Technical Information DA 12 T · 2008

dc motors

Engineering information
for Catalog DA 12

SIEMENS

Catalogs for "Large Drives"

SINAMICS G130/G150
Drive Converter Chassis Units
Drive Converter Cabinet Units
D 11

Order No.:
German: E86060-K5511-A101-A3
English: E86060-K5511-A101-A3-7600

SINAMICS GM150/SM150
Medium-Voltage Converters
0.8 MVA to 28 MVA
D 12

Order No.:
German: E86060-K5512-A101-A1
English: E86060-K5512-A101-A1-7600

SINAMICS S120
Drive System
0.12 kW to 1200 kW
D 21.1

Order No.:
German: E86060-K5521-A111-A2
English: E86060-K5521-A111-A2-7600

SINAMICS S150
Drive Converter Cabinet Units
75 kW to 1200 kW
D 21.3

Order No.:
German: E86060-K5521-A131-A1
English: E86060-K5521-A131-A1-7600

Asynchronous Motors
Standardline
N-compact 1LA8/H-compact 1LA4
D 86.1

Order No.:
German: E86060-K5586-A111-A2
English: E86060-K5586-A111-A2-7600

Three-phase synchronous motors
HT-direct 1FW4
D 86.2

Order No.:
German: E86060-K5586-A121-A2
English: E86060-K5586-A121-A2-7600

DC Motors
Sizes 160 to 630
31.5 kW to 1610 kW
DA 12

Order No.:
German: E86060-K5312-A101-A2
English: E86060-K5312-A101-A2-7600

DC Motors
Engineering information for Catalog DA 12
DA 12 T

Order No.:
German: E86060-T5312-A101-A2
English: E86060-T5312-A101-A2-7600

SIMOREG DC-MASTER 6RA70
Digital Chassis Converters
DA 21.1

Order No.:
German: E86060-K5321-A111-A2
English: E86060-K5321-A111-A2-7600
www.siemens.com/simoreg-catalog

Spare Parts for SIMOREG DC MASTER 6RA70
DA 21.1 E

www.siemens.de/simoreg-katalog
www.siemens.com/simoreg-catalog

SIMOREG K 6RA22
Analog Chassis Converters
DA 21.2

Order No.:
German: E86060-K5121-A121-A1
English: E86060-K5121-A121-A1-7600

SIMOREG DC MASTER 6RM70
Digital Converter Cabinet Units
DA 22

www.siemens.de/simoreg-katalog
www.siemens.com/simoreg-catalog

Catalog CA 01
The Offline Mall of Automation and Drives
CA 01

Order No.:
German: E86060-D4001-A100-C6 (CD-ROM)
E86060-D4001-A500-C6 (DVD)
English: E86060-D4001-A110-C6-7600 (CD-ROM)
E86060-D4001-A510-C6-7600 (DVD)

A&D Mall

Internet:
www.siemens.com/automation/mall

SINAMICS MICROMASTER SIZER
Configuration tool
Order No.: 6SL3070-0AA00-0AG0

The configuration of DC-motors and converters is realized via SIZER LD Snap-in Suite, which has to be obtained from the regional contact partner and installed in addition to the SINAMICS MICROMASTER SIZER.

Engineering information for Catalog DA 12

DC Motors

DA 12 T · 2008

Supersedes:
Engineering information for Catalog DA 12 · 2005

The products and systems described in this catalog are manufactured/distributed under application of a certified quality management system in accordance with EN ISO 9001 (Certified Registration No. 002241 QM UM). The certificate is recognized by all IQNet countries.

SIEMENS

Introduction

Siemens DC machines are used wherever power saving technology and high availability are required. Due to their high output density with small outside dimensions and their modular installation, they perfectly fit into even the smallest installation space. Due to the stepless adjustable speed, the drive can be optimally adapted to the respective conditions of use.

Together with the digital SIMOREG DC MASTER converter, the DC drives can be found in all industrial sectors all over the world.

DC technology is used in rolling mills, in paper machines, on cranes, in extruders, in printing machines, on presses and on skiing lifts.

Siemens DC machines are available for frame sizes from 160 to 630.

Depending on the frame size, the motors are built in 4 or 6-pole versions.

Armature voltages of up to 810 V are also possible.

The motors are available with various cooling types, open-circuit ventilation, or closed-circuit ventilation with degrees of protection IP23 or IP54.

A vast range of installation and mounting accessories, as well as protection and monitoring devices round up our supply.

For selection of the motors there are at your disposal Catalog DA 12 · 2008 or the motor selection tool SINAMICS MICROMASTER SIZER with LD add ons.

This “Technical Information” may help you to solve additional problems concerning the configuration and operation of the DC machine. It contains a mounting description and an accessories description of the machines and serves as supplement to Catalog DA 12 · 2008.

Short code table

The following table gives an overview over short codes used for DC motors.

The use of these short codes, possible restrictions with various motor versions and frame sizes are described in Catalog DA 12 · 2008, section "Selection and Ordering – Options".

Short code table for field voltage with digit "9" at position 11 of the order number (refer to section "Field", page 13)

Short Code	Meaning
L3Y	Non-standard field voltage 110 V – 500 V
L4Y	Non-standard field voltage < 110 V, > 500 V
L5A	Field voltage 200 V
L5B	Field voltage 350 V
L5C	Field voltage 190 V
L5D	Field voltage 325 V
L5E	Field voltage 340 V
L5F	Field voltage 330 V

Short code table for the type of construction with digit "9" at position 12 of the order number (refer to section "Types of construction", page 15)

Short Code	Meaning
M1A	Type of construction IM B6
M1B	Type of construction IM B7
M1C	Type of construction IM B8
M1D	Type of construction IM V5 w/o protective cover
M1E	Type of construction IM V6
M1G	Type of construction IM V3
M1H	Type of construction IM V15
M1J	Type of construction IM V35

Short code table for order numbers with "-Z" (refer to Catalog DA 12 · 2008, section "Selection and Ordering – Options")

Short Code	Meaning
A00	Brush monitoring, signalling brush
A05	Earthing brushes
A06	Brush monitoring, microswitch
A08	Air flow monitor 24 V DC, type 3201.01
A09	Air flow monitor 230 V AC, type 3201.51
A11	PTC thermistor, tripping
A12	PTC thermistor, alarm + tripping
A23	KTY 84
A31	Thermostatic switch, tripping
A45	Resistance thermometer in cooling circuit
A62	PT100
A76	Bearing monitoring with PT 100
A97	Air flow monitor 24 V DC type 3201.03
C00	Brake 24 V DC
C05	Field weakening speeds 1.15 to 1.7 x n_N
C06	Field weakening speeds > 1.7 x n_N
C34 [1)]	Paper machine drives
C35 [1)]	Extruder drives
C36 [1)]	Pump motors for waterworks
C37 [1)]	Press motors
C38 [1)]	Motors for lifts and cable railways (up to –20 °C KT)
C40 [1)]	Printing machine drives
C41 [1)]	Rolling mill drives
C42 [1)]	Lifting gear drives
C49	Flexible commutator infeed
G00	Fan mounted on the non-drive end left, air intake from the non-drive end
G01	Fan mounted on the non-drive end left, air intake from the drive end
G02	Fan mounted on the non-drive end right, air intake from the non-drive end
G03	Fan mounted on the non-drive end right, air intake from the drive end
G04	Fan mounted on the non-drive end top, air intake from the non-drive end
G05	Fan mounted on the non-drive end top, air intake from the drive end
G06	Fan mounted on the drive end left, air intake from the non-drive end
G07	Fan mounted on the drive end left, air intake from the drive end
G08	Fan mounted on the drive end right, air intake from the non-drive end
G09	Fan mounted on the drive end right, air intake from the drive end
G10	Fan mounted on the drive end top, air intake from the non-drive end
G11	Fan mounted on the drive end top, air intake from the drive end
G14	Air filter
G15	Silencer

[1)] The machine design depends on the user-specific operating conditions. The performed measures depend on the frame size and cooling type of the motor.

General technical information

Short Code	Meaning
G16	P0G9 D500 pulse generator
G18	Tachometer mounting TDP 1.2-5
G20	Tachometer mounting TD3 A4 KAEM or KASM
G28	Tachometer mounting GTB 9.06 L/420
G30	Tachometer mounting TDP 0.09L T-3
G37	Tachometer mounting GMP 1.0L S-4
G39	Tachometer mounting REO 444R
G40	Brake mounting
G50	Measuring nipple
G75	Prepared for the mounting of TDP 0.2LT, POG9, POG10, REO444R, L&L 850 or FG4
G76	Prepared for the mounting of TDP 0.09
G77	Prepared for the mounting of TDP 1.2 or GMP 1.0 (type of construction B5n)
G78	Prepared for the mounting of ROD436
G92	Tachometer/pulse generator mounting with brake
H14	Tachometer mounting TDP 0.2L T-4
H42	G14 + G15
H48	POG9 D600 pulse generator
H54	ROD 436 pulse generator, 1024 pulses
H55	POG9D pulse generator, 1024 pulses
H56	POG10D pulse generator, 1024 pulses
H60	Measuring nipple
K02	Vibration quantity level
K04	High-precision flange
K09	Terminal box, right
K10	Terminal box, left
K11	Terminal box, top
K16	2nd standard shaft end
K17	Sealing ring on drive end
K18	Bearing design for gear mounting, oil-tight flange
K19	Reducing flange
K20	Heavy-duty bearing
K24	With primer
K26	Special paint finish RAL 7030
K29	Terminal box, top + seperate fan unit on non-drive end top
K31	2nd rating plate
K40	Regreasable bearing
K42	Standard shaft end without keyway
K45	Space heater 230 V
K46	Space heater 115 V
K48	Degree of protection IP54
K49	Degree of protection IP55
K55	Cable entry plate, drilled (with PG thread in accordance with DIN 46320) [1]
K57	Cable entry plate, drilled (with metric thread in accordance with DIN 89280) [1]

Short Code	Meaning
K64	Air flow from drive end to non-drive end
K65	Duct connection on the drive end, right
K66	Duct connection on the drive end, left
K67	Duct connection on the drive end, top
K68	Duct connection on the drive end, bottom
K69	Duct connection on the non-drive end, right
K70	Duct connection on the non-drive end, left
K71	Duct connection on the non-drive end, top
K72	Duct connection on the non-drive end, bottom
K82	Manual release device for brake
K83	Cable entry on the drive end, terminal box rotated through 90°
K84	Cable entry on the non-drive end, terminal box rotated through 90°
K85	Terminal box rotated through 180°
K97	Clockwise rotation
K98	Counter-clockwise rotation
K99	Both directions of rotation
L00	Next larger terminal box
L50	With adapter
L53	Special paint finish in accordance with RAL 7016
L68	Full-key balancing
L69	Half-key balancing
L72	Special steel shaft
L73	Servicing covers with inspection window
L96	Heavy-duty bearings, version II
M10	Water cooler in special design
X99	Final short code
Y53	Standard paint finish in RAL .....
Y54	Special paint finish in RAL .....
Y55	Non-standard shaft end if $d < d_{standard}$
Y70	Non-standard tachometer/pulse generator, procurement by factory
Y80	Non-standard rating plate data
Y81	Non-standard voltage, frequency of fan unit motor
Y82	Additional plate with ordering data

[1] Drilled for max. number of screw glands. Plain text is required for other design.

General information on the dimension tables in Catalog DA12

Dimensions

All dimensions are in mm.

Fits

The shaft ends and centering spigot diameters specified in the dimension tables are machined in accordance with the fits specified in the following table.

Dimension	ISO fit in accordance with DIN 748, DIN ISO 286 and DIN EN 50347 mm	
d, d_1	to 50 over 50	k6 m6
b_1	to 230 over 230	j6 h6

Certified dimensions, tolerances

The dimensions a, b, b_1, e_1, h, d, i, t and u, specified in the following dimension tables, are certified for all listed designs and will remain unchanged for the validity of Catalog DA 12 · 2008.

The tolerances specified in the following table are valid for the dimensions a, b, e_1 and h.

Dimension	Dimension mm	Tolerance mm
a and b	to 250 over 250 to 500 over 500 to 750 over 750 to 1000	± 0.75 ± 1.0 ± 1.5 ± 2.0
e_1	to 200 over 200 to 500 over 500	± 0.25 ± 0.5 ± 1.0
h	to 250 over 250	–0.5 –1.0

Keyways and featherkeys (dimensions t, t_1, u and u_1) are constructed in accordance with DIN 6885.

Shaft ends

Tapped centre holes 60° in accordance with DIN 332, threads for fitting and extracting tool – refer to the table:

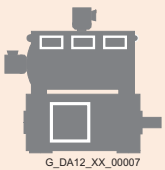
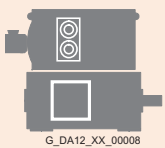
Shaft end diameter mm	Thread in acc. with DIN 332-2
over 21 to 24 over 24 to 30 over 30 to 38	M8 M10 M12
over 38 to 50 over 50 to 85 over 85 to 95 from 110 to 200	M16 M20 M24 M30

Undercut

All motors are provided with an undercut whereby the design for motors from frame size 180 upwards is in accordance with form E of DIN 509.

