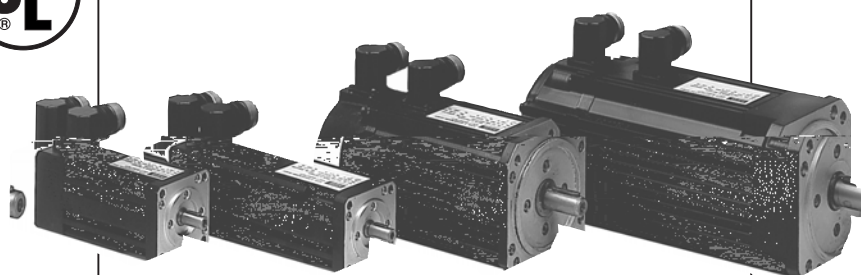

BETRIEBSANLEITUNG

INSTRUCTION MANUAL



KEB Servomotore
KEB Servo Motors

Größe 11 . . . 84
Size 11 ... 84

Diese Betriebsanleitung beschreibt die Servomotoren 11...84 und muß jedem Anwender zugänglich gemacht werden. Vor jeglichen Arbeiten muß sich der Anwender mit dem Gerät vertraut machen. Den **Sicherheits- und Warnhinweisen** in dieser Anleitung und in der Beschreibung für den Servosteller sowie in weiterer Dokumentation ist für einen sicheren Betrieb unbedingt Folge zu leisten. Die in dieser Anleitung aufgeführten Sicherheits- und Warnhinweise erheben keinen Anspruch auf Vollständigkeit. Die KEB Antriebstechnik GmbH behält sich das Recht vor, Spezifikationen und technische Daten ohne vorherige Benachrichtigung zu ändern, bzw. anzupassen.

Die in dieser Betriebsanleitung verwendeten Pictogramme entsprechen folgender Bedeutung:



Gefahr / Warnung / Vorsicht

Wird verwendet, wenn Leben oder Gesundheit des Benutzers gefährdet sind oder erheblicher Sachschaden auftreten kann.



Achtung

Unbedingt beachten! Besondere Hinweise für den sicheren und störungsfreien Betrieb.



Information

Hilfestellung, Tip

This Instruction Manual describes the Servo Motors 11...84 and must be made available to every user. Prior to performing any work the user must familiarize himself with the unit.

The **safety and warning notes** listed in this instruction manual and in the description of the servo controller as well as in other documentation must be observed at any rate to ensure a safe operation. The safety and warning instructions specified in this manual do not lay claim on completeness. KEB reserves the right to change/adapt specifications and technical data without prior notice.

Below the meaning of the pictograms used in this manual:



Danger / Warning / Caution

Used when life or health of the user are exposed to danger or when the possibility of severe damage to the material exists.



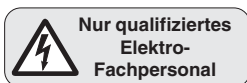
Attention

Observe at all costs! Special instructions for a safe and trouble-free operation.



Information

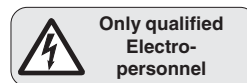
Assistance, Tips



Nur qualifiziertes Elektro-Fachpersonal

Alle Arbeiten zum Transport, Anschluß, zur Inbetriebnahme und Instandhaltung sind von qualifizierten, verantwortlichen Fach-

personal auszuführen. Unsachgemäßes Verhalten kann schwere Personen- und Sachschäden verursachen. Ein sicherer und störungsfreier Betrieb ist nur bei Einhaltung der jeweils gültigen Vorschriften gemäß DIN VDE 0100, IEC 1000, EN 60204-1, EN 55014, EN 50082-2 sowie einschlägiger örtlicher Bestimmungen gegeben.



Only qualified Electro-personnel

The KEB COMBIVERT is operated with voltages that can cause a severe electric shock dangerous to life. Therefore the installation of the unit as well as of the available accessories is only permissible by qualified electro-personnel. A safe and trouble-free operation is only possible when the valid regulations according to DIN VDE 0100, IEC 1000, EN 60204-1, EN 55014, EN 50082-2 as well as the relevant regulations for your area are observed.

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1. Introduction

1.1 Intended Use

The synchronous servo motors KEB COMBIVERT SM serve for the operation on digital servo controllers and are intended for industrial systems. They comply to the harmonized standards of the series VDE 0530/EN 60034. The use in hazardous areas is prohibited, unless it is explicitly permitted (observe additional instructions).

2. Safety Instructions



- All works on the installation are to be carried out in a **de-energized** state.
- In the case of synchronous motors with rotating rotor a high voltage is applied onto the motor connections.
- After mounting the motor check the faultless function of the brake (if available).
- Repairs may be carried out only by the manufacturer or repair places authorized by him. Unauthorized opening and improper tampering can lead to bodily injuries or damages to property.
- Before starting up motors with featherkey in the shaft end, the featherkey must be secured against flinging out, if this is not already prevented through output components like belt pulley, clutches or similar elements.
- The motors are not intended for direct connection to the three-phase system. They must be operated by a servo controller. A direct power connection can lead to the destruction of the motor.
- The motors can reach a surface temperature of more than 100°C. No temperature-sensitive parts may lay close to or be attached onto the motor. If necessary, protective measurements must be taken against touching.
- The optional built-in deadlock holding brake is only designed for a limited number of emergency stops. The use as a working brake is not permitted.
- For motors with plug connection and built-in brake you must install the varistor required for the brake wiring at commissioning.
- The thermistor fitted in the winding is to be connected and evaluated by a suitable wiring, for the protection of the motor against thermal overload in case of slow changes. **Attention:** The thermistor does not represent an all-around protection of the winding.

