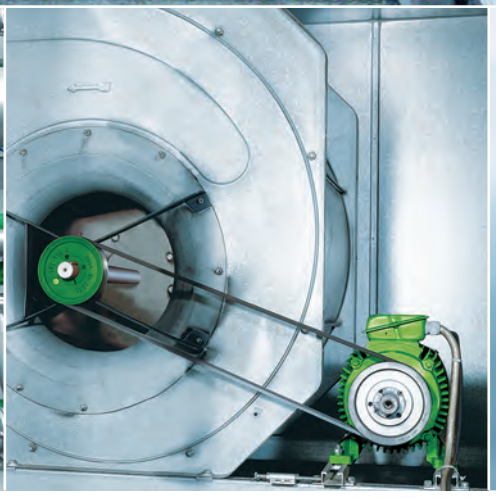
DC1, DA1 variable frequency drives
DS7 soft starters
Rapid Link 4.0 distributed, electronic drive system

Product range catalog

Efficient Engineering for starting and controlling motors.



EATON
Powering Business Worldwide

Powering Business Worldwide

There's a certain energy at Eaton. An energy produced by the combination of globally established engineering companies into one brand. One brand that cleverly and efficiently meets all your requirements in the field of power management and industrial automation. Energy for our customers worldwide – That's what we mean by 'Powering Business Worldwide'. From power distribution and control to industrial automation right through to uninterruptible power supply.

Eaton helps you to manage your entire power system proactively and efficiently. For this we offer you electrical solutions that make your applications safer, more reliable and highly efficient. Visit us at www.eaton.com/electrical.

Contents


Aerospace


Truck

Powering Business Worldwide

Discover Eaton – a leader in the power management field

Since 1911, when our company began trading as a small truck parts supplier, Eaton® Corporation has come a long way. Today, as a diversified power management company, Eaton has sales of $16 billion USD (FY 2011), employs 73,000 people and has customers in more than 150 countries. Everyday, we help companies across the world to manage power, and do more, while consuming less energy.

Eaton's innovative products, solutions and technologies are designed to help customers to manage power and conserve resources while working more productively, safely and sustainably. Our integrated and diversified business strategy ensures that we remain at the forefront of our industry, decade after decade.

Aerospace

A leading global supplier to commercial and military aviation and aerospace industries. An extensive technology portfolio includes hydraulic systems, fuel systems, motion control systems, propulsion sub-systems, cockpit controls and displays and fluid health monitoring systems. Our products improve fuel economy, aircraft performance, reliability and safety.

Truck

A leader in the design, manufacture and marketing of complete line of drivetrain systems and components for medium- and heavy-duty commercial vehicles. Under the "Roadranger" brand, Eaton also markets lubricants, safety products and service tools. Eaton's hybrid power systems have earned the company recognition as a global leader in alternative power for commercial vehicles.

Electrical

A global leader in electrical control, power distribution, uninterruptible power supply and industrial automation products and services. Our products provide customer-driven PowerChain Management® solutions to serve the power system needs of the industrial, institutional, government, utility, commercial, residential, IT, mission critical and OEM markets worldwide.

EATON
Powering Business Worldwide


Electrical


Automotive


Hydraulics

Powering business more sustainably

Sustainability – smaller footprint in the world

The principle of sustainability means meeting the current needs of our own society without compromising the needs or options of future generations. It is a principle, which forms the very core of our design and production philosophy and guides all our activities across the world. Our commitment to reducing our own ecological footprint covers a wide range of green technologies, products and services that help our customers utilise electrical power more efficiently, while improving environmental performance.

Automotive

A supplier of critical components that reduce emissions and fuel consumption and improve stability and performance of cars, light trucks and commercial vehicles. Principal products include engine valves and valve train components, transmission and engine controls, supercharger, locking and limited slip differentials, cylinder heads, fluid conveyance components, body mouldings and spoilers.

Hydraulics

A worldwide leader in reliable, high-efficiency hydraulic systems and components for use in mobile and industrial applications. Markets include agriculture, construction, mining, forestry, utility, material handling, earth moving, truck and bus, machine tools, moulding, primary metals, automotive, power generation, port machinery and entertainment.

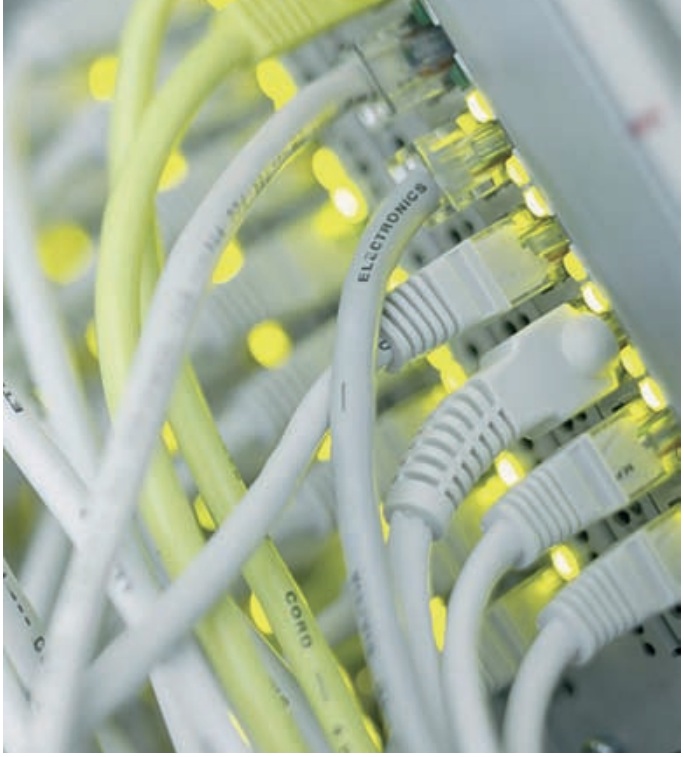
2012 WORLD'S MOST ETHICAL COMPANIES WWW.ETHISPHERE.COM

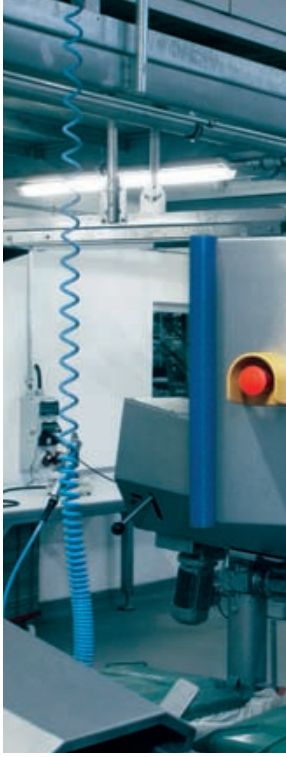
Eaton has been recognised throughout the world for its uncompromising business ethics. For example, it was listed as one of the 'World's Most Ethical Companies' on the Ethisphere Institute's annual list for six consecutive years (2007, 2008, 2009, 2010, 2011 and 2012).

An Eaton Green Solution

Learn more about Eaton Green Solutions at **www.eaton.com/greensolutions**

When you see this symbol, you know the solution represents an Eaton benchmark for environmental performance.





Powering electrical systems worldwide

Buildings

- Residential
- Healthcare
- Education
- Commercial offices
- Retail
- Public sector
- Airports

- Electrical distribution solutions for safe and efficient power delivery
- Power quality systems for uptime and reliability
- Power metering and monitoring to add intelligence and save costs
- Industrial control products for HVAC applications

Information Technology

- Data centers
- Telecommunication
- Networks
- Computer rooms

- World's most efficient line of UPSs to reduce footprint and save energy
- Reliable power systems with inherent redundancy to improve availability
- Power metering and monitoring to diagnose problems and lower costs
- Local service and support for quick response

Public and private sectors

Buildings, Information Technology, Industrial & Machinery, Energy & Utilities
We provide reliable, efficient and safe power management.

Industrial & Machinery

- Machine building:
  - Food and packaging machines
  - Woodworking and processing machines
- Agriculture
- Construction
- Mining and metals
- Paper industry
- Chemical and pharmaceutical industry
- Automotive industry
- Logistics centers

- Electrical distribution equipment to deliver power throughout the enterprise
- Control & automation and power quality equipment for process control
- Power metering and monitoring to manage energy costs and uptime
- Power and motion control products to optimize productivity, reliability, safety and operator comfort

Energy & Utilities

- Renewable energy:
  - Solar
  - Wind
  - Hydropower
- Traditional energy:
  - Oil
  - Gas
- Smart grid
- Water and waste water

- Electrical balance of system and turnkey services for residential, utility and commercial solar installations
- Power distribution equipment, control components and system installations services
- Network power grid technology for intelligent data, lower costs and crew/public safety

PowerXL™ DC1, DA1 variable frequency drives

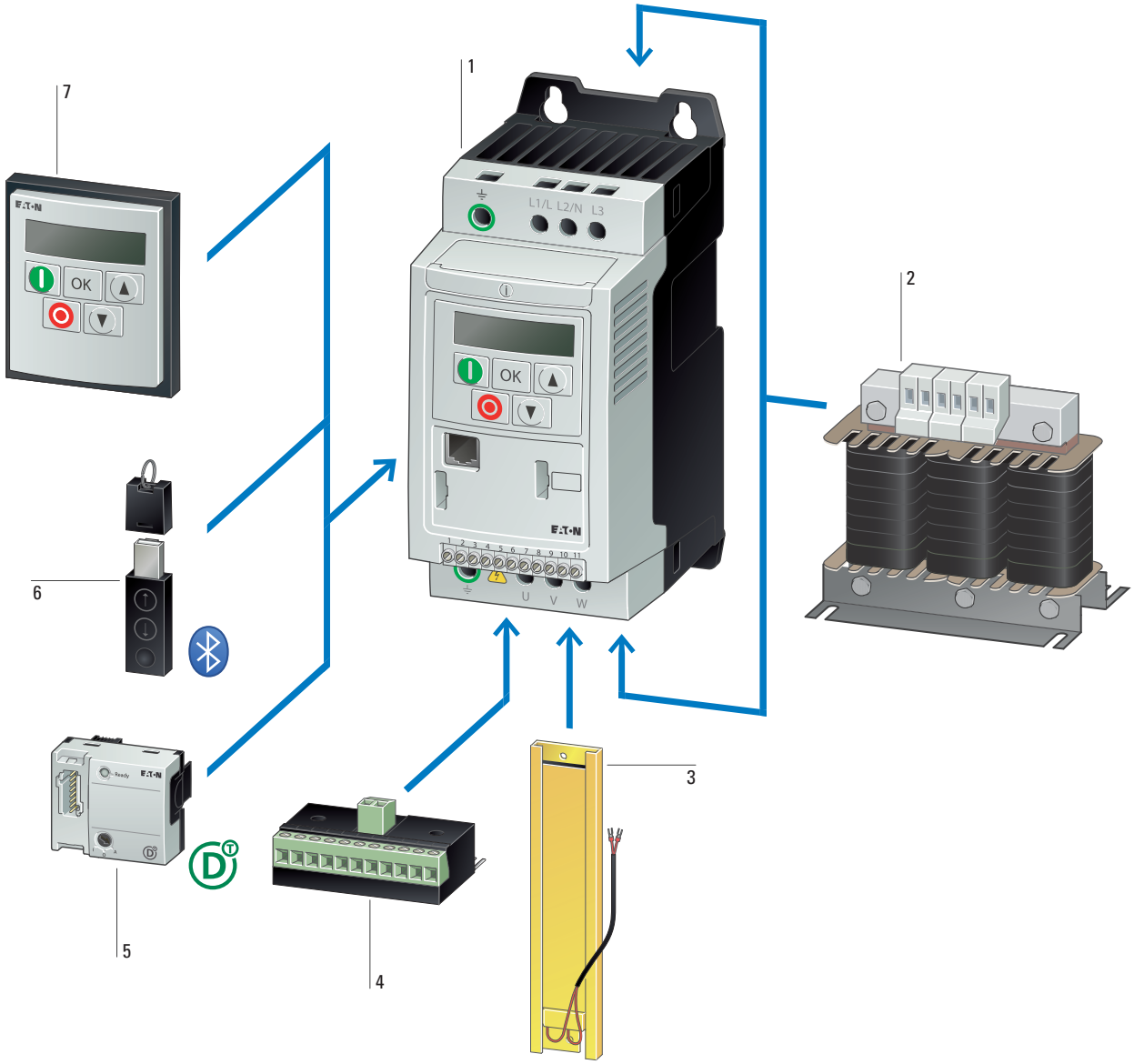
Variable frequency drives make it possible to use continuously variable speed control with three-phase asynchronous motors and AC motors. To do this, they convert a single-phase AC current or three-phase current with a specific frequency and voltage amplitudes into a single-phase AC current or three-phase current with a variable frequency and variable voltage amplitudes.

With its DC1 and DA1 series, Eaton has just the right variable frequency drives for any series production application in the field of machine building and beyond, regardless of whether your needs are extremely simple or extremely complex.

PowerXL™ DC1 variable frequency drives
Output voltage with sinusoidal pulse-width modulation (PWM) when using Volts-per-Hertz control (V/Hz control) and voltage boost
DC1-12…: 1~230 V/3~230 V, allocated motor rating 0.37 – 4 kW
DC1-32…: 3~230 V/3~230 V, allocated motor rating 0.37 – 4 kW
DC1-34…: 3~400 V/3~400 V, allocated motor rating 0.75 – 11 kW
DC1-S2…: 1~230 V/1~230 V, allocated motor rating 0.37 – 1.1 kW
DC1-S1…: 1~115 V/1~115 V, allocated motor rating 0.37 – 0.55 kW
DC1-1D…: 1~115 V/3~230 V, voltage doubler, allocated motor rating 0.37 – 1.1 kW

PowerXL™ DA1 variable frequency drives
Output voltage with sinusoidal pulse-width modulation (PWM) when using Volts-per-Hertz control (V/Hz control) and sensorless (SLVC) and sensored vector control
DA1-12…: 1~230 V/3~230 V, allocated motor rating 0.75 – 2.2 kW
DA1-32…: 3~230 V/3~230 V, allocated motor rating 0.75 – 75 kW
DA1-34…: 3~400 V/3~400 V, allocated motor rating 0.75 – 250 kW

System overview



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Expansion modules → page 27	4
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External keypad → page 26	7

Description

The DC1 is Eaton's compact variable frequency drive. It has been specifically designed for simple applications. With only 14 basic parameters and outstanding ease of mounting and installation, the DC1 is perfect for quick commissioning. This makes these compact variable frequency drives ideal for series production applications in the field of machine building.

Typical applications for this series include fans, pumps, and conveyor systems. In addition, additional parameters and functionalities can be flexibly enabled in order to allow the DC1 to handle more demanding applications as well.

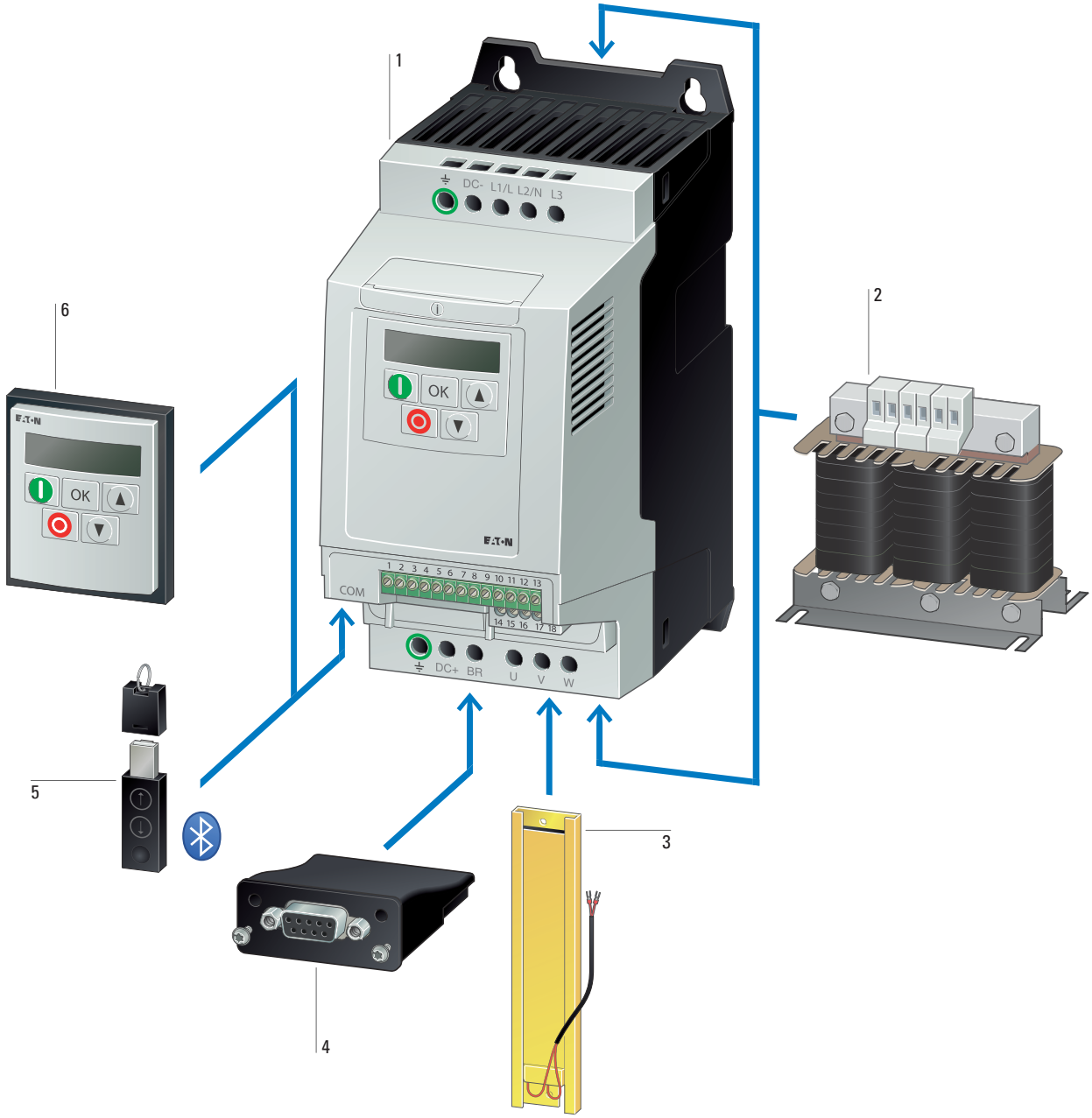
Essential features

- Fast commissioning with 14 basic parameters
- Performance range
  - 0.37 - 4 kW (1~ 230 V / 3~ 230 V)
  - 0.37 - 4 kW (3~ 230 V / 3~ 230 V)
  - 0.75 - 11kW (3~ 400 V / 3~ 400 V)
  - 0.37 - 1.1 kW (1~230 V / 1~230 V)
  - 0.37 - 0.55 kW (1~ 115 V / 1~ 115 V)
  - 0.37 - 1.1 kW (1~ 115 V / 3~ 230 V)
- Large overload capability: 150% for 60 seconds, 175% for 2 seconds
- Ambient air temperature of 50°C without derating (IP20)
- Plug-in modules can be used to expand the number of I/Os
- Integrated CANopen® and Modbus RTU
- Can be connected to SmartWire-DT
- Ingress protection: IP 20
- EMC filter, optional
- Braking transistor, optional
- Integrated PI controller
- V/Hz control with voltage boost
- International standards (CE, UL, cUL, c-Tick, Ukr Sepro, RoHS)

Accessories

- Field bus module SmartWire-DT
- I/O expansions
- External keypad for the panel door
- Mains chokes
- Motor chokes
- Sine filter
- Braking resistances

System overview



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Mains choke, motor choke, sine filter → page 28, → page 29	2
Braking resistance → page 26	3
Fieldbus modules → page 27	4
Bluetooth communication stick → page 26	5
External keypad → page 26	6

Description

DA1 variable frequency drives are the perfect match for demanding, speed-dependent applications. Their wide performance range of up to 250 kW, together with their compact dimensions and high level of functionality, are sure to leave a lasting impression. Accordingly, the DA1 comes with an integrated EMC filter and braking transistor. Moreover, the Modbus RTU and CANopen protocols are integrated as standard. With sensorless vector control, the DA1 is able to provide 200% torque at zero revolutions. This makes it the perfect choice for applications that involve lifting or tractive forces. Comprehensive expansions such as additional inputs and outputs (analog, digital) and various field bus modules round off this variable frequency drive's flexibility.

Essential features

- Performance range:
  – 0.75 - 2.2 kW (1~ 230 V / 3~ 230 V)
  – 0.75 - 75 kW (3~ 230 V / 3~ 230 V)
  – 0.75 - 250 kW (3~ 400 V / 3~ 400 V)
- Large overload capability: 150% for 60 seconds, 200% for 4 seconds
- Modbus RTU and integrated CANopen®
- EMC filter, integrated
- Braking transistor, integrated
- Control method: V/Hz control, sensorless vector control, vector control with encoder
- Various I/O expansions
- Optional fieldbus module adapter
- Safe Torque Off (STO)
- Optional high-resolution OLED display
- Can be used to drive high-efficiency PM motors
- International standards (CE, UL, cUL, c-Tick, Ukr Sepro, RoHS)

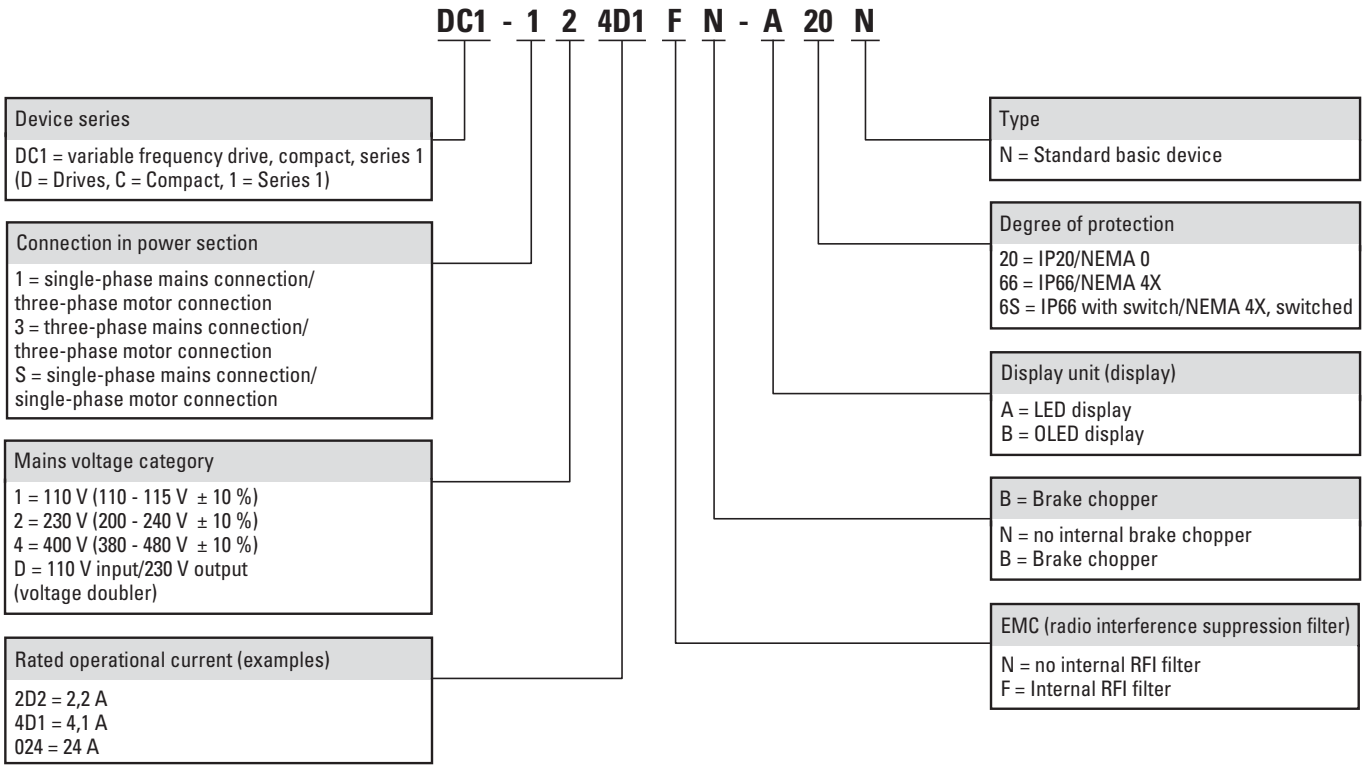
Accessories

- Field bus module SmartWire-DT
- Field bus modules (PROFIBUS, PROFINET, Ethernet/IP, EtherCat, Modbus TCP, BACnet, and DeviceNet)
- I/O expansions
- External keypad for the panel door
- Mains chokes
- Motor chokes
- Sine filter
- Braking resistances

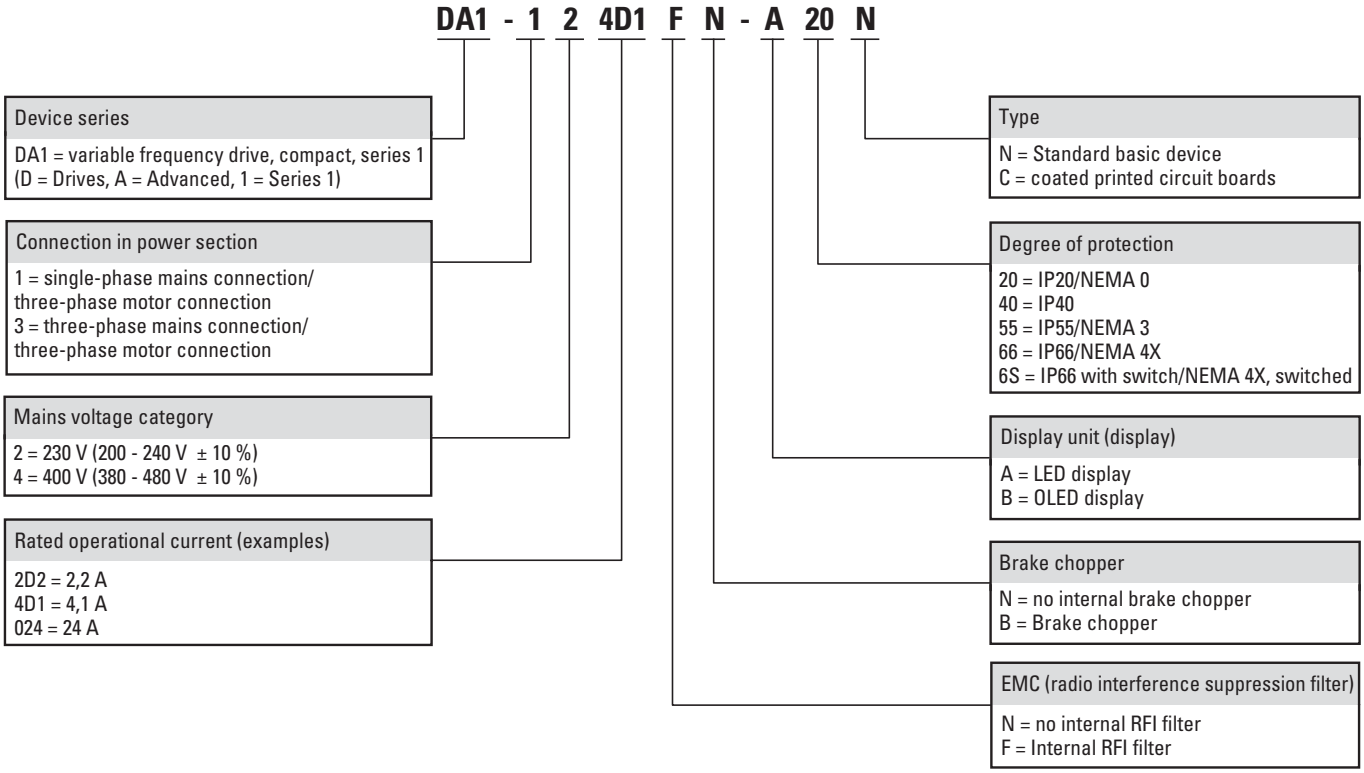
Technical overview

			DC1...	DA1...
Rated operational voltage	U_e			
115 V AC, 1-phase			✓	-
230 V AC, 1-phase			✓	✓
230 V AC, 3-phase			✓	✓
400 V AC, 3-phase			✓	✓
Supply frequency	f_{LN}	Hz	50/60	50/60
Rated operational current	I_e	A	2.3 - 24	2.2 - 450
Overload current for 60 s every 600 s	I_L	%	150	150
Starting current for 2 s every 20 s	I_L	%	175	-
Starting current for 4 s every 40 s	I_L	%	-	200
Assigned motor rating				
at 115 V, 50 Hz	P	kW	0.37 - 0.5	-
at 230 V, 50 Hz	P	kW	0.37 - 4	0.75 - 75
at 400 V, 50 Hz	P	kW	0.75 - 11	0.75 - 250
Ambient temperature				
Operation		°C		
IP20/NEMA 0			-10 - +50	-10 - +50
IP40			-	-10 - +30
IP55			-	-10 - +30 / -10 - +40 (I_e < 180 A)
Storage		°C	-40 - +60	-40 - +60
Operation Mode				
U/f control			✓	✓
Slip compensation			✓	✓
sensorless vector control (SLV)			-	✓
Vector control with feedback (CLV)			-	✓
Switching frequency	f_{PWM}	kHz	4 - 32	4 - 32
Output voltage	U_2			
115 V AC, 1-phase			✓	-
230 V AC, 1-phase			✓	-
230 V AC, 3-phase			✓	✓
400 V AC, 3-phase			✓	✓
Output Frequency	f_2	Hz	0 - 500 Hz	0 - 500 Hz
Protection type				
IP20/NEMA 0			✓	✓
IP40			-	✓
IP55			-	✓
Fitted with				
Radio interference suppression filter			✓	✓
Brake chopper			✓	✓
Additional PCB protection			-	✓
7-digital display assembly			✓	✓
OLED display			-	✓
Interface			RS485/Modbus RTU, CANopen®	RS485/Modbus RTU, CANopen®
Fieldbus connection			SmartWire-DT	Ethernet IP DeviceNet PROFIBUS PROFINET Modbus/TCP EtherCAT BACnet/IP SmartWire-DT
Analog inputs			parameterizable, max. 2 x (0 - 10 V, 0/4 - 20 mA)	parameterizable, 2 x (0 - 10 V, 0/4 - 20 mA)
Analog outputs			parameterizable, 1 x (0 - 10 V, 0/4 - 20 mA)	parameterizable, max. 2 x (0 - 10 V, 0/4 - 20 mA)
Digital inputs			parameterizable, max. 4 x (max. 30 V DC)	parameterizable, 3 x (max. 30 V DC)
Digital outputs			parameterizable, 1 x (24 V DC)	parameterizable, max. 2 x (24 V DC)
Relay outputs			parameterizable, 1 x N/O, 6 A (250 V AC) / 5 A (30 V DC)	parameterizable, 1 x N/O and 1 x changeover contact, 6 A (250 V AC) / 5 A (30 V DC)
Production quality			RoHS, ISO 9001	RoHS, ISO 9001
Safety functions			-	STO (Safe Torque Off)
Standards			EMC: EN 61800-3:2004+A1-2012 Radio interference: EN 55011: 2010 Security: EN 61800-5: 2007 Protection type: EN 60529: 1992	EMC: EN 61800-3:2004+A1-2012 Radio interference: EN 55011: 2010 Security: EN 61800-5: 2007 Protection type: EN 60529: 1992
Certifications			CE, cUL, UL, c-Tick, Ukr Sepro	CE, cUL, UL, c-Tick, Ukr Sepro

DC1 variable frequency drives

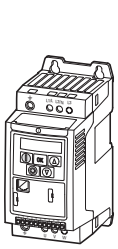


DA1 variable frequency drives

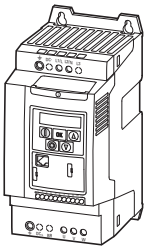


Size	Rated operational current[1] I_e A	Assigned motor rating [2] P kW	Rated motor current I_e A	Fitted with 7-digital display assembly	Brake chopper	Radio interference suppression filter	Protection type	**Part no.** Article no.	**Price** see price list	Std. pack
U_e 115 V AC, 1-phase / U_2 115 V AC, 1-phase										
Mains voltage IEC (50/60Hz) U_{LN} 110 (-10%) - 115 (+10%) V Interface RS485/Modbus RTU, CANopen®										
FS1	7	0.37	7	✓	-	-	IP20/NEMA 0	**DC1-S17D0NN-A20N** 169497		1 off
FS2	10.5	0.5	10.5	✓	✓	-	IP20/NEMA 0	**DC1-S1011NB-A20N** 169500		
U_e 230 V AC, 1-phase / U_2 230 V AC, 1-phase										
Mains voltage IEC (50/60Hz) U_{LN} 200 (-10%) - 240 (+10%) V Interface RS485/Modbus RTU, CANopen®										
FS1	4.3	0.37	4.3	✓	-	-	IP20/NEMA 0	**DC1-S24D3NN-A20N** 169512		1 off
FS1	4.3	0.37	4.3	✓	-	✓	IP20/NEMA 0	**DC1-S24D3FN-A20N** 169521		
FS1	7	0.75	7	✓	-	-	IP20/NEMA 0	**DC1-S27D0NN-A20N** 169515		
FS1	7	0.75	7	✓	-	✓	IP20/NEMA 0	**DC1-S27D0FN-A20N** 169524		
FS2	10.5	1.1	10.5	✓	✓	-	IP20/NEMA 0	**DC1-S2011NB-A20N** 169518		
FS2	10.5	1.1	10.5	✓	✓	✓	IP20/NEMA 0	**DC1-S2011FB-A20N** 169527		

Notes



FS1



FS2

[1] Rated operational current at an operating frequency of 4 kHz and an ambient air temperature of +50°C
[2] For AC motors with internal and external ventilation with 50 Hz / 60 Hz

Information relevant for export to North America

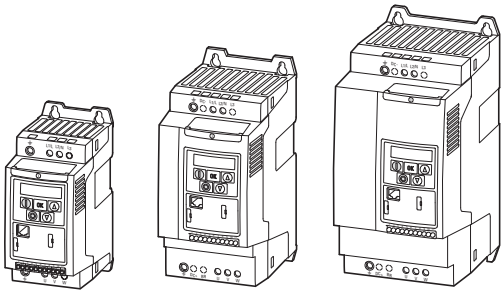
Product Standards	UL 508C; CSA-C22.2 No. 14; IEC/EN61800-3; IEC/EN61800-5; CE marking
UL File No.	E172143
UL CCN	NMMS, NMMS7
CSA File No.	UL report applies to both US and Canada
CSA Class No.	3211-06
NA Certification	UL listed, certified by UL for use in Canada
Suitable for	Branch circuits
Max. Voltage Rating	1~ 240 V AC IEC: TN-S UL/CSA: "Y" (Solidly Grounded Wey)
Degree of Protection	IEC: IP20

Size	Rated operational current[1] I_e A	Assigned motor rating [2] P kW	Rated motor current I_e A	Fitted with: 7-digital display assembly	Fitted with: Brake chopper	Fitted with: Radio interference suppression filter	Protection type	**Part no.** Article no.	**Price** see price list	Std. pack
U_e 115 V AC, 1-phase / U_2 230 V AC, 3-phase										
Mains voltage IEC (50/60Hz) U_{LN} 110 (-10%) - 115 (+10%) V Interface RS485/Modbus RTU, CANopen®										
FS1	2.3	0.37	2	✓	-	-	IP20/NEMA 0	**DC1-1D2D3NN-A20N** 169503		1 off
FS1	4.3	0.75	3.2	✓	-	-	IP20/NEMA 0	**DC1-1D4D3NN-A20N** 169506		
FS2	5.8	1.1	4.6	✓	✓	-	IP20/NEMA 0	**DC1-1D5D8NB-A20N** 169509		
U_e 230 V AC, 1-phase / U_2 230 V AC, 3-phase										
Mains voltage IEC (50/60Hz) U_{LN} 200 (-10%) - 240 (+10%) V Interface RS485/Modbus RTU, CANopen®										
FS1	2.3	0.37	2	✓	-	-	IP20/NEMA 0	**DC1-122D3NN-A20N** 169222		1 off
FS1	2.3	0.37	2	✓	-	✓	IP20/NEMA 0	**DC1-122D3FN-A20N** 169240		
FS1	4.3	0.75	3.2	✓	-	-	IP20/NEMA 0	**DC1-124D3NN-A20N** 169225		
FS1	4.3	0.75	3.2	✓	-	✓	IP20/NEMA 0	**DC1-124D3FN-A20N** 169243		
FS1	7	1.5	6.3	✓	-	-	IP20/NEMA 0	**DC1-127D0NN-A20N** 169228		
FS1	7	1.5	6.3	✓	-	✓	IP20/NEMA 0	**DC1-127D0FN-A20N** 169246		
FS2	7	1.5	6.3	✓	✓	-	IP20/NEMA 0	**DC1-127D0NB-A20N** 169231		
FS2	7	1.5	6.3	✓	✓	✓	IP20/NEMA 0	**DC1-127D0FB-A20N** 169249		
FS2	10.5	2.2	8.7	✓	✓	-	IP20/NEMA 0	**DC1-12011NB-A20N** 169234		
FS2	10.5	2.2	8.7	✓	✓	✓	IP20/NEMA 0	**DC1-12011FB-A20N** 169252		
FS3	15	4	14.8	✓	✓	-	IP20/NEMA 0	**DC1-12015NB-A20N** 169237		
U_e 230 V AC, 3-phase / U_2 230 V AC, 3-phase										
Mains voltage IEC (50/60Hz) U_{LN} 200 (-10%) - 240 (+10%) V Interface RS485/Modbus RTU, CANopen®										
FS1	2.3	0.37	2	✓	-	-	IP20/NEMA 0	**DC1-322D3NN-A20N** 169255		1 off
FS1	4.3	0.75	3.2	✓	-	-	IP20/NEMA 0	**DC1-324D3NN-A20N** 169258		
FS1	7	1.5	6.3	✓	-	-	IP20/NEMA 0	**DC1-327D0NN-A20N** 169261		
FS2	7	1.5	6.3	✓	✓	-	IP20/NEMA 0	**DC1-327D0NB-A20N** 169264		
FS2	7	1.5	6.3	✓	✓	✓	IP20/NEMA 0	**DC1-327D0FB-A20N** 169444		
FS2	10.5	2.2	8.7	✓	✓	-	IP20/NEMA 0	**DC1-32011NB-A20N** 169438		
FS2	10.5	2.2	8.7	✓	✓	✓	IP20/NEMA 0	**DC1-32011FB-A20N** 169447		
FS3	18	4	14.8	✓	✓	-	IP20/NEMA 0	**DC1-32018NB-A20N** 169441		
FS3	18	4	14.8	✓	✓	✓	IP20/NEMA 0	**DC1-32018FB-A20N** 169450		

Notes
[1] Rated operational current at an operating frequency of 4 kHz and an ambient air temperature of +50°C
[2] for normal internally and externally ventilated 4 pole, three-phase asynchronous motors with 1500 rpm^{-1} at 50 Hz or 1800 min^{-1} at 60 Hz

Size	Rated operational current[1] I_e A	Assigned motor rating [2] P kW	Rated motor current I_e A	Fitted with 7-digital display assembly	Fitted with Brake chopper	Fitted with Radio interference suppression filter	Protection type	**Part no.** Article no.	**Price** see price list	Std. pack
U_e 400 V AC, 3-phase / U_2 400 V AC, 3-phase										
Mains voltage IEC (50/60Hz) U_{LN} 380 (-10%) - 480 (+10%) V Interface RS485/Modbus RTU, CANopen®										
FS1	2.2	0.75	1.9	✓	-	-	IP20/NEMA 0	**DC1-342D2NN-A20N** 169453		1 off
FS1	2.2	0.75	1.9	✓	-	✓	IP20/NEMA 0	**DC1-342D2FN-A20N** 169475		
FS1	4.1	1.5	3.6	✓	-	-	IP20/NEMA 0	**DC1-344D1NN-A20N** 169456		
FS1	4.1	1.5	3.6	✓	-	✓	IP20/NEMA 0	**DC1-344D1FN-A20N** 169478		
FS2	4.1	1.5	3.6	✓	✓	-	IP20/NEMA 0	**DC1-344D1NB-A20N** 169459		
FS2	4.1	1.5	3.6	✓	✓	✓	IP20/NEMA 0	**DC1-344D1FB-A20N** 169481		
FS2	5.8	2.2	5	✓	✓	-	IP20/NEMA 0	**DC1-345D8NB-A20N** 169462		
FS2	5.8	2.2	5	✓	✓	✓	IP20/NEMA 0	**DC1-345D8FB-A20N** 169484		
FS2	9.5	4	8.5	✓	✓	-	IP20/NEMA 0	**DC1-349D5NB-A20N** 169465		
FS2	9.5	4	8.5	✓	✓	✓	IP20/NEMA 0	**DC1-349D5FB-A20N** 169487		
FS3	14	5.5	11.3	✓	✓	-	IP20/NEMA 0	**DC1-34014NB-A20N** 169468		
FS3	14	5.5	11.3	✓	✓	✓	IP20/NEMA 0	**DC1-34014FB-A20N** 169490		
FS3	18	7.5	15.2	✓	✓	-	IP20/NEMA 0	**DC1-34018NB-A20N** 169471		
FS3	18	7.5	15.2	✓	✓	✓	IP20/NEMA 0	**DC1-34018FB-A20N** 169493		
FS3	24	11	21.7	✓	✓	-	IP20/NEMA 0	**DC1-34024NB-A20N** 169474		
FS3	24	11	21.7	✓	✓	✓	IP20/NEMA 0	**DC1-34024FB-A20N** 169496		

Notes



FS1 FS2 FS3

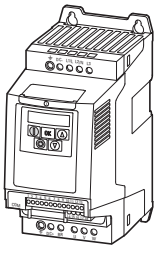
[1] Rated operational current at an operating frequency of 4 kHz and an ambient air temperature of +50°C
[2] for normal internally and externally ventilated 4 pole, three-phase asynchronous motors with 1500 rpm^{-1} at 50 Hz or 1800 min^{-1} at 60 Hz

Information relevant for export to North America

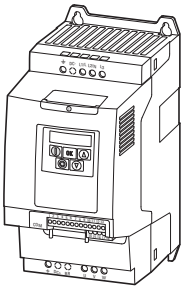
Product Standards	UL 508C; CSA-C22.2 No. 14; IEC/EN61800-3; IEC/EN61800-5; CE marking
UL File No.	E172143
UL CCN	NMMS, NMMS7
CSA File No.	UL report applies to both US and Canada
CSA Class No.	3211-06
NA Certification	UL listed, certified by UL for use in Canada
Suitable for	Branch circuits
Max. Voltage Rating	1~ 240 V AC IEC: TN-S UL/CSA: "Y" (Solidly Grounded Wey)
Degree of Protection	IEC: IP20

Size	Rated operational current[1] I_e A	Assigned motor rating [2] P kW	Rated motor current I_e A	Fitted with: Radio interference suppression filter	Brake chopper	7-digital display assembly	OLED display	Additional PCB protection	Protection type	**Part no.** Article no.	**Price** see price list	Std. pack
U_e 230 V AC, 1-phase / U_2 230 V AC, 3-phase												
Mains voltage IEC (50/60Hz) U_{LN} 200 (-10%) - 240 (+10%) V Interface RS485/Modbus RTU, CANopen®												
FS2	4.3	0.75	3.2	✓	✓	✓	-	-	IP20/NEMA 0	**DA1-124D3FB-A20N** 169152		1 off
FS2	4.3	0.75	3.2	✓	✓	✓	-	✓	IP20/NEMA 0	**DA1-124D3FB-A20C** 169078		
FS2	7	1.5	6.3	✓	✓	✓	-	-	IP20/NEMA 0	**DA1-127D0FB-A20N** 169155		
FS2	7	1.5	6.3	✓	✓	✓	-	✓	IP20/NEMA 0	**DA1-127D0FB-A20C** 169081		
FS2	10.5	2.2	8.7	✓	✓	✓	-	-	IP20/NEMA 0	**DA1-12011FB-A20N** 169158		
FS2	10.5	2.2	8.7	✓	✓	✓	-	✓	IP20/NEMA 0	**DA1-12011FB-A20C** 169084		
U_e 230 V AC, 3-phase / U_2 230 V AC, 3-phase												
Mains voltage IEC (50/60Hz) U_{LN} 200 (-10%) - 240 (+10%) V Interface RS485/Modbus RTU, CANopen®												
FS2	4.3	0.75	3.2	✓	✓	✓	-	-	IP20/NEMA 0	**DA1-324D3FB-A20N** 169161		1 off
FS2	4.3	0.75	3.2	✓	✓	✓	-	✓	IP20/NEMA 0	**DA1-324D3FB-A20C** 169087		
FS2	7	1.5	6.3	✓	✓	✓	-	-	IP20/NEMA 0	**DA1-327D0FB-A20N** 169164		
FS2	7	1.5	6.3	✓	✓	✓	-	✓	IP20/NEMA 0	**DA1-327D0FB-A20C** 169090		
FS2	10.5	2.2	8.7	✓	✓	✓	-	-	IP20/NEMA 0	**DA1-32011FB-A20N** 169167		
FS2	10.5	2.2	8.7	✓	✓	✓	-	✓	IP20/NEMA 0	**DA1-32011FB-A20C** 169093		
FS3	18	4	14.8	✓	✓	✓	-	-	IP20/NEMA 0	**DA1-32018FB-A20N** 169170		
FS3	18	4	14.8	✓	✓	✓	-	✓	IP20/NEMA 0	**DA1-32018FB-A20C** 169096		

Notes



FS2



FS3

[1] With a switching frequency of 4 kHz and an ambient air temperature of +40°C or +50°C for IP20/NEMA 0

[2] Assigned motor rating for normal internally and externally ventilated four-pole, three-phase asynchronous motors with 1500 rpm (at 50 Hz) or 1800 rpm (at 60 Hz)

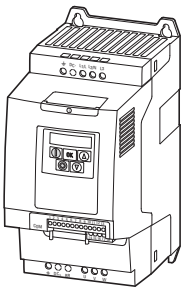
Information relevant for export to North America

Product Standards	UL 508C; CSA-C22.2 No. 14; IEC/EN61800-3; IEC/EN61800-5; CE marking
UL File No.	E172143
UL CCN	NMMS, NMMS7
CSA File No.	UL report applies to both US and Canada
CSA Class No.	3211-06
NA Certification	UL listed, certified by UL for use in Canada
Suitable for	Branch circuits
Max. Voltage Rating	1~ 240 V AC IEC: TN-S UL/CSA: "Y" (Solidly Grounded Wey)
Degree of Protection	IEC: IP20

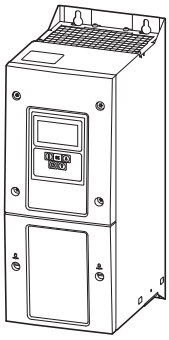
Size	Rated operational current[1] I_e A	Assigned motor rating[2] P kW	Rated motor current I_e A	Fitted with: Radio interference suppression filter	Brake chopper	7-digital display assembly	OLED display	Additional PCB protection	Protection type	Part no. Article no.	Price see price list	Std. pack
U_e 230 V AC, 3-phase / U_2 230 V AC, 3-phase												
Mains voltage IEC (50/60Hz) U_{LN} 200 (-10%) - 240 (+10%) V Interface RS485/Modbus RTU, CANopen®												
FS4	24	5.5	19.6	✓	✓	-	✓	✓	IP55	**DA1-32024FB-B55C** 169361		1 off
FS4	24	5.5	19.6	✓	✓	✓	-	✓	IP55	**DA1-32024FB-A55C** 169100		
FS3	24	5.5	19.6	✓	✓	✓	-	✓	IP20/NEMA 0	**DA1-32024FB-A20C** 169099		
FS4	24	5.5	19.6	✓	✓	-	✓	-	IP55	**DA1-32024FB-B55N** 169294		
FS4	24	5.5	19.6	✓	✓	✓	-	-	IP55	**DA1-32024FB-A55N** 169174		
FS4	39	7.5	26.5	✓	✓	✓	-	-	IP55	**DA1-32039FB-A55N** 169175		
FS4	39	7.5	26.4	✓	✓	✓	-	✓	IP55	**DA1-32039FB-A55C** 169101		
FS4	39	7.5	26.4	✓	✓	-	✓	-	IP55	**DA1-32039FB-B55N** 169295		
FS4	39	7.5	26.4	✓	✓	-	✓	✓	IP55	**DA1-32039FB-B55C** 169362		
FS4	46	11	38	✓	✓	-	✓	-	IP55	**DA1-32046FB-B55N** 169296		
FS4	46	11	38	✓	✓	-	✓	✓	IP55	**DA1-32046FB-B55C** 169363		
FS4	46	11	38	✓	✓	✓	-	-	IP55	**DA1-32046FB-A55N** 169176		
FS4	46	11	38	✓	✓	✓	-	✓	IP55	**DA1-32046FB-A55C** 169102		
FS5	61	15	51	✓	✓	-	✓	-	IP55	**DA1-32061FB-B55N** 169297		
FS5	61	15	51	✓	✓	-	✓	✓	IP55	**DA1-32061FB-B55C** 169364		
FS5	61	15	51	✓	✓	✓	-	-	IP55	**DA1-32061FB-A55N** 169177		
FS5	61	15	51	✓	✓	✓	-	✓	IP55	**DA1-32061FB-A55C** 169103		
FS5	72	18.5	63	✓	✓	-	✓	-	IP55	**DA1-32072FB-B55N** 169298		
FS5	72	18.5	63	✓	✓	-	✓	✓	IP55	**DA1-32072FB-B55C** 169365		
FS5	72	18.5	63	✓	✓	✓	-	-	IP55	**DA1-32072FB-A55N** 169178		
FS5	72	18.5	63	✓	✓	✓	-	✓	IP55	**DA1-32072FB-A55C** 169104		
FS6	90	22	71	✓	-	-	✓	-	IP55	**DA1-32090FN-B55N** 169299		
FS6	90	22	71	✓	✓	✓	-	-	IP55	**DA1-32090FB-A55N** 169180		
FS6	90	22	71	✓	-	✓	-	✓	IP55	**DA1-32090FN-A55C** 169105		
FS6	90	22	71	✓	✓	✓	-	✓	IP55	**DA1-32090FB-A55C** 169106		
FS6	90	22	71	✓	✓	-	✓	✓	IP55	**DA1-32090FB-B55C** 169367		
FS6	90	22	71	✓	-	-	✓	✓	IP55	**DA1-32090FN-B55C** 169366		
FS6	90	22	71	✓	-	✓	-	-	IP55	**DA1-32090FN-A55N** 169179		
FS6	90	22	71	✓	✓	-	✓	-	IP55	**DA1-32090FB-B55N** 169300		
FS6	110	30	96	✓	✓	-	✓	✓	IP55	**DA1-32110FB-B55C** 169369		
FS6	110	30	96	✓	✓	✓	-	-	IP55	**DA1-32110FB-A55N** 169182		
FS6	110	30	96	✓	✓	✓	-	✓	IP55	**DA1-32110FB-A55C** 169108		

Size	Rated operational current[1] I_e A	Assigned motor rating [2] P kW	Rated motor current I_e A	Fitted with: Radio interference suppression filter	Brake chopper	7-digital display assembly	OLED display	Additional PCB protection	Protection type	**Part no.** Article no.	**Price** see price list	Std. pack
U_e 230 V AC, 3-phase / U_2 230 V AC, 3-phase												
Mains voltage IEC (50/60Hz) U_{LN} 200 (-10%) - 240 (+10%) V Interface RS485/Modbus RTU, CANopen®												
FS6	110	30	96	✓	-	✓	-	✓	IP55	**DA1-32110FN-A55C** 169107		1 off
FS6	110	30	96	✓	✓	-	✓	-	IP55	**DA1-32110FB-B55N** 169302		
FS6	110	30	96	✓	-	-	✓	-	IP55	**DA1-32110FN-B55N** 169301		
FS6	110	30	96	✓	-	✓	-	-	IP55	**DA1-32110FN-A55N** 169181		
FS6	110	30	96	✓	-	-	✓	✓	IP55	**DA1-32110FN-B55C** 169368		
FS6	150	45	141	✓	-	✓	-	-	IP55	**DA1-32150FN-A55N** 169183		
FS6	150	45	141	✓	-	-	✓	-	IP55	**DA1-32150FN-B55N** 169303		
FS6	150	45	141	✓	-	✓	-	✓	IP55	**DA1-32150FN-A55C** 169109		
FS6	150	45	141	✓	-	-	✓	✓	IP55	**DA1-32150FN-B55C** 169370		
FS6	150	45	141	✓	✓	✓	-	-	IP55	**DA1-32150FB-A55N** 169184		
FS6	150	45	141	✓	✓	-	✓	✓	IP55	**DA1-32150FB-B55C** 169371		
FS6	150	45	141	✓	✓	✓	-	✓	IP55	**DA1-32150FB-A55C** 169110		
FS6	150	45	141	✓	✓	-	✓	-	IP55	**DA1-32150FB-B55N** 169304		

