

Medium Pressure Regulator



Medium pressure regulator Type FRM

Direct acting pressure regulator with adjustable setpoint springs and modular mounted safety shutoff valve (SAV)

In compliance with EN 334 and EN 14382

- Inlet pressures up to 25 bar (2 500 kPa)
- High flow rate
- Stable, accurate and sensitive regulation of the outlet pressure
- Admission pressure compensation diaphragm for a high regulation accuracy
- External impulse
- Maintenance-friendly
- Flange connection according to DN 25 - DN 50



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FRM

Spring-loaded, pressure compensating regulator with adjustable setpoint springs for regulation of the regulator outlet pressure. External impulse of the regulator outlet pressure.

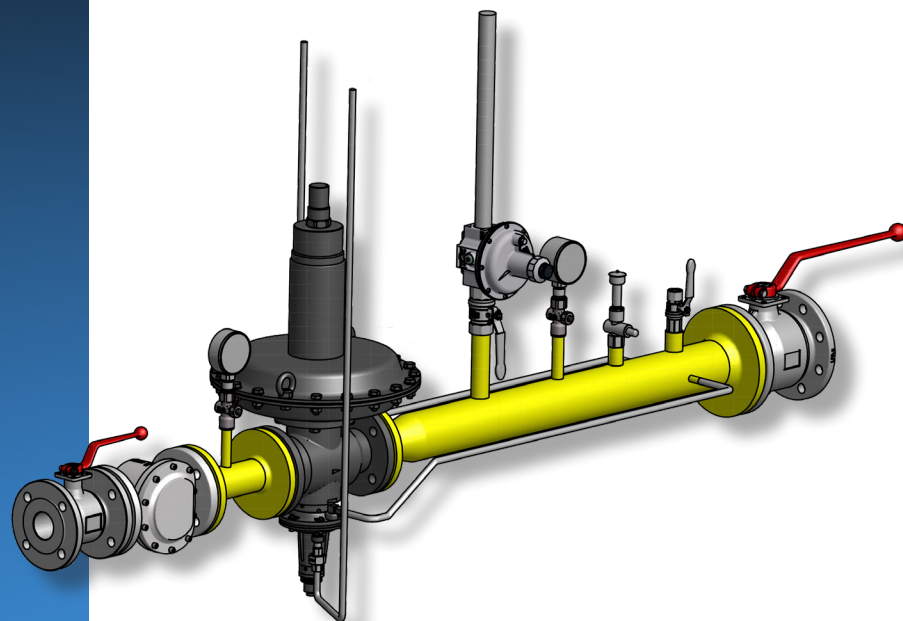
Application

Pressure regulation of industrial gas burners and gas heating appliances. Also for installation in the municipal and commercial gas supply.

Suitable for gases of gas families 1, 2, 3 and other neutral gases.

Approval

EC type testing certificate as per:
• EC-Pressure Equipment Directive



Technical Data FRM



Spring-loaded medium pressure regulator in compliance with EN334

Type	FRM 100... IS (integral strength range) / FRM 250... DS (differential strength range)	
Type of gas	Family 1+2+3 (e.g. manufactured gas (town gas), commercial grade natural gas and commercial grade LPG gases in the vaporized phase).	
Nominal diameters Flanges	Connecting flange PN 25 according to EN1092-1 or ANSI class 150 per B 16.5 DN 25 40 50 NPS 1" 1.5" 2"	
Max. inlet pressure	FRM 100... 10 bar (145 PSI / 1 000 kPa) / FRM 250... 25 bar (360 PSI / 2 500 kPa)	
Outlet pressure range	30 mbar up to 4 000 mbar (3 - 400 kPa) / 12 to 1 606 "W.C. (0.4 - 58 PSI)	
Minimum inlet pressure (ND)	200 mbar (20 kPa) / 80 "W.C. (2.9 PSI)	
Minimum inlet pressure (MD)	300 mbar (30 kPa) / 120 "W.C. (4.3 PSI)	
Minimum inlet pressure (HD)	750 mbar (75 kPa) / 301 "W.C. (10.9 PSI)	
Minimum inlet pressure (UHD)	1 500 mbar (150 kPa) / 600 "W.C. (21 PSI)	
Accuracy class	up to AC 5 (see adjustment range, page 3)	
Lock-up pressure class	up to SG 10 (see adjustment range, page 3)	
Failure mode (diaphragm rupture)	fail-open	
Materials	Main body housing:	cast iron GJS 400 - 15 (GJS 400 - 18 LT on request)
	Diaphragm housing:	steel
	Diaphragms:	NBR
Ambient temperature	-20 °C to + 60 °C / -4 °F to + 140 °F	

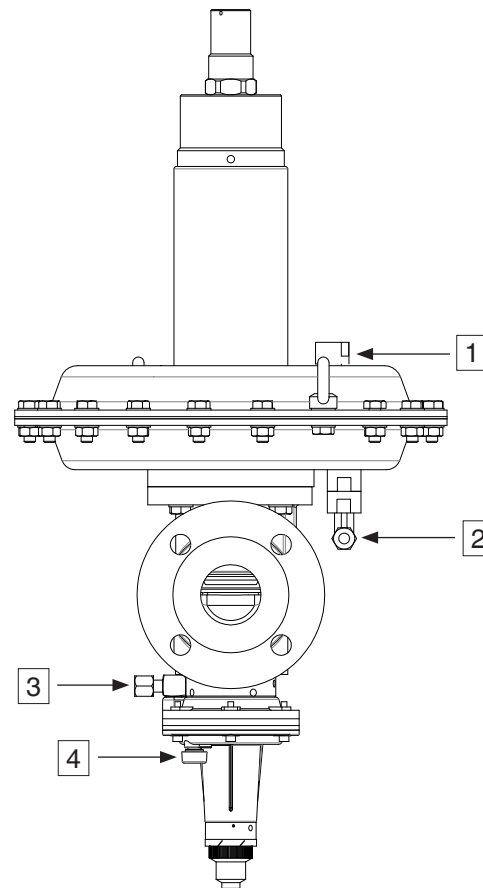
Technical Data SAV



Safety shut-off valve in compliance with EN14382

Type	SAV 100... IS (integral strength range) / SAV 250... DS (differential strength range)	
Response time	< 2 s	
Lower adjustment range W_{du}	10 mbar up to 3 000 mbar (1 - 300 kPa) / 4 to 1 200 "W.C. (0.3 - 43 PSI)	
Upper adjustment range W_{do}	60 mbar up to 5 000 mbar (6 - 500 kPa) / 24 to 2 005 "W.C. (0.9 - 72 PSI)	
Materials	Main body housing:	cast iron GJS 400 - 15 (GJS 400 - 18 LT on request)
	Diaphragm housing:	aluminium
	Diaphragms:	NBR

Pressure taps



- 1 Vent line connection of the regulator,
G ½ ISO 228
- 2 External impulse line connection of the
regulator, Ermeto screw connection
GE 12- ½ for tubes 12 x 1.5
- 3 External impulse line connection of the
SAV, Ermeto screw connection
GE 12- ¼ for tubes 12 x 1.5
- 4 Vent line connection of the SAV,
G ¼ ISO 228

Only for US/CDN Versions:

- 1 ½ " NTP adapter
- 2 ½ " elbow connector for ½ " tubes
- 3 ¼ " straight connector for ½ " tubes
- 4 ¼ " NPT adapter



