R88M-1A□, R88D-1SAN□□□-ECT

1S Servo System with Motion Safety

Safe & Running – 1S Servo System with Motion Safety Functionality

- All safety functions conform to maximum safety performance level PLe (SIL-3)
- Hardwired and FSoE STO (Safe Torque Off)
- FSoE functions: SS1 (Safe Stop 1), SS2 (Safe Stop 2), SOS (Safe Operating Stop), SLS (Safely-Limited Speed), SLP (Safely-Limited Position), SDI (Safe Direction), SBC (Safe Brake Control)
- Battery-free absolute multi-turn encoder
- One cable connection: power, encoder and brake in a pre-assembled cable with IP67 connector
- Fast and secure screw-less push-in in all connectors
- 20-bit high resolution encoder
- Up to 350% momentary maximum torque

Ratings

- 230 VAC from 200 W to 1.5 kW
  (rated torque from 0.637 to 9.55 Nm)
- 400 VAC from 750 W to 3 kW
  (rated torque from 2.39 to 19.1 Nm)

Type designation

1S servo drive with Motion Safety

R88D-1S AN 02 H -ECT
(1) (2) (3) (4) (5)

No	Item	Symbol	Specifications
(1)	1S Series servo drive		
(2)	Drive type	A	Motion Safety type
		N	Communication (Network) interface
(3)	Capacity	02	200 W
		04	400 W
		08	750 W
		10	1 kW
		15	1.5 kW
		20	2 kW
		30	3 kW
(4)	Voltage	H	230 VAC
		F	400 VAC
(5)	Network type	ECT	EtherCAT communications

1S servo motor with Motion Safety

R88M-1 AM 200 30 T -BOS2
(1) (2) (3) (4) (5) (6)

No	Item	Symbol	Specifications
(1)	1S Series servo motor		
(2)	Servo motor type	AL	Motion Safety/Low-inertia type
		AM	Motion Safety/Middle-inertia type
(3)	Capacity	200	200 W
		400	400 W
		750	750 W
		1K0	1 kW
		1K5	1.5 kW
		2K0	2 kW
		3K0	3 kW
(4)	Rated speed	15	1500 rpm
		30	3000 rpm
(5)	Voltage and encoder specifications	T	230 V, absolute encoder
		C	400 V, absolute encoder
(6)	Options		
	Brake	Blank	No brake
		B	Brake
	Oil seal	Blank	No oil seal
		O	Oil seal
	Shaft end	Blank	Straight shaft, no key
		S2	Straight, key, tapped (standard)

Specifications

1S servo drive with Motion Safety

Single-phase, 230 V

Servo drive model			R88D-1SAN02H-ECT	R88D-1SAN04H-ECT	R88D-1SAN08H-ECT	R88D-1SAN15H-ECT
Applicable servo motor R88M-□		3000 r/min	1AM20030T	1AM40030T	1AM75030T	1AL1K030T 1AL1K530T
		1500 r/min	–			1AM1K515T
Max. applicable motor capacity			200 W	400 W	750 W	1.5 kW
Input	Main circuit	Power supply voltage	Single-phase 200 to 240 VAC (170 to 252 V)			
		Frequency	50/60 Hz (47.5 to 63 Hz)			
		Rated input current (Single-phase)	2.7 Arms	4.6 Arms	7.3 Arms	15.7 Arms
	Control circuit	Power supply voltage	24 VDC (21.6 to 26.4 V)			
		Current consumption	700 mA			1000 mA
Output	Rated output current		1.5 Arms	2.5 Arms	4.6 Arms	9.7 Arms
	Max. current		5.6 Arms	9.1 Arms	16.9 Arms	28.4 Arms
Heating value		Main circuit	17.0 W	25.0 W	42.0 W	88.0 W
		Control circuit	11.9 W		14.5 W	22.4 W
Weight			2.6 kg			4.2 kg

