# COMET SYSTEM H5024 CO2 Concentration Transmitter with Relay Outputs Instruction Manual



Contents



## COMET SYSTEM H5024 CO2 Concentration Transmitter with Relay Outputs


## Product Information

The CO2 concentration, temperature, and humidity regulator is a device that measures and regulates the levels of CO2 concentration, temperature, humidity, and other calculated humidity variables. It comes in three models: H5021, H5024, and H6020. The device has two relay outputs and an LCD display for readings.

**Regulator Mounting and Connection**
The regulator should be mounted in a dry and clean location away from direct sunlight and sources of heat or cold. It should be connected to a power source using the provided lead-in cables. The device should only be connected and disconnected by a qualified person.

**Device Function and Setting**
The device has several functions and settings:

- Device setting from the manufacturer
- Relay outputs for controlling other devices
- CO2 concentration measurement
- Regulator preset for regulating CO2 concentration, temperature, and humidity levels

**Error States of the Device**
The device has several error states that can be identified through the LCD display. If an error occurs, refer to the user manual for troubleshooting steps.

**Readings on LCD Display**
The LCD display shows readings for CO2 concentration, temperature, humidity, and other calculated humidity variables. It also displays error messages if an error occurs.

**Preventive Maintenance and Calibration**
The device should be calibrated periodically to ensure accurate readings. Refer to the user manual for calibration instructions. Preventive maintenance should also be performed periodically to ensure proper functioning of the device. Technical Specification The device has several technical parameters, including common parameters, relative humidity and temperature restriction, and values computed from measured relative humidity and temperature. Refer to the user manual for detailed technical specifications.

**Appendices**

The user manual includes two appendices: Appendix A and Appendix B. Refer to these appendices for additional information and technical specifications.

## Product Usage Instructions

### Regulator Mounting and Connection

1. Choose a dry and clean location away from direct sunlight and sources of heat or cold to mount the regulator.
2. Connect the regulator to a power source using the provided lead-in cables.
3. Ensure that the device is only connected and disconnected by a qualified person.

### Device Function and Setting

Refer to the user manual for instructions on how to set the device functions, including device setting from the manufacturer, relay outputs, CO2 concentration measurement, and regulator preset.

### Error States of the Device

If an error occurs, refer to the user manual for troubleshooting steps.

### Readings on LCD Display

The LCD display shows readings for CO2 concentration, temperature, humidity, and other calculated humidity variables. Refer to the user manual for information on how to interpret these readings.

### Preventive Maintenance and Calibration

The device should be calibrated periodically to ensure accurate readings. Refer to the user manual for calibration instructions. Preventive maintenance should also be performed periodically to ensure proper functioning of the device.

## 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.
- Connect and disconnect correctly. Do not connect and disconnect 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.

### ABOUT COMPANY

- Models marked HxxxxZ are non-standard versions of the devices. Description is not included in this manual.

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- COMET System, Ltd makes constant development and improvement of all its products. That is why it reserves the right to make any technical changes on the device/product without previous notice.
- Manufacturer is not responsible for damages caused by using the device in conflict with this manual. To damages caused by using the device in conflict with this manual cannot be provided free repairs during the warranty period.
- Contact the manufacturer of this device:
  - COMET SYSTEM, s.r.o. Bezrucova 2901
  - 756 61 Roznov pod Radhostem Czech Republic
  - **www.cometsystem.com**

## General description

- The regulators are designed for online measurement of temperature (°C or °F), relative humidity and carbon dioxide concentration of air without aggressive ingredients. Measured temperature and relative humidity are recomputed to following humidity expression: dew point temperature, absolute humidity, specific humidity, mixing ratio and specific enthalpy.

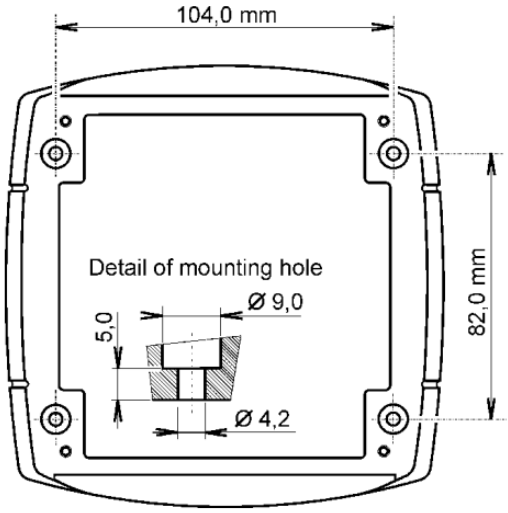
| Type | Temperature | Humidity | CO2 | Computed value |
|---|---|---|---|---|
| **H5021** | – | – | ✓ | – |
| **H5024** | – | – | ✓ | – |
| **H6020** | ✓ | ✓ | ✓ | ✓ |

- 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.
- Measured and computed values are optionally shown on dual line 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. On the left LCD side there are placed three LEDs for CO2 zone level indication.

