



**Variable frequency drive, 230 V AC, 3-phase, 11 A, 2.2 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. DM1-32011EB-S20S-EM**  
**Catalog No. 3-5003-003A**

## Delivery program

|                                    |                 |    |  |
|------------------------------------|-----------------|----|--|
| Product range                      |                 |    | Variable frequency drives  |
| Part group reference (e.g. DIL)    |                 |    | DM1  |
|                                    |                 |    |  |
| Rated operational voltage          | U <sub>e</sub>  |    | 230 V AC, 3-phase<br>240 V AC, 3-phase   |
| Output voltage with V <sub>e</sub> | U <sub>2</sub>  |    | 230 V AC, 3-phase<br>240 V AC, 3-phase   |
| Mains voltage (50/60Hz)            | U <sub>LN</sub> | V  | 208 (-10%) - 240 (+10%)  |
| <b>Rated operational current</b>   |                 |    |  |
| At 150% overload                   | I <sub>e</sub>  | A  | 11   |
| At 110% overload                   | I <sub>e</sub>  | A  | 17.5   |
| 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<br>for PM motors |
| Note                               |                 |    | Overload cycle for 60 s every 600 s  |
| Note                               |                 |    | at 230 V, 50 Hz  |
| 150 % Overload                     | P               | kW | 2.2  |
| 110 % Overload                     | P               | kW | 4  |
| 150 % Overload                     | I <sub>M</sub>  | A  | 8.7  |
| 110 % Overload                     | I <sub>M</sub>  | A  | 14.8   |
| Note                               |                 |    | at 230 V, 60 Hz  |
| 150 % Overload                     | P               | HP | 3  |
| 110 % Overload                     | P               | HP | 5  |
| 150 % Overload                     | I <sub>M</sub>  | A  | 9.6  |
| 110 % Overload                     | I <sub>M</sub>  | A  | 15.2   |
| Degree of Protection               |                 |    | IP20/NEMA0   |
| Interface/field bus (built-in)     |                 |    | Modbus RTU<br>Modbus TCP<br>BACnet MS/TP<br>Ethernet IP<br>BACnet TCP  |
| Fieldbus connection (optional)     |                 |    | Profibus, CAN, DeviceNet, SmartwireDT  |
| Fitted with                        |                 |    | Radio interference suppression filter<br>7-digital display assembly<br>Setpoint potentiometer<br>Brake chopper   |
| Parameterization                   |                 |    | Keypad<br>Fieldbus<br>Power Xpert inControl  |
| Frame size                         |                 |    | FS2  |
| Connection to SmartWire-DT         |                 |    | yes<br>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<br>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)<br>Operation with 150% overload (1 min./10 min.): -10 to +50 (max. +60 with 1% derating per Kelvin above limit)<br>-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<br>C3 ≤ 25 m  |
| Mechanical shock resistance        |          | g  | EN 61800-5-1, EN 60068-2-6: 10 - 150 Hz<br>Amplitude: 0,75 mm (peak) bei 10 - 57 Hz<br>Maximum acceleration amplitude: 1 g at 57 – 150 Hz  |
| Mounting position                  |          |    | Vertical   |
| Altitude                           |          | m  | 0 - 1000 m above sea level<br>Above 1000 m: 1% derating for every 100 m<br>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<br>240 V AC, 3-phase  |
| Mains voltage (50/60Hz)                 | $U_{LN}$  | V   | 208 (-10%) - 240 (+10%)   |
| Input current (150% overload)           | $I_{LN}$  | A   | 12.7  |
| Input current (110% overload)           | $I_{LN}$  | A   | 20.1  |
| 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   | 16.5  |
| Overload current (110% overload)        | $I_L$     | A   | 19.25   |
| 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<br>240 V AC, 3-phase  |
| Output Frequency                        | $f_2$     | Hz  | 0 - 50/60 (max. 400)  |
| Switching frequency                     | $f_{PWM}$ | kHz | 4<br>adjustable 1 - 16  |
| Operation Mode                          |           |     | U/f control<br>Speed control with slip compensation<br>sensorless vector control (SLV)<br>Torque regulation |

