

ifm electronic



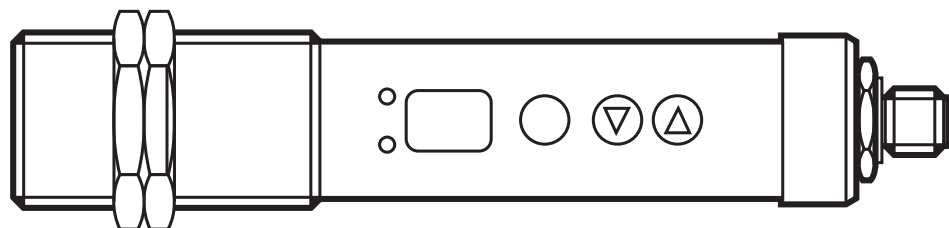
Operating instructions  
Infrared temperature sensor

**efector600<sup>®</sup>**

**TW70xx**

**UK**

706229 / 00 09 / 2012



# Contents

1	Miscellaneous .....	4
1.1	Information about this manual .....	4
1.2	Explanation of symbols.....	4
1.3	Liability and Warranty .....	4
1.4	Copyright .....	4
2	Safety.....	5
2.1	Intended use.....	5
2.2	User's responsibility .....	5
2.3	Safety requirements .....	5
2.4	Electromagnetic Compatibility .....	5
3	General Description .....	6
4	Function.....	6
4.1	Switching threshold .....	7
4.2	Upper threshold delay .....	7
4.3	Lower threshold delay .....	7
4.4	Output signal .....	7
4.5	Switching function.....	8
4.6	Internal signal processing.....	9
5	Electrical connection.....	9
6	Shielding and Grounding .....	10
6.1	Potential Equalisation .....	10
7	Operating controls and display .....	11
8	Menu.....	12
8.1	Menu OUT1 .....	12
8.2	Menu OUT2 .....	13
8.3	Menu test function, factory reset .....	14
9	Menu Explanation .....	15
9.1	Configuration layer .....	15
9.2	Parameter Layer .....	15
10	Operating parameters.....	16
10.1	Setting parameters .....	16
10.2	Diagnostics feature .....	17

- 11 Operation Mode ..... 18
  - 11.1 View operating parameters ..... 18
  - 11.2 Ambient temperature..... 18
  - 11.3 Error indications ..... 18
- 12 Maintenance ..... 19
  - 12.1 Cleaning the lens ..... 19
- 13 Shipping, Packaging and Disposal ..... 19
  - 13.1 Inspecting your shipment..... 19
  - 13.2 Packaging ..... 19
- 14 Copyright ..... 20
- 15 Default settings ..... 21

UK

# 1 Miscellaneous

## 1.1 Information about this manual

The Operating Manual shall enable the user to properly install the infrared temperature sensor and the required accessories.

Before starting installation, be sure to read and understand this entire manual, in particular the chapter on safety! The instructions contained in this manual, especially those concerning safety, as well as site-specific regulations governing accident prevention regulations must be complied with at all times!

## 1.2 Explanation of symbols

Important safety-related references in this manual are marked with a symbol.

### CAUTION

This symbol indicates important information which, if neglected, might result in damage to the instrument or malfunction or breakdown.



### PLEASE NOTE

This symbol points out guidelines which should be heeded for efficient and trouble-free operation.

▶ Action

This symbol instructs the operator to take action.

> Reaction, Result

This symbol indicates the result of the action taken.

## 1.3 Liability and Warranty

All information compiled in this manual is in accordance with applicable regulations. The statements made are based on state-of-the-art technology and reflect our extensive knowledge and many years of experience.



Always carefully read this Operating Manual before beginning any work on or with the instrument, especially prior to installation and initial setup! The Manufacturer shall not be held liable for any damages or malfunctions arising from a disregard of the warnings and instructions contained herein.

## 1.4 Copyright

This Operating Manual should be treated as confidential. It is solely intended for use by persons involved with the instrument. This manual may not be made

available to a third party without prior Manufacturer's consent. Please contact the Manufacturer if the need should arise.

## 2 Safety

This chapter outlines all important safety aspects to be considered for optimum employee protection and to ensure safe and reliable operations.

### 2.1 Intended use

The infrared temperature sensor is solely intended for use as described in this manual.

Operational safety can only be ensured when the instrument is used for its intended purpose.



The use of the infrared temperature sensor for any other purpose beyond what is specified in this manual is prohibited.

Using the instrument in any other manner will be considered as improper.

The Manufacturer/Authorised Agent shall not be held liable for any damages or loss resulting from such unintended or improper use; in this case the risk is solely borne by the user.

### 2.2 User's responsibility

The infrared temperature sensor may only be used when it is in perfect working condition.

### 2.3 Safety requirements

The instrument operates at low voltage (10...34 V DC). The power supply unit must conform to directive EN 50178, SELV, PELV.

### 2.4 Electromagnetic Compatibility

The instrument complies with the requirements of EC Directive 89/336/EEC changed by 91/263/EEC; 92/31/EEC; 93/68/EEC relating to radio interference suppression and electromagnetic compatibility.

European certification:

EN 61000-6-4

EN 61000-6-2

EN 61000-4-2/-3/-4/-6

EN 55011

When connecting a power supply unit, make sure that it also conforms to these standards.