## Regulator mounting and connection

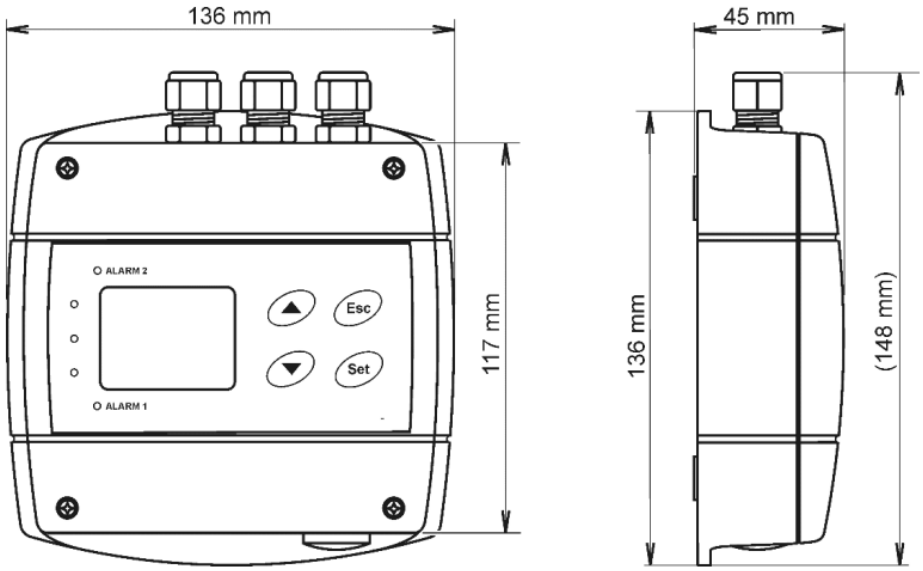
- Regulators are designed for wall mounting. Device must be mounted on the plane surface to prevent its deformation. Mounting holes and connection terminals are accessible after demounting of four screws in the corners of the box and removing the lid. There is recommended to use screws with half round head with cross-recessed screw ST 3.9 (DIN 7981). Unpack external probe for measuring the concentration of CO2 and connect to the device.
- Lace the lead-in cable with outer diameter of 3 to 6.5 mm through the glands at the case wall and connect them according schematic below. Terminals are self-clamping and can be opened by a suitable screwdriver. For the opening, insert the screwdriver to smaller terminal hole and lever by him. Do not forget to tighten glands and case lid with inserted packing after cables connecting.
- Insert attached plug into unused cable glands too. Do not connect the regulator under voltage.

- It is not recommended to use the H6020 regulator 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.
- Electrical system (wiring) may be done only by a worker with required qualification by rules in operation.

