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Controls

THERMAL OVERLOAD RELAYS – RW..D (up to 40A)

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Thermal Overload Relays
– RW..D (up to 40A)

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Summary

Thermal Overload **Relay**

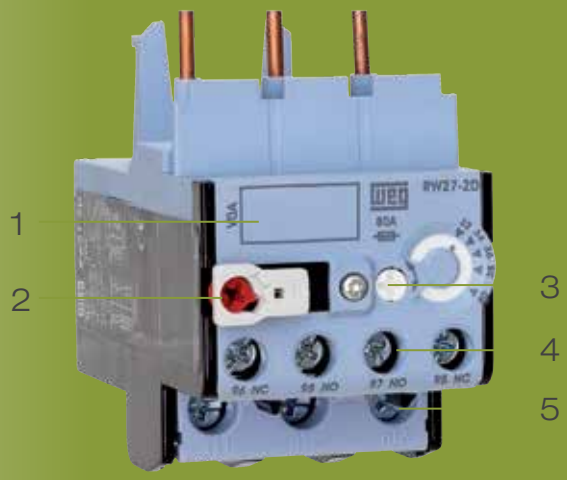
RW thermal overload relays are designed to be combined with contactors to assemble motor starters.

Thermal overload relays are very reliable devices intended to protect motors, controllers and branch-circuit conductors against phase failures and overloads that cause excessive heating.

The thermal overload relay has no power contacts and cannot disconnect the motor by itself. Motor overloads or phase failures increase the motor current. This current increase trips the mechanism and switches the auxiliary contacts.

The auxiliary contacts, when properly wired in series with the coil of the contactor will de-energize the contactor when an overload occurs. Thus, the contactor disconnects the power to the motor and stops its operation. The bimetallic thermal overload relays have thermal memory. Once tripped, the relay will not reset until it has cooled down, allowing the motor to cool before it can be re-started.

General Information



1 Identification tag
2 Multifunction RESET / TEST button
3 Current setting dial
4 Auxiliary contact terminals
5 Main contact terminals

Applications

RW thermal overload relays have been designed to protect three-phase and single-phase AC motors and direct current motors[1)]. When the RW thermal overload relays are intended to protect single-phase AC loads or DC loads, the connection should be made as shown in the diagrams on page C-9.

RW Thermal Overload Relays in Contactor Assemblies for Wye-Delta Starters

When using thermal overload relays in conjunction with contactor assemblies for wye-delta starters, it should be taken into consideration that only 0.58 (√3 / 3) x the motor current flows through the main contactor. An overload relay mounted on the main contactor must be set to the same multiple of the motor current.

A second overload relay may be mounted on the wye contactor if it is desired the load to be optimally protected in wye operation. The wye current is 1/3 of the rated motor current. The relay must then be set to this current.

Protection Against Short-Circuit

The RW thermal overload relays must be protected against short-circuits by fuses or circuit breakers.

Ambient Air Temperature Compensation

RW thermal overload relays are temperature compensated. Its trip point is not affected by temperature, and it performs consistently at the same value of current. The time-current characteristics of RWs refer to a stated value of ambient air temperature within the range of -20 °C to +60 °C and are based on no previous loading of the overload relay (i.e. from an initial cold state). For ambient air temperature within the range of +60 °C up +80 °C (maximum ambient air temperature), the current correction factor shown in the table below should be applied:

Ambient air temperature	Current correction factor
65 °C	0.94
70 °C	0.87
75 °C	0.81
80 °C	0.73

Note: 1) Models RW317 and RW407 should be used only with electric motors in alternating current.

Site Altitude Compensation

The site altitude and hence the air density play a role with respect to the cooling conditions and dielectric withstand voltage. A site altitude of up to 2000 m is considered as normal in accordance with IEC 60947. For higher altitudes, the current settings on the thermal overload relay should be higher than the motor rated current. On the other hand, the operational voltage must be reduced.