Motor design

Overview of cooling types and degrees of protection

		Cooling method			Degree of protection	Adapting the basic motor module		Motor type
		Designation to DIN EN 60 034, Part 6		With duct connection	Designation to DIN EN 60 034, Part 5			
The modular structure of the motors enables the following cooling methods and degrees of protection to be derived from one basic motor module  G_DA12_XX_00005	**Open-looped cooling circuit**							
	Suitable for use in dry indoor rooms with low dust levels	Internal cooling with radially mounted fan unit	IC06	–	IP23	Fan unit	 G_DA12_XX_00002	1GG
		Internal cooling using separately-mounted fan through duct	IC17	Single-end (cooling air inlet)	IP23	No	 G_DA12_XX_00005	1GH
			IC37	Both ends (cooling air inlet and outlet)	IP54			
	Closed-looped cooling circuit							
	Suitable for use outdoors or in extremely dusty and/or humid environments	Heat exchange through external cooling using air-to-air heat exchanger	IC A06 A66	–	IP54	Air-to-air heat exchanger, fan unit	 G_DA12_XX_00007	1HQ
		Heat exchange through external cooling using air-to-water heat exchanger	IC W37 A86	–	IP54	Air-to-water heat exchanger, fan unit	 G_DA12_XX_00008	1HS

Structure of standard DC motors

	Type		
	1G.6/1H.6	**1G.7/1H.7**	**1G.5/1H.5**
Motor detail	Frame sizes 160 to 280 31 to 510 kW	Frame sizes 355 to 450 240 to 1000 kW	Frame sizes 500 and 630 250 to 1600 kW
Stator			
Iron active part	Rectangular design	Rectangular design	Hexagonal design
	Fully laminated, non-enclosed stator core; main and compole field circuit are thus designed for quick-response flux change		
	Frame size 160: main and interpoles stamped From frame size 180: main and interpoles screwed on	Main and interpoles screwed on	Main and interpoles screwed on
Windings	Stator and field coils impregnated by dipping		
	With main pole and interpole winding	With main pole, interpole and compensation winding	With main pole, interpole and compensation winding
No. of poles	No. of poles 4	No. of poles 4	No. of poles 6
Rotor			
Iron active part with commutator	Laminated rotor core with skewed slots for low noise and torque ripple		
	Axial cooling-air ducts for high utilization		
	Commutators for high maximum speeds		
	Friction-locked connection for frame size 160 and keyed (featherkey) connection laminated core – shaft from frame size 180 upwards	Keyed (featherkey) connection laminated core – shaft	Keyed (featherkey) connection laminated core – shaft
	Dynamically balanced rotor		
Windings	Frame size 160: Impregnated rotor winding (protection against dust and moisture) From frame size 180: Fully sealed, impregnated rotor winding (increased protection against severe environmental conditions)	Fully sealed, impregnated rotor winding (increased protection against severe environmental conditions)	Fully sealed, impregnated rotor winding (increased protection against severe environmental conditions)
End shields			
	Gray cast-iron end shields	Gray cast-iron end shields	Disk-type end shields made of steel
	Condensate drain holes	Condensate drain holes	Condensate drain holes (in unit)
Brushgear, commutation			
Brush holders	Pressure finger holder	Pressure finger holder	Coiled-strip spring holder or pressure finger holder
Brush monitoring (optional)	Limit value monitoring with microswitch	Limit value monitoring with microswitch	Signalling brushes
Carbon brushes	Top-cushioned brushes for low-vibration operation. Adjusted brush quality		
Commutation	Almost sparkless commutation with converter connection even in the overload range due to optimized compole field, magnetic decoupling of the main and compole field circuits and rotor windings with very good commutation characteristics. Brush lifetime is thus considerably longer.		
Connection system			
Terminal box	Die-cast aluminum terminal box for frame size 160, Gray cast-iron box for frame size 180 upwards with removable cable entry plate to facilitate connection with large cable cross-sectional areas	Die-cast aluminum terminal box with removable cable entry plate to facilitate connection with large cable cross-sectional areas	Gray cast-iron box with removable cable entry plate to facilitate connection with large cable cross-sectional areas
	Modular design enables terminal box to be mounted in different ways	Modular design enables terminal box to be mounted in different ways	Terminal box can be mounted on the right or left
Ventilation			
	Standard air flow direction from non-drive end to drive end for intensive commutator ventilation, air flow direction from drive end to non-drive end also possible. Derating possibly required.		

Mechanical design

DURIGNIT 2000 insulation system

The insulation consists mainly of plastic materials with a high thermal overload capacity and resistance to tracking. It also meets the requirements placed on motors that are operating in tropical conditions (humid and hot climate).

Temperature class 155 (F) (overtemperature limit 105 K at a cooling medium temperature of 40 °C) is used for 1G.5/1H.5 motors. The output must be reduced by 13% to 87% when the motors are used in accordance with temperature class 130 (B).

Temperature class 180 (H) (overtemperature limit 125 K at a cooling medium temperature of 40 °C) is used for 1G.6/1H.6 and 1G.7/1H.7 motors. The output must be reduced by 8% to 92% when the motors are used in accordance with temperature class 155 (F) (speed 103%).

Windings, magnetic circuit, current rate of rise and commutation

Field winding

In the standard version, all motors are provided with a field winding for separate field excitation.

The standard field voltage is 310 V (refer to section “Field”, page 13).

Interpole winding

All motors have an interpole winding.

Compensation winding

Motors of frame sizes 355 to 630 have a compensating winding as standard.

Magnetic circuit, current rate of rise

The stator yoke, armature, main and interpoles are laminated.

All motors have a fully laminated magnetic circuit and are, therefore, especially suitable for converter operation. Current rates of rise up to 250 I_N/s are permissible for dynamic processes.

Commutation, brush material

In addition to pure design criteria, the commutation function depends especially on the operating and ambient conditions of the DC motor. Even critical applications can be handled by selecting suitable brush materials.

The standard brush material has the following application restrictions:

- Changing load operation, 50% to 150%
- Relative air humidity 10% to 50% [1)]
- Cooling air temperature ≥ 10 °C (refer to section “Other operating and ambient conditions”, page 13)
- Cooling air without any solid particles and aggressive substances
- The maximum permissible external vibration levels, as specified on page 27, section “Mechanical performance, vibrations”, should be observed.

1) The following relationships exist at 40 °C:

Relative air humidity %	Absolute air humidity g (water)/m^3 (air)
10	5
50	25
85	40

Supply, converter connection, armature voltage and smoothing reactor

The rated voltages specified in the selection tables are standard voltages in accordance with DIN 40030.

The ratings at these rated voltages are only valid in conjunction with the specified converter connection and supply voltage.

All inductance values specified in the "Selection and ordering data" tables of Catalog DA 12 · 2008 are at 100 Hz, for single-phase and at 300 Hz, for three-phase bridge circuits.

Assignment of armature and rated voltages to supply voltage and converter connection

Rated armature voltage	For converter connection	Supply voltage	Duty
160 V	Fully-controlled single-phase bridge circuit (B2)A(B2)C	50/60 Hz 230 V 1 AC	Motoring and generating Two or four-quadrant operation
180 V	Half-controlled single-phase bridge circuit B2H	50/60 Hz 230 V 1 AC	Motoring Single-quadrant operation
280 V	Fully-controlled single-phase bridge circuit (B2)A(B2)C	50/60 Hz 400 V 2 AC	Motoring and generating Two or four-quadrant operation
310 V	Half-controlled single-phase bridge circuit B2H	50/60 Hz 400 V 2 AC	Motoring Single-quadrant operation
420 V	Fully-controlled three-phase bridge circuit (B6)A(B6)C	50/60 Hz 400 V 3 AC	Motoring and generating Two or four-quadrant operation
470 V	Fully-controlled three-phase bridge circuit B6C	50/60 Hz 400 V 3 AC	Motoring Single-quadrant operation
520 V	Fully-controlled three-phase bridge circuit (B6)A(B6)C	50/60 Hz 500 V 3 AC	Motoring and generating Two or four-quadrant operation
600 V	Fully-controlled three-phase bridge circuit B6C	50/60 Hz 500 V 3 AC	Motoring Single-quadrant operation
720 V	Fully-controlled three-phase bridge circuit (B6)A(B6)C	50/60 Hz 690 V 3 AC	Motoring and generating Two or four-quadrant operation
810 V	Fully-controlled three-phase bridge circuit B6C	50/60 Hz 690 V 3 AC	Motoring Single-quadrant operation

Non-standard voltages and converter connections

The standard ratings specified on the rating plate should – whenever possible – be kept, even if the motor characteristics deviate from the rated values in the selection tables, because the rating plate data, with these rated values, is part of the order number. Non-standard rating plate data would require the short code **Y80** for "Non-standard rating plate data" (refer to Catalog DA 12 · 2004, section 3 "Selection and Ordering – Options").

If the rated DC voltage of the converter selected has to be lower than the rated armature voltage specified in the selection tables, with the converter connection and system voltage rating remaining unchanged to accommodate higher AC supply voltages, the motor speed and output can be obtained by changing the rated motor values in the same ratio as the voltages. Operation with other converter connections available on request.

Converter operation

For motor operation with converters the controller has to be set up optimally before starting the operation. The dynamic of the controller should be chosen as low as possible in order to spare the mechanical system of the drive train. An automatic speed controller optimization run requires a connected driven machine. The resulting settings have to be checked and to undergo a plausibility check.

Optimization runs don`t always produce good results for each application case. Therefore the controller adjustments have to be checked by means of adequate tools (oscilloscope, etc.).

In certain cases a manual postoptimization might be necessary.

The operation manual of the converter has to be observed.

Smoothing reactor

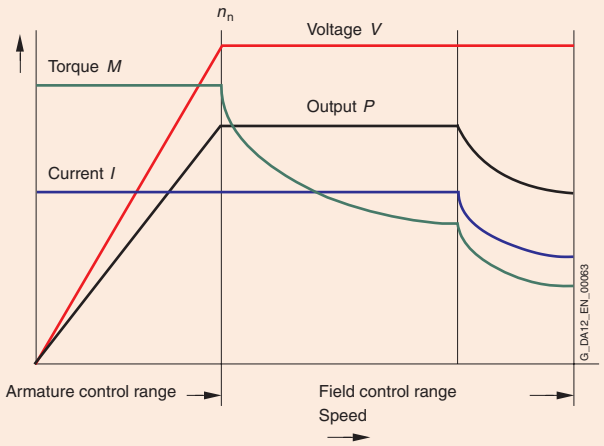
For motors with very small armature circuit inductances, i.e. balanced motors and motors with high output (referring to the frame size), the use of a smoothing reactor can reduce the current ripple and thereby also the torque and the speed ripple, as well as the commutation stress. This leads to extended brush lifetimes.

Electrical data

Speed and speed control

DC motors are operated within the armature control range until they reach the rated speed n_N. In this case the motor speed n is approximately proportional to the armature voltage *V*. Furthermore the machine can be operated by field weakening, i.e. by reducing the field current to the maximum field weakening speed n_{Fmax}, respectively to the mechanic speed limit n_{mech}.

The speed-output diagram shows the relation between Voltage *V*, Current *I*, Output *P*, Torque *M* and Speed *n*.



n_N Rated speed
n_{Fmax} Max. field weakening speed at P_N = constant
n_{mech} Max. permissible operating speed

Speed-output diagram for DC motors

Armature control range

The DC motors listed in Catalog DA 12 · 2008 can be operated continuously in the armature control range at constant torque down to a speed of 10 rpm. A static load is only possible for a limited period of time or with a reduced torque.

Field control range

The motor speed can be controlled above the rated speed using field weakening

- with constant armature voltage and output up to the field weakening speeds n_{Fmax} specified in Catalog DA 12 · 2008, section 3 "Selection and Ordering".
- above n_{Fmax} up to the maximum operating speed n_{mech} with reduced output P_{red} as follows:

$$P_{red} = \frac{\frac{n^*}{n_F} - 1}{\frac{n^*}{n_{Fmax}} - 1} \cdot P_N$$

The formula can be rewritten as follows if n_F is required:

$$n_F = \frac{n^*}{\left(\frac{n^*}{n_{F\,max}} - 1\right)\frac{P_{red}}{P_N} + 1}$$

n^* Ficticious reference value with the dimension of speed from the table below

n_F Required field weakening speed in the range $n_{Fmax} < n_F \leq n_{mech}$

Speeds n^* (ficticious reference values only):

Motors, frame size	Speed n^* RPM	Motors, frame size	Speed n^* RPM
160	14400	355	6400
180	13000	400	5700
200	11700	450	4950
225	10500	500	4580
250	9400	630	3580
280	8300		

Noise can increase in the speed range from n_{Fmax} to n_{mech} (further details are available on request).

For uncompensated motors, field weakening ranges exceeding 1:1.2 are only permissible if stable operation is ensured using speed control. Motors which are not controlled must be equipped with a stabilizing series winding to ensure stable operation (please inquire).

Speed increase by field weakening is also possible from any speed within the armature control range. The ratio for loading with the rated current must be

Field weakening speed / Speed at full field ≤ n_{Fmax}/n_N.

Speed specifications on the rating plate

When ordering, the field weakening speed is specified on the rating plate as shown in the following table.

Design		Field weakening speed n_F RPM
Standard design		1.15 · n_N however max. n_{Fmax}
Extended field weakening range for an additional price, with short code	**C05**	>1.15 · n_N to 1.7 · n_N however max. n_{Fmax}
	C06	> 1.7 · n_N = n_{Fmax}

n_{Fmax} in accordance with Catalog DA 12 · 2008, section 3 “Selection and Ordering”

Short code **C05** and **C06** according to Catalog DA 12 · 2008, section 3 “Selection and Ordering – Options”

If the motor speeds deviate from the specifications in Catalog DA 12 · 2008, section 3 “Selection and Ordering”, e.g. as a

result of

- speed adaption using armature voltage change and/or field weakening
- further defined permissible field weakening speeds (without short code or with short codes **C05** and **C06**) which are not available for standard versions

the short code **Y80** (non-standard rating plate data) and plain text will also be required when ordering (refer to Catalog DA 12 · 2008, section 3 “Selection and Ordering – Options”).

Direction of rotation

Motors are designed for both clockwise and counter-clockwise directions of rotation or reversing operation. When ordering, it is only necessary to specify the direction of rotation for motors of frame sizes 500 and 630 (counter-clockwise rotation: **K98**, or both directions of rotation: **K99**).

Output and overload capacity

The rated outputs specified in the selection tables refer to continuous running duty S1 in accordance with DIN EN 60034-1 for converter operation using the rated armature voltage, the assigned converter connections and supply voltages (refer to section “Supply, converter connection, armature voltage and smoothing reactor”, page 9).

The permissible output and the associated speed for other operating conditions can be seen in diagrams on page 13.

Overloading of the motors is possible in accordance with the following table.

Duration, min.	Overload capacity for uncompensated motors		Overload capacity for compensated motors	
	Torque [1] M_{max}/M_N	Current [1] I_{max}/I_N	Torque [1] M_{max}/M_N	Current [1] I_{max}/I_N
15 s	1.6	~1.85	1.8	~1.85
5 s	1.8	~2.2	2.1	~2.2

In the event of frequent overloading, it is assumed that the effective load of the motor does not exceed the rated load.

