

Synco™ 700



## Boiler Sequence Controller RMK770

- Modular controller for sequencing up to 6 boilers, for boiler temperature, heating circuit and precontrol; supplied with 18 programmed multiboiler plants
- Menu-driven operation with separate operator unit (plug-in type or detached)
- KNX bus connection facility for operation and process information

### Use

#### Types of buildings

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

#### Types of plant

- Heat generation with a maximum of 6 boilers
- Heating sections of ventilation and air conditioning plant
- Distribution zones of ventilation and air conditioning plant
- Heating systems with own heat generation
- Basic load heating systems

## Functions

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### General functions

- Maximum of 7 control systems with modulating outputs (3-position or DC 0...10 V):
  - Modulating burner
  - Heating circuit with mixing valve
  - Precontrol with mixing valve
  - Maintained boiler return temperature with mixing valve
- Control of a maximum of 7 pumps (single or twin pumps)
- 18 programmed multiboiler plants integrated
- Freely configurable inputs for measuring signals and extra operating functions
- Fault status indication with red LED, acknowledgement with button. In addition, 2 relay outputs can be configured as fault relays, plus 4 universal inputs as fault status signal inputs

### Boiler sequence control

- Acquisition and evaluation of the main flow and main return temperature
- Sequence control of a maximum of 6 boilers
- The boiler sequence (lead boiler) can be defined as follows:
  - Automatically: The lead boiler changes automatically based on selectable parameters (boiler sequence mode "Auto")
  - Manually: Selection is made via the operator unit
  - Via signals at the digital inputs
- 3 fault inputs, preconfigured for overpressure, underpressure and shortage of water
- Acquisition and evaluation of the heat requisition signals (via KNX bus, external setpoint, external DHW requisition, and frost protection)

### Control of the boiler temperature – general functions

- Boiler temperature control of a maximum of 6 boilers, with separate settings for each boiler
- Individual operation; boiler 1 can be switched to independent operation

### Control of the boiler temperature – functions per boiler

- Boiler temperature control with 1-stage, 2-stage or modulating burner
- Modulating burner with 3-position or DC 0...10 V control, with check back signal
- Acquisition of the flue gas temperature, with limit value alarm
- Acquisition of the pump flow
- Maximum and minimum limitation of the boiler temperature
- Maintained boiler return temperature without or with separate mixing valve (3-position or DC 0...10 V)
- Control of a shutoff valve, with check back signal
- Selection of boiler operating mode
- Limitation of the minimum burner running time and return temperature
- Protective boiler startup
- Release of boilers
- Flue gas measuring mode (boiler test mode, chimney sweep function)
- 3 fault inputs, preconfigured for overpressure, underpressure and shortage of water
- Burner hours run counter and burner start counter

### Heating circuit control

- Weather-compensated flow temperature control, optionally:
  - Without mixing valve, without circulating pump (only setpoint compensation)
  - Without mixing valve, with circulating pump (pump circuit)
  - With mixing valve, with circulating pump (mixing circuit)
- Adjustable setpoint of the room operating modes Comfort, Precomfort, Economy and Protection
- 7-day program with a maximum of 6 switching points per day
- Adjustable room temperature influence
- Optimum start / stop control
- Boost heating and quick setback

- Room model for room functions without room temperature sensor
- Automatic heating limit for demand-dependent control of the heating system with adjustable heating limits for Comfort and Economy mode
- Automatic changeover to summer operation (heating off)
- Maximum limitation of the room temperature
- Minimum and maximum limitation of the flow temperature
- Maximum limitation of the return temperature
- Limitation of the rate of flow temperature increase
- Valve overrun, valve kick
- Pump overrun, pump kick
- Outside temperature-dependent frost protection for the plant
- Frost protection for the building
- Remote operation with multifunctional room unit via KNX bus
- Heating circuit connection to the main header or precontrolled header

### Precontrol

- Acquisition and evaluation of heat requisitions (via KNX bus, external setpoint, external DHW requisition, and frost protection)
- Demand-compensated precontrol through control of the mixing valve (3-position or DC 0...10 V) or of the system pump in the main flow
- Minimum and maximum limitation of the flow temperature
- Maximum limitation of the return temperature
- Maintained boiler return temperature with or without dedicated mixing valve

### Data acquisition

#### Consumption values

Four meters are available for acquiring consumption values.

- Suited for handling pulses delivered by gas, hot water, cold water and electricity meters
- Pulse counting in Wh, kWh, MWh, kJ, MJ, GJ, ml, l, m<sup>3</sup>, heat cost units, BTU, or with no unit

#### Trend data display

Four independent trend channels available to log measured values for a set period. KNX bus room temperature and outside air temperatures can be logged in addition to logical device inputs.

### Use of extension modules

Extension modules are used on applications where the number of inputs or outputs do not suffice for the number of functions required:

<i>Type reference</i>	<i>Number of universal inputs</i>	<i>Number of analog outputs</i>	<i>Relay outputs</i>	
			<i>N.O. contact</i>	<i>Changeover contact</i>
<b>RMZ785</b>	8	–	–	–
<b>RMZ787</b>	4	–	3	1
<b>RMZ788</b>	4	2	1	1
<b>RMZ789</b>	6	2	2	2

A maximum of 3 extension modules can be used, irrespective of the type of module.

### Bus functions

- Room operator unit with its functions
- Display of fault status messages from other devices on the bus
- Delivery of common fault status messages of all devices on the bus to a fault relay
- Time synchronization
- Passing on and adoption of outside temperature signals
- Sending yearly clock data (time of day, weekday, date, summer- / wintertime changeover) to some other controller, or reception of the yearly clock data from another controller

- Sending the 7-day or yearly program for holidays / special days to some other controller, or reception of the 7-day or yearly program for holidays / special days from another controller

### Universal transmission and reception zones

Device RMK770 allows for universal data exchange via own terminals as well as via terminals of extension modules RMZ78x.

Data between devices is exchanged via KNX bus.

Universal inputs, digital and analog outputs of RMK770 can be used as transmission objects (for transmission zones).

Universal inputs of RMK770 can be used as reception objects (in reception zones).

- Transmission zones:
  - Universal inputs (N.X1...A9(3).X6)
  - Digital outputs (N.Q1...A9(3).Q4)
  - Analog outputs (N.Y1...A9(3).Y2)
- Reception zones:
  - Universal inputs (N.X1...A9(3).X6)

### Examples for not allowed applications

The following applications or input/output values may **not** be implemented using universal transmission and reception zones:

- Safety-relevant plants and equipment (e.g. fire alarm off, smoke extraction, frost protection function).
- If request "Simultaneous start condition of plants" exists.
- Applications where communications failure of transmission or reception zones may cause damage.
- Time-critical control paths or control paths with greater degree of difficulty (e.g. speed control via pressure, humidity).
- Main controlled variables that must be available.
- Acquisition and evaluation of pulses.

