



NVT-E Operating-/Assembly Instructions



The series of level switches NVT-E is suitable for monitoring level and temperature in tanks in fluid systems. Depending on the model, the level switches are equipped with a different number of switching outputs.

Please find the configuration on the type plate. Here you find the order acknowledgement number, the product key and the model description.

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1 Technical Data

Technical Data

Operating pressure:	Max. 1 bar
Operating temperature:	-20 °C to +80 °C
Ambient temperature:	-20 °C to +70 °C
Weight:	approx. 400g
Sealing fluid:	Min. 0,8 kg/dm ³
Swimmer:	PU
Immersion pipe:	MS
G 3/4 flange:	MS
Multiplier:	Reed chain
Resolution:	10 mm
Temperature sensor:	PT100 class B DIN 60751

Display and control unit

Display:	4-digit 7-segment LED display
Operation:	over 3 keys
Memory:	Min. and max. value memory
Current consumption with starting:	approx. 100 mA for 100 ms
Current consumption during operation:	approx. 50 mA
Supply voltage (U _B):	10-32 V DC (nominal voltage 24 V DC)
Protection:	IP 65
Display units:	Level: %, cm, L, i, Gal Temperature: -20 °C to +120 °C or -4 °F to 248 °F
Setting range:	Level: e. g. 0-100 % Temperature: 0 °C to +100 °C or 32 °F to 212 °F
Accuracy:	1 % of final value

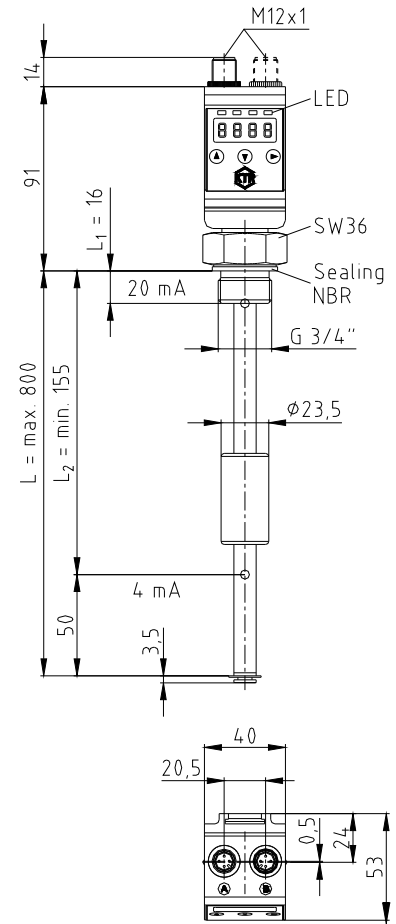


Illustration 1

Table 1: Pin assignment

Types	NVT-E...-2S	NVT-E ...-4S
PNP transistor output	2 times	4 times
Analogue output – level	---	---
Analogue output – temperature	---	---
Types	NVT-E ...-2S-KN-KT	NVT-E ...-4S-KN-KT
PNP transistor output	2 times	4 times
Analogue output – level	1 time	1 time
Analogue output – temperature	1 time	1 time

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2 Hints

2.1 General Hints

Please read through these mounting instructions carefully before you set the level and temperature control into operation.

The mounting instructions are part of your product. Please keep them carefully and close to the level and temperature control.

2.2 Safety and Advice Hints



DANGER!

Danger of injury to persons.



CAUTION!

Damages on the machine possible.



ATTENTION!

Pointing to important items.

2.3 General Hints to Danger



DANGER!

With assembly, operation and maintenance of the level and temperature control it has to be made sure that the entire drive train is protected against unintentional engagement. You can be seriously hurt by rotating parts. Please make absolutely sure to read through and observe the following safety instructions.

- All operations on and with the NVT-E have to be performed taking into account "safety first".
- Please make sure to disengage the power pack before you perform your work on the NVT-E.
- Protect the power pack against unintentional engagement, e. g. by providing hints at the place of engagement or removing the fuse for current supply.
- Do not touch the operation area of the machine as long as it is in operation.
- Please protect the rotating drive components against unintentional touch. Please provide for the necessary protection devices and caps.

2.4 Proper Use

You may only assemble, operate and maintain the NVT-E if you

- carefully read through the mounting instructions and understood them
- had technical training
- are authorized to do so by your company

The NVT-E may only be used in accordance with the technical data (see chapter 1). Unauthorized modifications on the NVT-E design are not admissible. We do not take any warranty for resulting damages. To further develop the product we reserve the right for technical modifications.

The **level and temperature control (NVT-E)** described in here corresponds to the technical status at the time of printing of these mounting instructions.

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3 Assembly

The level switches are supplied fully assembled and can be fixed to the tank by means of the thread. In this context please make sure that the float can move freely and sufficient distance to the tank walls and to other equipment is kept. If the float has potentially been disassembled it has to be made sure that the magnet inside the float is situated above the fluid level. This can easily be inspected by means of a piece of iron which allows to find out the position of the magnet in the float.

3.1 Starting (General)



CAUTION!

The electric connection may be performed by trained technical staff only.

Connection

The mains voltage is connected to connector S6 or M12, respectively. Nominal voltage of devices is 24 V DC. Please refer to the mounting dimensions and pin assignment in the chapter 1 *Technical Data*.

The switching outputs are designed as PNP transistor outputs (see illustration 2).



ATTENTION!

If the switching output is measured with high-impedance measuring equipment or if the frequency output is used, connect a 10 kΩ resistor between output and ground to avoid faulty measurements.

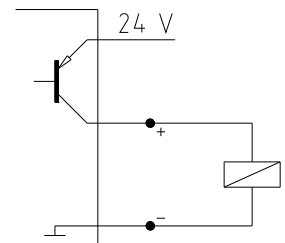


Illustration 2

4 Operation

4.1 Switching On

If an error message occurs during normal operation, please refer to chapter 7.1 *Breakdowns, Causes and Elimination*.

After connecting the device to the mains, the software version is displayed for a short time. Afterwards, the measured values are displayed.

The functions of the display- and control unit are explained in the following chapters.

