



Norval

Pressure regulator

NORVAL

Classification and Field of Application

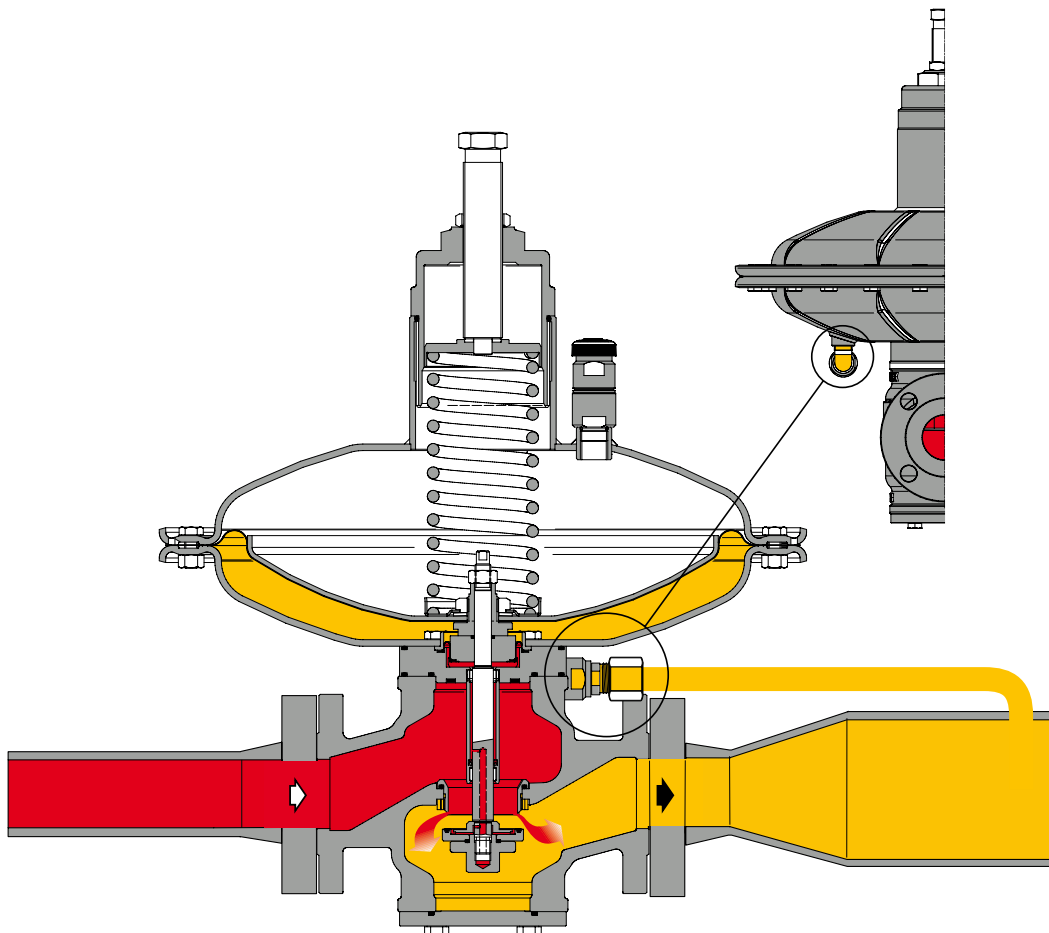
The **NORVAL** is a downstream pressure regulator, self actuated, spring loaded for medium and low pressure applications. It is suitable for gaseous, non-corrosive, previously filtered fluids.

Its balanced valve design gives quick response to varying operating conditions, which make it particularly suitable for use when serving **ON-OFF** burners and in any industrial process where you have a quick change of the flow rate.

Its features of good accuracy of regulation, even in presence of significant upstream pressure changes and/or flow rate, which makes make the Norval regulator also particularly suitable in natural gas gate stations and industrial and commercial applications.

The **NORVAL** regulator, in its basic version, is classified as a regulator which fails open (**Fail to Open**).

It is Truly a **TOP ENTRY** design, which confers to the regulator management advantages, for example the ability to performs full maintenance without removing it from the connected piping.



