

X62T-MIT Installation Guide

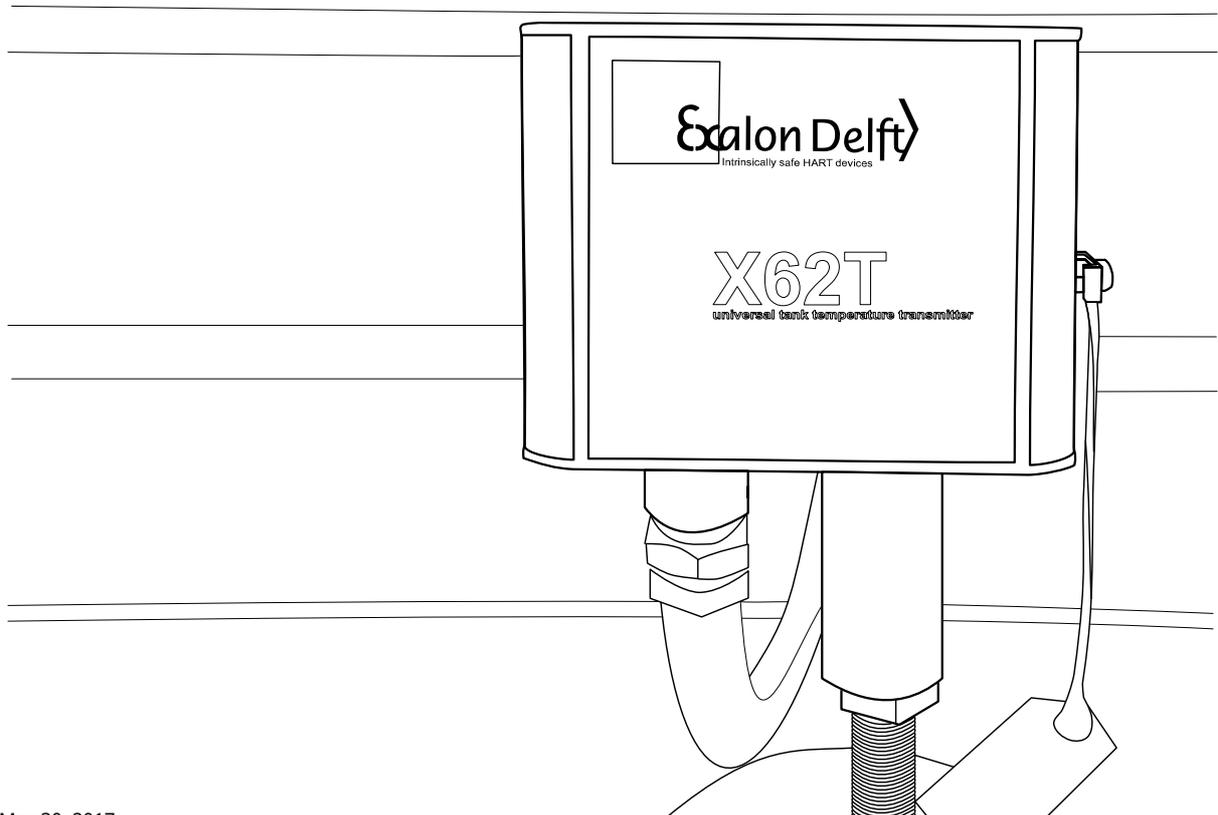


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1 Preface

1.1 Document conventions

Warnings, Cautions and **Notes** are used throughout this installation guide to bring special matters to the immediate attention of the reader.

- A Warning concerns danger to the safety of the technician or user.
- A Caution draws the attention to an action which may damage the equipment.
- A Note points out a statement deserving more emphasis than the general text.

1.2 Preface

This installation guide is intended for technicians involved in the mechanical and electrical installation of the Exalon Delft X62T Interface. The technician must have basic technical skills and knowledge of safety regulations and explosion proof equipment in hazardous areas and must work in accordance with the (local) requirements for electrical equipment in hazardous areas.

Warning

In hazardous areas it is mandatory to use personal protection and safety gear such as:

hard hat, fire-resistive overall, safety shoes, safety glasses and working gloves.

Avoid possible generation of static electricity.

Use non-sparking tools and explosion-proof testers.

Make sure no dangerous quantities of combustible gas mixtures are present in the working area.

Never start working before the work permit has been signed by all parties.

Pay attention to the kind of product in the tank. If any danger for health, wear a gas mask and take all necessary precautions.

The X62T is installed external to storage tanks and converts temperature and capacitance parameters from sensors provided by third parties which are installed inside the storage tank. Please refer to the sensor manufacturers installation guide for details on installing the sensor inside the tank.

