ROTARY METER SERIES
FMR 300 & 600

FMG
Flow Meter Group

The best way to predict the future is to create it

Introduction

The FMR 300 & 600 Series are designed to accurately and reliably meet the highest demands of gas flow measurement. The meters are MID approved and fully comply with EN12480, OIML R137 and ANSI B109.3. The compact exchangeable aluminum cartridge allows local repair and on-site cleaning.

The 300 Series entire aluminum casing is designed for working pressures up to 500psi with a safety factor of 4 making it the lightest meter in its pressure class. The square impellers, improved position of the main bearings and shafts, make the meter more resistant to overload and pressure shocks.

The Series 600 utilizes a steel casing with the same cartridge design and enhanced bearings for higher operating pressures up to 1450psi. The steel casing is designed to absorb pipe stresses caused by misalignments keeping the running stress free. For applications with higher then usual gas contaminations, the meter can be equipped with oilers for the rear bearings to flush out dirt.

Low Cost of Ownership

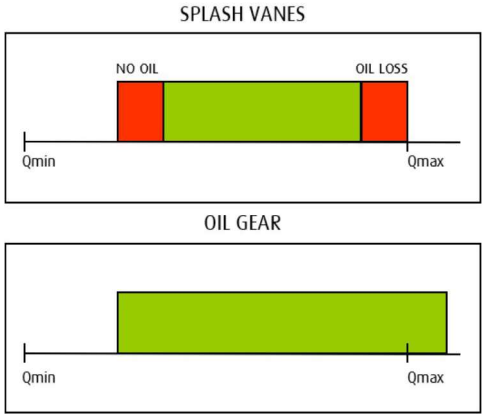
All FMR Series rotary meters use a fix gear ratio in the index head (no adjustment gears) making it a "one-fits-all" design. Together with the exchangeable cartridge design, the parts required for maintenance and repairs has been significantly lowered. The proprietary oiling system not only reduces wear and tear but keeps required oil changes over the meter's lifespan to a minimum.

Applications

The FMR 300 & 600 Series are suitable for custody transfer gas measurement of all non-corrosive gases* such as Natural gas, propane, butane, air, hydrogen, etc.

Typical applications include:

- Gas distribution in medium to high pressure networks
- Industrial applications
- Compressed Natural Gas applications (NGV filling stations, etc.)



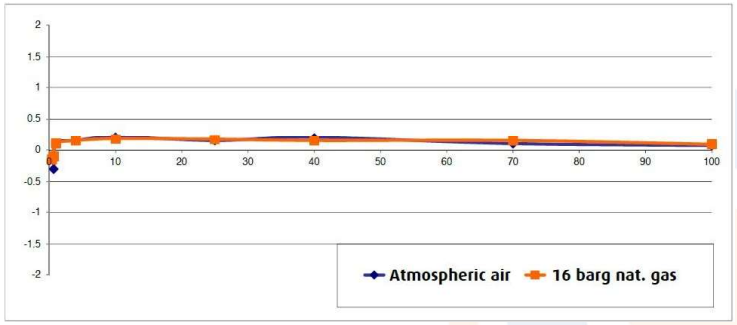
Proprietary Oil Gear System
vs. Conventional Splash Vanes

Accuracy

Each FMR rotary meter is tested with atmospheric air to traceable VSL (formerly NMi) calibrated references. It has been proven as part of the type approval testing that the difference between the accuracy at atmospheric air and at high pressure natural gas is negligible.

Typical metrological characteristics

- Accuracy 5% of Qmax to Qmax: ± 1% or better
- Accuracy Qmin to 5% of Qmax: ± 2% or better
- Repeatability: better than 0.1%



* not suitable for oxygen services of any kind

Robust Construction

In the new cartridge FMR design, the impellers, timing gears and bearings are fixed and positioned by a SynchroPlate. With the SynchroPlate machined in one operation, the tolerances are maintained at a very high level. This design and manufacturing process allow for equally divided clearances between meter body and impellers, making the meters more dirt and debris resistant. The short impeller and high strength shaft connecting the timing gear to the impeller overcomes flexing or bending of the impellers, making the meters more resistant to flow and pressure shocks. Severe intermittent on/off applications are typically handled without damage. A temporary overload up to 50% of maximum capacity without degradation of the metrological quality is possible.

