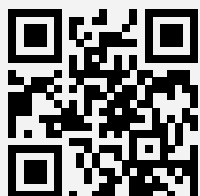


Rotary Servo Actuators

More productive
More efficient
More precise



TPM+



Cad data and operating manuals

http://www.wittenstein-motion-control.de/de_DE/division/industrial-systems/download.html

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Overview of TPM⁺ product range

The TPM⁺ product range impresses! With its dynamics, torque and torsional rigidity. Combined with an extremely short overall length, high power density and superior running on a completely new level together with practical graduated performance settings that ensure greater operating efficiency in all your production applications.

Product declarations

Actuators

The TPM⁺ product range is above all dynamic and compact. Servo motors and gearheads merge seamlessly into a single versatile unit. The benefit: Maximum power density meets functional design.

Motor

Outstanding performance: Rare earth magnets, a high pole count and a high fill factor in the permanent magnet excited synchronous servo motors result in high power density with barely discernible cogging torques.

Gearhead

The planetary gearheads offer minimal backlash while achieving a high degree of torsional and tilting rigidity. The smooth-running helical teeth guarantee silent operation.

More productive. More efficient. More precise.

More productive ...

The benefits for your machines and plants: An actuator with a low moment of inertia and an extremely rigid drive train provide for the highest precision and dynamics. A decisive increase in productivity.

More efficient ...

Low torsional backlash, an output bearing with a high degree of tilting rigidity and integration of the gearhead pinion in the motor shaft result in: smaller motors, reduced energy consumption and lower investment costs.

More precise ...

Low levels of operating noise due to helical teeth and outstanding control properties ensure greater precision in your machines and plants. The result: genuinely economical products.

Further features

- | | | |
|--|--|---|
| <ul style="list-style-type: none">- Different encoder systems and permanent magnet holding brake available.- Direct attachment of drive components (pinion, belt pulley, indexing table) to standardized output flange. | <ul style="list-style-type: none">- UL version as standard.- Pre-assembled cables for selected servo controllers available.- Simple commissioning through special instructions for more than 25 servo controllers. | <ul style="list-style-type: none">- Torsional backlash reduction to less than 1 arcmin possible.- Electrical connection via time-saving bayonet couplings.- Robust output bearing eliminates the need for additional bearing point. |
|--|--|---|

TPM+ dynamic

More dynamic – Shorter – Quieter

Extra productivity: Outstanding dynamics, compact dimensions and extremely smooth running. Actuator with two-stage gearhead designed primarily for rotary applications.

TPM+ power

Stronger – Quieter – More compact

Extra power: High torque, compact dimensions. Single or two-stage motor/gearhead combination for linear and rotary applications.

TPM+ high torque

Stronger – More compact – Higher torsional rigidity

The uncompromising plus: High torsional rigidity and superior power density. Two or three-stage servo actuator for heavy-duty applications.



The background is a deep blue with several concentric, glowing circles of varying radii. A horizontal band of a lighter, semi-transparent blue color runs across the middle of the image. The text is positioned within this band.

TPM⁺ servo actuators



TPM⁺ dynamic

More dynamic. Shorter. Quieter.

Experience extraordinary dynamics through modern motor technology with high power density, a low moment of inertia and optimal torsional rigidity. Benefit from a reduced installation length: The coupling-free connection between motor and gearhead and the space-saving attachment of motor instruments make the TPM⁺ dynamic over 50 percent more compact than conventional gearhead motors. Helical-toothed precision planetary gearheads ensure low-vibration and silent operation.





Source: Hastamat Verpackungstechnik

Applications

Whether used as an axle drive on spraying robots, a swivel drive in the production of optical media and semiconductors, in packaging machines or as a drive for changeover systems in machine tools or wood processing systems, the TPM+ dynamic is ideal for all robotic and automated applications.

Size	Installation length in mm	Acceleration torque in Nm	Max. power in kW
004	from 113	up to 40	up to 1.0
010	from 142	up to 100	up to 1.5
025	from 153	up to 300	up to 4.7
050	from 187	up to 650	up to 10.2
110	from 268	up to 1300	up to 14.2

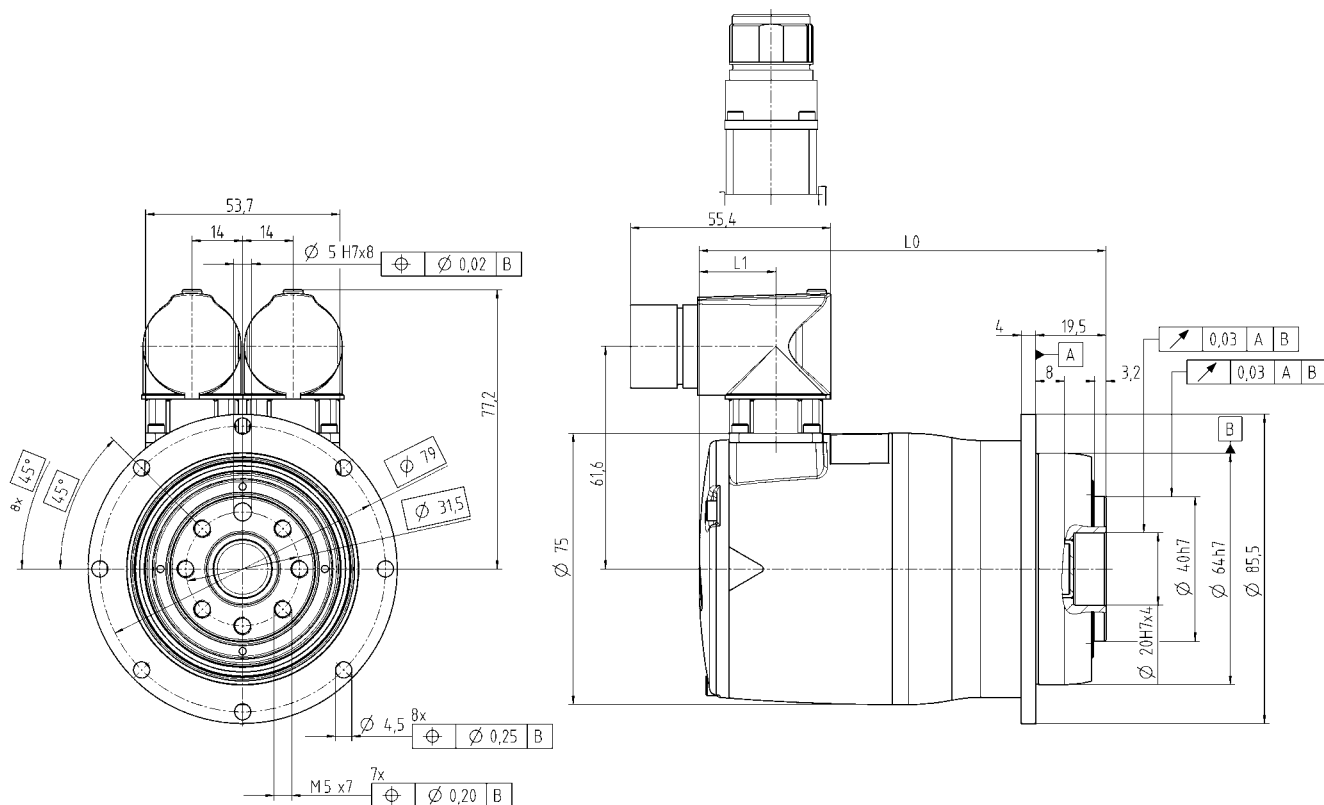
TPM⁺ dynamic 004

Ratio	i		16		21		31		61		64		91	
Intermediate circuit voltage	U _D	V DC	320	560	320	560	320	560	320	560	320	560	320	560
Max. acceleration torque at output (max. 1000 cycles per hour)	T _{2B}	Nm	30		32		40		32		32		32	
Static output torque	T ₂₀	Nm	8		11		17		15		15		15	
Brake holding torque at output, 100°C	T _{2BR}	Nm	18		23		34		67 ¹⁾		70 ¹⁾		100 ¹⁾	
Max. speed	n _{2max}	rpm	375		286		194		98		94		66	
Speed limit for T _{2B}	n _{2B}	rpm	313		262		189		98		94		66	
Max. motor acceleration torque	T _{Mmax}	Nm	2.0		2.0		2.0		1.0		1.0		1.0	
Max. motor acceleration current	I _{maxdyn}	A _{eff}	5.5	3.2	5.5	3.2	5.5	3.2	4.2	2.4	4.2	2.4	4.2	2.4
Static motor current	I ₀	A _{eff}	1.9	1.1	1.9	1.1	1.9	1.1	1.4	0.8	1.4	0.8	1.4	0.8
Moment of inertia (at motor shaft, without brake, with resolver)	J ₁	kgm²•10 ⁻⁴	0.21		0.20		0.20		0.12		0.11		0.12	
Torsional backlash	j _t	arcmin	Standard ≤ 4 / Reduced ≤ 2											
Torsional rigidity	C _t	Nm/arcmin	–		10		9		9		–		7	
Tilting rigidity	C _K	Nm/arcmin	–											
Max. axial force	F _{Amax}	N	1630											
Max. tilting moment (distance from point of rotation to output flange 57.6 mm)	M _{Kmax}	Nm	110											
Weight (with resolver, without brake)	m	kg	2.2						2.0					
Operating noise (measured at motor speed of 3000 rpm)	L _{PA}	dB(A)	≤ 58											
Max. permitted housing temperature		°C	+90											
Ambient temperature		°C	0 to +40											
Protection class			IP65											
Mount. pos.			Any											
Lubrication			Synthetic oil, lubricated for life											
Insulating material class			F											
Paint			Metallic blue 250 and natural cast aluminum											

Tolerances T, I and n: Maximal +/- 10%.

¹⁾ greater than T_{2B} of the gearhead. In case of an emergency stop, can be used approx. 1000 times while the motor is rotating.

Please refer to the instructions and graphic illustration of the speed and torque values in the chapter “Project planning”.



Electrical connection: Integral sockets, straight or angled, manufactured by Intercontec, speedtec model, series A and B, size 1

without brake

Ratio	Motor feedback	Length L0 in mm	Length L1 in mm
i = 16/21/31	Resolver	128	22
	Hiperface	153	47
	EnDat	157	51
i = 61/64/91	Resolver	113	22
	Hiperface	138	47
	EnDat	142	51

with brake

Ratio	Motor feedback	Length L0 in mm	Length L1 in mm
i = 16/21/31	Resolver	165	22
	Hiperface	190	47
	EnDat	194	51
i = 61/64/91	Resolver	150	22
	Hiperface	175	47
	EnDat	179	51

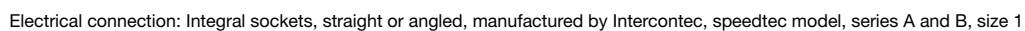
TPM⁺ dynamic 010

Ratio	i		16		21		31		61		64		91	
Intermediate circuit voltage	U _D	V DC	320	560	320	560	320	560	320	560	320	560	320	560
Max. acceleration torque at output (max. 1000 cycles per hour)	T _{2B}	Nm	57		75		100		80		80		80	
Static output torque	T ₂₀	Nm	13		18		27		29		28		35	
Brake holding torque at output, 100°C	T _{2BR}	Nm	18		23		34		67		70		100 ¹⁾	
Max. speed	n _{2max}	rpm	375		286		194		98		94		66	
Speed limit for T _{2B}	n _{2B}	rpm	256		195		132		81		78		54	
Max. motor acceleration torque	T _{Mmax}	Nm	3.8		3.8		3.8		1.9		1.9		1.9	
Max. motor acceleration current	I _{maxdyn}	A _{eff}	9.0	5.2	9.0	5.2	9.0	5.2	5.2	3.0	5.2	3.0	5.2	3.0
Static motor current	I ₀	A _{eff}	2.3	1.3	2.3	1.3	2.3	1.3	1.6	0.9	1.6	0.9	1.6	0.9
Moment of inertia (at motor shaft, without brake, with resolver)	J ₁	kgm ² *10 ⁻⁴	0.32		0.32		0.32		0.17		0.17		0.17	
Torsional backlash	j _t	arcmin	Standard ≤ 3 / Reduced ≤ 1											
Torsional rigidity	C _t	Nm/arcmin	–		26		24		24		–		21	
Tilting rigidity	C _K	Nm/arcmin	225											
Max. axial force	F _{Amax}	N	2150											
Max. tilting moment (distance from point of rotation to output flange 82.7 mm)	M _{Kmax}	Nm	270											
Weight (with resolver, without brake)	m	kg	4.8						4.3					
Operating noise (measured at motor speed of 3000 rpm)	L _{PA}	dB(A)	≤ 62											
Max. permitted housing temperature		°C	+90											
Ambient temperature		°C	0 to +40											
Protection class			IP65											
Mount. pos.			Any											
Lubrication			Synthetic oil, lubricated for life											
Insulating material class			F											
Paint			Metallic blue 250 and natural cast aluminum											

Tolerances T, I and n: Max. +/- 10%.

¹⁾ greater than T_{2B} of the gearhead. In case of an emergency stop, can be used approx. 1000 times while the motor is rotating.

Please refer to the instructions and graphic illustration of the speed and torque values in the chapter “Project planning”.



Ratio	Motor feedback	Length L0 in mm	Length L1 in mm
i = 16/21/31	Resolver	157	24
	Hiperface	178	45
	EnDat	182	49
i = 61/64/91	Resolver	142	24
	Hiperface	163	45
	EnDat	167	49

Ratio	Motor feedback	Length L0 in mm	Length L1 in mm
i = 16/21/31	Resolver	178	24
	Hiperface	199	45
	EnDat	202	49
i = 61/64/91	Resolver	163	24
	Hiperface	184	45
	EnDat	187	49

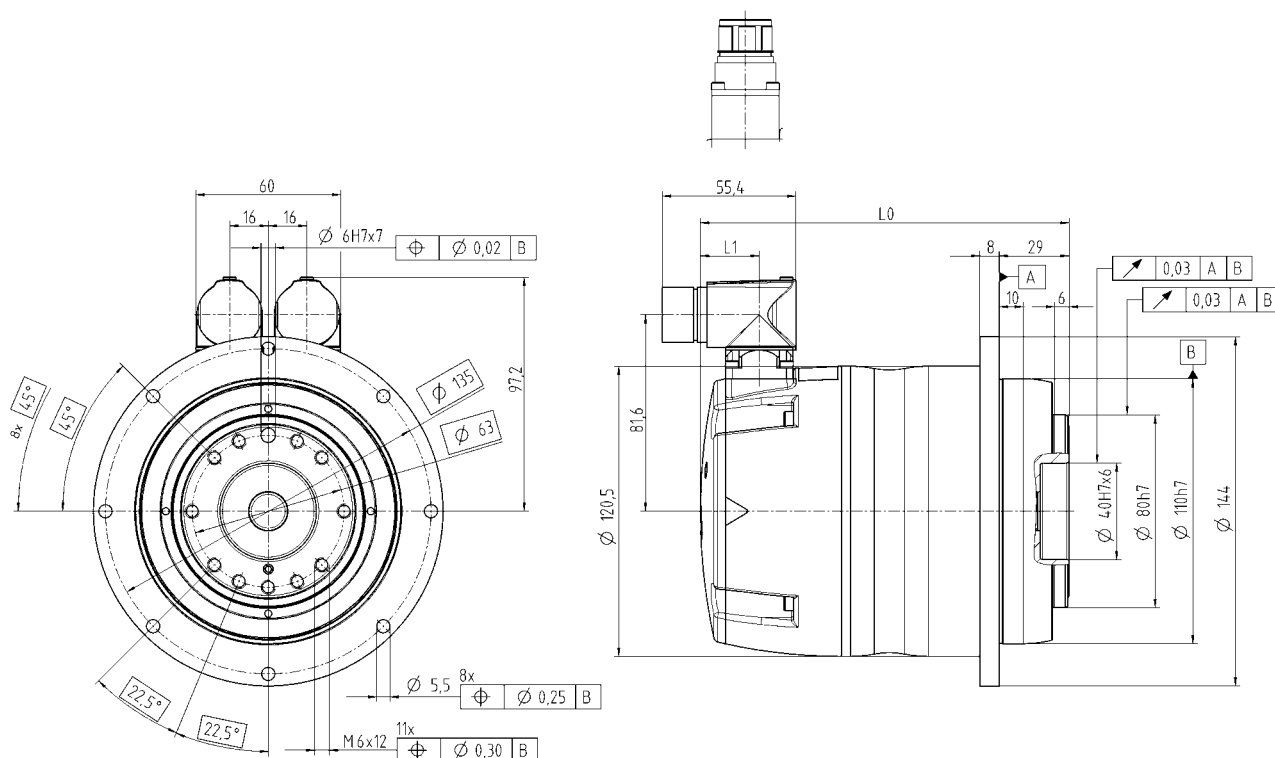
TPM⁺ dynamic 025

Ratio	i		16		21		31		61		64		91	
Intermediate circuit voltage	U _D	V DC	320	560	320	560	320	560	320	560	320	560	320	560
Max. acceleration torque at output (max. 1000 cycles per hour)	T _{2B}	Nm	182		239		300		250		250		250	
Static output torque	T ₂₀	Nm	74		97		146		87		83		100	
Brake holding torque at output, 100°C	T _{2BR}	Nm	72		94		140		274 ¹⁾		288 ¹⁾		410 ¹⁾	
Max. speed	n _{2max}	rpm	375		286		194		98		94		66	
Speed limit for T _{2B}	n _{2B}	rpm	244		185		125		59		56		39	
Max. motor acceleration torque	T _{Mmax}	Nm	12.1		12.1		12.1		4.4		4.4		4.4	
Max. motor acceleration current	I _{maxdyn}	A _{eff}	29.4	17.0	29.4	17.0	29.4	17.0	10.4	6.0	10.4	6.0	10.4	6.0
Static motor current	I ₀	A _{eff}	9.9	5.7	9.9	5.7	9.9	5.7	3.3	1.9	3.3	1.9	3.3	1.9
Moment of inertia (at motor shaft, without brake, with resolver)	J ₁	kgm ² ·10 ⁻⁴	2.16		2.16		2.17		0.77		0.76		0.76	
Torsional backlash	j _t	arcmin	Standard ≤ 3 / Reduced ≤ 1											
Torsional rigidity	C _t	Nm/arcmin	–		70		54		61		–		55	
Tilting rigidity	C _K	Nm/arcmin	550											
Max. axial force	F _{Amax}	N	4150											
Max. tilting moment (distance from point of rotation to output flange 94.5 mm)	M _{Kmax}	Nm	440											
Weight (with resolver, without brake)	m	kg	8.5						7.1					
Operating noise (measured at motor speed of 3000 rpm)	L _{PA}	dB(A)	≤ 64											
Max. permitted housing temperature		°C	+90											
Ambient temperature		°C	0 to +40											
Protection class			IP65											
Mount. pos.			Any											
Lubrication			Synthetic oil, lubricated for life											
Insulating material class			F											
Paint			Metallic blue 250 and natural cast aluminum											

Tolerances T, I and n: Maximum +/- 10%.

