

For Operation in the Control Cabinet

3RW Soft Starters

3RW40 for standard applications

Overview

SIRIUS 3RW40 soft starters have all the same advantages as the 3RW30 soft starters.

The SIRIUS 3RW40 soft starters are characterized above all by their small space requirements. Integrated bypass contacts mean that no power loss has to be taken into the bargain at the power semiconductors (thyristors) after the motor has started up. This cuts down on heat losses, enabling a more compact design and making external bypass circuits superfluous.

At the same time this soft starter comes with additional integrated functions such as adjustable current limiting, motor overload and intrinsic device protection, and optional thermistor motor protection. The higher the motor rating, the more important these functions because they make it unnecessary to purchase and install protection equipment such as overload relays.

Internal intrinsic device protection prevents the thermal overloading of the thyristors and the power section defects this can cause. As an option the thyristors can also be protected by semiconductor fuses from short-circuiting.

Thanks to integrated status monitoring and fault monitoring, this compact soft starter offers many different diagnostics options. Up to four LEDs and relay outputs permit differentiated monitoring and diagnostics of the operating mechanism by indicating the operating state as well as for example mains or phase failure, missing load, non-permissible tripping time/class setting, thermal overloading or device faults.

Soft starters rated up to 300 Hp (at 460 V) for standard applications in three-phase networks are available. Extremely small sizes, low power losses and simple start-up are just three of the many advantages of the SIRIUS 3RW40 soft starters.

"Increased safety" type of protection EEx e according to ATEX directive 94/9/EC

The 3RW40 soft starter sizes S0 to S12 are suitable for the starting of explosion-proof motors with "increased safety" type of protection EEx e.

See "Appendix" → "Standards and approvals" → "Type overview of approved devices for potentially explosive areas (ATEX explosion protection)".

Function

The space required by the compact SIRIUS 3RW40 soft starter is often only about one third of that required by a contactor assembly for wye-delta starting of comparable rating. This not only saves space in the control cabinet and on the standard mounting rail but also does away completely with the wiring work needed for wye-delta starters. This is notable in particular for higher motor ratings which are only rarely available as fully wired solutions.

At the same time the number of cables from the starter to the motor is reduced from six to three. Compact dimensions, short start-up times, easy wiring and fast commissioning make themselves felt as clear-cut cost advantages.

The bypass contacts of these soft starters are protected during operation by an integrated solid-state arc quenching system. This prevents damage to the bypass contacts in the event of a fault, e. g. brief disconnection of the control voltage, mechanical shocks or life-related component defects on the coil operating mechanism or main contact spring.

The starting current of particularly powerful operating mechanisms can place an unjustifiable load on the local supply system. Soft starters reduce this starting current by means of their voltage ramp. Thanks to the adjustable current limiting, the SIRIUS 3RW40 soft starter takes even more pressure off the supply system. It leaves the set start ramp during the ramp-up – the ramp gradient is fixed by the starting voltage and the ramp time – as soon as the selected current limit is reached. From this moment the voltage of the soft starter is controlled so that the current supplied to the motor remains constant. This process is ended either by completion of the motor ramp-up or by tripping by the intrinsic device protection or the motor overload protection. As the result of this function the actual motor ramp-up can well take longer than the ramp time selected on the soft starter.

Thanks to the integrated motor overload protection according to IEC 60947-4-2 there is no need of an additional overload relay on the new soft starters. The rated motor current, the setting of the overload tripping time (Class times) and the reset of the motor overload protection function can be adjusted easily and quickly. Using a 4-step rotary potentiometer it is possible to set different overload tripping times on the soft starter. In addition to Class 10, 15 and 20 it is also possible to switch off the motor overload protection if a different motor management control device is to be used for this function, e. g. with connection to PROFIBUS.

Device versions with thermistor motor protection evaluation are available up to a rating of 55 kW (at 400 V). A "Thermoclick" measuring probe can be connected directly, as can a PTC of type A. Thermal overloading of the motor, open circuits and short-circuits in the sensor circuit all result in the direct disconnection of the soft starter. And if ever the soft starter trips, various reset options are available the same as with intrinsic device protection and motor load protection: manually with the reset button, automatically or remotely through brief disconnection of the control voltage.

The new series of devices comes with the "polarity balancing" control method, which is designed to prevent direct current components in two-phase controlled soft starters. On two-phase controlled soft starters the current resulting from superimposition of the two controlled phases flows in the uncontrolled phase. This results for physical reasons in an asymmetric distribution of the three phase currents during the motor ramp-up. This phenomenon cannot be influenced, but in most applications it is non-critical.

