

R88M-1□

1S servo motor

Simplified machine design and maintenance

- 23-bit resolution encoder
- Compact and small motor size
- Multi-turn encoder design without mechanics: 16-bit, 65536 turns
- Battery-free absolute multi-turn encoder or incremental encoder
- Pre-assembled motor cables
- Designed for easy EMC compliance

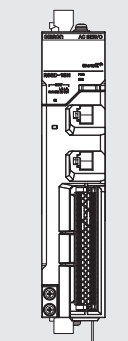
Ratings

- 230 VAC from 50 W to 1.5 kW
(rated torque from 0.159 to 8.59 Nm)
- 400 VAC from 400 W to 15 kW
(rated torque from 1.91 to 95.5 Nm)



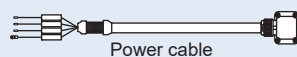
System configuration

(Refer to servo drive chapter)

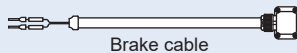


1S servo drive

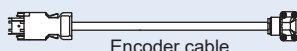
1S servo motor (Flange size 80 mm or less)



Power cable

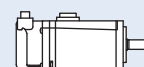


Brake cable



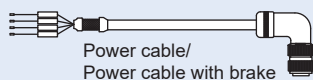
Encoder cable

SYSMAC
always in control

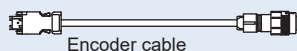


3000 rpm (50 W - 750 W)

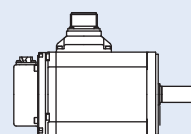
1S servo motor (Flange size 100 mm or more)



Power cable/
Power cable with brake



Encoder cable



3000 rpm (1 kW - 5 kW)
2000 rpm (400 W - 3 kW)
1500 rpm (4 kW - 15 kW)
1000 rpm (900 W - 3 kW)

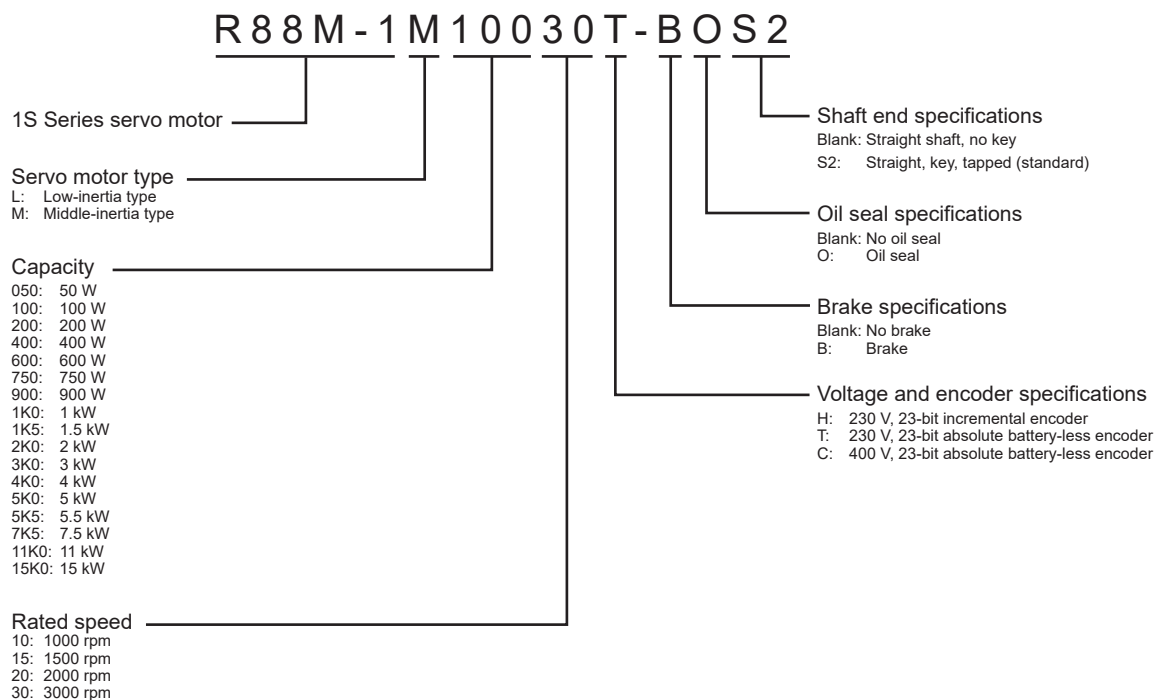
Servo motor / Servo drive combination

1S servo motor						1S servo drive
Appearance	Speed	Voltage	Rated torque	Capacity	Model	
	3000 min ⁻¹	230 V	0.159 Nm	50 W	R88M-1M05030T-□	R88D-1SN01H-ECT
			0.318 Nm	100 W	R88M-1M10030(H/T)-□	R88D-1SN01H-ECT
			0.637 Nm	200 W	R88M-1M20030(H/T)-□	R88D-1SN02H-ECT
			1.27 Nm	400 W	R88M-1M40030(H/T)-□	R88D-1SN04H-ECT
			2.39 Nm	750 W	R88M-1M75030(H/T)-□	R88D-1SN08H-ECT
			3.18 Nm	1 kW	R88M-1L1K030(H/T)-□	R88D-1SN15H-ECT
			4.77 Nm	1.5 kW	R88M-1L1K530(H/T)-□	R88D-1SN15H-ECT
		400 V	2.39 Nm	750 W	R88M-1L75030C-□	R88D-1SN10F-ECT
			3.18 Nm	1 kW	R88M-1L1K030C-□	R88D-1SN10F-ECT
			4.77 Nm	1.5 kW	R88M-1L1K530C-□	R88D-1SN15F-ECT
			6.37 Nm	2 kW	R88M-1L2K030C-□	R88D-1SN20F-ECT
			9.55 Nm	3 kW	R88M-1L3K030C-□	R88D-1SN30F-ECT
			12.7 Nm	4 kW	R88M-1L4K030C-□	R88D-1SN55F-ECT
			15.9 Nm	5 kW	R88M-1L5K030C-□	R88D-1SN55F-ECT
	2000 min ⁻¹	230 V	4.77 Nm	1 kW	R88M-1M1K020(H/T)-□	R88D-1SN15H-ECT
			7.16 Nm	1.5 kW	R88M-1M1K520(H/T)-□	R88D-1SN15H-ECT
		400 V	1.91 Nm	400 W	R88M-1M40020C-□	R88D-1SN06F-ECT
			2.86 Nm	600 W	R88M-1M60020C-□	R88D-1SN06F-ECT
			4.77 Nm	1 kW	R88M-1M1K020C-□	R88D-1SN10F-ECT
			7.16 Nm	1.5 kW	R88M-1M1K520C-□	R88D-1SN15F-ECT
			9.55 Nm	2 kW	R88M-1M2K020C-□	R88D-1SN20F-ECT
			14.3 Nm	3 kW	R88M-1M3K020C-□	R88D-1SN30F-ECT
	1500 min ⁻¹	400 V	25.5 Nm	4 kW	R88M-1M4K015C-□	R88D-1SN55F-ECT
			35 Nm	5.5 kW	R88M-1M5K515C-□	R88D-1SN55F-ECT
			47.8 Nm	7.5 kW	R88M-1M7K515C-□	R88D-1SN75F-ECT
			70 Nm	11 kW	R88M-1M11K015C-□	R88D-1SN150F-ECT
	1000 min ⁻¹	400 V	95.5 Nm	15 kW	R88M-1M15K015C-□	R88D-1SN150F-ECT
		230 V	8.59 Nm	900 W	R88M-1M90010T-□	R88D-1SN15H-ECT
			8.59 Nm	900 W	R88M-1M90010C-□	R88D-1SN10F-ECT
			19.1 Nm	2 kW	R88M-1M2K010C-□	R88D-1SN20F-ECT
			28.7 Nm	3 kW	R88M-1M3K010C-□	R88D-1SN30F-ECT

Note: For servo motor and cable part numbers, refer to ordering information at the end of this chapter.

Note: Refer to the servo drive chapter for drive options selection and detailed specifications.

