Australian Government
Department of Industry, Innovation and Science

National Measurement Institute

Certificate of Approval

NMI 14/1/1

Issued by the Chief Metrologist under Regulation 60
of the
National Measurement Regulations 1999

This is to certify that an approval for use for trade has been granted in respect of the instruments herein described.

FMG Model FMR G25-40BSP Gas Meter

submitted by Accutherm International Pty Ltd
18-20 Pickering Road
Mulgrave VIC 3170

NOTE: This Certificate relates to the suitability of the pattern of the instrument for use for trade only in respect of its metrological characteristics. This Certificate does not constitute or imply any guarantee of compliance by the manufacturer or any other person with any requirements regarding safety.

This approval has been granted with reference to document NMI R 137 Gas meters, Part 1 *Metrological and Technical Requirements* and Part 2 *Metrological Controls and Tests*, dated October 2013.

This approval becomes subject to review on 1/03/22, and then every 5 years thereafter.

DOCUMENT HISTORY

Rev	Reason/Details	Date
0	Pattern & variant 1 approved – certificate issued	13/02/17

CONDITIONS OF APPROVAL

General

Instruments purporting to comply with this approval shall be marked with pattern approval number 'NMI 14/1/1' and only by persons authorised by the submittor.

It is the submittor's responsibility to ensure that all instruments marked with this approval number are constructed as described in the documentation lodged with the National Measurement Institute (NMI) and with the relevant Certificate of Approval and Technical Schedule. Failure to comply with this Condition may attract penalties under Section 19B of the National Measurement Act and may result in cancellation or withdrawal of the approval, in accordance with document NMI P 106.

Signed by a person authorised by the Chief Metrologist to exercise their powers under Regulation 60 of the *National Measurement Regulations 1999*.

Dr Phillip Mitchell

TECHNICAL SCHEDULE No 14/1/1

1. Description of Pattern approved on 13/02/17

An FMG model FMR G25-40BSP gas meter (Figures 1 and 2) intended for the volumetric measurement of gas flow supply for trade.

1.1 Field of Operation

The field of operation of the pattern is determined by the following characteristics:

- Cyclic volume, V 0.24973 dm^3
- Maximum flow rate, Q_{max} 40 m^3/h
- Minimum flow rate, Q_{min} 0.25 m^3/h
- Transitional flow rate, Q_t 2.00 m^3/h
- Maximum working pressure, p_{max} 2100 kPa
- Minimum working pressure, p_{min} Atmospheric
- Ambient temperature range -25 to 55°C
- Gas temperature range -25 to 55°C
- Pressure loss, Δp 120 Pa
- Accuracy class 1 or 1.5
- Mechanical class: M1
- Orientation: All orientations
- Flow Direction: Unidirectional (indicated with an arrow)

1.2 Features/Functions

A positive displacement rotary piston-type 40 mm Class 1 or Class 1.5 gas meter incorporating a mechanical indicating device and which has features/functions as listed below:

- Connection type: Threaded end connections
- A mechanical digital indicator having a series of eight (8) aligned digits with the last element incorporating a graduated verification scale of 0.002 m^3 allowing for a maximum display of 999 999.998 m^3 in 0.002 m^3 increments.
- The indicator may be as a ‘basic index’ version as shown in Figures 1 and 4, or as a ‘universal index’ version as shown in Figure 6.
- Meter body: Aluminium
- Outputs:
  - The meter is fitted with a low frequency pulse output including two LF switches and a tamper switch.
  - The meter may be fitted with a Wiegand pulser to allow for pulse output from the meter at a rate of 10 pulses per 1 m^3.
  - The meter may be fitted with an encoder allowing for the volume registration to be transmitted every 400 milliseconds.

The meter may be fitted with a reverse flow locking device to prevent unintended reverse flow.

1.3 Conditions

1.3.1 Installation conditions:

No installation conditions are specified for this meter.

1.3.2 Gas quality:

The meter is approved for use in the metering air and natural gas supplies.

1.4 Software Version

Not applicable.

1.5 Verification Provision

Provision is made for the application of a verification mark.

1.6 Sealing Provision

Provision is made for the gas meter to be sealed by the application of one or more mechanical seals (Figure 3) so as to prevent dismantling or modification of the instrument without damaging the mechanical seals.

1.7 Descriptive Markings

Instruments shall be marked with the following data, either grouped or distributed on the casing, the indicating device dial or an identification plate:

Manufacturer's name or mark	.....	
Serial number	.....	
Year of manufacturer	.....	
Pattern approval number	NMI 14/1/1	
Accuracy class	.....	
Maximum flow rate, Q_{max}	..... m^3/h	
Minimum flow rate, Q_{min}	..... m^3/h	
Transitional flow rate, Q_t	..... m^3/h	
Unit of measurement	m^3	
Gas temperature range	.....-.....°C	
Gas pressure range	.....-..... kPa	
Maximum pressure loss	..... Pa	
Measurement point for the working pressure	..... p_m or p_r	(#1)
Pulse output value	.....imp/m^3	(#2)
Direction of flow	→ or similar	

(#1) only for meters fitted with a pulse output

(#2) may be located separately from the other markings

2. Description of Variant 1 **approved on 13/02/17**

Certain other models of the FMR G series of meters (Figures 4 to 6) similar to the pattern but with specifications as listed in Tables 1 to 3 below.

