Level | Pressure | Flow | Temperature | Liquid Analysis | Registration | Systems Components | Services | Solutions

Technical Information

Tank computer NRM 571 (SW version 4.0)

Multi function receiver for tank gauging systems

Application

The Tank Computer NRM 571 is a unique intelligent interface unit, combined with data display, calculation and gauge operating functions, to meet the tough demands of today's tank gauging requirements.
Unlike a conventional loop connection field interface unit, the NRM 571 is able to display measured values and various information on the integrated LCD display. The front panel of the NRM 571 has control key pads that an operator can directly command gauges without auxiliary controllers.
The NRM 571 can be connected up to 40 field sensors (max. 10 sensors x 4 loops) via bi-serial communication.
The collected tank data in the NRM 571 can be directly transmitted and / or calculated by integrated conversion tables (Volume & Mass calculation) to the host tank gauge program via RS232C (Modbus and others integrated) output.
For the safety of the device and environment, the NRM 571 has integrated surge protection and efficient power management system to meet appropriate EN standards.

Feather and benefits

The new Tank Computer NRM 571 version 4.x has several new features over the previous version.

Radar application

The new NRM 571 can communicate to the Tank Side Monitor NRF 590. This dedicated V1 communication enables seamless data acquisition for radar applications.

"ToF" tool compatibility

To comply with Endress+Hauser's standard service tool, the ToF tool, the NRM571 can be configured by a ToF tool installed PC by simple serial port connection without modems.

Density Profile functionality

The new NRM 571 has complete data access and full control of the Proservo NMS 53x with density profile function implemented via V1 communication.

TI 014N/08/en/10.05
Software Ver. 4.00

Endress+Hauser
People for Process Automation

Table of Contents

Function and system design

Measuring System

The Tank Computer NRM 571 is a uniquely featured Endress+Hauser tank gauge interface unit designed for small to medium sized tank farms with connectivity to up to 40 tank sensors.
Tank information (level, temperature, density, etc.) are carried on the field bus via the Proservo NMS 53x or Tank Side Monitor NRF 590 to the NRM in the control room. Then, the measured and processed information within the NRM are transmitted to the desired host program

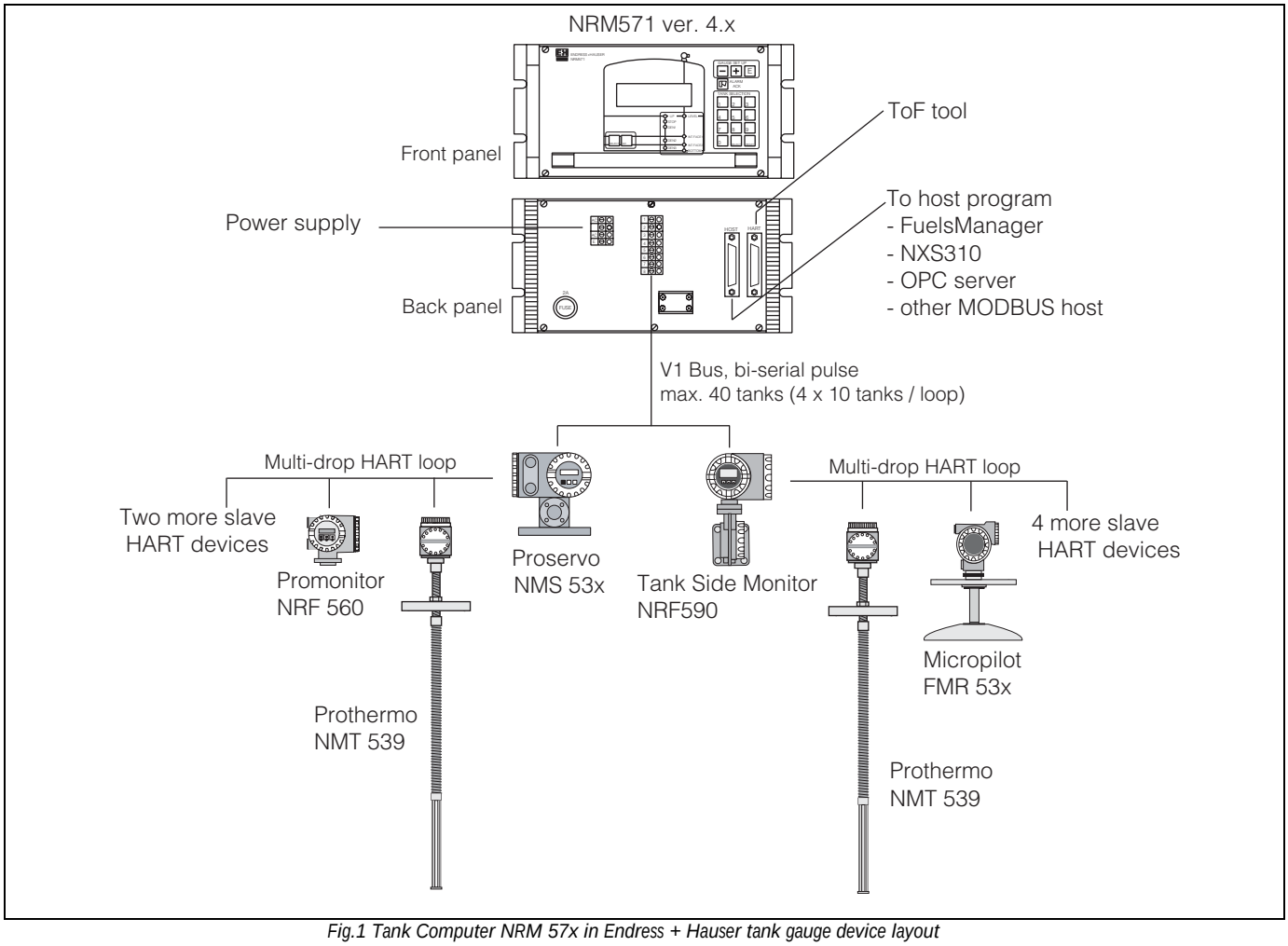

Fig.1 Tank Computer NRM 57x in Endress + Hauser tank gauge device layout

Internal block diagram

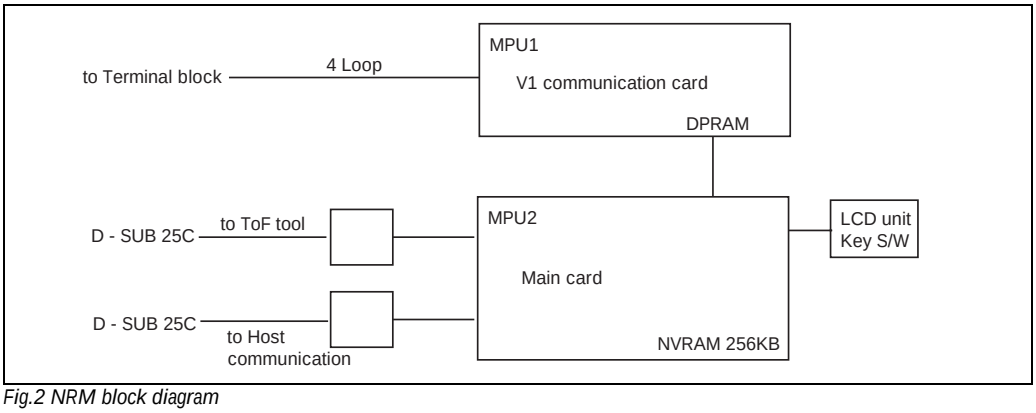

Fig.2 NRM block diagram

To achieve simple construction and fast internal communication, the NRM employs one communication card and one main CPU card along with a HART and RS-232C converter only.

Bus connection

The NRM 571 offers available field bus communication protocol as V1 bi-serial. The maximum number of bus connected transmitters is normally 40 (some restriction may apply depending on the loop condition). The recommended loop connection limits to 10 tanks per loop.