Warning

Do not use the instrument for anything else than its intended purpose.

Warning

Improper installation of cable glands, conduits or stopping plugs will invalidate the Ex approval of the X62T Interface.

Caution

The X62T Interface has intrinsically safe output/input circuits. Modifications to the instrument may only be carried out by trained personnel with written authorization from Exalon Delft. Unauthorized modifications will invalidate the approval certificate and impair safety.

1.3 Legal aspects

The mechanical and electrical installation shall only be carried out by trained personnel with knowledge of the requirements for installation of explosion proof equipment in hazardous areas.

The information in this installation guide is the copyright property of Exalon Delft B.V., Netherlands. Exalon Delft B.V. disclaims any responsibility for personal injury or damage to equipment caused by:

- Deviation from any of the prescribed procedures.
- Execution of activities that are not prescribed.
- Neglect of the general safety precautions for handling tools, use of electricity and microwave radiation.

The contents, descriptions and specifications are subject to change without notice. Exalon Delft B.V. accepts no responsibility for any errors that may appear in this installation guide.

1.4 EU Declaration of Conformity

This Exalon Delft instrument is in conformity with all applicable EC Council Directives, including the EMC Directive 2014/30/EU and the ATEX114 Directive 2014/34/EU. Refer to the EC Declaration of Conformity supplied with each instrument separately.

1.5 Additional information

Please do not hesitate to contact Exalon Delft or its representative if you require additional information.

2 Introduction

2.1 What is the X62T-MIT?

The X62T is a Tank Thermometer transmitter based on the X62U multi-input HART transmitter. The X62U is a modern micro controller based transmitter design with inputs that are software configurable for precision resistor, thermocouple and capacitive sensor inputs. By programming different firmwares X62T-HART (HART configurable multi-input transmitter), X62T-MIT (Honeywell Enraf 862 MIT emulation), X62T-MIR (Honeywell Enraf 862 MIR emulation) and X62T-VT (Honeywell Enraf 762 VITO® or 762 VITO®LT emulation) are implemented.

Note

Currently emulation of Enraf 762 VITO MRT and MPT is not supported.

The X62T-MIT can be connected to Enraf servo gauges 854 ATG, 854 XTG, 873 radar gauge or 877 hydrostatic gauge that are fitted with appropriate option boards (see Section 4.1).

Both enclosure entry openings of the X62T-MIT (in deviation from the X62T Installation Guide PN 500013) are PG16:

- The cable entry allows a PG16 cable gland or adapter to be used (not supplied).
- The MTT entry is also PG16 with positioning hole compatible to the original Enraf MTT G1/2-G1/2 adapter. If you are upgrading from a Enraf 862 MIT this adapter will already be glued on top of the 864 MTT. In a new installation or when replacing a Enraf 762 VITO you will require a Exalon Delft X62T-G1/2-M/F adapter (sold separately).

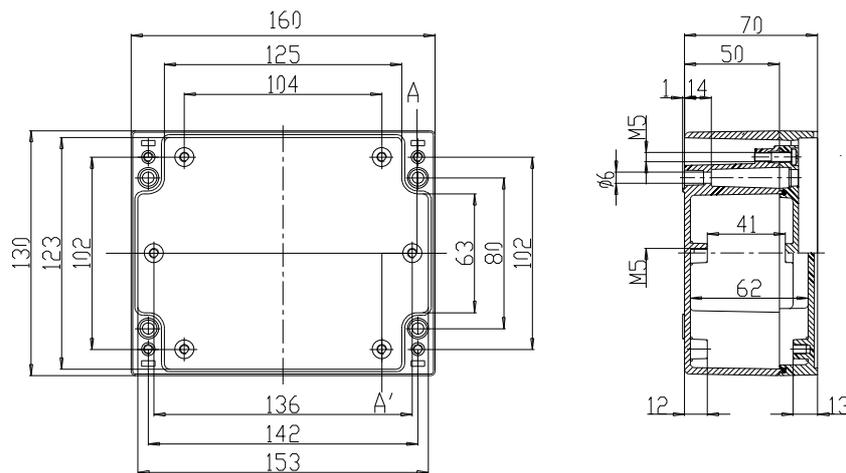
2 versions of the X62T-MIT enclosure can be selected: X62T-MIT/H and X62T-MIT/W:
/H This is the default enclosure.

/W In certain installations with rigid conduits it may be difficult to mirror the external connections. In this case the /W enclosure can be applied. Internally the MIT wires will cross the host connection wires. As the MIT wires and host wires are 2 different Intrinsically Safe circuits they MUST be kept isolated with a total of > 0.5mm solid isolation. An additional isolation sleeve (not supplied) may be needed to increase solid isolation.



