NRT 300: Electronic air-conditioning controller, heating/cooling, equiflex

How energy efficiency is improved
Key directly on device for individual changeover between presence and absence

Areas of use
Individual unitary control and zone control (heating, cooling, heating/cooling) e.g. in air conditioning systems (2- or 4-pipe systems) in hotels and residential and business spaces.

Features
- Air-conditioning controller for 2- and 4-pipe systems (heating, cooling, heating/cooling)
- Measurement of room temperature by either integrated or external temperature sensor
- Saves energy costs by means of presence/absence key and rotary knob on front
- Inputs for C/O signal, changeover between presence and absence, dew-point monitoring and set-point shift
- Choice of P or PI control with 2-point, pulse-pause, 3-point or outputs (0...10 V)
- LED indicator
- Servicing level with adjustable control parameters
- Frost-protection facility
- Electrical connection in baseplate
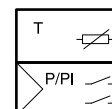- Electronics in attachable housing

NRT300F0*1

NRT300F041

NRT300F061

Sequence, dead zone normal

Sequence, dead zone extended

Technical data

Power supply

	Power supply	24 V~, ±20%, 50...60 Hz
	Power consumption	Approx. 2.5 VA

Parameters

	Setting range X_s	10...30 °C
	Proportional band	2...20 K
	Integral action time	2...20 minutes or OFF (as P-controller)
	Period or running time of actuator	0.5...20 minutes
	Control parameters	Non-volatile
Dead zone X_t	Normal	0,4...5 K
	Extended	8 K
Sensor time constant for air	In room (0.1 m/s)	8 minutes
	In duct (0.5 m/s)	3 minutes
	In duct (3 m/s)	1 minutes

Ambient conditions

	Admissible ambient temperature	0...50 °C
	Admissible ambient humidity	5...95% rh, no condensation

Inputs/outputs

	Command variable w	0...10 V, R_i = 90 kΩ
	Influence of w	1.6 K/V

Function

	Operating mode	Sequence (heating/cooling)
	Change-over functions[1]	X_t, C/O, TP

Construction

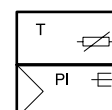|		
	Weight	0.1 kg
	Housing	Pure white (RAL 9010)
	Housing material	Fire-retardant thermoplastic
	Fitting	Wall fitting/recessed junction box
	Cable feed	At rear

[1] X_t = dead zone ON/OFF; C/O = summer/winter, (changeover); TP = dew point monitoring
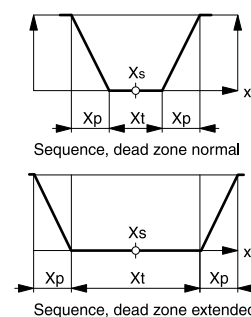
Screw terminals	For wire of up to 1 mm²

Standards and directives

	Type of protection	IP30 (EN 60529)
	Protection class	III (IEC 60730)
	Energy class	I = 1 % as per EU 811/2013, 2010/30/EU, 2009/125/EC
CE conformity according to	EMC Directive 2014/30/EU	EN 60730-1, EN 60730-2-9

Overview of types

Type	Output signal	Load on outputs
NRT300F041	Switched	0.5 A (0.9 A when external sensor fitted)
NRT300F061	Continuous	0...10 V, load > 5 kΩ; with overflow > 11 V (load-dependent)

☀ *NRT300F061: Suitable as a master controller for max. 10 × NRT 300: (slope S = P-band X_p; shift starting point FF = setpoint X_S; operating mode = sequence)*

Accessories

Type	Description
AVF***	Motorised valve actuator (see product data sheet)
AVM***	Motorised valve actuator (see product data sheet)
AXM***	Motorised valve actuator (see product data sheet)
AXT2**	Thermal actuators for unit valves (see product data sheet)
EGH102F001	Dew-point monitor with sensor in housing
EGH102F101	Dew-point monitor with sensor on cable
0296724000	Sensor holder for wall mounting
0368139000	Rubber bung as sensor holder in ventilation duct
0303124000	Recessed junction box
0313347001	Cover plate, pure white, for 76 × 76 mm
EGT353F101	Cable temperature sensor; NTC 10k; -35...100 °C; L = 1.5 m
EGT353F103	Cable temperature sensor; NTC 10k; -35...100 °C; L = 3 m
EGT353F110	Cable temperature sensor; NTC 10k; -35...100 °C; L = 10m
EGT353F120	Cable temperature sensor; NTC 10k; -35...100 °C; L = 20m
0313414001	Bracket for wall mounting
0386273001	Plug-in power unit, input 230 V~, output 21 V~ (0.34 A), length of cable 1.8 m, IP30
0313409001	Holder for sensor cartridge in ventilation duct
0313501001	Housing with scale 10...30 °C

