PRODUCT CONFORMITY CERTIFICATE

This is to certify that the

TTFM 6.1 clamp-on ultrasonic flowmeter

Manufactured by:

Greyline Instruments Inc. (trading name of Pulsar Measurement)

16456 Sixsmith Dr
Long Sault, Ontario K0C 1P0
Canada

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:
TTFM 6.1 (AC) is 4.88% (Class 2)
TTFM 6.1 (DC) is 4.87% (Class 2)

Certification Range:

Velocity:	0.1m/s to 5m/s
Size:	DN15 to DN200

Project No.:	80066272
Certificate No:	CSA MC250372/00
Initial certification:	9 September 2025
Certificate issued:	9 September 2025
Renewal date:	8 September 2030

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Environmental Team Manager

MCERTS is operated on behalf of the Environment Agency by

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Form 3005
Issue 6

Certificate Contents

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 13th September 2023 and the 13th December 2023 at a sewage treatment works in Cromwell, 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:

WRc Test report, ref. 'UC17863 V2', January 2025
CSA Group report ref. 80066272, incorporating Lab and Field test results, dated May 2025

Product Certified

The TTFM 6.1 clamp-on ultrasonic flowmeter measuring system consists of the following parts:

- Transmitter with NEMA4X polycarbonate enclosure with white backlit matrix display
- Transducers with stainless steel mounting straps and CPVC/PBT/PTFE construction (IP67):
  -SE16A stainless steel track with pipe clamps, built in ruler and coupling compound.
  -SE16B stainless steel transducer brackets, clamps, alignment bar and coupling compound

This certificate applies to all instruments fitted with firmware version 1.27.9 with serial number 92599 onwards.

Certified Performance

The instrument was evaluated for use under the following conditions:
Ambient Temperature Range: -20°C to +50°C
Instrument IP rating: IP66
The instrument meets **MCERTS Class 2** 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	*Result expressed as % of the certification range*				*Other results*	*Class*	*MCERTS specification*
	<0.5	*<1*	*<2*	*<5*			
LABORATORY TESTS							
General requirements/initial checks							
Protection against unauthorised access	Password protected unique to the device						cl. 3.1.2
Indicative device and/or analogue digital output signal	TTFM 6.1 has a display for flow indication and a mA analog output as standard						cl. 3.1.3
Units of measurement	Verified						cl. 3.1.6 & 3.1.7
Comparison of output values	Verified within ±1 l/s - results comparable						cl. 6.1.4
Warm-up time							cl. 6.1.2 - no specification assigned, to be reported
AC					5 secs		
DC					15 secs		
Combined performance characteristic (Uc)							cl. 6.4 - Table 6 - class specific
AC	**4.88**					**2**	
DC	**4.87**					**2**	
Performance tests							
Loss of power	Settings retained for all 11 parameters						cl. 6.3.1
Mean error, x							cl. 6.3.2 - Table 6 - class specific
AC - DN100							
Test point 1A				4.46			
Test point 1B	0.42						
Test point 2A				2.05			
Test point 3				-2.35			
Test point 4			-1.39				
Test point 5			-1.37				
Test point 6		-0.95					
DC - DN100							
Test point 1A				2.60			
Test point 1B			-1.11				
Test point 2A				3.44			
Test point 3			-1.39				
Test point 4				-2.60			
Test point 5			-1.83				
Test point 6				-2.31			

Certificate No: CSA MC250372/00
Certificate issued: 9 September 2025

Test	Result expressed as % of the certification range				Other results	Class	MCERTS specification
	<0.5	<1	<2	<5			
Repeatability, U_R							
AC - DN100							
Test point 1A			1.98				
Test point 1B			1.73				
Test point 2A			1.72				
Test point 3		0.84				1	
Test point 4			1.39				
Test point 5		0.62					
Test point 6		0.85					cl. 6.3.2 - Table 6 - class specific
DC - DN100							
Test point 1A				2.33			
Test point 1B		0.79					
Test point 2A		0.97					
Test point 3	0.46						
Test point 4	0.34						
Test point 5	0.19						
Test point 6		0.57					
Supply voltage, X_V (note 1)							cl. 6.3.3 - Table 6 - class specific
AC mains powered (100 to 240V)		0.69					cl. 6.3.3.1 - table 6 - class specific
DC powered, X_V (9V to 32V)	0.25						cl. 6.3.3.2 - Table 6 - class specific
Output impedance, X_O (10Ω to 1000Ω)							cl. 6.3.4 - Table 6 - class specific
AC	0.12						
DC	0.37						
Fluid temperature, X_{FT} (4°C to +30°C)							cl. 6.3.5 - Table 6 - class specific
AC			1.30				

