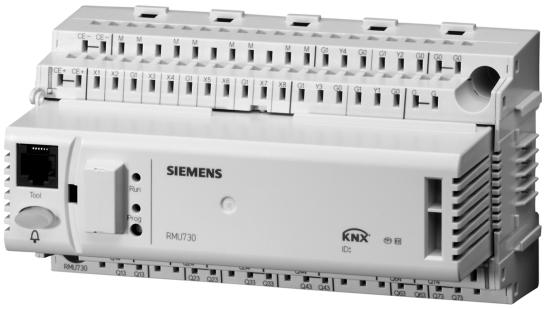
PRELIMINARY EDITION 14.01.2003



Synco™700

Heating Controllers RMH760

- **Heating controller for medium-size and large buildings. The RMH760… is used as a heating circuit or primary controller. The controller is supplied with 28 preprogrammed heating plants**
- **Boiler temperature control, control of a second heating circuit and DHW heating with option modules**
- **Menu-driven operation with separate operator unit (plug-in type or detached)**

Use

Buildings

- Office and administrative buildings
- Commercial buildings and shops
- Schools
- Hospitals
- Industrial buildings and workshops
- Apartment blocks and terraced houses

Plants

- Heating sections of ventilation and air conditioning plants
- Distribution zones of ventilation and air conditioning plants
- Heating systems with own heat source
- Heating zones of a larger plant
- Basic load heating systems

Functions

Note

Several of the functions listed require option modules.

Room operating modes

Room operating modes are:
- AUTO: Automatic changeover between 3 setpoints according to the time program
- Comfort: Continuously heating to the Comfort setpoint
- Precomfort: Continuously heating to the Precomfort setpoint
- Economy: Continuously heating to the Economy setpoint
- Protective mode: Heating to the setpoint of Protective mode, if necessary

Clock functions

- Year clock with automatic summer-/wintertime changeover
- 7-day clock for time program with a maximum of 6 switching points per day, for 1 or 2 heating circuits

Holiday functions

- Holiday and special day program with 16 periods per year
- Selectable room operating mode for the holiday periods
- Selectable DHW operating mode for the holiday periods
- Time program for special days

Ready configured inputs

2 ready configured inputs for:
- Flow temperature (averaging possible)
- Outside temperature

Freely configurable inputs

3 freely configurable inputs, optionally for:
- Reception of the following measuring signals:
  - Room temperature (averaging possible)
  - Return temperature
  - Wind speed
  - Intensity of solar radiation
- Connection of a remote setpoint adjuster with relative or absolute room setpoint adjustment
- Connection of an external switch for:
  - Operating mode changeover
  - Timer function
  - Changeover to holiday mode
  - Changeover to special day
  - Indication of faults

Note

If more than 3 configurable inputs are required, option modules must be used.

Remote operation

Remote operation with multifunctional room unit via Konnex bus

Control functions

- Heating circuit controller
  - Weather-compensated flow temperature control via the heating circuit mixing valve, with adjustable setpoints of Comfort, Precomfort, Economy and Protective mode
  - Adjustable influence of room temperature, solar radiation and wind
  - Optimized setback and heating up
  - Boost heating and quick setback
  - Automatic heating limit for demand-dependent control of the heating with adjustable heating limits for the Comfort and Economy modes
  - Automatic changeover to summer operation (heating off)
  - Room model for room functions without room sensor

- Primary controller
  Demand-dependent precontrol via the mixing valve in the common flow, based on the received heat demand signals

Limitation functions

- Maximum limitation of the room temperature
- Minimum and maximum limitation of the flow temperature
- Minimum or maximum limitation of the return temperature
- Limitation of the rate of flow temperature increase

Switching functions

- Control of an actuator with 3-position **or** DC 0...10 V control
- Pump control (system or heating circuit pump)
- Control of maximum 2 twin pumps
- Indication of heat demand
- Configurable relays

Supervisory and protective functions

- Mixing valve overrun, mixing valve kick
- Pump overrun, pump kick
- Outside temperature-dependent frost protection for the plant
- Frost protection for the building
- Overload supervision
- Fault relay
- Handling of status and error messages

Service functions

- Password protection for the configuration
- Outside temperature simulation
- Wiring test
- Storage and reset of parameter sets

Boiler functions (requiring boiler module RMZ781)

- Demand-dependent boiler temperature control
- Boiler pump control
- Control of a 1- or 2-stage **or** modulating burner

Second heating circuit (requiring heating circuit module RMZ782)

- Control of a second heating circuit
- Maintained boiler return temperature with own mixing circuit
- Control of an actuator with 3-position **or** DC 0...10 V control

DHW functions (requiring DHW module RMZ783)

- Storage tank charging with charging pump, with or without mixing valve control
- Storage tank charging via internal or external heat exchanger
- Time programs for DHW heating and the circulating pump
- Operating modes: AUTO, continuously Normal, continuously Reduced, Protective mode

Note

For a more detailed description of all controller functions, refer to Basic Documentation CE1P3131en.