Note!
The integrated function on the latest software version V4.0 and later will only be available with serial pulse V1 protocol (see details on the later section “Field device communication”).

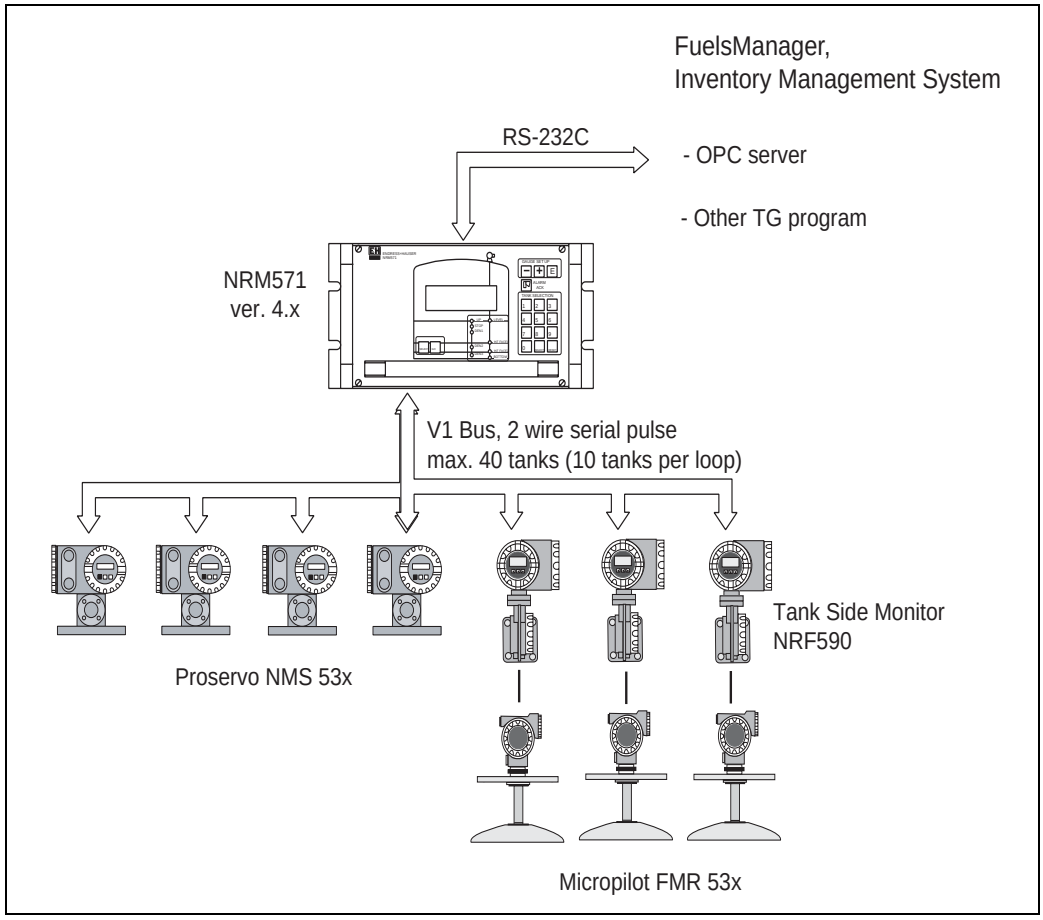

Fig.3 V1 bi-serial Bus connection diagram

Computing functionality

Unlike other interface units, the NRM 571 has integrated volume/mass calculation functionality along with 200 point strapping table configuration. The input sensory data will be precisely converted and standardized to meet the requirements of custody transfer applications (see details on the BA005N/08/en NRM 571 operation manual)

Communication to the host system

The measured and calculated values are transmitted to the host system. Mainly, these values become useful factors to establish operation parameters in tank gauging designated programs like FuelsManager or NXS 310. However, the NRM 571 is also highly adaptable to conventional open systems due to the employment of RS-232C Modbus protocol. This easily allows the NRM 571 to be combined with the OPC server and parallel redundant system.

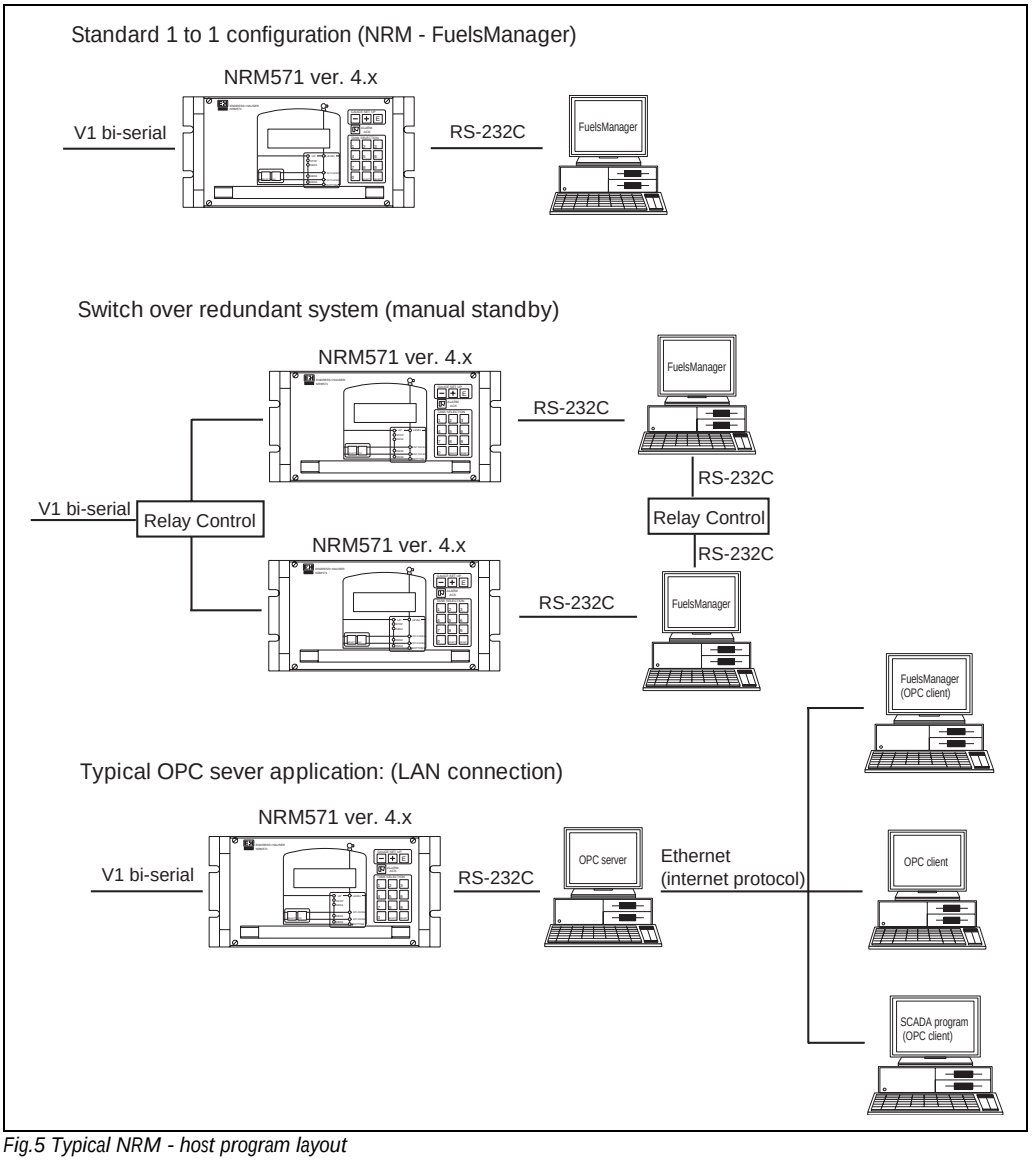

Fig.5 Typical NRM - host program layout

Note!
Software version 4.0 or later will be compatible with OPC server functionality.

