



**DM1-344D3NB-S20S-EM - Variable frequency drive, 400 V AC, 3-phase, 4.3 A, 1.5 kW, IP20/NEMA0, 7-digit display assembly, Setpoint potentiometer, Brake chopper, STO (Safe Torque Off, SIL2, PLd Cat 3)**



**3-5010-007A**  
**DM1-344D3NB-S20S-EM**

[Overview](#)

[Specifications](#)

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## DELIVERY PROGRAM

[Delivery program](#)

Product range  
Variable frequency drives

[Technical data](#)

Part group reference (e.g. DIL)  
DM1

[Design verification as per IEC/EN 61439](#)



[Technical data ETIM7.0](#)

[Approvals](#)

Rated operational voltage [U<sub>e</sub>]  
400 V AC, 3-phase  
480 V AC, 3-phase  
500 V AC, 3-phase

[Dimensions](#)

Output voltage with V<sub>e</sub> [U<sub>2</sub>]  
400 V AC, 3-phase  
480 V AC, 3-phase  
500 V AC, 3-phase

Mains voltage (50/60Hz) [U<sub>N</sub>]  
380 (-10%) - 500 (+10%) V

## Rated operational current [ $I_e$ ]

At 150% overload [ $I_e$ ]  
4.3 A

At 110% overload [ $I_e$ ]  
5.6 A

Note  
Rated operational current for a switching frequency of 1 - 16 kHz and an ambient temperature of +50 °C for a 150% overload and +40 °C for a 110% overload

## Assigned motor rating

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 for PM motors

Note  
Overload cycle for 60 s every 600 s

Note  
at 400 V, 50 Hz

150 % Overload [P]  
1.5 kW

110 % Overload [P]  
2.2 kW

150 % Overload [ $I_M$ ]  
3.6 A

110 % Overload [ $I_M$ ]  
5 A

Note  
at 500 V, 50 Hz

150 % Overload [P]  
2.2 kW

110 % Overload [P]  
3 kW

150 % Overload [I<sub>M</sub>]  
4 A

110 % Overload [I<sub>M</sub>]  
5.3 A

Note  
at 480 V, 60 Hz

150 % Overload [P]  
2 HP

110 % Overload [P]  
3 HP

150 % Overload [I<sub>M</sub>]  
3.4 A

110 % Overload [I<sub>M</sub>]  
4.8 A

Degree of Protection  
IP20/NEVA0

Interface/field bus (built-in)  
Modbus RTU  
Modbus TCP  
BACnet MS/TP  
Ethernet IP  
BACnet TCP

Fieldbus connection (optional)  
Profibus, CAN, DeviceNet, SmartwireDT

Fitted with  
7-digital display assembly  
Setpoint potentiometer  
Brake chopper

Parameterization  
Keypad  
Fieldbus

Power Xpert inControl

Frame size  
FS1

Connection to SmartWire-DT  
yes  
in conjunction with DXG-NET-SWD SmartWire DT  
module

## TECHNICAL DATA

### General

#### Standards

General requirements: IEC/EN 61800-2

EMV requirements: IEC/EN 61800-3

Safety requirements: IEC/EN 61800-5-

1:2007/A1:2017; UL 61800-5-1:2012 (Rev. 2018),

CSA C22.2 No. 274-17:2017

#### Certifications

CE, UL, cUL, c-Tick, UkrSEPRO, EAC

#### Production quality

RoHS, ISO 9001

#### Climatic proofing [ $\rho_w$ ]

< 95%, average relative humidity (RH), non-  
condensing, non-corrosive %

#### Air quality

3C2, 3S2

#### Ambient temperature

Operating ambient temperature min.

-10 °C

#### Ambient temperature

Operating ambient temperature max.

+50 °C

#### Ambient temperature

operation (110 % overload) [9]

-10 - +40 (max. +55 with 1 % derating per Kelvin temperature rise) °C

Ambient temperature

Operation with 110 % overload (1 min./10 min.): -10 to +40 (max. +55 with 1% derating per Kelvin above limit)

Operation with 150% overload (1 min./10 min.): -10 to +50 (max. +60 with 1% derating per Kelvin above limit)

-20 with cold-weather mode

Ambient temperature

Storage [9]

-40 - +70 °C

Overvoltage category

III

Pollution degree

2

Radio interference level

Radio interference class (EMC)

C1 (with external filter, for conducted emissions only), C2, C3, depending on the motor cable length, the connected load, and ambient conditions.

