

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 (2500 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 65 – DN 80



Application	3
Approval	3
Technical data	4 + 5
Pressure taps	6
Nomenclature	7
Adjustment range	8
Selection of regulator springs	9
Selection of SAV springs	10
Dimensions	11 + 12
Function	13
Sectional drawing FRM/SAV	13 + 14
Device selection / flow rate tables	15 - 17
Contact details	19

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.

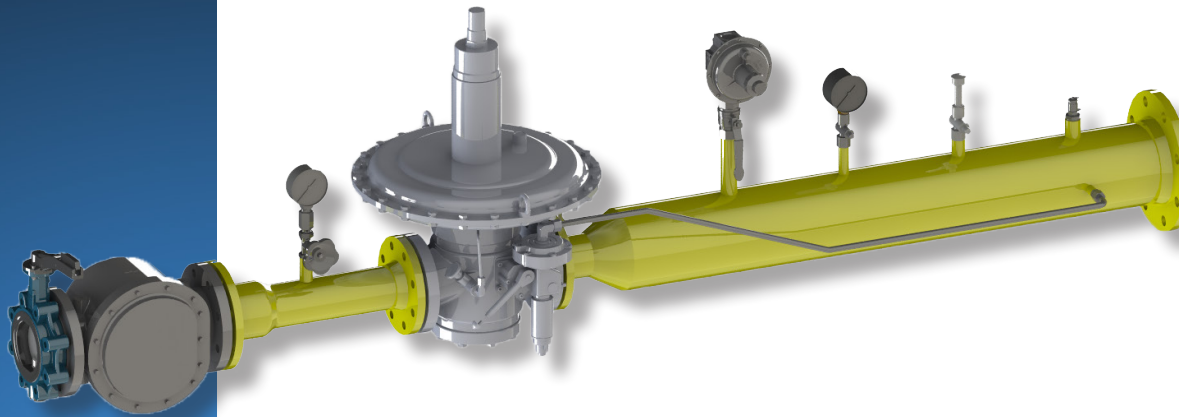
Suitable for gases of gas families 1, 2, 3 and other neutral gases.

Approval

EC type test approval as per EC Pressure Appliance Directive.

FRM 100...CE-0085CP0256

FRM 250...CE-0085CP0256



Spring-loaded medium pressure regulator in compliance with EN334

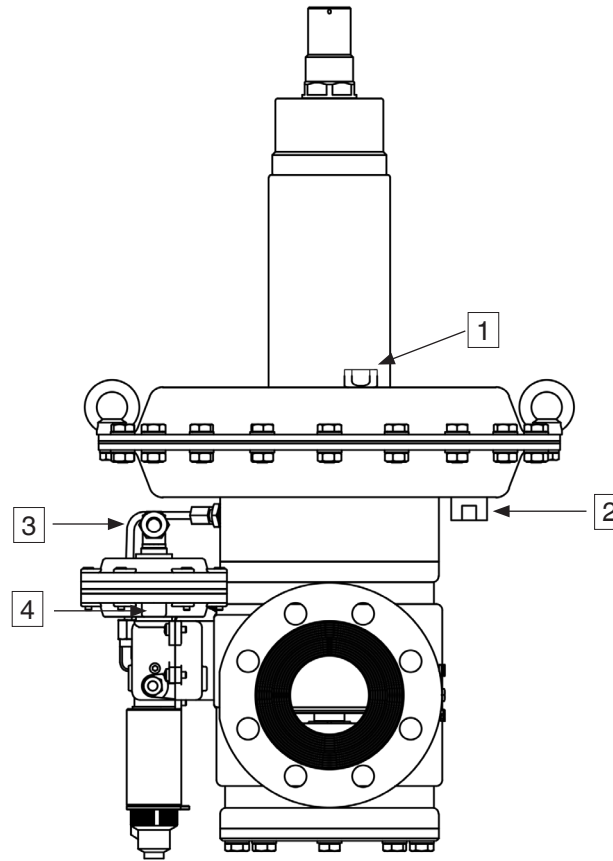
Type	FRM 100... IS (integral strength range) / FRM 250... DS (differential strength range)	
Type of gas	Family 1+2+3	
Nominal diameters Flanges	Connecting flange PN 25 according to EN1092-1 or ANSI 150 lbs (B16.5) DN 65 80	
Max. inlet pressure	FRM 100... 10 bar (1000 kPa) / FRM 250... 25 bar (2500 kPa)	
Outlet pressure range	90 mbar a 4000 mbar (9-400 kPa)	
Minimum differential pressure (MD)	350 mbar (35 kPa)	
Minimum differential pressure (HD/UHD)	500 mbar (50 kPa)	
Accuracy class	up to AC 5 (see adjustment range, page 8)	
Lock-up pressure class	up to SG 10 (see adjustment range, page 8)	
Failure mode (diaphragm rupture)	fail-open	
Materials	Main body housing:	cast iron GGG 50
	Diaphragm housing:	steel
	Diaphragms:	NBR
Ambient temperature	-20 °C to +60 °C	