¹⁾ greater than T_{2B} of the gearhead. In case of an emergency stop, can be used approx. 1000 times while the motor is rotating.

Please refer to the instructions and graphic illustration of the speed and torque values in the chapter “Project planning”.



Electrical connection: Integral sockets, straight or angled, manufactured by Intercontec, speedtec model, series A and B, size 1

without brake

Ratio	Motor feedback	Length L0 in mm	Length L1 in mm
i = 16/21/31	Resolver	183	24
	Hiperface	204	45
	EnDat	208	49
i = 61/64/91	Resolver	153	24
	Hiperface	174	45
	EnDat	178	49

with brake

Ratio	Motor feedback	Length L0 in mm	Length L1 in mm
i = 16/21/31	Resolver	202	24
	Hiperface	223	45
	EnDat	227	49
i = 61/64/91	Resolver	172	24
	Hiperface	193	45
	EnDat	197	49

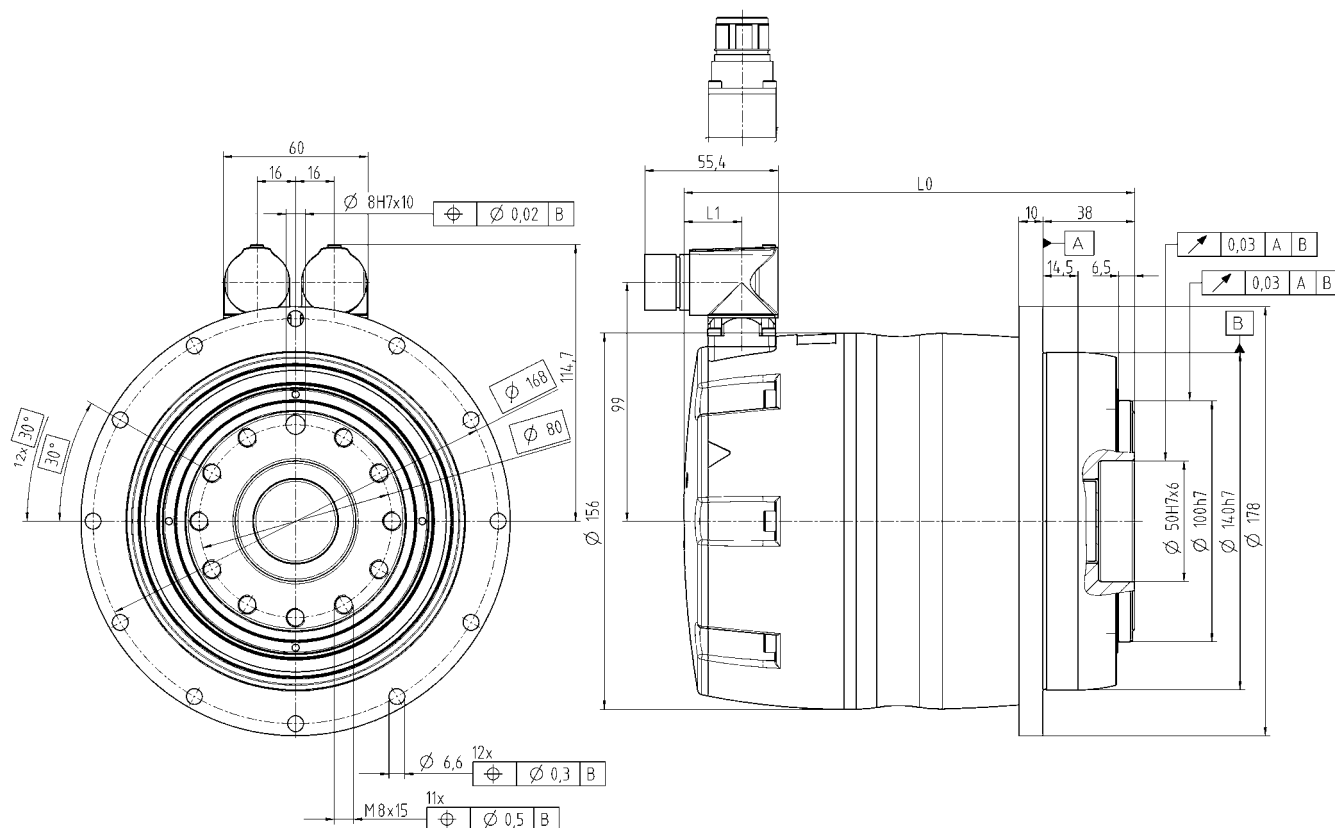
TPM⁺ dynamic 050

Ratio	i		16		21		31		61		64		91	
Intermediate circuit voltage	U _D	V DC	320	560	320	560	320	560	320	560	320	560	320	560
Max. acceleration torque at output (max. 1000 cycles per hour)	T _{2B}	Nm	435		500		650		447		469		500	
Static output torque	T ₂₀	Nm	185		220		370		173		166		220	
Brake holding torque at output, 100°C	T _{2BR}	Nm	208		273		403		793 ¹⁾		832 ¹⁾		1183 ¹⁾	
Max. speed	n _{2max}	rpm	312		238		161		82		78		55	
Speed limit for T _{2B}	n _{2B}	rpm	225		171		116		59		56		39	
Max. motor acceleration torque	T _{Mmax}	Nm	28.9		28.9		28.9		7.8		7.8		7.8	
Max. motor acceleration current	I _{maxdyn}	A _{eff}	70.0	40.0	70.0	40.0	70.0	40.0	21.0	12.0	21.0	12.0	21.0	12.0
Static motor current	I ₀	A _{eff}	23.7	13.7	23.7	13.7	23.7	13.7	6.6	3.8	6.6	3.8	6.6	3.8
Moment of inertia (at motor shaft, without brake, with resolver)	J ₁	kgm ² ·10 ⁻⁴	9.07		9.07		8.94		2.51		2.49		2.49	
Torsional backlash	j _t	arcmin	Standard ≤ 3 / Reduced ≤ 1											
Torsional rigidity	C _t	Nm/arcmin	–		145		130		123		–		100	
Tilting rigidity	C _K	Nm/arcmin	560											
Max. axial force	F _{Amax}	N	6130											
Max. tilting moment (distance from point of rotation to output flange 81.2 mm)	M _{Kmax}	Nm	1335											
Weight (with resolver, without brake)	m	kg	18.5						14.7					
Operating noise (measured at motor speed of 3000 rpm)	L _{PA}	dB(A)	≤ 65											
Max. permitted housing temperature		°C	+90											
Ambient temperature		°C	0 to +40											
Protection class			IP65											
Mount. pos.			Any											
Lubrication			Synthetic oil, lubricated for life											
Insulating material class			F											
Paint			Metallic blue 250 and natural cast aluminum											

Tolerances T, I and n: Maximum +/- 10%.

¹⁾ greater than T_{2B} of the gearhead. In case of an emergency stop, can be used approx. 1000 times while the motor is rotating.

Please refer to the instructions and graphic illustration of the speed and torque values in the chapter “Project planning”.



Electrical connection: Integral sockets, straight or angled, manufactured by Intercontec, speedtec model, series A and B, size 1

without brake

Ratio	Motor feedback	Length L0 in mm	Length L1 in mm
i = 16/21/31	Resolver	232	24
	Hiperface	253	45
	EnDat	257	49
i = 61/64/91	Resolver	187	24
	Hiperface	208	45
	EnDat	212	49

with brake

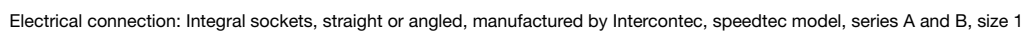
Ratio	Motor feedback	Length L0 in mm	Length L1 in mm
i = 16/21/31	Resolver	256	24
	Hiperface	278	45
	EnDat	281	49
i = 61/64/91	Resolver	211	24
	Hiperface	233	45
	EnDat	236	49

TPM⁺ dynamic 110

Ratio	i		16		21		31		61		64		91	
Intermediate circuit voltage	U _D	V DC	320	560	320	560	320	560	320	560	320	560	320	560
Max. acceleration torque at output (max. 1000 cycles per hour)	T _{2B}	Nm	660		867		1279		1300		1300		1300	
Static output torque	T ₂₀	Nm	208		278		419		700		700		700	
Brake holding torque at output, 100°C	T _{2BR}	Nm	208		273		403		793		832		1183	
Max. speed	n _{2max}	rpm	231	312	176	238	119	161	82		78		55	
Speed limit for T _{2B}	n _{2B}	rpm	118	206	90	157	61	106	59		56		39	
Max. motor acceleration torque	T _{Mmax}	Nm	43.9		43.9		43.9		28.9		28.9		28.9	
Max. motor acceleration current	I _{maxdyn}	A _{eff}	70.0		70.0		70.0		70.0	40.0	70.0	40.0	70.0	40.0
Static motor current	I ₀	A _{eff}	16.7		16.7		16.7		23.7	13.7	23.7	13.7	23.7	13.7
Moment of inertia (at motor shaft, without brake, with resolver)	J ₁	kgm²*10 ⁻⁴	13.14		13.14		12.84		8.89		8.83		8.83	
Torsional backlash	j _t	arcmin	Standard ≤ 3 / Reduced ≤ 1											
Torsional rigidity	C _t	Nm/arcmin	–		465		440		415		–		360	
Tilting rigidity	C _K	Nm/arcmin	1452											
Max. axial force	F _{Amax}	N	10050											
Max. tilting moment (distance from point of rotation to output flange 106.8 mm)	M _{Kmax}	Nm	3280											
Weight (with resolver, without brake)	m	kg	37.1						35.9					
Operating noise (measured at motor speed of 3000 rpm)	L _{PA}	dB(A)	≤ 72											
Max. permitted housing temperature		°C	+90											
Ambient temperature		°C	0 to +40											
Protection class			IP65											
Mount. pos.			Any											
Lubrication			Synthetic oil, lubricated for life											
Insulating material class			F											
Paint			Metallic blue 250 and natural cast aluminum											

Tolerances T, I and n: Maximum +/- 10%.

Please refer to the instructions and graphic illustration of the speed and torque values in the chapter “Project planning”.



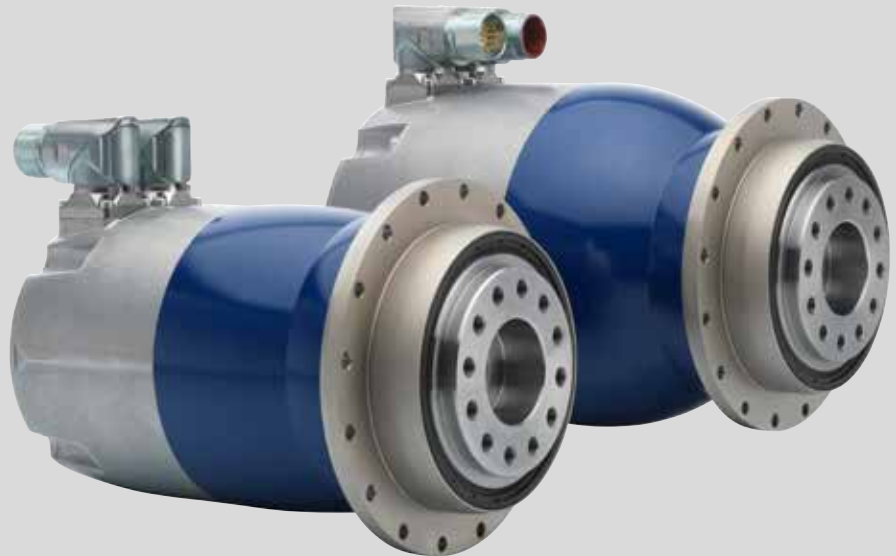
Ratio	Motor feedback	Length L0 in mm	Length L1 in mm
i = 16/21/31	Resolver	283	24
	Hiperface	304	45
	EnDat	308	49
i = 61/64/91	Resolver	268	24
	Hiperface	289	45
	EnDat	293	49

Ratio	Motor feedback	Length L0 in mm	Length L1 in mm
i = 16/21/31	Resolver	307	24
	Hiperface	328	45
	EnDat	332	49
i = 61/64/91	Resolver	292	24
	Hiperface	313	45
	EnDat	317	49

TPM+ high torque

Stronger. More compact. Higher torsional rigidity.

This servo actuator brings you further advancement: with 50% more torque and improved performance. Even better power transmission due to the more rigid drive train enables higher acceleration and shorter cycle times. Effectiveness from which you benefit. An additional planet in the gearbox significantly increases the torsional rigidity of the particularly short and light actuator. The coupling-free integration of motor and gearhead and the efficient attachment of motor instruments is the formula for success.





Applications

Thanks to the TPM⁺ high torque, processing machines and swivel axes become significantly more productive. The high torsional rigidity and the ample torque reserve in the case of disturbing forces ensure extremely stable drive control. The reliable servo actuator therefore guarantees dynamics and precision for your (heavy-duty) tasks.

Size	Installation length in mm	Acceleration torque in Nm	Max. power in kW
010	from 183	up to 230	up to 4.5
025	from 219	up to 530	up to 9.8
050	from 279	up to 950	up to 15.6
110	from 328	up to 3100	up to 49.9

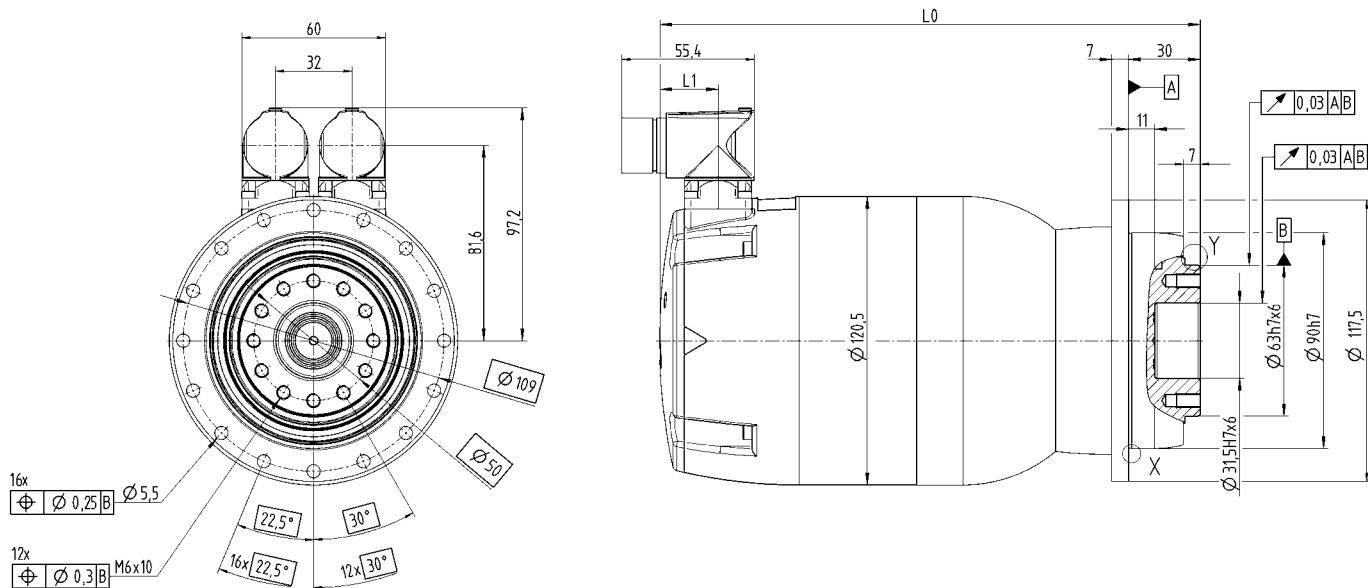
TPM⁺ high torque 010

Ratio	i		22		27.5		38.5		55		88		110		154		220	
Intermediate circuit voltage	U _D	V DC	560	320	560	320	560	320	560	320	560	320	560	320	560	320	560	320
Max. acceleration torque at output (max. 1000 cycles per hour)	T _{2B}	Nm	230															
Static output torque	T ₂₀	Nm	79		99		139		110		180		180		180		180	
Brake holding torque at output, 100°C	T _{2BR}	Nm	99		124		173		248 ¹⁾		396 ¹⁾		495 ¹⁾		277 ¹⁾		396 ¹⁾	
Max. speed	n _{2max}	rpm	220		176		126		88		55		44		31		22	
Speed limit for T _{2B}	n _{2B}	rpm	187		163		126		88		55		44		31		22	
Max. motor acceleration torque	T _{Mmax}	Nm	12		12		12		12		12		12		4.4		4.4	
Max. motor acceleration current	I _{maxdyn}	A _{eff}	17	29.4	17	29.4	17	29.4	17	29.4	17	29.4	17	29.4	6	10.4	6	10.4
Static motor current	I ₀	A _{eff}	5	8.6	5	8.6	5	8.6	5	8.6	5	8.6	5	8.6	1.9	3.3	1.9	3.3
Moment of inertia (at motor shaft, without brake, with resolver)	J ₁	kgm ² ·10 ⁻⁴	2.06		2.03		2.01		1.99		2.01		2		0.68		0.67	
Torsional backlash	j _t	arcmin	≤ 1															
Torsional rigidity	C _t	Nm/arcmin	43								42							
Tilting rigidity	C _K	Nm/arcmin	225															
Max. axial force	F _{Amax}	N	2150															
Max. tilting torque (distance from point of rotation to output flange 82.7 mm)	M _{Kmax}	Nm	400															
Weight (with resolver, without brake)	m	kg	7.6								8.0				6.5			
Operating noise (measured at motor speed of 3000 rpm)	L _{PA}	dB(A)	≤ 60															
Max. permitted housing temperature		°C	90															
Ambient temperature		°C	0 to +40															
Protection class			IP65															
Mount. pos.			Any															
Lubrication			Synthetic oil, lubricated for life															
Insulating material class			F															
Paint			Metallic blue 250 and natural cast aluminum															

Tolerances T, I and n: Maximum +/- 10%.

