SensyCal IR
Contactless temperature monitoring for power transmission systems

Manual
Document No. 42/18-70 EN
Edition: 08.01
Revision: 00

Manufacturer:
ABB Automation Products GmbH
Borsigstrasse 2
D-63755 Alzenau

Phone: +49 (0) 60 23 - 92 - 0
Telefax: +49 (0) 60 23 - 92 - 32 10

© Copyright 2001 by ABB Automation Products GmbH
Subject to technical changes

This technical documentation is protected by copyright. Translating, photocopying and disseminating it in any form whatsoever - even editings or excerpts thereof - especially as reprint, photomechanical or electronic reproduction or storage on data processing systems or networks is not allowed without the permission of the copyright owner and non-compliance will lead to both civil and criminal prosecution.
1 General safety instructions, intended use .......................................................... 5
  1.1 Prerequisites for safe operation ................................................................. 5
  1.2 Intended use ................................................................................................. 5
  1.3 Safe operation ............................................................................................. 6
  1.4 To be observed: ........................................................................................... 6
  1.5 Emergencies ................................................................................................. 7
2 Components, intended use, functional principle .............................................. 8
3 Mounting ........................................................................................................... 9
  3.1 Selecting the mounting site ......................................................................... 9
  3.2 Mounting the device .................................................................................... 9
  3.2.1 Mounting the pyrometers ...................................................................... 9
  3.2.2 Mounting the caloric energy computer ................................................. 10
4 Connecting ....................................................................................................... 11
  4.1 Caloric energy computer, basic unit ........................................................... 11
  4.2 Pyrometer .................................................................................................. 12
5 Commissioning – safety instructions ............................................................... 13
  5.1 Checking the installation .......................................................................... 13
  5.2 Connecting the power cables ..................................................................... 13
  5.3 Switching on the Device ........................................................................... 13
6 Operation, configuration, parameterization ..................................................... 14
  6.1 Operator panel ............................................................................................ 14
  6.2 Navigation .................................................................................................. 15
  6.3 Safety levels ............................................................................................... 15
  6.4 Menus ......................................................................................................... 5
    6.4.1 Mains Menus ....................................................................................... 15
    6.4.2 Maximum values, physical variables: Menu 1 to Menu 4 ............... 17
    6.4.3 Electrical variables Menu 5 ............................................................... 18
    6.4.4 Error messages Menu 6 ................................................................. 19
    6.4.5 Date/time Menu 7 ........................................................................... 20
    6.4.6 Service Menu 8 ............................................................................... 21
    6.4.7 Data logger Menu 9 ....................................................................... 23
    6.4.8 Print function Menu 10 ................................................................. 24
    6.4.9 Tag name Menu 11 .......................................................................... 24
    6.4.10 Device data Menu 12 ................................................................. 25
    6.4.11 Password Menu 13 ....................................................................... 26
7 Error Messages ............................................................................................... 27
  7.1 Process errors ............................................................................................ 27
  7.2 Internal Errors ........................................................................................... 27
8 Retrofitting ...................................................................................................... 28
  8.1 General safety instructions ....................................................................... 28
  8.2 Retrofitting option modules ..................................................................... 28
9 Maintenance ..................................................................................................... 29
  9.1 Safety instructions ..................................................................................... 29
  9.2 Replacing fuse ......................................................................................... 29
10 Technical data ................................................................................................ 30
  10.1 Pyrometers ............................................................................................... 30
  10.2 Caloric energy computer ......................................................................... 31
11 Communication program .............................................................................. 33
12 Putting out of service and packaging ............................................................ 34
1 General safety instructions, intended use

1.1 Prerequisites for safe operation

In these instructions SensyCal® IR is consistently referred to as ‘the device’. These instructions contain important information about safe and proper operation of the device. Follow these instructions to ensure safe operation. Ignoring the safety instructions can result in death, injuries, or damages to the device itself or other devices and equipment.

Make sure that
– the device is in a proper condition
– the device is used properly and in accordance with the intended use
– you know and observe all safety instructions and are aware of all potential risks
– you follow all instructions in this manual.

Read these instructions prior to commissioning or maintaining/repairing the device or putting it out of service.

Target groups

The information in this manual is intended for
– the operator/owner
– the installing engineer
– the commissioning engineer
– the user

Observe

– the information in these instructions
– the safety instructions on the labels attached to the device
– the relevant safety regulations and standards for the installation and operation of electrical systems.

1.2 Intended use

The device is intended to be used for monitoring the temperature of power transmission systems.

Observe

– the commissioning instructions,
– the operating instructions,
– the instructions for putting the device out of service,
– the maintenance and repair instructions and
– the instructions for proper disposal
– to ensure proper use as intended.

Observe the “Technical Data” of the device. These can be found in the respective section of this manual or in the appropriate data sheets.

Operator/owner

The operator/owner of the plant must ensure proper and safe operation through qualified personnel and is fully liable for this.

The operator/owner must make sure that these instructions are read and understand by the persons of the target groups. A copy of these instructions must be stored permanently in the appropriate place on the mounting site of the device. The standards, regulations and directives referred to in these operating instructions are valid in Germany. When using the device outside the scope of validity of the German standards and regulations the appropriate and valid regulations of the respective country must be observed.
1.3 Safe operation

The device is in accordance with the state of the art. It has been designed and tested in accordance with DIN EN 61 010 Part 1/IEC 10 10-1 "Safety Requirements for Electrical Measuring, Control and Laboratory Apparatus" and has been supplied in a safe condition. In order to retain the device in a safe condition and to ensure safe operation the safety instructions in this manual marked with the appropriate symbol must be observed. Otherwise, persons can be endangered or the device itself or other devices or equipment may be damaged or fail.

The safety instructions are marked with symbols, which have the following meaning:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>WARNING</td>
<td>This symbol is printed next to warnings indicating a direct endangerment of a person's health or life. Observe these instructions. Inform all other users involved. Observe the information in these instructions, the general safety instructions, and the regulations for the prevention of accidents.</td>
</tr>
<tr>
<td>CAUTION</td>
<td>This symbol is printed next to cautions indicating that the relevant standards, regulations and directives and the respective notes in this manual must be observed and that the work on the device must be performed in the described order to prevent damage or destruction of the device.</td>
</tr>
</tbody>
</table>

Observe the information labels in the operator's/owner's workshop and the labels attached to the devices.

