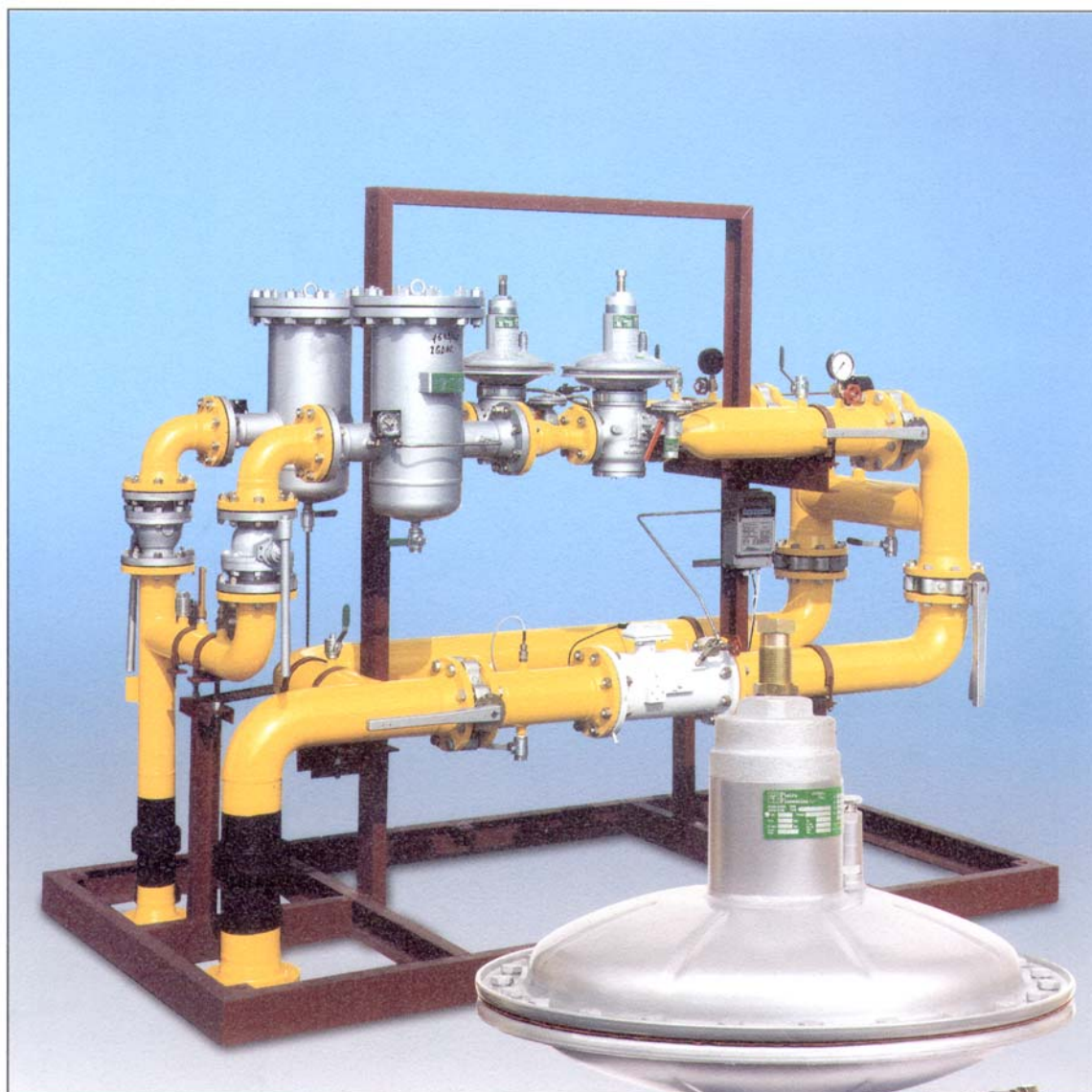
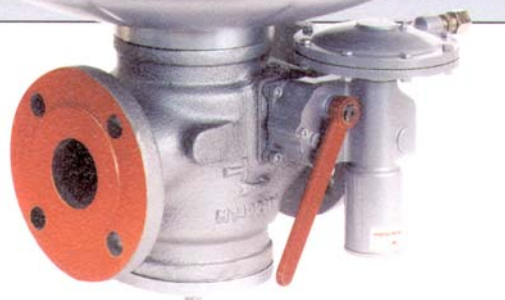


