Australian Government
Department of Industry, Innovation and Science

National Measurement Institute

Certificate of Approval

No 5/1/8

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.

Endress + Hauser Proservo Model NMS530 Liquid Level Measuring System

submitted by Endress + Hauser Australia Pty Ltd
Level 1, 16 Giffnock Avenue
Macquarie Park NSW 2113

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 85, Automatic level gauges for measuring the level of liquid in fixed storage tanks, dated July 2004.

This approval becomes subject to review on 1/09/21, and then every 5 years thereafter.

DOCUMENT HISTORY

Rev	Reason/Details	Date
0	Pattern approved – certificate issued	10/08/16

CONDITIONS OF APPROVAL

General

Instruments purporting to comply with this approval shall be marked with pattern approval number ‘NMI 5/1/8’ 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*.

Dr A Rawlinson

TECHNICAL SCHEDULE No 5/1/8

1. Description of Pattern approved on 10/08/16

The pattern is an Endress + Hauser Proservo model NMS530 wire drum displacer type Automatic Level Gauge static volume measuring system for measuring the liquid level in fixed tanks (Figure 1a). The system uses version 4.2X software.

1. Field of Operation

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

- Measuring height range: 0 to 40 m
- Ambient temperature range -25 to +55°C
- Liquid temperature range -200 to +230°C
- Liquid pressure range 0 to 2500 kPa
- Liquid density range 400 to 1076 kg/m^3
- Power supply range 24 to 48 V DC, or 48 to 240 V AC
- Accuracy class 2

Note: The system is required to be calibrated and used with petroleum products.

1.2 Measuring Principle

The level measuring system is based on displacement measurement. A small displacer is placed on the liquid medium using a servo motor; the displacer is suspended on a measuring wire which is wound on finely-grooved drum housing within the instrument.

Systems may be with or without a stilling well (Figures 1b & 1c).

The system includes an Endress+Hauser model NMS530 level transmitter (Figures 1 and 2). The system may also include either or both an Endress+Hauser model NRF560 level indicator (Figures 1 and 4) and/or an Endress+Hauser model NMT539 temperature transmitter (Figures 1 and 5).

1.3 Calculator/Indicator

The Endress+Hauser Tankvision series NXA82 or NXA83 calculator/indicator (Figures 3a and 3b) is equipped with a matrix LCD for displaying information such as density (#1), temperature, height, etc. Alternatively, any other compatible (#2) NMI-approved calculator/indicator may be used.

An Endress+Hauser model NRF560 LCD liquid level indicating device (Figure 4) or equivalent (#3) is required for displaying information such as height, temperature, density (#2), etc.

(#1) The display of density is not for trade use.

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

(#3) ‘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.

1.4 Volume Conversion for Temperature

An electronic volume conversion for temperature facility in the calculator/indicator may be used to convert the measured volume to volume at 15°C. The conversion is based on ASTM-IP-API Petroleum Measurement Tables 54A and 53A for Crude Oil, Tables 54B and 53B for Generalised Petroleum Products and Tables 54D and 53D for Lube Oils.

1.5 Temperature Probe

For temperature measurement applications, an Endress+Hauser model NMT539 transmitter (Figure 5) or any other 4 to 20 mA temperature transmitter may be used compatible with the temperature range specified in the field of operation.

1.6 Verification Provision

Provision is made for the application of a verification mark.

1.7 Sealing Provision

For the model NMS530 level gauge, sealing provision is made by a mask on the operation switch (Figure 6), sealing bolts and wires outside the gauge (Figures 7a, 7b, and 7c), and by a write-protection switch on CPU module (Figure 8).

1.8 Descriptive Markings and Notices

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

Pattern approval number	NMI No 5/1/8	
Manufacturer's identification mark or trade mark	…..	
Model number	…..	
Serial number	…..	
Year of manufacture	…..	
Liquid temperature range	… to …°C	(#1 & #2)
Liquid pressure range	… to … kPa	(#1 & #2)
Maximum height	….. m	(#2)
Minimum height	….. m	(#2)
Accuracy class	class 2	
Environmental class	class C	

In addition, for each tank/compartment, the type of liquid and the minimum measured quantity are indicated/marked, either together with the above markings or in a separate clearly visible location.