Type designation



Specifications

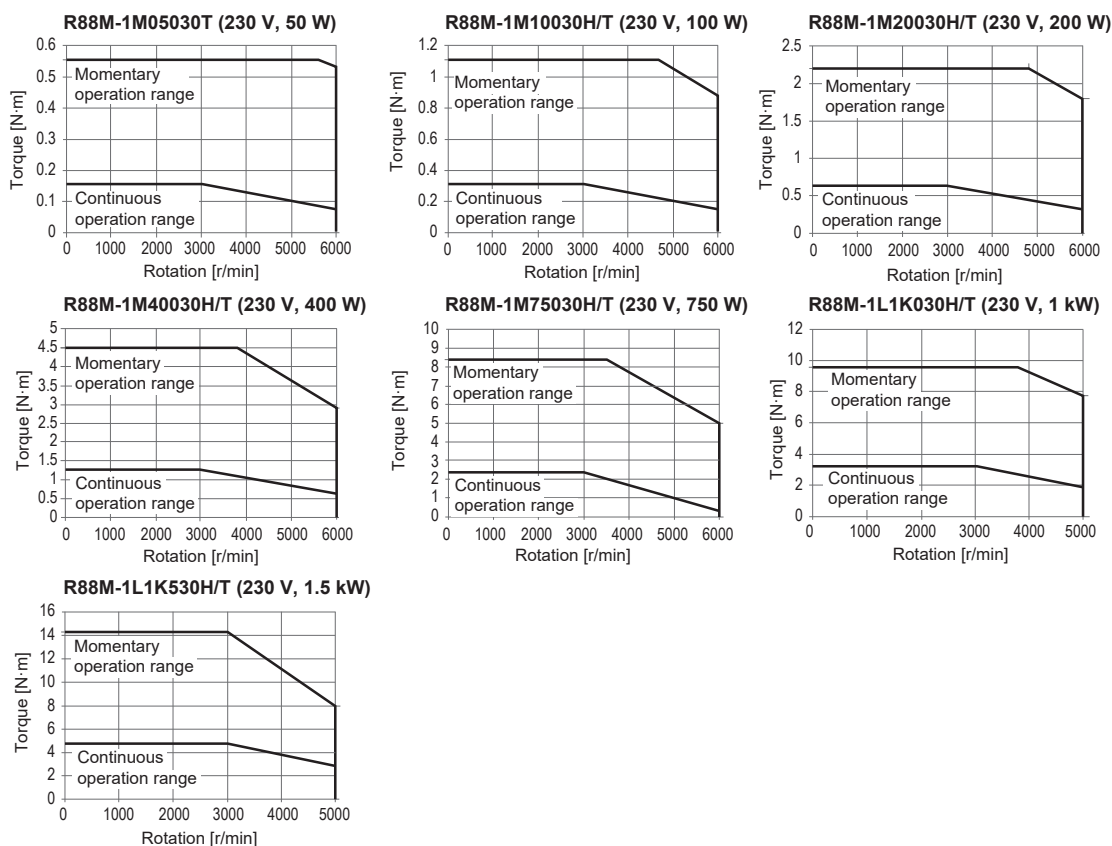
3000 r/min servo motors, 230 V

Ratings and specifications

Voltage			230 V							
Servo motor model: R88M-1□		23-bit incremental encoder	—	M10030H-□	M20030H-□	M40030H-□	M75030H-□	L1K030H-□	L1K530H-□	
		23-bit absolute encoder	M05030T-□	M10030T-□	M20030T-□	M40030T-□	M75030T-□	L1K030T-□	L1K530T-□	
Rated output		W	50	100	200	400	750	1000	1500	
Rated torque		Nm	0.159	0.318	0.637	1.27	2.39	3.18	4.77	
Instantaneous peak torque		Nm	0.56	1.11	2.2	4.5	8.4	9.55	14.3	
Rated current		A (rms)	0.67	0.84	1.5	2.5	4.6	5.2	8.8	
Instantaneous max. current		A (rms)	2.6	3.1	5.6	9.1	16.9	16.9	28.4	
Rated speed		min ⁻¹	3000							
Max. speed		min ⁻¹	6000						5000	
Torque constant		N·m/A	0.25	0.42	0.48	0.56	0.59	0.67	0.58	
Rotor moment of inertia		kg·m ² x10 ⁻⁴ (without brake)	0.0418	0.089	0.2232	0.4452	1.8242	2.1042		
		kg·m ² x10 ⁻⁴ (with brake)	0.0496	0.0968	0.2832	0.5052	2.0742	2.5542		
Electrical time constant		ms	0.67	0.83	2.4	2.6	3.3	5.9	6.1	
Allowable radial load		N	68			245		490		
Allowable thrust load		N	58			88		196		
Weight		kg (without brake)	0.35	0.52	1.0	1.4	2.9	5.7		
		kg (with brake)	0.59	0.77	1.3	1.9	3.9	7.4		
Brake specifications	Excitation voltage ^{*1}		24 VDC ±10%							
	Holding brake moment of inertia J		kg·m ² x10 ⁻⁴ 0.0078			0.06		0.25	0.45	
	Current consumption (at 20°C)		A 0.27			0.32		0.37	0.70	
	Static friction torque		Nm (minimum) 0.32			1.37		2.55	9.3	
Basic specifications	Insulation class		Type F							
	Ambient operating/storage temperature		0 to 40°C/-20 to 65°C							
	Ambient operating/storage humidity		20 to 90% (non-condensing)							
	Atmosphere		No corrosive gases							
	Insulation resistance		10 MΩ min. at 500 VDC between the power terminals and FG terminal							
	Vibration resistance		Vibration acceleration of 49 m/s ²							
	Impact resistance		Acceleration of 98 m/s ² max. 3 times each in X, Y and Z directions							
	Enclosure		IP67 (except for through-shaft parts when connectors are inserted)							

^{*1} This is a non-excitable brake (it is released when excitation voltage is applied).

Torque-speed characteristics



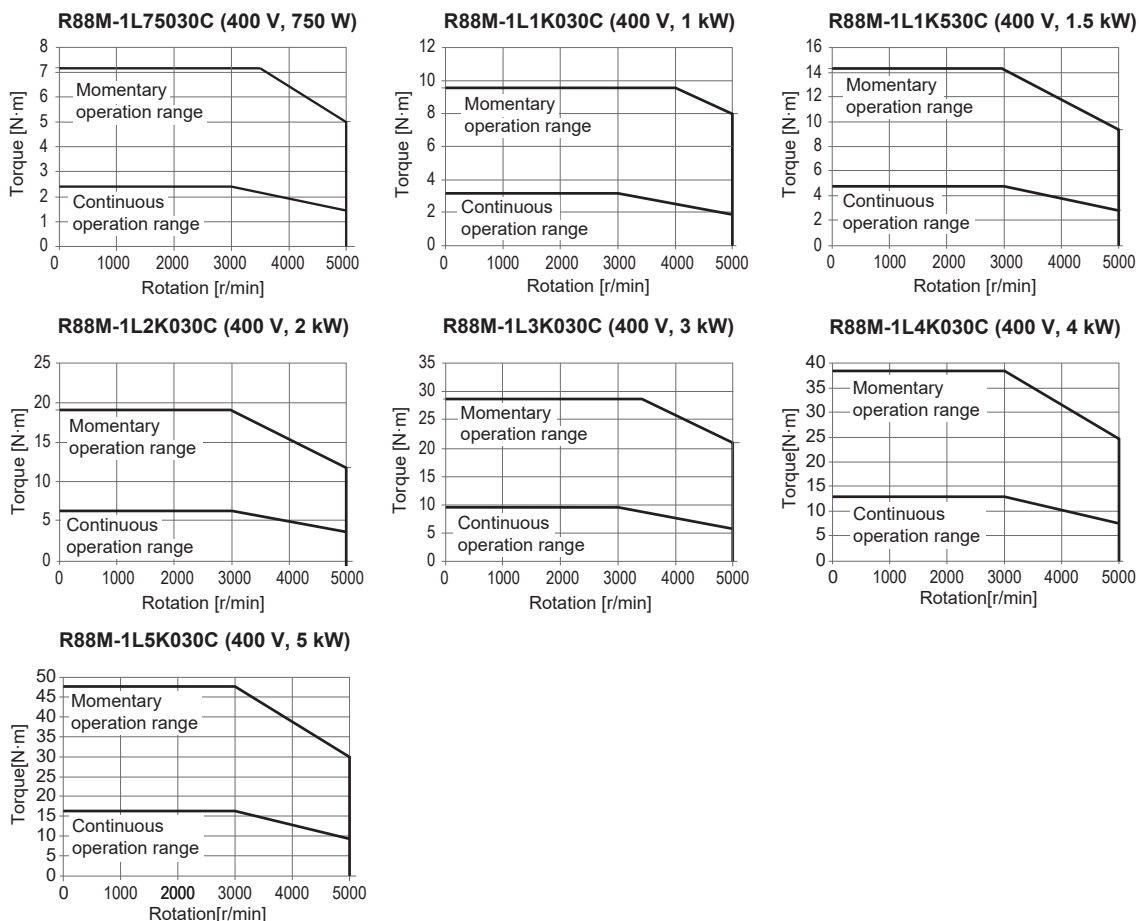
3000 r/min servo motors, 400 V

Ratings and specifications

Voltage		400 V						
Servo motor model: R88M-1□	23-bit absolute encoder	L75030C-□	L1K030C-□	L1K530C-□	L2K030C-□	L3K030C-□	L4K030C-□	L5K030C-□
Rated output	W	750	1000	1500	2000	3000	4000	5000
Rated torque	Nm	2.39	3.18	4.77	6.37	9.55	12.7	15.9
Instantaneous peak torque	Nm	7.16	9.55	14.3	19.1	28.7	38.2	47.7
Rated current	A (rms)	3.0	3.0	4.5	6.3	8.7	12.8	13.6
Instantaneous max. current	A (rms)	9.6	9.6	14.1	19.8	27.7	42.4	
Rated speed	min ⁻¹	3000						
Max. speed	min ⁻¹	5000						
Torque constant	N·m/A	0.91	1.17	1.17	1.15	1.23	1.11	1.32
Rotor moment of inertia	kg·m ² ×10 ⁻⁴ (without brake)	1.3042	2.1042		2.4042	6.8122	8.8122	10.6122
	kg·m ² ×10 ⁻⁴ (with brake)	1.7542	2.5542		2.8542	7.3122	11.3122	13.1122
Electrical time constant	ms	4.3	5.9		6.3	11.0	12.0	13.0
Allowable radial load	N	490						880
Allowable thrust load	N	196						343
Weight	kg (without brake)	4.1	5.7		6.4	11.5	13.5	16.0
	kg (with brake)	5.8	7.4		8.1	12.5	16.0	18.5
Brake specifications	Excitation voltage ^{*1}	24 VDC ±10%						
	Holding brake moment of inertia J	kg·m ² ×10 ⁻⁴	0.45			0.50	2.5	
	Current consumption (at 20°C)	A	0.70			0.66	0.6	
	Static friction torque	Nm (minimum)	9.3			12.0	16.0	
Basic specifications	Insulation class	Type F						
	Ambient operating/storage temperature	0 to 40°C/-20 to 65°C						
	Ambient operating/storage humidity	20 to 90% (non-condensing)						
	Atmosphere	No corrosive gases						
	Insulation resistance	10 MΩ min. at 500 VDC between the power terminals and FG terminal						
	Vibration resistance	Vibration acceleration of 49 m/s ²						
	Impact resistance	Acceleration of 98 m/s ² max. 3 times each in X, Y and Z directions						
	Enclosure	IP67 (except for through-shaft parts when connectors are inserted)						

^{*1} This is a non-excitable brake (it is released when excitation voltage is applied).