Example FRM 100025 ND / SAV ND	FRM	100	025	ND	SAV	ND
Type	Spring-loaded medium pressure regulator					
Maximum operating pressure MOP	100 ... 10 000 mbar (1 000 kPa) 4 018 "W.C. (145 PSI)					
	250... 25 000 mbar (2 500 kPa) 2 500 "W.C. (360 PSI)					
Nominal diameter	025 DN 25 (1")					
	040 DN 40 (1½")					
	050 DN 50 (2")					
Pressure range, outlet pressure	ND Low pressure					
	MD Medium pressure					
	HD High pressure					
	UHD Ultra high pressure					
Safety device	SAV Integrated safety shutoff valve					
Pressure range, trip pressure	ND Low pressure					
	MD Medium pressure					
	HD High pressure					
	UHD Ultra high pressure					
Flange type	ANSI with standard PN-25 with ANSI Class 150					

Adjustment range



Type	Con- nection	Ver- sion	Accuracy class* [AC]	Lock-up pressure class* [SG]	Outlet pressure range W_d	Lower tripping point SAV	Upper tripping point SAV
						W_{du}	W_{do}
FRM 100025 ND	DN 25	ND	AC 10	SG 20	30 - 100 mbar 12 - 40 "W.C.		
FRM 100025 MD	DN 25	MD	AC 5/10**	SG 10/20**	90 - 420 mbar 36 - 168 "W.C.		
FRM 100025 HD	DN 25	HD	AC 5	SG 10	400 - 1 500 mbar 160 - 602 "W.C.		
FRM 250025 UHD	DN 25	UHD	AC 5	SG 10	1 000 - 4000 mbar 400 - 1 600 "W.C.		
FRM 100025 ND / SAV ND	DN 25	ND	AC 10	SG 20	30-100 mbar 12 - 40 "W.C.	10-90 mbar 4-36 "W.C.	60-450 mbar 24-180 "W.C.
FRM 100025 MD / SAV MD	DN 25	MD	AC 5/10**	SG 10/20**	90 - 420 mbar 36 - 168 "W.C.	10-500 mbar 4-200 "W.C.	60-999 mbar 24-401 "W.C.
FRM 100025 HD / SAV HD	DN 25	HD	AC 5	SG 10	400 - 1 500 mbar 160 - 602 "W.C.	150-3 000 mbar 60-1200 "W.C.	600-5 000 mbar 241-2 005 "W.C.
FRM 250025 UHD / SAV UHD	DN 25	UHD	AC 10	SG 10	1 000 - 4000 mbar 400 - 1 600 "W.C.	150-3000 mbar 60-1 200 "W.C.	600-5 000 mbar 241-2 005 "W.C.
FRM 100040 ND	DN 40	ND	AC 10	SG 20	30 - 100 mbar 12 - 40 "W.C.		
FRM 100040 MD	DN 40	MD	AC 5/10**	SG 10/20**	90 - 420 mbar 36 - 168 "W.C.		
FRM 100040 HD	DN 40	HD	AC 5	SG 10	400 - 1 500 mbar 160 - 602 "W.C.		
FRM 250040 UHD	DN 40	UHD	AC 5	SG 10	1 000 - 4000 mbar 400 - 1 600 "W.C.		

*Accuracy class / lock-up pressure class according to EN 334

** p_d = 90 - 180 mbar / 36 - 72 "W.C.: AC 10, SG 20

p_d = 180 - 420 mbar / 72 - 168 "W.C.: AC 5, SG 10

Adjustment range



Type	Con- nection	Ver- sion	Accuracy class* [AC]	Lock-up pressure class* [SG]	Outlet pressure range W_d	Lower tripping point SAV	Upper tripping point SAV
						W_{du}	W_{do}
FRM 100040 ND / SAV ND	DN 40	ND	AC 10	SG 20	30 - 100 mbar 12 - 40 "W.C.	10-90 mbar 4-36 "W.C.	60-450 mbar 24-180 "W.C.
FRM 100040 MD / SAV MD	DN 40	MD	AC 5/10**	SG 10/20**	90 - 420 mbar 36 - 168 "W.C.	10-500 mbar 4-200 "W.C.	60-999 mbar 24-401 "W.C.
FRM 100040 HD / SAV HD	DN 40	HD	AC 5	SG 10	400 - 1 500 mbar 160 - 602 "W.C.	150-3 000 mbar 60-1200 "W.C.	600-5 000 mbar 241-2 005 "W.C.
FRM 250040 UHD / SAV UHD	DN 40	UHD	AC 10	SG 10	1 000 - 4 000 mbar 400 - 1 600 "W.C.	150-3000 mbar 60-1 200 "W.C.	600-5 000 mbar 241-2 005 "W.C.
FRM 100050 ND	DN 50	ND	AC 10	SG 20	30 - 100 mbar 12 - 40 "W.C.		
FRM 100050 MD	DN 50	MD	AC 5/10**	SG 10/20**	90 - 420 mbar 36 - 168 "W.C.		
FRM 100050 HD //	DN 50	HD	AC 5	SG 10	400 - 1 500 mbar 160 - 602 "W.C.		
FRM 250050 UHD	DN 50	UHD	AC 5	SG 10	1 000 - 4 000 mbar 400 - 1 600 "W.C.		
FRM 100050 ND / SAV ND	DN 50	ND	AC 10	SG 20	30 - 100 mbar 12 - 40 "W.C.	10-90 mbar 4-36 "W.C.	60-450 mbar 24-180 "W.C.
FRM 100050 MD / SAV MD	DN 50	MD	AC 5/10**	SG 10/20**	90 - 420 mbar 36 - 168 "W.C.	10-500 mbar 4-200 "W.C.	60-999 mbar 24-401 "W.C.
FRM 100050 HD / SAV HD	DN 50	HD	AC 5	SG 10	400 - 1 500 mbar 160 - 602 "W.C.	150-3 000 mbar 60-1200 "W.C.	600-5 000 mbar 241-2 005 "W.C.
FRM 250050 UHD / SAV UHD	DN 50	UHD	AC 10	SG 10	1 000 - 4 000 mbar 400 - 1 600 "W.C.	150-3000 mbar 60-1 200 "W.C.	600-5 000 mbar 241-2 005 "W.C.

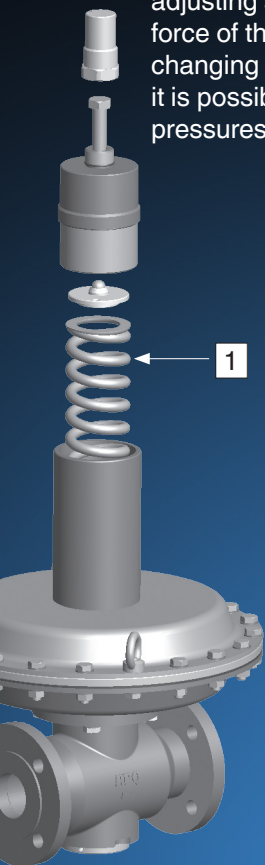
*Accuracy class / lock-up pressure class according to EN 334

** p_d = 90 - 180 mbar / 36 - 72 "W.C.: AC 10, SG 20

p_d = 180 - 420 mbar / 72 - 168 "W.C.: AC 5, SG 10

Selection of regulator springs

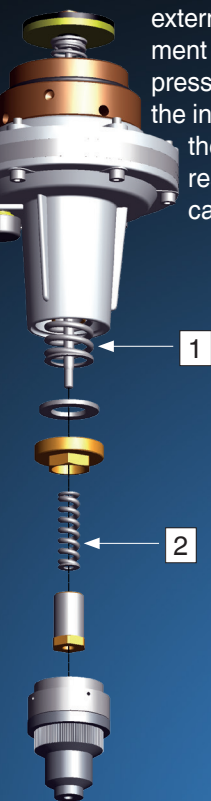
The response pressure results from the force of the installed adjusting spring and the weight force of the movable parts. By changing the setpoint **spring 1**, it is possible to set different outlet pressures.