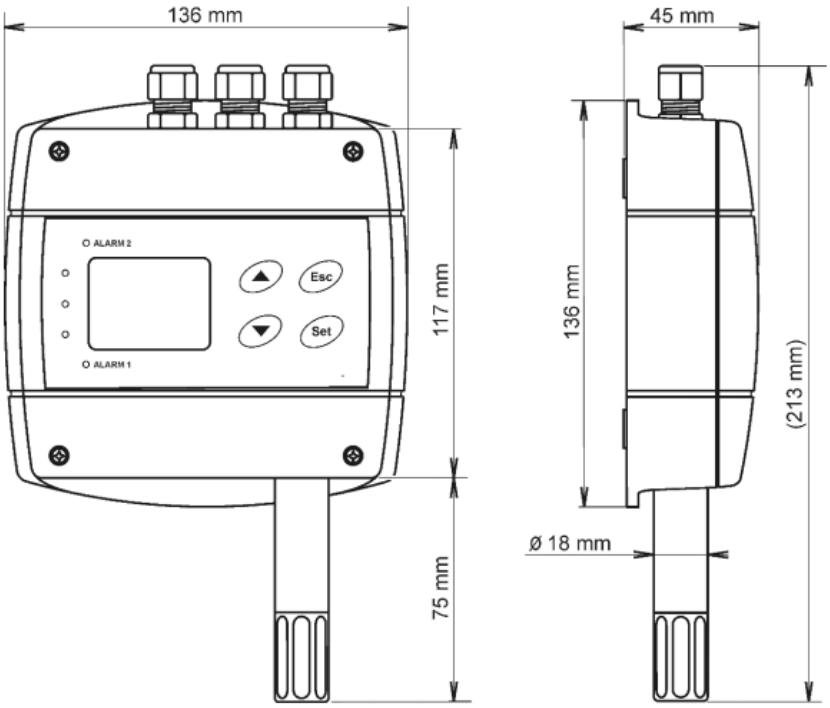



## Dimensions

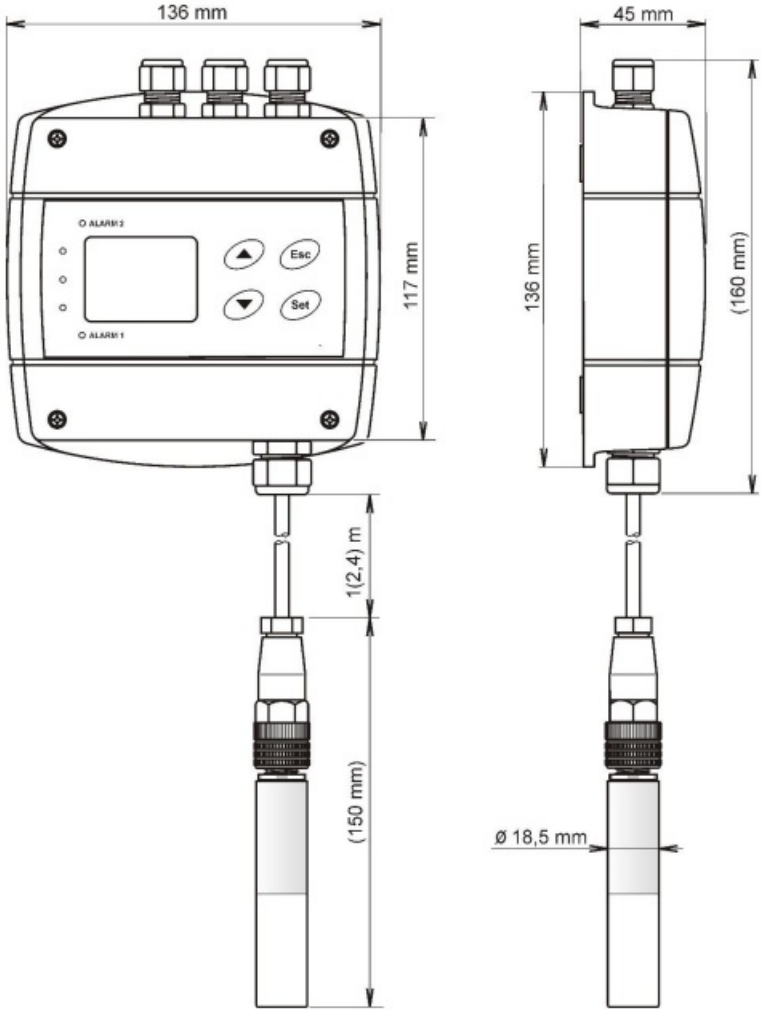
**H5024**



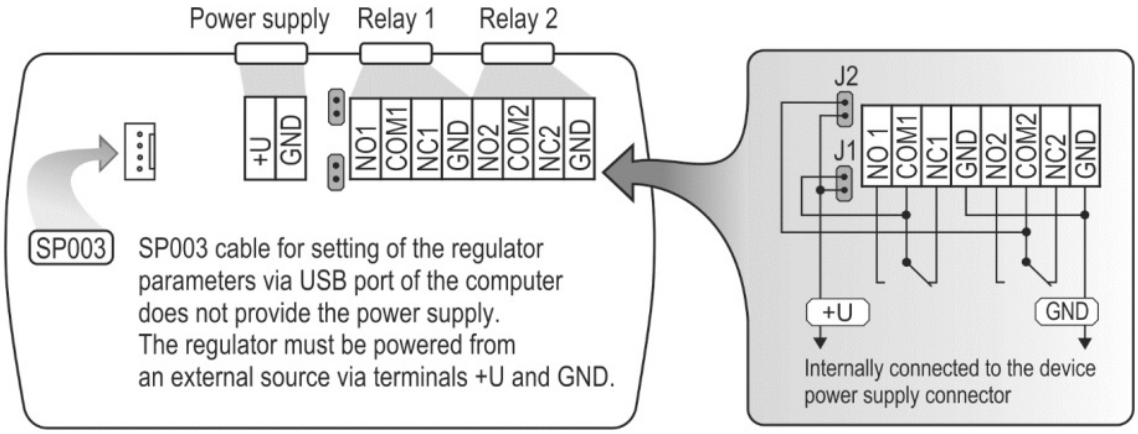
## H6020




## H5021




**Device connection**




## Description of device function and setting

### Device setting from the manufacturer

- **Value assigned to Relay1 and Relay2:** none
- P**assword for setting through keys:** 0000
- **LCD display:** on
- **value shown at first LCD line:** temperature / CO2 – by device type
- **value shown at second LCD line:** relative humidity / dew point temp. – by device type
- **temperature unit:** °C
- **computed value preset:** dew point temperature
- **relay response for error:** stay unchanged at previous condition
- **acoustic alarm:** off
- **LED indication:** up to 1000 ppm lights green LED, between 1000 and 1200 ppm lights yellow LED and over 1200 ppm lights red LED
- **altitude:** 300 m above sea level at the installation site

### Relay outputs

- Regulator is equipped with two relay outputs. It is possible to assign any input or computed value 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. Each relay status is indicated with LED diode and shown on LCD with corresponding symbols „ALARM 1“ or „ALARM 2“.
- Terminal block for connecting the relays is equipped with terminals GND, which are connected to the power supply of the device (see chapter “Device connection”). When you need to use relays to switching the voltage identical with the supply voltage of the device, you can use jumpers J1 and J2 for interconnection the power supply of the device directly with the common contacts of the relays. This modification is used in devices with serial number higher than 16981000 (the wiring diagram of the relay contacts for devices with serial number lower than 16981000 is given in the “Appendix B”).
- The devices are equipped with two relays that are not intended for direct switching power circuits or mains voltage. If necessary, use suitable type of external relay (an example of wiring is given in the “Appendix A”).