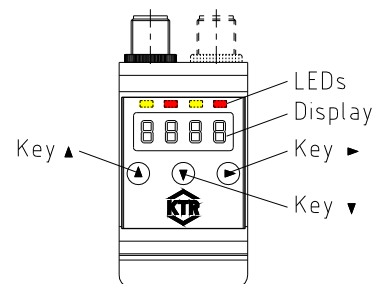


Illustration 3

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4 Operation

4.2 LED-Status Display

Light emitting diodes above the reading indicate the switching status of the outputs. The LEDs are assigned to the switching output numbered the same.



ATTENTION!

The table 2 shows the factory settings as level or temperature output.

Table 2: LED-Status display

LED-Display		2 switching outputs	4 switching outputs
	LED 1 – yellow indicates switching output 1	Level	Level
	LED 2 – red indicates switching output 2	Temperature	Level
	LED 3 – yellow indicates switching output 3	---	Temperature
	LED 4 – red indicates switching output 4	---	Temperature



ATTENTION!

The switching behavior of the LED (ON with closed or opened switching output) can be changed, please note chapter 4.7 *switching outputs*.

4.3 Key Functions

Operation is performed via the keys underneath the display.

Table 3: Key functions

Key	Operation mode	Function
▶	- Measured value display:	Switching the displayed units (example): (▶)
	- Within the menu:	Switching to a submenu
	- At the end of the menu:	Switching to a superordinate menu (Exit) indicates the end of the menu
	- After input/selection:	Accepting and saving a value entered or a feature selection
▲	- Measured value display:	Displaying the configuration
	- Within the menu:	Scrolling up the menu item, value or feature selection. Holding the key changes the value continuously.
▼	- Measured value display:	Switching to the main menu
	- Within the menu:	Scrolling down the menu item, value or feature selection. Holding the key changes the value continuously.
▼ + ▶ *	- Within the menu:	Exiting the main, sub or optional menu and returning to measured value display
▲ + ▶ *	- Within the menu:	Switching to the superior menu level
60 s no action *	- Within the menu:	Exiting the main, sub or optional menu

* The values that were modified are not stored if you exit the optional or setting menu.



ATTENTION!

A detailed explanation of the menu control is listed in the following chapters.

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4 Operation

4.3 Key Functions

To select a menu item and set the values please proceed as follows:

- Open the main menu via the key ►.
- Select the submenu via the keys ▼ and ▲ and open the submenu via the key ►.
- If applicable, select the next submenu via the keys ▼ and ▲ and open it using the key ►.
- Select the requested menu item via the keys ▼ and ▲ and open the parameter list via the key ►.
- Set the value using the keys ▼ and ▲ and accept via the key ►.
The amended settings are saved and the device returns to the submenu.
- Exit the submenu by selecting menu item EXIT and press key ► to accept.
The device returns to the superordinate menu or measured value display, respectively.

4.4 Key Lock Active

If the key lock is activated, retrieving the menu via key ▼ shows the display



instead of the main menu. The active digit is indicated by a dot.

- Enter the code via the keys ▼ and ▲ and press the key ► to accept.
The active digit shifts to the right by one place. Having entered the 3rd digit the main menu is opened.



ATTENTION!

Having entered an incorrect code, the device returns to measured value display. If you have lost the password, enter the master code 287 to return to the menu.

To unlock the key lock, reset the password to the input 000 in the menu item **L o c** in the sub-menu *Basic Settings Extended Functions* **b.E.F.**

4.5 Summary of Menu

The menu structure is based on the VDMA standard 24574 and following.

The menu has a hierarchy structure. The highest menu level includes input of the main menu, e. g. **o | L**, **t | E | P**, **b.E.F.**, **d | A**, **E**. Each main menu comprises further submenu items.

The menu items may vary depending on the configuration of the device. Your device may not provide all menu items described below. You can retrieve the configuration by pressing the key ▲ in the display mode. A 4-digit code is displayed, e. g.:

	<p>Meaning of the 4-digit code tsav:</p> <p>t: Type s: number of switching outputs a: number of analogue outputs v: mounting of device</p> <p>t = temperature measurement o = level and temperature measurement 2 or 4 0 or 2 i = standard mounting (installation of tank)</p>
--	---



4 Operation

4.5 Summary of Menu

The different menu items are not displayed if the option is not available.

Example: With a=0 the menu items for setting the analogue output are not available. In this case you may skip the description of these items.

The structure of the main menu *charging level* (o, L) and *temperature* (t, E, P) are identical. These menus include all settings for the switching outputs or the analogue outputs (if available).

The basic settings of the device may be changed. General settings are set in the menu *Basic settings extended functions* (b, E, F). These settings should be performed first, since they affect displays and settings in the different menus. General settings are, for example, the units used and the classification of the switching outputs for measurement of charging level and temperature. The classification of the analogue outputs cannot be changed.

In addition the menu *Diagnostics* provides options of diagnostics.

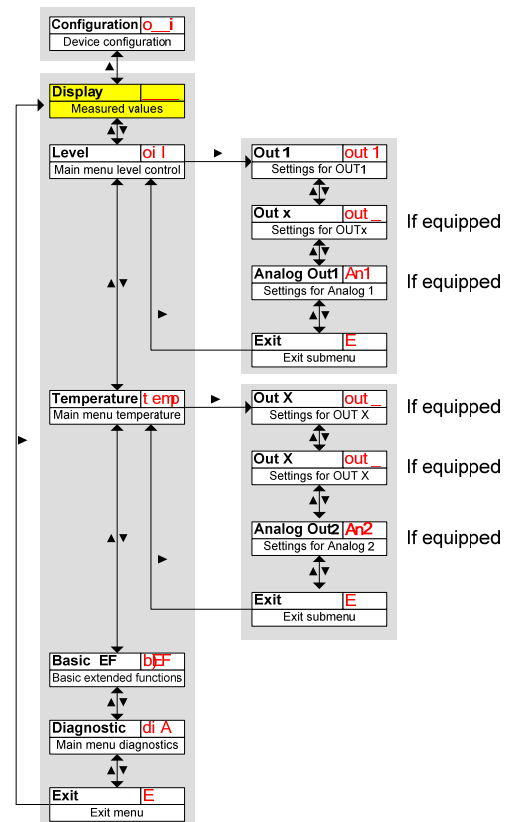


Illustration 4



ATTENTION!

