



Variable frequency drive, 400 V AC, 3-phase, 9.5 A, 4 kW, IP66/NEMA 4X, Brake chopper, FS2



**Part no.** DC1-349D5NB-A66CE1  
**Catalog No.** 185734  
**Alternate Catalog No.** DC1-349D5NB-A66CE1

## Delivery program

Product range			Variable frequency drives
Part group reference (e.g. DIL)			DC1
Rated operational voltage	$U_e$		400 V AC, 3-phase 480 V AC, 3-phase
Output voltage with $V_e$	$U_2$		400 V AC, 3-phase 480 V AC, 3-phase
Mains voltage (50/60Hz)	$U_{LN}$	V	380 (-10%) - 480 (+10%)
<b>Rated operational current</b>			
At 150% overload	$I_e$	A	9.5
Note			Rated operational current at an operating frequency of 6 kHz and an ambient air temperature of +40 °C
<b>Assigned motor rating</b>			
Note			for normal internally and externally ventilated 4 pole, three-phase asynchronous motors with 1500 rpm <sup>-1</sup> at 50 Hz or 1800 min <sup>-1</sup> at 60 Hz
Note			Overload cycle for 60 s every 600 s
Note			at 400 V, 50 Hz
150 % Overload	P	kW	4
150 % Overload	$I_M$	A	8.5
Note			at 440 - 480 V, 60 Hz
150 % Overload	P	HP	5
150 % Overload	$I_M$	A	7.6
Degree of Protection			IP66/NEMA 4X
Interface/field bus (built-in)			OP-Bus (RS485)/Modbus RTU, CANopen®
Fieldbus connection (optional)			SmartWire-DT
Fitted with			Brake chopper 7-digital display assembly Additional PCB protection
Frame size			FS2
Connection to SmartWire-DT			no

## Technical data

### General

Standards			Specification for general requirements: IEC/EN 61800-2 EMC requirements: IEC/EN 61800-3 Safety requirements: IEC/EN 61800-5-1
Certifications			CE, UL, cUL, RCM, Ukr SEPRO, EAC
Production quality			RoHS, ISO 9001
Climatic proofing	$\rho_w$	%	< 95%, average relative humidity (RH), non-condensing, non-corrosive
Air quality			3C3, 3S3
Ambient temperature			
Operating ambient temperature min.		°C	-10
Operating ambient temperature max.		°C	+ 40
			operation (with 150 % overload)
Storage	$\theta$	°C	-40 - +60
Mounting position			Vertical
Altitude		m	0 - 1000 m above sea level Above 1000 m: 1% derating for every 100 m max. 4000 m
Degree of Protection			IP66/NEMA 4X