Adjustment range, outlet pressure W_{ds}								
Spring colour	Order number	Wire Ø [mm]	Length [mm]	Ø [mm]	Setpoint range			
					ND	MD	HD	UHD
Silver	270341	5.5	300	60	30 - 40 mbar 12 - 16 "W.C.	90 - 110 mbar 36 - 44 "W.C.		
Green	270345	6.5	280	62.5	40 - 55 mbar 16 - 22 "W.C.	110 - 170 mbar 44 - 68 "W.C.		
Yellow	270346	7.0	300	63	55 - 80 mbar 22 - 32 "W.C.	170 - 240 mbar 68 - 98 "W.C.		
Blue	270347	8.0	300	65	80 - 100 mbar 32 - 40 "W.C.	240 - 330 mbar 96 - 132 "W.C.		
Black	270348	9.0	300	68		330 - 420 mbar 132 - 168 "W.C.	400 - 580 mbar 160 - 233 "W.C.	
Purple	270349	10.0	300	69			560 - 850 mbar 225 - 341 "W.C.	
Orange	270350	11.0	300	71			800 - 1 200 mbar 321 - 482 "W.C.	1 000 - 1 600 mbar 402 - 652 "W.C.
Pink	270352	12.0	300	73			1 100 - 1 500 mbar 442 - 602 "W.C.	
White	271113	13.0	300	75				1 500 - 2 500 mbar 603 - 1 004 "W.C.
Red	271132	14.0	300	77				1 900 - 3 300 mbar 763 - 1 325 "W.C.
Red/ Brown	276127	14.0/8.0	300	77/46				2 900 - 4 000 mbar 1 164 - 1 608 "W.C.

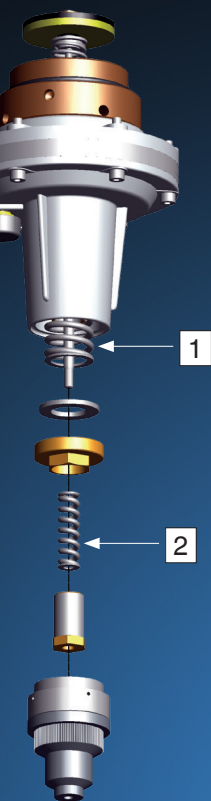
Selection of SAV springs

The response pressure results from the force of the installed adjusting spring. The upper response pressure (overpressure) is set on the external **spring 1** of the measurement device. The lower response pressure (vacuum) can be set on the internal **spring 2**. By changing the setpoint springs, different response pressures can be set.



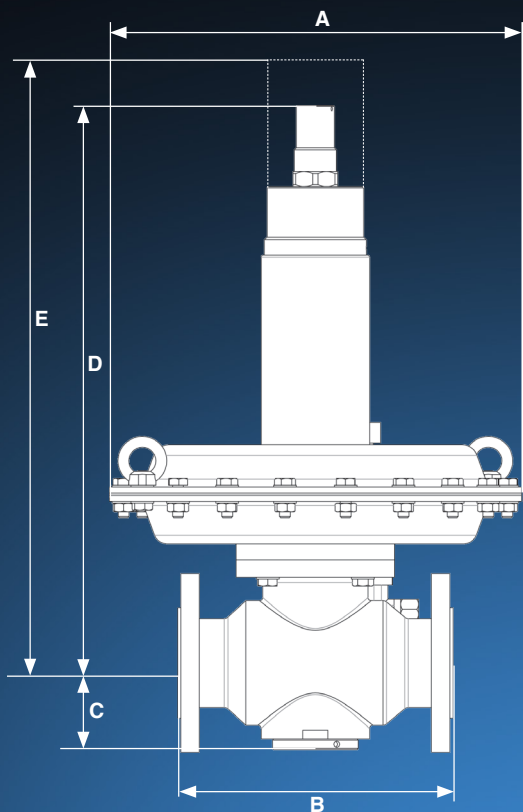
Specific adjustment range, underpressure W_{dsu}						
Spring colour	Order number	Wire diameter [mm]	Length [mm]	Diameter [mm]	Setpoint range [mbar]	
					ND-MD	HD-UHD
Yellow	303335	1,4	58,5	13	10 - 30	-
Blue	303336	1,6	58,2	13	25 - 90	150 - 290
Black	303337	1,8	58,3	13	70 - 160	250 - 560
Purple	303338	2	58,3	13	140 - 310	520 - 1100
Orange	303339	2,25	58,3	13	290 - 500	1 050 - 1 800
Pink	303340	2,5	58,2	13	-	1 650 - 3 000

Selection of SAV springs



Specific adjustment range, overpressure W_{dso}						
Spring colour	Order number	Wire diameter [mm]	Length [mm]	Diameter [mm]	Setpoint range [mbar]	
					ND-MD	HD-UHD
Silver	303321	2,4	55,2	30	60 - 140	-
Green	303322	2,8	55	30	80 - 220	-
Red	303323	3,2	54,6	30	160 - 450	600 - 1 700
Yellow	303324	3,6	54,5	30	300 - 680	1 250 - 2 500
Blue	303325	4	54,5	30	500 - 999	1 900 - 4 500
Black	303326	4,25	54,4	30	-	3 500 - 5 000