¹⁾ greater than T_{2B} of the gearhead. In case of an emergency stop, can be used approx. 1000 times while the motor is rotating.

Please refer to the instructions and graphic illustration of the speed and torque values in the chapter “Project planning”.



Electrical connection: Integral sockets, straight or angled, manufactured by Intercontec, speedtec model, series A and B, size 1

without brake

Ratio	Motor feedback	Length L0 in mm	Length L1 in mm
i = 22/27.5/38.5/55	Resolver	207	24
	Hiperface	228	45
	EnDat	232	49
i = 88/110	Resolver	213	24
	Hiperface	234	45
	EnDat	238	49
i = 154/220	Resolver	183	24
	Hiperface	204	45
	EnDat	208	49

with brake

Ratio	Motor feedback	Length L0 in mm	Length L1 in mm
i = 22/27.5/38.5/55	Resolver	226	24
	Hiperface	247	45
	EnDat	251	49
i = 88/110	Resolver	232	24
	Hiperface	253	45
	EnDat	257	49
i = 154/220	Resolver	202	24
	Hiperface	223	45
	EnDat	227	49

TPM⁺ high torque 025

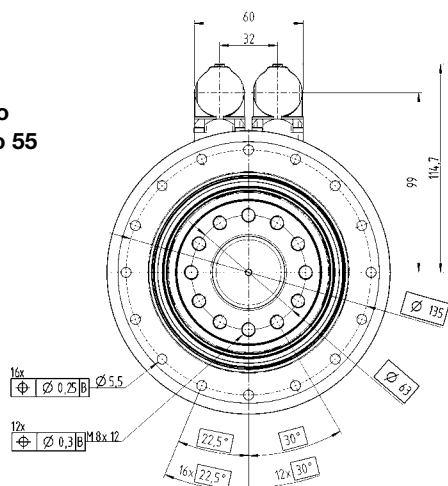
Ratio	i		22		27.5		38.5		55		66		88		110		154		220	
Intermediate circuit voltage	U _D	V DC	320	560	320	560	320	560	320	560	320	560	320	560	320	560	320	560	320	560
Max. acceleration torque at output (max. 1000 cycles per hour)	T _{2B}	Nm	530		530		530		530		480		480		480		480		480	
Static output torque	T ₂₀	Nm	232		291		375		375		260		260		260		260		260	
Brake holding torque at output, 100°C	T _{2BR}	Nm	286		358		500		715 ¹⁾		297		396		495 ¹⁾		693 ¹⁾		990 ¹⁾	
Max. speed	n _{2max}	rpm	220		176		126		88		73		55		44		31		22	
Speed limit for T _{2B}	n _{2B}	rpm	177		155		122		88		70		55		44		31		22	
Max. motor acceleration torque	T _{Mmax}	Nm	28.9		28.9		28.9		28.9		12		12		12		12		12	
Max. motor acceleration current	I _{maxdyn}	A _{eff}	70	40	70	40	70	40	70	40	29.4	17	29.4	17	29.4	17	29.4	17	29.4	17
Static motor current	I ₀	A _{eff}	22.7	13.1	22.7	13.1	22.7	13.1	22.7	13.1	10.0	5.8	10.0	5.8	10.0	5.8	10.0	5.8	10.0	5.8
Moment of inertia (at motor shaft, without brake, with resolver)	J ₁	kgm²·10 ⁻⁴	9.01		8.83		8.74		8.69		2.03		1.96		1.93		1.91		1.89	
Torsional backlash	j _t	arcmin	≤ 1																	
Torsional rigidity	C _t	Nm/arcmin	105		105		105		100		95		95		95		95		95	
Tilting rigidity	C _K	Nm/arcmin	550																	
Max. axial force	F _{Amax}	N	4150																	
Max. tilting torque (distance from point of rotation to output flange 94.5 mm)	M _{Kmax}	Nm	550																	
Weight (with resolver, without brake)	m	kg	14.8									10								
Operating noise (measured at motor speed of 3000 rpm)	L _{PA}	dB(A)	≤ 62																	
Max. permitted housing temperature		°C	90																	
Ambient temperature		°C	0 to +40																	
Protection class			IP65																	
Mount. pos.			Any																	
Lubrication			Synthetic oil, lubricated for life																	
Insulating material class			F																	
Paint			Metallic blue 250 and natural cast aluminum																	

Tolerances T, I and n: Maximum +/- 10%.

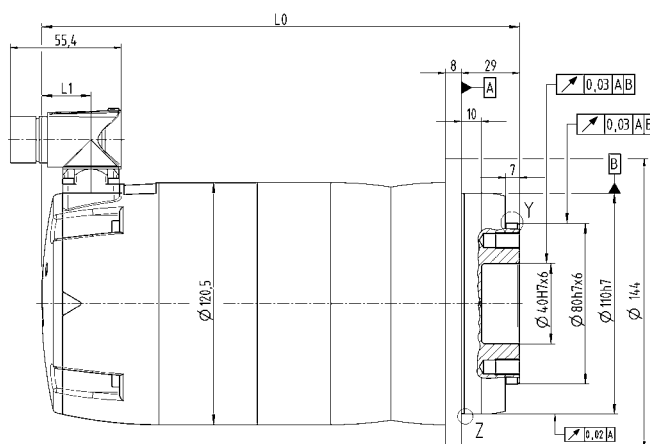
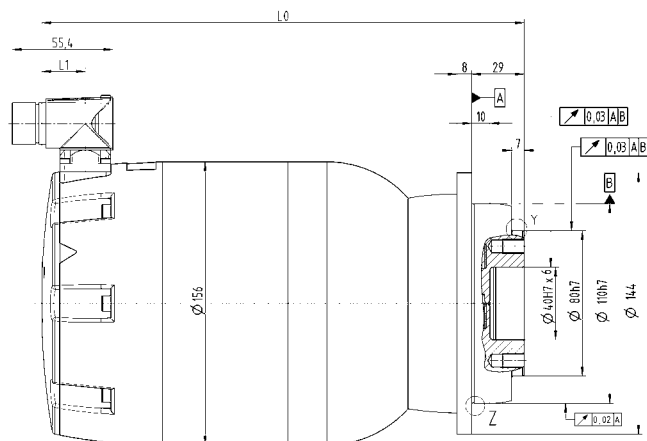
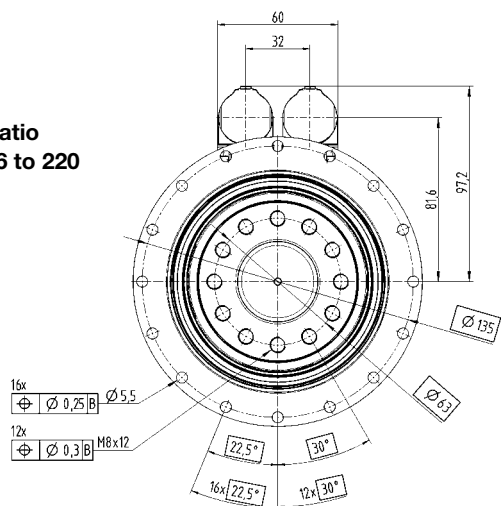
¹⁾ greater than T_{2B} of the gearhead. In case of an emergency stop, can be used approx. 1000 times while the motor is rotating.

Please refer to the instructions and graphic illustration of the speed and torque values in the chapter “Project planning”.

**Ratio
22 to 55**



**Ratio
66 to 220**



Electrical connection: Integral sockets, straight or angled, manufactured by Intercontec, speedtec model, series A and B, size 1

without brake

Ratio	Motor feedback	Length L0 in mm	Length L1 in mm
i = 22/27.5/38.5/55	Resolver	242	24
	Hiperface	263	45
	EnDat	267	49
i = 66/88/110/154/220	Resolver	219	24
	Hiperface	240	45
	EnDat	244	49

with brake

Ratio	Motor feedback	Length L0 in mm	Length L1 in mm
i = 22/27.5/38.5/55	Resolver	266	24
	Hiperface	287	45
	EnDat	291	49
i = 66/88/110/154/220	Resolver	238	24
	Hiperface	259	45
	EnDat	263	49

TPM⁺ high torque 050

Ratio	i		22	27.5	38.5	55	66	88	110	154	220
Intermediate circuit voltage	U _D	V DC	560								
Max. acceleration torque at output (max. 1000 cycles per hour)	T _{2B}	Nm	950								
Static output torque	T ₂₀	Nm	406	513	650	675	675	675	675	675	675
Brake holding torque at output, 100°C	T _{2BR}	Nm	506	632	886	1265 ¹⁾	858	1144 ¹⁾	1430 ¹⁾	2002 ¹⁾	2375 ¹⁾
Max. speed	n _{2max}	rpm	205	164	117	82	73	55	44	31	22
Speed limit for T _{2B}	n _{2B}	rpm	156	136	108	82	69	55	44	31	22
Max. motor acceleration torque	T _{Mmax}	Nm	56.6	56.6	56.6	56.6	28.9	28.9	28.9	28.9	28.9
Max. motor acceleration current	I _{maxdyn}	A _{eff}	63.5	63.5	63.5	63.5	40	40	40	40	40
Static motor current	I ₀	A _{eff}	17.9	17.9	17.9	17.9	12.6	12.6	12.6	12.6	12.6
Moment of inertia (at motor shaft, without brake, with resolver)	J ₁	kgm²·10 ⁻⁴	23.8	23.35	22.99	22.81	9.23	9.04	8.84	8.74	8.69
Torsional backlash	j _t	arcmin	≤ 1								
Torsional rigidity	C _t	Nm/arcmin	220	220	220	220	205	205	205	205	205
Tilting rigidity	C _K	Nm/arcmin	560								
Max. axial force	F _{Amax}	N	6130								
Max. tilting torque (distance from point of rotation to output flange 81.2 mm)	M _{Kmax}	Nm	1335								
Weight (with resolver, without brake)	m	kg	25.3				21.8				
Operating noise (measured at motor speed of 3000 rpm)	L _{PA}	dB(A)	≤ 64								
Max. permitted housing temperature		°C	90								
Ambient temperature		°C	0 to +40								
Protection class			IP65								
Mount. pos.			Any								
Lubrication			Synthetic oil, lubricated for life								
Insulating material class			F								
Paint			Metallic blue 250 and natural cast aluminum								

Tolerances T, I and n: Maximum +/- 10%.

¹⁾ greater than T_{2B} of the gearhead. In case of an emergency stop, can be used approx. 1000 times while the motor is rotating.

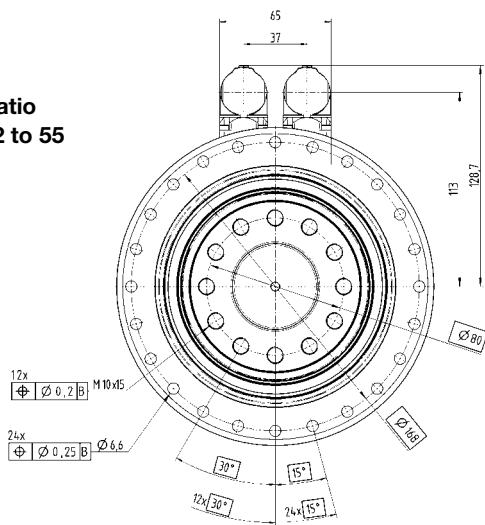
Please refer to the instructions and graphic illustration of the speed and torque values in the chapter “Project planning”.



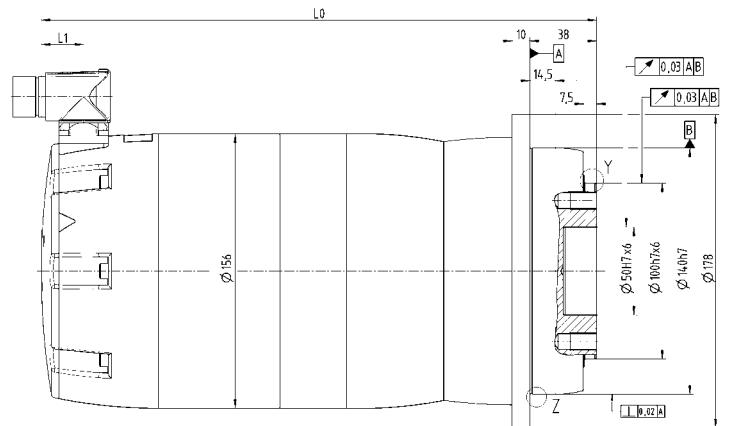
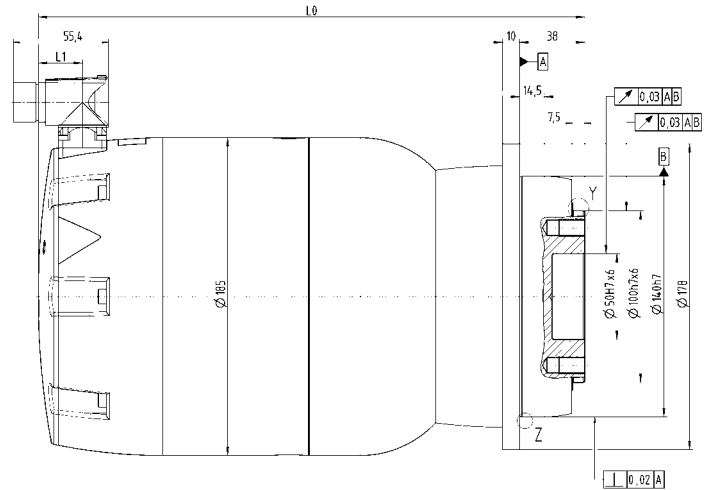
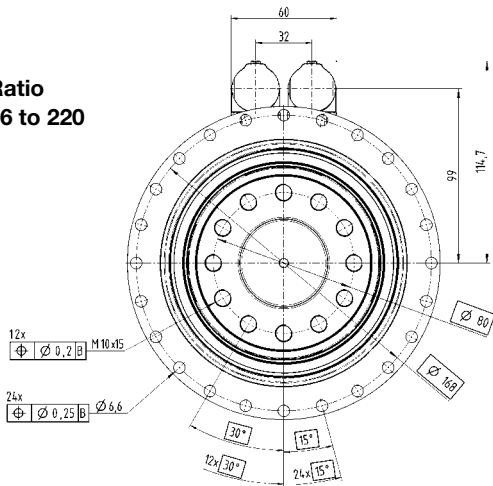
WITTENSTEIN

motion control

**Ratio
22 to 55**



**Ratio
66 to 220**



Electrical connection: Integral sockets, straight or angled, manufactured by Intercontec, speedtec model, series A and B, size 1

without brake

Ratio	Motor feedback	Length L0 in mm	Length L1 in mm
i = 22/27.5/38.5/55	Resolver	279	26
	Hiperface	304	50
	EnDat	304	50
i = 66/88/110/154/220	Resolver	292	24
	Hiperface	313	45
	EnDat	317	49

with brake

Ratio	Motor feedback	Length L0 in mm	Length L1 in mm
i = 22/27.5/38.5/55	Resolver	319	26
	Hiperface	344	50
	EnDat	344	50
i = 66/88/110/154/220	Resolver	316	24
	Hiperface	337	45
	EnDat	341	49

