

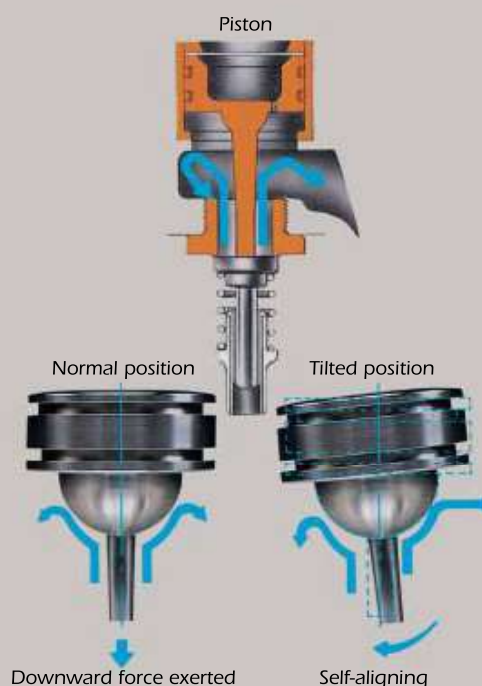


STEAM PRESSURE REDUCING VALVES

COSR-3
COSR-16
COSR-21



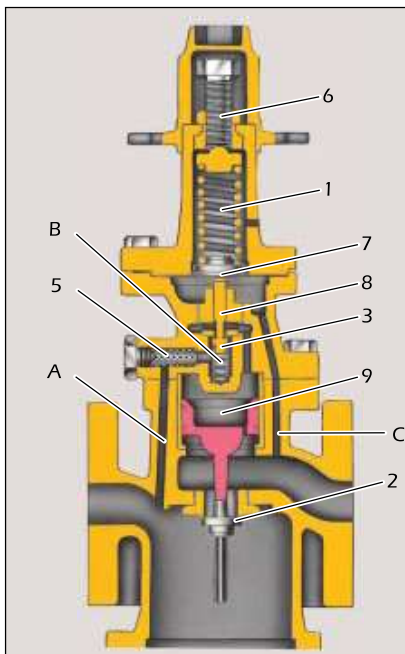
SAS: Shock Absorbing Spherical Piston



Features

- The shock absorbing spherical (**SAS**) piston maintains the secondary pressure with high accuracy.
- Stable secondary pressure can be maintained, even with fluctuations in primary pressure or flow rate.
- Self-aligning feature allows the piston to move smoothly, resulting in accurate responsive control.
- Internal primary and secondary pressure sensing channels make external sensing line attachments to the valve unnecessary for most applications.
- All key internal parts are made of stainless steel.
- Motorized type (**M-COSR**) and computerized (**MC-COSR**) valves are also available.

How It Works



Until upper coil spring (1) is compressed, main valve (2) and pilot valve (3) are closed. Steam enters through passage (A), passes through screen (5) and enters pilot chamber (B).

When secondary pressure is set by tightening adjusting screw (6), upper coil spring (1) is compressed and diaphragm (7) flexes, forcing pilot guide (8) to open pilot valve (3). Steam enters chamber above piston (9), forcing it down. Main valve (2) opens the orifice, providing steam to the secondary side.

Some steam, entering the outlet side, flows through outlet pressure passage (C) into a chamber below the diaphragm (7), and lifts it. The position of pilot valve (3) is then determined by the balance of the upward force on the diaphragm with the downward force of upper coil spring (1). Thus the preset secondary steam pressure itself adjusts the force applied to the piston (9) and the opening of the main valve (2). Secondary pressure remains stable at all times.

