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having established that the Measuring instrument meets the applicable
requirements of Directive 2014/32/EU, to:

Manufacturer Flow Meter Group B.V.
Innovatieweg 32
7007 CD Doetinchem
The Netherlands

Measuring instrument **A Rotary Displacement Gas Meter**
Type : FMR
FMR-Dual
Manufacturer's mark or name : Flow Meter Group B.V.
Destined for the measurement of : Gas volume
Accuracy class : Class 1,0 or 1,5 (see tables under
1.2.1 of the description)
Environment classes : M1 / E2
Temperature range : -40 °C / +70 °C

Further properties are described in the annexes:

- Description T10372 revision 12;
- Documentation folder T10372-9.

Valid until 30 August 2031

Remarks This revision replaces the earlier versions, except for its documentation folder.

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1 General information about the gas meter

All properties of the gas meter, whether mentioned or not, shall not be in conflict with the legislation. A general description of the meter is given in document no. 10372/2-02 and 10372/2-01.

1.1 Essential parts

Measuring part

The dimensions of the rotors are presented in the tables below, while also the appertaining volumes are indicated for the following two meter types: FMR and FMR-Dual.

<i>FMR</i>			
rotor height [mm]	rotor thickness [mm]	rotor length [mm]	volume (V) ^[1] [dm ³]
80	36,8	45	0,25
		70	0,39
		110	0,61
		150	0,85
		175	0,99
99	45,7	85	0,73
		136	1,16
		168	1,45
140,8	65,3	212	1,81
		115	1,98
		184	3,17
		230	3,96
		299	5,15

<i>FMR-Dual</i>			
rotor height [mm]	rotor thickness [mm]	rotor length [mm]	volume (V) ^[1] [dm ³]
80	36,8	45	0,5
		70	0,78
		110	1,22
		175	1,98
99	45,7	85	1,46
		136	2,32
		168	2,9
140,8	65,3	70	2,41
		115	3,96
		184	6,34
		299	10,3

[1] On the name plate of the rotary meter the cyclic volume can be given in two possible formats:

- with two digits behind the comma as stated in the tables above, or
- with a number containing 6 significant digits. In this case a HF pulse value can be accurately derived from the spinning rotors with an optical sensor.

1.1.1 Bearings of the rotors

The bearings of the rotors are presented in document no. 10372/7-02.

The characteristics of the bearings which are used in the FMR and FMR-Dual rotary meters are given in the following two tables.

<i>FMR</i>				
Volume V ^[1]	Position of bearing	Main shaft diameter (minimum)	Basic dynamic radial load C _r (minimum)	Basic static radial load C _{0r} (minimum)
[dm ³]		[mm]	[N]	[N]
0,25	front	6,35	1651	670
	rear	4,00	658	226
0,39	front	6,35	1651	670
	rear	4,763	1339	488
0,61	front	8,00	1798	797
	rear	4,763	1339	488
0,85	front	8	1798	797
	rear	6,35	1651	670
0,99	front	8	1798	797
	rear	6,35	1651	670
0,73	front	9,525	2555	1129
	rear	6,35	1651	670
1,16	front	9,525	2555	1129
	rear	6,35	2522	1057
1,45	front	9,525	2555	1129
	rear	6,35	2522	1057
1,81	front	9	3758	1632
	rear	6,35	2522	1057
1,98	front	15	7939	3744
	rear	10	4698	1982
3,17	front	15	7939	3744
	rear	12	5237	2359
3,96	front	17	9811	4734
	rear	12	5237	2359
5,15	front	17	9811	4734
	rear	12	5237	2359

[1] See remark [1] regarding the cyclic volume on page 1.

<i>FMR-Dual</i>				
Volume V ^[1]	Position of bearing	Main shaft diameter (minimum)	Basic dynamic radial load C _r (minimum)	Basic static radial load C _{0r} (minimum)
[dm ³]		[mm]	[N]	[N]
0,5	front	6,35	1651	670
	rear	4	658	226
	shared	8	1798	797
0,78	front	6,35	1651	670
	rear	4,763	1339	488
	shared	9,525	2555	1129
1,22	front	8	1798	797
	rear	4,763	1339	488
	shared	9,525	2555	1129
1,98	front	8	1798	797
	rear	6,35	1651	670
	shared	10	4698	1982
1,46	front	9,525	2555	1129
	rear	6,35	1651	670
	shared	10	4698	1982
2,32	front	9,525	2555	1129
	rear	6,35	2522	1057
	shared	10	4698	1982
2,9	front	9,525	2555	1129
	rear	6,35	2522	1057
	shared	10	4698	1982
2,41	front	15	7939	3744
	rear	10	4698	1982
	shared	20	9400	5050
3,96	front	15	7939	3744
	rear	10	4698	1982
	shared	20	9400	5050
6,34	front	15	7939	3744
	rear	12	5237	2359
	shared	25	14000	7850
10,3	front	17	9811	4734
	rear	12	5237	2359
	shared	25	14000	7850

[1] See remark [1] regarding the cyclic volume on page 1.