Type summary

Heating controller

Type of unit	*Type reference*	*Data Sheet*
Heating controller (de, fr, it)	**RMH760-1**	CE1N3131en
Heating controller (en, fr, nl, es)	**RMH760-2**	CE1N3131en
Heating controller (sv, fi, no, da)	**RMH760-3**	CE1N3131en
Heating controller (pl, cs, sk, hu)	**RMH760-4**	CE1N3131en

Operator/service units

Operator unit, plug-in type	**RMZ790**	CE1N3111en
Operator unit, detached	**RMZ791**	CE1N3112en
Servicetool	**OCI700.1**	CE1N5655en

Option modules

Boiler module	**RMZ781**	CE1N3135en
Heating circuit module	**RMZ782**	CE1N3135en
DHW module	**RMZ783**	CE1N3135en
Twin pump module	**RMZ786**	CE1N3145en
Universal module with 4 universal inputs and 4 relay outputs	**RMZ787**	CE1N3146en
Universal module with 4 universal inputs and 2 analog and 2 relay outputs	**RMZ788**	CE1N3147en
Module connector for detached option modules	**RMZ780**	CE1N3138en

Ordering

When ordering, please give type reference according to the above table.
The required operator unit and option modules must be ordered as separate items.
Room units, sensors, actuator and valve must also be ordered separately.

Equipment combinations

Suitable sensors

Type of sensor	*Type of sensing element, Signal*	*Type reference*	*Data Sheet*
Outside sensor	LG-Ni 1000	**QAC22**	CE1N1811E
Outside sensor	NTC 575	**QAC32**	CE1N1811E
Strap-on temperature sensor	LG-Ni 1000	**QAD22**	CE1N1801E
Immersion temperature sensor	LG-Ni 1000	**QAE2…**	CE1N1791E
Immersion temperature sensor	LG-Ni 1000	**QAE21.3**	CE1N1832E
Room temperature sensor	LG-Ni 1000	**QAA24**	CM1N1721E
Room temperature sensor	LG-Ni 1000	**QAA64**	CM1N1722E
Wind effect sensor	DC 0...10 V	**QVV60**	CM1N19XXE
Solar impact sensor	DC 0...10 V	**QLS60**	CM1N1943E

Suitable room units

Type of room unit	*Type reference*	*Data Sheet*
Room temperature sensor with setpoint adjuster	**QAA25**	CM1N1721E
Room temperature sensor with setpoint readjuster	**QAA27**	CM1N1721E
Room unit with Konnex interface	**QAW740**	CE1N1633en

Suitable remote setpoint adjusters

Type of remote setpoint adjuster	*Type reference*	*Data Sheet*
Remote setpoint adjuster, signal 0...1000 Ω	**BSG21.1**	CE1NXXXXen
Remote setpoint readjuster, ±3 K	**BSG21.5**	CA1NXXXXen

Suitable actuators

All types of electromotoric and electrohydraulic actuators from SBT HVAC Products can be used:

- Operating on AC 24…230 V
- 3-position control
- DC 0...10 V modulating control

For detailed information about actuators and valves, refer to Data Sheets CE1N4000E…4999E.

Product documentation

Type of document	*Number*
Product Range Description	**CE1N3146en**
Basic Documentation	**CE1P3130en**
Installation instructions	**7431903390**
Operating Instructions (de, fr, it)	**7431903450**
Declaration of Conformity (CE)	**CE1T3100en**
Environmental Declaration	**CE1E3100en**

Technical design

Mode of operation

The controller is supplied with 28 basic types of heating plant preprogrammed. They have been selected to cover the majority of standard applications. Some of them require option modules.
When commissioning a plant, the relevant basic plant type must be entered. All associated functions, terminal assignments, settings and displays will automatically be activated, and parameters not required will be deactivated.

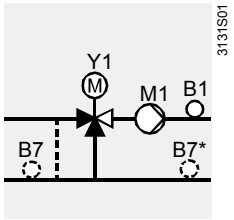
Use of individual devices

Precontrol

Precontrol can only be provided by the controller. There are 2 choices:

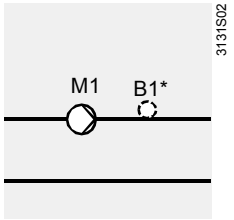
With mixing valves:

P1



With system pump:

P2



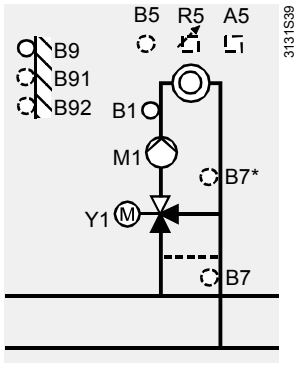
B1 Flow temperature sensor
B1* Flow temperature sensor (optioanal, for display only)
B7 Return temperature sensor (optional, for minimum limitation)
B7* Return temperature sensor (optional, for maximum limitation)
M1 System pump (can be a twin pump)
Y1 Mixing valve

Measuring input B7 for the return temperature can be configured for either minimum or maximum limitation.

