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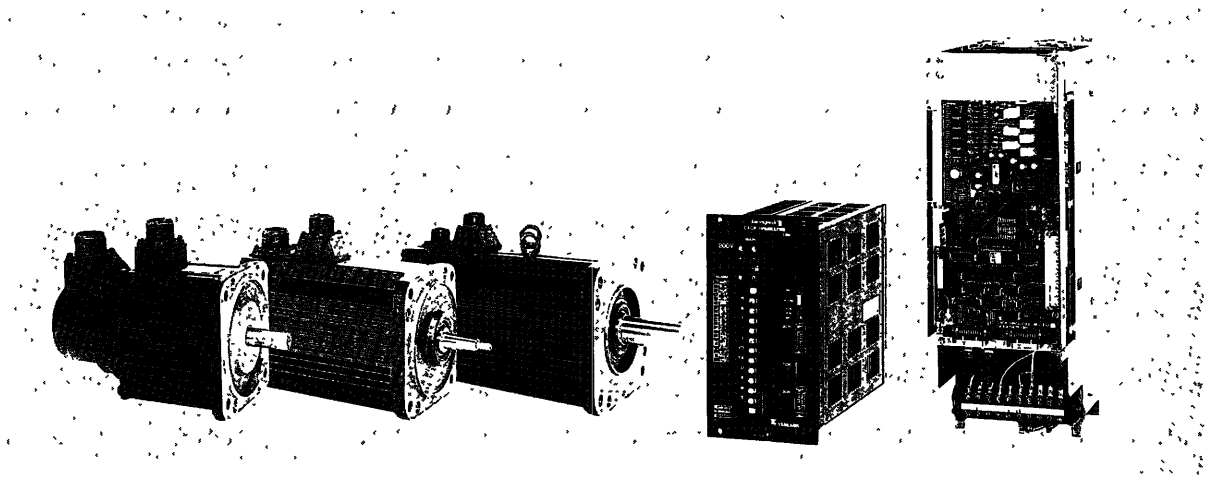
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AC SERVO DRIVES

FOR MOTIONPACK-10,-120/POSITIONING CONTROL

SERVOMOTOR TYPES USAMED, USAFED, USAGED, USADED,
USASEM, USAREM, USAPEM

SERVOPACK CACR-HR AAB (Rack-mounted Type)
CACR-HR AB (Base-mounted Type)



YASKAWA

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Servopack type CACR-HR□ AAB and -HR□□AB can be used only in combination with Motionpack-10 and -120. Only servopack unit cannot be operated.

For operation method, refer to user's manual of Motionpack-10 or -120.

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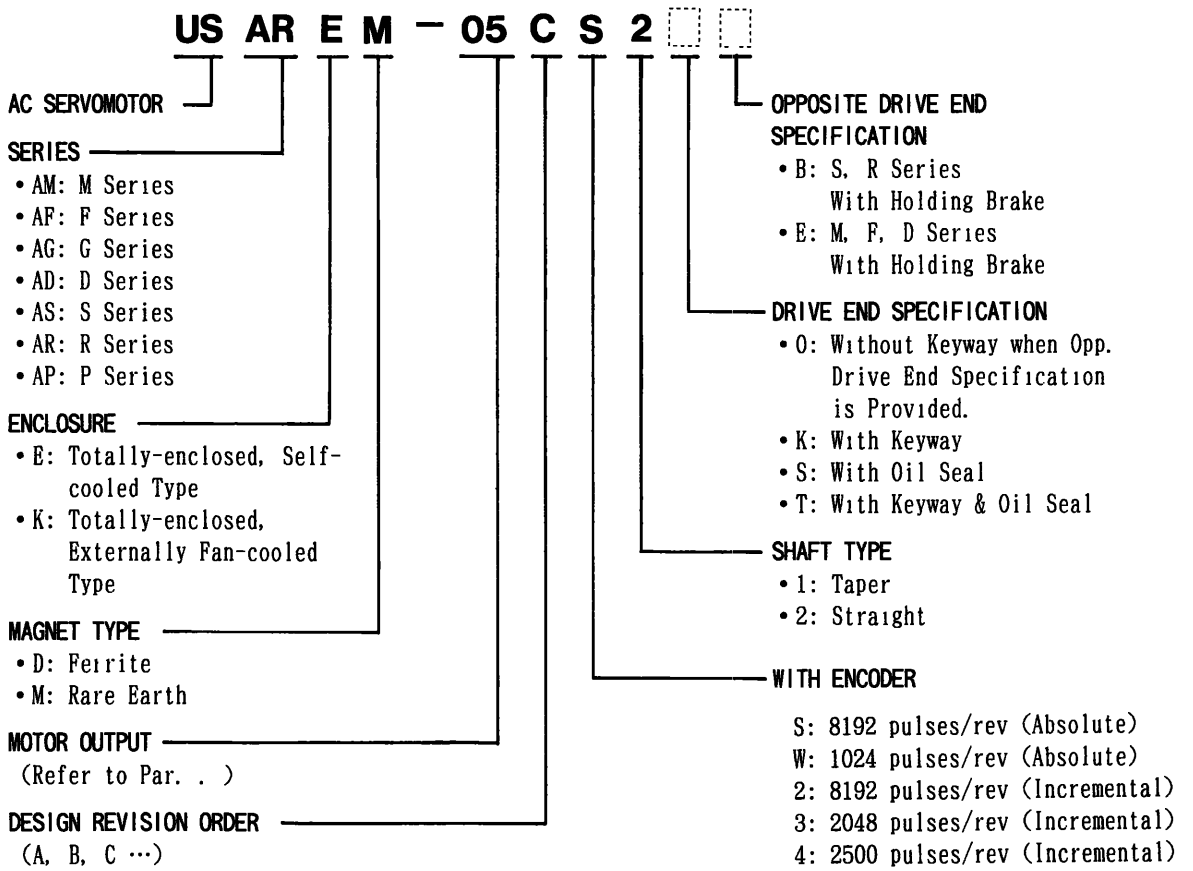
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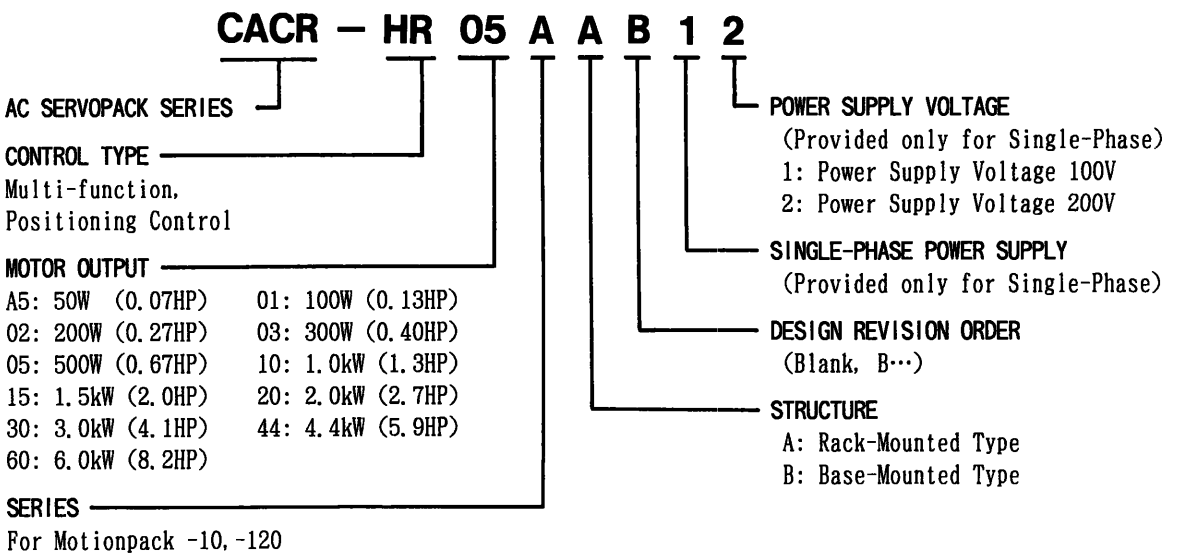
1 TYPE DESIGNATION AND CONFIGURATION

1.1 TYPE DESIGNATION

(1) Servomotor



(2) Servopack



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1.2 COMBINATION OF AC SERVOPACK AND SERVOMOTOR

Table 1.1 Rack-mounted Type Servopack (200 VAC)

Configuration, Main Circuit Voltage			Rack-mounted Type, Single-phase 200VAC						Rack-mounted Type, 3-phase 200VAC		
Type CACR-HR			A5AAB12	01AAB12	02AAB12	03AAB12		05AAB12	10AAB		15AAB
M Series	Applicable Servomotor	Type USAMED-	—	—	—	03B ☐ 1		—	06B ☐ 1	09B ☐ 1	12B ☐ 1
		Output kW HP	--	—	—	0 3 0 4		—	0 6 0 8	0 9 1 2	1 2 1 6
		Speed r/min	—	—	—	Rating 1000/Max 2000		—	Rating 1000/Max 2000		
	Continuous Output Current Arms		—	—	—	3 0		—	5 8	7 6	11 7
	Max Output Current Arms		—	—	—	7 3		—	13 9	16 6	28 0
	Allowable $J_L(=GD^2_L/4)$ kg・cm² / lb・in・S²×10⁻³		—	—	—	67 5 60		—	121 5 107 5	183 5 162 5	334 296
F Series	Applicable Servomotor	Type USAFED-	—	—	—	02C ☐ 1	03C ☐ 1	05C ☐ 1	09C ☐ 1		13C ☐ 2
		Output kW HP	—	—	—	0 15 0 2	0 3 0 4	0 45 0 6	0 85 1 1		1 3 1 7
		Speed r/min	—	--	—	Rating 1500/Max 2500			Rating 1500/Max 2500		
	Continuous Output Current Arms		—	—	—	3 0	3 0	3 8	6 2		9 7
	Max Output Current Arms		—	—	—	8 5	8 5	11 0	17 0		27 6
	Allowable $J_L(=GD^2_L/4)$ kg・cm² / lb・in・S²×10⁻³		—	—	—	6 5 5 75	10 9	67 5 60	121 5 107 5		183 5 162 5
G Series	Applicable Servomotor	Type USAGED-	—	—	—	02A ☐ 1	03A ☐ 1	05A ☐ 1	09A ☐ 1		13A ☐ 2
		Output kW HP	—	—	—	0 15 0 2	0 3 0 4	0 45 0 6	0 85 1 1		1 3 1 7
		Speed r/min	—	—	—	Rating 1500/Max 3000			Rating 1500/Max 3000		
	Continuous Output Current Arms		—	—	—	3 0	3 0	3 8	7 6		11 7
	Max Output Current Arms		—	—	—	8 5	8 5	11 0	17 0		28 0
	Allowable $J_L(=GD^2_L/4)$ kg・cm² / lb・in・S²×10⁻³		—	—	—	6 5 5 75	10 9	67 5 60	121 5 107 5		183 5 162 5
D Series	Applicable Servomotor	Type USADED-	—	—	--	—		05E ☐	—		10E ☐
		Output kW HP	—	—	—	—		0 5 0 67	—		1 0 1 34
		Speed r/min	—	—	—	—		Rating2000 Max 2500	—		Rating2000 Max 2500
	Continuous Output Current Arms		—	—	—	—		3 5	—		7 9
	Max Output Current Arms		—	—	—	—		10 6	—		25 2
	Allowable $J_L(=GD^2_L/4)$ kg・cm² / lb・in・S²×10⁻³		—	—	—	—		105 91	—		160 143

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Table 1.1 Rack-mounted Type Servopack (200 VAC) (Cont'd)

Configuration, Main Circuit Voltage			Rack-mounted Type, Single-phase 200VAC					Rack-mounted Type 3-phase 200VAC	
Type CACR-HR			A5AAB12	01AAB12	02AAB12	03AAB12	05AAB12	10AAB	15AAB
R Series	Applicable Servomotor	Type USASEM-	—	—	02A ☐ 2	03A ☐ 2	05A ☐ 2	08A ☐ 2	15A ☐ 2
		Output kW / HP	—	—	0 154 / 0 2	0 303 / 0 4	0 462 / 0 6	0 771 / 1 0	1 54 / 2 1
		Speed r/min	—	—	Rating 3000/Max 4000			Rating 3000/Max 4000	
	Continuous Output Current Arms		—	—	2 1	3 0	4 2	5 3	10 4
	Max Output Current Arms		—	—	6 0	8 5	11 0	15 6	28 0
	Allowable $J_L(=GD^2_L/4)$ kg・cm² / OZ・in・S²×10⁻³		—	—	0 65 / 0 55	2 55 / 2 25	3 75 / 3 35	14 25 / 12 65	16 5 / 14 4
S Series	Applicable Servomotor	Type USAREM-	A5CS	01CS	02CS	03CS	05CS	07CS	—
		Output W / HP	50 / 0 07	100 / 0 13	200 / 0 27	300 / 0 40	500 / 0 67	700 / 0 94	—
		Speed r/min	Rating 3000/Max 4500					Rating 3000/Max 4500	—
	Continuous Output Current Arms		0 71	1 0	2 0	2 7	3 6	5 7	—
	Max Output Current Arms		2 1	2 8	5 7	7 8	10 6	16 3	—
	Allowable $J_L(=GD^2_L/4)$ kg・cm² / lb・in・S²×10⁻¹		0 775 / 10 8	1 25 / 17 8	5 075 / 71 8	7 65 / 109	27 2 / 386	37 2 / 528	—
P Series	Applicable Servomotor	Type USAPEM-	—	01CW	02CW	03CW	05CW	07CW	—
		Output W / HP	—	100 / 0 13	200 / 0 27	300 / 0 40	500 / 0 67	700 / 0 94	—
		Speed r/min	—	Rating 3000/Max 4500				Rating 3000/Max 4500	—
	Continuous Output Current Arms		—	1 0	2 0	2 7	3 6	5 7	—
	Max Output Current Arms		—	2 8	5 7	7 8	10 6	16 3	—
	Allowable $J_L(=GD^2_L/4)$ kg・cm² / OZ・in・S²×10⁻³		—	1 95 / 27 75	3 2 / 45 15	4 9 / 69 5	23 9 / 339	32 85 / 465	—

Table 1.2 Rack-mounted Type Servopack (Single-phase 100 VAC)

Configuration, Main Circuit Voltage			Rack-mounted Type, Single phase 100VAC				
Type CACR-HR			A5AAB11	01AAB11	02AAB11	03AAB11	05AAB11
R Series	Applicable Servomotor	Type USAREM-	A5DS	01DS	02DS	03DS	05DS
		Output W / HP	50 / 0 07	100 / 0 13	200 / 0 27	300 / 0 40	500 / 0 67
		Speed r/min	Rating 3000/Max 4000				
	Continuous Output Current Arms		1 2	1 7	2 9	3 6	5 5
	Max Output Current Arms		3 6	5 0	8 5	10 6	16 3
	Allowable $J_L(=GD^2_L/4)$ kg・cm² / OZ・in・S²×10⁻³		0 775 / 10 8	1 25 / 17 8	5 075 / 71 8	7 65 / 109	27 2 / 386

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Combination of Servomotor and encoder is as shown below:

No. of Pulses / Servomotor	Incremental Encoder			Absolute Encoder	
	2048	2500	8192	1024	8192
M Series	○	—	◎	○	◎
F Series	○	—	◎	○	◎
G Series	○	—	◎	○	◎
D Series	◎	—	○	◎	○
S Series	◎	○	—	○	◎
R Series		—			◎
P Series		—		◎	

◎ Standard

○ Semi-standard

Note: When exceeding allowable J_1 during use, be sure to follow the instructions in Par. 3.4.2 "Load Inertia".

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Table 13 Base-mounted Type Servopack (3-phase 200 VAC)

	Configuration, Main Circuit Voltage		Base-mounted Type, 3-phase 200VAC								
	Type CACR-HR		03AB	05AB	10AB		15AB	20AB	30AB	44AB	60AB*
M Series	Applicable Servomotor	Type USAMED-	03B □ 1	—	06B □ 1	09B □ 2	12B □ 2	20B □ 2	30B □ 2	44B □ 2	USAMKD -60B □ 2
		Output kW / HP	0 3 / 0 4	—	0 6 / 0 8	0 9 / 1 2	1 2 / 1 6	2 0 / 2 7	3 0 / 4 1	4 4 / 5 9	6 0 / 8 2
		Speed r/min	Rating 1000/Max 2000		—	Rating 1000/Max 2000				Rating 1000/Max 1500	
	Continuous Output Current Arms		3 0	—	5 8	7 6	11 7	18 8	26 0	33 0	45 0
	Max Output Current Arms		7 3	—	13 9	16 6	28 0	42 0	56 5	70 0	80 6
	Allowable J_L ($=GD^2_L/4$)	kg・cm² / lb・in・S²×10⁻³	67 5 / 60	—	121 5 / 107 5	183 5 / 162 5	334 / 296	550 / 486	715 / 633 5	1200 / 1063	1200 / 1063
F Series	Applicable Servomotor	Type USAFED-	02C □ 1	03C □ 1	05C □ 1	09C □ 1	13C □ 2	20C □ 2	30C □ 2	44C □ 2	—
		Output kW / HP	0 15 / 0 2	0 3 / 0 4	0 45 / 0 6	0 85 / 1 1	1 3 / 1 7	1 8 / 2 4	2 9 / 3 9	4 4 / 5 9	—
		Speed r/min	Rating 1500/Max 2500								—
	Continuous Output Current Arms		3 0	3 0	3 8	6 2	9 7	15 0	20 0	33 0	—
	Max Output Current Arms		8 5	8 5	11 0	17 0	27 6	42 0	56 5	77 0	—
	Allowable J_L ($=GD^2_L/4$)	kg・cm² / lb・in・S²×10⁻¹	6 5 / 5 75	10 / 9	67 5 / 60	121 5 / 107 5	183 5 / 162 5	334 / 296	550 / 486	715 / 633 5	—
G Series	Applicable Servomotor	Type USAGED-	02A □ 1	03A □ 1	05A □ 1	09A □ 1	13A □ 2	20A □ 2	30A □ 2	44A □ 2	—
		Output kW / HP	0 15 / 0 2	0 3 / 0 4	0 45 / 0 6	0 85 / 1 2	1 3 / 1 8	1 8 / 2 4	2 9 / 3 9	4 4 / 5 9	—
		Speed r/min	Rating 1500/Max 3000								—
	Continuous Output Current Arms		3 0	3 0	3 8	7 6	11 7	19 0	26 0	33 0	—
	Max Output Current Arms		8 5	8 5	11 0	17 0	28 0	42 0	56 5	70 0	—
	Allowable J_L ($=GD^2_L/4$)	kg・cm² / lb・in・S²×10⁻³	6 5 / 5 75	10 / 9	67 5 / 60	121 5 / 107 5	183 5 / 162 5	334 / 296	550 / 486	715 / 633 5	—
D Series	Applicable Servomotor	Type USADED-	—		05E □	—	10E □	15E □	22E □	37E □	—
		Output kW / HP	—		0 5 / 0 67	—	1 0 / 1 3	1 5 / 2 0	2 2 / 2 9	3 7 / 5 0	—
		Speed r/min	—		Rating2000 Max 2500	—	Rating 2000/Max 2500				—
	Continuous Output Current Arms		—		3 5	—	7 9	12 6	16 6	23 3	—
	Max Output Current Arms		—		10 6	—	25 2	40 7	54 0	77 0	—
	Allowable J_L ($=GD^2_L/4$)	kg・cm² / lb・in・S²×10⁻³	—		105 / 91	—	160 / 143	310 / 274 5	415 / 367 5	740 / 655	—
S Series	Applicable Servomotor	Type USASEM-	02A □ 2	03A □ 2	05A □ 2	08A □ 2	15A □ 2	—	30A □ 2	—	—
		Output kW / HP	0 154 / 0 2	0 308 / 0 4	0 462 / 0 6	0 771 / 1 0	1 54 / 2 1	—	3 08 / 4 1	—	—
		Speed r/min	Rating 3000/Max 4000					—	Rating3000 Max 4000	—	—
	Continuous Output Current Arms		2 1	3 0	4 2	5 3	10 4	—	19 9	—	—
	Max Output Current Arms		6 0	8 5	11 0	15 6	28 0	—	56 5	—	—
	Allowable J_L ($=GD^2_L/4$)	kg・cm² / OZ・in・S²×10⁻³	0 65 / 0 55	2 55 / 2 25	3 75 / 3 35	14 25 / 12 65	16 5 / 14 4	—	28 7 / 25 45	—	—

*To be released shortly

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NOTE

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2 RATINGS AND SPECIFICATIONS OF AC SERVOMOTOR

2.1 RATINGS AND SPECIFICATIONS

2.1.1 M Series

(1) Ratings

Time Rating: Continuous
Insulation: Class F
Isolation Voltage: 1500 VAC, one minute
Insulation Resistance: 500 VDC, 10MΩ or more
Enclosure: Totally-enclosed, self-cooled for 03 to 44 and externally fan-cooled for 60; Equivalent to IP55
Ambient Temperature: 0 to + 40℃
Ambient Humidity: 20% to 80% (non-condensing)
Vibration: 15μm or below
Finish in Munsell Notation: N1.5
Excitation: Permanent magnet
Mounting: Flange mounted
Drive Method: Direct drive

(2) Combination with encoder

- Standard
  - USAM□D - □□□ BS □ : With absolute encoder (8192 pulses/rev)
  - USAM□D - □□□ B2 □ : With incremental encoder (8192 pulses/rev)
- Semi-Standard
  - USAM□D - □□□ BW □ : With absolute encoder (1024 pulses/rev)
  - USAM□D - □□□ B3 □ : With incremental encoder (2048 pulses/rev)

Table 2.1 Ratings and Specifications of M Series AC Servomotors

Item \ Motor Type USAMED-		03B □ 1	06B □ 1	09B □ 2	12B □ 2	20B □ 2	30B □ 2	44B □ 2	USAMKD-60B □ 2
Rated Output*	kW (HP)	0 3 (0 4)	0 6 (0 8)	0 9 (1 2)	1 2 (1 6)	2 0 (2 7)	3 0 (4 0)	4 4 (5 9)	6.0 (8 2)
Rated Torque*	N•m (lb•in)	2 84 (25)	5 68 (50)	8 63 (76)	11 5 (102)	19 1 (169)	28 4 (252)	41 9 (372)	57 2 (507)
Continuous Max Torque*	N•m (lb•in)	2 94 (26)	5 88 (52)	8 82 (78)	11 8 (104)	21 6 (191)	32 3 (286)	46 1 (408)	62 9 (557)
Instantaneous Peak Torque*	N•m (lb•in)	7 17 (63)	14 1 (125)	19 3 (171)	28 0 (248)	44 0 (390)	63 7 (564)	91 1 (807)	106 (938)
Rated Current*	A	3 0	5 8	7 6	11 7	18 8	26	33	45
Rated Speed*	r/min	1000							
Instantaneous Max Speed*	r/min	2000						1500	
Torque Constant	N • m/A (lb • in/A)	1 01 (8 9)	1 04 (9 2)	1 21 (10 7)	1 02 (9 0)	1 07 (9.5)	1 16 (10 2)	1 33 (11 8)	1 33 (11 8)
Moment of Motor Inertia J_M (=$GD_M^2/4$)	Kg•m²×10⁻⁴ (lb•in•S²×10⁻¹)	13 5 (12 0)	24 3 (21.5)	36.7 (32 5)	58 (51 2)	110 (97 2)	143 (126 7)	240 (212 6)	240 (212 6)
Power Rate*	kW/s	6 0	13 3	20 3	22 7	33 2	57 0	74 0	138
Inertia Time Constant	ms	12 8	6 3	4 4	6 0	5 2	3 5	3 6	3 6
Inductive Time Constant	ms	2 7	5 1	6 5	10 4	12 9	15 3	16 2	16 2

* Typical value at armature winding temperature of 20℃, in combination with Servopack

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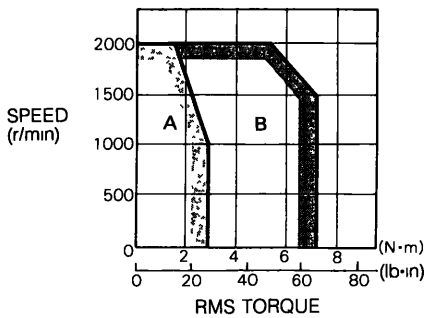
(3) Speed-torque characteristics

Typical at 20°C (Armature Winding Temp.)

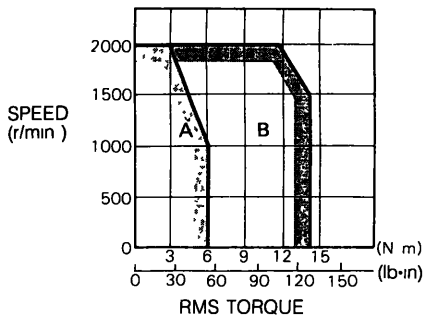
A Continuous Duty Zone

Intermittent Duty Zone

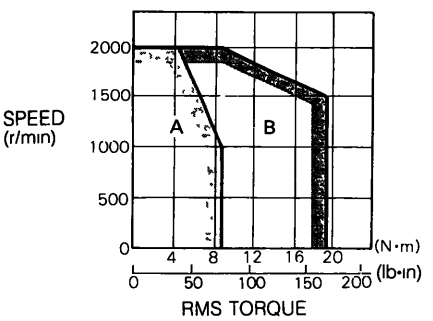
USAMED-03B



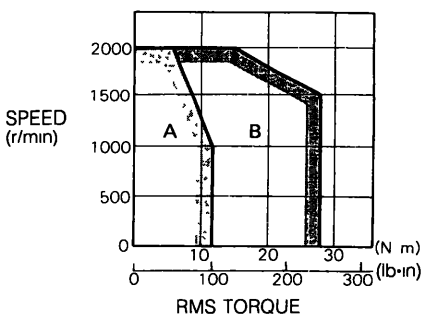
USAMED-06B



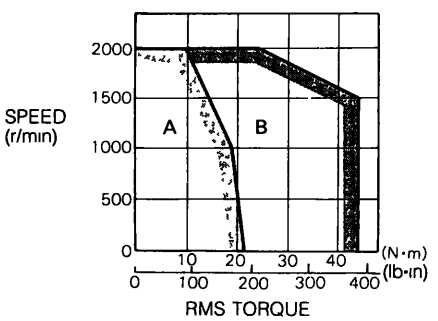
USAMED-09B



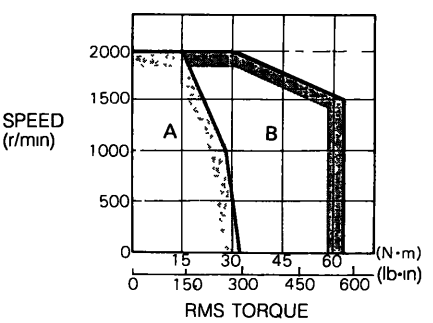
USAMED-12B



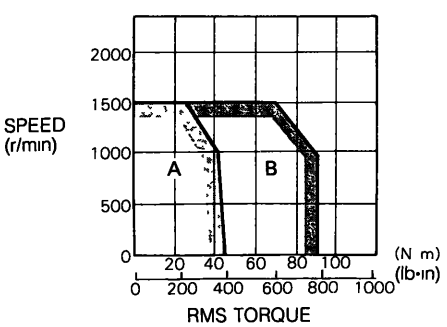
USAMED-20B



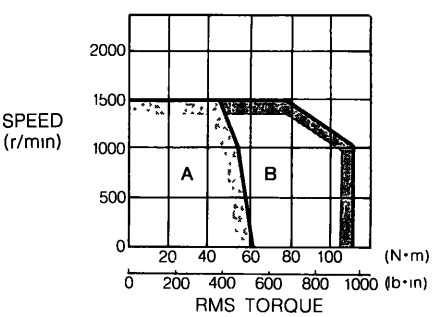
USAMED-30B



USAMED-44B



USAMKD-60B



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2.1.2 F Series

(1) Ratings

Time Rating: Continuous
Insulation: Class F
Isolation Voltage: 1500 VAC, one minute
Insulation Resistance: 500 VDC, 10MΩ or more
Enclosure: Totally-enclosed, self-cooled
Equivalent to IP55
(Shaft penetrating section excluded)
Ambient Temperature: 0 to + 40℃
Ambient Humidity: 20% to 80%
(non-condensing)
Vibration: 15μm or below
Finish in Munsell Notation: N1.5
Excitation: Permanent magnet
Mounting: Flange mounted
Drive Method: Direct drive

(2) Combination with encoder

- Standard
  USAFED- □□□ CS □ : With absolute encoder (8192 pulses/rev)
  USAFED- □□□ C2 □ : With incremental encoder (8192 pulses/rev)
- Semi-Standard
  USAFED- □□□ CW □ : With absolute encoder (1024 pulses/rev)
  USAFED- □□□ C3 □ : With incremental encoder (2048 pulses/rev)

Table 2.2 Ratings and Specifications of F Series AC Servomotors

Item \ Motor Type USAFED-		02C □ 1	03C □ 1	05C □ 1	09C □ 1	13C □ 2	20C □ 2	30C □ 2	44C □ 2
Rated Output*	kW (HP)	0.15 (0.2)	0 3 (0.4)	0 45 (0.6)	0 85 (1 1)	1.3 (1.7)	1 8 (2.4)	2 9 (3.9)	4.4 (5 9)
Rated Torque*	N•m (lb•in)	0.98 (8.7)	1.96 (17)	2.84 (25)	5.39 (48)	8.34 (74)	11 5 (102)	18.6 (165)	28.4 (252)
Continuous Max Torque*	N•m (lb•in)	1.08 (10)	2.16 (19)	2 94 (26)	5 88 (52)	8 83 (78)	11 8 (104)	22 6 (200)	37 3 (330)
Instantaneous Peak Torque*	N•m (lb•in)	2 91 (26)	5 82 (52)	8.92 (79)	15.2 (135)	24 7 (219)	34 0 (301)	54 1 (479)	76 2 (675)
Rated Current*	A	3.0	3.0	3.8	6 2	9.7	15	20	30
Rated Speed*	r/min	1500							
Instantaneous Max. Speed*	r/min	2500							
Torque Constant	N • m/A (lb • in/A)	0.36 (3.2)	0.72 (6 3)	0.8 (7.1)	0.92 (8.2)	0.92 (8 2)	0.82 (7.3)	0.98 (8 7)	1 02 (9.0)
Moment of Inertia J_M (=$GD^2/4$)	Kg•m²×10⁻⁴ (lb•in•S²×10⁻³)	1.30 (1.2)	2.06 (1.8)	13.5 (12.0)	24.3 (21.5)	36.7 (32.5)	58 (51.2)	110 (97.2)	143 (126.7)
Power Rate*	kW/s	7.4	18.3	6 0	12	18 9	22 7	31 5	57.0
Inertia Time Constant	ms	3.9	2.5	10.9	6.0	4.4	5.9	5.2	3.7
Inductive Time Constant	ms	3.4	4 3	3.2	5 2	6 1	10 4	13 0	15 2

* Typical value at armature winding temperature of 20℃, in combination with Servopack

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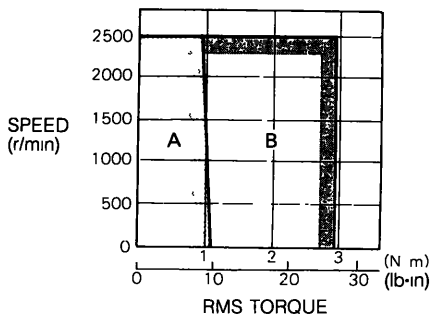
(3) Speed-torque characteristics

Typical at 20°C (Armature Winding Temp.)

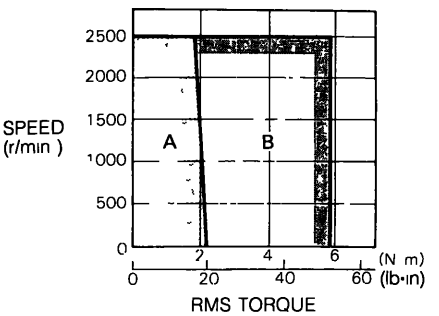
A Continuous Duty Zone

B Intermittent Duty Zone

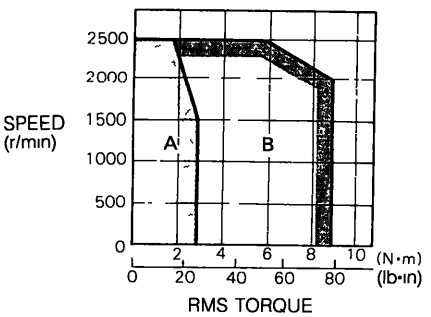
USAFED-02C



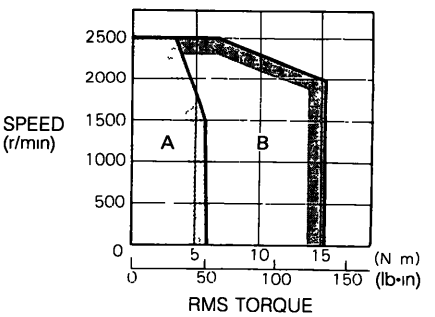
USAFED-03C



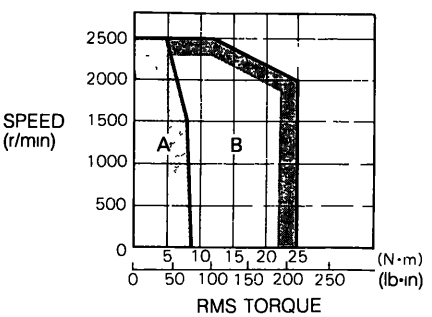
USAFED-05C



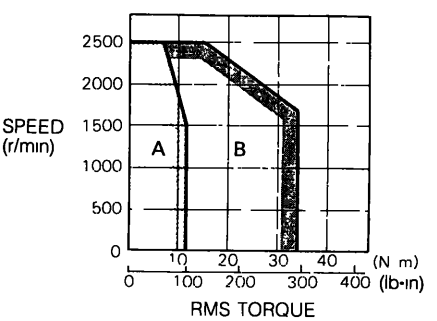
USAFED-09C



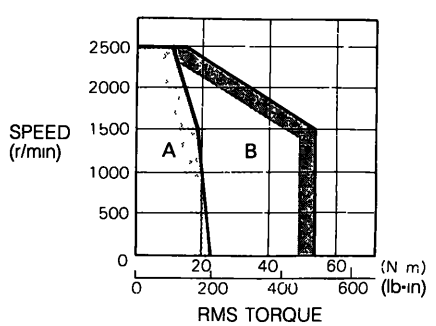
USAFED-13C



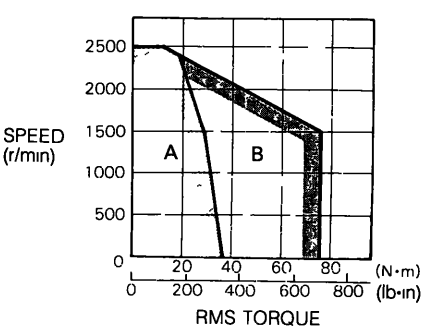
USAFED-20C



USAFED-30C



USAFED-44C



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2.1.3 G Series

(1) Ratings

Time Rating: Continuous
Insulation: Class F
Isolation Voltage: 1500 VAC, one minute
Insulation Resistance: 500 VDC, 10MΩ or more
Enclosure: Totally-enclosed, self-cooled
Ambient Temperature: 0 to + 40℃
Ambient Humidity: 20% to 80% (non-condensing)
Vibration: 15μm or below
Finish in Munsell Notation: N1.5
Excitation: Permanent magnet
Mounting: Flange mounted
Drive Method: Direct drive

(2) Combination with encoder

- Standard
  USAGED- □□ AS □ : With absolute encoder (8192 pulses/rev)
  USAGED- □□ A2 □ : With incremental encoder (8192 pulses/rev)
- Semi-Standard
  USAGED- □□ AW □ : With absolute encoder (1024 pulses/rev)
  USAGED- □□ A3 □ : With incremental encoder (2048 pulses/rev)

Table 2.3 Ratings and Specifications of G Series AC Servomotors

Item \ Motor Type USAGED-	02A □ 1	03A □ 1	05A □ 1	09A □ 1	13A □ 2	20A □ 2	30A □ 2	44A □ 2
Rated Output* kW (HP)	0.15 (0.2)	0.3 (0.4)	0.45 (0.6)	0.85 (1.1)	1.3 (1.7)	1.8 (2.4)	2.9 (3.9)	4.4 (5.9)
Rated Torque* N•m (lb•in)	0.98 (8.7)	1.96 (17)	2.84 (25)	5.39 (48)	8.34 (74)	11.5 (102)	18.6 (165)	28.4 (252)
Continuous Max. Torque* N•m (lb•in)	1.08 (10)	2.16 (19)	2.94 (26)	5.83 (52)	8.83 (78)	11.8 (104)	22.6 (200)	37.3 (330)
Instantaneous Peak Torque* N•m (lb•in)	2.91 (26)	5.83 (52)	8.92 (79)	13.3 (118)	23.3 (207)	28.0 (248)	45.1 (339)	66.2 (587)
Rated Current* A	3.0	3.0	3.8	7.6	11.7	19.0	26.0	33.0
Rated Speed* r/min	1500							
Max. Speed* r/min	3000							
Torque Constant N•m/A (lb•in/A)	0.36 (3.2)	0.72 (6.3)	0.80 (7.1)	0.80 (7.1)	0.83 (7.4)	0.67 (5.9)	0.80 (7.1)	0.95 (8.4)
Moment of Inertia $J_M(=GD_M^2/4)$ Motor $kg \cdot m^2 \times 10^{-4}$ (lb•in•s²×10⁻³)	1.3 (1.2)	2.06 (1.8)	13.5 (12.0)	24.3 (21.5)	36.7 (32.5)	58 (51.2)	110 (97.2)	143 (126.7)
Power Rate* kW/s	7.4	18.3	6.0	12.0	18.9	22.7	36.5	57.0
Inertia Time Constant ms	4.5	2.5	10.9	6.1	4.3	5.8	5.2	3.4
Inductive Time Constant ms	3.4	4.3	3.2	5.2	6.7	10.4	13.2	15.9

* Typical value at armature winding temperature of 20℃, in combination with Servopack

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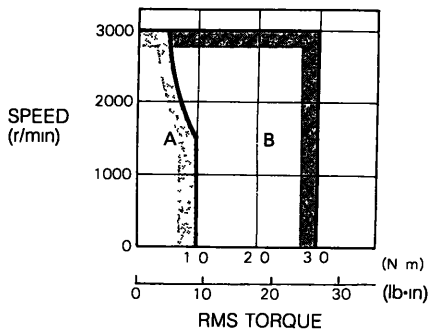
(3) Speed-torque characteristics

Typical at 20°C (Armature Winding Temp.)

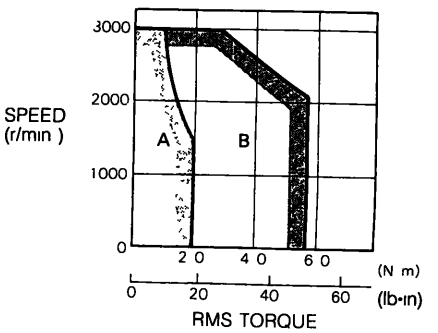
A Continuous Duty Zone

B Intermittent Duty Zone

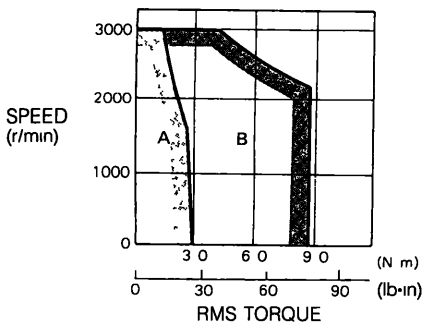
USAGED-02A



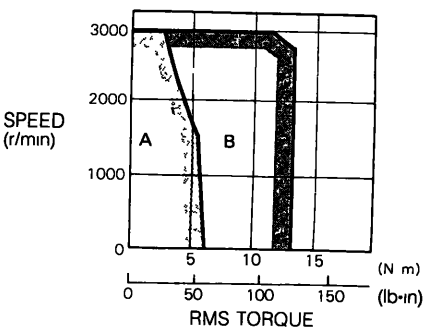
USAGED-03A



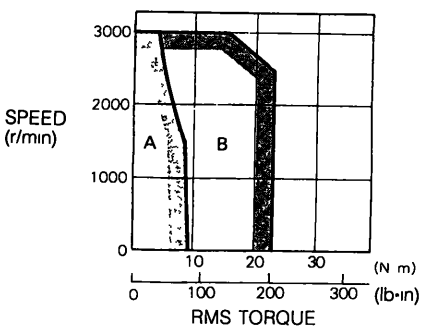
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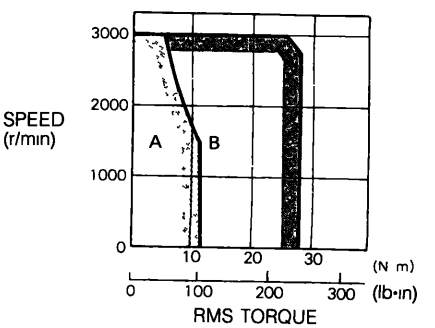
USAGED-09A



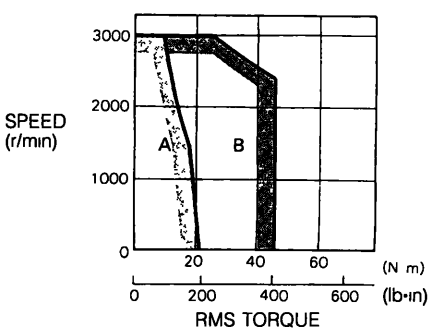
USAGED-13A



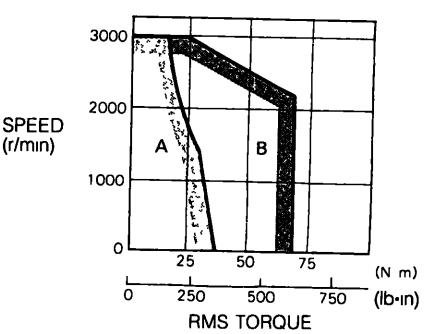
USAGED-20A



USAGED-30A



USAGED-44A



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2.1.4 D Series

(1) Ratings

Time Rating: Continuous
Insulation: Class F
Isolation Voltage: 1500 VAC, one minute
Insulation Resistance: 500 VDC, 10MΩ or more
Enclosure: Totally-enclosed, self-cooled
Ambient Temperature: 0 to + 40℃
Ambient Humidity: 20% to 80%(non-condensing)
Vibration: 15μm or below
Finish in Munsell Notation: N1.5
Excitation: Permanent magnet
Mounting: Flange mounted
Drive Method: Direct drive
Holding Brake Provided

(2) Combination with encoder

- Standard
  USADED- □□□ EW : With absolute encoder (1024 pulses/rev)
  USADED- □□□ E3 : With incremental encoder (2048 pulses/rev)
- Semi-Standard
  USADED- □□□ ES : With absolute encoder (8192 pulses/rev)
  USADED- □□□ E2 : With incremental encoder (8192 pulses/rev)

Table 2.4 Ratings and Specifications of D Series AC Servomotors

Item \ Motor Type USADED-		05E □	10E □	15E □	22E □	37E □
Rated Output*	kW (HP)	0.5 (0 67)	1.0 (1.3)	1.5 (2.0)	2.2 (2 9)	3.7 (5 0)
Rated Torque*	N•m (lb•in)	2.35 (21)	4.80 (43)	7.16 (63)	10.5 (93)	17.7 (156)
Continuous Max Torque*	N•m (lb•in)	3.43 (30)	6 37 (56)	8.82 (78)	13.7 (122)	21.6 (191)
Instantaneous Peak Torque*	N•m (lb•in)	8.24 (73)	16.9 (149)	25.1 (222)	36.8 (326)	61.8 (547)
Rated Current*	A	3.5	7 9	12.6	16.6	23.3
Rated Speed*	r/min	2000				
Instantaneous Peak Speed*	r/min	2500				
Torque Constant	N•m/A (lb•n/1)	0.83 (7.38)	0.69 (6.07)	0.64 (5.64)	0.71 (6.25)	0.82 (7.29)
Moment of Motor Inertia J_M (=$GD^2/4$)	$kg•m^2×10^{-4}$ ($lb•in•s^2×10^{-3}$)	21, 13† (13 2, 11 3†)	32, 24† (28. 6, 21. 5†)	62, 59† (54. 7, 52. 1†)	83, 80† (73. 8. 71. 1†)	148, 145† (131, 128†)
Power Rate*	kW/s	2.7 4.4†	7.3 9.7†	8.2 8.6†	13 14†	21 22†
Inertia Time Constant	ms	18 11†	7.8 5.9†	7.1 6.8†	6.2 6.0†	4.3 4.2†
Inductive Time Constant	ms	4.4	6.9	9.4	11	15

* Typical value at armature winding temperature of 20℃, in combination with Servopack.
† Values show those of D series without holding brake.

