Australian Government
Department of Industry, Innovation and Science

National Measurement Institute

36 Bradfield Road, West Lindfield NSW 2070

Certificate of Approval

NMI 14/3/32

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.

Aquamonix Model I500 Water Meter

submitted by **Aquamonix Pty Ltd**
(formerly known as Pentair Environmental Systems)
268 Milperra Road
Milperra NSW 2214

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 M 10-1 Meters Intended for the Metering of Water in Full Flowing Pipes*, Part 1 Metrological and Technical Requirements*, dated July 2010.

This approval becomes subject to review on **1/09/23**, and then every 5 years thereafter.

DOCUMENT HISTORY

Rev	Reason/Details	Date
0	Pattern & variants 1 & 2 approved – certificate issued	2/12/15
1	Variant 3 approved (Change of **submittor** name & minor **amendments**) – certificate issued	28/03/17
2	Pattern amended (installation conditions, software and communications) – certificate issued	26/04/17
3	Pattern reviewed and amended (installation conditions) variants 4 & 5 approved – certificate issued	08/08/18

Rev	Reason/Details	Date
4	Variants 6 & 7 provisionally approved – certificate issued	30/10/18
5	Period of validity extended for provisional approval (Variants 6 & 7) – certificate issued	11/04/19
6	Variants 6 & 7 updated and approved – certificate issued	04/09/20

CONDITIONS OF APPROVAL

General

Instruments purporting to comply with this approval shall be marked with pattern approval number 'NMI 14/3/32' 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*.

Darryl Hines
Manager
Policy and Regulatory Services

TECHNICAL SCHEDULE No 14/3/32

1. Description of Pattern

approved on 2/12/15
amended on 26/04/17
amended on 08/08/18

An Aquamonix model I500 electromagnetic Class 2.5 DN150 water meter (Figures 1 and 2) intended to measure water supply for trade.

The pattern may also be known as a Pentair/Tyco/EMFLUX Model I500 Water Meter.

1.1 Field of Operation

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

Minimum flow rate, Q_1	4.4 L/s
Maximum continuous flow rate, Q_3	88 L/s
Overload flow rate, Q_4	110 L/s
Flow rate ratio, Q_3/Q_1	20
Maximum admissible temperature	50°C
Maximum admissible pressure	1500 kPa
Pressure loss class	ΔP0
Accuracy class	2.5
Flow profile sensitivity class	U0/D0
Electromagnetic class	E1 & E2 (industrial)
Environmental class	B & O (indoor & outdoor)
Orientation	Horizontal
Flow Direction	Forward/reverse
Power supply:	12 V DC replaceable battery

(Note: Available battery voltage is accessible via the electronic display)

1.2 Features/Functions

An Aquamonix model I500 Class 2.5 water meter incorporating an Aquamonix model I500 flow transmitter (with or without optional solar panel as shown in Figure 1) and an Aquamonix Flow Detector (*) model IR2060 DN150 size electromagnetic flow sensor (Figure 2), and having features/functions as listed below:

Connection type: flanged end connections

Display: a digital, electronic, liquid crystal display of 6 aligned digits capable of displaying totalised volume in units of litres (L), kilolitres (kL) and megalitres (ML).

Communications: the meter is able to provide up to 4 multifunctional digital outputs. Output options include MODBUS, modem and 4-20 mA.

Materials: model I500 flow transmitter: stainless steel
model IR2060 flow sensor: stainless steel

Meter length: 429 mm

(*) The Aquamonix Flow Detector model IR2060 flow sensor may also be known as a Pentair/Tyco/EMFLUX flow sensor of the same model.

1.3 Conditions

1.3.1 Installation conditions:

No flow straightener or flow conditioner is required.

The flow profile sensitivity class is U0/D0 as specified in Table 1.

Table 1 – Minimum pipe lengths required by flow disturbance type

Disturbance Type (*)	Minimum upstream pipe length	Minimum downstream pipe length
1	0	0
2	0	0
3	0	0

(*) For information on the different types of flow disturbances which are examined as part of pattern approval, refer to NMI M 10-2.

1.3.2 Water Quality:

The meter is approved for use in the metering of non-potable water supplies of an unspecified nature.