Safety shut-off valve in compliance with EN14382, class A

Type	FRM 100... IS (integral strength range) / FRM 250... DS (differential strength range)
Response time	< 2 s
Lower adjustment range W_{du}	35 mbar up to 3000 mbar (3,5-300 kPa)
Upper adjustment range W_{do}	180 mbar up to 5000 mbar (18-500 kPa)
Materials	Main body housing: cast iron GGG 50 Diaphragm housing: aluminium Diaphragms: NBR





- 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 SAV,
G ¼ ISO 228

Example FRM 100080 MD/ SAV MD FRM	100	080	MD	SAV	MD
Type	Spring-loaded medium pressure regulator				
MOP	100 ...	10 000 mbar			
	250 ...	25 000 mbar			
Nominal diameter	DN 65	065			
	DN 80	080			
Pressure range, outlet pressure	MD	Medium pressure			
	HD	High pressure			
	UHD	Ultra high pressure			
Safety device	SAV	Integrated shut-off valve			
Pressure range, trip pressure	MD	Medium pressure			
	HD	High pressure			
	UHD	Ultra high pressure			
Flange type	ANSI	with standard PN-25 with ANSI 150 lbs			



Adjustment range

Type	Connec- tion	Ver- sion	Accuracy class* [AC]	Lock-up pressure class* [SG]	Outlet pressure range W_d	Under pressure monitoring SAV		Over pressure monitoring SAV	
						W_{du}	AG	W_{do}	AG
FRM 100065 MD	DN 65	MD	AC 5/10**	SG 10/20**	90-420 mbar				
FRM 100065 HD	DN 65	HD	AC 5	SG 10	400-1500 mbar				
FRM 250065 UHD	DN 65	UHD	AC 5	SG 10	1000-4000 mbar				
FRM 100065 MD / SAV MD	DN 65	MD	AC 5/10**	SG 10/20**	90-420 mbar	35-400 mbar	AG 10	180-800 mbar	AG 10
FRM 100065 HD / SAV HD	DN 65	HD	AC 5	SG 10	400-1500 mbar	150-1400 mbar	AG 5	500-3500 mbar	AG 5
FRM 250065 UHD / SAV UHD	DN 65	UHD	AC 5	SG 10	1000-4000 mbar	150-3000 mbar	AG 5	1300-5000 mbar	AG 5
FRM 100080 MD	DN 80	MD	AC 5/10**	SG 10/20**	90-420 mbar				
FRM 100080 HD	DN 80	HD	AC 5	SG 10	400-1500 mbar				
FRM 250080 UHD	DN 80	UHD	AC 5	SG 10	1000-4000 mbar				
FRM 100080 MD / SAV MD	DN 80	MD	AC 5/10**	SG 10/20**	90-420 mbar	35-400 mbar	AG 10	180-800 mbar	AG 10
FRM 100080 HD / SAV HD	DN 80	HD	AC 5	SG 10	400-1500 mbar	150-1400 mbar	AG 5	500-3500 mbar	AG 5
FRM 250080 UHD / SAV UHD	DN 80	UHD	AC 5	SG 10	1000-4000 mbar	150-3000 mbar	Ag 5	1300-5000 mbar	AG 5

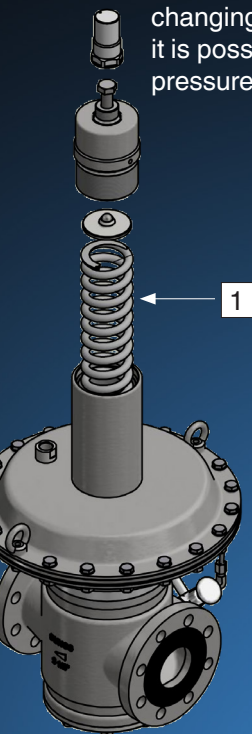
*Accuracy class / Lock-up pressure class to EN 334

