SPINDASYN
Hollow shaft motors.

With integrated heavy duty bearing.

AMK


AMK

Hollow shaft motors with integrated axial bearing for high forces: SPINDASYN

For applications requiring high forces and extremely accurate linear positioning, SPINDASYN hollow shaft motors from AMK are the perfect choice:

SPINDASYN is a pre-assembled turnkey solution. Each unit consists of a powerful servo motor with an axial bearing and an integrated multiturn absolute encoder. Various adapter flanges are available for connecting to different screw-nut systems. To meet the requirements of customer specific applications, there is a variety of motors and bearings in the SPINDASYN modular kits according to screw lead and other parameters. In the end, the customer receives a mechatronic system that is perfectly suited for the speeds and forces in the application.

Various motor designs with blind hollow shafts or hollow through-shafts are available so that process costs can be optimized. Motors with a blind hollow shaft are excellent candidates for applications where only short strokes are required. Unlimited stroke lengths are possible in motors with hollow through-shafts. Motors with hollow through-shafts also allows power or compressed air to be fed along the moving axis.

SPINDASYN motors are available in convection or liquid-cooled models. In particular, the liquid-cooled models can be used to realize solutions with extreme short cycle times as they are possible with hydraulic or pneumatic systems. The excellent dynamic performance of the position controller allows for highly precise and reproducible processes.

The entire system of SKT motors and screw-nut systems is an economically superior alternative to hydraulic and linear motors in applications with high forces and varying speeds. SKT solutions can greatly reduce your design and operational costs.

Our expertise – an advantage.

Flexibility via modular concept
The modular design of SPINDASYN linear drives with respect to performance, screw diameter and axial force allows them to be specifically adapted to various applications. There is the choice from models with hollow through-shafts or blind hollow shafts, so that there is the option of limiting the strokes or not.

Energy efficiency
Compared to hydraulic systems and linear direct drives, SPINDASYN offers significantly higher efficiencies. Thus the customer achieves a better overall energy efficiency.

Extremely compact design
Since SPINDASYN includes an integrated screw, an entire linear drive with minimal dimensions can be designed. All of the functional elements such as the servo motor, bearing, DIN fitting for screw nuts, holding brake and encoder system are concentrated together as a compact unit within a single enclosure.

High stiff
The integrated bearing eliminates the need for shaft couplings and significantly reduces the number of bearing points required. With the stiff enclosure and the amply dimensioned power-train components, the entire system provides extreme stiff.

High dynamic performance
Since the design is extremely compact, the moment of inertia is also very low. The servo motor offers high power and acceleration ratings as well as high overload capacity. Of special note, the torsionally stiff connection to the screw nut allows very dynamic controller settings to be used.

Reduced design complexity
The ready-to-install unit consists of a servo motor, heavy duty bearing and multiturn absolute encoder and can be connected directly to a screw nut.

IP54 protection rating
With IP54 protection rating, these motors are also suitable for harsh environments.

Installation at any location
Fitted with sealed bearings, SPINDASYN units can be installed in any location. According to customer application, the bearings can also be re-lubricated.

Maintenance-free operation
Since SPINDASYN uses high-torque motors with sealed enclosures, they are practically maintenance-free and offer high availability. The integrated temperature sensors protect the motors against thermal overloading. Depending on the lifetime lubricated angular contact ball bearings and tapered roller bearings may have to be re-lubricated.

Heavy duty applications and high speeds
SPINDASYN hollow shaft motors are an efficient alternative to existing hydraulic solutions or linear drives in applications where high loads have to be moved at various different speeds.

Highest power density through liquid cooling (optional)
Liquid-cooled motors are compact in design and offer higher dynamic performance through less moving mass. Since the motors weigh less and are smaller in size, they are also easier to install.

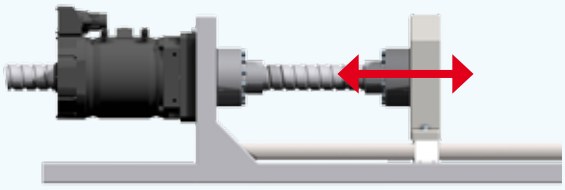
At a glance, this means:

- Highest productivity
- Outstanding process control
- High precision
- Very high efficiency
- Low energy consumption

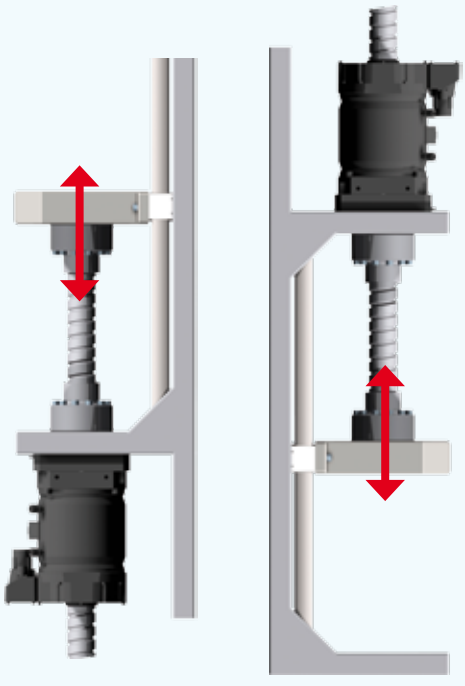
High performance and productivity for:

- Injection moulding machines
- Blow moulding machines
- Extruders
- Presses
- Tube bending machines
- Punches
- Fitting and joining presses
- Injecting/dosing
- Pumps

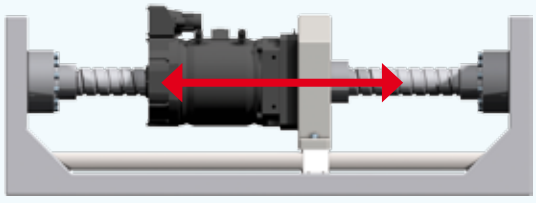
Functionality and applications.



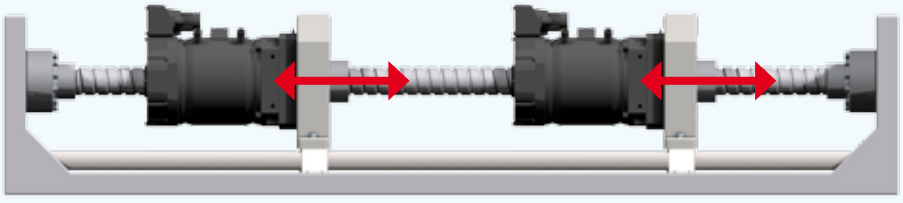
Horizontal configuration, hollow through-shaft, no limiting of strokes



Vertical configuration, e.g., stroke unit, press



One motor on a stationary screw



Multiple motors on a stationary screw, e.g., format adjustments

Anti-twist protection

In linear movements, the motor torque is applied to the screw in the opposite direction. This torque has to be braced by a linear guidance.

Companion structure

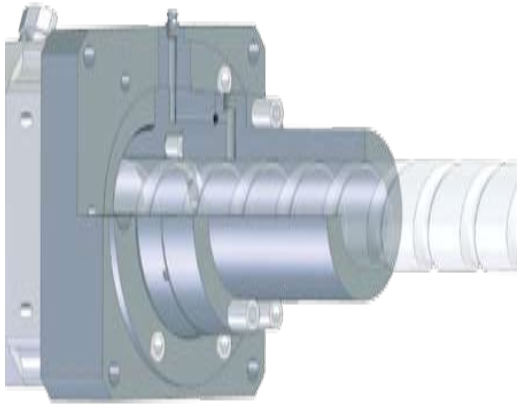
Radial loads or overturning torques reduce the life of the screw-nut systems. The companion structure, makes sure that the motor and screw-nut system are flush with each other and that no radial forces are present.

Screw-nut system

SKT motors are suitable for screw-nut systems such as roller or ball screws. As a rule of thumb, roller screws can support larger forces with smaller diameters while ball screws offer better dynamic performance and are more cost-effective.

Connecting flange to central lubrication

The optional flange with stationary lubrication bore can be easily connected to a central lubrication system. In this solution, the screw nut is continuously lubricated. A stop of the machine for re-lubrication is not necessary.



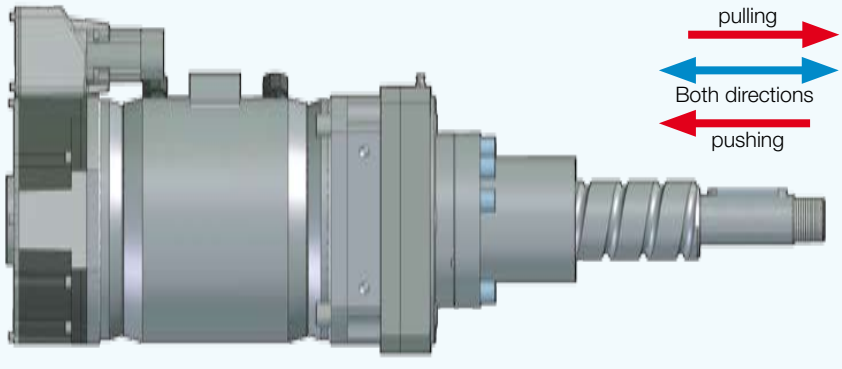
Direction of force

The SPINDASYN hollow shaft motors are designed for very high axial loads. In versions with normal duty bearings, the motor hollow shaft is designed to withstand both pulling and pushing forces. With heavy duty bearings, the specified direction of force must be observed. There are heavy duty bearings for both force directions and heavy duty bearings the force can only be applied in direction D or Z as specified. The direction of force can be found in the product code on page 11.

Direction of force onto motor hollow shaft

D = pushing, Z = pulling, B = both directions ball bearing, R = both directions roller bearing

The direction of force is relative to the motor hollow shaft (threaded screw). Note that the forces are applied to the hollow-shaft flange in the opposite direction.



Designing bearings for SKT motors

For the dimensioning of the motor, a bearing life characteristic is provided for each motor type. As the example shows, the bearing life can be calculated for a specific application.

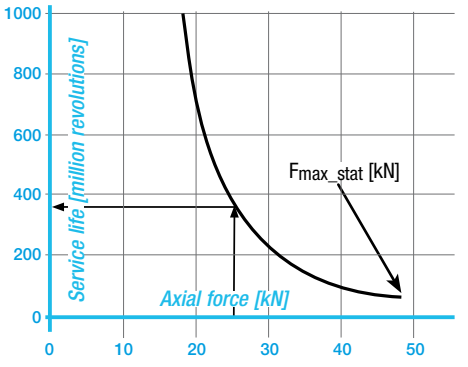
Example for an electrical press:

Pressing force:	Fp = 25 kN
Stroke:	Sv = 0.5 m
Press stroke:	Sp = 0.1 m
Screw lead:	h = 20 mm
Cycle time:	t = 2 s

Number of revolutions over press stroke:
A = Sp/h
A = 0.1 m/0.02 m
A = 5 revolutions

From diagram:
L10 = 380 million revolutions for 25 kN
Number of cycles: Z = L10/A
Z = 380 million/5
Z = 76 million cycles

Service life: L10h = t * Z
L10h = 2 s * 76 million
L10h = 152 million s
L10h = 42222h



Life of A-bearing (L10) for various axial forces Fa in [kN]

SPINDASYN hollow shaft motor in connection with screw-nut systems.

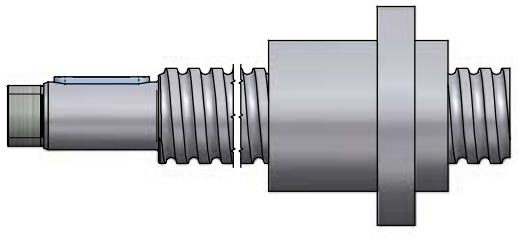
The SKT principle of rotating nuts.

The screw nut is directly connected to the hollow shaft of the motor. The direction of rotation of the screw nuts is converted to the linear movement of the screw. Here, the screw only moves linearly and does not rotate. The direct drive of the screw nut offers many advantages, especially compared to systems with rotating screws. Thus, higher speeds of movement are possible with the direct drive and the torsionally stiff connection to the screw nut allows for better dynamic performance. With the SKT series, the dynamic performance, torsional stiff and precision no longer suffer the negative effects from mechanical transmission elements such as belt drives or couplings. The motor bearings take up the high forces directly so that heavy duty applications are possible. Hence, machine design becomes much simpler.
The SKT series also allows for completely new solutions to be developed, such as multiple SKT motors on a stationary screw.

Interface between hollow-shaft flange and screw nut.

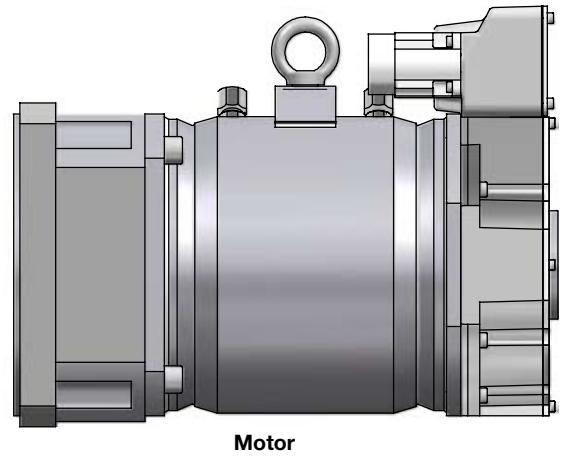
The screw nut is fastened to the hollow-shaft flange using a matching adapter (to be ordered separately). An exception to this is the SKT7 motor where the hollow-shaft flange is designed to fit a DIN 69051 flange nut.

The dimensions for choosing screw nuts are shown in the following overview.

