

# Installation and Operating Instructions

## HTI16 electronic thermostat

### Contents

1. **Safety**
  - 1.1. Intended Usage
  - 1.2. Non - intended usage
  - 1.3. Operator
  - 1.4. Safety - relevant notice
  - 1.5. Liability exclusion
2. **General**
  - 2.1. Unpacking and inspecting
  - 2.2. Standards and regulations
3. **Description**
4. **Commissioning**
5. **Display, Buttons, Switches and Error Messages**
6. **Calibration / setting target value**
7. **Signal**
8. **System monitoring**
9. **Writing diagram**
10. **Technical data**
11. **Fault elimination / maintenance**
12. **Connections requirements**
13. **Disposal**



### 1. Safety

This chapter provides important information about the safe operation of your HTI16 and the use of these instructions.

#### 1.1 Intended Usage

The HTI16 is a microprocessor-based temperature regulator for industrial applications. Within the context of intended usage, the integral regulator is operated without sensor in conjunction with a (manufacturer approved) heating resistor having a defined temperature coefficient. The integral regulator must be adapted to the heating resistor by way of software calibration prior to being used for the first time.

#### 1.2 Non-intended usage

All usage outside the scope of those described in Point 1.1 are non-intended usage and may be hazardous and/or lead to consequential damage.

#### 1.3 Operator

Installation, electrical connection, commissioning, operating and maintenance of the HTI16 may only be performed by trained professionals who have been authorised or instructed for these activities by the operating authority.

#### 1.4 Safety-relevant notices

Safety notices in this guide are marked by symbols. These notices are placed immediately before the procedure step to which they apply and must be followed precisely in order to avoid hazardous situations for persons and property damage to objects.

The following pictograms are used to call attention to notices:



**Attention !** is used to call attention to potential health hazards or lethal situations.



**Note !** is used for notices which, if disregarded, could result in failures during operational processes.



**Tip !** is used to provide advice or additional information.

### 1.5 Liability exclusion

We herewith expressly serve notice that Hillesheim is not liable for any damage resulting from incorrect or negligent operation, maintenance or non-intended usage. This also applies to device modifications, attachments and conversions which could be detrimental to safety. In these cases the manufacturer's warranty is voided.

## 2. General

### 2.1 Unpacking and inspecting

The product must be inspected for possible shipping damage when it is unpacked. If damage is found then the freight carrier, railway company or postal authority is to be notified so that a damage report can be initiated.

### 2.2 Standards and regulations

This product complies with the following national and European regulations:



The "Electromagnetic compatibility" directive (89/336/EEC and 93/68/EEC)

The "Low voltage equipment" directive (73/23/EEC und 93/68/EEC)

## 3. Description

The integral temperature controller controls the temperature of the heating conductor. The temperature measurement is via the change in resistance of the heating wire without further sensors. Because the resistance of the heating wire increases with rising temperature, the heating wire temperature can be derived from it. The HTI controller must always be adapted to the corresponding heating circuit (characteristic curve pure nickel 99.6). On supply of a heating system with an associated control system the setting is made at the factory. Corresponding identification codes are applied to the heating system and the controller. Please see section 6 of these instructions for a description of the calibration procedure.

The device has the following outstanding features:

- Simple operation and installation.
- Temperature measurement directly via the heating conductor.
- No temperature sensor.
- Simple adjustment of the electronics to differing heating resistance levels.
- Burst firing control with zero crossing detection and defined heating pause time.

## 4. Commissioning

Important: Please read prior to operation



"Per the EMC Directive 89/336/EEC, this device represents only a component in a system. It complies with the requirements of the EMC Directive 89/336/EEC per EN 61326:1997 + A1:1998 + A2:2001, and there should therefore be no EMC interference when operated with ohmic consumers / heating devices. After connection of a heating system, the EMC Directive 89/336/EEC requires a new EMC test. We would point out that the person commissioning the system is required pursuant to Directive 89/336/EEC to comply with these guidelines.

