

X62T-MIR Installation Guide

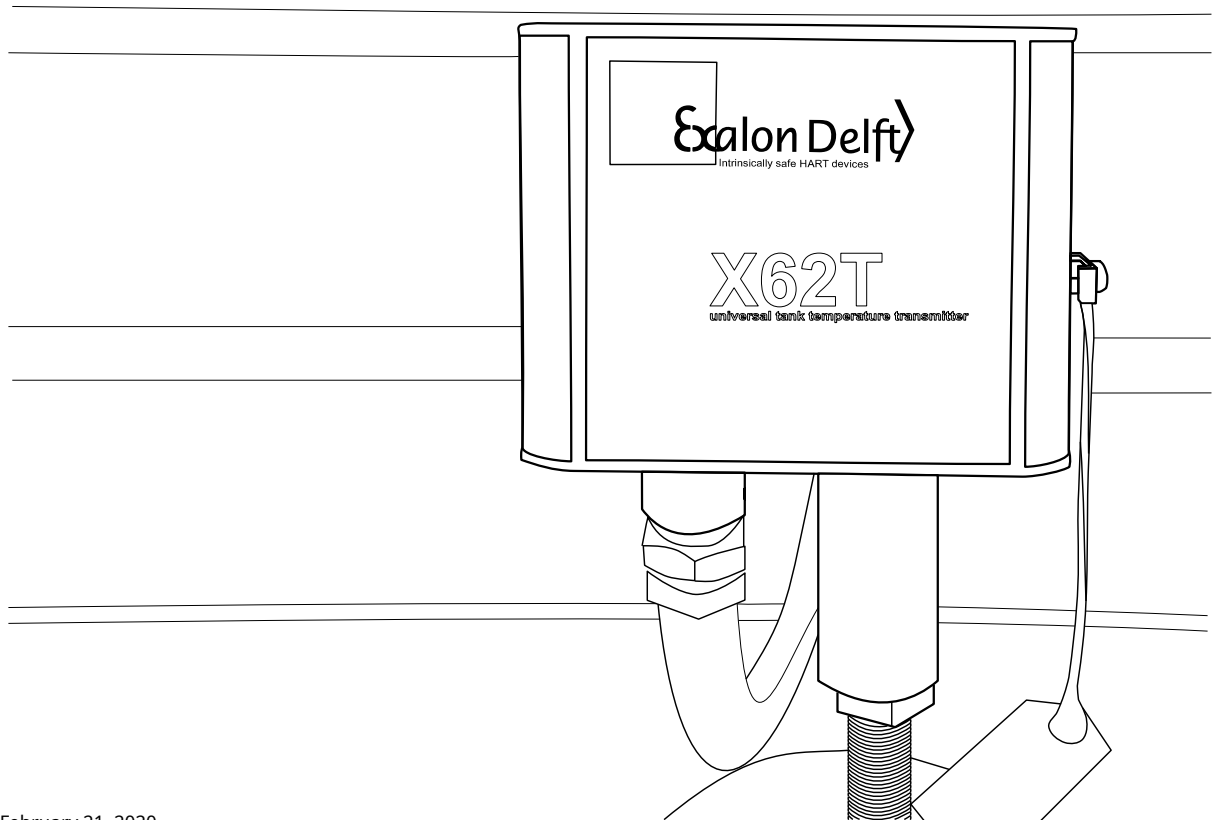


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1 Preface

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 EC Declaration of Conformity

This Exalon Delft instrument is in conformity with all applicable EC Council Directives, including the EMC Directive 89/336/EC and the ATEX114 Directive 2014/34/EC. 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-MIR?

The X62T-MIR is a Tank Thermometer transmitter based on the X62U multi-input HART transmitter. X62T-MIR can be connected to Enraf servo gauges 854 ATG, 854 XTG, 873 radar gauge or 877 hydrostatic gauge that are fitted with MPU, HPU or OPU option boards (see Section 4.1).