**Carbon dioxide concentration measurement**

- A multiple point CO2 and temperature adjustment procedure leads to excellent CO2 measurement accuracy over the entire temperature working range; this is a must for process control and outdoor applications. The dual wavelength NDIR CO2 sensing procedure compensates automatically for ageing effects. The CO2 module is highly resistant to pollution and offers maintenance free operation and outstanding long term stability. Measured values can be read in „SLOW mode“ (filtered, averaged) or in „FAST mode“ (current values without averaging). SLOW mode has advantages in applications like climate control because of filtering short time peaks. As an example exhaled air from an employee passing the sensor could affect the climate control negatively with a short response time because the control would trigger a change of the ventilation based on this one-time measurement. On the contrary in „FAST mode“ no software filter is used for calculating the output value. This fact adds a noise of typ. ±30 ppm which has to be considered in terms of accuracy. From the principle of measurement, the measured value of CO2 concentration depends on the value of air pressure – altitude at the installation site. For this reason, it is suitable for accurate measurement to set the altitude of the installation site by TSensor software.
- After power up there is internal check in progress and takes about 20 s. During this time LCD display shows (—-) instead of CO2 concentration value.
- Parameter setting description is into chapter “Extended setting mode” at page 10.

**Actual regulator preset**

It is possible to display actual regulator preset on its LCD display by pressing of „▲“ key. LCD shows information about Relay1 and then Relay2 setting step by step. Information about Relay1 are indicated with symbol „ALARM 1“, for Relay2 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 „Change of “Password for setting through keys” (PASS)“ at page 10. Following examples are for Relay1 setting, similarly are displayed values for Relay2. 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.

1. **Value assigned to output relay**

*None, relay is still off*


*Temperature at °C*


*Relative humidity*


*Computed value – dew point temperature*

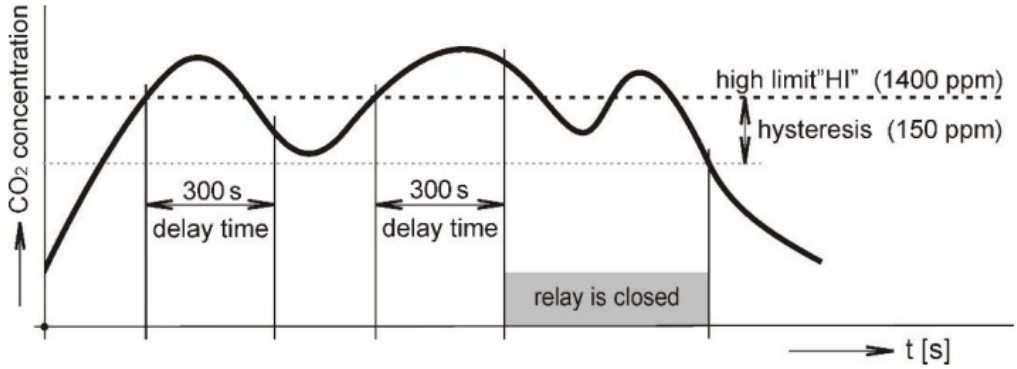

*$CO_2$ concentration*


2. **When close output relay**
   - **High limit „HI“ –** the relay closes when measured value exceeds preset „high limit” for longer time than preset „delay time“. Relay goes open when measured value decrease under „high limit“ value minus the „hysteresis” value. See example.

*High limit „HI“*

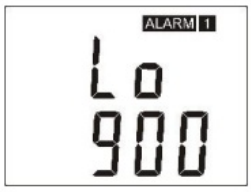

*Delay [s]*


*Hysteresis*

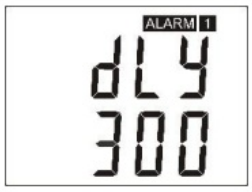




- **Low limit „Lo“ –** the relay closes when measured value falls below preset „low limit” for longer time than preset „delay time“. Relay goes open when measured value exceeds „low limit“ value plus the „hysteresis” value. See example.

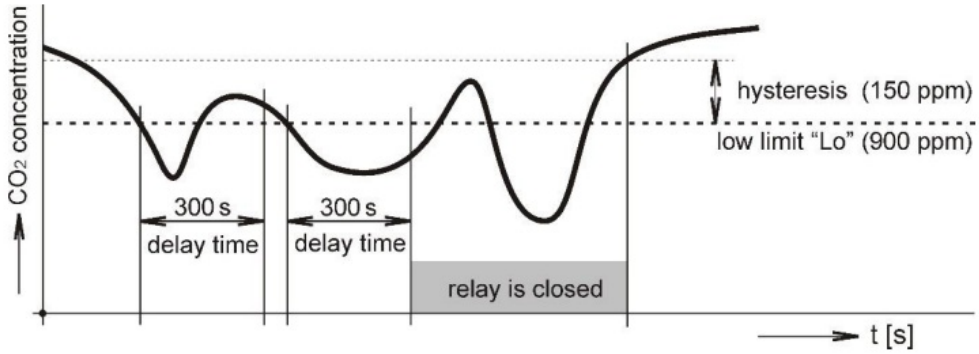
*Low limit „Lo“*




*Delay [s]*




*Hysteresis*


**Regulator setting change**

1. **Setting with PC and TSensor software**
   - Device adjustment is performed by means of optional SP003 communication cable connected to USB port of PC. It is necessary to have installed program TSensor on the PC (the program is available free to download at web page www.cometsystem.com). Run the program and follow the program instructions. Regulator includes hardware write protection of internal setting, new setting is possible to write only while:
     - during write period press „SET“ key – do requested setting in TSensor software, press „SET“ key on regulator and keep it down, then click on the button „Save Changes“ into TSensor software and after end of write release „SET“ key, or

- jumper placed nearby keys is closed (jumper is accessible after demounting of four screws in the corners of the box and removing the lid, don't confuse with jumper nearby Ethernet connector!). This jumper is suitable e.g. until device adjustment is in process and regulator is placed into calibration box and keys are not accessible. Don't forget to remove (open) jumper after procedure finish (restore write protection)

- TSensor software supports to make the adjustment of the regulator too. This procedure is described at file „Calibration manual.pdf" which is installed commonly with the software.

