

**Symaro™**  
**Flush-mount room sensors KNX S-Mode /**  
**KNX LTE-Mode / KNX PL-Link**  
**AQR253... AQR257...**  
**Technical principles**

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# Contents

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<b>1</b>	<b>About this document</b> .....	<b>5</b>
1.1	Revision history.....	5
1.2	Before you start.....	5
1.2.1	Trademarks.....	5
1.2.2	Copyright.....	5
1.2.3	Quality assurance.....	5
1.2.4	Use of documents/ Request to the reader.....	5
1.3	Abbreviations and naming conventions.....	6
1.3.1	Abbreviations.....	6
1.3.2	Naming convention.....	6
1.4	Reference documents.....	6
<b>2</b>	<b>Device</b> .....	<b>7</b>
2.1	Type summary.....	7
2.2	Equipment combinations.....	7
2.3	Variant and device parts.....	8
2.4	Service and connection elements.....	8
2.4.1	Adhesive address labels.....	9
2.5	Dimensions.....	10
2.6	Environmental compatibility, disposal.....	12
<b>3</b>	<b>Safety and EMC optimization</b> .....	<b>13</b>
3.1	Notes on safety.....	13
3.2	Device-specific regulations.....	13
3.3	Notes on EMC optimization.....	14
<b>4</b>	<b>Mounting and electrical installation</b> .....	<b>15</b>
4.1	Mounting.....	15
4.2	Electrical installation/cabling.....	15
<b>5</b>	<b>Functionality / Use</b> .....	<b>17</b>
5.1	Basics.....	17
5.1.1	System environment.....	17
5.1.2	Engineering and commissioning documentation.....	17
5.2	Purpose.....	17
5.3	Functions.....	18
5.4	Application examples.....	20
5.4.1	Room temperature control.....	20
5.4.2	Room temperature control with demand-controlled ventilation.....	21
5.4.3	Room temperature, humidity, and air quality control (KNX LTE-Mode, Synco 700).....	22
<b>6</b>	<b>GAMMA building management systems</b> .....	<b>24</b>
6.1	Engineering.....	24
6.2	Commissioning.....	24
6.3	KNX S-Mode data points.....	24
6.3.1	Room temperature sensor & controller.....	25
6.3.2	Room humidity sensor & controller.....	25

6.3.3	Room air quality sensor & controller .....	26
6.3.4	Universal temperature sensor .....	27
6.3.5	Binary inputs.....	27
6.3.6	Fault information .....	28
6.4	Parameter description .....	29
6.4.1	Basic configuration.....	29
6.4.2	Room temperature sensors.....	29
6.4.3	Universal temperature sensor .....	30
6.4.4	Room temperature controller .....	30
6.4.5	Room humidity sensor .....	31
6.4.6	Room humidity controller .....	31
6.4.7	Room air quality sensor .....	32
6.4.8	Room air quality controller .....	32
6.4.9	Binary inputs.....	33
<b>7</b>	<b>Synco building automation and control system.....</b>	<b>36</b>
7.1	Engineering .....	36
7.2	Commissioning.....	36
7.3	Parameter description .....	37
7.3.1	General parameters .....	37
7.3.2	Communication .....	37
7.3.3	Room temperature sensors.....	38
7.3.4	Universal temperature sensor .....	38
7.3.5	Room humidity sensor .....	38
7.3.6	Room air quality sensor .....	38
7.3.7	Binary inputs.....	38
7.3.8	Faults.....	38
<b>8</b>	<b>Desigo building automation and control system.....</b>	<b>39</b>
8.1	Engineering .....	39
8.2	Commissioning.....	39
8.3	Parameter description .....	40
8.3.1	General parameters .....	40
8.3.2	Functions.....	40
8.3.3	Communication .....	41
8.3.4	Room temperature sensors RTS .....	41
8.3.5	Universal temperature sensor GPTS .....	41
8.3.6	Room humidity sensor RRHS .....	41
8.3.7	Room air quality sensor RAQS .....	42
8.3.8	Binary inputs.....	42

# 1 About this document

## 1.1 Revision history

Version	Date	Changes	Section	Pages

## 1.2 Before you start

### 1.2.1 Trademarks

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Trademark(s)	Legal owner
KNX®	KNX Association, B - 1831 Brussels-Diegem Belgium <a href="http://www.knx.org/">http://www.knx.org/</a>

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- All necessary corrections are included in subsequent versions.
- Documents are automatically amended as a consequence of modifications and corrections to the products described.

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## 1.3 Abbreviations and naming conventions

### 1.3.1 Abbreviations

Abbr.	Description
ABT	Automation Building Tool used for engineering with Desigo™ Total Room Automation (TRA). (KNX PL-Link)
ACS790	Engineering Tool for Synco devices (KNX LTE-Mode)
Desigo TRA	Total Room Automation (part of Desigo V5)
ETS	Engineering Tool Software (KNX S-Mode) <a href="http://www.knx.org/">http://www.knx.org/</a>
KNX LTE-Mode	Communication with KNX LTE-Mode (Logical Tag Extended Mode)
KNX PL-Link	Communication with PL-Link (Peripheral Link)
KNX S-Mode	Communication with KNX S-Mode (System Mode)
SSA	Setup & Service Assistant

### 1.3.2 Naming convention

The term "room sensor" in this document always refers to types AQR257... (base modules) and AQR253... (front modules).

## 1.4 Reference documents

The following documents are available at <http://www.siemens.com/bt/download>

- [1] Data sheet for flush-mount room sensors KNX AQR253..., AQR257... ([N1411](#))
- [2] Mounting instructions for flush-mount room sensors AQR253..., AQR257... ([M1411](#))
- [3] KNX bus ([CE1N3127](#))
- [4] KNX Standard, Volume 3: System Specifications, Part 7, Chapter 2: Data Point Types (<http://www.knx.org/>)
- [5] Service- and Operating software ACS790 ([CE1N5649](#))
- [6] ABT online help

## 2 Device

### 2.1 Type summary

Product number		Measured variables				Inputs		
Base module	+	Front module	CO <sub>2</sub>	Relative humidity	Temperature	Air quality indication	Passive temp. sensor NTC 10k	2 potential-free contacts
AQR2570Nx	+	AQR2530NNW	-	-	-	-	X	X
AQR2570Nx	+	AQR2532NNW	-	-	X	-	X	X
AQR2570Nx	+	AQR2533NNW	-	X	-	-	X	X
AQR2570Nx	+	AQR2535NNW	-	X	X	-	X	X
AQR2576Nx	+	AQR2530NNW	X	-	-	-	X	X
AQR2576Nx	+	AQR2532NNW	X	-	X	-	X	X
AQR2576Nx	+	AQR2533NNW	X	X	-	-	X	X
AQR2576Nx	+	AQR2535NNW	X	X	X	-	X	X
AQR2576Nx	+	AQR2535NNWQ	X	X	X	X	X	X

Replace x by:

- F for CEE/VDE
- H for British Standard
- G for Italian Standard
- J for UL Standard

An installed sensor comprises front module, base module and mounting plate as well as separate-order design frame. Both front and base module can be combined as needed:

### 2.2 Equipment combinations

The room sensors are KNX certified and can be connected to all suitable KNX devices, provided the corresponding data points are available.

The room sensors can be used with the following building automation and control systems:

- GAMMA Building Management Systems / third-party devices (KNX S-Mode)
- Synco 700 (KNX LTE-Mode)
- Desigo™ Total Room Automation (TRA) V5.1 (KNX PL-Link)

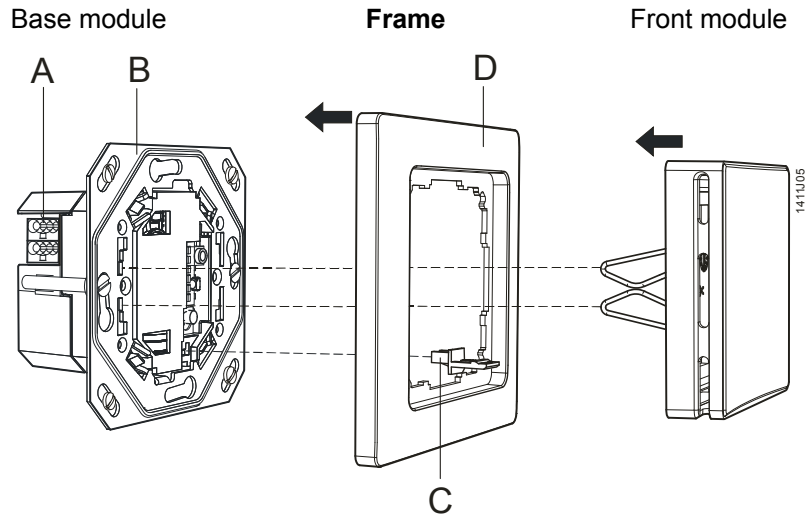
Suitable device examples are provided in data sheet [1].

## 2.3 Variant and device parts

The room sensor comprises:

- One base module with snapped-on mounting plate.
- One design frame (ordered as separate accessory) and
- One front module.

The sensing elements are located in either the base or the front module (see "Type summary").



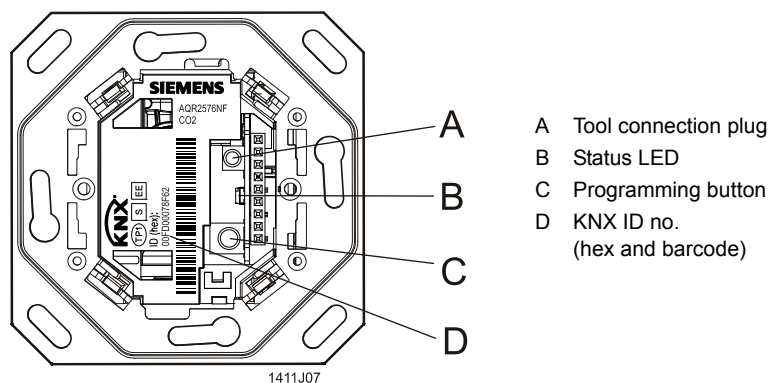
- A KNX bus connection terminals
- B Mounting plate
- C Anti-theft device
- D Design frame

## 2.4 Service and connection elements

Service and connection elements

The service elements program button with LED and the tool connection plug as well as printed KNX ID are available on the base module.

The base module also contains the measuring circuit and the connection terminals on the rear.

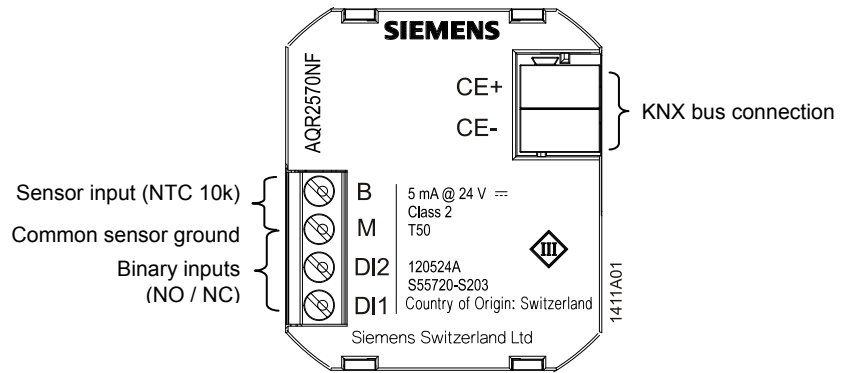


- A Tool connection plug
- B Status LED
- C Programming button
- D KNX ID no.  
(hex and barcode)

The service element functions are described in Section Commissioning.