Dynamic overload limits without taking thermal stress into consideration:

Type	Frame size	Uncompensated motors		Compensated motors	
		Torque [1] M_{max}/M_N	Current [1] I_{max}/I_N	Torque [1] M_{max}/M_N	Current [1] I_{max}/I_N
1G.6/1H.6	**160 ... 280**	1.8	~2.2	–	–
1G.7/1H.7	**355 ... 450**	–	–	2.2	2.3
1G.5/1H.5	**500 ... 630**	–	–	2.2	2.3

[1] with reference to P_N and n_N

Electrical data

Duty S3

The following increases in output, referred to the rated outputs, are assumed for separately-driven fan motors for duty S3 (intermittent duty):

Duty S3	Increase in output compared with P_N for duty S1
–60%	1.15
–40%	1.3
–25%	1.5 [1] (please inquire)

Static load

If DC motors are loaded at downtimes over a longer period of time or with high current, damages at the commutator can arise.

The following static torque values are permitted for separately-driven fan motors:

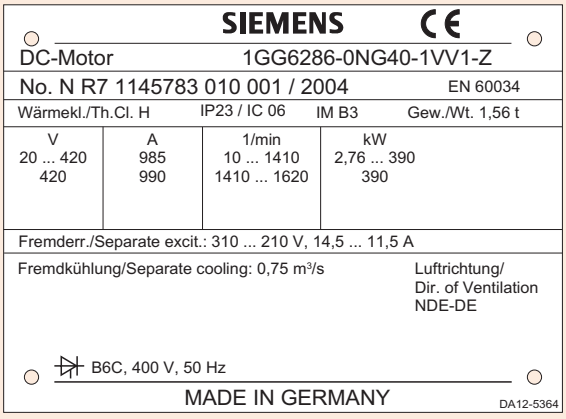
Rated torque	Duty
100%	S2 – 20 s
20%	S1

The permissible static torque depends on the commutator version and the type and number of brushes. Calculations made in individual cases can, therefore, result in higher static torque and/or longer downtimes. Please inquire.

Rating plate

For operation of the motors apply the data specified on the rating plate.

Motors of frame sizes 160 to 630 are equipped with rating plates corresponding to the following picture.



Rating plate for motors of frame sizes 160 to 630

Efficiency

The efficiency values listed in Catalog DA 12 · 2008, section 3 “Selection and Ordering” refer to rated output, rated voltage and rated speed and allow for field losses.

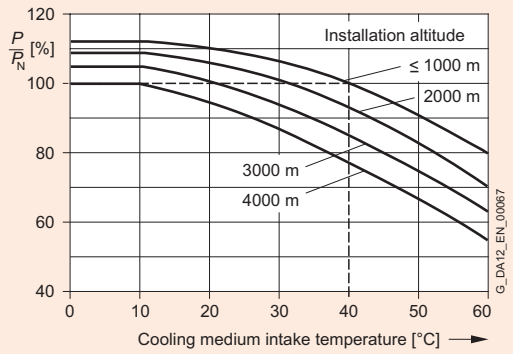
Fan unit motors are not taken into account in the efficiency specifications.

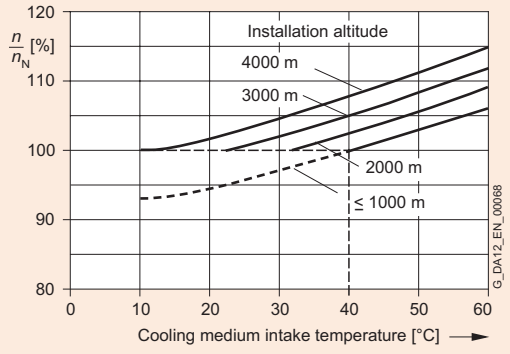
[1] Please observe the dynamic limit torque.

Other operating and ambient conditions

The outputs and speeds specified in Catalog DA 12 · 2008, section 3 “Selection and Ordering” apply for a cooling air temperature of 40 °C and an installation altitude of ≤ 1000 m.

In the case of deviating conditions, the motor output has to be reduced and the motor speed to be increased according to the following diagrams.





Output (left) and speed deviations (right) as a function of installation altitude and the cooling medium intake temperature

The following operating and ambient conditions should be specified when ordering:

- Continuous low-load conditions under 50% rated load
- Cooling air temperature below 10 °C
- Relative air humidity less than 10% or greater than 50%
- If gas or gas mixtures such as chlorine, hydrogen sulphide, silicone or oil occur, the gas/gas mixture type and concentration must be specified.

Fan unit motors for cooling medium temperatures above 55 °C or installation altitudes above 3000 m on request.

Field

Field voltage

The standard field voltage is 310 V. Other field voltages have been determined in accordance with the recommended field voltages in accordance with DIN 40030 and in accordance with the SIMOREG product range as “Standard version”.

They can be coded using a digit at position 11 of the order number or using a short code.

Standard rated field voltages:

Field voltage	Position:	1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16	-	Z	Short code
110 V DC													3									
180 V DC													1									
190 V DC													9									**L5C**
200 V DC													9									**L5A**
210 V DC													6									
220 V DC													2									
310 V DC													**4**									
325 V DC													9									**L5D**
330 V DC													9									**L5F**
340 V DC													9									**L5E**
350 V DC													9									**L5B**
360 V DC													7									
500 V DC													5									

Electrical data

Non-standard rated field voltages:

If a field voltage other than "Standard" is required, the digit "9" must be placed in position 11 of the order number.

The short code for the field voltage range must be specified in accordance with the table below and the required field voltage must be specified in plain text.

Field voltage	Position:	1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16	-	Z	Short code [1]
< DC 110 V													9									**L4Y**
from DC 110 V to DC 500 V													9									**L3Y**
> DC 500 V													9									**L4Y**

Protective field winding shunt resistor

If the motor field winding is supplied from a separate voltage source (always required for armature control), a shunt resistor should be provided for protection against overvoltages produced as a result of self-induction at switch-off. The same applies to motors with a common supply for the armature and field circuits when the field winding is disconnected from the armature when the motor is shut down. The protective shunt resistor is not included in the scope of supply of the motor.

The approximate resistor size can be seen in the following table. Intermediate values may be interpolated linearly.

For motors	Required protective shunt resistor	
Frame size	as a multiple of the field winding resistance	for field voltage V
160	4.3	180/200
	2.5	310/360
180 to 630	10	110
	8	180/200
	6	310/360

The field winding resistance is approximately

$$R_{field} = V_{field}^2 / P_{field}$$

Where

R_{field} field resistance [Ohm]

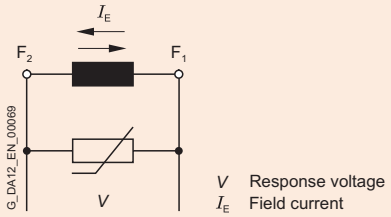
V_{field} rated field voltage [V]

P_{field} field rating [Watt]

The shunt resistor specified in the table above is dimensioned in accordance with the permissible voltage stressing in the motor. If field reversal is used, it may be necessary to limit the voltage to a lower value in view of the voltage limit specified for the field rectifier.

If other components are used instead of protective shunt resistors, for example such as varistors or overvoltage arrestors (refer to fig.), these should be selected in accordance with the following criteria.

1. Rated response voltage ≤ 2 kV.
2. The approximate field energy W_S which must be dissipated via the protective element, can be seen in the table below.

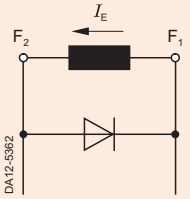


Average magnetic field energy (Ws) at full excitation and with separate ventilation:

Motor type 1GG6 . . . 1GH6 . . .	Ws	Motor type 1GG6 . . . 1GH6 . . .	Ws	Motor type 1GG7 . . . 1GH7 . . .	Ws	Motor type 1GG7 . . . 1GH7 . . .	Ws	Motor type 1GG5 . . . 1GH5 . . .	Ws
. . . . **162**	115	. . . . **256**	540	. . . . **351**	850	. . . . **451**	1350	. . . . **500**	1260
. . . . **164**	150	. . . . **258**	690	. . . . **352**	960	. . . . **452**	1650	. . . . **501**	1740
. . . . **166**	190	. . . . **286**	780	. . . . **353**	1200	. . . . **453**	2000	. . . . **502**	2060
. . . . **186**	185	. . . . **288**	950	. . . . **354**	1380	. . . . **454**	2400	. . . . **503**	2480
. . . . **188**	220			. . . . **355**	1710	. . . . **455**	3100	. . . . **504**	3070
. . . . **206**	250			. . . . **401**	1400			. . . . **631**	2740
. . . . **208**	300			. . . . **402**	1650			. . . . **632**	3430
. . . . **226**	360			. . . . **403**	1850			. . . . **633**	4140
. . . . **228**	450			. . . . **404**	2200			. . . . **634**	4680
				. . . . **405**	2700			. . . . **635**	5890

A free-wheeling diode can be used if the motor is only operated with one field current direction and the field is not switched.

The free-wheeling diode is not required if the field winding is fed from a field supply unit with free-wheeling function.



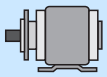
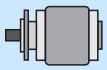
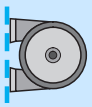
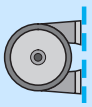
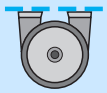
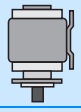
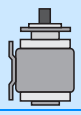
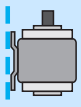
[1] The short code only determines the price of the version, so plain text is also required.

Types of construction

The types of construction of the motors are in accordance with DIN EN 60034, part 7, flange design in accordance with IEC 60072.

The desired type of construction must be specified by code digit in position 12 of the order number. In case of code digit “9”, the short code must also be specified in accordance with the table below.

Types of construction for motors frame sizes 160 to 280 [1]

Type of construction	Position:	1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16	-	Z	Short code
IM B3/ IM 1001														0								
IM B35/ IM 2001														6								
IM B5/ IM 3001														1 [2]								
IM V1/ IM 3011														4 [2]								
IM B6/ IM 1051														9 [3]								**M1A**
IM B7/ IM 1061														9 [3]								**M1B**
IM B8/ IM1071														9								**M1C**
IM V15/ IM 2011														9								**M1H**
IM V3/ IM 3031														9 [2]								**M1G**
IM V35/ IM 2031														9								**M1J**
IM V5/ IM 1011														9 [3]								**M1D**
IM V6/IM 1031														9 [3]								**M1E**

[1] DC motors of frame sizes 355 to 630 are offered in the catalog only in the IM B3 type of construction.

[2] For type of construction IM B5, the motors are supplied in IM B35, for IM V1 in IM V15 and for IM V3 in IM V35.
1HQ and 1HS motors are only available in types of construction IM B3 and IM B35.

[3] For these types of construction, special support feet must be provided for relieving the strain on the fixing bolts in the transverse direction.

Mechanical data

Cooling type, degree of protection

The cooling types of the motors are in accordance with DIN EN 60034-6 or IEC 60034-6, the degrees of protection in accordance with DIN EN 60034-5 or IEC 60034-5.

For an overview of the cooling types and degrees of protection for standard DC motors refer to section “Overview of cooling types and degrees of protection”, page 6.

The degree of protection symbols for motors and terminal boxes specified in the catalog consist of 2 code letters and 2 code digits. These are described below:

IP International Protection: Code letters designating the degree of protection against contact with live or moving parts inside the enclosure and the ingress of solid bodies and water.

1st digit: Degree of protection against contact with live and moving parts and the ingress of solid bodies.

2nd digit: Degree of protection against the ingress of water.

Note:

The higher the 1st and 2nd digit, the higher the degree of protection.

For vertical types of construction, the degree of protection IP23 is only granted if the air inlet point shows downwards.

The short codes for the cooling types of the motors specified in the catalog consist of 2 letters (IC = International Cooling) and a combination of digits and letters. Further details can be found in DIN EN 60034-6.

Cooling, air flow direction

The cooling air is normally fed from the commutator end (non-drive end NDE) to the output end (drive end DE), where it discharges through ventilation plates to the left and right. The output is reduced by approximately 12% for motors of frame size 160 if one side of the air outlet has to be blocked, the output is only reduced by 6% if the duct is on one side.

Arrangement of the air inlet or outlet openings on DE and NDE:

Frame size	Air intake and discharge opening on
160 to 200	3x: on the right, left and top
225 to 630	on all 4 sides

The air flow direction can be changed from the drive end to the non-drive end, short code (refer to Catalog DA 12 · 2008, section 3 “Selection and Ordering – Options”). Derating may be necessary in certain cases (refer to the table below). In many application fields, but especially when machines are operated with weak loading, low cooling air inlet temperature or under difficult ambient conditions, it is recommended to ventilate the machine from DE to NDE.

Refer to Catalog DA 12 · 2008, section 3 “Selection and Ordering – Options” for possible duct connections for 1GH motors.

Motor output for air flow direction from the drive end to the non-drive end (the armature circuit code letter is position 10 of the order number):

Motor type	Armature circuit										
1GG6 . . . **1GH6 . . .** **1HS6 . . .**	A %	B %	C %	D %	E %	F %	G %	H %	J %	K %	L %
. . . . 162	–	–	100	100	90	90	90	90	–	–	–
. . . . 164	–	–	90	90	90	90	90	90	–	–	–
. . . . 166	–	–	90	90	90	90	90	90	–	–	–
. . . . 186	100	100	100	95	100	90	80	80	–	–	–
. . . . 188	100	100	100	95	100	90	80	80	–	–	–
. . . . 206	100	100	95	100	90	80	80	80	–	–	–
. . . . 208	100	100	95	100	90	80	80	80	–	–	–
. . . . 226	100	100	100	100	90	85	85	80	–	–	–
. . . . 228	100	100	100	100	90	90	80	75	–	–	–
. . . . 256	100	100	100	100	100	90	85	80	–	–	–
. . . . 258	100	100	100	100	100	90	85	80	–	–	–
. . . . 286	100	100	100	100	95	85	90	90	–	–	–
. . . . 288	100	100	100	100	95	85	90	85	–	–	–

Motor type	Armature circuit										
1GG7 . . . **1GH7 . . .**	A %	B %	C %	D %	E %	F %	G %	H %	J %	K %	L %
. . . . 351	100	100	100	100	100	100	95	90	90	–	–
. . . . 352	100	100	100	100	100	100	90	85	85	–	–
. . . . 353	100	100	100	100	100	95	90	85	80	–	–
. . . . 354	100	100	100	100	100	95	90	80	80	–	–
. . . . 355	100	100	100	95	90	90	85	80	80	–	–
. . . . 401	100	100	100	100	100	100	100	95	90	–	–
. . . . 402	100	100	100	100	100	100	100	95	90	–	–
. . . . 403	100	100	100	100	100	100	100	90	85	–	–
. . . . 404	100	100	100	100	100	100	95	90	85	–	–
. . . . 405	100	100	100	100	100	95	95	90	80	–	–
. . . . 451 to **. . . . 455**				on request							
1GG5 . . . **1GH5 . . .**											
. . . . 500 to **. . . . 630**				on request							

Cooling air flow, pressure head

For the ventilation of 1GH motors, the ducts and fan units must be dimensioned in such a way that the values for the cooling air flow $\dot{V}$ and the pressure head Δp in the table below are maintained.

