PRODUCT CONFORMITY CERTIFICATE

This is to certify that the

M2000 electromagnetic flowmeter

Manufactured by:

Badger Meter s.r.o
Maříkova 26
621 00 Brno
Czech Republic

has been assessed by CSA Group
and for the conditions stated on this certificate complies with:

Performance Standards and Test Procedures for Continuous Water Monitoring Equipment, Part 3: Performance standards and test procedures for water flowmeters, Environment Agency, version 4, March 2020

The combined performance characteristic (U_c, the expanded uncertainty) are as follows:
M2000 electromagnetic flowmeter is **0.33% (Class 1)**

Certification Range:

Size: DN50 to DN800

Project No.:	80131536
Certificate No:	CSA MC240413/00
Initial certification:	8 March 2024
Certificate issued:	8 March 2024
Renewal date:	7 March 2029

Andrew Young
Environmental Team Manager

MCERTS is operated on behalf of the Environment Agency by

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UKAS PRODUCT CERTIFICATION 0011

The MCERTS certificate consists of this document in its entirety.
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Form 3005
Issue 6

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Approved Site Application

Any potential user should make sure, in consultation with the manufacturer, that the monitoring system is suitable for the intended application. For general guidance on monitoring techniques refer to the Environment Agency guidance available at www.mcerts.net

The product is suitable for use, where it is appropriate, for regulated applications such as abstraction, effluent discharge, ultraviolet disinfection and industrial processing.

The field test was carried out between the 1st October 2023 and 31st December 2023 at a wastewater treatment works in Wiltshire, UK.

Basis of Certification

This certification is based on the following test report(s) and on CSA Group's assessment and ongoing surveillance of the product and the manufacturing process:

OIML Type Evaluation Report, NMi-13200483-01, Revision 1. NMi Certain B.V. July 2022
LAT237_B00014_DN600_SN2207-548 Laboratorio Accreditato di Tarature, Jan 2023
LAT237_B00015_DN600_SN2207-548 Laboratorio Accreditato di Tarature, Jan 2023
LAT237_B00016_DN600_SN2207-548 Laboratorio Accreditato di Tarature, Jan 2023
LAT237_B00017_DN600_SN2207-548 Laboratorio Accreditato di Tarature, Jan 2023
WRC test report ref. 'UC16537 V3.0', February 2024.
CSA Group report ref. 80131536, incorporating report "Laboratory and Field Test Results", dated 13th February 2024.

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Product Certified

The Badger Meter M2000 flowmeter system consists of the following parts:

- ModMag® M2000 meter with transmitter in IP67 housing with LCD display.

Meter Size	Flow rate		Unit
	Min (Q1)	Max (Q3)	
DN50	0.252	63	m^3/h
DN65	0.4	100	m^3/h
DN80	0.64	160	m^3/h
DN100	1	250	m^3/h
DN125	1.6	400	m^3/h
DN150	2.52	630	m^3/h
DN200	4	1000	m^3/h
DN250	6.4	1600	m^3/h
DN300	10	2500	m^3/h
DN350	10	2500	m^3/h
DN400	16	4000	m^3/h
DN450	25.2	6300	m^3/h
DN500	25.2	6300	m^3/h
DN600	25.2	6300	m^3/h
DN800	40	10000	m^3/h

This certificate applies to all instruments fitted with software version V1.23 onwards.

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Certified Performance

The instrument was evaluated for use under the following conditions:

Ambient Temperature Range: -20°C to +60°C
Instrument IP rating: IP67 / remote version sensor IP68

The instrument meets **MCERTS Class 1** requirements for the combined performance characteristic as specified in Table 6 of the MCERTS performance standard. Details of individual performance characteristics are summarised below:

Test	Results expressed as % of the certification range				Other results	MCERTS specification
	<0.5	<1	<2	<5		
LABORATORY TESTS ***General requirements/Initial checks*** - Protection against unauthorised access	Password protected unique to the device.					Clause 3.1.2
Indicative device and/or analogue or digital output signal	LCD and 4-20mA output incorporated.					Clause 3.1.3
Units of measurement	Verified					Clause 3.1.6 & 3.1.7
Comparison of output values	Verified - results comparable					Clause 6.1.4
Combined performance characteristic (Uc)					**0.33**	Clause 6.4 Class 1
Warm-up time					65s	Clause 6.1.2 Value(s) obtained to be reported.
Loss of Power					All settings retained for 10 parameters	Clause 6.3.1
*Mean error, *x* Test point 1A Test point 1B Test point 3 Test point 4 Test point 5	 -0.38 0.25 -0.01 -0.07 -0.02					Clause 6.3.2 Class 1
*Repeatability, U_R Test point 1A Test point 1B Test point 3 Test point 4 Test point 5	 0.06 0.04 - 0.01 -				 Note 2 Note 2	Clause 6.3.2 Class 1

