



Assets Planning and Delivery Group
Engineering

Strategic Product Specification

SPS 320

Magnetic Flowmeters

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REVISION 1

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FOREWORD

Each Strategic Product Specification has been prepared to inform Water Corporation staff, consultants, contractors, and land developers of the requirements for selecting and acquiring a manufactured product to be used in strategic Corporation infrastructure. The definition of 'Product' includes items that comprise assembled components, equipment, or plant for mechanical, electrical, and civil infrastructure applications.

The objective of a Strategic Product Specification is to specify fit-for-purpose Product which will contribute to the provision of effective water services at least whole-of-life cost and with least risk to service standards and safety. A Strategic Product Specification also provides uniform standards for compatibility of new water infrastructure with existing water assets.

Many Strategic Product Specifications have drawn on the design, asset management and operational experience of Product performance in live service gained by the Corporation over time. Some Strategic Product Specifications have drawn on the experience of the water industry nationally by referencing Australian or WSAA standards.

Strategic Product Specifications are intended for reference and use in the following typical procurement scenarios:

- Capital funded infrastructure design and construction work;
- Private developer funded subdivision infrastructure for takeover by the Corporation;
- Operationally funded infrastructure design and construction work;
- Corporation period contracts for Product purchases;
- Product purchases for stock or for miscellaneous minor work.

A published Strategic Product Specification will, in some cases, comprise technical content that is typical of a range of products of the same type (type specification) but may exclude specific requirements that should apply to a particular project or application. In such cases, the project designer is required to document the supplementary project specific requirements in the 'Project Specific Requirements' Appendix of the Specification.

The text of a published Specification should not be directly modified. In the event that a text variation is considered necessary to accommodate the needs of a particular project or application, the text modification should be documented in the appropriate Clause of a 'Project Specific Requirements' Appendix.

Enquiries relating to the technical content of this Specification should be directed to the Senior Principal Engineer – Mechanical Advisory, Engineering and/or the Principal – OT Systems Assurance, Operational Technology. Future Specification changes, if any, will be issued to registered Specification users as and when published.

Head of Engineering

This document is prepared without the assumption of a duty of care by the Water Corporation. The document is not intended to be nor should it be relied on as a substitute for professional engineering design expertise or any other professional advice.

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Strategic Product Specification

SPS 320 Magnetic Flowmeters

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1 Scope and General

1.1 Scope

This Specification sets out requirements for the design, manufacture, testing, handling, and delivery of Magnetic Flowmeters of the 'in-line' type. Insertion (probe) type magnetic flow meters are not covered.

The Magnetic Flowmeter will be used by the Corporation for the purpose stated in the *Purchasing Schedule*, which may include for flow measurement in potable water, wastewater, seawater or chemical handling applications. Water Corporation water and wastewater conveyance standards require Magnetic Flowmeters to be installed above ground or partially buried. Fully buried Magnetic Flowmeters shall only be specified with approval of the relevant Senior Principal Engineer.

The Specification also details the means by which compliance with the Specification shall be demonstrated and the criteria for acceptance of Product.

The document has its origins in the Corporation's Mechanical and Electrical Services Branch. This *SPS 320* is the first Strategic Product Specification covering Magnetic Flowmeters, compiled by the Mechanical Advisory and Design sections of Engineering in collaboration with Operational Technology. For queries and feedback please contact the Senior Principal Engineer – Mechanical Advisory, Engineering

1.2 Referenced Documents

The following documents are referenced in this Specification:

Water Corporation "Strategic Product Appraisal Process Manual" (Internally controlled)

The latest editions of the following Australian and other Standards are referred to and form an integral part of this Specification:

AS/NZS 4251.1	Electromagnetic Compatibility - Generic Emission Standard
AS/NZS 4252.1	Electromagnetic Compatibility - Generic Immunity Standard
AS 4020	Products for use in Contact with Water Intended for Human Consumption with regard to their effect on the Quality of Water.
AS 4087	Metallic Flanges for Waterworks Purposes
AS 2317	Collared Eyebolts
AS 3776	Lifting Components for Grade T Chain Slings
ISO/DIN 13359	Measurement of Conductive Liquid Flow in Closed Conduits - Flanged Type Electromagnetic Flowmeters - Overall Length
AS 1939	Degrees of Protection Provided by Enclosures for Electrical Equipment (IP Code)
ANSI/ISA S51.1	Process Instrumentation Terminology
ISO 5168	Measurement of Fluid Flow - Estimation of Uncertainty of a Flowrate Measurement
EN1092.1	Flanges and their joints – Circular flanges for pipes, valves, fittings, and accessories, PN designated – Part 1: Steel Flanges
ISO12944	Paints and varnishes — Corrosion protection of steel structures by protective paint systems

1.3 Definitions and Notation

The following definitions are intended to clarify the terminology used in this Specification.

1.3.1 Australian Standards®

Standards that are developed, published, and maintained by Standards Australia

1.3.2 Certificate

A formal certificate issued by a Certification Body in accordance with the third-party product certification system described in HB 18.28, including associated Product licence schedules.

1.3.3 Certification Body

An independent (or third party) organisation duly accredited by the Joint Accreditation System of Australia and New Zealand (JAS-ANZ) to operate product Certification Schemes.

1.3.4 Certification Mark

A proprietary mark of product conformity issued in accordance with HB 18.23.

1.3.5 Certification Scheme

A third-party product certification system operated in accordance with HB 18.28.

NOTE: The effect of this is to require maintenance by the manufacturer of effective production control planning in addition to full type testing from independently sampled production and subsequent verification of conformity with specified standards.

1.3.6 Compliant Product

Product that has been assessed, by means of Product Appraisal, as conforming with standards and specifications that are specified by the Corporation.

1.3.7 Corporation

The Water Corporation of Western Australia.

1.3.8 Designation of Size

This Specification generally covers flow meter sizes from DN50 up to DN1400.

1.3.9 Flow Converter (Transmitter)

Also known as the Transmitter, the Flow Converter is either mounted directly on the Flowmeter or remotely (e.g. panel, housing or post mounted). It converts voltage data from the electrodes circuit to rate of and cumulative flow and may transmit the information in specified communications data protocols.

1.3.10 Flowmeter

The Flowmeter comprises: a stainless-steel flow measuring tube (flow tube), surrounded by magnetising coils and sensor electrodes housed in an outer carbon steel housing with the assembly welded between carbon steel flanges.

1.3.11 Hydrostatic Test Pressure

If required this is the pressure to which the flow meter is to be hydrostatically pressure tested during production.

1.3.12 Manufacturer

An entity or combination of entities that are responsible for selection, processing and control of Product constituent materials or compounds and for the processing equipment that collectively result in the manufactured product.

1.3.13 Allowable Operating Pressure (AOP)

The allowable operating pressure, at which the flow meter is designed to operate.

1.3.14 Nominal Size

An alphanumeric designation of size for components of a pipework system, which is used for reference purposes. It comprises the letters DN followed by a dimensionless whole number which is indirectly related to the physical size, in millimetres, of the bore or outside diameter of the end connections.

