STRE-RACK, STE-RACK, STRPE-RACK

Instruction manual

Table of content

General safety rules

The following summary is designed to prevent injury hazards or device damage. Operate the instrument in accordance with this manual to prevent electric trauma.

Service should be performed by a qualified person only.

Use a safety ac/dc adapter.

Use only an adapter with the power voltage recommended by its manufacturer and which is approved by proper standards. Check that the adapter has undamaged cables and cover.

Connect and disconnect correctly.

Do not connect and disconnect a LAN cable or lead-in cables if the device is under electric voltage.

Do not use the instrument without the cover.

Do not use the instrument, if it does not work correctly.

If the instrument seems not to work correctly, have it checked by a qualified service person.

Do not use the instrument in an explosive environment.

Read instruction manual before the first device connection, please.

General description

Monitoring systems of STx(x)E-RACK line are designed for online monitoring of temperature in °C or °F, relative humidity of air without aggressive ingredients, barometric pressure and three binary inputs for detection of binary signals. Measured temperature and relative humidity are recomputed to following humidity expression: dew point temperature, absolute humidity, specific humidity, mixing ratio and specific enthalpy. It is possible to set correction for altitude (pressure offset) and to choose one of the following pressure units: hPa, kPa, mbar, mmHg, inHg, inH2O, PSI, oz/in2. The device is equipped with two relay outputs for alarming or controlling of external devices. It is possible to assign any input value to each relay, to set comparing limit, delay, hysteresis and acoustic alarm or change its status by far control with using of Modbus communication protocol. The device is communicating through Ethernet interface. The device is internally separated into two units. The first unit provides measurement and controlling of output relays – there is possible to change these parameters directly through device's keys or TSensor software. The second unit provides all Ethernet services, its configuration is possible through Telnet terminal or TSensor software (this setting is impossible to change through device's keys).

Type	Temperature	Humidity	Pressure	Computed value	Binary inputs
STRE-RACK	✓	✓		✓	3x
STE-RACK */	✓				3x
STRPE-RACK	✓	✓	✓	✓	3x

/ the type STE-RACK is designed for two wires connection of external Pt1000/3850 ppm temperature sensor.

Measured values are available from Ethernet interface or are displayed on LCD display. If there are two values displayed at one LCD line, they are periodically switched between both readings with period of 4 seconds. Display can be switched OFF totally too. The following formats are supported:

- WWW pages with user-design possibility
- Modbus protocol
- SNMPv1 protocol
- SOAP

The instrument may send a warning message to several defined points if the measured value gets out of adjusted limits. There are the following possible ways to deliver the warning report:

- to send an e-mail to maximum of three e-mail addresses
- to send a SNMP trap to maximum of three IP addresses
- to display an alarm state on the device WWW page
- to send a message to Syslog server

Alarm limits may be set via TSensor software, Modbus, Telnet or a SNMPv1 protocol. The alarm state may be read via the device WWW pages, Modbus or the SNMPv1 protocol.
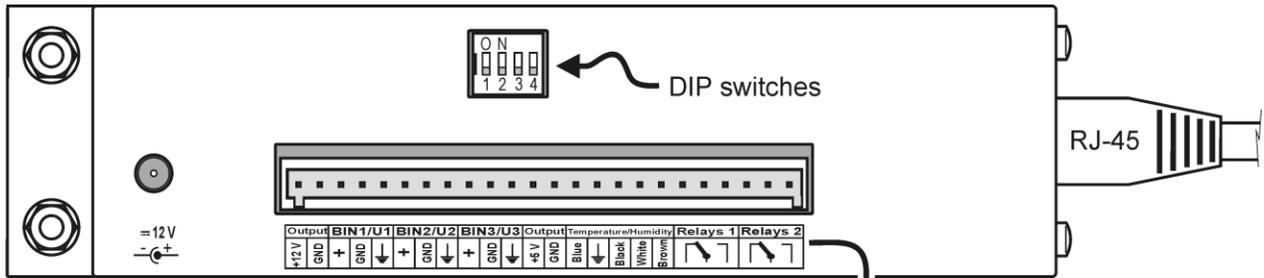
The value assign to each relay is possible through TSensor software or through device's keys.

If Power over Ethernet is needed, it is necessary to use some PoE Splitter. Tested is e.g. D-Link DWL-P50. Device itself does NOT support PoE internally!

Monitoring system supports Internet protocol version 4 (IPv6 is NOT supported).

Monitoring system mounting and connection

The devices are designed for mounting into 19-inch rack (mounting screws and female screws included). At back side of the device there are connectors for power source, 24pins CAGE CLAMP connector and RJ-45 Ethernet connector. There is possible to use +12V and +5V power output for powering of external sensors and detectors – see picture below.

It is NOT recommended to use the device for long time under condensation conditions. It could be the cause of water steam condensation inside the sensor's cover into water phase. This liquid phase stays inside sensor's cover and can't escape from the cover easily. It can dramatically increase response time to relative humidity change. If water condensation occurs for longer time it can cause sensor damage. Similar effect can occur under water aerosol conditions. External temperature probe connectable to STE-RACK must be type of "two wires with shielding". The probe cable length and size of conductor affects measurement accuracy. If connected probe is equipped with metal stem, we recommend using probes with metal stem not connected to cable shielding. Or else it is necessary to arrange metal stem is not connected to any other circuitry.

Binary inputs are designed for dry contact or external voltage connection – see picture
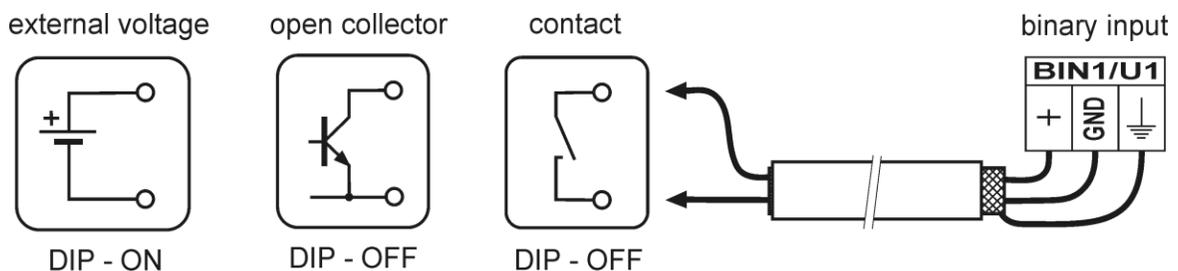
The maximal length of binary inputs and external Pt1000 temperature probe (STE-RACK only) is 10 m. Connect probe cable shielding to proper terminal and do not connect it to any other circuitry and do not ground it.

The cables for binary inputs and external sensor must be placed as far as possible from potential interference sources.

Electrical system (wiring) may be done only by a worker with required qualification by rules in operation.

Preparation to operation

To provide all STx(x)E-RACK monitoring systems functions it is necessary to make its setting through PC to satisfy your requirements. Requested parts necessary for operation:

- ac/dc adapter 12V
- RJ-45 LAN connection
- free IP address in your network
- temperature probe with a Pt1000 sensor for the STE-RACK monitor

Contact network administrator to get free IP address.

Warning! Reliability of warning messages reception (e-mail, trap) depends on current accessibility of required network services. It is recommended to protect device from unauthorized access to device settings and cables connection.

Procedure of instrument connection

The cables and temperature probe for STE-RACK connect in order as shown in the pictures. After power supply connection, make monitoring system configuration.