1.4 To be observed:

**Prior to mounting**
Perform all mounting/installation work in the least dangerous area. The mounting site must meet the requirements specified in Section "Technical Data" under "Operating Conditions", Environmental specifications".

**Prior to commissioning or putting back to service**
The following steps must be performed to comply with these instructions:
- Commissioning
- Putting out of service
- Putting back to service

Prior to commissioning the device or putting it back to service always check that the mains voltage applied to the device is in accordance with the voltage specified on the rating plate.

Prior to commissioning the operator/owner must make sure that the system is checked and tested by an expert for electricity matters for
- proper mounting
- proper installation
- proper operation
- fire alarm and fire fighting equipment

**During operation**
The operator/owner must make sure that the system is checked and tested periodically by an expert for electricity matters for
- proper mounting
- proper installation
- proper operation

The checking intervals must be defined such that any defects that are likely to occur are recognized in good time.

The checks must be performed every three years at the latest. If the electrical system is permanently monitored and checked by the engineer in charge, the periodic check can be omitted.

The operator/owner is obliged to
- keep the system in a proper condition
- make sure that the plant is permanently monitored
- see to it that the necessary maintenance and repair work is carried out immediately
- see to it that the necessary precautions are taken.
Maintenance and repair

Prior to performing any maintenance or repair work on the electrical systems or devices always disconnect the systems or devices from the mains. The point of separation must be marked with the appropriate warning sign, e.g.

<table>
<thead>
<tr>
<th>System under repair/out of service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do not switch on</td>
</tr>
</tbody>
</table>

Spare parts

Use genuine spare parts, only.

1.5 Emergencies

In cases of emergency immediately switch off the system/plant using the emergency switch.
Components, intended use, functional principle

SensyCal IR consists of
– non-contact thermometers for temperature measurement on contact points and conductor rails, hereinafter referred to as "pyrometers".
– a data processing and display unit for the measured variables and electric variables, in the following text called a "caloric energy computer", and an additional metal housing for optimal protection against electromagnetic interference.
– Pt100 resistance thermometers (optional) for measuring the ambient temperature at the mounting site.

The thermometer detects any excess temperature and generates a pre-alarm or main alarm when a limit value is exceeded.

Additionally, the temperature values are compared to each other, and the maximum value is output via the output card as a linear 4 … 20 mA signal. Optionally, the device is available with a MOD-BUS card instead of the output card.

Pyrometer operating principle:
Contactless temperature measurement is based on the fact that all bodies emit heat radiation, depending on their temperature. Pyrometers are capable of measuring the intensity of the heat radiation received. This intensity is a measure for the temperature of the contact point or the conductor rail.

Caution
Important! Do not use bright metal surfaces for temperature measurement!
Usually, bright metal surfaces reflect perturbing radiation from the environment to a large extent. Therefore, such surfaces are not suitable for contactless temperature measurement at all. Use varnished or plastic-coated surfaces instead. All kinds of varnish except those containing metal particles are permissible.

The caloric energy computer consists of the following components:
– Power supply unit, graphic display and processing electronics
– up to 12 analog mV inputs and up to 2 inputs for Pt100
– 3 digital outputs for alarm, prealarm and error signalling
– mA output (alternatively: MOD-BUS)
– M-Bus interface
– optical interface, front-mounted, can be operated according to IRDA or ZWEI Standard, depending on the configuration
3 Mounting

3.1 Selecting the mounting site

The mounting site must meet the requirements specified in Section “Technical Data” under “Operating Conditions”. Additionally, the device must be protected against

- heat radiation, e.g. from the sun, a furnace, a vessel, etc.
- corrosive atmospheres
- strong temperature variations
- dust deposits or permeation

3.2 Mounting the device

3.2.1 Mounting the pyrometers

Make sure that the pyrometer housing is connected to the same electrical potential as the cabinet.

Selecting the measuring point

Consider the following selection criteria:

- Insulation gap between energized conductor rail and pyrometer
- Focal spot in dependence of the distance. Correct temperature measurement requires that the sensor can “see” the energized objects completely. The relation between the size of the focal spot and the distance is seen in the optical diagram to the left.

Mounting the sensors

1. Drill a hole of Ø 19 mm into the partition.
2. Undo the foremost sensor nut.
3. Place the sensor in its fitting position.
4. Fasten the sensor using the counternut.
5. Lay the connection cable between the sensor and SensyCal in cable ducts.
6. Follow the instructions in Section 4.2 to connect the pyrometers to the calorific energy computer.
3.2.2 Mounting the caloric energy computer

Fig. 3-3 Components of the caloric energy computer
Basic unit consists of the following parts:
A) Caloric energy computer - basic unit
B) Connector block
C) EMC protection housing (frame)
D) Cable bushing
E) EMC protection housing (rear part)

Fig. 3-4 Dimensional drawing, front view
(dimensions in mm, cover removed)
1  Fastening screws

Fig. 3-5 Dimensional drawing, side view
EMC protection housing removed
2  Covers
(dimensions in mm)

Mounting the device into the door of the secondary compartment.
1. Prepare a panel cutout, 138 mm x 68 mm.
2. Remove the small covers 2 on the left and right side of the basic unit to be able to access the fastening screws 1.
3. Insert the basic unit into the panel from the front.
4. Fasten the basic unit to the panel using the fastening screws 1.
5. Replace the covers 2.
6. Slide the EMC protection housing onto the caloric energy computer from the back.
7. Insert the signal and power cables (observe the safety instructions and the instructions in Section "Connecting" on page 4 and the following pages) through the cable bushing into the EMC protection housing (free cable length in the rear part of the housing is around 50 mm):
8. Put on the rear fastening screws on the back side
9. Fasten the rear part of the housing to the device using the fastening screws.
10. Establish the equipotential bonding with the cabinet.
4 Connecting

4.1 Caloric energy computer, basic unit

The caloric energy computer consists of the following components:

- **Basic unit**: Connection of up to 2 x Pt100 (optional), switching outputs, error output, M-Bus
- **Power supply**: 24 V DC
- **Module 1**: max. 4 pyrometer inputs
- **Module 2**: max. 4 pyrometer inputs
- **Module 3**: max. 4 pyrometer inputs
- **Module 4**: max. 2 analog signals (4...20 mA)

Fig. 4-1 Connections on the caloric energy computer's back (see next page for terminal assignment)
1...53: Connections of the basic unit
(numbering to EN 1434-2)

<table>
<thead>
<tr>
<th>No.</th>
<th>Connection</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ITw +</td>
<td>Supply current for Ta1</td>
</tr>
<tr>
<td>2</td>
<td>ITw -</td>
<td>Supply current for Ta1</td>
</tr>
<tr>
<td>5</td>
<td>Tw +</td>
<td>Temperature sensor Ta1</td>
</tr>
<tr>
<td>6</td>
<td>Tw -</td>
<td>Temperature sensor Ta1</td>
</tr>
<tr>
<td>16</td>
<td>AB1</td>
<td>Alarm output +</td>
</tr>
<tr>
<td>17</td>
<td>AB1</td>
<td>Alarm output -</td>
</tr>
<tr>
<td>18</td>
<td>AB2</td>
<td>Prealarm output +</td>
</tr>
<tr>
<td>19</td>
<td>AB2</td>
<td>Prealarm output -</td>
</tr>
<tr>
<td>24</td>
<td>MBUS</td>
<td>M-Bus interface</td>
</tr>
<tr>
<td>25</td>
<td>MBUS</td>
<td>M-Bus interface</td>
</tr>
<tr>
<td>27</td>
<td>N</td>
<td>24 VDC -</td>
</tr>
<tr>
<td>28</td>
<td>L</td>
<td>24 VDC +</td>
</tr>
<tr>
<td>52</td>
<td>ERR+</td>
<td>Error output</td>
</tr>
<tr>
<td>53</td>
<td>ERR-</td>
<td>Error output, reference potential</td>
</tr>
</tbody>
</table>

90...97: Connections of output module

<table>
<thead>
<tr>
<th>No.</th>
<th>Connection</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>90</td>
<td>AX1 +</td>
<td>mA output</td>
</tr>
<tr>
<td>91</td>
<td>AX1 -</td>
<td>mA output, reference potential</td>
</tr>
</tbody>
</table>

60...67: Connections of input module 1

<table>
<thead>
<tr>
<th>No.</th>
<th>Connection</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>T01 +</td>
<td>Pyrometer 01</td>
</tr>
<tr>
<td>61</td>
<td>T01 -</td>
<td>Pyrometer 01</td>
</tr>
<tr>
<td>62</td>
<td>T02 +</td>
<td>Pyrometer 02</td>
</tr>
<tr>
<td>63</td>
<td>T02 -</td>
<td>Pyrometer 02</td>
</tr>
<tr>
<td>64</td>
<td>T03 +</td>
<td>Pyrometer 03</td>
</tr>
<tr>
<td>65</td>
<td>T03 -</td>
<td>Pyrometer 03</td>
</tr>
<tr>
<td>66</td>
<td>T04 +</td>
<td>Pyrometer 04</td>
</tr>
<tr>
<td>67</td>
<td>T04 -</td>
<td>Pyrometer 04</td>
</tr>
</tbody>
</table>

70...77: Connections of input module 2

<table>
<thead>
<tr>
<th>No.</th>
<th>Connection</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>70</td>
<td>T05 +</td>
<td>Pyrometer 05</td>
</tr>
<tr>
<td>71</td>
<td>T05 -</td>
<td>Pyrometer 05</td>
</tr>
<tr>
<td>72</td>
<td>T06 +</td>
<td>Pyrometer 06</td>
</tr>
<tr>
<td>73</td>
<td>T06 -</td>
<td>Pyrometer 06</td>
</tr>
<tr>
<td>74</td>
<td>T07 +</td>
<td>Pyrometer 07</td>
</tr>
<tr>
<td>75</td>
<td>T07 -</td>
<td>Pyrometer 07</td>
</tr>
<tr>
<td>76</td>
<td>T08 +</td>
<td>Pyrometer 08</td>
</tr>
<tr>
<td>77</td>
<td>T08 -</td>
<td>Pyrometer 08</td>
</tr>
</tbody>
</table>

80...87: Connections of input module 3

<table>
<thead>
<tr>
<th>No.</th>
<th>Connection</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>T09 +</td>
<td>Pyrometer 09</td>
</tr>
<tr>
<td>81</td>
<td>T09 -</td>
<td>Pyrometer 09</td>
</tr>
<tr>
<td>82</td>
<td>T10 +</td>
<td>Pyrometer 10</td>
</tr>
<tr>
<td>83</td>
<td>T10 -</td>
<td>Pyrometer 10</td>
</tr>
<tr>
<td>84</td>
<td>T11+</td>
<td>Pyrometer 11</td>
</tr>
<tr>
<td>85</td>
<td>T11 -</td>
<td>Pyrometer 11</td>
</tr>
<tr>
<td>86</td>
<td>T12 +</td>
<td>Pyrometer 12</td>
</tr>
<tr>
<td>87</td>
<td>T12 -</td>
<td>Pyrometer 12</td>
</tr>
</tbody>
</table>

4.2 Pyrometer

1. Mount the pyrometer at the measuring point.
2. Lay a connection cable of 10 m of length to the calorific energy computer.
3. If the cable is too long, please cut to length!
4. Strip off the insulation over a length of around 15 cm!
5. Provide the wires with wire end sleeves or tinplate them accordingly.
6. Insert the cables through the cable bushings (IR sensors 1 ... 12)
7. Connect the shielding wire to the strain relief.
8. Connect the signal cables to the appropriate connectors of the basic unit. Connect the power supply to the appropriate terminals on the rear side of the EMC protection housing as seen in the illustration.
5 Commissioning – safety instructions

Prerequisites
Prior to commissioning the device must be mounted properly, and the signal cables must be connected as specified.