## Connection terminals



### 2.4.1 Adhesive address labels

The devices are supplied with peel-off adhesive address labels containing the unique KNX ID as alphanumeric and barcode display.

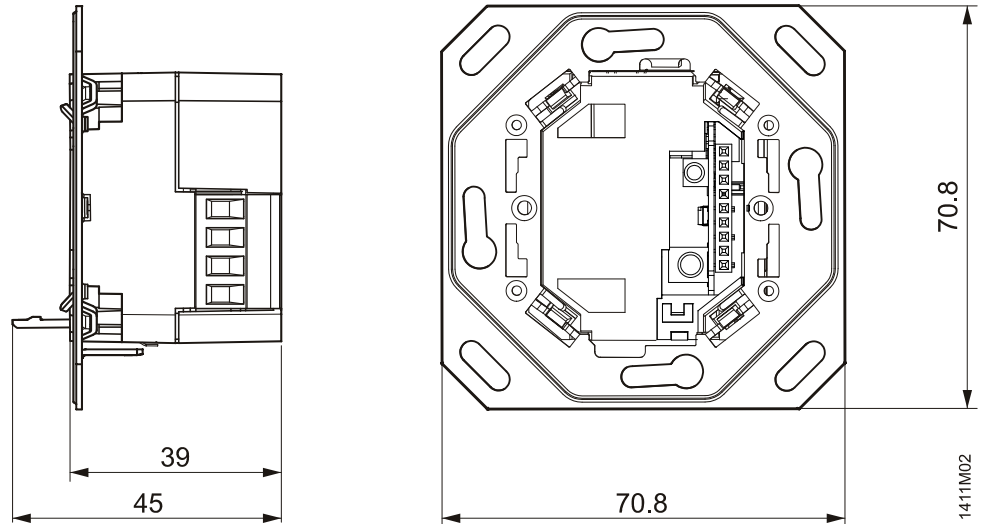


## Simplifying engineering and commissioning

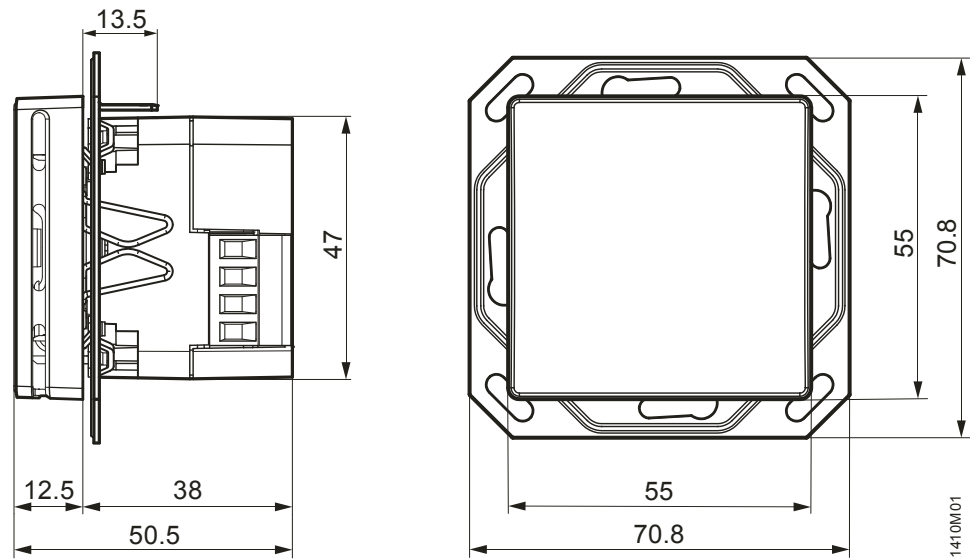
The address label can be peeled off the device during mounting and stuck to a floor plan or similar. The floor plan thus contains the assignment of KNX IDs and physical installation location. This greatly simplifies the following steps. In addition, the procedure serves as the basis for the recommended engineering and commissioning process. If the adhesive labels are lost, all information is still available in printed form on the housing.

## 2.5 Dimensions

### Base module

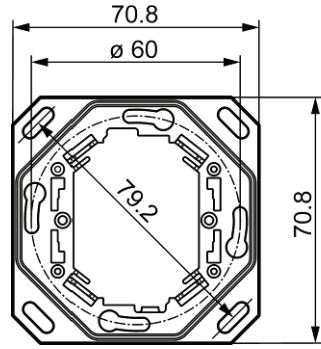


### Front and base module (assembled without design frame)

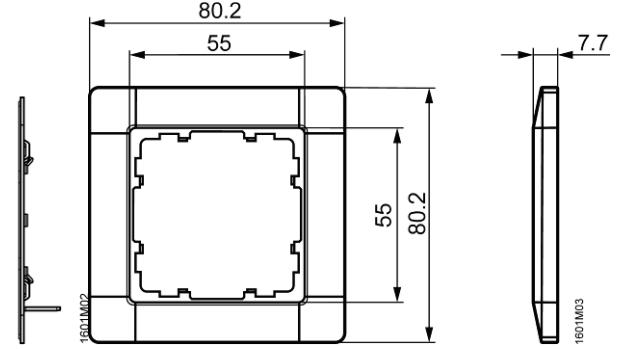


**Mounting plate and design frame**

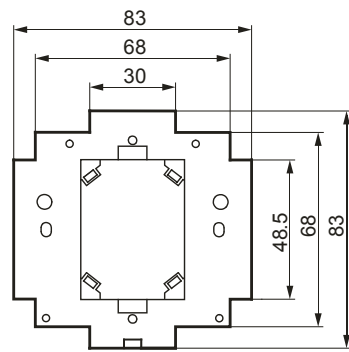
Mounting plate "CEE/VDE" (square):



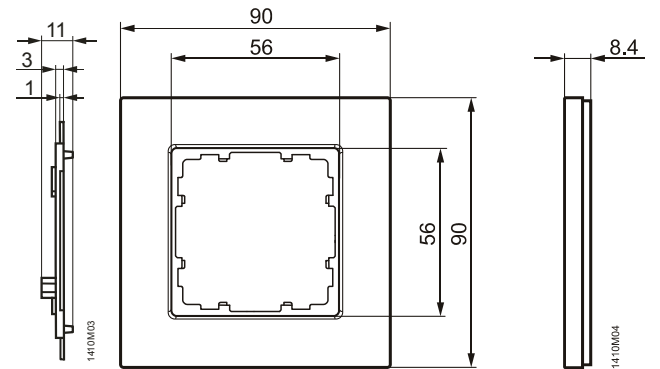
DELTA line design frame:



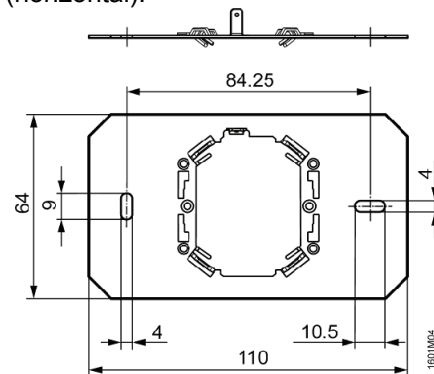
Mounting plate "British standard" (square):



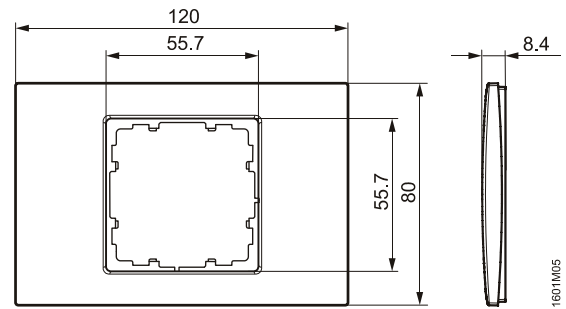
DELTA miro<sup>1</sup> design frame:



Mounting plate "3 Modular" (horizontal):



DELTA azio design frame:



Mounting plate "UL" (vertical):  
Dimensions as for mounting plate "3 Modular" (see above) but vertical.

DELTA azio design frame:  
Dimensions as for DELTA azio design frame (see above), but vertical.

<sup>1</sup> DELTA miro glass not compatible with mounting plate "British standard"

## 2.6 Environmental compatibility, disposal

### General notes

This device was developed and manufactured with environmentally compatible materials and procedures complying with all relevant environmental standards. Note the following to dispose of the product following its useful life or in case of replacement:

- Do not dispose of the device as part of standard household garbage, but as special waste from plastic and steel, ferrite-magnet components.  
This applies in particular to the PCB.
- For this reason, dispose of the components compatible with current environmental, recycling, and disposal technologies.  
**Observe all local, applicable laws.**
- The aim is to reuse as much of the basic materials as possible at the lowest possible environmental impact. To this end, note any material and disposal notes in individual components.

### Environmental declaration

The product environmental declaration CE1E1411en contains data on environmentally compatible product design and assessments (RoHS compliance, materials composition, packaging, environmental benefit, disposal)

## 3 Safety and EMC optimization

### 3.1 Notes on safety



Please comply with these notes

 General regulations

This section explains general and system-specific regulations for mains and operating voltages. It includes important information for your safety and the safety of the entire plant.

Please comply with the following general regulations during engineering and execution:

- Electrical and mains power ordinances for the given country.
- Other applicable, national regulations.
- Building installation regulations for the given country.
- Regulations of the utility company.
- Diagrams, cable lists, dispositions, specifications, and orders by the customer or authorized engineering office.
- Third-party regulations, e.g. by the general contractor or building owner.

Safety

The electrical safety for building automation and control systems by Siemens is essentially based on **safely separating low voltage from mains voltage**.

### 3.2 Device-specific regulations

**KNX bus supply**

Note permissible line lengths and topologies when planning and installing room controllers and field devices featuring KNX bus connection. Make sure the bus supply complies with the KNX standard.



Warning, maintenance

**Do not open the device.**

The device is maintenance free. Only the manufacturer can maintain the device.

### 3.3 Notes on EMC optimization

Setting up cable ducts	When setting up cable ducts, separate strongly interfering cables from susceptible entities.
Cable types	<ul style="list-style-type: none"><li>• Interfering cables: Motor cables especially from motors supplied by inverters, energy-supplying cables.</li><li>• Susceptible entities: Control cables, low voltage cables, interface cables, LAN cables, digital and analog signal cables.</li></ul>
Separate cables	<ul style="list-style-type: none"><li>• Both types of cables may be in the same cable duct, but in separate compartments.</li><li>• If no three-sided, closed duct with separating wall is available, the interfering cables must be separated by at least 150 mm from the others or placed in separate ducts.</li><li>• Crossings of strongly interfering cables with possibly susceptible entities must be at a right angle.</li><li>• In exceptional cases, signal and interfering power cables may be run in parallel, resulting in a high interference risk.</li></ul>
Unscreened cables	We recommend to generally use unscreened cables. Comply with the manufacturer's installation recommendations for selecting unscreened cables. In general, <b>unshielded twisted pair cables</b> have sufficient EMC properties for technical building applications (including data applications) and do not require consideration of coupling to surrounding earth.