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

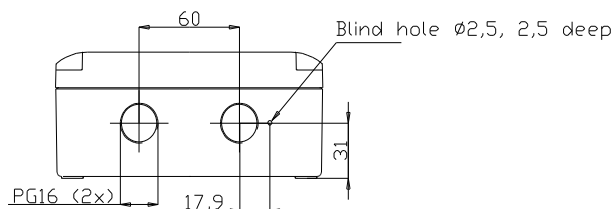
- The cable entry allows a PG16 cable gland or adapter to be used (not supplied).
- The MRT entry is also PG16 with positioning hole compatible to the original Enraf MRT G1/2-G1/2 adapter. If you are upgrading from a Enraf 862 MIR this adapter will already be glued on top of the 863 MRT. In a new installation 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-MIR enclosure can be selected: X62T-MIR/H and X62T-MIR/W:

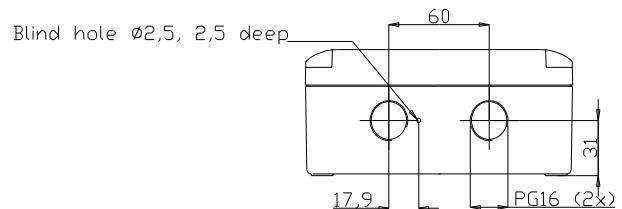
/H This is the default enclosure.

/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 MRT wires will cross the host connection wires.

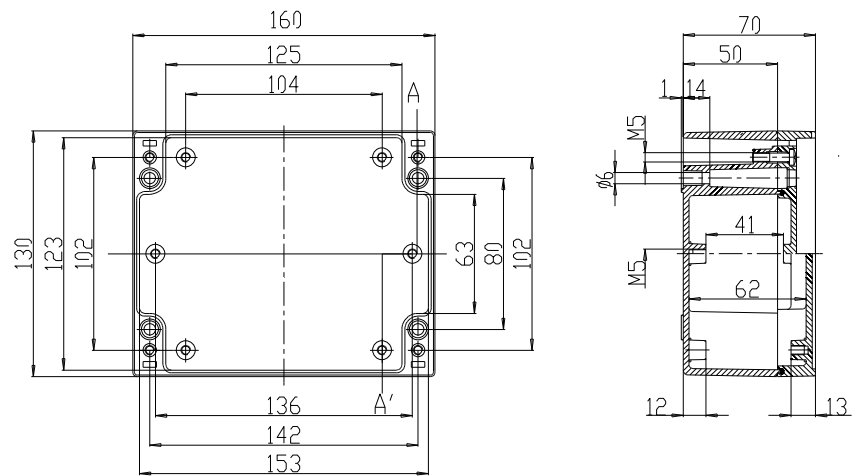
As the MRT wires and host wires are 2 different Intrinsically Safe circuits they MUST be kept isolated with a total of > 0.5mm solid isolation. An additional isolation sleeve (not supplied) may be needed to increase solid isolation.



X62T-MIR/H



X62T-MIR/W

**Mounting holes**

2.2 Other X62T variants

The X62T Host Interface and Probe Type are programmable. By supplying different firmware versions various combinations are supported to suite your application. See our Product Selection Guide at <https://www.exalondelft.nl/en/products/x62t/x62t-selection-guide> for a complete list.

3 Instructions for use in potentially explosive atmospheres

3.1 Explanation of the type identification code

Designation according to Directive 2014/34/EC:

CE 0344 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 3: Connection of MRT probe with spot element) 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-MIR compatibility to Enraf gauge option boards

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

Note

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

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 MRT type.
- Make sure the MRT 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 MIR by temporarily replacing the unit by a Known Good 862 MIR (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. For example 'MPUA3.0'. The 'A' indicates a MIR firmware version.

Note

If the MRT or MPU/HPU/OPU option board are malfunctioning while the 862 MIR works correctly, this problem can not be resolved by replacing the 862 MIR by a X62T-MIR. In fact it will be more difficult to diagnose problems when a X62T-MIR is connected.

4.2 X62T-MIR compatibility to the Enraf probes.

The X62T-MIR supports the same MRT probes as supported by the Enraf 862 MIR. Issue command "multi temperature element type": MT, this will return a 3 letter code. Only types with Rxx (MRT), Qxx (MRT with a spot element), Dxx and Exx (both dual temperature element) are supported.

Note

TPL indicates the probe is a MTT type (see remarks above). Dxx and Exx indicate a separate spot element for the vapor phase is installed (854 XPU A4.0 or later only). A separate junction box will also be present to combine the wiring of the MRT and vapor phase spot.

5 Installation

5.1 Powering the X62T-MIR

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

The X62T-MIR 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 MIR to X62T-MIR an Enraf G1/2-G1/2 M/F adapter may already be installed on the adjusting pipe¹. This will be compatible with the X62T enclosure and does not need to be replaced if the O-ring is in good condition.