1.3.15 Notation

Statements governed by use of the word 'shall' are mandatory or 'normative' requirements of the Specification. Statements expressed by use of the words 'should' or 'may' are 'informative' but not mandatory and are provided for information and guidance. Notes in Specification text are informative. Notes that form part of Specification Tables are normative. An Appendix to the Specification that is designated 'normative' contains mandatory requirements. An Appendix that is designated 'informative' is provided for information and guidance only. The term 'specified' includes requirements of the Specification and requirements stated or referenced in other project documentation.

1.3.16 Officer

A duly authorised representative or appointed agent of the Corporation.

1.3.17 Pressure Class (PN)

The *Pressure Class* should be equal to or exceed the *Allowable Operating Pressure* at which the flow meter has been designed to continuously operate.

1.3.18 Product

A single unit or multiple units of manufactured end product or an assembly of manufactured component products, materials, or equipment. This Specification and accompanying Purchasing Schedule define the nature and details of Product to be supplied.

NOTE 1: An end product is most commonly an output of manufacturing processes that result in finished end products having the same features and characteristics and can be the result of a single or multiple production batches.

NOTE 2: Manufactured equipment and assemblies of Product components or materials are commonly procured for mechanical, electrical, and civil infrastructure applications.

1.3.19 Product Appraisal

A formal process whereby Product, including product design, is subjected to systematic engineering assessment to determine Product fitness for prescribed end uses and to evaluate conformity of its production systems with specified standards and requirements. Product Appraisal includes verification of the extent of compliance in accordance with the requirements of a relevant 'Technical Compliance Schedule'.

1.3.20 Product Assessor

An organization, Officer, or other person who, having demonstrated specialist product knowledge and competence acceptable to the Corporation, is appointed to evaluate Product, appraises the Product and issues one or more Product Verification Reports.

1.3.21 Product Certification

A formal process whereby the production and management systems for the manufacture of Product, are assessed by a Certification Body to evaluate compliance of these systems with specified product standards and tests, in accordance with Certification Scheme rules.

1.3.22 Product Verification Report

A formal report wherein a Product Assessor evaluates the extent of Product compliance with the specified product standards and specifications.

NOTE: Verification may be on a project-by-project basis or at agreed intervals, as appropriate to the scope of a Purchasing Schedule and Product end use, subject to determination by the Corporation.

1.3.23 Product Warranty

A formal express undertaking by a Supplier that indemnifies the Corporation against the consequences of supplied Product failure to comply with specified fitness for application and in-service life expectancy performance requirements.

1.3.24 Purchasing Schedule

A Corporation purchase order, tender, schedule of prices, bill of quantities, or specification that details the nature, quantity, and other characteristics of Product to be supplied, purchased, or installed.

1.3.25 Quality System

A management system that establishes, documents, implements, and maintains organizational structures, resources, responsibilities, processes, and procedures for the manufacture of Product and provision of Product related services in accordance with the requirements of AS/NZS ISO 9001.

1.3.26 Standards Australia

The peak non-government standards development body in Australia which develops Australian Standards®.

1.3.27 Strategic Product

An essential infrastructure component whose performance is critical to the elimination of risk to the safe and effective provision of water services, which are functions of the Corporation under the Water Corporation Act as licensed under the Water Services Coordination Act.

NOTE: Strategic product is a component of permanent Corporation infrastructure. Ancillary operational and safety equipment that does not form part of permanent infrastructure but offers exceptional enhancements in operational performance or personnel safety may also be deemed strategic.

1.3.28 Strategic Product Appraisal Process

The process described in the Strategic Product Appraisal Process Manual whereby manufactured products and equipment are evaluated and, where they comply with specified requirements, authorised for use in Corporation infrastructure.

1.3.29 Supplier

An entity or combination of entities that is responsible for the supply of Product.

NOTE: A Supplier may be a Manufacturer, owner, producer, distributor, vendor, agent, tenderer, or contractor for supply of Product or Product related service.

1.3.30 Testing

The determination of Product characteristics by inspection and by the application of specified test procedures.

2 Materials and Components

2.1 General

Magnetic Flowmeters shall include a Flowmeter, a Flow Converter and any interconnecting cable and cable termination / sealing required at the Flowmeter. Flow converters may be mounted integrally on the Flowmeter or mounted remotely.

2.2 Materials of Construction

Materials shall be selected according to the Flowmeter size, fluid, pressure rating and site conditions as specified in Table 11.1, and as required by Table 2.1.

Materials tabulated below are minimum requirements and equivalent or higher-grade materials may be considered for use.

Table 2.1 Flow Meter Material Requirements

Component	Material	Standard	Grade
Flowmeter (Flow measuring tube)	Stainless Steel	Relevant recognised standard	Grade with PREN ≥ 22
Flowmeter (Housing)	Carbon Steel	Relevant recognised standard	Manufacturer select
Flowmeter (Flanges)	Carbon Steel	Relevant recognised standard	Manufacturer select
Liner >PN16	Elastomer	AS 1646	Ebonite (Hard Rubber)
Liner \leq PN16	Elastomer	AS 1646	Ebonite or EPDM ⁽¹⁾
Liner - Chemical	Elastomer	Refer Clause 2.5	
Electrodes	Stainless Steel (316L) or Hastelloy C	Relevant recognised standard	Grade with PREN ≥ 22 ⁽²⁾
Earthing Studs/Rings	Stainless Steel (316L)	Relevant recognised standard	Grade with PREN ≥ 22 ⁽²⁾

Note: (1) For potable water or wastewater applications, Ebonite is preferred. However, for pressure classes PN16 or less, soft rubber liners such as EPDM are permitted for use. Liner materials should be selected for long term durability with the service fluid specified.

(2) Pitting Resistance Equivalent Number (PREN) for seawater uses shall be ≥ 40

2.3 Stainless Steel

Stainless steel castings, plate and bar subjected to welding during the manufacture of any component shall be a low carbon or stabilized grade. Stainless steel components except fasteners shall be passivated in accordance with ASTM A380. Stainless steel castings shall be heat treated in accordance with AS 2074.

2.4 Contamination of Drinking Water

Materials for construction of components and coatings in contact with drinking water shall be certified, by an authorized certification laboratory, as complying with the requirements for such materials, to one or more of the following standards or authorities:

- Australia - AS/NZS 4020
- UK – BS 6920:2000 and the Water Regulations Advisory Scheme (WRAS)

- USA - ANSI/NSF 61 – Drinking Water System Components
- France - ACS (Attestation de conformité sanitaire).

2.5 Flowmeters for Chemical Use

For chemical flow measuring applications, all wetted components (e.g., liner, seals) shall be selected for the highest consensus compatibility rating (variously: *Excellent*, *Recommended* or *A rated*) with the measured chemical solution, based on widely available chemical compatibility charts.

Wetted metallic components (e.g., electrodes, earthing rings) shall have a high degree of corrosion resistance in the chemical solution.

