Pilot-Operated Regulator

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Figure 1. Type EZR Pilot-Operated Regulator

INTRODUCTION

The **Type EZR** is a pilot-operated regulator used in transmission and distribution networks or pipe lines supplying industries and commercial businesses.

The **Type EZR** can be equipped with a slam shut Type OS2 (Type EZR body change) which permits the gas flow to be cut off rapidly and totally in the case of under or over outlet regulator pressure.

Description

Main Valve

The Type EZR consists of:

A version without integral slam shut:

- A body («E body» type), a bonnet
- A regulation subassembly consisting of a slotted cage and a diaphragm/plug
- A travel indicator, an inlet screen
- A pilot assembly consisting of a filter, an adjustable restrictor and a pilot

A version with integral slam shut:

- A body («X body» type), a bonnet, a connecting part
- A regulation subassembly consisting of a slotted cage and a diaphragm/plug
- A travel indicator
- A pilot assembly consisting of a filter, an adjustable restrictor and a pilot
- A slam shut orifice
- A integral O-ring tightshut valve/bypass assembly
- A release relay Type OS2 according to D103683X012_OS2_IM:
 - a mechanism box (BM)
 - a safety manometric box (BMS) to be connected outlet side of the regulator

The **Type EZR** is in conformity with the PED 2014/68/EU and is classified in Category IV.



FISHER

Pilot

Type PRX/120:

Outlet pressure range of 1 to 40 bar. The Type PRX/120 can be used as the pilot on single stage pressure reducing regulators or as the monitor pilot or as the working pilot in wide-open monitor systems.

Type PRX/120-AP:

Outlet pressure range of 30 to 80 bar. The Type PRX/120-AP can be used as the pilot on single stage pressure reducing regulators or as the monitor pilot or as the working pilot in wide-open monitor systems.

Type PRX/125:

Identical to the Type PRX/120 except the restriction screw is removed. The Type PRX/125 can only be used as the monitor override pilot on working monitor applications.

• Type PRX/125-AP:

Identical to the Type PRX/120-AP except the restriction screw is removed. The Type PRX/125-AP can only be used as the monitor override pilot on working monitor applications.

Type 161EB

High accuracy pilot with an outlet pressure range of 0.34 to 24.1 bar. Pilot bleeds (exhausts) downstream through the sense (control) line.

Type 161EBM

The monitor version of the Type 161EB pilot. The pilot bleed (exhaust) is isolated from the sense (control) line. This pilot is used in monitoring systems requiring an isolated pilot bleed (exhaust).

• Type 161EBH

The high pressure version of the Type 161EB pilot with an outlet pressure range from 17.2 to 48.3 bar.

• Type 161EBHM

The high pressure version of the Type 161EBM pilot with an outlet pressure range from 17.2 to 48.3 bar.

Regulator Options

- **Travel Indicator**
- Relief Size-reduction Trim

CHARACTERISTICS

Table 1. General Characteristics for	r Type EZR Regulator
--------------------------------------	----------------------

Operating pressure		PS	72.4 bar ⁽¹⁾	SLAM	SHUT				
Operating temperature		TS	-17 / 66°C ⁽¹⁾	Accuracy			2.5		
REGULATOR						AG	5 (Piston)		
Outlet pressure		Pa	0.35 to 69 bar	r Set point range Pt up to 1			up to 100 bar		
Minimum differential		∆P min	2 to 3 bar						
	PN 20		18.6 bar		Groups 1 and 2 according to PED 97/23/EC 1st and 2 rd family gas according				
Maximum operating differential	PN 50	∆P max	50.0 bar	Eluid					
	PN 100		55.2 bar	bar Fiuld to EN 437 or other gases (compressed air, hitrogen)		acessan() and (and dry		
Max emergency differential ΔP e		∆P emerg	72.4 bar	1	noncorrosive, clear (initiation of fine side necessary) and dry.				
Accuracy		AC	2.5 - 5						
1. Values correspond to the characteristics of the regulator diaphragm.									