Security of Supply

Rotary gas meters are used in a wide variety of commercial and industrial applications due to their reliability and accuracy over an extremely large range. However, rotary meters can be blocked due to dirt or other circumstance, stopping the gas supply unless precautions are taken.

An automatic bypass valve integrated in the meter is the most convenient and reliable precaution. This provides security of supply as the bypass opens automatically when the differential pressure over the meter reaches a pre-set level (various springs for different set points are available).

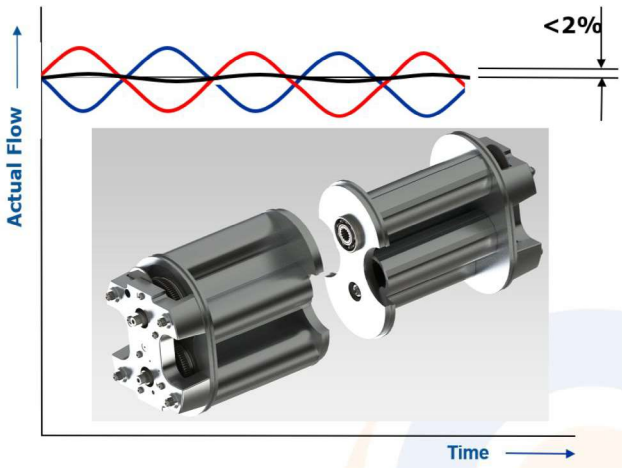
The FMR Series 300 & 600 rotary meters can be equipped with an automatic bypass (MID approved). The bypass operates as a "reverse" safety shut-off valve, whereby the bypass valve is triggered by an accurate spring loaded diaphragm. When triggered, the bypass allows for full meter capacity flow with a significantly lower pressure loss compared to spring loaded bypass systems.

With two reed switches (one normally closed, one normally open) the bypass on FMR Series 300 can by monitored with an EVC like the Elgas Elcor Series, Flow Computer, RTU or Scada System. Once triggered, the bypass can be manually reset on site after depressurizing the meter.

The FMR Series 600 has an auto-reset bypass that will close as soon as the differential pressure falls below the setpoint determined by the spring rating. To monitor the bypass, a dp gauge with a switch can be installed externally and connected to the already provided pressure tapping points. The contact of the dp gauge can than be feed into a EVC, Flow Computer, RTU or Scada System.

FMR 600 DUAL Series (pulsation free)

Turbine meters have a limited range and depending on local regulations, must be calibrated close to the operating conditions (high pressure natural gas). This limited range and higher costs of calibration, make the larger rotary meters more popular as replacement for turbine meters. However, larger rotary meters in certain applications, 11M and bigger, have the drawback of pulsation and high resonance. As a solution, FMG rotary meters are also available as pulsation free meters. The pulsation free series DUAL rotary meters use two phase shifted pairs of impellers to fully eliminate the pulsations by countering the characteristic sine wave and its resultant resonance making the DUAL meters extremely quiet and accurate. Another advantage of the pulsation free rotary meters are the relatively short impellers that will not deform easily and provide reliable long-term performance. Because pulsation free meters can be less resistant to load changes between the two sets of impellers, the FMG DUAL meters use a significantly stronger spline and spline shaft connecting the impeller pairs.



FMR 300 Series Main Features

- Flow range 23cfh – 16,000cfh
- Diameters 2″ up to 4″
- MAOP 500psi
- Compliant with ANSI B109.3
- Compliant with OIML R137 1&2 (2014)
- Temperature range -40F to +158F
- Large rangeability > 1:160
- Robust construction
- Square impeller technique
- Cartridge design
- Proprietary Oiling System
- Standard Low Freq. Output (Reed contact or Wiegand)
- Optional High Freq. Output
- Multi position
- Tamper proof, exchangeable index

FMR 300 Series General Technical Specification

Flow Rates:	23cfh up to 16,000cfh
Nominal Diameters:	2″ to 4″
Flange Connections:	ANSI 300 FF
Max. Operating Pressure:	500psi
Temperature Range:	-40F to +158F
Mounting Position:	Horizontally or Vertically
Metrological Approvals:	OIML R137 1&2 (2014)
	EN12480:2002
	EN12480:2015
	MID 2014/32/EU
Electrical Compliance:	UL, CSA, ATEX
Body:	ANSI B109.3, PED 2014/68/EU

Materials:

Body: Aluminum heat treated
Impellers: Aluminum
Cartridge: Aluminum

Shafts: Stainless steel
Gears: Delrin
Index frame: Aluminum

Timing Gears: Carbon Steel
Bearings: Carbon Steel / Stainless Steel
Index cover: Polycarbonate ECI

FMR 600 Series Main Features

- Flow range 11cfh – 16,000cfh
- Diameters 1-1/2" up to 6"
- MAOP 1450psi
- Compliant with ANSI B109.3
- Compliant with OIML R137 1&2 (2014)
- Temperature range -40F to +158F
- Large rangeability > 1:160
- Robust construction
- Square impeller technique
- Cartridge design
- Proprietary Oiling System
- Standard Low Freq. Output (Reed contact or Wiegand)
- Optional High Freq. Output
- Multi position
- Tamper proof, exchangeable index

FMR 600 & 600 DUAL Series General Technical Specification

Flow Rates:	11cfh up to 16,000cfh
Nominal Diameters:	1-1/2" to 6"
Flange Connections:	ANSI 600 RF
Max. Operating Pressure:	1450psi
Temperature Range:	-40F to +158F
Mounting Position:	Horizontally or Vertically
Metrological Approvals:	OIML R137 1&2 (2014)
	EN12480:2002
	EN12480:2015
	MID 2014/32/EU
Electrical Compliance:	UL, CSA, ATEX
Body:	ANSI B109.3, PED 2014/68/EU

Materials:

Body: Steel/Aluminum
Impellers: Aluminum
Cartridge: Aluminum

Shafts: Stainless steel
Gears: Delrin
Index frame: Aluminum

Timing Gears: Carbon Steel
Bearings: Carbon Steel / Stainless Steel
Index cover: Polycarbonate ECI

FMR Series 300 Technical Specifications

MAOP: 500psig
Temperature Range: -40F to +158F

Displaced Volume	Model	Base Rating (Qmax)	Qmin	Nominal Pipe Size	Flange to Flange	Start Rate	Stop Rate
cf		Atm. Air cf	Atm. Air cf	in	in	cfh	cfh
0.041	1.5M	1,500	23	2"	6-3/4"	<2.47	<2.47
	2.5M	2,500	23	2"	6-3/4"	<2.47	<2.47
	3.5M	3,500	23	2"	6-3/4"	<2.47	<2.47
0.051	5.5M	5,500	57	3" or 4"	9-1/2"	<3.53	<3.53
	7M	7,000	88	3" or 4"	9-1/2"	<3.53	<3.53
	9M	9,000	88	3" or 4"	9-1/2"	<3.53	<3.53
	11M	11,000	88	3" or 4"	9-1/2"	<3.53	<3.53
0.182	9M	9,000	141	4"	10-1/4"	<3.53	<3.53
	11M	11,000	141	4"	10-1/4"	<3.53	<3.53
	16M	16,000	141	4"	10-1/4"	<3.53	<3.53

FMR 600 & 600 DUAL Series Technical Specifications

MAOP: 1450psi
Temperature Range: -40F to +158F

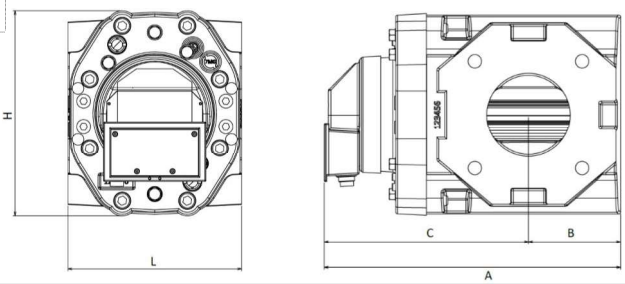
Displaced Volume	Model	Base Rating (Qmax)	Qmin	Nominal Pipe Size	Flange to Flange	Start Rate	Stop Rate
cf		Atm. Air cf	Atm. Air cf	in	in	cfh	cfh
0.0138	4C	400	11	1-1/2" or 2"	6-3/4"	<1.77	<1.77
	8C	800	11	1-1/2" or 2"	6-3/4"	<1.77	<1.77
0.0215	1.5M	1,500	23	1-1/2" or 2"	6-3/4"	<2.47	<2.47
	2.5M	2,500	23	1-1/2" or 2"	6-3/4"	<2.47	<2.47
0.0254	2.5M	2,500	35	2"	10-3/4"	<2.47	<2.47
0.0300	3.5M	3,500	35	2"	6-3/4"	<3.53	<3.53
0.0410	3.5M	3,500	35	2"	10-3/4"	<3.53	<3.53
0.0505	5.5M	5,500	88	3"	10-3/4"	<5.30	<5.30
	7M	7,000	88	3"	10-3/4"	<5.30	<5.30
0.1119	9M	9,000	141	3" or 4"	14-3/4"	<7.06	<7.06
	11M	11,000	141	3" or 4"	14-3/4"	<7.06	<7.06
0.1398	11M	11,000	141	4" or 6"	17-3/4"	<8.83	<8.83
	16M	16,000	141	4" or 6"	17-3/4"	<8.83	<8.83