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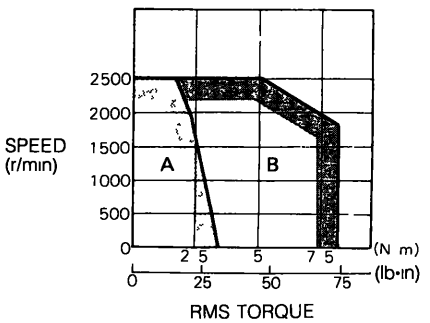
(3) Speed-torque characteristics

Typical at 20°C (Armature Winding Temp.)

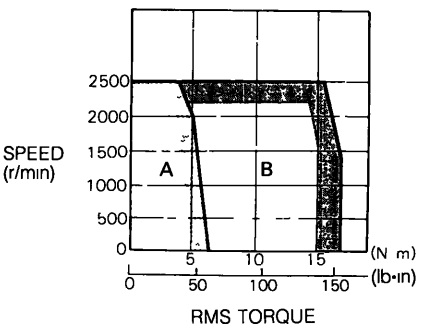
A Continuous Duty Zone

Intermittent Duty Zone

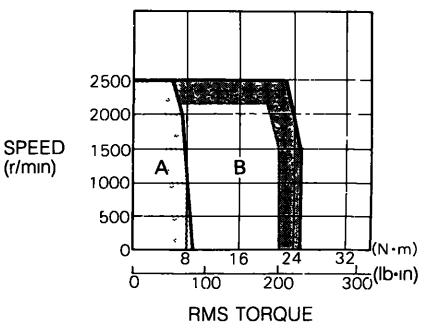
USADED-05E



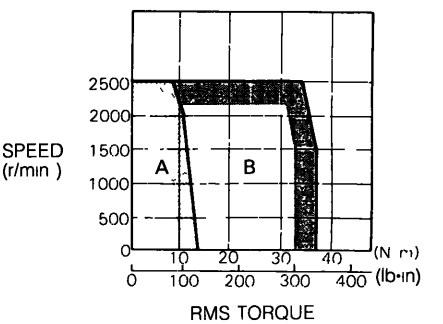
USADED-10E



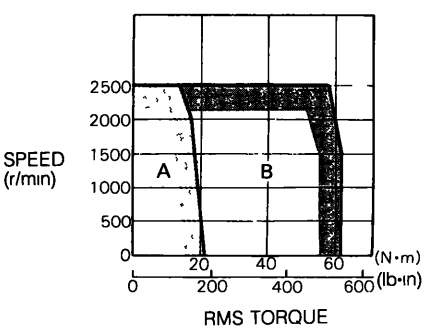
USADED-15E



USADED-22E



USADED-37E



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2.1.5 S Series

(1) Ratings

Time Rating: Continuous
Insulation: Class B (Types USASEM-02A □ 2, -03A □ 2, -05A □ 2)
Class F (Types USASEM-08A □1, -15A □ 1, -30A □ 1)
Isolation Voltage: 1500 VAC, one minute
Insulation Resistance: 500 VDC, 10MΩ or more
Enclosure: Totally-enclosed, self-cooled
Ambient Temperature: 0 to + 40℃
Ambient Humidity: 20% to 80% (non-condensing)
Vibration: 15 μm or below
Finish in Munsell Notation: N1.5
Excitation: Permanent magnet
Mounting: Flange mounted
Drive Method: Direct drive

(2) Combination with encoder

- Standard
  USASEM- □□ AS : With absolute encoder (8192 pulses/rev)
  USASEM- □□ A3 : With incremental encoder (2048 pulses/rev)
- Semi-Standard
  USASEM- □□ AW : With absolute encoder (1024 pulses/rev)
  USASEM- □□ A4 : With incremental encoder (2500 pulses/rev)

Table 2.5 Ratings and Specifications of S Series AC Servomotors

Item \ Motor Type USASEM-		02A □ 2	03A □ 2	05A □ 2	08A □ 1	15A □ 1	30A □ 1
Rated Output*	W (HP)	154 (0.2)	308 (0.4)	462 (0 6)	771 (1.0)	1540 (2 1)	3080 (4 1)
Rated Torque*	N•m (lb•in)	0.49 (4.3)	0.98 (8.7)	1.47 (13)	2 45 (22)	4 90 (43)	9 80 (87)
Continuous Max Torque*	N•m (lb•in)	0 57 (5 0)	1 18 (10)	1.67 (15)	3 33 (30)	6.17 (55)	12.2 (108)
Instantaneous Peak Torque*	N•m (lb•in)	1.47 (13)	2.94 (26)	4.02 (36)	7.35 (65)	13 7 (122)	29.0 (257)
Rated Current*	A	2.1	3.0	4.2	5.3	10.4	19.9
Rated Speed*	r/min	3000					
Instantaneous Max Speed*	r/min	4000					
Torque Constant	N•m/A (lb•in/A)	0.25 (2.19)	0 35 (3.10)	0.37 (3.25)	0.51 (4.49)	0.50 (4.43)	0.52 (4.64)
Moment of Motor Inertia $J_M(=GD^2/4)$	$kg•m^2\times10^{-4}$ ($lb•in•s^2\times10^{-3}$)	0.13 (0.11)	0.51 (0.45)	0.75 (0.67)	2.85 (2.53)	3.3 (2.88)	5.74 (5.09)
Power Rate*	kW/s	18.5	18.9	28.9	21	74	167
Inertia Time Constant	ms	1 8	2 2	1.8	1.9	0.7	0.4
Inductive Time Constant	ms	1.5	2.7	3 1	6.2	13	26

* Typical value at armature winding temperature of 100℃, in combination with Servopack
Other values at 20℃.

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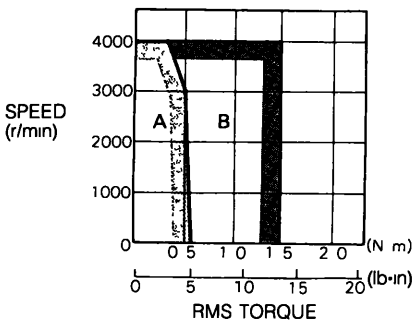
(3) Speed-torque characteristics

Typical at 100°C (Armature Winding Temp.)

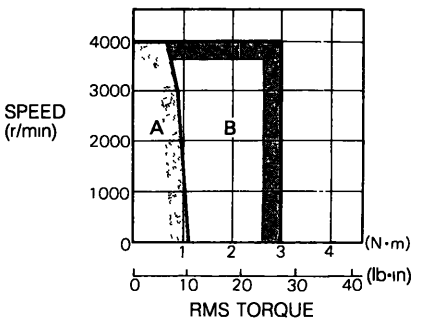
A Continuous Duty Zone

Intermittent Duty Zone

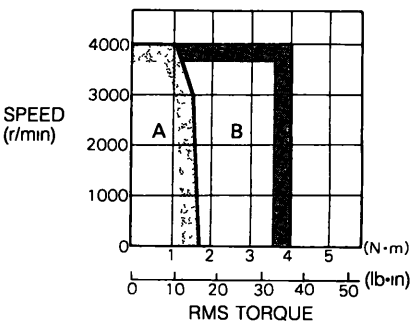
USASEM-02A



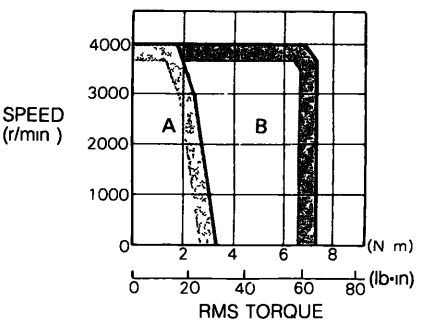
USASEM-03A



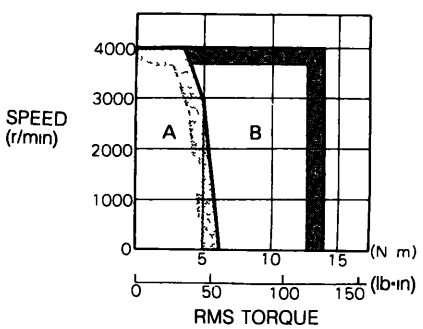
USASEM-05A



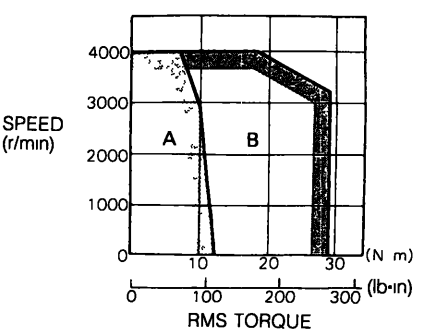
USASEM-08A



USASEM-15A



USASEM-30A



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2.1.6 R Series (For 200V)

(1) Ratings

Time Rating: Continuous
Insulation: Class B
Isolation Voltage: 1000 VAC, one minute
Insulation Resistance: 500 VDC, 10MΩ or more
Enclosure: Totally-enclosed, self-cooled
Ambient Temperature: 0 to +40℃
Storage Temperature: −20 to +60℃
Ambient Humidity: 20% to 80% (non-condensing)
Vibration: 15μm or below
Finish in Munsell Notation: N1.5
Excitation: Permanent magnet
Mounting: Flange mounted
Drive Method: Direct drive

(2) Combination with encoder

• Standard

USAREM- ☐☐☐ CS2 : With absolute encoder (8192 pulses/rev)

Table 2.6 Ratings and Specifications of R Series AC Servomotors (For 200 V)

Item \ Motor Type USAREM-		A5C ☐ 2	01C ☐ 2	02C ☐ 2	03C ☐ 2	05C ☐ 2	07C ☐ 2
Rated Output*	W (HP)	50 (0.07)	100 (0.13)	200 (0.27)	300 (0.40)	500 (0.67)	700 (0.93)
Rated Torque*	N•m (oz•in)	0 159 (22.5)	0 318 (45)	0.637 (90)	0.955 (135)	1.59 (225)	2.23 (316)
Continuous Max. Torque*	N•m (oz•in)	0.19 (26 9)	0 382 (54.2)	0.765 (108.3)	1.15 (162.5)	1.90 (269.4)	2 67 (378)
Peak Torque*	N•m (oz•in)	0.476 (67 5)	0.955 (135)	1.91 (270)	2.86 (405)	4.76 (675)	6.68 (948)
Rated Current*	A	0 71	1.0	2.0	2.7	3.6	5.7
Rated Speed*	r/min	3000					
Max. Speed*	r/min	4500					
Torque Constant	N•m/A (oz•in/A)	0.235 (33.3)	0.353 (50.0)	0.346 (49.0)	0.378 (53.6)	0.466 (66.0)	0 426 (60.4)
Moment of Motor Inertia $J_M(=GD^2/4)$	kg•cm² (oz•in•s²×10⁻³)	0.076 (1.08)	0.125 (1.78)	0.507 (7.18)	0.766 (10.9)	2.72 (38.6)	3.72 (52 8)
Power Rate*	kW/s	3.30	8.09	8.01	11.9	9.26	13.3
Inertia Time Constant	ms	4.4	3.4	2.9	2 6	2.8	2.5
Inductive Time Constant	ms	1.3	1.6	4.1	4.5	9.4	10.0

* Typical value at armature winding temperature of 75℃, in combination with Servopack. Other values at 20℃.

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(3) Speed-torque characteristics

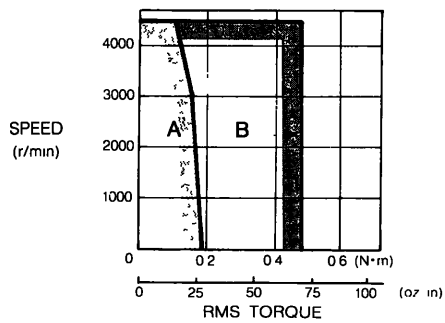
Typical at 20°C (Armature Winding Temp)

A Continuous Duty Zone

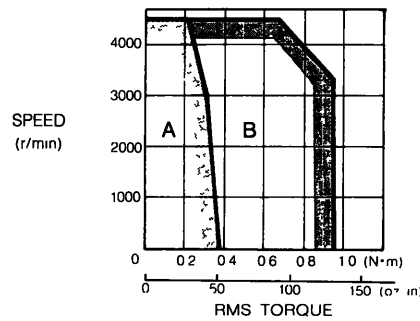
Intermittent Duty Zone

Note : Values in the intermittent duty zone are typical values when Servopack power supply voltage is 200 VAC. When it is less than 200 VAC, output characteristics may be reduced even if the values are within in the allowable variation range.

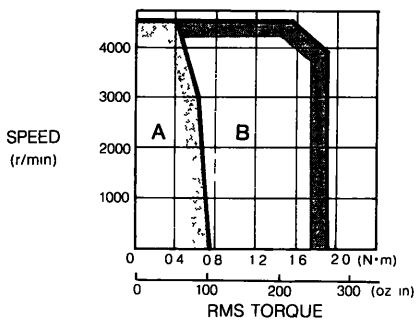
USAREM-A5C



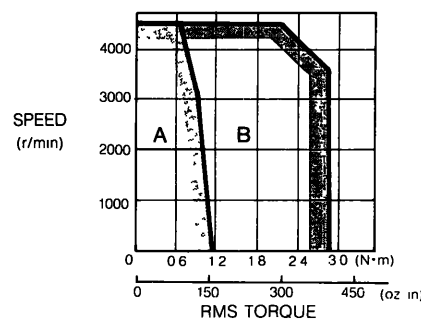
USAREM-01C



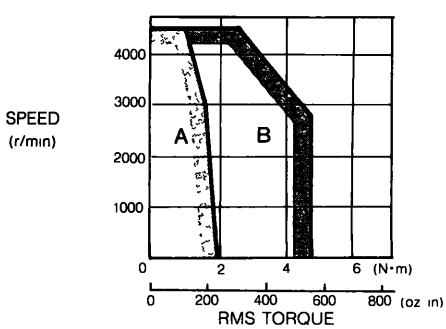
USAREM-02C



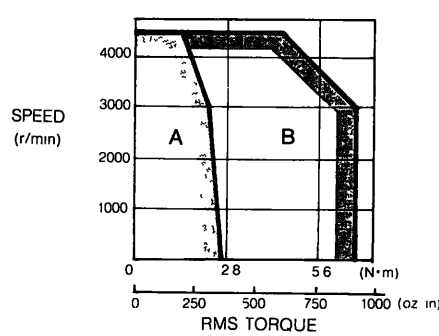
USAREM-03C



USAREM-05C



USAREM-07C



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2.1.7 R Series (For 100V)

(1) Ratings

Time Rating: Continuous
Insulation: Class B
Isolation Voltage: 1000 VAC, one minute
Insulation Resistance: 500 VDC, 10MΩ or more
Enclosure: Totally-enclosed, self-cooled
Ambient Temperature: 0 to + 40℃
Storage Temperature: −20 to + 60℃
Ambient Humidity: 20% to 80% (non-condensing)
Vibration: 15μm or below
Finish in Munsell Notation: N1.5
Excitation: Permanent magnet
Mounting: Flange mounted
Drive Method: Direct drive

(2) Combination with encoder

• Standard

USAREM- □□ DS2 : With absolute encoder (8192 pulses/rev)

Table 2.7 Ratings and Specifications of R Series AC Servomotors (For 100 V)

Item \ Motor Type USAREM-		A5D □ 2	01D □ 2	02D □ 2	03D □ 2	05D □ 2
Rated Output*	W (HP)	50 (0.07)	100 (0.13)	200 (0.27)	300 (0.40)	500 (0.67)
Rated Torque*	N•m (oz•in)	0.159 (22.5)	0.318 (45)	0.637 (90)	0.955 (135)	1.59 (225)
Continuous Max Torque*	N•m (oz•in)	0.19 (26.9)	0.382 (54.2)	0.765 (108.3)	1.15 (162.5)	1.90 (269.4)
Peak Torque*	N•m (oz•in)	0.476 (67.5)	0.955 (135)	1.91 (270)	2.86 (405)	4.76 (675)
Rated Current*	A	1.2	1.7	2.9	3.6	5.5
Rated Speed*	r/min	3000				
Max Speed*	r/min	4000				
Torque Constant	N•m/A (oz•in/A)	0.136 (19.3)	0.198 (28.1)	0.235 (33.3)	0.284 (40.3)	0.308 (43.6)
Moment of Motor Inertia J_M (=GD2/4)	kg•cm² (oz•in•s²×10⁻³)	0.076 (1.08)	0.125 (1.78)	0.507 (7.18)	0.766 (10.9)	2.72 (38.6)
Power Rate*	kW/s	3.30	8.09	8.01	11.9	9.26
Inertia Time Constant	ms	4.2	3.2	3.0	2.5	2.7
Inductive Time Constant	ms	1.4	1.7	4.0	4.6	9.6

* Typical value at armature winding temperature of 75℃, in combination with Servopack
Other values at 20℃

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(3) Speed-torque characteristics

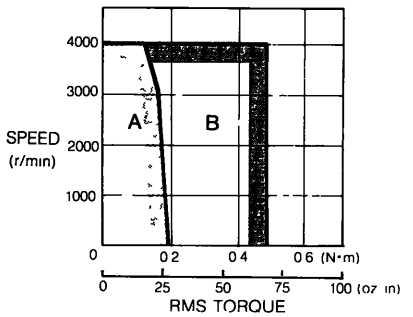
Typical at 20°C (Armature Winding Temp.)

A Continuous Duty Zone

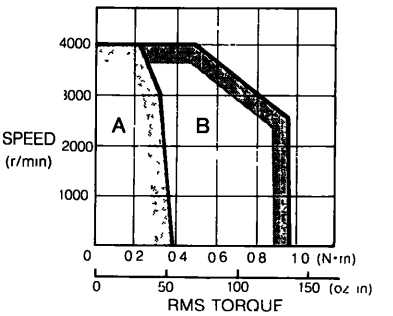
B Intermittent Duty Zone

Note: Values in the intermittent duty zone are typical values when Servopack power supply voltage is 100 VAC. When it is less than 100 VAC, output characteristics may be reduced even if the values are within in the allowable variation range.

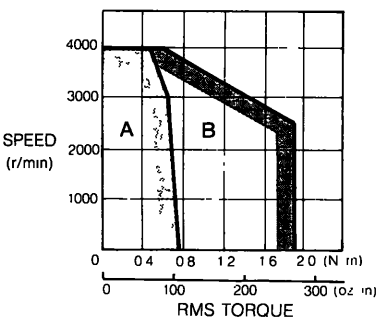
USAREM-A5D



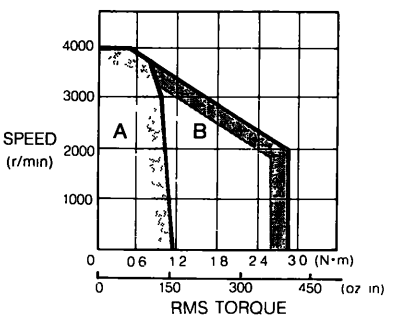
USAREM-01D



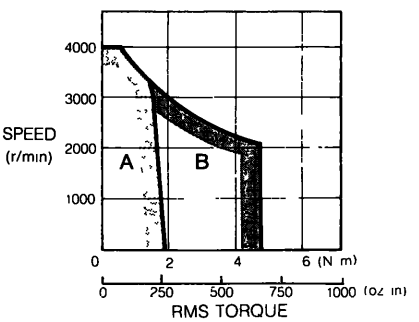
USAREM-02D



USAREM-03D



USAREM-05D



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2.1.8 P Series

(1) Ratings

Time Rating: Continuous
Insulation: Class B
Isolation Voltage: 1000 VAC, one minute
Insulation Resistance: 500 VDC, 10MΩ or more
Enclosure: Totally-enclosed, self-cooled
Ambient Temperature: 0 to + 40℃
Storage Temperature: −20 to + 60℃
Ambient Humidity: 20% to 80% (non-condensing)
Vibration: 15μm or below
Finish in Munsell Notation: N1.5
Excitation: Permanent magnet
Mounting: Flange mounted
Drive Method: Direct drive

(2) Combination with encoder

• Standard

USAPEM- ☐☐☐ CW2 : With absolute encoder (1024 pulses/rev)

Table 2.8 Ratings and Specifications of P Series AC Servomotors

Item \ Motor Type USAPEM-		01C ☐ 2	02C ☐ 2	03C ☐ 2	05C ☐ 2	07C ☐ 2
Rated Output*	W (HP)	100 (0.13)	200 (0.27)	300 (0.40)	500 (0.67)	750 (1.0)
Rated Torque*	N•m (oz•in)	0.32 (45)	0.64 (90)	0.95 (135)	1 59 (225)	2 39 (339)
Continuous Max Torque*	N•m (oz•in)	0 32 (45)	0 64 (90)	0 95 (135)	1 59 (225)	2 39 (339)
Peak Torque*	N•m (oz •in)	0.96 (136)	1.91 (270)	2.86 (405)	4.76 (675)	7 06 (1000)
Rated Current*	Arms	1.0	2.0	2.7	3.6	5.7
Rated Speed*	r/min	3000				
Max Speed*	r/min	4500				
Torque Constant	N•m/A (oz•in/A)	0 35 (49.6)	0.34 (47 8)	0 37 (52.8)	0 51 (72.5)	0.44 (62.6)
Moment of Motor Inertia J_M (=$GD^2/4$)	kg•cm² (oz•in•s²×10⁻³)	0.39 (5 55)	0.64 (9.03)	0.98 (13.9)	4.78 (67.8)	6.57 (93.0)
Power Rate*	kW/s	2.59	6.37	9.30	5.27	8 71
Inertia Time Constant	ms	5.3	2 8	2 2	4.9	3.3
Inductive Time Constant	ms	4.7	5.8	6.4	10.0	14.0

* Typical value at armature winding temperature of 75℃, in combination with Sevopack. Other values at 20℃.

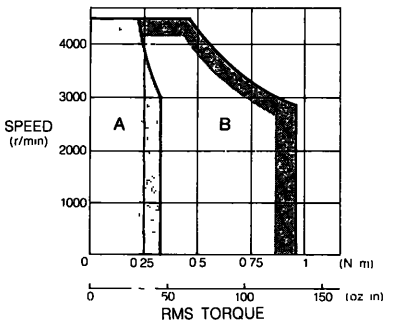
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(3) Speed-torque characteristics

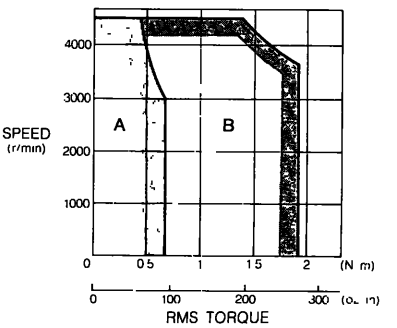
Typical at 20°C (Armature Winding Temp.)
A Continuous Duty Zone
Intermittent Duty Zone

Note: Values in the intermittent duty zone are typical values when Servopack power supply voltage is 200 VAC. When it is less than 200 VAC, output characteristics may be reduced even if the values are with in the allowable variation range.

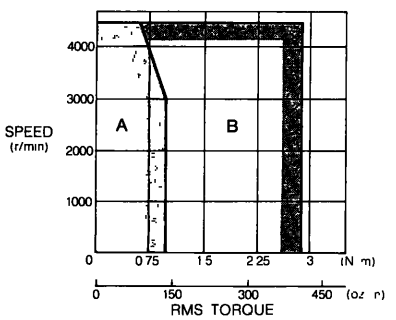
Type USAPEM-01C



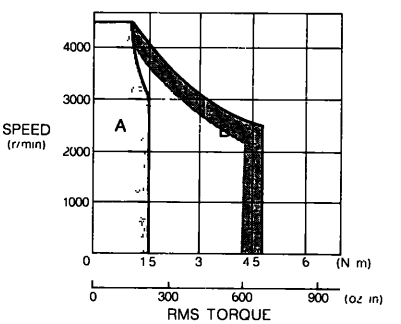
Type USAPEM-02C



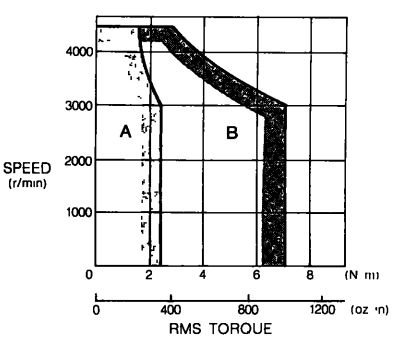
Type USAPEM-03C



Type USAPEM-05C



Type USAPEM-07C



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2.2 MECHANICAL CHARACTERISTICS

2.2.1 Mechanical Strength

AC servomotors can carry up to 300% (350% only for D series) of the rated momentary maximum torque at output shaft.

2.2.2 Allowable Radial Load and Thrust Load

Table 3.9 shows allowable loads according to AC servomotor types.

Table 2.9 Allowable Radial Load and Thrust Load

• M Series

Motor Type USAM □ D-	Allowable Radial Load* N(lb)	Allowable Thrust Load N(lb)
03B □ 1	490(110)	98(22) †
06B □ 1		
09B □ 2	686(154)	343(77)
12B □ 2	1470(330)	490(110)
20B □ 2		
30B □ 2		
44B □ 2	1764(397)	588(132)
60B □ 2		

• F Series

Motor Type USAFED-	Allowable Radial Load* N(lb)	Allowable Thrust Load N(lb)
02C □ 1	147(33)	49(11) †
03C □ 1		
05C □ 1	490(110)	98(22) †
09C □ 1	686(154)	343(77)
13C □ 2		
20C □ 2		
30C □ 2	1470(331)	490(110)
44C □ 2		

• G Series

Motor Type USAGED-	Allowable Radial Load* N(lb)	Allowable Thrust Load N(lb)
02A □ 1	147(33)	49(11) †
03A □ 1		
05A □ 1	490(110)	98(22) †
09A □ 1	686(154)	343(77)
13A □ 2		
20A □ 2		
30A □ 2	1470(331)	490(110)
44A □ 2		

• D Series

Motor Type USADED-	Allowable Radial Load* N(lb)	Allowable Thrust Load N(lb)
05E □	686(154)	343(77)
10E □		
15E □	1176(265)	490(110)
22E □		
37E □		

• S Series

Motor Type USASEM-	Allowable Radial Load* N(lb)	Allowable Thrust Load N(lb)
02A □	78.4(18)	39.2(9)
03A □	245(55)	98(22)
05A □		
08A □	392(88)	147(33)
15A □	490(110)	
30A □	686(154)	196(44)

• R Series

Motor Type USAREM-	Allowable Radial Load* N(lb)	Allowable Thrust Load N(lb)
A5 □□ 2	78.4(18)	39.2(9)
01 □□ 2		
02 □□ 2	245(55)	98(22)
03 □□ 2		
05 □□ 2	392(88)	147(33)
07 □□ 2		

• P Series

Motor Type USAPEM-	Allowable Radial Load* N(lb)	Allowable Thrust Load N(lb)
01C □ 2	88.2(20)	39.2(9)
02C □ 2	147(33)	58.8(13)
03C □ 2	196(44)	
05C □ 2	343(77)	98(22)
07C □ 2	441(99)	127.4(29)

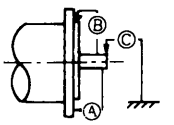
* Maximum values of the load applying to the shaft extension

† Do not apply the exceeding load because motor can not be rotated

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2.2.3 Mechanical Specifications

Table 2.10 Mechanical Specifications in mm

Accuracy(T. I. R.)*1		Reference Diagram
Flange surface perpendicular to shaft Ⓐ	0.04 (0.06)*2	
Flange diameter concentric to shaft Ⓑ	0.04	
Shaft run out Ⓒ	0.02 (0.04)*3	

*1 T. I. R. (Total Indicator Reading)
*2 Accuracy for motor types USADED-15E, -22E, and -37E.
*3 Accuracy for motor types USAMED-44B □ 2 and USAMKD-60B □ 2.

2.2.4 Rotating Direction

AC Servomotor rotating direction is CCW when viewed from the load side when connection shown in Par. 3. 3. 1 is performed and forward command is given to Servopack. (Fig. 3. 11)

2.2.5 Shock Resistance

When mounted horizontally and exposed to vertical shock impulses, the motor can withstand up to two incidents with shock acceleration of 10G (Fig. 3. 12).

Note

A precision detector is mounted on the oppositedrive end of AC servomotor. Care should be taken to protect the shaft from impacts that could damage the detector.

2.2.6 Vibration Resistance

When mounted horizontally, the motor can withstand vibration (vertical, lateral, axial) of2. 5 G (Fig. 3. 13).

2.2.7 Vibration Class

Vibration of the motor running at rated speed is 15 μm or below (Fig. 3. 14).

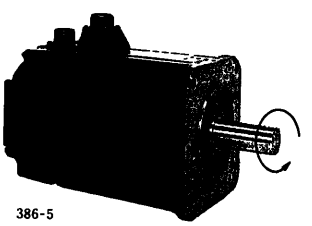


Fig. 2.11 AC Servomotor

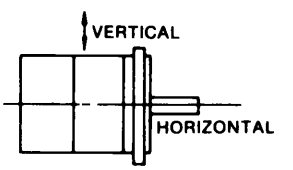


Fig. 2.12 Impact Resistance

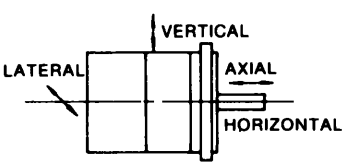


Fig. 2.13 Vibration Resistance

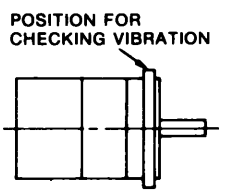


Fig 2.14 Vibration Checking

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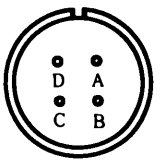
2.3 RECEPTACLES

2.3.1 Connector Specifications

(1) Without brake (M, F, G, S, R series)

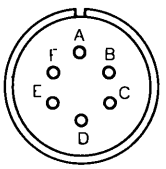
(a) Motor receptacle

• M, F, G, R series



A	Phase U
B	Phase V
C	Phase W
D	Frame Ground

Fan terminal box
connector specifications
Type USAMKD-60B□2

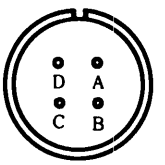


A, B	Fan motor
C	—
D, E	Alarm terminal
F	—

• S series
Type USASEM-02

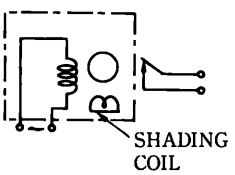
Color of Lead	Applicable
Rec	Phase U
White	Phase V
Blue	Phase W
Green	Frame Ground

Type USASEM-03A to 30A



A	Phase U
B	Phase V
C	Phase W
D	Frame Ground

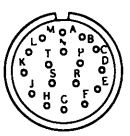
Fan motor connection



Power supply:single-phase
200/200/220V, 50/60/60Hz
Alarm contact :
OFF at fan rotation normal
ON at 1800±200r/min or less
ON for 3 seconds after starting
Contact capacity :
Resistance load max 110V 0.3A

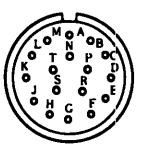
(b) Detector receptacle

• Incremental encoder



A	Channel A output	K	—
B	Channel $\overline{A}$ output	L	—
C	Channel B output	M	—
D	Channel $\overline{B}$ output	N	—
E	Channel C output	P	—
F	Channel $\overline{C}$ output	R	—
G	0V	S	—
H	+5VDC	T	—
J	Frame Ground	-	—

• Absolute encoder

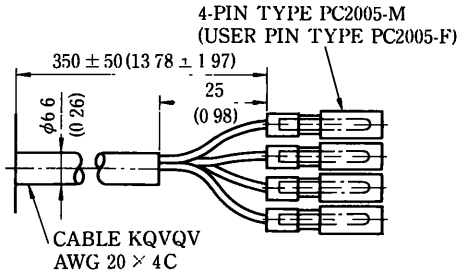


A	Channel A output	J	Frame Ground
B	Channel $\overline{A}$ output	K	—
C	Channel B output	L	—
D	Channel $\overline{B}$ output	M	—
E	Channel Z output	N	—
F	Channel $\overline{Z}$ output	P	—
G	0V	R	Reset
H	+5VDC	S	0V(battery)
-	—	T	3.6V(battery)

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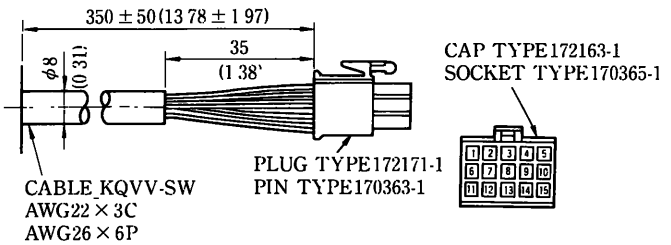
(2) Without brake (P series)

(a) Motor side



Phase U	Red
Phase V	White
Phase W	Blue
Frame Ground	Green

(b) Detector side (absolute encoder)

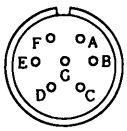


1	Channel A output	Blue	9	Frame ground	Green/Yellow
2	Channel $\overline{A}$ output	White/Blue	10	Channel S output	Purple
3	Channel B output	Yellow	11	Channel $\overline{S}$ output	White/Purple
4	Channel $\overline{B}$ output	White/Yellow	12	Capacitor reset	Grey
5	Channel Z output	Green	13	Reset	White/Grey
6	Channel $\overline{Z}$ output	White/Green	14	0V(battery)	White/Orange
7	0V	Black	15	3.6V(battery)	Orange
8	5VDC	Red	—	—	—

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(3)With brake

• M, F, G, D Series



A	Phase U	E	Brake terminal
B	Phase V	F	Brake terminal
C	Phase W	G	—
D	Frame Ground	-	—

Note:
1. D series is provided with brake as standard.
2. For motor without brake of D series, E and F are idle terminals.

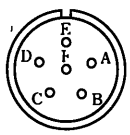
• S, R Series

USASEM-02A

Color of Lead	Applicable
Red	Phase U
White	Phase V
Blue	Phase W
Black	Brake
Black	Brake
Green	Frame Ground

USASEM -08A to -30A

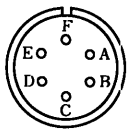
USAREM -05C, -05D, -07C



A	Phase U
B	Phase V
C	Phase W
D, E	Brake terminal
F	Frame Ground

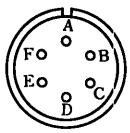
USASEM -03A, -05A

USAREM -02C, -02D, -03C, -03D



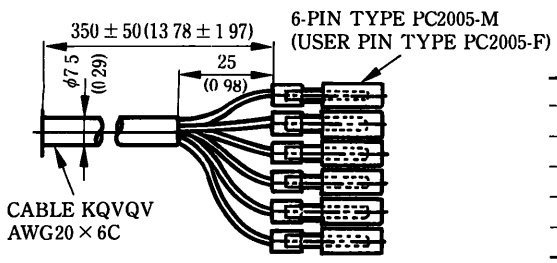
A	Phase U
B	Phase V
C	Phase W
D, E	Brake terminal
F	Frame Ground

USAREM -A5C, -A5D, -01C, -01D



A	Phase U
B	Phase V
C	Phase W
D, E	Brake terminal
F	Frame Ground

• P Series



Phase U	Red
Phase V	White
Phase W	Blue
Frame Ground	Green
Brake terminal	Black
Brake terminal	Black

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2.3.2 List of Standard Combination

Table 2.11 M Series: Characteristics of AC Servomotor, Detector, and Holding Brake (Option) for Standard Combination

AC Servomotor Type USAMED-	AC Servomotor				Detector			
	Receptacle	L-type Plug	Straight Plug	Cable Clamp	Receptacle	L-type Plug	Straight Plug	Cable Clamp
03B □ 1	MS3102A 18-10P	MS3108B 18-10S	MS3106B 18-10S	MS3057 -10A	MS3102A 20-29P	MS3108B 20-29S	MS3106B 20-29S	MS3057 -12A
06B □ 1								
09B □ 2								
12B □ 2	MS3102A 22-22P	MS3108B 22-22S	MS3106B 22-22S	MS3057 -12A				
20B □ 2								
30B □ 2								
44B □ 2	MS3102A 32-17P	MS3108B 32-17S	MS3106B 32-17S	MS3057 -20A				
USAMKD-60B □ 2*								

Table 2.12 F Series: Characteristics of AC Servomotor, Detector, and Holding Brake (Option) for Standard Combination

AC Servomotor Type USAFED-	AC Servomotor				Detector			
	Receptacle	L-type Plug	Straight Plug	Cable Clamp	Receptacle	L-type Plug	Straight Plug	Cable Clamp
02C □ 1	MS3102A 14S-2P	MS3108B 14S-2S	MS3106B 14S-2S	MS3057 -6A	MS3102A 14S-29P	MS3108B 20-29S	MS3106B 20-29S	MS3057 -12A
03C □ 1								
05C □ 1	MS3102A 18-10P	MS3108B 18-10S	MS3106B 18-10S	MS3057 -10A	MS3102A 20-29P			
09B □ 1								
13B □ 2								
20B □ 2	MS3102A 22-22P	MS3108B 22-22S	MS3106B 22-22S	MS3057 -12A	MS3102A 20-29P			
30B □ 2								
44B □ 2								

Table 2 13 G Series. Characteristics of AC Servomotor, Detector, and Holding Brake (Option) for Standard Combination

AC Servomotor Type USAGED-	AC Servomotor				Detector			
	Receptacle	L-type Plug	Straight Plug	Cable Clamp	Receptacle	L-type Plug	Straight Plug	Cable Clamp
02A □ 1	MS3102A 14S-2P	MS3108A 14S-2S	MS3106B 14S-2S	MS3057 -6A	MS3102A 20-29P	MS3108B 20-29S	MS3106B 20-29S	MS3057 -12A
03A □ 1								
05A □ 1	MS3102A 18-10P	MS3108B 18-10S	MS3106B 18-10S	MS3057 -10A				
09A □ 1								
13A □ 2								
20A □ 2	MS3102A 22-22P	MS3108B 22-22S	MS3106B 22-22S	MS3057 -12A				
30A □ 2								
44A □ 2								

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	Holding Brake			
	Receptacle	L-type Plug	Straight Plug	Cable Clamp
	MS3102A 20-15P	MS3108B 20-15S	MS3106B 20-15S	MS3057 -12A
	MS3102A 24-10P	MS3108B 24-10S	MS3106B 24-10S	MS3057 -16A
	–	–	–	–

* Cooling fan required.
Receptacle type
MS3102A14S-6B
Plug type
MS3108B14S-6S
Cable clamp type
MS3057-6A

Note These connectors are made by DAI-ICHI DENSHI KOGYO Co ,Ltd

	Holding Brake			
	Receptacle	L-type Plug	Straight Plug	Cable Clamp
	MS3102A 14S-6P	MS3108B 14S-6S	MS3106B 14S-6S	MS3057 -6A
	MS3102A 20-15P	MS3108B 20-15S	MS3106B 20-15S	MS3057 -12A
	MS3102A 24-10P	MS3108B 24-10S	MS3106B 24-10S	MS3057 -16A

Note. These connectors are made by DAI-ICHI DENSHI KOGYO Co ,Ltd

	Holding Brake			
	Receptacle	L-type Plug	Straight Plug	Cable Clamp
	MS3102A 14S-6P	MS3108B 14S-6S	MS3106B 14S-6S	MS3057 -6A
	MS3102A 20-15P	MS3108B 20-15S	MS3106B 20-15S	MS3057 -12A
	MS3102A 24-10P	MS3108B 24-10S	MS3106B 24-10S	MS3057 -16A

Notes:
1. For connection parts(plugs, clamps, etc) contact your Yaskawa representative. For connecting method, there are two types·soldering(MS type)and compression(JA type).
2. There connectors are made by DAI-ICHI DENSHI KOGYO Co Ltd.

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Table 2.14 D Series: Characteristics of AC Servomotor, Detector, and Holding Brake for Standard Combination

AC Servomotor Type USADED-	Holding Brake				Detector			
	Receptacle	L-type Plug	Straight Plug	Cable Clamp	Receptacle	L-type Plug	Straight Plug	Cable Clamp
05E ☐	MS3102A 20-15P	MS3108B 20-15S	MS3106B 20-15S	MS3057 -12A	MS3102A 20-29P	MS3108B 20-29S	MS3106B 20-29S	MS3057 -12A
10E ☐								
15E ☐	MS3102A 24-10P	MS3108B 24-10S	MS3106B 24-10S	MS3057 -16A				
22E ☐								
37E ☐								

Table 2.15 S Series: Characteristics of AC Servomotor, Detector and Holding Brake (Option) for Standard Combination

AC Servomotor Type USASEM-	AC Servomotor				Detector			
	Receptacle	L-type Plug	Straight Plug	Cable Clamp	Receptacle	L-type Plug	Straight Plug	Cable Clamp
02A ☐	Since lead outlet method differs, refer to the data separately							
03A ☐	MS3102A 18-10P	MS3108B 18-10S	MS3106B 18-10S	MS3057 -10A	MS3102A 20-29P	MS3108B 20-29S	MS3106B 20-29S	MS3057 -12A
05A ☐								
08A ☐	MS3102A 20-4P	MS3108B 20-4S	MS3106B 20-4S	MS3057 -12A				
15A ☐								
30A ☐								

Note There connectors made by DAI-ICHI DENSHI KOGYO Co., Ltd

Table 2.16 R Series: Characteristics of AC Servomotor, Detector, and Holding Brake (Option) for Standard Combination

AC Servomotor Type USAREM-	AC Servomotor			Detector			Holding Brake		
	Receptacle Type	L-type Plug	Cable Clamp	Receptacle Type	L-type Plug	Cable Clamp	Receptacle Type	L-type Plug	Cable Clamp
A5C ☐ 2	MS3101A 14S-2P	MS3106B* 14S-2S	MS3057 -6A	MS3101A 20-29A	MS3106B 20-29S*	MS3057 -12A	MS3101A 14S-6P	MS3106B 14S-6S*	MS3057 -6A
01C ☐ 2									
02C ☐ 2	MS3102A 18-10P	MS3108B 18-10S	MS3057 -10A	MS3102A 20-29P	MS3108B 20-29S		MS3102A 18-12P	MS3108B 18-12S	MS3057 -10A
03C ☐ 2									
05C ☐ 2	MS3102A 20-4P	MS3108B 20-4S	MS3057 -12A				MS3102A 20-17P	MS3108B 20-17S	MS3057 -12A
07C ☐ 2									
A5D ☐ 2	MS3101A 14S-2P	MS3106B 14S-2S*	MS3057 -6A	MS3101A 20-29A	MS3106B 20-29S*	ME3057 -12A	MS3101A 14S-6P	MS3106B 14S-6S*	MS3057 -6A
01D ☐ 2									
02D ☐ 2	MS3102A 18-10P	MS3108B 18-10S	MS3057 -10A	MS3102A 20-29P	MS3108B 20-29S		MS3102A 18-12P	MS3108B 18-12S	MS3057 -10A
03D ☐ 2									
05D ☐ 2	MS3102A 20-4P	MS3108B 20-4S	MS3057 -12A				MS3102A 20-17P	MS3108B 20-17S	MS3057 -12A

* Straight Plug
Note: These connectors are made by DAI-ICHI DENSHI KOGYO Co., Ltd

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Notes·
1. For connection parts(plugs. clamps. etc.), contact your Yaskawa representative For connecting method, there are two types·soldering(MS type) compression(JA type)
2. These connectors are made by DAI-ICHI DENSHI KOGYO Co . Ltd

	Holding Brake			
	Receptacle	L-type Plug	Straight plug	Cable Clamp
	MS3102A 18-12P	MS3108B 18-12S	—	MS3057 -10A
	MS3102A 20-17P	MS3108B 20-17S	—	MS3057 -12A

Note These connectors are made by DAI-ICHI DENSHI KOGYO Co., Ltd

Table 2 17 P Series: Characteristics of AC Servomotor, Detector, and Holding Brake for Standard Combination

AC Servomotor Type USAPEM-	AC Servomotor	Detector		Holding Brake
	Pin Terminal	Connector(Maintain LOCK Conversal)		Pin Terminal
		Plug	Pin	
01C □ 2	PC2005-M	172171-1	170363-1	PC2005-M
02C □ 2	PC2005-M	172171-1	170363-1	PC2005-M
03C □ 2	PC2005-M	172171-1	170363-1	PC2005-M
05C □ 2	PC2005-M	172171-1	170363-1	PC2005-M
07C □ 2	PC2005-M	172171-1	170363-1	PC2005-M

Note: These connectors are made by AMP (Japan) Ltd.