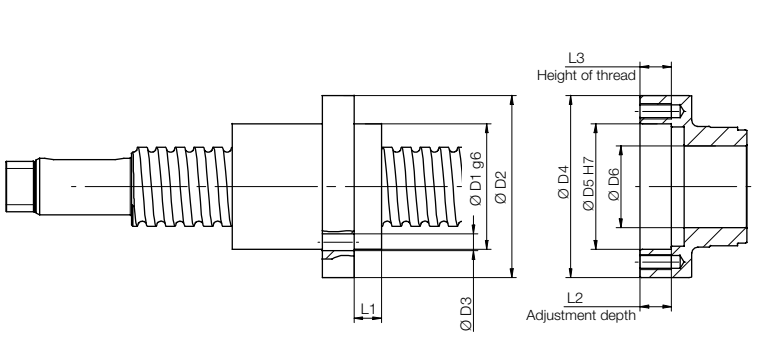


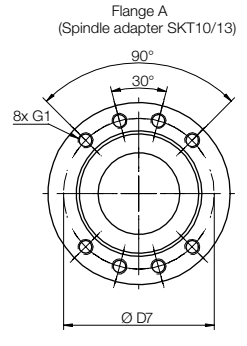
Screw-nut system

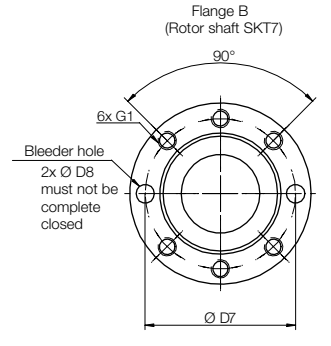
Adapter



Motor





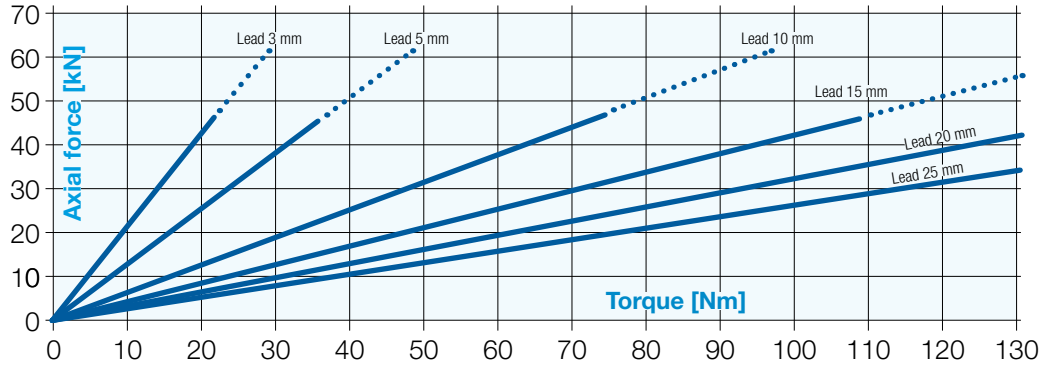


Motor type		Standard Adaptor No.	J * [kgcm^2]	Screw ø [mm]	Flange	D1=D5 [mm]	L1 [mm]	D2 [mm]	D3 [mm]	D4 [mm]	D6 [mm]	L2 [mm]	D7 [mm]	G1	L3 [mm]
Normal duty applications	SKT7	–*	–	32	B*	50	min. 20 max. 49	max. 95	9.5	95	50	50	65	M8	20
	SKT10	AN10-01	103	63	A	95	max. 21	–	13.5	140	65	22	115	M12	20
	SKT13	AN13-01	616	100	A	150	max. 54	–	17.5	212	105	55	176	M16	20
Heavy duty applications	SKT10	AS10-01	104	63	A	95	max. 24	–	13.5	140	65	25	115	M12	25
	SKT13	AS13-01	766	100	A	150	max. 74	–	17.5	212	105	75	186	M16	25

* SKT7 hollow-shaft flange fits DIN69051 flange nut, no adapter required

Overview: Adapting the speed and axial force via screw lead.

Axial forces SKT7 and SKT10 normal duty

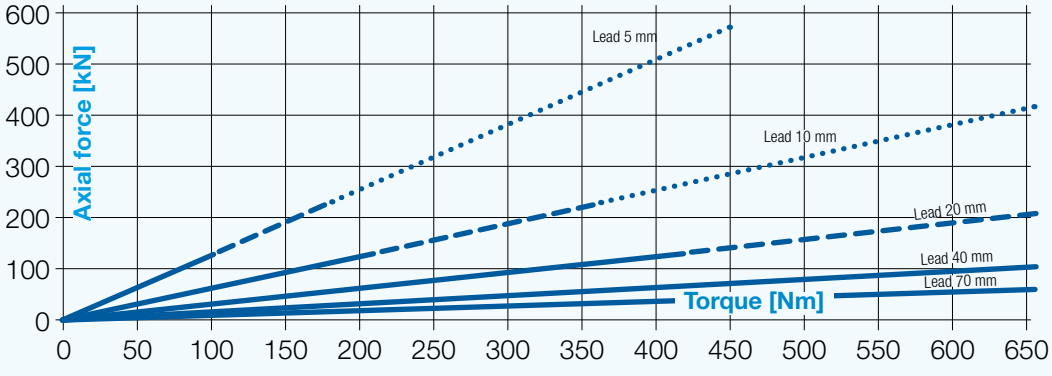


$$F = \frac{M \cdot 2\pi}{h}$$

F = Axial force [kN]
M = Torque [Nm]
h = Screw lead [mm]

SKT7 and SKT10
> 48 kN only SKT10

Axial forces SKT10 heavy duty, SKT13 normal and heavy duty



$$F = \frac{M \cdot 2\pi}{h}$$

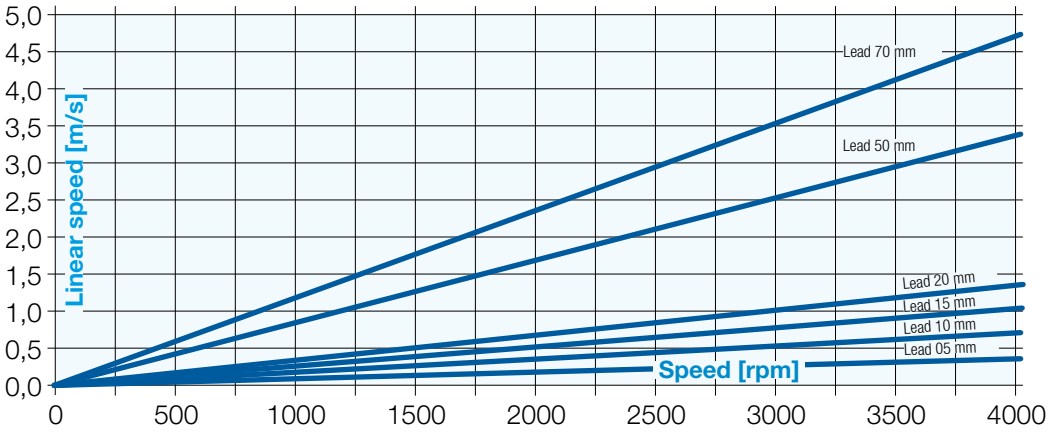
F = Axial force [kN]
M = Torque [Nm]
h = Screw lead [mm]

SKT10 heavy duty and SKT13

> of 135–216 kN SKT10 heavy duty and SKT13 heavy duty

> 216kN only SKT13 heavy duty

Linear speeds for various leads



$$V = \frac{n \cdot h}{60 \cdot 1000}$$

V = Linear speed [m/s]
n = Speed [rpm]
h = Screw lead [mm]

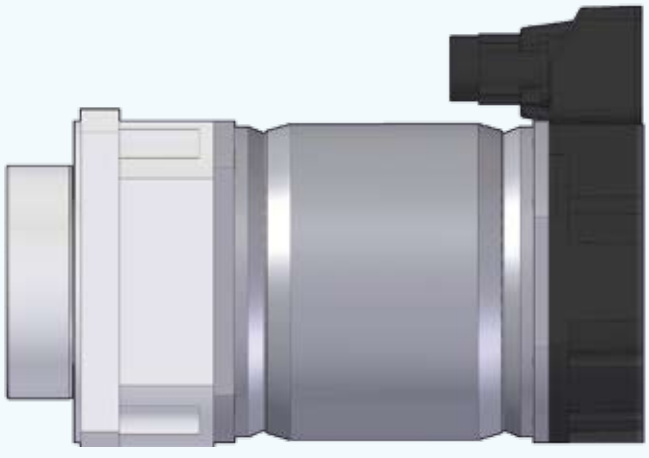
Modular design of SPINDASYN hollow shaft motors.

The SPINDASYN series is a modular system. First a motor can be choosen from the various sizes available. Next, the SPINDASYN motor can be modified for the specific forces, travel distances or cycle times for a specific application by choosing from the various motor elements:

The motor bearings can be selected for dynamic or heavy duty applications.

The active component of the motor can be fitted with convection or liquid-cooling. Since liquid-cooled motors allows for higher power densities, they are a good choice to achieve faster cycle times, for instance.

A hollow through-shaft at the end of the motor provides sufficient room for screw strokes of unlimited length as well as for a multiturn absolute encoder.

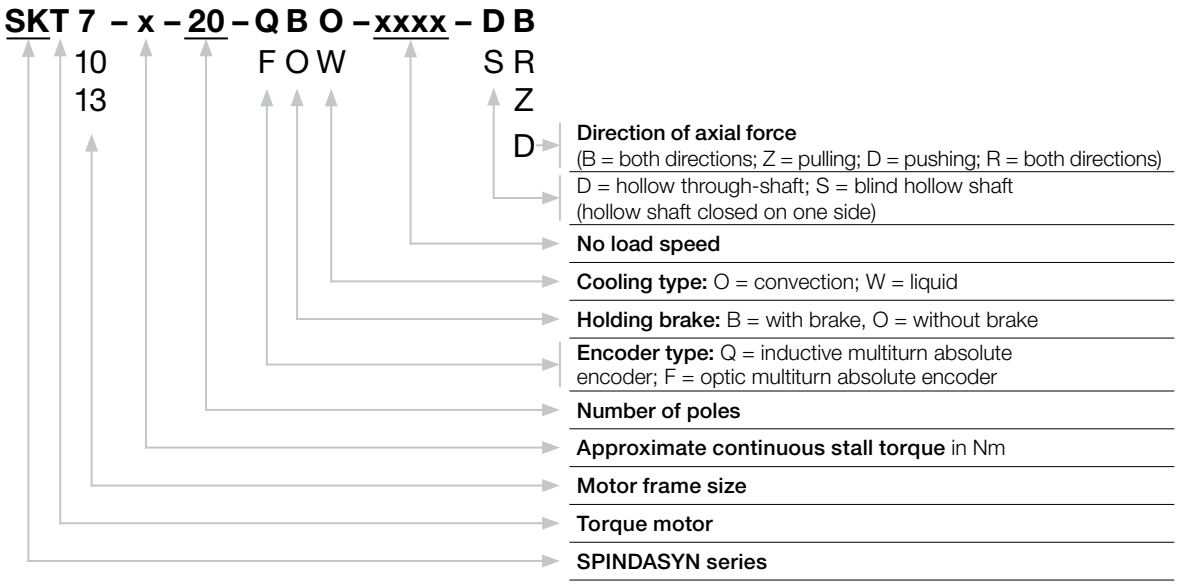


Options:

A customized SPINDASYN configuration

Bearing side of motor	Active component of motor	Motor end
Normal duty bearing - Lubricated-for-life, normal duty bearing with continuous lubrication depending on application - Good acceleration characteristics - Support of high axial loads - For pushing and pulling forces - Seals on both sides of the bearing offer good protection against dirt - High stiff and low friction - For dynamic applications for sizes SKT7, SKT10, and SKT13	**Convection-cooled** - Various overall lengths for each size - Highly dynamic - High maximum torque - Smooth surface	**Hollow through-shaft** - No limits in screw stroke - Compact overall lengths - Multiturn absolute encoder - Optional hollow shaft brake
Heavy duty bearing - For highest forces in sizes SKT10 and SKT13 - Lubricated-for-life heavy duty bearing with continuous lubrication depending on application - Support of highest axial loads - Especially suited for heavy duty screws - Static forces of up to 570 kN - Dynamic forces of up to 210 kN - High stiff and low friction	**Liquid-cooled** - Various overall lengths for each size - Highly dynamic - High maximum torque - Smooth surface at the end - Increase in continuous torque for shorter cycle times - Cooling circuit made of stainless steel to protect against corrosion	**Blind hollow shaft** - Closed end of motor - Bleeding of trapped air via front end bell - Multiturn absolute encoder - Optional holding brake