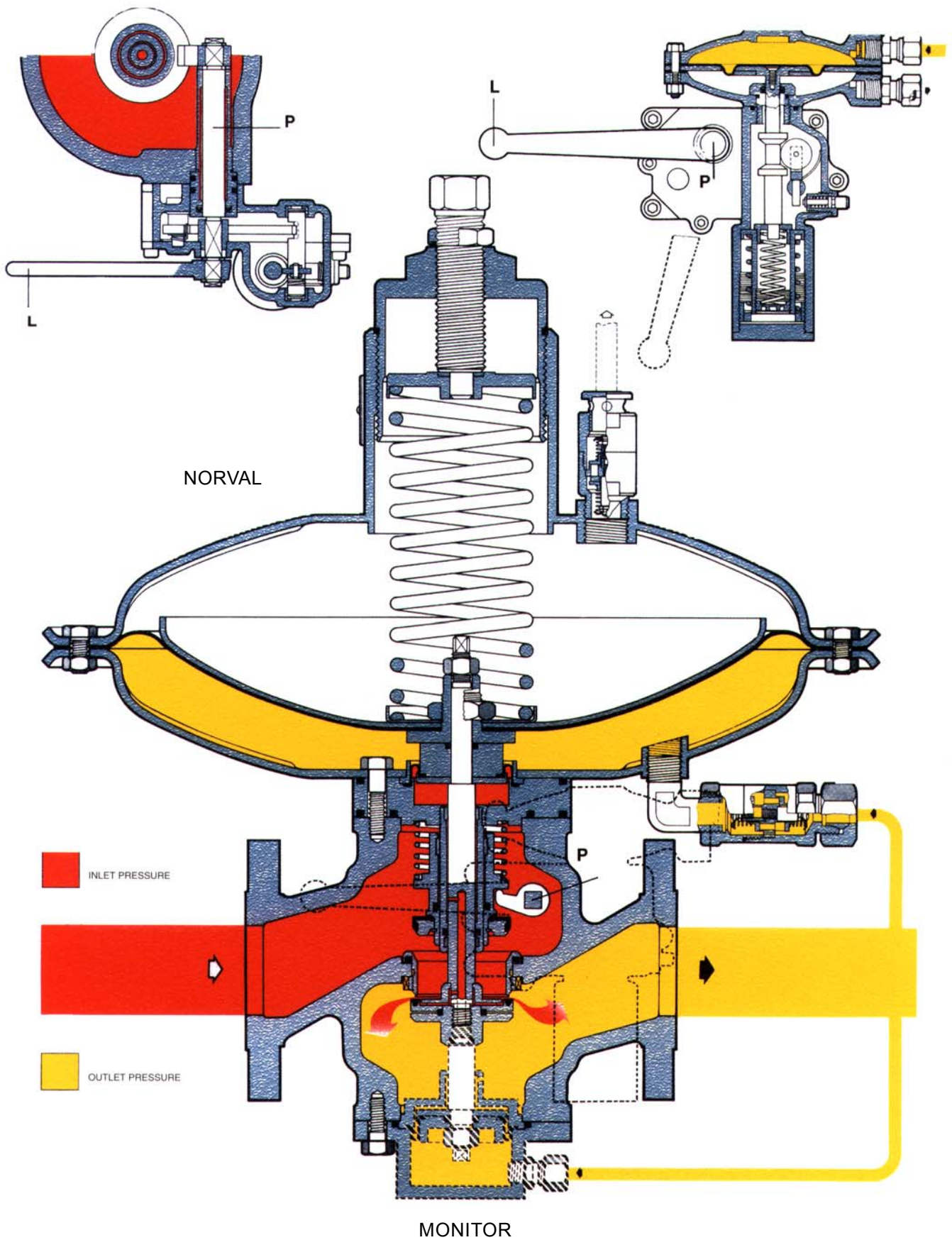
PRESSURE REGULATOR



NORVAL



NORVAL + I-N + MONITOR



INTRODUCTION

The NORVAL pressure regulators are direct action devices for low and medium pressure, controlled by a diaphragm and counterspring.

These regulators are suitable for use with previously filtered, non corrosive gases.



