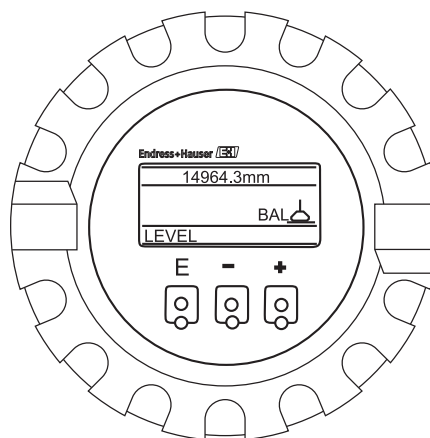


Technical Information

Proservo NMS 5/7 series

Intelligent tank gauge with high accuracy performance
Liquid level, I/F, Density & Density Profile



Application

The Proservo NMS 5/7 series of intelligent tank gauges is designed for high accuracy liquid level measurement in storage and process applications.

They fulfill the exact demands of tank inventory management, loss control, total cost saving and safe operation.

Typical areas of application include:

- Oil (fuels)
- LPG/LNG
- Chemicals
- Water / chemical interface measurement
- Foods, Liquid Food

Tank mounted intelligence makes the Proservo NMS 5/7 series ideal for single or multi-task installation, converting a wide range of measurement functions including:

- Liquid level
- Interface level
- Spot density
- Density profile
- Tank bottom
- Water dip

Features and benefits

- Measures liquid to an accuracy of +/- 0.7 mm
- Measures two clear interface levels and specific gravity of up to three liquid phases
- Profiling of liquid density throughout the tank (Tank profile) and upper layer (I/F profile)
- Latest microtechnology keeps the design simple, lightweight and compact
- Wetted parts are completely separated from the electronic circuit
- Tank top mounting with 3" flange weighing only 12 kg (aluminum version)
- Wide range of output signals including V1, RS 485, WM550, M/S, Enraf BPM and HART® protocol
- Material and pressure rating of the wetted parts can be selected according to the application.
- Suitable for atmospheric and high pressure applications up to 25 bar
- Maintenance prediction of the instrument
- Direct connection of spot or average temperature probes
- Easy to program using the E+H matrix system
- Robust IP67 housing
- Proactive safety diagnostics output to display and System Operators (patent pending)

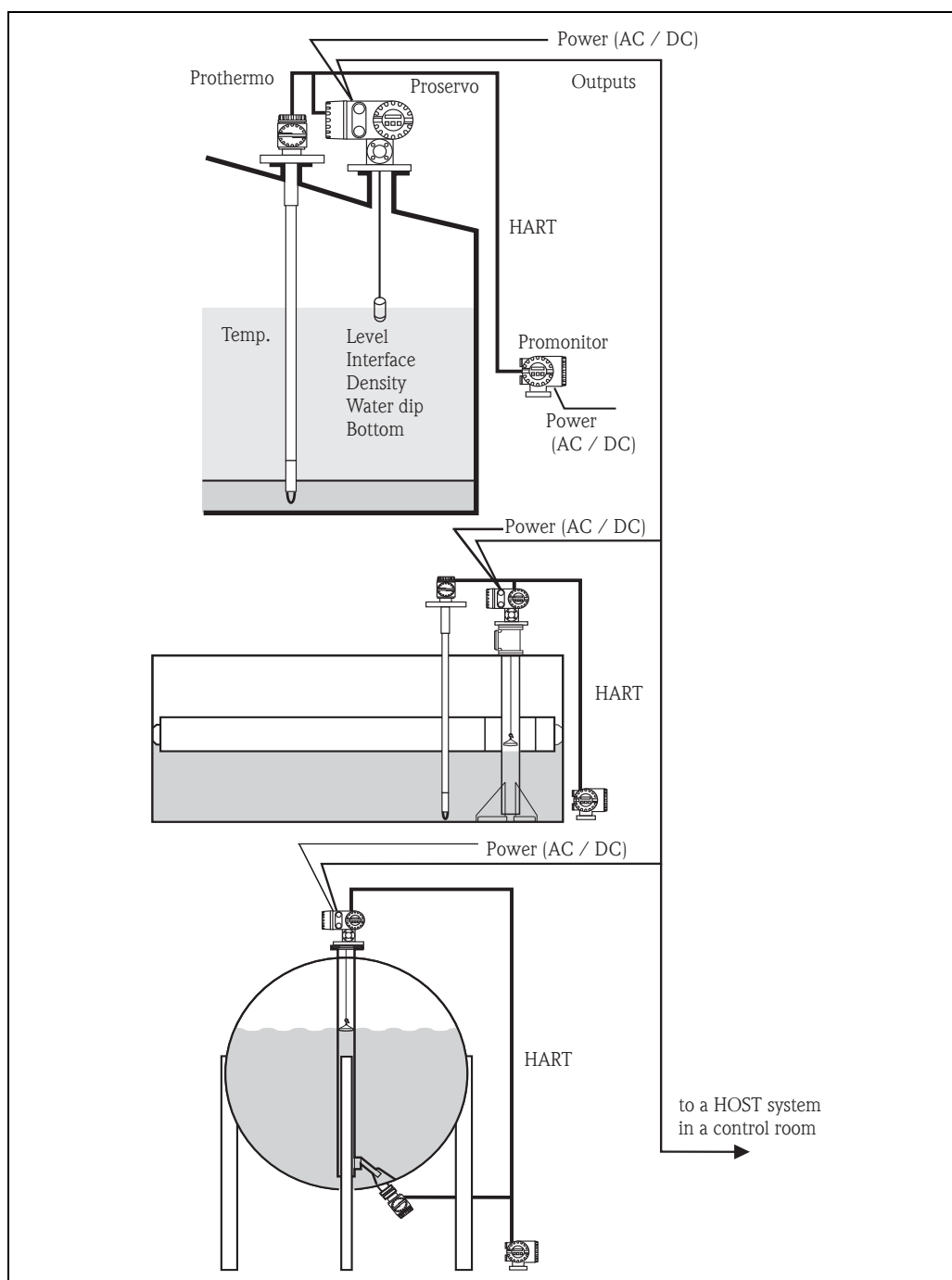
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Function and system design

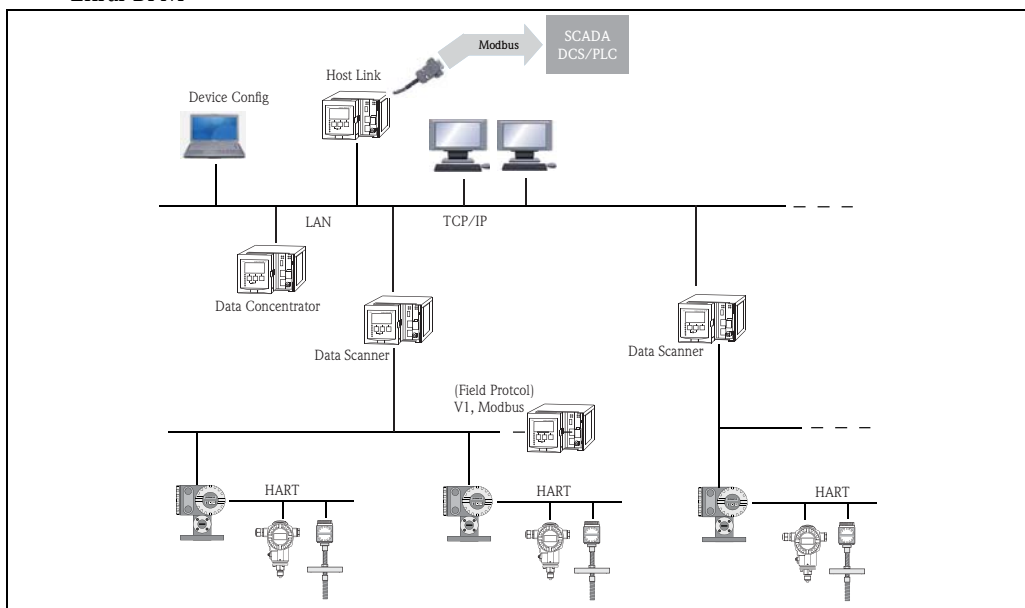
Measuring System

The Proservo NMS 5/7 is an intelligent tank gauge for high accuracy liquid level measurement employing the latest microprocessor technology. As well as level measurement, Proservo NMS 5/7 can determine the interfaces between three liquids, specific gravity of these liquids and tank bottom. To enable accurate volume calculation or simply for indication, Proservo NMS 5/7 will accept an input from either an average temperature probe NMT 53x series (via twisted pair cables, HART protocol) or via spot temperature element (via 3 wire Pt. 100 RTD signal). Once installed, all calibration and operating functions can be made via the user friendly Matrix program and touch sensitive keypad. Tank side monitoring and operation can be performed by the Promonitor NRF 560.



System Configuration

- From single tank level measurement to the largest oil refinery application, Proservo is an integral part of tank farm management solutions. A wide variety of data output protocols is available for seamless integration into many commonly used systems.
- The primary example is Endress+Hauser’s revolutionary Tankvision, a scalable concept offering local tank management for up to 225 tanks via Modbus, V1 or Whessomatic 550 protocols. Collected data is available to DCS and other plant management systems via a Host Link.
- Other examples include Endress+Hauser’s legacy systems such as MDP V1 Interface, FuelsManager, Tank Computers NRM571 and NRS57.
- Output protocols
 - Modbus, RS485 or current loop
 - V1 serial pulse
 - Whessomatic 550
 - HART
 - Mark/Space
 - Enraf BPM



Proservo NMS 5/7 system configuration Serial pulse output

Major Application

The number of measuring functions and output options as well as the lightweight compact design enables Proservo NMS 5/7 to be installed in a wide range of applications at minimal cost.

Petroleum Industry

From the production of oil to storage at an oil depot, there is a need to measure and manage a wide variety of products. A remote tank gauging and inventory management system combined with Proservo NMS 5 and a receiving computer is an ideal way to measure and control the contents of the tanks.

Chemical Industry

For this industry, a wide choice of materials is available for the construction of the wetted parts, to ensure chemical compatibility and long life.

Food Industry

In the brewing and beverage industries, where large volume of water or water-based products are being handled, it is essential to obtain a precise level measurement to establish low cost production. Proservo NMS 7 can be supplied with a built in CIP nozzle if required.

Power Plant

Fuel oil levels are major applications where precise measurement is required to ensure safe operation.

