	0.50	0.80	1.50
K1000	0.25	0.50	1.00
MPS	3.00	6.00	8.00

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Table 5. *Adjustable Pre-expansion Differential for EZH, EZH FO, EZHSO, MP, Bertin EZ, Working Monitor Regulator or CPV Metering*

	MIN	NOMINAL	MAX
MP	Pd + 1.2	Pd + 2.4	Pd + 4.8
BERTIN EZ	Pd + 1.2	Pd + 2.4	Pd + 4.8
MPS	Pd + 2	Pd + 4	Pd + 4.8
EZH, EZH FO, EZHSO	Pd + 1.7	Pd + 2	Pd + 3

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Table 6. *Adjustable Pre-expansion Differential for Type FO Regulators*

	ACTUATOR	NOMINAL
MPNO BERTIN EZ NO	269	Pd + 0.8
	374	Pd + 1.1
Adjustable from 0.4 to 1.3 bar Adjustable according to size of actuator (factory set)		

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Operating Instructions and Regulation Optimization

Table 7. *Operating Instructions and Regulation Optimization*

	UNIT OR PARAMETER	INDICATIONS	INSTABILITY	SLOW REACTION	LACK OF PRECISION
Hard trim pilot systems (Figures 3, 4, 5)	Modulated pressure valve (key 25)	Wide open. All settings available except completely closed	Progressively close, without completely closing	Open as wide as possible	No incidence
	Reject tap (key.26)	Open 3/4 turn. All settings available	Open by successive fractions	Close by successive fractions	
	Pre-expansion relay (key 13)	See table 4	Decrease the pre-expansion by successive fractions	Increase the pre-expansion by successive fractions	
Boot trim pilot systems (Figure 6)	Pilot vent valve (BMP 162)	Open 1/2 turn. All settings available except completely closed	Look for the best position between 1/4 and 2 turns	Progressively open	No incidence
	Feeding tap (key 29)	Open 1/2 turn. All settings available	Open by successive fractions	Close by successive fractions	
	Pre-expansion relay (key 13)	See table 5	Decrease the pre-expansion by successive fractions	Increase by pre-expansion by successive fractions	

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PILOT SETTING RANGES

Table 8. *Distribution Regulators Range*

DISTRIBUTION REGULATORS	Pd (bar)		PRE-EXPANSION RELAY				PILOTAGE				MANOMETER RANGE (bar)	RELIEF VALVE [(1)]	
	Nominal Pd	Range	Type	Size	PSD (bar)	ϕ Wire (mm)	Type	Size	PSD (bar)	ϕ Wire (mm)		Maxi Setting (bar)	Setting (bar)
EZR	0.02	0.01 to 0.05	Diaphragm	114	10	5.5	Diaphragm	162	5	2	0 - 6	10.3	5
	0.10	0.05 to 0.18								3			
	0.30	0.18 to 0.77						114	10	4			6
	1.00	0.77 to 1.20		071	20	4.5				4.5	0 - 16		
	2.00	1.00 to 2.40				5.5				5.5			7
	4.00	2.40. to 4.80								6.5			10
	8.00	4.80 to 10.50				6.5		071	20	5.5	0 - 40	24.3	16
	16.00	10.50 to 18.00	Bellows	236	**35**					6.5			23
K1000 K3000	0.02	0.01 to 0.05	Diaphragm	114	10	4.5		162	5	2	0 - 6	10.3	5
	0.10	0.05 to 0.18								3			
	0.30	0.18 to 0.77				5.5		114	10	4			
	1.00	0.77 to 1.20								4.5			
	2.00	1.20 to 2.40		071	20	4.5				5.5	0 - 16		
	4.00	2.40. to 4.80				5.5				6.5			7
	8.00	4.80 to 10.50				6.5		071	20	5.5		24.3	13
	16.00	10.50 to 16.00	Bellows	236	35					6.5	0 - 40		18

(1) Note: If Pu <= 10 bar and Pd <= 8 bar. the relief valve is removed and replaced by a plug.

