



**Variable frequency drive, 400 V AC, 3-phase, 4.1 A, 1.5 kW, IP20/NEMA 0, Radio interference suppression filter, Brake chopper, FS2**

**Part no.** DC1-344D1FB-A20CE1  
**Catalog No.** 185749  
**Alternate Catalog No.** DC1-344D1FB-A20CE1  
**EL-Nummer (Norway)** 4137030

## 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	4.1
Note			Rated operational current at a switching frequency of 8 kHz and an ambient air temperature of +50 °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	1.5
150 % Overload	$I_M$	A	3.6
Note			at 440 - 480 V, 60 Hz
150 % Overload	P	HP	2
150 % Overload	$I_M$	A	3.4
Degree of Protection			IP20/NEMA0
Interface/field bus (built-in)			OP-Bus (RS485)/Modbus RTU, CANopen®
Fieldbus connection (optional)			SmartWire-DT
Fitted with			Radio interference suppression filter Brake chopper 7-digital display assembly Additional PCB protection
Parameterization			Keypad Fieldbus drivesConnect drivesConnect mobile (App)
Frame size			FS2
Connection to SmartWire-DT			yes in conjunction with DX-NET-SWD3 SmartWire DT module

## Technical data

<b>General</b>			
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			3C2, 3S2
<b>Ambient temperature</b>			
Operating ambient temperature min.		°C	-10
Operating ambient temperature max.		°C	+50
			operation (with 150 % overload)

Storage	θ	°C	-40 - +60
Radio interference level			
Radio interference class (EMC)			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 as per EN 61800-3
maximum motor cable length	l	m	C2 ≤ 5 m C3 ≤ 25 m
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			IP20/NEMA0
Protection against direct contact			BGV A3 (VBG4, finger- and back-of-hand proof)

### Main circuit

Supply			
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	5.6
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
Power section			
Function			Variable frequency drive with internal DC link and IGBT inverter
Overload current (150% overload)	$I_L$	A	6.15
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
Rated operational current			
At 150% overload	$I_e$	A	4.1
Note			Rated operational current at a switching frequency of 8 kHz and an ambient air temperature of +50 °C
Power loss			
Heat dissipation at rated operational current $I_e = 150\%$	$P_V$	W	76.5
Efficiency	$\eta$	%	94.9
Heat dissipation at current/speed [%]			
Current = 100%			
Drehzahl = 0 %	$P_V$	W	32
Drehzahl = 50 %	$P_V$	W	39
Drehzahl = 90 %	$P_V$	W	44
Current = 50 %			
Drehzahl = 0 %	$P_V$	W	26
Drehzahl = 50 %	$P_V$	W	28
Drehzahl = 90 %	$P_V$	W	31
Current = 50 %			
Drehzahl = 0 %	$P_V$	W	23
Drehzahl = 50 %	$P_V$	W	23

Maximum leakage current to ground (PE) without motor	I <sub>PE</sub>	mA	12.6
Fitted with			Radio interference suppression filter Brake chopper 7-digital display assembly Additional PCB protection
Frame size			FS2
Motor feeder			
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	1.5
Note			at 440 - 480 V, 60 Hz
150 % Overload	P	HP	2
maximum permissible cable length	l	m	screened: 100 screened, with motor choke: 200 unscreened: 150 unscreened, with motor choke: 300
Apparent power			
Apparent power at rated operation 400 V	S	kVA	2.84
Apparent power at rated operation 480 V	S	kVA	3.41
Braking function			
Standard braking torque			max. 30 % MN
DC braking torque			max. 100% of rated operational current I <sub>e</sub> , variable
Braking torque with external braking resistance			Max. 100% of rated operational current I <sub>e</sub> with external braking resistor
minimum external braking resistance	R <sub>min</sub>	Ω	250
Switch-on threshold for the braking transistor	U <sub>DC</sub>	V	780 V DC

