



**Variable frequency drive, 230 V AC, 3-phase, 1.6 A, 0.25 kW, IP20/NEMA0, Radio interference suppression filter, 7-digital display assembly, Setpoint potentiometer, Brake chopper, STO (Safe Torque Off, SIL2, PLd Cat 3)**



**Part no. DM1-321D6EB-S20S-EM**  
**Catalog No. 3-5001-005A**

## Delivery program

Product range			Variable frequency drives
Part group reference (e.g. DIL)			DM1
Rated operational voltage	$U_e$		230 V AC, 3-phase 240 V AC, 3-phase
Output voltage with $V_e$	$U_2$		230 V AC, 3-phase 240 V AC, 3-phase
Mains voltage (50/60Hz)	$U_{LN}$	V	208 (-10%) - 240 (+10%)
<b>Rated operational current</b>			
At 150% overload	$I_e$	A	1.6
At 110% overload	$I_e$	A	3
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
<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 for PM motors
Note			Overload cycle for 60 s every 600 s
Note			at 230 V, 50 Hz
150 % Overload	P	kW	0.25
110 % Overload	P	kW	0.55
150 % Overload	$I_M$	A	1.4
110 % Overload	$I_M$	A	2.7
Note			at 230 V, 60 Hz
150 % Overload	P	HP	0.25
110 % Overload	P	HP	0.5
150 % Overload	$I_M$	A	0
110 % Overload	$I_M$	A	2.2
Degree of Protection			IP20/NEMA0
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			Radio interference suppression filter 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.		°C	-10
Operating ambient temperature max.		°C	+50
operation (110 % overload)	$\theta$	°C	-10 - +40 (max. +55 with 1 % derating per Kelvin temperature rise) °C
			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
Storage	$\theta$	°C	-40 - +70
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.
Environment (EMC)			1st and 2nd environments as per EN 61800-3
maximum motor cable length	l	m	C2 ≤ 5 m C3 ≤ 25 m
Mechanical shock resistance		g	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
Mounting position			Vertical
Altitude		m	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)
Degree of Protection			IP20/NEMA0
Protection against direct contact			BGV A3 (VBG4, finger- and back-of-hand proof)

## Main circuit

Supply			
Rated operational voltage	$U_e$		230 V AC, 3-phase 240 V AC, 3-phase
Mains voltage (50/60Hz)	$U_{LN}$	V	208 (-10%) - 240 (+10%)
Input current (150% overload)	$I_{LN}$	A	2.1
Input current (110% overload)	$I_{LN}$	A	3.3
System configuration			TN-S, TN-C, TN-C-S, TT, IT
Supply frequency	$f_{LN}$	Hz	50/60
Frequency range	$f_{LN}$	Hz	45–66 (± 0%)
Mains switch-on frequency			Maximum of one time every 60 seconds
Mains current distortion	THD	%	40
Rated conditional short-circuit current	$I_q$	kA	< 100
Power section			
Function			Variable frequency drive with internal DC link, DC link choke and IGBT inverter
Overload current (150% overload)	$I_L$	A	2.4
Overload current (110% overload)	$I_L$	A	3.3
max. starting current (High Overload)	$I_H$	%	200
Note about max. starting current			for 2 seconds every 20 seconds
Output voltage with $V_e$	$U_2$		230 V AC, 3-phase 240 V AC, 3-phase
Output Frequency	$f_2$	Hz	0 - 50/60 (max. 400)
Switching frequency	$f_{PWM}$	kHz	4 adjustable 1 - 16
Operation Mode			U/f control Speed control with slip compensation sensorless vector control (SLV) Torque regulation