X62T-MIT/H

X62T-MIT/W



Mounting holes

3 Instructions for use in potentially explosive atmospheres

3.1 Explanation of the type identification code

Designation according to Directive 2014/34/EC:

CE₀₃₄₄ Ex II 2(1) G

- Notified body performing the QA surveillance: DEKRA Certification _____
- Equipment Group II : Surface Industries _____
- Equipment Category 2(1) : Suitable for installation in Zone 1 with wiring into Zone 0 _____
- For explosive mixtures of gases, mists, or vapors in air _____

Ex marking (type of protection):

Ex ia IIB T4

- Electrical apparatus with explosion protection Ex ia when connected to ATEX certified associated apparatus with protection [Ex ia] or Ex [ia] _____
- Gas group IIB _____
- Temperature class T4 _____

EC-Type Examination Certificate Number: KEMA 06ATEX 0294X

Special conditions for use:

The programming terminal CN9 of the X62T is not Intrinsically Safe. Programming is only allowed using special tools provided by Exalon Delft.

Warning

Do not program the X62T in the Hazardous Area.

Caution

Connecting the X62T directly to a RS232 port may (unnoticeably) damage the Intrinsically Safe circuitry inside the X62T. The X62T shall only be connected to an Exalon Delft supplied programming adapter. Refer to your local distributor when a software upgrade is necessary.

3.2 Electrical connections

3.2.1 Environmental conditions

Temperature	-40 °C < Ta < +70 °C
Ingress Protection	IP65 (with proper installation)
Pressure	Atmospheric
Humidity	0 – 100%RH

3.2.2 Nominal input voltage

Input voltage	12V @ 4mA (low current mode) 14V @ 15mA (high current mode)
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3.2.3 Ex i parameters

Power supply / Output circuit / HART (CN1)		Sensors / Input circuit (CN3) (circuits combined)	
Ui	30V	Uo	5.9V
Ii	270mA	Io	62mA
Pi	1.2W	Po	92mW
Ci	5nF	Co	900uF
Li	-	Lo	30mA

Power supply / Output circuit are infallibly galvanically isolated from Sensors / Input circuit.

3.2.4 Grounding

Proper grounding of the X62T Interface to the tank (P.E.) is required. Use the external ground terminal on the X62T Interface housing.

Warning

When measuring the ground resistance, use a suitable explosion-proof tester.

Note

Grounding shall be performed according to local regulations.

3.2.5 Lightning protection

The field bus terminals of the X62T are floating except for a 90V gas arrester. If the field wiring isolation needs to be tested the internal wire from terminal CN1-2 and CN1-4 (see Figure 2: Connection of MTT or VITO MTT probes) to the enclosure may need to be temporarily disconnected.

3.2.6 Wiring inside the enclosure

Supply and input circuits are separate Intrinsically safe circuits. Keep wiring separated with a minimum distance of 6 mm. When necessary use a suitable cable binder (not supplied) or isolation sleeve.

3.2.7 Supply cable

Follow local regulations for routing of I.S. wiring. Use shielded twisted pair, loop resistance < 50Ω. Using Co / Lo from the gauge:

$C_c \leq C_o - 5nF$, $L_c \leq L_o$.

Note

Use metallic cable glands (M16/EMC/IP68) to provide good contact between cable shield and X62T Interface housing. The shield of the cable shall be connected inside the cable gland and connected to ground at both ends of the cable.

4 Verification before installation

4.1 X62T-MIT compatibility to Enraf gauge option boards

At this time the X62T-MIT can only be connected to MPU, HPU, OPU option boards that support MTT.

Note

*Each option board also exists in a MIR version that supports MRT.
These option boards are currently only supported by the X62T-MIR.*

If unsure about which option board is installed in your Enraf gauge and a PET (Portable Enraf Terminal) is available the following procedure can be used:

- Make sure the attached tank thermometer is of the MTT type with 16 elements.
- Make sure the MTT is functioning correctly. This can be verified by issuing command EM, which should return EM=xx00. If errors are returned it may be possible to verify the errors are caused by the 862 MIT by temporarily replacing the unit by a Known Good 862 MIT (for instance from another tank).
- Make sure the gauge is certified as Ex d [ia] or Ex ed [ia] by examining the type plate and the documentation.
- Issue command software version: SV. This will return the installed option boards. At least an MPU, HPU or OPU option board needs to be present, example MPUA3.0
- Issue command number of temperature elements: MN, this will return the number of temperature elements, example MN=16.

Note

If the MTT or MPU/HPU/OPU option board are malfunctioning while the 862 MIT works correctly, this problem can not be resolved by replacing the 862 MIT by a X62T-MIT.

