



Digital Thermostat

**B 70.1050.5.1**  
**Operating Instructions**

03.07



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# 1 Identifying the instrument

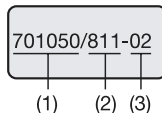
The nameplate with the order code is affixed to the side of the instrument. The supply voltage connected must correspond to the voltage specified on the nameplate.



All necessary settings are described in these Operation Instructions. However, if any difficulties should still arise during start-up, you are asked not to carry out any unauthorized manipulations on the unit. This could endanger your rights under the instrument warranty! Please contact the nearest subsidiary or the head office in such a case.

Please read these operating instructions before commissioning the instrument. Keep the manual in a place that is accessible to all users at all times. Please assist us to improve these operating instructions, where necessary.

Order example



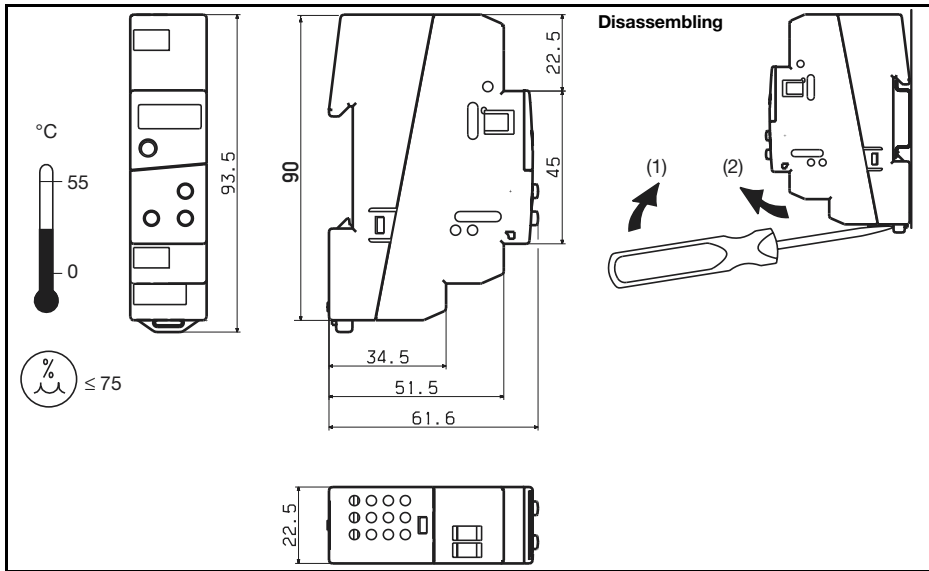
701050/	<b>(1) Basic version</b> eTRON T
8	factory-set, configurable
9	customized configuration
	<b>(2) Measurement input</b>
1	Pt100 in 2-wire circuit
	Pt1000 in 2-wire circuit
	KTY2X-6
2	Fe-Con J
	Fe-Con L
	NiCr-Ni K
3	0(4) – 20 mA
4	0 – 10 V
1	1 relay, changeover 10A 230V
	<b>(3) Supply</b>
	02 230V AC +10/-15% 48 – 63Hz
	05 115V AC +10/-15% 48 – 63Hz
	31 12 – 24V DC +15/-15% /
	24V AC +15/-15%, 48 – 63Hz

 factory-set

## Included in delivery:

1 Operating Instructions 70.1050.0

## 2 Assembling



## 3 Electrical connection

### 3.1 Installation notes

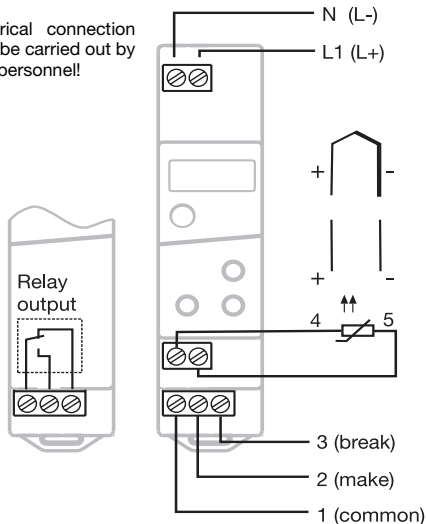
- The choice of cable, the installation, the fusing and the electrical connection must conform to the requirements of VDE 0100 "Regulations on the Installation of Power Circuits with nominal voltages below 1000 V" or the appropriate local regulations.
- The electrical connection must only be carried out by qualified personnel.
- Electromagnetic compatibility conforms to the standards and regulations listed under Technical data.
- The instrument is not suitable for installation in areas with an explosion hazard and must be built into a housing that provides protection against fire /electrical hazards.
- Apart from faulty installation, incorrect settings on the instrument (setpoint, parameter level data) may also affect the proper functioning of controlled processes or lead to damage. Provision should therefore always be made for safety devices that are independent of the instrument, e. g. overpressure valves or temperature limiters/monitors. Adjustment must be restricted to specialist personnel (lock parameters for operation). Please observe the corresponding safety regulations in this matter. Unfavorable parameter adjustment may result in unstable control. The process value obtained should therefore be monitored for its stability and knowledge about the process should be obtained.
- The load circuit must be fused for the maximum relay current in order to prevent welding of the output relay contacts in the event of a short circuit.
- Do not connect any additional loads to the supply terminals of the instrument.
- The external fuse of the supply should not be rated below 1A, depending on the conductor cross-section. If contact with live components is possible while working on the instrument, it must be disconnected on both poles from the supply (via a separate mains supply switch, for instance).