A detailed explanation of the overall menu structure is shown at the end of these operating/assembly instructions.

4.6 Amendment of Basic Settings

The menu *Basic settings extended functions* (b, E, F) comprises general basic settings. These settings affect the display of values in the measured value display as well as the options of settings in the menus charging level and temperature. It is possible to change the assignment of switching outputs for measurement of charging level and temperature (if available), too.

- Press the key ▼ to open the main menu.
- Select the menu item **b, E, F** via the keys ▼ and ▲ and open the menu via the key ►.

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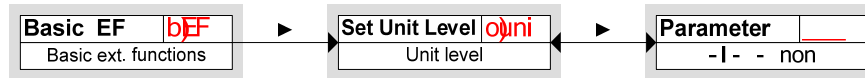


4 Operation

4.6 Amendment of Basic Settings

4.6.1 Defining Charging Level

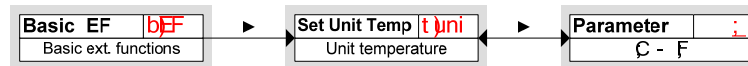
In this menu the displayed unit symbol for the charging level is defined.



<p>Optional settings: [- -, c n, i n, L i t e, [A L, n o n]</p>	The following menu items are available:					
	Per cent	cm	Inch	Litre	Gallons	None
<p>Please note:</p> <ul style="list-style-type: none"> • If „no unit“ is selected, the measured values are scaled to a 4-digit display. • The measured values are not automatically converted. Having converted the unit the measurement range should be scaled, if necessary (see menu <i>charging level</i> o.H and o.L). 						

4.6.2 Defining Temperature

In this menu the displayed unit symbol for temperature is defined.



	The following menu items are available:	
	Degrees Celsius	Degrees Fahrenheit
<p>Please note:</p> <ul style="list-style-type: none"> • If changing the setting, all corresponding settings such as setting of switching points are amended accordingly. 		

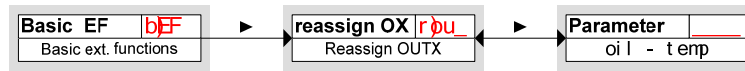


4 Operation

4.6 Amendment of Basic Settings

4.6.3 Re-assignment of Switching Outputs

The amendment of assignment of the switching outputs is described here based on the example of switching output 1.



The switching outputs 1 to n can be assigned optionally to the measuring size charging level or temperature. The assignment affects the appearance of the menu *charging level* **o i l** and *temperature* **t e m p**. In the factory setting the switching output OUT 1 is assigned to the charging level.

Example: OUT 1 shall be assigned to temperature. For that purpose **r.ou 1** must be set to **t e m p**. As a result the setting menu **o u t 1** is shifted from the menu *charging level* to the menu *temperature*. The procedure for amending the settings does not change.



ATTENTION!

With a re-assignment of the switching outputs all corresponding settings have to be verified. The figures set before are not automatically adapted. The assignment of LEDs for status display does not change.

The following menu items are available:	
Measurement of charging level	Measurement of temperature



ATTENTION!

The other switching outputs for measurement of charging level of temperature are assigned in the same way as switching output 1. Perform the same steps as described for switching output OUT 1.

4.6.4 Setting Updating Rate of Display

Depending on the application the updating rate of the display can be set. The display can be fully switched off as well. The function of LED continues to be existing.



The following menu items are available:			
	fast	medium	slow
	display off		
Please note:			
<ul style="list-style-type: none"> Problem reports continue to be indicated in spite of the display being switched off. 			

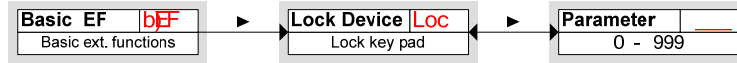


4 Operation

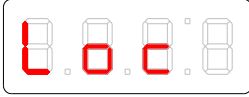
4.6 Amendment of Basic Settings


4.6.5 Activating/Deactivating Key Lock

To prevent unauthorized modifications of settings on the device, it is possible to activate a key lock.



The key lock is activated if at least one digit is set > 0. While entering the data the active digit is marked with a dot.



- Open the parameter menu by pressing the key ►: 
- Set the digit via the keys ▼ and ▲ (0 to 9) and accept by pressing the key ►. The active digit shifts to the right by one place.
- Finally accept the code by pressing the key ►. The device returns to the submenu.

Please note:

- Enter 000 to deactivate the key lock.

4.6.6 Scaling of Charging Level

Scaling of the display range is effected between the highest and the lowest level of the float. The display accuracy and the resolution for defining the switching outputs for the charging level are affected by this scaling, too.

The factory setting of the switching point and the display is shown in illustration 5:

- A: Factory settings
1: Measuring range

A: Types with analogue output:

The factory setting provides for an ascending display with the charging level being ascending so that 0 % are displayed with the lowest possible point and 100 % with the highest possible point. These values can be modified as described below.

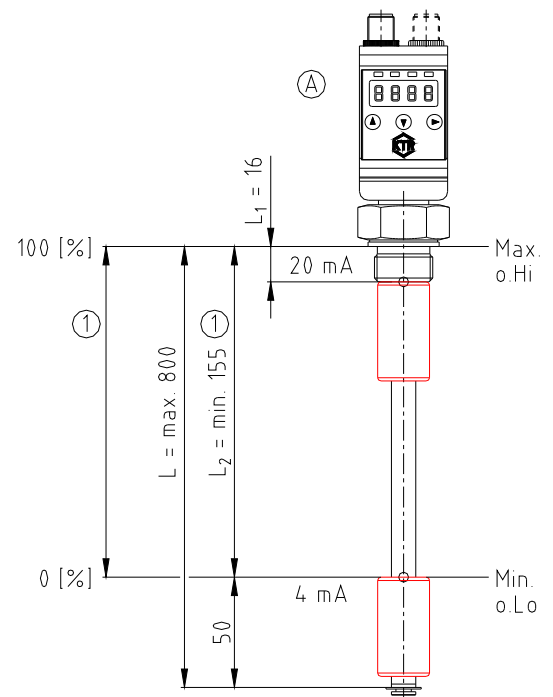


Illustration 5

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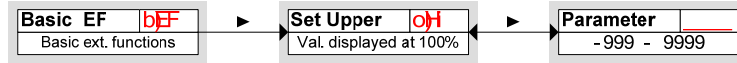


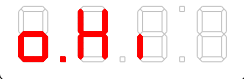
4 Operation

4.6 Amendment of Basic Settings

4.6.7 Maximum Displayed Value of Charging Level

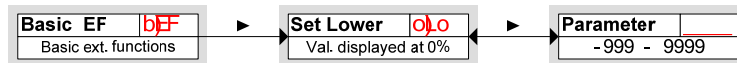
The displayed value (upper limit of the measurement range) for the maximum charging level is defined here.