2. **Setting with using regulator keys**

   If „Actual regulator preset" is displayed, it is possible to enter into edit mode and edit displayed value by pressing „SET" key. 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 16. 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 regulator 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 regulator still works and changes are valid immediately after its storing – it is NOT necessary to restart regulator.

3. **Extended setting mode**

   - During regulator operation it is possible to change only parameters described in chapter "Actual regulator preset" at page 8. Rest of regulator parameters are available through "Extended setting mode". In this mode regulator does NOT communicate, does NOT do any measurements and does NOT service output relays. To leave this mode press „ESC" key and open jumper nearby keys. To enter into Extended setting mode do following steps:
     1. disconnect power supply
     2. demount four screws in the corners of the box and remove the lid
     3. closed jumper placed nearby keys (don't confuse with jumper nearby Ethernet connector)
     4. press „▲" and „▼" keys together and keep them down
     5. connect power supply to regulator – 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. 0400)
     6. 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.

- **Acoustic alarm assign to Relay1 (Relay2)**

*acoustic indication of Relay1 is OFF*


*close of Relay1 contact starts acoustic indication*


*acoustic indication of Relay2 is OFF*


*close of Relay2 contact starts acoustic indication*


- **Acoustic alarm deactivation**

*activated acoustic alarm is possible to deactivate by pressing „ESC“ key*


*acoustic alarm is still activated for all time and it is impossible to deactivate it*


- **Relay response for error**

Regulator continuously checks its state during operation. In case error of assigned value measurement is found then output relay:

*stays unchanged (in previous status)*


*Relay1 switch OFF*


*Relay1 switch On*


*stays unchanged (in previous status)*

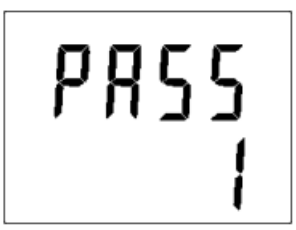

*Relay2 switch OFF*


*Relay2 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*




- **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*


- **CO2 measurement mode selection**

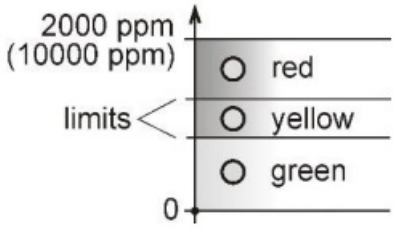
  This item provides to choice if measured value is displayed and read in “SLOW” or “FAST” mode. “FAST” mode provides last measured value without averaging; this means that no software filter is used for calculating the output value. “SLOW” mode provides value averaged from last 11 measured values.

*averaged value „SLOW“ mode*


*current value without averaging „FAST“ mode*


- **CO2 zone level indication setup**

  Whole measuring range can be divided into three areas. Each active area there is indicated by green, yellow or red LED depends on actual measured value. It is done by two boundary limits setting. „YELL“ limit sets boundary between green and yellow indication. It means that if actual measured value is lower than „YELL“ limit, there is green LED active. If actual measured value is higher than „YELL“ limit, then there is yellow LED active. Yellow LED lights until actual measured value exceeds „RED“ limit. If actual value is higher than „RED“ limit, red LED is active. If you don’t want to use this indication then set “YELL” limit to 0.




*„YELLOW“ limit setting*


*„RED“ limit setting*


- **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*


- **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*


- **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*


*don't show value on LCD*


- **Show CO2 concentration at LCD display**

  This item provides to choice if CO2 value 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*


- **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:

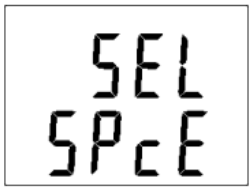
*dew point temperature*


*absolute humidity*


*mixing ratio*


*specific humidity*


*specific enthalpy*




**Restore to „Factory default“ – measurement part**
This item provides regulator 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
- **correction for altitude:** 0 hPa (absolute pressure)
- **computed value preset:** dew point temperature
- **relay response for error:** stay unchanged at previous condition
- **acoustic alarm:** off


*restore to factory default*


### 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 concentration of CO2) 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 CO2 concentration 9999 ppm 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 or CO2 concentration measurement error occurred. 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).
    - 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). At this state device does not measure temperature and relative humidity. This error does not affect CO2 concentration measurement. 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 CO2 concentration sensor initialization. Under this condition device does not measure concentration of CO2. Value read from device is -9999 (concentration of CO2). CO2 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.