** p_a = 90-180 mbar: AC 10, SG 20; p_a = 180-420 mbar: AC 5, SG 10



Selection of regulator springs

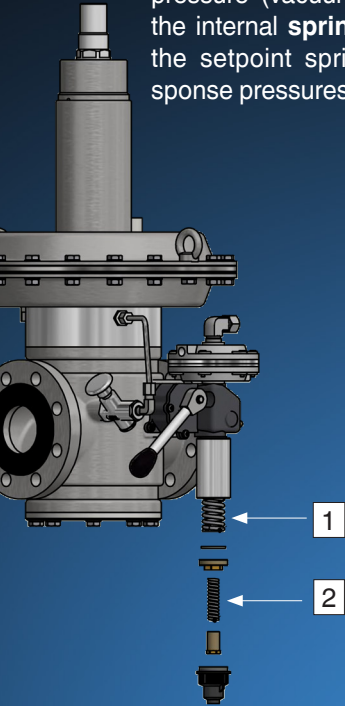
The response pressure results from the force of the installed adjusting spring and the weight force of the movable parts. By changing the setpoint **spring 1**, it is possible to set different outlet pressures.



Specific set range, outlet pressure W_{ds}							
Spring colour	Order number	Wire diameter [mm]	Length [mm]	Diameter [mm]	Setpoint range [mbar]		
					MD	HD	UHD
Blue	270347	8.0	300	65	90-140		
Black	270348	9.0	300	68	120-185	400-550	
Purple	270349	10.0	300	69	180-280	540-850	1000-1300
Orange	270350	11.0	300	71	250-420	800-1150	1100-1800
Pink	270352	12.0	300	73		1100-1500	1600-2500
Red	271132	14.0	300	77			2400-4000

Selection of SAV springs

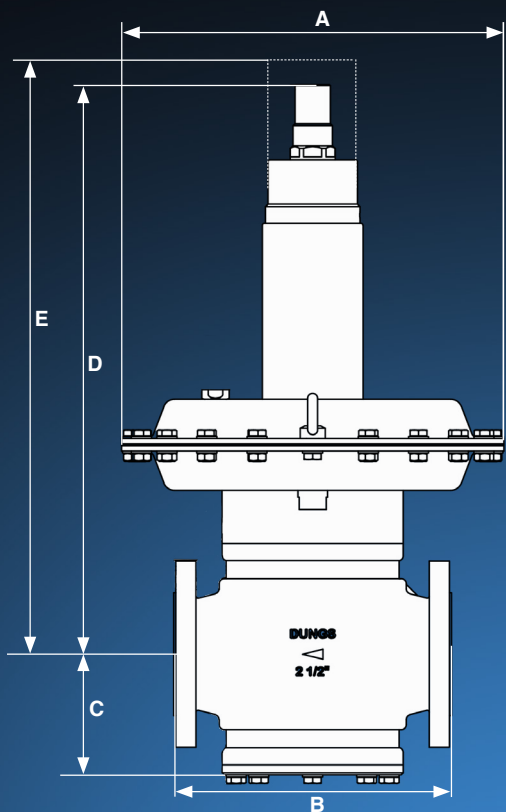
The response pressure results from the force of the installed adjusting spring. The upper response pressure (overpressure) is set on the external **spring 1** of the measurement device. The lower response pressure (vacuum) can be set on the internal **spring 2**. By changing the setpoint springs, different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



Specific set range, underpressure W_{dsu}							
Spring colour	Order number	Wire diameter [mm]	Length [mm]	Diameter [mm]	Setpoint range [mbar]		
					MD	HD	UHD
Blue	270356	2.0	55	12.3	35-110		
Black	270357	2.3	55	12.3	50-250		
Purple	270358	2.5	55	12.3	80-400	150-500	150-500
Orange	270359	2.8	55	12.3		300-1000	300-1000
Silver	270360	3.0	60	15.0		800-1400	800-1400
Pink	276126	3.5	60	15.0			1200-3000