|   |            |          |  | PM motors  |
|---|------------|----------|--|--|
| Frequency resolution (setpoint value)                       | $\Delta f$ | Hz       |  | 0.01   |
| Rated operational current                                   |            |          |  |  |
| At 150% overload  | $I_e$      | A        |  | 11   |
| At 110% overload  | $I_e$      | A        |  | 17.5   |
| 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        |  | $0.1 - 2 \times I_H$ (CT)  |
| Power loss  |            |          |  |  |
| Heat dissipation at rated operational current $I_e = 150\%$ | $P_V$      | W        |  | 93   |
| Heat dissipation at rated operational current $I_e = 110\%$ | $P_V$      | W        |  | 159  |
| Heat dissipation at current/speed [%]                       |            |          |  |  |
| Current = 100%  |            |          |  |  |
| Speed = 0 %   | $P_V$      | W        |  | 114  |
| Speed = 50 %  | $P_V$      | W        |  | 71   |
| Speed = 90 %  | $P_V$      | W        |  | 158  |
| Current = 50 %  |            |          |  |  |
| Speed = 0 %   | $P_V$      | W        |  | 133  |
| Speed = 50 %  | $P_V$      | W        |  | 73   |
| Speed = 90 %  | $P_V$      | W        |  | 80   |
| Current = 50 %  |            |          |  |  |
| Speed = 0 %   | $P_V$      | W        |  | 51   |
| Speed = 50 %  | $P_V$      | W        |  | 52   |
| Fan   |            |          |  | temperature controlled   |
| Internal fan delivery rate                                  |            | $m^3/h$  |  | 42   |
| Fitted with   |            |          |  | Radio interference suppression filter<br>7-digital display assembly<br>Setpoint potentiometer<br>Brake chopper   |
| Safety function   |            |          |  | STO (Safe Torque Off, SIL2, PLd Cat 3)   |
| Frame size  |            |          |  | FS2  |
| 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<br>for PM motors |
| Note  |            |          |  | Overload cycle for 60 s every 600 s  |
| Note  |            |          |  | at 230 V, 50 Hz  |
| 150 % Overload  | P          | kW       |  | 2.2  |
| 110 % Overload  | P          | kW       |  | 4  |
| Note  |            |          |  | at 230 V, 60 Hz  |
| 150 % Overload  | P          | HP       |  | 3  |
| 110 % Overload  | P          | HP       |  | 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                         | $R_{min}$  | $\Omega$ |  | 16   |
| 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<br>Modbus TCP  |

|                 |  |  |   |
|-----------------|--|--|---|
|                 |  |  | BACnet MS/TP<br>Ethernet IP<br>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 %   |  |   | PKZM0-12   |
| IEC (Type B, gG), 110 %   |  |   | PKZM0-20   |
| UL (Class CC or J)  |  | A | 25   |
| 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-LN3-016   |
| 110 % overload (VT/I <sub>L</sub> , at 40 °C)                                 |  |   | DX-LN3-025   |
| 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-BR022-1K4   |
| 20 % duty factor (DF)   |  |   | DX-BR022-1K4   |
| 40 % duty factor (DF)   |  |   | DX-BR022-1K4   |
| 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-LM3-011   |
| 110 % overload (VT/I <sub>L</sub> , at 40 °C)                                 |  |   | DX-LM3-035   |
| Sine filter   |  |   |  |
| 150 % overload (CT/I <sub>H</sub> , at 50 °C)                                 |  |   | DX-SIN3-016  |
| 110 % overload (VT/I <sub>L</sub> , at 40 °C)                                 |  |   | DX-SIN3-023  |
| All-pole sine filter  |  |   |  |
| 150 % overload (CT/I <sub>H</sub> , at 50 °C)                                 |  |   | DX-SIN3-013-A  |
| 110 % overload (VT/I <sub>L</sub> , at 40 °C)                                 |  |   | DX-SIN3-024-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  | 17.5   |
| Equipment heat dissipation, current-dependent  | P <sub>vid</sub> | W  | 159  |
| 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  $\leq 1$  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])

