

Cronos Series Pilot-Operated Pressure Regulator

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INTRODUCTION

Scope of the Manual

This manual provides instructions for installation, startup, maintenance and spare parts ordering for the Cronos Series pilot operated regulators. It also contains information for the controller, pilots, booster valves and filter.

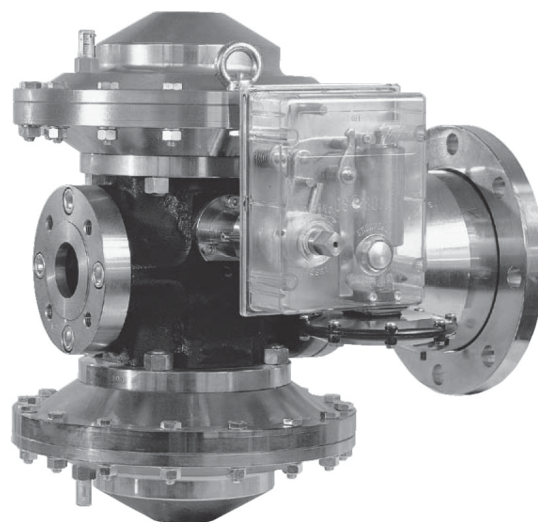


Figure 1. Type Cronos CCB Regulator + Monitor + Slam-shut

Product Description

The Cronos Series pilot operated regulators are “top entry” type with a single seat and counterbalanced shutter. The following versions are available:

- CCB:** Regulator – Monitor – Slam-shut Device
- CBB:** Regulator - Slam-shut Device - Slam-shut Device
- CB:** Regulator – Slam-shut Device
- CC:** Monitor
- C:** Regulator

Type SR and/or SRS silencers are also available.

All standard gas pressure devices (regulators & safety shut-off devices) used in assemblies will comply to EN 12186 and EN 12279 standards.

Any accessories (e.g. pilots or filters) used on the Emerson range of pressure regulators, with or without built-in safety shut-off devices, must be manufactured by one of the Emerson companies and bear that label.

If this is not respected, Emerson will not be responsible in the case of any inefficiency.

In a configuration with integrated safety shut-off device and pilot, when the maximum allowable pressures are different, the slam-shut device is the differential strength type.

Type CRONOS

PED CATEGORIES AND FLUID GROUP

The CRONOS C and CC Series without built-in safety slam-shut devices may be used as a stand-alone safety accessory in a fail-to-close configuration to protect pressure equipment under the Pressure Equipment Directive PED 2014/68/EU categories.

The technical features of the downstream equipment, protected by this regulator, should be classified under a higher category according to the Pressure Equipment Directive PED 2014/68/EU, see Table 1. According to EN 14382, only in an integral strength and Class A type configuration (in both over and under pressure protection configurations), can the possible built-in safety slam-shut device (CB and CCB) be classified as a safety accessory according to PED.

The minimum PS between slam-shut device and pilot shall be the PS of the safety accessory, complying to EN 14382 for integral strength types. The technical features of the downstream equipment, protected by possible built-in safety slam-shut device (in integral strength and Class A type configurations) shall be classified according to the Pressure Equipment Directive PED 2014/68/EU, see Table 1.

Table 1. PED Category for Cronos Series Regulators

PRODUCT SIZE	CATEGORY	FLUID GROUP
DN 25-50-80	IV	1

The built-in pressure accessories (e.g. Types OS/80X, OS/80X-PN, PRX/, PS/, and V/31-2 Series pilots or filters Type SA/2, FU/ and FD-GPL/) conform to Pressure Equipment Directive PED 2014/68/EU Article 4 Section 3 were designed and manufactured in accordance to the Sound Engineering Practice (SEP).

According to Article 4 Section 3, these "SEP" products must not bear the CE marking.

CHARACTERISTICS

Body Sizes and End Connection Styles

C • CC • CB • CCB

DN 25 - 50 - 80
PN 16-25-40 UNI/ DIN
ANSI 150-300-600 flanged

CBB

DN 50
PN 16-25-40 UNI/DIN
ANSI 150-300-600 flanged

C • CC • CB • CCB with Type SRS silencer or widened outlet

DN 25 x 100 - 50 x 150 - 80 x 250
PN 16-25-40 UNI/ DIN
ANSI 150-300-600 flanged

CBB with SRS or Widened outlet

DN 50 x 150
PN 16-25-40 UNI/DIN
ANSI 150-300-600 flanged

Maximum Operating Inlet Pressure⁽¹⁾⁽²⁾

PN 16: 16 bar
PN 25: 25 bar
PN 40: 40 bar
ANSI 150: 20 bar
ANSI 300: 50 bar
ANSI 600: 100 bar

WARNING

Outlet Set Pressure Ranges (Regulator)

PN 16 - ANSI 150: 0.01 to 16 bar
PN 25-40 - ANSI 300-600: 0.5 to 80 bar

Overpressure Set Range (built-in Slam-shut)

0.03 to 80 bar

Underpressure Set Range (built-in Slam-shut)

0.01 to 70 bar

Minimum/Maximum Allowable Temperature (TS)⁽¹⁾

See Nameplate

Functional Features

Accuracy Class AC: Up to ± 1%
Lockup Pressure Class SG: Up to + 5%
Class of Lockup Pressure Zone SZ: Up to 5%

Slam-shut Device

Accuracy Class AG: ± 1%
Response Time t_a : ≤ 1 second

Temperature

Standard Version: Working -10° to 60°C
Low Temperature Version: Working -20° to 60°C

Materials

Body, flanges and covers: Steel
Regulator and slam-shut shutter: Steel
Seat: Stainless steel
Diaphragms: Fabric Nitrile (NBR)+PVC/
Nitrile (NBR) rubber
Nitrile (NBR) rubber

LABELLING

TARTARINI		CE	Notified body XXXX	APPARECCHIO TIPO / DEVICE TYPE
				Note 1
MATRICOLA / ANNO SERIAL Nr. / YEAR	/ Note 2		DN1	
REAZIONE FAIL SAFE MODE	FAIL OPEN <input type="checkbox"/>	FAIL CLOSE <input type="checkbox"/>	DN2	
NORME ARMONIZ. HARMONIZED STD.	EN		Wds	bar
CLASSE DI PERDITA LEAKAGE CLASS		TIPO TYPE	Wdso	bar
CLASSE FUNZIONALE FUNCTIONAL CLASS		Cg	Wdsu	bar
FLUIDO GRUPPO FLUID GROUP	1	pmax	bar	DN seat
TS	Note 3	°C	PS	Note 4
			bar	PSD
				Bar
				PT=
				1.5
				x PS bar

Note 1: See "Characteristics"

Note 2: Year of Manufacture

Note 3: Class 1: -10° to 60°C
Class 2: -20° to 60°C

Note 4: PN 16 PS: 16 bar
PN 25 PS: 25 bar
PN 40 PS: 40 bar
ANSI 150 PS: 19.3 bar
ANSI 300 PS: 50 bar
ANSI 600 PS: 100 bar

1. The pressure/temperature limits indicated in this instruction manual or any applicable standard or code limitation should not be exceeded.
2. At average ambient temperature.

OVERPRESSURE PROTECTION

The recommended safety pressure limitations are stamped on the regulator nameplate. If actual version hasn't a built-in safety shut-off device, some type of overpressure protection is needed if the actual inlet pressure exceeds PS (see nameplate).

Downstream side pressure after safety shut-off device's intervention (in the built-in safety shut-off device configurations) shall stay within the actual maximum operating set-up range to avoid anomalous back pressures that can damage the safety shut-off device's pilot. Equipment's operation below the maximum pressure limitations does not preclude the possibility of damage from external sources or debris in the line.

Downstream overpressure protection shall be also provided if the safety shut-off device outlet pressure can be greater than the PS of the safety shut-off device pilot (differential strength type). The regulators and possible built-in safety shut-off device should be inspected for damage after any overpressure condition and intervention.

TRANSPORT AND HANDLING

Established transport and handling procedures shall be followed to avoid any damage on the pressure containing parts by shocks or anomalous stresses. Ringbolts are designed just for handling of equipment weight. Built-up sensing lines and pressure accessories (e.g. pilots) shall to be protected by shocks or anomalous stresses.

DESCRIPTION

The CRONOS Series regulators are used in reduction, distribution and conveying stations using suitably filtered natural gas. This product has been designed to be used with fuel gases of 1st and 2nd family according to EN 437, and with other non-aggressive and non fuel gases. For any other gases, other than natural gas, please contact your local sales agent.

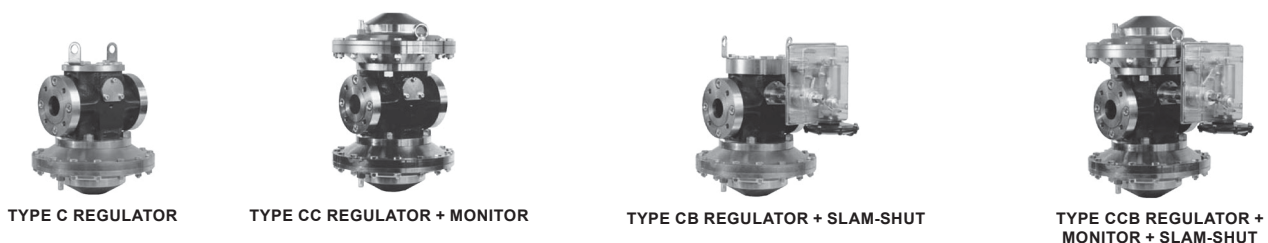


Figure 2. Type Cronos Series Configurations

Table 3. Cronos Series Configurations

CONFIGURATIONS	ID-ABBREVIATIONS		
	Standard	Silencer Type SR	Silencer Type SRS
Regulator	C	C-SR	C-SRS
Regulator + Slam-shut	CB	CB-SR	CB-SRS
Regulator + Monitor	CC	CC-SR	CC-SRS
Regulator + Monitor + Slam-shut	CCB	CCB-SR	CCB-SRS
Regulator + Slam-shut + Slam-shut	CBB	CBB-SR	CBB-SRS

N.B.: Type SRS silencer solutions have a widened output flanged. Also available: version with widened output, but without a built-in silencer.

ATEX REQUIREMENTS

Application of ATEX Product Directive:

Table 2. Overview

TYPE	CLASSIFICATION	ATEX ASSEMBLIES	ATEX LABELLING
Regulator/SSD	Non-electrical equipment	Not falling under the 2014/34/EU Directive	No
Regulator/SSD + electrical device	Non-electric equipment equipped with an electrical device falling under the scope of the ATEX Directive 2014/34/EU	Constitutes an assembly according to the 2014/34/EU Directive	CE II 2 G T



WARNING

Carefully follow below instructions for the usage of "ATEX Assembly" in an explosive atmosphere.

A non-electrical equipment incorporating an electrical device (proximity, microswitch...) is an "ATEX Assembly", and in the scope of the ATEX Directive 2014/34/EU.

Type CRONOS

When such equipment(s) is used in a natural gas pressure control and/or measuring station in compliance with the following European standards: EN12186, EN12279 and EN 1776, can be installed in any type of classified zones according to the Directive 1999/92/EC dated 16 December 1999, in the following conditions:

- the equipment(s) / electrical circuit is connected to a suitable and certified intrinsically safe apparatus (suitable zener barrier)
- the equipment(s) / electrical circuit is used according to this instruction manual issued by the manufacturer and / or available on our website

ATEX Labelling

The nameplate will be installed on the ATEX assembly.



Where:

- Manufacturer:** Name and address and/or logo of the manufacturer
- CE:** Conformity marking to European Directive
- Type:** Description of the ATEX Assembly
- Serial Number and Year of Construction
- Ex:** Specific marking of explosion protection
- II:** Equipment group
- 2:** Equipment Category/level of protection 2 = suitable for zone 1
- G:** For gases, vapour or mists
- T:** Temperature Class (i.e.: T6 > 85 ... ≤ 100 °C)
- Intended Use:** Natural Gas infrastructures

PILOTS

The Cronos Series regulators are equipped with the PS/ or PRX/ Series pilots and with OS/80X or OS/80X-PN Series slam shut device.

Table 4. Pilot Types PS/ and PRX/ Characteristics

Regulator or Monitor	APPLICATION		ALLOWABLE PRESSURE PS, bar	SET RANGE W _d , bar	BODY AND COVERS MATERIAL
	Regulator	Monitor			
PS/79-1	-	-	20	0.01 - 0.5	Aluminium
PS/79-2	-	-		0.5 - 3	
PS/79	PSO/79	REO/79	100	0.5 - 40	Steel
PS/80	PSO/80	REO/80		1.5 - 40	
PRX/120	PRX/120	PRX/125		1 - 40	
PRX-AP/120	PRX-AP/120	PRX-AP/125		30 - 80	

N.B.: All PS Series pilots are supplied with a filter (5 μ filtering degree) and built-in pressure stabilizer, with the exception of Types PSO/79 and PSO/80. The Type SA/2 stabilizer filter must be used with PRX Series pilots. All pilots are supplied with 1/4" NPT female threaded connections.

Table 5. Stabilizer Filter Type SA/2 Characteristics

MODEL	ALLOWABLE PRESSURE PS, bar	SUPPLIED PRESSURE	BODY AND COVERS MATERIAL
SA/2	100	3 bar + Downstream pressure	Steel

N.B.: The Type SA/2 stabilizer filter is supplied with a filter (5 μ filtering degree) and is suitable for heating. Supplied with 1/4" NPT female threaded connections.

Table 6. Booster Valve Type V/31-2, PRX/131 and PRX-AP/131 Characteristics

MODEL	ALLOWABLE PRESSURE PS, bar	SET RANGE W _d , bar	BODY AND COVERS MATERIAL
V/31-2	19	0.025 - 0.55	Aluminium
PRX/131	100	0.5 - 40	Steel
PRX-AP/131		30 - 80	

N.B.: 1/4" NPT female threaded connections

Table 7. Spring Loaded Pneumatic Slam Shut Device Type OS/80X Characteristics

MODEL	SERVOMOTOR BODY RESISTANCE, bar	OVERPRESSURE SET RANGE W_{do} , bar		UNDERPRESSURE SET RANGE W_{du} , bar		BODY MATERIAL
		Min.	Max.	Min.	Max.	
OS/80X-BP	5	0.03	2	0.01	0.60	Aluminium
OS/80X-BPA-D	20					
OS/80X-MPA-D	100	0.50	5	0.25	4	Steel
OS/80X-APA-D		2	10	0.30	7	
OS/84X		5	41	4	16	Brass
OS/88X		18	80	8	70	

N.B.: 1/4" NPT female threaded connections

Table 8. Pneumatic Slam Shut Device Controlled by PRX Pilot Type OS/80X-PN Characteristics

MODEL	SERVOMOTOR BODY RESISTANCE, bar	OVERPRESSURE SET RANGE W_{do} , bar		UNDERPRESSURE SET RANGE W_{du} , bar		BODY MATERIAL
		Min.	Max.	Min.	Max.	
OS/80X-PN	100	0.5	40	0.5	40	Steel
OS/84X-PN	100	30	80	30	80	Brass

Type OS/80X-PN: Pressure range 0.5 to 40 bar

Appliance made of a Type OS/80X-APA-D set at about 0.4 bar and a variable number of Type PRX/182-PN pilots for overpressure and Type PRX/181-PN for underpressure, as many as necessary to control different points of the installation.

Type OS/84X-PN (Safety accessory): Pressure range 30 to 80 bar

Appliance made of a Type OS/84X set at about 20 bar and a variable number of Type PRX-AP/182-PN pilots for overpressure and Type PRX-AP/181-PN for underpressure, as many as necessary to control different points of the installation.

Note: Slam Shut Device supplied with 1/4" NPT female threaded connections

Table 9. Type Cronos CBB - DN 50 Dimensions and Weights

DN 50 - CBB	PN 16 - ANSI 150					PN 25/40 - ANSI 300/600					PN 16 - ANSI 150		PN 25/40 - ANSI 300		ANSI 600	
OVERALL DIMENSIONS (mm)	A	B	C	D	E	A	B	C	D	E	I	I1	I	I1	I	I1
	245	255	335	285	318	260	255	287	285	318	254	465	267	471.5	286	482
WEIGHT (kg) STD - SR	105					127					----		----		----	
WEIGHT (kg) SRS	----					----					130		162			

Table 10. Type Cronos Series Dimensions

DN	OVERALL DIMENSIONS, mm										FACE-TO-FACE, mm					
	PN 16 - ANSI 150					PN 25/40 - ANSI 300/600					PN 16 - ANSI 150		PN 25/40 - ANSI 300		ANSI 600	
	A	B	C	D	E	A	B	C	D	E	I	I1	I	I1	I	I1
25	215	180	285	260	170	220	180	225	260	170	184	350	197	353.5	210	360
50	245	195	335	285	175	260	195	287	285	175	254	465	267	471.5	286	482
80	330	260	400	325	185	350	260	400	325	185	298	570	317	590	337	600

N.B.: 1/4" NPT female threaded connections

Table 11. Type Cronos Series Weights

DN	STANDARD AND TYPE SR, kg								WIDENED OUTLET AND TYPE SRS, kg							
	PN 16 - ANSI 150				PN 25/40 - ANSI 300/600				PN 16 - ANSI 150				PN 25/40 - ANSI 300/600			
	C	CB	CC	CCB	C	CB	CC	CCB	C	CB	CC	CCB	C	CB	CC	CCB
25	36	38	56	58	37	39	61	63	49	51	69	71	56	58	78	80
50	62	66	96	100	74	78	118	122	87	91	121	125	109	113	153	157
80	128	142	191	197	171	185	271	277	190	204	253	259	273	279	373	379

Type CRONOS

DIMENSIONS AND WEIGHTS

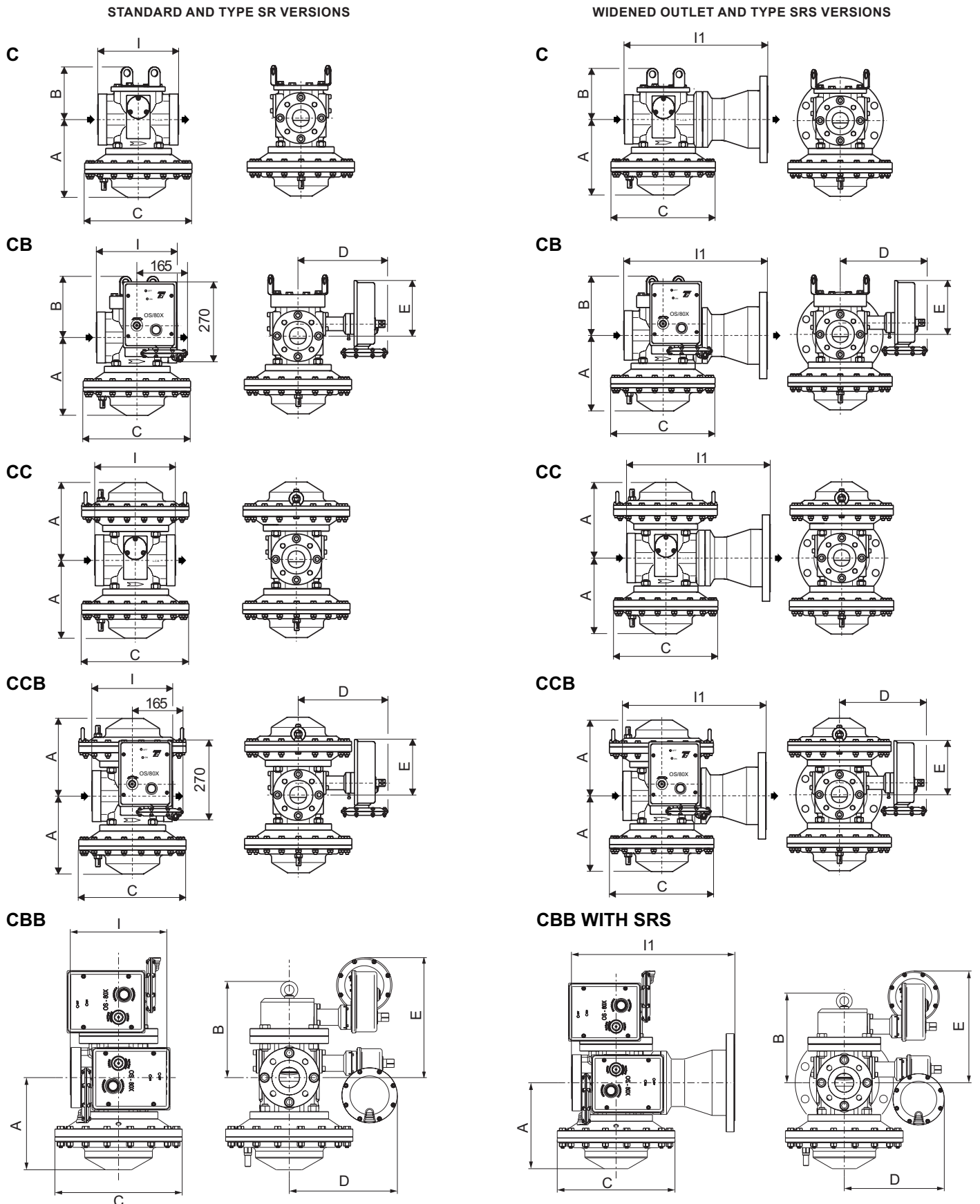


Figure 3. Type Cronos Series Dimensions

OPERATION

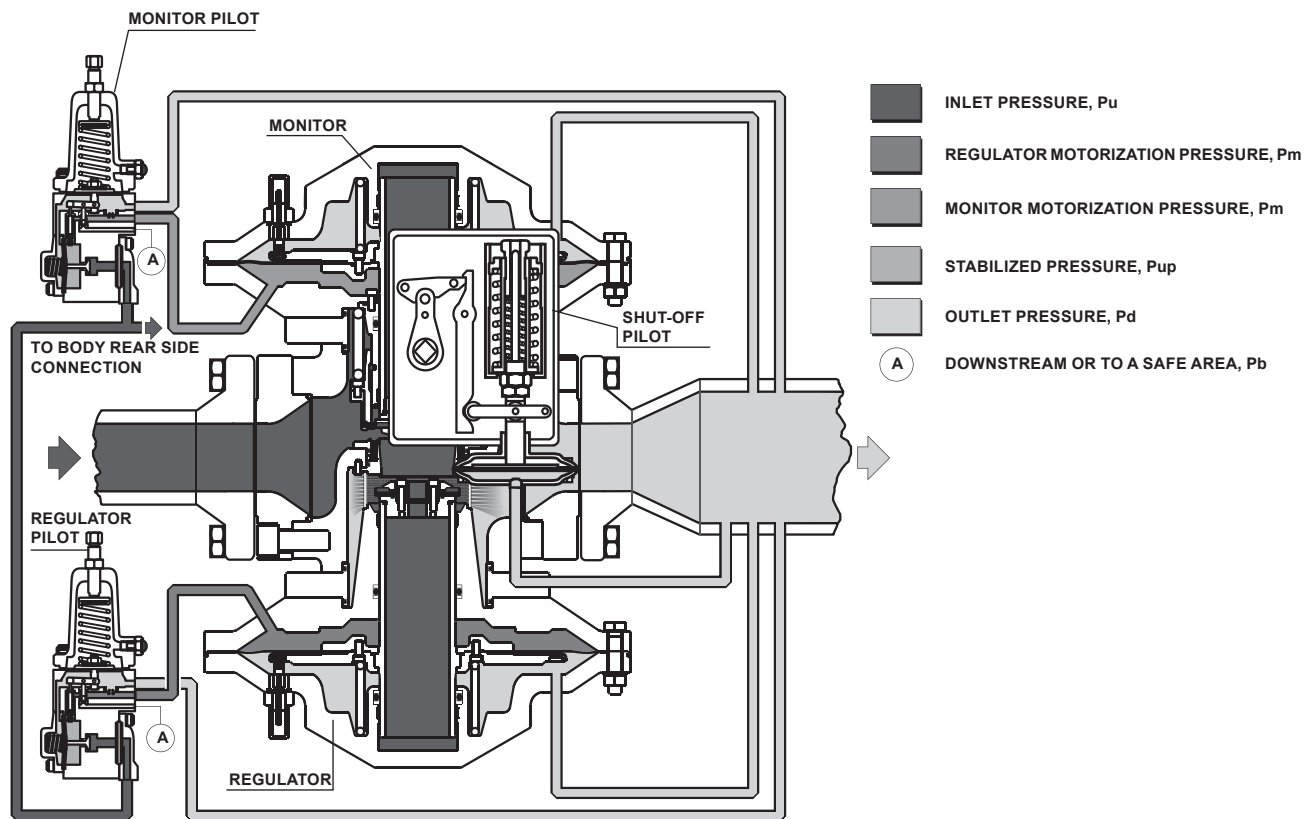


Figure 4. Type Cronos CCB Operational Schematic

Regulator

The Diaphragm Unit (permanently connected to the shutter) divides the regulator control head into two chambers.

