

Soft starter DS7
Soft to start, powerful in torque

Soft starters have become a well-established alternative to the star-delta starter. This is where the DS7, featuring two-phase control and designed to work seamlessly with DILM and PKZ switchgear, comes in. It can be flexibly combined with other units and adds the ability to "start motors softly" to the switching, protection, and starting functions common to control panels.
A patented method ensures that motor run-ups will be exceptionally soft while providing a higher torque than other available solutions.

Designed for normal applications such as pumps, fans and small conveyors, the compact DS7 soft starter is ideal.
The DS7 is also available with a SmartWire-DT connection to simplify wiring and enhance functionality as an automation solution.

Performance range:

- 4 - 200 A
- 1.10 - 110 kW (U_e: 200 - 480 V)

Applications:

- Conveyor belts
- Fans
- Pumping
- Cooling compressors

Features:

- Ramp time in a range of 1 to 30 s (for starting) or 0 to 30 s (for stopping)
- Starting voltage in the range from 30% to 100% of the mains voltage
- Control voltages: 24 V AC/DC, 110 V AC or SmartWire-DT
- The thermal load on the engine is lower thanks to asymmetric ignition control
- Ambient temperature -40°C to 60°C

Accessory:

- Three-phase commoning links
- Terminal cover
- Feeder unit
- IP2X protection against contact with a finger
- Device fans
- Mounting kit

For more information, visit:
www.Eaton.com/DS7



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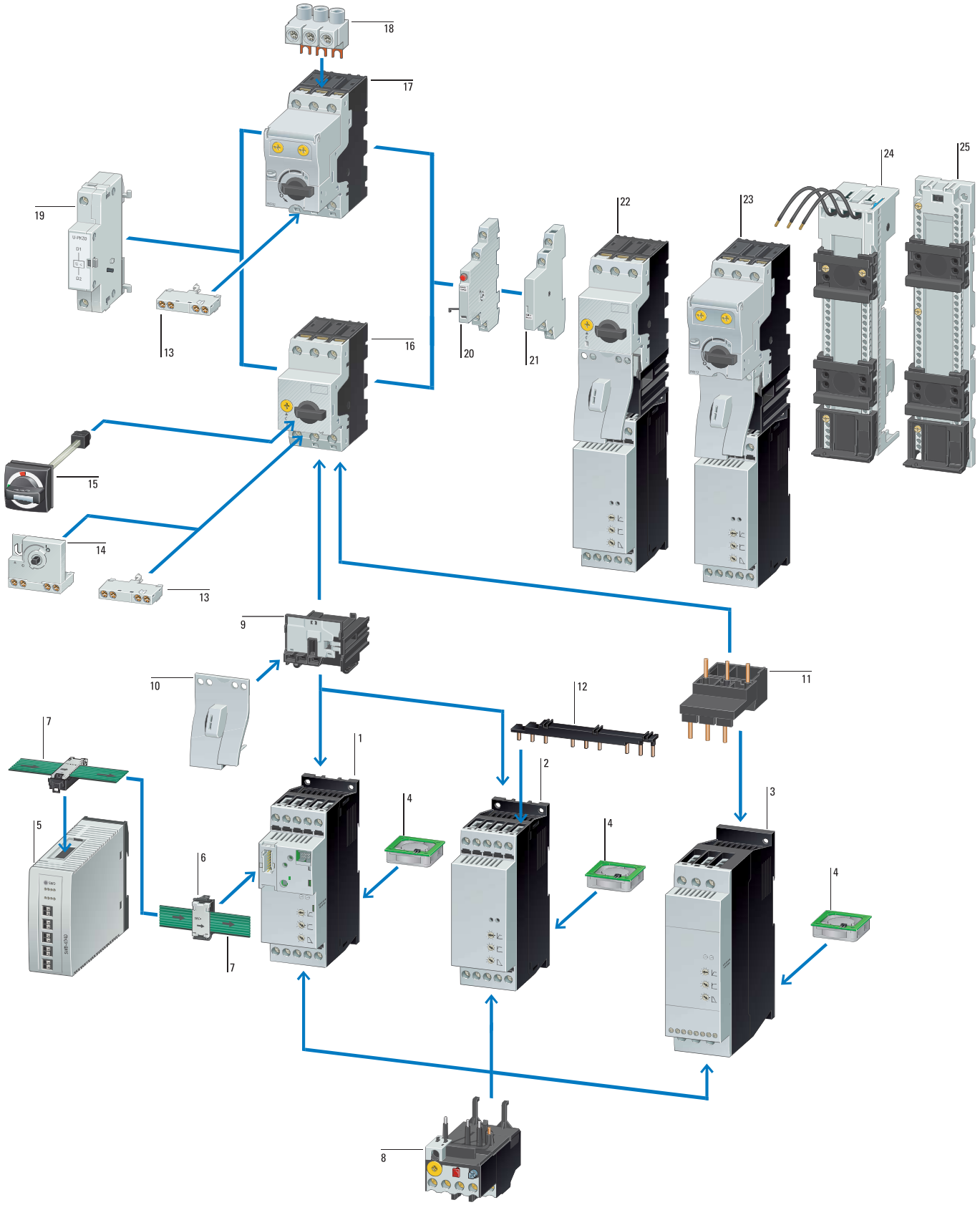
1.1 Soft starter DS7

DS7 < 32 A system overview

System overview



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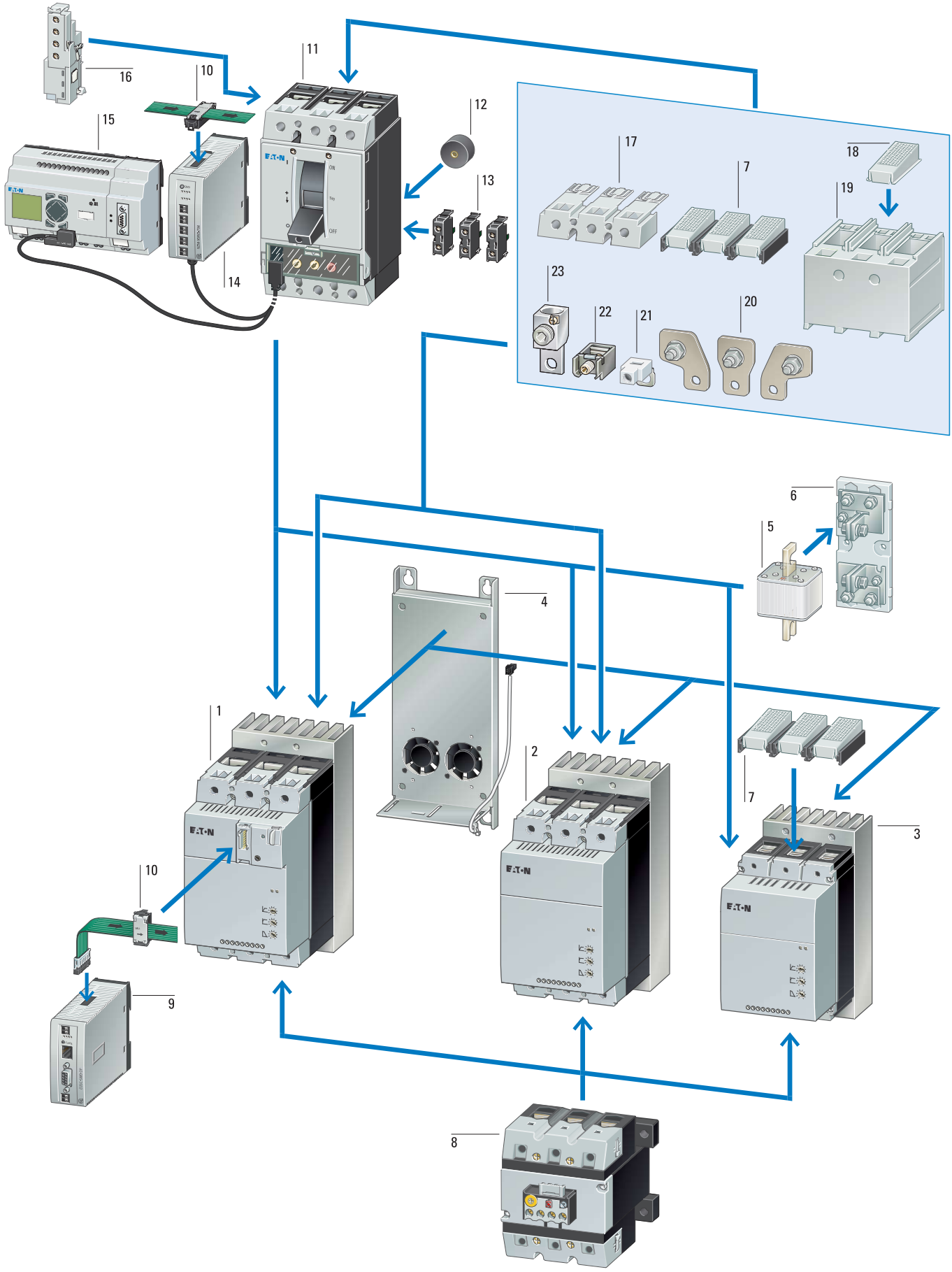

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Key to type references

DS7 - 3 4 0 SX 004 N 0 - N

Device series	Generation 7
Number of phases	3 = Three-phase main terminal
Voltage class	4 = 400 V (380 V -15% to 480 V +10%)
Control voltage supply	0 = 24 V AC/DC 2 = 110/230 V AC D = 24 V DC SmartWire-DT
Device version	SX = Standard soft starter with internal bypass relay
Rated operational current	004 = 4 A : 200 = 200 A
Radio interference suppression filters	N = No internal radio interference suppression filter
Protection type	0 = IP20
Options	N = no option D = SmartWire-DT L = extended temperature range up to -40°C

Description







Application

DS7 soft starters are two-phase control soft starters used to soft start three-phase AC motors in applications with a normal operating frequency and a current range of 3 to 200 A (1.1 to 110 kW with a 400 V supply voltage).
Closing transients and DC components during startup are effectively suppressed and guarantee even motor starting.
The special control method (asymmetrical firing control) for the soft start function avoids the DC components (Eaton patent) that are normally produced by two-phase control soft starters. This prevents the formation of an elliptically rotating field, which would otherwise result in the motor not accelerating smoothly and increase starting times unnecessarily. Accordingly, the smooth starting provided by DS7 soft starters is comparable to that provided by three-phase control soft starters.