Body	P _{max} (bar)	T _{min} (°C)	T _{max} (°C)				
A216WCB	96.7	-20	71				
A352LCC 100 -30 71							
The regulator body and the slam shut have been designed to support different pressure and temperature levels							

2

B050

Table 3. How Coemclents and Valve Hug Haver Information								
Coefficients	Capacity	DN 25	DN 50	DN 80	DN 100	DN 150		
	100%	480	1800	3400	5550	11200		
C _g	60%	290	1020	1970	3300	7150		
	30%	140	560	970	1690	3570		
	100%	33	36	37	38	36		
C ₁	60%	29	28	29	27	30		
	30%	30	29	26	26	26		
Valve plug travel (mm	Valve plug travel (mm) 35 35 50 50 50							
805a								

Table 3. Flow Coefficients and Valve Plug Travel Information

Table 4. Pilot Pressure Ranges

Tura	Outlet Pressure Denge has	Pilot Control Spring Information			
туре	Outlet Pressure Range, bar	Spring Color	Part Number		
PRX/120	1.0 to 1.8 1.8 to 3.0 3.0 to 5.5 5.5 to 8.5	Yellow Green Blue Black	M0255240X12 M0255230X12 M0255180X12 M0255220X12		
PRX/125	8.5 to 14.5 Silver 14.5 to 23.0 Gold 23.0 to 30.0 Aluminium 30.0 to 40.0 Red		M0255210X12 M0255200X12 M0255860X12 M0255190X12		
PRX/120-AP PRX/125-AP	30.0 to 80.0	Clear	M0273790X12		
161EB 161EBM	0.35 to 1.0 0.69 to 2.8 2.1 to 5.2 4.8 to 9.7 9.0 to 13.8 13.8 to 24.1	White Yellow Black Green Blue Red	17B1260X012 17B1262X012 17B1259X012 17B1261X012 17B1263X012 17B1264X012		
161EBH 161EBHM	17.2 to 31.0 27.6 to 48.2	Blue Red	17B1263X012 17B1264X012		

Material

Regulator Body

Body Bonnet Slotted disc Diaphragm, O-rings Slam shut Connecting part Orifice Valve plug Pilot Body Manometric box Restrictor Filter Cartridge Steel Steel Stainless steel Nitrile (NBR)

Steel Stainless steel Stainless steel

Stainless steel or Steel Stainless steel or Aluminium Stainless steel Aluminium or Steel Polythene

Connections

Inlet / Outlet:	CL150 RF - CL300 RF - CL600 RF
	PN 16B - PN 25B - PN 40B
	Other configurations
	available (contact factory)
Pilot Impulse line (IP):	1/4" NPT tapped
Pilot Monitor impulse line (IM):	1/4" NPT tapped
Intermediate impulse line (PI)	:1/4" NPT tapped
Slam shut impulse line (IS):	1/4" NPT tapped
Mechanism box vent (E):	1/4" NPT tapped
Impulse diameter:	Pipe interior Ø 8/10 mm min.

RF - CL300 RF - CL600 RF - PN 25B - PN 40B onfigurations (contact factory) T tapped T tapped T tapped T tapped T tapped

LABELLING



Figure 2. Type EZR Regulator Label



Figure 3. Type EZR Regulator with Type OS2 Slam Shut Label



INLET PRESSURE
MODULATED PRESSURE
OUTLET PRESSURE

Figure 4. Type EZR Operational Schematic

OPERATION

Regulator

The Type EZR is a pilot-driven, diaphragm/plug regulator.

Tight shutoff is achieved by the diaphragm/plug pushing against the slotted cage, the force of the closing spring and the inlet pressure.

Opening

As the flow increases, the outlet pressure P_d decreases on the outlet side of the regulator and on the pilot diaphragm.

Due to the force of the spring, the pilot opens.

The pilot flow increases, the pressure loss through the pilot restrictor increases.

The modulated pressure P_m decreases.

The force of the closing spring and that of the P_m becomes inferior to that provoked by the P_u , the regulator OPENS.

Closing

As the flow decreases, the P_{d} increases outlet side of the regulator.

The force of the pilot diaphragm is overcome by the force of the spring, the pilot closes.