Type code



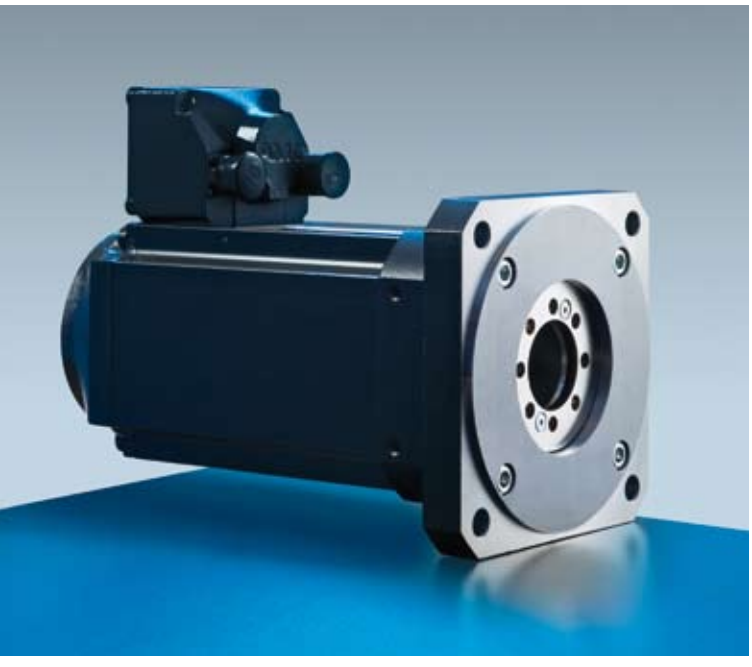
SKT hollow shaft motors

	SKT motor type	Convection cooled	Liquid cooled	Blind hollow shaft	Hollow through-shaft	Ø Hollow shaft	Force direction (B = both sides, Z = pulling, D = pushing, R = both sides)		Bearing axial forces		Stall data		Rated data						Maximum data		Mechanical data			
									Fmax stat [kN]	Fmax dyn [kN]	M_o [Nm]	I_o [A]	M_N [Nm]	P_N [kW]	I_N [A]	n_N [rpm]	k_T [Nm/A]	M_{max} [Nm]	I_{max} [A]	n_{max} [rpm]	J * [kgcm²]	L * [mm]	m * [kg]
Normal duty applications	SKT7-17-20-xxO-3500	O	–	–	D	35	B		48	18	17	11.3	11,3	2.8	7,2	2,500	1.5	65	50	3,500	64	270	22
	SKT7-28-20-xxO-2600	O	–	S	D	35	B		48	18	32	15.2	19	4	9	2,000	2.1	130	75	4,000	90	330	28
	SKT7-40-20-xxO-2000	O	–	S	D	35	B		48	18	42	15.2	29	3	10,5	1,000	2.76	210	100	2,000	118	390	34
	SKT7-55-20-xxW-4000	–	W	S	D	35	B		48	18	60	40.2	45	12	30	2,500	1.49	116	99	5,000	90	327	34
	SKT10-54-20-xxO-1400	O	–	–	D	65	B		61	23	64	16	42	4.5	10,5	1,000	4	194	67	2,000	425	316	48
	SKT10-95-20-xxO-1400	O	–	S	D	65	B		61	23	90	23.4	73	6.1	19	800	3.85	360	105	3,000	494	436	67
	SKT10-100-20-xxW-3000	–	W	S	D	65	B		61	23	95	54.3	66	11	38	1,500	1.75	160	132	3,000	425	316	48
	SKT10-145-20-xxW-2000	–	W	S	D	65	B		61	23	160	66.6	120	18	50	1,500	2.4	310	200	2,500	569	436	65
	SKT13-200-20-xxW-2600	–	W	–	D	105	B		135	70	360	145.8	240	45	103	1,800	2.3	640	330	3,300	1,822	520	160
Heavy duty applications	SKT10-100-20-xxW-3000	–	W	–	D	65	D, Z		216	85	95	54.3	66	11	38	1,500	1.75	160	132	3,000	458	357	55
	SKT10-145-20-xxW-2000	–	W	S	D	65	D, Z		216	85	160	66.6	120	18	50	1,500	2.4	310	200	2,500	610	477	71
	SKT13-200-20-xxW-2600	–	W	–	D	105	R	push	570	210	360	145.8	240	45	103	1,800	2.3	640	330	3,300	2,399	600	191
						105		pull	380														
	SKT13-650-20-xxW-1200	–	W	–	D	105	R	push	570	210	660	108.7	600	63	130	1,000	4.6	1,280	330	1,500	3,366	780	240
						105		pull	380														

* Variants with hollow through-shaft

SKT7 convection-cooled

with hollow through-shaft or blind hollow shaft



Features

- Torque motor with broad, linear current-torque characteristic
- Speeds optimized for screw-nut systems
- Anti-backlash bearing
- Very stiff radial coupling between hollow shaft of motor and nut
- Very high axial stiff
- Customized flanges available
- Lubricated-for-life, sealed bearing
- Suitable for radial and axial loads
- Optional lubrication of screw nut on stationary component
- Force can be applied in both directions
- Optional brake for vertical axes

Applications

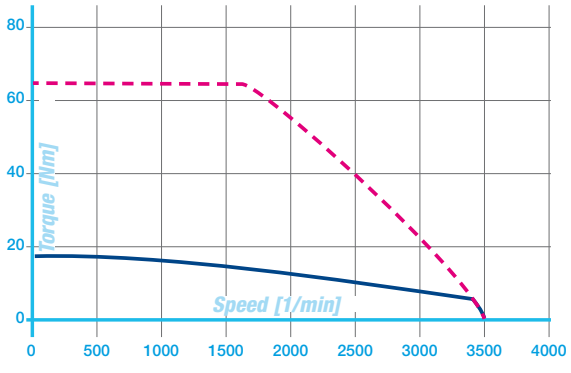
- Normal duty
- Short movements or unlimited stroke length

Equipment

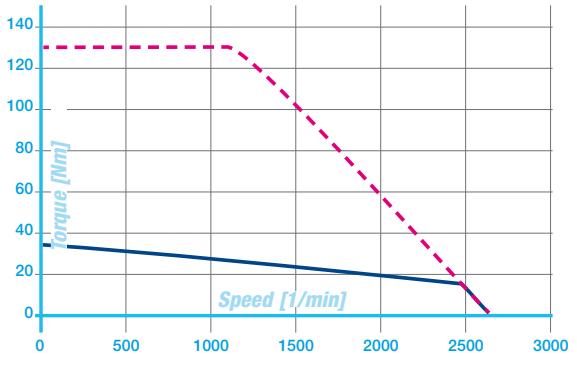
	Standard	Option
Brake	–	18 Nm
Encoder	Q, multiturn, inductive	F, multiturn, optical

Connecting cable: Nominal cross-section of copper conductor 1.5 mm²
Power connector, size 1

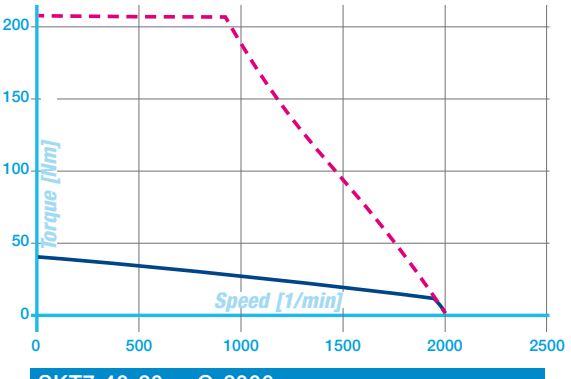
Characteristic curves



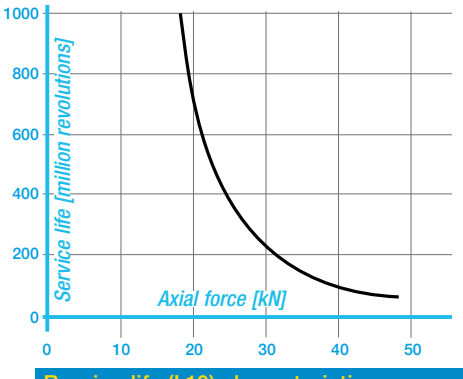
SKT7-17-20-xxO-3500



SKT7-28-20-xxO-2600



SKT7-40-20-xxO-2000



Bearing life (L10) characteristic

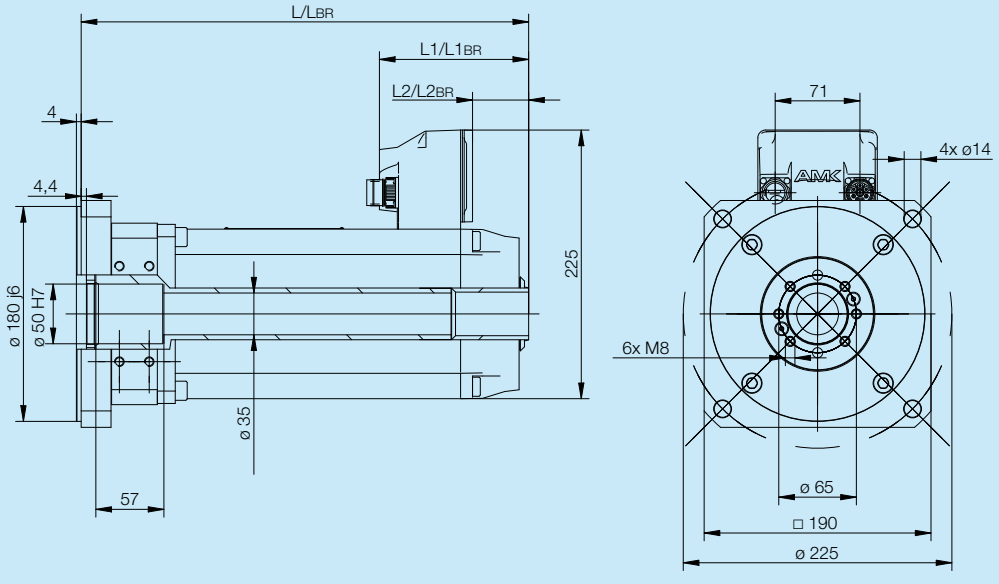
Maximum torque — Thermal continuous torque

Technical data

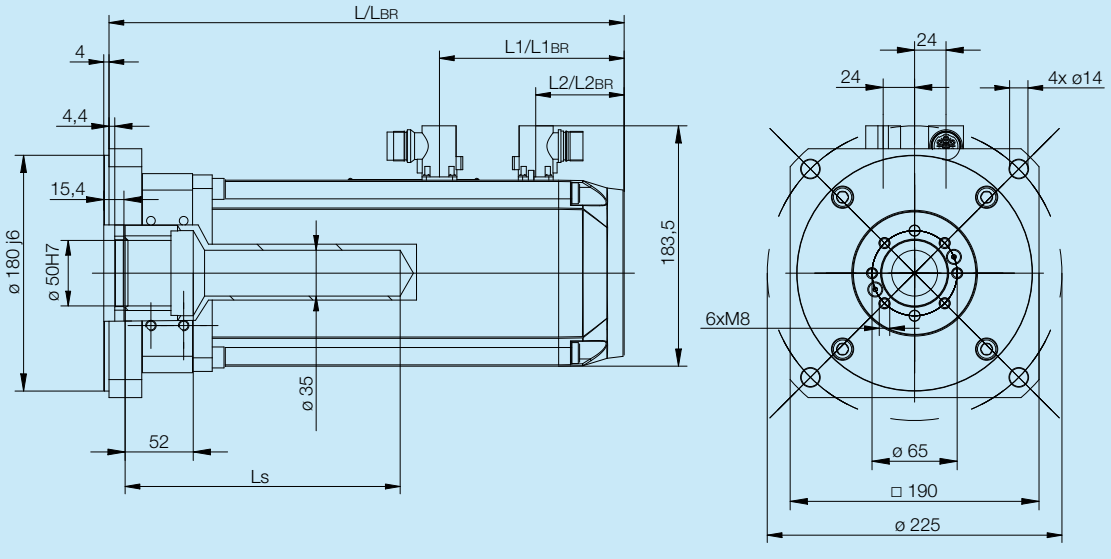
Motor type	Blind hollow shaft	Hollow through-shaft	Bearing axial forces		Stall data		Rated data					Maximum data		Mechanical data										
			$F_{max\ stat}$ [kN]	$F_{max\ dyn}$ [kN]	M_0 [Nm]	I_0 [A]	M_N [Nm]	P_N [kW]	I_N [A]	n_N [rpm]	k_T [Nm/A]	M_{max} [Nm]	I_{max} [A]	n_{max} [rpm]	J [kgcm²]	Ls [mm]	L [mm]	L1 [mm]	L2 [mm]	L_{BR} [mm]	$L1_{BR}$ [mm]	$L2_{BR}$ [mm]	m [kg]	m_{BR} [kg]
SKT7-17-20-xxO-3500	–	D	48	18	17	11.3	11.3	2.8	7.2	2,500	1.5	65	50	3,500	64	∞	270	80	10	315	125	47	22	27
SKT7-28-20-xxO-2600	S	–	48	18	32	15.2	19	4	9	2,000	2.1	130	75	4,000	77	210	348	96	68	393	141	68	29	31
	–	D													90	∞	330	80	10	375	125	47	28	33
SKT7-40-20-xxO-2000	S	–	48	18	42	15.2	29	3	10.5	1,000	2.76	210	100	2,000	99	270	408	96	68	453	141	68	35	37
	–	D													118	∞	390	80	10	435	125	47	34	39

Dimensions

Motors with hollow through-shaft



Motors with blind hollow shaft



Flange connection to screw nut, see page 8 · Legend on page 31 · All dimensions in mm.

