

Servo motor



Further descriptions, that relate to this document:

UL: 12-01



Plugs - Product description

UL: 12-02



Cables - Product description

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Made in Germany, 2004

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The most important thing first

Thanks for your confidence choosing our product.

These operating instructions present themselves as an overview of the technical data and features.

Please read the operating instructions before operating the product.

If you have any questions, please contact your nearest SSD Drives representative.

Improper application of the product in combination with dangerous voltage can lead to injuries.

In addition, damage can also occur to motors or other products.

Therefore please observe our safety precautions strictly.

Safety precautions

We assume that, as an expert, you are familiar with the relevant safety regulations, especially in accordance with VDE 0100, VDE 0113, VDE 0160, EN 50178, the accident prevention regulations of the employers liability insurance company and the DIN regulations and that you are able to use and apply them.

As well, relevant European Directives must be observed.

Depending on the kind of application, additional regulations e.g. UL, DIN are subject to be observed.

If our products are operated in connection with components from other manufacturers, their operating instructions are also subject to be observed strictly.

1 General

1.1 Description

By using high-energy magnetic materials it is possible to design small diameter disk motors. For this reason and due to a carefully optimized technical construction of the rotor, the motors have a low moment of inertia.

The stability of the magnetic material and the design of the magnetic field in the face of demagnetisation allow maximum currents of up to **3- 4 times the rated current**.

The high acceleration capacity of the low-inertia three-phase AC servo drives is the result of this.

Through the excitation of the permanent magnets, no heat losses due to current occur in the rotor.

With the three-phase AC-servomotors AC G heat losses due to current occur only in the stator, which then can be directly drawn off.

These favorable cooling conditions allow high-capacity windings.

Since all the current heat losses are drawn off directly via the surface, the motors are designed at low cost with the enclosure type providing protection in accordance with **IP xx** and they are thus very resistant to liquids and dirt.

The resolver is built into the B-side bearing bracket.

The signals of this integrated measuring system for the actual speed value, the rotor position and the indirect position are taken at the motor over a 12-pin connector.

Synchronous three-phase AC servo drives have a series of advantages over the DC drives:

- no electromechanical parts to wear out, therefore "maintenance-free".
- a low moment of inertia of the rotor due to power density, therefore high acceleration capacity.
- no commutation limit curve, therefore high acceleration moments, also in higher speed ranges.
- no losses in the rotor of the motor, therefore favorable thermic qualities and a high degree of protection due to the closed construction.

Three-phase AC servomotors built in the way described, are specifically more efficient (higher rated torque) than DC servomotors and also have a small moment of inertia. The size necessary for an application will, for this reason, be smaller with three-phase AC servos than with DC servos.

Important !

- The motor series AC G is not attachment- or pin-compatible to our drives AC Mxx or AC R.
- Motor design AC G only in standard.

General

1.2 Type code

Marking	Standard						optional	
	a	b	c	d	e	f	g	h
Type:	AC	XXX	XXXX	-X	/X	-X	XX	+ ...

Marking	Description
a	AC = three-phase
b	motor models: <u>G</u> = motor series <u>G</u> without cases <u>M</u> = motor series (old) <u>Mn</u> = motor series <u>new</u> <u>M2n</u> = motor series <u>2nd</u> new version <u>MHS</u> = motor series <u>H</u> iperface <u>S</u> ingleturn (under preparation) <u>MHM</u> = motor series <u>H</u> iperface <u>M</u> ultiturn <u>R</u> = motor series <u>R</u> <u>R(L)</u> = motor series <u>RL</u> with separate fan
c	<u>xxxx</u> = approx. rated torque in Ncm
d	-4 = 4000 rpm "AC <u>G</u> ; AC <u>Mn</u> ; AC <u>M2n</u> ; AC <u>MHx</u> " 1..6 = *1000 1/min "AC <u>R</u> " (designation does not apply with motor / gearbox systems) -X = further on request
e	/Y..4 = motor size (designation does not apply with motor / gearbox systems)
f	-3 = 325 V DC intermediate circuit rated voltage -6 = 565 V DC intermediate circuit rated voltage
g	identification for <u>options</u> and custom features XX = see chapter 1.3
h	+ ... = with attached gear-box: (for short description for inserted gearbox models see gearbox documentation)

Note:

Up to marking "g" it is only necessary with options or custom features.

No options are possible for the AC G drive.

