

X62T-VR Installation Guide

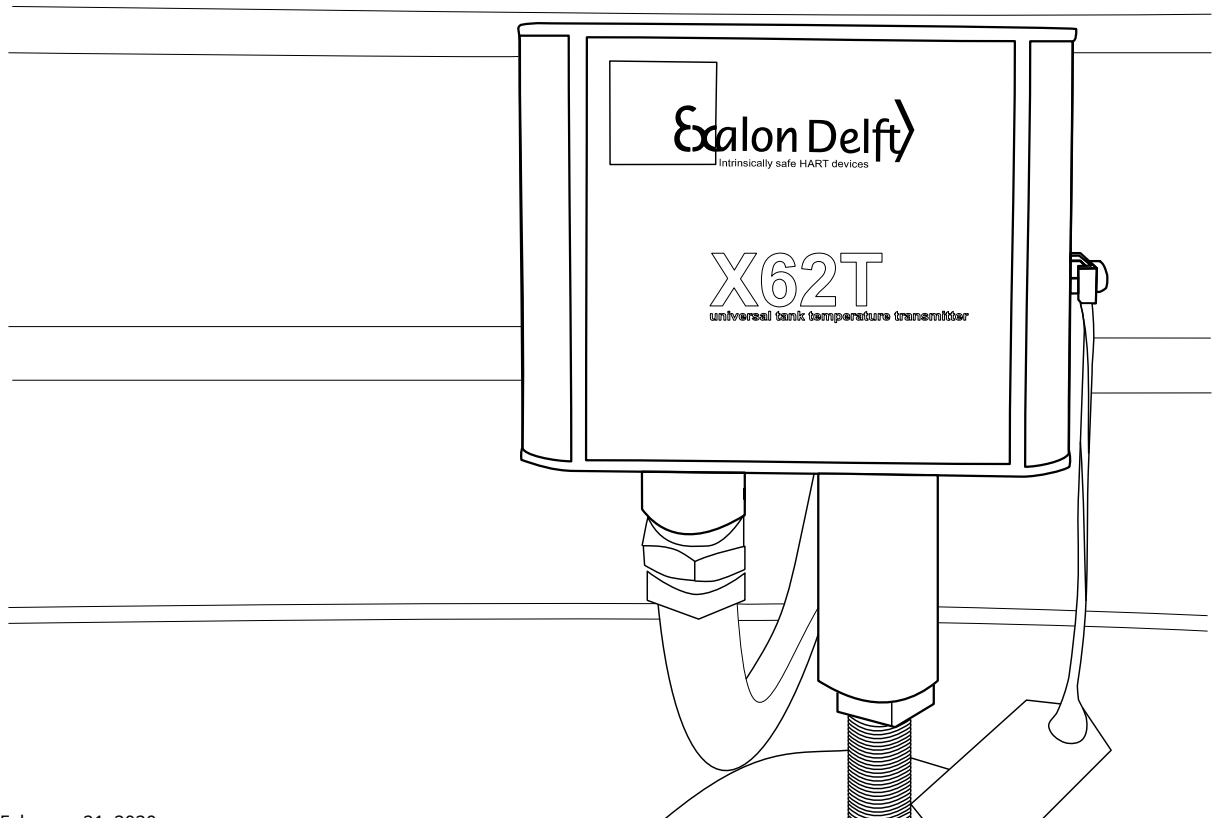


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1 Preface

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 2014/30/EU 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-VR?

The X62T is a Tank Thermometer transmitter based on the X62U multi-input HART transmitter. The X62T-VR can be connected to Enraf servo gauges 854 ATG and 854 XTG, 873 radar, 97x SmartRadar or 990 SmartRadar FlexLine gauge that are fitted with HCU, ICU_HPI or FII-VT option boards (see Section 4.1).

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

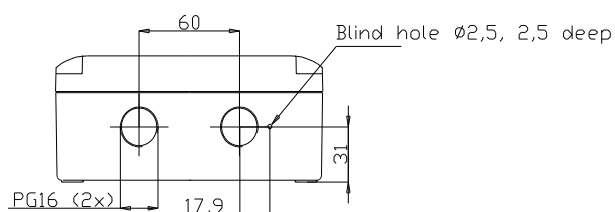
- The cable entry allows a PG16 cable gland or adapter to be used (not supplied).
- The MRT entry is also PG16 with positioning hole compatible to the original Enraf MRT G1/2-G1/2 adapter. If you are upgrading from a Enraf 862 MIR this adapter will already be glued on top of the 863 MRT. In a new installation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

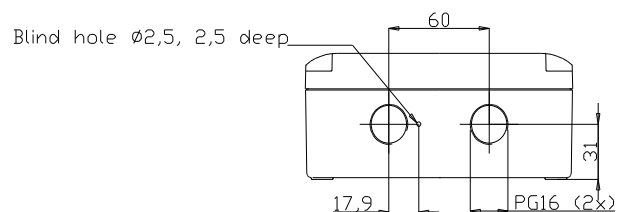
/H This is the default enclosure.