(#1) As specified by user for the application; otherwise as per clause **1.1 Field of Operation**.

(#2) Determined at verification.

TEST PROCEDURE No 5/1/8

Instruments shall be tested in accordance with any relevant tests specified in the National Instrument Test Procedures.

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

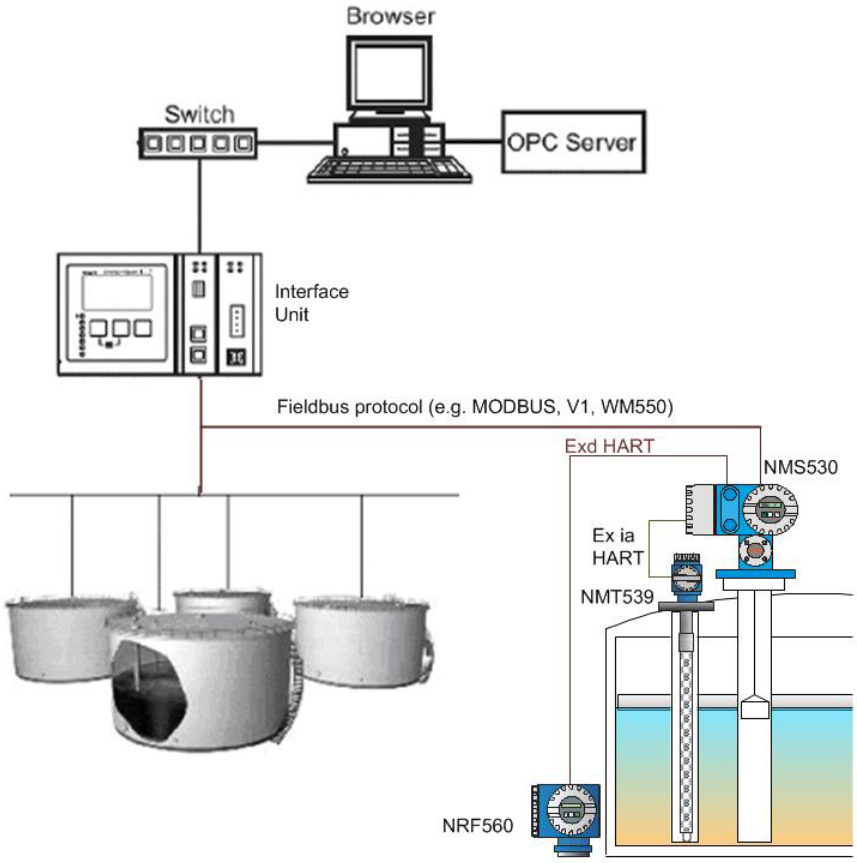
The maximum permissible errors are specified in Schedule 1 of the National Trade Measurement Regulations 2009.

Tests

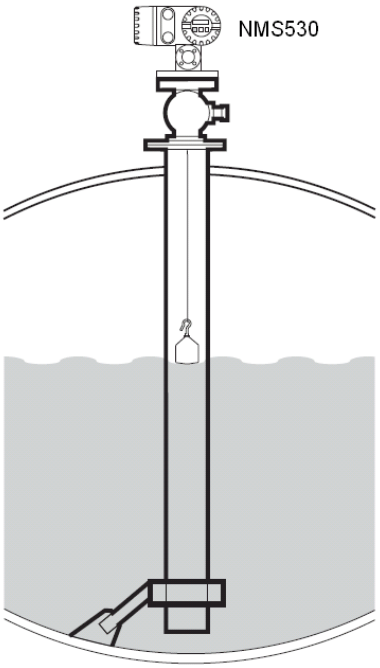
The maximum permissible error at verification/certification is ±0.04% of the liquid level measured or ±2 mm, whichever is greater, i.e. ±2 mm up to 5 m of the liquid level measured and ±0.04% over 5 m.