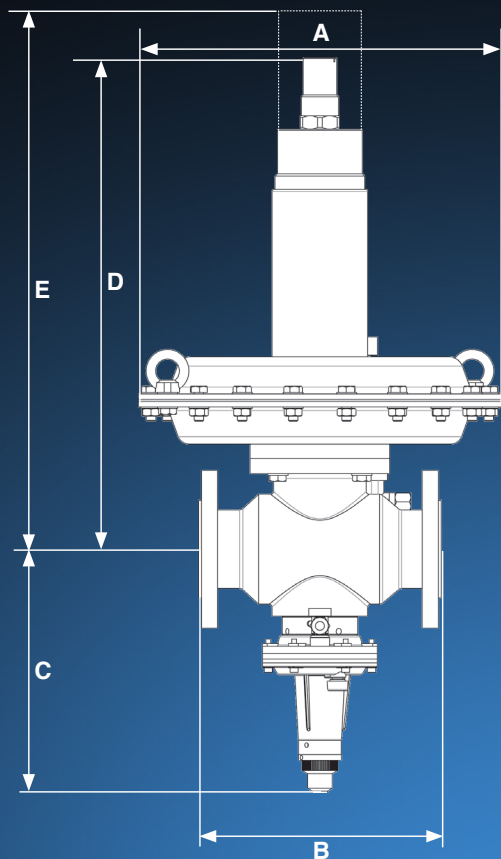
Dimensions FRM



Type	Order number	p _{max.} [bar/kPa/PSI]	DN	Dimensions							Weight [kg]
				A	B	C	D	E	F**	G	
FRM 100025 ND	270272	10 / 1 000 / 145	25	500	184	57	492	820	½ "G	ø 12	38 (83.8 lbs)
FRM 100025 MD	270273	10 / 1 000 / 145	25	380	184	57	492	820	½ "G	ø 12	32 (70.5 lbs)
FRM 100025 HD	270274	10 / 1 000 / 145	25	380	184	57	502	830	½ "G	ø 12	36 (79.4 lbs)
FRM 250025 UHD	271116	25 / 2 500 / 360	25	380	184	57	502	830	½ "G	ø 12	36 (79.4 lbs)
FRM 100040 ND	270278	10 / 1 000 / 145	40	500	223	69	505	830	½ "G	ø 12	42 (92.6 lbs)
FRM 100040 MD	270279	10 / 1 000 / 145	40	380	223	69	505	830	½ "G	ø 12	36 (79.4 lbs)
FRM 100040 HD	270280	10 / 1 000 / 145	40	380	223	69	515	840	½ "G	ø 12	40 (88.2 lbs)
FRM 250040 UHD	271118	25 / 2 500 / 360	40	380	223	69	515	840	½ "G	ø 12	40 (88.2 lbs)
FRM 100050 ND	270284	10 / 1 000 / 145	50	500	254	80	515	840	½ "G	ø 12	49 (108 lbs)
FRM 100050 MD	270285	10 / 1 000 / 145	50	380	254	80	515	840	½ "G	ø 12	43 (94.8 lbs)
FRM 100050 HD	270286	10 / 1 000 / 145	50	380	254	80	525	850	½ "G	ø 12	47 (103 lbs)
FRM 250050 UHD	271120	25 / 2 500 / 360	50	380	254	80	525	850	½ "G	ø 12	47 (103 lbs)

**½ "G to ½ "NPT adapter p/n 231945

Dimensions FRM with SAV



Type	Order number	p max. [bar/kPa/PSI]	DN	Dimensions							Weight [kg]
				A	B	C	D	E	F**	G	
FRM 100025 ND/SAV ND	270275	10 / 1 000 / 145	25	500	184	267	492	1 070	½ "G	ø 12	40 (88.2 lbs)
FRM 100025 MD/SAV MD	270276	10 / 1 000 / 145	25	380	184	267	492	1070	½ "G	ø 12	34 (75.0 lbs)
FRM 100025 HD/SAV HD	270277	10 / 1 000 / 145	25	380	184	267	502	1 080	½ "G	ø 12	38 (83.8 lbs)
FRM 250025 UHD/SAV UHD	271117	25 / 2 500 / 360	25	380	184	267	502	1 080	½ "G	ø 12	38 (83.8 lbs)
FRM 100040 ND/SAV ND	270281	10 / 1 000 / 145	40	500	223	273	505	1 080	½ "G	ø 12	44 (97.0 lbs)
FRM 100040 MD/SAV MD	270282	10 / 1 000 / 145	40	380	223	273	505	1 080	½ "G	ø 12	38 (83.8 lbs)
FRM 100040 HD/SAV HD	270283	10 / 1 000 / 145	40	380	223	273	515	1 090	½ "G	ø 12	42 (92.6 lbs)
FRM 250040 UHD/SAV UHD	271119	25 / 2 500 / 360	40	380	223	273	515	1 090	½ "G	ø 12	42 (92.6 lbs)
FRM 100050 ND/SAV ND	270287	10 / 1 000 / 145	50	500	254	276	515	1 090	½ "G	ø 12	51 (112.0 lbs)
FRM 100050 MD/SAV MD	270288	10 / 1 000 / 145	50	380	254	276	515	1 090	½ "G	ø 12	45 (99.2 lbs)
FRM 100050 HD/SAV HD	270289	10 / 1 000 / 145	50	380	254	276	525	1 100	½ "G	ø 12	49 (108.0 lbs)
FRM 250050 UHD/SAV UHD	271121	25 / 2 500 / 360	50	380	254	276	525	1 100	½ "G	ø 12	49 (108.0 lbs)

**½ "G to ½ "NPT adapter p/n 231945

Function

Mode of operation according to the force comparison principle between the force:

- of the adjustable setpoint spring,
- of the defined return spring,
- coming from the differential pressure on the working diaphragm and
- of the weight of the movable parts.

The setting spring acts independently of the weight of the movable parts. The outlet pressure is set depending on the preload of the setting spring.

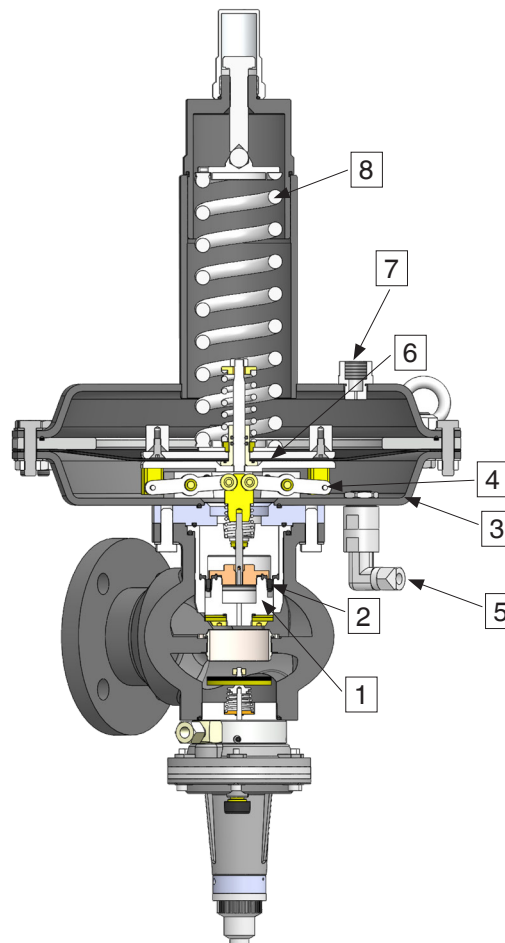
Information

gas carrying and impulse lines and connecting lines must be resistant to thermal, chemical and mechanical stresses. They must also be durable and resistant to deformation and cracks.

 Any condensate from impulse lines must not flow into the pressure regulator.

 Combustible gas and gas/air mixtures must not enter the installation space of the adjusting spring.

Sectional drawing FRM Pressure regulator in open position



In case of an increase of the outlet pressure, the working diaphragm 6 is pushed upwards, until the force of the setpoint spring 8 is equal to that of the outlet pressure.

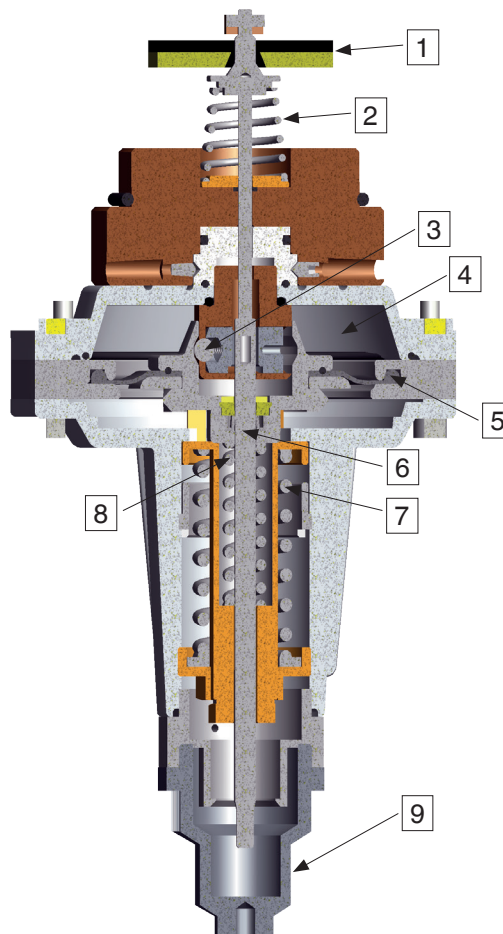
The upward movement of the working diaphragm 6 causes the lever system 4 to be pulled upwards. In this way, the control plate 1 is then pushed downwards and the valve gap is reduced.