5.1 Checking the installation
Prior to commissioning the device make sure that it has been installed properly.
Follow the check list:

<table>
<thead>
<tr>
<th>Check</th>
<th>1. Has the device been fastened properly and reliably?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. Have all electrical signal, control and interface cables been laid and connected properly?</td>
</tr>
</tbody>
</table>

5.2 Connecting the power cables

Caution
When selecting the cables and making the electrical installation observe the standards, regulations and devices for power installations of up to 1000 V applicable and valid in the country where the device is used.

Prior to connecting the power supply make sure that the operating voltage selected on the device is identical with the local mains voltage.

Prior to making any other connections first set up a ground connection between the grounding connector on the device and protective ground.

Provide an all-pole mains switch with sufficient breaking capacity close to the mounting site for disconnecting the device from the mains if required. Make sure the switch does not eliminate the protective capacity of the equipment grounding conductor.

Avoid any unintentional cut of the equipment grounding conductor inside or outside the device. Do not disconnect the device from protective ground. Otherwise, a serious safety hazard will occur.

When powering the device with 24 V UC exclusively use extra low voltage with protective separation from other circuits (German standard DIN VDE 0106). Do not connect mains voltage (115 V AC or 230 V AC) to the 24-V-UC input. This will damage the device electronics.

The rated current intensity of the overcurrent protector must not exceed 16 A on the installation side.

5.3 Switching on the Device

Caution
Prior to switching on the device make sure that all tasks specified in Section 5.2 were performed properly.

Check again that the operating voltage setting on the device complies with the local mains voltage.

Operational check
After switch-on the device automatically starts operation and can be controlled, configured, and parameterized as required.

Date and Time
Proper date and time setting are vital to proper operation of the device. Check if the date and time need to be set.
Refer to Section 6.4.5 for details about date/time setting.
The built-in supercup capacitor retains the date and time setting for more than three days.
6 Operation, configuration, parameterization

6.1 Operator panel

**Display**

Please refer to the "Menus" section for details about the individual displays. The symbols in the bottom part of the display always have the following meaning:

<table>
<thead>
<tr>
<th>No.</th>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>✔</td>
<td>Key <code>&lt;▲&gt;</code> (increment) is active</td>
</tr>
<tr>
<td>2</td>
<td>■</td>
<td>Changing width means that the device is working</td>
</tr>
<tr>
<td>3</td>
<td>▲</td>
<td>Key <code>&lt;▼&gt;</code> (decrement) is active</td>
</tr>
<tr>
<td>4</td>
<td>■</td>
<td>Error message is present</td>
</tr>
<tr>
<td>5</td>
<td>![EEPROM symbol]</td>
<td>Key <code>&lt;.localStorage&gt;</code> is available</td>
</tr>
<tr>
<td>6</td>
<td>■</td>
<td>EEPROM write action in progress on the right side, not seen in this photo</td>
</tr>
</tbody>
</table>

**Operating elements**

<table>
<thead>
<tr>
<th>No.</th>
<th>Symbol</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td><code>&lt;▲&gt;</code></td>
<td>Previous / increment returns to the previous menu item</td>
</tr>
<tr>
<td></td>
<td></td>
<td>increment to the next digit</td>
</tr>
<tr>
<td>10</td>
<td><code>&lt;▼&gt;</code></td>
<td>Next / decrement changes to the next menu item</td>
</tr>
<tr>
<td></td>
<td></td>
<td>decrements to the previous digit</td>
</tr>
<tr>
<td>11</td>
<td><code>&lt;localStorage&gt;</code></td>
<td>Enter</td>
</tr>
<tr>
<td></td>
<td></td>
<td>changes over from a main menu item to a submenu, enables changes of the value, switches to the next value exits the submenu.</td>
</tr>
</tbody>
</table>

**Note**

Pressing and holding a key will repeat the respective function (with time delay for `<localStorage>`).

**Optical interface**

7 Optical interface for IRDA or ZVEI

8 Inscription field (use waterproof pens)
6.2 Navigation

- Press <▼> or <▲> to select a main menu.
- Press < entrar > to select the first submenu of that main menu item.
- Press <▼> or <▲> to select a submenu.

If one or several value(s) can be edited in a submenu, the first value can be activated for change by pressing < entrar >. The first digit of that value starts flashing. Press < entrar > to confirm the new value of this digit and call the next digit or value.

- Press <▼> or <▲> to decrement/increment the value of the first digit.
- Press < entrar > to select the second digit.
- Press <▼> or <▲> to decrement/increment the value of the second digit.
- Press <▼> or <▲> to select the next submenu (if no other digit is flashing).
- Press <▼> or <▲> to select the last submenu ("End submenu").
- Press < entrar > to return to the main menu.

6.3 Safety levels

The device has four safety levels.

- **Safety level S1**
  The submenus of safety level S1 are only accessible for manufacturing or service personnel.

- **Safety level S2** (see submenu 8.4...)
  The submenus of safety level S2 can only be accessed by setting Jumper J accordingly (see Figure 8-1) and entering a password.

- **Safety level S3** (see submenu 12.2 ...)
  The submenus of safety level S3 are password-protected.

- **Safety level S4** (lowest safety, not marked in the display)
  The submenus of safety level S4 are always accessible.
6.4 Menus

6.4.1 Mains Menus

Fig. 6-2 Main menus

Delivery State
The device is set to safety level 4 when it is delivered, i.e.
- no password is set (0000)
- jumper J (see Figure 11) is set.
All menus and submenus are visible and accessible.
Upon device switch-on Menu 1 pops up in the display.

Selecting a Menu
Press <↓> to navigate through the main menu items from the left to the right or
Press <↑> to navigate through the main menu items from the right to the left.
Press <→> to select the first submenu of the highlighted main menu item.