Torque-speed characteristics



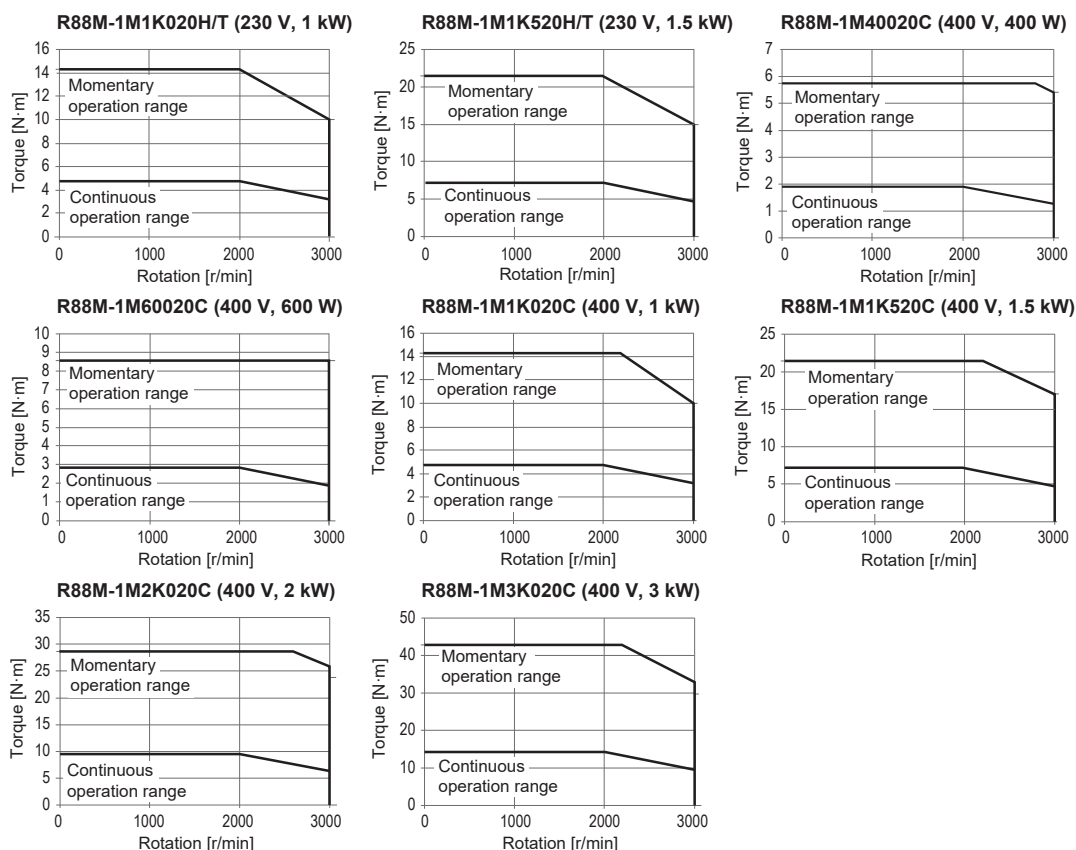
2000 r/min servo motors, 230 V/400 V

Ratings and specifications

Voltage		230 V		400 V						
Servo motor model: R88M-1□		23-bit incremental encoder	M1K020H-□	M1K520H-□						
		23-bit absolute encoder	M1K020T-□	M1K520T-□	M40020C-□	M60020C-□	M1K020C-□	M1K520C-□	M2K020C-□	M3K020C-□
Rated output		W	1000	1500	400	600	1000	1500	2000	3000
Rated torque		Nm	4.77	7.16	1.91	2.86	4.77	7.16	9.55	14.3
Instantaneous peak torque		Nm	14.3	21.5	5.73	8.59	14.3	21.5	28.7	43.0
Rated current		A (rms)	5.2	8.6	1.1	1.6	2.9	4.1	5.7	8.6
Instantaneous max. current		A (rms)	16.9	28.4	3.9	5.5	9.4	13.5	19.8	28.3
Rated speed		min ⁻¹	2000							
Max. speed		min ⁻¹	3000							
Torque constant		N·m/A	0.93	0.83	1.75	1.84	1.69	1.75		1.74
Rotor moment of inertia		kg·m ² ×10 ⁻⁴ (without brake)	6.0042	9.0042	2.5042	3.9042	6.0042	9.0042	12.2042	15.3122
		kg·m ² ×10 ⁻⁴ (with brake)	6.5042	9.5042	2.8472	4.2472	6.5042	9.5042	12.7042	17.4122
Electrical time constant		ms	13.0	15.0	6.8	7.8	13.0	13.0	14.0	20.0
Allowable radial load		N	490							784
Allowable thrust load		N	196							343
Weight		kg (without brake)	6.6	8.5	3.9	4.7	6.6	8.5	10.0	12.0
		kg (with brake)	8.6	10.5	4.8	5.8	8.6	10.5	12.0	15.0
Brake specifications	Excitation voltage ^{*1}		24 VDC ±10%							
	Holding brake moment of inertia J		kg·m ² ×10 ⁻⁴		0.5		0.343		0.5	
	Current consumption (at 20°C)		A		0.51		0.3		0.51	
	Static friction torque		Nm (minimum)		9.0		3.92		9.0	
Basic specifications	Insulation class		Type F							
	Ambient operating/storage temperature		0 to 40°C/-20 to 65°C							
	Ambient operating/storage humidity		20 to 90% (non-condensing)							
	Atmosphere		No corrosive gases							
	Insulation resistance		10 MΩ min. at 500 VDC between the power terminals and FG terminal							
	Vibration resistance		Vibration acceleration of 49 m/s ²							
	Impact resistance		Acceleration of 98 m/s ² max. 3 times each in X, Y and Z directions							
	Enclosure		IP67 (except for through-shaft parts when connectors are inserted)							

^{*1} This is a non-excitable brake (it is released when excitation voltage is applied).

Torque-speed characteristics



1500 r/min servo motors, 400 V

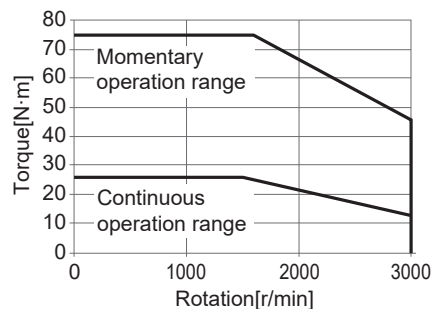
Ratings and specifications

Voltage		400 V				
Servo motor model: R88M-1□	23-bit absolute encoder	M4K015C-□	M5K515C-□	M7K515C-□	M11K015C-□	M15K015C-□
Rated output	W	4,000	5,500	7,500	11,000	15,000
Rated torque	Nm	25.5	35.0	47.8	70	95.5
Instantaneous peak torque	Nm	75	95	119	175	224
Rated current	A (rms)	12.8	14.0	22.0	31.4	33.3
Instantaneous max. current	A (rms)	42.4		56.5	80.7	81.2
Rated speed	min ⁻¹	1,500				
Max. speed	min ⁻¹	3,000			2,000	
Torque constant	N·m/A (rms)	2.07	2.68	2.49	2.6	3.27
Rotor moment of inertia	kg·m ² x10 ⁻⁴ (without brake)	54.0122	77.0122	113.0122	229.0122	340.0122
	kg·m ² x10 ⁻⁴ (with brake)	60.0122	83.0122	118.0122	253.0122	365.0122
Electrical time constant	ms	18	19	23	29	
Allowable radial load	N	1,200	1,470		2,500	
Allowable thrust load	N	343	490		686	
Weight	kg (without brake)	21	29	39	63	85
	kg (with brake)	26	34	45	73	99
Brake specifications	Excitation voltage ^{*1}	24 VDC ±10%				
	Holding brake moment of inertia J	6.0		5.0	24.0	25.0
	Current consumption (at 20°C)	1.0		1.4	1.7	0.92
	Static friction torque	Nm (minimum)	32 min.	42 min.	54.9 min.	90 min.
Basic specifications	Insulation class	Class F				
	Ambient operating/storage temperature	0 to 40°C/-20 to 65°C				
	Ambient operating/storage humidity	20 to 90% (non-condensing)				
	Atmosphere	No corrosive gases				
	Insulation resistance	10 MΩ min. at 500 VDC between the power terminals and FG terminal				
	Vibration resistance	Vibration acceleration of 49 m/s ²				
	Impact resistance	Acceleration of 98 m/s ² max. 3 times each in X, Y and Z directions				
	Enclosure	IP67 (except for through-shaft parts when connectors are inserted)				

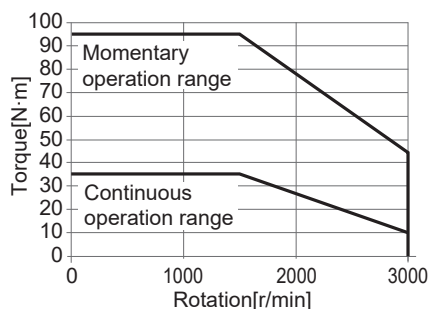
*1 This is a non-excitable brake (it is released when excitation voltage is applied).

Torque-speed characteristics

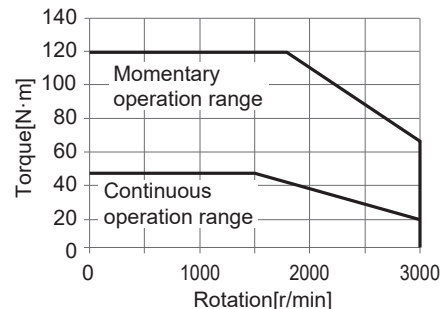
R88M-1M4K015C (400 V, 4 kW)



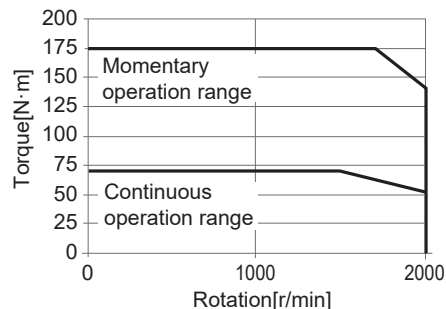
R88M-1M5K515C (400 V, 5.5 kW)



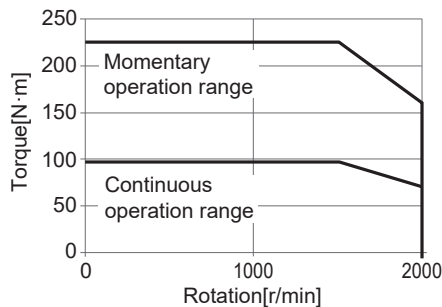
R88M-1M7K515C (400 V, 7.5 kW)



R88M-1M11K015C (400 V, 11 kW)



R88M-1M15K015C (400 V, 15 kW)



