

Synco-GAMMA Application Guide

School building – class room



More efficiency in schools – with Synco and GAMMA building control

Requirements

School buildings require special building technology solutions. They demand low construction costs and economical operation. The buildings must ensure optimum learning and working conditions, the lowest possible energy consumption, safe operation, and protection against damage and vandalism. In addition, they must safeguard people in case of emergency. These are requirements that cannot be met by systems based on conventional technology.

Single source

As a complete supplier in the building automation and control sector, Siemens offers integrated, energy-efficient and tested solutions – from the production of heat/cooling energy to individual room control and from energy distribution to the power socket in the classroom, thus satisfying all requirements.

Objective of this document

The present Application Guide describes 3 variants of a classroom application in school buildings. Each variant includes an integrated solution with heating, lighting and blind control.

The application focuses on energy efficiency and comfort. The 3 variants offer different stages of room automation: From a simple solution with only a few automatic functions to a sophisticated solution with a number of automatic functions. However, manual control is still being possible in each case. There is no need for people to care about energy savings, the system does it automatically and provides best climatic and lighting conditions in the classrooms.

Structure of the document

Each application variant includes the following sections:

- Overview of functionality
- Sales arguments
- Device list
- Function diagrams with possible scenarios
- Communication diagram
- Limitations
- Detailed functional description
- Topology
- Secondary documentation

Special group addresses in Synco

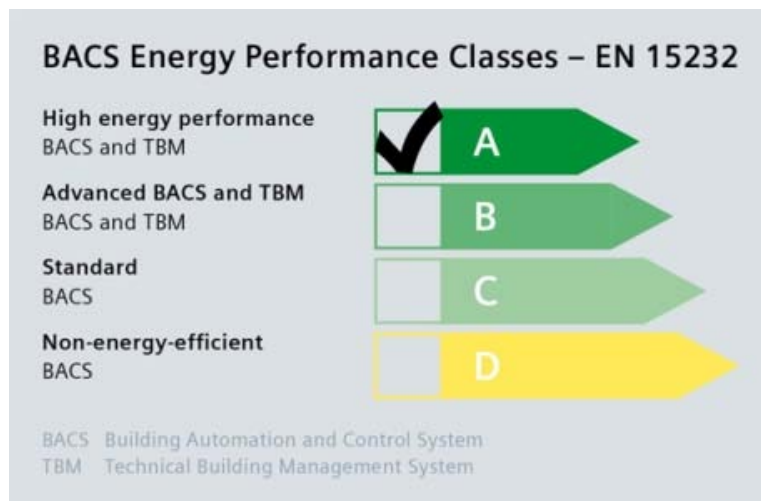
The Synco devices include default group addresses to distribute the system time and fault information. When an application program is downloaded to the Synco device via ETS, the aforementioned group addresses are deleted. For this reason, the special group addresses need to be downloaded via ETS. Otherwise, the Synco devices will not be able to communicate. The group addresses can be downloaded from the Internet: www.siemens.com/synco

Notes on planning

This document covers an example of a classroom application and gives an idea of how to implement it. For the configuration and parameter settings to be made on the individual devices, refer to the respective application and function sheets which can be downloaded from www.siemens.com/hit or www.siemens.com/knx-td

Overview

No.	Functions	Benefits	Page
1a	Basic application	Energy performance class C	5
	Functions: <ul style="list-style-type: none"> • Individual room temperature control with time program • Manual/remote control and monitoring of lighting • Manual/remote control and monitoring of blinds • Blind protection control • Central acquisition and monitoring of HVAC, lighting and blind status • Heating energy efficiency indication • Remote alarming 	Your customer will get: <ul style="list-style-type: none"> • More comfort and energy savings because each room maintains just the right temperature • Enhanced comfort and security due to remote monitoring, alarming and control • Investment protection thanks to blind protection control • Energy savings due to energy efficiency indicator which informs the user about energy waste and faults when set limits are exceeded 	
1b	Advanced application	Energy performance class B	12
	Additional functions: <ul style="list-style-type: none"> • Automatic switching of lights according to the presence status and brightness level in the room • Facade shading control • Control of blinds according to twilight • Central acquisition and monitoring of room occupancy 	Your customer will get the following additional benefits: <ul style="list-style-type: none"> • More comfort and energy savings thanks to automatic presence detection • Energy savings because the lights are on just when needed • Better room climate thanks to automatic shading control • More security because the facility manager knows whether people are in the building 	
1c	High-end application	Energy performance class A	20
	Additional functions: <ul style="list-style-type: none"> • Constant light control • Sunlight tracking control • Shadow outline tracking control for more daylight 	Your customer will get the following additional benefits: <ul style="list-style-type: none"> • More comfort and energy savings with just as much artificial light as needed. The lights are dimmed automatically and unnoticed • Better room climate thanks to automatic shading control with a maximum of natural light 	



Basic application

Synco™ living &
GAMMA

Classroom



This application variant provides basic room automation for classrooms with radiator heating in school buildings with up to 8 classrooms on 4 floors. It meets the requirements to reach energy performance class C.



Overview of functionality

Room temperature control:

1. Heating of the room when used.
2. Room temperature reduction when the window is left open.
3. Room temperature reduction during the night – time schedule.
4. Automatic exchange of heating and cooling requests with the primary plant if required.

Control of lighting:

5. Manual control via wall switch.
6. Remote control and status monitoring of lighting.

Control of blinds:

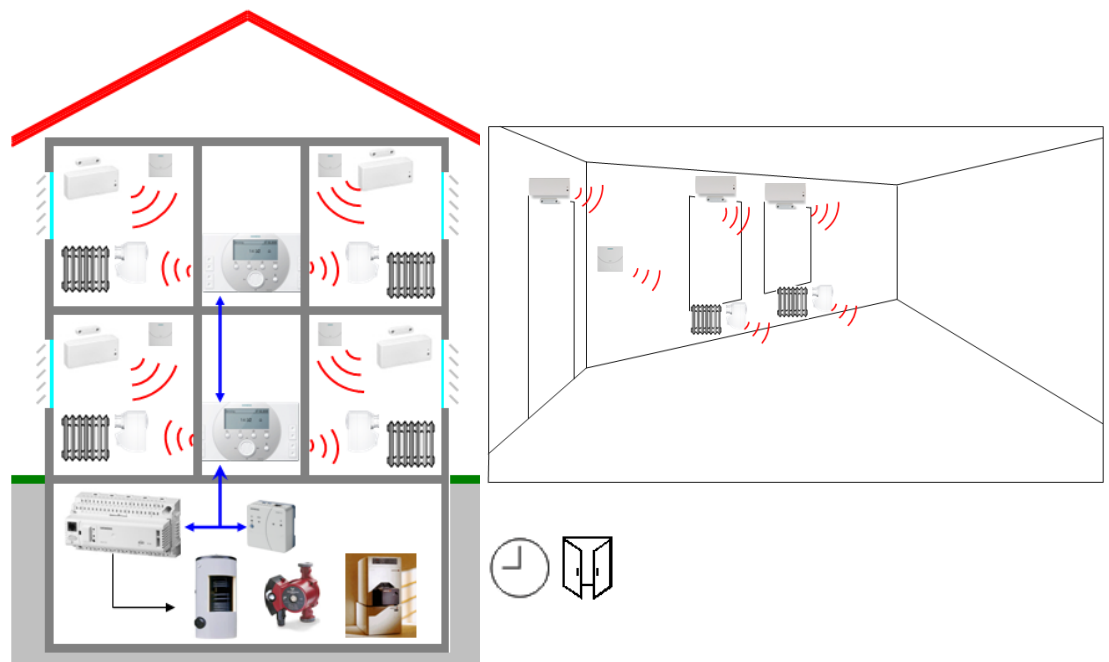
7. Manual control via wall switch.
8. Remote control and status monitoring of blinds.
9. Blind protection control in case of storm (safety function).

Remote monitoring, operation and alarming

10. Central acquisition and monitoring of the room temperature including trend visualization.
11. Heating energy efficiency indication.
12. Central acquisition and monitoring of lighting status.
13. Central acquisition and monitoring of blind status.
14. Remote alarming in case of faults, alarms or if the plant doesn't run energy-efficiently.