1.2.1 Typical example

A typical example of an order corresponding to the model key would be:

Type: AC <u>G</u> 0090-4/01-3 AC = three phase <u>G</u> = motor series 0090 = rated torque in Ncm -4 = 4000 rpm /01 = motor size -3 = 325V DC	Type: AC <u>M2n</u> 0090-4/1-3 AC = three phase <u>M2n</u> = motor series <u>2nd</u> new version 0090 = rated torque in Ncm -4 = 4000 rpm /1 = motor size -3 = 325V DC	Type: AC <u>R</u> 0095-6/1-3 AC = three phase <u>R</u> = motor series 0068 = rated torque in Ncm -6 = 6000 rpm /1 = motor size -3 = 325V DC
---	---	---

General

1.3 Possible options (Marking: g)

Marking	Options			and Marking	Description	motor types			
	BR	GW	IP 65			A C G	A C M n	A C M 2n	A C R
GW		X			smooth motor shaft	☐	☒	☒	☒
BR	X				holding brake, 24V DC	☐	☒	☒	☒
65			X		degree of protection IP 65	☐	☒	☒	☒
BG	X	X				☐	☒	☒	☒
AI					absolute or incremental encoder preparation of attachment	☐	☒	☒	☒
BI	X			AI		☐	☒	☒	☐
PL					electrical connections via PG couplings and cable ends	☐	☒	☒	☒
2P					2 nd featherkey way	☐	☒	☒	☒
6P			X	2P		☐	☒	☒	☒
90					flange receptacle for motor and resolver 90° angled	☐	☒	☒	☐
GP		X		PL		☐	☒	☒	☐
G6		X	X			☐	☒	☒	☒
MS					mech. custom designs	☐	☒	☒	☒
PU				PL	unpainted motor	☐	☒	☒	☒
PS		X		PU		☐	☒	☒	☐
SL					special finish	☐	☒	☒	☒
GK		X			smooth motor shaft shortend	☐	☒	☒	☒
VA	X	X		PL		☐	☒	☒	☐
R6			X		rust-proof motor shaft	☐	☒	☒	☐
P6			X	PL		☐	☒	☒	☐
B6	X		X			☐	☒	☒	☒
F6			X		flange receptacle B-side	☐	☒	☒	☐
VI	X	X		AI		☐	☒	☒	☒
GI		X		AI		☐	☒	☒	☒
V6	X	X	X			☐	☒	☒	☒
L6		X	X	PL		☐	☒	☒	☐
BL	X		X	PL		☐	☒	☒	☐
B4	X				flange B 14	☐	☒	☒	☐
VR		X		PL+R6+AI		☐	☒	☒	☐
S6			X	PL+R6+2P		☐	☒	☒	☐
GZ		X			with Centre hole	☐	☒	☒	☐
N6		X	X		with special rotation speed about software (6000)	☐	☒	☒	☐
HW		X			with Hollow shaft	☐	☒	☒	☐
T6			X		for tropical climate	☐	☒	☒	☐
X6				F6 + 2P		☐	☒	☒	☐

- standard design
- ◐ optional
- not possible

2 General technical data

		A C G	A C M n	A C M 2 n	A C R
Degree of protection: with mounted mating connectors and built-on motor	IP44 (with separate fan)	☐	☐	☐	☒
	IP54	☒	☒	☒	☐
	IP65	☐	☒	☒	☒
Magnetic material:	NdFeB	☒	☒	☒	☐
	SE	☐	☐	☐	☒
Electrical connections:	straight flanged sockets	☐	☒	☐	☒
	rotatable 90° angled for motor-, resolver- and thermal connection-flanged sockets	☒	☐	☒	☐
	PG couplings with cable ends	☒	☒	☒	☐
Thermal protection of motor:	thermal detector PTC	☒	☒	☒	☒
Power:	In accordance with DIN VDE 0530 installation site: 1000 ASL T = 100K, Tu 40°C measured with attached cooling surface	☒	☒	☒	☒
Voltage:	325 V DC	☒	☒	☒	☒
	565 V DC	☐	☒	☒	☒
	other windings are possible.	☐	☒	☒	☐
Cooling:	self-cooling	☒	☒	☒	☒
	separate cooling	☐	☐	☐	☒
Operating mode:	Continuous operation S1	☒	☒	☒	☒
Bearings:	Ball bearings, service life approx. 15.000 h	☒	☒	☒	☒
Motor shaft: (standard)	with fitting key in accordance with DIN 6885	☒	☒	☒	☒
Rotational accuracy:	N, in acc. with DIN ISO 2373	☒	☒	☒	☒
Number of pole pairs:	2	☐	☐	☐	★
	3	☒	☒	☒	★
Resolver type:	2 pole transmitter resolver	☒	☒	☒	☒
Insulation class	F (VDE 0530) 155° C, heating 100° K	☒	☒	☒	☒
Varnish: (standard)	similar RAL 9005 (black)	☒	☒	☒	☒

