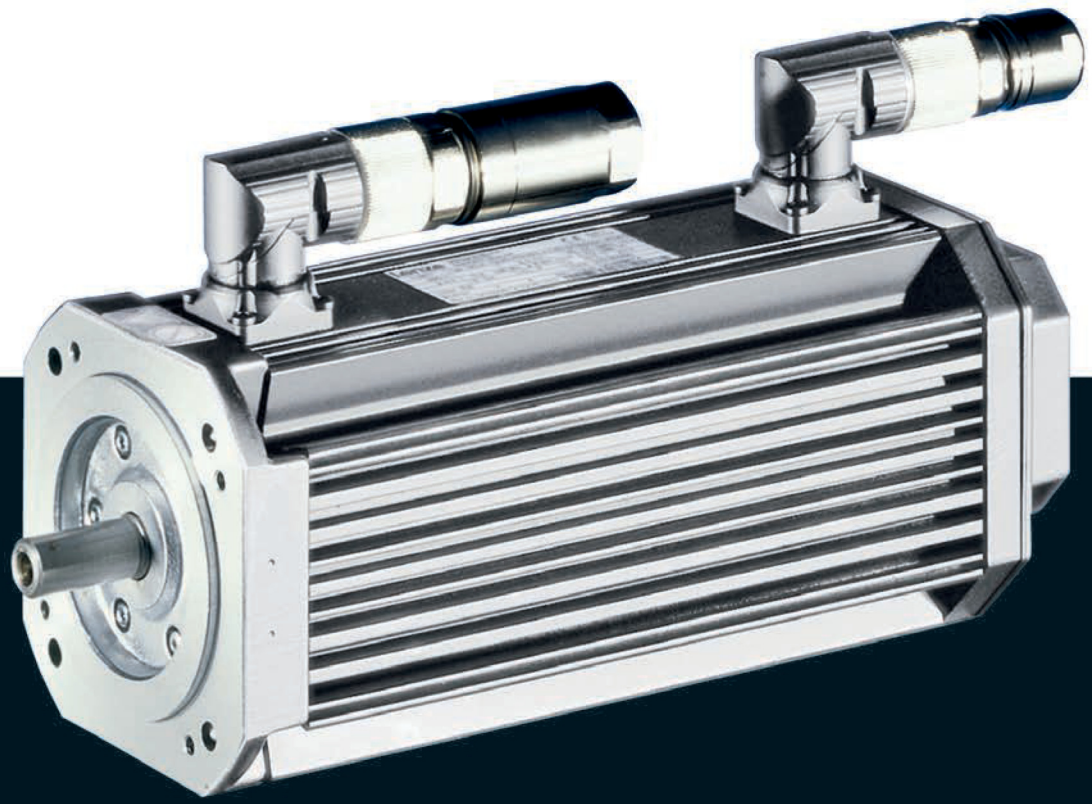
MD□KS synchronous servo motors

2.8 to 52 Nm



MD□KS synchronous servo motors

Contents

List of abbreviations

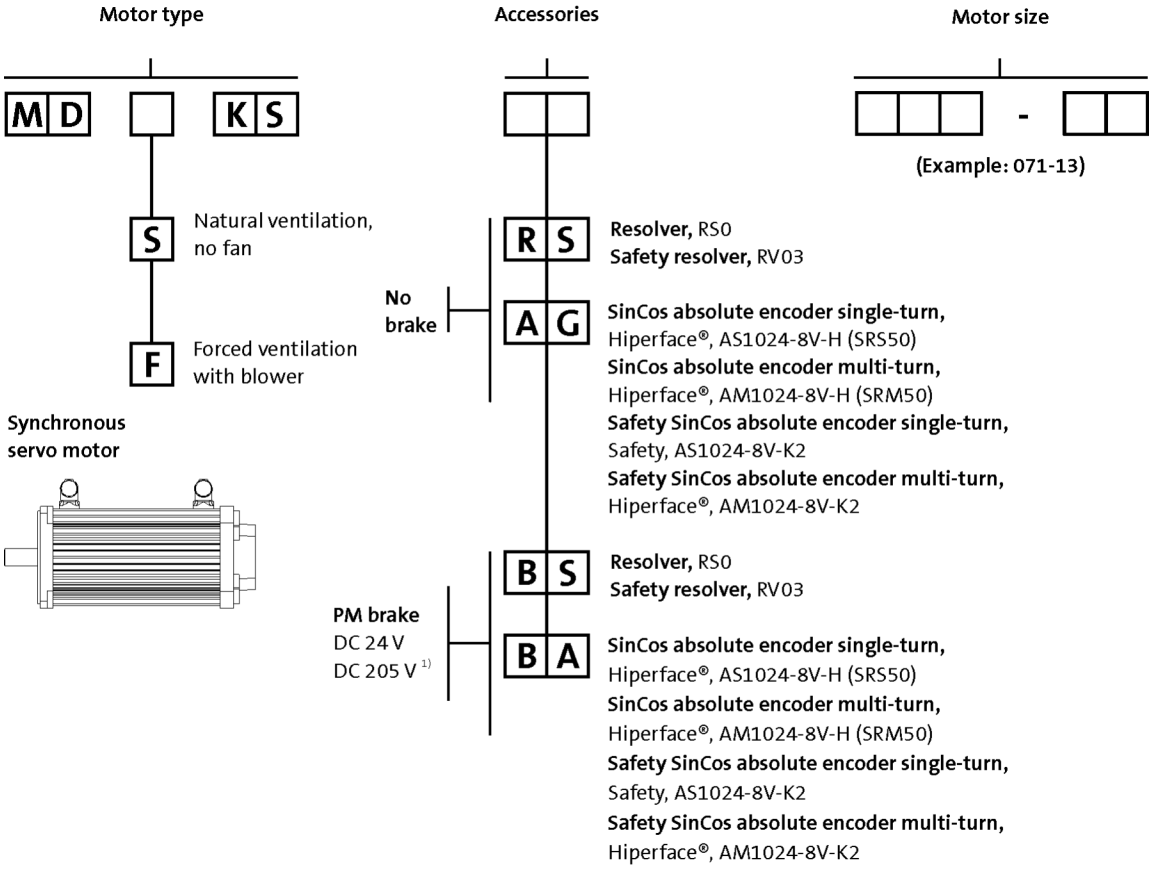
$\eta_{100\,\%}$	[%]	Efficiency
cos ϕ		Power factor
du/dt	[kV/µs]	Insulation resistance
$F_{ax,-}$	[N]	Min. axial force
$F_{ax,+}$	[N]	Max. axial force
$f_{in,max}$	[Hz]	Max. input frequency
f_{max}	[kHz]	Limit frequency
f_{max}	[kHz]	Max. switching frequency
f_N	[Hz]	Rated frequency
F_{rad}	[N]	Max. radial force
H_{max}	[m]	Site altitude
I_0	[A]	Standstill current
I_{max}	[A]	Max. short-time DC-bus current
I_{max}	[A]	Max. current
I_{max}	[A]	Max. current consumption
I_{max}	[A]	Max. current
I_{max}	[A]	Max. DC-bus current
I_N	[A]	Rated current
J	[kgcm²]	Moment of inertia
J_{MB}	[kgcm²]	Moment of inertia
$KE_{LL\,150\,°C}$	[V /(1000 r/min)]	Voltage constant
$Kt_{0\,150\,°C}$	[Nm/A]	Torque constant
L	[mH]	Mutual inductance
$L_{1\sigma}$	[mH]	Stator leakage inductance
$L_{2\sigma}$	[mH]	Rotor leakage inductance
L_N	[mH]	Rated inductance
m	[kg]	Mass
M_0	[Nm]	Stall torque
$M_{0,\,max}$	[Nm]	Max. standstill torque
M_{av}	[Nm]	Average dynamic torque
M_{max}	[Nm]	Max. torque
M_N	[Nm]	Rated torque
n_{eto}	[r/min]	Transition speed
n_k	[r/min]	Speed
n_{max}	[r/min]	Max. speed

n_N	[r/min]	Rated speed
P_N	[kW]	Rated power
Q_E	[J]	Maximum switching energy
R	[Ω]	Insulation resistance
R	[Ω]	Min. insulation resistance
R_1	[Ω]	Stator impedance
R_2	[Ω]	Charging resistor
R_2	[Ω]	Rotor impedance
$R_{UV\,150\,°C}$	[Ω]	Stator impedance
$R_{UV\,20\,°C}$	[Ω]	Stator impedance
$S_{hü}$	[1/h]	Transition operating frequency
T	[°C]	Operating temperature
T	[°C]	Rated temperature
T	[°C]	Max. ambient temperature of bearing
T	[°C]	Max. surface temperature
T	[°C]	Max. ambient temperature for transport
T	[°C]	Min. ambient storage temperature
T	[°C]	Min. ambient temperature for transport
T	[°C]	Ambient temperature
t_1	[ms]	Engagement time
t_2	[ms]	Disengagement time
$T_{opr,max}$	[°C]	Max. ambient operating temperature
$T_{opr,min}$	[°C]	Min. ambient operating temperature
$U_{in,max}$	[V]	Max. input voltage
$U_{in,min}$	[V]	Min. input voltage
U_{max}	[V]	Max. mains voltage
U_{max}	[V]	Min. input voltage
U_{min}	[V]	Min. mains voltage
$U_{N,\,AC}$	[V]	Rated voltage
$U_{N,\,DC}$	[V]	Rated voltage
Z_{ro}	[Ω]	Rotor impedance
Z_{rs}	[Ω]	Impedance
Z_{so}	[Ω]	Stator impedance

List of abbreviations

CE	Communauté Européenne
CSA	Canadian Standards Association
DIN	Deutsches Institut für Normung e.V.
EMC	Electromagnetic compatibility
EN	European standard
EAC	Customs union Russia / Belarus / Kazakhstan certificate
IEC	International Electrotechnical Commission
IM	International Mounting Code
IP	International Protection Code
NEMA	National Electrical Manufacturers Association
UkrSEPRO	Certificate for Ukraine
UL	Underwriters Laboratory Listed Product
UR	Underwriters Laboratory Recognized Product
VDE	Verband deutscher Elektrotechniker (Association of German Electrical Engineers)

Product key



5.3

1) Not possible for UL design.

Ordering details checklist	
Product key	MDSKS... / MDFKS...
Built-on accessories: brake	Without/24 V DC/205 V DC
Motor design	B14 / B5 design
Shaft design	with/without keyway
Enclosure	IP54 / IP65
Motor connection	Circular connector / terminal box...
Colour	RAL 9005 (jet black) / RAL...

8 - Servo motor designs

Product information

An application-oriented structure, low moments of inertia, compact dimensions and a high degree of intrinsic operational reliability characterise these robust and dynamic motors.

Whether naturally ventilated or with blower – in a power range from 1.1 kW to 5.9 kW these servo motors provide rated torque values from 2.8 Nm to 17 Nm with peak torques of up to 52 Nm.
High overload capacity and rapid angular acceleration ensure the best possible dynamic performance, while also guaranteeing excellent smooth running characteristics.
Continuous internal temperature measurement guarantees optimum control behaviour at all times, regardless of the temperature. A reinforced insulation system with thermal reserve (enamel-insulated wire in line with temperature class H, utilisation in line with F) ensures a long service life of the winding. Together with the IP54 protection, the prestressed roller bearings with high temperature-resistant grease guarantee long, maintenance-free operation. Thanks to the compact structure and modular motor concept, the MD□KS motors can be adapted for use with virtually any drive task.

Advantages

- High dynamic performance thanks to low moments of inertia
- Compact size with high power density
- Cooling with or without axial external fan
- Robust regenerative resolver system as standard
- Alternatively, sin/cos encoder for the highest precision
- Easy to install and service friendly thanks to use of SpeedTec connectors
- Optional terminal box
- Protection: IP54, IP65 optional for naturally ventilated motors
- GOST-certified, CE, RoHS-compliant, optionally available in UR
- High maximum speeds
- Wide speed setting range

MDSKA071 synchronous servo motor

Functions and features

	MDSKS□□056	MDSKS□□071	MDFKS□□071
Design			
	B14-FT85 B5-FF100	B14-FT130 B5-FF130	
Shaft end (with and without keyway)			
	14 x 30	19 x 40	
A end shield			
	Not oil-tight		
Brake			
Permanent magnetic brake	DC 24 V AC 230 V [1] DC 205 V [1]		
Speed and angle encoder			
	Resolver SinCos single-turn/multi-turn		
Cooling			
Without blower	Naturally ventilated		
Axial blower, 1 phase			230 V; 50 Hz
Temperature sensor			
Thermal detector	KTY		
Motor connection: plug connector			
	Power + brake Encoder + thermal sensor		Power + brake Encoder + thermal sensor Blower
Motor connection: terminal box			
	Power + brake Encoder + thermal sensor		Power + brake Encoder + thermal sensor + blower
Motor connection: Terminal box + plug connector			
Terminal box	Power + brake Encoder + thermal sensor		
Plug connector			Blower
Shaft bearings			
Bearing type	Deep-groove ball bearing with high-temperature resistant grease, sealing disc or cover plate		
Position of the locating bearing	Drive end Standard motors (B3, B5, B14): side B Motors for gearbox direct mounting: side A		
Colour			
	RAL9005M		

[1] Not possible for UR version.