The flow volume decreased in this way reduces the outlet pressure until the set nominal value (outlet pressure) is reached and a balance of forces at the working diaphragm 6 is established.

- 1 Control plate
- 2 Inlet pressure compensation diaphragm
- 3 Lower diaphragm shell
- 4 Lever system
- 5 Impulse connection for the outlet pressure
- 6 Working diaphragm
- 7 Vent connection
- 8 Setpoint spring

Function

Sectional drawing SAV Device in the closed position



Chamber 4 is connected to the outlet pressure via an impulse line. The pressure being monitored acts on the working diaphragm 5. The force of the setpoint springs 7 and 8 acts as counterforce. In case of an unbalance of forces (overpressure or underpressure), the SAV is actuated and the gas supply is blocked.

- 1 Valve disc
- 2 Closing spring
- 3 Ball catch / trigger mechanism
- 4 Chamber with the pressure to be monitored
- 5 Working diaphragm
- 6 Push rod
- 7 Setpoint spring for p_{d_o}
- 8 Setpoint spring for p_{d_u}
- 9 Protective cap

The following flow rate tables can be used to select the device. The maximum indicated volume flow refers to natural gas with a density of 0.81 kg/m^3 at a temperature of 15°C . In case of different types of gases, a conversion of the volume flow according to the equation on page 29 is carried out. It is possible to determine the maximum flow volume of the corresponding regulator at the operating point defined using p_d and p_u . This corresponds to the maximum power of the regulator at which an accuracy class of AC 10 is observed.

 **Design a straight stabilisation section with the equal diameter.**

 **Impulse connection at a distance of $> 5 \times \text{DN}$.**

 **Maximum flow velocity in the stabilisation section of $\leq 30 \text{ m/s}$.**

 **FRM with SAV max. flow of $2\,500 \text{ Nm}^3/\text{h}$ (Air).**

FRM 100025... DN 25 - max. flow volume $[\text{Nm}^3/\text{h}]$ natural gas of density 0.81 kg/m^3 (AC 10)

FRM ...	ND				MD							HD					
$p_o [\text{bar}] \backslash p_u [\text{bar}]$	0,03	0,05	0,075	0,1	0,1	0,15	0,2	0,25	0,3	0,35	0,4	0,4	0,5	0,75	1	1,25	1,5
0,2	99	120	122	110	110	113											
0,5	164	207	224	220	220	211	199	185	169	149	124	124					
0,75	203	259	283	281	281	276	270	262	254	244	232	232	203				
1	236	301	331	330	330	328	325	321	316	311	304	304	287	219			
1,5	295	377	415	415	415	415	415	415	414	413	411	411	406	379	331	248	
2	354	452	497	497	497	497	497	497	497	497	497	497	497	490	468	430	370
2,5	412	527	580	580	580	580	580	580	580	580	580	580	580	580	573	555	523
3	471	602	662	662	662	662	662	662	662	662	662	662	662	662	662	657	641
3,5	530	676	745	745	745	745	745	745	745	745	745	745	745	745	745	745	740
4	588	751	827	827	827	827	827	827	827	827	827	827	827	827	827	827	827
4,5	647	826	910	910	910	910	910	910	910	910	910	910	910	910	910	910	910
5	706	901	992	992	992	992	992	992	992	992	992	992	992	992	992	992	992
6	823	1051	1157	1157	1157	1057	1157	1157	1157	1157	1157	1157	1057	1057	1057	1057	1057
7	940	1201	1322	1322	1322	1322	1322	1322	1322	1322	1322	1322	1322	1322	1322	1322	1322
8	1058	1351	1487	1487	1487	1497	1487	1487	1487	1487	1487	1487	1497	1497	1497	1497	1497
9	1175	1501	1652	1652	1652	1652	1652	1652	1652	1652	1652	1652	1652	1652	1652	1652	1652
10	1292	1651	1817	1817	1817	1817	1817	1817	1817	1817	1817	1817	1817	1817	1817	1817	1817


 FRM 100025 ... DN 25 - max. flow volume [CFH] natural gas of density 0.81 kg/m³ (AC 10)

FRM ...		ND				MD						HD							
Outlet pressure p _u [PSI]	Inlet pressure p _d [PSI]	0.400	0.500	1.00	1.50	1.50	2.00	3.00	4.00	5.00	6.00	6.00	10.00	15.00	20.00	22.00			
	Inlet pressure p _d [°W.C.]	11.1	13.9	27.7	41.6	41.6	55.4	83.1	110.8	138.5	166.2	166.2	277.1	415.6	554.2	609.6			
3.0		3548	3718	4370	3974	3980	4047												
5.0		4604	4853	5967	5759	5752	5684	3504	3011	2575	2113	2113							
10.0		6836	7253	9299	9402	9387	9242	9073	8413	7851	7270	7270							
15.0		8477	8999	11631	11859	11855	11809	11749	11477	11247	10995	10995	8678						
20.0		9913	10529	13629	13929	13928	13916	13901	13816	13720	13599	13599	12332	108491	74877				
30.0		12781	13574	17558	17952	17952	17952	17952	17952	17952	17952	17952	17791	16864	14766	13806			
40.0		15624	16598	21492	21976	21976	21976	21976	21976	21976	21976	21976	21976	21802	21025	20619			
50.0		18498	19639	25419	26001	26001	26001	26001	26001	26001	26001	26001	26001	25998	25870	25765			
60.0		21335	22658	29339	30007	30007	30007	30007	30007	30007	30007	30007	30007	30007	30007	30007			
70.0		24208	25705	33269	34026	34026	34026	34026	34026	34026	34026	34026	34026	34026	34026	34026			
80.0		27063	28738	37194	38038	37913	36657	37031	38038	38038	38038	36216	36216	36216	36216	36216			
90.0		29912	31767	41123	42055	41863	39928	40504	42055	42055	42055	39249	39249	39249	39249	39249			
100.0		32761	34795	45052	46073	46047	45791	45867	46073	46073	46073	45701	45701	45701	45701	45701			
110		35630	37840	48981	50090	50104	50247	50204	50090	50090	50090	50297	50297	50297	50297	50297			
120		38494	40880	52910	54108	54125	54302	54250	54108	54108	54108	54364	54364	54364	54364	54364			
130	41343	43908	56839	58125	58126	58135	58133	58125	58125	58125	58138	58138	58138	58138	58138				
145	45627	48463	62748	64167	64167	64167	64167	64167	64167	64167	64167	64167	64167	64167	64167				



FRM 100040... DN 40 - max. flow volume [Nm³/h] natural gas of density 0,81 kg/m³ (AC 10)