Room temperature control



The temperature of each classroom is acquired and controlled. The heat demand from all rooms is collected and transmitted to the primary plant. Non-occupancy periods during the night can be programmed in a time scheduler for each room. During these time periods, the room temperatures are automatically reduced. Open windows are automatically detected and room temperatures lowered to save heating energy.

Basic application

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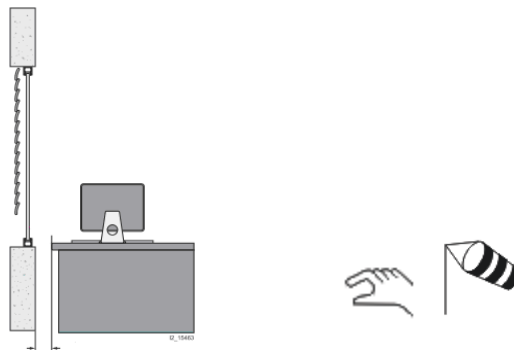
Classroom

Control of lighting



The lights are manually switched via push buttons in the room or through remote control.

Control of blinds



A wind speed sensor protects the blinds from damage caused by storms.

Remote control



Lights, blinds, windows and room temperatures can be controlled and monitored from a central location via the Synco living central apartment unit or a touch panel. By integrating a Web server, remote control and monitoring are made possible via Web browser on a PC or smartphone.

Basic application

Synco™ living &
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Classroom

- Sales arguments**
- 1 **Total room automation solution:** Siemens offers a total room automation solution for small and medium-size school buildings which also includes the primary HVAC control part – a fully integrated and tested solution with products from a single source.
 - 2 **Energy savings through individual room temperature control:** Due to individual room control, up to 30% heating and/or cooling energy can be saved.
 - 3 **Energy savings through time programs:** Time programs for each room automatically reduce the room temperature during the night, on weekends and during holiday periods.
 - 4 **Energy savings thanks to window contact:** Room heating is automatically stopped if the window is left open. So, the actuator will not open to warm up outside air.
 - 5 **Investment protection through weather monitoring:** A weather sensor protects the blinds from storm damage.
 - 6 **Energy savings through automatic data exchange:** Synco living allows the straightforward integration of Synco 700 controllers via KNX bus and therefore automatic data exchange between room and HVAC primary plant. With automatic data exchange, the HVAC primary controllers provide only as much heat (or cooling energy) as demanded by the room controllers. This means that valuable energy is saved.
 - 7 **Remote monitoring and control:** Occupancy, lighting, the blinds and temperatures of each room can be monitored and adjusted on a touch panel or Web browser from a central location or when on the move. An energy efficiency indicator informs the operator when settings are outside predefined limits. So, wrong or temporarily changed settings will never be forgotten and the building is kept under control at all times.
 - 8 **Reduced installation effort:** Wireless KNX RF communication between the Synco living devices including KNX TP1 bus reduces the installation effort and ensures a high level of flexibility. This technology is ideal for renovation projects or building types where rooms need to be easily reallocated.

Device list	Key	Product no. and description	Stock no.	Quantity
	1	QAA910 room temperature sensor	QAA910	1 per room
	2	SSA955 radiator control actuator	SSA995	1...6 per room
	3	AP260 door/window switch	5WG3 260-3AB11	1...6 per room
	5	N526E02 switch/dim actuator (triple)	5WG1 526-1EB02	1 per room
	6	N523/11 blind actuator (octuple)	5WG1 523-1AB11	1 per room
	7	UP222 wall switch, double	5WG1 222-2ABx	Min. 2 per room
	8	UP117 bus coupling unit	5WG1 117-2AB12	Min. 2 per room
	9	AP257/42 wind speed sensor	5WG1 257-3AB42	1 per building
	10	RMH760B heating controller	RMH760B-x	1 per heating plant
	11	QAX913 central apartment unit	S55621-H1xx	1 per floor
	12	QAC910 meteo sensor	QAC910	1 per building
	13	OZW772.16 Web server	OZW772.16	1 per building
	14	N151 IP viewer	5WG1 151-1AB01	1 per building
	15	N140/13 line/backbone coupler	5WG1 140-1AB13	1 per floor
	16	N125/12 power supply	5WG1 125-1AB12	1 per floor

Optional	Key	Product no. and description	Stock no.	Quantity
	17	UP588/x3 color touch panel	5WG1 588-2ABx3	1 per floor








Basic application

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Classroom

Variant	Key	Product no. and description	Stock no.	Quantity
	2a	RRV918 heating circuit controller	RRV918	1 per floor (window front), max. 8 rooms
		STA23 electrothermic actuator	STA23	1 per radiator
	11a	QAX903 central apartment unit	S55621-H1xx	1 per floor

Room devices

				
1 Synco living room temperature sensor QAA910	2 Synco living radiator control actuator SSA955	3 GAMMA door/window switch AP260	7 GAMMA wall switch, double UP222	8 GAMMA bus coupling unit UP117
		<i>Variant:</i>		
5 GAMMA switch/dim actuator N526E02	6 GAMMA blind actuator N523/11	2a Synco living heating controller RRV918		Electrothermic actuator STA23

Other HVAC devices


10 Synco 700 heating controller RMH760B

Other system devices and sensors

			
16 GAMMA power supply N125/12	15 GAMMA line/backbone coupler N140/13	9 GAMMA wind speed sensor AP257/42	12 Synco living meteo sensor QAC910

Devices for remote control

			
11 Synco living central apartment unit QAX913	17 GAMMA color touch panel UP588	13 Synco Web server OZW772	14 GAMMA IP viewer N151

Basic application

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Classroom

Function diagrams

HVAC scenario		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	0
People are present																										
Room operating mode	Comfort																									
	Precomfort																									
	Economy																									
	Protection																									

This could be a possible HVAC scenario:
 The room temperature is increased at 6.00 – controlled by a time schedule – to the Comfort temperature setpoint and reduced again at 21.00 to the Economy temperature level.

Communication diagram

	QAA	260	SSA	222	257	526	523	QAX****	RMH	OZW*	151**
Communication objects						Lighting	Blinds	HVAC			
Room temperature	▷							▷		▷	▷
Window/door status		▷						▷		▷	▷
Room temp. setpoint			◁					◁		◁	◁
Room heating operating mode			◁					◁			
Heat request								▷	▷		
Heating plant status									▷	▷	▷
Heating plant operation									◁	◁	◁
Lighting on/off				▷		▷		◁		◁***	◁
Light status						▷					▷
Outside temperature							▷	▷	▷	▷	
Wind speed					▷		▷		▷		
Blinds up/down				▷			▷	◁		◁***	◁
Blind status							▷				▷

▷ = transmitter ◁ = receiver

Notes

- * OZW772 is the Web server for HVAC. Additionally, it supports the control of lighting and blinds. If variant 11a (QAX903 central apartment unit) is installed, the control of lighting and blinds will not be possible via OZW772
- ** The total number of functions in the IP viewer N151 is limited to 40. In place of or supplementary to the IP viewer, a touch panel UP588 can be used
- *** Control is possible via OZW772 Web server and QAX913 central apartment unit
- **** The QAX central apartment unit works as a gateway between KNX TP1 and KNX RF. It can also be used as an operator station if no Web server or touch panel shall be integrated. However, the QAX only supports 8 push buttons to switch either a blind or a light actuator. Dimming and scenes are also possible

Limitations

- 1 One central apartment unit is required for a maximum of 12 classrooms.
- 2 Max. 6 window/door switches can be installed in one classroom.
- 3 Max. 6 radiators can be controlled in one classroom. One actuator acts as a master, the others as slaves.
- 4 Max. 40 functions can be displayed on the IP viewer N151.
- 5 Max. 110 functions on 10 main and 10 sub pages can be displayed on the touch panel N588.

Basic application

Classroom

Synco™ living &
GAMMAFunctional
description

Description of functions

Individual room temperature control

The room temperature sensor (QAA) acquires the room temperature and sends the value periodically to the central apartment unit (QAX) via KNX RF. The window/door switches (AP) send window/door status information to the central apartment unit (QAX) as well.

The central apartment unit (QAX) manages the time schedules regarding operating modes and setpoints for each room individually and sends setpoint information to the master radiator actuator of each room. The slave radiator actuators adopt the actuator position information from the master.

Demand-dependent heat generation

When at least one room calls for heat, the central apartment unit (QAX) forwards a heat request directly to heat generation (RMH) via heat distribution zone 1 on the KNX bus.