Fig. 1

MAIN FEATURES

- Design pressure: up to 19.2 bar.
- Operating temperature: -10°C +60°C (lower and upper temperature available on request).
- Ambient temperature: -20 +60°C.
- Max inlet pressure p_{max}:
 - 16 bar per ND 1" to 3"
 - 8 bar per ND 4" to 8"
- Range of outlet pressure Wh:
 - 8 to 4400 mbar per ND 1" ÷ 4"
 - 12 to 1800 mbar per ND 6" ÷ 8"
- Accuracy class RG = up to 5
- Closing pressure class SG: up to 10
- Available size ND:
 - 1" - 1"¼ - 1"½ - 2" - 2"½ - 3" - 4" - 6" - 8"
- Flanging: class 150 RF according to ANSI B16.5 and NP16 according to UNI 2282 or DIN 2633.

Modular design of pressure regulator NORVAL allows application of slam shut or device for use as "in line monitor" on the same body without changing the face-to-face dimension. Furthermore "top entry design" allows an easy periodical maintenance without removing body from pipeline.

MATERIALS

Body	Cast steel ASTM A 216 WBC for all sizes Nodular cast iron GS 400-18 ISO 1083 for ND ≤ 6"
Cover	Drop-forged carbon steel
Diaphragm	Rubberized canvas
Seat	Steel
Sealing	Nitril rubber
Compression fittings	According to DIN 2353 in zincplated carbon steel

Above listed features are relevant to standard execution. Special features and materials may be supplied upon request for special application.

Tab. 1 VALVE COEFFICIENTS CG

Size (ND)	25	32	40	50	65	80	100	150	200
	1"	1"¼	1"½	2"	2"½	3"	4"	6"	8"
Cg coefficient	331	520	848	1360	2240	3395	5100	10600	16600

CONTROL HEADS

The pressure ranges are determined by the control heads installed. Table 2 sums up the heads available for every size and the ranges of outlet pressure expressed in mbar.

Tab. 2

ND		COVERS (mm)						Outlet pressure mbar
		Ø 817	Ø 658	Ø 630	Ø 495	Ø 375	Ø 375TR	
25	1"				8 ÷ 83	80 ÷ 1050	900 ÷ 4400	
32	1"¼				8 ÷ 83	80 ÷ 1050	900 ÷ 4400	
40	1"½				8 ÷ 83	80 ÷ 1050	900 ÷ 4400	
50	2"				8 ÷ 83	80 ÷ 1050	900 ÷ 4400	
65	2"½			8 ÷ 80	75 ÷ 500	470 ÷ 2800	900 ÷ 4400	
80	3"			8 ÷ 80	75 ÷ 500	470 ÷ 2800	900 ÷ 4400	
100	4"			10 ÷ 80	75 ÷ 500	470 ÷ 2800	900 ÷ 4400	
150	6"	12 ÷ 79	75 ÷ 405	220 ÷ 650	390 ÷ 1800			
200	8"	12 ÷ 79	75 ÷ 405	220 ÷ 650	390 ÷ 1800			

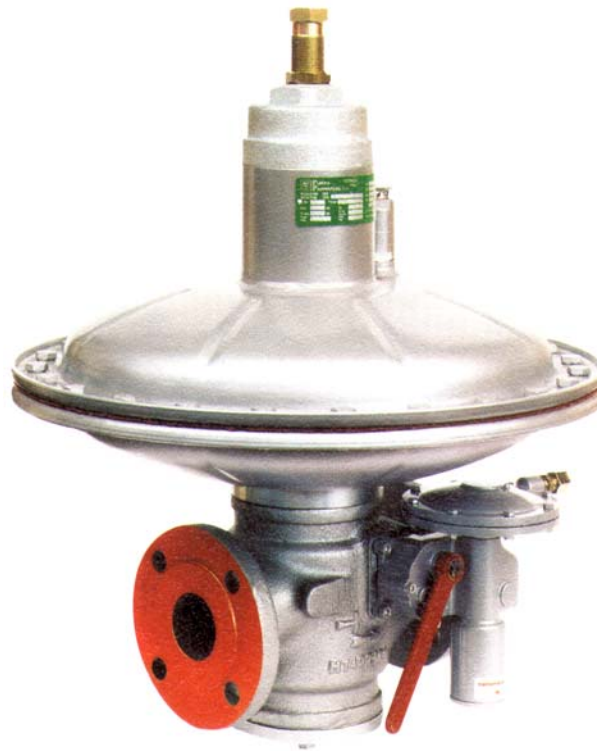


Fig. 2

SLAM-SHUT VALVE

This is a device which immediately blocks the gas flow (SAV) when, in the event of failure, the downstream pressure increases to reach the set-point, or if actuated manually.

