



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.

Supplementary documentation

User Manual RWF55	U7867
Environmental Declaration RWF55.....	E7867

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)
- Low-voltage directive, to DIN EN 60730-1

2004/108/EC
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

Technical Data

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 RE >2 MΩ	≤0,2%	200 ppm/K
	Voltage DC 0...10 V Input resistance RE >2 MΩ	≤0,1%	100 ppm/K
	Voltage DC 1...5 V Input resistance RE >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 I_{nP2}
(external setpoint,
setpoint shifting)

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

Sampling time	750 ms
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 RE >2 MΩ	≤0,2%	200 ppm/K
Voltage DC 0...10 V Input resistance RE >2 MΩ	≤0,1%	100 ppm/K
Voltage DC 1...5 V Input resistance RE >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 I_{nP3}
(outside temperature)

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

Sampling time	6 s
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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.

Technical Data (cont'd)

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

Technical Data (cont'd)

Controller outputs

Out P

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 $\cos\phi > 0.6$
Contact life	250,000 switching cycles at high-fire
Contact protection	Varistor

Power supply for transducer G+, G-	DC 24 V $\pm 10\%$ /max. 30 mA, short-circuit-proof
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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 $\cos\phi > 0.6$
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 $\cos\phi > 0.6$
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 $\cos\phi > 0.6$
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	$\leq 0.25\%$, ± 50 ppm/K

Current	0...20 mA/4...20 mA
Load resistance	$R_{Last} \leq 500 \Omega$
Accuracy	$\leq 0.25\%$, ± 50 ppm/K

Interface RS-485

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

Profibus interface

Only present with RWF55.6!

Technical Data (cont'd)

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	0.25...1.5 mm ² fine-wired
	- Stranded wire with	- 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	(Fully equipped)
	- RWF55.5	Approx. 329 g
	- RWF55.6	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

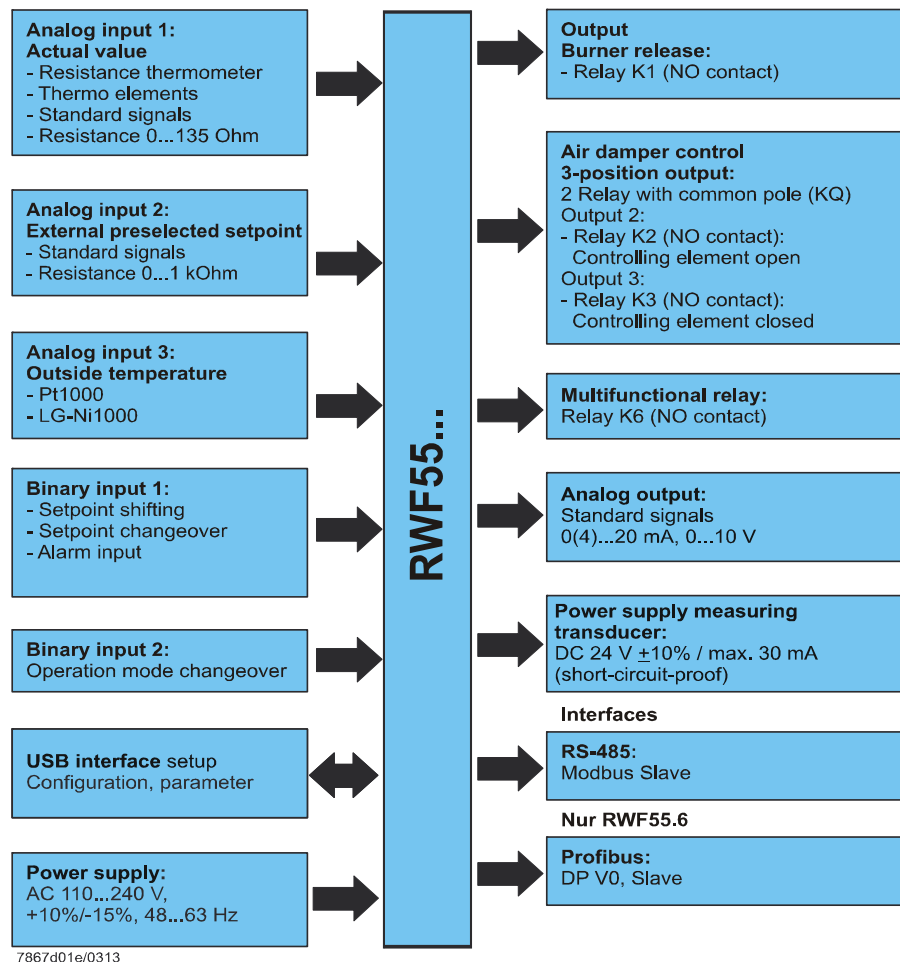
Height of numerals	
- Upper display	10 mm
- Lower display	7 mm
Color	
- Upper display	Red
- Lower display	Green
Digits	4 (including 0, 1 or 2 decimal places, configurable)
Range of display	-1999...9999