/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 probe wires will cross the host connection wires.

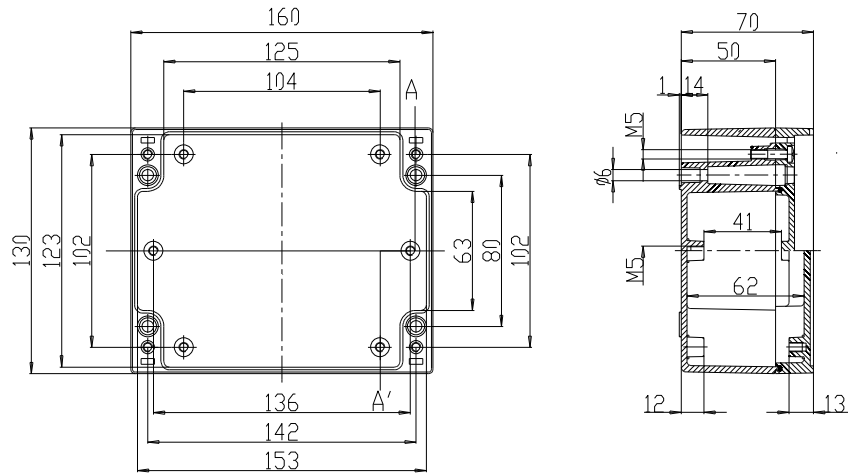
As the probe wires and host wires are 2 different Intrinsically Safe circuits they MUST be kept isolated with a total of > 0.5mm solid isolation. An additional isolation sleeve (not supplied) may be needed to increase solid isolation.



X62T-VR/H



X62T-VR/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:

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)	
U _i	30V	U _o	5.9V
I _i	270mA	I _o	62mA
P _i	1.2W	P _o	92mW
C _i	5nF	C _o	900uF
L _i	-	L _o	30mH

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 MRT and VITO MPT 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 C_o / L_o 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 Compatibility of the X62T-VR with Enraf gauge option boards

The X62T-VR can be connected to HCU (854 Servo, 873 Radar), ICU_HPI (97x SmartRadar) and FII-VT (990 SmartRadar FlexLine) option boards to emulate Honeywell Enraf 762 VITO MRT transmitters.

Note

Not all Honeywell Enraf option board versions support all functions. As the X62T-VR closely emulates 762 VITO MRT the same limitations apply to the X62T-VR as to Honeywell Enraf 762 VITO MRT interfaces.

If unsure what is supported by your HCU/ICU_HPI/FII-VT please contact your Honeywell Enraf representative.

Internally in the gauge the HCU communicates with the XPU board. Depending on the XPU HW and SW version the HCU might be configured to emulate a MPU option board which only supports VITO MRT.

To find out the software version issue command SV.

Note

*To issue commands directly at the gauge you require a PET (Portable Enraf Terminal).
Alternatively there are tools available to connect to the Enraf Fieldbus and issue commands to the gauge from the safe area.*

Table 1: Option boards installed in the gauge and supported functions

Command	Example	Interpretation
VP=00.01	VVHCU CONFIG: 2E	HCU with option 0A 2E 1A 3F support VITO
VP=00.00	VVHSU HC--ST---- VVMPU HC—MR----	HSU emulation, no VITO supported MPU emulation, VITO average MRT/multi spot probe supported

When supported by the XPU preferably select HCU mode instead of MPU or HPU emulation. Selection is done by jumpers on the option board. Please refer to the Honeywell Enraf manual on changing emulation type.

4.2 Compatible probes

4.2.1 Enraf MRT, MPT and RTD probes

The X62T-VR supports the same MRT probes as the obsolete Enraf 862 MIR interface as well as 762 VITO MRT supported RTD based probes (see Table 2: Supported Enraf probes).

4.2.2 Other supported RTD probes

The X62T-VR also supports RTD probes having resistors in *3-wire Individual Sense* or *4-Wire* configurations. The RTD values are emulated to the level gauge as if resulting from an MPT probe (*3-wire Common Sense*). This allows for temperature measurements of up to 9 (for *3-wire Individual Sense*) or 6 (for *4-Wire*) elements.

Table 2: Supported Enraf probes

Type	Description	Supported
863	MRT probe	Yes
361	VITO MPT probe	Yes
	Up to 14 Pt100 RTD elements 3w common sense	Yes
	Up to 9 Pt100 RTD elements 3w individual sense	Yes
	Up to 6 Pt100 RTD elements 4w	Yes
365	Combined MPT and Water probe	No
765	VITO Water probe only	No

4.3 Determine mechanical dimensions

For the 361 probes mechanical dimensions can be determined from the probe type identification plate (see Table 3: Mechanical dimensions for MPT probes).

For an MRT you can check the number of elements (see Table 4: 863 MRT: Element Position/Length (m) from bottom end of probe) and the colors of the wires (see Table 5: MRT and MPT probe connections).