INCORPORATED I-N SLAM-SHUT

I-N Slam shut (see figure 2) can be incorporated both on the service regulator and on the in-line monitor. The regulator with the incorporated slam-shut has Cg coefficients equal to 95% of those of the basic regulator.

A further advantage of the incorporated slam-shut valve is that it can be fitted at any time on a previously installed NORVAL without modifying the regulating unit.

The main features of this slam-shut device are:

- design pressure 19.2 bar for all the components;
- accuracy (AG): $\pm 1\%$ of the pressure set-point for pressure increase, $\pm 5\%$ for pressure decreasing;
- internal by-pass;
- intervention for over pressure and/or under pressure;
- manual push-button control;
- possibility of pneumatic or electromagnetic remote control;
- reduced overall dimensions;
- easy maintenance;
- possibility of application of devices for remote signal (contact or inductive microswitches).

Table 3 shows the available pressure switches.

Tab. 3 - SLAM-SHUT PRESSURE SWITCHES

Pressure switch	I - N	I - N TR
	Setting for increase of P max	
Working pressure in bar	0,013 ÷ 1,2	0,75 ÷ 5
	Setting range for decrease of P min	
	0,01 ÷ 0,9	0,15 ÷ 2,7

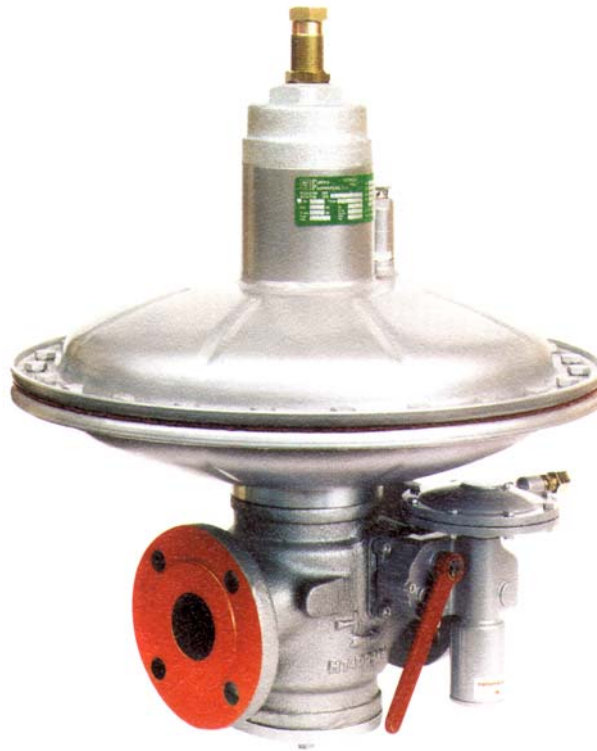


Fig. 3

NORVAL FUNCTIONING AS MONITOR

The monitor is an emergency regulator which comes into operation in place of the main regulator if, in the event of failure, the latter allows the downstream pressure to reach the monitor set-point.

OPERATION OF THE NORVAL FUNCTIONING AS MONITOR

The NORVAL functioning as an in-line monitor is a regulator which, in addition to the normal version, has a further mobile assembly balancing device which guarantees greater accuracy of the regulated pressure and therefore an equally precise value for the intervention pressure without risk of interference with the main regulator (see figure 3).

This device can be fitted even on a normal regulator which has already been installed.

INSTALLATION

To ensure proper operation and the declared performance, the following should be observed when installing the Norval pressure regulator:

a) filtering: the gas flowing in the piping must be adequately filtered.

It is also recommended that the piping upstream from the regulator is clean and avoids impurities;

b) sensing line: for correct operation, the sensing line nipple must be appropriately positioned. Between the regulator and the downstream take-off there must be a length of pipe \geq four times the diameter of the outlet pipe; beyond the take-off, there must be a further length of pipe \geq twice the same diameter.

