

INSTALLATION MANUAL

XMT-SI-485

MAGNETOSTRICTIVE I.S. PROBE







INDEX:

INTRODUCTION	pag. 4
GENERAL WARNINGS	pag. 4
GENERAL INFORMATION	pag. 5
TECHNICAL CHARACTERISTICS XMT-SI	pag. 6
PRODUCT LABEL	pag. 8
MECHANICAL INSTALLATION XMT-SI	pag. 9
EXAMPLE OF RISER PREPARATION FOR RF PROBES	pag.11
ELECTRICAL CONNECTION	pag.14
JUMPER SETTING	pag.15
XMT-SI-RF MODEL	pag.16
XMT-SI-485 MODEL	pag.18
XMT-SI-485-LOG – PROBE WITH MEMORY AND DATA LOGGER FUNCTIONALITY	pag.20



INTRODUCTION

This manual gives all the installation and use instructions for XMT-SI level probes family .

GENERAL WARNINGS

- Before the installation and use of the equipment please carefully read the instructions given into this manual.
- The manufacturer is not responsible of any possible operation not mentioned into this manual.
- Any failure or faulty operation would occur to the equipment, please refer to the authorized personnel for maintenance or directly to the manufacturer.
- The manufacturer refuses all responsibility for any eventual injury and/or damage to things caused to the nonobservance of the safety regulations.
- The assigned personnel is required to know all the safety regulations relative to the hereby described equipment.
- Any doubt may occur about the functioning of the equipment please refer to the authorized personnel for maintenance or directly to the manufacturer.
- Tampering releases the manufacturer from any responsibility in front of the competent authority.



- 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.
- If mixed with air, the flammable vapors may cause explosion. Hazardous areas may be originated therefore by the presence of gas or vapors.
- Explosions or fire may cause damages, even lethal.
- The magnetostrictive probe can be installed in hazardous areas.



GENERAL INFORMATION

The magnetostrictive level transmitters are based on the principle named Wiedemann effect and enable continuous and highly accurate reading of liquid's level.

The XMT-SI level transmitter consists of a microprocessor based electronic circuit placed inside one aluminium case head and a stainless steel shaft containing a wave guide placed inside the tank.

An high frequence electric impulse is transmitted through the electronic device. In the matching point with the magnetic field generated by the permanent magnet placed inside the float, a mechanic impulse is generated thanks to the magnetostrictive torsional strain. The mechanic impulse spreads through the wave guide to the speed of sound up to the sensor placed in the measuring head. The timing between the transmission of the going impulse and the return impulse exactly defines the position of the floats.

XMT-SI family are high precision measure instrumentation which are suitable to measure product level, water level and temperature in various type of underground and above ground tank, also placed in hazardous areas.

The XMT-SI family is intrinsically safe certified for 0 Zone and through an intrinsically safety barrier can be connected to console or PC positioned in a safety zone for having a complete control of the tank.

The following models are available:

XMT-SI-485 transmits data on the 485 bus. It can be configured for polling mode or push mode functioning based on the needing. It is externally powered by the communication bus.

XMT-SI-RF transmits data using a radiofrequency transmission with variable frequency depending on the level changes inside the tank. It is powered by a lithium battery positioned inside the probe and certified also for intrinsically safety. In order to grant the intrinsically safety of the transmitter, the battery must be replaced only by another one supplied by Start Italiana.

XMT-SI-TTL transmits data using a TTL interface for OEM applications. The associated instrument must be certified in case it is necessary to install the product in a certified zone.

XMT-SI-485-LOG transmits data on a 485 bus. It is configured for functioning in polling mode. Normally it is powered externally using a communication bus. If the external power is disconnected, automatically a battery placed inside allows to keep the probe working and stores the level changes in a non-volatile memory for subsequent download of the data possible on recovery of the main supply.



TECHNICAL CHARACTERISTICS XMT-SI

Four types of interface are available:

RS 485 serial door for multipoint connection

- Power supply 12 VDC through an intrinsically safe barrier.
- Consumption <15 mA @ 12 Vdc normal functioning
- Consumption < 200 uA @12 Vdc in sleep mode functioning
- Connection cable: hydrocarbons resistant, suitable for underground pose with insulation 0,6-1KV, 2 shielded and twisted pairs, section of the power cable pair of at least 1mm2.
- Type of cable supplied by Start Italiana: LiYstCYY INSULATION LEVEL 4 (0,6/1KV) (2x0.25mm²) + 2x1.00mm² CEI 20-22II IEC 60332-3A ENI 00.181.00
- Maximum transmission distance: up to 2 Km based on standard of RS485 interface.