Field device communication

Sensor input

The field sensory input (maximum of 40 sensors) can be available with Vi bi-serial communication protocol.

Note!
The new NRM 571 software version 4.0 does not offer Rackbus protocol communication that is only available with previous version 2.0.

Serial pulse V1

V1 protocol is the standard Endress+Hauser tank gauging field protocol. Specialized for tank gauging, V1 bi-serial communication enables the connection of field devices to the NRM 571 up to 6000 m per loop.

Note!
The communication cable wiring must be isolated from the power supply or any other noise affected cables. The recommended cable type is a twisted pair shield cable AWG18.

Data transmission parameters
V1 protocol has two different commanding groups, “Z command” and “R command”, to carry data parameters from connected sensors. All information in both commanding groups is coded by ASCII.

Z command
This is a group of parameters that are normally required for the majority of tank gauging operations. Z0 is the full length version and Z1 is the preliminary short version.

Note!
Below, the described data parameters are a part of the whole Z command sequence. In order to complete Z command, start text, device address, data address, A, ETX and checksum information must be combined.

Table 1: Z command data parameter

Parameter	Digit	Coding	Z0	Z1
Level	6	10^4 | 10^3 | 10^2 | 10^1 | 10^0 | 10^{-1}	available	available
Temperature	5	± | 10^2 | 10^1 | 10^0 | 10^{-1}	available	N.A.
Sensor status	2	01: UP 02: STOP 03: BOTTOM 04: UPPER DENSITY 05: LEVEL (Displacer hoist) 06: LEVEL (Displacer Balanced) 07: LEVEL (Displacer down) 08: UPPER I/F LEVEL 09: RELEASE OVERTENSION 10: MIDDLE DENSITY (NMS only) 11: BOTTOM DENSITY (NMS only) 12: MIDDLE I/F LEVEL (NMS only) 13: CALIBRATION ACTIVE (NMS only)	available	available
Sensor error information	2	01: OVERTENSION 02: UNDERTENSION 03: ENCODER 04: HALL SENSOR	available	available
External status	1 byte	0,1,...F (contact input)	available	available
0.0 ~ 100.0% signal (for 4 ~ 20mA input)	4	10^2 | 10^1 | 10^0 | 10^{-1} (NMS not available)	available	N.A.

Parameter	Digit	Coding	Z0	Z1
Alarm	1 byte	0: No alarm 1: Alarm-1 2: Alarm-2 3: Alarm 1-2, depends on alarm condition at GVH280 ~ 283	available	available
Balance status	1 byte	0: UNBALANCED 1: BALANCED	available	available
Answer back operation	2	00: Level 01: UP 02: STOP 03: BOTTOM 04: RELEASE 05: UPPER DENSITY 06: UPPER I/F LEVEL 07: MIDDLE DENSITY 08: DENSITY BOTTOM 09: MIDDLE I/F LEVEL	available	available

R command

This is an optional read command to look into the specific value and registered parameters. Data access can be completed by entering “Mode” and “Item”. The concept of “Mode” and “Item” are defined in the V1 protocol specification.

Note!

Normally, the Proservo NMS 53x, Tank Side Monitor NRF 590 and TMD series float and tape digital transmitters are connected on the V1 bus loop. Available output values from these field devices depend on the performance of each instrument. Please refer to each designated operation manual to confirm output parameters.

Connectable sensor type

NMS / TGM type servo gauge
Tank Side Monitor NRF 590 for radar tank gauging
TMD / MX / MS type digital transmitters (along with LT series Float and Tape gauges)

Max.connectable tank data

40 tanks (max. 10 tanks per loop)

Auxiliary energy

Electrical connection

The NRM has the simplest terminal connection to field sensors and host connection on its back panel.

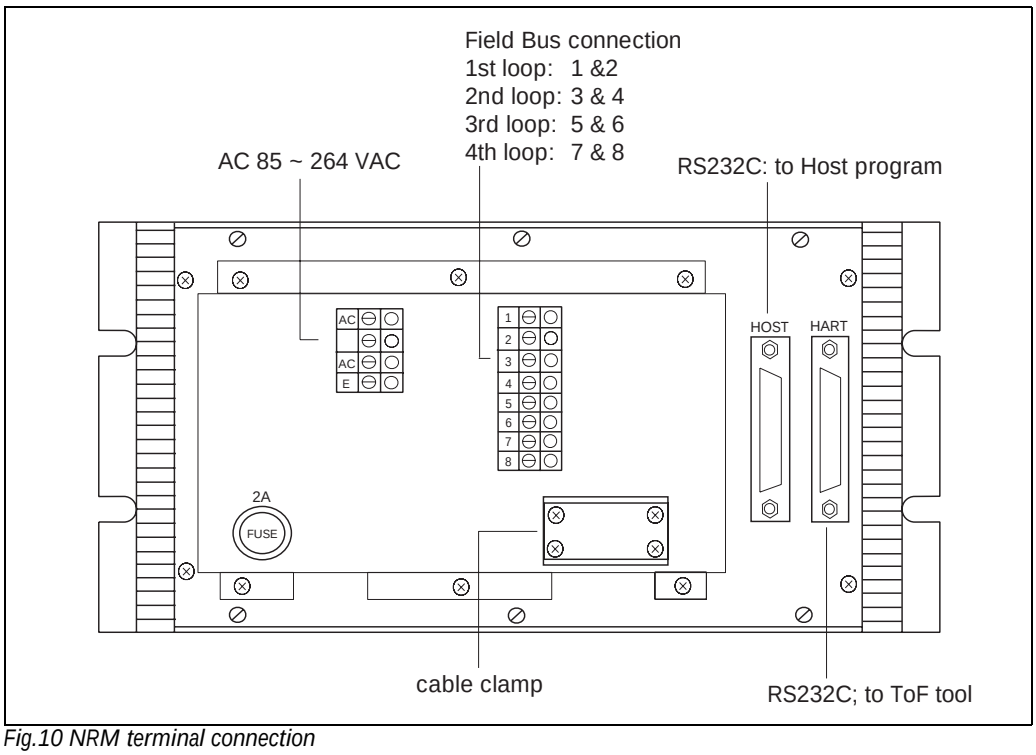

Fig.10 NRM terminal connection

Over voltage protection

The internal protection circuit endures up to AC 2000 V for one minute.

Note!
An auxiliary surge protector between input and ground is not included.

For the use of the auxiliary surge protector, the following precautions must be taken:

- · Connect the external over voltage protector and NRM field bus input to the local potential matching system.
- · Potentials shall be equalized both in and out of the explosion hazardous area.
- · The cable connection the over voltage protector and NRM shall not exceed one metre in length.
- · The cable must be protected with armored hose.

Power supply

Input	AC85 ~ 264V, 50 / 60Hz
Cooling method	Air cooled
Surge protection	max.2000VAC for one minute.(exclude auxiliary surge protector)

Ambient condition

Ambient temperature	0...+50°C (operation) -10...+60°C (storage)

Output (RS232C for host programs)

Baud rate	2,400 / 4,800 / 9,600 /19,200 bps
Parity	Even / Odd / No Parity
Spot bit	1 or 2
Protocol	MDP / BBB MODBUS: NRM / Float 1 and 2 / MDP / Density Profile

Mechanical construction

Design and dimensions

The NRM can be used as a rack mount type or desktop type depending on installation conditions.