For site altitudes higher than 2,000 m, the values for the current and voltage shown in the table below should be applied:

Altitude above sea level (m)	Adjustment factor on the current setting	Maximum operational voltage U_e (V)
2,000	1.00 x I_n	690
3,000	1.05 x I_n	550
4,000	1.08 x I_n	480
5,000	1.12 x I_n	420

Characteristic Tripping Curve

Thermal overload relays are designed to mimic the heat actually generated in the motor. As the motor temperature increases, so does the temperature of the overload relay thermal unit.

The motor and relay heating curves have a strong relationship. No matter how high the current drawn by the motor, the thermal overload relay provides protection and yet, does not trip unnecessarily.

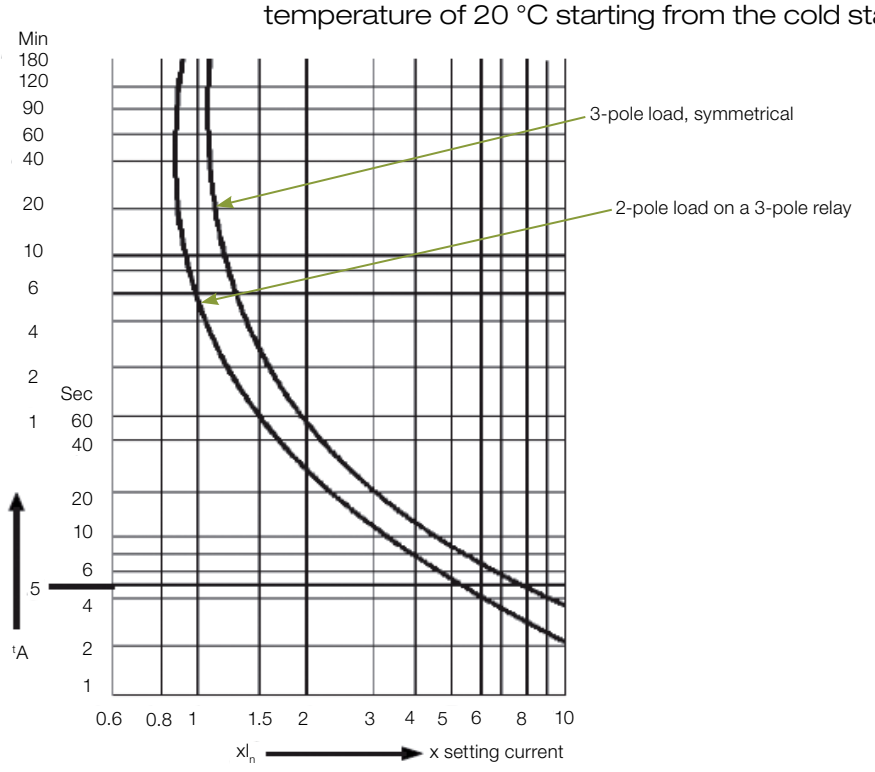
Thus, the characteristic tripping curves indicate how the tripping time, starting from the cold state, varies with the current for multiples of the full-load current for three-pole symmetrical loads.

Phase Failure Sensitivity

In order to ensure fast tripping in case of phase loss, protecting the motor and avoiding expensive repairs / corrective maintenance services, RW27-2D thermal overload relays include phase failure sensitivity protection as standard.

For this purpose, they have a differential release mechanism that, in the case of phase failure, ensures the de-energized cooled down bimetal strip to generate an additional tripping displacement (simulating an overcurrent that actually doesn't exist). This way, in the event of phase failure, the differential release ensures tripping at a lower current than with a three-phase load (characteristic curve below).

However, for more effective protection against phase failure, specific protective products should be evaluated ensuring that such failure is detected much faster. The curve below shows the tripping time in relation to the rated current. It is also considered average values of the tolerance range and at ambient temperature of 20 °C starting from the cold state.



Multifunction Reset / Test Button

The thermal overload relay has a multifunction RESET / TEST button that can be set in four different positions:

- A - Automatic RESET only;
- AUTO - Automatic RESET / TEST;
- HAND - Manual RESET / TEST;
- H - Manual RESET only.