Dimensioning

Speed-dependent safety functions

Single encoder concepts with resolvers

Servo motors can perform speed-dependent safety functions for safe speed and / or safe relative position monitoring in a drive system with the Servo Drives 9400. The SM301 safety module, which can be integrated in the Servo Drives 9400, is used to implement these functions. When planning systems/installations of this kind, the following must always be observed:

When using just one single feedback system in the environment of these safety applications, the applicable safety engineering standard IEC 61800-5-2 [Adjustable speed electrical power drive systems - Part: 5-2: Safety requirements - Functional] stipulates special requirements for the connection between feedback system and motor shaft. This is due to the fact that two-channel safety systems at this point in the mechanical system are actually designed as single-channel systems. If this mechanical connection is designed with considerable overdimensioning, the standard permits exclusion of the fault "encoder-shaft breakage" or "encoder-shaft slip".
As such, acceleration limit values must not be exceeded for the individual drive solutions. You can find the limit values in the corresponding feedback data of the individual motor ranges.

Speed-dependent safety functions in connection with the SM301 safety module

For the following speed-dependent safety functions, the motor-feedback system combinations listed in the following table are available:
- Safe stop 1 (SS1)
- Safe operational stop (SOS)
- Safely Limited Speed (SLS)
- Safe Maximum Speed (SMS)
- Safe direction (SDI)
- Operation mode selector (OMS) with confirmation (ES)
- Safe speed monitor (SSM)
- Safely limited increment (SLI).

Encoder type	Encoder type	Product key	Feedback	Safe speed monitoring
			Design	
SinCos absolute value	Single-turn	AS1024-8V-K2		PL d/SIL 2
	Multi-turn	AM1024-8V-K2		
Resolver		RV03		PL e/SIL 3
			2-encoder concept	up to PL e / SIL 3

Dimensioning

Cooling effect of mounting flange

Mounting on a thermally conducting / insulating plate or machine chassis has an influence on heating up the motor, particularly when using naturally ventilated motors.

The motor rating data specified in the catalogue applies when mounting on a steel plate with free convection with the following dimensions:
- MDSKS□□036 / 056 / 071: 270 x 270 mm

Vibrational severity

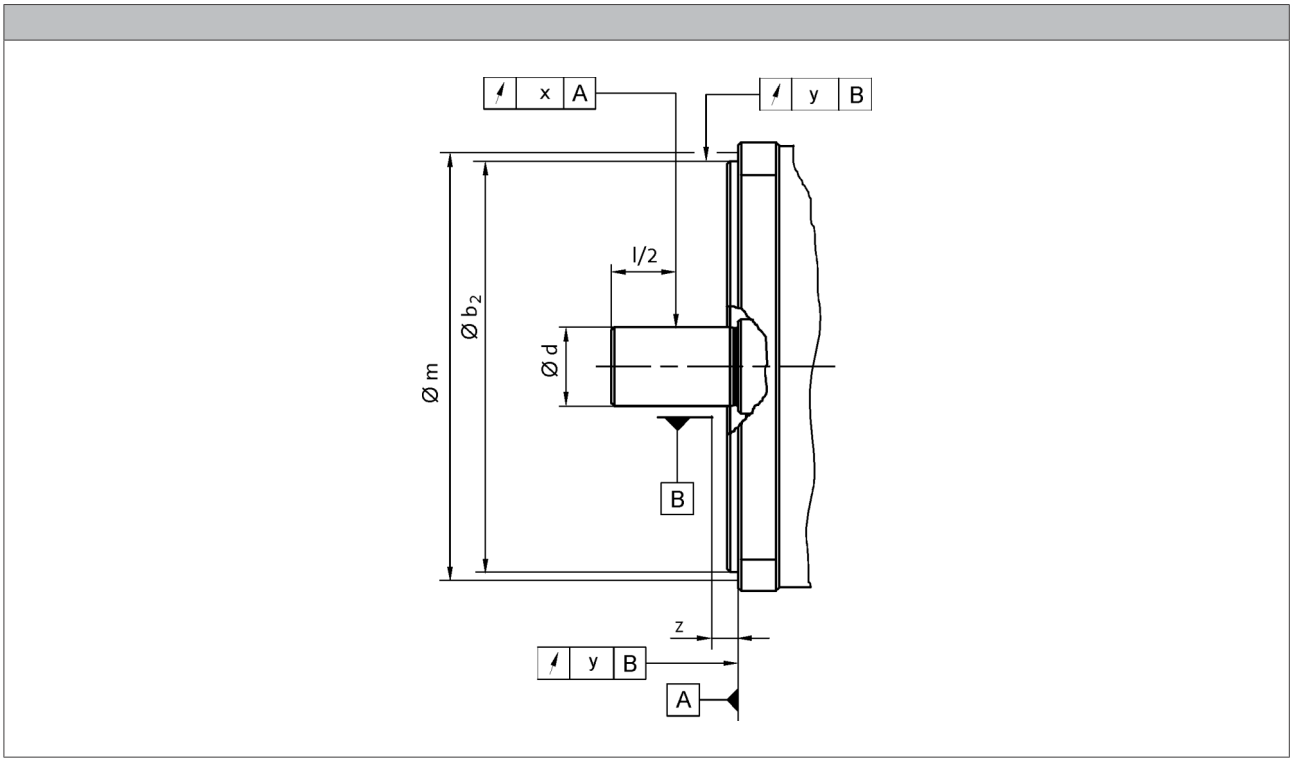
		MDSKS□□056	MDSKS□□071	MDFKS□□071
Vibrational severity				
IEC/EN 60034-14		A		
Maximum r.m.s. value of the vibration velocity [1)]	[mm/s]	1.60		

[1)] Free suspension

► at n = 600 to 3,600 rpm

Dimensioning

Concentricity and axial run-out of the mounting flanges and smooth running of the shaft ends



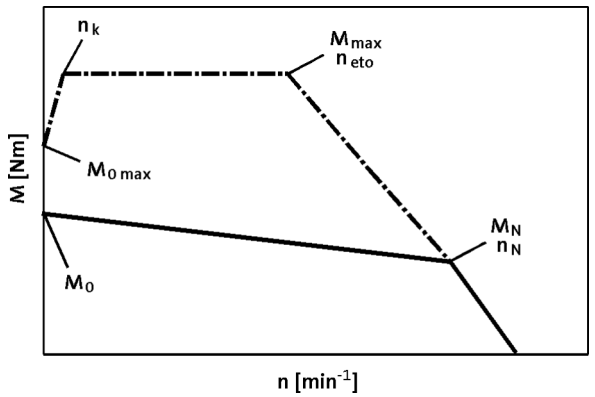
				MDSKS□□056		MDSKS□□071		MDFKS□□071	
Flange size									
				FF100	FT85	FF130	FT130	FF130	FT130
Dimensions									
	b_2	j6	[mm]	80	70	110			
	d	k6	[mm]						
Distance									
Measuring diameter	m		[mm]	113	98.0	149			
Dial gauge holder for flange check	z	+/- 1	[mm]	10.0					
Concentricity									
IEC 60072				Normal class					
Value	y		[mm]	0.080		0.10			
Axial run-out									
IEC 60072				Normal class					
Value	y		[mm]	0.080		0.10			
Smooth running									
IEC 60072				Normal class					
Value	x		[mm]	0.035		0.040			

► Limit values for checking the smooth running of the shaft ends as well as the concentricity and axial run-out of the mounting flange to IEC 60072

Dimensioning

Notes on the selection tables

Graphical display of the operating points



	n_k
	[r/min]
MCS	75.0
MDSKS	100
MDFKS	

Please note:
- In case of an active load (e.g. vertical drive axes, hoists, test benches, unwinders), $M_{0\,max}$ has to be considered
- In case of a passive load (e.g. horizontal drive axes), M_{max} can be usually used
- In case of a speed < n_k and inverter-specifically, the achievable torque $M_{0\,max}$ is smaller than M_{max}
- In case of a speed n = 0, the standstill torque M_0 and the standstill current I_0 have to be reduced by 30% after 2 seconds. In case of applications which require a longer holding of M_0, we recommend the drive to be held via the holding brake and reduce the current, e.g. by controller inhibit.
- In case of servo inverters, the switching frequency dependent overload capacity is considered in the default setting. For more information, see the servo inverter catalogue.

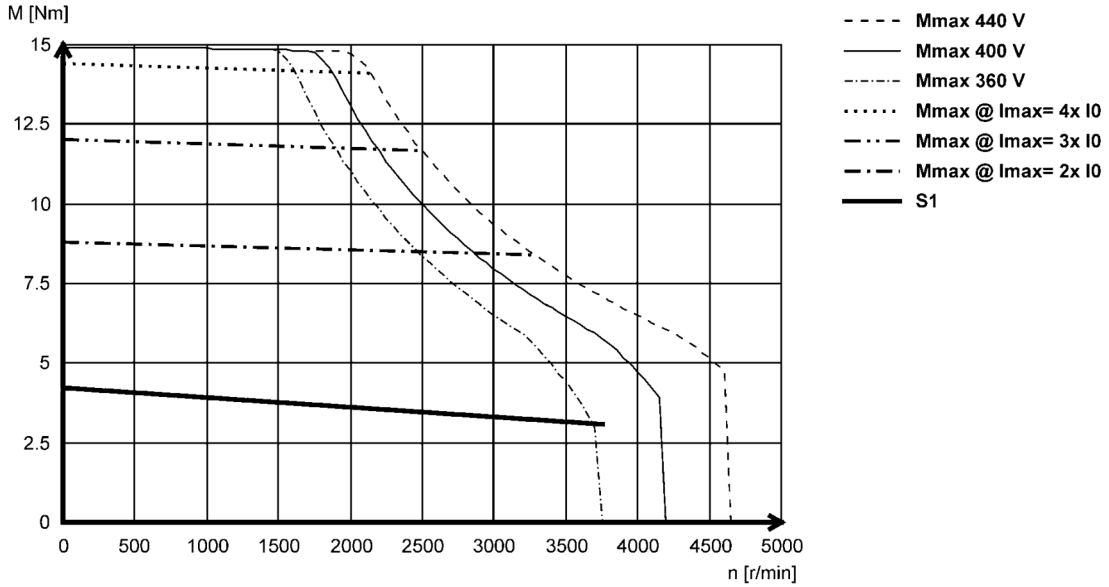
Further selection tables with different switching frequencies are available with the following codes:
- DS_ZT_MCS_0001
- DS_ZT_MCA_0001
- DS_ZT_MDSKS_0001
- DS_ZT_MDFKS_0001

Simply enter this code (e.g. DS_ZT_MCS_0001) as a search string at **www.lenze.de/dsc** and you will be given the information immediately in the form of a PDF format.

Dimensioning

Notes on the torque characteristics

Graph of the torque characteristics



With synchronous servo motors, the limit torque characteristics that result from the selection of servo inverters with maximum currents are also shown alongside the characteristics for continuous operation (S1). These correspond to a multiple of the motor standstill current (2x I0 to 4x I0).

Characteristics in the Internet

Torque characteristics for selectable motor/inverter combinations can be determined in the EASY Product Finder in the Internet. The S1 continuous characteristic and the max. limit characteristic are generated. The result can be saved or printed in a PDF protocol. In the EASY Explorer, available torque characteristics are provided automatically.

Further information on the terms switching frequency and default setting can be found in the respective operating instructions of the servo inverter.