Supply	Measurement input and supply	
230V AC and 115V AC	short-circuit-proof	electrically isolated from each other
12 – 24V DC and 24V AC	not short-circuit-proof	not electrically isolated from each other

### 3.2 Connection diagram



The electrical connection must only be carried out by specialist personnel!



#### Supply voltage

230V AC +10/-15%  
115V AC +10/-15%  
12 — 24V DC +15/-15% /  
24V AC +15/-15%, 48 — 63Hz

#### Measurement input

Thermocouples:  
Fe-Con J, L and NiCr-Ni K

Standard signals:  
current 0(4) — 20 mA  
voltage 0 — 10 V

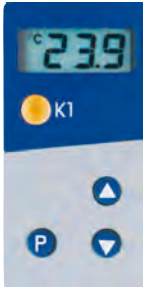



Resistance thermometers:  
Pt100 / Pt1000 / KTY2X-6

#### Relay output

changeover (floating)  
10A/250V AC

## 4 Commissioning the instrument

### 4.1 Displays and controls

<b>LC display</b>	3-digit 9-segment display, 6 mm high, and symbols for the temperature unit	
<b>LED K1</b>	LED K1 lights up when the relay is energized. LED K1 goes out when the relay is de-energized.	
<b>Keys</b>	 programming  increase value select operational status at enabling level  decrease value select operational status at enabling level	
<b>Setup interface</b>	The instrument is linked to a PC via a PC interface with TTL/RS232 converter and adapter (3-pole pins).	

\* Connect supply voltage – all segments light up twice as a test (segment test).


When everything has been connected up correctly on the instrument, the present process value will be shown.

If an alarm message appears, see Chapter 7 “Alarm messages”.



The relay operates according to the controller type that was set, see Chapter 4.2 “Setting the instrument functions (parameter level)”.




## 4.2 Setting the instrument functions (parameter level)

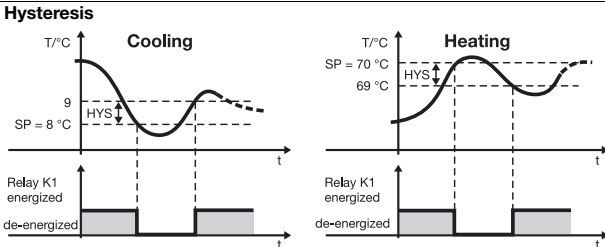
-  **Time-out**  
If no key is pressed for 60 seconds, the instrument automatically switches back to process value display, see *Overview of operation* on the first inside page.

The instrument functions and values are set at the parameter level.

- \* Press (P) for 3 seconds and  will appear alternately.
- \* Set code 72 for accessing the parameter level by using the ▲ and ▼ keys.  
The longer the key is pressed, the faster the value will change.
- \* Acknowledge with (P),  
**parameter name** and **value** appear alternately, e.g. .
- \* Set value within the specified value range by using the ▲ and ▼ keys.
- \* Acknowledge settings with (P).
- \* Set next parameter, see *Overview of operation* on the first inside page.

-  **Switching parameters out of display:**  
The table below lists all the parameters for each instrument type.  
Depending on the type designation on the nameplate, parameters which are not required can be hidden.