If ducts are mounted on 1GG motors, these must be dimensioned in such a way that the permissible pressure head Δp is not exceeded.

For motors **1GG6 . . .** **1GH6 . . .**	Cooling air flow $\dot{V}$ m^3/s	Permissible pressure drop Δp in the ducts for motors 1GG Pa	Required pressure head Δp for motors 1GH Pa
. . . . 160	0.20	60	1300
. . . . 180	0.30	70	1350
. . . . 200	0.35	70	1250
. . . . 225	0.50	80	1600
. . . . 250	0.60	80	1500
. . . . 280	0.75	80	1600
1GG7 . . . **1GH7 . . .**			
. . . . 351	1.3	100	1800
. . . . 352			1900
. . . . 353			2000
. . . . 354			2300
. . . . 355			2500
. . . . 401	1.6	100	1800
. . . . 402			1900
. . . . 403			2100
. . . . 404			2200
. . . . 405			2500
. . . . 451	2.0	100	1700
. . . . 452			1800
. . . . 453			2000
. . . . 454			2200
. . . . 455			2400
1GG5 . . . **1GH5 . . .**			
. . . . 500	2.0	70	1400
. . . . 630	3.0	70	1350

Mechanical data

Air-to-water and air-to-air coolers

Motors with air-to-water cooler (1HS) are ventilated by means of a fan unit with a three-phase motor mounted in the cooler assembly. The heated internal air is recooled via a water cooler. With a cooling water inlet temperature of 25 °C, 1HS motors have the same output as 1GH motors.

The standard water connections (as viewed from the drive end) are located on the right. For 1HS6 186 to 288 and 1HS7 351 to 455, a subsequent changeover of the cooler for water connections to the left is only possible for special design water coolers.

Motors 1HS5 500 to 635 are equipped with coolers with removable water boxes. In this case a later relocation of the cooler is also possible.

Normal cooling water temperature rises up to 10 K, water pressure up to 6 bar (test pressure 9 bar).

If you feel uncertain about the required cooling types, please inquire a cooler with water analysis.

Standard version:

Coolers with copper tubes and copper collectors (not removable) for non-aggressive water which has been cleaned to remove any solid particles. Vibration stress up to 0.6 g (63 Hz).

Special design (short code **M10**):

Coolers with CuNi10Fe tubes, CuZn38SnAl tube sheets and removable plastic-coated steel chambers for water with a pH value of between 5 and 9 and a maximum chloride content of 25 g/l.

The cooling tubes can be cleaned mechanically.

Motors of frame sizes 250 to 630 can be provided with a filter in the internal air circuit.

Fan units

1GG, 1HQ and 1HS motors have built-on fan units with three-phase motor, supply voltage 380 to 420 V AC, 50 Hz or 380 to 500 V.

For operation at 60 Hz with motors from frame size 250, a plain text indication in the order is necessary.

The specific data of fan motors can be taken from the following tables.

Assignment table of the fan motors:

Motor type	Fan motor	I_{max} at 50 Hz A	I_{max} at 60 Hz A
1GG6 162 to **166**	2CW5307-7	2.5	2.2

The fan unit is designed as follows:

- Wide range winding 380 V to 500 V Y, 50/60 Hz
- Cooling medium temperature 40 °C
- Type of construction IM B14
- 2-pole

The motor circuit-breaker has to be adjusted to the specified maximum current.

Air-to-water cooler data:

Motor type		Water volumetric flow required l/min	Water volumetric flow required m^3/h	Pressure drop in cooling element bar
1HS6	**186**	39	2.3	0.1
	188	42	2.5	0.1
	206	45	2.7	0.1
	208	50	3.0	0.12
	226	58	3.5	0.15
	228	63	3.8	0.18
	256	75	4.5	0.15
	258	80	4.8	0.18
	286	95	5.7	0.22
	288	100	6.0	0.24
1HS7	**35.**	95	5.7	0.13
	40.	110	6.6	0.2
	45.	125	7.5	0.26
1HS5	**50.**	115	6.9	0.3
	631	150	9.0	0.37
	632	150	9.0	0.37
	633	150	9.0	0.37
	634	150	9.0	0.37
	635	160	9.6	0.43

Motors with air-to-air cooler (1HQ) are ventilated by means of two fan units with a three-phase motor mounted in the cooler assembly. The recooling of the heated internal air takes place via an air-/air-heat exchanger. The fan unit for the internal air circuit is mounted axially, the fan unit for the external air circuit is mounted on top of the cooler. 1HQ motors have an output of approximately 70% of 1GH motors.

Motor type	Three-phase fan motor Size	Rated voltage V	Connection	Frequency Hz	Rated output kW	Rated current A
1GG6 182 to **222**	90 S	400 460	Y Y	50 60	1.5 1.7	3.5 3.4
1GG6 226 to **288**	100 L	400 460	Y Y	50 60	3 3.4	6.3 6
1GG7 351 to **455**	132 S	400 460	Δ Δ	50 60	7.5 8.6	14.7 14.2
1GG5 500 to **635**	132 S (2x)	400 460	Δ Δ	50 60	7.5 8.6	14.5 14
1HS6 186 to **208**	90 S	400 460	Y Y	50 60	1.5 1.7	3.5 3.4
1HS6 222 to **288**	100 L	400 460	Y Y	50 60	3 3.4	6.3 6
1HS7 351 to **455**	132 S	400 460	Δ Δ	50 60	7.5 8.6	14.7 14.2
1HS5 500 to **635**	132 S (2x)	400 460	Δ Δ	50 60	7.5 8.6	14.5 14
Internal air						
1HQ6 186 to **208**	90 S	400 460	Y Y	50 60	1.5 1.7	3.5 3.4
1HQ6 222 to **288**	100 L	400 460	Y Y	50 60	3 3.4	6.3 6
1HQ7 351 to **455**	132 S	400 460	Δ Δ	50 60	7.5 8.6	14.7 14.2
1HQ5 500 to **635**	132 S (2x)	400 460	Δ Δ	50 60	7.5 8.6	14.7 14.2
External air						
1HQ6 186 to **208**	80 2-pole	400 460	Y Y	50 60	0.75 0.86	1.73
1HQ6 226 to **288**	90 S 2-pole	400 460	Y Y	50 60	1.5 1.75	3.25 3.1
1HQ7 351 to **455**	100 L 4-pole	400 460	Y Y	50 60	2 2.55	4.7
1HQ5 500 to **504**	100 L 4-pole	400 460	Δ Δ	50 60	3 3.45	6.4
1HQ5 631 to **635**	112 M 4-pole	400 460	Δ Δ	50 60	4 4.6	8.2

The fan motors are designed as follows:

- Type of construction B5
- Degree of protection IP55
- Insulation class F
- Cooling medium temperature 55 °C
- Voltage tolerance ±10%
- Rating plate with 50 and 60 Hz data

Mechanical data

Three-phase terminals of fan motors

All fan motors are equipped with a plastic terminal box which is mounted on the fan motor. The terminal box is freely accessible.

Each terminal box has 6 terminals. Threaded holes with metric threads are provided for cable entries according to the table below.

Assignment of the entry drillings of the fan motor terminal boxes:

For motor type	Cable gland	Max. conductor cross-section mm²
1GG6 162 to **166**	1x M16 x 1.5 and 1x M25 x 1.5	2.5
186 to **208**	2x M25 x 1.5	2.5
226 to **288**	2x M25 x 1.5	4
1GG7 351 to **455**	2x M32 x 1.5	6
1GG5 500 to **635**	2x M32 x 1.5	6

	Internal air circuit		External air circuit (1HQ motors only)	
For motor type	Cable gland	Max. conductor cross-section mm²	Cable gland	Max. conductor cross-section mm²
1HQ6 186 to **208**	2x M25 x 1.5	2.5	2x M25 x 1.5	2.5
226 to **288**	2x M25 x 1.5	4	2x M25 x 1.5	2.5
1HQ7 351 to **455**	2x M32 x 1.5	6	2x M25 x 1.5	4
1HQ5 500 to **633**	2x M32 x 1.5	6	2x M25 x 1.5	4
1HS6 186 to **208**	2x M25 x 1.5	2.5	–	–
226 to **288**	2x M25 x 1.5	4	–	–
1HS7 351 to **455**	2x M32 x 1.5	6	–	–
1HS5 500 to **633**	2x M32 x 1.5	6	–	–

Filter and silencer mounting

Air filter

If the installation place of the motors supplies only cooling air with unsufficient percentage of purity, the mounting of a filter is necessary.

If in the case of very high percentage of dust at the location of use the effect of the filter is not sufficient or if the maintenance intervals for the filters are too short, it is recommended to use a surface-cooled motor in degree of protection IP54 or a with a duct connection separately cooled motor of the 1GH type in degree of protection IP54/IC37.

A dry-type filter can be mounted on all 1GG motors (refer to Catalog DA 12 · 2008, section 3 “Selection and Ordering – Options”). The filter is mounted axially in front of the fan intake.

Filters can also be retrofitted. Derating is not required.

The filtration efficiency is 99% for a dust particle size of 10 µm. The efficiency decreases for smaller particle sizes.

The noise levels are reduced by 1 to 2 dB for motor frame sizes from 160 to 280 if a filter is mounted.

Silencer

For 1GG motors from frame size 180, a silencer can be mounted on the air inlet of the fan unit. Thereby the sound pressure level L_{pA} of the 1GG motors can be reduced by approximately 5 dB.

The mounting of a silencer is also possible in combination with an air filter.

Noise levels

The sound-pressure levels L_{pA} and the sound power level L_{WA} (including tolerance) specified in the table below apply at full load up to 2000 RPM for B6C converter connection and standard fan unit at 50 Hz.

The values for L_{WA} are significantly lower than the values permitted in accordance with EN 60034-9.

For motors	Measuring-surface sound-pressure level L_{pA} in dB (A)	A-sound power level L_{WA} in dB (A)
1GG6 . . . **1GH6 . . .**		
. . . . 160	73	86

1G.6 . . . **1H.6 . . .**	**1GH6 and 1HS6**	**1GG6 and 1HQ6**	**1GH6 and 1HS6**	**1GG6 and 1HQ6**
. . . . 180	72	76	85	90
. . . . 200	73	77	87	91
. . . . 225	76	80	90	94
. . . . 250	78	82	93	97
. . . . 280	80	84	95	99

Sound power level and sound-pressure level for motors of frame sizes 355 to 630 on request.

The sound power level L_{WA} is the sum of the measuring-surface level and measuring-surface sound-pressure level L_{pA}.

A motor noise no-load/load differential of 3 to 5 dB can be assumed when making comparisons with the standard. The no-load noise levels, when fed from pure DC, are approximately 3 dB below the noise values for converter supply.

When using a silencer, the specified noise levels can be reduced by approx. 5 dB.

Bearings

Motors up to and including frame size 200 have pre-lubricated rolling contact bearings. Larger motors have regreasable rolling contact bearings.

The original grease charge of the pre-lubricated bearings normally lasts for two years, after which time it must be replaced.

Motors with regreasable bearings can be re-lubricated while the motor is running.

For extreme conditions, e.g. high cooling temperatures (exceeding 60 °C), motors, frame sizes 160 to 200, normally fitted with pre-lubricated bearings, can be supplied with regreasable bearings (refer to Catalog DA 12 · 2008, section 3 “Selection and Ordering – Options”).

For all motors, a locating bearing is used at the non-drive end and a floating bearing is used at the drive end.

Depending on the degree of protection or the arrangement of the bearings, the bearings are sealed using grease-packed grooves and/or axial shaft sealing rings or INA ring disks or sealing disks (RS bearings) preventing the ingress of dust.

For motors, frame size up to 280, the bearings can accept the weight of the rotor including that of the coupling half if the motor is mounted in an inclined or vertical position.

Please inquire if the motor is to be subject to higher axial loading and for motors with frame size from 355 upwards.

Refer to the table below for the bearing assignments.

The bearing assignments are valid for motors with all types of construction and vibration quantity level A.

Mechanical data

Bearing assignment Motor type **1G.6 ...** **1H.6 ...**	Deep-groove ball bearings in accordance with DIN 625 Cylindrical roller bearing in accordance with DIN 5412 Standard version Drive end bearing	Non-drive end bearing	Bearing for high cantilever force	Special design bearing for extremely high cantilever forces Drive end bearing	Non-drive end bearing
.... 160	6213-RSJC3	6213-RSJC3	NU 213E [1]	–	–
.... 180	6214ZC3	6214ZC3	NU 214E	NU 314E	7213 BG
.... 200	6215ZC3	6215ZC3	NU 215E	NU 315E	7214 BG
.... 225	6217C3	6217C3	NU 217E	NU 317E	7216 BG
.... 250	6219C3	6219C3	NU 219E	NU 319E	7218 BG
.... 280	6220C3	6220C3	NU 220E	NU 320E	7219 BG
1G.7 ... **1H.7 ...**					
.... 355	6226 C3	6226 C3	–	–	–
.... 400	6230 C3	6230 C3	–	–	–
.... 450	6234 C3	6234 C3	–	–	–
1G.5 ... **1H.5 ...**					
.... 500	NU 230	NU 226 + 6226 C3	–	–	–
.... 501	NU 230	NU 226 + 6226 C3	–	–	–
.... 502	NU 232	NU 226 + 6226 C3	–	–	–
.... 503	NU 234	NU 228 + 6228 C3	–	–	–
.... 504	NU 234	NU 228 + 6228 C3	–	–	–
.... 631	NU 234	NU 230 + 6230 C3	–	–	–
.... 632	NU 236	NU 230 + 6230 C3	–	–	–
.... 633	NU 240	NU 236 + 6236 C3	–	–	–
.... 634	NU 240	NU 236 + 6236 C3	–	–	–
.... 635	NU 244	NU 236 + 6236 C3	–	–	–

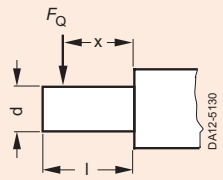
Permissible cantilever forces

When using power transmission elements, which result in cantilever forces of the shaft end (belt drive or direct mounting on gears), it has to be taken care that the limits specified in the cantilever force diagrams aren`t exceeded. Possibly, it is necessary to use a cylindrical roller bearing at the drive end (short code **K20**, refer to Catalog DA 12 · 2008, section 3 “Selection and Ordering – Options”).