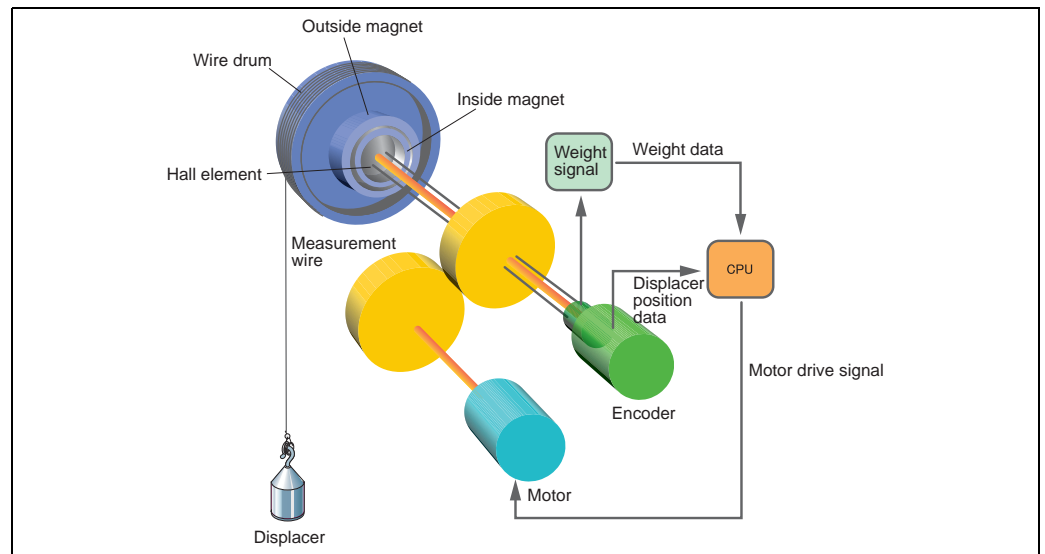
Operating Principle

The Proservo NMS 5/7 tank gauging system is based on the principle of displacement measurement.

A small displacer is accurately positioned in the liquid medium using a servo motor. The displacer is suspended on a measuring wire which is wound onto a finely grooved drum housing within the instrument.

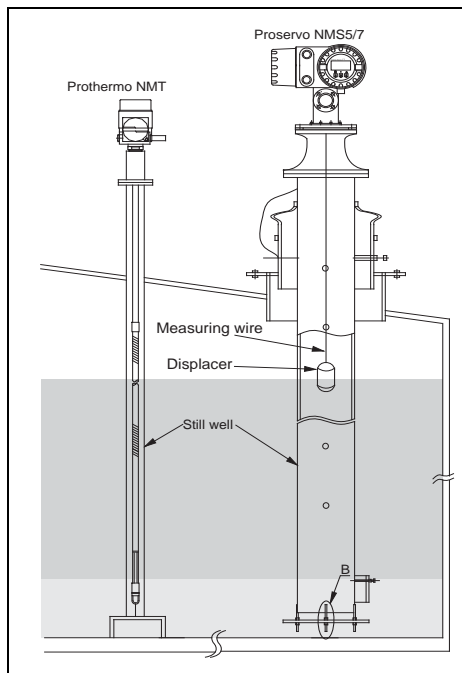
The drum is driven via coupling magnets which are completely separated by the drum housing. Outer magnets are connected to the wire drum whilst the inner magnets are connected to the drive motor. As the magnets turn, its magnetic attraction causes the outer magnets to turn as well, as a result turning the entire drum assembly. The weight of the displacer on the wire creates a torque on the outer magnets generating the change of magnetic flux. These changes generated between the drum assembly are detected by a unique electromagnetic transducer on the inner magnet. The drive motor is actuated to balance the voltage generated by the variations of magnetic flux to equal the reference voltage defined by the operating command.

When the displacer is lowered and touches the liquid, the weight of the displacer is reduced because of the buoyant force of the liquid. As a result, the torque in the magnetic coupling is changed and this change is measured by 5 sets of Hall sensors, (patented) chips which are temperature compensated. The signal, an indication of the position of the displacer, is sent to the motor control circuit. As the liquid level rises and falls, the position of the displacer is adjusted by the drive motor. The rotation of the wire drum is precisely evaluated to determine the level value which is accurate to an outstanding ± 0.7 mm.

