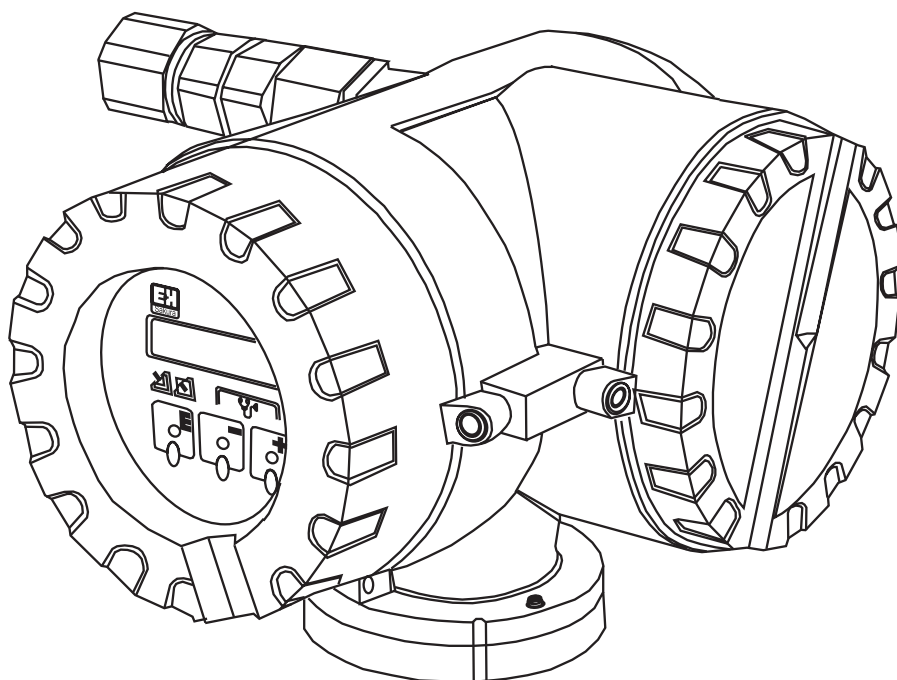


Promonitor **NRF560** **Tank Side Monitor**

Operating Manual



Endress + Hauser

The Power of Know How



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General Notes

Instruction Manual:

- Please read this manual carefully and make sure you understand its contents before using the product.
- This manual is solely intended to describe product functions and should not be used for any other purpose.
- No part of this manual may be reproduced or reprinted without permission.
- This manual may be subject to change without prior notice.
- This manual was prepared with the highest degree of care. However, should you find any errors or have any questions, contact one of our service offices or your local sales agent.

On safety and improper use:

Follow the safety guidelines presented in this manual when using this product. This is important in order to allow the system to control the safe operation by itself. If the user does not follow these instructions properly, we cannot guarantee the safety of the system.

Safety Notes

To maintain a high level of safety and to ensure correct operation, the operator should at all times observe the safety notes given in this operating manual. They are indicated by the following pictograms:



Observe this note to prevent serious injury or material damage.



Observe this note to prevent serious material damage.



Observe this note to achieve the specified performance of the instrument.

Product Requirements

- Power source
Check the voltage of the power supply before connecting it to the product. It should be the exact voltage required for proper operation of the product.
- Use in hazardous areas
When using the product in the first or second-class hazard location (Zone 1 or Zone 2) be sure to use an intrinsically safe or pressure and explosion proof apparatus. Take the utmost care during the installation, wiring, and piping of such apparatus to ensure the safety of the system. For safety reasons, maintenance or repairs on the product while it is being used with such apparatus should only be performed by qualified personnel.
- External connection
When an external connection is required, the product should be protectively grounded before it is connected to a measurement object or an external control circuit.

Return

The following procedures must be carried out before a transmitter is sent to Endress+Hauser for repair:

- Always enclose a duly completed “Declaration of Contamination” form. Only then can Endress + Hauser transport, examine and repair a returned device.
- Enclose special handling instructions if necessary, for example a safety data sheet as per EN 91/155/EEC.
- Remove all residue which may be present. Pay special attention to the gasket grooves and crevices where fluid may be present. This is especially important if the fluid is dangerous to health, e.g. corrosive, poisonous, carcinogenic, radioactive, etc.



Note!

Note!

A copy of the “**Declaration of Contamination**” is included at the end of this operating manual.



Caution!

Caution!

- No instrument should be sent back for repair without all dangerous material being completely removed first, e.g. in scratches or diffused through plastic.
- Incomplete cleaning of the instrument may result in waste disposal or cause harm to personnel (burns, etc.). Any costs arising from this will be charged to the operator of the instrument.

1. System Configuration

The Promonitor NRF 560 is a tank side monitor and control station for the Proservo NMS 53... of intelligent tank gauges.

The Promonitor NRF 560 is a simple low-cost tank site monitor for displaying interface level, tank bottom level, and temperature. Additionally, the Proservo NMS 53... can be operated to measure the level, interface level, bottom level, or to hoist the displacer. The tank gauge is operated by three visual operating elements ("touch control"). For the transmission between the Proservo NMS 53... and the Promonitor NRF 560, a two-wire HART[®] protocol is utilized