The permissible cantilever forces for motors of frame size up to 450 are specified in the following cantilever force diagrams. For motors with frame size 355 to 450, it is assumed that no cantilever forces appear as the output takes place via a coupling. In this case, cantilever force diagrams only exist for bearings with high cantilever forces.

The cantilever force diagrams are only applicable for standard drive shaft ends. The permissible cantilever forces for non-drive shaft ends and non-standard drive shaft ends must be determined for each particular case (please inquire).

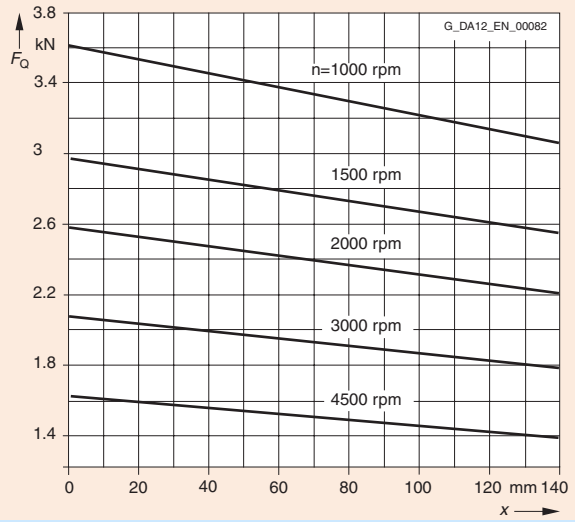
The dimension x specified in the cantilever force diagrams is the distance between the line of action of the force F_Q and the shaft shoulder. The dimension x_{max} corresponds to the length l of the shaft end.



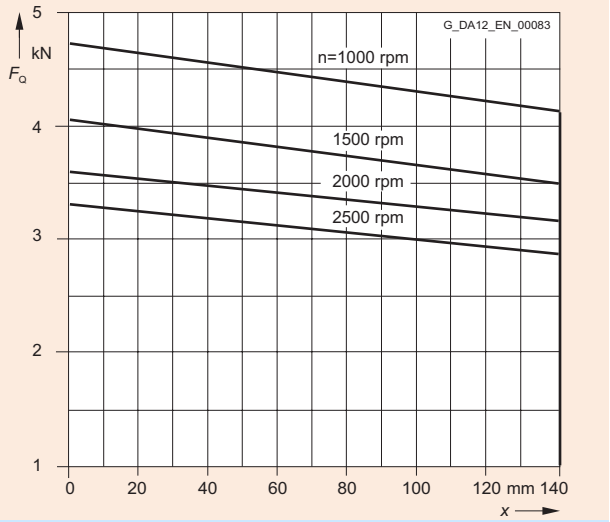
The permissible cantilever forces for radial loading at the drive shaft end are specified in the following cantilever force diagrams (based on a normal bearing service life of 20 000 hours)

[1] With restricted radial air intake according to factory information.

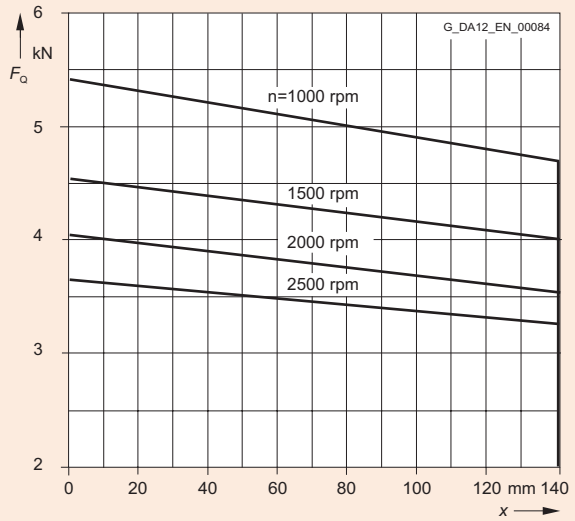
Cantilever force diagrams – Standard bearing design



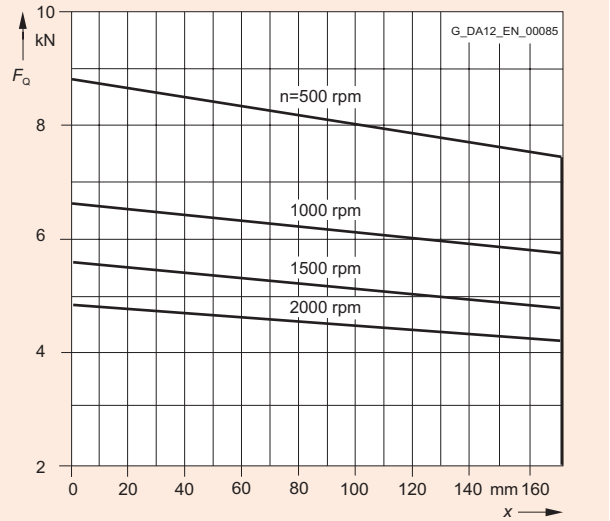
1G.6 16.



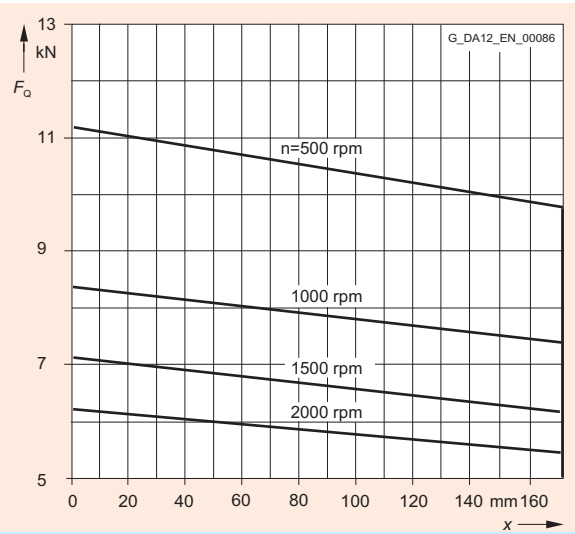
1G.6/1H.6 186/188



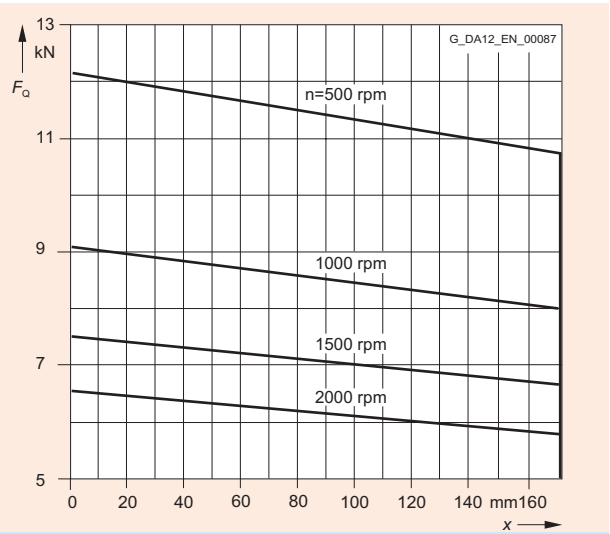
1G.6/1H.6 206/208



1G.6/1H.6 226/228



1G.6/1H.6 256/258

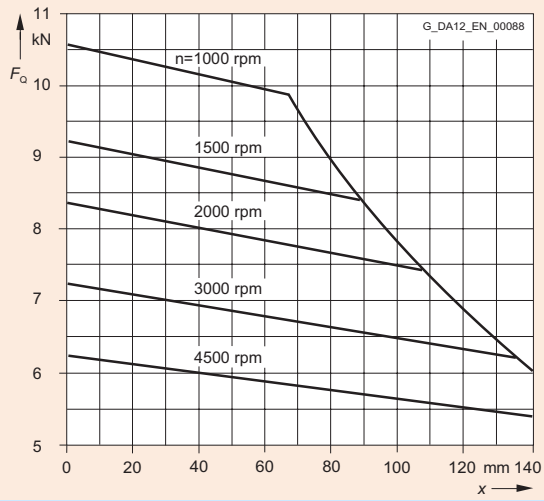


1G.6/1H.6 286/288

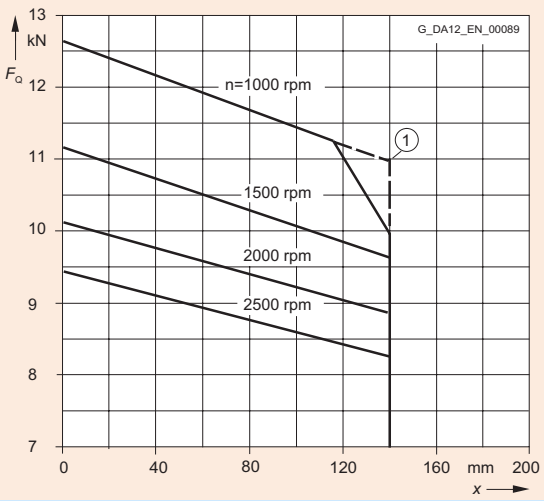
Mechanical data

Cantilever force diagrams – Heavy-duty bearings for high cantilever forces

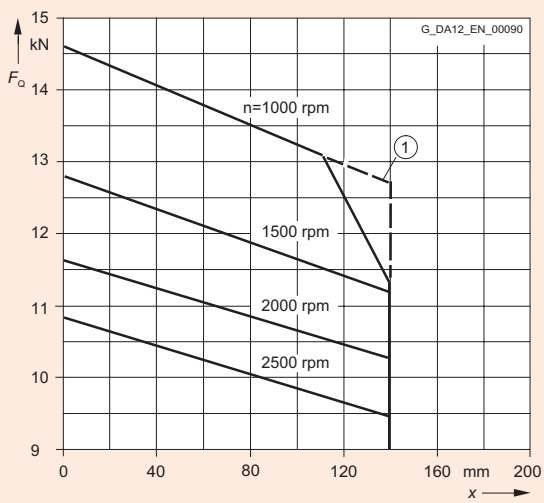
The roller bearings used here may be damaged under no-load conditions. Observe the minimum cantilever forces.



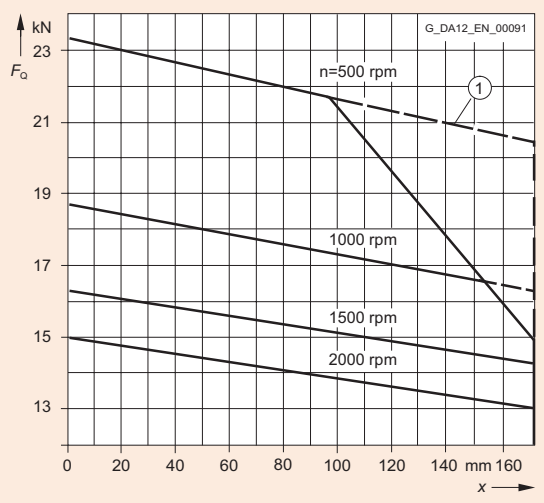
Minimum cantilever force 1.2 kN 1G.6 16.



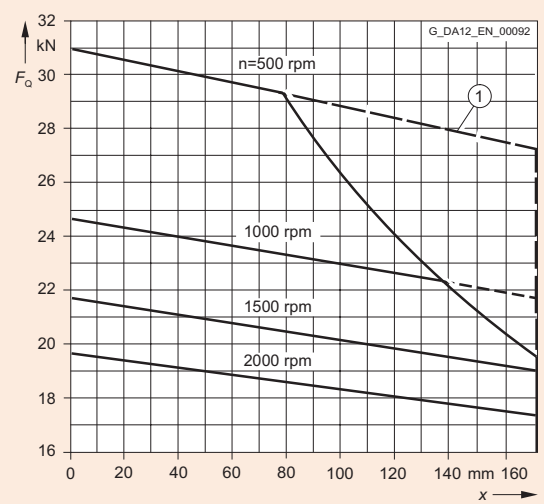
Minimum cantilever force 4 kN 1G.6/1H.6 186/188



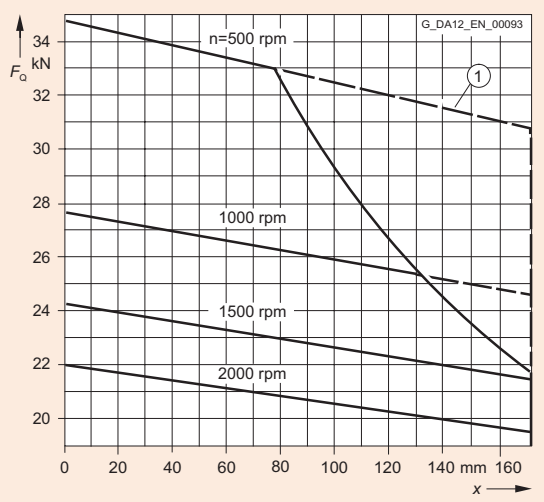
Minimum cantilever force 4.5 kN 1G.6/1H.6 206/208