3. Transport and Storage

After final tests all motors leave the factory in perfect condition. On delivery check the motor for outside damages. If you should determine transport damages, then a notice of damage is to be issued in the presence of the carrier. If necessary, **stop the commissioning** of these motors.

Screwed-in ring bolts a3056 signed for the weight of the (motor, i.e. n the) TjT*-0.0083 Tc0.1581 Twa

close
no n

General

4.2 Ambient Temperature / Cooling

Ambient temperature: -5°C . . . 40 °C (194 °F)

Site altitude: ≤ 1000 m above sea level

The motor must be mounted in such a manner that the ventilation is not obstructed, i.e. sufficient heat dissipation through convection and radiation must be ensured.

If the motor is equipped with a separate ventilator, it must be connected correctly. The exhaust air of neighbouring units may not be sucked in again directly. For three-phase separate ventilator connection the correct direction of rotation is to be checked (direction arrow towards ventilator housing).

4.3 Output Components

The rotor of the motor is dynamically balanced through a full featherkey in the shaft end according to DIN 6885 Sheet 1.

For motors with built-in radial sealing ring (option) only a reduced maximum speed is permissible according to the instruction manual.

For putting on or taking off output components (gear wheels, belt pulleys, clutches and similar parts) suitable devices are to be used. The bracing must be carried out on the D-side shaft end (Drive-End).

Attention: Servo motors are precision drive components, no shocks or impacts may arrive at the motor.

5. Electrical Connection

All work may be carried out only by qualified technical personnel on the motor at rest in de-energized status and secured against restarting. Verify the safe isolation from supply!

The connection must be carried out in such a way that a permanently safe, electrical connection is maintained. Pay attention to a safe protective conductor connection.

6. Operation and Maintenance

In case of changes as compared to the normal operation, e.g. increased temperature, noises, oscillations, find out the cause, if necessary, contact the manufacturer. In case of doubt switch off the motor!

The maintenance of the motor is limited to the cleaning of the motor surface.

The radial groove ball bearings of the motor are lubricated for life and are designed for nominal service life of 20.000 hours.

7. Part Code

The KEB servo motors of series 11...84 have the following standard design:

- UL/CSA - Acceptance test (PRGY2.E224106)
- Rotatable angular flange socket for encoder and motor connection
- Vibration quality "R" according to DIN ISO 2373
- Shaft end with featherkey balanced according to ISO 8821
- Resolver 2 pole
- Type of protection IP65 (IP64 at shaft gland)
- Type of construction B5
- PTC-resistor

Further definitions can be taken from the following key.

2	2	.	S	M	.	4	0	0	-	6	2	0	0
Encoder													
0: 2-pole resolver													
5: Incremental encoder													
A: Stegmann Hiperface Singletum SRS 50/60													
B: Stegmann Hiperface Multitum SRM 50/60													
C: Heidenhain EnDat Singletum ECN 1113/1313 512 Inc													
D: Heidenhain EnDat Multitum EQN 1125/1325 512 Inc													
F: Heidenhain Sin/Cos Encoder ERN 1387 2048 Inc													
H: Heidenhain Sin/Cos Encoder ERN 1188 512 Inc													
I: Heidenhain EnDat Singletum ECI 1317 32 Inc													
J: Heidenhain EnDat Multitum EQI 1329 32 Inc													
Connection													
B: Connector/connector turnable angular flange connector													
G: Plug Size 1,5 / connector angular flange, across outgoing													
K: Plug Size 1,5 / connector angular flange, outgoing to B-side													
N: 1,5 m cabel for motor and encoder													
Voltage													
2: 190 V (230V class) 4: 330 V (400V class)													
Speed													
1: 1500 RPM 4: 4000 RPM													
2: 2000 RPM 6: 6000 RPM													
3: 3000 RPM													
Version													
0: without brake; with feather key; IP65 (standard)													
1: Standard with brake													
2: Standard without feather key													
3: Standard with brake, without feather key													
4: Standard with oil-tight flange IP65 (Radial shaft seal ring)													
5: Standard with brake and oil-tight flange													
8: Standard with center hole M5													
9: Standard with brake and center hole													
B: Standard without feahter key and oilt-tight flange													
C: Standard with brake, without feather key and oil-tight flange													
Cooling													
0: Self-cooling with flange B5 IFT5 compatible													
1: Separate cooling with flange B5 IFT5 compatible													
2: Self-cooling;foot													
3: Separate cooling; foot													
Motor Type													
2: Three-phase synchronous motor													
Unit Type													
SM: Servo motor													

8. Project design

8.1 Selection of the Servo Motor

Calculate the following values before you selection the servo motor:

- Determine inertia (J_{App}) of the application without motor
- Calculate required peak torque (M_{Lmax}) of the application at the drive. The inertia of the motor (J_{Mot}) can be accepted here with 1/5 inertia (J_{App}) of the application.
- Determine the effective torque (M_{eff}) via the time.

Now the motor can be selected on the basis of the calculated values and the technical data of the following pages. The following selection features must be observed:

calculate	motor data
$n_{max} \leq n_N$	
$M_{Lmax} \leq M_{max}$	
$M_{eff} \leq M_{dN}$	
$J_{App}/10 \leq J_{mot}$	

For examination or optimization it can be calculated again with the real motor data.

8.2 Selection of the Servo Controller

The selection of the servo controller occurs via the max. short time current limit and the output rated current.

$$\text{Max. short time current limit} = \frac{M_{Lmax} \cdot \text{Stall current (Id0)}}{\text{Stall torque (Md0)}}$$

$$\text{Output rated current} = \frac{\text{Effective torque} \cdot \text{Stall current (Id0)}}{\text{Stall torque (Md0)}}$$

9. Start-up

Before initial operation and after major inspections, check the complete plant both from a mechanical and electrical point of view.