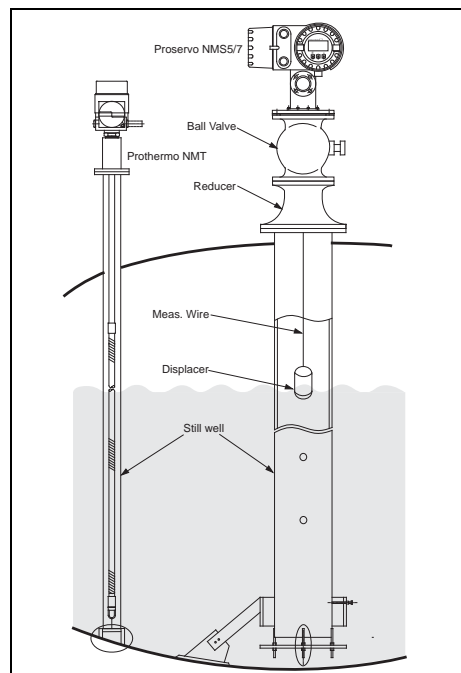


Direct Torque Detection

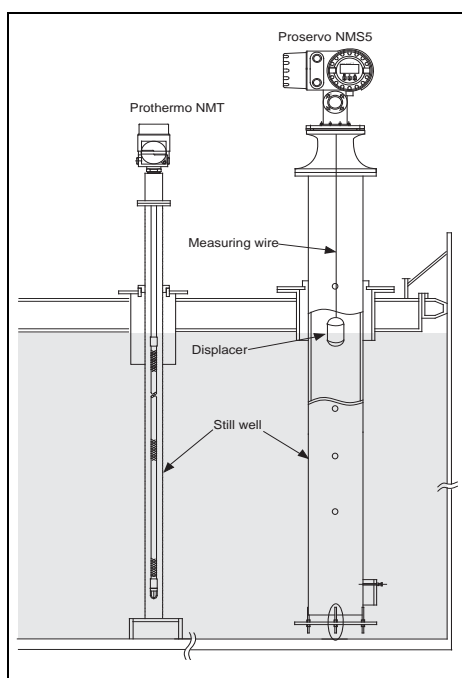
Typical Tank installation



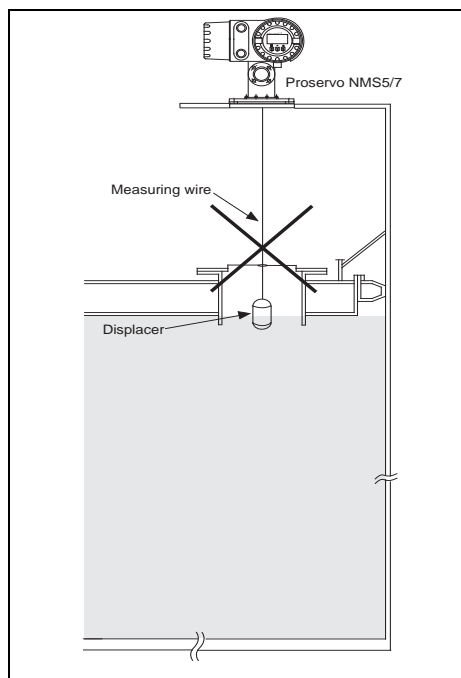
Fixed roof tank with stilling well



High pressure tank with stilling well and ball valve

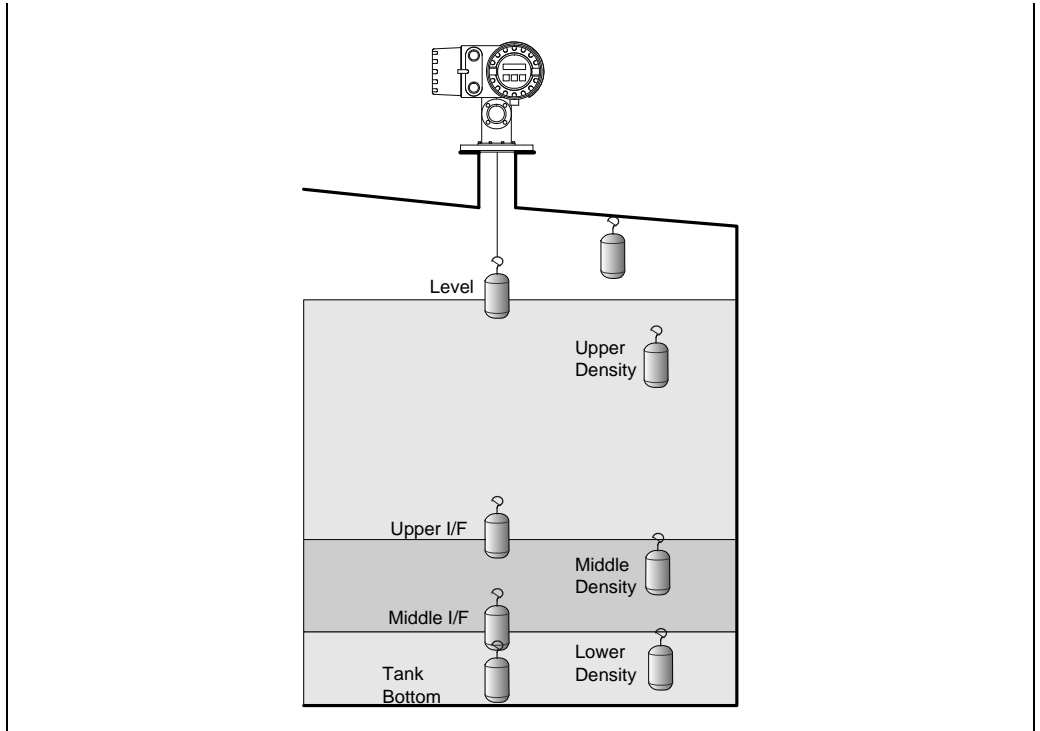


Floating roof tank and/or covered floating roof tank

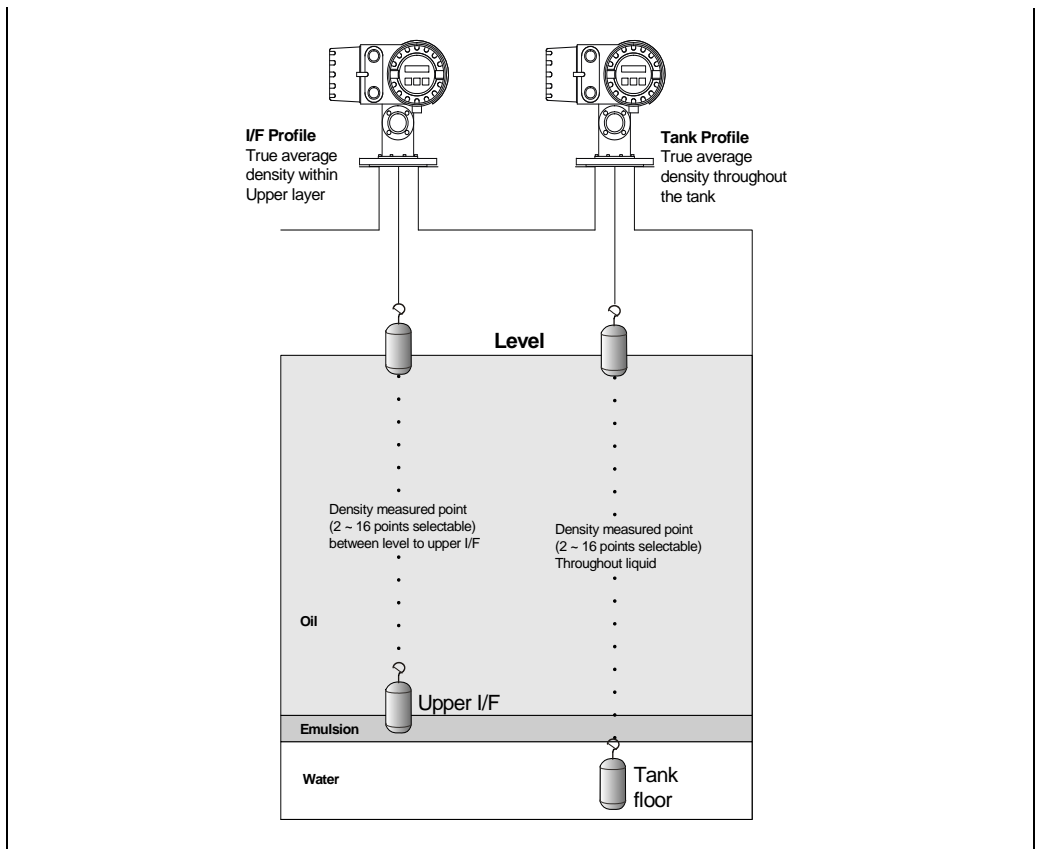


Note: When the proservo is installed on Floating roof tank, be sure to use Stilling Well

Measurement terminology



NMS 5/7 Proservo with standard level, I/F x 2, Tank bottom and spot density x 3 measurement



Left: Density Profile measurement "I/F (Interface) Profile" measurement range

Right: Density Profile measurement "Tank Profile" measurement range

Input

Input for local devices

Signal	Multi drop local HART® protocol max. 4 devices
Power supply	DC 24V
Additional units	NMT 53x average temperature sensor NRF 560 field data processor Other - compatible HART® devices Spot temperature Pt 100 Ohm ISO standard three wire connection

Output

Output parameters based on communication protocol

	V1 (new)	V1 (old)	MODBUS	HART	WM550	ENRAF	M/S
Level	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Temperature (Product)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vapor Temperature	Yes	-	Yes	Yes	Yes	-	-
Upper I/F (Water Level) *1	Yes	-	Yes	Yes	Yes	Yes	-
Middle I/F	Yes	-	Yes	Yes	-	-	-
Upper Density *2	Yes	-	Yes	Yes	Yes	-	-
Middle Density*3	Yes	-	Yes	Yes	-	-	-
Lower Density*4	Yes	-	Yes	Yes	-	-	-
Average Density *5	Yes	-	Yes	-	Yes	-	-
1-16 points Individual Density *6	Yes	-	Yes	-	-	-	-
Multi-Element Temperature	Yes	-	Yes	Yes	Yes	--	-
HART device input (Device 1)	Yes	-	Yes	Yes	Yes	-	-
HART device input (Device 2)	Yes	-	Yes	Yes	Yes	-	-
Alarm / Discrete Value	Yes	Yes	Yes	Yes	Yes	Yes	-
Protocol Documentation	-	-	KA0002N	-	KA001N	-	-

Remarks

1. Upper I/F output value can be either selected from the Proservo's own displacer measurement or Water Bottom measured value via the Prothermo NMT 539.
2. A single point density measurement within the upper layer liquid in the tank. The measurement position is configured to 150mm below the liquid surface at default.
3. A single point density measurement within the middle layer liquid in the tank. The measurement position is configured to 150mm below the upper interface level at default.
4. A single point density measurement within the lower layer liquid in the tank. The measurement position is configured to 150mm below the middle interface at default.
5. The value of this "Average Density" is based on the calculation after performing the Density Profile operation at the Proservo.
6. All of the selected number of density measured value from 1 ~ 16 points can be transmitted.

RS485 Modbus

Module name	Commdule RS 485 communication module (~2008), COM - 5 (2009~)
No. of unit	Maximum 10 instruments per loop
Baud rate	600/1,200/ 2,400/ 4,800/ 9,600/ 19,200 bit/s, selectable
Parity	Odd, Even, None, selectable
Cable	Two wire twisted cable with screening (DGND is connected to the ground cable)
Topology	Serial bus, electrically isolated, tree structure
Transmission distance	Maximum 1,200 m including limbs or branches (negligible with branches under 3 m)
Instrument address	Accessed via touch control
Isolation	Bus inputs are electrically isolated from the other electronics

**Bidirectional serial pulse
(V1 protocol)**

Module name	COM - 1
No. of units	Maximum 10 instruments per loop
Baud rate	3,300 BPS
Cable	Two wire (twisted pair) unshielded cable
Topology	Serial bus, tree structure
Transmission distance	Maximum 6,000 m
Instrument address	Accessed via touch control
Isolation	Serial communication circuit isolated from other circuits

HART Protocol

Module name	Commdule HART (2009), COM - 6 (2009~)
No. of units	Maximum 15 instruments per loop
Baud rate	1,200 BPS
Cable	Two wire, twisted pair screened cable Minimum core ϕ 0.15 (24AWG)
Transmission distance	Maximum 1,200 m
Instrument address	Accessed via touch control
Isolation	Bus input are electrically isolated from the other electronics

Whessoematic 550

Module name	WM550 communication module
No. of units	15 instruments per loop (connected to RTU)
Baud rate	1,200 / 2,400 bit/s
Cable	Two wire, twisted cable with screening
Topology	20 mA current loop
Transmission distance	Depending on specifications (ask your E+H engineer)
Instrument address	Setting by DIP switches on communication board
Isolation	Current loop circuit isolated from other circuits

Mark / Space

Module name	Mark/Space communication module
No. of units	Depending on specification (ask to E+H engineer)
Baud rate	1,200 / 2,400 / 4,800 / 9,600 / 19,200 bit/s
Cable	Four wire
Topology	Serial bus, tree structure
Transmission distance	Depending on specifications (ask your E+H engineer)
Instrument address	Setting by DIP switches on communication board
Isolation	Serial pulse isolated from other circuits

Enraf Bi Phase Mark (BPM)

Module name	COM - 3
No. of units	Maximum 10 instruments per loop
Baud rate	1,200, 2,400 bit/s, selectable
Cable	Two wire, twisted cable with screening
Topology	Serial bus, electrically isolated, tree structure
Transmission distance	Maximum 10 km
Instrument address	Accessed via touch control
Isolation	Serial communication circuit isolated from other circuits

Analogue output

Module name	I/O - 5
Output	4...20 mA, two channels freely assignable value
On alarm	Switchable +110%, -10% or hold last measured value
Electrical isolation	Analogue output isolated from other circuits
Adjustable damping	0 to 99 s
Maximum load	500 ohm
Load effect	Negligible

Relay

Module name	I/O - 3
Version	4 relays with potential free change-over contacts, freely assignable to measured value
Hysteresis	Switch points and switching hysteresis freely adjustable, residual current fail-safe mode: minimum or maximum, selectable
Switching capacity	AD max. 2 A, max. 250 V, max. 62.5 VA DC max. 2 A, max. 220 V, max. 60 W For FM / CSA: 5A250VAC, 8A250VAC

Power supply

Supply voltage

High voltage type: 85 ... 264 VAC 50/60 Hz
Low voltage type: 20 ... 60 VDC / 20 ... 55 VAC 50/60Hz

Caution!

Allowable voltage supply is specifically stated depending on each Ex approvals. Refer to the designated certification

Power consumption

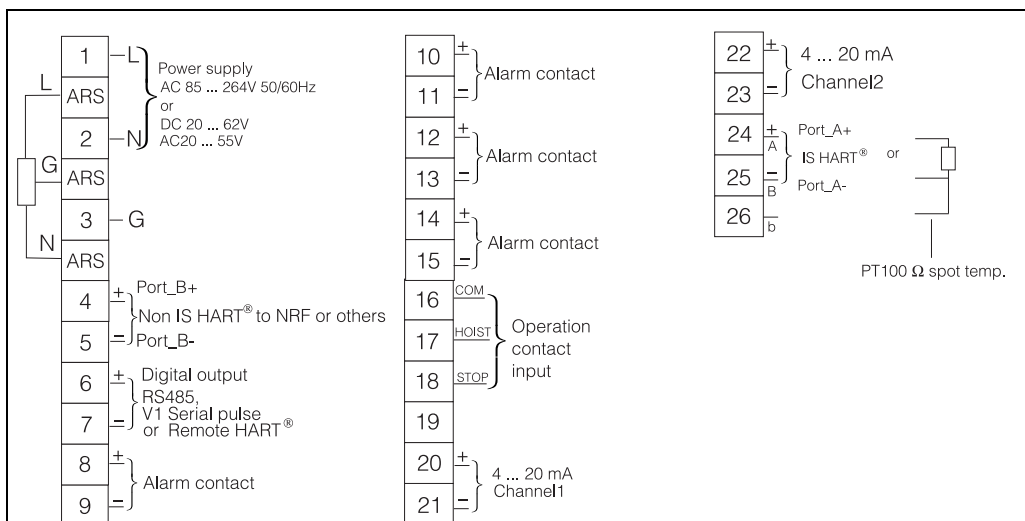
Maximum 50 VA, 50W (cos j=0.5)

Safe electrical isolation

Between power supply and signal output, CPU, RS 485, relay and other electronics

Electrical connection

Electrical for Primary output
 V1 Serial Pulse
 Modbus RS 485
 HART
 Enraf BPM

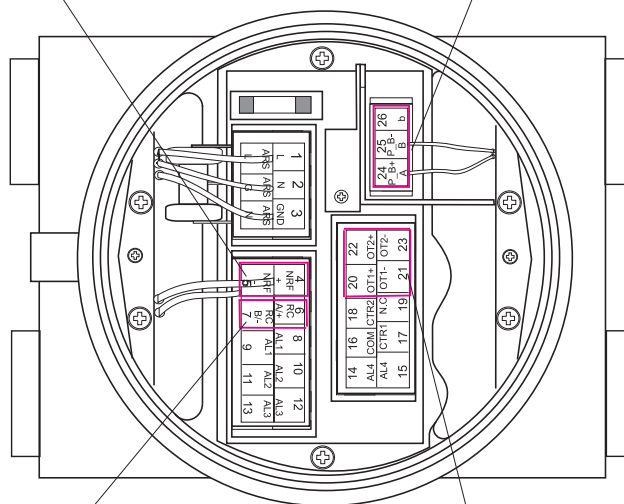


Note* : Terminal connection for Whessoe Matic 550 (WM550) and Mark Space, please refer to the next few pages.