- standard design
- ◐ optional
- not possible
- ★ dependent on size

3 Technical data

Type: AC G

AC-Servomotor Type:	size	Nominal- power	Technical datd			Static torque	max. Static torque	Static current strom	Moment of inertia included resolver
			Rated torque	Rated current with 325V DC 560V DC					
		P _N (KW)	M _N (Nm)	I _{N325} (A)	I _{N560} (A)	M ₀ (Nm)	M _{0max} (Nm)	I ₀ (A)	J _M (kgcm²)
AC G0060-4/01-3	01.1	0,25	0,6	1,15	-	0,7	2,1	1,25	0,33
AC G0090-4/01-3	01.2	0,36	0,9	1,75	-	1,1	3,3	2,0	0,51
AC G0170-4/01-3	01.3	0,70	1,7	3,28	-	2,1	6,3	3,8	1,0
AC G0190-4/01-3	01.4	0,78	1,9	3,70	-	2,6	7,8	4,9	1,5

Data at rated speed of 4000 rpm

Technical data

Type: AC G

AC-Servomotor	BG	Mass	Motor-resistance	Motor-inductance	Thermal time constant		Torque constant	e.m.f constant "eff."
Type:					with I_N	with I_{max}		
		m (kg)	$R_{ph/ph}$ (Ω)	$L_{ph/ph}$ (mH)	T_{thN} (min)	T_{thmax} (s)	KT (Nm/A)	KE (V/1000 min ⁻¹)
AC G0060-4/01-3	01.1	1,8	14,4	15,3	11	1,22	0,52	31
AC G0090-4/01-3	01.2	2,0	6,9	8,4	13	1,44	0,52	31
AC G0170-4/01-3	01.3	3,0	2,5	3,6	20	2,22	0,51	31
AC G0190-4/01-3	01.4	3,9	1,5	2,4 *	23	2,55	0,51	31

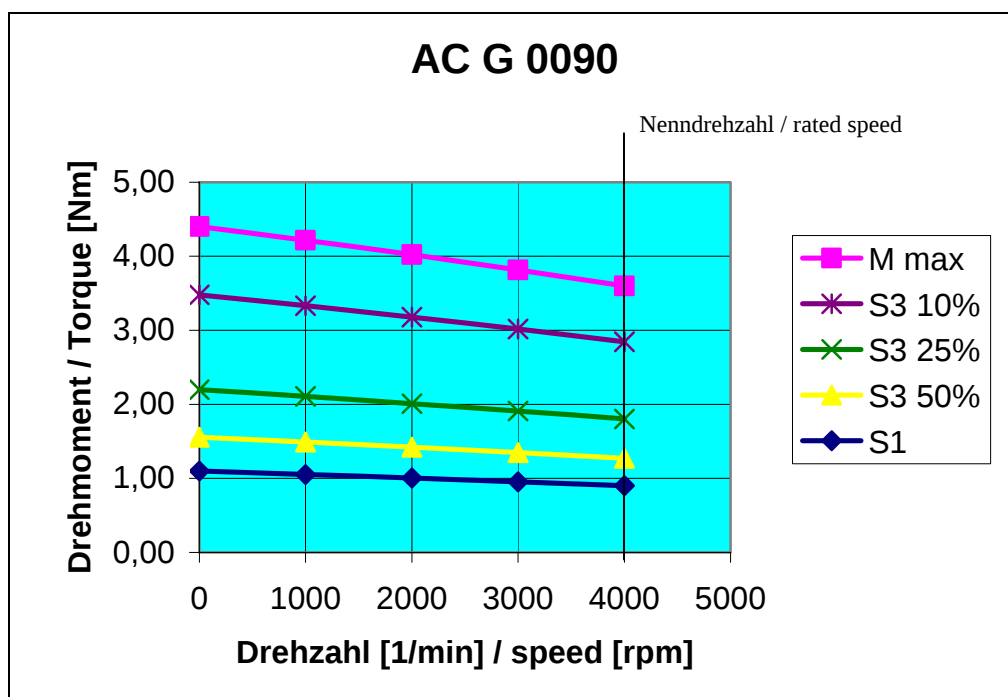
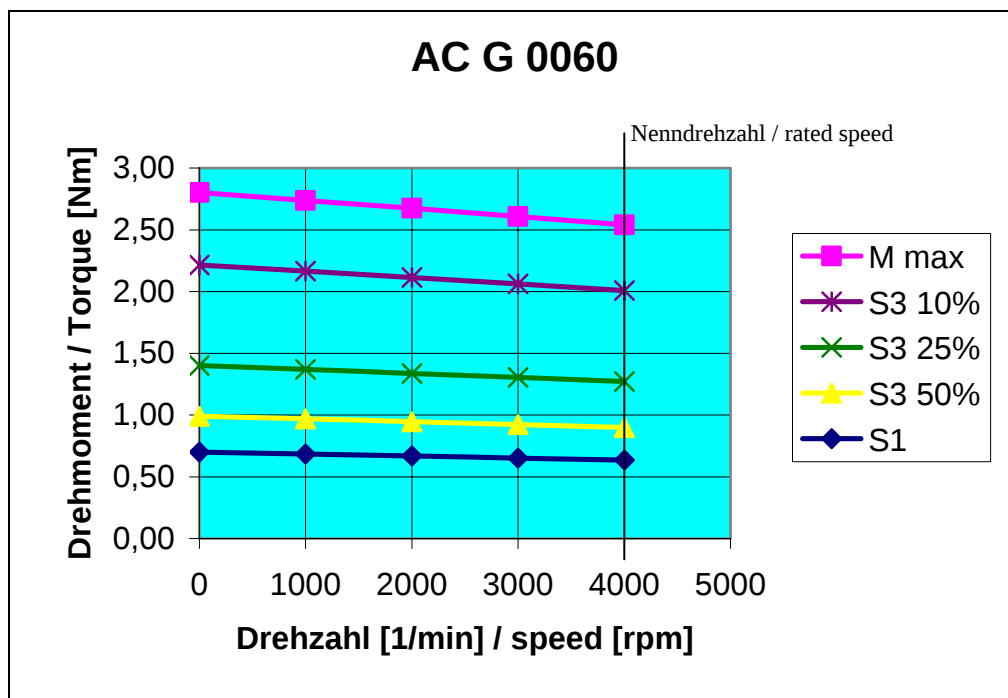
KT: $KT_0 \approx KT_N$