TPM⁺

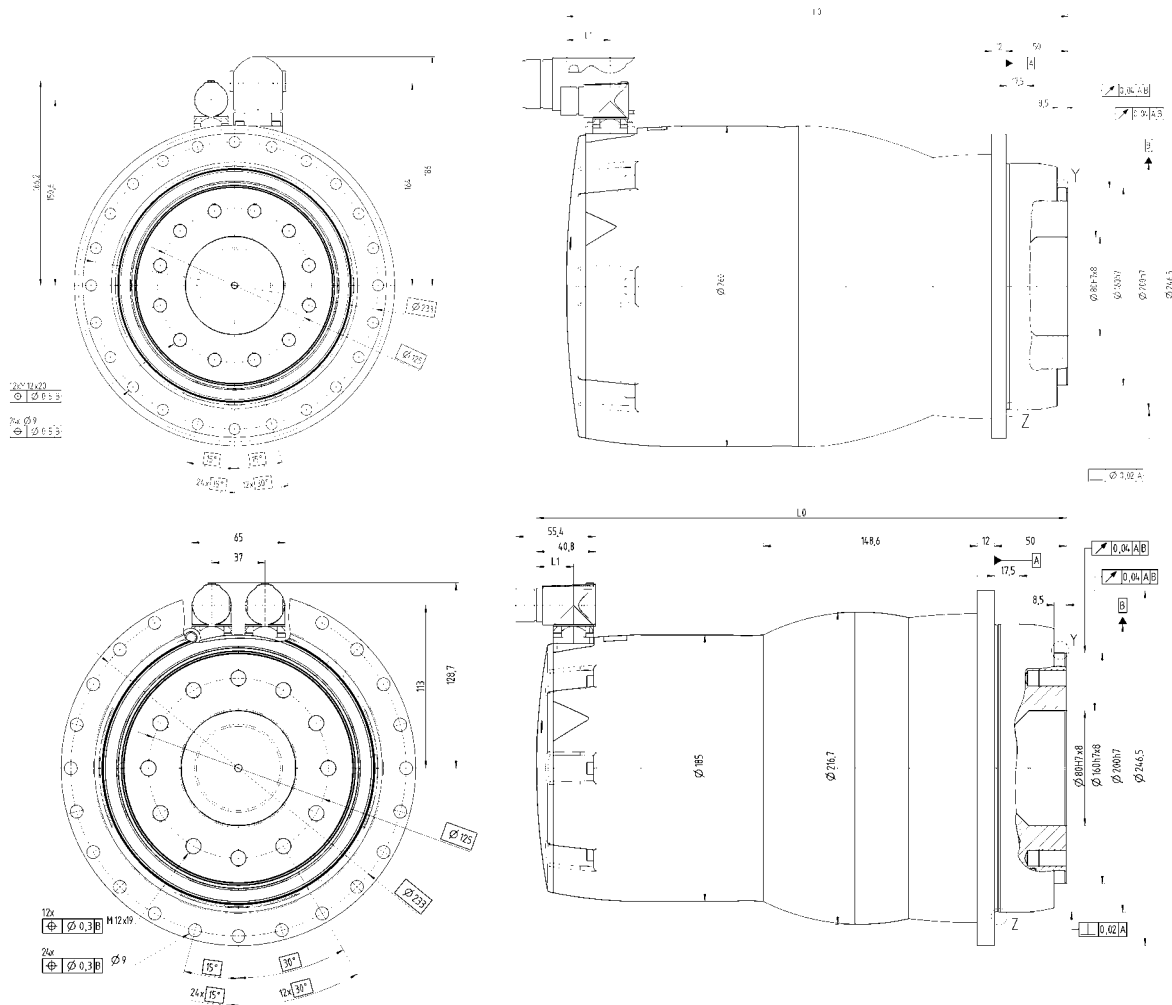
high torque 110

Ratio	i		22	27.5	38.5	55	66	88	110	154	220
Intermediate circuit voltage	U _D	V DC	560								
Max. acceleration torque at output (max. 1000 cycles per hour)	T _{2B}	Nm	3100	3100	3100	2000	2600	2600	2600	2600	2600
Static output torque	T ₂₀	Nm	1368	1600	1650	1400	1600	1750	1750	1750	1750
Brake holding torque at output, 100°C	T _{2BR}	Nm	1584	1980	2772	3960 ¹⁾	4752 ¹⁾	6336 ¹⁾	2530	3542 ¹⁾	5060 ¹⁾
Max. speed	n _{2max}	rpm	189	151	108	75	63	47	41	29	20
Speed limit for T _{2B}	n _{2B}	rpm	154	135	106	75	63	47	38	29	20
Max. motor acceleration torque	T _{Mmax}	Nm	164.5	164.5	164.5	164.5	88	88	56.6	56.6	56.6
Max. motor acceleration current	I _{maxdyn}	A _{eff}	160	160	160	160	100	100	63.5	63.5	63.5
Static motor current	I ₀	A _{eff}	53.7	53.7	53.7	53.7	40.9	40.9	20.5	20.5	20.5
Moment of inertia (at motor shaft, without brake, with resolver)	J ₁	kgm²·10 ⁻⁴	220.4	218.9	217.6	216.9	111.8	108.2	2.9	22.5	22.3
Torsional backlash	j _t	arcmin	≤ 1								
Torsional rigidity	C _t	Nm/arcmin	730	725	715	670	650	650	650	650	650
Tilting rigidity	C _K	Nm/arcmin	1452								
Max. axial force	F _{Amax}	N	10050								
Max. tilting torque (distance from point of rotation to output flange 106.8 mm)	M _{Kmax}	Nm	3280								
Weight (with resolver, without brake)	m	kg	76.8				63.8		45.5		
Operating noise (measured at motor speed of 3000 rpm)	L _{PA}	dB(A)	≤ 66								
Max. permitted housing temperature		°C	90								
Ambient temperature		°C	0 to +40								
Protection class			IP65								
Mount. pos.			Any								
Lubrication			Synthetic oil, lubricated for life								
Insulating material class			F								
Paint			Metallic blue 250 and natural cast aluminum								

Tolerances T, I and n: Maximum +/- 10%.

¹⁾ greater than T_{2B} of the gearhead. In case of an emergency stop, can be used approx. 1000 times while the motor is rotating.

Please refer to the instructions and graphic illustration of the speed and torque values in the chapter “Project planning”.



Electrical connection: Integral sockets, straight or angled, manufactured by Intercontec, speedtec model, series A and B, size 1

without brake

Ratio	Motor feedback	Length L0 in mm	Length L1 in mm
i = 22/27.5/38.5/55	Resolver	417	36
	Hiperface	441	60
	EnDat	441	60
i = 66/88	Resolver	357	36
	Hiperface	381	60
	EnDat	381	60
i = 110/154/220	Resolver	328	26
	Hiperface	353	50
	EnDat	353	50

with brake

Ratio	Motor feedback	Length L0 in mm	Length L1 in mm
i = 22/27.5/38.5/55	Resolver	467	36
	Hiperface	491	60
	EnDat	491	60
i = 66/88	Resolver	407	36
	Hiperface	431	60
	EnDat	431	60
i = 110/154/220	Resolver	368	26
	Hiperface	393	50
	EnDat	393	50

TPM+ power

Stronger. More compact. Quieter.

Generate more power: More torque, high capability. A perfect combination of motors and efficient planetary gearheads makes light work of even the most difficult motion applications. 40 percent more compact due to coupling-free connection of motor and gearhead and efficient attachment of motor instruments. Shorter installation length for greater flexibility when mounting. Helical-toothed precision planetary gearheads for extremely quiet and low-vibration operation reduce operating noise to very low levels.





Source: Schmale Maschinenbau GmbH

Applications

The compact TPM+ power drive unit easily copes with highly dynamic linear applications with rack and pinions or spindles as well as in rotary movements with high masses and disturbing forces.

Size	Installation length in mm	Acceleration torque in Nm	Max. power in kW
004	from 149	up to 50	up to 1.4
010	from 175	up to 130	up to 4.7
025	from 197	up to 380	up to 10.6
050	from 236	up to 750	up to 16.5
110	from 307	up to 1600	up to 32.0

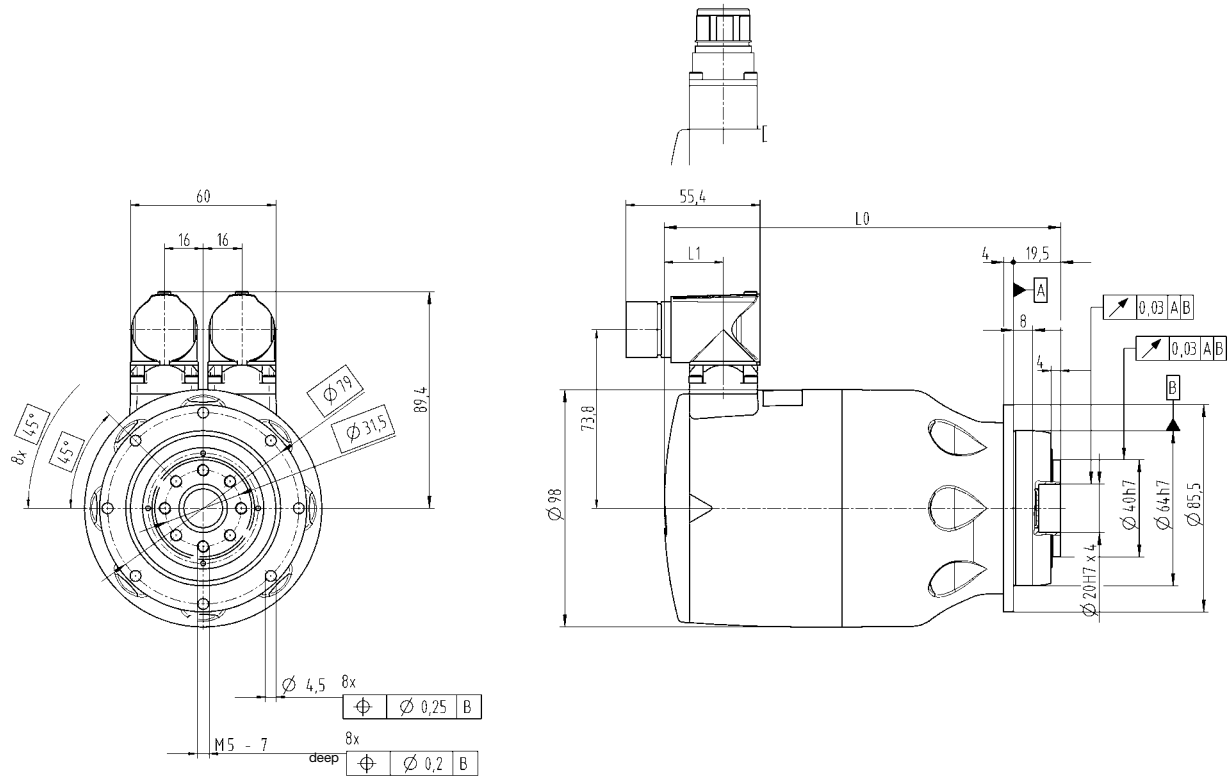
TPM⁺

power 004 1-stage

Ratio	i		4		5		7		10	
Intermediate circuit voltage	U _D	V DC	320	560	320	560	320	560	320	560
Max. acceleration torque at output (max. 1000 cycles per hour)	T _{2B}	Nm	15		18		26		26	
Static output torque	T ₂₀	Nm	4		6		8		12	
Brake holding torque at output, 100°C	T _{2BR}	Nm	4		6		8		11	
Max. speed	n _{2max}	rpm	1500		1200		857		600	
Speed limit for T _{2B}	n _{2B}	rpm	1040		830		590		460	
Max. motor acceleration torque	T _{Mmax}	Nm	3.8		3.8		3.8		3.8	
Max. motor acceleration current	I _{maxdyn}	A _{eff}	9.0	5.2	9.0	5.2	9.0	5.2	9.0	5.2
Static motor current	I ₀	A _{eff}	2.7	1.6	2.7	1.6	2.7	1.6	2.7	1.6
Moment of inertia (at motor shaft, without brake, with resolver)	J ₁	kgm²·10 ⁻⁴	0.39		0.36		0.33		0.31	
Torsional backlash	j _t	arcmin	Standard ≤ 4 / Reduced ≤ 2							
Torsional rigidity	C _t	Nm/arcmin	12		12		11		8	
Tilting rigidity	C _K	Nm/arcmin	–							
Max. axial force	F _{Amax}	N	1630							
Max. tilting moment (distance from point of rotation to output flange 57.6 mm)	M _{Kmax}	Nm	110							
Weight (with resolver, without brake)	m	kg	3.6							
Operating noise (measured at motor speed of 3000 rpm)	L _{PA}	dB(A)	≤ 58							
Max. permitted housing temperature		°C	+90							
Ambient temperature		°C	0 to +40							
Protection class			IP65							
Mount. pos.			Any							
Lubrication			Synthetic oil, lubricated for life							
Insulating material class			F							
Paint			Metallic blue 250 and natural cast aluminum							

Tolerances T, I and n: Maximum +/- 10%.

Please refer to the instructions and graphic illustration of the speed and torque values in the chapter “Project planning”.



Electrical connection: Integral sockets, straight or angled, manufactured by Intercontec, speedtec model, series A and B, size 1

without brake

Ratio	Motor feedback	Length L0 in mm	Length L1 in mm
i = 4/5/7/10	Resolver	164	24
	Hiperface	185	45
	EnDat	189	49

with brake

Ratio	Motor feedback	Length L0 in mm	Length L1 in mm
i = 4/5/7/10	Resolver	184	24
	Hiperface	205	45
	EnDat	209	49

TPM⁺

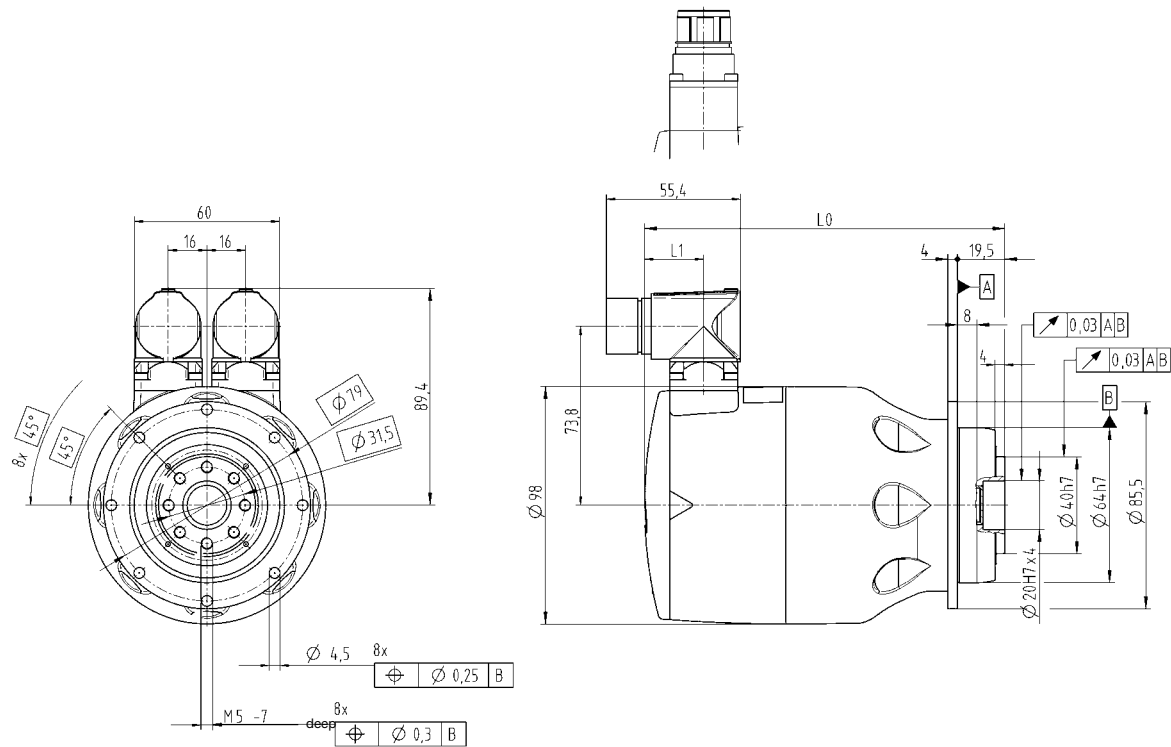
power 004 2-stage

Ratio	i		16		20		25		28		35		40		50		70		100			
Intermediate circuit voltage	U _D	V DC	320	560	320	560	320	560	320	560	320	560	320	560	320	560	320	560	320	560		
Max. acceleration torque at output (max. 1000 cycles per hour)	T _{2B}	Nm	50		50		50		50		50		50		50		50		35			
Static output torque	T ₂₀	Nm	18		23		28		32		40		24		30		40		18			
Brake holding torque at output, 100°C	T _{2BR}	Nm	18		22		28		31		38		44		55 ¹⁾		77 ¹⁾		110 ¹⁾			
Max. speed	n _{2max}	rpm	375		300		240		214		171		150		120		86		60			
Speed limit for T _{2B}	n _{2B}	rpm	260		230		200		185		158		144		120		86		60			
Max. motor acceleration torque	T _{Mmax}	Nm	3.8										1.9									
Max. motor acceleration current	I _{maxdyn}	A _{eff}	9.0	5.2	9.0	5.2	9.0	5.2	9.0	5.2	9.0	5.2	5.2	3.0	5.2	3.0	5.2	3.0	5.2	3.0		
Static motor current	I ₀	A _{eff}	2.7	1.6	2.7	1.6	2.7	1.6	2.7	1.6	2.7	1.6	1.7	1.0	1.7	1.0	1.7	1.0	1.7	1.0		
Moment of inertia (at motor shaft, without brake, with resolver)	J ₁	kgm ² ·10 ⁻⁴	0.32		0.31		0.31		0.31		0.31		0.16		0.16		0.16		0.16			
Torsional backlash	j _t	arcmin	Standard ≤ 4 / Reduced ≤ 2																			
Torsional rigidity	C _t	Nm/arcmin	12		12		12		12		12		11		12		11		8			
Tilting rigidity	C _K	Nm/arcmin	–																			
Max. axial force	F _{Amax}	N	1630																			
Max. tilting torque (distance from point of rotation to output flange 57.6 mm)	M _{Kmax}	Nm	110																			
Weight (with resolver, without brake)	m	kg	3.7										3.3									
Operating noise (measured at motor speed of 3000 rpm)	L _{PA}	dB(A)	≤ 58																			
Max. permitted housing temperature		°C	+90																			
Ambient temperature		°C	0 to +40																			
Protection class			IP65																			
Mount. pos.			Any																			
Lubrication			Synthetic oil, lubricated for life																			
Insulating material class			F																			
Paint			Metallic blue 250 and natural cast aluminum																			

Tolerances T, I and n: Maximum +/- 10%.

¹⁾ greater than T_{2B} of the gearhead. In case of an emergency stop, can be used approx. 1000 times while the motor is rotating.

Please refer to the instructions and graphic illustration of the speed and torque values in the chapter “Project planning”.