1.2 Essential characteristics

1.2.1 The FMR and FMR-Dual meters have the following characteristics:

FMR							
Volume ^[1] V [dm ³]	G-value	maximum Q _{max} [m ³ /h]	minimum Q _{min} [m ³ /h]	minimum Q _t [m ³ /h]	maximum p _{max} [bar]	Diameter D [mm]	Accuracy class
0,25	G6	10	0,25	0,5	101	40 or 50 ^[2]	1,0
	G10	16	0,25	0,8	101	40 or 50 ^[2]	1,0
	G16	25	0,25	1,25	101	40 or 50 ^[2]	1,0
	G25	40	0,25	2	101	40 or 50 ^[2]	1,0 or 1,5
0,39	G10	16	0,25	0,8	101	40 or 50 ^[3]	1,0
	G16	25	0,25	1,25	101	40 or 50 ^[3]	1,0
	G25	40	0,25	2	101	40 or 50 ^[3]	1,0 or 1,5
	G40	65	0,25	3,2	101	40 or 50 ^[3]	1,0 or 1,5
0,61	G16	25	0,25	1,25	101	40 or 50	1,0
	G25	40	0,25	2	101	40 or 50	1,0 or 1,5
	G40	65	0,25	3,2	101	40 or 50	1,0 or 1,5
	G65	100	0,25	5	101	40 or 50	1,0 or 1,5
0,73	G16	25	0,2	1,25	101	40 or 50	1,0
	G25	40	0,2	2	101	40 or 50	1,0 or 1,5
	G40	65	0,2	3,2	101	40 or 50	1,0 or 1,5
	G65	100	0,2	5	101	40 or 50	1,0 or 1,5
	G100	160	0,4	8	12	50 or 80	1,0 or 1,5
0,85	G25	40	1	2	101	50 or 80	1,0
	G40	65	1	3,2	101	50 or 80	1,0
	G65	100	1	5	101	50 or 80	1,0
	G100	160	1	8	12	50 or 80	1,0 or 1,5
0,99	G25	40	1	2	101	50 or 80	1,0
	G40	65	1	3,2	101	50 or 80	1,0
	G65	100	1	5	101	50 or 80	1,0
	G100	160	1	8	101	50 or 80	1,0 or 1,5
1,16	G40	65	0,4	3,2	101	50 or 80	1,0 or 1,5
	G65	100	0,4	5	101	50 or 80	1,0 or 1,5
	G100	160	0,4	8	101	50 or 80	1,0 or 1,5
	G160	250	0,65	12,5	12	50 or 80	1,0 or 1,5
1,45	G65	100	0,6	5	101	80 or 100	1,0 or 1,5
	G100	160	0,6	8	101	80 or 100	1,0 or 1,5
	G160	250	0,6	12,5	101	80 or 100	1,0 or 1,5
1,81	G65	100	0,6	5	101	80 or 100	1,0 or 1,5
	G100	160	0,6	8	101	80 or 100	1,0 or 1,5
	G160	250	0,6	12,5	101	80 or 100	1,0 or 1,5
	G250	400	1	20	12	80 or 100	1,0 or 1,5
1,98	G100	160	1	8	101	80 or 100	1,0 or 1,5
	G160	250	1	12,5	101	80 or 100	1,0 or 1,5
	G250	400	2,5	20	12	80 or 100	1,0 or 1,5
3,17	G160	250	1,6	12,5	101	80 or 100	1,0 or 1,5
	G250	400	1,6	20	101	80 or 100	1,0 or 1,5
	G400	650	2,5	32	12	80 or 100	1,0 or 1,5
3,96	G250	400	2,5	20	101	100 or 150	1,0 or 1,5
	G400	650	4	32	101	100 or 150	1,0 or 1,5
	G650	1000	4	32	12	150 or 200	1,0 or 1,5
5,15	G250	400	2,5	20	101	100 or 150	1,0 or 1,5
	G400	650	2,5	32	101	100 or 150	1,0 or 1,5
	G650	1000	6,25	50	12	100 or 150	1,0 or 1,5

[1] See remark [1] regarding the cyclic volume on page 1.

[2] These meters are equipped with a threaded connection.