4.2 X62T-MIT compatibility to the MTT

4.2.1 Software revision X62-MIT-V002 and up (SN X62T-2012-0006 and up)

The X62T-MIT supports the same MTT probes as the obsolete Enraf 862 MIT interface. Further 764□ VITO MTT based probes are supported (see Table 1: Supported MTT probes), certain limitations may apply.

You can identify a compatible probe from the identification code on the type plate:

□□□□**YYYYX**□□□□**0**□□□□**0**

The color of the wiring can also be helpful to determine the type of probe:

864, 764 B and C: 2 x RED, 2 x BROWN, 1 x YELLOW, 14 x BLUE

764 A and D: 2 x RED, 2 x BROWN, 1 x YELLOW, 1 x ORANGE, 13 x BLUE

Information

The presence of an ORANGE wire indicates the Pt100 reference element is NOT in the position of the lowest spot. This is the case for 764A and 764D MTT probes. MPU/HPU/OPU do not support this configuration directly. However the X62T recalculates the data in such away that the correct temperatures are shown in the gauge.

Table 1: Supported MTT probes

YYY	X	Description
864		Supported obsolete 16 spot probe. Pt100 at 65mm from probe bottom.
764	A	Supported obsolete 16 spot probe. Pt100 is the second spot at 1m from the probe bottom. Lowest spot at 65mm from probe bottom. This distribution of spots is not directly supported by the MPU/HPU/OPU and requires a work around ¹⁾ .
764	B	Supported obsolete 16 spot probe. Pt100 is the lowest spot at 65mm from probe bottom.
764	C	16 spot temperature probe, Pt100 is the lowest spot at 1m from probe bottom.
764	D	16 spot temperature probe. Pt100 is the second spot at 1m from the probe bottom. Lowest spot at 65mm from probe bottom. This distribution of spots is not directly supported by the MPU/HPU/OPU and requires a work around ¹⁾ .
766	*	VITO combined water and 16 spot temperature probe – not supported.
767	*	9 spot temperature probe – not supported.
768	*	Combined water and 9 spot temperature probe – not supported.
765	*	VITO Water probe only – not supported.
863		MRT probe – not supported.
361		MPT probe – not supported.
365		Combined MPT and Water probe – not supported.

1 Due to limitations in the MPU/HPU/OPU option board the position of the lowest spot can not be set correctly. This is because the option board expects an even distribution of the spots. For the type A and D probe distance between the Pt100 position and the bottom of the probe is 1000mm, the other 15 elements are distributed evenly. The distance between these elements can be calculated to be the position between the highest element and the Pt100 position: $(hhhh - 1000 \text{ mm}) / 14$. The sensitive length should be set to this distance multiplied by 15 (Table 2: Mechanical dimensions).