Heating circuit control

The control of 1 or 2 heating circuits can be provided either by the controller or the RMZ782 heating circuit module. The available choices are the same with both types of unit, provided the required connection terminals are present or can be configured.
Please also note the following:

- If the controller and heating circuit module do not have a sufficient number of configurable connection terminals, an additional option module can be used
- If the controller is used as a primary controller, the RMZ782 heating circuit module must be used for the control of the heating circuit
- A second heating circuit must be controlled with the RMZ782 heating circuit module
- Measuring input B7 for the return temperature can be configured for either minimum or maximum limitation



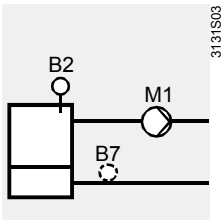
A5 Room unit (optional)
B1 Flow temperature sensor
B5 Room temperature sensor (optional)
B7 Return temperature sensor (optional, for minimum limitation)
B7* Return temperature sensor (optional, for maximum limitation)
B9 Outside sensor
B91 Solar impact sensor (optional)
B92 Wind effect sensor (optional)
M1 Heating circuit pump (can be a twin pump)
R5 Remote setpoint adjuster (optional)
Y1 Mixing valve

Boiler temperature control

Boiler temperature control requires the RMZ781 boiler module. There are 2 choices:

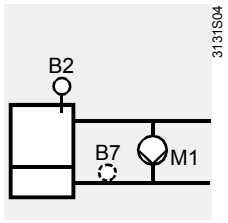
Boiler pump in the flow:

G1



Boiler pump in the bypass:

G2



B2 Boiler temperature sensor
B7 Return temperature sensor (optional, for minimum limitation)
M1 System or bypass pump (E1: can be a twin pump)

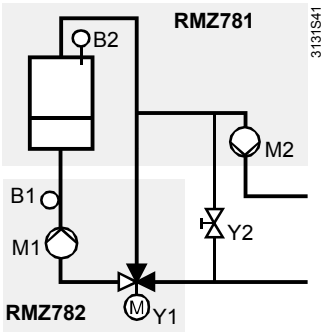
Maintained boiler return temperature

In plants with maintained boiler return temperature, the following types of modules are required, in addition to the controller:

- Heating circuit module RMZ782; it controls the boiler return temperature via a mixing valve, depending on the temperature acquired with B1. The module also controls boiler pump M1
- Boiler module RMZ781; this module controls the boiler temperature depending on the temperature acquired with B2, and also controls system pump M2

One of the basic types 4–... must be selected on the controller.

G3

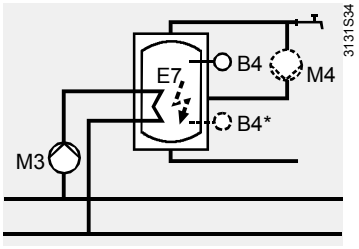


B1 Boiler return temperature sensor (controlled variable)
B2 Boiler temperature sensor
M1 Boiler pump (can be a twin pump)
M2 System pump (can be a twin pump)
Y1 Mixing valve
Y2 Balancing valve

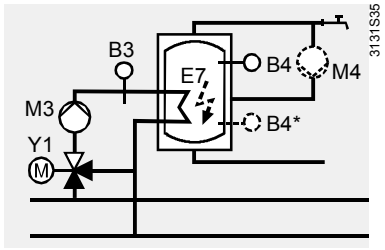
DHW heating

DHW heating requires the RMZ783 DHW module. There are 5 choices:

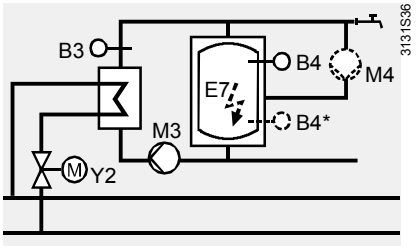
DHW1



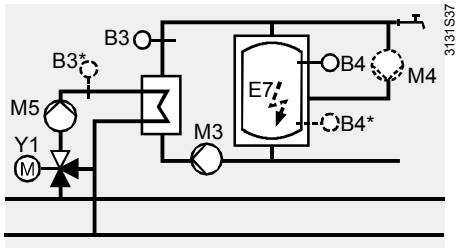
DHW2



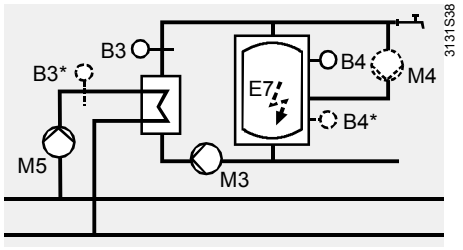
DHW3



DHW4



DHW5

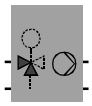


B3 Charging temperature sensor
B3* Primary flow temperature sensor (optional)
B4 Storage tank sensor at the top
B4* Storage tank sensor at the bottom (optional)
E7 Electrical immersion heater (optional)
M3 Charging pump (can be a twin pump)
M4 Circulating pump (optional)
M5 Primary pump (can be a twin pump)
Y1 Mixing valve
Y2 2-port valve

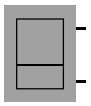
Basic types

Note on illustrations

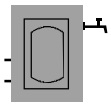
The illustrations contained in this section use the following symbols for precontrol, boiler temperature control and DHW heating:



Precontrol

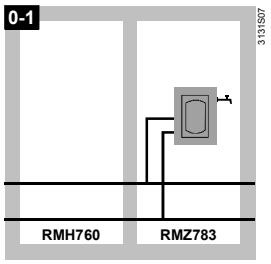


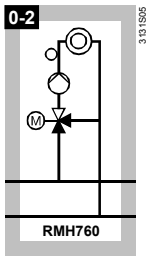
Boiler temperature control

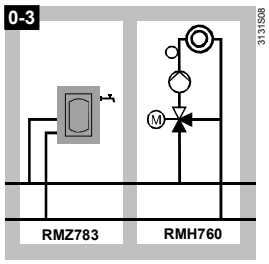


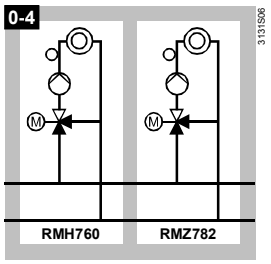
DHW heating

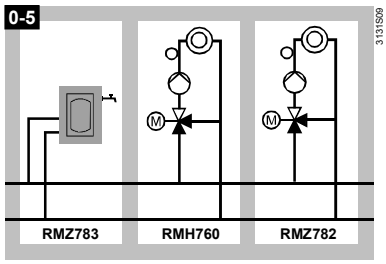
Basic types 0–x





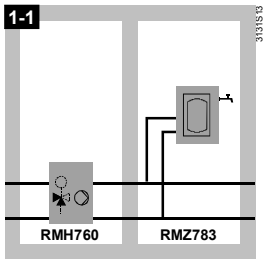


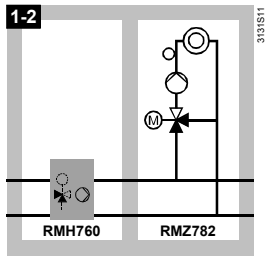


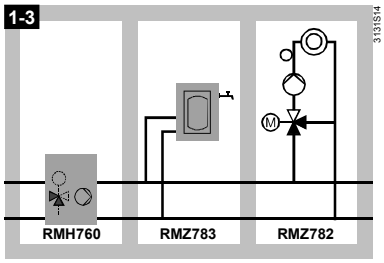


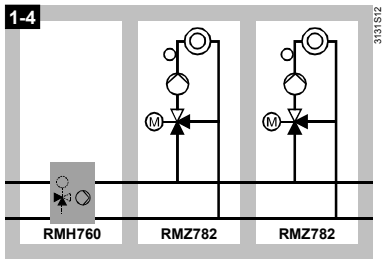
Basic types 1–x

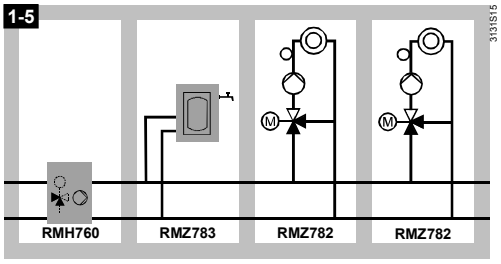
With all basic types 1–x, primary controller variants P1 and P2 can be selected.





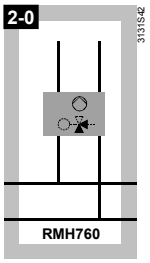


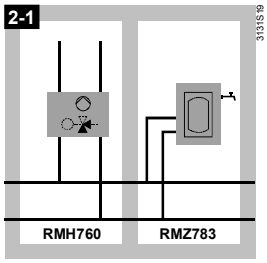


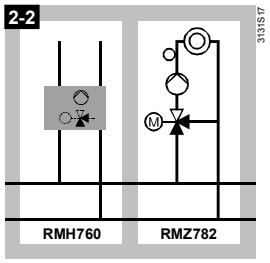


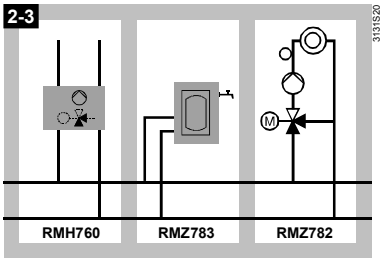
Basic types 2–x

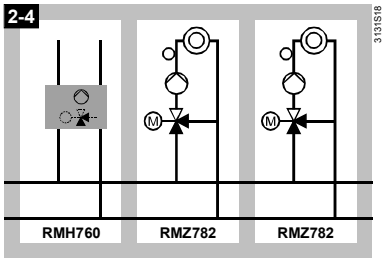
With all basic types 2–x, primary controller variants P1 and P2 can be selected.