**Note:** After RMK770 power-up, it may take some time until the bus signals are available. This may result in faulty plant behavior in the case of transmission and reception zone applications that are not allowed.

### Logic function blocks

4 freely configurable logic function blocks are available to process multiple logically linked universal input variables.

- Configurable logic functions: AND, NAND, OR, NOR, EXOR and EXNOR
- Adjustable switch-on and switch-off delay and minimum switch-on and switch-off time.
- Operating switch (AUTO, ON, OFF), configurable for manual control.

### Comparators

2 comparators are available to compare two analog input signals.

- Output signal with adjustable switch on and off delay as well as adjustable minimum switch on and off period.

### Service and operating functions

- Wiring test
- Boiler test mode
- Simulation of the outside temperature
- Display of setpoints, actual values and active limitations
- Data protection

### Note

For a detailed description of all functions of the RMK770 boiler sequence controller, refer to the Basic Documentation P3132.

## Type summary

<b>Boiler sequence controller</b>	<i>Device</i>	<i>Type</i>	<i>Data sheet</i>
	Boiler sequence controller	<b>RMK770-1</b>	N3132

## Selection of languages

The following languages are loaded:

English, German, French, Italian, Spanish, Portuguese, Dutch, Danish, Finnish, Norwegian, Swedish, Polish, Czech, Hungarian, Russian, Slovakian, Bulgarian, Greek, Romanian, Slovenian, Serbian, Croatian, Turkish.

## Note

Starting from software version 3.00, all languages are included in the same type.

## Operator and service units

Operator unit (plug-in type)	<b>RMZ790</b>	N3111
Operator unit (detached)	<b>RMZ791</b>	N3112
Bus operator unit	<b>RMZ792</b>	N3113
Service tool	<b>OCI700.1</b>	N5655
Service terminal + service tool	<b>OCI702 + ACS790</b>	A6V10438951 N5649
Web server	<b>OZW772...</b>	N5701

## Extension modules and accessories

Universal module with 8 universal inputs	<b>RMZ785</b>	N3146
Universal module with 4 universal inputs and 4 relay outputs	<b>RMZ787</b>	N3146
Universal module with 4 universal inputs, 2 analog and 2 relay outputs	<b>RMZ788</b>	N3146
Universal module with 6 universal inputs, 2 analog and 4 relay outputs	<b>RMZ789</b>	N3146
Module connector for detached extension modules	<b>RMZ780</b>	N3138

For information about extension modules, refer also to section "Functions".

## Ordering

When ordering, please specify the quantity, product name and type code for the device, e.g: Boiler sequence controller **RMK770-1**.

The required operator unit and extension modules must be ordered as separate items.

## Equipment combinations

Possible equipment combinations are available in HIT.

## Product documentation

<i>Documentation type</i>	<i>Document no.</i>
Product range description: Synco™ 700	<b>CE1S3110en</b>
Basic documentation, detailed description of all functions	<b>CE1P3132en</b>
Installation instructions: RMH760B, RMK770	<b>CE1G3133xx</b>
Operating instructions: RMH760B, RMK770	<b>CE1B3133xx</b>
Data sheet for KNX bus	<b>CE1N3127en</b>
Synco KNX S-mode data points	<b>CE1Y3110en</b>
Basic documentation: Communication via KNX bus	<b>CE1P3127en</b>

### Mode of operation

The RMK770 boiler sequence controller is supplied complete with 18 programmed standard applications including heat sources with 2 boilers. Some of them necessitate extension modules. All types of plant can be matched to specific requirements, such as additional boilers, primary controller, heating circuit or twin pumps.

When commissioning the system, the relevant plant type must be entered whereupon all associated functions, terminal assignments, settings and displays will automatically be activated. Parameters that are not required will be deactivated.

In addition, an empty application is provided.

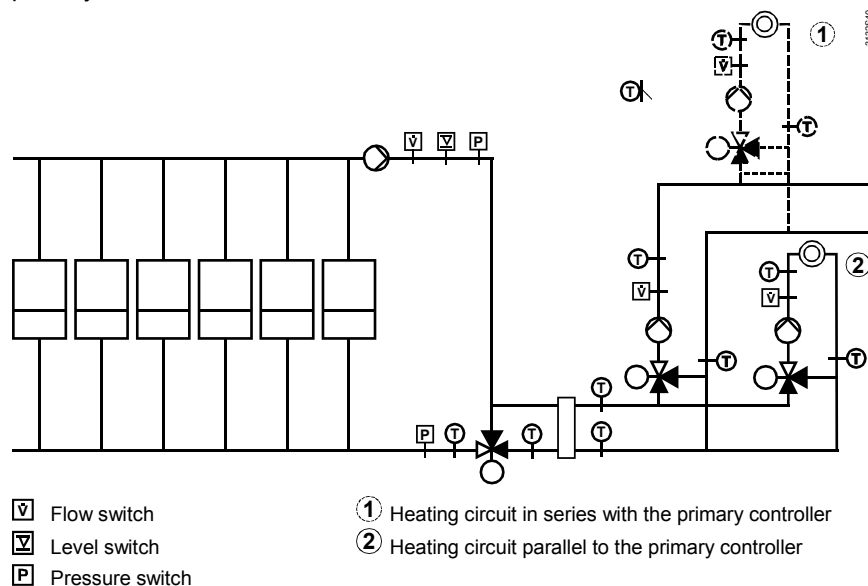
With the help of the operator unit, the boiler sequence controller facilitates the following:

- Activation of a programmed application
- Modification of a programmed application
- Free configuration of applications
- Optimization of settings

For more detailed information, refer to the Basic Documentation P3132.

### Control loops

The RMK770 can control a maximum of 6 boilers, 1 heating circuit and 1 precontrol circuit. The controlled heating circuit can be operated parallel to or in series with the primary controller.