One of the chambers is connected to regulated pressure (P_d), and the other to motorization pressure (P_m) produced by the pilot according to pressure downstream.

Due to underpressure, the regulator spring acts on the diaphragm unit and closes the shutter.

The shutter moves to an open position when the force produced by motorization pressure (P_m) acting on the diaphragm unit becomes greater than the force produced by downstream regulated pressure (P_d) added to the load of the regulator spring. The shutter stays idle when the two forces are equal, under these conditions, downstream pressure is equal to the system's set value.

Any change in requested flow-rate produces a variation in downstream regulated pressure and the regulator controlled by the pilot opens or closes to deliver the requested flow-rate while keeping downstream pressure stable.

Monitor

The Monitor or emergency regulator is used as a safety device in gas pressure reduction systems.

The purpose of this device is to protect the system against possible overpressure, while keeping the reduction line in service.

The monitor controls downstream pressure at the same point as the main regulator and is set a little higher than the latter.

Under normal operation, the monitor is fully open as it detects a pressure value lower than its set value. If, due to any regulator fault, downstream pressure increases, when it exceeds the tolerated level, the monitor comes into operation and adjusts pressure to its own set value.

Slam-shut Device

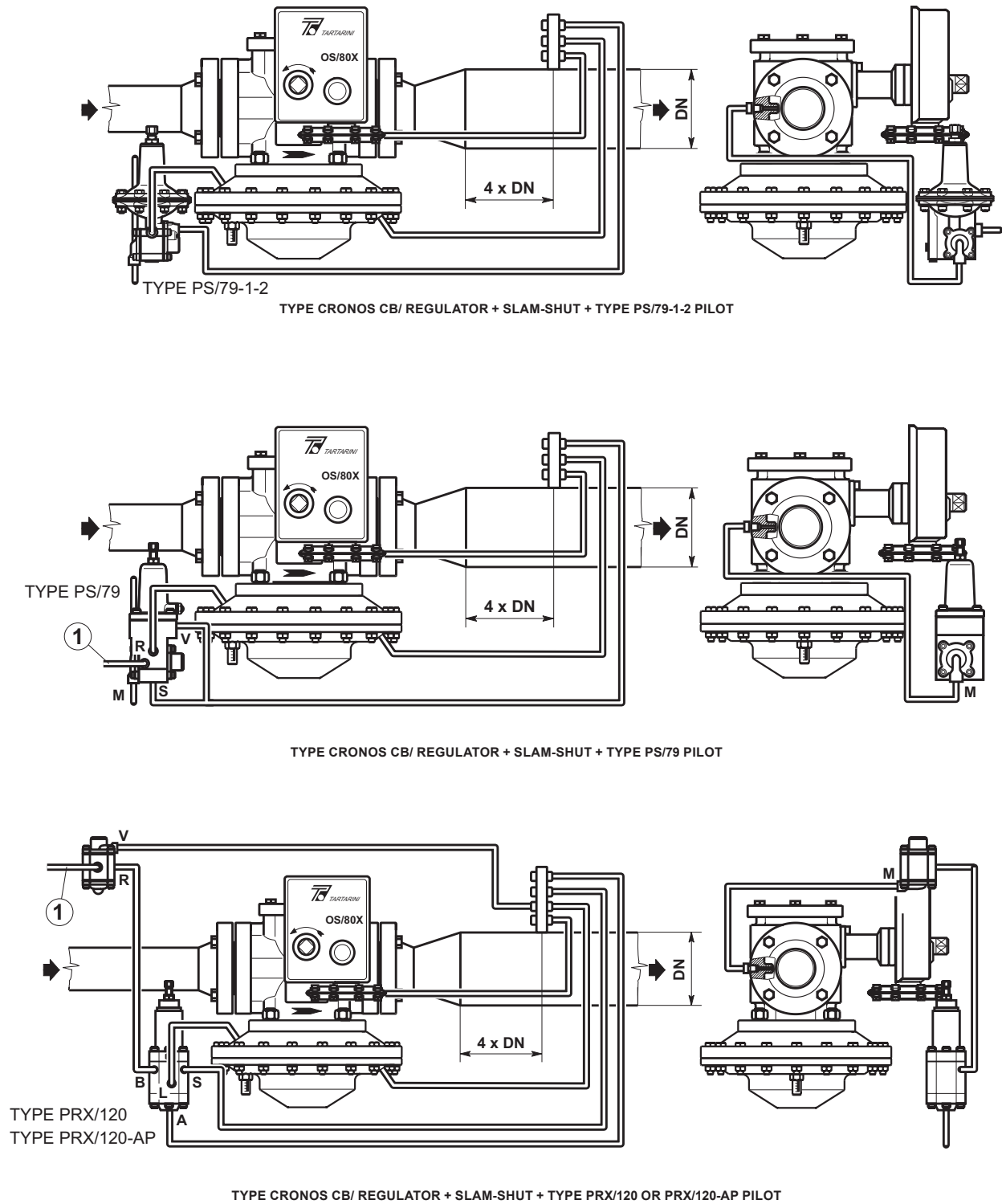
The slam-shut device has a shutter and individual seat. It functions independently of the regulator/monitor. The shutter can only be hand-opened, by rotating the slam-shut reset shaft counter clockwise. To keep the shutter open, the controller OS/80X or OS/80X-PN Series is used. Both series are designed to operate on maximum and minimum, maximum only, or minimum only pressure.

When the system's downstream pressure is at normal operating value, the controller remains set and prevents the slam-shut reset shaft from turning by keeping the slam-shut shutter open.

When downstream pressure varies beyond its set limits, the controller releases the reset shaft and the shutter is closed by the thrust of the spring.

Type CRONOS

INSTALLATION

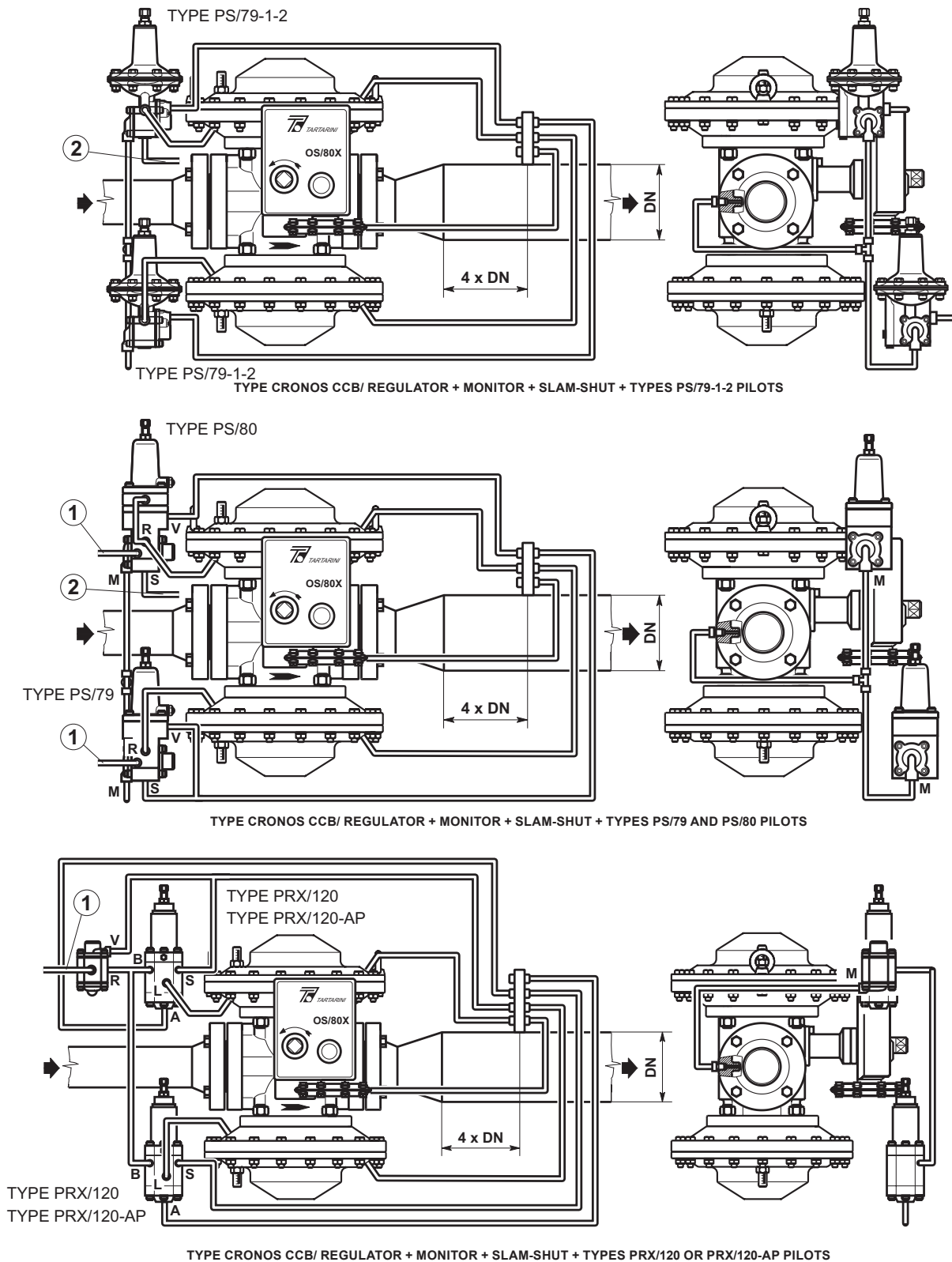


LEGEND:

① TO THE HEATING

NOTE: RECOMMENDED PIPING IS STAINLESS STEEL WITH 10 mm DIAMETER.

Figure 5. Cronos Series Connection/Installation Diagrams



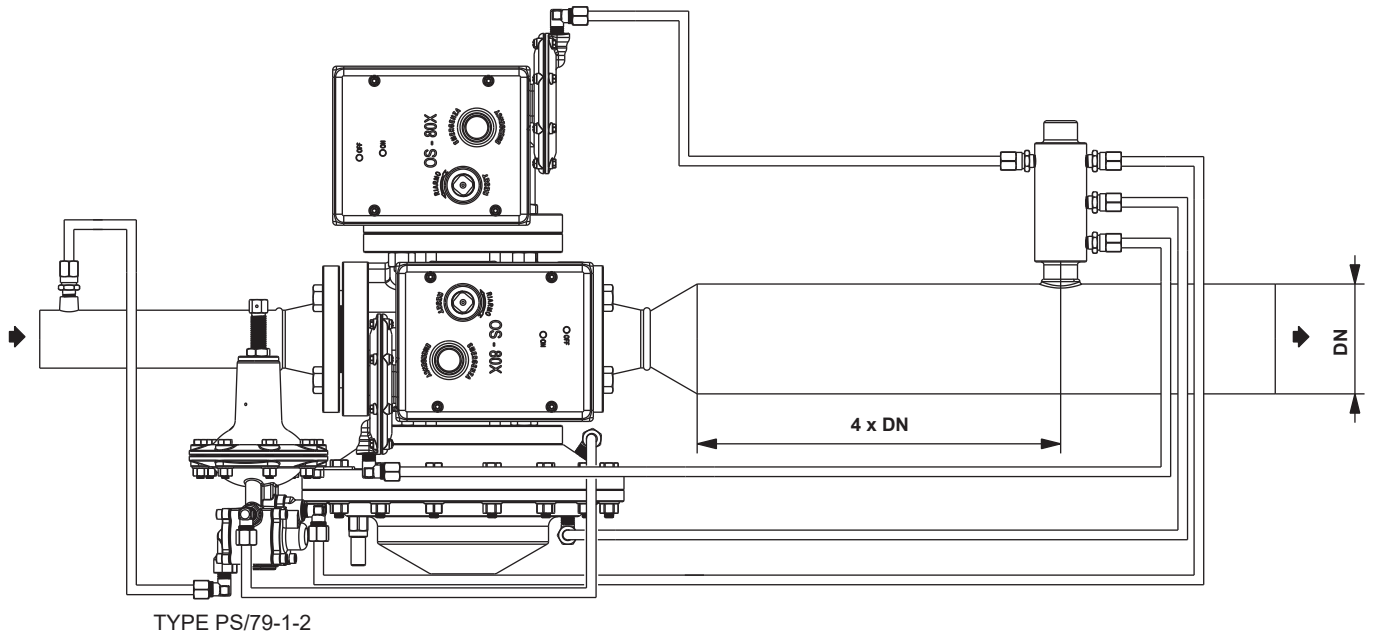
LEGEND:

- ① TO THE HEATING
- ② DOWNSTREAM OR TO A SAFE AREA

NOTE: RECOMMENDED PIPING IS STAINLESS STEEL WITH 10 mm DIAMETER.

Figure 5. Cronos Series Connection/Installation Diagrams (continued)

Type CRONOS



TYPE PS/79-1-2
 TYPE CRONOS CBB/ REGULATOR + DOUBLE SLAM-SHUT + TYPE PS79-1-2
 Figure 5. Cronos Series Connection/Installation Diagrams (continued)

INSTALLATION (continued)

- Ensure that the data found on the regulator plate are compatible with usage requirements.
- Ensure that the regulator is mounted in accordance with the direction of flow indicated by the arrow.
- Make the connections as indicated in Figure 5.

WARNING

Only qualified personnel should install or service a regulator.

Regulators should be installed, operated, and maintained in accordance with international and applicable codes and regulations.

If the regulator vents fluid or a leak develops in the system, it indicates that servicing is required.

Failure to take the regulator out of service immediately may create a hazardous condition.

Personal injury, equipment damage, or leakage due to escaping fluid or 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 Characteristics section, or where conditions exceed any ratings of the adjacent piping or piping connections.

To avoid such injury or damage, provide pressure-relieving or pressure-limiting devices (as required by the appropriate code, regulation, or standard) to prevent service conditions from exceeding limits.

Additionally, physical damage to the regulator could result in personal injury and property damage due to escaping fluid.

To avoid such injury and damage, install the regulator in a safe location.

Before installation, check if service conditions are consistent with usage limitations and if pilot set-up or possible built-in safety slam-shut device, is in accordance with service conditions of protected equipment.

All means for venting must be provided in assemblies where the pressure equipment is installed (ENs 12186 and 12279).

All means for draining must be provided for any equipment installed before regulators and slam-shut devices (ENs 12186 and 12279).

According to EN 12186 and 12279, where this product is used:

- Provide a cathodic protection and electrical isolation to avoid any corrosion;

- In accordance with clause 7.3/7.2 of aforesaid standards, the gas shall be cleaned by proper filters / separators / scrubbers to avoid any technical and reasonable hazard of erosion or abrasion for pressure containing parts.

All pressure equipment should be installed in a non-seismic area and should not undergo fire and thunderbolt action.

All pipelines should be cleaned before installation of the regulator and checked that the regulator has not been damaged or contains foreign material after shipment.

Use suitable line gaskets and approved piping and bolting practices.

Install the regulator in a horizontal position, and check that flow through the body is in the direction indicated by the arrow on the body.

Installation must be performed avoiding to create pressure force on the body and using suitable joint means according to equipment dimensions and service conditions.

The user should check and carry out any protection suitable for assembly's specific environment.

Note

It is important that the regulator be installed so that the vent hole in the spring case is unobstructed at all times.

For outdoor installations, the regulator should be located away from vehicular traffic and positioned so that water, ice, and other foreign materials cannot enter the spring case through the vent.

Avoid placing the regulator beneath eaves or downspouts, and be sure it is above the probable snow level.

STARTUP

The regulator and possible built-in slam-shut device is factory set at approximately the midpoint of the spring range or the pressure requested, so an initial adjustment may be required to obtain desired results.

With proper installation completed and relief valves properly adjusted, slowly open the upstream and downstream line valves.

- a. Let the filtered, and if necessary preheated, gas reach the regulator.
- b. Slightly open the On-Off valve located downstream.

- c. Open the On-Off valve located upstream just slightly and very slowly.
- d. Wait until the downstream pressure is stabilized.
- e. Finish opening the upstream and downstream valves slowly.

PILOT ADJUSTMENT

To change the regulator outlet pressure, turn the pilot adjusting screw clockwise to increase pressure or counter clockwise to decrease pressure.

To change the slam-shut setpoints (overpressure and/or underpressure), remove the spring closing cap of the pilot and turn the adjusting screws clockwise to increase outlet pressure or counter clockwise to decrease pressure.

Monitor the outlet pressure with a test gauge during the adjustment.

SHUTDOWN



WARNING

To avoid personal injury resulting from sudden release of pressure, isolate the regulator from all pressure before attempting disassembly and release trapped pressure from the equipment and pressure line.

In case of disassembly of main pressure retaining parts for checks and maintenance procedures, external and internal tightness tests have to be done according to applicable codes.

PERIODICAL CHECKS



CAUTION

It is recommended that checks be made periodically on the efficiency of the regulator and pilots.

Slowly close the On-Off valve located downstream and check the pressure in the line section between the regulator and the valve.

Some increase in the downstream pressure should be observed, due to overpressure closure.

The pressure will then stabilize.

If a steady increase in the downstream pressure occurs, this is a clear sign that the unit is not tightshut.

Check whether the leakage is due to the regulator or the pilot and then proceed with maintenance as required.

REGULATOR MAINTENANCE (SEE FIGURES 6 TO 12)



WARNING

All maintenance procedures must be carried out only by qualified personnel. If necessary, contact our technical support representatives or our authorized dealers.

The regulator and its pressure accessories are subject to normal wear and must be inspected periodically and replaced if necessary.

The frequency of inspection/checks and replacement depends upon the severity of service conditions and according to applicable National or Industry codes, standards and regulations/recommendations.

In accordance with applicable National or Industry codes, standards and regulations/recommendations, all hazards covered by specific tests after final assembling before applying the CE marking, shall be covered also after every subsequent reassembly at installation site, in order to ensure that the equipment will be safe throughout its intended life.

Before proceeding with any maintenance work, shutoff the gas upstream and downstream from the regulator, also ensure that there is no gas under pressure inside the body by loosening the upstream and downstream connections. Upon completion, check for leaks using suds.

General Maintenance

- a. Disconnect all connections.

Slam-shut Device

- a. Unscrew the screws (key 102) and remove the controller (key 98).
- b. Unscrew the screws (key 90) and remove the slam-shut hub (key 100).
- c. Remove the snap ring (key 95) and then the shaft (key 96).

Upper Cover Assembly for CBB

- a. Disassemble, with the aid of the eyebolt (key 224), the upper cover assembly (key 216) by unscrewing the screws (key 223) and nuts (key 222).
- b. Remove the spring (key 12).
- c. Remove the pad retainer upper cover (key 46) by unscrewing the screws (key 38) remove the pad unit (key 44).
- d. Remove the slam-shut shutter (key 9) and then unscrew the screws (key 11).
- e. Remove, unscrewing it completely, the pad support (key 15) then remove the spring (key 221).



CAUTION

Perform this operation with extreme caution considering the spring load.

- f. Remove the shutter guide (key 219) unscrew the screws (key 217) and remove the sleeve (key 220).

Monitor

- a. Disassemble the upper monitor cover (key 20) by unscrewing the screws (key 39) and the eyebolts (key 86).
- b. Remove the entry plate (key 31), the indicator (key 139) and the spring collet (key 144). Unscrew the support (key 141) on the upper monitor cover, the sheath (key 138) and the bushing (key 140), using the special wrench.
- c. Unscrew the nuts (key 88) and remove the lower cover (key 37).
- d. Remove the monitor pad retainer (key 46) by unscrewing the screws (key 38).
- e. Remove the pad unit (key 44), then the shutter-diaphragm unit and unscrew the pad support (key 15).
- f. Remove the spring (key 12), the slam-shut shutter (key 9) and then unscrew the screws (key 11).
- g. Unscrew the screws (key 19) and remove the shutter guide (key 32).
- h. Unscrew the screws (key 27) and disassemble the diaphragm (key 36) separating the plates (keys 30 and 31).

