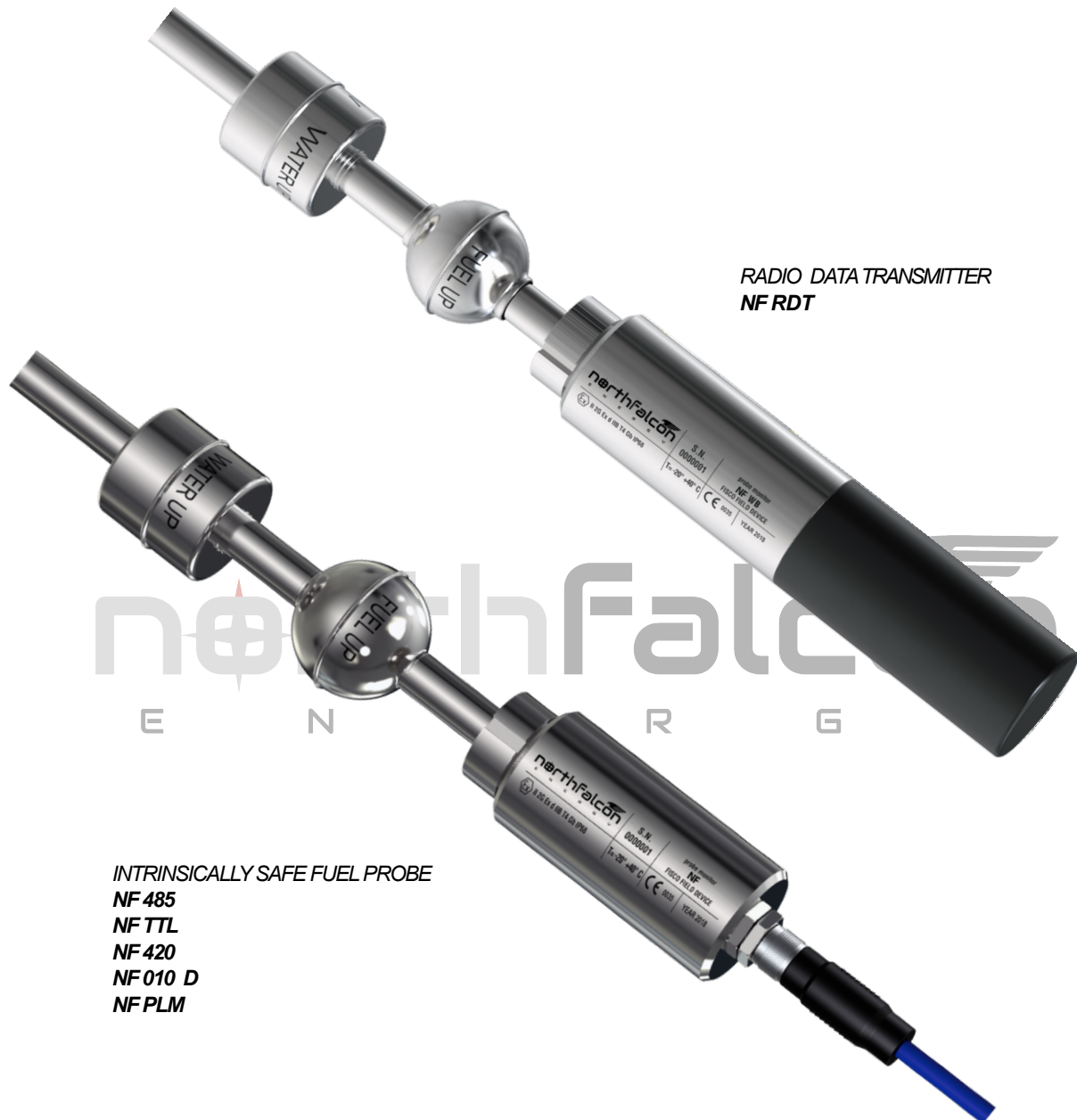


INTRINSICALLY SAFE MAGNETOSTRICTIVE LEVEL PROBE





NF LevelProbe

User Manual

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1 - INSTRUCTION

This manual provides all the necessary information about the installation operations of the NF level probes family.

The family probes should only be installed by trained service engineers.

In the realization of this document, particular attention was paid to make it as complete and accurate as possible. Therefore North Falcon Energy reserves the right to make unannounced upgrades aimed at improving the product, including management programs.

North Falcon Energy is not responsible for damages deriving from information contemplated in the following document.

This manual was written in the compliance with the IEC 82079-1 standard and the ATEXA DIRECTIVE 2014/34 / EU intended for the use of equipment and protective system used in potentially explosive atmospheres.

