



Australian Government
Department of Industry, Science,
Energy and Resources

National Measurement Institute

36 Bradfield Road, West Lindfield NSW 2070

Supplementary Certificate of Approval NMI S495

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.

M+F Model MFX_4 Control System for Use in Liquid-measuring Systems

submitted by M+F Technologies GmbH
Helbingtwiete 5
22047 Hamburg
Germany.

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 is subject to review at the decision of the Chief Metrologist in accordance with the conditions specified in the document NMI P 106.

DOCUMENT HISTORY

Rev	Reason/Details	Date
0	Pattern approved – certificate issued	22/03/07
1	Variants 1 & 2 approved – certificate issued	12/06/07
2	Pattern amended (submitted by, Field of Operation) – Variants 3 to 7 approved – certificate issued	03/12/20

CONDITIONS OF APPROVAL

General

Instruments purporting to comply with this approval shall be marked with pattern approval number 'NMI S495' and only by persons authorised by the submitter.

Instruments incorporating a component purporting to comply with this approval shall be marked 'NMI S495' in addition to the approval number of the instrument, 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
Manager
Policy and Regulatory Services

TECHNICAL SCHEDULE No S495

1. Description of Pattern approved on 2/12/16

An M+F model MFX_4 flowmetering control system (Figures 1 and 2) for use with compatible (#) approved liquid-measuring systems (fixed or mobile).

(#) '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.

1.1 Field of Operation

The field of operation is determined by the following characteristics:

- Input pulse rate Less than 2 kHz/channel
 - Input voltage ranges:

for the calculator/controller	20.4 V to 26.4 V DC
for indicator	20.4 V to 26.4 V DC
for pulse generator	10.0 V to 12.0 V DC
for the printer	204 V to 264 V AC or 24 V DC
 - Liquid temperature range -10°C to 50°C
 - Environment temperature range -25°C to 55°C
 - Non-linearity correction facility Frequency range 4 points
 - Density range for volume conversion to 15°C:

for generalised products and	
crude oils	0.610 to 1.076 kg/L
for LPG	0.500 to 0.600 kg/L
for special products (*)	0.600 to 0.960 kg/L
 - Accuracy class:

for products other than LPG	Class 0.5
for LPG	Class 1.0
- (*) Approved special products are:
- (i) various grades of pure biodiesel and biodiesel/distillate blends (to Australian government standard); and
 - (ii) various grades of ethanol and ethanol/petrol blends

1.2 Design/Features

The M+F model MFX_4 flowmetering control system consists of a number of terminal units each able to display the data from up to 8 controller units. The system may operate with a MFX-4 controller unit only and the MFX-4 Ex terminal units may be configured as an optional part of the system.

A typical system is shown in Figure 1.

(i) **An MFX_4 Ex terminal.** (May also be known as a model MFX_4.) This is the operator interface and includes the following features/functions:

- An alphanumeric keypad;
- A VGA graphical display; and
- Configurable menu facility.

An integral or external swipe card reader and/or RFID proximity card reader for pre-designated cards may be fitted.

The indicator may be configured to display a variety of information including volume at 15°C, metered volume, flow rate, density, batch pre-set and daily totals.

The maximum volume display is 999999 L when the resolution is set to 1 L.

- (ii) **An MFX_4 controller.** This performs the calculation functions of the pattern and is fitted with a liquid crystal display to automatically display a cycle of information including the software version number, the liquid temperature, the set density and volume at 15°C.

The instrument is approved for use with M+F version Legal Firmware 1.0.8 software, which is displayed as part of the automatic display cycle.

The density is fixed via the calibration mode. Density and temperature are displayed on both the controller and the terminal displays.

Communications host. Refer to manufacturer's documentation.

1.3 Linearity Correction Facility

When the linearity correction facility is enabled, up to four k-factors can be entered as a function of frequency (flow rate) in the range 0 to 2 kHz generated by the measurement transducer. The k-factor can be set with in the range of 0.001 to 50 000 pulses/litre and additional k-factors may be entered limited to $\pm 5\%$ variation from preceding or subsequent k-factors.