Description of operation

The temperature is measured with a temperature sensor. In the room controller, the sensor is integrated into the housing. For channel controllers, an external sensor is connected. The resistance of the sensor is converted into an actual-value signal (x_i) by a measuring bridge, and is then compared with the setpoint X_S. The controller amplifies the control offset and, depending on its type, creates the corresponding output signals:

F041, S1/2 = OFF:
OPEN/STOP/CLOSED signals (3-point control) for the PI control with a motorised drive without a positioner. For heating with changeover to cooling via external signal (C/O) for 2-pipe system.

F041, S1/2 = ON:
Pulse-pause signals (2-point control) for P control for heating and cooling, for a thermal or continuous actuator for 4-pipe systems, or heating with changeover via external signal (C/O) to cooling for thermal actuator of a 2-pipe system.

F061:
Continuous signal for PI control for heating and cooling, for a continuous actuator for 4-pipe systems, or heating with changeover via external signal (C/O) to cooling for continuous actuator of a 2-pipe system.
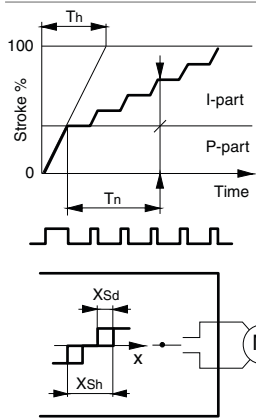
Open-Stop-Close signals
(Proportional-integral control F041)
In the case of an abrupt control offset,
first a longer P pulse and then continuous
smaller I pulses are output, until the control offset is smaller than half the switching range X_{Sh}.
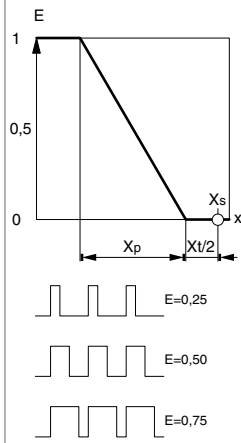
Pulse-Pause signals (proportional control F041)
Control factor E (pulse duration/period duration)
changes in proportion to the control offset. As a
result, the average heating output also changes,
as well as the stroke of a proportional thermal actuator such as a P-controller.

Dead zone changeover (X_t):

Thus, for the heating/cooling sequence, the dead zone is increased to 4 Xp. As a result, the temperature is decreased in heating mode and increased in cooling mode (Eco mode).

Setpoint shift (command variable w):

The setpoint is increased with respect to the defined value X_S with an influence of + 1.6 K/V. This can be used, for example, to adjust the room temperature to the increasing outside temperature (summer shift), or to avoid condensation due to rising humidity.

Dew point (TP):

Frost-protection function:

When the contact of the dew-point monitor is closed, the cooling output becomes inactive or the cooling valve is closed.

Independently of the defined setpoint and dead zone, at temperatures < 6 °C, the heating valve is opened. If the temperature rises above 7 °C, the frost-protection function becomes inactive. If necessary, the temperature must be compensated in order to adhere precisely to the switching points.

Summer-/wintertime changeover (C/O):

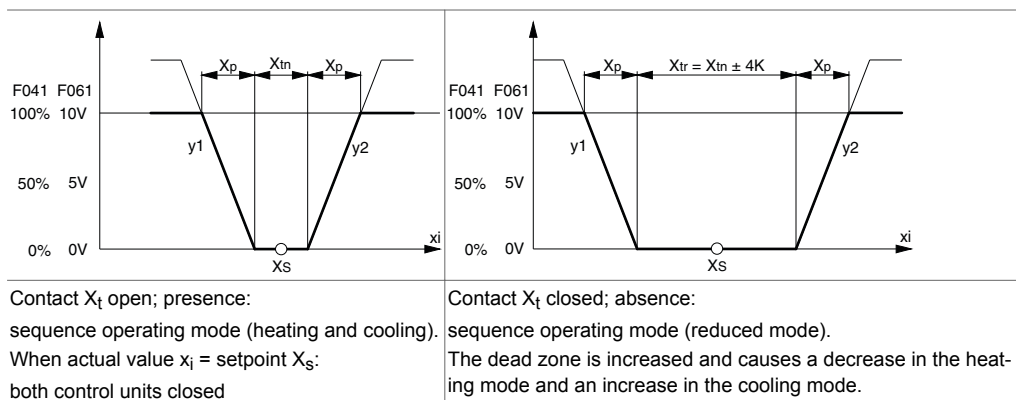When the contact is closed, the output for heating is switched to cooling.