Functions

Typical fields of application for Series DS7 soft starters are:
- Pump drives: pressure surges are prevented through soft starting reducing mechanical loads on the entire system and lengthening its life.
- Fan drives: soft starting keeps fan belts from slipping, preventing premature wear. This not only lowers operating costs, but also extends the corresponding system's life.
- Conveyor belts: conveyor belts start running smoothly, instead of starting with a jolt. This ensures that any goods being conveyed will not topple over. In addition, it prevents mechanical damage to the belt itself, making it last longer.

Features

- The ramp time can be adjusted by potentiometer within a range of 1 to 30 s (for starting) or 0 to 30 s (for stopping) with a potentiometer
- The start voltage (or start torque) can be adjusted within a range of 30 to 100 percent of the mains voltage with a potentiometer
- Significant reduction in switch-on current, achieved with a short soft start ramp time (min. 1 s) for lamp and heating loads
- Internal bypass relay: switches on automatically after the end of the ramp, bypassing the internal thyristors.
- This makes it possible to comply with radio interference level B without any additional measures.
- The motor's thermal load is smaller than it would be without asymmetric ignition control.
- Designed specifically for long cables

Documentation

Surface mounting and standard mounting procedures are described in the corresponding instruction leaflets and in the manual.

Instruction leaflets:
IL03902003Z: for size 1 devices (up to 12 A motor output)
IL03902004Z: for size 2 devices (up to 32 A motor output)
IL03902005Z: for size 3, 4 devices (up to 200 A motor output)

Manual:
MN03901001Z

You can download the documentation for the DS7 soft starters from the Internet
at: www.moeller.net/support

Communication interface SmartWire-DT

The use of a SmartWire-DT interface completely eliminates the need for conventional control wiring. This has several advantages:
- No incorrect wiring
- Faster wiring
- Cost saving

The interface can be used to send control commands to a DS7-SWD device and modify and diagnose the latter's parameter configuration; in addition, the control electronics can be powered via the SmartWire-DT cable.
The device is controlled with one of three selectable profiles:
- A "start/stop" profile, which should already be familiar from the PKE motor-protective circuit-breaker and contactor combination
- An 8 bit-wide profile for the soft starter, which is provided the same way for the variable frequency drive and features more options
- A control profile comparable to a Profidrive profile, just like the one available for the variable frequency drive.

Regardless of the profile chosen, a DS7-SWD device's parameters can be read and written to at any time by using acyclical services.
DS7-SWD devices make it possible to read and write to all device parameters. The mechanisms of the parameter channel that is described for the drives in the Profidrive profile are used for this purpose. This profile provides a standardized parameter access method for variable frequency drives and soft starters.
It is also possible to overwrite the potentiometer settings on the DS7-SWD, which can come in handy, for instance, when a change made to the machine needs to be undone.

DS7-SWD devices come with a detailed diagnostic system with options that extend far beyond those of wired devices. In addition to having an error log, DS7-SWD devices can detect and report nine different device faults. A warning parameter is used to report any alarm messages present. Moreover, the response to each individual fault can be customized. Finally, there are 35 additional messages for communication errors. Using a DS7 in connection with a PKE opens up new functionalities that were previously thought impossible to implement with a low-cost soft starter and that were reserved to significantly more expensive devices. Combining a PKE unit and a DS7-SWD makes it possible to completely protect the DS7-SWD device against overloads. In addition, it provides a current limiting function and can be used to report thermal loads to higher-level controllers.

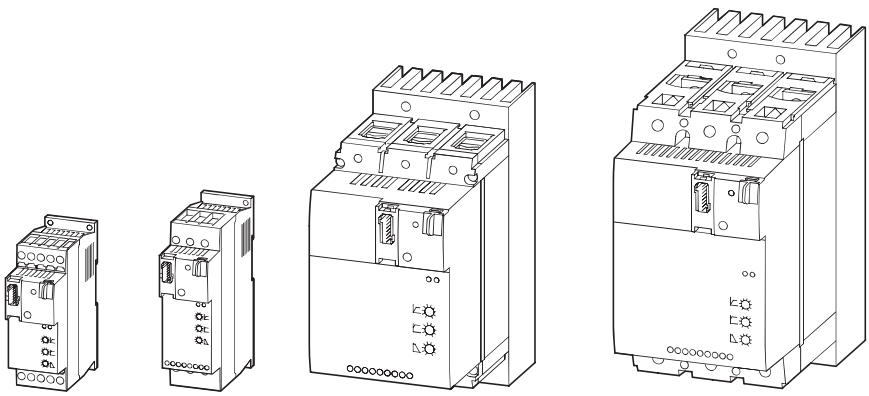
Extended temperature range

DS7-340SX…-L soft starters can operate at temperatures as low as -40°C.

Ordering

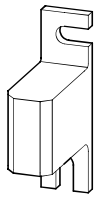
Rated operational current	Assigned motor output		Catalog Number	Article no.	Catalog Number	Article no.	Std. pack
Device (AC-53)	at 400 V, 50 Hz	at 460 V, 60 Hz					
I_e	P	P					
Soft Starters							
Soft starters for three-phase loads Mains supply voltage (50/60 Hz) U_{LN} 200 - 480 V AC							
			U_C 24 V AC/DC U_s 24 V AC/DC Standard temperature range		**U_C 24 V AC/DC U_s 24 V AC/DC Expanded temperature range down to -40°C**		
4	1.5	2	**DS7-340SX004N0-N**	134847	**DS7-340SX004N0-L**	171740	1 unit
7	3	5	**DS7-340SX007N0-N**	134849	**DS7-340SX007N0-L**	171741	
9	4	5	**DS7-340SX009N0-N**	134910	**DS7-340SX009N0-L**	171742	
12	5.5	10	**DS7-340SX012N0-N**	134911	**DS7-340SX012N0-L**	171743	
16	7.5	10	**DS7-340SX016N0-N**	134912	**DS7-340SX016N0-L**	171744	
24	11	15	**DS7-340SX024N0-N**	134913	**DS7-340SX024N0-L**	171745	
32	15	25	**DS7-340SX032N0-N**	134914	**DS7-340SX032N0-L**	171746	
41	22	30	**DS7-340SX041N0-N**	134916	**DS7-340SX041N0-L**	171747	
55	30	40	**DS7-340SX055N0-N**	134917	**DS7-340SX055N0-L**	171748	
70	37	50	**DS7-340SX070N0-N**	134918	**DS7-340SX070N0-L**	171749	
81	45	60	**DS7-340SX081N0-N**	134919	**DS7-340SX081N0-L**	171750	
100	55	75	**DS7-340SX100N0-N**	134920	**DS7-340SX100N0-L**	171751	
135	75	100	**DS7-340SX135N0-N**	134921	**DS7-340SX135N0-L**	171752	
160	90	125	**DS7-340SX160N0-N**	134922	**DS7-340SX160N0-L**	171753	
200	110	150	**DS7-340SX200N0-N**	134923	**DS7-340SX200N0-L**	171754	
			U_C 110 - 230 V AC U_s 110 - 230 V AC		**U_C 24 V DC U_s 24 V DC**		
4	1.5	2	**DS7-342SX004N0-N**	134925	**DS7-34DSX004N0-D**	134943	1 unit
7	3	5	**DS7-342SX007N0-N**	134927	**DS7-34DSX007N0-D**	134945	
9	4	5	**DS7-342SX009N0-N**	134928	**DS7-34DSX009N0-D**	134946	
12	5.5	10	**DS7-342SX012N0-N**	134929	**DS7-34DSX012N0-D**	134947	
16	7.5	10	**DS7-342SX016N0-N**	134930	**DS7-34DSX016N0-D**	134948	
24	11	15	**DS7-342SX024N0-N**	134931	**DS7-34DSX024N0-D**	134949	
32	15	25	**DS7-342SX032N0-N**	134932	**DS7-34DSX032N0-D**	134950	
41	22	30	**DS7-342SX041N0-N**	134934	**DS7-34DSX041N0-D**	134952	
55	30	40	**DS7-342SX055N0-N**	134935	**DS7-34DSX055N0-D**	134953	
70	37	50	**DS7-342SX070N0-N**	134936	**DS7-34DSX070N0-D**	134954	
81	45	60	**DS7-342SX081N0-N**	134937	**DS7-34DSX081N0-D**	134955	
100	55	75	**DS7-342SX100N0-N**	134938	**DS7-34DSX100N0-D**	134956	
135	75	100	**DS7-342SX135N0-N**	134939	**DS7-34DSX135N0-D**	134957	
160	90	125	**DS7-342SX160N0-N**	134940	**DS7-34DSX160N0-D**	134958	
200	110	150	**DS7-342SX200N0-N**	134941	**DS7-34DSX200N0-D**	134959	