- Terminal 4 & 5 and 24 & 25 for HART devices are inter-connected on Explosion proof (Ex d) certified version.
- Terminal 24 & 25 (and 24, 25 & 26 for spot temp) will be intrinsically safe (i.s.) device connection only when Intrinsically Safe certified version is selected.

Exd local (slave) HART® :
 Terminal 4 & 5
 NRF (and other HART device)

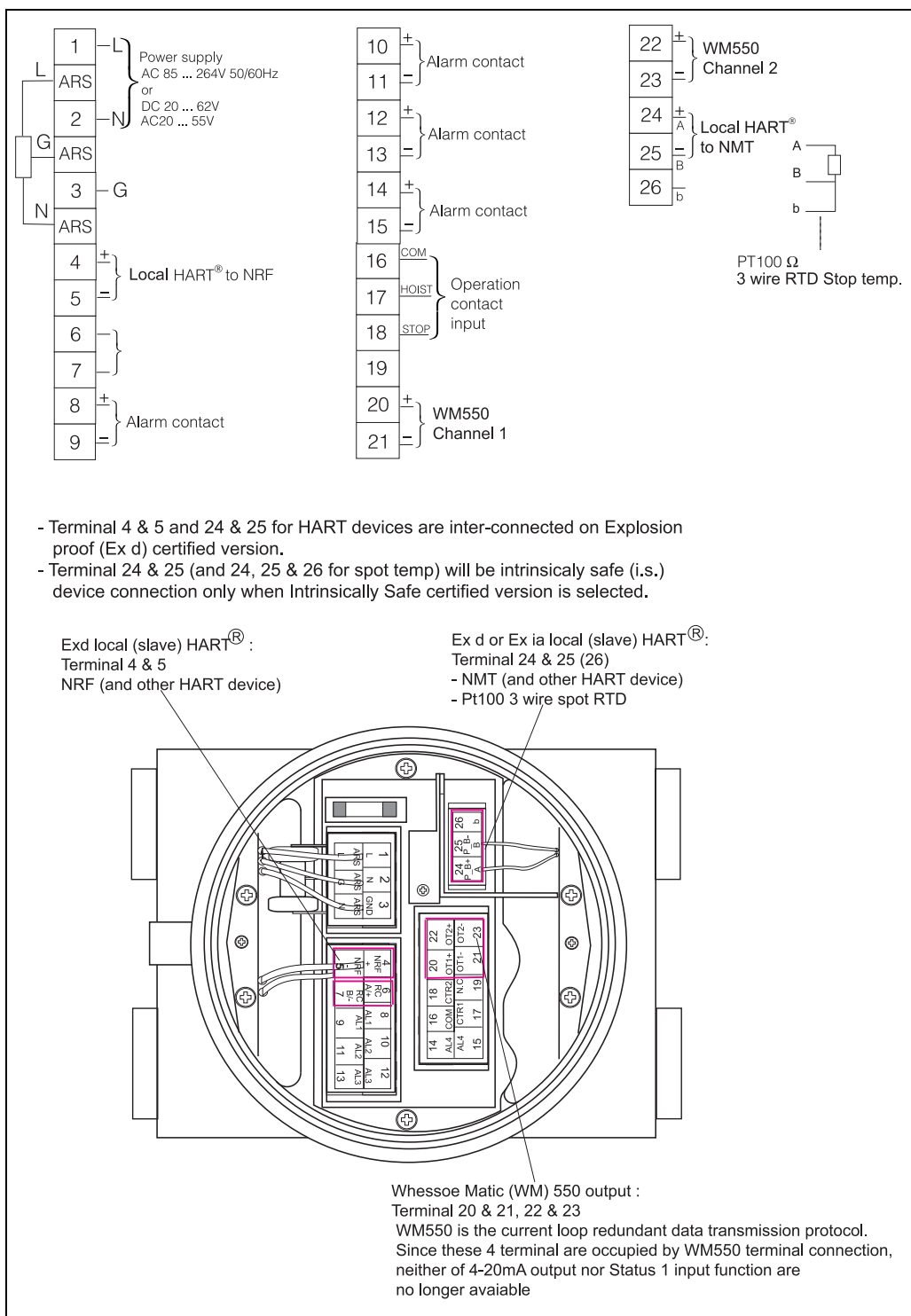
Ex d or Ex ia local (slave) HART® :
 Terminal 24 & 25 (26)
 - NMT (and other HART device)
 - Pt100 3 wire spot RTD



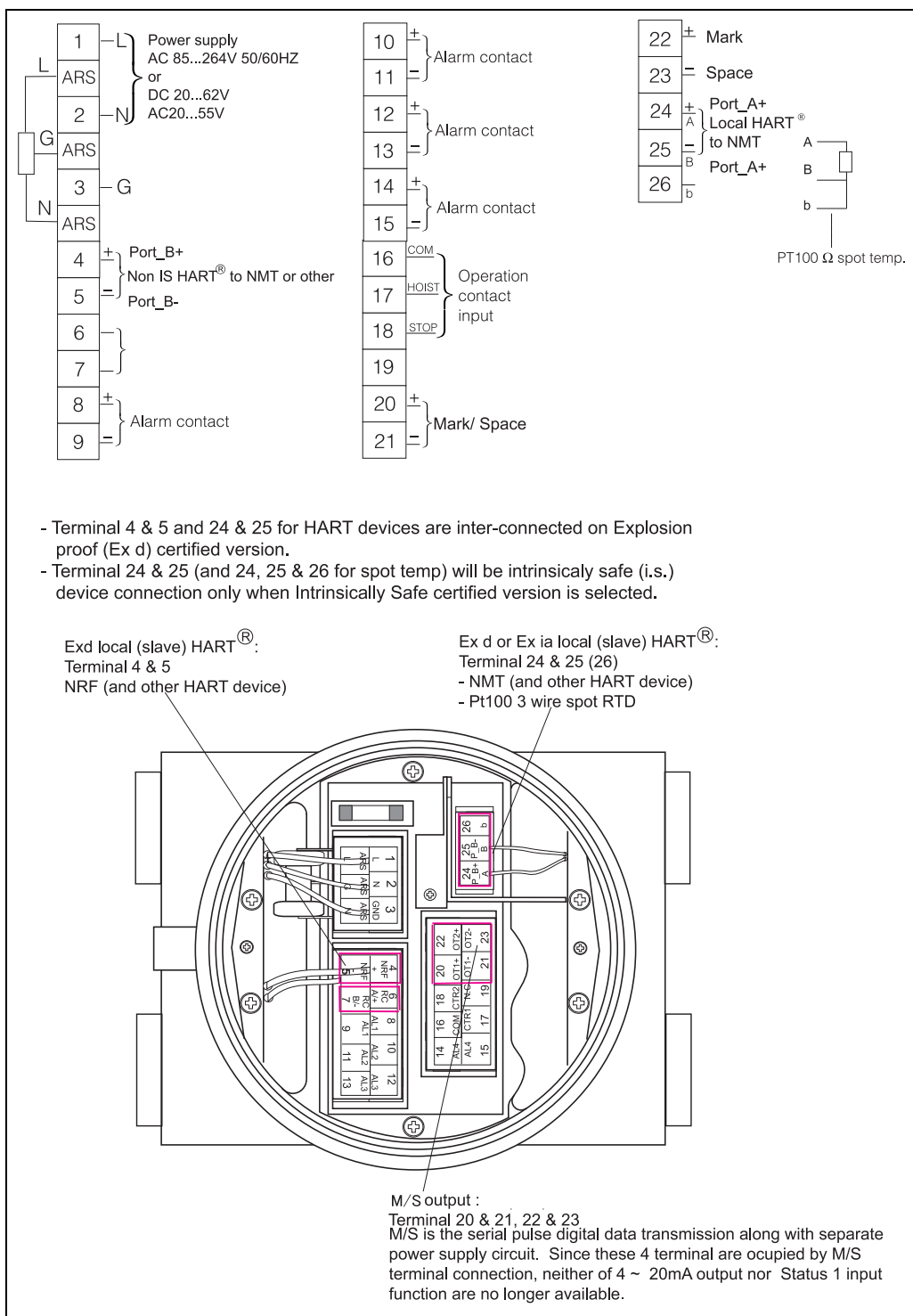
Digital out:
 Terminal 6 & 7
 - V1 serial pulse
 - Modbus (RS 85)
 - HART
 - Enraf BPM

4 ~ 20mA output:
 Terminal 20 & 21, 22 & 23
 Note!
 Terminal 22 & 23 will be used as "Status 1 input" when, Signal input from field unit
 4: HART and Status 1 input
 5: HART, Pt100 Spot and Status 1 input
 6: HART, Pt100 Spot temp, Operation contact, and Status 1 input is selected on .

Electrical for Primary output
WM 550



Electric for Primary output
M/S



Bus Installation

Modbus (RS485 Output)

The initial bus voltage is provided by the PC plug-in board or the interface adapter. If an adapter is being used, then the bus plug must be configured accordingly.

Termination Resistors

It is not necessary to set any termination resistors.

Bus Address

Each transmitter has an individual bus address. Depending on the type of transmitter, this is either defined by the address switches or by the software of the transmitter itself.

Linking to a Personal Computer

A personal computer is connected using either a RS 485 PC board or an RS 232C / RS 485 external converter (both with electrical isolation).

Bus Cabling

The bus cabling is galvanically isolated from the transmitter and the PC plug-in board or the interface adapter. The screening must be grounded and have electrical continuity throughout.

EMC tests indicate the best result when the grounding at both ends and each transmitter is established. If there is a potential difference in between the grounds, measurement must be taken to equalize whilst observing a relevant hazardous area.

Bus Topology

When planning the system, attention should be paid to the possible segmentation of the bus according to individual plant sections. Suitable topologies are:

- Serial, max. 1200 m
- Tree of total length 1200 m

The bus screening is to be connected at various points.

Sakura V1 Serial Pulse Output

The bus is connected to a NRM, NRS, RTU8, MDP-III interface, Tankvision or to a receiver. The interface or receiver must be configured accordingly.

Termination Resistors

It is not necessary to set any termination resistors for serial pulse output.

Bus Address

Each transmitter on a signal loop has an individual bus address. This is defined within the transmitter software.

Bus Cabling

The bus cabling is electrically isolated from the transmitter and from the interface receiver.

Standard communication cable (non-shielded twisted pair cable) can be used for the data transmission.

Bus Topology

The suitable topologies for the serial pulse output are:

- Serial max. 6000 m (Sakura V1)
- Tree of total length 6000 m. (Sakura V1)

Data transmission & Operation

Sakura serial pulse (V1) output is capable to transmit density profile data (both Tank profile & I/F profile independently), operation command, & parameter setting between NMS 5/7 Proservo and NRM 571 Tank Computer.

Enraf Bi Phase Mark Output

The bus is connected to an Enraf I/F CIU or RTU8 to transmit measured value to upper host system as Entis (Enraf TG program) or Fuels Manager. These interface must be configured accordingly.