1.4 Volume Conversion for Temperature Facility

An electronic volume conversion for temperature facility is used to convert the measured volume to volume at 15°C. The conversion is based on the following *ASTM-IP- API Petroleum Measurement* tables, metric editions:

- Table 54 for LPG;
- Table 54B for Generalised Petroleum Products;
- Table 54A for Crude Oils; and
- Table 54C for Special Products. (refer to clause 1.1 Field of Operation)

1.5 Pulse Generator

The calculator/indicator is approved for use with a Brodie model BiRotor Plus B27X positive displacement flowmeter fitted with dual pick-off coils which produce an electrical output signal proportional to the volume throughput as described in the documentation of approval NMI 5/6B/217 or any other compatible (#) approved measurement transducer.

- (#) '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.

1.6 Temperature Transmitter

For temperature measurement applications, a flameproof Moore Industries model LH2MS [A] 4-wire RTD transmitter, or any other equivalent (*) temperature probe with similar characteristics, is used.

1.7 Printer

An Epson FX-890 model P361A printer (Figure 3) or any other equivalent (*) printer may be connected to the controller via an MFX-4EDI (Ethernet Data Interface) device (Figure 3) or a MFX-4 Terminal.

(*) 'Equivalent' is defined to mean other proprietary equipment of the same or better specifications requiring no changes to software for satisfactory operation of the complete system including all checking facilities.

1.8 Flow Control Valve

Any compatible (#) solenoid-operated or analogue 4 to 20 mA flow control valve, located downstream of the flowmeter, may be interfaced to the instrument 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 hardware/software are required for satisfactory operation of the complete system including all checking facilities.

1.9 Checking Facilities

The instrument incorporates the following checking facilities:

- A segment check is performed on the display whenever the batch quantities are reset and also whenever the system is printing.
- A check of the presence and of the correct signal output from the measurement transducer.
- Outputs are provided to the flow control valve to control the delivery process and to prevent measurements when errors are detected, e.g. when temperature or density is outside the approved range.
- When the system is configured for use with a printer, the calculator/indicator checks for the presence and correct operation of the printer.
- The indication is retained on power failure.

1.10 Sealing Provision

DIN Rail mount version: Access to the calibration parameters via the pin-hole switch located in the bottom right corner of the front panel of the controller is sealed by means of a destructible label (Figure 4). Additionally, at least two of the screws affixing each side cover of the controller have provision to be sealed with wire and lead (Figure 4).

Exd version: Access to the calibration parameters via the button switch located under a removable cover sealed with wire and lead. (Figure 8).

1.11 Descriptive Markings and Notices

Provision is made for the application of a verification mark.

- Instruments are marked with the following data, together in one location:
 - Pattern approval sign NMI S495
 - Manufacturer's name or mark M+F
 - Manufacturer's designation (model)
 - Serial number
 - Year of manufacture
 - Accuracy class
 - Environmental class C
 - Density Range (*) kg/m³ to kg/m³
 - Liquid temperature range (*) -10°C to 50°C
- (*) Required when volume conversion for temperature facility is activated.
- When the volume conversion facility is activated, the indicator reading face shall display 'Litres at 15°C' or 'Volume at 15°C'.
- The minimum measured quantity shall be marked or displayed on the face of the indicator in the form 'Minimum Delivery 1000 L'. Alternatively, the instrument can be programmed with a minimum pre-set value that is equal to or greater than the minimum measured quantity specified for the meter.

1.12 Sealing Provision

Provision is made for the application of a verification/certification mark.

2. Description of Variant 1 approved on 12/06/07

Model MFX_4 terminal (Figure 5) which has the same features/capabilities as the terminal of the pattern but in an IP20 housing.

3. Description of Variant 2 approved on 12/06/07

Model MFX_4 Ex controller (Figures 6 and 7) which has the same features/capabilities as the controller of the pattern but is in a flameproof housing.