[3] These meters can be equipped with a flange or threaded connection.

<i>FMR-Dual</i>							
Volume ^[1] V [dm ³]	G-value	maximum Q _{max} [m ³ /h]	minimum Q _{min} [m ³ /h]	minimum Q _t [m ³ /h]	maximum p _{max} [bar]	Diameter D [mm]	Accuracy class
0,5	G40	65	0,4	3,2	21 / 101	50 or 80	1,0 or 1,5
	G65	100	0,65	5	21 / 101	50 or 80	1,0 or 1,5
0,78	G65	100	0,65	5	21 / 101	50 or 80	1,0 or 1,5
	G100	160	1	8	21 / 101	80 or 100	1,0 or 1,5
1,22	G100	160	1	8	21 / 101	80 or 100	1,0 or 1,5
	G160	250	1,6	12,5	21 / 101	80 or 100	1,0 or 1,5
1,98	G160	250	1,6	12,5	21 / 101	80 or 100	1,0 or 1,5
	G250	400	2,5	20	21 / 101	80, 100 or 150	1,0 or 1,5
1,46	G100	160	1	8	21 / 101	80 or 100	1,0 or 1,5
	G160	250	1,6	12,5	21 / 101	80 or 100	1,0 or 1,5
2,32	G160	250	2,5	12,5	21 / 101	80 or 100	1,0
	G250	400	4	20	21 / 101	80, 100 or 150	1,0
2,9	G250	400	2,5	20	21 / 101	80, 100 or 150	1,0 or 1,5
	G400	650	4	32	21 / 101	100 or 150	1,0 or 1,5
2,41	160	250	1	12,5	21 / 101	80 or 100	1,0 or 1,5
	250	400	2,5	20	21 / 101	80 or 100	1,0 or 1,5
3,96	250	400	2,5	20	21 / 101	100 or 150	1,0 or 1,5
	400	650	4	32	21 / 101	100 or 150	1,0 or 1,5
	650	1000	4	32	21 / 101	150 or 200	1,0 or 1,5
6,34	400	650	4	32	21 / 101	150 or 200	1,0 or 1,5
	650	1000	6,5	50	21 / 101	150 or 200	1,0 or 1,5
10,3	G650	1000	6,5	50	21 / 101	150 or 200	1,0 or 1,5
	G1000	1600	10	80	21 / 101	150 or 200	1,0 or 1,5

[1] See remark [1] regarding the cyclic volume on page 1.

[2] The FMR-Dual can be delivered as a low pressure ($P_{max} = 21$ bar) or a high pressure ($P_{max} = 101$ bar) variant. The two different housings used for the specific pressure rating are given in document no. 10372/7-02 page 12 ($P_{max} = 21$ bar) and page 15 ($P_{max} = 101$ bar).

See also the tables and drawings in document no. 10372/11-01 with all the dimensions of the meters.

1.2.2 Flow rate range

The flow rate range shall fulfill the following conditions:

Class	Q_{max} / Q_{min}	Q_{max} / Q_t
1,5	≥ 150	≥ 10
1,0	≥ 20	≥ 5

1.3 Essential shapes

1.3.1 The nameplate is bearing at least, good legible, the following information:

- CE marking including the supplementary metrological marking (M + last 2 digits of the year in which the instrument has been put into use);
- Notified Body identification number, following the supplementary metrological marking;
- EU-type examination certificate no. T10372;
- manufacturer's name, registered trade name or registered trade mark;
- manufacturer's postal address;
- serial number of the meter and year of manufacture;
- mechanical environment class;
- electromagnetic environment class;
- Q_{max} , Q_t and Q_{min} ;
- maximum working pressure p_{max} ;
- cyclic volume;
- ambient temperature range;
- accuracy class;
- pulse values of HF and LF frequency outputs;
- indication of the flow direction, e.g. an arrow.

An example of the markings is shown in document no. 10372/9-02.

The optional bypass is bearing at least, good legible, the information as stated below (see also document no. 10372/4-03):

- a) "bypass not activated" and "bypass activated" including applicable schematic representation of the bypass status.
- b) "no valid measurement in case of activated bypass".

1.3.2 Sealing: see chapter 2.

1.4 Conditional parts

1.4.1 Construction

In addition to the essential parts as mentioned at 1.1, the meter contains at least the following conditional parts:

- housing;
- transmission;
- register;
- front cover;
- rear cover (only for G160-G1000);
- synchronization wheels;
- pressure measuring points.

The meter can also be provided with low and high frequency impulse outputs respectively.

1.4.2 Housing

The gas meter has a housing, which has sufficient tensile strength. The meters housing is made out of aluminium, the outside surface is anodized.