Factory settings:

Proportional band	X_p = 2 K
Dead zone for normal	X_{tn} = 0.4 K
Integral action time	t_n = inactive
Temperature compensation	ZERO = inactive

Additionally for F041:

Period or running time	t_p = 4 min
	t_y = 4 min

Control characteristics

Contact X_t open; presence:
sequence operating mode (heating and cooling).
When actual value x_i = setpoint X_S:
both control units closed

Contact X_t closed; absence:
sequence operating mode (reduced mode).
The dead zone is increased and causes a decrease in the heating mode and an increase in the cooling mode.

Fixed-value + schedule function With NRT 300 as the master controller	With NRT 300 as the slave controller
Output y_2 or y_1 of the master controller can influence multiple controllers. With setpoint adjustment knob X_S, shift starting point FF can be selected, and with P-band X_P the slope can be selected.	In the fixed-value range, all the connected controllers regulate to the defined value X_S. In the follow-on range, the temperature is increased with slope S. The result of the influence of 1.6 K/V for the slave controller and the P-band of the master controller of 10 V/XP is: S = 16/X_p. With X_P = 2...20 K for the master controller, the following slope results in K/K: S = 8...0.8

Intended use

This product is only suitable for the purpose intended by the manufacturer, as described in the "Description of operation" section.

All related product regulations must also be adhered to. Changing or converting the product is not admissible.

Disposal

When disposing of the product, observe the currently applicable local laws.

More information on materials can be found in the Declaration on materials and the environment for this product.

