

## Terminal and lead-through data for the power cables

Input, motor and brake resistor cable terminal sizes (per phase), maximum accepted cable and tightening torques are given below.

U1, V1, W1, U2, V2, W2, UDC+/R+, UDC-, R-				Grounding PE	
Number of holes per phase	Max. cable mm <sup>2</sup>	Screw	Tightening torque N·m	Screw	Tightening torque N·m
3	3×240	M12	50...75	M10	30...44

Max. cable kcmil/AWG	U1, V1, W1, U2, V2, W2, UDC+/R+, UDC-, R-		Grounding PE	
	Screw	Tightening torque lbf·ft	Screw	Tightening torque lbf·ft
3 × 700 MCM	1/2	37...55	3/8	22...32

Two-hole 1/2 inch diameter cable lugs can be used.

## Terminal data for the control cables

See page [87](#).

## Electrical power network specification

<b>Voltage (<math>U_1</math>)</b>	380/400/415/440/460/480/500 VAC 3-phase ± 10%
<b>Rated conditional short-circuit current (IEC 60439-1)</b>	65 kA when protected by fuses given in the fuse tables
<b>Short-circuit current protection (UL 508C, CSA C22.2 No. 14-05)</b>	US and Canada: The drive is suitable for use on a circuit capable of delivering not more than 100 kA symmetrical amperes (rms) at 600 V maximum when protected by fuses given in the table <a href="#">Fuses (UL)</a> .
<b>Frequency</b>	48 to 63 Hz, maximum rate of change 17%/s
<b>Imbalance</b>	Max. ± 3% of nominal phase to phase input voltage
<b>Fundamental power factor (cos <math>\phi_1</math>)</b>	0.98 (at nominal load)

## Motor connection data

<b>Motor types</b>	Asynchronous AC induction motors, permanent magnet synchronous motors
<b>Voltage (<math>U_2</math>)</b>	0 to $U_1$ , 3-phase symmetrical, $U_{\max}$ at the field weakening point
<b>Frequency</b>	DTC mode: 0 to $3.2 \cdot f_f$ . Maximum frequency 500 Hz (120 Hz with du/dt or sine filter). Low motor noise mode is recommended with high frequencies (see also <i>Firmware manual</i> ).
	$f_f = \frac{U_N}{U_m} \cdot f_m$
	$f_f$ : frequency at field weakening point; $U_N$ : electrical power system voltage; $U_m$ : rated motor voltage; $f_m$ : rated motor frequency
<b>Frequency resolution</b>	0.01 Hz
<b>Current</b>	See section <a href="#">Ratings</a> .
<b>Field weakening point</b>	0...500 Hz
<b>Switching frequency</b>	3 kHz (typically)

Maximum recommended motor cable length	Type code (EMC equipment)	Max. motor cable length	
		DTC control	Scalar control
	-	300 m (984 ft)	300 m (984 ft)
	+E210 *	100 m (328 ft)	100 m (328 ft)

\* Motor cable longer than 100 m (328 ft) is allowed but then the EMC Directive requirements may not be fulfilled.

## Brake resistor connection data

See page [142](#).

## Control unit (JCU-11) connection data

<b>Power supply</b>	24 V ( $\pm 10\%$ ) DC, 1.6 A Supplied from the power unit of the drive, or from an external power supply through connector XPOW (pitch 5 mm, wire size 2.5 mm <sup>2</sup> ).
<b>Relay outputs RO1...RO3 (XRO1 ... XRO3)</b>	Connector pitch 5 mm, wire size 2.5 mm <sup>2</sup> 250 V AC / 30 V DC, 2 A Protected by varistors  <b>Note:</b> The relay outputs of the drive do not fulfill the Protective Extra Low Voltage (PELV) requirements at installation sites above 4000 meters (13123 feet) if used with a voltage greater than 48 V. At installation sites between 2000 meters (6562 feet) and 4000 meters (13123 feet), PELV requirements are not fulfilled if one or two relay outputs are used with a voltage greater than 48 V and the remaining relay output(s) are used with a voltage lower than 48 V.
<b>+24 V output (XD24)</b>	Connector pitch 5 mm, wire size 2.5 mm <sup>2</sup>
<b>Digital inputs DI1...DI6 (XDI:1 ... XDI:6)</b>	Connector pitch 3.5 mm, wire size 1.5 mm <sup>2</sup> 24 V logic levels: "0" < 5 V, "1" > 15 V $R_{in}$ : 2.0 kohm Filtering: 0.25 ms min.  DI6 (XDI:6) can alternatively be used as an input for 1...3 PTC thermistors. <b>Note:</b> The input has no safety insulation (see page <a href="#">90</a> ). $I_{max}$ : 15 mA
<b>Start interlock input DIIL (XDI:A)</b>	Wire size 1.5 mm <sup>2</sup> 24 V logic levels: "0" < 5 V, "1" > 15 V $R_{in}$ : 2.0 kohm

**Digital inputs/outputs DIO1 and DIO2****(XDIO:1 and XDIO:2)**

Input/output mode selection by parameters.

DIO1 can be configured as a frequency input (0...16 kHz) for 24 V level square wave signal (sinusoidal or other wave form cannot be used). DIO2 can be configured as a 24 V level square wave frequency output. See *Firmware Manual*, parameter group 12.

Connector pitch 3.5 mm, wire size 1.5 mm<sup>2</sup>

As inputs:

24 V logic levels: "0" < 5 V, "1" > 15 V

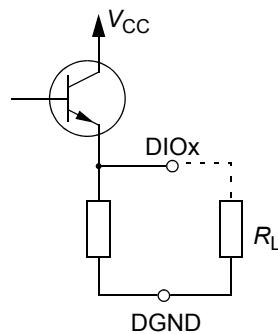
$R_{in}$ : 2.0 kohm

Filtering: 0.25 ms min.

As outputs:

Total output current limited by auxiliary voltage outputs to 200 mA

Output type: Open emitter

**Reference voltage for analog inputs +VREF and -VREF (XAI:1 and XAI:2)****Analog inputs AI1 and AI2 (XAI:4 ... XAI:7).**

Current/voltage input mode selection by jumpers. See page 88.

Connector pitch 3.5 mm, wire size 1.5 mm<sup>2</sup>  
10 V ±1% and -10 V ±1%,  $R_{load} > 1$  kohm

Connector pitch 3.5 mm, wire size 1.5 mm<sup>2</sup>

Current input: -20...20 mA,  $R_{in}$ : 100 ohm

Voltage input: -10...10 V,  $R_{in}$ : 200 kohm

Differential inputs, common mode ±20 V

Sampling interval per channel: 0.25 ms

Filtering: 0.25 ms min.

Resolution: 11 bit + sign bit

Inaccuracy: 1% of full scale range

**Analog outputs AO1 and AO2 (XAO)**

Connector pitch 3.5 mm, wire size 1.5 mm<sup>2</sup>

0...20 mA,  $R_{load} < 500$  ohm

Frequency range: 0...800 Hz

Resolution: 11 bit + sign bit

Inaccuracy: 2% of full scale range

**Drive to drive link (XD2D)**

Connector pitch 3.5 mm, wire size 1.5 mm<sup>2</sup>

Physical layer: RS-485

Termination by jumper

**Safe Torque Off connection (XSTO)**

Connector pitch 3.5 mm, wire size 1.5 mm<sup>2</sup>

For the drive to start, both connections (OUT1 to IN1, and OUT2 to IN2) must be closed

**Control panel / PC connection**

Connector: RJ-45

Cable length < 3 m