Australian Government
Department of Industry, Innovation and Science

National Measurement Institute

Certificate of Approval

No 5/6B/224

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.

KROHNE Model Optimass 7400C_F DN 80 Mass Bulk Flowmetering System

submitted by Krohne Australia
5 Phiney Place
Ingleburn NSW 2565

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 1/08/21, and then every 5 years thereafter.

DOCUMENT HISTORY

Rev	Reason/Details	Date
0	Pattern & variants 1 to 3 approved – certificate issued	20/07/16

CONDITIONS OF APPROVAL

General

Instruments purporting to comply with this approval shall be marked with pattern approval number ‘NMI 5/6B/224’ and only by persons authorised by the submittor.

It is the submittor’s responsibility to ensure that all instruments marked with this approval number are constructed as described in the documentation lodged with the National Measurement Institute (NMI) and with the relevant Certificate of Approval and Technical Schedule. Failure to comply with this Condition may attract penalties under Section 19B of the National Measurement Act and may result in cancellation or withdrawal of the approval, in accordance with document NMI P 106.

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*.

Mario Zamora

TECHNICAL SCHEDULE No 5/6B/224

1. Description of Pattern approved on 20/07/16

A KROHNE model Optimass 7400C_F DN 80 mass flowmetering system (Figure 1 and Table 1) for bulk metering of liquids other than LPG. The pattern uses using version ER 1.0.x software.

1.1 Field of Operation

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

• Minimum measured quantity, V_{min} or M_{min}	500 kg
• Maximum flow rate, Q_{max}	7200 kg/min
• Minimum flow rate, Q_{min}	720 kg/min
• Maximum pressure of the liquid, P_{max}	10 000 kPa
• Density range	480 to 2000 kg/m^3
• Ambient temperature range	-40 to 55°C
• Accuracy class	0.3
• Power supply range	20 to 55 V DC/16 to 62 V AC 85 to 264 V AC

1.2 The Flowmetering System (Figure 1)

(i) Supply Tank

To ensure air does not enter the pipework, the supply tank incorporates a device for detecting low liquid level.

(ii) Pump

A positive displacement, centrifugal or submersible turbine type pump may be used to provide flow through one or more flowmeters. The pump is fitted in a positive suction head (flooded suction) installation, i.e. below the liquid level in the supply tank (Figure 1).

For all combination of usage, the pump(s) shall be of sufficient capacity to ensure that each flowmeter can operate within its approved flow rate range.

(iii) Non-return Valve

A non-return valve may (or may not) be fitted at least between the pump and the flowmeter to prevent the reverse flow of the liquid and keep the flowmeter full of liquid at all times.

(iv) Gas Elimination Device

A gas elimination device need not be fitted as the flowmetering system is designed to keep the pipework full of liquid at all times, and on the occasion that small amounts of vapour may form in the pipework, the mass of this vapour will be insignificant compared to the mass of liquid.

(v) Measurement Transducer

The measurement transducer of the pattern comprises a KROHNE model Optimass MFS 7000C_F DN 80 flow sensor (Figure 2) interfaced to a KROHNE model MFC400 microprocessor-based transmitter (Figure 3a) designed to provide pulse output signal proportional to the mass throughput. The transmitter is connected to an AC or DC power supply. The transmitter may be fitted with a liquid crystal display however this display is not approved for trade use.

The Optimass flow sensor is available in either 'compact' or 'remote/field' versions (Figure 2) may be used for measuring volume and density. The minimum and maximum volumetric flow rate is derived from the mass flow rates divided by the density of the liquid. The V_{min} is equal to the M_{min} divided by the density. The volume and density outputs can only be applied for trade measurement purposes if at least one of the following two conditions is met:

1. A factory density calibration, prior to installation in the field, has been performed.
2. A standard density calibration followed by a density calibration in the field on the liquid to be measured, has been performed.

For verification purposes, provision is made for inserting a thermometer and connecting a pressure gauge to measure the temperature and pressure of the liquid at the flowmeter.

(vi) Calculator/Indicator

An Enraf Contrec model Trac-40 calculator/indicator (as described in the documentation of approval S367A) or any other compatible (#) NMI-approved calculator/indicator is interfaced to the MFC 400 flow transmitter and configured to provide a frequency/pulse output proportional to mass flow/volume throughput at observed temperature, or volume throughput referenced to 15ºC.

The calculator/indicator may display mass flow throughput, volume throughput at observed temperature, or the volume throughput at 15ºC. In the latter case the display facia is clearly marked "Volume at 15ºC" or similar wording. The volume conversion calculations may be performed in the calculator/indicator or in the MFC 400 flow transmitter

(#) 'Compatible' is defined to mean that no additions/changes to hardware/software are required for satisfactory operation of the complete system.