Fig. 1 shows an example of a Promonitor NRF560 application

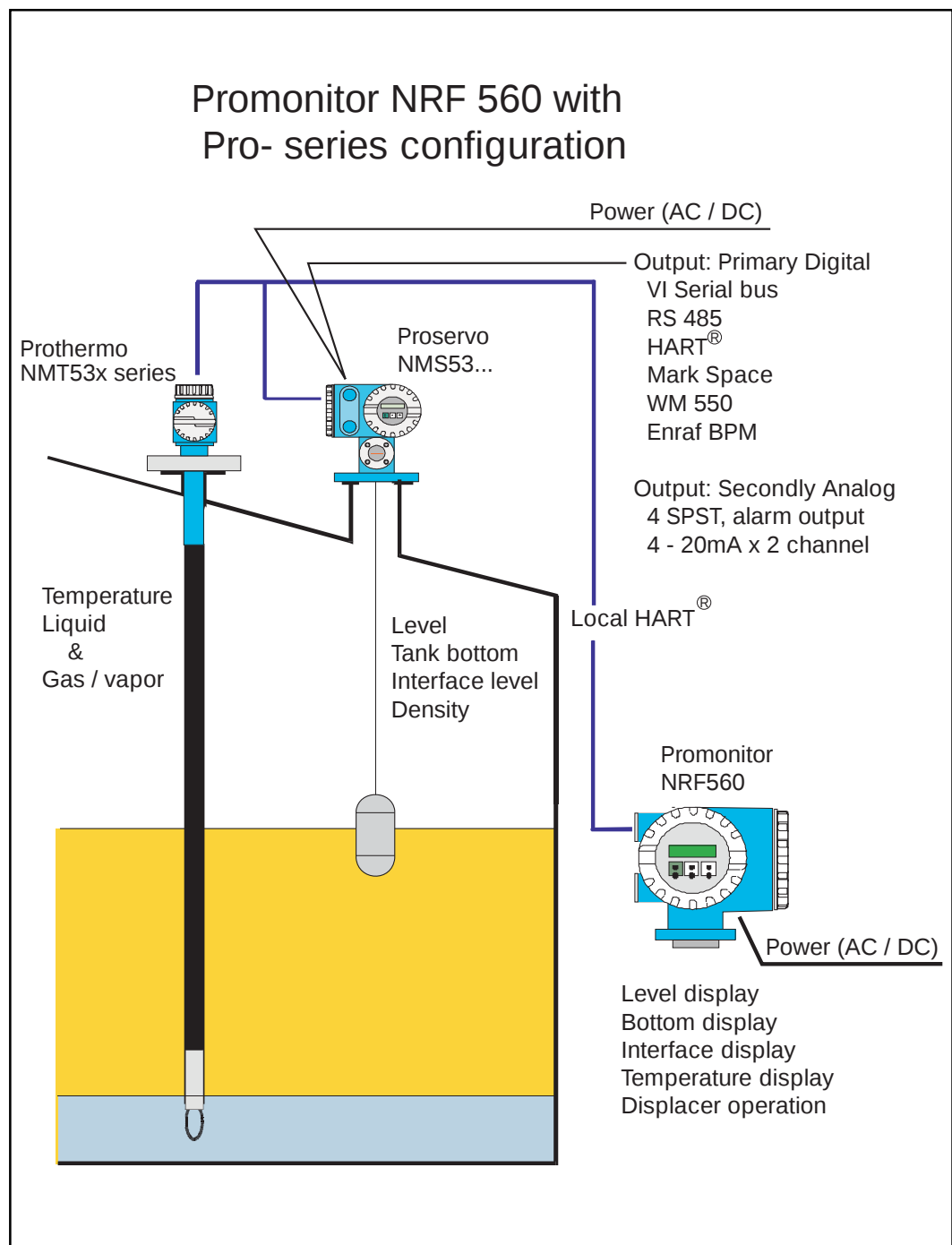


Fig. 1:
Example of a Promonitor
NRF560 application

2. Specifications and Dimensions

2.1 Specifications

Input	Multidrop local HART®
Display (LCD)	2 lines. 16 digits, illuminated Language selection: English, German, Japanese, French, and Italian.
Programming	3 visual operating elements for selection of matrix functions ("touch control")
Power supply	High Voltage: AC 85... 264V 50/60Hz Low Voltage: AC 20... 55V 50/60Hz DC 20... 62V
Power consumption	Maximum 10 VA
Lightning Arrester	Standard equipment
Range of ambient temperature	-20...60°C (standard)



Note!

Note!
The LCD could not be seen below -10°C

Weight	Appox. 6.5kg.
Certification	Explosion-proof EExd IIC T4 (BVS,CENELEC) Exd IIB T4 (TIIS) EExd IIC T4 (ATEX)
Protection	IP67 with closed housing and cable glands of same protection type.
Electromagnetic compatibility	Immunity and emission to EN 50081-1, EN 50082-2