Heat generation (RMH) provides heat only when at least one of the consumers in the system calls for it (demand-dependent control).

Weather-compensated heating control

The outside sensor (QAC) sends the outside temperature signal to the heating controller (RMH) whose flow temperature setpoint is shifted depending on the outside temperature to adjust the amount of heat delivered.

Time schedule for each room

A time schedule defines the time periods the room is not occupied. During these periods of time, the operating mode is reduced to Economy with lower temperature setpoints. So, during the night, on weekends and during holidays, valuable heating energy can be saved. After these time periods, the setpoints are set back to the Comfort level.

Window contact

When one or more windows is/are opened in the room, the operating mode changes automatically to Economy. As a result, heating or cooling energy can be saved because the system does not try to compensate for energy losses.

Blind protection

The wind speed sensor (AP257/42) acquires permanently the wind speed. When strong winds come up, the blinds are driven up to a secure position.

Remote control and supervision

All rooms can be monitored and controlled on a Web browser via Web server (OZW). The following parameters can be monitored:

- The current status of windows and doors
- The current room temperatures
- The current room temperature setpoints
- The current room operating modes

The following parameters can be changed, if required:

- The room operating modes, individually or in groups
- The room temperature setpoints, individually or in groups
- The time schedule for each individual room or for room groups

All rooms can be monitored and controlled on a Web browser via Web server (IP viewer). The following parameters can be monitored and changed, if required:

- The heating plant (temperatures, setpoints, operating modes, faults, alarms)
- The status of lighting (on/off)
- The status of the blinds (raised/lowered)

Energy efficiency indication

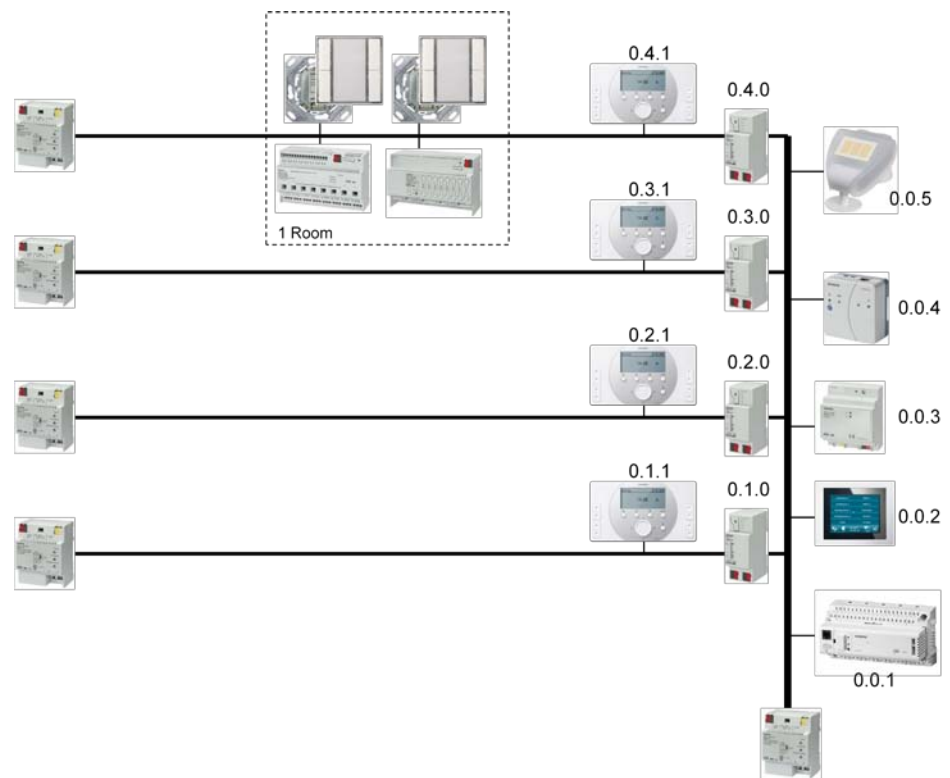
Web server OZW772 provides the energy efficiency indication function for the HVAC system which reminds the user of settings outside the limits from the point of view of energy efficiency. In case of a non-efficient status, the user will be notified by e-mail or smartphone app. The limits can be defined by the user.

Basic application

Classroom

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Topology



Secondary documentation

The following application sheets describe individual controller applications with more specific information. They can be downloaded from the Internet: www.siemens.com/hit for Synco and www.siemens.com/knx-td for GAMMA.

Application number	Title	Product no.
Synco application sheet QRA001 QA9 HQ	Synco living central apartment unit for HVAC	QAX910
Synco application sheet TH0001 SS9 HQ	Room heating control for Synco living/Home Automation	SSA955
Synco application sheet HB0001 H6B HQ	Demand-compensated boiler temperature control with controlled maintained boiler return temperature	RMH760B



This application variant provides advanced room automation for classrooms with radiator heating in school buildings with up to 8 classrooms on 4 floors. It meets the requirements to reach energy performance class B.



Overview of functionality

Room temperature control:

1. Heating of the room when used – time schedule.
2. Room temperature reduction when the room is not occupied – presence detector.
3. Room temperature reduction when the window is left open.
4. Room temperature reduction during the night – time schedule.
5. Automatic exchange of heating and cooling requests with the primary plant if required.

Control of lighting:

6. Manual control via wall switch.
7. Remote control and status monitoring of lighting.
8. Automatic switching off of all lights when the room is not occupied.
9. Automatic switching of lighting according to the presence status in the room.
10. Automatic switching of lighting according to the brightness level in the room.

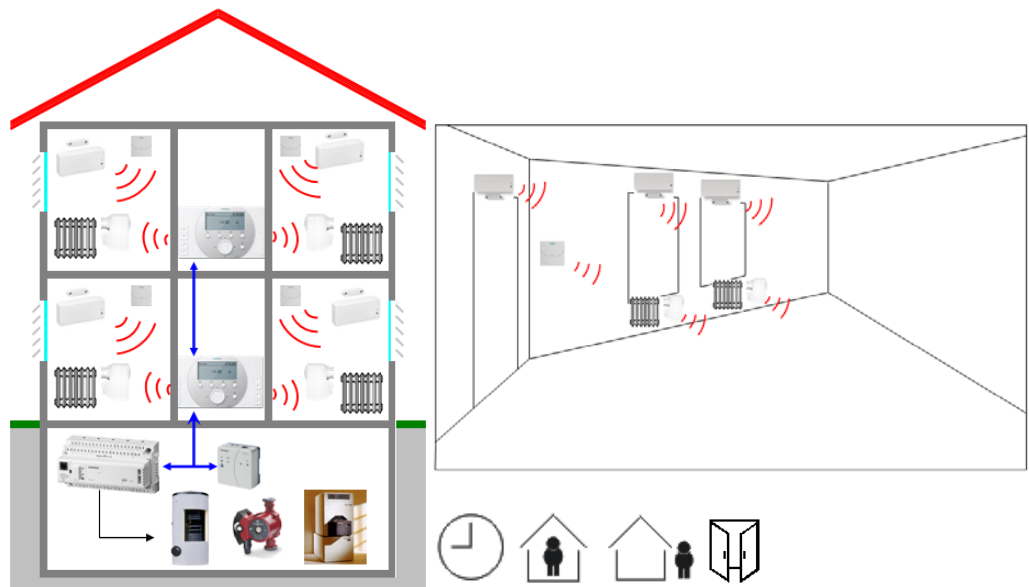
Control of blinds:

11. Manual control via wall switch.
12. Remote control and status monitoring of blinds.
13. Blind control according to twilight (automatically lowered during the night).
14. Blind protection control in case of storm (safety function).
15. Facade shading control

Remote monitoring, operation and alarming

16. Central acquisition and monitoring of room temperature including trend visualization.
17. Heating energy efficiency indication.
18. Central acquisition and monitoring of room occupancy.
19. Central acquisition and monitoring of lighting status.
20. Central acquisition and monitoring of blinds status.
21. Remote alarming in case of faults, alarms or if the plant doesn't run energy-efficiently.