NORVAL - standard version

FEATURES

Functional features:*

■ Maximum inlet pressure up to:	284 PSIG for regulators from 1" to 3" 116 PSIG for regulators from 4" to 8" 275 PSIG for Steel Body and 246 PSIG for Ductile Iron
■ Range of downstream pressure:	from 4.0" W.C. to 63.81 PSIG for regulators from 1" to 4" from 4.8 " W.C. to 26.10 PSIG for regulators (6") and (8")
■ Minimum ambient temperature:	Execution up to -40°F (to specify in the request).
■ Maximum ambient temperature:	+140°F
■ Flowing gas temperature:	up to -4°F + 140°F
■ Accuracy class AC:	up to 5
■ Look-up pressure class SG:	up to 10

Design features:

■ Nominal dimensions DN:	1" - 1" -1/2 - 2" - 2"1/2 - 3" - 4" - 16" - 8"
■ Flanged connections:	UNI PN 16; class 150 RF

Materials: **

■ Body:	Cast steel ASTM A 216 WCB (all DN). Spheroidal ductile iron GS 400 – 18 ISO 1083 DN 150 (6") included.
■ Covers:	Diameter from 375 to 630 Drop-forged carbon steel / from 658 to 817 Alluminium
■ Diaphragm:	Rubberized canvas (performed by hot-pressing process).
■ Seat:	Stainless steel
■ Sealing ring:	Nitril rubber
■ Connection fittings:	In zinc-plated carbon steel according to DIN 2353; Stainless steel on request

REMARK: * Different functional features available on request.

** The materials indicated above refer to the standard models.
Different materials can be provided according to specific needs.

MODULARITY AND ACCESSORIES

The **NORVAL** regulator has been designed with a high degree of modularity that allows you to incorporate, within the basic regulator, alternative devices and additional accessories.

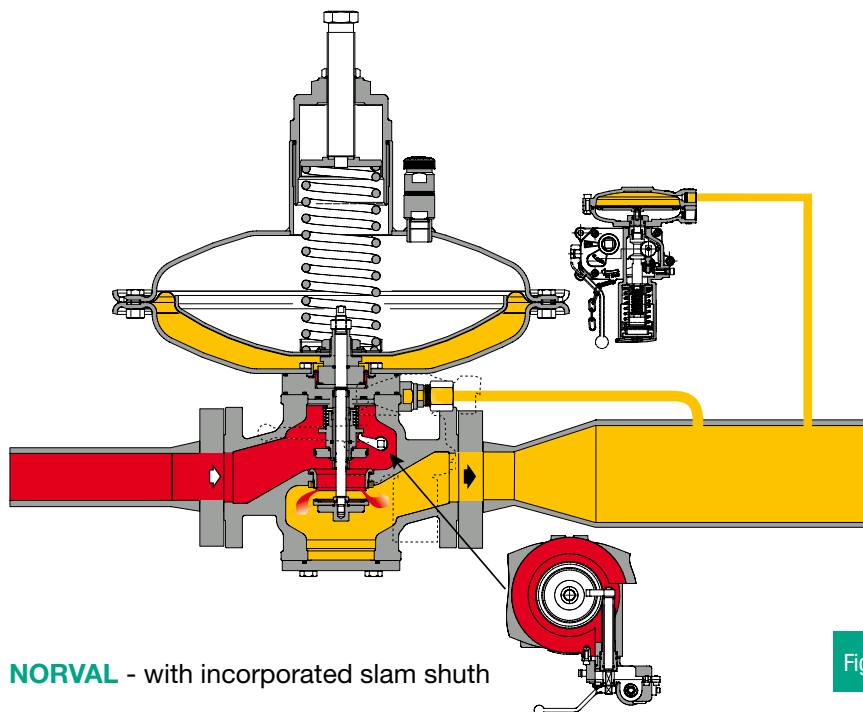
These can also be added to a basic regulator at a later time, with no need to change the existing piping connections.

SLAM SHUT DEVICE model SN/...

The slam shut is a **Safety Accessory** which will shut off the gas flow if abnormal pressure conditions appear, compared to the set point of the dedicated pressure switch. The set point can be changed, according to the operating conditions in the field, referenced in the table N.2 below, according to the model of pressure switch installed.

There are two available models: SN91 and SN92, the accuracy class of the block device is up to **AG up to 2,5**. The slam shut device is equipped with an optional button for local manual tripping. The reset of the slam shut device, for safety reasons, is performed manually and, inside the slam shut valve, a bypass device is provided, in order to make the reset operation easier.

The slam-shut device can be equipped with pneumatic or electromagnetic accessories allowing remote control, as well as with sensors (micro-switches) for the remote signaling of its tripping.



The slam shut valve can be set for pressure increase, **over pressure shut off (OPSO)** and/or for pressure drop, **under pressure shut off (UPSO)**.

The two tripping modes can be set independently, using the dedicated springs: a spring for the tripping of maximum pressure and a second spring for the tripping of minimum pressure.

Device for in line monitor regulator operation (ER)

The **MONITOR REGULATOR'S** task is that of performing the functions of the worker regulator in case of failure of the worker regulator.

It is a regulator that is normally in the fully open position during normal operation of the worker regulator.

The Monitor regulator is an emergency pressure regulator that is generally located in the flow direction of the gas, upstream another pressure regulator that performs the function of WORKER regulator.

In order to allow a **NORVAL** regulator to perform the MONITOR regulator function it is necessary to include, in addition to the Basic regulator, a **ER** device ensuring greater accuracy of the regulated pressure and allows quick intervention of the device.