Regulator

- a. Disassemble upper regulator cover (key 63) by unscrewing the screws (key 59).
- b. Remove the entry plate (key 72), the indicator (key 139) and the spring collet (key 144). Unscrew the support (key 141) on the upper monitor cover, the sheath (key 138) and the bushing (key 140), using the special wrench.
- c. Unscrew the nuts (key 106) and remove the lower regulator cover (key 62).
- d. Remove the regulator pad retainer (key 83) by unscrewing the screws (key 56).
- e. Remove the pad unit (key 54), then the shutter-diaphragm unit and unscrew the pad support (key 57).
- f. Unscrew the screws (key 70) and disassemble the diaphragm (key 84) separating the plates (keys 72 and 68).
- g. Unscrew the screws (keys 87 and 107), disassemble intermediate flanges (keys 35 and 85).
- h. Use the specific special wrenches to disassemble the slam-shut seat (key 47) and the seat (key 48).

Replacing O-rings and Tight Shutoff Pads

- a. Regarding the slam-shut device, the static tight shutoff O-rings (keys 97, 101 and 93), the antifriction ring (key 99) and the slam-shut pad unit (key 8) must be checked and replaced if necessary.
- b. Regarding the monitor and regulator, check the efficiency of all dynamic tight shutoff O-rings (keys 17, 13 and 66), antifriction rings (keys 16, 24, 65 and 74) and moving

parts, with special attention focused on the nickel-plated surfaces. Replace any parts that are no longer in suitable condition. Proceed with checks and any needed replacements of the tight shutoff pad units for the monitor (key 44) and regulator (key 54).

- c. Regarding the upper cover unit on the CBB configuration, check the efficiency of all dynamic tight shutoff O-rings (key 215, 13) antifriction rings (key 24, 250) and moving parts, with special attention focused on the nickel-plated surfaces replacing any parts that are no longer in suitable condition. Proceed with checks and any needed replacements of the pad unit (key 44).
- d. It is advisable to replace the static tight shutoff gaskets only when and if certain that they are inefficient.
- e. Clean all of the disassembled parts with gasoline and dry with compressed air .

Reassembly

Lubricate all gaskets with Molykote 55 M* grease paying special attention not to damage them during reassembly procedures.

Reassemble the parts by following the procedures listed above in reverse order (key replacing O-rings and tight shutoff pad section).

As you proceed, ensure that all parts are moving freely and without any friction, and then tighten all screws uniformly.

For the assembly of the travel indicator in the monitor and regulator, screw the indicator unit without the sheath (key 138) onto the respective upper covers.

Rivet the indicator (key 139) with a rubber or wood hammer in order to have the spring collet (key 144) hook onto the entry plate. Then mount the sheath (key 138).

Reconnect all connections previously disconnected.

* Molykote® is a registered trademark of the Dow Corning Corporation.

CONTROLLER MAINTENANCE OS/80X SERIES (SEE FIGURE 13)

Installation

- a. Install the controller in a covered area and protect it against weather agents.
- b. Check that data on the plate are compatible with actual working conditions.
- c. Make sure controller is installed upright, i.e. screw (key 49) on top.



CAUTION

Mounting in any other way will jeopardize controller's performance.

- d. Carry out the connection of gas outlet (A). It must be derived from the pressure control piping, in a straight tract, possibly far away from restrictions, curves or derivations, in order to avoid turbulence that can alter the trip pressure setpoints.

Startup

- a. Using lever, activate slam-shut by turning reset pin (key 6) in the direction shown by the arrow.
- b. CBB VERSION:
Using the appropriate lever, activate the first slam-shut by turning reset pin (key 6) in the direction indicated by the arrow and keep it open manually, then open slowly and carefully the second slam-shut adopting the same procedure.
- c. Wait until the pressure being controlled stabilizes and then slowly release lever.
- d. Now repeat this procedure, make sure that levers keep controller properly set and that lever (key 33) is in horizontal position.

Periodical Checks

It is recommended that controller be efficiency checked periodically.

Cut-off Test

- a. Cut-off the circuit by means of inlet and outlet valves and disconnect the pressure control pipe (A). The controller should cut-off at minimum pressure (only if so set).
- b. Through the pressure control connection, use a small pump or other appropriate means, to raise the pressure to normal operating level. Reset controller after cut-off in step a.
- c. Simulate pressure increase until maximum pressure cutoff value is reached.
- d. Connect the controller pressure control (A) and set the circuit back to operating conditions by following the instructions described in the Startup section.

Valve-seal Check

- a. Slowly close the valve located downstream.
- b. Press the "EMERGENCY" button. This will cause the immediate closing of slam-shut device.
- c. Loosen a connector in the downstream line of the slam-shut device or of the regulator. Check the connector with soap and water, making sure there are no leaks; make any necessary repairs otherwise.

Type CRONOS

Maintenance

Routine controller maintenance entails simply periodic checking of the diaphragm on the Type OS/80X (the piston lip seal on the Type OS/84X) and the movement of the levers, i.e. they should move freely with a minimum of friction. If necessary, lubricate pins with "Molykote 55 M".



WARNING

For a successful job it is indispensable to use qualified personnel, possibly calling on our Technical Support Representatives.

Before starting maintenance, disconnect impulse connection (A) to make sure there is no gas under pressure in the pilot.

When maintenance operations are finished check the tightness with suds.

Replacing Diaphragm (OS/80X Series only)

- Remove screws (key 27) and cover (key 61).
- Replace diaphragm (key 62).
- To remount diaphragm, coat it with grease, set it in place around the edge of cover (key 61) and evenly tighten screws (key 27) to ensure proper sealing.

Replacing O-ring (key Types OS/84X and OS/88X only)

- Remove plug (key 61) and extract piston (key 68) from body (key 60).
- Replace O-ring (key 67) and lip seal (key 66).
- Reassemble by reversing the above procedures.

General Maintenance

- Remove screws (key 40) and casing (key 47).
- Remove dowels (key 12) and bushing (key 13).
- Slide off pin (key 6), lever assembly (keys 17 and 2), balls (key 10) and shim ring (key 15). Wash parts, replace any if worn.
- Remove nuts (key 18), levers (keys 20 and 36) and springs (keys 37 and 21).
- Remove nut (key 30), screw (key 29) and lever (key 33).
- Remove minimum register screw (key 49), maximum register ring (key 50) and springs (keys 53 and 54).
- Remove cover (key 61) on OS/80X Series, or body (key 60) on Types OS/84X and OS/88X, and proceed as directed in replacing diaphragm/O-ring section.
- Remove nut (key 70) and locknut (key 69), then slide off stem assembly (key 57).
- Loosen dowel (key 3), unscrew ring (key 9), remove ball holder (key 5) and check seals (keys 4 and 8) for wear.
- Clean all parts with petrol, replace any if worn.

Reassembly

Reassemble all parts by reversing the steps in the general maintenance section.

As you proceed, make sure all parts move freely without friction. If necessary, lubricate them with Molykote 55 M.

Make sure to:

- Narrow the gap between nuts (keys 30 and 18) so that levers (keys 33, 36 and 20) have minimum play yet move freely without friction.
- Before mounting minimum spring (key 54), register position of lever (key 33) by means of nut (key 70), locking it into place with locknut (key 69).

Note

The lever (key 33) is in proper position when it is exactly horizontal and in the center of the groove of lever (key 36).

- Now remount lever assembly (key 17 and 2), balls (key 10), keeping them in their seat with grease, and stem (key 6), which is to be turned so the balls enter their seats. The stem and lever assembly should now be tightly fitted together.
- Remount bushing (key 13), make sure that the dowels are firmly set in the grooves of the stem (key 6).
- Repeatedly check if pilot resets properly and, lastly, remount minimum spring (key 54).
- Always check pilot setting.

Minimum and Maximum Setting

- Make sure that the lever (key 33) is in horizontal position when pilot is reset. If necessary, use nut and locknut (key 69 and 70) to adjust (see step b, Reassembly section).
- Use ring nut (key 50) to completely load maximum pressure spring (key 53). Loosen screw (key 49) to completely relieve minimum pressure spring (key 54).
- Disconnect pressure control pipe (A).
- Through the pressure control connection, use a small pump or other appropriate means to raise the pressure to normal operating level.
- Reset pilot and reduce the pressure until it reaches minimum cutoff level.
- Use register (key 49) to load spring (key 54) slowly until pilot is triggered.
- Repeat procedures (d) and (e) above, making any necessary adjustment in the setting.
- Bring pressure back to normal values.
- Reset pilot and raise the pressure until it reaches maximum cutoff level.

- j. Using ring nut (key 50), slowly unload spring (key 53) until cut-off point is reached.
- k. Repeat procedures (h) and (i) above, making any adjustment necessary in the setting.

Note

Whenever minimum or maximum pressure setting is not required, omit corresponding steps.

PILOT MAINTENANCE TYPES PRX/120, PRX/125, PRX-AP/120 AND PRX-AP/125 (SEE FIGURE 14)

Installation

- a. Make sure that specifications on the pilot plate comply with the intended use.
- b. Make sure that all connections are correctly made.

Startup

Refer to the regulator startup instructions.

Adjustment

Adjusting response stability and rapidity is achieved by means of the appropriate adjusting screws, R (restrictor) and D (damper).

The register D is normally completely unscrewed; by screwing the register, the response of the regulator can be slowed down.

The register R is normally completely screwed; in case of hunting of the set pressure, we suggest unscrewing slowly the register until pressure steadiness is reached.

By unscrewing the register, the set pressure decreases; intervene on register screw (key 1) in order to re-establish the correct pressure.

CAUTION

If register R is completely unscrewed, the regulator can not deliver the maximum requested capacity.

In order to better assess the effects of adjustments, it is advisable to turn the adjusting screws only one fourth of a turn at a time and to verify the new conditions before carrying out the further rotation.

Periodical Checks

Gas-tightness Test

When starting up the regulator, and at regular intervals, check gas tightness as follows:

- a. Slowly close downstream cut-off valve.

- b. In order to avoid excessive lock-up pressures, close the valve and simultaneously open the outlet vent tap. In case of safety slam-shut device being fitted, keep this valve manually open in order to prevent it from tripping.
- c. Slowly close the vent tap and read the lock-up pressure value. An increase in outlet pressure will initially be detected, after which pressure will stabilize. If, on the contrary, outlet pressure continues increasing, then the seal is defective. Check if leak is ascribable to pilot or regulator.

Checking Pilot Gas Tightness

- a. Link up together connection A, connection B, a vent tap and a pressure gauge with appropriate scale.
- b. Close connection L.
- c. Slightly open vent tap, feed either gas or compressed air to the pilot through connection S. Pressure gauge will show the pilot set pressure.
- d. Close vent tap and read the lock-up pressure value, which should be less than 0.4 bar. If this value is higher than 0.4 bar, pilot pad or seal seat are worn out or damaged.
- e. Use soapy water to check there are no gas leaks.

Maintenance

CAUTION

Maintenance should be carried out by skilled personnel to ensure good servicing results. Contact our technical support representatives or our authorized dealers for any information.

Let gas under pressure flow out of the relevant part of the system before servicing.

General Maintenance

- a. Disconnect and remove the pilot from the line.
- b. Fully unscrew the adjusting screw (key 1).
- c. Unscrew the cap (key 3), remove the spring holder (key 6) and the spring (key 7). Replace the O-rings (keys 4 and 5).
- d. Loosen screws (key 10), remove the upper cover (key 8) and the lower cover (key 21). Replace the O-ring (key 18).
- e. Lock the stem (key 23) by inserting a key into the notches and unscrew nuts (keys 20 and 26).
- f. Disassemble the parts and replace the diaphragm (key 14) and the pad (key 22).
- g. Unscrew the seat (key 19) and replace the O-ring (key 17).
- h. Use petrol to cleanse the pilot body and all metal parts. Blow them thoroughly with compressed air and check for clear holes along the gas conduits. Replace any worn parts.

Type CRONOS

Reassembly

Reassemble all parts by following in reverse order the assembly as described above (see General Maintenance section).

As parts are assembled, make sure they move freely causing no friction. Make sure to:

- a. O-rings and diaphragms should be lubricated by applying a thin layer of 'Molykote 55 M' grease.

Pay attention not to damage them during reassembly. All other pilot parts require no lubrication.

- b. The cover clamping screws (key 10) should be tightened evenly to ensure proper tightness.
- c. Pilot operation, calibration and tightness should be tested as described in the Gas-tightness test section.
- d. Previously disassembled fittings must be connected. Check for leaks by using suds.

Calibration

See the paragraph Pilot Adjustment on page 11.

TYPES PRX/181-PN, PRX/182-PN PILOTS AND PRX/131 BOOSTER VALVES (SEE FIGURES 15 AND 16)

Installation

Identical to PRX/120, PRX/125 Series (see page 15).

Startup

Identical to PRX/120, PRX/125 Series (see page 15).

Periodical Checks

Pilot tightness should be tested regularly by referring to the following procedure:

- a. Supply fitting A with normal operating pressure.
- b. Make sure there is no gas outflow from fitting B.

Maintenance

Identical to PRX/120, PRX/125 Series (see page 15).

Calibration

Identical to PRX/120, PRX/125 Series (see page 15).

TYPES PS/79, RE/79, PS/80 AND RE/80 (SEE FIGURE 17)

Installation

- a. Make sure that data on the pilot's plate are compatible with actual working conditions.
- b. Install as directed for regulator.

Startup

Refer to the startup instructions applying to the regulator.

Periodical Checks

Slowly close the outlet slam-shut and check line pressure between it and regulator.

A slight increase in pressure should be detected: this results from overload due to closing, and is followed by pressure stabilization. If, however, outlet pressure continues to rise, then seal is defective. Check if leak is coming from regulator or pilot, and service.

Maintenance



Servicing should be carried out by qualified, skilled personnel only. For further information, please contact our Technical Support Representatives or our authorized dealers.

Let gas under pressure flow out of the relevant part of the system before servicing.

Replacing Filter

- a. Remove the screws (key 41), cover (key 59) and replace felt (key 61).

Reassemble by reversing the above sequence.

Replacing Stabilizer Diaphragm and Seal Pad

- a. Remove screws (key 41), cover (key 64), spring (key 47) and diaphragm assembly (keys 48, 49, 50, 51, 52 and 53). Replace diaphragm if necessary.
- b. Unscrew seat (key 54) and replace pad holder (key 56).
- c. Reassemble by reversing the above sequence, make sure not to "pinch" O-rings (key 55).

Replacing Valve Seal Pads

- a. Remove plug (key 27) and seat (key 30). Slide out spring (key 32), pad holder unit (key 34) and forked stem (key 35).
- b. Replace pad holder (key 34) and O-ring (key 37).

Reassemble by reversing above sequence.

General Maintenance

- a. Completely release spring (key 5) by turning the adjusting screw (key 1) counter clockwise.
- b. Remove screws (key 7) and cover (key 4).
- c. Keep plate (key 9 or 75 for the AP version) blocked with a box wrench, unscrew nut (key 6). This must be done exactly as described to prevent damage to or breaking of safety valve (key 20).
- d. Unscrew plate (key 9 or 75 for the AP version) from stem (key 13) remove parts (keys 10, 11, and 12 or 76, 78, 10, 77 and 12 for the AP version).

For Types PS/80 and PS/80-AP version:

Unscrew plate (key 9 or 75 for the AP version) from stem (key 13) remove parts (keys 10, 68, 69, 11 and 12 or 76, 78, 68, 69, 10, 77 and 12 for the AP version).

- e. Slide off split pin (key 40). Remove locknut (key 16) with appropriate wrench and slide out parts (keys 17, 18, 19 and 20).
- f. Make sure that the surface of seat (key 26) which is sealed by pad (key 21) is in proper condition.
- g. Replace diaphragms (key 10) and all seals.
- h. Proceed as directed in the replacement of filter, stabilizer diaphragm and seal pad, and valve seal pads (see instructions above).

Reassembly

Lubricate the static O-rings with a thin layer of Molykote 55 M, be very careful not to damage the O-rings when reassembling. No other pilot parts are to be lubricated.

Reassemble parts by reversing the above steps. As you proceed, make sure that parts move freely and without friction. In addition:

- a. Once lever (key 39) and stem (key 13) have been mounted with stem (key 13) against body (key 25), check that a clearance between forked stem (key 35) and registered (key A) of lever (key 39) is 0.2 to 0.3 mm. If this is not the case, use register to correct.

CAUTION

The above clearance can be checked by gently pulling stem (key 13) upward.

Use the proper tool to make sure that the top plate (key 9) is on the same plane as the supporting the diaphragm (key 10) in the body (key 25).

- b. Mount diaphragm (key 10) and screw on plate (key 9), first by hand then with box wrench, (key always holding upper diaphragm (key 10) firmly in place) in order to avoid damage to stem (key 13) and levers below.
- c. Holding plate (key 9) firmly in place with box wrench, tighten nut (key 6).

- d. Before remounting cover (key 4), center diaphragm as follows:
 - mark a reference point (with pencil) on the diaphragm;
 - turn it to the right without forcing and mark another reference on body
 - turn diaphragm to the left and mark a further reference
 - position the diaphragm mark midway between the two marks on the body.
- e. Tighten all screws uniformly to ensure proper sealing.

Calibration

See the paragraph Pilot Adjustment on page 11.

CAUTION

The pilot has a wide range of self-adjustment values. However, given actual operating conditions, it may necessary to assist it at times by finding the best setting of register/ pin screw (key 29) or the most suitable calibration jet (key 15).

TYPES PS/79-1, PS/79-2, RE/79-1 AND RE/79-2 PILOTS (SEE FIGURE 18)

Installation

Identical to Type PS/79 and 80 series (see page 15).

Startup

Identical to Type PS/79 and 80 series (see page 15).

Periodical Checks

Identical to Type PS/79 and 80 series (see page 15).

Maintenance

CAUTION

Servicing should be carried out by qualified, skilled personnel only. For further information, please contact our Technical Support Representatives or our authorized dealers. Let gas under pressure flow out of the relevant part of the system before servicing.

Replacing Filter

- a. Remove screws (key 54), cover (key 58), and replace felt (key 41). Reassemble by reversing the above sequence.

Replacing Stabilizer Diaphragm and Seal Pad

- a. Remove screws (key 54), cover (key 55), spring (key 52) and diaphragm assembly (keys 53, 51, 50, 49, 48 and 47). Replace diaphragm if necessary.
- b. Unscrew seat (key 44) and replace pad holder (key 45).
- c. Reassemble by reversing the above sequence.

Type CRONOS

Replacing Valve Seal Pads

- Remove plug (key 23) and seat (key 25). Slide out spring (key 27), pad holder unit (key 29) and forked stem (key 31).
- Replace pad holder (key 29) and O-ring (key 32).
- Reassemble by reversing above sequence.

General Maintenance

- Proceed as directed in the replacement of filter, stabilizer diaphragm and seal pad, and valve seal pads (see instructions above).
- Completely release spring (key 5) by turning the adjusting screw (key 1) counter clockwise.
- Remove screws (key 10) and cover (key 6).
- Keep plate (key 8) blocked with a box wrench, unscrew nut (key 7). This must be done exactly as described to prevent damage to or breaking of drilled needle valve (key 17).
- Unscrew plate (key 8) from stem (key 12) and slide off split pin (key 35).
- In Types RE/79-1 and 2, remove locknut (key 15) by means of an appropriate wrench and slide out parts (keys 62, 63, 16 and 17), make sure that the surface of seat (key 61) is intact.
- Replace any worn seals.

Reassembly

Lubricate the static O-rings with a thin layer of Molykote 55 M, be very careful not to damage the O-rings when reassembling. No other pilot parts are to be lubricated. Reassemble parts by reversing the above steps. As you proceed, make sure that parts move freely and without friction. In addition:

- Once lever (key 36) and stem (key 12) have been mounted, check that, with stem (key 12) against body (key 19), clearance between forked stem (key 31) and register (A) of lever (key 36) is 0.2 to 0.3 mm. If not, use register to correct.

CAUTION

The above clearance can be checked by gently pulling the stem (key 12) upward. Use the proper tool to make sure that support of diaphragm (key 9) on the stem (key 12) is on the same plane as that supporting the diaphragm (key 9) in the body (key 19).

- Mount diaphragm (key 9) and screw on plate (key 8), first by hand then with box wrench, always keep diaphragm (key 9) firmly in place to avoid damage to stem (key 12) and underlying levers.
- Holding plate (key 8) firmly in place with box wrench, tighten nut (key 7).
- Before remounting cover (key 6), center diaphragm as follows: mark a reference point (with pencil) on the diaphragm; turn it to the right without forcing and mark another reference on body. Now turn diaphragm to the left and mark a further reference. Position the diaphragm mark midway between the two marks on the body.
- Tighten all screws uniformly to ensure proper sealing.

Calibration

See the paragraph Pilot Adjustment on page 11.

CAUTION

The pilot has a wide range of self-adjustment values. However, given actual operating conditions, it may necessary to assist it at times by finding the best setting of pin screw/register (key 24) or the most suitable calibration orifice (key 18).

BOOSTER VALVE MAINTENANCE TYPE V/31-2 (KEY SEE FIGURE 19)

- Disconnect all fittings, remove valve from the line and unscrew nuts (key 13) then remove cover (key 4), spring holder (key 5) and spring (key 6).
- Replace gasket (key 26).
- Hold stem (key 19) using a wrench inserted into the notch and unscrew nut (key 7).
- Disassemble parts and replace diaphragm (key 10) and O-ring (key 22).
- Unscrew seat (key 16) and replace O-ring (key 15).
- Using a tube wrench disassemble pad holder (key 18) and replace pad (key 17).
- Remove stem unit (key 19), unscrew stem guide (key 20), replace O-ring (key 15) and lip seals (key 21).

STABILIZER FILTER MAINTENANCE TYPE SA/2 (SEE FIGURE 20)

Maintenance

Replacing Filter

- Remove screws (key 2), cover (key 11); replace felt (key 12) and O-ring (key 13). Reassemble in reverse order the above sequence.

Replacing Stabilizer Diaphragm and Seal Pad

- Remove cover (key 19); spring (key 1) and diaphragm assembly (keys 21, 20, 3, 4, 18 and 17). Replace diaphragm if necessary.
- Unscrew seat (key 5), replace pad holder (key 15) and O-ring (key 6).
- Reassemble in reverse order the above sequence.

SPARE PARTS

Spare parts storage shall be done by proper procedures according to national standard/rules to avoid over aging or any damage.