Data at rated speed of 4000 rpm

- On account of low inductance the motor AC G0190-4/01-3 is operable only with the Servo Drive 631 / 006.

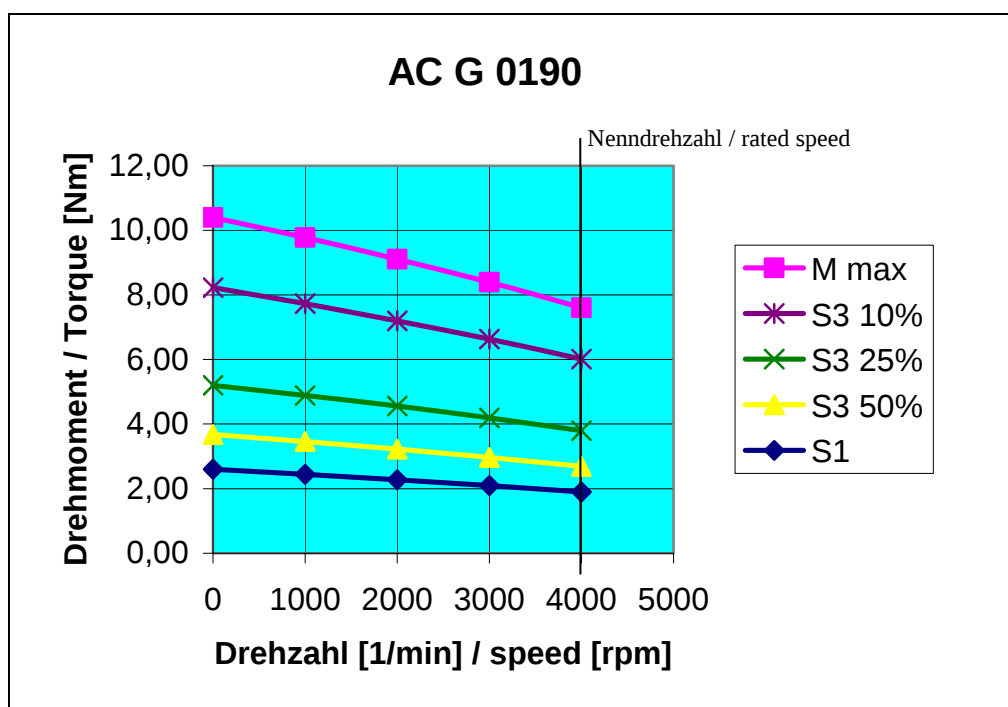
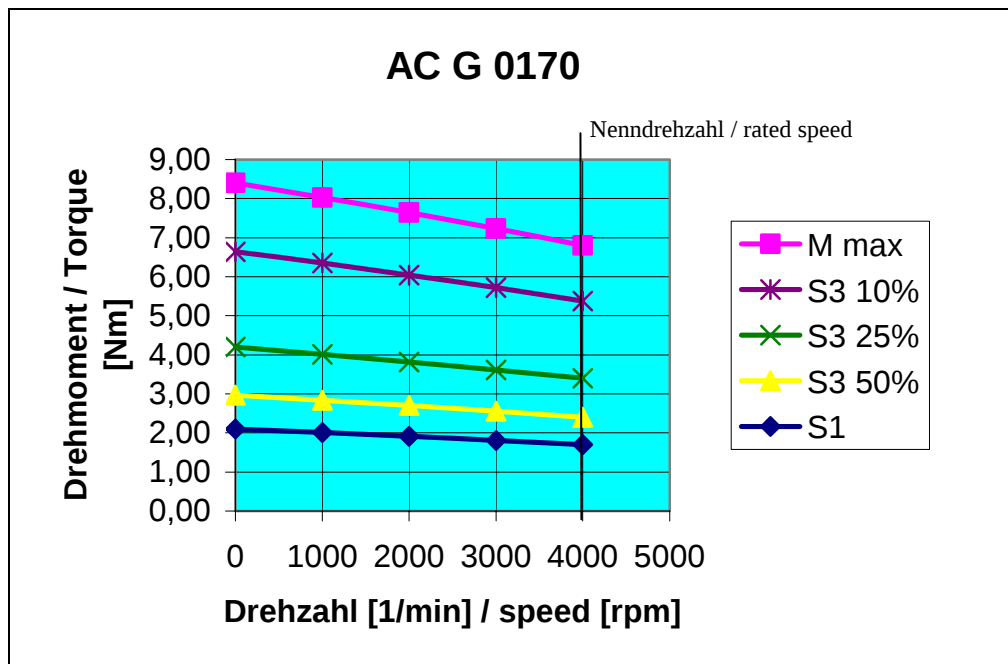
Technical data