				PM motors
Frequency resolution (setpoint value)	$\Delta f$	Hz		0.01
Rated operational current				
At 150% overload	$I_e$	A		1.6
At 110% overload	$I_e$	A		3
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
Motor current limit	$I$	A		0.1 - 2 x $I_H$ (CT)
Power loss				
Heat dissipation at rated operational current $I_e = 150\%$	$P_V$	W		22
Heat dissipation at rated operational current $I_e = 110\%$	$P_V$	W		33
Heat dissipation at current/speed [%]				
Current = 100%				
Speed = 0 %	$P_V$	W		24
Speed = 50 %	$P_V$	W		22
Speed = 90 %	$P_V$	W		28
Current = 50 %				
Speed = 0 %	$P_V$	W		23
Speed = 50 %	$P_V$	W		23
Speed = 90 %	$P_V$	W		12
Current = 50 %				
Speed = 0 %	$P_V$	W		18
Speed = 50 %	$P_V$	W		19
Fan				temperature controlled
Internal fan delivery rate		$m^3/h$		26
Fitted with				Radio interference suppression filter 7-digital display assembly Setpoint potentiometer Brake chopper
Safety function				STO (Safe Torque Off, SIL2, PLd Cat 3)
Frame size				FS1
Motor feeder				
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 for PM motors
Note				Overload cycle for 60 s every 600 s
Note				at 230 V, 50 Hz
150 % Overload	P	kW		0.25
110 % Overload	P	kW		0.55
Note				at 230 V, 60 Hz
150 % Overload	P	HP		0.25
110 % Overload	P	HP		0.5
Braking function				
Standard braking torque				max. 30 % $M_N$
DC braking torque				adjustable to 150 %
Braking torque with external braking resistance				Max. 100% of rated operational current $I_e$ with external braking resistor
minimum external braking resistance	$R_{min}$	$\Omega$		36
DC braking	%	$I/I_e$		$\leq 150$ , adjustable

## Control section

External control voltage	$U_C$	V		24 V DC (max. 100 mA options incl.)
Reference voltage	$U_S$	V		10 V DC (max. 10 mA)
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 N/O, 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

<b>Power Wiring</b>			
Safety device (fuse or miniature circuit-breaker)			
IEC (Type B, gG), 150 %			PKZM0-1,6
IEC (Type B, gG), 110 %			PKZM0-4
UL (Class CC or J)		A	4
Mains contactor			
150 % overload (CT/I <sub>H</sub> , at 50 °C)			DILM7-10 (230V50HZ,240V60HZ)
110 % overload (VT/I <sub>L</sub> , at 40 °C)			DILM7-10 (230V50HZ,240V60HZ)
Main choke			
150 % overload (CT/I <sub>H</sub> , at 50 °C)			DX-LN3-004
110 % overload (VT/I <sub>L</sub> , at 40 °C)			DX-LN3-004
Radio interference suppression filter (external, 150 %)			
Radio interference suppression filter (external, 110 %)			
Radio interference suppression filter, low leakage currents (external, 150 %)			
Radio interference suppression filter, low leakage currents (external, 110 %)			
Note regarding radio interference suppression filter			
			Optional external radio interference suppression filter for longer motor cable lengths and for use in different EMC environments
<b>DC link connection</b>			
Braking resistance			
10 % duty factor (DF)			DX-BR050-0K4
20 % duty factor (DF)			DX-BR050-0K4
40 % duty factor (DF)			DX-BR050-0K4
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.
<b>Motor feeder</b>			
motor choke			
150 % overload (CT/I <sub>H</sub> , at 50 °C)			DX-LM3-008
110 % overload (VT/I <sub>L</sub> , at 40 °C)			DX-LM3-008
Sine filter			
150 % overload (CT/I <sub>H</sub> , at 50 °C)			DX-SIN3-004
110 % overload (VT/I <sub>L</sub> , at 40 °C)			DX-SIN3-004
All-pole sine filter			
150 % overload (CT/I <sub>H</sub> , at 50 °C)			DX-SIN3-006-A
110 % overload (VT/I <sub>L</sub> , at 40 °C)			DX-SIN3-006-A

### 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	3
Equipment heat dissipation, current-dependent	P <sub>vid</sub>	W	33
Operating ambient temperature min.		°C	-10
Operating ambient temperature max.		°C	50
<b>IEC/EN 61439 design verification</b>			
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])