### Control section

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

Power Wiring			
Safety device (fuse or miniature circuit-breaker)			
IEC (Type B, gG), 150 %			FAZ-B10/3
UL (Class CC or J)		A	6
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-LN3-006
Radio interference suppression filter (external, 150 %)			DX-EMC34-008
Radio interference suppression filter, low leakage currents (external, 150 %)			DX-EMC34-008-L
Note regarding radio interference suppression filter			Optional external radio interference suppression filter for longer motor cable lengths and for use in different EMC environments
DC link connection			
Braking resistance			
10 % duty factor (DF)			DX-BR400-0K4
20 % duty factor (DF)			DX-BR400-0K4
40 % duty factor (DF)			R:2 x DX-BR150-0K5
Notes concerning braking resistances:			R:m = "m" resistors connected in series The brake resistors are assigned based on the maximum rated power of the variable frequency drive. Additional brake resistors and designs (e.g. different duty cycles) are available upon request.
Motor feeder			
motor choke			

150 % overload (CT/I <sub>H</sub> , at 50 °C)			DX-LM3-008
Sine filter			
150 % overload (CT/I <sub>H</sub> , at 50 °C)			DX-SIN3-010
All-pole sine filter			
150 % overload (CT/I <sub>H</sub> , at 50 °C)			DX-SIN3-006-A

## Design verification as per IEC/EN 61439

Technical data for design verification			
Rated operational current for specified heat dissipation	I <sub>n</sub>	A	4.1
Heat dissipation per pole, current-dependent	P <sub>vid</sub>	W	0
Equipment heat dissipation, current-dependent	P <sub>vid</sub>	W	76.5
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	50
			Operation (with 150 % overload)
IEC/EN 61439 design verification			
10.2 Strength of materials and parts			
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 <= 1 kV (EC001857)			
Electric engineering, automation, process control engineering / Electrical drive / Static frequency converter / Static frequency converter = < 1 kV (ecl@ss10.0.1-27-02-31-01 [AKE177014])			
Mains voltage		V	342 - 528
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	4.1
Max. output at quadratic load at rated output voltage		kW	1.5

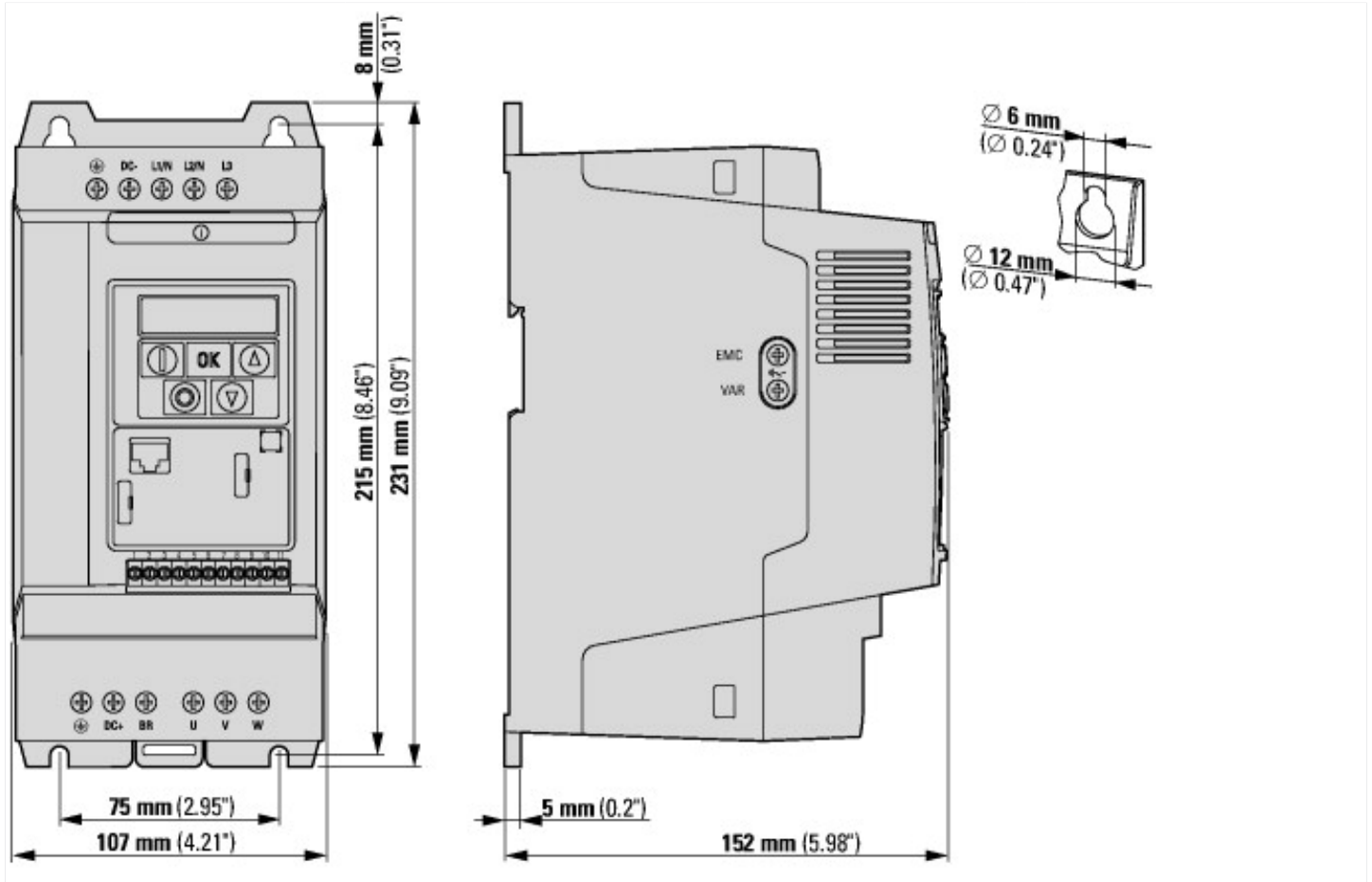
Max. output at linear load at rated output voltage		kW	1.5
Relative symmetric net frequency tolerance		%	10
Relative symmetric net voltage tolerance		%	10
Number of analogue outputs			1
Number of analogue inputs			2
Number of digital outputs			1
Number of digital inputs			4
With control unit			Yes
Application 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			Yes
Type of converter			U converter
Degree of protection (IP)			IP20
Degree of protection (NEMA)			Other
Height		mm	231
Width		mm	107
Depth		mm	152