## Controller

Parameter	Meaning	Value range from...factory-set...to
<b>SP</b>	<b>Setpoint</b> target value of control action (temperature value, current or voltage).	SPL ... <b>0.0</b> ... SP.H
<b>HYS</b>	<b>Hysteresis</b> 	0.2 ... <b>1.0</b> ... 99.9
<b>SPL</b>	<b>Low setpoint limit</b> SP can be set up to this low limit.	-999 ... <b>-50</b> ... +999
<b>SP.H</b>	<b>High setpoint limit</b> SP can be set up to this high limit.	-999 ... <b>500</b> ... +999
<b>typ</b>	<b>Controller type</b> <i>CoL</i> : cooling controller <i>HoL</i> : heating controller	<b>Hot</b> , <b>CoL</b>

Parameter	Meaning	Value range from...factory-set...to
<i>dLY</i>	<b>Switch-on delay after power-on</b> for staggered switch-on of several equipment units.	0 ... 60min
<i>t.ON</i>	<b>Minimum ON time</b>	0 ... 999 s
<i>t.OFF</i>	<b>Minimum OFF time</b> Here you can set the time for which the equipment unit, for instance, has to remain switched on or off. These values depend on the heating or cooling unit being used (observe manufacturer's specifications).  In the event of a <b>probe error</b> , the relay is operated immediately as set in parameter S.Er.	0 ... 999 s



#### Alarms

<i>ALL</i>	<b>Low alarm limit</b> As soon as the process value falls below this limit, the alarm message <i>ALL</i> is displayed, see Chapter 7 "Alarm messages".	-999 ... -200 ... +999
<i>ALH</i>	<b>High alarm limit</b> As soon as the process value goes above this limit, the alarm message <i>ALH</i> is displayed, see Chapter 7 "Alarm messages".	-999 ... 500 ... +999
<i>AHY</i>	<b>Alarm hysteresis</b> The hysteresis that was set is below <i>ALH</i> or above <i>ALL</i> .	0.2 ... 1.0 ... 99.9
<i>ALd</i>	<b>Alarm suppression time</b> An alarm from <i>ALL</i> or <i>ALH</i> is not displayed for this time. If an alarm is present for longer than <i>ALd</i> , then it will be displayed.	0 ... 60 min

Parameter	Meaning	Value range from...factory-set...to
<b>S.Er</b>	<b>Response to over/underrange</b> 0: relay de-energized 1: relay energized	0, 1

## Input

<b>SEn</b>	Sensor connected in 2-wire circuit Measurement input group 1 on Type: 701050/X1X-1-XX	<b>Pt100:</b> P, Ih Pt1000: P, It KTY2X-6: P, tC or tAb
	Measurement input group 2 on Type: 701050/X2X-1-XX	Fe-Con J: t c, J Fe-Con L: t c, L NiCr-Ni K: t c, H or tAb
	Measurement input group 3 on Type: 701050/X3X-1-XX	0(4)... 20 mA: L in / tAb
	Measurement input group 4 on Type: 701050/X4X-1-XX	0 ... 10 V: L in / tAb
<b>S.cL</b>	<b>Start value</b> for indication range with measurement input voltage or current. Example: input signal (e.g. 4 – 20mA) is to be represented on the display from -10 to 50. Setting: S.cL= -10 and S.cH=50.	-999 ... 0... +999
<b>S.cH</b>	<b>End value</b> for indication range with measurement input voltage or current	-999 ... 100... +999
<b>i. 0</b>	<b>Signal</b> for measurement input current: 0 = 0 – 20mA 1 = 4 – 20mA	0, 1

Parameter	Meaning	Value range from...factory-set...to
OF.t	<b>Process value offset</b> process value offset in °C, °F or digit (no unit)	-99.9 ... 0.0 ... 99.9
OF.r	<b>Lead compensation resistance</b> This value is used for compensating the resistance of the probe lead for resistance sensors and is dependent on the lead length. For best temperature measurement results, the resistance value of the probe lead has to be entered here.   If the total resistance at the measurement input (sensor resistance + selected value for OF.r) exceeds 320 Ω with Pt100 or 3200 Ω with Pt1000/KTY2x-6, a measurement error will occur !	0.0 ... 0.0 ... 99.9 in Ω
Un i	<b>Unit</b> for the indicated process value   For settings in °F, the process value will be converted correspondingly. All other setting, such as for SP, will retain their values.	°C, °F or no (= no unit)



Parameter	Meaning	Value range from...factory-set...to
<b>df</b>	<b>Filter time constant</b> For adapting the digital input filter. At a signal step, 63% of the changes are registered after the filter time constant has elapsed. Values between 0.1 and 0.7 are interpreted as 0.8 (sampling time). If the filter time constant is long: - high damping of interference signals - slow reaction of the process value display to process value changes	0.1 ... <b>0.8</b> ... 99.9 s



Return to the first parameter SP of the parameter level by pressing **P** > 3 sec.