Protection against direct contact			BGV A3 (VBG4, finger- and back-of-hand proof)
<b>Main circuit</b>			
<b>Supply</b>			
Rated operational voltage	$U_e$		400 V AC, 3-phase 480 V AC, 3-phase
Mains voltage (50/60Hz)	$U_{LN}$	V	380 (-10%) - 480 (+10%)
Input current (150% overload)	$I_{LN}$	A	11.5
System configuration			AC supply systems with earthed center point
Supply frequency	$f_{LN}$	Hz	50/60
Frequency range	$f_{LN}$	Hz	48 - 62
Mains switch-on frequency			Maximum of one time every 30 seconds
<b>Power section</b>			
Function			Variable frequency drive with internal DC link and IGBT inverter
Overload current (150% overload)	$I_L$	A	14.25
max. starting current (High Overload)	$I_H$	%	175
Note about max. starting current			for 2,5 seconds every 600 seconds
Output voltage with $V_e$	$U_2$		400 V AC, 3-phase 480 V AC, 3-phase
Output Frequency	$f_2$	Hz	0 - 50/60 (max. 500)
Switching frequency	$f_{PWM}$	kHz	8 adjustable 4 - 32 (audible)
Operation Mode			U/f control Speed control with slip compensation sensorless vector control (SLV) PM motors Synchronous reluctance motors BLDC motors
Frequency resolution (setpoint value)	$\Delta f$	Hz	0.1
<b>Rated operational current</b>			
At 150% overload	$I_e$	A	9.5
Note			Rated operational current at an operating frequency of 6 kHz and an ambient air temperature of +40 °C
<b>Power loss</b>			
Heat dissipation at rated operational current $I_e = 150\%$	$P_V$	W	136
Efficiency	$\eta$	%	96.6
Maximum leakage current to ground (PE) without motor	$I_{PE}$	mA	12.6
Fitted with			Brake chopper 7-digital display assembly Additional PCB protection
Frame size			FS2
<b>Motor feeder</b>			
Note			for normal internally and externally ventilated 4 pole, three-phase asynchronous motors with $1500 \text{ rpm}^{-1}$ at 50 Hz or $1800 \text{ min}^{-1}$ at 60 Hz
Note			Overload cycle for 60 s every 600 s
Note			at 400 V, 50 Hz
150 % Overload	P	kW	4
Note			at 440 - 480 V, 60 Hz
150 % Overload	P	HP	5
maximum permissible cable length	l	m	screened: 100 screened, with motor choke: 200 unscreened: 150 unscreened, with motor choke: 300
<b>Apparent power</b>			
Apparent power at rated operation 400 V	S	kVA	6.58
Apparent power at rated operation 480 V	S	kVA	7.9
<b>Braking function</b>			
Standard braking torque			max. 30 % MN
DC braking torque			max. 100% of rated operational current $I_e$ , variable
Braking torque with external braking resistance			Max. 100% of rated operational current $I_e$ with external braking resistor
minimum external braking resistance	$R_{min}$	$\Omega$	120

Switch-on threshold for the braking transistor	U <sub>DC</sub>	V	780 V DC
<b>Control section</b>			
Reference voltage	U <sub>s</sub>	V	10 V DC (max. 10 mA)
Analog inputs			2, parameterizable, 0 - 10 V DC, 0/4 - 20 mA
Analog outputs			1, parameterizable, 0 - 10 V
Digital inputs			4, parameterizable, max. 30 V DC
Digital outputs			1, parameterizable, 24 V DC
Relay outputs			1, parameterizable, N/O, 6 A (250 V, AC-1) / 5 A (30 V, DC-1)
Interface/field bus (built-in)			OP-Bus (RS485)/Modbus RTU, CANopen®

### Assigned switching and protective elements

<b>Power Wiring</b>			
Safety device (fuse or miniature circuit-breaker)			
IEC (Type B, gG), 150 %			FAZ-B16/3
UL (Class CC or J)		A	15
Mains contactor			
150 % overload (CT/I <sub>H</sub> , at 50 °C)			DILM7 DILEM-10
Main choke			
150 % overload (CT/I <sub>H</sub> , at 50 °C)			DX-LN3-016
Radio interference suppression filter (external, 150 %)			DX-EMC34-016
<b>DC link connection</b>			
Braking resistance			
10 % duty factor (DF)			DX-BR100-0K8
20 % duty factor (DF)			DX-BR100-1K6
40 % duty factor (DF)			DX-BR100-6K2
<b>Motor feeder</b>			
motor choke			
150 % overload (CT/I <sub>H</sub> , at 50 °C)			DX-LM3-011
Sine filter			
150 % overload (CT/I <sub>H</sub> , at 50 °C)			DX-SIN3-010