## 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
- **CO2 ppm** – reading next to this symbol is measured concentration of CO2 or error state of value.
- **°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
- **3 –** this symbol is on if jumper is closed
  If specific enthalpy is selected, there is shown only value (number) without corresponding unit

**Preventive maintenance and calibration**
Pay heed to recommended calibration interval. Do not subject the device to mechanical stress.

## Technical specification

**Common parameters**

- **Power voltage:** 9 to 30 V DC
- **Power consumption:**
  - 1W during normal operation
  - 4W for 50ms with 15 s period
- **Measuring interval:**
  - temperature, relative humidity . . . . . 0,5s
  - CO2 concentration . . . . . 15s
- **Display switching interval:** 4 s (when more than two values are displayed)
- **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! (relay contact parameters: max 220Vdc, 125Vac, 2A, 60 W, 62.5 VA)
- **EMC:** EN 61326-1, EN 55011

**H5021 – CO2 regulator**

- **Concentration of CO2:**
  - **Accuracy:** ± (100 ppm + 5 % of measuring value) at 25°C (77°F) and 1013 hPa
  - **Range:** 0 to 10000 ppm
  - **Temperature dependence:** typ. 2 ppm CO2 / ºC in the range 0 to 50 ºC (32 to 122°F)
  - **Long term stability:** typ. 20 ppm / year
  - **Resolution:** 1 ppm
- **Response time:**
  - t90 < 195 s in „SLOW“ measurement mode
  - t90 < 75 s in „FAST“ measurement mode

**H5024 – CO2 regulator**

- **Concentration of CO2:**
  - **Accuracy:** ± (50 ppm + 2 % of measuring value) at 25°C (77°F) and 1013 hPa
  - **Range:** 0 to 2000 ppm
  - **Temperature dependence:** typ. 2 ppm CO2 / ºC in the range 0 to 50 ºC (32 to 122°F)
  - **Long term stability:** typ. 20 ppm / year
  - **Resolution:** 1 ppm
- **Response time:**
  - t90 < 195 s in „SLOW“ measurement mode
  - t90 < 75 s in „FAST“ measurement mode

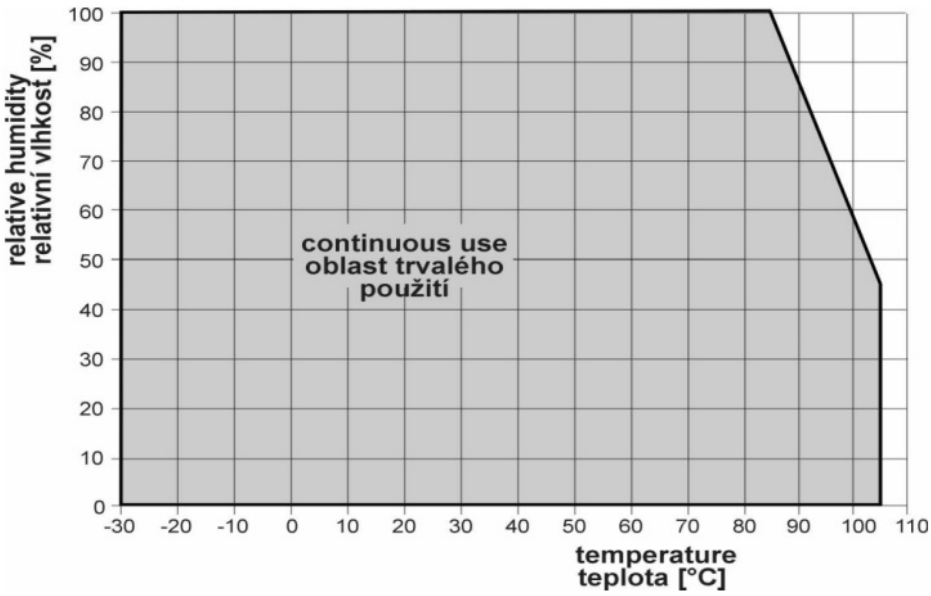
**H6020 – temperature, relative humidity and CO2 regulator**

- **Temperature:**

- **Accuracy:** ± 0,4 °C (±0,7 °F)
- **Range:** -30 to +60 °C (-22 to 140 °F)
- **Resolution:** 0,1 °C (0,2 °F)

