



**Head Office:**  
 268 Milperra Road MILPERRA NSW 2214  
 ABN: 26 609 047 878  
 Ph: 1300 797 246  
 Web: [www.aquamonix.com.au](http://www.aquamonix.com.au)

Technical Bulletin Series  
**Magnetic Flow Meters**

**TBWFP – 047**

ISSUE: V1  
 DATE: April 2016  
 ECRO:  
 PAGES: 4

**Product Background**

The *Emflux* range of electromagnetic flow meters has been in operation across Australian water authorities for over 35 years. The design and operating principles of the meters has remained consistent with advancements in electronics and manufacturing improving accuracy, reliability and operational features.

All *Emflux* flow meters are manufactured in an ISO 9001-2016 accredited facility and “wet flow calibrated” (flow tested) in a NATA certified flow rig across the full range of typical flow conditions. This guarantees that every flow meter leaves the factory in a fully working condition, with a traceable calibration certificate.

The flow tubes (flow detector) can consist of ABS plastic body, steel construction or pit style specification, in either flanged or non-flanged configuration.

The flow transmitter units are specified as either solar powered (i500) for remote applications or mains powered (M500) for application in industrial or infrastructure applications. The mains powered unit is capable of providing higher velocity readings and increased accuracy for critical metering and control applications in both forward and reverse flow applications.

Depending upon the intended application, meters are calibrated to the following specifications:

Irrigation, pumping, resources, surface and groundwater metering – Accuracy better than  $\pm 0.5\%$

Food service, industrial process control, urban infrastructure metering – Accuracy better than  $\pm 0.2\%$

To achieve these specified accuracies, the meters must be operated in a full pipe situation at all times and are recommended to be fitted with a short run of straight pipe diameters (Dia) on the upstream (US) and downstream (DS) side of the meter as measured from the center of the meter body.

The manufacturer’s recommendation which has been consistent for over 25 years is shown in Table 1.

Category	Model	Connection Type	US Dia	DS Dia
Closed Conduit	IR2060	Flanged	5	3
	IR2020	Spigot (Solvent welded)	5	3
	IR2020	Flanged	5	3
Pit Style	IR2030	Bulkhead mount	5	0*
Insertion Style	IR2030	Insertion mount	5	0*

\* Free outflow at the downstream end of the meter

*Table 1: Historical installation requirements for Emflux flowmeters*

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The performance of the meters during manufacture is closely controlled, and independently verified by master meters and volumetric testing. “In field” performance of the meters has been subject to extensive third party verification confirming the accuracy and long term operational performance of the meters is well within required standards. *In situ* flow calibration testing regimes and return-to-factory testing has been conducted by irrigation agencies over the past 15 years as part of the verification and auditing of major metering works.

The independent test results have confirmed:

- Flowmeters are continuing to deliver reliable and accurate flow metering across the full range of installation types, flow rates as well as across the full size range of 50mm to 1000mm.
- Typically, meters installed in the field are delivering accuracy errors of less than  $\pm 1.5\%$
- When returned to an independent flow rig for calibration review meter accuracy meters have been confirmed to be stable and repeatable, typically delivering long term accuracy better than  $\pm 1.0\%$ .

Considering the allowable error limits under Australian Non-Urban Metering Standard AS4747 are  $\pm 2.5\%$ , as certified on an approved flow rig at the time of manufacture, and  $\pm 5.0\%$  when installed in the field, the *Emflux* flow meters consistently deliver accuracies well inside the required standards.

***Aquamonix Emflux* meters are typically providing long term an in-field accuracy at least 2 to 5 times better than that required by the National Metering Standard.**

### Pattern Approval Testing Summary:

Over the past two years the *Emflux* flow meters have undertaken an extensive testing program as part of the Pattern Approval certification.