You will need these dimensions to configure the temperature transmitter correctly.

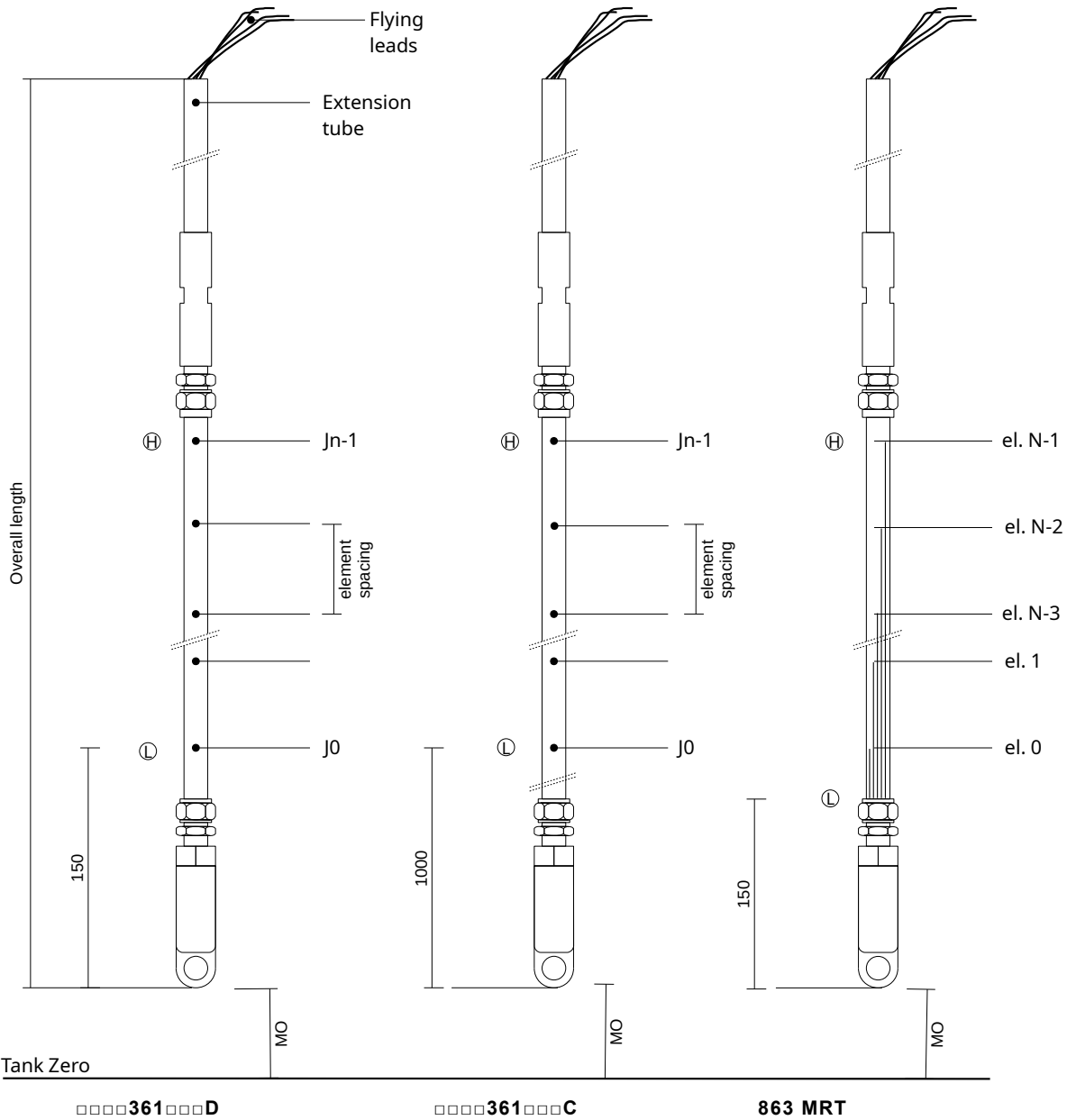


Table 3: Mechanical dimensions for MPT probes

Probe	Lowest spot element position
361C	100 cm
361D	15 cm

For MPT probes the element positions (**J0..JF**) can be read from the test certificate. It (J_x) can also be computed using these formulas:

$$element\ spacing = \frac{highest\ element\ position - lowest\ element\ position}{number\ of\ elements - 1}$$

$$Jx = \text{position lowest element} + (x * \text{element spacing})$$

For MRT probes use the following table.

Table 4: 863 MRT: Element Position/Length (m) from bottom end of probe

# of elements	Without Spot U0..UC	Wit Spot U0..UC
1	0.65	0.25
2	1.25	0.65
3	1.95	1.25
4	2.85	1.95
5	4.15	2.85
6	5.65	4.15
7	7.37	5.65
8	9.25	7.37
9	11.65	9.25
10	14.65	11.65
11	18.45	14.65
12	22.95	18.45
13	29.65	22.95
14	-	29.65

5 Installation

5.1 Powering the X62T-VR

The X62 can be configured to draw a constant current of either 4 mA or 15 mA. When programmed with X62T-VR firmware preferably the low current mode should be selected (SW1 BROWN in OFF position).