2.2 Dimension

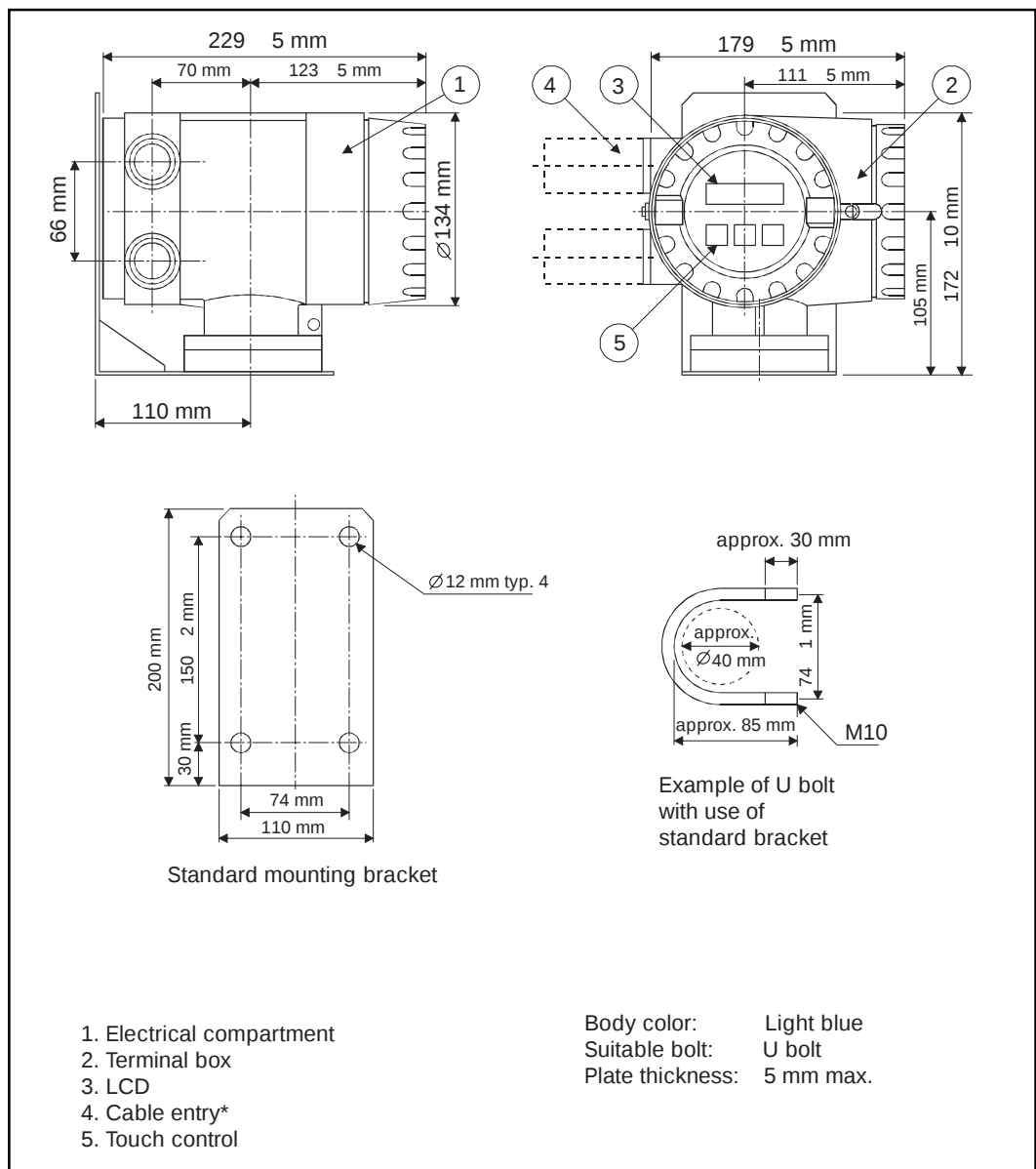


Fig. 2:
Dimensions of the Promonitor
NRF560

* For Ex d IIB T4 IIIS explosion-proof, the same class of cable gland is standard.
 For EExd IIC T4 CENELEC, EEx d IIC T4 ATEX explosion-proof, however, cable gland will not be supplied.

3. Mounting

3.1 Safety Instructions



Caution!

Caution!

Although the Promonitor NRF 560 is certified for use in explosion hazardous areas, the following guidelines should be followed:

- Keep the unit (Promonitor NRF 560) clean and be careful not to damage
- Tighten the bolts.
- Use a cable of the required size for wiring.
- Use the appropriate cable gland and tighten it firmly.



Warning!

Warning!

For the mounting of the Promonitor NRF 560, make sure that the ambient temperature does not exceed the limit.

3.2 Types of Mounting

The following installation procedures are available for the Promonitor NRF560 with standard mounting bracket:

- Mounting on the wall (see Fig. 3)
- Mounting on a 2" (50mm) pipe (see Fig. 5)

It is also possible to mount the Promonitor NRF 560 in a similar way without mounting bracket.

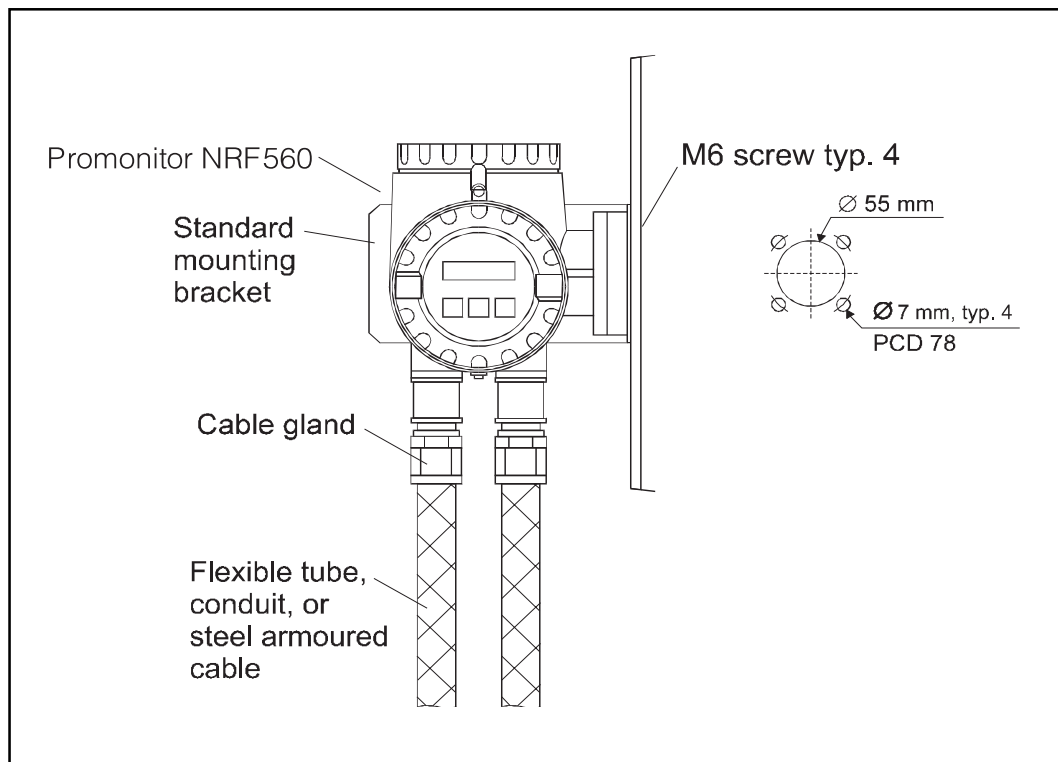


Fig. 3:
Mounting on the wall

**Note!**

After removal of the cover, the display and operating elements of the Promonitor NRF560 can be engaged in steps of 90° (see Fig. 4)