TROUBLESHOOTING

Table 12. General Troubleshooting for Cronos Series Regulator

SYMPTOMS	CAUSE	ACTIONS
The regulator does not open	Lack of incoming gas	Check the station feeding
	Pilot is not being supplied	Check pilot connections
	Regulator diaphragm is broken	To be replaced
	The slam-shut device has not been reset	Manually reset the slam-shut device
Drop in pressure downstream from the regulator	Insufficient upstream pressure	Check the station feeding
	Flow requirements higher than the flow that the regulator can supply	Check the regulator sizing
	Faulty supply to or leakage from the pilot	Check pilot connections and internal parts
	Filter upstream is obstructed	Clean or replace it
Increase in pressure downstream from the regulator	Tight shutoff gaskets are worn	To be replaced
	Deposits of grime on the tight shutoff pad are obstructing proper positioning of the shutter	Clean or replace it
Regulator hunting	Control intakes in incorrect positions	Check connections position
	Very low flow demand	Check the pilots setting and tuning
	Pilot supply and discharge valves are not adjusted perfectly	Check supply and discharge valves opening position
Freezing occurs	Heating insufficient or lacking	Increase gas heating temperature or dry the gas
Slam-shut device does not execute tight shutoff procedure	O-ring and/or slam-shut pad worn	To be replaced
	Slam-shut seat damaged	To be replaced

Table 13. Troubleshooting for Types PS/79-1, PS/79-2, RE/79-1 and RE/79-2 Pilots

SYMPTOMS	CAUSE	ACTIONS
Desired setpoint is not reached	Calibration spring (key 5) is too weak	Check the springs catalogue and replace it with a stronger one
	Leaks from pilot connections	Check pilot feed connections and proper gas flow feeding
Outlet pressure drops well below setpoint	Filter (key 41) is clogged preventing proper through-flow of gas	Clean or to be replaced
	Pad holder (key 45) is swollen preventing proper feed flow	To be replaced
	Pad holder (key 29) is swollen preventing proper feed flow	To be replaced
Outlet pressure increases over setpoint	Faulty sealing of pad holder (key 45)	To be replaced
	Faulty sealing of pad holder (key 29)	To be replaced
Slow response to changes in gas demand	Insufficient flow rate of valve seat (key 25)	Increase flow by means of register/pin screw (key 24)
	Over large calibration jet (key 18) (only for Types PS/79-1 and PS/79-2)	To be replaced with a smaller one
Overly rapid response to changes in gas demand, i.e. Hunting	Excessive flow rate of valve seat (key 25)	Reduce flow by means of a pin screw (key 24)
	Calibration jet (key 18) is too small (only for Types PS/79-1 and PS/79-2)	To be replaced with a larger one
	Not proper internal parts assembly	Check clearance between lever (key 36) and valve seat (key 25)
Gas continually escaping from relief (S)	Defective seal of pad (key 59) (only for Types RE/79-1 and RE/79-2)	To be replaced

Type CRONOS

Table 14. Troubleshooting for Types PS/79, RE/79, PS/80 and RE/80 Pilots

SYMPTOMS	CAUSE	ACTIONS
Desired setpoint is not reached	Calibration spring (key 5) is too weak	Check the springs catalogue and replace it with a stronger one
	Leaks from pilot connections	Check pilot feed connections and proper gas flow feeding
Outlet pressure drops well below setpoint	Filter (key 61) is clogged preventing proper through-flow of gas	Clean or replace it
	Pad holder (key 56) is swollen preventing proper feed flow	To be replaced
	Pad holder (key 34) is swollen preventing proper feed flow	To be replaced
Outlet pressure increases over setpoint	Faulty sealing of pad holder (key 56)	To be replaced
	Faulty sealing of pad holder (key 34)	To be replaced
Slow response to changes in gas demand	Insufficient flow rate of valve seat (key 30)	Increase flow by means of register/pin screw (key 29)
	Over-large calibration jet (key 15) (only for Types PS/79 and PS/80)	To be replaced with a smaller one
Over rapid response to changes in gas demand, i.e. Hunting	Excessive flow rate of valve seat (key 30)	Reduce flow by means of a pin screw (key 29)
	Calibration jet (key 15) is too small (only for Types PS/79 and PS/80)	To be replaced with a larger one
	Not proper internal parts assembly	Check clearance between lever (key 39) and forked stem (key 35)
Gas continually escaping from relief (S)	Defective seal of pad (key 21)	To be replaced
The outlet pressure is not within the usual values	Diaphragm (key 10) are damaged	Replace diaphragm
	Upper diaphragm (key 10) is damaged (only for Types PS/80 and RE/80)	Replace diaphragm

Table 15. Troubleshooting for OS/80X Series Controller

SYMPTOMS	CAUSE	ACTIONS
Controller does not remain set	The controller impulse intake (A) is not connected properly	Check connections (A)
	Downstream pressure coincides with the maximum or minimum slam-shut settings	Check slam-shut settings
	Diaphragm (key 62) is damaged (Lip seal (key 66) on Types OS/84X, OS/88X)	To be replaced

PARTS LISTS

Main Valve

(See Figures 6 to 12)

Item	Description	Item	Description	Item	Description
1	Body	70	Screw	197	Plate
2	Screw	71*	O-ring	198	Support
3	Metallic gasket	72	Inlet plate	200	Flange
5	Inlet-outlet flange	73	Spring	201	Support
6*	O-ring	74*	Anti-friction ring	202	Nut
7	Elastic pin	75	Shutter	203	Plate
8*	Slam-shut pad unit	82*	O-ring	204	Pin
9	Slam-shut shutter	83	Pad retainer	205	Flange
10	Slam-shut pad retainer	84*	Diaphragm	206	Locknut
11	Screw	85	Intermediate flange	207	Plate
12	Spring	86	Eyebolt	208	Plate
13*	O-ring	87	Screw	209	Studbolt
14*	O-ring	88	Nut	210	Pipe
15	Pad holder	89	Bolt	211	Spring
16	Anti-friction ring	90	Screw	212	Plug
17*	O-ring	91	Axial needle bearing	215	O-ring
18*	O-ring	92	Sludge	216	Cover
19	Screw	93*	O-ring	217	Screw
20	Upper cover	94	Needle	218	O-ring
24*	Anti-friction ring	95	Snap ring	219	Shutter
25	Shutter	96	Shaft	220	Sleeve
26*	O-ring	97*	O-ring	221	Spring
27	Screw	98	Controller	222	Nut
28	Spring	99*	Anti-friction ring	223	Screw
29*	O-ring	100	Slam-shut hub	224	Eyebolt
30	Outlet plate	101*	O-ring	250*	Anti-friction ring (DN 80 only)
31	Inlet plate	102	Special screw	271	Back-up ring
32	Shutter guide	103	Pin	300	Bracket
33*	O-ring	104	Bushing	301	Spring
35	Intermediate flange	105	Bolt	302	Bushing
36*	Diaphragm	106	Nut	303	Nut
37	Lower cover	107	Screw	304*	O-ring
38	Screw	108	Screw	305*	O-ring
39	Screw	109	Slam-shut plug	306	Spring
40	Washer	110*	O-ring	307	Ratchet
41	Nut	111	Bracket	308	Support
42*	O-ring	112	Plug	309	Indicator
43	Elastic washer	113*	O-ring	310	Ratchet
44*	Pad unit	114	Screw	311	Transducer
45	Screw	115	Bracket	400	Disk
46	Monitor pad retainer	116	Screw	401	Bushing
47	Slam-shut seat	117	Guide shutter	402*	O-ring
48	Seat	118*	O-ring	403	Support
49	Silencer	119*	O-ring	404*	O-ring
50	Metallic gasket	120	Screw	405	Spring collet
51	Inlet-outlet flange	121	O-ring	406	Indicator
53	Elastic washer	122	Flange	407	Nut
54*	Pad unit	123	Gasket	408	Bracket
55*	O-ring	124	O-ring	409	Support
56	Screw	137	Screw	410	Proximity switch
57	Pad support	138	Sheath	411	Connection
58*	O-ring	139	Indicator	501	Spring collet
59	Screw	140	Bushing	502*	O-ring
60	Washer	141	Support	503	Support
61	Nut	142*	O-ring	504	Bracket
62	Lower cover	143*	O-ring	505	Nut
63	Upper cover	144	Spring collet	506	Indicator
65*	Anti-friction ring	145	Plug	507	Spring
66*	O-ring	174	Washer	508	Transducer
68	Outlet plate	192	Plate	509	Ratchet
69*	O-ring	195	Rivet	510	Bushing
		196	Plate	511*	O-ring

Type CRONOS

OS/80X Series Controller (See Figure 13)

Item	Description
1	Plate
2	Releasing bushing
3	Screw
4*	Gasket
5	Balls holder
6	Stem
7	Roller
8*	O-ring
9	Reloading nut
10	Ball - Roller
11	Roller
12	Screw
13	Reloading bushing
14*	O-ring
15	Ring
17	Reloading lever unit
18	Self-locking nut
19	Washer
20	Return lever
21	Spring
22	Fulcrum
24	Label
26	Nut
27	Screw
28	Reloading pin
29	Screw
30	Self-locking nut
31	Washer
32	Plate fulcrum
33	Lever
34	Screw
35	Cone
36	Releasing lever
37	Spring
38	Plug
39	Locking pin
40	Screw
41	Indicator pin
42	On-Off indicator
43	Button
44*	O-ring
45	Spring
46	Gasket
47	Casing
48	Screw
49	Minimum pressure adjusting screw
50	Maximum pressure adjusting nut
51	Pipe assembly
52	Washer
53	Spring
54	Spring
55	Lower spring holder unit
56	Elastic ring
57	Stem unit
58	Spring
59	Plate holding stem unit
60	Top cover
61	Lower cover
62*	Diaphragm
63	Screw
64	Block
65*	O-ring
66*	Lip seal
67*	O-ring

Item	Description
68	Piston
69	Nut
70	Locknut
71	Microswitch
73*	Gasket (only for BP, BPA-D, MPA-D)
74	Filter

Types PRX/120, PRX/125, PRX-AP/120 and PRX-AP/125 Pilots (See Figure 14)

Item	Description
1	Adjusting screw
2	Nut
3	Cap
4*	O-ring
5*	O-ring
6	Spring carrier plate
7	Spring
8	Upper cover
9	Spring carrier plate
10	Screw
11	Washer
12	Filter
13	Plate
14*	Diaphragm
15	Plate
16	Body
17*	O-ring
18*	O-ring
19	Seat
20	Nut
21	Lower cover
22*	Pad holder unit
23	Stem
24	Plate
25*	O-ring
26	Nut
27	Adjusting screw
28*	O-ring
29	Plate
30	Ring nut
31	Screw
32	Adjusting screw with hole
33	Plug
34	Plug
35	Spring barrel extension for AP

TYPE PRX/131 BOOSTER VALVES (See Figure 15)

Item	Description
1	Adjusting screw
2	Nut
3	Cap
4*	O-ring
5*	O-ring
6	Spring carrier plate
7	Spring

Item	Description
8	Upper cover
9	Spring carrier plate
10	Screw
11	Washer
12	Filter
13	Plate
14*	Diaphragm
15	Plate
16	Body
17*	O-ring
18*	O-ring
19	Seat
20	Nut
21	Lower cover
22*	Pad holder unit
23	Stem
24	Plate
25*	O-ring
26	Nut
28*	O-ring
29	Plate
31	Screw
33	Plug
34	Plug

Types PRX/181-PN and PRX/182-PN Pilots (See Figure 16)

Item	Description
36	Lower cover
37*	O-ring
38	Special connection

Types PS/79, RE/79, PS/80 and RE/80 Pilots (See Figure 17)

Item	Description
1	Adjusting screw
2	Nut
3	Spring holder
4	Cover
5	Spring
6	Nut
7	Screw
8	Washer
9	Plate
10*	Diaphragm
11	Plate
12*	O-ring
13	Stem
14*	O-ring
15*	Jet
16	Locking nut
17*	Lip seal
18	Thrust bearing
19	Spring
20	Safety valve

Types PS/79, RE/79, PS/80 and RE/80 Pilots (See Figure 17) (continued)

Item	Description
21*	Pad
22*	O-ring
23*	O-ring
24	Plug
25	Body
26	Seat
27	Plug
28*	O-ring
29	Pin screw
30	Seat
31*	O-ring
32	Spring
34*	Pad holder unit
35	Forked stem
36	Spacer
37*	O-ring
38*	O-ring
39	Lever unit
40	Split pin
41	Screw
42	Washer
43	Elastic ring
44	Data plate
45	Silencer
46	Pin
47	Spring
48	Autolocking nut
49	Washer
50	Washer
51	Plate
52*	Diaphragm
53	Screw unit
54	Seat
55*	O-ring
56*	Pad holder unit
57	Spring
58*	O-ring
59	Filter cover
60	Filter net
61*	Felt
62*	O-ring
63	Pawl
64	Cover
65	Plug

Type PS/80 only

Item	Description
66	Elbow Fitting
67	Screw
68	Middle flange
69	Hub

Types RE/79, RE/80, REO/79 and REO/80 only

Item	Description
15	Plug

Types PS/79-D and PS/80-D only

Item	Description
70	Extension
71*	O-ring
72	Elastic ring
73*	O-ring

Types PS/79-AP and PS/80-AP only

Item	Description
75	Plate
76	Spacer
77	Plate
78*	O-ring
79	Spring holder

Types PS/79-1, PS/79-2, RE/79-1 and RE/79-2 Pilots (See Figure 18)

Item	Description
1	Adjusting screw
2	Nut
3	Cap
4	Spring holder
5	Spring
6	Cover
7	Nut
8	Plate
9*	Diaphragm
10	Screw
11*	Gasket (Types PS/79-1 and RE/79-1 only)
12	Stem
13	Washer
14	Nut
15	Locking nut
16	Spring
17	Drilled needle valve
18	Jet
19	Body
20*	O-ring
21	Plug
22*	O-ring
23	Plug
24	Pin screw
25	Seat
26*	O-ring
27	Spring
29*	Pad holder unit
30	Spacer
31	Forked stem
32*	O-ring
33*	O-ring
34	Screw
35	Split pin
36	Lever unit
37	Data plate
38	Pin
39	Elastic ring

Item	Description
40*	O-ring
41*	Felt
42	Filter net
43	Spring
44	Seat
45*	Pad holder unit
46*	O-ring
47	Screw unit
48*	Diaphragm
49	Plate
50	Washer
51	Washer
52	Spring
53	Autolocking nut
54	Screw
55	Cover
56*	O-ring
57	Plug
58	Filter cover

Types RE/79-1 and RE/79-2 only

Item	Description
17	Safety Valve
59*	Pad
60*	O-ring
61	Seat
62	Thrust bearing
63*	Lip seal

Types PS/79-1-D, PS/79-2-D, RE/79-1-D and RE/79-2-D Pilots

Item	Description
69*	O-ring
70	Elastic ring
71*	O-ring

Type REOPS/79-1 Pilot

Item	Description
77	Body

Type V/31-2 Booster Valve (See Figure 19)

Item	Description
1	Adjusting screw
2	Nut
3	Cap
4	Cover
5	Spring holder
6	Spring
7	Nut
8	Washer
9	Plate

Type CRONOS

Type V/31-2 Booster Valve (See Figure 19) (continued)

Item	Description
10*	Diaphragm
11	Screw
12	Washer
13	Nut
14	Fitting
15*	O-ring
16	Seat
17*	Pad
18	Pad holder
19	Stem
20	Stem guide
21*	Lip seal
22*	O-ring
23	Plate
24	Body
25	Screw
26*	Gasket
27	Label

Type SA/2 Stabilizer Filter (See Figure 20)

Item	Description
1	Spring
2	Screw
3	Washer
4	Plate
5	Seat
6*	O-ring
7	Body
8	Net
9	Washer
10	Nut
11	Filter cover
12*	Felt
13*	O-ring
14	Spring
15	Pad holder unit
16	Data plate
17	Screw plate unit
18*	Diaphragm
19	Upper cover
20	Washer
21	Nut

Rubber parts marked with (*) are supplied in the "spare parts kit", recommended as stock.

To order the kit it is necessary to communicate to us the type of the regulator or pilot and its serial number.

SCHEMATIC ASSEMBLIES

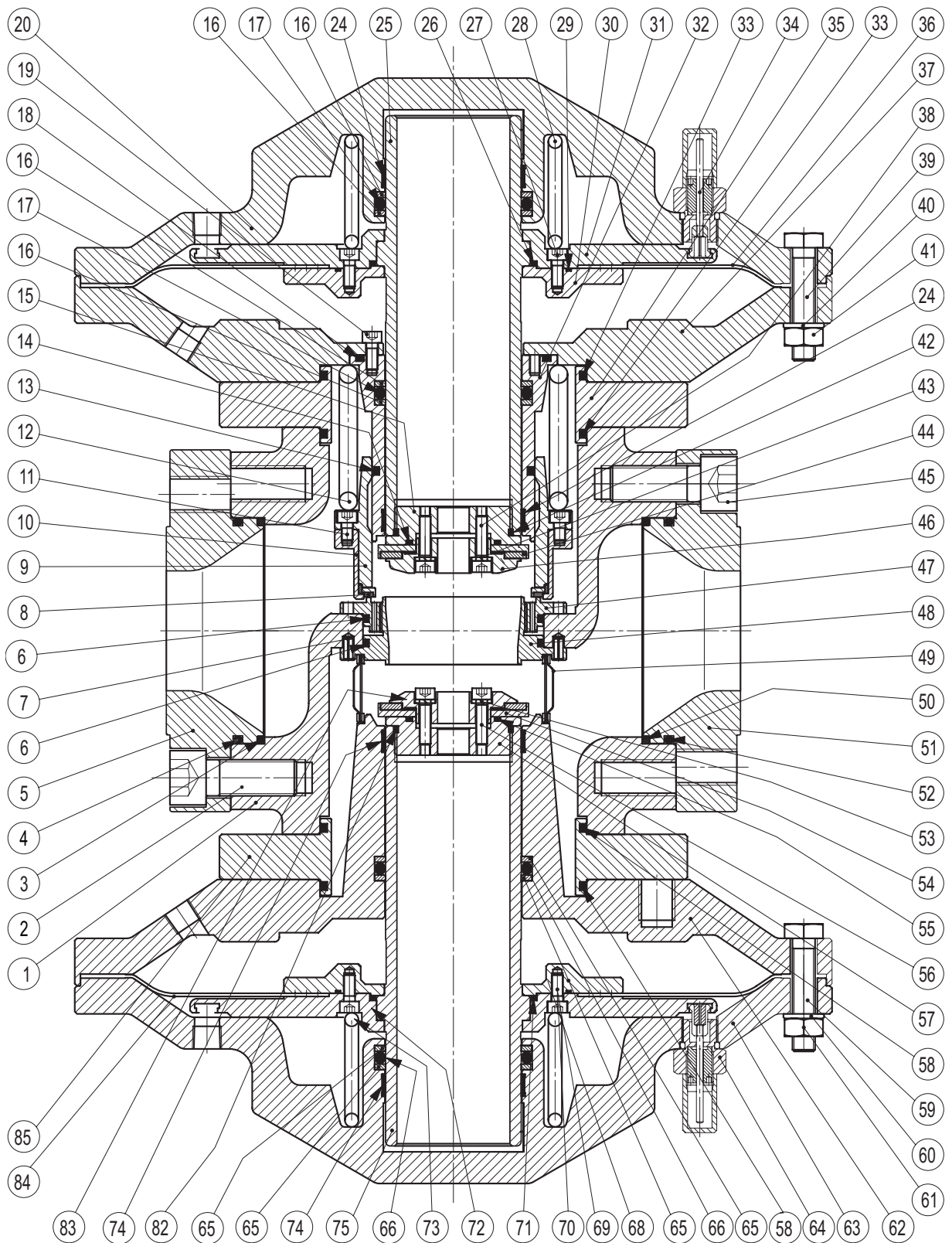
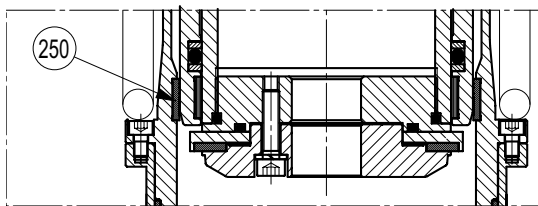
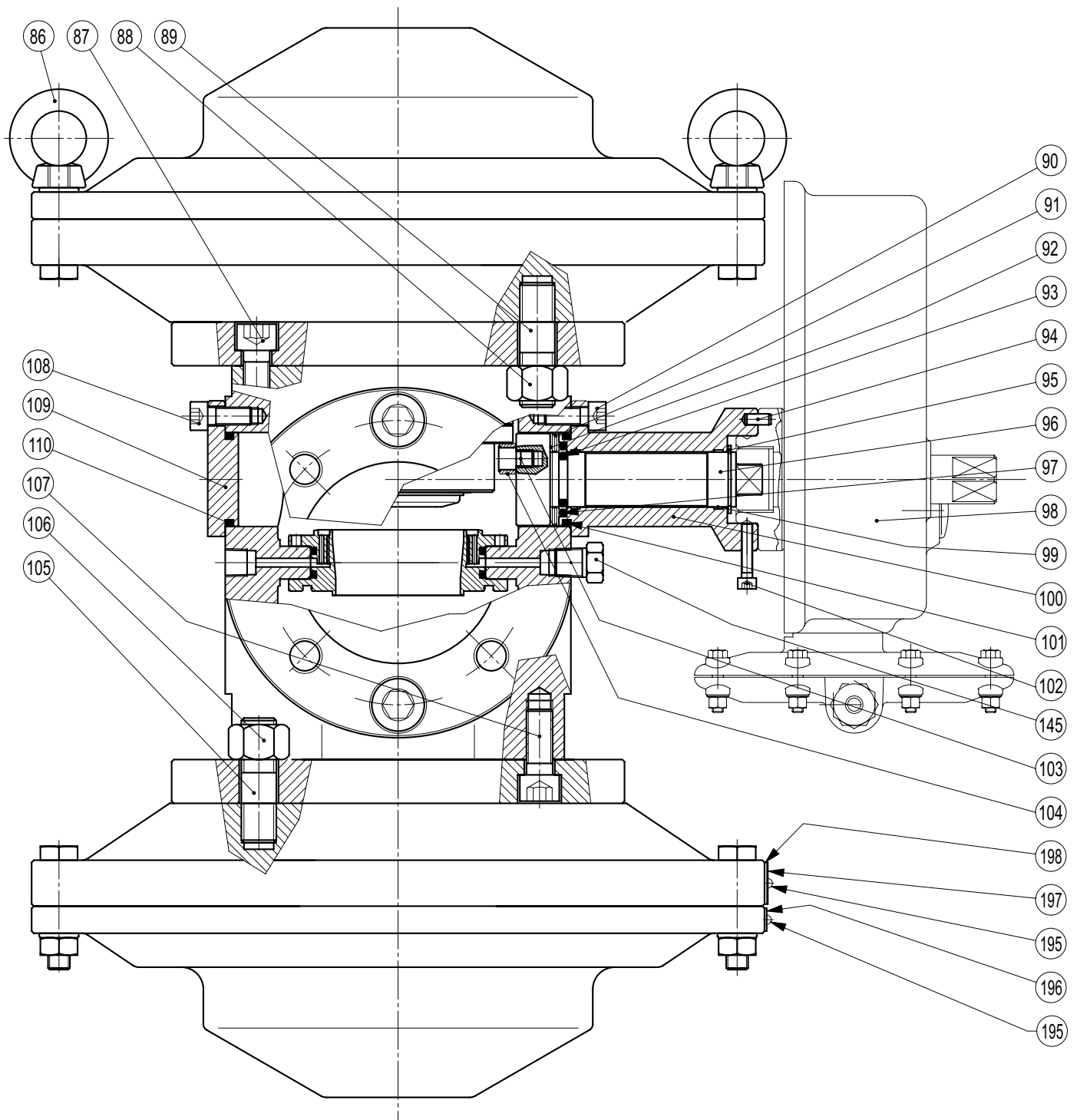
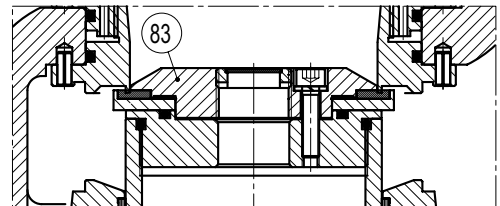