Radio interference may arise if the infrared temperature sensor is interconnected with such peripheral devices which have not been properly interference-suppressed. This may necessitate additional interference suppression measures.

### 3 General Description

The infrared temperature sensor detects temperatures and monitors temperature ranges without contact.

The sensor detects the infrared energy radiated by a hot object and converts this to an electric switch signal.

The advantage of this technique is that there is no mechanical contact between the sensor and the hot object.

The instrument is suitable for the following applications:

- Moving or hard-to-reach objects
- Surface-treated or voltage-carrying objects
- Sticky materials such as dough or aggressive chemicals
- Applications requiring fast response times

The rugged stainless steel housing enables the instrument to be used in harsh industrial environments. The instruments are splash-proof according to IP65 (DIN 40050). The infrared temperature sensor features two switching relays which can be custom configured as NC or NO contacts.

### 4 Function

The infrared temperature sensor is equipped with two open collector outputs which can be used concurrently.

- The instrument's display panel shows a value which is a percentage relating to the temperature range.
- It generates 2 output signals according to the configured function:

OUT1	Switch signal for temperature threshold 1
OUT2	Switch signal for temperature threshold 2

## 4.1 Switching threshold

OUTx changes switching status when the configured upper and lower thresholds (SP, RP) are exceeded.

First set the upper threshold [SP] as a percentaged value based on the temperature span. Then set the lower threshold [RP]. When you adjust the upper threshold [SP] the lower threshold [RP] will change accordingly. The span remains the same.

The lower threshold [RP] cannot be configured higher than the value of the upper threshold [SP]. When these parameter values are set to be equivalent, the lower threshold will be a ½ digit lower than the upper threshold.

UK

## 4.2 Upper threshold delay

Once the sensor has detected a temperature which exceeds the switching threshold [SP] the time delay [DS] starts running. When this delay period has elapsed, the output OUTx activates switching. This status is sustained until the lower threshold [RP] is violated. If this occurs before the time delay has elapsed, the delay will reset. This function can be used, for example, to suppress spurious impulse signals at the output.

- Delay:  $[OUTx] \rightarrow [DS] = x s$

## 4.3 Lower threshold delay

To make sure the output impulse is correctly identified, e.g. by a downstream control system, the output impulse can be lengthened.

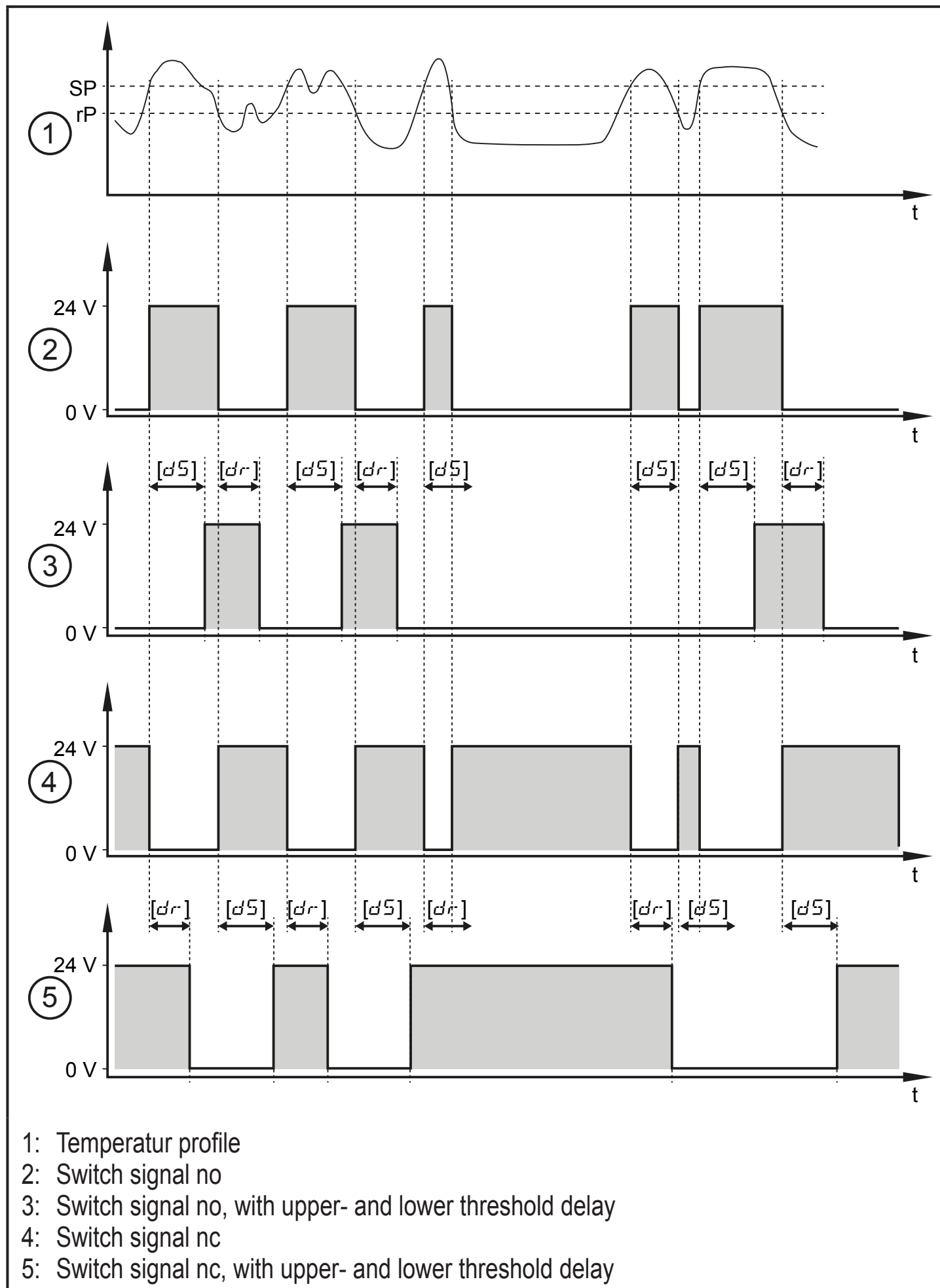
- Delay:  $[OUTx] \rightarrow [DL] = x s$