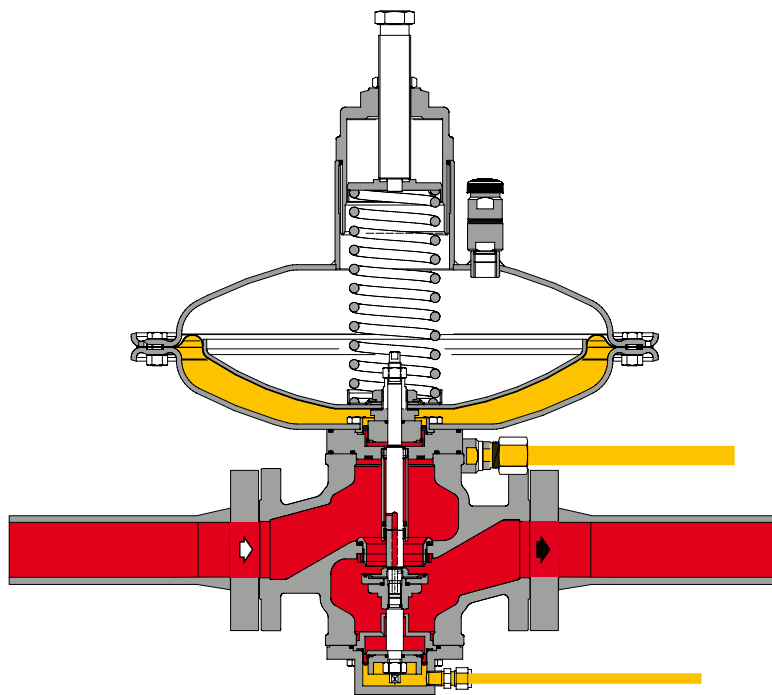


Fig.3

NORVAL - With in-line monitor

Possible set pressure range

The regulated outlet pressure range is determined by the control head installed. The table below sums up the heads available for every size and the ranges of outlet pressure expressed in psi.

Pressure regulator

Nominal dimension DN								
Millimeter	25	40	50	65	80	100	150	200
Inches	1"	1"1/2	2"	2"1/2	3"	4"	6"	8"
ø 817							0.17 ÷ 1.14	0.17 ÷ 1.14
ø 658							1.08 ÷ 5.87	1.08 ÷ 5.87
ø 630				0.14 ÷ 1.16	0.14 ÷ 1.16	0.17 ÷ 1.16	3.19 ÷ 9.42	3.19 ÷ 9.42
ø 495	0.23 ÷ 1.20	0.23 ÷ 1.20	0.23 ÷ 1.20	1.16 ÷ 7.68	1.16 ÷ 7.68	1.68 ÷ 7.68	5.65 ÷ 26.10	5.65 ÷ 26.10
ø 375	1.16 ÷ 15.95	1.16 ÷ 15.95	1.16 ÷ 15.95	6.81 ÷ 40.61	6.81 ÷ 40.61	6.81 ÷ 40.61		
ø 375TR	13.05 ÷ 63.81	13.05 ÷ 63.81	13.05 ÷ 63.81	13.05 ÷ 63.81	13.05 ÷ 63.81	13.05 ÷ 63.81		

Tab.1

Slam shut

Pressure switch	SN 91	SN 92
Set point range for Overpressure (OPSO)	0.36 ÷ 15.95	9.42 ÷ 79.77
Set point range for Underpressure (UPSO)	0.14 ÷ 13.05	2.90 ÷ 44.96

Tab.2

Sizing of the Pressure Regulator

In general, the choice of a regulator is made on the basis of the calculation of the flow rate determined by the use of flow rate coefficients (Cg or KG).

The mathematical method of calculation of Cg or KG is not suitable for a correct sizing of the Norval regulator. This is due to its design capacity you can not to use the whole theoretical flow rate obtained from the analytical method, but only a percentage of it, which varies from case to case, depending on the desired class of accuracy and on the available pressure drop.

Therefore it is more appropriate to refer to the following tables that provide directly the value of the flow rates that can be provided by the specific regulator considered, depending on the specific operating conditions. The tables provide the value of the flow rate, expressed in Stmc/h, of a natural gas having a relative density to air of 0.61 and at a temperature of 60°F, to the barometric pressure of 14.6 PSI.