9.1 Before Switching on

The procedure should include checks that:

- the installation and the operating conditions comply with the specified name-plate data,
- the motor is properly installed and aligned,
- the driving elements are properly adjusted (e.g. proper belt tension, coupling properly aligned and balanced),
- the motor is properly wired (power cables and leads of monitoring devices),
- The earthing and equipotential bonding have been made as specified in the applicable regulations,
- all fastening screws, connecting elements and electrical connections are properly tightened,
- the key is safed unless prevented otherwise by driving elements such as pulleys, couplings etc.
- the forced ventilation is correctly connected and in proper service condition,
- the direction of rotation of the fan motor corresponds with the direction arrow on the fan housing,
- the cooling air flow is not impaired (the hot outlet cooling air must not be drawn in by the fan!),
- the brakes, if provided, are inspected for proper functioning.

The following measures are recommended to be taken after installing or inspecting the motors:

9.2 Switch on the Motor

- Start the motor with no load.
- Check the mechanical running for any noise or vibrations on the bearings or end shields.
- If there is any abnormal noise or the motor runs unevenly, switch it off immediately and find out the cause.
- If the mechanical running improves immediately after the motor has been switched off, there is an electrical or magnetic cause. If this is not the case, there is a mechanical cause.
- If the mechanical running is smooth at no load, load the motor. Check the running smoothness, measure the voltage, current and power and record them. Measure and record these values also for the driven equipment, if possible.
- Monitor the temperatures of the bearings, windings etc. until they have stabilised and record the values (as far as this is possible with the available measuring equipment).

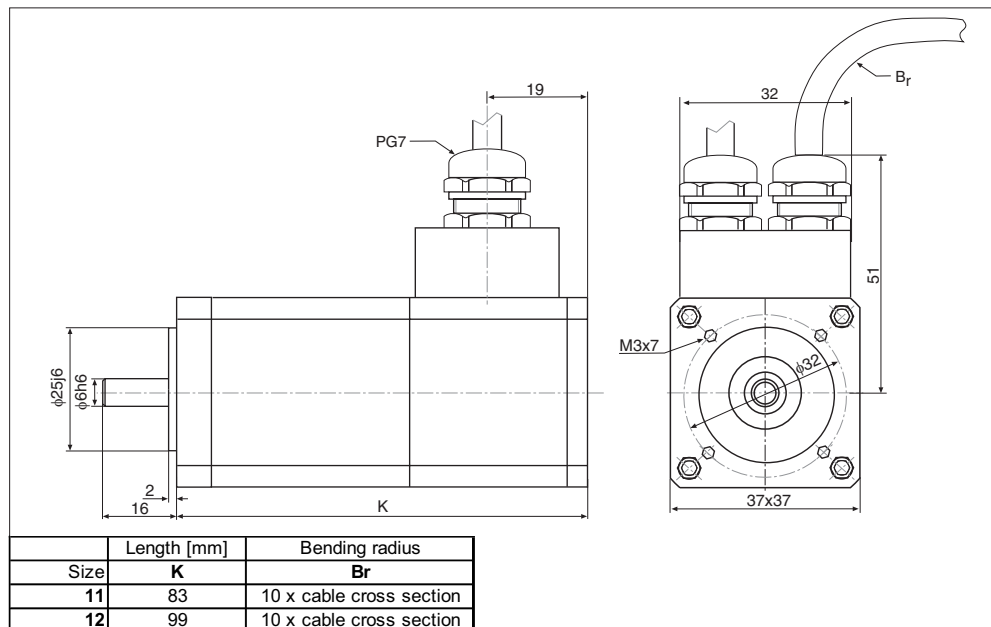
Technical Data

10. Technical Data

Servo motor		xx.SM.202-62yy	
Size (x)		11	12
Voltage and speed variant (y)		62yy	62yy
Stall torque M_{d0}	Nm	0,1	0,2
Current at stall torque I_{d0}	A	0,60	0,93
Nominal Rating			
Rated voltage U_N	V	230	230
Rated torque M_{dN}	Nm	0,09	0,18
Rated current I_{dN}	A	0,6	0,9
Rated speed n_N	min ⁻¹	6000	6000
Rated power P_N	W	60	110
Voltage constant k_E ¹⁾	V/1000min ⁻¹	10,5	13,0
Winding resistance R_{u-v}	Ohm	38,90	18,90
Winding inductance L_{u-v}	mH	6,5	4,5
Max. values			
max. torque M_{max}	Nm	0,40	0,80
max. current (peak value) I_{max}	A	2,5	4,2
mechanical data ²⁾			
Inertia J_L	kgcm ²	0,06	0,08
Weight m	kg	0,8	0,8

¹⁾ Specify the peak value of motor EMK at 1000 rpm as line-to-line voltage.