External radio interference suppression filters (optional) may be necessary.

Radio interference level

Environment (EMC)

1st and 2nd environments as per EN 61800-3

Mechanical shock resistance

EN 61800-5-1, EN 60068-2-6: 10 - 150 Hz

Amplitude: 0,75 mm (peak) bei 10 - 57 Hz

Maximum acceleration amplitude: 1 g at 57 – 150 Hz g

Mounting position

Vertical

Altitude

0 - 1000 m above sea level

Above 1000 m: 1% derating for every 100 m

max. 3000 m (2000 m for Corner Grounded TN Systems) m

Degree of Protection

IP20/NEVA0

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  
500 V AC, 3-phase

Supply  
Mains voltage (50/60Hz) [ $U_{LN}$ ]  
380 (-10%) - 500 (+10%) V

Supply  
Input current (150% overload) [ $I_{LN}$ ]  
5.2 A

Supply  
Input current (110% overload) [ $I_{LN}$ ]  
6.7 A

Supply  
System configuration  
TN-S, TN-C, TN-C-S, TT, IT

Supply  
Supply frequency [ $f_{LN}$ ]  
50/60 Hz

Supply  
Frequency range [ $f_{LN}$ ]  
45-66 ( $\pm 0\%$ ) Hz

Supply  
Mains switch-on frequency  
Maximum of one time every 60 seconds

Supply  
Mains current distortion [THD]  
40 %

Supply  
Rated conditional short-circuit current [ $I_k$ ]

< 100 kA

Power section

Function

Variable frequency drive with internal DC link, DC link choke and IGBT inverter

Power section

Overload current (150% overload) [I<sub>L</sub>]

6.45 A

Power section

Overload current (110% overload) [I<sub>L</sub>]

6.16 A

Power section

max. starting current (High Overload) [I<sub>H</sub>]

200 %

Power section

Note about max. starting current  
for 2 seconds every 20 seconds

Power section

Output voltage with V<sub>e</sub> [U<sub>2</sub>]

400 V AC, 3-phase

480 V AC, 3-phase

500 V AC, 3-phase

Power section

Output Frequency [f<sub>2</sub>]

0 - 50/60 (max. 400) Hz

Power section

Switching frequency [f<sub>PWM</sub>]

4

adjustable 1 - 16 kHz

Power section

Operation Mode

U/f control

Speed control with slip compensation

sensorless vector control (SLV)

Torque regulation

PM motors

Power section

Frequency resolution (setpoint value) [Δf]

0.01 Hz

Power section  
Rated operational current  
At 150% overload [ $I_e$ ]  
4.3 A

Power section  
Rated operational current  
At 110% overload [ $I_e$ ]  
5.6 A

Power section  
Note  
Rated operational current for a switching  
frequency of 1 - 16 kHz and an ambient  
temperature of +50 °C for a 150% overload and  
+40 °C for a 110% overload

Power section  
Motor current limit [ $I$ ]  
 $0.1 - 2 \times I_H$  (CT) A

Power section  
Power loss  
Heat dissipation at rated operational current  $I_e$   
=150% [ $P_V$ ]  
62 W

Power section  
Power loss  
Heat dissipation at rated operational current  $I_e$   
=110% [ $P_V$ ]  
75 W

Power section  
Heat dissipation at current/speed [%]  
Current = 100%  
Speed = 0% [ $P_V$ ]  
70 W

Power section  
Heat dissipation at current/speed [%]  
Current = 100%  
Speed = 50% [ $P_V$ ]  
56 W

Power section  
Heat dissipation at current/speed [%]  
Current = 100%  
Speed = 90% [ $P_V$ ]  
80 W



Power section  
Heat dissipation at current/speed [%]  
Current = 50 %  
Speed = 0 % [R<sub>v</sub>]  
71 W

Power section  
Heat dissipation at current/speed [%]  
Current = 50 %  
Speed = 50 % [R<sub>v</sub>]  
55 W

Power section  
Heat dissipation at current/speed [%]  
Current = 50 %  
Speed = 90 % [R<sub>v</sub>]  
57 W