Standard Specifications

Model	COSR-3		COSR-16		COSR-21
Body Material*	Cast Iron	Ductile Cast Iron	Cast Iron	Ductile Cast Iron	Ductile Cast Iron
Connection	Screwed	Flanged	Screwed	Flanged	Flanged
		ASME DIN		ASME DIN	ASME DIN
Size (mm)	20, 25	20, 25, 32, 40, 50	15, 20, 25, 40, 50	15, 20, 25, 32, 40, 50, 65, 80, 100, 125**, 150	15, 20, 25, 32, 40, 50, 65, 80, 100
Max. Operating Pressure (MPaG) PMO	0.3		1.6		2.1
Max. Operating Temperature (°C) TMO	220		220		220
Primary Pressure Range (MPaG)	0.1 – 0.3		0.2 – 1.6		1.35 – 2.1
Adjustable Pressure Range (all conditions must be met)	0.01 – 0.05 MPaG		Within 10 - 84% of primary pressure but with minimum pressure of 0.03 MPaG		From 0.55 MPaG to 84% of primary pressure
	—		Differential pressure between 0.07 – 0.85 MPa		Maximum differential pressure 0.85 MPa
Minimum Adjustable Flow Rate	5% of rated flow rate***		5% of rated flow rate*** (65 mm and larger: 10% of rated flow rate***)		

* COSR-3 flanged: cast stainless steel sizes 20, 25, 40, 50 available on request

COSR-16 flanged: cast stainless steel sizes 15, 20, 25, 40, 50 (ASME and DIN) and cast steel sizes 65 & 80 (DIN) available on request

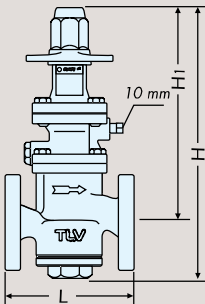
** Not available with DIN *** See SDS (Specification Data Sheet) for rated flow rate

PRESSURE SHELL DESIGN CONDITIONS (NOT OPERATING CONDITIONS): Maximum Allowable Pressure (MPaG): PMA: 1.6 (Cast Iron), 2.1 (Ductile Cast Iron)
Maximum Allowable Temperature (°C) TMA: 220



To avoid abnormal operation, accidents or serious injury, DO NOT use this product outside of the specification range. Local regulations may restrict the use of this product to below the conditions quoted.

Dimensions

	COSR-3/COSR-16 Screwed, Flanged							(mm)							COSR-21 Flanged							(mm)						
	Size (DN)	Screwed Rc(PT)	L				H	H ₁	Weight** (kg)	Size (DN)	L		H	H ₁	H	H ₁	Weight* (kg)											
			ASME Class								DIN2501	ASME Class						DIN2501	ASME	DIN								
	125FF	150RF	250RF	300RF	PN25/40	150RF	300RF	PN25/40	ASME	DIN																		
	(15)	175	—	170	—	170	130	357	285	9.5[10]	(15)	161	167	130	405	305	377	305	11[12]									
	(20)	—	—	182	—	182	150	—	—	11[11]	(20)	172	178	150	—	—	—	—	13[13]									
	25	190	176	188	180	192	160	—	282	13[13]	25	181	187	160	422	302	—	302	15[15]									
	32	220	206	220	220	220	180	385	295*	17[19]	32	212	219	180	457	322	405	322	19[21]									
	40	—	209	220	222	224	200	—	302	19[20]	40	215	222	200	—	—	—	—	21[22]									
	50	260	247	255	260	261	230	412	315	26[27]	50	254	260	230	490	335	432	335	36[29]									
65	—	362	372	377	378	290	554	411	55[57]	65	371	377	290	655	430	576	432	59[59]										
80	—	365	374	383	384	310	—	—	59[58]	80	374	384	310	—	—	—	—	62[60]										
100	—	—	450	450	450	350	633	448	95[87]	100	434	450	350	768	468	655	470	95[89]										
125	—	434	434	456	456	—	—	—	119[—]	() No ASME standard exists for ductile cast iron; machined to fit steel flanges																		
150	—	600	600	622	622	480	810	530	204[180]	Other standards available, but length and weight may vary * Weight is for Class 300 RF, [] DIN PN 25/40																		

Sizes 15 – 25 mm shown. Configuration of larger sizes differs slightly.

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ISO 9001/ISO 14001

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Kakogawa, Japan

is approved by LRQA Ltd. to ISO 9001/14001



(M)

Internet World Wide Web URL <http://www.tlv.com>

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Specifications subject to change without notice.