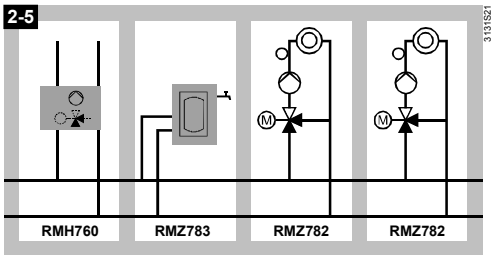






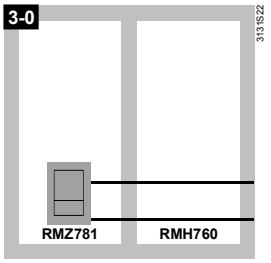


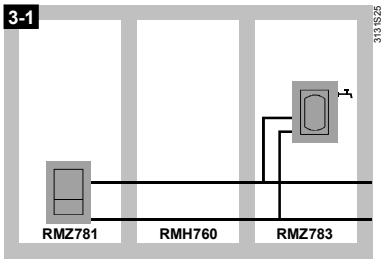


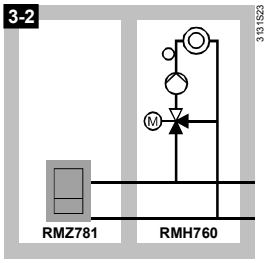


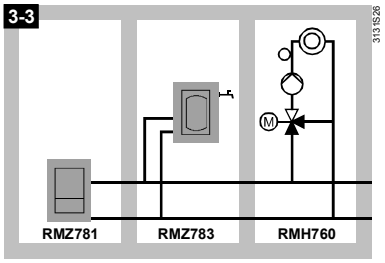
Basic types 3–x

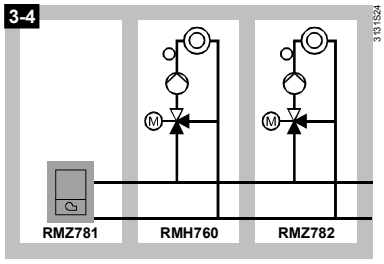
With all basic types 3–x, boiler pump variants G1 and G2 can be selected.

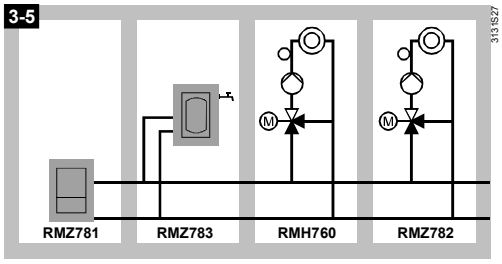








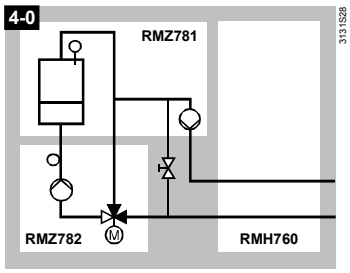


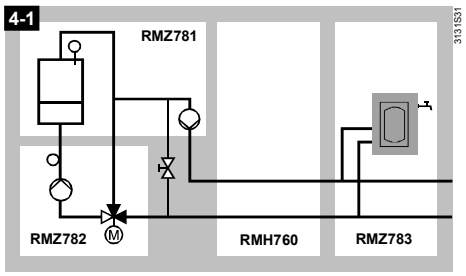


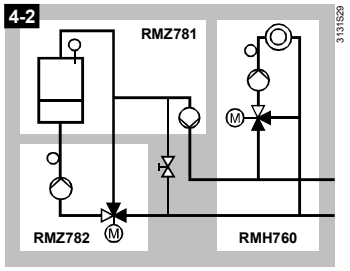
For minimum limitation of the boiler return temperature, basic types 4–x have their own mixing circuit.

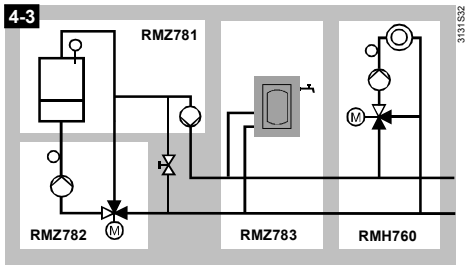
Basic types 4–x

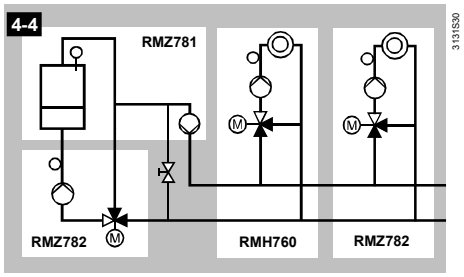
For minimum limitation of the boiler return temperature, basic types 4–x have their own mixing circuit