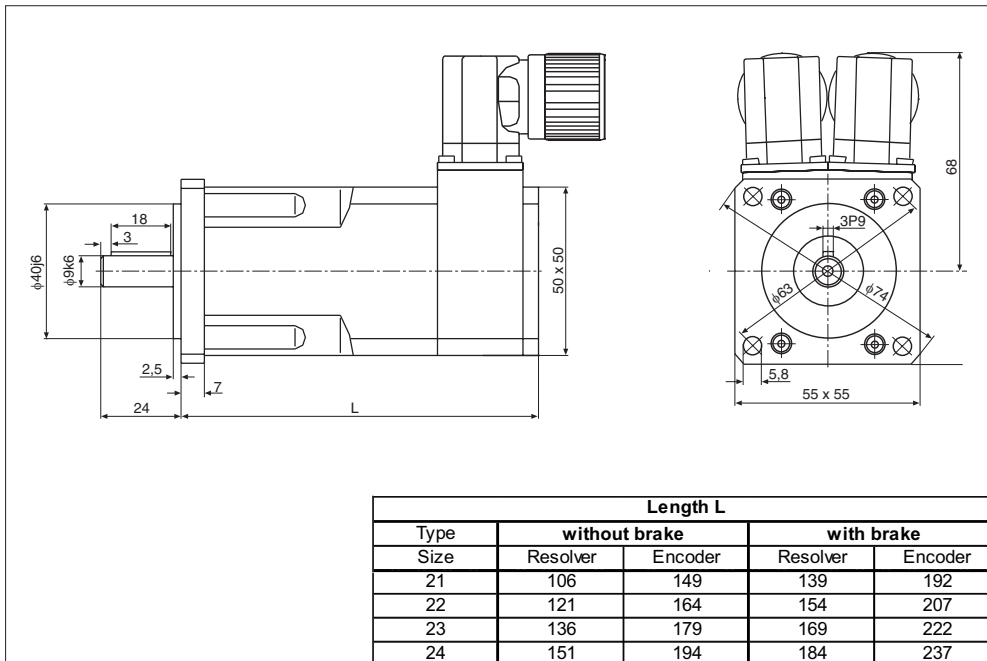
²⁾ With resolver; without holding brake



Servo motor		2x.SM.200-yyyy							
Size (x)		21		22		23		24	
Voltage and speed variant (y)		4200	4400	4200	4400	4200	4400	4200	4400
Stall torque M_{d0}	Nm	0,2		0,4		0,6		0,8	
Current at stall torque I_{d0}	A	0,59	0,4	0,9	0,5	1,2	0,7	1,5	0,9
Nominal Rating									
Rated voltage U_N	V	230	400	230	400	230	400	230	400
Rated torque M_{dN}	Nm	0,19		0,36		0,55		0,72	
Rated current I_{dN}	A	0,6	0,5	0,9	0,5	1,1	0,7	1,5	0,9
Rated speed n_N	min ⁻¹	4500		4500		4500		4500	
Rated power P_N	W	90		170		260		340	
Voltage constant k_E ¹⁾	V/1000min ⁻¹	20,5	27,5	26,5	45,0	31,0	50,0	32,0	57,0
Winding resistance R_{U-V}	Ohm	53	99,5	26	77	19,4	50,8	14,6	46,5
Winding inductance L_{U-V}	mH	30,7	54	21,5	61,5	17,5	45,5	14,5	46,2
Max. values									
max. torque M_{max}	Nm	0,8		1,6		2,4		3,2	
max. current (peak value) I_{max}	A	2,5	1,9	3,9	2,3	5,0	3,1	6,5	3,6
mechanical data ²⁾									
Inertia J_L	kgcm ²	0,06		0,08		0,11		0,13	
Weight m	kg	0,9		1,1		1,25		1,45	

¹⁾ Specify the peak value of motor EMK at 1000 rpm as line-to-line voltage.