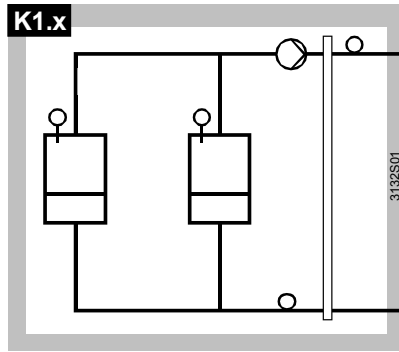
### Boiler sequence control

#### Plant types

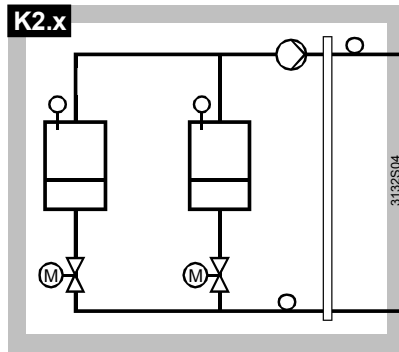
The individual plant types for boiler sequence control are characterized as follows:

- There is a total of 6 **hydraulic circuits**. These are listed in section “Types of hydraulic circuits“ (plant types K1.x ... K6.x)
- For each type of hydraulic circuit, the **burner type** for boiler temperature control can be selected for each boiler:
  - 1-stage burner (plant type Kx.1), optionally a modulating burner with DC 0...10 V control
  - 2-stage burner (plant type Kx.2)
  - Modulating burner (plant type Kx.3) with 3-position control

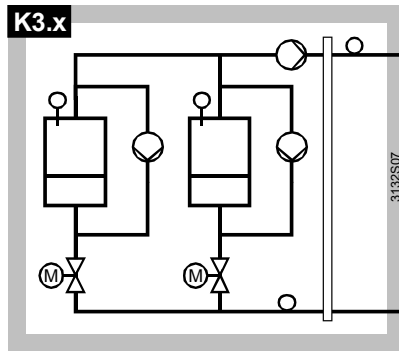
Types of hydraulic circuits



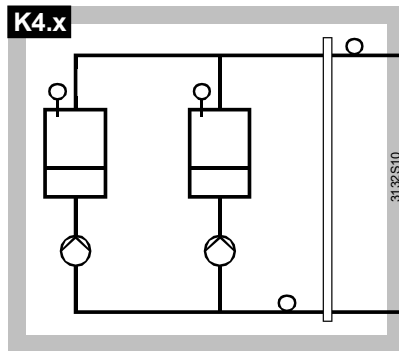
- Multiboiler plant with
- 1 main pump in the common boiler flow



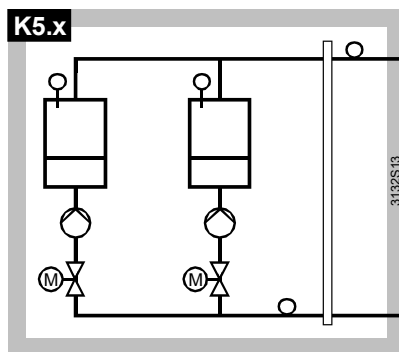
- Multiboiler plant with
- 1 main pump in the common boiler flow
  - 1 shutoff valve in the return of each boiler



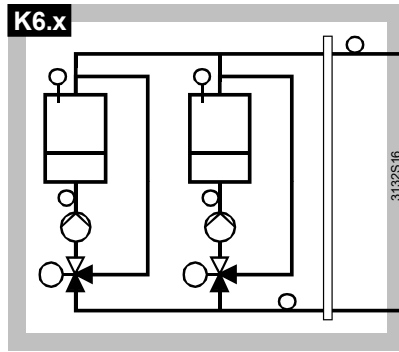
- Multiboiler plant with
- 1 main pump in the common flow
  - 1 bypass pump per boiler
  - 1 shutoff valve in the return of each boiler



- Multiboiler plant with
- 1 pump in the return of each boiler



- Multiboiler plant with
- 1 pump in the return of each boiler
  - 1 shutoff valve in the return of each boiler

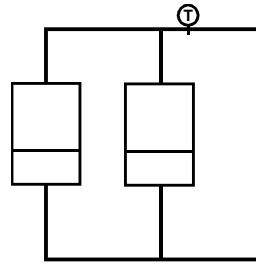


Multiboiler plant with

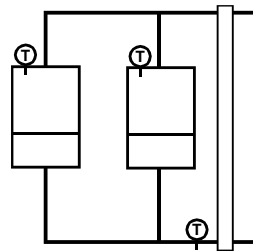
- 1 shutoff valve in the return of each boiler
- Maintained boiler return temperature of each boiler (modulating or 3-position control)

## Variants

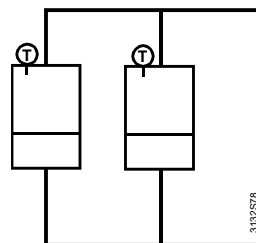
To ensure optimum plant operation, all programmed plant types are configured with boiler sensor, main flow sensor and main return sensor. Following must be observed:



If no boiler sensor is installed, use of a main flow sensor is mandatory.



If a pressureless header is used, it is recommended to install a main return sensor.



If no main flow sensor is installed, the controller adopts the measured value from the boiler sensor of the current lead boiler. Hence, the boiler sequence can be controlled with no need for using a main flow sensor.

This variant can only be used on dual boiler plant.



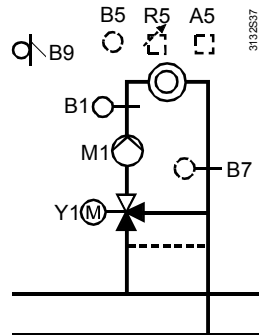
## Control loops

In addition to boiler sequence control and boiler temperature control (boilers 1...6), the RMK770 provides the following control functions:

- Control of a heating circuit in the form of weather-compensated flow temperature control
- Demand-dependent precontrol

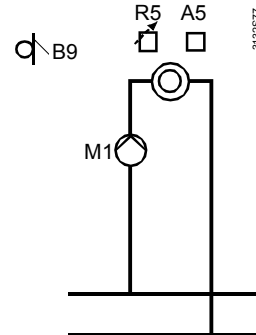
## Heating circuit control

### Weather-compensated heating circuit control



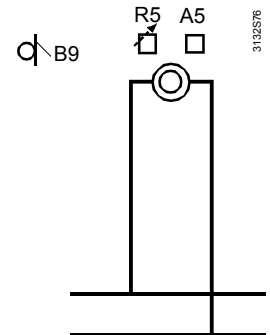
- A5 Room unit (optional)
- B1 Flow temperature sensor
- B5 Room temperature sensor (optional)
- B7 Room temperature sensor (optional, for maximum limitation)
- B9 Outside sensor
- M1 Heating circuit pump
- R5 Remote setpoint adjuster (optional)
- Y1 Mixing valve

### Weather-compensated pump heating circuit control



- A5 Room unit (optional)
- B9 Outside sensor
- M1 Heating circuit pump
- R5 Remote setpoint adjuster (optional)

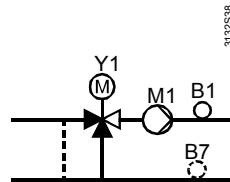
### Generation of a weather-compensated flow temperature setpoint



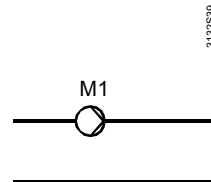
- A5 Room unit (optional)
- B9 Outside sensor
- R5 Remote setpoint adjuster (optional)

## Precontrol

### With mixing valve



### With system pump



- B1 Flow temperature sensor
- B7 Return temperature sensor (optional, for maximum limitation)
- M1 System pump
- Y1 Mixing valve

## Extension modules

Extension modules are used depending on the plant's complexity, ensuring that a sufficient number of inputs and outputs are available.