Note: meters with displaced volume 0.1398 are DUAL versions

Dimensions (in) & Weight (lbs)

L	H	A Index Head			B	C Index Head			Weight
		ID	BI	UI		ID	BI	UI	
6-3/4" | 9-1/2"	7.95	15.87	11.93	12.72	3.62	12.24	8.31	9.09	30.9
6-3/4" | 9-1/2"	7.95	15.87	11.93	12.72	3.62	12.24	8.31	9.09	30.9
6-3/4" | 9-1/2"	7.95	15.87	11.93	12.72	3.62	12.24	8.31	9.09	30.9
9-1/2"	7.95	16.69	12.76	13.54	4.65	12.83	8.90	9.69	44.1
9-1/2"	7.95	16.69	12.76	13.54	4.65	12.83	8.90	9.69	44.1
9-1/2"	7.95	16.69	12.76	13.54	4.65	12.83	8.90	9.69	44.1
9-1/2"	7.95	16.69	12.76	13.54	4.65	12.83	8.90	9.69	44.1
10-1/4"	11.34	22.48	18.54	19.33	8.58	14.69	10.75	11.54	112.4
10-1/4"	11.34	22.48	18.54	19.33	8.58	14.69	10.75	11.54	112.4
10-1/4"	11.34	22.48	18.54	19.33	8.58	14.69	10.75	11.54	112.4

Note: ID = Instrument Drive; UI = Universal Index; BI = Basic Index



Dimensions (in) & Weight (lbs)

L	H	A Index Head			B	C Index Head			Weight
		ID	BI	UI		ID	BI	UI	
9-1/2"	9.49	17.60	13.66	14.45	5.91	11.69	7.76	8.54	143.3
9-1/2"	9.49	17.60	13.66	14.45	5.91	11.69	7.76	8.54	143.3
9-1/2"	9.49	17.60	13.66	14.45	5.91	11.69	7.76	8.54	143.3
9-1/2"	9.49	17.60	13.66	14.45	5.91	11.69	7.76	8.54	143.3
10-3/4"	10.24	13.82	9.88	10.67	2.83	10.98	7.05	7.83	143.3
9-1/2"	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10-3/4"	10.24	18.66	14.72	15.51	4.65	14.02	10.08	10.87	160.9
10-3/4"	10.24	19.92	15.98	16.77	5.28	14.65	10.71	11.50	187.4
10-3/4"	10.24	19.92	15.98	16.77	5.28	14.65	10.71	11.50	187.4
14-3/4"	14.29	31.93	27.99	28.78	9.76	16.26	12.32	13.11	374.8
14-3/4"	14.29	31.93	27.99	28.78	9.76	16.26	12.32	13.11	374.8
17-3/4"	14.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	418.9
17-3/4"	14.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	418.9