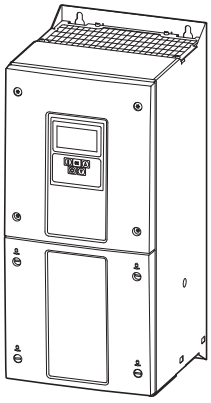
Notes



FS3



FS4



FS5

[1] With a switching frequency of 4 kHz and an ambient air temperature of +40°C or +50°C for IP20/NEMA 0

[2] Assigned motor rating for normal internally and externally ventilated four-pole, three-phase asynchronous motors with 1500 rpm (at 50 Hz) or 1800 rpm (at 60 Hz)

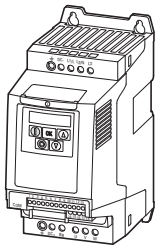
Information relevant for export to North America

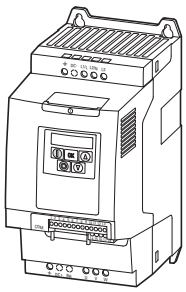
Product Standards	UL 508C; CSA-C22.2 No. 14; IEC/EN61800-3; IEC/EN61800-5; CE marking
UL File No.	E172143
UL CCN	NMMS, NMMS7
CSA File No.	UL report applies to both US and Canada
CSA Class No.	3211-06
NA Certification	UL listed, certified by UL for use in Canada
Suitable for	Branch circuits
Max. Voltage Rating	1~ 240 V AC IEC: TN-S UL/CSA: "Y" (Solidly Grounded Wey)
Degree of Protection	IEC: IP20

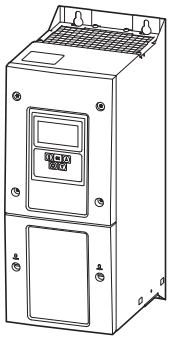
Size	Rated operational current[1] I_e A	Assigned motor rating [2] P kW	Rated motor current I_e A	Fitted with: Radio interference suppression filter	Brake chopper	7-digital display assembly	OLED display	Additional PCB protection	Protection type	**Part no.** Article no.	**Price** see price list	Std. pack
U_e 230 V AC, 3-phase / U_2 230 V AC, 3-phase												
Mains voltage IEC (50/60Hz) U_{LN} 200 (-10%) - 240 (+10%) V Interface RS485/Modbus RTU, CANopen®												
FS6	180	55	173	✓	-	-	✓	-	IP55	**DA1-32180FN-B55N** 169305		1 off
FS6	180	55	173	✓	-	✓	-	-	IP55	**DA1-32180FN-A55N** 169185		
FS6	180	55	173	✓	-	-	✓	✓	IP55	**DA1-32180FN-B55C** 169372		
FS6	180	55	173	✓	✓	-	✓	-	IP55	**DA1-32180FB-B55N** 169306		
FS6	180	55	173	✓	-	✓	-	✓	IP55	**DA1-32180FN-A55C** 169111		
FS6	180	55	173	✓	✓	✓	-	-	IP55	**DA1-32180FB-A55N** 169186		
FS6	180	55	173	✓	✓	✓	-	✓	IP55	**DA1-32180FB-A55C** 169112		
FS6	180	55	173	✓	✓	-	✓	✓	IP55	**DA1-32180FB-B55C** 169373		
FS7	202	55	173	✓	-	✓	-	-	IP55	**DA1-32202FN-A55N** 169187		
FS7	202	55	173	✓	-	-	✓	-	IP55	**DA1-32202FN-B55N** 169307		
FS7	202	55	173	✓	✓	-	✓	-	IP55	**DA1-32202FB-B55N** 169308		
FS7	202	55	173	✓	-	✓	-	✓	IP55	**DA1-32202FN-A55C** 169113		
FS7	202	55	173	✓	-	-	✓	✓	IP55	**DA1-32202FN-B55C** 169374		
FS7	202	55	173	✓	✓	✓	-	-	IP55	**DA1-32202FB-A55N** 169188		
FS7	202	55	173	✓	✓	-	✓	✓	IP55	**DA1-32202FB-B55C** 169375		
FS7	202	55	173	✓	✓	✓	-	✓	IP55	**DA1-32202FB-A55C** 169114		
FS7	248	75	233	✓	-	✓	-	-	IP55	**DA1-32248FN-A55N** 169189		
FS7	248	75	233	✓	-	-	✓	-	IP55	**DA1-32248FN-B55N** 169309		
FS7	248	75	233	✓	✓	✓	-	-	IP55	**DA1-32248FB-A55N** 169190		
FS7	248	75	233	✓	✓	-	✓	-	IP55	**DA1-32248FB-B55N** 169310		
FS7	248	75	233	✓	-	-	✓	✓	IP55	**DA1-32248FN-B55C** 169376		
FS7	248	75	233	✓	-	✓	-	✓	IP55	**DA1-32248FN-A55C** 169115		
FS7	248	75	233	✓	✓	-	✓	✓	IP55	**DA1-32248FB-B55C** 169377		
FS7	248	75	233	✓	✓	✓	-	✓	IP55	**DA1-32248FB-A55C** 169116		

Size	Rated operational current[1] I_e A	Assigned motor rating[2] P kW	Rated motor current I_e A	Fitted with: Radio interference suppression filter	Brake chopper	7-digital display assembly	OLED display	Additional PCB protection	Protection type	Part no. Article no.	Price see price list	Std. pack
U_e 400 V AC, 3-phase / U_2 400 V AC, 3-phase												
Mains voltage IEC (50/60Hz) U_{LN} 380 (-10%) - 480 (+10%) V Interface RS485/Modbus RTU, CANopen®												
FS2	2.2	0.75	1.9	✓	✓	✓	-	-	IP20/NEMA 0	**DA1-342D2FB-A20N** 169191		1 off
FS2	2.2	0.75	1.9	✓	✓	✓	-	✓	IP20/NEMA 0	**DA1-342D2FB-A20C** 169117		
FS2	4.1	1.5	3.6	✓	✓	✓	-	-	IP20/NEMA 0	**DA1-344D1FB-A20N** 169194		
FS2	4.1	1.5	3.6	✓	✓	✓	-	✓	IP20/NEMA 0	**DA1-344D1FB-A20C** 169120		
FS2	5.8	2.2	5	✓	✓	✓	-	-	IP20/NEMA 0	**DA1-345D8FB-A20N** 169197		
FS2	5.8	2.2	5	✓	✓	✓	-	✓	IP20/NEMA 0	**DA1-345D8FB-A20C** 169051		
FS2	9.5	4	8.5	✓	✓	✓	-	-	IP20/NEMA 0	**DA1-349D5FB-A20N** 169200		
FS2	9.5	4	58.5	✓	✓	✓	-	✓	IP20/NEMA 0	**DA1-349D5FB-A20C** 169054		
FS3	14	5.5	11.3	✓	✓	✓	-	-	IP20/NEMA 0	**DA1-34014FB-A20N** 169203		
FS3	14	5.5	11.3	✓	✓	✓	-	✓	IP20/NEMA 0	**DA1-34014FB-A20C** 169057		
FS3	18	7.5	15.2	✓	✓	✓	-	-	IP20/NEMA 0	**DA1-34018FB-A20N** 169206		
FS3	18	7.5	15.2	✓	✓	✓	-	✓	IP20/NEMA 0	**DA1-34018FB-A20C** 169060		
FS4	24	11	21.7	✓	✓	-	✓	-	IP55	**DA1-34024FB-B55N** 169323		
FS4	24	11	21.7	✓	✓	✓	-	-	IP55	**DA1-34024FB-A55N** 169210		
FS3	24	11	21.7	✓	✓	✓	-	-	IP20/NEMA 0	**DA1-34024FB-A20N** 169209		
FS4	24	11	21.7	✓	✓	-	✓	✓	IP55	**DA1-34024FB-B55C** 169390		
FS3	24	11	21.7	✓	✓	✓	-	✓	IP20/NEMA 0	**DA1-34024FB-A20C** 169063		
FS4	24	11	21.7	✓	✓	✓	-	✓	IP55	**DA1-34024FB-A55C** 169064		

Notes


FS2


FS3


FS4

[1] With a switching frequency of 4 kHz and an ambient air temperature of +40°C or +50°C for IP20/NEMA 0

[2] Assigned motor rating for normal internally and externally ventilated four-pole, three-phase asynchronous motors with 1500 rpm (at 50 Hz) or 1800 rpm (at 60 Hz)

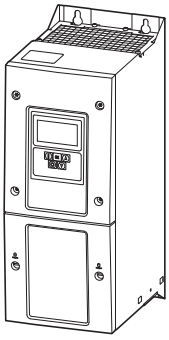
Information relevant for export to North America

Product Standards	UL 508C; CSA-C22.2 No. 14; IEC/EN61800-3; IEC/EN61800-5; CE marking
UL File No.	E172143
UL CCN	NMMS, NMMS7
CSA File No.	UL report applies to both US and Canada
CSA Class No.	3211-06
NA Certification	UL listed, certified by UL for use in Canada
Suitable for	Branch circuits
Max. Voltage Rating	1~ 240 V AC IEC: TN-S UL/CSA: "Y" (Solidly Grounded Wey)
Degree of Protection	IEC: IP20

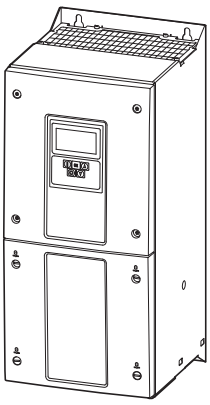
Size	Rated operational current[1] I_e A	Assigned motor rating [2] P kW	Rated motor current I_e A	Fitted with: Radio interference suppression filter	Brake chopper	7-digital display assembly	OLED display	Additional PCB protection	Protection type	Part no. Article no.	Price see price list	Std. pack
U_e 400 V AC, 3-phase / U_2 400 V AC, 3-phase												
Mains voltage IEC (50/60Hz) U_{LN} 380 (-10%) - 480 (+10%) V Interface RS485/Modbus RTU, CANopen®												
FS4	30	15	30	✓	✓	-	✓	-	IP55	**DA1-34030FB-B55N** 169324		1 off
FS4	30	15	29.3	✓	✓	✓	-	-	IP55	**DA1-34030FB-A55N** 169211		
FS4	30	15	29.3	✓	✓	✓	-	✓	IP55	**DA1-34030FB-A55C** 169065		
FS4	30	15	29.3	✓	✓	-	✓	✓	IP55	**DA1-34030FB-B55C** 169391		
FS4	39	18.5	36	✓	✓	✓	-	-	IP55	**DA1-34039FB-A55N** 169212		
FS4	39	18.5	36	✓	✓	-	✓	-	IP55	**DA1-34039FB-B55N** 169325		
FS4	39	18.5	36	✓	✓	✓	-	✓	IP55	**DA1-34039FB-A55C** 169066		
FS4	39	18.5	36	✓	✓	-	✓	✓	IP55	**DA1-34039FB-B55C** 169392		
FS4	46	22	41	✓	✓	-	✓	-	IP55	**DA1-34046FB-B55N** 169326		
FS4	46	22	41	✓	✓	✓	-	-	IP55	**DA1-34046FB-A55N** 169213		
FS4	46	22	41	✓	✓	✓	-	✓	IP55	**DA1-34046FB-A55C** 169067		
FS4	46	22	41	✓	✓	-	✓	✓	IP55	**DA1-34046FB-B55C** 169393		
FS5	61	30	55	✓	✓	✓	-	-	IP55	**DA1-34061FB-A55N** 169214		
FS5	61	30	55	✓	✓	-	✓	-	IP55	**DA1-34061FB-B55N** 169327		
FS5	61	30	55	✓	✓	✓	-	✓	IP55	**DA1-34061FB-A55C** 169068		
FS5	61	30	55	✓	✓	-	✓	✓	IP55	**DA1-34061FB-B55C** 169394		
FS5	72	37	68	✓	✓	-	✓	-	IP55	**DA1-34072FB-B55N** 169328		
FS5	72	37	68	✓	✓	✓	-	-	IP55	**DA1-34072FB-A55N** 169215		
FS5	72	37	68	✓	✓	-	✓	✓	IP55	**DA1-34072FB-B55C** 169395		
FS5	72	37	68	✓	✓	✓	-	✓	IP55	**DA1-34072FB-A55C** 169069		
FS6	90	45	81	✓	-	-	✓	-	IP55	**DA1-34090FN-B55N** 169329		
FS6	90	45	81	✓	-	✓	-	-	IP55	**DA1-34090FN-A55N** 169216		
FS6	90	45	81	✓	-	-	✓	✓	IP55	**DA1-34090FN-B55C** 169396		
FS6	90	45	81	✓	✓	-	✓	-	IP55	**DA1-34090FB-B55N** 169330		
FS6	90	45	81	✓	✓	✓	-	-	IP55	**DA1-34090FB-A55N** 169037		
FS6	90	45	81	✓	-	✓	-	✓	IP55	**DA1-34090FN-A55C** 169070		
FS6	90	45	81	✓	✓	-	✓	✓	IP55	**DA1-34090FB-B55C** 169397		
FS6	90	45	81	✓	✓	✓	-	✓	IP55	**DA1-34090FB-A55C** 169071		
FS6	110	55	99	✓	-	-	✓	-	IP55	**DA1-34110FN-B55N** 169331		
FS6	110	55	99	✓	-	✓	-	-	IP55	**DA1-34110FN-A55N** 169038		
FS6	110	55	99	✓	-	✓	-	✓	IP55	**DA1-34110FN-A55C** 169072		
FS6	110	55	99	✓	-	-	✓	✓	IP55	**DA1-34110FN-B55C** 169398		

Size	Rated operational current[1] I_e A	Assigned motor rating [2] P kW	Rated motor current I_e A	Fitted with: Radio interference suppression filter	Brake chopper	7-digital display assembly	OLED display	Additional PCB protection	Protection type	Part no. Article no.	Price see price list	Std. pack
U_e 400 V AC, 3-phase / U_2 400 V AC, 3-phase												
Mains voltage IEC (50/60Hz) U_{LN} 380 (-10%) - 480 (+10%) V Interface RS485/Modbus RTU, CANopen®												
FS6	110	55	99	✓	✓	✓	-	-	IP55	**DA1-34110FB-A55N** 169039		1 off
FS6	110	55	99	✓	✓	-	✓	-	IP55	**DA1-34110FB-B55N** 169332		
FS6	110	55	99	✓	✓	✓	-	✓	IP55	**DA1-34110FB-A55C** 169265		
FS6	110	55	99	✓	✓	-	✓	✓	IP55	**DA1-34110FB-B55C** 169399		
FS6	150	75	134	✓	-	-	✓	-	IP55	**DA1-34150FN-B55N** 169333		
FS6	150	75	134	✓	-	✓	-	-	IP55	**DA1-34150FN-A55N** 169040		
FS6	150	75	134	✓	✓	✓	-	-	IP55	**DA1-34150FB-A55N** 169041		
FS6	150	75	134	✓	✓	-	✓	-	IP55	**DA1-34150FB-B55N** 169334		
FS6	150	75	134	✓	-	-	✓	✓	IP55	**DA1-34150FN-B55C** 169400		
FS6	150	75	134	✓	-	✓	-	✓	IP55	**DA1-34150FN-A55C** 169266		
FS6	180	90	161	✓	✓	✓	-	-	IP55	**DA1-34180FB-A55N** 169043		
FS6	150	75	134	✓	✓	✓	-	✓	IP55	**DA1-34150FB-A55C** 169267		
FS6	150	75	134	✓	✓	-	✓	✓	IP55	**DA1-34150FB-B55C** 169401		
FS6	180	90	161	✓	-	-	✓	-	IP55	**DA1-34180FN-B55N** 169335		
FS6	180	90	161	✓	-	✓	-	-	IP55	**DA1-34180FN-A55N** 169042		
FS6	180	90	161	✓	✓	-	✓	-	IP55	**DA1-34180FB-B55N** 169336		
FS6	180	90	161	✓	-	-	✓	✓	IP55	**DA1-34180FN-B55C** 169402		
FS6	180	90	161	✓	-	✓	-	✓	IP55	**DA1-34180FN-A55C** 169268		
FS6	180	90	161	✓	✓	✓	-	✓	IP55	**DA1-34180FB-A55C** 169269		
FS6	180	90	161	✓	✓	-	✓	✓	IP55	**DA1-34180FB-B55C** 169403		

Notes



FS4



FS5

[1] With a switching frequency of 4 kHz and an ambient air temperature of +40°C or +50°C for IP20/NEMA 0

[2] Assigned motor rating for normal internally and externally ventilated four-pole, three-phase asynchronous motors with 1500 rpm (at 50 Hz) or 1800 rpm (at 60 Hz)

Information relevant for export to North America

Product Standards	UL 508C; CSA-C22.2 No. 14; IEC/EN61800-3; IEC/EN61800-5; CE marking
UL File No.	E172143
UL CCN	NMMS, NMMS7
CSA File No.	UL report applies to both US and Canada
CSA Class No.	3211-06
NA Certification	UL listed, certified by UL for use in Canada
Suitable for	Branch circuits
Max. Voltage Rating	1~ 240 V AC IEC: TN-S UL/CSA: "Y" (Solidly Grounded Wey)
Degree of Protection	IEC: IP20

Size	Rated operational current[1] I_e A	Assigned motor rating [2] P kW	Rated motor current I_e A	Fitted with: Radio interference suppression filter	Brake chopper	7-digital display assembly	OLED display	Additional PCB protection	Protection type	**Part no.** Article no.	**Price** see price list	Std. pack
U_e 400 V AC, 3-phase / U_2 400 V AC, 3-phase												
Mains voltage IEC (50/60Hz) U_{LN} 380 (-10%) - 480 (+10%) V Interface RS485/Modbus RTU, CANopen®												
FS7	202	110	196	✓	-	✓	-	-	IP55	**DA1-34202FN-A55N** 169044		1 off
FS7	202	110	196	✓	-	-	✓	-	IP55	**DA1-34202FN-B55N** 169337		
FS7	202	110	196	✓	✓	✓	-	-	IP55	**DA1-34202FB-A55N** 169045		
FS7	202	110	196	✓	-	-	✓	✓	IP55	**DA1-34202FN-B55C** 169404		
FS7	202	110	196	✓	-	✓	-	✓	IP55	**DA1-34202FN-A55C** 169270		
FS7	202	110	196	✓	✓	-	✓	-	IP55	**DA1-34202FB-B55N** 169338		
FS7	202	110	196	✓	✓	✓	-	✓	IP55	**DA1-34202FB-A55C** 169271		
FS7	202	110	196	✓	✓	-	✓	✓	IP55	**DA1-34202FB-B55C** 169405		
FS7	240	132	231	✓	-	✓	-	-	IP55	**DA1-34240FN-A55N** 169046		
FS7	240	132	231	✓	-	-	✓	-	IP55	**DA1-34240FN-B55N** 169339		
FS7	240	132	231	✓	✓	✓	-	-	IP55	**DA1-34240FB-A55N** 169047		
FS7	240	132	231	✓	-	✓	-	✓	IP55	**DA1-34240FN-A55C** 169272		
FS7	240	132	231	✓	-	-	✓	✓	IP55	**DA1-34240FN-B55C** 169406		
FS7	240	132	231	✓	✓	-	✓	-	IP55	**DA1-34240FB-B55N** 169340		
FS7	240	132	231	✓	✓	✓	-	✓	IP55	**DA1-34240FB-A55C** 169273		
FS7	240	132	231	✓	✓	-	✓	✓	IP55	**DA1-34240FB-B55C** 169407		
FS7	302	160	279	✓	-	✓	-	-	IP55	**DA1-34302FN-A55N** 169048		
FS7	302	160	279	✓	-	-	✓	✓	IP55	**DA1-34302FN-B55C** 169408		
FS7	302	160	279	✓	-	-	✓	-	IP55	**DA1-34302FN-B55N** 169341		
FS7	302	160	279	✓	✓	-	✓	-	IP55	**DA1-34302FB-B55N** 169342		
FS7	302	160	279	✓	-	✓	-	✓	IP55	**DA1-34302FN-A55C** 169274		
FS7	302	160	279	✓	✓	✓	-	-	IP55	**DA1-34302FB-A55N** 169073		
FS7	302	160	279	✓	✓	✓	-	✓	IP55	**DA1-34302FB-A55C** 169275		
FS7	302	160	279	✓	✓	-	✓	✓	IP55	**DA1-34302FB-B55C** 169217		
FS8	370	200	349	✓	-	✓	-	-	IP40	**DA1-34370FN-A40N** 169074		1 off
FS8	370	200	349	✓	-	-	✓	-	IP40	**DA1-34370FN-B40N** 169343		
FS8	370	200	349	✓	-	✓	-	✓	IP40	**DA1-34370FN-A40C** 169276		
FS8	370	200	349	✓	-	-	✓	✓	IP40	**DA1-34370FN-B40C** 169218		
FS8	370	200	349	✓	✓	✓	-	-	IP40	**DA1-34370FB-A40N** 169075		
FS8	370	200	349	✓	✓	-	✓	-	IP40	**DA1-34370FB-B40N** 169344		
FS8	370	200	349	✓	✓	✓	-	✓	IP40	**DA1-34370FB-A40C** 169277		
FS8	370	200	349	✓	✓	-	✓	✓	IP40	**DA1-34370FB-B40C** 169219		

Size	Rated operational current[1] I_e A	Assigned motor rating [2] P kW	Rated motor current I_e A	Fitted with: Radio interference suppression filter	Brake chopper	7-digital display assembly	OLED display	Additional PCB protection	Protection type	**Part no.** Article no.	**Price** see price list	Std. pack
U_e 400 V AC, 3-phase / U_2 400 V AC, 3-phase												
Mains voltage IEC (50/60Hz) U_{LN} 380 (-10%) - 480 (+10%) V Interface RS485/Modbus RTU, CANopen®												
FS8	450	250	437	✓	-	✓	-	-	IP40	**DA1-34450FN-A40N** 169076		1 off
FS8	450	250	437	✓	-	-	✓	-	IP40	**DA1-34450FN-B40N** 169345		
FS8	450	250	437	✓	✓	-	✓	-	IP40	**DA1-34450FB-B40N** 169346		
FS8	450	250	437	✓	✓	✓	-	-	IP40	**DA1-34450FB-A40N** 169077		
FS8	450	250	437	✓	-	✓	-	✓	IP40	**DA1-34450FN-A40C** 169278		
FS8	450	250	437	✓	-	-	✓	✓	IP40	**DA1-34450FN-B40C** 169220		
FS8	450	250	437	✓	✓	-	✓	✓	IP40	**DA1-34450FB-B40C** 169221		
FS8	450	250	437	✓	✓	✓	-	✓	IP40	**DA1-34450FB-A40C** 169279		

Notes

[1] With a switching frequency of 4 kHz and an ambient air temperature of +40°C or +50°C for IP20/NEMA 0

[2] Assigned motor rating for normal internally and externally ventilated four-pole, three-phase asynchronous motors with 1500 rpm (at 50 Hz) or 1800 rpm (at 60 Hz)

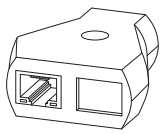
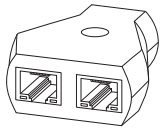
Information relevant for export to North America

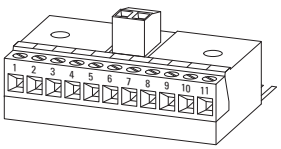
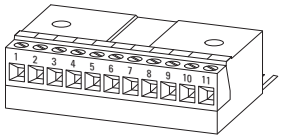
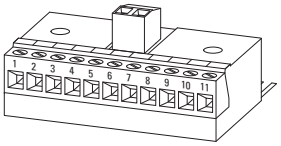
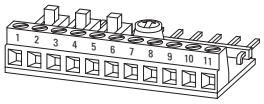
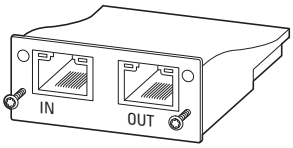
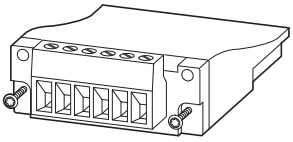
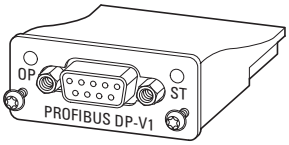
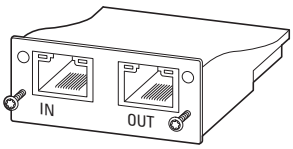
Product Standards	UL 508C; CSA-C22.2 No. 14; IEC/EN61800-3; IEC/EN61800-5; CE marking
UL File No.	E172143
UL CCN	NMMS, NMMS7
CSA File No.	UL report applies to both US and Canada
CSA Class No.	3211-06
NA Certification	UL listed, certified by UL for use in Canada
Suitable for	Branch circuits
Max. Voltage Rating	1~ 240 V AC IEC: TN-S UL/CSA: "Y" (Solidly Grounded Wey)
Degree of Protection	IEC: IP20

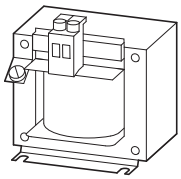
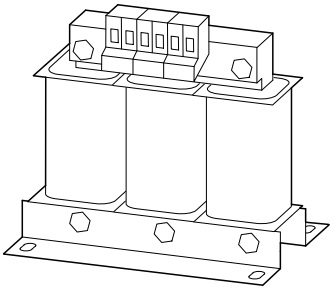
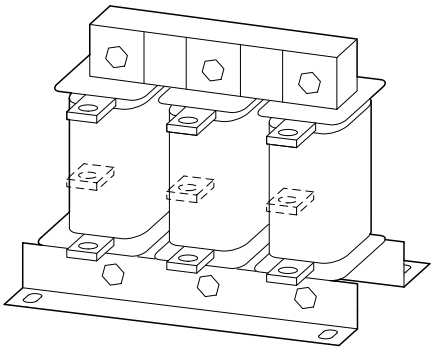
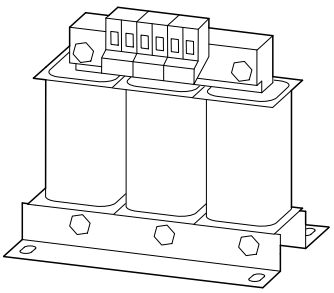
Braking resistances

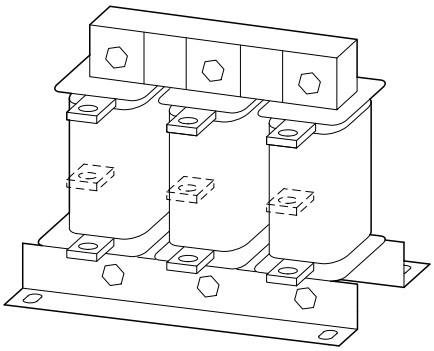
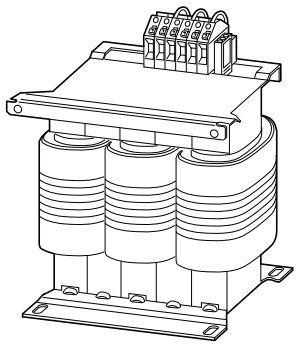
for direct installation in variable frequency drive enclosure of frame sizes 2 and 3.
Braking resistance in anodized aluminium enclosure

	minimum external braking resistance R_{min} Ω	Continuous braking rating P_{DB} W	For use with	Part no. Article no.	Price see price list	Std. pack	Information relevant for export to North America
	33	500	DC1, DA1	**DX-BR3-033** 169151		1 off	
	100	200	DC1, DA1	**DX-BR3-100** 169150		1 off	

	Description	For use with	Part no. Article no.	Price see price list	Std. pack	Information relevant for export to North America
External keypad						
	with LED display	DC1, DA1	**DX-KEY-LED** 169132		1 off	UL/CSA certification not required
	with OLED display	DC1, DA1	**DX-KEY-OLED** 169133			
Bluetooth communication stick						
	-	DC1, DA1	**DX-COM-STICK** 169134		1 off	UL/CSA certification not required
Licence key						
	for enabling the drivesConnect program's PLC function	DA1	**DX-COM-SOFT** 169136		1 off	UL/CSA certification not required
PC connection						
Connection cable with RJ45 plugs						
	Length 0.5 m	DC1, DA1	**DX-CBL-RJ45-0M5** 169137		1 off	UL/CSA certification not required
	Length 1 m	DC1, DA1	**DX-CBL-RJ45-1M0** 169138			
	Length 3 m	DC1, DA1	**DX-CBL-RJ45-3M0** 169139			
Bus termination resistor						
	-	DC1, DA1	**DX-CBL-TERM** 169140		1 off	UL/CSA certification not required
Cable and splitter						
	RJ45, 3 sockets	DC1, DA1	**DX-SPL-RJ45-3SL** 169141		1 off	UL/CSA certification not required
	RJ45, 2 sockets/1 plug	DC1, DA1	**DX-SPL-RJ45-2SL1PL** 169142			

	Description	For use with	Part no. Article no.	Price see price list	Std. pack	Information relevant for export to North America
Expansion modules						
	110-V-input (electrically isolated)	DC1	**DXC-EXT-IO110** 169032		1 off	
	230-V-input (electrically isolated)	DC1	**DXC-EXT-IO230** 169033			
	2 relay outputs	DC1	**DXC-EXT-2RO** 169031			
	3 relay outputs	DA1	**DXA-EXT-3RO** 169121			
	2 relay outputs 1 analog output	DC1	**DXC-EXT-2RO1AO** 169030			
	3 digital inputs Relay output 1	DA1	**DXA-EXT-3DI1RO** 169036			
Simulator						
	3 digital inputs Relay output 1 1 Potentiometer	DC1	**DXC-EXT-LOCSIM** 169034		1 off	UL/CSA certification not required
Encoder						
	-	DA1	**DXA-EXT-ENCOD** 169035		1 off	UL/CSA certification not required
Fieldbus modules						
	Ethernet IP	DA1	**DX-NET-ETHERNET-2** 169122		1 off	UL/CSA certification not required
	DeviceNet	DA1	**DX-NET-DEVICENET** 169123			
	PROFIBUS	DA1	**DX-NET-PROFIBUS** 169124			
	PROFINET	DA1	**DX-NET-PROFINET-2** 169125			
	Modbus/TCP	DA1	**DX-NET-MODBUSTCP-2** 169126			
	EtherCAT	DA1	**DX-NET-ETHERCAT-2** 169127			
	BACnet/IP	DA1	**DX-NET-BACNETIP-2** 169128			
	SmartWire-DT	DA1 (IP20)	**DX-NET-SWD1** 169129			
	SmartWire-DT	DC1/DA1 (IP55/IP66)	**DX-NET-SWD2** 169130			
	SmartWire-DT	DC1 (IP20)	**DX-NET-SWD3** 169131			

	Rated operational current I_e A	Inductance L mH	Maximum heat dissipation P_v W	Part no. Article no.	Price see price list	Std. pack
Mains choke						
1-phase max. permitted mains supply voltage V AC: 260 V + 0% (50/60 Hz)						
	5.8	5.05	9	**DX-LN1-006** 269490		1 off
	8.6	3.41	11	**DX-LN1-009** 269495		
	13	2.25	12	**DX-LN1-013** 269496		
	18	1.63	17	**DX-LN1-018** 269497		
	24	1.22	20	**DX-LN1-024** 269498		
	32	0.92	24	**DX-LN1-032** 169791		
3-phase max. permitted mains supply voltage V AC: 550 V + 0% (50/60 Hz)						
	3.9	7.51	17	**DX-LN3-004** 269500		1 off
	6	4.9	19	**DX-LN3-006** 269501		
	10	2.94	33	**DX-LN3-010** 269502		
	16	1.84	44	**DX-LN3-016** 269503		
	25	1.18	57	**DX-LN3-025** 269504		
	40	0.64	59	**DX-LN3-040** 269505		
	50	0.37	58	**DX-LN3-050** 269506		
	60	0.31	60	**DX-LN3-060** 269507		
	80	0.23	86	**DX-LN3-080** 269508		
	100	0.18	101	**DX-LN3-100** 269509		
	120	0.15	100	**DX-LN3-120** 269510		
	160	0.11	140	**DX-LN3-160** 269511		
	200	0.09	154	**DX-LN3-200** 269512		
	250	0.07	155	**DX-LN3-250** 269513		
	300	0.06	196	**DX-LN3-300** 269514		
	303	0.06	230	**DX-LN3-303** 169143		
	370	0.05	290	**DX-LN3-370** 169144		
	450	0.04	300	**DX-LN3-450** 169145		
Motor chokes			max. heat dissipation (pulse frequency) (12 kHz)			
3-phase max. permitted mains supply voltage V AC: 750 V + 0% (50/60 Hz)						
	5	2	24	**DX-LM3-005** 269538		1 off
	8	4.1	54	**DX-LM3-008** 269539		
	11	3	71	**DX-LM3-011** 269541		
	16	1.5	78	**DX-LM3-016** 269542		
	35	1	116	**DX-LM3-035** 269543		
	50	0.6	168	**DX-LM3-050** 269544		

	Rated operational current I_e A	Inductance L mH	Maximum heat dissipation P_v W	Part no. Article no.	Price see price list	Std. pack
Motor chokes			max. heat dissipation (pulse frequency) (12 kHz)			
3-phase max. permitted mains supply voltage V AC: 750 V + 0% (50/60 Hz)						
	63	0.5	193	**DX-LM3-063** 269545		1 off
	80	0.5	206	**DX-LM3-080** 269546		
	100	0.45	294	**DX-LM3-100** 269547		
	150	0.35	424	**DX-LM3-150** 269548		
	180	0.3	439	**DX-LM3-180** 269549		
	220	0.2	517	**DX-LM3-220** 269560		
	260	0.15	520	**DX-LM3-260** 269561		
	303	0.15	-	**DX-LM3-303** 169146		
	370	0.12	-	**DX-LM3-370** 169147		
	450	0.1	-	**DX-LM3-450** 169148		
Sine filter						
3-phase						
	4	11	50	**DX-SIN3-004** 271538		1 off
	10	5.1	100	**DX-SIN3-010** 271590		
	16.5	3.07	70	**DX-SIN3-016** 271591		
	23.5	2.5	125	**DX-SIN3-023** 271593		
	32	2	100	**DX-SIN3-032** 271594		
	37	1.7	100	**DX-SIN3-037** 271595		
	48	1.2	240	**DX-SIN3-048** 271597		
	61	1	280	**DX-SIN3-061** 271599		
	72	0.95	300	**DX-SIN3-072** 271600		
	90	0.8	290	**DX-SIN3-090** 271601		
	115	0	460	**DX-SIN3-115** 271602		
	150	0.5	530	**DX-SIN3-150** 271603		
	180	0.4	500	**DX-SIN3-180** 271604		
	250	0.35	550	**DX-SIN3-250** 271605		
	440	0.14	650	**DX-SIN3-440** 271606		1 off
	480	0.14	1550	**DX-SIN3-480** 169149		1 off

Notes

Information relevant for export to North America

Product Standards	UL 508C; CSA-C22.2 No. 14; IEC/EN61800-3; IEC/EN61800-5; CE marking
UL File No.	E167225
UL CCN	XPTQ2, XPTQ8
CSA File No.	UL report applies to both US and Canada
CSA Class No.	3211-06
NA Certification	UL listed, certified by UL for use in Canada
Suitable for	Branch circuits
Max. Voltage Rating	1~ 240 V AC IEC: TN-S UL/CSA: "Y" (Solidly Grounded Wey)
Degree of Protection	IEC: IP00

SVX, SPX variable frequency drives

SVX9000 variable frequency drives
The SVX9000 can be used for simple and complex applications. Typical applications are, for example, pumps, ventilation systems and conveyor belts. The SVX9000 features integrated help functions that simplify parameterization of the variable frequency drives. Enclosures are available with IP21 and IP54 degree of protection.

The SVX9000 Series at a glance:
- Extensive range of power and voltage variants
- Quick start-up wizard.
- Modular design
- The communication can be operated via external 24 VDC
- Built-in 3% main choke
- 30-fault history with status at time of fault
- Simple operation

KiloWatts	Voltage range	Enclosures
0.55–75	208–240	IP21, IP54
0.75–132	380–500	IP21, IP54
2.2–160	525–690	IP21, IP54

SPX9000 variable frequency drives
SPX9000 units can be used in high-power and/or high-performance applications. Typical high-power applications include: synchronizing multi-motor systems, positioning control applications, and controlling and synchronizing winder systems. The SPX9000 supports fast communications between multiple variable frequency drives. Equipped with superior processing power, the SPX9000 variable frequency drives can use an absolute encoder or rotational feedback to provide precise motor control. Enclosures are available with protection types IP21, IP54, and IP00.

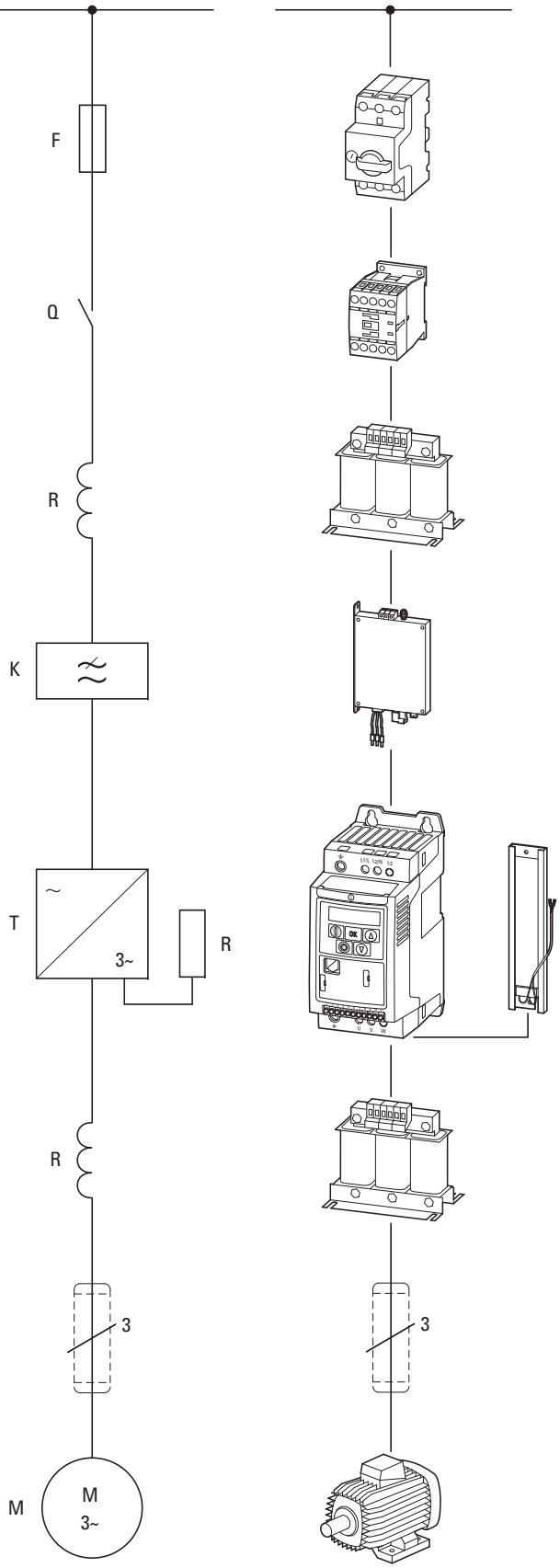
The SPX9000 Series at a glance:
- High performance for demanding applications
- Increased micro-processing power (4 times more CPU capability)
- Encoder feedback
- High-resolution analog inputs
- Speed and torque loop capability
- Customized software
- Same ease of operation
- Master / Slave capability

KiloWatts	Voltage range	Enclosures
0.55–75	208–240	IP21, IP54
0.75–1100	380–500	IP21, IP54 and IP00 modules
2.2–1800	525–690	IP21, IP54 and IP00 modules

If you have any questions regarding our SVX or SPX variable frequency drives, please contact your Eaton contact person.
To find the right contact person:
The contact person for your region:
→ http://salesbonn.moeller.net

Contact person for worldwide questions:
→ www.eaton.eu/electrical/contact

Engineering



Variable frequency drives can be connected without restriction to AC supply systems with grounded star point (TN/TT networks).

Fuses (circuit-breakers) allow the protection of lines and electrical apparatus. For the protection of persons, AC/DC-sensitive residual current devices (RCD Type B) are required in addition.

Contactors are used to switch the mains voltage on and off.

Mains chokes damp harmonic distortion (THD) and current spikes and limit inrush currents (the DC link capacitors' charging current). In addition, they protect the mains rectifier from voltage spikes coming from the mains.

Radio interference suppression filter attenuate high-frequency electromagnetic emissions from devices.
They ensure that the EMC limit values for conducted interference specified in the applicable product standards are observed (variable frequency drives).
Note: Use only with variable frequency drives that do not feature an internal radio interference suppression filter. They are usually integrated into variable frequency drives nowadays. External radio interference suppression filters (optional) make it possible to use longer motor cables and have low leakage currents.

Variable frequency drives allow a continuously variable speed control of three-phase motors.
On **Brake resistor** converts the variable frequency drive's regenerative braking energy into heat.
The variable frequency drive must be equipped with a brake chopper, which connects the braking resistance parallel to the internal DC link.

Motor chokes
- Compensate the capacitive capacitive currents,
- Reduce current ripple and the motor's current change noise,
- Attenuate the retroaction on parallel connection of several motors.

Sine filter
- Smoothen the output voltage sinusoidally,
- reduce motor noise through du/dt reduction, and thereby increase the motor insulation's lifespan,
- Reduce the leakage currents to allow better motor performance at improved EMC values.

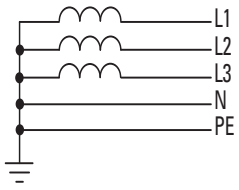
Screened motor cables attenuate radiated and conducted high-frequency emissions within the limits defined in the applicable product standard (EMC). They must be connected to the earth potential on both sides across a large area.

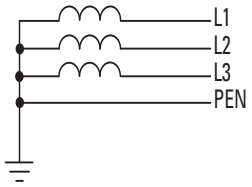
Three-phase asynchronous motor (standard motor) converts electric power (P ~ U × I) into mechanical power (P ~ M × n).

Equipment code
F = fuses and circuit-breakers
Q = controlled switching within energy flow (contactors, circuit-breakers)
R = limitation (chokes, resistors)
K = radio interference suppression filters
T = variable frequency drives
M = motors

Electrical mains connection

Variable frequency drives can be connected to and operated on star point-earthed AC supply systems (as per IEC 60364) without restrictions.





Connecting them to and operating them on asymmetrically earthed networks, such as phase-earthed delta networks (grounded delta, USA) or non-earthed or high-resistance earthed (> 30 Ω) IT networks is permitted with limitations. In these networks, only variable frequency drives without internal radio interference suppression filters (EMC) may be used. In the case of devices with an integrated radio interference suppression filter, the filter's protective earth connection must be disconnected.

The standardized rated operating voltages of the utility companies fulfil the following conditions at the point of transfer to the consumer:

- maximum deviation from the rated voltage (U_{LN}): ±10 %
- Maximum deviation in the voltage symmetry: ±3 %
- Maximum deviation from the rated frequency: ±4 %

A further voltage drop of up to 4% in the consumer networks is permissible relative to the lower voltage value (U_{LN} -10%) of the mains voltage.

In ring-operated mesh networks (such as in the EU) the standardized consumer voltages (230/400/690 V) are identical to the utility company's supply voltages. In star networks (for example in North America/USA), the stated consumer voltages take the voltage drop from the utility company's infeed point to the last consumer into account.

Table: North American voltage level

Supply voltage U_{LN} of the EVU	Motor voltage according to UL 508 C	Consumer voltage, rated value for the motors
120 V	110 - 120 V	115 V
240 V	220 - 240 V	230 V
480 V	440 - 480 V	460 V
600 V	550 - 600 V	575V

Safety and switching

For variable frequency drives, the components placed on the mains-side are assigned as per the input-side rated operational current I_{LN} and the AC-1 utilization category.

Fuses, circuit-breakers and conductor cross-sections must meet the national and regional requirements and the required approvals at the point of operation.

For fire prevention and the protection of persons and domestic animals from excessive contact voltages residual current devices (RCD) must be used. Only AC/DC sensitive residual current devices (RCD, type B) may be used in connection with a variable frequency drive.

Marking on residual current devices for AC/DC sensitive RCDs, type B:

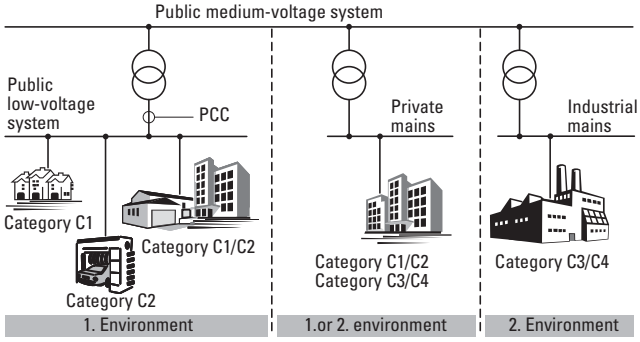
Earth leakage currents will be produced when using frequency-controlled drives due to the nature of the system. The main reasons for this consist of external capacitances between the phases of the motor cable, the motor cable's screening, Y capacitors in the variable frequency drive, and radio interference suppression filters, as well as earthing measures at the motor's site of operation. These leakage currents can exceed 3.5 mA and require improved PDS earthing as per EN 50178 (earth conductor cross-section ≥ 10 mm²).

EMC compliance

Variable frequency drives work with fast electronic switches (IGBT) in the inverter. This can cause radio interference in a drive system, which, in turn, can adversely affect nearby electronic equipment. To provide protection from this high-frequency interference, these should be spatially separated and screened from frequency-controlled drives.

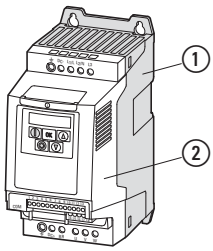
In Europe, adherence to the EMC Directive is mandatory. The EMC product standard for power drive systems (PDS) is IEC/EN 61800-3. This standard covers the complete drive system, from mains infeed to the motor.

Both versions of DC1 and DA1 series variable frequency drives (with internal/external radio interference suppression filter) meet the requirements of the EMC product standard for residential areas (first environment) and therefore the higher limits for industrial environment (second environment) as well.



Variable frequency drives

A variable frequency drive is an electronic apparatus used for the variable-speed control of three-phase motors. It is intended for installation in a machine or for assembly with other components to a machine or plant. The main components of a modern compact variable frequency drive are a power section ① and a control section ②.



① **Power section** with:

A = Rectifier
B = Internal DC link
C = inverter (IGBT)

② **Control section** with:

I/O = Analog and binary inputs and outputs
KEYPAD = Operating unit with display unit
BUS = Serial ports/interfaces (RS485, field bus, PC interface)

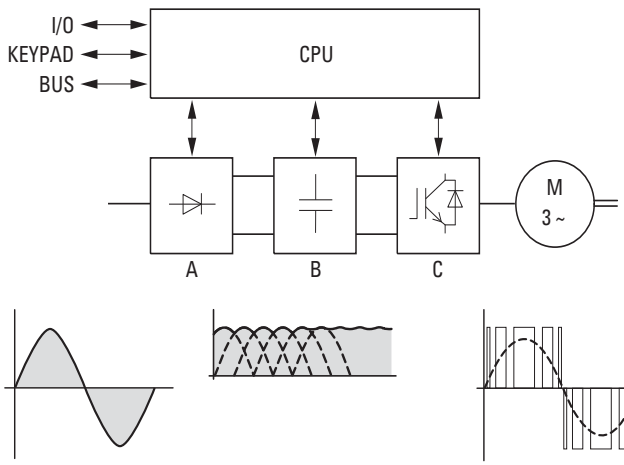
The functional control of the variable frequency drive and the output values in the power section (such as frequency, voltage and current) can be adjusted through:

- Control terminals (I/O) with analog and digital (binary) inputs,
- A keypad with function keys and display units,
- Serial interfaces (BUS) with RS485 (Modbus RTU) and optional fieldbus connections (CANopen, PROFIBUS-DP etc.) and an optional PC connection.

Internal open and closed-loop control circuits monitor all variable values in the variable frequency drive and automatically switch the process off if a value reaches a dangerous level.

The power section of a static compact frequency generally consists of three subgroups:

- Rectifier (A),
- Internal DC link (B),
- Inverter module (C).



U_{LN} = phase voltage fromsupplying AC mains

U_{DC} = DC link voltage
U_{DC} = 1.41 x U_{LN}

Output voltage = switched DC link voltage with sinusoidal pulse width modulation (PWM)

Block diagram with main components of a variable frequency drive

Control methods

The IGBTs in the variable frequency drive series' inverter are controlled with sinusoidal pulse-width modulation (PWM). In real-life applications, the industry draws a distinction between the following control methods:

- Voltage frequency control (U/f control),
- V/Hz control with slip compensation
- Sensorless vector control (speed control)
- Vector control (closed-loop)

The **Voltage frequency control** is the best known and most commonly used method. A simple characteristic curve (linear or quadratic) defines the motor's rotating field frequency and the corresponding three-phase line-to-line motor voltage is selected such that the motor is neither over nor under-magnetized.

Main applications of U/f control:

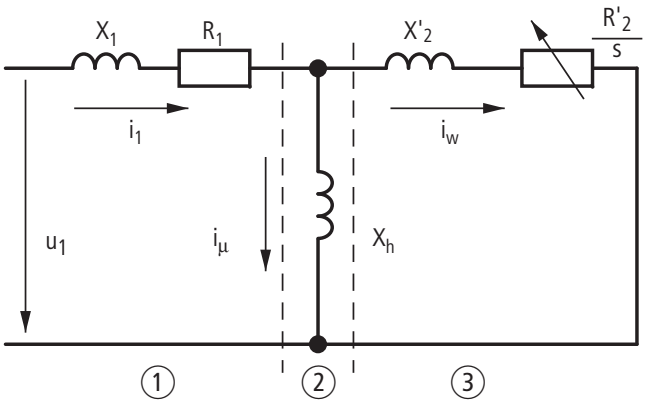
- pump and fan drives,
- horizontal conveying and transportation systems,
- multiple motor drives (parallel operation of several motors at the variable frequency drive's output).

V/Hz control with slip compensation can compensate for the load-dependent speed change in individual drives (sensorless).

In sensorless vector control the magnetic fields of the stator and rotor windings are aligned so as to oppose each other. With asynchronous motors the magnetic flux in the rotor must be mapped in an electronic model of the motor. This requires the physical parameters on the motor's rating plate to be entered.
In vector operation the variable frequency drives can control only one motor. A parallel operation of several motors is not possible here. The exact calculation of the phase voltages at the variable frequency drive's output, however, improves the motor's operational behavior. The motor also heats up less in the lower speed range. The field-oriented vector control results in a significant improvement in the drive dynamics as well as optimizing performance; it also increases the range of possible applications.
The main applications of sensorlessvector control are:

- Material machining and processing equipment
- Condensors (compressor),
- Heavy starting duty (extruder, agitators, mixer),
- Horizontal conveying equipment (cranes, elevators).

Vector control uses the variable frequency drive's output current as a process variable. This makes it possible to perfectly adjust the three-phase motor in line with the corresponding torque boost. The motor speed can be controlled in connection with an rpm sensor (tachometer, pulse generator) (closed loop).