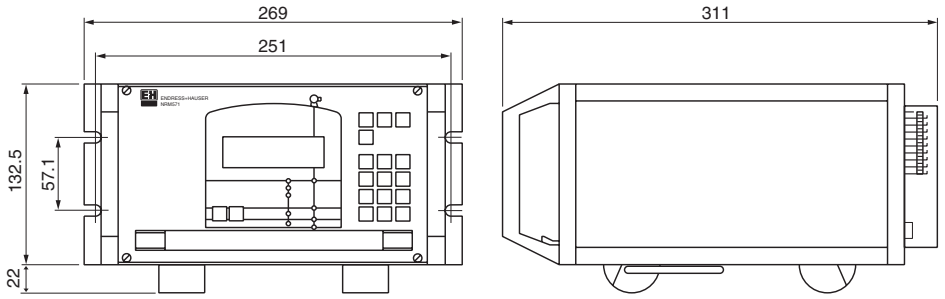

Fig.11 NRM dimension

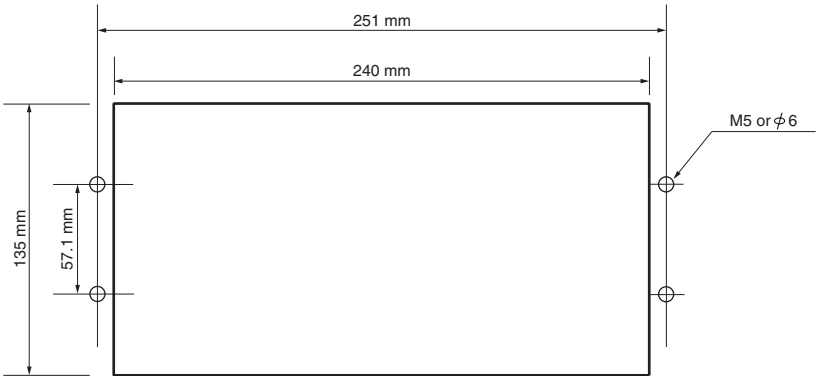

Fig.12 NRM rack mount panel cut dimension

Note!
Thickness of rack mount installation panel shall be more than 2mm.

Volume calculation

Gross volume calculation by tank table (CRT/FRT)
Tank coefficenct (ST)
VCF calculation for net volume calculation ASTM D 1250 T54A, B,D, T55, 6X...etc

Setting function

Calendar (year, month, data)time (HOUR, MINUTE, SECOND)
Measurement variable: level / Temperature / Density...etc

Tank selection
10 key / "SELECT" key / "RESET" key

Matrix selection
[+], [-], [E] keys

Alarm recognition
"ALARM ACK" key

Buzzer
Output when alarm is set off

Human interface

Front panel

Unlike other stand alone remote I/F units, the NRM has the distinctive features of a front panel display and direct key operation.

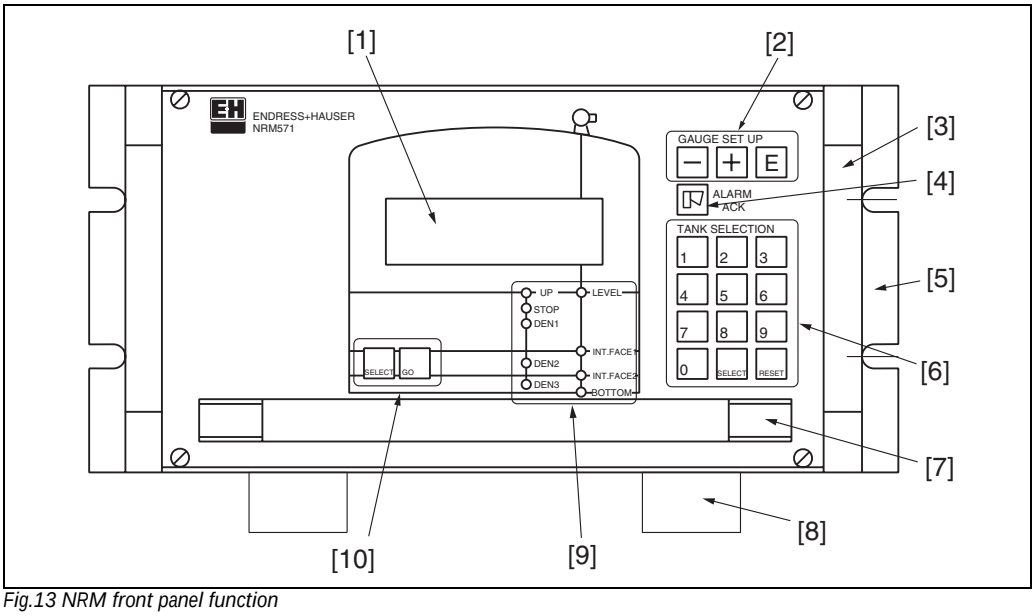

Fig.13 NRM front panel function

1: Backlit LCD indicator
For the display of various tank data. Measured values, gauge operation status and alarm status are available.

2: Gauge setup key
Same operation concept as the Endress+Hauser three-key concept. Enter to matrix and function group and read and write various parameters.

3: Carrying handle “A”
A pair of carrying handles attached on the NRM external housing.

4: “ALARM ACK” key
Alarm acknowledgement key. It can also be used as the alarm release switch.

5: Panel mount adapter
Mounting adapter used to embed the device in a panel.

6: “TANK SELECTION” key
Typical numeric 10-key pad operation switches to select desired tank number.

7: Withdraw handle “B”
A pair of simple pull handles to withdraw NRM's internal module from the main external housing for service purposes.

8: Feet
Retractable feet to adjust the NRM to the appropriate operating angle on the desktop installation.

9: LED gauge condition indicator
Indication of NMS/TGM type servo gauge displacer position. It is also used as alarm indication with blinking LEDs.

10: Gauge operation key
Actual command key for servo gauge operation. “SELECT” to choose desired measurement command, and “GO” to execute.

LCD Display

Backlit LCD indication: 20 character x 40 line
Character composition: 5 x 8 dots
Character size: 2.95 x 4.75 mm

Lauguage
- English
- Japanese

Display and Operation

One of the unique features of the NRM is the backlit LCD display for various measured data, configuration parameters and gauge and communication status. Operation can be performed by three integrated keys (same principle as Proservo) and a 10-key pad. As a result, auxiliary PC or HHT (Hand Held Terminal) input devices are not required during normal operating conditions (see details on the later section “Human interface”).

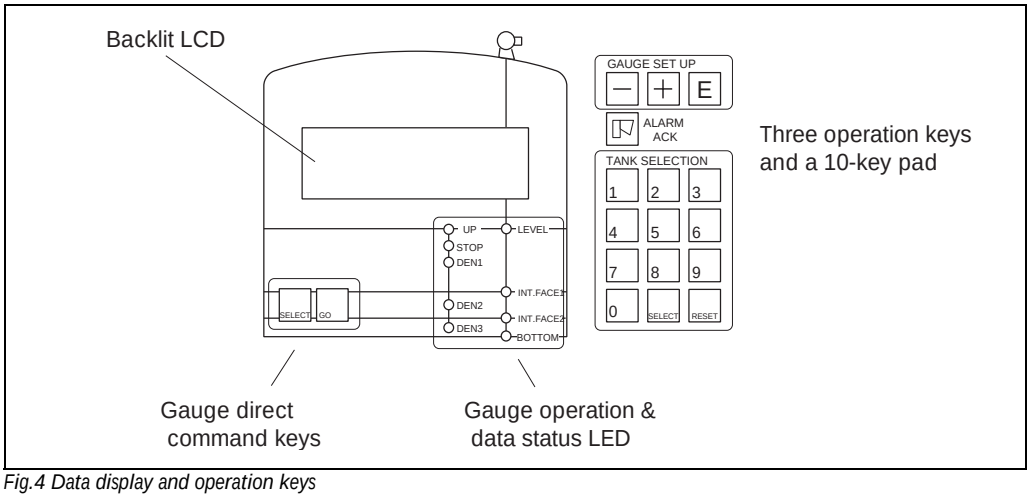

Fig.4 Data display and operation keys

Gauge operation
The NRM can transmit gauge operation commands (various measurement functions) to each of the connected servo gauges on the V1 loop.
- Level
- Upper and Middle interface
- Upper, Middle and Lower spot density
- Tank and Interface density profile
- Tank bottom
- Repeatability check
- Water dip

ToF tool

A new feature added on version 4.0 is compatible to Endress+Hauser's field service tool, ToF tool. The PC installed ToF software is connected to one of the RS-232C ports, on the back of the NRM 571, directly without a HART modem or any other communication interface.