Termination Resistors

It is not necessary to set any termination resistors for serial pulse output.

Bus Address

Each transmitter on a signal loop has an individual bus address. This is defined within the transmitter software.

Bus Cabling

The bus cabling is electrically isolated from the transmitter and from the interface receiver. Standard communication cable can be used for the data transmission.

Bus Topology

The suitable topologies for Enraf BPM serial pulse output are:

Serial max. resistance: 400 ohm at 3 bus loops or less (10 transmitters per 1 bus loop)

Serial max. capacitance: 1 micro F or less

Data transmission & Operation

NMS 5/7 Proservo is capable to transmit following sensory data as well as gauge operation command via Enraf BPM serial pulse output.

- Data: level, temperature, operation status
- Gauge command: STOP, UP, LEVEL, I/F

HART Output

Registered host system via non-I.S. HART port.

Bus Address

Each transmitter on a signal loop has an individual bus address. This is defined within the transmitter software and / or auxiliary configuration environment such as host system & hand held terminal (HHT).

Bus Cabling

The bus cabling is galvanically isolated from the transmitter and the PC plug-in board or the interface adapter. The screening must be grounded and have electrical continuity throughout. EMC tests indicate the best result when the grounding at both ends and each transmitter is established. If there is a potential difference in between the grounds, measurement must be taken to equalize whilst observing a relevant hazardous area.

Bus Topology

The suitable topologies are:

Serial max. 1000 m

Tree of total length 1000 m.

Whessoematic 550 (WM 550) Output

The bus is normally connected to Whessoe 1098, RTU 8 or other upper host system via dual channel (can be single) WM550 current loop.

Termination Resistors

Admissible termination resistance should be calculated as follow.

$$R = [V_a - \{n \times (V_b + V_c)\}] / 0.02$$

R = terminal resistance in the system

n = number of transmitter in the system

V_a = max. available voltage at receiver

V_b = voltage drop across transmitter

V_c = voltage drop across receiver

Bus Address

Each transmitter on a signal loop has an individual bus address. This is defined within the transmitter by mechanical dip switch on com board.

Bus Cabling

The bus cabling is galvanically isolated from the transmitter and the PC plug-in board or the interface adapter. BS5308 or equivalent 1.5sq.mm screened twisted pairs are recommended for bus cabling.

Bus Topology

The suitable topologies for the WM550 current output are depending on number of transmitter & cable quality on the loop. Recommended number of transmitter on single loop shall be less than 15 units to achieve the maximum performance.

Varec Mark Space (M/S) Output

The bus is normally connected to Interface Unit (IFU), Data acquisition Processor (DAP), RTU 8 or other upper host system via 4 wire M/S serial bus link.

Termination Resistors

Admissible termination resistance should be calculated as follow.

$$R = (48 - 33) / \{60\text{mA} + N (2.0\text{mA})\}$$

R = terminal resistance in the system

N = number of transmitter in the system

48 = supply voltage to receiver

33 = minimum M/S board operation voltage

60mA = required current for system operation

2.0mA = required current per transmitter

Bus Address

Each transmitter on a signal loop has an individual bus address. This is defined within the transmitter by mechanical dip switch on com board.

Bus Cabling

The bus cabling is galvanically isolated from the transmitter and the PC plug-in board or the interface adapter. The total length of field wiring shall be determined by calculation of maximum resistance within the system & required operation current. Once the total length is determined, distance has to be reduced by half because of current flow in both B+ & B- leads.

Bus Topology

The suitable topologies for the M/S serial pulse output are depending on number of transmitter & cable quality on the loop.

Performance characteristics

Accuracy

Liquid level	+/-0.7 mm for L=10 m, D=1 g/cm ³ with 50 mm displacer
Interface level	+/-2.7 mm for L=10m, ΔD=0.2 g/cm ³ with 50 mm displacer ΔD=0.1 g/cm ³ difference between densities of 2 liquids
Spot & profile density	+/-5kg/m ³ or better, (at reference condition)
Tank bottom	+/-2.1 mm (independent from liquid condition)

Compensation

Wire

Compensation of wire expansion due to temperature and wire weight

Displacer

Automatic compensation of displacer weight

Tank wall

Compensation of depression and distortion

Ambient condition

Ambient temperature

-20... +60°C
-40... +60°C (ATEX approval)

Liquid temperature

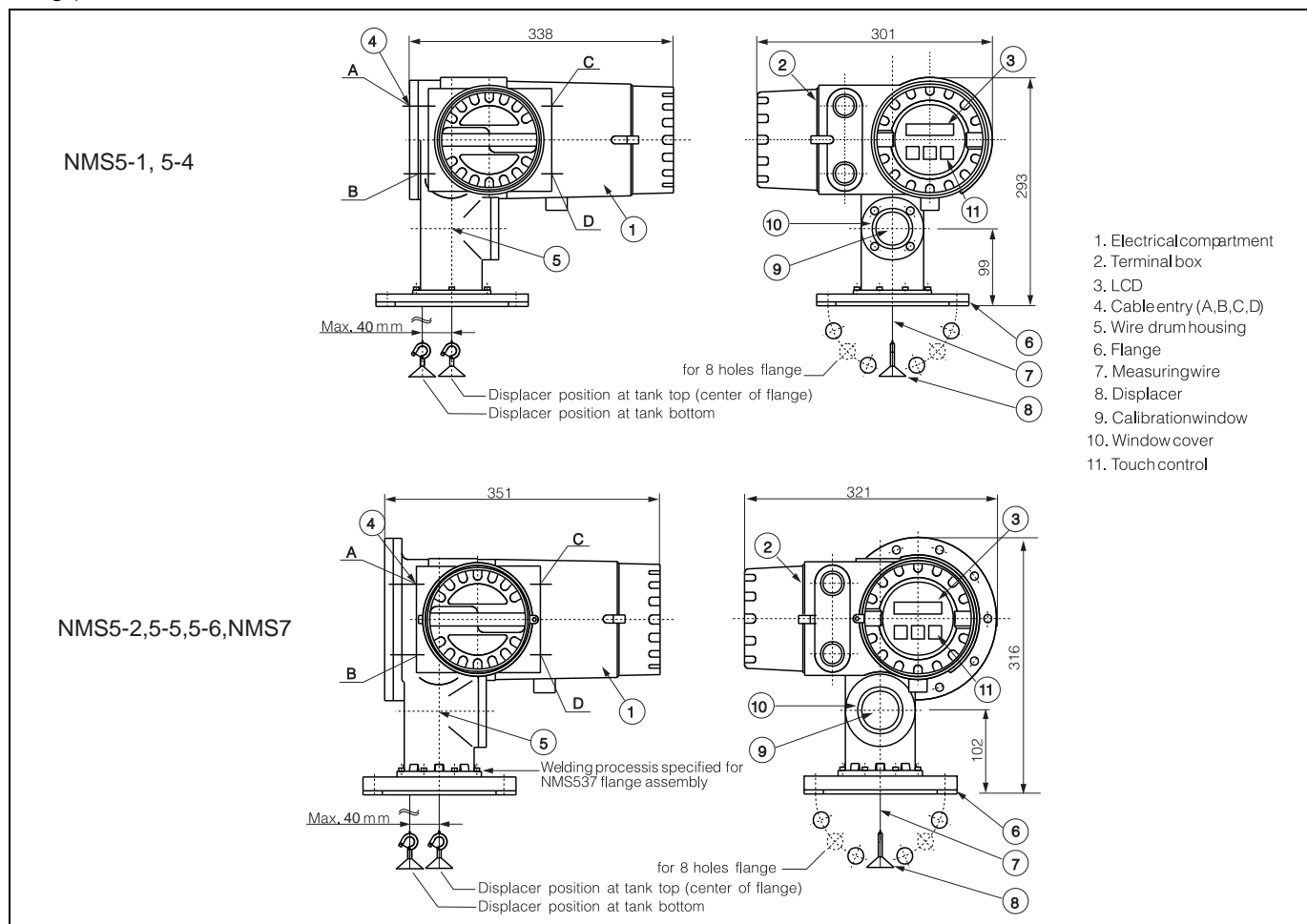
-200... +200°C

Protection

IP 67 with closed housing and cable glands of equal protection type.... (ATEX/THIS)
NEMA 4X...(FM/CSA)

Mechanical construction

Design, dimensions



Housing materials of Construction

Electrical compartment : aluminium casting
 Drum chamber for NMS 5-1/5-4 : aluminium casting
 Drum chamber for NMS 5-2/5-5/5-6 and NMS7 : stainless steel 316 casting

Weight
 NMS 5-1/5-4 : 12 kg
 NMS 5-2/5-5/5-6 and NMS7 : 27 kg

Flange type
 ANSI, JIS, DIN 3" and 6" (standard) or equivalent. Refer to order code for full selection.

Measuring range
Level
 0 - 36 m (100 m available on request)

Density
 0.5000 to 2.0000 g/cm³

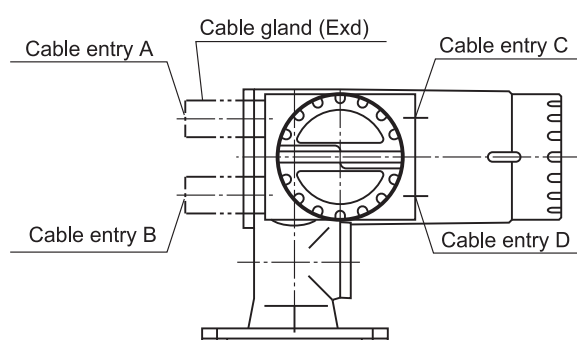
Measuring wire

Range	10 m, 16 m, 28 m, 36 m
Material (standard)	Stainless steel 316, 0.15 mm (standard) Hastelloy C. ϕ 0.2 mm (max. 16 m range) PFA coated St/St 316L, 0.4 mm (max. 16m range)

Displacer

Diameter	50 mm (Standard), 30...110mm (optional)
Material (standard)	Stainless steel 316
Material (optional)	Hastelloy C, PTFE
Horizontal movement	10, 16, 28 m (AISI316) :1.23 mm / m with standard 0.15mm wire 36 m (AISI316): 1.1 mm / m with standard 0.15mm wire 10, 16 m (AISI316): 2.17mm /m with PFA covered wire 10, 16 m (Alloy C): 1.73mm/m
Traveling speed	0...2500 mm / min...maximum

Cable entry



Caution!

All of cable entries need the cable gland for Explosion-proof (Ex d) or Explosion-proof conduit , even if you selected a product of IS and Explosion proof (Ex d[ia]).