Connection of STRE-RACK and STRPE-RACK
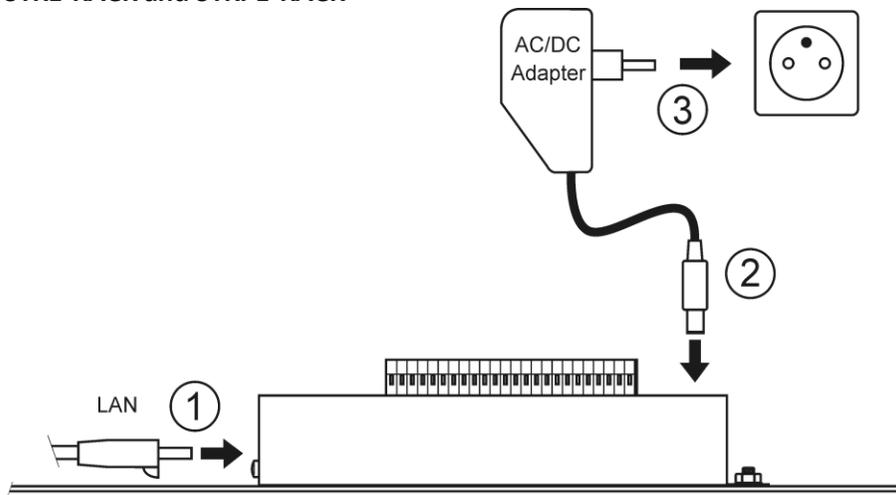
Connection of STE-RACK

PoE splitter

select DC 12 V

Dimensions

483mm

44 mm

45mm

26 mm

46 mm

ALARM 2

Esc

Set

ALARM 1
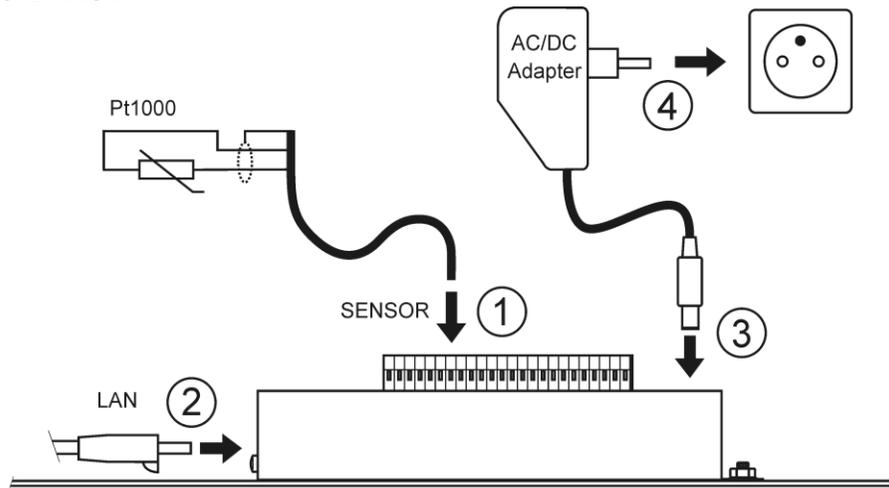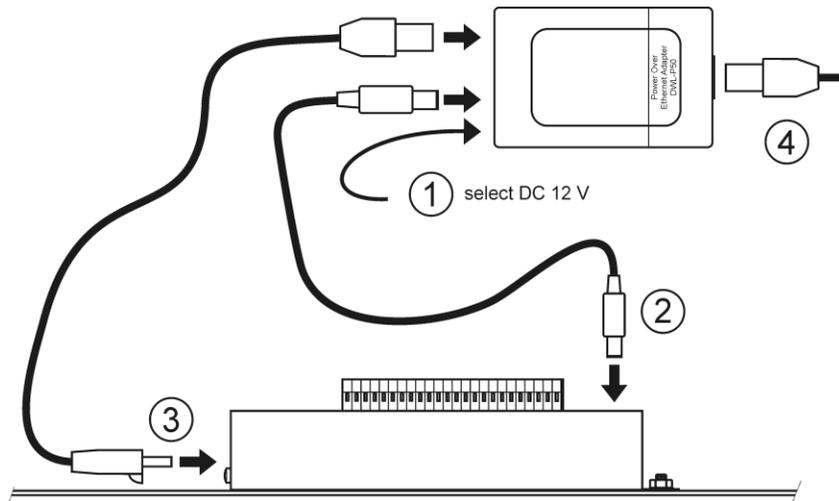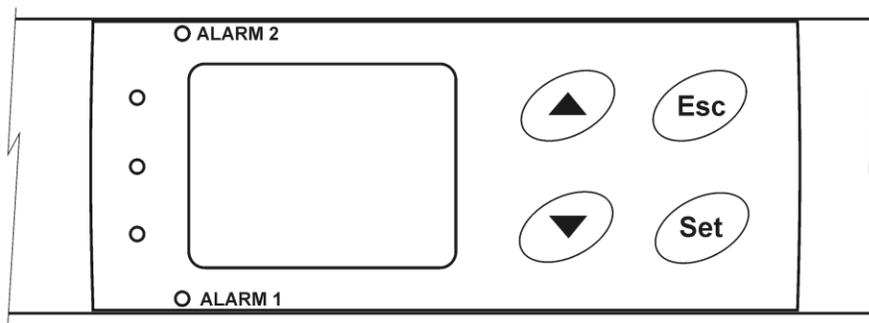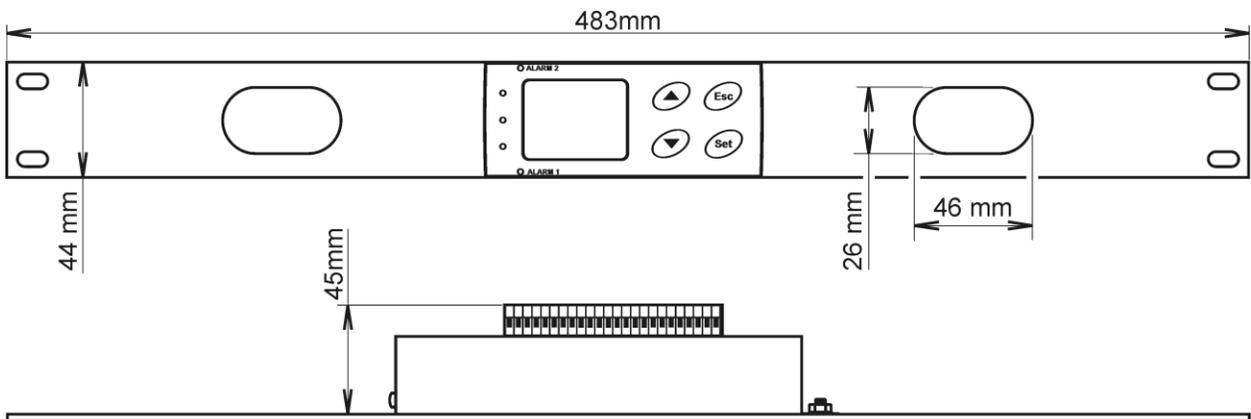
Installation

It is necessary to assign a new suitable IP address to the device at the first connection to it in order to prevent collisions with already existing network IP addresses, and make the address conform to the local habits. If installing several new devices, connect them to the network one after another! If a suitable IP address is not known, contact your network administrator and ask him for the following:

IP address of monitor	_____._____._____._____
IP address of gateway	_____._____._____._____
Network mask	_____._____._____._____

The IP gate address and the network mask need not be specified if the device will be operated only in a local network. If you set the IP address to one which is already used in the network the device will NOT work correctly and collisions in the network will appear. It is possible to set the IP address by DHCP server.

Device setting from the manufacturer:

|	
IP address:	`192.168.1.213`
Gateway:	`not set`
Value assigned to relay 1 and relay 2:	`none`
Password for setting through keys (PASS):	`0000`
Password for setting via TSensor:	`none`
Value shown at first LCD line:	`temperature (temperature/pressure)`
Value shown at second LCD line:	`relative humidity/dew point temperature`
Temperature unit:	`°C`
Pressure unit:	`hPa`
Correction for altitude:	`0 hPa (absolute pressure)`
Computed value preset:	`dew point temperature`
Relay response for error:	`stay unchanged at previous condition`
Signalization of binary inputs status:	`LED diode lights if input contact is open`
Acoustic alarm:	`off`

Installation procedure

- run TSensor software (default monitoring system IP address is `192.168.1.213`) or use command line at PC with command „`telnet 192.168.1.213 9999`". Telnet provides to set all Ethernet services. For setting of measurement and controlling of output relays use keys – see chapter *0.*
- assign new device IP address
- make your own device setting by your requirements (alarm settings, used units, email and trap sending ...)
- save setting

Operation checking

Visual check

When power source is on, there are actually measured values shown on LCD display (if the LCD has not been switched off). When Ethernet cable is connected, there is one light on its connector lighting.

Communication check via a LAN

Open a browser of www pages and enter the devices IP address into appropriate field.

Example: `http://192.168.1.213`

Monitoring system shows its name, serial number, measured values, alarm status and alarm settings or shows message `Access denied` in case of web pages are disabled or setting through Telnet is in operation.