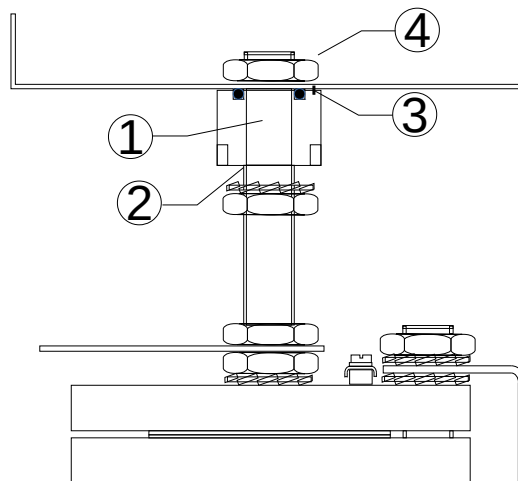


Figure 1: X62T-MIR installation

- 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.

¹ 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 MRT wiring through the G1/2-G1/2 M/F adapter (1).
- Apply a suitable thread locking pipe sealant on the first 25mm of the MRT 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 MRT probe

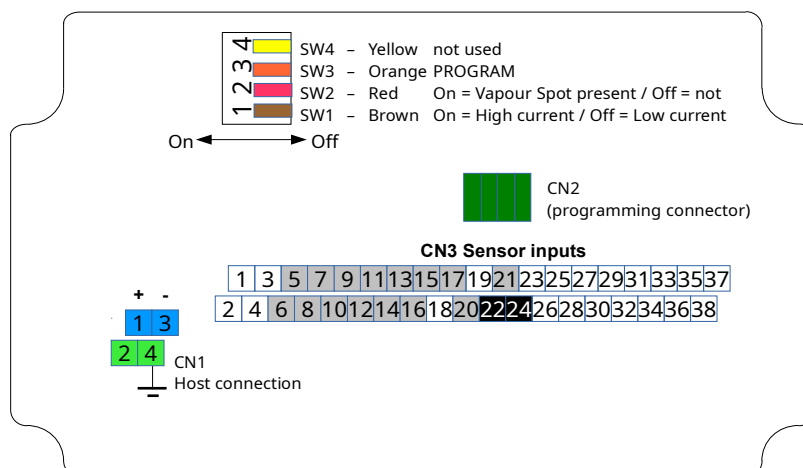


Figure 2: X62T-MIR DIP switches

1. Set switch SW1 BROWN in On position.
2. When connecting a Vapour Spot set switch SW2 Red in On position. Otherwise set it in Off position.
3. Set switch SW3 ORANGE in Off position.
4. Leave SW4 in Off position.

Connect the MRT probe according to Figure 3: Connection of MRT probe with spot element, Figure 4: Connection of MRT probe without spot element or Figure 5: Connection of MRT probe with Vapour Spot.

Caution

Discharge tools to the tank before bringing into contact with the X62 terminals to prevent ESD (electrostatic discharges). Then FIRST connect one BLACK wire to terminal 24 on CN3. Damage due to ESD related events are not covered by the warranty.