Power section  
Heat dissipation at current/speed [%]  
Current = 50 %  
Speed = 0 % [R<sub>v</sub>]  
48 W

Power section  
Heat dissipation at current/speed [%]  
Current = 50 %  
Speed = 50 % [R<sub>v</sub>]  
51 W

Power section  
Fan  
temperature controlled

Power section  
Internal fan delivery rate  
26 m<sup>3</sup>/h

Power section  
Fitted with  
7-digital display assembly  
Setpoint potentiometer  
Brake chopper

Power section  
Safety function  
STO (Safe Torque Off, SIL2, FLd Cat 3)

Power section  
Frame size  
FS1

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 for PM motors

Motor feeder

Note

Overload cycle for 60 s every 600 s

Motor feeder

Note

at 400 V, 50 Hz

Motor feeder

150 % Overload [F]

1.5 kW

Motor feeder

110 % Overload [F]

2.2 kW

Motor feeder

Note

at 500 V, 50 Hz

Motor feeder

150 % Overload [F]

2.2 kW

Motor feeder

110 % Overload [F]

3 kW

Motor feeder

Note

at 480 V, 60 Hz

Motor feeder

150 % Overload [F]

2 HP

Motor feeder

110 % Overload [F]

3 HP

Motor feeder  
Braking function  
Standard braking torque  
max. 30 %  $M_N$

Motor feeder  
Braking function  
DC braking torque  
adjustable to 150 %

Motor feeder  
Braking function  
Braking torque with external braking resistance  
Max. 100% of rated operational current  $I_e$  with  
external braking resistor

Motor feeder  
Braking function  
minimum external braking resistance [ $R_{min}$ ]  
105  $\Omega$

Motor feeder  
Braking function  
Switch-on threshold for the braking transistor  
[ $U_{bc}$ ]  
800 V DC V

Motor feeder  
Braking function  
DC braking [%]  
 150, adjustable  $I/I_e$

## Control section

External control voltage [ $U_c$ ]  
24 V DC (max. 100 mA options incl.) V

Reference voltage [ $U_s$ ]  
10 V DC (max. 10 mA) V

Analog inputs  
1, can be parameterized, 0–10 V DC, 2–10 V DC,  
0/4–20 mA

Analog outputs  
1, parameterizable, 0 - 10 V

Digital inputs  
4, parameterizable, max. 30 V DC

Relay outputs  
2, parameterizable, 1 changeover contacts and 1  
NO, 3 A (240 VAC) / 3 A (24 VDC)

Interface/field bus (built-in)  
Modbus RTU  
Modbus TCP  
BACnet MS/TP  
Ethernet IP  
BACnet TCP

Expansion slots  
1

## Assigned switching and protective elements

Power Wiring  
Safety device (fuse or miniature circuit-breaker)  
IEC (Type B, gG), 150 %  
PKZMD-6,3

Power Wiring  
Safety device (fuse or miniature circuit-breaker)  
IEC (Type B, gG), 110 %  
PKZMD-6,3

Power Wiring  
Safety device (fuse or miniature circuit-breaker)  
UL (Class CC or J)  
10 A

Power Wiring  
Mains contactor  
150 % overload (CT/I<sub>H</sub>, at 50 °C)  
DILM7-10 (230V/50HZ,240V/60HZ)

Power Wiring  
Mains contactor  
110 % overload (VT/I<sub>L</sub>, at 40 °C)  
DILM7-10 (230V/50HZ,240V/60HZ)

Power Wiring  
Main choke  
150 % overload (CT/I<sub>H</sub>, at 50 °C)  
DX-LN3-006

Power Wiring  
Main choke  
110 % overload (VT/I<sub>L</sub> at 40 °C)  
DX-LNB-006

Power Wiring  
Radio interference suppression filter (external,  
150 %)  
DX-EMC34-008

Power Wiring  
Radio interference suppression filter (external,  
110 %)  
DX-EMC34-008

Power Wiring  
Radio interference suppression filter, low leakage  
currents (external, 150 %)  
DX-EMC34-008-L

Power Wiring  
Radio interference suppression filter, low leakage  
currents (external, 110 %)  
DX-EMC34-008-L

