2.2.3 Cables and wiring length

(1) Applied cable size

Select the recommended cable size to ensure that a voltage drop will be 2% max.
If the wiring distance is long between the inverter and motor, a main circuit cable voltage drop will cause the motor torque to decrease especially at the output of a low frequency.
The following table indicates a selection example for the wiring length of 20m (65.62feet).

200V class (when input power supply is 220V)

Applicable Inverter Type	Terminal Screw Size *4	Tightening Torque N·m	Crimping Terminal		Cable Sizes								
					HIV, etc. (mm^2) *1				AWG/MCM *2		PVC, etc. (mm^2) *3		
			R/L1, S/L2, T/L3	U, V, W	R/L1, S/L2, T/L3	U, V, W	P/+, P1	Earth (Ground) cable	R/L1, S/L2, T/L3	U, V, W	R/L1, S/L2, T/L3	U, V, W	Earth (Ground) cable
FR-A720-00030 to 00110-NA	M4	1.5	2-4	2-4	2	2	2	2	14	14	2.5	2.5	2.5
FR-A720-00175-NA	M4	1.5	5.5-4	5.5-4	3.5	3.5	3.5	3.5	12	12	4	4	4
FR-A720-00240-NA	M4-M5	2.5	5.5-5	5.5-5	5.5	5.5	5.5	5.5	10	10	6	6	6
FR-A720-00330-NA	M4-M5	2.5	14-5	8-5	14	8	14	14	6	8	16	10	16
FR-A720-00460-NA	M5	2.5	14-5	14-5	14	14	14	14	6	6	16	16	16
FR-A720-00610-NA	M6	4.4	22-6	22-6	22	22	22	14	4	4	25	25	16
FR-A720-00760-NA	M8-M6	7.8	38-8	38-8	38	38	38	22	2	2	35	35	25
FR-A720-00900-NA	M8-M6	7.8	38-8	38-8	38	38	38	22	2	2	35	35	25
FR-A720-01150-NA	M8-M6	7.8	60-8	60-8	60	60	60	38	1/0	1/0	50	50	25
FR-A720-01450-NA	M10-M8	14.7	80-10	80-10	80	80	80	38	3/0	3/0	70	70	35
FR-A720-01750-NA	M10-M8	14.7	100-10	100-10	100	100	100	60	4/0	4/0	95	95	50
FR-A720-02150-NA	M12-M8	24.5	100-12	100-12	100	100	100	60	4/0	4/0	95	95	50
FR-A720-02880-NA	M12-M10	24.5	150-12	150-12	125	125	125	38	250	250	—	—	—
FR-A720-03460-NA	M12-M10	24.5	150-12	150-12	150	150	150	60	300	300	—	—	—

*1 For the 02150 or less, the cable size is that of the cable (HIV cable (600V class 2 vinyl-insulated cable) etc.) with continuous maximum permissible temperature of 75°C (167°F). Assumes that the ambient temperature is 50°C (122°F) or less and the wiring distance is 20m (65.62feet) or less.
For the 02880 or more, the recommended cable size is that of the cable (LMFC (heat resistant flexible cross-linked polyethylene insulated cable) etc.) with continuous maximum permissible temperature of 90°C (194°F). Assumes that the ambient temperature is 50°C (122°F) or less and wiring is performed in an enclosure.

*2 The recommended cable size is that of the cable (THHW cable) with continuous maximum permissible temperature of 75°C (167°F). Assumes that the ambient temperature is 40°C (104°F) or less and the wiring distance is 20m (65.62feet) or less.
(Selection example for use mainly in the United States.)

*3 For the 00610 or less, the recommended cable size is that of the cable (PVC cable) with continuous maximum permissible temperature of 70°C (158°F). Assumes that the ambient temperature is 40°C (104°F) or less and the wiring distance is 20m (65.62feet) or less.
For the 00760 or more, the recommended cable size is that of the cable (XLPE cable) with continuous maximum permissible temperature of 90°C (194°F). Assumes that the ambient temperature is 40°C (104°F) or less and wiring is performed in an enclosure.
(Selection example for use mainly in Europe.)

*4 The terminal screw size indicates the terminal size for R/L1, S/L2, T/L3, U, V, W, and a screw for earthing (grounding). For the 00240 and 00330, screw sizes are different (R1/L11, S1/L21, PR, PX - R/L1, S/L2, T/L3, U, V, W, a screw for earthing (grounding)). For the 00760 or more, screw sizes are different. (R/L1, S/L2, T/L3, U, V, W - a screw for earthing (grounding))

400V class (when input power supply is 440V)