Entering Values
In some submenus you can edit or enter values, e.g. password, date, M-Bus address, etc. Proceed as described below (see also Section 6.1.2 "Navigation":)
1. Press <→> to select the first digit. The first digit starts flashing.
2. Press <↑> to increment or <↓> to decrement the indicated value.
3. Press <→> to move the cursor to the next digit. The next digit starts flashing.
4. Press <↑> to increment or <↓> to decrement the indicated value, and so on.
5. After setting the last digit press <←> to exit the input mode.
6. Press <↓> to select the next or <↑> to select the previous submenu.
6.4.2 Maximum values, physical variables: Menu 1 to Menu 4

Menu 1
Start menu

Menu 2
Tmax
Display of the maximum pyrometer temperature value Tmax for T1 to T12.
If an alarm occurs (limit exceeded or device error) „ERROR“ flashes in the display.
Press < ▼ > to switch display to smaller digits.

Submenu 2.1
Tmax: display with smaller digit.

Menu 3
Tmax minus Tambient (ambient temperature)
Display of the maximum temperature value Tmax for T1 to T12 minus ambient temperature Ta1.

Submenu 3.1
Tmax minus Ta (ambient temperature):
display with smaller digits.

Menu 4
Physical variables
Display of all current temperature values.

Submenu 4.1
Display of
– maximum temperature with tag name
– current temperatures for T1 to T12 (unconnected temperature inputs are set to the inactive state)
– ambient temperatures Ta1 and Ta2

Press < ▼ > to navigate through the submenu items until reaching the End submenu.

Press < ▼ > to return Menu 5 „Physical variables”.
6.4.3 Electrical variables **Menu 5**

**Submenu 5.1 and Submenu 5.2**
Pt100: Current resistance value in Ω and ambient temperature of Ta1 and Ta2

**Submenus 5.1.2 and 5.2.1**
Temperature ranges of Ta1 and Ta2 (with mA input)

**Submenu 5.3**
Digital input: not active for this application

**Submenus 5.4, 5.5 and 5.6**
Inputs of the extension boards, current pyrometer output voltage in mV

**Submenus 5.4.1, 5.4.2, 5.5.1, 5.5.2, 5.6.1 and 5.6.2**
Pyrometer temperature range settings for T1 to T12 (default: 0...250 °C) and alarm values.

**Submenu 5.7**
Outputs 1 and 2 of the extension board, momentary output current of the caloric energy computer in mA

**Submenu 5.7.1 and 5.7.2**
Temperature range setting for outputs 1 and 2 through 4...20 mA signal.

End Submenu
Press < to return to Menu 6 „Electrical variables“.
6.4.4 Error messages **Menu 6**

**Menu 6**

Error messages

Submenu 6.1 and 6.1.1
Last power failure
Press < ▼ > to display the last (up to 10) power failures.

Submenus 6.2 and 6.2.1
Last process error with time of occurrence and (if applicable) debugging time.
Displayed when alarm limits are exceeded.
Press < ▼ > to display the last (up to 10) process errors (see also Section 7 "Error Messages").

**Submenu 6.3 (S3)**
Delete the "process error" record (password-protected, safety level S3).

**Submenu 6.4**
Safety inquiry prior to deletion of the "process error" record.

**Submenu 6.5**
Internal error (device error)
(see also Section 7 "Error messages")

End Submenu
Press < ▼ > to return to Menu 6 „Error messages“.

(S3) = Safety level 3

---

Operation, configuration, parameterization

42/18-70 EN Sensycal IR, Contactless temperature monitoring for power transmission systems 19
6.4.5 Date/time  Menu 7

**Menu 7**

**Date/time**

The current date (year only as a two-digit number) and time are displayed.
In case of a power failure the date and time are retained for about 3 days by the built-in supercup capacitor.

**Submenu 7.1 S3**

Indication of run time in h

**Submenu 7.2 S3**

Setting date/time (password-protected)

How to make the setting (example): 22.06.00 18:06

Press <↑> to select the first digit

Press <L> to increment or press <M> to decrement the values.

Press <→> to activate the next digit.

After setting the last digit, press <→> to exit the set mode. (See also "Entering Values" in Section 6.4.1.)

End Submenu

Press <→> to return to Menu 7 „Date/time“.

S3 = Safety level 3
### Menu 8

#### Service

**Safety levels:**
- **Level S1:** The submenus of this level are only accessible to manufacturing and service personnel.
- **Level S2:** The submenus of this level are only accessible if jumper J is set accordingly (see Figure 11) and a password is entered.
- **Level S3:** The submenus of this level are password-protected.
- **Level S4:** The submenus of this level are always accessible.

**Submenu 8.1**

**Status menu.**
This menu is password-protected. (See Section 6.4.11 for details about how to enter a password).
Upon password entry the message "enabled" appears in the display. If no password is entered, menus 8.2 to 8.9 are not displayed to the user.

**Submenu 8.2 (S3)**

**Display test;** press <  > to activate this test.
Press <M> to return.

**Submenu 8.3 (S3)**

**LCD contrast;** press <  > to change:
Range: 1 (low) to 15 (high).
Press <M> to return.

**Submenu 8.4 (S2)**

Not relevant for this application.

**Submenu 8.4.1**

Not relevant for this application.

**Submenu 8.5 (S2)**

Not relevant for this application.

**Submenu 8.5.1**

Not relevant for this application.

**Submenu 8.6**

**Reset counter - Tmx**

**°C**

**Submenu 8.6.1**

**Are you sure?**
Yes: ENTER

**Submenu 8.7**

**Reset counter - Data logger**

**Submenu 8.7.1**

**Are you sure?**
Yes: ENTER

**Submenu 8.8**

**Reset counter - Key day**

**Submenu 8.8.1**

**Are you sure?**
Yes: ENTER

**Submenu 8.9**

**Reset counter - Counter 1 Run**

**Submenu 8.9.1**

**Are you sure?**
Yes: ENTER

**Submenu 8.10**

**Version:**
BSYST 01.00.06
RECHEN 00.00.06

**Version:**
HARDW 01.00.06
PARA 00.00.06

End Submenu

Return to Menu 8 "Service"
Continued from previous page

**Submenu 8.6 (S2)**
Not relevant for this application.

**Submenu 8.6.1**
Not relevant for this application.

**Submenu 8.7 (S2)**
Press < ↑ > to delete the data logger.
Only possible with properly set jumper J (see Figure 11) and upon password entry (see description above)

**Submenu 8.7.1**
Safety inquiry for deletion of the data logger.
If yes, press ENTER key < ↑ > ,
else continue with < ↓ > .
S2 = Safety level 2 (see above)
S3 = Safety level 3 (see above)

**Submenu 8.8 (S3)**
Not relevant for this application.

**Submenu 8.8.1**
Not relevant for this application.

**Submenu 8.9 (S3)**
Not relevant for this application.

**Submenu 8.9.1**
Not relevant for this application.

**Submenu 8.10**
Indication of OS revision: BSYST 01.00.06
Indication of comp. program rev.: RECHEN00.00.01
Press < ↑ > to display the hardware and software revision number.