Note!
Please refer to BA 005N/08/en for a description of each matrix function and available function groups via the PC installed ToF tool.

Device configuration

As an alternative to the device key pads, the ToF tool can configure all of the NRM 571 device parameters via PC.

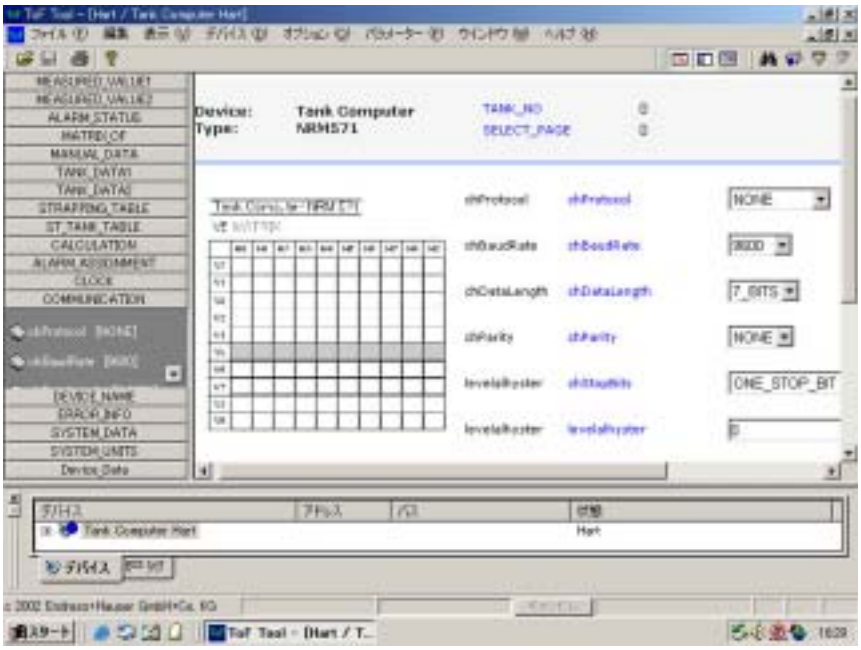

Fig.6 ToF screen shot for V1 communication configuration

Tank table development

NRM can perform correction in various volume calculation based on pre-configured strapping table (up 200 points / tank). These parameters and correction factors can be entered on the ToF tool.

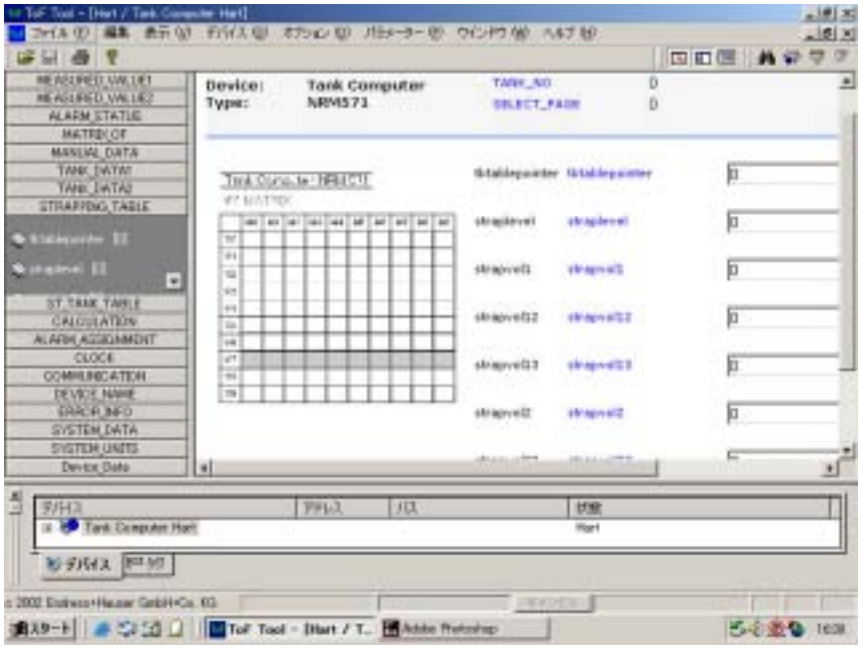

Fig.7 ToF screen shot for strapping table development

V1 Packed HART (ver. 4.1 and later... pending)

V1 packed HART configuration functionality is integrated in NRM software version 4.1. This smart remote access functionality enables the operator to configure the Tank Side Monitor NRF 590 along with the Micropilot and other multi-drop loop powered HART devices conveniently from non-hazardous areas via the V1 loop.

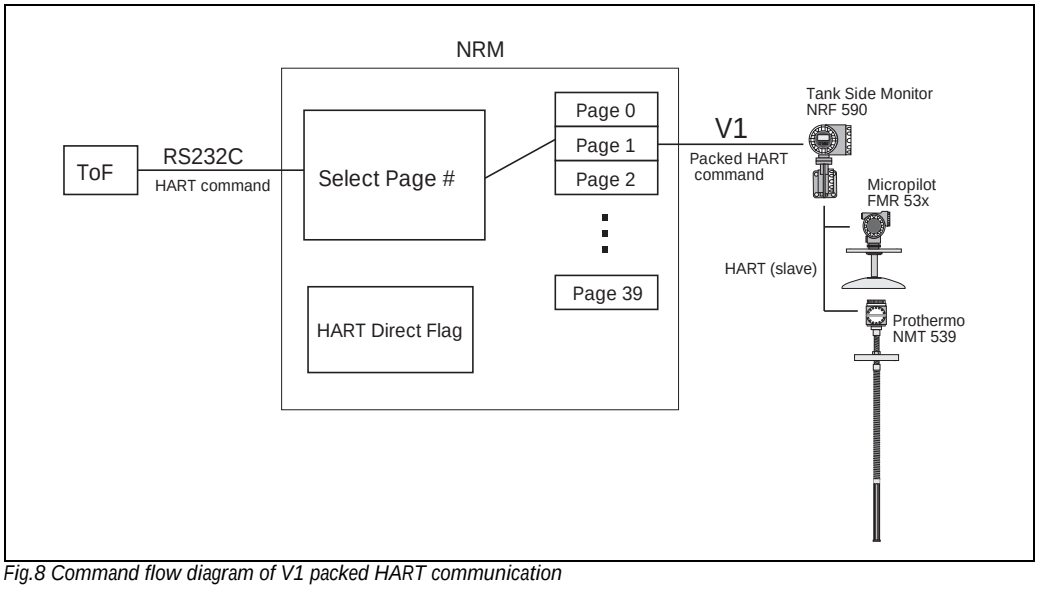

Fig.8 Command flow diagram of V1 packed HART communication

Note!
Only NRF 590 software version 2.0 or later will have this V1 packed HART compatibility.

Host communication

Output signals to host receiver

The NRM 571 does not initiate command requests since it is positioned as a “slave” device when connected to a host receiver (host tank gauging program). The NRM 571 has a serial port output, RS 232C, to communication to a host tank gauging program via conventional Endress+Hauser tank gauging protocols BBB and MDP or various Modbus protocols. The NRM 571 contains five different Modbus address maps depending on the host program requires. Other than protocol type, the NRM 571 has baud rate, data length, parity and various hysteresis adjustment functions as well.

