SIEMENS

7⁸⁶⁷

Compact universal controllers

RWF55...

The RWF55 is used mainly for controlling the temperature or pressure in oil- or gas-fired heating plants.
If the relevant parameters are set, the RWF55 can be switched to cooling mode and then controls in reverse operation.

The RWF55 and this Data Sheet are intended for use by OEMs which integrate the controllers in their products!

Use

The RWF55 is used either as a 3-position controller without angular positioning feedback or a continuous controller with analog output depending on the setting. An external switch can be used to change to a 2-position controller for controlling 2-stage burners. The integrated thermostat function switches the burner on and off.

LED symbols on the front indicate the following operating states:
- Burner release
- Control pulses OPEN or CLOSED for driving the burner's air damper when using a modulating burner control, or stage I / stage II when using 2-stage burner control
- 2-stage operation
- Position of programmable contact «K6»
- Activation of a ramp function
- Communication via USB, Modbus or Profibus

During operation, the digital displays above the keys shows the setpoint (green), the actual value (red) and – when making parameter settings – the relevant parameters.

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Building Technologies Division

Infrastructure & Cities Sector

Supplementary documentation

Warning notes

To avoid injury to persons, damage to property or the environment, the following warning notes must be observed!

Do not open, interfere with or modify the unit!

- All activities (mounting, installation and service work, etc.) must be performed by qualified staff
- Before making any wiring changes in the connection area, completely isolate the plant from mains supply (all-polar disconnection). Ensure that the plant cannot be inadvertently switched on again and that it is indeed dead. If not observed, there is a risk of electric shock hazard
- Ensure protection against electric shock hazard by providing adequate protection for the connection terminals
- When selecting the cable material, during installation and when creating the electrical connections, observe the regulations of VDE 0100 *Erection of power installations with rated voltages below AC 1000 V* and the relevant national regulations
- Disconnect the device from the mains supply if there is a risk of touching live parts while work is carried out
- Each time work has been carried out (mounting, installation, service work, etc.), check to ensure that wiring is in an orderly state
- Fall or shock can adversely affect the safety functions. Such units must not be put into operation, even if they do not exhibit any damage.

Caution!
The safety, warning and technical notes given in the User Manual on the RWF55 (U7867) apply fully to the present document also!

Mounting notes

Ensure that the relevant national safety regulations are complied with.

Standards and certificates

 Conformity to EEC directives
- Electromagnetic compatibility EMC (immunity) 2004/108/EC
- Low-voltage directive, to DIN EN 60730-1 2006/95/EC

 ISO 9001: 2008
Cert. 00739

 ISO 14001: 2004
Cert. 38233

Service notes

- For service purposes, the controller can be slid out of its housing. This can however lead to damage of the housing
- The electrical connections are made via the fixing terminals on the rear of the housing

Disposal notes

The unit contains electrical and electronic components and must not be disposed of together with domestic waste.
Local and currently valid legislation must be observed.

Type summary

Compact universal controller   RWF55.50A9
- Full version
- 3-position output
- Analog output
- RS-485
- Housing
- Fixing material and seal
- User Manual
- Single pack

Compact universal controller   RWF55.60A9
- Full version
- 3-position output
- Analog output
- RS-485
- Profibus-DP
- Housing
- Fixing material and seal
- User Manual
- Single pack

Packaging variants (20 pieces, without User Manual)   RWF55.51A9
                                                              RWF55.61A9

PC software   **ACS411**

Analog input `InP1`
(actual value)

For resistance thermometers, thermal elements or standard signals with 2nd order digital filters (configurable).

Sampling time	250 ms

Resistance thermometer

Type	Measuring range	Measuring accuracy [a]	Impact of ambient temperature
Pt100 DIN EN 60751	-200...+850 °C (-328...+1562 °F)	≤0,05%	50 ppm/K
Pt1000 DIN EN 60751	-200...+850 °C (-328...+1562 °F)	≤0,05%	50 ppm/K
LG-Ni1000	-50...+160 °C (-58...+320 °F)	≤0,05%	50 ppm/K
0...135 Ω		≤0,05%	50 ppm/K

[a] Accuracies relate to the maximum measuring range.