In HAND and AUTO positions, when RESET button is pressed, both NO (97-98) and NC (95-96) contacts change states.

Operation description

In H (manual RESET only) or A (automatic RESET only) position, the test function is blocked. However in the positions HAND (manual RESET / TEST) or AUTO (automatic RESET / TEST) it is possible to simulate the test and the trip functions by pressing the RESET button.

When set in the H or HAND position the RESET button must be pressed manually to reset the overload relay after a tripping event. On the other hand, when set in A or AUTO position, the overload relay will reset automatically after a tripping event.

The H, HAND, AUTO and A function setting is carried out by rotating without pressing the red button and placing it on the desired position of the RESET button.

When changing from HAND to AUTO, the RESET button must be slightly pressed while the red button is rotated.

Functions	H	HAND	AUTO	A
Relay reset	Manual[1)]	Manual[1)]	Automatic	Automatic
Auxiliary contact trip test 95-96 (NC)	Function is disabled	Test is allowed	Test is allowed	Function is disabled
Auxiliary contact trip test 97-98 (NO)	Function is disabled	Test is allowed	Test is allowed	Function is disabled

Note: 1) A recovery time of a few minutes is necessary before resetting the thermal overload relay.

Recovery Time

The RW thermal overload relays have thermal memory.

After tripping due to an overload, the relay requires a certain period of time for the bimetal strips to cool down. This period of time is so-called recovery time. The relay can only be reset once it has cooled down. The recovery time depends on the characteristic tripping curves and the level of the tripping current. After tripping due to overload, the recovery time allows the load to cool down.

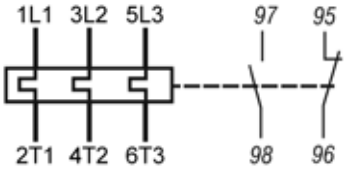
Operation in the Output Side of Frequency Inverters

The RW27-2D thermal overload relays are designed for operation on 50/60 Hz up to 400 Hz and the tripping values are related to the heating by currents within this frequency range. Depending on the design of the frequency inverter, the switching frequency can reach several kHz and generate harmonic currents at the output that result in additional temperature rise in the bimetal strips. In such applications, the temperature rise not only depends on the rms value of the current, but on the induction effects of the higher frequency currents in the metal parts of the device (skin effect caused by eddy currents).

Due to these effects, the current settings on the overload relay should be higher than the motor rated current.

RW27-2D Thermal Overload Relay from 0.28 up to 40 A

- Bimetallic overload relay with tripping class 10
- Phase failure sensitivity protection
- Temperature compensation
- Manual or automatic reset
- Direct mounting on CWB contactors
- Hand/Auto/Reset button
- Auxiliary contacts 1NO + 1NC

Direct mounting Screw terminals	Setting current (A)	Circuit diagram	Blue version Reference	Weight kg
CWB9...38	0.28...0.4		RW27-2D3-D004	0.165
CWB9...38	0.43...0.63		RW27-2D3-C063	
CWB9...38	0.56...0.8		RW27-2D3-D008	
CWB9...38	0.8...1.2		RW27-2D3-D012	
CWB9...38	1.2...1.8		RW27-2D3-D018	
CWB9...38	1.8...2.8		RW27-2D3-D028	
CWB9...38	2.8...4		RW27-2D3-U004	
CWB9...38	4...6.3		RW27-2D3-D063	
CWB9...38	5.6...8		RW27-2D3-U008	
CWB9...38	7...10		RW27-2D3-U010	
CWB9...38	8...12.5		RW27-2D3-D125	
CWB9...38	10...15		RW27-2D3-U015	
CWB9...38	11...17		RW27-2D3-U017	
CWB9...38	15...23		RW27-2D3-U023	
CWB9...38	22...32		RW27-2D3-U032	
CWB9...38	32...40		RW27-2D3-U040	

