



Australian Government
Department of Industry,
Innovation and Science

National Measurement Institute

Supplementary Certificate of Approval NMI S745

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.

ABB Spirit IT model Flow-X Controller for Liquid-measuring Systems

submitted by ABB B.V. (formerly Spirit IT b.v.)
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 The Netherlands

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 R 117 Measuring Systems for Liquids Other than Water, dated June 2011.

This approval becomes subject to review on 1/07/22, and then every 5 years thereafter.

DOCUMENT HISTORY

Rev	Reason/Details	Date
0	Pattern & variant 1 approved – certificate issued	16/06/17
1	Pattern amended (submittor name)	8/11/17

CONDITIONS OF APPROVAL

General

Instruments purporting to comply with this approval shall be marked with pattern approval number 'NMI S745' and only by persons authorised by the submitter.

It is the submitter'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.

Auxiliary devices used with this instrument shall comply with the requirements of General Supplementary Certificate No S1/0B.

Signed by a person authorised by the Chief Metrologist to exercise their powers under Regulation 60 of the *National Measurement Regulations 1999*.



Darryl Hines

TECHNICAL SCHEDULE No S745

1. Description of Pattern **approved on 16/06/17**

An ABB Spirit IT model Flow-X (*) loading controller (Figure 1) for liquid-measuring systems incorporating compatible (#) NMI-approved flowmeters.

1.1 Field of Operation

The field of operation of the measuring system is determined by the following characteristics:

- Environmental class 5°C to 55°C indoor use only
- Power supply 24 V DC
- Maximum input frequency 10 000 pulses/second/channel
- Accuracy class:
 - for products other than LPG Class 0.5
 - for LPG Class 1.0

For volume conversion for temperature facility:

- Liquid temperature range -50°C to 150°C
- The conversion is based on *ASTM-IP-API Petroleum Measurement*, metric editions, Table 54A for Crude Oils, or Table 54B for Generalised Petroleum Products, or Table 54C for pure biodiesel (to Australian government standard), or Table 54D for Lube Oils, or Table 54 for LPG.

1.2 Controller

The Flow-X control system comprises at least one Flow-X/M computer module (Figure 1) installed in a Flow-X enclosure.

Each Flow-X/M computer module can address a single flow meter system and includes its own LCD display.

The computer modules are installed in one of the following enclosures:

- Flow-X/P (Figure 2a) is a panel mounted enclosure for up to four Flow-X/M modules. The enclosure includes an additional 7" touchscreen LCD display.
- Flow-X/S (Figure 2b) is a DIN rail mountable enclosure for a single Flow-X/M module. The measured and calculated data is available on the LCD display of the Flow-X/M module/
- Flow-X/R (Figure 2c) is a rack mountable enclosure for up to eight Flow-X/M modules. The measured and calculated data is available on the LCD display of each Flow-X/M module.

The delivery operation is authorised by entering a personal identification number (PIN) for identifying the user, if configured. The data entry/selection is made via the touch screen user interface. The volume display resolution can be programmed for 1 L, 0.1 L, or 0.01 L increments. The maximum volume display is 999999 L when the resolution is set to 1 L.

The firmware version is ARM#, where # represents the number of loading arms from 1 to 6. The number of allowed arms is identified in the "Device Information" sub menu which is in the Main display screen.

Selecting “Device Information” will display the following:

Firmware Revision – Revision of the firmware

Firmware Identifier – Unique hexadecimal code

Maximum Available Arms – Number of load arm that were purchased

Firmware Lock – (Unlocked or Locked) when locked, disallows new firmware downloads

1.3 Measurement Transducer

The Flow-X controller is approved for use with Micro Motion model MVD measurement transducer as described in approval NMI 5/6B/92B, or any other compatible (#) NMI-approved measurement transducer(s).

(#) ‘Compatible’ is defined to mean that no additions/changes to the hardware/software specified in this approval are required for satisfactory operation of the complete system.

1.4 Non-Linearity Correction Facility

A multi-point correction facility is available, which allows up to 12 meter factors to be programmed as a function of flow rate within the approved range. The Flow-X controller applies interpolation processes to calculate the meter factor for the current flow rate based on the meter factor programmed for the next highest and the next lowest flow rate.

Meter factors entries must be within 2% of the value entered for the master meter factor, otherwise the self-checking facilities of the Flow-X will produce a critical error alarm.

1.5 Checking Facilities

- A display test can be initiated by the user and is found on display ‘System’, ‘Display’, selecting the “Test LCD Flash”, ‘Test LCD Black’ and ‘Test LCD white’ commands.
- Monitors the dual output signal from the measurement transducer.
- Outputs are provided to control solenoid-operated valves to control the delivery process and prevent measurements when errors are detected, e.g. when temperature measurements are outside the approved range.
- To display the delivered volume during power failure, an uninterruptible power supply (UPS) is required. The UPS design must include:
 - (a) the capacity to allow for display of data on all Flow-X controllers for a period of 30 minutes; and
 - (b) a monitoring system providing a low battery alarm to the Loading Control Room.

1.6 Operational Procedures

The Flow-X controller is able to automatically control the delivery of a flow metering system based on the entered pre-set volume and the pre-programmed flow profile.