**Submenu 8.10.1**
Indicate hardware revision No.: HARDW 01.00.00
Parameterization program: PARA 00.00.00

Press < ↓ > to reach the
End submenu
Press < ↑ > to return to Menu 8 "Service".

S2 = Safety level 2 (see above)
S3 = Safety level 3 (see above)
6.4.7 Data logger  Menu 9

Menu 9
Data logger

The data logger records various process variables with date and time.

Submenu 9.1
Logging period and integration time for maximum, minimum and mean values.

Submenu 9.2
Logging period with number and time or date stamp.
Press < or > to call the next logging period. Maximum number of logging periods: 64

Submenu 9.2.1
Next logging period up to ...

Submenu 9.3
Tmax: Maximum temperature with logging date and time.

Submenu 9.4
Tmax-Ta1: Maximum temperature minus ambient temperature with date and time of storage.

Submenu 9.5 to 9.8
T1 to T12: Pyrometer temperature values with date and time of storage.

Submenu 9.9
Ta1 and Ta2: Current ambient temperature with date and time of storage.

Submenu 9.10
Maximum value of the most important temperature within the specified time interval, with date and time of storage.

Submenu 9.11
Minimum value of the most important temperature within the specified time interval, with date and time of storage.

Submenu 9.12
Mean value of the most important temperature within the specified time interval, with date and time of storage.

Submenu 9.13
Next logging period
Press < or > to call the next logging period.

Press < or > to reach the End submenu

Press < or > to return to Menu 9 "Data logger".

Submenu 9.1
Log. period: 1h
Integr. period: 15 min

Submenu 9.2
Log. period No. 2
24.06.00  0:00

Submenu 9.3
Tmax: °C
27
24.06.00  0:00

Submenu 9.4
Tmax: °C
29
24.06.00  1:00

Submenu 9.5
T1: 24,34 °C
T2: 26,54 °C
T3: 29,27 °C

Submenu 9.6
T4: 24,34 °C
T5: 26,54 °C
T6: 29,27 °C

Submenu 9.7
T7: 24,34 °C
T8: 26,54 °C
T9: 29,27 °C

Submenu 9.8
T10: 24,34 °C
T11: 26,54 °C
T12: 29,27 °C

Submenu 9.9
Ta1: 24,24 °C
Ta2: not activ

Submenu 9.10
Maximum Tmax: °C
28,4
23.06.00  23:45

Submenu 9.11
Minimum Tmin: °C
24,5
23.06.00  23:23

Submenu 9.12
Mean Tmean: °C
26,2
24.06.00  00:00

Submenu 9.13
Next logging period

Return to Menu 9 "Data logger"
6.4.8 Print function  Menu 10

The following parameters can be output via the infrared interface and the hand-held printer:
- Current pyrometer temperature values (T1 … T12)
- Maximum pyrometer temperature
- Ambient temperatures Ta1 and Ta2,
- Serial number with printing date and time

Press < > to update the values and select Submenu 10.1

Submenu 10.1
Press ENTER to update the values.
Press < > to update again.
Press < > to reach the
End submenu
Press < > to return to Menu 10 "Print function".

6.4.9 Tag name  Menu 11

In this menu the tag name - i.e. an arbitrary text of 2 x 20 characters - can be displayed. The text can only be entered or edited by using the appropriate parameterization program. In factory, the SensyCal communication program is used for this purpose.
6.4.10 Device data  Menu 12

**Menu 12**

**Device data**

**Submenu 12.1**
Serial number

**Submenu 12.2 (S3)**
M-Bus address. Can be set to a value between 1…250 (password-protected). See Section 6.4.1 "Entering Values" for details.

**Submenu 12.3 (S3)**
M-Bus baud rate. Can be set to 300, 600, 1200, 2400, 4800, 9600, 19200, or 38400 bauds (password-protected). Press the key < | > to change. Press the key < | > to call the next submenu.

**Submenu 12.4 (S3)**
M-Bus source, the following can be selected (password-protected): ZVEI / IRDA / automatic IRDE / automatic ZVEI / M-Bus Press the key < | > to change. Press the key < | > to call the next submenu.

**Submenu 12.5 (S3)**
Protocol: Must be set to M-Bus for this application. Press the key < | > to change. Press the key < | > to call the next submenu.

**Submenu 12.6**
Here you can select the language:
German, English, French, English (parameterization)
Press the key < | > to change. Press the key < | > to call the next submenu.

**Submenu 12.7**
Here you can change the logging period:
1 / 2 / 3 / 4 / 6 / 8 / 12 hours, 1 / 2 / 3 / 4 / 5 / 6 / 7 / 10 days, 1 / 2 / 3 months.
Press the key < | > to change. Press the key < | > to call the next submenu.

**Submenu 12.8**
Here you can select the integration time for the min. value, max. value and calculation: 15 / 30 / 45 / 60 / 75 / 90 / 105 / 120 minutes.
For this application the integration time has no effect. Press the key < | > to change. Press the key < | > to call the next submenu.

**Submenus 12.9 to 12.12**
Extension boards:
Opt.1 to Opt.3 are input boards. Opt. 4 is the output board
Press the key < | > to change.

Press < | > to reach the End submenu
Press < | > to return to Menu 12
6.4.11 Password  Menu 13

**Menu 13**
Password
Entering and changing the password

**Submenu 13.1**
Password entry
0000 = enabled

**Submenu 13.2**
Here you can enter the password.
4-digit password: XXXX

**Submenu 13.3**
Here you can change the password.
4-digit password: XXXX
(See Section 6.4.1 “Entering Values” for details)

Press <▼> to reach the
End submenu
Press <▼> to return to Menu 13 “Password”
7 Error Messages

7.1 Process errors

Process errors that have a direct impact on the temperature measurement are indicated by the message "Error" flashing in the display. A plain text description of the error with date and time stamp can be called in the "Error messages" menu.