## 4 Mounting and electrical installation

### 4.1 Mounting

Comply with the following notes as well as the mounting instructions [2] to mount the room sensor.

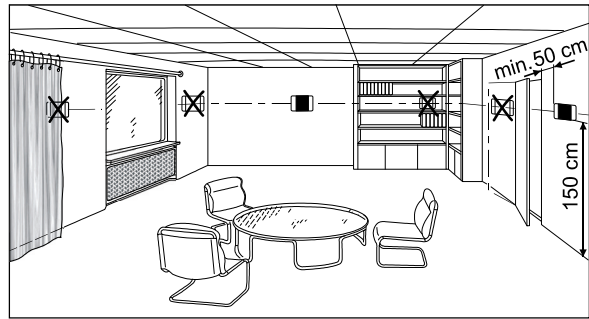
Ambient conditions

Note the permissible ambient temperature and humidity. See data sheet [1] for environmental conditions.

Mounting location

Sensor mounted on interior wall of room to be conditioned:

- At ca. 1.5 m height in the room and at least 50 cm from the next wall.
- Not on outside walls.
- Not in niches or behind curtains.
- Not above or near heat sources or shelves.
- Not on walls covering heat sources such as a chimney.
- Not in the radiation range of heat sources and lighting bodies e.g. spotlights.
- Not in areas exposed to direct solar radiation.



### 4.2 Electrical installation/cabling

The device is designed for flush-mounted cabling.

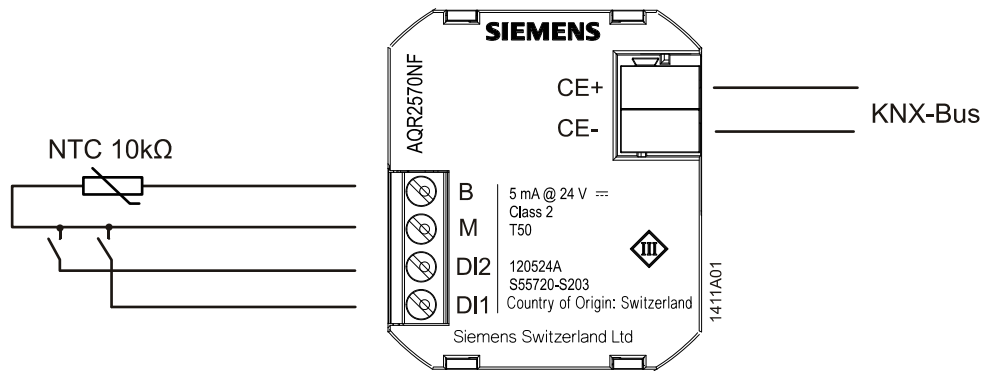
Run the cables from the wall outlet to the room sensor base module.

- Use only suitable cables for the KNX bus.
- Do not swap the wires for the KNX cable.
  - Red terminal is for CE +
  - Gray terminal is for CE –
- Comply with local installation regulations.
- Use a flat plug to connect the ground cable in the box (in case of switch or mains plug in the same box).
- **The device is not protected against inadvertent connection to AC 230 V.**



**Caution**

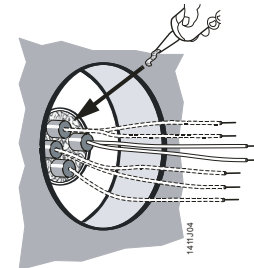
## Connection diagram



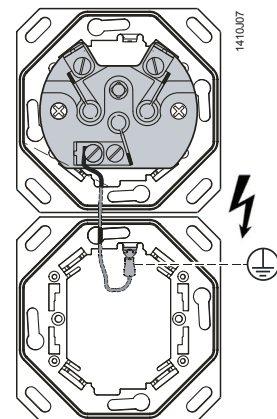
Maximum line length for universal temperature sensors and binary inputs: 10 m

## Base module connection

Seal the end of the installation conduit to prevent false measurements due to air drafts.



Comply with the various regulations on separating various voltage levels when mounting the temperature sensor (with safety extra-low voltage protection) alongside the recessed conduit boxes connected to the low-voltage power. In this case, the mounting frame must be connected to the protective ground wire with a flat plug connector plug designed for grounding.



## Bus cabling

Information in topology and addressing in KNX networks is available in document KNX bus [3]. The following information requires electrical installation as per the KNX-TP1 standard.



# 5 Functionality / Use

## 5.1 Basics

### 5.1.1 System environment

Prerequisites

For engineering and commissioning, sound knowledge of KNX networks as well as sufficient knowledge of working with ETS, ACS790, or ABT depending on system environment is a prerequisite.

System environments and associated tools:

System/Network environment	Engineering and commissioning tool(s)
KNX PL-Link	ABT, SSA
KNX LTE-Mode	Synco ACS790
KNX S-Mode	ETS

- For ACS: An interface converter, e.g. OCI700 (part of service tool OCI700.1) is required to connect a PC with USB interface to a KNX network.
- For ETS: An IP-interface, e.g. N148/22 (5WG1 148-1AB22), is required to access a KNX network via internet protocol (IP).
- The base modules AQR257... are supplied with the physical address 0.2.255 (default address).

### 5.1.2 Engineering and commissioning documentation

Engineering and commissioning documentation

We recommend documenting and storing all planning data and settings to ensure easy reuse even after an extended period of time or change of responsibilities. Clear documentation is required especially in case of calculated or customized settings. In KNX S-Mode systems, ETS for example can be used for this purpose.

## 5.2 Purpose

The room sensor is used in heating, ventilating and air conditioning plants to optimize comfort and energy consumption via demand-controlled ventilation.

The room sensor records:

- CO<sub>2</sub> concentration in rooms with varying occupancy due to time or number of people such as in museums, movie theaters, offices, meeting rooms, class rooms, auditoriums, hospitals, living spaces.
- Relative room humidity.
- Room temperature.
- A second room temperature for averaging, or floor or ceiling temperature.

The room sensor helps control:

- Room temperature via PID controller.
- Air quality
- Humidity

as well as

- Switching of electrical equipment
- Switching and dimming of lights
- Control solar protection systems
- Monitor window contacts

## 5.3 Functions

The room sensor allows for measuring the room temperature, relative humidity, and CO<sub>2</sub> concentration in the room. An additional, passive temperature sensor can be connected to measure another temperature. The binary inputs of the room sensor detect the status of up to two connectable, potential-free contacts. As a result, up to four measured values and two states can be transmitted to other members of the building automation and control system via KNX bus.

Integrated control functions for room temperature and ventilation allow for immediate control of suitable actuators to control heating, cooling, and ventilation.

### Temperature (AQR2532..., AQR2535...)

The room sensor measures the room temperature via an integrated sensing element. The room temperature can be transmitted to other bus members and serves in KNX S-Mode as control variable of the integrated room temperature controller. If an additional, passive room temperature sensor is connected to the base module, the second measured room temperature can be averaged with the internally measured room temperature.

(AQR257...)

Each base module has an input for a passive NTC 10k sensing element. The measured temperature can be transmitted to the bus members depending on the selected sensor type as either a room temperature, weighted from 100%:0% to 0%:100% (ext.:int.) or as a universal temperature, e.g. floor or ceiling temperature.

### Relative humidity (AQR2533..., AQR2535...)

The room sensor acquires the relative humidity in the room with the aid of a humidity sensing element integrated in the front module. The relative room humidity can be transmitted to other bus members and serves in KNX S-Mode as control variable of the integrated ventilation controller.

### CO<sub>2</sub> concentration (AQR2576...)

The room sensor determines the CO<sub>2</sub> concentration via infrared absorption measurement (NDIR). The sensor provides exact measurements at all times and does not require maintenance or recalibration thanks to an integrated, stable reference light source. The CO<sub>2</sub> concentration can be transmitted to other bus members and serves in KNX S-Mode as control variable of the integrated ventilation controller.

### Air quality indication



(AQR2535...Q)

The background-lit symbol informs on the current level of CO<sub>2</sub> in the room. The colors **green** / **orange** / **red** of the background lighting indicate **good** / **mediocre** / **poor** air quality. The display can be switched on or off by another bus member, e.g. switch or timer.

### Binary inputs (AQR257...)

The room sensor acquires the states of up to two potential-free contacts. The two inputs can be parameterized freely to switch and dim lighting as well as control solar protection plants via suitable actuators. At the same time, window contacts, for example, can also be monitored. The states are transmitted to other bus members.

### Control functions (AQR257..., KNX S-Mode)

The room sensors can be connected to suitable KNX S-Mode heating, ventilating, and air conditioning actuators via integrated control functions for room temperature, humidity, and air quality.

A proven PID controller for heating and cooling in KNX S-Mode is provided to control the room temperature. The controller supplies a continuous or a pulse-width-modulated PID signal for one heating and cooling actuator each. The room temperature setpoints for the two operating modes heating and cooling as well as a blocking object can be received from the bus. Changeover to the operating mode Heating/Cooling is automatic. Preset control parameters, adjusted to the building type, are available for selection.

The integrated room humidity controller and room air quality controller can be used for ventilation control. Both controllers receive up to three switching point values, one blocking/release object, or a switching signal (e.g. motion detector) via the bus. When the respective switching point is exceeded, up to three control signals and one quasi-continuous signal to control the ventilation actuators are transmitted to other bus members. In addition, a signal with the max. control value from both controllers is available.

**Air quality measurement and assessment**  
(AQR2576...)

The following table provides information on assessing room air quality based on the determined CO<sub>2</sub> concentration.

[ppm]	Typical CO <sub>2</sub> concentration
<400	Outside air
700	City air
1000	Comfort limit
1500	Ventilation strongly recommended
2000	Inacceptable indoor air quality
4000	Bedroom at poor ventilation
5000	Max. concentration for workspaces (MAC value)
40000	Exhaled air

CO<sub>2</sub> concentration measurements are influenced by air pressure and temperature. The lower the air pressure, the lower the measured value. Temperature influence is corrected automatically if a front module with temperature sensor is installed. The sensor allows for correcting the determined measured value to the prevailing average air pressure at the mounting location. To do this, altitude [m above sea level] must be set. The correction has the following effect on an uncorrected measured value of 1000 ppm at normal conditions (0 m altitude, 25 °C):

Altitude [m]	0	500	1000	1500	2000	2500	3000
CO <sub>2</sub> [ppm]	1000	1095	1201	1317	1445	1586	1740

**Response to errors**

The room sensor monitors the parameterized sensor variables and the parameterized front module. An error message is generated if a required sensor variable does not exist or cannot be measured.