This model controller has provision for sealing as shown in Figure 8.

4. Description of Variant 3 approved on 03/12/20

With the system able to accept mass input pulses and display mass (kg).

5. Description of Variant 4 approved on 03/12/20

The system is also able to convert from volume to mass for the following products: Asphalt, Bitumen and Bitumen cutback products.

For volume conversion for temperature facility:

- Liquid temperature range 0°C to 200°C

6. Description of Variant 5 **approved on 03/12/20**

Model MFX_4 Terminal Pro which has the same features/capabilities as the terminal of the pattern but with a larger graphical colour display (Figure 9).

7. Description of Variant 6 **approved on 03/12/20**

The instrument is approved for use with M+F version Legal Firmware 1.0.x or 1.1.x software, which is displayed as part of the automatic display cycle.

8. Description of Variant 7 **approved on 03/12/20**

An optional HMI terminal may be installed to facilitate Driver loading applications for Driver login sequence and load monitoring. The HMI shall be labelled “Not for Trade use” (Figure 10).

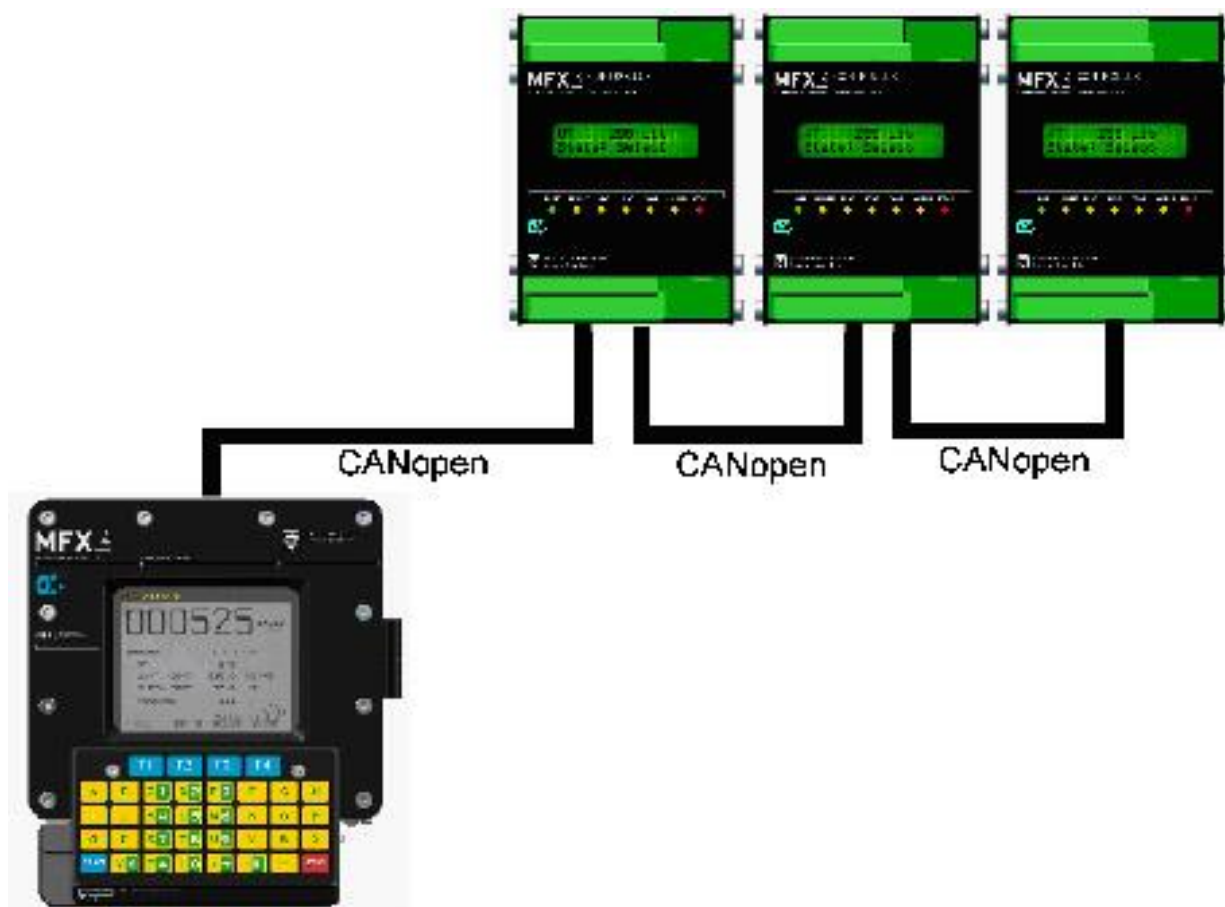
TEST PROCEDURE

Instruments shall be tested in accordance with any relevant tests specified in the national instrument test procedures.

Maximum Permissible Errors

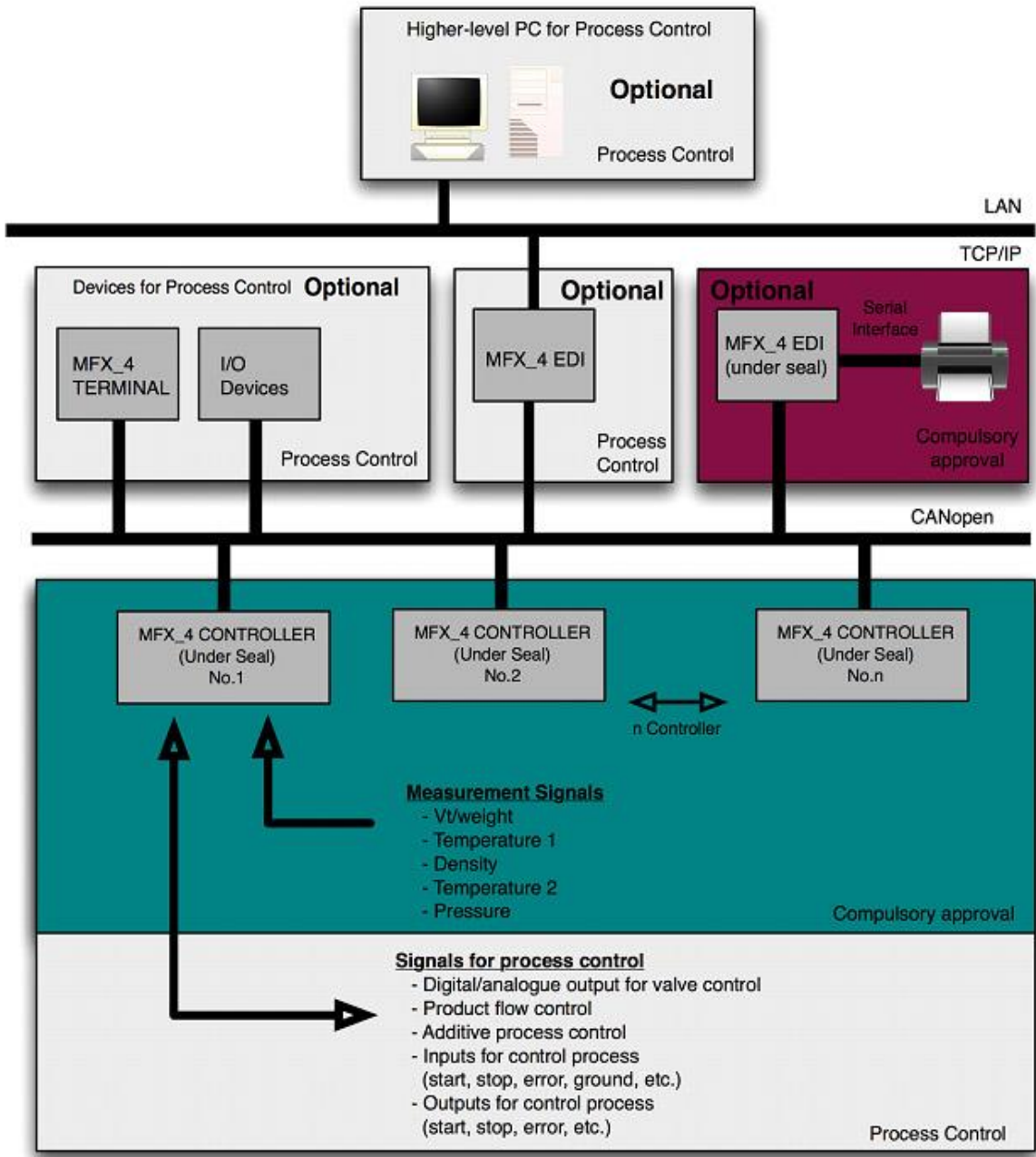
The maximum permissible errors are specified in Schedule 1 of the *National Trade Measurement Regulations 2009*.