TLV[®]

COSPECT[®]

PRESSURE REDUCING VALVES

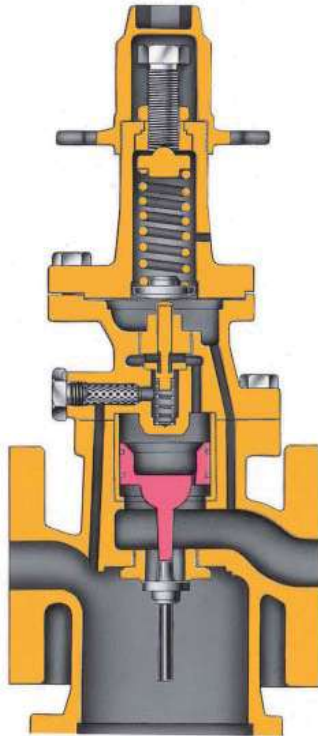
**Three-in-One
Pressure Regulator,
Separator, and
Steam Trap**



COSPECT:

Three-in-One Design

A Product of Advanced Fluid Control Technology



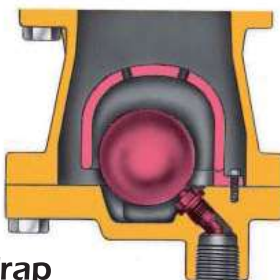
1. SAS

Shock Absorbing Spherical piston



2. SCE

Super Cyclonical Effects separator



3. SST

Super Steam Trap

Three sub-units combine to form the reliable, accurate, cost-effective **COSPECT**

Reducing valves had remained essentially unchanged for decades—conventional designs seemed good enough. But manufacturers increasingly demanded more effective process control for improved product quality; **TLV** responded with this remarkable innovation.

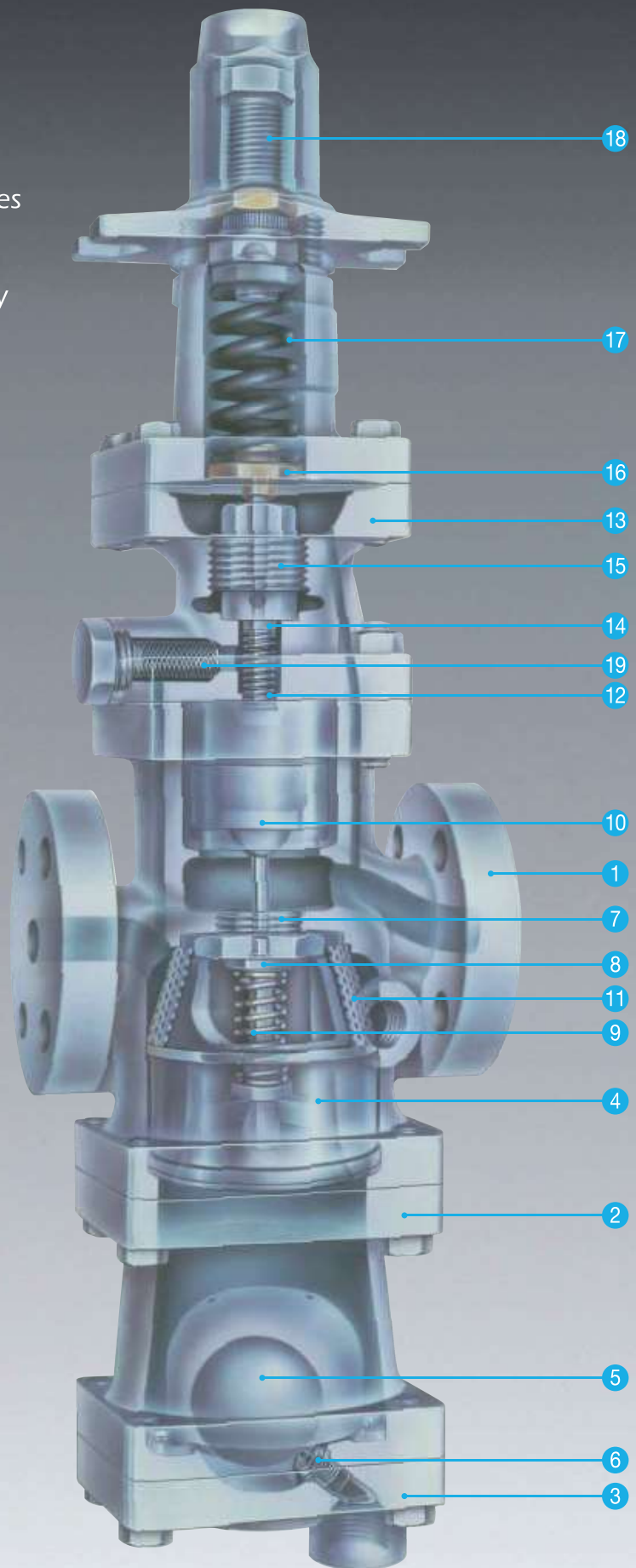
With conventional pressure reducing valves, wide variations in primary pressure cause the secondary pressure to fluctuate; this produces temperature variation, which results in inconsistent product quality. Also, valve hunting and vibration make it difficult to accurately set the precise system pressure needed. These valves are also subject to failure from the effects of rust, scale, and other impurities. In addition, conventional condensate separators do not efficiently remove condensate, reducing the productivity of steam-using equipment.