## 5.4 Application examples

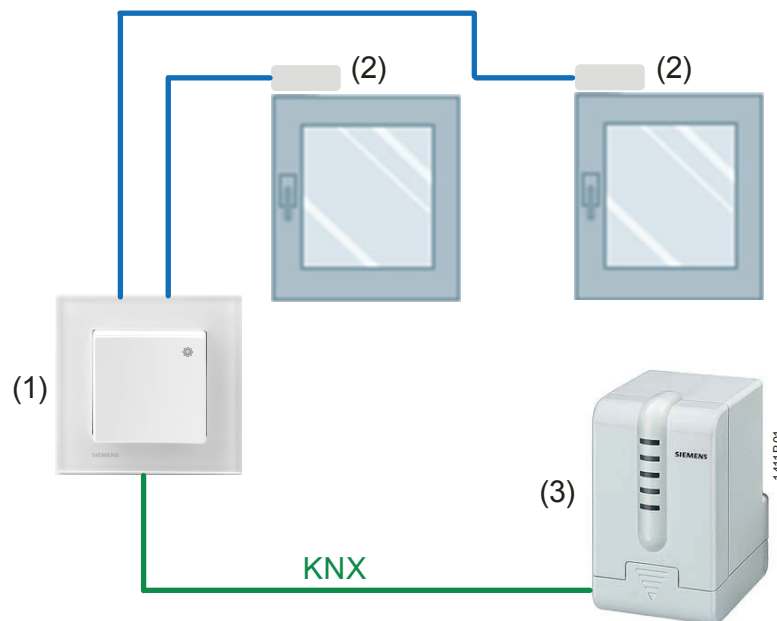
Below are a few typical application examples for the AQR257... or AQR253... room sensors.

### 5.4.1 Room temperature control

This application is recommended primarily for small offices or rooms.

#### Required devices

- (1) Room temperature sensor comprising basic module AQR257... + front module: AQR2532NNWQ with LED to indicate air quality (2 binary inputs for window contacts on basic module).
- (2) Window contact S290.
- (3) Electric, motorized valve actuator AP562/02 with integrated bus coupling.



#### Function description

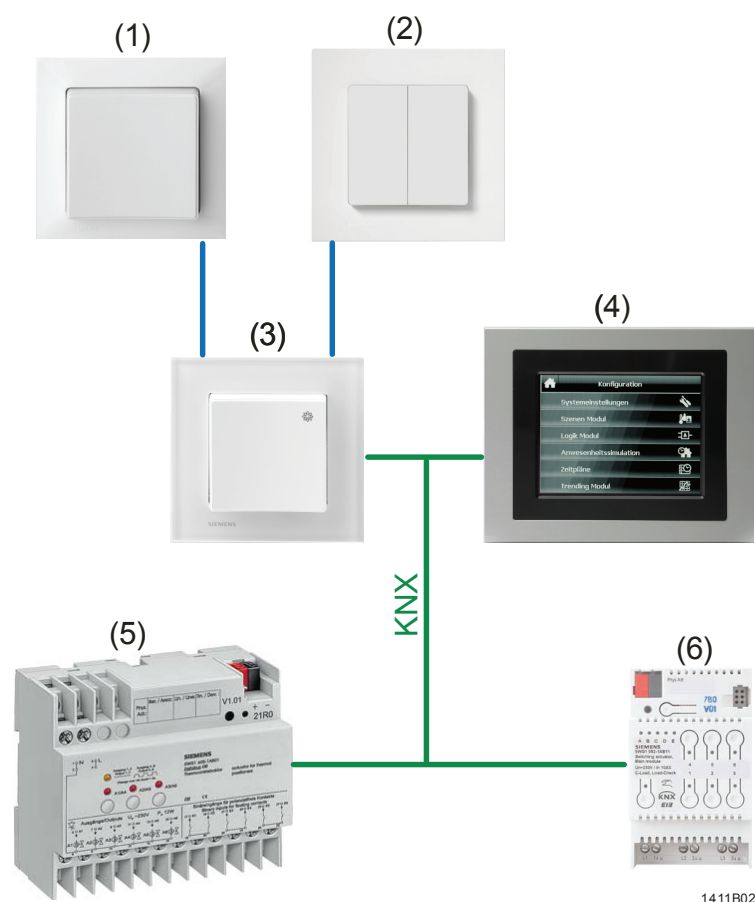
The sensor measures and controls the room temperature and sends the control value to the valve actuator via the KNX bus. When connected to a window contact, the sensor additionally is able to detect and report the window status (open/closed) via KNX bus. The AP562/02 valve actuator also has 2 binary inputs for window contacts, allowing for monitoring of 2 additional windows.

## 5.4.2 Room temperature control with demand-controlled ventilation

This application is suited especially for large rooms with several radiators such as large offices, auditoria, or conference rooms.

### Required devices

- (1) Temperature sensor AQR2500... (mounting plate) + AQR2531FNW (NTC 10k).
- (2) Dual switch 5TD2 111.
- (3) Room sensor AQR2576... + AQR2535NNWQ  
(2 binary inputs and 1 analog input NTC 10k on base module).
- (4) Touch panel UP588/13.
- (5) Thermal actuator N605 for 6 control circuits (at 6 binary inputs for window contacts and dew point monitors).
- (6) Switching actuator N562/11.



### Function description

The flush-mounted sensor (3) measures the CO<sub>2</sub> portion of room air and uses switching actuator N562/11 (6) to provide demand-controlled ventilation. The switching actuator contains 3 relays and is thus able to control a 3-speed fan. The present room air quality is indicated via LED on the sensor in the front module. The room temperature controller integrated in the sensor controls heating via a thermal actuator (5).

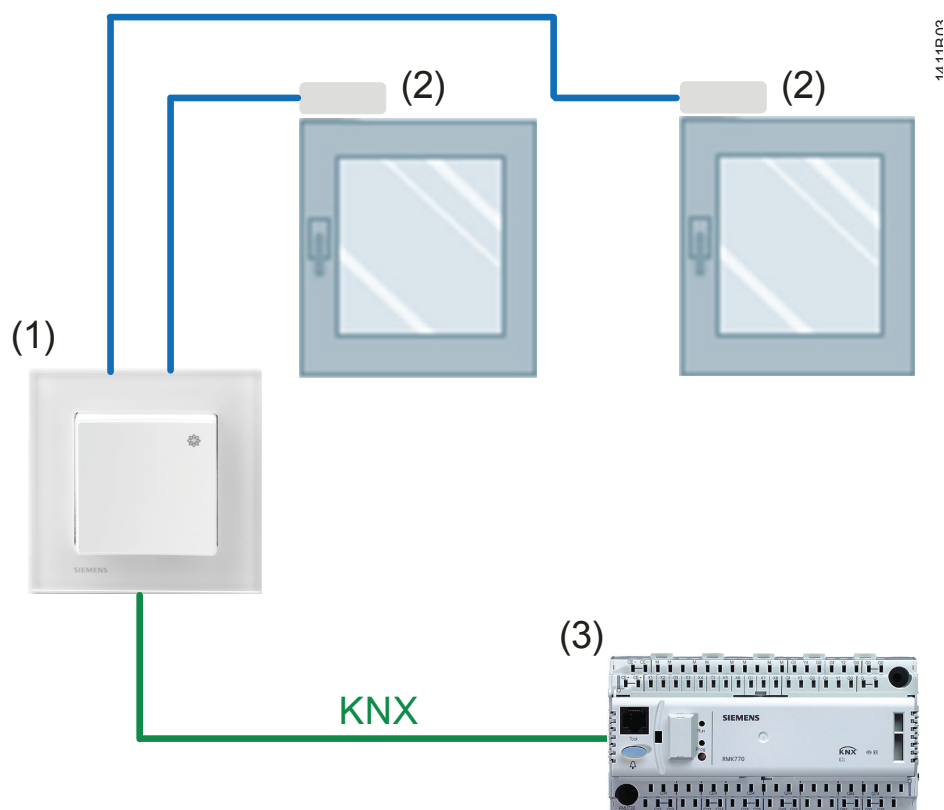
A conventional dual switch (2) allows for controlling a solar protection plant via suitable actors, or for dimming and switching lighting. In large rooms, an additional room temperature sensor (1) can be connected. The controller calculates the mean value from the two room temperature values.

Touch panel UP588/13 is used to display status, measured values, fault indications, week schedules, and to set threshold values and setpoints as well as to release functions.

### 5.4.3 Room temperature, humidity, and air quality control (KNX LTE-Mode, Synco 700)

#### Required devices

- (1) Room sensor AQR2576... + AQR2535NNWQ.
- (2) Window contact S290.
- (3) Synco 700 controller RMU730B.



#### Function description

The flush-mounted sensor (1) measures the CO<sub>2</sub> concentration, room humidity, and room temperature, and passes on these values to the controller via the KNX bus. The controller controls air quality, humidity, and temperature of the corresponding room based on the measured values. In addition, binary inputs allow for monitoring window contacts. The status of the windows (open/closed) is sent via KNX bus to the controller, which in turn triggers the related action (change operating mode, switch off ventilation, etc.).

#### 5.4.3.1 HVAC applications (Synco 700) with GAMMA building control technology

Integrated applications for office buildings and conference rooms featuring Synco or GAMMA devices are located in the [Synco-GAMMA application guide for office buildings - office and conference rooms](#).

This manual contains 2 applications for flush-mounted sensors to measure and control air quality as well as blinds and lighting:

- Page 35: "Ventilation with floor heating for blinds and lighting control, dependent on occupancy"
- Page 40: "VAV and floor heating for blinds and lighting control, dependent on occupancy for large office or conference rooms".

Other application guides are available at the Download Center <http://www.siemens.com/bt/download> under "Synco-Gamma".

### 5.4.3.2 Additional application examples for Synco 700

The HVAC Integrated Tool (HIT) contains additional application examples for use with RDG400KN or RDF341 room thermostats under:

[www.siemens.com/hit](http://www.siemens.com/hit) → In the HIT Start Center, select your country/language  
→ Applications → Individual rooms → Controller range: RDG/RDF from the dropdown list box, and then select operating voltage = AC 24 V.

The application examples for the selected range will be displayed.

# 6 GAMMA building management systems

## 6.1 Engineering

**KNX product data** The product data (\*.vd5 or \*.knxprod) must be downloaded from the website and imported in the ETS device catalog for KNX S-Mode engineering. The product data is available at [www.siemens.com/hvac-td](http://www.siemens.com/hvac-td) or [www.siemens.com/symaro](http://www.siemens.com/symaro)

**ETS version** If ETS3 is used, make sure to install first ETS3 patch (additional software column SW) for ETS3.0f → [www.siemens.com/hvac-td](http://www.siemens.com/hvac-td)

For ETS4, make sure the latest version is installed or at least version 4.1.2.

## 6.2 Commissioning

**Commissioning prerequisites** Depending on the environment, both type and number of adjustable parameters will vary. Prior to commissioning, all devices must be mounted as per the mounting instructions [2] and connected to bus cabling. If available, pushbuttons and external temperature sensors must also be connected to the device. Bus cabling must be tested.