Line resistance	Max. 30 Ω per line with 3-wire circuit
Line balancing	Not required with 3-wire circuits. With 2-wire circuits, line balancing can be performed by making an actual value correction

Thermal elements

Type	Measuring range	Measuring accuracy [a]	Impact of ambient temperature
Fe-CuNi **J** DIN EN 60584	-200...+1200 °C (-328...+2192 °F)	≤0,25%	≤100 ppm/K
NiCr-Ni **K** DIN EN 60584	-200...+1372 °C (-328...+2502 °F)	≤0,25%	≤100 ppm/K
Cu-CuNi **T** DIN EN 60584	-200...+400 °C (-328...+752 °F)	≤0,25%	≤100 ppm/K
NiCrSi-NiSi **N** DIN EN 60584	-100...+1300 °C (-148...+2372 °F)	≤0,25%	≤100 ppm/K
Pt-RhPt **S** DIN EN 60584	-50...+1768 °C (-58...+3214 °F)	≤0,25%	≤100 ppm/K
Pt-RhPt **R** DIN EN 60584	-50...+1768 °C (-58...+3214 °F)	≤0,25%	≤100 ppm/K
Pt-RhPt **B** DIN EN 60584	0...1820 °C (32...3308 °F)	≤0,25%	≤100 ppm/K

[a] Accuracies relate to the maximum measuring range.

Cold-function temperature	Internal

Technical Data (cont'd)

Standard signals

Measuring range	Measuring accuracy [a]	Impact of ambient temperature
Voltage DC 0...5 V Input resistance R_E >2 MΩ	≤0,2%	200 ppm/K
Voltage DC 0...10 V Input resistance R_E >2 MΩ	≤0,1%	100 ppm/K
Voltage DC 1...5 V Input resistance R_E >2 MΩ	≤0,2%	200 ppm/K
Current 0...20 mA Voltage drop ≤2 V	≤0,1%	100 ppm/K
Current 4...20 mA Voltage drop ≤2 V	≤0,1%	100 ppm/K

[a] Accuracies relate to the maximum measuring range.

Analog input `InP2`
(external setpoint,
setpoint shifting)

Resistance measurement 0...1 kΩ or standard signals without linearization.

Sampling time	750 ms

Resistance
thermometer

Resistance (2-wire circuit)	0...1 kΩ linear ≤0.05% 50 ppm/K

Standard signals

Measuring range	Measuring accuracy [a]	Impact of ambient temperature
Voltage DC 0...5 V Input resistance R_E >2 MΩ	≤0,2%	200 ppm/K
Voltage DC 0...10 V Input resistance R_E >2 MΩ	≤0,1%	100 ppm/K
Voltage DC 1...5 V Input resistance R_E >2 MΩ	≤0,2%	200 ppm/K
Current 0...20 mA Voltage drop ≤2 V	≤0,1%	100 ppm/K
Current 4...20 mA Voltage drop ≤2 V	≤0,1%	100 ppm/K

[a] Accuracies relate to the maximum measuring range.

Analog input `InP3`
(outside temperature)

For resistance thermometers in 2-wire circuit, with fixed filter time constant.

Sampling time	6 s

Resistance
thermometer

Type	Measuring range	Measuring accuracy [a]	Impact of ambient temperature
Pt1000 DIN EN 60751	-200...+850 °C (-328...+1562 °F)	≤0,05%	50 ppm/K
LG-Ni1000	-50...+160 °C (-58...+320 °F)	≤0,05%	50 ppm/K

[a] Accuracies relate to the maximum measuring range.

Binary input D1	Potentialfree contact for the following functions, depending on the configuration: - No function - Setpoint shifting - Setpoint changeover - Alarm input

Binary input D2   Potentialfree contact for operating mode changeover:

Burner modulating, if contacts D2 and DG are open	LED operating mode, 2-stage, **does not** light up on the front
Burner 2-stage, if contacts D2 and DG are closed	LED operating mode, 2-stage, **lights up** on the front

Monitoring the measuring circuit

In the event of error, the outputs assume defined states (configurable).

Measuring transducer	**Measured value crossed limit**	**Sensor/line has short-circuit**	**Sensor/line interrupted**
Resistance thermometer	●	●	●
Thermal elements	●	---	●
Voltage DC 1...5 V DC 0...5 V DC 0...10 V	 ● (●) (●)	 ● --- ---	 ● --- ---
Current DC 4...20 mA DC 0...20 mA	 ● (●)	 ● ---	 ● ---

● = detected

(●) = detected only if measuring range is exceeded

--- = not detected

Controller outputs

OutP

Galvanic separation between supply voltage, analog inputs, and controller outputs.