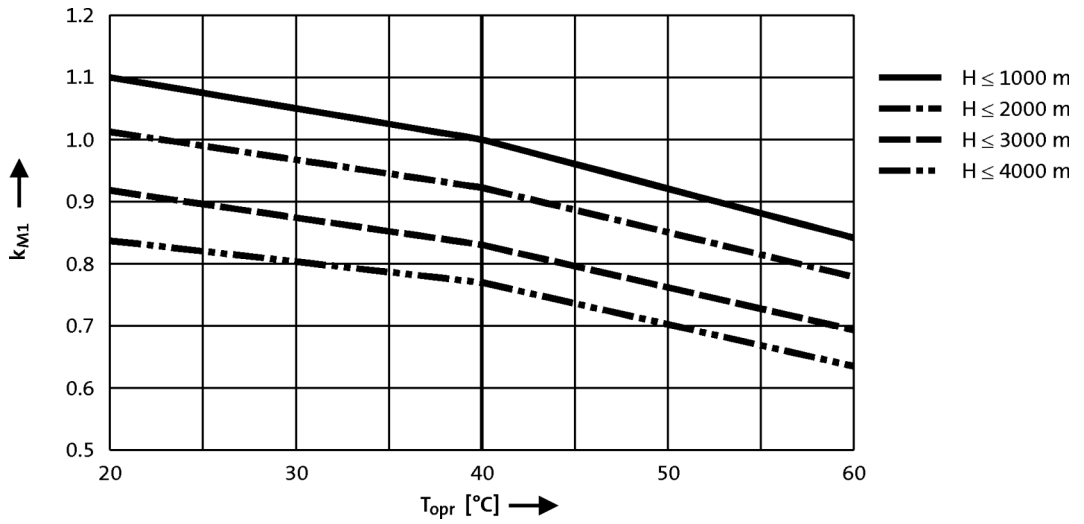
Dimensioning

Influence of ambient temperature and site altitude

The information relating to the servo motors in the tables and graphs is valid for a maximum ambient temperature (T_{opr}) of 40 °C and a site altitude (H) up to 1000 m above sea level. The torque correction factor (k_{M1}) shall be applied to the S1 torque characteristic (M_0...M_N) in the event of differing installation conditions.

- The maximum permissible ambient temperature (T_{opr}) for servo motors with blowers is 40 °C

Torque correction factor k_{m1}



5.3

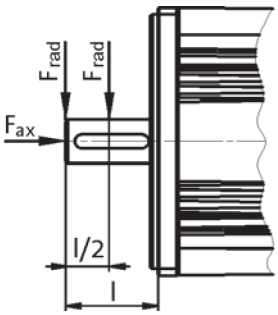
Standards and operating conditions

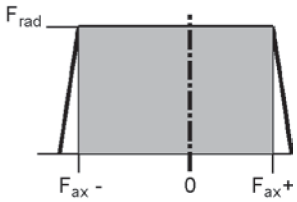
			MDSKS	MDFKS
Cooling type				
			Naturally ventilated	Blower
Degree of protection				
EN 60529			IP54 IP65	IP54
Temperature class				
IEC/EN 60034-1; utilisation			F	
IEC/EN 60034-1; insulation system (enamel-insulated wire)			H	
Conformity				
CE			Low-Voltage Directive	
			2006/95/EC	
EAC			TP TC 004/2011 (TR CU 004/2011)	
Approval				
			UkrSEPRO	
CSA [1]			CSA 22.2 No. 100	
cURus [1]			UL 1004-1 UL 1004-6 Power Conversion Equipment (File-No. E210321)	
Max. voltage load				
IEC/TS 60034-25			Pulse voltage limiting curve A	
Smooth running				
IEC 60072			Normal class	
Axial run-out				
IEC 60072			Normal class	
Concentricity				
IEC 60072			Normal class	
Mechanical ambient conditions (vibration)				
IEC/EN 60721-3-3			3M6	
Min. ambient operating temperature				
Without brake	$T_{opr,min}$	[°C]	-20	-15
With brake	$T_{opr,min}$	[°C]	-10	
Max. ambient operating temperature				
	$T_{opr,max}$	[°C]	40	
Max. surface temperature				
	T	[°C]	140	110
Mechanical tolerance				
Flange centring diameter			$b_2 \leq 230$ mm = j6 $b_2 > 230$ mm = h6	
Shaft diameter			d ≤ 50 mm = k6 d > 50 mm = m6	
Site altitude				
Amsl	H_{max}	[m]	4000	

[1] Optional on request.

Permissible radial and axial forces

Application of forces





Application of force at l/2

Bearing service life L_{10}															
	5000 h			10000 h			20000 h			30000 h			50000 h		
	F_{rad} [N]	$F_{ax,-}$ [N]	$F_{ax,+}$ [N]	F_{rad} [N]	$F_{ax,-}$ [N]	$F_{ax,+}$ [N]	F_{rad} [N]	$F_{ax,-}$ [N]	$F_{ax,+}$ [N]	F_{rad} [N]	$F_{ax,-}$ [N]	$F_{ax,+}$ [N]	F_{rad} [N]	$F_{ax,-}$ [N]	$F_{ax,+}$ [N]
MDSKS□□056	590	-90	280	470	-40	230	370	0	190	310	10	180	220	10	180
MDSKS□□071	910	-50	520	700	20	450	430	20	450		20	450	50	-50	520
MDFKS□□071															

Application of force at l

5.3

Bearing service life L_{10}															
	5000 h			10000 h			20000 h			30000 h			50000 h		
	F_{rad} [N]	$F_{ax,-}$ [N]	$F_{ax,+}$ [N]	F_{rad} [N]	$F_{ax,-}$ [N]	$F_{ax,+}$ [N]	F_{rad} [N]	$F_{ax,-}$ [N]	$F_{ax,+}$ [N]	F_{rad} [N]	$F_{ax,-}$ [N]	$F_{ax,+}$ [N]	F_{rad} [N]	$F_{ax,-}$ [N]	$F_{ax,+}$ [N]
MDSKS□□056	550	-90	280	430	-40	230	340	0	190	290	10	180	200	10	180
MDSKS□□071	820	-50	520	630	20	450	390	20	450	280	20	450	40	-50	520
MDFKS□□071															

► The values for the bearing service life L_{10} refer to an average speed of 4000 r/min. Depending on the ambient temperatures, the service life of the bearings is also reduced by the grease lifetime.

Rated data, non-ventilated

► The data applies to a mains connection voltage of 3 x 400 V.

	n_N	M_0	M_N	M_{max}	P_N	I_0	I_N	I_{max}	$U_{N, AC}$	f_N
	[r/min]	[Nm]	[Nm]	[Nm]	[kW]	[A]	[A]	[A]	[V]	[Hz]
MDSKS□□056-23	3800	3.20	2.80	11.6	1.10	2.60	2.30	10.0	330	190
MDSKS□□056-33	4000	4.70	4.20	17.2	1.80	4.00	3.60	16.0	325	200
MDSKS□□071-03	3400	6.70	5.70	23.6	2.00	4.90	4.20	19.0	330	170
MDSKS□□071-13	3700	10.0	8.30	35.2	3.20	8.40	7.00	32.0	325	185
MDSKS□□071-33	3600	14.7	12.3	52.0	4.60	11.9	10.0	45.0	325	180

	$\eta_{100\,\%}$	J [1]	$KE_{LL\,150\,°C}$	$R_{UV\,20\,°C}$	$R_{UV\,150\,°C}$	L_N	$Kt_{0\,150\,°C}$	n_{max} [2]	m [1]
	[%]	[kgcm²]	[V /(1000 r/min)]	[Ω]	[Ω]	[mH]	[Nm/A]	[r/min]	[kg]
MDSKS□□056-23	85.0	1.20	78.1	10.1	13.6	17.1	1.23	5500	5.30
MDSKS□□056-33	87.0	1.80	74.6	5.10	6.90	10.8	1.18	5500	6.30
MDSKS□□071-03	85.0	6.00	93.0	3.40	4.60	10.6	1.37	5000	8.90
MDSKS□□071-13	82.0	8.00	84.5	1.50	2.10	5.30	1.19	5000	10.9
MDSKS□□071-33	82.0	10.0	88.2	1.10	1.60	5.80	1.24	5000	13.0

[1] Without brake.
[2] Mechanically permissible maximum speed.

Rated data, forced ventilated

► The data applies to a mains connection voltage of 3 x 400 V.

	n_N	M_0	M_N	M_{max}	P_N	I_0	I_N	I_{max}	$U_{N, AC}$	f_N
	[r/min]	[Nm]	[Nm]	[Nm]	[kW]	[A]	[A]	[A]	[V]	[Hz]
MDFKS□□071-03	3300	8.80	7.50	23.6	2.60	6.60	5.60	19.0	330	165
MDFKS□□071-13	3600	13.3	11.0	35.2	4.10	11.1	9.20	32.0	325	180
MDFKS□□071-33	3500	19.3	16.2	52.0	5.90	15.6	13.1	45.0	325	175

	$\eta_{100\,\%}$	J [1]	$KE_{LL\,150\,°C}$	$R_{UV\,20\,°C}$	$R_{UV\,150\,°C}$	L_N	$Kt_{0\,150\,°C}$	n_{max} [2]	m [1]
	[%]	[kgcm²]	[V /(1000 r/min)]	[Ω]	[Ω]	[mH]	[Nm/A]	[r/min]	[kg]
MDFKS□□071-03	81.0	6.00	93.0	3.40	4.60	10.6	1.33	5000	10.2
MDFKS□□071-13	79.0	8.00	84.5	1.50	2.10	5.30	1.20	5000	12.2
MDFKS□□071-33	80.0	10.0	88.2	1.10	1.60	5.80	1.24	5000	12.2

[3] Without brake.
[4] Mechanically permissible maximum speed.

Selection tables, Servo Drives 9400 HighLine

Non-ventilated motors

► The data applies to a mains connection voltage of 3 x 400 V and an inverter switching frequency of 4 kHz.

					E94A□□	E0024	E0034	E0044	E0074	E0094	E0134	E0174
					I_N	1.9	3.1	5.0	8.8	11.7	16.3	20.6
					$I_{0,max}$	6.0	10.0	16.0	21.0	28.0	39.0	49.5
MDSKS	M_N	n_N	I_N	P_N	I_{max}	6.0	10.0	16.0	21.0	28.0	39.0	49.5
056-23	2.8	3800	2.3	1.10	M_0	2.3	3.2					
					M_N	2.3	2.8					
					$M_{0,max}$	7.5	11.6					
					M_{max}	7.5	11.6					
					n_{eto}	-	-					
056-33	4.2	4000	3.6	1.80	M_0		3.6	4.7				
					M_N		3.6	4.2				
					$M_{0,max}$		12.0	17.2				
					M_{max}		12.0	17.2				
					n_{eto}		-	-				
071-03	5.7	3400	4.2	2.00	M_0		4.2	6.7	6.7			
					M_N		4.2	5.7	5.7			
					$M_{0,max}$		15.2	21.4	23.6			
					M_{max}		15.2	21.4	23.6			
					n_{eto}		-	-	-			
071-13	8.3	3700	7.0	3.20	M_0			6.0	10.0	10.0	10.0	
					M_N			5.9	8.3	8.3	8.3	
					$M_{0,max}$			22.0	27.1	32.7	35.2	
					M_{max}			22.0	27.1	32.7	35.2	
					n_{eto}			-	-	-	-	
071-33	12.3	3600	10.0	4.60	M_0				10.9	14.3	14.7	14.7
					M_N				10.8	12.3	12.3	12.3
					$M_{0,max}$				31.2	38.9	48.3	52.0
					M_{max}				31.2	38.9	48.3	52.0
					n_{eto}				-	-	-	-

► I... [A], M... [Nm], n... [r/min], P... [kW]

Selection tables, Servo Drives 9400 HighLine

Forced ventilated IP54 motors

► The data applies to a mains connection voltage of 3 x 400 V and an inverter switching frequency of 4 kHz.

					E94A□□	E0044	E0074	E0094	E0134	E0174
					I_N	5.0	8.8	11.7	16.3	20.6
					$I_{0,max}$	16.0	21.0	28.0	39.0	49.5
MDFKS	**M_N**	**n_N**	**I_N**	**P_N**	I_{max}	16.0	21.0	28.0	39.0	49.5
071-03	7.5	3300	5.6	2.60	M_0	6.7	8.8			
					M_N	6.7	7.5			
					$M_{0,max}$	21.6	23.6			
					M_{max}	21.6	23.6			
					n_{eto}	-	-			
071-13	11.0	3600	9.2	4.10	M_0		10.5	13.3	13.3	
					M_N		10.5	11.0	11.0	
					$M_{0,max}$		27.8	33.1	35.2	
					M_{max}		27.8	33.1	35.2	
					n_{eto}		-	-	-	
071-33	16.2	3500	13.1	5.90	M_0			14.4	19.3	19.3
					M_N			14.3	16.2	16.2
					$M_{0,max}$			40.0	48.8	52.0
					M_{max}			40.0	48.8	52.0
					n_{eto}			-	-	-

► I... [A], M... [Nm], n... [r/min], P... [kW]

Selection tables, Inverter Drives 8400 TopLine

Non-ventilated motors

► The data applies to a mains connection voltage of 3 x 400 V and an inverter switching frequency of 8 kHz.