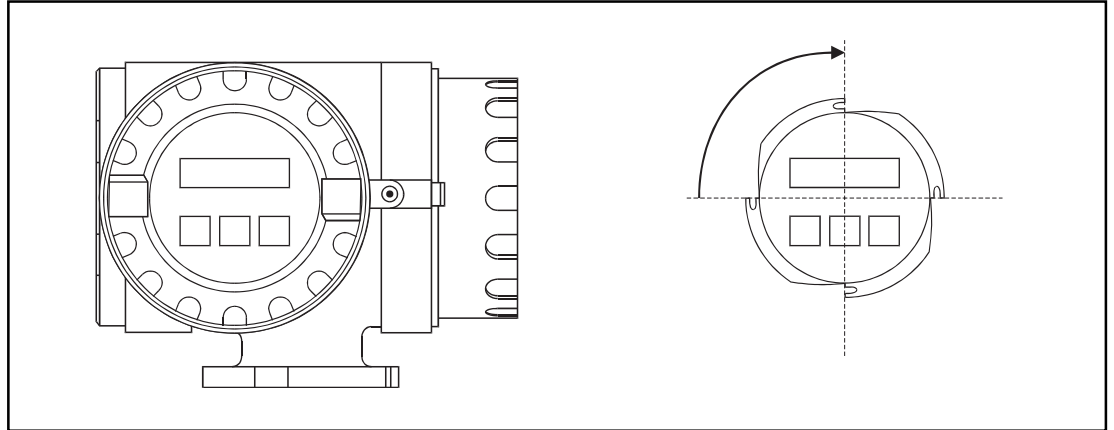


Fig. 4:
Engaging the display
and operating
elements

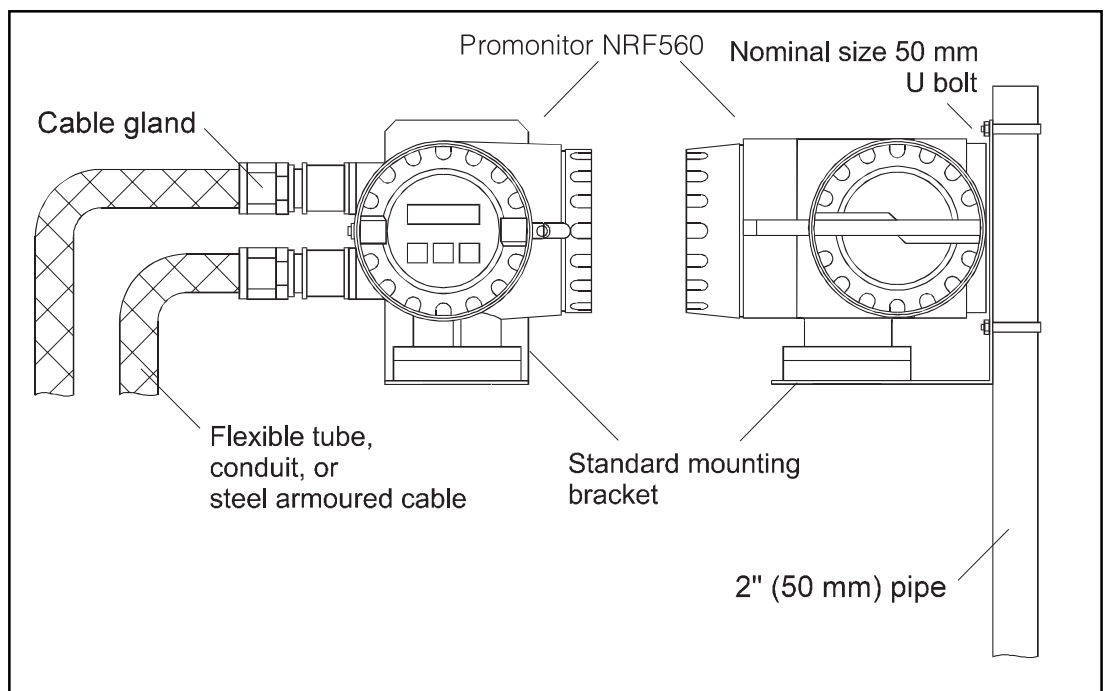


Fig. 5:
Mounting on a 2"
(50MM) pipe

4. Wiring

4.1 Safety Instructions



Warning!

- Shut off the power supply before mounting the Promonitor NRF560 or changing a wire.
- Check that voltage and frequency of the local power supply tally with the data written on the name plate of the Promonitor NRF560
- Inspect the grounding of the Promonitor NRF560 before turning the power on.

4.2 Connection Procedure

The electrical connection of the Promonitor NRF560 is shown in Fig. 6

- Check that the power supply of the Promonitor is turned off.
- Insert AC power supply and signal cable from each side of the cable entries. Establish a grounding for the signal cable screen.
- Connect cables to each terminal (see Fig. 6) We recommend a crimped connection.
- After completing all electric connections, screw the terminal cover and hook its lock (shroud).
- During the installation take care of mounting the conductor in such a way that selfloosening and corrosive effects will be prevented.