Room temperature control



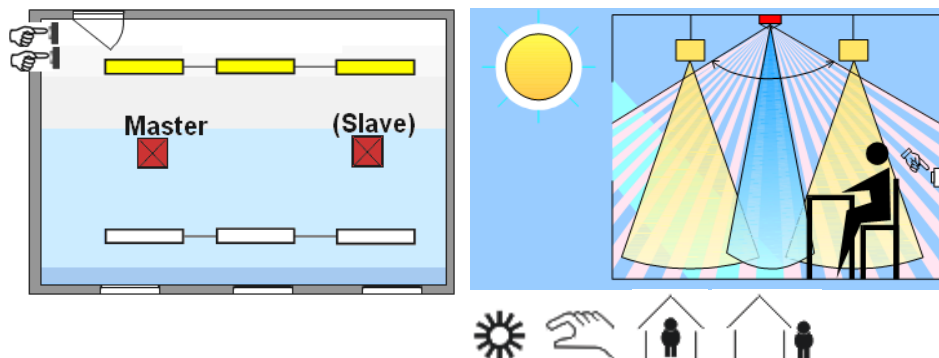
The temperature of each classroom is acquired and controlled. The heat demand from each room is acquired and transmitted to the primary plant. Non-occupancy periods during the night can be programmed for each room. During these time periods, the room temperatures are automatically reduced. Open windows are automatically detected and room temperatures lowered to save heating energy. Also during the day when the rooms are not occupied, the room temperatures are slightly lowered.

Advanced application

Classroom

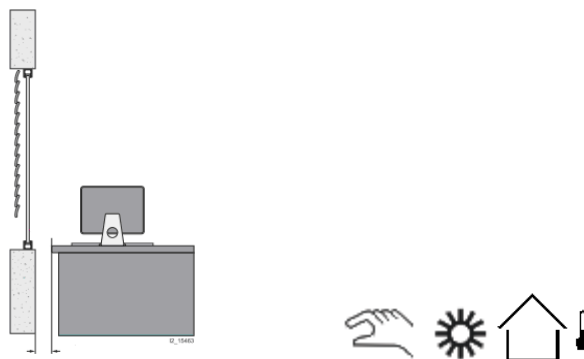
Synco™ living & GAMMA

Control of lighting



Presence detectors also help save energy by automatically turning off the lights when the room is not occupied. A brightness sensor helps to switch the lights so that the room is optimally illuminated using as little artificial light as necessary.

Control of blinds



A weather station outside of the building protects up to 4 facades against excessive solar irradiance in the summer. This function helps keep classrooms cool. The weather station also protects the blinds from damage caused by storms or other natural influences and controls them according to twilight and temperature to save heating energy during winter nights.

Remote control



Lights, blinds, windows and room temperatures can be monitored and controlled from a central location via the Synco living central apartment unit or a touch panel. By integrating a Web server, remote control and monitoring are made possible via Web browser on a PC or smartphone.

Advanced application

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Classroom

- Sales arguments**
- 1 **Total room automation solution:** Siemens offers a total room automation solution for small and medium-size school buildings which also includes the primary HVAC control part – a fully integrated and tested solution with products from a single source.
 - 2 **Energy savings through individual room temperature control:** Due to individual room control, up to 30% heating energy can be saved.
 - 3 **Energy savings through time programs:** Time programs for each room automatically reduce the room temperature during the night, on weekends and during holiday periods.
 - 4 **Energy savings thanks to window contact:** Room heating is automatically stopped if the window is left open. So, the actuator will not open to warm up outside air.
 - 5 **Energy savings through presence survey:** A presence detector ensures that the lights are automatically switched off if nobody is in the room. Turning off the lights will never be forgotten when people are leaving. Thanks to the presence detector, up to 20% lighting energy can be saved. In addition, when no presence is detected, the room temperature will automatically be lowered by 1 to 2 K. Each degree of temperature reduction can save up to 6% heating energy.
 - 6 **Energy savings through lighting control:** Lighting control helps ensure that only as much artificial light as necessary is used. Together with the natural light, the users will get optimal lighting conditions and another 10 to 20% lighting energy can be saved.
 - 7 **Energy savings through weather monitoring:** A weather station protects the blinds from storm damage and ensures that the blinds are down to protect the room from excessive solar irradiance in the summer. In cold winter nights, the blinds are automatically lowered to improve the building's thermal insulation.
 - 8 **Energy savings through automatic data exchange:** Synco living allows the straightforward integration of Synco 700 controllers via KNX bus and therefore automatic data exchange between room and HVAC primary plant. With automatic data exchange, the HVAC primary controllers provide only as much heat (or cooling energy) as demanded by the room controllers. This means that valuable energy can be saved.
 - 9 **Remote monitoring and control:** Occupancy, lighting, the blinds and temperatures of each room can be monitored and adjusted on a touch panel or Web browser from a central location or when on the move. An energy efficiency indicator informs the operator when settings are outside predefined limits. So, wrong or temporarily changed settings will never be forgotten and the building is kept under control at all times.
 - 10 **Reduced installation effort:** Wireless KNX RF communication between the Synco living devices including KNX TP1 bus reduces the installation effort and ensures a high level of flexibility. This technology is ideal for renovation projects or building types where rooms need to be easily reallocated.

	Key	Product no. and description	Stock no.	Quantity
Device list	1	QAA910 room temperature sensor	QAA910	1 per room
	2	SSA955 radiator control actuator	SSA995	1...6 per room
	3	AP260 door/window switch	5WG3 260-3AB11	1...6 per room
	4	UP258D11 presence detector	5WG1 258-2DB11	1...2 per room
	5	N526E02 switch/dim actuator (triple)	5WG1 526-1EB02	1 per room
	6	N523/11 blind actuator (octuple)	5WG1 523-1AB11	1 per room
	7	UP222 wall switch, double	5WG1 222-2DB13	Min. 2 per room
	8	UP117 bus coupling unit	5WG1 117-2AB12	Min. 2 per room
	9	AP257/32 weather station (GPS)	5WG1 257-3AB32	1 per building
	10	RMH760B heating controller	RMH760B-x	1 per heating plant
	11	QAX913 central apartment unit	S55621-H1xx	1 per floor, max. 12 rooms
	12	OZW772.16 Web server	OZW772.16	1 per building
	13	N151 IP viewer	5WG1 151-1AB01	1 per building
	14	N140/13 line/backbone coupler	5WG1 140-1AB13	1 per floor
	15	N125/12 power supply	5WG1 125-1AB12	1 per floor

Advanced application

Classroom

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Optional	Key	Product no. and description	Stock no.	Quantity
	16	UP588/x3 color touch panel	5WG1 588-2ABx3	1 per building

Variant	Key	Product no. and description	Stock no.	Quantity
	2a	RRV918 heating circuit controller	RRV918	1 per floor (window front), max. 8 rooms
		STA23 electrothermic actuator	STA23	1 per radiator
	11a	QAX903 central apartment unit	S55621-H1xx	1 per floor

Room devices



1 Synco living room temperature sensor QAA910



2 Synco living radiator control actuator SSA955



3 GAMMA door/window switch AP260



7 GAMMA wall switch, double UP222



8 GAMMA bus coupling unit UP117



4 GAMMA presence detector UP258D11



5 GAMMA switch/dim actuator N526E02



6 GAMMA blind actuator N523/11



Variant:
2a Synco living heating controller RRV918
Electrothermic actuator STA23

Other HVAC devices



10 Synco 700 heating controller RMH760B

Other system devices and sensors



15 Power supply N125/12



14 Line/backbone coupler N140/13



9 Weather station AP257/32 (GPS)

Devices for remote control



11 Synco living central apartment unit QAX913



16 Colour touch panel UP588



12 Synco Web server OZW772



13 IP viewer N151

Advanced application

Synco™ living & GAMMA

Classroom

Function diagrams

HVAC scenario		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	0
People are present																										
Room operating mode	Comfort																									
	Precomfort																									
	Economy																									
	Protection																									

This could be a possible HVAC:

The room temperature is increased at 6.00 – controlled by a time schedule – to the Precomfort temperature setpoint (20 °C) and reduced again at 21.00 to the Economy temperature level (18 °C). Also, when people enter the room, the temperature is increased to the Comfort level (21 °C) and reduced again when people leave.

Light scenario		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	0
People are present																										
Device	Status																									
Light	Light on enforced																									

This could be a possible light scenario:

People manually switch on the lights via the push buttons. After a certain time after they have left the room, all lights are automatically turned off. Individual lighting groups are switched according to the natural light contribution.