EMC Directive 89/336/EEC also requires compliance with the maximum permissible flicker rate per DIN EN 6100-3-3. This depends on the connected load and the number of switching cycles arising. The higher the load, the less switching cycles are permissible. For this reason, we recommend that the heating load be maintained as low as possible. However, if your control circuit still exceeds the flicker rate, a change of the control parameters can achieve a reduction of the flicker rate. A reduction of the mains impedance also reduces the flicker rate."



Should an electrical heating system or heating device be operated unsupervised (night operation), we would refer to the German VDE regulations (Safety in Electrical Heating Systems DIN EN 60619-2 [VDE 0721 Part 411]), and to the regulations of the Mutual Indemnity Associations and the Health & Safety Executive (UK), which specify in such cases the use of thermal monitoring (or a thermal limiter), or require a fail-safe design.

Important operating information:

- Do not expose controller to heat or sunlight – risk of overheating!
- Ensure sufficient cooling of the power semiconductor.
- Operate the controller only in closed condition.
- To avoid jamming the buttons, always fit the cover parallel.

## Installation

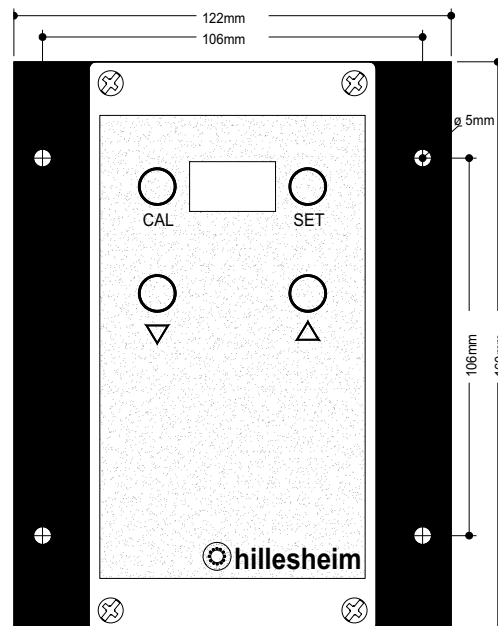
The controller can be operated in any position. When selecting a location, please ensure that the cooling panel (rear panel) is adequately ventilated. The controller can be fixed in place using M4 screws via the borings in the cooling panel.

## Mains connection

Compare mains voltage with nameplate. Connect the controller only to earthed mains sockets. Use only the screw terminals and plugs provided for that purpose. with version –D, connect heating device using the cable connector.

## Heating connection

Via terminals with version - K. The pluggable version - D is connected via a 3-pole built-in socket (2+PE). The corresponding plug is permanently attached to the heating device power cable or can be ordered as a spare part.



## 5. Display, Buttons, Switches and Error Messages

LED → display, 3-digit

Right display point → heating display

In the basic setting, the measured temperature of the heating wire is displayed. By pressing up  $\Delta$  or down  $\nabla$  the display will switch to the set value for temperature regulation. The values entered will be saved in non-volatile memory.

There are 4 buttons and a DIP switch (only accessible after opening cover) to enter:

<b>UP</b>	Higher setting $\Delta$
<b>DOWN</b>	Lower setting $\nabla$
<b>SET</b>	Confirm the entry made at the latest 5 seconds after releasing UP or DOWN
<b>CAL</b>	Calibration button

The heating system is generally OFF during all entries.

When a new setting has been confirmed using the SET button, the user can check the new setting by briefly pressing either the UP or DOWN button. The set value saved will be displayed for 1 sec.

### DIP-Switch 4pole:

SETTING LOCK → SET and CAL can be released or locked during operation via the DIP switches close to the display (only accessible with cover opened). If the DIP switch 4 is set to ON, SET and CAL are blocked. while the setting can be changed on the display, it will neither be saved nor used for control.