MANUFACTURER DATA:

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The following symbols are adopted within the document:

SYMBOL	DESCRIPTION
	IMPORTANT: Danger to people (including death), things or the environment.
	ATTENTION: Information and notes concerning important operations and useful considerations.
	IMPORTANT: The crossed-out bin symbol indicates that the product, at the end of its life cycle, must be disposed of separately from household waste and must be taken to a collection point for electrical and electronic equipment as required by the European Directive 2012/19 / EU



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2 - SAFETY INDICATION

The level sensors have been developed, manufactured and tested in accordance with the latest safety standards. Nevertheless, hazard may arise from their use.

The following safety precautions must be observed in order to reduce the risk of injury, electric shocks, fire or damage to the equipment:

1. Before the installation and use of the equipment please carefully read the instructions given into this manual.
2. The manufacturer is not responsible of any possible operation not mentioned into this manual.
3. Any failure or faulty operation would occur to the equipment, please refer to the authorized personnel for maintenance or directly to the manufacturer.
4. The manufacturer refuses all responsibility for any eventual injury and/or damage to things caused to the non-observance of the safety regulations.
5. The assigned personnel is required to know all the safety regulations relative to the hereby described equipment.
6. Any doubt may occur about the functioning of the equipment please refer to the authorized personnel for maintenance or directly to the manufacturer.
7. Tampering releases the manufacturer from any responsibility in front of the competent authority.
8. This product is used in fuel tanks and in hazardous areas for risk of explosion and fire. Subterranean leakages of the fuel tanks may cause serious damages to environment and injury.
9. If mixed with air, the flammable vapors may cause explosion. Hazardous areas may be originated therefore by the presence of gas or vapors.
10. Explosions or fire may cause damages, even lethal.
11. The magnetostrictive probe can be installed in hazardous areas
12. The product may be powered only via the permissible auxiliary power supply.
13. **The device must be powered and connected with a INTRINSICALLY SAFE BARRIER, North Falcon model: ISB-PC or ISB-PR or equivalent intrinsically safety device**

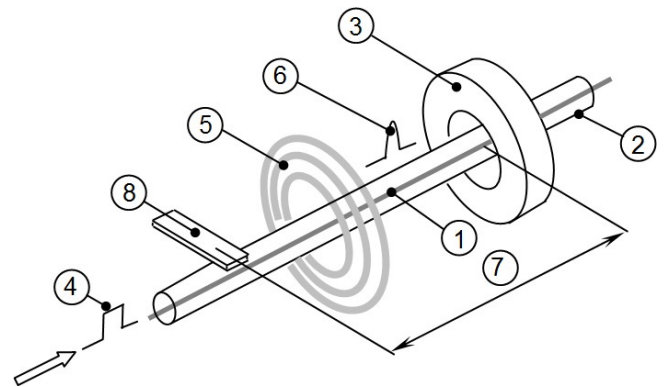


3-DEVICE DESCRIPTION

The sensors consist of a probe head and a probe tube made of stainless steel. The probe tube is fitted in the tank with a screw-in unit for height adjustment. For riser installation, the screw-in unit is not required. A float (4) for measuring the product filling level and an additional float

for continuous water detection move on this probe tube. In the case of products having a density greater than 0.9 kg/l, water detection cannot take place and the water float must be removed.

The sensor operates according to the magnetostrictive measuring principle. The probe tube contains a wire made of magnetostrictive material. The sensor electronics transmit pulses through the wire that generate a circular magnetic field. Permanent magnets are used as filling level sensors and are installed in both the product float and the water float. The magnetic fields of the float magnets axially magnetise the wire in this area. Due to the overlapping of the two magnetic fields, a torsion pulse, which runs in both directions through the wire from the float position, is created in the area of the float magnets. One torsion pulse runs directly to the probe head, the other torsion pulse is reflected at the lower end of the probe tube. The time between the current pulse being transmitted and the two torsion pulses arriving at the probe head is measured and the float position calculated. The position of the water float is calculated by measuring a second pulse.



- | | | | |
|---|-----------------------|---|---------------------|
| 1 | magnetostrictive wire | 5 | magnetic field |
| 2 | external pipe | 6 | torsional vibration |
| 3 | permanent magnet | 7 | back timing pulse |
| 4 | current pulse | 8 | pickup sensor |

4 - ELECTRICAL CHARACTERISTICS

4.1.1 NF RTD

Radio frequency version connection with self-powered

1. Power supply through intrinsically safe lithium battery 3.6Vdc, model SAFT LS33600 or EVEER34615.
2. Battery life up to 3 years.(standard setting)
3. Consumption in transmission mode functioning <70mA.
4. Consumption in sleep mode < 200 uA.
5. Frequency transmission 169Mhz
6. Transmission power up to 200mW
7. Proprietary serial data protocol
8. The serial number is unique and corresponds to the probe address for the consequent configuration into the electronics control.