RF interface:

- Internal power supply through an instrinsically safe battery 3.6V, 16Ah
- Low frequency transmission to a receiver located in a safety zone.
- Consumption <15 mA @ 12 Vdc normal functioning
- Consumption < 200 uA @12 Vdc in sleep mode functioning

TTL Interface for OEM applications:

- Power supply 5Vmax, 100mA max from certified external device
- Serial transmission TTL levels
- Maximum distance:3 mt, compatible with TTL signals

RS485-LOG serial door for multipoint connection with internal battery for storage of data in case of missing external power supply or polling

- Power supply 12 VDC through an intrinsically safe barrier.
- Consumption <15 mA @ 12 Vdc normal functioning
- Consumption < 200 uA @12 Vdc in sleep mode functioning
- Internal power supply through an instrinsically safe battery 3.6V, 16Ah
- Connection cable: hydrocarbons resistant, suitable for underground pose with insulation 0,6-1KV, 2 shielded and twisted pairs, section of the power cable pair of at least 1mm2.
- Type of cable supplied by Start Italiana: LiYstCYY INSULATION LEVEL 4 (0,6/1KV) (2x0.25mm²) + 2x1.00mm² CEI 20-22II IEC 60332-3A ENI 00.181.00
- Maximum transmission distance: up to 2 Km based on standard of RS485 interface.

For all the types the measurement characteristics are:

- Electronics based on a Microprocessor
- Support telediagnostics and telemaintenance
- Possibility to configure remotely the functional parameters
- 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.
- 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 (nippled fixed, flanged, ...)
- Stainless steel case, IP68.
- Probe shaft Stainless Steel AISI 304 / 316



- Measurement range: from 200 mm. to 12.500 mm.
- Maximum mechanical length: 13.000 mm.
- 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)
- Measurement accuracy: +/- 0,5 mm.
- Measurement resolution: +/- 0,05 mm.
- Temperature accuracy: +/- 0,2°C
 - Certifications:
 - CEC 09 ATEX 131 rev2 : II 1G Ex ia IIB T4 II 1D Ex tD A20 T135°C
 - CEC 09 ATEX 131 rev3 : II 1G Ex ia IIB T4 Ga II 1D Ex t IIIC T135°C Da IP66/68
- Approvals :
 - OIML-R85 for fixed applications
 - OIML-R80 per mobile applications

WIRING OF THE CONNECTOR





PRODUCT LABEL

XMT-SI-485

START ITALIANA S.r.I. - Italy Via Pola 6, 20813 Bovisio Masciago (MI) (e) 0722 CEC 09 ATEX 131 REV.3 $\langle E_x \rangle$ II 1G Ex ia IIB T4 Ga $\langle E_x \rangle$ II 1D Ex t IIIC T135°C Da IP66/68

Tipo/Type: XMT-SI-485 Anno/Year: 13 S.N.: 12345 $T= -40^{\circ}C + 85^{\circ}C$ Ui = 16V Ii = 125mA Ci = trascurabile/negligible Li = trascurabile/negligible



The serial number is unique and corresponds to the probe address for the consequent configuration into the control electronics.

XMT-SI-RF

START ITALIANA S.r.l. - Italy Via Pola 6, 20813 Bovisio Masciago (MI) (c) 0722 CEC 09 ATEX 131 REV.3 (cx) II 1G Ex ia IIB T4 Ga (cx) II 1D Ex t IIIC T135°C Da IP66/68 Tipo/Type: XMT-SI-RF

Anno/Year: **12** S.N.: **12345** $T= -40^{\circ}C + 85^{\circ}C$ Batteria al litio/Lithium battery inside



The serial number is unique and corresponds to the probe address for the consequent configuration into the control electronics.



MECHANICAL INSTALLATION XMT-SI

The XMT-SI magnetostrictive level probe is supplied into carton packages for station, packed singularly or up to 7 pieces. We recommend to check packing integrity.

When removing the original packing please pay attention not to bend the stainless steel men-hole reminding that it is an electronic device.

The standard version of level probe XMT-SI is supplied with a sliding 2" gas M fitting or without fitting in case of installation inside a protection riser.

The sliding 2" gas M fitting and the assembled floats enable to easily shift into 2" connection. This makes the probe insertion inside the tank easier, and it means that no part of the probe must be disassembled.