In low current mode the X62 requires a voltage between 12V and 24V on the terminals CN1-1 and CN1-3 and larger than 14V in high current mode. When connected to an Enraf HCU or ICU_HPI option board in low current mode the supply voltage will always be sufficient (> 16V).

Note

The HCU/ICU_HPI has 2 HART channels. Channel 2 will deliver only 12.5V with the X62T-VR in high current mode. Select low current to operate on Channel 2.

Note

Issuing a reset command to the gauge (RS) will temporarily cut power and RESET the X62.

5.2 Mechanical connection

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

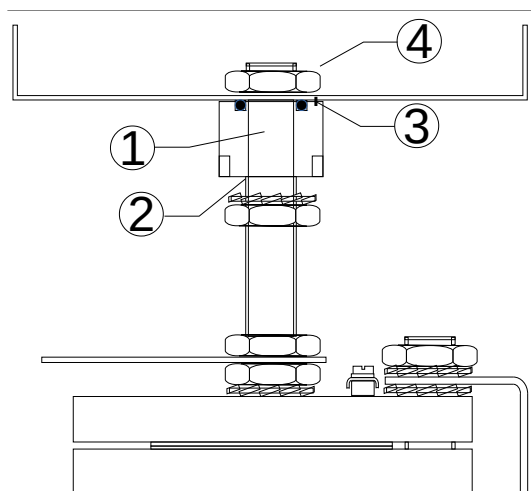


Figure 1: X62T-VR installation

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

- Connect the MRT or VITO MPT probes according to Figure 2: Connection of MRT and VITO MPT probes and Table 5: MRT and MPT probe connections. The X62T-VR allows to connect up to 14 elements.
- Connect RTD probes according to Figure 3: Connection of RTD probes and Table 6: RTD probe connections. The X62T-VR allows to connect up to 3 RTDs.

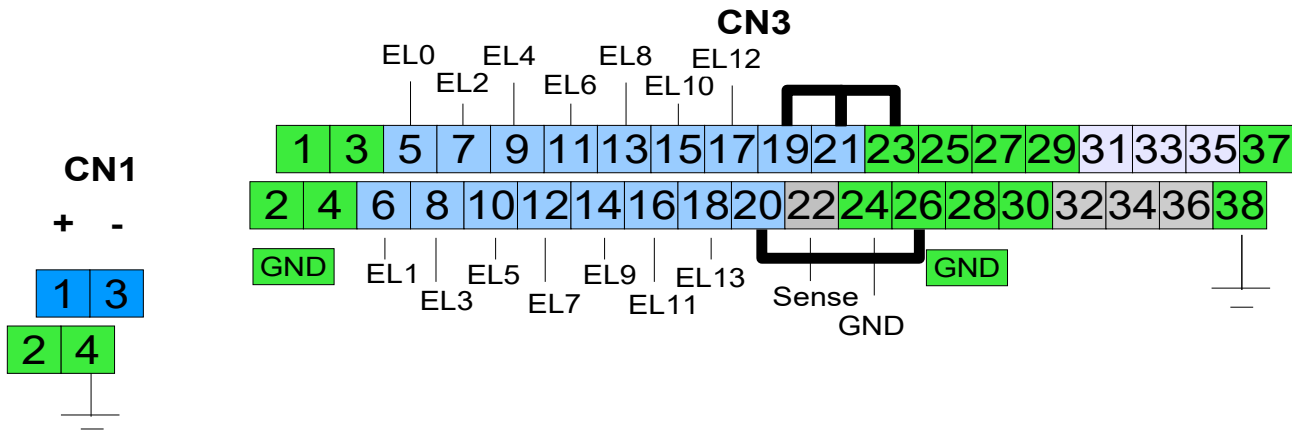
Caution

*Discharge tools to the tank before bringing into contact with the X62 terminals to prevent ESD (electrostatic discharges). Then **FIRST** connect one Ground wire to terminal 1 on CN3. Damage due to ESD related events are not covered by the warranty.*

- If an MRT or MPT probe is present set SW4 Yellow to **Off**. If a RTD probe is present set SW4 Yellow to **ON**.

Note

The X62T-VR will operate with unused inputs left floating. However this may cause tiny temperature offsets on used inputs, this causes EMC degradation.