**Pushbuttons**

Pushbutton actuation	Meaning
Short (< 0.5 s)	Switch over to programming mode or acknowledge display of a connection test.
	No functions are executed when the programming button is pressed longer (> 0.5 s to 2 s).
Medium-long (>2 s and <20 s)	Special mode (connection test for Desigo TRA). This manufacturer-specific function can lock the device for programming mode for ca. 10 s. In this case, the LED status indication briefly blinks (orange).
Long (> 20 s)	Reset to factory settings.

**LED status indication**

LED indication	Meaning
Orange	Feedback on special mode.
Red	Device is in programming mode.

All other indication types do not apply to KNX S-Mode.

**Switch-on response** During parameterization using the commissioning software, the input objects are set to default values upon initial switch-on or following standard reset. In the event of a bus voltage failure, the sensor detects the failure and saves the values received last to non-volatile memory. After bus power restoration, the saved status of all input objects is restored.

## 6.3 KNX S-Mode data points

The number and type of available group objects as well as adjustable parameters can vary depending on basic configuration. For detailed documentation on KNX S-Mode data point types, see [4].

Max. number of communication objects 65  
Max. number of associations 120  
Max. number of group addresses 120



### 6.3.1 Room temperature sensor & controller

Base module AQR2570 / AQR2576, with front module AQR2532 / AQR2535

Object index	Name in ETS	I/O <sup>1</sup>	Data point type KNX			Value range
			ID	Format	Unit	
1	Room temperature [°C]	O	9.001	2 bytes	°C	-10.00...+60.00
62	Fault - room temperature sensor	O	1.001	1 bit	---	0 = Normal / 1 = Faulty
If the room temperature sensor is not available or the room temp. cannot be measured, "1 = Faulty" is generated.						
5	Room temperature controller operating mode	I	20.105	1 byte	---	0, 4, 7, 9-11, 13-15, 17-20 = Auto / 1, 2, 8, 12 = Heating / 3, 5, 16 = Cooling / 6 = Off / 21-255 = Res.
In operating mode "Auto", the controller automatically changes over between heating and cooling mode. In automatic mode, only cooling or heating is active at any given time. If the room temperature controller object is enabled, the operating mode changes from "Off" (Obj. 6 = 0) to "Auto" (Obj. 6 = 1). Default operating mode is "Auto".						
6	Enable room temperature controller	I	1.003	1 bit	---	0 = Controller off / 1 = Controller on
If the room temperature controller is enabled (1 = Controller on), the operating mode changes over to "Auto". When switched off (0 = Controller off), the operating mode changes to "Off". Default state is 1 = Controller On.						
7	Room temperature setpoint while cooling	I	9.001	2 bytes	°C	10...30
8	Room temperature setpoint while heating	I	9.001	2 bytes	°C	10...30
The setpoints for cooling and heating mode are not interlocked. In operating mode "auto", heating mode is active despite cooling setpoint < the heating setpoint. The parameterized default setpoints apply for as long as no value is received by the bus.						
9	Control value cooling – cont.	O	5.001	1 byte	%	0...100% (scaled from 0 to 255)
10	Control value heating – cont.	O	5.001	1 byte	%	0...100% (scaled from 0 to 255)
11	Control value cooling – on/off	O	1.001	1 bit	---	0 = Off / 1 = On
12	Control value heating - on/off	O	1.001	1 bit	---	0 = Off / 1 = On
<p>Parameters heating/cooling type allow for adapting the controller to the type of heating. In addition, the controller features two control algorithms: one for continuous mode (0..100%) and one for PWM mode (On/Off). The mode is selected via parameter "Control value type". The control value type is identical for all operating modes. In continuous mode (obj. 9, 10), the associated PWM output is "On" at continuous control value ≠ 0.</p> <p>In PWM mode (obj. 11, 12, and obj. 9, 10), cycle time and pulse width are adapted to the type of heating, the setpoint, and the measured room temperature. The min. cycle time is 12 minutes, the min. pulse width is 4 minutes. The continuous control value issues 0% or 100% in this operating mode.</p>						
<p>The top graph shows a control value that decreases linearly from 100% to 0% as temperature rises towards a heating setpoint, then jumps to 100% and decreases linearly as temperature falls towards a cooling setpoint. The bottom graph shows a PWM signal where the pulse width is 100% when the control value is non-zero and 0% when it is zero. The cycle time is constant.</p>						

### 6.3.2 Room humidity sensor & controller

Base module AQR2570 / AQR2576, with front module AQR2533 / AQR2535

Object index	Name in ETS	I/O <sup>1</sup>	Data point type KNX			Value range
			ID	Format	Unit	
2	Room humidity [%r.h.]	O	9.007	2 bytes	% r.h.	0...100
63	Fault - Room humidity sensor	O	1.001	1 bit	---	0 = Normal / 1 = Faulty
If the room temperature sensor is not available or the room temp. cannot be measured, "1 = Faulty" is generated.						
13	Switching point r.h.- stage 1	I	9.007	2 bytes	% r.h.	0...100
14	Switching point r.h.- stage 2	I	9.007	2 bytes	% r.h.	0...100
15	Switching point r.h.- stage 3	I	9.007	2 bytes	% r.h.	0...100
If no value is received from the bus, the parameterized default switching points apply.						
16	Control value r.h. cont. – manual setpoint	I	5.001	1 byte	%	0...100% (scaled from 0 to 255)
In manual mode (obj. 17, 1=Manual), this object is used to receive a setpoint and output it directly as continuous control value (obj. 23). Default value is 0.						
17	Control value r.h. cont. - manual mode	I	1.003	1 bit	---	0 = Auto / 1 = Manual
Changeover to manual mode allows for receiving a manual setpoint (obj. 16) for the continuous control value (obj. 23). Otherwise the parameterized control values of the related stage are output. Default is "Auto".						
18	Enable room r.h. controller	I	1.003	1 bit	---	0 = Controller off / 1 = Controller on
When receiving "Controller off", all outputs of the controller are disabled. The controller remains disabled until "Controller On" is again received. Default is "Controller On".						

Object index	Name in ETS	I/O <sup>1</sup>	Data point type KNX			Value range
			ID	Format	Unit	
19	Override room r.h. controller	I	1.003	1 bit	---	0 = Normal / 1 = Overridden
	When overriding a controller, the stage defined as "Stage if overridden" is activated. In this case, only the corresponding object assumes value "1 = On" among objects 20, 21, 22; the two other objects assume value "0 = Off". The continuous control value (obj. 23) issues the parameterized value for the related stage. Override takes highest priority. Default state is "Normal".					
20	Control value r.h. stage 1 - on/off	O	1.001	1 bit	---	0 = Off / 1 = On
21	Control value r.h. stage 2 - on/off	O	1.001	1 bit	---	0 = Off / 1 = On
22	Control value r.h. stage 3 - on/off	O	1.001	1 bit	---	0 = Off / 1 = On
	<p>If room humidity exceeds a switching point r.h., the control value r.h. for the respective stage is switched on. Control value r.h. is switched off again when room humidity &lt; switching point r.h. – hysteresis.</p>					
23	Control value r.h.- cont.	O	5.001	1 byte	%	0...100% (scaled from 0 to 255)
	<p>If room humidity exceeds switching point r.h., the control value parameterized for this stage is issued. The control value again issues the next lower stage value when room humidity &lt; switching point r.h. – hysteresis.</p>					

### 6.3.3 Room air quality sensor & controller

#### Base module AQR2576

Object index	Name in ETS	I/O <sup>1</sup>	Data point type KNX			Value range
			ID	Format	Unit	
3	CO <sub>2</sub> concentration [ppm]	O	9.008	2 bytes	ppm	0...5000
64	Fault - room air quality sensor	O	1.001	1 bit	---	0 = Normal / 1 = Faulty
	If room air quality cannot be measured, "1 = Faulty" is generated and sent.					
25	Switching point CO <sub>2</sub> - stage 1	I	9.008	2 bytes	ppm	0...5000
26	Switching point CO <sub>2</sub> - stage 2	I	9.008	2 bytes	ppm	0...5000
27	Switching point CO <sub>2</sub> - stage 3	I	9.008	2 bytes	ppm	0...5000
	The parameterized default switching points apply if no value is received from the bus.					
28	Control value CO <sub>2</sub> cont. - manual setpoint	I	5.001	1 byte	%	0...100% (scaled from 0 to 255)
	In manual mode (obj. 29, 1=Manual), this object is used to receive a setpoint and issue it directly as continuous control value (obj. 35). Default value is 0.					
29	Control value CO <sub>2</sub> cont. - manual mode	I	1.003	1 bit	---	0 = Auto / 1 = Manual
	Changeover to manual mode allows for receiving a manual setpoint (obj. 28) for the continuous control value (obj. 35). Otherwise the parameterized control values of the related stage are output. Default state is "Auto".					
30	Enable room air quality controller	I	1.003	1 bit	---	0 = Controller Off / 1 = Controller On
	When receiving "Controller off", all outputs of the controller are disabled. The controller remains disabled until "Controller On" is again received. Default is "Controller On".					
31	Override room air quality controller	I	1.003	1 bit	---	0 = Normal / 1 = Overridden
	When overriding a controller, the stage defined as "Stage if overridden" is activated. In this case, only the corresponding object assumes value "1 = On" among objects 32, 33, 34; the two other objects assume value "0 = Off". The continuous control value (obj. 35) issues the parameterized value for the related stage. Override takes highest priority. Default state is "Normal".					

Object index	Name in ETS	I/O <sup>1</sup>	Data point type KNX			Value range
			ID	Format	Unit	
32	Control value CO <sub>2</sub> stage 1 - on/off	O	1.001	1 bit	---	0 = Off / 1 = On
33	Control value CO <sub>2</sub> stage 2 - on/off	O	1.001	1 bit	---	0 = Off / 1 = On
34	Control value CO <sub>2</sub> stage 3 - on/off	O	1.001	1 bit	---	0 = Off / 1 = On
	If the CO <sub>2</sub> concentration exceeds a switching point CO <sub>2</sub> , the control value CO <sub>2</sub> for the related stage is switched on. The control value CO <sub>2</sub> is again switched off, if the CO <sub>2</sub> concentration returns to < switching point CO <sub>2</sub> - hysteresis.					
35	Control value CO <sub>2</sub> - cont.	O	5.001	1 byte	%	0...100% (scaled from 0 to 255)
	If the CO <sub>2</sub> concentration exceeds a switching point CO <sub>2</sub> , the control value CO <sub>2</sub> for the related stage is switched on. The control value issues again the value of the next lower stage when CO <sub>2</sub> concentration < switching point CO <sub>2</sub> - hysteresis.					
36	Control value CO <sub>2</sub> , r.h. max. - cont.	O	5.001	1 byte	%	0...100% (scaled from 0 to 255)
	This object issues the greater value of obj. 23 and 35.					
57*	Air quality indication on/off	I	1.003	1 bit	---	0 = Off / 1 = On
	This object allows for enabling/disabling the air quality indication. The object is available only if "can be de-/activated via bus" is selected for the air quality indication bus influence. Default is "On".					