Controlling the power semiconductors results not only in this unbalance, however, but also in the previously mentioned direct current components which can cause severe noise generation on the motor at starting voltages of less than 50 %.

The control method used for these soft starters eliminates these direct current components during the ramp-up phase and prevents the braking torque which they can cause. It creates a motor ramp-up that is uniform in speed, torque and current rise, thus permitting a particularly gentle, two-phase starting of the motors. At the same time the acoustic quality of the starting operation comes close to the quality of a three-phase controlled soft starter. This is made possible by the on-going dynamic harmonizing and balancing of current half-waves of different polarity during the motor ramp-up. Hence the name "polarity balancing".

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As an option the thyristors can also be protected by SITOR semiconductor fuses from short-circuiting so that the soft starter is still functional after a short-circuit (type of coordination 2). Three LEDs are used to indicate the operating state as well as possible errors, e. g. non-permissible tripping time (CLASS setting), mains or phase failure, missing load, thermal overloading or device faults.

- Soft starting with voltage ramp; the starting voltage setting range U_s is 40 to 100 % and the ramp time t_R can be set from 0 to 20 s.³⁾
- Smooth ramp-down with voltage ramp; the running down time t_{off} can be set between 0 s to 20 s.³⁾
- Solid-state motor overload and intrinsic device protection
- Optional thermistor motor protection (up to size S3)
- Remote reset (integrated up to size S3, optional for size S6 and larger)
- Adjustable current limiting

- Integrated bypass contact system to minimize power loss
- Setting with potentiometers
- Simple mounting and commissioning
- Integrated status monitoring and fault monitoring
- Mains voltages 50/60 Hz, 200 to 600 V
- Various control voltage versions
 - Sizes S0 to S3:
24 V AC/DC and
110 to 230 V AC/DC
 - Sizes S6 to S12:
115 V AC and 230 V AC.
 Control by way of the internal 24 V DC supply and direct control by means of PLC are possible.
- Wide temperature range from -25 to +60 °C
- Built-in auxiliary contacts ensure user-friendly control and possible further processing within the system (for status graphs see page 6/66).

Technical specifications

Type				3RW40 2.		3RW40 3., 3RW40 4.	
Control electronics							
Rated values		Terminal	V				
Rated control supply voltage		A1/A2	V	24	110 ... 230	24	110 ... 230
• Tolerance			%	±20	-15/+10	±20	-15/+10
Rated control supply current							
• STANDBY			mA	< 150	< 50	< 200	< 50
• During pick-up			mA	< 200	< 100	< 5000	< 1500
• ON without fan			mA	< 250	< 50	< 200	< 50
• ON with fan			mA	< 300	< 70	< 250	< 70
Rated frequency			Hz	50/60			
• Tolerance			%	±10			
Control inputs							
IN				ON/OFF			
Rated operational current							
• AC			mA	Approx. 12	3/6	Approx. 12	3/6
• DC			mA	Approx. 12	1.5/3	Approx. 12	1.5/3
Relay outputs							
Output 1	ON/RUN mode ¹⁾	13/14		Operating indication (NO)			
Output 2	BYPASSED	23/24		Bypass indication (NO)			
Output 3	OVERLOAD/FAILURE	95/96/98		Overload/error indication (NC/NO)			
Rated operational current			A	3 AC-15/AC-14 at 230 V,			
			A	1 DC-13 at 24 V			
Protection against overvoltages				Protection by means of varistor through contact			
Short-circuit protection				4 A gL/gG operational class;			
				6 A quick (fuse is not included in scope of supply)			

1) Factory default: ON mode.

Type				3RW40 5.		3RW40 7.	
Control electronics							
Rated values		Terminal A1/A2	V AC	115	230	115	230
Rated control supply voltage			%	-15/+10		-15/+10	
• Tolerance							
Rated control supply current STANDBY			mA	15		15	
Rated control supply current ON ¹⁾			mA	440	200	660	360
Rated frequency			Hz	50/60		50/60	
• Tolerance			%	±10		±10	
Control inputs							
IN				ON/OFF			
Rated operational current			mA	Approx. 10 acc. to DIN 19240			
Rated operational voltage			V DC	24 from internal supply dc+ or external DC supply (acc. to DIN 19240) through terminals and IN			
Relay outputs							
Output 1	ON/RUN mode ²⁾	13/14		Operating indication (NO)			
Output 2	BYPASSED	23/24		Bypass indication (NO)			
Output 3	OVERLOAD/FAILURE	95/96/98		Overload/error indication (NC/NO)			
Rated operational current			A	3 AC-15/AC-14 at 230 V,			
			A	1 DC-13 at 24 V			
Protection against overvoltages				Protection by means of varistor through contact			
Short-circuit protection				4 A gL/gG operational class;			
				6 A quick (fuse is not included in scope of supply)			

1) Values for the coil power consumption at +10 % U_n , 50 Hz.