### Design verification as per IEC/EN 61439

<b>Technical data for design verification</b>			
Rated operational current for specified heat dissipation	I <sub>n</sub>	A	9.5
Heat dissipation per pole, current-dependent	P <sub>vid</sub>	W	0
Equipment heat dissipation, current-dependent	P <sub>vid</sub>	W	136
Static heat dissipation, non-current-dependent	P <sub>vs</sub>	W	0
Heat dissipation capacity	P <sub>diss</sub>	W	0
Operating ambient temperature min.		°C	-10
Operating ambient temperature max.		°C	40
			Operation (with 150 % overload)
<b>IEC/EN 61439 design verification</b>			
<b>10.2 Strength of materials and parts</b>			
10.2.2 Corrosion resistance			Meets the product standard's requirements.
10.2.3.1 Verification of thermal stability of enclosures			Meets the product standard's requirements.
10.2.3.2 Verification of resistance of insulating materials to normal heat			Meets the product standard's requirements.
10.2.3.3 Verification of resistance of insulating materials to abnormal heat and fire due to internal electric effects			Meets the product standard's requirements.
10.2.4 Resistance to ultra-violet (UV) radiation			Meets the product standard's requirements.
10.2.5 Lifting			Does not apply, since the entire switchgear needs to be evaluated.
10.2.6 Mechanical impact			Does not apply, since the entire switchgear needs to be evaluated.
10.2.7 Inscriptions			Meets the product standard's requirements.
10.3 Degree of protection of ASSEMBLIES			Does not apply, since the entire switchgear needs to be evaluated.
10.4 Clearances and creepage distances			Meets the product standard's requirements.
10.5 Protection against electric shock			Does not apply, since the entire switchgear needs to be evaluated.
10.6 Incorporation of switching devices and components			Does not apply, since the entire switchgear needs to be evaluated.

10.7 Internal electrical circuits and connections		Is the panel builder's responsibility.
10.8 Connections for external conductors		Is the panel builder's responsibility.
10.9 Insulation properties		
10.9.2 Power-frequency electric strength		Is the panel builder's responsibility.
10.9.3 Impulse withstand voltage		Is the panel builder's responsibility.
10.9.4 Testing of enclosures made of insulating material		Is the panel builder's responsibility.
10.10 Temperature rise		The panel builder is responsible for the temperature rise calculation. Eaton will provide heat dissipation data for the devices.
10.11 Short-circuit rating		Is the panel builder's responsibility. The specifications for the switchgear must be observed.
10.12 Electromagnetic compatibility		Is the panel builder's responsibility. The specifications for the switchgear must be observed.
10.13 Mechanical function		The device meets the requirements, provided the information in the instruction leaflet (IL) is observed.