Figure 6. Type Cronos CCB Regulator with Monitor and Slam-shut Device

Type CRONOS



SHUT-OFF DETAIL FOR SIZES DN 50 THROUGH 80



DN 80 REGULATOR DETAIL

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Figure 6. Type Cronos CCB Regulator with Monitor and Slam-shut device (continued)

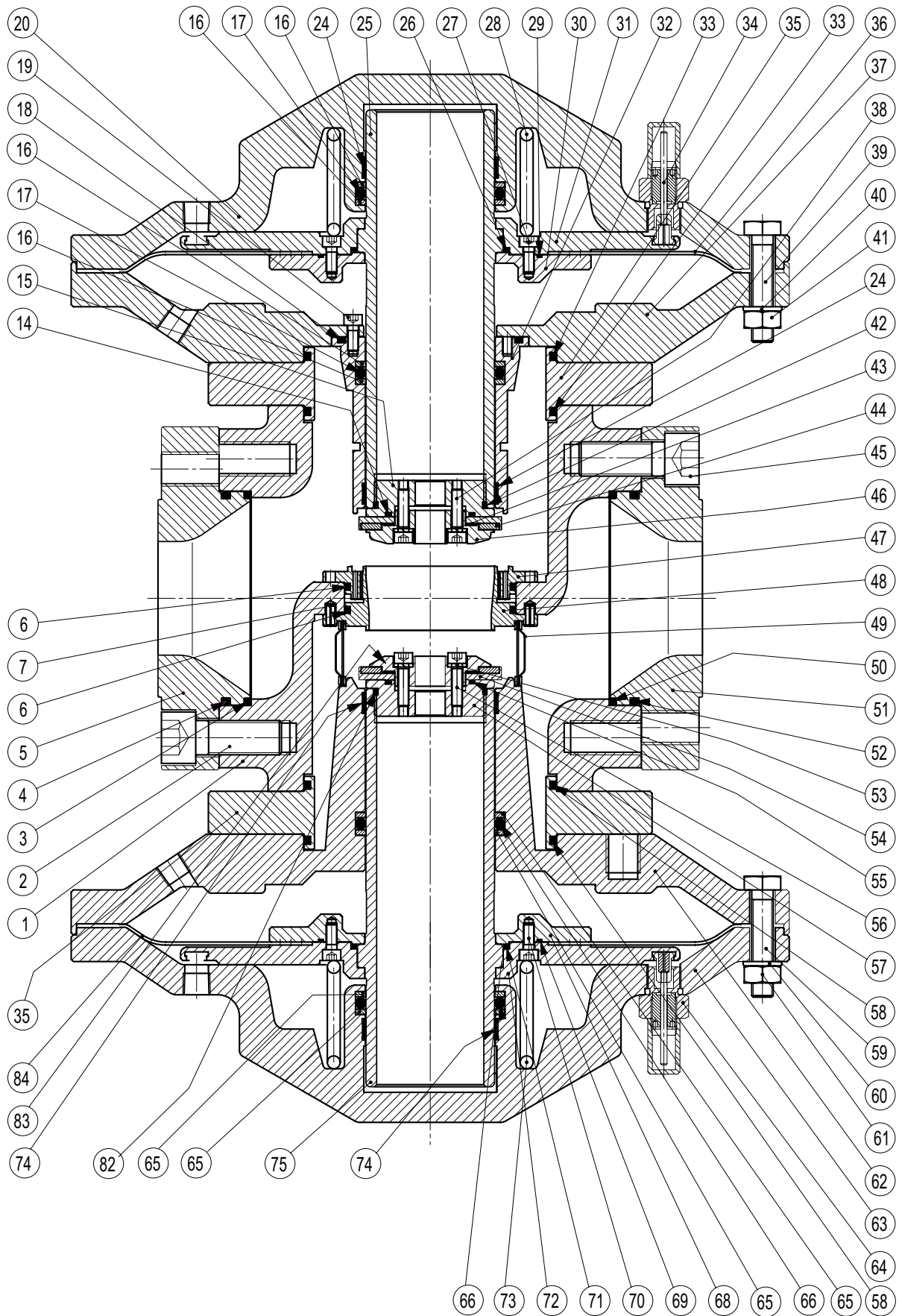
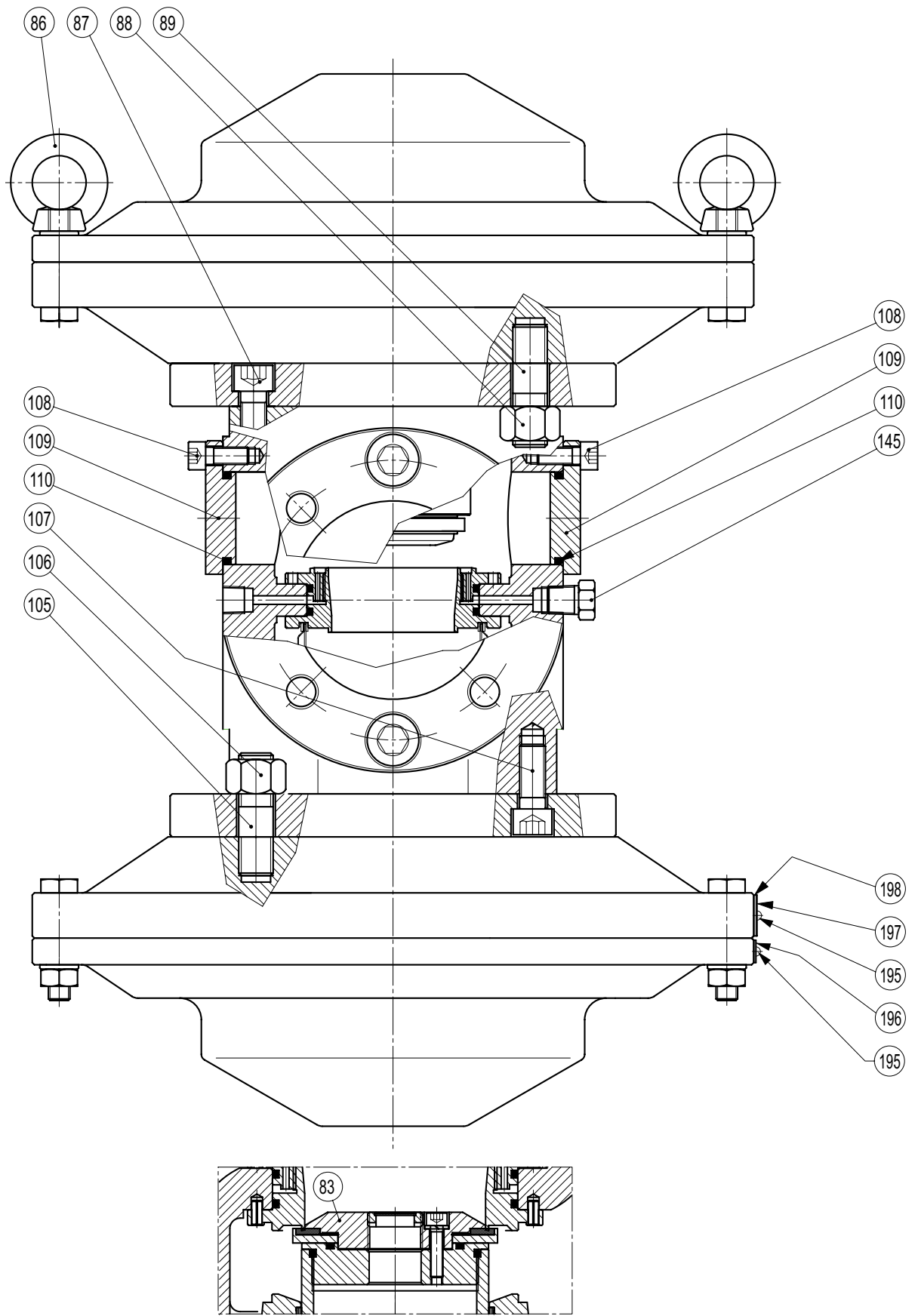


Figure 7. Type Cronos CC Regulator with Monitor

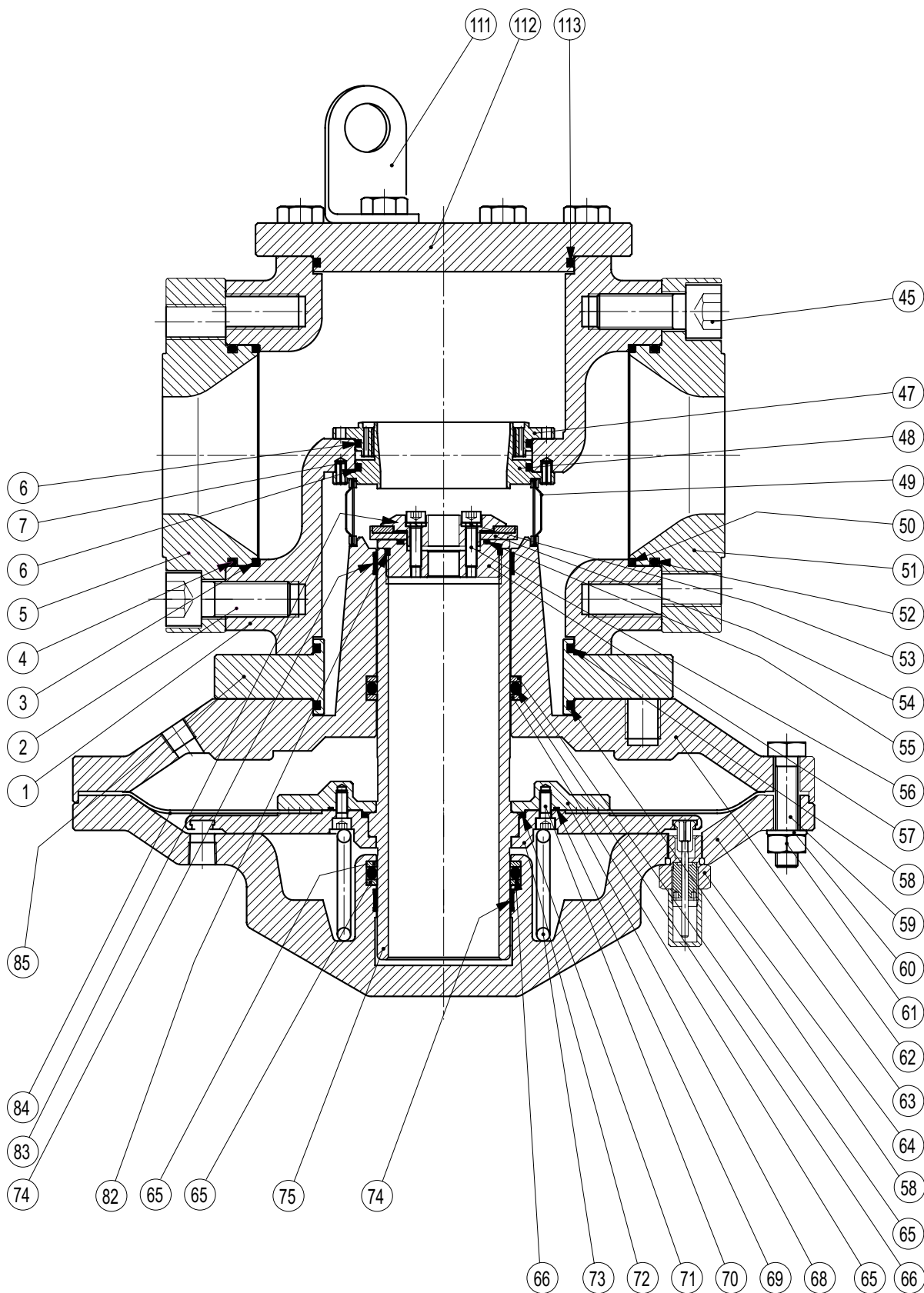
Type CRONOS



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DN 80 REGULATOR DETAIL

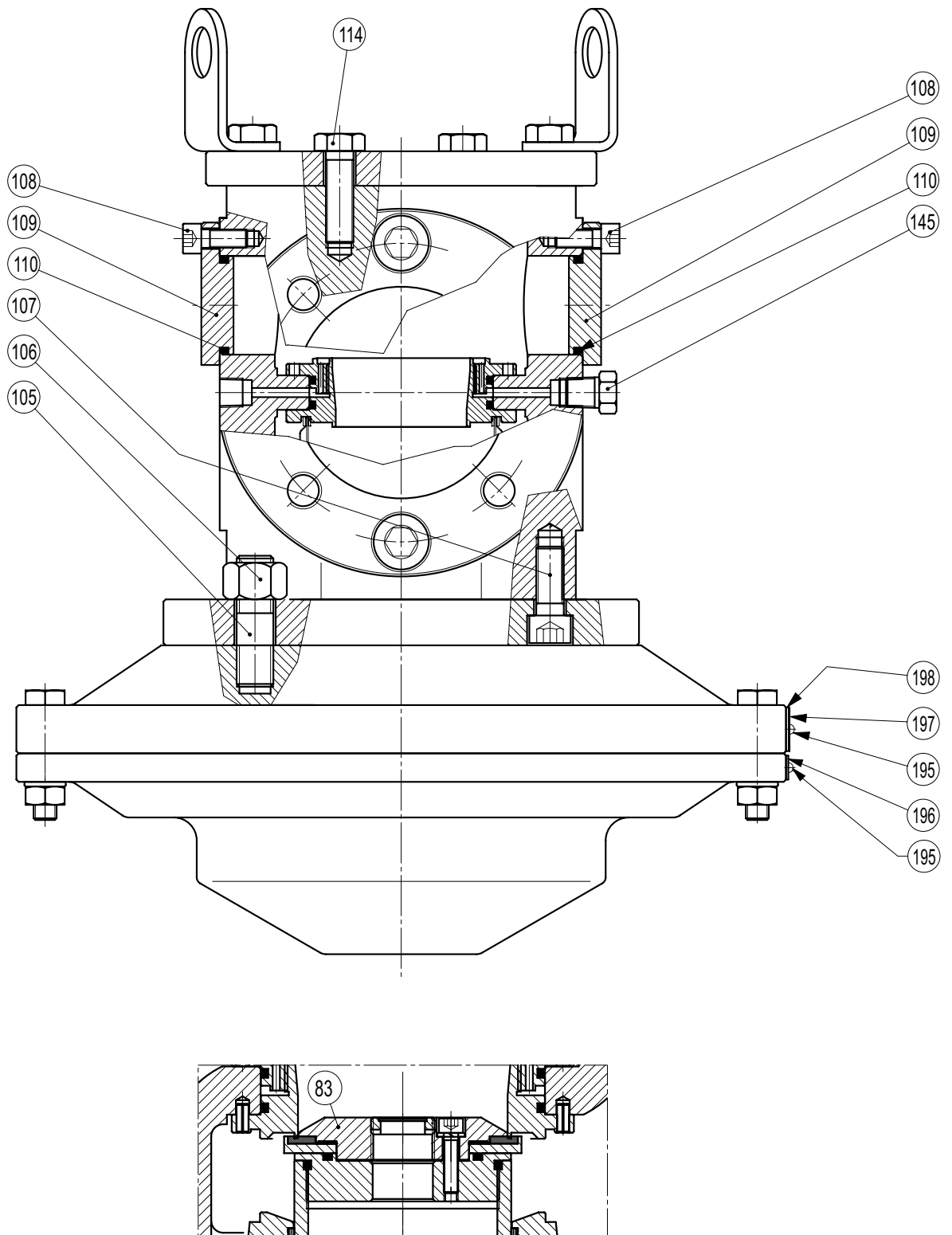
Figure 7. Type Cronos CC Regulator with Monitor (continued)



LM/1513

Figure 8. Type Cronos C Regulator

Type CRONOS



DN 80 REGULATOR DETAIL

LM/1513

Figure 8. Type Cronos C Regulator (continued)

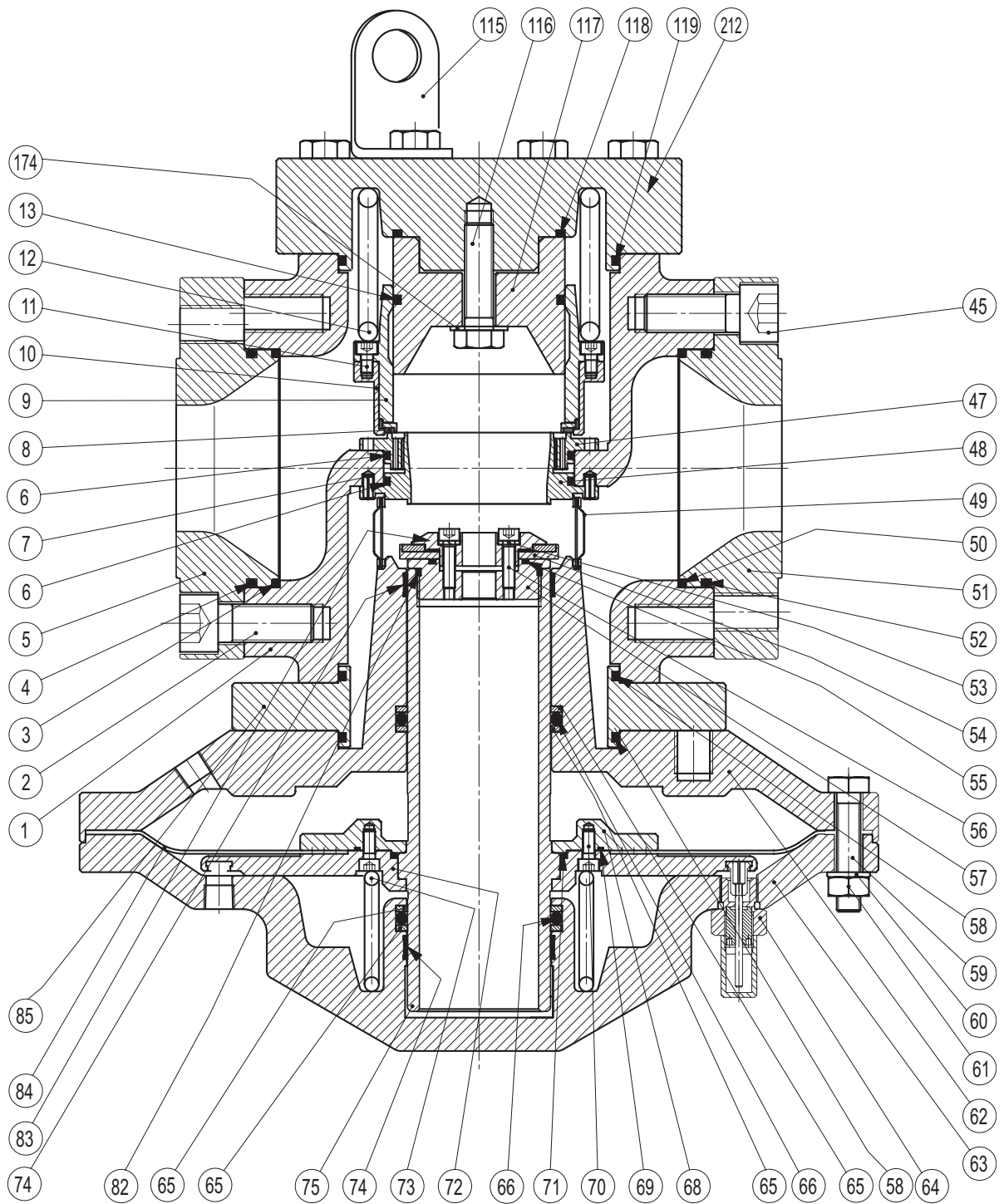
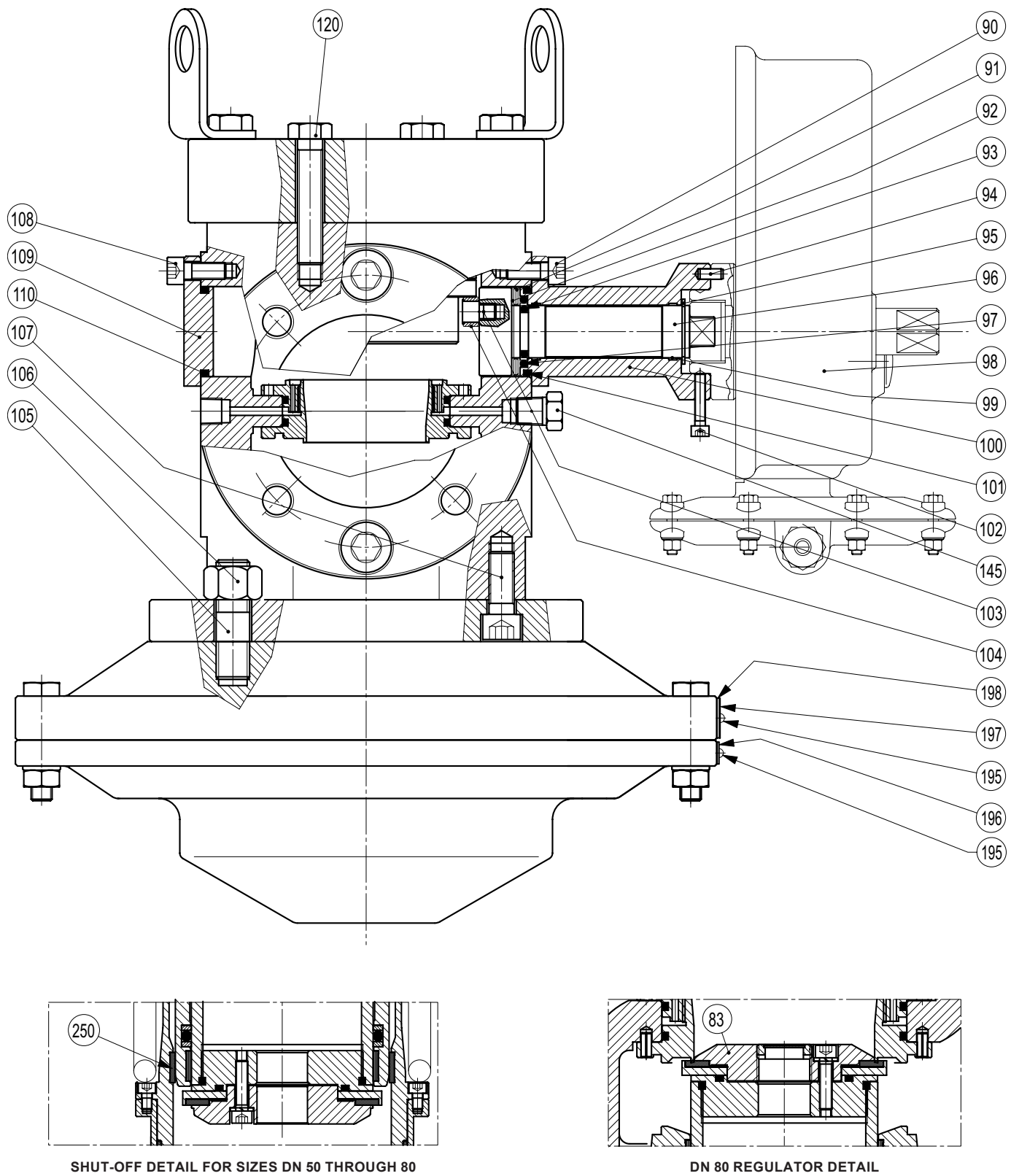