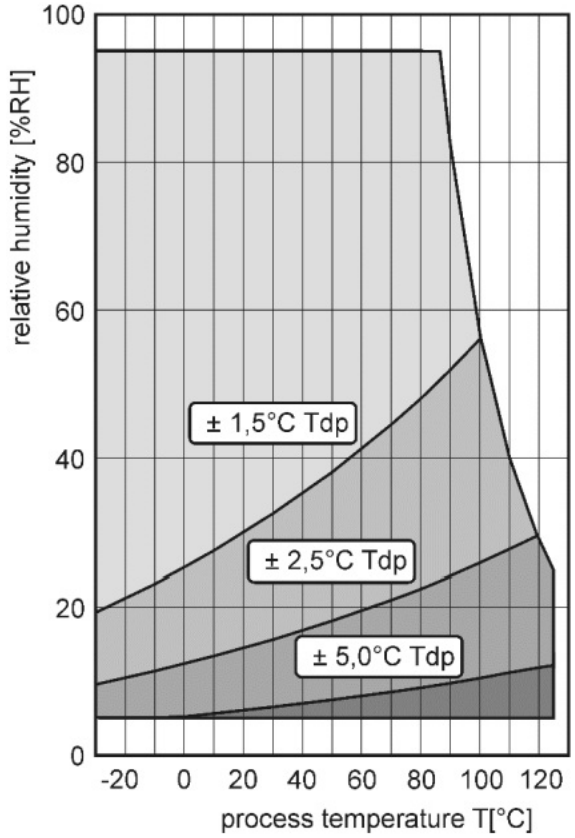
- **Relative humidity:**
  - **Accuracy:** ± 2,5 %RH from 5 to 95 %RH at 23 °C (73,4 °F)
  - **Range:** 0 to 100 %RH
  - **Resolution:** 0,1 %RH
- **Concentration of CO2:**
  - **Accuracy:** ± (50 ppm + 2 % of measuring value) at 25°C (77°F) and 1013 hPa
  - **Range:** 0 to 2000 ppm
  - **Temperature dependence:** typ. 2 ppm CO2 / ºC in the range 0 to 50 ºC (32 to 122°F)
  - **Long term stability:** typ. 20 ppm / year
  - **Resolution:** 1 ppm
- Measuring temperature and humidity range is limited in accordance with the graph below.
- Response time measurement of temperature and relative humidity with stainless steel mesh sensor cover (F5200B) and bronze sensor cover (F0000 – selectable option), air flow approximately 1 m/s:
  - **temperature:** t90 < 6 min (temperature step 20 °C (36 °F))
  - **relative** h**u**m**i**dity: t90 < 30 s (humidity step 65 %RH, constant temperature)
- **Response time measurement of CO2 concentration:**
  - t90 < 195 s in „SLOW“ measurement mode
  - t90 < 75 s in „FAST“ measurement mode

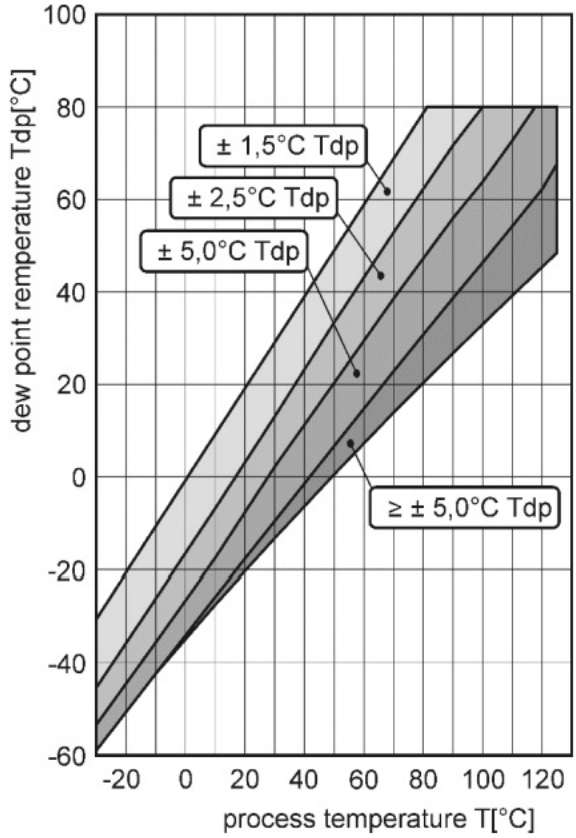
**Relative humidity and temperature restriction**



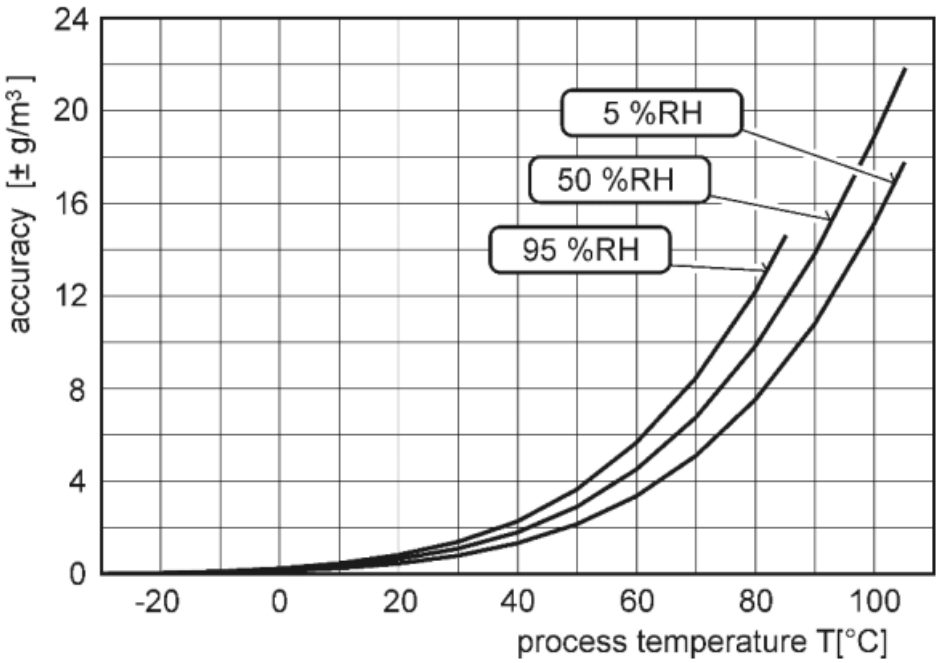

**Value computed from measured relative humidity and temperature**

- **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/m3
  - **Accuracy:** ±1,5 g/m3 at ambient temperature T < 25°C (104 °F), for more details see graph below