Flow rate (Stft³/h NG) *

NORVAL 2" (DN 50)												
Inlet pressure Pu (psi)	Outlet pressure Pd (psi)											
	0.29	0.73	1.16	1.45	4.35	7.25	10.88	14.5	21.75	29.01	43.51	63.81
2.9	19072	17659	15893	15187								
4.35	23663	22957	21191	21191								
7.25	31787	31080	30021	30021	21191							
10.88	33553	38850	38850	37084	31787	24723						
14.5	35319	45914	45914	45914	42382	37084	26489					
21.75	40616	60042	60042	60042	58276	54744	51212	40616				
29.01	42382	66399	70637	65339	70637	70637	67105	60042	49446			
58.01	42382	69578	88296	65339	113019	116551	120083	120083	120083	113019	84765	
87.02	46620	70637	88296	61807	120083	151870	169529	165997	165997	169529	158933	130679
116.03	52271	72403	88296	62867	127147	151870	176593	211911	215443	218975	215443	204848
145.03	56510	77701	98892	62867	130679	151870	176593	211911	247230	264889	264889	264889
188.54	64633	84765	105956	63573	130679	151870	176593	211911	247230	300208	310803	310803
232.05	80173	97126	105956	82999	130679	151870	176593	211911	247230	300208	370845	406163

Tab.3

NORVAL 2" ½ (DN 65)												
Inlet pressure Pu (psi)	Outlet pressure Pd (psi)											
	0.29	0.73	1.16	1.45	4.35	7.25	10.88	14.5	21.75	29.01	43.51	63.81
2.9	31787	28255	26489	24723								
4.35	38850	37084	35319	35319								
7.25	49446	51212	49446	49446	37084							
10.88	56510	63573	63573	63573	56510	40616						
14.5	63573	74169	74169	74169	72403	63573	44148					
21.75	70637	98892	98892	91828	91828	91828	84765	67105				
29.01	74169	113019	116551	105956	105956	105956	113019	102424	82999			
58.01	77701	123615	134211	113019	141274	201316	194252	194252	194252	183656	141274	
87.02	81233	127147	141274	120083	158933	247230	247230	247230	264889	275485	247230	211911
116.03	84765	130679	144806	120083	169529	257825	264889	317867	335526	353186	317867	317867
145.03	88296	134211	148338	127147	176593	257825	282548	353186	353186	423823	388504	388504
188.54	91828	137742	155402	134211	211911	257825	296676	353186	370845	423823	459141	459141
232.05	95360	141274	158933	141274	218975	257825	296676	353186	388504	423823	600415	635734

Tab.4

NORVAL 3" (DN 80)

Inlet pressure Pu (psi)	Outlet pressure Pd (psi)											
	0.29	0.73	1.16	1.45	4.35	7.25	10.88	14.5	21.75	29.01	43.51	63.81
2.9	47680	42382	40616	38850								
4.35	60042	56510	52978	52978								
7.25	77701	77701	75935	75935	56510							
10.88	88296	98892	95360	95360	84765	61807						
14.5	102424	116551	105956	105956	109488	95360	67105					
21.75	130679	151870	141274	141274	144806	139508	123615	102424				
29.01	176593	180125	180125	162465	183656	176593	158933	151870	127147			
58.01	176593	211911	194252	190720	261357	307271	264889	282548	289612	282548	215443	
87.02	176593	229571	201316	197784	289612	388504	353186	370845	423823	423823	353186	335526
116.03	105956	229571	211911	180125	331994	388504	388504	459141	494460	529778	529778	512119
145.03	105956	229571	215443	187188	331994	388504	423823	536842	565097	671053	635734	671053
188.54	105956	229571	218975	194252	331994	388504	448546	536842	565097	706371	777008	777008
232.05	105956	229571	222507	201316	331994	388504	448546	536842	565097	706371	882964	882964

Tab.5

NORVAL 4" (DN 100)

Inlet pressure Pu (psi)	Outlet pressure Pd (psi)											
	0.29	0.73	1.16	1.45	4.35	7.25	10.88	14.5	21.75	29.01	43.51	63.81
2.9	72403	63573	56510	56510								
4.35	88296	84765	77701	77701								
7.25	120083	116551	105956	113019	86530							
10.88	134211	141274	134211	144806	130679	141274						
14.5	155402	176593	158933	173061	162465	176593	158933					
21.75	204848	229571	229571	229571	218975	229571	229571	229571				
29.01	247230	264889	247230	247230	275485	275485	275485	264889	275485			
58.01	247230	317867	282548	317867	388504	441482	388504	423823	423823	423823	459141	
87.02	247230	317867	289612	317867	423823	565097	529778	529778	635734	635734	635734	635734
116.03	247230	317867	317867	317867	459141	600415	565097	635734	741690	741690	777008	812327

Tab.6

NORVAL 6" (DN 150)

Inlet pressure Pu (psi)	Outlet pressure Pd (psi)										
	0.29	0.73	1.16	1.45	4.35	7.25	10.88	14.5	26.11		
2.9	148338	130679	127147	120083							
4.35	187188	176593	165997	162465							
7.25	240166	240166	236634	236634	176593						
10.88	275485	307271	296676	296676	264889	190720					
14.5	317867	363781	328463	328463	342590	296676	208379				
21.75	406163	473269	437950	437950	452077	434418	384972	317867			
29.01	550969	561565	565097	505055	572161	550969	494460	476800	388504		
58.01	550969	660457	600415	600415	812327	953601	826454	882964	882964		
87.02	550969	716967	628670	618075	904155	1200831	1094875	1130194	1306787		
116.03	331994	716967	660457	565097	1024238	1200831	1200831	1412742	1518698		