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3 RATINGS AND SPECIFICATIONS OF AC SERVOPACK

3.1 RATINGS AND SPECIFICATIONS

(1) 200V (Rack-mounted Type)

Table 3.1

Servopack Type. CACR-HR			A5AAB12	01AAB12	02AAB12	03AAB12	05AAB12	10AAB	15AAB
Max Applicable Motor Capacity kw(HP)			0.05(0.07)	0.1(0.13)	0.2(0.27)	0.3(0.40)	0.5(0.67)	1.0(1.3)	1.5(2.0)
Basic Specifications	Input power Supply	Main	Single-phase AC200 to 230V +10, -15% 50/60Hz					3-phase AC200 to 230V +10, -15% 50/60Hz	
		Control	Single-phase AC200 to 230V +10 -15% 50/60Hz						
	Control Method		Full-wave rectifying, transistorized PWM control, sine-wave drives						
	Feedback		Absolute encoder (8192P/R, 1024P/R), incremental encoder (8192 P/R, 2500P/R, 2048P/R)						
	Ambient Temperature		0 to +55℃*2						
	Storage Temperature		-20 to +85℃						
	Ambient/ Storage Humidity		90% or less (non-condensing)						
	Configuration		Rack-mounted						
	Approx Weight	kg	2.0	2.1	2.6	2.9	3.6	4.5	5.0
Performance	Position Control		Kp = 1 to 200 (1/S)						
	Speed Control	Regulation	0%(load fluctuation 0 to 100%, Voltage fluctuation ±10%, temperature fluctuation 25±25℃)						
		Frequency Characteristic	100Hz ($J_L = J_M$)						
Input/Output	Command Input		Communication through FA bus						
	Interface I/O	Input	+OT, -OT, EXP						
		Output	ALM, BK						
Built-in Function	Dynamic Brake (DB)		Operated at main power OFF, servo alarm, servo OFF						
	Regeneration		Not provided	Built-in (regenerating resistor included)					
	Rapid Discharge		Not provided	Rapid discharge of main circuit capacitor at main power supply OFF					
	Overtravel Protection		By soft limit and hard LS internal command stop at operation						
	Protective Function		OV, OC, OL, OS, MCCB, PG, UV, CPU, ABS, POS, O-PH, RWY, RG, HARD, OF, SYS						
	Display		Main circuit power supply (MP), communicating with Motionpack (RUN), alarm (ALM), Alarm contents (ALARM), main circuit voltage (MAIN)						
	Monitor		Speed, torque reference, or speed refefence output in analog values						
Others			Absolute encoder battery mounted in Motionpack						

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(2) 200V (Base-mounted Type)

Table 3.2

	Servopack Type, CACR-HR		03AB	05AB	10AB	15AB	20AB	30AB	44AB	60AB*3
	Max Applicable Motor Capacity kw(HP)		0.3(0.40)	0.5(0.67)	1.0(1.3)	1.5(2.0)	2.0(2.7)	3.0(4.1)	4.4(5.9)	6.0(8.2)
Basic Specifications	Input power Supply	Main	3-phase AC200 to 230V +10, -15% 50/60Hz							
		Control	Single-phase AC200 to 230V +10, -15% 50/30Hz (3-phase for model 60AB)							
	Control Method		Full-wave rectifying, transistorized PWM control, sine-wave drives							
	Feedback		Absolute encoder (8192P/R, 1024P/R), incremental encoder (8192 P/R, 2500P/R, 2048P/R)							
	Ambient Temperature		0 to +55℃*2							
	Storage Temperature		-20 to +85℃							
	Ambient/ Storage Humidity		90% or less (non-condensing)							
	Configuration		Base-mounted							
	Approx Weight	kg	7				9		12	
Performance	Position Control		Kp = 1 to 200 (1/S)							
	Speed Control	Regulation	0%(load fluctuation 0 to 100%, Voltage fluctuation ±10%, temperature fluctuation 25±25℃)							
		Frequency Characteristic	100Hz ($J_L = J_M$)							
Input/Output	Command Input		Communication through FA bus							
	Interface I/O	Input	+OT, -OT EXP							
		Output	ALM, BK							
Built-in Function	Dynamic Brake (DB)		Operated at main power OFF, servo alarm, servo OFF							
	Regeneration		Built-in (regenerating resistor included) For model 60AB regenerating resistor is separated							
	Rapid Discharge		Rapid discharge of main circuit capacitor at main power supply OFF							
	Overtravel Protection		By soft limit and hard LS internal command stop at operation							
	Protective Function		OV, OC, OL, OS, MCCB, PG, UV, CPU, ABS, POS, O-PH, RWY, RG, HARD, OF, SYS.OH							
	Display		Main circuit power supply (MP), control power supply (P) alarm (ALM), Alarm contents (7 segments),							
	Monitor		Speed, torque regerence, or speed reference output in analog values							
Others			Absolute encoder battery mounted in Motionpack							

*1 Cannot be used when power supply voltage exceeds 230V, +10% (253V)
Lower-voltage transformer is needed in this case

*2 Use servopack within this range of ambient temperature
The temperature in the box should not exceed this value when storing servopack in the box

*3 To be released soon

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(3) 100V (Rack-mounted Type)

Table 3.3

Servopack Type, CACR-HR			A5AAB11	01AAB11	02AAB11	03AAB11	05AAB11
Max Applicable Motor Capacity kw(HP)			0.05(0.07)	0.1(0.13)	0.2(0.27)	0.3(0.40)	0.5(0.67)
Basic Specifications	Input power Supply	Main	Single-phase AC100 to 115V +10, -15% 50/60Hz				
		Control	Single-phase AC100 to 115V +10, -15% 50/60Hz				
	Control Method		Full-wave rectifying, transistorized PWM control, sine-wave drives				
	Feedback		Absolute encoder (8192 P/R)				
	Ambient Temperature		0 to +55℃*2				
	Storage Temperature		-20 to +85℃				
	Ambient/ Storage Humidity		90% or less (non-condensing)				
	Configuration		Rack-mounted				
	Approx Weight kg		2.0	2.1	2.6	2.9	3.6
Performance	Position Control		Kp = 1 to 200 (1/S)				
	Speed Control	Regulation	0%(load fluctuation 0 to 100%, Voltage fluctuation ±10%, temperature fluctuation 25±25℃)				
		Frequency Characteristic	100Hz ($J_L = J_M$)				
Input/Output	Command Input		Communication through FA bus				
	Interface I/O	Input	+OT, -OT, EXP				
		Output	ALM, BK				
Built-in Function	Dynamic Brake (DB)		Operated at main power OFF, servo alarm, servo OFF				
	Regeneration		Not provided	Built-in (regenerating resistor included)			
	Rapid Discharge		Not provided	Rapid discharge of main circuit capacitor at main power supply OFF			
	Overtravel Protection		By soft limit and hard LS, internal command stop at operation				
	Protective Function		OV, OC, OL, OS, WCCB, PG, UV, CPU, ABS, POS, O-PH, RWY, RG, HARD, OF, SYS				
	Display		Main circuit power supply (MP), communicating with Motionpack (RUN), alarm (ALM), Alarm contents (ALARM), main circuit voltage (MAIN)				
	Monitor		Speed, torque reference, or speed reference output in analog values				
Others			Absolute encoder battery mounted in Motionpack				

*1 Cannot be used when power supply voltage exceeds 230V, +10% (253V)
Lower-voltage transformer is needed for this case

*2 Use servopack within this range of ambient temperature
The temperature in the box should not exceed the value when storing servopack in the box

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3.2 INTERNAL BLOCK DIAGRAM (Figs. 3.1, 3.2, 3.3)

3.2.1 Servopack Type CACR-HRA5AAB1□ to -HR05 AAB1□

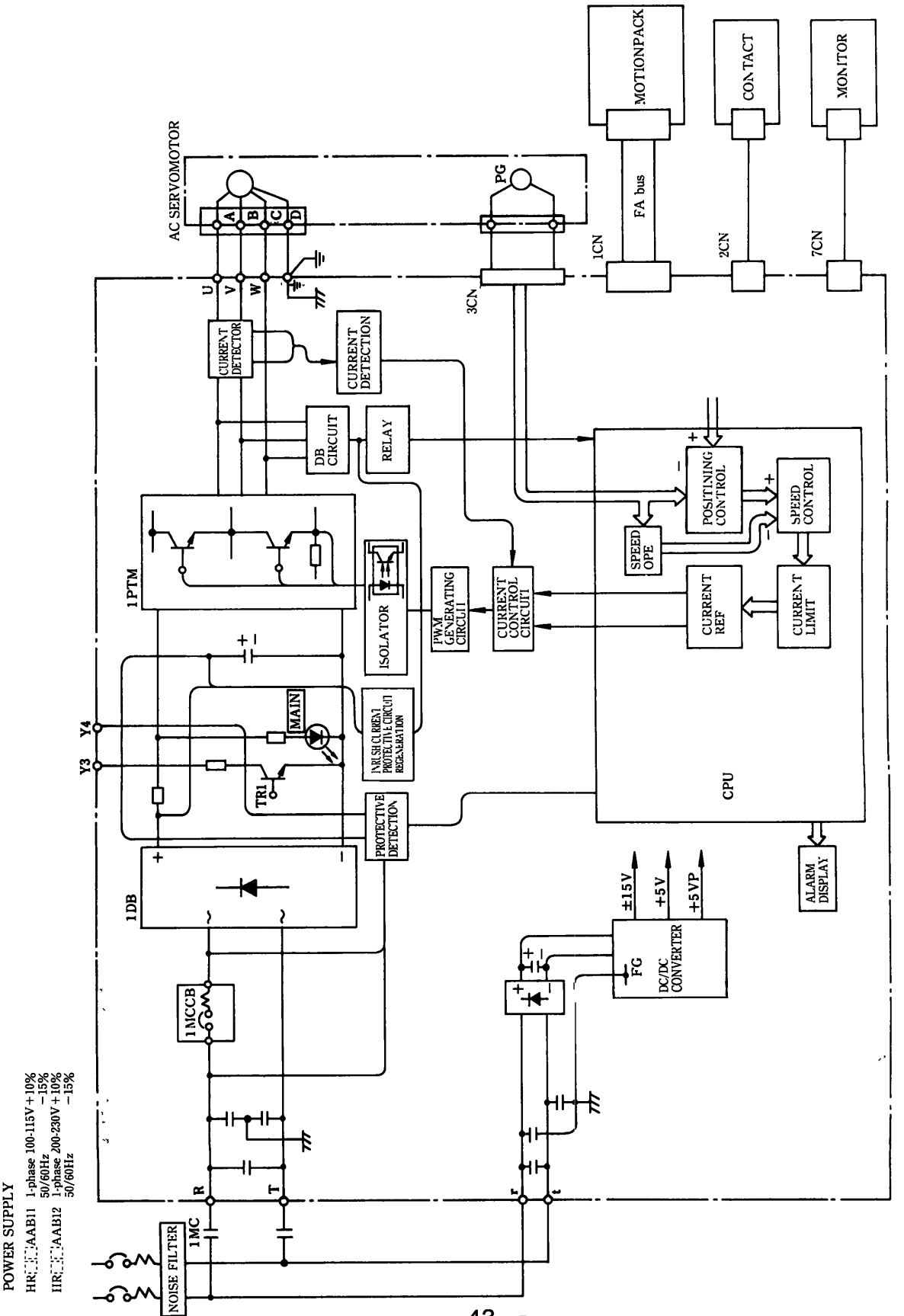


Fig. 3.1 Internal Block Diagram of Servopack Type CACR-HRA5 to -05AAB□
(Regenerative transistor TR1 not provided for A5AAB11, A5AAB12 and 01AAB12)

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3.2.2 Servopack Type CACR-HR10AAB, -HR15AAB

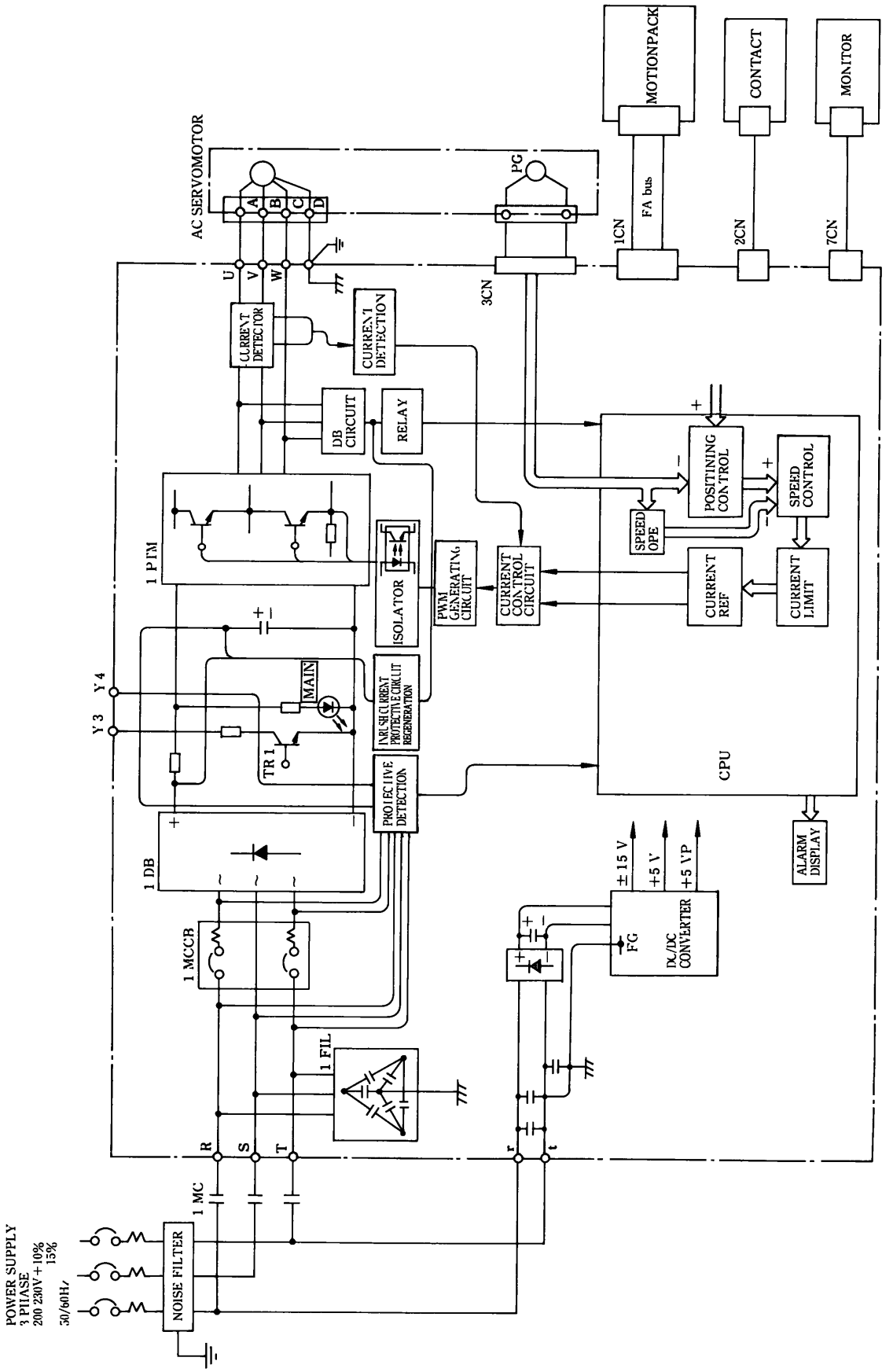


Fig. 3.2 Internal Block Diagram of Servopack Type CACR-HR10AAB, -15AAB

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3.2.3 Servopack Type CACR-HR□ □AB

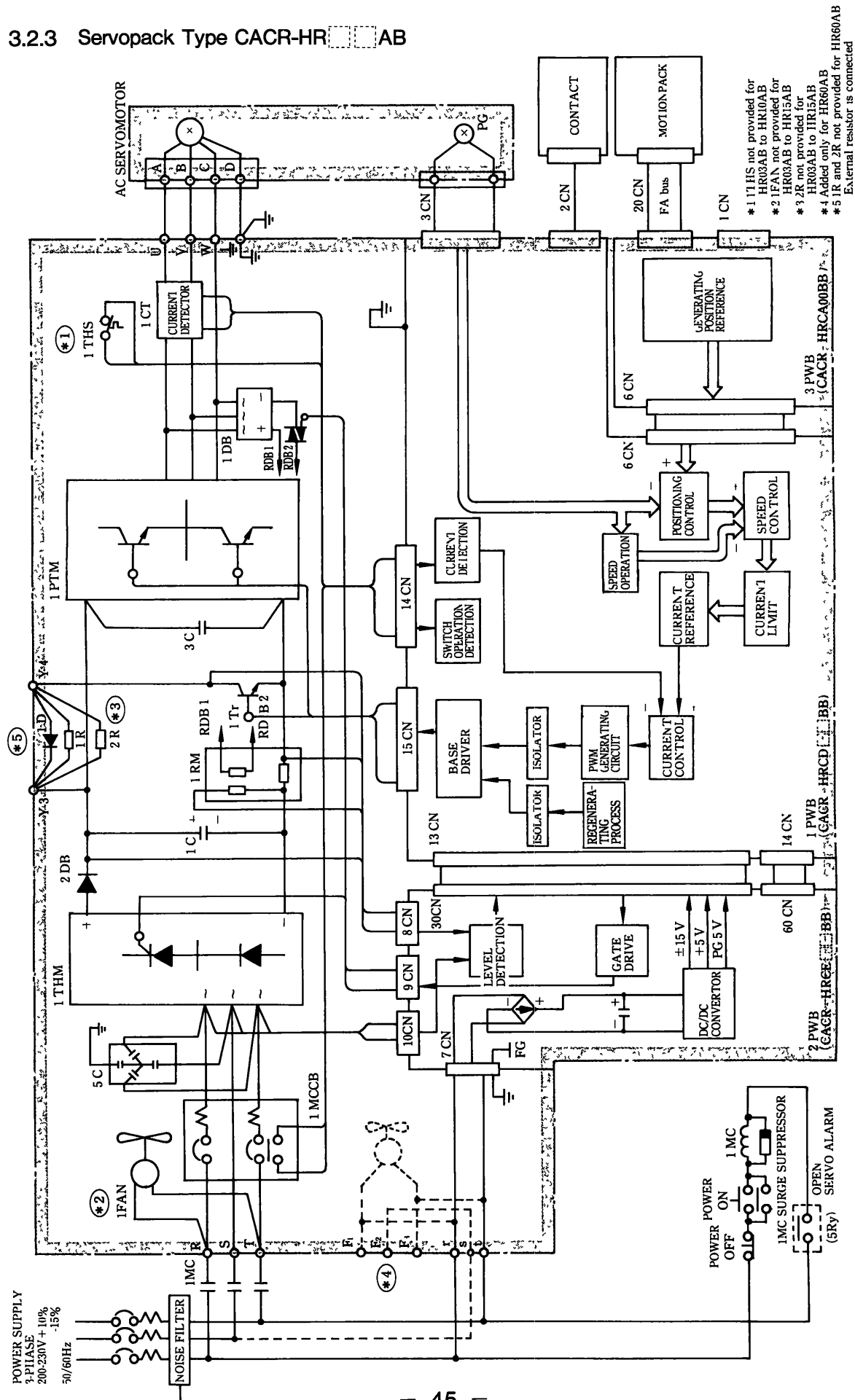


Fig. 3.3 Internal Block Diagram Servopack Type CACR-HR03AB to HR60AB

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3.3 PROTECTIVE CIRCUIT

Servopack provides functions to protect the Servopack and motor from malfunctions.

(1) Dynamic brake function

Servopack incorporates a dynamic brake for emergency stopping. This brake operates when:

- Alarm (fault detection) occurs.
- Servo ON command is opened.
- Main power supply is turned off.

(2) Trouble detecting functions

Table 3.4 Trouble Detecting Functions

Trouble	Detection
Overcurrent (OC)	Overcurrent flow in the main circuit (at 1.2 times or more of inst. max. current)
Circuit Protector Trip (MCCB)	Circuit protecter tripped
Regeneration Trouble (RG)	Regenerative circuit not activated in Servopack.
Overvoltage (OV)	Excessively high DC voltage in the main circuit. (200V input: approx. 420V, 100V input: approx. 220V)
Overspeed (OS)	Excessively large motor speed.
Main Circuit Power Supply Fault	Main circuit rush current limit circuit fault
Overload (OL)	Overload condition of motor and Servopack.
Heatsink Overheat (OH)	Overheat of heatsink (approx. 85 ℃ min.) (for types HR15AB to HR60AB)
System Error (SYS)	FABUS communication error
PG Disconnection (PG)	Encoder signal disconnection
Overflow Deviation (OF)	Excessive set deviation amount
Open Phase (O-PH)	Any one phase open in three-phase power supply.
Overrun Prevention (RWY)	Wrong wiring of motor circuit or PG signal line.
CPU Error (CPU)	Any error of CPU
Hardware Error (HARD)	
Absolute Control Error (ABS)	Errors related to absolute encoder
Position Error (POS)	

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(3) Overload Detection (OL) Level

Overload detection level can be set as shown in Fig. 4.4 when motor rated current = 100%. When allowable current applving time at motor locking is at the maximum, higher rotating speed can make more rapid motion for the same overload.

NOTE

Overload detection level is determined with hot start conditions of ambient temperature 55° C. The set value cannot be changed.

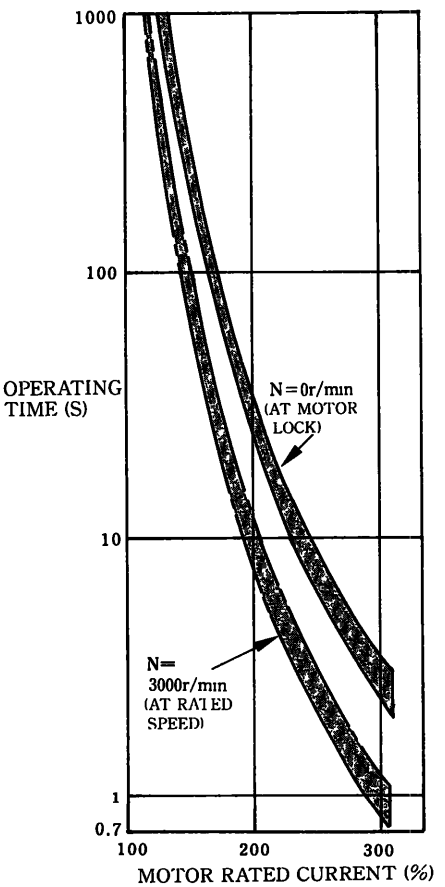


Fig. 3.4 Overload Characterisitics

(4) Servo alarm output [ALM]

If any trouble detection occurrs in Table 3.4 functions, the power drive circuit in the Servopack goes off, 7-segment LED indicates the operation condition and a servo alarm signal is output.

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3.4 PRECAUTIONS FOR APPLICATION

3.4.1 Minus Load

The motor is rotated by the load; it is impossible to apply brake (regenerative brake) against this rotation and achieve continuous running.

Example: Driving a motor to lower objects (with no counterweight)

Since Servopack has the regenerative brake capability of short time (corresponding to the motor stopping time), for application to a minus load, contact your Yaskawa representative.

3.4.2 Load Inertia (J_L)

The allowable load inertia J_L converted to the motor shaft must be within five times (M, F, G, D, S, P series) or ten times (R series) the inertia of the applicable AC servomotor. If the allowable inertia is exceeded, an overvoltage alarm may be given during deceleration. If this occurs, take the following actions:

- Reduce the current limit.
- Slow down the deceleration curve.
- Decrease the maximum speed.

For details, contact your Yaskawa representative.

3.4.3 Allowable Cyclic Operating Frequency

Start/Stop cyclic operating frequency is limited separately by Servopack and Servomotor. It is necessary to satisfy both conditions.

(1) Allowable cyclic operating frequency limited by Servopack

Servopack limitation is due to Servopack built-in regenerative resistor power loss. Allowable frequency differs depending on combined motor types, capacities, load inertia J_I, accel/decel current and motor speed.

For the following cases, contact your Yaskawa representative.

- When start/stop cyclic operating frequency up to rated speed exceeds 60 times/min at load inertia $J_I = 0$.
- When start/stop cyclic operating frequency up to rated speed sxceeds $\frac{60}{m+1}$ times/min at load inertia J_I = motor inertia $J_M \times m$ times.

(2) Allowable cyclic operating frequency limited by Servomotor

When AC Servomotor effective torque in an operation cycle is within the continuous duty zone of motor performance (Par. 3.1). the operation can be repeated in the operation cycle.

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3.4.4 High Voltage Line

If the supply voltage is 400/440 V, the voltage must be stepped down three-phase 400/440V to 200 V* by using a power transformer. Table 6.3 shows the transformer selection. Connection should be made so that the power is supplied and cut through the primary side of the transformer.

*100V for Servopack type HR □□□ AAB11.

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3.5 POWER LOSS

The power loss of Servopack is shown in Table 4.2.

Table 3.5 Power Loss at Rated Output

Servopack Type CACR-	Output Current A	Power Loss			
		Main Circuit W	Regenerative Resistor * W	Control Circuit W	Total W
HRA5AAB12	0.7	20	–	30	50
HR01AAB12	1.0	25	–		55
HR02AAB12	2.0	30	6		66
HR03AAB12	2.7	35	6		71
HR05AAB12	3.6	55	6		91
HR10AAB	7.6	70	20		120
HR15AAB	11.7	80	20		130
HR03AB	3.0	20	10	60	90
HR05AB	4.2	40	10		110
HR10AB	7.6	70	20		150
HR15AB	11.7	80	20		160
HR20AB	18.8	100	40		200
HR30AB	26.0	160	80		300
HR44AB	33.0	210	100		370
HR60AB	45.0	300	120		480
HRA5AAB11	1.2	20	–	30	50
HR01AAB11	1.7	25	6		61
HR02AAB11	2.9	40	6		76
HR03AAB11	3.6	50	6		86
HR05AAB11	5.5	45	15		90

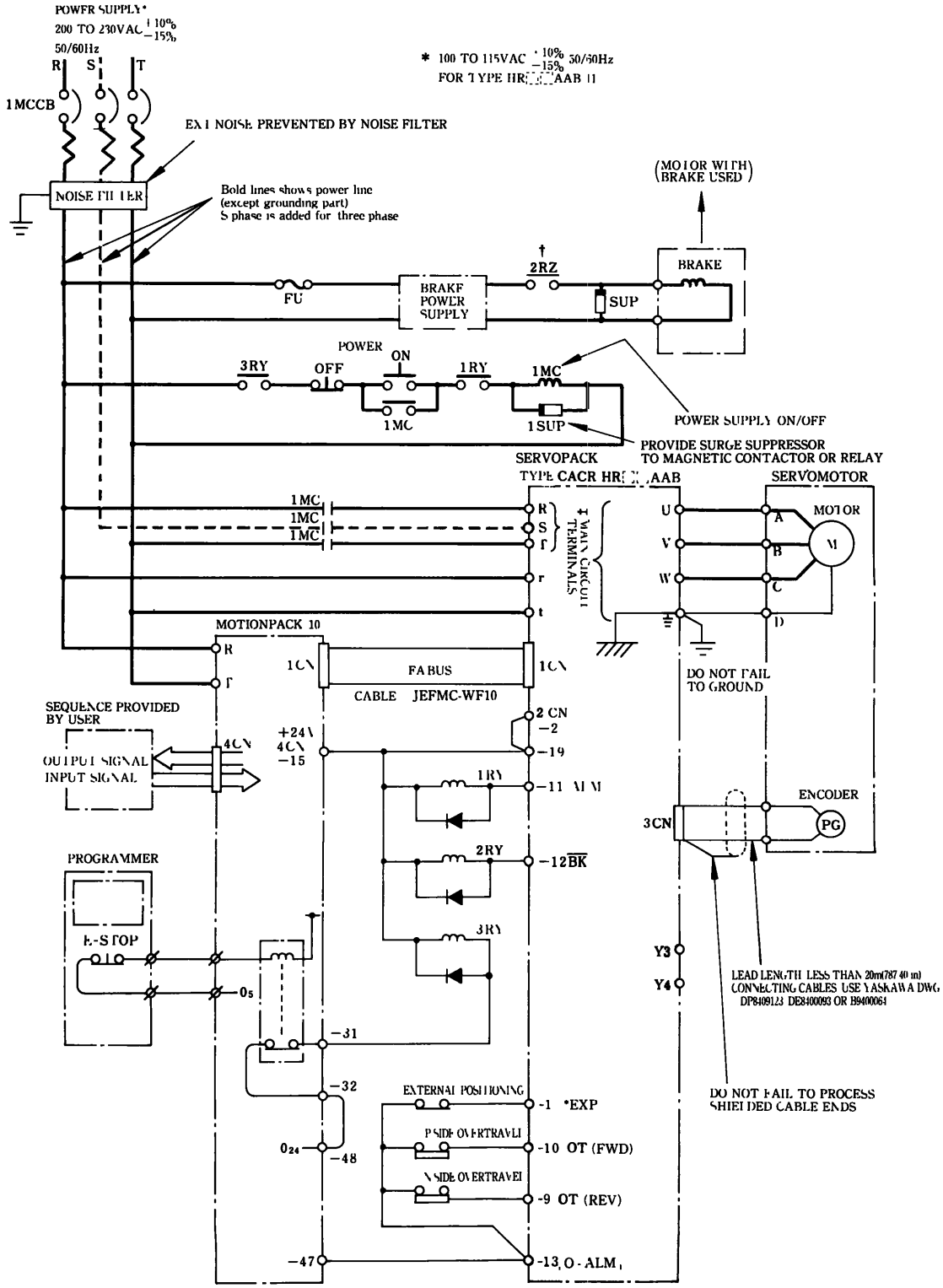
* Power loss in regenerative resistors occurs at motor deceleration. The maximum allowable value of average power loss is shown. When a motor operates in a duty cycle exceeding this value, a regenerative resistor must be provided.

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4 CONNECTION

4.1 TYPICAL CONNECTION

4.1.1 Connection between Servopack Type HR□ □AAB and Motionpack-10

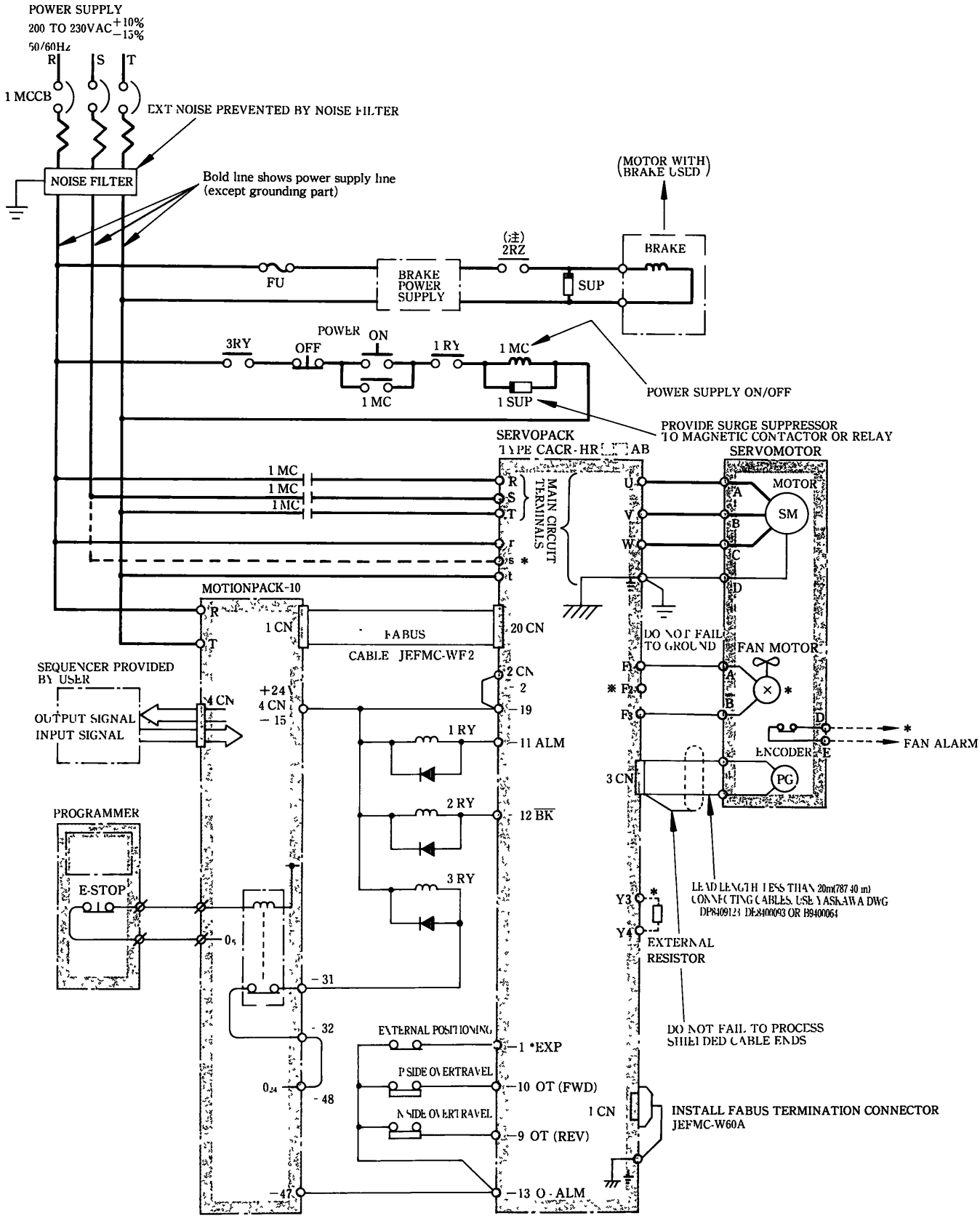


* † Select braking circuit ON/OFF relay 2RZ in consideration of current flowing in braking circuit
* ‡ S-phase is added for types CACR-HR 10 AAB and -HR 15AAB

Fig. 4.1 Connection Example between Servopack Type CACR-HR□ □AAB, Motor and Motionpack-10

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4.1.2 Connection between Servopack Type HR□□AB and Motionpack-10



* Added only to type 60 AB.

† Select braking circuit ON/OFF relay 2RZ in consideration of current flowing in braking circuit

Fig. 4.2 Connection Example between Servopack Type CACR-HR□□AB, Motor and Motionpack-10

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4.1.3 Connection between Servopack Type HR□□AB and Motionpack-120

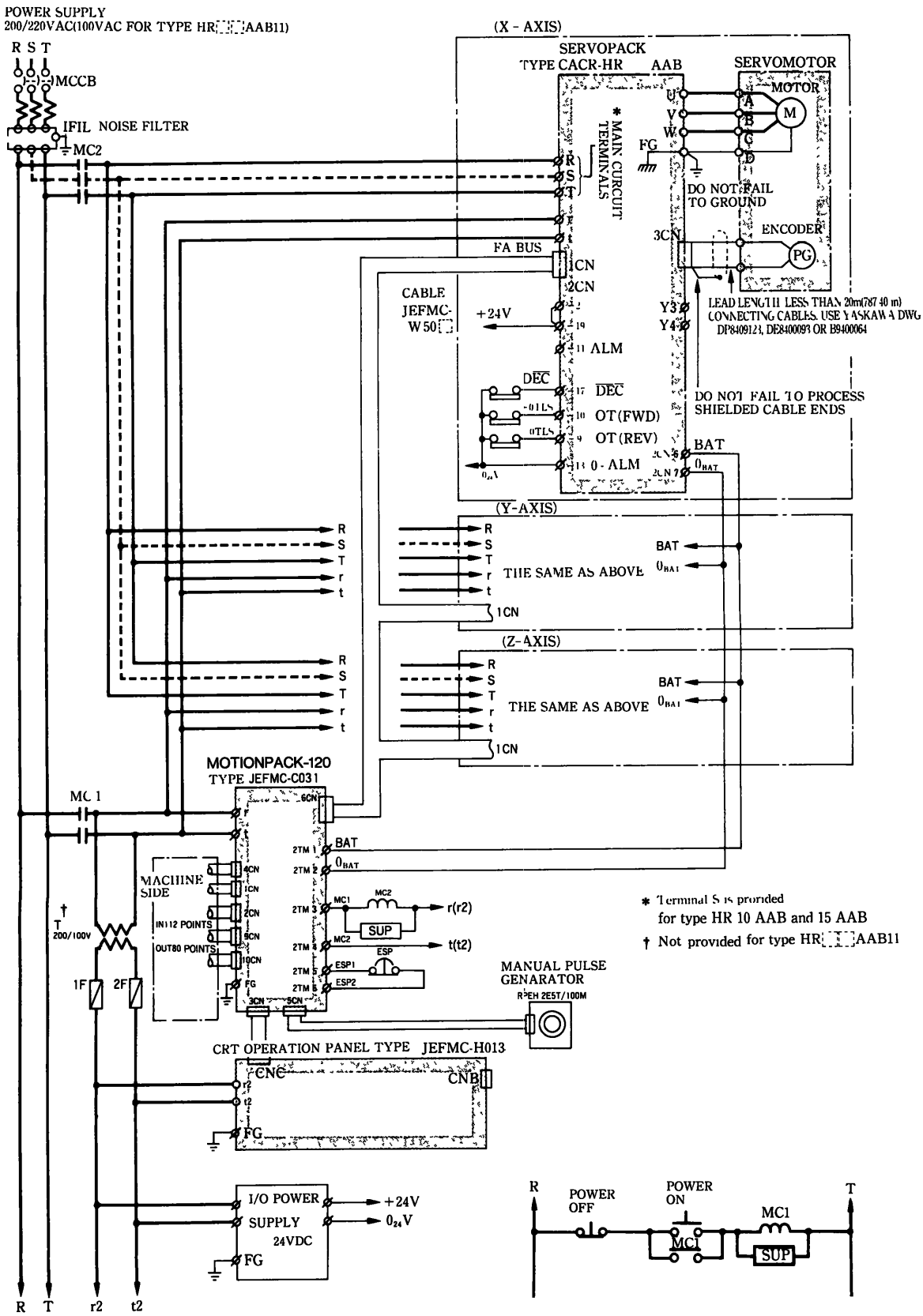


Fig. 4.3 Connection Example between Servopack Type CACR-HR□□AAB, Motor and Motionpack-120

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4.1.4 Connection between Servopack Type HR□ □AB and Motionpack-120

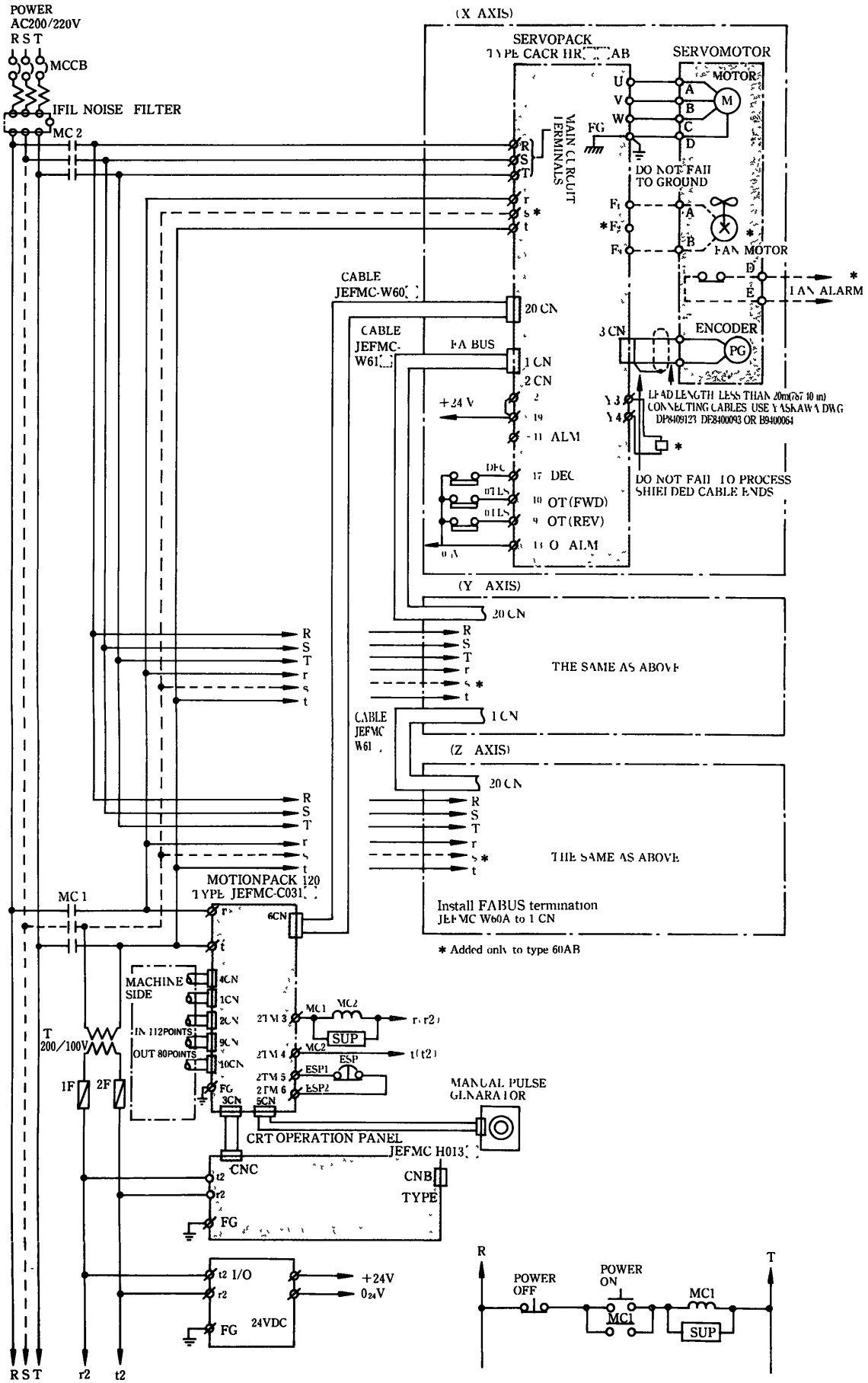


Fig. 4.4 Connection Example between Servopack Type CACR-HR□ □AB, Motor and Motionpack-120

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4.2 MAIN CIRCUIT TERMINAL NAMES AND OUTLINE

Table 4.1 Main Circuit Terminal Names and Outline

Symbol	Name	Outline
*1 Ⓡ Ⓢ Ⓣ	Main circuit power supply input terminal	*2 3-phase 200 to 230VAC +10% −15%, 50/60Hz
Ⓤ Ⓥ Ⓦ	Motor connection terminal	Ⓤ and motor terminal A; Ⓥ and motor terminal B; Ⓦ and motor terminal C connected
*3 ⓡ ⓣ	Control power supply input terminal	*1 Single-phase 200 to 230VAC +10% −15%, 50/60Hz
⏚	Grounding terminal	Connected with motor terminal D to ground.
Y3 Y4	Regenerative resistor connecting terminal	*5 Regenerative resistor connecting terminal (Normally, external connection not needed)
*6 F1 F2 F3	Motor cooling fan connecting terminal	Conection needed only when Type USAMKD-60B is used.

*1 : Ⓡ, Ⓣ for Type HR □□ AAB1□
*2 : Single-phase 100 to 115VAC +10% -15%, 50/60Hz for Type HR □□ AAB11.
Single-phase 200 to 230VAC +10% -15%, 50/60Hz for Type HR □□ AAB12.
*3 : ⓡ, Ⓢ, ⓣ only for Type HR60AB
*4 : Single-phase 100 to 115VAC +10% -15%, 50/60Hz for Type HR □□ AAB11.
3-phase 200 to 230VAC +10% -15%, 50/60Hz for Type HR60AB.
*5 : External resistor must be connected for Type HR60AB.
*6 : Provided only for Type HR60AB.