### Selecting variable parameters via the DIP – Switch

#### DIP-Switch

		1	2	3	(4)*
Temperature range 1	0 to +100°C	0	0	0	
Temperature range 2	-20 to + 40°C	0	0	1	
Temperature range 3	+10 to +150°C	0	1	0	
Temperature range 4	+10 to +250°C	0	1	1	

Invalid setting or faulty settings always correspond to a temperature range 0...100 °C

\* DIP switch 4 serves to block settings. In position ON (1), changed values will not be accepted.

The re-set jumper will be read only when the device is switched on again.

### Displays

HI	Measured value higher than display range
LO	Measured value lower than display range

### Error messages

F0	Heating interrupted	(2)
F1	Synchronisation error	(1)
F2	Failure on saving	(1)
F3	Calibration error	(1)
F <sup>-</sup>	Window upper limit exceeded	(2)
F <sub>-</sub>	Measurement error	(2)
F <sub>-</sub>	Window lower limit exceeded	(2)

(1) = error indicator static, restart or mains interruption required

(2) = error indicator blinking alternate with the IST - Wert

## 6. Calibration / setting target value



To connect a heating hose or another heating system to the controller for the first time, first adjust the controller to the heating system at a known ambient temperature. The ambient temperature may be between 0 °C and 50 °C. Prior to calibration, please ensure that the heating system has sufficient time to adjust itself to the ambient temperature. With high mass or strong insulation, this may take several hours.

Steps to adapt the controller to the heating system (calibration) and set the target value:

- |  |   |
|--|---|
| 1. Disconnect controller from the mains  |   |
| 2. Disconnect from the heating system  |   |
| 3. Re-connect controller to the mains  | Display "F0/HI"   |
| 4. Room temperature = set heating wire temperature<br>using UP/DOWN and confirm with SET                                     | Display e.g. "2 0" for 20 °C  |
| 5. Select the calibration mode to do this press UP/DOWN/CAL simultaneously*  | Display "----"  |
| 6. Connect heating system to controller, with screw<br>terminals first switch off power and then<br>restore mains connection | Display "----"  |
| 7. To calibrate, press CAL   | Display "----", then the room<br>temperature set, e.g. "20"             |
| 8. Set desired control temperature, e.g. 80 °C<br>using UP/DOWN and confirm with SET**                                       | Display e.g. "80", right<br>display point indicates<br>heating phase on |

\* To leave/abort the calibration mode, press UP and DOWN simultaneously.

\*\* The target value can always be changed as described under point 5. Important!! Always confirm with SET. Only then will the value be accepted and used for regulation

## 7. Signal

A relay with a potential-free change-over contact is activated when the ACT temperature is within the signal range. The signal is deactivated if the temperature leaves the signal range. To filter erroneous messages, the signal message only appears following several detections of the signal at the relay output. The appearance of the signal message at the relay output is thus delayed by approx. 20 seconds. This delay also occurs when switching on.

ACT temperature > SIGNAL range                      Display "F<sup>-</sup> / ACT temperature"

ACT temperature < SIGNAL range                      Display "F<sub>-</sub> / ACT temperature"

The signal relay will also switch over in the event heating is interrupted. This permits switching off of the temperature controller (see section 8) to be monitored.

## 8. System monitoring

An electro-mechanical safety element (e.g. thermal fuse, bi-metal controller...) may be present in the heating system as a safety element (Safety in Electrical Heating Systems, DIN EN 60619-2 [VDE 0721 Part 411]) for unsupervised operations. With temperature controllers without resetting, the device must be disconnected from the mains to RESET. After cooling down, the device can be put back into operation. Please first check the reason for the failure and, if necessary, eliminate any fault. An interrupt message takes place via the signal relay.

## 9. Writing diagram



To earth the cooling unit, the device must always be connected with the earthed conductor (PE terminal)!!!  
Mains connection to terminals N and L1, heating system to terminals H1 and H2. Signal relay: potential-free change-over switch

### Additional installation information

(Electronics supplied for installation in a housing)

For technical data: see point 10

Contamination: The creepage and air paths of the electronics are designed for contamination level 2 (non-conductive contamination).