4.1.2 NF 485(RS 485 serial port for multipoint connection)

1. Nominal power supply 12 Vdc (30Vmax)through an intrinsically safe barrier.
2. Consumption in normal functioning <15 mA @ 12 Vdc(25mALPM)
3. Consumption in sleep mode functioning < 200 uA @12Vdc
4. Connection cable supplied by North Falcon: LYstCY INSULATION LEVEL 4 (0,6/1KV) - (2x0.25mm²) + 2x1.00mm² CEI20-22II IEC60332-3A ENI 00.181.00
5. Maximum transmission distance: up to 2 Km based on standard of RS485 interface.
6. T= - 40°C +85°C
7. Proprietary serial data protocol
8. The serial number is unique and corresponds to the probe address for the consequent configuration into the electronics control

U_i = 30V

I_i = 100mA

C_i = trascurabile/negligibile

L_i = trascurabile/negligibile

4.1.3 NF PLM (RS 485 serial port for multipoint connection)

1. Nominal power supply 12 Vdc (30Vmax) through an intrinsically safe barrier.
2. Consumption in normal functioning <15 mA @ 12 Vdc (25mA LPM)
3. Consumption in sleep mode functioning < 200 uA @ 12 Vdc
4. Connection cable supplied by North Falcon: LYstCYY INSULATION LEVEL 4 (0,6/1KV) - (2x0.25mm²) + 2x1.00mm² CEI 20-22 II IEC 60332-3A ENI 00.181.00
5. Maximum transmission distance: up to 2 Km based on standard of RS485 interface.
6. T = - 40°C + 85°C
7. Proprietary serial data protocol
8. The serial number is unique and corresponds to the probe address for the consequent configuration into the electronics control

U_i = 30V

I_i = 100mA

C_i = trascurabile/negligible

L_i = trascurabile/negligible

4.1.4 NF 420

Wired connection version and analogue output of standard 4-20mA current

1. · Power supply 30 Vdc through an intrinsically safe barrier.
2. · Signal 4 to 20 mA over 2 wires only 1 product float

4.1.5 NF 010

Wired connection version and analogue output of standard 0-10Vdc




1. · Power supply 30 Vdc through an intrinsically safe barrier.
2. · Signal 10Vdc over 4 wires only 1 product float.

4.1.6 COMMON CHARACTERISTICS FOR ALL TYPES




1. Electronics based on a Microprocessor
2. Support telediagnosics and telemaintenance
3. Possibility to configure remotely the functional parameters
4. In case of maintenance the internal part of the sensor (wave guide) can be removed without degas the tank, especially useful for LPG applications where the tanks are in pressure.
5. Tank connection: Not needed if probe is inserted into a riser with internal diameter 2"
 - 2" sliding connection as standard.
 - Other type of optional connections under request (nipped fixed, flanged).
6. · Stainless steel case, IP68.
7. · Probe shaft Stainless Steel AISI 304 / 316
8. · Measurement range: from 200 mm. to 12.500 mm.
9. · Maximum mechanical length: 13.000 mm.
10. · Data transmitted:
 - Product level in 0.01 mm
 - Water level in 0.01 mm
 - Medium temperature detected through digital temperature sensor placed along the probe shaft (max 5)
11. Measurement accuracy: +/- 0,5 mm.
12. Measurement resolution: +/- 0,05 mm.
13. Temperature accuracy: +/- 0,2°C (up to 5 temperature sensor option is available for static leak test)
14. Approvals : OIML-R85 for fixed applications

5 - PRODUCT MARKING

5.1.1 NF 485, NF TTL, NF 420, NF 010, NF LPM

		S.N. XXXXXX	Magnetostrictive Probe NF 485
			YEAR 2018
	AR19ATEX042	T=-40 +80°C	Ui = 30V Li=Negligible Ii = 100mA Ci=Negligible

5.1.2 NF RDT

		S.N. XXXXXX	Magnetostrictive Probe NF RDT
			YEAR 2018
	AR19ATEX042	T=-40 +80°C	Lithium battery inside 3.6Vdc Size D

6-INSTALLATION GUIDE



IMPORTANT: For the installation and maintenance of the sensors, the requirements of the Explosion Protection Regulations, the Industrial Health and Safety Regulations and the Equipment Safety Regulations as well as generally accepted rules of engineering and this manual must be observed.



IMPORTANT: All applicable local safety and accident prevention regulations not included in this manual must also be observed.



ATTENTION: During the assembly, it is important to make sure that the probe tube is not bent. Protect the floats from knocks at all times. No moisture may enter the M12 connector.