## 4.4 Output signal

The following switching functions can be selected:

- Normally open contact:  $[OUTx] \rightarrow [OUT] = NO$
- Normally closed contact:  $[OUTx] \rightarrow [OUT] = NC$

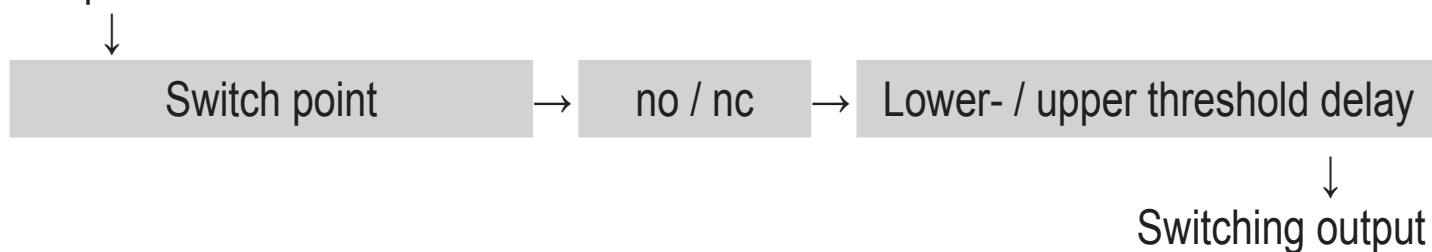
## 4.5 Switching function





## 4.6 Internal signal processing

Temperature



Emissivity of Materials:

The infrared temperature sensor reacts to the thermal energy (infrared radiation) emitted by an object.

The ability to radiate heat depends on the type of material and its surface properties. Shiny metals or aluminium, for example, have a very low emissivity coefficient.

An infrared temperature sensor which has been calibrated by a black body will detect less infrared radiation when measuring a material with low emissivity. In such cases, you should select a lower switching temperature.

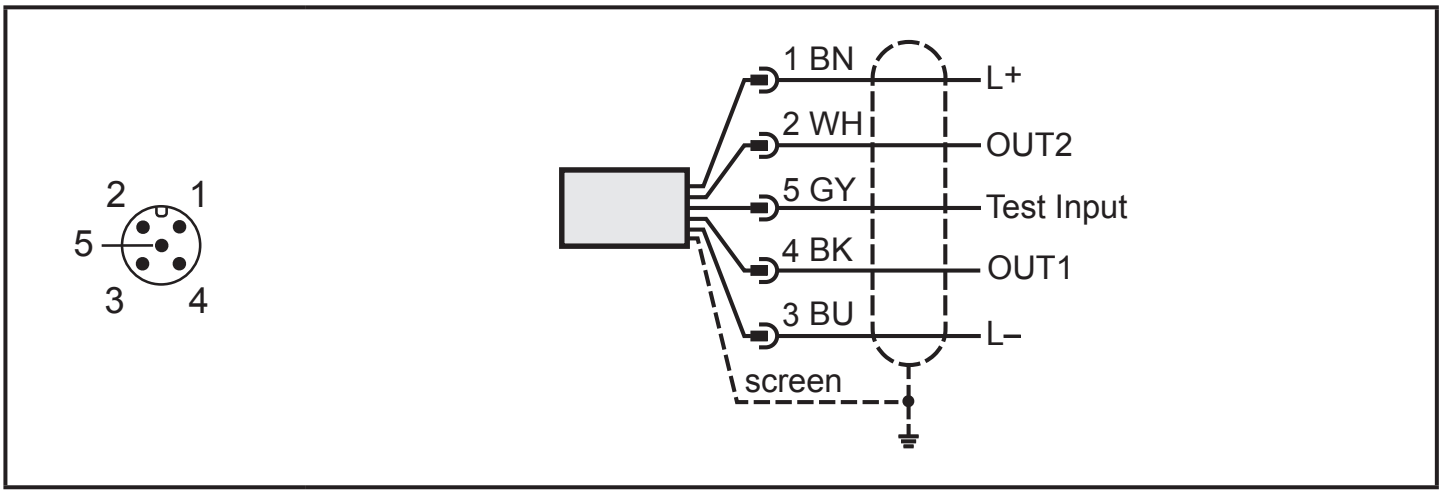
UK

## 5 Electrical connection

### CAUTION

The infrared temperature sensor may only be installed by a skilled, qualified electrician. Do not connect the instrument while the voltage supply source is turned on. Please observe international safety regulations at all times.