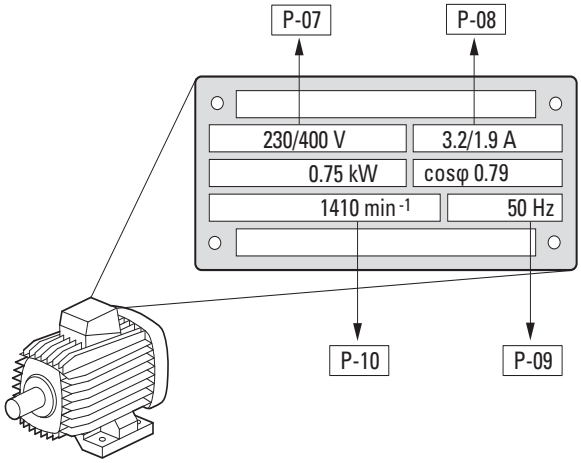
① Stator winding
② Air gap
③ Transformed rotor winding
Simplified equivalent circuit diagram for a three-phase motor

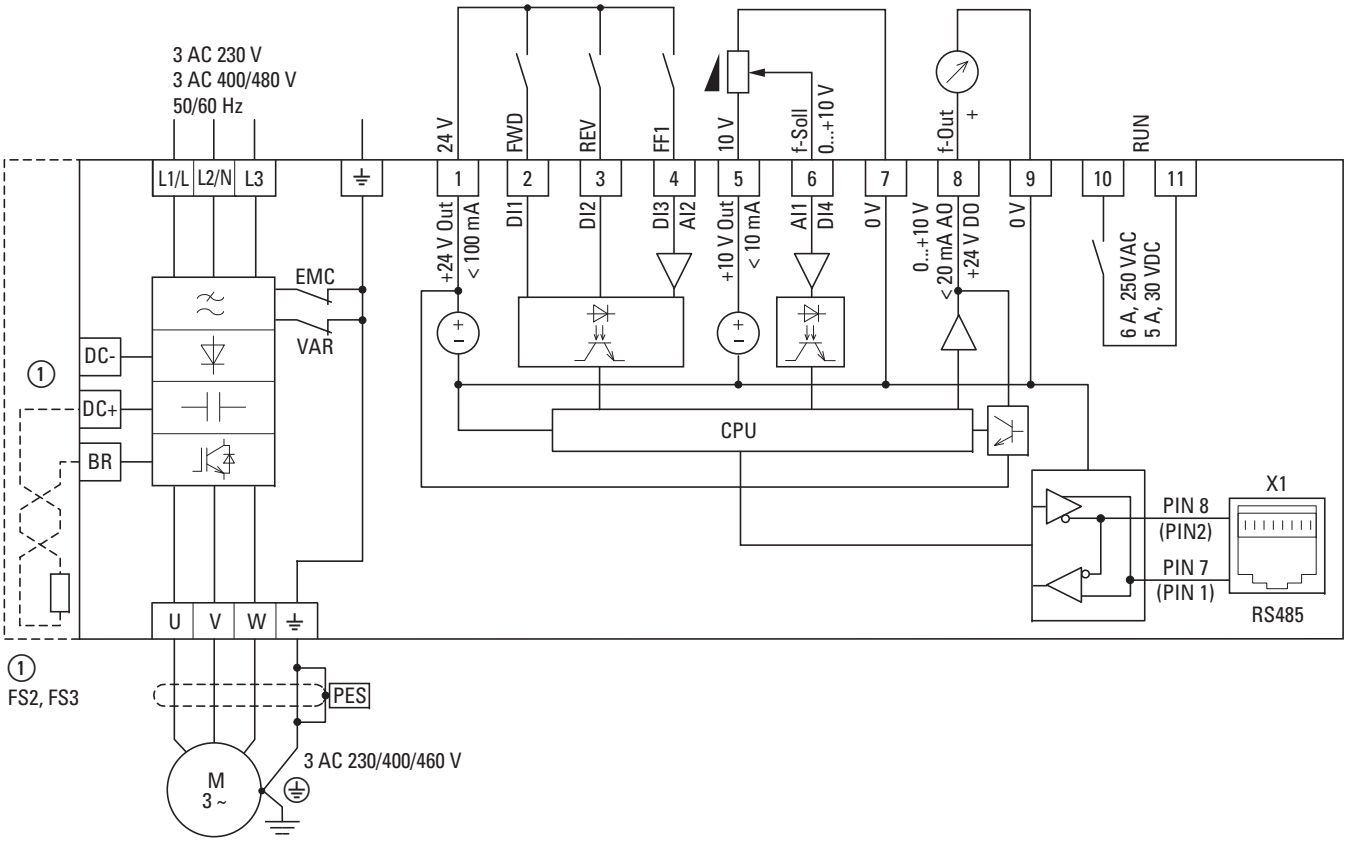
Explanation:
EMC = Electromagnetic compatibility
EVU = Utility company
IGBT = Insulated-gate bipolar transistor
PDS = Power drives system
RCD = Residual current device

Connecting example for a 0.75 kW motor with the rating plate illustrated here.

The variable frequency drives are configured by default in such a way that they can be operated immediately with V/Hz control when connected to the assigned motor rating without having to configure any additional parameters.

To ensure ideal operational behavior (e.g., slip compensation, vector control, etc.), the data on the motor's rating plate should be entered into the variable frequency drive (electric motor map).
The following example shows the necessary parameter settings for a variable frequency drive (a DC1 in this example) and connection examples for 1-phase and 3-phase mains voltages:





Block diagram DC1-32... and DC1-34...
Only sizes FS2 and FS3 have connection terminals DC+ and DC- for an external braking resistor (optional).

The control signal terminals are factory set as follows:

- 1: 24 V: +24 V control voltage, max. 100 mA
- 2: DI1: FWD = Clockwise rotating field enable (Forward)
- 3: DI2: REV = Anticlockwise rotating field enable (Reverse)
- 4: DI3: FF1 = Fixed frequency 1 or AI2
- 5: 10 V: +10 V reference voltage, max. 10 mA
- 6: AI1: f-setpoint = Frequency setpoint value (0 - +10 V)
- 7: 0 V, reference potential
- 8: AO: f-Out = Output frequency to motor (0 - +10 V)
- 9: 0 V, reference potential
- 10/11: Relay: RUN = Operating signal (N/O)

DI: Digital input = +24 VDC digital input
AI: Analog input = 0 - 10 V, 0/4 - 20 mA analog input
DO: Digital output = +24 VDC, max. 20 mA digital output
AO: Analog output = 0 - +10 V, max. 20 mA analog output

Parameters are used to define the function and mode of operation for the digital and analog inputs/outputs. These parameters are described in manual MN04020003Z.

Connection example for a 0.75 kW motor

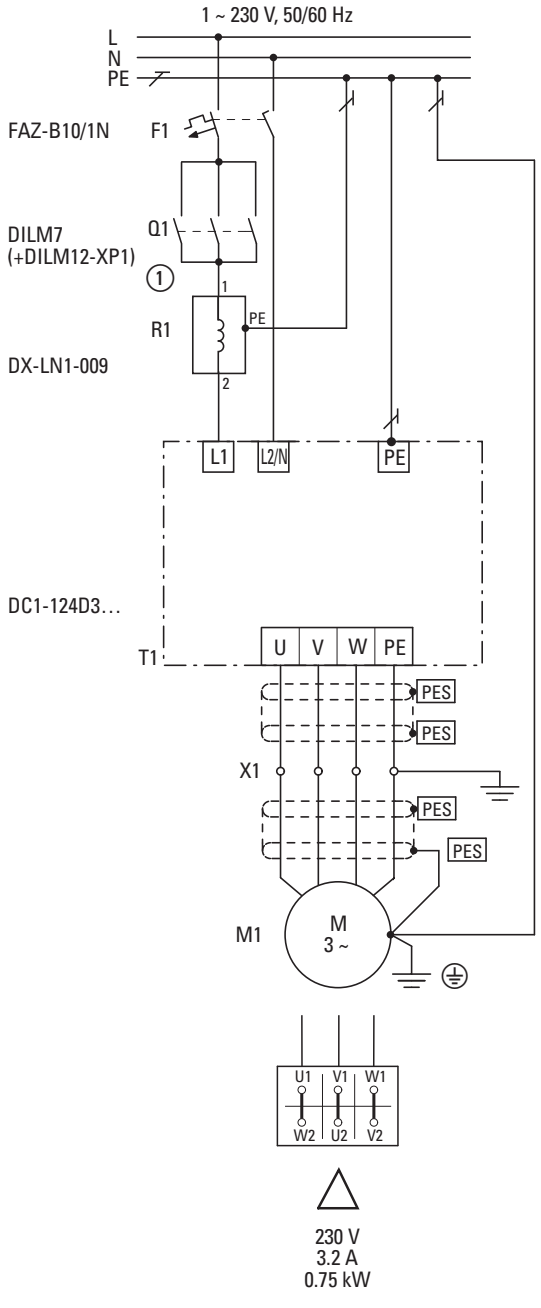
Motor: P = 0.75 kW
Mains: 3/N/PE 400 V 50/60 Hz
Connection examples meeting EMC requirements: Power section (see figure below)

The previously indicated 0.75 kW motor can be connected in a delta configuration for a 1-phase 230-V supply system (version A) or in a star configuration for a 400-V supply system (version B).
The variable frequency drive and the type-specific accessories are selected for 1 AC 230 V (DC1-124D3...) or for 3 AC 400 V (MMX34AA2D4) depending on the mains voltage selected.

Variant A:

Motor in delta configuration

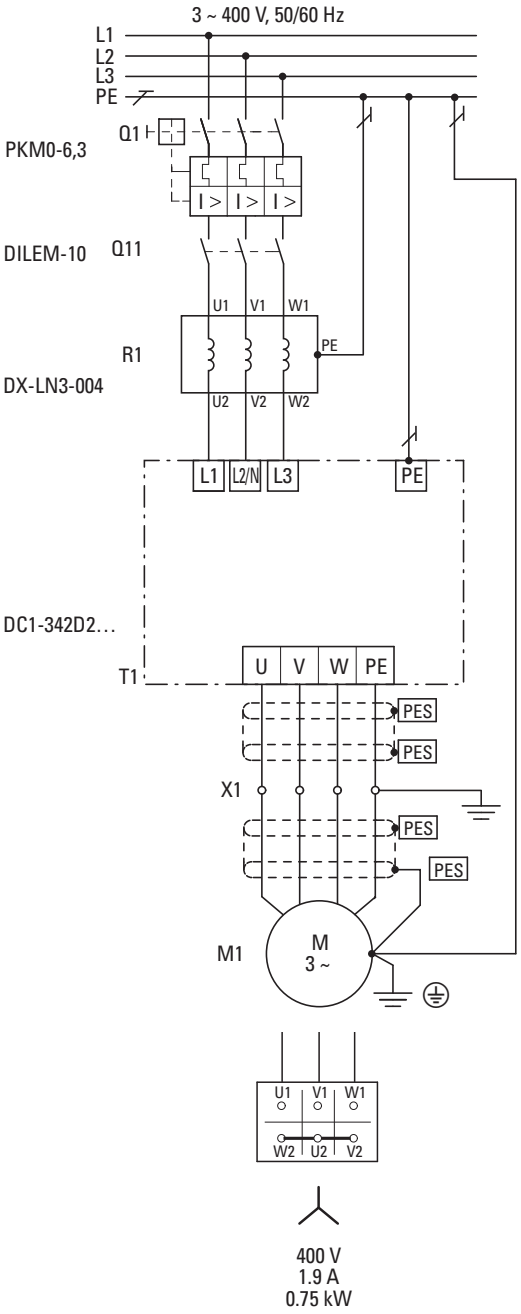
DC1… variable frequency drive with 1-phase mains supply (230 V)



Variant B:

Motor in star configuration

DC1… variable frequency drive with 3-phase mains supply (400 V)



① Optional connection option for 1-phase connections

Engineering

Part no.	Motor			Variable frequency drives		Power Wiring				Motor connection	
	Assigned motor rating [1]		Rated motor current	Rated operational current[2]	Input current	Protection device	Protection device	Contactor	Mains choke	Motor choke	Sine filter
	P	P	I_e	I_e	I_{LN}						
	kW	HP	A	A	T						
U_e230 V AC, 1-phase/$U_2$230 V AC, 3-phase											
DC1-122D3	0.37	0.5	2	2.3	5	FAZ-B10/1N	-	DILM7	DX-LN1-006	DX-LM3-005	DX-SIN3-004
DC1-124D3	0.75	1	3.2	4.3	8.5	FAZ-B10/1N	-	DILM7	DX-LN1-013	DX-LM3-005	DX-SIN3-010
DC1-127D0	1.5	2	6.3	7	13.9	FAZ-B16/1N	-	DILM7	DX-LN1-018	DX-LM3-008	DX-SIN3-010
DC1-12011	2.2	3	8.7	10.5	19.5	FAZ-B25/1N	-	DILM7	DX-LN1-024	DX-LM3-011	DX-SIN3-016
DC1-12015	4	5	14.8	15	30.5	FAZ-B40/1N	-	DILM7	DX-LN1-032	DX-LM3-016	DX-SIN3-016
U_e230 V AC, 3-phase/$U_2$230 V AC, 3-phase											
DC1-322D3	0.37	0.5	2	2.3	3	FAZ-B6/3	PKM0-6,3	DILM7	DX-LN3-004	DX-LM3-005	DX-SIN3-004
DC1-324D3	0.75	1	3.2	4.3	4.5	FAZ-B6/3	PKM0-6,3	DILM7	DX-LN3-006	DX-LM3-005	DX-SIN3-010
DC1-327D0	1.5	2	6.3	7	7.3	FAZ-B10/3	PKM0-10	DILM7	DX-LN3-010	DX-LM3-008	DX-SIN3-010
DC1-32011	2.2	3	8.7	10.5	11	FAZ-B16/3	PKM0-16	DILM7	DX-LN3-016	DX-LM3-011	DX-SIN3-016
DC1-32018	4	5	14.8	18	18.8	FAZ-B20/3	PKM0-20	DILM7	DX-LN3-025	DX-LM3-035	DX-SIN3-023
U_e400 V AC, 3-phase/$U_2$400 V AC, 3-phase											
DC1-342D2	0.75	1	1.9	2.2	2.4	FAZ-B6/3	PKM0-6,3	DILM7	DX-LN3-004	DX-LM3-005	DX-SIN3-004
DC1-344D1	1.5	2	3.6	4.1	4.3	FAZ-B6/3	PKM0-6,3	DILM7	DX-LN3-006	DX-LM3-005	DX-SIN3-010
DC1-345D8	2.2	3	5	5.8	6.1	FAZ-B10/3	PKM0-10	DILM7	DX-LN3-010	DX-LM3-008	DX-SIN3-010
DC1-349D5	4	5	8.5	9.5	9.8	FAZ-B16/3	PKM0-16	DILM7	DX-LN3-010	DX-LM3-011	DX-SIN3-010
DC1-34014	5.5	7.5	11.3	14	14.6	FAZ-B20/3	PKM0-20	DILM7	DX-LN3-016	DX-LM3-016	DX-SIN3-016
DC1-34018	7.5	10	15.2	18	18.1	FAZ-B25/3	PKM0-25	DILM7	DX-LN3-025	DX-LM3-035	DX-SIN3-023
DC1-34024	11	15	21.7	24	24.7	FAZ-B32/3	PKM0-32	DILM17	DX-LN3-025	DX-LM3-035	DX-SIN3-023
U_e230 V AC, 1-phase/$U_2$230 V AC, 3-phase											
DA1-124D3	0.75	1	3.2	4.3	8.5	FAZ-B10/1N	-	DILM7	DX-LN1-013	DX-LM3-005	DX-SIN3-010
DA1-127D0	1.5	2	6.3	7	13.9	FAZ-B16/1N	-	DILM7	DX-LN1-018	DX-LM3-008	DX-SIN3-010
DA1-12011	2.2	3	8.7	10.5	19.5	FAZ-B25/1N	-	DILM7	DX-LN1-024	DX-LM3-011	DX-SIN3-016
U_e230 V AC, 3-phase/$U_2$230 V AC, 3-phase											
DA1-324D3	0.75	1	3.2	4.3	4.5	FAZ-B6/3	PKM0-6,3	DILM7	DX-LN3-006	DX-LM3-005	DX-SIN3-010
DA1-327D0	1.5	2	6.3	7	7.3	FAZ-B10/3	PKM0-10	DILM7	DX-LN3-010	DX-LM3-008	DX-SIN3-010
DA1-32011	2.2	3	8.7	10.5	11	FAZ-B16/3	PKM0-16	DILM7	DX-LN3-016	DX-LM3-011	DX-SIN3-016
DA1-32018	4	5	14.8	18	18.8	FAZ-B20/3	PKM0-20	DILM7	DX-LN3-025	DX-LM3-035	DX-SIN3-023
DA1-32024	5.5	7.5	19.6	24	24.8	FAZ-B32/3	PKM0-32	DILM17	DX-LN3-025	DX-LM3-035	DX-SIN3-032
DA1-32039	7.5	10	26.4	39	40	FAZ-B50/3	-	DILM25	DX-LN3-040	DX-LM3-050	DX-SIN3-048
DA1-32046	11	15	38	46	47.1	FAZ-B63/3	-	DILM40	DX-LN3-050	DX-LM3-050	DX-SIN3-048
DA1-32061	15	20	51	61	62.4	NZMC1-S80	-	DILM50	DX-LN3-080	DX-LM3-063	DX-SIN3-061
DA1-32072	18.5	25	63	72	74.1	NZMC1-S80	-	DILM65	DX-LN3-080	DX-LM3-080	DX-SIN3-072
DA1-32090	22	30	71	90	92.3	NZMC2-S100	-	DILM80	DX-LN3-100	DX-LM3-100	DX-SIN3-090
DA1-32110	30	40	96	110	112.7	NZMC2-S125-SVE	-	DILM95	DX-LN3-120	DX-LM3-150	DX-SIN3-115
DA1-32150	45	50	141	150	153.5	NZMC2-S160-SVE	-	DILM150	DX-LN3-160	DX-LM3-150	DX-SIN3-150
DA1-32180	55	60	173	180	183.8	NZMC2-S200-SVE	-	DILM170	DX-LN3-200	DX-LM3-180	DX-SIN3-180
DA1-32202	55	75	173	202	206.2	NZMC3-S250-AVE	-	DILM185A	DX-LN3-250	DX-LM3-220	DX-SIN3-250
DA1-32248	75	100	233	248	252.8	NZMC3-S320-AVE	-	DILM185A	DX-LN3-300	DX-LM3-260	DX-SIN3-250

[1] Assigned motor rating for normal internally and externally ventilated four-pole, three-phase asynchronous motors with 1500 rpm (at 50 Hz) or 1800 rpm (at 60 Hz)
[2] With a switching frequency of 4 kHz and an ambient air temperature of +40°C or +50°C for IP20/NEMA 0

Part no.	Motor			Variable frequency drives		Power Wiring				Motor connection	
	Assigned motor rating [1]		Rated motor current	Rated operational current[2]	Input current	Protection device	Protection device	Contactor	Mains choke	Motor choke	Sine filter
	P	P	I_e	I_e	I_{LN}						
	kW	HP	A	A	T						
U_e400 V AC, 3-phase/$U_2$400 V AC, 3-phase											
DA1-342D2	0.75	1	1.9	2.2	2.4	FAZ-B6/3	PKM0-6,3	DILM7	DX-LN3-004	DX-LM3-005	DX-SIN3-004
DA1-344D1	1.5	2	3.6	4.1	4.3	FAZ-B6/3	PKM0-6,3	DILM7	DX-LN3-006	DX-LM3-005	DX-SIN3-010
DA1-345D8	2.2	3	5	5.8	6.1	FAZ-B10/3	PKM0-10	DILM7	DX-LN3-010	DX-LM3-008	DX-SIN3-010
DA1-349D5	4	5	8.5	9.5	9.8	FAZ-B16/3	PKM0-16	DILM7	DX-LN3-010	DX-LM3-011	DX-SIN3-010
DA1-34014	5.5	7.5	11.3	14	14.6	FAZ-B20/3	PKM0-20	DILM7	DX-LN3-016	DX-LM3-016	DX-SIN3-016
DA1-34018	7.5	10	15.2	18	18.1	FAZ-B25/3	PKM0-25	DILM7	DX-LN3-025	DX-LM3-035	DX-SIN3-023
DA1-34024	11	15	21.7	24	24.7	FAZ-B32/3	PKM0-32	DILM17	DX-LN3-025	DX-LM3-035	DX-SIN3-023
DA1-34030	15	20	29.3	30	30.8	FAZ-B40/3	-	DILM17	DX-LN3-040	DX-LM3-035	DX-SIN3-032
DA1-34039	18.5	25	36	39	40	FAZ-B50/3	-	DILM25	DX-LN3-040	DX-LM3-050	DX-SIN3-048
DA1-34046	22	30	41	46	47.1	FAZ-B63/3	-	DILM40	DX-LN3-050	DX-LM3-050	DX-SIN3-048
DA1-34061	30	40	55	61	62.8	NZMC1-S80	-	DILM50	DX-LN3-080	DX-LM3-063	DX-SIN3-061
DA1-34072	37	50	68	72	73.8	NZMC1-S80	-	DILM65	DX-LN3-080	DX-LM3-080	DX-SIN3-090
DA1-34090	45	60	81	90	92.2	NZMC1-S100	-	DILM80	DX-LN3-100	DX-LM3-100	DX-SIN3-115
DA1-34110	55	75	99	110	112.5	NZMC2-S125-SVE	-	DILM95	DX-LN3-120	DX-LM3-150	DX-SIN3-115
DA1-34150	75	100	134	150	153.2	NZMC2-S160-SVE	-	DILM150	DX-LN3-160	DX-LM3-150	DX-SIN3-150
DA1-34180	90	150	161	180	183.7	NZMC2-S200-SVE	-	DILM170	DX-LN3-200	DX-LM3-180	DX-SIN3-180
DA1-34202	110	175	196	202	205.9	NZMC3-S250-SVE	-	DILM185A	DX-LN3-250	DX-LM3-220	DX-SIN3-250
DA1-34240	132	200	231	240	244.5	NZMC3-S320-SVE	-	DILM185A	DX-LN3-250	DX-LM3-260	DX-SIN3-250
DA1-34302	160	250	279	302	307.8	NZMC3-S400-SVE	-	DILM225A	DX-LN3-370	DX-LM3-303	DX-SIN3-440
DA1-34370	200	300	349	370	-	-	-	-	-	-	-
DA1-34450	250	350	437	450	-	-	-	-	-	-	-

[1] Assigned motor rating for normal internally and externally ventilated four-pole, three-phase asynchronous motors with 1500 rpm (at 50 Hz) or 1800 rpm (at 60 Hz)
[2] With a switching frequency of 4 kHz and an ambient air temperature of +40°C or +50°C for IP20/NEMA 0

			DC1-S17D0…	DC1-S1011…	DC1-1D2D3…	DC1-1D4D3…	DC1-1D5D3…	DC1-S24D3…	DC1-S27D0…	DC1-S2011…
General										
Climatic proofing	ρ_w	%	< 95 %, average relative humidity (RH), non-condensing (EN 50178)							
Mounting position			Vertical							
Altitude		m	0 - 1000 m above sea level above 1000 m with 1% performance reduction per 100 m max. 4000 m							
Protection against direct contact			BGV A3 (VBG4, finger- and back-of-hand proof)							
Radio interference level										
Radio interference class (EMC)			C1, C2, C3, depending on the motor cable length, the connected load, and ambient conditions. External radio interference suppression filters (optional) may be necessary.							
Environment (EMC)			1st and 2nd environments							
longest permissible length of motor cable	l	m	25 (200)	25 (200)	25 (200)	25 (200)	25 (200)	25 (200)	25 (200)	25 (200)
Main circuit										
Supply										
Rated operational voltage	U_e		115 V AC, 1-phase					230 V AC, 1-phase		
Notes			-	-	The mains voltage of 115 V is raised to 230 V (output voltage) through an internal voltage double connection.			-	-	-
Mains voltage IEC (50/60Hz)	U_{LN}	V	110 (-10%) - 115 (+10%)					200 (-10%) - 240 (+10%)		
Input current	I_{LN}	T	8.5	12.5	11	19	25	6	9.3	14
Supply frequency	f_{LN}	Hz	50/60	50/60	50/60	50/60	50/60	50/60	50/60	50/60
Frequency range	f_{LN}	Hz	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz
Mains switch-on frequency			Maximum of one time every 30 seconds		Maximum of one time every 30 seconds			Maximum of one time every 30 seconds		
Power section										
Overload current for 60 s every 600 s	I_L	A	10.5	15.75	3.45	6.45	8.7	6.45	10.5	15.75
Starting current for 2 s every 20 s	I_L	A	12.25	18.38	4.03	7.53	10.15	7.53	12.25	18.38
Output voltage	U_2		115 V AC, 1-phase		230 V AC, 3-phase			230 V AC, 1-phase	230 V AC, 1-phase	230 V AC, 1-phase
Output Frequency	f_2	Hz	0 - 500 Hz	0 - 500 Hz	0 - 500 Hz	0 - 500 Hz	0 - 500 Hz	0 - 500 Hz	0 - 500 Hz	0 - 500 Hz
Switching frequency	f_{PWM}	kHz	16 (adjustable 4 - 32)					16 (adjustable 4 - 32)	16 (adjustable 4 - 32)	16 (adjustable 4 - 32)
Operation Mode			U/f control Slip compensation					U/f control Slip compensation		
Frequency resolution (setpoint value)	l	Hz	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Rated operational current	I_e	A	7	10.5	2.3	4.3	5.8	4.3	7	10.5
Power loss										
Heat dissipation at rated operational current	P_V	W	18.5	22	18.5	37.5	44	18.5	37.5	44
Efficiency	η	%	95	96	95	95	96	95	95	96
Maximum leakage current to ground (PE) without motor	I_{PE}	mA	2.49	2.49	< 1	< 1	< 1	2.49	2.49	2.49
Size			FS1	FS2	FS1	FS1	FS2	FS1	FS1	FS2
Motor feeder										
Assigned motor rating										
at 115 V, 50 Hz	P	kW	0.37	0.5	-	-	-	-	-	-
at 230 V, 50 Hz	P	kW	-	-	0.37	0.75	1.1	-	-	-
110 - 120 V, 60 Hz	P	HP	0.5	0.75	-	-	-	-	-	-
at 220 - 240 V, 60 Hz	P	HP	-	-	0.5	1	1.5	-	-	-
Apparent power										
Apparent power at rated operation 230 V	S	kVA	0	0	-	-	-	0.99	1.61	2.42
Apparent power at rated operation 240 V	S	kVA	0	0	-	-	-	1.03	1.68	2.52
Braking function										
Standard braking torque			-	-	max. 30 % MN	max. 30 % MN	max. 30 % MN	-	-	-
DC braking torque			max. 100% of rated operational current I_e, variable					max. 100% of rated operational current I_e, variable		
Braking torque with external braking resistance			-	max. 100% rated operational current I_e, with external braking resistance	-	-	max. 100% rated operational current I_e, with external braking resistance	-	-	max. 100% rated operational current I_e, with external braking resistance
minimum external braking resistance	R_{min}	Ω	-	47	-	-	47	-	-	47
Switch-on threshold for the braking transistor	U_{DC}	V	-	-	-	-	390 V DC	-	-	390 V DC
DC braking	%	I/I_e	-	-	-	-	-	-	-	-
Braking torque	%	I/I_e	-	-	-	-	-	-	-	-
Control section										
External control voltage	U_c	V	24 V DC (max. 100 mA)					24 V DC (max. 100 mA)	24 V DC (max. 100 mA)	24 V DC (max. 100 mA)
Reference voltage	U_s	V	10 V DC (max. 10 mA)					10 V DC (max. 10 mA)	10 V DC (max. 10 mA)	10 V DC (max. 10 mA)

Note [1] With a switching frequency of 4 kHz and an ambient air temperature of +40°C or +50°C for IP20/NEMA 0

Part no.			DC1-122D3…	DC1-124D3…	DC1-127D0…	DC1-12011…	DC1-12015…	DC1-322D3…	DC1-324D3…	DC1-327D0…	DC1-32011…	DC1-32018…
General												
Climatic proofing	ρ_w	%	< 95 %, average relative humidity (RH), non-condensing (EN 50178)									
Mounting position			Vertical									
Altitude		m	0 - 1000 m above sea level above 1000 m with 1% performance reduction per 100 m max. 4000 m									
Protection against direct contact			BGV A3 (VBG4, finger- and back-of-hand proof)									
Radio interference level												
Radio interference class (EMC)			C1, C2, C3, depending on the motor cable length, the connected load, and ambient conditions. External radio interference suppression filters (optional) may be necessary.									
Environment (EMC)			1st and 2nd environments									
longest permissible length of motor cable	l	m	25 (200)	25 (200)	25 (200)	25 (200)	25 (200)	25 (200)	25 (200)	25 (200)	25 (200)	25 (200)
Main circuit												
Supply												
Rated operational voltage	U_e		230 V AC, 1-phase					230 V AC, 3-phase	230 V AC, 3-phase	230 V AC, 3-phase	230 V AC, 3-phase	230 V AC, 3-phase
Mains voltage IEC (50/60Hz)	U_{LN}	V	200 (-10%) - 240 (+10%)					200 (-10%) - 240 (+10%)				
Input current	I_{LN}	T	5	8.5	13.9	19.5	30.5	3	4.5	7.3	11	18.8
Supply frequency	f_{LN}	Hz	50/60	50/60	50/60	50/60	50/60	50/60	50/60	50/60	50/60	50/60
Frequency range	f_{LN}	Hz	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz
Mains switch-on frequency			Maximum of one time every 30 seconds					Maximum of one time every 30 seconds				
Power section												
Overload current for 60 s every 600 s	I_L	A	3.45	6.45	10.5	15.75	22.5	3.45	6.45	10.5	15.75	27
Starting current for 2 s every 20 s	I_L	A	4.03	7.53	12.25	18.38	26.25	4.03	7.53	12.25	18.38	31.5
Output voltage	U_2		230 V AC, 3-phase					230 V AC, 3-phase				
Output Frequency	f_2	Hz	0 - 500 Hz	0 - 500 Hz	0 - 500 Hz	0 - 500 Hz	0 - 500 Hz	0 - 500 Hz	0 - 500 Hz	0 - 500 Hz	0 - 500 Hz	0 - 500 Hz
Switching frequency	f_{PWM}	kHz	16 (adjustable 4 - 32)				8 (adjustable 4 - 24)	16 (adjustable 4 - 32)	16 (adjustable 4 - 32)	16 (adjustable 4 - 32)	16 (adjustable 4 - 32)	8 (adjustable 4 - 24)
Operation Mode			U/f control Slip compensation					U/f control Slip compensation				
Frequency resolution (setpoint value)	l	Hz	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Rated operational current	I_e	A	2.3	4.3	7	10.5	15	2.3	4.3	7	10.5	18
Power loss												
Heat dissipation at rated operational current	P_V	W	18.5	45.75	63	103.4	160	14.8	39.75	61.5	90.2	160
Efficiency	η	%	95	93.9	95.8	95.3	96	96	94.7	95.9	95.9	96
Maximum leakage current to ground (PE) without motor	I_{PE}	mA	2.49	2.49	2.49	2.49	< 1	< 1	< 1	< 1	< 1	< 1
Size			FS1	FS1	FS2	FS2	FS3	FS1	FS1	FS2	FS2	FS3
Motor feeder												
Assigned motor rating												
at 230 V, 50 Hz	P	kW	0.37	0.75	1.5	2.2	4	0.37	0.75	1.5	2.2	4
at 220 - 240 V, 60 Hz	P	HP	0.5	1	2	3	5	0.5	1	2	3	5
Apparent power												
Apparent power at rated operation 230 V	S	kVA	0.92	1.71	2.79	4.18	5.98	0.92	1.71	2.79	4.18	7.17
Apparent power at rated operation 240 V	S	kVA	0.96	1.79	2.91	4.36	6.24	0.96	1.79	2.91	4.36	7.48
Braking function												
Standard braking torque			max. 30 % MN	max. 30 % MN	max. 30 % MN	max. 30 % MN	max. 30 % MN	max. 30 % MN	max. 30 % MN	max. 30 % MN	max. 30 % MN	max. 30 % MN
DC braking torque			max. 100% of rated operational current I_e, variable					max. 100% of rated operational current I_e, variable				
Braking torque with external braking resistance			-	-	max. 100% rated operational current I_e, with external braking resistance				-	max. 100% rated operational current I_e, with external braking resistance	max. 100% rated operational current I_e, with external braking resistance	max. 100% rated operational current I_e, with external braking resistance
minimum external braking resistance	R_{min}	Ω	-	-	47	47	47		-	47	47	47
Switch-on threshold for the braking transistor	U_{DC}	V	-	-	390 V DC	390 V DC	390 V DC		-	390 V DC	390 V DC	390 V DC
DC braking	%	I/I_e	-	-	-	-	-		-	-	-	-
Braking torque	%	I/I_e	-	-	-	-	-		-	-	-	-
Control section												
External control voltage	U_c	V	24 V DC (max. 100 mA)					24 V DC (max. 100 mA)	24 V DC (max. 100 mA)	24 V DC (max. 100 mA)	24 V DC (max. 100 mA)	24 V DC (max. 100 mA)
Reference voltage	U_s	V	10 V DC (max. 10 mA)					10 V DC (max. 10 mA)	10 V DC (max. 10 mA)	10 V DC (max. 10 mA)	10 V DC (max. 10 mA)	10 V DC (max. 10 mA)

Note [1] With a switching frequency of 4 kHz and an ambient air temperature of +40°C or +50°C for IP20/NEMA 0

Part no.			DC1-342D2…	DC1-344D1…	DC1-345D8…	DC1-349D5…	DC1-34014…	DC1-34018…	DC1-34024…
General									
Climatic proofing	ρ_w	%	< 95 %, average relative humidity (RH), non-condensing (EN 50178)				< 95 %, average relative humidity (RH), non-condensing (EN 50178)		
Mounting position			Vertical				Vertical		
Altitude		m	0 - 1000 m above sea level above 1000 m with 1% performance reduction per 100 m max. 4000 m				0 - 1000 m above sea level above 1000 m with 1% performance reduction per 100 m max. 4000 m		
Protection against direct contact			BGV A3 (VBG4, finger- and back-of-hand proof)				BGV A3 (VBG4, finger- and back-of-hand proof)		
Radio interference level									
Radio interference class (EMC)			C1, C2, C3, depending on the motor cable length, the connected load, and ambient conditions. External radio interference suppression filters (optional) may be necessary.				C1, C2, C3, depending on the motor cable length, the connected load, and ambient conditions. External radio interference suppression filters (optional) may be necessary.		
Environment (EMC)			1st and 2nd environments				1st and 2nd environments		
longest permissible length of motor cable	l	m	25 (200)	25 (200)	25 (200)	25 (200)	25 (200)	25 (200)	25 (200)
Main circuit									
Supply									
Rated operational voltage	U_e		400 V AC, 3-phase	400 V AC, 3-phase	400 V AC, 3-phase	400 V AC, 3-phase	400 V AC, 3-phase	400 V AC, 3-phase	400 V AC, 3-phase
Mains voltage IEC (50/60Hz)	U_{LN}	V	380 (-10%) - 480 (+10%)	380 (-10%) - 480 (+10%)	380 (-10%) - 480 (+10%)	380 (-10%) - 480 (+10%)	380 (-10%) - 480 (+10%)	380 (-10%) - 480 (+10%)	380 (-10%) - 480 (+10%)
Input current	I_{LN}	T	2.4	4.3	6.1	9.8	14.6	18.1	24.7
Supply frequency	f_{LN}	Hz	50/60	50/60	50/60	50/60	50/60	50/60	50/60
Frequency range	f_{LN}	Hz	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz
Mains switch-on frequency			Maximum of one time every 30 seconds				Maximum of one time every 30 seconds		
Power section									
Overload current for 60 s every 600 s	I_L	A	3.3	6.15	8.7	14.25	21	27	36
Starting current for 2 s every 20 s	I_L	A	3.85	7.18	10.15	16.63	24.5	31.5	42
Output voltage	U_2		400 V AC, 3-phase	400 V AC, 3-phase	400 V AC, 3-phase	400 V AC, 3-phase	400 V AC, 3-phase	400 V AC, 3-phase	400 V AC, 3-phase
Output Frequency	f_2	Hz	0 - 500 Hz	0 - 500 Hz	0 - 500 Hz	0 - 500 Hz	0 - 500 Hz	0 - 500 Hz	0 - 500 Hz
Switching frequency	f_{PWM}	kHz	16 (adjustable 4 - 32)	16 (adjustable 4 - 32)	16 (adjustable 4 - 32)	16 (adjustable 4 - 32)	8 (adjustable 4 - 24)	8 (adjustable 4 - 24)	8 (adjustable 4 - 24)
Operation Mode			U/f control Slip compensation				U/f control Slip compensation		
Frequency resolution (setpoint value)	l	Hz	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Rated operational current	I_e	A	2.2	4.1	5.8	9.5	14	18	24
Power loss									
Heat dissipation at rated operational current	P_V	W	63.75	76.5	101.2	136	209	30	297
Efficiency	η	%	91.5	94.9	95.4	96.6	96.2	99.6	97.3
Maximum leakage current to ground (PE) without motor	I_{PE}	mA	< 1	< 1	< 1	< 1	< 1	< 1	2.49
Size			FS1	FS2	FS2	FS2	FS3	FS3	FS3
Motor feeder									
Assigned motor rating									
at 400 V, 50 Hz	P	kW	0.75	1.5	2.2	4	5.5	7.5	11
at 440 - 480 V, 60 Hz	P	HP	1	2	3	5	7.5	10	15
Apparent power									
Apparent power at rated operation 400 V	S	kVA	1.52	2.84	4.02	6.58	9.67	12.47	16.63
Apparent power at rated operation 480 V	S	kVA	1.83	3.41	4.82	7.9	11.64	14.96	19.95
Braking function									
Standard braking torque			max. 30 % MN	max. 30 % MN	max. 30 % MN	max. 30 % MN	max. 30 % MN	max. 30 % MN	max. 30 % MN
DC braking torque			max. 100% of rated operational current I_e, variable				max. 100% of rated operational current I_e, variable		
Braking torque with external braking resistance			-	max. 100% rated operational current I_e, with external braking resistance			max. 100% rated operational current I_e, with external braking resistance		
minimum external braking resistance	R_{min}	Ω	-	100	100	100	22	22	22
Switch-on threshold for the braking transistor	U_{DC}	V	-	780 V DC	780 V DC	780 V DC	780 V DC	780 V DC	780 V DC
DC braking	%	I/I_e	-	-	-	-	-	-	-
Braking torque	%	I/I_e	-	-	-	-	-	-	-
Control section									
External control voltage	U_c	V	24 V DC (max. 100 mA)	24 V DC (max. 100 mA)	24 V DC (max. 100 mA)	24 V DC (max. 100 mA)	24 V DC (max. 100 mA)	24 V DC (max. 100 mA)	24 V DC (max. 100 mA)
Reference voltage	U_s	V	10 V DC (max. 10 mA)	10 V DC (max. 10 mA)	10 V DC (max. 10 mA)	10 V DC (max. 10 mA)	10 V DC (max. 10 mA)	10 V DC (max. 10 mA)	10 V DC (max. 10 mA)

Note [1] With a switching frequency of 4 kHz and an ambient air temperature of +40°C or +50°C for IP20/NEMA 0

Typ			DA1-124D3…	DA1-127D0…	DA1-12011…	DA1-324D3…	DA1-327D0…	DA1-32011…	DA1-32018…	DA1-32024…
General										
Climatic proofing	ρ_w	%	< 95 %, average relative humidity (RH), non-condensing (EN 50178)							
Mounting position			Vertical							
Altitude		m	0 - 1000 m above sea level above 1000 m with 1% performance reduction per 100 m max. 4000 m							
Protection against direct contact			BGV A3 (VBG4, finger- and back-of-hand proof)							
Radio interference level										
Radio interference class (EMC)			C1, C2, C3, depending on the motor cable length, the connected load, and ambient conditions. External radio interference suppression filters (optional) may be necessary.							
Environment (EMC)			1st and 2nd environments							
longest permissible length of motor cable	l	m	25 (200)	25 (200)	25 (200)	25 (200)	25 (200)	25 (200)	25 (200)	25 (200)
Main circuit										
Supply										
Rated operational voltage	U_e		230 V AC, 1-phase	230 V AC, 1-phase	230 V AC, 1-phase	230 V AC, 3-phase	230 V AC, 3-phase	230 V AC, 3-phase	230 V AC, 3-phase	230 V AC, 3-phase
Mains voltage IEC (50/60Hz)	U_{LN}	V	200 (-10%) - 240 (+10%)							
Input current	I_{LN}	T	8.5	13.9	19.5	4.5	7.3	11	18.8	24.8
Supply frequency	f_{LN}	Hz	50/60	50/60	50/60	50/60	50/60	50/60	50/60	50/60
Frequency range	f_{LN}	Hz	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz
Mains switch-on frequency			Maximum of one time every 30 seconds							
Power section										
Overload current for 60 s every 600 s	I_L	A	6.45	10.5	15.75	6.45	10.5	15.75	27	36
Starting current for 4 s every 40 s	I_L	A	8.6	14	21	8.6	14	21	36	48
Output voltage	U_2		230 V AC, 3-phase	230 V AC, 3-phase	230 V AC, 3-phase	230 V AC, 3-phase	230 V AC, 3-phase	230 V AC, 3-phase	230 V AC, 3-phase	230 V AC, 3-phase
Output Frequency	f_2	Hz	0 - 500 Hz	0 - 500 Hz	0 - 500 Hz	0 - 500 Hz	0 - 500 Hz	0 - 500 Hz	0 - 500 Hz	0 - 500 Hz
Switching frequency	f_{PWM}	kHz	16 (adjustable 4 - 32)	16 (adjustable 4 - 32)	16 (adjustable 4 - 32)	16 (adjustable 4 - 32)	16 (adjustable 4 - 32)	16 (adjustable 4 - 32)	16 (adjustable 4 - 24)	16 (adjustable 4 - 16)
Operation Mode			U/f control Slip compensation sensorless vector control (SLV) Vector control with feedback (CLV)			U/f control Slip compensation sensorless vector control (SLV) Vector control with feedback (CLV)				
Frequency resolution (setpoint value)	l	Hz	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Rated operational current	I_e	A	4.3	7	10.5	4.3	7	10.5	18	24
Power loss										
Heat dissipation at rated operational current	P_V	W	45.75	63	103.4	39.75	61.5	90.2	160	170.5
Efficiency	η	%	93.9	95.8	95.3	94.7	95.9	95.9	96	96.9
Maximum leakage current to ground (PE) without motor	I_{PE}	mA	2.49	2.49	2.49	1.73	1.73	1.73	0.93	0.93
Size			FS2	FS2	FS2	FS2	FS2	FS2	FS3	FS3
Motor feeder										
Assigned motor rating										
at 230 V, 50 Hz	P	kW	0.75	1.5	2.2	0.75	1.5	2.2	4	5.5
at 220 - 240 V, 60 Hz	P	HP	1	2	3	1	2	3	5	7.5
Apparent power										
Apparent power at rated operation 230 V	S	kVA	1.71	2.79	4.18	1.71	2.79	4.18	7.17	9.56
Apparent power at rated operation 240 V	S	kVA	1.79	2.91	4.36	1.79	2.91	4.36	7.48	9.98
Braking function										
Standard braking torque			max. 30 % MN	max. 30 % MN	max. 30 % MN	max. 30 % MN	max. 30 % MN	max. 30 % MN	max. 30 % MN	max. 30 % MN
DC braking torque			max. 100% of rated operational current I_e, variable			max. 100% of rated operational current I_e, variable				
Braking torque with external braking resistance			max. 100% rated operational current I_e, with external braking resistance			max. 100% rated operational current I_e, with external braking resistance				
minimum external braking resistance	R_{min}	Ω	33	33	22	33	33	22	15	15
Switch-on threshold for the braking transistor	U_{DC}	V	390 V DC	390 V DC	390 V DC	390 V DC	390 V DC	390 V DC	390 V DC	390 V DC
Control section										
External control voltage	U_c	V	24 V DC (max. 100 mA)	24 V DC (max. 100 mA)	24 V DC (max. 100 mA)	24 V DC (max. 100 mA)	24 V DC (max. 100 mA)	24 V DC (max. 100 mA)	24 V DC (max. 100 mA)	24 V DC (max. 100 mA)
Reference voltage	U_s	V	10 V DC (max. 10 mA)	10 V DC (max. 10 mA)	10 V DC (max. 10 mA)	10 V DC (max. 10 mA)	10 V DC (max. 10 mA)	10 V DC (max. 10 mA)	10 V DC (max. 10 mA)	10 V DC (max. 10 mA)

Note [1] With a switching frequency of 4 kHz and an ambient air temperature of +40°C or +50°C for IP20/NEMA 0

Typ			DA1-32039…	DA1-32046…	DA1-32061…	DA1-32072…	DA1-32090…	DA1-32110…	DA1-32150…	DA1-32180…	DA1-32202…	DA1-32248…
General												
Climatic proofing	ρ_w	%	< 95 %, average relative humidity (RH), non-condensing (EN 50178)									
Mounting position			Vertical									
Altitude		m	0 - 1000 m above sea level above 1000 m with 1% performance reduction per 100 m max. 4000 m									
Protection against direct contact			BGV A3 (VBG4, finger- and back-of-hand proof)									
Radio interference level												
Radio interference class (EMC)			C1, C2, C3, depending on the motor cable length, the connected load, and ambient conditions. External radio interference suppression filters (optional) may be necessary.									
Environment (EMC)			1st and 2nd environments									
longest permissible length of motor cable	l	m	25 (200)	25 (200)	25 (200)	25 (200)	25 (200)	25 (200)	25 (200)	25 (200)	25 (200)	25 (200)
Main circuit												
Supply												
Rated operational voltage	U_e		230 V AC, 3-phase	230 V AC, 3-phase	230 V AC, 3-phase	230 V AC, 3-phase	230 V AC, 3-phase	230 V AC, 3-phase	230 V AC, 3-phase	230 V AC, 3-phase	230 V AC, 3-phase	230 V AC, 3-phase
Mains voltage IEC (50/60Hz)	U_{LN}	V	200 (-10%) - 240 (+10%)									
Input current	I_{LN}	T	40	47.1	62.4	74.1	92.3	112.7	153.5	183.8	206.2	252.8
Supply frequency	f_{LN}	Hz	50/60	50/60	50/60	50/60	50/60	50/60	50/60	50/60	50/60	50/60
Frequency range	f_{LN}	Hz	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz
Mains switch-on frequency			Maximum of one time every 30 seconds									
Power section												
Overload current for 60 s every 600 s	I_L	A	45	69	91.5	108	135	165	225	270	303	372
Starting current for 4 s every 40 s	I_L	A	60	92	122	144	180	220	300	360	404	496
Output voltage	U_2		230 V AC, 3-phase					230 V AC, 3-phase	230 V AC, 3-phase	230 V AC, 3-phase	230 V AC, 3-phase	230 V AC, 3-phase
Output Frequency	f_2	Hz	0 - 500 Hz	0 - 500 Hz	0 - 500 Hz	0 - 500 Hz	0 - 500 Hz	0 - 500 Hz	0 - 500 Hz	0 - 500 Hz	0 - 500 Hz	0 - 500 Hz
Switching frequency	f_{PWM}	kHz	8 (adjustable 4 - 24)				4 (adjustable 4 - 16)	4 (adjustable 4 - 16)	4 (adjustable 4 - 12)	4 (adjustable 4 - 8)	4 (adjustable 4 - 16)	4 (adjustable 4 - 12)
Operation Mode			U/f control Slip compensation sensorless vector control (SLV) Vector control with feedback (CLV)					U/f control Slip compensation sensorless vector control (SLV) Vector control with feedback (CLV)				
Frequency resolution (setpoint value)	l	Hz	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Rated operational current	I_e	A	39	46	61	72	90	110	150	180	202	248
Power loss												
Heat dissipation at rated operational current	P_V	W	187.5	264	345	518	550	720	814	945	1100	1425
Efficiency	η	%	97.5	97.6	97.7	97.2	97.5	97.6	97.8	97.9	98	98.1
Maximum leakage current to ground (PE) without motor	I_{PE}	mA	1.42	1.42	0.28	0.28	1.54	1.54	1.54	1.54	2.74	2.74
Size			FS4	FS4	FS5	FS5	FS6	FS6	FS6	FS6	FS7	FS7
Motor feeder												
Assigned motor rating												
at 230 V, 50 Hz	P	kW	7.5	11	15	18.5	22	30	45	55	55	75
at 220 - 240 V, 60 Hz	P	HP	10	15	20	25	30	40	50	60	75	100
Apparent power												
Apparent power at rated operation 230 V	S	kVA	11.95	18.33	24.3	28.68	35.85	43.82	59.76	71.71	80.47	98.8
Apparent power at rated operation 240 V	S	kVA	12.47	19.12	25.36	29.93	37.41	45.73	62.35	74.82	83.97	103.09
Braking function												
Standard braking torque			max. 30 % MN	max. 30 % MN	max. 30 % MN	max. 30 % MN	max. 30 % MN	max. 30 % MN	max. 30 % MN	max. 30 % MN	max. 30 % MN	max. 30 % MN
DC braking torque			max. 100% of rated operational current I_e, variable					max. 100% of rated operational current I_e, variable				
Braking torque with external braking resistance			max. 100% rated operational current I_e, with external braking resistance					max. 100% rated operational current I_e, with external braking resistance				
minimum external braking resistance	R_{min}	Ω	6	6	6	6	6	3	3	3	3	3
Switch-on threshold for the braking transistor	U_{DC}	V	390 V DC	390 V DC	390 V DC	390 V DC	390 V DC	390 V DC	390 V DC	390 V DC	390 V DC	390 V DC
Control section												
External control voltage	U_c	V	24 V DC (max. 100 mA)					24 V DC (max. 100 mA)	24 V DC (max. 100 mA)	24 V DC (max. 100 mA)	24 V DC (max. 100 mA)	24 V DC (max. 100 mA)
Reference voltage	U_s	V	10 V DC (max. 10 mA)					10 V DC (max. 10 mA)	10 V DC (max. 10 mA)	10 V DC (max. 10 mA)	10 V DC (max. 10 mA)	10 V DC (max. 10 mA)

Note [1] With a switching frequency of 4 kHz and an ambient air temperature of +40°C or +50°C for IP20/NEMA 0

Part no.			DA1-342D2…	DA1-344D1FB…	DA1-345D8…	DA1-349D5…
General						
Climatic proofing	ρ_w	%	< 95 %, average relative humidity (RH), non-condensing (EN 50178)			
Mounting position			Vertical			
Altitude		m	0 - 1000 m above sea level above 1000 m with 1% performance reduction per 100 m max. 4000 m			
Protection against direct contact			BGV A3 (VBG4, finger- and back-of-hand proof)			
Radio interference level						
Radio interference class (EMC)			C1, C2, C3, depending on the motor cable length, the connected load, and ambient conditions. External radio interference suppression filters (optional) may be necessary.			
Environment (EMC)			1st and 2nd environments			
longest permissible length of motor cable	l	m	25 (200)	25 (200)	25 (200)	25 (200)
Main circuit						
Supply						
Rated operational voltage	U_e		400 V AC, 3-phase	400 V AC, 3-phase	400 V AC, 3-phase	400 V AC, 3-phase
Mains voltage IEC (50/60Hz)	U_{LN}	V	380 (-10%) - 480 (+10%)			
Input current	I_{LN}	T	2.4	4.3	6.1	9.8
Supply frequency	f_{LN}	Hz	50/60	50/60	50/60	50/60
Frequency range	f_{LN}	Hz	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz
Mains switch-on frequency			Maximum of one time every 30 seconds			
Power section						
Overload current for 60 s every 600 s	I_L	A	3.3	6.15	8.7	14.25
Starting current for 4 s every 40 s	I_L	A	4.4	8.2	11.6	19
Output voltage	U_2		400 V AC, 3-phase	400 V AC, 3-phase	400 V AC, 3-phase	400 V AC, 3-phase
Output Frequency	f_2	Hz	0 - 500 Hz	0 - 500 Hz	0 - 500 Hz	0 - 500 Hz
Switching frequency	f_{PWM}	kHz	8 (adjustable 4 - 24)	8 (adjustable 4 - 24)	8 (adjustable 4 - 32)	8 (adjustable 4 - 32)
Operation Mode			U/f control Slip compensation sensorless vector control (SLV) Vector control with feedback (CLV)			
Frequency resolution (setpoint value)	l	Hz	0.1	0.1	0.1	0.1
Rated operational current	I_e	A	2.2	4.1	5.8	9.5
Power loss						
Heat dissipation at rated operational current	P_V	W	63.75	76.5	101.2	136
Efficiency	η	%	91.5	94.9	95.4	96.6
Maximum leakage current to ground (PE) without motor	I_{PE}	mA	4.65	4.65	4.65	4.65
Size			FS2	FS2	FS2	FS2
Motor feeder						
Assigned motor rating						
at 400 V, 50 Hz	P	kW	0.75	1.5	2.2	4
at 440 - 480 V, 60 Hz	P	HP	1	2	3	5
Apparent power						
Apparent power at rated operation 400 V	S	kVA	1.52	2.84	4.02	6.58
Apparent power at rated operation 480 V	S	kVA	1.83	3.41	4.82	7.9
Braking function						
Standard braking torque			max. 30 % MN	max. 30 % MN	max. 30 % MN	max. 30 % MN
DC braking torque			max. 100% of rated operational current I_e, variable			
Braking torque with external braking resistance			max. 100% rated operational current I_e, with external braking resistance			
minimum external braking resistance	R_{min}	Ω	47	47	47	33
Switch-on threshold for the braking transistor	U_{DC}	V	780 V DC	780 V DC	780 V DC	780 V DC
Control section						
External control voltage	U_c	V	24 V DC (max. 100 mA)	24 V DC (max. 100 mA)	24 V DC (max. 100 mA)	24 V DC (max. 100 mA)
Reference voltage	U_s	V	10 V DC (max. 10 mA)	10 V DC (max. 10 mA)	10 V DC (max. 10 mA)	10 V DC (max. 10 mA)