Blind scenario		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	0
Sun is shining into the room																										
People are present																										
Blind status	Raised																									
	Lowered																									

This could be a possible blind scenario:

People raise the blinds manually via the push buttons. The facade protection function lowers the blinds when the sun shines on the facade. After sunset, the blinds are automatically lowered.

Advanced application

Synco™ living & GAMMA

Classroom

Communication diagram

	QAA	260	SSA	258	222	257	526	523	QAX****	RMH	OZW*	151**
Communication objects							Lighting	Blinds	HVAC			
Room temperature	▷								▷		▷	▷
Window/door status		▷							▷		▷	▷
Room temp. setpoint			◁						◁		▷	▷
Room heating operating mode			◁	▷					▷			
Heat request									▷	▷		
Heating plant status										▷	▷	▷
Heating plant operation										◁	◁	◁
Lighting on/off				▷	▷		▷		◁		◁***	◁
Lighting status							▷					▷
Presence status				▷				▷				▷
Outside temperature						▷		▷	▷	▷	▷	▷
Brightness/solar irradiance						▷		▷		▷		
Wind speed						▷		▷		▷		
Blinds up/down					▷			▷	◁		◁***	◁
Blind status								▷				▷

▷ = transmitter ▷ = receiver

Notes

- * OZW772 is the Web server for HVAC. In addition, it supports the control of lighting and blinds. If variant 11a (QAX903 central apartment unit) is installed, the control of lighting and blinds will not be possible via OZW772
- ** The total number of functions in the IP viewer N151 is limited to 40. In place of or supplementary to the IP viewer, a touch panel UP588 can be used
- *** Control is possible via OZW772 Web server and QAX913 central apartment unit
- **** The QAX central apartment unit works as a gateway between KNX TP1 and KNX RF. It can also be used as an operator station if no Web server or touch panel shall be integrated. However, the QAX only supports 8 push buttons to switch either a blind or a light actuator. Dimming and scenes are also possible

Limitations

- 1 One central apartment unit is required for a maximum of 12 classrooms.
- 2 Max. 6 window/door switches can be installed in one classroom.
- 3 Max. 6 radiators can be controlled in one classroom. One actuator acts as a master, the others as slaves.
- 4 Max. 40 functions can be displayed on the IP viewer N151.
- 5 Max. 110 functions on 10 main and 10 sub pages can be displayed on the touch panel N588.

Advanced application

Classroom

Synco™ living &
GAMMA

Functional description

Description of functions

Individual room temperature control

The room temperature sensor (QAA) acquires the room temperature and sends the value periodically to the central apartment unit (QAX) via KNX RF. The window/door switches (AP) send window/door status information to the central apartment unit (QAX) as well.

The central apartment unit (QAX) manages the time schedules regarding operating modes and setpoints for each room individually and sends setpoint information to the master radiator actuator of each room. The slave radiator actuators adopt over the actuator position information from the master.

Demand-dependent heat generation

When at least one room calls for heat, the central apartment unit (QAX) forwards a heat request directly to heat generation (RMH) via heat distribution zone 1 on the KNX bus.

Heat generation (RMH) provides heat only when at least one of the consumers in the system calls for it (demand-dependent control).

Weather-compensated heating control

The weather station (AP257/32) sends the outside temperature signal to the heating controller (RMH) whose flow temperature setpoint is shifted depending on the outside temperature to adjust the amount of heat delivered.

Time schedule for each room

A time schedule defines the time periods the room is not occupied. During these periods of time, the operating mode is reduced to Economy with lower temperature setpoints. So, during the night, on weekends and during holidays, valuable heating energy can be saved. After these time periods, the setpoints are set back to the Precomfort level.

Presence-dependent heating control

During periods of time when people are detected in the room by the presence detector, the room temperature is increased to the Comfort level. Afterwards, it is again lowered to the Precomfort level.

Window contact

When one or more windows is/are opened in the room, the operating mode changes automatically to Economy. As a result, heating or cooling energy can be saved because the system does not try to compensate for energy losses.

Control of lighting (On/Off)

Lighting control keeps the room light at a constant brightness level by adding artificial light to the natural light. The brightness of the light is automatically adjusted by switching lighting groups on or off.

Manual switching and dimming is possible via wall switch. In this case, lighting control is stopped and the status of the lighting groups in the room is maintained as long as presence is detected.

Presence-dependent control of lighting

The presence detector (UP258D11) allows switching up to 4 lighting groups and detects the presence of people in its detection area. When a person is detected, the lights are switched on. When everybody leaves the room, the lights are switched off. A master-slave configuration is possible to extend the detection area.

Control of blinds

The weather station (AP257/32) with integrated GPS receiver offers efficient control to protect facades from the sun. Up to 4 facade areas can be defined, which are automatically controlled – independent of each other the sun.

In cold winter nights and when no occupancy is detected in the classroom, the blinds are lowered to improve the building's thermal insulation.

On winter days, blind control raises the blinds to let the sunshine in und to warm up the room.

Blind protection

The wind speed sensor (AP257/42) acquires permanently the wind speed. When strong winds come up, the blinds are driven up to a secure position.

Remote control and supervision

All rooms can be monitored and controlled on a Web browser via Web server (OZW). The following parameters can be monitored:

- The current status of windows and doors
- The current room temperatures
- The current room temperature setpoints
- The current room operating modes

The following parameters can be changed, if required:

- The room operating modes, individually or in groups
- The room temperature setpoints, individually or in groups
- The time schedule for each room or for room groups
- The heating plant (temperatures, setpoints, operating modes, faults, alarms)

All rooms can be monitored and controlled on a Web browser via Web server (IP viewer). The following parameters can be monitored and changed, if required:

- The status of lights (on/off)
- The occupancy of classrooms

Advanced application

Classroom

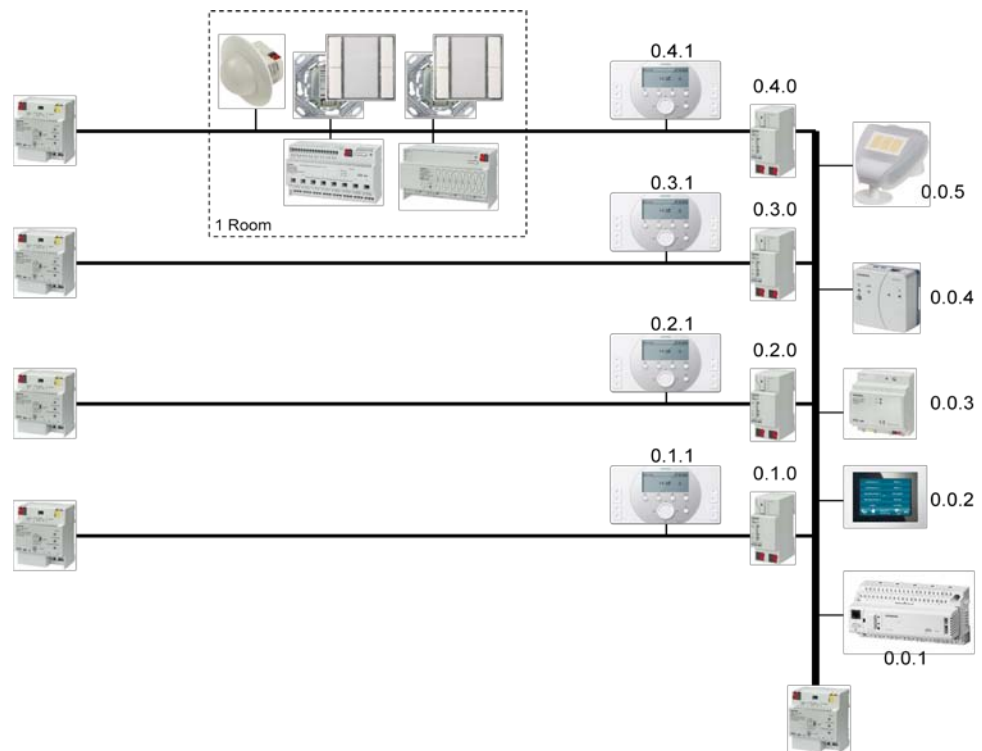
Synco™ living & GAMMA

- Status of blinds (raised/lowered)

Energy efficiency indication

Web server OZW772 provides the energy efficiency indication function for the HVAC system which reminds the user of settings outside the limits from the point of view of energy efficiency. In case of a non-efficient status, the user will be notified by e-mail or smartphone app. The limits can be defined by the user.