Example liner materials include Teflon (PTFE) or Perfluoroalkoxy Alkane (PFA). Service fluids that may be used in a chemical application shall include but not be limited to:

- 12.5% Sodium Hypochlorite
- 0.8% Sodium Hypochlorite Solution
- FSA (Fluorosilicic Acid)
- Saturated Sodium Fluoride Solution
- Sodium Hydroxide (up to 50%)
- Sulphuric Acid (up to 98%)
- Hydrochloric Acid
- Aluminium Sulphate Solution
- Ferric Chloride Solution
- Poly Aluminium Chloride (PACl) Solution
- Citric Acid Solutions
- Ammonium Hydroxide Solution
- Hydrogen Peroxide
- Polyelectrolyte Solutions
- Soda Ash (Sodium Carbonate) Solution
- Urea Solution
- Coagulants

3 Design

3.1 General

3.2 Flowmeter

The Flowmeter shall consist of a circular tube with an insulating liner, transducer coils and a minimum of two measuring electrodes. Flowmeters will normally be flanged at each end but may in smaller sizes have alternate end connections as discussed below.

3.2.1 Flanges

Except as noted below, Flowmeters shall be connected to pipework by virtue of integral flanges. Generally, the Corporation will use Flowmeters in applications with pressure classes of PN16, PN21, PN25, PN35 & PN40. Flanges are Specified in Table 11.1.

Flanges shall be drilled in accordance with AS 4087 as the first preference, however if the required pressure class is not available or is substantially impractical, flanges shall be provided to EN1092-1.

Flowmeters for chemical dosing applications (generally 25mm to 50mm in diameter) may be wafer type, suitable for clamping between pipe flanges.

Small Flowmeters for low pressure liquid analysis panel applications may have threaded or glued socket connections, where used with plastic piping materials.

3.2.2 Pressure Rating

The Allowable Operating Pressure of the Flowmeter shall not be less than that of the flanges and shall be as required in Table 11.1.

3.2.3 Earthing Studs

In order to prevent interference with flow sensing, it is usual to ensure that the Flowmeter is at the same electrical potential as the process fluid and some Flowmeters are provided with integral earthing studs. Regardless of any integral studs, Earthing Provision shall be as required in Section 3.4.

3.2.4 Electrodes

Electrodes shall be flush with the lining of the Flowmeter.

3.2.5 Installed Location and Ingress Protection (Flowmeter)

Flowmeters may be installed above ground, below ground located in a pit, or partially buried. Corporation Standard flowmeter installation drawings for below ground pipework are:

Water Conveyance	EG20-004-002-01
Wastewater Conveyance:	CA01-057-001-01
	CA01-057-002-01

Fully buried or immersed installation shall only be specified in exceptional circumstances and with approval by the relevant Senior Principal Engineer, following consideration of lifetime cost and risk.

Flowmeters (including any co-located components) shall have ingress protection and protective coatings suited to long term reliable service in the applicable installed location (Refer Section 4 Coating). Flowmeters may be installed:

- Above ground external - exposed to driving rain and solar radiation
- Above ground internal - potential for hose down, burst pipe spray, but solar protected
- Below ground in a pit – potentially immersed in groundwater (<3m depth)
- Below ground buried – subject to fine particle ingress and immersion in groundwater (<3m depth)

Flowmeters shall be suited to the Installed Location as required in Table 11.1, in accordance with AS1939 "Degrees of Protection Provided by Enclosures for Electrical Equipment (IP Code)", and the following:

Indoor Protected - shall have an IP rating of IP65

Outdoor Above Ground - shall have an IP rating of IP 65

Below Ground - whether direct buried, partially buried or in a pit, shall be suitable for direct burial and permanent immersion (IP68) to a depth of 3m, with documentary evidence of an immersion 'type' test to ≥ 3 m for ≥ 12 hours. Below ground meters shall be supplied with pre-fitted cables.

3.2.6 Sizes Required

The Flowmeter shall be supplied with the nominal internal diameter required in Table 11.1.

3.2.7 Flow Rates

Flowmeters will be operated under different conditions. Linear flow velocity will never exceed 10 m/s and the Upper Range Values will usually fall within the range 0.6 to 5 m/s.

The range of flow values to be measured will not normally exceed 15:1. Flow may be in either direction.

Flowmeter systems shall be suitable for operation under the range of flows specified in Table 11.1. The supplier shall indicate Flowmeter accuracy within this range.

3.2.8 Straight Pipe Diameters and Flowmeter Accuracy

The required lengths of straight pipe upstream and downstream of the Flowmeter, to achieve the specified accuracy shall be as a maximum 5 and 3 times the nominal diameter, respectively. Where fewer than 5 and 3 straight pipe diameters are available, the number of available diameters shall be specified in Table 11.1 and details of the piping arrangement, including pumps, valves, bends and appurtenances, provided.

The supplier shall indicate any resulting reduction in Flowmeter accuracy resulting from reduced straight pipe diameters.

3.2.9 Lifting Rings

Flowmeters weighing more than 100 kg shall be supplied fitted with lifting rings or eye bolts, rated in accordance with AS 3776 "Lifting components for Grade T chain slings" or AS 2317 "Collared Eyebolts".

3.2.10 Overall Length

The overall length of the Flowmeter shall be in accordance with the requirements of ISO/DIN 13359, "Measurement of Conductive Liquid Flow in Closed Conduits - Flanged Electromagnetic Flowmeters - Overall Length", where applicable.

3.3 Flow Converter

Flow Converters shall be supplied with a fieldbus communications interface and analogue outputs. All Flow Converters shall have standard options for Modbus (RTU RS485) and Profibus (DP-V0) and Profibus PA. Other interfaces may be required such as Industrial Ethernet. The type of interface required shall be as listed in Table 11.1. Analogue, 4-20mA outputs shall incorporate the HART protocol.

The Flow Converter shall allow for the use of fieldbus interface and/or analogue outputs as required in the Table 11.1.

The fieldbus registers shall be independent from those used for the local user display and protected via password level access or similar.

The Flow Converter shall have an Ethernet port accessible via an RJ45 or similar connection.

The Flow Converter shall provide on-board self-verification which shall be enabled as standard.

Remote verification should be accessible via the communication module.

The Flow Converter shall perform the following functions:

- Energise the Flowmeter field.
- Receive field intensity and flow-generated signals from the Flowmeter.
- Calculate the following values and make them available via the analogue outputs and place the values, in engineering units, into registers accessible via the fieldbus:
 - Instantaneous flow rate. The direction of the flow shall be indicated by either using a signed number or other means.
 - Accumulated total net flow volume (totalised flow)
 - Accumulated total forward volume (totalised forward flow)
 - Accumulated total reverse volume (totalised reverse flow)
- Indicate by local display instantaneous flow rates, total flow, total forward, and total reverse flow in engineering units.

3.3.1 Interchange between Flowmeters

The Flow Converter shall be freely interchangeable between all sizes of Flowmeter as listed in the Schedule of Rates. The matching of a specific Flowmeter to a Flow Converter shall be by means of a calibration factor(s) for the specific Flowmeter. The factor(s) shall be stored in digital form in either the Flowmeter or the Flow Converter. In the event of damage to the components storing the factor(s), it shall be possible to replicate their values.