(vii) Transfer Device

A transfer device, which defines the start and stop of the quantity measured, is installed downstream of the mass flowmeter. The transfer device is in the form of a positive shut-off component such as a manually or automatically-operated shut-off valve.

The transfer device may also be designed to control the flow rate within the specified flow rate range of the flowmeter.

1.3 Verification Provision

Provision is made for the application of a verification mark.

1.4 Sealing Provision

Provision is made for sealing the cover of the transmitter which contains the calibration functions of the instrument (Figure 3b).

1.5 Markings and Notices

Each measuring system shall bear the following information, placed together either on the indicating device or on a data plate:

Manufacturer's identification mark or trade mark	…..
Meter model	…..
Serial number of the instrument	…..
Pattern approval mark	NMI 5/6B/224
Year of manufacture	…..
Maximum flow rate, Q_{max}	….. kg/min
Minimum flow rate, Q_{min}	….. kg/min
Maximum pressure of the liquid, P_{max}	….. kPa
Type of the liquid for which the system is verified	..... (#)
Environmental class	class C or I

(#) This may be located separately, e.g. on a metal tag sealed to the instrument.

The minimum measured quantity (V_{min} or M_{min}) is clearly visible on the indicating device, e.g. 'Minimum Delivery 1000 kg', or alternatively the controller/indicator is programmed for deliveries equal to or greater than the stated minimum delivery.

2. Description of Variant 1 approved on 20/07/16

The pattern and variants for use to dispense various petrol/ethanol blends and pure ethanol ('E100').

3. Description of Variant 2 approved on 20/07/16

The pattern and variants constructed for use to dispense various grades of pure biodiesel and biodiesel/distillate blends (to Australian government standard).

4. Description of Variant 3 approved on 20/07/16

A bulk flowmetering system using any model of the KROHNE Optimass 2400C_F, 6400C_F or 7400C_F series of flow sensors (Figure 4) listed in Table 1 below.

The flow sensors are available in either 'compact' or 'remote/field' versions.

TABLE 1

Sensor Series Model	Size (mm)	Mass Flow Rate Maximum (kg/min)	Mass Flow Rate Minimum (kg/min)	Minimum Quantity (*) (kg)
2400C_F DN 100	100	3600	180	200
2400C_F DN 150	150	8300	420	200
2400C_F DN 250	250	20 000	1000	500
2400C_F DN 400	400	42 000	1667	500
6400C_F DN 08	8	13	0.5	1
6400C_F DN 10	10	26	1	1
6400C_F DN 15	15	82	3.2	1
6400C_F DN 25	25	410	16	5
6400C_F DN 50	50	760	30	50
6400C_F DN 80	80	1690	65	100
6400C_F DN 100	100	3792	146	100
6400C_F DN 150	150	6933	267	200
6400C_F DN 200	200	11 917	460	200
6400C_F DN 250	250	21 667	835	500
7400C-F DN 15	15	190	19	1
7400C-F DN 25	25	580	58	5
7400C-F DN 40	40	1530	152	100
7400C-F DN 50	50	3000	300	100
7400C-F D 80 (#)	**80**	**7200**	**720**	**500**

Note: The pattern (#) is shown in **bold** text.

(*) For minimum measured quantities (V_{min} or M_{min}) less than 200 kg, the scale interval of the calculator/indicator is 0.1 kg; for deliveries greater than 200 kg the scale interval is 1 kg.

TEST PROCEDURE No 5/6B/224

Instruments shall be tested in accordance with any relevant tests specified in the National Instrument Test Procedures. Tests should be conducted in conjunction with any tests specified in the approval documentation for any controller/indicator and/or any conversion device, etc. used.

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 are specified in Schedule 1 of the *National Trade Measurement Regulations 2009*.

Tests

The mass flowmeter may be verified gravimetrically by comparing the indicated mass (conventional weight in air) against the weight of the contents delivered into a container on a certified weighing instrument.