Before installation move the supplied floats to the bottom end of the probe tube, otherwise they will slip down suddenly when you erect the sensors and could be damaged when striking the stop cap on bottom

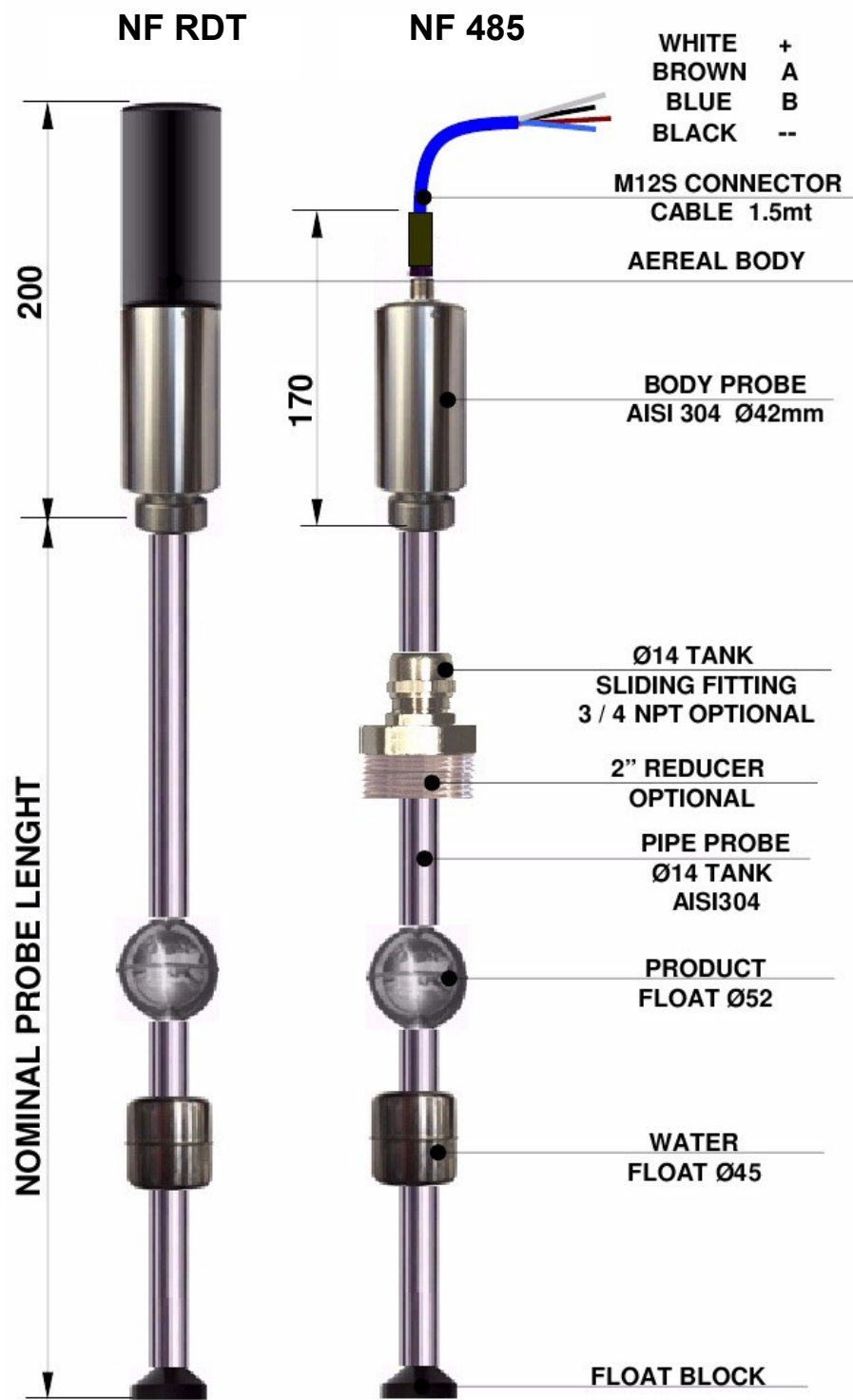


ATTENTION: During the installation, following data of the NF sensors, tanks, and products are to be noted for configuring the Sibylla Console:

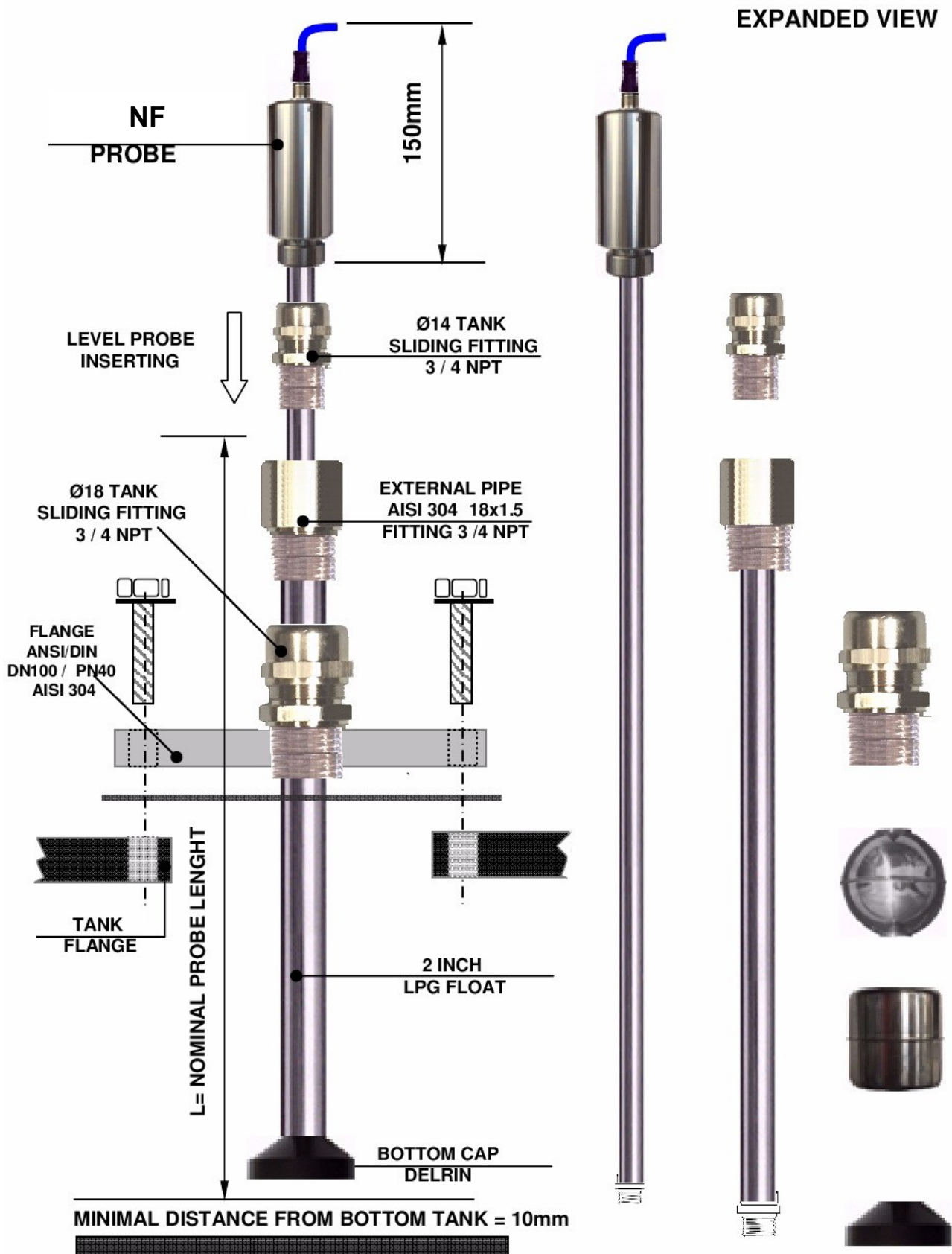
- Device numbers of the sensors,
- Tank assignments of the sensors,
- Tank assignments of the products,
- Terminal connection of the sensors in wired setting features
- Sensor distances from the central vertical axes of the tanks

7 - PROBE DIMENSION

7.1.1 NF 485-420-010-TTL-RTD

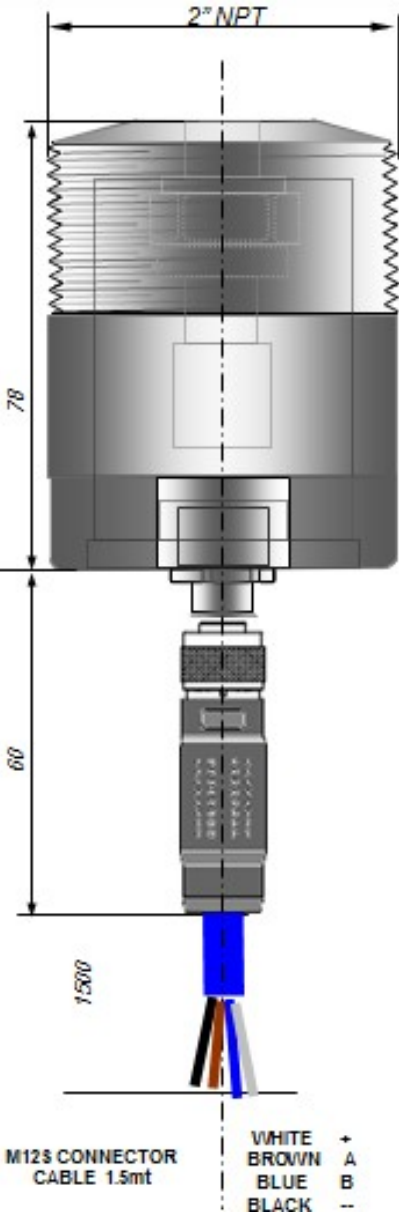


7.1.2 NF 485PP



7.1.3 NF PLM

PROCESSORLINE MONITOR



8 - ON TANK INSTALLATION

8.1.1 GENERAL RULES

The NF level probe is delivered in cardboard packaging per station or individually or up to a maximum of n.5 probes.