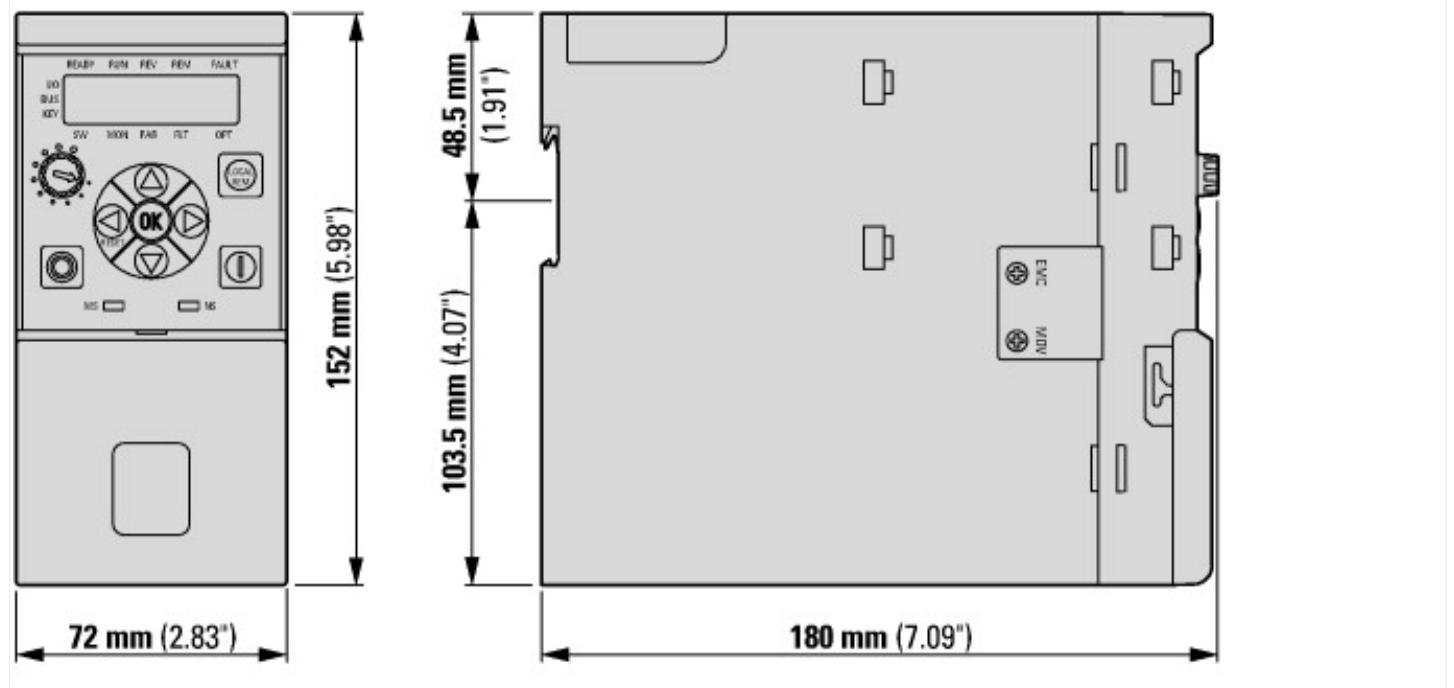
Mains voltage	V	170 - 264
Mains frequency		50/60 Hz
Number of phases input		3
Number of phases output		3
Max. output frequency	Hz	400
Max. output voltage	V	240
Nominal output current I <sub>2N</sub>	A	3
Max. output at quadratic load at rated output voltage	kW	0.55
Max. output at linear load at rated output voltage	kW	0.25
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		Yes
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