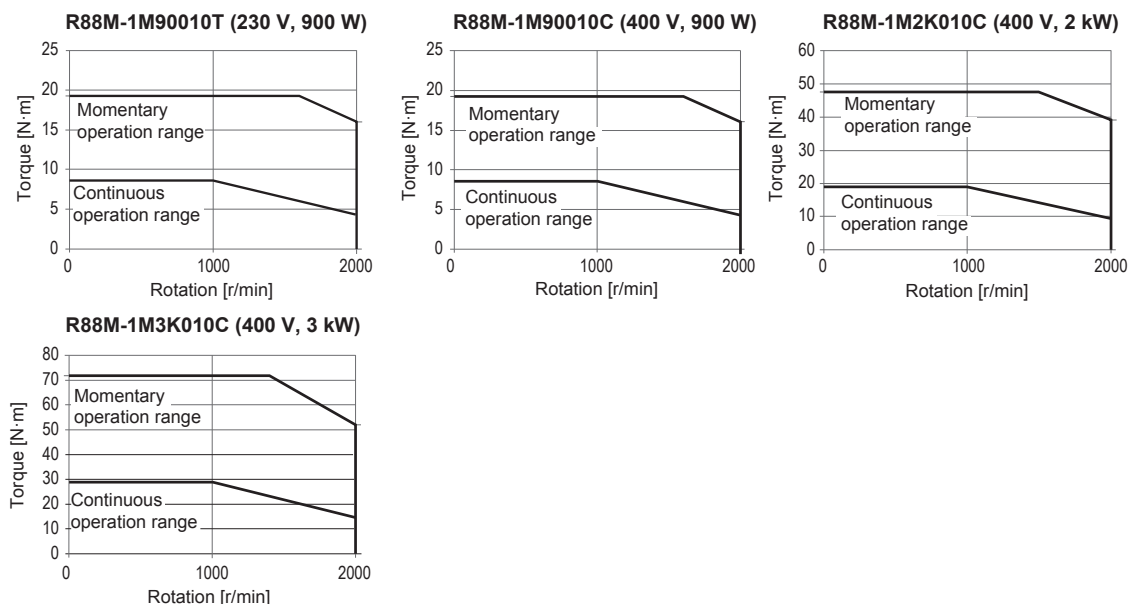
1000 r/min servo motors, 230 V/400 V

Ratings and specifications

Voltage		230 V		400 V	
Servo motor model: R88M-1□		23-bit absolute encoder		M90010T-□	M90010C-□
Rated output		W		2000	3000
Rated torque		Nm		19.1	28.7
Instantaneous peak torque		Nm		47.7	71.7
Rated current		A (rms)		7.1	10.6
Instantaneous max. current		A (rms)		19.5	27.7
Rated speed		min ⁻¹		1000	
Max. speed		min ⁻¹		2000	
Torque constant		N·m/A		1.28	2.41
Rotor moment of inertia		kg·m ² ×10 ⁻⁴ (without brake)		40.0122	68.0122
		kg·m ² ×10 ⁻⁴ (with brake)		45.1122	73.1122
Electrical time constant		ms		15.0	13.0
Allowable radial load		N		686	1176
Allowable thrust load		N		196	490
Weight		kg (without brake)		8.5	18.0
		kg (with brake)		10.5	22.0
Brake specifications	Excitation voltage ^{*1}		24 VDC ±10%		
	Holding brake moment of inertia J		kg·m ² ×10 ⁻⁴		5.1
	Current consumption (at 20°C)		A		0.51
	Static friction torque		Nm (minimum)		9.0
Basic specifications	Insulation class		Type F		
	Ambient operating/storage temperature		0 to 40°C/-20 to 65°C		
	Ambient operating/storage humidity		20 to 90% (non-condensing)		
	Atmosphere		No corrosive gases		
	Insulation resistance		10 MΩ min. at 500 VDC between the power terminals and FG terminal		
	Vibration resistance		Vibration acceleration of 49 m/s ²		
	Impact resistance		Acceleration of 98 m/s ² max. 3 times each in X, Y and Z directions		
	Enclosure		IP67 (except for through-shaft parts when connectors are inserted)		

^{*1} This is a non-excitable brake (it is released when excitation voltage is applied).

Torque-speed characteristics



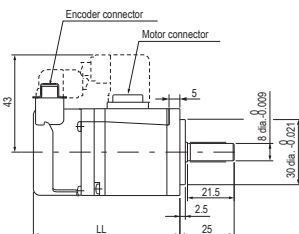
Dimensions

Servo motors

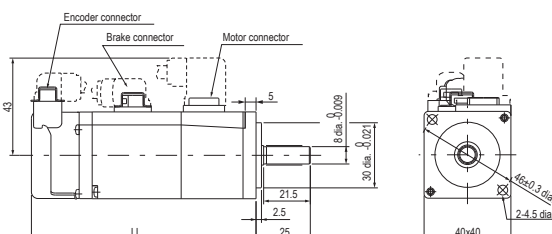
Type 3000 r/min motors (230 V, 50 W)

Dimensions (mm)	Without brake	With brake	Approx. mass (kg)	
Model: R88M-1□	LL	LL	Without brake	With brake
M05030T-□S2	67.5	103.5	0.35	0.59

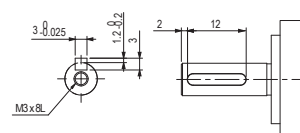
Models without brake



Models with brake



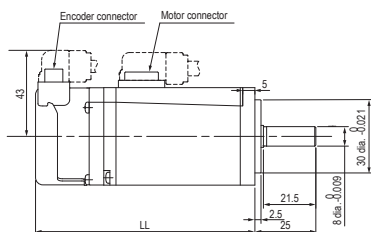
Shaft end



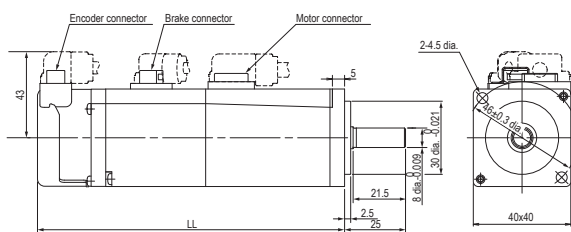
Type 3000 r/min motors (230 V, 100 W)

Dimensions (mm)	Without brake	With brake	Approx. mass (kg)	
Model: R88M-1□	LL	LL	Without brake	With brake
M10030(H/T)-□S2	90	126	0.52	0.77

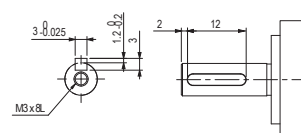
Models without brake



Models with brake



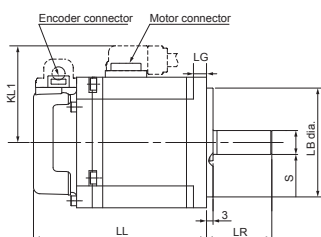
Shaft end



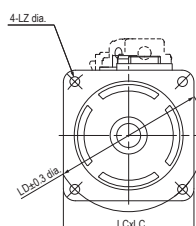
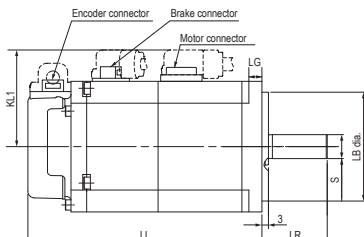
Type 3000 r/min motors (230 V, 200 W to 750 W)

Dimensions (mm)	Without brake		With brake		LR	Flange surface					Shaft end							Approx. mass (kg)	
Model: R88M-□	LL	KL1	LL	KL1		LB	LC	LD	LG	LZ	S	QA	QK	W	U	T	Tap x depth	Without brake	With brake
M20030(H/T)-□S2	79.5	52.6	107.5	52.6	30	50 dia. $0_{-0.025}^0$	60	70	6	4.5	11 dia. $0_{-0.011}^0$	2	20	$4_{-0.03}^0$	$1.5_{-0.2}^0$	4	M4 x 10L	1.0	1.3
M40030(H/T)-□S2	105.5		133.5								14 dia. $0_{-0.011}^0$			$5_{-0.03}^0$	$2_{-0.2}^0$	5	M5 x 12L	1.4	1.9
M75030(H/T)-□S2	117.3	63.2	153	63.2	35	70 dia. $0_{-0.03}^0$	80	90	8	6	19 dia. $0_{-0.013}^0$	3	24	$6_{-0.03}^0$	$2.5_{-0.2}^0$	6		2.9	3.9

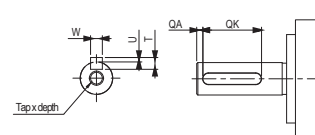
Models without brake



Models with brake



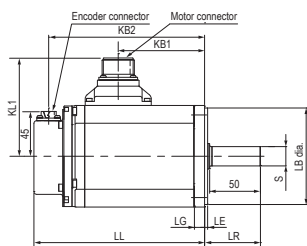
Shaft end



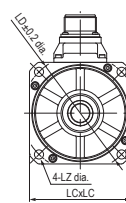
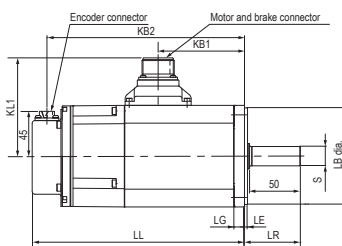
Type 3000 r/min motors (230 V, 1 kW to 1.5 kW / 400 V, 750 W to 3 kW)

Dimensions (mm)	Without brake				With brake				LR	Flange surface						Shaft end						Approx. mass (kg)																
Model: R88M-1□	LL	KB1	KB2	KL1	LL	KB1	KB2	KL1		LB	LC	LD	LE	LG	LZ	S	QA	QK	W	U	T	Tap x depth	Without brake	With brake														
L1K030(H/T)-□S2	168	85	153	97	209	85	194	97	55	95 dia. ⁰ _{-0.035}	100	115	3	10	9	19 dia. ⁰ _{-0.013}	3	42	6 ⁰ _{-0.03}	2.5 ⁰ _{-0.2}	6	M5 x 12L	5.7	7.4														
L1K530(H/T)-□S2																																						
L75030C-□S2	139	56	124			180	56	165															104														4.1	5.8
L1K030C-□S2	168	85	153			209	85	194																													5.7	7.4
L1K530C-□S2																																						
L2K030C-□S2	179	96	164		220	96	205																6.4	8.1														
L3K030C-□S2	184	112	169	116	230	112	215	119		110 dia. ⁰ _{-0.035}	130	145	4	12	9	22 dia. ⁰ _{-0.013}			8 ⁰ _{-0.036}	3 ⁰ _{-0.4}	7		11.5	12.5														

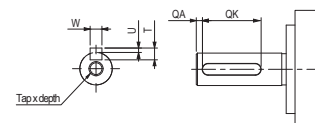
Models without brake



Models with brake



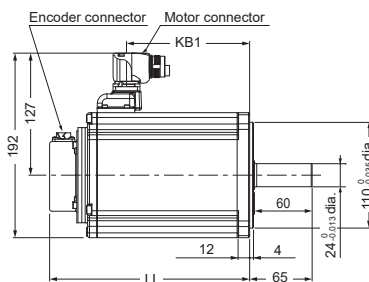
Shaft end



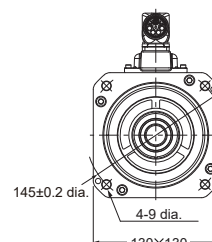
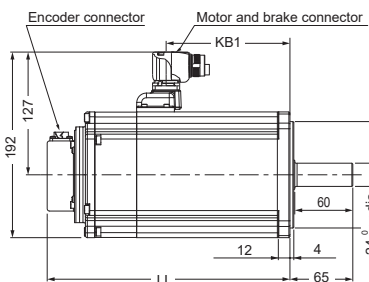
Type 3000 r/min motors (400 V, 4 kW to 5 kW)