When you receive the device need to checking de integrity of the packaging.

In the removal phase from de original packaging please pay attention not to fold the steel pipe, the probe is an electronic tool!

The NF must be sensor are installed vertically inside the tanks as close as possible to the central vertical axix. Afterwards, it will be necessary to configure the respective positions of the sensors.

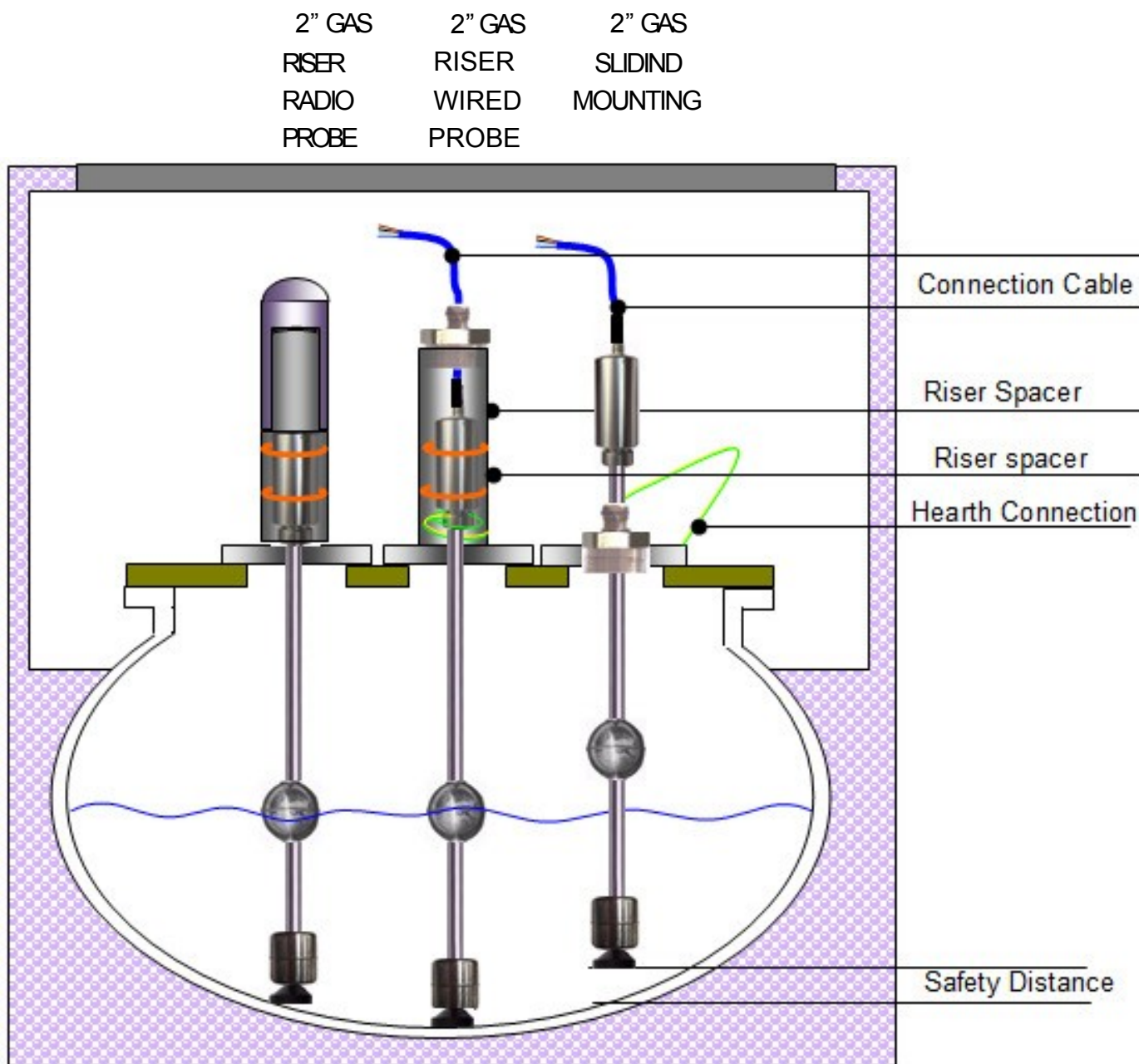


IMPORTANT: in case of hydrocarbon vapor please use anti-sparks tools.