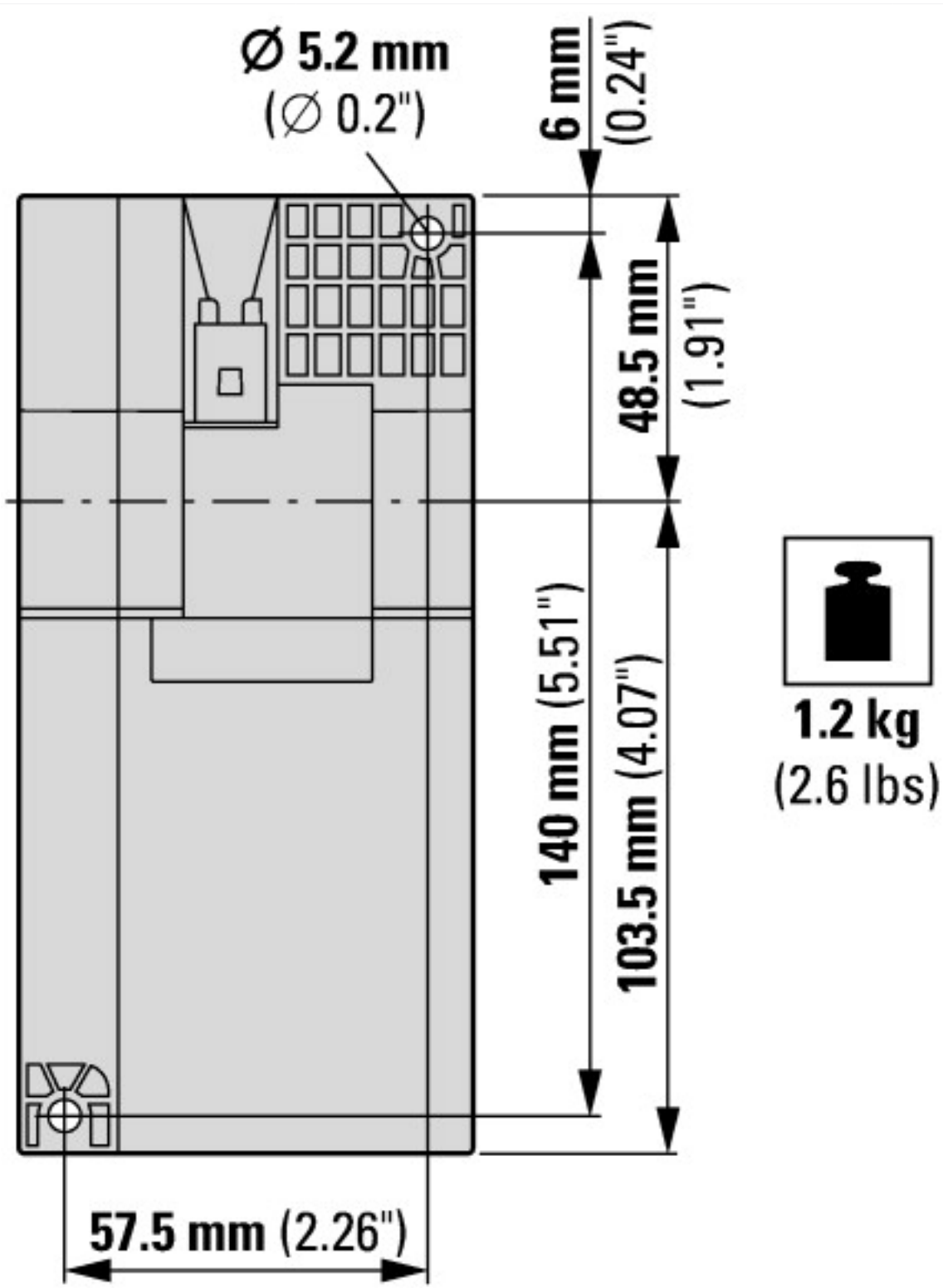
Supporting protocol for AS-Interface Safety at Work			No
Supporting protocol for DeviceNet Safety			No
Supporting protocol for INTERBUS-Safety			No
Supporting protocol for PROFI-safe			No
Supporting protocol for SafetyBUS p			No
Supporting protocol for BACnet			Yes
Supporting protocol for other bus systems			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		mm	152
Width		mm	72
Depth		mm	180

## 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			3-240 V AC IEC: TN-S UL/CSA: 'Y' (Solidly Grounded Wey)
Degree of Protection			IP20/NEMA0