Neither the Flowmeter nor the Flow Converter shall contain analogue calibration components for matching a specific Flowmeter to a Flow Converter.

3.3.2 Field-Coil Energisation

The Flowmeter field coils shall be energised by a bi-polar pulsed direct current with a repetition frequency not greater than 10 Hz.

3.3.3 Instantaneous Flow Rate Output

The Flow Converter shall derive a value for the instantaneous flow rate. This value shall be scaled to nominated engineering units. The flow rate value shall function independent of flow direction. The flow direction shall be indicated.

3.3.4 Totalised Net Flow

The Flow Converter shall derive a value of accumulated total water flow accounting for flow direction. This value shall be scaled to nominated engineering units.

3.3.5 Totalised Flow Forward

The Flow Converter shall derive a value of accumulated total forward water flow. This value shall be scaled to nominated engineering units. The flow rate value shall only accumulate in the forward water flow direction.

3.3.6 Totalised Flow Reverse

The Flow Converter shall derive a value of accumulated total reverse water flow. This value shall be scaled to nominated engineering units. The flow rate value shall only accumulate in the reverse water flow direction.

3.3.7 Time Constant

The Flow Converter shall filter the flow rate signal. It shall be possible to adjust the filter time constant to any value between 1 and 30 seconds.

3.3.8 Low Flow Cut-Off

It shall be possible to suppress the total flow accumulation whenever the flow rate falls below a certain value. This value shall be continuously adjustable anywhere in the range 0 to 5% of full-scale flow rate.

3.3.9 Ingress Protection

Depending on the particular application, the Principal may mount the Flow Converter either integrally with, on or remote from the Flowmeter. Where the Flow Converter is mounted remote from the Flowmeter it may be mounted inside on a building wall, inside a cubicle or outside on a post/upstand.

Flow Converters shall have an Ingress Protection rating of IP65 or better in accordance with AS 1939 "Degrees of Protection Provided by Enclosures for Electrical Equipment (IP Code)", excepting panel mount units which shall have an IP54 rating.

Table 11.1 specifies the required location and IP rating for the Flow Converter.

3.3.10 Adjustments

It shall be possible to make adjustments to all the parameters necessary for full operation of the Flow Converter without recourse to specialised tools or instruments.

3.3.11 Displays

The Flow Converter shall display the following:

- (a) Instantaneous flow
- (b) Totalised flow (resettable)
- (c) Totalised forward flow (resettable)
- (d) Totalised reverse flow (resettable)

Values shall be displayed in engineering units, and the units shall be displayed in English.

All displays, except panel mount units, shall be suitable for operation in direct sunlight.

The user displayed values and engineering units shall be independently configurable to the fieldbus communication registers.

3.3.12 Units

The engineering unit selection of the fieldbus registers shall be lockable to prevent unwanted changes.

The engineering unit selection of the Flowmeter local display shall be independent of the internal registers used for data transmission and freely selectable.

Instantaneous flow units:

- Litres/second
- m³/second (or kL/second)
- m³/hour (or kL/hour)
- ML/day

Accumulated total flow units:

- Litres
- m³ (or kL)
- ML

The following units shall be available to the respective fieldbus registers:

- Instantaneous flow - Litres/second

- Accumulated total flow - m³ (or kL)

3.3.13 Mounting

Depending on the particular installation the Flow Converter may be mounted: in an electrical switchboard; separately from the Flowmeter on a pipe bracket or wall; or integrally on the Flowmeter.

Where panel (switchboard) installation is specified in Table 11.1, the Flow Converter shall be suited to panel mounting with a frontal display and for cable termination at the rear of the panel.

3.3.14 Fieldbus Interface

The following fieldbus options shall be available as a minimum:

- Modbus RTU RS485
- Profibus DP-V0
- Profibus PA

All equipment functions shall be fully configurable and operable via the fieldbus interface.

It is not expected that more than one option would be required on a single flow meter, but all options should be available, project specific requirements are specified in Table 11.1.

3.3.15 Analogue Interface

Where an analogue interface is specified in Table 11.1, the following outputs shall be provided. The 4-20mA signal shall also provide a HART interface.

- Instantaneous Flow Rate Output
- This signal shall be scaled to a range of 4 to 20 mA, powered by the converter and capable of driving a DC load of up to 600 Ω with unimpaired performance. The flow rate signal shall function independently of flow direction, and it shall be possible to adjust the span to any value in the range 0.5 to 10 m/s.
- Totalised Flow
- Separate outputs for forward and reverse flow are preferred. This indication shall consist of a pulse train capable of driving both electronic and electromechanical external counters. The requirements of the electromechanical counter are 24 V DC pulses, not less than 20ms long and of not less than 150 mA. An external DC power supply will be provided by the Principal to energise this function.
- Flow Direction
- For Flow Converters that do not have separate outputs for forward and reverse flow, a voltage free contact or transistor switch, rated at 24 V DC, shall operate to indicate reverse flow.

3.4 Earthing Provision

The Flowmeter shall be provided with Earthing to ensure electrical potential equalisation with the fluid. Earthing Rings shall be provided in all applications (regardless of any integral earthing stud provision), except where External Earthing Electrodes are specified in Table 11.1.

Generally External Earthing Electrodes will only be required where all of the following apply:

- The Flowmeter size is \geq DN900
- The Flowmeter Pressure Rating is \geq PN21
- The Flowmeter is located in a pit with access for cleaning of External Earthing Electrodes.

Note: Earthing rings have historically been preferred on Water Corporation applications as integral earthing studs have been reported to develop scale deposits and lose conductivity over time where water characteristics are scale forming. However in larger sizes and at higher pressures Earthing Rings can result in complicated isolated flange

joints to prevent interference from cathodic protection (refer Section 3.7). External Earthing Electrodes have also been developed which can be removed from the pipeline for cleaning

3.4.1 Earthing Rings

Where Earthing Rings are required, typical isolated joints are shown in Figure 1 below (details taken from standard drawing JZ39-91-10).