Tab.7

NORVAL 8" (DN 200)

Inlet pressure Pu (psi)	Outlet pressure Pd (psi)										
	0.29	0.73	1.16	1.45	4.35	7.25	10.88	14.5	26.11		
2.9	233102	204848	197784	187188							
4.35	293144	275485	257825	257825							
7.25	377909	377909	370845	370845	275485						
10.88	430886	480332	466205	466205	413227	476800					
14.5	497992	568629	515651	515651	529778	565097	565097				
21.75	635734	741690	688712	688712	706371	741690	706371	706371			
29.01	861773	879432	882964	777008	882964	882964	812327	847645	882964		
58.01	861773	1034834	953601	943005	1271468	1483379	1289127	1377424	1412742		
87.02	861773	1119598	988920	971260	1412742	1871883	1730609	1801246	2048476		
116.03	515651	1119598	1024238	882964	1589335	1871883	1871883	2225069	2542936		

Tab.8

For operating conditions and dimensions not covered by the tables above please contact our customer care.

For different gases and for natural gas with a different density than 0,61 shall be applied the correction coefficients resulting from the following formula:

$$F_c = \sqrt{\frac{175.8}{S \times (273.16 + t)}}$$

S = relative density to air

Correction factors FC		
Type of gas	Relative density	Fc factor
Air	1.0	0.78
Propane	1.53	0.63
Butane	2.0	0.55
Nitrogen	0.97	0.79
Oxygen	1.14	0.73
Carbon dioxide	1.52	0.63
		Tab.9

The chart 9 show the correction factors FC valid for above mentioned gas at 60 °C and the relative density declared.

Flow rate conversion			
Stm³/h	x	0,94795	= Nm³/h
			Tab.10

TYPICAL CONNECTION DIAGRAMS

The following examples are provided as a recommendation to get the best performance from the regulator **NORVAL**.