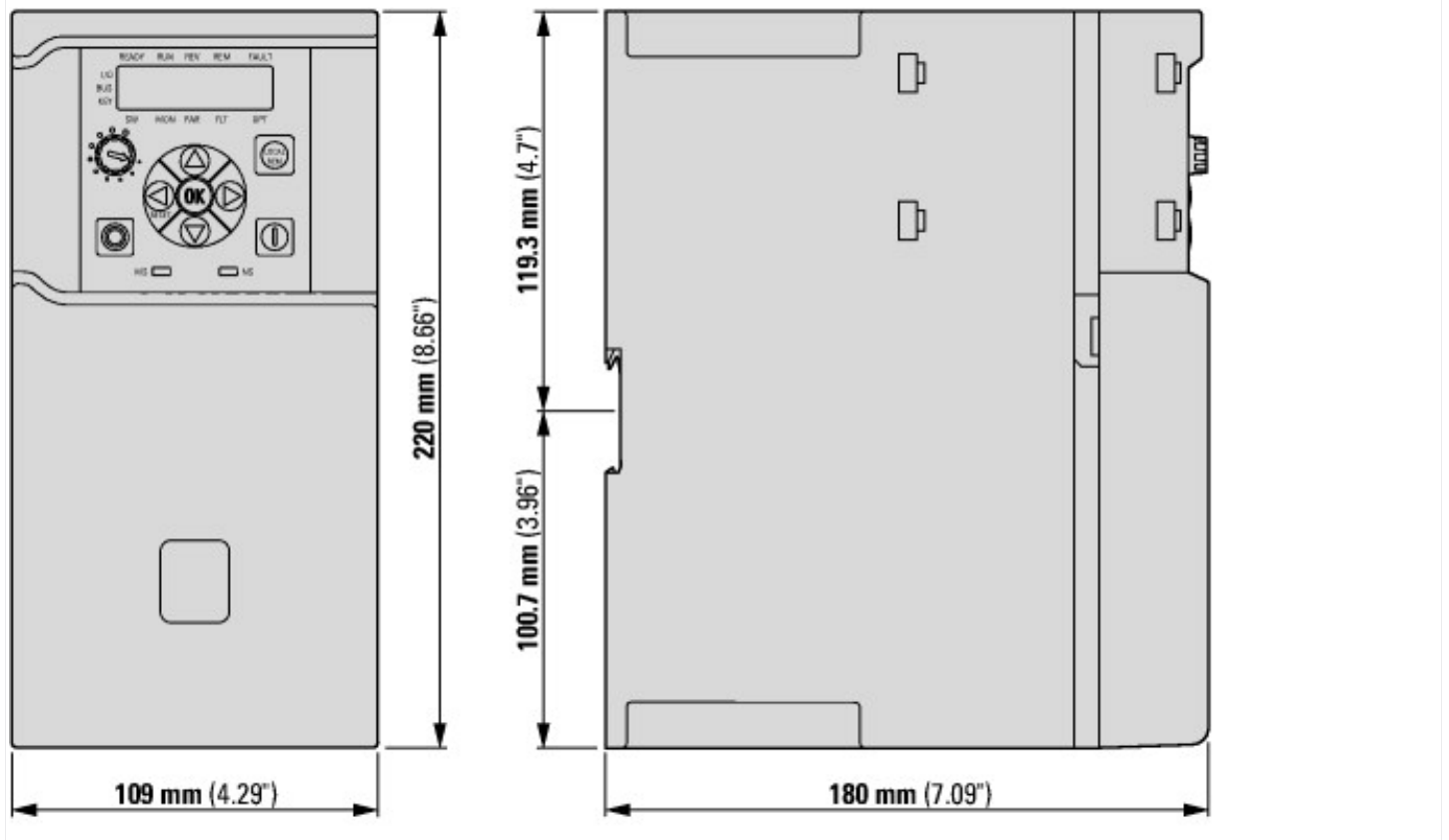
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|--|----|-----------|
| Mains voltage  | V  | 170 - 264 |
| Mains frequency  |    | 50/60 Hz  |
| Number of phases input                                 |    | 3         |
| Number of phases output                                |    | 3         |
| Max. output frequency                                  | Hz | 400       |
| Max. output voltage                                    | V  | 240       |
| Nominal output current I <sub>2N</sub>                 | A  | 17.5      |
| Max. output at quadratic load at rated output voltage  | kW | 4         |
| Max. output at linear load at rated output voltage     | kW | 2.2       |
| 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       |