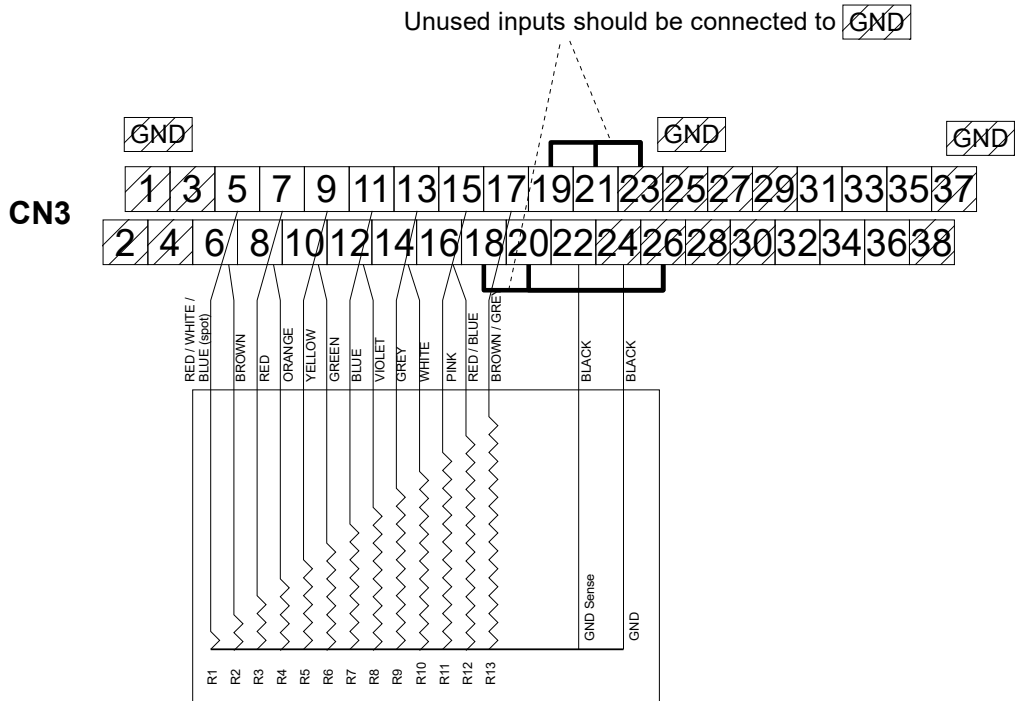
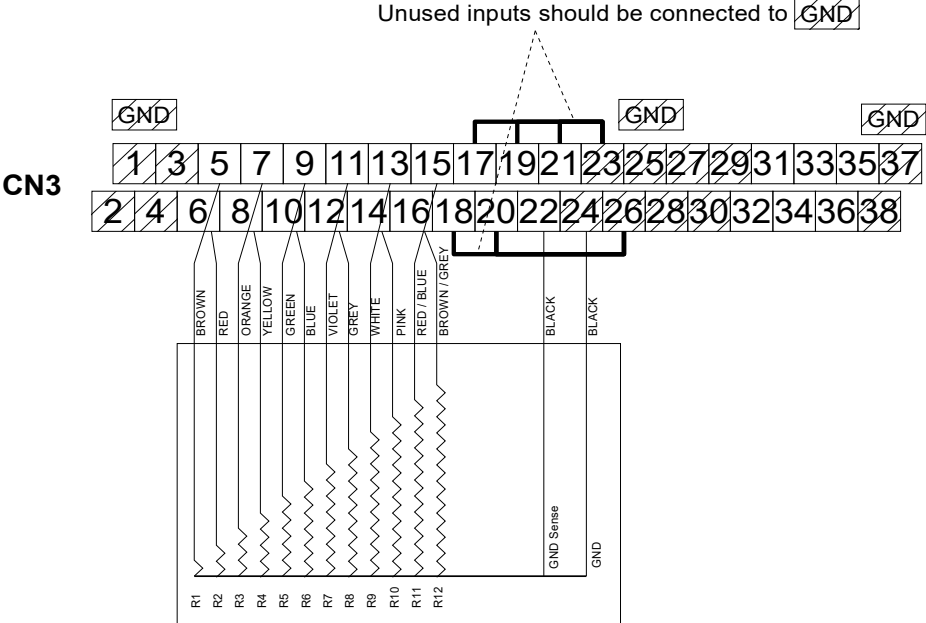
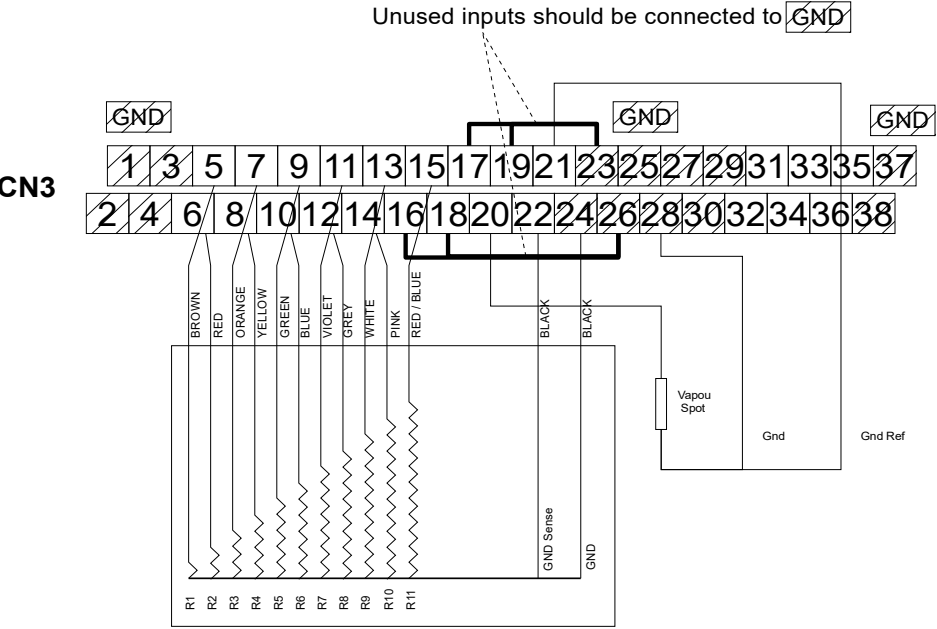