4.3 CONNECTOR 2CN (FOR I/O SIGNAL)

4.3.1 Applicable Receptacle Specifications

Table 4.2 Applicable Receptacle Specifications

Specifications of Connector Used in Servopack *1	Applicable Receptacle Type			
	Soldered Type	Caulking Type	Case	Maker
MR-20RFA Right angle 20P	MR-20M*2	MRP-20M01	MR-20L*2	HONDA Tsushin Co., Ltd.

*1 Made by HONDA Tsushin Co., Ltd.
*2 Standard attachment of Servopack

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4.3.2 Connector 2CN Layout and Connection

Table 5.3 shows the terminal layout of connector 2CN and Fig. 5.6 shows connector 2CN and I/O signal connection and the processing method.

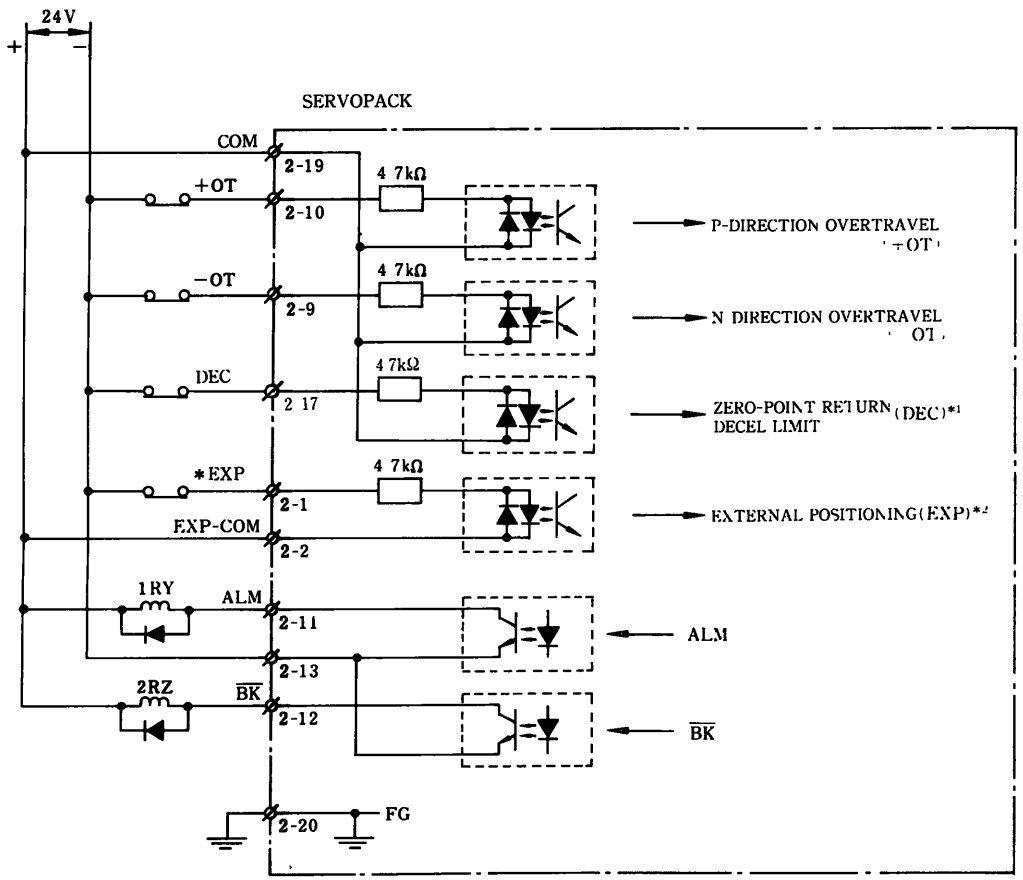
Table 4.3 Connector 2CN Layout

1	2	3	4	5	6	7
*EXP *1	EXP-COM	—	—	—	BAT *3	O_{BAT} *3

8	9	10	11	12	13
—	− OT	+ OT	ALM	$\overline{BK}$	O - ALM

14	15	16	17	18	19	20
—	—	—	DEC *2	—	COM	FG

*1 Not used for Motionpack-120.
*2 Not used for Motionpack-10.
*3 Necessary when using absolute encoder.



*1 Not used for Motionpack-10.
*2 Not used for Motionpack-120.

Fig 4.5 2CN and I/O Signal Connection and External Signal Process

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4.3.3 Connector 2CN I/O Signals and How to Use

Table 4.3 Input Signals

Signal Name	Pin No.	Name	Function
+OT	10	P-side overtravel	Connects limit switch signal according to forward or reverse side. This signal is turned on at normal operation and off at limit switch operation.
-OT	9	N-side overtravel	
*EXP	1	External positioning	Used as contact for external positioning in Motionpack. On at normal operation. *1
DEC	17	Zero point return decel limit	Used in zero-point return. After 2-step deceleration by DEC signal, zero-point return is performed. ON at narmal operation. *2

Table 4.4 Output Signals

Signal Name	Pin No.	Name	Function
ALM	11	Servo alarm	Output transistor is turned off when an alarm occurs in servopack or watch dog timer is dropped out. Transistor is ON at normal operation (Signal is "L" level).
BK	12	Brake	Relay control signal for brake. Relay is turned on by the signal under current conduction (SVON), off under non-current conduction.

*1 : Not used in Motionpack-120.
*2 : Not used in Motionpack-10.

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4.4 CONNECTOR 3CN (FOR ENCODER)

4.4.1 Applicable Receptacle and Cable Specifications

Table 4.5 Applicable Receptacle and Cable Specifications

Specifications of Connector Used in Servopack *1	Applicable Receptacle Type				Connecting Cable Specifications
	Soldered Type	Caulking Type	Case	Maker	
MR-20RFA Right angle 20P	MR-20F *2	MRP-20F01	MR-20L *2	HONDA Tsushin Co., Ltd.	DP8409123, B9400064 or DE8400093

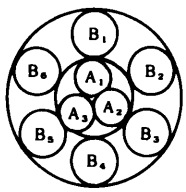
*1 Made by HONDA Tsushin Co., Ltd.
*2 Standard attachment of Servopack

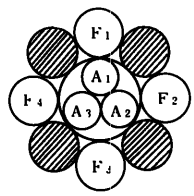
Note: For connecting cables, YASKAWA prepares the cables with the following specifications. However, they are not attached to Servopack or motor. They can be purchased at prepared length on request. (Table 5.5)

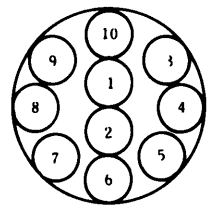
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Table 4.6 Applicable Cable Specifications

Applicable Encoder	Absolute Encoder	Incremental Encoder	Absolute Encoder, Incremental Encoder
Connecting Method	Soldered type	Soldered type	Caulking type
Cable Specification	YASKAWA DWG. No. DP8409123	YASKAWA DWG. No. B9400064	YASKAWA DWG. No DE8400093
Maker	Fujikura Cable Co		
Finished Dimension	ϕ8 0mm	ϕ7.5mm	ϕ10.0mm
(Recommended Receptacle Type)	(For soldered type)	(For soldered type)	(For caulking type)







Internal Configuration and Lead Colors (DP8409123 and B9400064 are standard.)

A_1	Red	
A_2	Black	
A_3	Green-yellow	
B_1	Blue-white-blue	Twisted cable
B_2	Yellow-white-yellow	
B_3	Green-white-green	
B_4	Orange-white orange	
B_5	Purple-white-purple	
B_6	Gray-white-gray	

A_1	Red	
A_2	Black	
A_3	Green/yellow	
F_1	Blue-white/blue	Twisted cable
F_2	Yellow-white/yellow	
F_3	Pale green-white/pale green	
F_4	Orange-white/orange	

1	Blue-white	Twisted cable
2	Yellow-white	
3	Green-white	
4	Red-white	
5	Purple-white	
6	Blue-brown	
7	Yellow-brown	
8	Green-brown	
9	Red-brown	
10	Purple-brown	

YASKAWA Specifications	Standard length : 5m, 10m, 20m Terminal ends are not provided (without connectors).

NOTES:
1. When applicable cable is used, allowable wiring distance between Servopack and motor (PG) is up to 20m.
2. When wiring distance between Servopack and motor (PG) exceeds 20m, cable which can be used for up to 50m wiring distance (YASKAWA DWG No. DP8409179) is available Contact your YASKAWA representative

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4.4.2 Connector 3CN Layout and Connection

The terminal layout for the Servopack connector (3CN) is shown in Table 5.6, the connecting method with absolute encoder in Figs. 5.7 and 5.8 and the connecting method with incremental encoder in Figs. 5.9 and 5.10.

Table 4.7 Connector 3CN Layout

1	2	3	4	5	6	7
PG0V	PG0V	PG0V	PG5V	PG5V	PG5V	—

8	9	10	11	12	13
—	—	—	—	BAT*	BAT0*

14	15	16	17	18	19	20
PC	*PC	PA	*PA	PB	*PB	FG

* Required only when absolute encoder is used.

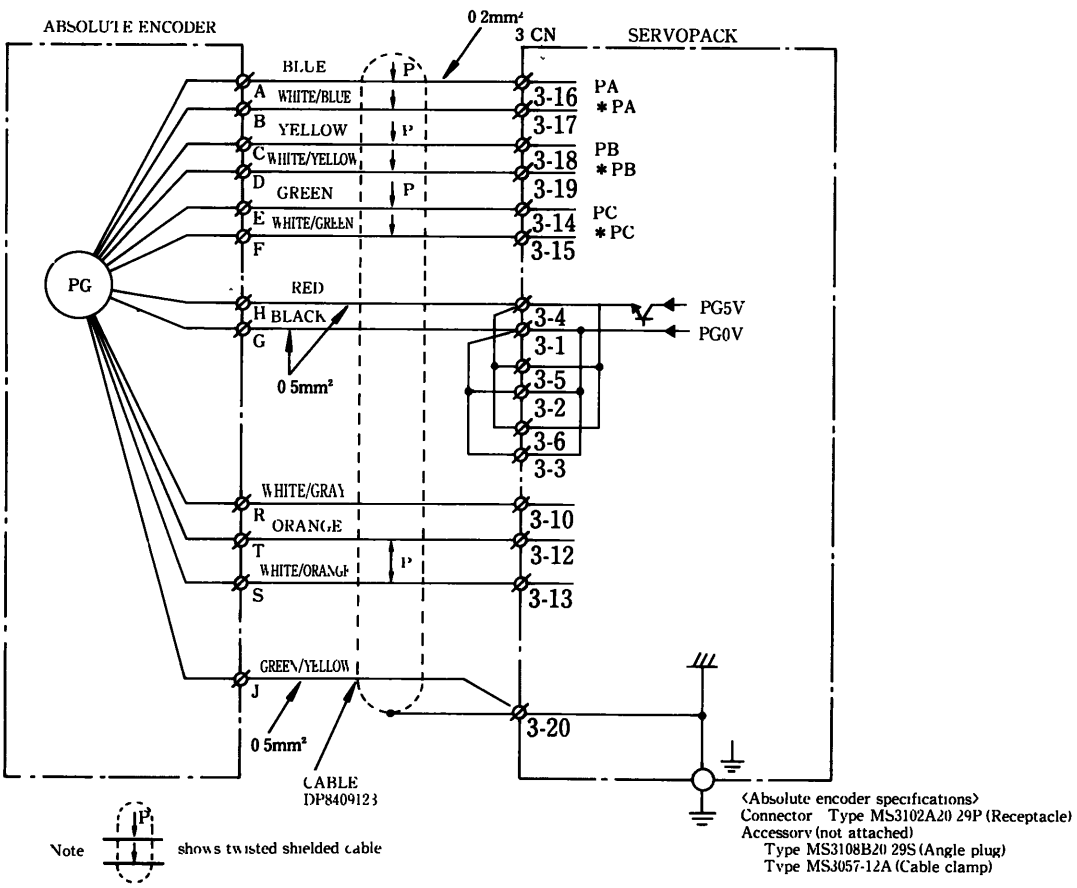


Fig. 4.6 Connection between 3CN and Absolute Encoder
(When soldered type cable DP8409123 is used)

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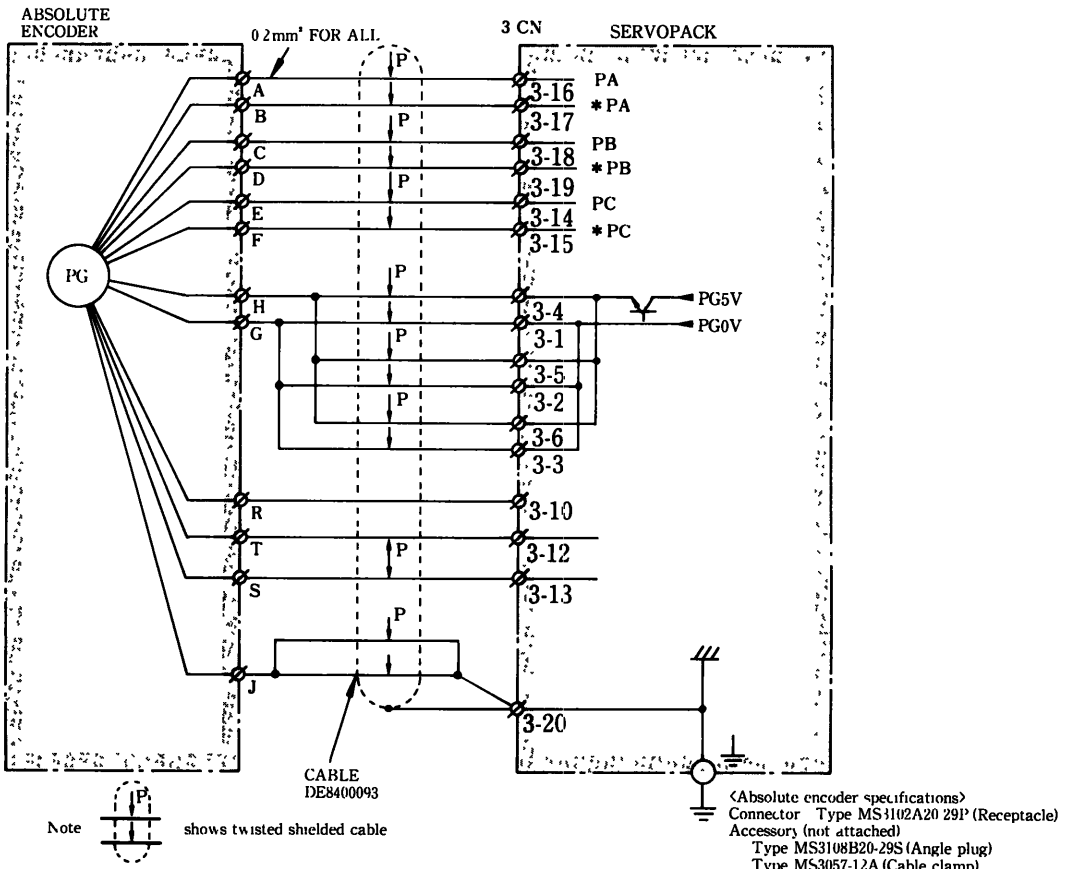


Fig. 4.7 Connection between 3CN and Absolute Encoder
(When caulking type cable DE8400093 is used)

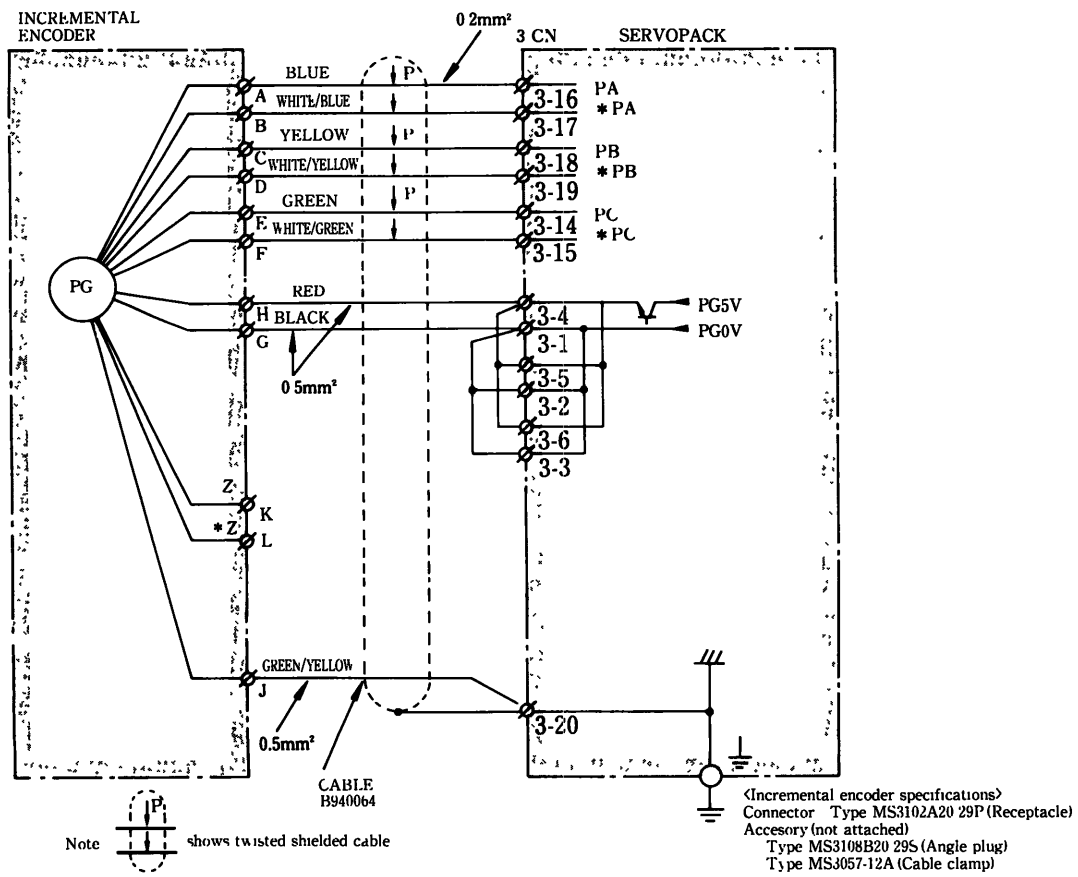


Fig. 4.8 Connection between 3CN and Incremental Encoder
(When soldered type cable B9400064 is used)

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4.4.2 Connector 3CN Layout and Connection (Cont'd)

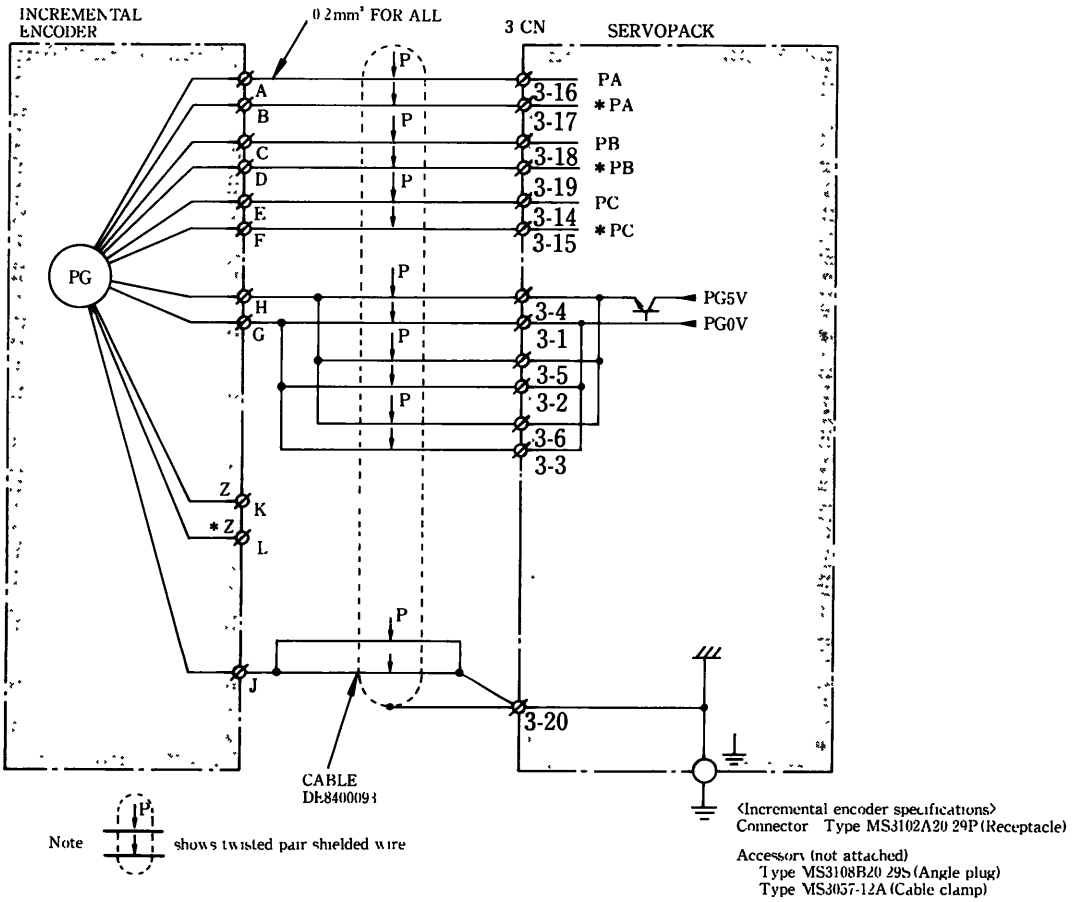


Fig. 4 9 Connection between 3CN and Incremental Encoder
(When caulking type cable DE8400093 is used)

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5 DISPLAY/MONITOR FUNCTIONS

5.1 DISPLAY

Each type of display is performed by LED indicators and 7-segment indicator. Table 5.1 shows LED indicators. Table 5.2 shows status and Table 5.3 shows alarm display.

Table 5.1 LED Indicators

Display specifications	Name	Conditions at Lighting
Alarm Display	ALM	At alarm occurrence
Communication Display	RUN	FABUS communication normal *1
Power Supply Display	P	At control power supply input *2
	MP	Normal main circuit power supply
	MAIN	Voltage is provided in main circuit *1

*1: Only for type HR □□ AAB
*2: Only for type HR □□ AB

Table 5.2 Status

Display	Display Contents (at lighting)
—	Waiting for communication with Motionpack
--.	Baseblocking (Stops current conduction)
.	Baseblock is released (Indicates current conduction to motor)
P.	P-side overtravel
n.	N-side overtravel

Table 5.3 Alarm Display

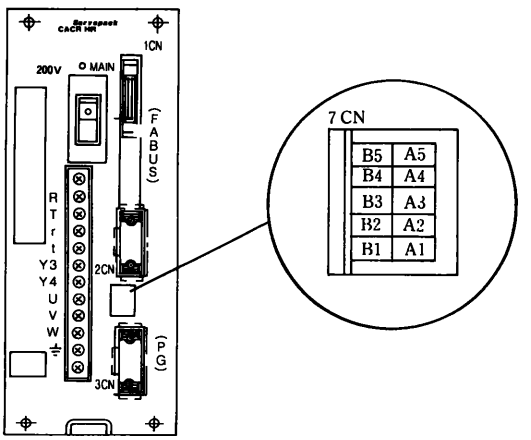
Display	Display Contents (at lighting)
0.	ABSO error
1.	Overcurrent
2.	Circuit protector trip
3.	Regenerative error
4.	Overvoltage
5.	Overspeed
6.	Under voltage
7.	Overload
8.	Position error
A.	Heatsink overheat (only for TYPE HR15AB to HR60AB)
C.	PG disconnection
E.	System error
F.	Open Phase
J.	Overflow deviation
L.	Overrun
	CUP error
H.	Hardware error

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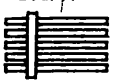
5.2 MONITOR FUNCTION OF SERVOPACK TYPE CACR-HR□□AAB AND TYPE CACR-HR□□AB

Motor speed, torque reference or speed reference can be monitored in analog value.
Torque or speed reference are selected by parameter. (Refer to user's manual of Motionpack for parameter.)
Make sure not to be short-circuited with next pin in measuring.

5.2.1 Servopack Type CACR-HR□□AAB



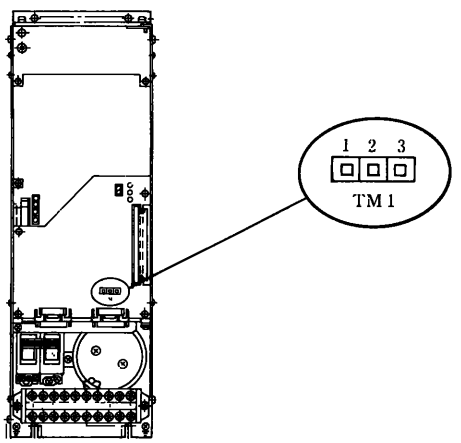
Notes:
1 Check terminals can be observed by oscilloscope If the pin is inserted 7mm or more, it may by shorted the other signal
Inset to the short-side pin of connector type PS-10PE D4R1-A1(made by Japan Aviation Electronics Industry. Ltd.).



2 At observation, do not contact adjacent check terminals.
3. Accuracy ±10%
4 8-bit D/A converter is used Ripple for 1-bit generates at output

Pin No.	Signal Name	Name	Output Voltage	
B5	V_{TG}	Motor Speed	∓ 2.0V/±1000r/min	
A5	T_{MON}	Torque or speed reference	Torque reference	∓ 3.0V/±100%
			Speed reference	±2.0V/ ±1000r/min
B1	GND	0V for signal	0V	

5.2.2 Servopack Type CACR-HR□□AB



Pin No.	Signal Name	Name	Output Voltage	
TM1-1	V_{TG}	Motor Speed	∓ $2.0\times\frac{P^*}{8192}$ V/±1000r/min	
TM1-2	T_{MON}	Torque or speed reference	Torque reference	∓ 3.0V/±100%
			Speed reference	±2.0V/ ±1000r/min
TM1-3	GND	0V for signal	0V	

*: P Value is number of encoder pulses per revolution (P/R) to be used.

Notes: 1. Accuracy :±10%
2. 8-bit D/A converter is used. Ripple for 1-bit generates at output.

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6 OPERATION

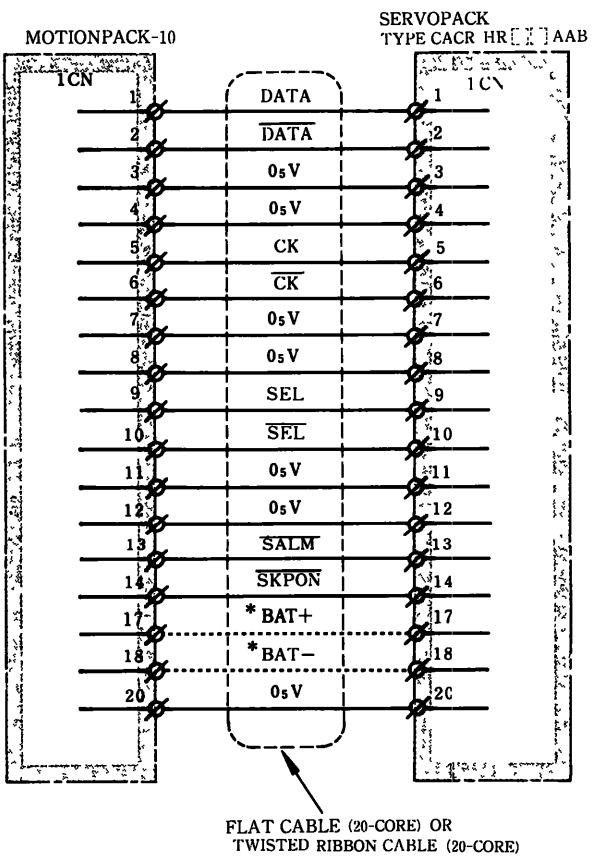
6.1 COMMAND INPUT

Command input of servopack is performed through FABUS.
Motionpack controls each reference by command.
Refer to user's manuals of Motionpack-10 or -120 for system starting and operation.

6.2 CONNECTION WITH MOTIONPACK

6.2.1 Type HR ☐☐ AAB

Connection with Motionpack is performed by FABUS. Use 20-core flat cable when the distance between units are less than 30cm(11.8 in); use 20-core twisted ribbon cable when more than 30cm(11.8 in).



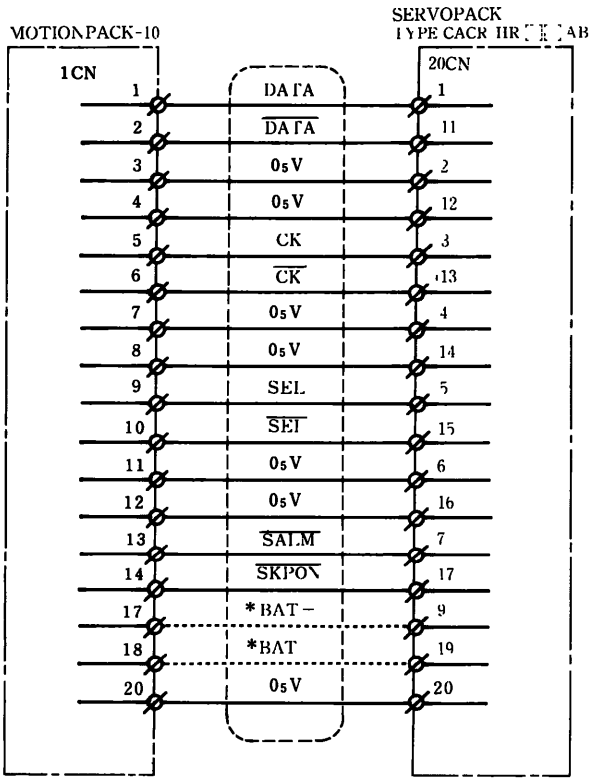
* Connection is different between Motionpack-10 and -120. For details, refer to user's manual of Motionpack.

Fig 6.1 FABUS

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6.2.2 Type HR□□AB

Connection with Motionpack is performed by FABUS, as show in Fig. 6.3. Connection cables must be provided by user.



* Connection is different between Motionpack-10 and -120. For details, refer to user's manual of Motionpack

Fig 6.2 FABUS

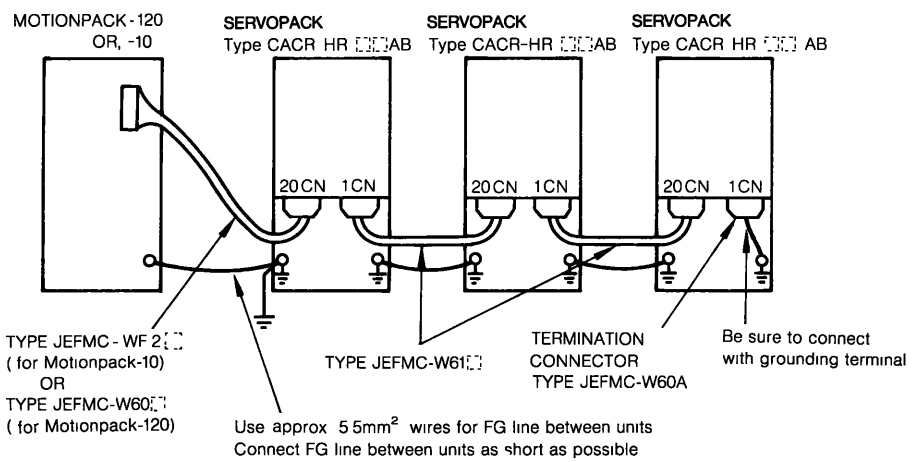


Fig 6.3 Connection with Motionpack

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6.3 CONFIGURATION OF I/O CIRCUIT

Each I/O circuit is a non-contact circuit insulated with photocouplers. The external circuits, therefore, must be constructed with the specified voltage and current.

6.3.1 Input Circuit

There are three input signals: Overtravel (OT), external positioning (*EXP), zero-point return decel limit (DEC). Construct the input circuit using 24V power supply (Fig. 6.4). 24V power supply is provided with Motionpack.

NOTE

24VDC±1V, 25mA or more (approx 5mA/circuit)

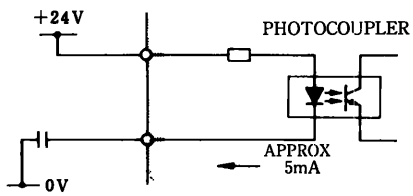


Fig 6.4 Configuration of I/O Circuit

6.3.2 Output Circuit

There are two output signals: Servo alarm (ALM) and brake (BK).

These output circuits are non-contact, employing transistors. 24V power supply is provided with Motionpack.

Applied Voltage(Vmax)≦30V
Conduction Current (Ip)≦50mA

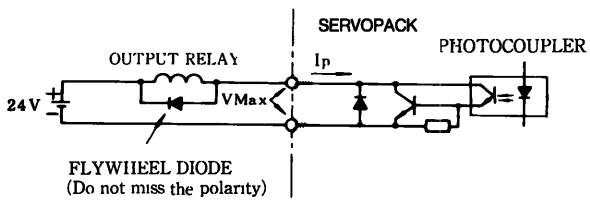


Fig 6.5 Output Circuit

6.3.3 Absolute Encoder

Absolute encoder memorizes position information even during power failure by batteries connected with Motionpack-10 and -120.

The power is supplied through FABUS in Motionpack-10 and through 2CN in Motionpack-120. Therefore, do not remove FABUS or 2CN for more than 4 days except at setting-up, etc. Accurate position information is lost.

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■ Setting up of Absolute Encoder

When machine rotation data is to set to 0 during motor test run, or when keep absolute encoder disconnecting with battery for more than 4 days, the following setting up is necessary.

(If the above state occurs. the capacitor voltage becomes incomplete value and internal devices may not work normally.)

① Discharge

- Short-circuit between connector R and S of encoder for more than two minutes. 〔Discharge capacitor in encoder. 〕
- When signal cable of encoder side is not connector but in bulk, short-circuit between reset signal terminal (purple) and 0V (white/purple).

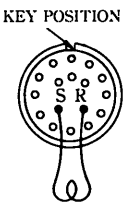


Fig 6.6

② Wiring and Battery Connection

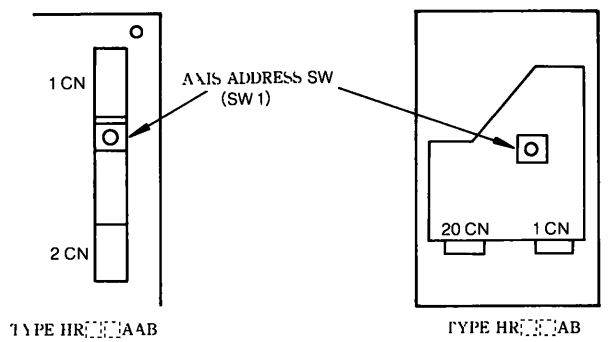
Refer to user's manual of Motionpack.

③ Power ON

Refer to user's manual of Motionpack.

6.4 SETTING OF AXIS ADDRESS

Set axis address according to user's manual of Motionpack-10 or -120.



Be sure to set SW1 to "1" when connecting with Motionpack-10.

Set SW1 to "X-axis = 1", "Y-axis=2", "Z-axis=3", "A-axis=5", and "B-axis=6" when connecting with Motionpack-120.

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6.5 SETTING OF MOTOR CODE

Motor codes are set by Motionpack for servopack types CACR-HR□□□AAB and -HR□□□AB. For details, refer to user's manual of Motionpack.

Table 6.1 Motor Selection Code

M Series		F Series		G Series		D Series	
Motor Type USAMED-	Code	Motor Type USAFED-	Code	Motor Type USAGED-	Code	Motor Type USADED-	Code
	0	02 C□□1	10	02 A□□1	50		40
03 B□□1	1	03 C□□1	11	03 A□□1	51		41
06 B□□1	2	05 C□□1	12	05 A□□1	52	05 E□□	42
09 B□□2	3	09 C□□1	13	09 A□□1	53	10 E□□	43
12 B□□2	4	13 C□□2	14	13 A□□2	54	15 E□□	44
20 B□□2	5	20 C□□2	15	20 A□□2	55	22 E□□	45
30 B□□2	6	30 C□□2	16	30 A□□2	56	37 E□□	46
44 B□□2	7	44 C□□2	17	44 A□□2	57		47
USAMKD- 60 B□□2	8		18		58		48

S Series		R Series (200V)		R Series (100V)		P Series	
Motor Type USASEM-	Code	Motor Type USAREM-	Code	Motor Type USAREM-	Code	Motor Type USAPEM-	Code
02 A□□	20		30		60		70
03 A□□	21		31		61		71
05 A□□	22	A 5 C□□2	32	A 5 D□□2	62		72
08 A□□	23	01 C□□2	33	01 D□□2	63	01 C□□2	73
15 A□□	24	02 C□□2	34	02 D□□2	64	02 C□□2	74
	25	03 C□□2	35	03 D□□2	65	03 C□□2	75
30 A□□	26	05 C□□2	36	05 D□□2	66	05 C□□2	76
	27	07 C□□2	37		67	07 C□□2	77

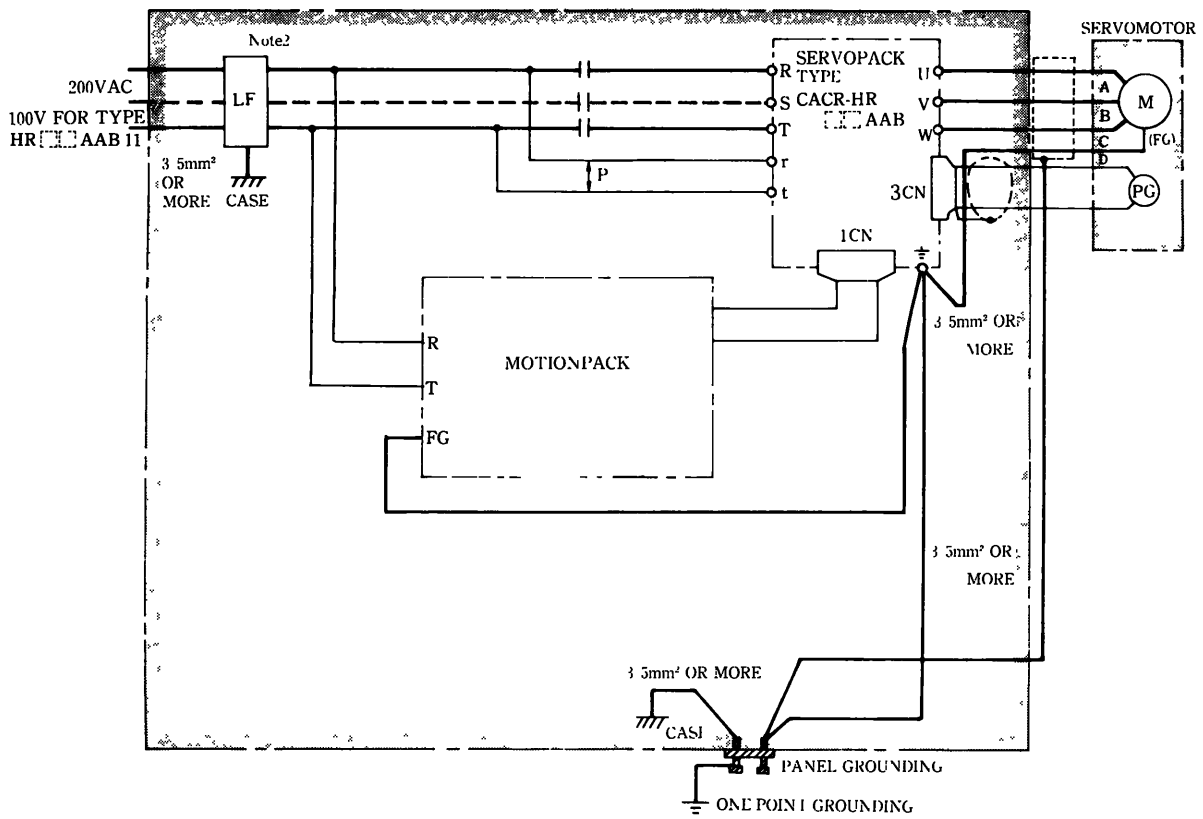
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6.6 NOISE TREATMENT

Servopack uses power transistors in the main circuit. When these transistors are switched, the effect of di/dt or dv/dt (switching noise) may sometimes occur depending on the wiring or grounding method.

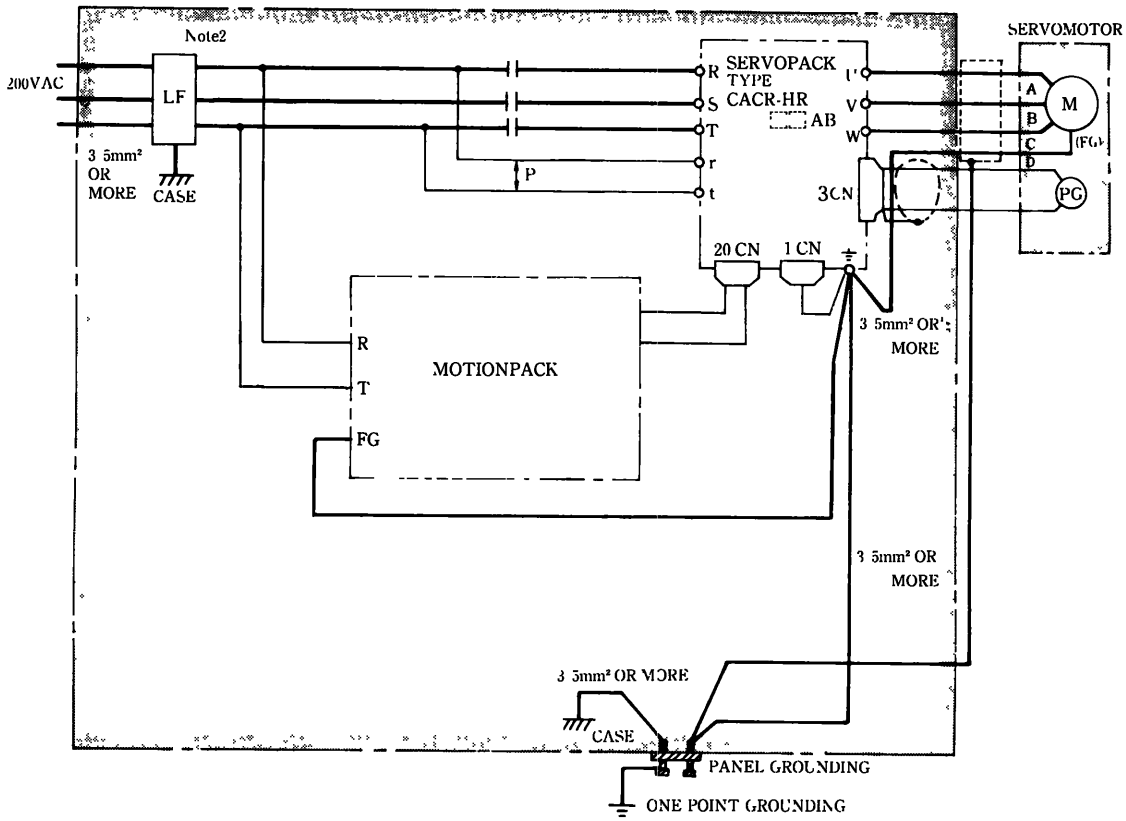
The Servopack incorporates CPU. This requires wiring and treatment to prevent noise interference. To reduce switching noise as much as possible, the recommended method of wiring and grounding is shown in Fig. 6.7.

(1) Grounding method (Fig. 6.7)



(a) Type HR □ □ AAB

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(b) Type HR ⬚⬚ AB

P Twisted cable'

Notes· 1. Use wires of 3.5mm² or more for grounding to the case (preferably flat-woven copper wire).

2 Connect line filters observing the precautions as shown in (2) Noise filter installatably

Fig. 6.7 Grounding Method

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• Motor frame grounding

When the motor is at the machine side and grounded through the frame, Cf dv/dt current flows from the PWM power through the stray capacity of the motor. To prevent this effect of current, motor ground terminal Ⓓ (motor frame) should be connected to terminal ⏚ of Servopack.
(Terminal ⏚ of Servopack should be directly grounded.)

• Metallic Conduit Grounding

When motor wiring is in a metallic conduit, ground the conduit and the terminal box. Perform the following grounding procedures at one point.

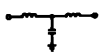
(2) Noise filter installation

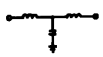
When noise filters are installed to prevent noise from the power line, the block type must be used. The recommended noise filter is shown in Table 5.16. The power supply to peripherals also needs noise filters.

Note

If the noise filter connection is wrong, the effect decreases greatly. Observing the precautions, carefully connect them as shown in Figs. 6.8 to 6.11.