2) Factory default: ON mode.

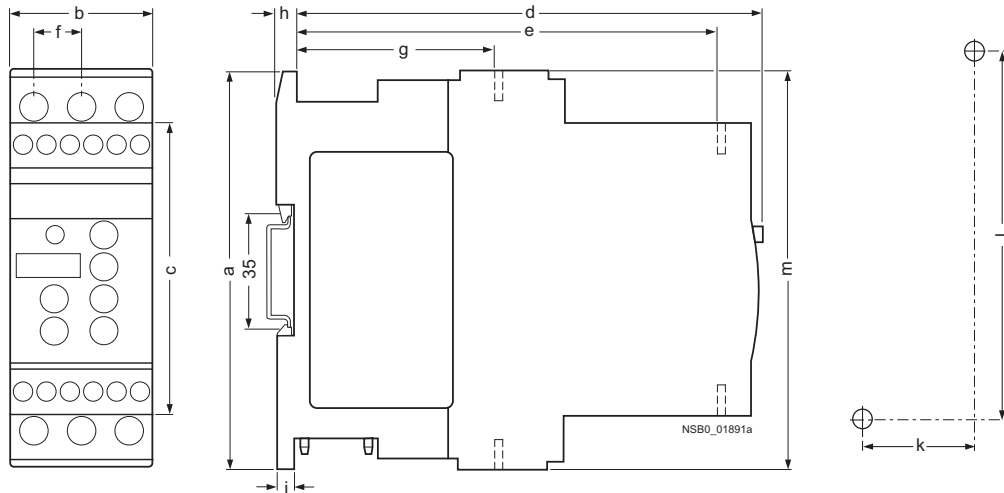
3) Actual motor start times are load dependent.

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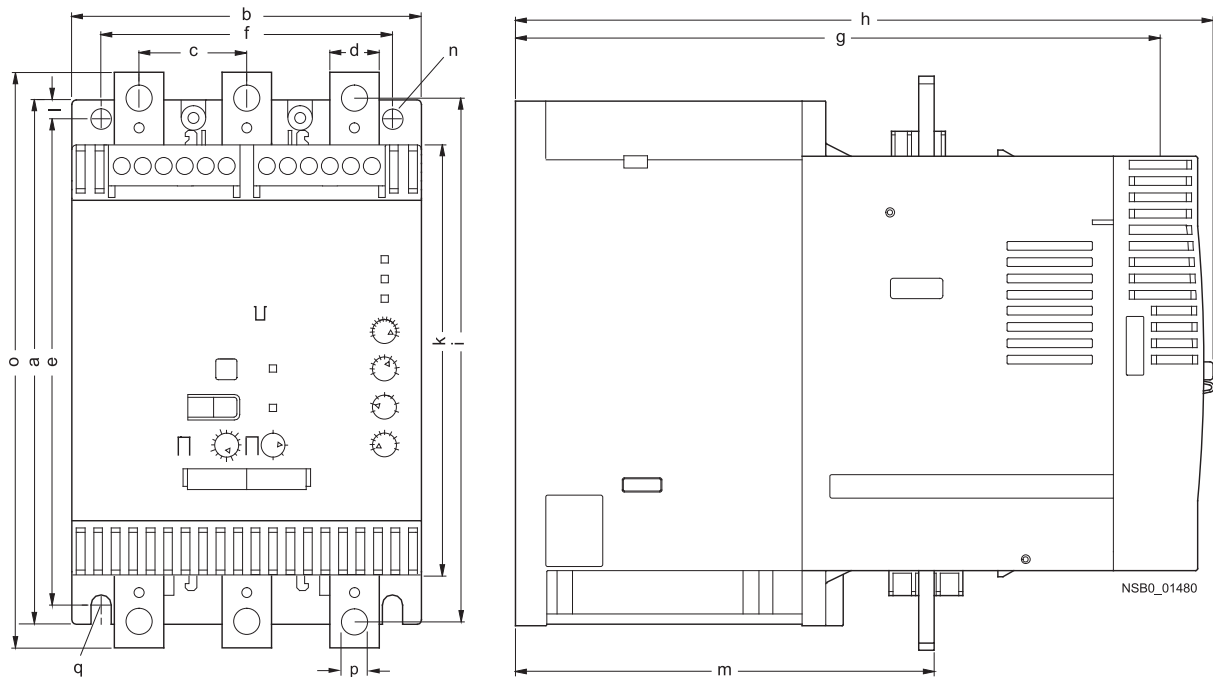
Project planning aids