TLV applied its fluid control technology to solve these critical problems. The answer? The **COSPECT**—an innovative design with three unique features: **SAS**, **SCE** and **SST**.

Construction

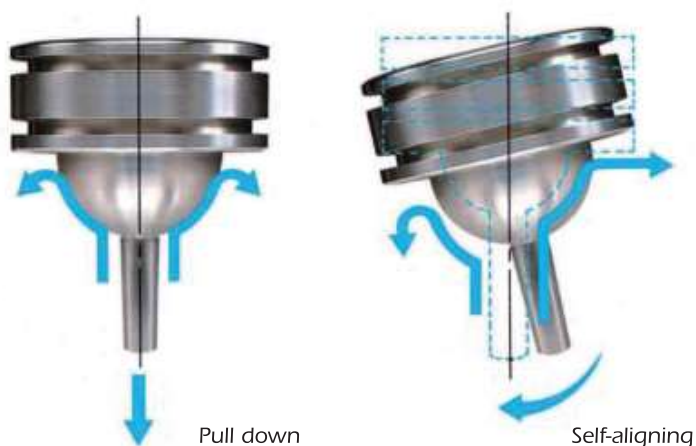
The three remarkable features—**SAS**, **SCE**, and **SST** combine into a single space-saving unit, which also simplifies system layout, piping, and maintenance. **COSPECT**. Three problem-solvers in one to increase productivity and improve product quality.

Part	Material
1 Main body	Cast iron or Ductile cast iron
2 Trap body	Cast iron or Ductile cast iron
3 Trap cover	Cast iron or Ductile cast iron
4 Separator	Stainless steel or Ductile cast iron
5 Float	Stainless steel
6 Trap valve seat	Stainless steel
7 Main valve seat	Stainless steel
8 Main valve	Stainless steel
9 Main valve spring	Stainless steel
10 Piston	Stainless steel
11 Separator screen	Stainless steel
12 Pilot valve spring	Stainless steel
13 Pilot body	Cast iron or Ductile cast iron
14 Pilot valve	Stainless steel
15 Pilot valve seat	Stainless steel
16 Diaphragm	Stainless steel
17 Coil spring	Carbon steel
18 Adjustment screw	Cr-Mo steel
19 Pilot screen	Stainless steel



Three **COSPECT** Design Breakthroughs Provide Dry Saturated Steam at a Constant Pressure and Temperature.

1. SAS: Shock-Absorbing Spherical Piston



High Stability of Set Pressure

The spherical surface of this new SAS piston creates a low pressure area in the passing steam flow. This pulls the piston down, making the orifice easy to open for accurate, responsive control. The piston is also self-centering when the valve stem tilts. As illustrated, steam flows slower through the shorter path on the left side than on the right side, creating a high pressure region on the left side and a low pressure region on the right side. This pressure difference causes the piston to self-align. The unique SAS design permits a smooth high velocity flow eliminating the turbulent steam flow characteristic of conventional valve designs.