Accessories

External Cable for Reset

Illustrative picture	Description	Cable length (mm)	Reference code	Weight (kg)
	Metallic cable for external reset of all overload relays models RW assembled on electric panels and MCCs Notes: - Hole for external fixation: Ø6.5...7 mm - Panel plate thickness: 2 or 4.25 mm	250	ERC250RW	0.034
		375	ERC375RW	0.036
		500	ERC500RW	0.041

Technical Data

Main Data

Models			RW27
Standards			IEC 60947-1 and UL 508
Rated insulation voltage U_i (pollution degree 3)	IEC 60947-4-1	(V)	690
	UL, CSA	(V)	600
Rated impulse withstand voltage Uimp (IEC 60947-1)		(kV)	6
Rated operational frequency		(Hz)	25...400
Use with direct current			Yes
Maximum operation per hour		(ops./h)	15
Protection degree (IEC 60529)	Main contacts		IP10
	Auxiliary contacts		IP20
	Frontal		IP20
Mounting			Direct on the contactor
Resistance to impact (IEC 60068-2-27 - 1/2 sinusoid)		(g/ms)	10/11
Ambient temperature	Transport and storage		-50 °C...+80 °C
	Operating		-20 °C...+70 °C
	Temperature compensation		-20 °C...+60 °C
Altitude		(m)	2000

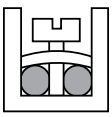
Main Contacts

Models			RW27
Rated operational voltage U_e	IEC 60947-4-1	(V)	690
	UL, CSA	(V)	600
Setting current / max fuse (gL/gG)1)		(A)	0.28...0.4 / 2
			0.43...0.63 /2
			0.56...0.8 / 2
			0.8...1.2 / 4
			1.2...1.8 / 6
			1.8...2.8 / 6
			2.8...4 / 10
			4...6.3 / 16
			5.6... 8 / 20
			7...10 / 25
			8...12.5 / 25
			10...15 / 35
			11...17 / 40
			15...23 / 50
			22...32 / 63
			32...40 / 90
Average power dissipation per pole		(W)	≤3

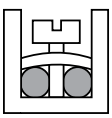
Auxiliary Circuit

Models			RW27
Standards			IEC 60 947-4-1 and UL 508
Rated insulation voltage U_i (pollution degree 3)	IEC	(V)	690
	UL, CSA	(V)	600
Rated operational voltage U_e	IEC	(V)	690
	UL, CSA	(V)	600
Rated thermal current Ith ($\theta \leq 55$ °C)		(A)	6
Rated operational current I_e			
AC-14 / AC-15 (IEC 60947-5-1)	24 V	(A)	4
	60 V	(A)	3.5
	125 V	(A)	3
	230 V	(A)	2
	400 V	(A)	1.5
	500 V	(A)	0.5
	690 V	(A)	0.3
UL, CSA			C600
DC-13 / DC-14 (IEC 60947-5-1)	24 V	(A)	1
	60 V	(A)	0.5
	110 V	(A)	0.25
	220 V	(A)	0.1
UL, CSA			R300
Short-circuit protection with fuse (gL/gG)		(A)	6
Minimum voltage / admissible current (IEC 60947-5-4)			17 V / 5 mA

Terminal Capacity and Tightening Torque - Main Contacts

Models			RW27
Type of screws			M4 x 10
			Phillips
Cable size (75 °C / C_u cable)			
Flexible cable	(mm^2)		1.5...10
Cable with terminal / rigid cable	(mm^2)		1.5...6.0
AWG-wire			16...8
Tightening torque	(N.m / lb.in)		2.3 / 20

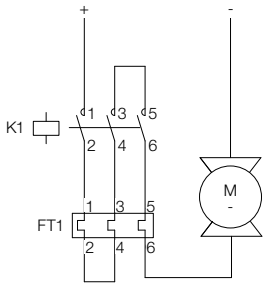
Terminal Capacity and Tightening Torque - Auxiliary Contacts

Models			RW27
Type of screws			M3.5 x 10 Philips
Cable size (75 °C / C_u cable)			
Cable with or without terminal	(mm^2)		2 x 1...2.5
AWG-wire			16...12
Tightening torque	(N.m / lb.in)		1.5 / 13