The pressure loss through the pilot restrictor decreases. The force of the closing spring and that of the P_m becomes superior to that provoked by the P_u , the regulator CLOSES.

Slam Shut

The pressure of the zone to be protected (generally the pipeline on the outlet side of the regulator and after the slam shut) is sensed by the safety manometric box (BMS).

If the pressure exceeds the set tripping pressure, the release relay frees the valve plug.

Due to the force of the closing spring and the fluid (trying to close), the valve plug closes on the orifice.

The gas flow is obstructed until the fault has been corrected and the mechanism box manually rearmed.

To reopen the valve plug an equal pressure balance on inlet and outlet sides of the regulator is required.

The mechanism box is rearmed after opening the internal bypass.

Rearming and balancing are achieved at the same time.

DIMENSIONS AND WEIGHTS

Table 5. Dimensions (mm) - Type EZR-OS2 (part 1)

Bedy			E	E	
DN	В	С	Type 161EB Pilot	Type PRX Pilot	Н
25	233	315	348	252	250
50	243	330	357	261	265
80	361	366	410	314	301
100	393	410	454	358	345
150	423	396	468	372	332
					B15b

Table 7. Dimensions (mm) - Type EZR (part 1)

		())	1 (1	,
			E	
Body DN	В	С	Type 161EB Pilot	Type PRX Pilot
25	220	62	335	239
50	226	83	340	245
80	343	105	392	297
100	372	137	433	336
150	420	178	465	368
				B15a

B

 Table 9. Dimensions (mm) - Types EZR and EZR-OS2 (part 2)

	A								
Body DN		PN		CLASS			D	J	м
	16	25	40	150	300	600			
25	193.5	193.5	193.5	184	197	210	165	68	54
50	254	267	267	254	267	286	165	68	54
80	310	317	317	298	317	337	181	95	54
100	350	368	368	352	368	394	187	95	54
150	451	473	473	451	473	508	249	95	54
									B17a

F Disassembly 25



B14a

Figure 5. Dimensions (mm) - Type EZR-OS2

Table 6. Weights (kg) - Type EZR-OS2

Body DN	CL150 RF	CL300 RF	CL600 RF
25	20	21	22
50	39	41	43
80	63	69	71
100	104	113	123
150	192	211	244

Table 8. Weights (kg) - Type EZR

Body DN	CL150 RF	CL300 RF	CL600 RF
25	12	14	16
50	26	27	31
80	50	51	57
100	67	73	88
150	97	108	161
		•	B16a

Table 10. Dimensions (mm) - BMS (Safety Manometric Box)

Туре	F	G
Diaphragm	162	181
Piston	71	204
Bellows	74	223
		B17

F

B14b



Figure 6. Dimensions (mm) - Type EZR

INSTALLATION



Figure 7. Type EZR Installation Configurations

All interventions on the equipment should only be performed by qualified and trained personnel.

\Lambda WARNING

Personal injury or equipment damage, due to bursting of pressure-containing parts may result if this regulator is over-pressured or is installed where service conditions could exceed the limits given in the Specification section and on the appropriate nameplate, or where conditions exceed any rating of the adjacent piping or piping connections.

To avoid such injury or damage, provide pressure-relieving or pressure-limiting devices to prevent service conditions from exceeding those limits. Also, be sure the installation is in compliance with all applicable codes and regulations.

Additionally, physical damage to the regulator could 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.

Λ WARNING

Only personnel qualified through training and experience should install, operate and maintain a regulator. Before installation, make sure that there is no damage to, or debris in, the regulator. Also make sure that all tubing and piping are clean and unobstructed.

- The regulator is installed on horizontal pipeline. Version with slam shut, the release relay is situated towards the bottom (see schematic).
- Installation according to EN12186 recommended.
- Install according to direction of fluid flow (arrow).
- When assembling with adjacent elements care must be taken not to create pressure force on the body and the assembling elements (bolts, O-rings, flanges) should be compatible with the geometry and working conditions of the equipment.