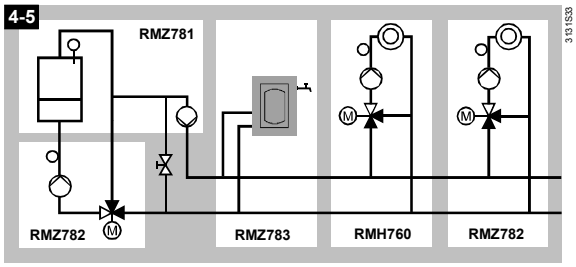












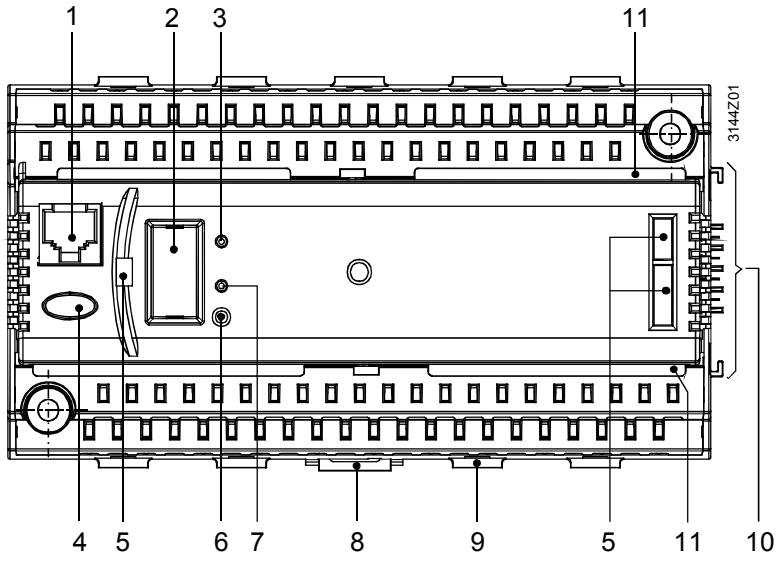
Mechanical design

Basic design

The controller consists of terminal base and controller insert. It has a plastic housing with the printed circuit boards, 2 terminal levels and carries the connecting elements (electrical and mechanical) for an option module.

The controller can be fitted to a top hat rail conforming to EN 60 715-TH35-7.5, or can be mounted directly on a wall.
Operation takes place with either a plug-in type or detached operator unit (refer to section "Type summary").

Operating, indicating and connecting elements



1 Connection facility for the service interface (RJ45 socket)
2 Connection facility for the operator unit (with removable cover)
3 LED (green) for indication of operation
4 Fault button with LED (red) for indication of faults and for resetting
5 Openings for plug-in type operator unit RMZ790
6 Button for assignment of the device address
7 LED (red) for indication of the programming process
8 Mounting facility for fitting the controller to a top hat rail
9 Fixing facility for a cable tie
10 Electrical and mechanical connection elements for the option module
11 Rest for the terminal cover

Engineering notes

- The controller operates on AC 24 V. Operating voltage must conform to the requirements of SELV (safety extra low-voltage)
- The transformers used must be safety isolating transformers featuring double insulation to EN 60 742 and EN 61 558-2-6; they must be suited for 100 % duty
- Fuses, switches, wiring and earthing must be in compliance with local regulations
- The lines of the measuring circuits carry protective low-voltage, those to the 3-position actuator and the pumps carry AC 24...230 V
- Sensor wires should not be run parallel to mains carrying cables powering fans, actuators, pumps, etc.
- The controller can be used with a **maximum of 4** option modules
- The reference room for control with a room temperature sensor should be the room that cools down quickest. That room may not be equipped with thermostatic radiator valves; manual valves must be locked in their fully open position

Mounting and installation notes

- Standard mounting location is the control panel. Not permitted are wet or damp spaces. The permissible environmental conditions must be observed
- Suitable mounting locations are walls (in rooms or control panels) and front panels
- The control panel must be prepared for the proposed operator unit. This applies to both the variant and the outer dimensions
- Disconnect the equipment from power supply during mounting and installation
- **The controller insert may not be removed from the terminal base!**

- If option modules are used, they must be attached to the right side of the controller in the correct order. This means in agreement with ascending type reference numbers: RMH760 – RMZ781 – RMZ782 – RMZ782 – RMZ783 – RMZ786 – RMZ787 – RMZ788.
- The option modules require no wiring between one another or to the controller; the electrical connections are made automatically when attaching the modules. If it is not possible to arrange the option modules side by side, the first of the detached modules must be connected to the last previous module or to the controller using the RMZ780 module connector. In that case, the maximum cable length is 10 m
- All connection terminals for protective extra low-voltage (sensors and data bus) are located on the upper terminal block, those for mains voltage (actuators and pumps) on the lower terminal block
- Each terminal (spring cage terminal) can accommodate only one solid wire or one stranded wire. For making the connections, the cables should be stripped for 7 to 8 mm. To introduce the cables into the spring cage terminals and to remove them, a screw driver size 0 or 1 is required; cable strain relief can be provided with the help of the fixing facility for cable ties
- The controller is supplied complete with Installation and Operating Instructions

Commissioning notes

- The operator unit can be removed and plugged in or connected while the controller is in operation
- For commissioning, there are several auxiliary functions available (refer to «Service and operating functions»)
- Commissioning is carried out with the RMZ79... operator unit or the OCI700.1 service tool

Disposal notes

Larger plastic parts carry material identifications conforming to ISO/DIS 11 469 to facilitate environment-compatible disposal.