Topology



Secondary documentation

The following application sheets describe individual controller applications with more specific information. They can be downloaded from the Internet: www.siemens.com/hit for Synco and www.siemens.com/knx-td for GAMMA.

Application number	Title	Product no.
Synco application sheet QRA001 QA9 HQ	Synco living central apartment unit for HVAC	QAX910
Synco application sheet TH0001 SS9 HQ	Room heating control for Synco living/Home Automation	SSA955
Synco application sheet HB0001 H6B HQ	Demand-compensated boiler temperature control with controlled maintained boiler return temperature	RMH760B
GAMMA application sheet function no. 010	Optimum shading for facades	AP257/32



This application variant provides high-end room automation for classrooms with radiator heating in school buildings with up to 8 classrooms on 4 floors. It meets the requirements to reach energy performance class A.



Overview of functionality

Room temperature control:

1. Heating of the room when used – time schedule.
2. Room temperature reduction when the room is not occupied – presence detector.
3. Room temperature reduction when the window is left open.
4. Room temperature reduction during the night – time schedule.
5. Automatic exchange of heating and cooling requests with the primary plant if required.

Air quality monitoring:

6. Indication of the air quality.

Control of lighting:

7. Manual control via wall switch.
8. Remote control and status monitoring of lighting.
9. Automatic switching off of all lights when the room is not occupied.
10. Automatic switching of lighting according to the presence status in the room.
11. Automatic switching of lighting according to the brightness level in the room.
12. Constant light control.

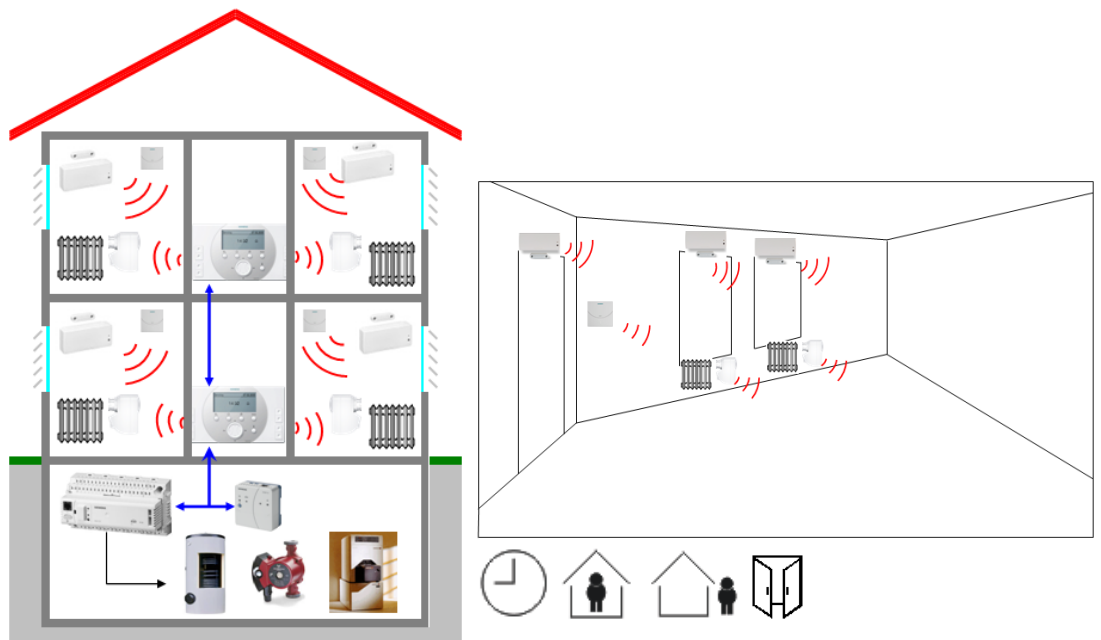
Control of blinds:

13. Manual control via wall switch.
14. Remote control and status monitoring of the blinds.
15. Control of blinds according to twilight (automatically lowered during the night).
16. Blind protection control in case of storm (safety function).
17. Facade shading control.
18. Sunlight tracking control for more daylight.
19. Shadow outline tracking control for more daylight.

Remote monitoring, operation and alarming:

20. Central acquisition and monitoring of the room temperature including trend visualization.
21. Heating energy efficiency indication.
22. Central acquisition and monitoring of room occupancy.
23. Central acquisition and monitoring of lighting status.
24. Central acquisition and monitoring of blind status.
25. Remote alarming in case of faults, alarms or if the plant doesn't run energy-efficiently.

Room temperature control



High-end application

Classroom

Synco™ living & GAMMA

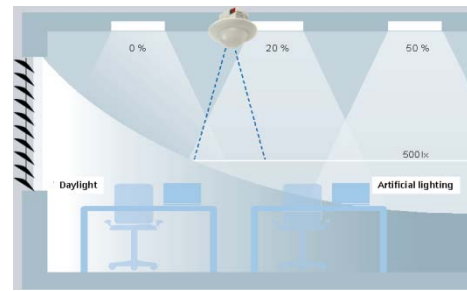
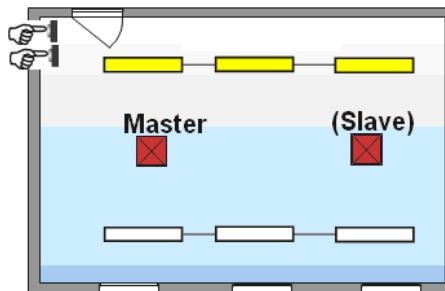
The temperature of each classroom is acquired and controlled. The heat demand from each room is acquired and transmitted to the primary plant. Non-occupancy periods during the night can be programmed for each room. During these time periods, the room temperatures are automatically reduced. Open windows are automatically detected and room temperatures lowered to save heating energy. Also during the day when the rooms are not occupied, the room temperatures are slightly lowered.

Air quality monitoring



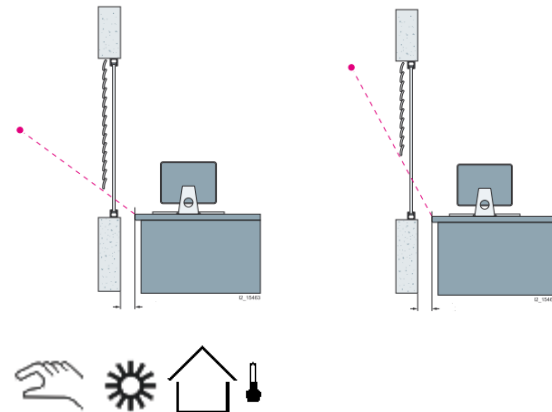
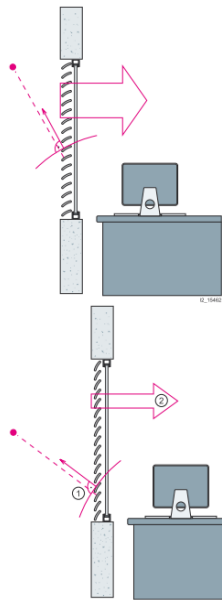
The air quality sensor measures the CO₂ concentration in the room air and shows the measured value via a high-lighted LED on the front of the device. A red lighted LED indicates that the room shall be supplied by fresh air.

Control of lighting



Presence detectors also help save energy by automatically turning off the lights when the room is not occupied. A brightness sensor helps to switch the lights so that the room is optimally illuminated using as little artificial light as necessary.

Control of blinds



A weather station outside of the building protects up to 8 facades against excessive solar irradiance in the summer. This function helps keep classrooms cool. The weather station also protects the blinds from damage caused by storms or other natural influences and controls it according to twilight and temperature to save heating energy during winter nights. Finally, sunlight tracking and Shadow outline tracking provide the room users with as much natural light as possible to ensure optimum learning conditions.

High-end application

Classroom

Synco™ living &
GAMMA

Remote control



Lights, blinds, windows and room temperatures can be monitored and controlled from a central location via the Synco living central apartment unit or a touch panel. By integrating a Web server, remote control and monitoring are made possible via Web browser on a PC or smartphone.