					E84AVTC	□5514	□7514	□1124	□1524	□2224	□3024	□4024	□5524	□7524	□1134	□1534
					I_N	1.8	2.4	3.2	3.9	5.9	7.3	9.5	13.0	16.5	23.5	32.0
					$I_{0,max}$	2.7	3.6	4.8	5.9	8.4	11.0	14.3	19.5	26.4	32.9	43.2
MDSKS	M_N	n_N	I_N	P_N	I_{max}	3.6	4.8	6.4	7.8	11.2	14.6	19.0	26.0	33.0	47.0	64.0
056-23	2.8	3800	2.3	1.10	M_0	2.4	3.1	3.2	3.2	3.2	3.2					
					M_N	2.2	2.8	2.8	2.8	2.8	2.8					
					$M_{0,max}$	4.6	6.2	8.0	9.8	11.6	11.6					
					M_{max}	4.6	6.2	8.0	9.8	11.6	11.6					
					n_{eto}	-	-	-	-	-	-					
056-33	4.2	4000	3.6	1.80	M_0			4.1	4.6	4.7	4.7	4.7	4.7			
					M_N			3.7	4.2	4.2	4.2	4.2	4.2			
					$M_{0,max}$			8.2	10.0	14.0	17.2	16.8	17.2			
					M_{max}			8.2	10.0	14.0	17.2	16.8	17.2			
					n_{eto}			-	-	-	-	-	-			
071-03	5.7	3400	4.2	2.00	M_0			4.3	5.3	6.7	6.7	6.7	6.7			
					M_N			4.3	5.3	5.7	5.7	5.7	5.7			
					$M_{0,max}$			10.5	12.8	17.8	22.0	23.0	23.6			
					M_{max}			10.5	12.8	17.8	22.0	23.0	23.6			
					n_{eto}			-	-	-	-	-	-			
071-13	8.3	3700	7.0	3.20	M_0					7.0	8.7	10.0	10.0	10.0	10.0	
					M_N					7.0	8.7	8.3	8.3	8.3	8.3	
					$M_{0,max}$					17.4	21.6	25.0	29.3	29.3	29.3	
					M_{max}					17.4	21.6	25.0	34.3	35.2	35.2	
					n_{eto}					-	-	-	-	-	-	
071-33	12.3	3600	10.0	4.60	M_0							14.0	14.7	14.7	14.7	14.7
					M_N							11.7	12.3	12.3	12.3	12.3
					$M_{0,max}$							28.5	39.1	42.7	42.7	42.7
					M_{max}							28.5	39.1	52.0	52.0	52.0
					n_{eto}							-	-	-	-	-

► I... [A], M... [Nm], n... [r/min], P... [kW]

Selection tables, Inverter Drives 8400 TopLine

Forced ventilated IP54 motors

► The data applies to a mains connection voltage of 3 x 400 V and an inverter switching frequency of 8 kHz.

					E84AVTC	□1124	□1524	□2224	□3024	□4024	□5524	□7524	□1134	□1534
					I_N	3.2	3.9	5.9	7.3	9.5	13.0	16.5	23.5	32.0
					$I_{0,max}$	4.8	5.9	8.4	11.0	14.3	19.5	26.4	32.9	43.2
MDFKS	**M_N**	**n_N**	**I_N**	**P_N**	I_{max}	6.4	7.8	11.2	14.6	19.0	26.0	33.0	47.0	64.0
071-03	7.5	3300	5.6	2.60	M_0	4.3	5.2	8.8	8.8	8.8	8.8			
					M_N	4.3	5.2	7.5	7.5	7.5	7.5			
					$M_{0,max}$	8.6	10.4	18.3	22.7	23.0	23.6			
					M_{max}	8.6	10.4	18.3	22.7	23.0	23.6			
					n_{eto}	-	-	-	-	-	-			
071-13	11.0	3600	9.2	4.10	M_0			7.1	8.8	13.3	13.3	13.3	13.3	
					M_N			7.1	8.8	11.0	11.0	11.0	11.0	
					$M_{0,max}$			14.2	17.5	25.7	29.9	29.9	29.3	
					M_{max}			14.2	17.5	25.7	35.2	35.2	35.2	
					n_{eto}			-	-	-	-	-	-	
071-33	16.2	3500	13.1	5.90	M_0					11.8	16.1	19.3	19.3	19.3
					M_N					11.8	16.1	16.2	16.2	16.2
					$M_{0,max}$					29.7	40.7	43.6	43.6	43.6
					M_{max}					29.7	40.7	52.0	52.0	52.0
					n_{eto}					-	-	-	-	-

► I... [A], M... [Nm], n... [r/min], P... [kW]

Selection tables, Servo Drives ECS

Non-ventilated motors

► The data applies to a mains connection voltage of 3 x 400 V and an inverter switching frequency of 4 kHz.

					ECS□□	008C□B	016C□B	032C□B	048C□B
					I_N	4.0	8.0	12.7	17.0
					$I_{0,max}$	4.6	9.1	18.1	27.2
MDSKS	M_N	n_N	I_N	P_N	I_{max}	8.0	16.0	32.0	48.0
056-23	2.8	3800	2.3	1.10	M_0	3.2	3.2		
					M_N	2.8	2.8		
					$M_{0,max}$	5.9	10.7		
					M_{max}	9.6	11.6		
					n_{eto}	2816	2452		
056-33	4.2	4000	3.6	1.80	M_0	4.7	4.7		
					M_N	4.2	4.2		
					$M_{0,max}$	5.4	11.1		
					M_{max}	9.9	17.2		
					n_{eto}	3620	2705		
071-03	5.7	3400	4.2	2.00	M_0	5.5	6.7		
					M_N	5.4	5.7		
					$M_{0,max}$	6.2	14.1		
					M_{max}	12.7	21.4		
					n_{eto}	3177	2750		
071-13	8.3	3700	7.0	3.20	M_0		9.5	10.0	
					M_N		8.3	8.3	
					$M_{0,max}$		10.8	24.3	
					M_{max}		22.0	35.2	
					n_{eto}		3517	3000	
071-33	12.3	3600	10.0	4.60	M_0		9.9	14.7	14.7
					M_N		9.8	12.3	12.3
					$M_{0,max}$		11.2	27.6	38.1
					M_{max}		24.8	42.7	52.0
					n_{eto}		3368	2840	2350

► I... [A], M... [Nm], n... [r/min], P... [kW]

Selection tables, Servo Drives ECS

Forced ventilated IP54 motors

► The data applies to a mains connection voltage of 3 x 400 V and an inverter switching frequency of 4 kHz.

					ECS□□	008C□B	016C□B	032C□B	048C□B
					I_N	4.0	8.0	12.7	17.0
					$I_{0,max}$	4.6	9.1	18.1	27.2
MDFKS	**M_N**	**n_N**	**I_N**	**P_N**	I_{max}	8.0	16.0	32.0	48.0
071-03	7.5	3300	5.6	2.60	M_0	5.3	8.8		
					M_N	5.4	7.5		
					$M_{0,max}$	6.2	14.6		
					M_{max}	13.2	21.6		
					n_{eto}	3177	2750		
071-13	11.0	3600	9.2	4.10	M_0		9.6	13.3	
					M_N		9.6	11.0	
					$M_{0,max}$		10.9	25.0	
					M_{max}		22.8	35.2	
					n_{eto}		3517	3000	
071-33	16.2	3500	13.1	5.90	M_0			15.7	19.3
					M_N			15.7	16.2
					$M_{0,max}$			22.4	39.2
					M_{max}			43.6	52.0
					n_{eto}			2840	2350

► I... [A], M... [Nm], n... [r/min], P... [kW]

Selection tables, Servo Inverter 9300

Non-ventilated motors

► The data applies to a mains connection voltage of 3 x 400 V and an inverter switching frequency of 8 kHz.

					EVS	9322-E□	9323-E□	9324-E□	9325-E□	9326-E□	9327-E□
					I_N	2.5	3.9	7.0	13.0	23.5	32.0
					$I_{0,max}$	3.8	5.9	10.5	19.5	23.5	32.0
MDSKS	M_N	n_N	I_N	P_N	I_{max}	3.8	5.9	10.5	19.5	35.3	48.0
056-23	2.8	3800	2.3	1.10	M_0	3.1	3.2	3.2			
					M_N	2.8	2.8	2.8			
					$M_{0,max}$	4.9	7.4	11.6			
					M_{max}	4.9	7.4	11.6			
					n_{eto}	3601	3248	2452			
056-33	4.2	4000	3.6	1.80	M_0		4.6	4.7	4.7		
					M_N		4.2	4.2	4.2		
					$M_{0,max}$		7.6	12.5	17.2		
					M_{max}		7.6	12.5	17.2		
					n_{eto}		3834	3360	2455		
071-03	5.7	3400	4.2	2.00	M_0		5.3	6.7	6.7		
					M_N		5.3	5.7	5.7		
					$M_{0,max}$		9.7	15.8	23.6		
					M_{max}		9.7	15.8	23.6		
					n_{eto}		3291	3047	2500		
071-13	8.3	3700	7.0	3.20	M_0			8.3	10.0	10.0	
					M_N			8.3	8.3	8.3	
					$M_{0,max}$			15.5	25.7	29.3	
					M_{max}			15.5	25.7	35.2	
					n_{eto}			3690	3418	3000	
071-33	12.3	3600	10.0	4.60	M_0				14.7	14.7	14.7
					M_N				12.3	12.3	12.3
					$M_{0,max}$				29.3	34.1	42.7
					M_{max}				29.3	45.4	52.0
					n_{eto}				3252	2716	2350

► I... [A], M... [Nm], n... [r/min], P... [kW]

Selection tables, Servo Inverter 9300

Forced ventilated IP54 motors

► The data applies to a mains connection voltage of 3 x 400 V and an inverter switching frequency of 8 kHz.

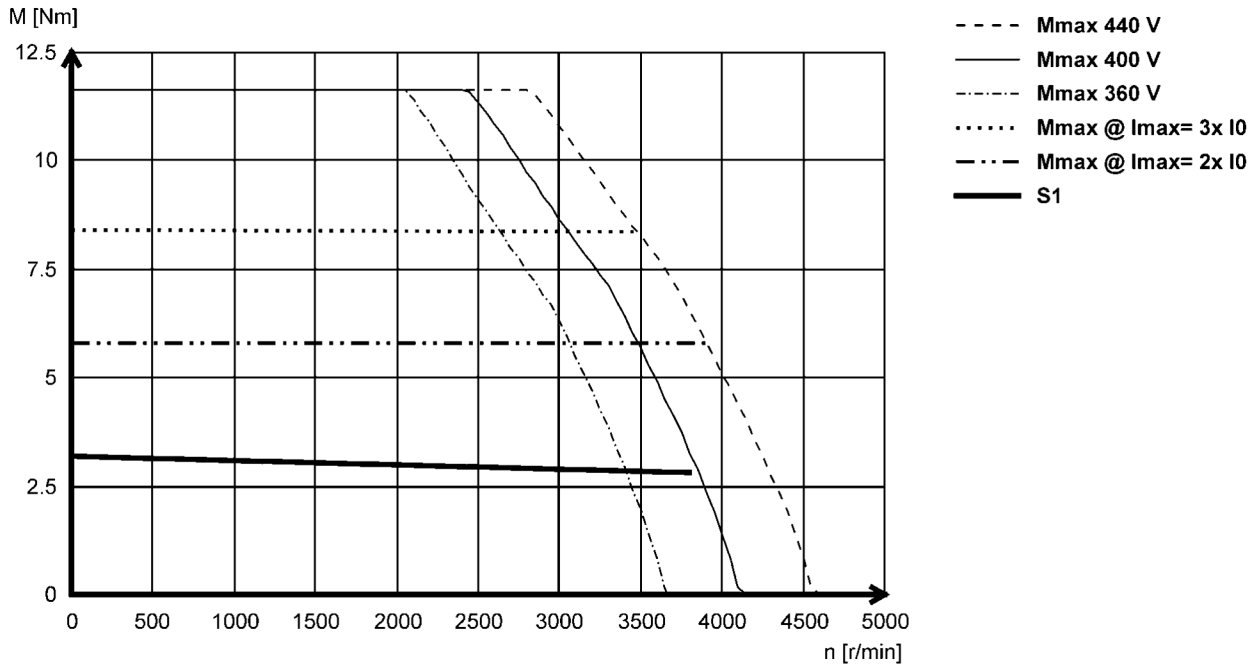
					EVS	9323-E□	9324-E□	9325-E□	9326-E□	9327-E□
					I_N	3.9	7.0	13.0	23.5	32.0
					$I_{0,max}$	5.9	10.5	19.5	23.5	32.0
MDFKS	M_N	n_N	I_N	P_N	I_{max}	5.9	10.5	19.5	35.3	48.0
071-03	7.5	3300	5.6	2.60	M_0	5.2	8.8	8.8		
					M_N	5.2	7.5	7.5		
					$M_{0,max}$	7.9	16.3	23.6		
					M_{max}	7.9	16.3	23.6		
					n_{eto}	3291	3047	2500		
071-13	11.0	3600	9.2	4.10	M_0		8.4	13.3	13.3	
					M_N		8.4	11.0	11.0	
					$M_{0,max}$		12.6	26.4	29.9	
					M_{max}		12.6	26.4	35.2	
					n_{eto}		3690	3418	3000	
071-33	16.2	3500	13.1	5.90	M_0			16.1	19.3	19.3
					M_N			16.1	16.2	16.2
					$M_{0,max}$			30.5	35.2	43.6
					M_{max}			30.5	46.2	52.0
					n_{eto}			3252	2716	2350