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Europe, Middle East, and Africa Only

PILOT SETTING RANGES (continued)

Table 9. *Transmission Regulator Range*

TRANSMISSION REGULATORS	Pd (bar)		PRE-EXPANSION RELAY Nozzle ϕ 3.2				PILOT SYSTEM Nozzle ϕ 4.0				MANOMETER RANGE (bar)	RELIEF VALVE	
	Nominal Pd	Range	Type	Size	PSD (bar)	Wire ϕ (mm)	Type	Size	PSD (bar)	Wire ϕ (mm)		Max. Setting (bar)	Setting (bar)
MP BERTIN EZ	2.00	1.00 to 2.40	Diaphragm	114 DR	100	6.5	Diaphragm	114 MD	100	5.5	0 - 16	10.3	8
	4.00	2.40 to 4.80								6.5			10
	8.00	4.80 to 10.50					Bellows	236	35	4.5	0 - 40	24.3	16
	16.00	10.50 to 18.00								5.5			23
	32.00	18.00 to 35.00								6.5	0 - 100	40.3	40
	40.00	35.00 to 47.00						227	47			70	52
	50.00	47.00 to 60.00						222	70				65
EZH	2.00	1.00 to 2.40				5.5	Diaphragm	114 MD	100	5.5	0 - 16	10.3	8
	4.00	2.40 to 4.80								6.5			10
	8.00	4.80 to 10.50					Bellows	236	35	4.5	0 - 40	24.3	16
	16.00	10.50 to 18.00								5.5			23
	32.00	18.00 to 35.00								6.5	0 - 100	40.3	40
	40.00	35.00 to 47.00						227	47			70	52
	50.00	47.00 to 60.00						222	70				65
MPS	2.00	1.00 to 2.40	Bellows	236	35	5.5	Diaphragm	114	10	5.5	0 - 16	24.3	12
	4.00	2.40 to 4.80								6.5			14
	8.00	4.80 to 10.50						071	20	5.5	0 - 40		20
	16.00	10.50 to 18.00				6.5				6.5		70	27
	32.00	18.00 to 35.00		227	47		Bellows	236	35		0 - 100		44
	40.00	35.00 to 47.00		222	70			227	47				56
	50.00	47.00 to 60.00						222	70				69
MPNO BERTIN EZ NO	2.00	1.00 to 2.40	Diaphragm	114 DA	100	4	Membrane	114	10	5.5	0 - 16	10.3	8
	4.00	2.40 to 4.80								6.5			10
	8.00	4.80 to 10.50						071	20	5.5	0 - 40	24.3	16
	16.00	10.50 to 18.00								6.5			23
	32.00	18.00 to 35.00					Soufflet	236	35		0 - 100	40.3	40
	40.00	35.00 to 47.00						227	47			70	52
	50.00	47.00 to 60.00						222	70				65
EZHFO. EZHSO	2.00	1.00 to 2.40		114 DR		5.5 EZHFO 6.5 EZHSO	Membrane	114	10	5.5	0 - 16	10.3	8
	4.00	2.40 to 4.80								6.5			10
	8.00	4.80 to 10.50						071	20	5.5	0 - 40	24.3	16
	16.00	10.50 to 18.00								6.5			23
	32.00	18.00 to 35.00					Soufflet	236	35		0 - 100	40.3	40
	40.00	35.00 to 47.00						227	47			70	52
	50.00	47.00 to 60.00						222	70				65

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Europe, Middle East, and Africa Only

PILOT SETTING RANGES (continued)

Table 10. *Transmission Regulators – Working Monitor*

TRANSMISSION REGULATORS	Pd (bar)		PRE-EXPANSION RELAY				PILOT SYSTEM				MANOMETER RANGE (bar)	RELIEF VALVE	
			Nozzle ϕ 3.2				Tightshut Nozzle ϕ 4.0						
	Nominal Pd	Range	Type	Size	PSD (bar)	ϕ Fil (mm)	Type	Taille	PSD (bar)	ϕ Fil (mm)		Max. Setting (bar)	Setting (bar)
MP BERTIN EZ	2.00	1.00 to 2.40	Diaphragm	114 DR	100	6.5	Diaphragm	114 MD	100	5.5	The manometer and relief valve are defined according to the Pi (see table below)		
	4.00	2.40 to 4.80								6.5			
	8.00	4.80 to 10.50					Bellows	236	35	4.5			
	16.00	10.50 to 18.00								5.5			
	32.00	18.00 to 35.00								6.5			
	40.00	35.00 to 47.00						227	47				
	50.00	47.00 to 60.00						222	70				
EZH	2.00	1.00 to 2.40				5.5	Diaphragm	114MD	100				
	4.00	2.40 to 4.80								5.5			
	8.00	4.80 to 10.50					Bellows	236	35	6.5			
	16.00	10.50 to 18.00								4.5			
	32.00	18.00 to 35.00								5.5			
	40.00	35.00 to 47.00						227	47	6.5			
	50.00	47.00 to 60.00						222	70				
MPNO	2.00	1.00 to 2.40		114 DA		4	Diaphragm	114	10	5.5			
	4.00	2.40 to 4.80								6.5			
	8.00	4.80 to 10.50						071	20	5.5			
	16.00	10.50 to 18.00								6.5			
	32.00	18.00 to 35.00					Bellows	236	35				
	40.00	35.00 to 47.00						227	47				
	50.00	47.00 to 60.00						222	70				
EZHFO. EZHSO	2.00	1.00 to 2.400		114 DR		5.5 EZHFO 6.5 EZHSO	Diaphragm	114	10	5.5			
	4.00	2.40 to 4.80								6.5			
	8.00	4.80 to 10.50						071	20	5.5			
	16.00	10.50 to 18.00								6.5			
	32.00	18.00 to 35.00					Bellows	236	35				
	40.00	35.00 to 47.00						227	47				
	50.00	47.00 to 60.00						222	70				