## Technical data ETIM 7.0

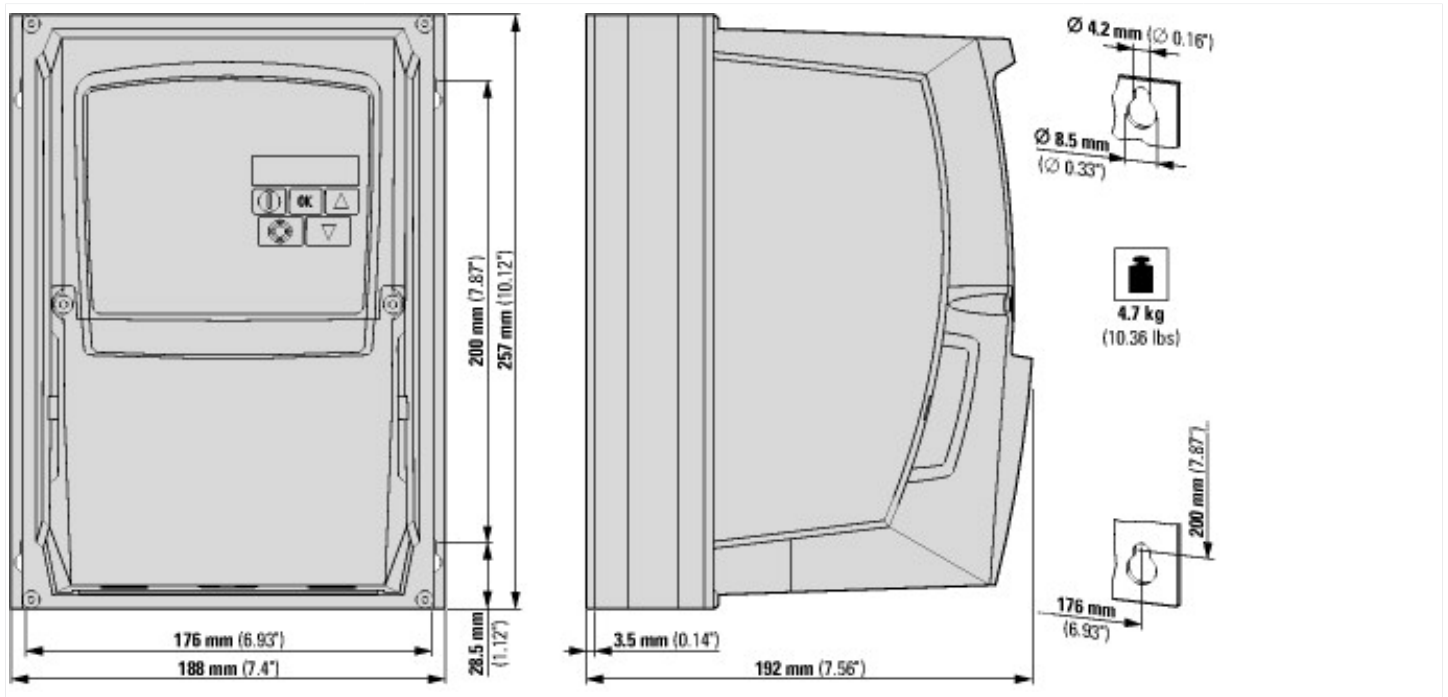
Low-voltage industrial components (EG000017) / Frequency converter $\leq$ 1 kV (EC001857)		
Electric engineering, automation, process control engineering / Electrical drive / Static frequency converter / Static frequency converter = < 1 kV (ec@ss10.0.1-27-02-31-01 [AKE177014])		
Mains voltage	V	380 - 480
Mains frequency		50/60 Hz
Number of phases input		3
Number of phases output		3
Max. output frequency	Hz	500
Max. output voltage	V	500
Nominal output current I <sub>2N</sub>	A	9.5
Max. output at quadratic load at rated output voltage	kW	4
Max. output at linear load at rated output voltage	kW	4
Relative symmetric net frequency tolerance	%	10
Relative symmetric net voltage tolerance	%	10
Number of analogue outputs		1
Number of analogue inputs		2
Number of digital outputs		1
Number of digital inputs		4
With control unit		Yes
Application in industrial area permitted		Yes
Application in domestic- and commercial area permitted		Yes
Supporting protocol for TCP/IP		No
Supporting protocol for PROFIBUS		No
Supporting protocol for CAN		Yes
Supporting protocol for INTERBUS		No
Supporting protocol for ASI		No
Supporting protocol for KNX		No
Supporting protocol for MODBUS		Yes
Supporting protocol for Data-Highway		No
Supporting protocol for DeviceNet		No
Supporting protocol for SUCONET		No
Supporting protocol for LON		No
Supporting protocol for PROFINET IO		No
Supporting protocol for PROFINET CBA		No
Supporting protocol for SERCOS		No
Supporting protocol for Foundation Fieldbus		No
Supporting protocol for EtherNet/IP		Yes
Supporting protocol for AS-Interface Safety at Work		No
Supporting protocol for DeviceNet Safety		No
Supporting protocol for INTERBUS-Safety		No
Supporting protocol for PROFIsafe		No
Supporting protocol for SafetyBUS p		No

Supporting protocol for BACnet		No
Supporting protocol for other bus systems		Yes
Number of HW-interfaces industrial Ethernet		0
Number of interfaces PROFINET		0
Number of HW-interfaces RS-232		0
Number of HW-interfaces RS-422		0
Number of HW-interfaces RS-485		1
Number of HW-interfaces serial TTY		0
Number of HW-interfaces USB		0
Number of HW-interfaces parallel		0
Number of HW-interfaces other		0
With optical interface		No
With PC connection		Yes
Integrated breaking resistance		Yes
4-quadrant operation possible		No
Type of converter		U converter
Degree of protection (IP)		IP66
Degree of protection (NEMA)		4X
Height	mm	257
Width	mm	188
Depth	mm	192