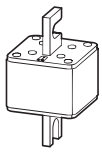
Notes



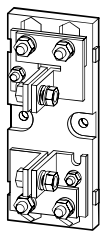
4 - 12 A | 16 - 32 A | 41 - 100 A | 135 - 200 A

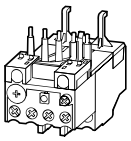
Nominal Current	Max. heat dissipation P_v	Frame size	For use with	Article no.	Std. pack
A	W				
Superfast semiconductor fuses					
DIN 43653, 690/700 V (IEC/UL) Pitch measure 80 mm					
16	5.5	000	DS7-34…SX004N0-…	170M1359	10 unit
25	9	000	DS7-34…SX007N0-…	170M1361	
32	10	000	DS7-34…SX009N0-… DS7-34…SX012N0-…	170M1362	
50	15	000	DS7-34…SX016N0-…	170M1364	
63	16	000	DS7-34…SX024N0-…	170M1365	
80	19	000	DS7-34…SX032N0-…	170M1366	
125	26	S1*	DS7-34…SX041N0-… DS7-34…SX055N0-…	170M3013	
200	45	S1	DS7-34…SX070N0-… DS7-34…SX081N0-… DS7-34…SX100N0-…	170M4008	
315	58	S1	DS7-34…SX135N0-…	170M4010	
400	65	S2	DS7-34…SX160N0-… DS7-34…SX200N0-…	170M5008	

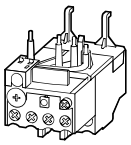




	For use with	Article no.	Std. pack
Fuse Bases			
Dimensions (W x H x D) mm 145 x 43 x 50	000, 00	170H1007	3 unit
205 x 88 x 80	S1*, S1, S2, S3	170H3004	

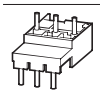


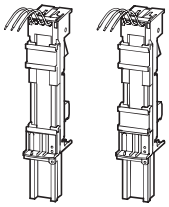


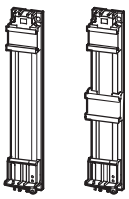




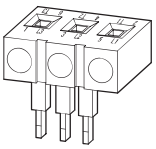
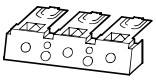
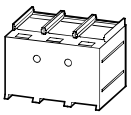


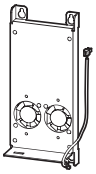
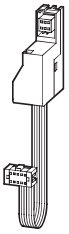
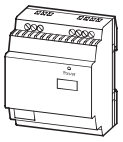






For use with	Catalog Number Article no.	Std. pack
Overload relay		
DS7-34…SX004…	**ZB12-4** 278438	1 unit
DS7-34…SX007… DS7-34…SX009…	**ZB12-10** 278440	
DS7-34…SX012…	**ZB12-12** 278441	
DS7-34…SX016…	**ZB32-16** 278452	
DS7-34…SX024…	**ZB32-24** 278453	
DS7-34…SX032…	**ZB32-32** 278454	
Wiring set		
For DOL Starter		
DS7-34…SX004… DS7-34…SX007… DS7-34…SX009… DS7-34…SX012…	**PKZM0-XDM12** 283149	1 unit
Electric contact module		
DS7-34…SX016… DS7-34…SX024… DS7-34…SX032…	**PKZM0-XM32DE** 239349	5 unit
Busbar adapter		
PKZM0, PKE + DS7...004N... PKZM0, PKE + DS7...007N... PKZM0, PKE + DS7...009N... PKZM0, PKE + DS7...012N...	**BBA0L-25** 142526	1 unit
PKZM0, PKE + DS7...016N... PKZM0, PKE + DS7...024N... PKZM0, PKE + DS7...032N...	**BBA0L-32** 142527	1 unit
Top-hat rail adapter		
45 mm wide adapter plate		
PKZM0, PKE + DS7...004N... PKZM0, PKE + DS7...007N... PKZM0, PKE + DS7...009N... PKZM0, PKE + DS7...012N...	**PKZM0-XC45L** 142529	1 unit
PKZM0, PKE + DS7...016N... PKZM0, PKE + DS7...024N... PKZM0, PKE + DS7...032N...	**PKZM0-XC45L/2** 142570	1 unit

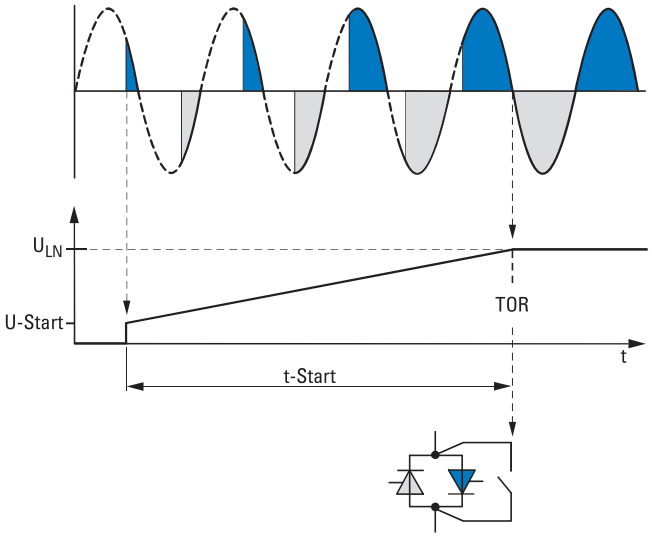
	For use with	Catalog Number Article no.	Std. pack	Notes
	Three-phase commoning links			
	Protected against accidental contact, short-circuit proof, U_e = 690 V, I_u = 35 A can be extended by rotating installation ($\sum I_u \leq 35$ A)			
	DS7-34…SX004… DS7-34…SX007… DS7-34…SX009… DS7-34…SX012…	**DILM12-XDSB0/3** 240084	5 unit	For the primary side of DS7 Suitable for 3 DS7 soft starters Length 112 mm
		**DILM12-XDSB0/4** 240085		For the primary side of DS7 Suitable for 4 DS7 soft starters Length 157 mm
		**DILM12-XDSB0/5** 240086		For the primary side of DS7 Suitable for 5 DS7 soft starters Length 202 mm
	Feeder unit			
	DS7-34…SX004… DS7-34…SX007… DS7-34…SX009… DS7-34…SX012…	**DILM12-XEK** 240083	5 unit	For three-phase commoning link, protected against accidental contact, U_e = 690 V, I_u = 35 A. Terminal capacity: stranded 2.5…-16 mm² Flexible with ferrule 2.5…16 mm² AWG14…8
	Terminal cover			
	Type contains parts for a terminal located at top or bottom for 3 pole circuit-breakers.			
knockout **For box terminal** 	DS7-34…SX041… DS7-34…SX055… DS7-34…SX070… DS7-34…SX081… DS7-34…SX100…	**NZM1-XKSFA** 100780	1 unit	Enhancement of the busbar tag shroud (simple protection against contact with a finger). Cannot be combined with NZM-XSTK control circuit terminal.
knockout 	DS7-34…SX135… DS7-34…SX160… DS7-34…SX200…	**NZM2-XKSFA** 104640	1 unit	Enhancement of the busbar tag shroud (simple protection against contact with a finger). Protection when reaching into the cable connection area with the connection of cables in the box terminal. With two conductors max cross-section 22 mm² or AWG4. Cannot be combined with NZM-XSTK control circuit terminal.
	DS7-34…SX135… DS7-34…SX160… DS7-34…SX200…	**NZM2-XKSA** 260038	1 unit	Busbar tag shroud where cable lugs, busbars or tunnel terminals are used. When using insulated conductor material to IP1X.