FRM ...	ND				MD							HD					
p_d [bar] \ p_u [bar]	0,03	0,05	0,075	0,1	0,1	0,15	0,2	0,25	0,3	0,35	0,4	0,4	0,5	0,75	1	1,25	1,5
0,2	142	172	206	184	160	133											
0,5	237	298	380	367	320	352	383	329	360	284	270	200					
0,75	293	372	479	468	408	461	519	466	541	464	505	373	408				
1	340	434	561	551	480	548	626	571	674	592	661	489	577	473			
1,5	424	542	703	691	603	693	799	737	883	787	896	662	816	819	719	500	
2	509	640	843	829	723	831	957	883	1060	947	1082	800	1000	1057	1016	867	852
2,5	593	758	982	967	843	969	1116	1030	1236	1104	1262	932	1165	1250	1245	1119	1205
3	678	866	1122	1104	963	1107	1275	1176	1411	1261	1441	1065	1331	1428	1438	1324	1476
3,5	762	974	1262	1242	1083	1245	1434	1323	1587	1418	1621	1198	1497	1606	1617	1501	1704
4	847	1082	1402	1379	1203	1383	1593	1469	1763	1576	1801	1330	1663	1784	1796	1667	1905
4,5	931	1189	1542	1517	1323	1521	1752	1616	1939	1733	1980	1463	1829	1962	1975	1834	2095
5	1016	1297	1681	1654	1443	1658	1911	1762	2115	1890	2160	1596	1995	2140	2154	2000	2285
6	1185	1513	1961	1930	1683	1934	2228	2056	2467	2204	2519	1861	2327	2496	2512	2333	2665
7	1353	1729	2241	2205	1922	2210	2546	2349	2818	2518	2878	2127	2658	2852	2870	2665	3045
8	1522	1945	2520	2480	2162	2486	2864	2642	3170	2833	3237	2392	2990	3208	3229	2998	3425
9	1691	2160	2800	2755	2402	2762	3182	2935	3522	3147	3597	2657	3322	3564	3587	3330	3805
10	1860	2376	3080	3030	2642	3037	3499	3228	3874	3461	3956	2923	3654	3920	3945	3663	4185

FRM 100040 ... DN 40 - max. flow volume [CFH] natural gas of density 0.81 kg/m³ (AC 10)

FRM ...		ND				MD						HD					
Outlet pressure p _u [PSI]	Inlet pressure p _d [PSI]	0.400	0.500	1.00	1.50	1.50	2.00	3.00	4.00	5.00	6.00	6.00	10.00	15.00	20.00	22.00	
	Inlet pressure p _d [°W.C.]	11.1	13.9	27.7	41.6	41.6	55.4	83.1	110.8	138.5	166.2	166.2	277.1	415.6	554.2	609.6	
3.0		5092	5334	7115	6645	5717	5093										
5.0		6634	6989	9751	9616	8380	8416	6234	5878	4975	4600	3408					
10.0		9868	10458	15206	15663	13772	14938	16161	16458	15132	15825	11693					
15.0		12210	12966	19049	19796	17416	19108	20965	22496	21686	23911	17687	18367				
20.0		14255	15141	22306	23205	20448	22509	24801	27078	26470	29633	21899	26161	235524	150960		
30.0		18381	19453	28682	29943	26380	29069	32049	35190	34631	39080	28890	37741	36282	31814	31794	
40.0		22490	23887	35173	36644	32283	35577	39227	43058	42372	47827	35336	46606	46903	45438	47490	
50.0		26598	28252	41613	43348	38187	42085	46405	50928	50113	56576	41813	55132	55879	55949	59329	
60.0		30724	32630	48051	50033	44091	48593	53583	58798	57888	65332	48254	63659	64516	64934	69111	
70.0		34837	36994	54468	56730	49992	55084	60748	66674	65631	74072	54731	72186	73150	73633	78363	
80.0		38958	41370	60899	63438	55895	61583	67911	74555	73374	82819	61189	80712	81782	82328	87616	
90.0		43066	45735	67339	70151	61792	68089	75081	82434	81116	91561	67649	89237	90415	91023	96869	
100.0		47157	50087	73780	76847	67673	74590	82258	90297	88856	100302	74125	97758	99045	99710	106121	
110		51268	54455	80204	83542	73573	81097	89436	98170	96616	109043	80582	106284	107696	108406	115373	
120		55382	58823	86631	90238	79477	87606	96613	106045	104372	117794	87034	114810	116341	117100	124626	
130	59497	63189	93066	96934	85381	94114	103791	113921	112115	126559	93486	123337	124971	125786	133878		
145	65685	69761	102750	107003	94256	103874	114550	125763	123759	139705	103225	136159	137953	138866	147792		


FRM 100050... DN 50 - max. flow volume [Nm³/h] natural gas of density 0,81 kg/m³ (AC 10)

FRM ...	ND				MD							HD					
p_d [bar] \ p_u [bar]	0,03	0,05	0,075	0,1	0,1	0,15	0,2	0,25	0,3	0,35	0,4	0,4	0,5	0,75	1	1,25	1,5
0,2	150	182	218	194	169	140											
0,5	250	315	401	388	338	372	405	348	381	300	285	211					
0,75	309	393	506	494	431	486	548	492	571	490	533	394	431				
1	359	458	592	581	507	579	661	602	712	625	698	516	609	499			
1,5	448	572	742	730	636	732	843	778	932	831	645	699	862	864	759	528	
2	537	686	889	875	763	877	1011	932	1119	1000	1142	844	1055	1116	1073	915	945
2,5	626	800	1037	1020	890	1023	1178	1087	1307	1166	1332	984	1230	1320	1314	1181	1336
3	716	914	1185	1166	1016	1168	1346	1242	1490	1331	1522	1124	1405	1508	1518	1397	1636
3,5	805	1028	1332	1311	1143	1314	1514	1396	1676	1497	1711	1264	1581	1696	1707	1585	1889
4	864	1142	1480	1456	1270	1460	1682	1551	1861	1663	1901	1404	1756	1883	1896	1760	2112
4,5	983	1256	1627	1601	1396	1605	1849	1706	2047	1829	2090	1545	1931	2071	2085	1936	2323
5	1072	1369	1775	1746	1523	1751	2017	1861	2233	1995	2280	1685	2106	2259	2274	2111	2533
6	1250	1597	2070	2037	1779	2042	2352	2170	2604	2327	2659	1965	2456	2635	2652	2462	2955
7	1429	1825	2365	2327	2029	2333	2688	2479	2975	2659	3038	2245	2806	3011	3030	2813	3376
8	1607	2053	2661	2618	2283	2624	3023	2789	3347	2990	3418	2525	3156	3386	3408	3165	3797
9	1785	2280	2956	2908	2536	2915	3359	3098	3718	3322	3797	2805	3507	3762	3786	3516	4000
10	1964	2508	3251	3199	2789	3206	3694	3408	4089	3654	4100	3086	3857	4100	4100	3867	4100


 FRM 100050 ... DN 50 - max. flow volume [CFH] natural gas of density 0.81 kg/m³ (AC 10)

FRM ...		ND				MD						HD				
Outlet pressure p _u [PSI]	Inlet pressure p _d [PSI]	0.400	0.500	1.00	1.50	1.50	2.00	3.00	4.00	5.00	6.00	6.00	10.00	15.00	20.00	22.00
	Inlet pressure p _d ["W.C.]	11.1	13.9	27.7	41.6	41.6	55.4	83.1	110.8	138.5	166.2	166.2	277.1	415.6	554.2	609.6
3.0		5378	5636	7529	7007	6038	5366									
5.0		7001	7380	10303	10156	8851	8885	6590	6219	5256	4856	3595				
10.0		10408	11035	16061	16539	14546	15762	17057	17380	15981	16703	12349				
15.0		12893	13689	20102	20878	18395	20187	22144	23743	22897	24522	18664	19379			
20.0		15060	15992	23542	24506	21575	23771	26185	28581	27948	23231	23120	27606	248631	159415	
30.0		19394	20598	30335	31601	27841	30680	33839	37151	36571	41247	30483	39841	38311	34456	35262
40.0		23746	25219	37141	38680	34070	37548	41405	45481	44741	50500	37300	49213	49507	49254	52645
50.0		28097	29838	43923	45759	40301	44416	48984	53766	52906	59721	44118	58223	58991	60688	65769
60.0		31662	33847	50720	52820	46539	51292	56563	62073	61089	68960	50945	67199	68109	70442	76624
70.0		36765	39046	57501	59881	52761	58152	64127	70400	69276	78187	57788	76201	77223	79868	86876
80.0		41099	43649	64291	66960	59042	65033	71698	78708	77460	87421	64605	85202	86336	89297	97139
90.0		45441	48261	71078	74038	65293	71902	79266	87010	85643	96649	71423	94204	95449	98731	107407
100.0		49800	52887	77866	81099	71448	78745	86841	95313	93827	105877	78240	103205	104563	108157	117657
110		54137	57496	84670	88181	77680	85609	94408	103636	101995	115126	85058	112192	113680	117592	127908
120		58472	62101	91466	95257	83918	92474	101977	111953	110166	124369	91876	121185	122796	125938	136052
130		62806	66701	98248	102318	90142	99335	109552	120255	118350	133597	98694	130193	131909	132626	140995
145		69358	73655	108456	112972	99501	109654	120929	132757	130657	144790	108981	142713	143664	140806	144790