Three-phase, 400 V

Servo drive model			R88D-1SAN10F-ECT	R88D-1SAN15F-ECT	R88D-1SAN20F-ECT	R88D-1SAN30F-ECT
Applicable servo motor R88M-□		3000 r/min	1AL75030C 1AL1K030C	1AL1K530C	1AL2K030C	1AL3K030C
		1500 r/min	–	1AM1K515C	–	1AM3K015C
Max. applicable motor capacity			1 kW	1.5 kW	2 kW	3 kW
Input	Main circuit	Power supply voltage	Three-phase 380 to 480 VAC (323 to 504 V)			
		Frequency	50/60 Hz (47.5 to 63 Hz)			
		Rated input current (Three-phase)	3.1 Arms	4.3 Arms	6.5 Arms	8.4 Arms
	Control circuit	Power supply voltage	24 VDC (21.6 to 26.4 V)			
		Current consumption	1 A			
Output	Rated output current		4.1 Arms	4.7 Arms	7.8 Arms	11.3 Arms
	Max. current		9.6 Arms	14.1 Arms	19.8 Arms	28.3 Arms
Heating value		Main circuit	56.0 W	81.0 W	120.0 W	150.0 W
		Control circuit	22.4 W			
Weight			4.2 kg			

Safety functions

Function	Description
Safe torque off (STO)	The function is used to cut off a motor current and stop the motor.
Safe stop 1 (SS1)	This function is used to stop a motor by activating STO function at any timing after receiving a command from a safety controller.
Safes stop 2 (SS2)	This function is used to monitor a motor's stop by activating SOS function at any timing after receiving a command from a safety controller.
Safe operating stop (SOS)	This function is used to monitor that a motor stops at any positions. Both a position and velocity are monitored. Excessive limit value error occurs when the motor operates from a position where it stops.
Safely-limited speed (SLS)	This function is used to monitor a safety present motor velocity. When the safety present motor velocity exceeds the velocity limit for monitoring, excessive limit value error occurs.
Safely-limited position (SLP)	This function is used to monitor current positions. Excessive limit value error occurs when the positions surpass a range for monitoring.
Safe direction (SDI)	This function is used to monitor motor's rotating direction. Excessive limit value error occurs when a motor rotates toward the banned rotating direction.
Safe brake control (SBC)	This function is used to provide safety output for a holding brake. The function can be used with STO, SS1 functions and the brake operation.

Note: Safety Servo Drives have two type STO functions. Use either or both functions according to configuration of safety devices.
- STO function by safety input signals
- STO function via EtherCAT communications

Note: When you use just STO function by safety input signals, you do not need a setting related EtherCAT network.

1S servo motor with Motion Safety

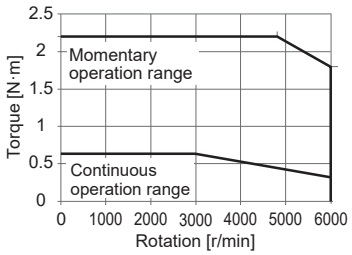
3000 r/min servo motors, 230 V

Voltage			230 V				
Servo motor model: R88M-□		20-bit absolute encoder	1AM20030T	1AM40030T	1AM75030T	1AL1K030T	1AL1K530T
Rated output		W	200	400	750	1,000	1,500
Rated torque		N·m	0.637	1.27	2.39	3.18	4.77
Instantaneous peak torque		N·m	2.2	4.5	8.4	9.55	14.3
Rated speed		r/min	3,000				
Max. speed		r/min	6,000			5,000	
Rated current		A(rms)	1.5	2.5	4.6	5.2	8.8
Instantaneous max. current		A(rms)	5.6	9.1	16.9		28.4
Rotor moment of inertia	Without brake	$\times10^{-4}$ kg·m^2	0.224	0.446	1.825	2.105	
	With brake	$\times10^{-4}$ kg·m^2	0.284	0.506	2.075	2.555	
Applicable load inertia		$\times10^{-4}$ kg·m^2	4.80	8.40	19.4	35.3	47.6
Torque constant		N·m/A(rms)	0.48	0.56	0.59	0.67	0.58
Power rate		kW/s	18.1	36.2	31.3	48	108
Mechanical time constant		ms	0.79	0.58	0.66	0.58	
Electrical time constant		ms	2.4	2.6	3.3	5.9	6.1
Allowable radial load		N	245		490		
Allowable thrust load		N	88		196		
Weight	Without brake	kg	1.3	1.8	3.2	5.8	
	With brake	kg	1.7	2.2	4.1	7.5	
Radiator plate dimensions (material)		mm	250 × 250 × t6 (aluminum)			400 × 400 × t20 (aluminum)	
Brake specifications	Excitation voltage*1	V	24 DC±10%				
	Current consumption (at 20°C)	A	0.32		0.37	0.70	
	Static friction torque	N·m	1.37 min.		2.55 min.	9.3 min.	
Basic specifications	Insulation class		Class F				
	Ambient operating/storage temperature		0 to 40ºC/-20 to 65ºC				
	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/s²				
	Impact resistance		Acceleration of 98 m/s² max. 3 times each in X, Y and Z directions				
	Enclosure		IP67 (except for the through-shaft parts and connector pins)				

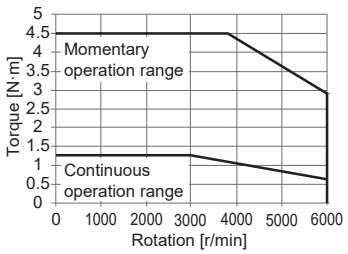
*1 This is a non-excitation brake. It is released when excitation voltage is applied.