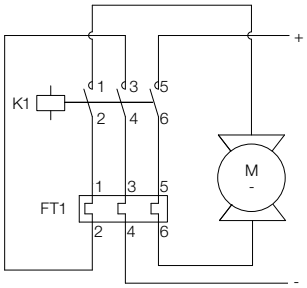
Diagrams

Motor Protection - Direct Current

1-Pole

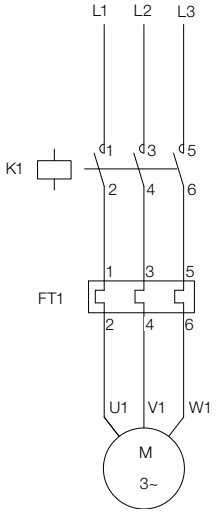


2-Pole

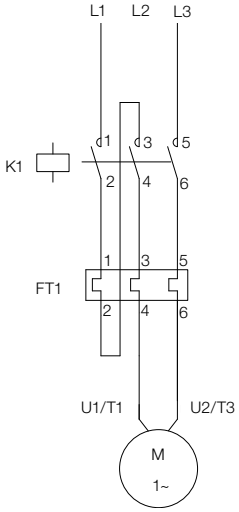


Motor Protection - Alternating Current

3-Pole

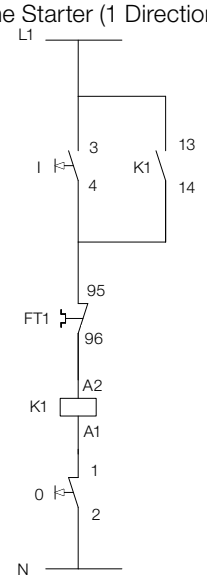


2-Pole

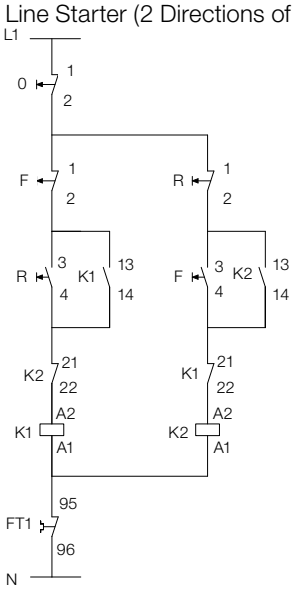


Typical Connection - Contactor + Overload Relay

Direct On Line Starter (1 Direction of Rotation)

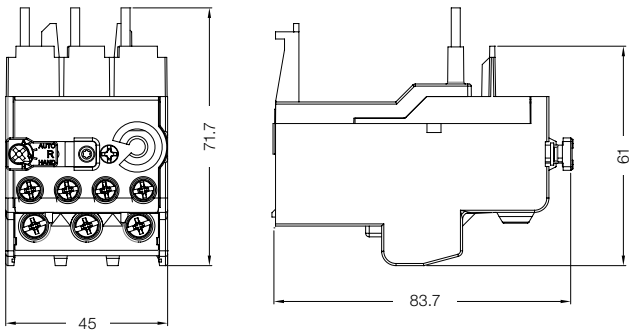


Direct On Line Starter (2 Directions of Rotation)

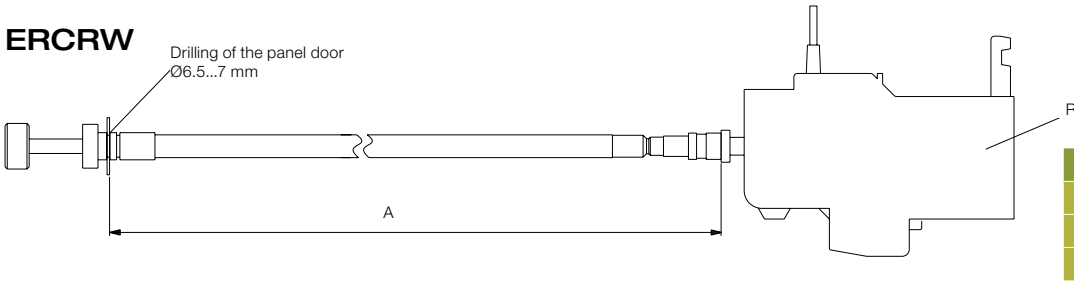


Dimensions (mm)