3.1 Torque/Speed Diagrams



Technical data

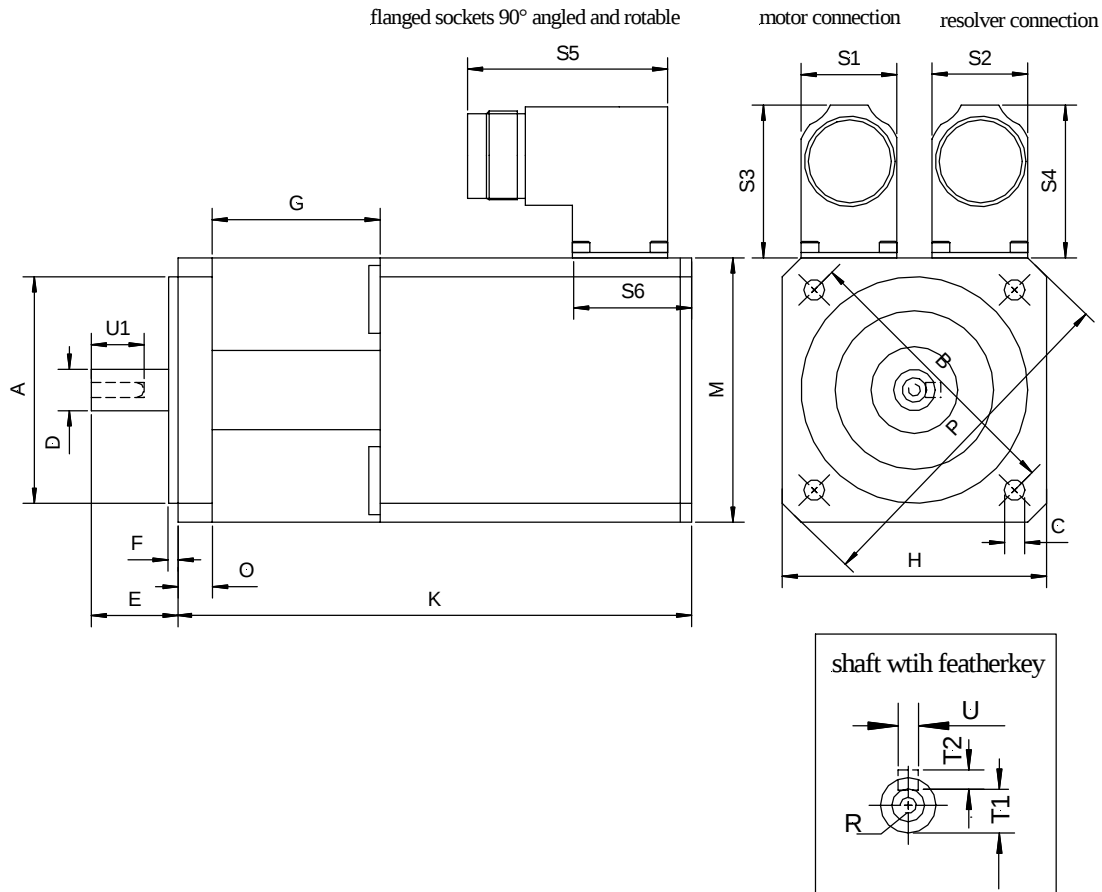
Torque/Speed Diagrams



4 Dimensions

4.1 Standard design motor size 01

4.1.1 Connections via connectors



Type	Motor				Resolver			
	S1	S3	S5	S6	S2	S4	S5	S6
AC G0060	25,7	40,0	53,0	31,6	25,7	40,0	53,3	31,6
AC G0090	25,7	40,0	53,0	31,6	25,7	40,0	53,3	31,6
AC G0170	25,7	40,0	53,0	31,6	25,7	40,0	53,3	31,6
AC G0190	25,7	40,0	53,0	31,6	25,7	40,0	53,3	31,6