Connection diagrams
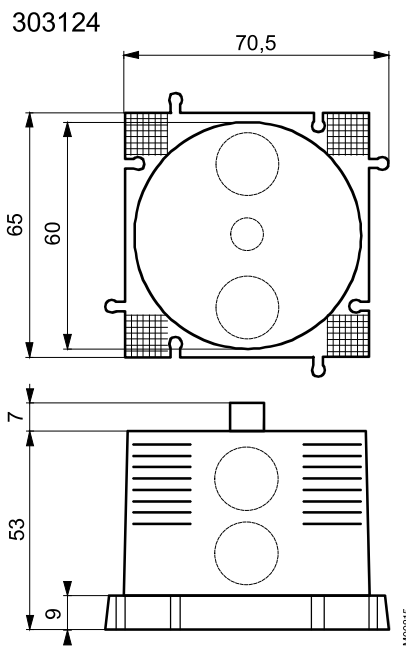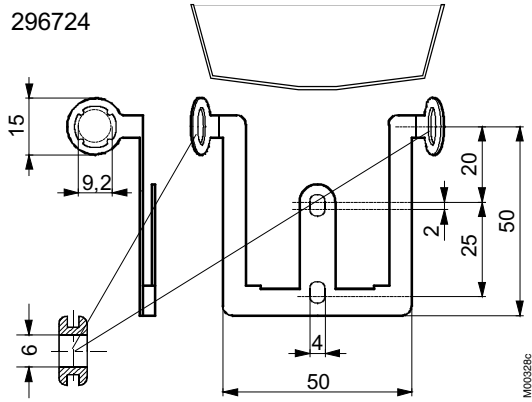
NRT 300 F041: 4-pipe system/2-pipe system/2-pipe system
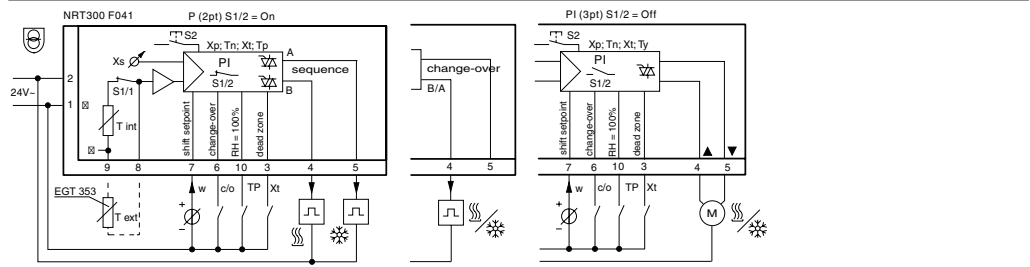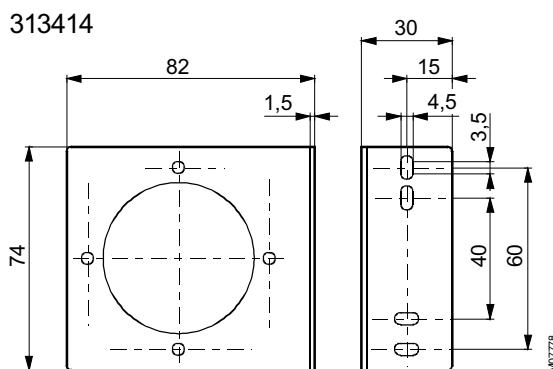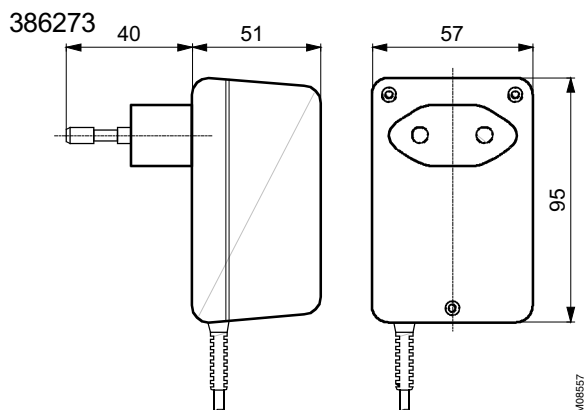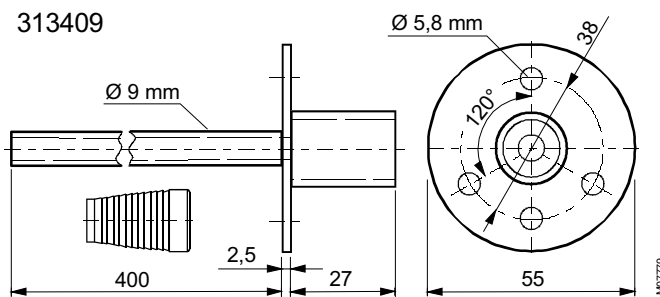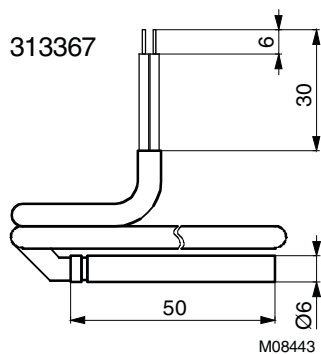