Table 11. *Pi Range for Definition of Manometer and Relief Valve Values*

TRANSMISSION REGULATORS	Pi (bar)		PILOT SYSTEM				MANOMETER RANGE (bar)	RELIEF VALVE	
			Tightshut Nozzle ϕ 4.0						
	Nominal Pi	Range	Type	Size	PSD (bar)	Wire ϕ (mm)		Max Setting (bar)	Setting (bar)
MP MPNO EZH BERTIN EZ EZHFO EZHSO	2.00	1.00 to 2.40	Diaphragm	114	10	5.5	0 - 16	10.3	8
	4.00	2.40 to 4.80				6.5			10
	8.00	4.80 to 10.50		071	20	5.5	0 - 40	24.3	16
	16.00	10.50 to 18.00				6.5			23
	32.00	18.00 to 35.00	Bellows	236	35		0 - 100	40.3	40
	40.00	35.00 to 47.00		227	47			70	52
	50.00	47.00 to 60.00		222	70				65

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PILOT SETTING RANGES (continued)

Table 11. *Transmission CPV Regulators*

TRANSMISSION REGULATORS	Pd (bar)		PRE-EXPANSION RELAY Nozzle ϕ 3.2				PILOT SYSTEM Nozzle ϕ 4.0				MANOMETER RANGE (bar)	RELIEF VALVE	
	Nominal Pd	Range	Type	Size	PSD (bar)	Wire ϕ (mm)	Type	Size	PSD (bar)	Wire ϕ (mm)		Tarage Maxi (bar)	Réglage (bar)
MP BERTIN EZ	2.00	1.00 to 2.40	Diaphragm	114 DR	100	6.5	Diaphragm	114 MD	100	5.5	The manometer and relief valve are defined according to configuration (see page 18)		
	4.00	2.40 to 4.80								6.5			
	8.00	4.80 to 10.50					Bellows	236	35	4.5			
	16.00	10.50 to 18.00								5.5			
	32.00	18.00 to 35.00								6.5			
	40.00	35.00 to 47.00						227	47				
	50.00	47.00 to 60.00						222	70				
EZH	2.00	1.00 to 2.40				5.5	Diaphragm	114 MD	100	5.5			
	4.00	2.40 to 4.80								6.5			
	8.00	4.80 to 10.50					Bellows	236	35	4.5			
	16.00	10.50 to 18.00								5.5			
	32.00	18.00 to 35.00								6.5			
	40.00	35.00 to 47.00						227	47				
	50.00	47.00 to 60.00						222	70				
MPS	2.00	1.00 to 2.40				6.5	Diaphragm	114	10	5.5			
	4.00	2.40 to 4.80								6.5			
	8.00	4.80 to 10.50						071	20	5.5			
	16.00	10.50 to 18.00								6.5			
	32.00	18.00 to 35.00					Bellows	236	35				
	40.00	35.00 to 47.00						227	47				
	50.00	47.00 to 60.00						222	70				
EZHFO. EZHSO	2.00	1.00 to 2.40				5.5 EZHFO 6.5 EZHSO	Diaphragm	114	10	5.5			
	4.00	2.40 to 4.80								6.5			
	8.00	4.80 to 10.50						071	20	5.5			
	16.00	10.50 to 18.00								6.5			
	32.00	18.00 to 35.00					Bellows	236	35				
	40.00	35.00 to 47.00						227	47				
	50.00	47.00 to 60.00						222	70				
MPNO BERTIN EZ NO	2.00	1.00 to 2.40		114 DA		4	Diaphragm	114	10	5.5			
	4.00	2.40 to 4.80								6.5			
	8.00	4.80 to 10.50						071	20	5.5			
	16.00	10.50 to 18.00								6.5			
	32.00	18.00 to 35.00					Bellows	236	35				
	40.00	35.00 to 47.00						227	47				
	50.00	47.00 to 60.00						222	70				