1.4.3 Transmission

The transmission between the measuring part and the register is executed by means of a magnet coupling. The register is adjustable via adjustment wheels. An example of the gear transmission is presented in document no. 10372/7-02. A table of possible adjusting wheels is given in document no. 10372/0-01.

1.4.4 Register

The measured volume is presented by means of a mechanical register. Examples are stated in documentation no. 10372/3-02 and 10372/3-03.

The index can be rotated over 350° for flow directions left-right and bottom-top (referred to as "universal index, single counter" and "basic index" in this document and its attachments).

Optionally, the universal index can be equipped with a double counter to allow the change of flow direction, if desired on-site. After changing the flow direction the front plate needs to be rotated as well so that the counter registers positive flow.

All the registers are built up as follows:

meter size	Minimum number of drums		control-element [m ³]
	before the comma	behind the comma	
G6	5	3	0,0002
G10 – G65	6	2	0,002
G100 – G1000	7	1	0,02

1.4.5 Front and rear cover

The entrance to the transmission from the measuring part to the register is shielded by means of a front cover. The meter types G160-G1000 also have a rear cover which holds the two rear main bearings of both rotors.

1.4.6 Synchronization wheel

The rotors are coupled together mechanically by means of a synchronization wheel.

1.4.7 Pressure tapings

The housing contains a pressure tapping to determine the inlet pressure. This pressure tapping is provided with the indication "p_m". Other pressure measuring points are indicated with "p".

1.4.8 Low frequency impulse output

The meter is equipped with a low frequency impulse output, at which the appertaining impulse value [imp/m³] is stated on the meter.

1.4.9 High frequency impulse output (optional)

The meter can be provided with a high frequency impulse output, at which the appertaining impulse value (by means of the cyclic volume) is stated on the meter. The pulse value can be calculated according: $HF [imp/m^3] = 1000 / (2 * cyclic\ volume [dm^3])$. This formula will be included in the manual. An optical sensor which detects a rotating disc with one hole, indirectly attached to the main shaft, provides the high frequency signal.

1.4.10 Bypass (optional)

Meters with a maximum operating pressure of 100 bar can be equipped with an optional bypass, see document no. 10372/4-03. In case the differential pressure as given in the table below is exceeded, which can be the case when the rotors of the meter are blocked such that movement is not possible anymore, the bypass is activated.

A reset pin, which can be seen through a glass plug, indicates that the bypass is activated. Without a visible pin, the bypass is not activated. The recommended preset value for the differential pressure is given in the table below.

	Operating pressure up to 4 bar(g)	Operating pressure 4 - 8 bar(g)	Operating pressure 8 - 20 bar(g)	Operating pressure 20-50 bar(g)	Operating pressure 50-100 bar(g)
Recommended preset value	125 mbar	250 mbar	500 mbar	400-500 mbar	700-800 mbar

1.4.11 Reed contact (on the optional bypass)

A reed contact indicates whether the bypass is activated or not. The location of the "electrical status contact" is given in document no. 10372/4-03.

1.4.12 Cryo-index (optional)

See document no. 10372/9-01

1.5 Non-essential parts

1.5.1 Low frequency sensors and high frequency sensors

1.5.2 Oil filling plug, drain plug and sight glass for lubrication and checking oil level in the meter

1.5.3 Temperature points

1.5.4 The meter can be equipped with an encoder.

1.5.5 Manometer (optional)

When the meter is equipped with the bypass as given in section 1.4.10 Bypass the meter can also be equipped with an optional manometer which indicates the maximum pressure difference between the in- and outlet (p_{rm} and p pressure point) of the rotary meter. The manometer indicates the maximum pressure difference and maintains this value which can function as a secondary indication for jammed rotors (activation of bypass).

Whether or not a manometer is installed, the reset pin as described in section 1.4.10 Bypass is always the primary indication for bypass activation.

1.6 Interchangeable components

The mechanical index, equipped with a reed contact, Wiegand or encoder, is an interchangeable component.

2 Seals

The following items of the meter are sealed:

- The nameplate of the meter.
- The entrance to the measuring part is sealed with one or more seals.
- The entrance to the register is sealed with one or more seals.
- The rear cover (only for G160 up to and including G1000) is sealed with one or more seals.
- If the separate nameplate is used to show the pulse value this nameplate has to be sealed.

See the drawings in document no. 10372/3-01, 10372/3-02 and 10372/3-03 for an example of the sealing.

The glass plug, which visually indicates whether the optional bypass is activated or not, is sealed with a utility seal. See also document no. 10372/4-01.