Relay K1 (NO contact) **1P, 1N** (burner release)	
Contact rating	Max. 2 A at AC 240 V at cosφ >0.6
Contact life	250,000 switching cycles at high-fire
Contact protection	Varistor
Power supply for transducer G+, G-	DC 24 V ±10%/max. 30 mA, short-circuit-proof

The following relay data are those specified by the supplier.

Relay K2, KQ (controlling element OPEN)	
Contact rating	Max. 2 A at AC 450 V and cosφ >0.6
Contact life	200.000 switching cycles at high-fire
Contact protection	RC combination
Relay K3, KQ (controlling element CLOSE)	
Contact rating	Max. 2 A at AC 240 V at cosφ >0.6
Contact life	200.000 switching cycles at high-fire
Contact protection	RC unit
Relay K6 (NO contact)**, 6P, 6N** (multifunctional relay)	
Contact rating	Max. 2 A at AC 240 V at cosφ >0.6
Contact life	200.000 switching cycles at high-fire
Contact protection	Varistor

Relay data are those specified by the supplier.

Analog output A+, A-	
Voltage	DC 0...10 V short-circuit-proof
Load resistance	$R_{Load} \geq 500\ \Omega$
Accuracy	≤0.25%, ±50 ppm/K
Current	0...20 mA/4...20 mA
Load resistance	$R_{Last} \leq 500\ \Omega$
Accuracy	≤0.25%, ±50 ppm/K

Interface RS-485

Baudrate	4800 Baud
	9600 Baud
	19200 Baud
	38400 Baud
Protocol	Modbus
Unit address	1...99

Profibus interface

Only present with RWF55.6!

Controller	Type of controller	3-position controller and continuous controller
	Controller structure	P/PI/PD/PID
	Sampling time	250 ms
Electrical data	Power supply (switching network section)	AC 110...240 V +10/-15% 48...63 Hz
	Electrical safety	To DIN EN 60730, part 1 Overvoltage category III Degree of contamination 2
	Safety class I	With internal separation from SELV electrical circuits
	SELV voltage	Max. 30 V
	Power consumption	Max. 20 VA
	Data backup	EEPROM
	Electrical connection	At the rear via screw terminals
	- Cross-sectional area - Stranded wire with	0.25...1.5 mm² fine-wired - Ferrules to DIN 46228 - Pin-type cable socket to DIN 46231 - Crimp-type cable socket in fork-form for M3 thread (dimensions to DIN 46237)
	With UL applications	Use of the cable lug or ferrules to UL486A-B (UL listed or recognized)
	Tightening torque	0.5 Nm
	Electromagnetic compatibility	DIN EN 61326-1
	Emitted interference	Class B
	Immunity	Meeting industrial requirements
Housing	Type of housing	Made of Makrolon for control panel mounting to DIN IEC 61554 (use in indoor)
	Color	Light-grey RAL7035
	Mounting depth	122 mm
	Mounting position	Optional
	Degree of protection	To DIN EN 60529 Front side IP66 Rear IP20
	Weight - RWF55.5 - RWF55.6	(Fully equipped) Approx. 329 g Approx. 342 g

Technical Data (cont'd)

Environmental conditions	**Storage**	DIN IEC 60721-3-1
	Climatic conditions	Class 1K3
	Mechanical conditions	Class 1M2
	Temperature range	-40...70 °C
	Humidity	<95% r.h.
	Transport	DIN IEC 60721-3-2
	Climatic conditions	Class 2K2
	Mechanical conditions	Class 2M2
	Temperature range	-40...70 °C
	Humidity	<95% r.h.
	Operation	DIN IEC 60721-3-3
	Climatic conditions	Class 3K3
	Mechanical conditions	Class 3M3
	Temperature range	-20...50°C
	Humidity	<95% r.h.
	Installation altitude	Max. 2000 m above sea level

Attention!
Condensation, formation of ice and ingress of water are not permitted!