- ▶ Switch to neutral and verify absence of voltage.
- ▶ Connect instrument according to the following schematic:



Pin 1	BN (brown)	L+
Pin 2	WH (white)	Open Collector switching output 2 $I_{\max} = 150 \text{ mA}$
Pin 5	GY (grey)	Test Input
Pin 4	BK (black)	Open Collector switching output 1 $I_{\max} = 150 \text{ mA}$
Pin 3	BU (blue)	L-

**!** The infrared temperature sensor must be protected against high voltage and strong electromagnetic fields. Use a shielded cable, connecting it via connector casing to the device housing.

**!** Use a flyback diode when switching inductive loads.

## 6 Shielding and Grounding

### 6.1 Potential Equalisation

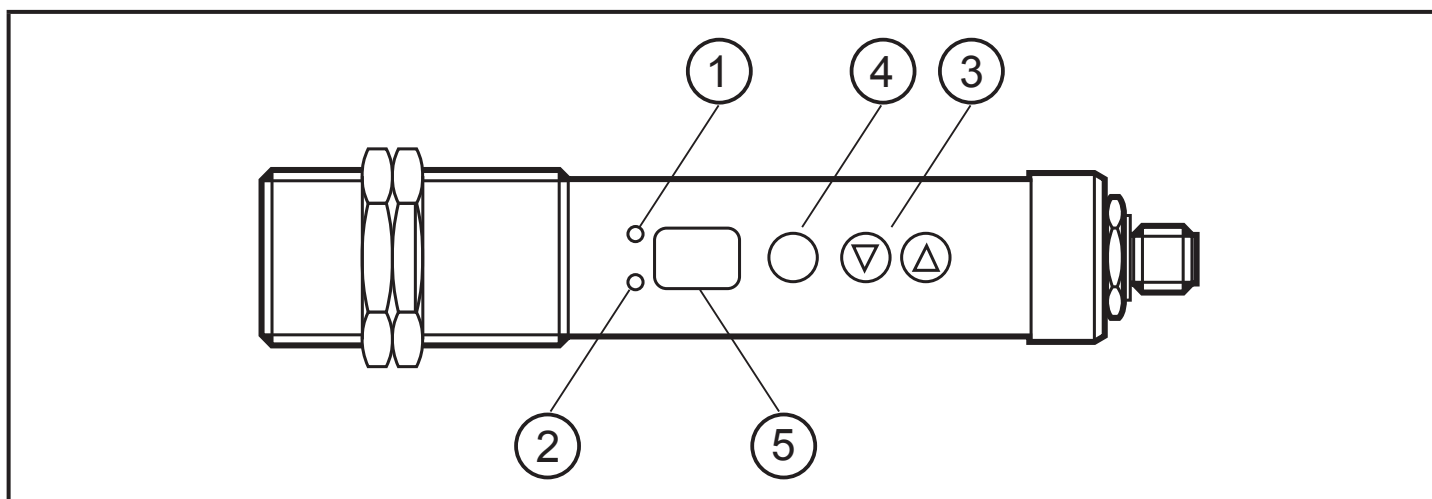
The infrared temperature sensor housing is connected to the shielding via the cable connector! Differences in ground potentials might cause an equalising current to flow between devices through a cable shielded at both ends. In this case, be sure to install an additional potential equalisation line.

To avoid an equalising current, the infrared temperature sensor can be mounted electrically insulated. The shielding must be connected to the plant's grounding.

**!** If the infrared temperature sensor is installed without an insulator and without potential equalisation, the interference voltage may not exceed 48 V.

## 7 Operating controls and display

The IR temperature sensor TW70xx features a 2-digit display, 3 control keys and 2 LEDs. During Run Mode, the display indicates the measurement value as a percentage relating to the temperature span.