Note [1] With a switching frequency of 4 kHz and an ambient air temperature of +40°C or +50°C for IP20/NEMA 0

DA1-34014…	DA1-34018…	DA1-34024…	DA1-34030…	DA1-34039…	DA1-34046…
< 95 %, average relative humidity (RH), non-condensing (EN 50178)					
Vertical					
0 - 1000 m above sea level above 1000 m with 1% performance reduction per 100 m max. 4000 m					
BGV A3 (VBG4, finger- and back-of-hand proof)					
C1, C2, C3, depending on the motor cable length, the connected load, and ambient conditions. External radio interference suppression filters (optional) may be necessary.					
1st and 2nd environments					
25 (200)	25 (200)	25 (200)	25 (200)	25 (200)	25 (200)
400 V AC, 3-phase	400 V AC, 3-phase	400 V AC, 3-phase	400 V AC, 3-phase	400 V AC, 3-phase	400 V AC, 3-phase
380 (-10%) - 480 (+10%)					
14.6	18.1	24.7	30.8	40	47.1
50/60	50/60	50/60	50/60	50/60	50/60
48 - 62 Hz	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz
Maximum of one time every 30 seconds					
21	27	36	45	58.5	69
28	36	48	60	78	92
400 V AC, 3-phase	400 V AC, 3-phase	400 V AC, 3-phase	400 V AC, 3-phase	400 V AC, 3-phase	400 V AC, 3-phase
0 - 500 Hz	0 - 500 Hz	0 - 500 Hz	0 - 500 Hz	0 - 500 Hz	0 - 500 Hz
8 (adjustable 4 - 24)	8 (adjustable 4 - 24)	8 (adjustable 4 - 24)	8 (adjustable 4 - 24)	8 (adjustable 4 - 24)	8 (adjustable 4 - 24)
U/f control Slip compensation sensorless vector control (SLV) Vector control with feedback (CLV)					
0.1	0.1	0.1	0.1	0.1	0.1
14	18	24	30	39	46
209	30	297	375	444	506
96.2	99.6	97.3	97.5	97.6	97.7
1.55	1.55	2.47	2.47	2.47	2.47
FS3	FS3	FS4	FS4	FS4	FS4
5.5	7.5	11	15	18.5	22
7.5	10	15	20	25	30
9.67	12.47	16.63	20.78	27.02	31.87
11.64	14.96	19.95	24.94	32.42	38.24
max. 30 % MN	max. 30 % MN	max. 30 % MN	max. 30 % MN	max. 30 % MN	max. 30 % MN
max. 100% of rated operational current I_e, variable					
max. 100% rated operational current I_e, with external braking resistance					
22	22	22	22	12	12
780 V DC	780 V DC	780 V DC	780 V DC	780 V DC	780 V DC
24 V DC (max. 100 mA)	24 V DC (max. 100 mA)	24 V DC (max. 100 mA)	24 V DC (max. 100 mA)	24 V DC (max. 100 mA)	24 V DC (max. 100 mA)
10 V DC (max. 10 mA)	10 V DC (max. 10 mA)	10 V DC (max. 10 mA)	10 V DC (max. 10 mA)	10 V DC (max. 10 mA)	10 V DC (max. 10 mA)

Part no.			DA1-34061…	DA1-34072…	DA1-34090F…	DA1-34110…	DA1-34150…	DA1-34180…	DA1-34202…	DA1-34240…	DA1-34302…
General											
Climatic proofing	ρ_w	%	< 95 %, average relative humidity (RH), non-condensing (EN 50178)								
Mounting position			Vertical								
Altitude		m	0 - 1000 m above sea level above 1000 m with 1% performance reduction per 100 m max. 4000 m								
Protection against direct contact			BGV A3 (VBG4, finger- and back-of-hand proof)								
Radio interference level											
Radio interference class (EMC)			C1, C2, C3, depending on the motor cable length, the connected load, and ambient conditions. External radio interference suppression filters (optional) may be necessary.								
Environment (EMC)			1st and 2nd environments								
longest permissible length of motor cable	l	m	25 (200)	25 (200)	25 (200)	25 (200)	25 (200)	25 (200)	25 (200)	25 (200)	25 (200)
Main circuit											
Supply											
Rated operational voltage	U_e		400 V AC, 3-phase	400 V AC, 3-phase	400 V AC, 3-phase	400 V AC, 3-phase	400 V AC, 3-phase	400 V AC, 3-phase	400 V AC, 3-phase	400 V AC, 3-phase	400 V AC, 3-phase
Mains voltage IEC (50/60Hz)	U_{LN}	V	380 (-10%) - 480 (+10%)				380 (-10%) - 480 (+10%)				
Input current	I_{LN}	T	62.8	73.8	92.2	112.5	153.2	183.7	205.9	244.5	307.8
Supply frequency	f_{LN}	Hz	50/60	50/60	50/60	50/60	50/60	50/60	50/60	50/60	50/60
Frequency range	f_{LN}	Hz	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz	48 - 62 Hz
Mains switch-on frequency			Maximum of one time every 30 seconds				Maximum of one time every 30 seconds				
Power section											
Overload current for 60 s every 600 s	I_L	A	91.5	105	135	165	225	270	303	360	453
Starting current for 4 s every 40 s	I_L	A	122	140	180	220	300	360	404	480	604
Output voltage	U_2		400 V AC, 3-phase	400 V AC, 3-phase	400 V AC, 3-phase	400 V AC, 3-phase	400 V AC, 3-phase	400 V AC, 3-phase	400 V AC, 3-phase	400 V AC, 3-phase	400 V AC, 3-phase
Output Frequency	f_2	Hz	0 - 500 Hz	0 - 500 Hz	0 - 500 Hz	0 - 500 Hz	0 - 500 Hz	0 - 500 Hz	0 - 500 Hz	0 - 500 Hz	0 - 500 Hz
Switching frequency	f_{PWM}	kHz	8 (adjustable 4 - 24)	8 (adjustable 4 - 24)	4 (adjustable 4 - 16)	4 (adjustable 4 - 16)	4 (adjustable 4 - 12)	4 (adjustable 4 - 8)	4 (adjustable 4 - 16)	4 (adjustable 4 - 12)	4 (adjustable 4 - 8)
Operation Mode			U/f control Slip compensation sensorless vector control (SLV) Vector control with feedback (CLV)				U/f control Slip compensation sensorless vector control (SLV) Vector control with feedback (CLV)				
Frequency resolution (setpoint value)	l	Hz	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Rated operational current	I_e	A	61	72	90	110	150	180	202	240	302
Power loss											
Heat dissipation at rated operational current	P_V	W	840	925	1080	1210	1575	1800	2090	2376	3040
Efficiency	η	%	97.2	97.5	97.6	97.8	97.9	98	98.1	98.2	98.1
Maximum leakage current to ground (PE) without motor	I_{PE}	mA	0.49	0.49	2.68	2.68	2.68	2.68	4.75	4.75	4.75
Size			FS5	FS5	FS6	FS6	FS6	FS6	FS7	FS7	FS7
Motor feeder											
Assigned motor rating											
at 400 V, 50 Hz	P	kW	30	37	45	55	75	90	110	132	160
at 440 - 480 V, 60 Hz	P	HP	40	50	60	75	100	150	175	200	250
Apparent power											
Apparent power at rated operation 400 V	S	kVA	42.26	48.5	62.35	76.21	103.92	124.71	139.95	166.28	209.23
Apparent power at rated operation 480 V	S	kVA	50.71	58.2	74.82	91.45	124.71	149.65	167.94	199.53	251.08
Braking function											
Standard braking torque			max. 30 % MN	max. 30 % MN	max. 30 % MN	max. 30 % MN	max. 30 % MN	max. 30 % MN	max. 30 % MN	max. 30 % MN	max. 30 % MN
DC braking torque			max. 100% of rated operational current I_e, variable				max. 100% of rated operational current I_e, variable				
Braking torque with external braking resistance			max. 100% rated operational current I_e, with external braking resistance				max. 100% rated operational current I_e, with external braking resistance				
minimum external braking resistance	R_{min}	Ω	12	12	6	6	6	6	6	6	6
Switch-on threshold for the braking transistor	U_{DC}	V	780 V DC	780 V DC	780 V DC	780 V DC	780 V DC	780 V DC	780 V DC	780 V DC	780 V DC
Control section											
External control voltage	U_c	V	24 V DC (max. 100 mA)	24 V DC (max. 100 mA)	24 V DC (max. 100 mA)	24 V DC (max. 100 mA)	24 V DC (max. 100 mA)	24 V DC (max. 100 mA)	24 V DC (max. 100 mA)	24 V DC (max. 100 mA)	24 V DC (max. 100 mA)
Reference voltage	U_s	V	10 V DC (max. 10 mA)	10 V DC (max. 10 mA)	10 V DC (max. 10 mA)	10 V DC (max. 10 mA)	10 V DC (max. 10 mA)	10 V DC (max. 10 mA)	10 V DC (max. 10 mA)	10 V DC (max. 10 mA)	10 V DC (max. 10 mA)

Note [1] With a switching frequency of 4 kHz and an ambient air temperature of +40°C or +50°C for IP20/NEMA 0

Technical data

			DX-LN1…	DX-LN3…	DX-LM3…
General					
Standards			IEC/EN 61558-2-20-2000, VDE 0570 Part 2-20/2001-04, UL, CSA	IEC/EN 61558-2-20-2000, VDE 0570 Part 2-20/2001-04, UL, CSA	IEC/EN 61558-2-20-2000, VDE 0570 Part 2-20/2001-04, UL, CSA
Operating temperature		°C	-25 to +40, up to 70 with current derating (see the note)	-25 to +40, up to 70 with current derating (see the note)	-25 to +40, up to 70 with current derating (see the note)
Storage temperature	ϑ	°C	-25 - +85	-25 - +85	-25 - +85
Mechanical shock resistance		g	11 ms²/15 3 shocks	11 ms²/15 3 shocks	11 ms²/15 3 shocks
Vibration resistance		g	1 (0 - 150 Hz)	1 (0 - 150 Hz)	1 (0 - 150 Hz)
Vibration			0.35 mm at 10 - 55 Hz	0.35 mm at 10 - 55 Hz	0.35 mm at 10 - 55 Hz
Altitude		m	0 – 1000 above sea level, up to 5000 with current reduction (see notes)	0 – 1000 above sea level, up to 5000 with current reduction (see notes)	0 – 1000 above sea level, up to 5000 with current reduction (see notes)
Mounting position			Standing vertically, suspended horizontally	Standing vertically, suspended horizontally	Standing vertically, suspended horizontally
Free surrounding areas		MM	< 50	< 50	< 50
Protection type			IP20 (terminal)	IP20 (terminal)	IP20 (terminal)
Rated duty factor		% DF	100	100	100
Weight		kg	0.7	1.5	1.5
Electrical data					
Rated operational voltage			1 AC 230 V	3 AC 400 V	3 AC 400 V
Max. supply voltage		V AC	260 V + 0% (50/60 Hz)	550 V + 0% (50/60 Hz)	750 V + 0% (50/60 Hz)
Operating frequency	f	Hz	50/60	50/60	0…200
Insulation class			B	B	B
Connection					
Terminations			✓	✓	✓
Connection lugs			-	✓ (≧ 50 A)	✓ (≧ 63 A)
PE stud			✓	✓	✓

Mains choke

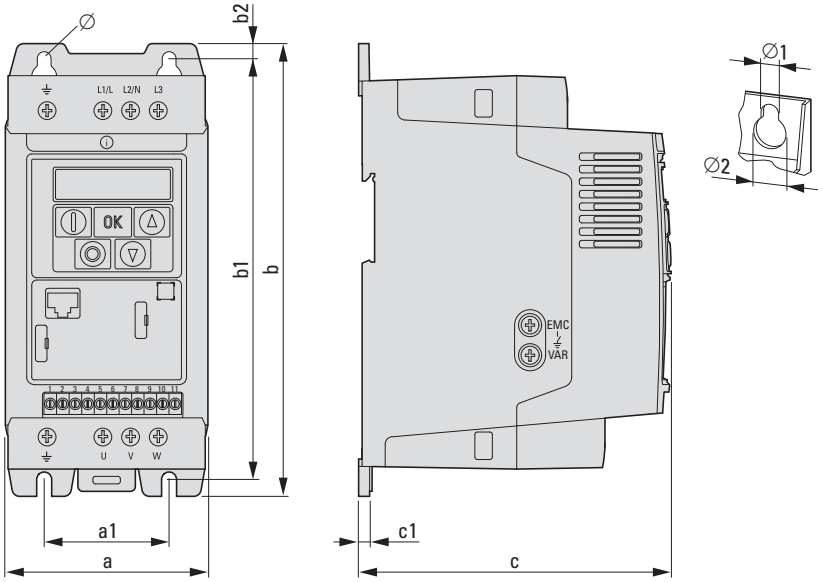
Part no.	Rated operational current I_e A	Induct-ance L mH	Maximum heat dissipation P_v W	Cu factor kg	Voltage sag U_k %	Connection Terminal mm²	Terminal AWG	Connection lug mm²	Drilling mm	Tightening torque Nm	Weight kg
Rated operational voltage 1 AC 230 V											
DEX-LN1-006	5.8	5.05	9	0,09	4	4	20 - 10	-	-	0.8	0.7
DEX-LN1-009	8.6	3.41	11	0,11	4	4	20 - 10	-	-	0.8	0.7
DEX-LN1-013	13	2.25	12	0,18	4	4	20 - 10	-	-	0.8	1.5
DEX-LN1-018	18	1.63	17	0,27	4	4	20 - 10	-	-	0.8	1.5
DEX-LN1-024	24	1.22	20	0,33	4	4	20 - 10	-	-	0.8	2
DX-LN1-032	32	0.92	24	0,00	4	4	20 - 10	-	0	0.8	3
Rated operational voltage 3 AC 400 V											
DEX-LN3-004	3.9	7.51	17	0,25	4	4	20 - 10	-	-	0.8	1.5
DEX-LN3-006	6	4.9	19	0,34	4	4	20 - 10	-	-	0.8	1.5
DEX-LN3-010	10	2.94	33	0,45	4	4	20 - 10	-	-	0.8	2.2
DEX-LN3-016	16	1.84	44	0,53	4	4	20 - 10	-	-	0.8	2.9
DEX-LN3-025	25	1.18	57	0,90	4	4	20 - 10	-	-	0.8	4.8
DEX-LN3-040	40	0.64	59	0,91	2.5	10	20 - 6	-	-	1.5	4.8
DEX-LN3-050	50	0.37	58	1,08	2.5	-	-	Cu 15 x 2	7	3	5.9
DEX-LN3-060	60	0.31	60	1,51	2.5	-	-	Cu 15 x 2	7	3	5.9
DEX-LN3-080	80	0.23	86	1,67	2.5	-	-	Cu 20 x 3	9	6	7.3
DEX-LN3-100	100	0.18	101	1,68	2.5	-	-	Cu 20 x 3	9	6	10.2
DEX-LN3-120	120	0.15	100	2,26	2.5	-	-	Cu 25 x 5	11	10	10.2
DEX-LN3-160	160	0.11	140	2,35	2.5	-	-	Cu 25 x 5	11	10	12.3
DEX-LN3-200	200	0.09	154	3,81	2.5	-	-	Cu 25 x 5	11	10	14.9
DEX-LN3-250	250	0.07	155	4,26	2.5	-	-	Cu 40 x 5	14	15.5	20.6
DEX-LN3-300	300	0.06	196	4,28	2.5	-	-	Cu 40 x 5	14	15.5	20.6
DX-LN3-303	303	0.06	230	0,00	2.5	-	-	Cu 40 x 5	14	15.5	20.6
DX-LN3-370	370	0.05	290	0,00	2.5	-	-	Cu 40 x 5	14	15.5	24.3
DX-LN3-450	450	0.04	300	0,00	2.5	-	-	Cu 40 x 10	14	15.5	23.8

Motor chokes

Part no.	Rated operational current I_e A	Induct-ance L mH	max. heat dissipation (pulse frequency) (3 kHz) P_v W	(5 kHz) P_v W	(12 kHz) P_v W	Cu factor kg	Connection Terminal mm²	Terminal AWG	Connection lug mm²	Drilling mm	Tightening torque Nm	Weight kg
Rated operational voltage 3 AC 400 V												
DEX-LM3-005	5	2	12	14	24	0,29	4	20 - 10	-	-	0.8	1.5
DEX-LM3-008	8	4.1	32	46	54	1,09	4	20 - 10	-	-	0.8	4.8
DEX-LM3-011	11	3	45	66	71	1,23	4	20 - 10	-	-	0.8	4.8
DEX-LM3-016	16	1.5	50	75	78	0,88	4	20 - 10	-	-	0.8	4.8
DEX-LM3-035	35	1	75	114	116	2,30	4	20 - 10	-	-	0.8	7.3
DEX-LM3-050	50	0.6	110	157	168	3,60	10	20 - 6	-	-	1.5	12.3
DEX-LM3-063	63	0.5	130	190	193	3,01	-	-	Cu 15 x 2	7	3	14.9
DEX-LM3-080	80	0.5	132	206	206	5,88	-	-	Cu 20 x 2	9	6	20.6
DEX-LM3-100	100	0.45	177	279	294	10,10	-	-	Cu 20 x 2	9	6	31
DEX-LM3-150	150	0.35	293	418	424	8,22	-	-	Cu 25 x 5	11	10	45
DEX-LM3-180	180	0.3	418	298	439	14,75	-	-	Cu 25 x 5	11	10	45
DEX-LM3-220	220	0.2	344	512	517	11,37	-	-	Cu 40 x 5	14	15.5	45
DEX-LM3-260	260	0.15	358	526	520	11,10	-	-	Cu 40 x 5	14	15.5	45
DX-LM3-303	303	0.15	685	-	-	0,00	-	-	Cu 40 x 5	14	15.5	48.7
DX-LM3-370	370	0.12	685	-	-	0,00	-	-	Cu 40 x 5	14	15.5	61.7
DX-LM3-450	450	0.1	730	-	-	0,00	-	-	Cu 40 x 10	14	15.5	81.7

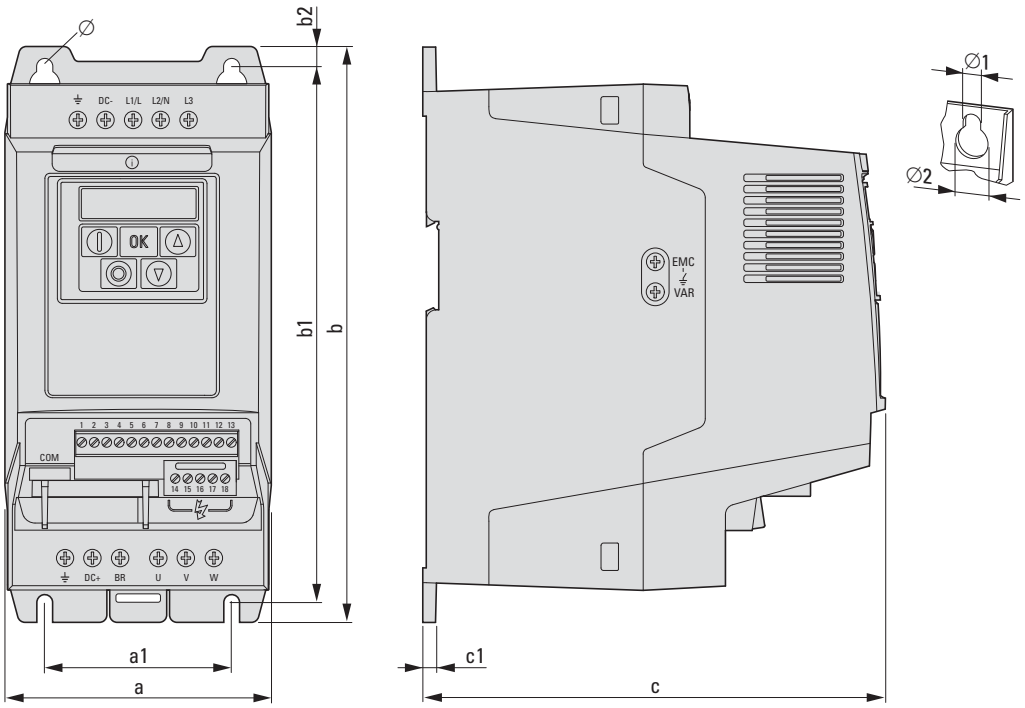
Dimensions

DC1, sizes FS1 - FS3



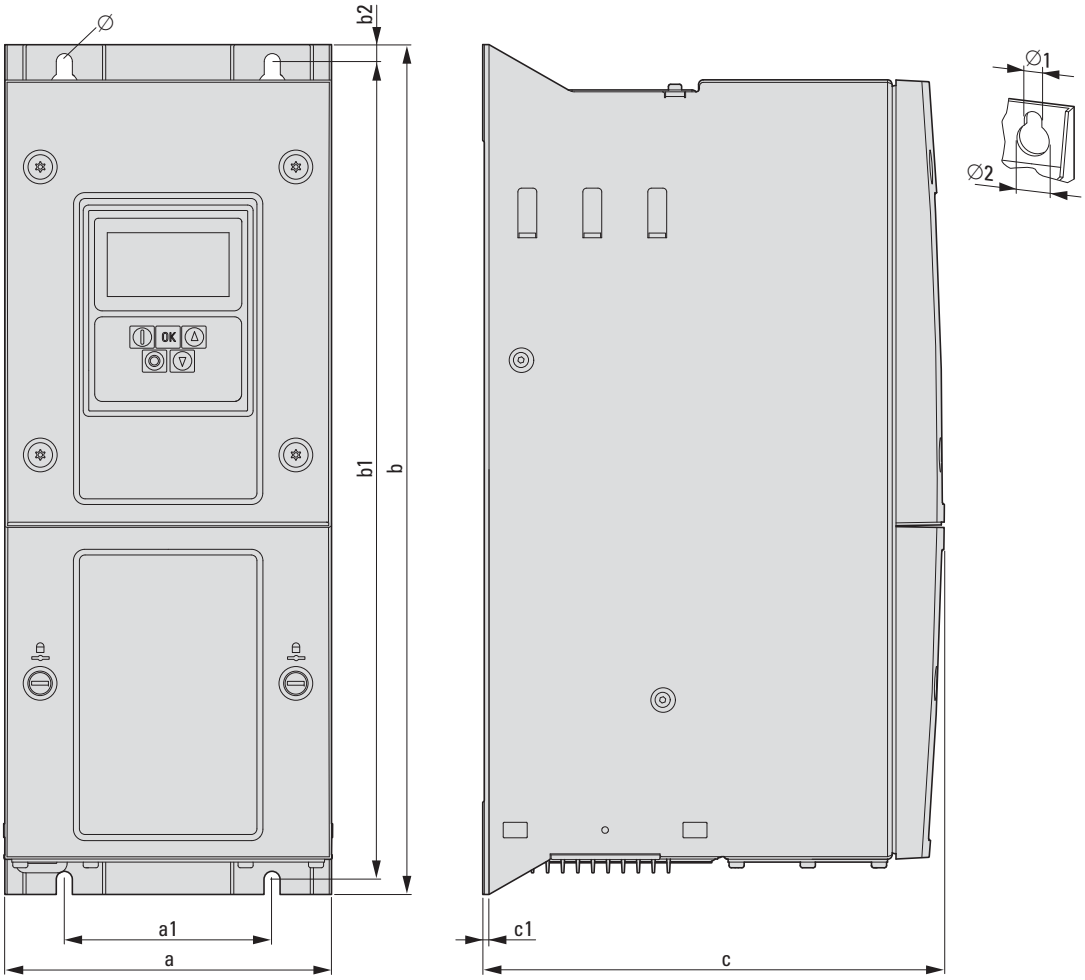
a mm (inch)	a1 mm (inch)	b mm (inch)	b1 mm (inch)	b2 mm (inch)	c mm (inch)	c1 mm (inch)	∅1 mm (inch)	∅2 mm (inch)	Weight kg	Size
81 (3.19)	50 (1.97)	184 (7.24)	170 (6.69)	7 (0.28)	124 (4.88)	4 (0.16)	6 (0.24)	12 (0.47)	1.1	FS1
107 (4.21)	75 (2.95)	231 (9.09)	215 (8.46)	8 (0.31)	152 (5.98)	5 (0.2)	6 (0.24)	12 (0.47)	2.6	FS2
131 (5.16)	100 (3.94)	273 (10.75)	255 (10.04)	8.5 (0.33)	175 (6.89)	5 (0.2)	6 (0.24)	12 (0.47)	4	FS3

DA1, sizes FS2 - FS3



a mm (inch)	a1 mm (inch)	b mm (inch)	b1 mm (inch)	b2 mm (inch)	c mm (inch)	c1 mm (inch)	∅1 mm (inch)	∅2 mm (inch)	Weight kg	Size
107 (4.21)	75 (2.95)	231 (9.09)	215 (8.46)	8 (0.31)	186 (7.32)	5 (0.2)	6 (0.24)	12 (0.47)	1.8	FS2
131 (5.16)	100 (3.94)	273 (10.75)	255 (10.04)	8.5 (0.33)	204 (8.03)	5 (0.2)	6 (0.24)	12 (0.47)	3.5	FS3

DA1, sizes FS4 - FS7



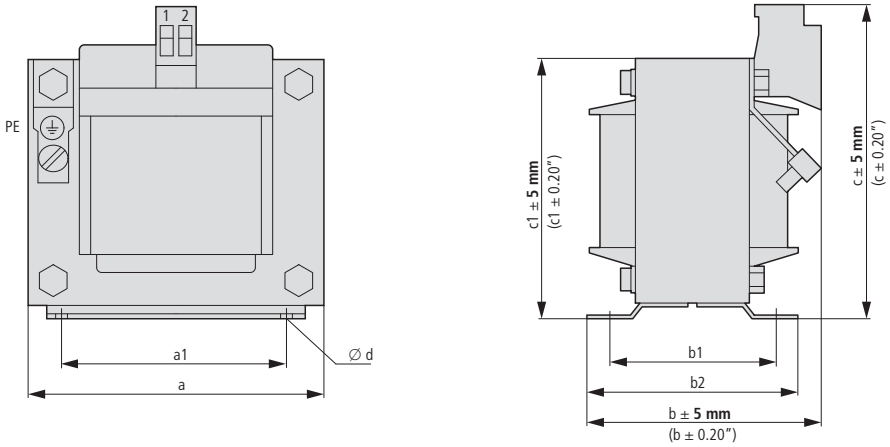
a mm (inch)	a1 mm (inch)	b mm (inch)	b1 mm (inch)	b2 mm (inch)	c mm (inch)	c1 mm (inch)	∅1 mm (inch)	∅2 mm (inch)	Weight kg	Size
171 (6.73)	110 (4.33)	450 (17.72)	428 (16.85)	9 (0.35)	240 (9.45)	2 (0.08)	8 (0.31)	15 (0.59)	11.5	FS4
235 (9.25)	175 (6.89)	540 (20.28)	515 (20.28)	12 (0.47)	270 (10.63)	2 (0.08)	8 (0.31)	15 (0.59)	22.5	FS5
330 (12.99)	200 (7.87)	865 (34.06)	840 (33.07)	15 (0.59)	330 (12.99)	2 (0.08)	11 (0.43)	22 (0.87)	50	FS6
330 (12.99)	200 (7.87)	1280 (50.39)	1255 (44.41)	15 (0.59)	360 (14.17)	2 (0.08)	11 (0.43)	22 (0.87)	80	FS7

DA1, size FS8

a mm (inch)	a1 mm (inch)	b mm (inch)	b1 mm (inch)	b2 mm (inch)	c mm (inch)	c1 mm (inch)	∅1 mm (inch)	∅2 mm (inch)	Weight kg	Size
500 (19.69)	350 (13.78)	2000 (78.74)	1950 (76.77)	33 (1.3)	516 (20.31)	2 (0.08)	18 (0.71)	35 (1.38)	270	FS8

Mains chokes

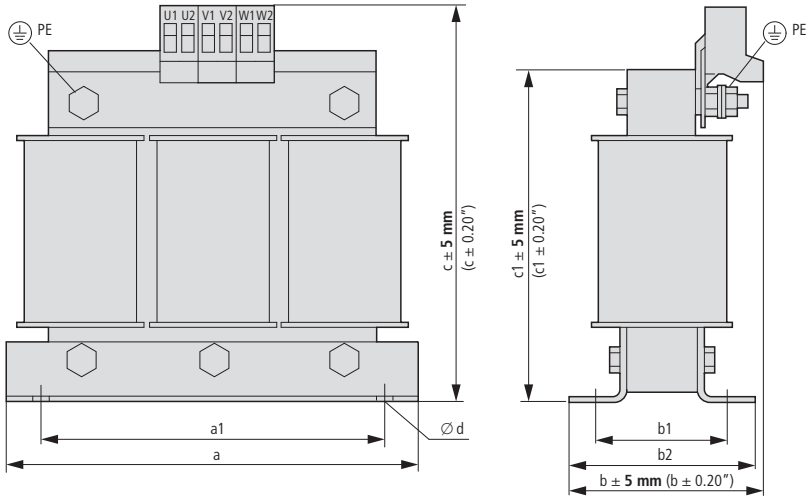
DX-LN1-…



	a mm (inch)	a1 mm (inch)	b mm (inch)	b1 mm (inch)	b2 mm (inch)	c mm (inch)	c1 mm (inch)	d mm (inch)	Weight kg
DX-LN1-006	66 (2.6)	50 (1.97)	71 (2.8)	44 (1.73)	55 (2.17)	80 (3.15)	61 (2.36)	4.5 x 8 (0.18 x 0.31)	0.7
DX-LN1-009	66 (2.6)	50 (1.97)	71 (2.8)	44 (1.73)	55 (2.17)	80 (3.15)	61 (2.36)	4.5 x 8 (0.18 x 0.31)	0.7
DX-LN1-013	84 (3.31)	64 (2.52)	67 (2.64)	47 (1.85)	60 (2.36)	90 (3.54)	75 (2.95)	4.8 x 8 (0.18 x 0.31)	1.5
DX-LN1-018	84 (3.31)	64 (2.52)	67 (2.64)	47 (1.85)	60 (2.36)	90 (3.54)	75 (2.95)	4.8 x 8 (0.18 x 0.31)	1.5
DX-LN1-024	84 (3.31)	64 (2.52)	81 (3.19)	61 (2.4)	74 (2.91)	90 (3.54)	75 (2.95)	4.8 x 8 (0.18 x 0.31)	2
DX-LN1-032	105 (4.13)	84 (3.31)	102 (4.02)	65 (2.56)	81 (3.19)	121 (4.76)	94 (3.7)	5.8 x 11 (0.23 x 0.43)	3

Mains chokes, motor chokes

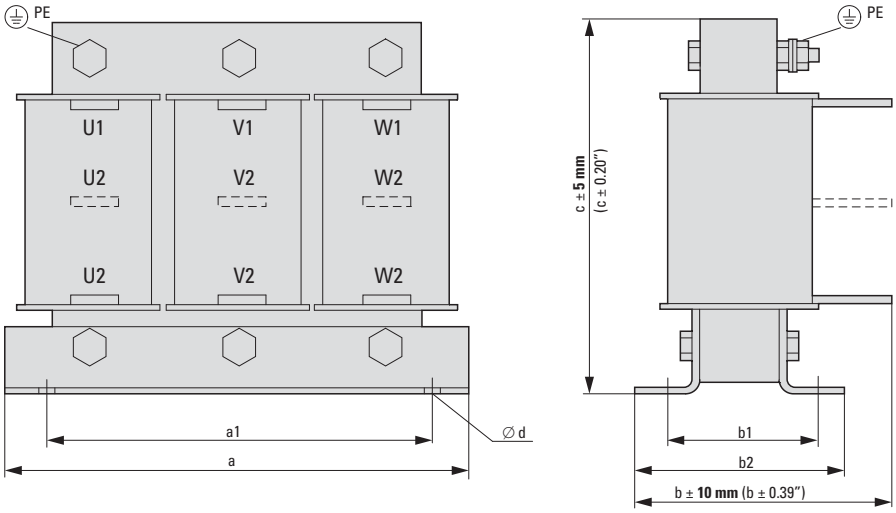
DX-LN3-004…-DX-LN3-040
DX-LM3-005…-DX-LM3-050



	a mm (inch)	a1 mm (inch)	b mm (inch)	b1 mm (inch)	b2 mm (inch)	c mm (inch)	c1 mm (inch)	d mm (inch)	Weight kg
DX-LN3-004	115 (4.53)	100 (3.94)	66 (2.6)	50 (1.97)	66 (2.6)	118 (4.65)	84 (3.31)	5 x 10 (0.2 x 0.39)	1.5
DX-LN3-006	115 (4.53)	100 (3.94)	66 (2.6)	50 (1.97)	66 (2.6)	118 (4.65)	84 (3.31)	5 x 10 (0.2 x 0.39)	1.5
DX-LN3-010	140 (5.51)	125 (4.92)	61 (2.4)	50 (1.97)	61 (2.4)	138 (5.43)	105 (4.13)	5 x 10 (0.2 x 0.39)	2.2
DX-LN3-016	140 (5.51)	125 (4.92)	71 (2.8)	50 (1.97)	71 (2.8)	138 (5.43)	105 (4.13)	5 x 10 (0.2 x 0.39)	2.9
DX-LN3-025	195 (7.68)	175 (6.89)	104 (4.09)	50 (1.97)	76.5 (3.01)	175 (6.89)	134 (5.28)	8 x 13 (0.31 x 0.51)	4.8
DX-LN3-040	195 (7.68)	175 (6.89)	104 (4.09)	50 (1.97)	76.5 (3.01)	188 (7.4)	134 (5.28)	8 x 13 (0.31 x 0.51)	4.8
DX-LM3-005	115 (4.53)	100 (3.94)	66 (2.6)	50 (1.97)	66 (2.6)	118 (4.65)	84 (3.31)	5 x 10 (0.2 x 0.39)	1.5
DX-LM3-008	195 (7.68)	175 (6.89)	104 (4.09)	50 (1.97)	76.5 (3.01)	175 (6.89)	134 (5.28)	8 x 13 (0.31 x 0.51)	4.8
DX-LM3-011	195 (7.68)	175 (6.89)	104 (4.09)	50 (1.97)	76.5 (3.01)	175 (6.89)	134 (5.28)	8 x 13 (0.31 x 0.51)	4.8
DX-LM3-016	195 (7.68)	175 (6.89)	104 (4.09)	50 (1.97)	76.5 (3.01)	175 (6.89)	134 (5.28)	8 x 13 (0.31 x 0.51)	4.8
DX-LM3-035	220 (8.66)	200 (7.87)	132 (5.2)	75 (2.95)	101.5 (4)	195 (7.68)	160 (6.3)	8 x 13 (0.31 x 0.51)	7.3
DX-LM3-050	270 (10.63)	250 (9.84)	106 (4.17)	75 (2.95)	96 (3.78)	228 (8.98)	198 (7.8)	8 x 13 (0.31 x 0.51)	12.3

Mains choke, motor chokes

DX-LN3-050…-DX-LN3-450
DX-LM3-063…-DX-LM3-450

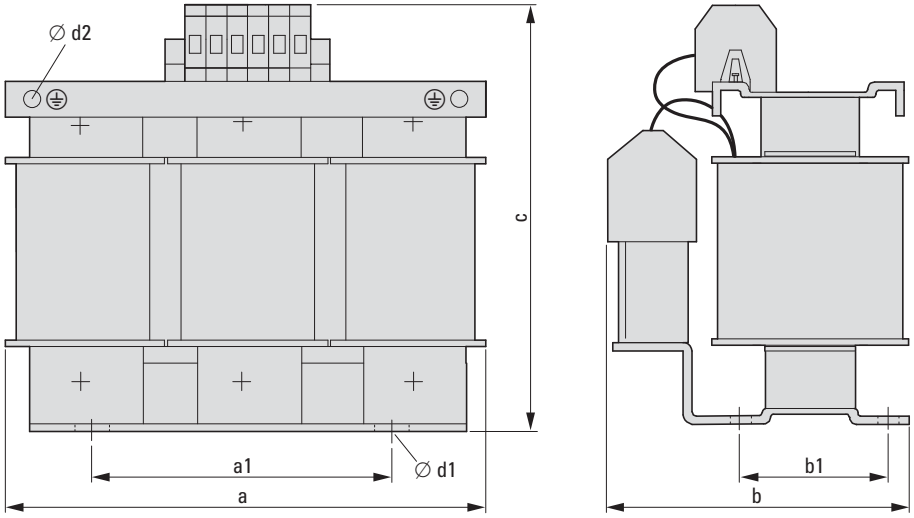


Height tolerance depends on gap
The position of connection lugs U2-V2-W2 depends on the coil material and can deviate from the position illustrated here.

	a mm (inch)	a1 mm (inch)	b mm (inch)	b1 mm (inch)	b2 mm (inch)	c mm (inch)	d mm (inch)	Weight kg
DX-LN3-050	195 (7.68)	175 (6.89)	105 (4.13)	75 (2.95)	91.5 (3.6)	132 ±5 (5.2 ±0.2)	8 x 13 (0.31 x 0.51)	5.9
DX-LN3-060	195 (7.68)	175 (6.89)	105 (4.13)	75 (2.95)	91.5 (3.6)	132 ±5 (5.2 ±0.2)	8 x 13 (0.31 x 0.51)	5.9
DX-LN3-080	220 (8.66)	200 (7.87)	110 (4.33)	50 (1.97)	81.5 (3.21)	160 ±5 (6.3 ±0.2)	8 x 13 (0.31 x 0.51)	7.3
DX-LN3-100	220 (8.66)	200 (7.87)	130 (5.12)	75 (2.95)	101.5 (4)	160 ±5 (6.3 ±0.2)	8 x 13 (0.31 x 0.51)	10.2
DX-LN3-120	220 (8.66)	200 (7.87)	130 (5.12)	75 (2.95)	101.5 (4)	160 ±5 (6.3 ±0.2)	8 x 13 (0.31 x 0.51)	10.2
DX-LN3-160	270 (10.63)	250 (9.84)	125 (4.92)	75 (2.95)	96 (3.75)	200 ±5 (7.87 ±0.2)	8 x 13 (0.31 x 0.51)	12.3
DX-LN3-200	270 (10.63)	250 (9.84)	155 (6.1)	100 (3.94)	120 (4.72)	202 ±5 (7.95 ±0.2)	8 x 13 (0.31 x 0.51)	14.9
DX-LN3-250	270 (10.63)	250 (9.84)	155 (6.1)	100 (3.94)	125 (4.92)	210 ±5 (8.27 ±0.2)	10 x 18 (0.39 x 0.71)	20.6
DX-LN3-300	270 (10.63)	250 (9.84)	155 (6.1)	100 (3.94)	125 (4.92)	210 ±5 (8.27 ±0.2)	10 x 18 (0.39 x 0.71)	20.6
DX-LN3-303	270 (10.63)	250 (9.84)	155 (6.1)	100 (3.94)	125 (4.92)	210 ±5 (8.27 ±0.2)	10 x 18 (0.39 x 0.71)	20.6
DX-LN3-370	384 (15.12)	350 (13.78)	215 (8.46)	100 (3.94)	130 (5.12)	258 ±5 (10.16 ±0.2)	12 x 20 (0.47 x 0.79)	24.3
DX-LN3-450	384 (15.12)	350 (13.78)	215 (8.46)	100 (3.94)	130 (5.12)	258 ±5 (10.16 ±0.2)	12 x 20 (0.47 x 0.79)	23.8
DX-LM3-063	270 (10.63)	250 (9.84)	155 (6.1)	100 (3.94)	120 (4.72)	202 ±10 (7.95 ±0.39)	8 x 13 (0.31 x 0.51)	14.9
DX-LM3-080	270 (10.63)	250 (9.84)	155 (6.1)	100 (3.94)	125 (4.92)	210 ±10 (8.27 ±0.39)	10 x 18 (0.39 x 0.71)	20.6
DX-LM3-100	384 (15.12)	350 (13.78)	215 (8.46)	100 (3.94)	130 (5.12)	258 ±30 (10.16 ±1.18)	12 x 20 (0.47 x 0.79)	31
DX-LM3-150	384 (15.12)	350 (13.78)	260 (10.24)	150 (5.91)	180 (7.09)	258 ±30 (10.16 ±1.18)	12 x 20 (0.47 x 0.79)	45
DX-LM3-180	384 (15.12)	350 (13.78)	260 (10.24)	150 (5.91)	180 (7.09)	258 ±30 (10.16 ±1.18)	12 x 20 (0.47 x 0.79)	45
DX-LM3-220	384 (15.12)	350 (13.78)	260 (10.24)	150 (5.91)	180 (7.09)	258 ±30 (10.16 ±1.18)	12 x 20 (0.47 x 0.79)	45
DX-LM3-260	384 (15.12)	350 (13.78)	260 (10.24)	150 (5.91)	180 (7.09)	258 ±30 (10.16 ±1.18)	12 x 20 (0.47 x 0.79)	45
DX-LM3-303	454 (17.87)	425 (16.73)	270 (10.63)	100 (3.94)	150 (5.9)	313 ±5 (12.32 ±0.2)	12 x 20 (0.47 x 0.79)	48.7
DX-LM3-370	454 (17.87)	425 (16.73)	285 (11.22)	125 (4.92)	165 (6.5)	313 ±5 (12.32 ±0.2)	12 x 20 (0.47 x 0.79)	61.7
DX-LM3-450	454 (17.87)	425 (16.73)	300 (11.81)	150 (5.9)	180 (7.09)	313 ±5 (12.32 ±0.2)	12 x 20 (0.47 x 0.79)	81.7

Sine filter

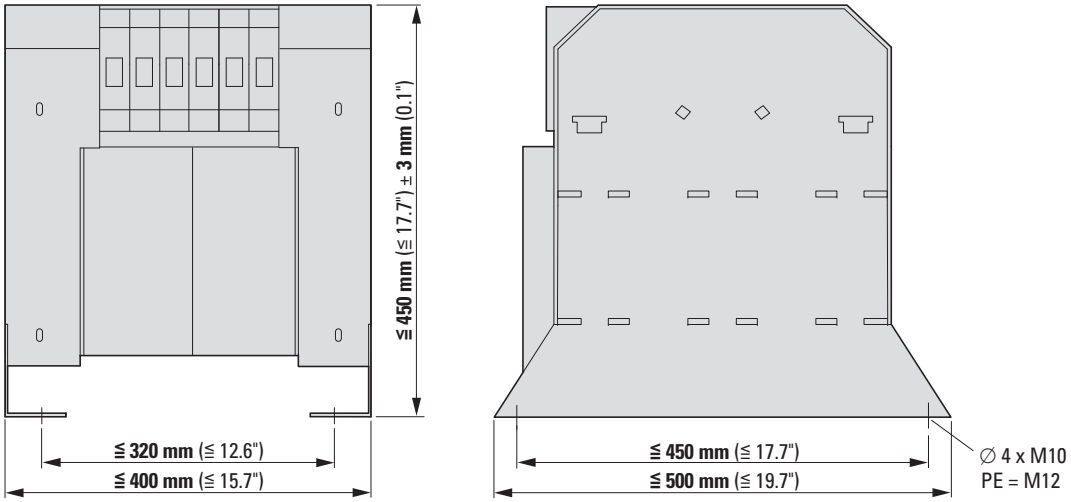
DX-SIN3-004 - DX-SIN3-180



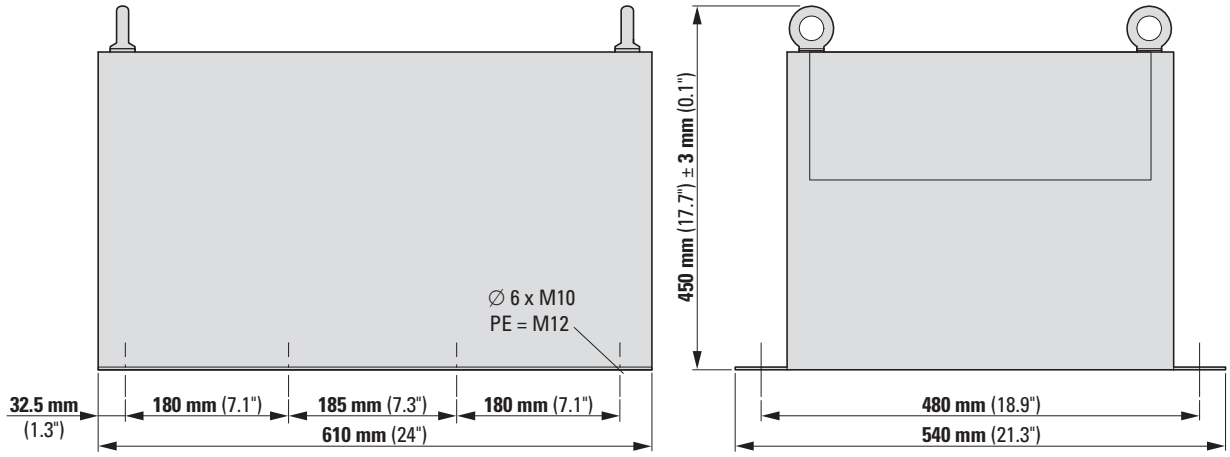
	a mm (inch)	a1 mm (inch)	b mm (inch)	b1 mm (inch)	c mm (inch)	d1	d2	Weight kg
DX-SIN3-004	155 (6.1)	130 (5.12)	105 (4.13)	56 (2.2)	160 (6.3)	4 x M5	M4	4.2
DX-SIN3-010	155 (6.1)	130 (5.12)	120 (4.72)	71 (2.8)	160 (6.3)	4 x M5	M4	6.1
DX-SIN3-016	190 (7.48)	170 (6.69)	160 (6.3)	67 (2.64)	185 (7.28)	4 x M5	M4	9.4
DX-SIN3-023	240 (9.45)	190 (7.48)	190 (7.48)	105 (4.13)	280 (11.02)	4 x M6	M6	14.5
DX-SIN3-032	240 (9.45)	190 (7.48)	200 (7.87)	105 (4.13)	280 (11.02)	4 x M6	M6	19.7
DX-SIN3-037	240 (9.45)	190 (7.48)	210 (8.27)	115 (4.53)	280 (11.02)	4 x M6	M6	21.3
DX-SIN3-048	240 (9.45)	190 (7.48)	220 (8.66)	125 (4.92)	280 (11.02)	4 x M6	M6	26.2
DX-SIN3-061	300 (11.81)	240 (9.45)	228 (8.97)	133 (5.24)	315 (12.4)	4 x M8	M8	35
DX-SIN3-072	300 (11.81)	240 (9.45)	240 (9.45)	145 (5.71)	315 (12.4)	4 x M8	M8	39
DX-SIN3-090	300 (11.81)	240 (9.45)	270 (10.63)	171 (6.73)	320 (12.6)	4 x M8	M8	53.3
DX-SIN3-115	360 (14.17)	264 (10.39)	210 (8.27)	125 (4.92)	415 (16.34)	4 x M8	M8	66
DX-SIN3-150	360 (14.17)	264 (10.39)	225 (8.86)	140 (5.51)	415 (16.34)	4 x M10	M8	69
DX-SIN3-180	360 (14.17)	264 (10.39)	240 (9.45)	154 (6.06)	415 (16.34)	4 x M10	M8	88.7

Sine filter

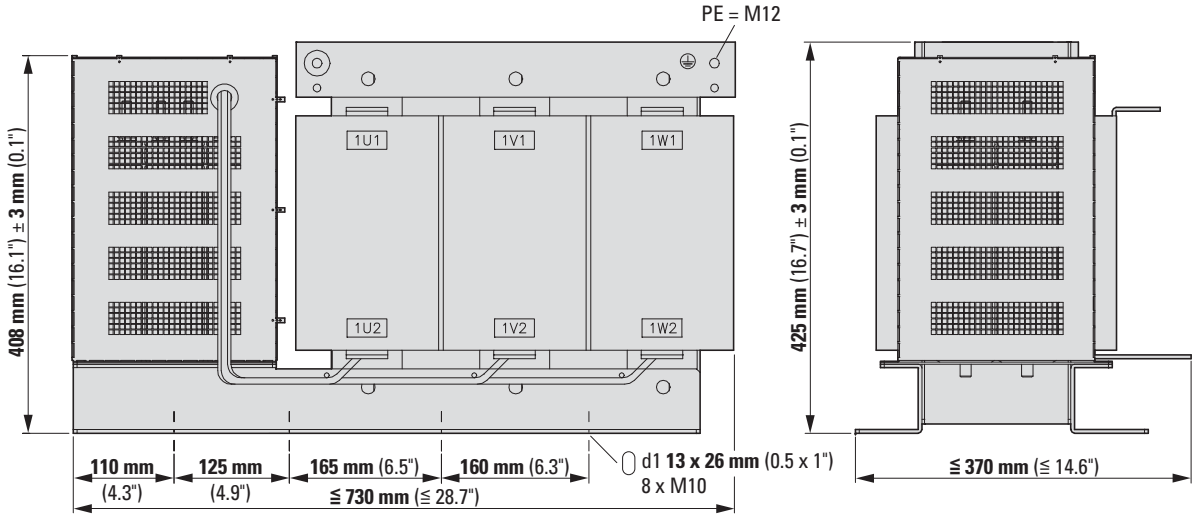
DX-SIN3-250



DX-SIN3-440

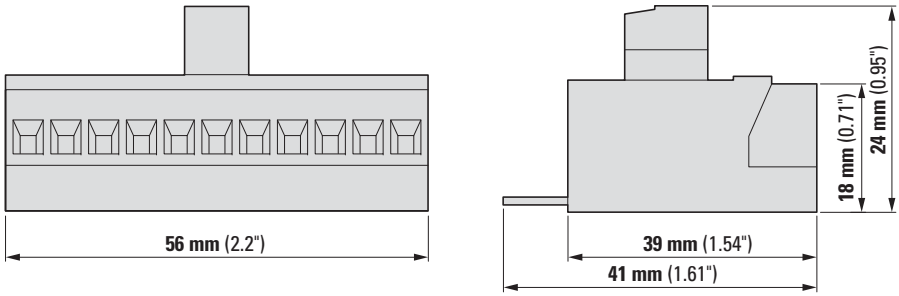


DX-SIN3-480

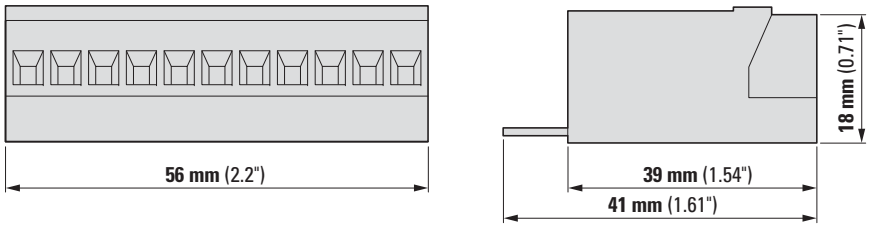


Expansion modules

DXC-EXT-IO110
DXC-EXT-IO230
DXC-EXT-2RO1AO

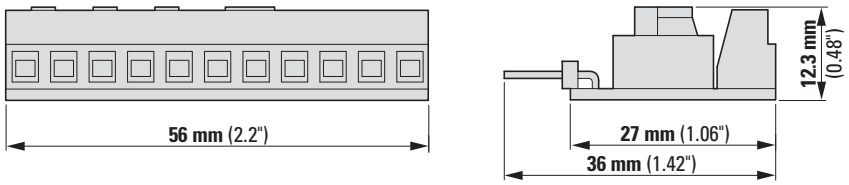


DXC-EXT-2RO



Simulator

DXC-EXT-LOCSIM

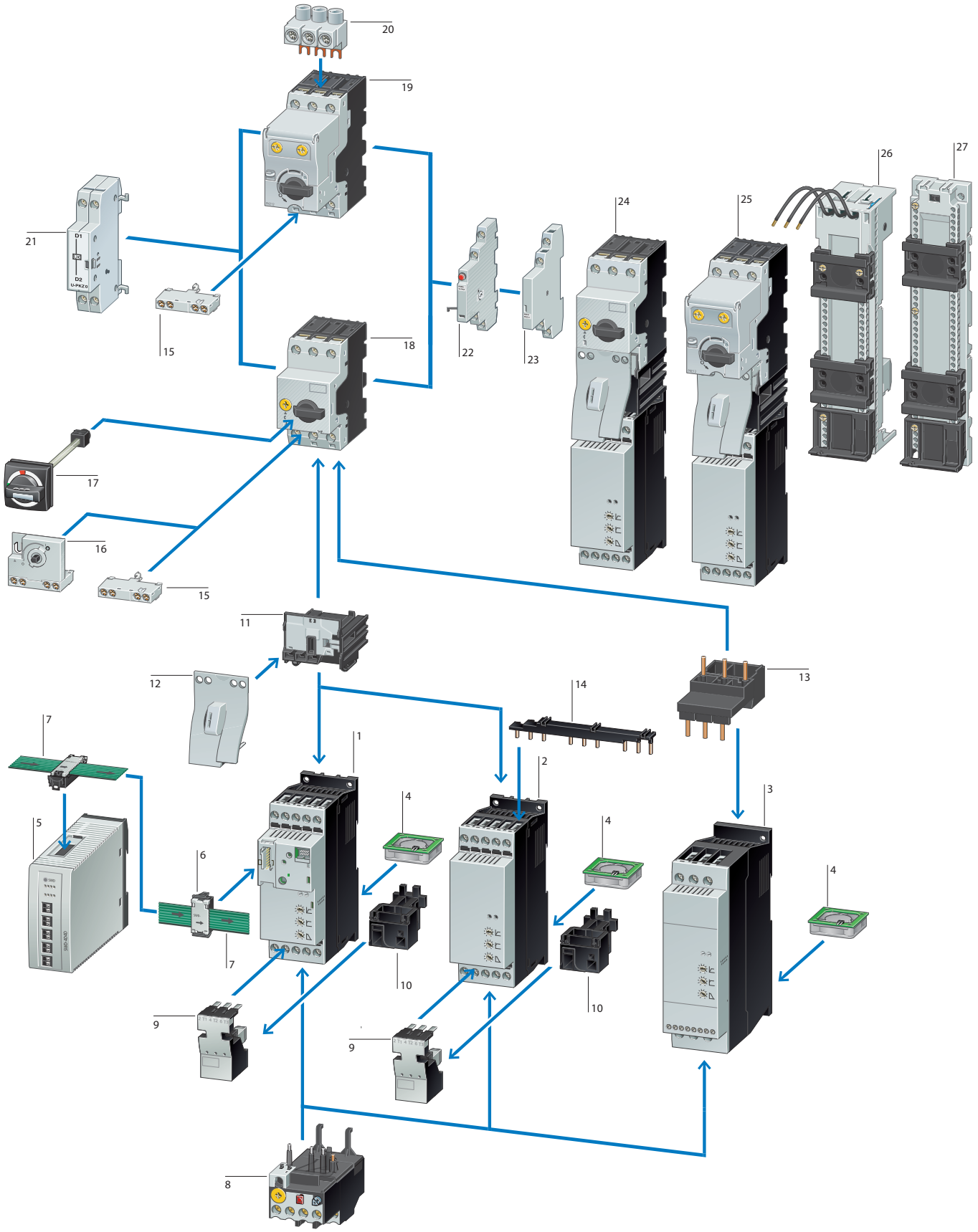


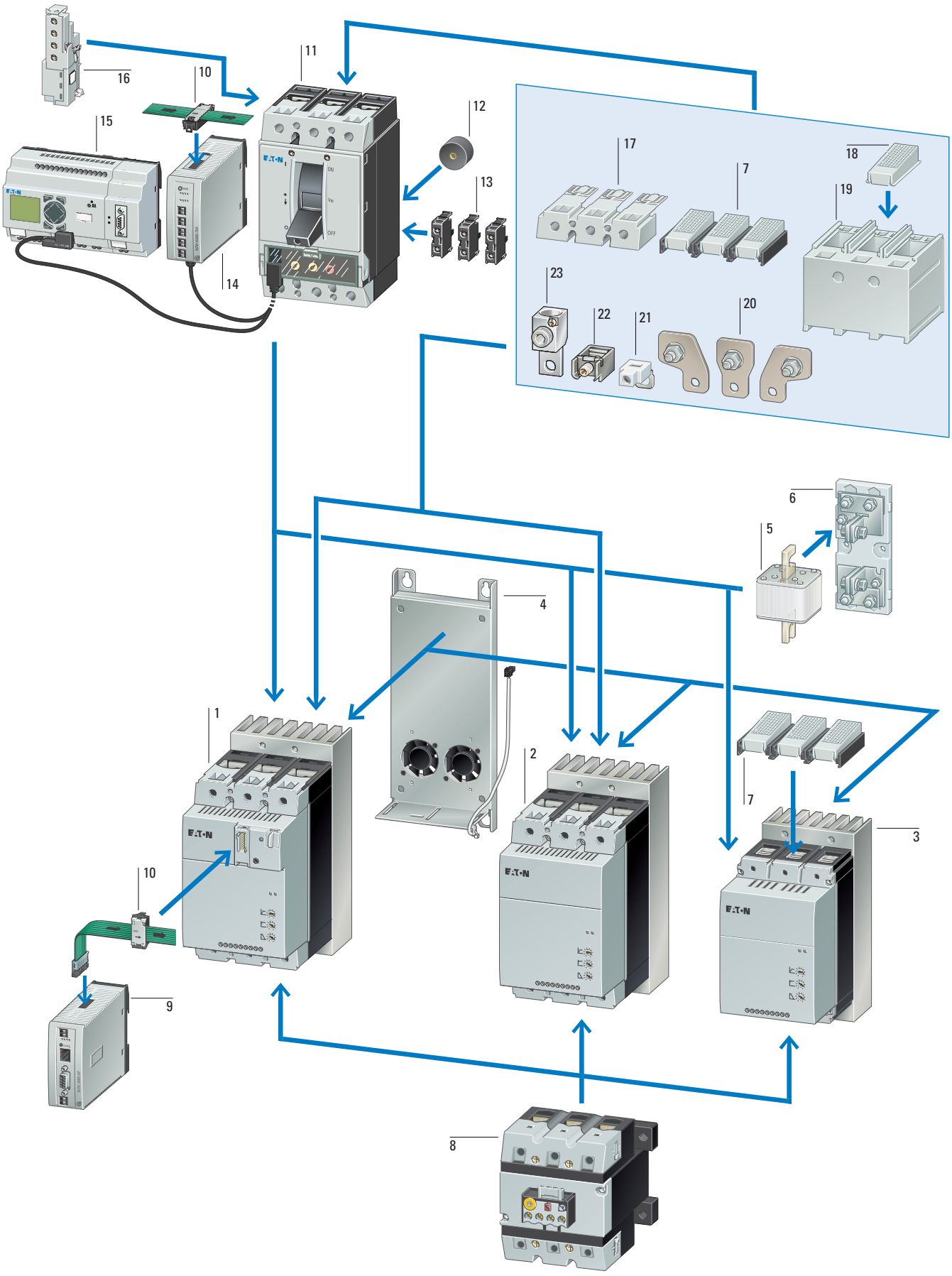
DS7 soft starters in xStart system – Soft to start, powerful in torque

The soft starters have become increasingly established as an alternative to the star-delta starter. The DS7 replaces the mechanical contactor and extends the function "Motor soft start". Motor start-up is soft but still at a higher torque than other available solutions using the patented method. Extended service intervals and reduced operating costs are welcomed side effects.