Unused EL-inputs should be connected to **GND**

Figure 2: Connection of MRT and VITO MPT probes

Table 5: MRT and MPT probe connections

X62T-VR Terminal	MPT	MRT with Spot	MRT without Spot
5, EL0	Brown, R1	Red/White/Blue, Spot/ R1	Brown, R1
6, EL1	Red, R2	Brown, R2	Red, R2
7, EL2	Orange, R3	Red, R3	Orange, R3
8, EL3	Yellow, R4	Orange, R4	Yellow, R4
9, EL4	Green, R5	Yellow, R5	Green, R5
10, EL5	Blue, R6	Green, R6	Blue, R6
11, EL6	Violet, R7	Blue, R7	Violet, R7
12, EL7	Grey, R8	Violet, R8	Grey, R8
13, EL8	White, R9	Grey, R9	White, R9
14, EL9	Pink, R10	White, R10	Pink, R10
15, EL10	Red/Blue, R11	Pink, R11	Red/Blue, R11
16, EL11	Brown/Grey, R12	Red/Blue, R12	Brown/Grey, R12
17, EL12	Black/White, R13	Brown/Grey, R13	-*
18, EL13	Red/Green, R14	-*	-
22, Sense	Black, Rc	Black, Rc	Black, Rc
2, Gnd (or any another Gnd)	Black, Gnd	Black, Gnd	Black, Gnd

*) If your MRT has 13 averaging elements connect the longest element to the next free terminal (T17 when no Spot or T18 when with Spot)

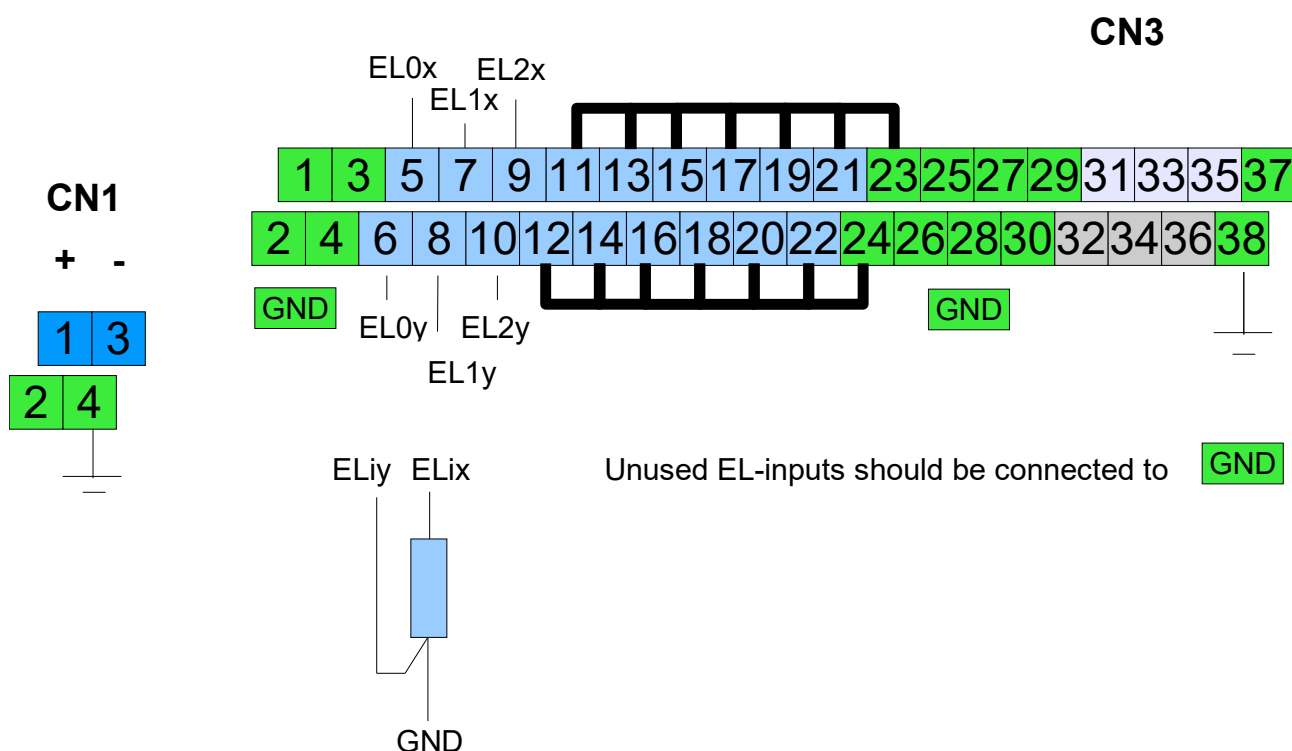


Figure 3: Connection of RTD probes

Table 6: RTD probe connections

X62T-VR Terminal	RTD Wire (vito mrt terminal)
5, EL0x	RTD1-x (R10)
6, EL0y	RTD1-y (Rc/R11)
1, Gnd (or any other gnd)	RTD1-gnd (Gnd-Ref2)
7, EL1x	RTD2-x (R12)
8, EL1y	RTD2-y (Rc/R13)
2, Gnd (or any other gnd)	RTD2-gnd (Gnd-Ref1)
9, EL2x	RTD3-x (R14)
10, EL2y	RTD3-y (Rc)
3, Gnd (or any other gnd)	RTD3-gnd (Gnd-Ref0)
not connected elements	unused terminals MUST be connected to ground¹

1 This is done to reduce noise and to be able to identify broken wires.

5.4 Electrical connection other supported RTD Probes

Due to the number of terminals the maximum number of elements for a 3-Wire Individual sense probe is 9 and for a 4-Wire probe it is 6.