FIGURE S495 – 1



Typical M+F Model MFX_4 Control System
(MFX_4 Ex (or MFX_4) Terminal and Three MFX_4 Controllers)

FIGURE S495 – 2



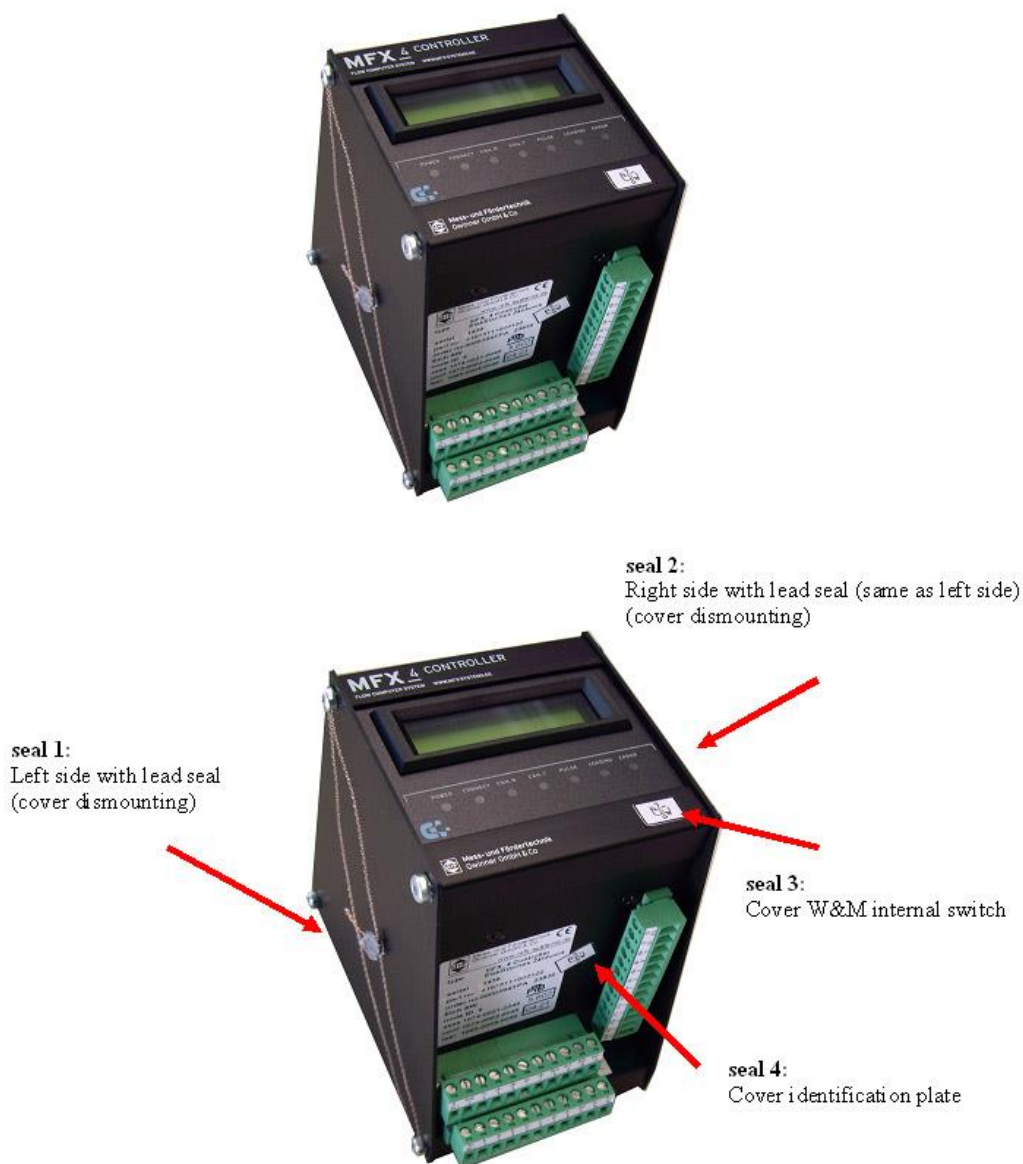
Typical MFX_4 Control System Overview

FIGURE S495 – 3