SKT7 liquid-cooled

with hollow through-shaft or blind hollow shaft

Features

- Torque motor with broad, linear current-torque characteristic
- Speeds optimized for screw-nut systems
- Anti-backlash bearing
- Very stiff radial coupling between hollow shaft of motor and nut
- Very high axial stiff
- Customized flanges available
- Lubricated-for-life, sealed bearing
- Suitable for radial and axial loads
- Optional lubrication of screw nut on stationary component
- Force can be applied in both directions
- Optional brake for vertical axes

Applications

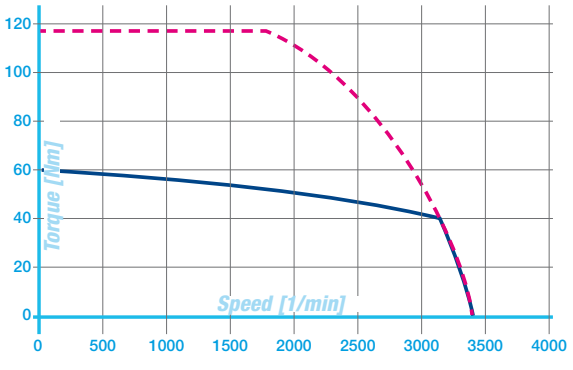
- Normal duty
- Short movements or unlimited stroke length

Equipment

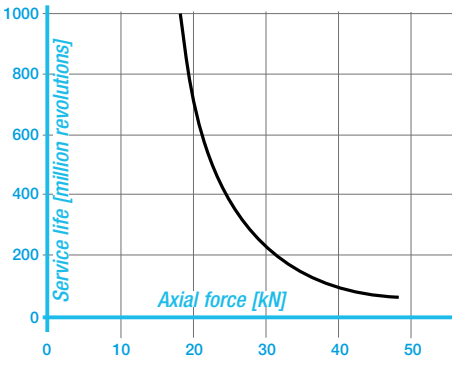
	Standard	Option
Brake	–	18/50* Nm * Brake for hollow through-shaft
Encoder	Q, multiturn, inductive	F, multiturn, optical

Connecting cable: Nominal cross-section of copper conductor 10 mm²
Power connector, size 1.5

Characteristic curves



SKT7-55-20-xxW-4000



Bearing life (L10) characteristic

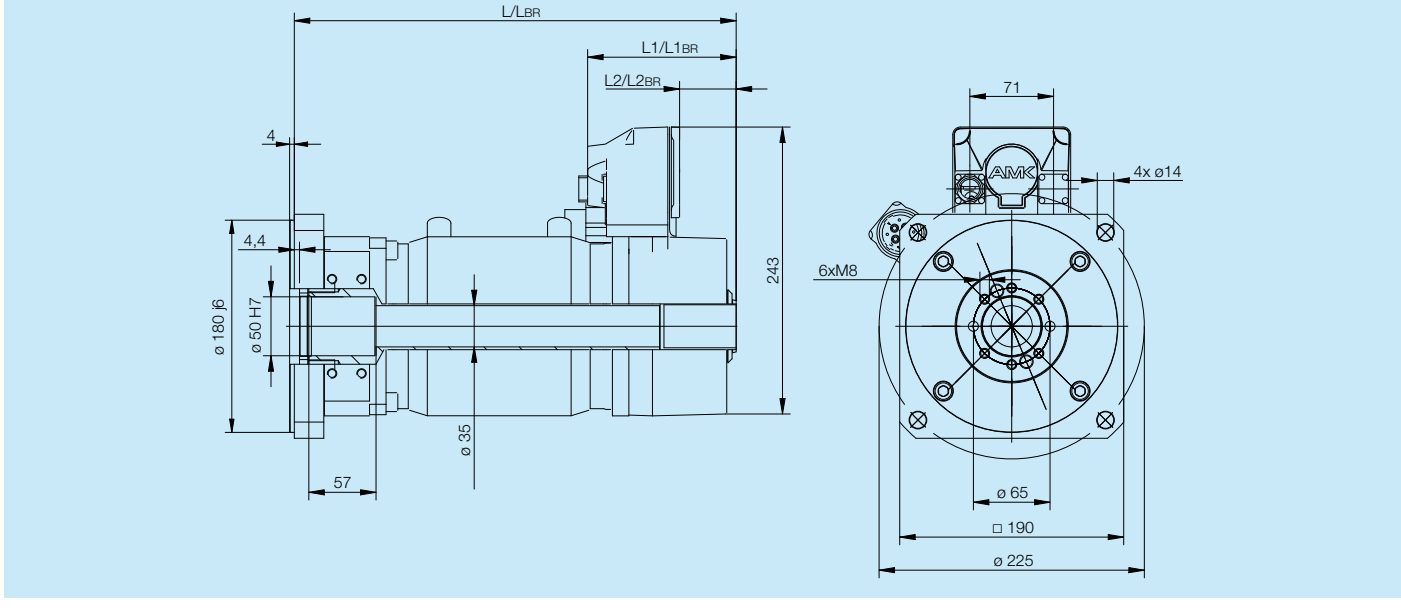
Maximum torque — Thermal continuous torque

Technical data

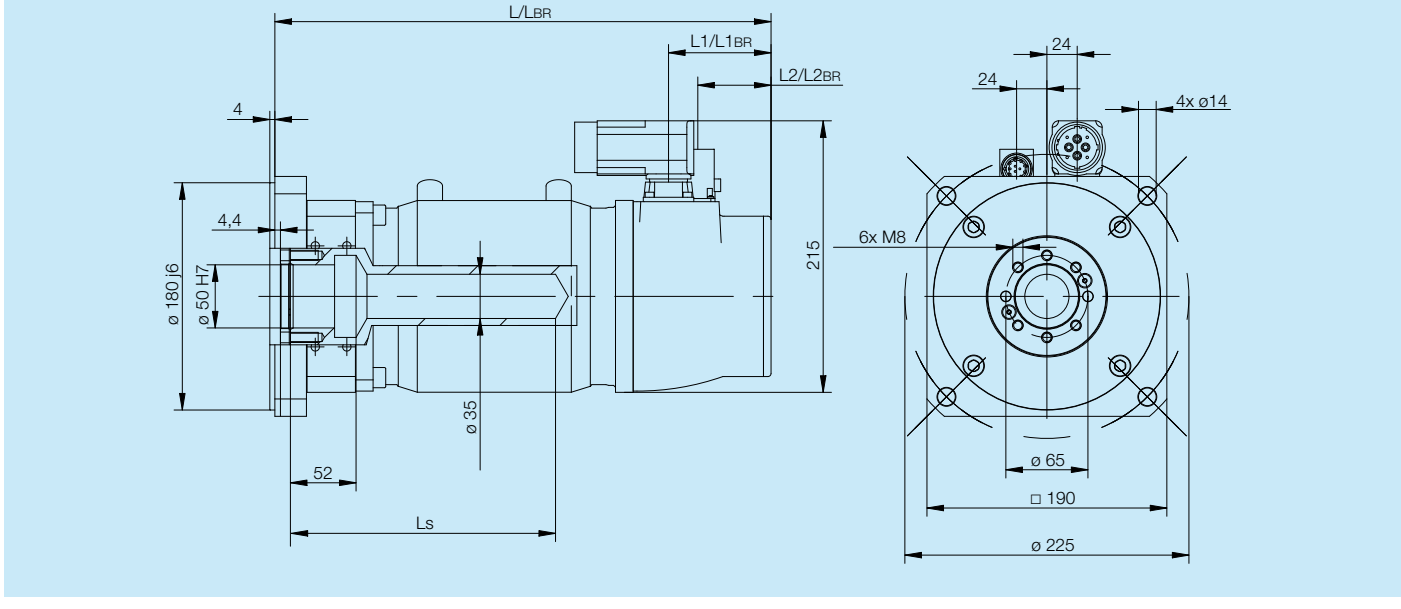
Motor type	Blind hollow shaft	Hollow through-shaft	Bearing axial forces		Stall data		Rated data					Maximum data		Mechanical data									
			$F_{max\ stat}$ [kN]	$F_{max\ dyn}$ [kN]	M_0 [Nm]	I_0 [A]	M_N [Nm]	P_N [kW]	I_N [A]	n_N [rpm]	k_T [Nm/A]	M_{max} [Nm]	I_{max} [A]	n_{max} [rpm]	J [kgcm²]	L_S [mm]	L [mm]	L1 [mm]	L2 [mm]	L_{BR} [mm]	$L1_{BR}$ [mm]	$L2_{BR}$ [mm]	m [kg]	m_{BR} [kg]
SKT7-55-20-xxW-4000	S	–	48	18	60	40.2	45	12	30	2,500	1.49	116	99	5,000	75	210	362	50	27	393	81	58	34	36
	–	D													90	∞	327	86	8	367	126	48	34	38

Dimensions

Motors with hollow through-shaft



Motors with blind hollow shaft



Flange connection to screw nut, see page 8 · Legend on page 31 · All dimensions in mm.

SKT10 convection-cooled

with hollow through-shaft or blind hollow shaft

Features

- Torque motor with broad, linear current-torque characteristic
- Speeds optimized for screw-nut systems
- Anti-backlash bearing
- Very stiff radial coupling between hollow shaft of motor and nut
- Very high axial stiff
- Customized flanges available
- Sealed bearing with possibility for continuous lubrication
- Ball bearing for medium duty and high speeds
- Optional lubrication of screw nut on stationary component
- Force can be applied in both directions
- Optional brake for vertical axes

Applications

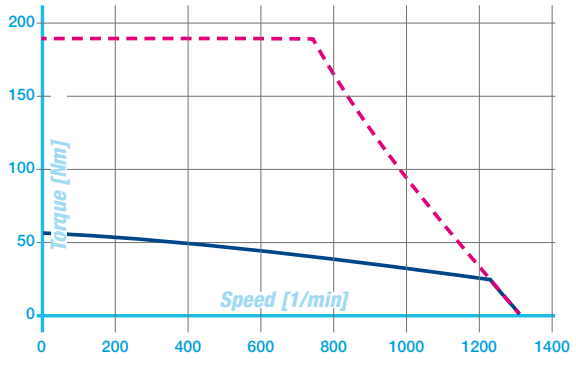
- Normal and medium duty
- Short movements or unlimited stroke length

Equipment

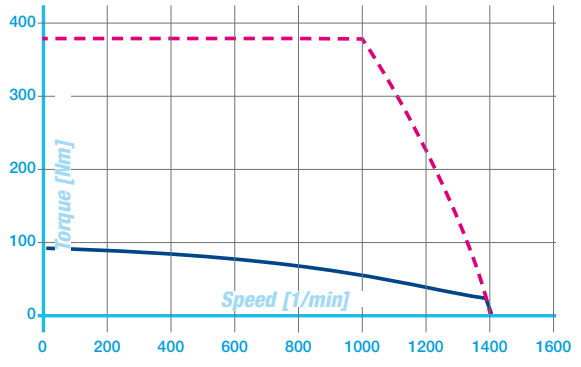
	Standard	Option
Brake	–	120 Nm
Encoder	Q, multiturn, inductive	F, multiturn, optical

Connecting cable: Nominal cross-section of copper conductor 4 mm²
Power connector, size 1.5

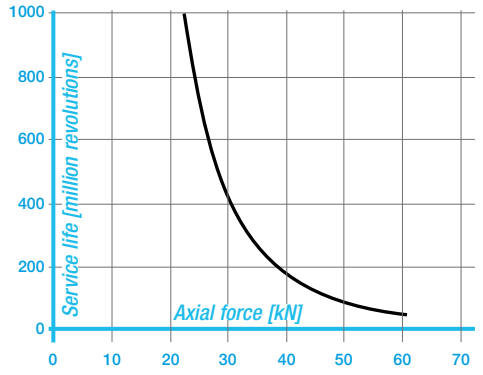
Characteristic curves



SKT10-54-20-xxO-1400



SKT10-95-20-xxO-1400



Bearing life (L10) characteristic

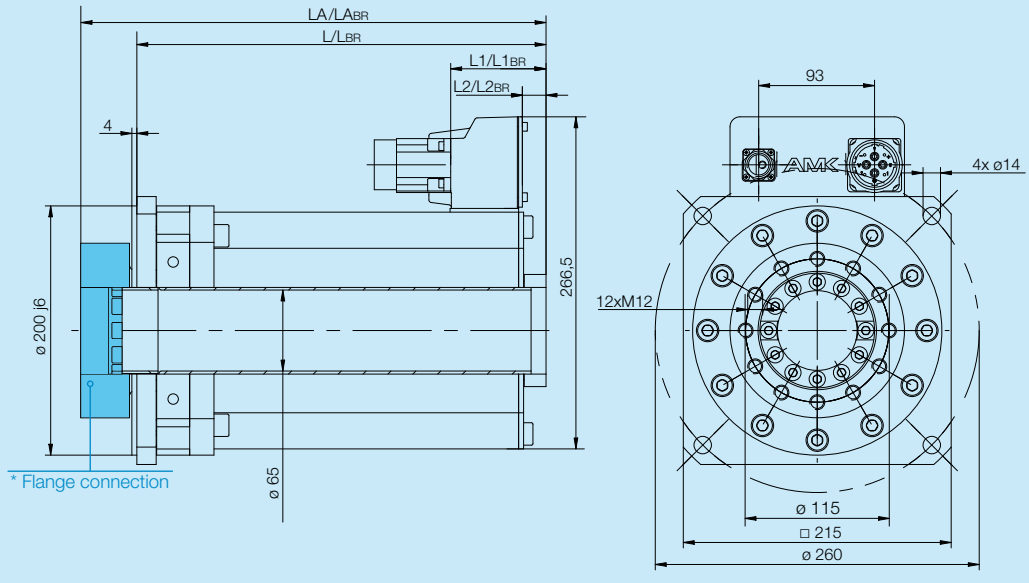
Maximum torque — Thermal continuous torque