	For use with	Catalog Number Article no.	Std. pack	Notes
		IP2X protection against contact with a finger		
		Type contains parts for a terminal located at top or bottom for 3 pole circuit-breakers. Enhancement of the busbar tag shroud to IP2X.		
For box terminal 	NZM2, PN2, N2	**NZM2-XIPK** 266773	1 unit	Protection when reaching into the cable connection area with the connection of cables in the box terminal. With 2 conductors max cross section 25 mm² or AWG4. Cannot be combined with NZM-XSTK control circuit terminal.
for cover NZM2-XKSA or NZM2 or NZM2...(C)NA und N(S)2...NA 	NZM2, PN2, N(S)2	**NZM2-XIPA** 266777	1 unit	When mounting NZM2-..-(C)NA or NZM...-NA the following applies: with 2 conductors max cross section 25 mm² or AWG4.
		Mounting kit		
		when using covers NZM1-XKSFA and NZM2-XKSA		
	DS7-34xSX041N0-x DS7-34xSX055N0-x DS7-34xSX070N0-x DS7-34xSX081N0-x DS7-34xSX100N0-x DS7-34xSX135N0-x DS7-34xSX160N0-x DS7-34xSX200N0-x	**DE6-MNT-NZM** 107323	1 unit	–
		Device fans		
		Device fan for increasing the load cycle (more starts per hour higher or longer-lasting starting current)		
	DS7-34…SX004… DS7-34…SX007… DS7-34…SX009… DS7-34…SX012… DS7-34…SX016… DS7-34…SX024… DS7-34…SX032…	**DS7-FAN-032** 135553	1 unit	Flush-mounted fan
	DS7-34…SX041… DS7-34…SX055… DS7-34…SX070… DS7-34…SX081… DS7-34…SX100…	**DS7-FAN-100** 169021		Bottom fans
	DS7-34…SX135… DS7-34…SX160… DS7-34…SX200…	**DS7-FAN-200** 169022		
		**Communication cable PKE**		
		6 pole Prefabricated with two plugs For connecting the PKE to DS7-SWD		
	DS7…SWD	**PKE32-COM** 168970	1 unit	
		**Switched-mode power supply units easyPOW**		
		Single-phase Rated input voltage 100 - 240 V AC Rated output voltage 24 V DC (± 3%) Rated output current: 1.25 A		
		EASY400-POW 212319	1 unit	

Engineering

Generalized phase control of motor voltage

By means of generalized phase control, the soft starter adjusts the grid's voltage (U_{LN}) smoothly from an adjustable start value to 100% of the rated value U_{LN}.

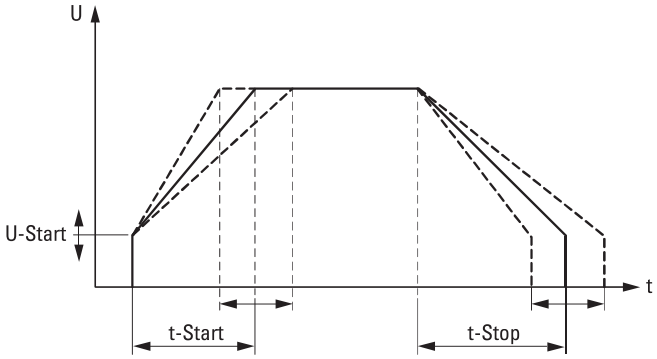


U_{LN} = mains supply voltage
U-Start: start voltage
t-Start: Ramp time of the voltage change at start
TOR (Top of Ramp) = Signals the end of the set "t-Start" ramp time (output voltage U_2 = mains supply voltage U_{LN}). The internal bypass contacts are closed after this.

This voltage control enables the inrush current of a three-phase asynchronous motor to be limited and its starting torque to be reduced. This enables a smooth and jerk-free increase in torque, adjusted in line with the machine's load behavior. This has a positive effect on the lifespan, operating behavior, and operating processes of the mechanical equipment and prevents negative effects such as:

- Impacting of cog edges in the gearbox
- Pressure surge in pipe systems (water impact),
- Slipping of V belts or
- Jitter with conveyor systems.

In DS7 and S801+/S811+ series soft starters, generalized phase control is achieved with anti-parallel thyristors that are bypassed for continuous operation by using bypass contacts (TOR = Top Of Ramp) after the time for a time-triggered voltage change (t-Start) has elapsed. The transition resistance of these bypass contacts is considerably lower than the transition resistance of the power semiconductors. This reduces the heat dissipation in the soft starter and extends the lifespan of the power semiconductors.
As well as the time-controlled startup of a motor, the soft starter also enables a time-controlled reduction of the motor voltage and thus a controlled stopping of the motor.



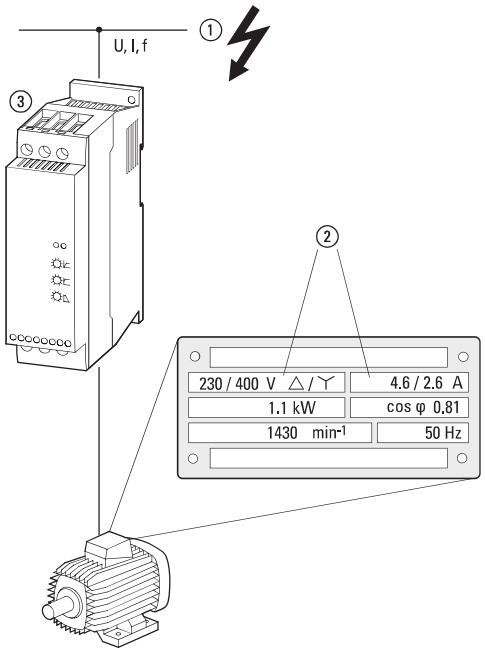
The output voltage of a soft starter determines the torque of the motor (M ~ U_2). Because of this, it is necessary to make sure that, when a machine starts up, the selected U-Start start voltage is not too low and the t-Start ramp time for the linear voltage change is set to be as short as possible.

Please note:

- Long ramp times (t-Start) will produce a soft startup behavior, but will also result in a higher thermal load on the thyristors
- A high start voltage (U-Start) will produce a higher torque and a high starting current
- Set the lowest possible start voltage and the shortest possible start ramps.

The following pages include application and setting configuration examples for DS7 soft starters.
If controlled deceleration is required, t-Stop must be set to a longer time than would be necessary for the machine to coast freely based on the load. For the thyristors, the controlled deceleration constitutes a load comparable to that produced during startup. If, for example, the deceleration ramp is activated on a soft starter with a maximum of 10 permissible starts per hour, the number of permissible starts will be reduced to five per hour (plus five stops within that hour).

Selection Criteria



Soft starters ③ are selected based on the supply voltage of the corresponding grid ① (U_{LN}) and the rated operational current of the assigned motor ②. The motor's circuit configuration (Δ/Y) must be selected in such a way that it matches the supply voltage. In addition, the soft starter's rated operational current (I_e) must be at least equal to that of the motor.

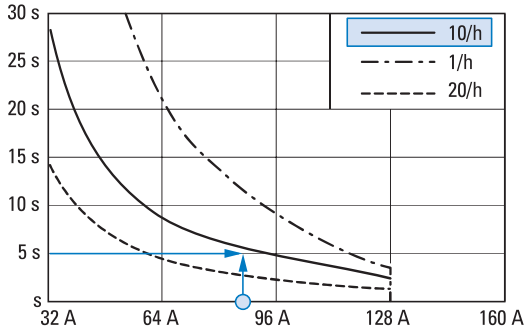
Additional selection criteria include:
- Ambient air temperature (rated value +40°C)
- The number of starts per hour (< 10 starts, take stops into account)
- Load torque (quadratic, linear)
- Starting torque

Centrifugal pumps, centrifugal fans, simple and smooth-running conveyor belts and traction drives, and circular saws and ribbon saws are some of the typical applications for which soft starters are used. Reciprocating compressors, mixers, mills, crushers, and lifting gear are instead categorized as heavy starting duty machines. In this case, the soft starter must be oversized in terms of its overload capacity.

In the case of applications that are typical for a soft starter, such as water pumps (centrifugal pumps), and that feature comparable operational data (operating frequency, run-up time, and/or inrush currents) a soft starter can be assigned directly to the motor on the basis of the rated operational current.

Example:
- 15 kW Pump motor
- 400 V
- Rated operational current 29 A
- About three times the starting current (I_{LRP} = 87 A),
- A maximum of 10 starts per hour
- 5-second start-up time,
- ambient air temperature 40°C.

=> DS7-34…032… (I_e = 32 A)



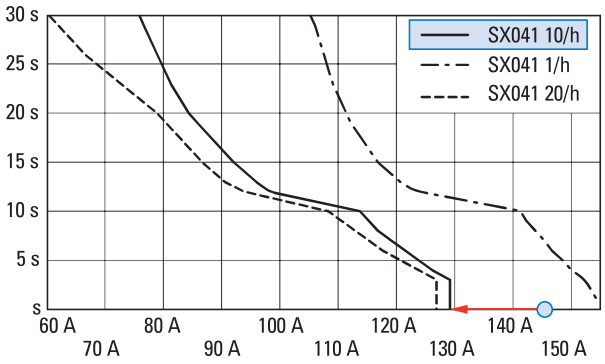
When different operating frequencies, acceleration and/or starting currents are involved, the thermal capacity of the DS7 soft starter must be taken into account in the design. This can be done by using the following diagrams or by calculating the I^2t values. These I^2t values define the corresponding load capacity and overload cycle and are defined in product standard IEC/EN 60947-4-2.

DS7-34…SX032…soft starter:
- 32 A: AC-53a: 3-5: 75-10
- Rated operational current (I_e) 32 A
- Load cycle AC-53a
- 300% overcurrent for 5 seconds
- 75% duty factor with 10 starts per hour

The resulting I2t value is: $(3 \times 32\ A)^2 \times 5\ s = 46\ 080\ A^2s$
The maximum I^2t value of the connected motor load must be smaller:
$(3 \times 29\ A)^2 \times 5\ s = 37\ 845\ A^2s$
Soft starter DS7-34…SX032… is the right choice for this application.