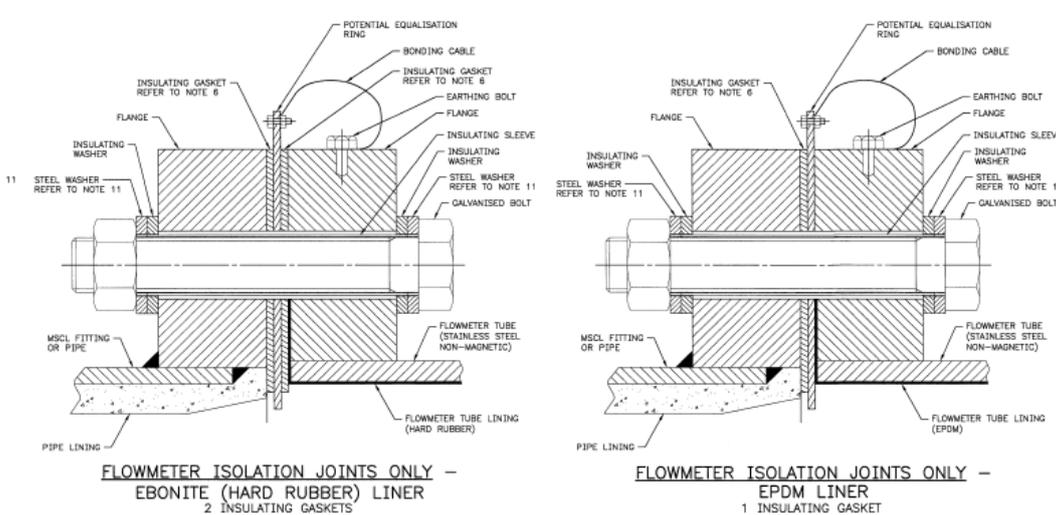


Figure 1 Isolated Joint Details

The design of the Flowmeter flange, liner and earthing ring shall be suitable for the arrangement shown in Figure 1 Isolated Joint Details. Earthing Rings shall be: made from materials as required in Table 2.1; sufficiently robust, thick and stiff to prevent buckling and deformation in the assembled connection; with a surface finish (typically a 6.3µm to 3.2µm gramophone) to achieve an effective seal in the required flanged assembly and at the required pressure rating.

3.4.2 External Earthing Electrodes

Where External Earthing Electrodes are required in Table 11.1, they do not form part of the Flowmeter supply scope, but the Flowmeter shall be suitable for use with such an arrangement. External Earthing Electrodes will be installed on the pipe immediately upstream and downstream of the Flowmeter and electrically bonded to the Flowmeter body as shown in Figure 2 **Error! Reference source not found.**

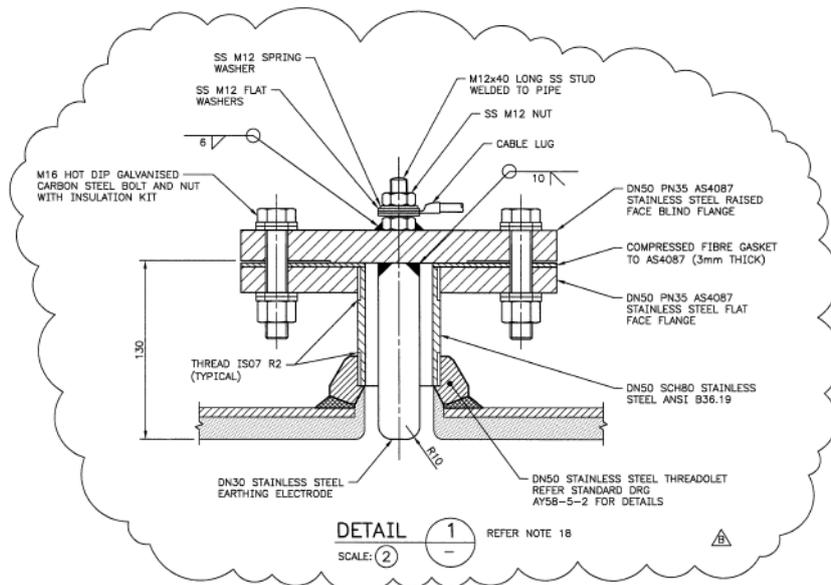


Figure 2 External Earthing Electrode

(reference IY83-11-3). This arrangement has the advantage of eliminating the earthing ring which greatly simplifies the flanged joint for improved sealing. It also allows removal of the electrodes for descaling and cleaning.

3.5 Interconnecting Cable

Where remote mounting of the Flow Converter is required, this will be indicated, together with the cable length in Table 11.1. Remotely located Flowmeters shall operate with unimpaired performance at a separation of up to 50 m. Interconnecting cables between the Flow Converter and the Flowmeter shall be supplied to a length specified at the time of ordering, but not exceeding 50 m. Best industrial practice shall be used in the design and manufacture of such cables to ensure minimisation of the effects of external noise. Armoured signal cable shall be supplied where specified in Table 11.1.

Where required for the Installed location (refer Table 11.1) and associated IP rating, the Flowmeter shall be supplied with the cable connected and sealed to achieve the required rating. With this option, all cables shall be individually colour coded so that they are separately identifiable.

Note: The majority of meters and cables will be required equipped for Below Ground installation with IP68 rating.

3.5.1 Lightning / Surge Protection

Where required in Table 11.1, surge protection supplied and fitted at both ends of the Flowmeter to converter cabling, shall be available as a purchasing option.

Where surge suppressors are required to be fitted to instruments or instrument signal cables, they shall have the following characteristics:

- rated operating current not less than 125% of maximum signal current,
- rated surge current not less than 5 kA (8/20 μ s impulse).
- rated voltage for 5 μ A leakage not greater than 150% and not less than 110% of the maximum working voltage of the protected device, residual voltage for a 5 kA 8/20 μ s impulse not greater than 130% of suppressor working voltage.

3.6 Cathodic Protection

The Principal inhibits the corrosion of some steel pipelines by means of Cathodic Protection (CP). The presence of CP shall be indicated in Table 11.1. The Flowmeter shall not be adversely affected in accuracy, reliability, or serviceability by CP and the Contractor shall advise of any precautions required where flow meters are to be installed in pipelines that have CP.

3.7 Flanged Installation

Installation of Magnetic Flow Meters has in the past provided significant challenges for the Corporation in terms of achieving a seal at the flanged joints due to the low bolt torques typically required to avoid damaging the flow meter and complicated joint arrangement as per Figure 1. Such problems are typically more prevalent for flow meters in larger sizes and higher pressures.

To that end, the Supplier shall provide the following information with their offer:

- Minimum bolt specification
- Flange bolt torques (maximum and minimum based on providing a seal)
- Gasket material and required properties
- Maximum compressive stress for the offered liner material
- Earth ring thickness and surface finish

Note: (1) The Corporation typically use Gr 8.8 galvanised mild steel bolting to AS1252 or AS1110

(2) Different liner materials for potable water and other applications are acceptable. Liners shall be supplied in compliance with Section 2.2 and for service fluid as per Table 11.1.

3.8 Power Supply

The Power supply available for the Flowmeter is indicated in Table 11.1 and will typically be 240V AC or 24V DC.

4 Coating

4.1 Flowmeter External Coating

The external surfaces of the Flowmeter shall be protected against corrosion to the level appropriate to ISO 12944 or equivalent Corrosion Category as specified in Table 11.1.

C5 (or equivalent) shall be used for locations deemed to have the potential to cause high rates of corrosion such as direct buried or above ground sites with high salinity.

C4 shall be used for non-coastal above ground outdoor locations and coastal indoor locations.

C2 may be used for Flowmeters which are to be installed indoors in generally dry and non-coastal conditions.

5 Testing

5.1 General

The corporation will not normally witness the testing of Flowmeters with the exception of external coatings which may be inspected and tested post-delivery. The manufacturers standard test and verification process and documentation shall therefore be comprehensive and made clear with any offer to supply.