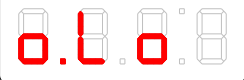


 <p>Setting range: -999...9999</p>	<p>Assignment of the maximum displayed value (upper limit of the measurement range) towards the maximum charging level</p> <p>Please note:</p> <ul style="list-style-type: none"> To prevent misoperation, the settings of the level outputs should be reviewed or adapted after changing.
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4.6.8 Minimum Displayed Value of Charging Level

The displayed value (lower limit of the measurement range) for the minimum charging level is defined here.



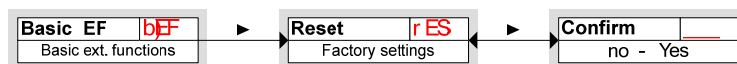
 <p>Setting range: -999...9999</p>	<p>Assignment of the maximum displayed value (upper limit of the measurement range) towards the maximum charging level</p> <p>Please note:</p> <ul style="list-style-type: none"> To prevent misoperation, the settings of the level outputs should be reviewed or adapted after changing.
---	---

4.6.9 Resetting Factory Settings (Reset)

The function **Reset (r E S)** allows to reset the factory settings. Since the limit values are reset, too, it is not absolutely necessary to review the settings for the charging level and the temperature.



CAUTION!
All modifications are lost when using the function RESET.



<p>The following menu items are available:</p>					
	<table border="0"> <tr> <td data-bbox="651 1848 805 1915">  </td> <td data-bbox="1189 1848 1343 1915">  </td> </tr> <tr> <td data-bbox="491 1915 842 1982"> <p>Delivery status: NO. The current settings are kept.</p> </td> <td data-bbox="1029 1915 1481 2013"> <p>Delivery status: Yes. The settings are reset to the standard factory settings.</p> </td> </tr> </table>			<p>Delivery status: NO. The current settings are kept.</p>	<p>Delivery status: Yes. The settings are reset to the standard factory settings.</p>
					
<p>Delivery status: NO. The current settings are kept.</p>	<p>Delivery status: Yes. The settings are reset to the standard factory settings.</p>				



4 Operation

4.6 Amendment of Basic Settings

4.6.10 Factory Settings

Definitions of the factory settings set:

SP_x / rP_x	Switching point / reset point x
dS_x / dr_x	Delay for switching/delay for resetting for switching output x
Rx.H_i / Rx.L_o	Maximum and minimum measured value for output
R.o.u_x	Signal characteristics of analogue output
o.u_x	Switching characteristics of switching output x
o.u.n_i / t.u.n_i	Unit for charging level/temperature
o.H_i / o.L_o	Maximum / minimum charging level
r.o.u_x	Assignment of switching output x towards charging level or temperature monitoring
d.i.S	Updating rate of display
L.o.c	Key lock
S.D.o.u	Recorded switching output
d.o.n.n	Delay for recording the minimum/maximum charging level
d.t.n.n	Delay for recording the minimum/maximum temperature



ATTENTION!

With customized parameters the pre-setting performed by the customers may differ from the figures mentioned in here.

Table 4: Type with 4 switching outputs

Switching outputs		Basic settings		Diagnostics	
SP1 / rP1	5% / 2%	o.u.n_i	-I (%)	S.D.o.u	o.u.t.1
dS1 / dr1 / ou1	0 / 0 / H n o	t.u.n_i	°X	d.o.n.n	0.0
SP2 / rP2	15% / 12%	o.H_i	100 %	d.t.n.n	0.0
dS2 / dr2 / ou2	0 / 0 / H n o	o.L_o	0 %		
SP3 / rP3	70 / 65 °X	r.o.u.1	o.i.L		
dS3 / dr3 / ou3	0 / 0 / H n o	r.o.u.2	o.i.L		
SP4 / rP4	80 / 75 °X	r.o.u.3	t.E.N.P		
dS4 / dr4 / ou4	0 / 0 / H n o	r.o.u.4	t.E.N.P		
		d.i.S	F.A.S.t		
		L.o.c	000		

Table 5: Type with 2 switching outputs and 2 analogue outputs

Switching outputs		Basic settings		Diagnostics	
SP1 / rP1	5% / 2%	o.u.n_i	-I (%)	S.D.o.u	o.u.t.1
dS1 / dr1 / ou1	0 / 0 / H n o	t.u.n_i	°X	d.o.n.n	0.0
SP2 / rP2	60 / 55 °X	o.H_i	100 %	d.t.n.n	0.0
dS2 / dr2 / ou2	0 / 0 / H n o	o.L_o	0 %		
		r.o.u.1	o.i.L		
Analogue outputs		r.o.u.2	t.E.N.P		
R1.H_i / R1.L_o / R.o.u.1	0 / 100 / 1	d.i.S	F.A.S.t		
R2.H_i / R2.L_o / R.o.u.2	0 / 100 / 1	L.o.c	000		



4 Operation

4.7 Switching Outputs

All switching outputs are set in the same way. Therefore, the number of the switching output is marked x. Select the switching output to be set via the menu of the corresponding measurement size (o, L or EEP).