Type	A (j6)	B	C	D (k6)	E	F	G	H	K	M	O	P	R	T1	T2 (h9)	U (h9)	U1
AC G0060	60	75	5,5	11	23	2,5	44,5	70	136	70	9	92	M3·12	8,5	4	4	14
AC G0090	60	75	5,5	11	23	2,5	44,5	70	146	70	9	92	M3·12	8,5	4	4	14
AC G0170	60	75	5,5	11	23	2,5	44,5	70	176	70	9	92	M3·12	8,5	4	4	14
AC G0190	60	75	5,5	11	23	2,5	44,5	70	205	70	9	92	M3·12	8,5	4	4	14

all specifications in "mm"

5 Connector assignment

5.1 Power connector

Power connector

motor side

SSD Drives - motor size 0...2

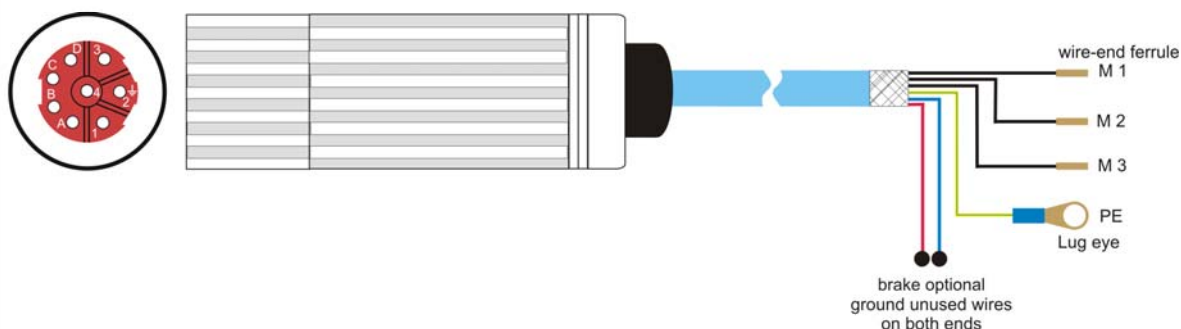
Model: AC G, AC M2n; ACM2G; AC M2K
AC MHS / MHM

regulator side

SSD Drives - Servo drives

Model: 631/635 and 637/637+/637f
637+/637f
in the compact enclosure

view solder / crimp connector - side



S MB GM2nRn BG 0/3-C+L ST.0100.3001		K MB BG 0/2-B KA.0003.6304		terminal strip	
PIN - Nr.		colour	function	PIN - Nr.	
1		black 1	motor connection	M1	
2	¹⁾	yellow/green	ground connection	PE	
3		black 2	motor connection	M2	
4		black 3	motor connection	M3	
A		red	brake +24V DC ²⁾	Connection not on terminal	
B		blue	brake 0V DC ²⁾		
C		-	-	-	
D		-	-	-	
case	¹⁾		screen	case	

¹⁾ motor mating plug
the screen is connected to
the groundpin and also
extensively to the case.

²⁾  **Attention ! Security and insulation:**
The brake must be insulated for secure division (PELV). Otherwise,
the insulation class of the drive becomes reduced or the effort
of an additional galvanic separation is required.

				Maßstab / scale:	
				Typ / model:	
				KK MB GM2nRn 0/2.K - XX.X / B	
				Bezeichnung / designation:	
				Blue motor cable (compact enclosure) for SSD Drives standard motors and servo drives	
				Zeichnungsnummer / drawing No:	
				Z-MK.6400.xxxx	
				Blatt sheet 1	
Zust.	Änderung	Datum	Name	Ursprung	Dateiname / File name: Z-MK-6400-E.cdr

Connector assignment

5.2 Resolver connector

Resolver connector

motor side

SSD Drives - motor size 0...4

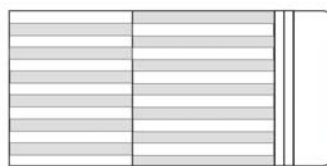
Type: AC G, AC R, AC Mn,
AC M2n, AC M2K; AC M2G
AC MRW, AC MRL

regulator side

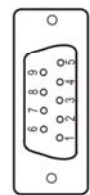
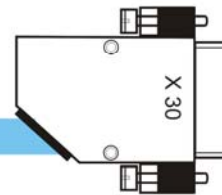
SSD Drives - servo drives