NRT 300 F061: 4-pipe system/2-pipe system

Dimension drawing

M07634b

Accessories

296724

M00328c

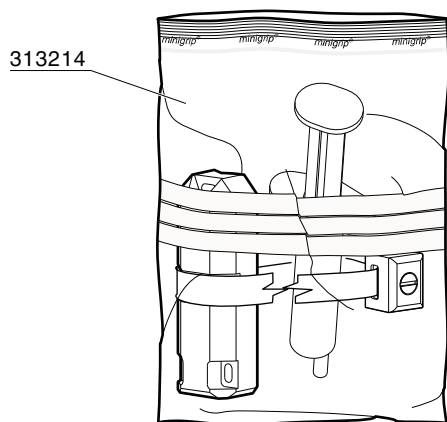303124

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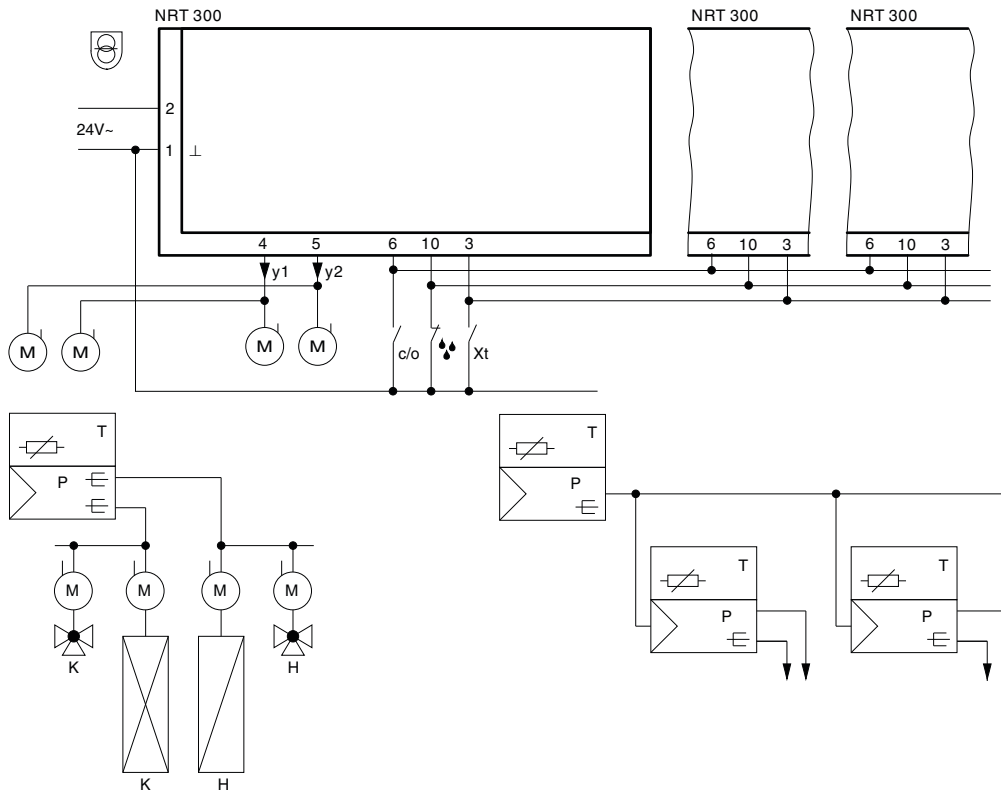368139

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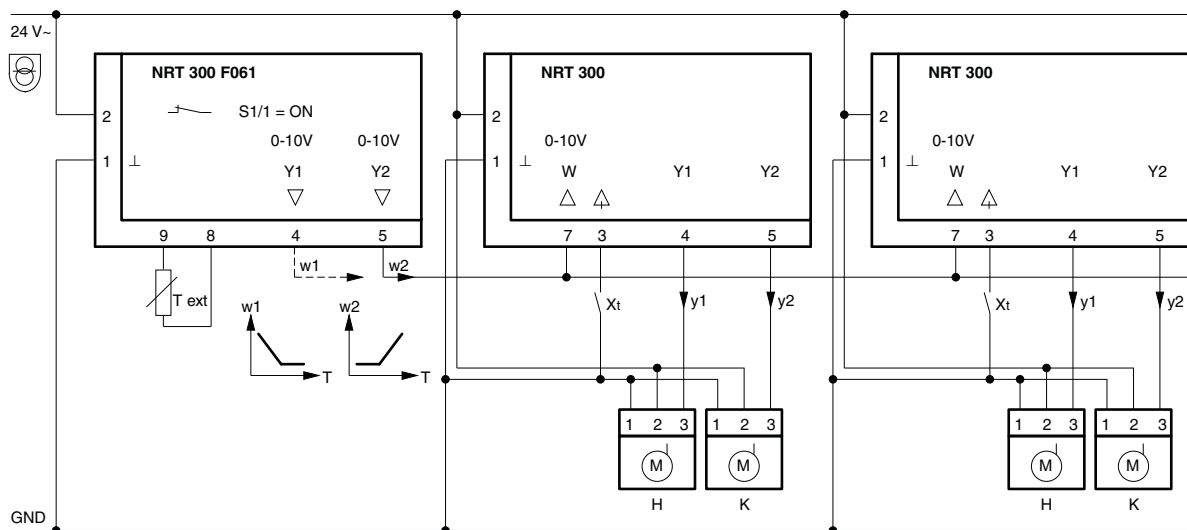313367