## Approvals

Product Standards		UL 508C; CSA-C22.2 No. 14; IEC/EN61800-3; IEC/EN61800-5; CE marking
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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: IP20

## Dimensions



## Additional product information (links)

<b>IL04020009Z DC1 variable frequency drive (FS1 - FS3, IP20)</b>	
IL04020009Z DC1 variable frequency drive (FS1 - FS3, IP20)	<a href="https://es-assets.eaton.com/DOCUMENTATION/AWA_INSTRUCTIONS/IL04020009Z2018_05.pdf">https://es-assets.eaton.com/DOCUMENTATION/AWA_INSTRUCTIONS/IL04020009Z2018_05.pdf</a>
<b>MN040023 DC1...E1 Installation manual</b>	
MN040023 DC1...E1 Installationshandbuch - Deutsch	<a href="https://es-assets.eaton.com/DOCUMENTATION/AWB_MANUALS/MN040023_DE.pdf">https://es-assets.eaton.com/DOCUMENTATION/AWB_MANUALS/MN040023_DE.pdf</a>
MN040023 DC1...E1 Installation manual - English	<a href="https://es-assets.eaton.com/DOCUMENTATION/AWB_MANUALS/MN040023_EN.pdf">https://es-assets.eaton.com/DOCUMENTATION/AWB_MANUALS/MN040023_EN.pdf</a>
MN040023 DC1...E1 manuale Installazione - italiano	<a href="https://es-assets.eaton.com/DOCUMENTATION/AWB_MANUALS/MN040023_IT.pdf">https://es-assets.eaton.com/DOCUMENTATION/AWB_MANUALS/MN040023_IT.pdf</a>
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<b>MN040022 DC1...E1, Parameters manual</b>	
MN040022 DC1...E1, Parameterhandbuch - Deutsch	<a href="https://es-assets.eaton.com/DOCUMENTATION/AWB_MANUALS/MN040022_DE.pdf">https://es-assets.eaton.com/DOCUMENTATION/AWB_MANUALS/MN040022_DE.pdf</a>
MN040022 DC1...E1, Parameters manual - English	<a href="https://es-assets.eaton.com/DOCUMENTATION/AWB_MANUALS/MN040022_EN.pdf">https://es-assets.eaton.com/DOCUMENTATION/AWB_MANUALS/MN040022_EN.pdf</a>
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