Figure 3: Connection of MRT probe with spot element



863 MRT without spot element

Figure 4: Connection of MRT probe without spot element



863 MRT with vapour spot element

Figure 5: Connection of MRT probe with Vapour Spot

Figure Figure 5 shows the connections for an MRT probe with a separate Vapour Spot.

When using a Dual Spot configuration the Product Spot must be wired the same as in Figure Figure 3. The Vapour Spot must be wired the same as in Figure Figure 5. All unused inputs must be connected to ground.

Note
 When connecting a Vapour Spot set switch SW2 Red in On position.

5.4 The X62T Configuration Switches

The X62T has 4 switches (DIP switches) located at the top side. These switches can be shifted to their **On** or **Off** position. The **On** position is when the switch is shifted to the direction where the numbers are printed. The **Off** position is when the switch is shifted to the direction where the text "OFF" is printed.

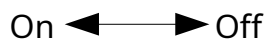


Figure 6: X62T Configuration Switches

Table 1: X62T Configuration Switch settings for the X62T-MIR

Switch	Description
1 Brown	This switch configures the Current Mode of the X62T. For X62T-MIR this switch must always be in On position for High Current Mode .
2 Red	This switch is used to indicate the presence of a Vapour Spot. When having a Vapour Spot set it in the On position. When not having one set it in the Off position.
3 Orange	This switch is reserved and must always be in Off position.
4 Yellow	For the X62T-MIR this switch is not used.

6 Commissioning MRT

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 documents *"Item documentation for Honeywell Enraf series 854 Level Gauges, 97x series SmartRadars Gauges and 877 Field Display & Interface"*, Part no.: 4416277 and *"Instruction manual 862 MIR Multiple temperature selector with MPU, HPU or OPU board"*, Part no.: 4416230 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=C3C2C1
		Example MT=QPL
		C3: R refers to an MRT without spot element Q refers to an MRT with spot element D refers to an MRT with spot element and separate gas spot element E refers to an MRT without spot element and separate gas spot element C2 C1: SA Sangamo MRT (-100 ÷ +280 °C) SS Sangamo spot (-100 ÷ +280 °C) BE Beacon MRT (-100 ÷ +280 °C) BS Beacon spot (-100 ÷ +280 °C) PL Pt100 large range (-200 ÷ +250 °C) PS Pt100 small range (-20 ÷ +120 °C) NI Ni191 (-20 ÷ +120 °C) CB Cu90 Beacon MRT (-100 ÷ +280 °C) CN Cu90 Nucletron MRT (-100 ÷ +280 °C) CS Cu90 spot (-100 ÷ +280 °C)
MR	Reference Resistance	+ .27750000E+03
MN	Number of elements	Elements including spot, max. 13. Note: the vapour spot is not included in this number. Default MN=16
MO	Temperature element offset	Lowest point of all elements, 152 mm above the Anchor eye. 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

Item	Name	Description
		Default MG=+000.1000 (m) for 877
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	370Ω ± 0.03% when EM shows no errors
V0 - VC	Element temperature	Temperature of the element (V0 is the 1 st element) preceded by the temperature status (same as AP).

6.3 Troubleshooting

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

For diagnostic purposes the X62T-MIR 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 MRT element measurement is indicated generating temperature out of range error for that element only.