²⁾ With resolver; without holding brake

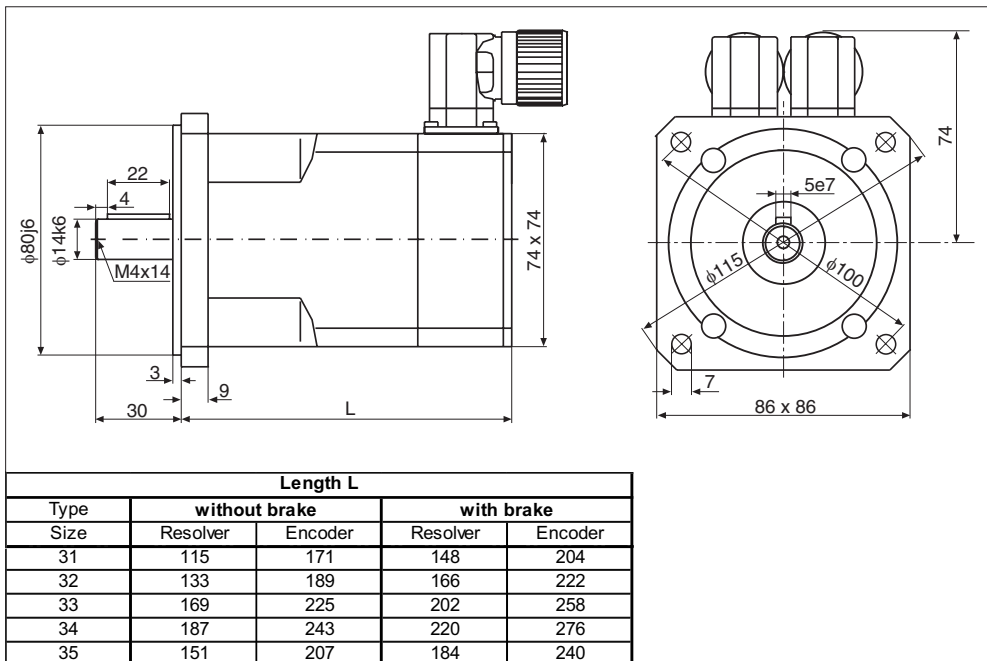


Technical Data

Servo motor		3x.SM.200-yyyy							
		31		32		35	33		34
Size (x)		32yy	34yy	32yy	34yy	34yy	32yy	34yy	34yy
Voltage and speed variant (y)									
Stall torque M_{d0}	Nm	0,65		1,3		1,9	2,5		3
Current at stall torque I_{d0}	A	1,1	0,7	1,7	1,0	1,4	3,0	1,8	2,1
Nominal Rating									
Rated voltage U_N	V	230	400	230	400	400	230	400	400
Rated torque M_{dN}	Nm	0,60		1,15		1,60	2,15		2,50
Rated current I_{dN}	A	1,0	0,6	1,6	1,0	1,3	2,7	1,6	1,8
Rated speed n_N	min^{-1}	3000		3000		3000	3000		3000
Rated power P_N	W	170		360		500	680		790
Voltage constant k_E ¹⁾	$\text{V}/1000\text{min}^{-1}$	37,0	60,0	47,0	78,0	81,0	50,0	84,0	87,0
Winding resistance R_{U-V}	Ohm	28,5	75	12,7	34,5	20,9	5,4	15	11,6
Winding inductance L_{U-V}	mH	33,3	88	21,5	62	40,4	11,7	33,2	26,7
Max. values									
max. torque M_{max}	Nm	2,60		5,2		7,6	10,0		12,0
max. current (peak value) I_{max}	A	4,6	2,8	7,2	4,3	6,1	13,0	7,7	9,0
mechanical data ²⁾									
Inertia J_L	kgcm^2	0,39		0,65		0,92	1,2		1,5
Weight m	kg	1,9		2,3		2,5	3,3		4

¹⁾ Specify the peak value of motor EMK at 1000 rpm as line-to-line voltage.

²⁾ With resolver; without holding brake

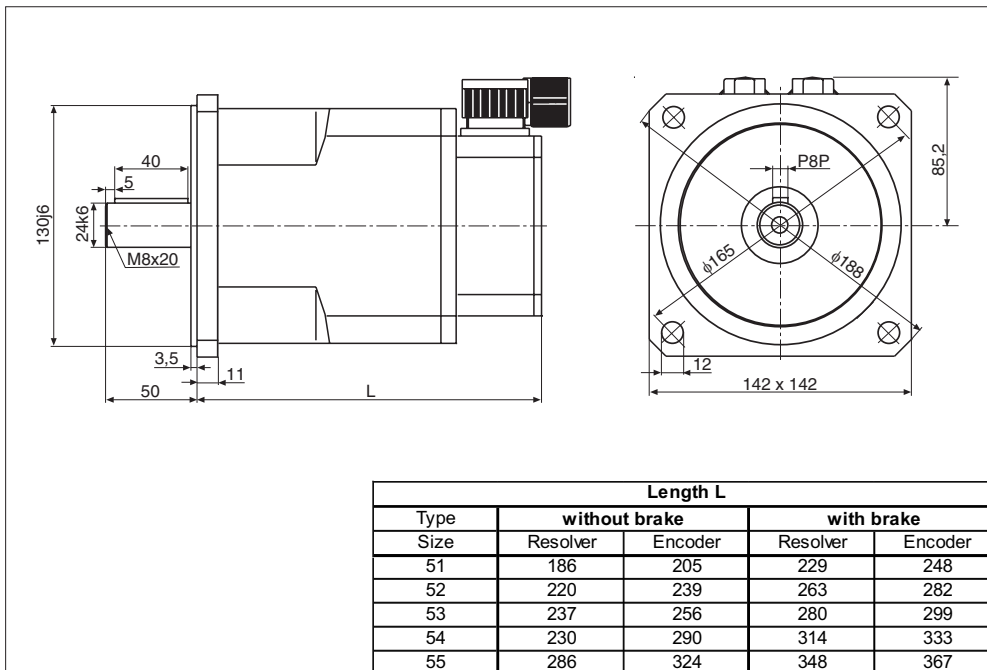


Technical Data

Servo motor		5x.SM.200-yyyy				
Size (x)		51	52	53	54	55
Voltage and speed variant (y)		34yy	34yy	34yy	34yy	34yy
Stall torque M_{d0}	Nm	6,6	10,5	13,5	17	22
Current at stall torque I_{d0}	A	4,7	7,2	9,2	10,6	12,8
Nominal Rating						
Rated voltage U_N	V	400	400	400	400	400
Rated torque M_{dN}	Nm	5,6	8,5	10,7	14,5	17,5
Rated current I_{dN}	A	4,2	6,2	7,7	9,3	10,5
Rated speed n_N	min ⁻¹	3000	3000	3000	3000	3000
Rated power P_N	W	1,76	2,67	3,36	4,55	5,5
Voltage constant k_E ¹⁾	V/1000min ⁻¹	85,0	88,0	89,0	97,0	104,0
Winding resistance R_{U-V}	Ohm	3,45	1,7	1,36	1,11	0,95
Winding inductance L_{U-V}	mH	20	12,5	10,5	11	10,5
Max. values						
max. torque M_{max}	Nm	19,8	31,5	40,5	51,0	66,0
max. current (peak value) I_{max}	A	23,4	35,9	45,7	52,8	63,7
mechanical data ²⁾						
Inertia J_L	kgcm ²	6,05	9,3	10,6	9,5	11,7
Weight m	kg	8	9,8	11,2	14	17

¹⁾ Specify the peak value of motor EMK at 1000 rpm as line-to-line voltage.

²⁾ With resolver; without holding brake



6x.SM.200-yyyy
61 62 63 64

Technical Data

7x.SM.200-yyy		
71	72	73
34yy	34yy	34yy
26	32	40
16,9	21,3	23,9
400	400	400
20	23	26
14,1	16,8	17,3
3000	3000	3000
6,28	7,22	8,17
93,0	91,0	101,0
0,46	0,3	0,27
5,1	3,7	3,4
78,0	96,0	120,0
65,9	82,9	93,0
67	81	101
28	32,5	40

¹⁾ Specify the peak value of motor EMK at 1000 rpm as line-to-line voltage.