Test	Result expressed as % of the certification range				Other results	Class	MCERTS specification
	<0.5	<1	<2	<5			
Ambient air temperature, X_T (-20°C to +50°C)							cl. 6.3.6 - Table 6 - class specific
AC			1.09				
DC			1.12				
Relative humidity, X_{RH} (95%, 20°C to 50°C)							cl. 6.3.6 - Table 6 - class specific
AC	0.13						
DC		0.75					
Bi-directional flow							cl. 6.3.13 - no specification assigned, to be reported
Mean error - AC							
Test point 1A				4.35			
Test point 3			-1.44				
Test point 5	-0.15						
Repeatability - AC							
Test point 1A			1.38				
Test point 3		0.80					
Test point 5	0.32						
Mean error - DC							
Test point 1A		0.95					
Test point 3				-3.36			
Test point 5				-2.17			
Repeatability - DC							
Test point 1A				6.63			
Test point 3		0.50					
Test point 5				2.20			

Test	Result expressed as % of the certification range				Other results	Class	MCERTS specification
	<0.5	<1	<2	<5			
Effect of conduit material							
Mean error - AC							
Metal - TP1A (DN65)				6.45			
Metal - TP1B (DN65)				-3.73			
Metal - TP2A (DN65)			1.43				
Metal - TP3 (DN65)			-1.95				
Metal - TP4 (DN65)	-0.23						
Metal - TP5 (DN65)	0.29						
Metal - TP6 (DN65)	-0.19						
Plastic - TP1A (DN100)				4.46			
Plastic - TP1B (DN100)	0.42						
Plastic - TP2A (DN100)				2.05			
Plastic - TP3 (DN100)				-2.35			
Plastic - TP4 (DN100)			-1.39				
Plastic - TP5 (DN100)			-1.37				
Plastic - TP6 (DN100)		-0.95					
Lined ductile iron - TP1A (DN150)				5.17			
Lined ductile iron - TP1B (DN150)				4.24			
Lined ductile iron - TP2A (DN150)	0.35						
Lined ductile iron - TP3 (DN150)			1.20				
Lined ductile iron - TP4 (DN150)		0.70					
Lined ductile iron - TP5 (DN150)	0.04						
Lined ductile iron - TP6 (DN150)		-0.64					

cl. 6.3.16 - no specification assigned, to be reported

Test	Result expressed as % of the certification range				Other results	Class	MCERTS specification
	<0.5	<1	<2	<5			
Effect of conduit material							cl. 6.3.16 - no specification assigned, to be reported
Repeatability - AC							cl. 6.3.16 - no specification assigned, to be reported
Metal - TP1A (DN65)				2.4			
Metal - TP1B (DN65)			1.37				
Metal - TP2A (DN65)			1.57				
Metal - TP3 (DN65)	0.23						
Metal - TP4 (DN65)		0.85					
Metal - TP5 (DN65)	0.34						
Metal - TP6 (DN65)	0.46						
Plastic - TP1A (DN100)			1.98				
Plastic - TP1B (DN100)			1.73				
Plastic - TP2A (DN100)			1.72				
Plastic - TP3 (DN100)		0.84					
Plastic - TP4 (DN100)			1.39				
Plastic - TP5 (DN100)		0.62					
Plastic - TP6 (DN100)		0.85					
Lined ductile iron - TP1A (DN150)			1.40				
Lined ductile iron - TP1B (DN150)			1.92				
Lined ductile iron - TP2A (DN150)				2.28			
Lined ductile iron - TP3 (DN150)		0.74					
Lined ductile iron - TP4 (DN150)				2.15			
Lined ductile iron - TP5 (DN150)			1.83				
Lined ductile iron - TP6 (DN150)	0.32						

Test	Result expressed as % of the certification range				Other results	Class	MCERTS specification
	<0.5	<1	<2	<5			
Effect of conduit material							cl. 6.3.16 - no specification assigned, to be reported
Mean error - DC							cl. 6.3.16 - no specification assigned, to be reported
Metal - TP1A (DN65)				6.32			
Metal - TP1B (DN65)				2.67			
Metal - TP2A (DN65)				2.44			
Metal - TP3 (DN65)			1.25				
Metal - TP4 (DN65)			1.07				
Metal - TP5 (DN65)		-0.72					
Metal - TP6 (DN65)		-0.93					
Plastic - TP1A (DN100)				2.60			
Plastic - TP1B (DN100)			-1.11				
Plastic - TP2A (DN100)				3.44			
Plastic - TP3 (DN100)			-1.39				
Plastic - TP4 (DN100)				-2.60			
Plastic - TP5 (DN100)			-1.80				
Plastic - TP6 (DN100)				-2.31			
Lined ductile iron - TP1A (DN150)				4.73			
Lined ductile iron - TP1B (DN150)				3.19			
Lined ductile iron - TP2A (DN150)			1.26				
Lined ductile iron - TP3 (DN150)			1.40				
Lined ductile iron - TP4 (DN150)	-0.20						
Lined ductile iron - TP5 (DN150)	0.02						
Lined ductile iron - TP6 (DN150)	0.21						