Figure 8. Type EZR-OS2 Regulator

WARNING

INLET PRESSURE (Pu)

OPTIONAL

OUTLET PRESSURE (Pd)

- · If the case arises a support must be used to avoid pressure force on the body (a support can be installed under the flanges).
- · Version with integral slam shut, connect the safety manometric box (IS) to the impulse at 4D on a straight run of the outlet pipe.
- · It is recommended to separate the slam shut impulse line (IS) from that of the pilot (IP). Do not connect the impulses on the lower generator line.
- · It is recommended to install an isolation valve and an atmospheric valve, which can be useful for slam shut tripping and verifications.
- · No modification should be made to the structure of the equipment (drilling, grinding, soldering...).
- · It is recommended to install a servicing valve on the outlet pipeline to facilitate adjustments and bleeding off to the atmosphere.
- Verify that the inlet side is protected by an appropriate device(s) to avoid exceeding the limits of utilization (PS, TS).

WARNING Λ

- · Verify that the limits of utilization correspond to the appropriate operating conditions.
- · Version with integral slam shut, verify that the safety manometric box (BMS) and spring correspond to the appropriate operating conditions on the outlet side of the regulator.
- · The equipment should not receive any type of shock, especially the release relay.
- · The user should verify or carry out a protection adapted to the environment.
- · Fire, seismic and lightening are not taken into consideration in standard regulators. If required, a special product selection and/ or specific calculations may be supplied according to specific requirements.
- · Version without integral slam shut, verify that a pressure limiting device on the outlet side of the regulator guarantees a pressure limit inferior or equal to the pilot PS.

COMMISSIONING

Operations concerning the integral slam shut version are in italic.

All interventions on equipment should only be performed by qualified personnel

Preliminary Verifications

Start-up positions

- Inlet and outlet valves → Closed Verify the absence of pressure between inlet and outlet valves
- Slam shut valve plug \rightarrow Closed
- Pilot A → Unloaded
- Restriction **B** → START position

Slam shut set point verification

Using the atmospheric valve, inject a pressure equal to the pressure required for the regulator

- 1st release relay stage → Set (Stage 1)
- Slam shut valve plug \rightarrow Open (Stages 2 and 3)
 - → Progressively increase the pressure to reach tripping
 - → Adjust setting if necessary (D103683X012_OS2_IM) Note the set point value on the equipment or mark it on a commissioning document

Positions before commissioning

- Impulse line isolating valve → Open
- Impulse line atmospheric valve \rightarrow Closed
- Slam shut valve plug → Closed
- Servicing valve → Closed

The equipment is ready for commissioning





Stage 1

Figure 9. Setpoint Verification Phase

Commissioning (Act slowly)

- Inlet valve → Open very slowly
- 1st release relay stage \rightarrow Set (Stage 1)
- Slam shut valve plug \rightarrow Bypass (Stage 2)
- → Open (Stage 3)
- Servicing valve

•

- → Open slightly Pilot → Screw to set outlet pressure
- Outlet valve
- → Open slowly
- Restriction
 - → Set to "RUN" by successive fractions 2, 4 or 6
- Servicing valve → Closed

The equipment is commissioned

It is recommended to seal the release relay

MAINTENANCE

Operations concerning the integral slam shut version are in italic.

Servicing Check

Recommended frequency:

· Twice yearly minimum

Verification:

- · Set point verification
- Regulator valve plug tightness
- Tripping and set point value
- Slam shut valve tightness

Departure positions

- Inlet valve → Open
- Outlet valve → Open
- Slam shut valve plug → Open
- Regulator \rightarrow In operation

Inlet and outlet sides of regulator under pressure

Tightshut verification (and tripping verification for integral slam shut versions)

- Inlet valve
- → Closed
- Outlet valve → Closed
- Regulator
- Observe the evolution of the outlet
- pressure (control regulator tightness)