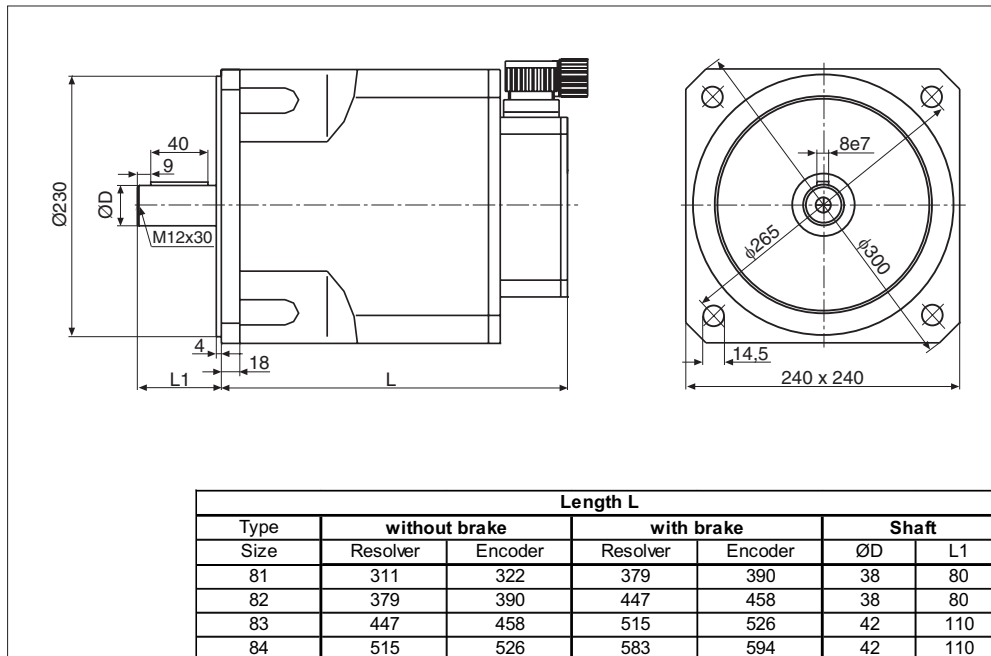
²⁾ With resolver; without holding brake



Servo motor		8x.SM.200-yyyy			
Size (x)		81	82	83	84
Voltage and speed variant (y)		34yy	34yy	34yy	34yy
Stall torque M_{d0}	Nm	40	68	93	115
Current at stall torque I_{d0}	A	21,8	35,8	33,1	42,1
Nominal Rating					
Rated voltage U_N	V	400	400	400	400
Rated torque M_{dN}	Nm	30	50	70	85
Rated current I_{dN}	A	17,8	27,8	26,0	32,4
Rated speed n_N	min ⁻¹	3000	3000	2000	2000
Rated power P_N	W	9,42	15,71	14,66	17,8
Voltage constant k_E ¹⁾	V/1000min ⁻¹	111,0	115,0	170,0	165,0
Winding resistance R_{U-V}	Ohm	0,25	0,13	0,15	0,11
Winding inductance L_{U-V}	mH	5,7	3,3	4,8	3,4
Max. values					
max. torque M_{max}	Nm	120,0	204,0	279,0	345,0
max. current (peak value) I_{max}	A	85,0	139,4	129,0	164,3
mechanical data ²⁾					
Inertia J_L	kgcm ²	76,1	113,6	152,6	190,1
Weight m	kg	43	54	74	93

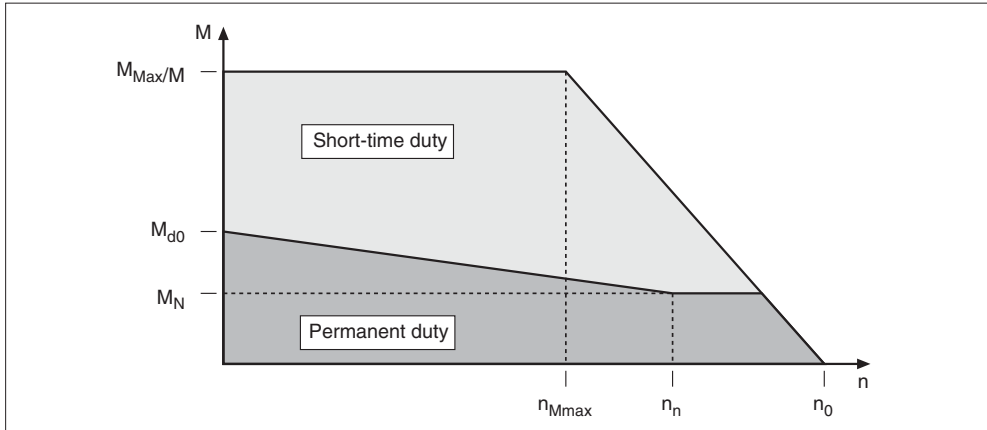
¹⁾ Specify the peak value of motor EMK at 1000 rpm as line-to-line voltage.

