

**Variable frequency drive, 400 V AC, 3-phase, 9.5 A, 4 kW, IP20/NEMA 0,  
Radio interference suppression filter, Brake chopper, FS2**



**Part no.** DC1-349D5FB-A20CE1  
**Catalog No.** 185755  
**Alternate Catalog No.** DC1-349D5FB-A20CE1  
**EL-Nummer (Norway)** 4137032



## Delivery program

Product range			Variable frequency drives
Part group reference (e.g. DIL)			DC1
Rated operational voltage	U <sub>e</sub>		400 V AC, 3-phase 480 V AC, 3-phase
Output voltage with V <sub>e</sub>	U <sub>2</sub>		400 V AC, 3-phase 480 V AC, 3-phase
Mains voltage (50/60Hz)	U <sub>LN</sub>	V	380 (-10%) - 480 (+10%)
<b>Rated operational current</b>			
At 150% overload	I <sub>e</sub>	A	9.5
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	4
150 % Overload	I <sub>M</sub>	A	8.5
Note			at 440 - 480 V, 60 Hz
150 % Overload	P	HP	5
150 % Overload	I <sub>M</sub>	A	7.6
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

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	ρ <sub>w</sub>	%	< 95%, average relative humidity (RH), non-condensing, non-corrosive
Air quality			3C2, 3S2
Ambient temperature			
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 <sub>e</sub>		400 V AC, 3-phase 480 V AC, 3-phase
Mains voltage (50/60Hz)	U <sub>LN</sub>	V	380 (-10%) - 480 (+10%)
Input current (150% overload)	I <sub>LN</sub>	A	11.5
System configuration			AC supply systems with earthed center point
Supply frequency	f <sub>LN</sub>	Hz	50/60
Frequency range	f <sub>LN</sub>	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 <sub>L</sub>	A	14.25
max. starting current (High Overload)	I <sub>H</sub>	%	175
Note about max. starting current			for 2,5 seconds every 600 seconds
Output voltage with V <sub>e</sub>	U <sub>2</sub>		400 V AC, 3-phase 480 V AC, 3-phase
Output Frequency	f <sub>2</sub>	Hz	0 - 50/60 (max. 500)
Switching frequency	f <sub>PWM</sub>	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)	Δf	Hz	0.1
Rated operational current			
At 150% overload	I <sub>e</sub>	A	9.5
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 <sub>e</sub> = 150 %	P <sub>V</sub>	W	136
Efficiency	η	%	96.6
Heat dissipation at current/speed [%]			
Current = 100%			
Speed = 0 %	P <sub>V</sub>	W	97
Speed = 50 %	P <sub>V</sub>	W	119
Speed = 90 %	P <sub>V</sub>	W	141
Current = 50 %			
Speed = 0 %	P <sub>V</sub>	W	61
Speed = 50 %	P <sub>V</sub>	W	67
Speed = 90 %	P <sub>V</sub>	W	80
Current = 25 %			
Speed = 0 %	P <sub>V</sub>	W	50
Speed = 50 %	P <sub>V</sub>	W	53

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	4
Note			at 440 - 480 V, 60 Hz
150 % Overload	P	HP	5
maximum permissible cable length	I	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	6.58
Apparent power at rated operation 480 V	S	kVA	7.9
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	120
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-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
Radio interference suppression filter, low leakage currents (external, 150 %)			DX-EMC34-016-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-BR150-0K5
20 % duty factor (DF)			DX-BR150-1K1
40 % duty factor (DF)			R:2 x DX-BR100-1K6
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-LM3-011
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-SIN3-013-A

## Design verification as per IEC/EN 61439

Technical data for design verification	I <sub>n</sub>	A	9.5
Rated operational current for specified heat dissipation	P <sub>vid</sub>	W	0
Heat dissipation per pole, current-dependent	P <sub>vid</sub>	W	136
Equipment heat dissipation, current-dependent	P <sub>vs</sub>	W	0
Static heat dissipation, non-current-dependent	P <sub>diss</sub>	W	0
Heat dissipation capacity		°C	-10
Operating ambient temperature min.		°C	50
Operating ambient temperature max.			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	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>N</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		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