The minimum fluid conductivity required for reliable operation is 5 µS/cm.

1.4 Software Version

The Aquamonix model I500 electromagnetic flowmeter is approved for use with Version 5.2 software, Version 6.0 software or Version 6.X software (where X is a number between 1-9).

1.5 Verification Provision

Provision is made for the application of a verification mark.

1.6 Sealing Provision

The pattern is protected from unauthorised access and tampering via a series of physical and electronic seals.

The Aquamonix model I500 flow transmitter is housed in a stainless steel case only accessible with a unique physical key. The door of the transmitter housing is also physically sealed (Figure 3) with a wire-crimping device marked with a unique identification number; thereby providing evidence of unauthorised access to the housing.

Physical access to the housing will allow the battery to be replaced, and this event is electronically logged by the flow transmitter.

Electronic access to the metrological functions of the flow computer is restricted by a series of access codes. Any changes to the metrology of the meter are logged by the flow transmitter.

The Aquamonix Flow Detector model IR2060 flow sensor is constructed such that any attempted physical access to the flow transducers or the coils would be evident.

1.7 Descriptive Markings

Instruments are marked with the following data, either grouped or distributed on the casing, the indicating device dial or an identification plate (Figure 4):

Manufacturer's name or mark	...
Serial number	...
Pattern approval number	NMI 14/3/32
Numerical value of maximum continuous flow rate, Q_3	...
Flow rate ratio, Q_3/Q_1	...
Unit of measurement	L, kL or ML
Temperature class (1)	T50
Maximum admissible pressure (2)	1500 kPa
Maximum pressure loss (3)	0 kPa or Δp0
Orientation (4)	H
Flow profile sensitive class (5)	U0/D0
Direction of flow	→ or similar
Accuracy class (6)	2.5

(1) Optional for Class T30

(2) Optional for meters with MAP of 1400 kPa or 600 kPa for DN ≥ 500

(3) Optional for Class Δp63

(4) Optional for meters approved for all orientations

(5) Optional for 0U/0D meters

(6) Optional for class 2 meters

For instruments that incorporate electronic devices, the following information can either be physically marked on the instrument or provided electronically via the indicating device or similar means:

Electromagnetic class	E1 and/or E2
Environmental class	B, O and/or M
For meters with an external power supply	the voltage and frequency
For battery powered meters	a replacement date or similar indication of expected battery life

2. Description of Variant 1 approved on 2/12/15

With certain other sizes of the Aquamonix Flow Detector (*) model IR2060 electromagnetic flow sensors similar to the pattern but with specifications as listed in Tables 2a, 2b and 2c below.

(*) The Aquamonix Flow Detector model IR2060 flow sensors may also be known as a Pentair/Tyco/EMFLUX flow sensors of the same model.

TABLE 2a – Approved flow sensor specifications (pattern & variant 1)

(The specifications of the flow sensor of the pattern, model IR2060, DN150 size is shown in **bold**.)

Flow sensor size	**DN50**	**DN80**	**DN100**	**DN150**	**DN200**
Minimum flow rate Q_1 (L/s)	0.50	1.25	2.00	**4.40**	7.85
Maximum continuous flow rate Q_3 (L/s)	10	25	40	**88**	157
Overload flow rate Q_4 (L/s)	12.50	31.25	50	**110**	196.25
Ratio Q_3/Q_1	20				
Nominal diameter (mm)	50	80	100	**150**	200
Meter Length (mm)	360	360	360	**429**	429
Maximum admissible pressure (kPa)	1500				
Verification scale interval (L)	0.00001	0.00001	0.00001	0.00001	0.00001

TABLE 2b – More approved flow sensor specifications (variant 1)

Flow sensor size	**DN250**	**DN300**	**DN350**	**DN375**	**DN400**
Minimum flow rate Q_1 (L/s)	12.25	17.65	24.05	27.60	31.40
Maximum continuous flow rate Q_3 (L/s)	245	353	481	552	628
Overload flow rate Q_4 (L/s)	306.25	441.25	601.25	690	785
Ratio Q_3/Q_1	20				
Nominal diameter (mm)	250	300	350	375	400
Meter Length	429	471	543	582	582
Maximum admissible pressure (kPa)	1500				
Verification scale interval (L)	0.00001	0.00001	0.00001	0.00001	0.00001