Power Wiring  
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

DC link connection  
Braking resistance  
20 % duty factor (DF)  
DX-BR150-0K5

DC link connection  
Braking resistance  
40 % duty factor (DF)  
DX-BR150-1K1

DC link connection  
Braking resistance  
Notes concerning braking resistances:

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 ( $CT/I_H$ , at 50 °C)  
DX-LMB-008

Motor feeder  
motor choke  
110 % overload ( $VT/I_L$ , at 40 °C)  
DX-LMB-008

Motor feeder  
Sine filter  
150 % overload ( $CT/I_H$ , at 50 °C)  
DX-SIN3-010

Motor feeder  
Sine filter  
110 % overload ( $VT/I_L$ , at 40 °C)  
DX-SIN3-010

Motor feeder  
All-pole sine filter  
150 % overload ( $CT/I_H$ , at 50 °C)  
DX-SIN3-006-A

Motor feeder  
All-pole sine filter  
110 % overload ( $VT/I_L$ , at 40 °C)  
DX-SIN3-006-A

## DESIGN VERIFICATION AS PER IEC/EN 61439

### Technical data for design verification

Rated operational current for specified heat  
dissipation [ $I_n$ ]  
5.6 A

Equipment heat dissipation, current-dependent  
[ $P_{vid}$ ]  
75 W

Operating ambient temperature min.  
-10 °C

Operating ambient temperature max.  
+50 °C

## 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 Strength of materials and parts  
10.2.3.1 Verification of thermal stability of enclosures  
Meets the product standard's requirements.

10.2 Strength of materials and parts  
10.2.3.2 Verification of resistance of insulating materials to normal heat  
Meets the product standard's requirements.

10.2 Strength of materials and parts  
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 Strength of materials and parts  
10.2.4 Resistance to ultra-violet (UV) radiation  
Meets the product standard's requirements.

10.2 Strength of materials and parts  
10.2.5 Lifting  
Does not apply, since the entire switchgear needs to be evaluated.

10.2 Strength of materials and parts  
10.2.6 Mechanical impact  
Does not apply, since the entire switchgear needs to be evaluated.

10.2 Strength of materials and parts  
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 Insulation properties  
10.9.3 Impulse withstand voltage  
Is the panel builder's responsibility.

10.9 Insulation properties  
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  $\leq$  1 kV (ecl@ss10.0.1-27-02-31-01 [AKE177014])

Mains voltage  
323 - 528 V

Mains frequency  
50/60 Hz

Number of phases input  
3

Number of phases output  
3

Max. output frequency  
400 Hz

Max. output voltage  
500 V

Nominal output current I<sub>2N</sub>  
5.6 A

Max. output at quadratic load at rated output  
voltage  
2.2 kW

Max. output at linear load at rated output voltage  
1.5 kW

Relative symmetric net frequency tolerance  
10 %

Relative symmetric net voltage tolerance  
10 %

Number of analogue outputs  
1

Number of analogue inputs  
1

Number of digital outputs  
0

Number of digital inputs  
4

With control unit  
Yes

Application in industrial area permitted  
Yes

Application in domestic- and commercial area  
permitted  
No

Supporting protocol for TCP/IP  
Yes

Supporting protocol for PROFIBUS  
Yes

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  
Yes

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 PROFI-safe  
No

Supporting protocol for SafetyBUS p  
No

Supporting protocol for BACnet  
Yes

Supporting protocol for other bus systems  
Yes

Number of HW-interfaces industrial Ethernet  
1

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  
1

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  
152 mm

Width  
72 mm

Depth  
180 mm

## APPROVALS

Product Standards  
UL508C, CSA-C22.2 No. 274-13; IEC/EN61800-3;  
IEC/EN61800-5; CE marking

UL File No.  
E134360

UL Category Control No.  
NMMS, NMMS7

CSA File No.  
UL report applies to both US and Canada

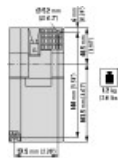
North America Certification  
UL listed, certified by UL for use in Canada

Suitable for  
Branch circuits

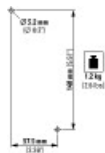
Max. Voltage Rating  
3~500 V AC IEC: TN-S UL/CSA: 'Y' (Solidly  
Grounded Wey)

Degree of Protection  
IP20/NEVA0

## DIMENSIONS



Back view



Drilling patterns