IN-LINE INSTALLATION

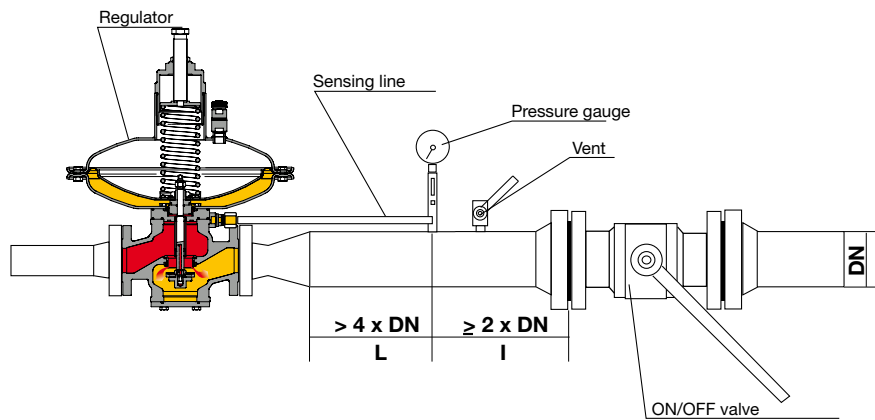


Fig.4

INSTALLATION AT SQUARE

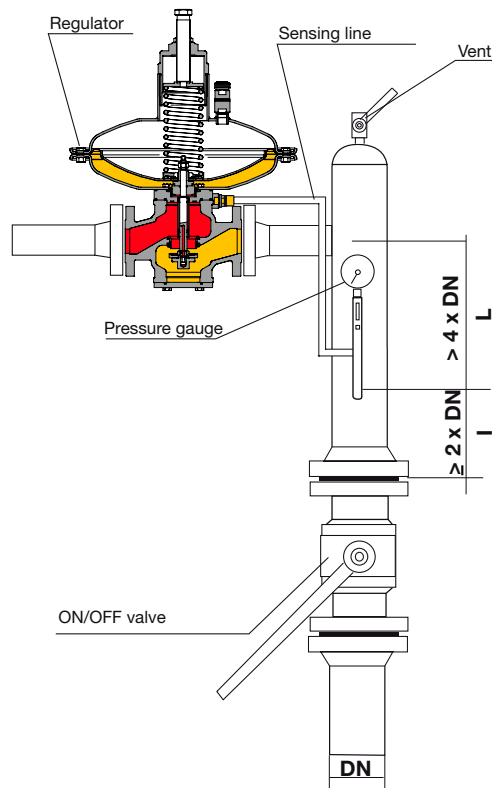


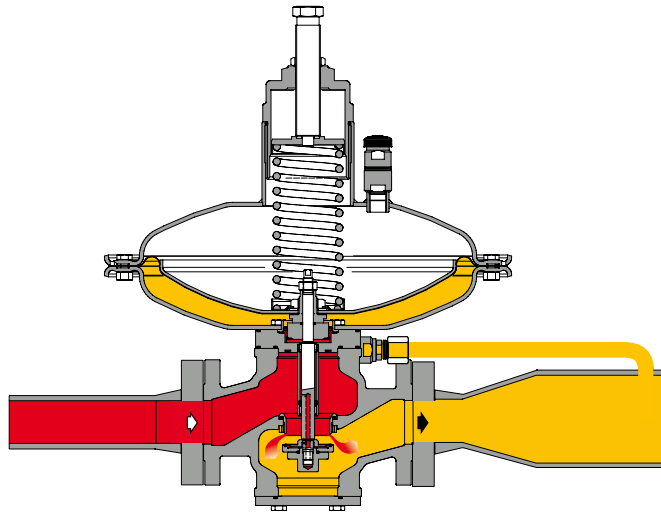


Fig.5

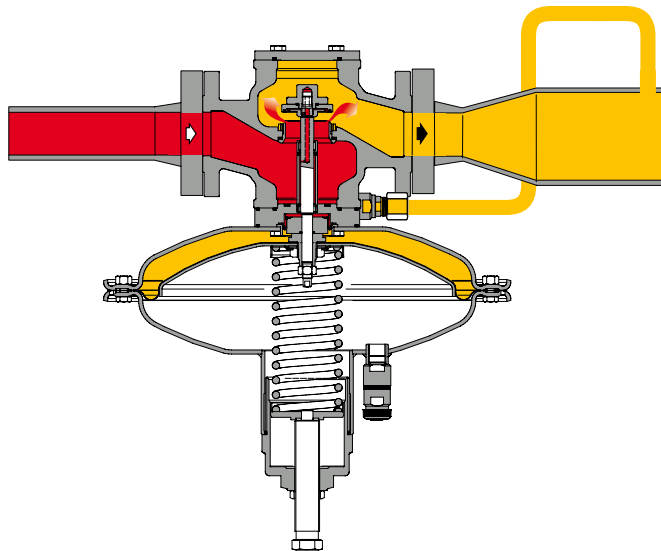
-  Inlet pressure
-  Outlet pressure

RECOMMENDED INSTALLATIONS



Standard position

Fig.6

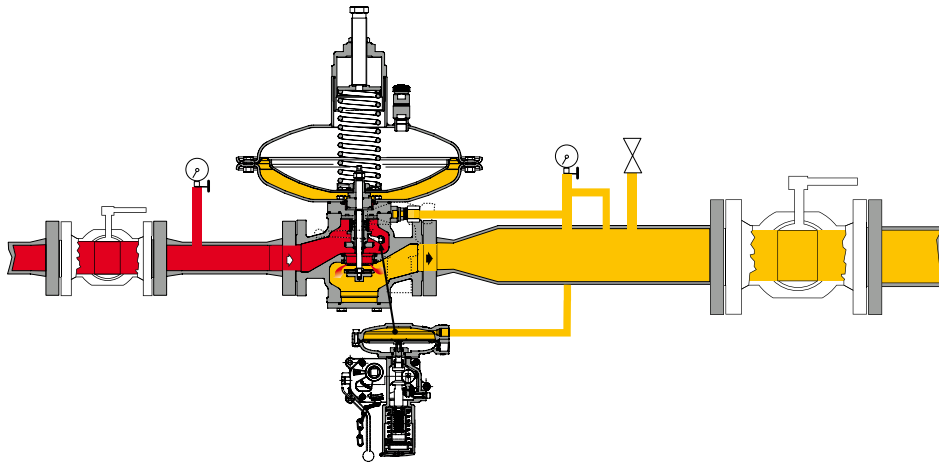


Upside down position

Fig.7

INSTALLATION EXAMPLES

Regulator with block device SN/...