The following error messages exist:

Ta1 out of meas. range, Ta2 out of meas. range, T max > high limit,
T1 out of range, T2 out of range, T3 out of range,
T4 out of range, T5 out of range, T6 out of range,
T7 out of range, T8 out of range, T9 out of range,
T10 out of range, T11 out of range, T12 out of range

7.2 Internal Errors

The binary coded error messages are indicated in the display as 4-digit numbers (most right digit = digit 1, most left digit = digit 4).

<table>
<thead>
<tr>
<th>Digit</th>
<th>Bit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>Not relevant</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>Display parameter error</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>Unit error</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>Phys./elect. max &lt; min</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>Not relevant</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>Critical process error</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>not used</td>
</tr>
<tr>
<td>7</td>
<td>7</td>
<td>not used</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
<td>Error of plug-in card 1</td>
</tr>
<tr>
<td>9</td>
<td>9</td>
<td>Error of plug-in card 2</td>
</tr>
<tr>
<td>10</td>
<td>10</td>
<td>Error of plug-in card 3</td>
</tr>
<tr>
<td>11</td>
<td>11</td>
<td>Error of plug-in card 4</td>
</tr>
<tr>
<td>4</td>
<td>12</td>
<td>not used</td>
</tr>
<tr>
<td>13</td>
<td>13</td>
<td>not used</td>
</tr>
<tr>
<td>14</td>
<td>14</td>
<td>not used</td>
</tr>
<tr>
<td>15</td>
<td>15</td>
<td>not used</td>
</tr>
</tbody>
</table>

Examples

Display: 0020
Digit 2 represents bits 4 to 7 and has the value 2.
Bit 4 represents 1, bit 5 represents 2.
Value = 2 = 0 x 1 (bit 4) + 0 x 2 (bit 5)
Bit 5 = 1 => Critical process error

Display: 0100
Digit 3 represents bits 8 to 11 and has the value 3.
Bit 8 represents 1, bit 9 represents 2, ...
Value = 1 = 1 x 1 (bit 8)
Bit 8 = 1 => Error in module 1 (e.g. parameterization error)

Display: 0600
Digit 3 represents bits 8 to 11 and has the value 6.
Bit 8 represents 1, bit 9 represents 2, ...
Value = 6 = 0 x 1 (bit 8) + 1 x 2 (bit 9) + 1 x 4 (bit 10)
Bit 9 = 1 and bit 10 = 1 => Errors of plug-in boards 2 and 3
8 Retrofitting

8.1 General safety instructions

**Caution**
When opening covers or removing parts, energized parts may be exposed, except if this is possible without using a tool. Also, exposed connections may be live.
Prior to working on an open device always disconnect the device from all power sources. Operations on the open device in which personnel may come into contact with energized parts may only be performed by experts trained in the maintenance of electrical equipment and who are fully aware of the risks involved. Capacitors in the device may still be charged, even when the device is disconnected from all power sources. Do not use any other fuses than those of the specified type and rated current to replace defective fuses. Do not use "repaired" fuses. Do not shorten the fuse holder. If it must be assumed that safe operation is no longer ensured, the device must be put out of service immediately and must be secured against being accidentally put back to service.

It must be assumed that safe operation is no longer possible if the device
- as visible damages,
- no longer work
- as been stored over a longer time under bad conditions
- as been exposed to bad transport conditions

8.2 Retrofitting option modules

1. Dismount the device (see Sections "Mounting", "Connecting" and "Commissioning")
2. Remove the EMC protection housing, the rear part of the housing, and the back panel.
3. Remove the main board.
4. Plug the option module onto the main board. Connect Module 1 (current input board) to connector 1 and Module 2 (transmitter supply) to connector 2, 3, or 4.
5. Make the appropriate cutout in the back panel.
6. Plug in the main board.
7. Mount the back panel (and rear part of the housing).
8. Install and connect the device (see Sections "Mounting", "Connecting" and "Commissioning").
9 Maintenance

9.1 Safety instructions

Caution
When opening covers or removing parts, energized parts may be exposed, except if this is possible without using a tool. Also, exposed connections may be live.

Prior to working on an open device always disconnect the device from all power sources. Operations on the open device in which personnel may come into contact with energized parts may only be performed by experts trained in the maintenance of electrical equipment and who are fully aware of the risks involved. Capacitors in the device may still be charged, even when the device is disconnected from all power sources. Do not use any other fuses than those of the specified type and rated current to replace defective fuses. Do not use "repaired" fuses. Do not shorten the fuse holder. If it must be assumed that safe operation is no longer ensured, the device must be put out of service immediately and must be secured against being accidentally put back to service.

It must be assumed that safe operation is no longer possible if the device
– as visible damages,
– oes no longer work
– as been stored over a longer time under bad conditions
– as been exposed to bad transport conditions

9.2 Replacing fuse

![Main board diagram]

1. Dismount the device (see Sections "Mounting, "Connecting" and "Commissioning")
2. Remove the (rear part of the housing and the) back panel.
3. Remove the main board.
4. Replace fuse S: 24 V, 0.8 A
5. Plug in the main board.
6. Mount the back panel (and rear part of the housing)
7. Mount and connect the device (see Sections "Mounting", "Connecting" and "Commissioning").
## Technical data