Electrical connection: Integral sockets, straight or angled, manufactured by Intercontec, speedtec model, series A and B, size 1

without brake

Ratio	Motor feedback	Length L0 in mm	Length L1 in mm
i = 16/20/25/28/35	Resolver	164	24
	Hiperface	185	45
	EnDat	189	49
i = 40/50/70/100	Resolver	149	24
	Hiperface	170	45
	EnDat	174	49

with brake

Ratio	Motor feedback	Length L0 in mm	Length L1 in mm
i = 16/20/25/28/35	Resolver	184	24
	Hiperface	205	45
	EnDat	209	49
i = 40/50/70/100	Resolver	169	24
	Hiperface	190	45
	EnDat	194	49

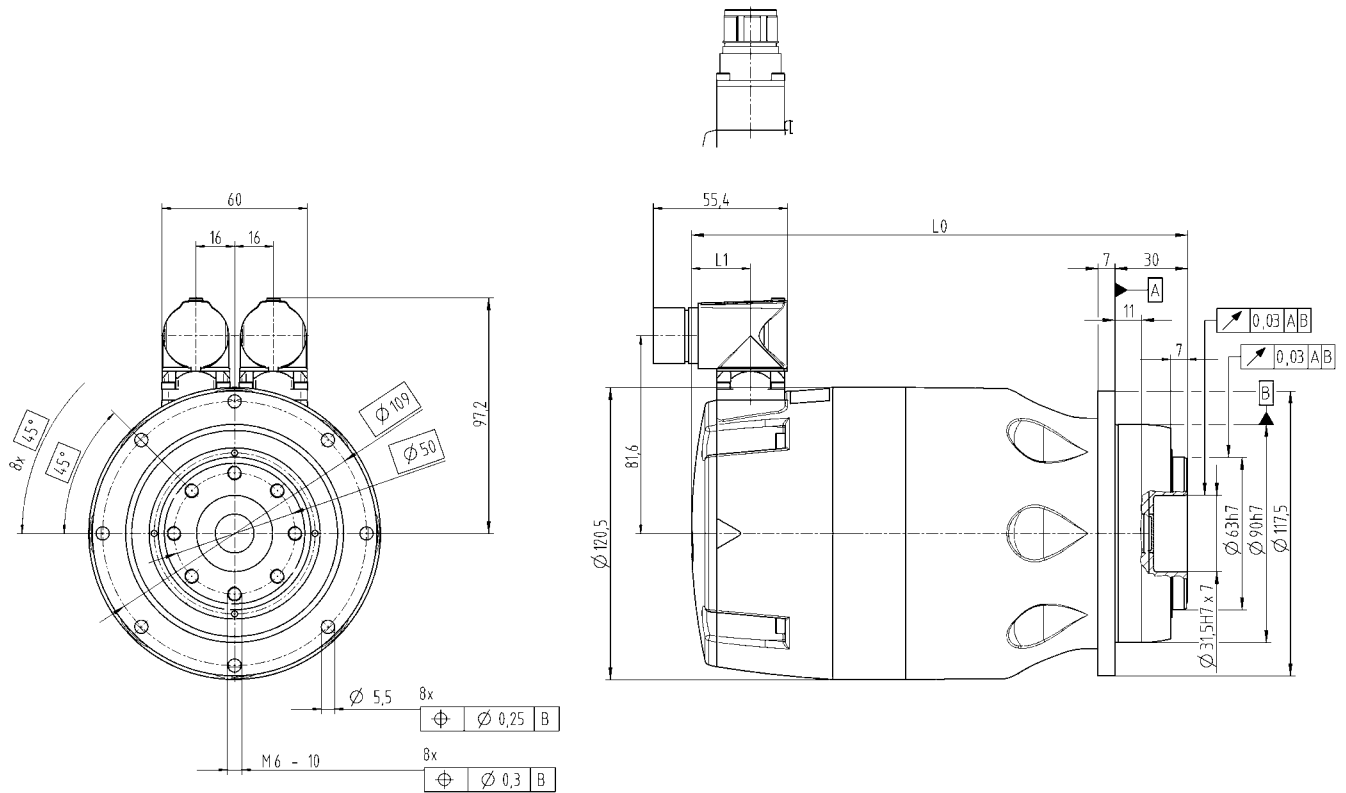
TPM⁺

power 010 1-stage

Ratio	i		4		5		7		10	
Intermediate circuit voltage	U _D	V DC	320	560	320	560	320	560	320	560
Max. acceleration torque at output (max. 1000 cycles per hour)	T _{2B}	Nm	44		56		80		85	
Static output torque	T ₂₀	Nm	14		18		27		40	
Brake holding torque at output, 100°C	T _{2BR}	Nm	18		22		32		45	
Max. speed	n _{2max}	rpm	1500		1200		857		600	
Speed limit for T _{2B}	n _{2B}	rpm	980		780		560		440	
Max. motor acceleration torque	T _{Mmax}	Nm	12.1		12.1		12.1		12.1	
Max. motor acceleration current	I _{maxdyn}	A _{eff}	29.4	17.0	29.4	17.0	29.4	17.0	29.4	17.0
Static motor current	I ₀	A _{eff}	9.4	5.4	9.4	5.4	9.4	5.4	9.4	5.4
Moment of inertia (at motor shaft, without brake, with resolver)	J ₁	kgm²·10 ⁻⁴	2.38		2.22		2.08		2.00	
Torsional backlash	j _t	arcmin	Standard ≤ 3 / Reduced ≤ 1							
Torsional rigidity	C _t	Nm/arcmin	32		33		30		23	
Tilting rigidity	C _K	Nm/arcmin	225							
Max. axial force	F _{Amax}	N	2150							
Max. tilting moment (distance from point of rotation to output flange 82.7 mm)	M _{Kmax}	Nm	270							
Weight (with resolver, without brake)	m	kg	7.2							
Operating noise (measured at motor speed of 3000 rpm)	L _{PA}	dB(A)	≤ 60							
Max. permitted housing temperature		°C	+90							
Ambient temperature		°C	0 to +40							
Protection class			IP65							
Mount. pos.			Any							
Lubrication			Synthetic oil, lubricated for life							
Insulating material class			F							
Paint			Metallic blue 250 and natural cast aluminum							

Tolerances T, I and n: Maximum +/- 10%.

Please refer to the instructions and graphic illustration of the speed and torque values in the chapter “Project planning”.



Electrical connection: Integral sockets, straight or angled, manufactured by Intercontec, speedtec model, series A and B, size 1

without brake

Ratio	Motor feedback	Length L0 in mm	Length L1 in mm
i = 4/5/7/10	Resolver	205	24
	Hiperface	226	45
	EnDat	230	49

with brake

Ratio	Motor feedback	Length L0 in mm	Length L1 in mm
i = 4/5/7/10	Resolver	224	24
	Hiperface	245	45
	EnDat	249	49

TPM⁺

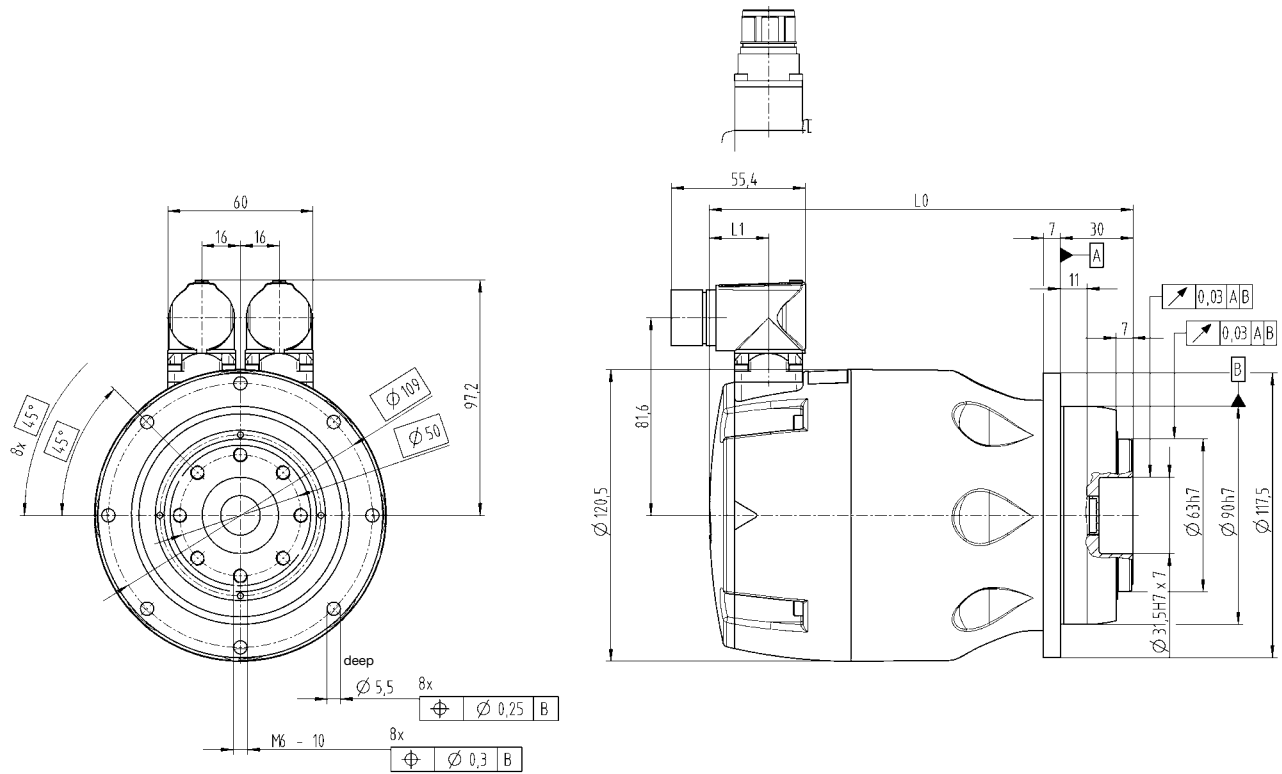
power 010 2-stage

Ratio	i		16		20		25		28		35		40		50		70		100	
Intermediate circuit voltage	U _D	V DC	320	560	320	560	320	560	320	560	320	560	320	560	320	560	320	560	320	560
Max. acceleration torque at output <small>(max. 1000 cycles per hour)</small>	T _{2B}	Nm	130		130		130		130		130		130		130		130		100	
Static output torque	T ₂₀	Nm	66		84		90		90		90		48		62		86		60	
Brake holding torque at output, 100°C	T _{2BR}	Nm	72		90		112		126		158 ¹⁾		180 ¹⁾		225 ¹⁾		250 ¹⁾		180 ¹⁾	
Max. speed	n _{2max}	rpm	375		300		240		214		171		150		120		86		60	
Speed limit for T _{2B}	n _{2B}	rpm	280		240		200		185		158		100		88		70		55	
Max. motor acceleration torque	T _{Mmax}	Nm	12.1		12.1		12.1		12.1		12.1		4.4		4.4		4.4		4.4	
Max. motor acceleration current	I _{maxdyn}	A _{eff}	29.4	17.0	29.4	17.0	29.4	17.0	29.4	17.0	29.4	17.0	10.4	6.0	10.4	6.0	10.4	6.0	10.4	6.0
Static motor current	I ₀	A _{eff}	9.4	5.4	9.4	5.4	9.4	5.4	9.4	5.4	9.4	5.4	3.2	1.9	3.2	1.9	3.2	1.9	3.2	1.9
Moment of inertia <small>(at motor shaft, without brake, with resolver)</small>	J ₁	kgm ² ·10 ⁻⁴	2.02		1.99		1.98		1.96		1.96		0.72		0.72		0.72		0.72	
Torsional backlash	j _t	arcmin	Standard ≤ 3 / Reduced ≤ 1																	
Torsional rigidity	C _t	Nm/arcmin	32		32		32		31		32		30		30		28		22	
Tilting rigidity	C _K	Nm/arcmin	225																	
Max. axial force	F _{Amax}	N	2150																	
Max. tilting torque <small>(distance from point of rotation to output flange 82.7 mm)</small>	M _{Kmax}	Nm	270																	
Weight <small>(with resolver, without brake)</small>	m	kg	7.4										6.0							
Operating noise <small>(measured at motor speed of 3000 rpm)</small>	L _{PA}	dB(A)	≤ 62																	
Max. permitted housing temperature		°C	+90																	
Ambient temperature		°C	0 to +40																	
Protection class			IP65																	
Mount. pos.			Any																	
Lubrication			Synthetic oil, lubricated for life																	
Insulating material class			F																	
Paint			Metallic blue 250 and natural cast aluminum																	

Tolerances T, I and n: Maximum +/- 10%.

¹⁾ greater than T_{2B} of the gearhead. In case of an emergency stop, can be used approx. 1000 times while the motor is rotating.

Please refer to the instructions and graphic illustration of the speed and torque values in the chapter “Project planning”.



Electrical connection: Integral sockets, straight or angled, manufactured by Intercontec, speedtec model, series A and B, size 1

without brake

Ratio	Motor feedback	Length L0 in mm	Length L1 in mm
i = 16/20/25/28/35	Resolver	205	24
	Hiperface	226	45
	EnDat	230	49
i = 40/50/70/100	Resolver	175	24
	Hiperface	196	45
	EnDat	200	49

with brake

Ratio	Motor feedback	Length L0 in mm	Length L1 in mm
i = 16/20/25/28/35	Resolver	224	24
	Hiperface	245	45
	EnDat	249	49
i = 40/50/70/100	Resolver	194	24
	Hiperface	215	45
	EnDat	219	49

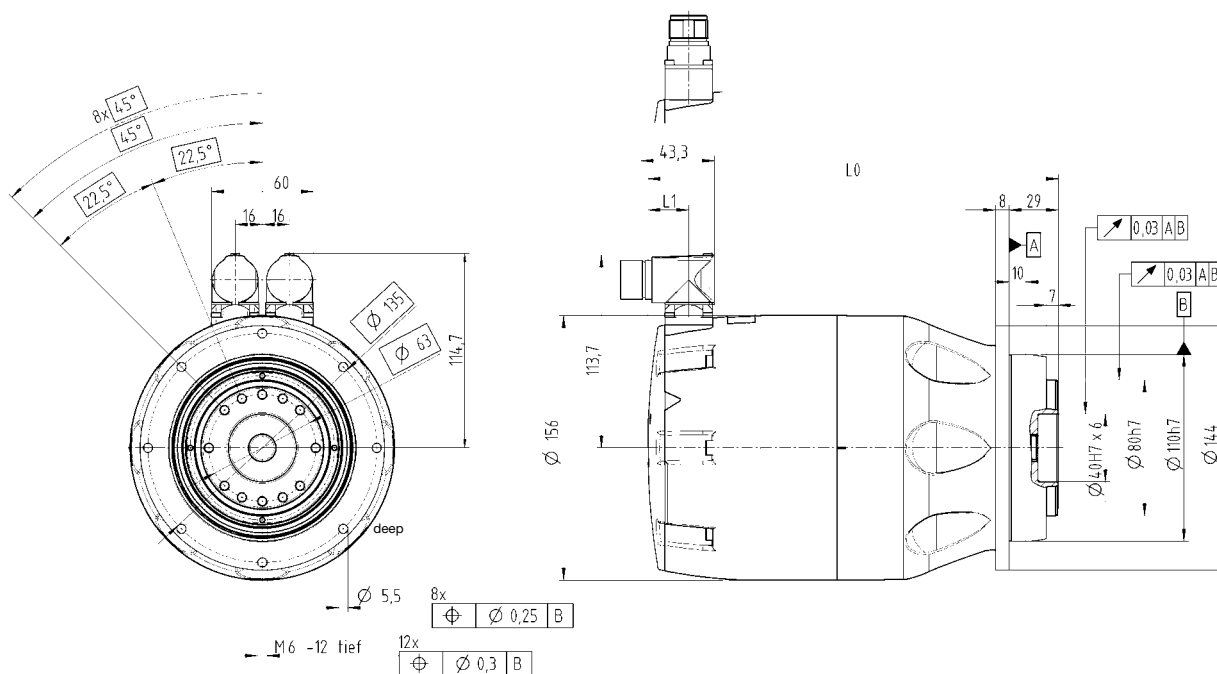
TPM⁺

power 025 1-stage

Ratio	i		4		5		7		10	
Intermediate circuit voltage	U _D	V DC	320	560	320	560	320	560	320	560
Max. acceleration torque at output (max. 1000 cycles per hour)	T _{2B}	Nm	112		141		199		200	
Static output torque	T ₂₀	Nm	43		55		78		113	
Brake holding torque at output, 100°C	T _{2BR}	Nm	52		65		91		130	
Max. speed	n _{2max}	rpm	1500		1200		857		600	
Speed limit for T _{2B}	n _{2B}	rpm	900		720		520		420	
Max. motor acceleration torque	T _{Mmax}	Nm	28.9		28.9		28.9		28.9	
Max. motor acceleration current	I _{maxdyn}	A _{eff}	70	40	70	40	70	40	70	40
Static motor current	I ₀	A _{eff}	23.7	13.7	23.7	13.7	23.7	13.7	23.7	13.7
Moment of inertia (at motor shaft, without brake, with resolver)	J ₁	kgm²·10 ⁻⁴	9.98		9.50		9.07		8.84	
Torsional backlash	j _t	arcmin	Standard ≤ 3 / Reduced ≤ 1							
Torsional rigidity	C _t	Nm/arcmin	80		86		76		62	
Tilting rigidity	C _K	Nm/arcmin	550							
Max. axial force	F _{Amax}	N	4150							
Max. tilting moment (distance from point of rotation to output flange 94.5 mm)	M _{Kmax}	Nm	440							
Weight (with resolver, without brake)	m	kg	14.0							
Operating noise (measured at motor speed of 3000 rpm)	L _{PA}	dB(A)	≤ 64							
Max. permitted housing temperature		°C	+90							
Ambient temperature		°C	0 to +40							
Protection class			IP65							
Mount. pos.			Any							
Lubrication			Synthetic oil, lubricated for life							
Insulating material class			F							
Paint			Metallic blue 250 and natural cast aluminum							

Tolerances T, I and n: Maximum +/- 10%.

Please refer to the instructions and graphic illustration of the speed and torque values in the chapter “Project planning”.