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



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 <i>setpoint shifting</i> is configured, the current setpoint is shifted by an adjustable amount. Configuration of <i>setpoint changeover</i> provides changeover between 2 setpoints adjusted on the RWF55. If analog input 2 is configured for an <i>external setpoint</i> , 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).

Function of the controller when used for burner control (cont'd)

Analog input 1

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

		Measuring range
Resistance thermometer in 2-wire or 3-wire technology	Pt100 DIN EN 60751	-200...+850 °C (-328...+1562 °F)
	Pt1000 DIN EN 60751	-200...+850 °C (-328...+1562 °F)
	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 in 2-wire technology	0...1 kΩ linear	
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%

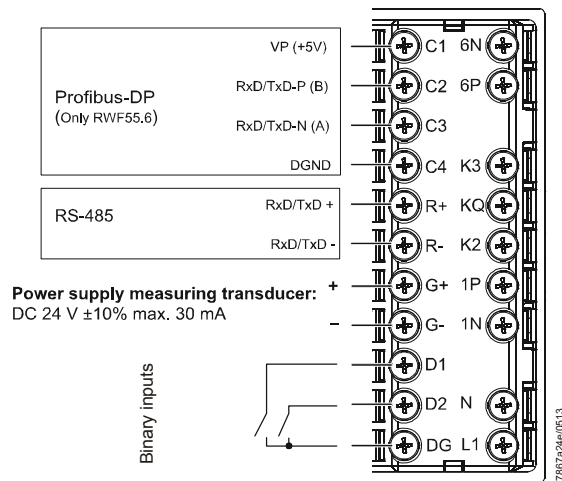
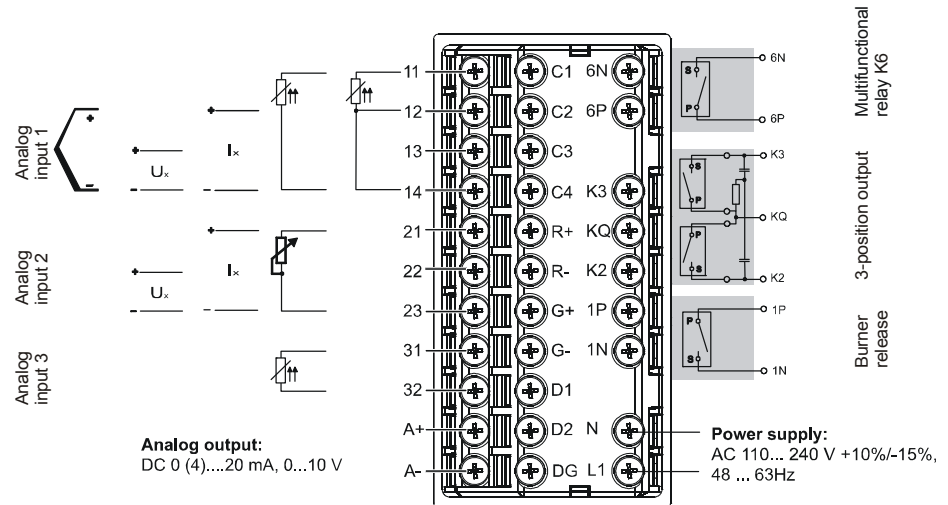
Analog input 3 (outside temperature)

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

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

Connection diagram

RWF55



Legend

Symbol	Description
	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
I_x	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
U_x	Power supply input
VP (+5V)	Supply voltage - Plus

Dimensions

Dimensions in mm