Minimum cantilever force 6 kN 1G.6/1H.6 226/228

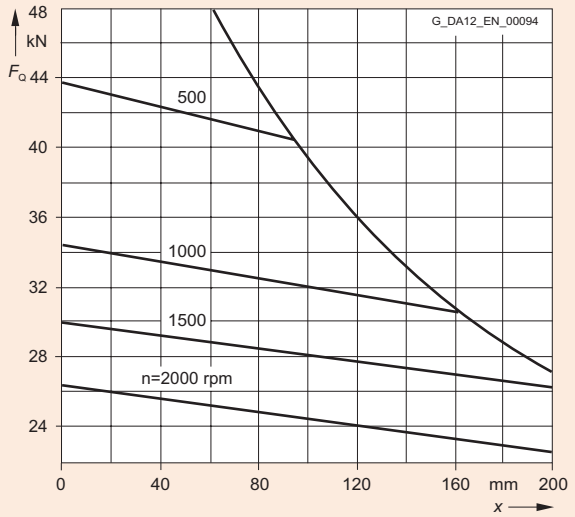


Minimum cantilever force 7.5 kN 1G.6/1H.6 256/258

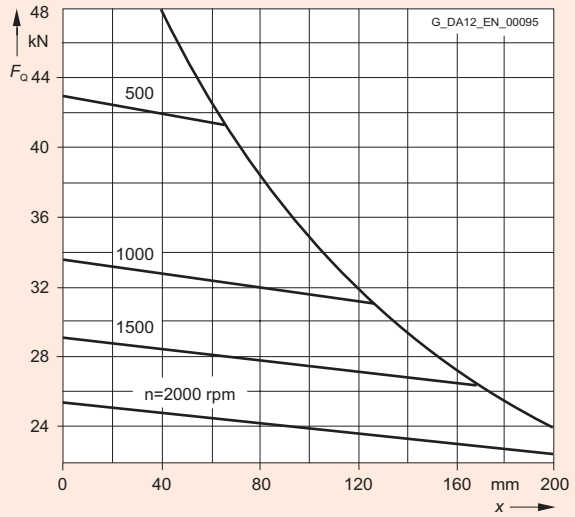


Minimum cantilever force 9 kN 1G.6/1H.6 286/288

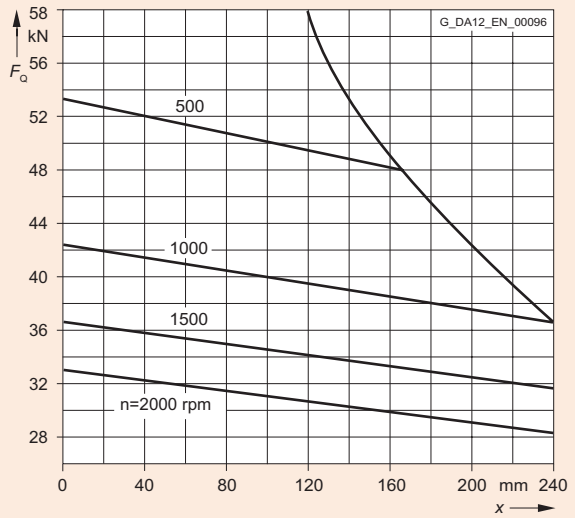
① Shaft made of special steel (short code **L72**)



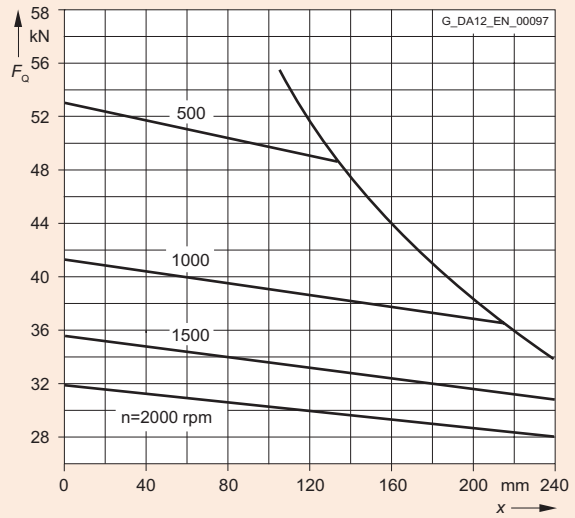
Minimum cantilever force 11 kN 1G.7/1H.7 351/352



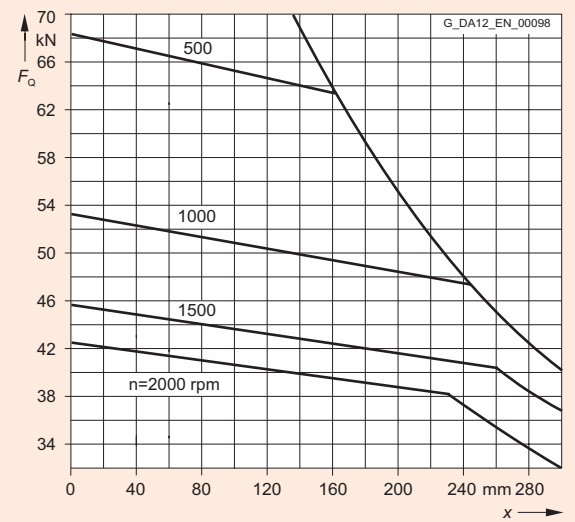
Minimum cantilever force 11 kN 1G.7/1H.7 353/354/355



Minimum cantilever force 14.5 kN 1G.7/1H.7 401/402/403



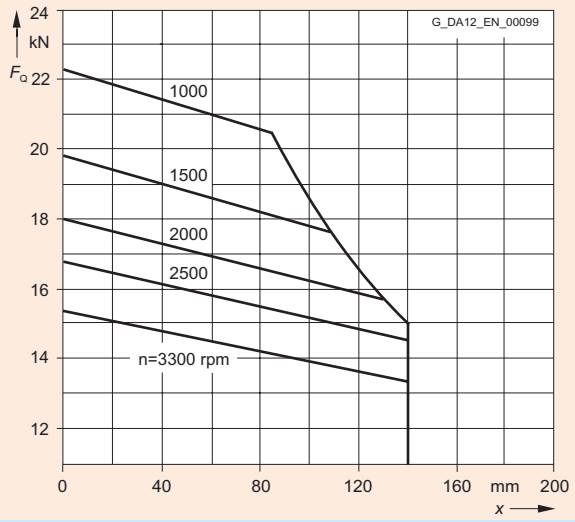
Minimum cantilever force 16.5 kN 1G.7/1H.7 404/405



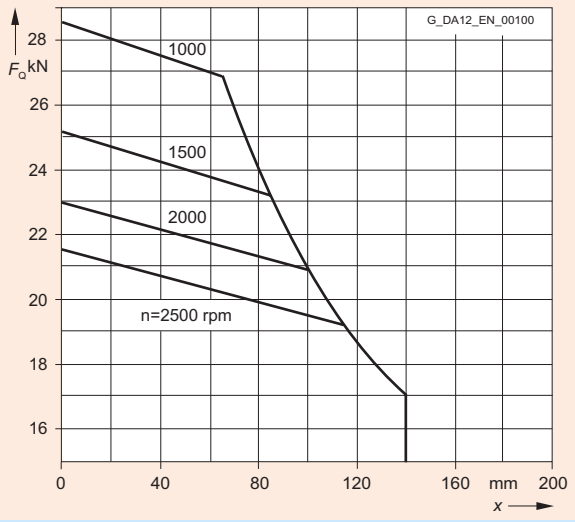
Minimum cantilever force 14.5 kN 1G.7/1H.7 451/452/453/454/455

Mechanical data

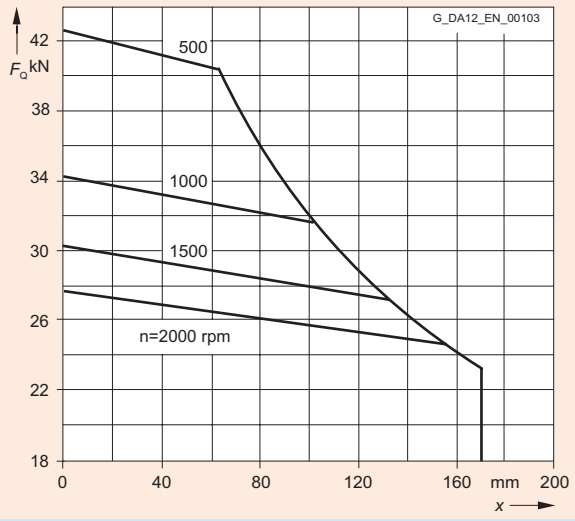
Cantilever force diagrams – Special design bearings for extremely high cantilever forces



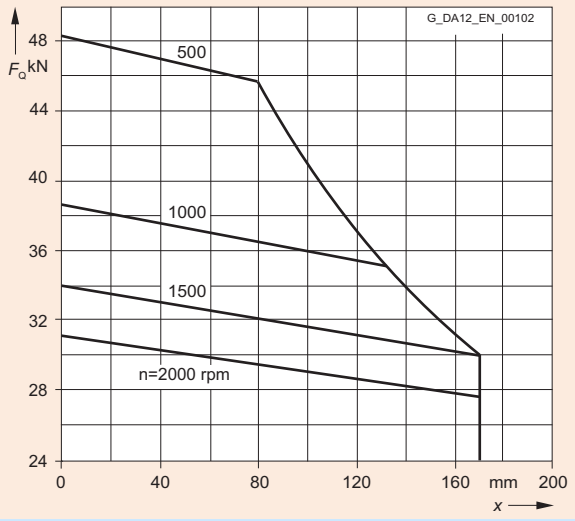
Minimum cantilever force 6 kN 1G.6/1H.6 186 and 188



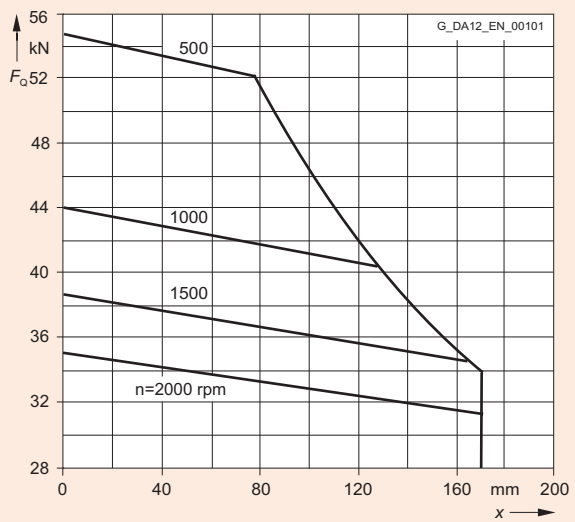
Minimum cantilever force 7 kN 1G.6/1H.6 206 and 208



Minimum cantilever force 9 kN 1G.6/1H.6 226 and 228



Minimum cantilever force 10.5 kN 1G.6/1H.6 256 and 258



Minimum cantilever force 12.5 kN 1G.6/1H.6 286 and 288

Motors 1G.6/1H.6 with special design bearings for extremely high cantilever forces are longer.

Frame size	Dimension k mm
180/200	+30
225/250/280	+40

Shaft ends

Shaft ends conform to DIN 748 and the centering holes (60°) to DIN 332, part 2.

The keyways are machined in accordance with DIN 6885, sheet 1. Featherkeys are always supplied with the motors.

All shaft ends have an undercut, whereby the design for motors from frame sizes 180 upwards is in accordance with form E in accordance with DIN 509.

If required, motors can also be supplied with a non-standard shaft end in accordance with the table below (refer to Catalog DA 12 · 2008, section 3 "Selection and Ordering – Options"). The permissible stressing depends on the desired dimensions.

A second shaft end can be provided for motors provided that no accessories are axially mounted. The non-drive shaft end is only suitable for flexible coupling outputs.

The shaft is accessible or can be made accessible at the non-drive end for speed measurement purposes.

	Shaft end diameter		Length	
Frame size	Larger than standard	Smaller than standard	Longer than standard	Shorter than standard
160	no	yes	no	yes
180 and upwards	no	yes	yes [1]	yes

Mechanical performance, vibrations

All motors are equipped with low-noise and low-vibration rolling-contact bearings. All the motors in Catalog DA 12 · 2008 fulfill vibration quantity level A.

Refer to the table below for recommended maximum vibration quantity levels for electric motors in accordance with DIN EN 60034-14 (up to 3600 RPM) and factory specifications.

Limit values (rms value) of maximum vibration quantity for vibration displacement (s), vibration velocity (v) and acceleration (a) for frame size H in accordance with DIN EN 60034-14.

Vibration quantity level	Frame size H mm	$56 \le H \le 132$			$132 < H \le 280$			$H > 280$		
	Machine installation	s_{eff} µm	v_{eff} mm/s	a_{eff} m/s²	s_{eff} µm	v_{eff} mm/s	a_{eff} m/s²	s_{eff} µm	v_{eff} mm/s	a_{eff} m/s²
A	Free suspension	25	1.6	2.5	35	2.2	3.5	45	2.8	4.4
	Rigid clamping	21	1.3	2.0	29	1.8	2.8	37	2.3	3.6
B	Free suspension	11	0.7	1.1	18	1.1	1.7	29	1.8	2.8
	Rigid clamping	–	–	–	14	0.9	1.4	24	1.5	2.4

There are no design restrictions for vibration quantity level A.

For flange-mounted motors of frame size 160 with vibration quantity level B, the reduced tolerances for the mounting flange (permissible positional variances for the shaft end) are maintained in accordance with DIN 42955. If these reduced tolerances are also to be maintained for flange-mounted motors, vibration quantity level A, these motors must be ordered with high-precision flanges level A in accordance with DIN 42955.

From frame size 180, the vibration quantity level B is only practicable with deep groove ball bearing at the drive end and with horizontal foot-mounted types. From frame size 355, vibration quantity level B on request.

Balancing

The rotors of 1G.5/1H.5 and 1G.6/1H.6 motors are dynamically balanced with complete featherkey (full-key balancing).

The rotors of 1G.7/1H.7 motors are balanced with half key (half-key balancing). This should be taken into account when balancing the drive elements.

Foundation

The systems engineer has to assure a resonance-free mounting of the motor.
For the design of the foundation DIN 4024 has to be observed.

Permissible vibration levels from external sources

The system vibration characteristics as a result of the mechanical drive output elements, alignment and mounting, as well as the influence of external vibrations can result in higher motor vibration values. The vibration limit values specified in DIN ISO 10816-3 must not be exceeded, in accordance with the following table, with a view to perfect commutation, low brush wear and long bearing service life.

Vibration frequency		Vibration values	
Hz		Frame size up to 280	from 355
< 6.3	Vibration displacement s (mm)	≤ 0.1	≤ 0.16
6.3 to 63	Vibration velocity V_{rms} (mm/s)	≤ 2.8	≤ 4.5
> 63	Vibration acceleration a (m/s²)	≤ 1.6	≤ 2.55

For applications where torsion vibrations are likely to occur or cannot be eliminated, a special connection system from the rotor winding to the commutator can be provided for frame sizes 355 to 450 (short code **C49**, refer to Catalog DA 12 · 2008, section 3 "Selection and Ordering – Options").

[1] Up to approx. double the length

Mechanical data

Terminal boxes

All motors have a terminal box for connecting the main DC supply. As standard for all motors, the terminal box is mounted on the right side when viewing on the drive side shaft end. If required, it can also be located on top (except for motors with top-mounted coolers) or on the left-hand side. For horizontal types of construction and terminal boxes on the right, the cable entry is at the bottom. The terminal box can be subsequently rotated through 90°. All terminal boxes have degree of protection IP55.