When connecting other supported Pt100 RTD probes connect the elements using the following diagrams/tables.

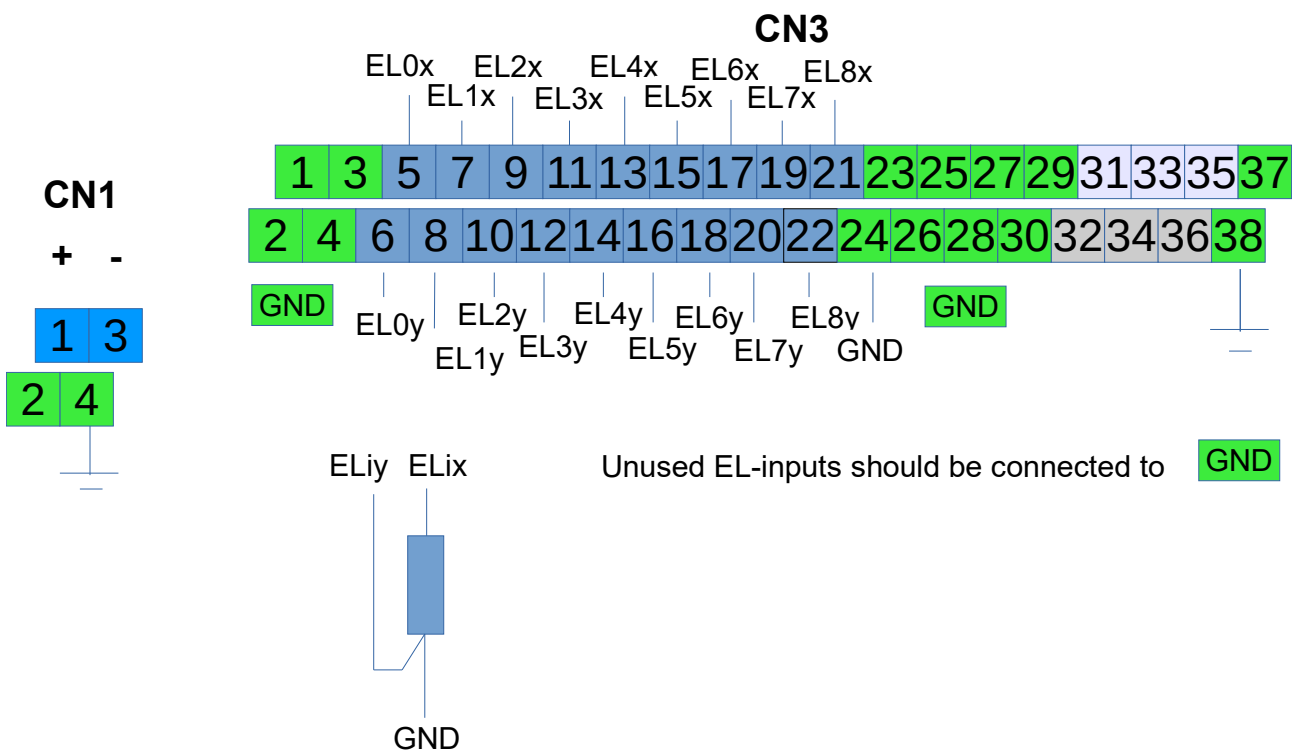


Figure 4: 3-Wire Individual Sense RTD in MPT mode

Table 7: 3-Wire Individual Sense RTD in MPT mode

Element	X62T-VR Terminal
1 st Element	5: EL0x, 6: EL0y
2 nd Element	7: EL1x, 8: EL1y
3 rd Element	9: EL2x, 10: EL2y
4 th Element	11: EL3x, 12: EL3y
5 th Element	13: EL4x, 14: EL4y
6 th Element	15: EL5x, 16: EL5y
7 th Element	17: EL6x, 18: EL6y
8 th Element	19: EL7x, 20: EL7y
9 th Element	21: EL8x, 22: EL8y
not connected elements	unused terminals MUST be connected to ground²

All GND terminals are the same ground and it does not matter which are used. For error reporting the X62T-VR assumes the grounds for elements 1..4 are connected to terminals 1..4 and for elements 5..9 to terminals 23..27.