Table 6.2 Recommended Noise Filter

Servopack Type CACR-	Applicable Noise Filter	Recommended Noise Filter	
		Type	Specifications
HRA5AAB12 HR01AAB12 HR02AAB12	(CORRECT)  (WRONG) 	LF-205A	Single-phase 200VAC class, 5A
HR03AAB12		LF-210	Single-phase 200VAC class, 10A
HR05AAB12		LF-215	Single-phase 200VAC class, 15A
HR10AAB HR15AAB		LF-315	Three-phase 200VAC class, 15A
HR03AB HR05AB		LF-305	Three-phase 200VAC class, 5A
HR10AB HR15AB		LF-315	Three-phase 200VAC class, 15A
HR20AB		LF-320	Three-phase 200VAC class, 20A
HR30AB		LF-330	Three-phase 200VAC class, 30A

Servopack Type CACR-	Applicable Noise Filter	Recommended Noise Filter	
		Type	Specifications
HR44AB	(CORRECT)  (WRONG) 	LF-340	Three-phase 200VAC class, 40A
HR60AB		LF-350	Three-phase 200VAC class, 50A
HRA5AAB11 HR01AAB11		LF-205A	Single-phase 200VAC class, 5A
HR02AAB11		LF-210	Single-phase 200VAC class, 10A
HR03AAB11		LF-215	Single-phase 200VAC class, 15A
HR05AAB11		LF-220	Single-phase 200VAC class, 20A

Note: Noise filter made by Tokin Corp.

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6.7 NOISE TREATMENT (Cont'd)

(a) Separate the input and output leads. Do not bundle or run them in the same duct.

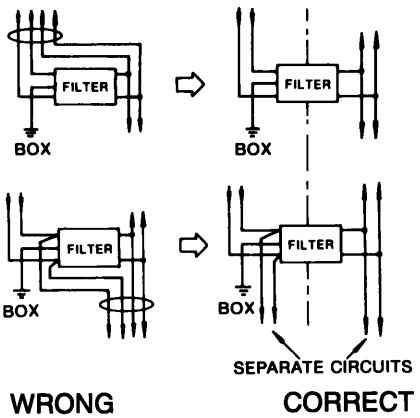


Fig. 6.8

(b) Do not bundle the ground lead with the filter output line or other signal lines or run them in the same duct.

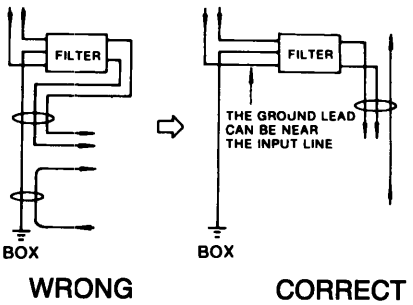


Fig. 6.9

(c) Connect the ground lead singly to the box or the ground panel.

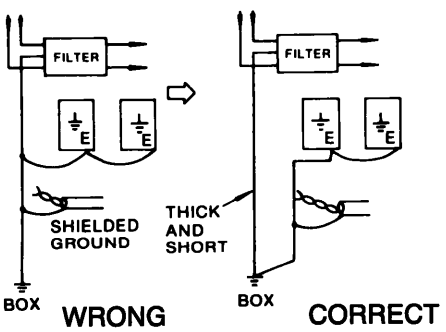


Fig. 6.10

(d) If the control panel contains the filter, connect the filter ground and the equipment ground to the base of the control unit.

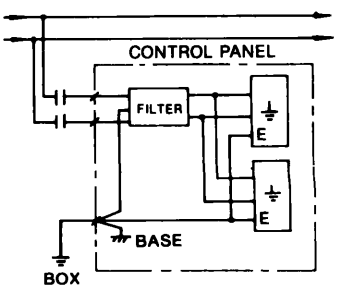


Fig. 6.11

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6.7.1 Protection of Power Supply Line

Servopack is operated by commercial power supply (200V).*
Therefore, MCCB or fuse is required to prevent power supply line from grounding or short-line accident and system from burning according to number of used servopack units. (Refer to Table 6.3.)
Fast blow type fuse cannot be used for fusing. Since servopack has capacitor input type power supply, fast blow type fuse may perform fusing when turning power supply on.

* 100V for type HR [illegible]AAB11.

Table 6.3 Power Supply Capacity and MCCB/Fuse Capacity

Servopack Type CACR-	Power Supply Capacity Per One Servopack (kVA)	Power Supply Capacity Per One MCCB or Fuse (A)
HRA5AAB12	0 3	5
HR01AAB12	0 5	5
HR02AAB12	0.75	5
HR03AAB12	1 0	7
HR05AAB12	1.4	11
HR10AAB	2.1	8
HR15AAB	3 1	10
HR03AB	0 65	5
HR05AB	1 1	5
HR10AB	2 1	8
HR15AB	3.1	10
HR20AB	4 1	12
HR30AB	6 0	18
HR44AB	8 0	24
HR60AB	11.0	32
HRA5AAB11	0 3	5
HR01AAB11	0 5	5
HR02AAB11	0.75	8
HR03AAB11	1 0	11
HR05AAB11	1.4	15

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7 INSTALLATION AND WIRING

7.1 RECEIVING

This motor has been put through severe tests at the factory before shipped. After unpacking, however, check and see the following.

- Its nameplate ratings meet your requirements.
- It has sustained no damage while in transit.
- The output shaft should be hand-rotated freely. However, the brake-mounted motor does not rotate as it is shipped with the shaft locked.
- Fastening bolts and screws are not loose.

If any part of the motor is damaged or lost, immediately notify us giving full details and nameplate data.

7.2 INSTALLATION

7.2.1 Servomotor

AC Servomotor can be installed either horizontally or vertically.

(1) Before mounting

Wash out anticorrosive paint on shaft extension and flange surface with thinner before connecting the motor to the driven machine. See Fig. 7.1.

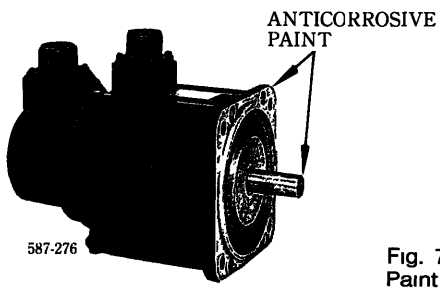


Fig. 7 1 Anticorrosive Paint to be Removed

(2) Location

Use the motor under the following conditions.

- Indoors
- Free from corrosive and/or explosive gases or liquids
- Ambient temperature: 0 to +40℃
- Clean and dry
- Accessible for inspection and cleaning

If the AC servomotor is subject to excessive water or oil droplets, protect the motor with a cover. The motor can withstand a small amount of splashed water or oil.

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7.2.1 Servomotor (Cont'd)

(3) Environmental conditions

Ambient temperature: 0 to +40℃

Storage temperature: −20 to +60℃

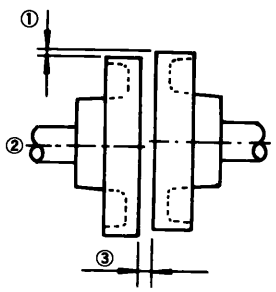
Humidity: 20% to 80% RH (non-condensing)

(4) Load coupling

True alignment of motor and driven machine is essential to prevent vibration, reduced bearing and coupling life, or shaft and bearing failures.

Use flexible coupling with direct drive. The alignment should be made in accordance with Fig. 7.2.

When mounting coupling, ease the impact on the shaft and avoid the excessive force on the bearing.



① Measure the gap between the straightedge and coupling halves at four equidistant points of the coupling The each reading should not exceed 0 03 mm (0 0012 in)

② Align the shafts

③ Measure the gap between the coupling faces at four equidistant points around the coupling rim with thickness gage The maximum variation between any two readings should not exceed 0 03 mm (0 0012 in)

Fig 7.2 Alignment of Coupling

(5) Allowable bearing load

Avoid both excessive thrust and radial loads to the motor shaft. If unavoidable, never exceed the values in Table 2.9.

When mounting the gear, coupling and pulley, ease the impact on the shaft and avoid excessive force on the bearing. (10G max.)

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7.2.2 Servopack

(1) Installation

The Servopack type CACR-HR □□ AAB □□ is rack-mounted type, and type CACR-HR □□ AB is base-mounted type.

(2) Location

- When installed in a panel:
  Keep the temperature around Servopack at 55℃ or below.
- When installed near a heat source:
  Keep the temperature around Servopack below 55℃.
- If subjected to vibration:
  Mount the unit on shock absorbing material.
- If corrosive gases are present:
  Avoid locations where corrosive gases exist as it may cause extensive damage over long use. Especially vulnerable are switching operation of contactors and relays.
- Unfavorable atmospheric conditions:
  Select a location with minimum exposure to oil, water, hot air, high humidity, excessive dust or metallic particles.

(3) Mounting Direction

ⓐ Type HR □□ AAB □□

Mount the Servopack unit vertically on the wall with main terminals being at the bottom to take advantage of natural air convection (Fig. 10.3). Install it with setscrews tightened at four mounting holes in the unit base.

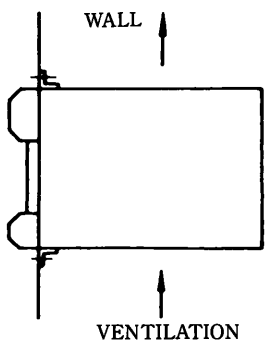


Fig. 7.3 Mounting Direction

ⓑ Type HR □□ AB

Mount the unit vertically on the wall using the mounting holes (4) on the base plate, with main terminals at the bottom (Fig. 10.4).

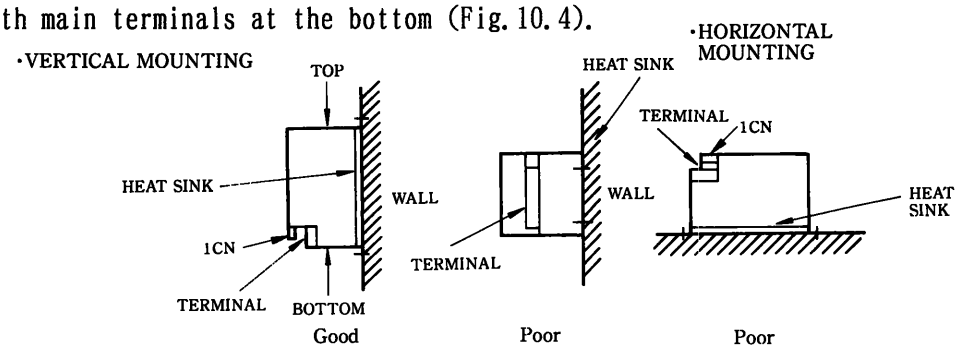


Fig. 7.4 Mounting Direction of Servopack

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7.3 WIRING

7.3.1 Rated Current and Wire Sizes

Tables 7.1 and 7.2 show rated current and wire sizes of Servopack external terminals. Wire types and sizes are selected by environmental condition and current capacity. Wire sizes shown in Table 7.2 are decided under the condition that rated current is supplied at 40℃ of ambient temperature and with 3 groups of cable. Cable type is shown in Table 7.3.

7.4 WIRING PRECAUTIONS

The following precautions should be taken for wiring.

(1) For signal lines and PG feedback lines, use twisted cables or multi-core shielded twisted-pair cables (Yaskawa Drawing No. DP8409123. DE8400093 or B9400064).
Cable length is maximum of 3 m for reference input lines and maximum of 20 m for PG feedback lines. Use the shortest possible length.

(2) For ground line, cable should be as heavy as possible to provide ground resistance 100 Ω or less. Make sure to ground at one point. If the motor and machine are insulated, ground the motor.

(3) To prevent malfunction due to noise, take the following precautions:
- Place the noise filter. Servopack and Motionpack as near as possible to each other.
- Make sure to mount a surge suppressor into the relay, magnetic contactor and solenoid coils.
- Run the power line and signal line, holding the distance to 30 cm or more; do not run them in the same duct or in a bundle.
- When the same power is used for Servopack, as for an electric welder or electrical discharge machine or when a high-frequency noise source is present in the vicinity, use filters in the power and input circuits.
- The Servopack uses a switching amplifier, and spurious noise may be present in the signal line.

(4) Remedy for Radio Frequency Interference (R.F.I)
Servopack is not provided with protected from radio frequency interference. If the controller affects radio waves, connect a noise filter to power supply.

(5) The signal line uses cables whose core is extremely fine (0.2 to 0.3 mm^2). Avoid using excessive force which may damage these cables.

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Table 7.1 Rated Current of Servopack External Terminals (A . rms)

	Terminal Name	Terminal Code	Type CACR- (For 200V)						
			HRA5AAB12	HR01AAB12	HR02AAB12	HR03AAB12	HR05AAB12	HR10AAB	HR15AAB
On-line	Main circuit power supply input	R. T*	1 3	2 5	4 4	6 5	10 4	8	10
	Motor connection	U,V,W	0 7	1 0	2 0	2 7	3 6	7 6	11 7
	Control power supply input	r t	0 5						
Off-line	Control I/O signal connector	2CN	Max DC 100mA						
	PG signal connector	3CN	Max DC 100mA 500mA for power supply line						
	Grounding	FG	–						

	Terminal Name	Terminal Code	Type CACR- (For 200V)						
			HR03AB	HR05AB	HR10AB	HR15AB	HR20AB	HR30AB	HR44AB	HR60AB
On-line	Main circuit power supply input	R.S.T	2	5	8	10	12	18	24	32
	Motor connection	U.V.W	3 0	4 2	7 6	11 7	18 8	26 0	33 0	45
	Control power supply input	r.t	0 5							
Off-line	Control I/O signal connector	2CN	Max DC 100mA							
	PG signal connector	3CN	Max DC 100mA 500mA for power supply line							
	Grounding	FG	–							

	Terminal Name	Terminal Code	Type CACR- (For 100V)				
			HRA5AAB11	HR01AAB11	HR02AAB11	HR03AAB11	HR05AAB11
On-line	Main circuit power supply input	R. T	2 6	4 5	8 0	11 0	15 0
	Motor connection	U.V.W	1 2	1 7	2 9	3 6	5 5
	Control power supply input	r.t	0.5				
Off-line	Control I/O signal connector	2CN	Max DC 100mA				
	PG signal connector	3CN	Max DC 100mA 500mA for power supply line				
	Grounding	FG	–				

* R. S. T for types HR10AAB and HR15AAB

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Table 7.2 Wire Size (mm²)

	Terminal Name	Terminal Code	Type CACR- (For 200V)						
			HRA5AAB12	HR01AAB12	HR02AAB12	HR03AAB12	HR05AAB12	HR10AAB	HR15AAB
On-line	Main circuit power supply input	R, T*	1 25			2 0			3 5
On-line	Motor connection	U,V,W	1 25					3 5	
On-line	Control power supply input	r, t	1 25						
Off-line	Control I/O signal connector	2CN	Twisted-pair lead or twisted-pair batched shielded lead core 0 2mm or more Galvanized mild steel stranded cable Cable dimensions less than φ16 for 2CN, φ11 for 3CN						
Off-line	PG signal connector	3CN							
	Grounding	FG	1 25					2 0	

	Terminal Name	Terminal Code	Type CACR- (For 200V)						
			HR03AB	HR05AB	HR10AB	HR15AB	HR20AB	HR30AB	HR44AB	HR60AB
On-line	Main circuit power supply input	R, S, T	1 25		2 0	3 5		5 5		8 0
On-line	Motor connection	U,V,W	1 25		3 5			5 5		8 0
On-line	Control power supply input	r t	1 25							
Off-line	Control I/O signal connector	2CN	Twisted-pair lead or twisted-pair batched shielded lead core 0 2mm or more Galvanized mild steel stranded cable Cable dimensions less than φ16 for 2CN, φ11 for 3CN							
Off-line	PG signal connector	3CN								
	Grounding	FG	2 0							

	Terminal Name	Terminal Code	Type CACR- (For 100V)				
			HRA5AAB11	HR01AAB11	HR02AAB11	HR03AAB11	HR05AAB11
On-line	Main circuit power supply input	R, T	1 25		2 0		
On-line	Motor connection	U,V,W	1 25				2 0
On-line	Control power supply input	r, t	1 25				
Off-line	Control I/O signal connector	2CN	Twisted-pair lead or twisted-pair batched shielded lead core 0 2mm or more Galvanized mild steel stranded cable Cable dimensions less than φ16 for 2CN, φ11 for 3CN				
Off-line	PG signal connector	3CN					
	Grounding	FG	1 25				

Notes: 1. All sizes are above HIV□

2. Selection condition of wire sizes

Rated current is supplied at 10℃ of ambient temperature and with 3 groups of leads

* R, S, T for types HR 10AAB and 15AAB

Table 7.3 Wire Type

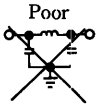
Type		Allowable Temperature
Code	Name	℃
PVC	Vinyl sheathed lead	—
IV	600V Vinyl sheathed lead	60
HIV	Heat-resistant vinyl sheathed lead	75

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8 PERIPHERAL DEVICES

8.1 COMBINATION OF PERIPHERAL DEVICES

Table 8.1 Combination of Servopack, Servomotor M Series and Peripheral Devices

Servopack Type CACR-	AC Servomotor Type USAMED-	Power Capacity per Servopack*1 KVA	Current Capacity Per MCCB of Fuse A	Applicable Noise Filter	Recommended Noise Filter*2 Type	Recommended Noise Filter*2 200VAC Class	Power ON/OFF Magnetic Contactor
HR03AAB12	03B ⬚ 1	1.0	7		LF-215	15A	YASKAWA Type HI-15E$_5$ (30A) or equivalent
HR10AAB	06B ⬚ 1 09B ⬚ 2	2.1	8		LF-315	15A	
HR15AAB	12B ⬚ 2	3.1	10				
HR03AB	03B ⬚ 1	0.65	5	Good 	LF-305	5A	
HR10AB	06B ⬚ 1	1.5	8		LF-310	10A	
	09B ⬚ 2	2.1	8		LF-315	15A	
HR15AB	12B ⬚ 2	3.1	10	Poor 			
HR20AB	20B ⬚ 2	4.1	12		LF-320	20A	YASKAWA Type HI-18E (35A) or equivalent
HR30AB	30B ⬚ 2	6.0	18		LF-330	30A	
HR40AB	44B ⬚ 2	8.0	24		LF-340	40A	
HR60AB	USA MKD- 60B ⬚ 2	11	32		LF-350	50A	YASKAWA Type HI-25E (50A) or equivalent

*1 Values at rated load
*2 Made by Tokin Corp.

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Table 8.2 Combination of Servopack, Servomotor F Series and Peripheral Devices

Servopack Type CACR-	AC Servomotor Type USAFED-	Power Capacity per Servopack KVA	Current Capacity per MCCB of Fuse A	Applicable Noise Filter	Recommended Noise Filter		Power ON/OFF Magnetic Contactor
					Type	200VAC class	
HR03AAB12	02C ⬚ 1	1.0	7	Good	LF-210	10A	YASKAWA Type HI-15E$_5$ (30A) or equivalent
	03C ⬚ 1						
HR05AAB12	05C ⬚ 1	1.4	11		LF-215	15A	
HR10AAB	09C ⬚ 1	2.1	8		LF-315	15A	
HR15AAB	13C ⬚ 2	3.1	10				
HR03AB	02C ⬚ 1	0.65	5		LF-305	5A	YASKAWA Type HI-18E (35A) or equivalent
	03C ⬚ 1						
HR05AB	05C ⬚ 1	1.1	5	Poor	LF-305	5A	
HR10AB	09C ⬚ 1	2.1	8		LF-315	15A	
HR15AB	13C ⬚ 2	3.1	10				
HR20AB	20C ⬚ 2	4.1	12		LF-320	20A	
HR30AB	30C ⬚ 2	6.0	18		LF-330	30A	
HR44AB	44C ⬚ 2	8.0	24		LF-340	40A	

Table 8.3 Combination of Servopack, Servomotor G Series and Peripheral Devices

Servopack Type CACR-	AC Servomotor Type USAFED-	Power Capacity per Servopack KVA	Current Capacity per MCCB of Fuse A	Applicable Noise Filter	Recommended Noise Filter		Power ON/OFF Magnetic Contactor
					Type	200VAC class	
HR03AAB12	02A ⬚ 1	1.0	7	Good	LF-210	10A	YASKAWA Type HI-15E$_5$ (30A) or equivalent
	03A ⬚ 1						
HR05AAB12	05A ⬚ 1	1.4	11		LF-215	15A	
HR10AAB	09A ⬚ 1	2.1	8		LF-315	15A	
HR15AAB	13A ⬚ 2	3.1	10				
HR03AB	02A ⬚ 2	0.65	5		LF-305	5A	
	03A ⬚ 1						
HR05AB	05A ⬚ 1	1.1	5	Poor	LF-305	5A	YASKAWA Type HI-18E (35A) or equivalent
HR10AB	09A ⬚ 1	2.1	8		LF-315	15A	
HR15AB	13A ⬚ 2	3.1	10				
HR20AB	20A ⬚ 2	4.1	12		LF-320	20A	
HR30AB	30A ⬚ 2	6.0	18		LF-330	30A	
HR44AB	44A ⬚ 2	8.0	24		LF-340	40A	

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Table 8.4 Combination of Servopack, Servomotor D Series and Peripheral Devices

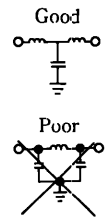
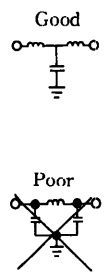
Servopack Type CACR-	AC Servomotor Type USADED-	Power Capacity per Servopack KVA	Current Capacity per MCCB of Fuse A	Applicable Noise Filter	Recommended Noise Filter		Power ON/OFF Magnetic Contactor
					Type	200VAC class	
HR05AAB12	05E ⬚	1.4	11		LF-215	15A	YASKAWA Type HI-15E$_5$ (30A) or equivalent
HR15AAB	10E ⬚	3.1	10		LF-315	15A	
HR05AB	05E ⬚	1.5	8		LF-310	10A	
HR15AB	10E ⬚	3.1	10		LF-315	15A	
HR20AB	15E ⬚	4.1	12		LF-320	20A	YASKAWA Type HI-18 (35A) or equivalent
HR30AB	22E ⬚	6.0	18		LF-330	30A	
HR44AB	37E ⬚	8.0	24		LF-340	40A	

Table 8.5 Combination of Servopack, Servomotor S Series and Peripheral Devices

Servopack Type CACR-	AC Servomotor Type USASED-	Power Capacity per Servopack KVA	Current Capacity per MCCB of Fuse A	Applicable Noise Filter	Recommended Noise Filter		Power ON/OFF Magnetic Contactor
					Type	200VAC class	
HR02AAB12	02A ⬚	0.75	5		LF-205A	5A	YASKAWA Type HI-15E$_5$ (30A) or equivalent
HR03AAB12	03A ⬚	1.0	7		LF-210	10A	
HR05AAB12	05A ⬚	1.4	11		LF-215	15A	
HR10AAB	08A ⬚	2.1	8		LF-315	15A	
HR15AAB	15A ⬚	3.1	10				
HR03AB	02A ⬚	0.65	5		LF-305	5A	
	03A ⬚						
HR05AB	05A ⬚	1.1	5				
HR10AB	08A ⬚	2.1	8		LF-315	15A	
HR15AB	15A ⬚	3.1	10				
HR30AB	30A ⬚	6.0	18		LF-330	30A	YASKAWA Type HI-18E (35A) or equivalent

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Table 8.6 Combination of Servopack, Servomotor R Series and Peripheral Devices

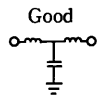
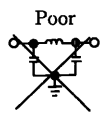
Servopack Type CACR-	AC Servomotor Type USARED-	Power Capacity per Servopack KVA	Current Capacity per MCCB of Fuse A	Applicable Noise Filter	Recommended Noise Filter		Power ON/OFF Magnetic Contactor
					Type	200VAC class	
HRA5AAB12	A5C ⬚ 2	0.3	5	Good  Poor 	LF-205A	5A	YASKAWA Type HI-15E$_5$ (30A) or equivalent
HR01AAB12	01C ⬚ 2	0.5					
HR02AAB12	03C ⬚ 2	0.75					
HR03AAB12	03C ⬚ 2	1.0	7		LF-210	10A	
HR05AAB12	05C ⬚ 2	1.4	11		LF-215	15A	
HR10AAB	07C ⬚ 2	2.1	8		LF-315	10A	
HRA5AAB11	A5D ⬚ 2	0.3	5		LF-205A	5A	
HR01AAB11	01D ⬚ 2	0.5					
HR02AAB11	02D ⬚ 2	0.75	8		LF-210	10A	
HR03AAB11	03D ⬚ 2	1.0	11		LF-215	15A	
HR05AAB11	05D ⬚ 2	1.4	15		LF-220	20A	

Table 8.7 Combination of Servopack, Servomotor P Series and Peripheral Devices

Servopack Type CACR-	AC Servomotor Type USAPEN-	Power Capacity per Servopack KVA	Current Capacity per MCCB of Fuse A	Applicable Noise Filter	Recommended Noise Filter		Power ON/OFF Magnetic Contactor
					Type	200VAC class	
HR01AAB12	USAPEM-01C ⬚ 2	0.5	5	Good  Poor 	LF-205A	5A	YASKAWA Type HI-15E$_5$ (30A) or equivalent
HR02AAB12	USAPEM-02C ⬚ 2	0.75					
HR03AAB12	USAPEM-03C ⬚ 2	1.0	7		LF-210	10A	
HR05AAB12	USAPEM-05C ⬚ 2	1.4	11		LS-215	15A	
HR10AAB	USAPEM-10C ⬚ 2	2.1	8		LF-315	10A	

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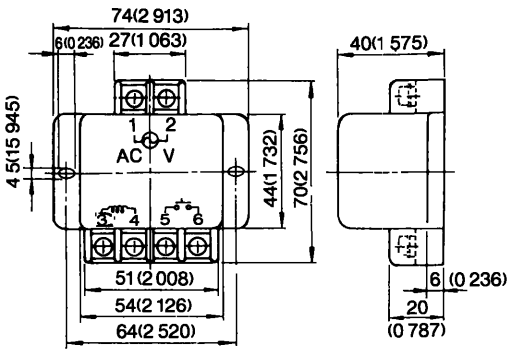
8.2 BRAKE POWER SUPPLY

There are two types of brake power supplies for M, F, G and D series and for S, R and P series. Select one suitable for the applicable motor.

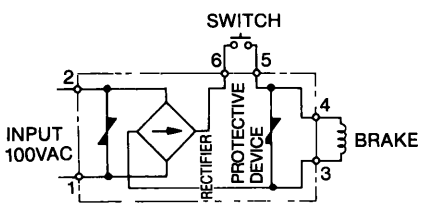
(a) Power supply unit for M, F, G, D series (made by Ogura Clutch Co., Ltd.)

- Input 100VAC, output 90VDC, Max. 0.4A (type OPR 109F)
- Input 200VAC, output 90VDC, Max. 0.4A (type OPR 109A)

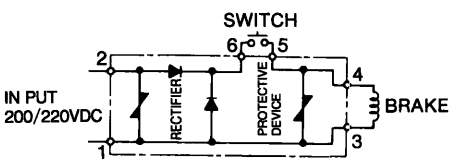
Dimensions in mm (inches)



Type OPR109F Circuit Diagram



Type OPR109A Circuit Diagram



Notes

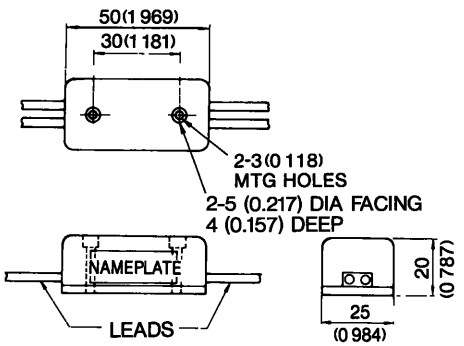
1 Do not short-circuit between output terminal Nos 3 and 4
2 The open/close value of the contact used for Nos 5 and 6 is 5 to 10 times the rated current of the brake used
Direct current open/close contacts must be used
3 Insert a fuse in the input or output side to protect the power supply

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(b) Power supply unit for S, P, R series (made by Tokushu Seiko Co., Ltd.)

- Input 100VAC, output 90VDC, Max. 0.2ADC (DP8401002-2)
- Input 200VAC, output 90VDC, Max. 0.2ADC (DP8401002-1)

Dimensions in mm (inches)

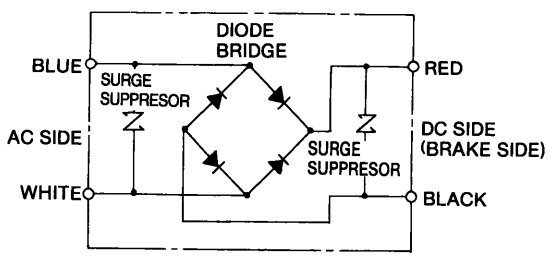


- Lead Length 500mm for each (19.69 inches.)
- Lead Color Distinction

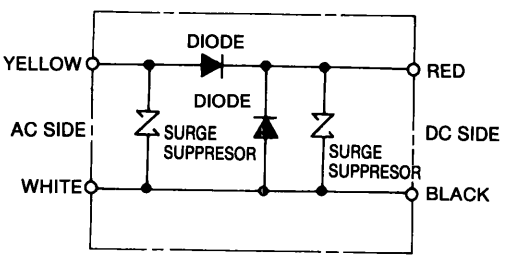
AC Input Side		Brake Side
100V	200V	
Blue White	Yellow White	Red Black

- Max Ambient Temperature 60° C

100VAC: Internal Circuit



200VAC· Internal Circuit



Note Close or open the brake power supply circuit on DC side
If AC side is operated, brake time becomes extended

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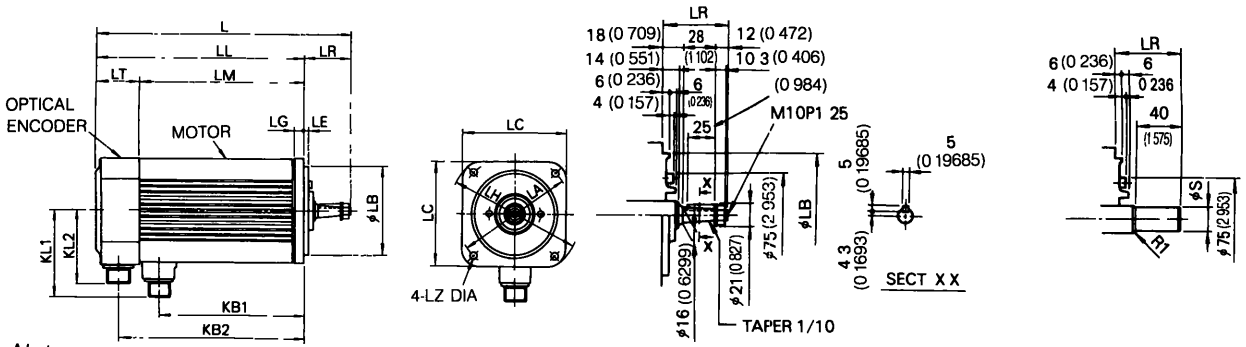
9 DIMENSIONS

9.1 AC SERVOMOTOR WITH ABSOLUTE ENCODER

(1) M Series

Dimensions in mm (inches)

Drawing 1 USAMED-03BS1, -06BS1 (Taper Shaft), -09BS2 (Straight Shaft)



For -03BS1, -06BS1

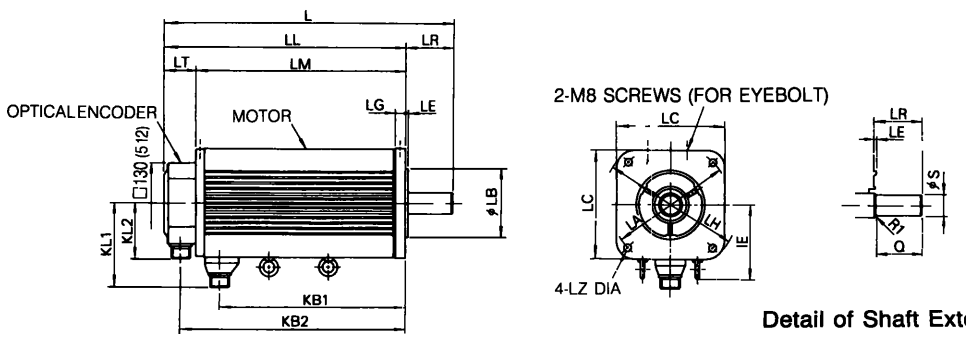
For -09BS2

Detail of Shaft Extension

Notes

1 *Plug and clamp are not attached for receptacle connection*
2 *Key and keyway comply with JIS B 1301-1976 (Parallel key, keyway common class)*
3 *Motor should be mounted with connectors down*

Drawing 2 USAMED-12BS2 to -44BS2 (Straight Shaft)

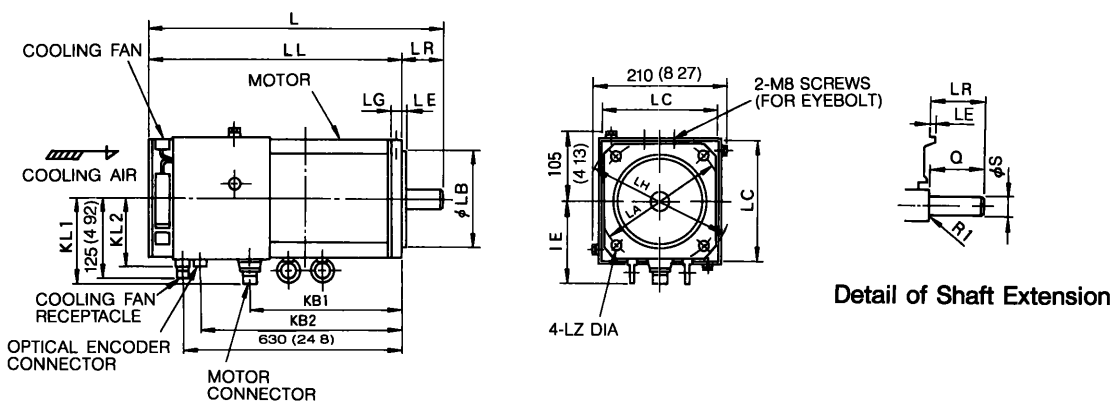


Detail of Shaft Extension

Notes

1 *Plug and clamp are not attached for receptacle connection*
2 *Motor should be mounted with connectors down*

Drawing 3 USAMKD-60BS2 (Straight Shaft)



Detail of Shaft Extension

Notes

1 *Plug and clamp are not attached for receptacle connection*
2 *Motor should be mounted with connectors down*

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AC Servomotor Type USAMED-*	Dwg No	L	LL	LM	LR	LT	KB1	KB2	IE	KL1	KL2	Flange Surface							Shaft Extension		Approx Weight kg (lb)
												LA	LB	LC	LE	LG	LH	LZ	S	Q	
03BS1†	1	277 (10 91)	219 (8 63)	150 (5 91)	58 (2 28)	69 (2 72)	127 (5 0)	177 (6 97)	—	109 (4 29)	92 (3 62)	145 (5 71)	110 (4 3307 $^{0}_{-0.0014}$)	130 (5 12)	6 (0 24)	12 (0 47)	165 (6 5)	9 (0 35)	—	—	9 (19 8)
06BS1†		334 (13 15)	276 (10 87)	207 (8 15)	58 (2 28)	69 (2 72)	184 (7 24)	234 (9 21)	—	109 (4 29)	92 (3 62)	145 (5 71)	110 (4 3307 $^{0}_{-0.0014}$)	130 (5 12)	6 (0 24)	12 (0 47)	165 (6 5)	9 (0 35)	—	—	14 (30 9)
09BS2†		403 (15 87)	345 (13 59)	276 (10 87)	58 (2 28)	69 (2 72)	253 (9 96)	303 (11 93)	—	109 (4 29)	92 (3 62)	145 (5 71)	110 (4 3307 $^{0}_{-0.0014}$)	130 (5 12)	6 (0 24)	12 (0 47)	165 (6 5)	9 (0 35)	22 ($^{0}_{-0.013}$ 0 8661 $^{0}_{-0.0005}$)	40 (1 575)	20 (44 1)
12BS2†	2	343 (13 49)	264 (10 38)	211 (8 30)	79 (3 11)	53 (2 08)	171 (6 73)	237 (9 33)	—	139 (5 47)	92 (3 62)	200 (7 87)	114 3 $^{0}_{-0.001}$ (4 5 $^{0}_{-0.001}$)	180 (7 08)	3 2 (0 13)	18 (0 71)	230 (9 1)	13 5 (0 53)	35 ($^{0}_{-0.0004}$ 1 3779 $^{0}_{-0.0004}$)	76 (2 992)	22 (48 5)
20BS2		401 (15 79)	322 (12 68)	269 (10 60)	79 (3 11)	53 (2 08)	229 (9 01)	295 (11 61)	123 (4 84)	139 (5 47)	92 (3 62)	200 (7 87)	114 3 $^{0}_{-0.001}$ (4 5 $^{0}_{-0.001}$)	180 (7 08)	3 2 (0 13)	18 (0 71)	230 (9 1)	13 5 (0 53)	35 ($^{0}_{-0.0004}$ 1 3779 $^{0}_{-0.0004}$)	76 (2 992)	29 (63 9)
30BS2		486 (19 13)	407 (16 02)	354 (13 94)	79 (3 11)	53 (2 08)	314 (12 36)	380 (14 96)	123 (4 84)	139 (5 47)	92 (3 62)	200 (7 87)	114 3 $^{0}_{-0.001}$ (4 5 $^{0}_{-0.001}$)	180 (7 08)	3 2 (0 13)	18 (0 71)	230 (9 1)	13 5 (0 53)	35 ($^{0}_{-0.0004}$ 1 3779 $^{0}_{-0.0004}$)	76 (2 992)	41 (90 4)
44BS2		687 (27 04)	577 (22 71)	524 (20 63)	110 (4 33)	53 (2 08)	476 (18 74)	550 (21 65)	124 (4 88)	149 (5 87)	92 (3 62)	200 (7 87)	114 3 $^{0}_{-0.001}$ (4 5 $^{0}_{-0.001}$)	180 (7 08)	3 2 (0 13)	18 (0 71)	230 (9 1)	13 5 (0 53)	42 ($^{0}_{-0.016}$ 1 6535 $^{0}_{-0.0006}$)	110 (4 33)	66 (145 5)
60BS2	3	820 (32 28)	710 (27 95)	—	110 (4 33)	—	482 (18 98)	587 (23 11)	124 (4 88)	150 (5 91)	100 (3 94)	200 (7 87)	114 3 $^{0}_{-0.001}$ (4 5 $^{0}_{-0.001}$)	180 (7 08)	3 2 (0 13)	18 (0 71)	230 (9 1)	13 5 (0 53)	42 ($^{0}_{-0.016}$ 1 6535 $^{0}_{-0.0006}$)	110 (4 33)	71 (156 5)

*For servomotor of 6kW, "K" is used instead of "E", because of externally fan-cooled type
† Not provided with an eyebolt

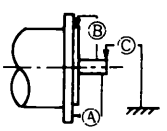
CONNECTOR TYPES

AC Servomotor Type USAMED-	Motor Connector Types				Absolute Encoder Connector Types			
	Receptacle	L-type Plug	Straight Plug	Cable Clamp	Receptacle	L-type Plug	Straight Plug	Cable Clamp
03BS1 06BS1 09BS2	MS3102 A18-10P	MS3108 B18-10S	MS3106 B18-10S	MS3057 -10A	MS3102 A20-29P	MS3108 B20-29S	MS3106 B20-29S	MS3057 -12A
12BS2 20BS2 30BS2	MS3102 A22-22P	MS3108 B22-22S	MS3106 B22-22S	MS3057 -12A				
44BS2 USAMKD-60BS2*	MS3102 A32-17P	MS3108 B32-17S	MS3106 B32-17S	MS3057 -20A				

*Cooling fan receptacle MS 3102 A 14 S-6P
Cooling fan plug MS 3108 B 14 S-6S
Cooling fan clamp MS 3057-6 A

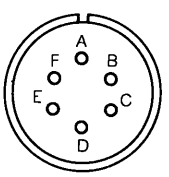
Servomotors with a brake or a modified shaft extension are also available

MECHANICAL SPECIFICATIONS

Accuracy (T I R)*		Reference Diagram
Flange surface perpendicular to shaft Ⓐ	0 04 (0 0016)	
Flange diameter concentric to shaft Ⓑ	0 04 (0 0016)	
Shaft run out Ⓒ	0 02 (0 0008) 0 04† (0 0016†)	

*T I R (Total Indicator Reading)
† Accuracy for motor types USAMED-44BS2, USAMKD-60BS2

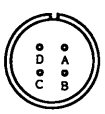
FAN TERMINAL CONNECTION
(For only 60BS2)



A	Fan motor
B	Fan motor
C	—
D	Alarm terminal
E	Alarm terminal
F	—

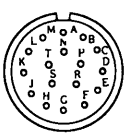
CONNECTOR SPECIFICATIONS

Motor Receptacle

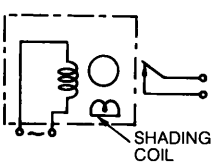


A	Phase U
B	Phase V
C	Phase W
D	Ground

Absolute Encoder Receptacle



A	Channel A output	K	—
B	Channel $\overline{A}$ output	L	—
C	Channel B output	M	—
D	Channel $\overline{B}$ output	N	—
E	Channel C output	P	—
F	Channel $\overline{C}$ output	R	For reset
G	0 V	S	0V (battery)
H	+5VDC	T	3 6V (battery)
J	Frame ground	—	—



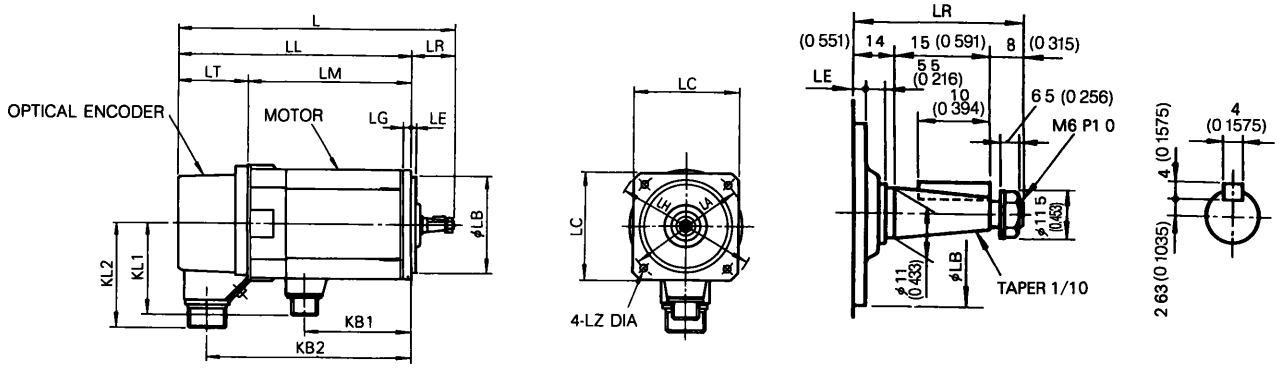
Alarm Contact
OFF at normal fan rotation
ON at 1800±200 r/min or less
(ON during 3 seconds at start-up)
Contact Capacity
Max resistive load 110V, 0 3A

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(2) F Series

Dimensions in mm (inches)

Drawing 1 USAFED-02CS1, -03CS1 (Taper Shaft)

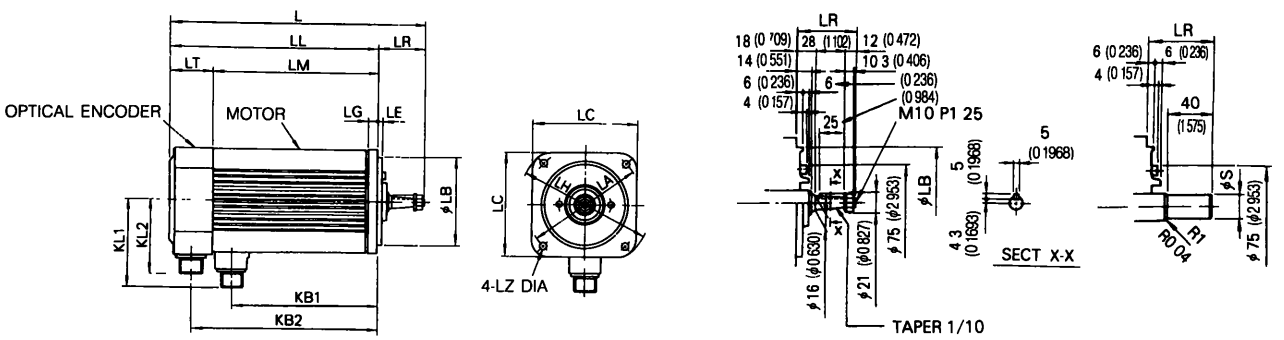


Detail of Shaft Extension

Notes

1 Plug and clamp are not attached for receptacle connection
2 Key and keyway comply with JIS B 1301-1976 (Parallel key, keyway common class)
3 Motor should be mounted with connectors down