Technical data

Operating voltage*	Rated voltage	AC 24 V (±10 %)
	Rated frequency	50 Hz
	Max. power consumption (without modules)	12 VA
	Fusing of supply lines	max. 16 A
Functional data	Reserve of clock	15 h
	Software class	A
	Mode of operation to EN 60 730	1b (automatic operation)
Relay outputs*	Rated voltage range	AC 24...230 V
	Rated current range	0.02…2 (2) A
	Switch-on current	≤15 A for ≤ 20 ms
	Switching capacity as valve actuator relay	max. 15 VA

* Nomenclature of electrotechnical variables as per EN 60 730-1

Other inputs and outputs	For definition of all other inputs and outputs, refer to «Connection terminals»	
Interfaces	Konnex bus	
	Type of interface	Konnex-TP1
	Transceiver	TP-UART

	Baud rate	9.6 kBit/s
	Bus loading number (SBT)	
	Decentral bus power supply, can be switched off	20 mA
	Type of cable	2-core, without shielding, twisted pairs, connections not interchangeable
	Connection of room unit QAW740	
	Cable	dia. 0.8 mm
	Cable length	normally 350 m (>350 m: refer to Konnex document)
	Service tool connection facility	RJ45 socket

For more information about the Konnex bus, refer to the following pieces of documentation:

- Data Sheet CE1N3127en
- Basic Documentation CE1P3127en

Permissible cable lengths

To the sensors	
Copper cable 0.6 mm dia.	20 m
Copper cable 1.0 mm^2	50 m
Copper cable 1.5 mm^2	80 m
To the room units QAA2...	
Copper cable 0.6 mm dia.	20 m
Copper cable 1.0 mm^2	50 m
Copper cable 1.5 mm^2	80 m

Degrees of protection

Degree of protection of housing to EN 60529	IP20 (when mounted)
Safety class to EN 60730	corresponding to safety class II if adequately mounted
Degree of contamination to EN 60 730	normal contamination

Materials and colors

Controllers	Polycarbonate, RAL 7035 (light-grey)
Packaging	corrugated cardboard

Permissible ambient conditions

Transport	
Temperature	–25..+70 °C
Humidity	<95 % r.h. (noncondensing)
Storage	
Temperature	–5..+55 °C
Humidity	<95 % r.h. (noncondensing)
Operation	
Temperature	0..+50 °C
Humidity	<95 % r.h. (noncondensing)

Norms and standards

Product safety	
Automatic electrical controls for household and similar use	EN 60 730-1
Special requirements for temperature-dependent controls	EN 60 730-2-11
CE conformity to	89/336/EEC
EMC directive	
Immunity	EN 50 082-2
Emissions	EN 50 081-1

	Low-voltage directive	73/23/EEC
	Electrical safety	EN 60 730-1, EN 60 730-2-9

Weight

Net weight	
Without operator unit	0.404 kg
With RZM790 operator unit plugged in	0.472 kg

Connection terminals

Configured connection terminals

For the power supply

Terminal	*Function*	*Voltage*
G	Operating voltage for controller, system potential	AC 24 V
G1	Operating voltage for connected devices	AC 24 V
G0	System neutral	AC 24 V
M	Ground for devices with no operating voltage	–
N1	Auxiliary terminal	AC 24...230 V

For the sensors and the data bus

Terminal	*Measuring variable*	*Signal source*	*Measuring range*
B1	Flow temperature	1 or 2 sensors LG-Ni 1000 or T1	–50...+150 °C
B9	Outside temperature	1 sensor LG-Ni 1000 or NTC 575	–50...+50 °C
CE+	Bus data	Konnex bus	
CE–	Bus ground		

For the actuating devices

Terminal	*Function*	*Signal receiver*	*Type of contact*
Y13	Input for Y14	3-position actuator	N.O.
Y14	Mixing valve opens		
Y23	Input for Y24	3-position actuator	N.O.
Y24	Mixing valve closes		
Q13	Input for Q14	Heating circuit pump M1	N.O.
Q14	Heating circuit pump on		

Configurable connection terminals

X3, X4 and X5 for input signals

Analog input signals

Measuring variable, function	*Signal source*	*Range*
Return temperature	1 or 2 sensors LG-Ni 1000 or T1	–50...+150 °C
Wind speed	Wind effect sensor 0...20 m/s	DC 0...10 V
Intensity of solar radiation	Solar impact sensor 0...1000 W/m^2	DC 0...10 V
Room temperature	1 or 2 sensors LG-Ni 1000 or T1	–50...+50 °C
Room temperature setpoint	Room unit QAA25	5...35 °C
Room temperature setpoint	Remote setpoint adjuster BSG21.1	0...50 °C
Room setpoint readjustment	Room temperature sensor QAA27	±3 K
Room setpoint readjustment	Remote setpoint adjuster BSG21.5	±3 K
Heat demand	Consumer	DC 0...10 V

Digital input signals

Function, variable	*Signal source*	*Range*
Room operating mode	External contact	On/off
Timer function	External contact	On/off
Heat demand	External contact	On/off
Special day	External contact	On/off
Holidays	External contact	On/off
Error message 1	External contact	On/off
Error message 2	External contact	On/off
Error message 3	External contact	On/off
Error message 4	External contact	On/off