Figure 9. Type Cronos CB Regulator with Built-in Slam-shut Device

Type CRONOS



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Figure 9. Type Cronos CB Regulator with Built-in Slam-shut Device (continued)

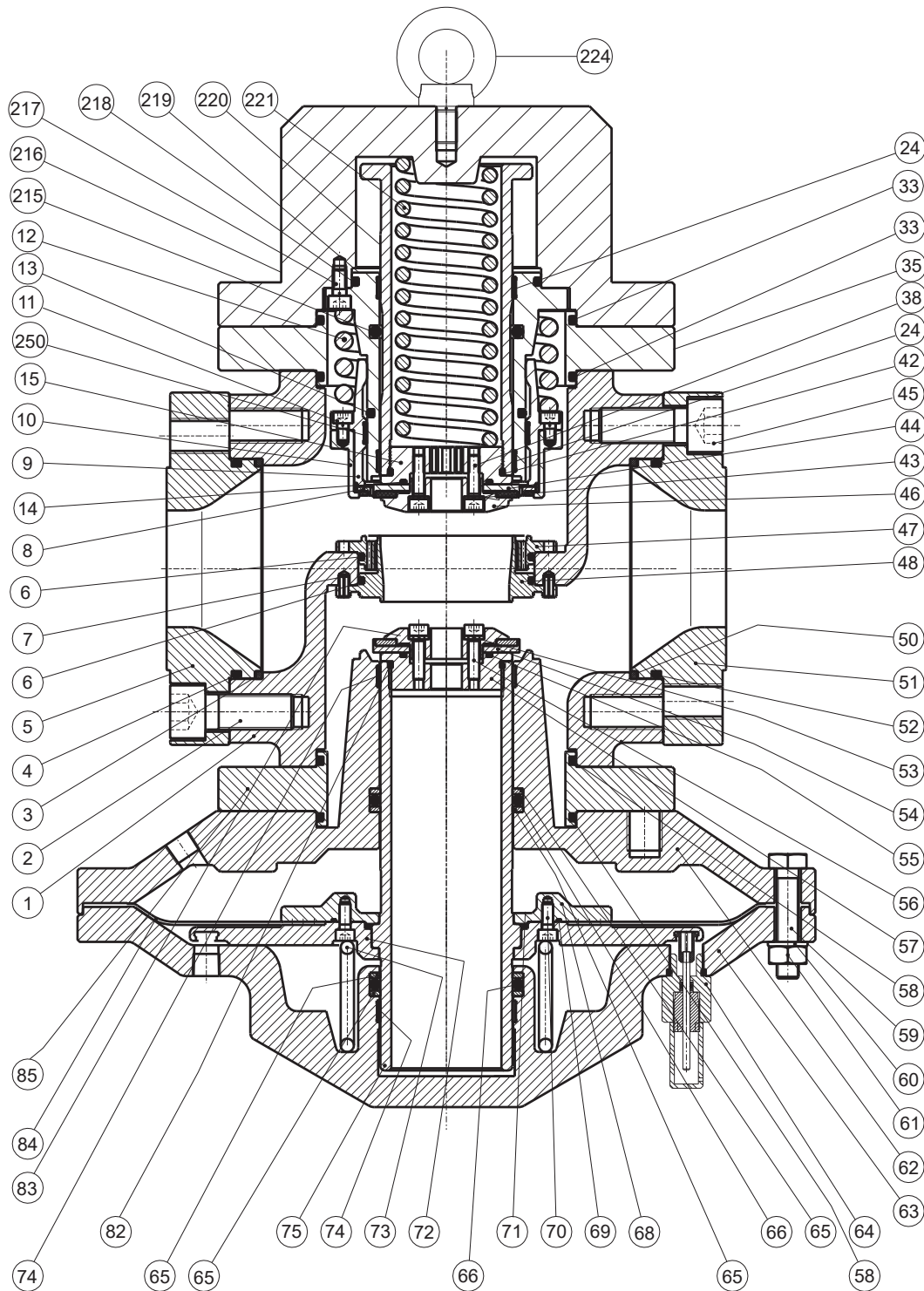


Figure 10. Type Cronos CBB Regulator

Type CRONOS

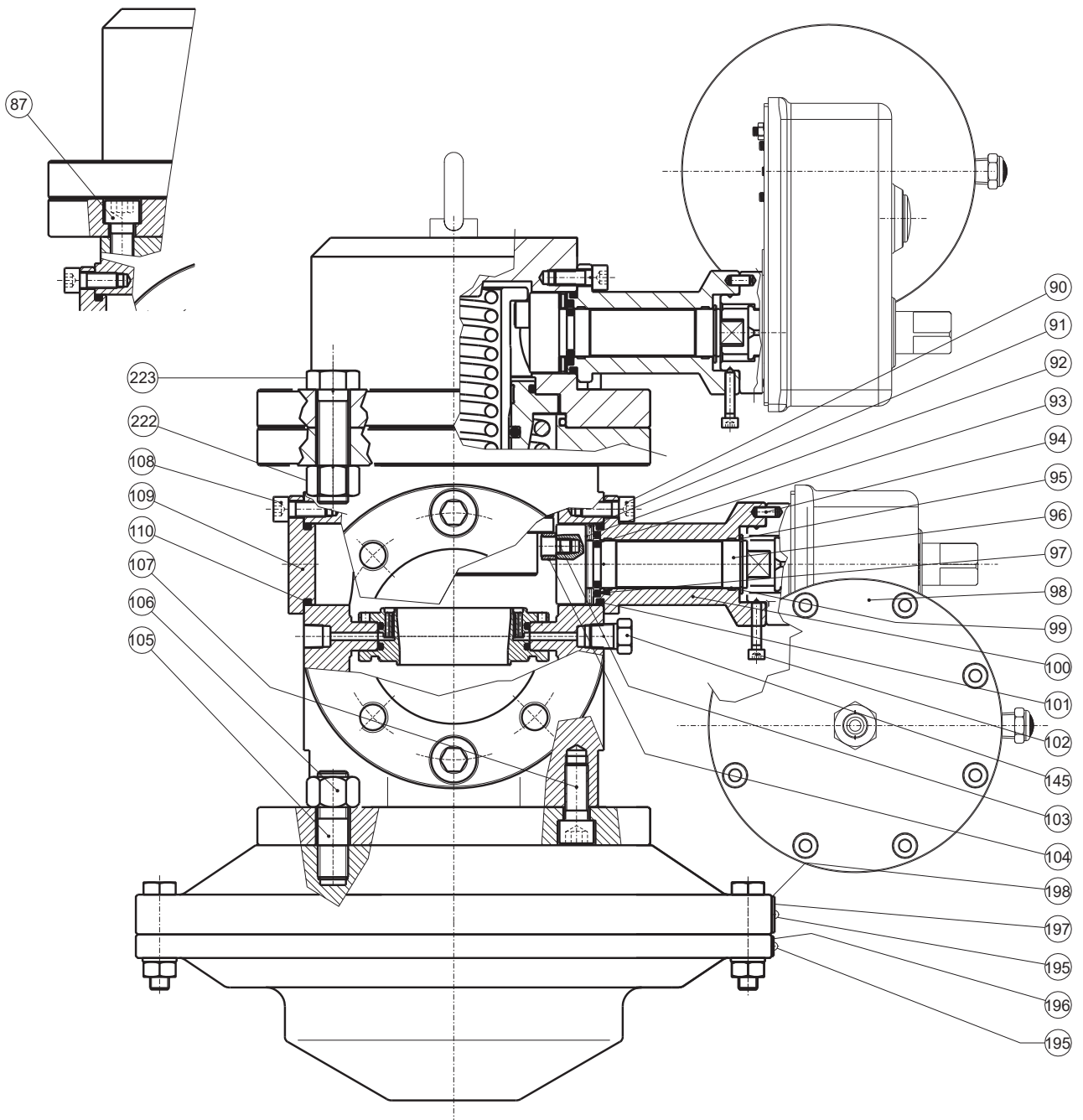
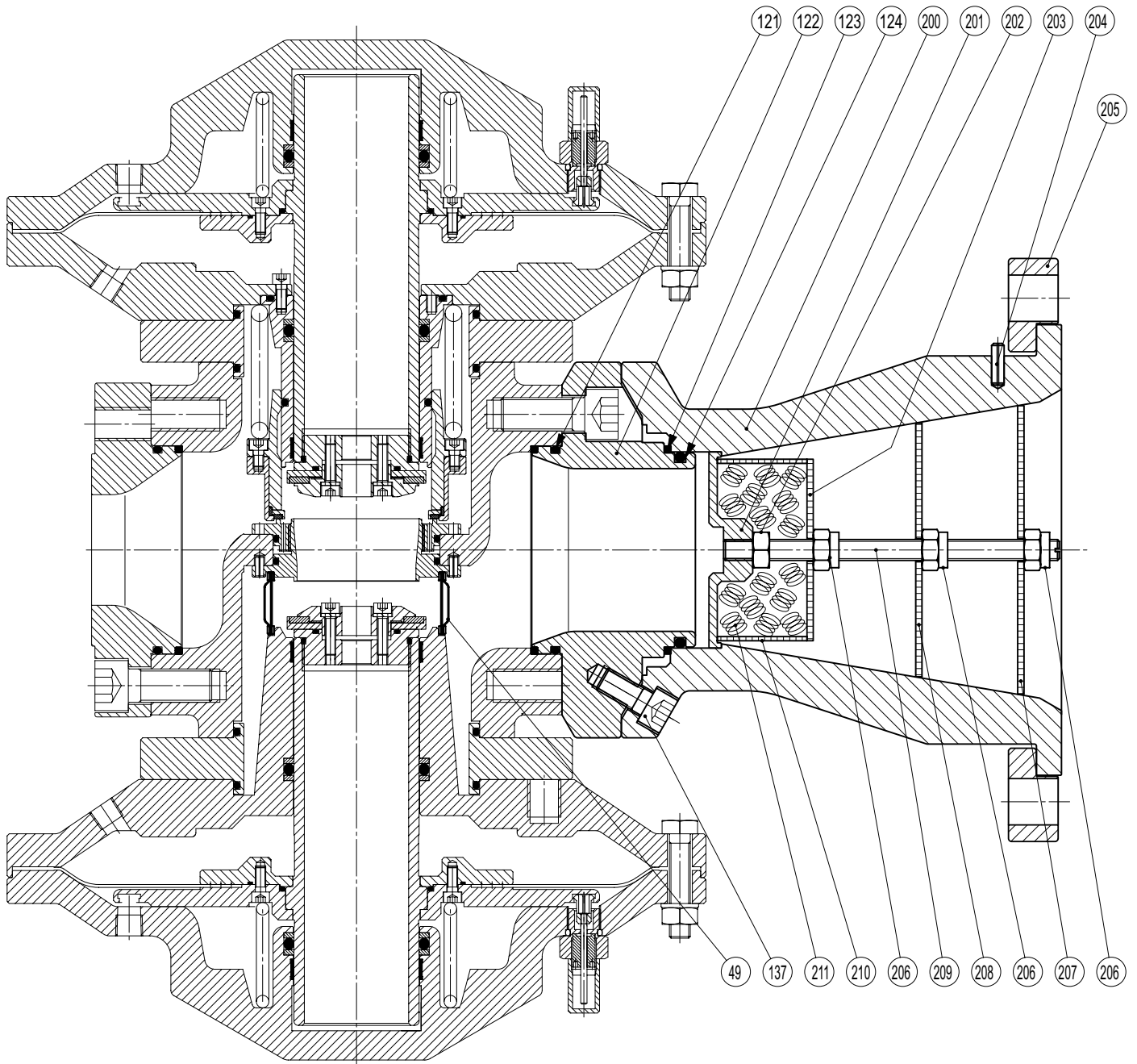
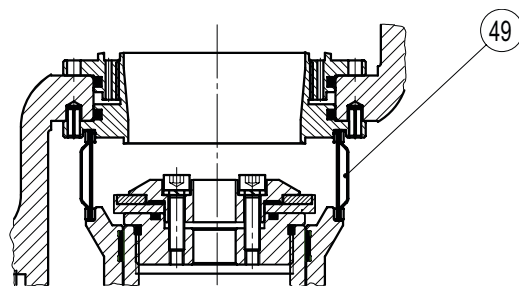


Figure 10. Type Cronos CBB Regulator (continued)



CRONOS SERIES REGULATOR WITH TYPE SRS SILENCER

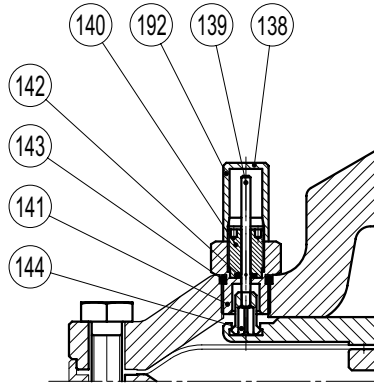


DETAIL OF TYPE SR

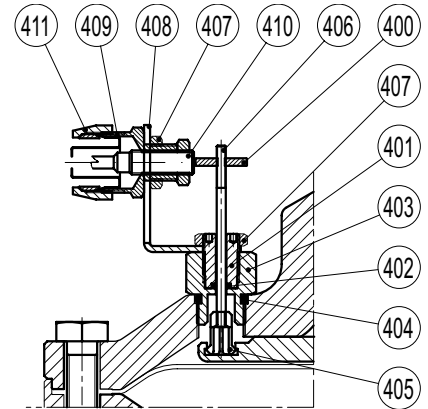
LM/1513

Figure 11. Types SR and SRS Silencers for Cronos Series Regulators

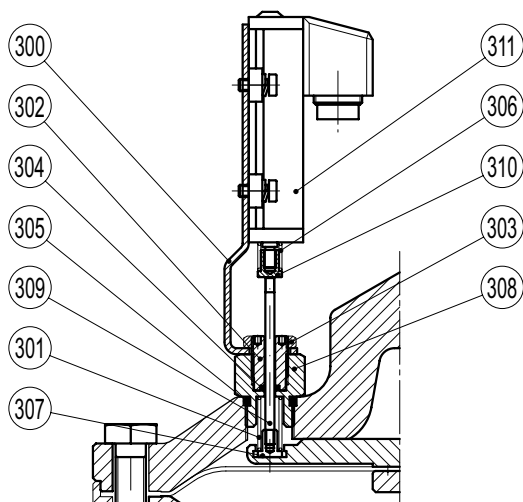
Type CRONOS



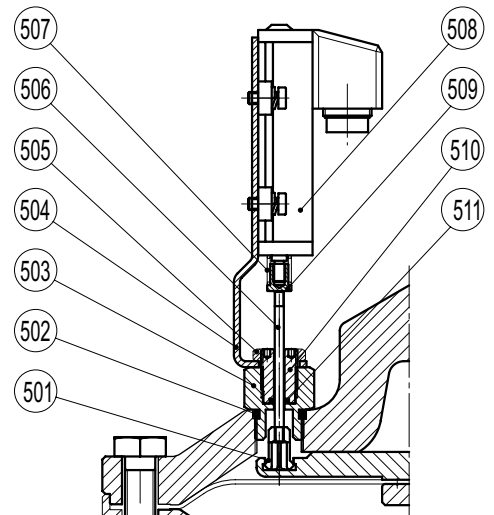
MECHANICAL TRAVEL INDICATOR DETAIL



PROXIMITY SWITCH DETAIL

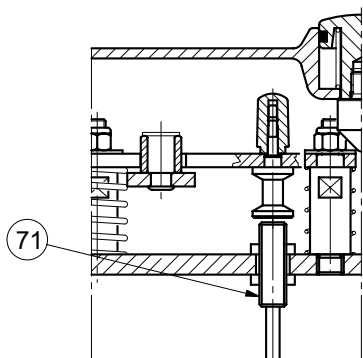


**TRANSDUCER DETAIL
(FOR DOWNSTREAM PRESSURE UP TO 5 BAR)**

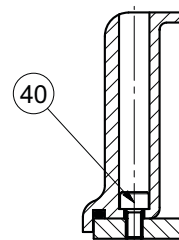


**TRANSDUCER DETAIL
(FOR DOWNSTREAM PRESSURE HIGHER THAN 5 BAR)**

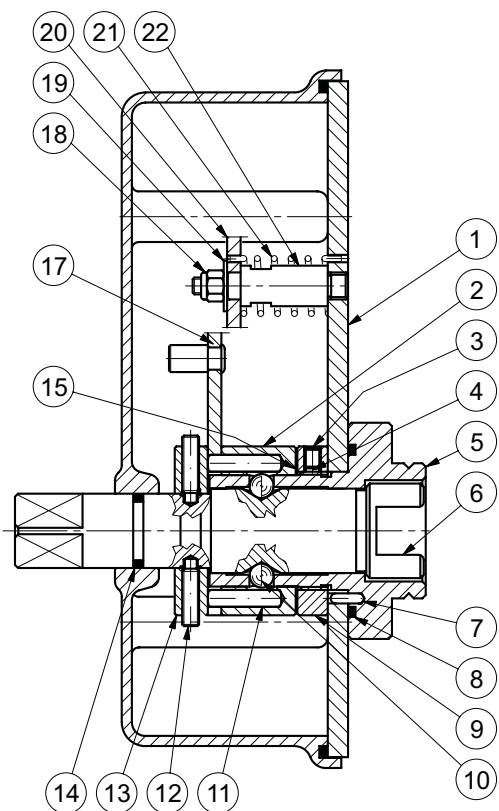
Figure 12. Travel Indicators for Cronos Series Regulators