TABLE 2c – More approved flow sensor specifications (variant 1)

Flow sensor size	**DN450**	**DN500**	**DN570**	**DN600**
Minimum flow rate Q_1 (L/s)	39.75	49.10	63.80	70.70
Maximum continuous flow rate Q_3 (L/s)	795	982	1276	1414
Overload flow rate Q_4 (L/s)	993.75	1227.50	1595	1767.50
Ratio Q_3/Q_1	20			
Nominal diameter (mm)	450	500	570	600
Meter Length	607	683	785	785
Maximum admissible pressure (kPa)	900			
Verification scale interval (L)	0.00001	0.00001	0.00001	0.00001

3. Description of Variant 2 approved on 2/12/15

Aquamonix Flow Detector (*) model IR2030 and model IR2020 electromagnetic flow sensors similar to the model IR2060 but with specifications as listed in Tables 3 and 4 below.

(*) The Aquamonix Flow Detector model flow sensors may also be known as a Pentair/Tyco/EMFLUX flow sensors of the same models.

TABLE 3 – Approved specifications model IR2030 flow sensor

- Connection type: Flangeless flow tubes to suit pit/end mount or insertion mounting (Figure 5)

Nominal diameter (mm)	Maximum continuous flow rate Q_3 (L/s)	Maximum admissible pressure (kPa)	Meter length (mm)	Materials
350	481	900	600	stainless steel housing stainless steel electrodes
450	795			
470	795			
485	982			
600	1414			

TABLE 4 – Approved specifications model IR2020 flow sensor

- Connection type: flanged or spigot (non-flanged) end connections (Figure 6)

Nominal diameter (mm)	Maximum continuous flow rate Q_3 (L/s)	Maximum admissible pressure (kPa)	Meter length (mm)	Materials
50	10	900	360	ABS plastic housing stainless steel electrodes
80	25		400	
100	40		420	
150	88		520	
200	157		610	
250	245		750	
300	353		818	
375	552		900	
450	795		1150	

4. Description of Variant 3 approved on 28/03/17

The pattern and variants may incorporate alternative markings as indicated in Figure 7.

5. Description of Variant 4 approved on 08/08/18

The pattern and variants may incorporate the model IR2030C flow sensor (Figure 8) with the specifications listed below:

Connection type: Flangeless flow tubes to suit insertion mounting

Table 5 Approved specifications model IR2030C flow sensor

Nominal diameter (mm)	Max continuous flow rate Q3 (L/s)	Maximum admissible pressure (kPa)	Meter length (mm)	Materials
299	351.08	900	405	stainless steel housing stainless steel electrodes
300	353.43			
371	540.51			
445	777.64			
500	981.75			

6. Description of Variant 5 approved on 08/08/18

The pattern and variants may incorporate the model GM1060 flow sensor (Figure 9) with the specifications listed below:

Connection type: Flanged end connections

Table 6 Approved specifications model GM1060 flow sensor

Nominal diameter (mm)	Max continuous flow rate Q3 (L/s)	Maximum admissible pressure (kPa)	Meter length (mm)	Materials
50	14.70	900	200	Welded steel construction stainless steel electrodes
100	58.90		250	
150	132.50		300	
200	235.60		350	
250	368.20		450	
300	530.10		500	
450	1192.80		600	
600	1953.40		600	

7. Description of Variant 6 approved on 04/09/20

The pattern and variants may incorporate the Aquamonix Flow Detector model IR2060 electromagnetic flow sensors similar to the pattern but with specifications as listed in Table 7 below.

TABLE 7 – Approved flow sensor specifications

Flow sensor size	**DN700**	**DN750**	**DN800**	**DN900**	**DN1000**
Minimum flow rate Q_1 (L/s)	96.21	97.60	122	156.16	195.20
Maximum continuous flow rate Q_3 (L/s)	1924.23	1952	1952	1952	1952
Overload flow rate Q_4 (L/s)	2405.29	2440	2440	2440	2440
Ratio Q_3/Q_1	20	20	16	12.5	10
Nominal diameter (mm)	700	750	800	900	1000
Meter Length	937	1050	1050	1180	1310
Maximum admissible pressure (kPa)	900				
Verification scale interval (L)	0.00001	0.00001	0.00001	0.00001	0.00001

8. Description of Variant 7 approved on 04/09/20

The pattern and variants may incorporate the model IR2030C flow sensor with the specifications listed in Table 8 below.

