



### UL STANDARDS ON CABLING

To obey the UL (Underwriters Laboratories) regulations, use a UL-approved Class 1 copper wire with a minimum heat resistance of 60 or 75 °C (140 or 167 °F).

You can use the drive on a circuit that gives a maximum of 100 000 rms symmetrical amperes, and a maximum of 600 V, when the drive is protected by Class T and J fuses.

### The dimensions of the cables must agree with the requirements of the National Electric Code (NEC) and the Canadian Electric Code (CEC).

- The cables must be PVC-isolated.
- The maximum ambient temperature is +86 °F.
- The maximum temperature of the cable surface is +158 °F.
- Use only cables with a concentric copper shield.
- The maximum number of parallel cables is 9.

When you use parallel cables, make sure that you obey the requirements of the cross-sectional area and the maximum number of cables.

For important information on the requirements of the grounding conductor, see the NEC and CEC.

For the correction factors for each temperature, see the instructions of the NEC and CEC.

### CABLE AND FUSE SIZES, NORTH AMERICA

We recommend the fuse class T (UL & CSA). To make a selection of the fuse voltage rating, refer to the mains. Refer also to local regulations, cable installation conditions and cable specification. Do not use larger fuses than what is recommended.

Make sure that the operation time of the fuse is less than 0.4 seconds. The operation time agrees with the fuse type and the impedance of the supply circuit. For more information on faster fuses, speak to the manufacturer. The manufacturer can also recommend some high speed Class J (UL & CSA ) fuse ranges.

The solid state short circuit protection does not supply protection for the branch circuit of the of the AC drive. To supply the branch circuit protection, refer to the National Electric Code and the local regulations. Do not use other devices than fuses to supply branch circuit protection.

### The technical data of the AC drive

Technical item or function		Technical data
Mains connection	Input voltage U <sub>in</sub>	208-240V, 380-500V, 525-600V, 525-690V, -10%...+10%
	Input frequency	50-60 Hz, -5...+10%
	Connection to mains	Once per minute or less
	Starting delay	6 s (MR4 to MR6), 8 s (MR7 to MR9)
	Mains	<ul style="list-style-type: none"> <li>• Mains types: TN, TT, and IT</li> <li>• Short circuit current: the maximum short circuit current must be &lt; 100 kA.</li> </ul>
Motor connection	Output voltage	0-U <sub>in</sub>
	Continuous output current	IL: Ambient temperature max. +40 °C overload 1.1 x IL (1 min/10 min) IH: Ambient temperature max. +50 °C overload 1.5 x IH (1 min/10 min) IH in 600/690 V drives: Ambient temperature max. +40 °C overload 1.5 x IH (1 min/10 min)
	Output frequency	0-320 Hz (standard)
	Frequency resolution	0.01 Hz

\* = For the motor thermal memory and the memory retention function to obey the UL 61800-5-1 requirements, you must use the system software version FW0072V007 or a newer version. If you use an older system software version, you must install a motor overtemperature protection to obey the UL regulations.

Technical item or function		Technical data
Protections	Overvoltage trip limit	Mains voltage 240 V: 456 VDC Mains voltage 500 V: 911 VDC Mains voltage 600 V: 1094 VDC Mains voltage 690 V: 1258 VDC
	Undervoltage trip limit	Depends on mains voltage (0.8775 x mains voltage): Mains voltage 240 V: trip limit 211 VDC Mains voltage 400 V: trip limit 351 VDC Mains voltage 500 V: trip limit 438 VDC Mains voltage 525 V: trip limit 461 VDC Mains voltage 600 V: trip limit 527 VDC Mains voltage 690 V: trip limit 606 VDC
	Earth fault protection	Yes
	Mains supervision	Yes
	Motor phase supervision	Yes
	Overcurrent protection	Yes
	Unit overtemp. protection	Yes
	Motor overload protection	Yes. * The motor overload protection activates at 110% of the full load current.
	Motor stall protection	Yes
	Motor underload protection	Yes
	Short-circuit protection of +24 V and +10 V reference voltages	Yes