Description of device function and setting

Information from device is available directly through LCD or you can read them with one of next communication protocols. For communication through some communication protocol (SNMPv1, Modbus, SOAP) there is necessary to have installed appropriate software supporting appropriate communication protocol on PC. Such software is not included in the delivery! The device is internally separated into two units. The first unit provides measurement and controlling of output relays – these parameters are possible to change directly through device's keys or TSensor software. The second unit provides all Ethernet services, its configuration is possible through TSensor software or Telnet terminal (this setting is impossible to change through device's keys).

Relay outputs

Monitoring system is equipped with two relay outputs. It is possible to assign any input or computed value or "far control" to each relay, to set comparing alarm limit, if the relay may close if measured value is higher (Hi) or lower (Lo) than preset limit, delay for while must be preset condition true before relay close its contact and hysteresis for return to open status. For binary inputs: if it is preset to „HI" then output relay is closed when input contact is opened, if it is preset to „Lo" then output relay is closed when input contact is closed. Each relay status is indicated with LED diode and shown on LCD with corresponding symbols „ALARM 1 " or „ALARM 2 ".

Binary inputs

It is possible to read three binary inputs status. It is possible to connect "open contact" or external voltage. Visualization of binary inputs is done by three LED diodes placed on the left side from LCD. Green one represents input Binary 1, yellow input binary 2 and red input binary 3. Configuration of binary inputs is done by DIP switch one to three placed at backside of the device. DIP switch 1 is assigned to binary input 1, DIP2 to BIN2, DIP3 to BIN3. If corresponding DIP switch is ON, then appropriate binary input is configured as "voltage input". It means that without connection of external voltage there is binary input read as "0", after external voltage is applied, there is binary input read as "1". This setting is for suitable for optional accessory "Power detector ATS-AC35" for example. If corresponding DIP switch is OFF, then appropriate binary input is configured as "dry contact input". It means that if the binary input is open/disconnected then binary input status is read as "1", if the binary input is closed (closed contact) then binary input status is read as "0". For each binary input there is possible to set indication LED function – if is lighting when binary input is closed or opened. Binary input status can be assigned to any of output relays. It is possible to choice if output relay is closed or opened when binary input is closed/opened. Binary inputs are not galvanic isolated.

Actual monitoring system preset – measurement part

It is NOT possible to make any changes of Ethernet services, for their setting see chapter *0* at page *18*.

If output relay alarm condition configuration is made using Modbus protocol, keyboard is blocked for this time. During this configuration is a word "bloc" shown in the display.

Value assigned to relay

actual value

`26.5 °`

insert password for access

`PASS 0000`

not set

`rELi OFF`

temperature

`rELi toC`

relative humidity

`rELi rh`

barometric pressure

`rELi PrES`

computed value

`rELi dP`

BIN input

`rELi bini`

far control

`rELi FArO`

When close relay

Preset if relay is closed when actual value is higher „HI" or lower „Lo" than preset value.

`HI 35.5`

`Lo 35.5`

`Lo 39.5`

`HI 39.5`

`PASS 0000`

`HI 39.5`

Delay

Time in seconds, when preset condition must be true and after this time rele is closed (transient reduction of measured value).

delay

`dLY 5`

`PASS 0000`

`dLY 5`

Hysteresis

The amount of measured value which must go under/over preset value to open appropriate output relay. It means if there is condition: relay 1 must be closed if measure value is "higher then" (HI), then measured value must decrease by this value under preset limit to relay output goes open.

hysteresis

`HYSt 0.5`

`PASS 0000`

`HYSt 0.5`

ATAL

It is possible to display actual device preset on its LCD display by pressing of „▲“ key. LCD shows information about relay 1 and then relay 2 setting step by step. Information about relay 1 are indicated with symbol „ALARM 1“, for relay 2 with symbol „ALARM 2“ (at right top corner of LCD). It is possible to edit parameters after pressing „SET“ key and entering of correct password „PASS“ – see chapter **0** at page **13**. Following examples are for relay 1 setting, similarly are displayed values for relay 2. Pressing of „ESC“ key ends this mode and switch to actual value displaying, the same occur if more than 20 s is not pressed any key.

Monitoring system setting change – part of measurement unit

Setting with PC and TSensor software

User's software **TSensor** is available free to download at web page www.atal.nl It provides **setting of all device parameters**. Run the TSensor program and follow the program instructions. Device includes hardware write protection of internal setting (except of Ethernet setting which is protected by password), new setting is possible to write only while:

1. during write period press „SET“ key – do requested setting in TSensor software, press „SET“ key on device and keep it down, then click on the button „Save Changes“ into TSensor software and after end of write release „SET“ key, or
2. when DIP switch 4 is ON – available at back side of the device, if it is ON then you can see small number 3 at left side of LCD and new setting can be write. Don't forget to move DIP switch 4 to OFF after setting procedure finish (restore write protection).

TSensor software supports to make the adjustment of the device too.

Setting with using monitoring system keys

If „Actual monitoring system preset" is displayed (see chapter "Actual monitoring system preset – measurement part" at page **11**), it is possible to enter into edit mode and edit displayed value by pressing „SET“ key. Then you are asked for valid password (PASS). If password is not valid there is shown for short time message "Err9" on LCD. You can edit selected value if right password is entered. During value editing there is range check executed and edited value is still compared with limits for corresponding value (range). If inserted value is higher or lower then edited number is automatically changed to its maximum / minimum value – for possible range see chapter „Technical parameters" at page **29**. Value can be changed with using „▲“ and „▼“ keys. Edited value is switched in "round" -9, -8, -7, …-2, -1, 0, 1, 2, …8, 9. To edit next number digit press „SET“ key, for moving back to previous digit press „ESC“ key. Edited value is stored by next „SET“ key pressing. It is possible to cancel editing by pressing „ESC“ key if necessary. If valid password is once inserted right, then there is possible to edit next items without asking for password insertion again, till "Actual monitoring system preset" is left (till actual measured values are shown). With new entering into edit mode it is necessary to enter Password again. Default password setting is preset from manufacturer to 0000, password change is possible into „Extended setting". During edit mode device still works and changes are valid immediately after its storing. After storing the Ethernet part is restarted automatically.

Extended setting mode

During device operation it is possible to change parameters available through "Actual monitoring system preset" only (see chapter **0** at page **11**). Rest of device parameters are available through "Extended setting mode". **In this mode device does NOT communicate, does NOT do any measurements and does NOT service output relays. To leave this mode press „ESC“ key and move DIP switch 4 to OFF.**
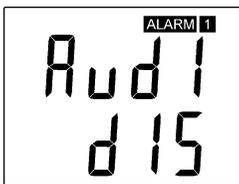
To enter into Extended setting mode do following steps:
1. disconnect power supply
2. move DIP switch 4 to ON (you should see small number 3 at left side of LCD)
3. press „▲ " and „▼ " keys together and keep them down
4. connect power supply to device – you should see message „SEL" on the top line of LCD and on the bottom line you should see number of Firmware version (e.g. 0404)
5. release „▲ " and „▼ " keys – you are into "Extended setting mode" now

Use „▲ " and „▼ " keys to inspect each items. If you want to change some shown item then press „SET" key, item starts blink. Now you can edit setting with using „ ▲ " and „▼ " keys. To store preset value press „SET" key. Press „ESC" key to leave editing (changing) without save – last stored value is kept. Into this mode you can set following items:

Acoustic alarm assign to relay 1
acoustic indication of relay 1 is OFF   *close of relay 1 contact starts acoustic indication*

ALARM 1   ALARM 1

Aud1   Aud1
d15   EnAb

Acoustic alarm assign to relay 2
acoustic indication of relay 2 is OFF   *close of relay 2 contact starts acoustic indication*
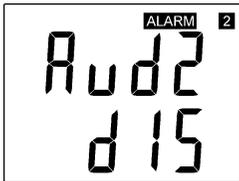
ALARM 2   ALARM 2

Aud2   Aud2
d15   EnAb

Acoustic alarm deactivation
activated acoustic alarm is possible to   *acoustic alarm is still activated for all time and it is*
deactivate by pressing „ESC" key   *impossible to deactivate it*

ALARM 1 2   ALARM 1 2

dEAC   dEAC
ESC   St1L

Relay response for error
Monitoring system continuously checks its state during operation. In case error of assigned value measurement is found then output relay:

stays unchanged (in previous status)

relay 1 switch OFF

relay 1 switch On

stays unchanged (in previous status)

relay 2 switch OFF

relay 2 switch On

Change of "Password for setting through keys" (PASS)

This item shows actual password setting. It is possible to change it after „SET" key pressing. It is number from range -19999 to +19999.

password setting
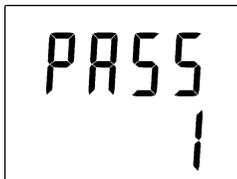
Visualization of binary inputs

Visualization of binary inputs is done by three LED diodes. This option defines at which binary input status should LED diode indication lights – LED diode lights if binary input is OPEN or CLOSED.