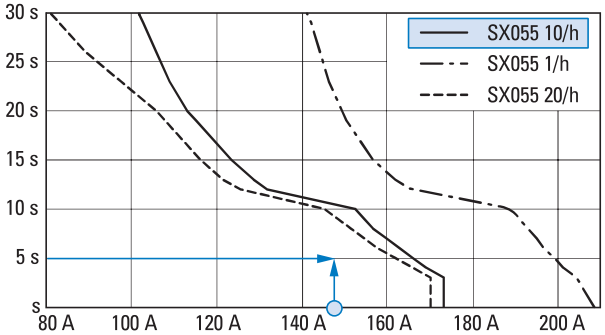
If the motor had a higher inrush current, e.g., 5 times the starting current, a more powerful soft starter would have to be selected:
- Motor inrush current:
  $I_{LRP} = 5 \times 29 = 145\ A$, I^2t value = $(5 \times 29\ A)^2 \times 5\ s = 105\ 125\ A^2s$
- DS7-34…SX041…: 41 A:
  AC-53a: 3-5: 75-10
  => $(3 \times 41\ A)^2 \times 5\ s = 75\ 645\ A^2s$

Soft starter DS7-34…SX041… cannot meet the required startup and load conditions required in this case.



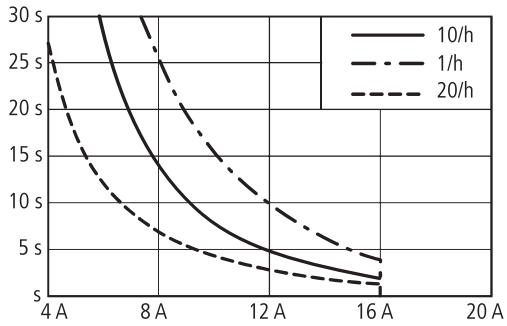
DS7-34…SX055…:
55 A: AC-53a: 3-5: 75-10
=> $(3 \times 55\ A)^2 \times 5\ s = 136\ 125\ A^2s$
Soft starter DS7-34…SX055…, however, does meet the required startup and load conditions.

Note: As the following diagram shows, the DS7-34…SX055… unit can handle even more demanding startup and load requirements, e.g., up to 20 starts per hour and longer start-up times (up to 10 seconds).

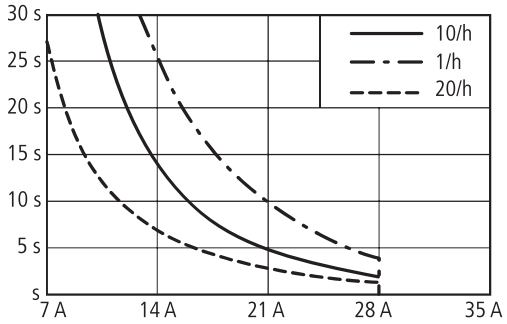


Design with different load cycles

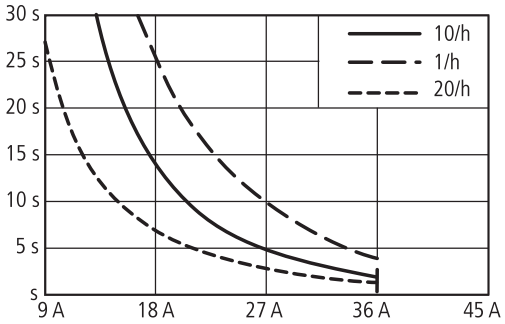
DS7-34x...SX004...



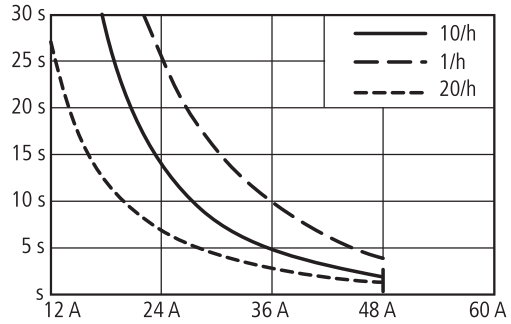
DS7-34x...SX007...



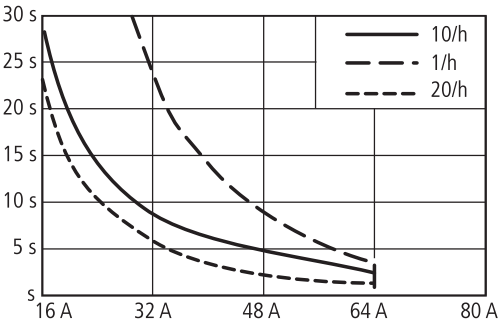
DS7-34x...SX009...



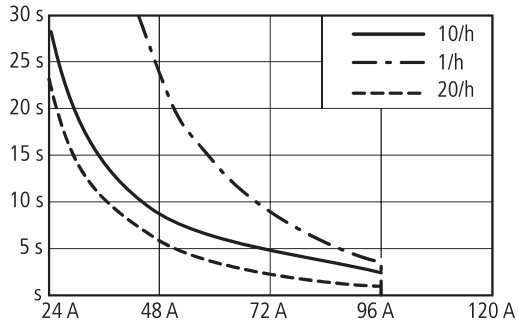
DS7-34x...SX012...



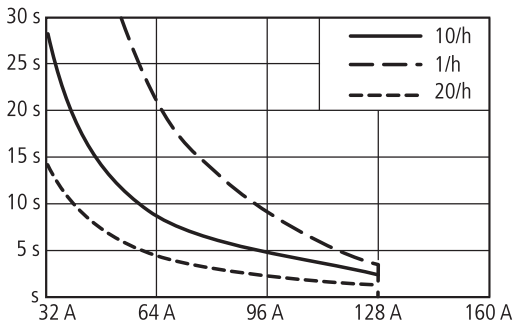
DS7-34x...SX016...



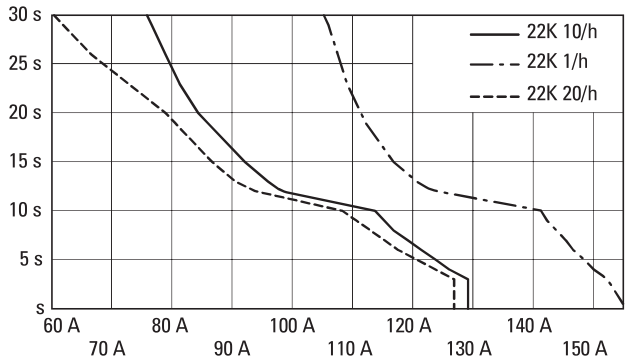
DS7-34x...SX024...



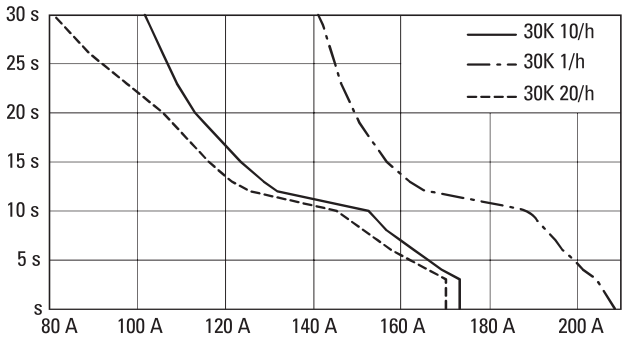
DS7-34x...SX032E...



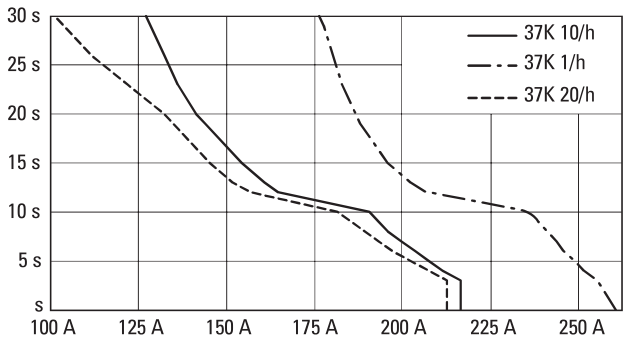
DS7-34...SX041N0-...



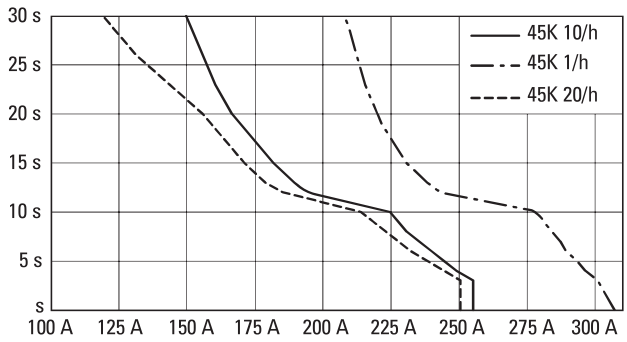
DS7-34...SX055N0-...



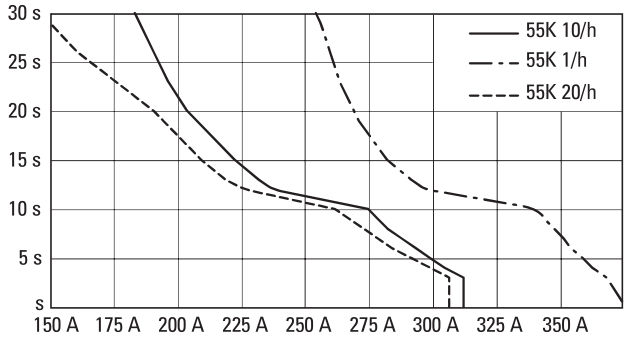
DS7-34...SX070N0-...