Technical data

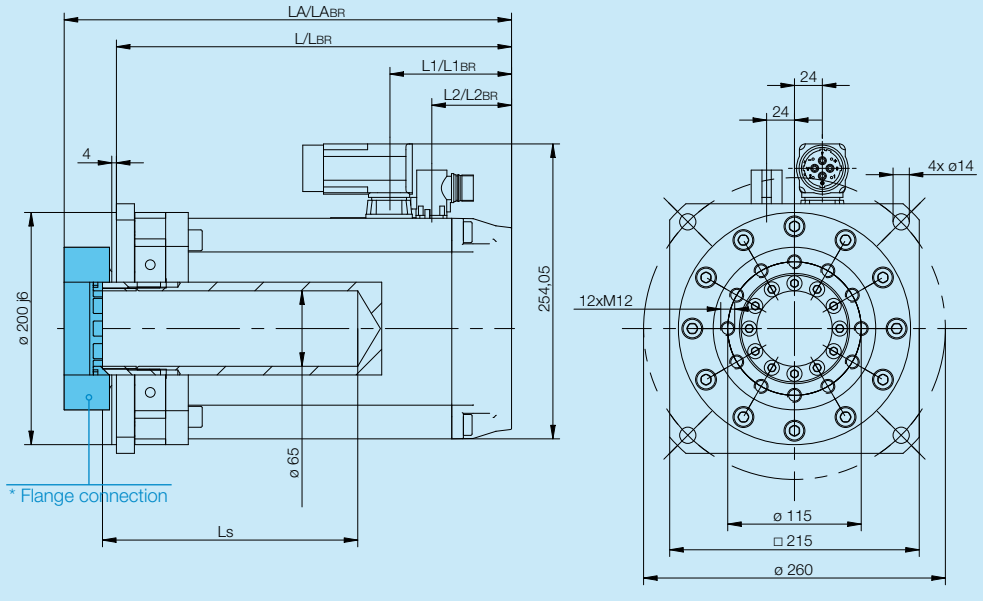
Motor type	Blind hollow shaft	Hollow through-shaft	Bearing axial forces		Stall data		Rated data					Maximum data		Mechanical data											
			$F_{max\ stat}$ [kN]	$F_{max\ dyn}$ [kN]	M_0 [Nm]	I_0 [A]	M_N [Nm]	P_N [kW]	I_N [A]	n_N [rpm]	k_T [Nm/A]	M_{max} [Nm]	I_{max} [A]	n_{max} [rpm]	J [kgcm²]	Ls [mm]	L [mm]	LA [mm]	L1 [mm]	L2 [mm]	L_{BR} [mm]	LA_{BR} [mm]	$L1_{BR}$ [mm]	$L2_{BR}$ [mm]	m [kg]	m_{BR} [kg]
SKT10-54-20-xxO-1400	–	D	61	23	64	16	42	4.5	10,5	1,000	4	194	67	2,000	425	∞	316	361	65	7	402	447	151	93	48	65
SKT10-95-20-xxO-1400	S	–	61	23	90	23.4	73	6.1	19	800	3.85	360	105	3,000	490	370	460	505	106	69	521	566	167	130	67	76
	–	D													494	∞	436	481	65	7	522	567	151	93	67	84

Dimensions

Motors with hollow through-shaft



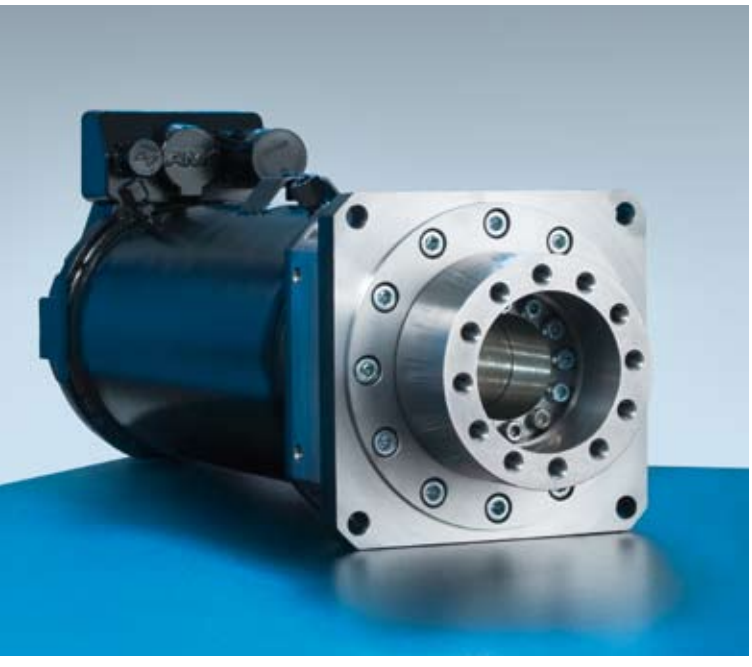
Motors with blind hollow shaft



* Flange connection to screw nut, see page 8 · Legend on page 31 · All dimensions in mm.

SKT10 liquid-cooled

with hollow through-shaft or blind hollow shaft



Features

- Torque motor with broad, linear current-torque characteristic
- Speeds optimized for screw-nut systems
- Anti-backlash bearing
- Highly stiff radial coupling between hollow shaft of motor and nut
- Very high axial stiff
- Customized flanges available
- Sealed bearing with possibility for continuous lubrication
- Ball bearing for medium duty and high speeds
- Optional lubrication of screw nut on stationary component
- Force can be applied in both directions
- Optional brake for vertical axes

Applications

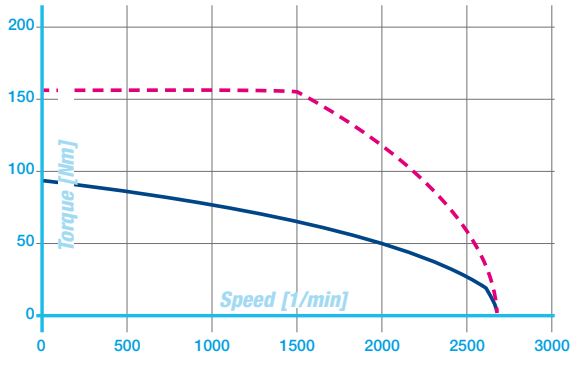
- Normal and medium duty
- Short movements or unlimited stroke length

Equipment

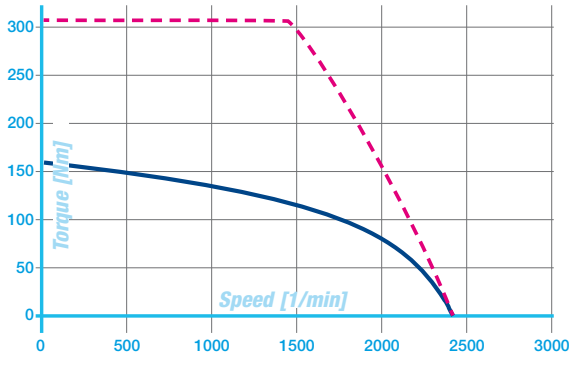
	Standard	Option
Brake	–	120 Nm
Encoder	Q, multiturn, inductive	F, multiturn, optical

Connecting cable: Nominal cross-section of copper conductor 16 mm²
Power connector, size 1.5

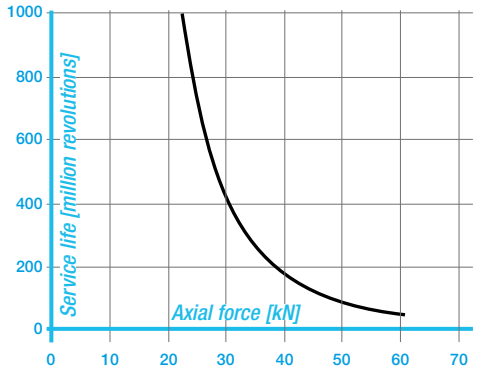
Characteristic curves



SKT10-100-20-xxW-3000



SKT10-145-20-xxW-2000



Bearing life (L10) characteristic

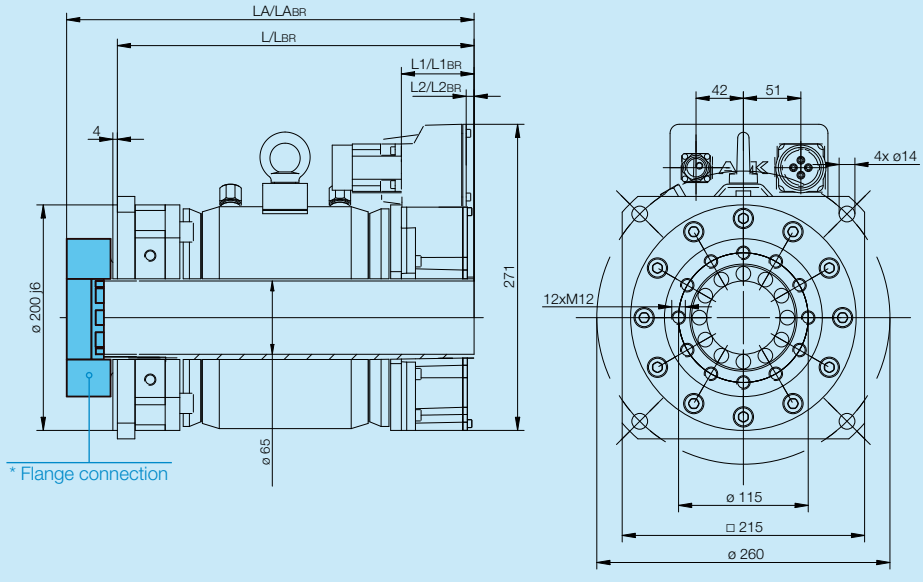
Maximum torque — Thermal continuous torque

Technical data

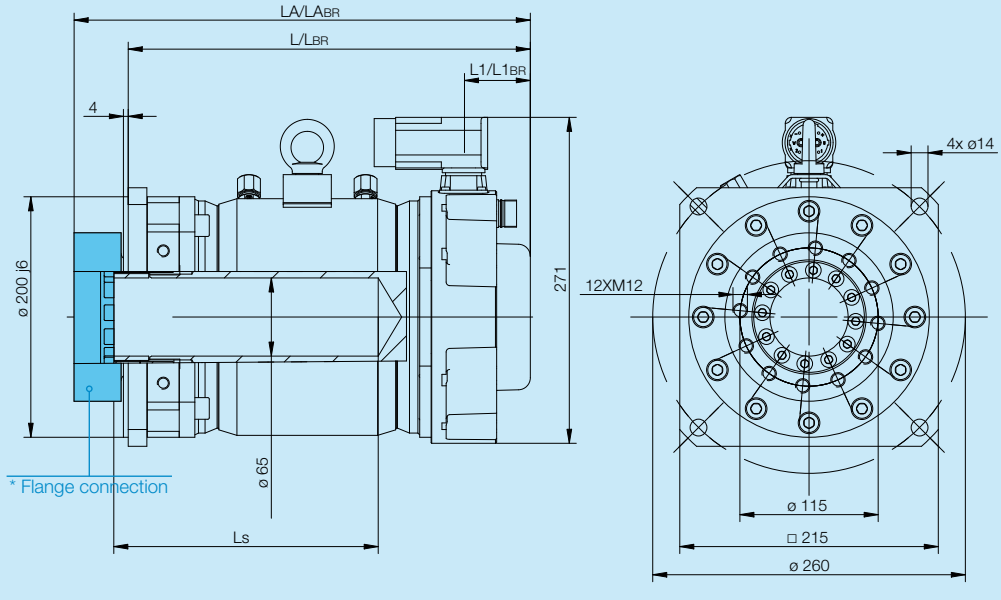
Motor type	Blind hollow shaft	Hollow through-shaft	Bearing axial forces		Stall data		Rated data					Maximum data		Mechanical data											
			F_{max_stat} [kN]	F_{max_dyn} [kN]	M_0 [Nm]	I_0 [A]	M_N [Nm]	P_N [kW]	I_N [A]	n_N [rpm]	k_T [Nm/A]	M_{max} [Nm]	I_{max} [A]	n_{max} [rpm]	J [kgcm²]	L_S [mm]	L [mm]	LA [mm]	L1 [mm]	L2 [mm]	L_{BR} [mm]	LA_{BR} [mm]	$L1_{BR}$ [mm]	$L2_{BR}$ [mm]	m [kg]	m_{BR} [kg]
SKT10-100-20-xxW-3000	S	–	61	23	95	54.3	66	11	38	1,500	1.75	160	132	3,000	340	250	334	379	56	48	420	465	117	109	48	57
	–	D													425	∞	316	361	65	7	402	457	151	93	48	65
SKT10-145-20-xxW-2000	S	–	61	23	160	66.6	120	18	50	1,500	2.4	310	200	2,500	490	370	454	499	56	48	540	585	117	109	64	74
	–	D													569	∞	436	481	65	7	522	567	151	93	65	82

Dimensions

Motors with hollow through-shaft



Motors with blind hollow shaft



* Flange connection to screw nut, see page 8 · Legend on page 31 · All dimensions in mm.