- **Specific humidity1**
  - **Accuracy:** ±2g/kg at ambient temperature T < 35°C (95 °F)
  - **Range:** 0 to 550 g/kg
- **Mixing ratio1**
  - **Accuracy:** ±2g/kg at ambient temperature T < 35°C (95 °F)
  - **Range:** 0 to 995 g/kg
- **Specific enthalpy1**
  - **Accuracy:** ± 3kJ/kg at ambient temperature T < 25°C (77 °F)
  - **Range:** 0 to 995 kJ/kg 2

The values computed from ambient temperature and relative humidity including their accuracy you can exactly determine by the program Conversions. It is free to download at **www.cometsystem.com**.

## Operating conditions

- **Operating temperature range:**
  - **electronics H5021:** -30 to +80 °C (-22 to 176 °F)
  - **electronics H5024, H6020:** -30 to +60 °C (-22 to 140 °F)
  - **measuring end of stem H6020:** -30 to +80 °C (-22 to +176 °F)
  - **CO2 probe H5021:** -40 to +60 °C (-40 to +140 °F)
    It is recommended to switch off the LCD display at ambient temperatures above 70°C (158 °F) around electronics.
- **Operating humidity range:**
  - **H5021:** 0 to 100 % RH (no condensation)
  - **H5024,** H6020: 5 to 95 % RH (no condensation)
- **Operating pressure range: 850 to 1100 hPa**
- **Protection:**
  - H5021 IP65 (electronics), IP65 (CO2 probe)
  - H5024 IP65 (electronics)
  - H6020 IP30 (electronics), IP40 (measuring end of stem)
- **Other environmental conditions (external influences) according to HD 60364-5-51:** normal
- **Recommended calibration interval:**
  - H5021 5 years (CO2)
  - H5024 5 years (CO2)
  - H6020 5 years (CO2), 1 year (relative humidity), 2 years (temperature)
- **Working position:**
  - H5021 negligible
  - H5024 with cable glands upwards
  - H6020 with sensor cover downwards
- **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.
- **Storage conditions:**
  - **temperature:** -40 to +60 °C (-40 to 140 °F)
  - **relative humidity:** 5 to 95 % RH (no condensation)
  - **atmospheric pressure:** 700 až 1100 hPa
- **Dimensions:** see dimensional drawings
- **Weight:** approximately:
  - H5021/1m probe 420 g
  - H5021/2m probe 450 g
  - H5021/4m probe 510 g
  - H5024 330 g

    - H6020 350 g
- **Material of the case:** ASA/ABS

**End of operation**
Disconnect the device and dispose it according to current legislation for dealing with electronic equipment.

**Technical support and service**

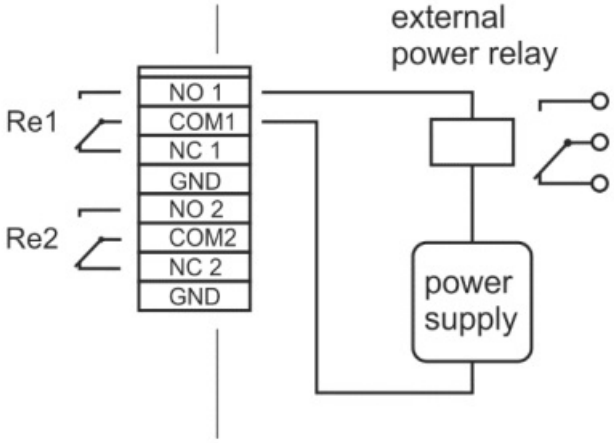
- The adjustment procedure is described at file „Calibration manual.pdf“ which is installed commonly with the TSensor software.
- Technical support and service is provided by distributor. For contact see warranty certificate. You can use discussion forum at web address: **http://www.forum.cometsystem.cz/**.

## Appendix

**Appendix A**

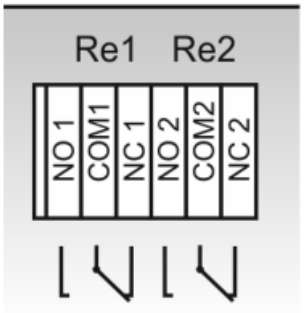
**Connection of external power relay**

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




**Appendix B**

Wiring diagram of relay contacts for devices with serial number lower than 16981000.



## Documents / Resources

| | |
|---|---|
|  | COMET SYSTEM H5024 CO2 Concentration Transmitter with Relay Outputs [pdf] Instruction Manual<br>H5024 CO2 Concentration Transmitter with Relay Outputs, H5024, CO2 Concentration Transmitter with Relay Outputs, Transmitter with Relay Outputs, Relay Outputs |

## References

- Manufacturer of Dataloggers, Thermometers, Hygrometers,CO2 meters
- Manufacturer of Dataloggers, Thermometers, Hygrometers,CO2 meters
- Comet system forum