DC terminals

The terminal box (refer to table below) has 2 field winding terminals and 2 armature terminals as well as additional terminals for temperature sensors, anti-condensation heating, etc.

Labeled terminals are available for connecting the protective conductor. An additional external protective conductor on the outer side of the motor is available (for cross-sections refer to table “Conductor sizes and cable entries”).

Main supply conductors

The dimensions of the main supply conductors have to be in accordance with DIN VDE 0298. The amount of the necessary parallel supplies is determined by

- the maximal connectable conductor cross-section
- the cable type
- the cable laying
- the ambient temperature and
- the permissible current in accordance with DIN VDE 0298.

Cable entries

The terminal boxes have a cable entry plate which is normally supplied undrilled. It can be unscrewed from the terminal box for drilling (for details refer to table “Conductor sizes and cable entries”).

Assignment of the terminal boxes:

For motor	Terminal box (max. permissible terminal current)					
Frame size	gk 602 (268 A)	1XB7 540 (360 A)	1XB7 700 (600 A)	1XB7 710 (1200 A)	1XB7 942 (2500 A)	1XB7 720 (2000 A)
160	●	–	–	–	–	–
182 to 184	–	●	–	–	–	–
186 to 188	–	–	●	–	–	–
202 to 204	–	●	–	–	–	–
206 to 208	–	–	●	–	–	–
222 to 224	–	–	●	–	–	–
226 to 288	–	–	–	●	–	–
351 to 455	–	–	–	–	–	●
501 to 635	–	–	–	●	●	–

Conductor sizes and cable entries:

Terminal box	Max. permissible rated current	Connecting thread for field current	Connecting thread for armature current	Max. conductor cross-section per terminal	Max. protective conductor cross-section	Max No. of cable entries	Max. external protective conductor cross-section	Cable entry plate
Type	A	A		mm^2	mm^2		mm^2	
gk 602	268	M4	M10	185	185	3 x Pg 29 + 2 x Pg 16	185	undrilled
1XB7 540	360	M5	M16	185	2 x 70	2 x M36 x 2 + 2 x M18 x 1.5	2 x 240	undrilled
1XB7 700	600	M6	M16	2 x 240	2 x 240	8 x M36 x 2 + 4 x M24 x 1.5	2 x 240	undrilled
1XB7 710	1200	M6	M16	4 x 240	2 x 240	10 x M45 x 2 + 4 x M24 x 1.5	2 x 240	undrilled
1XB7 720	2000	M6	M16	6 x 240	6 x 240	18 x M40 x 1.5 + 5 x M20 x 1.5	6 x 240	undrilled
1XB7 942	2500	M6	M16	9 x 240	4 x 300	20 x M50 x 1.5 + 4 x M32 x 1.5	2 x 240	undrilled

Terminal designations of DC motors

The terminal designation of DC motors is in accordance with DIN EN 60034-8.

For fixing the rotational direction in relation to the armature current and the field direction, applies the rule that on operation of a DC motor in clockwise rotation (when viewing at the drive side shaft end) the polarity of currents L+ and L- corresponds to the polarity of connections A1 and A2, as well as to connections F1 and F2.

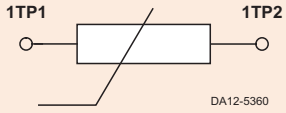
For counter-clockwise direction, the polarity of the supplies has to be changed either to the armature or the excitation field.

	Motor winding or winding type or conductors in the DC supply system	Terminal designations to DIN EN 60034-8
DC motors	Armature winding Interpole winding Compensating winding	A1 – A2 B1 – B2 C1 – C2
	Symmetrically-split interpole winding	B1 – B2 B3 – B4
	Field winding (series)	D1 – D2
	Field winding (shunt)	E1 – E2
	Field winding (separate field)	F1 – F2
	Field winding (separate field) – split or several separate windings	F1 – F2 F3 – F4 F5 – F6
DC supply system	Positive conductor Negative conductor Middle conductor	L+ L– M

Designation of auxiliary terminal boxes

The designation of the auxiliary terminal boxes is made by using the designation of the supplementary device in connection with:

- a pre-set digit, characterizing the respective circle or unit,
- a post-set digit, characterizing the function of the conductor.



Example of a temperature sensor with a positive temperature coefficient

Table: Designation of supplementary devices

BA	AC Brake
BD	DC Brake
BW	Brushwear detector
HE	Heater
R	Resistance thermometer
TP	Temperature sensor with positive temperature coefficient

Mechanical data

Paint finish

The standard color is gray in accordance with RAL 7016.

The paint finish can be carried out as standard or non-standard paint finish. Refer to the table below for the structure.

All colors deviating from the standard must be ordered using the short code **Y53** for standard paint finish or **Y54** for non-standard paint finish. The desired color must be specified in plain text (RAL ….).

Additional measures regarding insulation and surface protection are necessary (additional charge) if the motors are subject to chemically aggressive gases and vapors as encountered, for example, in bleaching plants in the textile industry.

Version with	Suitable for climate classification in accordance with IEC 60 721-2-2	Resistance to heat	Structure of primer for cast-iron, steel and sheet steel components	Final coat
Standard paint finish	**Moderate** (extended) for indoor and outdoor use Briefly: up to 100% relative humidity for temperatures up to +30 °C Continuously: up to 85% relative humidity for temperatures up to +25 °C	Briefly: +120 °C Continuously: +100 °C	As for final coat	Alkyd resin base
Special paint finish	**Worldwide** (global) for outdoor use Briefly: up to 100% relative humidity for temperatures up to +35 °C Continuously: up to 98% relative humidity for temperatures up to +30 °C Additionally: for aggressive ambient conditions with up to 1% acid and alkaline concentrations or continuous moisture in sheltered areas	Briefly: +140 °C Continuously: +120 °C	As for final coat	Polyurethane base (2 layers)

The motors can also be delivered without final coat, i.e. only primed (short code **K24**).

Thermal motor protection

The motors can be equipped on request with silicon sensors (KTY84), PTC thermistors, resistance thermometers PT100 or with a bimetal temperature sensor. In connection with the current limitation of the assigned SIMOREG converter reliable motor protection is reached. The thermistor sensors are connected to terminals in the terminal box and can be analyzed in the SIMOREG DC MASTER 6RA70 basic unit.

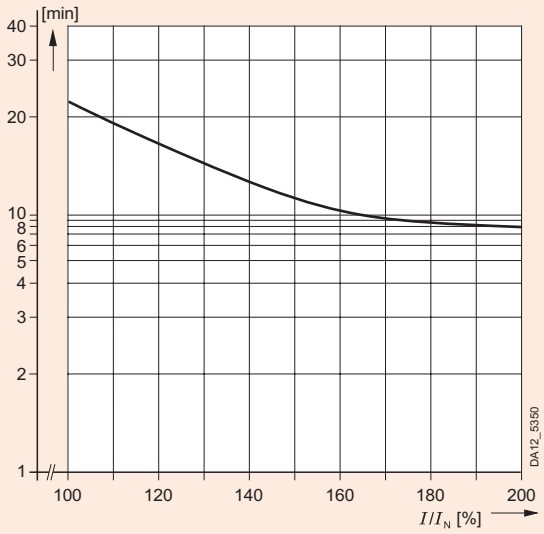
If the control unit is activated by an overshoot of the admissible overtemperature, the armature and the field circuits have to be shut down immediately under continuance of the separate ventilation.

If a warning is needed besides the shut down of the motors when monitoring via PTC sensors, 2 temperature sensors have to be installed. This option can be analyzed in the SIMOREG DC MASTER 6RA70 with the option “terminal expansion” (K00), or with the temperature monitoring relay 3RS10. The warning is normally displayed 10 to 15 K under the shut down temperature.

I^2t-Monitoring

In connection with the I^2t-monitoring of the SIMOREG DC MASTER converters, the motor can be protected from inadmissible loading. The I^2t-monitoring describes roughly the thermal image of the motor (no full motor protection).

For activating the I^2t-monitoring, the thermal equivalent time constant from the following diagram is needed. The thermal equivalent time constant depends on the maximum over-current.



Thermal equivalent time constant T_{therm}

Earthing brushes

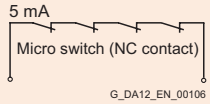
Motors from frame size 180 can be ordered with earthing brushes (refer to Catalog DA 12 · 2008, section “Selection and Ordering – Options”) or can be retrofitted (on request).

Earthing brushes avoid bearing damages, which arise from ripple voltages caused by the system (e.g. unequal capacity distribution on operation at non-earthed converters).

Brush monitoring

A monitoring of the brush length (limit) is possible as follows:

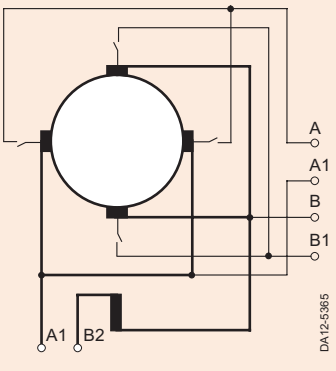
Motors of up to inclusive frame size 450 are equipped with a micro switch for each brush-holder stud. The normally closed contacts are connected in series, the signal is potential-free. The connection is made at 2 terminals of the auxiliary terminal strip in the motor terminal box. The evaluation can be either made in the SIMOREG DC MASTER 6RA70 with the motor interface or separately.



Micro switch connection

Motors of frame sizes 500 and 630 are equipped with a signalling brush for each brush-holder stud. The alarm signal is potentially fixed. The connection is made at 4 terminals of the auxiliary terminal strip in the motor terminal box. Both polarities have to be analyzed separately. For evaluation, the monitor KM01 of Schunk Metall und Kunststoff GmbH, Wettenberg can be used.

The cables between device and machine have to be installed short-circuit and earth-fault proof. Intermediate terminals, e.g. in a control cabinet, have to be equipped with a cover marked with a flash arrow.



Signalling brush connection

Protective and monitoring devices

Bearing temperature and bearing condition

For monitoring the bearing temperature, two resistance thermometers PT100 can be installed in machines from frame size 180 (short code **A76**). The connection is made at the auxiliary terminal in the motor terminal box.

The bearing condition can be monitored at machines from frame size 180 with the SPM method. For monitoring using a mobile device, measuring nipples of Type 32000 (short code **G50**) are fixed on both ends of the motor. Shock pulse sensors can be connected to the measuring nipples via a quick disconnect.

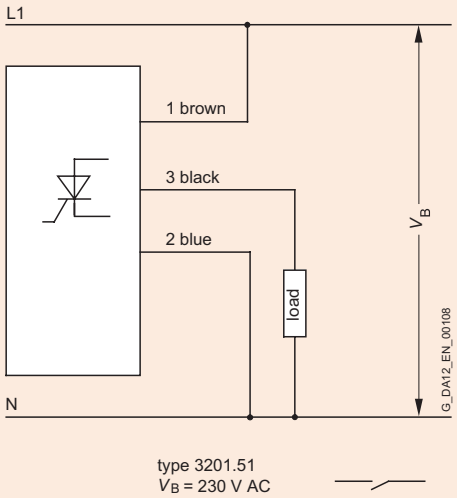
2 shock pulse sensors of Type 4000 (short code **H60**) are connected to the motor with a stationary monitoring device.

The shock pulse sensors can be connected with a measuring terminal or measuring device using a coaxial cable with TNC connector.

Air flow monitoring

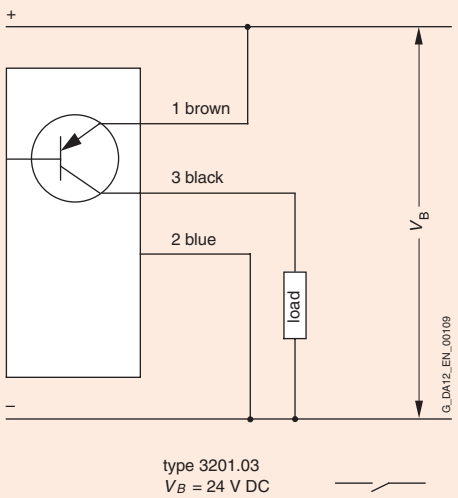
For monitoring the cooling air flow, the flow control switch vent-captor type 3201.03 or 3201.51 is available for machines with top-mounted fan or cooler.

The evaluation of the vent-captor type 3201.03 can be made in the SIMOREG DC MASTER 6RA70 with motor interface. For type 3201.51 the evaluation is made separately.



type 3201.51
V_B = 230 V AC

Short code **A09**



type 3201.03
V_B = 24 V DC

Short code **A97**

Anti-condensation heating

Anti-condensation heating can be provided for motors in which moisture may condense on the winding during standstill periods (due to high atmospheric humidity or wide temperature variations). The air in the motor is warmed up by several degrees Kelvin above the ambient temperature thus preventing moisture condensation and enhancing availability. The anti-condensation heating must not be switched-on when the motor is running.

The following alternative is possible:
Approximately 30% to 40% of the rated field voltage is applied to the field terminals with the armature circuit open (no separate ventilation). 10% to 15% of the rated field rating is then available as heating.

Refer to Catalog DA 12 · 2008, section 3 “Selection and Ordering – Options” for short codes when ordering motors with anti-condensation heating.

For motors Frame size		Heater rating for supply voltage 115 or 230 V AC, 50/60 Hz W
160	Ribbon heating elements	100
180 and 200		50
225 and 250		80
280		100
355 to 450	Tubular heaters	250
500		500
630		800

Mounted equipment

Tachometers/Pulse encoder

AC-Tachometers

AC tachometers generate a three-phase AC voltage proportional to their speed, which is rectified into a DC voltage for tachometers with an integrated or externally mounted three-phase bridge circuit rectifier. The polarity of this DC voltage is not dependent on the direction of rotation. AC tachometers are preferably only used for drives with one direction of rotation; they offer the advantage that they are almost completely maintenance-free. The rectifier has a linearity error of approx. 1.4 V due to the diode threshold, which however remains insignificant with the rated speeds involved.

DC-Tachometers

DC tachometers with permanent magnet generate a DC voltage proportional to their speed, the polarity of which changes with the direction of rotation of the drive. They are preferably used for multi-quadrant drives.