Human interface

Operating concept

Proservo NMS 5/7 is furnished with a four line illuminated liquid crystal display. With the E+H matrix driven operation, configuration is simple. Using only three key, all parameters can be selected and modified. For example:

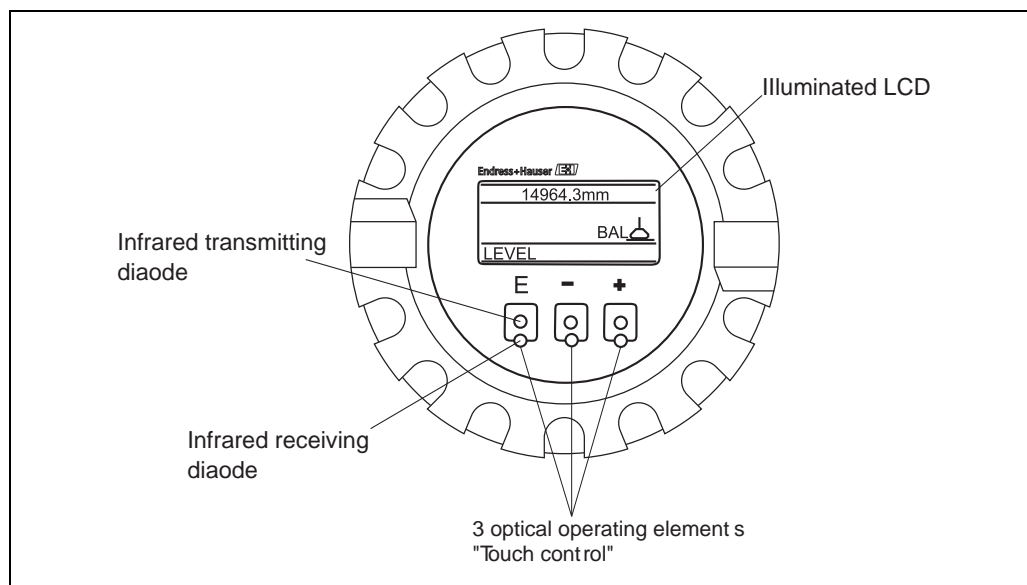
- Operation - level; interface; spot & profile density, water dip, & tank bottom
- Current output
- Relay output
- Custody transfer
- Maintenance prediction
- Calibration, etc.

The display can be configured to be displayed in English, Japanese or Chinese. Measurement unit & decimal point can be also configured within NMS matrix.

Operational Security

The programming information can be protected by software access codes that disable all programmable parameters or by a hardware switch to prevent changes from remote transmission or the touch control keypad. A self-diagnosis function checks for any operational failures.

Display(LCD)



Four line 16-digit illuminated display English, Japanese, Chinese selectable

Programming

Three optical keys (touch control) for selection of matrix functions.

Memo function

Memo of maintenance information.

Advanced Maintenance

Maintenance Prediction	Proservo NMS 5/7 will provide advance warning of required maintenance such as replacement of worn wire etc. The operating life-span of electrical and mechanical parts of the Proservo NMS 5/7 are factory set within the instruments memory. This information is checked involving with the built-in clock and compared and registered in the instrument.
Automatic Displacer Weight Compensation	The displacer can be checked for buildup or corrosion by comparing the measured weight of the displacer in the air with the pre-programmed displacer weight. Proservo NMS 5/7 can be set to the periodical check for the displacer weight, and any deviations in the weight will then be corrected and an alarm or memo initiated.
Automatic Compensation of Wire Length	When the displacer is moved from the level position to the reference point (mechanical stop within the instrument), the calibration can be checked. If there is any deviation outside the tolerance, then the instrument will emit an alarm. If the deviation is within the tolerance (set by the customer), then an automatic recalibration will be done. This function can be working manually or automatically in preset time intervals.
Maintenance	The maintenance record can be accessed via the matrix and will provide information of alarm data (e.g. date, time, alarm type). A memo function allows the user or an E+H Service Engineer to enter maintenance data manually.
Proactive Safety	Proactive safety diagnostic function warns of mechanical failure, and outputs maximum level value, e.g. 99999 to local display and fieldbus.

Certificates and Approval

Ex approvals**TIIS**

Ex d IIB T4

ATEX

EEx d IIB T6

EEx d IIB T6, Zone 0 (only for SS drum chamber)

EEx d IIC T6

EEx d IIC T6, Zone 0 (only for SS drum chamber)

EEx d IIB T6, -40 dec.

EEx d IIB T6, Zone 0 -40 degrees C.(only for SS drum chamber)

EEx d [ia] IIB T6

EEx d [ia] IIB T6, Zone 0 (only for SS drum chamber)

FM

XP - AIS Class I, Div 1, Groups CD

XP Class I, Div 1, Groups CD

CSA

Class I, Div 1, Groups CD

Custody transfer approvals**PTB:** Germany (pending for Chinese language version)**NMi:** Netherlands**Overspill protection****TÜV:** Germany**External standards and guidelines**

EMC-Directive 89/336/EC

PE-Directive 97/23/EC

EN 10204-3.1B

OIML-R85/1998-NL-00.03

ISO 9001:2001

JIS Z9901:1998

Ordering information

Proservo NMS5

010	Drum housing				
	1	0.2bar gauge; Alu.			
	2	0.2bar gauge; stainless steel			
	4	6bar gauge; Alu.			
	5	6bar gauge; stainless steel			
	6	25bar gauge; stainless steel			
	9	Special vesion			
020	Protection class				
	0	Weather proof ; IP 67 / NEMA 4X			
	1	TIIS Ex d IIB T4			
	5	XP Class 1, Div. 1, Gr. CD, FM			
	6	Class 1, Div. 1, Gr. CD, CSA			
	F	ATEX II 2G EEx d IIB T6			
	G	ATEX II 1/2G EEx d IIB T6			
	H	ATEX II 2G EEx d [ia] IIB T6			
	J	ATEX II 1/2G EEx d [ia] IIB T6			
	N	XP-AIS Class 1, Div.1, Gr.CD, FM: EEx d[ia]			
	O	Class 1, Div.1, Gr.CD CSA EExd(ia)			
	Q	ATEX II 1/2G EEx d IIC T6			
	R	ATEX II 2G EEx d IIB T6, -40 dec			
	S	ATEX II 1/2G EEx d IIB T6, -40 dec			
	T	*TIIS Ex d(ia) IIB T4			
	Y	Special vesion			
030	Measuring function				
	A	Level			
	B	PTB Weights & Measures, Level			
	C	NMi Weights & Measures, Level			
	D	Multi measurement, Level, I/F level, Bottom, Density			
	E	PTB Weights & Measures, Level, I/F level, Bottom, Density			
	F	MNi Weights & Measures, Level, I/F level, Bottom, Density			
	G	Density profile multi measurement, Level, I/F level, Bottom, Density			
	H	PTB Weights & Measures, Density profile, Level, I/F level, Bottom, Density			
	J	NMi Weights & Measures, Density profile, Level, I/F level, Bottom, Density			
	Y	Special vesion			
040	Primary (Digital) output				
	N	Enraf BPM			
	P	RS 485 Modbus			
	Q	*Modbus, current loop, dual output			
	F	Not selected			
	A	Serial pulse (Sakura V1/MDP)			
	J	Serial pulse (Sakura MDP)			
	B	Serial pulse (Sakura BBB)			
	C	Serial pulse (Sakura MIC + RS-232C)			
	D	Serial pulse (Sakura MIC)			
	G	HART (active)			
	H	HART (passive)			
	L	Whessoe matic 550+OVP=overvoltage protection			
	M	Mark / Space			
	Y	Special vesion			
050	Secondary output				
	0	Not selected			
	1	Alarm contact, 4x SPST			
	2	4 - 20 mA, 2 channels selectable			
	3	4 x SPST + 4 - 20 mA, 2 channels			
	4	2 x SPST, Overspill protection			
	5	4 x SPST, 4 - 20 mA, 1 channel			
	9	Special vesion			
NMS5-					Product designation (part 1)

060					Signal input from field units		
					0	HART protocol (e.g. NMT, NRF)	
					1	HART + Pt100 Spot temp.	
					2	HART + Operation contact, 3digits	
					3	HART + Pt100 Spot temp.+ Operation contact	
					4	HART + 1 x status	
					5	HART + Pt100 Spot temp. + 1 x status	
					6	HART + Pt100 + Operation contact +1 x status	
					9	Special vesion	
070					Element spacing		
					A	Range: 0 -10m, AISI316 wire	
					B	Range: 0 -16m, AISI316 wire	
					C	Range: 0 -28m, AISI316 wire	
					L	Range: 0 -36m, AISI316 wire	
					G	Range: 0 -10m, AISI316 wire PFA covered wire	
					H	Range: 0 -16m, AISI316 wire PFA covered wire	
					J	Range: 0 -10m, Alloy C	
					K	Range: 0 -16m, Alloy C	
					Y	Special version	
080					Cable entry		
					E	Four thread G(PF)1/2"	
					F	Four thread G(PF)3/4"	
					G	Four thread NPT1/2"	
					H	Four thread NPT3/4"	
					J	Four thread PG 16	
					K	Four thread PG 21	
					L	Four thread M20	
					M	Four thread M25	
					Y	Special version	
090					Process connection		
					A	Flange JIS10 K 80A RF	
					C	Flange JIS10 K 80A FF	
					E	Flange JIS 20 K 80A RF (only for 25bar drum chamber)	
					G	Flange ANSI 3" 150 lbs RF	
					J	Flange ANSI 3" 300 lbs RF (only for 25bar drum chamber)	
					U	Flange JIS10 K 150A RF	
					T	Flange ANSI 6" 150 lbs RF	
					L	Flange DIN DN80 PN10 RF	
					N	Flange DIN DN80 PN25 RF (only for 25bar drum chamber)	
					Q	Flange JPI 3" 150 lbs RF	
					S	Flange JPI 3" 300 lbs RF (only for 25bar drum chamber)	
					Y	Special version	
100					Power supply		
					3	85 - 264 VAC, 50/60 Hz	
					4	20 - 62 VDC, 20W/ 20 - 55 VAC, 50/60 Hz, 20VA	
					9	Special version	
110					Displacer shape, diameter, material		
					B	Conical 50 mm, PTFE	
					D	Cylindrical 50 mm, AISI316 (standard)	
					K	Cylindrical 40 mm, AISI316	
					N	Cylindrical 30 mm, AISI316	
					R	70 mm, W&M NMI	
					S	110 mm, W&M PTB	
					T	Cylindrical 50 mm, Alloy C	
					U	Cylindrical 50 mm, PTFE	
					V	Cylindrical 40 mm, PTFE	
					W	Cylindrical 30 mm, PTFE	
					Y	Special version	
NMS5-						product designation (part2)	

120	O-ring; chamber finishing
	<ul style="list-style-type: none"> 0 NBR; Standard chamber 1 Silicon rubber, Standard chamber 2 Fluor rubber, Standard chamber 3 PTFE (Wire drum FKM), Basic version 4 PTFE (Wire drum FKM), PFA coated 5 Silicon rubber, PFA coated chamber 6 Neoprene (ammonia application), standards chamber 9 Special version
130	Options
	<ul style="list-style-type: none"> A not selected C With cleaning nozzle D With gas purging nozzle E With guide wires (SUS316 standard) G With relief valve H With relief valve + pressure gauge J Sunshade Y Special version
NMSS-	Complete product designation