Test	Result expressed as % of the certification range				Other results	Class	MCERTS specification
	<0.5	<1	<2	<5			
Effect of conduit material							cl. 6.3.16 - no specification assigned, to be reported
Repeatability - DC							cl. 6.3.16 - no specification assigned, to be reported
Metal - TP1A (DN65)				4.44			
Metal - TP1B (DN65)				2.07			
Metal - TP2A (DN65)		0.70					
Metal - TP3 (DN65)				2.27			
Metal - TP4 (DN65)				2.23			
Metal - TP5 (DN65)			1.26				
Metal - TP6 (DN65)		0.53					
Plastic - TP1A (DN100)				2.33			
Plastic - TP1B (DN100)		0.79					
Plastic - TP2A (DN100)		0.97					
Plastic - TP3 (DN100)	0.46						
Plastic - TP4 (DN100)	0.34						
Plastic - TP5 (DN100)	0.19						
Plastic - TP6 (DN100)		0.57					
Lined ductile iron - TP1A (DN150)				3.93			
Lined ductile iron - TP1B (DN150)			1.08				
Lined ductile iron - TP2A (DN150)				3.80			
Lined ductile iron - TP3 (DN150)		0.89					
Lined ductile iron - TP4 (DN150)		0.77					
Lined ductile iron - TP5 (DN150)		0.71					
Lined ductile iron - TP6 (DN150)	0.41						

Test	Result expressed as % of the certification range				Other results	Class	MCERTS specification
	<0.5	<1	<2	<5			
Effect of conduit size							
Mean error - AC							
SMALL TP1A - (DN65)				6.45			
SMALL TP1B - (DN65)				-3.73			
SMALL TP2A - (DN65)			1.43				
SMALL TP3 - (DN65)			-1.95				
SMALL TP4 - (DN65)	-0.23						
SMALL TP5 - (DN65)	0.29						
SMALL TP6 - (DN65)	-0.19						
MEDIUM - TP1A (DN100)				4.46			
MEDIUM - TP1B (DN100)	0.42						cl. 6.3.17 - no specification assigned, to be reported
MEDIUM - TP2A (DN100)				2.05			
MEDIUM - TP3 (DN100)				-2.35			
MEDIUM - TP4 (DN100)			-1.39				
MEDIUM - TP5 (DN100)			-1.37				
MEDIUM - TP6 (DN100)		-0.95					
LARGE - TP1A (DN150)				5.17			
LARGE - TP1B (DN150)				4.24			
LARGE - TP2A (DN150)	0.35						
LARGE - TP3 (DN150)			1.20				
LARGE - TP4 (DN150)		0.70					
LARGE - TP5 (DN150)	0.04						
LARGE - TP6 (DN150)		-0.64					

Test	Result expressed as % of the certification range				Other results	Class	MCERTS specification
	<0.5	<1	<2	<5			
Effect of conduit size							cl. 6.3.17 - no specification assigned, to be reported
Repeatability - AC							
SMALL TP1A - (DN65)				2.4			
SMALL TP1B - (DN65)			1.37				
SMALL TP2A - (DN65)			1.57				
SMALL TP3 - (DN65)	0.23						
SMALL TP4 - (DN65)		0.85					
SMALL TP5 - (DN65)	0.34						
SMALL TP6 - (DN65)	0.46						
MEDIUM - TP1A (DN100)			1.98				
MEDIUM - TP1B (DN100)			1.73				
MEDIUM - TP2A (DN100)			1.72				cl. 6.3.17 - no specification assigned, to be reported
MEDIUM - TP3 (DN100)		0.84					
MEDIUM - TP4 (DN100)			1.39				
MEDIUM - TP5 (DN100)		0.62					
MEDIUM - TP6 (DN100)		0.85					
LARGE - TP1A (DN150)			1.40				
LARGE - TP1B (DN150)			1.92				
LARGE - TP2A (DN150)				2.28			
LARGE - TP3 (DN150)		0.74					
LARGE - TP4 (DN150)				2.15			
LARGE - TP5 (DN150)			1.83				
LARGE - TP6 (DN150)	0.32						