Electrical connection: Integral sockets, straight or angled, manufactured by Intercontec, speedtec model, series A and B, size 1

without brake

Ratio	Motor feedback	Length L0 in mm	Length L1 in mm
i = 4/5/7/10	Resolver	242	24
	Hiperface	263	45
	EnDat	267	49

with brake

Ratio	Motor feedback	Length L0 in mm	Length L1 in mm
i = 4/5/7/10	Resolver	266	24
	Hiperface	287	45
	EnDat	291	49

TPM⁺

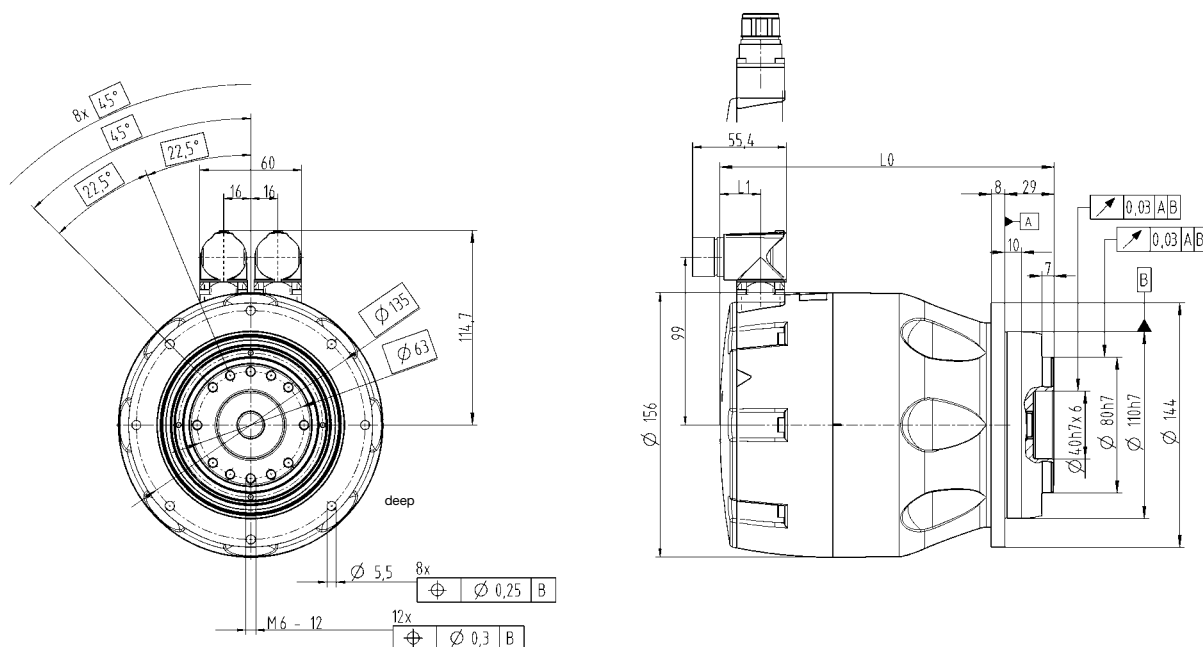
power 025 2-stage

Ratio	i		16		20		25		28		35		40		50		70		100	
Intermediate circuit voltage	U _D	V DC	320	560	320	560	320	560	320	560	320	560	320	560	320	560	320	560	320	560
Max. acceleration torque at output (max. 1000 cycles per hour)	T _{2B}	Nm	350		350		380		350		380		305		380		330		265	
Static output torque	T ₂₀	Nm	181		210		200		210		220		113		142		200		120	
Brake holding torque at output, 100°C	T _{2BR}	Nm	208		260		325		364 ¹⁾		455 ¹⁾		520 ¹⁾		625 ¹⁾		625 ¹⁾		600 ¹⁾	
Max. speed	n _{2max}	rpm	375		300		240		214		171		150		120		86		60	
Speed limit for T _{2B}	n _{2B}	rpm	260		220		185		170		140		90		70		65		50	
Max. motor acceleration torque	T _{Mmax}	Nm	28.9		28.9		28.9		28.9		28.9		7.8		7.8		7.8		7.8	
Max. motor acceleration current	I _{maxdyn}	A _{eff}	70	40	70	40	70	40	70	40	70	40	21.0	12.0	21.0	12.0	21.0	12.0	21.0	12.0
Static motor current	I ₀	A _{eff}	23.7	13.7	23.7	13.7	23.7	13.7	23.7	13.7	23.7	13.7	6.9	4.0	6.9	4.0	6.9	4.0	6.9	4.0
Moment of inertia (at motor shaft, without brake, with resolver)	J ₁	kgm ² ·10 ⁻⁴	8.94		8.83		8.81		8.72		8.71		2.48		2.48		2.48		2.47	
Torsional backlash	j _t	arcmin	Standard ≤ 3 / Reduced ≤ 1																	
Torsional rigidity	C _t	Nm/arcmin	81		81		83		80		82		76		80		71		60	
Tilting rigidity	C _K	Nm/arcmin	550																	
Max. axial force	F _{Amax}	N	4150																	
Max. tilting moment (distance from point of rotation to output flange 94.5 mm)	M _{Kmax}	Nm	440																	
Weight (with resolver, without brake)	m	kg	14.5										10.3							
Operating noise (measured at motor speed of 3000 rpm)	L _{PA}	dB(A)	≤ 64																	
Max. permitted housing temperature		°C	+90																	
Ambient temperature		°C	0 to +40																	
Protection class			IP65																	
Mount. pos.			Any																	
Lubrication			Synthetic oil, lubricated for life																	
Insulating material class			F																	
Paint			Metallic blue 250 and natural cast aluminum																	

Tolerances T, I and n: Maximum +/- 10%.

¹⁾ greater than T_{2B} of the gearhead. In case of an emergency stop, can be used approx. 1000 times while the motor is rotating.

Please refer to the instructions and graphic illustration of the speed and torque values in the chapter “Project planning”.



Electrical connection: Integral sockets, straight or angled, manufactured by Intercontec, speedtec model, series A and B, size 1

without brake

Ratio	Motor feedback	Length L0 in mm	Length L1 in mm
i = 16/20/25/28/35	Resolver	242	24
	Hiperface	263	45
	EnDat	267	49
i = 40/50/70/100	Resolver	197	24
	Hiperface	218	45
	EnDat	222	49

with brake

Ratio	Motor feedback	Length L0 in mm	Length L1 in mm
i = 16/20/25/28/35	Resolver	266	24
	Hiperface	287	45
	EnDat	291	49
i = 40/50/70/100	Resolver	221	24
	Hiperface	242	45
	EnDat	246	49

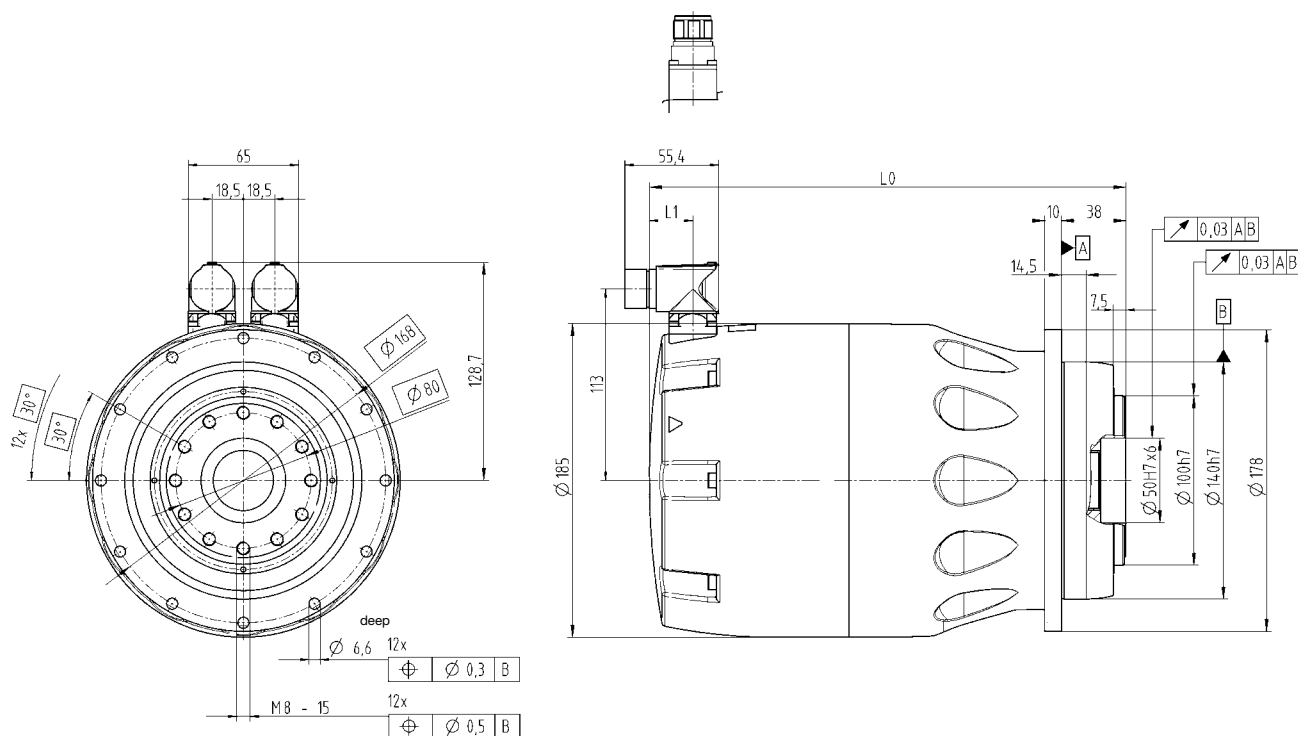
TPM⁺

power 050 1-stage

Ratio	i		4	5	7	10
Intermediate circuit voltage	U _D	V DC	560	560	560	560
Max. acceleration torque at output (max. 1000 cycles per hour)	T _{2B}	Nm	221	278	340	350
Static output torque	T ₂₀	Nm	72	91	130	188
Brake holding torque at output, 100°C	T _{2BR}	Nm	92	115	161	230
Max. speed	n _{2max}	rpm	1250	1000	714	500
Speed limit for T _{2B}	n _{2B}	rpm	780	620	450	370
Max. motor acceleration torque	T _{Mmax}	Nm	56.6			
Max. motor acceleration current	I _{maxdyn}	A _{eff}	63.5			
Static motor current	I ₀	A _{eff}	19			
Moment of inertia (at motor shaft, without brake, with resolver)	J ₁	kgm ² ·10 ⁻⁴	26.4	24.8	23.3	22.5
Torsional backlash	j _l	arcmin	Standard ≤ 3 / Reduced ≤ 1			
Torsional rigidity	C _t	Nm/arcmin	190	187	159	123
Tilting rigidity	C _K	Nm/arcmin	560			
Max. axial force	F _{Amax}	N	6130			
Max. tilting moment (distance from point of rotation to output flange 81.2 mm)	M _{Kmax}	Nm	1335			
Weight (with resolver, without brake)	m	kg	23.6			
Operating noise (measured at motor speed of 3000 rpm)	L _{PA}	dB(A)	≤ 66			
Max. permitted housing temperature		°C	+90			
Ambient temperature		°C	0 to +40			
Protection class			IP65			
Mount. pos.			Any			
Lubrication			Synthetic oil, lubricated for life			
Insulating material class			F			
Paint			Metallic blue 250 and natural cast aluminum			

Tolerances T, I and n: Maximum +/- 10%.

Please refer to the instructions and graphic illustration of the speed and torque values in the chapter “Project planning”.



Electrical connection: Integral sockets, straight or angled, manufactured by Intercontec, speedtec model, series A and B, size 1

without brake

Ratio	Motor feedback	Length L0 in mm	Length L1 in mm
i = 4/5/7/10	Resolver	281	26
	Hiperface	306	50
	EnDat	306	50

with brake

Ratio	Motor feedback	Length L0 in mm	Length L1 in mm
i = 4/5/7/10	Resolver	321	26
	Hiperface	346	50
	EnDat	346	50

TPM⁺

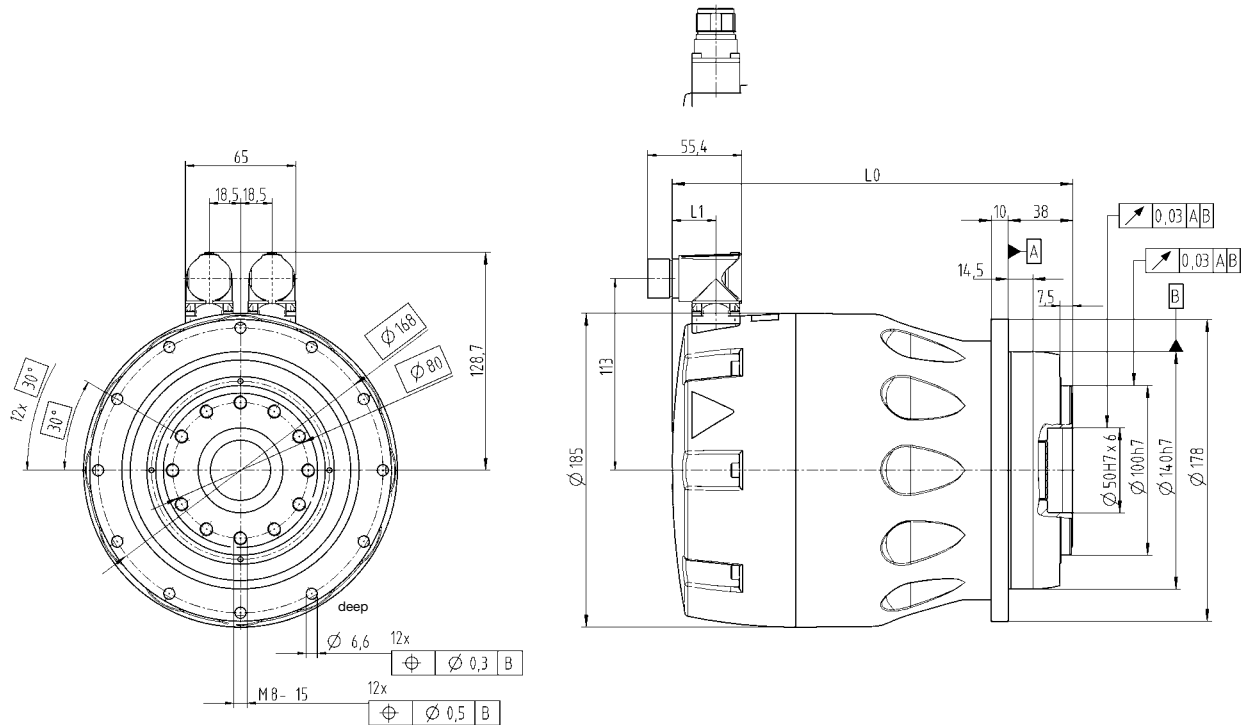
power 050 2-stage

Ratio	i		16	20	25	28	35	40	50	70	100
Intermediate circuit voltage	U _D	V DC	560	560	560	560	560	560	560	560	560
Max. acceleration torque at output (max. 1000 cycles per hour)	T _{2B}	Nm	750	750	750	750	750	607	750	700	540
Static output torque	T ₂₀	Nm	293	371	400	400	400	199	250	354	240
Brake holding torque at output, 100°C	T _{2BR}	Nm	368	460	575	644	805 ¹⁾	920 ¹⁾	1150 ¹⁾	1250 ¹⁾	1100 ¹⁾
Max. speed	n _{2max}	rpm	312	250	200	179	143	125	100	71	50
Speed limit for T _{2B}	n _{2B}	rpm	210	180	155	145	125	90	80	65	50
Max. motor acceleration torque	T _{Mmax}	Nm	56.6					15.6			
Max. motor acceleration current	I _{maxdyn}	A _{eff}	63.5					33			
Static motor current	I ₀	A _{eff}	19					7.5			
Moment of inertia (at motor shaft, without brake, with resolver)	J ₁	kgm ² ·10 ⁻⁴	23.1	22.6	22.6	22.2	22.2	6.3	6.3	6.3	6.3
Torsional backlash	j _t	arcmin	Standard ≤ 3 / Reduced ≤ 1								
Torsional rigidity	C _t	Nm/arcmin	180	185	180	180	175	175	175	145	115
Tilting rigidity	C _K	Nm/arcmin	560								
Max. axial force	F _{Amax}	N	6130								
Max. tilting torque (distance from point of rotation to output flange 81.2 mm)	M _{Kmax}	Nm	1335								
Weight (with resolver, without brake)	m	kg	25.1					19.4			
Operating noise (measured at motor speed of 3000 rpm)	L _{PA}	dB(A)	≤ 65								
Max. permitted housing temperature		°C	+90								
Ambient temperature		°C	0 to +40								
Protection class			IP65								
Mount. pos.			Any								
Lubrication			Synthetic oil, lubricated for life								
Insulating material class			F								
Paint			Metallic blue 250 and natural cast aluminum								

Tolerances T, I and n: Maximum +/- 10%.

¹⁾ greater than T_{2B} of the gearhead. In case of an emergency stop, can be used approx. 1000 times while the motor is rotating.

Please refer to the instructions and graphic illustration of the speed and torque values in the chapter “Project planning”.