Note: ID = Instrument Drive; UI = Universal Index; BI = Basic Index

Corrected Capacity at Metering Pressure in SCFH

FMR Series 300

PSIG	1.5M	2.5M	3.5M	5.5M	7M	9M	11M	16M
atm. Pr.	1,500	2,500	3,500	5,500	7,000	9,000	11,000	16,000
250	26,958	44,930	62,903	98,847	125,805	161,749	197,694	287,555
260	27,977	46,628	65,279	102,581	130,557	167,859	205,162	298,417
270	28,995	48,325	67,655	106,315	135,310	173,969	212,629	309,279
280	30,013	50,022	70,031	110,049	140,062	180,079	220,097	320,141
290	31,032	51,719	72,407	113,782	144,814	186,189	227,565	331,003
300	32,050	53,416	74,783	117,516	149,566	192,299	235,033	341,866
310	33,068	55,114	77,159	121,250	154,318	198,409	242,500	352,728
320	34,087	56,811	79,535	124,984	159,071	204,519	249,968	363,590
330	35,105	58,508	81,911	128,718	163,823	210,629	257,436	374,452
340	36,123	60,205	84,288	132,452	168,575	216,739	264,904	385,314
350	37,142	61,903	86,664	136,186	173,327	222,849	272,371	396,177
360	38,160	63,600	89,040	139,920	178,079	228,959	279,839	407,039
370	39,178	65,297	91,416	143,653	182,832	235,069	287,307	417,901
380	40,197	66,994	93,792	147,387	187,584	241,179	294,775	428,763
390	41,215	68,691	96,168	151,121	192,336	247,289	302,242	439,625
400	42,233	70,389	98,544	154,855	197,088	253,399	309,710	450,487
410	43,252	72,086	100,920	158,589	201,840	259,509	317,178	461,350
420	44,270	73,783	103,296	162,323	206,593	265,619	324,646	472,212
430	45,288	75,480	105,672	166,057	211,345	271,729	332,113	483,074
440	46,307	77,178	108,049	169,791	216,097	277,839	339,581	493,936
450	47,325	78,875	110,425	173,524	220,849	283,949	347,049	504,798
460	48,343	80,572	112,801	177,258	225,601	290,059	354,517	515,661
470	49,362	82,269	115,177	180,992	230,354	296,169	361,984	526,523
480	50,380	83,966	117,553	184,726	235,106	302,279	369,452	537,385
490	51,398	85,664	119,929	188,460	239,858	308,389	376,920	548,247
500	52,416	87,361	122,305	192,194	244,610	314,499	384,388	559,109

FMR Series 600 & 600 DUAL

PSIG	1.5M	2.5M	3.5M	5.5M	7M	9M	11M	16M
atm. Pr.	1,500	2,500	3,500	5,500	7,000	9,000	11,000	16,000
200	21,867	36,444	51,022	80,178	102,044	131,200	160,355	233,244
250	26,958	44,930	62,903	98,847	125,805	161,749	197,694	287,555
300	32,050	53,416	74,783	117,516	149,566	192,299	235,033	341,866
350	37,142	61,903	86,664	136,186	173,327	222,849	272,371	396,177
400	42,233	70,389	98,544	154,855	197,088	253,399	309,710	450,487
450	47,325	78,875	110,425	173,524	220,849	283,949	347,049	504,798
500	52,416	87,361	122,305	192,194	244,610	314,499	384,388	559,109
550	57,508	95,847	134,186	210,863	268,371	345,049	421,726	613,420
600	62,600	104,333	146,066	229,533	292,132	375,599	459,065	667,731
650	67,691	112,819	157,947	248,202	315,893	406,149	496,404	722,042
700	72,783	121,305	169,827	266,871	339,654	436,699	533,743	776,353
750	77,875	129,791	181,708	285,541	363,415	467,248	571,081	830,664
800	82,966	138,277	193,588	304,210	387,177	497,798	608,420	884,975
850	88,058	146,763	205,469	322,879	410,938	528,348	645,759	939,286
900	93,150	155,249	217,349	341,549	434,699	558,898	683,098	993,597
950	98,241	163,736	229,230	360,218	458,460	589,448	720,437	1,047,908
1,000	103,333	172,222	241,110	378,888	482,221	619,998	757,775	1,102,219
1,050	108,425	180,708	252,991	397,557	505,982	650,548	795,114	1,156,530
1,100	113,516	189,194	264,871	416,226	529,743	681,098	832,453	1,210,840
1,150	118,608	197,680	276,752	434,896	553,504	711,648	869,792	1,265,151
1,200	123,700	206,166	288,632	453,565	577,265	742,198	907,130	1,319,462
1,250	128,791	214,652	300,513	472,235	601,026	772,747	944,469	1,373,773
1,300	133,883	223,138	312,393	490,904	624,787	803,297	981,808	1,428,084
1,350	138,975	231,624	324,274	509,573	648,548	833,847	1,019,147	1,482,395
1,400	144,066	240,110	336,154	528,243	672,309	864,397	1,056,485	1,536,706
1,450	149,158	248,596	348,035	546,912	696,070	894,947	1,093,824	1,591,017

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Flow Meter Group

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