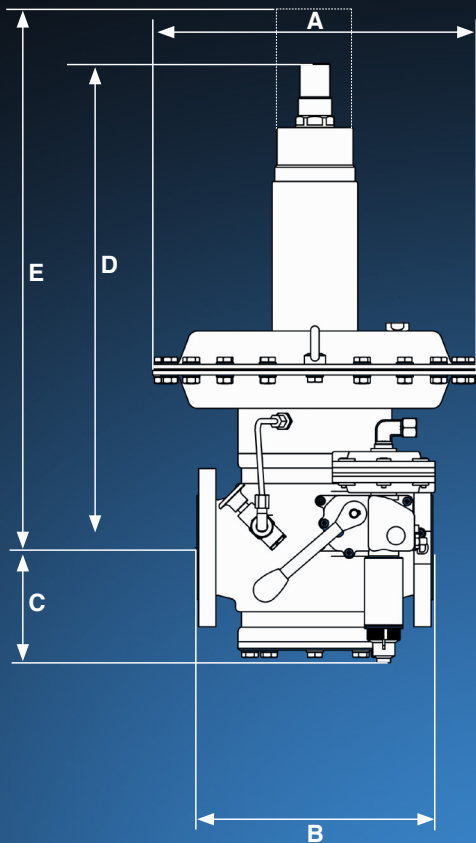
Specific set range, overpressure W_{dso}							
Spring colour	Order number	Wire diameter [mm]	Length [mm]	Diameter [mm]	Setpoint range [mbar]		
					MD	HD	UHD
Green	270366	2.5	60	30.0	180-270		
Red	270367	2.7	60	30.0	230-370		
Yellow	270368	3.2	60	30.0	300-500		
Blue	270369	3.5	60	30.0	400-800	500-1000	
Black	270370	3.7	60	30.0		700-1300	
Purple	270371	4.0	60	30.0		1000-1800	
Orange	270372	4.5	60	30.0		1300-2500	1300-2500
Pink	270373	4.8	60	30.0		1800-3500	1800-3500
White	271115	5.0	60	30.0			2500-5000

Dimensions FRM



Type	Order number	p _{max.} [bar / kPa]	DN	Dimensions [mm]					Weight [kg]
				A	B	C	D	E	
FRM 100065 MD	277241	10 / 1000	65	500	298	120	567	892	56
FRM 100065 HD	277242	10 / 1000	65	380	298	120	567	892	50
FRM 250065 UHD	277243	25 / 2500	65	380	298	120	567	892	52
FRM 100080 MD	277244	10 / 1000	80	500	298	120	567	892	58
FRM 100080 HD	277245	10 / 1000	80	380	298	120	567	892	53
FRM 250080 UHD	277246	25 / 2500	80	380	298	120	567	892	55

Dimensions FRM with SAV



Type	Order number	p _{max.} [bar / kPa]	DN	Dimensions [mm]					Weight [kg]
				A	B	C	D	E	
FRM 100065 MD/SAV MD	273061	10 / 1000	65	500	298	135	567	892	71
FRM 100065 HD/SAV HD	276113	10 / 1000	65	380	298	135	567	892	65
FRM 250065 UHD/SAV UHD	276114	25 / 2500	65	380	298	135	567	892	67
FRM 100080 MD/SAV MD	276115	10 / 1000	80	500	298	135	567	892	73
FRM 100080 HD/SAV HD	276116	10 / 1000	80	380	298	135	567	892	68
FRM 250080 UHD/SAV UHD	276117	25 / 2500	80	380	298	135	567	892	70