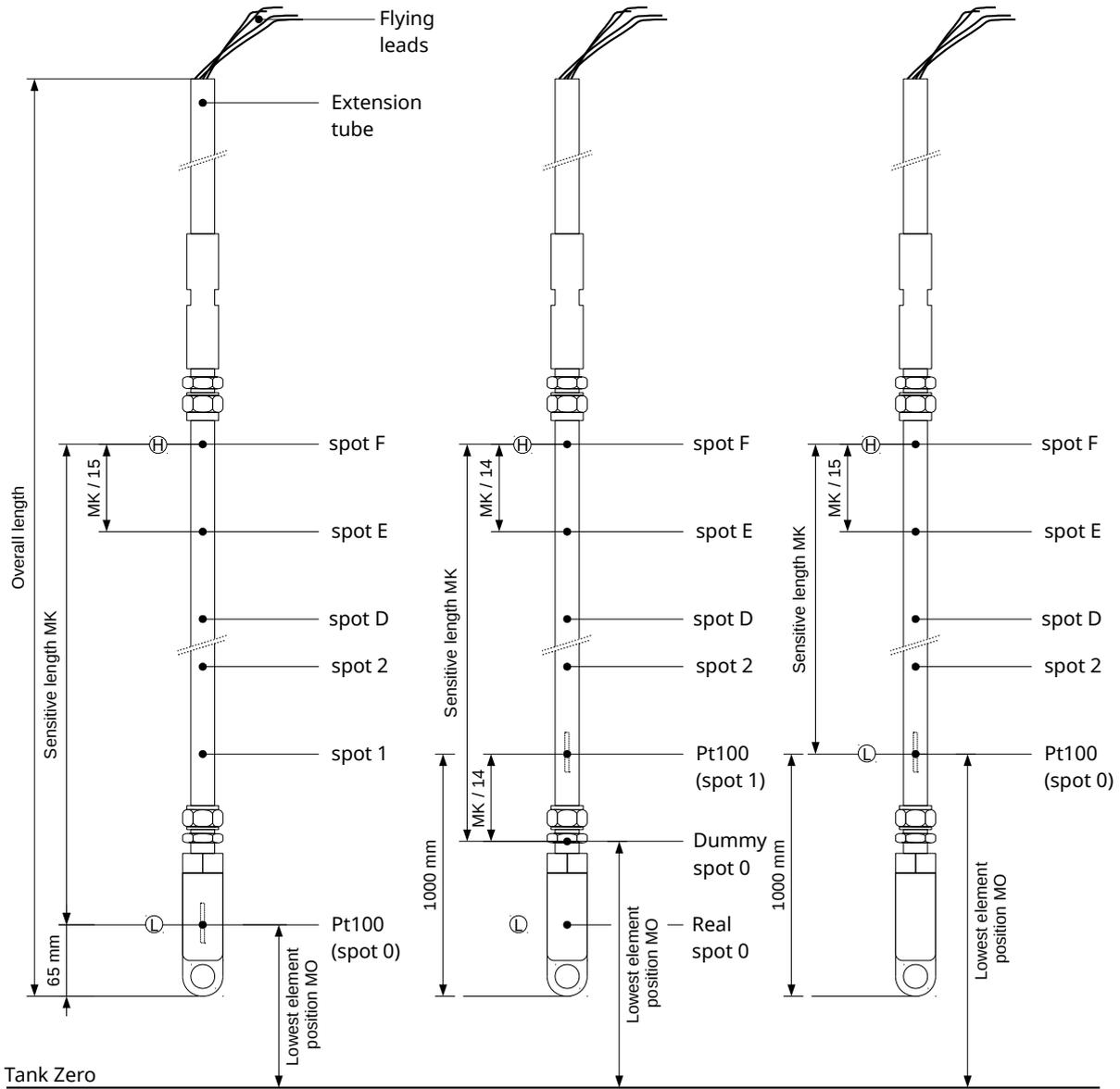
To correctly set the position of spot 1 – F, the lowest element position should be set 1 element distance below the Pt100, $1000 \text{ mm} - (hhhh - 1000) / 14$.

When the Pt100 is the second spot, the lowest spot is a thermocouple. This lowest thermocouple spot is always wired with an ORANGE wire. With an ORANGE wire present, the probe type is D (or an obsolete A)

4.3 Determine mechanical dimensions

Mechanical dimensions can be determined from the MTT probe type identification plate. You will need these dimensions to configure the gauge correctly.

- For MPU/HPU/OPU option boards the sensitive length is always measured from the position of the Pt100 to the highest element to the lowest element. This will be needed to configured in item MK in the gauge.
- The lowest spot position is measured from the bottom of the probe to the center of the lowest spot element. This will be needed to configure item MO in the gauge. Item MO is configured as the height from Tank Zero to the position of the lowest element. As a result, the height from tank zero to the bottom of the MTT needs to be added to the position of the lowest spot element (see Table 2: Mechanical dimensions).



□□□□864□□□□0ssss
 □□□□764B□□□□0hhhh

□□□□764A□□□□0hhhh
 □□□□764D□□□□0hhhh

□□□□764C□□□□0hhhh

Table 2: Mechanical dimensions

	Lowest spot element position MO	Pt100 position	Temperature sensitive length MK
764 temperature probe			
□□□□ 764A □□□□ 0hhhh	100 [cm] - (hhhh - 100 [cm]) ÷ 14	100 cm	(hhhh - 100 [cm]) ÷ 14 x 15
□□□□ 764B □□□□ 0hhhh	65 mm	65 mm	hhhh - 6.5 [cm]
□□□□ 764C □□□□ 0hhhh	1000 mm	100 cm	hhhh - 100 [cm]
□□□□ 764D □□□□ 0hhhh	100 [cm] - (hhhh - 100 [cm]) ÷ 14	100 cm	(hhhh - 100 [cm]) ÷ 14 x 15
864 temperature probe			
□□□□ 864 oooo 0ssss	65 mm	65 mm	ssss [cm]

*hhhh is the position of the highest element (764). ssss is the sensitive length (864),
If ssss is not available use the overall length oooo - 700 mm*

To verify if the correct values have been entered you can check the values of item UF (16 element probe). This item contains the position of the highest element (without MO having been added).

5 Installation

5.1 Powering the X62T-MIT

The X62T can be configured to draw a constant current of either 4 mA or 16 mA. When programmed with X62T-MIT firmware the high current mode must be selected (SW1 BROWN in ON position).

The X62T-MIT requires a voltage between 15V and 24V on the terminals CN1. When connected to an Enraf MPU or HPU option board the supplied power will be sufficient.