Device selection



Flow rate tables

FRM 250025 UHD... DN 25 - max. flow volume
[Nm³/h] natural gas of density 0,81 kg/m³ (AC 10)

FRM ...	UHD				
p_d [bar]	1	1,5	2	3	4
p_u [bar]					
1,5	331				
2	468	370			
2,5	573	523	405		
3	662	641	573		
3,5	745	740	702	467	
4	827	827	810	661	
6	1157	1157	1157	1145	1945
8	1487	1487	1487	1487	1487
10	1817	1817	1817	1817	1817
12	2147	2147	2147	2147	2147
14	2477	2477	2477	2477	2477
16	2807	2807	2807	2807	2807
18	3137	3137	3137	3137	3137
20	3467	3467	3467	3467	3467
25	4292	4292	4292	4292	4292

FRM 250025 UHD... DN 25 - max. flow volume
[Nm³/h] natural gas of density 0,81 kg/m³ (AC 5)

FRM ...	UHD				
p_d [bar]	1	1,5	2	3	4
p_u [bar]					
1,5	203				
2	287	340			
2,5	351	480	268		
3	405	588	378		
3,5	456	679	463	339	
4	506	760	535	480	
6	708	1063	764	831	766
8	910	1366	982	1079	1084
10	1112	1669	1200	1318	1332
12	1314	1972	1419	1558	1574
14	1517	2275	1637	1797	1816
16	1719	2578	1855	2037	2058
18	1921	2881	2073	2276	2300
20	2123	3184	2291	2515	2542
25	2628	3941	2836	3114	3147


FRM 250025 UHD... DN 25 - max. flow volume [CFH] natural gas of density 0.81 kg/m³ (AC 10)

FRM ...	UHD				
p_d [bar] \ p_u [bar]	15.00	25.00	35.00	45.00	58.00
22	11071				
30	16814	8505			
40	21772	19162	10189		
50	25984	25115	20364		
60	30002	29752	27406	22479	
80	38038	37973	37233	37915	
100	46073	46073	45976	47441	61451
120	54108	54108	54108	54108	54108
140	62143	62143	62143	62143	62143
160	70178	70178	70178	70178	70178
180	78213	78213	78213	78213	78213
200	86248	86248	86248	86248	86248
250	106335	106335	106335	106335	106335
300	126423	126423	126423	126423	126423
360	150529	150529	150529	150529	150529

FRM 250025 UHD... DN 25 - max. flow volume [CFH] natural gas of density 0.81 kg/m³ (AC 5)

FRM ...	UHD				
p_d [bar] \ p_u [bar]	1.00	1.50	2.00	3.00	4.00
22	6799				
30	10598	7589			
40	13758	15585	6730		
50	16442	20238	13836		
60	18988	23936	18766	16162	
80	24075	30508	25569	25745	
100	29161	37002	31598	33142	61451
120	34248	43454	37190	39283	54108
140	39335	49905	42709	45124	62143
160	44421	56365	48247	50971	70178
180	49514	62825	53783	56813	78213
200	54624	69276	59302	62639	86248
250	67344	85406	73115	77239	106335
300	80061	101534	86916	91812	126423
360	95320	120880	103492	109332	150529



Flow rate tables

FRM 250040 UHD... DN 40 - max. flow volume
 [Nm³/h] natural gas of density 0,81 kg/m³ (AC 10)

FRM ...	UHD				
p_d [bar] \ p_u [bar]	1	1,5	2	3	4
1,5	583				
2	825	852			
2,5	1011	1205	770		
3	1167	1476	1089		
3,5	1312	1704	1334	976	
4	1458	1905	1541	1381	
6	2039	2665	2201	2391	2206
8	2621	3425	2828	3106	3119
10	3203	4185	3456	3795	3836
12	3784	4945	4084	4484	4532
14	4366	5705	4711	5173	5229
16	4947	6465	5339	5863	5926
18	5529	7225	5966	6552	6622
20	6110	7985	6594	7241	7319
25	7564	9885	8163	8964	9060

FRM 250040 UHD... DN 40 - max. flow volume
 [Nm³/h] natural gas of density 0,81 kg/m³ (AC 5)

FRM ...	UHD				
p_d [bar] \ p_u [bar]	1	1,5	2	3	4
1,5	292				
2	413	489			
2,5	505	691	385		
3	583	847	545		
3,5	656	978	667	488	
4	729	1093	770	690	
6	1020	1530	1100	1196	1103
8	1310	1966	1414	1553	1560
10	1601	2402	1728	1898	1918
12	1892	2838	2042	2242	2266
14	2183	3274	2356	2587	2615
16	2474	3710	2669	2931	2963
18	2764	4147	2983	3276	3311
20	3055	4583	3297	3621	3659
25	3782	5673	4082	4482	4530



Flow rate tables

FRM 250040 UHD... DN 40 - max. flow volume [CFH] natural gas of density 0.81 kg/m³ (AC 10)

FRM ...	UHD				
p_d [bar] \ p_u [bar]	15.00	25.00	35.00	45.00	58.00
22	19517				
30	30154	19235			
40	39157	41009	19367		
50	46720	53455	39853		
60	54003	63252	54030	46501	
80	68448	80668	73621	74082	
100	82907	97850	90980	95384	92328
120	97374	114909	107083	113078	113611
140	111842	131975	122987	129924	131070
160	126292	149042	138892	146731	148145
180	140744	166106	154792	163526	165099
200	155211	183162	170683	180322	182070
250	191347	225818	210444	222342	224476
300	227478	268478	250196	264333	266882
360	270853	319666	297899	314730	317751

FRM 250040 UHD... DN 40 - max. flow volume [CFH] natural gas of density 0.81 kg/m³ (AC 5)

FRM ...	UHD				
p_d [bar] \ p_u [bar]	1.00	1.50	2.00	3.00	4.00
22	9780				
30	15250	10915			
40	19801	22442	9689		
50	23658	29153	19928		
60	27351	34436	26998	23237	
80	34680	43911	36804	37049	
100	41993	53264	45488	47702	46172
120	49302	62551	53543	56543	56821
140	56629	71838	61500	64976	65538
160	63956	81125	69450	73373	74073
180	71283	90412	77400	81766	82553
200	78610	99699	85357	90177	91051
250	96909	122913	105215	111165	112238
300	115212	146138	125105	132178	133426
360	137180	173999	148959	157365	158875