Transmission specifications

Physical layer:EIA RS232C
Synchronization method:Start – stop synchronization (asynchronism)
Communication procedure:Bi-directional half-duplex communication
Connection:Point to point
Transmission speed:2400 / 4800 / 9600 / 19200 BPS selectable

Frame

Start bit:1 start bit
Data:7 bits / 8 bits selectable
Parity:Even number / Odd number / None selectable
Stop bit:1 stop bit / 2 stop bits selectable
Mode:NRM 571 side – DTE mode, Host side – DCE mode

Conventional Endress+Hauser tank gauging protocols

BBB protocol

BBB, as the previous Endress+Hauser medium sized tank gauging interface unit, is employed to the host communication hardware in an existing tank gauging system, a protocol that was also called “BBB”.

BBB protocol address map

Please check the BA005N/08/en NRM 571 operation manual for details.

MDP protocol

MDP represents the specific Endress+Hauser tank gauging protocol that is widely used in “MDP-II” total tank gauging systems.

MDP protocol address map

Please check the BA005N/08/en NRM 571 operation manual for details.

MODBUS protocol

RS-232C Modbus is a widely accepted open protocol that achieves higher compatibility to foreign tank gauging systems or general instrument control systems.

Mode

RTU mode

Message configuration

Each message is delivered and transmitted in the following sequence:

Slave address: 8 bits
Function code: 8 bits
DATA: N * 8 bits
Error check CRC: 16 bits

Slave address

1 – 247

Function code
Function code 03:data read
Function code 16:data write

Error processing
The NRM executes the following process if an error (or errors) occurs in the transmitted text.

No reply	Slave address: 8 bits
	Function code: 8 bits
	DATA: N * 8 bits
	Error check CRC: 16 bits
Error message	01: Incorrect slave address requested (other than range of 1 ~ 247)
	02: Incorrect start address specified
	03: Incorrect data point number
	07: Incorrect function code

Communication time
Modbus data transmission between NRM to host receiver shall be completed based on the following sequence:

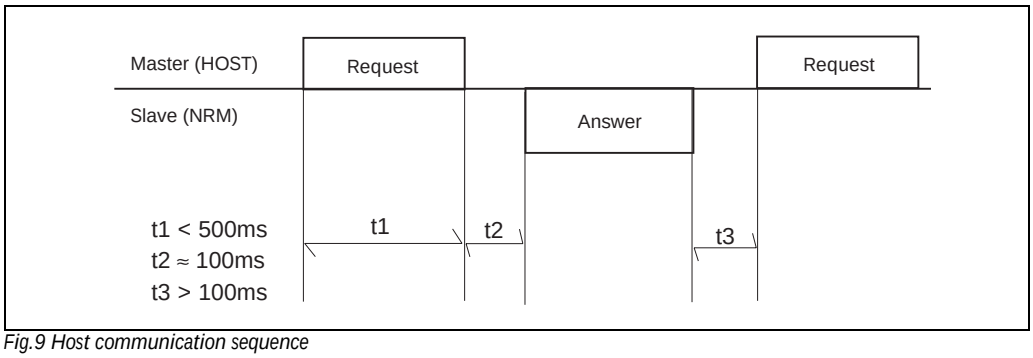

Fig.9 Host communication sequence

Note!
The transmitted values between NRM to host receiver must have designated units prior to performing any conversion.

- Level: mm (millimeters)
- Temperature: °C (Celsius)
- Gross and Net Standard Volume (NSV): l (liter)
- Mass: kg (kilogram)
- Ref. density: g/cm³ (grams per cubic centimeter)

MODBUS address map (NRM)

Address	Page	Function Code	Item	Tran sfer Range	Unit	Note
40001	0	03	Level	0 to 65535	mm	
40002	0	03	Temp.	-99.9 to 360.0	C	* 10^{-1}
40003	0	03	Gross Volume (L)	0 to 99999	L	99999 9.999
40004	0	03	Gross Volume (H)	0 to 32767	L	32767 9.999
40005	0	03	Net Volume (L)	0 to 99999	L	99999 9.999
40006	0	03	Net Volume (H)	0 to 32767	L	32767 9.999
40007	0	03	MASS (L)	0 to 99999	Kg	99999 9.999
40008	0	03	MASS (H)	0 to 32767	Kg	32767 9.999
40009	0	03	REF.Density	0 to 3.2767	g/Cm3	* 10^{-4}
40010	0	03	Status Data 1	0 to 1111		
40011	0	03	Status Data 2	0 to 1111		
40012	0	03	Sensor Alarm	0 to 4		
40013	0	03	Sensor Error	0 to 999		
40014	0	03	NRM Alarm	0 to 4		
40015	0	03	Communication Err.	0 to 999		
40016	0	03	Gauge Status	0 to 15		0 to F
40017	0	03	Balance Status	0 to 1		
40018	0	03	Water Level	0 to 32767	mm	
40019	0	03	Gas Temp .	-99.9 to 300.0	C	* 10^{-1}
40020	0	03	Gas Pressure	0 to 3.2767	kg/Cm2	* 10^{-4}
40021	0	03	Mid. Interface Level	0 to 32767	mm	
40022	0	03	Mid. Density	0 to 3.2767	g/Cm3	* 10^{-4}
40023	0	03	Bottom Density	0 to 3.2767	g/Cm3	* 10^{-4}
40024	0	16	Gauge Operation	0 to 15		0 to F
40025	0	---	SPARE			
40026	1					
:	:					
:	:					
40050	1					
:	:					
:	:					
40976	39					
:	:					
:	:					
41000	39					

MODBUS address map (Float 1)

Address	Page	Function Code	Item	Tran sfer Range	Unit	Note
40001	0	03	Level	IEEE FLOA T DATA	mm	
40002	0	03	Temp.		C	
40003	0	03	Gross Volume		L	
40004	0	03	Net Volume		L	
40005	0	03	MASS		Kg	
40006	0	03	REF.Density	g	/Cm3	
40007	0	03	Status Data 1			
40008	0	03	Status Data 2			
40009	0	03	Sensor Alarm			
40010	0	03	Sensor Error			
40011	0	03	NRM Alarm			
40012	0	03	Communication Err.			
40013	0	03	Gauge Status			
40014	0	03	Balance Status			
40015	0	03	Water Level		mm	
40016	0	03	Gas Temp .	C		
40017	0	03	Gas Pressure		kg/Cm2	
40018	0	03	Mid. Interface Level		mm	
40019	0	03	Mid. Density	g	/Cm3	
40020	0	03	Bottom Density	g	/Cm3	
40021	0	16	Gauge Operation			
40022	0	---	SPARE			
40023	1					
:	:					
:	:					
40045	1					
:	:					
:	:					
40859	39					
:	:					
:	:					
40880	39					

MODBUS address map (Float 2)

Address	Page	Function Code	Item	Transfer Range	Unit	Note
40001	0	03	Level	IEEE FLOAT DATA	mm	
40002	1	03	Level		mm	
40003	2	03	Level		mm	
40004	3	03	Level		mm	
40005	4	03	Level		mm	
40006	5	03	Level		mm	
40007	6	03	Level		mm	
40008	7	03	Level		mm	
40009	8	03	Level		mm	
40010	9	03	Level		mm	
40011	10	03	Level		mm	
40012	11	03	Level		mm	
40013	12	03	Level		mm	
40014	13	03	Level		mm	
40015	14	03	Level		mm	
40016	15	03	Level		mm	
40017	16	03	Level		mm	
40018	17	03	Level		mm	
40019	18	03	Level		mm	
40020	19	03	Level		mm	
40021	20	03	Level		mm	
40022	21	03	Level		mm	
40023	22	03	Level		mm	
40024	23	03	Level		mm	
40025	24	03	Level		mm	
40026	25	03	Level		mm	
40027	26	03	Level		mm	
40028	27	03	Level		mm	
40029	28	03	Level		mm	
40030	29	03	Level		mm	
40031	30	03	Level		mm	
40032	31	03	Level		mm	
40033	32	03	Level		mm	
40034	33	03	Level		mm	
40035	34	03	Level		mm	
40036	35	03	Level		mm	
40037	36	03	Level		mm	
40038	37	03	Level		mm	
40039	38	03	Level		mm	
40040	39	03	Level		mm	