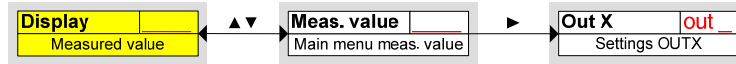


Table 6: Assignment of switching outputs (factory-provided)

Switching output	Assignment with 2 switching outputs	Assignment with 4 switching outputs
1	Charging level	Charging level
2	Temperature	Charging level
3		Temperature
4		Temperature

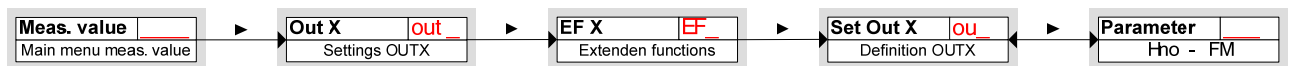


ATTENTION!

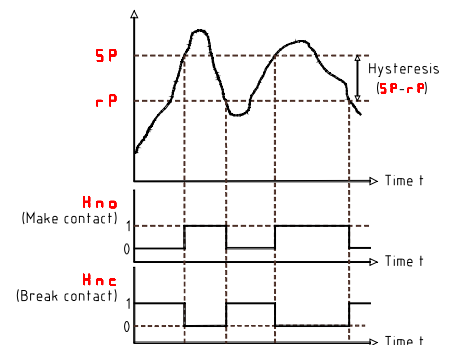
The assignment of the switching outputs as well as further basic settings referring to all switching outputs can be modified in the menu *Basic settings extended functions*. The submenu *Extended functions* allows to execute further settings for each switching output affecting, for example, the switching behaviour of the output. Testing the output is possible here, too.

4.7.1 Definition of Switching Characteristics

The switching characteristics for the output are defined in the following menu:



The following menu items are available:	
<p>Hysteresis function</p> <p>H h o o</p> <p>Hysteresis function make contact</p>	<p>Function of make contact or break contact setting the output signal when exceeding the switching point defined. If the reset point is fallen below, the output signal is deleted.</p> <p><i>Make contact</i> means here that the PNP switching output is closed if the measured value is above the switching point $S P_x$ and is opened if the reset point $r P_x$ is fallen below.</p>
<p>H h c</p> <p>Hysteresis function break contact</p>	<p><i>Break contact</i> means here that the PNP switching output is open if the measured value is above the switching point $S P_x$ and is closed if the reset point $r P_x$ is fallen below.</p>
	<p>See explanations in the drawing below.</p>

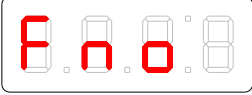
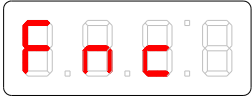
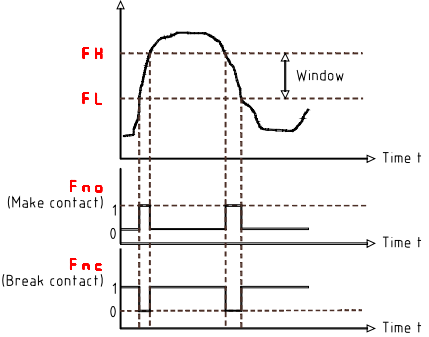
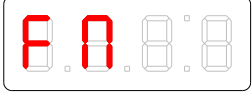
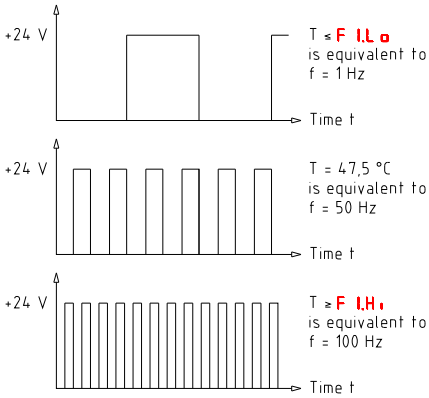




4 Operation

4.7 Switching Outputs

4.7.1 Definition of Switching Characteristics

<p>Window function</p>  <p>Window function make contact</p>  <p>Window function break contact</p>	<p>Function of make contact or break contact defining a signal window. If the measured window is reached, the output signal is set and deleted once it is left.</p> <p><i>Make contact</i> means here that the PNP switching output is closed if the measured value is within the window limits. Otherwise the switching output is open.</p> <p><i>Break contact</i> means here that the PNP switching output is open if the measured value is within the window limits. Otherwise the switching output is closed.</p>	
<p>Frequency output</p>  <p>Frequency output</p>	<p>If the output is defined as a frequency output, a square wave signal with a frequency between 1 Hz and 100 Hz is given proportionately to the measured value.</p> <p>ATTENTION! To increase the slew rate of the square wave signal, we recommend to load the switching output with a 10 kΩ resistance.</p>	<p>Example: $F.L.L. = 15\text{ }^\circ\text{C}$, $F.L.H. = 80\text{ }^\circ\text{C}$ with temperature T and frequency f:</p> 



ATTENTION!
The switching function may have different descriptions:

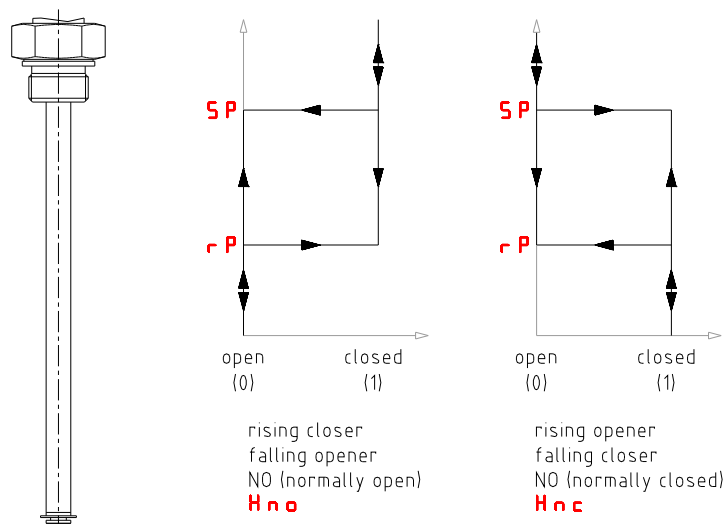


Illustration 6

Please note protection mark ISO 16016.	Drawn: 11.10.12 Pz/Wy	Replaced for: ---
	Verified: 19.11.12 Pz	Replaced by:



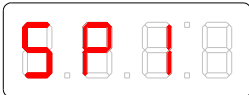


4 Operation

4.7 Switching Outputs

4.7.2 Upper Switching Limit (Set Point)

The upper switching limit for switching output OUT 1 is set in the following submenu:


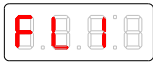



 <p>Setting range: [o.L] [o.H]</p>	<h3>Switching point for OUT x</h3> <p>Please note: The switching point must be set within the measuring range (see menu <i>Basic settings extended functions</i>).</p> <ul style="list-style-type: none"> If the function window was assigned to the switching output OUT 1,  is displayed. The value set corresponds to the upper window limit. If the function frequency output was assigned to the switching output OUT 1,  is displayed. The value set corresponds to the frequency 100 Hz.
---	---

4.7.3 Lower Switching Limit (Reset Point)

The lower switching limit for switching output OUT 1 is set in the following submenu:



 <p>Setting range: [o.L] [o.H]</p>	<h3>Reset point for OUT 1</h3> <p>Please note: The reset point must be set within the measuring range.</p> <ul style="list-style-type: none"> If the function window was assigned to switching output OUT 1,  is displayed. The value set corresponds to the upper window limit. If the function frequency output was assigned to the switching output OUT 1,  is displayed. The value set corresponds to the frequency 1 Hz.
---	--



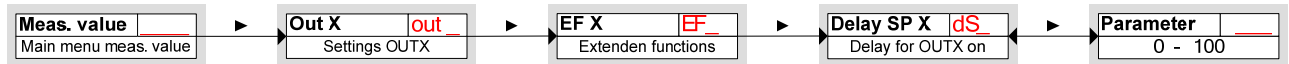
4 Operation


4.7 Switching Outputs

4.7.4 Delay for Set Point

The menu *Extended functions* **E F_x** provides further settings for the switching output x. The submenu is located on the second submenu level:

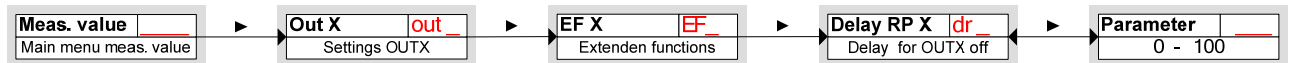
The delay time for set point and reset point prevents too many false alarms with turbulent conditions. The delay for the set point is set in the following menu:

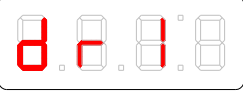


 <p>Setting range: 0 ... 100 seconds</p>	<p>Time period in seconds during which the signal must remain continuous to enable the switching output to respond.</p> <p>Please note:</p> <ul style="list-style-type: none"> • If the function window was assigned to the switching output OUT x, the value set corresponds to the delay for set point detecting when the measurement window is actually reached. • If the function frequency output was assigned to the switching output OUT x, this value has no effect.
---	--

4.7.5 Delay for Reset Point

The delay for reset point is set in the following menu:



 <p>Setting range: 0 ... 100 seconds</p>	<p>Delay for reset signal for OUT x</p> <p>Time periods in seconds during which the signal must remain continuous to enable the switching output to respond.</p> <p>Please note:</p> <ul style="list-style-type: none"> • If the function window was assigned to the switching output OUT 1, the value set corresponds to the delay for reset point detecting when the measurement window is actually left. • If the function frequency output was assigned to the switching output OUT 1, this value has no effect.
---	---

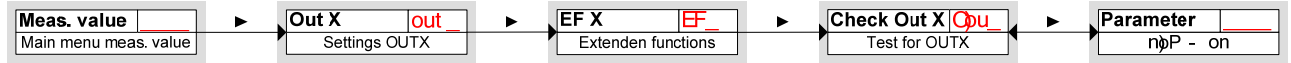


4 Operation

4.7 Switching Outputs

4.7.6 Testing the Switching Output

Testing the switching output can be started in the following menu:



	Testing options for the switching output		
	Options for setting from ou 1 to Hno / Hnc / Fno / Fnc:		
	Normal operation of switching output	Switching off the switching output permanently	Switching on the switching output permanently
Options for setting from ou 1 to FN			
Normal operation as a frequency output	Output frequency 1 Hz	Output frequency 100 Hz	



ATTENTION!

Having completed the tests, please make absolutely sure to set the function to normal operation **n.o.P.**

4.7.7 Changing Display Function of Status LED

The switching status of the output is indicated by the LEDs in the display. The assignment of LED to the switching output is shown in the table below:

Table 7:

Numbering of LED	Switching output x	Assignment with 2 switching outputs	Assignment with 4 switching outputs
	1	LED 1 – yellow	LED 1 – yellow
	2	LED 2 – red	LED 2 – red
	3		LED 3 – yellow
	4		LED 4 – red

In the factory settings the LED indicates the physical condition of the PNP switching output (switching output closed – LED is illuminated).

In some cases the logical function of the display is to act differently from the physical signal on the switching output. Therefore, the display in this menu item can also be reverted (switching output opened – LED is illuminated).

Example based on temperature:

Two switching outputs are available for temperature which are set as follows:

- Upper switching contact: maximum contact, ascending make contact. The LED is illuminated when the maximum value of temperature is exceeded and the temperature is beyond the requested range. Thus, the status indicated is “error” if the LED is illuminated.
- Lower switching contact: minimum contact, ascending break contact. The LED is illuminated with the factory settings when the minimum value of temperature is exceeded. In this case the LED would be illuminated if the status is in order.