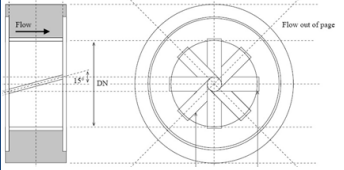
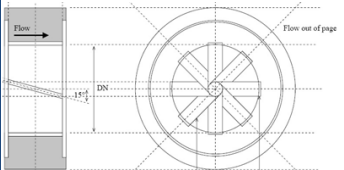
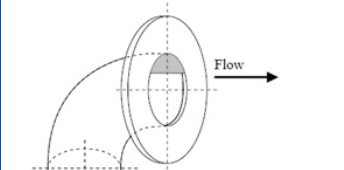
The *Emflux* range of meters are the only flowmeters which have been comprehensively tested against and successfully fulfilled all required physical, electrical and hydraulic flow testing conducted by the Australian testing agencies. Hydraulic testing was conducted by Manly Hydraulics Laboratory, whilst the electrical and physical testing was conducted by the South Australian Hydraulics Laboratories.

The Pattern Approval details are available for public download on [www.aquamonix.com.au](http://www.aquamonix.com.au).

Pattern Approval testing is not intended to be prescriptive in terms of installation of meters or to override manufacturers' recommendations with regard to the installation and operation of the flowmeters. The Pattern Approval process is designed to independently verify that the meters meet the requirements of the standard.

Where the approved testing facilities were not equipped to test a specific meter arrangement (eg: size, shape, disturbance or pipework arrangement) it does not infer that the meter fails to meet the requirement – only that the specific meter arrangement could not be tested by the authority at this time. In these situations, previous independent testing results, field audits, operational experience and engineering judgement along with the manufacturer's official published recommendations should be used for guidance on installation and operational requirements.

Hydraulic testing involved specific “types” of flow disturbances that can have an effect on flowmeters accuracy and as such may require increased upstream/downstream equivalent diameters to maintain the required accuracy. A description of the disturbance testing as conducted for the Emflux range of flow tubes is shown in Table 2.

Type	Description	Example
<b>Type 1</b>	Disturbances are left handed (sinistrorsal), rotational velocity fields (swirl) usually found downstream of two 90° bends directly connected at right angles. They can also be caused by other piping elements such as pumps, bends, tees, convergent and divergent sections.	
<b>Type 2</b>	Disturbances are right handed (dextrorsal), rotational velocity fields (swirl) usually found downstream of two 90° bends directly connected at right angles. They can also be caused by other piping elements such as pumps, bends, tees, convergent and divergent sections.	
<b>Type 3</b>	Disturbances are caused by valves or other throttling devices and are generally defined as asymmetric velocity profiles. They are usually found downstream of a protruding pipe joint, single bend or a gate valve not fully open.	
<b>All other Typical Installations</b>	All situations excepting those above as would normally be encountered in the design and installation of flow meters into pumped or gravity metering applications.	

*Table 2: Summary table of NMI Disturbance Types as tested by MHL*



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**Revised Manufacturer’s Recommendations Incorporating Pattern Approval Results:**

Category	Model	Connection Type	Meter Size (ID)	US Dia	DS Dia
<b>Typical Installations (Other than Type 1, 2, 3)</b>					
<b>Closed Conduit</b>	IR2060 or IR2020	Flanged or Spigot End	50mm-100mm	0	0
<b>Closed Conduit</b>	IR2060 or IR2020	Flanged or Spigot End	150mm-1000mm	5	3
<b>Pit Style</b>	IR2030	Bulkhead mount	All sizes to 1000mm	5	0 <sup>1</sup>
<b>Insertion Style</b>	IR2030	Insertion mount	All sizes to 1000mm	5	0 <sup>1</sup>
<b>Disturbance Type 1, 2 and 3 Installations (refer to Table 2)</b>					
<b>Closed Conduit</b>	IR2060 or IR2020	Flanged or Spigot End	50mm-100mm	0	0
<b>Closed Conduit</b>	IR2060 or IR2020	Flanged or Spigot End	150mm-1000mm	10 <sup>2</sup>	5 <sup>2</sup>
<b>Pit Style</b>	IR2030	Bulkhead mount	All sizes to 1000mm	5	0 <sup>1</sup>
<b>Insertion Style</b>	IR2030	Insertion mount	All sizes to 1000mm	5	0 <sup>1</sup>

Notes:

<sup>1</sup> Free outflow at the downstream end of the meter

<sup>2</sup> Testing limited to 10US & 5DS – Supplementary Testing is proposed to confirm 5 US & 3 DS.

*Table 3: Recommended installation recommendations for typical installations incorporating Pattern Testing results.*