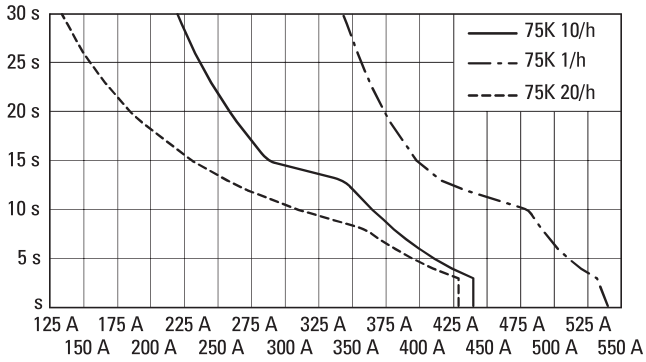
DS7-34...SX081N0-...



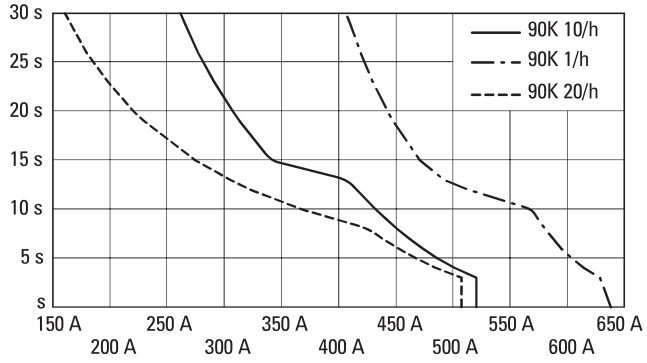
DS7-34...SX100N0-...



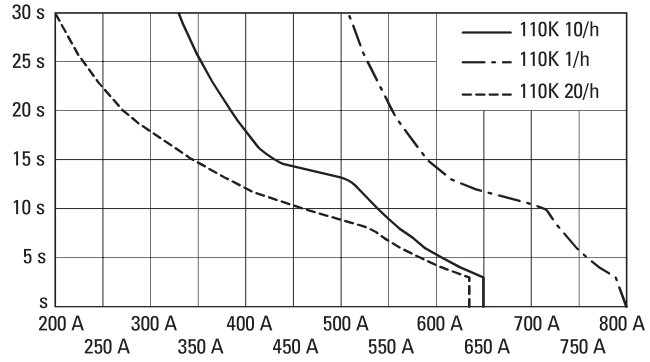
DS7-34...SX135N0-...



DS7-34...SX160N0-...



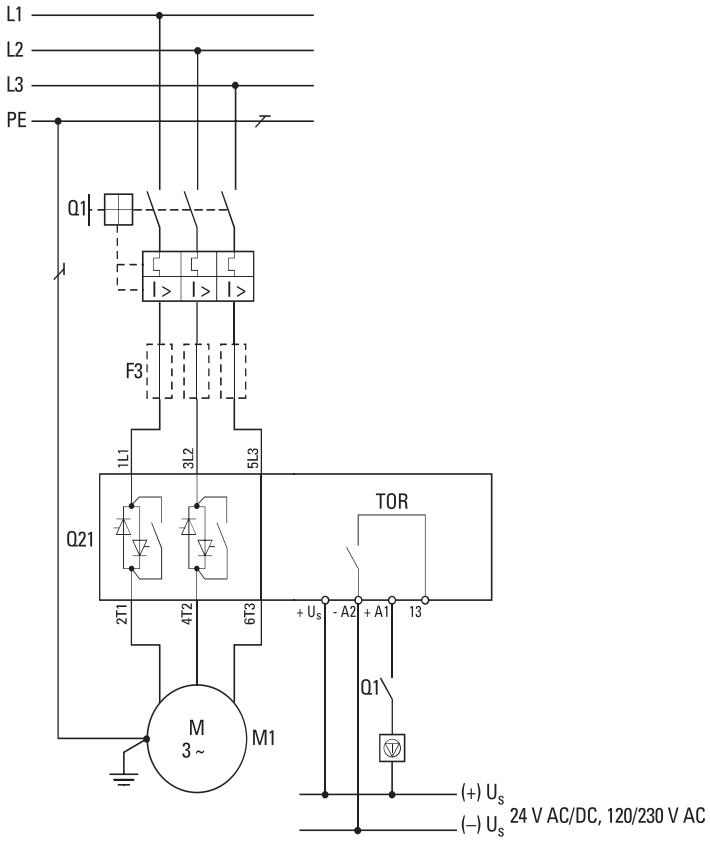
DS7-34...SX200N0-...



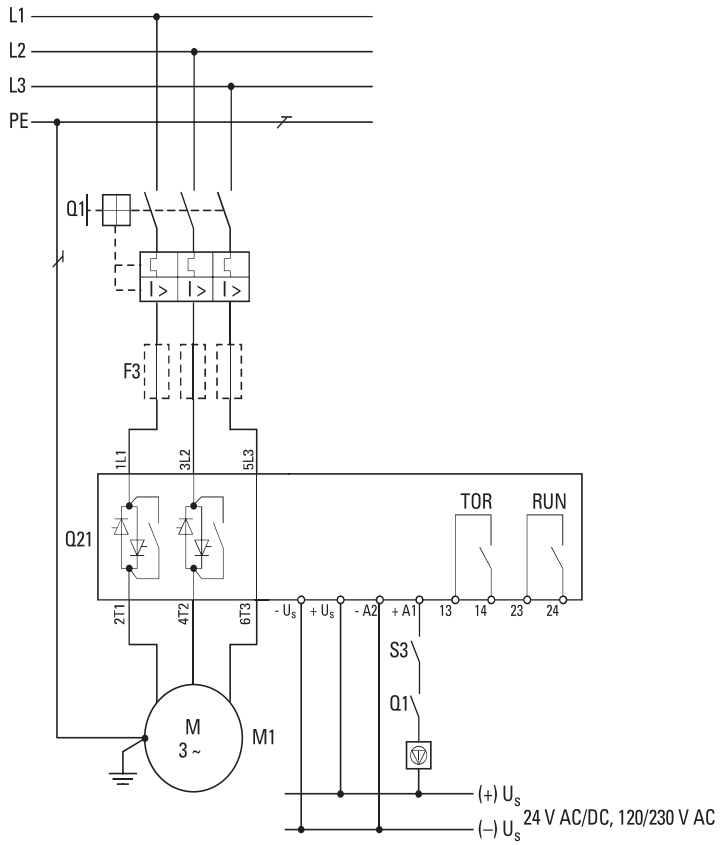
1.1 Soft starter DS7

Connection examples

Standard connection up to 12 A

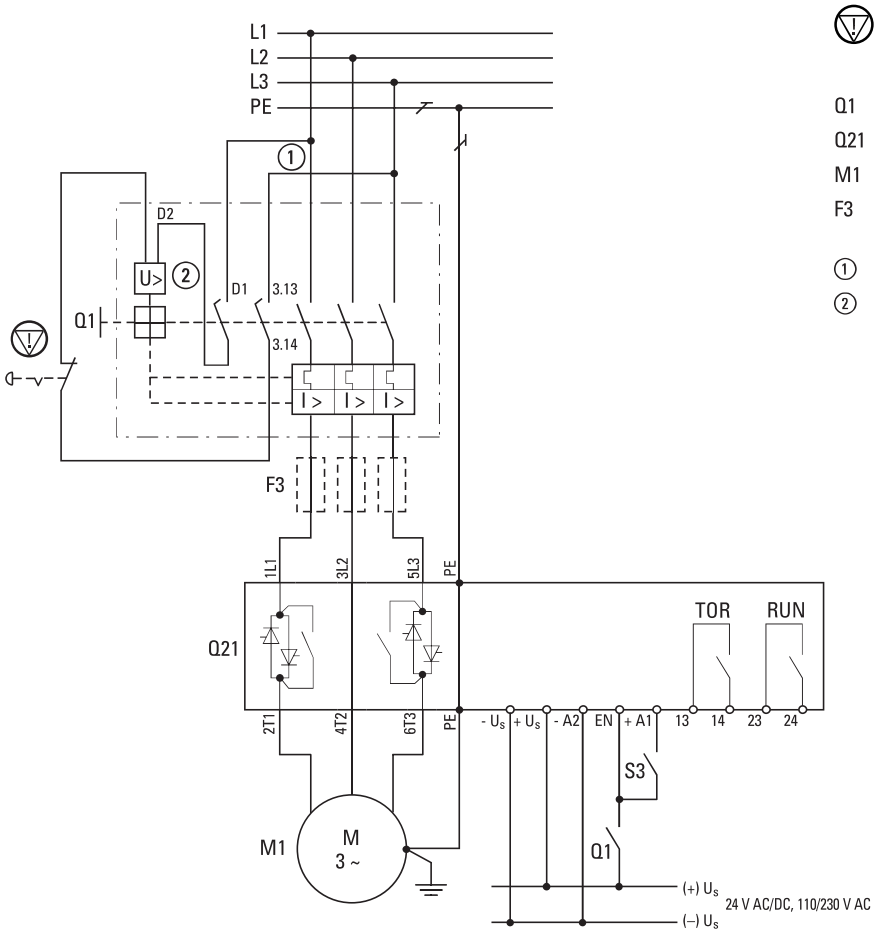


Standard connection up to 32 A



Standard connection 41 - 200 A

With Emergency switching off function according to IEC/EN 60 204-1 and VDE 0113 Part 1