DESCRIPTION FOR ORDERING

The following description should be used when ordering the regulator and accessories:

- Regulator

Main regulator Norval - size and type of flanging - body material - Pe variation in bar - diameter of control head - flow rate in Stm^3/h - type of gas.

Example: Norval - ND2" - ANSI 150RF - steel - Pe= 0.5-5 bar - head 495 - Q = 500 - natural gas.

- Monitor

When ordering the in-line monitor, the same description as for standard regulators, specifying its application as an inline monitor shall be used.

- Slam-shut valve

IN - dimension and model of the control head - Pmin setpoint - Pmax setpoint.

Example: ND 2" - IN-Pmax 50 mbar (no intervention for under pressure).

When ordering spare parts, indicate the serial number of the apparatus.

CHOOSING THE PRESSURE REGULATION AND CAPACITY TABLE

Sizing of pressure regulator Norval is made on the basis of following capacity tables.

The values of flow rate listed on the following tables are referred to natural gas with a specific gravity of 0.61 in relation to the air and a regulator inlet temperature of 15°C. For gases with a relative specific gravity S and temperature t in °C, value of flow rate must be adjusted multiplying by:

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

Table 4 show corrective factor Fc valid for several gases at a temperature of 15°C.

Type of gas	Specific gravity	Factor Fc
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

Regulator NORVAL ND 25

Inlet pressure Pe (bar)	Outlet pressure Pa (bar)														Flow rate in Stm ³ /h
	0,02	0,05	0,08	0,08	0,1	0,3	0,5	0,75	1	1	1,5	2	3	4	
	D=495			D=375		D=375/TR									
0,2	83	90	81	70	64										
0,3	103	116	110	94	91										
0,5	136	156	152	131	129	115									
0,75	171	197	195	167	166	173	158								
1	180	234	232	199	198	218	224	171							
1,5	180	305	305	261	261	293	322	297	258	258					
2	180	366	366	286	292	366	418	390	368	368	324				
4	180	417	429	286	292	574	696	696	696	696	783	724	580		
6	180	417	429	286	292	574	729	850	972	972	1097	1097	1030	921	
8	180	417	429	286	292	574	729	850	972	972	1325	1410	1410	1335	
10	315	417	429	382	389	574	729	850	972	972	1325	1590	1724	1724	
13	315	417	429	382	389	574	729	850	972	972	1325	1590	2121	2194	
16	315	417	429	382	389	574	729	850	972	972	1325	1590	2121	2651	

Regulator NORVAL ND 32

Inlet pressure Pe (bar)	Outlet pressure Pa (bar)														Flow rate in Stm ³ /h
	0,02	0,05	0,08	0,08	0,1	0,3	0,5	0,75	1	1	1,5	2	3	4	
	D=495			D=375		D=375/TR									
0,2	130	141	128	109	101										
0,3	162	182	173	148	142										
0,5	214	245	239	205	202	181									
0,75	268	310	306	262	260	272	248								
1	295	367	365	313	311	342	351	268							
1,5	295	479	479	410	410	460	505	466	405	405					
2	295	574	574	469	478	574	656	613	578	578	509				
4	295	684	704	469	478	941	1094	1094	1094	1094	1231	1137	911		
6	295	684	704	469	478	941	1194	1393	1532	1532	1723	1723	1618	1446	
8	295	684	704	469	478	941	1194	1393	1592	1592	2171	2216	2216	2097	
10	517	684	704	625	637	941	1194	1393	1592	1592	2171	2606	2708	2708	
13	517	684	704	625	637	941	1194	1393	1592	1592	2171	2606	3446	3446	
16	517	684	704	625	637	941	1194	1393	1592	1592	2171	2606	3474	4185	