Model: 631/635 and 637/637+/637f

view solderside



view solderside



SIR ST.0200.0001	KIR -B KA.0003.6301		SUB - D 09 S/M ST.1002.2001
PIN - Nr.	colour	function	PIN - Nr.
1	white	sin +	4
2	brown	sin -	8
3	green	cos +	3
4	yellow	cos -	7
5	red	PTC optional	2
6	blue	PTC optional	6
7	pink	carrier -	9
8	gray	carrier +	5
case		screen	case

						Maßstab / scale:		
						Typ / model: KK RT GMR-xx.x/B		
05	ACM2K	10.08.04	DL	Bear.	09.05.01	DL	Bezeichnung / designation: Blue resolver cable for SSD Drives standard motors and servo drives	
04	ACMRL	27.11.03	DL	Gep.	10.05.01	EH		
03	ACMRW	02.10.03	DL	Norm				
02	ACM2G	15.08.03	DL				Zeichnungsnummer / drawing No: Z-RK.6300.xxxx	Blatt sheet 1
01	637f	16.04.03	DL					
Zust.	Änderung	Datum	Name	Ursprung	Dateiname / File name: Z-R-6300-E.cdr			

Connector assignment

5.3 Cabling instructions

Important rules when operating servo regulators and servomotors:

1. A radio interference suppression level cannot be maintained without an interference suppression filter at the line input. Moreover, line filter increase the immunity of the system to interference.
2. The cable between the power electronics and the motor must be shielded as YCY. A SY shield is not suitable. The shield support for the power cable (motor cable) must be on both ends. We recommend using SSD Drives motor cables K M BG xx – B!
3. Metal parts in the switching cabinet must be connected with each other having large areas of contact and must carry high frequencies very well. Avoid anodized, yellow-passivized and painted surfaces which can have very high resistance values based on the frequency! Make sure that the metals lie close together in the chemical circuit voltage class! Use the good conductivity and the large surface of the galvanized mounting plate as earth potential!
4. Relays, contactors and solenoid valves build into the same circuit must be connected with spark-suppressing combinations or components limiting over voltage, respectively. This applies also if these parts are not mounted in the same cabinet as the servo regulator.
5. The shield for the analog signal lines must be installed on one end and, if possible, in the switching cabinet. Ensure a connection which provides extensive contact and which is low-resistant! The shield for the digital signal lines must be installed on both ends, must have extensive contact and must be low resistance. An additional equalizer is to be laid parallel when there are potential differences. It is necessary to use plugs with metal enclosures with separable connections.
6. Avoid unnecessary extra loops on all connecting cables. All measures regarding filtering and shielding can be short circuited on them with high frequency. Connect unused litz wires in cables on both ends to the equipment ground conductor.
7. Unshielded cables of a circuit, the conductors going out and returning, should be twisted due to symmetrical interferences.
8. Separate physically "live" and "dead" wires even in the planning phase. Give special attention to the motor cables. The area of the common terminal strip-line input and motor output is especially endangered.
9. Relays, contactors and solenoid valves. The cables should be laid in the switching cabinet as close as possible to the ground; wires hanging freely in the air are preferred EMC victims as well as active and passive aerials.
10. When operating with more than one line component in a common network, EMC problems are to be expected. From the start, the installation planner must integrate in his concept high frequency emitted interference as well as the electromagnetic susceptibility of the components to one another and take measures against it.
11. It is absolutely necessary to run cable shields completely up to the connectors. The connection of cable shields to ground must be in the near field of the servo regulator (10 - 50 cm). Sensitive measuring leads should be removed as far as possible from this area; this applies also when they are shielded!
12. It is mandatory to run the motor cables in a separate cable channel and to lay flexible cable shielding also when these are shielded. This channel must be separated by at least 30 - 40 cm from the channel for the signal lines.

Connector assignment

5.4 Plug designation

5.4.1 Mating plugs for motor- and brake connections

Size	Plug designation	Bemerkung
01	S MB G M2nRn 0/3	standard

5.4.2 Mating plugs for resolver- and thermal connection

Size	Plug designation	Comment
01	SIR	standard

5.5 Cable designation

5.5.1 Motor-cable

Size	Cable designation	Comment
01	K MB R BG 0/2 – B K	standard
	MB R BG 0/2 – B - LC	low cost

5.5.2 Resolver-cable

Size	Cable designation	Comment
01	K IR – B	standard
	K IR – B - LC	low cost

6 Technical data of the holding brake

The **AC G** motors are not with holding brake equip !

7 Shaft loads

7.1 Notation of definition



7.2 Technical dates of the max. radial F_R (N) and axial F_A (N) shaft load

Motor-Type	rated speed	maximum radial shaft load	maximum axial shaft load
(-)	N_n (1/min)	F_R (N)	F_A (N)
AC G 0060	4000	150	100
AC G 0090	4000	180	100
AC G 0170	4000	200	100
AC G 0190	4000	220	100

The specifications refers to 20000 hours of operation !