Caution!

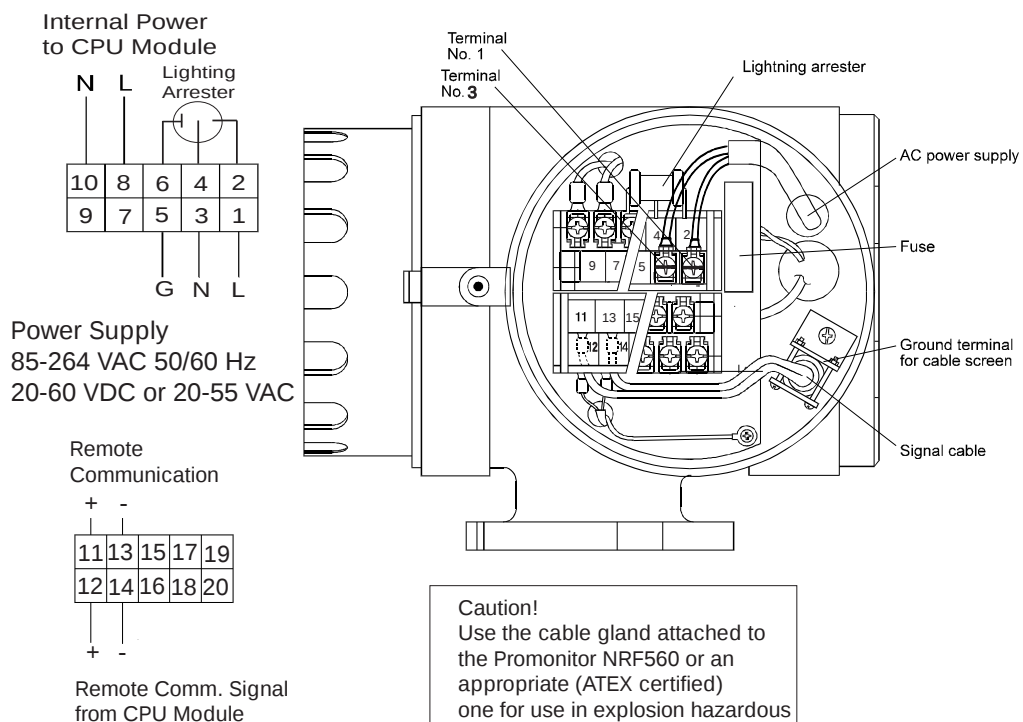


Fig. 6:
Electrical connection of
the Promonitor NRF560

4.3 Input

- The local HART[®] communications allow establishing a data connection to and from the Proservo NMS53....



The input cable must be shield and thicker than 24 A.W.G. (diameter of 0.51), or use a steel-armored cable designed for measurement equipment. For local HART[®] communications cable, use a shielded twisted-paired cable.

- The number of cable cores is 2C for power supply, and 1P for local HART[®] communications.

4.4 Cable Gland

- The Exd IIB T4 TIIS explosion-proof cable is delivered with cable glands.



If not all the cable entries (inlets) are needed, remove the unnecessary cable glands and plug the openings.

5. Touch Control and Programming Matrix

5.1 Display and Operating Elements

Display

The Promonitor NRF560 has an illuminated LCD that consists of two lines with 16 character each. During normal operation, it shows the level, the temperature, and the status of the device on the "HOME" position. For the display of the other data and the programming of the parameters for operation, the Promonitor NRF560 uses a convenient programming matrix.

Operating elements

The Promonitor NRF560 is operated by three visual operating elements, namely the keys , , and . They are activated when the appropriate field on the protective glass of the display is touched with the finger ("touch control"). The software and hardware installed in the Promonitor NRF560 rule out any malfunction that may be caused in this way. Even in explosion hazardous areas, the explosion-proof housing of the touch control ensures safe access to the data.