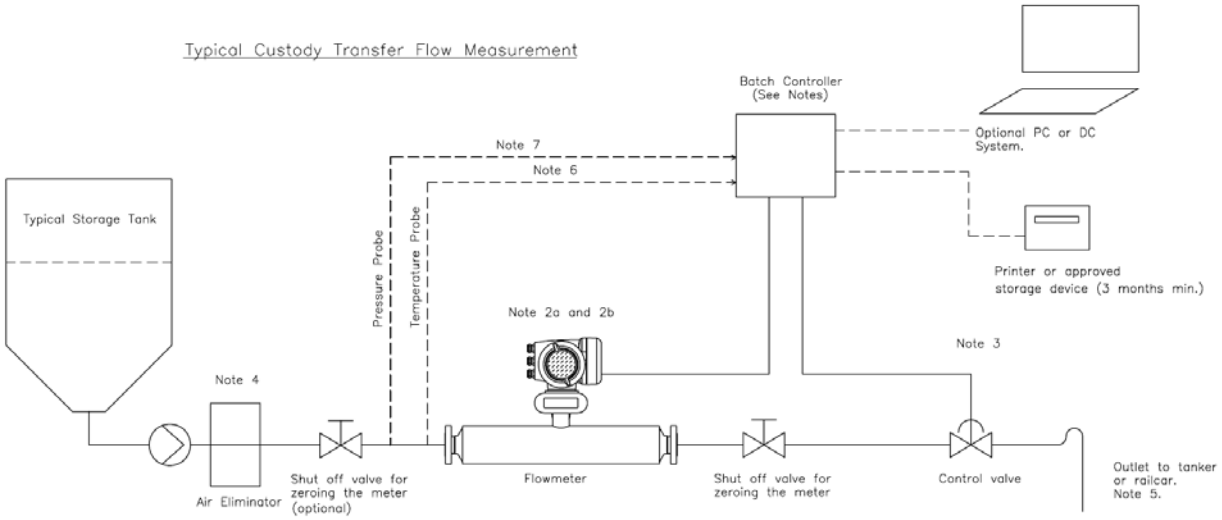
Alternatively, the mass flowmeter may verified volumetrically by manually converting the measured mass to volume, using the measured density of the liquid and the appropriate Tables to obtain the conversion factors for thermal expansion and compressibility of the measured volume of liquid.

Mass flowmetering systems indicating volume at operating conditions can be verified volumetrically by converting both the measured volume and the volume indicated by the flowmetering system to a volume at reference temperature (15ºC) and reference pressure (101.325 kPa absolute pressure).

Mass flowmetering systems indicating volume at 15ºC must be verified in two stages.

The first stage is to verify the accuracy of the volume measured by the flowmetering system with the controller/indicator displaying volume at operating temperature (refer to configuration of the controller/indicator) and the second stage is to check that the controller/indicator is correctly converting the metered volume to a volume at 15ºC.

FIGURE 5/6B/224 – 1



KROHNE Optimass 7400C_F Typical Mass Bulk Flowmetering System schematic

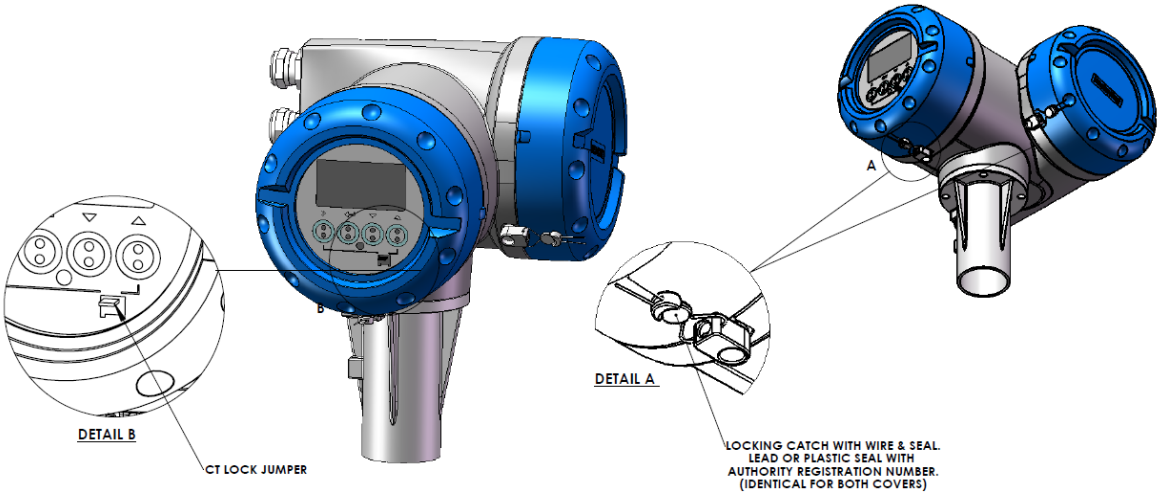
FIGURE 5/6B/224 – 2

(i) Compact Version (ii) Remote/Field version

KROHNE Optimass 7400C_F DN 80 Flow Sensor

FIGURE 5/6B/224 – 3

(a) KROHNE MFC 400 Transmitter



(b) Sealing of KROHNE Optimass 7400C_F Transmitter

FIGURE 5/6B/212 – 4

(i) Compact Version

(ii) Remote/Field Version

(a) KROHNE Optimass 2400C_F Series Flow Sensor

(i) Compact Version

(ii) Remote/Field Version

(b) KROHNE Optimass 6400C_F Series Flow Sensor

~ End of Document ~