M+F Model MFX_4EDI Device and Epson Printer

FIGURE S495 – 4



Typical Sealing of Model MFX_4 Controller (Pattern)

FIGURE S495 – 5



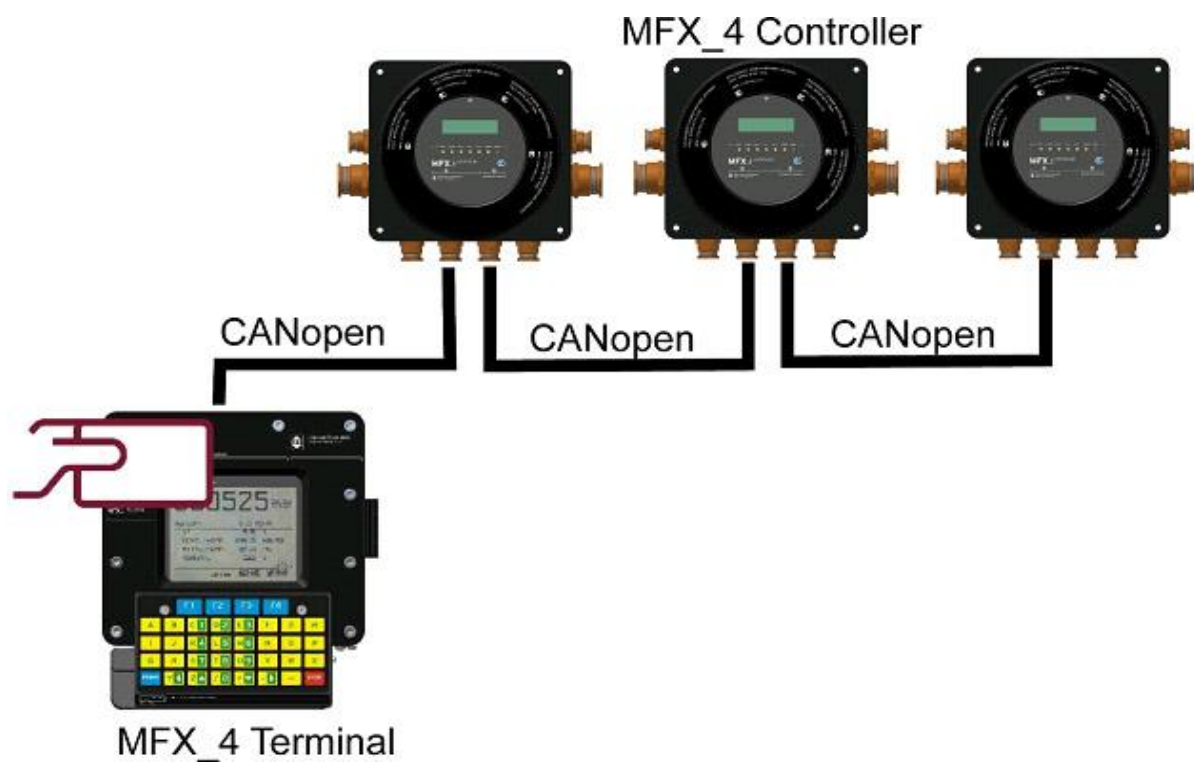
M+F Model MFX_4 Terminal in an IP20 Housing (Variant 1)