²⁾ With resolver; without holding brake



Torque-Speed Characteristic

11. Torque-Speed Characteristic



KEB Part No.	M_{max}/M_N	M_{d0} [Nm]	M_N [Nm]	n_{Mmax} [1rpm]	n_0 [1rpm]
11.SM.20B-62N0	5,0	0,1	0,09	12650	21900
12.SM.20B-62N0	5,0	0,2	0,18	10550	17650
21.SM.200-4200	5,0	0,2	0,19	4250	11200
21.SM.2xx-44xx	5,0	0,2	0,19	6850	14500
22.SM.200-4200	5,0	0,4	0,36	3850	8650
22.SM.2xx-44xx	5,0	0,4	0,36	4000	8850
23.SM.200-4200	5,0	0,6	0,55	3300	7400
23.SM.2xx-44xx	5,0	0,6	0,55	3700	8000
24.SM.200-4200	5,0	0,8	0,72	3050	7150
24.SM.2xx-44xx	5,0	0,8	0,72	3000	7000
31.SM.200-3200	5,0	0,65	0,60	2150	6200
31.SM.2xx-34xx	5,0	0,65	0,60	2500	6650
32.SM.200-3200	5,0	1,3	1,15	2000	4850
32.SM.2xx-34xx	5,0	1,3	1,15	2150	5100
33.SM.200-3200	4,6	2,5	2,15	2250	4600
33.SM.2xx-34xx	4,6	2,5	2,15	2400	4750
34.SM.2xx-34xx	4,1	3	2,50	2600	4550
35.SM.2xx-34xx	5,0	1,9	1,60	2300	4900
41.SM.200-3200	4,2	2,6	2,30	1850	4600
41.SM.2xx-34xx	4,0	2,6	2,30	2200	4850
42.SM.200-3200	3,1	5,3	4,60	2100	4600
42.SM.2xx-34xx	4,5	5,3	4,60	1700	5100

KEB Part No.	M_{max}/M_N	M_{d0} [Nm]	M_N [Nm]	n_{Mmax} [1rpm]	n_0 [1rpm]
43.SM.2xx-34xx	3,9	7,5	6,40	1850	4250
44.SM.2xx-34xx	3,6	9,5	8,50	2300	4400
51.SM.2xx-34xx	4,0	6,6	5,60	1950	4700
52.SM.2xx-34xx	3,5	10,5	8,50	2250	4500
53.SM.2xx-34xx	3,9	13,5	10,70	2000	4450
54.SM.2xx-34xx	3,2	17	14,50	1800	4100
55.SM.2xx-34xx	3,4	22	17,50	1450	3800
61.SM.2xx-34xx	3,5	13,5	10,00	1550	5150
62.SM.2xx-34xx	3,3	19	14,00	1700	4650
63.SM.2xx-34xx	3,1	22	16,00	1900	4450
64.SM.2xx-34xx	3,5	29	24,00	1950	3900
71.SM.2xx-34xx	3,5	26	20,00	2250	4300
72.SM.2xx-34xx	3,8	32	23,00	2400	4350
73.SM.2xx-34xx	3,6	40	26,00	2250	3950
81.SM.2xx-34xx	3,5	40	30,00	1400	3600
82.SM.2xx-34xx	3,2	68	50,00	1650	3450
83.SM.2xx-24xx	3,5	93	70,00	1100	2350
84.SM.2xx-24xx	3,5	115	85,00	1250	2400

12. Axial and Lateral Force

Information for a lifetime of 20000 hours. F_R and F_A shall not occur simultaneously.

The values mentioned below can be exceeded about 10 % with a lateral force F_R in the center line of shaft

Motor	Radial force F_R [N] at speed n [rpm]				Axial force F_A [N] at speed n [rpm]			
	2000	3000	4000	6000	2000	3000	4000	6000
1x	120	85	75	60	40	28	25	20
2x	200	115	85	50	67	38	28	17
3x	400	350	300	280	133	117	100	93
4x	700	580	520	500	233	193	173	167
5x	800	640	600	590	267	213	200	197
6x	850	680	670	650	283	227	223	217
7x	1100	780	740	720	367	260	247	240
8x	1800	1450	1400	1300	600	483	467	433

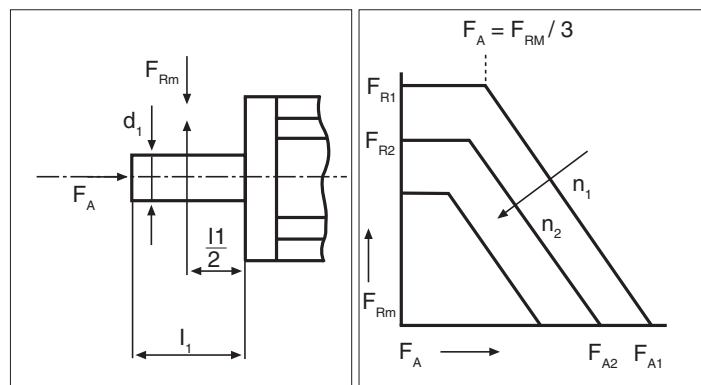
F_R : permissible lateral force at shaft end

F_{Rm} : permissible lateral force in the center line of shaft ($=F_R + 10\%$)

F_A : permissible Axial force

12.1 Shaft Load

The endurance strength of the shaft and the service life on the bearings determine the permissible lateral force F_{Rm} on the D(rive-End)-side shaft end.



Axial and Lateral Force

12.2 Output Component

The smallest possible effective circular diameter of the output component can be computed as follows:

$$D_w = \frac{k \cdot 2 \cdot M_b}{F_{Rm}}$$

D_w : effective circular diameter of the output components
 K : pretension factor
 F_{Rm} : permissible lateral force
 M_b : acceleration torque of the drive

12.3 Pretension Factor

Empirical values for the pretension factor k :

ca. $k = 1,5$ for pinion
ca. $k = 1,2$ to $2,0$ for toothed belt
ca. $k = 2,2$ to $3,0$ for flat belt

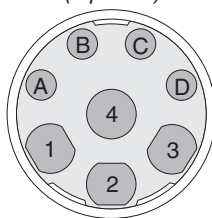
For dynamic processes like braking and accelerating, the permissible lateral force F_R is not to be exceeded in order to avoid a mechanical destruction of the motor.