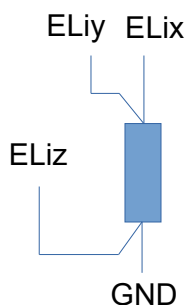
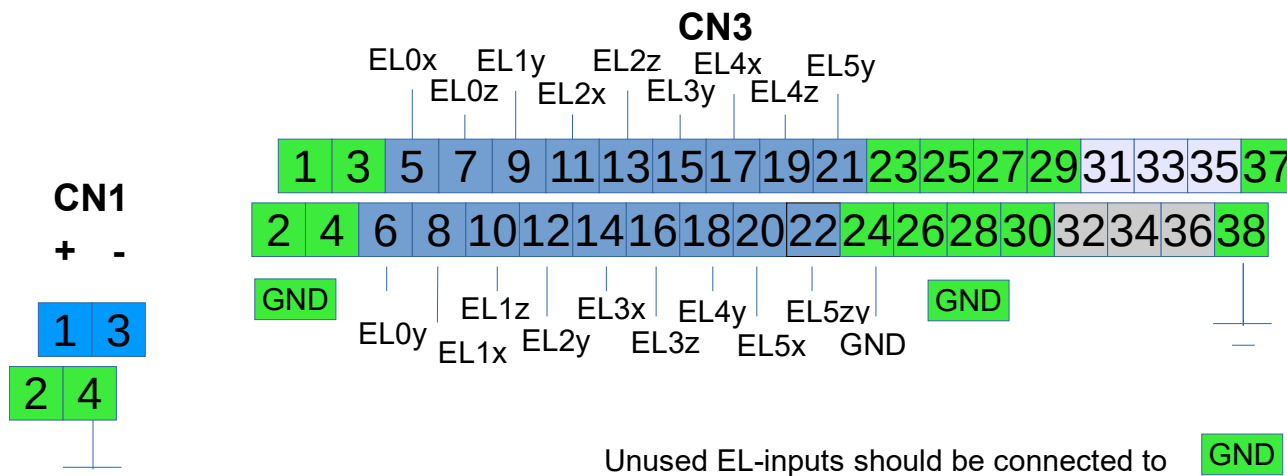


Figure 5: 4-Wire RTD in MPT mode

2 This is done to reduce noise and to be able to identify broken wires.

Table 8: 4-Wire RTD in MPT mode

Element	X62T-VR Terminal
1 st Element	5: EL0x, 6: EL0y, 7: EL0z
2 nd Element	8: EL1x, 9: EL1y, 10: EL1z
3 rd Element	11: EL2x, 12: EL2y, 13: EL2z
4 th Element	14: EL3x, 15: EL3y, 16: EL3z
5 th Element	17: EL4x, 18: EL4y, 19: EL4z
6 th Element	20: EL5x, 21: EL5y, 22: EL5z
not connected elements	unused terminals MUST be connected to ground³

All GND terminals are the same ground and it does not matter which are used. For error reporting the X62T-VR assumes the grounds for elements 1..4 are connected to terminals 1..4 and for elements 5..6 to terminals 23..24.

5.5 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.



On ← → Off

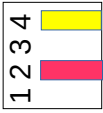
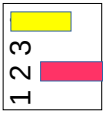
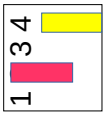
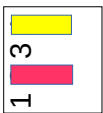
Figure 6: X62T Configuration Switches

Table 9: X62T Configuration Switch settings for the X62T-VR

Switch	Description
1 Brown	This switch configures the Current Mode of the X62T. For X62T-VR this switch can be in On position for High Current Mode or Off position for Low Current Mode
2 Red	This switch is used to configure the probe type. See below.
3 Orange	This switch is reserved and must always be in Off position.
4 Yellow	This switch is used to configure the probe type. See below.

³ This is done to reduce noise and to be able to identify broken wires.

Table 10: Probe Type selection using Switches

Switches	Description
 <p>MPT/MRT</p>	With both switches 2 & 4 in the Off position the probe type is set to MPT/MRT .
 <p>RTD</p>	With switch 2 in the Off – and switch 4 in the On position the probe type is set to RTD
 <p>3-Wire IS</p>	With switch 2 in the On – and switch 4 in the Off position the probe type is set to 3-Wire Individual Sense . In this mode 9 elements can be connected.
 <p>4-Wire</p>	With both switches 2 & 4 in the On position the probe type is set to 4-Wire . In this mode 6 elements can be connected.

6 Commissioning Probes

6.1 Commissioning Eraf MRT, VITO MPT and RTD probes

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=C3C2C1
		For 1 – 3 RTD's and MPT probe use: SPL
		For MRT probes use:
		Rxx: MRT without spot element
		Qxx: MRT with spot element
		where xx:
		SA: Sangamo MRT
		SS: Sangamo Spot
		BE: Beacon MRT
		BS: Beacon Spot
		PL*: Pt100 large
		PS*: Pt100 small
		NI*: Ni 191
		CB: Cu90 Beacon
		CN: Cu90 Nulectroh m
		CS: Cu90 Spot
		*) From HCI/ICU_HPI software version A1.9 and higher
MR	Reference Resistance	+.22200000E+03
MN	Number of elements	Elements including spot, max. 14.
MK	Sensitive length temperature probe	Use the value from Table 9: X62T Configuration Switch settings for the X62T-VR. Default MK=+030.0000 (m)
MO	Temperature element offset	Use the value from Table 9: X62T Configuration