Monitor regulator + adjusting regulator

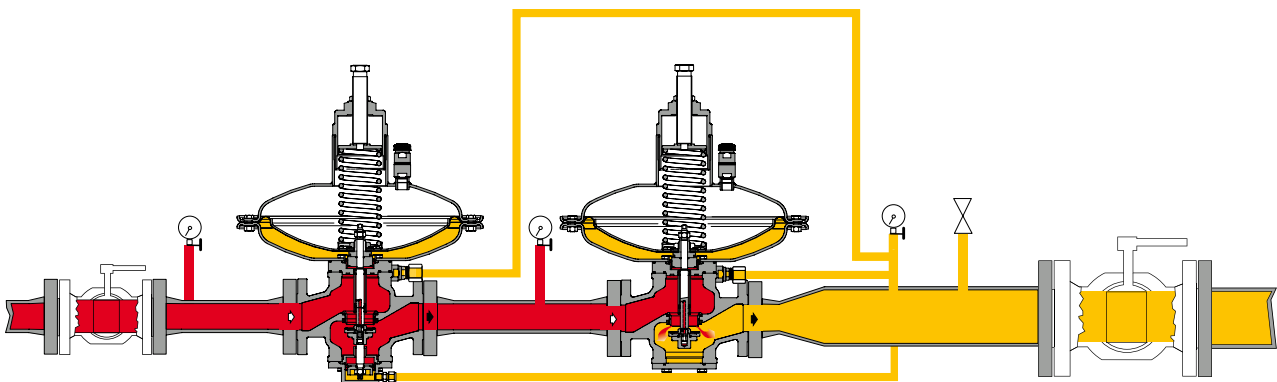


Fig.9

Monitor regulator with block device SN/... + adjusting regulator

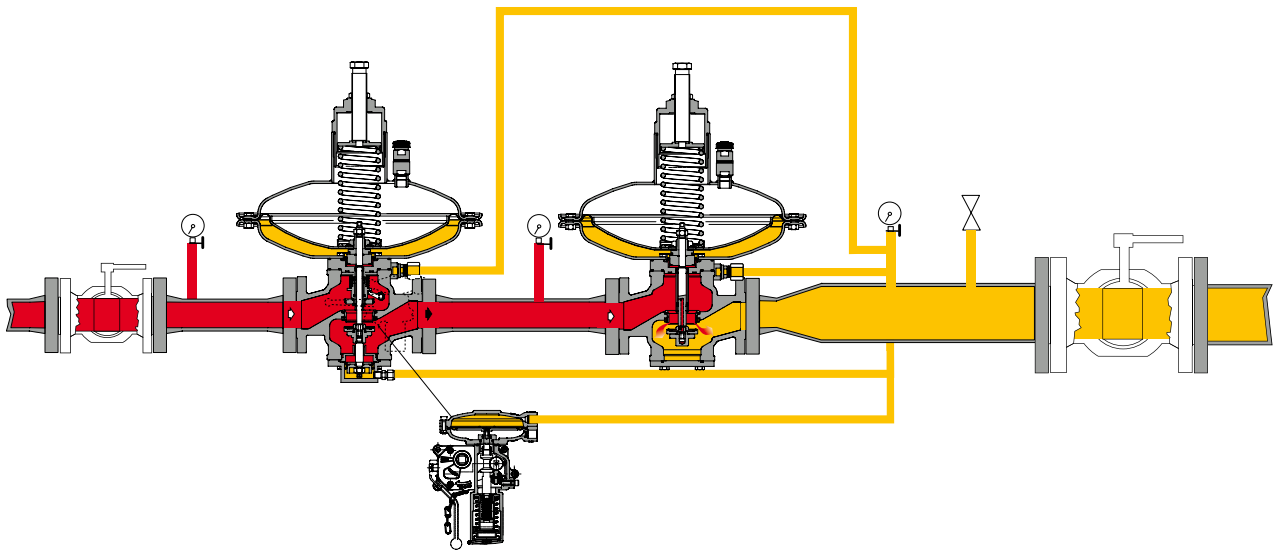


Fig.10

Slam shut valve SCN + adjusting regulator with block device SN/...