REMEMBER

1. The installation must b realized by specialized people
2. Respect the safety rules
3. Read carefully the instructions provided into this manual
4. The manufacturer is not responsible for any damage and or supplementary cost due to the missing respect of the supplied instructions

ON TANK MOUNTING EXAMPLE



8.1.2 SAFETY DISTANCE

To instal the probe with a 2 inch GAS sliding fitting press the probe tube gently to the bottom of the tank and then lift it again to lock at an appropriate safety distance, at least 10 cm. for tanks with a diameter up to 2900mm. To fix the probe tube tighten the locking screw.

If it is not consider a safety distance to the bottom of the tank the probe pipe could be bent and damaged the functioning process

8.1.3 INSTALLATION RULES

- 1 The NF level probe can be supplied with a 2" male Gas sliding fitting or without a fitting in case of installation inside a safety riser
- 2 The 2" male Gas sliding connector and the floats mounted on it guarantee an easy passage inside 2" pipe connection used like riser. This simplifies the insertion of the probe inside the tank and therefore it is not necessary to disassemble any element.
- 3 The probe pipe inside the tank must not be bent or exposed to impact stresses.
The probe must be mounted keeping the head as high as possible to avoid immersion.
- 4 If a ground connection is required for the dispersion of electrostatic charges, this will be achieved by means of a metal band applied to the sensor pipe and an appropriate conductor connected to the equipotential metallic structure
- 5 The probe is supplied with a 1,5 meters of cable connected to M12 connector at the probe head, this cable must be connected to the back bone using a junction box.
- 6 It is recommended to use a junction box IP68 for intrinsically safety connection.
- 7 In a typical RS485 serial connection all the probes are connected in parallel. Normally all the bus connections must be cascading to grant the lower transmission distance . In case of service stations distances are extremely reduced, branches no longer than 50 meters, in this case it is allowed to have a star type wiring.
- 8 The 4 wire connection cable has always red (or black), brown, blue and white colors.
- 9 Connect to the terminal box the cables with same color: white-white, red-red, etc. At the console the shield from the cables have all to be connected in parallel as a one wire and connected to the earth into the office using a separated ground wire which must not be shared with the motors or power systems earth connections.
- 10 To connection and programming the console please refer to the manual provided together with every device.
- 11 The installation must be done in compliance with CEI 64-8 and EN 60079-14 standards.

8.1.4 *ELECTRIC CONNECTION TO CONSOLE*

After the junction with the probe cable the connection cable between the sensor and the Console must have the following properties:

- Four unshielded wire cable, oil resistant and hydrocarbon resistant.
- Cable conductor section (4 x 0.5mm² up to 100m or 4 x 1mm² up to 200m)
- Cable color blue or printed blue (for intrinsically safe circuits)
- Maximum external diameter from 6 to 10mm for reliable sealing by the cable gland

The equipotential bonding must be carried out by the installer in accordance with the nationally applicable installation regulations. For the purpose the equipotential connection at the probe pipe can be realized through a metal tie.

8.1.5 *VOLTAGE SURGE PROTECTION*

To protect the level sensor from the voltage surges we recommend that you install a voltage surge protector directly upstream of the probe in the manhole.

Special EN regulations including EN 60079-14 and EN 60079-25 as well as local installation regulations must be observed.