► I... [A], M... [Nm], n... [r/min], P... [kW]

Torque characteristics

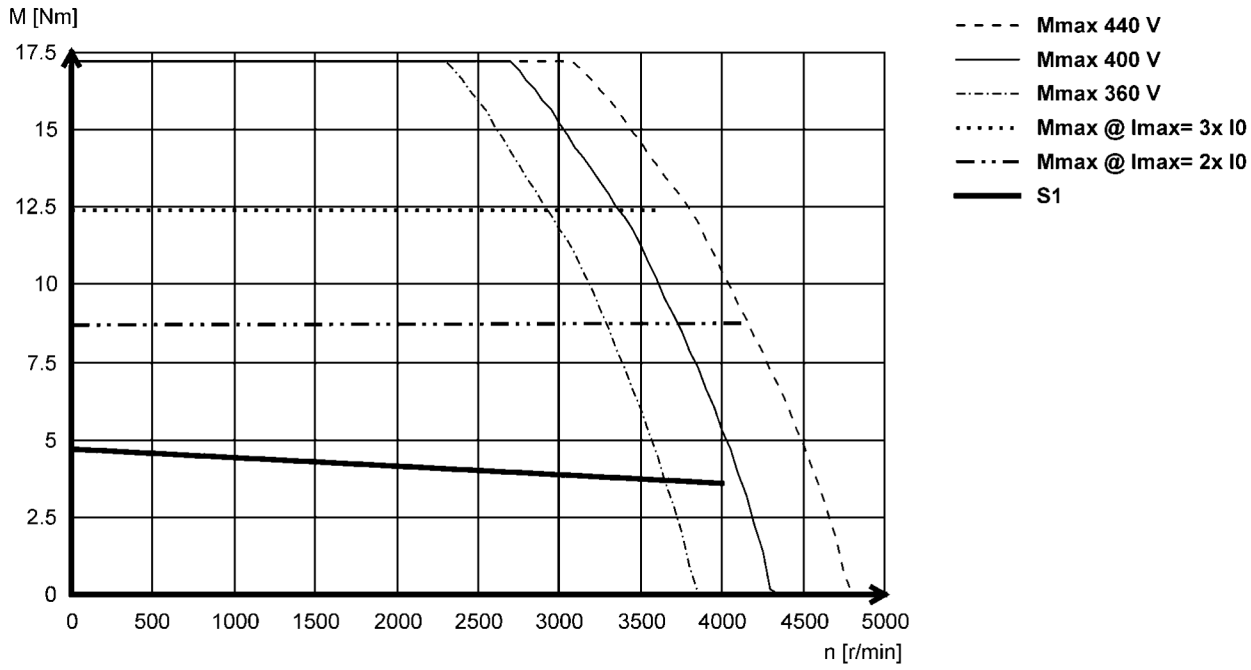
► The data applies to a mains connection voltage of 3 x 400 V.

MDSKS□□056-23 (non-ventilated)



5.3

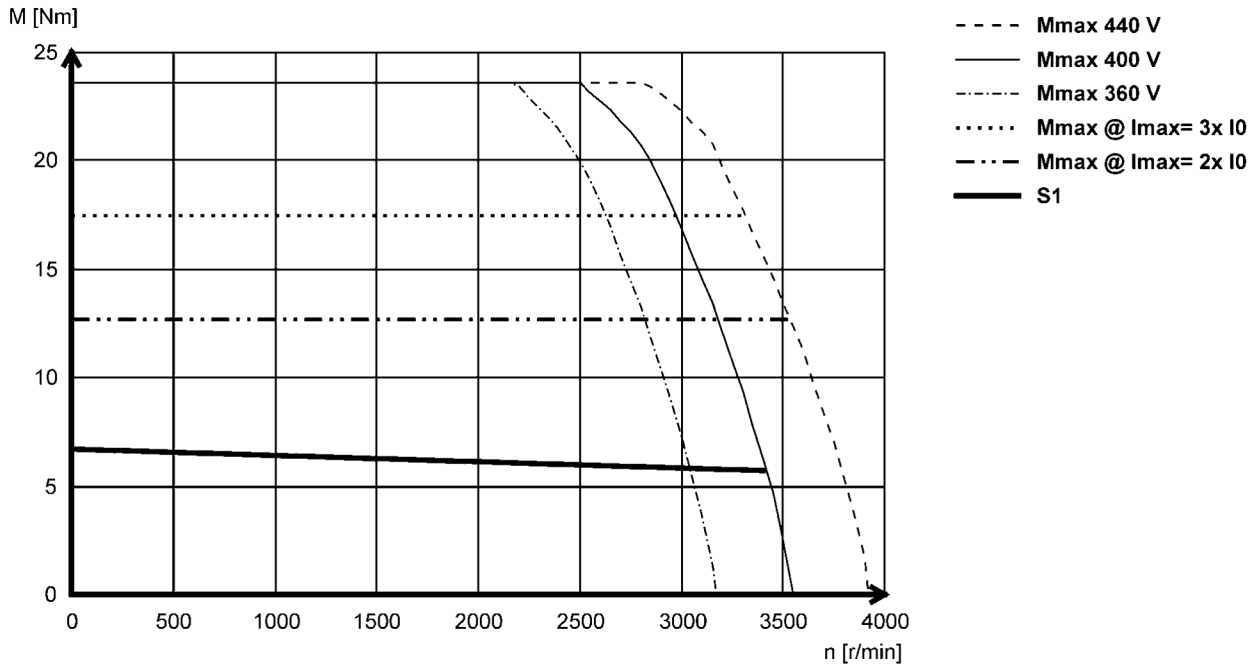
MDSKS□□056-33 (non-ventilated)



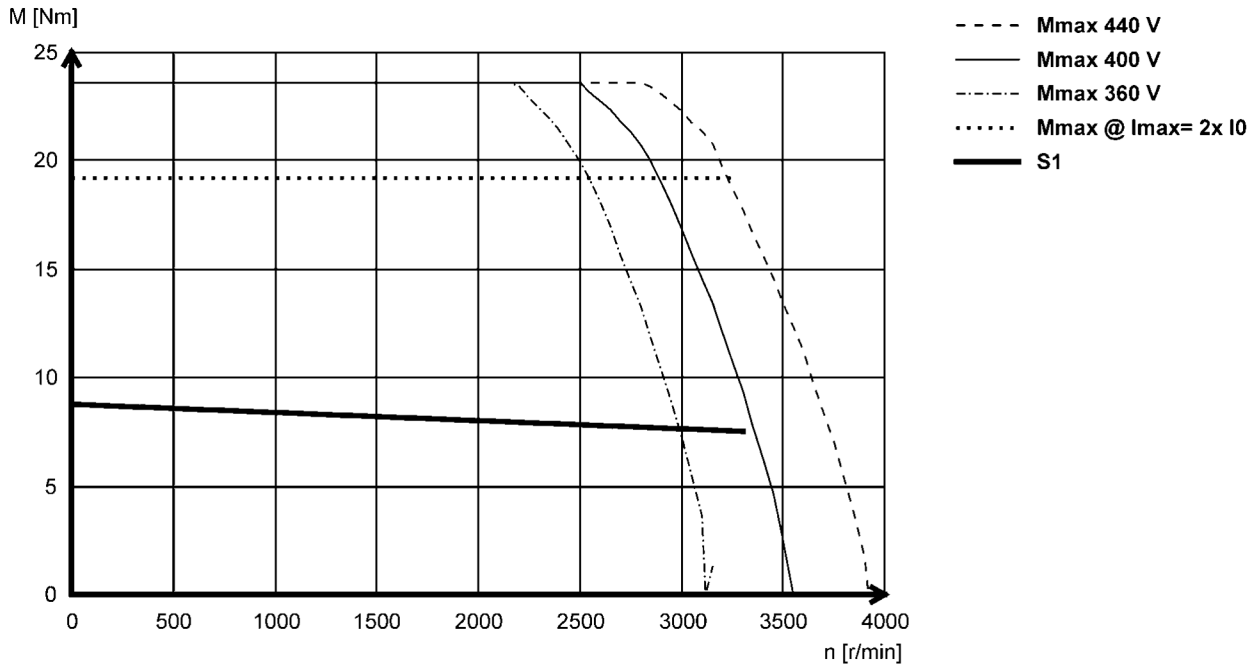
Torque characteristics

► The data applies to a mains connection voltage of 3 x 400 V.

MDSKS□□071-03 (non-ventilated)



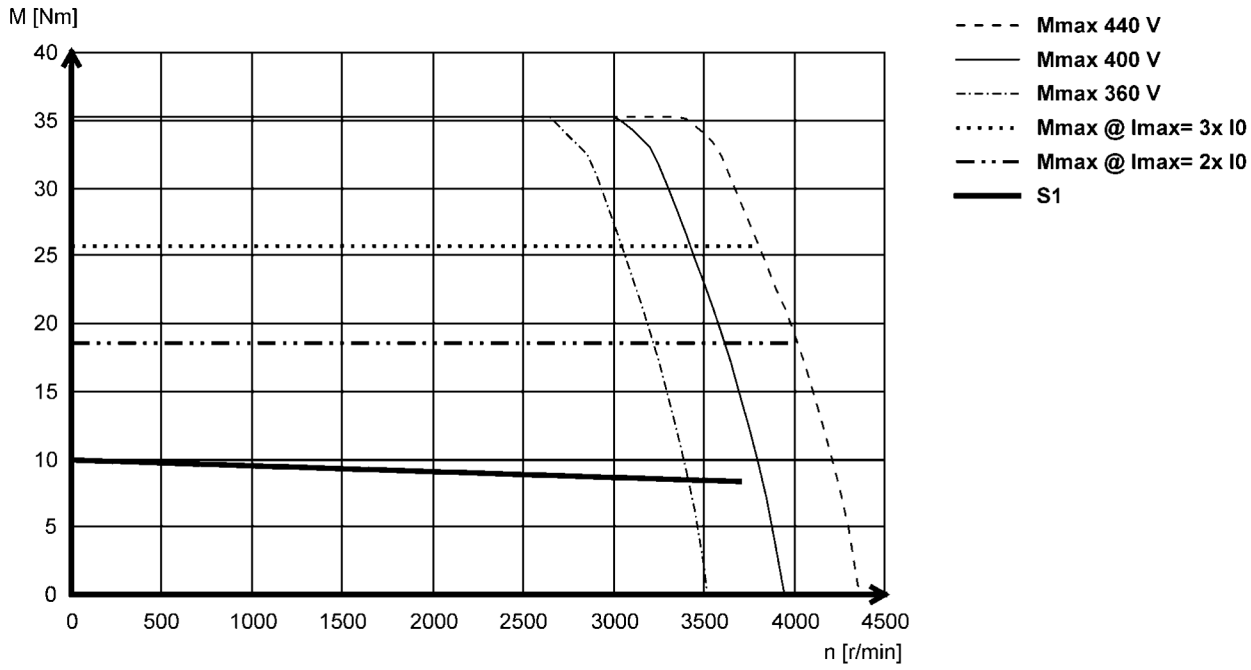
MDFKS□□071-03 (forced ventilated)