Note

Issuing a reset command to the gauge (RS) will temporarily cut power and RESET the X62T.

5.2 Mechanical connection

In case of an upgrade from 862 MIT to X62T-MIT an Enraf G1/2-G1/2 M/F adapter may already be installed on the adjusting pipe². This will be compatible with the X62T enclosure and does not need to be replaced if the O-ring is in good condition.

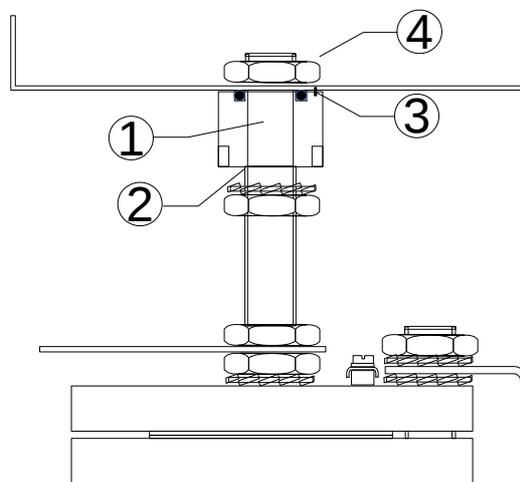


Figure 1: X62T-MIT installation

- Open the cover from the X62T enclosure.
- Remove the X62U from the enclosure.
- Place the empty X62T enclosure on top of the adapter (1) carefully positioning the position pin (3) in the enclosure blind hole.

² In case the adapter is in bad condition a replacement G1/2-G1/2 M/F adapter can be ordered separately.

- Secure the X62T enclosure using the half height G1/2 hexagon nut (4) and supplied shake proof washer until the O-ring is fully compressed and the enclosure will not be able to move.
- Turn the SS G1/2 hexagon nut onto the adjusting pipe (2) until 50mm of thread is free and place the SS shake proof washer.
- Feed the MTT wiring through the G1/2-G1/2 M/F adapter (1).
- Apply a suitable thread locking pipe sealant on the first 25mm of the MTT adjusting pipe (2).
- Turn the adapter (1) tightly onto the adjusting pipe (2) using a wrench on the adapter (3). Tighten the SS hex nut.

Caution
Do not attempt to tighten by applying force to the enclosure as this will damage the positioning pin.

5.3 Electrical connection to MTT or VITO MTT probe

Connect the MTT or VITO MTT probes according to Figure 2: Connection of MTT or VITO MTT probes.

Caution
Discharge tools to the tank before bringing into contact with the X62 terminals to prevent ESD (electrostatic discharges). Then FIRST connect one BROWN wire to terminal 3 on CN3. Damage due to ESD related events are not covered by the warranty.

Connect blue wires to the terminals with blue color in the drawing, yellow to the yellow terminal, etc.:

- If an orange wire is present connect this to terminal 19 of CN3 and set SW2 RED to ON (see also Section 4.2).

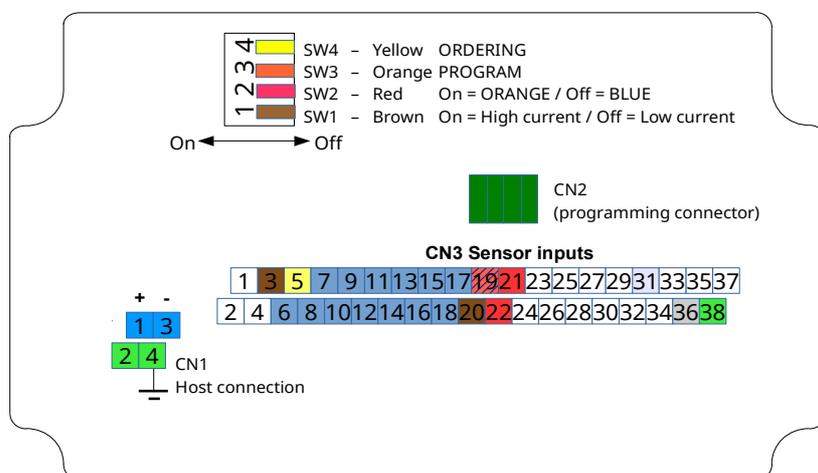


Figure 2: Connection of MTT or VITO MTT probes

5.3.1 Steps to Setup the X62T-MIT for use with an MTT or VITO MTT

- Set switch SW1 BROWN in Off position to enable low current mode.
- Set switch SW2 RED in Off position if there is NO ORANGE wire, ON if there IS an ORANGE wire.
- Set switch SW3 ORANGE in Off position to have the X62 start in Run Mode.
- Enable order detection of the thermocouples by setting switch SW4 YELLOW in On position. See the next section for details.
- Turn power of X62T on. Wait for 3 minutes minimum to perform the order detection.
- Turn power of X62T off and set switch SW4 YELLOW in Off position. All other switches need to be left in their current positions.