Torque-speed characteristics

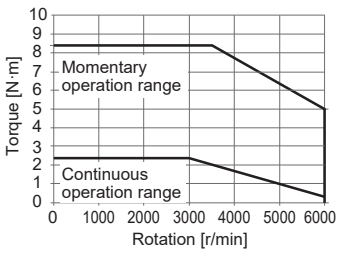
R88M-1AM20030T (230 V, 200 W)



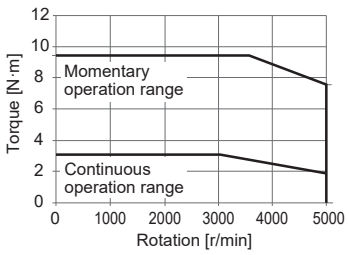
R88M-1AM40030T (230 V, 400 W)



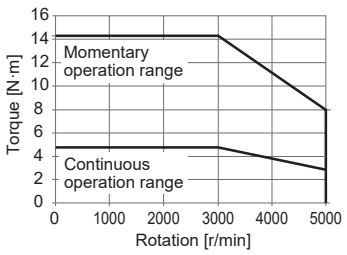
R88M-1AM75030T (230 V, 750 W)



R88M-1AL1K030T (230 V, 1 kW)



R88M-1AL1K530T (230 V, 1.5 kW)



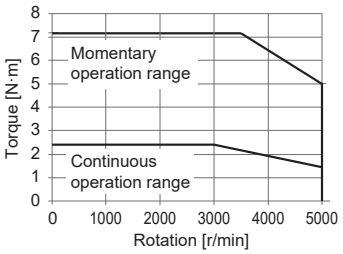
3000 r/min servo motors, 400 V

Voltage			400 V				
Servo motor model: R88M-□		20-bit absolute encoder	1AL75030C	1AL1K030C	1AL1K530C	1AL2K030C	1AL3K030C
Rated output		W	750	1,000	1,500	2,000	3,000
Rated torque		N·m	2.39	3.18	4.77	6.37	9.55
Instantaneous peak torque		N·m	7.16	9.55	14.3	19.1	28.7
Rated speed		r/min	3,000				
Max. speed		r/min	5,000				
Rated current		A(rms)	3.0		4.5	6.3	8.7
Instantaneous max current		A(rms)	9.6		14.1	19.8	27.7
Rotor moment of inertia	Without brake	$\times10^{-4}$ kg·m^2	1.305	2.105		2.405	6.813
	With brake	$\times10^{-4}$ kg·m^2	1.755	2.555		2.855	7.313
Applicable load inertia		$\times10^{-4}$ kg·m^2	38.6	35.3	47.6	60.2	118
Torque constant		N·m/A(rms)	0.91	1.17		1.15	1.23
Power rate		kW/s	44	48	108	169	134
Mechanical time constant		ms	1.1	0.58		0.52	0.49
Electrical time constant		ms	4.3	5.9		6.3	11
Allowable radial load		N	490				
Allowable thrust load		N	196				
Weight	Without brake	kg	4.2	5.8		6.5	11.5
	With brake	kg	5.9	7.5		8.2	13.5
Radiator plate dimensions (material)		mm	305 × 305 × t20 (aluminum)	400 × 400 × t20 (aluminum)		470 × 470 × t20 (aluminum)	
Brake specifications	Excitation voltage*1	V	24 VDC±10%				
	Current consumption (at 20°C)	A	0.70				0.66
	Static friction torque	N·m	9.3 min.				12 min.
Basic specifications	Insulation class		Class F				
	Ambient operating/storage temperature		0 to 40ºC/-20 to 65ºC				
	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/s²				
	Impact resistance		Acceleration of 98 m/s² max. 3 times each in X, Y and Z directions				
	Enclosure		IP67 (except for the through-shaft parts and connector pins)				

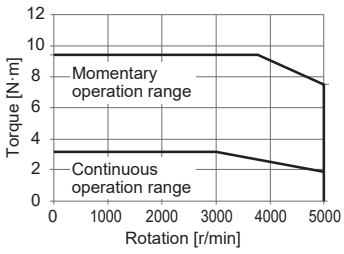
*1 This is a non-excitation brake. It is released when excitation voltage is applied.