40041	0	03	Temp.		C	
:	:	:	:	:	:	
40080	39	03	Temp .	C		
40081	0	03	Gross Volume		L	
:	:	:	:	:	:	
40120	39	03	Gross Volume	L		
40121	0	03	Net Volume		L	
:	:	:	:	:	:	
40160	39	03	Net Volume	L		
40161	0	03	MASS		Kg	
:	:	:	:	:	:	
40200	39	03	MASS		Kg	
40201	0	03	REF.Density	g	/Cm3	
:	:	:	:	:	:	
40240	39	03	REF.Density	g	/Cm3	
40241	0	03	Status Data 1			
:	:	:	:	:	:	
40280	39	03	Status Data 1			
40281	0	03	Status Data 2			
:	:	:	:	:	:	
40320	39	03	Status Data 2			
40321	0	03	Sensor Alarm			
:	:	:	:	:	:	
40360	39	03	Sensor Alarm			
40361	0	03	Sensor Error			
:	:	:	:	:	:	
40400	39	03	Sensor Error			
40401	0	03	NRM Alarm			
:	:	:	:	:	:	
40440	39	03	NRM Alarm			
40441	0	03	Communication Err.			
:	:	:	:	:	:	
40480	39	03	Communication Err.			
40481	0	03	Gauge Status			
:	:	:	:	:	:	
40520	39	03	Gauge Status			
40521	0	03	Balance Status			
:	:	:	:	:	:	
40560	39	03	Balancœ Status			
40561	0	03	Water Level		mm	
:	:	:	:	:	:	
40600	39	03	Water Level		mm	
40601	0	03	Gas Temp .	C		
:	:	:	:	:	:	
40640	39	03	Gas Temp.		C	
40641	0	03	Gas Pressure		kg /Cm2	
:	:	:	:	:	:	
40680	39	03	Gas Pressure		kg /Cm2	
40681	0	03	Mid. Interface Level		mm	
:	:	:	:	:	:	
40720	39	03	Mid. Interface Level		mm	
40721	0	03	Mid. Density	g	/Cm3	
:	:	:	:	:	:	
40760	39	03	Mid. Density	g	/Cm3	
40761	0	03	Bottom Density	g	/Cm3	
:	:	:	:	:	:	
40800	39	03	Botto m Density	g	/Cm3	
40801	0	16	Gauge Operation			
:	:	:	:	:	:	
40840	39	16	Gauge Operation			

MODBUS address map (MDP)

Address	Page	Function Code	Item	Transfer Range	Unit	Note
40001	0	03	Page No.	0 to 39		
40002	0	03	Level	0 to 65535	mm	
40003	0	03	Temp.	-99.9 to 360.0	C	* 10^{-1}
40004	0	03	Water Level	0 to 32767	L	
40005	0	03	Gross Volume (L)	0 to 99999	L	
40006	0	03	Gross Volume (H)	0 to 32767	L	
40007	0	03	Net Volume (L)	0 to 99999	L	
40008	0	03	Net Volume (H)	0 to 32767	L	
40009	0	03	MASS (L)	0 to 99999	Kg	
40010	0	03	MASS (H)	0 to 32767	Kg	
40011	0	03	REF.Density	0 to 3.2767	g/Cm3	* 10^{-4}
40012	0	03	Gas Temp.	-99.9 to 300.0	C	* 10^{-1}
40013	0	03	Gas Pressure	0 to 3.2767	kg/Cm2	* 10^{-4}
40014	0	---	SPARE			
40015	0	---	SPARE			
40016	0	---	SPARE			
40017	1					
:	:					
40032	1					
40625	39					
:	:					
40640	39					

MODBUS address map (Density Profile)

Address	Page	Function Code	Item	Transfer Range	Unit	Note
40001	0	03	Level	0 to 65535	mm	
40002	0	03	Temp.	-99.9 to 360.0	C	* 10^{-1}
40003	0	03	Gross Volume (L)	0 to 99999	L	
40004	0	03	Gross Volume (H)	0 to 32767	L	
40005	0	03	Net Volume (L)	0 to 99999	L	
40006	0	03	Net Volume (H)	0 to 32767	L	
40007	0	03	MASS (L)	0 to 99999	Kg	
40008	0	03	MASS (H)	0 to 32767	Kg	
40009	0	03	REF.Density	0 to 3.2767	g/Cm3	* 10^{-4}
40010	0	03	Status Data 1	0 to 1111		
40011	0	03	Status Data 2	0 to 1111		
40012	0	03	Sensor Alarm	0 to 4		
40013	0	03	Sensor Error	0 to 999		
40014	0	03	NRM Alarm	0 to 4		
40015	0	03	Communication Err.	0 to 999		
40016	0	03	Gauge Status	0 to F		
40017	0	03	Balance Status	0 to 1		
40018	0	03	Water Level	0 to 32767	mm	
40019	0	03	Gas Temp.	-99.9 to 300.0	C	* 10^{-1}
40020	0	03	Gas Pressure	0 to 3.2767	kg/Cm2	* 10^{-4}
40021	0	03	Mid. Interface Level	0 to 32767	mm	
40022	0	03	Mid. Density	0 to 3.2767	g/Cm3	* 10^{-4}
40023	0	03	Bottom Density	0 to 3.2767	g/Cm3	* 10^{-4}
40024	0	16	Gauge Operation	0 to F		
40025	0	16	Density Meas. Select	0 to 4		
40026	0	16	MEAS.POINT SELECT	2 to 16		
40027	0	16	I/F MANUAL LEVEL	0 to 65535	mm	

40028	0	03	Density Profile datas Operation Status	0 to 5		
40029	0	03	Level Condition	0 to 3		
40030	0	03	Operation Time(DAY)	01 to 31		
40031	0	03	Operation Time(HOUR)	00 to 24		
40032	0	03	Operation Time(MIN.)	00 to 59		
40033	0	03	Average Density	0 to 3.2767	kg/Cm2	$*10^{-4}$
40034	0	03	Average Temp.	-99.9 to 300.0	C	$*10^{-1}$
40035	0	03	Measured Density 01	0 to 3.2767	kg/Cm2	$*10^{-4}$
40036	0	03	Measured Density 02	0 to 3.2767	kg/Cm2	$*10^{-4}$
40037	0	03	Measured Density 03	0 to 3.2767	kg/Cm2	$*10^{-4}$
40038	0	03	Measured Density 04	0 to 3.2767	kg/Cm2	$*10^{-4}$
40039	0	03	Measured Density 05	0 to 3.2767	kg/Cm2	$*10^{-4}$
40040	0	03	Measured Density 06	0 to 3.2767	kg/Cm2	$*10^{-4}$
40041	0	03	Measured Density 07	0 to 3.2767	kg/Cm2	$*10^{-4}$
40042	0	03	Measured Density 08	0 to 3.2767	kg/Cm2	$*10^{-4}$
40043	0	03	Measured Density 09	0 to 3.2767	kg/Cm2	$*10^{-4}$
40044	0	03	Measured Density 10	0 to 3.2767	kg/Cm2	$*10^{-4}$
40045	0	03	Measured Density 11	0 to 3.2767	kg/Cm2	$*10^{-4}$
40046	0	03	Measured Density 12	0 to 3.2767	kg/Cm2	$*10^{-4}$
40047	0	03	Measured Density 13	0 to 3.2767	kg/Cm2	$*10^{-4}$
40048	0	03	Measured Density 14	0 to 3.2767	kg/Cm2	$*10^{-4}$
40049	0	03	Measured Density 15	0 to 3.2767	kg/Cm2	$*10^{-4}$
40050	0	03	Measured Density 16	0 to 3.2767	kg/Cm2	$*10^{-4}$
40051	0	03	Measured Position 01	0 to 65535	mm	
40052	0	03	Measured Position 02	0 to 65535	mm	
40053	0	03	Measured Position 03	0 to 65535	mm	
40054	0	03	Measured Position 04	0 to 65535	mm	
40055	0	03	Measured Position 05	0 to 65535	mm	
40056	0	03	Measured Position 06	0 to 65535	mm	
40057	0	03	Measured Position 07	0 to 65535	mm	
40058	0	03	Measured Position 08	0 to 65535	mm	
40059	0	03	Measured Position 09	0 to 65535	mm	
40060	0	03	Measured Position 10	0 to 65535	mm	
40061	0	03	Measured Position 11	0 to 65535	mm	
40062	0	03	Measured Position 12	0 to 65535	mm	
40063	0	03	Measured Position 13	0 to 65535	mm	
40064	0	03	Measured Position 14	0 to 65535	mm	
40065	0	03	Measured Position 15	0 to 65535	mm	
40066	0	03	Measured Position 16	0 to 65535	mm	