## Mechanical design

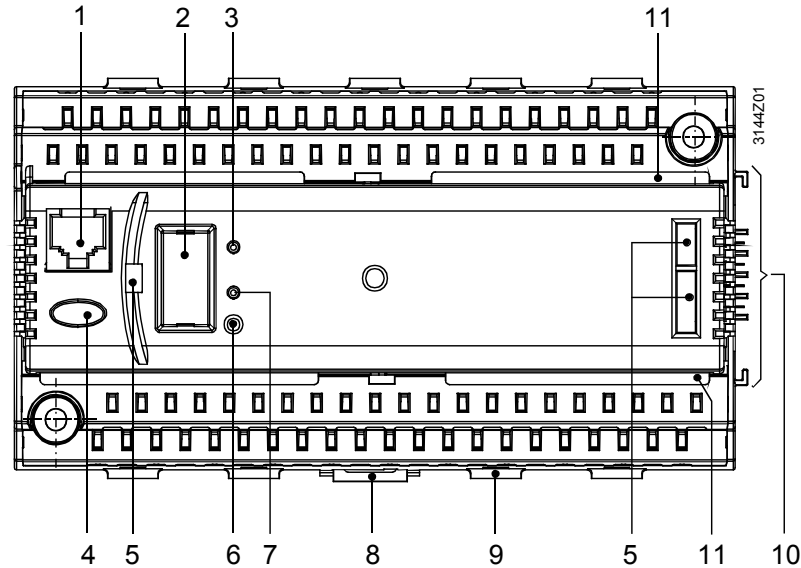
### Makeup

The RMK770 boiler sequence controller consists of terminal base and insert. It has a plastic housing with the printed circuit boards, 2 terminal levels and carries the connecting elements (electrical and mechanical) for 1 extension module.

The unit can be fitted to a top hat rail conforming to EN 60 715-TH 35-7.5, or can be mounted directly on a wall.

Operation is facilitated via a plug-in type or detached operator unit (refer to "Type summary").

## Operating, display and connecting elements



- 1 Connection facility for service interface (RJ45 socket)
- 2 Connection facility for 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 assigning the device address
- 7 LED (red) for indication of the programming process
- 8 Mounting facility for fitting the unit to a top hat rail
- 9 Fixing facility for a cable tie
- 10 Electrical and mechanical connecting elements for extension module
- 11 Rest for the terminal cover

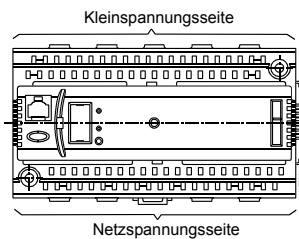
## Engineering notes



- The RMK770 can be used in connection with a **maximum of 3** extension modules
- The unit operates on AC 24 V. Operating voltage must conform to the requirements of SELV / PELV (safety extra low-voltage)
- The transformers used must be safety isolating transformers featuring double insulation to EN 60742 and EN 61558-2-6; they must be suited for 100 % duty
- Fuses, switches, wiring and grounding must be in compliance with local safety regulations for electrical installations
- Sensor wires should not be run parallel to mains carrying cables powering actuators, pumps, etc.
- To define the details of configuration and to generate the plant connection diagrams, the following pieces of documentation are helpful:
  - Configuration diagrams (contained in the Basic Documentation P3132)
  - Application Sheets
- The reference room for control with a room temperature sensor should be the room that cools down quickest. That room must not be equipped with thermostatic radiator valves; manual valves must be locked in their fully open position

## Mounting and installation notes

- Controller and extension modules are designed for:
  - Mounting in standard control cabinets conforming to DIN 43880
  - Wall mounting on an existing top hat rail (EN 50022-35×7,5)
  - Wall mounting with 2 fixing screws
  - Flush panel mounting
- Not permitted are wet or damp spaces. The permissible environmental conditions must be observed
- If the RMK770 shall not be operated inside a control panel, the detached RMZ791 operator unit can be used in place of the RMZ790 plug-in type



- Prior to mounting the RMK770, the system must be disconnected from power supply
- **The insert of the RMK770 must not be removed from the terminal base!**
- If extension modules are used, they must be attached to the right side of the RMK770 in the correct order and in accordance with the internal configuration
- The extension modules require no wiring between them or from the modules to the RMK770. The electrical connections are made automatically when attaching the modules. If it is not possible to arrange all required universal modules side by side, the first of the detached modules must be connected to the previous module or to the RMK770 using the RMZ780 module connector. In that case, the maximum cable length is 10 m
- All connection terminals for protective extra low-voltage (sensors, data bus) are located in the upper half of the unit, those for mains voltage (actuators and pumps) at the bottom
- Each terminal (spring cage terminals) can accommodate only 1 solid wire or 1 stranded wire. To connect the cables, the insulation must be stripped for 7 to 8 mm. To introduce the cables into the spring cage terminals and to remove them, a screwdriver of size 0 or 1 is required
- Cable strain relief can be provided with the help of the fixing facility for cable ties
- The unit is supplied complete with Installation Instructions and Operating Instructions

## Commissioning notes

- Configuration and parameters of the standard applications programmed in the RMK770 can be changed any time locally by personnel trained by Siemens who have the respective access rights to the RMZ790 or RMZ791 operator unit, or online or offline using the service tool
- During the commissioning process, the application remains switched off and the outputs are in a defined off state. During that time, no process and alarm signals will be delivered to the bus
- On completion of the configuration, the unit will automatically be restarted
- When leaving the commissioning pages, the peripheral devices (including the extension modules) connected to the universal inputs will automatically be checked and identified. If, later, a peripheral device is missing, a fault status message will be output
- The operator unit can be removed and plugged in or connected while the RMK770 is in operation
- Adaptations required due to specific plant conditions must be recorded and the relevant document should be stored in the control panel
- The procedure to be followed when starting up the plant for the first time is described in the Installation Instructions

## Disposal notes



The device is considered an electronics device for disposal in terms of European Directive 2012/19/EU and may not be disposed of as domestic garbage.