**FRM 250050 UHD... DN 50 - max. flow volume
[Nm³/h] natural gas of density 0,81 kg/m³ (AC 10)**

FRM ...	UHD				
p_d [bar]	1	1,5	2	3	4
p_u [bar]					
1,5	616				
2	871	1032			
2,5	1067	1460	813		
3	1232	1788	1150		
3,5	1385	2065	1408	1031	
4	1539	2308	1626	1457	
6	2153	3229	2323	2524	2328
8	2767	3900	2986	3279	3293
10	3381	4100	3648	4006	4049
12	3995	4300	4300	4300	4300
14	4609	4900	4900	4900	4900
16	5223	5400	5400	5400	5400
18	5500	5500	5500	5500	5500
20	5590	5590	5590	5590	5590
25	5700	5700	5700	5700	5700

**FRM 250050 UHD... DN 50 - max. flow volume
[Nm³/h] natural gas of density 0,81 kg/m³ (AC 5)**

FRM ...	UHD				
p_d [bar]	1	1,5	2	3	4
p_u [bar]					
1,5	308				
2	436	516			
2,5	533	730	407		
3	616	894	575		
3,5	693	1032	704	515	
4	769	1154	813	729	
6	1076	1615	1162	1262	1164
8	1383	2075	1493	1639	1646
10	1690	2536	1824	2003	2025
12	1997	2996	2155	2367	2392
14	2304	3456	2487	2731	2760
16	2611	3917	2818	3094	3128
18	2918	4377	3149	3458	3495
20	3225	4838	3480	3822	3863
25	3993	5700	4309	4731	4782



Flow rate tables

FRM 250050 UHD... DN 50 - max. flow volume [CFH]
 natural gas of density 0.81 kg/m³ (AC 10)

FRM ...	UHD				
p_d [bar] \ p_u [bar]	15.00	25.00	35.00	45.00	58.00
22	20632				
30	32172	23041			
40	41839	47386	20451		
50	49954	61547	42076		
60	57742	72715	57010	49063	
80	73203	92700	77703	78195	
100	88395	110262	96044	100693	97459
120	103284	125252	113054	119376	119945
140	117544	135155	129827	137150	138352
160	131805	144975	143234	146902	147561
180	146263	156203	156203	156203	156203
200	161190	170812	170812	170812	170812
250	190662	192883	192883	192883	192883
300	197941	197941	197941	197941	197941
360	201155	201155	201155	201155	201155

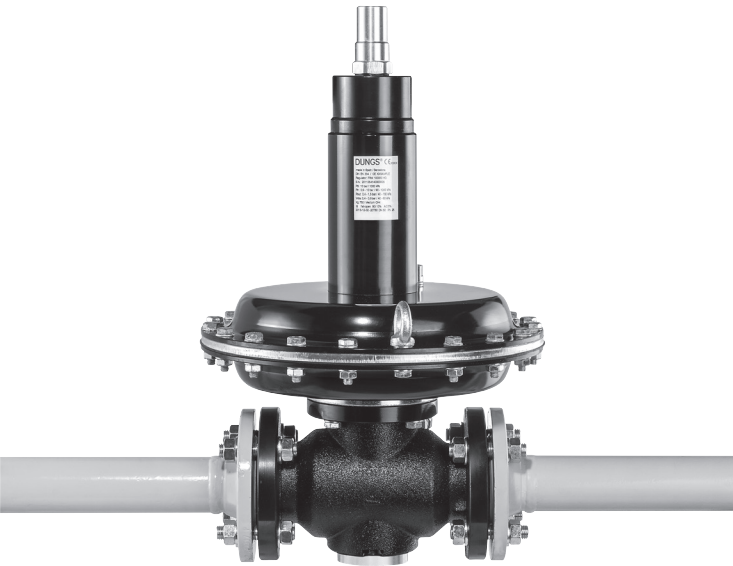
FRM 250050 UHD... DN 50 - max. flow volume
 [CFH] natural gas of density 0.81 kg/m³ (AC 5)

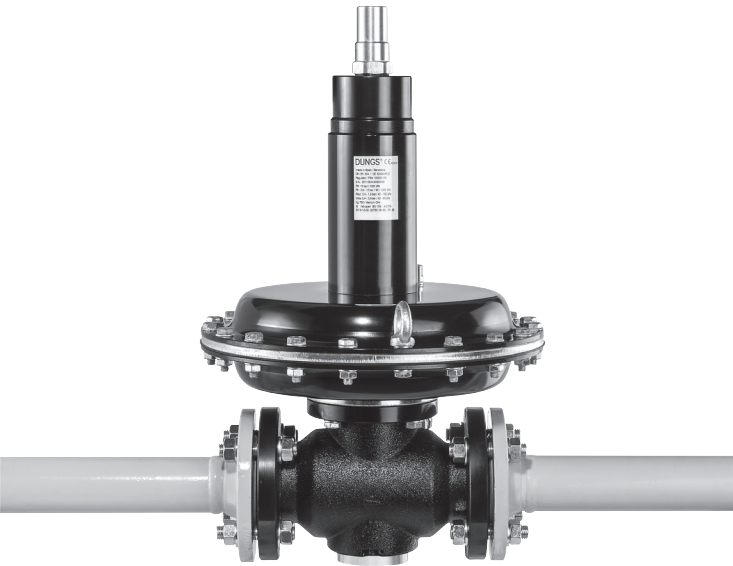
FRM ...	UHD				
p_d [bar] \ p_u [bar]	1.00	1.50	2.00	3.00	4.00
22	10317				
30	16098	11521			
40	20912	23697	10230		
50	24991	30765	21032		
60	28855	36359	28512	24546	
80	36587	46363	38861	39101	
100	44317	56232	48025	50338	48721
120	52047	66030	56521	59673	59960
140	59779	75838	64912	68573	69188
160	67509	85637	73303	77451	78197
180	75239	95435	81699	86322	87141
200	82969	105241	90105	95195	96100
250	102296	129751	111071	117343	118480
300	121530	153492	132051	139520	140862
360	144158	178247	157239	166109	167714

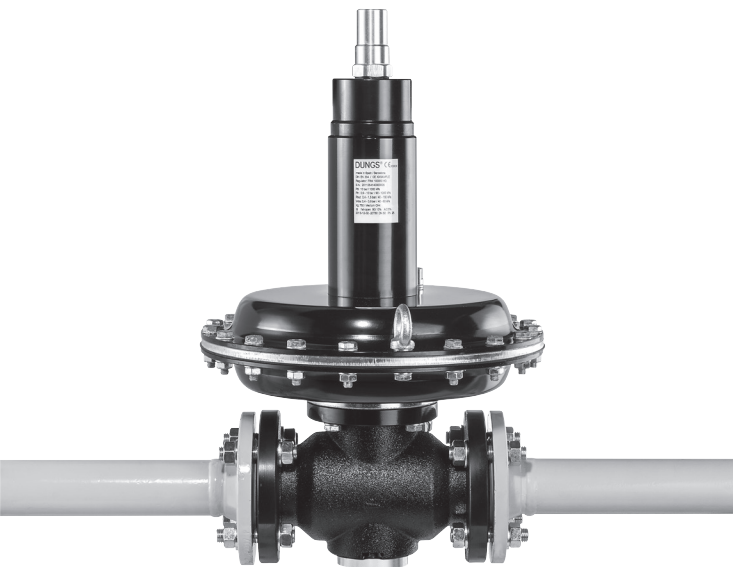


$\dot{V}_{\text{used gas}} =$	$\dot{V}_{\text{air}} \times f$	Type of gas	Spec. Wgt.	dv	f
			[kg/m³]		
		Natural gas	0.81	0.65	1.24
		City gas	0.58	0.47	1.46
		LPG	2.08	1.67	0.77
		Air	1.24	1.00	1.00

$f = \sqrt{\frac{\text{air density}}{\text{spec. weight of the gas used}}}$







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Subject to technical modification in the interest of technical progress.