Sales arguments

- 1 **Total room automation solution:** Siemens offers a total room automation solution for small and medium-size school buildings which also includes the primary HVAC control part – a fully integrated and tested solution with products from a single source.
- 2 **Energy savings through individual room temperature control:** Due to individual room control, up to 30% heating energy can be saved.
- 3 **Energy savings through time programs:** Time programs for each room automatically reduce the room temperature during the night, on weekends and during holiday periods.
- 4 **More comfort through optimal air quality:** The air quality sensor indicates the CO₂ concentration of the room air and animates people to supply the room with fresh air. A low CO₂ concentration increases the students comfort and learning efficiency.
- 5 **Energy savings thanks to window contact:** Room heating is automatically stopped if the window is left open. So, the actuator will not open to warm up outside air.
- 6 **Energy savings through presence survey:** A presence detector ensures that the lights are automatically switched off if nobody is in the room. Turning off the lights will never be forgotten when people are leaving. Thanks to the presence detector, up to 20% lighting energy can be saved. In addition, when no presence is detected, the room temperature will automatically be lowered by 1 to 2 K. Each degree of temperature reduction can save up to 6% heating energy.
- 7 **Energy savings through constant light control:** Constant light control helps ensure that only as much artificial light as necessary is used. Together with the natural light, the users will get optimum lighting conditions and another 10 to 20% of lighting energy can be saved.
- 8 **Energy savings through weather monitoring:** A weather station protects the blinds from storm damage and ensures that the blinds are down to protect the room from excessive solar irradiance in the summer. In cold winter nights, the blinds are automatically lowered to improve the building's thermal insulation.
- 9 **Energy savings through blind control:** In dependence of the sun position the blind slats are tracked that they are constantly at right angles to the sun. This saves energy and optimizes the utilization of daylight.
- 10 **Energy savings through automatic data exchange:** Synco living allows the straightforward integration of Synco 700 controllers via KNX bus and therefore automatic data exchange between room and HVAC primary plant. With automatic data exchange, the HVAC primary controllers provide only as much heat (or cooling energy) as demanded by the room controllers. This means that valuable energy can be saved.
- 11 **Central remote monitoring and control:** Occupancy, lighting, the blinds and temperatures of each room can be monitored and adjusted on a touch panel or Web browser from a central location or when on the move. An energy efficiency indicator informs the operator when settings are outside predefined limits. So, wrong or temporarily changed settings will never be forgotten and the building is kept under control at all times.
- 12 **Reduced installation effort:** Wireless KNX RF communication between the Synco living devices including KNX TP1 bus reduces the installation effort and ensures a high level of flexibility. This technology is ideal for renovation projects or building types where rooms need to be easily reallocated.

High-end application

Synco™ living & GAMMA

Classroom

Device list	Key	Product no. and description	Stock no.	Quantity
	1	QAA910 room temperature sensor	QAA910	1 per room
	2	SSA955 radiator control actuator	SSA995	1...6 per room
	3	AP260 door/window switch	5WG3 260-3AB11	1...6 per room
	4	UP258E21 presence detector	5WG1 258-2EB21	1...2 per room
	5	N526E02 switch/dim actuator (triple)	5WG1 526-1AB02	1 per room
	6	N523/11 blind actuator (octuple)	5WG1 523-1AB11	1 per room
	7	UP222 wall switch, double	5WG1 222-2ABx	Min. 2 per room
	8	UP117 bus coupling unit	5WG1 117-2AB12	Min. 2 per room
	9	AP257/22 weather station (GPS)	5WG1 257-3AB22	1 per building
	10	RMH760B heating controller	RMH760B-x	1 per heating plant
	11	QAX913 central apartment unit	S55621-H1xx	1 per floor, max. 12 rooms
	12	OZW772.16 Web server	OZW772.16	1 per building
	13	N151 IP viewer	5WG1 151-1AB01	1 per building
	14	N140/13 line/backbone coupler	5WG1 140-1AB13	1 per floor
	15	N125/12 power supply	5WG1 125-1AB12	1 per floor

Optional	Key	Product no. and description	Stock no.	Quantity
	16	UP588/x3 color touch panel	5WG1 588-2ABx3	1 per floor
	17	AQR2576Nx FM sensor front module	S55720-S207	1 per room
		AQR2530NNW FM sensor basic mod.	S55720-S137	1 per room

Variant	Key	Product no. and description	Stock no.	Quantity
	2a	RRV918 heating circuit controller	RRV918	1 per floor (window front), max. 8 rooms
		STA23 electrothermic actuator	STA23	1 per radiator
	11a	QAX903 central apartment unit	S55621-H1xx	1 per floor
	17a	QMX3.70 sensor for wall mounting	S55624-H104	1 per room

Room devices



1 Synco living room temperature sensor QAA910



2 Synco living radiator control actuator SSA955



3 GAMMA door/window switch AP260



7 GAMMA wall switch, double UP222



8 GAMMA bus coupling unit UP117



4 GAMMA presence detector UP258E21



5 GAMMA switch/dim actuator N526E02



6 GAMMA blind actuator N523/11



Variant:
2a Synco living heating controller RRV918
Electrothermic actuator STA23

High-end application

Synco™ living & GAMMA

Classroom



Front module



Basic module



17 Flush mount sensor
AQR2576Nx

17 Flush mount sensor
AQR2530NNW

17a Sensor for wall
mounting QMX3.P70

Other HVAC devices



10 Synco 700 heating controller RMH760B

Other system devices and sensors



15 Power supply
N125/12



14 Line/backbone
coupler N140/13



9 Weather station
AP257/22 (GPS)

Devices for remote control



11 Synco living central
apartment unit
QAX913



16 Color touch panel
UP588



12 Synco Web server
OZW772



13 IP viewer N151

High-end application

Synco™ living & GAMMA

Classroom

Function diagrams

HVAC scenario		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	0
People are present																										
Room operating mode	Comfort																									
	Precomfort																									
	Economy																									
	Protection																									

This could be a possible HVAC scenario:

The room temperature is increased at 6.00 – controlled by a time schedule – to the Precomfort temperature setpoint (20 °C) and reduced again at 21.00 to the Economy temperature level (18 °C). Also, when people enter the room, the temperature is increased to the Comfort level (21 °C) and reduced again when people leave.

Light scenario		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	0
People are present																										
Light status	On/Off																									

This could be a possible light scenario:

People manually switch on the lights via the push buttons. After a certain time after they have left the room, all lights are automatically turned off. The lighting groups are dimmed according to the natural light contribution to maintain a constant brightness level in the room when occupied.

Blind scenario		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	0
Sun is shining into the room																										
People are present																										
Blind status	Raised																									
	Lowered																									

This could be a possible blind scenario:

People raise the blinds manually via the push buttons. When the sun shines on the facade, the blinds are driven to a certain position to protect people from excessive solar irradiance by maintaining comfortable lighting conditions in the room. After sunset, the blinds are automatically lowered.

High-end application

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Classroom

Communication diagram

	QAA	260	SSA	258	222	257	526	523	QAX****	RMH	OZW*	151**
Communication objects							Lighting	Blinds	HVAC			
Room temperature	▷								▷		▷	▷
Window/door status		▷							▷		▷	▷
Room temp. setpoint			◁						◁		▷	▷
Room heating operating mode			◁	▷					▷			
Heat request									▷	▷		
Heating plant status										▷	▷	▷
Heating plant operation										◁	◁	◁
Lighting on/off				▷	▷		▷	◁	◁		◁***	◁
Lighting status							▷					▷
Presence status				▷				▷				▷
Outside temperature						▷		▷	▷	▷	▷	▷
Brightness/solar irradiance						▷		▷		▷		
Wind speed						▷		▷		▷		
Blinds up/down					▷			▷	◁		◁***	◁
Blind status								▷				▷

▷ = transmitter ◁ = receiver

Notes

- * OZW772 is the Web server for HVAC. In addition, it supports the control of lighting and blinds. If variant 11a (QAX903 central apartment unit) is installed, the control of lighting and blinds will not be possible via OZW772
- ** The total number of functions in the IP viewer N151 is limited to 40. In place of or supplementary to the IP viewer, a touch panel UP588 can be used
- *** Control is possible via OZW772 Web server and QAX913 central apartment unit
- **** The QAX central apartment unit works as a gateway between KNX TP1 and KNX RF. It can also be used as an operator station if no Web server or touch panel shall be integrated. However, the QAX only supports 8 push buttons to switch either a blind or a light actuator. Dimming and scenes are also possible

Limitations

- 1 One central apartment unit is required for a maximum of 12 classrooms.
- 2 Max. 6 window/door switches can be installed in one classroom.
- 3 Max. 6 radiators can be controlled in one classroom. One actuator acts as a master, the others as slaves.
- 4 Max. 40 functions can be displayed on the IP viewer N151.
- 5 Max. 110 functions on 10 main and 10 sub pages can be displayed on the touch panel N588.