LED lights if binary input is OPEN
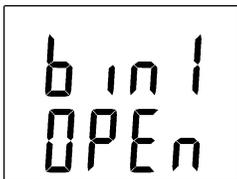
LED lights if binary input is CLOSED
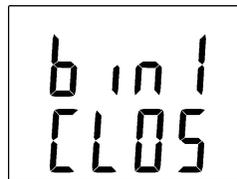
Temperature unit choice

It is possible to measure temperature at °C or °F. There is shown preset unit. It is possible to change it after „SET" key pressing.

preset to °C

preset to °F
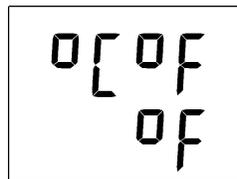
Barometric pressure unit choice

It is possible to measure barometric pressure at hPa, PSI, inHg, mBar, oz/in^2, mmHg, inH$_2$O and kPa. There is shown preset unit. It is possible to change it after „SET" key pressing.
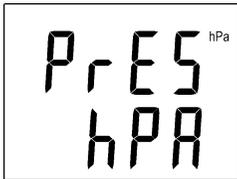
preset to hPa	preset to PSI	preset to inHg	preset to mBar
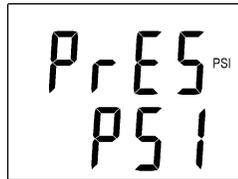
```
PrES hPa        PrES PSI        PrES inHg       PrES
hPA             PSI             inH9            nbAr
```
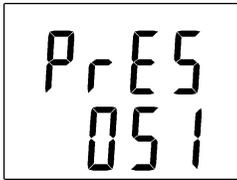
preset to oz/in²	preset to mmHg	preset to inH₂O	preset to kPa

```
PrES            PrES            PrES            PrES
0SI             nnH9            iH20            _PA
```
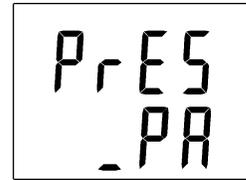
Setting of pressure correction for altitude

If is there necessary to read value of barometric pressure corrected with respect to altitude, it is possible to set corresponding pressure offset for this altitude. It is possible to change it after "SET" key pressing. Pressure correction value is then automatically added to measured pressure value. See chapter "Error States of the device" at page **25**, Error 2.

correction for altitude

```
P Sh hPa
249.8
```
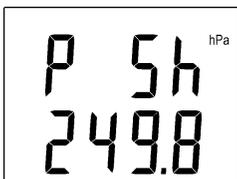
pressure correction value is from

|	
-25,0 to 650,0 hPa	-5,8 to 150,8 oz/in²
-0,363 to 9,427 PSI	-18,8 to 487,5 mmHg
-0,74 to 9,19 inHg	-10,0 to 261,0 inH₂O
-25,0 to 650,0 mBar	-2,5 to 65 kPa

Show temperature at LCD display

This item provides to choice if actual measured temperature may be displayed at LCD display or not. It is possible to change it after „SET" key pressing.

show value on LCD	don't show value on LCD

```
t °C            t °C
d 0n            d0FF
```

Show relative humidity at LCD display

This item provides to choice if actual measured relative humidity may be displayed at LCD display or not. It is possible to change it after „SET" key pressing.

show value on LCD	don't show value on LCD

```
  rh              rh
d 0n            d0FF
```
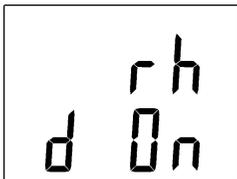
Show computed value at LCD display

This item provides to choice if actual computed value may be displayed at LCD display or not. There is shown the name of computed value on the top LCD line – see "Computed value selection" below. It is possible to change it after „SET" key pressing.

show value on LCD

```
  dP
d On
```

don't show value on LCD

```
  dP
dOFF
```
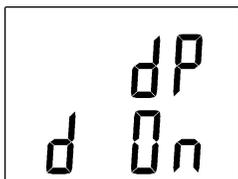
Show barometric pressure at LCD display

This item provides to choice if actual barometric pressure may be displayed at LCD display or not. It is possible to change it after „SET" key pressing.

show value on LCD

```
PrES
d On
```

don't show value on LCD

```
PrES
dOFF
```
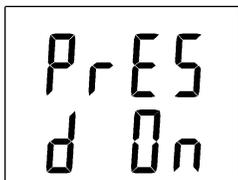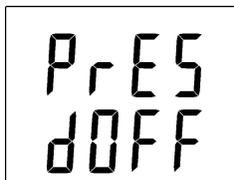
Computed value selection

It shows the actually selected computed value name. It is possible to change it after „SET" key pressing. There is possible choice one of the following computed values:

dew point temperature

```
SEL
dP
```

absolute humidity

```
SEL
AbSH
```

mixing ratio

```
SEL
rAt
```
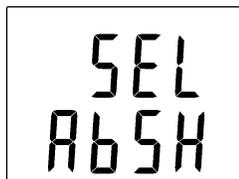
specific humidity

```
SEL
SPcH
```

specific enthalpy

```
SEL
SPcE
```
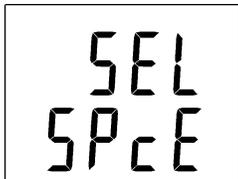
Restore to „Factory default" – measurement part

This item provides device restoring to factory setting. Press „SET" key, select „YES" and confirm it by pressing of „SET" key. It reset regulator parameters to following values:

Value assigned to relay 1 and relay 2: `none`
Password for setting through keys (PASS): `0000`
Display: `on`
Temperature unit: `°C`
Pressure unit: `hPa`
Correction for altitude: `0 hPa` (absolute pressure)
Computed value preset: `dew point temperature`
Relay response for error: `stay unchanged at previous condition`
Signalization of binary inputs status: `LED diode lights if input contact is open`
Acoustic alarm: `off`

restore to factory default
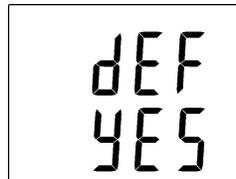
Monitoring system configuration – Ethernet interface

The Ethernet configuration is performed by TSensor software[1] or Telnet setup. Setting through the Telnet is described in separated document. Access to the Setup can be protected by a password. TSensor program you can find on web www.atal.nl or on the installation CD. This program is free for use and supports firmware update too. The newest firmware is available at web pages too.

Alarms – Ethernet interface

Analogue values

It is possible to set an upper limit, lower limit, hysteresis and time delay to each measured value. Figure shows a temperature curve with some specified upper limit (`temp_limit_high`) and `hysteresis`. At point 1 temperature exceeds the limit. From that moment a time delay is counted (`time_delay`) after which an alarm is set. Because at point 2 the temperature dropped below the limit value (`temp_limit_limit`) before the time delay expired, alarm was not set.

---

[1] In telnet some settings are not allowed (display settings, computed value selection), see chapter **0**
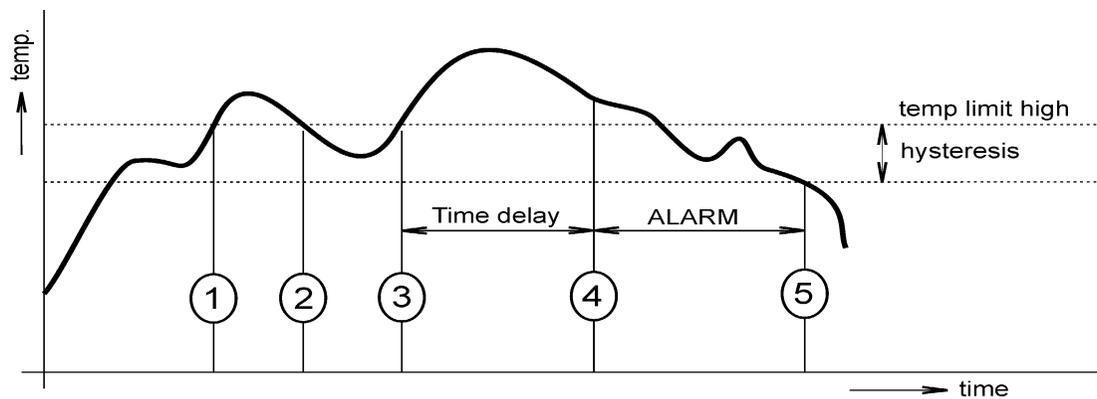
At point 3 the temperature again exceeded the limit, and because it did not drop below the limit value (`temp_limit_high`) before the time delay ended, the alarm was set at point 4. At this moment the alarm e-mails and traps are sent, if they are enabled, and the alarm flag is set (the flag is set when the alarm is active and reset when inactive). The state of the flag can be found on the WWW pages or via Modbus or the information console. The alarm lasted to point 5, where the temperature dropped below the limit value given by the adjusted hysteresis (`temp_limit_high` − `hysteresis`).