The probe must be placed as much as possible in the center of the tank, in vertical position, and it must be far from the product loading. The shaft inside the tank must not be either folded or blended and must not be subjected to impact or stress.

The probe must be mounted keeping the head as much high as possible to avoid its flooding. Insert the probe in the 2" G-F tank gate and make it reach the floor with care then raise it of at least 10mm, this will avoid bending of the shaft in case loading operation make tank deforming.

Before introducing the probe inside the tank please check the correct floats positioning and clamping of the shaft end.

Connect probe cable to the plant as described afterwards.

Connect sensors as described into the "Electrical connection" section.







EXAMPLE OF RISER PREPARATION FOR RF PROBES

- Use galvanized pipe with internal diameter of mm. 52 (weld pipe);
- Cut the correct size in order that once screwed the riser goes to cover the probe head leaving completely free the transmitting-receiving antenna;
- Seal the thread at the side flange with hemp and sealant to ensure tightness of the tank;



• After installation of the riser, place carefully the wireless probe into the tank;



• After positioning into the tank, tighten the PLT antenna protection supplied with the probe;



XMT-SI-485 - XMT-RF eng rev04 12/2013



• Finally tighten the PLT 2" protection supplied with the wireless probe applying a sealant product (Loctite, etc.) between the male riser and female, paying attention not to force too much the screwing.





Please follow the above procedures if probes are wired. The only difference is that the length of the riser must cover the total length of the probe, and a cap with a cable gland must be screwed to allow the exit of the connection cable.

Please refer to RF receiver technical manual supplied with the product for the installation procedure.



ELECTRICAL CONNECTION



In case of hydrocarbon vapor please use anti-sparks tools.

- The installation must be realized by specialized people
- Respect the safety rules
- Read carefully the instructions provided into this manual
- The manufacturer is not responsible for any damage and/or supplementary costs due to the missing respect of the supplied instructions.

The probe is supplied with 2 meters of cable connected through M12 or 7/8 connector to the probe head. This cable must be connected to the back bone using a junction box.

It is recommended to use a junction box IP68 for intrinsically safety connection supplied by Start Italiana under request.

In a typical electrical connection all the probes are connected in parallel. Normally all the bus connections must be cascading to grant certain transmission distances. In case of service stations distances are extremely reduced, branches no longer than 50 meters, and in this case it is acceptable to have a star type wiring.

Please use if possible Start Italiana junction boxes IP68 and complete of internal terminal box.

The 4 wire connection cable has always red (or black)-brown-blue and white colors.

Connect to the terminal box the same color type: red-red, white-white etc. Panel cables have all to be connected in parallel as a fifth wire and connected to the earth into the office using a protected ground tap which must not be shared with those of motors or power systems.

Any possible double wall and sump sensors will need the same connection on the same bus (model XLR). Check that the number of sensors on the same bus is not over 8.

For connection and programming of the consoles please refer to the manual provided together with every device.

The installation must be done in compliance with CEI 64-8 and CEI EN 60079-14 standards.

Use cable compliant with regulation in force in the country of installation.

64-8 Electrical installations with nominal voltage not higher than 1000Vac and 1500Vdc

60079-14 (1998) Classif.CEI 31-33 "Electrical costructions for explosive area for gas presence". Part 14: Electrical installation in ex-proof area for gas presence (excluded mines).



JUMPER SETTING

The meaning of the Jumpers is listed below. Jumpers are read during startup of the device. Every change made when the device is switched on won't be considered. It is necessary to switch off and restart again the device so that the changes are applied.

Jumper nr	INSERTED	REMOVED
1	1 FLOAT	2 FLOATS
2	Diagnostic mode	NORMAL mode (leave in this way)
3	For Wired probe	For RF probe
4	Select protocol n. 1	Select protocol n. 2





MODEL XMT-SI-RF

DIP-SWITCH PROGRAMMATION

There are several operation modes that can be selected through the internal DIP-Switch. These operation modes can be applied to RF probes. The operation mode defined will amend the life battery duration. Below is a table which gives the information on the estimated life battery referred to the selected operation mode. Radiofrequency probes use a frequency of 169,4Mhz, transmit on channel 5 (169,468 MHz) power 200mW.