Heat dissipation at the triac: The triac needs precautions for cooling. Permissible triac housing temperature T<sub>max</sub> = 80°C, measured at maximum ambient temperature (30 mm distance from triac) and maximum load.

## 10. Technical data



<b>Rated voltage</b>	230 V AC (optional 115 or 400V/AC), 50...60Hz
<b>Controllable heating rating</b>	3600W (max. 16A resistive load, duty cycle 70...80%)
<b>Minimum output current</b>	1A resistive load
<b>Control method</b>	HTI - integral system matched to pure nickel 99,6
<b>Operation</b>	1.Y (1) „automatic operation without tolerance settings“; (y) „electronic shut - off“
<b>Temperature control range</b>	see nameplate (-20 to +250°C in 4 components)
<b>Temperature setting</b>	Digital via buttons
<b>Power unit</b>	Triac
<b>Signal relay</b>	Change over relay 230V AC, max. 6A
<b>Protection class</b>	I
<b>Protection type</b>	IP65 in plugged condition
<b>Ambient temperature</b>	0 to +50°C (storage temperature -40°C to +70°C)
<b>Power cable (only -D)</b>	H 05 VV-F 3 G 1,5
<b>Length</b>	1,3 m
<b>Plug type</b>	Euro 16 A
<b>Socket, version -D</b>	Hirschmann STAKEI 200, 2+PE
<b>Dimensions in mm (B,H,T)</b>	81 x 161 x 65 (B x L x H) ABS housing without screw fixtures / base plate
<b>Terminal clamps</b>	2,5mm <sup>2</sup>
<b>Screw fixings</b>	2 x M16x1,5 (Version - K → 3 screw fixings)

Two versions of housing for the controller are available as standard:

Version – D → 2+PE Socket and power cable with Euro safety plug, screw connection for signal output

Version – K → For terminal connection with 3 screw terminals for mains, heating system and signal output

## 11. Fault elimination / maintenance

In the event of any faults not clearly attributable, the device should always be returned to the manufacturer.

As this device involves a direct combination between heating system and controller, the heating system should also be returned wherever possible.

**IMPORTANT!** Perfect operation can only be guaranteed if the device has been properly calibrated.

## 12. Connections requirements



Please always observe the generally accepted technical standards and accident prevention regulations applicable at the place of use (e.g. VBG4). The mains connection must always be protected according to such rules (e.g. VDE 0100 Section 31). For additional safety, the electrical circuit should also be equipped with an FI circuit breaker (DIN 57664 Part 1 / VDE 0664).

### Optional conversion of the controller to 115V (factory set)



For conversion to 115V, drill B01 (see component diagram) as wide as necessary (2.5 mm drill) until the printed conductor is interrupted. Solder in bridges BR1 and BR2. The conversion (always disconnect power first!) can be carried out without removing the circuit board. Contamination, drill residue etc. must be removed.

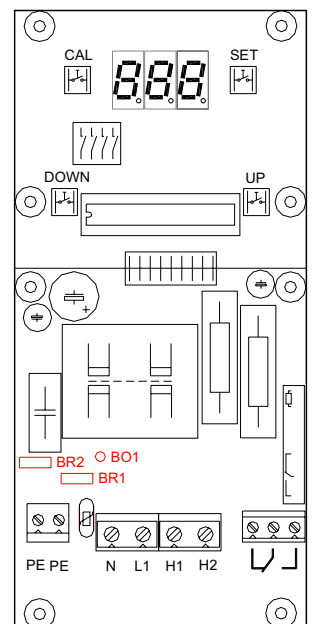
## 13. Disposal

### Packaging

Materials used to package the device for transport are to be disposed of in an environmentally-friendly manner by giving them to the appropriate local disposal facilities.

### Device components

Defective components are to be collected and disposed according to applicable regulations. The same applies to the device itself.



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