For other measured values the principle of alarm activity is analogical.

An alarm report is always sent right after an alarm appears. The device memorizes sent alarm reports of current alarms while the power is connected. In case of power disconnection or a reset of the device (e.g. by modification of configuration) a new alarm evaluation is performed and new alarm reports are sent again, if any.

It is possible to set the alarm parameters via telnet, Modbus protocol or a SNMPv1 protocol, TSensor program. Detailed description of setting via these protocols can be found in chapters informing about particular services.

Binary values

The binary values mean status of relay and binary inputs. Device can send warning message (e-mail, SNMP trap or Syslog message) in the course of relay or binary input change state. Every binary value has own time delay (relay – see chapter *0*, binary inputs – *0*). Binary inputs can have a name (max. 14 characters).
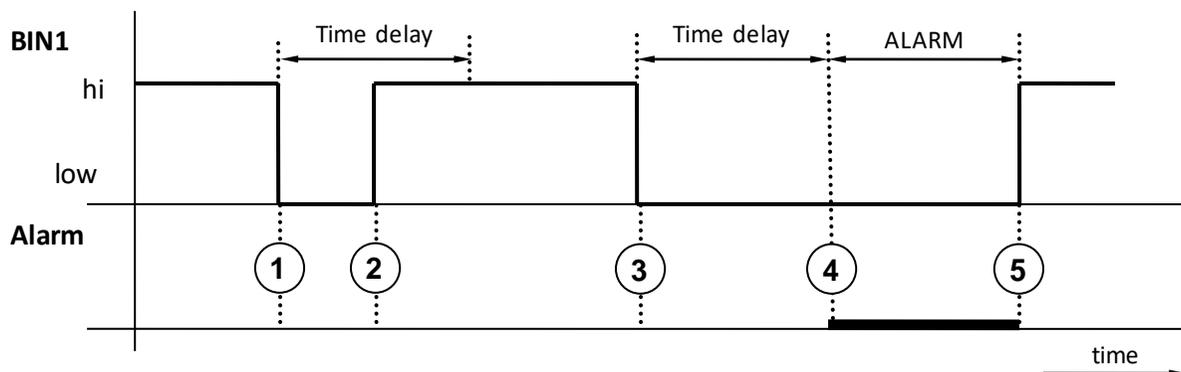
A figure shows a simple example. Binary input 1 is configured to send an e-mail if input change state from high to low (lower edge). At point 1 a binary input was opened. Because at point 2 input was closed before the time delay expired, alarm was not set. At point 3 was input opened again. At point 4 the time delay expires and at this moment e-mail, SNMP traps are sent. The alarm lasted to point 5, where the input was closed.

Factory default – Ethernet interface

This procedure describe how set Ethernet interface of device to factory defaults (new IP address: `192.168.1.212`, mask: `255.255.255.0`).

1. power off device
2. close the jumper near the Ethernet connector
3. power on the device
4. wait approximately 15s
5. remove/open the jumper

Factory default – Ethernet interface

Communication protocols

Modbus protocol

The device contains support for the Modbus TCP protocol to communicate with control systems. The port is set to 502. Port 502 enables full access, i.e. both read and write operations are supported. Access to port can be disabled in the Setup. Maximal number of client transaction is set to 1.

Supported Modbus commands:

Command	Code	Description
Read multiple register(s)	0x03	Reads 16 bit register(s)
Write multiple register(s)	0x10	Writes 16 bit register(s)

Modbus registers of monitoring system:

Variable	Unit	Format	Address [hex]	Address [dec]	Status
measured temperature	°C, °F	Int*10	0x0031	49	r
measured relative humidity (RH)	%	Int*10	0x0032	50	r
computed value (CV)	CV depend	Int*10	0x0033	51	r
measured barometric pressure [2]	CV depend	Int*X	0x0034	52	r
device serial number Hi	-	BCD	0x1035	4149	r
device serial number Lo	-	BCD	0x1036	5150	r
relay 1 status [0/1]	-	Int	0x003B	59	r
relay 2 status [0/1]	-	Int	0x003C	60	r
binary input 1 status [0/1]	-	Int	0x003D	61	r
binary input 2 status [0/1]	-	Int	0x003E	62	r
binary input 3 status [0/1]	-	Int	0x003F	63	r
far relay 1 control (see below) [0 – relay open, 1 – relay closed]	-	Int	0x0042	66	r/w
far relay 2 control (see below) [0 – relay open, 1 – relay closed]	-	Int	0x0043	67	r/w
status of all binary inputs (bit0, 1, 2)	-	Int	0x0008	8	r
status word (described below)	-	Int	0x0007	7	r
firmware version Hi	-	BCD	0x3001	12289	r
firmware version Lo	-	BCD	0x3002	12290	r
lower limit for temperature	°C, °F	Int*10	0x5001	20481	r/w
upper limit for temperature	°C, °F	Int*10	0x5002	20482	r/w
lower limit for humidity	%	Int*10	0x5003	20483	r/w
upper limit for humidity	%	Int*10	0x5004	20484	r/w
lower limit for computed value	CV depend	Int*10	0x5005	20485	r/w
upper limit for computed value	CV depend	Int*10	0x5006	20486	r/w
temperature hysteresis	°C, °F	Int*10	0x5007	20487	r/w
temperature time delay	s	uInt	0x5008	20488	r/w
RH hysteresis	%	Int*10	0x5009	20489	r/w
RH time delay	s	uInt	0x500A	20490	r/w
computed value hysteresis	CV depend	Int*10	0x500B	20491	r/w
computed value time delay	s	uInt	0x500C	20492	r/w
temperature alarm status	-	ASCII[a)	0x500D	20493	r
RH alarm status	-	ASCII[a)	0x500E	20494	r

Variable	Unit	Format	Address [hex]	Address [dec]	Status
computed value alarm status	-	ASCII[a)]	0x500F	20495	r
lower pressure limit	CV depend	Int*X	0x5010	20496	r/w
upper pressure limit	CV depend	Int*X	0x5011	20497	r/w
pressure hysteresis	CV depend	Int*X	0x5012	20498	r/w
pressure limit status	-	ASCII[a)]	0x5013	20499	r
pressure time delay	s	uInt	0x5014	20500	r/w
relay 1 alarm status	-	ASCII[b)]	0x5015	20501	r
relay 2 alarm status	-	ASCII[b)]	0x5016	20502	r
binary input 1 alarm status	-	ASCII[c)]	0x5017	20503	r
binary input 2 alarm status	-	ASCII[c)]	0x5018	20504	r
binary input 3 alarm status	-	ASCII[c)]	0x5019	20505	r
binary input 1 time delay	s	uInt	0x501A	20506	r/w
binary input 2 time delay	s	uInt	0x501B	20507	r/w
binary input 3 time delay	s	uInt	0x501C	20508	r/w

Legend:

- r   register is designed for read
- w   register is designed for write
- Int*10   register is in format of integer*10
- Int*X   register is in format of integer*10, int*100, int*1000 depend on type[2]
- BCD   register is in format of BCD
- uInt   register is at range of 0-65535
- ASCII   character, where:

  a) Temperature, RH, computed value, pressure alarm status
  no   no alarm
  lo   value is bigger than specified upper limit
  hi   value is lower than specified lower limit
  b) Relay alarm status:
  op   no alarm
  cl   relay is closed, alarm is signaled
  c) Binary inputs alarm status:
  no   no alarm
  lo   alarm on falling edge
  hi   alarm on raising edge

- Status word: 16b value return, bite description:

  Bit0   0/1   jumper open/closed
  Bit3   0/1   relay 1 open/closed
  Bit4   0/1   relay 2 open/closed
  Bit5   0/1   internal acoustic alarm status
  Bit6   0/1   binary input 1 status
  Bit7   0/1   binary input 1 status
  Bit8   0/1   binary input 1 status

- Far relay control: open/close relay through Modbus protocol. Before using remote relay control option is necessary setup FAR0 or FAR1 to the relay.