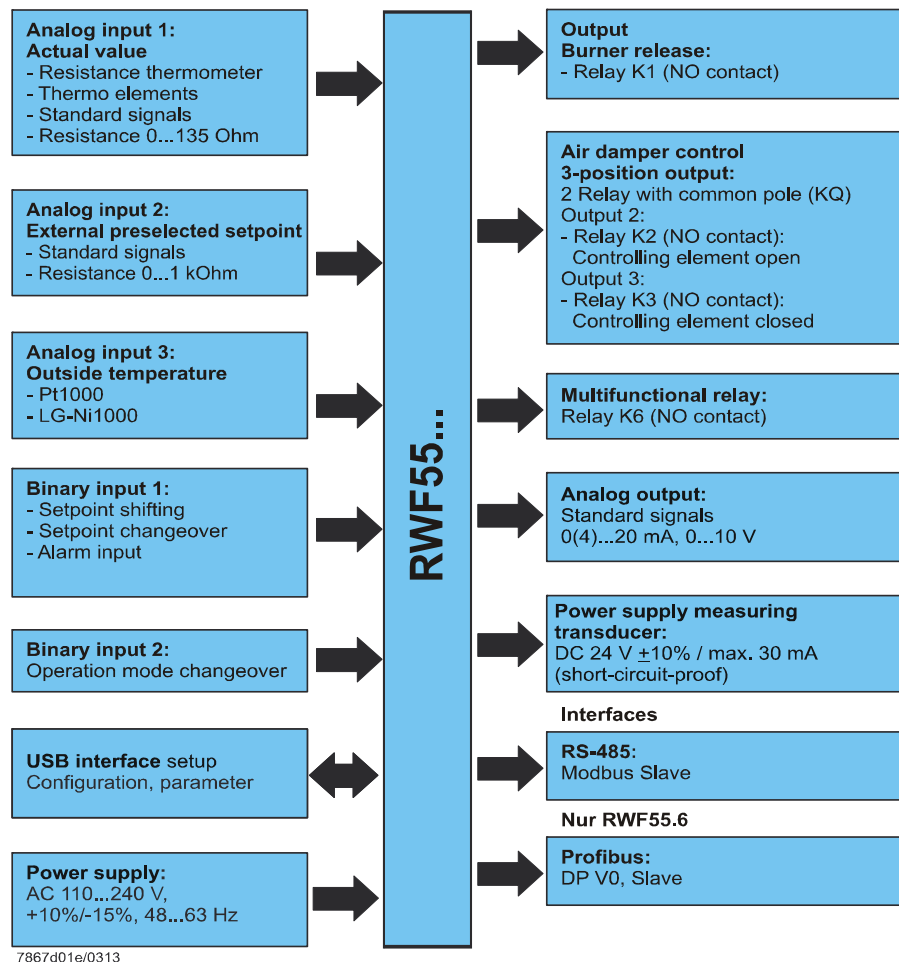| Segment display	Height of numerals	
	- Upper display	10 mm
	- Lower display	7 mm
	Color	
	- Upper display	Red
	- Lower display	Green
	Digits	4 (including 0, 1 or 2 decimal places, configurable)
	Range of display	-1999...9999

Function

The following functions are included in the RWF55:
- **Digital PID controller** with a 3-position and analog output of the calculated output level
- The controller can be switched to a 2-position controller for controlling 2-stage burners
- Automatic **thermostat (or pressure controller) function** in low-fire operation
- Shift controller for weather-dependent setpoint shifting
- **Minimum limiter and maximum limiter** for the boiler temperature or boiler pressure
- Temperature controller to DIN EN 14597
- Potential-free configurable contact
- Manual operating mode
- Self-setting function
- Parameterization and visualization via USB interface and PC software ACS411
- Communication via serial Modbus interface or optional Profibus interface
- Ramp functions (cold start/thermal shock protection)
- Heating/cooling

Block structure

Analog input 1:
Actual value
- Resistance thermometer
- Thermo elements
- Standard signals
- Resistance 0...135 Ohm

Analog input 2:
External preselected setpoint
- Standard signals
- Resistance 0...1 kOhm

Analog input 3:
Outside temperature
- Pt1000
- LG-Ni1000

Binary input 1:
- Setpoint shifting
- Setpoint changeover
- Alarm input

Binary input 2:
Operation mode changeover

USB interface setup
Configuration, parameter

Power supply:
AC 110...240 V,
+10%/-15%, 48...63 Hz

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RWF55...