Y9 for continuous output signal DC 0...10 V

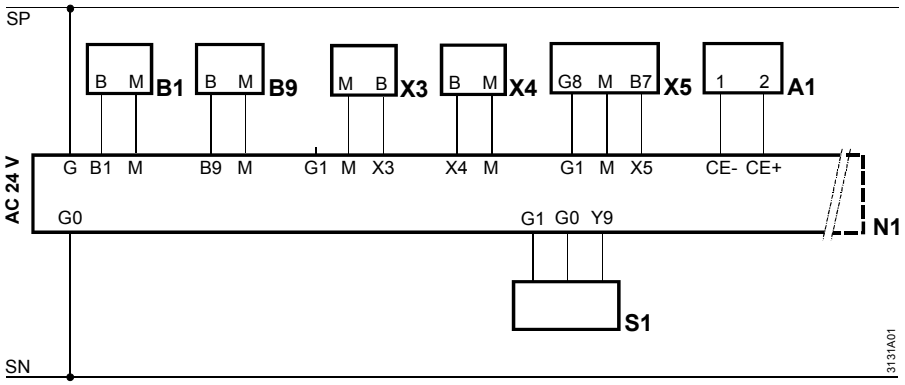
Type of signal	*Signal receiver*	*Range*
Positioning signal	Modulating actuator	0...100 %
Heat demand	Primary controller	Configurable

Q71 / Q72 / Q74 for changeover contacts

Changeover to connection Q71–Q74 ...	*Rated voltage range*
in the event of an urgent error message	AC 24...230 V
in the event of an error message that is not urgent	AC 24...230 V
when reaching the heating limit of heating circuit 1	AC 24...230 V
when reaching the heating limit of heating circuit 2	AC 24...230 V
during occupancy time of heating circuit 1	AC 24...230 V
during occupancy time of heating circuit 2	AC 24...230 V
when the outside temperature falls	AC 24...230 V
when there is a heat demand	AC 24...230 V

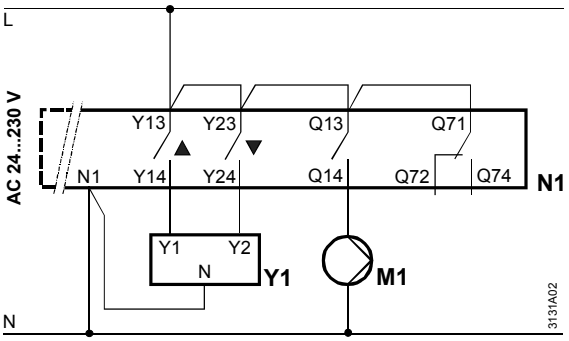
Connection diagrams

Low-voltage side



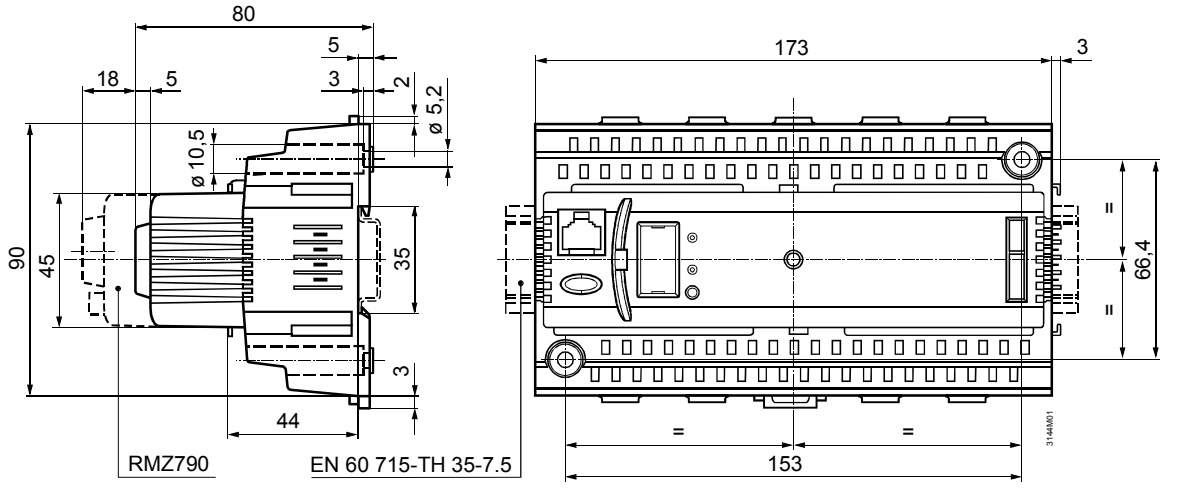
A1 Room unit QAW740
B1 Flow temperature sensor, e.g. QAD22
B9 Outside sensor QAC22
N1 Heating controller RMH760
X3 E.g. room temperature sensor (configurable input)
X4 E.g. return temperature sensor (configurable input)
X5 E.g. solar impact sensor QLS60 (configurable input)
Y9 E.g. actuator with DC 0...10 V input (configurable input)

Mains voltage side



M1 Heating circuit or system pump
N1 Heating controller RMH760
Y1 Actuator

Dimensions



Dimensions in mm