\* Together with front module AQR2535...Q only

### 6.3.4 Universal temperature sensor

Base module AQR2570 / AQR2576

Object index	Name in ETS	I/O <sup>1</sup>	Data point type KNX			Value range
			ID	Format	Unit	
4	Universal temperature [°C]	O	9.001	2 bytes	°C	-10.00...+60.00
	The object is available only if "Yes" is selected for the parameter to activate the universal temperature sensor object. In this case, the universal temperature and the room temperature cannot be averaged.					
65	Fault - universal temperature sensor	O	1.001	1 bit	---	0 = Normal 1 = Faulty
	If the universal temperature sensor is not available or cannot be measured, "1 = Faulty" is sent.					

### 6.3.5 Binary inputs

Base module AQR2570 / AQR2576

Object Index	Name in ETS	I/O <sup>1</sup>	Data point type KNX			Value range
			ID	Format	Unit	
37 <sup>A</sup>	State contact 1	O	1.001	1 bit	---	0 = Off / 1 = On
38 <sup>B</sup>	Input 1 - switch	I, O	1.001	1 bit	---	0 = Off / 1 = On
	Input 1/2 - switch					
39 <sup>B</sup>	Input 1 - send value	I, O	5.001	1 byte	%	0...100% (scaled from 0 to 255) 0...255
			5.010			
40 <sup>B</sup>	Input 1 - switch 2	I, O	1.001	1 bit	---	0 = Off / 1 = On
41 <sup>B</sup>	Input 1 - send value 2	I, O	5.001	1 byte	%	0...100% (scaled from 0 to 255) 0...255
			5.010			
42 <sup>C</sup>	Input 1 - switch	I, O	1.001	1 bit	---	0 = Off / 1 = On
	Input 1/2 - switch					
43 <sup>C</sup>	Input 1 - dim	I, O	3.007	4 bit	---	1 = Darker / 9 = Brighter / 0, 8 = Stop
	Input 1/2 - dim					
44 <sup>D</sup>	Input 1 - stopstep	I, O	1.007	1 bit	---	0 = Step up / 1 = Step down
	Input 1/2 - stopstep					

Object Index	Name in ETS	I/O <sup>1</sup>	Data point type KNX			Value range
			ID	Format	Unit	
45 <sup>D</sup>	Input 1 – up/down	I, O	1.008	1 bit	---	0 = Up / 1 = Down
	Input 1/2 – up/down					
46	Input 1 block	I	1.003	1 bit	---	0 = Enable / 1 = Disable
	Input 1/2 block					
47 <sup>E</sup>	State contact 2	O	1.001	1 bit	---	0 = Off / 1 = On
48 <sup>F</sup>	Input 2 - switch	I, O	1.001	1 bit	---	0 = Off / 1 = On
49 <sup>F</sup>	Input 2 – send value	I, O	5.001	1 byte	%	0...100% (scaled from 0 to 255) 0...255
			5.010		---	
50 <sup>F</sup>	Input 2 – switch 2	I, O	1.001	1 bit	---	0 = Off / 1 = On
51 <sup>F</sup>	Input 2 – send value 2	I, O	5.001	1 byte	%	0...100% (scaled from 0 to 255) 0...255
			5.010		---	
52 <sup>G</sup>	Input 2 - switch	I, O	1.001	1 bit	---	0 = Off / 1 = On
53 <sup>G</sup>	Input 2 - dim	I, O	3.007	4 bit	---	1 = Darker / 9 = Brighter / 0, 8 = Stop
54 <sup>H</sup>	Input 2 – stopstep	I, O	1.007	1 bit	---	0 = Step up / 1 = Step down
55 <sup>H</sup>	Input 2 – up/down	I, O	1.008	1 bit	---	0 = Up / 1 = Down
56	Input 2 block	I	1.003	1 bit	---	0 = Enable / 1 = Disable

A, B, C, D, E, F, G, H) Not all objects at the same time:

For both inputs 1/2 only B, C, or D in case of combined function.

Per input only A, B, C, or D; and E, F, G, or H simultaneously in case of single function.

### 6.3.6 Fault information

Base module AQR2570 / AQR2576

Object index	Name in ETS	I/O <sup>1</sup>	Data point type KNX			Value range
			ID	Format	Unit	
59	Fault information	O	219.001	6 bytes	---	[0...255 ] = Log no. [0...2] = Alarm priority [0...14] = Application area [0...4] = Fault class [0...7] = Attribute [0...7] = Fault state
	Information on generated fault.					
60	Fault state	O	1.001	1 bit	---	0 = Normal / 1 = Faulty
	Global fault indication. State is "Faulty" if another fault appears.					
61	Fault – configuration	O	1.001	1 bit	---	0 = Normal / 1 = Faulty
	The state changes to "Faulty" if another but the connected front module type was configured. If the front module contains at least the sensors as configured, no fault is generated..					

See sensor for sensor faults.

<sup>1)</sup> I/O: Input/output

## 6.4 Parameter description

Factory settings are **boldfaced**.

### 6.4.1 Basic configuration

Designation	Values	Description
Base module	<b>AQR2570</b> AQR2576 (CO <sub>2</sub> )	Available base module
Front module	<b>AQR2530 (empty)</b> AQR2532 (T) AQR2533 (rH) AQR2535 (T+rH) AQR2535...Q (T+rH+LED) <sup>A</sup>	Front module configured
Activate universal temperature sensor object	Yes <b>No</b>	Activation of object for external temperature input NTC 10k. If selection is "Yes" sensor value can be transmitted to bus, or, if "No", can be mixed with room temperature.

<sup>A</sup> Together with AQR2576 only

#### 6.4.1.1 Air quality indicator

Base module AQR2576 with front module AQR2535...Q

Designation	Values	Description
Bus influence	<b>No</b> Can be de-/activated via bus	The LED can be activated/deactivated by a bus member
Change of color green <-> yellow at [ppm] <sup>B</sup>	400...5000 ppm <b>1000 ppm</b>	CO <sub>2</sub> threshold value for change of LED color green <-> yellow
Change of color yellow <-> red at [ppm] <sup>B</sup>	400...5000 ppm <b>1500 ppm</b>	CO <sub>2</sub> threshold value for change of LED color yellow <-> red

### 6.4.2 Room temperature sensors

Base module AQR2570 / AQR2576, with front module AQR2532 / AQR2535

Designation	Values	Description
Sensor correction	-5...+5K at 0.1K steps <b>0 K</b>	Correction of room temperature sensor value
Mixing portion universal temperature sensor	0% ext, 100% int / ... / 100% ext 0% int at 10% steps <b>0% Ext, 100% Int</b>	Mixing of (ext) universal temperature sensor with internal room temperature sensor value. The mixed value is sent in place of the internal room temperature sensor value. Mixing only possible if universal temperature value is not transmitted to bus separately.
Send after change of	<b>0.1K</b> 0.2K 0.3K 0.5K 1K 1.5K 2K 2.5K	Min. change of room temperature until a telegram is sent.
Send cyclically after	1 min 2 min 3 min 4 min 5 min 10 min <b>15 min</b> 20 min 30 min 45 min 60 min	Time period after which the room temperature value is resent.

### 6.4.3 Universal temperature sensor

Base module AQR2570 / AQR2576

Designation	Values	Description
Sensor correction	-5...+5K in 0.1K steps <b>0K</b>	Correction of universal temperature sensor value
Send after change of	<b>0.2K</b> 0.3K 0.5K 1K 1.5K 2K 2.5K	Min. change of universal temperature until a telegram is sent.
Send cyclically after	1 min 2 min 3 min 4 min 5 min 10 min <b>15 min</b> 20 min 30 min 45 min 60 min	Time period after which the universal temperature sensor value is resent.

### 6.4.4 Room temperature controller

Base module AQR2570 / AQR2576, with front module AQR2532 / AQR2535

Designation	Values	Description
Heating type	Radiator heating slow <b>Radiator heating fast</b> Floor heating slow Floor heating fast	Type of heating
Cooling type	<b>Chilled ceiling</b> Floor cooling	Type of cooling
Default cooling setpoint	10...30 °C at 0.1K steps <b>24 °C</b>	Cooling setpoint, if no value is received from bus on object 7. For operation mode auto: If cooling setpoint < heating setpoint, then controller will heat.
Default heating setpoint	10...30 °C at 0.1K steps <b>21 °C</b>	Heating setpoint, if no value is received from bus on object 8.
Control value type	PWM <b>continuous 0...100%</b>	Output signal of the room temperature controller pulse-width-modulated/continuous
Send cyclically after	Do not send cyclically 1 min 2 min 3 min 4 min 5 min 10 min <b>15 min</b> 20 min 30 min 45 min 60 min	Time period after which the control values are resent. Changes of control values are sent immediately to the actuators, independently of the selected time period.

## 6.4.5 Room humidity sensor

Base module AQR2570 / AQR2576, with front module AQR2533 / AQR2535

Designation	Values	Description
Send after change of	2% r.h. 3% r.h. 4% r.h. 5% r.h. 7% r.h. 10% r.h.	Min. change of room humidity until a telegram is sent.
Send cyclically after	1 min 2 min 3 min 4 min 5 min 10 min <b>15 min</b> 20 min 30 min 45 min 60 min	Time period after which the room humidity value is resent.

## 6.4.6 Room humidity controller

Base module AQR2570 / AQR2576, with front module AQR2533 / AQR2535

Designation	Values	Description
Default switching point stage 1 [% r.h.]	0...100, <b>40</b>	r.h. switching point for stage 1
Default switching point stage 2 [% r.h.]	0...100, <b>70</b>	r.h. switching point for stage 2
Default switching point stage 3 [% r.h.]	0...100, <b>90</b>	r.h. switching point for stage 3
Hysteresis	2% r.h. 3% r.h. 4% r.h. <b>5% r.h.</b> 7% r.h. 10% r.h.	The value defines the lower switching point and prevents frequent stage switchover at small value changes.
Control value stage 0	0...100% <b>0%</b>	Control value sent to a bus member connected to the output. See Object 23
Control value stage 1	0...100% <b>35%</b>	Control value sent to a bus member connected to the output. See Object 23.
Control value stage 2	0...100% <b>70%</b>	Control value sent to a bus member connected to the output. See Object 23.
Control value stage 3	0...100% <b>100%</b>	Control value sent to a bus member connected to the output. See Object 23.
Stage when overridden	0 1 2 <b>3</b>	Direct activation of the control value stage when the controller is overridden.
Send cyclically after	Do not send cyclically 1 min 2 min 3 min 4 min 5 min 10 min <b>15 min</b> 20 min 30 min 45 min 60 min	Time period after which the control values are resent. Changes of control values are sent immediately to the actuators, independently of the selected time period.