1. Verification should be carried out at static conditions following a period of normal operation at normal filling and discharge rates, using a verified dip tape as a reference standard.
2. A series of comparative readings should be taken over a number of level changes. Readings should be taken following filling as well as emptying operations in approximately equal number. Mixers and/or heaters should be switched off in sufficient time to prevent errors arising from turbulence or convection currents when the readings are taken.
3. Three dip-tape readings should be taken at each level, at closely timed intervals by the same person using the same tape. The dip-tape readings should not differ by more than 1 mm. Failure of either group to be within this limit indicates a procedural error or faulty equipment. The tests should be repeated after corrective action has been taken.
4. For each level, an average of three dip-tape readings and an average of the three indicated by the instrument should be calculated. The difference between these two averages is referred to as the test difference, and should be within the maximum permissible errors.
5. The difference between dip-tape and the instrument readings at all levels should be randomly distributed. A close check of the trend of readings should be made over the period of tests as any tendency for the test differences to increase is indicative of a faulty gauge or installation, which should be corrected before proceeding. It will be found helpful to use graphical or control chart techniques to detect trends.

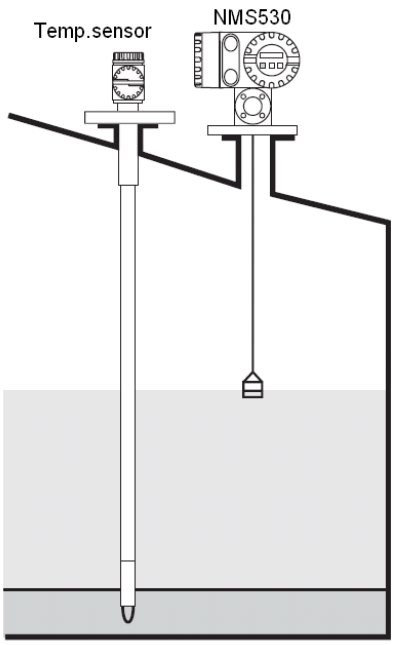
FIGURE 5/1/8 – 1



(a) Typical Model Proservo NMS530 System With Temperature Sensor and Indicator



(b) With Stilling Well



(c) Without Stilling Well

Endress + Hauser Proservo Model NMS530 Liquid Level Measuring System

FIGURE 5/1/8 – 2

Endress+Hauser Model NMS530 Level Transmitter

FIGURE 5/1/8 – 3

(a) Endress+Hauser Tankvision Series NXA82 Calculator/Indicator

(b) Endress+Hauser Tankvision Series NXA83 Calculator/Indicator

FIGURE 5/1/8 – 4

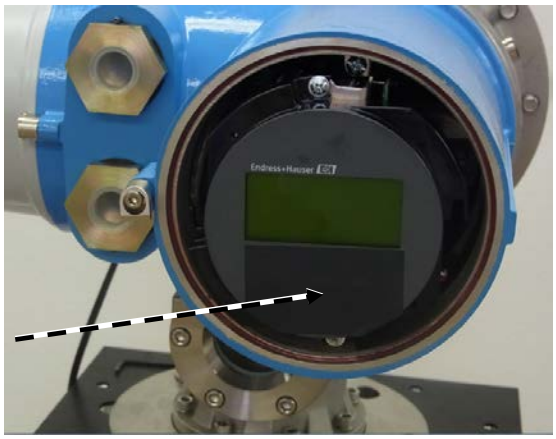
Endress+Hauser Model NRF560 LCD Liquid Level Indicating Device