5.1.1 ITP Documentation

For Flowmeter sizes \geq DN700 and where specified in Table 11.1, the Manufacturer shall prepare an Inspection and Test quality Plan (ITP) identifying relevant inspections and tests to be performed and any hold points and reporting requirements applicable to manufacture of the Flowmeter. An example ITP and reports shall be provided with the bid and shall include: inspections, tests, relevant standards, parameters and pass/fail thresholds.

5.2 Performance Test Requirements

5.2.1 Production Tests

The Manufacturer shall nominate applicable production tests, to be completed on each Flowmeter supplied, which shall be summarized with the bid or described in detail in the ITP where applicable.

5.2.2 Coating Tests

Manufacturer to nominate applicable coating tests and shall be detailed in the ITP where applicable.

5.2.3 Hydrostatic Pressure Test

This test shall be mandatory for Flowmeters of pressure rating PN21 and above for sizes DN900 or larger, or where specified in Table 11.1, the Flowmeter shall be hydrostatically pressure tested in the factory.

The test shall be undertaken against blanking flanges, with bolting, bolt torques, gaskets and earthing rings (where applicable) identical to the flanged joint configuration as proposed for site installation. The applicable test pressure shall be equivalent to the pressure class nominated for the Flowmeter and shall be sustained for 30 minutes without any leakage or permanent distortion of the body, liner or flanges, with particular attention paid to the liner radius and return onto the flange face.

Where this test is required, the Flowmeter shall be supplied with a test certificate providing key details for the test, including assembly components, bolt torques, test pressure, test duration and shall certify the Product item has complied with the specified test requirements.

Note. Testing is required to confirm the configuration for leak free site installation. Due to the anticipated cost of this testing, it should only required as indicated, or where the window for flowmeter installation is short and constrained by operational risk considerations.

5.2.4 Calibration Test

Where required in Table 11.1, Flowmeters shall be supplied with a factory test calibration certificate showing the tested accuracy over the required flow range and the method of testing undertaken (i.e. electronic or volumetric). For the purposes of acceptance, each test certificate shall, as a minimum, bear the relevant Product item serial number and shall certify that the Product item has complied with the specified test requirements.

6 Marking and Packaging

6.1 Marking

6.1.1 Flowmeter Markings

Each Flowmeter shall be fitted with a stainless-steel identification plate that shall have the following information engraved on it:

- Manufacturer's name and full model number
- Serial number
- Type and serial number of associated Flow Converter and the EPROM identifier
- Total weight
- Internal diameter
- Liner material
- Maximum operating pressure (in kPa)
- Flange standard and pressure rating (PN)
- Operating temperature range
- Ingress Protection rating
- The Principal's Agreement and Order numbers

6.1.2 Flow Converter Markings

Each Flow Converter shall be fitted with a stainless-steel identification plate that shall have the following information engraved on it:

- Manufacturer's name and full model number
- Serial number
- Type and serial number of associated Flowmeter and the EPROM identifier, if applicable.
- Operating temperature range
- Ingress Protection rating
- The Principal's Agreement and Order numbers

Where this is not a factory standard option, a separate engraved plate may be supplied where agreed by the Principal.

6.2 Packaging

6.2.1 General

Product shall be packaged with appropriate protection, which shall prevent damage or defects as a result of handling, storage, or transportation. Flexible packaging material shall have a minimum expected life in outside storage conditions of 12 months from the date of delivery.

6.2.2 Marking of Packaging

Where requested in the purchasing schedule the Product shall be identified by marking on the outside of any protective packaging the same information as shown on the identification tag.

7 Manuals

7.1 Format and Language

Where required in Table 11.1, Flowmeters shall be supplied complete with appropriate Installation, Operation and Maintenance manuals, in clear diagrammatic and text format, in English. Manuals may be required in electronic format only, or electronic with a number of hardcopies specified.

7.2 Content

The manuals shall contain all the relevant information required to commission, operate, and maintain the Product in live service, including the following:

- a) Details of Product features
- b) Operational adjustments
- c) Installation and commissioning instructions
- d) Preventative maintenance requirements and intervals
- e) Testing procedures
- f) Trouble shooting guidelines
- g) Complete list of parts and associated exploded views or sectional diagrams and reference part numbers
- h) Calibration Certificate where required.

8 Spare Parts and Special Tools

8.1 Spare Parts

8.1.1 Interchangeability

All spare parts shall be interchangeable for a manufacturer's product of the same size and model.

8.1.2 Availability

Spare parts and servicing facilities for the product shall be available in Western Australia.

The product shall have full technical support based in Mainland Australia.

8.2 Special Tools

Any special tools required for service and maintenance of the product shall be supplied.

9 Transportation, Handling and Storage

9.1 General

Transportation, handling, and storage facilities shall be designed to prevent Product damage or defects and to maintain Product free of deleterious matter. Product shall not be dropped off elevated vehicle platforms or sites. Mechanical handling equipment shall be in accordance with AS 2550.1, AS 2550.3, AS 2550.5 and AS 2550.11 and shall be appropriate to the loads to be lifted. Manual handling shall be in accordance with the National Standard for Manual Handling and the National Code of Practice for Manual Handling, published by National Occupational Health and Safety Commission, Australia. Product restraint during transportation shall be in accordance with Load Restraint Guide—Guidelines for Safe Carriage of Loads on Road Vehicles, published jointly by the Federal Office of Road Safety and the National Road Transport Commission, Australia.

NOTE: Where wire ropes or chains are used for loading and unloading, they should not come into direct contact with Product. Lifting elements in direct contact with Product should be of a non-abrasive design e.g., elastomeric or fabric webbing straps. During transportation, Product restraints should be checked for tension at regular intervals of travel and should not be released until the transporting vehicle is resting in a secure stable disposition on level ground.

9.2 Preservation of Product in Storage

Product shall be stored in original Product packaging in accordance with the published requirements of the manufacturer, prior to installation. Sensitive component materials shall be protected from extended exposure to direct sunlight and high temperatures e.g., elastomeric components shall be stored in accordance with the general principles of AS 1646. Designated Product storage areas shall be of sufficient size to accommodate Product deliveries and shall be flat, reasonably level and free of combustible vegetation, sharp stones or projections that could cause Product damage or defects.

10 Quality Assurance

10.1 Certification

10.1.1 Certification of Product

Wherever this Specification requires compliance with nominated Product and test Standards, conformance shall be certified by means of a Certification Scheme, conducted by a Certification Body. Each Certificate shall expressly attest compliance of all Product items with the nominated Standards. Wherever specified, Certificates shall be submitted to the Officer nominated for this purpose. Product shall be marked in accordance with the requirements of the Certification Body.

NOTE: Compliance of Product including related accessories and services with nominated Standards and specified requirements may be verified by means of a Product Verification Report provided by a Product Assessor. The Product Verification Report should identify all relevant Certificates of Product compliance, duly issued in accordance with Certification Scheme rules.

10.1.2 Quality System

The processes for manufacture, testing, supply, transportation, handling, delivery, and storage of Product to be supplied in accordance with this Specification shall form part of a documented Quality System. The System shall be certified by a Certification Body as complying with the requirements of AS/NZS ISO 9001 and shall provide for identification and traceability, control of production and delivery to the specified destination, customer verification and control of documents and records.