### 10 Technical data

### 10.1 Pyrometers

<table>
<thead>
<tr>
<th><strong>Thermal Parameters</strong></th>
<th><strong>General Parameters</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Temperature range</strong></td>
<td>Protection class of sensor head</td>
</tr>
<tr>
<td>0 … 200 °C</td>
<td>IP65 (IEC 529)</td>
</tr>
<tr>
<td><strong>Spec. wavelength</strong></td>
<td>Ambient temperature</td>
</tr>
<tr>
<td>7 … 18 µm</td>
<td>0 … 85 °C</td>
</tr>
<tr>
<td><strong>Sensor</strong></td>
<td>Storage temperature</td>
</tr>
<tr>
<td>Thermopile</td>
<td>-30 … 85 °C</td>
</tr>
<tr>
<td><strong>Measurement uncertainty</strong></td>
<td>Vibration</td>
</tr>
<tr>
<td>± 2 % of meas. value, at least ± 3 °C</td>
<td>IEC 68-2-27 (MIL STD 810D)</td>
</tr>
<tr>
<td><strong>Repeatability</strong></td>
<td>3 G per axis 11 … 200 Hz</td>
</tr>
<tr>
<td>± 1 % of meas. value, at least ± 1 °C</td>
<td><strong>Shock</strong></td>
</tr>
<tr>
<td><strong>Optical resolution</strong></td>
<td>IEC 68-2-27 (MIL STD 810D)</td>
</tr>
<tr>
<td>4:1</td>
<td>50 G, 11 ms per axis</td>
</tr>
<tr>
<td><strong>Emission</strong></td>
<td><strong>Dimensions</strong></td>
</tr>
<tr>
<td>0.95 (fixed)</td>
<td>Length: 89 mm × ∅ 19 mm</td>
</tr>
<tr>
<td><strong>Response time (t95)</strong></td>
<td>Weight</td>
</tr>
<tr>
<td>350 ms</td>
<td>130 g</td>
</tr>
</tbody>
</table>

| **Electrical Parameters** | |
|---------------------------|
| **Supply voltage:**       |
| 12 … 24 V DC, ± 5 %, 20 mA|
| **Output**                |
| 10 mV / °C                |
| **Connection cable**      |
| Length: 10 m (standard)   |
10.2  Caloric energy computer

### Input
12 x contact point temperature
12 pyrometers; mV input
Measuring range
0 ... 250 °C (32 ... 452 °F)

2 x ambient temperature
2 x Pt100 IEC for Ta1 and Ta2
Measuring range
-100...250 °C, (-148...452 °F)
Resolution
20 bit \( \cong 0.0012 \text{ K} \)

### Output
3 digital outputs DO1, DO2 and Err
Open collector, passive
Electrically isolated via opto-couplers
External supply to VDE 2188 category 2
Max. load
24 V (+2.5 %), <100 mA
Max. insulation voltage
500 V (peak-peak)
Ri when connected through
<20 Ω
DO1  Temperature alarm
DO2  Temperature prealarm
Err  Error output

2 analog outputs AX1 and AX2
Max. 2 active current outputs
Current output
Signal range 0/4...20 mA
Max. load 500 Ω
Open permissible, short-circuit-proof

### Characteristic values
- Pyrometer temperature inputs
  ≈ 16 bit
- Ambient temperature inputs
  Temperature deviation
  0.3 % of upper range value

### Operating conditions

#### Environmental specifications
Ambient temperature
-5...55 °C (23...131 °F)
Storage temperature
-25...+70 °C (-13...158 °F)
Climate class
  Ambient temperature class C to EN 1434-1
Relative humidity
  Tested according to EN 1434-4, IEC 62-2-30
Condensing
  Permissible
Protection
  IP 65
Shock resistance, operation, at 20 °C (68 °F)
Vibration test to IEC 68-2-6, sine,
10...150 Hz, 1 octave/min, 2g, 13 h on each axis
Shock test to IEC 68-2-27,
  half-sine, 30g, 11 ms, 3 shocks per axis

### Electromagnetic compatibility (EMC)
- EMI/RFI shielding to EN 50082-2 (EN 6100-4-2, -3, -4, -5, -6)
  additionally to EN 1434-4 (Class C)
- RFI suppression to EN 50081-2 (EN 55 011 Class A)

### Design features

#### Type/Dimensions
Panel-mounting
Basic unit
  Dimensions: 144 mm x 72 mm x 117 mm
  Weight: around 0.5 kg
Material: polycarbonate
Panel cutout: 137 mm x 68 mm
EMC protection housing
  Dimensions
## Technical data

### Display and GUI

**Display**
Graphics display, 120 x 32 pixels

**Storage**
Storage of meter readings in the EEPROM triple, all 5 minutes and after power failure

### Power supply, whole system

**Direct voltage**
12 or 24 V ±20 %

**Power consumption**
24 V 1...10 VA depending on extensions

### Error reporting and error output

**Detection of internal errors through regular self-diagnostics**

**Display**
- Critical device errors, e.g. memory failure
- Process errors, with time and date
- Last 10 power failures

**Storage of up to 10 operating errors**
- Plain text display with time stamp

**Error output**
- Open collector, passive (see output), Display

### Data logger and key day recording

**Two key days for the storage of all temperatures settable hours**

**Data logger**
Storage of 16 operating variables over 64 periods:
12 pyrometer values
11 Communication program

The communication program is used for
– setting the device parameters
– reading current process data in online mode
– reading device and data logger data
– setting date, time, baud rate, address, meter reading, etc.

The program can be run under Windows 95, 98 and NT.

There are three ways of connecting the device to a PC or laptop (see Fig. 11-1):
– Optical read head (opto-head), RS 232 (seen at the top of the illustration)
– Bus repeater, RS 232 (seen in the middle of the illustration)
– Optical interface IRDA (seen at the bottom of the illustration)

Note
Refer to the user’s guide delivered with the program for details.

Fig. 11-1 Possible ways to connect the device to a PC / laptop
Top  optical read head (opto-head), RS 232
Middle  M-Bus repeater, RS 232
Bottom  optical interface IRDA (must be available on the PC/laptop)
12 Putting out of service and packaging

Packaging for transport or return to the manufacturer
If the original packaging material is no longer available, wrap the device in a padded plastic film or corrugated paper board and place it in a box of sufficient size lined with a shock-absorbing material (e.g. cellular material). The thickness of this material should be in accordance with the device weight and the type of shipment. Attach a “handle with care” sticker to the box.

For overseas shipping add a desiccant bag (e.g. with silica gel) to the device and then weld it in a 0.2 mm polyethylene foil. The required amount of desiccant depends on the packing volume and the approximate transportation time (assume at least 3 months). Additionally line the box with a layer of union paper.