Drawing 2 USAFED-05CS1, -09CS1 (Taper Shaft), -13CS2 (Straight Shaft)



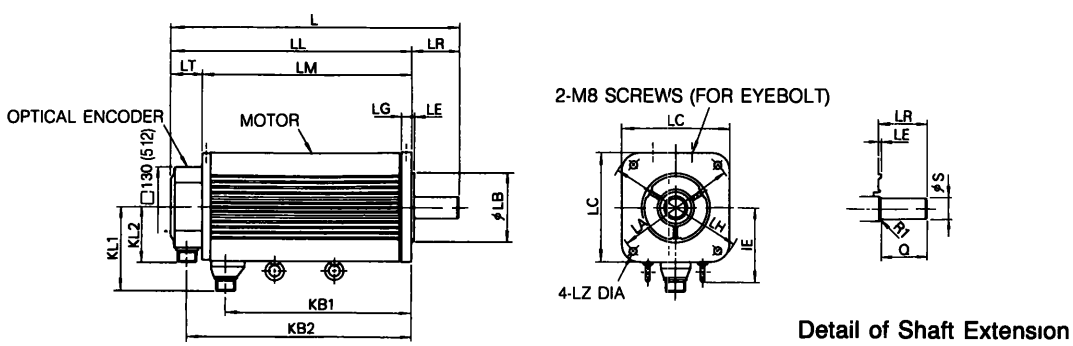
For -05CS1, -09CS1 For -13CS2

Detail of Shaft Extension

Notes

1 Plug and clamp are not attached for receptacle connection
2 Key and keyway comply with JIS B 1301-1976 (Parallel key, keyway common class)
3 Motor should be mounted with connectors down

Drawing 3 USAFED-20CS2 to -44CS2 (Straight Shaft)



Detail of Shaft Extension

Notes

1 Plug and clamp are not attached for receptacle connection
2 Motor should be mounted with connectors down

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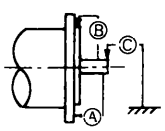
AC Servomotor Type USAFED-	Dwg No	L	LL	LM	LR	LT	KB1	KB2	IE	KL1	KL2	Flange Surface							Shaft Extension		Approx Weight kg (lb)
												LA	LB	LC	LE	LG	LH	LZ	S	Q	
02CS1	1	234 (9 21)	197 (7 75)	137 (5 39)	37 (1 46)	60 (2 36)	90 (3 54)	172 (6 77)	—	76 (3 43)	89 (2 99)	100 (3 94)	80 $^{0}_{-0.030}$ (3 1496 $^{0}_{-0.0012}$)	90 (3 54)	4 (0 157)	7 (0 276)	120 (4 72)	6 6 (0 26)		—	5 5 (7 7)
03CS1		280 (11 02)	243 (9 56)	183 (7 2)	37 (1 46)	60 (2 36)	136 (5 35)	218 (8 58)	—	76 (3 43)	89 (2 99)	100 (3 94)	80 $^{0}_{-0.030}$ (3 1496 $^{0}_{-0.0012}$)	90 (3 54)	4 (0 157)	7 (0 276)	120 (4 72)	6 6 (0 26)	-	—	6 5 (14 3)
05CS1	2	277 (10 90)	219 (8 62)	150 (5 91)	58 (2 28)	69 (2 72)	127 (5 0)	177 (6 97)	—	109 (4 29)	92 (3 62)	145 (5 71)	110 $^{0}_{-0.035}$ (4 3307 $^{0}_{-0.0014}$)	130 (5 12)	6 (0 24)	12 (0 47)	165 (6 5)	9 (0 35)		—	8 5 (18 7)
09CS1		334 (13 14)	276 (10 86)	207 (8 16)	58 (2 28)	69 (2 72)	184 (7 24)	234 (9 21)	—	109 (4 29)	92 (3 62)	145 (5 71)	110 $^{0}_{-0.035}$ (4 3307 $^{0}_{-0.0014}$)	130 (5 12)	6 (0 24)	12 (0 47)	165 (6 5)	9 (0 35)	-	—	13 (28 7)
13CS2		403 (15 87)	345 (13 59)	276 (10 87)	58 (2 28)	69 (2 72)	253 (9 96)	303 (11 93)	—	109 (4 29)	92 (3 62)	145 (5 71)	110 $^{0}_{-0.035}$ (4 3307 $^{0}_{-0.0014}$)	130 (5 12)	6 (0 24)	12 (0 47)	165 (6 5)	9 (0 35)	22 $^{0}_{-0.013}$ (0 8661 $^{0}_{-0.0005}$)	40 (1 57)	20 (44 1)
20CS2	3	343 (13 5)	264 (10 39)	211 (8 3)	79 (3 11)	53 (2 09)	171 (6 73)	237 (9 33)	—	139 (5 47)	92 (3 62)	200 (7 88)	114 3 $^{0}_{-0.025}$ (4 5 $^{0}_{-0.001}$)	180 (7 09)	3 2 (0 13)	18 (0 71)	230 (9 06)	13 5 (0 53)	35 $^{+0.01}_{0}$ (1 3379 $^{+0.0004}_{0}$)	76 (2 99)	22 (48 5)
30CS2		401 (15 79)	322 (12 68)	269 (10 59)	79 (3 11)	53 (2 09)	229 (9 02)	295 (11 61)	123 (4 85)	139 (5 47)	92 (3 62)	200 (7 88)	114 3 $^{0}_{-0.025}$ (4 5 $^{0}_{-0.001}$)	180 (7 09)	3 2 (0 13)	18 (0 71)	230 (9 06)	13 5 (0 53)	35 $^{-0.01}_{0}$ (1 3379 $^{-0.0004}_{0}$)	76 (2 99)	29 (63 9)
44CS2		486 (19 14)	407 (16 02)	354 (13 93)	79 (3 11)	53 (2 09)	314 (12 36)	380 (14 96)	123 (4 85)	139 (5 47)	92 (3 62)	200 (7 88)	114 3 $^{0}_{-0.025}$ (4 5 $^{0}_{-0.001}$)	180 (7 09)	3 2 (0 13)	18 (0 71)	230 (9 06)	13 5 (0 53)	35 $^{-0.01}_{0}$ (1 3379 $^{-0.0004}_{0}$)	76 (2 99)	41 (90 4)

Not provided with an eyebolt

CONNECTOR TYPES

AC Servomotor Type USAFED-	Motor Connector Types				Absolute Encoder Connector Types			
	Receptacle	L-type Plug	Straight Plug	Cable Clamp	Receptacle	L-type Plug	Straight Plug	Cable Clamp
02CS1 03CS1	MS3102 A14S-2P	MS3108 B14S-2S	MS3106 B14S-2S	MS3057 -6A	MS3102 A20-29P	MS3108 B20-29S	MS3106 B20-29S	MS3057 -12A
05CS1 09CS1 13CS2	MS3102 A18-10P	MS3108 B18-10S	MS3106 B18-10S	MS3057 -10A				
20CS2 30CS2 44CS2	MS3102 A22-22P	MS3108 B22-22S	MS3106 B22-22S	MS3057 -12A				

MECHANICAL SPECIFICATIONS

Accuracy (T I R)*		Reference Diagram
Flange surface perpendicular to shaft Ⓐ	0 04 (0 0016)	
Flange diameter concentric to shaft Ⓑ	0 04 (0 0016)	
Shaft run out Ⓒ	0 02 (0 0008)	

T I R (Total Indicator Reading)

Servomotors with a brake or a modified shaft extension are also available

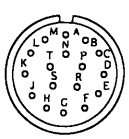
CONNECTOR SPECIFICATIONS

Motor Receptacle



A	Phase U
B	Phase V
C	Phase W
D	Ground

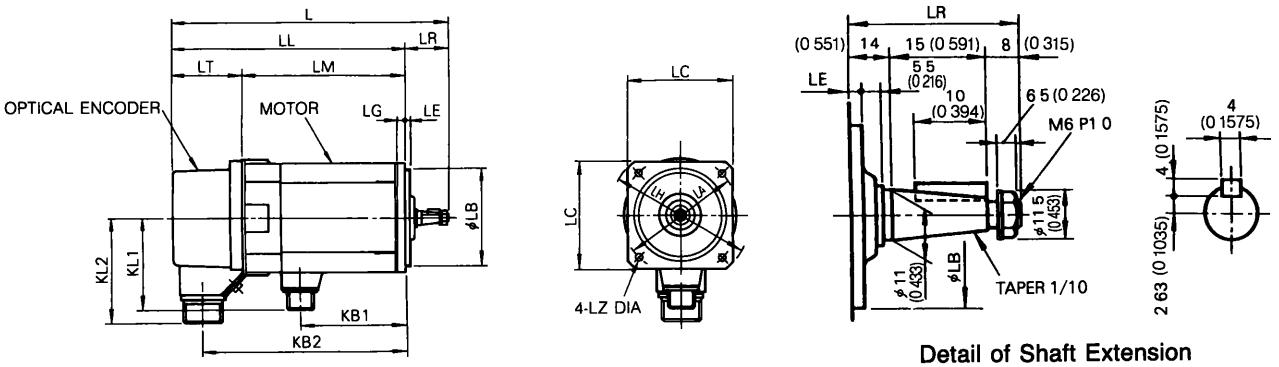
Absolute Encoder Receptacle



A	Channel A output	K	—
B	Channel $\overline{A}$ output	L	—
C	Channel B output	M	—
D	Channel $\overline{B}$ output	N	—
E	Channel C output	P	—
F	Channel $\overline{C}$ output	R	For reset
G	0 V	S	0V (battery)
H	+ 5VDC	T	3 6V (battery)
J	Frame ground	—	—

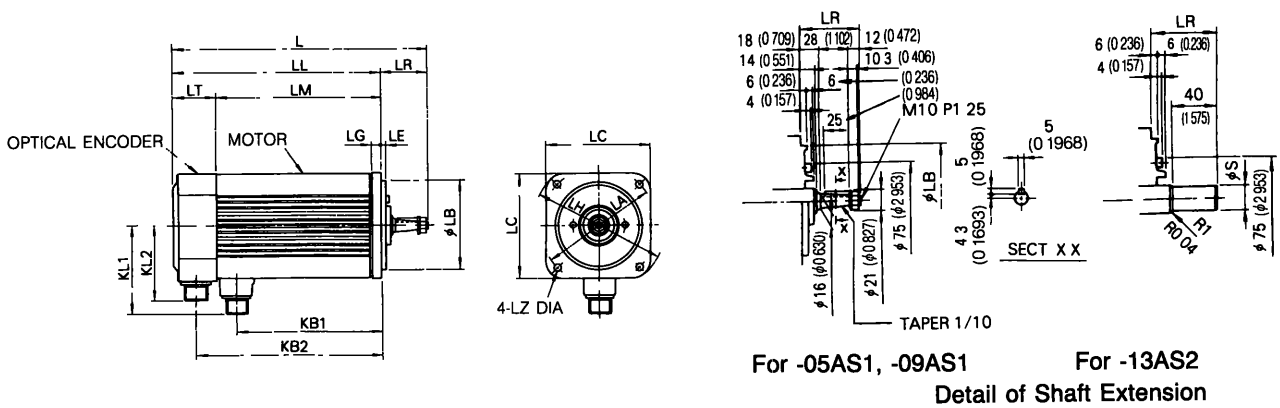
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Drawing 1 USAGED-02AS1, -03AS1 (Taper Shaft)



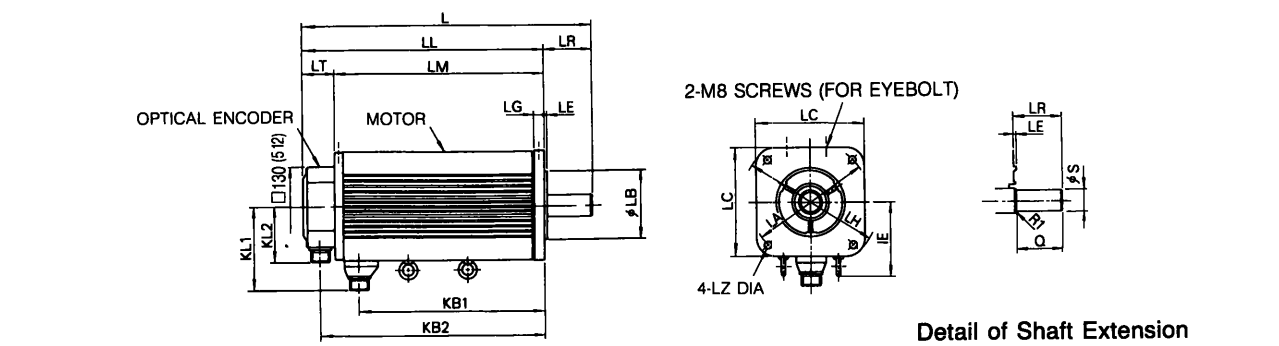
Notes
1 *Plug and clamp are not attached for receptacle connection*
2 *Key and keyway comply with JIS B 1301-1976*
(Parallel key, keyway common class)
3 *Motor should be mounted with connectors down*

Drawing 2 USAGED-05AS1, -09AS1 (Taper Shaft), -13AS2 (Straight Shaft)



Notes
1 *Plug and clamp are not attached for receptacle connection*
2 *Key and keyway comply with JIS B 1301-1976*
(Parallel key, keyway common class)
3 *Motor should be mounted with connectors down*

Drawing 3 USAGED-20AS2 to -44AS2 (Straight Shaft)



Notes
1 *Plug and clamp are not attached for receptacle connection*
2 *Motor should be mounted with connectors down*

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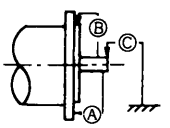
AC Servomotor Type USAGED-	Dwg No.	L	LL	LM	LR	LT	KB1	KB2	IE	KL1	KL2	Flange Surface							Shaft Extension		Approx Weight kg (lb)
												LA	LB	LC	LE	LG	LH	LZ	S	Q	
02AS1*	1	234 (9 21)	197 (7 75)	137 (5 39)	37 (1 46)	60 (2 36)	90 (3 54)	172 (6 77)	—	76 (3 43)	89 (2 99)	100 (3 94)	80 $^{0}_{-0.030}$ (3 1496 $^{0}_{-0.0012}$)	90 (3 54)	4 (0 157)	7 (0 276)	120 (4 72)	6 6 (0 26)	–	—	5 5 (7 7)
03AS1*		280 (11 02)	243 (9 56)	183 (7 2)	37 (1 46)	60 (2 36)	136 (5 35)	218 (8 58)	–	76 (3 43)	89 (2 99)	100 (3 94)	80 $^{0}_{-0.030}$ (3 1496 $^{0}_{-0.0012}$)	90 (3 54)	4 (0 157)	7 (0 276)	120 (4 72)	6 6 (0 26)	—	—	6 5 (14 3)
05AS1*	2	277 (10 90)	219 (8 62)	150 (5 91)	58 (2 28)	69 (2 72)	127 (5 0)	177 (6 97)	—	109 (4 29)	92 (3 62)	145 (5 71)	110 $^{0}_{-0.035}$ (4 3307 $^{0}_{-0.0014}$)	130 (5 12)	6 (0 24)	12 (0 47)	165 (6 5)	9 (0 35)	—	—	8 5 (18 7)
09AS1*		334 (13 14)	276 (10 86)	207 (8 16)	58 (2 28)	69 (2 72)	184 (7 24)	234 (9 21)	—	109 (4 29)	92 (3 62)	145 (5 71)	110 $^{0}_{-0.035}$ (4 3307 $^{0}_{-0.0014}$)	130 (5 12)	6 (0 24)	12 (0 47)	165 (6 5)	9 (0 35)	—	—	13 (28 7)
13AS2*		403 (15 87)	345 (13 59)	276 (10 87)	58 (2 28)	69 (2 72)	253 (9 96)	303 (11 93)	—	109 (4 29)	92 (3 62)	145 (5 71)	110 $^{0}_{-0.035}$ (4 3307 $^{0}_{-0.0014}$)	130 (5 12)	6 (0 24)	12 (0 47)	165 (6 5)	9 (0 35)	22 $^{0}_{-0.013}$ (0 8661 $^{0}_{-0.0005}$)	40 (1 57)	20 (44 1)
20AS2*	3	343 (13 5)	264 (10 39)	211 (8 3)	79 (3 11)	53 (2 09)	171 (6 73)	237 (9 33)	—	139 (5 47)	92 (3 62)	200 (7 88)	114 3 $^{0}_{-0.025}$ (4 5 $^{0}_{-0.001}$)	180 (7 09)	3 2 (0 13)	18 (0 71)	230 (9 06)	13 5 (0 53)	35 $^{+0.01}_{0}$ (1 3379 $^{0}_{-0.0004}$)	76 (2 99)	22 (48 5)
30AS2		401 (15 79)	322 (12 68)	269 (10 59)	79 (3 11)	53 (2 09)	229 (9 02)	295 (11 61)	123 (4 85)	139 (5 47)	92 (3 62)	200 (7 88)	114 3 $^{0}_{-0.025}$ (4 5 $^{0}_{-0.001}$)	180 (7 09)	3 2 (0 13)	18 (0 71)	230 (9 06)	13 5 (0 53)	35 $^{-0.01}_{0}$ (1 3379 $^{0}_{-0.0004}$)	76 (2 99)	29 (63 9)
44AS2		486 (19 14)	407 (16 02)	354 (13 93)	79 (3 11)	53 (2 09)	314 (12 36)	380 (14 96)	123 (4 85)	139 (5 47)	92 (3 62)	200 (7 88)	114 3 $^{0}_{-0.025}$ (4 5 $^{0}_{-0.001}$)	180 (7 09)	3 2 (0 13)	18 (0 71)	230 (9 06)	13 5 (0 53)	35 $^{+0.01}_{0}$ (1 3379 $^{0}_{-0.0004}$)	76 (2 99)	41 (90 4)

Not provided with an eyebolt

CONNECTOR TYPES

AC Servomotor Type USAGED-	Motor Connector Types				Absolute Encoder Connector Types			
	Receptacle	L-type Plug	Straight Plug	Cable Clamp	Receptacle	L-type Plug	Straight Plug	Cable Clamp
02AS1 03AS1	MS3102 A14S-2P	MS3108 A14S-2S	MS3106 B14S-2S	MS3057 -6A	MS3102 A20-29P	MS3108 B20-29S	MS3106 B20-29S	MS3057 -12A
05AS1 09AS1 13AS2	MS3102 A18-10P	MS3108 B18-10S	MS3106 B18-10S	MS3057 -10A				
20AS2 30AS2 44AS2	MS3102 A22-22P	MS3108 B22-22S	MS3106 B22-22S	MS3057 -12A				

MECHANICAL SPECIFICATIONS

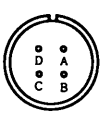
Accuracy (T. I R)*		Reference Diagram
Flange surface perpendicular to shaft Ⓐ	0 04 (0 0016)	
Flange diameter concentric to shaft Ⓑ	0 04 (0 0016)	
Shaft run out Ⓒ	0 02 (0 0008)	

T I R (Total Indicator Reading)

Servomotors with a brake or a modified shaft extension are also available

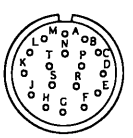
CONNECTOR SPECIFICATIONS

Motor Receptacle



A	Phase U
B	Phase V
C	Phase W
D	Ground

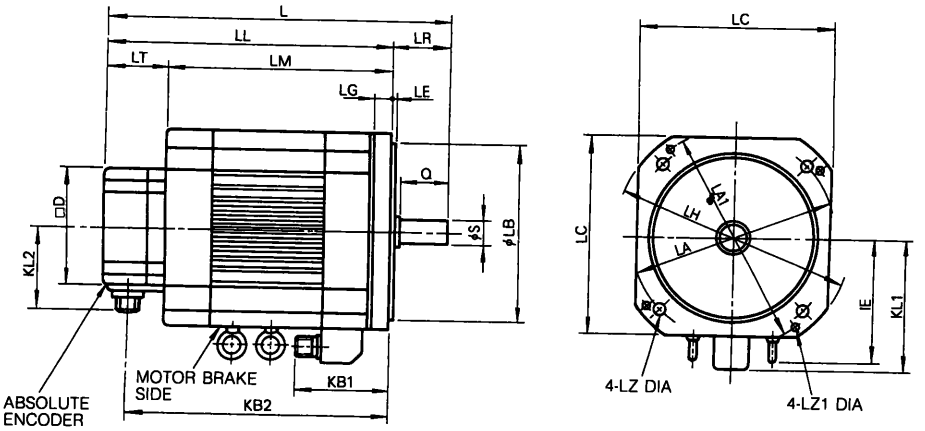
Absolute Encoder Receptacle



A	Channel A output	K	—
B	Channel $\overline{A}$ output	L	—
C	Channel B output	M	—
D	Channel $\overline{B}$ output	N	-
E	Channel C output	P	—
F	Channel $\overline{C}$ output	R	For reset
G	0V	S	0V (battery)
H	+5VDC	T	3 6V (battery)
J	Frame ground	—	—

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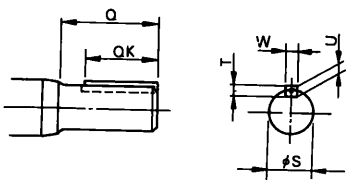
Drawing 1 USADED-05EW to -37EW



Notes

1 *Absolute encoder is used as a detector*
2 *Plug and clamp are not attached for receptacle connection*
3 *Motor should be mounted with connectors down*

Straight Shaft/With Key



Detail of Shaft Extension

Notes *Key and keyway comply with JIS B 1301-1976 (parallel key, keyway common class)*

AC Servomotor Type USADED-	Shaft Extension					
	S	Q	QK	T	U	W
05EW2K□	22 $^{0}_{-0.008}$ (0.8661 $^{0}_{-0.0003}$)	50 (1.97)	45 (1.77)	6 (0.236)	3.5 (0.138)	6 (0.2362)
10EW2K□	22 $^{0}_{-0.008}$ (0.8661 $^{0}_{-0.0003}$)	50 (1.97)	45 (1.77)	6 (0.236)	3.5 (0.138)	6 (0.2362)
15EW2K□	28 $^{0}_{-0.013}$ (1.1024 $^{0}_{-0.0005}$)	50 (1.97)	45 (1.77)	7 (0.275)	4 (0.157)	8 (0.3149)
22EW2K□	28 $^{0}_{-0.013}$ (1.1024 $^{0}_{-0.0005}$)	50 (1.97)	45 (1.77)	7 (0.275)	4 (0.157)	8 (0.3149)
37EW2K□	32 $^{0}_{-0.016}$ (1.2598 $^{0}_{-0.0006}$)	60 (2.36)	50 (1.97)	8 (0.315)	5 (0.197)	10 (0.3937)

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AC Servomotor Type USADED-	L	LL	LM	LR	LT	KB1	KB2	IE	KL1	KL2	D	Flange Surface									Shaft Extension		Approx Weight kg (lb)
												LA	LA1	LB	LC	LE	LG	LH	LZ	LZ1	S	Q	
05EW20E*	237 (9 33)	182 (7 17)	138 (5 44)	55 (2 16)	44 (1 73)	90 (3 54)	158 (6 22)		138 (5 43)	93 (3 66)	130 (5 12)	200 (7 87)	-	114 3 (4 5 $^{0}_{0.007}$)	180 (7 09)	3 2 (0 126)	12 (0 472)	230 (9 06)	13 5 (0 53)	—	22 $^{0}_{0.013}$ (0 8661 $^{0}_{0.0005}$)	50 (1 97)	17 (16) [37 5 (35 3)]
10EW20E*	257 (10 12)	202 (7 96)	158 (6 23)	55 (2 16)	44 (1 73)	90 (3 54)	178 (7 0)	-	138 (5 43)	93 (3 66)	130 (5 12)	200 (7 87)	-	114 3 $^{-0.025}_{-0.07}$ (4 5 $^{-0.001}_{-0.003}$)	180 (7 09)	3 2 (0 126)	12 (0 472)	230 (9 06)	13 5 (0 53)	—	22 $^{-0.013}_{0}$ (0 8661 $^{-0.0005}_{0}$)	50 (1 97)	19 (18) [41 9 (39 7)]
15EW20E	270 (10 63)	217 (8 47)	171 (6 66)	55 (2 16)	46 (1 81)	95 (3 74)	191 (7 52)	142 (5 59)	160 (6 3)	93 (3 66)	130 (5 12)	235 (9 25)	250 (9 84)	200 $^{0}_{-0.046}$ (7 874 $^{0}_{-0.0018}$)	220 (8 66)	4 (0 157)	16 (0 63)	270 (10 63)	13 5 (0 53)	M8	28 $^{-3}_{-0.013}$ (1 1024 $^{-0.0005}_{-0.0005}$)	50 (1 97)	30 (27) [66 2 (59 5)]
22EW20E	285 (11 22)	232 (9 06)	186 (7 25)	55 (2 16)	46 (1 81)	95 (3 74)	206 (8 11)	142 (5 59)	160 (6 3)	93 (3 66)	130 (5 12)	235 (9 25)	250 (9 84)	200 $^{0}_{-0.046}$ (7 874 $^{0}_{-0.0018}$)	220 (8 66)	4 (0 157)	16 (0 63)	270 (10 63)	13 5 (0 53)	M8	28 $^{0}_{-0.013}$ (1 1024 $^{0}_{-0.0005}$)	50 (1 97)	32 (29) [70 6 (63 9)]
37EW20E	345 (13 58)	282 (11 02)	236 (9 21)	65 (2 56)	46 (1 81)	95 (3 74)	256 (10 08)	142 (5 59)	160 (6 3)	93 (3 66)	130 (5 12)	235 (9 25)	250 (9 84)	200 $^{0}_{-0.046}$ (7 874 $^{0}_{-0.0018}$)	220 (8 66)	4 (0 157)	16 (0 63)	270 (10 63)	13 5 (0 53)	M8	32 $^{0}_{-0.016}$ (1 2598 $^{0}_{-0.0006}$)	60 (2 36)	39 (36) [86 (79 4)]

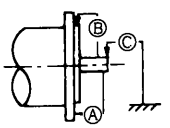
** Not provided with an eyebolt*

Notes *Dimensions above are applied for servomotor w/wo holding brake as well*
Approx weight in [ ] is for servomotor without holding brake

CONNECTOR TYPES

AC Servomotor Type USADED-	Motor Connector Types				Absolute Encoder Connector Types			
	Receptacle	L-type Plug	Straight Plug	Cable Clamp	Receptacle	L-type Plug	Straight Plug	Cable Clamp
05EW2□ 10EW2□	MS3102 A20-15P	MS3108 B20-15S	MS3106 B20-15S	MS3057 -12A	MS3102 A20-29P	MS3108 B20-29S	MS3106 B20-29S	MS3057 -12A
15EW2□ 22EW2□ 37EW2□	MS3102 A24-10P	MS3108 B24-10S	MS3106 B24-10S	MS3057 -16A				

MECHANICAL SPECIFICATIONS

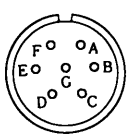
Accuracy (T I R)*		Reference Diagram
Flange surface perpendicular to shaft Ⓐ	0 04 (0 0016) 0 06† (0 0026†)	
Flange diameter concentric to shaft Ⓑ	0 04 (0 0016)	
Shaft run out Ⓒ	0 02 (0 0008)	

** T I R (Total Indicator Reading)*
† Accuracy for motor types USADED-15EW -22EW, and -37EW

Servomotors with a brake or a modified shaft extension are also available

CONNECTOR SPECIFICATIONS

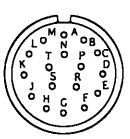
Motor Receptacle



A	Phase U	E	Brake term
B	Phase V	F	Brake term
C	Phase W	G	—
D	Ground		

When not provided with holding brake, E and F are not used

Absolute Encoder Receptacle



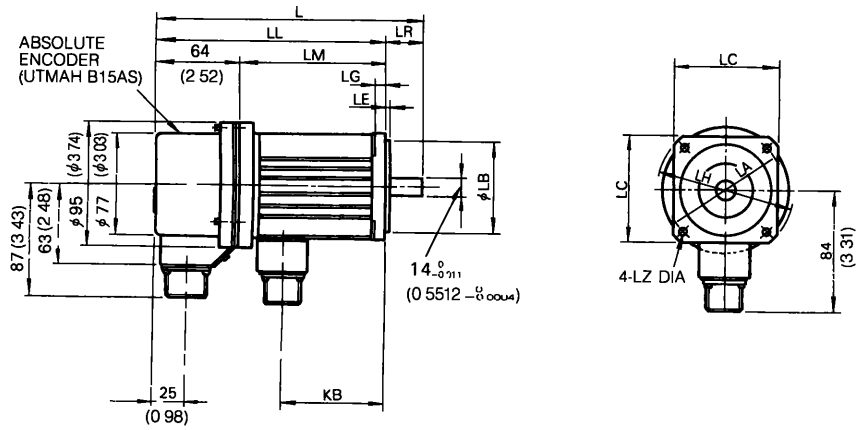
A	Channel A output	K	Channel S output
B	Channel $\overline{A}$ output	L	Channel S output
C	Channel B output	M	—
D	Channel $\overline{B}$ output	N	
E	Channel C output	P	—
F	Channel $\overline{C}$ output	R	For reset
G	0V	S	0V (battery)
H	+5VDC	T	3 6V (battery)
J	Frame ground	—	—

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(5) S series

Dimensions in mm (inches)

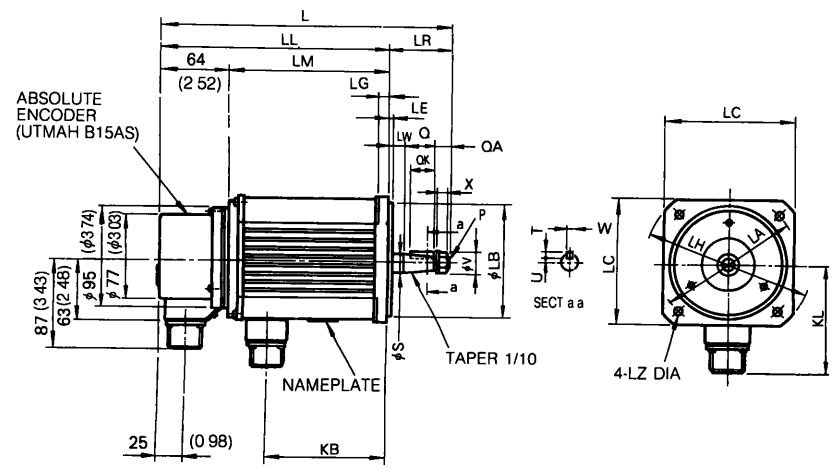
Drawing 1 USASEM-03AS2, -05AS2 (Straight Shaft)



Notes

1 *Plug and clamp are not attached for receptacle connection*
2 *Motor should be mounted with connectors down*

Drawing 2 USASEM-08AS1, -15AS1, -30AS1 (Taper Shaft)



Notes

1 *Plug and clamp are not attached for receptacle connection*
2 *Key and keyway comply with JIS B 1301-1976*
(Parallel key, keyway common class)
3 *Motor should be mounted with connectors down*

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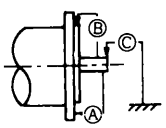
AC Servomotor Type USASEM-	Dwg No.	L	LL	LM	LR	KB	KL	Flange Surface							Approx Weight kg (lb)
								LA	LB	LC	LE	LG	LH	LZ	
03AS2	1	208 (8 19)	178 (7 01)	114 (4 49)	30 (1 18)	79 (3 11)	—	90 (3 54)	70 $^{0}_{-0.030}$ 2 7559 $^{0}_{-0.0012}$	80 (3 15)	3 (0 118)	8 (0 31)	105 (4 13)	6 (0 236)	3 2 (7 1)
05AS2	1	230 (9 01)	200 (7 83)	136 (5 31)	30 (1 18)	101 (3 98)	—	90 (3 54)	70 $^{0}_{-0.030}$ 2 7559 $^{0}_{-0.0012}$	80 (3 15)	3 (0 118)	8 (0 31)	105 (4 13)	6 (0 236)	3 8 (8 4)
08AS1	2	274 (10 79)	216 (8 51)	152 (5 99)	58 (2 28)	115 (4 53)	102 (4 02)	130 (5 12)	110 $^{0}_{-0.035}$ 4 3307 $^{0}_{-0.0014}$	120 (4 72)	3 (0 118)	10 (0 39)	155 (6 1)	9 (0 35)	6 3 (13 9)
15AS1	2	325 5 (12 81)	267 5 (10 53)	203 5 (8 01)	58 (2 28)	166 5 (6 56)	109 (4 29)	145 (5 71)	110 $^{0}_{-0.035}$ 4 3307 $^{0}_{-0.0014}$	130 (5 12)	6 (0 24)	12 (0 47)	165 (6 5)	9 (0 35)	11 5 (25 4)
30AS1	2	374 (14 72)	304 (11 96)	240 (9 44)	70 (2 76)	206 (8 11)	135 (5 31)	200 (7 87)	114 3 $^{0}_{-0.040}$ 4 5 $^{0}_{-0.0016}$	180 (7 09)	6 (0 24)	18 (0 71)	230 (9 1)	13 5 (0 53)	24 5 (54)

AC Servomotor Type USASEM-	Dwg No	Shaft Extension										
		LW	Q	QK	QA	X	S	V	P	U	W	T
08AS1	2	18 (0 71)	28 (1 1)	25 (0 98)	12 (0 47)	10 3 (0 41)	16 (0 63)	21 (0 83)	M10 (P1 25)	4 3 $^{0}_{-0.01}$ (0 169 $^{0}_{-0.004}$)	5 (01968)	5 (01968)
15AS1	2	18 (0 71)	28 (1 1)	25 (0 98)	12 (0 47)	10 3 (0 41)	19 (0 75)	21 (0 83)	M10 (P1 25)	5 8 $^{0}_{-0.1}$ (0 228 $^{0}_{-0.004}$)	5 (01968)	5 (01968)
30AS1	2	20 (0 79)	36 (1 42)	32 (1 26)	14 (0 55)	12 5 (0 49)	22 (0 87)	24 (0 94)	M12 (P1 25)	6 6 $^{0}_{-0.1}$ (0 26 $^{0}_{-0.004}$)	6 (0 2362)	6 (0 2362)

CONNECTOR TYPES

AC Servomotor Type USASEM-	Motor Connector Types				Absolute Encoder Connector Types			
	Receptacle	L-type Plug	Straight Plug	Cable Clamp	Receptacle	L-type Plug	Straight Plug	Cable Clamp
03AS2 05AS2	MS3102 A18-10P	MS3108 B18-10S	MS3106 B18-10S	MS3057 -10A	MS3102 A20-29P	MS3108 B20-29S	MS3106 B20-29S	MS3057 -12A
08AS1 15AS1 30AS1	MS3102 A20-4P	MS3108 B20-4S	MS3106 B20-4S	MS3057 -12A				

MECHANICAL SPECIFICATIONS

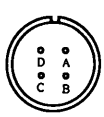
Accuracy (T I R)*		Reference Diagram
Flange surface perpendicular to shaft Ⓐ	0 04 (0 0016)	
Flange diameter concentric to shaft Ⓑ	0 04 (0 0016)	
Shaft run out Ⓒ	0 02 (0 0008)	

Servomotors with a brake or a modified shaft extension are also available

T I R (Total Indicator Reading)

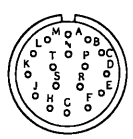
CONNECTOR SPECIFICATIONS

Motor Receptacle



A	Phase U
B	Phase V
C	Phase W
D	Ground

Absolute Encoder Receptacle



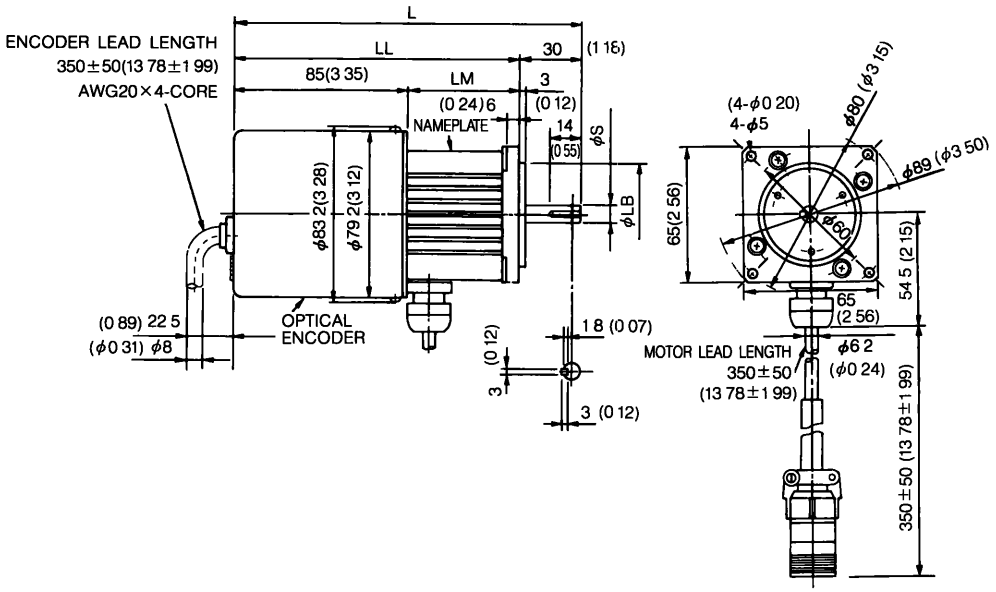
A	Channel A output	K	—
B	Channel $\overline{A}$ output	L	
C	Channel B output	M	—
D	Channel $\overline{B}$ output	N	—
E	Channel C output	P	—
F	Channel $\overline{C}$ output	R	For reset
G	0V	S	0V (battery)
H	+5VDC	T	3 6V (battery)
J	Frame ground	–	–

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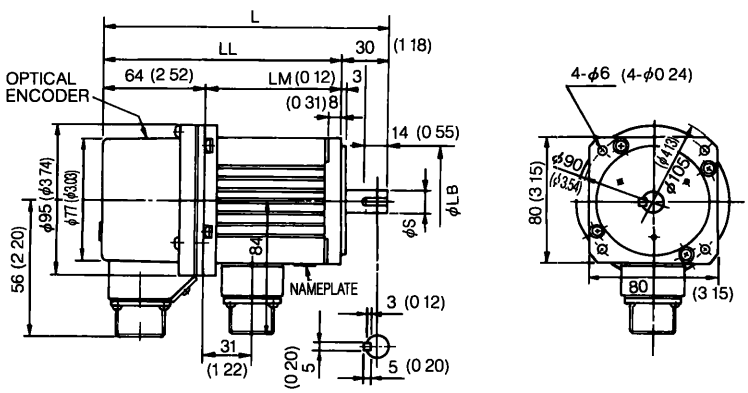
(6) R Series

Dimensions in mm (inches)

USAREM-A5CS2K 50W, -01CS2K 100W·····(200V)
USAREM-A5DS2K 50W, -01DS2K 100W·····(100V)



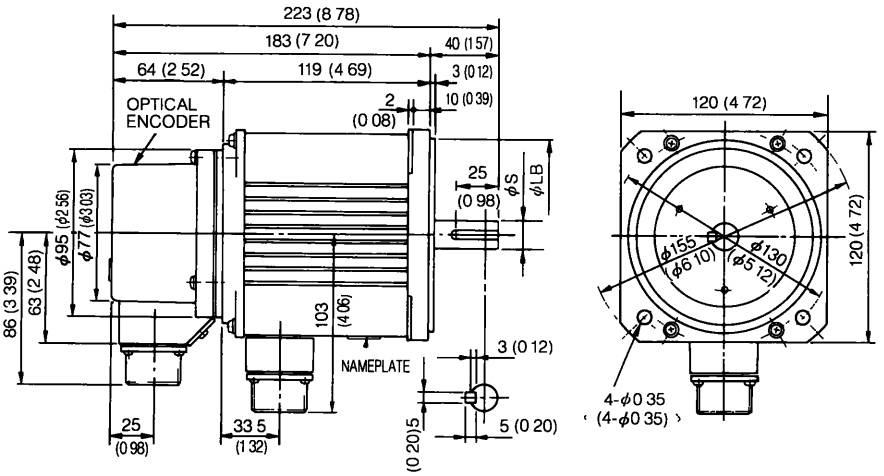
USAREM-02CS2K 200W, -03CS2K 300W·····(200V)
USAREM-02DS2K 200W, -03DS2K 300W·····(100V)



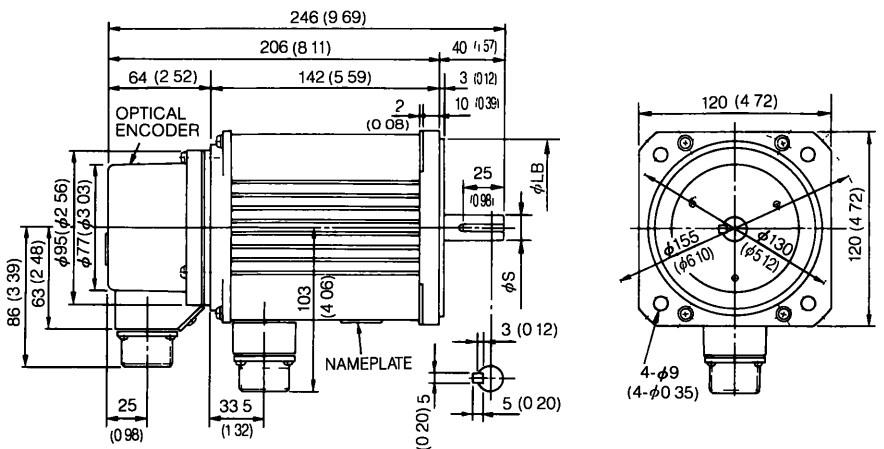
Drawing No.	Servomotor Type USAREM-	L	LL	LM	S	LB	Approx. Weight kg	(lb)
1	A5 C/D S2K	169 (6 66)	139 (5 48)	54 (2 13)	$8\ ^{0}_{-0.009}$	$50\ ^{0}_{-0.025}$	1 5	(3 3)
	01 C/D S2K	186 5 (7 34)	156 5 (6 16)	71 5 (2 81)	$(0.315\ ^{0}_{-0.00036})$	$(1.9685\ ^{0}_{-0.00098})$	1 8	(4 0)
2	02 C/D S2K	181 5 (7 15)	151 5 (5 96)	87 5 (3 44)	$14\ ^{0}_{-0.011}$	$70\ ^{0}_{-0.030}$	2 5	(5 5)
	03 C/D S2K	205 5 (8 09)	175 5 (6 91)	111 5 (4 39)	$(0.551\ ^{0}_{-0.00043})$	$(2.756\ ^{0}_{-0.0012})$	3 1	(6 9)
3	05 C/D S2K	See Drawing 3			$16\ ^{0}_{-0.011}$	$110\ ^{0}_{-0.035}$	4 9	(10 8)
4	07 C/D S2K	See Drawing 4			$(0.631\ ^{0}_{-0.00043})$	$(4.331\ ^{0}_{-0.00014})$	7 5	(16 5)

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USAREM-05CS2K 500W·····(200V)
USAREM-05DS2K 500W·····(100V)



USAREM-07CS2K 700W·····(200V)



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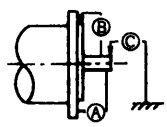
(6) R Series (Cont'd)

CONNECTOR TYPES

Servomotor Type USAREM-	Encoder Side			Motor Side		
	Receptacle Type	Plug* Type	Cable Clamp Type	Receptacle Type	Plug* Type	Cable Clamp Type
A5□† S2K 01□ S2K	MS3101A21 -29P	MS3106B20 -29S	MS3057 -12A	MS3101A 14S-2P	MS3106B 14-2S	MS3057 -6A
02□ S2K 03□ S2K	MS3102A20 -29P	MS3108B20 -29S		MS3102A 18-10P	MS3108B 18-10S	MS3057 -10A
05□ S2K 07□ S2K				MS3102A 20-4P	MS3108B 20-4S	MS3057 -12A

*Provided by customer
†□ in type designation is C (200V class) or D (100V class)
Note
1 With motor connection shown above by plus reference voltage, the motor rotates counterclockwise (when viewed from the drive end)
2 Dimensions of the keyway are based on JIS B 1301 "Sunk keys and their corresponding key ways (close keys) Parallel key has been attached Tolerance of keyway is precision class

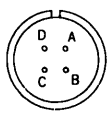
MECHANICAL SPECIFICATIONS

Accuracy (T I R)*		Reference Diagram
Flange surface perpendicular to shaft Ⓐ	0 04 (0 0016)	
Flange diameter concentric to shaft Ⓑ	0 04 (0 0016)	
Shaft run out Ⓒ	0 02 (0 0008)	

*T I R (Total Indicator Reading)

CONNECTOR SPECIFICATIONS

Motor Receptacle



A	Phase U
B	Phase V
C	Phase W
D	Frame ground

Encoder Receptacle

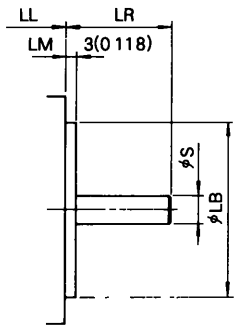


A	Channel A output	K	—
B	Channel $\overline{A}$ output	L	—
C	Channel B output	M	—
D	Channel $\overline{B}$ output	N	—
E	Channel Z output	P	—
F	Channel $\overline{Z}$ output	R	For reset
G	0 V	S	0V (battery)
H	+5VDC	T	3 6V (battery)
J	—	—	—

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Straight Shaft

Servomotor proper is the same dimensions as standard servomotor. Details of shaft extension are shown below:



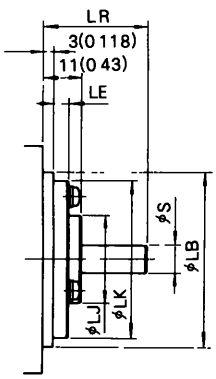
Detail of Shaft Extension

Dimensions in mm (inches)

Without Brake Type USAREM-	With Brake Type USAREM-	LR	S	LB
A5 □, S2	A5 □, S2B	30 (1 18)	8 $^{0}_{-0.009}$ (0 31 $^{0}_{-0.00035}$)	50 $^{0}_{-0.025}$ (1 97 $^{0}_{-0.00098}$)
01 □, S2	01 □, S2B			
02 □ S2	02 □, S2B		14 $^{0}_{-0.011}$ (0 551 $^{0}_{-0.00043}$)	70 $^{0}_{-0.030}$ (2 756 $^{0}_{-0.0012}$)
03 □, S2	03 □, S2B			
05 □, S2	05 □, S2B	40 (1 57)	16 $^{0}_{-0.011}$ (0 6299 $^{0}_{-0.00043}$)	110 $^{0}_{-0.035}$ (4 331 $^{0}_{-0.00014}$)

Straight Shaft with Oilseal

Servomotor proper is the same dimensions as standard servomotor. Details of shaft extension are shown below.