Certificate No: CSA MC240413/00
Certificate issued: 8 March 2024

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Test	Results expressed as % of the certification range				Other results	MCERTS specification
	<0.5	<1	<2	<5		
*Supply voltage, X_{SV} (72V to 291V AC)	0.0					clause 6.3.3 Class 1
Output impedance, X_I (10Ω to 800Ω)	0.03					clause 6.3.4 Class 1
Fluid temperature, X_{FT} (0°C to 30°C)	0.065					clause 6.3.5 Class 1
*Ambient air temperature, X_T (-25°C to 55°C)	0.085					clause 6.3.6 Class 1
Relative humidity, X_{RH} (95%, 20°C - 60°C)	0.085					clause 6.3.6 Class 1
Presence of stray currents, X_{SV}	0.005					clause 6.3.9 Class 1
*Effect of conduit size (range DN50 - DN800) ***Mean error,*** *x*						Clause 6.3.17.1 No specification assigned, value(s) obtained to be reported
Small (1A) - DN100 (0.035m/s)	-0.38					
Small (1B) - DN100 (0.057m/s)	0.25					
Small (3) - DN100 (3.11m/s)	-0.01					
Small (4) - DN100 (8.5m/s)	-0.07					
Small (5) - Dn100 (10.8m/s)	-0.02					
Medium (1A) - DN400 (0.038m/s)				-2.37		
Medium (1A) - DN400 (0.038m/s)			-1.61			
Medium (1B) - DN400 (0.059m/s)		-0.83				
Medium (3) - DN400 (3.10m/s)		-0.94				
Medium (4) - DN400 (6.37m/s)			-1.05			
Medium (5) - DN400 (10.89m/s)						
Large (1B) - DN600 (0.060m/s)				3.33		
Large (2A) - DN600 (0.094m/s)				3.22		
Large (3) - DN600 (2.98m/s)				3.23		
Large (4) - DN600 (4.90m/s)				3.23		
Large (5) - DN600 (9.79m/s)			1.02			

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Test	Results expressed as % of the certification range				Other results	MCERTS specification
	<0.5	<1	<2	<5		
*Effect of conduit size (range DN50 - DN800) ***Repeatability***, U_R Small (1A) - DN100 (0.035m/s) Small (1B) - DN100 (0.057m/s) Small (3) - DN100 (3.11m/s) note 1 Small (4) - DN100 (8.5m/s) Small (5) - DN100 (10.8m/s) note 1 Medium(1A) - DN400 (0.038m/s) Medium (1B) - DN400 (0.059m/s) Medium (3) - DN400 (3.10m/s) Medium (4) - DN400 (6.37m/s) Medium (5) - DN400 (10.89m/s) Large (1B) - DN600 (0.060m/s) Large (2A) - DN600 (0.094m/s) Large (3) - DN600 (2.98m/s) Large (4) - DN600 (4.90m/s) Large (5) - DN600 (9.79m/s)	 0.06 0.04 - 0.01 - 0.55 0.02 0.02 0.06 0.02 0.11 0.01 0.06 0.04 0.07					Clause 6.3.17.1 No specification assigned, value(s) obtained to be reported
*Flow reversal ***Mean error,*** *x* Test point 1A - 0.037m/s Test point 1B - 0.059m/s Test point 4 - 8.399m/s	 -0.10 0.40 0.18					clause 6.3.14 No specification assigned, value(s) obtained to be reported.
Response Time (either increasing or decreasing flow)					≤10s	clause 6.3.19 No specification assigned, value(s) obtained to be reported.

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Test	Results expressed as % of the certification range				Other results	MCERTS specification
	<0.5	<1	<2	<5		
FIELD TESTS Error under field conditions	Max error -7.09% Min error 0.01% Mean error -2.13% Proportion of errors ≤2% = 50.0% Proportion of errors ≤5% = 91.7% Proportion of errors ≤8% = 100%					Clause 7.3 Class 2
Up time					100% Note 3	Clause 7.4 ≥95%
Maintenance					None Note 4	Clause 7.5 To be reported

Note 1: Laboratory tests denoted '*' signify test data taken from the OIML test reports, all other laboratory test data taken from the WRC test report.

Note 2: For test points 3 and 5 the repeatability test data was limited and therefore could not be readily determined. Additional data for repeatability can be found under 'Effect of conduit size' test on page 6 of this certificate. Repeatability for test data points 3 and 5 for the sizes DN400 and DN600 were 0.02/0.02 and 0.06/0.07, respectively.

Note 3: Of the total operating time 132480 minutes, 0 minutes were attributed to power outages.

Note 4: The measuring system was installed in a wastewater treatment works with data acquired from 1st October 2023 to the 31st December 2023 with a total scheduled operating time of 132480 minutes. No maintenance was required during the field test.

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Description

The M2000 is a mains powered flow meter based on the electromagnetic principle. The meter targets a variety of applications for the water and wastewater treatment industry. The transmitter can be integrally mounted to the sensor or can be remote-mounted.

M2000 displays flow rate as well as forward, reverse and net totalizers. The meter has internal diagnostic functions and can be checked on site using a verification device. The meter also provides various digital out-/inputs (pulse, frequency, status), analogue output and a wide range of communication interfaces (Modbus, HART, M-Bus, EtherNet, BACnet, Profibus).

The electromagnetic flow metering is based on Faraday's law which states that when a conductor (fluid) moves through a magnetic field of given strength, a voltage is produced. In case of the electromagnetic flow measurement, the moving conductor is replaced by the flowing fluid. Two opposite measuring electrodes conduct the induced voltage which is proportional to flow velocity to the amplifier. Flow volume is calculated based on pipe diameter.

General Notes

1. This certificate is based upon the equipment tested. The Manufacturer is responsible for ensuring that on-going production complies with the standard(s) and performance criteria defined in this Certificate. The Manufacturer is required to maintain an approved quality management system controlling the manufacture of the certified product. Both the product and the quality management system shall be subject to regular surveillance according to 'Regulations Applicable to the Holders of CSA Certificates'.

2. The design of the product certified is defined in the CSA design schedule for certificate No. CSA MC2407413/00.

3. If the certified product is found not to comply, CSA Group should be notified immediately at the address shown on this certificate.

4. The certification marks that can be applied to the product or used in publicity material are defined in 'Regulations Applicable to the Holders of CSA Certificates'.

5. This document remains the property of CSA Group and shall be returned when requested by CSA Group.

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