UK

### 1 und 2:

LED 1, LED 2 = indicates switching status of respective output

### 3: Control key up and down

Adjust configuration parameters

### 4: Control key enter

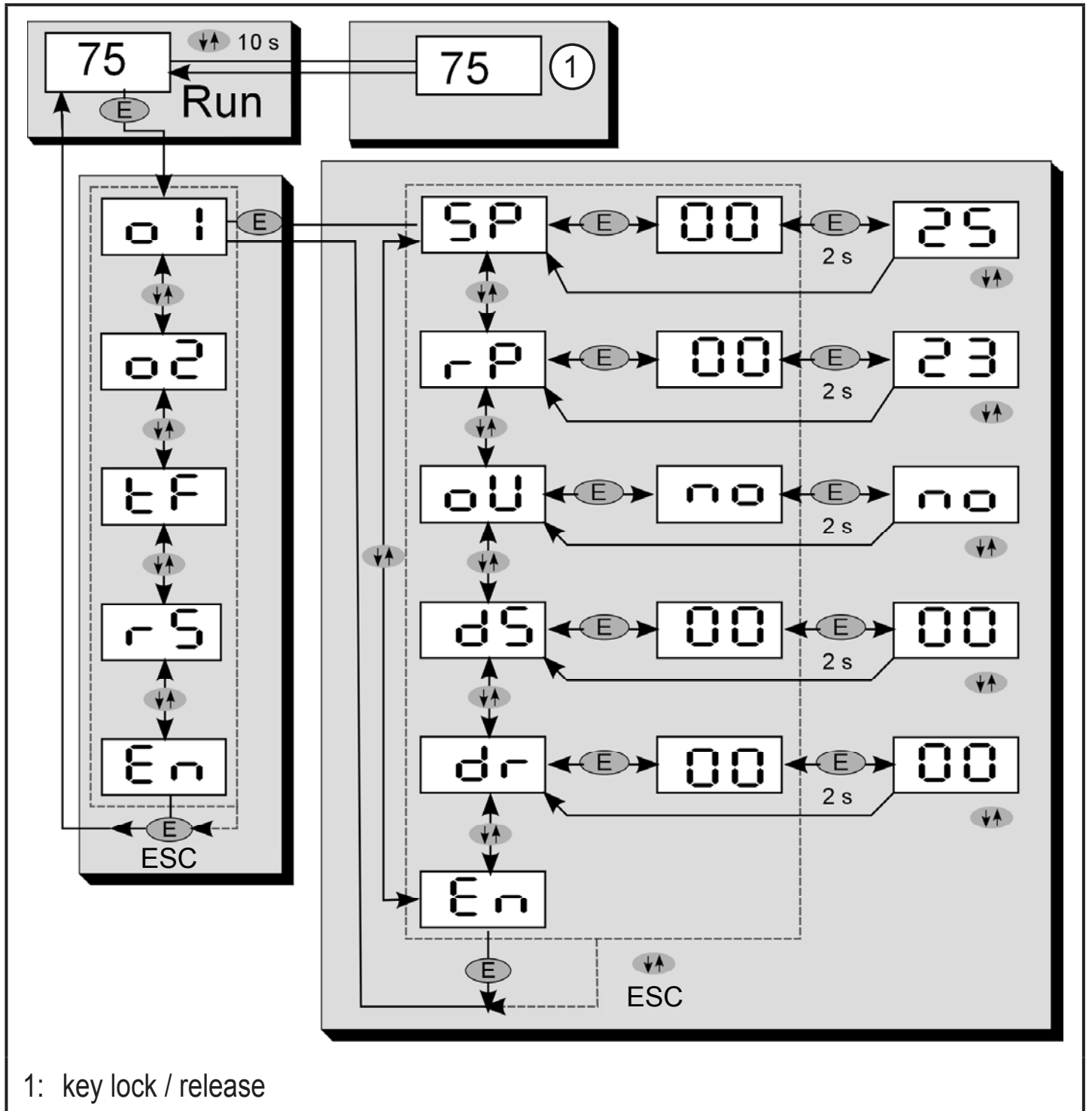
select parameter and confirm setting

### 5: Alphanumeric display, 2-digit

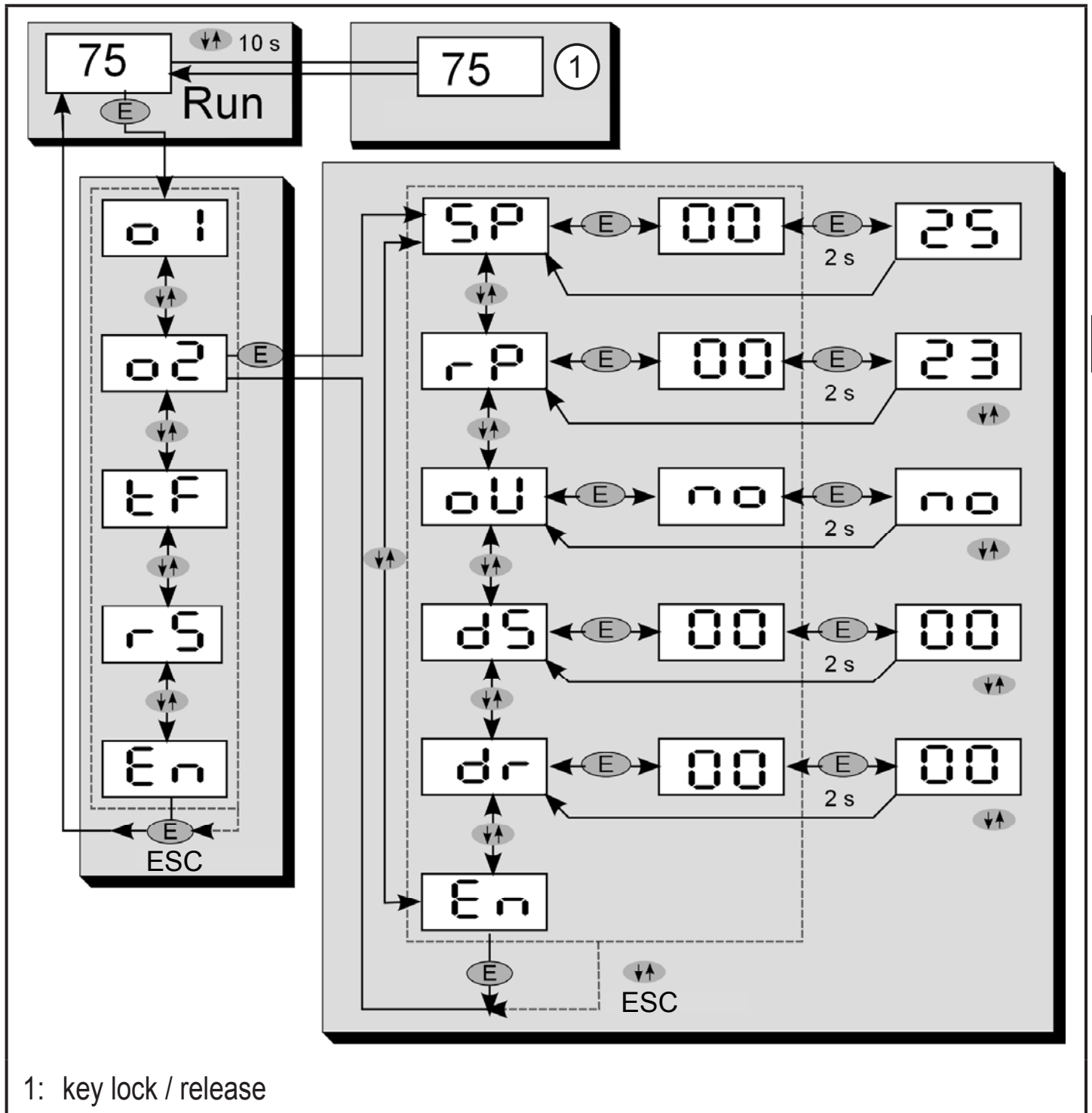
- indicates percentage of temperature value
- indicates parameters and configuration