FIGURE 5/1/8 – 5

Endress+Hauser Model NMT539 Temperature Probe

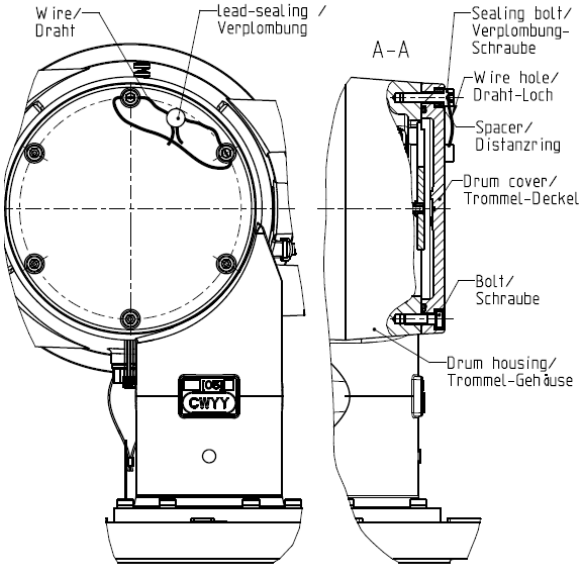
FIGURE 5/1/8 – 6

Mask on operating switch

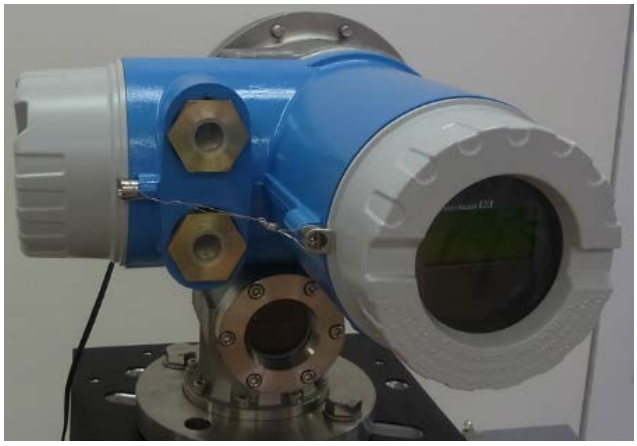


Typical Sealing on The Operation Switch

FIGURE 5/1/8 – 7



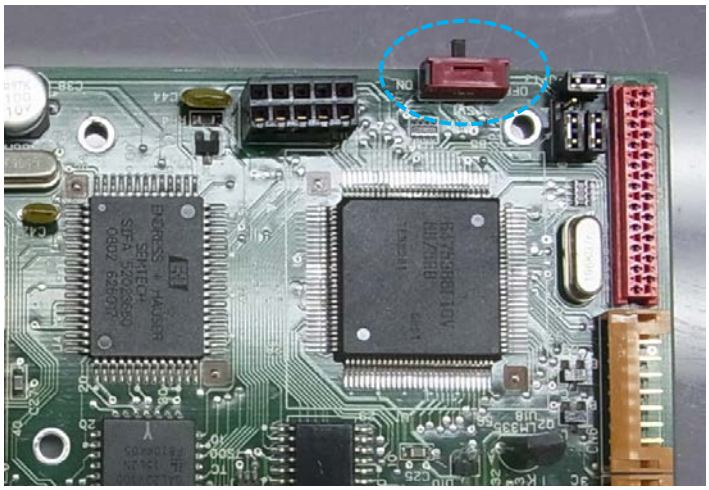
(a) Sealing of wire drum compartment

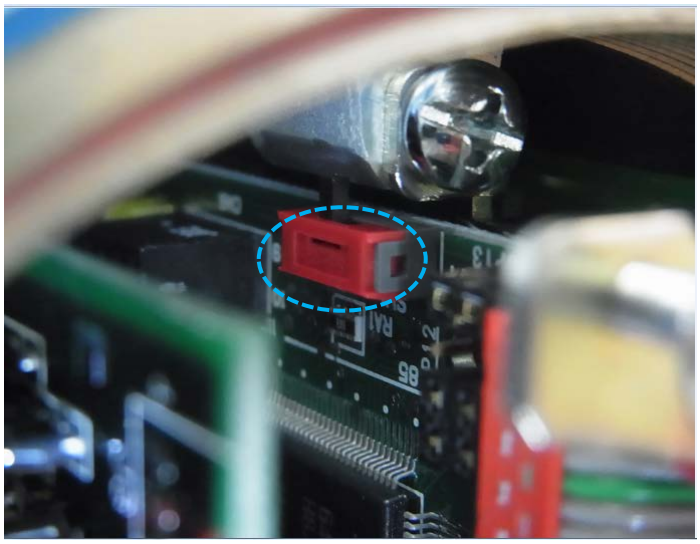


(b) Sealing of electric and terminal compartment

(c) Sealing of nameplate

FIGURE 5/1/8 – 8





Write protection - switch ‘on’ position

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