SKT13 liquid-cooled
with hollow through-shaft

Features
- Torque motor with broad, linear current-torque characteristic
- Speeds optimized for screw-nut systems
- Anti-backlash bearing
- Highly stiff radial coupling between hollow shaft of motor and nut
- Very high axial stiff
- Customized flanges available
- Sealed bearing with possibility for continuous lubrication
- Ball bearing for medium duty and high speeds
- Optional lubrication of screw nut on stationary component
- Force can be applied in both directions
- Optional brake for vertical loads

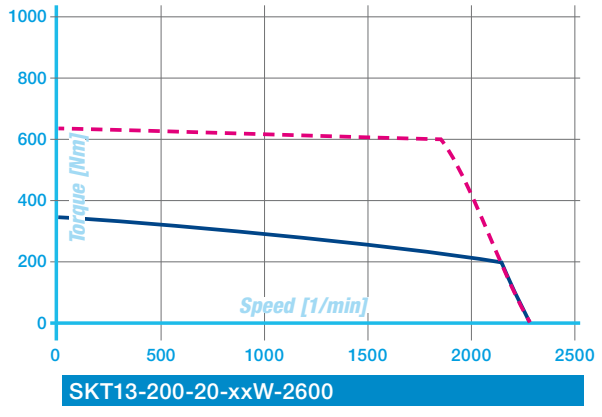
Applications
- Normal and medium duty
- Short movements or unlimited stroke length

Equipment

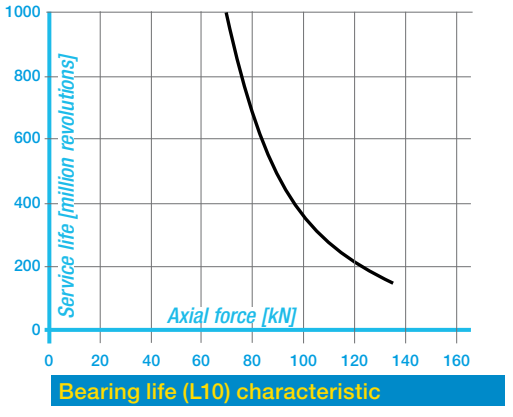
	Standard	Option
Brake	–	250 Nm
Encoder	Q, multiturn, inductive	F, multiturn, optical

Connecting cable: Nominal cross-section of copper conductor 35 mm²

Characteristic curves



SKT13-200-20-xxW-2600



Bearing life (L10) characteristic

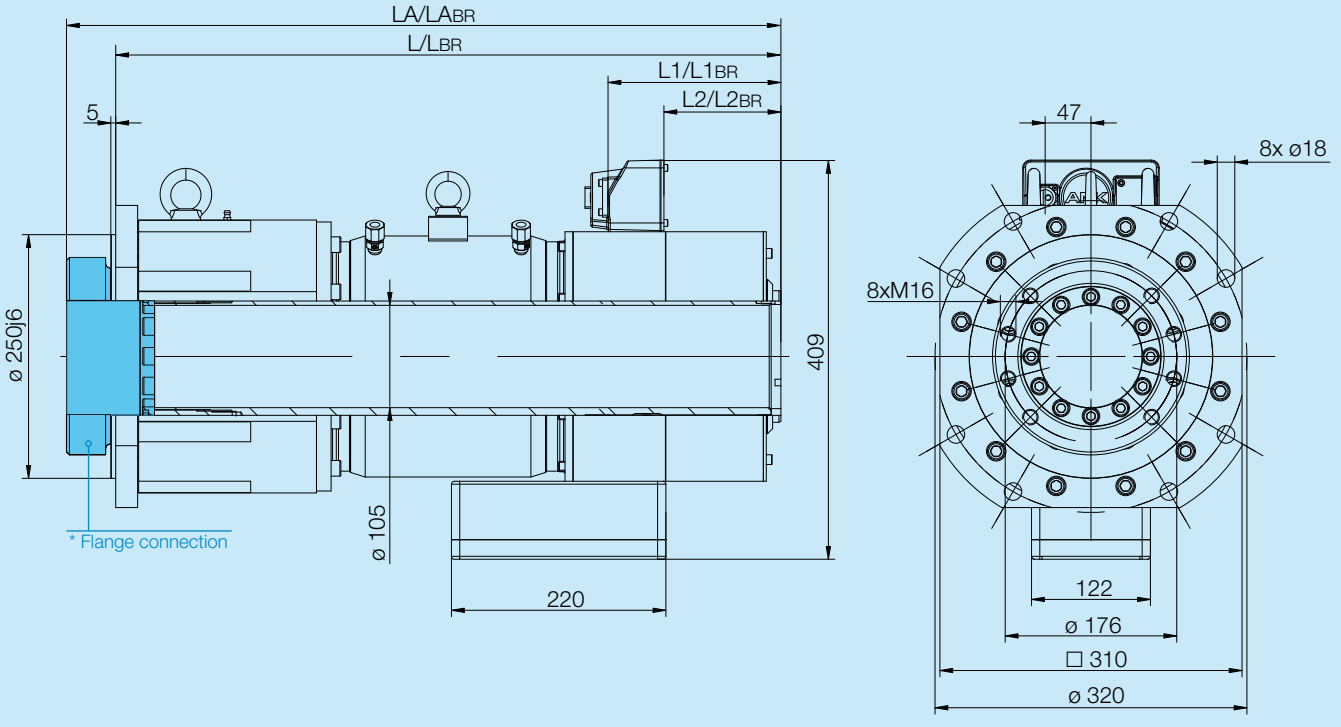
Maximum torque — Thermal continuous torque

Technical data

Motor type	Hollow through-shaft	Bearing axial forces		Stall data		Rated data					Maximum data		Mechanical data											
		F_{max} stat [kN]	F_{max} dyn [kN]	M_0 [Nm]	I_0 [A]	M_N [Nm]	P_N [kW]	I_N [A]	n_N [rpm]	k_T [Nm/A]	M_{max} [Nm]	I_{max} [A]	n_{max} [rpm]	J [kgcm²]	L [mm]	LA [mm]	L1 [mm]	L2 [mm]	L_{BR} [mm]	LA_{BR} [mm]	$L1_{BR}$ [mm]	$L2_{BR}$ [mm]	m [kg]	m_{BR} [kg]
SKT13-200-20-xxW-2600	D	135	70	360	145.8	240	45	103	1,800	2.3	640	330	3,300	1,822	520	560	85	27	630	670	195	137	160	180

Dimensions

Motors with hollow through-shaft



* Flange connection to screw nut, see page 8 · Legend on page 31 · All dimensions in mm.

SKT10 liquid-cooled

with hollow through-shaft or blind hollow shaft

Features

- Torque motor with broad, linear current-torque characteristic
- Speeds optimized for screw-nut systems
- Anti-backlash bearing
- Highly stiff radial coupling between hollow shaft of motor and nut
- Very high axial stiff
- Customized flanges available
- Sealed bearing with possibility for continuous lubrication
- Roller bearing for heavy duty and medium speeds
- Optional lubrication of screw nut on stationary component
- Direction of force: pushing or pulling
- Optional brake for vertical axes

Applications

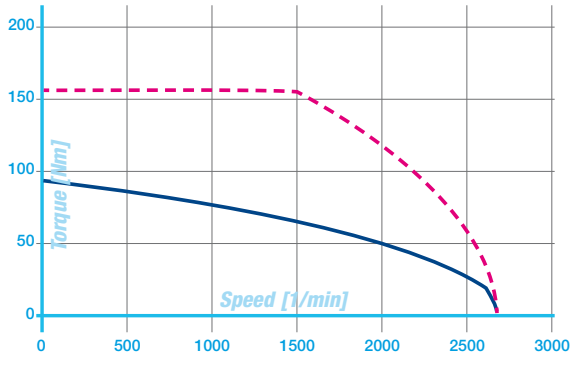
- Heavy duty
- Short movements or unlimited stroke length

Equipment

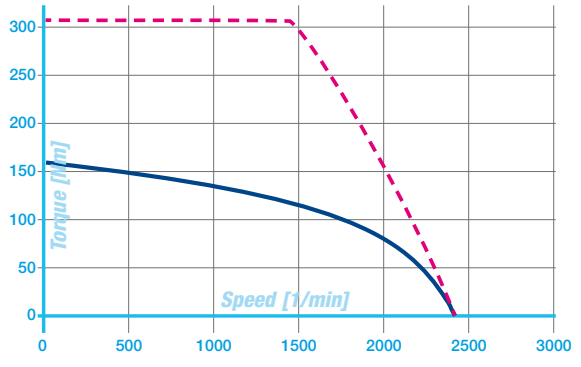
	Standard	Option
Brake	–	250 Nm
Encoder	Q, multiturn, inductive	F, multiturn, optical

Connecting cable: Nominal cross-section of copper conductor 16 mm²
Power connector, size 1.5

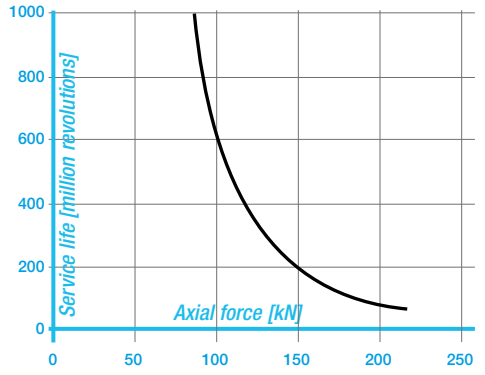
Characteristic curves



SKT10-100-20-xxW-3000



SKT10-145-20-xxW-2000



Bearing life (L10) characteristic

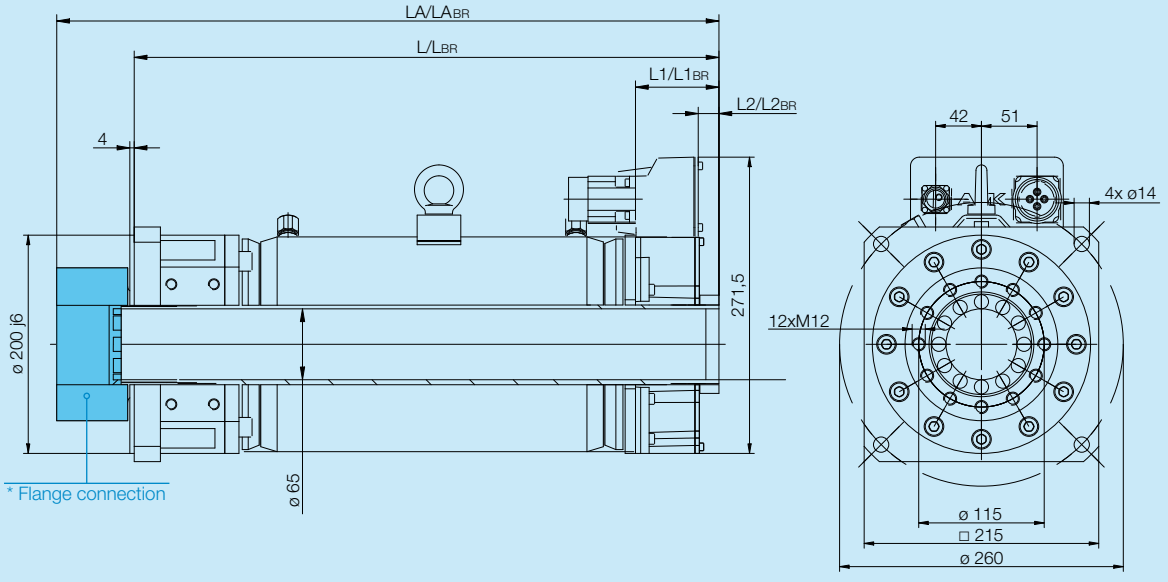
Maximum torque — Thermal continuous torque

Technical data

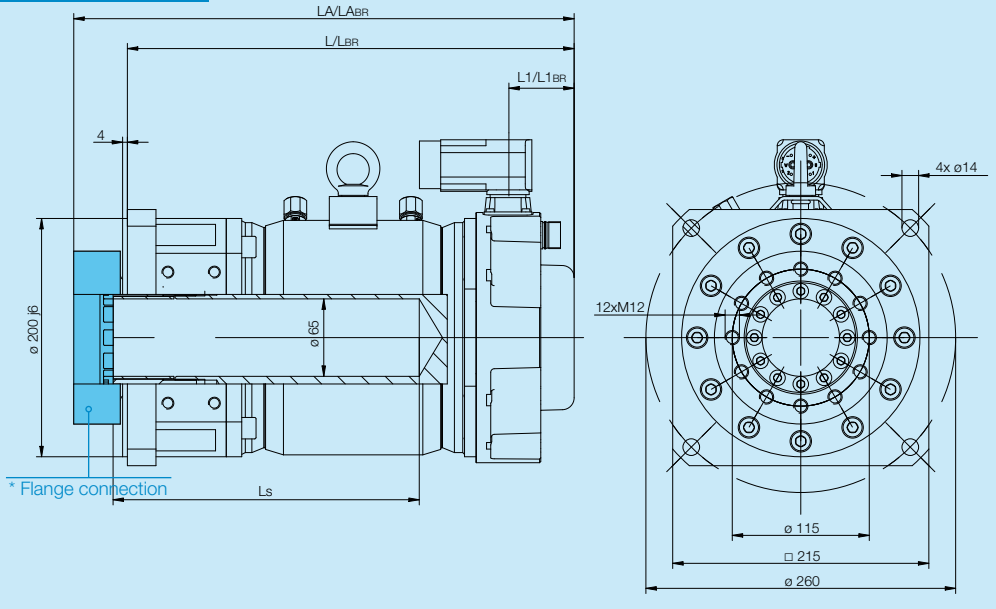
Motor type	Blind hollow shaft	Hollow through-shaft	Bearing axial forces		Stall data		Rated data					Maximum data		Mechanical data											
			$F_{max\ stat}$ [kN]	$F_{max\ dyn}$ [kN]	M_0 [Nm]	I_0 [A]	M_N [Nm]	P_N [kW]	I_N [A]	n_N [rpm]	k_T [Nm/A]	M_{max} [Nm]	I_{max} [A]	n_{max} [rpm]	J [kgcm²]	Ls [mm]	L [mm]	LA [mm]	L1 [mm]	L2 [mm]	L_{BR} [mm]	LA_{BR} [mm]	$L1_{BR}$ [mm]	$L2_{BR}$ [mm]	m [kg]	m_{BR} [kg]
SKT10-100-20-xxW-3000	–	D	216	85	95	54.3	66	11	38	1,500	1.75	160	132	3,000	458	∞	357	402	65	7	443	488	151	49	55	70
SKT10-145-20-xxW-2000	S	–	216	85	160	66.6	120	18	50	1,500	2.4	310	200	2,500	499	405	495	540	56	48	557	602	117	68	70	79
	–	D													610	∞	477	522	65	7	563	608	151	67	71	88

Dimensions

Motors with hollow through-shaft



Motors with blind hollow shaft



* Flange connection to screw nut, see page 8 · Legend on page 31 · All dimensions in mm.