Torque characteristics

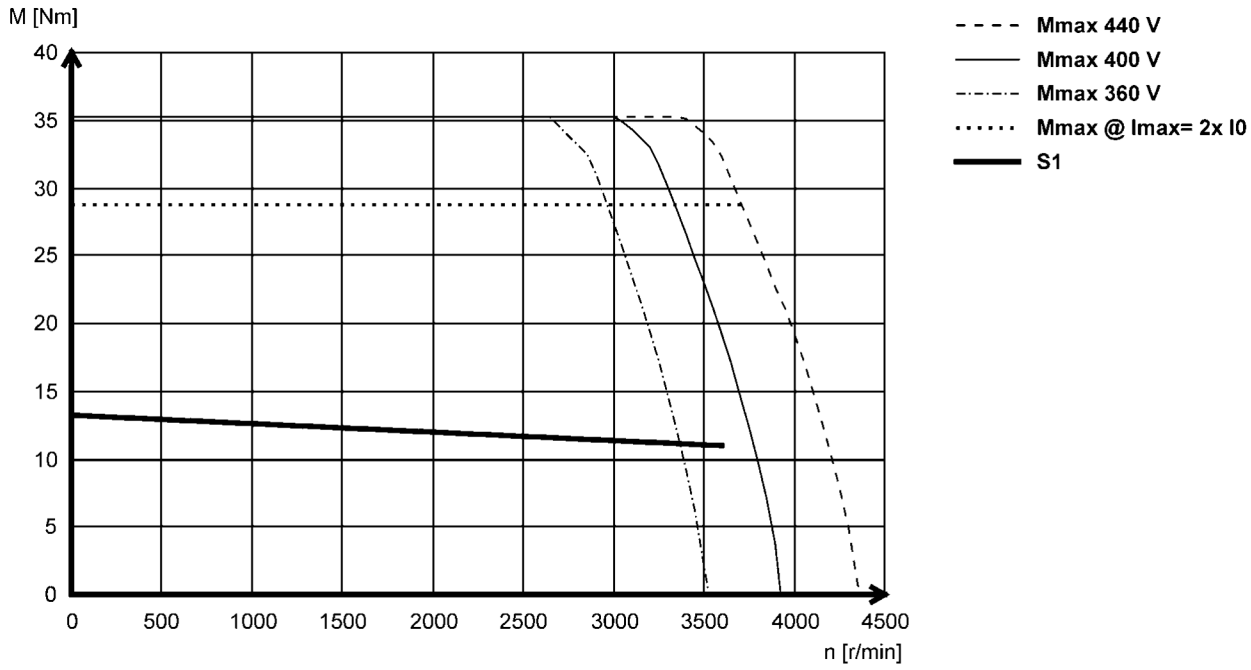
► The data applies to a mains connection voltage of 3 x 400 V.

MDSKS□□071-13 (non-ventilated)



5.3

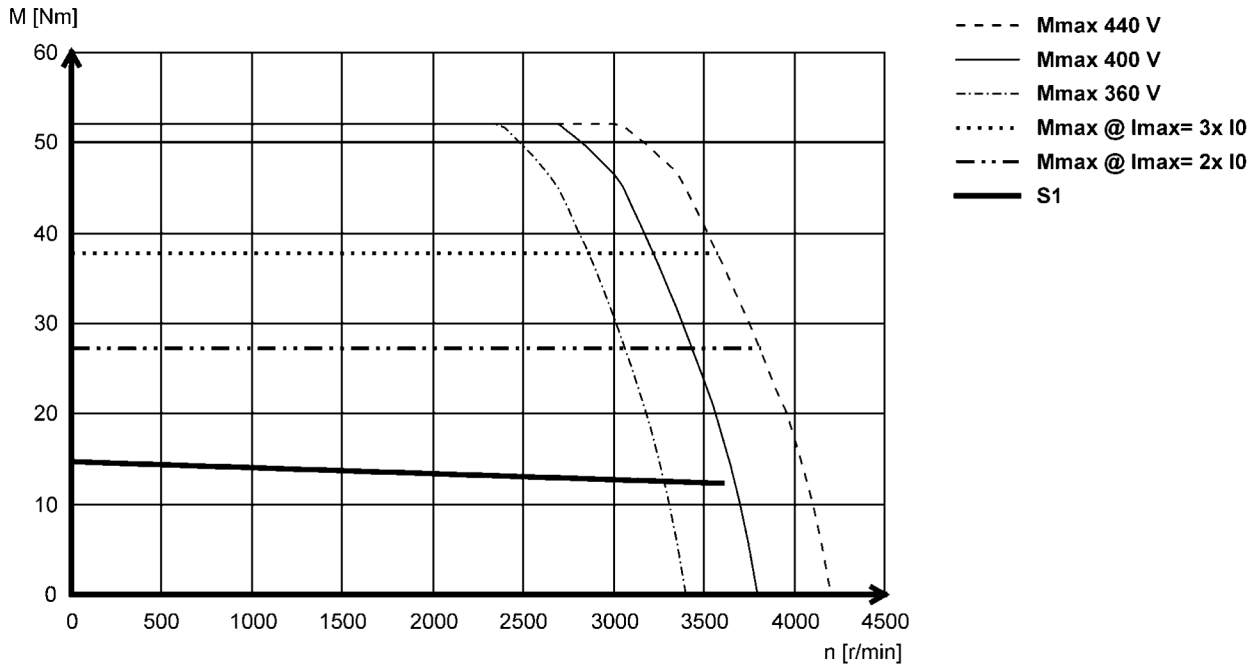
MDFKS□□071-13 (forced ventilated)



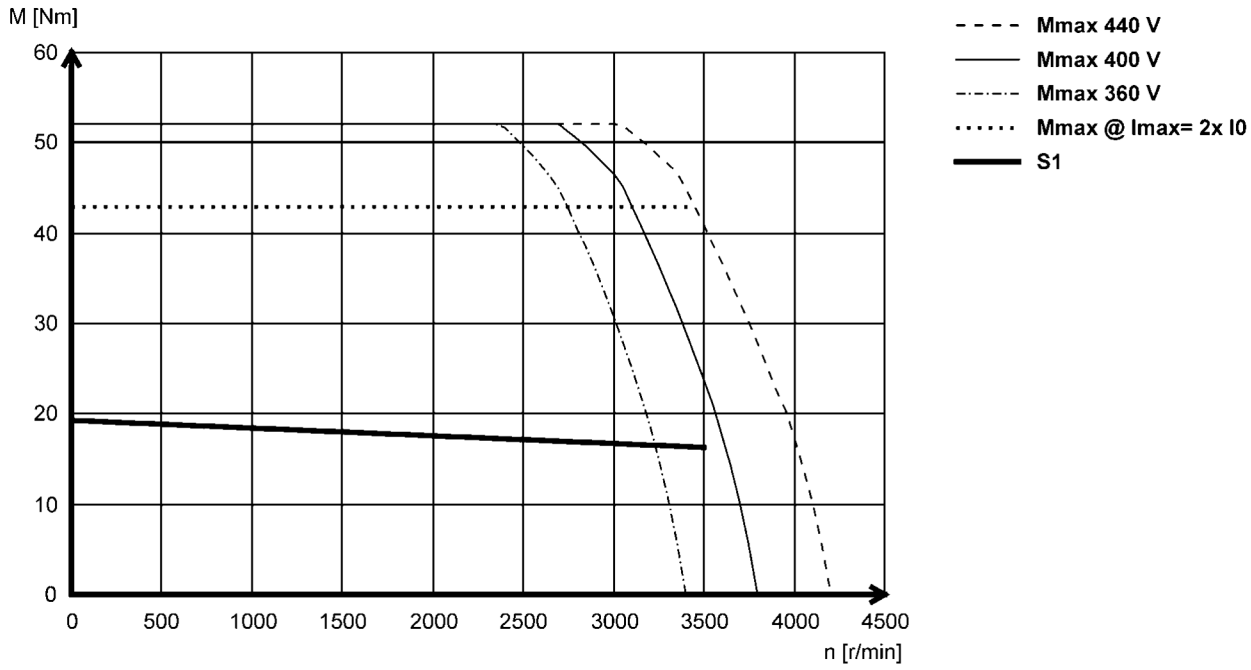
Torque characteristics

► The data applies to a mains connection voltage of 3 x 400 V.

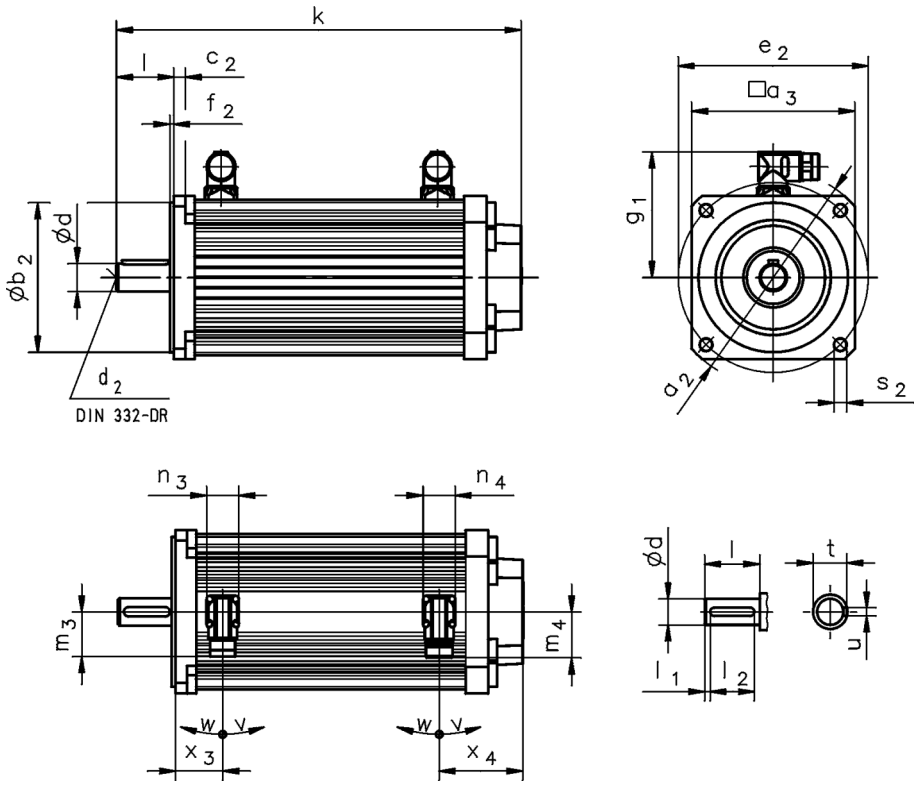
MDSKS□□071-33 (non-ventilated)



MDFKS□□071-33 (forced ventilated)



Dimensions, self-ventilated



5.3

			MDSKS□□056-23	MDSKS□□056-33
RS	k	[mm]	241	276
	x_3	[mm]	36	
	x_4	[mm]	60	
BS	k	[mm]	267	302
	x_3	[mm]	59	
	x_4	[mm]	60	
AG / IG	k	[mm]	295	330
	x_3	[mm]	36	
	x_4	[mm]	114	
BA / BI	k	[mm]	321	356
	x_3	[mm]	59	
	x_4	[mm]	114	

			MDSKS□□071-03	MDSKS□□071-13	MDSKS□□071-33
RS	k	[mm]	259	294	329
	x_3	[mm]	39		
	x_4	[mm]	58		
BS	k	[mm]	294	329	364
	x_3	[mm]	72		
	x_4	[mm]	58		
AG / IG	k	[mm]	314	349	384
	x_3	[mm]	39		
	x_4	[mm]	113		
BA / BI	k	[mm]	349	384	419
	x_3	[mm]	72		
	x_4	[mm]	113		