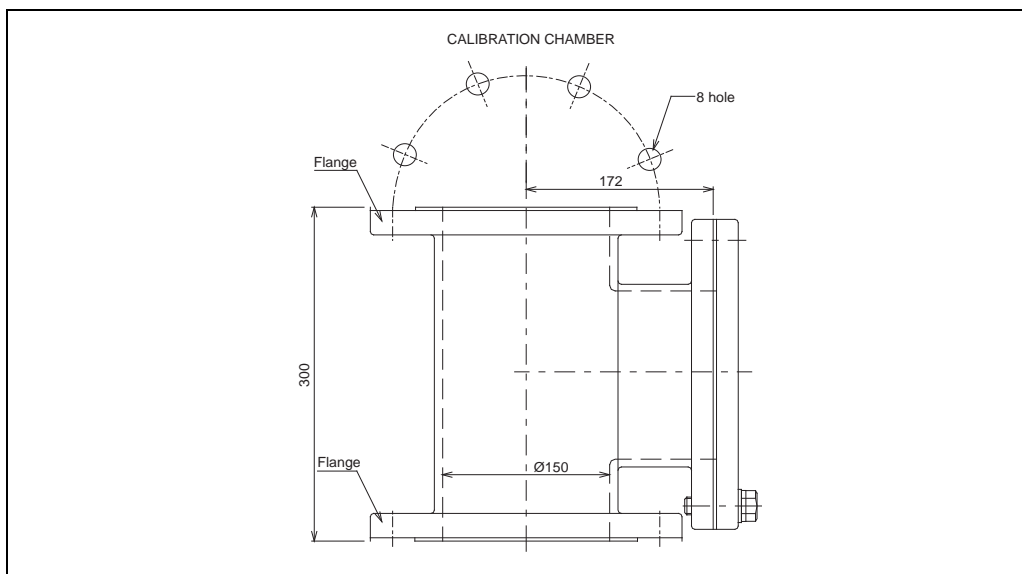
**Proservo NMS7..
(Sanitary version)**

010		Protection class	
	0	IP 67 / NEMA 4X	
	1	TIIS Ex d IIB T4	
020		Measuring function	
	A	Level	
	B	Level, 1/F level, Density	
	Y	Special version	
030		Primary (Digital) output	
	N	Enraf BPM	
	P	RS485 Modbus	
	F	Not selected	
	A	Serial pulse (Sakura V1/MDP)	
	J	Serial pulse (Sakura MDP)	
	B	Serial pulse (Sakura BBB)	
	C	Serial pulse (Sakura MIC + RS-232C)	
	D	Serial pulse (Sakura MIC)	
	G	HART (active)	
	H	HART (passive)	
	L	Whessoematic 550, with lightning protection	
	M	Mark / Space	
040		Secondary output	
	0	Not selected	
	1	Alarm contact, 4x SPST	
	2	4 - 20 mA , 2 channels selectable	
	3	4 x SPST + 4 - 20 mA, 2 channels	
	4	2 x SPST; Overspill protection	
	5	4 x SPST; 4 - 20 mA, 1 channel	
050		Signal input from field units	
	0	HART protocol (e.g. NMT, NRF)	
	1	HART + Pt100 Spot temp.	
	2	HART + Operation contact, 3digits	
	3	HART + Pt100 Spot temp.+ Operation contact	
	4	HART + 1 x status	
	5	HART + Pt100 Spot temp. + 1 x status	
	6	HART + Pt100 + Operation contact + 1 x status	
060		Measuring range, wire material	
	A	Range: 0 -10m, wire d=0.2 mm,AISI316	
	B	Range: 0 -16m, wire d=0.2 mm,AISI316	
	C	Range: 0 -10m, wire d=0.4 AISI316 PFA covered	
	D	Range: 0 -16m, wire d=0.4 AISI316 PFA covered	
	Y	Special version	
070		Cable entry	
	A	Four thread G(PF)1/2"	
	B	Four thread G(PF)3/4"	
	C	Four thread NPT1/2"	
	D	Four thread NPT3/4"	
	E	Four thread PG 16	
	F	Four thread PG 21	
	G	Four thread M20	
	H	Four thread M25	
	Y	Special version	
080		Process Connection	
	A	Flange JIS10 K 80A RF	
	B	Flange JIS10 K 80A FF	
	C	Flange ANSI 3" 150 lbs RF	
	D	Flange DIN DN80 PN10 RF	
	E	Flange JPI 3" 150 lbs RF	
	Y	Special version	
NMS7-		Product designation (part 1)	

090														Power supply			
														0	85 - 264 VAC, 50/60 Hz		
														1	20 - 62 VDC, 20W/ 20 - 55 VAC, 50/60 Hz, 20VA		
100														Displacer shape, diameter, material			
														A	Cylindrical 50 mm; AISI316 buff finished		
														B	Cylindrical 40 mm; AISI316 polished finished		
														C	Cylindrical 30 mm, AISI316 polished finished		
														D	Cylindrical 50 mm, PTFE		
														E	Cylindrical 40 mm, PTFE		
														F	Cylindrical 30 mm, PTFE		
														Y	Special version		
110														O-ring; chamber finishing			
														0	NBR; Standard chamber milling finished		
														1	Silicon; Standard chamber buff finished		
														2	Fluor rubber, basic version		
														5	Silicon rubber, PTFE coated chamber		
														9	Special version		
120														Nozzle			
														A	With cleaning nozzle PT 3/8" threaded		
														B	With cleaning nozzle NPT 3/8" threaded		
														C	With cleaning nozzle PF 3/8" threaded		
														D	With gas purging nozzle PT 3/8" threaded		
														E	With gas purging nozzle NPT 3/8" threaded		
														F	With gas purging nozzle PF 3/8" threaded		
														G	With cleaning + gas purging nozzle PT 3/8" threaded		
														H	With cleaning + gas purging nozzle NPT 3/8" threaded		
														J	With cleaning + gas purging nozzle PF 3/8" threaded		
														Y	Special version,		
130														Additional Option			
														A	Not selected		
														B	Sealing function		
														C	Degreased		
														D	Sun shade		
														E	Sealing function + Degreased		
														F	Sealing function + Sun shade		
														G	Sun shade + Degreased		
														H	Sealing function, Sun shade + Degreased		
														Y	Special version		
NMS7-																	Complete product designation

Accessories

Calibration Chamber



Calibration chamber is recommended for use with tank level gauges in order to allow maintenance (removing displacers), while tank is in service.

Standard chamber is 6" flange, with bolts & packing for NMS connection.

Note!

The dimensions differ depending on material, flange size. Please contact Endress+Hauaser for details.

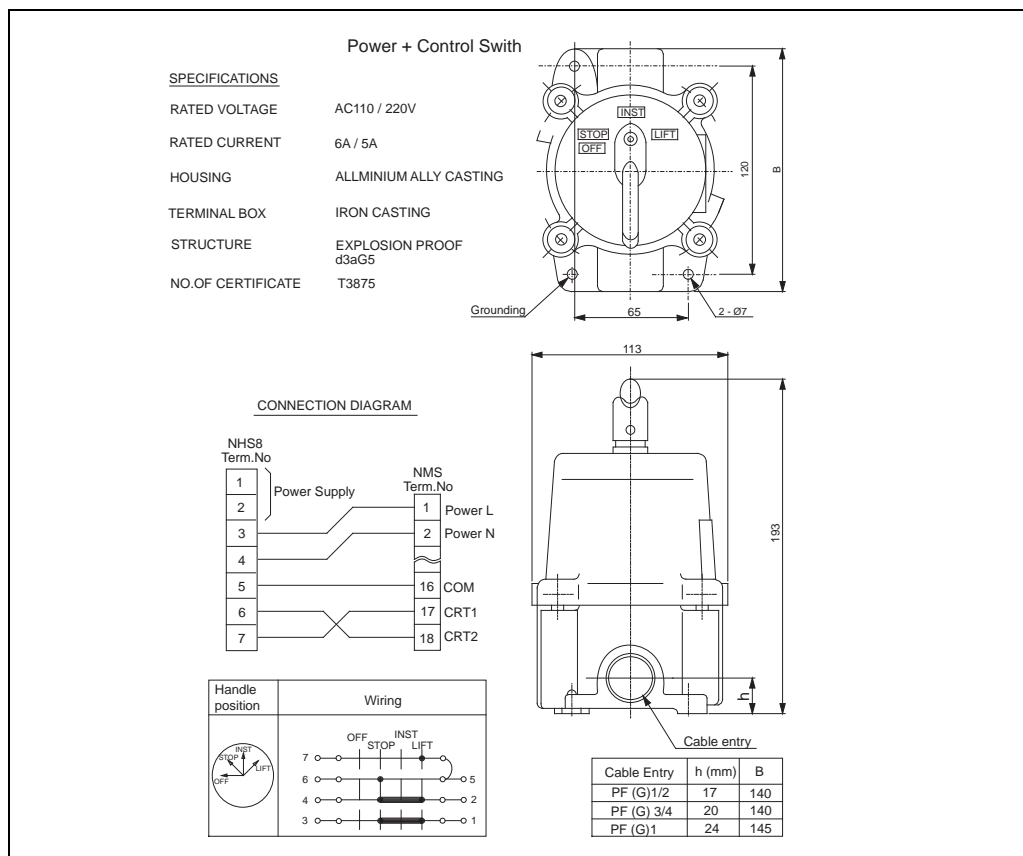
NHC4HP (high pressure version)

10	Process Connection	
	A	Flange JIS 10K 150A RF
	C	Flange JIS 10K 150A FF
	E	Flange JIS 20K 150A RF
	G	Flange ANSI 6" 150lbs RF
	J	Flange ANSI 6" 300lbs RF
	L	Flange DIN DN 150 PN 10 RF
	N	Flange DIN DN 150 PN 25 RF
	Q	Flange JPI 6" 150lbs RF
	S	Flange JPI 6" 300lbs RF
	9	Special version
20	Material	
	2	Carbon steel (STPG370/SS400)
	3	Stainless steel / SUS304
	9	Special version
30	Bolts, Packing	
	0	not used
	1	Stainless steel 304 + Valker #6502
	9	Special versiond
40	Pressure Gauge, Relief Valve	
	1	used
	9	Special version
NHC4HP-		Complete product designation

NHC4LP (low pressure version)

10	Process Connection		
	A	Flange JIS 10K 150A RF	
	C	Flange JIS 10K 150A FF	
	G	Flange ANSI 6" 150lbs RF	
	L	Flange DIN DN 150 PN 10 RF	
	Q	Flange JPI 6" 150lbs RF	
	9	Special version	
20	Material		
	1	Alu casting (AC4A)	
	3	Stainless steel / SUS304	
	9	Special version	
30	Bolts, Packing		
	0	not used	
	1	Stainless steel 304 + Walker #6502	
	9	Special version	
NHC4LP-	<input type="text"/>	<input type="text"/>	<input type="text"/>
			Complete product designation