Connection type: Flangeless flow tubes to suit insertion mounting

Table 8 Approved specifications model IR2030C flow sensor

Nominal diameter (mm)	Max continuous flow rate Q3 (L/s)	Q3/Q1 ratio	Maximum admissible pressure (kPa)	Meter length (mm)	Materials
693	1885.63	20	900	605	stainless steel housing stainless steel electrodes
750	1952	20		605	
1035	1952	10		800	

TEST PROCEDURE No 14/3/32

Water meters tested for initial verification shall comply with the Certificate of Approval, Technical Schedule, and the maximum permissible errors for initial and subsequent verifications at the operating conditions in effect at the time of verification. Maximum permissible errors for the initial and subsequent verification of water meters are given in the *National Trade Measurement Regulations 2009* (Cth).

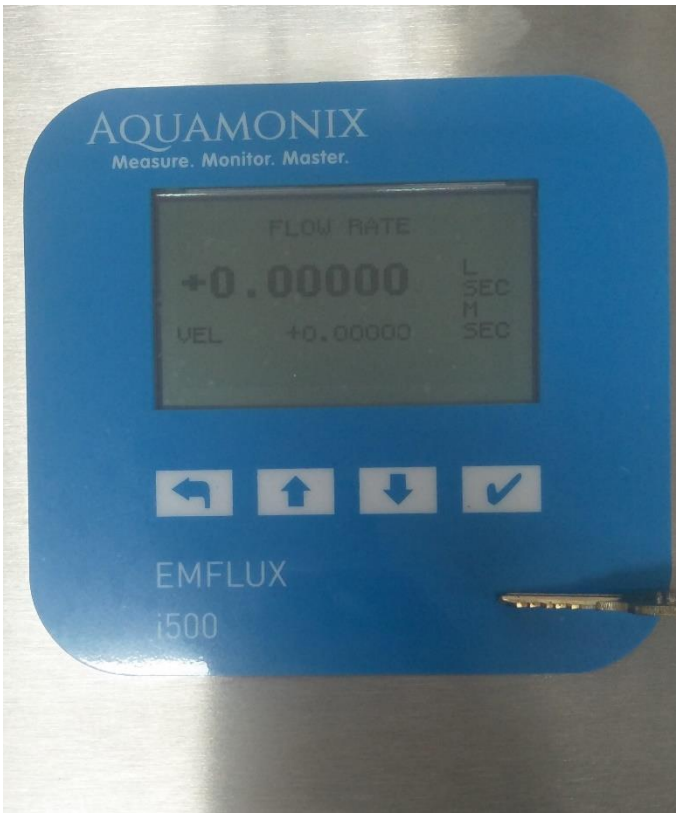
Water meters shall be verified in accordance with NITP 14 *National Instrument Test Procedures for Utility Meters*.

For accuracy class 2.5 meters:

- The maximum permissible errors for initial verification shall be ±2.5% from Q_1 to Q_4.
- The flow rates specified for initial verification in NMI M 10-2 may replace the flow rates specified in NITP 14.

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

FIGURE 14/3/32 – 1



Aquamonix Model I500 Flow Transmitter incl. Display

FIGURE 14/3/32 – 2

Aquamonix Flow Detector Model IR2060 DN150 Flow Sensor

FIGURE 14/3/32 – 3

Typical Mechanical Sealing Provision

FIGURE 14/3/32 – 4

PRINTED VALUES TABLE	
'A' NOMINAL DIAMETER	'C' FLOW Q3
50	10
80	25
100	40
150	88
200	157
250	245
300	353
350	481
375	552
400	628
450	795
500	982
570	1276
600	1414

PENTAIR

FLOWMETER BORE	'A' MM
MAXIMUM PRESSURE LOSS	ΔP=0
NUMERICAL VALUE OF MAXIMUM CONTINUOUS FLOW RATE Q_3	'C' L/S
FLOW RATE RATIO, Q_3 / Q_1	20
PATTERN APPROVAL NUMBER	PENDING
FLOWTUBE ORIENTATION	H/V
ACCURACY CLASS	2.5
UNIT OF MEASUREMENT (METRIC UNITS SHOWN)	L, ML, KL