FIGURE S495 – 6



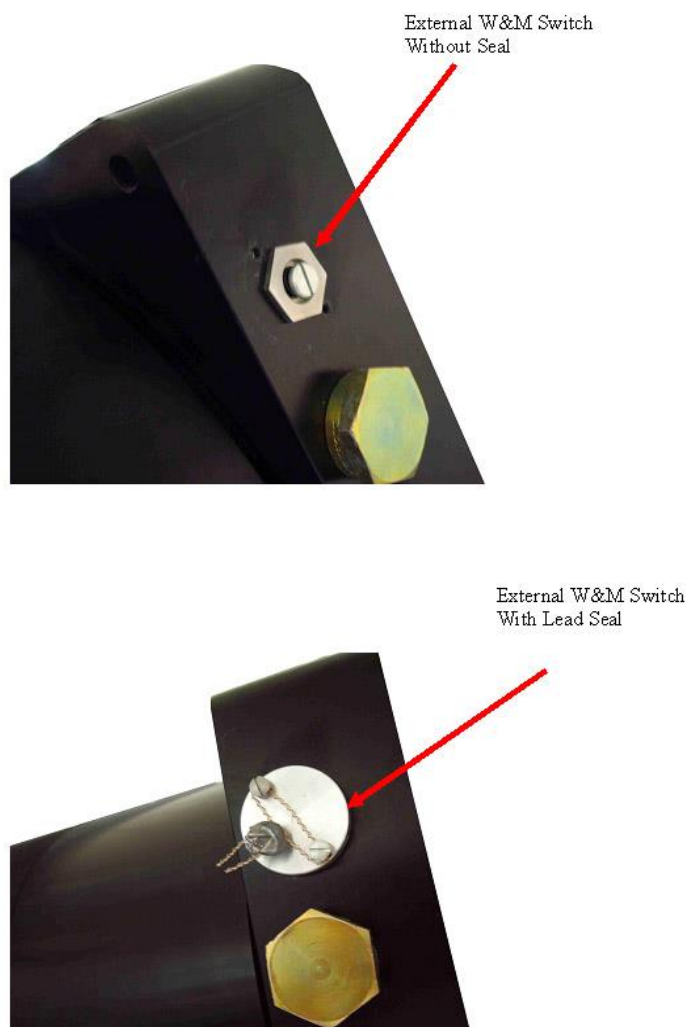
M+F Model MFX_4 Ex Controller (Variant 2)

FIGURE S495 – 7



Typical M+F Model MFX_4 Control System (Variant 2)
(MFX_4 Ex (or MFX_4) Terminal and Three MFX_4 Ex Controllers)

FIGURE S495 – 8



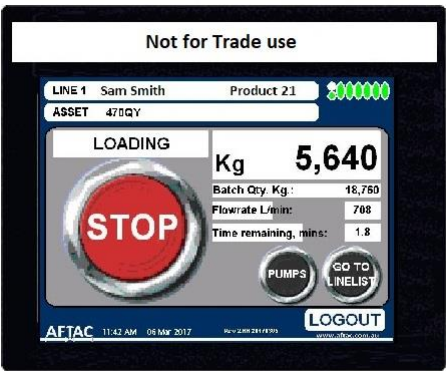
Typical Sealing of Model MFX_4 Ex Controller (Variant 2)

FIGURE S495 – 9



M+F Model MFX_4 Terminal Pro with large graphic color display

FIGURE S495 – 10



HMI Display for operator login and load monitoring

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