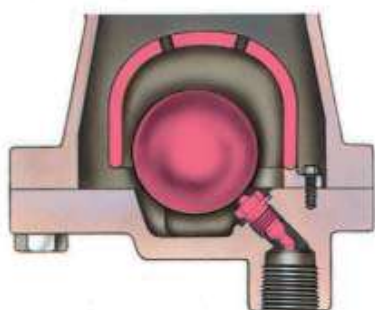
2. SCE: Super Cyclonical Effects Separator



98% Separation Efficiency

This unique SCE separator provides dry saturated secondary steam by effectively removing condensate and scale with its 98% separation efficiency, thus improving steam equipment productivity due to greater heat transfer. The pressure reducing valve service life is extended since the effective removal of condensate and scale protects the main valve from erosion.

3. SST: Super Steam Trap



Continuous Discharge and Seal-tight Shut-off

Separated condensate is instantly removed by this SST continuous discharge trap. The three-point seating design and precision ground spherical ball float provides seal-tight shut-off even under no-load conditions.

Glossary

Primary pressure: Steam pressure at the inlet of the pressure regulator.

Secondary pressure: Steam pressure at the outlet of the pressure regulator.

Minimum adjustable flow rate: Minimum flow that can be maintained at a constant pressure level.

Set pressure: Desired secondary pressure.

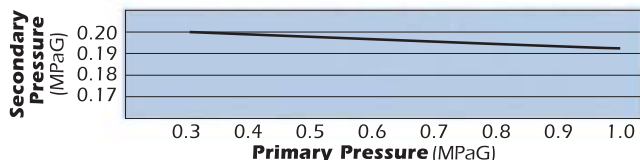
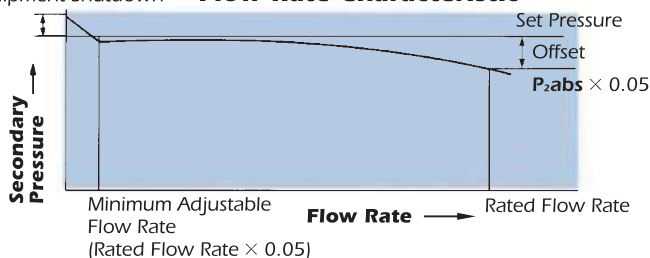
Rated flow rate: Maximum flow rate, at secondary pressure, that can be obtained within a given offset when the primary pressure is held constant.

Pressure rise: The increase in set pressure, following steam-using equipment shutdown by closing the inlet valve to the equipment.

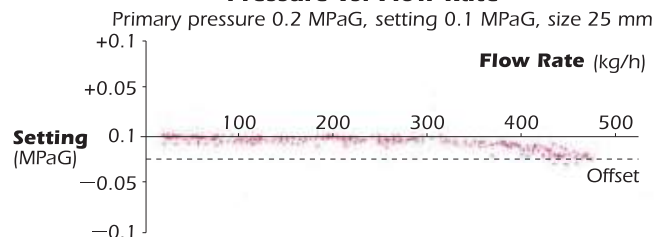
Offset: Difference between actual secondary pressure and set pressure, when flow rate is increased from the minimum adjustable flow rate to the rated flow rate while primary pressure is held constant.

Pressure Rise Following Equipment Shutdown

Flow Rate Characteristic



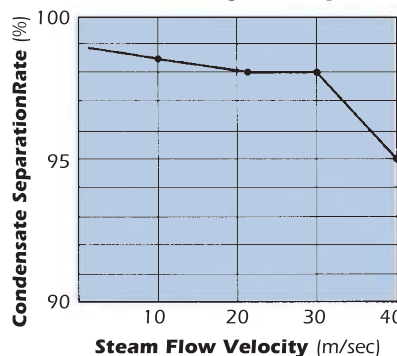
Pressure vs. Flow Rate



Above: The pressure and flow characteristic data prove stable valve performance: accurate pressure reduction is maintained even if flow varies. This test data was obtained by computer-controlled automated testing equipment.

Left: After setting the secondary pressure of 0.2 MPaG when the primary pressure is 0.3 MPaG the chart illustrates the variation of the secondary pressure when the primary pressure is increased to 1.0 MPaG

Steam Flow Velocity vs. Separation Rate



Accuracy: $\pm 2\%$
Condensation: 40 - 50 kg per hour

This test data demonstrates that the SCE separator provides the exceptionally high condensate separation rate of 98.5% at a steam flow velocity of 10 m/sec.