Dimensions (mm)	Without brake		With brake		Approx. mass (kg)	
Model: R88M-1□	LL	KB1	LL	KB1	Without brake	With brake
L4K030C-□S2	208	128	251	128	13.5	16.0
L5K030C-□S2	232	152	275	152	16.0	18.5

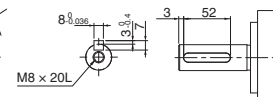
Models without brake



Models with brake



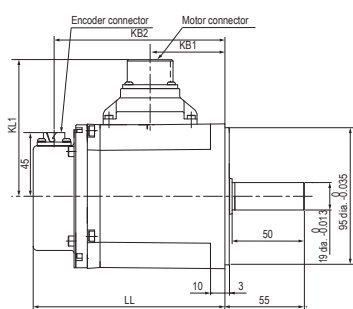
Shaft end



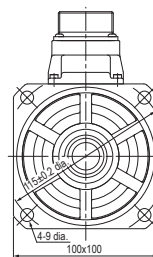
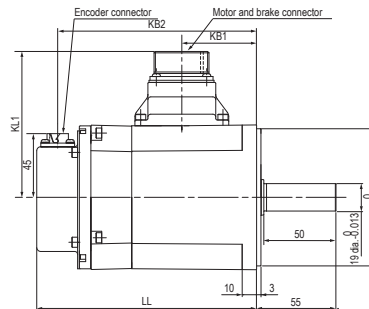
Type 2000 r/min motors (400 V, 400 W to 600 W)

Dimensions (mm)	Without brake				With brake				Approx. mass (kg)	
Model: R88M-1□	LL	KB1	KB2	KL1	LL	KB1	KB2	KL1	Without brake	With brake
M40020C-□S2	134.8	52	120.5	97	152.3	52	138	104	3.9	4.8
M60020C-□S2	151.8	69	137.5		169.3	69	155		4.7	5.8

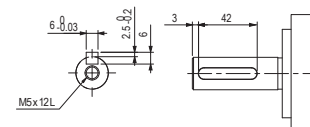
Models without brake



Models with brake



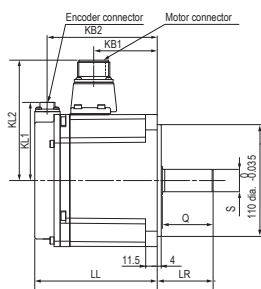
Shaft end



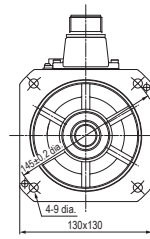
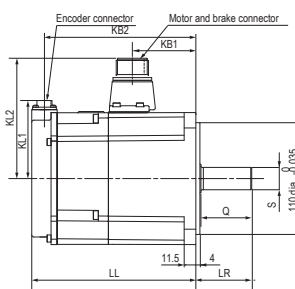
Type 2000 r/min motors (230 V, 1 kW to 1.5 kW / 400 V, 1 kW to 3 kW)

Dimensions (mm)	Without brake					With brake					LR	Shaft end										Approx. mass (kg)	
Model: R88M-1□	LL	KB1	KB2	KL1	KL2	LL	KB1	KB2	KL1	KL2		S	Q	QA	QK	W	U	T	Tap x depth			Without brake	With brake
M1K020(H/T)-□S2	120.5	63	109	76	118	162	63	149	76	118	55	22 dia. $0_{-0.013}^0$	50	3	42	8 $0_{-0.036}^0$	3 $0_{-0.4}^0$	7	M5 x 12L			6.6	8.6
M1K520(H/T)-□S2	138	79	125			179	79	166														8.5	10.5
M1K020C-□S2	120.5	63	109			162	64	150		119												6.6	8.6
M1K520C-□S2	138	79	125			179	81	167														8.5	10.5
M2K020C-□S2	160	98	148			201	99	189														10.0	12.0
M3K020C-□S2	191	119	176	45	116	234	118	219	45	119	65	24 dia. $0_{-0.013}^0$	60		52				M8 x 20L			12.0	15.0

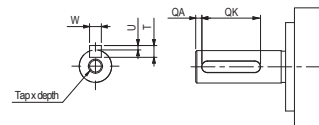
Models without brake



Models with brake



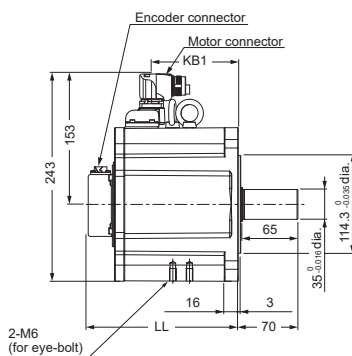
Shaft end



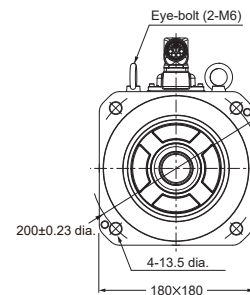
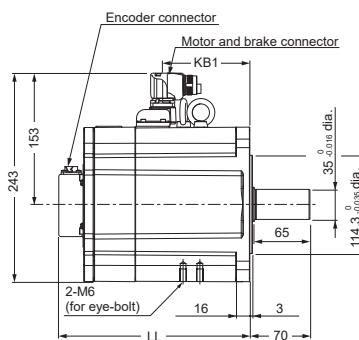
Type 1500 r/min motors (400 V, 4 kW)

Dimensions (mm)	Without brake		With brake		Approx. mass (kg)	
Model: R88M-1□	LL	KB1	LL	KB1	Without brake	With brake
M4K015C-□S2	176	102	223	102	21.0	26.0

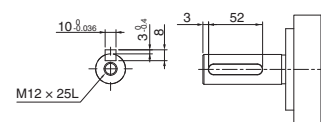
Models without brake



Models with brake



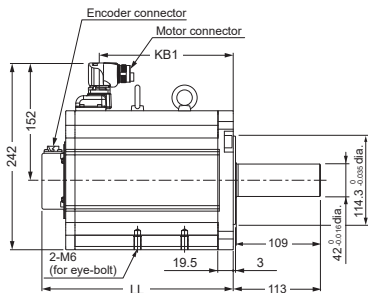
Shaft end



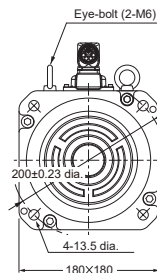
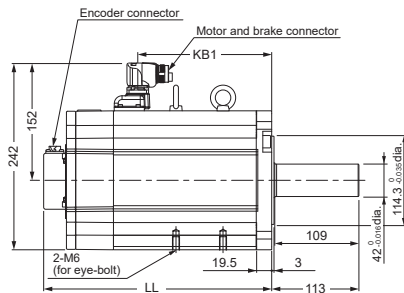
Type 1500 r/min motors (400 V, 5.5 kW to 7.5 kW)

Dimensions (mm)	Without brake		With brake		Approx. mass (kg)	
Model: R88M-1□	LL	KB1	LL	KB1	Without brake	With brake
M5K515C-□S2	248	174	295	174	29.0	34.0
M7K515C-□S2	295	221	352	221	39.0	45.0

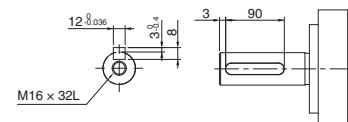
Models without brake



Models with brake

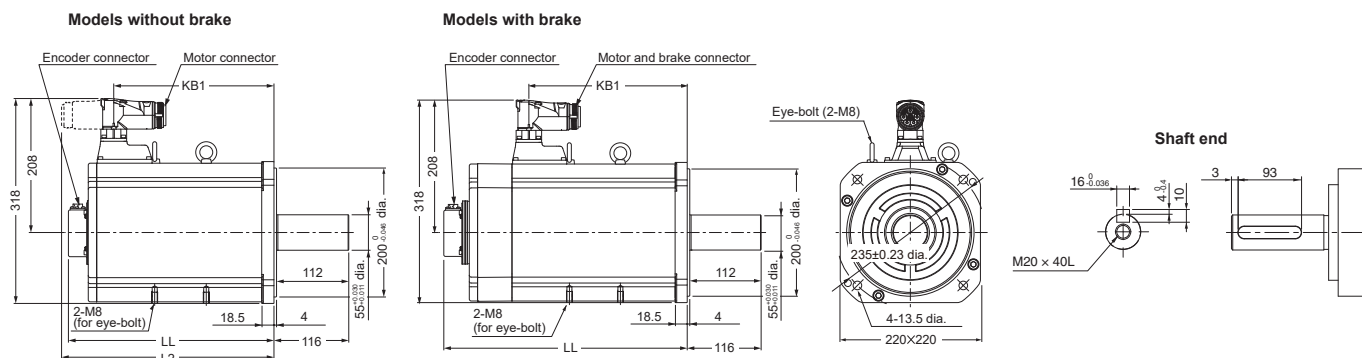


Shaft end



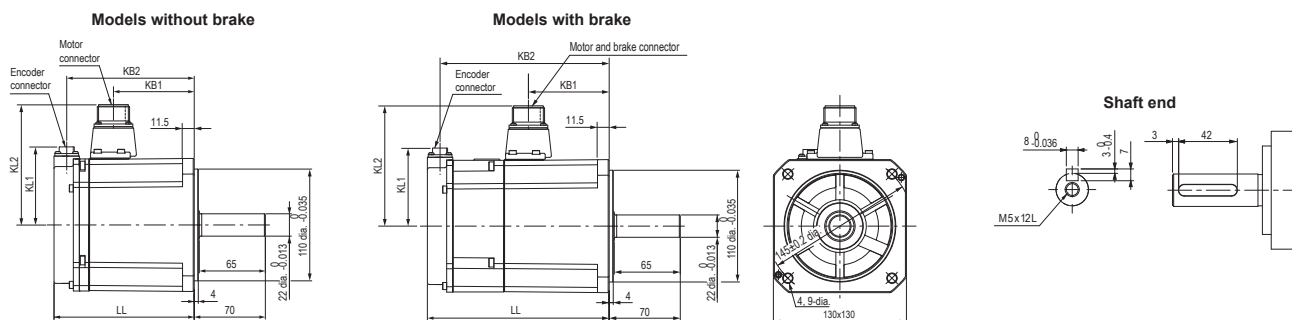
Type 1500 r/min motors (400 V, 11 kW to 15 kW)