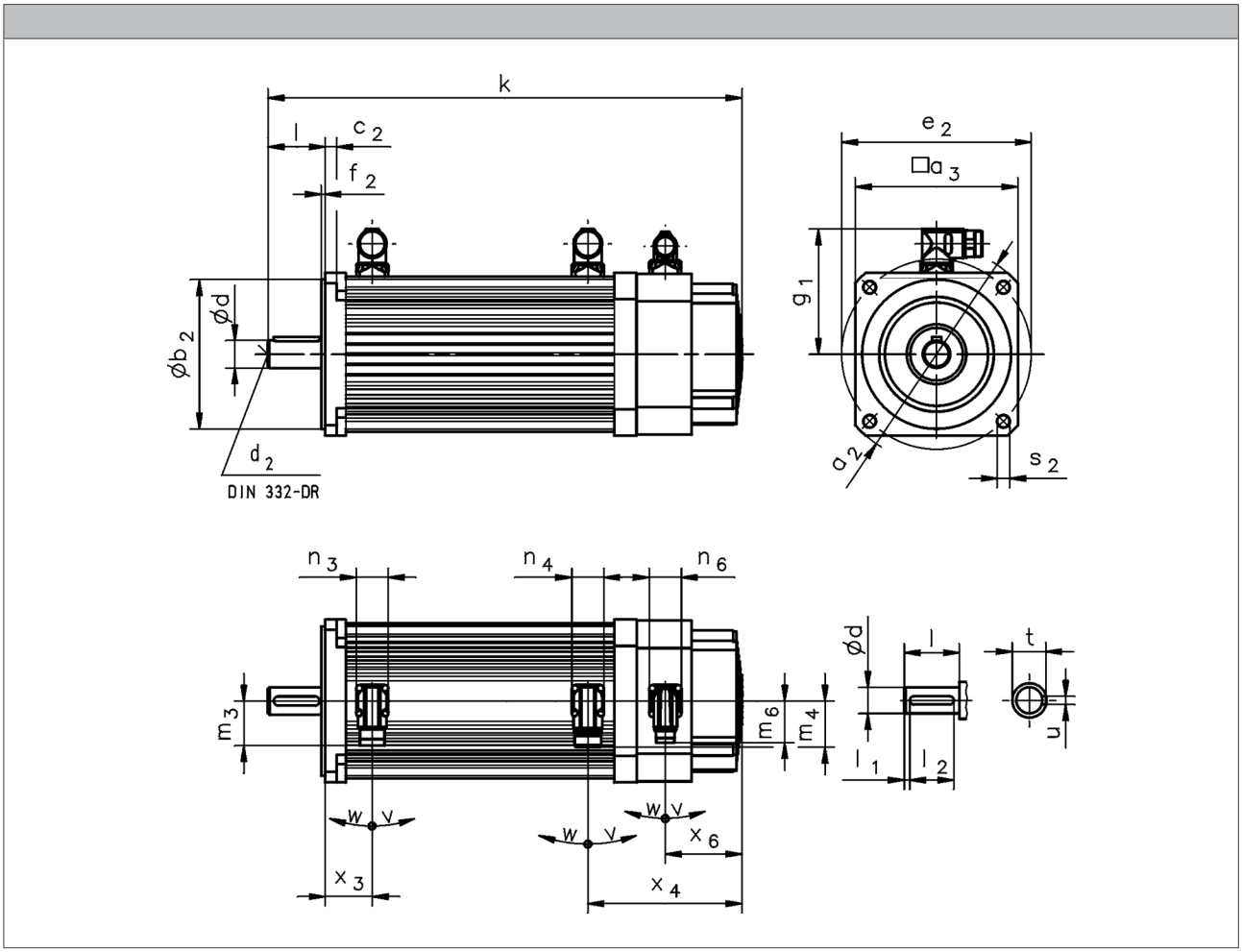
Dimensions, self-ventilated

	g_1	n_3	n_4	m_3	m_4	v	w
	[mm]	[mm]	[mm]	[mm]	[mm]	[°]	[°]
MDSKS□□056-23	90	28	28	40	40	195	80
MDSKS□□056-33							
MDSKS□□071-03	102						
MDSKS□□071-13							
MDSKS□□071-33							

	d	d_2	l	l_1	l_2	u	t
	k6						
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
MDSKS□□056	14	M5	30	2.5	25	5.0	16.0
MDSKS□□071	19	M6	40	2.0	36	6.0	21.5

		a_2	a_3	b_2	c_2	e_2	f_2	s_2
				j6				
		[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
MDSKS□□056	FF100	120	102	80	8	100	3.0	7
	FT85			70		85	2.5	M6
MDSKS□□071	FF130	160	130	110	9	130	3.5	9.0
	FT130							M8

Dimensions, forced ventilated



			MDFKS□□071-03	MDFKS□□071-13	MDFKS□□071-33
RS	k	[mm]	327	362	397
	x_3	[mm]	39		
	x_4	[mm]	126		
BS	k	[mm]	362	397	432
	x_3	[mm]	72		
	x_4	[mm]	126		
AG / IG	k	[mm]	382	417	452
	x_3	[mm]	39		
	x_4	[mm]	181		
BA / BI	k	[mm]	417	452	487
	x_3	[mm]	72		
	x_4	[mm]	181		
	x_6	[mm]	73		

Dimensions, forced ventilated

	g_1	n_3	n_4	n_6	m_3	m_4	m_6	v	w
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[°]	[°]
MDFKS□□071-03	102	28	28	28	40	40	40	195	80
MDFKS□□071-13									
MDFKS□□071-33									

	d	d_2	l	l_1	l_2	u	t
	k6						
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
MDFKS□□071	19	M6	40	2.0	36	6.0	21.5

		a_2	a_3	b_2	c_2	e_2	f_2	s_2
				j6				
		[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
MDFKS□□071	FF130	160	130	110	9	130	3.5	9.0
	FT130							M8

Permanent magnet holding brake

The synchronous servo motor can be fitted with integral permanent magnet holding brakes.
In the case of permanent magnet brakes, the rated torque applies solely as holding torque at standstill. This is due to the nature of their design. During braking from full motor speed, e.g. in the event of emergency stops, the braking torque is significantly reduced.
As such, they may not be used as safety elements (particularly with lifting axes) without additional measures being implemented.
The brakes are activated when the supply voltage is disconnected (closed-circuit principle). When using the brakes purely as holding brakes, virtually no wear occurs on the friction surfaces.

For traversing axes, adherence to the permissible load/brake motor (J_L / J_{MB}) moment of inertia ensures that the permissible maximum switching rate of the brake will not be exceeded and at least 2,000 emergency stop functions can be performed from a speed of 3,000 rpm.
For lifting axes, the load torque resulting from the weight acts additionally. In this case the specifications for J_L / J_{MB} do not apply.

Caution:
The brakes used are not safety brakes in the sense that a reduction in torque may arise as a result of disruptive factors that cannot be influenced, e.g. oil ingress.

The ohmic voltage drop along the cable must be taken into consideration in long motor supply cables and must be compensated for by a higher voltage at the line input.

The following applies for Lenze system cables:

$$U[V] = U_B[V] + 0.08\frac{[V]}{[A]\cdot[m]}\cdot l_{Lg}[m]\cdot I_B[A]$$

If no suitable voltage (incorrect value, incorrect polarity) is applied to the brake, the brake will be applied and can be overheated and destroyed by the motor continuing to rotate.
The shortest switching times of the brakes are achieved by DC switching of the voltage. A spark suppressor is required to suppress interference and to increase the service life of the relay contacts here.

Permanent magnet holding brake

Permanent magnet holding brake

Rated data with standard braking torque

► The figures stated apply to servo motors. They only apply to geared servo motors when the servo motor is connected via a mounting flange.

	$U_{N, DC}$ [3, 4, 6]	M_N	M_N	M_{av}	I_N [2]	J	t_1 [1]	t_2 [1]	Q_E [5]	m	J_{MB}	J_L/J_{MB}
		20 °C	120 °C	120 °C								
	[V]	[Nm]	[Nm]	[Nm]	[A]	[kgcm²]	[ms]	[ms]	[J]	[kg]	[kgcm²]	
MDSKS□□056-23	24	3.30	2.50	1.20	0.50	0.38	10.0	20.0	350	0.90	1.58	43.9
MDSKS□□056-33											2.18	31.5
MDSKS□□056-23	205				0.060						1.58	43.9
MDSKS□□056-33											2.18	31.5
MDSKS□□071-03	24	12.0	11.0	5.50	0.67	1.06	20.0	29.0	400	0.80	7.06	10.5
MDSKS□□071-13											9.06	8.20
MDSKS□□071-33											11.1	6.70
MDSKS□□071-03	205				0.080						7.06	10.5
MDSKS□□071-13											9.06	8.20
MDSKS□□071-33											11.1	6.70
MDFKS□□071-03	24				0.67						7.06	10.5
MDFKS□□071-13											9.06	8.20
MDFKS□□071-33											11.1	6.70
MDFKS□□071-03	205				0.080						7.06	10.5
MDFKS□□071-13											9.06	8.20
MDFKS□□071-33											11.1	6.70

5.3

[1] Engagement and disengagement times are valid for rated voltage (± 0 %) and protective circuit for brakes with varistor for DC switching. The times may increase without a protective circuit.
[2] The currents are the maximum values when the brake is cold (value used for dimensioning the current supply). The values for a motor at operating temperature are considerably lower.
[3] With 24 V DC brake: smoothed DC voltage, ripple ≤ 1 %.
With 205 V DC brake: connection to 230 V AC through rectifier.
[4] UR not possible in the case of a brake with a 205 V supply voltage.
[5] Maximum switching energy per emergency stop at n = 3000 r/min for at least 2000 emergency stops.
[6] Voltage tolerance: -10% to +5%

Permanent magnet holding brake

Rated data with increased braking torque

► These ratings apply only for geared servo motors with integrated servo motor (without mounting flange).

	$U_{N, DC}$ [3, 4, 6]	M_N	M_N	M_{av}	I_N [2]	J	t_1 [1]	t_2 [1]	Q_E [5]	m	J_{MB}	J_L/J_{MB}
		20 °C	120 °C	120 °C								
	[V]	[Nm]	[Nm]	[Nm]	[A]	[kgcm²]	[ms]	[ms]	[J]	[kg]	[kgcm²]	
MDSKS□□056-23	24	6.00	5.00	2.50	0.67	1.06	20.0	29.0	400	5.30	2.26	34.9
MDSKS□□056-33										6.30	2.86	27.3
MDSKS□□056-23	205				0.80					5.30	2.26	34.9
MDSKS□□056-33										6.30	2.86	27.3
MDSKS□□071-03	24	15.0	12.0	6.00	0.75	3.60	13.0	30.0	700	8.90	9.60	10.6
MDSKS□□071-13										10.9	11.6	8.80
MDSKS□□071-33										13.0	13.6	7.50
MDSKS□□071-03	205				0.090					8.90	9.60	10.6
MDSKS□□071-13										10.9	11.6	8.80
MDSKS□□071-33										13.0	13.6	7.50
MDFKS□□071-03	24				0.75					10.2	9.60	10.6
MDFKS□□071-13										12.2	11.6	8.80
MDFKS□□071-33											13.6	7.50
MDFKS□□071-03	205				0.090					10.2	9.60	10.6
MDFKS□□071-13										12.2	11.6	8.80
MDFKS□□071-33											13.6	7.50

[1] Engagement and disengagement times are valid for rated voltage (± 0 %) and protective circuit for brakes with varistor for DC switching. The times may increase without a protective circuit.
[2] The currents are the maximum values when the brake is cold (value used for dimensioning the current supply). The values for a motor at operating temperature are considerably lower.
[3] With 24 V DC brake: smoothed DC voltage, ripple ≤ 1 %.
With 205 V DC brake: connection to 230 V AC through rectifier.
[4] UR not possible in the case of a brake with a 205 V supply voltage.
[5] Maximum switching energy per emergency stop at n = 3000 r/min for at least 2000 emergency stops.
[6] Voltage tolerance: -10% to +5%

Resolver

Stator-fed resolver with two stator windings offset by 90° and one rotor winding with transformer winding.

Built-on accessories				RS BS	
	[1]				
Product key					
				RS0	RV03
Resolution					
Angle			[']	0.80	
Accuracy					
			[']	-10 ... 10	
Absolute positioning					
				1 revolution	
Max. speed					
	n_{max}		[r/min]	8000	
Max. input voltage					
DC	$U_{in,max}$		[V]	10.0	
Max. input frequency					
	$f_{in,max}$		[kHz]	4.00	
Ratio					
Stator / rotor		± 5 %		0.30	
Rotor impedance					
	Z_{ro}		[Ω]	51 + j90	
Stator impedance					
	Z_{so}		[Ω]	102 + j150	
Impedance					
	Z_{rs}		[Ω]	44 + j76	
Min. insulation resistance					
At DC 500 V	R		[MΩ]	10.0	
Number of pole pairs					
				1	
Max. angle error					
			[']	-10 ... 10	
Inverter assignment					
				i700 E84AVTC E94A ECS EVS93	E84AVTC E94A ECS EVS93

[1] 6 - Product key > built-on accessories

Speed-dependent safety functions

Suitable for safety function					
				No	Yes
Max. permissible angular acceleration					
MDxKS056 ... MDxKS071 [2]	α		[rad/s²]		17000
Functional safety					
IEC 61508					SIL3
EN 13849-1					Up to Performance Level e

[2] 9 - Single encoder concepts with resolvers

Incremental encoder and SinCos absolute value encoder

Encoder type			SinCos absolute value			
Built-on accessories			AG BA			
	-1)					
			AS1024-8V-H	AS1024-8V-K2	AM1024-8V-H	AM1024-8V-K2
Encoder type			Single-turn		Multi-turn	
Pulses			1024			
Output signals			1 Vss			
Interfaces			Hiperface			
Absolute revolutions			1		4096	
Resolution						
Angle 1)		[']	0.40			
Accuracy						
		[']	-0.8 ... 0.8			
Min. input voltage						
DC	$U_{in,min}$	[V]	7.00			
Max. input voltage						
DC	$U_{in,max}$	[V]	12.0			
Max. speed						
	n_{max}	[r/min]	6000			
Max. current consumption						
	I_{max}	[A]	0.080			
Limit frequency						
	f_{max}	[kHz]	200			
Inverter assignment			E84AVTC E94A ECS EVS93			

1) Inverter-dependent.