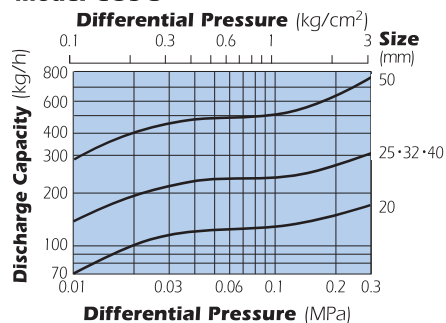
Separation rate (%) is given as:

$$\frac{\text{quantity of condensate discharged}}{\text{quantity of incoming condensate}} \times 100$$

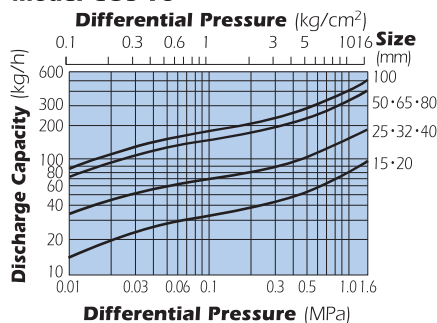
.....This combined with the pressure reducing function of the valve, delivers virtually 100% dry steam downstream.

Condensate Discharge Capacities

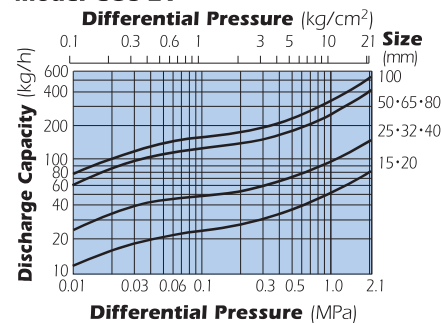
Model COS-3



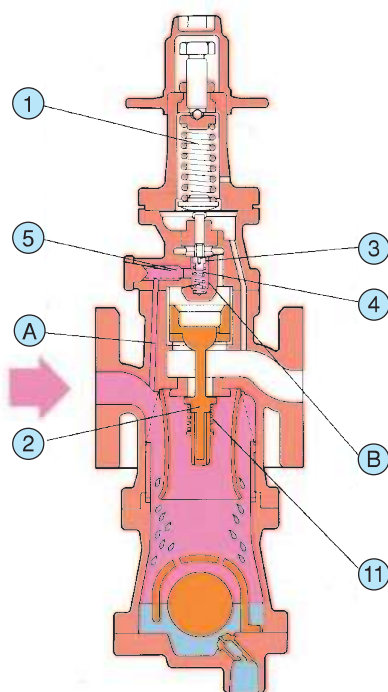
Model COS-16



Model COS-21

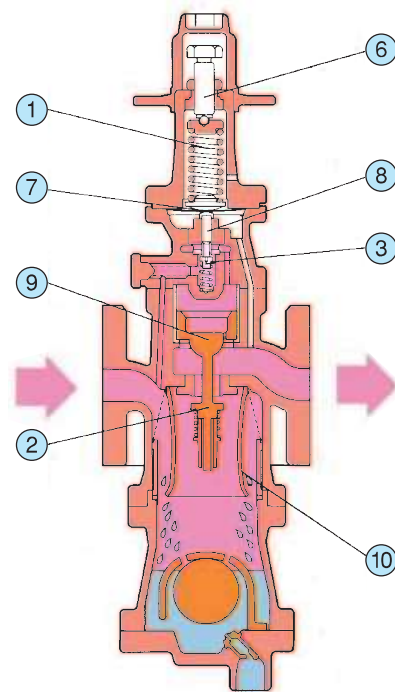


This discharge capacity chart shows maximum hourly discharge rates of condensate 6 °C below saturated steam temperature. The pressure differential is the difference between the trap primary and secondary pressures.



1

Until upper coil spring ① is compressed, main valve ② and pilot valve ③ are held closed by main valve spring ⑪ and pilot valve spring ④. Steam enters through passage ⑤, passes through pilot screen ⑥ and enters pilot chamber ⑦.