Test	Result expressed as % of the certification range				Other results	Class	MCERTS specification
	<0.5	<1	<2	<5			
Effect of conduit size							cl. 6.3.17 - no specification assigned, to be reported
Mean error - DC							cl. 6.3.17 - no specification assigned, to be reported
SMALL TP1A - (DN65)				6.32			
SMALL TP1B - (DN65)				2.67			
SMALL TP2A - (DN65)				2.44			
SMALL TP3 - (DN65)			1.25				
SMALL TP4 - (DN65)			1.07				
SMALL TP5 - (DN65)		-0.72					
SMALL TP6 - (DN65)		-0.93					
MEDIUM - TP1A (DN100)				2.60			
MEDIUM - TP1B (DN100)			-1.11				
MEDIUM - TP2A (DN100)				3.44			
MEDIUM - TP3 (DN100)			-1.39				
MEDIUM - TP4 (DN100)				-2.60			
MEDIUM - TP5 (DN100)			-1.80				
MEDIUM - TP6 (DN100)				-2.31			
LARGE - TP1A (DN150)				4.73			
LARGE - TP1B (DN150)				3.19			
LARGE - TP2A (DN150)			1.26				
LARGE - TP3 (DN150)			1.40				
LARGE - TP4 (DN150)	-0.20						
LARGE - TP5 (DN150)	0.02						
LARGE - TP6 (DN150)	0.21						

Test	Result expressed as % of the certification range				Other results	Class	MCERTS specification
	<0.5	<1	<2	<5			
Effect of conduit size							cl. 6.3.17 - no specification assigned, to be reported
Repeatability - DC							
SMALL TP1A - (DN65)				4.44			
SMALL TP1B - (DN65)				2.07			
SMALL TP2A - (DN65)		0.70					
SMALL TP3 - (DN65)				2.27			
SMALL TP4 - (DN65)				2.23			
SMALL TP5 - (DN65)			1.26				
SMALL TP6 - (DN65)		0.53					
MEDIUM - TP1A (DN100)				2.33			
MEDIUM - TP1B (DN100)		0.79					
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LARGE - TP1A (DN150)				3.93			
LARGE - TP1B (DN150)			1.08				
LARGE - TP2A (DN150)				3.80			
LARGE - TP3 (DN150)		0.89					
LARGE - TP4 (DN150)		0.77					
LARGE - TP5 (DN150)		0.71					
LARGE - TP6 (DN150)	0.41						
Response Time (either increasing or decreasing flow)							cl. 6.3.19 - ≤30 seconds
AC					≤10 secs		
DC					≤10 secs		

Test	*Parameter*	*Result*	*Class*	*MCERTS specification*
FIELD TESTS				
Error under field conditions	Maximum error (%)	6.51	**2**	cl. 7.3 - Table 6
	Minimum error (%)	0.07		
	Mean error (%)	0.91		
	Proportion of errors ≤2%	70.8%		
	Proportion of errors ≤5%	91.7%		
	Proportion of errors ≤8%	100%		
Up-time (%)		100 (note 2)		cl. 7.4 ≥95%
Maintenance		None (note 2)		cl. 7.5 - to be reported

Note 1: The TTFM 6.1 transmitter can be powered by both mains AC and low voltage DC.

Note 2: The flowmeter system was installed in September 2023 with data obtained between the 13th September and 13th December 2023 with a total scheduled operating time of 2191.5 hours, or 131,490 minutes. Of the total operating time 131,490 minutes, 0 minutes were attributed to outage time. No maintenance was required during the field test.

Description

The TTFM 6.1 transit time flow meter has two control relays for use as flow alarms, control functions, or assignable to pulse by volume units for remote recording or sampler operation. The controller is housed in a polycarbonate NEMA 4X (IP66) enclosure which has an isolated 4–20 mA output (configurable as 0–5 V) proportional to 'flow rate', and a USB port is provided to download parameters and Log files. Easy menu-driven set up, with clamp-on sensors suitable for a wide range of pipe materials and sizes, and advanced signal processing with automatic gain control to suit challenging applications. Internally there is a 128 MB data logger capable of storing up to 26 million time- and date-stamped flow values, retrievable via USB memory device. Other communication options include Modbus RTU via RS485, and additional relay modules can expand outputs up to six.

The non-invasive clamp-on transducers use transit time ultrasonic signals to measure liquid flow in full pipes without pipe cutting or process interruption. The IP67-rated sensors are supplied with shielded cables which may be extended up to 150 m from the controller.

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 MC250372/00.

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.