Electrical connection: Integral sockets, straight or angled, manufactured by Intercontec, speedtec model, series A and B, size 1

without brake

Ratio	Motor feedback	Length L0 in mm	Length L1 in mm
i = 16/20/25/28/35	Resolver	281	26
	Hiperface	306	50
	EnDat	306	50
i = 40/50/70/100	Resolver	236	26
	Hiperface	261	50
	EnDat	261	50

with brake

Ratio	Motor feedback	Length L0 in mm	Length L1 in mm
i = 16/20/25/28/35	Resolver	321	26
	Hiperface	346	50
	EnDat	346	50
i = 40/50/70/100	Resolver	276	26
	Hiperface	301	50
	EnDat	301	50

TPM⁺

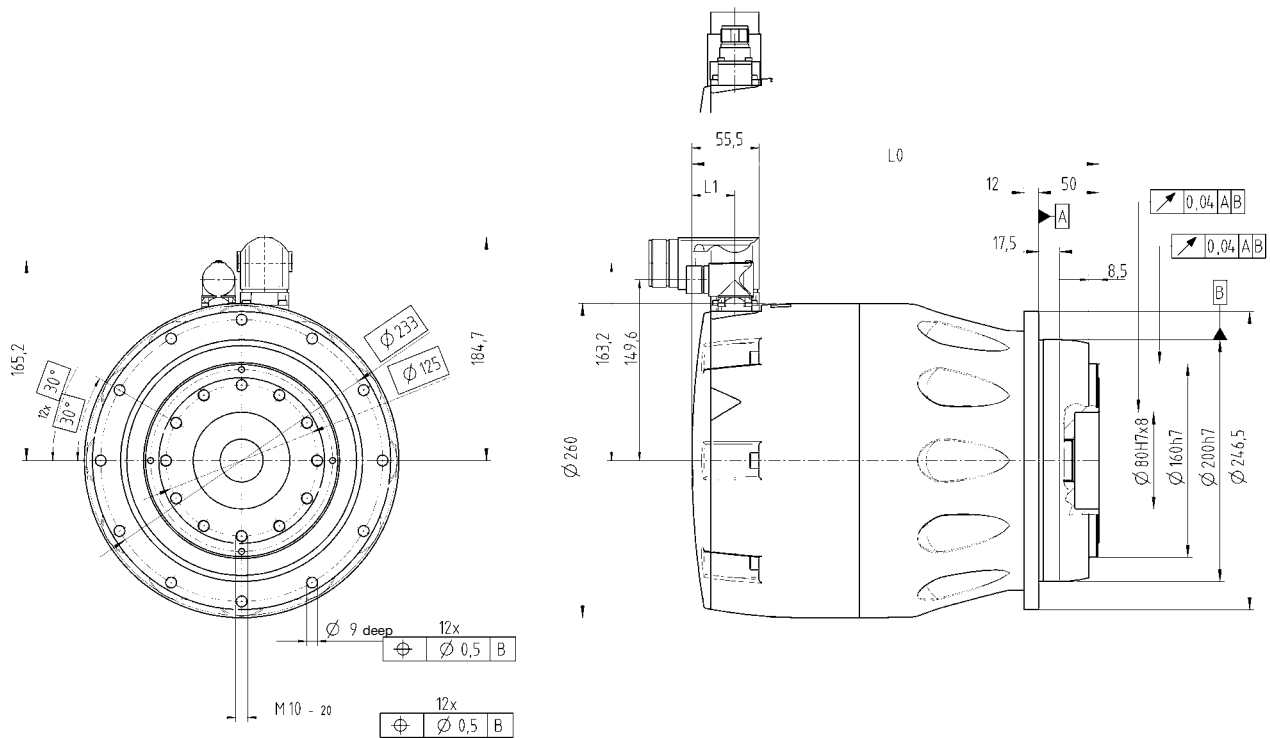
power 110 1-stage

Ratio	i		4	5	7	10
Intermediate circuit voltage	U _D	V DC	560	560	560	560
Max. acceleration torque at output (max. 1000 cycles per hour)	T _{2B}	Nm	340	428	603	555
Static output torque	T ₂₀	Nm	136	172	246	356
Brake holding torque at output, 100°C	T _{2BR}	Nm	288	360	504	720 ¹⁾
Max. speed	n _{2max}	rpm	1050	840	643	450
Speed limit for T _{2B}	n _{2B}	rpm	950	750	540	450
Max. motor acceleration torque	T _{Mmax}	Nm	88			
Max. motor acceleration current	I _{maxdyn}	A _{eff}	100			
Static motor current	I ₀	A _{eff}	38.6			
Moment of inertia (at motor shaft, without brake, with resolver)	J ₁	kgm ² ·10 ⁻⁴	142	132	123	118
Torsional backlash	j _l	arcmin	Standard ≤ 3 / Reduced ≤ 1			
Torsional rigidity	C _t	Nm/arcmin	610	610	550	445
Tilting rigidity	C _K	Nm/arcmin	1452			
Max. axial force	F _{Amax}	N	10050			
Max. tilting moment (distance from point of rotation to output flange 106.8 mm)	M _{Kmax}	Nm	3280			
Weight (with resolver, without brake)	m	kg	58.8			
Operating noise (measured at motor speed of 3000 rpm)	L _{PA}	dB(A)	≤ 70			
Max. permitted housing temperature		°C	+90			
Ambient temperature		°C	0 to +40			
Protection class			IP65			
Mount. pos.			Any			
Lubrication			Synthetic oil, lubricated for life			
Insulating material class			F			
Paint			Metallic blue 250 and natural cast aluminum			

Tolerances T, I and n: Maximum +/- 10%.

¹⁾ greater than T_{2B} of the gearhead. In case of an emergency stop, can be used approx. 1000 times while the motor is rotating.

Please refer to the instructions and graphic illustration of the speed and torque values in the chapter “Project planning”.



Electrical connection: Integral sockets, straight or angled, manufactured by Intercontec, speedtec model, series A and B, size 1.5

without brake

Ratio	Motor feedback	Length L0 in mm	Length L1 in mm
i = 4/5/7/10	Resolver	337	36
	Hiperface	361	60
	EnDat	361	60

with brake

Ratio	Motor feedback	Length L0 in mm	Length L1 in mm
i = 4/5/7/10	Resolver	387	36
	Hiperface	411	60
	EnDat	411	60

TPM⁺

power 110 2-stage

Ratio	i		16	20	25	28	35	40	50	70	100
Intermediate circuit voltage	U _D	V DC	560	560	560	560	560	560	560	560	560
Max. acceleration torque at output (max. 1000 cycles per hour)	T _{2B}	Nm	1375	1600	1600	1600	1600	1600	1600	1600	1400
Static output torque	T ₂₀	Nm	558	705	886	999	1250	794	997	900	800
Brake holding torque at output, 100°C	T _{2BR}	Nm	1152	1440	1800 ¹⁾	2016 ¹⁾	2520 ¹⁾	2750 ¹⁾	2750 ¹⁾	1750 ¹⁾	2500 ¹⁾
Max. speed	n _{2max}	rpm	281	225	180	161	129	112	90	64	45
Speed limit for T _{2B}	n _{2B}	rpm	230	190	170	160	135	95	85	65	50
Max. motor acceleration torque	T _{Mmax}	Nm	88					44.2			
Max. motor acceleration current	I _{maxdyn}	A _{eff}	100					50			
Static motor current	I ₀	A _{eff}	38.6					21.9			
Moment of inertia (at motor shaft, without brake, with resolver)	J ₁	kgm²·10 ⁻⁴	117	117	116	115	115	60	60	60	60
Torsional backlash	j _t	arcmin	Standard ≤ 3 / Reduced ≤ 1								
Torsional rigidity	C _t	Nm/arcmin	585	580	570	560	560	520	525	480	395
Tilting rigidity	C _K	Nm/arcmin	1452								
Max. axial force	F _{Amax}	N	10050								
Max. tilting moment (distance from point of rotation to output flange 106.8 mm)	M _{Kmax}	Nm	3280								
Weight (with resolver, without brake)	m	kg	59.6					52.3			
Operating noise (measured at motor speed of 3000 rpm)	L _{PA}	dB(A)	≤ 72								
Max. permitted housing temperature		°C	+90								
Ambient temperature		°C	0 to +40								
Protection class			IP65								
Mount. pos.			Any								
Lubrication			Synthetic oil, lubricated for life								
Insulating material class			F								
Paint			Metallic blue 250 and natural cast aluminum								

Tolerances T, I and n: Maximum +/- 10%.

¹⁾ greater than T_{2B} of the gearhead. In case of an emergency stop, can be used approx. 1000 times while the motor is rotating.

Please refer to the instructions and graphic illustration of the speed and torque values in the chapter “Project planning”.



Ratio	Motor feedback	Length L0 in mm	Length L1 in mm
i = 16/20/25/28/35	Resolver	337	36
	Hiperface	361	60
	EnDat	361	60
i = 40/50/70/100	Resolver	307	36
	Hiperface	331	60
	EnDat	331	60

Ratio	Motor feedback	Length L0 in mm	Length L1 in mm
i = 16/20/25/28/35	Resolver	387	36
	Hiperface	411	60
	EnDat	411	60
i = 40/50/70/100	Resolver	357	36
	Hiperface	381	60
	EnDat	381	60

The background features a dark blue field with a faint grid pattern. Overlaid on this are several concentric circles in a lighter blue hue. A horizontal band of light gray color spans the width of the page, serving as a backdrop for the main text.

Servo actuator options

Increased corrosion protection

All actuators of the “TPM+” product range are optionally available with increased corrosion protection.

Versions

1. Chemically nickel-plated gearbox housing.
2. Stainless steel output flange and shaft nut.
3. Small external screws made from stainless steel.
4. Additional U-seals on the external screws.
5. Important: No index bore in output flange.
6. Base (chemically nickel plated) for integral socket with laser-marking of identification plate.
7. Versions are generally equipped with straight integral socket only.
8. The TPM+ is completely painted with a highly resistant, two-component material on epoxy resin basis.

Colors: - Ultramarine blue silk matt (RAL 5002)
- Papyrus white silk matt (RAL 9018)

Fields of application

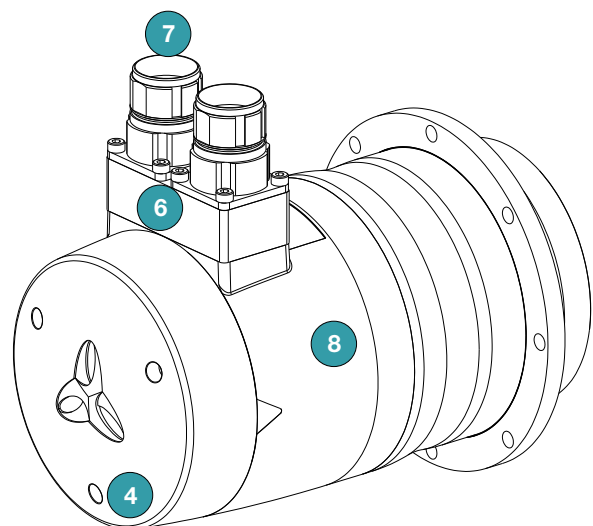
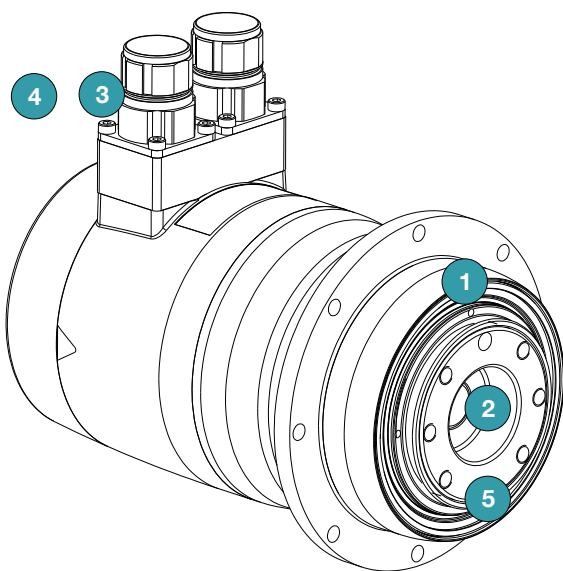
- Outdoor use in barriers, conveyors etc.
- Packaging machines, outside of the food sector.
- Textile machines.
- Pharmaceutical plants, outside of the medication sector.

Resistance

- To water and moisture.
- Restricted due to cleaning agents, especially under extended exposure period. Successful tests with Oxofam VF5L (Johnson Diversey) and Ultraclean VK3 (Johnson Diversey).
- Further cleaning agents can be qualified on request.

Protection class

Against spray water: IP66



Options

Holding brake

A compact permanent magnet brake is fitted to secure the motor shaft when the actuator is disconnected from the power.

Characteristics include no torsional backlash, no residual torque when the brake is released, unlimited duty cycles at zero speed and a constant torque at high operating temperatures.

Size dynamic		004 and 010	025	050 and 110
Holding torque at 100°C	Nm	1.1	4.5	13
Power supply	V DC	24 +6% / -10%		
Current	A	0.42	0.42	0.71

Size power		004	010	025	050	110
Holding torque at 100°C	Nm	1.1	4.5	13	23	72
Power supply	V DC	24 +6% / -10%				
Current	A	0.42	0.42	0.51	1	1.2

Size high Torque		10		25		50		110	
Ratios		22 - 110	154 - 220	22 - 55	66 - 220	22 - 55	66 - 220	22 - 88	110 - 220
Holding torque	Nm	4.5	1.8	13	4.5	23	13	72	23
Power supply	V DC	24 +6% / -10%							
Current	A	0.42	0.42	0.71	0.42	1	0.71	1.2	1

In the case of high ratios, the holding torque is reduced by the manufacturer, if necessary, in order to prevent damage to the gearbox. The exact holding torques at the output can be found in the relevant data tables for the actuators, e.g. TPM* power 110 2-stage.

Please refer to our project planning note on page 67.

Temperature sensors

Different sensors are available to protect the motor coil from overheating.

Standard: PTC resistor, type STM 160 according to DIN 44081/82
PTC resistor, type KTY 84-130

Encoder systems

A selection of encoder systems is available for positioning and speed measurement.

Standard: - Resolver, 2-pole, 1 sin/cos cycle per rotation
Optional: - Single-turn, EnDat 2.1 with 1 V_{SS}, 512 S/R
- Multi-turn, EnDat 2.1 with 1 V_{SS}, 512 S/R, 4096 R
- Hiperface, single-turn, 128 S/R
- Hiperface, multi-turn, 128 S/R, 4096 R
- TTL incremental encoder with hall signals and rectangular incremental signals 2048 S/R
- On request:
- DRIVECLiQ
- EnDat 2.2
- Hiperface DSL

Cables

For selected servo controllers (see page 64), pre-assembled cables are available in pin assignments 1 and 4 (see page 57/58), in lengths of 5, 10, 15, 20, 25, 30, 40 and 50 meters.

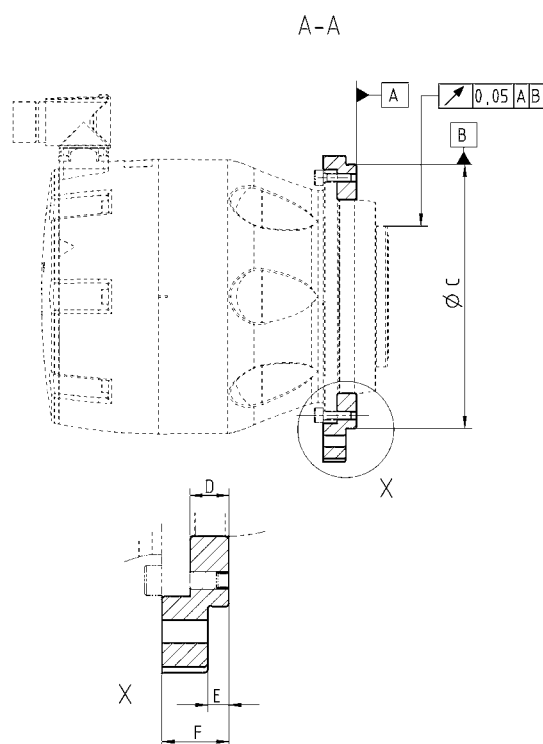
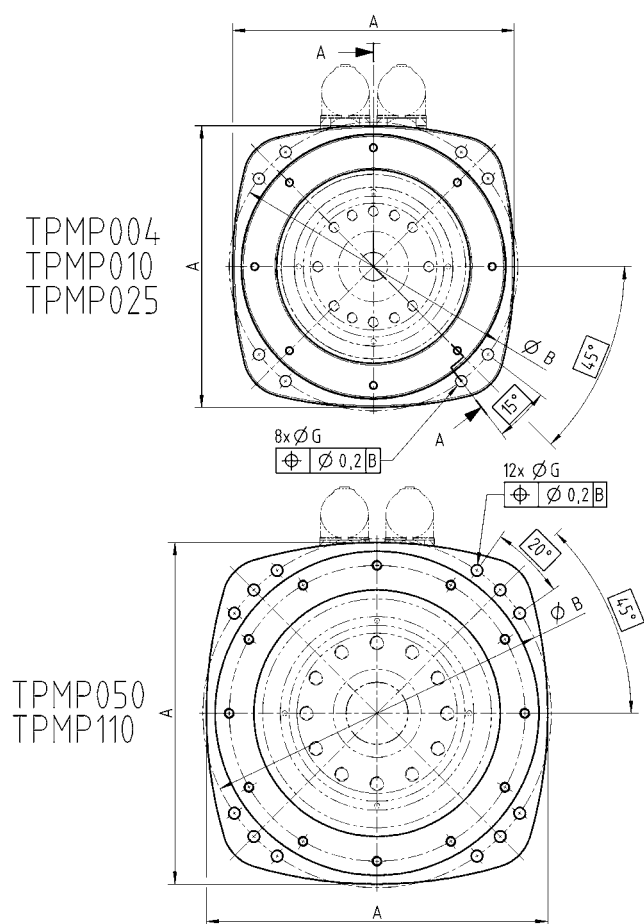
The cables are of the highest quality:

- Compatible with drag chains using highly flexible lines as specified in DIN VDE 0295, Cl. 6
- Oil and flame-resistant
- Free from halogen, silicone and CFCs

Options

Adapter flange for the TPM+ power

In certain installation situations, the flange bores must be accessed from the rear, for example. For this purpose, an adapter flange with a large hole circle is available for the TPM+ power. The flange is already fitted to the actuator on delivery.