Regulator NORVAL ND 40

Inlet pressure Pe (bar)	Outlet pressure Pa (bar)														Flow rate in Stm ³ /h
	0,02	0,05	0,08	0,08	0,1	0,3	0,5	0,75	1	1	1,5	2	3	4	
	D=495			D=375		D=375/TR									
0,2	230	229	208	178	165										
0,3	287	296	282	241	232										
0,5	378	399	391	335	329	295									
0,75	461	505	499	428	425	443	354								
1	461	594	595	510	508	557	501	382							
1,5	461	594	733	611	622	735	721	665	578	578					
2	461	594	733	611	622	735	937	874	824	824	646				
4	461	594	733	611	622	735	1357	1561	1561	1561	1561	1443	1156		
6	461	594	733	611	622	735	2121	1583	1810	1810	2186	2186	2052	1834	
8	461	594	733	611	622	735	2121	1583	1810	1810	2262	2714	2810	2660	
10	577	713	977	733	746	882	1527	1781	2036	1810	2262	2714	3435	3435	
13	577	713	977	733	746	882	2386	1781	2036	1810	2262	2714	3619	4371	
16	577	713	977	733	746	882	2386	1781	2036	1810	2262	2714	3619	4524	

Regulator NORVAL ND 50

Inlet pressure Pe (bar)	Outlet pressure Pa (bar)														Flow rate in Stm ³ /h			
	0,02	0,05	0,08	0,08	0,1	0,3	0,5	0,75	1	1	1,5	2	3	4				
	D=495			D=375			D=375/TR											
0,2	369	368	334	286	264													
0,3	460	475	452	387	372													
0,5	606	640	626	537	528	473												
0,75	721	810	801	687	681	710	567											
1	721	928	955	818	815	894	804	613										
1,5	721	928	1145	954	972	1149	1157	1067	927	927								
2	721	928	1145	954	972	1149	1502	1402	1322	1322	1036							
4	721	928	1145	954	972	1149	2121	2474	2504	2504	2504	2314	1853					
6	721	928	1145	954	972	1149	2121	2474	2827	2827	3505	3505	3292	3942				
8	721	928	1145	954	972	1149	2121	2474	2827	2827	3534	4241	4507	4266				
10	901	1113	1527	1145	1166	1378	2386	2783	3181	2827	3534	4241	5508	5508				
13	901	1113	1527	1145	1166	1378	2386	2783	3181	2827	3534	4241	5655	7011				
16	901	1113	1527	1145	1166	1378	2386	2783	3181	2827	3534	4241	5655	7069				

Regulator NORVAL ND 65

Inlet pressure	Outlet pressure Pa (bar)														Flow rate in Stm ³ /h			
	0,02	0,05	0,08	0,08	0,1	0,3	0,5	0,5	0,75	1	1,5	2	1	1,5		2	3	4
	D=630			D=495			D=375					D=375/TR						
0,2	560	519	471	393	362													
0,3	699	670	638	531	511													
0,5	922	904	884	737	725	612												
0,75	1155	1143	1131	942	935	919	801	668										
1	1218	1356	1348	1123	1118	1157	1135	946	721									
1,5	1218	1568	1767	1290	1314	1557	1633	1361	1256	1090			1090					
2	1218	1568	1935	1290	1314	1941	2121	1767	1649	1555	1462		1555	1462				
4	1218	1568	1935	1290	1314	1941	3136	2240	2613	2946	3535	3266	2946	3535	3266	2616		
6	1218	1568	1935	1290	1314	1941	3136	2240	2613	2986	4480	4949	2986	4480	4949	4647	4154	
8	1218	1568	1935	1290	1314	1941	3136	2240	2613	2986	4480	5376	2986	4480	5376	6362	6022	
10	1218	1568	1935	1290	1314	1941	3136	2240	2613	2986	4480	5376	2986	4480	5376	7168	7776	
13	1218	1568	1935	1290	1314	1941	3136	2240	2613	2986	4480	5376	2986	4480	5376	7168	8959	
16	1218	1568	1935	1290	1314	1941	3136	2240	2613	2986	4480	5376	2986	4480	5376	7168	8959	