# 8 Menu

## 8.1 Menu OUT1

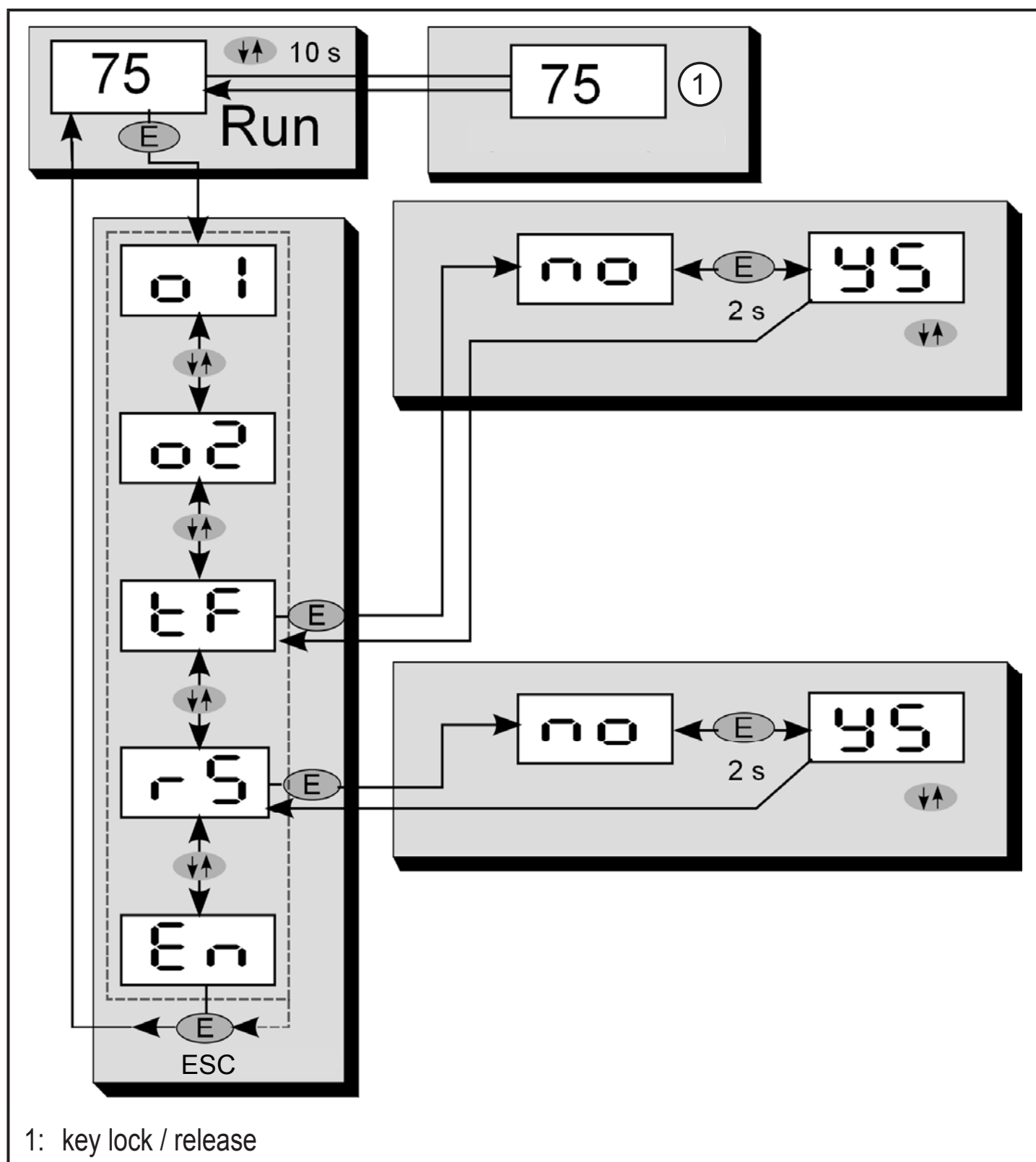


## 8.2 Menu OUT2



UK

### 8.3 Menu test function, factory reset



## 9 Menu Explanation

### 9.1 Configuration layer

Parameter	Function	Comments
<i>o1</i>	OUT1	Settings for Output 1
<i>o2</i>	OUT2	Settings for Output 2
<i>tF</i>	diagnostics (test) feature	Activates diagnostics feature for self-test
<i>rS</i>	Resetting to factory settings	The adjusted parameter are reset to factory settings