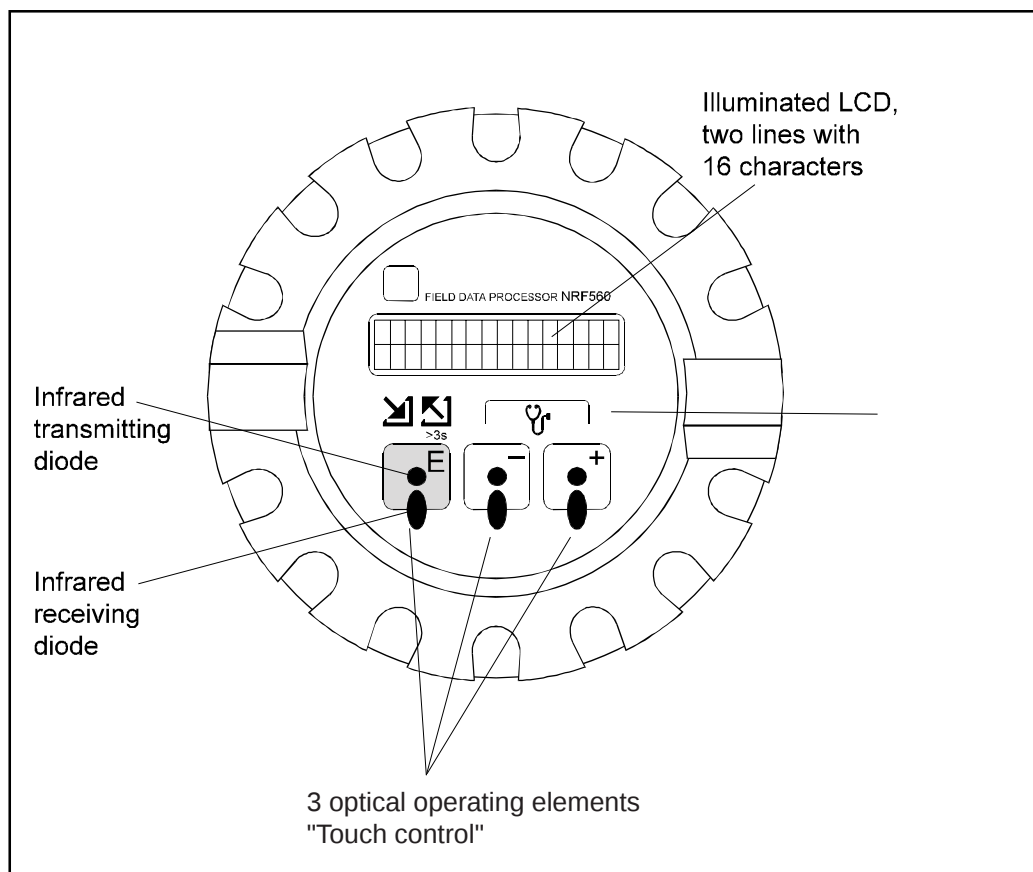


Fig. 7:
Display and operating
elements

5.2 Functions of the operating Elements.

Key	Functions
	• Access to the programming matrix (touching the key for more than 3 s) • Return to the HOME position (touching the key for more than 3 s) • Moving horizontally within a function group to select functions • Saving parameters or access code
 	• Moving vertically to select function groups • Selecting or setting parameters • Setting access code • Diagnostic function (touching both keys at the same time)

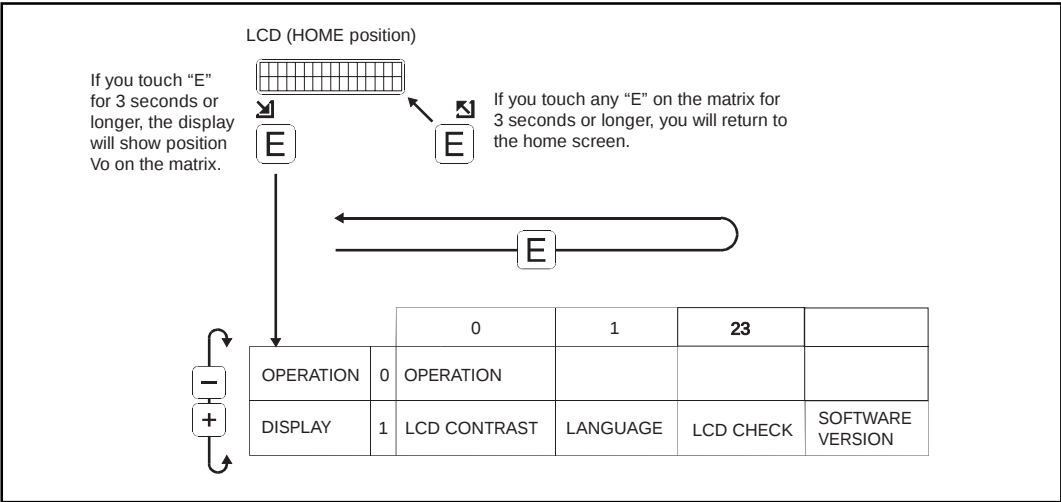
- If you do not touch any keys for 10 minutes, the LCD screen will be switched back to show its HOME display.
- Use the “+” and “-” keys to shift the number, If you hold either key, the right most digit starts to change (as with mechanical counters). When you release the key, you will go back to the right most digit.

5.3 Programming Matrix

From the Promonitor NRF560, you can operate the Proservo NMS53...
The following Proservo NMS53... operations are available from the Promonitor NRF560:

- Level measurement
- Displacer hoist
- Interface level measurement
- Tank bottom measurement

Fig. 8
Selecting functions
within the programming
matrix



Caution!

Caution!
Promonitor NRF560 access code is 50 only.

5.4 Access Code Setting

The access code is to ensure the confidentiality of the set up data.
Two security levels are available, along with access codes.

<Proservo NMS53... Access Code>

Security level		Access code
0	-	none
1	For Operator	50
2	For Engineer	51

<Promonitor NRF560 Access Code>

Security level		Access code
0	-	none
1	For Operator and Engineer	50

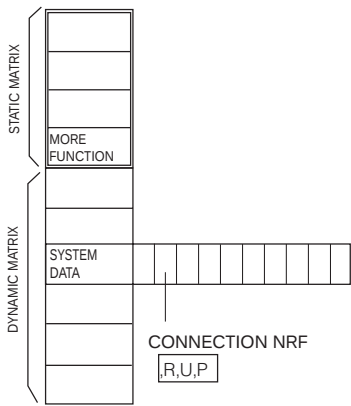


Caution!

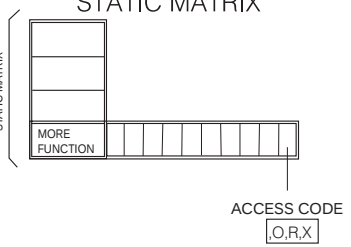
Caution!
An access no. included all the functions of any access no. of lesser value. Selecting code 51 means selecting code 50 as well: functions the selection of 50 offers are also available. Inversely, if you select code 50, the available functions are limited.