DETAIL OF TYPE OS/80X WITH MICROSWITCH



SECTION D-D



SECTION C-C

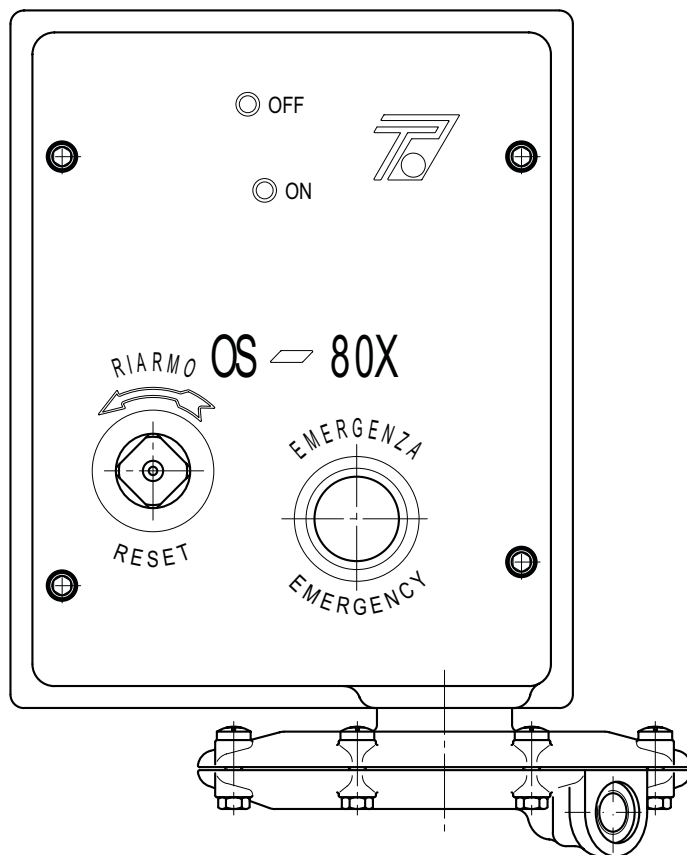
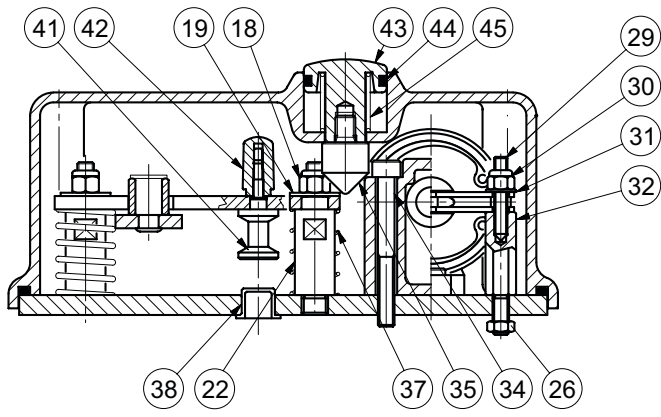
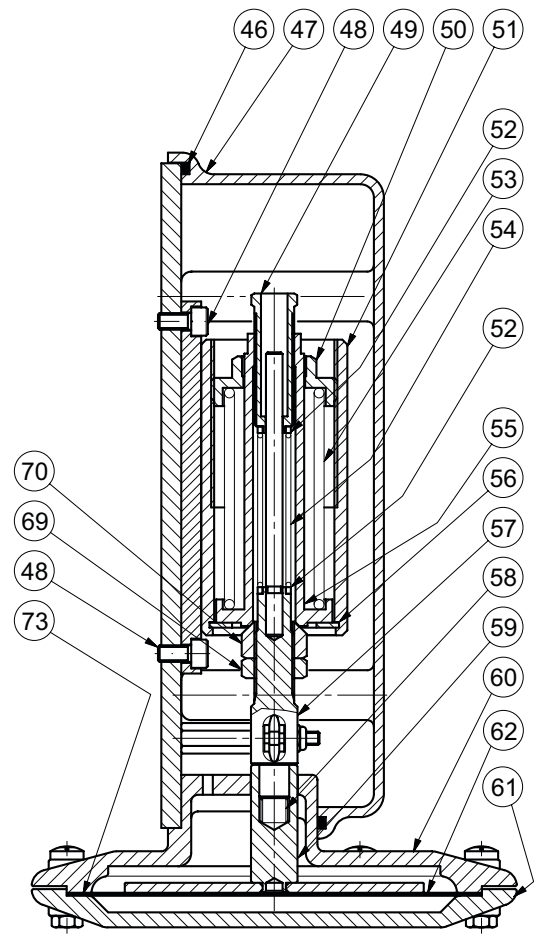
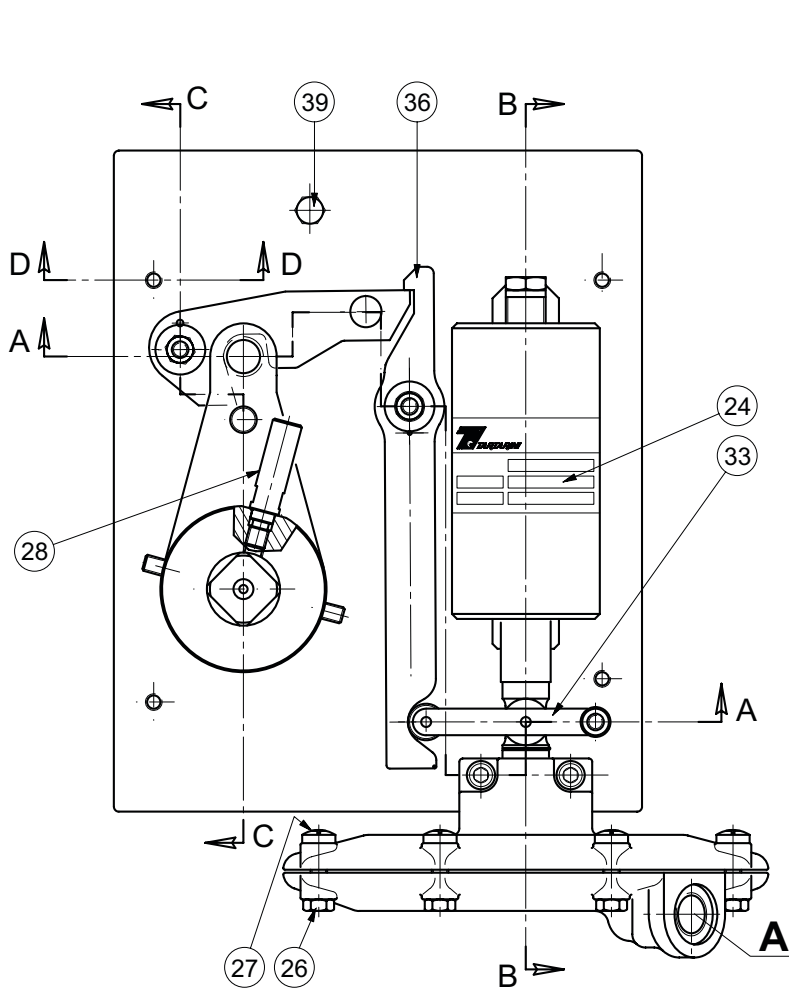


Figure 13. OS/80X Series Controller (Standard Version)

Type CRONOS



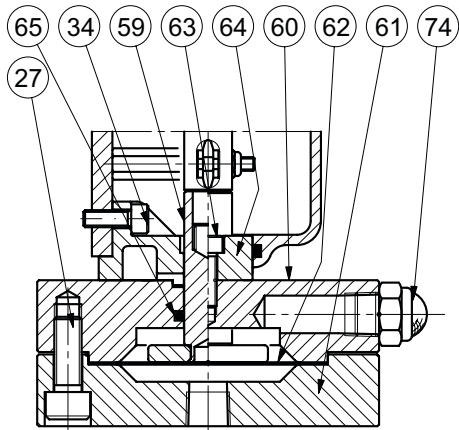
SECTION A-A



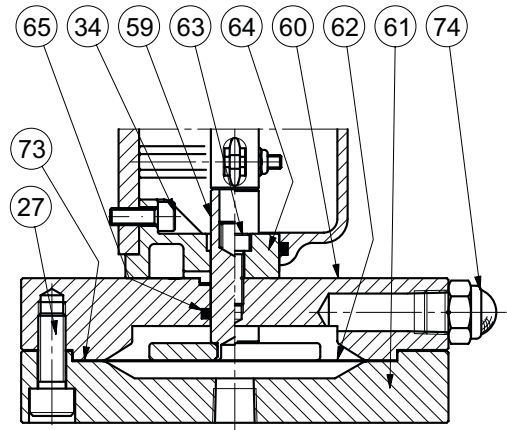
SECTION B-B

LM/1389

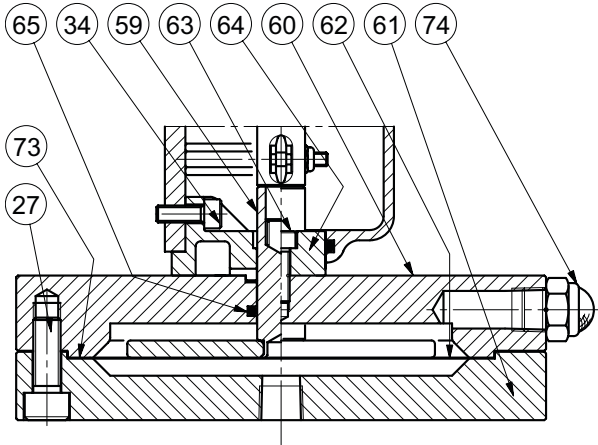
Figure 13. OS/80X Series Controller (Standard Version) (continued)



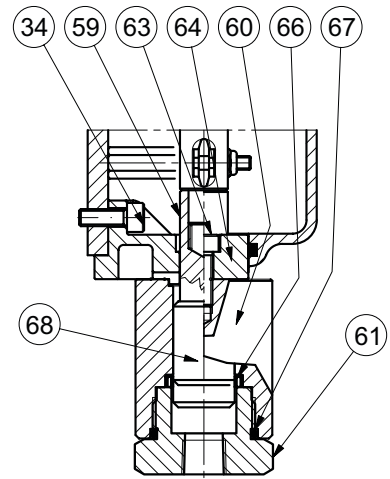
TYPE OS/80X-APA-D DETAIL



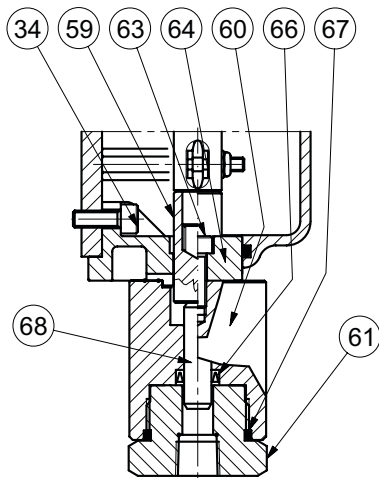
TYPE OS/80X-MPA-D DETAIL



TYPE OS/80X-BPA-D DETAIL

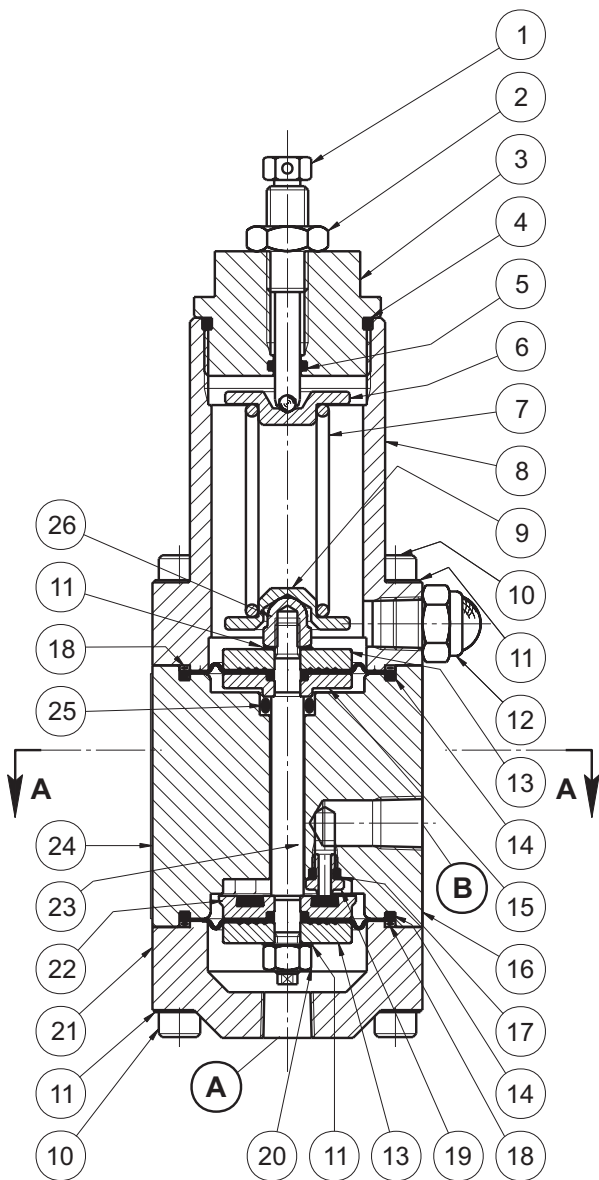


TYPE OS/84X DETAIL

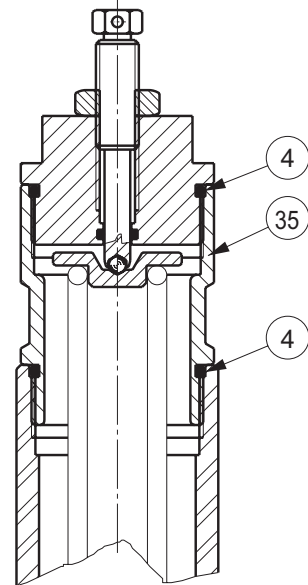


TYPE OS/88X DETAIL

Type CRONOS



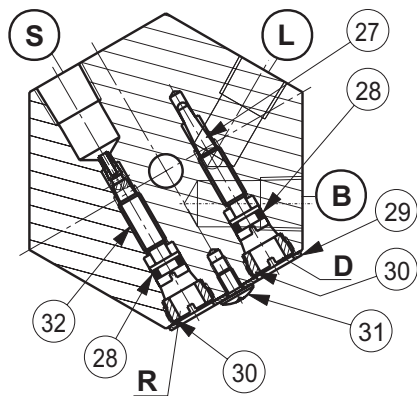
TYPES PRX/120 AND PRX/125



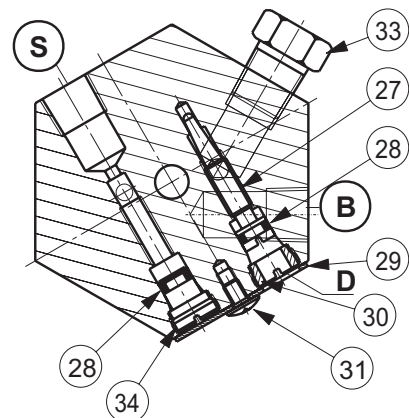
AP VERSION

Type PRX/120 Connections

CODE	BOOT TRIM	TUBE AND HARD TRIM
A	Downstream impulse	Downstream impulse
B	Outlet discharge	Pilot feed
S	Pilot feed	Outlet discharge
L	To regulator loading pressure chamber	To regulator loading pressure chamber



TYPE PRX/120 VERSION - SECTION A-A



TYPE PRX/125 VERSION - SECTION A-A

LM/1390

Figure 14. Types PRX/120 and PRX/125 Pilots

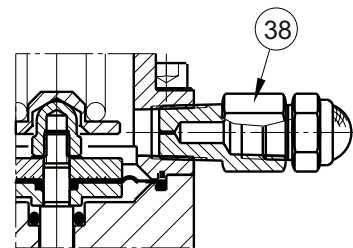
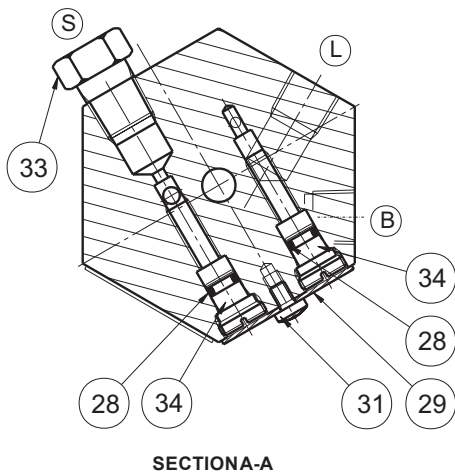
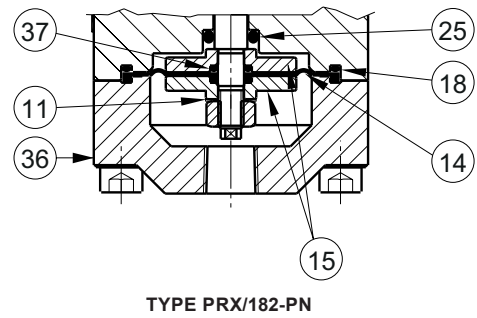
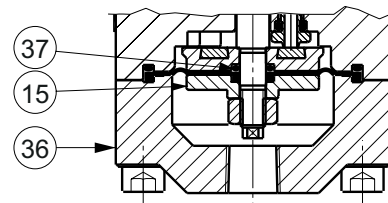
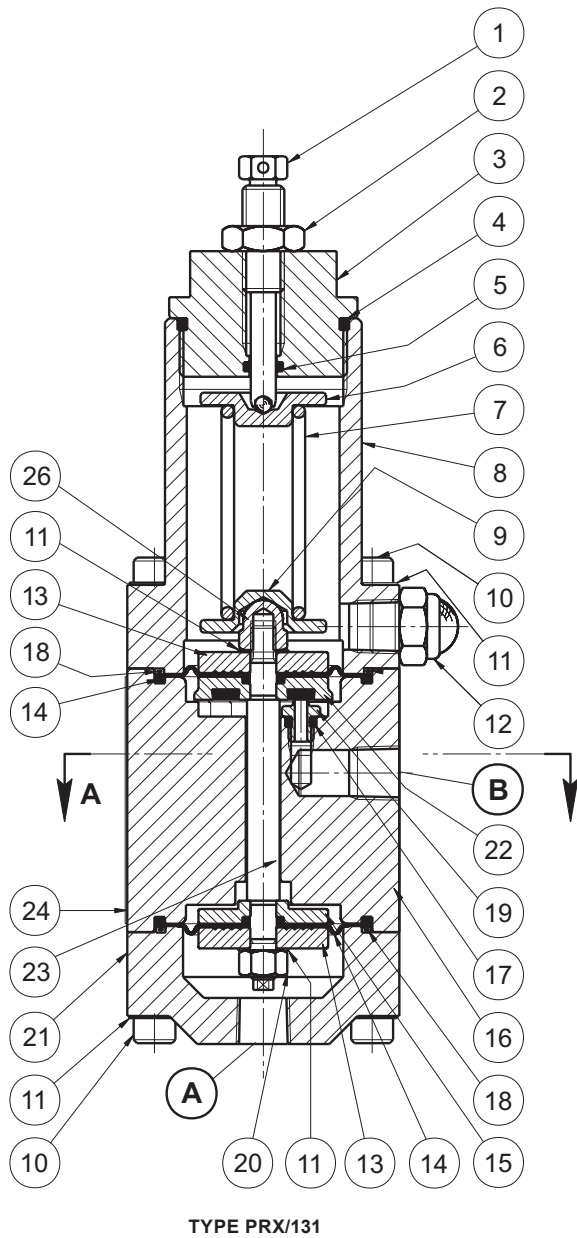
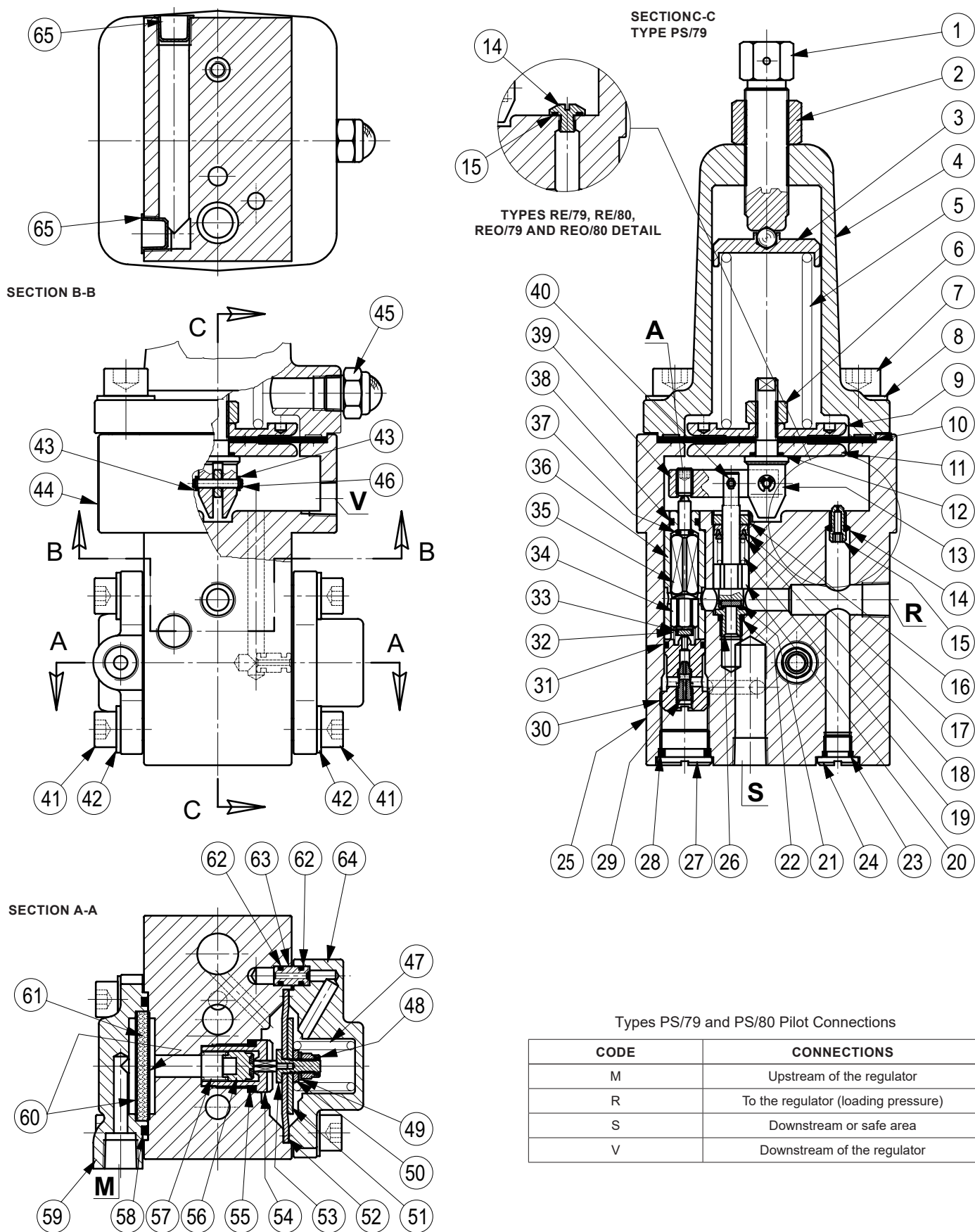


Figure 15. Type PRX/131 Pilot

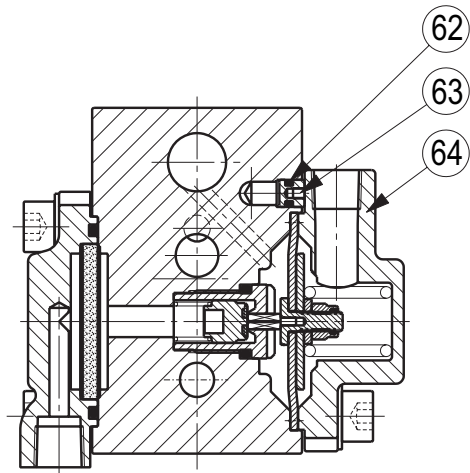
Figure 16. Types PRX/181-PN and PRX/182-PN Pilots

Type CRONOS

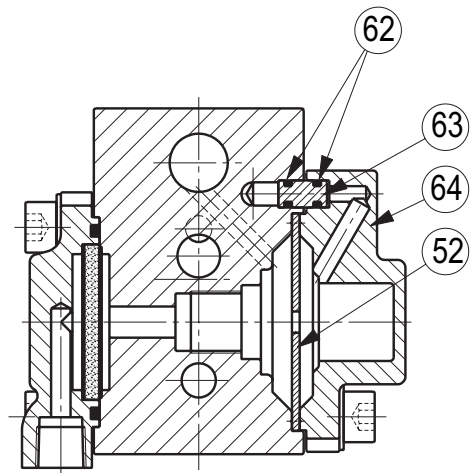


LM/1346

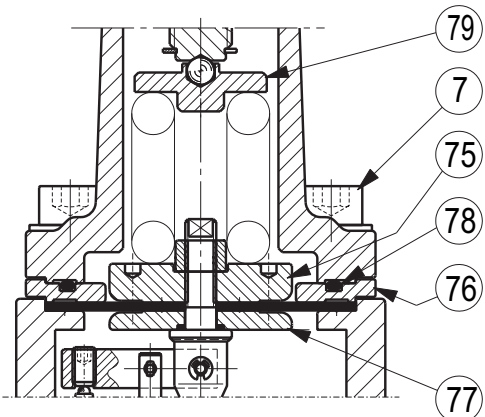
Figure 17. Types PS/79, PS/80, RE/79 and RE/80 Pilots