40067	0	03	I/F Density profile datas Operation Status	0 to 5		
40068	0	03	Level Condition	0 to 3		
40069	0	03	Operation Time(DAY)	01 to 31		
40070	0	03	Operation Time(HOUR)	00 to 24		
40071	0	03	Operation Time(MIN.)	00 to 59		
40072	0	03	Average Density	0 to 3.2767	kg/Cm2	$*10^{-4}$
40073	0	03	Average Temp.	-99.9 to 300.0	C	$*10^{-1}$
40074	0	03	Measured Density 01	0 to 3.2767	kg/Cm2	$*10^{-4}$
40075	0	03	Measured Density 02	0 to 3.2767	kg/Cm2	$*10^{-4}$
40076	0	03	Measured Density 03	0 to 3.2767	kg/Cm2	$*10^{-4}$
40077	0	03	Measured Density 04	to 3.2767	kg/Cm2	$*10^{-4}$
40078	0	03	Measured Density 05	to 3.2767	kg/Cm2	$*10^{-4}$
40079	0	03	Measured Density 06	to 3.2767	kg/Cm2	$*10^{-4}$
40080	0	03	Measured Density 07	to 3.2767	kg/Cm2	$*10^{-4}$
40081	0	03	Measured Density 08	to 3.2767	kg/Cm2	$*10^{-4}$
40082	0	03	Measured Density 09	to 3.2767	kg/Cm2	$*10^{-4}$
40083	0	03	Measured Density 10	to 3.2767	kg/Cm2	$*10^{-4}$
40084	0	03	Measured Density 11	to 3.2767	kg/Cm2	$*10^{-4}$
40085	0	03	Measured Density 12	to 3.2767	kg/Cm2	$*10^{-4}$
40086	0	03	MeaasuredDensity 13	to 3.2767	kg/Cm2	$*10^{-4}$
40087	0	03	Measured Density 14	to 3.2767	kg/Cm2	$*10^{-4}$
40088	0	03	Measured Density 15	to 3.2767	kg/Cm2	$*10^{-4}$
40089	0	03	Measured Density 16	to 3.2767	kg/Cm2	$*10^{-4}$
40090	0	03	Measured Position 01	0 to 65535	mm	
40091	0	03	Measured Position 02	0 to 65535	mm	
40092	0	03	Measured Position 03	0 to 65535	mm	
40093	0	03	Measured Position 04	0 to 65535	mm	
40094	0	03	Measured Position 05	0 to 65535	mm	
40095	0	03	Measured Position 06	0 to 65535	mm	
40096	0	03	Measured Position 07	0 to 65535	mm	
40097	0	03	Measured Position 08	0 to 65535	mm	
40098	0	03	Measured Position 09	0 to 65535	mm	
40099	0	03	Measured Position 10	0 to 65535	mm	
40100	0	03	Measured Position 11	0 to 65535	mm	
40101	0	03	Measured Position 12	0 to 65535	mm	
40102	0	03	Measured Position 13	0 to 65535	mm	
40103	0	03	Measured Position 14	0 to 65535	mm	
40104	0	03	Measured Position 15	0 to 65535	mm	
40105	0	03	Measured Position 16	0 to 65535	mm	
40106	1					page 01
:	:					
40210	1					
44096	39					page 39
:	:					
44200	39					

Certificates and approvals

CE approvals

By attaching the CE mark, Endress+Hauser confirms that the instruments pass the required tests.

External standards and guide lines

Based on IEC 61426-1: 1997 + A1: 1998 + A2: 2001
Emission

CISPR 16-1 /-2
Main terminal interference voltage and radiated electromagnetic field

EN 61000-3-2
Harmonic current emissions (less than 16A per phase)

EN 61000-3-3
Voltage changes, voltage fluctuations and flicker

Based on IEC 61426-1: 1997 + A1: 1998 + A2: 2001, Appendix A (industrial locations)
Immunity

EN 61000-4-2
Immunity to electrostatic discharge

EN 61000-4-3
Immunity to electromagnetic field disturbance

EN 61000-4-4
Immunity to burst on power and data lines

EN 61000-4-5
Immunity to surge on power and data lines

EN 61000-4-6
Immunity to conducted RF (high frequency) disturbance

EN 61000-4-8
Immunity to power frequency magnetic field

EN 61000-4-11
Immunity to v.dips, short interruptions, voltage variations

Ordering Information

Tank Computer NRM 571

10	Model type								
	1	Panel mounted type							
	2	Desktop type							
	9	Special version							
20		Power supply							
	1	AC85 ~ 264 V							
	9	Special version							
30			Input						
		D	V1 Serial Pulse(ver. 4.x) Density Profile						
		9	Special version						
40				Output					
			A2	RS232C					
			Y9	Special version					
50					Tank table				
				14	Basic version (100 points)				
				99	Special version				
60						Tank data configuration			
					0	Not required (customer configuration)			
					1	Required (factory configuration)			
NRM571-									Complete product designation

Note!
Prior to the NMR 571 purchase order, please acknowledge the segment between version 2.0 and the new 4.0 based on functionality differences.

Version 2.0

Field communication (bi-serial)
- Rackbus
- V1
- Rackbus + V1

Host communication (RS232C)
- Rackbus protocol
- Modbus protocol
- MDP / BBB protocol

Version 4.0

Field communication (bi-serial)
- V1

Host communication (RS232C)
- Modbus protocol
- MFDP / BBB protocol

Function
- Radar (Tank SIde Monitor NRF 590 via V1 communication) connection
- Proservo density profile compatible
- ToF tool configuration

Documentation

Special Documentation	SD 004V/00/en Servo Tank Gauging Special Document
Technical Information	TI 006N/08/en Proservo NMS 53x Technical Information
Operating Instruction	BA 001N/08/en Proservo NMS 53x Operation Instruction
	BA 005N/08/en Tank Computer NRM 571 Operation Instruction
	BA 256F/00/en Tank Side Monitor NTRF 590 Operation Instructions
	BA 257F/00/en Tank Side Monitor NRF 590 Description of Instrument Function

Supplementary Documentation

Technical Information	TI 039N Technical Information Prothermo NMT 535
	TI 041N Technical Information Prothermo NMT 538
	TI 042N Technical Information Prothermo NMT 539
	TI 008N Technical Information Promonitor NRF 560
	TI 014N Technical Information Tank Computer NRM 571
Operating Manual	BA 001N Operating Manual Proservo NMS 53x series
Compact Instructions	KA 001N Compact Instruction Whessoe Mtric 550
	KA 002N Compact Instruction RS 485 Modbus

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