The full model number of the pattern is FMR G25-40BSP.

TABLES 1 to 3 – Approved specifications (pattern & variant 1)

TABLE 1 – FMG-FMR Variants (Threaded connection)

The model designation has the form **FMG-FMR GXXX-YYBSP**
(The specifications of the pattern, model FMR G25-40BSP, is shown in **bold**.)

Volume (dm^3)	Model (GXXX*)	Q_{max} (m^3/h)	Q_{min} (m^3/h)	Q_t (m^3/h)	Δp (Pa)	P_{max} (kPa)	Accuracy class	Diameter & Connection type (YYBSP)
0.25	G6	10	0.25	0.5	8	2100	1	40BSP
	G10	16	0.25	0.8	20	2100	1	40BSP
	G16	25	0.25	1.25	48	2100	1	40BSP
	G25	**40**	**0.25**	**2**	**120**	**2100**	**1 or 1.5**	**40BSP**
0.39	G10	16	0.25	0.8	12	2100	1	40BSP
	G16	25	0.25	1.25	28	2100	1	40BSP
	G25	40	0.25	2	72	2100	1 or 1.5	40BSP
	G40	65	0.25	3.2	190	2100	1 or 1.5	50BSP
0.61	G16	25	0.25	1.25	25	2100	1	40BSP
	G25	40	0.25	2	64	2100	1 or 1.5	40BSP
	G40	65	0.25	3.2	170	2100	1 or 1.5	50BSP
0.73	G16	25	0.25	1.25	13	2100	1	40BSP
	G25	40	0.25	2	32	2100	1 or 1.5	40BSP
	G40	65	0.2	3.2	85	2100	1 or 1.5	50BSP
1.16	G40	65	0.4	3.2	23	2100	1 or 1.5	50BSP

* The model designation may be written with or without a ‘0’ preceding the numerical value. For example ‘G025’ or ‘G25’ are both valid.

TABLE 2(a) – FMG-FMR Variants (Flanged connection)

The model designation has the form **FMG-FMR GXXX-DNYYY**

Volume (dm^3)	Model (GXXX*)	Q_{max} (m^3/h)	Q_{min} (m^3/h)	Q_t (m^3/h)	Δp (Pa)	P_{max} (kPa)	Accuracy class	Diameter & Connection type (DNYYY)
0.39	G10	16	0.25	0.8	12	2100	1	DN40 or DN50
	G16	25	0.25	1.25	28	2100	1	DN40 or DN50
	G25	40	0.25	2	72	2100	1 or 1.5	DN40 or DN50
	G40	65	0.25	3.2	190	2100	1 or 1.5	DN40 or DN50
0.61	G16	25	0.25	1.25	25	2100	1	DN40 or DN50
	G25	40	0.25	2	64	2100	1 or 1.5	DN40 or DN50
	G40	65	0.25	3.2	170	2100	1 or 1.5	DN40 or DN50
	G65	100	0.25	5	400	2100	1 or 1.5	DN40 or DN50
0.73	G16	25	0.2	1.25	13	2100	1	DN40 or DN50
	G25	40	0.2	2	32	2100	1 or 1.5	DN40 or DN50
	G40	65	0.2	3.2	85	2100	1 or 1.5	DN40 or DN50
	G65	100	0.2	5	200	2100	1 or 1.5	DN40 or DN50
	G100	160	0.4	8	512	1200	1 or 1.5	DN50 or DN80
1.16	G40	65	0.4	3.2	23	2100	1 or 1.5	DN50 or DN80
	G65	100	0.4	5	74	2100	1 or 1.5	DN50 or DN80
	G100	160	0.4	8	190	2100	1 or 1.5	DN50 or DN80
	G160	250	0.65	12.5	460	1200	1 or 1.5	DN50 or DN80
1.45	G65	100	0.6	5	94	2100	1 or 1.5	DN80 or DN100
	G100	160	0.6	8	240	2100	1 or 1.5	DN80 or DN100
	G160	250	0.6	12.5	635	2100	1 or 1.5	DN80 or DN100

* The model designation may be written with or without a ‘0’ preceding the numerical value. For example ‘G065’ or ‘G65’ are both valid.