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	Verified: 19.11.12 Pz	Replaced by:



4 Operation






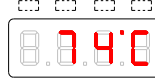


4.7 Switching Outputs

4.7.7 Changing Display Function of Status LED

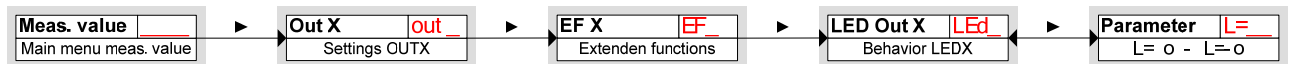
The table shows an example with factory settings and with inverted status function for LED3.
The switching points are defined as follows:




$$\begin{aligned} SP3 &= 70\text{ }^{\circ}\text{C}, & rP3 &= 65\text{ }^{\circ}\text{C} \\ SP4 &= 80\text{ }^{\circ}\text{C}, & rP4 &= 75\text{ }^{\circ}\text{C} \end{aligned}$$

Table 8:

	Factory settings	Status function LED3 inverted	Situation	Status
A	 LED3 on	 LED3 off	Temperature rising to > 70 °C PNP switching output 3 is closed	OK
B	 LED4 and LED3 on	 only LED4 on	Temperature rising to > 80 °C PNP switching output 4 is closed	Error
C	 LED3 on	 LED3 off	Temperature dropping to < 75 °C PNP switching output 4 is opened	OK
D	 LED3 off	 LED3 on	Temperature dropping to < 65 °C PNP switching output 3 is opened	Error

Here you can invert the status function of LED for a contact: the LED is illuminated if the contact is opened, thus falls below the minimum temperature, and when the LED is illuminated the status „error“ is indicated. Especially the recording of incidents depends on the illumination of LED (see chapter 4.9 *Diagnostics*, 0).



	The following menu items are available:	
	 LED = output; the LED is illuminated if the PNP switching output is closed.	 LED = -output; the LED is illuminated if the PNP output is opened.
<p>Please note: The recording of incidents specifically depends on the illumination of the LED (see chapter 4.9 <i>Diagnosis</i>, 0).</p>		



4 Operation

4.8 Analogue Outputs

4.8.1 Assignment of Upper Limit

The assignment is defined as to which charging level is necessary to display the maximum analogue signal. The setting is made in the following menu:



Setting range:
[o.L o] [o.H i]

Please note:

- The output range set must not be smaller than 10% of the measurement range:
 $A\ I.H\ i - A\ I.L\ o \geq 10\% * (o.L\ o - o.H\ i)$.
- If the range selected is too small, the analogue output value may have steps.

4.8.2 Assignment of Lower Limit

The assignment is defined as to which charging level is necessary to display the minimum analogue signal. The setting is made in the following menu:



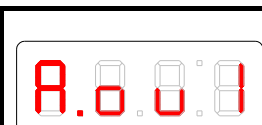
Setting range:
[o.L o] [o.H i]

Please note:

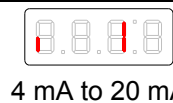
- The output range set must not be smaller than 10% of the measurement range:
 $A\ I.H\ i - A\ I.L\ o \geq 10\% * (o.L\ o - o.H\ i)$.
- If the range selected is too small, the analogue output value may have steps.

4.8.3 Defining the Type of Signal

The analogue output can be defined as voltage or current output with different value ranges. The setting is made in the following menu:



The following menu items are available:



4 mA to 20 mA



2 V to 10 V



0 V to 10 V



0 V to 5 V



4 Operation

4.8 Analogue Outputs

4.8.4 Testing the Analogue Output

The analogue output can be tested, too. The highest, the average and the smallest analogue value can be displayed one after another. The setting is made in the following menu:



	The following menu items are available:	
	Normal operation	Output of highest analogue value
	Output of average analogue value	Output of lowest analogue value



ATTENTION!

On termination of the test please make absolutely sure to set the function to normal operation **n.o.P.**

4.9 Diagnostics

The device is in a position to record the incidents for a switching output. A result is defined as an illumination of the LED. Accordingly, the recording of the switching processes depends on the setting of the switching function of LEDs. The settings and the evaluation can be performed as follows:



ATTENTION!

It is only possible to record one switching output. The switching output to be recorded is set in the menu item switching output Log Alarm **S.L.A.**

Press the key ▼ to open the main menu.
Select the menu item **d. A** via the keys ▼ and ▲.

	Please note:
	<p>This menu provides various diagnostics values and recordings for monitoring of charging level and temperature.</p> <ul style="list-style-type: none"> Open the menu via the key ►. <p>Now you are in a position to amend or retrieve the settings for diagnostics.</p>

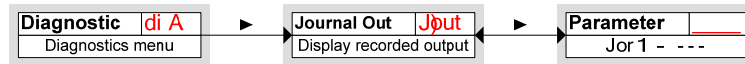


4 Operation

4.9 Diagnostics

4.9.1 Opening the Journal

The last 6 incidents recorded of the switching output can be retrieved or deleted here.



The journal entries are indicated in the following way:

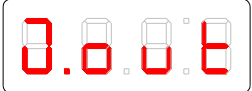
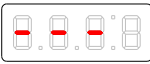
- Latest incident **Jor 1** took place x hours ago (h) / days ago (d)
- Incidents 2 to 5 took place x hours/days ago
- Latest incident took place **Jor 6** x hours/days ago
- Delete (- - -).

* not yet recorded, only 4 incidents have taken place

Example:

```

Jor 1 ⇔ 1.3 h, Key ▼
Jor 2 ⇔ 2.4 h, Key ▼, ▲
Jor 3 ⇔ 6.1 h, Key ▼, ▲
Jor 4 ⇔ 8.2 h, Key ▼, ▲
Jor 5 ⇔ non*, Key ▼, ▲
Jor 6 ⇔ non*, Key ▼, ▲
- - -, Key ▲; ► = delete
  
```

	<p>The display toggles between the index of recording x and the time when it occurred, e. g. Jor 1 ⇔ 1.4 h for the latest incident 1.4 hours ago.</p> <p>Accepting the display  via the key ► deletes the journal and returns to the submenu.</p> <p>Please note:</p> <ul style="list-style-type: none"> • If no incident was recorded, the display toggles between Jor x and non. • The data stored are overwritten after 6 months.
---	--

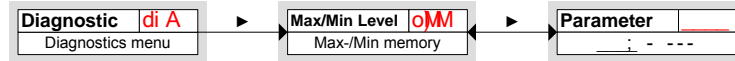


4 Operation

4.9 Diagnostics

4.9.2 Maximum/Minimum Charging Level

In this menu the maximum and minimum charging level saved is displayed or deleted.



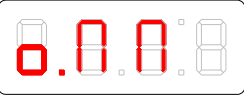
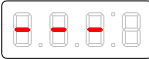
The values are displayed as follows:

- Maximum value of charging level,
- reached x hours/days ago,
- minimum value of charging level,
- reached x hours/days ago,
- delete function.