13. Connection

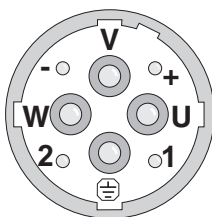
13.1 Connector Assignments

Connection power connector

Servo motor Power connector
(top view)



Connector PIN	Designation	Cable Core
1	U	1
4	V	2
3	W	3
2	PE	green-yellow
A	Brake +	5
B	Brake -	6
C	PTC-Contact (T1)	7
D	PTC-Contact (T2)	8

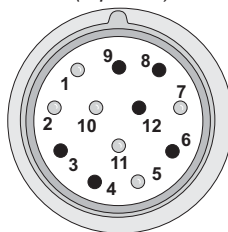


Connector PIN	Designation	Cable Core
U	U	1
V	V	2
W	W	3
PE	PE	green-yellow
+	Brake +	5
-	Brake -	6
1	PTC-Contact (T1)	7
2	PTC-Contact (T2)	8

PTC-connection (230 V / 400 V - Class)	1...3 PTC-detectors (series connection)
max. cold resistance of PTC-detector chain [Ω]	400
Error tripping range [Ω]	≥ 1650
Error reset range [Ω]	≤ 500

Connection resolver

Servo motor Resolver connector
(top view)

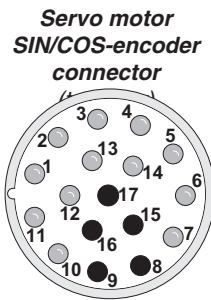


Connector PIN	Designation	Cable Color
1	SIN_LO	red
2	COS_LO	pink
5	SIN_REF_LO	yellow
7	SIN_REF	green
10	SIN	blue
11	COS	gray

Contacts 3, 4, 6, 8, 9 and 12 are not assigned.

Terminal Assignment

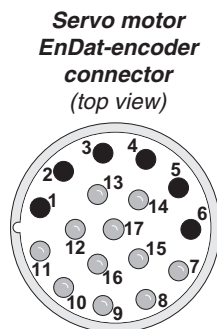
Connection SIN/COS
Encoder



Connector PIN	Designation	Cable Color
1	A (+)	green
2	A (-)	yellow
3	R (+)	gray
4	D (-)	purple
5	C (+)	white
6	C (-)	brown
7	GND	white/green
10	+ 5 V	gray / pink
11	B (+)	blue
12	B (-)	red
13	R (-)	pink
14	D (+)	black

Contacts 8, 9, 15, 16 and 17 are not assigned.

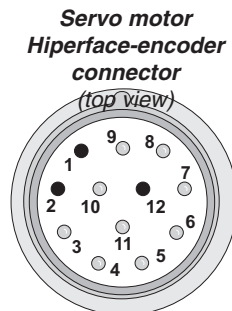
Connection EnDat
Encoder



Connector PIN	Designation	Cable Color
7	+5V	white
8	Clock (+)	black
9	Clock (-)	purple
10	COM	brown
12	B (+)	blue
13	B (-)	red
14	Data (+)	gray
15	A (+)	green
16	A (-)	yellow
17	Data (-)	pink

Contacts 1...6 are not assigned.

Connection Hiperface
Encoder



Connector PIN	Designation	Cable Color
4	REF_SIN (-)	red
5	REF_COS (-)	yellow
6	Data (+)	gray
7	Data (-)	pink
8	SIN (+)	blue
9	COS (+)	green
10	+7,5V	brown
11	COM	white

Contacts 1, 2 and 12 are not assigned.

Motor cable and encoder cable The UL tested motor and encoder cables can be acquired ready-made in different lengths by KEB. The cables are dragable and appropriated for a continuous bending radius of 120 mm.

14. Options

14.1 Holding Brake

Motor typ	1x.SM.202-yyyy	2x.SM.200-yyyy	3x.SM.200-yyyy	4x.SM.200-yyyy
Holding torque [Nm]	0,4	2	4,5	9
Moment of inertia [kgcm ²]	0,032	0,068	0,18	0,54
max. Speed [min ⁻¹]	10.000	10.000	10.000	10.000
Mass [kg]	0,14	0,18	0,35	0,52
Rated voltage [V]	24 (+6%, -10%)			
Rated current [A]	0,33	0,46	0,5	0,75
Release time t2 [ms]	10	25	35	40
Engaging delay t11 [ms]	2	2	2	2
Engaging time t1 [ms]	6	6	7	7
Power [W]	8	11	12	18
Typ	01.P1.320	03.P1.320	05.P1.320	06.P1.320

Motor typ	5x.SM.200-yyyy	6x.SM.200-yyyy	7x.SM.200-yyyy	8x.SM.200-yyyy
Holding torque [Nm]	18	36	36	145
Moment of inertia [kgcm ²]	1,66	5,9	5,9	39
max. Speed [min ⁻¹]	10.000	10.000	10.000	8.000
Mass [kg]	1	1,95	1,95	5,35
Rated voltage [V]	24 (+6%, -10%)			
Rated current [A]	0,83	1,09	1,09	2,1
Release time t2 [ms]	50	90	90	190
Engaging delay t11 [ms]	3	3	3	12
Engaging time t1 [ms]	30	22	22	65
Power [W]	24	26	26	50
Typ	07.P1.320	08.P1.320	08.P1.320	10.P1.320

The indicated switching times are reached with adjusted nominal air gap (Xmin). There are average values, whose leakage is dependent on the power supply and the coil temperature. The marking of the switching times corresponds to DIN VDE 580.

The motors of the series 11...84 with built-in holding brake are not to be loaded with axial forces, as this causes a change of the working airgap of the holding brake thereby making the brake inoperative.



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