TABLE 2(b) – FMG-FMR Variants (Flanged connection)

The model designation has the form **FMG-FMR GXXX-DNYYY**

Volume (dm^3)	Model (GXXX)	Q_{max} (m^3/h)	Q_{min} (m^3/h)	Q_t (m^3/h)	Δp (Pa)	P_{max} (kPa)	Accuracy class	Diameter & Connection type (DNYYY)
1.81	G65*	100	0.6	5	29	2100	1 or 1.5	DN80 or DN100
	G100	160	0.6	8	74	2100	1 or 1.5	DN80 or DN100
	G160	250	0.6	12.5	180	2100	1 or 1.5	DN80 or DN100
	G250	400	1	20	460	1200	1 or 1.5	DN80 or DN100
1.98	G100	160	1	8	78	2100	1 or 1.5	DN80 or DN100
	G160	250	1	12.5	190	2100	1 or 1.5	DN80 or DN100
	G250	400	2.5	20	460	1200	1 or 1.5	DN80 or DN100
3.17	G160	250	1.6	12.5	90	2100	1 or 1.5	DN80 or DN100
	G250	400	1.6	20	230	2100	1 or 1.5	DN80 or DN100
	G400	650	2.5	32	607	1200	1 or 1.5	DN80 or DN100
5.15	G250	400	2.5	20	106	2100	1 or 1.5	DN100 or DN150
	G400	650	2.5	32	280	2100	1 or 1.5	DN100 or DN150
	G650	1000	6.25	50	662	1200	1 or 1.5	DN100 or DN150

* The model designation may be written with or without a ‘0’ preceding the numerical value. For example ‘G065’ or ‘G65’ are both valid.

TABLE 3 – FMG-FMR Dual Variants (Flanged connection)

The model designation has the form **FMG-FMR GXXXD-DNYYY**

Volume (dm^3)	Model (GXXXD)	Q_{max} (m^3/h)	Q_{min} (m^3/h)	Q_t (m^3/h)	Δp (Pa)	P_{max} (kPa)	Accuracy class	Diameter & Connection type (DNYYY)
2.41	G160D	250	1	12.5	190	2100	1 or 1.5	DN80 or DN100
	G250D	400	2.5	20	460	2100	1 or 1.5	DN80 or DN100
3.96	G250D	400	2.5	20	106	2100	1 or 1.5	DN100 or DN150
	G400D	650	4	32	280	2100	1 or 1.5	DN100 or DN150
	G650D	1000	4	32	662	1200	1 or 1.5	DN150 or DN200
6.34	G400D	650	4	32	280	2100	1 or 1.5	DN150 or DN200
	G650D	1000	6.5	50	662	2100	1 or 1.5	DN150 or DN200

TEST PROCEDURE

Gas meters tested for initial verification shall comply with the Certificate of Approval, Technical Schedule, and the maximum permissible errors and weighted mean errors for initial and subsequent verification at the operating conditions in effect at the time of verification. Maximum permissible errors (MPEs) and weighted mean error (WME) for the initial and subsequent verification of gas meters are given below.

Test Procedure Table A. MPEs for Gas Meters

Flow rate Q	During pattern evaluation and initial verification Accuracy class			During subsequent verification and in-service Accuracy class		
	0.5	1	1.5	0.5	1	1.5
$Q_{min} \leq Q < Q_t$	± 1 %	± 2 %	± 3 %	± 2 %	± 4 %	± 6 %
$Q_t \leq Q \leq Q_{max}$	± 0.5 %	± 1 %	± 1.5 %	± 1 %	± 2 %	± 3 %

Test Procedure Table B. Maximum Permissible WME for Gas Meters

Flow rate Q	During pattern evaluation and initial verification Accuracy class		
	0.5	1	1.5
WME	± 0.2 %	± 0.4 %	± 0.6 %

The verification test procedure for the FMG Model FMR gas meter is given below.

Test conditions

The meter shall be tested within its rated operating conditions.

The meter may be tested with air or natural gas.

Test points

The errors of indication for the gas meter shall be determined at flow rates distributed over the measuring range of the meter at regular intervals, including Q_{min} and Q_{max} and preferably Q_t.

Based on three test points per decade the minimum number (N) of test points, ranking from $i = 1$ to $i = N$ can be calculated according to:

$$N = 1 + 3 \cdot \log\left(\frac{Q_{max}}{Q_{min}}\right)$$ where $N \geq 6$, and rounded to the nearest integer.

For flow rates covering two decades or more the following formula presents an adequate regular distribution of flow rates for $i = 1$ to $i = N–1$ and $Q_N = Q_{min}$.

$$Q_i = \left(\sqrt[3]{10}\right)^{1-i} \cdot Q_{max}$$

NOTE: NMI reserves the right to vary this procedure. Any such variation shall be notified in writing by NMI.

FIGURE 14/1/1 – 1

FMG Model FMR G25-40BSP Gas Meter (The pattern)

FIGURE 14/1/1 – 2

The above markings are provided as an example only.

FIGURE 14/1/1 – 3

(a) Typical Sealing of Model FMR G25-40BSP Gas Meter Body (The pattern)

(b) Typical Sealing of Indicator (Note markings shown are NOT correct for Australia)

FIGURE 14/1/1 – 4

Models G65-DN50 and G40-DN50

FIGURE 14/1/1 – 5

G100 DN80 G160 DN80 G400 DN100

G015 DN40 G040 DN50 G065 DN50 G250 DN100

Various Models as Listed (Variant 1)

FIGURE 14/1/1 – 6

Models G400-DN100, G250-DN80 and G160-DN100

~ End of Document ~