Pulse encoders

Pulse encoders produce a pulse frequency proportional to their speed. They are preferably used for digital speed displays and for highly accurate speed closed-loop controls.

Various tachometers and pulse encoders are designated for mounting on the motor (refer to Catalog DA 12 · 2008, section 3 “Selection and Ordering – Options”).

The most important data are specified in the tables below. Further information can be taken from the web sites of the individual manufacturers.

Technical data of the tachometers (according to actually valid manufacturers' information):

Manufacturer	Type	Max. permissible operating speed RPM	No-load voltage V_0 mV/RPM	Calibration tolerance %	Linearity tolerance %	No-load temperature coefficient % / K	Degree of protection
Baumer Hübner	**TDP 0.09LT-3**	10000	40	±3	≤ 0.15	± 0.005	IP56
	TDP 0.2LT-4	10000	60	±1	≤ 0.15	± 0.005	IP55
	GTB 9.06L/420K	9000	20	±5	≤ 0.15	± 0.005	IP68
	GMP 1.0LT-4	6000	100	±3	≤ 0.5	± 0.005	IP55
Radio-Energie	**REO 444 R**	10000	60	±1	≤ 0.15	± 0.005	IP56
Thalheim	**TD 3 A4 KA**	12000	30	±3	≤ 1	± 0.02	IP66

Technical data of the pulse encoders (according to actually valid manufacturers' information):

Manufacturer	Type	Pulses per revolution	Logic level	Max. permissible operating speed RPM	Supply voltage V V	No-load current drain mA	Switching frequency f_{max} kHz	Degree of protection
Baumer Hübner	**POG 9 D 500**	2 x 500	HTL	12000	+ 9 ... +30	100	120	IP56
	POG 9 D 600	2 x 600	HTL	12000	+ 9 ... +30	100	120	IP56
	POG 9 D 1024	2 x 1024	HTL	12000	+ 9 ... +30	100	120	IP56
	POG 10 D 1024	2 x 1024	HTL	12000	+ 9 ... +30	100	120	IP66
Heidenhain	**ROD 436.001E**	2 x 1024	HTL	16000	+10 ... +30	150	300	IP67

Accessories

Besides the speed encoders specified in the list of options, further types and versions of speed encoders can be obtained and mounted order-specifically by the factory. The technical data and the possible designs and combinations of tachometers or pulse encoders can be found in the catalog`s supply programs of the following manufacturers:

- Baumer Hübner www.baumerhuebner.com
- Hübner Gießen www.huebner-giessen.com
- Heidenhain www.heidenhain.de
- Radio Energie www.radio-energie.fr
- Thalheim www.thalheim.de
- Leine & Linde www.leinelinde.se

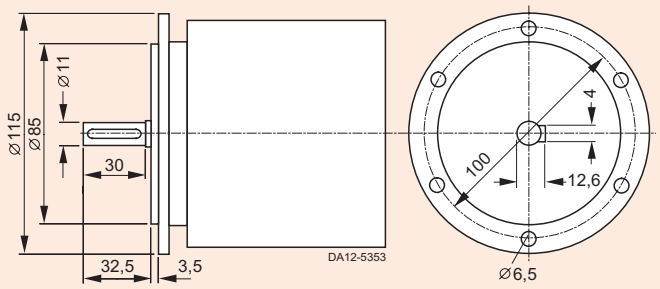
The desired encoder type has to be described precisely and has to be asked for in the factory together with the motor. On ordering, option **Y70** = "tachometer/pulse encoder in special design" has to be specified and additionally in plain text the order and type number as well as the manufacturer. The desired encoders can be obtained and mounted by the factory. Please observe for encoder types with long delivery time that the delivery time for motors can be extended.

Speed encoder mounting prepared

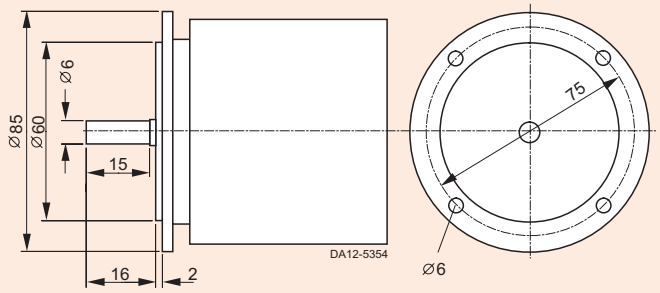
The motors can be delivered without encoder, but with a mounting flange and mounting parts for installation of a speed encoder.

Mounting parts are available for the following encoders:

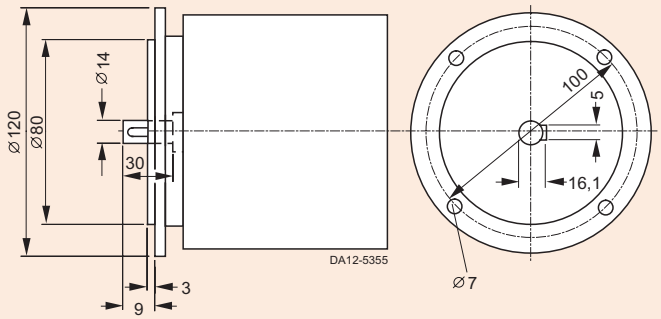
Short code **G75**
Baumer Hübner: OG 9; POG 9; POG10; TDP 0.2 LT
Hübner Gießen: FG4
Radio Energie: REO 444R
Leine & Linde: L&L 850



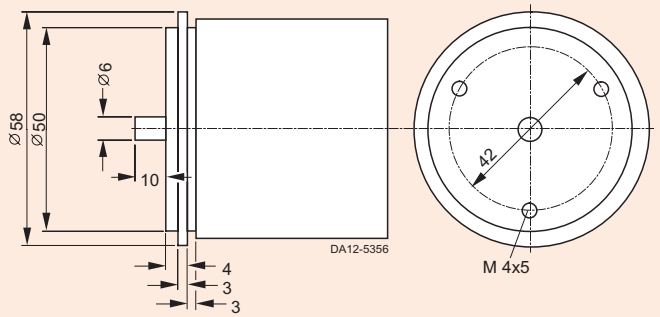
Short code **G76**
Baumer Hübner: TDP 0.09



Short code **G77**
Baumer Hübner: TDP 1.2; GMP 1.0L
(type of construction B5n)



Short code **G78**
Heidenhain: ROD 436



Couplings

Couplings for power transmission are recommended according to catalog MD 10.1.

Brakes

Motors of up to inclusive frame size 280 are available with mounting brake

- frame size 160 with multiple-disk spring-operated brake, manufactured by Binder company www.kendrion-binder.at (degree of protection IP43)
- with dihedral spring pressure brake, manufactured by Stromag www.stromag.com, from frame size 180 upwards (degree of protection IP55, micro switch built in).

The brakes are of the electromagnetic type for dry operation which use the force of an electromagnetic field to offset the braking force exerted by the springs. The spring-operated brakes are applied when de-energized and released when energized. The brake locks the drive in the braked position (holding brake which is activated when no current flows). Please inquire if the emergency stop function is required.

The brakes are designed for a 230 V AC 40 to 60 Hz supply. The silicon rectifier is accommodated in the brake terminal box. 24 V DC supply is possible for frame size 160 (refer to Catalog DA 12 · 2008, section 3 “Selection and Ordering – Options”).

The tables below show the assignment of the brake sizes to the motors as well as the output absorbed by the brake and the brake weight.

The assignment is chosen in a way that the torque of the brake lies within the order of magnitude of the motor torque.

Motors with brake mounting are not available in vibration quantity levels A and B.

A combinated mounting of brake and tachometer (short code **G92**) is only possible for a tachometer/pulse encoder with own bearing, i.e. the pulse encoder ROD 436 from Heidenhain company cannot be mounted in connection with a brake.

The brakes for motors of frame sizes 180 to 280 have a manual release device, which can for example cancel the braking effect manually in the case of a power failure. For motors of frame size 160, a manual release device is offered as an option (short code **K82**, refer to Catalog DA 12 · 2008, section 3 “Selection and Ordering – Options”).

For mounting on the motor	Brakes (short code **G40**)			
	Size	Braking torque	Power consumption	Approx. net weight
		Nm	VA	kg
1GG6 . . . **1GH6 . . .**	Multiple-disk spring-operated brake, type 72 627 C 13 (Binder)			
. . . . 162 **. . . . 164** **. . . . 166**	25	480	190	35
1GG6 . . . **1GH6 . . .** **1HQ6 . . .** **1HS6 . . .**	Dihedral spring pressure brake NFA (Stromag)			
. . . . 186	40/61-6	610	207	50
. . . . 188	63/76-6	760	243	60
. . . . 206 **. . . . 208**	63/96-6	960	243	60
. . . . 226 **. . . . 228**	100/150-6	1500	285	90
. . . . 256 **. . . . 258**	160/220-6	2200	372	160
. . . . 286 **. . . . 288**	250/330-6	3300	452	210

Accessories

Installation and mounting of motors

Sliding rail with fixing bolts and straining screw in accordance with DIN 42923

Sliding rails are used for slight and easy tensioning of a machine belt if there is no belt tensioning roller. They are fixed to the foundation with rag bolts or foundation blocks.

The assignment of the sliding rails to the motor size has to be taken from DIN 42923. For motors from frame size 355, there are no standardized sliding rails.

Source of supply, e.g.:

Lütgert & Co.

www.luetgert-antriebe.de

Foundation blocks in accordance with DIN 799

Foundation blocks are embedded into the stone foundation and grouted in with concrete. They are used for fixing middle sized machines, sliding rails, pedestal bearings, base frames and similar things. After unscrewing the fixing bolts, it is possible to move the machine to any place without having to lift it. On first installation, the foundation blocks, which are screwed down with the machine (without shims) and are provided with taper pins, are not grouted in until the machine is completely adjusted. On this occasion, the machine is set down lower by 2 to 3 mm. Only at the final assembly, the difference in the shaft height is balanced by placing plates underneath. On repeated removal and new installation the taper pins assure the exact position of the machine without renewed alignment.

Source of supply, e.g.:

Lütgert & Co.

www.luetgert-antriebe.de

Taper pins in accordance with DIN 258 with threaded stems and constant taper length

Taper pins are used with parts which are repeatedly unlatched. The drilling is rubbed out conically with a taper reamer until the pin can be pressed in manually so that the flat taper point lies approx. 3 to 4 mm above the edge of the hole. By driving the pin in with a hammer, the right position is reached. By unscrewing and driving in the nut, the pin can be taken out of the drilling again. Standardized taper pins are available at your specialist dealer.

Source of supply, e.g.:

Otto Roth GmbH & Co. KG

www.ottoroth.de

Spare parts

On ordering spare parts, the following details are required:

- Designation and part number
- Order No. and works serial number of the motor

For standard parts, there is no spare parts duty.

Documentation

The following technical documentation is included in the delivery of the motors:

- Operating manual on CD in German, English, French, Spanish, Italian, Swedish and Russian
- Inspection sheet (German/English)

A preliminary documentation either in German, English, French, Spanish, Italian, Swedish or Russian is delivered when ordering:

- Operating manual in PDF format
- Motor data sheet
- Spare parts list (only German)
- Obligatory dimension (only English/German)

Shipping data

Packaging tares for overland and sea transportation

Motor type	For overland transportation Type of construction IM B3		For sea transportation Type of construction IM B3
	In carton		In box
	On studs	In crate	In box
1GH6	Tare kg	Tare kg	Tare kg
.... 162 to 166	10	30	65
.... 186	24	40	80
.... 188	24	40	90
.... 206	26	46	125
.... 208	26	46	130
.... 226	28	50	145
.... 228	28	50	148
.... 256	30	52	158
.... 258	30	52	162
.... 286	34	60	180
.... 288	34	60	184

Packaging tares for larger motors on request.

Subject index

Subject index

Notes

Catalogs of the Automation and Drives Group (A&D)

Further information can be obtained from our branch offices listed in the appendix or at www.siemens.com/automation/partner

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• The Offline Mall of Automation and Drives	CA 01
Automation Systems for Machine Tools	
SINUMERIK & SIMODRIVE	NC 60
SINUMERIK & SINAMICS	NC 61
Drive Systems	
Variable-Speed Drives	
SINAMICS G110/SINAMICS G120 Inverter Chassis Units SINAMICS G120D Distributed Frequency Inverters	D 11.1
SINAMICS G130 Drive Converter Chassis Units, SINAMICS G150 Drive Converter Cabinet Units	D 11
SINAMICS GM150/SINAMICS SM150 Medium-Voltage Converters	D 12
SINAMICS S120 Drive Converter Systems	D 21.1
SINAMICS S150 Drive Converter Cabinet Units	D 21.3
Asynchronous Motors Standardline	D 86.1
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SIMOREG K 6RA22 Analog Chassis Converters	DA 21.2
PDF: SIMOREG DC MASTER 6RM70 Digital Converter Cabinet Units	*DA 22*
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Synchronous and asynchronous servomotors for SIMOVERT MASTERDRIVES	DA 65.3
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Low-Voltage Three-Phase-Motors	
IEC Squirrel-Cage Motors	D 81.1
IEC Squirrel-Cage Motors · New Generation 1LE1	D 81.1 N
PDF: Geared Motors	*M 15*
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• Main Spindle/Feed Motors	
• Converter Systems SIMODRIVE 611/POSMO	
Automation Systems for Machine Tools SINAMICS	NC 61
• Main Spindle/Feed Motors	
• Drive System SINAMICS S120	
Drive and Control Components for Hoisting Equipment	HE 1
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PDF: ALPHA Small Distribution Boards and Distribution Boards, Terminal Blocks	*ET A1*
PDF: ALPHA 8HP Molded-Plastic Distribution System	*ET A3*
PDF: BETA Low-Voltage Circuit Protection	*ET B1*
PDF: DELTA Switches and Socket Outlets	*ET D1*
GAMMA Building Controls	ET G1
Human Machine Interface Systems SIMATIC HMI	ST 80

	Catalog
Industrial Communication for Automation and Drives	IK PI
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Controls and Distribution – Technical Information SIRIUS, SENTRON, SIVACON	LV 1 T
SIDAC Reactors and Filters	LV 60
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SIVACON 8PS Busbar Trunking Systems	LV 70
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Field Instruments for Process Automation Measuring Instruments for Pressure, Differential Pressure, Flow, Level and Temperature, Positioners and Liquid Meters	FI 01
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SIMATIC PCS Process Control System	ST 45
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