## Approvals

Product Standards		UL 508C; CSA-C22.2 No. 14; IEC/EN61800-3; IEC/EN61800-5; CE marking
UL File No.		E172143
UL Category Control No.		NMMS, NMMS7
CSA File No.		UL report applies to both US and Canada
North America Certification		UL listed, certified by UL for use in Canada
Specially designed for North America		No
Suitable for		Branch circuits
Max. Voltage Rating		3~ 480 V AC IEC: TN-S UL/CSA: "Y" (Solidly Grounded Wey)
Degree of Protection		IEC: IP66

## Dimensions



## Additional product information (links)

IL04020013Z DC1 variable frequency drive (FS1 - FS3, IP66)

IL04020013Z DC1 variable frequency drive (FS1 - FS3, IP66)	<a href="ftp://ftp.moeller.net/DOCUMENTATION/AWA_INSTRUCTIONS/IL04020013Z2019_08.pdf">ftp://ftp.moeller.net/DOCUMENTATION/AWA_INSTRUCTIONS/IL04020013Z2019_08.pdf</a>
<b>MN040023 DC1...E1 Installation manual</b>	
MN040023 DC1...E1 Installationshandbuch - Deutsch	<a href="ftp://ftp.moeller.net/DOCUMENTATION/AWB_MANUALS/MN040023_DE.pdf">ftp://ftp.moeller.net/DOCUMENTATION/AWB_MANUALS/MN040023_DE.pdf</a>
MN040023 DC1...E1 Installation manual - English	<a href="ftp://ftp.moeller.net/DOCUMENTATION/AWB_MANUALS/MN040023_EN.pdf">ftp://ftp.moeller.net/DOCUMENTATION/AWB_MANUALS/MN040023_EN.pdf</a>
MN040023 DC1...E1 manuale Installazione - italiano	<a href="ftp://ftp.moeller.net/DOCUMENTATION/AWB_MANUALS/MN040023_IT.pdf">ftp://ftp.moeller.net/DOCUMENTATION/AWB_MANUALS/MN040023_IT.pdf</a>
MN040023 DC1...E1 podręcznik instalacji - polski	<a href="ftp://ftp.moeller.net/DOCUMENTATION/AWB_MANUALS/MN040023_PL.pdf">ftp://ftp.moeller.net/DOCUMENTATION/AWB_MANUALS/MN040023_PL.pdf</a>
<b>MN040022 DC1...E1, Parameters manual</b>	
MN040022 DC1...E1, Parameterhandbuch - Deutsch	<a href="ftp://ftp.moeller.net/DOCUMENTATION/AWB_MANUALS/MN040022_DE.pdf">ftp://ftp.moeller.net/DOCUMENTATION/AWB_MANUALS/MN040022_DE.pdf</a>
MN040022 DC1...E1, Parameters manual - English	<a href="ftp://ftp.moeller.net/DOCUMENTATION/AWB_MANUALS/MN040022_EN.pdf">ftp://ftp.moeller.net/DOCUMENTATION/AWB_MANUALS/MN040022_EN.pdf</a>
MN040022 DC1...E1, manuale Parametri - italiano	<a href="ftp://ftp.moeller.net/DOCUMENTATION/AWB_MANUALS/MN040022_IT.pdf">ftp://ftp.moeller.net/DOCUMENTATION/AWB_MANUALS/MN040022_IT.pdf</a>
MN040022 DC1...E1, podręcznik parametrów - polski	<a href="ftp://ftp.moeller.net/DOCUMENTATION/AWB_MANUALS/MN040022_PL.pdf">ftp://ftp.moeller.net/DOCUMENTATION/AWB_MANUALS/MN040022_PL.pdf</a>
CA04020001Z-EN Product Range Catalog: Efficient Engineering for Starting and Controlling Motors	<a href="http://www.eaton.eu/DE/ecm/groups/public/@pub/@europe/@electrical/documents/content/pct_1095238.pdf">http://www.eaton.eu/DE/ecm/groups/public/@pub/@europe/@electrical/documents/content/pct_1095238.pdf</a>