5.5 Setting for Promonitor NRF560 Connections

The following settings are required to display Promonitor NRF560 data on Proservo NMS53... screens

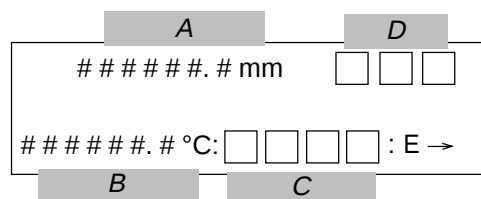
Item	Procedure	Remarks
MATRIX GROUP: SERVICE 	1) In the static matrix "Switch and error/alarm", select G0V3H9 "ACCESS CODE." 2) The default value is "0". Keep touching "+" until you get to "50" or "51". 3) The first digit increases to 9, then the second digit increases. Stop touching "+" once you reach "50". 4) "50" is blinking. Gently touch "+" again to increase the second digit from 0 to 1. Now you have 51. 5) Here touch "E"; "EDITING ENABLED" will be displayed.	 Note: 1. When you touch "E" while displaying an access code 0, 50, or 51, "EDITING LOCKED" will appear. 2. If an access code has not been selected before performing any setting, the screen will automatically change to show "EDITING ENABLED." Select "50" or "51", according to the matrix table.

5.6 How to Select an Access Code

Item	Procedure	Remarks
	1) At the static matrix "MORE FUNCTION", select G0V3H9 "ACCESS CODE." 2) The default value is "0". Keep touching "+" until you get to "50" or "51". 3) The first digit increases to 9, then the second digit increases. Stop touching "+" once you reach "50". 4) "50" is blinking. Gently touch "+" again to increase the second digit from 0 to 1. Now you have 51. 5) Here touch "E"; "EDITING ENABLED" will be displayed.	 Note: 1. When you touch "E" while displaying an access code other than 0, 50, or 51, "EDITING LOCKED" will appear. 2. If an access code has not been selected before performing any setting, the screen will automatically change to show "EDITING ENABLED." Select "50" or "51", according to the matrix table.

5.7 HOME Position

After turning on the power supply, the LCD first shows the current data on the HOME position. Its pattern is represented below, where # denotes a digit or a minus sign, and □ denotes a letter or a hyphen.



The letters A, B, and C stand for the areas where information on measured values and status of the device is displayed:

Area	Information
A	Current level
B	Current temperature
C	Gauge sign
D	Displacer status

The definition of the each gauge sign is as follows:

Gauge sign	Meaning
G-RE	The displacer is resting at the reference position.
UP	The UP command has been given.
DOWN	The DOWN command has been given.
STOP	The STOP command has been given.
LIQU	The Proservo NMS53x is measuring the surface level.
U-IF	The Proservo NMS53x is measuring the upper interface level.
M-IF	The Proservo NMS53x is measuring the middle interface level.
BOTM	The Proservo NMS53x is measuring the tank bottom level.
U-DE	The Proservo NMS53x is measuring the upper liquid density.
M-DE	The Proservo NMS53x is measuring the middle liquid density.
B-DE	The Proservo NMS53x is measuring the bottom liquid density.

The definition of the each Displacer status is as follows:

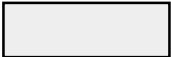
Displacer status	Meaning
BAL	The displacer is resting on the liquid surface or interface and in balanced status.
T-B	Automatic weight calibration is being carried out.
U-U	The displacer is being hoisted and in unbalanced status.
U-D	The displacer is being lowered and in unbalanced status.
R-U	The displacer is being hoisted and in correction balance.
R-D	The displacer is being lowered and in correction balance.
LOW	The displacer is resting at the lower stop.
“ “	The others.

6. Proservo NMS53... Programming Matrix

This section shows the programming matrix of the Proservo NMS53... (Necessary for Promonitor NRF560 only). Each matrix group appears on a separate page. The functions are described in the following way:

MATRIX GROUP		
V	H	Horizontal position: 0...9
	Vertical position: 0...3 (static) or 4...9 (dynamic)	FUNCTION GROUP FUNCTION Default value Set/Select/Display (Access code)

The access code is additionally indicated by the tint of the table cell:

Tint	Access code
	none
	50
	51



Caution!

Caution!

This section shows only the Proservo NMS53... programming matrix, which is needed to operate the Promonitor NRF560.



Caution!

Caution!

In order to perform appropriate Density profile operation with Proservo version 4.25, Promonitor NRF560 is required to have designated Software. Please consult with E+H representative for updating Promonitor NRF560

STATIC MATRIX												
V	H	0	123456789									
		MEASURED VALUE 1	MEASURED LEVEL 16000.0mm Display	ULLAGE LEVEL 0.0 mm Display	UPPER INTERF:LEV 0.0 mm Display	MIDD. INTERF:LEV 0.0 mm Display	BOTTOM LEVEL 0.0 mm Display	UPPER DENSITY 1.000g/ml Displ./Set(50)	MIDDLE DENSITY 1.000g/ml Displ./Set(50)	DENSITY BOTTOM 1.000g/ml Displ./Set(50)	LEVEL DATA 16000.0mm Display	
1		MEASURED VALUE 2	LIQUID TEMP. 0.0 C Display	(Primary VariableData) Display	(Secondary VariableData) Display					ZERO POINT 0.0 mm Display	SPAN 16000.0mm Display	LENGTH UNIT mm Display
2		OPERATION	OPERATION STOP Select(50)	OPERATING STATUS STOP Display	BALANCING STATUS UNBALANCED Display		OPERAT.BY NRF LEVEL Display	OPERAT. BY HOST LEVEL Display				
3		MORE FUNCTION	MATRIX OF CALIBRATION Select			CALENDAR Japartfocal time Display	ALARM CONTACT Display	(Alarm Message) Display	DIAGNOSTIC CO Display	(Erroneous Message) (Erroneous Date) Display		ACCESS CODE 0 Set