## 6.4.7 Room air quality sensor

Base module AQR2576

Designation	Values	Description
Altitude above sea level [m]	0...3000 m <b>0 m</b>	Entry of altitude above sea level at measuring location to correct CO <sub>2</sub> measured value
Send after change of	50 ppm 100 ppm 150 ppm <b>200 ppm</b> 250 ppm 300 ppm 400 ppm 500 ppm	Min. change of CO <sub>2</sub> value until a telegram is sent.
Send cyclically after	1 min 2 min 3 min 4 min 5 min 10 min <b>15 min</b> 20 min 30 min 45 min 60 min	Time period after which the CO <sub>2</sub> value is reset.

## 6.4.8 Room air quality controller

Base module AQR2576

Designation	Values	Description
Default switching point stage 1 [ppm CO <sub>2</sub> ]	400...5000 ppm, <b>800 ppm</b>	CO <sub>2</sub> switching point for stage 1
Default switching point stage 2 [ppm CO <sub>2</sub> ]	400...5000 ppm, <b>1000 ppm</b>	CO <sub>2</sub> switching point for stage 2
Default switching point stage 3 [ppm CO <sub>2</sub> ]	400...5000 ppm, <b>1500 ppm</b>	CO <sub>2</sub> switching point for stage 3
Hysteresis	50 ppm 100 ppm 150 ppm <b>200 ppm</b> 250 ppm 300 ppm 400 ppm 500 ppm	The hysteresis prevents frequent stage switching in the event of small value changes.
Control value stage 0	0...100% <b>0%</b>	Control value sent to a bus member connected to the output. See object 35.
Control value stage 1	0...100% <b>35%</b>	Control value sent to a bus member connected to the output. See object 35.
Control value stage 2	0...100% <b>70%</b>	Control value sent to a bus member connected to the output. See object 35.
Control value stage 3	0...100% <b>100%</b>	Control value sent to a bus member connected to the output. See object 35.
Stage when overridden	0 1 2 <b>3</b>	Direct activation of the control value stage when the controller is overridden.
Send cyclically after	Do not send cyclically 1 min 2 min 3 min 4 min 5 min 10 min <b>15 min</b> 20 min 30 min 60 min	Time period after which the control values are reset. Changes of control values are sent immediately to the actuators, independently of the selected time period.



## 6.4.9 Binary inputs

Base module AQR2570 / AQR2576

### 6.4.9.1 General settings

Designation	Values	Description
Assignment of inputs	Individual Combined	Use of binary inputs individually or combined.
Input 1/2	--- 2-button switching 2-button dimming 2-button blinds	Function of dual buttons on binary inputs 1 and 2 at combined function for both inputs.
Activate blocking object for inputs 1/2	Yes No	If the input is blocked (blocking object = 1), state changes for this input no longer are evaluated.
Input 1	--- 1-button switching / send value 1-button dimming 1-button blinds Contact	Function of the button on binary input 1 (at one function per input)
Activate blocking object for input 1	Yes No	If the input is blocked (blocking object = 1), state changes for this input no longer are evaluated.
Input 2	--- 1-button switching / send value 1-button dimming 1-button blinds Contact	Function of the button on binary input 2 (at one function per input)
Activate blocking object for input 2	Yes No	If the input is blocked (blocking object = 1), state changes for this input no longer are evaluated.

### 6.4.9.2 Inputs 1/2, 2-button functions

When function is combined for both inputs.

Designation	Values	Description
Type of contact	Normally open Normally closed	Contact status.
Long keypress	0.5 sec 0.6 sec 0.8 sec 1.0 sec 1.2 sec 1.5 sec 2.0 sec 2.5 sec 3.0 sec 4.0 sec 5.0 sec 6.0 sec 7.0 sec	Definition of the duration of a keypress, to differentiate between short and long keypress.
Action button 1, 2	On, off Off, on	Button function for 2-button switching.
Action button 1, 2 short/long keypress	On/brighter, off/darker; Off/darker, on/brighter	Button function for 2-button dimming.
Action button 1, 2 short/long keypress	Step/up, step/down Step/down, step/up	Button function for 2-button blinds.

### 6.4.9.3 Input, 1-button functions

When assigning individual functions per input, the same setting options are available for both binary inputs independent of each other.

Designation	Values	Description
Type of contact	<b>Normally open</b> Normally closed	Contact status.
Long keypress	<b>0.5 sec</b> 0.6 sec 0.8 sec 1.0 sec 1.2 sec 1.5 sec 2.0 sec 2.5 sec 3.0 sec 4.0 sec 5.0 sec 6.0 sec 7.0 sec	Definition of the duration of a keypress, to differentiate between short and long keypress.

#### 6.4.9.3.1 1-button light switch / send value

Designation	Values	Description
Reaction to	<b>Edge</b> Short/long keypress	Triggering of assigned button function via switching edge or duration of keypress.
Action at rising edge/short keypress	--- On Off Toggle Send percentage value Send value 0...255	Reaction after detection of rising edge or short keypress.
Send value	0...100% 0...255 <b>0%</b>	Default value when assigning send percentage value / send value 0...255 for action rising edge/short keypress.
Action at falling edge/long keypress	--- On Off Toggle Send percentage value Send value 0...255	Reaction after detection of falling edge or long keypress.
Send value	0...100% 0...255 <b>0%</b>	Default value when assigning send percentage value / send value 0...255 for action falling edge/long keypress.
Send long keypress over 2. object	Yes <b>No</b>	Allows for activation of a second group object at long keypress. If disabled, the same group object as for short keypress is used.

#### 6.4.9.3.2 1-button dimming

Designation	Values	Description
Action at short/long keypress	On/brighter Off/darker <b>Toggle/dimming</b>	Reaction after detection of short/long keypress always on/brighter or off/darker, or toggle and change dimming direction

#### 6.4.9.3.3 1-button blinds

Designation	Values	Description
Action at short/long keypress	Step/up Step/down <b>Step/toggle</b>	Reaction after detection of short/long keypress always step/up or step/down, or step and change direction

#### 6.4.9.3.4 Contact

Designation	Values	Description
Type of contact	<b>Normally open</b> Normally closed	Contact status.
Send cyclically after	Do not send cyclically 1 min 2 min 3 min 4 min 5 min 10 min <b>15 min</b> 20 min 30 min 45 min 60 min	Time period after which the state at the binary input is resent.
Response after bus power recovery	Never send * <b>Always send</b> Send if changed*	Determines if a measured value at the binary input is sent following bus power restoration. * Possible only, if do not send cyclically is assigned.

# 7 Synco building automation and control system

## 7.1 Engineering

Tool ACS790 is used for engineering in KNX LTE–Mode with devices from the Synco 700 range. This tool is documented in Service- and Operating software ACS790 [5].

ACS790 version

For ACS790, version 8.23 must be installed at a minimum.

Recommendation: Keep the adhesive address labels

During room sensor mounting, the address labels can be peeled off the devices and stuck to a floor plan or similar to show the KNX IDs and the physical location in one place.

After mounting/installation, the devices are detected after updating the ACS790 device list. The devices can be easily identified in the device list based on the collected KNX IDs, and the physical addresses can be assigned as planned. As a result, commissioning requires only very little effort.

## 7.2 Commissioning

Commissioning prerequisites

Depending on the environment, both type and number of adjustable parameters will vary. Prior to commissioning, all devices must be mounted as per the mounting instructions [2] and connected to bus cabling. If available, pushbuttons and external temperature sensors must also be connected to the device. Bus cabling must be tested.

Pushbuttons

Pushbutton actuation	Meaning
Short (< 0.5 s)	Switch over to programming mode or acknowledge display of a connection test.
	No functions are executed when the programming button is pressed longer (> 0.5 s to 2 s).
Medium-long (>2 s and <20 s)	Special mode (connection test for Desigo TRA). This manufacturer-specific function can lock the device for programming mode for ca. 10 s. In this case, the LED status indication briefly blinks (orange).
Long (> 20 s)	Reset to factory settings.

LED status indication

LED indication	Meaning
Orange	Feedback on special mode.
Red	Device is in programming mode.

All other indication types are irrelevant for KNX LTE-Mode.

KNX LTE–Mode commissioning

Room sensor AQR257..., KNX LTE–Mode controllers, and operator units are connected to power. Update first the ACS790 device list, then open.

### → Variant 1 (recommended)

1. Select a room sensor from the device list via the KNX ID (KNX-IDs must be collected during mounting).
2. Double-click this line to open the "Address assignment" dialog.

or

→ **Variant 2**

1. Set addressing mode for the room sensor (briefly press button on device → LED is red).
2. In the ACS790 device list, use "Addressing mode..." to select the currently active device → Enter a physical address in the "Address assignment" dialog → Click "Write".

→ Enter a physical address and short description for the selected room sensor.

→ Close the "Address assignment" dialog by clicking "Write...".

→ Repeat these steps for all room sensors to be commissioned.

Then: Continue configuration in ACS790.

KNX multi-Mode commissioning

The sensor can be operated as both KNX S-Mode and KNX LTE-Mode system at the same time. To do this, commissioning for both KNX S-Mode and KNX LTE-Mode is required. All parameters exist only once, i.e. all parameters excepting zone settings apply to both operating modes and are overwritten by ETS and ACS. For this reason, do not use ETS to set sending intervals > 15 min. for the measured values.

## 7.3 KNX LTE-Mode Parameter description

Factory settings are **boldfaced**.

### 7.3.1 General parameters

Designation	Values	Description
Front module	<b>AQR2530 (empty)</b> AQR2532 (T) AQR2533 (rH) AQR2535 (T+rH) AQR2535...Q (T+rH+LED) <sup>A</sup>	Front module configured
Digital Input 1	--- Contact	Function for input 1
Digital Input 2	--- Contact	Function for input 2
Activate universal temperature sensor	Yes <b>No</b>	Activation of external temperature input NTC 10k. If selection is "Yes" sensor value can be transmitted to bus, or, if "No", can be mixed with room temperature.

<sup>A</sup> Together with AQR2576 only

### 7.3.2 Communication

Base module AQR2570 / AQR2576, LTE zones valid for all room sensors.

Designation	Values	Description
Geographical zone (apartment)	---, <b>1...126</b>	Geographical communications address for KNX LTE-Mode, apartment
Geographical zone (room)	---, <b>1...63</b>	Geographical communications address for KNX LTE-Mode, room
Geographical zone (subzone)	---, <b>1...15</b>	Geographical communications address for KNX LTE-Mode, subzone

### 7.3.3 Room temperature sensors

Base module AQR2570 / AQR2576, with front module AQR2532 / AQR2535

Designation	Values	Description
LTE transmission zone	---, 1...4095	Sending zone for KNX LTE-Mode
Sensor correction	-5...+5K at 0.1K steps <b>0 K</b>	Correction of room temperature sensor value
Mixing portion universal temperature sensor	0% ext, 100% Int / ... / 100% ext 0% Int at 10% steps <b>0% Ext, 100% Int</b>	Mixing of (ext) universal temperature sensor with internal room temperature sensor value. The mixed value is sent in place of the internal room temperature sensor value. Mixing only possible if universal temperature value is not transmitted to bus separately.