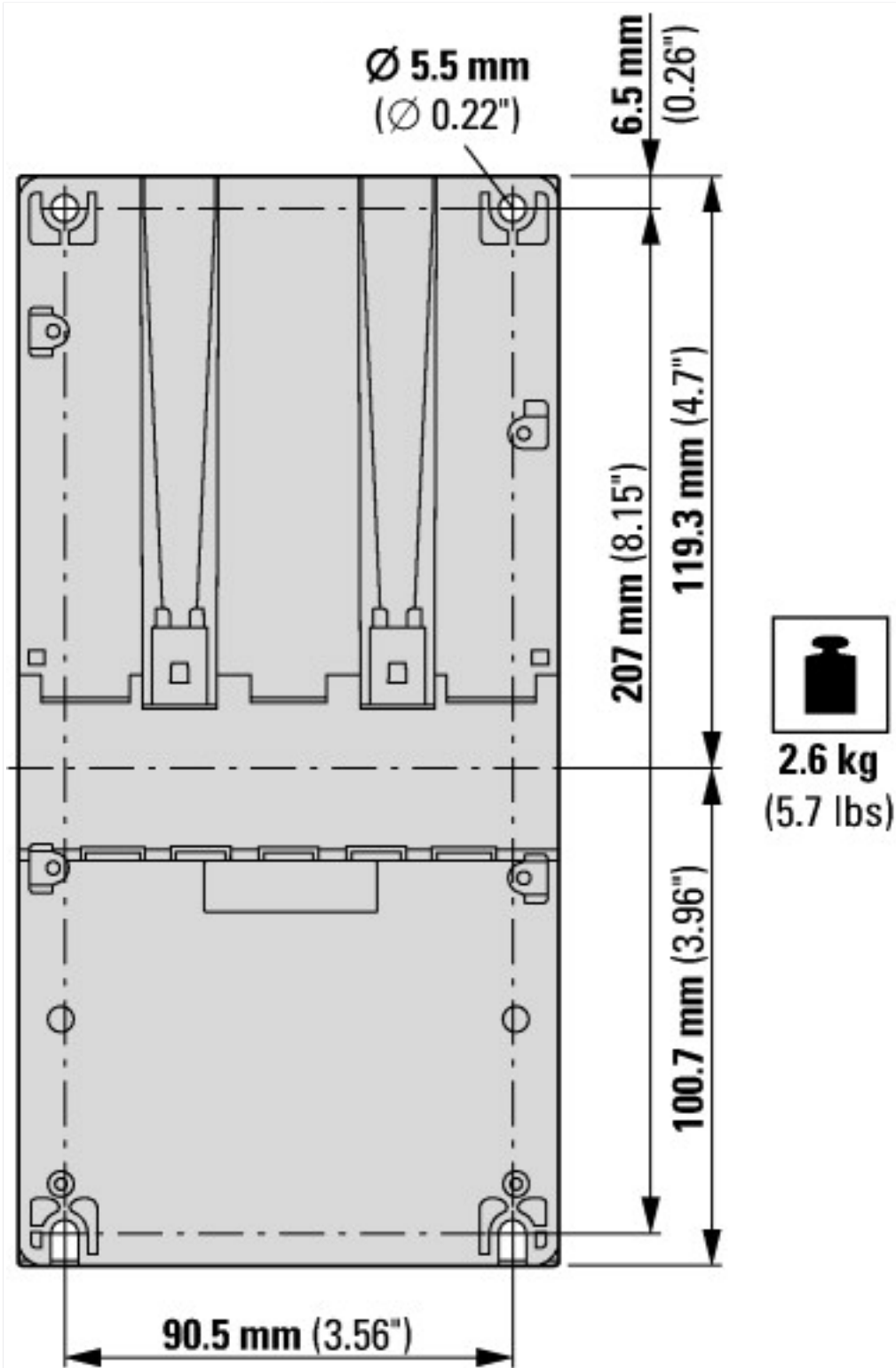
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|---|--|----|-------------|
| Supporting protocol for AS-Interface Safety at Work |  |    | No          |
| Supporting protocol for DeviceNet Safety            |  |    | No          |
| Supporting protocol for INTERBUS-Safety             |  |    | 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 | 220         |
| Width   |  | mm | 109         |
| 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   |