10.1.3 Product Re-verification

Product compliance with the Specification shall be subject to re-verification by a Product Assessor when, during the agreed Product supply period, there occurs any:

- substantive change in Product design, material formulation or performance
- Product failure to perform in operational service to the nominated performance specification.

Re-verification shall require the issue of a new or supplementary Product Verification Report. Product components and test outcomes that are not significantly affected by the Product change or failure may be excluded from the scope of re-verification, provided that these outcomes have already been reported in a current valid Product Verification Report that is acceptable to the Corporation.

Wherever the requirements of the Specification apply to a Product supply period in excess of three years, continuing acceptance of Product shall be subject to re-verification. The purpose of re-verification shall be to confirm the continuing compliance of Product quality and production control processes with the requirements of the Specification.

10.2 Compliance and Acceptance

10.2.1 Means of Demonstrating Compliance

Compliance with this Specification shall be demonstrated by means of Product Appraisal and issue by a Product Assessor of a Product Verification Report that confirms compliance. Otherwise, Product shall be deemed non-compliant and ineligible for registration as Product authorised for use in Corporation infrastructure.

NOTE 1: Where a project includes design work including Product design, Product Appraisal may form part of the project design review process and the Product Assessor may be a member of the project design review team.

NOTE 2: A Product Verification Report should verify the extent of compliance with the Specification including all relevant 'Technical Compliance Schedule' Appendices and the currency of a Certificate where relevant to the Product.

10.2.2 Acceptance Criteria

For acceptance, Product shall be supplied as specified in the Purchasing Schedule.

Prior to the implementation of any arrangement to supply Product, the Supplier shall, in accordance with specified requirements:

- nominate applicable Product Warranty terms; and
- provide documentary verification in the form of a current valid Certificate or Product Verification Report as appropriate to the Product; and
- detail each element of Product that does not comply with the specified requirements together with the extent of non-compliance.

NOTE: Where the Specification includes Technical Compliance Schedules, the nature and extent of all non-compliances should be provided in accordance with the appropriate Schedules.

10.3 Non-compliant Product

10.3.1 General

Product whose design, workmanship or performance fails to conform to the specified requirements shall be clearly tagged and quarantined by the Supplier as non-compliant and shall be subject to rejection for return to and replacement by the Supplier.

Where the Specification includes a 'Technical Compliance Schedule', Product shall be deemed non-compliant except where a Supplier has demonstrated compliance in accordance with the requirements of the 'Technical Compliance Schedule' Appendices of the Specification.

10.3.2 Manufacturing Repairs (In-process)

Welding, the use of fillers and other repairs shall generally not be permissible on Product which is in the course of production. Repairs to custom-built Products such as axially split pumps and large valves may be considered only if determined by the Corporation to be minor casting repair work in non-strategic locations. Accordingly, details of any defect which the Manufacturer considers can be repaired; together with details of proposed repair procedures shall be submitted in writing for determination by the Corporation.

The Manufacturer shall make provision in its production Quality System and in the appropriate ITPs for sufficient hold points whenever casting defects are encountered. Production work on non-compliant components shall cease and repair work shall not commence until the following details have been confirmed by the Corporation in writing:

- (a) that repair of the non-compliant components in lieu of their replacement is acceptable; and
- (b) that proposed repair procedures are acceptable; and
- (c) that any proposal to vary the terms of the original Product Warranty as a consequence of the in-process repair is acceptable.

10.3.3 Product Warranty

The Supplier shall replace non-compliant Product with Product that conforms to the acceptance criteria or shall repair or rectify all faults, damage or losses caused by defective Product. Except as may otherwise be specified, the Product Warranty shall indemnify and keep indemnified the Corporation against all losses suffered by the Corporation as a result of non-compliant Product for a period no less than 24 months after Product delivery or 12 months after Product installation, whichever period elapses first.

10.3.4 Product Repair

All reasonable proposals for repair or remedy of defects will be considered, provided that each such proposal is accompanied by a methodology statement that accords with the performance objectives of this Specification, as determined by the Corporation. For acceptance, a proposal for repair or remedy of Product defects shall not void or otherwise diminish the provisions of the Product Warranty.

11 Appendix A: Project Specific Requirements (Normative)

11.1 General

Project specific information and requirements, not included elsewhere in this Strategic Product Specification, shall apply as specified in the following Sections.

11.2 Revisions to Specification Text

Notwithstanding the content of Sections 1 to 9 of this Specification, the following amendments to the Specification shall apply and shall prevail in the event of conflict with Section 1 to 9 content.

Additional or amended Clauses with the appropriate original clause numbers can be documented here in the same sequence as in the Specification, subject to the agreement of the Standards Custodian for the relevant discipline.

11.3 Technical Requirements

Table 11.1 details project specific technical requirements for the flowmeter to be procured:

TABLE 11.1: PROJECT TECHNICAL REQUIREMENTS

Clause	Item	Requirement /Value	Units
	Flowmeter or project Identifier / Description / Tag No		-
2.2- 2.5	Service Fluid (Potable Water/ Wastewater/ Seawater/ Chemical) (include details and concentration if Chemical)		-
3.2.1	Flanges - AS4087 / EN1092-1 / Wafer (mating flanges)		-
3.2.2	Pressure Rating (PN 16/21/25/40)		Bar
3.2.5	Installed Location and IP rating Flowmeter: (Indoor / outdoor / above / below ground/coastal/non-coastal)		-
3.2.6	Nominal Size		mm
3.2.7	Required Flow Measuring Range (Max/min)		l/s
3.2.8	Straight Pipe Diameters Available - U/S, D/S (where <5 or <3) (Piping arrangement details to be provided)		No.
3.3.9	Flow Converter Mounting (Integral or Remote - wall, panel or post)		-
3.3.9	Flow Converter Ingress Protection rating IP65 or IP54		-
3.3.14	Fieldbus Interface (Modbus RTU RS485, Profibus DP-V0 or Profibus PA)		-
3.3.15	Analog Interface Required?	Yes / No	
3.4	Earthing Provision Type – Rings or External Electrodes		-
3.5	Remote Mounting of Flow Converter – Cable Length		m
3.5	Armoured Cable Required?	Yes / No	
3.5.1	Remote Mounting of Flow Converter – Surge Protection	Yes / No	
3.6	Pipeline with Cathodic Protection	Yes / No	
3.8	Power Supply (24 VDC, 240 VAC, etc.)		V - A/C or DC
4.1	Flowmeter External Coating - Corrosion Category (C5, C4, C2)		-
5.1.1	Inspection and Test Plan Required?	Yes / No	

5.2.3	Hydrostatic Pressure Test Required?	Yes / No	
5.2.4	Calibration Test required	Yes / No	
7.1	Manuals Format and Number (Electronic/Electronic and Paper)		No.