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

System overview

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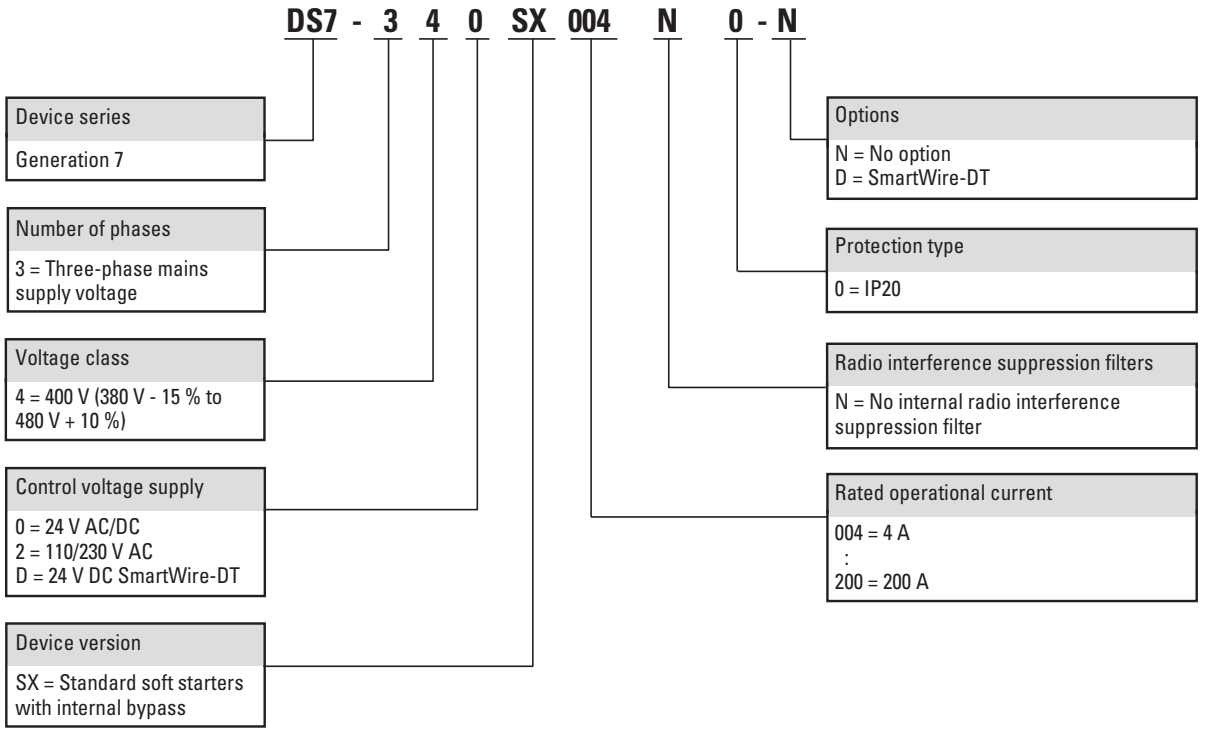
Key to type references



Description

Application

The DS7 series soft starters are two-phased controlled soft starters used for soft starting three-phase AC motors for applications with a normal operating frequency and a power range of 3 to 200 A (1.1 to 110 kW with a 400 V line voltage).
Starting transients and DC components during startup are effectively suppressed and guarantee even motor starting.
The special actuation method (asymmetrical trigger phase control) for the soft starter function avoids the DC components (Eaton patent) that would normally occur in two-phase-controlled soft starters. This suppresses the generation of an elliptical rotating field, which would cause uneven motor starting and increase the motor's startup time. The true run behavior of the DS7 is therefore comparable with that of a three-phase controlled soft starter.

Functions

Typical fields of application for Series DS7 soft starters are:
- Pump drives: pressure surges are prevented through soft starting. The mechanical load on the whole plant is reduced and its service life increases.
- Fan drives: soft starting keeps fan belts from slipping, preventing premature wear. This lowers operating costs and extends the system's lifespan.
- Conveyor belts: conveyor belts start running smoothly, instead of starting with a jolt. This ensures that any goods being conveyed do not topple over. Mechanical damage to the belt itself is avoided, making it more durable.

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 line 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 mounting instructions and in the manual.

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

Manual:
MN03901001Z

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

Communication interface SmartWire-DT

Our 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 the DS7-SWD and change and diagnose its 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

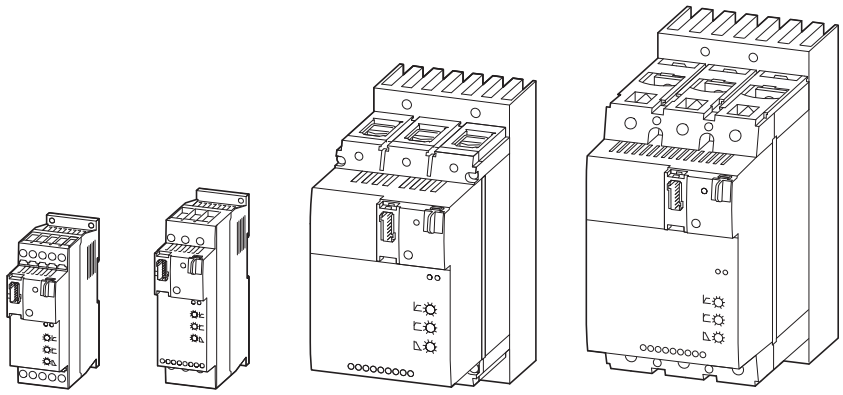
Regardless of the profile chosen, the DS7-SWD's parameters can be read and written to at any time by using acyclic services.
DS7-SWD makes it possible to read and write to all device parameters. The mechanisms of the parameter channel that is described for the drives in the PROFIdrive profile are used 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.

The DS7-SWD comes with a detailed diagnostic system with options that extend far beyond those of wired devices. In addition to having an error log, the DS7-SWD can detect and report nine different device faults. A warning parameter reports any present warning messages. Moreover, the response to each individual fault can be customized. Finally, there are 35 additional messages for communication errors. Using the DS7 in connection with the 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 report thermal capacity utilization levels to higher level controllers.

Ordering

Rated operational current	Assigned motor rating		Part no. Article no.	Price see price list	Part no. Article no.	Price see price list	Part no. Article no.	Price see price list	Std. pack
Device (AC-53)	at 400 V, 50 Hz	at 480 V, 60 Hz							
I_e	P	KP							
A	kW	HP	**U_C 110 - 230 V AC U_s 24 V AC/DC**		**U_C 110 - 230 V AC U_s 110/230 V AC**		**U_C 24 V DC U_s 24 V DC**		
Soft starters									
Soft starters for three-phase loads Mains supply voltage (50/60 Hz) U_{LN} 200 - 480 V AC									
4	1.5	2	**DS7-340SX004N0-N** 134847		**DS7-342SX004N0-N** 134925		**DS7-34DSX004N0-D** 134943		1 off
7	3	3	**DS7-340SX007N0-N** 134849		**DS7-342SX007N0-N** 134927		**DS7-34DSX007N0-D** 134945		
9	4	5	**DS7-340SX009N0-N** 134910		**DS7-342SX009N0-N** 134928		**DS7-34DSX009N0-D** 134946		
12	5.5	10	**DS7-340SX012N0-N** 134911		**DS7-342SX012N0-N** 134929		**DS7-34DSX012N0-D** 134947		
16	7.5	10	**DS7-340SX016N0-N** 134912		**DS7-342SX016N0-N** 134930		**DS7-34DSX016N0-D** 134948		
24	11	15	**DS7-340SX024N0-N** 134913		**DS7-342SX024N0-N** 134931		**DS7-34DSX024N0-D** 134949		
32	15	25	**DS7-340SX032N0-N** 134914		**DS7-342SX032N0-N** 134932		**DS7-34DSX032N0-D** 134950		
41	22	30	**DS7-340SX041N0-N** 134916		**DS7-342SX041N0-N** 134934		**DS7-34DSX041N0-D** 134952		
55	30	40	**DS7-340SX055N0-N** 134917		**DS7-342SX055N0-N** 134935		**DS7-34DSX055N0-D** 134953		
70	37	50	**DS7-340SX070N0-N** 134918		**DS7-342SX070N0-N** 134936		**DS7-34DSX070N0-D** 134954		
81	45	60	**DS7-340SX081N0-N** 134919		**DS7-342SX081N0-N** 134937		**DS7-34DSX081N0-D** 134955		
100	55	75	**DS7-340SX100N0-N** 134920		**DS7-342SX100N0-N** 134938		**DS7-34DSX100N0-D** 134956		
135	75	100	**DS7-340SX135N0-N** 134921		**DS7-342SX135N0-N** 134939		**DS7-34DSX135N0-D** 134957		
160	90	125	**DS7-340SX160N0-N** 134922		**DS7-342SX160N0-N** 134940		**DS7-34DSX160N0-D** 134958		
200	110	150	**DS7-340SX200N0-N** 134923		**DS7-342SX200N0-N** 134941		**DS7-34DSX200N0-D** 134959		

Notes



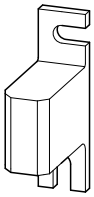
4 - 12 A | 16 - 32 A | 41 - 100 A | 135 - 200 A

Information relevant for export to North America

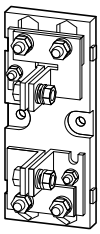
UL/CSA applies only for DS7…-N

Product Standards	IEC/EN 60947-4-2; GB 14048.6; UL 508; CSA-C22.2 No 0-M91; CSA-C22.2 No 14-05 CE marking
UL File No.	E251034
CSA File No.	2511305
CSA Class No.	321106
Suitable for	Branch circuits
Max. Voltage Rating	480 V
Degree of Protection	IP20; UL/CSA Type 1

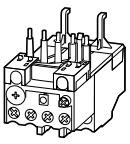
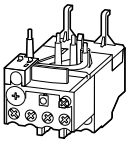
Fuses

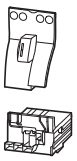
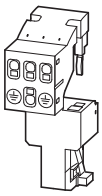
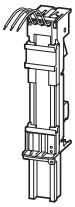
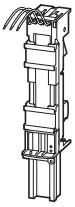
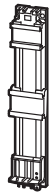
	Rated device current A	Maximum power loss P_v W	Size/inside caliper mm	For use with	**Part no.** Article no.	**Price** see price list	Std. pack	**Information relevant for export to North America**
-	16	5	10 x 38	DS4-140-010-H DS7-34…SX004N0-…	**50.179.06-16** 232077		10 off	Product Standards: UL 248-13, CE marking UL File No.: E180276 UL CCN: JFHR2 CSA File No.: UL report applies to both US and Canada CSA Class No.: JFHR8 NA Certification: UL recognized, certified by UL for use in Canada Max. Voltage Rating: 660V
-	25	7	22 x 58	DS7-34…SX007N0-…	**50.140.06-25** 138284		1 off	
-	32	9	80	DS7-34…SX009N0-… DS7-34…SX012N0-…	**20.282.20-32** 138285		1 off	
	50	15	22 x 58	DS7-34…SX016N0-…	**50.140.06-50** 232079		10 off	
	63	16	22 x 58	DS7-34…SX024N0-…	**50.140.06-63** 232080		10 off	
	80	18	22 x 58	DS7-34…SX032N0-…	**50.140.06-80** 232081		10 off	
	100	22	80	DS7-34…SX041N0-…	**20.282.20-100** 106654		6 off	
	125	24	80	DS7-34…SX055N0-…	**20.282.20-125** 232087		6 off	
-	200	44	80	DS7-34…SX070N0-… DS7-34…SX081N0-… DS7-34…SX100N0-…	**20.610.32-200** 106475		3 off	
-	350	61	80	DS7-34…SX135N0-…	**20.610.32-350** 221161		2 off	
-	400	70	80	DS7-34…SX160N0-…	**20.610.32-400** 106476		3 off	
-	500	72	80	DS7-34…SX200N0-…	**20.610.32-500** 221163		2 off	

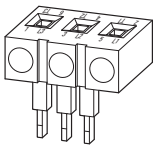
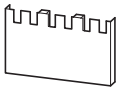
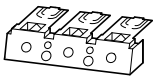
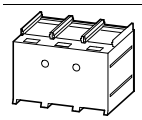
Fuse Bases

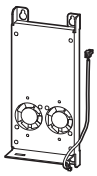
	-	-	10 x 38	50.179.06-…	**51.063.04** 232082		12 off	Product Standards: UL 512; CE marking UL File No.: E186970 UL CCN: IZLT2
	-	-	22 x 58	50.140.06-…	**51.060.04** 232084		6 off	
	-	-	80	20.282.20-… 20.189.20-…	**21.189.01** 232064		5 off	
	-	-	80	20.6xx.32-…	**21.313.02** 232076		2 off	

Overload relays

	For use with	**Part no.** Article no.	**Price** see price list	Std. pack	**Information relevant for export to North America**
	DS7-34…SX004…	**ZB12-4** 278438		1 off	Product Standards: UL 508; CSA-C22.2 No. 14; IEC/EN 60947-4-1; IEC/EN 60947-5-1; CE marking UL File No.: E29184 UL CCN: NKCR CSA File No.: 12528 CSA Class No.: 3211-03 NA Certification: UL listed, CSA certified Suitable for: Branch circuits Max. Voltage Rating: 600 V AC Degree of Protection: IEC: IP20, UL/CSA Type: -
	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			

	For use with	Part no. Article no.	Price see price list	Std. pack	Information relevant for export to North America	
Wiring set						
For DOL Starter						
	DS7-34…SX004… DS7-34…SX007… DS7-34…SX009… DS7-34…SX012…	**PKZM0-XDM12** 283149		1 off	Product Standards UL File No. UL CCN CSA File No. CSA Class No. NA Certification	UL 508; CSA-C22.2 No. 14; IEC60947-4-1; CE marking E36332 NLRV 12528 3211-05 UL listed, CSA certified
Electric contact module						
	DS7-34…SX016… DS7-34…SX024… DS7-34…SX032…	**PKZM0-XM32DE** 239349		5 off	Product Standards UL File No. UL CCN CSA File No. CSA Class No. NA Certification	UL 508; CSA-C22.2 No. 14; IEC60947-4-1; CE marking E36332 NLRV 12528 3211-05 UL listed, CSA certified
Motor feeder plug						
	DS7-34…SX004… DS7-34…SX007… DS7-34…SX009… DS7-34…SX012…	**DILM12-XMCP/T** 121770		1 off	Product Standards NA Certification	IEC/EN 60947-4-1; UL 508; CSA-C22.2 No. 14-05; CE marking Request filed for UL and CSA
Busbar adapters						
	PKZM0, PKE + DS7...004N... PKZM0, PKE + DS7...007N... PKZM0, PKE + DS7...009N... PKZM0, PKE + DS7...012N...	**BBA0L-25** 142526		1 off		
	PKZM0, PKE + DS7...016N... PKZM0, PKE + DS7...024N... PKZM0, PKE + DS7...032N...	**BBA0L-32** 142527		1 off		
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 off		
	PKZM0, PKE + DS7...016N... PKZM0, PKE + DS7...024N... PKZM0, PKE + DS7...032N...	**PKZM0-XC45L/2** 142570		1 off		

	For use with	Part no. Article no.	Price see price list	Std. pack	Notes	Information relevant for export to North America
Three-phase commoning links For the primary side of DS7 Suitable for 3 DS7 soft starters Length 112 mm protected against accidental contact, short-circuit proof, U_e = 690 V, I_u = 35 A can be extended by rotating by mounting						
	DS7-34…SX004… DS7-34…SX007… DS7-34…SX009… DS7-34…SX012…	**DILM12-XDSB0/3** 240084		5 off	For the primary side of DS7 Suitable for 3 DS7 soft starters Length 112 mm	Product Standards: IEC/EN 60947-4-1; UL 508; CSA-C22.2 No. 14-05; CE marking UL File No.: E36332 UL CCN: NLRV CSA File No.: 012528 CSA Class No.: 2411-03 NA Certification: UL listed, CSA certified
		**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	
Incoming connection block						
	DS7-34…SX004… DS7-34…SX007… DS7-34…SX009… DS7-34…SX012…	**DILM12-XEK** 240083		5 off	For three-phase commoning link, protected against accidental contact, U_e = 690 V, I_u = 35 A. Connection cross section: Stranded 2.5…16 mm² Flexible with ferrule 2.5…16 mm² AWG14…8	Product Standards: IEC/EN 60947-4-1; UL 508; CSA-C22.2 No. 14-05; CE marking UL File No.: E36332 UL CCN: NLRV CSA File No.: 012528 CSA Class No.: 2411-03 NA Certification: UL listed, CSA certified
Terminal cover Type contains parts for a terminal located at top or bottom for 3 pole circuit-breakers. Enhancement of the busbar tag shroud (simple protection against contact with a finger). Cannot be combined with NZM-XSTK control circuit terminal.						
knockout For box terminal 	DS7-34…SX041… DS7-34…SX055… DS7-34…SX070… DS7-34…SX081… DS7-34…SX100…	**NZM1-XKSFA** 100780		1 off	Type contains parts for a terminal located at top or bottom for 3 pole circuit-breakers. Enhancement of the busbar tag shroud (simple protection against contact with a finger). Cannot be combined with NZM-XSTK control circuit terminal.	UL/CSA certification not required
knockout 	DS7-34…SX135… DS7-34…SX160… DS7-34…SX200…	**NZM2-XKSFA** 104640		1 off	Type contains parts for a terminal located at top or bottom for 3 pole circuit-breakers. 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 2 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 off	Type contains parts for a terminal located at top or bottom for 3 pole circuit-breakers. Busbar tag shroud where cable lugs, busbars or tunnel terminals are used. When using insulated conductor material to IP1X.	Product Standards: UL489; CSA-C22.2 No. 5-09; IEC60947, CE marking UL File No.: E31593 UL CCN: DIHS CSA File No.: 22086 CSA Class No.: 1432-01 NA Certification: UL listed, CSA certified Suitable for: Refer to main component information

	For use with	Part no. Article no.	Price see price list	Std. pack	Notes	Information relevant for export to North America	
IP2X protection against contact with a finger Typ enthält Teile für eine Schalterseite oben oder unten für 3-polige Schalter. Erhöhung des Berührungsschutzes auf IP2X.							
For box terminal 	NZM2, PN2, N(S)2	**NZM2-XIPK** 266773		1 off	Type contains parts for a terminal located at top or bottom for 3 pole circuit-breakers. Enhancement of the busbar tag shroud to IP2X. 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 off	Type contains parts for a terminal located at top or bottom for 3 pole circuit-breakers. Enhancement of the busbar tag shroud to IP2X. 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 off	-		
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 off		NA Certification	Request filed for UL and CSA
	DS7-34…SX041… DS7-34…SX055… DS7-34…SX070… DS7-34…SX081… DS7-34…SX100…	**DS7-FAN-100** 169021		1 off			
	DS7-34…SX135… DS7-34…SX160… DS7-34…SX200…	**DS7-FAN-200** 169022		1 off			

S801+ soft starters and S811+ soft starters

The S801+ and S811+ soft starter series feature a number of multifunctional devices that are easy to install and program. They have been designed for controlling three-phase motors and cover a range of 11 – 1000 A. Not only are they among the smallest and most compact soft starters on the market, but they can also work with outputs of 10 – 900 kW.

S801+ Soft Starter

These soft starters meet today's need for smooth torque increases. They control the power supplied to a three-phase motor in such a way that its load behavior will be ideal for the machine being used. To enable operators to do this, they come with the option of using an extremely popular ramp control function with a starting torque of 0–85% and a ramp time of 0.5–180 seconds, as well as other starting functions, such as a kick start function (with breakaway torque) and current limiting. Additional functions include a soft stop control function, variable torque control, a programmable overload setting (31–100 %), and integrated overload protection. This overload protection protects the device from overheating when the temperature is too high and trips at a terminal temperature of 100 degrees.

S811+ Soft Starter

S811+ devices come with all the features of the S801+ series and also include new and improved communication options. The DIM digital interface module, with an alphanumeric display and soft keys, makes it possible to configure the device and read and write data. The keypad and the aforementioned soft keys are used to navigate through the devices' various menus, and enable users to display and enter system and parameter values. Moreover, measuring, monitoring, and diagnostic functions are available, as are troubleshooting error codes. Finally, on-board Modbus® provides a ready-to-use communications interface, and other field bus modules are also available.

Sizes

This soft starter series features four sizes (T and U have the same identical design) with five different performance ranges.

Construction size	Max. current	Three-phase motors			
		KW rate (50 Hz / 60 Hz)			
		230 V	380–400 V	440 V	575–690 V
N	37	10	18.5	18.5	30
	66	18.5	30	37	60
R	105	30	55	59	100
	135	40	63	80	125
T	180	51	90	110	150
	240	75	110	147	200
	304	90	160	185	300
U	360	110	185	220	350
	420	129	220	257	450
	500	150	257	300	500
V	360	110	185	220	350
	420	129	220	257	450
	500	150	257	300	500
	650	200	355	425	600
	720	220	400	450	700
	850	257	475	500	900
	1000	277	525	500	900

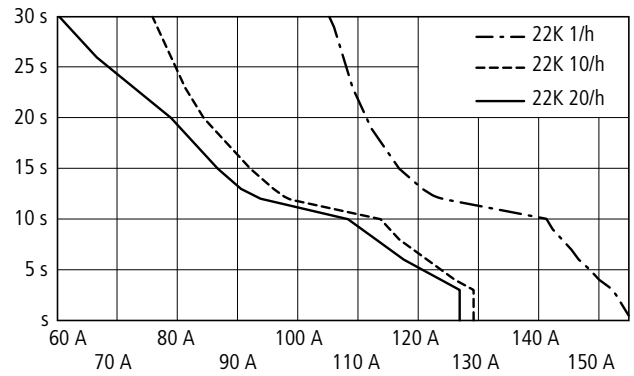
If you have any questions regarding our S801+ or S811+ soft starters, please contact your Eaton contact person.
To find the right contact person:

The contact person for your region:
→ http://salesbonn.moeller.net

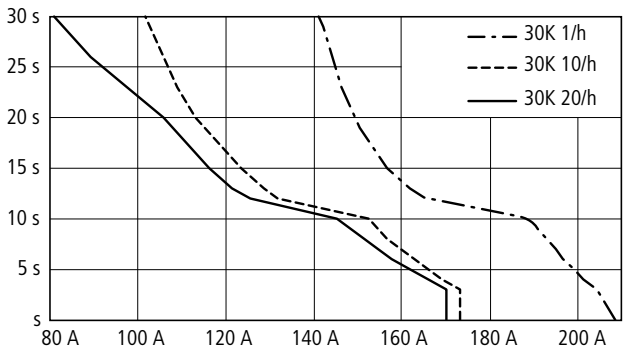
Contact person for worldwide questions:
→ www.eaton.eu/electrical/contact

Engineering

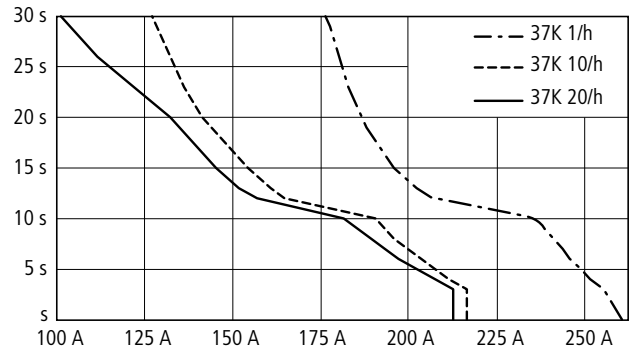
DS7-34...SX041N0-...



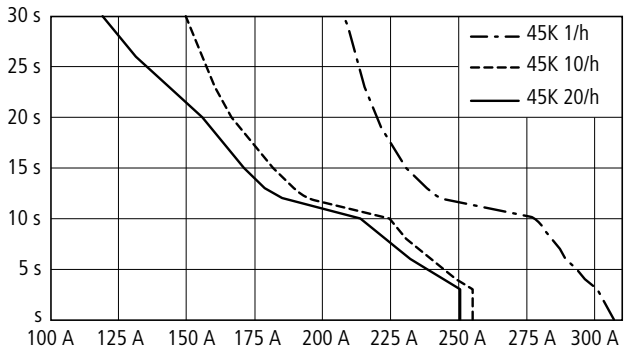
DS7-34...SX055N0-...



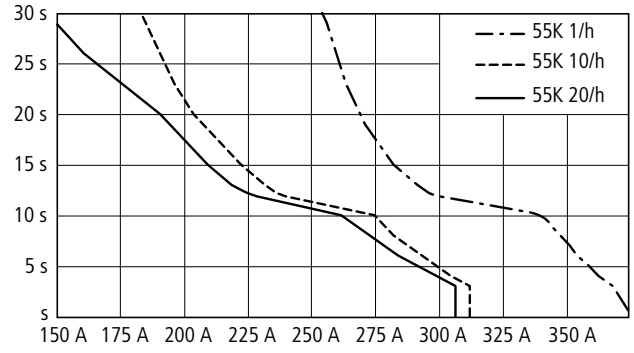
DS7-34...SX070N0-...



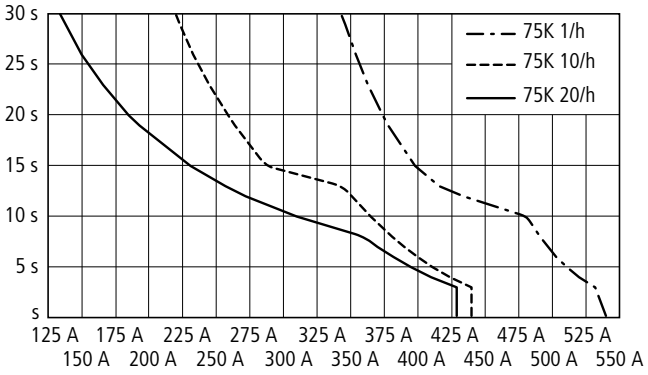
DS7-34...SX081N0-...



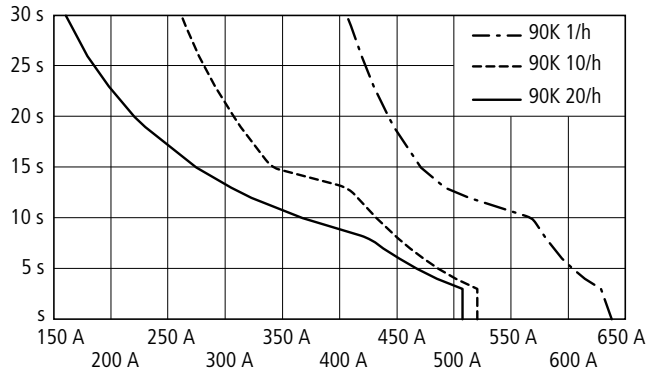
DS7-34...SX100N0-...



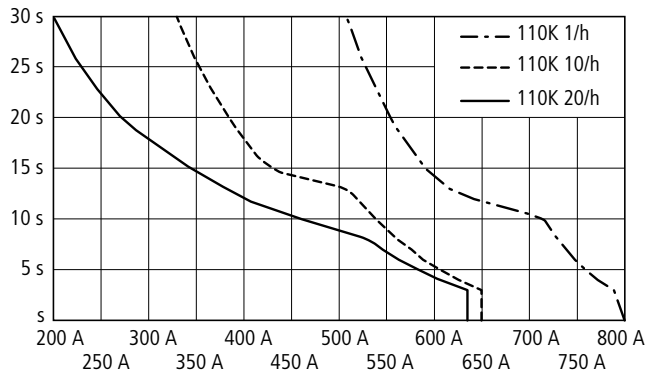
DS7-34...SX135N0-...



DS7-34...SX160N0-...



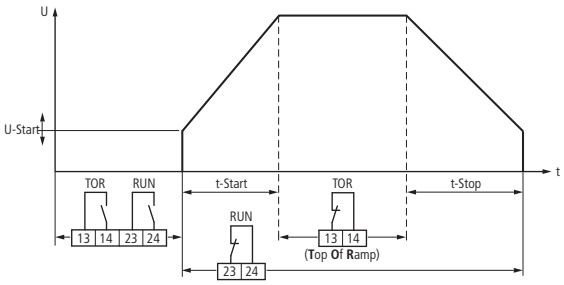
DS7-34...SX200N0-...

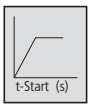


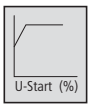
Note: Additional diagrams for 4-32 A soft starters can be found in the manual for DS7 soft starters (MN03901001Z).

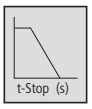
Potentiometer settings

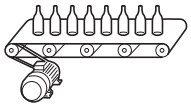
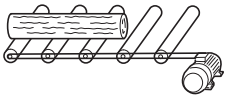
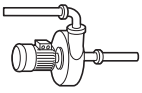
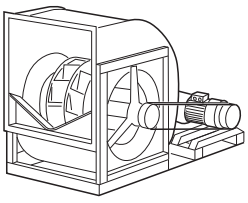
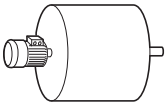
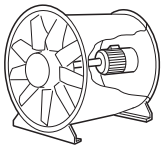
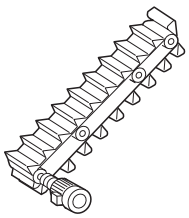
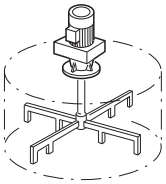
U	I (L)	(R) (AC11	I_{min}	U_{min}
250 V ~	0.2 A	1 A	10 mA	250 V ~
30 V H	0.7 A	0.5 A	100 mA	5 V H



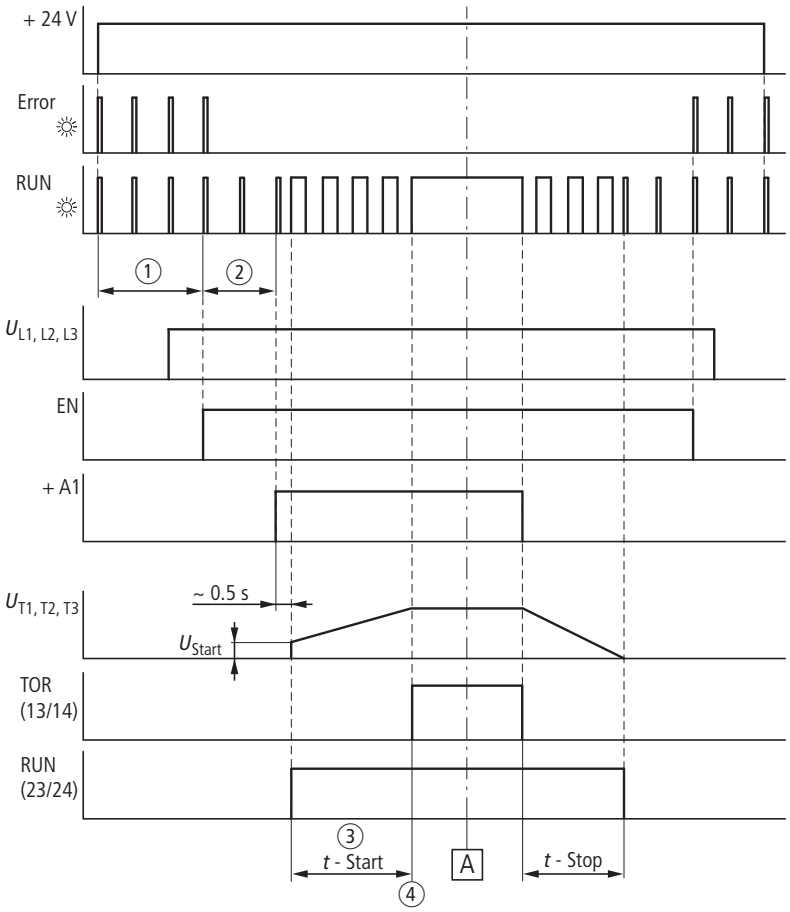




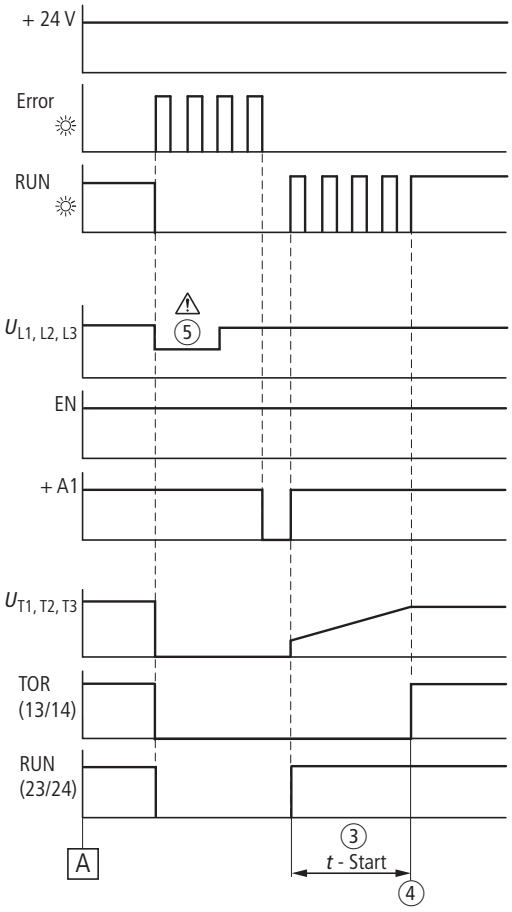


t-Start (s)	U-Start %	t-Stop (s)		
~10	~30	0		J → 0 Low flywheel mass
~25	~30	~30		Conveyor belt with loose belt
~20	~40	0		Roller conveyers
~10	~30	~20		Centrifugal pump
~15	~40	0		Fan general (building) with belt drive
~18	~40	0		J → ∞ Large gyrating mass→ The DS7 soft starter's rating should be higher than the assigned motor output.
~15	~50	0		Tunnel fan Axial fan a Soft starter DS7 should have a higher rating than the assigned motor.
~10	~60	0		Bulk conveyor Escalator
~10	~60	0		Mixers Agitators a Soft starter DS7 should have a higher rating than the assigned motor.

Operation



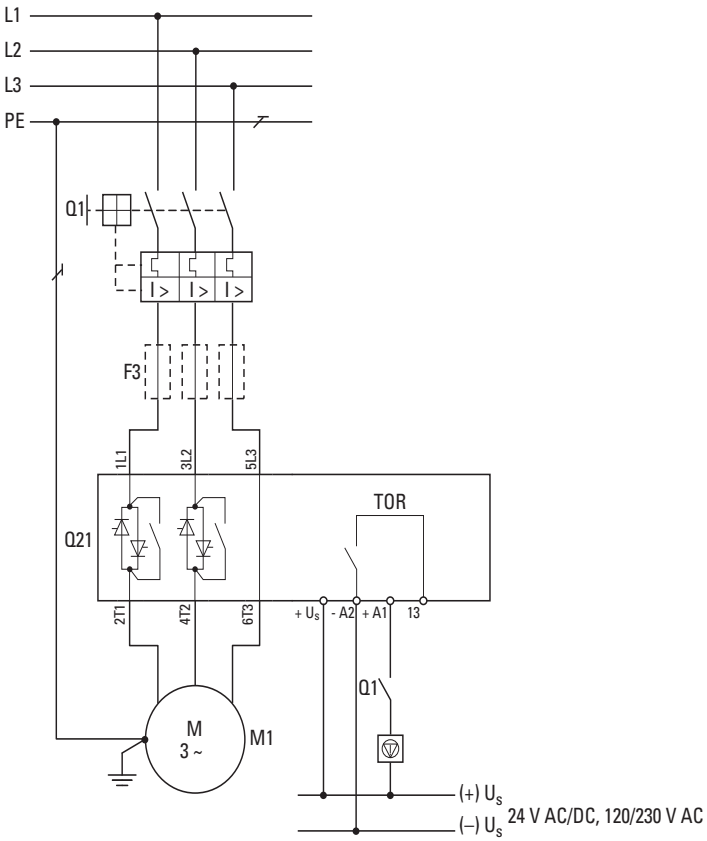
Fault

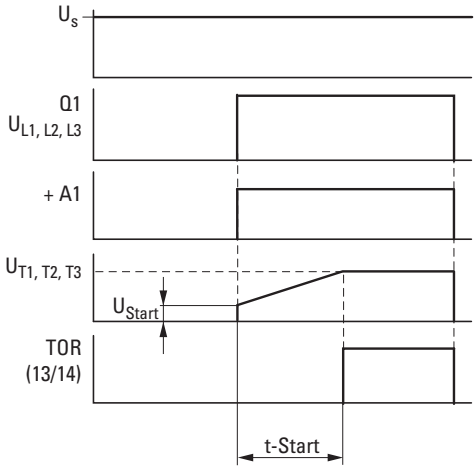


RUN-LED green
Error-LED red

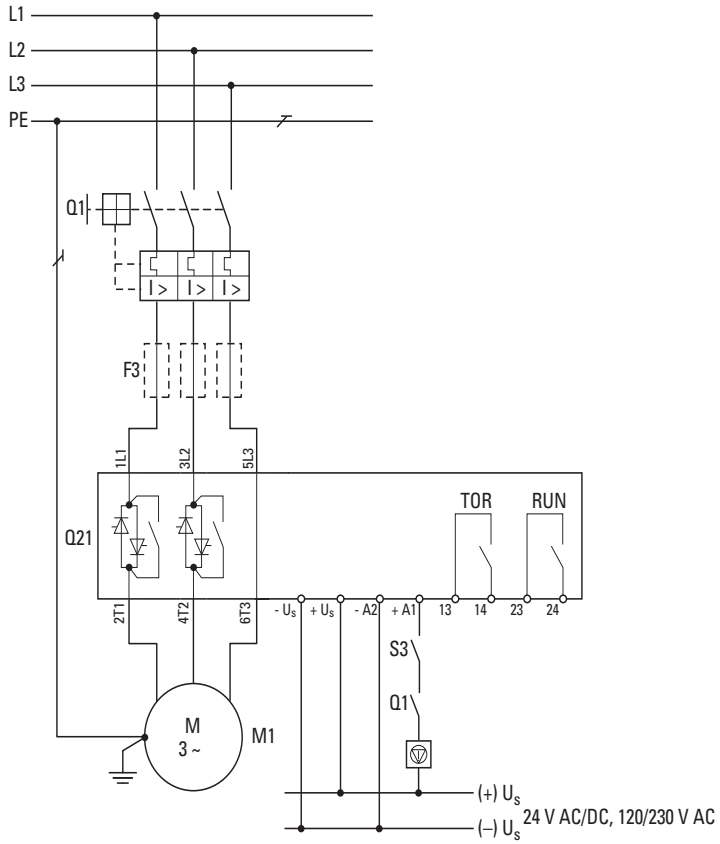
① Initialization
② Ready for operation
③ in ramp
④ Top of ramp reached
⑤ Fault – One phase drops out

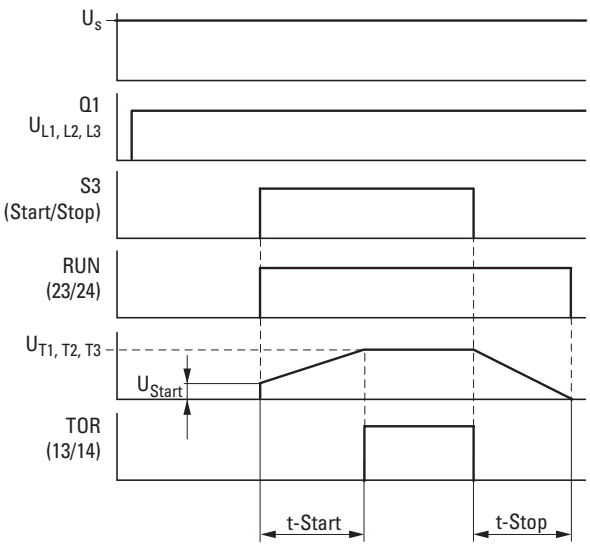
Standard connection
Up to 12 A





Standard connection
Up to 32 A



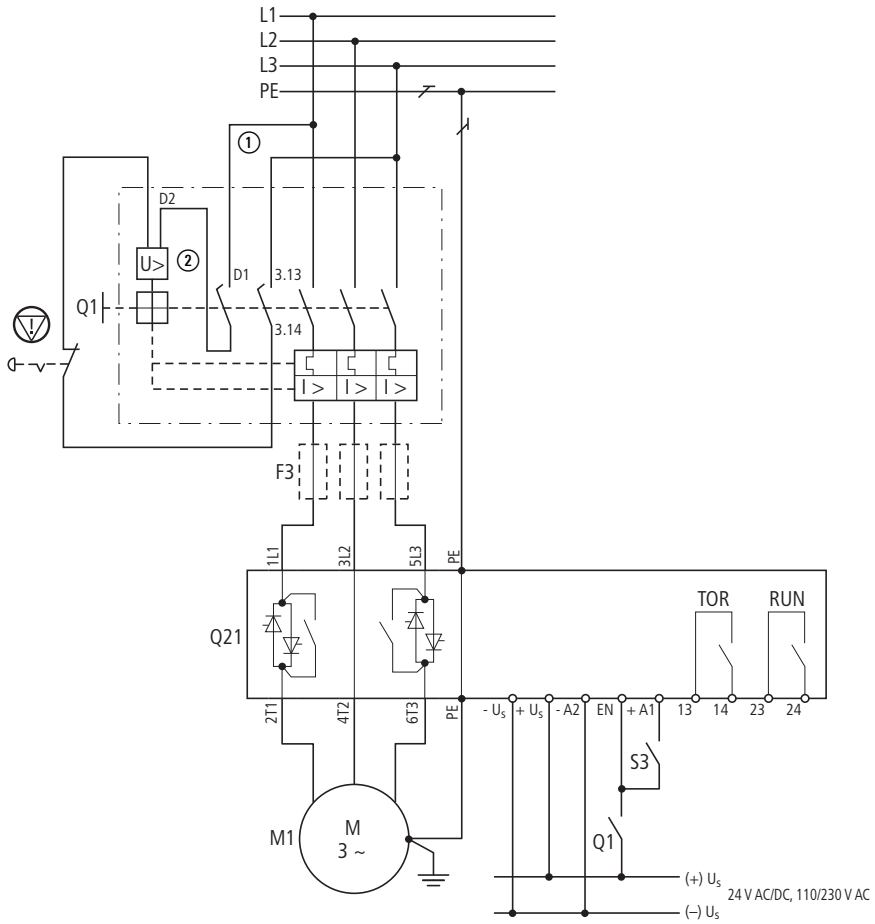


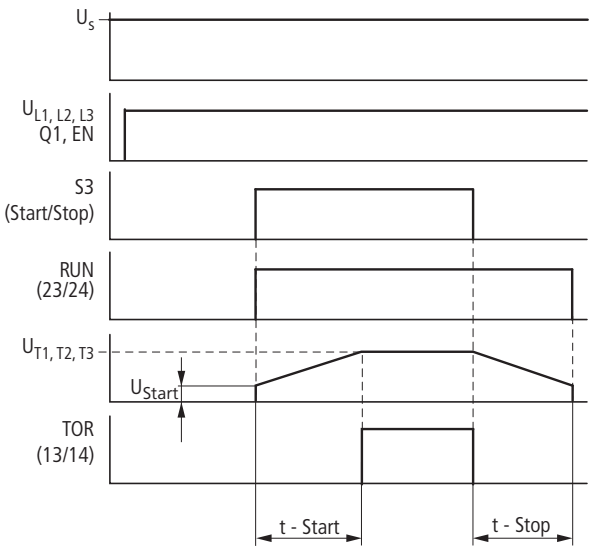
Standard connection
over 32 A

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

= Emergency switching off

① Control circuit terminal
② Undervoltage release with early-make auxiliary contact





assigned Motor power at		Rated operational current[1]		Part no. Soft starters (device to be selected)	Soft starter function
400 V	480 V	Motor	Soft starters		Cable protection[2]
KP kWh	KP HP	I_e T	I_e T		Type “1” coordination
				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

Instructions [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]	
Cable protection[2] Type “1” coordination	Overload relays[3]	optional[4]	Fuses	Fuse holders
			Number x Part no.	Number x Part no.
PKM0-4 (+ CL-PKZ0)	ZB12-4	DILM7	3 x 50.179.06-16	3 x 51.060.04
PKM0-10 (+ CL-PKZ0)	ZB12-10	DILM9	3 x 50.140.06-25	3 x 51.060.04
PKM0-10 (+ CL-PKZ0)	ZB12-10	DILM9	3 x 20.282.20-32	3 x 51.060.04
PKM0-12 (+ CL-PKZ0)	ZB12-12	DILM12	3 x 20.282.20-32	3 x 51.060.04
PZM0-16 (+ CL-PKZ0)	ZB32-16	DILM17	3 x 50.140.06-50	3 x 51.060.04
PZM0-25 (+ CL-PKZ0)	ZB32-24	DILM25	3 x 50.140.06-63	3 x 51.060.04
PZM0-32 (+ CL-PKZ0)	ZB32-32	DILM32	3 x 50.140.06-80	3 x 51.060.04
NZMN1-M50 / PKZM4-50	ZB65-40+ZB65-XEZ	DILM50	3 x 50.140.06-80	3 x 21.189.01
NZMN1-M63 / PKZM4-58	ZB65-57+ZB65-XEZ	DILM65	3 x 20.282.20-125	3 x 21.189.01
NZMN1-M80	ZB150-70/KK	DILM80	3 x 20.610.32-200	3 x 21.313.02
NZMN1-M100	ZB150-100/KK	DILM95	3 x 20.610.32-200	3 x 21.313.02
NZMN1-M100	ZB150-100/KK	DILM115	3 x 20.610.32-200	3 x 21.313.02
NZMN2-M160	ZB150-150/KK	DILM150	3 x 20.610.32-350	3 x 21.313.02
NZMN2-M200	Z5-160/FF250	DILM185	3 x 20.610.32-400	3 x 21.313.02
NZMN2-M200	Z5-220/FF250	DILM225	3 x 20.610.32-500	3 x 21.313.02