If the outlet pressure increases Internal leak	Control the regulator valve plug	
	Control the regulator orifice Control the pilot	or contact after-sales
If the outlet pressure decreases	External leak Locate and seal the leak	or contact after-sales
If the outlet pressure is constant	The regulator is tightshut Increase the set point until tripping occurs (without exceeding the outlet limits)	
If the slam shut valve plug will not close	Operating fault Control the release relay Control the slam shut valve plug	or contact after-sales
<i>If the slam shut valve plug closes</i> Observe the evolution of the outlet pressure (control tightness)	Operating correctly	
If the outlet pressure is constant Observe the evolution of the outlet pressure (control tightness)	Purge the outlet side of the regulator	
If the outlet pressure increases	<i>Internal leak</i> Control the slam shut valve plug Control the slam shut orifice Control the bypass	or contact after-sales
If the outlet pressure is constant	Slam shut valve plug is tightshut	

Table 11. Troubleshooting for Types EZR and EZR-OS2 Regulators

Filter verification

- Purge the filter C
- · Verify the filter element



Figure 9. Type EZR-OS2

Table 12.	Torque	Specifications
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Dedu	Corrow	Champer	Corrow	Torque N.m.			
DN / In.	keys 1 and 11 in.		keys 1 and 11	Fixation keys 18	Connector key 19	Bypass key 15	
25 / 1	9/16 - 12 x 1 3/4	13/16	110	8	130	14	
50 / 2	1/2 - 13 x 1 1/2	3/4	110	9	130	14	
80 / 3	5/8 - 11 x 1 3/4	15/16	175	28	280	20	
100 / 4	3/4 - 10 x 2 1/4	1 1/8	260	28	280	24	
150 / 6	1 - 8 x 2 3/4	1 1/2	510	70	410	24	
		B25				B25	

or
5

SYMPTOMS	CAUSE	ACTIONS
If outlet pressure is increases	Internal leak	Control the regulator valve plug Control the regulator seat Control the pilot or contact after-sales
If inlet pressure decreases	External leak	Locate and repair leak or contact after-sales
If inlet pressure is stable	The regulator is tightshut	Increase the set point until tripping occurs (without exceeding the outlet limits)
If the slam shut valve plug will not close	Operation faulty	Control the release relay Control the slam shut valve plug or contact after-sales
If the slam shut valve plug closes	Operation correct	
	Observe the evolution of the outlet pressure	(control tightness)
If the outlet pressure is stable	The valve plug is tightshut	Purge the outlet side of the regulator
	Observe the evolution of the outlet pressure	(control tightness)
If the outlet pressure increases	Internal leak	Control the slam shut valve plug Control the slam shut seat Control the bypass or contact after-sales
If the outlet pressure is stable	Valve plug is tightshut	

Disassembly

Recommended frequency:

Every 2 to 6 years (or less depending on operating conditions)

<u>Verification</u>: Condition of O-rings, diaphragms, lubrication

Replacement: O-rings, diaphragm

Tools:

Dimensions according to tables below

Preliminary Operations

- Valve plug closed
- Inlet and outlet valves closed
- Bleed off outlet pressure
- Bleed off inlet pressure
- Unscrew the pilot impulse connection
- Unscrew the screws (key 1) fixing the bonnet (key 2)
- Remove the bonnet (key 2)
- · Remove the diaphragm/plug assembly (key 3)
- Remove the slotted cage (key 4), the O-ring (key 5), the strainer (key 6) (or the space washer (key 6))
- Clean parts and replace them if necessary

Pilot

- Unscrew the manometric box screws
- · Remove the diaphragm

Slam Shut (Version with slam shut)

- · Unscrew the BMS impulse line connector (IS)
- Remove the BM cover (key 7)
- Unscrew the BM fixing screw (key 8)
- Remove the holding pin (key 10)
- Remove the BM (key 9)
- Unscrew the screws (key 11) from the connecting part (key 12)
- Remove the connecting part (key 12)
- Remove the spring (key 13) and the valve plug (key 14)
- Unscrew the bypass (key 15)
- Unscrew the screws CHC (key 16) (DN 100 and 150)

Removing the orifice (key 17) (not recommended) requires a special extraction tool

Reassembly

- Perform the above operations in reverse order (respect tightening torques)
- Replace the O-rings and diaphragm at each disassembly

Slam Shut Reassembly (Version with slam shut)