Item	Name	Description
		Switch settings for the X62T-VR. 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
MJ	Temperature distribution	Disables the lowest element from the average temperature calculation. This is necessary to comply with API and ISO recommendations that the lowest element used for average temperature calculation is 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. If MO is less than 1m MJ should be set to F if you require API/ISO compliance. This item is implemented in HCU/ICU_HPI firmware A1.8 or higher and is not yet documented in the "Item documentation ..." rev. 5 (August 2013). For older firmware use MW. Default MJ=F (lowest element disabled) Alternative MJ=C (lowest element enabled)
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	

Additional temperature settings may apply for the 877 FDI. Please refer to the document *"Instruction manual VITO interface and average temperature (and water) probes for 854 servo, 97x SmartRadar and 877 FDI"*, Part no.: 4416.655 from <http://www.honeywellprocess.com> for more information.

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) 3000 (HCU 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
V0 - VF	Spot temperature	Temperature of the spot (V0 is the lowest spot) preceded by the temperature status (same as AP).

6.3 Commissioning other supported RTD Probes

For both *3-Wire Individual Sense* as well as *4-Wire* the X62T-VR will emulate RTD values as if the probes elements are being measurement using *3-Wire Common Sense* method. Therefore the gauge must be configured as if it has an MPT probe. All other probe variables like *Element Type* and *Number of Elements* will reflect the actual present situation.

For example **MT SPL** and **MN 9** for a *3-Wire Individual Sense* probe with 9 elements.

6.4 Troubleshooting

The X62T-VR firmware measures all temperature elements independently from the gauges option board. Errors are detected in a much earlier stage than with the 762

VITO 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-VR 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 11: 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
	xx50..xx63 in MRT/MPT mode	Element X (1..14) not connected (CN3-5..18) Correct the wiring. (MU value will indicate the same element. See step 5.)	End
	xx50..xx58 in 3WIS/4W mode	Element X (1..9/1..6) not connected (CN3-5..18).	5
	xx81 and MU < 200Ω	Rtest error, X62T-VR 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

Step	Check	Description	Next
5	Check MU	<p>MU=+.1665ttx, with tt the terminal on CN3. ttx may need to be rounded to the nearest value.</p> <p>Example: +.1665199E+03 refers to terminal 20.</p> <p>The tt values 1..4 and 23..27 indicate ground terminals. It means the ground wire of an element is not connected.</p> <p>ttx=[1..4] => elements 1..4 ttx=[23..27] => elements 5..9</p> <p>Correct the wiring.</p>	End
6	Check MU	<p>If MU < 64, MU is the sum of</p> <ul style="list-style-type: none"> 1 Internal power supply failed 2 Internal power supply failed 4 Internal power supply failed 8 Internal Test Resistance failed <p>If MU >= 64, MU indicates</p> <ul style="list-style-type: none"> 182 Common Sense wire disconnected 183 Common Ground wire disconnected 184 EMC error, too much noise 185 EMC error, too much noise 	End
End Contact Exalon Delft for support			

6.5 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 3000.

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 V0 would be 9999999 and EM would be 3050.

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

```
+009.3120 m INN
9999999FL ----I1
```

where FL indicates 'General MPU/HPU fail'. Then MU would be +.18200000E+03 and EM would be 3081.

Table 11: Temperature status Byte 1

@	0	Spot element fail (one or more spots defect)	P	0	Spot element fail (one or more spots defect)	a	1	Spot element fail (one or more spots defect)	p	1	Spot element fail (one or more spots defect)
A	0	Level exceeds highest spot element	Q	0	Level exceeds highest spot element	b	1	Level exceeds highest spot element	q	1	Level exceeds highest spot element
B	0	Level exceeds lowest spot element	R	0	Level exceeds lowest spot element	c	1	Level exceeds lowest spot element	r	1	Level exceeds lowest spot element
C	0	Fail in average gas temperature	S	0	Fail in average gas temperature	d	1	Fail in average gas temperature	s	1	Fail in average gas temperature
D	0	Fail in average product temperature	T	0	Fail in average product temperature	e	1	Fail in average product temperature	t	1	Fail in average product temperature
E	0	General temperature fail	U	0	General temperature fail	f	1	General temperature fail	u	1	General temperature fail
F	0		V	0		g	1		v	1	
G	0		W	0		h	1		w	1	
H	0		X	0		i	1		x	1	
I	0		Y	0		j	1		y	1	
J	0		Z	0		k	1		z	1	
K	0		[0		l	1		{	1	
L	0		\	0		m	1			1	
M	0]	0		n	1		}	1	
N	0		^	0		o	1		~	1	
O	0		_	0			1			1	

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