SKT13 liquid-cooled
with hollow through-shaft

Features

- Torque motor with broad, linear current-torque characteristic
- Speeds optimized for screw-nut systems
- Anti-backlash bearing
- Highly stiff radial coupling between hollow shaft of motor and nut
- Very high axial stiff
- Customized flanges available
- Sealed bearing with possibility for continuous lubrication
- Roller bearing for heavy duty and medium speeds
- Optional lubrication of screw nut on stationary component
- Direction of force: 380 kN pulling or 570 kN pushing
- Optional brake for vertical axes

Applications

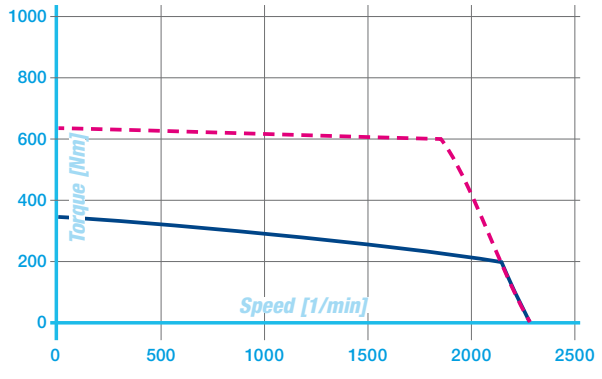
- Heavy duty
- Short movements or unlimited stroke length

Equipment

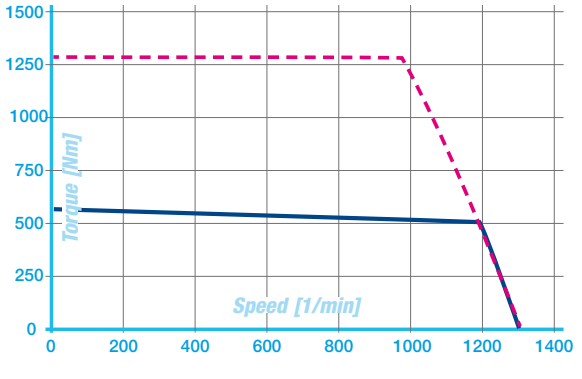
	Standard	Option
Brake	–	250 Nm
Encoder	Q, multiturn, inductive	F, multiturn, optical

Connecting cable: Nominal cross-section of copper conductor 35 mm²

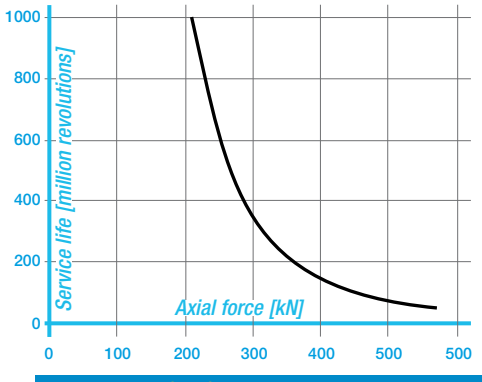
Characteristic curves



SKT13-200-20-xxW-2600



SKT13-650-20-xxW-1200



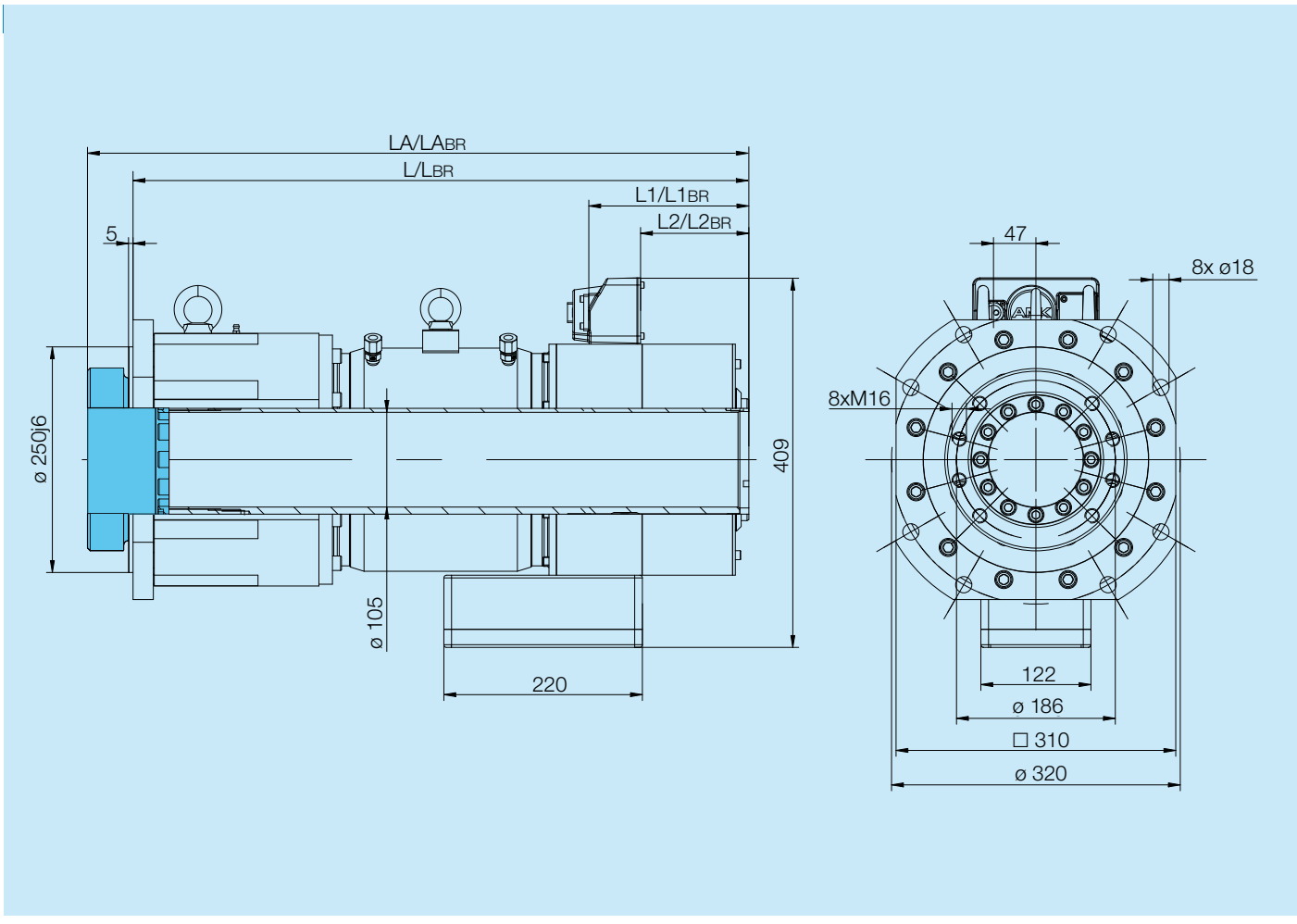
Bearing life (L10) characteristic

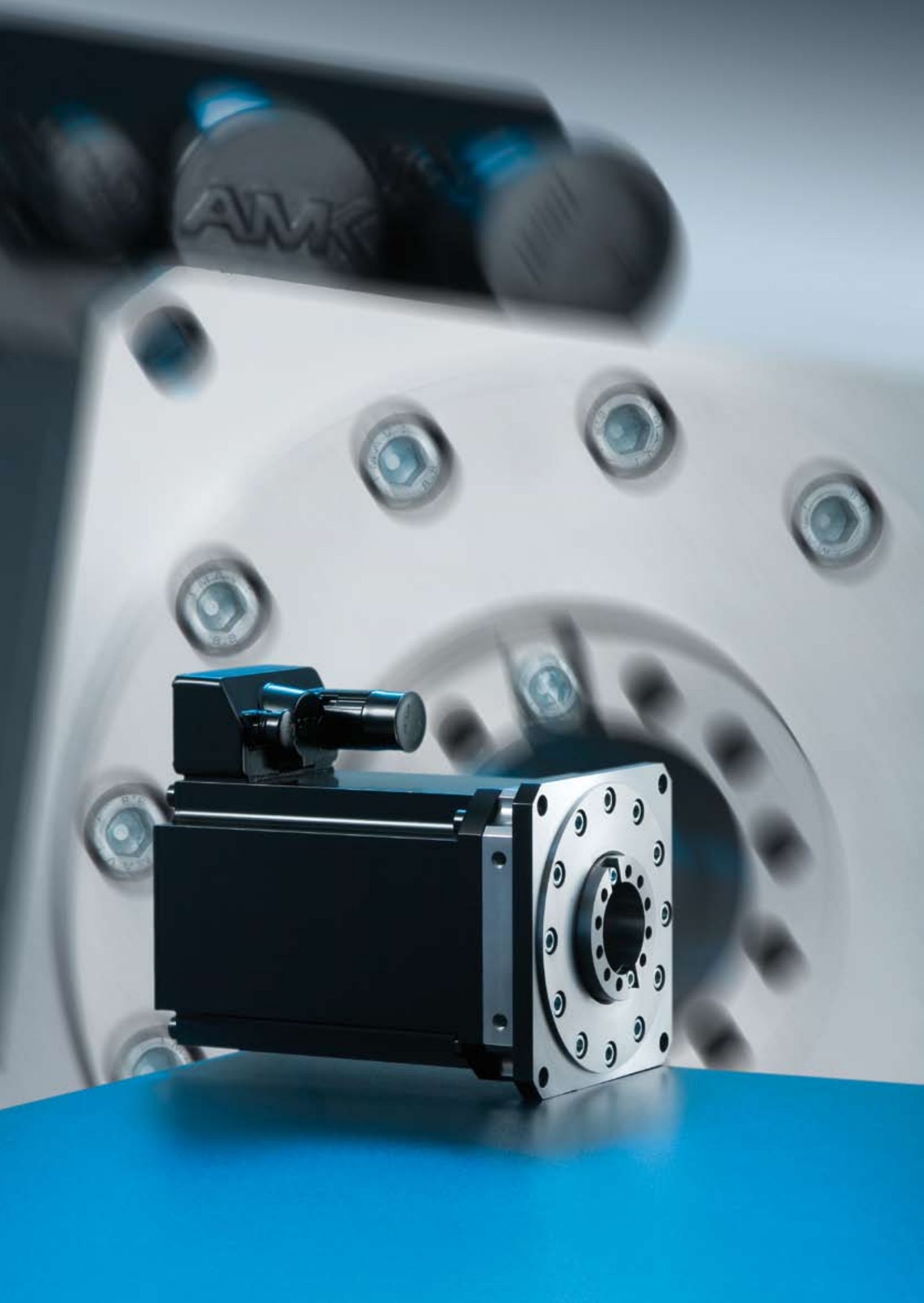
Maximum torque — Thermal continuous torque

Technical data

Motor type	Hollow through-shaft	Bearing axial forces		Stall data		Rated data					Maximum data		Mechanical data											
		F_{max} stat [kN]	F_{max} dyn [kN]	M_0 [Nm]	I_0 [A]	M_N [Nm]	P_N [kW]	I_N [A]	n_N [rpm]	k_T [Nm/A]	M_{max} [Nm]	I_{max} [A]	n_{max} [rpm]	J [kgcm²]	L [mm]	LA [mm]	L1 [mm]	L2 [mm]	L_{BR} [mm]	LA_{BR} [mm]	$L1_{BR}$ [mm]	$L2_{BR}$ [mm]	m [kg]	m_{BR} [kg]
SKT13-200-20-xxW-2600	D	570 D 380 Z	210	360	145.8	240	45	103	1,800	2.3	640	330	3,300	2,399	600	650	85	27	710	760	195	137	191	211
SKT13-650-20-xxW-1200	D	570 D 380 Z	210	660	108.7	600	63	130	1,000	4.6	1280	330	1,500	3,366	780	830	85	27	890	940	195	137	240	260

Dimensions




AWK

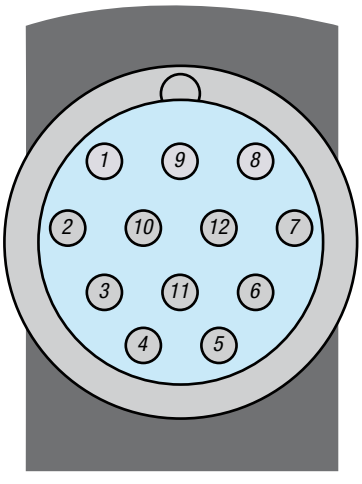
Position encoder

Encoder – overview

The motors can be equipped with various different position encoders.

Type	Technical data	Max. speed [1/min]
F	Optical absolute encoder EnDAT 2.1. multiturn 512 periods/revolution 13bit resolution/revolution Multiturn resolution 4096 revolutions ±25¨ system accuracy	12,000
Q	Inductive absolute encoder EnDAT 2.1, multiturn Hollow through-shaft: 18bit/16 periods/revolution Hollow shaft with blind hole: 19bit/32 periods/revolution Multiturn resolution 4096 revolutions ±480¨/280¨ system accuracy	12,000

Connector pin assignment on motor side



PIN Motor connector	Q/F encoder	
	Signal	Meaning
1	G2N	Channel 2 not inverted
2	G2I	Channel 2 inverted
3	G1N	Channel 1 not inverted
4	G1I	Channel 1 inverted
5	05P	Supply 5 VDC, max. 250 mA
6	GND	Reference for supply
7	CLK+	EnDat encoder interface
8	CLK-	EnDat encoder interface
9	DAT+	EnDat encoder interface
10	DAT-	EnDat encoder interface
11	05P	Supply 5 VDC, max. 250 mA
12	GND	Reference for supply
Shield		Connector housing

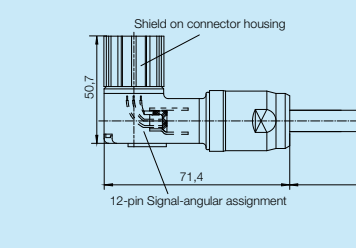
Encoder cable

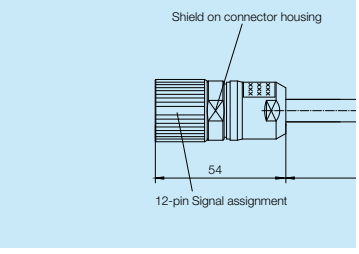
Prefabricated cables are available to connect the position encoder with KE/KW servo controllers. These are shielded multi paired conductor cables. Any length can be chosen in steps of 1 m up to 100 m.