### 4.3 Allocating user rights (enabling level)

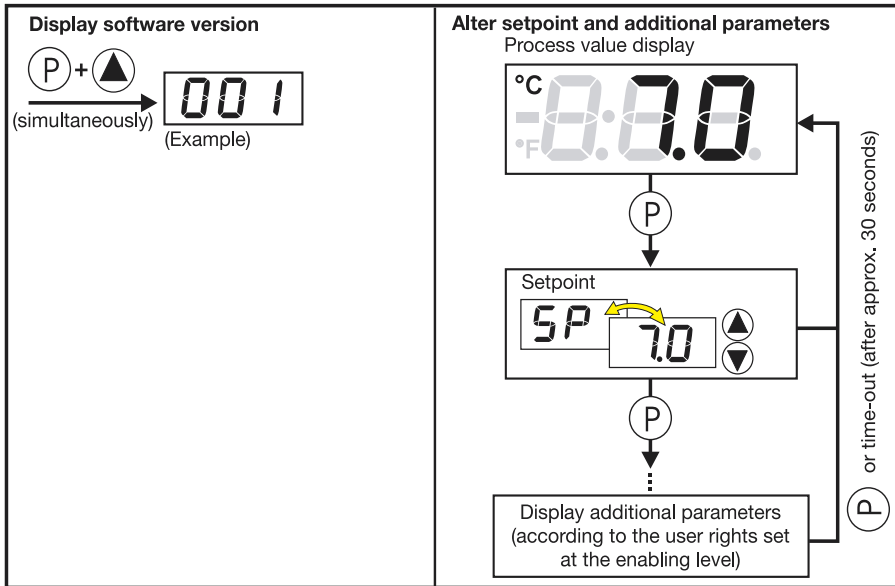
The setting at the enabling level defines **user rights** which determine whether a parameter is shown at the operating level, can be edited or is not shown at all.

- \* Press **(P)** for 3 seconds and  appears.
- \* Set code 82 for accessing the enabling level using **(▲)** and **(▼)**.
- \* Acknowledge with **(P)**  
**Parameter** and **User rights** blink in alternation e. g.  .
- \* Use the **(▲)** and **(▼)** keys to set user right *Ed 1*, *rd* or *no* .

User right	Display	Factory setting
Parameter <b>can be edited</b>	<i>Ed 1</i>	<i>SP</i>
Parameter <b>is shown</b>	<i>rd</i>	-
Parameter <b>is not shown</b>	<i>no</i>	all other parameters

- \* Acknowledge settings with **(P)**.
- \* Set next parameter, see *Overview of operation* on the first inside page.

## 5 Operation





## 6 Technical data

Meas. input	Designation	Range	Meas. accuracy <sup>1</sup> / ambient temperature error	Recognition of ...	
				Probe short- circuit	Probe break circuit
<b>Resistance thermometer</b>	Pt100 EN 60 751	-200 to +600 °C	0.1%/ ≤100ppm/°C	yes	yes
	Pt1000 EN 60 751	-200 to +600 °C	0.1%/ ≤100ppm/°C	yes	yes
	KTY2X-6 (PTC)	-50 to +150 °C	1%/ ≤100ppm/°C	yes	yes
	Resistance 0 – 3000 Ω	customer table <sup>3</sup>	0.1%/ ≤100ppm/°C <sup>3</sup>	= 0Ω	yes
Measuring current with Pt100: 0.2 mA, with Pt1000, KTY2X-6 and resistance: 0.02 mA					
Lead compensation is settable via the parameter Lead compensation resistance $\Delta F_r$ . Total resistance (sensor+lead) must not exceed 320Ω with Pt100 and 3200Ω with Pt1000, KTY2X-6 and resistance.					
<b>Thermo- couples</b>	Fe-Con J EN 60 584	-200 to +999 °C	0.4%/ ≤100ppm/°C <sup>2</sup>	no	yes
	Fe-Con L DIN 43 710	-200 to +900 °C	0.4%/ ≤100ppm/°C <sup>2</sup>	no	yes
	NiCr-Ni K EN 60 584	-200 to +999 °C	0.4%/ ≤100ppm/°C <sup>2</sup>	no	yes
	-10 to 60 mV	customer table <sup>3</sup>	0.1%/ ≤100ppm/°C <sup>3</sup>	no	yes
For the voltage input (-10 to 60 mV), the terminal temperature compensation for thermocouples can be used. Internal terminal temperature compensation can be switched off through the setup program (0°C).					