  FAR0   remote relay control, after device reboot relay is open
  FAR1   remote relay control, after device reboot

- Output relay alarm condition configuration.

---

[2] hPa, mBar, mmHg, inH$_2$O, oz/in^2 are Int*10, inHg, kPa are Int*100, PSI are Int*1000

SMTP

In case of exceeding adjusted limits of measured values the device can send e-mails to maximum of three addresses. It is necessary to set your SMTP server address (IP address, authentication, etc.) for correct function of e-mail sending.

If limits of several measured values are exceeded a special alarm e-mail is sent for each alarm state. Dummy address `sensor@[device IP address]` is displayed as a sender of the e-mail. It is not possible to reply to this address. In the Subject field of the message the sentence `Alarm [Description of the device]` is displayed or `Test message [Description of the device]` in the case of sending a test e-mail.

SNMPv1

By means of the SNMPv1 protocol it is possible to find currently measured values, read and set parameters concerning alarms. In case of alarm activation, warning message (a trap) can be sent to specified addresses. By means of the SNMPv1 protocol it is also possible to display history of last 100 measured values.

For read and write the device communicates via `UDP port 161`. Traps are sent via port `UDP port 162`. Sending of traps can be disabled in the Setup. The following traps sent:

- `0/0`   device restart
- `1/0`   testing trap
- `1/1`   SNTP time synchronization error
- `1/2`   Ethernet firmware was uploaded
- `1/3 – 1/5`   SOAP communication error
- `1/6 – 1/8`   e-mail sending error
- `1/9`   Configuration changed via SNMP or Modbus
- `6/3 – 6/55`   report on a measured value being outside of the limits or a return of the measured value to the limits

For the correct function of the SNMPv1 server it is necessary to store the MIB table `Hx5xx.mib` and `RFC-1213.mib` to the MIB client. The path to the device is then:

`iso.org.dod.internet.private.enterprises.comet.products.hx5xx`

MIB tables are available on the installation CD in the MIB directory. Password for a read operation is set by the manufacturer to `public`, password for write is set to `private.` These passwords may be changed in the setup.

History

By means of the SNMPv1 protocol it is possible to display history of the last 100 measured values, stored in adjusted time interval. This interval is set by configuration program. If a value has not been measured yet or an error was detected the value is 9999, or -9999, if pressure is measured. The history is erased after each restart of the device. Restart occurred if device configuration is changed via keyboard or TSensor software.

WWW

The device supports display of measured values, adjusted limits and alarm states on its WWW pages. The address of the WWW pages is identical with its IP address. It is possible to upload self-made web pages to device.

Example: The device has an IP address `192.168.1.204`. Enter `http://192.168.1.204` to the browser address field and confirm it with the Enter key.

WWW pages have adjustable automatic refresh interval. The manufacturer sets it to 60 seconds. The value can be modified in the setup in a range of 10–65535s. If the device has WWW pages display disabled screen with message `Access denied`.

SNTP

The device allows time synchronization with SNTP server. The time synchronization is set to every 8 hours. If the time synchronization failed in next three hours, SNTP trap, e-mail and Syslog message will be sent.

Syslog protocol

Device allows send messages to selected Syslog server (`UDP` protocol, `port 514`). Events are described below.

Event	Text
device restart	`Device restart`
test message	`Testing message`
alarm occurred	`Alarm …`
SNTP connection error	`NTP connection error`
write to device via Modbus, SNMP	`Settings changed`
firmware was changed	`Firmware uploaded`
alarm is down	`Clearing …`
SOAP server communication error	`SOAP …`
e-mail sending error	`EMAIL …`

SOAP

Device allows sending SOAP messages with measured values to user defined remote web server in preset time intervals 10-65535 s. If the device cannot establish connection with the web server in the whole delay interval, device sends trap `1/3 – 1/5`.

How to configure sending SOAP messages example:

SOAP enable:	`Yes`
Target web page:	`my.hosting.cz/soap/server.php`
SOAP server IP address:	`111.247.121.123`
Source port:	`0` (never set to 80, causes it web server collision)
Destination port:	`80` (http servers usually listens at this port)
Sending interval:	`10`

What to do when…

I forgot the IP address of the device

Finding the device IP address

IP address is set to the value `192.168.1.213` by the manufacturer. If you changed it and forgot the new IP address, run the TSensor program and press the "`Find…`" button. In a new window all sensors will be show.

It is not possible to connect to the device from a LAN

In the "Find device" window is only IP and MAC address displayed

The next information is displayed as `N/A`. This problem will be occurred, when the device IP is set to another LAN.

In TSensor program choose `Find device/Change IP address`. Follow the program instruction.

The sensor IP address in Find device window is not displayed

In TSensor program select `Find device/Help my device Wasn't found!` Follow the program instruction.

Finding the MAC address

The MAC address is a unique address of a device which is necessary to be known e.g. in case when there are several devices connected to the network. MAC address is on device label.

It is not possible to find meter after manual MAC enter

In TSensor program select `Find device/Help my device Wasn't found`. In this select `Set IP to ARP only`. Into `device MAC address` enter the meters MAC address (e.g. 00-20-4A-84-F0-80) and press the `Set IP` button.

Open telnet to the IP address you assigned to the device MAC address by running a telnet command `telnet [IP_address_assigned_to_MAC_address] 9999` and confirm with the Enter key. Choose `0 - Global Settings`, set the meters IP address, clear the gate IP, no. of net mask set to 0. Pres the Enter key, until you are not back into a menu. `Press - 9 Save and Exit`. The connection will be closed. Now you can connect to meter by the TSensor program.

LCD display is Off

- check if power supply is connected properly
- disconnect and connect the power supply - watch the display at the moment of connecting the power. If all LCD segments light for 1 second and go out again, the display is turned off by the software

Error States of the device

Device continuously checks its state during operation. In case error is found LCD displays corresponding error code:

Error 0

First line of LCD displays „Err0". Check sum error of stored setting inside device's memory. This error appears if incorrect writing procedure to device's memory occurred or if damage of calibration data appeared. At this state device does not measure and calculate values. It is a serious error, contact distributor of the device to fix.

Error 1

Measured or calculated value except in pressure is over upper limit of allowed full scale range. There is a reading „Err1" on LCD display. Value read from the device is +999.9. This state appears in case of:

- Measured temperature is higher than approximately 600 °C (i.e. high non-measurable resistance of temperature sensor, probably opened circuit).
- Relative humidity is higher than 100%, i.e. damaged humidity sensor, or humidity calculation of humidity is not possible (due to error during temperature measurement).
- Computed value – calculation of the value is not possible (error during measurement of temperature or relative humidity or value is over range).

The value of pressure +999.9 hPa is correct value!

Error 2

There is a reading „Err2" on LCD display. Measured or calculated value is below lower limit of allowed full scale range. Value read from the device is -999.9. This state appears in case of:

- Measured temperature is lower than approximately -210°C (i.e. low resistance of temperature sensor, probably short circuit).
- Relative humidity is lower than 0%, i.e. damaged sensor for measurement of relative humidity, or calculation of humidity is not possible (due to error during temperature measurement).
- Measured pressure value **with added correction for altitude** is outside of range from 300 hPa to 1350 hPa (from 4.351 PSI to 19.580 PSI) or the pressure sensor is damaged. Please check setting of pressure correction for altitude with User's software.
- Computed value – calculation of computed value is not possible (error during measurement of temperature or relative humidity).

Error 3

There is a reading „Err3" on LCD display upper line.

Error of internal A/D converter appeared (converter does not respond, probably damage of A/D converter). This error does NOT affect pressure measurement. Rest values are NOT measured. It is a serious error, contact distributor of the device.

Error 4

There is a reading „Err4" on LCD display. It is internal device error during pressure sensor initialization. Under this condition device does NOT measure atmospheric pressure. Value read from device is -999.9. Pressure sensor is probably damaged. It is a serious error, contact distributor of the device.

Error 5, 6

There is problem with assigned value to output relay, there is some wrong setting (mismatch). This error appears if incorrect writing procedure to device's memory occurred.