The following is a typical operating sequence; however, each site may require a different operating procedure depending on the configuration parameters of the Flow-X.

- Connect grounding and overfill protection system, if configured
- Enter driver info, if configured
- Enter the pre-set quantity
- Select “Start loading”
- To stop the load prior to the end of the pre-set quantity, select “Stop loading”. Then select “Start loading” to continue the loading if required.
- Upon completion of the load, select “Finish loading / print ticket”. This concludes the load sequence and prints the ticket.

1.7 Flow Control Valve

Any compatible (#) solenoid-operated flow control valve, located downstream of the flowmeter, may be interfaced to the Flow-X controller for controlling the delivery process and to stop measurements in the event of errors detected by the checking facility.

- (#) ‘Compatible’ is defined to mean that no additions/changes to the hardware/software specified in this approval are required for satisfactory operation of the complete system.

1.8 Temperature Probe

For temperature measurement applications and for volume conversions utilising the “RTD” module option, a PT 100 4-wire 100 ohm RTD element or any other compatible (#) temperature transducer may be used. For measurements utilising the “Current Input” module option, any compatible (#) temperature transmitter may be used.

- (#) ‘Compatible’ is defined to mean that no additions/changes to the hardware/software specified in this approval are required for satisfactory operation of the complete system.

1.9 Volume Conversion for Temperature Facility

An electronic volume conversion for temperature facility can be enabled to convert the measured volume to volume at 15°C. The conversion is based on *ASTM-IP-API Petroleum Measurement* Table 54A for Crude Oils, or Table 54B for Generalised Petroleum Products, or Table 54C for pure biodiesel, or Table 54D for Lube Oils, or Table 54 for LPG, where the density is set for the product for which the instrument is verified.

1.10 Markings and Notices

A. Instruments are marked with the following data, together in one location:

Pattern approval number	NMI S745	
Manufacturer's identification mark or trade mark	
Model number	
Serial number of the instrument	
Year of manufacture	
Environmental class	5°C to 55°C	
Type of liquid for which the system is verified	(*)(#)
Maximum temperature of the liquid (T_{max})°C	(*)(#)
Minimum temperature of the liquid (T_{min})°C	(*)(#)

(*) Required when volume conversion for temperature is utilised.

(#) Marking may alternatively be displayed in software under menu option "Device Information"

B. For applications (other than LPG) when the delivered volume is enabled for temperature corrections to 15°C the display indicates GSV at 15°C. GSV indicates Gross Standard Volume.

Note: The minimum measured quantity specified for the meter shall be programmed into the Flow-X controller to prevent deliveries less than the specified minimum delivery for the flowmeter to which the controller is interfaced.

1.11 Sealing Provision

Provision is made for the calibration adjustments to be sealed by means of a tampering switch on each Flow-X/M computer module (Figure 3). Access to the switch is protected by a seal or a locking bar on the enclosure may also prevent access to the switch.

1.12 Verification Provision

Provision is made for the application of a verification mark.

TEST PROCEDURE No S745

Instruments shall be tested in accordance with any relevant tests specified in the National Instrument Test Procedures and in accordance with any tests included in the approval documentation for the system in which the pattern is fitted, and in accordance with any relevant tests.

The instrument shall not be adjusted to anything other than as close as practical to zero error, even when these values are within the maximum permissible errors.

Maximum Permissible Errors

The maximum permissible errors applicable are those applicable to the fuel dispensers to which the instrument approved herein is fitted, as stated in the approval documentation for the fuel dispensers or in Schedule 1 of the *National Trade Measurement Regulations 2009*.

For checking the linearity correction facility, refer to the operating manual.

Check that the minimum measured quantity specified for the flowmeter is programmed into the loading controller to prevent deliveries less than the specified minimum delivery for the flowmeter to which the controller is interfaced.

Tests

Recommended Procedure for Systems with Volume Conversion for Temperature Facility Enabled

1. Verify the accuracy of the flowmeter for the arm/line selected using the displayed metered volume at operating conditions (unconverted volume).
2. For each delivery, record the volume at 15°C, the set density and the average temperature displayed by the instrument. Verify that the density setting is within ± 1 kg/m³ for Class 0.5 applications, and that temperature measurement is within $\pm 0.5^\circ\text{C}$.
3. For the temperature and density displayed by the instrument, use the appropriate petroleum tables to determine the volume conversion factor and calculate the volume at 15°C. The maximum permissible error between the calculated volume at 15°C and the volume at 15°C displayed by the instrument is 0.05% for Class 0.5 applications.

Notes:

- (i) Refer to clause **1.6 Operational Procedures** to obtain the required readings of volume at 15°C.
- (ii) When verifying the accuracy of the flowmeter, it is recommended that this be done with a single k-factor and the linearity correction facility disabled. Once the linearity of the flowmeter has been established, the appropriate meter factors as a function of flow rate can be calculated and entered into the instrument. A final calibration check shall be carried out to check for correct implementation of the linearisation factors entered.

FIGURE S745 – 1



ABB Spirit IT Flow-X/M computer module

FIGURE S745 – 2



(a) Flow-X/P Enclosure



(b) Flow-X/S Enclosure



(c) Flow-X/R Enclosure

FIGURE S745 – 3



Typical Sealing

~ End of Document ~