= EMERGENCY SWITCHING OFF

Q1 = Cable and motor protection (NZM (NZM1, NZM2)
Q21 = Soft starter DS7
M1 = Motor
F3 = superfast semiconductor fuse, optional for type 2 coordination (in addition to Q1)
① Control circuit terminal
② Undervoltage release with early-make auxiliary contact

Soft starter DS7

Assigned switching and protective elements

Assigned Motor output at		Rated operational current[1]		**Catalog Number** Soft Starters (device to be selected)	Soft starter function
400 V	480 V	Motor	Soft Starters		Line protection[2]
P	P	I_e	I_e		Type 1 coordination
kW	HP	A	A		
				Soft starters for three-phase mains connection, low operating frequency, (5 s, 3 x I_e, 10 starts/h)	
1.5	2	3.6	4	**DS7-34xSX004N0-x**	PKZM0-4 (+ CL-PKZ0)
3	3	6.6	7	**DS7-34xSX007N0-x**	PKZM0-10 (+ CL-PKZ0)
4	5	8.5	9	**DS7-34xSX009N0-x**	PKZM0-10 (+ CL-PKZ0)
5.5	7.5	11.3	12	**DS7-34xSX012N0-x**	PKZM0-12 (+ CL-PKZ0)
7.5	10	15.2	16	**DS7-34xSX016N0-x**	PKZM0-16 (+ CL-PKZ0)
11	15	21.7	24	**DS7-34xSX024N0-x**	PKZM0-25 (+ CL-PKZ0)
15	20	29.3	32	**DS7-34xSX032N0-x**	PKZM0-32 (+ CL-PKZ0)
22	25	41	41	**DS7-34xSX041N0-x**	NZMN1-M50 / PKZM4-50
30	30	55	55	**DS7-34xSX055N0-x**	NZMN1-M63 / PKZM4-58
37	40	68	70	**DS7-34xSX070N0-x**	NZMN1-M80
45	50	81	81	**DS7-34xSX081N0-x**	NZMN1-M100
55	60	99	100	**DS7-34xSX100N0-x**	NZMN1-M100
75	75	134	135	**DS7-34xSX135N0-x**	NZMN2-M160
90	100	160	160	**DS7-34xSX160N0-x**	NZMN2-M200
110	125	196	200	**DS7-34xSX200N0-x**	NZMN2-M200

Notes

[1] Rated operational current based on the load cycle specified here.

[2] Indicates the circuit-breaker required for the indicated load cycle. At different duty cycles (operating frequency, overcurrent, overcurrent time, duty factor), this value changes and must then be adapted accordingly.

[3] An external overload relay is required if the main contacts should not be disconnected in the event of an overload and a controlled soft stop is desired instead.

[4] A mains contactor is not required. Disconnection characteristics in accordance with VDE can only be ensured with the specified circuit-breaker.

[5] The superfast semiconductor fuses protect the soft starters from motor-side short-circuits. This can not, however, prevent damage caused by voltage peaks, for example through lightning strike.

Soft starter function with soft stop in case of overload		Mains contactor	Semiconductor contactor (optional, in addition to the protective devices for type 1 coordination, required for type 2 coordination) [5]	
Line protection[2] Type 1 coordination	Overload relays[3]	optional[4]	Fuses	Fuse holders
			Quantity x Part no.	Quantity x Part no.
PKM0-4 (+ CL-PKZ0)	ZB12-4	DILM7	3 × **170M1359**	3 × **170H1007**
PKM0-10 (+ CL-PKZ0)	ZB12-10	DILM9	3 × **170M1361**	3 × **170H1007**
PKM0-10 (+ CL-PKZ0)	ZB12-10	DILM9	3 × **170M1362**	3 × **170H1007**
PKM0-12 (+ CL-PKZ0)	ZB12-12	DILM12	3 × **170M1362**	3 × **170H1007**
PZM0-16 (+ CL-PKZ0)	ZB32-16	DILM17	3 × **170M1364**	3 × **170H1007**
PZM0-25 (+ CL-PKZ0)	ZB32-24	DILM25	3 × **170M1365**	3 × **170H1007**
PZM0-32 (+ CL-PKZ0)	ZB32-32	DILM32	3 × **170M1366**	3 × **170H1007**
NZMN1-M50 / PKZM4-50	ZB65-40+ZB65-XEZ	DILM50	3 × **170M3013**	3 × **170H3004**
NZMN1-M63 / PKZM4-58	ZB65-57+ZB65-XEZ	DILM65	3 × **170M3013**	3 × **170H3004**
NZMN1-M80	ZB150-70/KK	DILM80	3 × **170M4008**	3 × **170H3004**
NZMN1-M100	ZB150-100/KK	DILM95	3 × **170M4008**	3 × **170H3004**
NZMN1-M100	ZB150-100/KK	DILM115	3 × **170M4008**	3 × **170H3004**
NZMN2-M160	ZB150-150/KK	DILM150	3 × **170M4010**	3 × **170H3004**
NZMN2-M200	Z5-160/FF250	DILM185	3 × **170M5008**	3 × **170H3004**
NZMN2-M200	Z5-220/FF250	DILM225	3 × **170M5008**	3 × **170H3004**

Technical specifications

		Supply voltage U_c		
		24 V AC/DC	120/230 V AC	+24 V
		DS7-340…	DS7-342…	DS7-34D… (SmartWire-DT)
General				
Radio interference level		B	"A" group 1	B
Actuating circuit				
Regulator supply voltage U_s				
Voltage	V	+24 +10%/-15%	120 (-15%) - 230 (+10%)	+24 DC +10%/-15%
Frequency at V AC	Hz	(50/60)	50/60	
Current consumption no-load losses (without device fan)	mA	50	50	50
Current consumption operation (without device fan)	mA	130	100	130
Current consumption peak performance (Close bypass contacts, without device fan)	mA	130	130	130
Fan current consumption (operation)	mA	50	50	50
Control voltage range U_c				
DC operated	V DC	24 +10%/-15%		24 +10%/-15%
AC operated	A DC	24 +10%/-15%	120 (-15%) - 230 (+10%)	
Current consumption per input (+A1, EN)	mA	1.6	4	1.6
Pick-up voltage (High signal)				
DC operated	V DC	17.3 - 27		17.3 - 27
AC operated	V AC	17.3 - 27	~100 - 253	
Drop-out voltage (Low signal)				
DC operated	V DC	0 - 3		0 - 3
AC operated	V AC	0 - 3	0 - 28	
Pick-up time				
DC operated	ms	250		250
AC operated	ms	250	250	
Falling time				
DC operated	ms	350		350
AC operated	ms	~0	350	

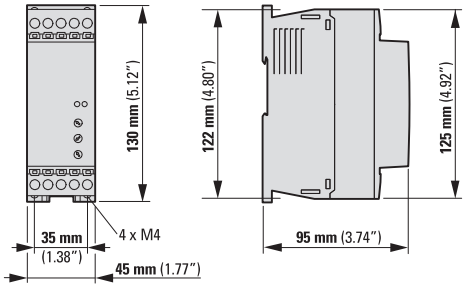
Size	Unit	Frame size 1: 4 - 12 A	Frame size 2: 16 - 32 A	Frame size 3: 41 - 100 A	Frame size 4: 135 - 200 A
General					
Dimensions W x H x D	mm	45 x 130 x 95	45 x 150 x 118	93 x 175 x 139	108 x 215 x 178
Weight	kg	0.35	0.4	1.8	3.7
Terminal capacities					
Cables (box terminal)					
Solid	mm^2	1 x (0.75 - 4) 2 x (0.75 - 2.5)	1 x (0.75 - 16) 2 x (0.75 - 10)	1 x (25 - 70) 2 x (6 - 25)	1 x (4 - 185) 2 x (4 - 70)
Flexible with ferrule	mm^2	1 x (0.75 - 2.5) 2 x (0.75 - 2.5)	1 x (0.75 - 16) 2 x (0.75 - 10)		
Stranded	mm^2		1 x 16 2 x 16	1 x (25 - 70) 2 x (6 - 25)	1 x (4 - 185) 2 x (4 - 70)
Solid or stranded	AWG	1 x (18 - 10) 2 x (18 - 10)	1 x (14 - 8) 2 x (14 - 8)	1 x (12 - 2/0)	1 x (12 - 350) 2 x (12 - 00)
Flat conductor					
minimum	mm			2 x 9 x 0.8	2 x 9 x 0.8
maximum	mm			9 x 9 x 0.8	10 x 16 x 0.8
Tightening torque	Nm	1.2	3.2	9 (> 10 mm^2) 6 (≦ 10 mm^2)	14 (> 10 mm^2) 5 (≦ 10 mm^2)
Control cables					
Solid	mm^2	1 x (0.75 - 4) 2 x (0.75 - 2.5)	1 x (0.75 - 4) 2 x (0.75 - 1.5)	1 x (0.75 - 4) 2 x (0.75 - 1.5)	1 x (0.75 - 4) 2 x (0.75 - 1.5)
Flexible with ferrule	mm^2	1 x (0.75 - 2.5) 2 x (0.75 - 2.5)	1 x (0.75 - 2.5) 2 x (0.75 - 1.5)	1 x (0.75 - 2.5) 2 x (0.75 - 1.5)	1 x (0.75 - 2.5) 2 x (0.75 - 1.5)
Stranded	mm^2				
Solid or stranded	AWG	1 x (18 - 10) 2 x (18 - 10)	1 x (18 - 14) 2 x (18 - 16)	1 x (18 - 14) 2 x (18 - 16)	1 x (18 - 14) 2 x (18 - 16)
Tightening torque	Nm	1.2	0.6	0.6	0.6
Screwdriver (flat blade)	mm	0.6 x 3.5	0.6 x 3.5	0.6 x 3.5	0.6 x 3.5
Actuating circuit					
Relay outputs					
Qty.		1 (TOR)	2 (TOR, RUN/READY)[1)]	2 (TOR, RUN/READY)[1)]	2 (TOR, RUN/READY)[1)]
Max. voltage range	V AC/DC	= U_s	250	250	250
Max. load current	A	1	1	1	1

Notes [1)] Does not apply for soft starter DS7 with SmartWire-DT (DS7-…-D).