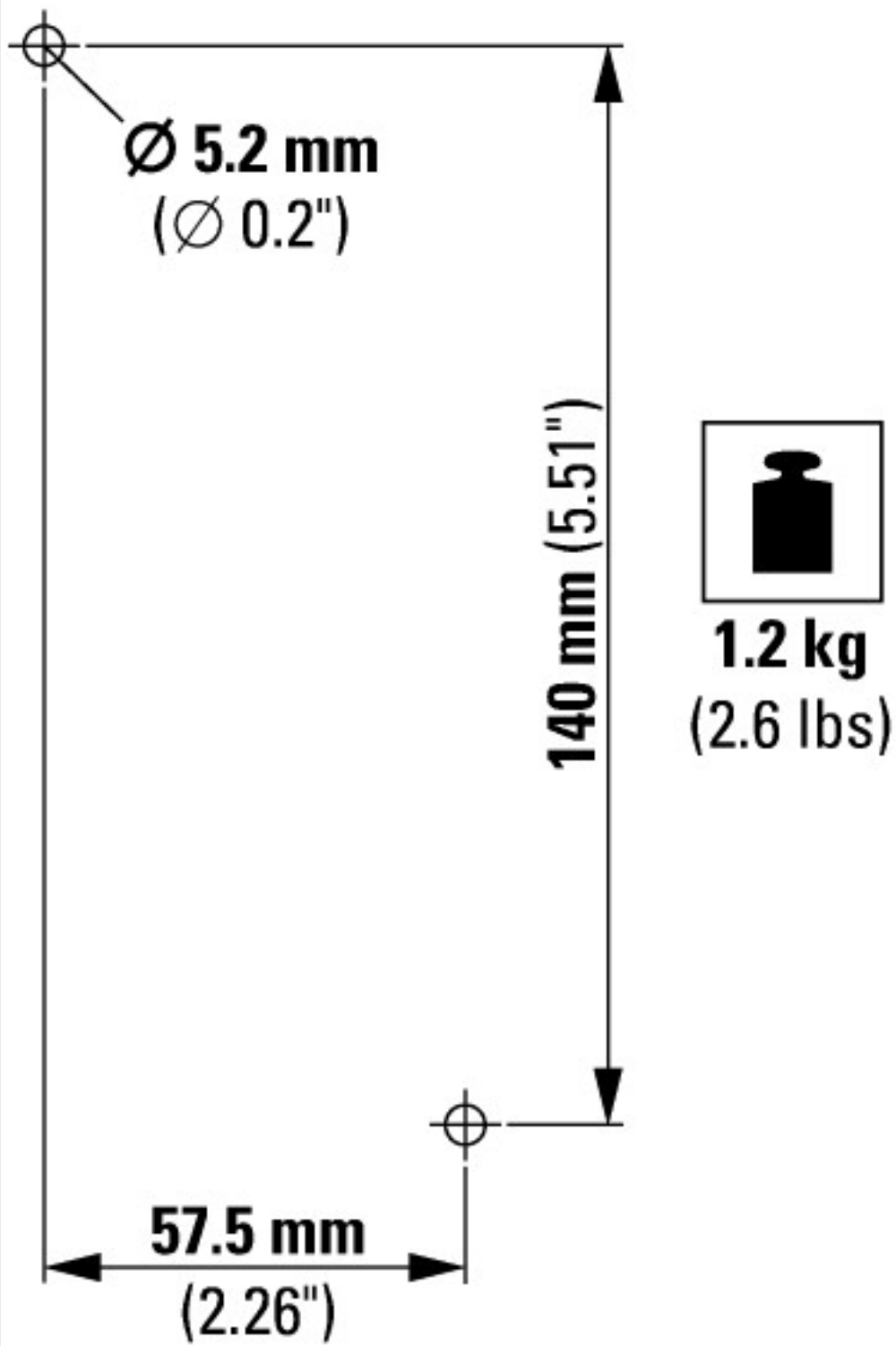
## Dimensions





Back view





Drilling patterns