- Dispose of the device through channels provided for this purpose.
- Comply with all local and currently applicable laws and regulations..

## Technical data


<b>Power supply (G, G0)</b>	Operating voltage	AC 24 V $\pm$ 20 % (SELV)
	Requirements for external safety isolating transformer (100 % duty, max. 320 VA) to	EN 60742 / EN 61558-2-6
	Frequency	50/60 Hz
	Power consumption (excl. modules)	12 VA
	External supply line protection	fuse max. 10 A (slow release) or automatic circuit breaker max. 13 A tripping characteristic B, C, D according to EN 60898 or power supply with current limiting at 10 A

<b>Functional data</b>	Reserve of clock	
	Typically	48 h
	Minimum	12 h

<b>Analog inputs X1...X8</b>	Sensors	
	Passive	1 or 2 LG-Ni 1000, T1, Pt 1000
	Active	DC 0...10 V
	Signal sources	
	Passive	0...2500 $\Omega$
Active	DC 0...10 V	

<b>Digital inputs X1...X8, D1, D2</b>	Contact sensing	
	Voltage	DC 15 V
	Current	5 mA
	Requirements for status and impulse contacts	
	Signal coupling	potential-free
	Type of contact	maintained or impulse contacts
	Insulating strength against mains potential	AC 3750 V to EN 60730
	Permissible resistance	
	Contacts closed	max. 200 $\Omega$
	Contacts open	min. 50 k $\Omega$

<b>Positioning output Y1, Y2</b>	Output voltage	DC 0...10 V
	Output current	$\pm$ 1 mA
	Max. load	continuous short-circuit

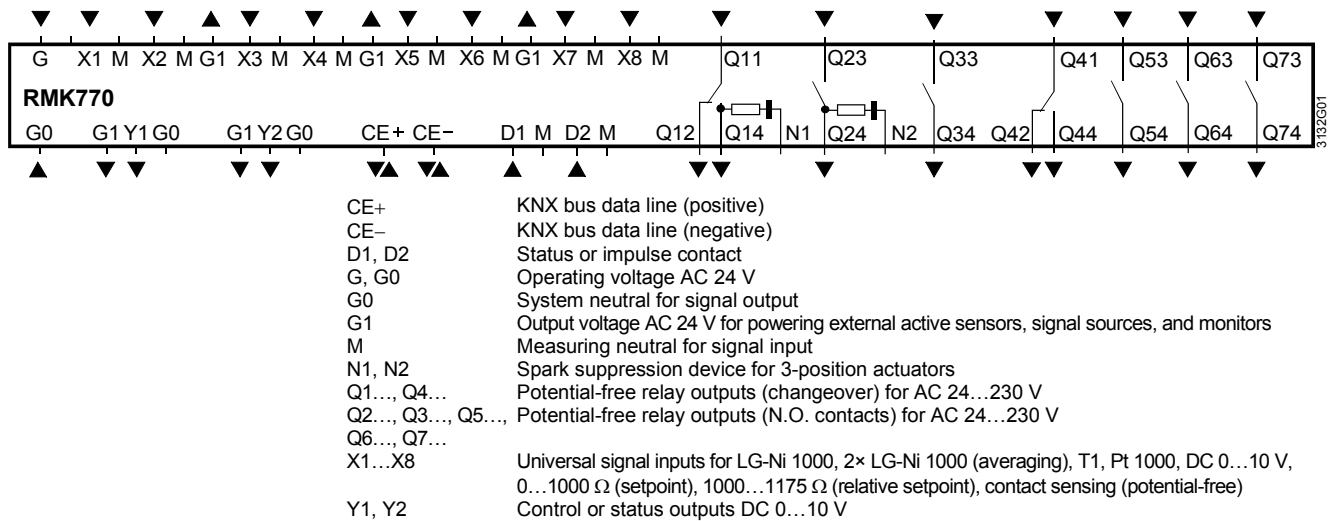
 <b>Switching outputs Q1x...Q7x</b>	External supply line protection	
	Wire fuse (slow)	max. 10 A
	Automatic line cutout	max. 13 A
	Release characteristic	B, C, D to EN 60898
	Cable length	max. 300 m
	Relay contacts	
	Switching voltage	max. AC 250 V / min. AC 19 V
	AC current	max. 4 A ohm., 3 A ind. ( $\cos \varphi = 0.6$ )
	At 250 V	min. 5 mA
	At 19 V	min. 20 mA
Switch-on current	max. 10 A (1 s)	

	Contact life at AC 250 V	guide values:
	0.1 A (res.)	$2 \times 10^7$ cycles
	N.O. contact at 0.5 A (res.)	$4 \times 10^6$ cycles
	Changeover contact at 0.5 A (res.)	$2 \times 10^6$ cycles
	N.O. contact at 4 A (res.)	$3 \times 10^5$ cycles
	Changeover contact at 4 A (res.)	$1 \times 10^5$ cycles
	Reduction factor at ind. ( $\cos \varphi = 0.6$ )	0.85
	<b>Insulating strength</b>	
	between relay contacts and system electronics (reinforced insulation)	AC 3750 V to EN 60730-1
	between neighboring relay contacts (operational insulation) Q1↔Q2; Q3↔Q4; Q5↔Q6↔Q7	AC 1250 V to EN 60730-1
	between relay groups (reinforced insulation) (Q1, Q2) ↔ (Q3, Q4) ↔ (Q5, Q6, Q7)	AC 3750 V to EN 60730-1
<b>Power supply external devices (G1)</b>	Voltage	AC 24 V
	Current	max. 4 A
<b>Interfaces</b>	<b>KNX bus</b>	
	Type of interface	KNX TP1
	Bus loading number	2,5
	Bus power supply (decentral, can be switched off)	25 mA
	Power failure of short duration to EN 50 090-2-2	100 ms with 1 extension module
	<b>Extension bus</b>	
	Connector specification	4 contacts SELV / PELV
	Number of plugging cycles	max. 10
	Service tool connection facility	RJ45
<b>Perm. Cable lengths</b>	For passive measuring and positioning signals*	
	LG-Ni 1000	max. 300 m
	0...1000 Ω	max. 300 m
	1000...1235 Ω	max. 300 m
	Contact sensing	max. 300 m
	For DC 0...10 V measuring and control signals	refer to the documentation of the signal-delivering device
	For KNX bus	max. 700 m
	Type of cable	2-core, unshielded, twisted pairs
	* Measuring errors can be corrected via the "Settings > Inputs" menu	
<b>Electrical connections</b>	Connection terminals	spring cage terminals
	Solid wires	dia. 0.6 mm...2.5 mm <sup>2</sup>
	Stranded wires without ferrules	0.25...2.5 mm <sup>2</sup>
	Stranded wires with ferrules	0.25...1.5 mm <sup>2</sup>
	Connection facility for KNX bus	wires cannot be interchanged
<b>Protective data</b>	Degree of protection of housing to IEC 60 529	IP20 (when built in)
	Safety class to EN 60730	device suited for use in equipment of class II