				DS7-340SX004	DS7-340SX007	DS7-340SX009	DS7-340SX012
General							
Standards				IEC/EN 60 947-4-2			
Climatic proofing				Damp heat, cyclic, to DIN IEC Part 68 2-10, Damp heat, constant, to DIN IEC 68 Part 2-3			
Ambient temperature			°C	0…40, up to 60 °C at 1 % derating per Kelvin temperature rise			
Ambient temperature storage			°C	-25 - +55			
Installation altitude	Higher installation altitude upon request			0…1000 m, above that 1 % derating per 100 m, up to 2000 m			
Mounting position				Vertical			
Protection type				IP20			
Protection type applies to the front and operator control and operating elements. Protection type from all sides is IP00.				Protection type IP40 can be achieved on all sides with covers from the NZM range.			
Protection against direct contact				Finger- and back-of-hand proof			
Overvoltage category/pollution degree				II/2			
Mechanical shock resistance				8 g/11 ms			
Vibration resistance to EN 60721-3-2				2M2			
Average heat dissipation with nominal load cycle			W	0.2	0.35	0.45	0.6
Dimensions (W x H x D)			mm	45 x 130 x 95			
Radio interference level				B			
Weight			kg	0.35	0.35	0.35	0.35
Main contacts							
Rated operational voltage			V AC	230 - 460			
Mains frequency			Hz	50/60			
Rated operational current	AC-53 (motor loads)	I_e	A	4	7	9	12
Assigned motor rating	230 V	P	kW	0.75	1.5	2.2	3
	400 V	P	kW	1.5	3	4	5.5
	480 V	P	HP	2	3	5	7.5
Overload cycle to EN 60947-4-2							
AC-53a (int. bypass)	For AC-53a:3-5:75-10		A	4	7	9	12
Terminal capacity							
Power cable (box terminal)	Solid		mm^2	1 x (0.75 - 4); 2 x (0.75 - 2.5)			
	Flexible with ferrule		mm^2	1 x (0.75 - 2.5); 2 x (0.75 - 2.5)			
	Stranded		mm^2	-	-	-	-
	Solid or stranded		AWG	18 - 10			
	Flat conductor		min, mm	-	-	-	-
			max, mm	-	-	-	-
	Tightening torque		Nm	1.2	1.2	1.2	1.2
Control cables	Solid		mm^2	1 x (0.75 - 4); 2 x (0.75 - 2.5)			
	Flexible with ferrule		mm^2	1 x (0.75 - 2.5); 2 x (0.75 - 2.5)			
	Stranded		mm^2	-	-	-	-
	Solid or stranded		AWG	18 - 10			
	Tightening torque		Nm	1.2	1.2	1.2	1.2
	Screwdriver (flat blade)		mm	0.8 x 5.5; 1 x 6			
Power section							
Rated impulse withstand voltage	U_{imp} 1.2/50 µs		kV	4	4	4	4
Rated insulation voltage		U_i	V	500	500	500	500
Short-circuit rating							
Type "1" coordination	For AC-53a:3-5:75-10			PKZM0-4 (+ CL-PKZ0)	PKZM0-10 (+ CL-PKZ0)	PKZM0-10 (+ CL-PKZ0)	PKZM0-12 (+ CL-PKZ0)
Type "2" coordination (in addition to fuses for type "1" of coordination)				3 x 50.179.06-16	3 x 50.140.06-25	3 x 20.282.20-32	3 x 20.282.20-32
Fuse holders				3 x 51.060.04	3 x 51.060.04	3 x 51.060.04	3 x 51.060.04
Control circuit							
Controller supply voltage	Voltage	U_s	V	24 V AC/DC + 10 % / - 15 %			
	Current consumption at no load 24 V DC		mA	-	-	-	-
	Current consumption in operation at 24 V DC		mA	-	-	-	-
	Current consumption at peak load (close bypass) at 24 V DC		mA/ms	-	-	-	-
Control voltage range	AC operated			24 V AC/DC + 10 % / - 15 %			
	Current consumption at 230 V DC		mA	-	-	-	-
Pick-up voltage	DC operated		V DC	+17.3 - +27	+17.3 - +27	+17.3 - +27	+17.3 - +27
	AC operated		V AC	-	-	-	-
Drop-out voltage	DC operated		V DC	0 - +3	0 - +3	0 - +3	0 - +3
	AC operated		V AC	-	-	-	-
Pick-up time	AC operated		ms	-	-	-	-
Drop-out time	AC operated		ms	-	-	-	-
Relay outputs	Number			1 (TOR)			
	Voltage range		V AC	250			
	Current range		A	1 A, AC-1			
Soft start functions							
Ramp times	Acceleration		s	1 - 30			
	Deceleration		s	0 - 30			
Start voltage (= switch-off voltage)				30 % - 100 %			
Voltage reduction at stop				8 %			

DS7-340SX016	DS7-340SX024	DS7-340SX032	DS7-340SX041	DS7-340SX055	DS7-340SX070	DS7-340SX081	DS7-340SX100	DS7-340SX135	DS7-340SX160	DS7-340SX200
IEC/EN 60 947-4-2										
Damp heat, cyclic, to DIN IEC Part 68 2-10, Damp heat, constant, to DIN IEC 68 Part 2-3										
0…40, up to 60 °C at 1 % derating per Kelvin temperature rise										
-25 - +55										
0…1000 m, above that 1 % derating per 100 m, up to 2000 m										
Vertical										
IP20										
Protection type IP40 can be achieved on all sides with covers from the NZM range.										
Finger- and back-of-hand proof										
II/2										
8 g/11 ms										
2M2										
0.8	1.1	1.5	7	10	13	18	25	24	30	42
45 x 150 x 118			93 x 175 x 139					108 x 215 x 178		
B										
0.4	0.4	0.4	1.8	1.8	1.8	1.8	1.8	3.7	3.7	3.7
230 - 460										
50/60										
16	24	32	41	55	70	81	100	135	160	200
4	5.5	7.5	11	15	15	22	30	30	45	55
7.5	11	15	22	30	37	45	55	75	90	110
10	15	20	30	40	50	60	75	100	125	150
16	24	32	41	55	70	81	100	135	160	200
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)		
1 x (0.75 - 16); 2 x (0.75 - 10)			-	-	-	-	-	-	-	-
1 x 16			1 x (25 - 70); 2 x (6 - 25)					1 x (4 - 185); 2 x (4 - 70)		
18 - 6			1 x (12 - 2/0)					1 x (12 - 350 kcmil); 2 x (12 - 00)		
-	-	-	2 x 9 x 0.8					2 x 9 x 0.8		
-	-	-	9 x 9 x 0.8					10 x 16 x 0.8		
3	3	3	-	-	-	-	-	-	-	-
1 x (0.5 - 2.5); 2 x (0.5 - 1.0)										
1 x (0.5 - 1.5); 2 x (0.5 - 0.75)										
1 x (0.5 - 1.5); 2 x (0.5 - 1.0)										
1 x (21 - 14); 2 x (21 - 18)										
1.2	1.2	1.2	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
0.6 x 3.5										
4	4	4	4	4	4	4	4	4	4	4
500	500	500	500	500	500	500	500	500	500	500
PKZM0-16 (+ CL-PKZ0)	PKZM0-25 (+ CL-PKZ0)	PKZM0-32 (+ CL-PKZ0)	NZMN1-M50/ PKZM4-50	NZMN1-M63/ PKZM4-58	NZMN1-M80	NZMN1-M100	NZMN1-M100	NZMN2-M160	NZMN2-M200	NZMN2-M200
3 x 50.140.06-50	3 x 50.140.06-63	3 x 50.140.06-80	3 x 20.282.20-100	3 x 20.282.20-125	3 x 20.610.32-200	3 x 20.610.32-200	3 x 20.610.32-200	3 x 20.610.32-350	3 x 20.610.32-400	3 x 20.610.32-500
3 x 51.060.04	3 x 51.060.04	3 x 51.060.04	3 x 21.189.01	3 x 21.189.01	3 x 21.313.02	3 x 21.313.02	3 x 21.313.02	3 x 21.313.02	3 x 21.313.02	3 x 21.313.02
24 V AC/DC + 10 % / - 15 %										
-	-	-	35	35	35	35	35	35	35	35
-	-	-	65	65	65	65	65	65	65	65
-	-	-	600/50	600/50	600/50	600/50	600/50	600/50	600/50	600/50
24 V AC/DC + 10 % / - 15 %										
-	-	-	14	14	14	14	14	14	14	14
+17.3 - +27	+17.3 - +27	+17.3 - +27	+17.3 - +27	+17.3 - +27	+17.3 - +27	+17.3 - +27	+17.3 - +27	+17.3 - +27	+17.3 - +27	+17.3 - +27
-	-	-	-	-	-	-	-	-	-	-
0 - +3	0 - +3	0 - +3	0 - +3	0 - +3	0 - +3	0 - +3	0 - +3	0 - +3	0 - +3	0 - +3
-	-	-	-	-	-	-	-	-	-	-
-	-	-	250	250	250	250	250	250	250	250
-	-	-	190	190	190	190	190	190	190	190
2 (TOR)										
250										
1 A, AC-1			3 A, AC-1							
1 - 30										
0 - 30										
30 % - 100 %										
8 %										

				DS7-342SX004	DS7-342SX007	DS7-342SX009	DS7-342SX012
General							
Standards				IEC/EN 60 947-4-2			
Climatic proofing				Damp heat, cyclic, to DIN IEC Part 68 2-10, Damp heat, constant, to DIN IEC 68 Part 2-3			
Ambient temperature			°C	0…40, up to 60 °C at 1 % derating per Kelvin temperature rise			
Ambient temperature storage			°C	-25 - +55			
Installation altitude	Higher installation altitude upon request			0…1000 m, above that 1 % derating per 100 m, up to 2000 m			
Mounting position				Vertical			
Protection type				IP20			
Protection type applies to the front and operator control and operating elements. Protection type from all sides is IP00.				Protection type IP40 can be achieved on all sides with covers from the NZM range.			
Protection against direct contact				Finger- and back-of-hand proof			
Overvoltage category/pollution degree				II/2			
Mechanical shock resistance				8 g/11 ms			
Vibration resistance to EN 60721-3-2				2M2			
Average heat dissipation with nominal load cycle			W	0.2	0.35	0.45	0.6
Dimensions (W x H x D)			mm	45 x 130 x 95			
Radio interference level				B			
Weight			kg	0.4	0.4	0.4	0.4
Main contacts							
Rated operational voltage			V AC	230 - 460			
Mains frequency			Hz	50/60			
Rated operational current	AC-53 (motor loads)	I_e	A	4	7	9	12
Assigned motor rating	230 V	P	kW	0.75	1.5	2.2	3
	400 V	P	kW	1.5	3	4	5.5
	480 V	P	HP	2	3	5	7.5
Overload cycle to EN 60947-4-2							
AC-53a (int. bypass)	For AC-53a:3-5:75-10		A	4	7	9	12
Terminal capacity							
Power cable (box terminal)	Solid		mm^2	1 x (0.75 - 4); 2 x (0.75 - 2.5)			
	Flexible with ferrule		mm^2	1 x (0.75 - 2.5); 2 x (0.75 - 2.5)			
	Stranded		mm^2	-	-	-	-
	Solid or stranded		AWG	18 - 10			
	Flat conductor		min, mm	-	-	-	-
			max, mm	-	-	-	-
	Tightening torque		Nm	1.2	1.2	1.2	1.2
Control cables	Solid		mm^2	1 x (0.75 - 4); 2 x (0.75 - 2.5)			
	Flexible with ferrule		mm^2	1 x (0.75 - 2.5); 2 x (0.75 - 2.5)			
	Stranded		mm^2	-	-	-	-
	Solid or stranded		AWG	18 - 10			
	Tightening torque		Nm	1.2	1.2	1.2	1.2
	Screwdriver (flat blade)		mm	0.8 x 5.5; 1 x 6			
Power section							
Rated impulse withstand voltage	U_{imp} 1.2/50 µs		kV	4	4	4	4
Rated insulation voltage		U_i	V	500	500	500	500
Short-circuit rating							
Type "1" coordination	For AC-53a:3-5:75-10			PKZM0-4 (+ CL-PKZ0)	PKZM0-10 (+ CL-PKZ0)	PKZM0-10 (+ CL-PKZ0)	PKZM0-12 (+ CL-PKZ0)
Type "2" coordination (in addition to fuses for type "1" of coordination)				3 x 50.179.06-16	3 x 50.140.06-25	3 x 20.282.20-32	3 x 20.282.20-32
Fuse holders				3 x 51.060.04	3 x 51.060.04	3 x 51.060.04	3 x 51.060.04
Control circuit							
Controller supply voltage	Voltage	U_s	V	120 -15 % - 230 +10 %			
	Current consumption at no load 24 V DC		mA	-	-	-	-
	Current consumption in operation at 24 V DC		mA	-	-	-	-
	Current consumption at peak load (close bypass) at 24 V DC		mA/ms	-	-	-	-
Control voltage range	AC operated			120 -15 % - 230 +10 %			
	Current consumption at 230 V DC		mA	-	-	-	-
Pick-up voltage	DC operated		V DC	-	-	-	-
	AC operated		V AC	120 -15 %			
Drop-out voltage	DC operated		V DC	-	-	-	-
	AC operated		V AC	-	-	-	-
Pick-up time	AC operated		ms	-	-	-	-
Drop-out time	AC operated		ms	-	-	-	-
Relay outputs	Number			1 (TOR)			
	Voltage range		V AC	250			
	Current range		A	3 A, AC1			
Soft start functions							
Ramp times	Acceleration		s	1 - 30			
	Deceleration		s	0 - 30			
Start voltage (= switch-off voltage)				30 % - 92 %			
Voltage reduction at stop				8 %			

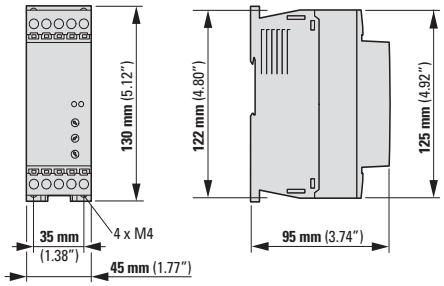
DS7-342SX016	DS7-342SX024	DS7-342SX032	DS7-342SX041	DS7-342SX055	DS7-342SX070	DS7-342SX081	DS7-342SX100	DS7-342SX135	DS7-342SX160	DS7-342SX200
IEC/EN 60 947-4-2										
Damp heat, cyclic, to DIN IEC Part 68 2-10, Damp heat, constant, to DIN IEC 68 Part 2-3										
0…40, up to 60 °C at 1 % derating per Kelvin temperature rise										
-25 - +55 °C										
0…1000 m, above that 1 % derating per 100 m, up to 2000 m										
Vertical										
IP20										
Protection type IP40 can be achieved on all sides with covers from the NZM range.										
Finger- and back-of-hand proof										
II/2										
8 g/11 ms										
2M2										
0.8	1.1	1.5	7	10	13	18	25	24	30	42
45 x 150 x 118			93 x 175 x 139					108 x 215 x 178		
B										
0.45	0.45	0.45	1.8	1.8	1.8	1.8	1.8	3.7	3.7	3.7
230 - 460										
50/60										
16	24	30	41	55	70	81	100	135	160	200
4	5.5	7.5	11	15	15	22	30	30	45	55
7.5	11	15	22	30	37	45	55	75	90	110
10	15	20	30	40	50	60	75	100	125	150
16	24	30	41	55	70	81	100	135	160	200
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)		
1 x (0.75 - 16); 2 x (0.75 - 10)			-	-	-	-	-	-	-	-
1 x 16			1 x (25 - 70); 2 x (6 - 25)					1 x (4 - 185); 2 x (4 - 70)		
18 - 6			1 x (12 - 2/0)					1 x (12 - 350 kcmil); 2 x (12 - 00)		
-	-	-	2 x 9 x 0.8					2 x 9 x 0.8		
-	-	-	9 x 9 x 0.8					10 x 16 x 0.8		
3	3	3	-	-	-	-	-	-	-	-
1 x (0.5 - 2.5); 2 x (0.5 - 1.0)										
1 x (0.5 - 1.5); 2 x (0.5 - 0.75)										
1 x (0.5 - 1.5); 2 x (0.5 - 1.0)										
1 x (21 - 14); 2 x (21 - 18)										
1.2	1.2	1.2	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
0.8 x 5.5; 1 x 6			0.6 x 3.5							
4	4	4	4	4	4	4	4	4	4	4
500	500	500	500	500	500	500	500	500	500	500
PKZM0-16 (+ CL-PKZ0)	PKZM0-25 (+ CL-PKZ0)	PKZM0-32 (+ CL-PKZ0)	NZMN1-M50 / PKZM4-50	NZMN1-M63 / PKZM4-58	NZMN1-M80	NZMN1-M100	NZMN1-M100	NZMN2-M160	NZMN2-M200	NZMN2-M200
3 x 50.140.06-50	3 x 50.140.06-63	3 x 50.140.06-80	3 x 20.282.20-100	3 x 20.282.20-125	3 x 20.610.32-200	3 x 20.610.32-200	3 x 20.610.32-200	3 x 20.610.32-350	3 x 20.610.32-400	3 x 20.610.32-500
3 x 51.060.04	3 x 51.060.04	3 x 51.060.04	3 x 21.189.01	3 x 21.189.01	3 x 21.313.02	3 x 21.313.02	3 x 21.313.02	3 x 21.313.02	3 x 21.313.02	3 x 21.313.02
120 -15 % - 230 +10 %										
-	-	-	35	35	35	35	35	35	35	35
-	-	-	65	65	65	65	65	65	65	65
-	-	-	600/50	600/50	600/50	600/50	600/50	600/50	600/50	600/50
120 -15 % - 230 +10 %										
-	-	-	14	14	14	14	14	14	14	14
-	-	-	-	-	-	-	-	-	-	-
120 -15 %										
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
-	-	-	250	250	250	250	250	250	250	250
-	-	-	190	190	190	190	190	190	190	190
2 (TOR)										
250										
3 A, AC1										
1 - 30										
0 - 30										
30 % - 92 %										
8 %										

				DS7-34DSX004	DS7-34DSX007	DS7-34DSX009	DS7-34DSX012
General							
Standards				IEC/EN 60 947-4-2			
Climatic proofing				Damp heat, cyclic, to DIN IEC Part 68 2-10, Damp heat, constant, to DIN IEC 68 Part 2-3			
Ambient temperature			°C	0…40, up to 60 °C at 1 % derating per Kelvin temperature rise			
Ambient temperature storage			°C	-25 - +55 °C			
Installation altitude	Higher installation altitude upon request			0…1000 m, above that 1 % derating per 100 m, up to 2000 m			
Mounting position				Vertical			
Protection type				IP20			
Protection type applies to the front and operator control and operating elements. Protection type from all sides is IP00.				Protection type IP40 can be achieved on all sides with covers from the NZM range.			
Protection against direct contact				Finger- and back-of-hand proof			
Overvoltage category/pollution degree				II/2			
Mechanical shock resistance				8 g/11 ms			
Vibration resistance to EN 60721-3-2				2M2			
Average heat dissipation with nominal load cycle			W	0.2	0.35	0.45	0.6
Dimensions (W x H x D)			mm	45 x 135 x 95			
Radio interference level				B			
Weight			kg	0.41	0.41	0.41	0.41
Main contacts							
Rated operational voltage			V AC	230 - 460			
Mains frequency			Hz	50/60			
Rated operational current	AC-53 (motor loads)	I_e	A	4	7	9	12
Assigned motor rating	230 V	P	kWh	0.75	1.5	2.2	3
	400 V	P	kWh	1.5	3	4	5.5
	480 V	P	HP	2	3	5	7.5
Overload cycle to EN 60947-4-2							
AC-53a (int. bypass)	For AC-53a:3-5:75-10		A	4	7	9	12
Terminal capacity							
Power cable (box terminal)	Solid		mm^2	1 x (0.75 - 4); 2 x (0.75 - 2.5)			
	Flexible with ferrule		mm^2	1 x (0.75 - 2.5); 2 x (0.75 - 2.5)			
	Stranded		mm^2	-	-	-	-
	Solid or stranded		AWG	18 - 10			
	Flat conductor		min, mm	-	-	-	-
			max, mm	-	-	-	-
	Tightening torque		Nm	1.2	1.2	1.2	1.2
Control cables	Solid		mm^2	1 x (0.75 - 4); 2 x (0.75 - 2.5)			
	Flexible with ferrule		mm^2	1 x (0.75 - 2.5); 2 x (0.75 - 2.5)			
	Stranded		mm^2	-	-	-	-
	Solid or stranded		AWG	18 - 10			
	Tightening torque		Nm	1.2	1.2	1.2	1.2
	Screwdriver (flat blade)		mm	0.8 x 5.5; 1 x 6			
Power section							
Rated impulse withstand voltage	U_{imp} 1.2/50 µs		kV	4	4	4	4
Rated insulation voltage		U_i	V	500	500	500	500
Short-circuit rating							
Type "1" coordination	For AC-53a:3-5:75-10			PKZM0-4 (+ CL-PKZ0)	PKZM0-10 (+ CL-PKZ0)	PKZM0-10 (+ CL-PKZ0)	PKZM0-12 (+ CL-PKZ0)
Type "2" coordination (in addition to fuses for type "1" of coordination)				3 x 50.179.06-16	3 x 50.179.06-25	3 x 20.282.20-32	3 x 20.282.20-32
Fuse holders				3 x 51.060.04	3 x 51.060.04	3 x 21.189.01	3 x 21.189.01
Control circuit							
Controller supply voltage	Voltage	U_s	V	+24 V AC/DC +10 %/-15 %			
	Current consumption at no load 24 V DC		mA	-	-	-	-
	Current consumption in operation at 24 V DC		mA	-	-	-	-
	Current consumption at peak load (close bypass) at 24 V DC		mA/ms	-	-	-	-
Control voltage range	AC operated			24 +10 %/-15 %			
	Current consumption at 230 V DC		mA	-	-	-	-
Pick-up voltage	DC operated		V DC	+17.3 - +27	+17.3 - +27	+17.3 - +27	+17.3 - +27
	AC operated		V AC	-	-	-	-
Drop-out voltage	DC operated		V DC	0 - +3	0 - +3	0 - +3	0 - +3
	AC operated		V AC	-	-	-	-
Pick-up time	DC operated		ms	-	-	-	-
Drop-out time	DC operated		ms	-	-	-	-
Relay outputs	Number			1 (TOR)			
	Voltage range		V AC	250			
	Current range		A	3 A, AC1			
Soft start functions							
Ramp times	Acceleration		s	1 - 30			
	Deceleration		s	0 - 30			
Start voltage (= switch-off voltage)				30 % - 92 %			
Voltage reduction at stop				8 %			

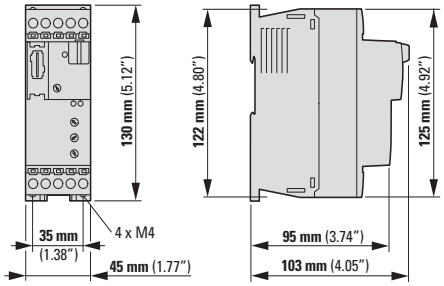
DS7-34DSX016	DS7-34DSX024	DS7-34DSX032	DS7-34DSX041	DS7-34DSX055	DS7-34DSX070	DS7-34DSX081	DS7-34DSX100	DS7-34DSX135	DS7-34DSX160	DS7-34DSX200
IEC/EN 60 947-4-2										
Damp heat, cyclic, to DIN IEC Part 68 2-10, Damp heat, constant, to DIN IEC 68 Part 2-3										
0…40, up to 60 °C at 1 % derating per Kelvin temperature rise										
-25 - +55 °C										
0…1000 m, above that 1 % derating per 100 m, up to 2000 m										
Vertical										
IP20										
Protection type IP40 can be achieved on all sides with covers from the NZM range.										
Finger- and back-of-hand proof										
II/2										
8 g/11 ms										
2M2										
0.8	1.1	1.5	7	10	13	18	25	24	30	42
45 x 150 x 118			93 x 175 x 139					108 x 215 x 178		
B										
0.41	0.46	0.46	1.8	1.8	1.8	1.8	1.8	3.7	3.7	3.7
230 - 460										
50/60										
16	24	30	41	55	70	81	100	135	160	200
4	5.5	7.5	11	15	15	22	30	30	45	55
7.5	11	15	22	30	37	45	55	75	90	110
10	15	20	30	40	50	60	75	100	125	150
16	24	30	41	55	70	81	100	135	160	200
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)		
1 x (0.75 - 16); 2 x (0.75 - 10)			-	-	-	-	-	-	-	-
1 x 16			1 x (25 - 70); 2 x (6 - 25)					1 x (4 - 185); 2 x (4 - 70)		
18 - 6			1 x (12 - 2/0)					1 x (12 - 350 kcmil); 2 x (12 - 00)		
-	-	-	2 x 9 x 0.8					2 x 9 x 0.8		
-	-	-	9 x 9 x 0.8					10 x 16 x 0.8		
3	3	3	-	-	-	-	-	-	-	-
1 x (0.75 - 4); 2 x (0.75 - 4)			1 x (0.5 - 2.5); 2 x (0.5 - 1.0)					1 x (0.5 - 2.5); 2 x (0.5 - 1.0)		
1 x (0.75 - 2.5); 2 x (0.75 - 2.5)			1 x (0.5 - 1.5); 2 x (0.5 - 0.75)					1 x (0.5 - 1.5); 2 x (0.5 - 0.75)		
-	-	-	1 x (0.5 - 1.5); 2 x (0.5 - 1.0)					1 x (0.5 - 1.5); 2 x (0.5 - 1.0)		
18 - 14			1 x (21 - 14); 2 x (21 - 18)					1 x (21 - 14); 2 x (21 - 18)		
1.2	1.2	1.2	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
0.6 x 3.5; 1 x 6			0.6 x 3.5					0.6 x 3.5		
4	4	4	4	4	4	4	4	4	4	4
500	500	500	500	500	500	500	500	500	500	500
PKZM0-16 (+ CL-PKZ0)	PKZM0-25 (+ CL-PKZ0)	PKZM0-32 (+ CL-PKZ0)	NZMN1-M50 / PKZM4-50	NZMN1-M63 / PKZM4-58	NZMN1-M80	NZMN1-M100	NZMN1-M100	NZMN2-M160	NZMN2-M200	NZMN2-M200
3 x 50.140.06-50	3 x 50.140.06-63	3 x 50.140.06-80	3 x 20.282.20-100	3 x 20.282.20-125	3 x 20.610.32-200	3 x 20.610.32-200	3 x 20.610.32-200	3 x 20.610.32-350	3 x 20.610.32-400	3 x 20.610.32-500
3 x 51.060.04	3 x 51.060.04	3 x 51.060.04	3 x 21.189.01	3 x 21.189.01	3 x 21.313.02	3 x 21.313.02	3 x 21.313.02	3 x 21.313.02	3 x 21.313.02	3 x 21.313.02
+24 V AC/DC +10 %/-15 %										
-	-	-	35	35	35	35	35	35	35	35
-	-	-	65	65	65	65	65	65	65	65
-	-	-	600/50	600/50	600/50	600/50	600/50	600/50	600/50	600/50
24 +10 %/-15 %										
-	-	-	14	14	14	14	14	14	14	14
+17.3 - +27	+17.3 - +27	+17.3 - +27	+17.3 - +27	+17.3 - +27	+17.3 - +27	+17.3 - +27	+17.3 - +27	+17.3 - +27	+17.3 - +27	+17.3 - +27
-	-	-	-	-	-	-	-	-	-	-
0 - +3	0 - +3	0 - +3	0 - +3	0 - +3	0 - +3	0 - +3	0 - +3	0 - +3	0 - +3	0 - +3
-	-	-	-	-	-	-	-	-	-	-
-	-	-	250	250	250	250	250	250	250	250
-	-	-	190	190	190	190	190	190	190	190
2 (TOR, Ready)										
250										
3 A, AC1										
1 - 30										
0 - 30										
30 % - 92 %										
8 %										

Dimensions

DS7-340SX004N0-N
DS7-340SX007N0-N
DS7-340SX009N0-N
DS7-340SX012N0-N
DS7-342SX004N0-N
DS7-342SX007N0-N
DS7-342SX009N0-N
DS7-342SX012N0-N



DS7-34DSX004N0-D
DS7-34DSX007N0-D
DS7-34DSX009N0-D
DS7-34DSX012N0-D



DS7-340SX041N0-N
DS7-340SX055N0-N
DS7-340SX070N0-N
DS7-340SX081N0-N
DS7-340SX100N0-N
DS7-342SX041N0-N
DS7-342SX055N0-N
DS7-342SX070N0-N
DS7-342SX081N0-N
DS7-342SX100N0-N
DS7-34DSX041N0-D
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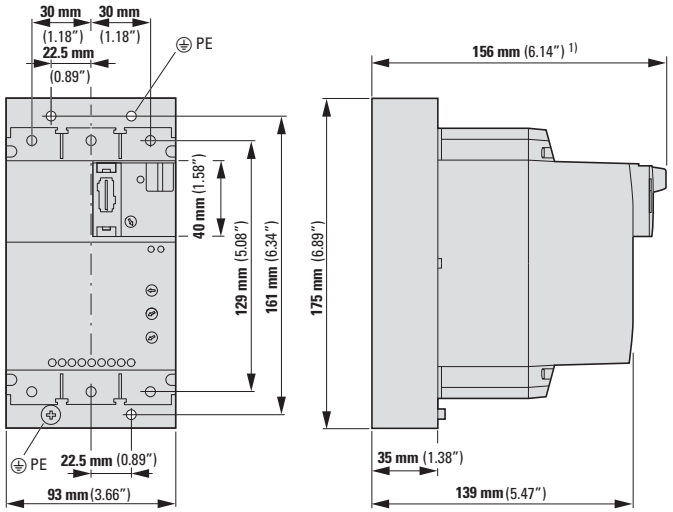
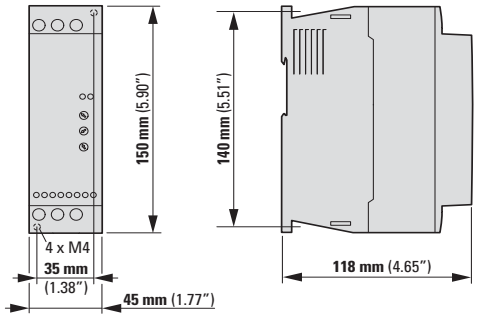
DS7-34DSX081N0-D
DS7-34DSX100N0-D

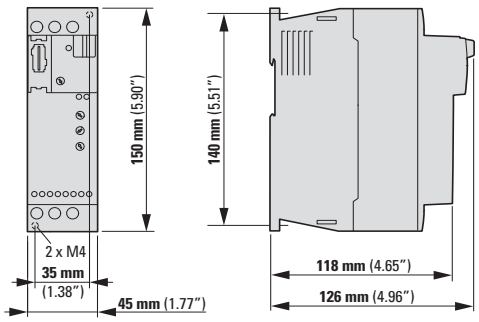


1 DS7-...-D

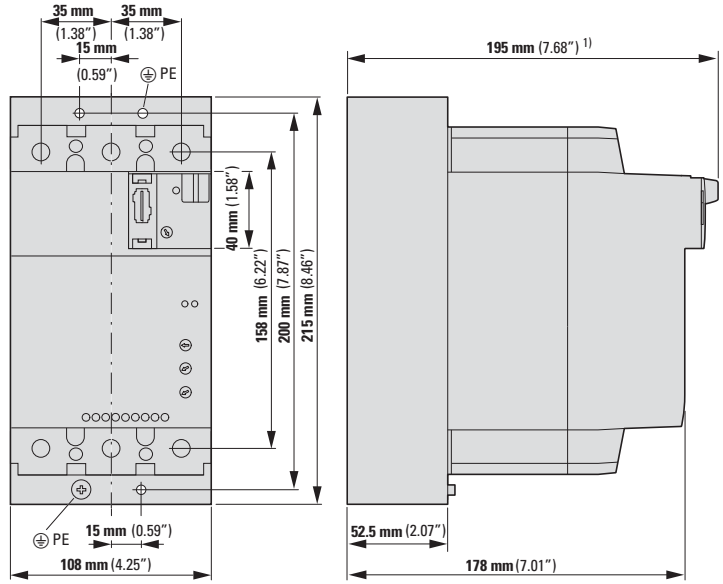
DS7-340SX016N0-N
DS7-340SX024N0-N
DS7-340SX032N0-N
DS7-342SX016N0-N
DS7-342SX024N0-N
DS7-342SX032N0-N



DS7-34DSX016N0-D
DS7-34DSX024N0-D
DS7-34DSX032N0-D



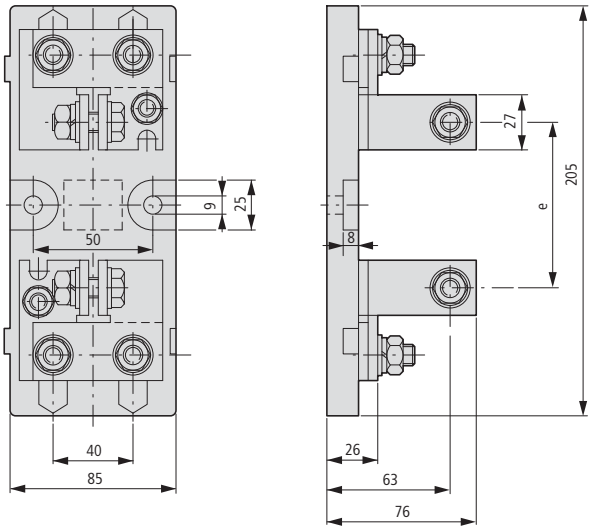
DS7-342SX135N0-N
DS7-342SX160N0-N
DS7-342SX200N0-N
DS7-340SX135N0-N
DS7-340SX160N0-N
DS7-340SX200N0-N
DS7-34DSX135N0-D
DS7-34DSX160N0-D
DS7-34DSX200N0-D



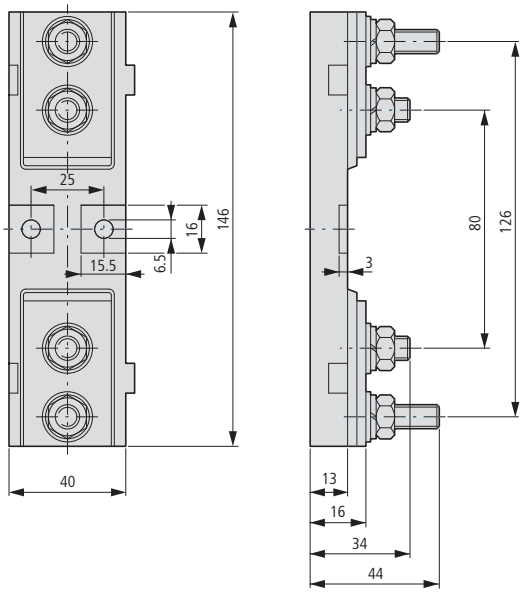
1 DS7-...-D

Fuse-links

21.313.02

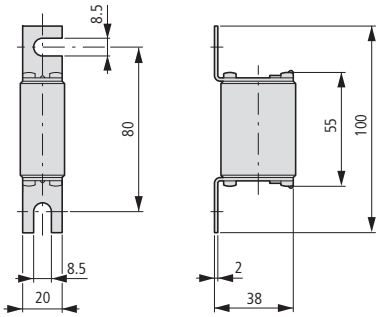


21.189.01

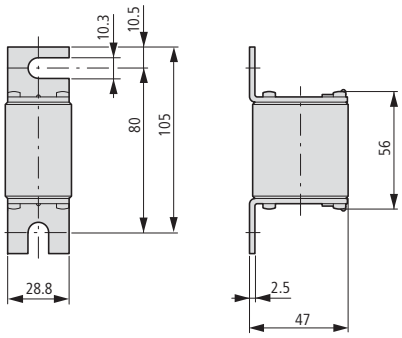


Fuse-links

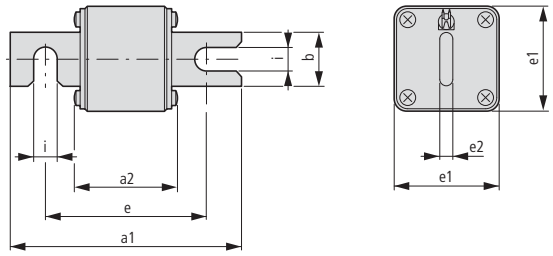
20.282.20-…



20.189.20-…

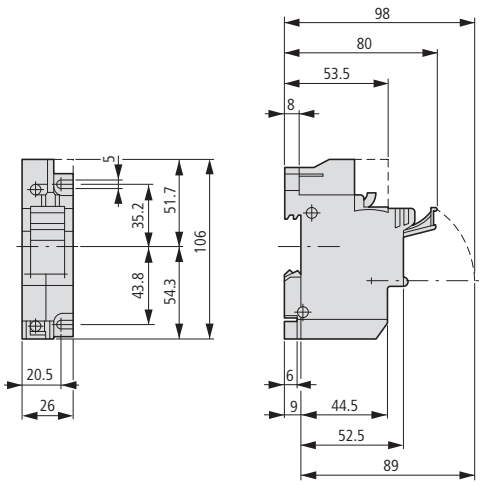


20.6X0.20



Part no.	a1	a2	b	e	e1	e2	i
20.610.32-200	109	47,5	26	76	51	6	11
20.610.32-350	109	47,5	26	76	51	6	11
20.610.32-450	109	47,5	26	76	51	6	11
20.610.32-500	109	47,5	26	76	51	6	11
20.610.32-630	109	47,5	26	76	51	6	11
20.610.32-900	109	49	35	76	73	6	11
20.610.32-1250	109	49	35	76	73	6	11

51.060.04



Rapid Link 4.0 distributed, electronic drive system

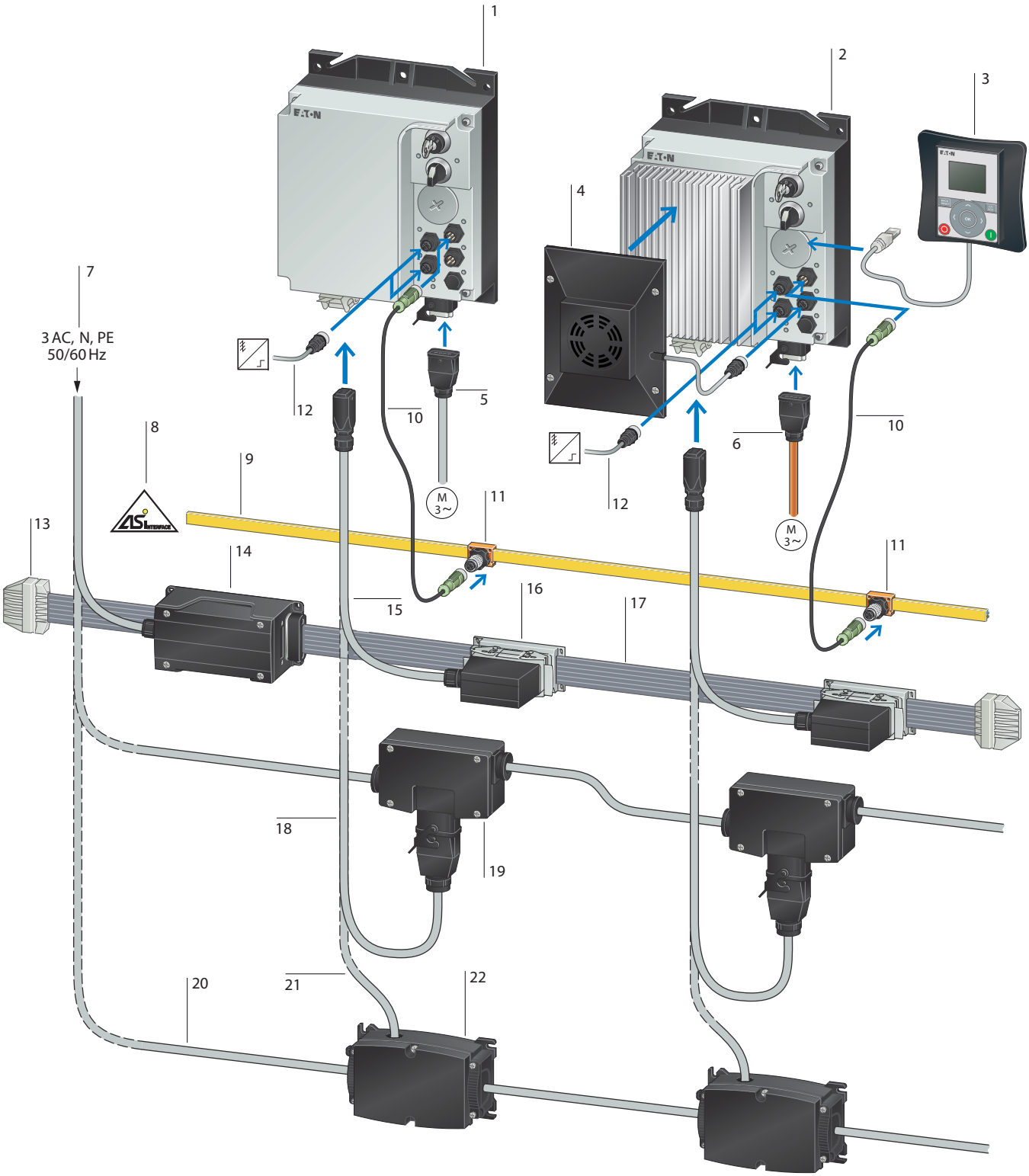
Standardized installation procedures, the ability to directly and locally configure parameters with a plug and play configuration, and networked communications – these are the needs of material handling system applications today when it comes to state-of-the-art drive engineering and the systems it produces.

Eaton delivers a modern answer with the Rapid Link 4.0 distributed electronic drive system. With its flexible power spectrum, its simple handling and its intelligent programming options, this new motor starter and variable frequency drives generation is the first choice for all kinds of conveying engineering applications.

RAMO electronic motor starters
Electronic DOL and reversing starters with a lifespan of more than 10 million Operations
Rated operational current of 0.3 – 6.6 A with a three-phase mains connection of 400 V; assigned
Motor rating 0.09 – 3.0 kW, protection type IP65
RAMO-D…: DOL starter in a compact design
RAMO-W…: reversing starters in a compact design

RASP speed controllers
Frequency-controlled motor starters with Volts-per-Hertz control (V/Hz control) and vector control, as well as an integrated radio interference suppression filter (EMC), IP65 protection type.
RASP-2…: Rated operational current of 0.48 – 4.6 A with three-phase mains connection of 400 V; assigned motor output of up to 0.75 kW
RASP-3…: Rated operational current of 0.66 – 6.6 A with three-phase mains connection of 400 V; assigned motor output of up to 1.1 kW
RASP-4…: Rated operational current of 0.86 – 8.6 A with three-phase mains connection of 400 V; assigned motor output of up to 1.5 kW
RASP-5…: Rated operational current of 1.12 – 11.2 A with three-phase mains connection of 400 V; assigned motor output of up to 2.2 kW

System overview



Function modules

Motor starter (Motor Control Unit) 1
Three-phase electronic DOL starter or reversing starter
→ page 96

Speed controller RASP (Speed Control Unit) 2
Three phase frequency-controlled motor starter (fixed speeds, two rotational directions, adjustable acceleration and deceleration ramps)
→ page 97

Operating unit 3
for parameter setting
→ page 98

Fan 4
for operation at high temperatures without derating
→ page 98

Motor feeder

Unscreened motor cable 5
→ page 98

Screened motor cable (EMC) 6
→ page 98

Power and data bus

Energy supply (3 AC 400 V) via circuit-breaker for overload and short-circuit protection 7
for protection against short-circuit and overload

AS-Interface® Incomers 8

AS-Interface® flat cable 9

AS-Interface® connection cable 10
→ page 101

AS-Interface® junction 11
→ page 101

Sensor connection 12
→ page 101

End-piece for flat cable 13
→ page 100

Distributor module 14
for 400-V-AC incoming unit of the flat cable
→ page 99

Power connection cable 15
to flexible busbar junction
→ page 98

flexible busbar junction 16
→ page 99

Ribbon cable for 400 V AC 17
→ page 98

Power connection cable 18
to round cable junction
→ page 100

Round cable junction 19
→ page 100

Round cable for 400 V AC 20

Power connection cable 21
to round cable junction
→ page 101

Round cable junction 22
→ page 100

Rapid Link 4.0 is a modern, efficient drive and automation system. It is the competent further development of the Rapid Link 2.1/3.0 device series, suitable for simple and complex tasks in all aspects of material handling. For example in airports, industrial production and logistics centers.
The Rapid Link system consists of the RAMO electronic motor starters and the RASP frequency controlled motor starters.

The RAMO and RASP motor starters are designed with IP65 protection and can be installed in direct proximity to the drive. Their versions and mounting depend on the required specifications and the local conditions.
The RAMO and RASP are connected with standard plug connectors to the energy and databus systems predominantly used in material handling systems (AS-Interface). Connection can be implemented without interrupting the required location. This simplifies installation and reduces the wiring requirement.







Overview of features

RAMO 4.0 electronic motor starters

Application and function
The RAMO motor starters enable the electronic DOL or reversing starting of three-phase motors in automatic or manual mode. The electronic overload protection for motor ratings from 90 W to 3 kW at 400 V (50/60 Hz) is configured with DIP switches. Full motor protection is ensured when used in connection with temperature sensors.
The operating mode is set via the AUTO - OFF/RESET – MANUAL keyswitch and can be combined with the 'Quick stop' and 'Interlocked manual operation' via the two sensor inputs (M12 sockets). 2 settable fixed frequencies and cyclical program sequences extend the application range and relieve the load on the higher-level head-end controller (PLC). Operating states are diagnosed and error messages (Reset) acknowledged on the device or via the AS-Interface.
RAMO is available in different versions:
- with actuator output (24 V DC) for a direct actuation of external switching devices, e.g. solenoid valves.
- with electronic actuation for mechanical motor brakes.
- with lockable repair switch for diagnostic and maintenance work, making it possible to safely de-energize the device locally (under development).

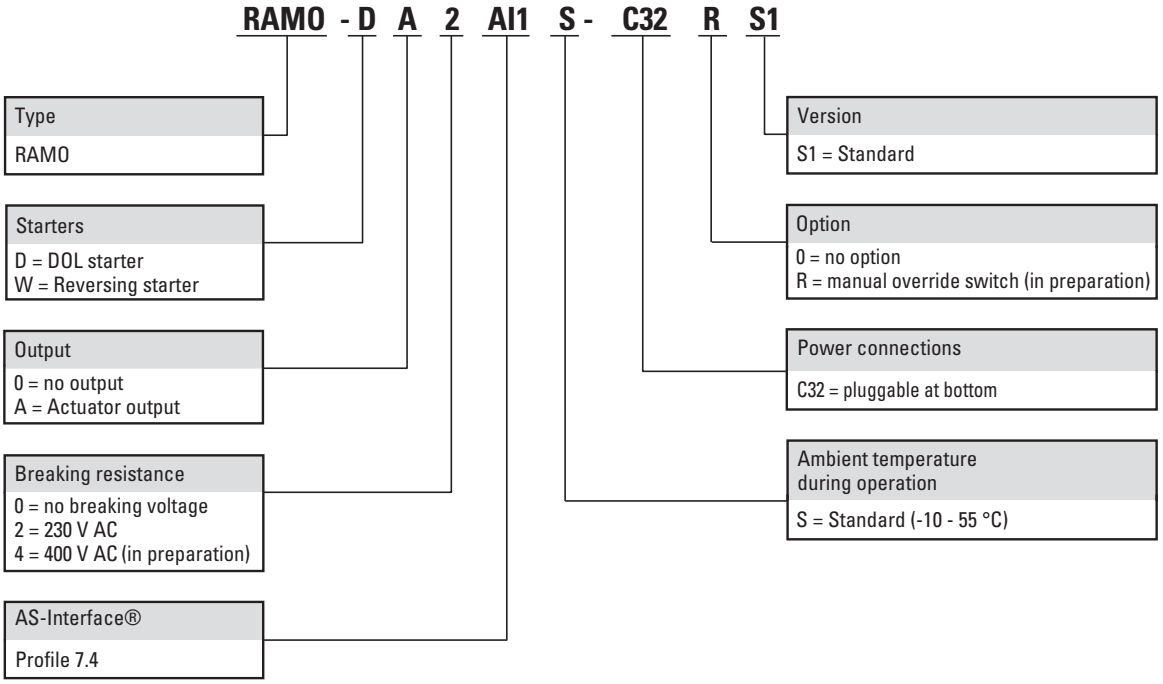
Essential features
- Standard size in square enclosure. The bottom section with the two power terminals (power plug, motor feeder socket) and the repair and maintenance switch can be turned 90° clockwise and counterclockwise.
- Long lifespan up to 10 million switch operations and up to 3,000 switch cycles per hour at 2.2 kW.
- Rated operational current 6.6 A.
- Operating and ambient temperature from -10 to +55 °C, without derating.
- Monitoring of thermistor and motor cable.
- Maximum motor cable length: 10 m.

Frequency controlled motor starter RASP 4.0

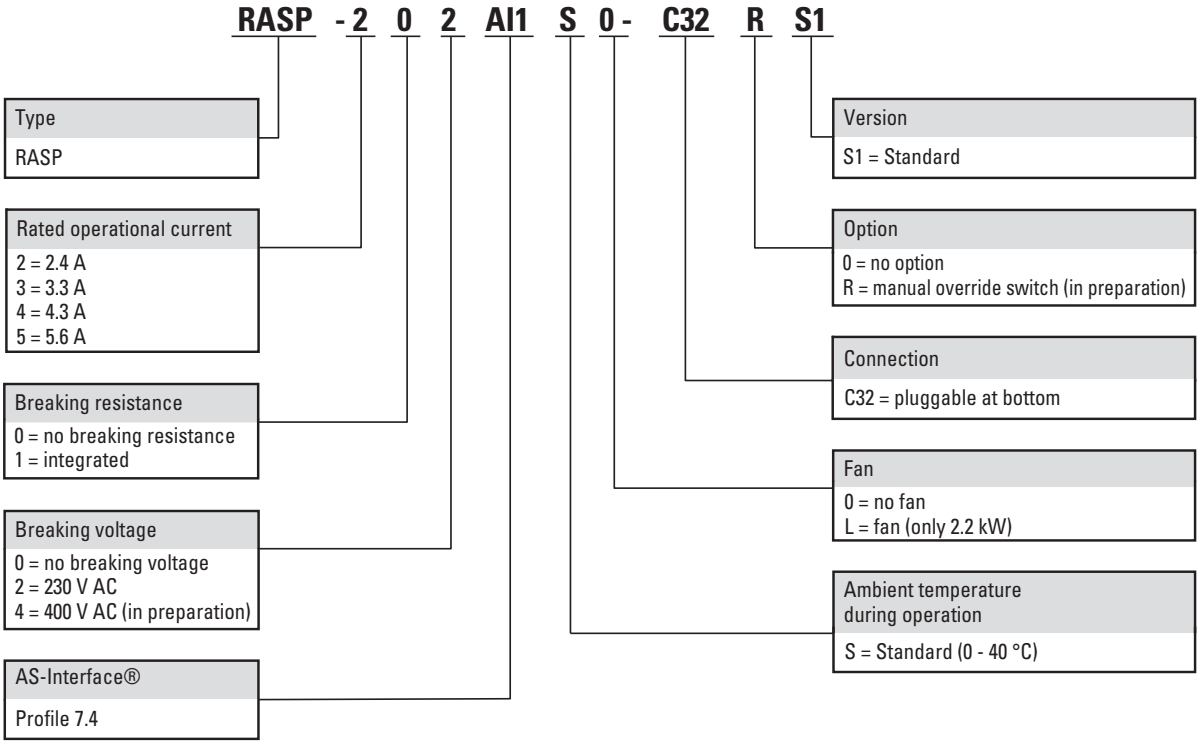
Application and function
The RASP motor starter enables the infinitely variable speed control of three-phase motors in the range from zero to 320 Hz . The standard size for 400 V (50/60 Hz) is assigned four motor ratings: 0.75 kW, 1.1 kW, 1.5 kW and 2.2 kW (with fan). Full motor protection is ensured by the adjustable current limitation (I2t controller) when used in connection with temperature sensors.
The operating mode is set via the AUTO - OFF/RESET – MANUAL keyswitch and can be combined with the 'Quick stop' and 'Interlocked manual operation' via the two sensor inputs (M12 sockets). Settable fixed frequencies and cyclical program sequences extend the application range and relieve the load on the higher-level head-end controller (PLC). Operating states are diagnosed and error messages (Reset) acknowledged on the device or via the AS-Interface. A hand-held programmer and a PC interface are available for the parameterization of the variable frequency drive module.
RASP is available in different versions:
- with integrated brake chopper with braking resistor for dynamic braking.
- with electronic actuation for mechanical motor brakes.
- with lockable repair switch for diagnostic and maintenance work, making it possible to safely de-energize the device locally (under development).