Standard Specifications

Model	COS-3			COS-16			COS-21		
Body Material*	Cast Iron		Ductile Cast Iron	Cast Iron		Ductile Cast Iron	Ductile Cast Iron		
Connection	Screwed	Flanged	Flanged	Screwed	Flanged	Flanged	Screwed	Flanged	Flanged
Size (mm)	20, 25	20 - 50	20, 25, 40, 50	15 - 25	15 - 100	15 - 25, 40 - 100	15 - 25	15 - 100	15 - 25, 40 - 100
Max. Operating Press. (MPaG) PMO	0.3			1.6			2.1		
Max. Operating Temp. (°C) TMO	220			220			220		
Primary Pressure Range (MPaG)	0.1 - 0.3			0.2 - 1.6			1.35 - 2.1		
Adjustable Pressure Range (all conditions must be met)	0.01 - 0.05 MPaG			10 - 84% of primary pressure but with minimum press. 0.03 MPaG			From 0.55 MPaG to 84% of primary pressure		
Minimum Adjustable Flow Rate	5% of rated flow rate			Differential press 0.07 - 0.85 MPa			Max. differential Press 0.85 MPa		
	5% of rated flow rate (for 65 - 100 mm: 10% of rated flow rate)								

* COS-3 & COS-16 also available in stainless steel; contact TLV for details

1 MPa = 10 bar = 10.197 kg/cm²

** For rated flow rate, see specification data sheets (SDS) COS-3 / COS-16 and COS-21

PRESSURE SHELL DESIGN CONDITIONS (NOT OPERATING CONDITIONS):

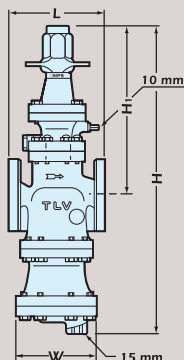
Maximum Allowable Pressure (MPaG) PMA: 1.6 (cast iron), 2.1 (ductile cast iron); Maximum Allowable Temperature (°C) TMA: 220



CAUTION

To avoid abnormal operation, accidents or serious injury, DO NOT use this product outside of the specification range. Local regulations may restrict the use of this product to below the conditions quoted.

Dimensions



Size (mm)	Screwed	L (mm)					H (mm)	H ₁ (mm)	Weight* (kg)
		ASME Class				DIN2501 PN25/40			
		125FF	(150RF)	250RF	(300RF)				
(15)**	175	—	170 [161]	—	170 [167]	150***	495 [515]	285 [305]	15 [16]
(20)		—	182 [172]	—	182 [178]	150			16 [17]
25	190	176	188 [181]	188	192 [187]	160	522 [542]	282 [302]	21 [22]
32	—	206	220 [212]	220	220 [219]	—	572 [592]	302 [322]	25 [27]
40	—	209	220 [215]	222	224 [222]	200			27 [28]
50	—	255	255 [254]	260	261 [260]	230	635 [655]	315 [335]	43 [46]
65**	—	362	372 [371]	377	378 [377]	370***	870 [892]	410 [422]	69 [70]
80**	—	365	374 [374]	383	384 [384]	374***			72 [74]
100**	—	434	434 [434]	450	450 [450]	434***	1028 [1050]	448 [450]	105 [102]

() ASME Class 150 RF and 300 RF do not exist for cast iron and sizes 15 mm and 20 mm ductile cast iron; machined to fit steel flanges

Class 125 FF can connect to 150 RF, 250 RF can connect to 300 RF

ASME Class 125 FF and 250 RF are not available for ductile cast iron

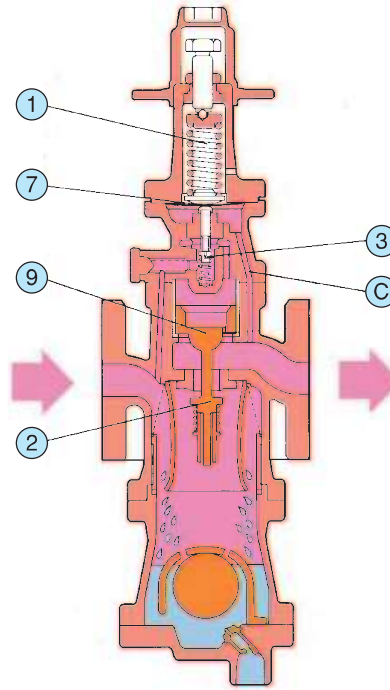
Other standards available, but length and weight may vary