After the order detection is complete temperature should be indicated on the display or the PET.

Example

The display indicates +023.97FL ---I1 meaning temperature has been detected but the gauge needs configuration.

Example

The PET item AP = IF@@9999999 meaning temperature is not ready.

*AP = C@@@+023.97 indicates correct temperature, with
C = '0' - 'F' indicating the highest submerged spot element.*

5.3.2 Order Detection of Thermocouples

The Blue thermocouples of the MTT or VITO MTT can be connected in any order. Using the Yellow switch SW4 the X62T can be configured to determine the connection order during power-up. This can take up to 3 minutes.

Note

With 862 MIT the detection of the connection order is done by the HCU/HPI on each startup. The result is that when one of these wires is broken the order cannot be detected and temperature measurement status will show a failure.

For improved reliability in the X62T-MIT order detection is done once during commissioning and the results are stored in the X62T-MIT non-volatile memory. The connection order of the blue wires and the therefore the position of the spots is presented to the MPU/HPU in the correct order. The result is that the X62T-MIT will always measure all spots that are correctly connected.

After detection the X62T stores the detected order in internal persistent storage (EEPROM) and uses this for operation. Once the correct connection order has been determined and stored turn off Ordering using SW4 YELLOW.

As the order of wires is stored in EEPROM the X62T will continue to function after power-up, even when a MTT wire is broken and automatic order detection is no longer possible.

Note

After connecting or reconnecting MTT wires the order of the Blue wires will most likely be changed and the correct thermocouple order must be re-detected. To make the X62T re-determine the order set switch SW4 YELLOW (Ordering) in position 'On' and turn the gauge power off and on or issue an RS command using the PET.

5.3.3 Setting the MTT order in the Enraf gauge

As the X62 internally determines the correct order of the Thermocouple elements, the spot temperature are always output in the correct order to the MPU or HPU option board. It is therefore not needed to have the MPU or HPU determine the order.

Instead a fixed order must be configured using the following item command:
MW=0123456789ABCDEF

6 Commissioning MTT and VITO temperature

6.1 Commissioning

The following settings are intended to set up temperature measurement quickly, for settings customized to your local installation please consult your gauge manual or download the document *“Item documentation for Honeywell Enraf series 854 Level Gauges, 97x series SmartRadars Gauges and 877 Field Display & Interface”*, Part no.: 4416277 from <http://www.honeywellprocess.com>.

Item	Name	Description
W2	Protection level 2	Default W2=ENRAF2
TD	Temperature dimension	Default TD=C (Celsius)
MT	Element type	MT=TPL
MR	Reference Resistance	+22200000E+03
MK	Sensitive length temperature probe	Use the value from Table 2: Mechanical dimensions. Default MK=+030.0000 (m)
MO	Temperature element offset	Use the value from Table 2: Mechanical dimensions. Default MO=+000.0000 (m)
MI	Switch hysteresis	Default MI=+000.1000 (m)
MP	Product immersion depth	Default MP=+000.5000 (m)
MG	Gas immersion depth	Default MG=+000.5000 (m) for 854, 97x Default MG=+000.1000 (m) for 877
MW	Temperature distribution	0123456789ABCDEF Default MW=0000000000000000 Programs the order of the temperature sensors. As the X62T always sorts the sensors in the correct order the above values should always be used. To disable the lowest element from the average temperature calculation (MPU B1.3 / OPU B1.1 / HPU B2.1 or higher) use F in stead of 0: F123456789ABCDEF This can be used to comply with API and ISO recommendations that the lowest element used for average temperature calculation is

Item	Name	Description
		positioned 1m from the bottom of the tank. If the product level drops below 1m the lowest element will be used to calculate the average product temperature. The temperature status 'level below lowest element' will be set.
TU	Temperature status conversion	The character used to indicate a reduced accuracy for the temperature status caused by: <ul style="list-style-type: none"> • temperature out of range • temperature gradient out of range • last valid level used • manual level used • level below the lowest element Default TU=T
EX	Exit	

6.2 Operation

If the gauge is equipped with a display, depending on the selected display format a correct temperature measurement will show the temperature followed by the selected unit of temperature 'C' or 'F' (example: +027.13°C ---I1). Incorrect temperature may show FL (example +023.97FL ---↓I1).

Without display, temperature related data may be retrieved using the PET.