High-end application

Synco™ living &
GAMMA

Classroom

Functional description

Description of functions

Individual room temperature control

The room temperature sensor (QAA) acquires the room temperature and sends the value periodically to the central apartment unit (QAX) via KNX RF. The window/door switches (AP) send window/door status information to the central apartment unit (QAX) as well.

The central apartment unit (QAX) manages the time schedules regarding operating modes and setpoints for each room individually and sends setpoint information to the master radiator actuator of each room. The slave radiator actuators adopt the actuator position information from the master.

Demand-dependent heat generation

When at least one room calls for heat, the central apartment unit (QAX) forwards a heat request directly to heat generation (RMH) via heat distribution zone 1 on the KNX bus.

Heat generation (RMH) provides heat only when at least one of the consumers in the system calls for it (demand-dependent control).

Weather-compensated heating control

The weather station (AP257/32) sends the outside temperature signal to the heating controller (RMH) whose flow temperature setpoint is shifted depending on the outside temperature to adjust the amount of heat delivered.

Time schedule for each room

A time schedule defines the time periods the room is not occupied. During these periods of time, the operating mode is reduced to Economy with lower temperature setpoints. So, during the night, on weekends and during holidays, valuable heating energy can be saved. After these time periods, the setpoints are set back to the Precomfort level.

Presence-dependent heating control

During periods of time when people are detected in the room by the presence detector, the room temperature is increased to the Comfort level. Afterwards, it is again lowered to the Precomfort level.

Air quality monitoring

The air quality sensor measures the CO₂ concentration in the room air. The background-lit symbol on the front side of the device informs on the current level of CO₂ in the room. The colors green / orange / red of the background lighting indicate good / mediocre / poor air quality.

Window contact

When one or more windows is/are opened in the room, the operating mode changes automatically to Economy. As a result, heating or cooling energy can be saved because the system does not try to compensate for energy losses.

Constant light control

Constant light control keeps the room light at a constant brightness level by adding artificial light to the natural light. The brightness of the light is automatically and continuously adjusted. Offset settings allow the configuration of constant light control with just one presence detector. Manual switching and dimming are possible via wall switch. In this case, the control of lighting is stopped and the brightness level in the room is maintained as long as presence is detected.

Presence-dependent control of lighting

The presence detector (UP258E21) allows switching or controlling up to 4 lighting groups and detects the presence of people in its detection area. When a person is detected, lighting is switched on to the required brightness level. When everybody leaves the room, lighting goes off. A master-slave configuration is possible to extend the detection area.

Control of blinds

The weather station (AP257/22) with integrated GPS receiver offers efficient control to protect facades from the sun. Up to 8 facade areas can be defined, which are automatically controlled – independent of each other.

Sunlight tracking control and Shadow outline tracking control are other functions which ensure maximum use of daylight and minimum glare in the classroom. The sunlight tracking function continually adjusts the blind slats so that they are constantly at right angles to the sun radiation. Shadow outline tracking controls the blinds' position so that the shadow outline keeps a constant distance to the window. This optimizes the utilization of daylight, thus reducing energy consumption for room lighting.

In cold winter nights and when no occupancy is detected in the classroom, the blinds are lowered to improve the building's thermal insulation.

On winter days, blind control raises the blinds to let the sunshine in and to warm up the room.

Blind protection

The weather station acquires permanently the wind speed. When strong winds come up, the blinds are driven up to a secure position.

Remote control and supervision

All rooms can be supervised and operated on a Web browser via Web server (OZW). The following parameters can be supervised:

- The current status of windows and doors
- The current room temperatures
- The current room temperature setpoints
- The current room operating modes

The following parameters can be operated:

- The room operating modes, individually or in groups
- The room temperature setpoints, individually or in groups

High-end application

Synco™ living & GAMMA

Classroom

- The time schedule for each room or for room groups
- The heating plant (temperatures, setpoints, operating modes, faults, alarms)

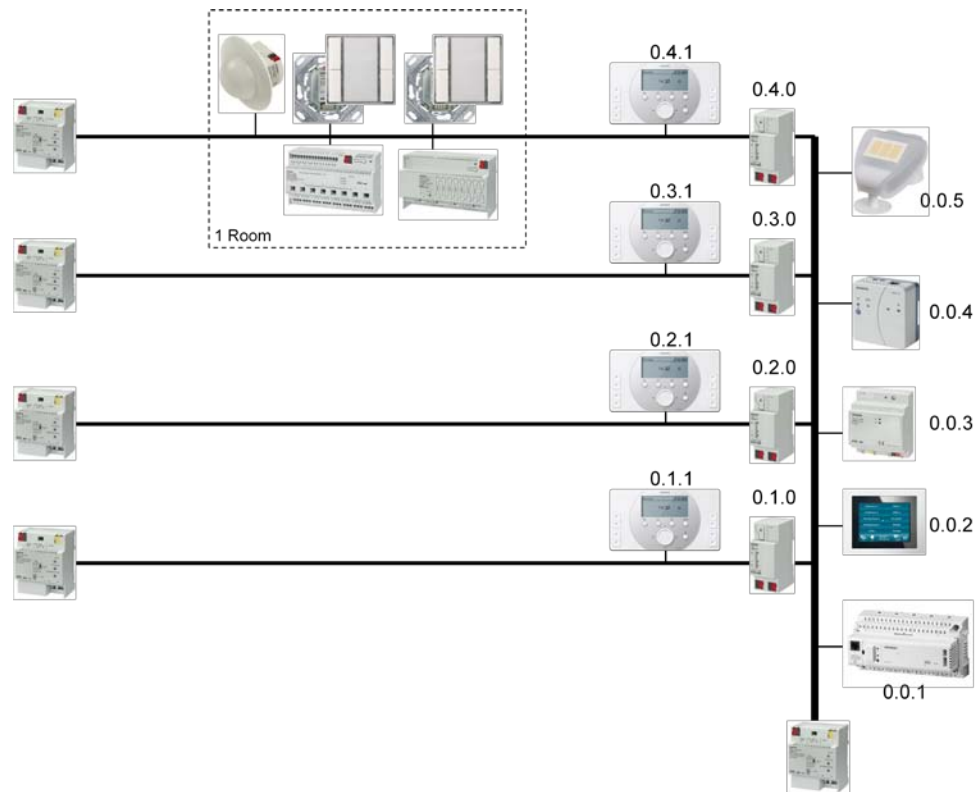
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All rooms can be monitored and controlled on a Web browser via Web server (IP viewer). The following parameters can be monitored and changed, if required:

- The status of lights (on/off)
- The occupancy of classrooms
- The status of blinds (raised/lowered)

Topology



High-end application

Synco™ living &
GAMMA

Classroom

**Secondary
documentation**

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GAMMA application sheet Function No. 010	Optimum shading for facades	AP257/32
GAMMA application sheet Function No. 011	Sunlight tracking control for more daylight	AP257/22
GAMMA application sheet Function No. 012	Shadow outline tracking for more comfort	AP257/22
GAMMA application sheet Function No. 013	Constant light control with KNX/DALI Gateway	UP258E21

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The information in this document contains general descriptions of technical options available, which do not always have to be present in individual cases. The required features should therefore be specified in each individual case at the time of closing the contract.

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Answers for infrastructure.

Our world is undergoing changes that force us to think in new ways: demographic change, urbanization, global warming and resource shortages. Maximum efficiency has top priority – and not only where energy is concerned. In addition, we need to increase comfort for the well-being of users. Also, our need for safety and security is constantly growing. For our customers, success is defined by how well they manage these challenges. Siemens has the answers.

“We are the trusted technology partner for energy-efficient, safe and secure buildings and infrastructure.”