Dimensions (mm)	Without brake			With brake		Approx. mass (kg)	
Model: R88M-1□	LL	L2	KB1	LL	KB1	Without brake	With brake
M11K015C-□S2	319	330	249	382	249	63.0	73.0
M15K015C-□S2	397	408	327	493	327	85.0	99.0



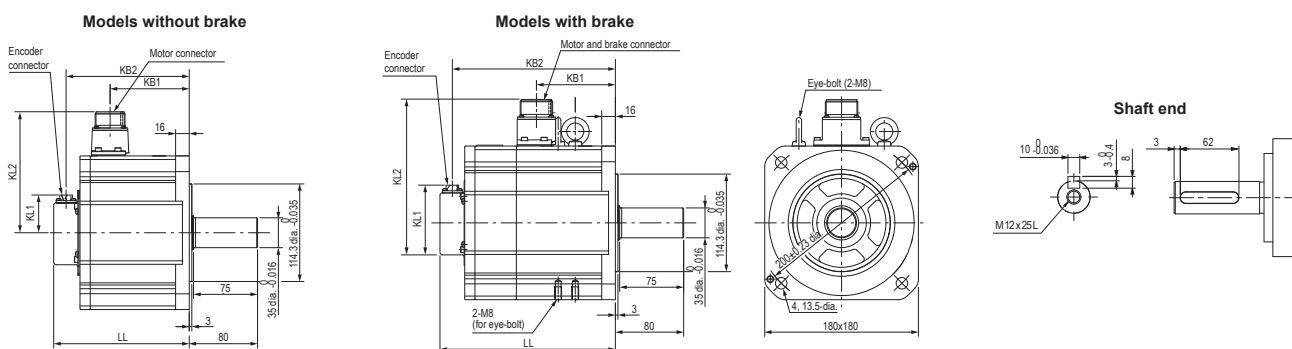
Type 1000 r/min motors (230 V, 900 W / 400 V, 900 W)

Dimensions (mm)	Without brake					With brake					Approx. mass (kg)	
Model: R88M-1□	LL	KB1	KB2	KL1	KL2	LL	KB1	KB2	KL1	KL2	Without brake	With brake
M90010T-□S2	138	79	125	76	118	179	79	166	76	118	8.5	10.5
M90010C-□S2							81	167		117		

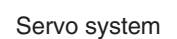


Type 1000 r/min motors (400 V, 2 kW)

Dimensions (mm)	Without brake					With brake					Approx. mass (kg)	
Model: R88M-1□	LL	KB1	KB2	KL1	KL2	LL	KB1	KB2	KL1	KL2	Without brake	With brake
M2K010C-□S2	159	93	145	45	141	206	92	191	45	144	18.0	22.0



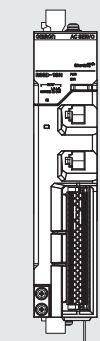
Dimensions (mm)	Without brake					With brake					Approx. mass (kg)	
Model: R88M-1□	LL	KB1	KB2	KL1	KL2	LL	KB1	KB2	KL1	KL2	Without brake	With brake
M3K010C-□S2	228	162	213	45	141	274	162	260	45	144	28.0	33.0



Ordering information

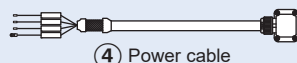
(Refer to servo drive chapter)

②
Drive options

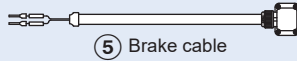


1S servo drive

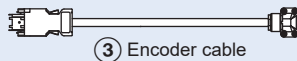
1S servo motor (Flange size 80 mm or less)



④ Power cable



⑤ Brake cable

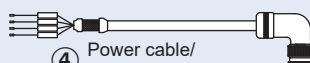


③ Encoder cable

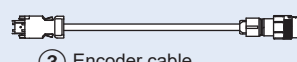


3000 rpm (50 W - 750 W)

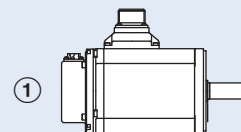
1S servo motor (Flange size 100 mm or more)



④ Power cable/
Power cable with brake



③ Encoder cable



3000 rpm (1 kW - 5 kW)
2000 rpm (400 W - 3 kW)
1500 rpm (4 kW - 15 kW)
1000 rpm (900 W - 3 kW)

Servo motors

① Select motor from R88M-1□ family using motor tables in next pages.

Servo drives

② Refer to the 1S servo drive chapter for detailed drive specifications and selection of drive accessories.

Servo motors

Servo motors 3000 r/min (100 W to 5 kW)

Symbol	Specifications						Model	Compatible 1S servo drive
	Voltage	Encoder and design		Rated torque	Capacity	Flange size		
①	230 V	Incremental encoder (23-bit)	Without brake	0.318 Nm	100 W	40 mm	R88M-1M10030H-S2	R88D-1SN01H-ECT
				0.637 Nm	200 W	60 mm	R88M-1M20030H-S2	R88D-1SN02H-ECT
				1.27 Nm	400 W		R88M-1M40030H-S2	R88D-1SN04H-ECT
				2.39 Nm	750 W	80 mm	R88M-1M75030H-S2	R88D-1SN08H-ECT
				3.18 Nm	1 kW	100 mm	R88M-1L1K030H-S2	R88D-1SN15H-ECT
				4.77 Nm	1.5 kW		R88M-1L1K530H-S2	R88D-1SN15H-ECT
			With brake	0.318 Nm	100 W	40 mm	R88M-1M10030H-BS2	R88D-1SN01H-ECT
				0.637 Nm	200 W	60 mm	R88M-1M20030H-BS2	R88D-1SN02H-ECT
				1.27 Nm	400 W		R88M-1M40030H-BS2	R88D-1SN04H-ECT
				2.39 Nm	750 W	80 mm	R88M-1M75030H-BS2	R88D-1SN08H-ECT
				3.18 Nm	1 kW	100 mm	R88M-1L1K030H-BS2	R88D-1SN15H-ECT
				4.77 Nm	1.5 kW		R88M-1L1K530H-BS2	R88D-1SN15H-ECT
		Absolute encoder (23-bit)	Without brake	0.159 Nm	50 W	40 mm	R88M-1M05030T-S2	R88D-1SN01H-ECT
				0.318 Nm	100 W		R88M-1M10030T-S2	R88D-1SN01H-ECT
				0.637 Nm	200 W	60 mm	R88M-1M20030T-S2	R88D-1SN02H-ECT
				1.27 Nm	400 W		R88M-1M40030T-S2	R88D-1SN04H-ECT
				2.39 Nm	750 W	80 mm	R88M-1M75030T-S2	R88D-1SN08H-ECT
				3.18 Nm	1 kW	100 mm	R88M-1L1K030T-S2	R88D-1SN15H-ECT
				4.77 Nm	1.5 kW		R88M-1L1K530T-S2	R88D-1SN15H-ECT
			With brake	0.159 Nm	50 W	40 mm	R88M-1M05030T-BS2	R88D-1SN01H-ECT
				0.318 Nm	100 W		R88M-1M10030T-BS2	R88D-1SN01H-ECT
				0.637 Nm	200 W	60 mm	R88M-1M20030T-BS2	R88D-1SN02H-ECT
				1.27 Nm	400 W		R88M-1M40030T-BS2	R88D-1SN04H-ECT
				2.39 Nm	750 W	80 mm	R88M-1M75030T-BS2	R88D-1SN08H-ECT
				3.18 Nm	1 kW	100 mm	R88M-1L1K030T-BS2	R88D-1SN15H-ECT
				4.77 Nm	1.5 kW		R88M-1L1K530T-BS2	R88D-1SN15H-ECT

Symbol	Specifications					Model	Compatible 1S servo drive		
	Voltage	Encoder and design		Rated torque	Capacity			Flange size	
①	400 V	Absolute encoder (23-bit)	Without brake	2.39 Nm	750 W	100 mm	R88M-1L75030C-S2	R88D-1SN10F-ECT	
				3.18 Nm	1 kW		R88M-1L1K030C-S2	R88D-1SN10F-ECT	
		Straight shaft with key and tap		4.77 Nm	1.5 kW		130 mm	R88M-1L1K530C-S2	R88D-1SN15F-ECT
				6.37 Nm	2 kW			R88M-1L2K030C-S2	R88D-1SN20F-ECT
				9.55 Nm	3 kW	R88M-1L3K030C-S2		R88D-1SN30F-ECT	
				12.7 Nm	4 kW	R88M-1L4K030C-S2		R88D-1SN55F-ECT	
				15.9 Nm	5 kW	R88M-1L5K030C-S2		R88D-1SN55F-ECT	
		With brake	2.39 Nm	750 W	100 mm	R88M-1L75030C-BS2	R88D-1SN10F-ECT		
			3.18 Nm	1 kW		R88M-1L1K030C-BS2	R88D-1SN10F-ECT		
			4.77 Nm	1.5 kW		R88M-1L1K530C-BS2	R88D-1SN15F-ECT		
			6.37 Nm	2 kW		R88M-1L2K030C-BS2	R88D-1SN20F-ECT		
			9.55 Nm	3 kW	130 mm	R88M-1L3K030C-BS2	R88D-1SN30F-ECT		
			12.7 Nm	4 kW		R88M-1L4K030C-BS2	R88D-1SN55F-ECT		
			15.9 Nm	5 kW		R88M-1L5K030C-BS2	R88D-1SN55F-ECT		

Servo motors 2000 r/min (400 W to 3 kW)

Symbol	Specifications						Model	Compatible 1S servo drive			
	Voltage	Encoder and design		Rated torque	Capacity	Flange size					
①	230 V	Incremental encoder (23-bit)	Without brake	4.77 Nm	1 kW	130 mm	R88M-1M1K020H-S2	R88D-1SN15H-ECT			
				7.16 Nm	1.5 kW		R88M-1M1K520H-S2	R88D-1SN15H-ECT			
		Straight shaft with key and tap	With brake	4.77 Nm	1 kW		R88M-1M1K020H-BS2	R88D-1SN15H-ECT			
				7.16 Nm	1.5 kW		R88M-1M1K520H-BS2	R88D-1SN15H-ECT			
		Absolute encoder (23-bit)	Without brake	4.77 Nm	1 kW		R88M-1M1K020T-S2	R88D-1SN15H-ECT			
				7.16 Nm	1.5 kW		R88M-1M1K520T-S2	R88D-1SN15H-ECT			
		Straight shaft with key and tap	With brake	4.77 Nm	1 kW		R88M-1M1K020T-BS2	R88D-1SN15H-ECT			
				7.16 Nm	1.5 kW		R88M-1M1K520T-BS2	R88D-1SN15H-ECT			
		400 V	Straight shaft with key and tap	Without brake	1.91 Nm		400 W	100 mm	R88M-1M40020C-S2	R88D-1SN06F-ECT	
					2.86 Nm		600 W		R88M-1M60020C-S2	R88D-1SN06F-ECT	
							4.77 Nm	1 kW	130 mm	R88M-1M1K020C-S2	R88D-1SN10F-ECT
							7.16 Nm	1.5 kW		R88M-1M1K520C-S2	R88D-1SN15F-ECT
	9.55 Nm			2 kW		R88M-1M2K020C-S2	R88D-1SN20F-ECT				
	14.3 Nm			3 kW		R88M-1M3K020C-S2	R88D-1SN30F-ECT				
	With brake			1.91 Nm	400 W	100 mm	R88M-1M40020C-BS2	R88D-1SN06F-ECT			
				2.86 Nm	600 W		R88M-1M60020C-BS2	R88D-1SN06F-ECT			
				4.77 Nm	1 kW	130 mm	R88M-1M1K020C-BS2	R88D-1SN10F-ECT			
				7.16 Nm	1.5 kW		R88M-1M1K520C-BS2	R88D-1SN15F-ECT			
	9.55 Nm			2 kW	R88M-1M2K020C-BS2		R88D-1SN20F-ECT				
	14.3 Nm			3 kW	R88M-1M3K020C-BS2		R88D-1SN30F-ECT				