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SPARE PARTS

Table 13. *Spare Parts (Figures 15 to 19)*

KEY	DESCRIPTION	DIAPHRAGM BMP SIZE						BELLOWS BMP SIZE			
		71	162	114	114 DA	114 DR	114 MD	250	236	227	222
	Pre-expansion BMP	198742		198743	199191	199190		198753	198750	198751	198752
	Pilot BMP	195574	195606	195373			199187	196584	196580	196576	196574
1*	O-ring	400520									
2	BMP Spring case	114890	144259	115625	145658			121560			
3*	Impulse element	142549	137906	117562	144910			180923	180922	180924	180971
4	Nut	404006									
5	Spring box	124524	122798	122841	145659			129833			
6	Spring carrier	102351									
7	Adjustment knob	105184			145660	181362	181363	105184			
8*	Pre-expansion BMP O-ring	400512		400512				400512			
9	Contact stem	145116	118018	145117	145119		144943	145118			
10	Nut	404002	404003	404002	404003						
11	Screw	402008	402019	402010	402040		402043	402515			
12	Plate	108552	102113	105235							
13	Setting spring	See table 2									
14	Spring							115029			
15*	O-ring							400068			
16	Spring carrier							140769			
17	Washer				405007			405253			
18	Screw							402506			
19	Screw				402019						
20*	O-ring				400220						
21	Spacer						144945				
22	Crown						145661				
23	MD bottom						145662				
24	O-ring				400522						
25	O-ring				400506						
26	DR-DA bottom				145663						
	Vent	27A5516X012		27A5516X012			27A5516X012				
	Restriction vent		180874								

* 1st necessity parts

SPARE PARTS (continued)