**Sectional drawing FRM
Pressure regulator in open position**

Function


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


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

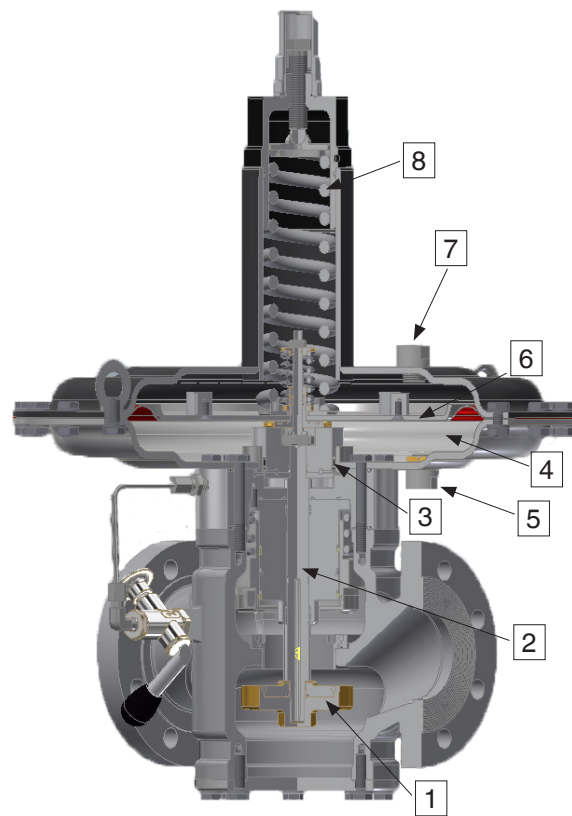
The setting spring acts independently of the weight of the movable parts. The outlet pressure is set depending on the preload of the setting spring.

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.

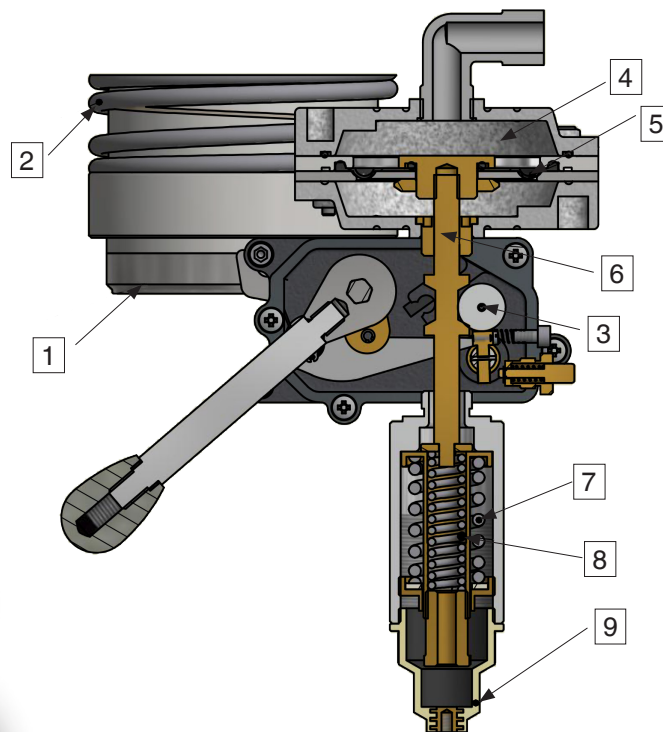


As the output pressure increases, the force in the lower diaphragm shell **4** increases to the working diaphragm **6**.

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 working plate shaft **2** to be pulled upwards. In this way, the control plate **1** is then pushed upwards 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 Control plate shaft
- 3 Inlet pressure compensation diaphragm
- 4 Lower diaphragm shell
- 5 Impulse connection for the outlet pressure
- 6 Working diaphragm
- 7 Vent connection
- 8 Setpoint spring



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 pd_o
- 8 Setpoint spring for pd_u
- 9 Protective cap

Flow rate tables

Device selection

The following flow rate tables can be used to select the device. The maximum indicated volume flow refers to the natural gas with a standard density of 0,81 kg / m³ 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 18 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 or AC 5 as indicated in the table.



Design a straight stabilisation section with the equal diameter.



Impulse connection at a distance of > 5 x DN.



Maximum flow velocity in the stabilisation section of <= 30 m/s.

FRM 100065... DN 65 - max. flow volume [Nm³/h] natural gas of density 0,81 kg/m³ (AC 10)