Typical Markings

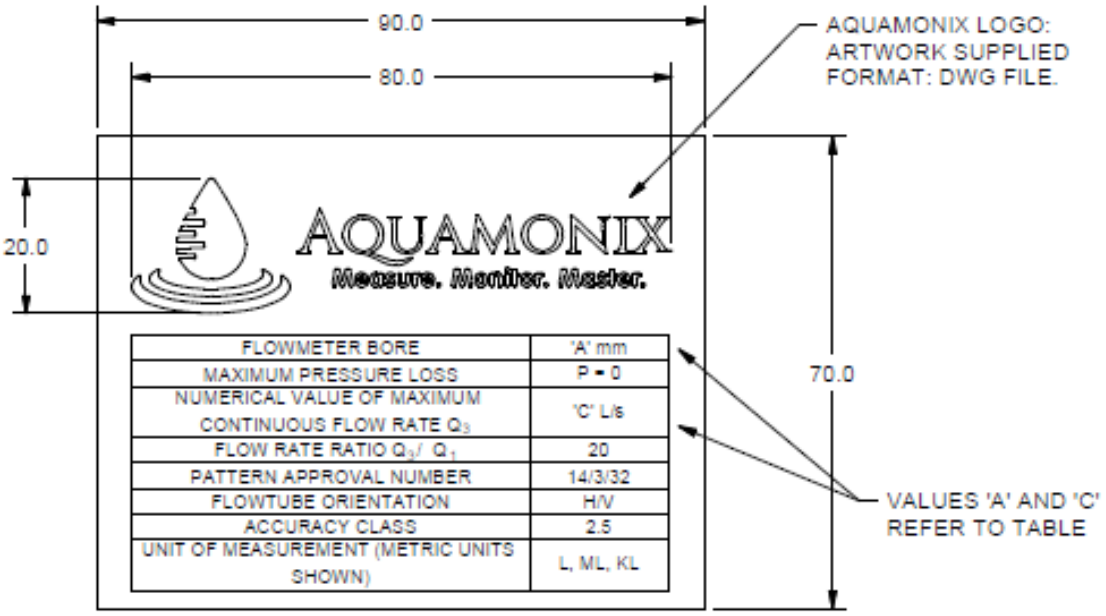
FIGURE 14/3/32 – 5

Model IR2030 DN600 Flow Sensor without Flanges (Variant 2)

FIGURE 14/3/32 – 6

Model IR2020 DN150 Flow Sensor with Flanges (Variant 2)

FIGURE 14/3/32 – 7



FLOWMETER BORE	'A' mm
MAXIMUM PRESSURE LOSS	P = 0
NUMERICAL VALUE OF MAXIMUM CONTINUOUS FLOW RATE Q_3	'C' L/s
FLOW RATE RATIO Q_3/ Q_1	20
PATTERN APPROVAL NUMBER	14/3/32
FLOWTUBE ORIENTATION	H/V
ACCURACY CLASS	2.5
UNIT OF MEASUREMENT (METRIC UNITS SHOWN)	L, ML, KL

PRINTED VALUES: TABLE

'A' NOMINAL DIAMETER	'C' FLOW Q3
50	10
80	25
100	40
150	88
200	157
250	245
300	353
350	481
375	552
400	628
450	795
470	795
485	982
500	982
570	1276
600	1414

APPLICATION NOTES:
- BONDED TO STAINLESS STEEL 304 SHEET (POLISHED)
- PLACED OUTSIDE ENCLOSURE IN SUNLIGHT AND WEATHER (MUST BE VISIBLE TO LANDHOLDER)
- FITMENT OCCURS INSIDE FACTORY CONDITIONS ONTO CLEANED SURFACES (ISOPROPANOL)

Alternative Markings (Variant 3)

FIGURE 14/3/32 – 8

The model IR2030C flow sensor (Variant 4)

FIGURE 14/3/32 – 9

The model GM1060 flow sensor (Variant 5)

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