Detail of Shaft Extension

Dimensions in mm (inches)

Without Brake Type USAREM-	With Brake Type USAREM-	LR	LE	LJ	LK	S	LB	Oilseal
A5 □, S2S	A5 □, S2SB	30 (1 18)	4 5 (0 18)	25 (0 98)	45 (1 77)	8 $^{0}_{-0.009}$ (0 31 $^{0}_{-0.00035}$)	50 $^{0}_{-0.025}$ (1 97 $^{0}_{-0.00098}$)	SB08187
01 □, S2S	01 □, S2SB							
02 □, S2S	02 □, S2SB			36 (1 42)	60 (2 36)	14 $^{0}_{-0.011}$ (0 551 $^{0}_{-0.00043}$)	70 $^{0}_{-0.030}$ (2 756 $^{0}_{-0.0012}$)	SB14287
03 □, S2S	03 □, S2SB							
05 □, S2S	05 □, S2SB	40 (1 57)	2 5 (0 10)	50 (1 97)	73 (2 87)	16 $^{0}_{-0.011}$ (0 6299 $^{0}_{-0.00043}$)	110 $^{0}_{-0.040}$ (4 331 $^{0}_{-0.00014}$)	SB16307

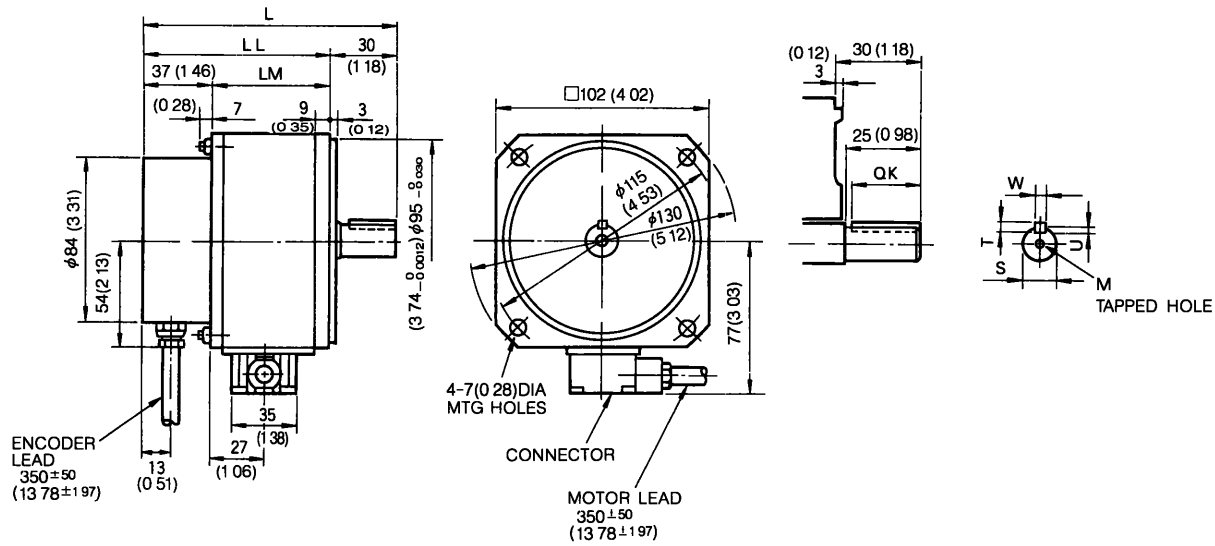
Straight Shaft with Keyway and Oilseal

Servomotor proper and shaft extension are same dimensions as standard Servomotor. Oilseal is same dimensions as shown above.

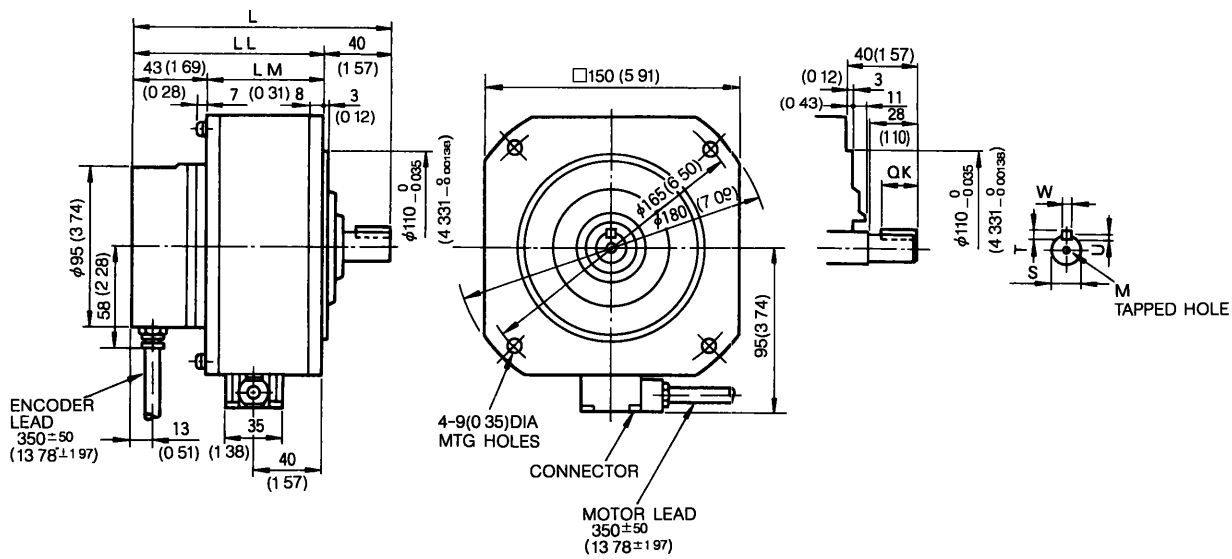
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Dimensions in mm (inches)

Drawing 1 USAPEM-01CW2K, -02CW2K, -03CW2K (Straight Shaft, With Key)



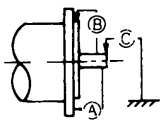
Drawing 2 USAPEM-05CW2K, -07CW2K (Straight Shaft, With Key)



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AC Servomotor Type USAPEM-	Dwg. No	L	LL	LM	Shaft Extension						Approx kg	Weight (lb)
					S	QK	U	W	T	M		
01CW2K	1	123 (4 84)	93 (3 66)	56 (2 20)	11 $^{0}_{-0.011}$ (0 433 $^{0}_{-0.00043}$)	18 (0 71)	2 5 (0 10)	4 (0 157)	4 (0 157)	M3, Deep 6 (0 24)	1 7	(3 7)
02CW2K	1	126 (4 96)	96 (3 78)	59 (2 32)	14 $^{0}_{-0.011}$ (0 551 $^{0}_{-0.00043}$)	18 (0 71)	3 (0 12)	5 (0 197)	5 (0 197)	M4, Deep 10 (0 39)	2 0	(4 4)
03CW2K	1	130 (5 12)	100 (3 94)	63 (2 48)	14 $^{0}_{-0.011}$ (0 551 $^{0}_{-0.00043}$)	18 (0 71)	3 (0 12)	5 (0 197)	5 (0 197)	M4, Deep 10 (0 39)	2 3	(5 1)
05CW2K	2	152 (5 98)	112 (4 41)	69 (2 72)	16 $^{0}_{-0.011}$ (0 630 $^{0}_{-0.00043}$)	20 (0 79)	3 (0 12)	5 (0 197)	5 (0 197)	M4, Deep 10 (0 39)	4 6	(10 1)
07CW2K	2	152 (5 98)	112 (4 41)	69 (2 72)	16 $^{0}_{-0.1}$ (0 630 $^{0}_{-0.00043}$)	20 (0 79)	3 (0 12)	5 (0 197)	5 (0 197)	M4, Deep 10 (0 39)	5	(11 0)

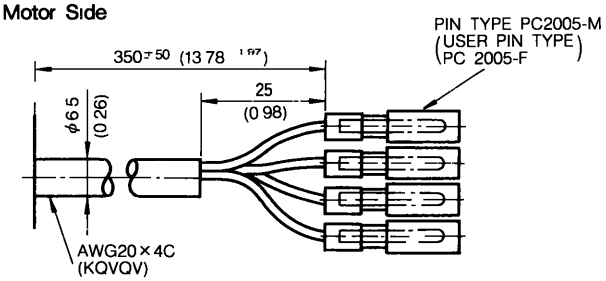
MECHANICAL SPECIFICATIONS

Accuracy (T I R)*		Reference Diagram
Flange surface perpendicular to shaft Ⓐ	0 04 (0 0016)	
Flange diameter concentric to shaft Ⓑ	0 04 (0 0016)	
Shaft run out	0 02 (0 0008)	

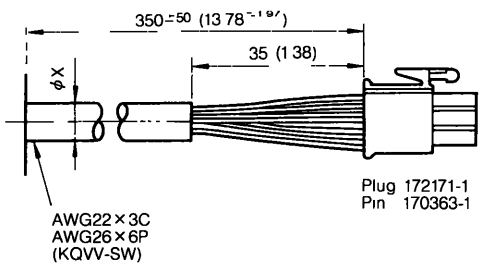
T I R (Total Indicator Reading)

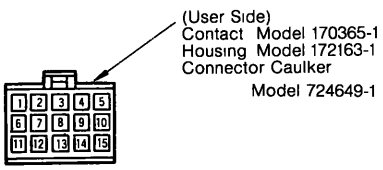
CONNECTOR SPECIFICATIONS

• Motor Side



• Encoder Side





1	Channel A output	Blue
2	Channel $\overline{A}$ output	White/Blue
3	Channel B output	Yellow
4	Channel $\overline{B}$ output	White/Yellow
5	Channel Z output	Green
6	Channel $\overline{Z}$ output	White/Green
7	0V (Power Supply)	Black
8	+5V (Power Supply)	Red
9	FG frame ground	Green/Yellow
10	Channel S output	Purple
11	Channel $\overline{S}$ output	White/Purple
12	Capacitor reset	Gray
13	Reset	White/Gray
14	0V (Battery)	White/Orange
15	3 6V (Battery)	Orange

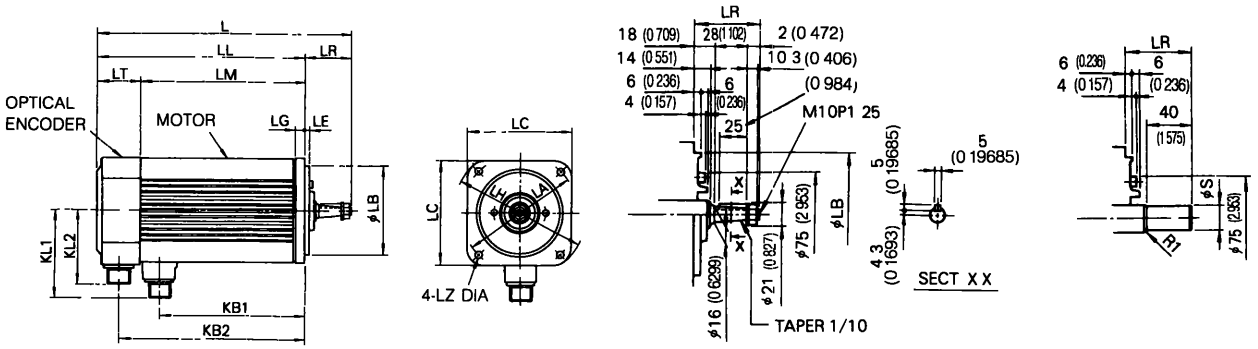
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9.2 AC SERVOMOTOR WITH INCREMENTAL ENCODER

(1) M Series

Dimensions in mm (inches)

Drawing 1 USAMED-03B21, -06B21 (Taper Shaft), -09B22 (Straight Shaft)



For -03B21, -06B21

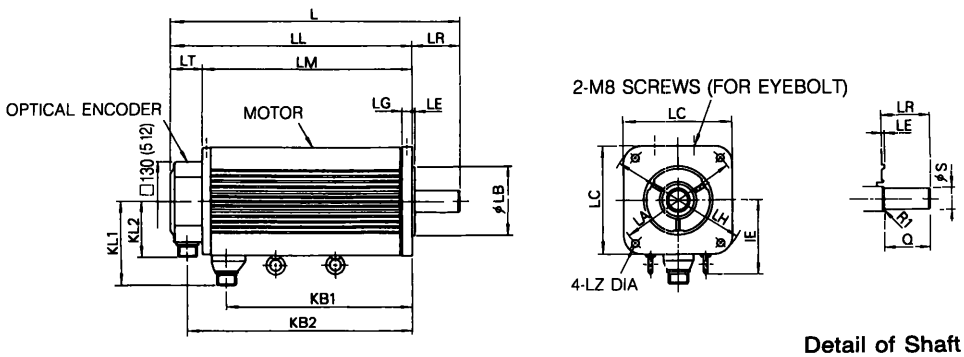
For -09B22

Detail of Shaft Extension

Notes

1 *Plug and clamp are not attached for receptacle connection*
2 *Key and keyway comply with JIS B 1301-1976 (Parallel key, keyway common class)*
3 *Motor should be mounted with connectors down*

Drawing 2 USAMED-12B22 to -44B22 (Straight Shaft)

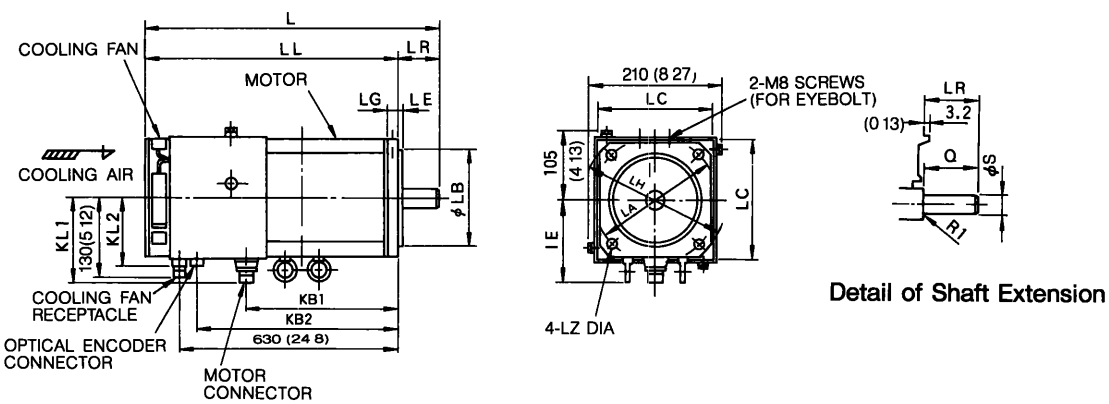


Detail of Shaft Extension

Notes

1 *Plug and clamp are not attached for receptacle connection*
2 *Motor should be mounted with connectors down*

Drawing 3 USAMKD-60B22 (Straight Shaft)



Detail of Shaft Extension

Notes

1 *Plug and clamp are not attached for receptacle connection*
2 *Motor should be mounted with connectors down*

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AC Servomotor Type USAMED-*	Dwg No	L	LL	LM	LR	LT	KB1	KB2	IE	KL1	KL2	Flange Surface							Shaft Extension		Approx Weight kg (lb)
												LA	LB	LC	LE	LG	LH	LZ	S	Q	
03B21†	1	263 (10 34)	205 (8 06)	150 (5 9)	58 (2 28)	55 (2 16)	127 (5 0)	177 (6 97)	—	109 (4 29)	92 (3 62)	145 (5 71)	110 $^{0}_{-0.035}$ (4 3307 $^{0}_{-0.0014}$)	130 (5 12)	6 (0 24)	12 (0 47)	165 (6 5)	9 (0 35)	—	—	8 5 (18 7)
06B21†		320 (12 59)	262 (10 31)	207 (8 15)	58 (2 28)	55 (2 16)	184 (7 24)	234 (9 21)	—	109 (4 29)	92 (3 62)	145 (5 71)	110 $^{0}_{-0.035}$ (4 3307 $^{0}_{-0.0014}$)	130 (5 12)	6 (0 24)	12 (0 47)	165 (6 5)	9 (0 35)	—	—	13 (28 7)
09B22†		389 (15 31)	331 (13 03)	276 (10 87)	58 (2 28)	55 (2 16)	253 (9 96)	303 (11 93)	—	109 (4 29)	92 (3 62)	145 (5 71)	110 $^{0}_{-0.035}$ (4 3307 $^{0}_{-0.0014}$)	130 (5 12)	6 (0 24)	12 (0 47)	165 (6 5)	9 (0 35)	22 $^{0}_{-0.013}$ (0 8661 $^{0}_{-0.0005}$)	40 (1 575)	20 (44 1)
12B22†	2	343 (13 49)	264 (10 38)	211 (8.30)	79 (3 11)	53 (2 08)	171 (6 73)	237 (9 33)	—	139 (5 47)	92 (3 62)	200 (7 87)	114 3 $^{0}_{-0.025}$ (4 5 $^{0}_{-0.001}$)	180 (7 08)	3 2 (0 13)	18 (0 71)	230 (9 1)	13 5 (0 53)	35 $^{+0.01}_{0}$ (1 3779 $^{+0.0004}_{0}$)	76 (2 992)	22 (48 5)
20B22		401 (15 79)	322 (12 68)	269 (10 60)	79 (3 11)	53 (2 08)	229 (9 01)	295 (11 61)	123 (4 84)	139 (5 47)	92 (3 62)	200 (7 87)	114 3 $^{0}_{-0.025}$ (4 5 $^{0}_{-0.001}$)	180 (7 08)	3 2 (0 13)	18 (0 71)	230 (9 1)	13 5 (0 53)	35 $^{-0.01}_{0}$ (1 3779 $^{+0.0004}_{0}$)	76 (2 992)	29 (63 9)
30B22		486 (19 13)	407 (16 02)	354 (13 94)	79 (3 11)	53 (2 08)	314 (12 36)	380 (14 96)	123 (4 84)	139 (5 47)	92 (3 62)	200 (7 87)	114 3 $^{0}_{-0.025}$ (4 5 $^{0}_{-0.001}$)	180 (7 08)	3 2 (0 13)	18 (0 71)	230 (9 1)	13 5 (0 53)	35 $^{+0.01}_{0}$ (1 3779 $^{+0.0004}_{0}$)	76 (2 992)	41 (90 4)
44B22		687 (27 04)	577 (22 71)	524 (20 63)	110 (4 33)	53 (2 08)	476 (18 74)	550 (21 65)	124 (4 88)	149 (5 87)	92 (3 62)	200 (7 87)	114 3 $^{0}_{-0.025}$ (4 5 $^{0}_{-0.001}$)	180 (7 08)	3 2 (0 13)	18 (0 71)	230 (9 1)	13 5 (0 53)	42 $^{0}_{-0.016}$ (1 6535 $^{0}_{-0.0006}$)	110 (4 33)	66 (145 5)
60B22		820 (32 28)	710 (27 95)	—	110 (4 33)	—	482 (18 98)	587 (23 11)	124 (4 88)	150 (5 91)	100 (3 94)	200 (7 87)	114 3 $^{0}_{-0.025}$ (4 5 $^{0}_{-0.001}$)	180 (7 08)	3 2 (0 13)	18 (0 71)	230 (9 1)	13 5 (0 53)	42 $^{0}_{-0.016}$ (1 6535 $^{0}_{-0.0006}$)	110 (4 33)	71 (156 9)

** For servomotor of 6kW, "K" is used instead of "E", because of externally fan-cooled type*
† Not provided with an eyebolt

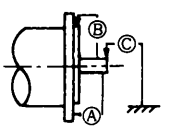
CONNECTOR TYPES

AC Servomotor Type USAMED-	Motor Connector Types				Incremental Encoder Connector Types			
	Receptacle	L-type Plug	Straight Plug	Cable Clamp	Receptacle	L-type Plug	Straight Plug	Cable Clamp
03B21 06B21 09B22	MS3102 A18-10P	MS3108 B18-10S	MS3106 B18-10S	MS3057 -10A	MS3102 A20-29P	MS3108 B20-29S	MS3106 B20-29S	MS3057 -12A
12B22 20B22 30B22	MS3102 A22-22P	MS3108 B22-22S	MS3106 B22-22S	MS3057 -12A				
44B22 USAMKD-60B22*	MS3102 A32-17P	MS3108 B32-17S	MS3106 B32-17S	MS3057 -20A				

** Cooling fan receptacle MS3102A14S-6P*
Cooling fan plug MS3108B14S-6P
Cooling fan cable clamp MS3057-6A

Servomotors with a brake or a modified shaft extension are also available For detailed information, refer to related Bulletins (TSE-S800-11 1)

MECHANICAL SPECIFICATIONS

Accuracy (T. I. R)*		Reference Diagram
Flange surface perpendicular to shaft Ⓐ	0 04 (0 0016)	
Flange diameter concentric to shaft Ⓑ	0 04 (0 0016)	
Shaft run out Ⓒ	0 02 (0 0008) 0 04† (0 0016†)	

** T I R (Total Indicator Reading)*
† Accuracy for motor types USAMED-44B22, USAMKD-60B22

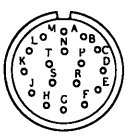
CONNECTOR SPECIFICATIONS

Motor Receptacle



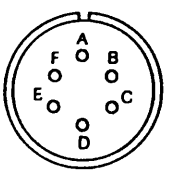
A	Phase U
B	Phase V
C	Phase W
D	Ground

Incremental Encoder Receptacle

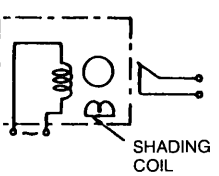


A	Channel A output	K	—
B	Channel $\overline{A}$ output	L	--
C	Channel B output	M	
D	Channel $\overline{B}$ output	N	—
E	Channel C output	P	--
F	Channel $\overline{C}$ output	R	—
G	0V	S	—
H	+5VDC	T	—
J	Frame ground	—	—

FAN TERMINAL CONNECTION
(For only 60B22)



A	Fan motor
B	Fan motor
C	-
D	Alarm terminal
E	Alarm terminal
F	—



Alarm Contact

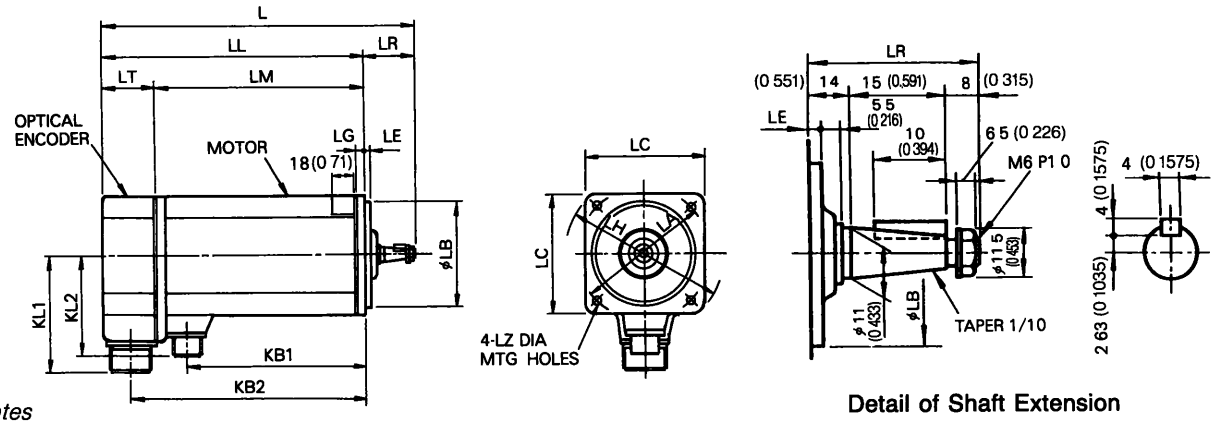
OFF at normal fan rotation
ON at 1800±200 r/min or less
(ON during 3 seconds at start-up)

Contact Capacity

Max resistive load 110V, 0 3A

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Drawing 1 USAFED-02C21, -03C21 (Taper Shaft)

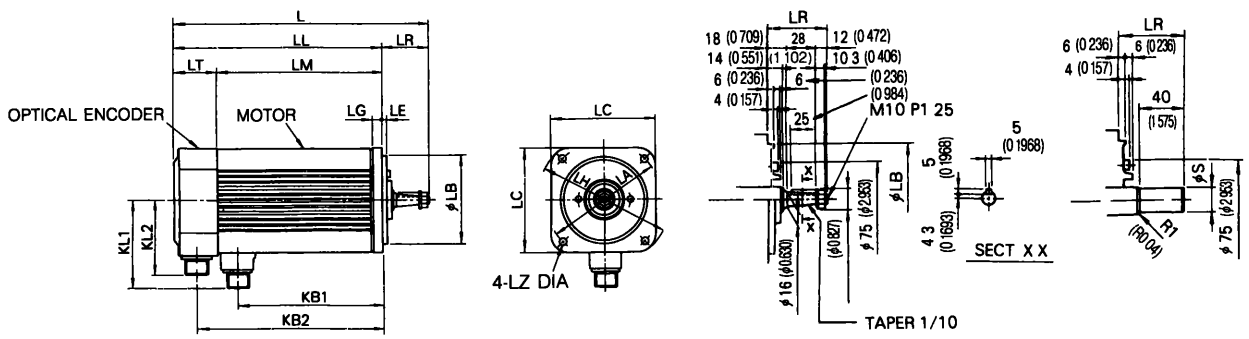


Detail of Shaft Extension

Notes

1 *Plug and clamp are not attached for receptacle connection*
2 *Key and keyway comply with JIS B 1301-1976 (Parallel key, keyway common class)*
3 *Motor should be mounted with connectors down*

Drawing 2 USAFED-05C21, -09C21 (Taper Shaft), -13C22 (Straight Shaft)



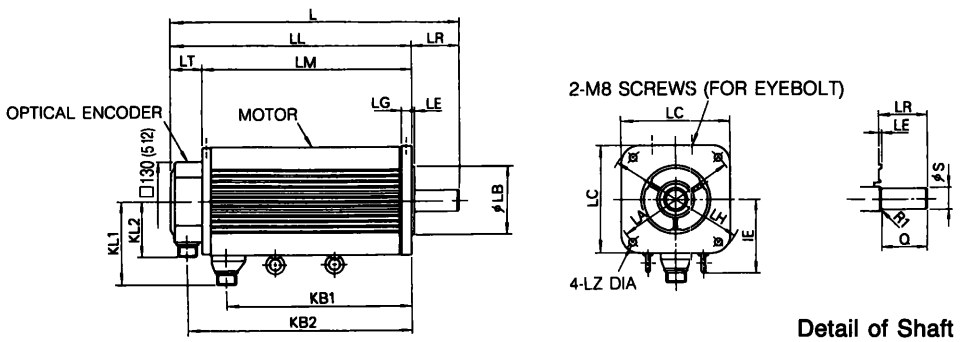
For -05C21, -09C21 For -13C22

Detail of Shaft Extension

Notes

1 *Plug and clamp are not attached for receptacle connection*
2 *Key and keyway comply with JIS B 1301-1976 (Parallel key, keyway common class)*
3 *Motor should be mounted with connectors down*

Drawing 3 USAFED-20C22 to -44C22 (Straight Shaft)



Detail of Shaft Extension

Notes

1 *Plug and clamp are not attached for receptacle connection*
2 *Motor should be mounted with connectors down*

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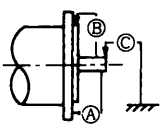
AC Servomotor Type USAFED-	Dwg No	L	LL	LM	LR	LT	KB1	KB2	IE	KL1	KL2	Flange Surface							Shaft Extension		Approx Weight kg (lb)
												LA	LB	LC	LE	LG	LH	LZ	S	Q	
02C21*	1	190 (7 48)	153 (6 02)	113 (4 45)	37 (1 46)	40 (1 57)	90 (3 54)	132 (5 19)	—	76 (3 43)	89 (2 99)	100 (3 94)	80 $^{0}_{-0.030}$ ($^{0}_{-0.0012}$)	90 (3 54)	4 (0 157)	7 (0 276)	120 (4 72)	6 6 (0 26)	—	—	5 5 (7 7)
03C21*		236 (9 29)	199 (7 83)	159 (6 26)	37 (1 46)	40 (1 57)	136 (5 35)	178 (7 0)	—	76 (3 43)	89 (2 99)	100 (3 94)	80 $^{0}_{-0.030}$ ($^{0}_{-0.0012}$)	90 (3 54)	4 (0 157)	7 (0 276)	120 (4 72)	6 6 (0 26)	-	-	6 5 (14 3)
05C21*	2	263 (10 35)	205 (8 07)	150 (5 91)	58 (2 28)	55 (2 16)	127 (5 0)	177 (6 97)	—	109 (4 29)	92 (3 62)	145 (5 71)	110 $^{0}_{-0.035}$ ($^{0}_{-0.0014}$)	130 (5 12)	6 (0 24)	12 (0 47)	165 (6 5)	9 (0 35)	—	—	8 5 (18 7)
09C21*		320 (12 6)	262 (10 32)	207 (8 16)	58 (2 28)	55 (2 16)	184 (7 24)	234 (9 21)	—	109 (4 29)	92 (3 62)	145 (5 71)	110 $^{0}_{-0.035}$ ($^{0}_{-0.0014}$)	130 (5 12)	6 (0 24)	12 (0 47)	165 (6 5)	9 (0 35)	—	-	13 (28 7)
13C22*		389 (15 31)	331 (13 03)	276 (10 87)	58 (2 28)	55 (2 16)	253 (9 96)	303 (11 93)	—	109 (4 29)	92 (3 62)	145 (5 71)	110 $^{0}_{-0.035}$ ($^{0}_{-0.0014}$)	130 (5 12)	6 (0 24)	12 (0 47)	165 (6 5)	9 (0 35)	22 $^{0}_{-0.013}$ 0 8661 $^{0}_{-0.0005}$	40 (1 57)	20 (44 1)
20C22*	3	343 (13 5)	264 (10 39)	211 (8 3)	79 (3 11)	53 (2 09)	171 (6 73)	237 (9 33)	—	139 (5 47)	92 (3 62)	200 (7 87)	114 3 $^{0}_{-0.025}$ (4 5 $^{0}_{-0.001}$)	180 (7 09)	3 2 (0 13)	18 (0 71)	230 (9 06)	13 5 (0 53)	35 $^{+0.01}_{0}$ 1 3779 $^{+0.0004}_{0}$	76 (2 99)	22 (48 5)
30C22		401 (15 79)	322 (12 68)	269 (10 59)	79 (3 11)	53 (2 09)	229 (9 02)	295 (11 61)	123 (4 85)	139 (5 47)	92 (3 62)	200 (7 87)	114 3 $^{0}_{-0.025}$ (4 5 $^{0}_{-0.001}$)	180 (7 09)	3 2 (0 13)	18 (0 71)	230 (9 06)	13 5 (0 53)	35 $^{+0.01}_{0}$ 1 3779 $^{+0.0004}_{0}$	76 (2 99)	29 (63 9)
44C22		486 (19 14)	407 (16 02)	354 (13 93)	79 (3 11)	53 (2 09)	314 (12 36)	380 (14 96)	123 (4 85)	139 (5 47)	92 (3 62)	200 (7 87)	114 3 $^{0}_{-0.025}$ (4 5 $^{0}_{-0.001}$)	180 (7 09)	3 2 (0 13)	18 (0 71)	230 (9 06)	13 5 (0 53)	35 $^{+0.01}_{0}$ 1 3779 $^{+0.0004}_{0}$	76 (2 99)	41 (90 4)

Not provided with an eyebolt

CONNECTOR TYPES

AC Servomotor Type USAFED-	Motor Connector Types				Incremental Encoder Connector Types			
	Receptacle	L-type Plug	Straight Plug	Cable Clamp	Receptacle	L-type Plug	Straight Plug	Cable Clamp
02C21 03C21	MS3102 A14S-2P	MS3108 B14S-2S	MS3106 B14S-2S	MS3057 -6A	MS3102 A20-29P	MS3108 B20-29S	MS3106 B20-29S	MS3057 -12A
05C21 09C21 13C22	MS3102 A18-10P	MS3108 B18-10S	MS3106 B18-10S	MS3057 -10A				
20C22 30C22 44C22	MS3102 A22-22P	MS3108 B22-22S	MS3106 B22-22S	MS3057 -12A				

MECHANICAL SPECIFICATIONS

Accuracy (T. I R)*		Reference Diagram
Flange surface perpendicular to shaft Ⓐ	0 04 (0 0016)	
Flange diameter concentric to shaft Ⓑ	0 04 (0 0016)	
Shaft run out Ⓒ	0 02 (0 0008)	

T I R (Total Indicator Reading)

Servomotors with a brake or a modified shaft extension are also available For detailed information, refer to related Bulletins (TSE-S800-11 1)

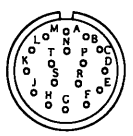
CONNECTOR SPECIFICATIONS

Motor Receptacle



A	Phase U
B	Phase V
C	Phase W
D	Ground

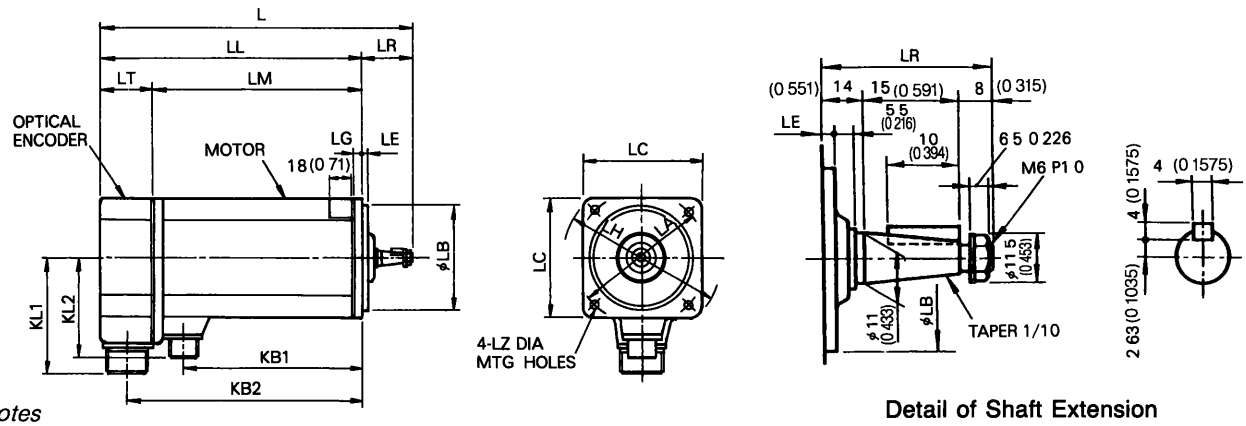
Incremental Encoder Receptacle



A	Channel A output	K	—
B	Channel $\overline{A}$ output	L	—
C	Channel B output	M	—
D	Channel $\overline{B}$ output	N	—
E	Channel C output	P	--
F	Channel $\overline{C}$ output	R	—
G	0V	S	—
H	+5VDC	T	—
J	Frame ground	—	—

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Drawing 1 USAGED-02A21, -03A21 (Taper Shaft)

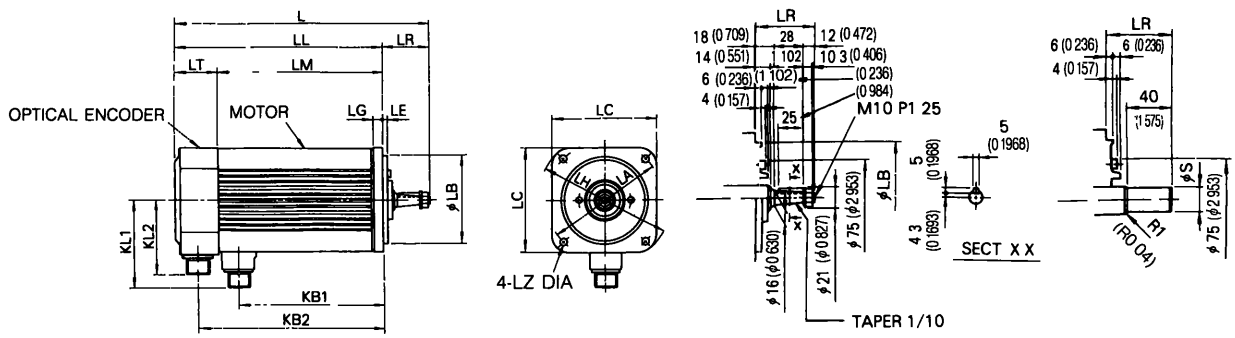


Detail of Shaft Extension

Notes

1 *Plug and clamp are not attached for receptacle connection*
2 *Key and keyway comply with JIS B 1301-1976 (Parallel key, keyway common class)*
3 *Motor should be mounted with connectors down*

Drawing 2 USAGED-05A21, -09A21 (Taper Shaft), -13A22 (Straight Shaft)



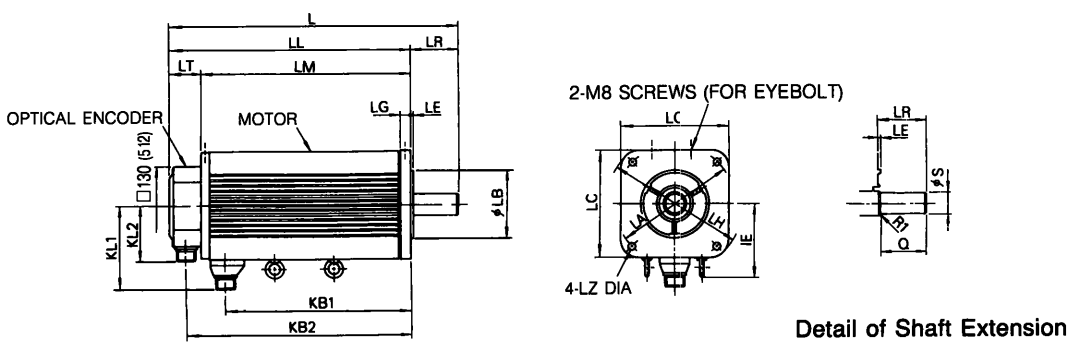
For -05A21, -09A21 For -13A22

Detail of Shaft Extension

Notes

1 *Plug and clamp are not attached for receptacle connection*
2 *Key and keyway comply with JIS B 1301-1976 (Parallel key, keyway common class)*
3 *Motor should be mounted with connectors down*

Drawing 3 USAGED-20A22 to -44A22 (Straight Shaft)



Detail of Shaft Extension

Notes

1 *Plug and clamp are not attached for receptacle connection*
2 *Motor should be mounted with connectors down*

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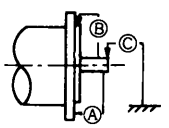
AC Servomotor Type USAGED-	Dwg No	L	LL	LM	LR	LT	KB1	KB2	IE	KL1	KL2	Flange Surface							Shaft Extension		Approx Weight kg (lb)
												LA	LB	LC	LE	LG	LH	LZ	S	Q	
02A21*	1	190 (7 48)	153 (6 02)	113 (4 45)	37 (1 46)	40 (1 57)	90 (3 54)	132 (5 19)	—	76 (3 43)	89 (2 99)	100 (3 94)	80 (3 1496 $^{0}_{-0.030}$ $^{0}_{-0.0012}$)	90 (3 54)	4 (0 157)	7 (0 276)	120 (4 72)	6 6 (0 26)	—	–	5 5 (7 7)
03A21*		236 (9 29)	199 (7 83)	159 (6 26)	37 (1 46)	40 (1 57)	136 (5 35)	178 (7 0)	—	76 (3 43)	89 (2 99)	100 (3 94)	80 (3 1496 $^{0}_{-0.030}$ $^{0}_{-0.0012}$)	90 (3 54)	4 (0 157)	7 (0 276)	120 (4 72)	6 6 (0 26)	—	—	6 5 (14 3)
05A21*	2	263 (10 35)	205 (8 07)	150 (5 91)	58 (2 28)	55 (2 16)	127 (5 0)	177 (6 97)		109 (4 29)	92 (3 62)	145 (5 71)	110 $^{0}_{-0.035}$ (4 3307 $^{0}_{-0.0014}$)	130 (5 12)	6 (0 24)	12 (0 47)	165 (6 5)	9 (0 35)	—	—	8 5 (18 7)
09A21*		320 (12 6)	262 (10 32)	207 (8 16)	58 (2 28)	55 (2 16)	184 (7 24)	234 (9 21)	—	109 (4 29)	92 (3 62)	145 (5 71)	110 $^{0}_{-0.035}$ (4 3307 $^{0}_{-0.0014}$)	130 (5 12)	6 (0 24)	12 (0 47)	165 (6 5)	9 (0 35)	—	—	13 (28 7)
13A22*		389 (15 31)	331 (13 03)	276 (10 87)	58 (2 28)	55 (2 16)	253 (9 96)	303 (11 93)	—	109 (4 29)	92 (3 62)	145 (5 71)	110 $^{0}_{-0.035}$ (4 3307 $^{0}_{-0.0014}$)	130 (5 12)	6 (0 24)	12 (0 47)	165 (6 5)	9 (0 35)	22 $^{0}_{-0.013}$ (0 8661 $^{0}_{-0.0005}$)	40 (1 57)	20 (44 1)
20A22*	3	343 (13 5)	264 (10 39)	211 (8 3)	79 (3 11)	53 (2 09)	171 (6 73)	237 (9 33)	—	139 (5 47)	92 (3 62)	200 (7 87)	114 3 $^{0}_{-0.025}$ (4 5 $^{0}_{-0.001}$)	180 (7 09)	3 2 (0 13)	18 (0 71)	230 (9 06)	13 5 (0 53)	35 $^{+0.01}_{0}$ (1 3779 $^{-0.0004}_{0}$)	76 (2 99)	22 (48 5)
30A22		401 (15 79)	322 (12 68)	269 (10 59)	79 (3 11)	53 (2 09)	229 (9 02)	295 (11 61)	123 (4 85)	139 (5 47)	92 (3 62)	200 (7 87)	114 3 $^{0}_{-0.025}$ (4 5 $^{0}_{-0.001}$)	180 (7 09)	3 2 (0 13)	18 (0 71)	230 (9 06)	13 5 (0 53)	35 $^{+0.01}_{0}$ (1 3779 $^{-0.0004}_{0}$)	76 (2 99)	29 (63 9)
44A22		486 (19 14)	407 (16 02)	354 (13 93)	79 (3 11)	53 (2 09)	314 (12 36)	380 (14 96)	123 (4 85)	139 (5 47)	92 (3 62)	200 (7 87)	114 3 $^{0}_{-0.025}$ (4 5 $^{0}_{-0.001}$)	180 (7 09)	3 2 (0 13)	18 (0 71)	230 (9 06)	13 5 (0 53)	35 $^{+0.01}_{0}$ (1 3779 $^{-0.0004}_{0}$)	76 (2 99)	41 (90 4)