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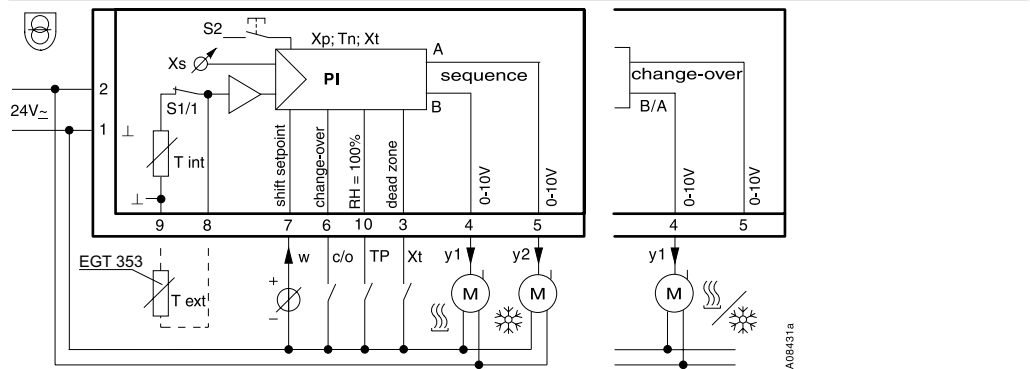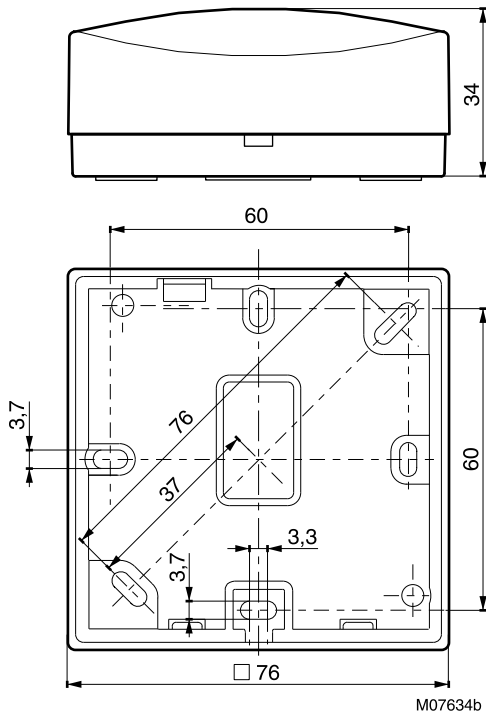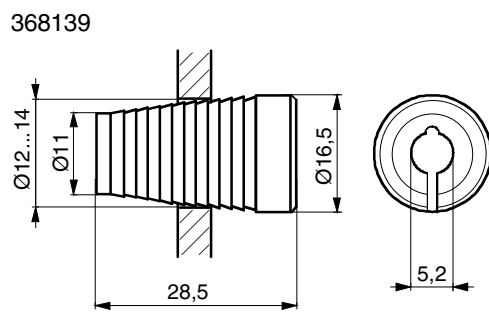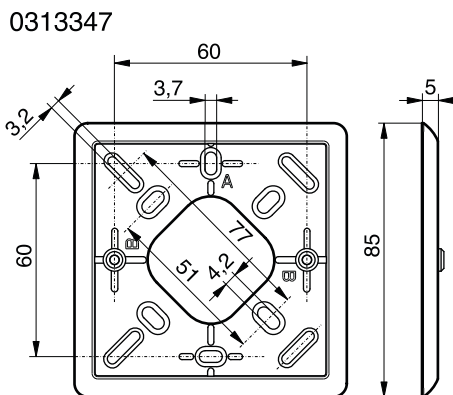
Fixed-value control for heating/cooling

F041: Maximum of 4 actuators per output

F061: Outputs y_1 and y_2 (total load > 5 kΩ) for actuators with positioner, e.g. max. 6 per R_i = 30 kΩ
(AVR...S, B1W...S, V1W...S, AR...S, AK...S)

Fixed-value + schedule control with NRT 300 F061 as master controller

Outputs w1 (y_1) and w2 (y_2) (total load > 5 kΩ) of the master controller to shift max. 10 × NRT 300

Key	
H	Heating
K	Cooling
T	Temperature
w	Command signal