Applicable Inverter Type	Terminal Screw Size *4	Tightening Torque N·m	Crimping Terminal		Cable Sizes								
					HIV, etc. (mm²) *1				AWG/MCM *2		PVC, etc. (mm²) *3		
			R/L1, S/L2, T/L3	U, V, W	R/L1, S/L2, T/L3	U, V, W	P/+, P1	Earth (Ground) Cable	R/L1, S/L2, T/L3	U, V, W	R/L1, S/L2, T/L3	U, V, W	Earth (Ground) Cable
FR-A740-00015 to 00090-NA	M4	1.5	2-4	2-4	2	2	2	2	14	14	2.5	2.5	2.5
FR-A740-00120-NA	M4	1.5	2-4	2-4	2	2	3.5	3.5	12	14	2.5	2.5	4
FR-A740-00170-NA	M4	1.5	5.5-4	5.5-4	3.5	3.5	3.5	3.5	12	12	4	4	4
FR-A740-00230-NA	M5	2.5	5.5-5	5.5-5	5.5	5.5	5.5	8	10	10	6	6	10
FR-A740-00310-NA	M5	2.5	8-5	8-5	8	8	8	8	8	8	10	10	10
FR-A740-000380-NA	M6	4.4	14-6	8-6	14	8	14	14	6	8	16	10	16
FR-A740-00430-NA	M6	4.4	14-6	14-6	14	14	22	14	6	6	16	16	16
FR-A740-00570-NA	M6	4.4	22-6	22-6	22	22	22	14	4	4	25	25	16
FR-A740-00710-NA	M8	7.8	22-8	22-8	22	22	22	14	4	4	25	25	16
FR-A740-00860-NA	M8	7.8	38-8	38-8	38	38	38	22	1	2	50	50	25
FR-A740-01100-NA	M8	7.8	60-8	60-8	60	60	60	22	1/0	1/0	50	50	25
FR-A740-01440-NA	M10	14.7	60-10	60-10	60	60	60	38	1/0	1/0	50	50	25
FR-A740-01880-NA	M10	14.7	60-10	60-10	60	60	80	38	3/0	3/0	50	50	25
FR-A740-02160-NA	M10-M12	14.7	80-10	80-10	80	80	80	38	3/0	3/0	70	70	35
FR-A740-02600-NA	M10-M12	14.7	100-10	100-10	100	100	100	38	4/0	4/0	95	95	50
FR-A740-03250-NA	M12-M10	24.5	150-12	150-12	125	150	150	38	250	250	120	120	70
FR-A740-03610-NA	M12-M10	24.5	150-12	150-12	150	150	150	38	300	300	150	150	95
FR-A740-04320-NA	M12-M10	24.5	100-12	100-12	2×100	2×100	2×100	60	2×4/0	2×4/0	2×95	2×95	95
FR-A740-04810-NA	M12-M10	24.5	100-12	100-12	2×100	2×100	2×125	60	2×4/0	2×4/0	2×95	2×95	95
FR-A740-05470-NA	M12-M10	24.5	150-12	150-12	2×125	2×125	2×125	60	2×250	2×250	2×120	2×120	120
FR-A740-06100-NA	M12-M10	24.5	150-12	150-12	2×150	2×150	2×150	100	2×300	2×300	2×150	2×150	150
FR-A740-06830-NA	M12-M10	24.5	C2-200	C2-200	2×200	2×200	2×200	100	2×350	2×350	2×185	2×185	2×95
FR-A740-07700-NA	M12-M10	24.5	C2-200	C2-200	2×200	2×200	2×200	100	2×400	2×400	2×185	2×185	2×95
FR-A740-08660-NA	M12-M10	24.5	C2-250	C2-250	2×250	2×250	2×250	100	2×500	2×500	2×240	2×240	2×120
FR-A740-09620-NA	M12-M10	24.5	C2-200	C2-250	3×200	2×250	3×200	2×100	2×500	2×500	2×240	2×240	2×120

*1 For the 01100 or less, the cable size is that of the cable (HIV cable (600V class 2 vinyl-insulated cable) etc.) with continuous maximum permissible temperature of 75°C (167°F). Assumes that the ambient temperature is 50°C (122°F) or less and the wiring distance is 20m (65.62feet) or less.
For the 01440 or more, the recommended cable size is that of the cable (LMFC (heat resistant flexible cross-linked polyethylene insulated cable) etc.) with continuous maximum permissible temperature of 90°C (194°F). Assumes that the ambient temperature is 50°C (122°F) or less and wiring is performed in an enclosure.

*2 For the 00860 or less, the recommended cable size is that of the cable (THHW cable) with continuous maximum permissible temperature of 75°C (167°F). Assumes that the ambient temperature is 40°C (104°F) or less and the wiring distance is 20m (65.62feet) or less.
For the 01100 or more, the recommended cable size is that of the cable (THHN cable) with continuous maximum permissible temperature of 90°C (194°F). Assumes that the ambient temperature is 40°C (104°F) or less and wiring is performed in an enclosure.
(Selection example for use mainly in the United States.)

*3 For the 00860 or less, the recommended cable size is that of the cable (PVC cable) with continuous maximum permissible temperature of 70°C (158°F). Assumes that the ambient temperature is 40°C (104°F) or less and the wiring distance is 20m (65.62feet) or less.
For the 01100 or more, the recommended cable size is that of the cable (XLPE cable) with continuous maximum permissible temperature of 90°C (194°F). Assumes that the ambient temperature is 40°C (104°F) or less and wiring is performed in an enclosure.
(Selection example for use mainly in Europe.)

*4 The terminal screw size indicates the terminal size for R/L1, S/L2, T/L3, U, V, W, and a screw for earthing (grounding).
For the 02160 and 02600, screw sizes are different (R/L1, S/L2, T/L3, U, V, W, a screw for earthing (grounding) - P/+ for option connection)
For the 03250 or more, screw sizes are different. (R/L1, S/L2, T/L3, U, V, W - a screw for earthing (grounding))

The line voltage drop can be calculated by the following formula:

$$\text{line voltage drop [V]} = \frac{\sqrt{3} \times \text{wire resistance[m}\Omega\text{/m]} \times \text{wiring distance[m]} \times \text{current[A]}}{1000}$$

Use a larger diameter cable when the wiring distance is long or when it is desired to decrease the voltage drop (torque reduction) in the low speed range.

CAUTION

- Tighten the terminal screw to the specified torque.
  A screw that has been tighten too loosely can cause a short circuit or malfunction.
  A screw that has been tighten too tightly can cause a short circuit or malfunction due to the unit breakage.
- Use crimping terminals with insulation sleeve to wire the power supply and motor.