Torque-speed characteristics

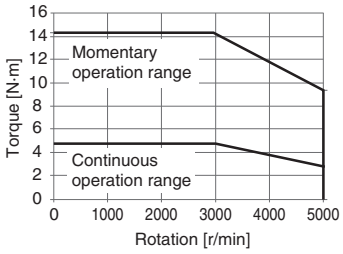
R88M-1AL75030C (400 V, 750 W)



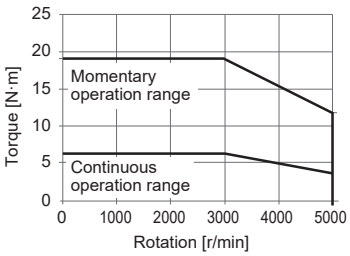
R88M-1AL1K030C (400 V, 1 kW)



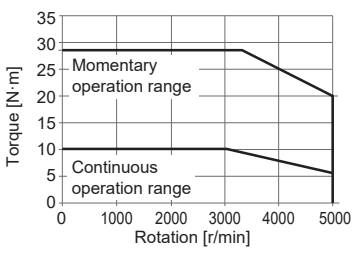
R88M-1AL1K530C (400 V, 1.5 kW)



R88M-1AL2K030C (400 V, 2 kW)



R88M-1AL3K030C (400 V, 3 kW)



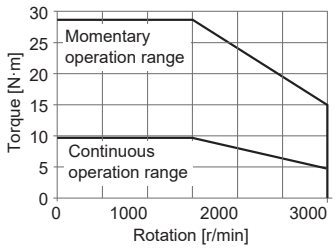
1500 r/min servo motors, 230 V/400 V

Voltage			230 V	400 V	
Servo motor model: R88M-□		20-bit absolute encoder	1AM1K515T	1AM1K515C	1AM3K015C
Rated output		W	1,500		3,000
Rated torque		N·m	9.55		19.1
Instantaneous peak torque		N·m	28.7		57.3
Rated speed		r/min	1,500		
Max. speed		r/min	3,000		
Rated current		A(rms)	8.6	4.4	8.5
Instantaneous max. current		A(rms)	28.4	14.1	28.3
Rotor moment of inertia	Without brake	$\times 10^{-4}$ kg·m^2	12.413	12.413	40.013
	With brake	$\times 10^{-4}$ kg·m^2	13.013		45.113
Applicable load inertia		$\times 10^{-4}$ kg·m^2	127.05		270.63
Torque constant		N·m/A(rms)	1.11	2.21	2.46
Power rate		kW/s	73		91
Mechanical time constant		ms	0.75		1.2
Electrical time constant		ms	17		16
Allowable radial load		N	490		1176
Allowable thrust load		N	196		490
Weight	Without brake	kg	11		18
	With brake	kg	13		22
Radiator plate dimensions (material)		mm	470 × 470 × t20 (aluminum)		
Brake specifications	Excitation voltage*1	V	24 VDC±10%		
	Current consumption (at 20°C)	A	0.66		1.20
	Static friction torque	N·m	12 min.		22 min.
Basic specifications	Insulation class		Class F		
	Ambient operating/storage temperature		0 to 40ºC/-20 to 65ºC		
	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/s²		
	Impact resistance		Acceleration of 98 m/s² max. 3 times each in X, Y and Z directions		
	Enclosure		IP67 (except for the through-shaft parts and connector pins)		

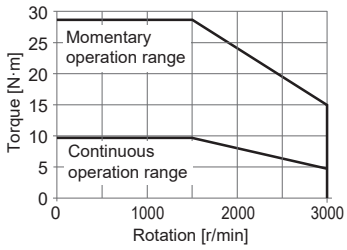
*1 This is a non-excitation brake. It is released when excitation voltage is applied.

Torque-speed characteristics

R88M-1AM1K515T (230 V, 1.5 kW)



R88M-1AM1K515C (400 V, 1.5 kW)



R88M-1AM3K015C (400 V, 3 kW)