Power+Control Switch

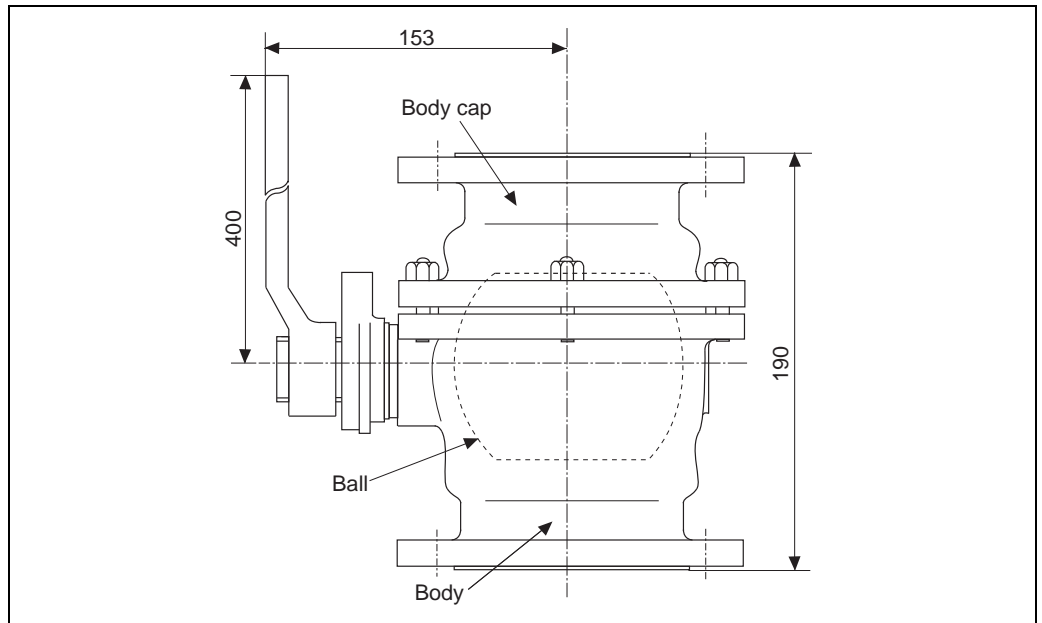


Power & Control Switch is used for tank gauges field mounted, for tank gauges. It provides additional switching of operation contacts of the gauge in order to control the gauge's operation such as lift up displacer.

NHS8

10	Approval
	1 Weather proof IP67 2 Flame proof (JIS d3aG5) 9 Special version
20	Cable entry
	0 2 x thread G3/4 1 2 x thread G1 2 2 x thread NPT3/4 3 2 x thread NPT1 9 Special version
NHS8-	Complete product designation

Ball Valve



Ball valve is recommended for use with tank level gauges in order to allow maintenance such as removing displacers, while tank is in service.

Standard ball valve with ANSI flanges. Ball material is SS304, seat material is PTFE.

Note!

The dimensions differ depending on material, flange size. Please contact Endress+Hauser for details.

NHV4A (ANSI flanges)

Standard ball valve with ANSI flanges. Ball material is SS304, seat material is PTFE.

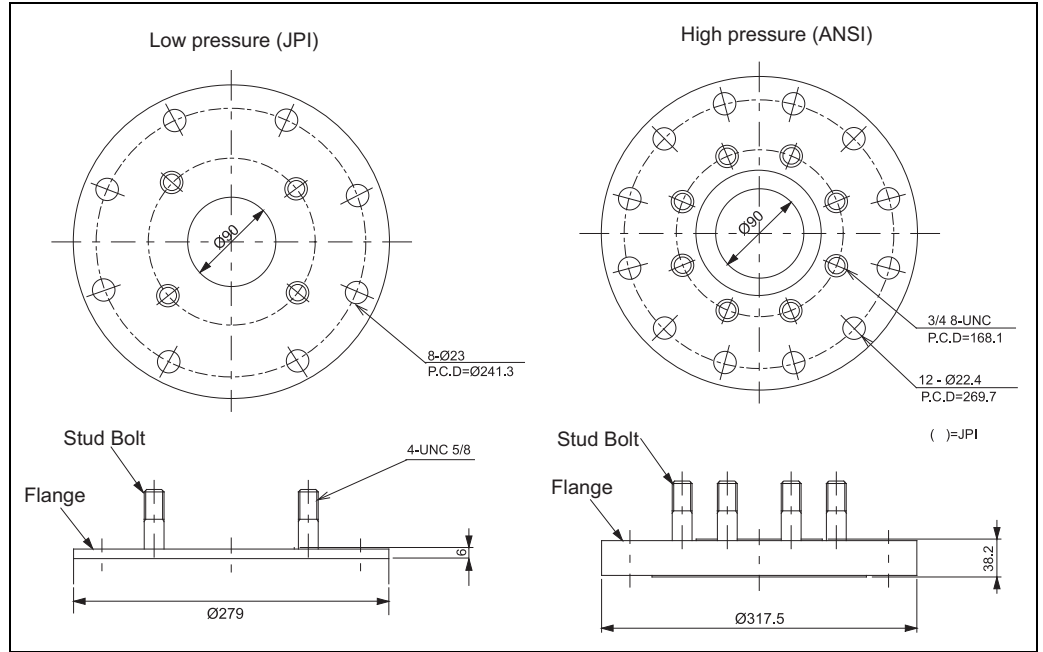
10	Process Connection ; Body
	C31 Flange ANSI 3" 150lbs RF; mild steel
	C33 Flange ANSI 3" 300lbs RF; mild steel
	C61 Flange ANSI 6" 150lbs RF; mild steel
	C63 Flange ANSI 6" 300lbs RF; mild steel
	S31 Flange ANSI 3" 150lbs RF; SS304
	S33 Flange ANSI 3" 300lbs RF; SS304
	S61 Flange ANSI 6" 150lbs RF; SS304
	S63 Flange ANSI 6" 300lbs RF; SS304
	Y99 Special version
20	Ball Type
	A full bore
	B reduced bore
	9 Special version
NHV4A- <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Complete product designation	

NHV4J (JIS flanges)

For body in mild steel and in SS304, ball material is SS304, ball material is SS304. For body in SS316, ball material is SS316. Seal material is PTFE.

10		Process Connection ; Body
	C11	Flange JIS 10K 80A RF; steel
	C12	Flange JIS 10K 150A RF; steel
	C21	Flange JIS 20K 80A RF; steel
	C22	Flange JIS 20K 150A RF; steel
	S11	Flange JIS 10K 80A RF; SS316
	S12	Flange JIS 10K 150A RF; SS316
	S21	Flange JIS 20K 80A RF; SS316
	S22	Flange JIS 20K 150A RF; SS316
	H11	Flange JIS 10K 80A RF; steel
	H12	Flange JIS 10K 150A RF; steel
	H21	Flange JIS 20K 80A RF; steel
	H22	Flange JIS 20K 150A RF; steel
	Y99	Special version
20		Ball Type
	A	full bore
	B	reduced bore
	9	Special version
NHV4J-		Complete product designation

Reducing Flange



Mounting with Guide Wire requires the reducing flange. Also, it is required to match customer's nozzle with Proservo flange. Proservo connection is always 3"/DN80. The reducing flange is equipped with stud bolts for the Proservo uge connection.

NHF4

10	Process Connection ; Body														
	A	Flange JIS 10K 150A RF													
	C	Flange JIS 10K 150A FF													
	E	Flange JIS 20K 150A RF													
	G	Flange ANSI 6" 150lbs RF													
	J	Flange ANSI 6" 300lbs RF													
	L	Flange DIN DN150 PN10 RF													
	N	Flange DIN DN150 PN25 RF													
	Q	Flange JPI 6" 150lbs RF													
	S	Flange JPI 6" 300lbs RF													
	Y	Special version													
20	Flange Material														
	0	Mild steel (JIS SS41)													
	1	Stainless steel SS304													
	9	Special version													
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NHF4-												Complete product designation			

Supplementary Documentation

Technical Information

TI 039N
Technical Information Prothermo NMT 535

TI 042N
Technical Information Prothermo NMT 539

TI 008N
Technical Information Promonitor NRF 560

TI 014N
Technical Information Tank Computer NRM 571

Operating Manual

BA1001N
Operating Manual Proservo NMS5/7 series

Compact Instructions

KA 001N
Compact Instruction Whessoemtric 550

KA 002N
Compact Instruction RS485 Modbus

Safety Instructions

XA 006N
Proservo NMS5/7 series - ATEX II 2/1 G, II 2 G (KEMA)

XA 007N
Proservo NMS5/7 series - ATEX II 2/1 G, II 2 G (PTB)

XA 001N
Proservo NMS5/7 series - ATEX II 2/1 G, II 2 G (ZELM)

Appendix

Stainless Steel conversion table

The stainless steel material used in products of Endress + Hauser Yamanashi normally have expressions according to Japanese industrial standards, such as JIS. Each country or region may have different expressions place to place.

The following conversion table contains the expression of equivalent stainless steel material based on the chemical composition and mechanical properties.

Country	Standard	Expressions			
Japan	JIS	SUS304	SUS304L	SUS316	SUS316L
Germany	DIN 17006	X5 CrNi 18 10 X5 CrNi 18 12	X2 CrNi 18 11	X5 CrNiMo 17 12 2 / 17 13 3	X2 CrNiMo 17 13 2
	W.N. 17007	1.4301 1.4303	1.4306	1.4401 / 1.4436	1.4404
France	AFNOR	Z 6 CN 18-09	Z 2CN 18-10	Z 6 CND 17-11 / 17 12	Z2 CND 17-12
Italy	UNI	X5 CrNi 1810	X2 CrNi 1911	X5 CrNiMo 1712 / 1713	X2 CrNiMo 1712
U.K.	BSI	304S15 / 304S16	304S11	316S31 / 316S33	316S11
U.S.A.	AISI	304	304 L	316	316L
U.E.	EURONORM	X6 CrNi 1810	X3 CrNi 1810	X6 CrNiMo 17 12 2 / 17 13 3	X3 CrNiMo 17 12 2
Spain	UNE	X6 CrNi 19-10	X2 CrNi 19-10	X6 CrNiMo 17-12-03	X2 CrNiMo 17-12-03
Russia	GOST	08KH18N10 06KH18N11	03KH18N11	-	03KH17N14M2
-	ISO	11	10	20	19
-	ASME	S30400	S30403	S31600	S31603

Note!

Since each standard carries its own mechanical and scientific definition, some expressions may not have the straight conversion from the Japanese standard. Consult with the local authority or legislature to ensure the proper comparison of the applied standard prior to determining specification.

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