Manometric Boxes

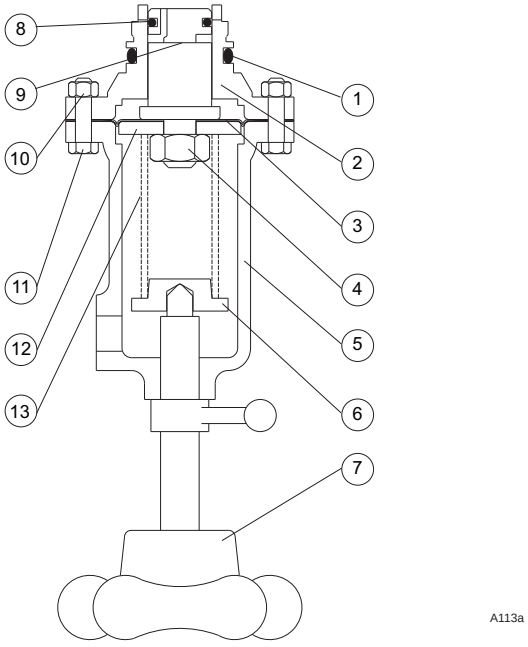


Figure 15. *BMP 071, 114, 162*

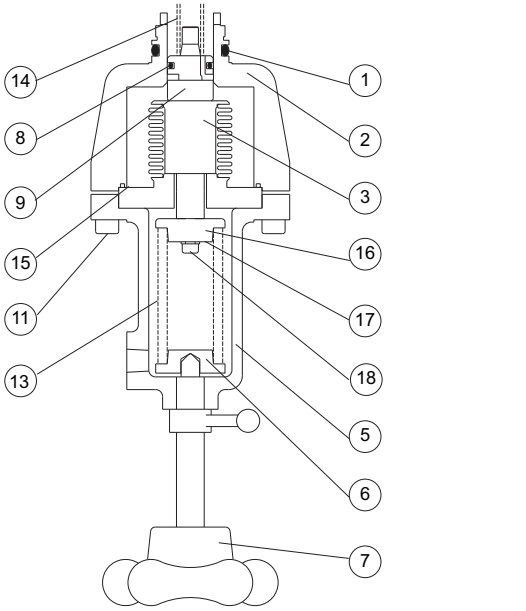


Figure 16. *BMP 236, 222, 227*

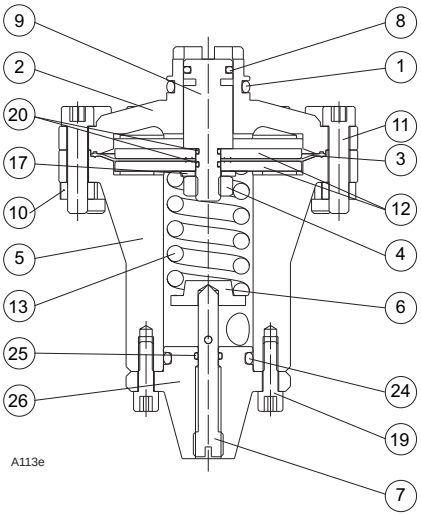


Figure 17. *BMP 114 DA*

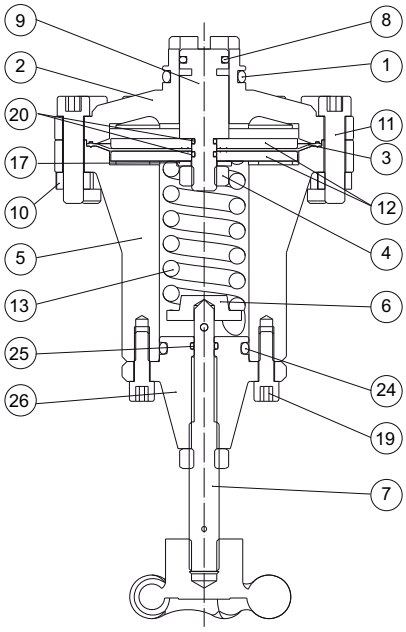


Figure 18. *BMP 114 DR*

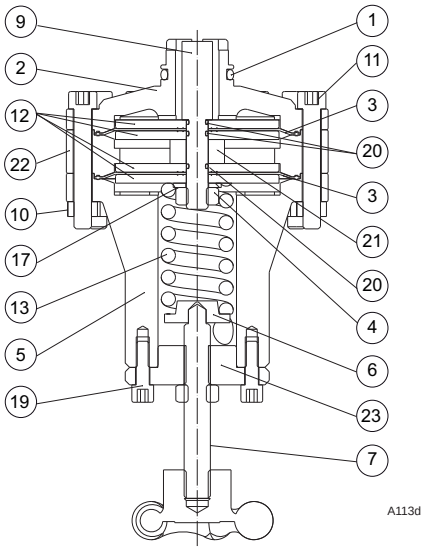
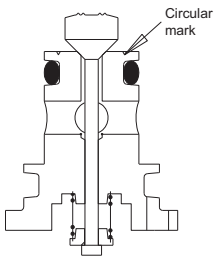
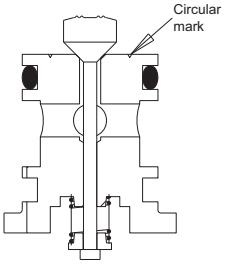
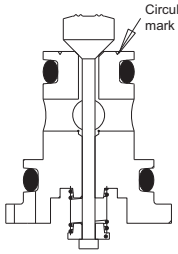
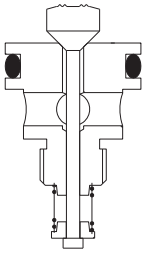
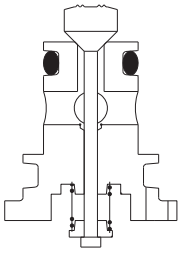
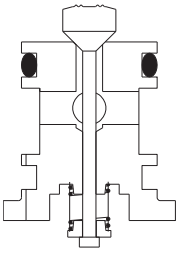
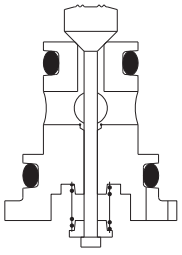
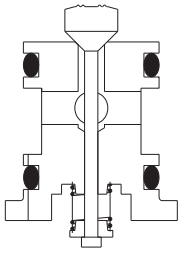
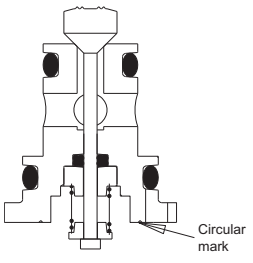
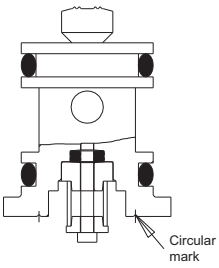