Meas. input	Designation	Range	Meas. accuracy <sup>1)/</sup> ambient temperature error	Recognition of ...	
				Probe short-circuit	Probe break circuit
<b>Current</b>	0 to 20 mA	-2 to 22 mA scalable with $S_{cL}$ and $S_{cH}$ or customer table	0.1%/ $\leq 100 \text{ ppm}/^{\circ}\text{C}^3$	no	no
	4 to 20 mA	2.4 to 21.6 mA scalable with $S_{cL}$ and $S_{cH}$	0.1%/ $\leq 100 \text{ ppm}/^{\circ}\text{C}^3$	yes	yes
Input resistance $R_{IN} \leq 3\Omega$					
<b>Voltage</b>	0 – 10 V	-1 to 11 V scalable with $S_{cL}$ and $S_{cH}$ or customer table	0.1%/ $\leq 100 \text{ ppm}/^{\circ}\text{C}$	no	no
Input resistance $R_{IN} \geq 100\text{k}\Omega$					
1.) The accuracy refers to the measuring range span. 2.) valid from $-50^{\circ}\text{C}$ 3.) A valid customer table must be entered through the setup program and switched over to $tAb$ in the instrument. This may reduce the measuring accuracy.					

### Ambient conditions

Ambient temperature range	0 to $+55^{\circ}\text{C}$ , with side-by-side mounting: 0 to $+40^{\circ}\text{C}$
Storage temperature range	$-40$ to $+70^{\circ}\text{C}$
Climatic conditions	$\leq 75\%$ rel. humidity, no condensation

**Output**

Relais K1 (changeover contact)	150,000 operations at 10A/250V AC 50Hz resistive load 800,000 operations at 3A/250V AC 50Hz resistive load
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**Supply**

Supply voltage	230V AC +10/-15%, 48 – 63Hz or 115V AC +10/-15%, 48 – 63Hz (isolated from measurement input) 12 – 24V DC +15/-15%, 24V AC +15/-15%, 48 – 63Hz (not isolated from measurement input)
Power consumption	< 2VA

**Housing**

Material	polycarbonate
Mounting	DIN rail 35mm x 7.5mm to EN 50 022
Operating position	unrestricted
Weight	approx. 110g
Protection	IP20
Flammability class	UL 94 V0

**Electrical data**

Data backup	EEPROM
Connection	screw terminals for wire cross-sections up to 2.5 mm <sup>2</sup>
Electromagnetic compatibility interference emission immunity to interference	EN 61 326 Class B to industrial requirements
Electrical safety	EN 61 010, Part 1, overvoltage category III, pollution degree 2

## 6.1 Setup program

The program and the interface with adapter are available as accessories and offer the following advantages:

- simple and convenient parameterization and archiving from a PC
- simple duplicating of parameters on instruments of the same type
- possibility of entering a linearization table




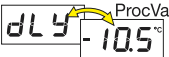


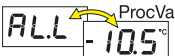
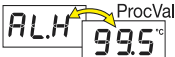
### Minimum hardware and software requirements:

- PC Pentium 100 or compatible
- 128 MB RAM, 16 MB free on hard disk
- CD-ROM drive
- free COM interface
- Microsoft Windows 98/ME/NT4.0/2000/XP
- \* Link PC interface to the RS232 interface on the PC
- \* Insert black adapter (3-pole pins) into the side of the instrument



## 7 Alarm messages

The following alarm messages can be shown in the temperature display:

Error message	Cause	Elimination
	<b>Display overrun</b> The measured value is too large and outside the range.	<ul style="list-style-type: none"> <li>- Check sensor and connecting cable for damage or short-circuit</li> <li>- Check whether the correct sensor has been set or connected</li> </ul> <p>⇒ Chapter 4 “Commissioning the instrument”</p> <p> These messages are only output to the temperature display.</p>
	<b>Display underrun</b> The measured value is too small and is outside the range.	
	Time for <b>switch-on delay</b> after power-on has elapsed. With display over/underrun, the switch-on delay becomes ineffective.	* Cancel switch-on delay with  + 
	Value has fallen below the <b>low alarm limit</b>	<ul style="list-style-type: none"> <li>* Depending on the controller type, check whether the heating or cooling unit functions faultlessly.</li> <li>* Check whether the installed relay fuse is still in good working order.</li> </ul> <p>The alarm disappears as soon as the process value goes above or below the AL limits by the amount of the hysteresis.</p>
	Value has gone above the <b>high alarm limit</b>	