RW27-2D

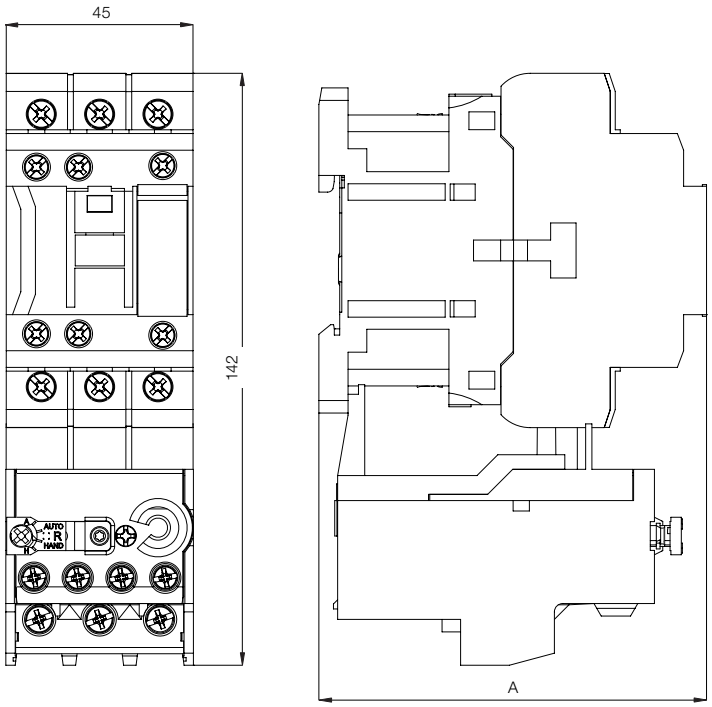


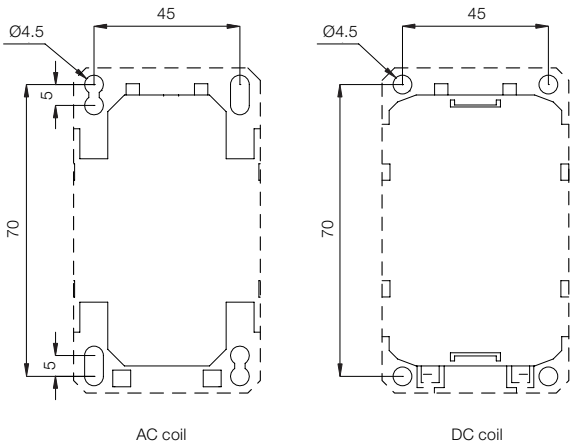
ERCRW



Models	A
ERC250RW	250
ERC375RW	375
ERC500RW	500

CWB9...38 + RW27-2D



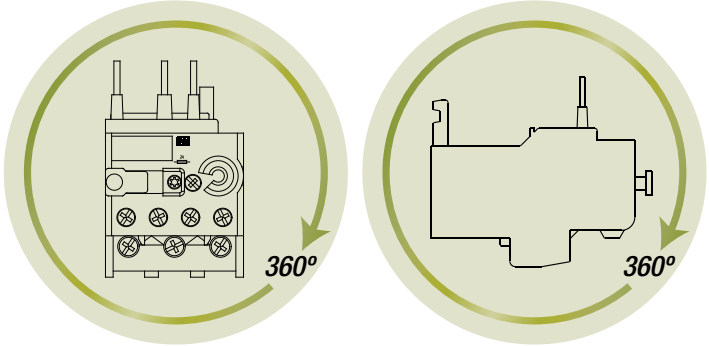


CWB9...18	A
AC coil	89.5
DC coil	95.7

CWB25...38	A
AC coil	93
DC coil	102.2

Mounting Position

RW27-2D



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