FRM ...	MD							HD					
p_d [bar] \ / \ p_u [bar]	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
0,5	736	647	624	602	580								
0,75	846	906	932	899	867	837							
1	1014	1155	1142	1129	1090	1129	942	942	910				
1,5	1174	1393	1484	1431	1460	1686	1143	1143	1104	1204	1351		
2	1357	1622	1729	1669	1790	2148	1431	1431	1383	1561	1510	1461	1516
2,5	1562	1813	1965	1896	2057	2423	1733	1733	1743	1926	1906	1845	1866
3	1644	1969	2190	2115	2264	2615	1976	1976	2178	2236	2247	2175	2185
3,5	1723	2092	2304	2325	2487	2753	2166	2166	2378	2533	2534	2454	2493
4	1744	2235	2412	2477	2654	2886	2303	2303	2571	2737	2771	2684	2865
4,5	1844	2373	2441	2599	2791	2923	2436	2436	2715	2933	2959	2867	3039
5	1939	2480	2542	2692	2899	2980	2520	2520	2790	3062	3063	3044	3170
6	2056	2631	2710	2874	3092	3143	2706	2706	2965	3088	3163	3288	3512
7	2194	2776	2848	3026	3190	3299	2843	2843	3072	3092	3241	3524	3807
8	2300	2868	2933	3127	3284	3450	2935	2935	3137	3097	3334	3805	4056
9	2379	2932	2993	3223	3310	3594	2983	2983	3160	3100	3387	3936	4144
10	2501	2993	3072	3251	3313	3733	2990	2990	3182	3085	3384	4044	4212



FRM 100080... DN 80 - max. flow volume [Nm³/h] natural gas of density 0,81 kg/m³ (AC 10)

FRM ...	MD							HD					
p_d [bar] \ / p_u [bar]	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
0,5	1191	1038	991	947	904								
0,75	1363	1446	1473	1407	1343	1283							
1	1624	1833	1795	1757	1678	1720	1419	1419	1355				
1,5	1871	2200	2319	2215	2235	2554	1711	1711	1634	1759	1950		
2	2152	2547	2688	2567	2724	3233	2129	2129	2034	2266	2164	2066	2114
2,5	2463	2831	3037	2900	3111	3623	2561	2561	2545	2777	2712	2590	2584
3	2579	3058	3367	3215	3403	3886	2901	2901	3158	3200	3174	3031	3002
3,5	2688	3230	3520	3512	3715	4064	3158	3158	3424	3600	3553	3393	3397
4	2706	3432	3663	3719	3939	4231	3335	3335	3675	3861	3855	3681	3872
4,5	2844	3622	3684	3877	4114	4257	3502	3502	3852	4107	4085	3902	4074
5	2974	3761	3812	3991	4246	4310	3598	3598	3931	4254	4196	4108	4214
6	3135	3967	4038	4232	4498	4513	3835	3835	4145	4256	4298	4401	4628
7	3324	4159	4216	4426	4608	4704	4000	4000	4263	4229	4367	4677	4973
8	3464	4269	4315	4542	4710	4882	4097	4097	4318	4201	4455	5007	5253
9	3559	4336	4372	4650	4713	5049	4133	4133	4315	4171	4487	5133	5318
10	3718	4396	4457	4657	4683	5204	4110	4110	4310	4116	4445	5229	5356

Device selection



Flow rate tables

FRM 250065 UHD... DN 65 - 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]					
8	1756	1893	2293	3073	3458
10	1844	2132	2542	3219	3928
12	1988	2764	2979	4079	4651
16	2045	2819	3290	4644	5337
18	2370	3309	3614	4477	5644
20	2928	3473	4138	5121	6136
25	3469	3897	4585	6086	6691

FRM 250080 UHD... DN 80 - 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]					
8	1965	2362	3224	4080	4935
10	2141	2779	3599	4521	5442
12	2492	3613	4349	5403	6456
16	2667	4030	4724	5844	6963
18	3070	4321	5186	6258	7330
20	3875	4904	6110	7087	8065
25	4278	5196	6572	7502	8432

Calculation of gas types



$\dot{V}_{\text{used gas}} = \dot{V}_{\text{air}} \times f$

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

Type of gas	Spec. Wgt. [kg/m ³]	dv	f
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



Subject to technical modification in the interest of technical progress.

Head of office and factory

Karl Dungs GmbH & Co. KG
Karl-Dungs-Platz 1
D-73660 Urbach,
Germany
Phone +49 (0)7181-804-0
Fax +49 (0)7181-804-166
e-mail: info@dungs.com
Internet: www.dungs.com

Subsidiary

Karl Dungs Limited
18, Liberty Way
Attleborough Fields Ind. Est.
GB-Nuneaton CV11 6RZ
Großbritannien / Great Britain
Phone +44 (0)24/76 37 57 33
Fax +44 (0)24/76 34 28 52
e-mail: info.gb@dungs.com
Internet: www.dungs.com