Not provided with an eyebolt

CONNECTOR TYPES

AC Servomotor Type USAGED-	Motor Connector Types				Incremental Encoder Connector Types			
	Receptacle	L-type Plug	Straight Plug	Cable Clamp	Receptacle	L-type Plug	Straight Plug	Cable Clamp
02A21 03A21	MS3102 A14S-2P	MS3108 B14S-2S	MS3106 B14S-2S	MS3057 -6A	MS3102 A20-29P	MS3108 B20-29S	MS3106 B20-29S	MS3057 -12A
05A21 09A21 13A22	MS3102 A18-10P	MS3108 B18-10S	MS3106 B18-10S	MS3057 -10A				
20A22 30A22 44A22	MS3102 A22-22P	MS3108 B22-22S	MS3106 B22-22S	MS3057 -12A				

MECHANICAL SPECIFICATIONS

Accuracy (T I. R)*		Reference Diagram
Flange surface perpendicular to shaft Ⓐ	0 04 (0 0016)	
Flange diameter concentric to shaft Ⓑ	0 04 (0 0016)	
Shaft run out Ⓒ	0 02 (0 0008)	

T I R (Total Indicator Reading)

Servomotors with a brake or a modified shaft extension are also available For detailed information, refer to related Bulletins (TSE-S800-11 1)

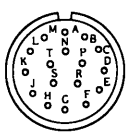
CONNECTOR SPECIFICATIONS

Motor Receptacle



A	Phase U
B	Phase V
C	Phase W
D	Ground

Incremental Encoder Receptacle

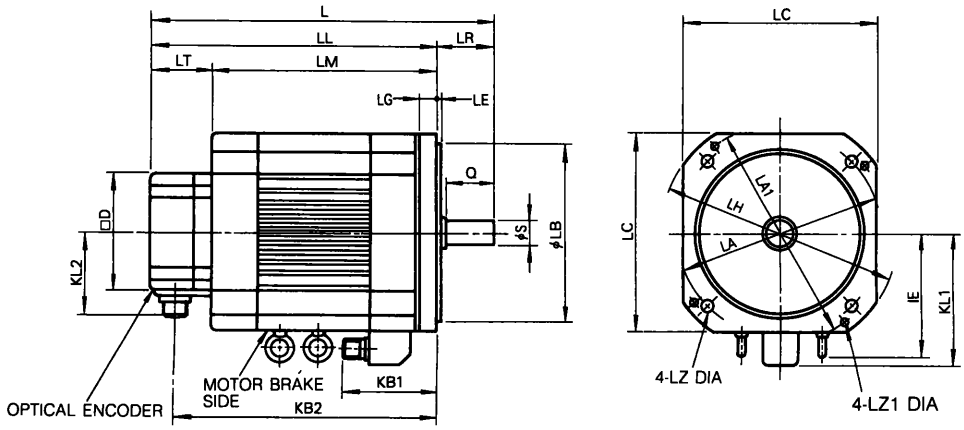


A	Channel A output	K	-
B	Channel $\overline{A}$ output	L	—
C	Channel B output	M	—
D	Channel $\overline{B}$ output	N	-
E	Channel C output	P	—
F	Channel $\overline{C}$ output	R	—
G	0V	S	—
H	+5VDC	T	—
J	Frame ground	—	—

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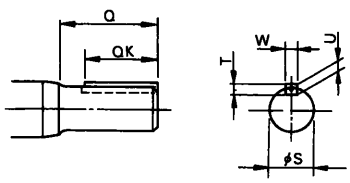
Dimensions in mm (inches)

Drawing 1 USADED-05E3 to -37E3



Notes
1 *Plug and clamp are not attached for receptacle connection*
2 *Motor should be mounted with connectors down*

Straight Shaft/With Key



Detail of Shaft Extension

Note · Key and keyway comply with JIS B 1301-1976 (parallel key, keyway common class)

AC Servomotor Type USADED-	Shaft Extension					
	S	Q	QK	T	U	W
05E32K□	22 $^{0}_{-0.021}$ (0.8661 $^{0}_{-0.0008}$)	50 (1.97)	46 (1.77)	6 (0.236)	3.5 (0.138)	6 (0.2362)
10E32K□	22 $^{0}_{-0.021}$ (0.8661 $^{0}_{-0.0008}$)	50 (1.97)	45 (1.77)	6 (0.236)	3.5 (0.138)	6 (0.2362)
15E32K□	28 $^{0}_{-0.013}$ (1.1024 $^{0}_{-0.0005}$)	50 (1.97)	45 (1.77)	7 (0.275)	4 (0.157)	8 (0.3149)
22E32K□	28 $^{0}_{-0.013}$ (1.1024 $^{0}_{-0.0005}$)	50 (1.97)	45 (1.77)	7 (0.275)	4 (0.157)	8 (0.3149)
37E32K□	32 $^{0}_{-0.016}$ (1.2598 $^{0}_{-0.0006}$)	60 (2.36)	50 (1.97)	8 (0.315)	5 (0.197)	10 (0.3937)

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AC Servomotor Type USADED-	L	LL	LM	LR	LT	KB1	KB2	IE	KL1	KL2	D	Flange Surface								Shaft Extension		Approx Weight kg (lb)
												LA	LA1	LB	LC	LE	LG	LH	LZ	LZ1	S	Q	
05E32OE	237 (9 33)	182 (7 17)	138 (5 44)	55 (2 16)	44 (1 73)	90 (3 54)	158 (6 22)	—	138 (5 43)	93 (3 66)	130 (5 12)	200 (7 87)	–	114 3 (4 5	180 (7 09)	3 2 (0 126)	12 (0 472)	230 (9 06)	13 5 (0 53)	—	22 (0 8661	50 (1 97)	17 (16) [37 5 (35 3)]
10E32OE	257 (10 12)	202 (7 96)	158 (6 23)	55 (2 16)	44 (1 73)	90 (3 54)	178 (7 0)	—	138 (5 43)	93 (3 66)	130 (5 12)	200 (7 87)	—	114 3 (4 5	180 (7 09)	3 2 (0 126)	12 (0 472)	230 (9 06)	13 5 (0 53)	--	22 (0 8661	50 (1 97)	19 (18) [41 9 (39 7)]
15E32OE	270 (10 63)	217 (8 47)	171 (6 66)	55 (2 16)	46 (1 81)	95 (3 74)	191 (7 52)	142 (5 59)	160 (6 3)	93 (3 66)	130 (5 12)	235 (9 25)	250 (9 84)	200 (7 874	220 (8 66)	4 (0 157)	16 (0 63)	270 (10 63)	13 5 (0 53)	M8	28 (1 1024	50 (1 97)	30 (27) [66 2 (59 5)]
22E32OE	285 (11 22)	232 (9 06)	186 (7 25)	55 (2 16)	46 (1 81)	95 (3 74)	206 (8 11)	142 (5 59)	160 (6 3)	93 (3 66)	130 (5 12)	235 (9 25)	250 (9 84)	200 (7 874	220 (8 66)	4 (0 157)	16 (0 63)	270 (10 63)	13 5 (0 53)	M8	28 (1 1024	50 (1 97)	32 (29) [70 6 (63 9)]
37E32OE	345 (13 58)	282 (11 02)	236 (9 21)	65 (2 56)	46 (1 81)	95 (3 74)	256 (10 08)	142 (5 59)	160 (6 3)	93 (3 66)	130 (5 12)	235 (9 25)	250 (9 84)	200 (7 874	220 (8 66)	4 (0 157)	16 (0 63)	270 (10 63)	13 5 (0 53)	M8	32 (1 2598	60 (2 36)	39 (36) [86 (79 4)]

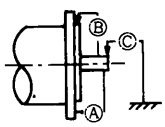
*Not provided with an eyebolt

Notes *Dimensions above are applied for servomotor w/wo holding brake as well*
Approx weight in [ ] is for servomotor without holding brake

CONNECTOR TYPES

AC Servomotor Type USADED-	Motor Connector Types				Incremental Encoder Connector Types			
	Receptacle	L-type Plug	Straight Plug	Cable Clamp	Receptacle	L-type Plug	Straight Plug	Cable Clamp
05E32 10E32	MS3102 A20-15P	MS3108 B20-15S	MS3106 B20-15S	MS3057 -12A	MS3102 A20-29P	MS3108 B20-29S	MS3106 B20-29S	MS3057 -12A
15E32 22E32 37E32	MS3102 A24-10P	MS3108 B24-10S	MS3106 B24-10S	MS3057 -16A				

MECHANICAL SPECIFICATIONS

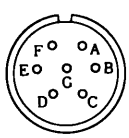
Accuracy (T I R)*		Reference Diagram
Flange surface perpendicular to shaft Ⓐ	0 04 (0 0016) 0 06† (0 0024†)	
Flange diameter concentric to shaft Ⓑ	0 04 (0 0016)	
Shaft run out Ⓒ	0 02 (0 0008)	

T I R (Total Indicator Reading)
† *Accuracy for motor types USADED-15E3 -22E3, and -37E3*

Servomotors with a brake or a modified shaft extension are also available For detailed information, refer to related Bulletins (TSE-S800-11 1)

CONNECTOR SPECIFICATIONS

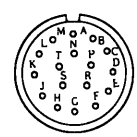
Motor Receptacle



A	Phase U	E	Brake term
B	Phase V	F	Brake term
C	Phase W	G	—
D	Ground		

When not provided with holding brake, E and F are not used

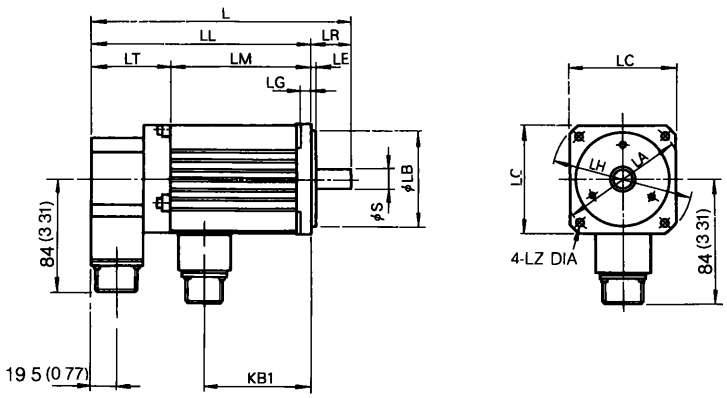
Incremental Encoder Receptacle



A	Channel A output	K	—
B	Channel $\overline{A}$ output	L	—
C	Channel B output	M	—
D	Channel $\overline{B}$ output	N	
E	Channel C output	P	—
F	Channel $\overline{C}$ output	R	—
G	0V	S	—
H	+5VDC	T	
J	Frame ground	—	—

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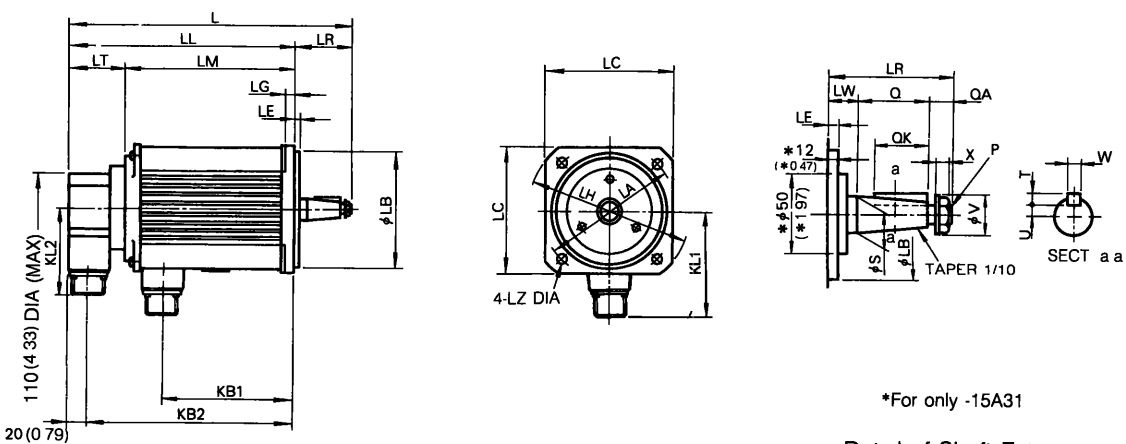
Drawing 1 USASEM-02A32, -03A32, -05A32 (Straight Shaft)



Notes

1 *Type USASEM-02A32 terminates in bare wires with a waterproof gland (seal) fitting*
Therefore, the MS-connector part differs from the figure above
For details, contact your YASKAWA representative
2 *Plug and clamp are not attached for receptacle connection*
3 *Motor should be mounted with connectors down*

Drawing 2 USASEM-08A31, -15A31, -30A31 (Taper Shaft)



*For only -15A31

Detail of Shaft Extension

Notes

1 *Hexagon socket head bolts should be used to mount the motor*
2 *Plug and clamp are not attached for receptacle connection*
3 *Key and keyway comply with JIS B 1301-1976*
(Parallel key precise class)
4 *Motor should be mounted with connectors down*

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Drawing 1

AC Servomotor Type USASEM-	L	LL	LM	LT	LR	KB1	Flange Surface and Shaft Extension								Approx Weight kg (lb)
							LA	LB	LC	LE	LG	LH	LZ	S	
02A32	164 5 (6 48)	134 5 (5 3)	95 5 (3 76)	39 5 (1 54)	30 (1 18)	76 5 (3 61)	80 (3 15)	50 $^{0}_{-0.025}$ (1 9685 $^{0}_{0.01}$)	65 (2 559)	3 (0 118)	6 (0 24)	89 (3 50)	5 (0 197)	8 $^{0}_{-0.009}$ (0 315 $^{0}_{0.0003}$)	1 4 (3 1)
03A32	178 5 (7 03)	148 5 (5 85)	109 (4 29)	39 5 (1 56)	30 (1 18)	78 (3 07)	90 (3 54)	70 $^{0}_{0.030}$ (2 7559 $^{0}_{-0.0012}$)	80 (3 15)	3 (0 118)	8 (0 31)	105 (4 13)	6 (0 236)	14 $^{0}_{-0.011}$ (0 5512 $^{0}_{-0.0004}$)	2 6 (5 7)
05A32	200 5 (7 89)	170 5 (6 71)	131 (5 16)	39 5 (1 55)	30 (1 18)	100 (3 94)	90 (3 54)	70 $^{0}_{0.030}$ (2 7559 $^{0}_{0.0012}$)	80 (3 15)	3 (0 118)	8 (0 31)	105 (4 13)	6 (0 236)	14 $^{0}_{0.011}$ (0 5512 $^{0}_{0.0004}$)	3 3 (7 3)

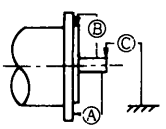
Drawing 2

AC Servomotor Type USASEM-	L	LL	LM	LT	LR	KB1	KB2	KL1	KL2	Flange Surface								Shaft Extension									Approx Weight kg (lb)
										LA	LB	LC	LE	LG	LH	LZ	LW	Q	QK	QA	X	S	V	P	U	W	T	
08A31	257 (10 12)	199 (7 84)	148 5 (5 85)	50 5 (1 99)	58 (2 28)	115 (4 53)	188 (7 4)	102 (4 02)	86 (3 39)	130 (5 12)	110 $^{0}_{-0.035}$ (4 3307 $^{0}_{0.0014}$)	120 (4 72)	3 (0 12)	10 (0 4)	155 (6 1)	9 (0 35)	18 (0 71)	28 (1 1)	25 (0 98)	12 (0 47)	10 3 (0 41)	16 (0 63)	21 (0 83)	M10 (P1 25)	4 3 $^{0}_{0.1}$ (0 169 $^{0}_{0.004}$)	5 (0 1968)	5 (0 1968)	6 (13 2)
15A31	317 5 (12 5)	259 5 (10 22)	203 5 (8 02)	56 (2 2)	58 (2 28)	166 5 (6 56)	239 5 (9 43)	109 (4 29)	87 (3 43)	145 (5 71)	110 $^{0}_{-0.035}$ (4 3307 $^{0}_{-0.0014}$)	130 (5 12)	6 (0 24)	12 (0 47)	165 (6 5)	9 (0 35)	18 (0 71)	28 (1 1)	25 (0 98)	12 (0 47)	10 3 (0 41)	19 (0 75)	21 (0 83)	M10 (P1 25)	5 8 $^{0}_{-0.1}$ (0 228 $^{0}_{0.004}$)	5 (0 1968)	5 (0 1968)	11 (24 3)
30A31	366 (14 41)	296 (11 65)	240 (9 45)	56 (2 2)	70 (2 76)	206 (8 11)	276 (10 87)	135 (5 32)	87 (3 43)	200 (7 87)	114 3 $^{0}_{0.045}$ (4 3 $^{0}_{0.0018}$)	180 (7 09)	6 (0 24)	18 (0 71)	230 (9 1)	13 5 (0 53)	20 (0 79)	36 (1 42)	32 (1 26)	14 (0 55)	12 5 (0 49)	22 (0 87)	24 (0 94)	M12 (P1 25)	6 6 $^{0}_{0.1}$ (0 26 $^{0}_{0.004}$)	6 (0 2362)	6 (0 2362)	24 (52 9)

CONNECTOR TYPES

AC Servomotor Type USASEM-	Motor Connector Types				Incremental Encoder Connector Types			
	Receptacle	L-type Plug	Straight Plug	Cable Clamp	Receptacle	L-type Plug	Straight Plug	Cable Clamp
03A32 05A32	MS3102 A18-10P	MS3108 B18-10S	MS3106 B18-10S	MS3057 -10A	MS3102 A20-29P	MS3108 B20-29S	MS3106 B20-29S	MS3057 -12A
08A31 15A31 30A31	MS3102 A20-4P	MS3108 B20-4P	MS3106 B20-4P	MS3057 -12A				

MECHANICAL SPECIFICATIONS

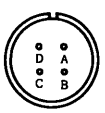
Accuracy (T I. R)*		Reference Diagram
Flange surface perpendicular to shaft Ⓐ	0 04 (0 0016)	
Flange diameter concentric to shaft Ⓑ	0 04 (0 0016)	
Shaft run out Ⓒ	0 02 (0 0008)	

T I R (Total Indicator Reading)

Servomotors with a brake or a modified shaft extension are also available For detailed information, refer to related Bulletins (TSE-S800-11 1)

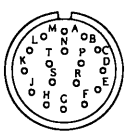
CONNECTOR SPECIFICATIONS

Motor Receptacle



A	Phase U
B	Phase V
C	Phase W
D	Ground

Incremental Encoder Receptacle



A	Channel A output	K	—
B	Channel $\overline{A}$ output	L	—
C	Channel B output	M	—
D	Channel $\overline{B}$ output	N	—
E	Channel C output	P	—
F	Channel $\overline{C}$ output	R	—
G	0V	S	—
H	+5VDC	T	—
J	Frame ground	—	—

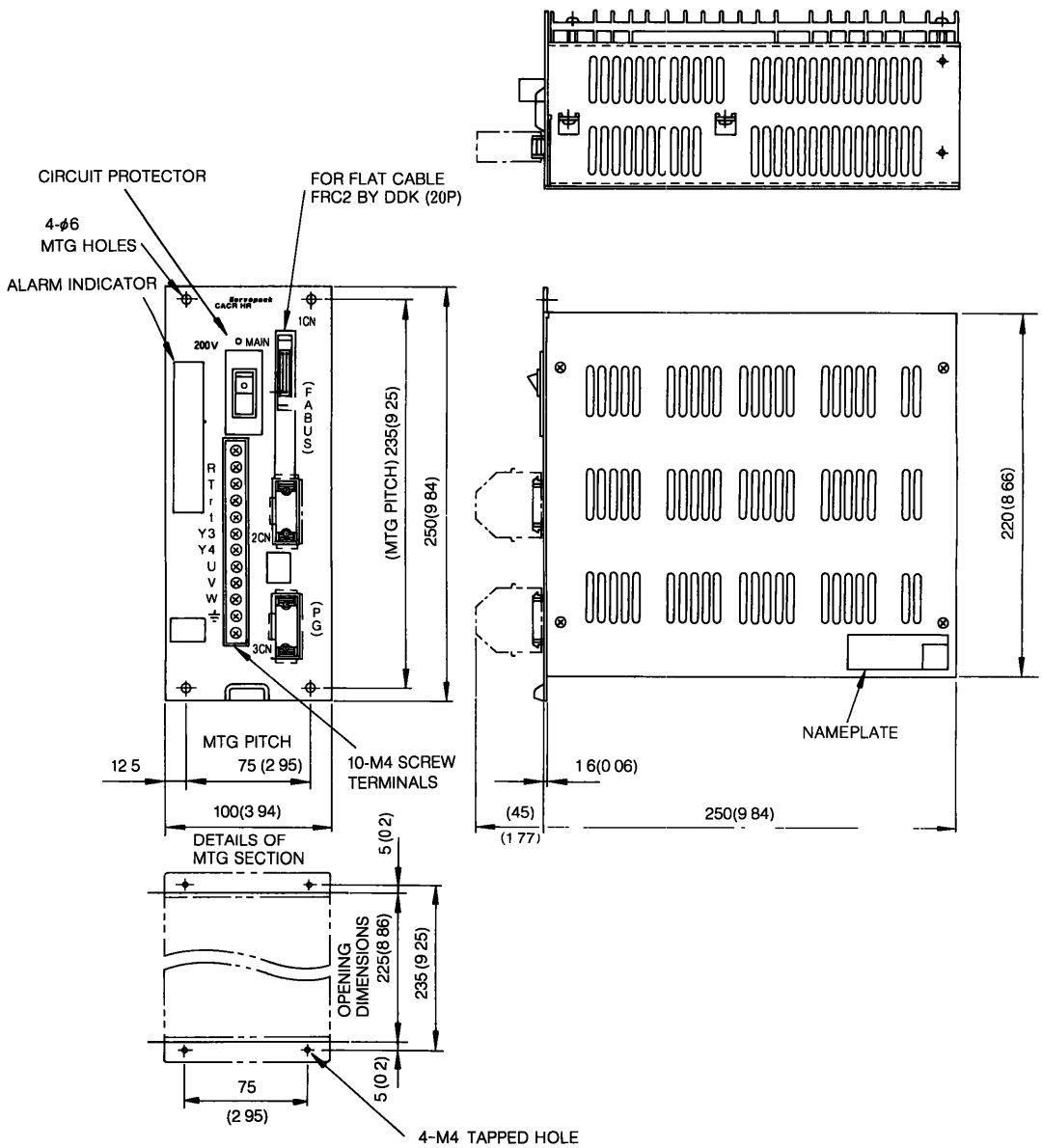
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9.3 SERVOPACK

9.3.1 Rack-mounted Type CACR-HR ☐☐ AAB ☐☐

Dimensions in mm (inches)

(1) CACR-HRA 5 to 05 AAB 12
CACR-HRA 5 to 03 AAB 11

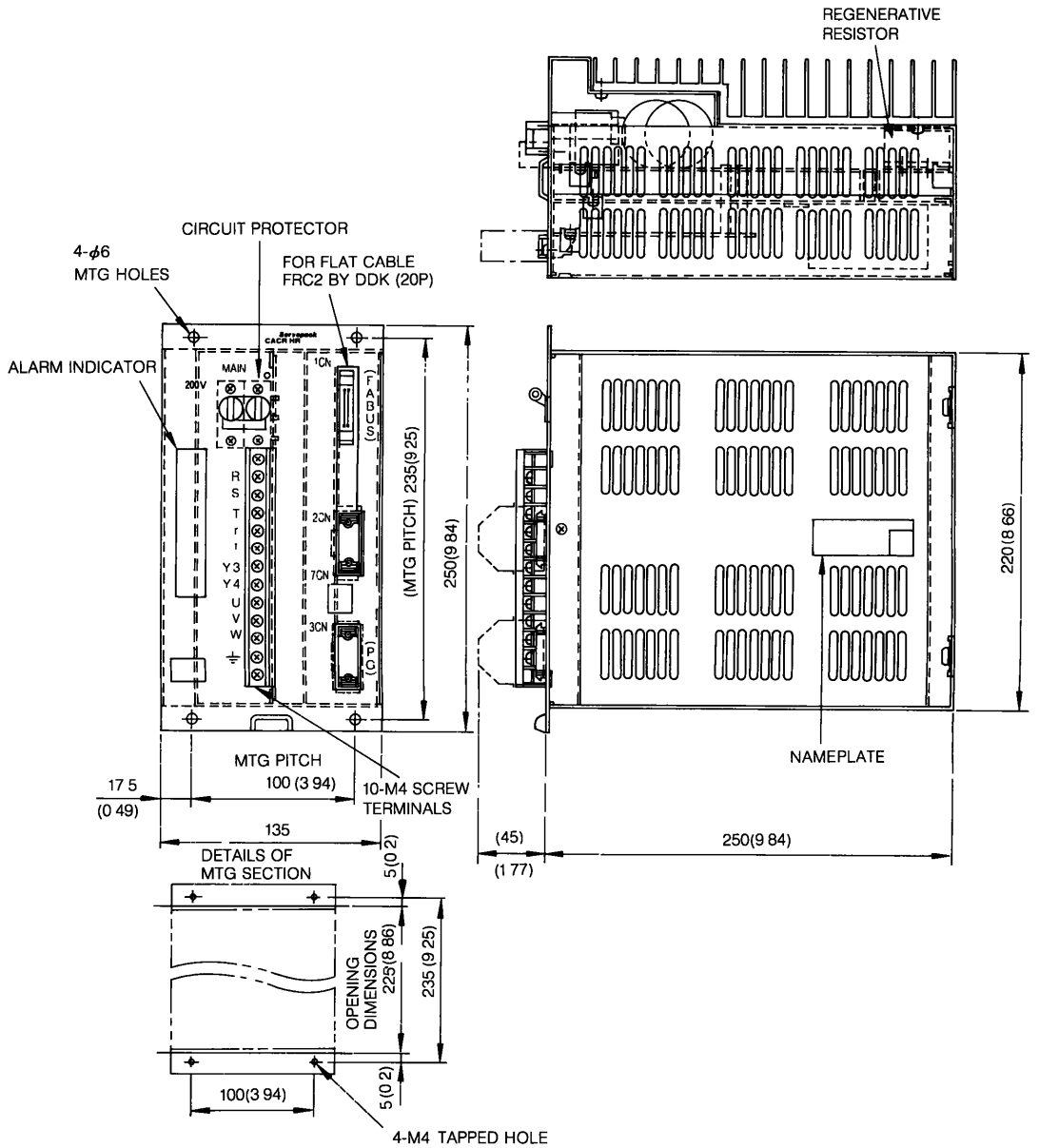


Attachments

Name	Type	Q'ty	Manufacturer
2CN Connector (for cable)	MR-20L (Case)	1	Honda Tsushin Co.
	MR-20M (Receptacle)	1	
3CN Connector (for cable)	MR-20L (Case)	1	
	MR-20F (Receptacle)	1	

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(2) CACR-HR 10 to 15 AAB
CACR-HR 05 AAB 11



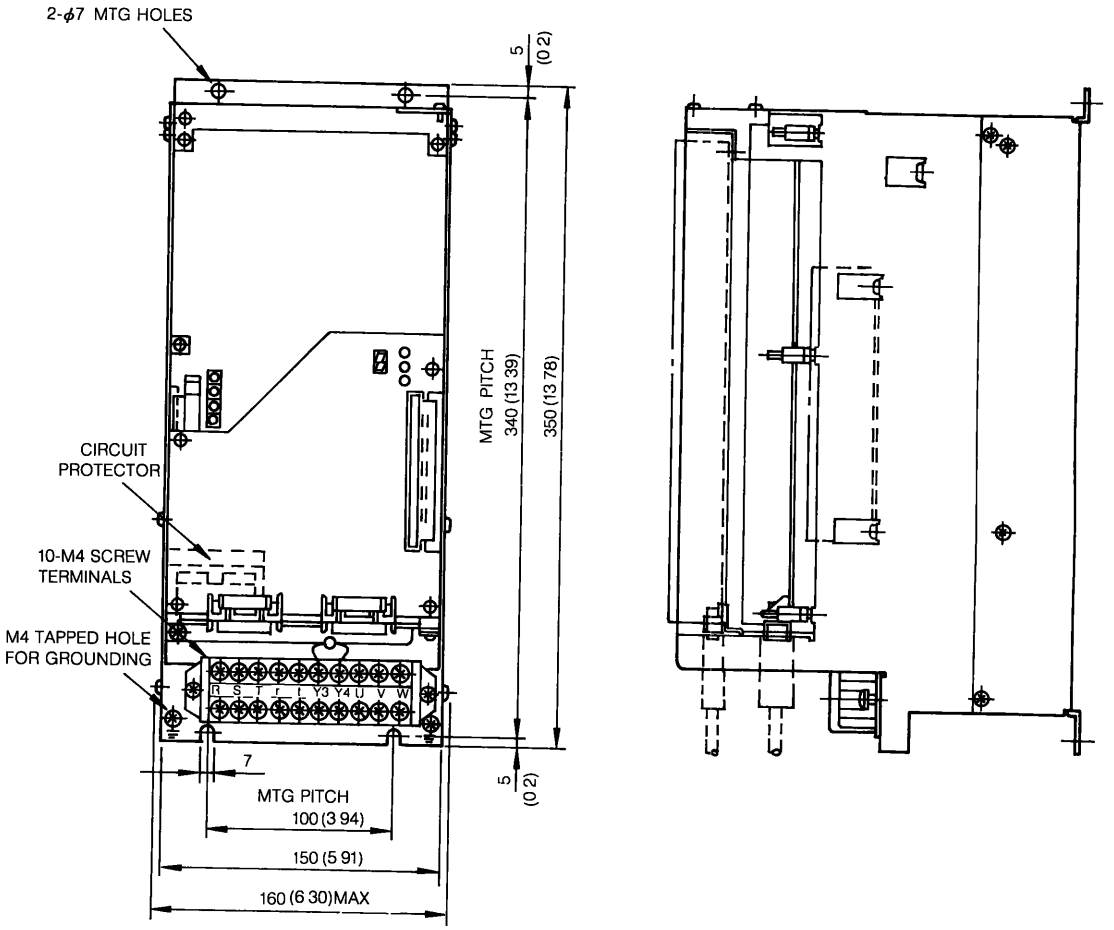
Attachments

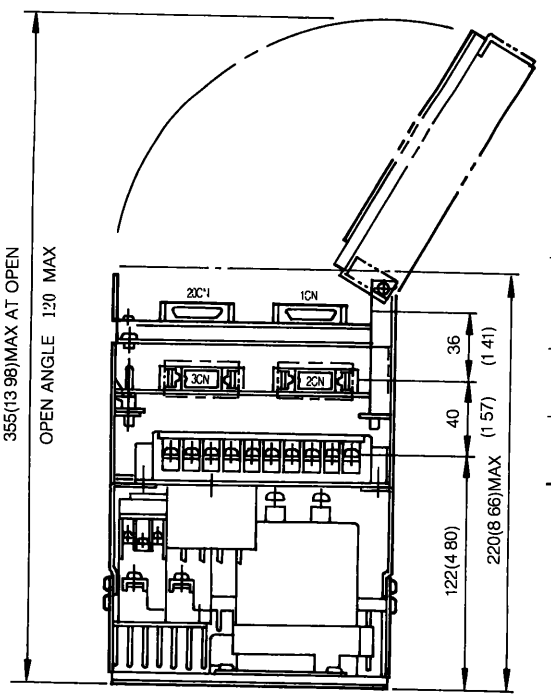
Name	Type	Q'ty	Manufacturer
2CN Connector (for cable)	MR-20L (Case)	1	Honda Tsushin Co.
	MR-20M (Receptacle)	1	
3CN Connector (for cable)	MR-20L (Case)	1	
	MR-20F (Receptacle)	1	

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9.3.2 Base-mounted Type CACR-HR ☐☐ AB

(1) CACR-HR 03 AB to HR 15 AB



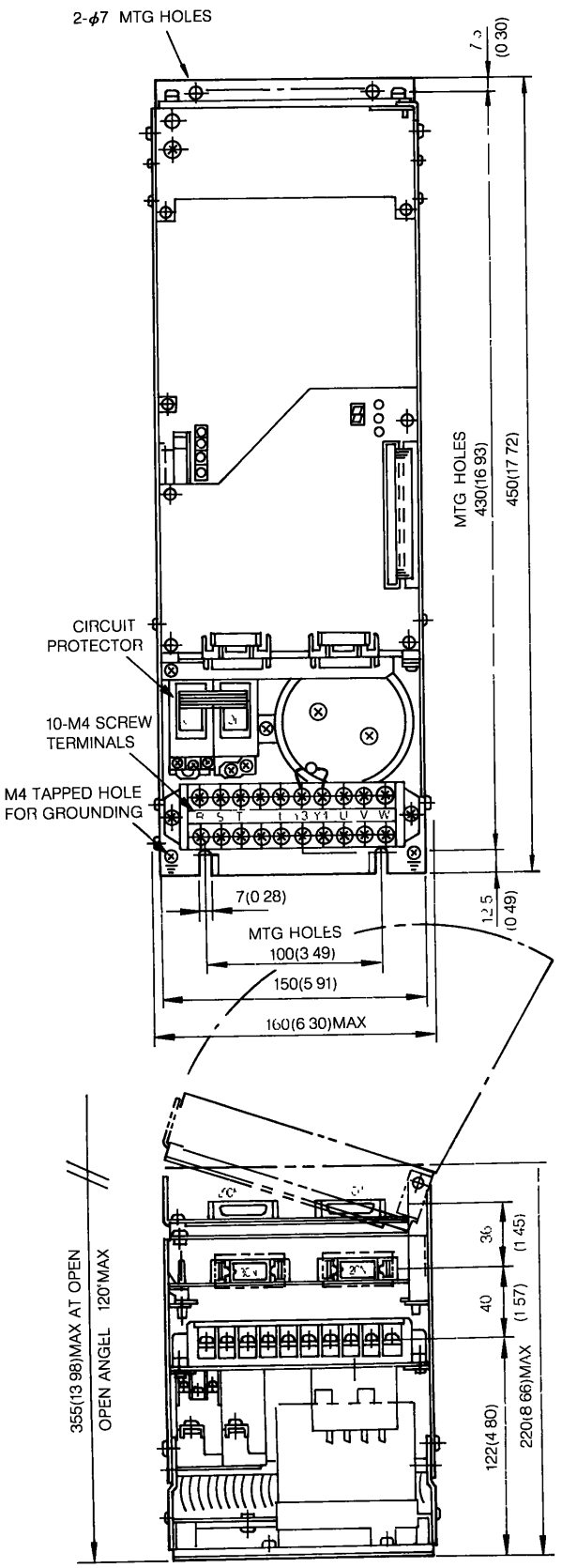


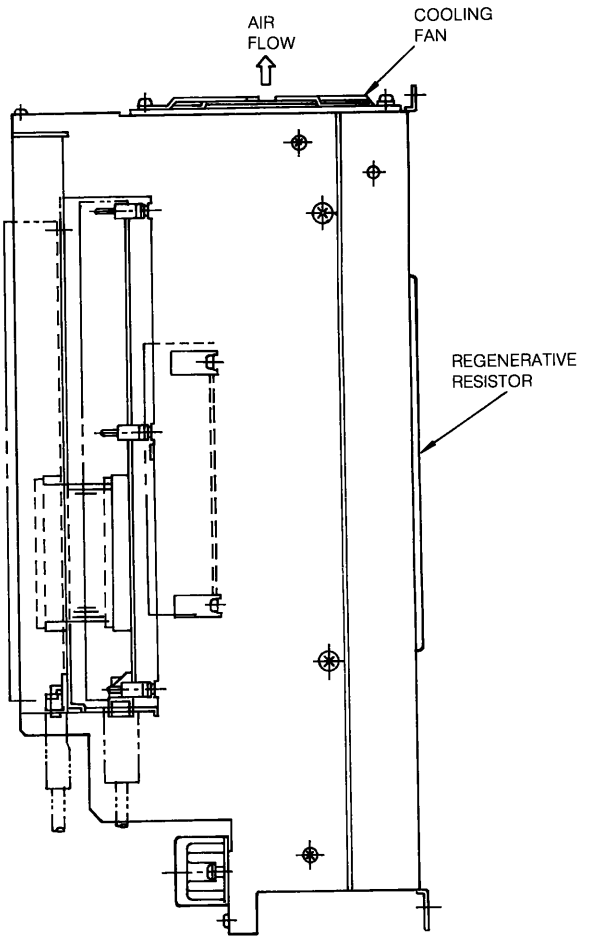
Approx. Weight: 7kg (15.6lb)

Code	Connector Type	Attachments
2CN	MR-20 RFA	Case MR-20L Receptacle MR-20M (Made by Honda Tsushin Co.)
3CN	MR-20 RMA	Case MR-20L Receptacle MR-20F (Made by Honda Tsushin Co.)
1CN	DO5-20SA-1L1	(Made by JAPAN AVIATION ELECTRONICS INDUSTRY, LTD.)
2OCN	DO5-20SA-1L1	

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(2) CACR-HR 20 AB, -HR 30 AB



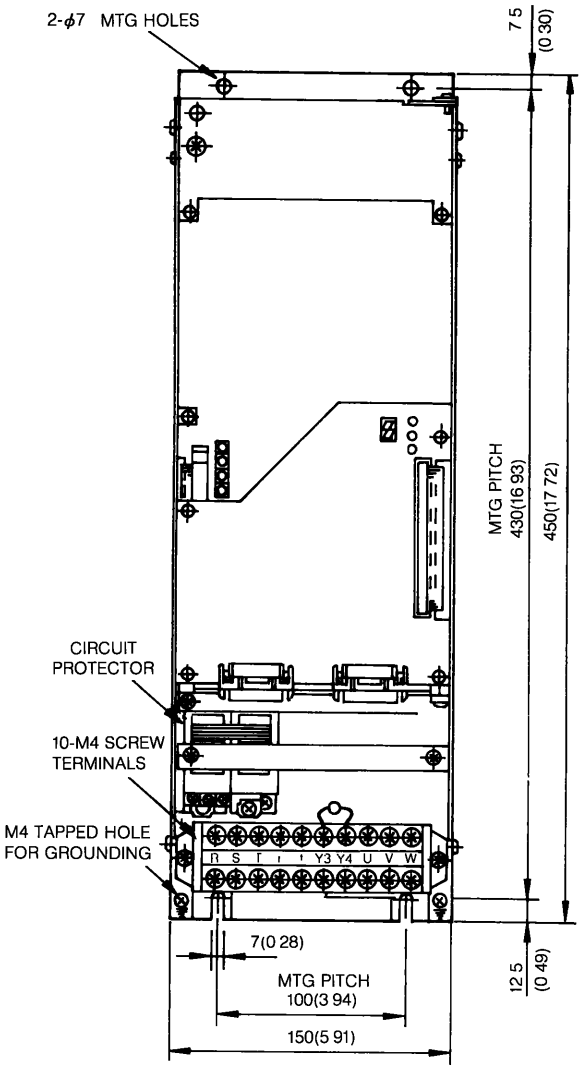


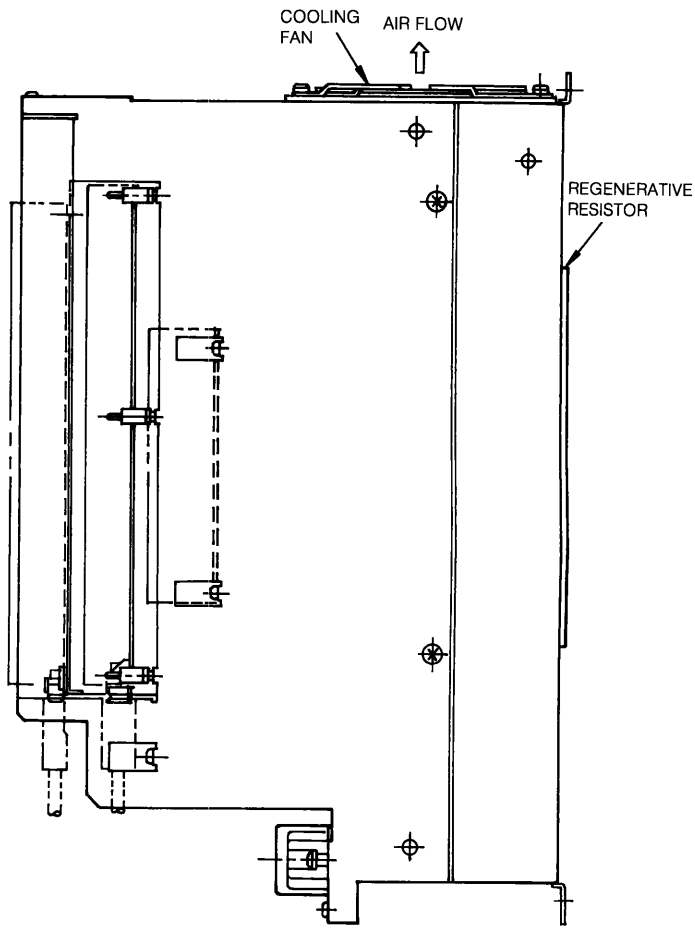
Approx. Weight: 9kg (19.91b)

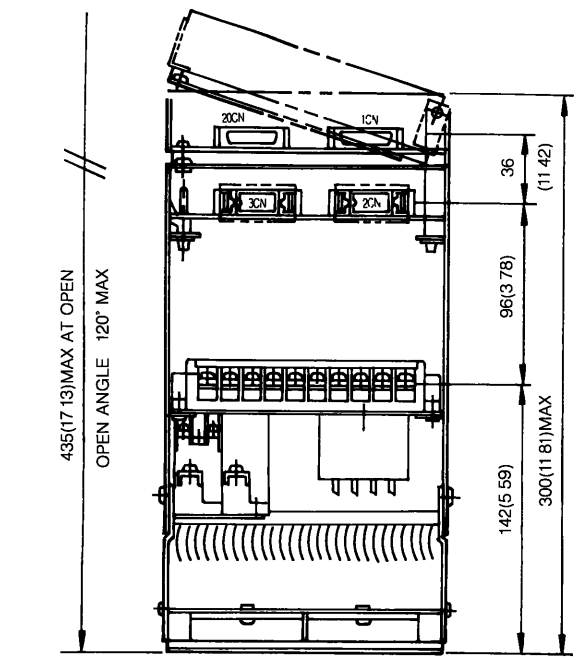
Code	Connector Type	Attachments
2CN	MR-20 RFA	Case MR-20L Receptacle MR-20M (Made by Honda Tsushin Co.)
3CN	MR-20 RMA	Case MR-20L Receptacle MR-20F (Made by Honda Tsushin Co.)
1CN	DO5-20SA-1L1	(Made by JAPAN AVIATION ELECTRONICS INDUSTRY, LTD.)
20CN	DO5-20SA-1L1	

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(3) CACR-HR 44 AB







Approx. Weight: 12kg (26.5lb)

Code	Connector Type	Attachments
2CN	MR-20 RFA	Case MR-20L Receptacle MR-20M (Made by Honda Tsushin Co.)
3CN	MR-20 RMA	Case MR-20L Receptacle MR-20F (Made by Honda Tsushin Co.)
1CN	DO5-20SA-1L1	(Made by JAPAN AVIATION ELECTRONICS INDUSTRY, LTD.)
20CN	DO5-20SA-1L1	

(4) CACR-HR 60 AB

To be released soon.
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NOTE

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