7.3 Use Ball bearing type

Motorsize	Ball bearing type	
	A-side	B-side
01	6002	6000

8 Nominal power dependence of the SSD Drives AC servo motors concerning the installation altitude t

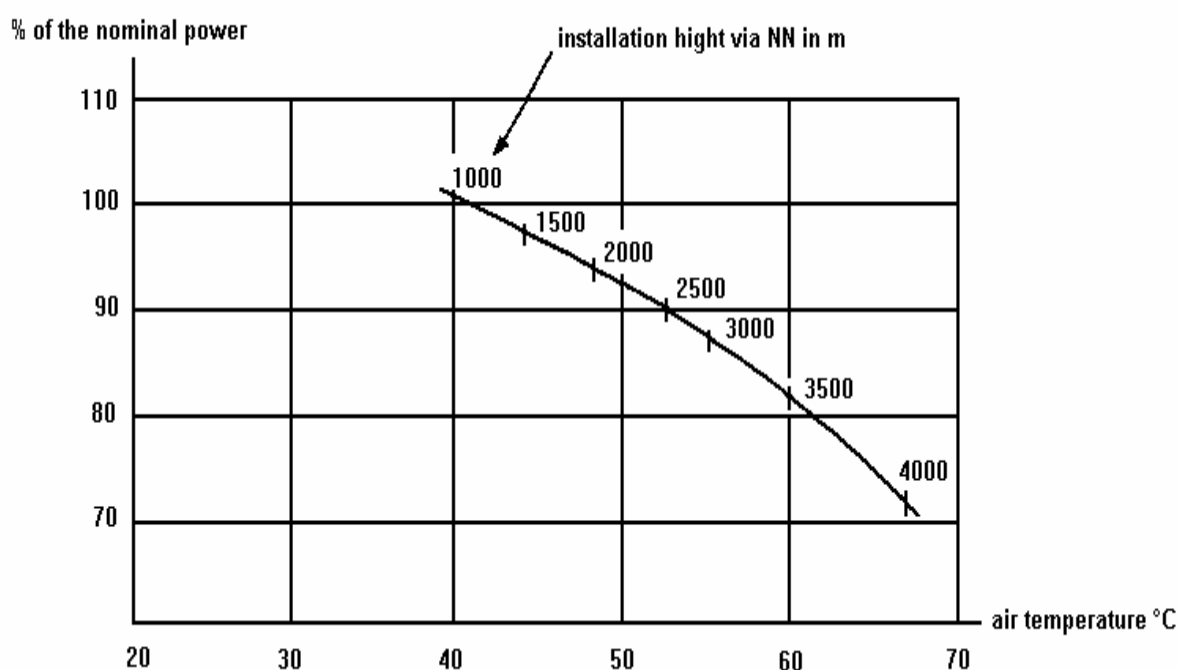
8.1 Short description

When selecting an adequate motor the following is to be considered:

Workload (power), operating mode, starting, braking and by-passing processes, additional moment of inertia, moment course of the operating machine, speed control if necessary, net ratios, coolant temperature, installation height etc.

The nominal power is the power which is mechanically available at the shaft, if the installation site is not situated above 1000 m above NN, the air temperature does not exceed 40° C, and the net ratios are normal.

With differing conditions concerning installation height and air temperature, the permissible power must be corrected corresponding to the following picture.



Check the air temperature and the installation height separately. Should there be differing air temperatures and installation heights at the same time, the factors for the permissible power must be multiplied.

9 Certificates



Standard Specifications and Certifications Manufacturer's Declaration

**In accordance with the EC – Machinery Directive 89/392/EEC
Annex II B approximation of the regulation of the member states for machinery.**

The following Products

AC – Servo - motors of series

AC M2n, AC M2K, AC MHx, AC M2G and AC G

in standard design are components to be incorporated into machinery and may not be operated alone. The complete machinery or installation using this equipment may only be put into service when the safety considerations of the Directive 89/3892/EEC are fully adhered to.

The above mentioned products are in accordance with the relevant clauses from the following standards.

Basic directives:

- EN 60034 / VDE 0530
- IEC 34 – 1,5,6,8,9,14 / IEC 72 / IEC 85
- VDE 0100, VDE 0110, VDE 0530-1
- EC – MASCHINERY DIRECTIVE 89/392/EEC
- EC – LOW VOLTAGE DIRECTIVE 73/23/EEC

CE – Label
as standard on the name plate.

Issuer:

SSD Drives GmbH
Im Sand 14
76669 Bad Schönborn

Bad Schönborn, 01.11.2004

Legally binding signature


ppa. Erich Ehlen
Plant Manager

This declaration does not include any assertion of properties. The references for safety and protection (operating instruction) are to observe in every case keep.

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