Speed-dependent safety functions

Suitable for safety function			No	Yes	No	Yes
Max. permissible angular acceleration						
MDxKS056 ... MDxKS071	α	[rad/s²]		240000		240000
Functional safety						
IEC 61508				SIL2		SIL2
EN 13849-1				Up to Performance Level d		Up to Performance Level d

Blower

Rated data for 50 Hz

		Degree of protection	Number of phases					
				U_{min}	U_{max}	$U_{N, AC}$	P_N	I_N
				[V]	[V]	[V]	[kW]	[A]
MDFKS□□071	F10	IP54	1	210	240	230	0.019	0.12

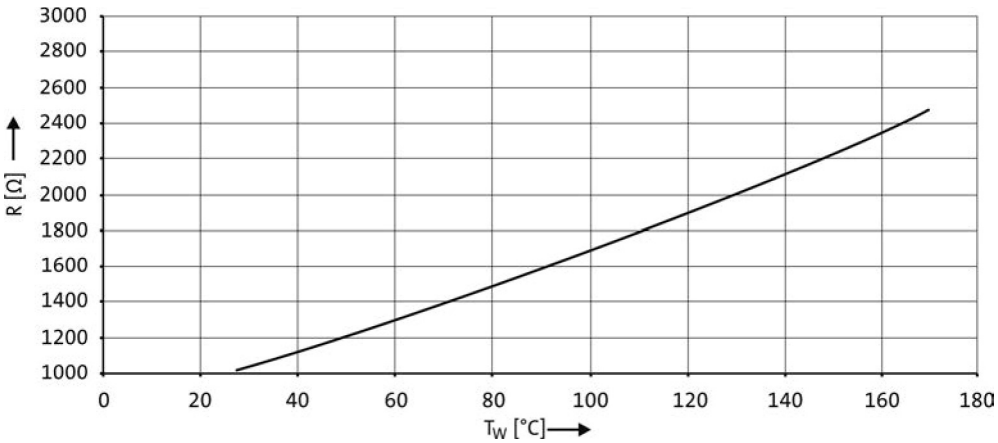
Rated data for 60 Hz

		Degree of protection	Number of phases					
				U_{min}	U_{max}	$U_{N, AC}$	P_N	I_N
				[V]	[V]	[V]	[kW]	[A]
MDFKS□□071	F10	IP54	1	210	240	230	0.019	0.12

Temperature monitoring

The thermal sensors (1x KTY 83-110) used continuously monitor the motor temperature. The temperature signal is transmitted over the system cable of the feedback system to the servo controller.
This means that the temperature of the motor is determined with great accuracy in the permitted operating range and at the same time the overtemperature response configured in the controller is executed in the event of overtemperature in one of the winding phases.

Variation of resistance



► If the thermal sensor is supplied with a measurement current of 1 mA, the above relationship between the temperature and the resistance applies.

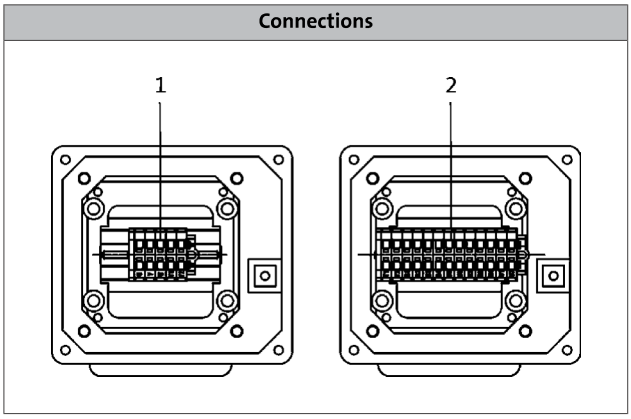
Terminal box

If a servo motor is to be connected to an existing cable or plug connectors are not to be used for other reasons, the connection can also be made via a terminal box.

The motor can either be fitted with a terminal box for the power connection and motor holding brake or a second terminal box provided to connect the motor feedback and blower (if applicable).

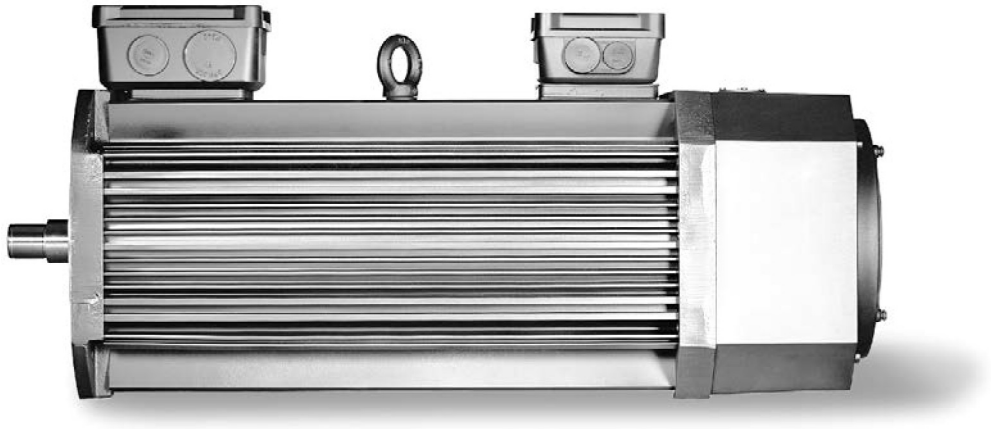
Connections

Connections



1: Power connection + brake connection + PE connection.

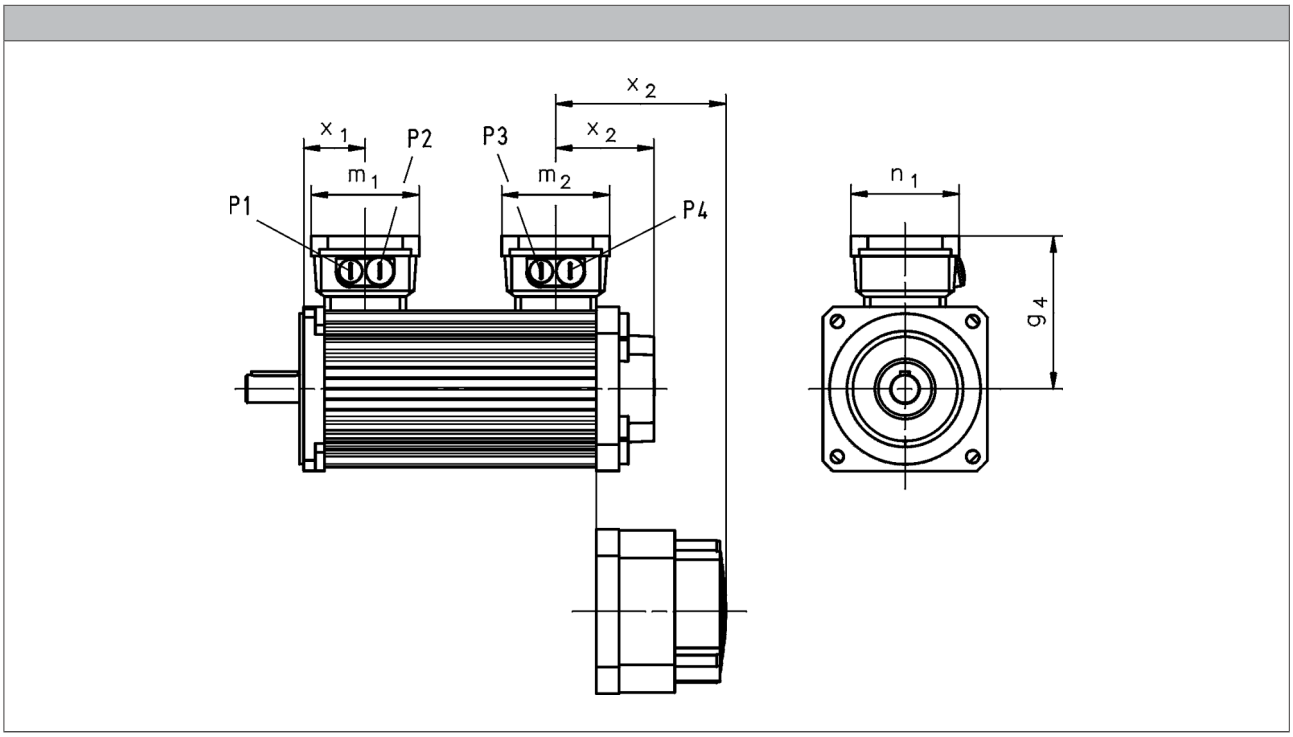
2: Angle/speed sensor connection + thermal sensor connection



MD□KS synchronous servo motors with blower and terminal box

Terminal box

Dimensions



			MDSKS□□056-23	MDSKS□□056-33	MDSKS□□071-03	MDSKS□□071-13	MDSKS□□071-33
RS	x_2	[mm]	63	78	62	77	
BS	x_2	[mm]	78		77		
AG / IG	x_2	[mm]	117	132	116	131	
BA / IG	x_2	[mm]	132		131		

			MDFKS□□071-03	MDFKS□□071-13	MDFKS□□071-33
RS	x_2	[mm]	130	145	
BS	x_2	[mm]	145		
AG / IG	x_2	[mm]	184	199	
BA / IG	x_2	[mm]	199		

	g_4	m_1	m_2	n_1	x_1	P_1	P_2	P_3	P_4
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
MDSKS□□056	113	93	93	93	54	M20x1.5	M20x1.5	M20x1.5	M20x1.5
MDSKS□□071	125				57				
MDFKS□□071									

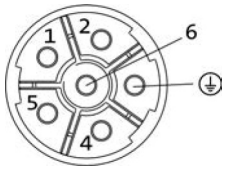
ICN connector

An ICN connector is used as standard for the electrical connection to the servo motors.

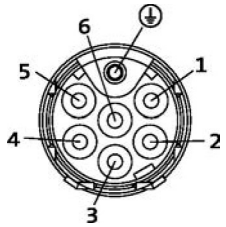
A connector is used for the connection of motor and brake.
The connections to the feedback system/temperature monitoring and the blower each employ a separate connector.

The connectors can be rotated through 270° and are fitted with a bayonet catch for SpeedTec connectors. As the connector fixing is also compatible with conventional union nuts. Existing mating connectors can therefore still be used without difficulty.

Connection for power and brake

Pin assignment			
Contact	Designation	Meaning	
1	BD1	Holding brake +	
2	BD2	Holding brake -	
PE	PE	PE conductor	
4	U	Phase U power	
5	V	Phase V power	
6	W	Phase W power	

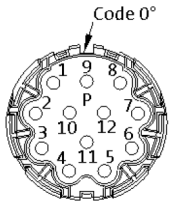
Blower connection

Pin assignment			
Contact	Designation	Meaning	
PE	PE	PE conductor	
1	U1	Fan	
2	U2		
3		Not assigned	
4			
5			
6			

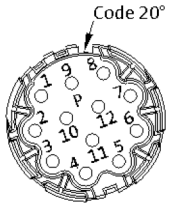
ICN connector

Feedback connection

► Resolver

Pin assignment			
Contact	Designation	Meaning	
1	+Ref	Transformer windings	
2	-Ref		
3	+VCC ETS	Supply: Electronic nameplate	
4	+COS	Cosine stator windings	
5	-COS		
6	+SIN	Sine stator windings	
7	-SIN		
8		Not assigned	
9			
10			
11	+KTY	KTY temperature sensor	
12	-KTY		

► Hiperface incremental encoder and SinCos absolute value encoder

Pin assignment			
Contact	Designation	Meaning	
1	B	Track B/+SIN	
2	$\overline{A}$	Track A inverse/-COS	
3	A	Track A/+COS	
4	$+U_B$	Supply +	
5	GND	Mass	
6	$\overline{Z}$	Zero track inverse/-RS485	
7	Z	Zero track/+RS485	
8		Not assigned	
9	$\overline{B}$	Track B inverse/-SIN	
10		Not assigned	
11	+KTY	KTY temperature sensor	
12	-KTY