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Type/Dimension (mm)	a	b	c	d	e	f	g	h	i	k	l	m
3RW40 2.-1.	125	45	92	149	126	14.4	63	5	6.5	35	115	125
3RW40 2.-2.	125	45	92	149	126	14.4	63	5	6.5	35	115	150
3RW40 3.	170	55	110	165	140	18	63	5	6.5	30	150	144
3RW40 4.	170	70	110	183	158	22.5	85	5	10	60	160	160

Clearances to grounded parts (mm)	Lateral	Top	Bottom	Fixing screws	Tightening torques (Nm)
3RW40 2.	5	60	40	M4	1
3RW40 3.	30	60	40	M4	1
3RW40 4.	30	60	40	M4	2



Type/Dimension (mm)	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q
3RW40 5.	180	120	37	17	167	100	223	250	180	148	6.5	153	7	198	9	M6, 10 Nm
3RW40 7.	210	160	48	25	190	140	240	278	205	166	10	166	9	230	11	M8, 15 Nm

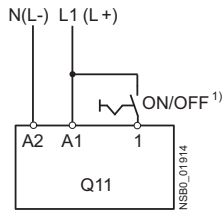
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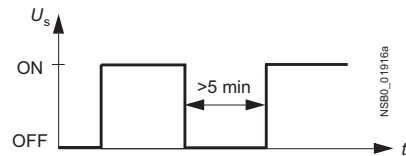
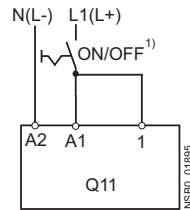
Project planning aids

3RW40 2. ... 3RW40 4. connection examples for control circuit

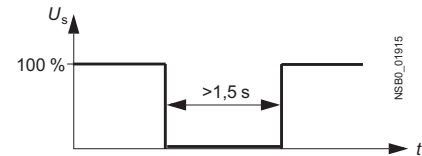
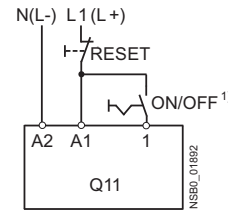
Control using switches



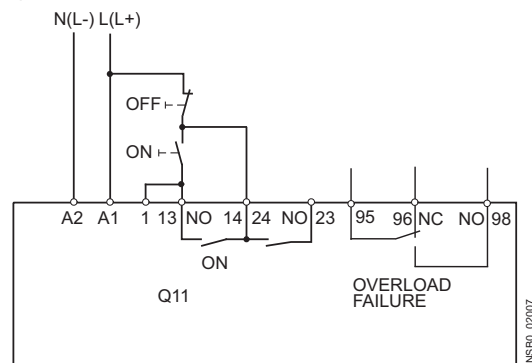
Automatic mode



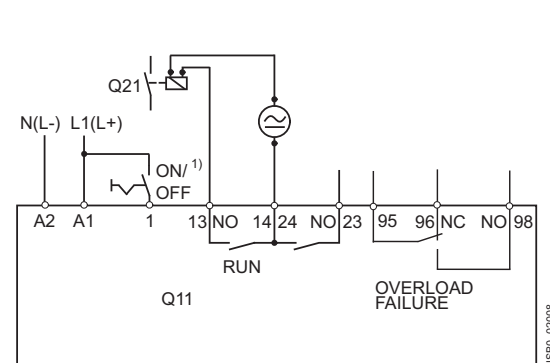
Control with remote reset



Control of 3RW40 2. ... 3RW40 4. by pushbutton

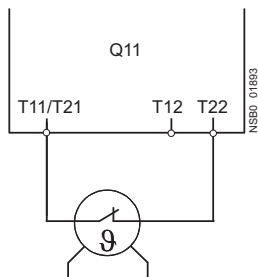


Control of a main contactor

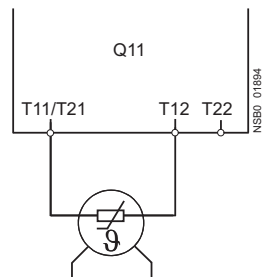


Connection example of 3RW40 2. ... 3RW40 4. for PTC sensors (thermistor motor protection)

Thermoclick



PTC type A



1) Caution: Risk of restarting!

When operating with a switch (ON/OFF) a new, automatic restart will take place automatically if the start command is still active at terminal 1.