Regulator NORVAL ND 80

Inlet pressure	Outlet pressure Pa (bar)														Flow rate in Stm ³ /h			
	0,02	0,05	0,08	0,08	0,1	0,3	0,5	0,5	0,75	1	1,5	2	1	1,5		2	3	4
	D=630			D=495			D=375					D=375/TR						
0,2	849	787	715	595	549													
0,3	1060	1016	966	805	775													
0,5	1397	1370	1340	1117	1099	927												
0,75	1750	1733	1714	1428	1417	1393	1214	1012										
1	1846	2056	2043	1702	1695	1753	1720	1433	1093									
1,5	1846	2375	2679	1954	1991	2360	2475	2063	1903	1652			1652					
2	1846	2375	2931	1954	1991	2941	3214	2679	2499	2357	2216		2357	2216				
4	1846	2375	2931	1954	1991	2941	4750	3393	3958	4464	5357	4950	4464	5357	4950	3966		
6	1846	2375	2931	1954	1991	2941	4750	3393	3958	4524	6786	7500	4524	6786	7500	7043	6295	
8	1846	2375	2931	1954	1991	2941	4750	3393	3958	4524	6786	8143	4524	6786	8143	9643	9128	
10	1846	2375	2931	1954	1991	2941	4750	3393	3958	4524	6786	8143	4524	6786	8143	10857	11786	
13	1846	2375	2931	1954	1991	2941	4750	3393	3958	4524	6786	8143	4524	6786	8143	10857	13572	
16	1846	2375	2931	1954	1991	2941	4750	3393	3958	4524	6786	8143	4524	6786	8143	10857	13572	

Regulator NORVAL ND 100

Inlet pressure	Outlet pressure Pa (bar)																Flow rate in Stm ³ /h
	0,02	0,05	0,075	0,075	0,1	0,3	0,5	0,5	0,75	1	1,5	1	1,5	2	3	4	
	D=630			D=495			D=375			D=375/TR							
0,2	1170	1084	1002	911	825												
0,3	1460	1399	1342	1220	1164												
0,5	1924	1887	1853	1684	1651	1266											
0,75	2410	2386	2364	2149	2129	1902	1520	1520									
1	2847	2831	2816	2560	2546	2394	2153	2153	1642								
1,5	2884	2969	3039	3039	3110	3223	3099	3099	2859	2482		2482					
2	2884	2969	3039	3039	3110	3676	4024	4024	3755	3541	2774	3541	2774				
4	2884	2969	3039	3039	3110	3676	4241	5301	6185	6707	6707	6707	6707	6197	4964		
6	2884	2969	3039	3039	3110	3676	4241	5301	6185	7069	8836	7069	8836	9389	8817	7881	
8	2884	2969	3039	3039	3110	3676	4241	5301	6185	7069	8836	7069	8836	10603	12072	11426	

Regulator NORVAL ND 150

Inlet pressure	Outlet pressure Pa (bar)												Flow rate in Stm ³ /h
	0,02	0,05	0,075	0,075	0,1	0,3	0,3	0,5	0,5	0,75	1	1,5	
	D=817			D=658			D=630		D=495				
0,2	2431	2253	2082	1893	1714								
0,3	3034	2907	2790	2537	2419								
0,5	3999	3921	3850	3500	3431	2631	2631						
0,75	5009	4959	4914	4468	4424	3954	3954	3159	3159				
1	5917	5883	5853	5321	5291	4975	4975	4475	4475	3413			
1,5	6489	6680	6839	6839	6970	6699	6699	6440	6440	5941	5159		
2	6489	6680	6839	6839	6998	8270	8363	8363	8363	7804	7360	5766	
4	6489	6680	6839	6839	6998	8270	10338	11928	11928	13916	13939	13939	
6	6489	6680	6839	6839	6998	8270	10338	11928	11928	13916	15904	19515	
8	6489	6680	6839	6839	6998	8270	10338	11928	11928	13916	15904	19880	

Regulator NORVAL ND 200

Inlet pressure	Outlet pressure Pa (bar)												Flow rate in Stm ³ /h
	0,02	0,05	0,075	0,075	0,1	0,3	0,3	0,5	0,5	0,75	1	1,5	
	D=817			D=658			D=630		D=495				
0,2	3807	3528	3261	2964	2684								
0,3	4751	4553	4370	3972	3789								
0,5	6263	6141	6030	5482	5373	4120	4120						
0,75	7844	7766	7696	6996	6928	6192	6192	4947	4947				
1	9266	11875	9166	8333	8286	7791	7791	7009	7009	5345			
1,5	11536	11875	12006	10915	10915	10490	10490	10086	10086	9304	8079		
2	11536	11875	12158	12158	12441	13097	13097	13097	13097	12221	11526	9030	
4	11536	11875	12158	12158	12441	14703	18378	21206	21206	21829	21829	21829	
6	11536	11875	12158	12158	12441	14703	18378	21206	21206	24740	28274	30561	
8	11536	11875	12158	12158	12441	14703	18378	21206	21206	24740	28274	35343	