Figure 19. *BMP 114 MD*

SPARE PARTS (continued)

Table 14. *Spare Parts for Nozzles*

NOZZLE TYPE	PRE-EXPANSION RELAY		PILOT	
ϕ 3.2 (1 O-ring) Transmission Applications 25 to 80 bar				
	181250	181083		
ϕ 3.2 ADGE (2 O-rings)				
	181292			
ϕ 3.2 ADGT (1 O-ring)				
	181097			
ϕ 4 (1 pre-expansion O-ring) Distribution Applications 0 to 70 bar (2 O-rings for pilot)				
	181249	180373	181248	180372
ϕ 4 E (3 O-rings)				
			181251	180826

SPARE PARTS (continued)

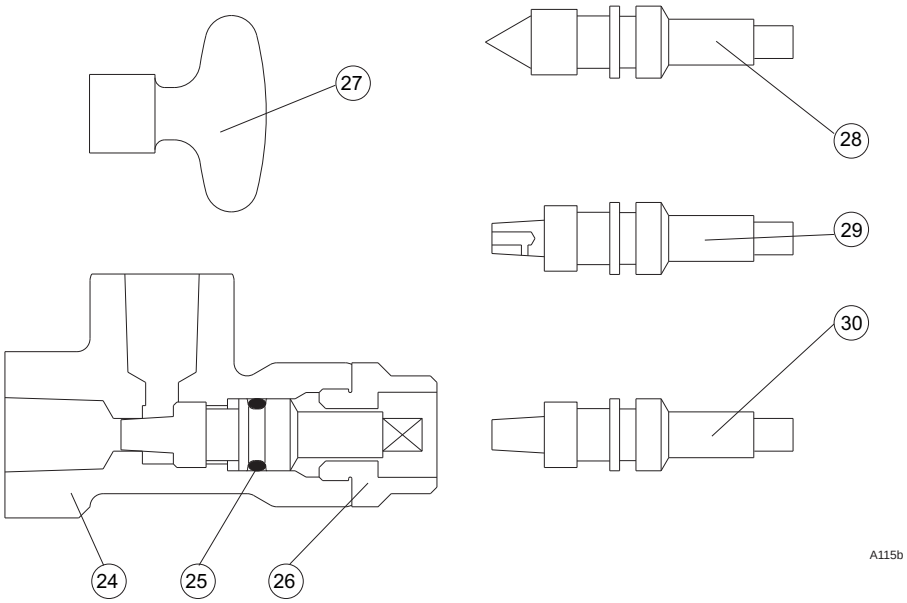


Figure 20. *Adjustment Tap*

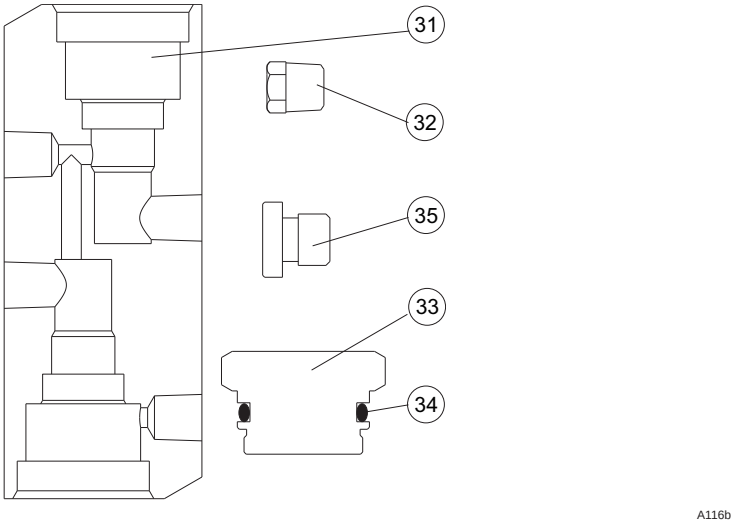


Figure 21. *Pilot Body*

Table 15. *Adjustment Tap Spare Parts*

DESCRIPTION	KEY.	CODE
Body	24	144491
O-ring	25	400506
Masking	26	119946
Square spanner	27	461508
60° cone gauge	28	121823
7° cone gauge with permanent leak	29	132161
7° cone gauge	30	144857