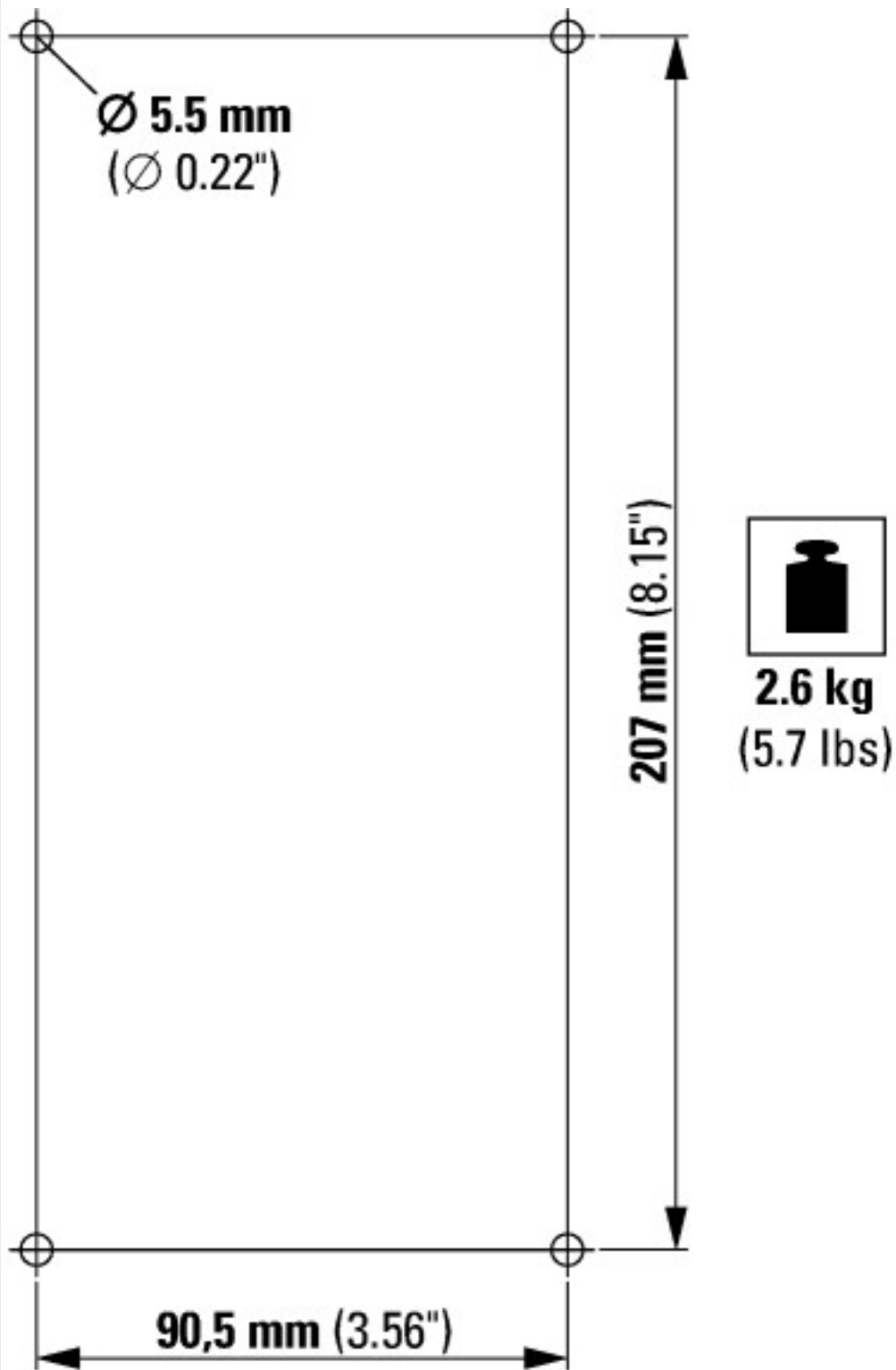
## Dimensions





Back view





Drilling patterns