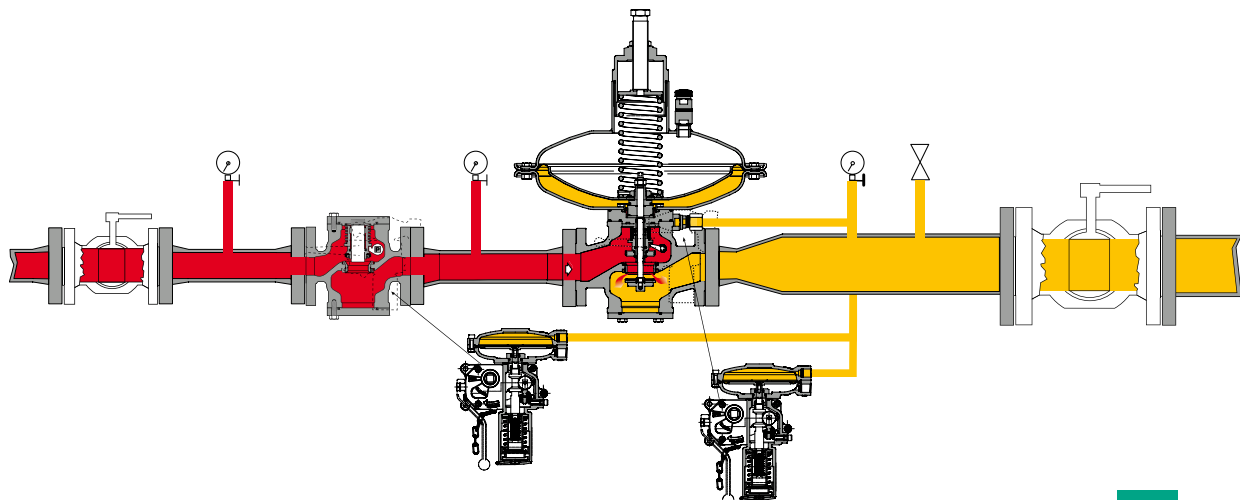
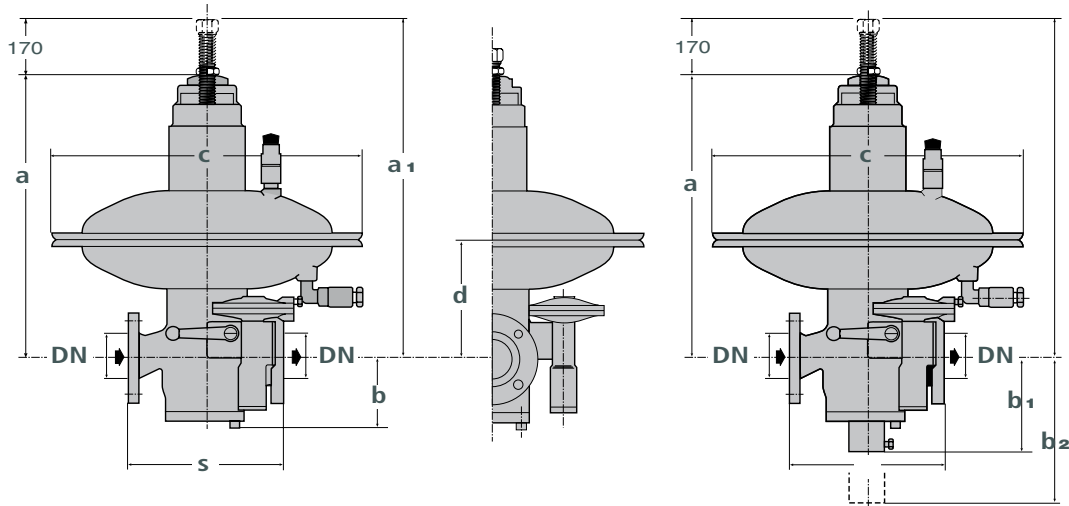


Fig.11

DIMENSIONS



Overall dimensions in inch

Nominal dimensions		c				ø 817			ø 658			ø 630			ø 495			ø 375			ø 375TR		
mm	Inches	s*	b	b1	b2	a	a1	d	a	a1	d	a	a1	d	a	a1	d	a	a1	d	a	a1	d
25	1"	7.2	3.9	7.9	9.8										18.1	24.8	6.9	16.3	23	5.9	16.7	23.4	6.1
40	1"1/2"	8.8	4.7	8.7	10.6										18.7	25.4	7.5	17.1	23.8	6.5	17.5	24.2	6.7
50	2"	10	4.7	8.7	10.6										18.7	25.4	7.5	17.1	23.8	6.5	17.5	24.2	6.7
65	2"1/2"	10.9	5.5	9.4	11.4							21.3	28	8.7	19.7	26.4	8.3	17.9	24.6	7.5	18.3	25	7.7
80	3"	11.7	5.5	9.4	11.4							21.3	28	8.7	19.7	26.4	8.3	17.9	24.6	7.5	18.3	25	7.7
100	4"	13.9	7.1	11	13							25.2	31.9	12.2	23.6	30.3	11.8	21.9	28.5	10.8	22.2	28.9	11
150	6"	17.8	8.7	12.6	14.6	29.9	36.6	15.7	28.3	35	15	26.6	33.3	15	26.4	33.1	14.8						
200	8"	21.4	10.2	14.2	16.1	33.9	40.6	19.7	32.3	39	18.9	30.5	33.3	18.9	30.3	37	18.7						

Tab.11

Pneumatic fittings: Sensing line regulator: 0.55 x 0.47 in. **Other:** 0.39 x 0.31 in.

Dimensions S according to EN 334 and IEC 534-3.

Weight in lbs

Size Inches	1"	1"1/2"	2"	2"1/2"	3"	4"	6"	8"
mm	25	40	50	65	80	100	150	200
Norval	97	106	110	165	203	267	454	641
Norval with slam-shut (SN)	106	117	121	181	214	278	465	652
Norval with monitor (ER)	106	121	128	187	220	284	476	666
Norval with slam-shut (SN) and monitor (ER)	117	132	139	198	231	295	487	677

Tab.12

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