DIPSW1	DIPSW2	DIPSW3	DIPSW4	MODE
OFF	OFF	OFF	OFF	OP1
ON	OFF	OFF	OFF	OP2
OFF	ON	OFF	OFF	OP3
ON	ON	OFF	OFF	OP4
OFF	OFF	ON	OFF	OP5
ON	OFF	ON	OFF	OP6
OFF	ON	ON	OFF	OP7
ON	ON	ON	OFF	OP8
ON	ON	OFF	ON	OP12
OFF	OFF	ON	ON	OP13
ON	OFF	ON	ON	OP14
OFF	ON	ON	ON	OP15
ON	ON	ON	ON	OP16

DIP-Switch are read during startup of the device. Every change made when the device is switched on won't be considered. It is necessary to switch off and restart again the device so that the changes are applied.

- OP1: wake up probe every 1 minute (Default setting)
- OP2: wake up probe every 2 minute •
- OP3: wake up probe every 4 minute
- OP4: wake up probe every 5 minute
- OP5: wake up probe every 10 minute
- OP6: not active, don't set
- OP11: not active, don't set
- OP12: wake up probe every 30 seconds
- OP13: wake up probe every 20 seconds



- OP14: wake up probe every 15 seconds
- OP15: wake up probe every 10 seconds
- OP16: wake up probe every 5 seconds

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.

At power up:

During the probe installation open the housing of the probe to connect the battery to the electronic board, because the probe is supplied with battery disconnected to preserve the charge until the use of the probe.

If 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.

This allow to check the signal during the installation without waiting the programmed sleeping time.

This function won't be available if the chosen operation mode is between 12 and 16.

TIME LIFE BATTERY ESTIMATION FOR RF PROBES DEPENDING ON THE OPERATION MODE DEFINED

It is possible to set different levels of transmission power. Default value is 200mW.

OP	Transmission	Years of duration of the
MODE	every x minutes	battery if the transmission
		power is 200mW
1	1	2,6
2	2	4,1
3	4	5,7
4	5	6,2
5	10	7,6
12	30 sec	1,3
13	20 sec	0,9
14	15 sec	0,7
15	10 sec	0,5
16	5 sec	0,3

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 Start Italiana 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 compromisd and Start Italiana won't be responsible in case any failure occurs.



MODEL XMT-SI-485

DIP-SWITCH PROGRAMMATION

For this model it is possible to set an address between 1 and 15 in case it would not be possible to use the addressed defined into the memory, which coincides with the serial number.



DIPSW1	DIPSW2	DIPSW3	DIPSW4	ADDRESS
OFF	OFF	OFF	OFF	MEMORY ADDRESS
ON	OFF	OFF	OFF	1
OFF	ON	OFF	OFF	2
ON	ON	OFF	OFF	3
OFF	OFF	ON	OFF	4
ON	OFF	ON	OFF	5
OFF	ON	ON	OFF	6
ON	ON	ON	OFF	7
ON	ON	OFF	ON	11
OFF	OFF	ON	ON	12
ON	OFF	ON	ON	13
OFF	ON	ON	ON	14
ON	ON	ON	ON	15

DIP-Switch are read only at startup of the device.

Every change made when the device is switched on won't be considered. It is necessary to switch off and restart again the device so that the changes are applied.

TRANSMISSION PROTOCOL

Protocol valid for XMT-SI-485, XMT-SI-485-LOG and TTL probes in polling mode. Do not use this protocol for RF probes.

Transmission parameters

- Speed: 9600 bps
- Parity: none
- Data bit: 8
- Stop bit: 1
- Flow control: none



Using this setting the probe is not placed in sleeping mode but it is always active receiving all the data transmitted on the bus and answering only when a message is coming on its address.

Two different replies are available in order to grant compatibility with previous protocols.

Jumper nr	INSERTED	REMOVED
1	1 FLOAT	2 FLOATS
2	Diagnostic mode	Normal mode (don't change it)
3	Polling Mode	Push mode
4	Procotol selection answer 1	Protocol selection answer 2

Command for data reading:

M[address]CrLf

Reply nr.1:

00348=0=+216=03722=0038=241

address=status=temperature in 10th of degree=product in 10th of mm=water in mm= checksum

Reply nr.2:

00348N0=+217=00682.84=00073.22=098

address=status=temperature in 10th of degree=product in mm=water in mm= checksum

Checksum calculation:

ASCII sum from the beginning up to the last one = included module 255.

Status:

0 = OK

1 probe unable to do the measure, check number of floats inserted with reference to the jumper setting, the orientation, check if the shaft is bended and if there is presence of humidity inside the probe.