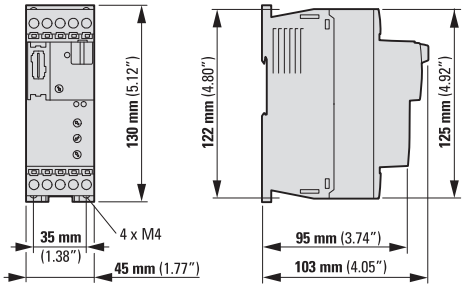
Dimensions and weights

Frame size 1

Dimension drawing DS7 without SWD – Size 1 (up to 12 A)



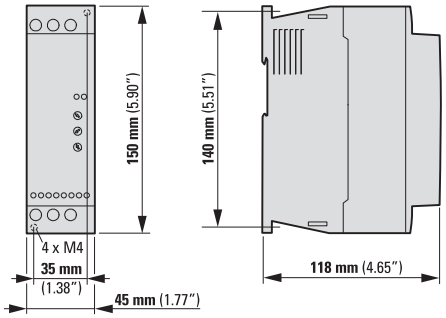
Dimension drawing DS7 with SWD – Size 1 (up to 12 A)



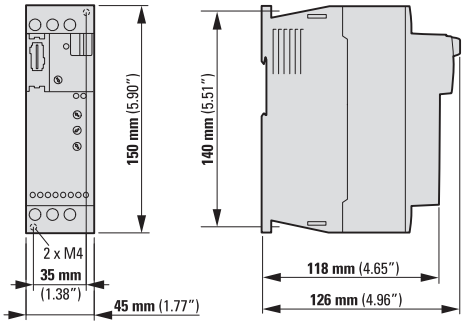
DS7-34…SX…	Ø	Weight
	mm	kg
…003…	4	DS7-340…: 0.3
…004…		DS7-340…: 0.3
…005…		DS7-34D…-D: 0.33
…007…		
…009…		
…012…		

Frame size 2

Dimension drawing for DS7 without SWD – Size 2 (16 - 32 A)



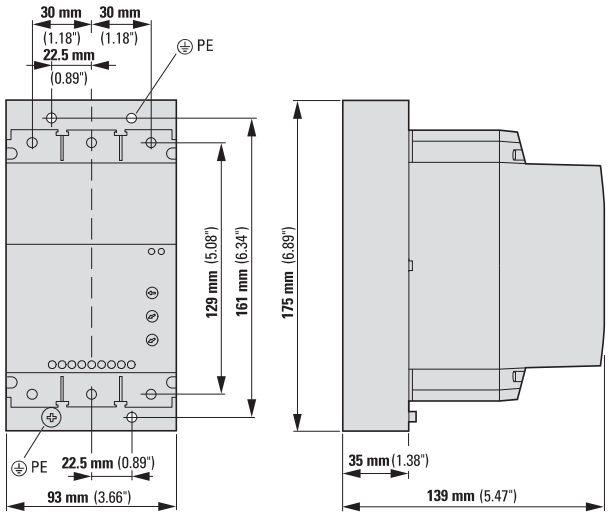
Dimension drawing for DS7 with SWD – Size 2 (16 - 32 A)



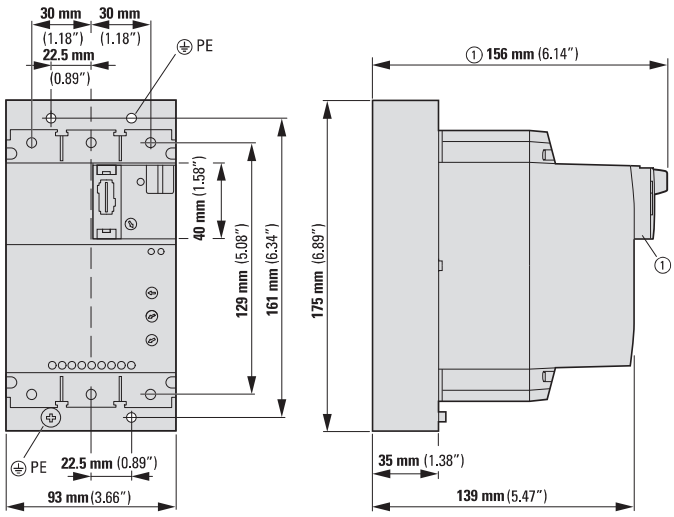
DS7-34…SX…	Ø	Weight
	mm	kg
…016…	4	0.4
…024…		
…032…		

Frame size 3

Dimension drawing for DS7 without SWD – Size 3 (41 - 100 A)



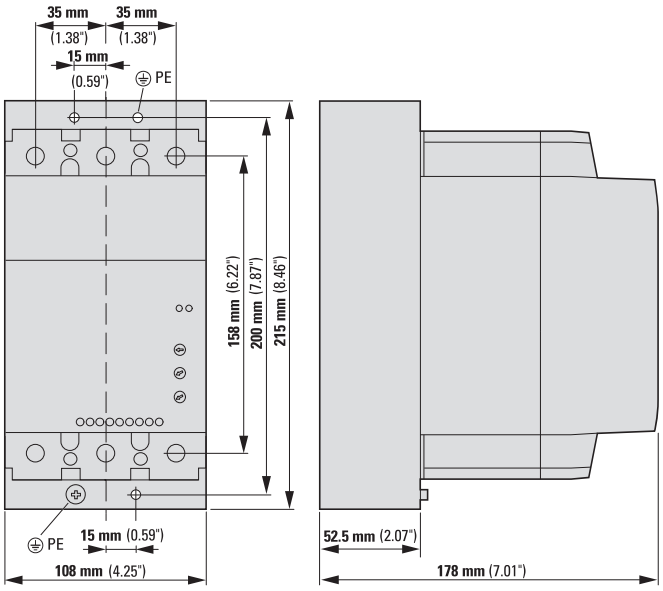
Dimension drawing for DS7 with SWD – Size 3 (41 - 100 A)



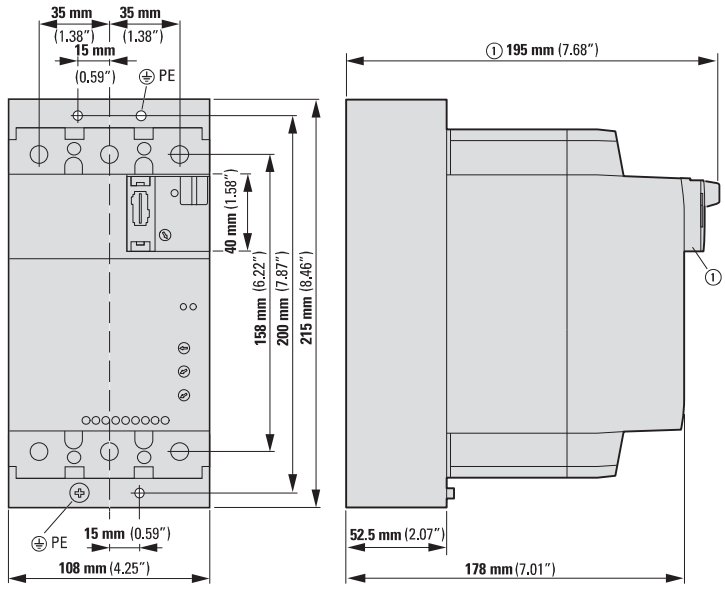
DS7-34…SX…	Ø	Weight
	mm	kg
…036…	4	1.8
…041…		
…055…		
…070…		
…081…		
…100…		

Frame size 4

Dimension drawing for DS7 without SWD – Size 4 (135 - 200 A)



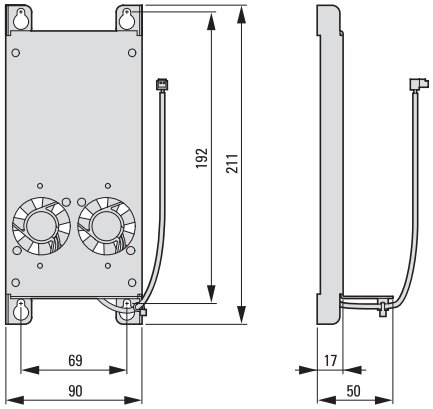
Dimension drawing for DS7 with SWD – Size 4 (135 - 200 A)



DS7-34…SX…	Ø	Weight
	mm	kg
…135…	5	3.4
…160…		
…200…		

DS7-FAN-... device fan

DS7-FAN-100



DS7-FAN-200