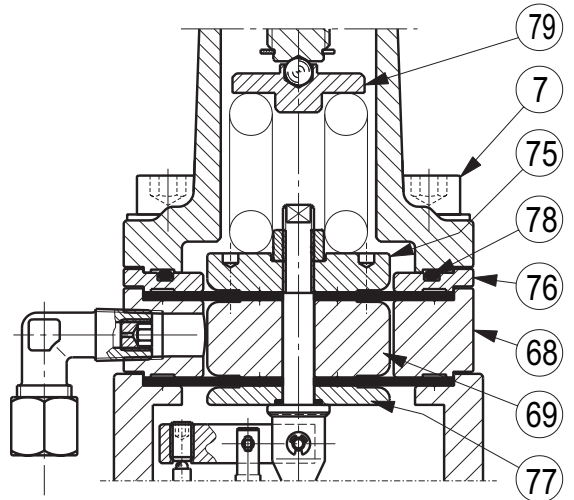
TYPES REO/79 AND REO/80



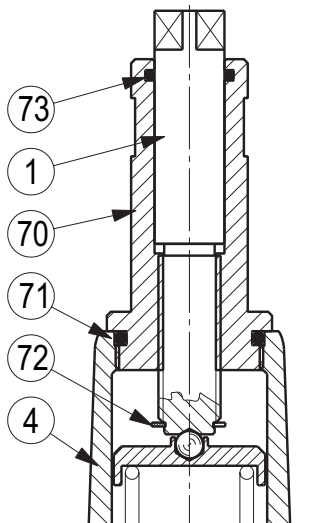
TYPES PSO/79 AND PSO/80



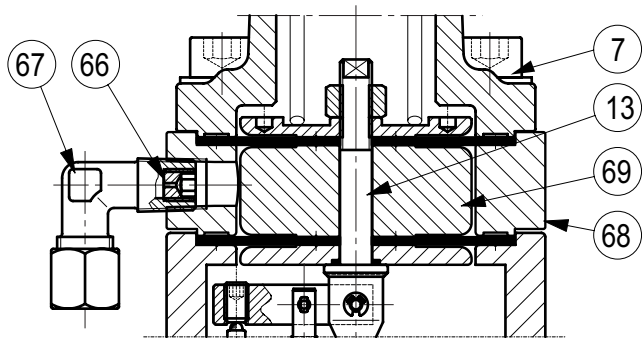
TYPE PS/79-AP



TYPE PS/80-AP



TYPES PS/79-D AND PS/80-D

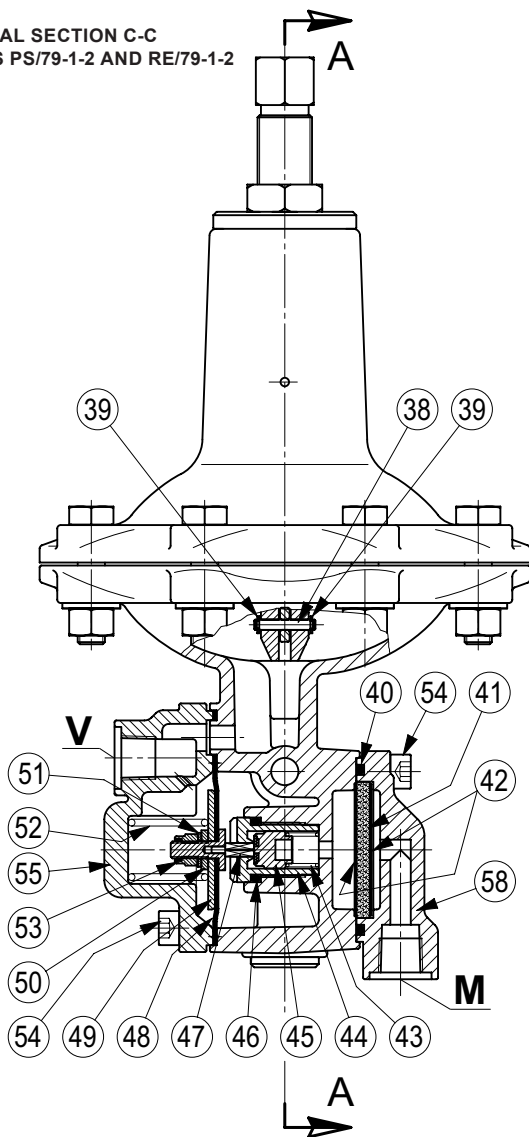


TYPE PS/80

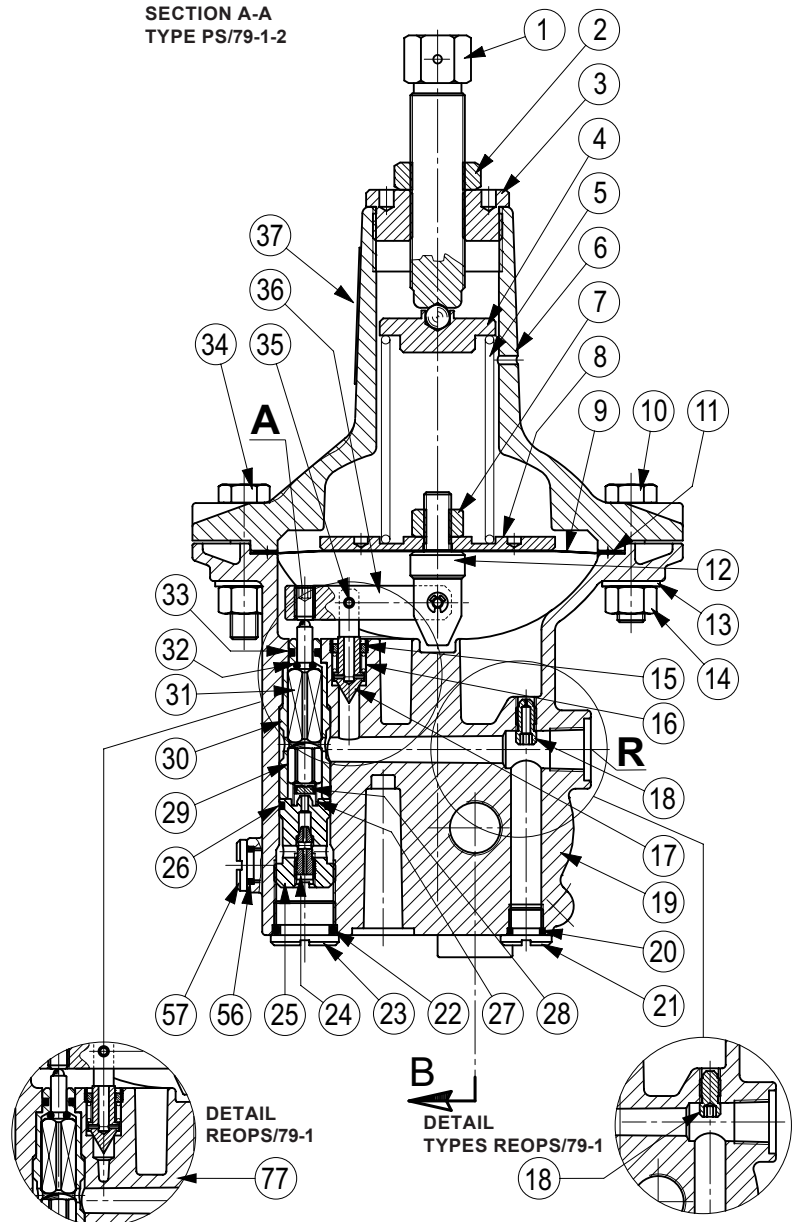
Figure 17. Types PS/79, PS/80, RE/79 and RE/80 Pilots (continued)

Type CRONOS

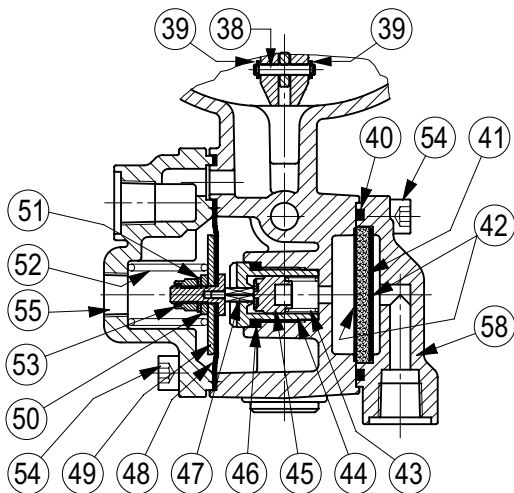
PARTIAL SECTION C-C
TYPES PS/79-1-2 AND RE/79-1-2



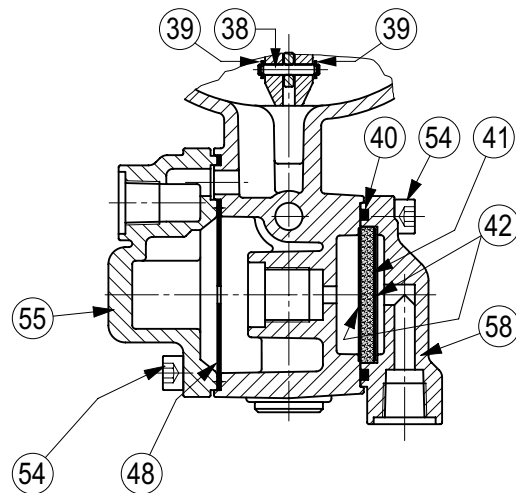
SECTION A-A
TYPE PS/79-1-2



TYPES REOPS/79-1 AND REO/79-2



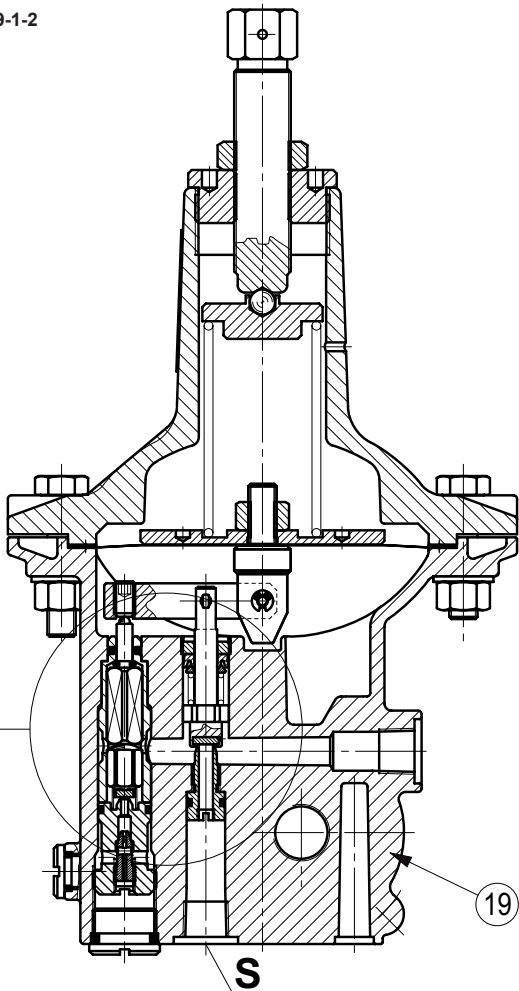
TYPE PSO/79-1-2



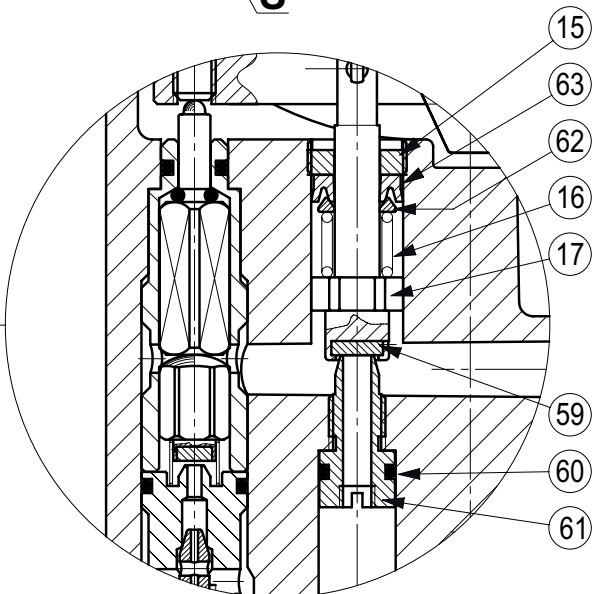
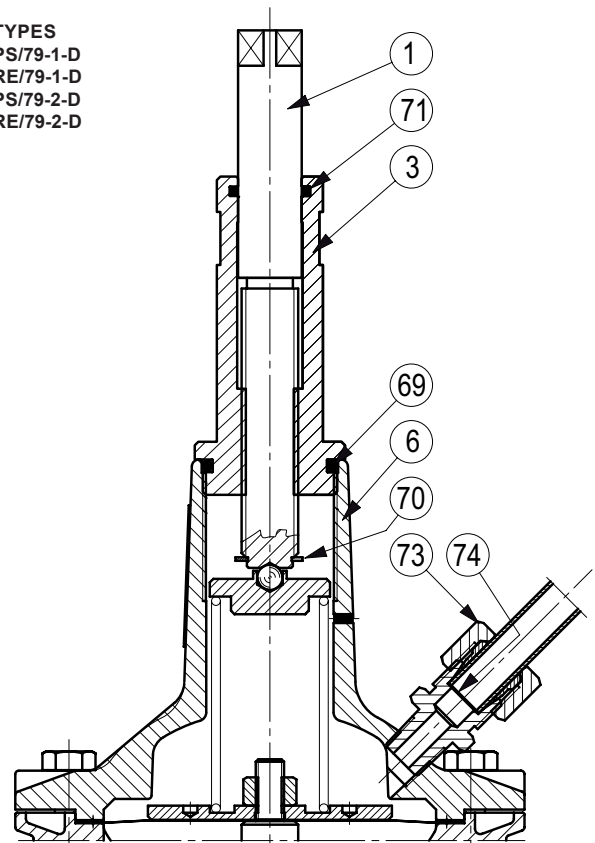
LM/1348

Figure 18. Types PS/79-1, PS/79-2, RE/79-1 and RE/79-2 Pilots

TYPES RE/79-1-2



TYPES
PS/79-1-D
RE/79-1-D
PS/79-2-D
RE/79-2-D



Types PS/79-1 and PS/79-2 Pilot Connections

CODE	CONNECTIONS
M	Upstream of the regulator
R	To the regulator (loading pressure)
S	Downstream or safe area
V	Downstream of the regulator

Figure 18. Types PS/79-1, PS/79-2, RE/79-1 and RE/79-2 Pilots (continued)

Type CRONOS

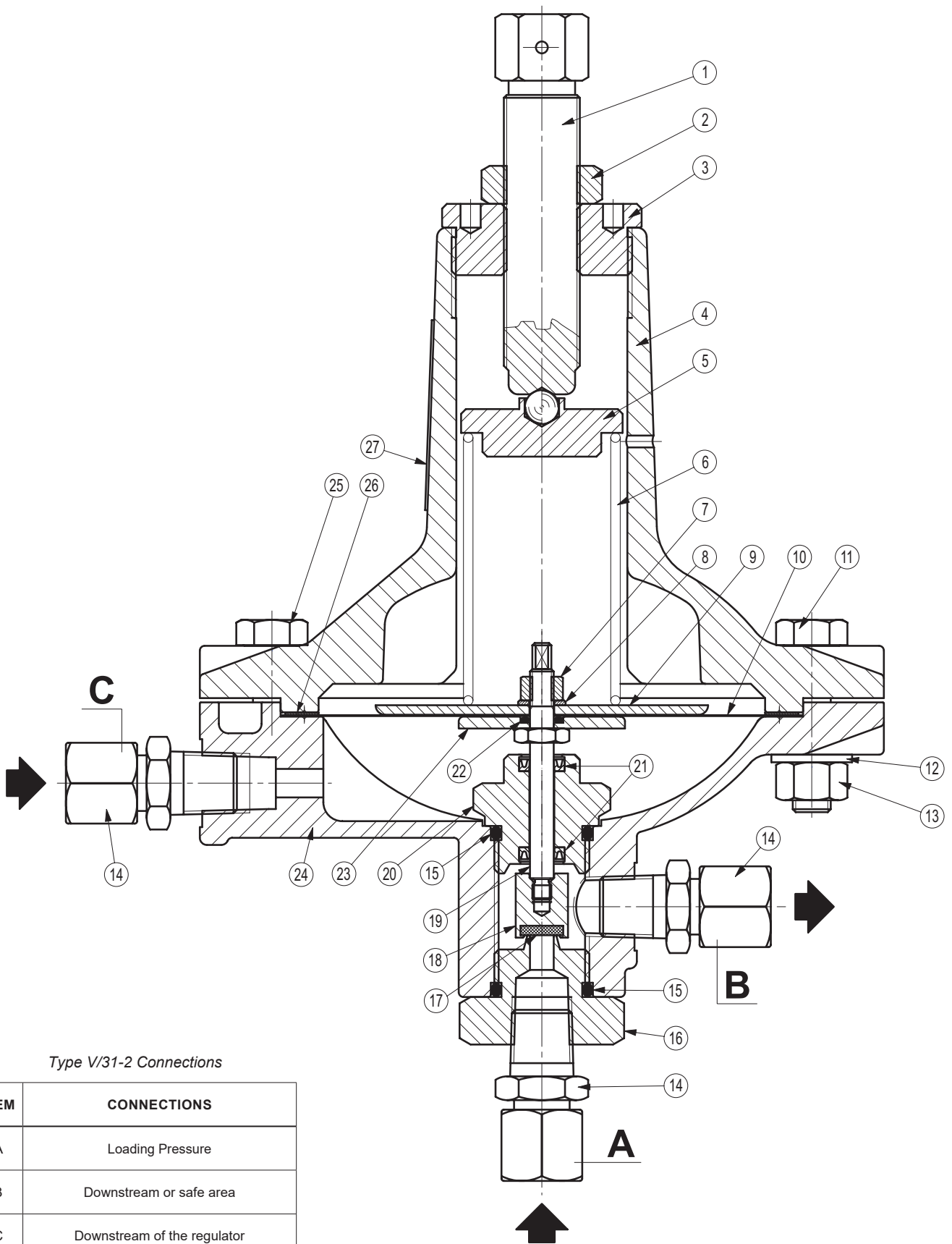
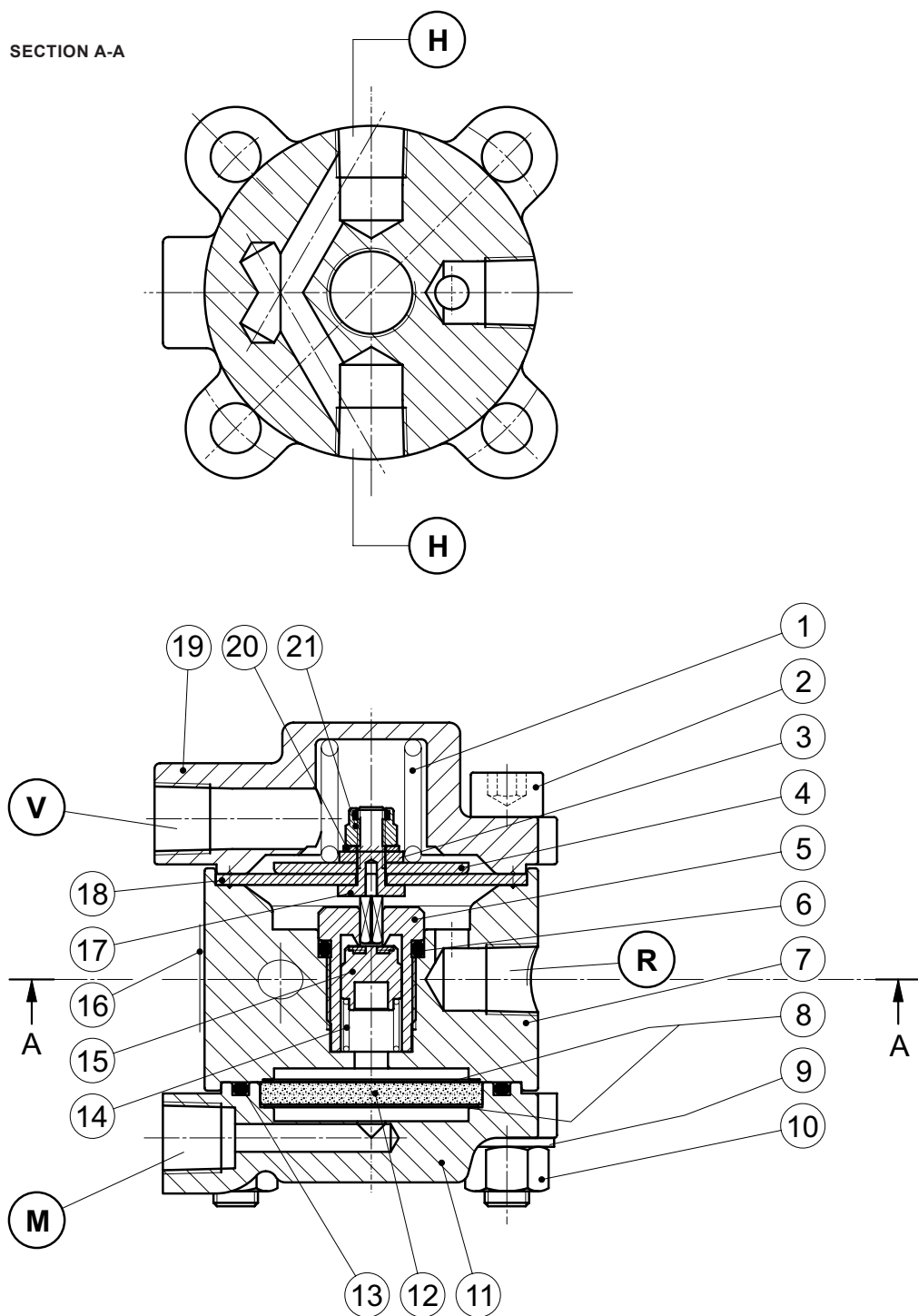


Figure 19. Type V/31-2 Booster Valve Assembly



Type SA/2 Connections

CODE	CONNECTIONS
H	Water inlet/outlet
M	Upstream of the regulator
R	To the pilot feed
V	Downstream of the regulator

LM/1162

Figure 20. Type SA/2 Stabilizer Filter Assembly


Type CRONOS

 Webadmin.Regulators@emerson.com

 Tartarini-NaturalGas.com

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