<b>Ambient conditions</b>	Operation to	IEC 60721-3-3		
	Climatic conditions	class 3K5		
	Temperature (housing with electronics)	0...50 °C		
	Humidity	5...95 % r. h. (non-condensing)		
	Mechanical conditions	class 3M2		
	Transport to	IEC 60 721-3-2		
Climatic conditions	class 2K3			
Temperature	-25...+70 °C			
Humidity	<95 % r. h.			
Mechanical conditions	class 2M2			
<b>Classifications to EN 60730</b>	Mode of operation, automatic controls	type 1B		
	Degree of contamination, controls' environment	2		
	Software class	A		
	Rated surge voltage	4000 V		
	Temperature for ball-pressure test of housing	125 °C		
<b>Standards, directives and approvals</b>	Product standard	EN 60730-1.		
		Automatic electronic controls for household and similar use.		
	Product family standard	EN 50491-x		
		General requirements for Home and Building Electronic Systems (HBES) and Building Automation and Control Systems (BACS).		
	Electromagnetic compatibility (application)	For residential, commercial, and industrial environments.		
	EU conformity (CE)	CE1T3110en_C1*)		
	RCM conformity	CE1T3110en_C1*)		
	EAC conformity	Eurasia- conformity		
Environmental compatibility	The environmental product declaration contains data on environmentally compatible product design and assessments (RoHS compliance, materials composition, packaging, environmental benefit, disposal)	CE1E3110en01		
	Eco design and labeling directives	Controller class	Efficiency gain	
	Application with one room temperature sensor and one outdoor temperature sensor and modulating control	VI	4.0%	
	Application with one outdoor temperature sensor and modulating control	II	2.0%	
	Application with one room temperature sensor and one outdoor temperature sensor and on/off control	VII	3.5%	
	Application with one outdoor temperature sensor and on/off control	III	1.5%	
	<b>Materials and colors</b>	Terminal base	Polycarbonate, RAL 7035 (light-gray)	
		Controller insert	Polycarbonate, RAL 7035 (light-gray)	
		Packaging	corrugated cardboard	
	<b>Weight</b>	Net weight excl. packaging	0.490 kg	

\*) Documents can be downloaded at: <http://siemens.com/bt/download>

## Connection diagram

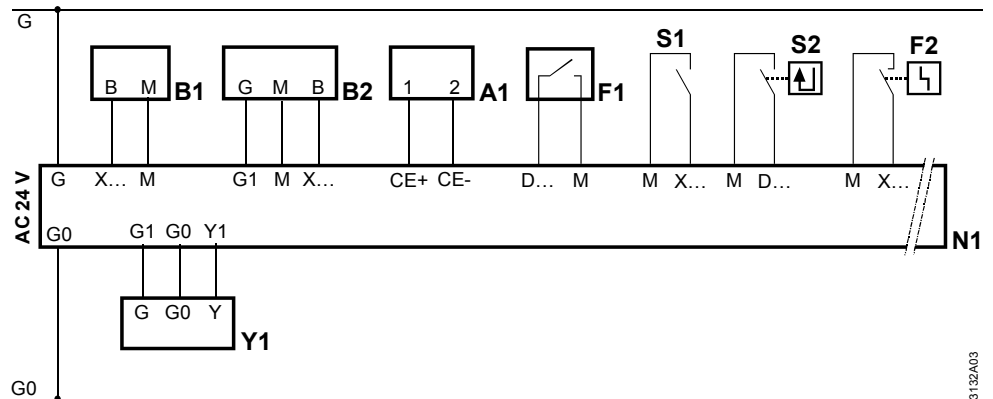


## Notes

- Each terminal (spring cage terminals) can accommodate only 1 solid wire or 1 stranded wire
- Double terminals are internally interconnected

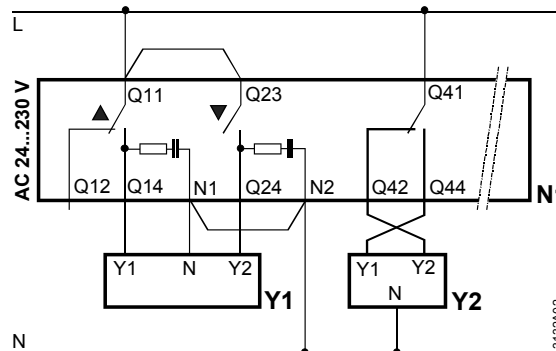
## Connection examples

### Low-voltage connections



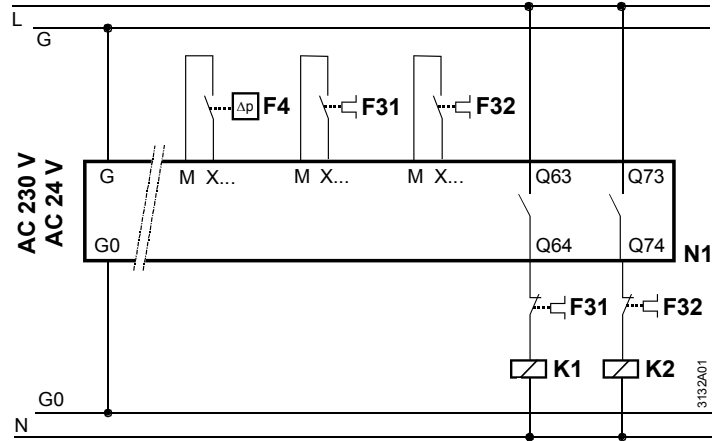
- A1 KNX device  
 B1 Passive sensor (setpoint adjuster)  
 B2 Active sensor (setpoint adjuster)  
 F1 Fault contact (e.g. thermostat)  
 F2 Fault contact (e.g. pressure switch), on the burner  
 N1 RMK770 boiler sequence controller  
 S1 Manual switch, service switch, etc.  
 S2 Operational signal, e.g. from the burner or shutoff valve  
 Y1 Actuator with DC 0...10 V control input