Error 9

Inserted password is not valid, there is shown for short time message "Err9" on LCD display. Try to insert password again. If you forgot the password see chapter Change of "Password for setting through keys" (PASS) at page *15*.

Readings on LCD display

°C, °F reading next to this symbol is measured temperature or error state of value

%RH reading next to this symbol is measured relative humidity or error state of value

hPa, PSI, inHg reading next to this symbol is measured pressure or error state of value. If selected pressure unit is **mBar** or **oz/in²** or **mmHg** or **inH₂O** or **kPa**, there is shown only value (number) without corresponding pressure unit!

°C / °F DP reading next to this symbol is calculated dew point temperature or error state of value

g/m³ reading next to this symbol is calculated absolute humidity or error state of value

g/kg reading next to this symbol is calculated specific humidity or mixing ratio (depends on device setting) or error state of value

If specific enthalpy is selected, there is shown only value (number) without corresponding unit.

3 this symbol is on if jumper is closed

Preventive maintenance

Pay heed to recommended calibration interval. Do not subject the device to mechanical stress.

Recommended calibration intervals:

- STE-RACK   1 years
- STRE-RACK   2 year
- STRPE-RACK   2 year

Technical specification

Technical parameters

Common parameters

Power voltage: 12 V DC
Power consumption: approx. 1 W
Power connector: coaxial connector, diameter 5,5 x 2,1 mm, (+) internal contact
Measuring interval: 1 s
Display switching interval: 4 s (when more than two values are displayed)
Communication with computer: Ethernet connection (RJ-45 connector)
Protection: IP30
Relay outputs:

       Amount: 2
       Maximal voltage: 50 V
       Maximal current: 2A
       Maximal power: 60 VA
       Relays contact is not designed for direct control of line voltage!
       (output relay contact parameters: max 220Vdc, 125Vac, 2A, 60 W, 62.5 VA)

Binary inputs:

       Amount: 3
       Signal for binary input: from floating contact or binary voltage
       Caution! Binary inputs are NOT galvanic isolated!
       Minimal input pulse duration: 500 ms (detection of shorter pulses is not guaranteed)
       Current through closed contact: 25 μA
       Open contact voltage: <   3,3 V
       Maximal input voltage: +30 V
       Low level input voltage: 0 to +0,5 V
       Hi level input voltage: +3,0 to +30 V
       Cable for input signal wiring: shielded, max. 10 m long, cable should not be led in parallel along power cabling.

Power output +12 V and +5 V for powering of external sensors and detectors:
       Total load max. 5 W (+12 V/ max. 400 mA, +5V / max. 500 mA)
EMC: EN 61326-1, EN 55011, EN55022

Accuracy, range and resolution of monitoring systems

Temperature:

	STRE-RACK	STE-RACK	STRPE-RACK
accuracy	± 0,4 °C (±0,7 °F)	± 0,2 °C (±0,4 °F)	± 0,4 °C (±0,7 °F)
range	-30 to +105 °C (-22 to 221 °F), includes probe cable	-200 to +600 °C (-328 °F to 998.6°F)	-30 to +105 °C (-22 to 221 °F), includes probe cable
resolution	0,1 °C (0,2 °F)	0,1 °C (0,2 °F)	0,1 °C (0,2 °F)

Relative humidity:

|	STRE-RACK	STE-RACK	STRPE-RACK
accuracy	± 2,5 %RH from 5 to 95 %RH at 23 °C (73,4 °F)	-	± 2,5 %RH from 5 to 95 %RH at 23 °C (73,4 °F)
range	0 to 100 %RH	-	0 to 100 %RH
resolution	0,1 %RH	-	0,1 %RH

Barometric pressure STRPE-RACK:

Unit	hPa, mBar	PSI	mmHg	inHg	inH$_2$O	oz/in^2	kPa
Range	600	8,70	450,0	17,72	240,9	139,2	60,00
	1100	15,95	825,1	32,48	441,6	255,3	110,00
accuracy							
T=23°C (73,4°F)	±1,3	±0,02	±1,0	±0,04	±0,5	±0,3	±0,13
0≤T≤40°C (32≤T≤104°F)	±1,5	±0,02	±1,1	±0,04	±0,6	±0,3	±0,15
Else	±2,0	±0,03	±1,5	±0,06	±0,8	±0,5	±0,20

Response time with stainless steel mesh sensor cover (F5200B) and bronze sensor cover (F0000 - selectable option), air flow approximately 1 m/s:

    temperature: t90 < 9 min (temperature step 20 °C (36 °F))
    relative humidity: t90 < 30 s (humidity step 65 %RH, constant temperature)
    pressure: t90 <44s [3]

**Measuring temperature and humidity range is limited in accordance with the graph below!**

---
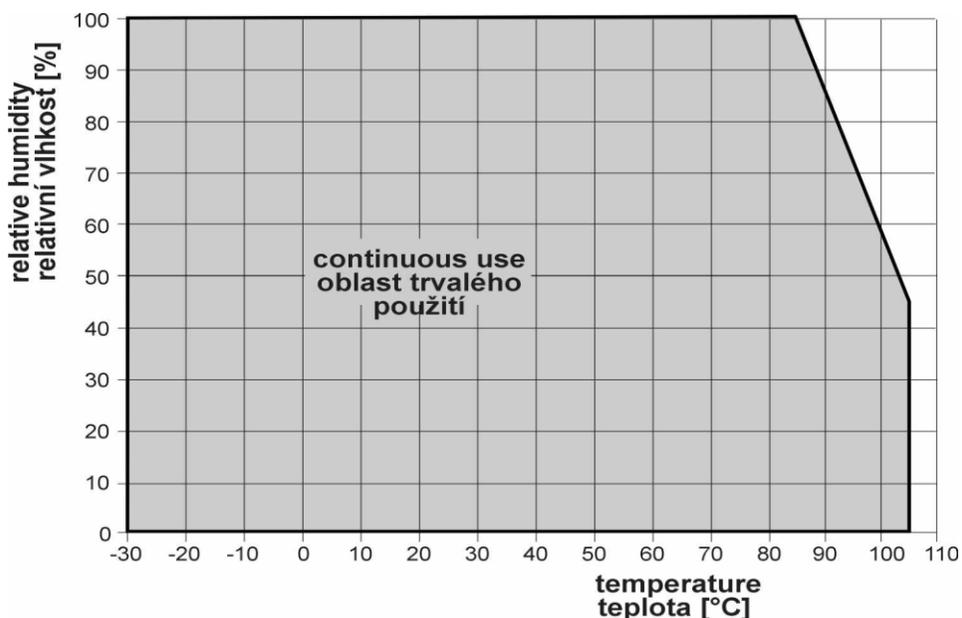
[3] There is possible to change response time. For more details see file "Description of calibration and adjustment procedure.pdf", which is installed together with Users software.