DYNAMIC MATRIX 3: SERVICE											
		0	1	2	3	4	5	6	7	8	9
4	MEASURES WIRE & DRUM	WIRE DRUM CIRC. 300.00mm Set (51)	WIRE WEIGHT 1.40 g/10m Set (51)	DISPLACER WEIGHT 200.0g Set (51)	DISPLACER VOLUME 60.0 ml Set (51)	BALANCE VOLUME 25.0ml Set (51)	VOLUME TOLERANCE 1.0 ml Set (51)		DELAY 2 x 100 ms Set (51)	DRUM CORRECTION 0.00 mm/m Set (51)	DISPL. HUNT. COUNT 0 count Set (51)
5	GAUGE DATA			NON HYSTER. MODE OFF Select (51)	HI. ACCURACY MODE OFF Select (51)	HI. ACCR. OPE. TIME 0 s Set (51)	HI ACC. DISP. UP 50 mm Set (51)	GAUGE TEMP Current data Display (51)			
6	SYSTEM DATA	SENSOR DATA Display	Connection NRF OFF Select (51)	Connection NMT OFF Select (51)	Off	Select (51)					SOFT RESET Off Select (51)
7	SERVICE	MEASURED WEIGHT 200.0g Display	RELE. OVER TENS OFF Select (51)	DRUM SETTING OFF Select (51)	WEIGHT CALIBR. OFF Select (51)					DISPL. REFERENCE 70 mm Set (51)	ZERO ADJ WEIGHT 0.0 g Set (51)
8	SENSOR VALUE	Sa# :A# Sb# :B# A=16000, B=14000 Display (51)									
9	SENSOR DATA					WT. COUNT CAL A 0.0 g Display (51)	WT. COUNT CAL B 0.0 g Display (51)				

6.1 Description of the Programming Matrix

The programming matrix of the Promonitor NRF560 follows that of the Proservo NMS53... series. For detailed information on touch control and programming matrix, refer to the operation manual of the Proservo NMS53....

Matrix Group	Function Group	Item	Access code	Description	Default value	Set Select Display	Possible settings, selection, or display	Index no. GVH
STATIC MATRIX (This word is not shown)	OPERATION	OPERATION	50	Displacer operation from the Promonitor NRF560	LEVEL	Display	LEVEL UP STOP BOTTOM LEVEL UPPER INTERF. LEV MID INTERF. LEV UPPER DENSITY MIDDLE DENSITY BOTTOM DENSITY	024
		MATRIX OF	0	Selection of the dynamic matrix of the programming matrix	CALIBRATION	Select	LEVEL UP STOP BOTTOM LEVEL UPPER INTERF. LEV MID INTERF. LEV UPPER DENSITY MIDDLE DENSITY BOTTOM DENSITY	025
SERVICE	SYSTEM DATA	ACCESS CODE	0	Access code for programming	0	Set	0...9999	037
		CONNECTION NRF	51	Connection of Promonitor NRF560	OFF	Select	OFF TYPE 1 (connect to old type) TYPE 2 (connect to new type)	361

7.1 Description of the Programming Matrix

Matrix Group	Function group	Item	Access code	Description	Default value	Set Select Display	Possible settings, selection, or display	Index no. GVH
STATIC MATRIX	OPERATION	OPERATION	50	Selection of an operation of the Proservo NMS53..."s displacer; you may select an option from those listed in the column of "possible settings, selections, or displays" on the right hand side of this table, and store the selection by pressing "E" (Enter)	LEVEL	Select	LEVEL UP STOP UPPER INTERF. LEV MIDD. INTERF. LEV UPPER DENSITY* MIDDLE DENSITY* DENSITY BOTTOM*	00
		LCD CONTRAST	50	Varies the display contrast in 16 steps	Phase16	Set	(The contrast can be adjusted with the + and - keys.)	10
	Display	LANGUAGE	50	Checks if the LCD display is in good order.	English	Select	ENGLISH JAPANESE GERMAN FRENCH ITALIAN	11
		LCD CHECK	50	Checks if the LCD display is in good order; if it is, it blackens for 3 seconds when selecting ON, and whitens for the same length of time when selecting OFF	OFF	Select	ON OFF	12
		SOFTWARE VERSION	50	Shows the Promonitor NRF560's control software version.	1.9 X	Display		13

8. Troubleshooting

If an error occurs in the Proservo NMS53..., or the Promonitor NRF560, your current matrix and error message will blink alternately in the Promonitor NRF560's LDC screen.

Controls relevant to the display are operative even while an error message is displayed.

Message	Cause	Remedy
LOCAL ERROR: NMT	No communication with the Promonitor NRF560, Prothermo NMT535/6 series.	Check the connection and setting of the Prothermo NMT535/6.
LOCAL ERROR: DEV1 (or 2)	No communication with the HART [®] device 1 (or 2).	Check the connection and setting of the HART [®] device 1 (or 2). Check the HART [®] device 1 (or 2).
DEVICE ERROR: NMS	The Proservo NMS53... gives an error signal.	Check the diagnosis of the Proservo NMS53....
DEVICE ERROR: NMT	The ProthermoNMT535/6 gives an error signal.	Check the diagnosis of the Prothermo NMT535/6
DEVICE ERROR: DEV 1 (or 2)	The HART [®] device 1 (or 2) gives an error signal.	Check the HART [®] device 1 (or 2).
OVER TENSION	The Proservo NMS53... gives over tension error.	Check if the displacer motion is blocked by clogging or sticking.
UNDER WEIGHT	The Proservo NMS53... gives under tension error.	Check if the measuring wire is cut or the displacer is lost.
Z PHASE NO INPUT	The Proservo NMS53... gives Z phase no input error.	Check the Proservo NMS53.... Replace the detector unit of the Proservo NMS53....
SIFA ERROR	The Proservo NMS53... gives SIFA error.	Check the Proservo NMS53.... Replace the CPU board of the Proservo NMS53....
ROM ERROR	Check data of EEPROM.	Consult E+H Service.
POWER FAILURE	The supply voltage has dropped.	Check the power supply. (Tax & Weight spec. only)
RAM FAILURE	The data of the RAM are illegal.	Consult E+H Service.

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