### 7.3.4 Universal temperature sensor

Base module AQR2570 / AQR2576

Designation	Values	Description
LTE transmission zone	---, 1...4095	Sending zone for KNX LTE-Mode
Sensor correction	-5...+5K in 0.1K steps <b>0K</b>	Correction of universal temperature sensor value

### 7.3.5 Room humidity sensor

Base module AQR2570 / AQR2576, with front module AQR2533 / AQR2535

Designation	Values	Description
LTE transmission zone	---, 1...4095	Sending zone for KNX LTE-Mode

### 7.3.6 Room air quality sensor

Base module AQR2576

Designation	Values	Description
LTE transmission zone	---, 1...4095	Sending zone for KNX LTE-Mode
Altitude above sea level [m]	0...3000 m <b>0 m</b>	Entry of altitude above sea level at measuring location to correct CO <sub>2</sub> measured value

### 7.3.7 Binary inputs

Base module AQR2570 / AQR2576

#### 7.3.7.1 Contact

Designation	Values	Description
LTE transmission zone	---, 1...4095	Sending zone for KNX LTE-Mode
Type of contact	<b>Normally open</b> Normally closed	Contact status.

### 7.3.8 Faults

Designation	Values	Description
Enable AlarmInfo	Enabled <b>Disabled</b>	Enabling of cyclical alarm information for KNX LTE-Mode.

# 8 Desigo building automation and control system

## 8.1 Engineering

Engineering at the system level is based on the Automation Building Tool ABT. The web server-based tool SSA (Setup & Service Assistant) allows for data point testing during commissioning.

### Plug&play commissioning

If engineered accordingly, Desigo KNX PL-Link systems can be commissioned using plug&play, i.e. after applying power, commissioning is largely automatic. To this end, the workflow below must be adhered to. This workflow is based on correct preparation of the AQR257... capable automation station (e.g. PXC3... from Desigo V5.1).

### Recommended engineering workflow

The following (ideal) engineering workflow is recommended to take advantage of the functionality of the flush-mount room sensor AQR257... or KNX PL-Link.

1. The **design engineer** DE plans the system using the **ABT** [6] tool. The planning data for the entire project are saved to the engineering data server.
2. The **electrical installer** EI installs the flush-mount room sensor, peels off the **address labels** from the devices and sticks them to a floor plan or similar plan. The floor plan is then returned to the planning engineer who uses the floor plan to complete the planning data (assignment of room sensor as per actual addresses in ABT).
3. The **design engineer** can now preconfigure the **automation station** (e.g. PXC3..) offline in **ABT**: After adding the required number of room sensor the KNX PL-Link bus of an automation station, the configuration dialog of the individual room sensor now allows for entering the KNX ID alphanumerically or, if supported, via a barcode scanner. This configuration is then compiled into a pack&go file for upload into the automation station at the installation location.
4. The **design engineer** sends the pack&go file to the **electrical installer**. The electrical installer uploads this file into the automation station and runs initial tests via the SSA tool.
5. The **commissioning engineer** CE uses the planning data and **ABT** to complete commissioning.

## 8.2 Commissioning

### Commissioning prerequisites

Depending on the environment, both type and number of adjustable parameters will vary. Prior to commissioning, all devices must be mounted as per the mounting instructions [2] and connected to bus cabling. If available, pushbuttons and external temperature sensors must also be connected to the device. Bus cabling must be tested.

### Pushbuttons

Pushbutton actuation	Meaning
Short (< 0.5 s)	Switch over to programming mode or acknowledge display of a connection test.
Medium-long (>2 s and <20 s)	Carry out connection test ( <i>only available with KNX PL-Link</i> ).
Long (> 20 s)	Reset to factory settings.

LED status indication

LED indication	Meaning
Dark	a) Device is not connected to power. b) Device is powered and works as intended.
1x orange flash	Feedback on pressing button medium-long.
<i>Permanent</i> orange flash	Wait (connection test or reset to factory settings).
Flashing red	Connection test failed.
Red	Device is in programming mode.
Green	Connection test successful.

KNX PL-Link  
commissioning

Several room sensors can be connected concurrently or in sequence to power. For plug&play commissioning, the automation station must be set up accordingly as per the recommended workflow in Section Engineering. A simultaneous KNX S-Mode operation is not possible.

The automation station is started and connected to the bus, the room sensors are disconnected from power.

- Initiate connection of all room sensors to power (concurrently or by device).
- The automation station and room sensor register and assign the addresses. Configuration data is transmitted from the controller to the room sensors.
- Optional: Test the connection via medium-long keypress(>2 s and <20 s).

## 8.3 Parameter description

Factory settings are **boldfaced**.

### 8.3.1 General parameters

Designation	Values	Description
Activate GPTS object	Yes <b>No</b>	Activation of object for external temperature input NTC 10k. If selection is "Yes" sensor value can be transmitted to bus, or, if "No", can be mixed with room temperature.

### 8.3.2 Functions

Designation	Channel name	Type	Description
Room Sensors	AC_FMS_1	RTS, RRHS, RAQS. <sup>A</sup>	Room temperature sensor, room relative humidity sensor, room air quality sensor. Available sensors depend on selected combination of base and front module. <sup>A</sup>
Binary Input 1 / 2	AC_FMS_2	LSSB, LDSB, SSSB, or GPDI	Electro functions for switching, dimming, blinds, or contact monitoring.1-button or 2-button mode.
Binary Input 2	AC_FMS_3	LSSB, LDSB, SSSB, or GPDI	Electro functions for switching, dimming, blinds, or contact monitoring.1-button mode only.
General purpose temperature	AC_FMS_4	GPTS	External universal NTC10k temperature sensor

<sup>A</sup> For available types see section 2.1 Type summary.



### 8.3.3 Communication

Base module AQR2570 / AQR2576, LTE zone per function valid for assigned types.

Designation	Values	Description
Geographical zone (apartment)	---, 1...126	Geographical communications address for KNX LTE-Mode, apartment
Geographical zone (room)	---, 1...63	Geographical communications address for KNX LTE-Mode, room
Geographical zone (subzone)	---, 1...15	Geographical communications address for KNX LTE-Mode, subzone

### 8.3.4 Room temperature sensors RTS

Base module AQR2570 / AQR2576, with front module AQR2532 / AQR2535

Designation	Values	Description
Sensor correction	-5...+5K at 0.1K steps <b>0 K</b>	Correction of room temperature sensor value
Mixing portion GPTS	0% ext, 100% int / ... / 100% ext 0% int at 10% steps <b>0% Ext, 100% Int</b>	Mixing of (ext) universal temperature sensor with internal room temperature sensor value. The mixed value is sent in place of the internal room temperature sensor value. Mixing only possible if universal temperature value is not transmitted to bus separately.
Change of value, COV	<b>0.1</b> ...2.5K	Min. change of room temperature until a telegram is sent.
Heartbeat	<b>120</b> ...900s	Time period after which the room temperature value is resent.
Minimal repetition time	<b>10</b> ...60s	Minimal delay between consecutive telegrams.

### 8.3.5 Universal temperature sensor GPTS

Base module AQR2570 / AQR2576

Designation	Values	Description
Sensor correction	-5...+5K in 0.1K steps <b>0K</b>	Correction of universal temperature sensor value
Change of value, COV	<b>0.2</b> ...2.5K	Min. change of universal temperature until a telegram is sent.
Heartbeat	<b>120</b> ...900s	Time period after which the universal temperature sensor value is resent.
Minimal repetition time	<b>10</b> ...60s	Minimal delay between consecutive telegrams.

### 8.3.6 Room humidity sensor RRHS

Base module AQR2570 / AQR2576, with front module AQR2533 / AQR2535

Designation	Values	Description
Change of value, COV	<b>2</b> ...10% r.h.	Min. change of room humidity until a telegram is sent.
Heartbeat	<b>120</b> ...900s	Time period after which the room humidity value is resent.
Minimal repetition time	<b>10</b> ...60s	Minimal delay between consecutive telegrams.

## 8.3.7 Room air quality sensor RAQS

Base module AQR2576

Designation	Values	Description
Altitude above sea level [m]	0...3000 m <b>0 m</b>	Entry of altitude above sea level at measuring location to correct CO <sub>2</sub> measured value
Change of value, COV	50...500 ppm <b>100 ppm</b>	Min. change of CO <sub>2</sub> value until a telegram is sent.
Heartbeat	<b>120</b> ...900s	Time period after which the CO <sub>2</sub> value is resent.
Minimal repetition time	10...60s	Minimal delay between consecutive telegrams.

## 8.3.8 Binary inputs

Base module AQR2570 / AQR2576

### 8.3.8.1 Inputs 1/2, 2-button functions

When channel AC\_FMS\_3 is deactivated and function is combined for both inputs.

Designation	Values	Description
Type of contact normally closed	True <b>False</b>	Contact status.
Button 1, action at rising edge	--- On Off <b>Toggle</b>	LSSB, reaction after detection of rising edge.
Button 1, action at falling edge	--- On Off Toggle	LSSB, reaction after detection of falling edge.
Button 2, action at rising edge	--- On Off Toggle	LSSB, reaction after detection of rising edge.
Button 2, action at falling edge	--- On Off Toggle	LSSB, reaction after detection of falling edge.
Long keypress	<b>0.5</b> ...7.0s	LDSB, SSSB, definition of the duration of a keypress, to differentiate between short and long keypress.
Invert dimming direction in 2-button-mode	True <b>False</b>	LDSB, button function for 2-button dimming.
Polarity inverse	True <b>False</b>	SSSB, button function for 2-button blinds. Invert assignment of moving directions.

### 8.3.8.2 Input, 1-button functions

When channel AC\_FMS\_3 is activated and assigning individual functions per input, the same setting options are available for both binary inputs independent of each other.

Designation	Values	Description
Type of contact normally closed	True <b>False</b>	Contact status.

### 8.3.8.2.1 1-button switching LSSB

Designation	Values	Description
Action at rising edge	--- On Off Toggle	Reaction after detection of rising edge.
Action at falling edge	--- On Off Toggle	Reaction after detection of falling edge.

### 8.3.8.2.2 1-button dimming LDSB

Designation	Values	Description
Action at short/long keypress	On/brighter Off/darker <b>Toggle/dimming</b>	Reaction after detection of short/long keypress always on/brighter or off/darker, or toggle and change dimming direction
Long keypress	<b>0.5...7.0s</b>	Definition of the duration of a keypress, to differentiate between short and long keypress.

### 8.3.8.2.3 1-button blinds SSSB

Designation	Values	Description
Action at short/long keypress	Step/up Step/down <b>Step/toggle</b>	Reaction after detection of short/long keypress always step/up or step/down, or step and change direction
Long keypress	<b>0.5...7.0s</b>	Definition of the duration of a keypress, to differentiate between short and long keypress.

### 8.3.8.2.4 Contact GPDI

Designation	Values	Description
Heartbeat	0, 120... <b>900s</b>	Time period after which the state at the binary input is resent. No heartbeat if 0s.
Response after bus power recovery	Never send * <b>Always send</b> Send after a change	Determines if a measured value at the binary input is sent following bus power restoration. * Possible only, if heartbeat is not assigned.

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