Output
Burner release:
- Relay K1 (NO contact)

Air damper control
3-position output:
2 Relay with common pole (KQ)
Output 2:
- Relay K2 (NO contact):
  Controlling element open
Output 3:
- Relay K3 (NO contact):
  Controlling element closed

Multifunctional relay:
Relay K6 (NO contact)

Analog output:
Standard signals
0(4)...20 mA, 0...10 V

Power supply measuring transducer:
DC 24 V ±10% / max. 30 mA
(short-circuit-proof)

Interfaces

RS-485:
Modbus Slave

Nur RWF55.6

Profibus:
DP V0, Slave

Function of the controller when used for burner control

Low-fire operation	Low-fire operation means that only small amounts of energy are drawn from the boiler. With the relay 1 burner release, the 2-position controller controls the set setpoint by switching the burner on and off like a thermostat. An adjustable switching differential ensures that the burner's switching frequency can be selected to help protect the material.
High-fire operation	High-fire operation means that large amounts of energy are drawn from the boiler with the burner running continuously. The RWF55 controls the required output using the 3-position or analog output.
Binary input 1 (changeover of operating mode)	Using a potential-free contact, the RWF55 can be switched from the modulating mode to *2-stage* operation.
Binary input 2 (setpoint shifting or setpoint changeover)	In the case *setpoint shifting* is configured, the current setpoint is shifted by an adjustable amount. Configuration of *setpoint changeover* provides changeover between 2 setpoints adjusted on the RWF55. If analog input 2 is configured for an *external setpoint*, changeover is provided between the setpoint adjusted on the RWF55 and an external setpoint.
Multifunctional relay	Potential-free contact K6 can be assigned a number of functions. Example: Limit value supervision
Operation	The RWF55 is operated and programmed with 4 buttons on the front of the unit. During operation and programming, the 7-segment displays show the parameter value and parameter name.
Weather-compensated setpoint shifting	The RWF55 can be configured so that weather-compensated setpoint shifting is activated when an LG-Ni1000 outside sensor or a Pt1000 is connected.

⚠️ **Attention!**
Each RWF55 must have its own separate outside sensor (no parallel connection).

Analog input 1

To acquire the actual value, the following sensors can be connected to the RWF55:

		Measuring range
Resistance thermometer	Pt100 DIN EN 60751	-200...+850 °C (-328...+1562 °F)
in 2-wire or	Pt1000 DIN EN 60751	-200...+850 °C (-328...+1562 °F)
3-wire technology	LG-Ni1000	-50...+160 °C (-58...+320 °F)
	0...135 Ω	
Thermal element	Fe-CuNi **J** DIN EN 60584	-200...+1200 °C (-328...+2192 °F)
	NiCr-Ni **K** DIN EN 60584	-200...+1372 °C (-328...+2502 °F)
	Cu-CuNi **T** DIN EN 60584	-200...+400 °C (-328...+752 °F)
	NiCrSi-NiSi **N** DIN EN 60584	-100...+1300 °C (-148...+2372 °F)
	Pt-RhPt **S** DIN EN 60584	-50...+1768 °C (-58...+3214 °F)
	Pt-RhPt **R** DIN EN 60584	-50...+1768 °C (-58...+3214 °F)
	Pt-RhPt **B** DIN EN 60584	0...1820 °C (32...3308 °F)
Linearized standard signals	DC 0...5 V	≤0,2%
	DC 0...10 V	≤0,1%
	DC 1...5 V	≤0,2%
	0...20 mA	≤0,1%
	4...20 mA	≤0,1%

The power provided for the measuring transducers is DC 24 V ±10% / max. 30 mA.

Analog input 2 (external setpoint, setpoint shifting)

The setpoint of the controller can be influenced by a signal at analog input 2. The influence can be scaled.

Alternatively, the input can be used as a feedback input of the actuator position and this feedback of position can be read via RS-485 interface.

The following detectors are used as signal:

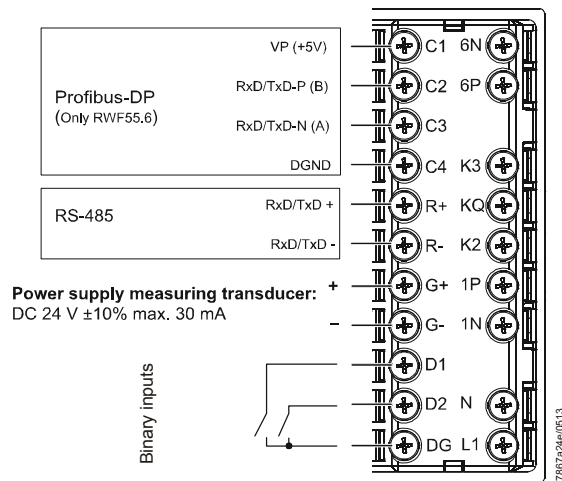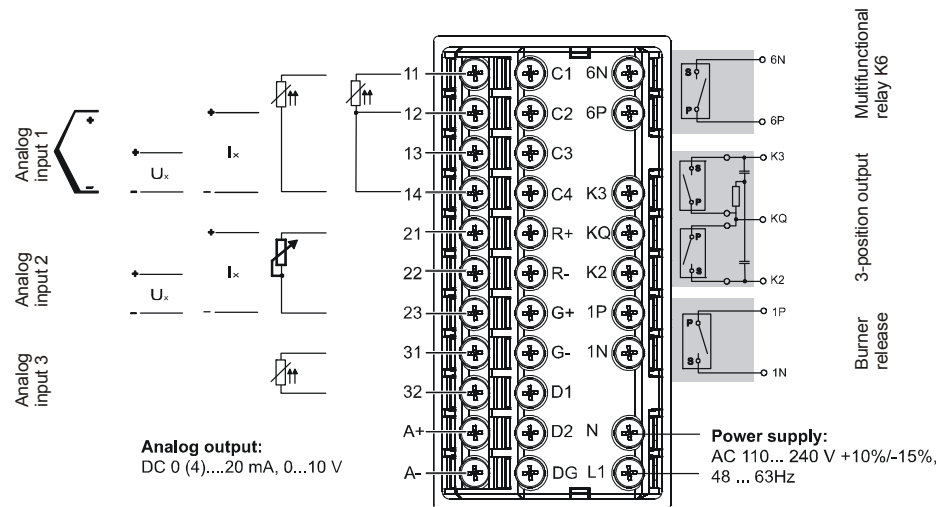|		Measuring range
Resistance thermometer	0...1 kΩ linear	
in 2-wire technology		
Linearized standard signals	DC 0...5 V	≤0,2%
	DC 0...10 V	≤0,1%
	DC 1...5 V	≤0,2%
	0...20 mA	≤0,1%
	4...20 mA	≤0,1%

Analog input 3 (outside temperature)

For detection of the outside temperature, the following detectors can be connected to the RWF55:

		Measuring range
Resistance thermometer	Pt1000 DIN EN 60751	-200...+850 °C (-328...+1562 °F)
in 2-wire technology	LG-Ni1000	-50...+160 °C (-58...+320 °F)

Connection diagram

RWF55

Analog input 1

Analog input 2

Analog input 3

U_x

I_x

U_x

I_x

11	C1	6N		Multifunctional relay K6
12	C2	6P		
13	C3			
14	C4	K3		3-position output
21	R+	KQ		
22	R-	K2		
23	G+	1P		Burner release
31	G-	1N		
32	D1			
A+	D2	N		
A-	DG	L1		

6N
6P

K3
KQ
K2

1P
1N

Analog output:
DC 0 (4)....20 mA, 0...10 V

Power supply:
AC 110... 240 V +10%/–15%,
48 ... 63Hz

Profibus-DP
(Only RWF55.6)

VP (+5V)

RxD/TxD-P (B)

RxD/TxD-N (A)

DGND

RS-485

RxD/TxD +

RxD/TxD -

Power supply measuring transducer: +
DC 24 V ±10% max. 30 mA   –

Binary inputs

C1	6N
C2	6P
C3	
C4	K3
R+	KQ
R-	K2
G+	1P
G-	1N
D1	
D2	N
DG	L1

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Legend		
		The RWF55 contains these components
	1N	Relay K1: NO-contact
	1P	Relay K1: Pole
	6N	Relay K6: NO-contact
	6P	Relay K6: Pole
	DGND	Functional earth
	Ix	Current input
	K2	Relay: Controlling element OPEN
	K3	Relay: Controlling element CLOSED
	KQ	Common pole
	P	Pole
	RxD/TxD-P (B)	Receive / Send data - Plus, B-lead
	RxD/TxD-N (A)	Receive / Send data - N, A-lead
	RxD/TxD +	Receive / Send data - Plus
	RxD/TxD -	Receive / Send data - Minus
	S	NO-contact
	Ux	Power supply input
	VP (+5V)	Supply voltage - Plus

Dimensions

Dimensions in mm

51

99

91,5

96

110

11,8

44,5

(1)

48

57,1

45 +0.6

92 +0.8

(2)

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