Step	Check	Description	Next
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' or 'OR' may be shown. x indicates the highest submerged spot. @@@ indicates no errors or warnings. See Table 2 Temperature status Byte 1 .	2
2	Check EM		
	xx00	No last error available.	3
	xx11 xx92 xx70	No initial communication. Communication interrupted. Subsystem error.	4
	xx93	Unused input must be connected to GND. Correct the wiring.	Stop
	<i>No Vapour Spot</i> xx50..xx62 and MU = $370\Omega \pm 0.03\%$	Element 1-13 not connected (non fatal). Correct the wiring.	Stop

Step	Check	Description	Next
	With Vapour Spot xx50..xx60 and MU = $370\Omega \pm 0.03\%$	Element 1-11 not connected (non fatal) or Vapour Spot wires disconnected. Correct the wiring. Vx = +999.99 & MU = 370.020 : Vapour Spot X disconnected Vx = -9xx.xx & MU = 370.021 : Vapour Spot Y disconnected Vx = -24x.xx & MU = 370.028 : Vapour Spot Gnd disconnected	Stop
	xx50..xx62 and MU = 250Ω	GND wire not connected (CN3-24) (fatal). Correct the wiring.	Stop
	xx80 and MU = 200Ω	Ground Sense wire not connected (CN3-22) (non fatal) Correct the wiring.	Stop
	xx62 and MU < 200Ω	Rtest error, X62T-MIR signals a fatal error.	5
3	MU V0 - VF	Value of the X62T test resistor $370\Omega \pm 0.03\%$. 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	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	End

End Contact Exalon Delft for support

Note: at startup the RTest value sent to the gauge is 100Ω to indicate there are no measurement values yet. This temporary situation will not last more than one minute.

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 $+.37000675E+03$ and EM would be 2200.

When Spot 2 on T7 is disconnected the display will show for example

```
+009.3120 m INN
```

+025.74OR ----I1

where the OR instead of the °C indicates 'Temperature calculation out of range'. Then MU would be +.37000675E+03 and EM would be 2252.

When the Ground Sense on T22 is disconnected the display will show for example

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

where FL indicates 'General TPU fail or temperature fail'. Then MU would be +.20000000E+03 and EM would be 2262.

Table 2: Temperature status Byte 1

	Spot element fail (one or more spots defect)	Level exceeds highest spot element	Level exceeds lowest spot element	Fail in average gas temperature	Fail in average product temperature	General temperature fail
@	0	0	0	0	0	0
A	0	0	0	0	0	1
B	0	0	0	0	1	0
C	0	0	0	0	1	1
D	0	0	0	1	0	0
E	0	0	0	1	0	1
F	0	0	0	1	1	0
G	0	0	0	1	1	1
H	0	0	1	0	0	0
I	0	0	1	0	0	1
J	0	0	1	0	1	0
K	0	0	1	0	1	1
L	0	0	1	1	0	0
M	0	0	1	1	0	1
N	0	0	1	1	1	0
O	0	0	1	1	1	1
P	0	1	0	0	0	0
Q	0	1	0	0	0	1
R	0	1	0	0	1	0
S	0	1	0	0	1	1
T	0	1	0	1	0	0
U	0	1	0	1	0	1
V	0	1	0	1	1	0
W	0	1	0	1	1	1
X	0	1	1	0	0	0
Y	0	1	1	0	0	1
Z	0	1	1	0	1	0
[0	1	1	0	1	1
\	0	1	1	1	0	0
]	0	1	1	1	0	1
^	0	1	1	1	1	0
_	0	1	1	1	1	1
'	1	0	0	0	0	0
a	1	0	0	0	0	1
b	1	0	0	0	1	0
c	1	0	0	0	1	1
d	1	0	0	1	0	0
e	1	0	0	1	0	1
f	1	0	0	1	1	0
g	1	0	0	1	1	1
h	1	0	1	0	0	0
i	1	0	1	0	0	1
j	1	0	1	0	1	0
k	1	0	1	0	1	1
l	1	0	1	1	0	0
m	1	0	1	1	0	1
n	1	0	1	1	1	0
o	1	0	1	1	1	1
p	1	1	0	0	0	0
q	1	1	0	0	0	0
r	1	1	0	0	1	1
s	1	1	0	0	1	1
t	1	1	0	1	0	0
u	1	1	0	1	0	0
v	1	1	0	1	1	1
w	1	1	0	1	1	1
x	1	1	1	0	0	0
y	1	1	1	0	0	0
z	1	1	1	0	1	1
{	1	1	1	0	1	1
	1	1	1	1	0	0
}	1	1	1	1	0	0
~	1	1	1	1	1	1
	1	1	1	1	1	1

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