Essential features
- Standard size in square enclosure. The bottom section with the two power terminals (power plug, motor feeder socket) and the repair and maintenance switch can be turned 90° clockwise and counterclockwise.
- Monitoring of thermistor and motor cable.
- Operating and ambient temperatures from 0 to +40 °C without derating, with optional fan in the performance range up to 1.5 kW max. +55 °C.
- Rated operational current: 2.4 A, 3.3 A, 4.3 A, 5.6 A
- EMC class C3 in 2nd environment
- Maximum motor cable length: 5 m.

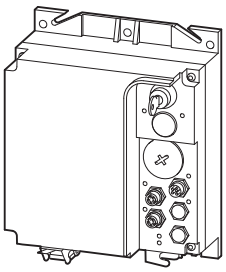
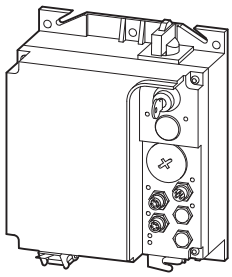
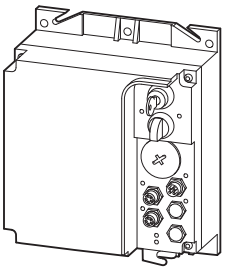
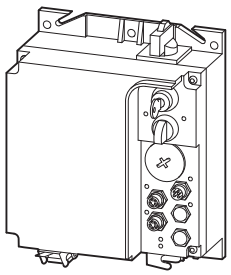
Electronic motor starters RAMO



Frequency controlled motor starter RASP



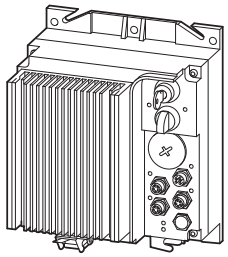
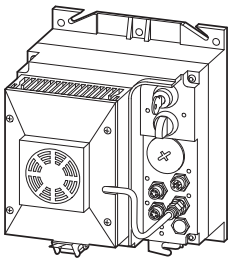
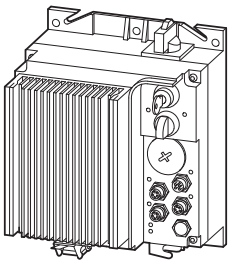
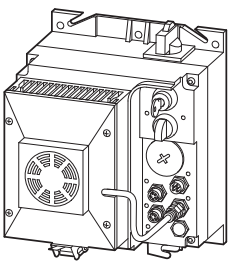
Ordering

	Rated operational current I_e A	Control voltage external brake (50/60 Hz)[1] V AC	Actuator output[2] Number	Part no. Article no.	Price see price list	Std. pack
Motor starter RAMO						
Rated operational voltage 400 V AC, 3-phase						
DOL starters						
	6.6	-	-	**RAMO-D00AI1S-C320S1** 150150		1 off
	6.6	230	-	**RAMO-D02AI1S-C320S1** 150152		
	6.6	230	1	**RAMO-DA2AI1S-C320S1** 164321		
	6.6	400	-	**RAMO-D04AI1S-C320S1** 169799		
	6.6	400	1	**RAMO-DA4AI1S-C320S1** 169800		
with manual override switch						
	6.6	-	-	**RAMO-D00AI1S-C32RS1** 150158		1 off
	6.6	230	-	**RAMO-D02AI1S-C32RS1** 150160		
	6.6	400	-	**RAMO-D04AI1S-C32RS1** 169801		
Reversing starter with selector switch REV - OFF - FWD						
	6.6	-	-	**RAMO-W00AI1S-C320S1** 150151		1 off
	6.6	230	-	**RAMO-W02AI1S-C320S1** 150153		
	6.6	230	1	**RAMO-WA2AI1S-C320S1** 164322		
	6.6	400	-	**RAMO-W04AI1S-C320S1** 169802		
	6.6	400	1	**RAMO-WA4AI1S-C320S1** 169803		
with manual override switch						
	6.6	230	-	**RAMO-W02AI1S-C32RS1** 150161		1 off
	6.6	400	-	**RAMO-W04AI1S-C32RS1** 169804		
	6.6	-	-	**RAMO-W00AI1S-C32RS1** 150159		

Notes

[1] for actuation of motors with mechanical brake
[2] Operation with external 24V DC supply

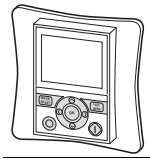
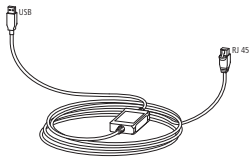
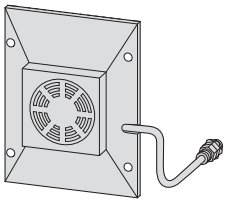
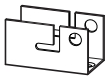
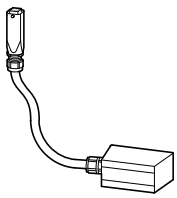
Information about equipment supplied
Motor feeder socket to DESINA Standard
with AS-Interface, Profile 7.4 for 31 stations (M12 plug) on the unit
with power incomer socket on the unit

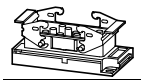
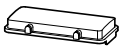
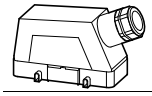
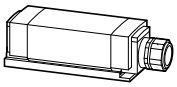
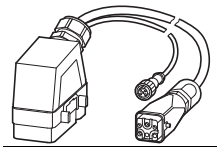
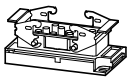
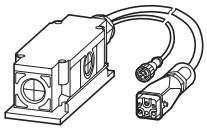
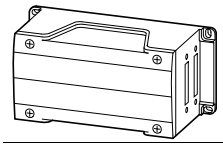
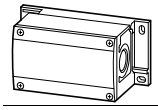
	Rated operational current[1]	assigned motor rating P[2] at 400 V, 50 Hz	Control voltage external brake (50/60 Hz)[3]	Part no. Article no.	Price see price list	with braking resistance[4] Part no. Article no.	Price see price list	Std. pack
	I_e A	P kW	V AC					
RASP speed controllers								
Rated operational voltage 400 V AC, 3-phase								
	2.4	-	-	**RASP-200AI1S0-C320S1** 150168		**RASP-210AI1S0-C320S1** 150172		1 off
	2.4	-	230	**RASP-202AI1S0-C320S1** 150176		**RASP-212AI1S0-C320S1** 150180		
	2.4	-	400	**RASP-204AI1S0-C320S1** 169805		**RASP-214AI1S0-C320S1** 169809		
	3.3	-	-	**RASP-300AI1S0-C320S1** 150169		**RASP-310AI1S0-C320S1** 150173		
	3.3	-	230	**RASP-302AI1S0-C320S1** 150177		**RASP-312AI1S0-C320S1** 150181		
	3.3	-	400	**RASP-304AI1S0-C320S1** 169806		**RASP-314AI1S0-C320S1** 169810		
	4.3	-	-	**RASP-400AI1S0-C320S1** 150170		**RASP-410AI1S0-C320S1** 150174		
	4.3	-	230	**RASP-402AI1S0-C320S1** 150178		**RASP-412AI1S0-C320S1** 150182		
	4.3	-	400	**RASP-404AI1S0-C320S1** 169807		**RASP-414AI1S0-C320S1** 169811		
	5.6	-	-	**RASP-500AI1SL-C320S1** 150171		**RASP-510AI1SL-C320S1** 150175		
	5.6	-	230	**RASP-502AI1SL-C320S1** 150179		**RASP-512AI1SL-C320S1** 150183		
	5.6	-	400	**RASP-504AI1SL-C320S1** 169808		**RASP-514AI1SL-C320S1** 169812		
with manual override switch								
	2.4	-	-	**RASP-200AI1S0-C32RS1** 150200		**RASP-210AI1S0-C32RS1** 150204		1 off
	2.4	-	230	**RASP-202AI1S0-C32RS1** 150208		**RASP-212AI1S0-C32RS1** 150212		
	2.4	-	400	**RASP-204AI1S0-C32RS1** 169813		**RASP-214AI1S0-C32RS1** 169817		
	3.3	-	-	**RASP-300AI1S0-C32RS1** 150201		**RASP-310AI1S0-C32RS1** 150205		
	3.3	-	230	**RASP-302AI1S0-C32RS1** 150209		**RASP-312AI1S0-C32RS1** 150213		
	3.3	-	400	**RASP-304AI1S0-C32RS1** 169814		**RASP-314AI1S0-C32RS1** 169818		
	4.3	-	-	**RASP-400AI1S0-C32RS1** 150202		**RASP-410AI1S0-C32RS1** 150206		
	4.3	-	230	**RASP-402AI1S0-C32RS1** 150210		**RASP-412AI1S0-C32RS1** 150214		
	4.3	-	400	**RASP-404AI1S0-C32RS1** 169815		**RASP-414AI1S0-C32RS1** 169819		
	5.6	-	-	**RASP-500AI1SL-C32RS1** 150203		**RASP-510AI1SL-C32RS1** 150207		
	5.6	-	230	**RASP-502AI1SL-C32RS1** 150211		**RASP-512AI1SL-C32RS1** 150215		
	5.6	-	400	**RASP-504AI1SL-C32RS1** 169816		**RASP-514AI1SL-C32RS1** 169820		

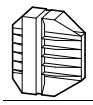
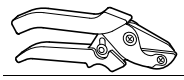
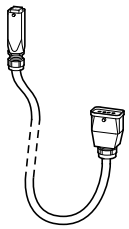
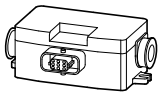
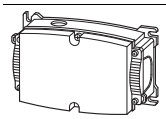
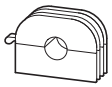
Notes

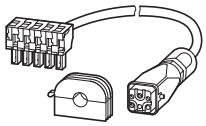
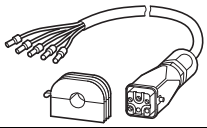
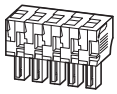
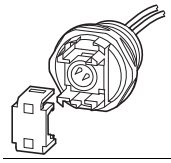
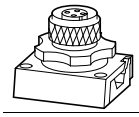
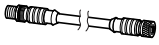
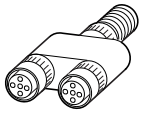
[1] for normal internally and externally ventilated 4 pole, three-phase asynchronous motors with 1500 rpm^{-1} at 50 Hz or 1800 min^{-1} at 60 Hz
[2] Rated operational current at an operating frequency of 6 kHz and an ambient air temperature of +40 °C
[3] for actuation of motors with mechanical brake
[4] integrated brake chopper with braking resistance for dynamic braking

Information about equipment supplied
Motor feeder socket to DESINA Standard
with AS-Interface, Profile 7.4 for 31 stations (M12 plug) on the unit
with power incomer socket on the unit

	Description		For use with	Part no. Article no.	Price see price list	Std. pack	Notes
Communications							
Operating unit for setting the device parameters							
	with non-volatile parameter memory for copying parameter sets Equipment supplied: including 1 m connection cable with RJ45 connectors		RASP	**RASP-KEY-S1** 156644		1 off	-
Programming cable for connecting the device to the PC							
	For configuring the device's parameters with the MaxConnect computer program with RJ 45 plug and USB plug	Length 3.4 m	RASP	**XMX-CBL-3M4-USB** 153448		1 off	-
Device fans							
RASP device fan for operation at high temperatures without derating							
	Power supply and control via RASP through M12 plug connector Enhanced cooling for ambient temperatures of up to +55 °C for RASP-2…, RASP-3…., and RASP-4... Spare part for RASP-5...		RASP	**RASP-FAN-S1** 156643		1 off	-
Motor feeder							
Motor cable for connecting the motor starter to the motor		Length m					
	halogen free, 8 x 1.5 mm², plastic plug	2	RAMO	**RAMO-CM1-2M0** 164282		1 off	-
		5	RAMO	**RAMO-CM1-5M0** 164283		1 off	-
		10	RAMO	**RAMO-CM1-10M** 164284		1 off	-
	halogen free, screened, 4 x 1.5 mm² + 2 x (2 x 0.75 mm²), plastic plug	2	RASP	**RASP-CM1-2M0** 164285		1 off	-
		5	RASP	**RASP-CM1-5M0** 164286		1 off	-
Locking brackets for the safe isolation of the motor cables from power							
	For motor cables and motor plugs, disconnection device to EN 60204-1		RAMO-CM1… RASP-CM1…	**SET-M-LOCK** 272085		1 off	For padlocks with hasp thickness up to 8 mm
Power supply at flat cable RA-C1							
Flat cable for 400 V AC/24 V DC decentralized power supply or AS-Interface							
	halogen free, 7 x 4 mm²		RA-C1…	**RA-C1-7X4HF** 230860		100 runn. m	Paint film contaminant/ silicon-free
Power connection cable for connecting the device with the 400 V AC flexible busbar junction							
	with power plug and plug for flexible busbar junction, halogen-free, 5 x 1.5 mm²		RAMO RASP RA-C1-PLF	**RA-C3/C1-1,5HF** 290210		1 off	-

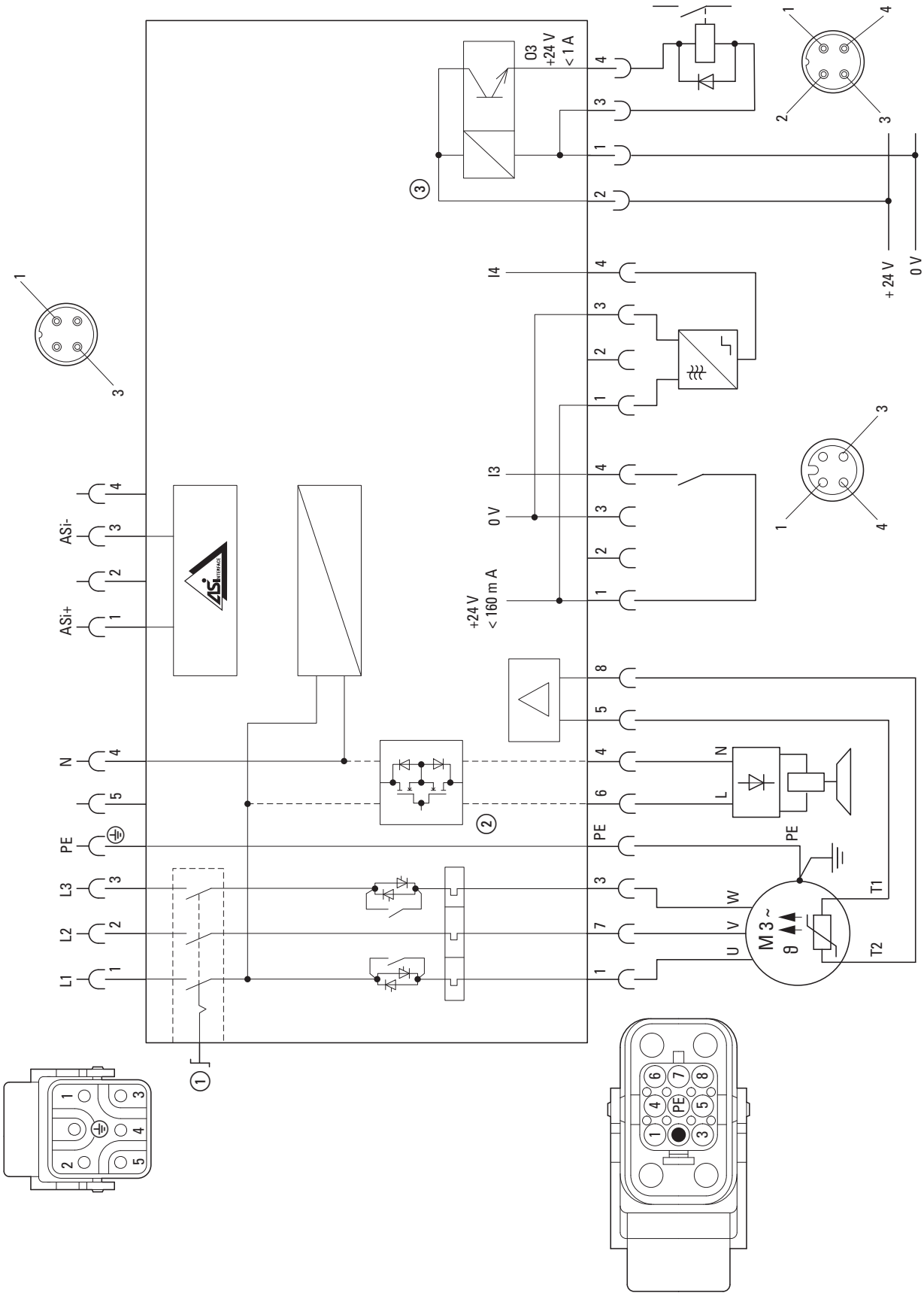
	Description	For use with	Part no. Article no.	Price see price list	Std. pack	Notes
Power supply at flat cable RA-C1						
Flexible busbar junction 400 V AC/24 V DC Connection socket for power connection cable						
	Insulation piercing terminals, terminal socket with lock mechanism	RA-C1-7X4HF RA-C3/C1-1,5HF	**RA-C1-PLF** 290188		5 off	-
Protection cover for protecting the 400 V AC/24 V DC flexible busbar junction						
	-	RA-C1-PLF	**RA-C1-COV** 254693		10 off	-
Plug connector for 400 V AC/24 V DC flexible busbar junction						
	Plug insert with hood	RA-C1-PLF	**RA-C1-VP-PLM** 231574		5 off	Order cable gland V-M25 separately.
Distributor module for feeding the 400-V-AC/24-V-DC of the ribbon cable with a round cable						
	Termination with piercing screws, 2 x V-M25 and 2 x V-M20 knockout plates, connection module with spring-loaded terminals, connection of round cables up to 4 mm².	RA-C1-7X4HF	**RA-C1-AM-7** 290214		5 off	Order cable gland V-M25 or V-M20 separately.
Power/AS-Interface connection cable for connecting the device with the 400 V AC AS-Interface flexible busbar junction						
	Double cable with outgoer plug (flexible busbar end) and M12 plug and power plug (device end)	RAMO RASP RA-C1-PLF1	**RA-C1-PLM/C3-1M5** 112624		1 off	Can be used when AS-Interface implemented in flat cable.
400 V AC/AS-Interface flexible busbar junction Connection socket for power/AS-Interface cable						
	Insulation piercing terminals, terminal socket with lock mechanism	RA-C1-7X4HF RA-C1-PLM/C3-1M5	**RA-C1-PLF1** 116904		1 off	Can be used when AS-Interface implemented in flat cable.
Power/AS-Interface connection cable For connecting the device with 400 V AC/24 V DC/AS-Interface flexible busbar						
	Double cable with connection module (flexible busbar end) and M12 plug as well as power plug (device end), termination with piercing screws, knockouts Length 1.5 m	RAMO RASP RA-C1-7X4HF	**RA-C1-AM/C3-1M5** 112625		1 off	Can be used when AS-Interface implemented in flat cable.
Distributor module for the 400V AC feeding to the ribbon cable with a round cable						
	With 3 flexible busbar inputs and 2 round cable inputs Connection of round cables 4 mm²	RA-C1-7X4HF	**RA-C1-VM-7** 264244		2 off	Order V-M25/V-M20 cable gland and RA-C1-DF bushing separately.
Flexible busbar bushing for bushing for flat cable in distributor module or control cabinet						
	-	RA-C1-VM-7	**RA-C1-DF** 264243		10 off	-
Distributor module 24 V DC control voltage is taken from the ribbon cable						
	Termination with piercing screws, connection sockets with screw contacts	RA-C1-7X4HF	**RA-C1-VP-AM-2** 264315		5 off	Order cable gland V-M20 separately
Flexible busbars for fastening the ribbon cable						
	-	RA-C1-7X4HF	**RA-C1-FIX** 272086		100 off	One set with 100 clips.

	Description	Length m	For use with	Part no. Article no.	Price see price list	Std. pack	Notes
Power supply at flat cable RA-C1							
End-piece for terminating the ribbon cable							
	-		RA-C1-7X4HF	**RA-C1-END1** 290189		10 off	-
Tools							
	For cutting flat cable		RA-C1-7X4HF	**RA-C1-CUT** 254690		1 off	-
	for removing casing at the ends of the flat cable		RA-C1-7X4HF	**RA-C1-AZ-4** 272087		1 off	A standard engineer's pliers is required.
Power supply at round cable RA-C2							
Power connection cable for connecting the device with the round cable junction							
	with power plug and plug for round cable junction, halogen-free, 5 x 1.5 mm²	1.5	RAMO RASP RA-C2-S1-4	**RA-C3/C2-1,5HF** 290211		1 off	-
Round cable junction Connection socket for power connection cable							
	for 7 x 2.5/4 mm², 400 V AC and 24 V DC, termination with insulation piercing technology, cable fixing with metal screws, pre-wired socket insert, suitable for cable outer diameters 10 - 13 mm.		RA-C3/C2-1,5HF	**RA-C2-S1-4** 257830		1 off	Equipment supplied: 1 pairs of gaskets for these cable diameters, 1 lock mechanism.
Blanking plug for closing the last round cable junction in the power line							
	-		RA-C2-S1-4	**RA-C2-SBL** 265357		10 off	One set with 10 blanking plugs.
Power supply at round cable RA-C4							
Round cable junction Connection socket for power cables from 2.5 - 6 mm²							
	T junction via spring-cage terminal, 1.5 to 6 mm² and/or plug connection of 0.5 - 4 mm², Enclosure IP65		RA-C4-PPB/C3-1M5 RA-C4-X/C3-1M5	**RA-C4-PB65** 116905		1 off	Tools required: Stripping tool AM16 from Weidmüller or similar. Enclosure continuous seals must be ordered separately.
Gasket Slotted enclosure bushing seal							
	for Ø 11 - 13 mm EPDM round cable, silicon free and halogen free, IP65		RA-C4-PB65	**RA-C4-D13** 116907		10 off	-
	for Ø 13 - 15 mm EPDM round cable, silicon free and halogen free, IP65		RA-C4-PB65	**RA-C4-D15** 116908		10 off	-
	for Ø 15 - 17 mm EPDM round cable, silicon free and halogen free, IP65		RA-C4-PB65	**RA-C4-D17** 116909		10 off	-
Blanking plug for closing off unused housing openings							
	Enclosure seal, closed, EPDM, silicon free and halogen free, IP65		RA-C4-PB65	**RA-C4-D0** 116960		10 off	One set with 10 blanking plugs.

	Description	Length m	For use with	**Part no.** Article no.	**Price** see price list	Std. pack	**Notes**
Power connection cable for connecting the device with the round cable junction							
	Cable 5 x 1.5 mm², halogen-free, with RA-C4-PPB plug for round cable junction, power plug and gasket IP65	1.5	RAMO RASP RA-C4-PB65	**RA-C4-PPB/C3-1M5** 116962		1 off	-
Power connection cable for user assembly for connecting the device with the round cable junction							
	Cable 5 x 1.5 mm² halogen free, with ferrules, power plug and IP65 gasket	1.5	RAMO RASP RA-C4-PB65	**RA-C4-X/C3-1M5** 116961		1 off	-
Plug connectors for wiring the power connection cable for user assembly							
	Plug with spring-cage terminal 0.5 - 4 mm², printed with 1; N; 2; PE; 3.		RA-C4-PB65	**RA-C4-PPB** 116906		10 off	-
AS-Interface connection and sensors							
Connection clip for AS-Interface flat cable to AS-Interface incomer/outgoer for connection modules							
	with integrated AS-Interface overvoltage protection, protection against interference on switch operations or short-circuit, cable termination with insulation displacement		RA-C1-AM-7 RA-C1-AM/C3-1M5 RA-C1-VP-AM-2	**RA-C1-AZPG** 112978		1 off	-
AS-Interface link M12 connection socket for AS-Interface connection cable							
	IDC termination		RAMO RASP	**ZB2-100-AZ1** 082667		1 off	-
24V/AS-Interface connection cable for supplying the device with 24 V/AS-Interface							
	with M12 socket and double outgoer for AS-Interface and 24 V, cable termination with insulation displacement	1	RASP RASP	**RA-XAZ2-1M** 292253		1 off	-
AS-Interface connection cable for connecting the device with AS-Interface junction							
	with M12 socket and M12 plug, 3-pole	1	RAMO RASP	**RA-XM12-1M** 272057		1 off	Pins 1, 3, 4 are assigned
Y connector For connecting up to 2 sensors per M12 socket							
	-		RASP	**RA-XM12-Y** 290424		1 off	-
AS-Interface connection and sensors							
Spare keys for AUTO - OFF/RESET - HAND key-switches							
	Lock mechanism MS1		RAMO RASP	**M22-ES-MS1** 216416		5 off	-

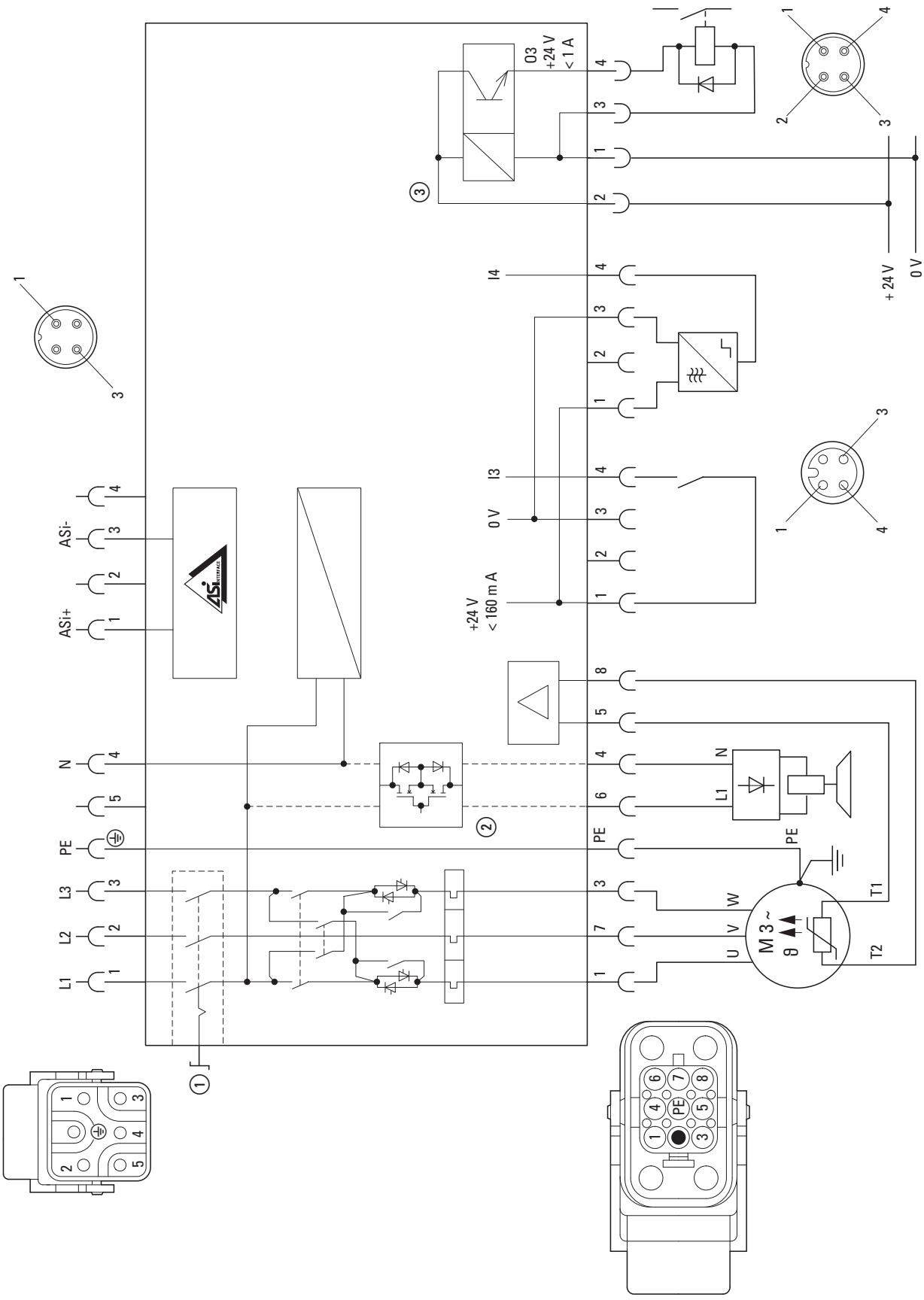
Engineering

Block diagram DOL starter RAMO-D



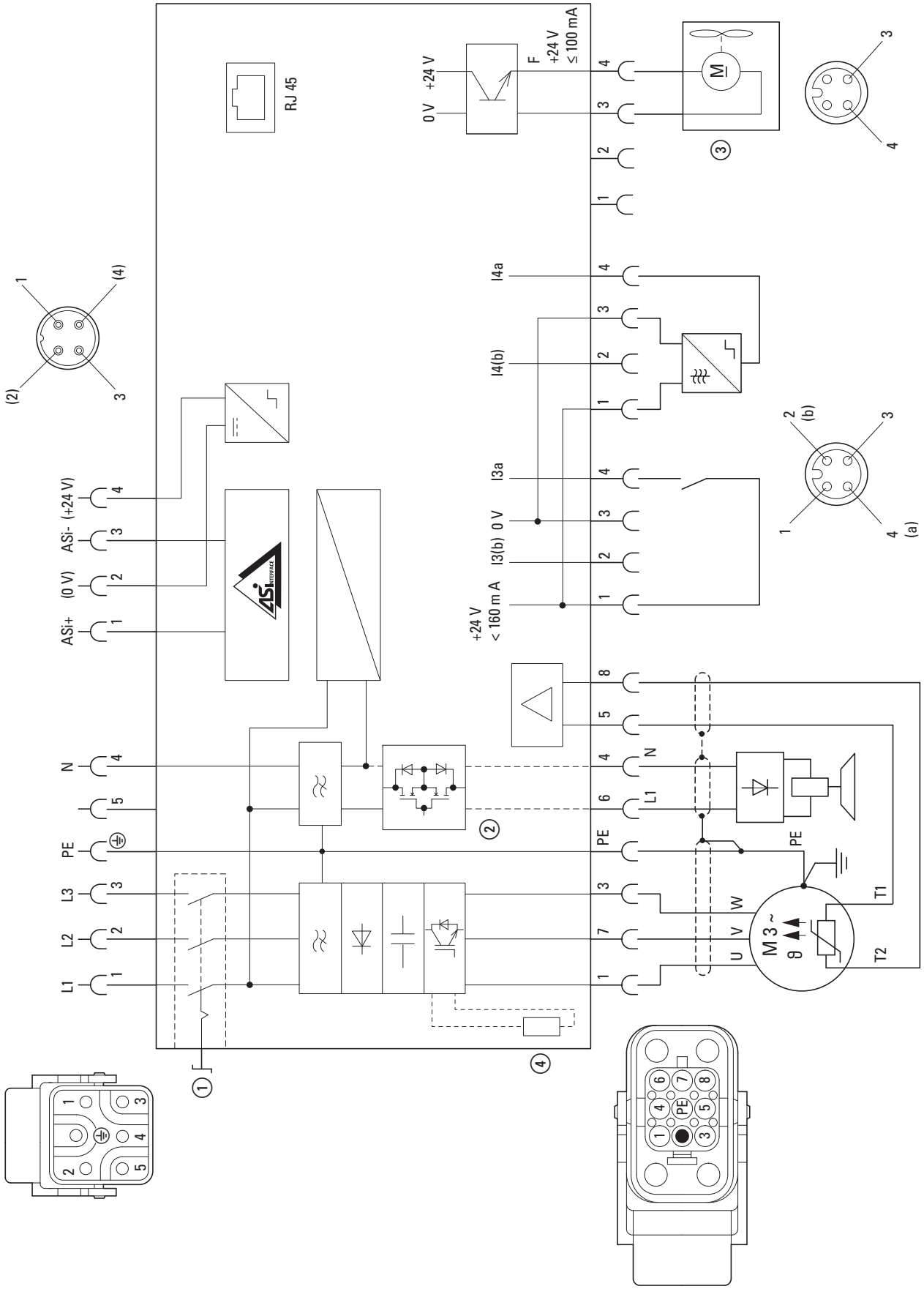
Optional features:
① Repair and maintenance switch
② Actuation of external brake
③ Actuator output

Block diagram reversing starter RAMO-W



Optional features:
① Repair and maintenance switch
② Actuation of external brake
③ Actuator output

Block diagram RASP



Optional features:
① Repair and maintenance switch
② Actuation of external brake
③ Device fans
④ Internal braking resistance

Technical data

			RAMO-D…	RAMO-W…	RASP-2…	RASP-3…	RASP-4…	RASP-5…
General								
Standards			IEC/EN 60947-4-2 IEC/EN 60947-5-1 IEC/EN 61000-6-2 IEC/EN 61000-6-4 Directive 2002/95/EG (RoHS) CE approval		EN 61800-5-1 EN 61800-3 Directive 2002/95/EG (RoHS) CE approval			
Climatic proofing	ρ_w	%	< 95%, non-condensing IEC/EN 50178					
Ambient temperature								
Operation	ϑ	°C	-10 - +55	-10 - +55	0 - +40 0 - +55 (with fan RASP-FAN-1)			0 - +45
Storage	ϑ	°C	-30 - +70	-30 - +70	-30 - +70	-30 - +70	-30 - +70	-30 - +70
Overvoltage category			III	III	III	III	III	III
Pollution degree			2	2	2	2	2	2
Rated impulse withstand voltage	U_{imp}	kV	4	4	2	2	2	2
Radio interference level								
Environment (EMC)			Device class A	Device class A	2. Environment, Class C3	2. Environment, Class C3	2. Environment, Class C3	2. Environment, Class C3
longest permissible length of motor cable	l	m	10	10	5	5	5	5
Mechanical shock resistance		g	1000 shocks per shaft, semi-sinusoidal 15 g/11 ms IEC/EN 60068-2-27					
Vibration			Oscillation frequency: 10 - 150 Hz Amplitude 0.15 mm: 6 Hz Amplitude transition frequency on acceleration: 57 Hz IEC/EN 60068-2-6					
Mounting position			Vertical	Vertical	Vertical	Vertical	Vertical	Vertical
Altitude		m	0 - 1000 m above sea level above 1000 m with 1% performance reduction per 100 m max. 2000 m					
Protection type			IP65 IEC/EN 60529	IP65 IEC/EN 60529	IP65 IEC/EN 60529	IP65 IEC/EN 60529	IP65 IEC/EN 60529	IP65 IEC/EN 60529
Weight								
without manual override switch	m	kg	1,6160	1,6530	4,3750	4,3750	4,3750	4,5950
with manual override switch	m	kg	1,8690	1,9060	4,2220	4,2220	4,2220	4,4420
Main circuit								
Supply								
Rated operational voltage	U_e		400 V AC, 3-phase		400 V AC, 3-phase			
Mains voltage IEC (50/60Hz)	U_{LN}	V	400 (-15%) - 415 (+10%)		380 (-15%) - 400 (+10%)			
Input current	I_{LN}	T	≤ 6.6	≤ 6.6	3.2	4	5.6	7.3
System configuration			AC voltage Center-point earthed star network (TN-S network) Phase-earthed AC supply systems are not permitted.					
Supply frequency	f_{LN}	Hz	50/60	50/60	50/60	50/60	50/60	50/60
Frequency range	f_{LN}	Hz	47 - 63 Hz ± 0%	47 - 63 Hz ± 0%	47 - 66 Hz ± 0%	47 - 66 Hz ± 0%	47 - 66 Hz ± 0%	47 - 66 Hz ± 0%
Mains switch-on frequency			max. one time per minute					
Mains current distortion	THD	%	-	-	> 120	> 120	> 120	> 120
Rated conditional short-circuit current	I_q	kA	< 10	< 10	< 5	< 5	< 5	< 5
Short-circuit protective device			Type 1 coordination Power bus incoming unit -> PKZM0, FAZ		Type 1 coordination Power bus incoming unit -> PKZM0, FAZ			

			RAMO-D…	RAMO-W…	RASP-2…	RASP-3…	RASP-4…	RASP-5…
Power section								
Function			DOL starter with thyristors and bypass contacts, 2-phase	Reversing starter with relays, thyristors and bypass contacts, 2-phase controlled	Variable frequency drive with internal DC link and IGBT inverter			
On-delay	t_{ON}	ms	20 - 35	20 - 35	30 - 50	30 - 50	30 - 50	30 - 50
Off-delay	t_{OFF}	ms	20 - 35	20 - 35	15 - 35	15 - 35	15 - 35	15 - 35
Lifespan, mechanical	Opera-tions		AC3: > 10.000.000	AC3: > 10.000.000	-	-	-	-
Lifespan, electrical	Opera-tions		AC3: > 10.000.000	AC3: > 10.000.000	-	-	-	-
Overload cycle			AC-53a	AC-53a	-	-	-	-
Overload current for 60 s every 600 s	I_L	A	-	-	3.6 (at 40 °C)	5 (at 40 °C)	6.5 (at 40 °C)	8.4 (at 40 °C)
Starting current for 2 s every 20 s	I_L	A	-	-	4.8 (at 40 °C)	6.6 (at 40 °C)	8.6 (at 40 °C)	11.2 (at 40 °C)
Output voltage	U_2		= U_{LN}	= U_{LN}	0 - U_{LN}	0 - U_{LN}	0 - U_{LN}	0 - U_{LN}
Output Frequency	f_2	Hz	= f_{LN}	= f_{LN}	0 - 50 Hz, max. 320			
Switching frequency	f_{PWM}	kHz	-	-	6 (adjustable 1.5 - 16)			
Operation Mode			-	-	linear, parameterizable			
Frequency resolution (setpoint value)	I	Hz	-	-	0.01	0.01	0.01	0.01
Rated operational current	I_e	A	6.6	6.6	2.4	3.3	4.3	5.6
Note			-	-	Rated operational current at an operating frequency of 6 kHz and an ambient air temperature of +40 °C			
Motor current limit	I	A	0.3 - 6.6 adjustable	0.3 - 6.6 adjustable	0.48 - 4.8 adjustable	0.66 - 6.6 adjustable	0.86 - 8.6 adjustable	1.12 - 11.2 adjustable
Efficiency	η	%	-	-	0.95	0.95	0.96	0.96
Maximum leakage current to ground (PE) without motor	I_{PE}	mA	-	-	3.5	3.5	3.5	3.5
Fan			-	-	internal, temperature controlled optional RASP-FAN-S1 on heat sink, temperature-controlled			internal and on heat sink, temperature-controlled
Motor feeder								
Assigned motor rating								
Note			for normal internally and externally ventilated 4 pole, three-phase asynchronous motors with 1500 rpm^{-1} at 50 Hz or 1800 min^{-1} at 60 Hz					
at 400 V, 50 Hz	P	kW	0.09 - 3	0.09 - 3	-	-	-	-
Actuator for external motor brake								
Breaking voltage	U	V	230 V AC -15% / +10% 400 V AC -15% / +10%		230 V AC -15% / +10% 400 V AC -15% / +10%			
Braking current	I	A	≤ 0.6 A (max. 6 A for 120 ms)	≤ 0.6 A (max. 6 A for 120 ms)	≤ 0.6 A (max. 6 A for 120 ms)	≤ 0.6 A (max. 6 A for 120 ms)	≤ 0.6 A (max. 6 A for 120 ms)	≤ 0.6 A (max. 6 A for 120 ms)
Braking function								
Braking torque	%	I/I_e	-	-	≦ 30	≦ 30	≦ 30	≦ 30
Switch-on threshold for the braking transistor	U_{DC}	V	-	-	765 V DC	765 V DC	765 V DC	765 V DC
DC braking	%	I/I_e	-	-	≦ 100, adjustable			
Control section								
External control voltage	U_c	V	24 V DC - 15 % / + 20 % (optional, for actuators O3)		24 V DC - 15 % / + 20 % (for quick stop control via AS-Interface® plug)			
AS-Interface®			max. total power consumption from AS-Interface® power supply unit (30 V): 250 mA Specification: 7.4 Number of slave addresses: 31					

			Flat cable RA-C1-7X4HF	Distributor module RA-C1-AM-7
General				
Standards			IEC 60332-1 DIN VDE 0295 Class 6 DIN VDE 0281 Part 404	DIN/EN 60664-1 DIN/EN 60529 DIN/EN 60999 DIN VDE 0470 Part 1
Protection type			IP65 IEC/EN 60529	IP65 IEC/EN 60529
Mounting position			As required	As required
Ambient temperature				
Operation	ϑ	°C	-15 - +50	-15 - +40
Storage	ϑ	°C	-5 - +70	-5 - +50
Flame retardance, fire propagation			Self-extinguishing to IEC 60332-1	-
Resistance to oils and acids			To VDE 0473, Part 811-2-1	-
Sheathing			Material according to DIN VDE 0282, EVA mixture EM4, black	-
Minimum bending radius		mm	18	-
Cable weight		kg/km	440	-
Outer dimensions L x W x H		mm	L x 34.8 x 6.0	160 x 60.2 x 59.5
Overvoltage category			-	III
Pollution degree			-	3
Termination			-	Springloaded terminals 1.5 to 4 mm²
Outer cable diameter		mm	-	V-M25: 9 - 17 V-M20: 6 - 13
Main circuit				
Rated operational voltage	U_e		500 V AC	500 V AC
Rated operational current	I_e	A	25	25
Line protection		Type	PKZ2/ZM25-8 FAZ-3-B20 FAZ-3-C20	PKZ2/ZM25-8 FAZ-3-B20 FAZ-3-C20
Control circuit				
Rated operational voltage	U_e	V	24 V DC	24 V DC
Rated operational current	I_e	A	25	10

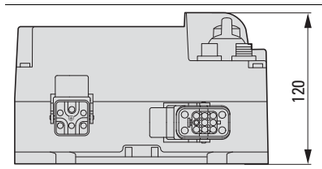
			Motor cable and motor feeder plug RAMO-CM1-2M0 /-5M0 /-10M0	Motor cable and motor feeder plug RASP-CM1-2M0 /-5M0
General				
Standards			EN 61684 DIN VDE 0110	EN 61684 DIN VDE 0110
Protection type			IP65 IEC/EN 60529	IP65 IEC/EN 60529
Ambient temperature				
Operation	ϑ	°C	-30 - +70	-30 - +70
Connection cable				
Terminal capacities		mm²	8 x 1.5	4 x 1.5 + 2 x (2 x 0.75) screened
Outer cable diameter		mm	9 - 13	9 - 13
Minimum bending radius		mm	6 x outer cable diameter	10 x outer cable diameter
Conductor material			-	-
Material			Outer casing halogen free Cable: Cu flexible to VDE 0295 Class 5	Outer casing halogen free Cable: Cu flexible to VDE 0295 Class 6
Colour			Silver grey (RAL 7001)	Orange (RAL 2003)
Resistance to oils and acids			VDE 0472 Part 803 B	VDE 0472 Part 803 A/B
Flame retardance, fire propagation			EN 50265-2-1	IEC 60332-2
Metal housing with plug-in connection				
Conductor cross-section		mm²	Contact pins: 8 x 1.5	Contact pins: 4 x 1.5 + 4 x 0.75
Material				
Contacts			Polycarbonate	Polycarbonate
Contact material			Cu silver-plated	Cu silver-plated
Housing			Polycarbonate	Polycarbonate
Locking facility			Polyamide	Polyamide

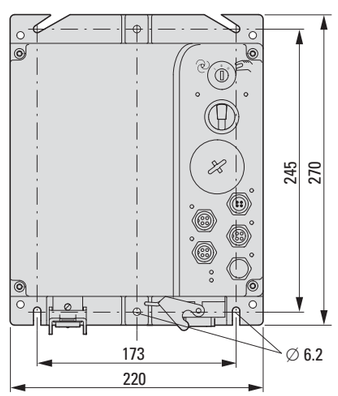
Distributor module RA-C1-VM-7	Flexible busbar junction 400 V AC/24 V DC RA-C1-PLF	Round cable junction RA-C2-S1-4	Round cable junction RA-C4-PB65
IEC/EN 60047-7-1 DIN VDE 0470 Part 1	IEC/EN 68000-2-27 IEC/EN 60998-3 DIN VDE 0660 Part 1535	EN 61684 DIN VDE 0110 DESINA	-
IP65 IEC/EN 60529	IP65 IEC/EN 60529	IP65 IEC/EN 60529	IP65 IEC/EN 60529
As required	As required	As required	As required
-15 - +50	-15 - +50	-15 - +50	-40 - +55
-5 - +50	-5 - +50	-5 - +50	-10 - +40
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
175 x 83 x 78	119 x 57.5 x H	158 x 112.5 x 55	181 x 104 x 67
III	III	III	III
3	3	3	3
Twin-level terminal block, 1.5 to 4 mm²	IDC termination	Piercing/screw terminals	Insulation piercing terminals
9 - 17	-	10 - 13 13 - 16	11 - 13 13 - 15 15 - 17
500 V AC	500 V AC	500 V AC	690 V AC
25	-	20/25 (2.5 mm²/4 mm²)	25 (4 mm²)
PKZ2/ZM25-8 FAZ-3-B20 FAZ-3-C20	PKZ2/ZM25-8 FAZ-3-B20 FAZ-3-C20	PKZ2/ZM25-8 FAZ-3-B20 FAZ-3-C20	PKZ2/ZM25-8 FAZ-3-B20 FAZ-3-C20
24 V DC	24 V DC	24 V DC	-
25	-	20/25 (2.5 mm²/4 mm²)	-

Dimensions

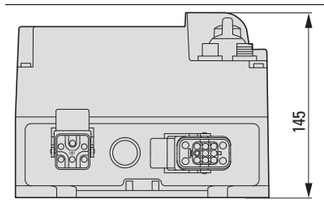
Motor starter RAMO

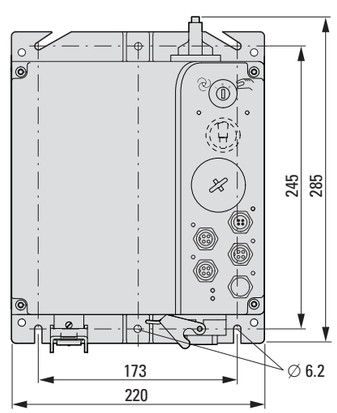
without manual override switch





with manual override switch

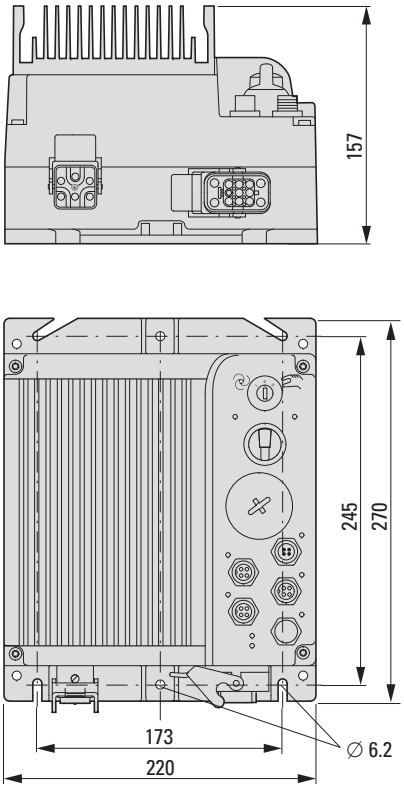




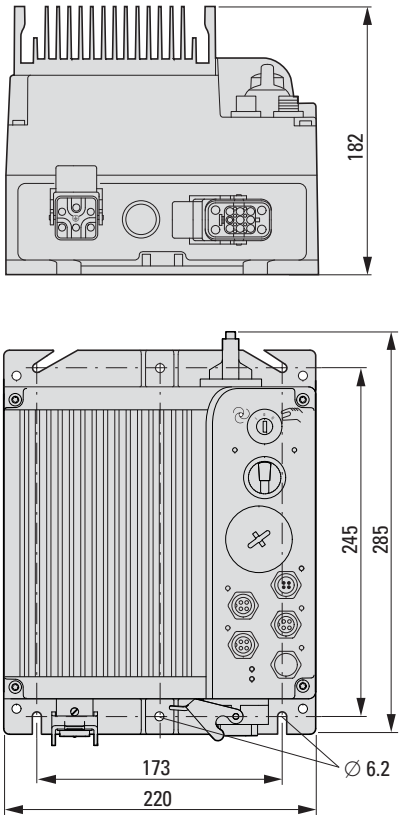
RASP speed controllers

without fan

without manual override switch

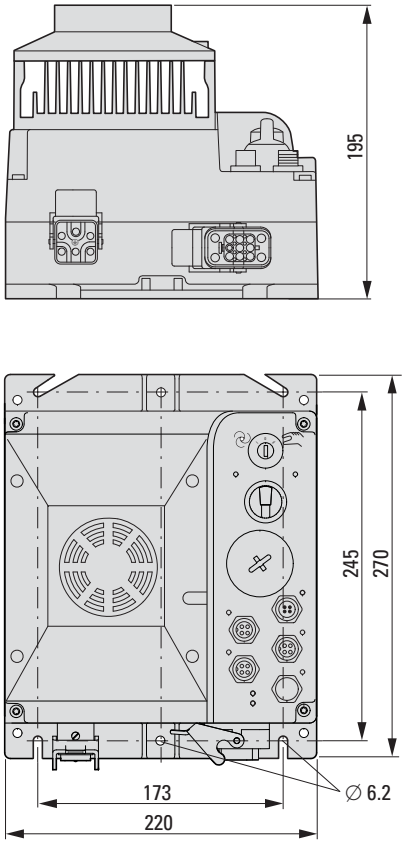


with manual override switch

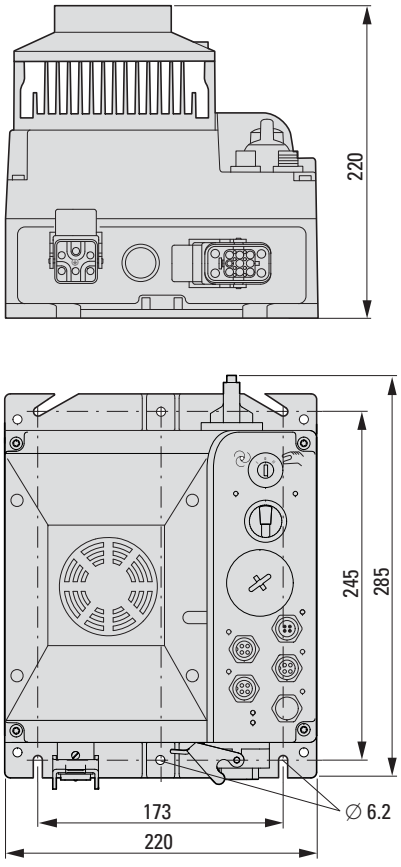


with fan

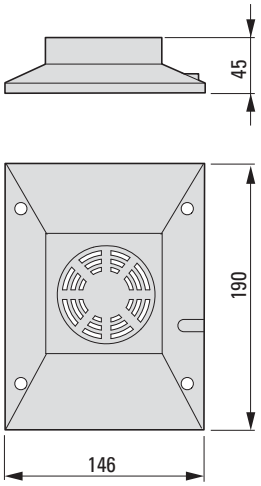
without manual override switch



with manual override switch



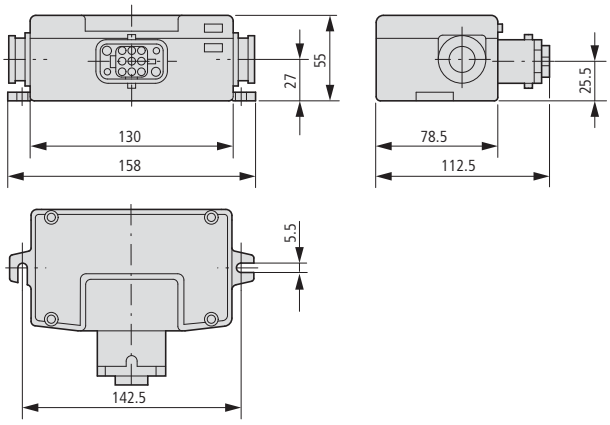
Device fans RASP-FAN-S1



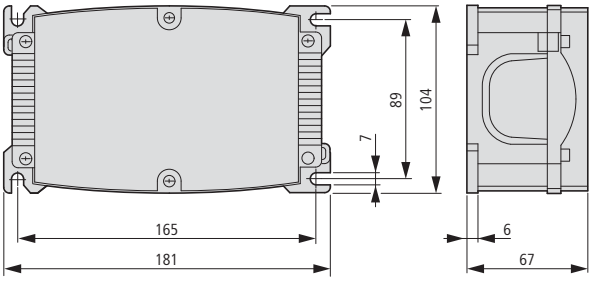
Accessories

Round cable junction

RA-C2-S1-4

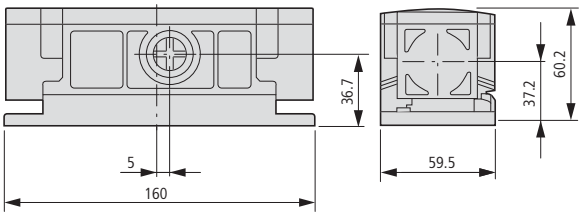


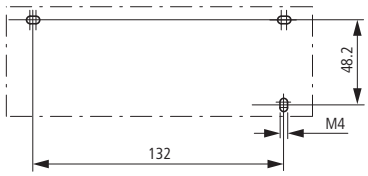
RA-C4-PB65



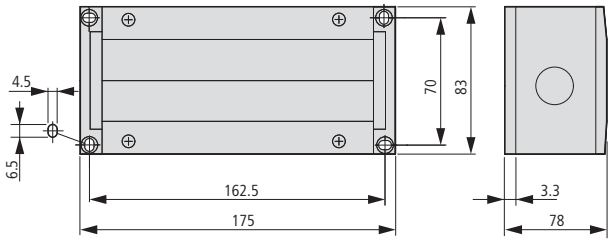
Distributor module

RA-C1-AM-7

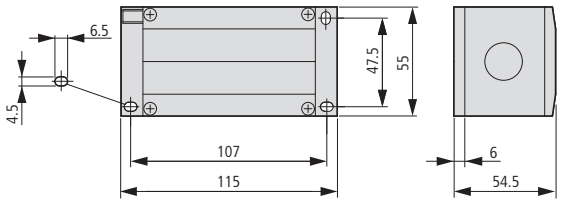




RA-C1-VM-7

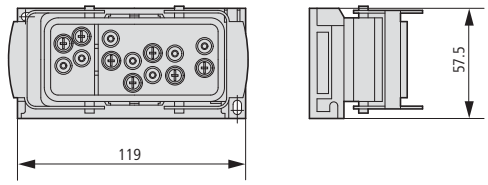


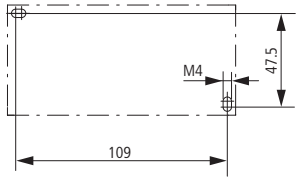
RA-C1-VP-AM-2



flexible busbar junction

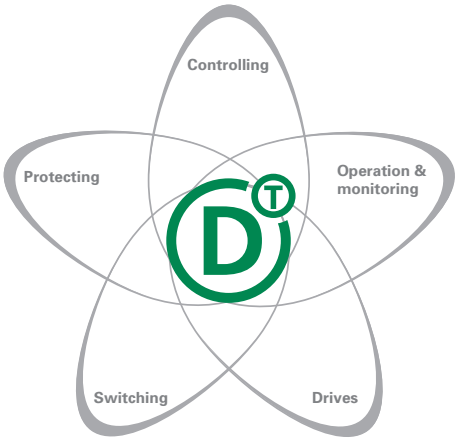
RA-C1-PLF
RA-C1-PLF1





Rapid Link

SmartWire-DT®.
Cost-optimized communication for switchgear

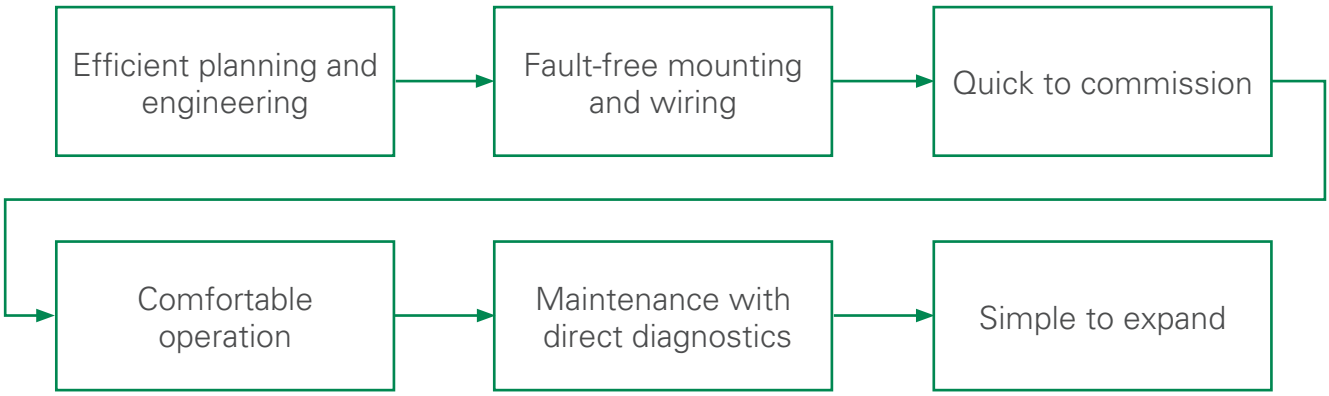


Manufacturers of machines and systems strive to achieve a balance between the maximum level of functionality and cost optimization. SmartWire-DT is a communication system for industrial switchgear based on the concept of continued development in the control panel and in the peripherals:
from control through to protection and switching, and extending to driving, operation and monitoring.
A technology that benefits you, both now, and in the future.