**The cable and fuse sizes in North America, mains voltage 208-240 V and 380-500 V**

Frame	Type	IL [A]	Fuse (Class T/J) [A]	Mains, motor and brake resistor* cable Cu [AWG]	Terminal cable size	
					Mains cable terminal [AWG]	Grounding terminal [AWG]
MR4	0003 2 / 0003 5	3.7 / 3.4	6	14	24-10	17-10
	0004 2 / 0004 5	4.8	6	14	24-10	17-10
	0006 2 / 0005 5	6.6 / 5.6	10	14	24-10	17-10
	0008 2 / 0008 5	8.0	10	14	24-10	17-10
	0011 2 / 0009 5	11.0 / 9.6	15	14	24-10	17-10
	0012 2 / 0012 5	12.5 / 12.0	20	14	24-10	17-10
MR5	0018 2 / 0016 5	18.0 / 16.0	25	10	20-5	17-8
	0024 2 / 0023 5	24.0 / 23.0	30	10	20-5	17-8
	0031 2 / 0031 5	31.0	40	8	20-5	17-8
MR6	0038 5	38.0	50	4	13-0	13-2
	0048 2 / 0046 5	48.0 / 46.0	60	4	13-0	13-2
	0062 2 / 0061 5 **	62.0 / 61.0	80	4	13-0	13-2
MR7	0075 2 / 0072 5	75.0 / 72.0	100	2	9-2/0	9-2/0
	0088 2 / 0087 5	88.0 / 87.0	110	1	9-2/0	9-2/0
	0105 2 / 0105 5	105.0	150	1/0	9-2/0	9-2/0
MR8	0140 2 / 0140 5	140.0	25	3/0	1 AWG-350 kcmil	1 AWG-350 kcmil
	0170 2 / 0170 5	170.0	30	250 kcmil	1 AWG-350 kcmil	1 AWG-350 kcmil
	0205 2 / 0205 5	205.0	40	350 kcmil	1 AWG-350 kcmil	1 AWG-350 kcmil
MR9	0261 2 / 0261 5	261.0	60	2x250 kcmil	1 AWG-350 kcmil	1 AWG-350 kcmil
	0310 2 / 0310 5	310.0	80	2x350 kcmil	1 AWG-350 kcmil	1 AWG-350 kcmil

\* = If you use a multi-conductor cable, 1 of the conductors of the brake resistor cable stays unconnected. It is also possible to use a single cable if you obey the minimum cross-sectional area of the cable.

\*\* = To obey the UL regulations with the 500 V drive, it is necessary to have cables with a + 90 °C (+194 °F) heat resistance.

**The cable and fuse sizes in North America, mains voltage 525-600 V**

Frame	Type	IL [A]	Fuse (Class T/J) [A]	Mains, motor and brake resistor* cable Cu [AWG]	Terminal cable size	
					Mains cable terminal [AWG]	Grounding terminal [AWG]
MR5 (600V)	0004 6	3.9	6	14	20-5	17-8
	0006 6	6.1	10	14	20-5	17-8
	0009 6	9.0	10	14	20-5	17-8
	0011 6	11.0	15	14	20-5	17-8
MR6	0007 7	7.5	10	12	13-0	13-2
	0010 7	10.0	15	12	13-0	13-2
	0013 7	13.5	20	12	13-0	13-2
	0018 6 / 0018 7	18.0	20	10	13-0	13-2
	0022 6 / 0022 7	22.0	25	10	13-0	13-2
	0027 7 / 0027 7	27.0	30	8	13-0	13-2
MR7	0034 6 / 0034 7	34.0	40	8	13-0	13-2
	0041 6 / 0041 7	41.0	50	6	9-2/0	9-2/0
	0052 6 / 0052 7	52.0	60	6	9-2/0	9-2/0
MR8	0062 6 / 0062 7	62.0	70	4	9-2/0	9-2/0
	0080 6 / 0080 7	80.0	90	1/0	1 AWG-350 kcmil	1 AWG-350 kcmil
	0100 6 / 0100 7	100.0	110	1/0	1 AWG-350 kcmil	1 AWG-350 kcmil
MR9	0125 6 / 0125 7	125.0	150	2/0	1 AWG-350 kcmil	1 AWG-350 kcmil
	0144 6 / 0144 7	144.0	175	3/0	1 AWG-350 kcmil	1 AWG-350 kcmil
	0170 7	170.0	200	4/0	1 AWG-350 kcmil	1 AWG-350 kcmil
	0208 6 / 0208 7	208.0	250	300 kcmil	1 AWG-350 kcmil	1 AWG-350 kcmil

\* = If you use a multi-conductor cable, 1 of the conductors of the brake resistor cable stays unconnected. It is also possible to use a single cable if you obey the minimum cross-sectional area of the cable.

**The tightening torques of the terminals**

Frame	Type	Tightening torque: the mains cable and motor cable terminals		Tightening torque: the grounding clamps for cable shield		Tightening torque: the grounding clamps for grounding conductor	
		Nm	lb-in.	Nm	lb-in.	Nm	lb-in.
MR4	0003 2 - 0012 2 0003 5 - 0012 5	0.5-0.6	4.5-5.3	1.5	13.3	2.0	17.7
MR5	0018 2 - 0031 2 0016 5 - 0031 5 0004 6 - 0011 6	1.2-1.5	10.6-13.3	1.5	13.3	2.0	17.7
MR6	0048 2 - 0062 2 0038 5 - 0061 5 0018 6 - 0034 6 0007 7 - 0034 7	10	88.5	1.5	13.3	2.0	17.7
MR7	0075 2 - 0105 2 0072 5 - 0105 5 0041 6 - 0062 6 0041 7 - 0062 7	8 * / 5.6 **	70.8 * / 49.6 **	1.5	13.3	8 * / 5.6 **	70.8 * / 49.6 **
MR8	0140 2 - 0205 2 0140 5 - 0205 5 0080 6 - 0125 6 0080 7 - 0125 7	30	266	1.5	13.3	20	177
MR9	0261 2 - 0310 2 0261 5 - 0310 5 0144 6 - 0208 6 0144 7 - 0208 7	40	266	1.5	13.3	20	177

\* = The tightening torque for a torx screw.

\*\* = The tightening torque for an Allen screw.