UK

### 9.2 Parameter Layer

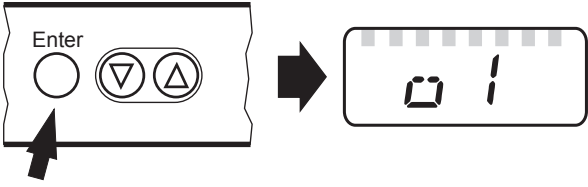
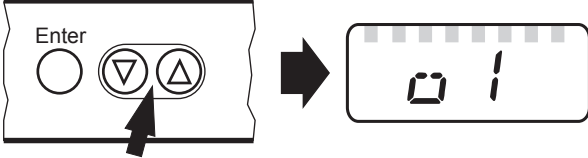
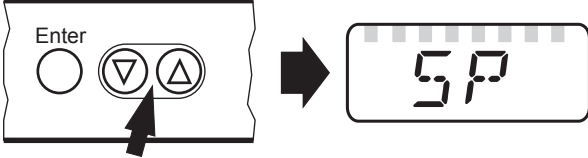
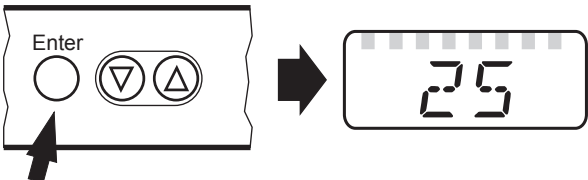
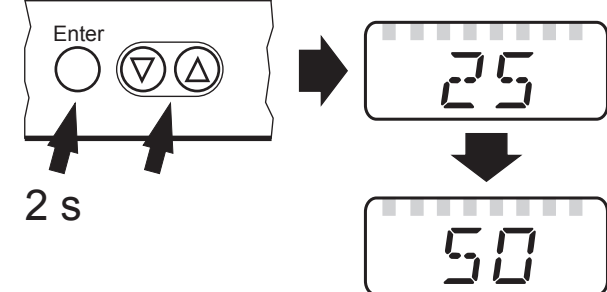
Parameter	Function	Comments
<i>SP</i>	Upper threshold	Value is % of defined temperature span
<i>rP</i>	Lower threshold	Value is % of defined temperature span Always ( $\leq$ switching point)
<i>ou</i>	Output function	<i>no</i> normally opened <i>nl</i> normally losed
<i>dS</i>	Upper threshold delay	Value in s *
<i>dr</i>	Lower threshold delay	Value in s *
<i>En</i>	End	Exit menu

\* Maximum 9.9 s in 0.1 s increments

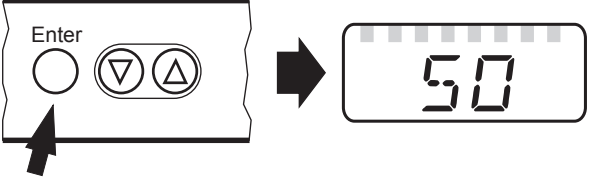
# 10 Operating parameters

When you reset/adjust the operating parameters the instrument remains in run mode. It continues to operate, using the current parameter settings, until you have finished configuring by pressing [Enter].

## 10.1 Setting parameters

1	<p><b>Configuration layer</b></p> <ul style="list-style-type: none"> <li>▶ Press [Enter] to access the configuration layer.</li> </ul>	
2	<p><b>Select output or diagnostics feature</b></p> <ul style="list-style-type: none"> <li>▶ Press control key [▲ ▼] until the display shows the desired output or diagnostics feature.</li> <li>▶ [Enter].</li> </ul>	
3	<p><b>Adjust parameters</b></p> <ul style="list-style-type: none"> <li>▶ Press control key [▲ ▼] until the display shows the desired parameter.</li> <li>▶ [Enter].</li> </ul>	
4	<p><b>Show parameter value</b></p> <ul style="list-style-type: none"> <li>▶ Press [Enter] to view current parameter value. *</li> </ul>	
<p>* The infrared temperature sensor will display the parameter value for 30 s. After that the display will once again indicate the measurement as a percentage.</p>		
5	<p><b>Change parameter value</b></p> <ul style="list-style-type: none"> <li>▶ Press and hold [Enter] key for 2 sec</li> <li>&gt; Current setting will flash as long as [Enter] key is held down.</li> <li>▶ Press control key [▲ ▼] to change parameter setting.</li> </ul>	



6	<p><b>Confirm parameter value</b></p> <ul style="list-style-type: none"> <li>▶ Press [Enter].</li> <li>&gt; the display indicates the parameter. The new value has been saved and will take effect.</li> </ul>	
<p><b>Adjust additional parameters</b></p> <ul style="list-style-type: none"> <li>▶ Go back to Step 2.</li> </ul>		
<p><b>Return to configuration layer</b></p> <ul style="list-style-type: none"> <li>▶ Go to <math>\overline{Err}</math> and use [Enter] key to reach the configuration layer.</li> </ul>		
<p><b>Exit operating parameters layer</b></p> <ul style="list-style-type: none"> <li>▶ At the configuration layer, use control key [<math>\blacktriangle \blacktriangledown</math>] to select <math>\overline{Err}</math> to end the parameters layer. Then press [Enter].</li> </ul>		

UK



The instrument features a keylock. Activate / deactivate as follows:

- ▶ Press [ $\blacktriangle \blacktriangledown$ ] keys simultaneously and hold them down for 10 sec.
- > The display will flash once.