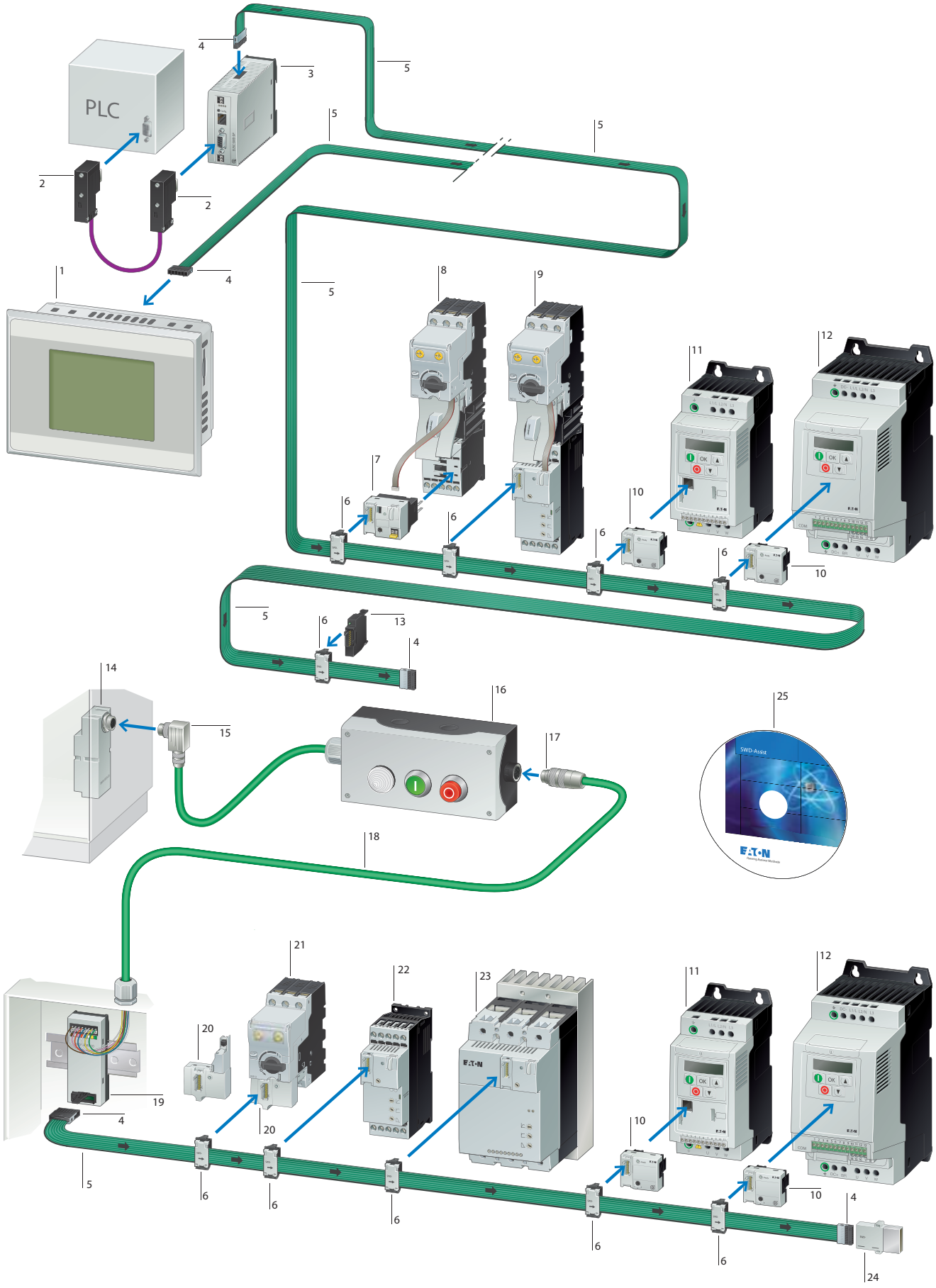
SmartWire-DT ®
The easy way to connect

SmartWire-DT: The easy way to connect.

SmartWire-DT reduces the wiring effort and expense with many switchgear systems by more than 60% and helps along the entire value-added chain – from the design to the construction, to the commissioning up to system expansion – in the reduction of costs. SmartWire-DT relies on the tried-and-tested Eaton Moeller industrial switchgear and grants intelligent communication features.



System overview



Note: You can find the entire SmartWire-DT range of products by consulting our Industrial Switchgear 2011 catalog or our online catalog at http://ecat.moeller.net

Features

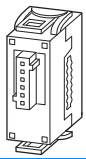
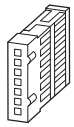
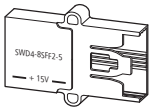
SmartWire-DT HMI-PLC
- with SmartWire-DT master interface and PLC function
- Compact design with light plastic enclosures
- Wide selection of onboard interfaces
- 3.5", 5.7" or 7" TFT-LCD screen

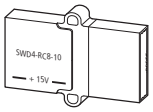
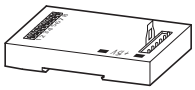
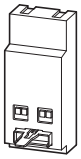
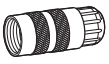
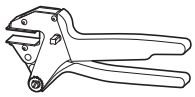
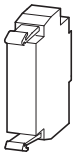
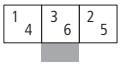
SmartWire-DT gateways
- Connection of SmartWire-DT to field bus.
- Field bus address setting with dip switches
- Automatic baud rate detection
- Feeding the supply voltage for the SmartWire-DT modules
- Supplies the control voltage for the motor starter or contactor
- Configuration button for automatic addressing of the SmartWire-DT slaves.
- Support of up to 99 SmartWire-DT slaves.

SmartWire-DT module
- Function element for connecting to RMQ-Titan pilot devices.
- Function element for connecting to DLM contactors
- Function element for connecting to PKZ/PKE motor-protective circuit-breakers
- Function module for connecting to NZM2,3,4 circuit-breakers
- Connection of digital and analog input/output modules
- Connection to soft starter DS7
- Function element for connecting to variable frequency drive

SmartWire-DT Assist (SWD-Assist)
- Easy creation of SmartWire-DT networks
- Integrated validity check
- Generation of ordering lists.
- Online-Functionality
  – Simple pre-commissioning
  – Configuration check and comparison
  – Display of parameters and diagnostics
  – easy diagnostics of SmartWire-DT slave
- Free download under: http://downloadcenter.moeller.net

Ordering

	Description	Baud Rates	Number of SmartWire-DT slaves	Part no. Article no.	Price see price list	Std. pack	Information relevant for export to North America	
SmartWire-DT gateways								
supply of the SmartWire-DT modules and switchgear								
	For connection to PROFIBUS-DP field bus field bus connection through 9-pin SUB-D socket Separate RS232 diagnostics interface (RJ45)	up to 12 MBit/s	Max. 58	**EU5C-SWD-DP** 116308		1 off	UL File No. UL CCN CSA File No. CSA Class No. NA Certification	E29184 NKCR 2324643 3211-07 UL listed, CSA certified
	For connection to CANopen® field bus Field bus connection through 9-pin SUB-D plug Separate RS232 diagnostics interface (RJ45)	up to 1 MBit/s	Max. 99	**EU5C-SWD-CAN** 116307				
	For connection to the Ethernet-IP/MODBUS-TCP field bus Field bus connection via Ethernet Switch Separate RS232 diagnostics interface (RJ45)	10/100 MBit/s	Max. 99	**EU5C-SWD-EIP-MODTCP** 153163				
	for connection to field bus PROFINET as PROFINET IO-Device Field bus connection via Ethernet Switch Separate USB diagnostics interface (Mini-USB)	100 MBit/s	Max. 99	**EU5C-SWD-PROFINET** 170124		1off	NA Certification	Request filed for UL and CSA
Flat band conductor, 8 pole								
For connecting the SmartWire-DT modules within the control panel 8 pole								
	not ready-assembled		Length 100 m	**SWD4-100LF8-24** 116026		1 off	UL File No. UL CCN CSA File No. CSA Class No. NA Certification	E29184 NKCR 2324643 3211-07 UL listed, CSA certified
	not ready-assembled		Length 3 m	**SWD4-3LF8-24-2S** 116027				
			Length 5 m	**SWD4-5LF8-24-2S** 116028				
			Length 10 m	**SWD4-10LF8-24-2S** 116029				
External device plugs								
	For connecting the ribbon cable to SmartWire-DT modules			**SWD4-8SF2-5** 116022		10 off	UL File No. UL CCN CSA File No. CSA Class No. NA Certification	E29184 NKCR 2324643 3211-07 UL listed, CSA certified
Link								
	For bridging open mounting locations for external device plugs Front fixing			**SWD4-SEL8-10** 116021		5 off	UL File No. UL CCN CSA File No. CSA Class No. NA Certification	E29184 NKCR 2324643 3211-07 UL listed, CSA certified
Blade terminal								
	For connecting the ribbon cable to the gateway, power feeder module, coupling, bus termination resistor			**SWD4-8MF2** 116023		10 off	UL File No. UL CCN CSA File No. CSA Class No. NA Certification	E29184 NKCR 2324643 3211-07 UL listed, CSA certified
Coupling								
	Coupling blade terminal 8-pole			**SWD4-8SFF2-5** 116024		1 off	UL File No. UL CCN CSA File No. CSA Class No. NA Certification	E29184 NKCR 2324643 3211-07 UL listed, CSA certified

	Description	Part no. Article no.	Price see price list	Std. pack	Information relevant for export to North America	
Network terminator						
	For connecting each SmartWire-DT line	**SWD4-RC8-10** 116020		1 off	UL File No. UL CCN CSA File No. CSA Class No. NA Certification	E29184 NKCR 2324643 3211-07 UL listed, CSA certified
Cable adapters						
	for connection flat cable (plug) on round cable (terminal)	**SWD4-8FRF-10** 121377		1 off	UL File No. UL CCN CSA File No. CSA Class No. NA Certification	E29184 NKCR 2324643 3211-07 UL listed, CSA certified
Switch cabinet bushing						
for transition from SmartWire-DT ribbon cable to round cable Connection of ribbon cable with blade terminal SWD4-8MF2 8 pole double conductor run pluggable Additional control voltage feeder for the motor starter and contactors.						
	Connection round cable via socket	**SWD4-SFL8-20** 121380		1 off	UL File No. UL CCN CSA File No. CSA Class No. NA Certification	E29184 NKCR 2324643 3211-07 UL listed, CSA certified
	Connection round cable via plug	**SWD4-SML8-20** 121381		1 off		
Round conductor						
For laying the SmartWire-DT network outside of the control panel.						
	For connecting the SmartWire-DT module outside the control panel 8 pole HK-S0-Li2YY, 8 mm diameter Length 50 m	**SWD4-50LR8-24** 116030		1 off	UL File No. UL CCN CSA File No. CSA Class No. NA Certification	E29184 NKCR 2324643 3211-07 UL listed, CSA certified
Connectors for SWD round conductors						
	8 pole socket Straight	**SWD4-SF8-67** 116033		1 off	UL File No. UL CCN CSA File No. CSA Class No. NA Certification	E29184 NKCR 2324643 3211-07 UL listed, CSA certified
	8-pinplug connector Straight	**SWD4-SM8-67** 116034				
	8 pole socket 90° angled	**SWD4-SF8-67W** 116035				
	8-pinplug connector 90° angled	**SWD4-SM8-67W** 116036				
Tools for plugs						
	Pliers for connecting external device plug and ribbon cable	**SWD4-CRP-1** 116025		1 off	UL/CSA certification not required	
	Pliers for making contacts with blade terminals and ribbon cables	**SWD4-CRP-2** 116699				
Universal slave						
for configured but not yet installed SmartWire-DT slaves Front mount						
	Configuration 	**M22-SWD-NOP** 147637		20 off	NA Certification	Request filed for UL and CSA

Technical data

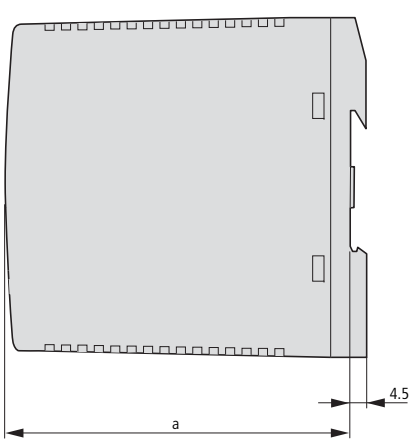
			EU5C-SWD-DP	EU5C-SWD-CAN	EU5C-SWD-EIP-MODTCP
General					
Standards			IEC/EN 61131-2 EN 50178		
Dimensions (W x H x D)		mm	35 x 90 x 127		35 x 90 x 124
Weight		kg	0.16	0.16	0.17
Mounting			Top-hat rail IEC/EN 60715, 35 mm		
Mounting position			As required		
Ambient conditions, mechanical					
Protection type (IEC/EN 60529, EN50178, VBG 4)			IP20	IP20	IP20
Vibrations (IEC/EN 61131-2:2008)					
Constant amplitude 3,5 mm		Hz	5 - 8.4	5 - 8.4	5 - 8.4
Constant acceleration 1 g		Hz	8.4 - 150	8.4 - 150	8.4 - 150
Mechanical shock resistance (IEC/EN 60068-2-27) semi-sinusoidal 15 g/11 ms		Impacts	9	9	9
Drop to IEC/EN 60068-2-31	Drop height	mm	50	50	50
Free fall, packaged (IEC/EN 60068-2-32)		m	0.3	0.3	0.3
Electromagnetic compatibility (EMC)					
Overvoltage category			II	II	II
Pollution degree			2	2	2
Electrostatic discharge (IEC/EN 61131-2:2008)					
Air discharge (Level 3)		kV	8	8	8
Contact discharge (Level 2)		kV	4	4	4
Electromagnetic fields (IEC/EN 61131-2:2008)					
80 - 1000 MHz		V/m	10	10	10
1.4 - 2 GHz		V/m	3	3	3
2 - 2.7 GHz		V/m	1	1	1
Radio interference suppression (SmartWire-DT)			EN 55011 Class A		
Burst (IEC/EN 61131-2:2008, Level 3)					
Supply cables		kV	2	2	2
CAN/DP bus cable		kV	1	1	1
SmartWire-DT cables		kV	1	1	1
Surge (IEC/EN 61131-2:2008, Level 1)					
Supply cables/CAN/DP bus cable			Supply cables 0.5 kV, CAN/DP bus cable 1 kV		
Radiated RFI (IEC/EN 61131-2:2008, Level 3)		V	10	10	10
Climatic environmental conditions					
Operating ambient temperature (IEC 60068-2)		°C	- 25 - + 55	- 25 - + 55	- 25 - + 55
Condensation			Take appropriate measures to prevent condensation		
Storage		°C	- 40 - + 70	- 40 - + 70	- 40 - + 70
relative humidity, non-condensing (IEC/EN 60068-2-30)		%	5 - 95	5 - 95	5 - 95
Supply voltage U_{Aux}					
Rated operational voltage		V	24 V DC (-15/+20%)		
Residual ripple on the input voltage		%	5	5	5
Protection against polarity reversal			Yes	Yes	Yes
Max. current	I_{max}	A	3	3	3
			If contactors with a total power consumption > 3 A are connected, a power feeder module EU5C-SWD-PF1/2 has to be used.		
Short-circuit rating			no, external fuse FAZ Z3		
Power loss		W	Normally 1	Normally 1	Normally 1
Potential isolation			No	No	No
Rated operating voltage of 24-V-DC slaves		V	typ. U_{Aux} - 0.2	typ. U_{Aux} - 0.2	typ. U_{Aux} - 0.2

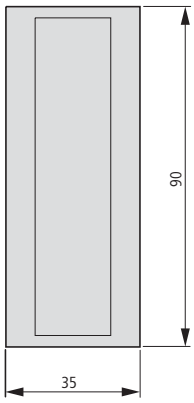
			EU5C-SWD-DP	EU5C-SWD-CAN	EU5C-SWD-EIP-MODTCP
Supply voltage U_{Pow}					
Supply voltage		V	24 DC -15 % + 20 %	24 DC -15 % + 20 %	24 DC -15 % + 20 %
Input voltage ripple		%	≦ 5	≦ 5	≦ 5
Siemens MPI, (optional)			yes	yes	yes
Rated current	I	A	0.7	0.7	0.7
Overload proof			yes	yes	yes
Inrush current and duration		A	12.5 A/6 ms	12.5 A/6 ms	12.5 A/6 ms
Heat dissipation at 24 V DC		W	3.8	3.8	3.8
Potential isolation between U_{Pow} and 15 V SmartWire-DT supply voltage			No	No	No
Bridging voltage dips		ms	10	10	10
Repetition rate		s	1	1	1
Status indication		LED	yes	yes	yes
SmartWire-DT supply voltage					
Rated operating voltage	U_e	V	14,5 ± 3 %	14,5 ± 3 %	14,5 ± 3 %
max. current	I_{max}	A	0.7	0.7	0.7
			If SmartWire-DT modules with a total power consumption > 0.7 A are connected, a power feeder module EU5C-SWD-PF2 has to be used.		
Short-circuit rating			Yes	Yes	Yes
Connection supply and inputs/outputs					
Connection type			Push in terminals		
Solid		mm^2	0.2 - 1.5	0.2 - 1.5	0.2 - 1.5
Flexible with ferrule		mm^2	0.25 - 1.5	0.25 - 1.5	0.25 - 1.5
UL/CSA solid or stranded		AWG	24 - 16	24 - 16	24 - 16
SmartWire-DT network					
Station type			SmartWire-DT master		
Number of SmartWire-DT slaves			58	99	99
Baud Rates		kBd	125 250	125 250	125 250
Address allocation			automatic	automatic	automatic
Status indication		LED	SmartWire-DT master LED: green Configurations LED: red		
Connection SmartWire-DT			Plug, 8-pole		
Plug connectors			Blade terminal SWD4-8MF2		
Fieldbus interface					
Function			PROFIBUS DP slave	CANopen® slave	Ethernet IP/MODBUS-TCP Slave
Protocol			PROFIBUS-DP	CANopen®	Ethernet IP/MODBUS-TCP
Input data, max.		Byte	240	128	Ethernet-IP: 546 MODBUS-TCP: 800
Output data, max.		Byte	240	128	Ethernet-IP: 496 MODBUS-TCP: 642
Baud Rates			up to 12 MBit/s	up to 1 MBit/s	10/100 MBit/s
Baud rates switching			automatic	automatic	automatic
Address			2 … 125	2 … 32	-
Address allocation			DIP switch	DIP switch	Dip switch/DHCP/ BOOTP Selection via DIP switch
Status display interface		LED	Two-coloured red/green	Two-coloured red/green	Link status: yellow (10 MBit), green (100 MBit) flashing
Terminating resistor			switchable via plug	DIP switches	-
Terminal type			1 x D-SUB socket, 9-pin	1 x D-SUB socket, 9-pin	2 x RJ45 (2-channel switch)
Potential isolation			Yes	Yes	Yes

Part no.			M22-SWD-NOP...	SWD4-RC8-10	SWD4-8SF2-5	SWD4-8SFF2-5	SWD4-8FRF-10	SWD4-SFL8-20	SWD4-SML8-20
General									
Standards			IEC/EN 61131-2 EN 50178	IEC/EN 61131-2 EN 50178	IEC/EN 61131-2 EN 50178	IEC/EN 61131-2 EN 50178	IEC/EN 61131-2 EN 50178	IEC/EN 61131-2 EN 50178	IEC/EN 61131-2 EN 50178
Dimensions (W x H x D)		mm	12 x 42 x 39	48.5 x 34.5 x 10	15 x 36.5 x 17.5	48.5 x 34.5 x 10	35 x 90 x 35	35 x 83 x 40	35 x 83 x 46
Weight		kg	-	-	-	-	-	-	-
Weight		g	10	10	5.5	4.5	42	50	50
Mounting position			As required	As required	As required	As required	As required	As required	As required
Ambient conditions, mechanical									
Protection type (IEC/EN 60529, EN50178, VBG 4)			IP20	IP20	IP20	IP20	IP20	IP67	IP67
Vibrations (IEC/EN 61131-2:2008)									
Constant amplitude 3,5 mm		Hz	5 - 8.4	5 - 8.4	5 - 8.4	5 - 8.4	5 - 8.4	5 - 8.4	5 - 8.4
Constant acceleration 1 g		Hz	8.4 - 150	8.4 - 150	8.4 - 150	8.4 - 150	8.4 - 150	8.4 - 150	8.4 - 150
Mechanical shock resistance (IEC/EN 60068-2-27) semi-sinusoidal 15 g/11 ms		Impacts	9	9	9	9	9	9	9
Drop to IEC/EN 60068-2-31	Drop height	mm	50	50	-	-	-	-	-
Free fall, packaged (IEC/EN 60068-2-32)		m	0.3	0.3	-	-	-	-	-
Electromagnetic compatibility (EMC)									
Overvoltage category			Not applicable	II	-	-	-	-	-
Pollution degree			2	2	-	-	-	-	-
Electrostatic discharge (IEC/EN 61131-2:2008)									
Air discharge (Level 3)		kV	8	8	-	8	8	8	8
Contact discharge (Level 2)		kV	4	4	-	4	4	4	4
Electromagnetic fields (IEC/EN 61131-2:2008)									
80 - 1000 MHz		V/m	10	10	-	-	-	10	10
1.4 - 2 GHz		V/m	3	3	-	-	-	3	3
2 - 2.7 GHz		V/m	1	1	-	-	-	1	1
Radio interference suppression (SmartWire-DT)			EN 55011 Class A	EN 55011 Class A	-	-	-	-	-
Burst (IEC/EN 61131-2:2008, Level 3)									
Supply cables		kV	2	-	-	-	-	-	-
SmartWire-DT cables		kV	1	1	-	-	-	-	-
Radiated RFI (IEC/EN 61131-2:2008, Level 3)		V	10	10	-	-	-	10	10
Climatic environmental conditions									
Operating ambient temperature (IEC 60068-2)		°C	- 30 - + 55	- 25 - + 55	- 25 - + 55	- 25 - + 55	- 25 - + 55	- 25 - + 55	- 25 - + 55
Condensation			Take appropriate measures to prevent condensation	Take appropriate measures to prevent condensation	Take appropriate measures to prevent condensation	Take appropriate measures to prevent condensation	Take appropriate measures to prevent condensation	Take appropriate measures to prevent condensation	Take appropriate measures to prevent condensation
Storage		°C	- 40 - 80	- 40 - 70	- 40 - 70	- 40 - 70	- 40 - 70	- 40 - 70	- 40 - 70
relative humidity, non-condensing (IEC/EN 60068-2-30)		%	5 - 95	5 - 95	5 - 95	5 - 95	5 - 95	5 - 95	5 - 95
SmartWire-DT network									
Station type			SmartWire-DT slave	-	-	-	-	-	-
Number			-	-	-	-	-	-	-
Baud rate setting			automatic	-	-	-	-	-	-
SmartWire-DT status LED		LED	Green	-	-	-	-	-	-
Connections			Plug, 8-pole	-	-	-	-	-	-
Plug connectors			SWD4-8SF2-5	-	-	-	-	-	-
Number of insertion cycles			≥ 50	-	-	-	-	-	-
Function element									
Contacts			-	-	-	-	-	-	-
Lifespan mechanical/electrical	Oper-ations		-	-	-	-	-	-	-
LED display		LED	No	-	-	-	-	-	-
Diagnostics			Yes	-	-	-	-	-	-
Fixing			Front fixing	-	-	-	-	-	-
Connection options									
SWD-In				Plug, 8-pole	Plug connector	Plug, 8-pole	Plug, 8-pole	Plug, 8-pole	Plug, 8-pole
Number of insertion cycles				≥ 200	≥ 1	≥ 200	≥ 200	≥ 200	≥ 500
SWD-Out				-	Socket, 8-pole	Plug, 8-pole	Push in terminals	Socket, 8-pole	Plug, 8-pole
Number of insertion cycles				-	≥ 200	≥ 200	-	≥ 500	≥ 200

Dimensions

SmartWire-DT Gateways

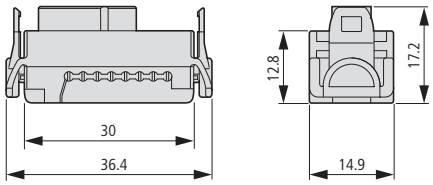




	a
EU5C-SWD-DP	122
EU5C-SWD-CAN	122
EU5C-SWD-EIP-MODTCP...	120
EU5C-SWD-PROFINET	120

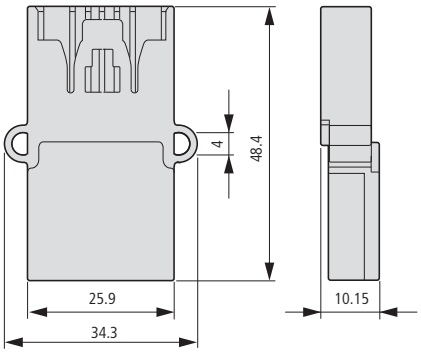
External device plugs

SWD4-8SF2-5



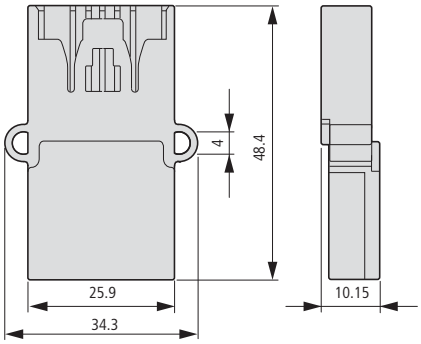
Network terminator

SWD4-RC8-10



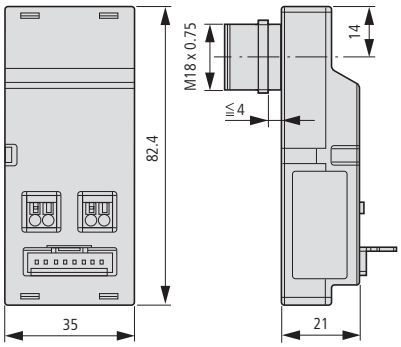
Coupling

SWD4-8SFF2-5



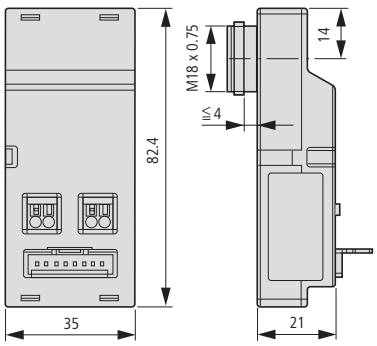
Switch cabinet bushing plug

SWD4-SM8-20



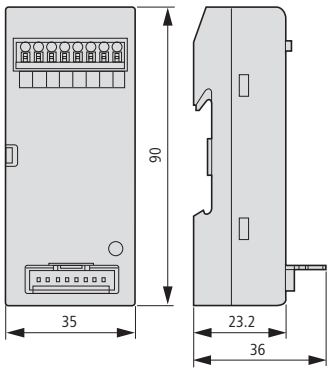
Switch cabinet bushing socket

SWD4-SFL8-20



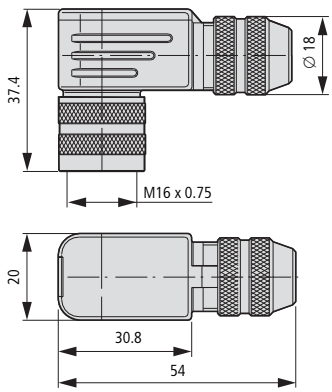
Adapter flat cable on round cable

SWD4-8FRF-10

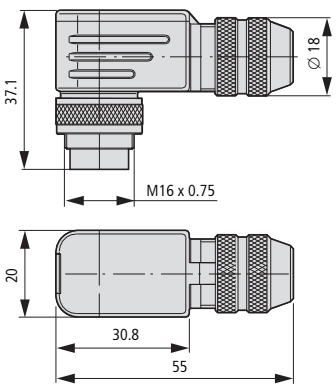


Connectors for SmartWire-DT round cables, angled

SWD4-SF8-67W

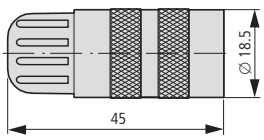


SWD4-SM8-67W

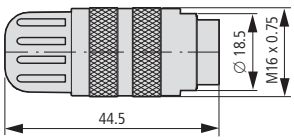


Plug connectors for SmartWire-DT round cables, flat

SWD4-SF8-67



SWD4-SM8-67

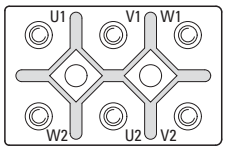


Drives egineering selection criteria

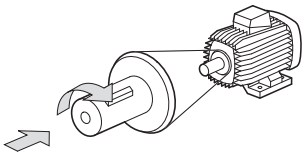
Each drive task requires a drive motor. The speed, torque and controllability of each motor must fulfill the requirements of the task. The following generally applies:
the application determines the drive.
The drive motor most frequently used worldwide in industrial plants and large buildings is the 3-phase asynchronous motor. Its robust and simple construction as well as its high degrees of protection and standard types are the main features of this inexpensive electric motor.

Motor connection

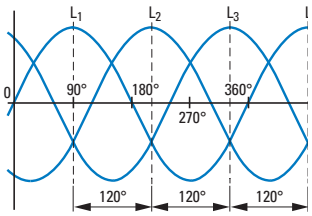
When connecting a 3-phase motor to the mains supply, the data on the rating plate of the motor must correspond to the mains voltage and frequency.
The standard connection is implemented via six screw terminals in the terminal box of the motor and with two types of circuit, the star connection and the delta circuit, depending on the mains voltage.



The rotation direction of a motor is always determined by directly looking at the drive shaft of the motor (from the drive end). On motors with two shaft ends, the driving end is denoted with D (= Drive), the non-driving end with N (= No drive).



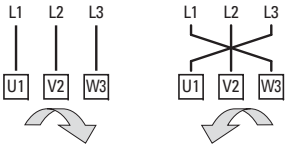
Regardless of the circuit type and the type of three-phase asynchronous motor, the connections must be labeled, so that their alphabetical sequence (e.g. U1, V1, W1) corresponds with the order of the mains voltage phase sequence (L1, L2, L3) and causes the motor to rotate clockwise.



On the three-phase asynchronous motor, three windings are arranged offset from each other by 120°/p (p = number of pole pairs). To generate a rotating field in the motor, an alternating voltage is applied to each phase in turn at a time delay of 120 °.

The effect of inductance causes the rotation field and torque to be formed in the rotor winding. The speed of the motor thus depends on the number of pole pairs and the frequency of the supply voltage. The operating direction can be reversed by swapping over two of the supply phases.

Clockwise (FWD) Anticlockwise operation (REV)

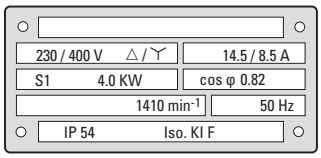


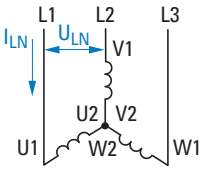
FWD = forward run (clockwise rotation field)
REV = reverse run (anticlockwise rotation field)

Information on the rating plate

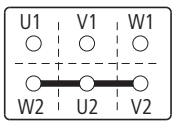
The electrical and mechanical rating data of the motor must be stated on its rating plate (IEC 34-1, VDE 0530). The data on the rating plate describes the stationary operation of the motor in the area of its operating point (MN, e.g. at 400 V and 50 Hz). The operational data is unstable in the motor start phase. The following examples show the rating plates for two motors with a motor shaft output of 4 kW and the respective connection circuits on a 3-phase AC network with 400 V and 50 Hz.

Star circuit



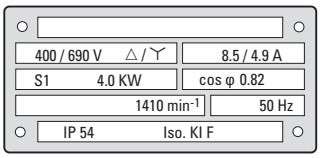


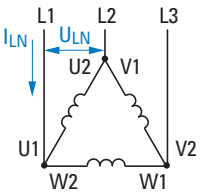
$$I_{LN} = \sqrt{3} \times U_{V\,LN} = I_W$$



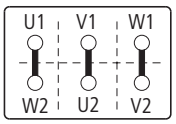
- With the specified 230/400 V voltage, this motor must be connected to the 3-phase system (U_{LN} = 400 V) in a star-connected circuit.
- The voltage of each motor winding is designed for 230 V. The windings must therefore be connected in sequence to the phase voltage (400 V).
- The three winding phases (W2-U2-V2) are configured in the terminal box to the so-called star point. The voltage of the individual phases to the star point is 230 V (= U_W).

Delta circuit





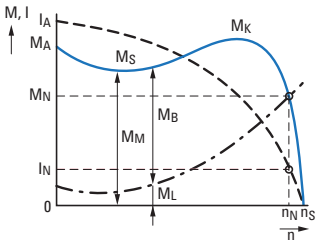
$$I_{LN} = U_{V\,LN} = \sqrt{3} \times I_W$$



- With the specified 400/690 V voltage, this motor must be connected to the 3-phase system (U_{LN} = 400 V) in a delta circuit.
- Each motor winding is designed here for the maximum phase voltage of 400 V and can be connected directly.
- The three winding phases (U1 – W2, V1 – U2, W1 – V2) are combined in the terminal box and connected directly to the individual phases.

Startup characteristics

The following figure shows the characteristic startup curves of a 3-phase asynchronous motor.



I_A: Starting current
I_N: Rated operational current at the operating point
M_A: Starting torque
M_B: Accelerating torque ($M_M > M_L$)
M_K: Breakdown torque
M_L: Load torque
M_M: Motor torque
M_N: Rated load torque, (stable operating point, intersection point of the 3-phase speed torque characteristic with the load characteristic)
M_S: Pull-up torque
n: Speed (actual value)
n_N: Rated speed at the operating point
n_S: Synchronous speed (n_S - n_N = slip speed s)

Synchronous speed:

$$n_s = \frac{f}{p}$$

Slip speed in %:

$$s = \frac{n_s - n}{n_s} \cdot 100\%$$

3-phase asynchronous motor speed:

$$n = \frac{f}{p} \cdot (1 - s)$$

f Frequency of voltage in Hz (= s^{-1})
n: Speed in r.p.m.
p Number of pole pairs
s: Slip speed in r.p.m.

Electric power:

$$P_1 = U \times I \times \sqrt{3} \times \cos\varphi$$

P_1: Electrical power in W
U: Rated operating voltage in V
I: Rated operational current in A
cos ?: Power factor

Motor output (power equation):

$$P_2 = \frac{M_N \times n}{9550}$$

P_2: Mechanical shaft output power in kW
M_N: Rated torque in Nm
n: Speed in r.p.m.

Efficiency:

$$\eta = \frac{P_2}{P_1}$$

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Worldwide export of machines and plants

European machine and system building and worldwide exports are closely related. Even if you don't export your machines at present, you should be prepared for it in the future. Eaton provides switchgear and protective devices with all the essential approvals and certificates for machine and system building. In most countries around the world, conformity with international standards is the sole requirement for successful exports. This is because components in these locations are governed by compliance with well known and established IEC standards. In this respect, the European CE mark is not only the passport for exports within Europe but also far beyond its borders.

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These product lines include those for

- Pilot devices, limit switches
- Contactors and various timing and special relays
- Motor-protective circuit-breakers and relays
- Electronic components and systems.

With circuit-breakers and switch-disconnectors, Eaton offers IEC devices for use in most countries in the world and NA devices with virtually the same dimensions and the same accessories for the North American market. This considerably simplifies device selection since the North American standards often involve the need for considerably different technical specifications.

Electrical engineering products and their applications are not harmonized internationally.

The greatest differences to the IEC world are in North America, i.e. the USA and Canada. For many newcomers to the export business, it is initially surprising to experience the very different approaches and solutions.

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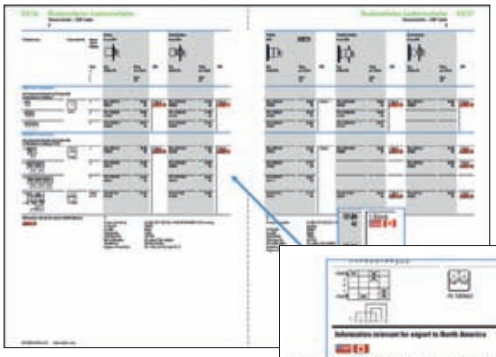
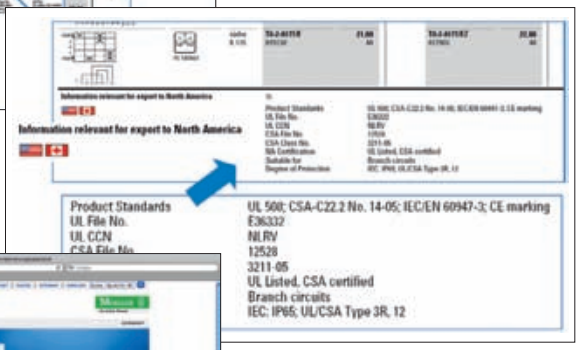
Qualified information is a critical key to success



The Eaton Main Catalogue for Moeller® series products provides reliable information for machine and panel builders on the approval of components deployed for North American market. Each selection page provides information such as the relevant product standard, the E-File Number, the Category Control Number or the CSA Class Number. Many customers incorporate this information in their parts lists in order to be well prepared for the acceptance procedures.



Up to 13 data items are listed here for each product, such as the suitability for use in feeders or branch circuits, the maximum operating voltage, or the North American degree of protection, such as UL / CSA Type 4X. The Main Catalogue also contains a glossary with explanations of the American terms.

The link http://www.moeller.net/eaton-approbationen/en/index.jsp shows the relevant approvals or permits for each component type. This therefore enables you to view the certificates provided or, depending on the test authority, also the product report. The information given is the same as what is provided in the databases of the authorities.

Anyone wishing to avoid unfortunate experiences, should make use beforehand of the large number of publications that Eaton is offering on the issue of exports to North America. They contain the implementation of the codes & standards and a description of different practices.

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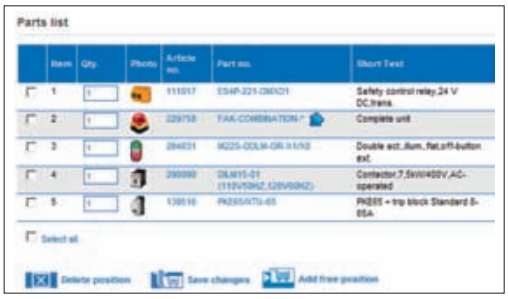
HTML data sheet; can be saved as PDF file.



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Full-load motor-running currents in amperes corresponding to various AC horsepower ratings

HP	110 - 120 V			220 - 240 V[a,b]			360 - 380 V		440 - 480 V			550 - 600 V		
	Single phase	Two phase	Three phase	Single phase	Two phase	Three phase	Single phase	Three phase	Single phase	Two phase	Three phase	Single phase	Two phase	Three phase
1/10	3.0	-	-	1.5	-	-	1.0	-	-	-	-	-	-	-
1/8	3.8	-	-	1.9	-	-	1.2	-	-	-	-	-	-	-
1/6	4.4	-	-	2.2	-	-	1.4	-	-	-	-	-	-	-
1/4	5.8	-	-	2.9	-	-	1.8	-	-	-	-	-	-	-
1/3	7.2	-	-	3.6	-	-	2.3	-	-	-	-	-	-	-
1/2	9.8	4.0	4.4	4.9	2.0	2.2	3.2	1.3	2.5	1.0	1.1	2.0	0.8	0.9
3/4	13.8	4.8	6.4	6.9	2.4	3.2	4.5	1.8	3.5	1.2	1.6	2.8	1.0	1.3
1	16.0	6.4	8.4	8.0	3.2	4.2	5.1	2.3	4.0	1.6	2.1	3.2	1.3	1.7
1-1/2	20.0	9.0	12.0	10.0	4.5	6.0	6.4	3.3	5.0	2.3	3.0	4.0	1.8	2.4
2	24.0	11.8	13.6	12.0	5.9	6.8	7.7	4.3	6.0	3.0	3.4	4.8	2.4	2.7
3	34.0	16.6	19.2	17.0	8.3	9.6	10.9	6.1	8.5	4.2	4.8	6.8	3.3	3.9
5	56.0	26.4	30.4	28.0	13.2	15.2	17.9	9.7	14.0	6.6	7.6	11.2	5.3	6.1
7-1/2	80.0	38.0	44.0	40.0	19.0	22.0	27.0	14.0	21.0	9.0	11.0	16.0	8.0	9.0
10	100	48.0	56.0	50.0	24.0	28.0	33.0	18.0	26.0	12.0	14.0	20.0	10.0	11.0
15	135	72.0	84.0	68.0	36.0	42.0	44.0	27.0	34.0	18.0	21.0	27.0	14.0	17.0
20	-	94.0	108	88.0	47.0	54.0	56.0	34.0	44.0	23.0	27.0	35.0	19.0	22.0
25	-	118	136	110	59.0	68.0	70.0	44.0	55.0	29.0	34.0	44.0	24.0	27.0
30	-	138	160	136	69.0	80.0	87.0	51.0	68.0	35.0	40.0	54.0	28.0	32.0
40	-	180	208	176	90.0	104	112	66.0	88.0	45.0	52.0	70.0	36.0	41.0
50	-	226	260	216	113	130	139	83.0	108	56.0	65.0	86.0	45.0	52.0
60	-	-	-	-	133	154	-	103	-	67.0	77.0	-	53.0	62.0
75	-	-	-	-	166	192	-	128	-	83.0	96.0	-	66.0	77.0
100	-	-	-	-	218	248	-	165	-	109	124	-	87.0	99.0
125	-	-	-	-	-	312	-	208	-	135	156	-	108	125
150	-	-	-	-	-	360	-	240	-	156	180	-	125	144
200	-	-	-	-	-	480	-	320	-	208	240	-	167	192
250	-	-	-	-	-	602	-	403	-	-	302	-	-	242
300	-	-	-	-	-	-	-	482	-	-	361	-	-	289
350	-	-	-	-	-	-	-	560	-	-	414	-	-	336
400	-	-	-	-	-	-	-	636	-	-	477	-	-	382
500	-	-	-	-	-	-	-	786	-	-	590	-	-	472

[a)]To obtain full-load currents for 200 and 208 V motors, increase corresponding 220 - 240 V ratings by 15 and 10 percent, respectively.
[b)]To obtain full-load currents for 265 and 277 V motors, decrease corresponding 220 - 240 V ratings by 13 and 17 percent, respectively.

Quote from "Power Conversion Equipment - UL 508C, May 3, 2002".
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Minimum fuse sizes for short-circuit protection of three-phase motors
The maximum value depends on the switching device or the overload relay.

Motor power			230 V			400 V			440 V			500 V			690 V		
			Motor rated operational current	Fuse Starting		Motor rated operational current	Fuse Starting		Motor rated operational current	Fuse Starting		Motor rated operational current	Fuse Starting		Motor rated operational current	Fuse Starting	
				DOL	Y/Δ		DOL	Y/Δ		DOL	Y/Δ		DOL	Y/Δ		DOL	Y/Δ
kWh	p.f.	η (%)	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
0.06	0.7	58	0.37	2	–	0.21	2	–	0.19	2	–	0.17	2	–	0.12	2	–
0.09	0.7	60	0.54	2	–	0.31	2	–	0.28	2	–	0.25	2	–	0.18	2	–
0.12	0.7	60	0.72	4	2	0.41	2	–	0.37	2	–	0.33	2	–	0.24	2	–
0.18	0.7	62	1.04	4	2	0.6	2	–	0.54	2	–	0.48	2	–	0.35	2	–
0.25	0.7	62	1.4	4	2	0.8	4	2	0.76	2	–	0.7	2	–	0.5	2	–
0.37	0.72	66	2	6	4	1.1	4	2	1	4	2	0.9	2	2	0.7	2	–
0.55	0.75	69	2.7	10	4	1.5	4	2	1.4	4	2	1.2	4	2	0.9	4	2
0.75	0.79	74	3.2	10	4	1.9	6	4	1.7	4	2	1.5	4	2	1.1	4	2
1.1	0.81	74	4.6	10	6	2.6	6	4	2.4	4	2	2.1	6	4	1.5	4	2
1.5	0.81	74	6.3	16	10	3.6	6	4	3.3	6	4	2.9	6	4	2.1	6	4
2.2	0.81	78	8.7	20	10	5	10	6	4.6	10	6	4	10	4	2.9	10	4
3	0.82	80	11.5	25	16	6.6	16	10	6	16	10	5.3	16	6	3.8	10	4
4	0.82	83	14.8	32	16	8.5	20	10	7.7	16	10	6.8	16	10	4.9	16	6
5.5	0.82	86	19.6	32	25	11.3	25	16	10.2	20	10	9	20	16	6.5	16	10
7.5	0.82	87	26.4	50	32	15.2	32	16	13.8	25	16	12.1	25	16	8.8	20	10
11	0.84	87	38	80	40	21.7	40	25	19.8	32	25	17.4	32	20	12.6	25	16
15	0.84	88	51	100	63	29.3	63	32	26.6	50	32	23.4	50	25	17	32	20
18.5	0.84	88	63	125	80	36	63	40	32.8	63	32	28.9	50	32	20.9	32	25
22	0.84	92	71	125	80	41	80	50	37	80	40	33	63	32	23.8	50	25
30	0.85	92	96	200	100	55	100	63	50	100	63	44	80	50	32	63	32
37	0.86	92	117	200	125	68	125	80	61	125	80	54	100	63	39	80	50
45	0.86	93	141	250	160	81	160	100	74	125	100	65	125	80	47	80	63
55	0.86	93	173	250	200	99	200	125	90	125	100	79	160	80	58	100	63
75	0.86	94	233	315	250	134	200	160	122	160	125	107	200	125	78	160	100
90	0.86	94	279	400	315	161	250	200	146	200	160	129	200	160	93	160	100
110	0.86	94	342	500	400	196	315	200	179	250	200	157	250	160	114	200	125
132	0.87	95	401	630	500	231	400	250	210	315	250	184	250	200	134	250	160
160	0.87	95	486	630	630	279	400	315	254	400	250	224	315	250	162	250	200
200	0.87	95	607	800	630	349	500	400	318	400	315	279	400	315	202	315	250
250	0.87	95	–	–	–	437	630	500	397	630	400	349	500	400	253	400	315
315	0.87	96	–	–	–	544	800	630	495	630	630	436	630	500	316	500	400
400	0.88	96	–	–	–	683	1000	800	621	800	800	547	800	630	396	630	400
450	0.88	96	–	–	–	769	1000	800	699	800	800	615	800	630	446	630	630
500	0.88	97	–	–	–	–	–	–	–	–	–	–	–	–	491	630	630
560	0.88	97	–	–	–	–	–	–	–	–	–	–	–	–	550	800	630
630	0.88	97	–	–	–	–	–	–	–	–	–	–	–	–	618	800	630

Instructions

The rated motor currents apply to normal internally and surface-cooled three-phase motors with 1500 rpm.

DOL starting: Starting current max. 6 × rated motor current.
Starting time max. 5 s.

Y/Δ-start: Starting current max. 2 × motor rated current.
Starting time max. 15 s.
Set overload relay in line to 0.58 × motor rated current.

Fuse ratings at Y/Δ starting apply also to three-phase slipring motors.
For higher rated currents, starting currents and/or longer starting times, larger fuses will be required. Table applies for time delay and gL fuses (VDE 0636)

For LV h.b.c. fuse with aM characteristics the fuse should be equal to the rated operational current.

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