- The valve plug should be held in an upper position using a packing gland and a box to facilitate reassembly
- Precaution must be taken concerning the passage of the valve plug over the segments
- · Lubricate screws before tightening
- Lightly lubricate the O-rings (silicone grease) except for the valve plug O-ring
- Lightly lubricate the stem (silicone grease)
- Lubricate the release relay mechanism (yoke and bolt) (molybdenum graphite grease)
- Lubricate the BMS spring (molybdenum graphite grease)
- · A special tool is required for reassembling a new orifice

SPARE PARTS







Figure 10. Types 161EB, 161EBH, 161EBM and 161EBHM Pilots

Figure 11. Type 252 Filter

Figure 12. Type 112 Adjustable Restrictor

B06

Table 11	161EB S	Carias Pilot	Type 1	12 Restrictor and	Tune 252	Filter Snare	Parts List
Table 14.	IDIED S	series Pilol,	турет	12 Restrictor and	Type 252	riller Spare	Parts List

		Reference							
Description	Key	Pilot Type							
		161EB	161EBH	161EBM	161EBHM				
Pilot kit 0.34 to 13.8 bar	15	R161X000012		R161MX00012					
Pilot kit 13.8 to 24.1 bar	15	R161X000022	R161MX00022						
Pilot kit EBH(M)	16		R161HX00012		R161HMX0012				
O-ring	17		1C8538X0052						
Filter cartridge	18		17B6813X012						
O-ring	19		1F269206992						
SAV kit 0.34 to 13.8 bar ⁽¹⁾		197435		197438					
SAV kit 13.8 to 24.1 bar ⁽¹⁾		197436		197439					
SAV kit 24.1 to 48.3 bar ⁽¹⁾			197437		197440				
1. The SAV kits include item numbers 15 or 16, 17,	1. The SAV kits include item numbers 15 or 16, 17, 18 and 19.								



Figure 13. Types EZR and EZR-OS2 Spare Parts

Table 15.	Types EZR and	EZR-OS2 Spare	Parts List
	.,,		

Des later	Description		Reference				
Regulator,		Key	DN / In.				
Regulator, Type EZR with slam shut without slam shut			25 / 1	50 / 2	80 / 3	100 / 4	150 / 6
	O-ring	1	400009	400024	400091	400045	400262
	O-ring	2	19B2838X012	18B2124X012	18B8514X012	18B2140X012	19B0359X012
	Guide	3	401950	401951	401952	401953	401954
with slam shut	O-ring	4	400527	400263	400258	400260	400261
	Bypass	5	180977	180977	180977	180977	180977
	SAV kit PN 20	1 to 14	197421	197422	197424	197425	197427
	SAV kit PN 50/100	1 to 14	197421	197423	197424	197426	197427
without slam shut	SAV kit PN 20	6 to 14	197428	197429	197431	197432	197434
	SAV kit PN 50/100	6 to 14	197428	197430	197431	197433	197434
	O-ring	6	18B3438X012	18B3438X012	10A8931X012	10A8931X012	10A3800X012
	O-ring	7	1H2926X0032	1H2926X0032	1D191706992	1D191706992	1D191706992
	O-ring	8	13A1584X052	13A1584X052	10A3803X062	10A3803X062	T12050X0012
	O-ring	9	19B2838X012	18B2124X012	18B8514X012	18B2140X012	19B0359X012
with/without	PN 20 diaphragm	10	39B2397X012	29B2715X022	39B2726X012	38B5965X012	49B0357X012
slam shut	PN 50/100 diaphragm	10	39B2397X012	28B2123X052	39B2726X012	39B3996X012	49B0357X012
	O-ring	11	13A1584X052	13A1584X052	10A3803X062	10A3803X062	T12050X0012
	O-ring	12	1E216306992	1E216306992	1J4888X0052	1J4888X0052	11A8741X052
	O-ring	13	14A5713X012	10B4428X012	10B4366X012	10B4373X012	1H862306992
	O-ring	14					1D269206992
	Safety manometric box		See D103683X012_OS2_IM manual				



Figure 14. Type PRX Series Pilots



Figure 15. Type FU Filter

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