Value computed from measured relative humidity and temperature

Dew point temperature
Range: -60 to +80 °C (-76 to 176 °F)
Accuracy: ±1,5°C (±2,7°F) at ambient temperature T<25°C (77°F) and relative humidity RH >30%, for more details see graphs below
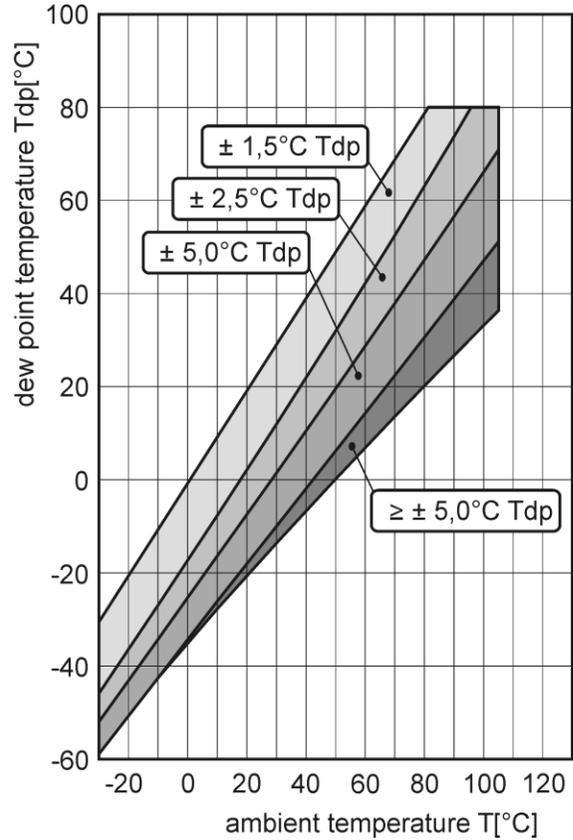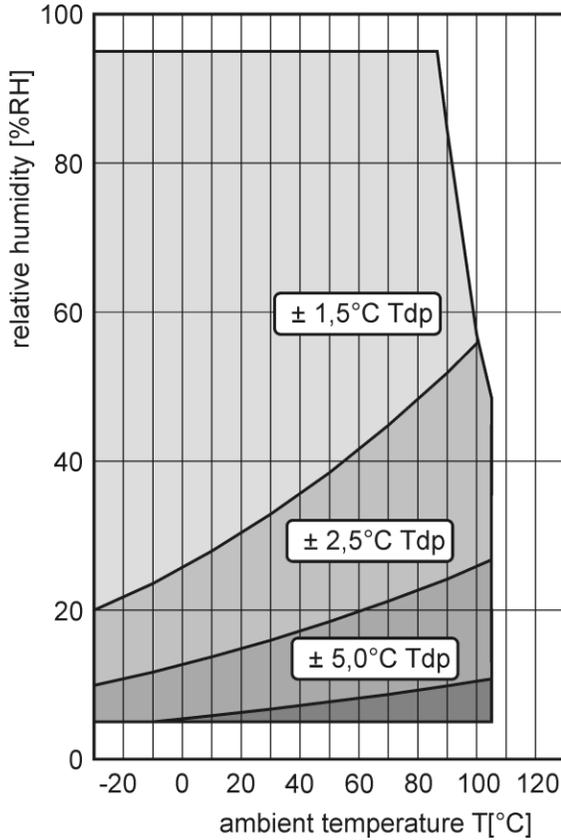
Absolute humidity
Range: 0 to 400 g/m^3
Accuracy: ±1,5 g/m^3 at ambient temperature T < 25°C (104 °F), for more details see graph below
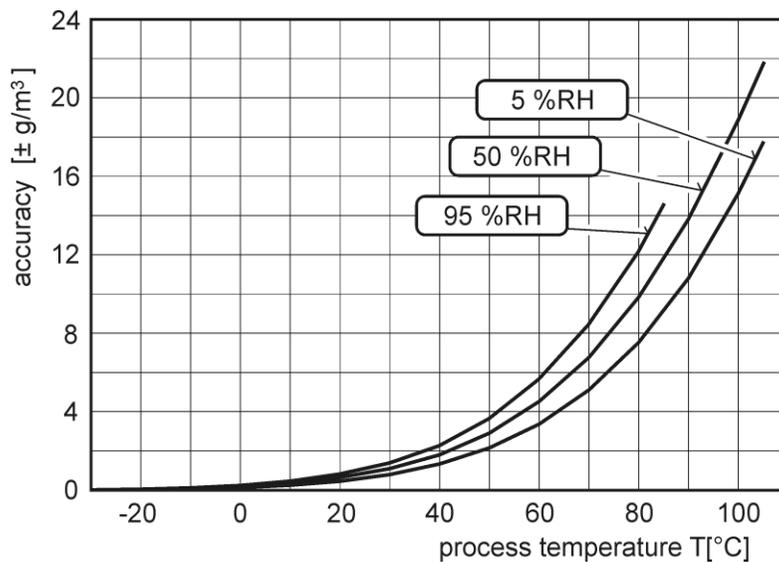
Specific humidity[4]
Accuracy: ±2g/kg at ambient temperature T < 35°C (95 °F)
Range: 0 to 550 g/kg

Mixing ratio[4]
Accuracy: ±2g/kg at ambient temperature T < 35°C (95 °F)
Range: 0 to 995 g/kg

Specific enthalpy[4]
Accuracy: ± 3kJ/kg at ambient temperature T < 25°C (77 °F)
Range: 0 to 995 kJ/kg [5]

Operating conditions

Operating temperature and relative humidity:
    electronics   -30 to +80 °C (-22 to 176 °F), 0 to 100 % RH (without condensation)
    probe: STRE-RACK, STRPE-RACK: -30 to +105 °C (-22 to 221 °F) probe cable included,
        0 to 100 %RH
    external probe for STE-RACK: by probe type (not included)
    It is recommended to switch off the LCD display at ambient temperatures above 70°C (158 °F) – around electronics.

Outer characteristics in accordance with Czech National Standard 33-2000-3:
    Normal environment with the specifications: AE1, AN1, AR1, BE1
Not allowed manipulations: It is not allowed to operate the device under conditions other than specified in technical parameters. Devices are not designed for locations with chemically aggressive environment. Temperature and humidity sensors must not be exposed to direct contact with water or other liquids. It is not allowed to remove the sensor cover to avoid any mechanical damage of the sensors.
Dimensions: see dimensional drawing
Weight: approximately:
    STE-RACK   1025g
    STRE-RACK/1m probe, STRPE-RACK/1m probe 1090g
    STRE-RACK/2m probe, STRPE-RACK/2m probe 1100g
    STRE-RACK/4m probe, STRPE-RACK/4m probe 1130g

End of operation

Device itself (after its life) is necessary to liquidate ecologically!

Technical support and service

The adjustment procedure is described at file „*Calibration manual.pdf*" which is installed commonly with the TSensor software.

Technical support and service is provided by distributor.

---

[4] This value depends on the atmospheric pressure. For computing is used constant value stored in device memory. Default value preset by manufacturer is 1013hPa and can be changed by user's software.
[5] This maximum is reached under conditions about 70°C/100%RH or 80°C/70%RH

Appendix A

Connection of external power relay

Coil data chart of external power relay:
  nominal voltage : max. 50V
  nominal power: max. 60VA
  current: max. 2A

Appendix B

This chapter contains basic information about connection of the detectors (optional accessories) to binary inputs of monitoring system. The detectors install in accordance with the attached instructions for use.

ATS-AC35 power detector

AC voltage presence sensor with optical indicator (green LED).

input voltage   : 230Vac/50Hz
power plug   : type C
response time   : approx. 1 sec

ATS-AC36 flood detector

This detector is a water flood indicator for cellars, bathrooms, …

ATS-AC32 optical smoke detector

This device is designed to detect the presence of fire inside residential or commercial buildings.
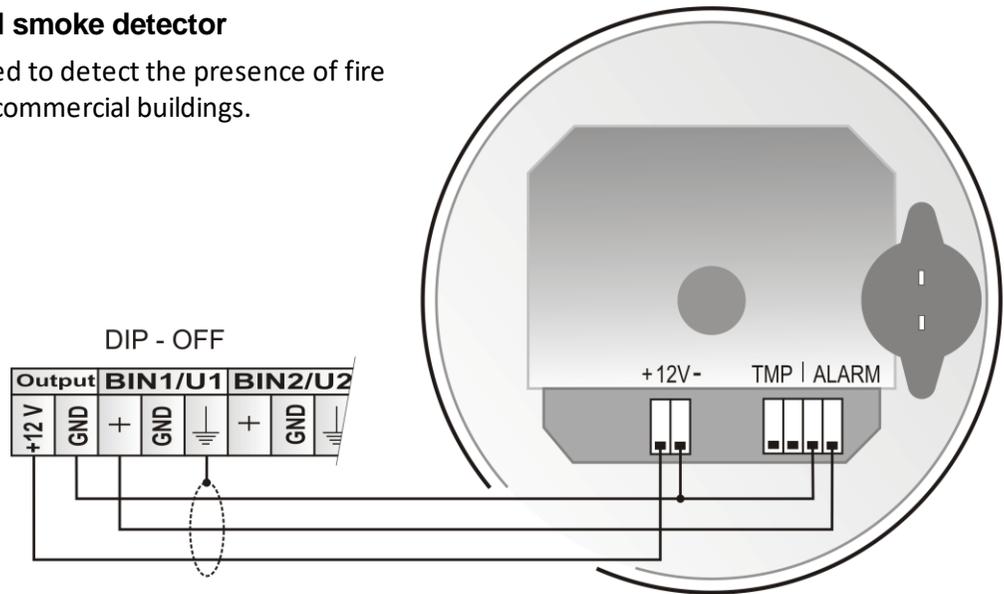
Notice: The connecting cables should be located as far as possible from the potential interference sources. The cable shield connect to "Shield" terminal of regulator only.