Example:

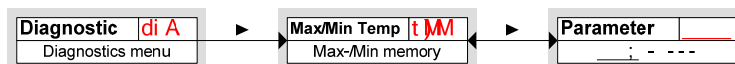
```

150, Key ▼
8.4 h, Key ▼, ▲
60, Key ▼, ▲
2.1 h, Key ▼, ▲
- - -, Key ▲; ▶ = delete
  
```

 <p>Menu order: Max. value, time Min. value, time delete</p>	 <p>Accepting the display via the key ▶ deletes the journal and returns to the submenu.</p> <p>Please note:</p> <ul style="list-style-type: none"> • The data saved are overwritten after six months.
---	--

4.9.3 Maximum/Minimum Temperature

In this menu the maximum and minimum temperature saved is displayed or deleted.



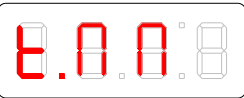
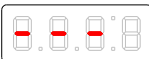
The values are displayed as follows:

- Maximum value of temperature,
- reached x hours/days ago,
- minimum value of temperature,
- reached x hours/days ago,
- delete function.

Example:

```

72°C, Key ▼
8.4 h, Key ▼, ▲
22°C, Key ▼, ▲
2.1 h, Key ▼, ▲
- - -, Key ▲; ▶ = delete
  
```

 <p>Menu order: Max. value, time Min. value, time delete</p>	 <p>Accepting the display via the key ▶ deletes the journal and returns to the submenu.</p> <p>Please note:</p> <ul style="list-style-type: none"> • The data saved are overwritten after 6 months.
---	--

Please note protection mark ISO 16016.	Drawn: 11.10.12 Pz/Wy Verified: 19.11.12 Pz	Replaced for: --- Replaced by:
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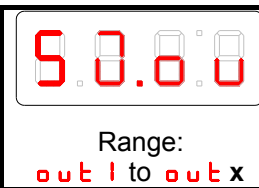
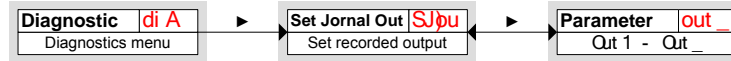


4 Operation

4.9 Diagnostics

4.9.4 Assigning the Switching Output for Recording

In this menu the switching output for recording is selected. Only one switching output can be recorded.

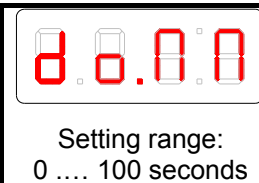
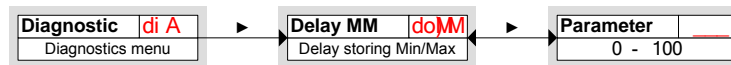


Please note:

- The figures are saved from the volatile memory to the nonvolatile memory about every three hours.
- The data saved are overwritten after 6 months.

4.9.5 Delay for Min./Max. Saving (Charging Level)

To record reliable values in case of fluctuating charging level, a delay period to save the minimum and maximum charging level can be set. Here the period in seconds is set during which the signal must remain continuous before the charging level is recorded.

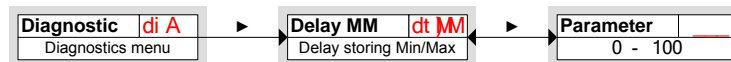


Please note:

- Open the value journal by pressing the key ►.
- Set the value via the keys ▼ and ▲ and accept via the key ► (e. g. 5 (seconds)). The device returns to the submenu.

4.9.6 Delay for Min./Max. Saving (Temperature)

To record reliable values in case of fluctuating temperature, a delay period to save the minimum and maximum temperature can be set. Here the period in seconds is set during which the signal must remain continuous before the temperature is recorded.



Please note:

- Open the value journal by pressing the key ►.
- Set the value via the keys ▼ and ▲ and accept via the key ► (e. g. 5 (seconds)). The device returns to the submenu.



5 Spares Inventory, Customer Service Addresses

Contact addresses of the KTR partners for spare parts and orders can be obtained from the KTR homepage under www.ktr.com.



ATTENTION!

KTR does not assume any liabilities or guarantees regarding the use of spare parts and accessories which are not provided by KTR and for the damages resulting herefrom.

6 Disposal

In respect of environmental protection we would ask you to dispose of the products on termination of their service life in accordance with the effective legal regulations and standards, respectively.

- **Gaskets**
Gaskets can be disposed of by residual waste.
- **Electric components**
Electric components have to be treated as electric waste.
- **Hydraulic oil**
Hydraulic oils have to be collected in suitable tanks and disposed of by a waste disposal company.

7 Maintenance and Service

NVT-E is a maintenance-free level switch and level with temperature switch. We recommend the **NVT-E** should be subject to a visual and functional inspection at least once a year.



ATTENTION!

If you find out any irregularities, please consult with KTR Kupplungstechnik.

Please note protection mark ISO 16016.	Drawn: 11.10.12 Pz/Wy	Replaced for: ---
	Verified: 19.11.12 Pz	Replaced by:



7 Maintenance and Service

7.1 Breakdowns, Causes and Elimination

The breakdowns mentioned can only be indications for troubleshooting. For troubleshooting generally the adjacent components have to be included.
In case of breakdown all outputs are set dead-voltage. The four LEDs are illuminated. The failures are saved in the device until it is switched off.

Breakdowns	Causes	Elimination
(no display)	No supply voltage	1) inspect cable and replace, if necessary
↔	Error indication in the display toggles between, e. g. Err- and E---	
Error 01	Ambient temperature too low	1) observe limit values
Error 02	Ambient temperature too high	1) observe limit values
Error 04	Pt 100 defective (short circuit)	1) Replace feed cable Pt 100 2) Send device for repair
Error 08	Pt 100 defective (cable break)	1) Replace feed cable Pt 100 2) Send device for repair
Error 16	Conductor chain defective (short circuit)	1) Replace feed cable 2) Send device for repair
Error 32	Conductor chain defective (feed cable open)	1) Replace feed cable 2) Send device for repair