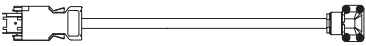
Servo motors 1500 r/min (4 kW to 15 kW)

Symbol	Specifications						Model	Compatible 1S servo drive
	Voltage	Encoder and design		Rated torque	Capacity	Flange size		
①	400 V	Absolute encoder (23-bit)	Without brake	25.5 Nm	4 kW	180 mm	R88M-1M4K015C-S2	R88D-1SN55F-ECT
				35 Nm	5.5 kW		R88M-1M5K515C-S2	R88D-1SN55F-ECT
		Straight shaft with key and tap		47.8 Nm	7.5 kW		R88M-1M7K515C-S2	R88D-1SN75F-ECT
				70 Nm	11 kW	220 mm	R88M-1M11K015C-S2	R88D-1SN150F-ECT
				95.5 Nm	15 kW		R88M-1M15K015C-S2	R88D-1SN150F-ECT
		With brake	25.5 Nm	4 kW	180 mm	R88M-1M4K015C-BS2	R88D-1SN55F-ECT	
			35 Nm	5.5 kW		R88M-1M5K515C-BS2	R88D-1SN55F-ECT	
			47.8 Nm	7.5 kW		R88M-1M7K515C-BS2	R88D-1SN75F-ECT	
			70 Nm	11 kW	220 mm	R88M-1M11K015C-BS2	R88D-1SN150F-ECT	
			95.5 Nm	15 kW		R88M-1M15K015C-BS2	R88D-1SN150F-ECT	

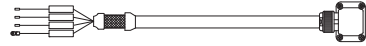
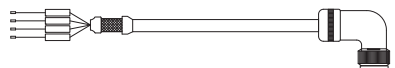
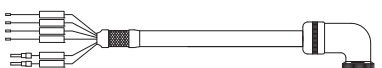
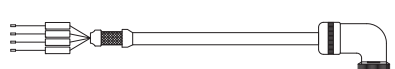
Servo motors 1000 r/min (900 W to 3 kW)

Symbol	Specifications					Model	Compatible 1S servo drive		
	Voltage	Encoder and design		Rated torque	Capacity			Flange size	
①	230 V	Absolute encoder (23-bit)	Without brake	8.59 Nm	900 W	130 mm	R88M-1M90010T-S2	R88D-1SN15H-ECT	
			With brake	8.59 Nm	900 W		R88M-1M90010T-BS2	R88D-1SN15H-ECT	
	400 V	Straight shaft with key and tap	Without brake	8.59 Nm	900 W	180 mm	R88M-1M90010C-S2	R88D-1SN10F-ECT	
				19.1 Nm	2 kW		R88M-1M2K010C-S2	R88D-1SN20F-ECT	
				28.7 Nm	3 kW		R88M-1M3K010C-S2	R88D-1SN30F-ECT	
			With brake	8.59 Nm	900 W	130 mm	R88M-1M90010C-BS2	R88D-1SN10F-ECT	
				19.1 Nm	2 kW		180 mm	R88M-1M2K010C-BS2	R88D-1SN20F-ECT
				28.7 Nm	3 kW			R88M-1M3K010C-BS2	R88D-1SN30F-ECT

Encoder cables

Symbol	Specifications	Model	Appearance
③	Encoder cable for servo motors R88M-1M05030T-□ R88M-1M(100/200/400/750)30(H/T)-□	1.5 m R88A-CR1A001-5CF-E	
		3 m R88A-CR1A003CF-E	
		5 m R88A-CR1A005CF-E	
		10 m R88A-CR1A010CF-E	
		15 m R88A-CR1A015CF-E	
		20 m R88A-CR1A020CF-E	
	Encoder cable for servo motors R88M-1L(1K0/1K5)30(H/T)-□ R88M-1L(750/1K0/1K5/2K0/3K0/4K0/5K0)30C-□ R88M-1M(1K0/1K5)20(H/T)-□ R88M-1M(400/600/1K0/1K5/2K0/3K0)20C-□ R88M-1M(4K0/5K5/7K5/11K0/15K0)15C-□ R88M-1M90010T-□ R88M-1M(900/2K0/3K0)10C-□	1.5 m R88A-CR1B001-5NF-E	
		3 m R88A-CR1B003NF-E	
		5 m R88A-CR1B005NF-E	
		10 m R88A-CR1B010NF-E	
		15 m R88A-CR1B015NF-E	
		20 m R88A-CR1B020NF-E	

Power cables

Symbol	Specifications			Model	Appearance			
④	For 230 V servo motors R88M-1M05030T-□S2 Note: For servo motors with brake R88M-1M05030T-BS2, the separate brake cable R88A-CA1A□□□BFR is needed.	Without brake	3 m	R88A-CA1A003SFR				
			5 m	R88A-CA1A005SFR				
			10 m	R88A-CA1A010SFR				
			15 m	R88A-CA1A015SFR				
			20 m	R88A-CA1A020SFR				
	For 230 V servo motors R88M-1M(100/200/400/750)30(H/T)-□S2 Note: For servo motors with brake R88M-1M(100/200/400/750)30(H/T)-BS2, the separate brake cable R88A-CA1A□□□BF-E is needed.	Without brake	1.5 m	R88A-CA1A001-5SF-E				
			3 m	R88A-CA1A003SF-E				
			5 m	R88A-CA1A005SF-E				
			10 m	R88A-CA1A010SF-E				
			15 m	R88A-CA1A015SF-E				
			20 m	R88A-CA1A020SF-E				
	For 230 V servo motors R88M-1L(1K0/1K5)30(H/T)-□S2 R88M-1M(1K0/1K5)20(H/T)-□S2 R88M-1M90010T-□S2	Without brake	1.5 m	R88A-CA1C001-5SF-E				
			3 m	R88A-CA1C003SF-E				
			5 m	R88A-CA1C005SF-E				
			10 m	R88A-CA1C010SF-E				
			15 m	R88A-CA1C015SF-E				
			20 m	R88A-CA1C020SF-E				
		With brake	1.5 m	R88A-CA1C001-5BF-E				
			3 m	R88A-CA1C003BF-E				
			5 m	R88A-CA1C005BF-E				
			10 m	R88A-CA1C010BF-E				
			15 m	R88A-CA1C015BF-E				
			20 m	R88A-CA1C020BF-E				
			For 400 V servo motors R88M-1L(750/1K0/1K5/2K0)30C-□S2 R88M-1M(400/600/1K0/1K5/2K0)20C-□S2 R88M-1M90010C-□S2	Without brake		1.5 m	R88A-CA1C001-5SF-E	
						3 m	R88A-CA1C003SF-E	
	5 m	R88A-CA1C005SF-E						
	10 m	R88A-CA1C010SF-E						
15 m	R88A-CA1C015SF-E							
20 m	R88A-CA1C020SF-E							
With brake	1.5 m	R88A-CA1E001-5BF-E						
	3 m	R88A-CA1E003BF-E						
	5 m	R88A-CA1E005BF-E						
	10 m	R88A-CA1E010BF-E						
	15 m	R88A-CA1E015BF-E						
	20 m	R88A-CA1E020BF-E						

Symbol	Specifications		Model	Appearance
④	For 400 V servo motors R88M-1L3K030C-□S2 R88M-1M3K020C-□S2 R88M-1M(2K0/3K0)10C-□S2	Without brake	1.5 m R88A-CA1E001-5SF-E	
			3 m R88A-CA1E003SF-E	
			5 m R88A-CA1E005SF-E	
			10 m R88A-CA1E010SF-E	
			15 m R88A-CA1E015SF-E	
			20 m R88A-CA1E020SF-E	
		With brake	1.5 m R88A-CA1E001-5BF-E	
			3 m R88A-CA1E003BF-E	
			5 m R88A-CA1E005BF-E	
			10 m R88A-CA1E010BF-E	
			15 m R88A-CA1E015BF-E	
			20 m R88A-CA1E020BF-E	
	For 400 V servo motors ^{*1} R88M-1L(4K0/5K0)30C-□S2 R88M-1M(4K0/5K5)15C-□S2	Without brake	3 m R88A-CA1G003SF	
			5 m R88A-CA1G005SF	
			10 m R88A-CA1G010SF	
			15 m R88A-CA1G015SF	
			20 m R88A-CA1G020SF	
		With brake	3 m R88A-CA1G003BF	
			5 m R88A-CA1G005BF	
			10 m R88A-CA1G010BF	
			15 m R88A-CA1G015BF	
			20 m R88A-CA1G020BF	
	For 400 V servo motors R88M-1M7K515C-□S2	Without brake	3 m R88A-CA1H003SF	
			5 m R88A-CA1H005SF	
			10 m R88A-CA1H010SF	
			15 m R88A-CA1H015SF	
			20 m R88A-CA1H020SF	
		With brake	3 m R88A-CA1H003BF	
			5 m R88A-CA1H005BF	
			10 m R88A-CA1H010BF	
			15 m R88A-CA1H015BF	
			20 m R88A-CA1H020BF	
	For 400 V servo motors R88M-1M(11K0/15K0)15C-□S2	Without brake	3 m R88A-CA1J003SF	
			5 m R88A-CA1J005SF	
			10 m R88A-CA1J010SF	
			15 m R88A-CA1J015SF	
			20 m R88A-CA1J020SF	
		With brake	3 m R88A-CA1J003BF	
			5 m R88A-CA1J005BF	
			10 m R88A-CA1J010BF	
			15 m R88A-CA1J015BF	
			20 m R88A-CA1J020BF	

^{*1} Refer to the "Using R88A-CA1G power cables" technical note when using multiple cables in the same duct.