### Connection of 3-position actuators



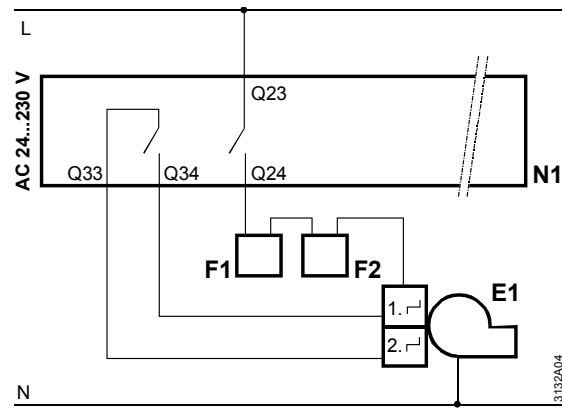
- N1 RMK770 boiler sequence controller  
 Y1 3-position actuator for mixing valve  
 Y2 3-position actuator for shutoff valve

**Connection of 1 twin pump  
or 2 single pumps**



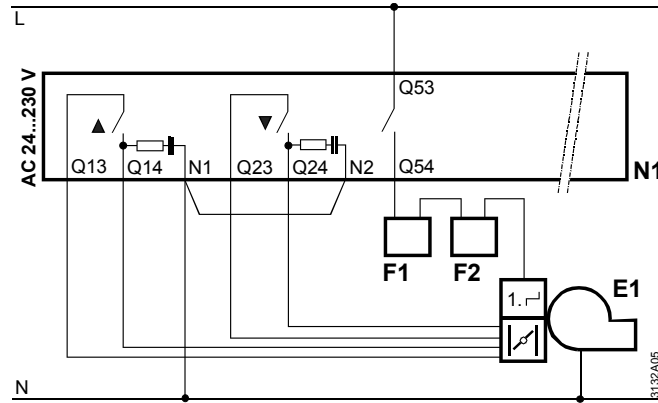
- F31, F32 Overcurrent release contact
- F4 Pressure switch
- K1 Motor contactor for pump
- K2 Motor contactor for pump
- N1 RMK770 boiler sequence controller

**Connection of safety loop  
for a 2-stage burner**



- E1 2-stage burner
- F1 Limit thermostat
- F2 Safety limit thermostat
- N1 RMK770 boiler sequence controller

**Connection of safety loop  
for a modulating burner**

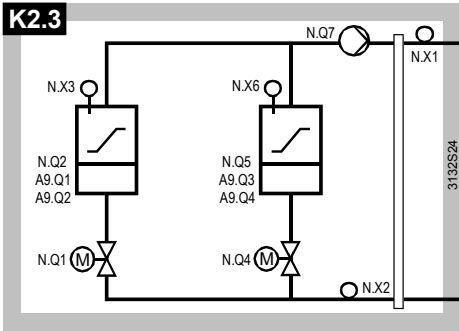
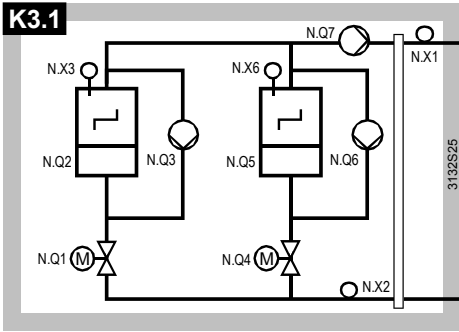
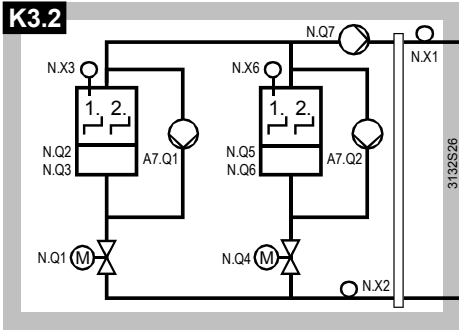
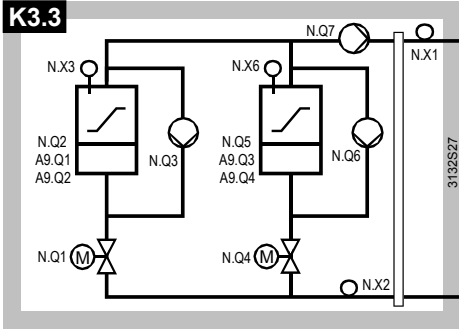
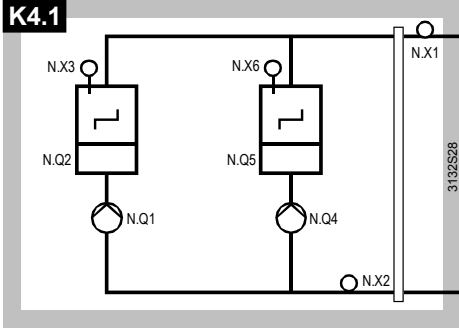


- E1 Modulating burner
- F1 Limit thermostat
- F2 Safety limit thermostat
- N1 RMK770 boiler sequence controller



## Overview of the programmed plant types

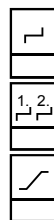
Plant type	Description	Plant diagram
<b>K1.1</b>	<b>Functions:</b> <ul style="list-style-type: none"> <li>Boiler temperature control with 1-stage burner; optionally with modulating burner using DC 0...10 V control</li> <li>Control of the main flow or main return temperature</li> <li>Control of the main pump</li> </ul>	
<b>K1.2</b>	<b>Functions:</b> <ul style="list-style-type: none"> <li>Boiler temperature control with 2-stage burner</li> <li>Control of the main flow or main return temperature</li> <li>Control of the main pump</li> </ul>	
<b>K1.3</b>	<b>Functions:</b> <ul style="list-style-type: none"> <li>Boiler temperature control with modulating burner using 3-position control</li> <li>Control of the main flow or main return temperature</li> <li>Control of the main pump</li> </ul> <p>This requires extension module type RMZ789</p>	
<b>K2.1</b>	<b>Functions:</b> <ul style="list-style-type: none"> <li>Boiler temperature control with 1-stage burner; optionally with modulating burner using DC 0...10 V control</li> <li>Control of the shutoff valve in the boiler return</li> <li>Control of the main flow or main return temperature</li> <li>Control of the main pump</li> </ul>	
<b>K2.2</b>	<b>Functions:</b> <ul style="list-style-type: none"> <li>Boiler temperature control with 2-stage burner</li> <li>Control of the shutoff valve in the boiler return</li> <li>Control of the main flow or main return temperature</li> <li>Control of the main pump</li> </ul>	