* Weight is for COS-3/COS-16 Class 250 RF/300 RF ** COS-16 and COS-21 only *** Not DIN length due to size of separator and steam trap

□ COS-21

2

When secondary pressure is set by tightening adjustment screw ⑥, upper coil spring ① is compressed and diaphragm ⑦ flexes, forcing pilot guide ⑧ to open pilot valve ③. Steam enters chamber above piston ⑨, forcing it down. Main valve ② opens the orifice, providing steam to the secondary side. Before entering the main valve, steam passes through the separator ⑩. The angled separator blades cause the steam to whirl and release the entrained condensate, which is discharged continuously through the steam trap.



3

Some steam, entering the outlet side, flows through outlet pressure passage ④ into a chamber below the diaphragm ⑦, and lifts it. The position of pilot valve ③ is then determined by the balance of the upward force on the diaphragm with the downward force of upper coil spring ①. Thus the preset secondary steam pressure itself adjusts the force applied to the piston ⑨ and the opening of the main valve ②. Secondary pressure remains stable, and dry saturated steam is supplied at all times.

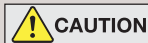
Specifications for Other COS Series Pressure Reducing Valves

Model	ACOS-10			VCOS	
Application	Air & Gas			Vacuum Pressure Steam	
Body Material*	Cast Iron		Ductile Cast Iron	Cast Iron	Ductile Cast Iron
Connection	Screwed	Flanged	Flanged	Flanged	Flanged
		ASME	DIN	ASME	DIN
Size (mm)	15, 20, 25	15, 20, 25, 32, 40, 50	15, 20, 25, 40, 50	25, 40, 50	
Max. Operating Press. (MPaG) PMO	0.9			0.2	
Max. Operating Temp. (°C) TMO	100			150	
Primary Pressure Range (MPaG)	0.1 – 0.9			0.1 – 0.2	
Adjustable Pressure Range (MPaG)	0.05 – 0.7			-0.08 – 0.08	
Min. Press. Differential (MPa)	0.05			0.02	
Minimum Adjustable Flow Rate	10% of rated flow rate				

PRESSURE SHELL DESIGN CONDITIONS (NOT OPERATING CONDITIONS):

Maximum Allowable Pressure (MPaG) PMA: 1.6 (ACOS-10), 0.2 (VCOS); Maximum Allowable Temperature (°C) TMA: 220 (ACOS-10), 150 (VCOS)

1 MPa = 10 bar = 10.197 kg/cm²



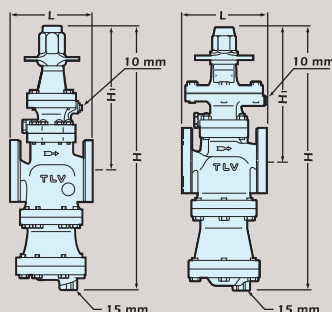
CAUTION

To avoid abnormal operation, accidents or serious injury, DO NOT use this product outside of the specification range. Local regulations may restrict the use of this product to below the conditions quoted.

Dimensions

ACOS-10

VCOS



	Size (mm)	L (mm)					H (mm)	H ₁ (mm)	Weight* (kg)	
		Screwed	ASME Class							DIN2501
			125FF	(150RF)	250RF	(300RF)				PN25/40
ACOS-10	(15)	175	—	170	—	170	150**	495	285	[14]
	(20)		—	182	—	182	150			[15]
	25	190	176	188	188	192	160	522	282	19
	32	—	206	220	220	220	—	572	302	23
	40	—	209		222	224	200			25
	50	—	255	255	260	261	230	635	315	40
VCOS	25	—	176	188	—	—	160	580	340	25
	40	—	209	220	—	—	200	630	360	30
	50	—	255	255	—	—	230	692	372	45

() No ASME standard exists for cast iron; machined to fit steel flanges

Class 125 FF can connect to 150 RF, 250 RF can connect to 300 RF

Other standards available, but length and weight may vary

* Weight is for Class 125 FF [150 RF] ** Not DIN length due to size of separator and steam trap



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Kakogawa, Japan

is approved by LRQA Ltd. to ISO 9001/14001

ISO 9001/ISO 14001



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