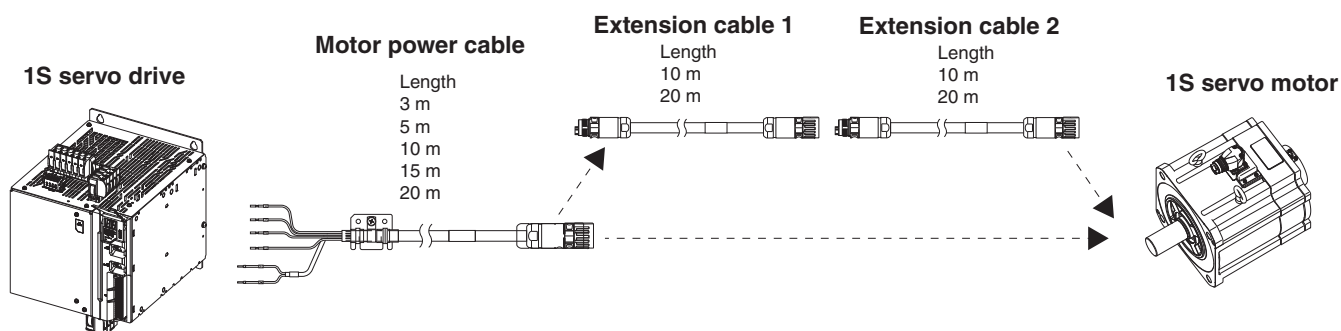
Extension power cables (for 400 V, 4 kW to 15 kW servo motors)

Symbol	Specifications		Model	Appearance
④	R88M-1L(4K0/5K0)30C-□S2 R88M-1M(4K0/5K5)15C-□S2	10 m	R88A-CA1GE10BF	
		20 m	R88A-CA1GE20BF	
	R88M-1M7K515C-□S2	10 m	R88A-CA1HE10BF	
		20 m	R88A-CA1HE20BF	
	R88M-1M(11K0/15K0)15C-□S2	10 m	R88A-CA1JE10BF	
		20 m	R88A-CA1JE20BF	

Combinations of Motor power cables and Extension power cables

The table below lists the combinations of cables that can be used to extend the motor power cable for a servomotor of 4 kW or more to more than 20 m.

Use the motor power cable and extension power cable in a specified combination. Not doing so may cause fire, equipment damage, or operation failure.



Length				Combination
Total	Motor power cable	Extension cable 1	Extension cable 2	
3	3	—	—	Motor power cable only
5	5	—	—	Motor power cable only
10	10	—	—	Motor power cable only
15	15	—	—	Motor power cable only
20	20	—	—	Motor power cable only
30	20	10	—	Motor power cable + extension cable 1
40	20	20	—	Motor power cable + extension cable 1
50	20	10	20	Motor power cable + extension cable 1 + extension cable 2 ^{*1}

^{*1} A 20 m extension cable 1 and a 10 m extension cable 2 can also be used.

Brake cables (for 230 V, 50 W to 750 W servo motors)

Symbol	Specifications	Model		Appearance
⑤	Brake cable only For 230 V servo motors with brake R88M-1M05030T-BS2	3 m	R88A-CA1A003BFR	
		5 m	R88A-CA1A005BFR	
		10 m	R88A-CA1A010BFR	
		15 m	R88A-CA1A015BFR	
		20 m	R88A-CA1A020BFR	
	Brake cable only For 230 V servo motors with brake R88M-1M(100/200/400/750)30(H/T)-BS2	1.5 m	R88A-CA1A001-5BF-E	
		3 m	R88A-CA1A003BF-E	
		5 m	R88A-CA1A005BF-E	
		10 m	R88A-CA1A010BF-E	
		15 m	R88A-CA1A015BF-E	
		20 m	R88A-CA1A020BF-E	

Connectors for encoder, power and brake cables

Specifications		Applicable servo motor	Model
Connectors for encoder cables	Drive side (CN2)	All models	R88A-CN101R
	Motor side	R88M-1M05030T-□ R88M-1M(100/200/400/750)30(H/T)-□ R88M-1L(1K0/1K5)30(H/T)-□ R88M-1L(750/1K0/1K5/2K0/3K0/4K0/5K0)30C-□ R88M-1M(1K0/1K5)20(H/T)-□ R88M-1M(400/600/1K0/1K5/2K0/3K0)20C-□ R88M-1M(4K0/5K5/7K5/11K0/15K0)15C-□ R88M-1M90010T-□ R88M-1M(900/2K0/3K0)10C-□	R88A-CN104R
Connectors for power cables	Motor side	R88M-1M(100/200/400/750)30(H/T)-_S2	R88A-CN111A
		R88M-1L(1K0/1K5)30(H/T)-S2 R88M-1M(1K0/1K5)20(H/T)-S2 R88M-1M90010T-S2 R88M-1L(750/1K0/1K5/2K0)30C-S2 R88M-1M(400/600/1K0/1K5/2K0)20C-S2 R88M-1M90010C-S2	MS3108E20-4S
		R88M-1L(1K0/1K5)30(H/T)-BS2 R88M-1M(1K0/1K5)20(H/T)-BS2 R88M-1M90010T-BS2	MS3108E20-18S
		R88M-1L3K030C-S2 R88M-1M3K020C-S2 R88M-1M(2K0/3K0)10C-S2	MS3108E22-22S
		R88M-1L(750/1K0/1K5/2K0/3K0)30C-BS2 R88M-1M(400/600/1K0/1K5/2K0/3K0)20C-BS2 R88M-1M(900/2K0/3K0)10C-BS2	MS3108E24-11S
Connectors for brake cables	Motor side	R88M-1M(100/200/400/750)30(H/T)-BS2	R88A-CN111B

Cable shield clamp (spare parts)

Applicable 1S power cable	Model
230 V, 100 W to 750 W models	R88A-SC011S-E
230 V, 1.5 kW model 400 V, 600 W to 3 kW models	R88A-SC021S-E
400 V, 5.5 kW to 15 kW models	R88A-SC10CA-PE

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.



SCATTERGOOD & JOHNSON LTD

ELECTRICAL ENGINEERING & FLUID CONTROL DISTRIBUTORS

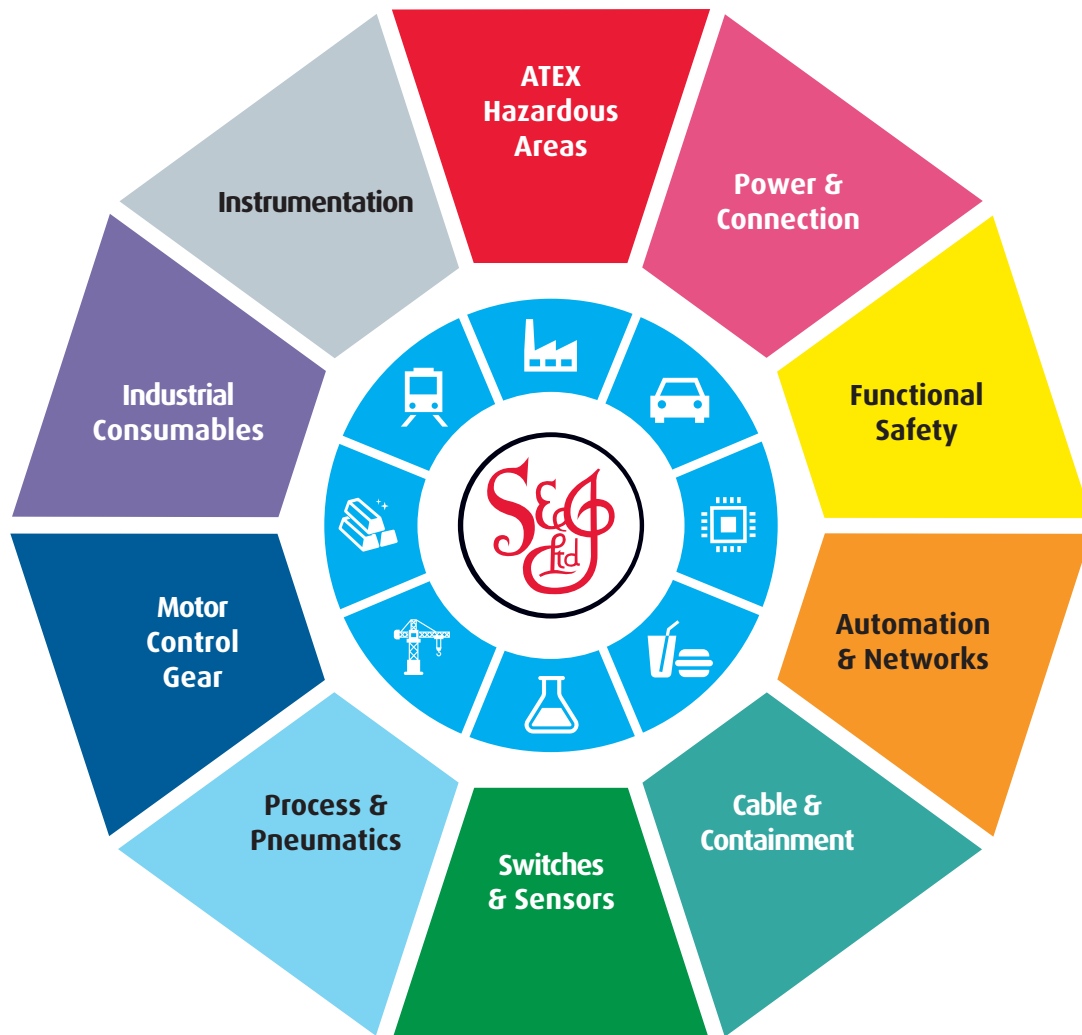
At Scattergood & Johnson Ltd, we pride ourselves on being a technical distributor to specialist industries.

Working with a range of quality product suppliers across a number of specialist markets, we are not your average 'box shifter' - we are your technical and supply chain partner.

We fully support every product we sell - for free! Our internal team and external sales engineers can answer any product or application question, no matter the complexity.

Backing up this technical ability is a range of 50,000+ products available from stock for nationwide next day delivery (same day if required!), or you can collect what you need from any of our trade counters around the UK.

Select your specialist interest below to learn more about how we can help.



Online, In Branch and On the Road - Scattergood & Johnson Ltd, there when you need us.

www.scatts.co.uk