Plant type	Description	Plant diagram
<b>K2.3</b>	<p>Functions:</p> <ul style="list-style-type: none"> <li>Boiler temperature control with modulating burner using 3-position control</li> <li>Control of the shutoff valve in the boiler return</li> <li>Control of the main flow or main return temperature</li> <li>Control of the main pump</li> </ul> <p>This requires extension module type RMZ789</p>	 <p>Diagram K2.3 shows a modulating burner system. It features two burner units, each with a 3-position control valve (N.X3 and N.X6) and a shutoff valve (N.Q2 and N.Q5). The system includes two pumps (N.Q1 and N.Q4) and a main flow/return temperature sensor (N.Q7). The diagram is labeled with extension module type 3132S24.</p>
<b>K3.1</b>	<p>Functions:</p> <ul style="list-style-type: none"> <li>Boiler temperature control with 1-stage burner; optionally with modulating burner using DC 0...10 V control</li> <li>Control of the shutoff valve in the boiler return</li> <li>Control of the boiler bypass pump</li> <li>Control of the main flow or main return temperature</li> <li>Control of the main pump</li> </ul>	 <p>Diagram K3.1 shows a 1-stage burner system. It features two burner units (N.X3 and N.X6) with shutoff valves (N.Q2 and N.Q5) and a boiler bypass pump (N.Q3). The system includes a main pump (N.Q1) and a main flow/return temperature sensor (N.Q7). The diagram is labeled with extension module type 3132S25.</p>
<b>K3.2</b>	<p>Functions:</p> <ul style="list-style-type: none"> <li>Boiler temperature control with 2-stage burner</li> <li>Control of the shutoff valve in the boiler return</li> <li>Control of the boiler bypass pump</li> <li>Control of the main flow or main return temperature</li> <li>Control of the main pump</li> </ul> <p>This requires extension module type RMZ787</p>	 <p>Diagram K3.2 shows a 2-stage burner system. It features two burner units (N.X3 and N.X6) with 2-stage control valves (N.Q2 and N.Q5) and a boiler bypass pump (N.Q3). The system includes a main pump (N.Q1) and a main flow/return temperature sensor (N.Q7). The diagram is labeled with extension module type 3132S26.</p>
<b>K3.3</b>	<p>Functions:</p> <ul style="list-style-type: none"> <li>Boiler temperature control with modulating burner using 3-position control</li> <li>Control of the shutoff valve in the boiler return</li> <li>Control of the boiler bypass pump</li> <li>Control of the main flow or main return temperature</li> <li>Control of the main pump</li> </ul> <p>This requires extension module type RMZ789</p>	 <p>Diagram K3.3 shows a modulating burner system. It features two burner units (N.X3 and N.X6) with 3-position control valves (N.Q2 and N.Q5) and a boiler bypass pump (N.Q3). The system includes a main pump (N.Q1) and a main flow/return temperature sensor (N.Q7). The diagram is labeled with extension module type 3132S27.</p>
<b>K4.1</b>	<p>Functions:</p> <ul style="list-style-type: none"> <li>Boiler temperature control with 1-stage burner; optionally with modulating burner using DC 0...10 V control</li> <li>Control of the boiler return pump</li> <li>Control of the main flow or main return temperature</li> </ul>	 <p>Diagram K4.1 shows a 1-stage burner system. It features two burner units (N.X3 and N.X6) with shutoff valves (N.Q2 and N.Q5) and a boiler return pump (N.Q1). The system includes a main flow/return temperature sensor (N.Q7). The diagram is labeled with extension module type 3132S28.</p>

Plant type	Description	Plant diagram
<b>K4.2</b>	Functions: <ul style="list-style-type: none"> <li>Boiler temperature control with 2-stage burner</li> <li>Control of the boiler return pump</li> <li>Control of the main flow or main return pump</li> </ul>	
<b>K4.3</b>	Functions: <ul style="list-style-type: none"> <li>Boiler temperature control with modulating burner using 3-position control</li> <li>Control of the boiler return pump</li> <li>Control of the main flow or main return temperature</li> </ul> This requires extension module type RMZ789	
<b>K5.1</b>	Functions: <ul style="list-style-type: none"> <li>Boiler temperature control with 1-stage burner; optionally with modulating burner using DC 0...10 V control</li> <li>Control of the boiler return pump</li> <li>Control of the shutoff valve in the boiler return</li> <li>Control of the main flow or main return temperature</li> </ul>	
<b>K5.2</b>	Functions: <ul style="list-style-type: none"> <li>Boiler temperature control with 2-stage burner</li> <li>Control of the boiler return pump</li> <li>Control of the shutoff valve in the boiler return</li> <li>Control of the main flow or main return temperature</li> </ul> This requires extension module type RMZ787	
<b>K5.3</b>	Functions: <ul style="list-style-type: none"> <li>Boiler temperature control with modulating burner using 3-position control</li> <li>Control of the boiler return pump</li> <li>Control of the shutoff valve in the boiler return</li> <li>Control of the main flow or main return temperature</li> </ul> This requires extension module type RMZ789	

Plant type	Description			Plant diagram
<b>K6.1</b>	Functions: <ul style="list-style-type: none"> <li>Boiler temperature control with 1-stage burner; optionally with modulating burner using DC 0...10 V control</li> <li>Controlled maintained boiler return temperature, with 3-position control (optionally with DC 0...10 V control)</li> <li>Control of the boiler circuit pump</li> <li>Control of the main flow or main return temperature</li> </ul> Depending on the plant's complexity, an extension module type RMZ789 is required:			
	<i>Boiler temperature control</i>	<i>Maintained boiler return temperature 3-position</i>	<i>Maintained boiler return temperature DC 0...10 V</i>	
	1-stage burner	RMZ789	None	
	Modulating DC 0...10 V	RMZ789	RMZ789	
<b>K6.2</b>	Functions: <ul style="list-style-type: none"> <li>Boiler temperature control with 2-stage burner</li> <li>Controlled maintained boiler return temperature, with 3-position control (optionally with DC 0...10 V control)</li> <li>Control of the boiler circuit pump</li> <li>Control of the main flow or main return temperature</li> </ul> If 3-position control is used for maintained boiler return temperature, extension module type RMZ789 is required			
<b>K6.3</b>	Functions: <ul style="list-style-type: none"> <li>Boiler temperature control with modulating burner using 3-position control</li> <li>Controlled maintained boiler return temperature, with 3-position control (optionally with DC 0...10 V control)</li> <li>Control of the boiler circuit pump</li> <li>Control of the main flow or main return temperature</li> </ul> This requires 2 extension modules type RMZ789			

Explanations:



= Boiler with 1-stage burner

= Boiler with 2-stage burner

= Boiler with modulating burner

N = Connection terminals of the RMK770

X1 = Configurable input at the RMK770

Q1 = Relay terminals Q11, Q12 and Q14

Q2 = Relay terminals Q23 and Q24

A7 = Connection terminals of RZM787 extension module

A9 = Connection terminals of RZM789 extension module

A9(2) = Connection terminals of second RZM789 extension module



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