Properties
Sheath: PUR, conductors TPE

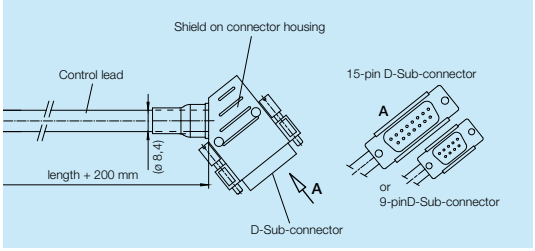
Cable trailing properties:
- min. bending radius 100 mm
- max. speed 1 m/s
- max. acceleration 4 m/s²
- 5 million bending cycles

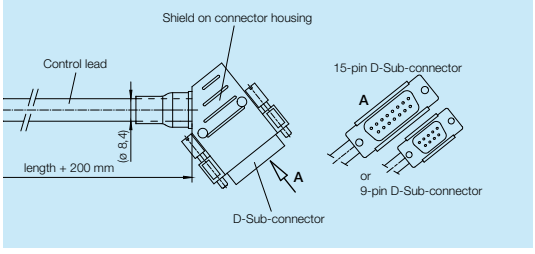
Motor side



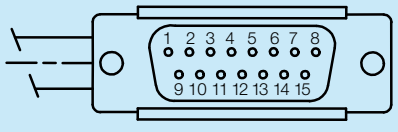


Drive side

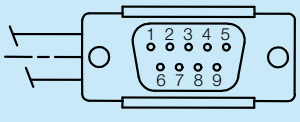




Connector pin assignment on drive side



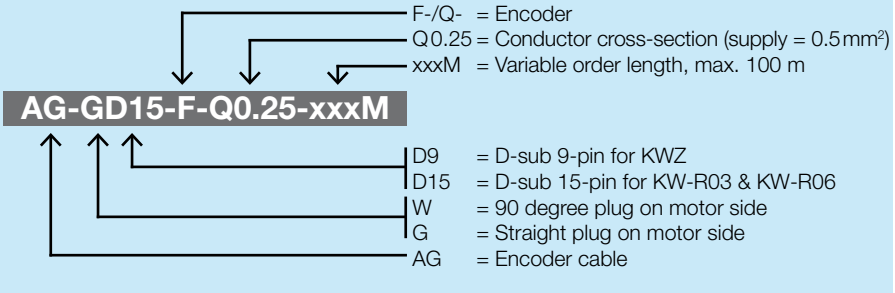
15-pin connector



9-pin connector

Connector pin assignment on motor side	Signal	Pin assignments on drive side		
		F encoder	Q encoder	
		KW-R03 & KW-R06	KW-R06	KWZ
		PIN D-sub 15	PIN D-sub 15	PIN D-sub 9
1	G2N	6	–	–
2	G2I	5	–	–
3	G1N	4	–	–
4	G1I	3	–	–
5	05P	13	13	1
6	GND	8	8	8
7	CLK+	12	12	3
8	CLK-	11	11	4
9	DAT+	10	10	5
10	DAT-	9	9	6
11	05P	7	7	9
12	GND	14	14	2
Shield	Plug casing			

Encoder cable order designation



Power connection

Power connector and cable

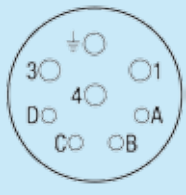
Prefabricated cables with power connectors and various cable cross-sections are available for the power supply, temperature sensor and brake. The cable sheathing is removed from the ends of the wires on the drive side. The cables are available in any length measured in complete meters.

Properties:
Sheath: PUR, conductors TPE

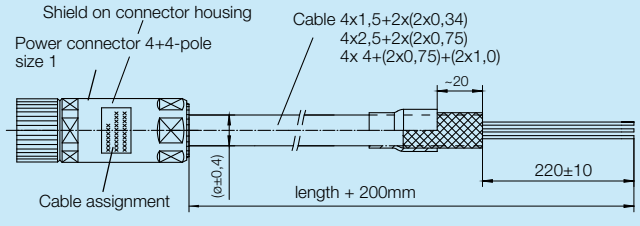
Cable trailing properties:
- min. bending radius:
  12 x outer diameter of cable

Pin assignments: Power connectors and power cables size 1 for SKT7

PIN	Meaning
A	Temperature sensor
B	Temperature sensor
C	Brake +
D	Brake 0 V
1	Motor phase u
3	Motor phase w
4	Motor phase v
⏚	Protective conductor

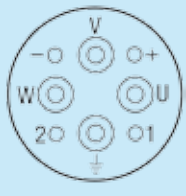


Power cable

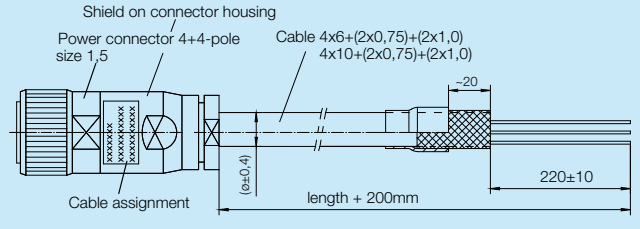


Pin assignments: Power connectors and power cables size 1.5 for SKT7_W and SKT10

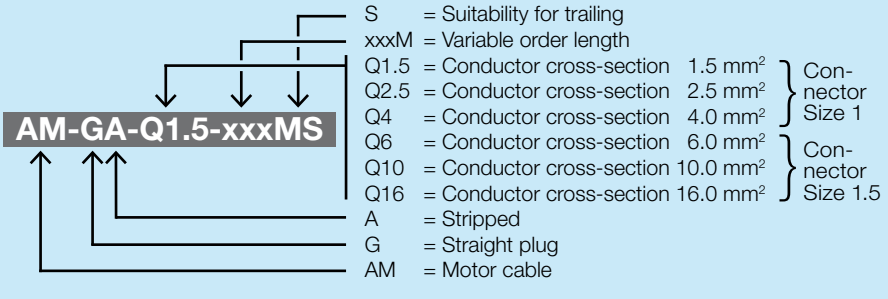
PIN	Meaning
u	Motor phase u
v	Motor phase v
w	Motor phase w
1	Temperature sensor
2	Temperature sensor
+	Brake +24 V
-	Brake 0 V
⏚	Protective conductor



Power cable



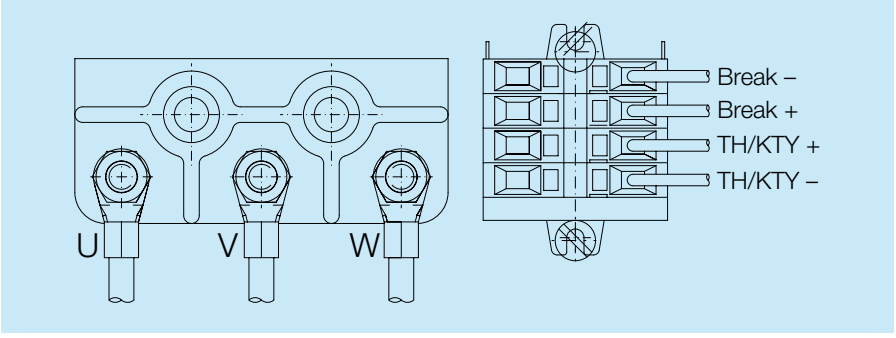
Power cable order designation



Legend on page 31 · all dimensions in mm.

Power connection SKT13

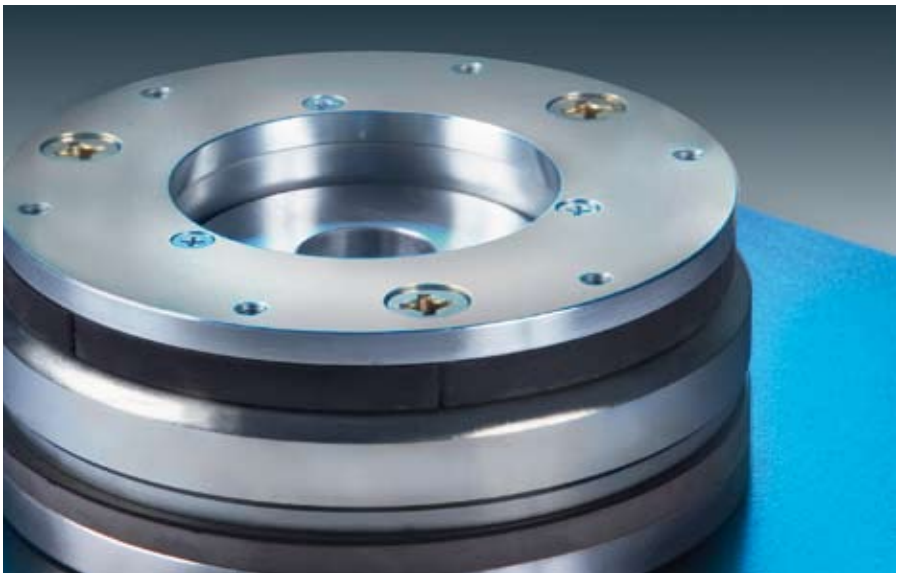
Terminal board assignments SKT13



Holding Brake

The motors can be optionally equipped with a holding brake. The brake is **not** suitable as an operational brake. The brakes are disengaged using 24 VDC (unfiltered).

Note: The maximum speed of the motor is limited by the maximum speed of the brake.



Series	Blind hollow shaft	Hollow through-shaft	Holding brake for SPINDASYN motors						
			M_{BR} [Nm]	U_{BR} [V]	I_{br} [A]	J_{BR} [kgcm²]	n_{maxBR} [rpm]	T_{on} [ms]	T_{off} [ms]
SKT7	S	–	18	24	0.8	0.5	6,000	30	70
	–	D	50		1.15	1.1			
SKT10	S	–	120	24	2.3	2.4	6,000	30	70
	–	D			1.3	60			
SKT13	–	D	250	24	2.9	130	3,000	250	250

Legend on page 31 · all dimensions in mm.

Abbreviations

Characters	Unit	Explanation
F_{max_stat}	kN	Maximum force, static
F_{max_dyn}	kN	Maximum force, dynamic
M_O	Nm	Continuous stall torque
I_O	A	Continuous stall current
M_N	Nm	Rated torque
P_N	kW	Rated power
I_N	A	Rated current
n_N	rpm	Rated speed
k_T	Nm/A	Torque constant ($M = I * k_T$)
M_{max}	Nm	Maximum torque
I_{max}	A	Maximum current
n_{max}	rpm	Maximum speed
J	$kgcm^2$	Motor moment of inertia
L	mm	Motor length
Ls	mm	Length of blind hole
LA/LA_{BR}	mm	Motor length with adapter
L1	mm	Distance from connector to end of motor
L2	mm	Distance from encoder connector to end of motor (with hollow through-shafts, right side of connector casing to end of motor)
L_{BR}	mm	Length of motor with brake
$L1_{BR}$	mm	Distance from power connector to end of motor with brake
$L2_{BR}$	mm	Distance from encoder connector to end of motor with brake (for hollow through-shaft, right side of connector casing to end of motor)
m	kg	Motor mass
m_{BR}	kg	Motor mass with brake
M_{BR}	Nm	min. static braking torque
U_{BR}	V	Brake voltage
I_{BR}	A	Brake current
J_{BR}	$kgcm^2$	Brake moment of inertia
n_{maxBR}	rpm	Maximum brake speed
T_{on}	ms	Time for brake to engage
T_{off}	ms	Time for brake to disengage

General technical data

Protection class:
IP54. Higher protection classes available on request.

Rated data:
Relative to temperature rise of 80 K in windings. The motor is tested for this using a thermally insulated flange.

Dissipation losses in screw-nut system may require verification in application.

Insulating material class/heat class:
F in acc. with DIN VDE 0530.

Thermal protection:
PTC thermistor, cold resistance approx. 150–800 Ω.

Motor bearing, A-side:
Lubricated-for-life angular contact ball bearings and tapered roller bearings, must be greased occasionally depending on the application.

Motor bearing, B-side:
Lubricated-for-life, sealed bearing.

Balance quality grade:
G 2.5 in accordance with VDI 2056.

Vibration severity grade:
N in acc. with DIN ISO 2373.

Painting:
RAL 9005, flat black.

Cooling:
Convection cooling or liquid cooling

Ambient conditions

Ambient temperature:
+5 to +40 °C. At higher ambient temperatures of up to maximum 60 °C, the rated data must be reduced by 1 % per 1 K temperature increase.

Elevation of installation site:
Up to 1000 m above sea level. When operated at sites with elevations higher than 1000 m, the ambient temperatures given in DIN VDE 0530 Table 4 apply.

Humidity:
Maximum 85 % relative humidity, no condensation.

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- **TORQ**System®
  Gear motors
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