<u>XMT-SI-485-LOG</u> <u>PROBE WITH MEMORY AND DATA LOGGER</u> <u>FUNCTIONALITY</u>

WHAT HAPPENS IF POWER SUPPLY GOES OFF? PROBE CONTINUES TO WORK AND STORE MOVEMENT DATA

WHAT HAPPENS IF POLLING IS DEACTIVATED OR DATA POLLING IS LOST? PROBE CONTINUES TO WORK AND STORE MOVEMENT DATA

This model belongs to the XMT-SI-485 family with data logger functionality which is normally activated when external power supply goes off and data polling is lost.

Probe works normally when external power supply is present, in polling mode, and connected to RS485 line. When external power supply is missing, the internal battery is automatically connected to the electronic through an additional board of battery management.

The following actions are performed:

- Start a minute counter set at 0.
- Store the mm value measured at this time.
- Goes in power down mode.
- Every minute it wakes up, measures the level and checks if there is a difference of +/-1 mm compared to the previous measure. If major it stores the data.
- Returns in power down mode until the next minute.
- This continues until the external supply is missing.
- When external supply returns there is up to 1 minute of latency before the probe is able to reply, because it must go out of power down mode.

The same procedure happens when polling is missing for more than 1 consecutive minute.

The maximum capacity of event recorded is 3968. Supposing that there is one record every 10 minutes as average the logger time is around 27 giorni. After that the newer will delete the older.

With this functionality, even if the power supply is disconnected by the probe or if data transmission is interrupted, it is possible to track all the internal tank movement for a future downloading.

When the external power supply returns or data polling is re-activated, the probe returns to normal working suspending the logger data recording.

DATA LOGGER PROTOCOL

In this case two additional commands have been added in order to manage the logger data reading and deleting:

Data logger reading: S[address]CrLf

Data logger delating: Z[address]CrLf

Here is an example of the reply to S command:

S02102=00015=00237=00098=052 S02102=00014=00228=00098=051 S02102=00013=00225=00107=038 S02102=00012=00208=00115=037 S02102=00011=00204=00134=033



S02102=00010=00183=00155=041 S02102=00009=00173=00169=053 S02102=00008=00166=00159=053 S02102=00007=00155=00146=046 S02102=00006=00142=00136=040 S02102=00005=00135=00129=043 S02102=00004=00134=00115=036 S02102=00003=00002=00113=027 S02102=00002=00001=00102=023 S02102=00001=00000=00102=021

Meaning of the fields:

S[address]=[record_counter]=[minutes_from_starting_logging]=[mm]=[chk]CrLf

Address: is the probe address

record_counter: is the progressive number of stored record

minutes_from_starting_logging: is related to the minute to which the stored record refers to. Minutes are calculated starting from the moment of power loss or after 1 minute of polling missing. mm: level stored at that moment

Chk: ASCII sum of the entire frame included the last = mod 255.

At minute nr. 0 there is always the value in mm at the power off moment. At the last record transmitted there is always the value of the measurement referred to the moment of the power on after return of external supply. Looking at the above example from minute 2 to minute 134 the level has not changed.

Expanding the above data it is possible to have the real movement of the level inside the tank registered during the power loss or polling.



This graph has been generated expanding the above 15 records stored in 237 minutes of power loss.

NOTE: it is possible to send S command several times, will be always displayed the same results which are the logger content. The probe will transmit records con consecutively but on groups of 16 records, it is necessary to wait 1 second in order to let the receiver system to flush and elaborate the buffer. Then further 16 records will be send and so on. If during this delay time the probe is receiving an ESC command [0x1b] the transmission history will be stopped and probe goes to normal operation.

Once all the data have been read, it is suggested to perform Z command in order to delete the logger content. This is suggested because in case of another power loss the probe can store records starting from minute 0.



It happens the same on a probe that is not queried for a consecutive minute, also in this case a new record session starts with storage from minute 0.

If the buffer is empty performing command S the probe will not send any answer.

This option is available both for new probes and for a retrofit on existing intrinsically safe probes. In this case probes should be returned in factory for adding battery, longer housing and firmware modification.

PS: OPERATION TO BE PERFORMED AFTER INSTALLATION

During the probe installation open the housing of the probe to connect the battery to the electronic board, because the probe is supplied with battery disconnected to preserve the charge until the use of the probe. In this case the probe starts immediately to register data because external power is off. Then the probe is moved in order to be inserted inside the tank and start to store data, but they don't have any meaning since they belong to installation movements.

We strongly recommend to issue Z command in order to cancel those data and start with empty buffer.



APPLICATIONS

Service station



Depot





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