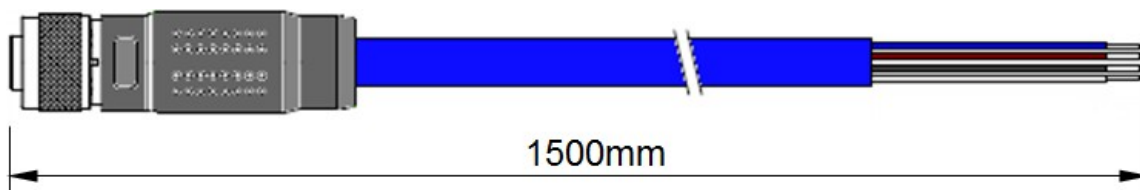
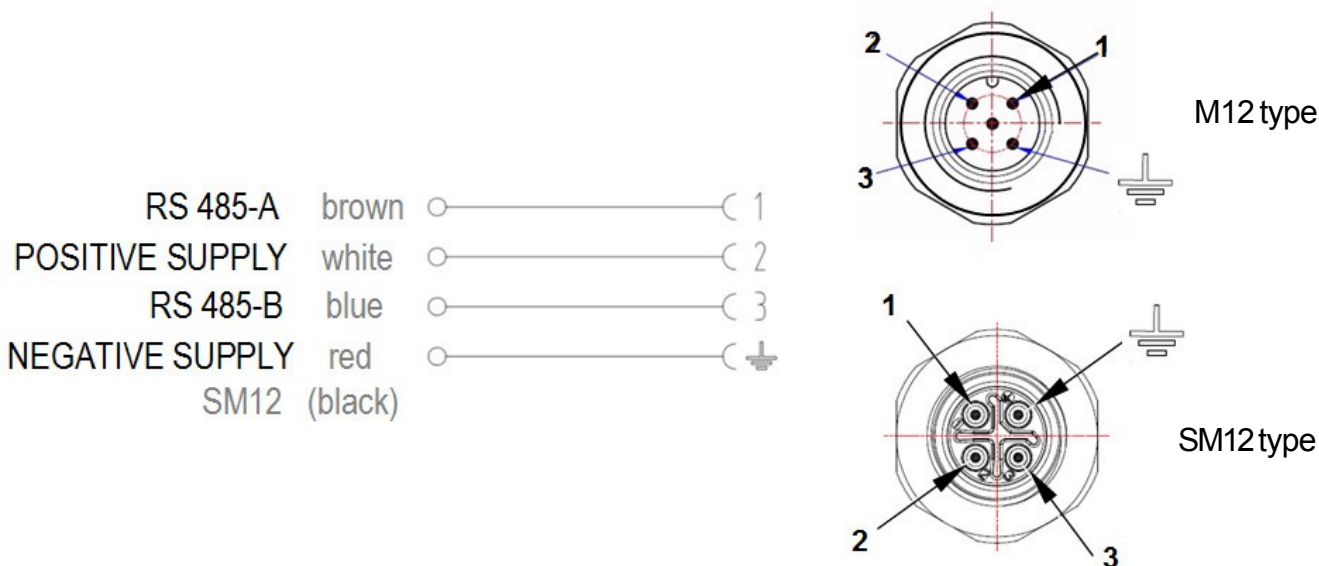
9 - WIRED CONNECTIONS

Always ensure that the power has been disconnected before you wire up the NF sensors to the Sibylla Console. For wiring, proceed as follows:

- If not already connected, plug the M12 flying connector supplied by North Falcon to the connector of the probe head.

Before to tighten the connector nut look for the correct coupling position as the connectors are provided with a polarization key, do not use excessive tightening torque should be between 100 ...150 Ncm.

- Connect the probe cable to the connection cable using an junction box with pin assignment as follows:



IMPORTANT: There are two different probe connectors M12 type and SM12. The two typology are not compatible make attention at the different wire colors.

10 - WIRELESS SETTING FEATURES AND OPERATIONS

Normally the probe is in sleeping mode in order to optimize the life battery duration.

At the set time the probe wakes up and makes the measure. If the measure of the product or of the water has a difference of ± 1 mm compared to that previously measured, the probe transmits the measure via radio or via cable, otherwise it returns in sleeping mode.

In any case after 10 minutes of non-transmission, the probe transmits the data even if they are unchanged to avoid the time-out of the system. This has to be considered as an heart-beat for the receiver. The receiver should activate a non-rx alarm after 1 hour of transmission absence.



IMPORTANT: The device is provided with the battery inserted, if it is necessary to store the probe for more than 3 months it is recommended remove the battery. The operation mode defined is between 1 and 5 after power up, the probe transmits data every 5 seconds for 24 hours, after that the probes goes into the set operation mode.

THE BATTERY LIFE TIME ESTIMATION FOR MOD. NF RDT IS FUNCTION ON THE SELECTED OPERATION MODE

SETTING MODE	TRANSMISSION TIME sec	BATTERY LIFE MONTH
1	30	12
2	300	24
3	600	48
4	3600	5 years

These data are calculated considering the worst conditions, assuming that for example the probe is programmed to transmit every minute and effectively it transmits every minute. Indeed the probe will not transmit if there is not a difference of at least 1 mm, so the life battery will be higher than that shown into the above table. These data are calculated based on a 16.5 Ah battery. Use only battery supplied by North Falcon since this is an Intrinsically Safe certificated device and the supplied batteries satisfy the requirements. If another type of battery is used the Intrinsically Safe certification is compromised won't be responsible in case any failure occurs.

Important feature

The battery can be changed on the field by only qualified personal, not operate in present of inflamable liquid or explosive atmosphere, following the manual instructions.

**Must be use only the following intrinsically safe lithium battery:
EVE3,6V 19Ah D size ER34615 farnel 1973584 or SAFTLS33600**

11 - MAINTENANCE

The sensor and associated floats are maintenance free, if they are operated according to the manufacturer's specifications and not used to other applications.

12 - DEVICE RETURN

Before returning any North Falcon Energy equipment request the (RMA) Return Material Authorization to your account manager of North Falcon for have the instructions on how to return goods.

13 - REVISION

The following table lists the revisions of the document:

N. Of Revisions	Date	Description	Firmware Revision
01	March 2018	Emission	1.0.0
02			
03			
04			

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