Table 16. *Pilot Body Spare Parts*

DESCRIPTION	KEY.	CODE
Pilot body	31	144833
1/4” NPT cap	32	135232
Pilot body cap	33	143606
Cap O-ring	34	400520
M10x150 cap	35	408308

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SPARE PARTS (continued)

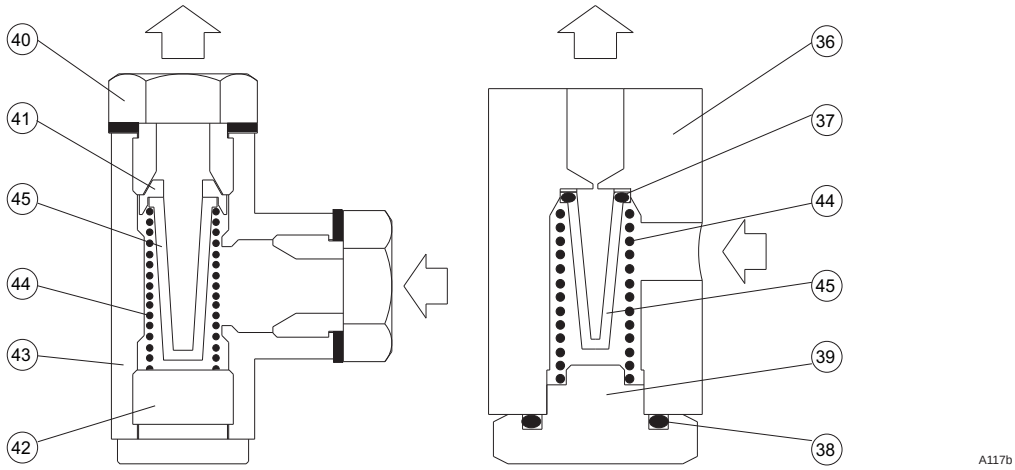

Figure 22. *Filter*

Table 17. *Filter Spare Parts*

DESCRIPTION	KEY.	CODE
SPS filter body	36	144108
Filter O-ring	37	401308
Cap O-ring	38	400517
Filter cap	39	118188
Reducer	40	408208
Filter holder	41	144885
Cap	42	408309
F tee	43	408556
Spring	44	118189
Filter	45	118926

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Table 18. *Relief Valve Codes*

SETTING RANGE (bar)	CODE
3.5 - 10.3	460063
10 - 24.3	460064
24 - 40.3	460065
20 - 70	181257

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Tableau 19. *Manometer Codes*

READING RANGE (bar)	CODE	
	Back Plug	Lower Plug
0 - 4	460376	460425
0 - 6	460381	
0 - 16	460377	460350
0 - 40	460378	460351
0 - 100	460379	

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Relief Valve Setting (factory set)

Normal or Monitor Assembly:

Spring Pd max + Pup max + 1 bar

MPNO Assembly:

Spring Pd max + Pup maxi differential (1.3 bar) + 1 bar

EZHFO, EZHSO Assembly:

Spring Pd max + Pup maxi differential (2 bar) + 1 bar

Working Monitor Assembly:

Spring Pi max + Pup maxi differential + 1 bar

CPV Assembly:

Pi max induced by the meter + Pup maxi differential + 1 bar

Manometric Ranges

Normal or Monitor Assembly:

(Spring Pd max + Pup max + 1 bar)/0.75

MPNO Assembly:

(Spring Pd max + Pup maxi differential (1.3 bar) + 1 bar)/0.75

EZHFO, EZHSO Assembly:

(Spring Pd max + Pup maxi differential (2 bar) + 1 bar)/0.75

Working Monitor Assembly:

(Spring Pi max + Pup maxi differential + 1 bar)/0.75

CPV Metering:

(Pi max induced by the meter + Pup maxi differential + 1 bar)/0.75

Note

The max Pi induced by the meter may require a manometer set at a high range, this may restrict the setting of the pre-expansion differential. However it is possible to install a precise manometer when setting by using an adapter on an available tapping of the pilot's body.

To check the different values required for settings see below:

- Spring Pd max: see table 2
- Pup max: see table 4
- Pup maxi differential: see table 5
- Spring Pi max: see table 2
- Pi max induced by the meter, contact factory

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