If you press both [ $\blacktriangle \blacktriangledown$ ] keys only briefly, you will exit the layer (ESC function).

## 10.2 Diagnostics feature

The infrared temperature sensor features an integrated diagnostics function which can be activated either using the control keys or by a static signal (10...34 V) on Pin 5.

Voltage must be applied for at least  $t > 400$  ms. The diagnostics function simulates the detection of infrared radiation. The display shows  $\overline{DL}$ .

To deactivate the diagnostics function, the static signal must be  $< 6$  V for a period longer than 0.3 s. If the diagnostics function is activated using the control keys on the instrument, it will remain in this mode for 10 s.

The diagnostics function checks the instrument's signal processing and tests the switching outputs.



When the test function is not being used, connect the test input (Pin 5) to the negative pole of the supply voltage. Alternatively, use a 4-pin cable socket (Pin 5 not assigned).

# 11 Operation Mode

After connecting the supply voltage the infrared temperature sensor will be automatically initialized and will perform a self-diagnosis. After approx. 0.5 s the sensor is ready to operate and the instrument runs the signal processing.

## 11.1 View operating parameters

- ▶ Press [Enter] and select the desired output.
  - ▶ Press [Enter] to go to the parameters layer.
  - ▶ Press [▼/▲] until the display shows the desired parameter.
  - ▶ Press [Enter].
- > The display will indicate the parameter value for 30 s. After that it returns to Run Mode.

## 11.2 Ambient temperature

The maximum permissible ambient operating temperature for the infrared temperature sensor is 65 °C. If the instrument is used in ambient temperatures above 65 °C, it must be either cooled or shielded from excess radiant heat by means of a deflector plate.

## 11.3 Error indications

Overload of output	Corresponding LED will flash at $f = 2.0 \text{ Hz}$
Excess temperature inside device	Display alternately shows $\square \bar{L}$ and measurement reading at $f = 0.5 \text{ Hz}$ . The LEDs indicate the output switching status.
Faulty connection of supply voltage	Both LEDs flash at $f = 2.0 \text{ Hz}$ . Display shows measurement reading.
Supply voltage $\leq 7,8 \text{ V}$	Both LEDs, display and switching outputs are deactivated. (When voltage $\geq 8 \text{ V}$ the device switches on and the switching outputs are activated)
Temperature below lower threshold	Display shows $\bar{L} \bar{L}$ .
Temperature above upper threshold	Display shows $\square \bar{L}$ .

## **12 Maintenance**

### **12.1 Cleaning the lens**

A false reading will be given when the lens is dirty. Therefore check the lens periodically and clean it, if necessary.

Dust can be removed by simply blowing it away or by using a soft brush. A special lens cleaning cloth is ideal, but any soft, clean, lint-free cloth will be suitable.

If the lens is quite dirty, use a very mild liquid detergent and rinse carefully with clear water while holding the device pointed down. Apply as little pressure as possible to avoid scratching the lens.

UK

## **13 Shipping, Packaging and Disposal**

### **13.1 Inspecting your shipment**

Unpack and inspect the entire shipment immediately upon receipt to make sure it is complete and undamaged.

If the container/package shows visible signs of damage, please refuse the shipment. If this is not possible, accept the shipment on the condition that the freight carrier's delivery record is noted with the extent of the damage in order to file a claim.

Should you discover a concealed loss or damage, report it to the shipper or freight carrier immediately. If the period for filing claims has expired, you will no longer be able to make any claims for compensation of damage or loss.

### **13.2 Packaging**

The packages used are made of carefully selected, environmentally compatible materials and are thus recyclable. We suggest you retain the packaging for possible future use; otherwise please ensure that they are disposed of in an ecologically sound manner.

# 14 Copyright

The device software contains portions of the avr-libc library.

Portions of avr-libc are Copyright (c) 1999-2007

Keith Gudger,  
Bjoern Haase,  
Steinar Haugen,  
Peter Jansen,  
Reinhard Jessich,  
Magnus Johansson,  
Artur Lipowski,  
Marek Michalkiewicz,  
Colin O'Flynn,  
Bob Paddock,  
Reiner Patommel,  
Michael Rickman,

Theodore A. Roth,  
Juergen Schilling,  
Philip Soeberg,  
Anatoly Sokolov,  
Nils Kristian Strom,  
Michael Stumpf,  
Stefan Swanepoel,  
Eric B. Weddington,  
Joerg Wunsch,  
Dmitry Xmelkov,  
The Regents of the University of California.

All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

\* Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.

\* Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.

\* Neither the name of the copyright holders nor the names of contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT OWNER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

## 15 Default settings

	Parameter	Factory default setting	Customized configuration
OUT1	SP	25 %	
	rP	23 %	
	dOU	no	
	dS	0 s	
	dr	0 s	
OUT2	SP	75 %	
	rP	73 %	
	dOU	no	
	dS	0 s	
	dr	0 s	

UK