Item	Name	Description
AP	Average product temperature	The temperature is preceded by 4 status bytes. The first byte indicates the highest submerged spot element ('0' ... 'F'). During startup it will be 'I'. Under normal operation the remaining three status bytes will be '@'
AG	Average gas temperature	Same as AP.
EM	Temperature system error	Last encountered error. If no errors after initialization will be: 2200 (MPU emulation) 2400 (HPU emulation)
MU	Value of the X62T test resistor	166.5Ω ± 0.03% when EM shows no errors
U0 - UF	Relative spot position	As calculated by the gauge without adding item MO

Item	Name	Description
V0 - VF	Spot temperature	Temperature of the spot (V0 is the lowest spot) preceded by the temperature status (same as AP).

6.3 Troubleshooting

The X62T-MIT firmware measures all MTT Pt100 and thermocouple elements independently from the MPU/HPU/OPU option board. Errors are detected in a much earlier stage than with the 862 MIT namely when calculating the resistance and voltages from the individual sub-measurements and before communicating the end result to the gauge.

Further, the X62T-MIT orders the thermocouple wires prior to sending the measurement results to the gauge. As a result the gauge does not know the real connection order to the X62T-MIT and item RW will always shows the spots ordered '0123456789ABCDEF'.

For diagnostic purposes the X62T-MIT provides the following mechanism:

- An X62T hardware failure purposely generates a large error shown in the value of the measured internal test resistor. The value is transmitted to the gauge to item MU and will cause a fatal error in the temperature measurement system.
- A non-fatal error in an MTT element measurement is indicated generating temperature out of range error for that element only.

Step	Check	Description	Next ³
1	Check display unit C or F Check AP status=x@@@	An invalid temperature on the display will not have the temperature unit and 'FL' may be shown. x indicates the highest submerged spot. @@@ indicates no errors or warnings. See Table 3 Temperature status Byte 1 .	3
2	Check EM		
	xx00	No last error available.	3
	xx11	No initial communication.	4
	xx92	Communication interrupted.	
	xx70	Subsystem error.	
	xx89	One of spot 1-15 not connected (non fatal).	5

3 If the Check condition is met, continue with the Step indicated under Next

Step	Check	Description	Next
	xx80	Rtest error, X62T-MIT signals a fatal error.	6
3	MU V0 - VF	Value of the X62T test resistor $166.5\Omega \pm 0.03\%$. Temperature of the spot (V0 is the lowest spot) preceded by the temperature status (as AP).	Stop
4	Check voltage on CN1 1-3	> 14V. Set SW1 to high current or correct wiring.	End
5	Check MU	MU=+.1665ttx, with tt the terminal on CN3. ttx may need to be rounded to the nearest value. Example: +.1665199E+03 refers to terminal 20. If the wire can not be repaired disable the spot using item MW.	End
6	Check MU	Example: +.6399999E+02 rounded to the nearest integer value is 64. If MU < 64, MU is the sum of 1 Internal power supply failed 2 Internal power supply failed 4 Internal power supply failed 8 Internal Test Resistance failed if MU 180..183 there is a wiring error 180 PT100 wire on T20 is disconnected 181 PT100 wire on T21 is disconnected 182 PT100 wire on T22 is disconnected 183 GND wire not connected (CN3-3) if MU 184..185 there is an EMC error 184 EMC error, to much noise 185 EMC error, to much noise If MU 205..223 there is a wiring error ordering can not complete due to a disconnected spot (fatal), with tt the terminal on CN3. 205..222 tt not connected (tt=MU-200) 223 GND wire not connected The MU value may need to be rounded to the nearest value. Correct the wiring.	End
End	Contact Exalon Delft or your local distributor for support		

6.3.1 Special case for TC-bottom spot

When the bottom spot of the probe is a thermo-couple (orange wire) and it's wire is disconnected it will be encoded as MU=166.519 to show on which terminal the error occurs. Then it's value can no longer be used as a source for the reported bottom spot resistance. Therefore as long as the disconnection occurs the real PT100 value is used for the bottom spot and the reported temperature of spot 1 will be invalid.

6.4 Display Examples

When all temperature measurements succeeded the display will show for example

```
+009.3121 m INN  
+025.71°C ----I1
```

Then MU would be +.16650675E+03 and EM would be 2200.

When Spot 1 on T5 is disconnected the display will show for example

```
+009.3120 m INN  
+025.74FL ----I1
```

where FL indicates 'General MPU/HPU fail'. Then MU would be +.166505000E+03 and EM would be 2289.

When the PT100 wire on T22 is disconnected the display will show for example

```
+009.3120 m INN  
+999.99FL ----I1
```

where FL indicates 'General MPU/HPU fail'. Then MU would be +.18200000E+03 and EM would be 2280.

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