NORVAL with SLAM-SHUT / IN

NORVAL with SLAM-SHUT / IN and monitor

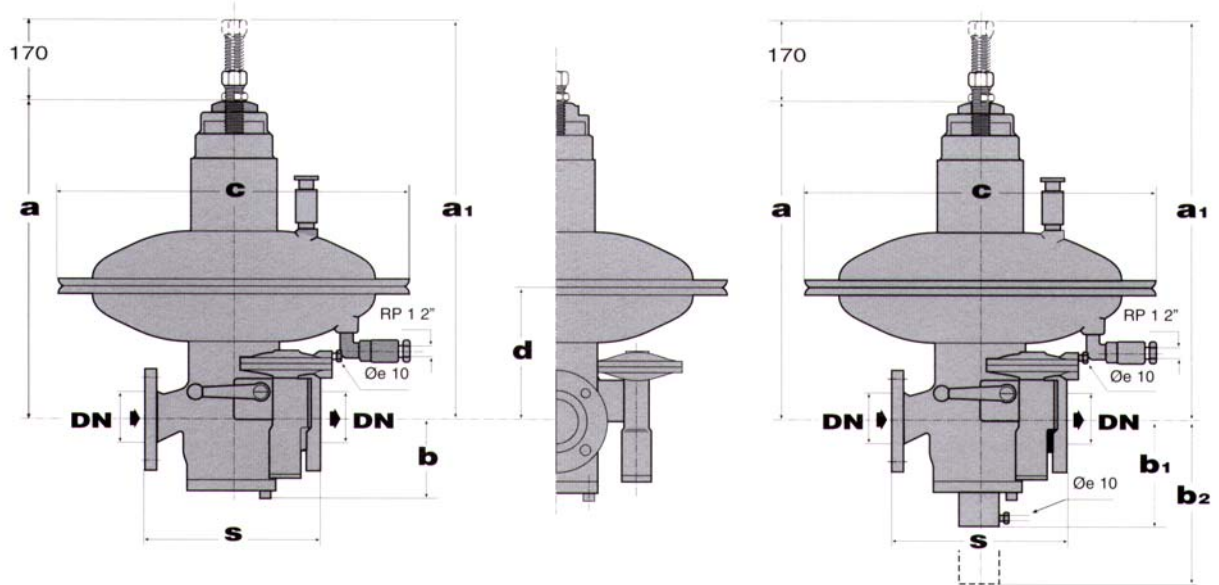


Fig. 4

Tab. 5

C						Ø 817			Ø 658			Ø 630			Ø 495			Ø 375			Ø 375TR		
ND	S*	b	b1	b2		a	a1	d	a	a1	d	a	a1	d	a	a1	d	a	a1	d	a	a1	d
25	1"	183	100	200	250										460	630	175	415	585	150	425	595	155
32	1 1/4"	183	100	200	250										460	630	175	415	585	150	425	595	155
40	1 1/2"	223	120	220	270										475	645	190	435	605	165	445	615	170
50	2"	254	120	220	270										475	645	190	435	605	165	445	615	170
65	2 1/2"	277	140	240	290							540	710	220	500	670	210	455	625	190	465	635	195
80	3"	298	140	240	290							540	710	220	500	670	210	455	625	190	465	635	195
100	4"	352	180	280	330							640	810	310	600	770	300	555	725	275	565	735	280
150	6"	451	220	320	370	760	930	400	720	890	380	675	845	380	670	840	375						
200	8"	543	260	360	410	860	1030	500	820	990	480	775	945	480	770	940	475						

(*) ANSI 150 - UNI NP 16 - UNI NP 40

The NORVAL regulator conforms to ISA 4.1 standard.

Tab. 6 - Weight in Kgf

ND	25	32	40	50	65	80	100	150	200
	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	4"	6"	8"
Norval	42	42	48	50	77	92	121	206	291
Norval with SLAM-SHUT / IN	47	47	53	55	82	97	126	211	296
Norval with MONITOR	48	48	55	58	85	100	129	216	302
Norval with SLAM SHUT / IN and MONITOR	53	53	60	63	90	105	134	221	307



DESIGN, SALE & INSTALLATION OF L.P.G. - NATURAL GAS SYSTEMS

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