12 Appendix B: Technical Compliance Schedules (Normative)

12.1 Compliance Schedules

Suppliers shall demonstrate Product compliance with the Specification by completing Technical Compliance Schedule 1 as shown in Table 12.1 on an item-by-item basis. For acceptance, the extent of scheduled technical item compliance shall be supported by verifiable documentary evidence. Each scheduled item nominates a Specification clause number with which the extent of Product compliance shall be demonstrated.

The Supplier shall denote compliance of an item by ticking the unshaded ‘Yes’ column appropriate to that item. Where Product does not comply with specified requirements, the Supplier shall tick the ‘No’ column and shall detail the reasons for non-conformance and any proposed alternatives in the ‘Comments’ column. The Supplier shall denote acceptance and understanding of a Specification clause by ticking the corresponding ‘Noted’ column wherever unshaded.

Failure to notify the Corporation of all non-compliant Product components, including the extent of non-compliance, may void an accepted offer to supply or may result in rectification of all non-compliant Product elements, at the Supplier’s cost.

TABLE 12.1: TECHNICAL COMPLIANCE SCHEDULE 1

Electromagnetic Flowmeters					
Section/Clause		Noted	Compliance		Comments
			Yes	No	
1. SCOPE AND GENERAL					
1.1	Scope				
1.2	Referenced Documents				
1.3	Definitions and Notations				
2. MATERIALS AND COMPONENTS					
2.1	General				
2.2	Materials of Construction				
2.3	Stainless Steel				
2.4	Contamination of Drinking Water				
2.5	Flowmeters for Chemical Use				
3. DESIGN					
3.1	General				
3.2	Flowmeter				
3.2.1	Flanges				
3.2.2	Pressure Rating				
3.2.3	Earthing Studs				
3.2.4	Electrodes				
3.2.5	Installed Location and Protection (Flowmeter)				
3.2.6	Sizes Required				
3.2.7	Flow Rates				
3.2.8	Straight Pipe Diameters and Flowmeter Accuracy				
3.2.9	Lifting Rings				
3.2.10	Overall Length				
3.3	Flow Converter				
3.3.1	Interchange between Flowmeter				
3.3.2	Field-Coil Energisation				
3.3.3	Instantaneous Flow Rate Output				
3.3.4	Totalised Net Flow				
3.3.5	Totalised Flow Forward				
3.3.6	Totalised Flow Reverse				
3.3.7	Time Constant				
3.3.8	Low Flow Cut-Off				
3.3.9	Ingress Protection				
3.3.10	Adjustments				
3.3.11	Displays				
3.3.12	Units				
3.3.13	Mounting				

3.3.14	Fieldbus Interface				
3.3.15	Analogue Interface				
3.4	Earthing Provision				
3.4.1	Earthing Rings				
3.4.2	External Earthing Electrodes				
3.5	Interconnecting Cable				
3.5.1	Lightning / Surge Protection				
3.6	Cathodic Protection				
3.7	Flanged Installation				
3.8	Power Supply				
4. COATING					
4.1	Flowmeter External Coating				
5. TESTING					
5.1	General				
5.1.1	ITP Documentation				
5.2	Performance Test Requirements				
5.2.1	Production Tests				
5.2.2	Coating Tests				
5.2.3	Hydrostatic Pressure Test				
5.2.4	Calibration Test				
6. MARKING AND PACKAGING					
6.1	Marking				
6.1.1	Flowmeter Markings				
6.1.2	Flow Converter Markings				
6.2	Packaging				
6.2.1	General				
6.2.2	Marking of Packaging				
7. MANUALS					
7.1	Format and Language				
7.2	Content				
8. SPARE PARTS & SPECIAL TOOLS					
8.1	Spare Parts				
8.1.1	Interchangeability				
8.1.2	Availability				
8.2	Special Tools				
9. TRANSPORTATION, HANDLING AND STORAGE					
9.1	General				
9.2	Preservation of Product in Storage				
10. QUALITY ASSURANCE					
10.1	Certification				
10.1.1	Certification of Product				
10.1.2	Quality System				
10.1.3	Product Re-verification				
10.2	Compliance and Acceptance				
10.2.1	Means of Demonstrating Compliance				
10.2.2	Acceptance Criteria				
10.3	Non-compliant Product				
10.3.1	General				
10.3.2	Manufacturing Repairs (In-process)				
10.3.3	Product Warranty				
10.3.4	Product Repair				

Name of Supplier:

.....

Signature:

Date:

.....

The Supplier shall provide the information required by Technical Compliance Schedule 2 as shown in Table 12.2.

TABLE 12.2: TECHNICAL COMPLIANCE SCHEDULE 2

Electromagnetic Flowmeters			
1. SUPPLIER'S REPRESENTATIVE			
1.1	Full Name		
1.2	Postal Address		
1.3	Email Address		
1.4	Phone Number		
1.5	Mobile Number		
2. QUALITY ASSURANCE			
2.1	Extent of third-party accreditation of Supplier		
2.2	Extent of third-party accreditation of Manufacturer		
2.3	Details of certificates and verification reports attached		(Yes/No)
3. TECHNICAL INFORMATION			
3.1	Performance information supplied		(Yes/No)
3.2	Inspection and testing plans supplied		(Yes/No)
3.3	Drawings supplied		(Yes/No)
3.4	Details of servicing facilities in Perth supplied		(Yes/No)
3.5	Additional pamphlets and drawings in conjunction with the technical literature supplied.		(Yes/No)
4. FLOWMETER DESIGN AND MANUFACTURE			
4.1	Manufacturer's name		
4.2	Place of manufacture		
4.3	Flowmeter model		
4.4	Size (DN)		
4.5	Pressure Rating (PN)		
4.7	Flange standard (E.g., AS 4087)		
4.8	Mass of Flowmeter (kg)		
4.9	IP rating of Flowmeter and Flow Converter		
4.10	Coating standard (E.g., ISO12944 Corrosion Category C4)		
4.11	Rated measurement range (m/s)		
4.12	Earthing rings (none if external electrodes specified)		(Rings/None)
4.13	Earthing ring thickness and finish (blank if N/A)		
4.14	Flow Converter interface – Fieldbus / Analog (HART) Simultaneous?		
4.15	Compatible with chemicals listed in Clause 2.5 (chemical Flowmeters only)		(Yes/No/Other (Specify)/Not Applicable)
4.16	Bolting torques for an effective seal (Nm)		
4.17	Liner maximum compressive stress (MPa)		
4.18	Power Supply (24 VDC, 240 VAC, etc.)		
5. FLOWMETER MATERIALS		MATERIAL	STANDARD
5.1	Flow tube		
5.2	Flanges		
5.3	Liner		
5.4	Electrodes		
5.5	Earthing Studs or Rings		
5.6	Flange Bolts Minimum Specification		
5.7	Gasket		
6. OTHER			
6.1	Tests performed (production, coating, hydrostatic pressure, etc.)		
6.2	Special tools (blank if N/A)		

Name of Supplier:

.....

Signature:

Date:

.....

13 Appendix C: Material Master Records (Informative)

The following Material Master Records (MMR) comprise Corporation catalogue numbers that are unique to the particular products described for the purposes of Corporation activities or work.

END OF DOCUMENT