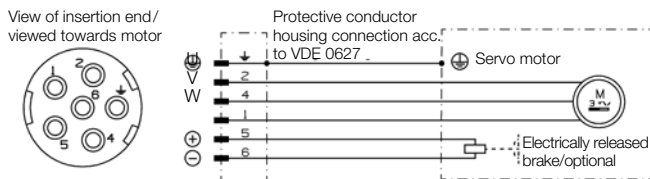


	TPM+ power 004	TPM+ power 010	TPM+ power 025	TPM+ power 050	TPM+ power 110
A	105	130	160	194	268
B	105	133	164	198	273
C	92 h7	120 h7	150 h7	184 h7	252 h7
D	8	10	11	14	16
E	5	5	6	7	8
F	12	17	19	24	28
G	4.5	5.5	5.5	6.5	9

Pin assignment 1

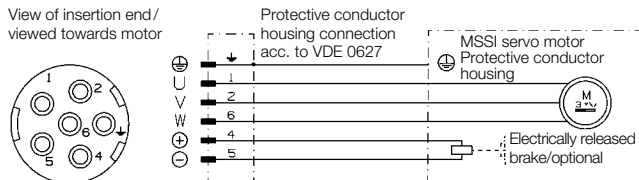
Version with resolver, size 1

Integral power socket: speedtec, BED size 1, Intercontec 6-pin, pin contact \varnothing 2 mm



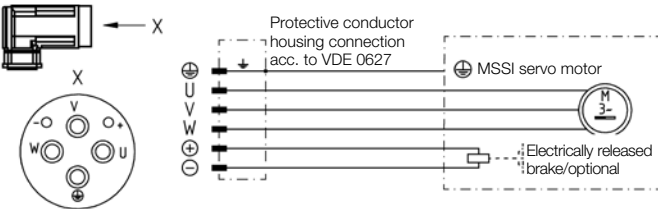
Version with optical sensor, size 1

Integral power socket: speedtec, BED size 1, Intercontec 6-pin, pin contact \varnothing 2 mm



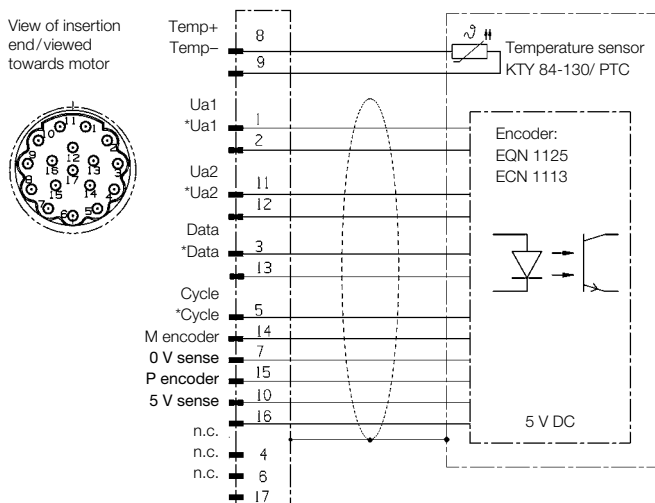
Version with resolver or optical sensor, size 1.5

Integral power socket: speedtec, CED size 1.5, Intercontec 6-pin, pin contact 4 x \varnothing 3.6 mm and 2 x \varnothing 2 mm



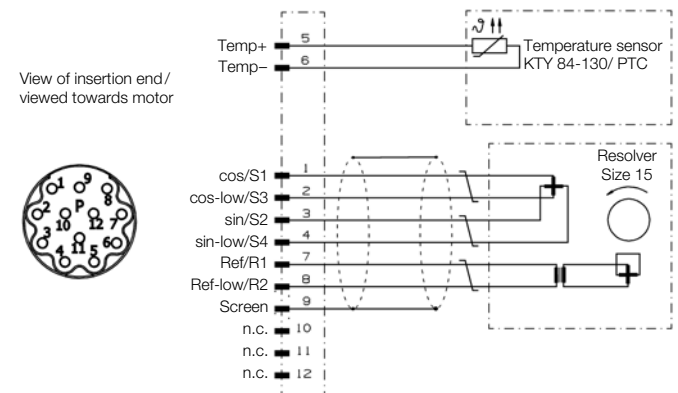
Options "S" and "M"

Integral signal socket: speedtec, AED size 1, Intercontec 17-pin, E-part, pin contact \varnothing 1 mm, housing code 0°



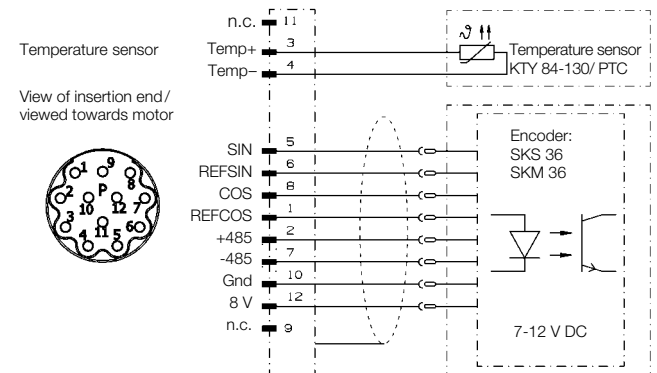
Option "R"

Integral signal socket: speedtec, AED size 1, Intercontec 12-pin, P-part, pin contact \varnothing 1 mm, housing code 0°



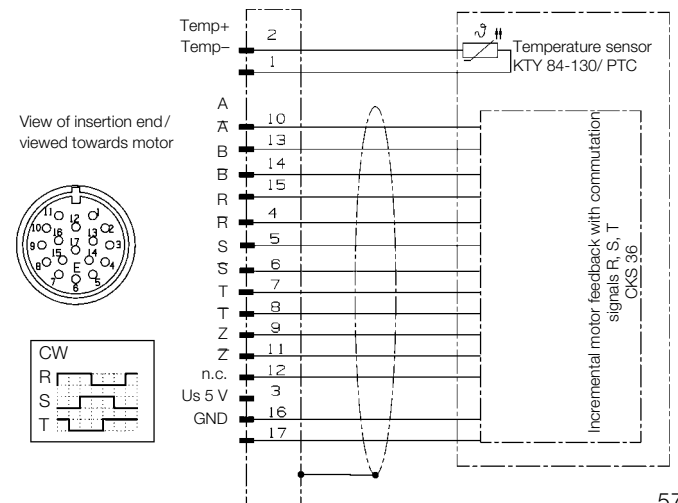
Options "N" and "K"

Integral signal socket: speedtec, AED size 1, Intercontec 12-pin, P-part, pin contact \varnothing 1 mm, housing code 0°



Option "T"

Integral signal socket: speedtec, AED size 1, Intercontec 17-pin, E-part, pin contact \varnothing 1 mm, housing code 0°

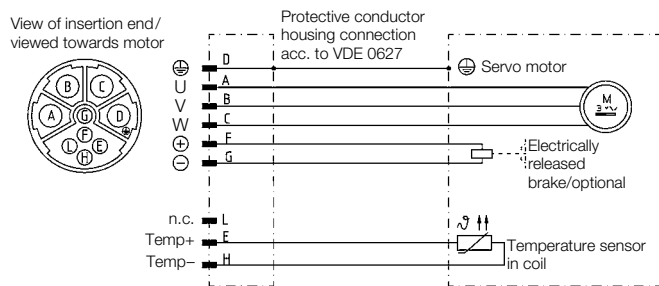


Options

Pin assignment 4

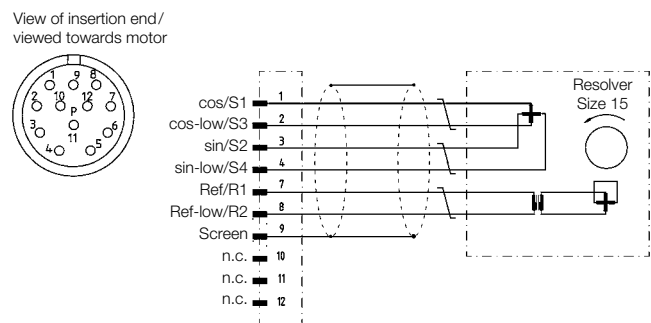
Version with resolver and optical sensor, size 1

Integral power socket: speedtec, BED size 1, Intercontec 9-pin, pin contact 4 x ø 2 mm + 5 x ø 1 mm



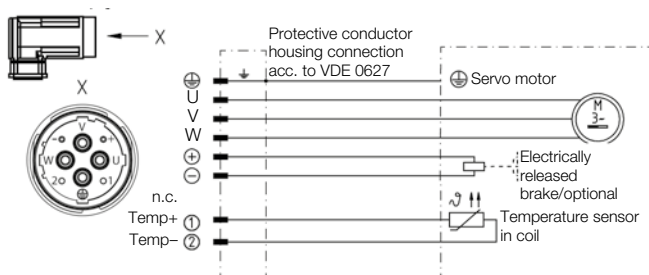
Option "R"

Integral signal socket: speedtec, AED size 1, Intercontec 12-pin, P-part, pin contact ø 1 mm, housing code 0°



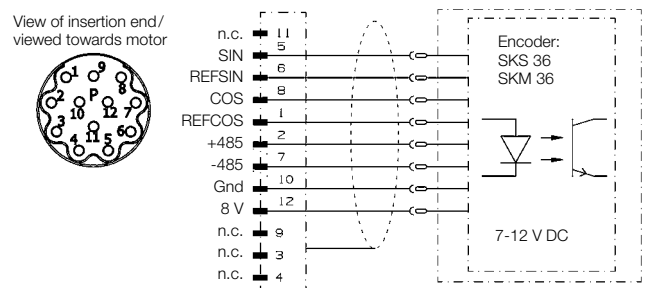
Version with resolver and optical sensor, size 1.5

Integral power socket: speedtec, CED size 1.5, Intercontec 8-pin, pin contact 4 x ø 3.6 mm + 4 x ø 2 mm



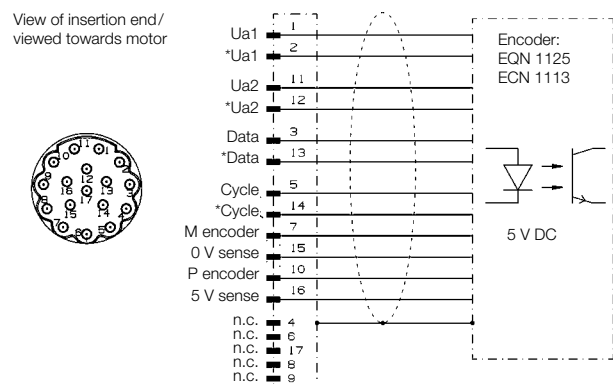
Options "N" and "K"

Integral signal socket: speedtec, AED size 1, Intercontec 12-pin, P-part, pin contact ø 1 mm, housing code 0°



Options "S" and "M"

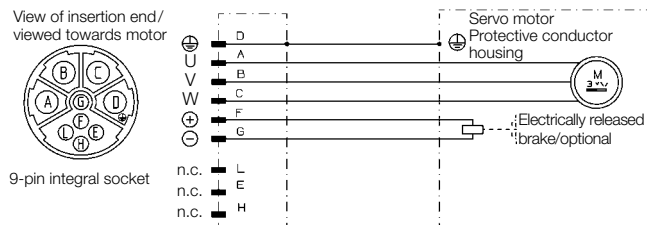
Integral signal socket: speedtec, AED size 1, Intercontec 17-pin, E-part, pin contact ø 1 mm, housing code 0°



Pin assignment 5 only for TPM⁺ dynamic (Rockwell-compatible)

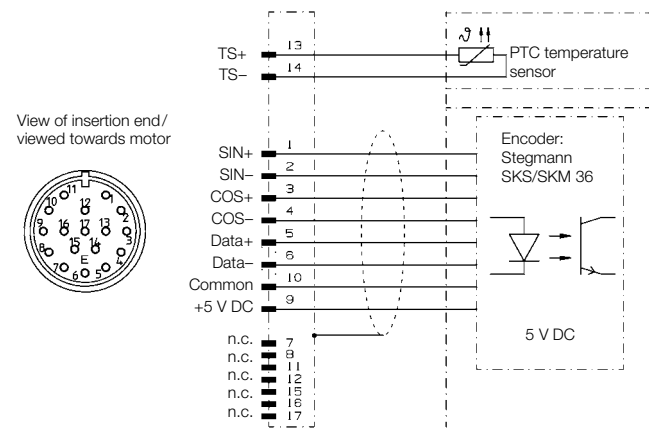
Version with optical sensor

Integral power socket: speedtec, BED size 1, Intercontec 9-pin, pin contact 4 x ø 2 mm + 5 x ø 1 mm



Options “E” and “V”

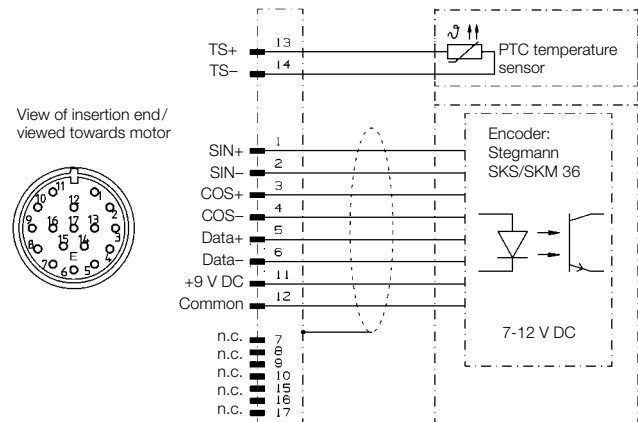
Integral signal socket: speedtec, AED size 1, Intercontec 17-pin, E-part, pin contact ø 1 mm, housing code 0°



On TPM⁺ dynamic sizes 004, 010 and 025 with 320 V intermediate circuit voltage.

Options “E” and “V”

Integral signal socket: speedtec, AED size 1, Intercontec 17-pin, E-part, pin contact ø 1 mm, housing code 0°



On TPM⁺ dynamic with 560 V intermediate circuit voltage.

Motor / gearbox assignment matrix

Ratio	BG 004		BG 010			BG 025			BG 050			BG 110		
	dynamic	power	dynamic	power	high torque	dynamic	power	high torque	dynamic	power	high torque	dynamic	power	high torque
4	x	64B	x	94C	x	x	130D	x	x	155D	x	x	220D	x
5	x	64B	x	94C	x	x	130D	x	x	155D	x	x	220D	x
7	x	64B	x	94C	x	x	130D	x	x	155D	x	x	220D	x
10	x	64B	x	94C	x	x	130D	x	x	155D	x	x	220D	x
16	53B	64B	64B	94C	x	94C	130D	x	130D	155D	x	130E	220D	x
20	x	64B	x	94C	x	x	130D	x	x	155D	x	x	220D	x
21	53B	x	64B	x	x	94C	x	x	130D	x	x	130E	x	x
22	x	x	x	x	94C	x	x	130D	x	x	155D	x	x	220H
25	x	64B	x	94C	x	x	130D	x	x	155D	x	x	220D	x
27.5	x	x	x	x	94C	x	x	130D	x	x	155D	x	x	220H
28	x	64B	x	94C	x	x	130D	x	x	155D	x	x	220D	x
31	53B	x	64B	x	x	94C	x	x	130D	x	x	130E	x	x
35	x	64B	x	94C	x	x	130D	x	x	155D	x	x	220D	x
38.5	x	x	x	x	94C	x	x	130D	x	x	155D	x	x	220H
40	x	64A	x	94A	x	x	130A	x	x	155A	x	x	220B	x
50	x	64A	x	94A	x	x	130A	x	x	155A	x	x	220B	x
55	x	x	x	x	94C	x	x	130D	x	x	155D	x	x	220H
61	53A	x	64A	x	x	94A	x	x	130A	x	x	130D	x	x
64	53A	x	64A	x	x	94A	x	x	130A	x	x	130D	x	x
66	x	x	x	x	x	x	x	94C	x	x	130D	x	x	220D
70	x	64A	x	94A	x	x	130A	x	x	155A	x	x	220B	x
88	x	x	x	x	94C	x	x	94C	x	x	130D	x	x	220D
91	53A	x	64A	x	x	94A	x	x	130A	x	x	130D	x	x
100	x	64A	x	94A	x	x	130A	x	x	155A	x	x	220B	x
110	x	x	x	x	94C	x	x	94C	x	x	130D	x	x	155D
154	x	x	x	x	94A	x	x	94C	x	x	130D	x	x	155D
220	x	x	x	x	94A	x	x	94C	x	x	130D	x	x	155D

x = no standard combination

Order code

Power cables for product range TPM+

1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0
C	A	B	-	P	O	W	-	E	-	S	T	D	0	0	1	-	D	0	1	5	0	-	S	-	L	0	5	0	0
Cable harness Cables for TPM+ Product range			Model POW = Power cable			Controller manufacturer Motor phases and brake on wire end sleeves STD000 = PE on wire end sleeve STD001 = PE on cable ring shoe etc... see top of next page			Power connector assignment Connector size 1 R = Resolver, 2-pole E = Encoder (EnDat, Hiperface, incremental, TTL) Connector size 1.5 U = Universal for all motor feedback			Motor manufacturer S = Connector size 1 C = Connector size 1.5 see table at bottom of next page			Cable cross section D0150 = 1.5 mm ² D0250 = 2.5 mm ² D0400 = 4 mm ² D0600 = 6 mm ² D1000 = 10 mm ² D1600 = 16 mm ²			Length L0500 = 5 m L1000 = 10 m L1500 = 15 m L2000 = 20 m L2500 = 25 m L3000 = 30 m L4000 = 40 m L5000 = 50 m											

Signal cables for product range TPM+

1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0
C A B			-	S I G			-	M	-	S I E M E N						-	D 0 0 0 0					-	S	-	L 0 5 0 0				
Cable harness Cables for TPM+ Product range			Model SIG = Signal cable			Controller manufacturer SIEMEN = Siemens SIMODRIVE 611 etc... see top of next page						Motor manufacturer S = Connector size 1					Cable cross section Standard for all signal cable sizes D0000					Length L0500 = 5 m L1000 = 10 m L1500 = 15 m L2000 = 20 m L2500 = 25 m L3000 = 30 m L4000 = 40 m L5000 = 50 m							
			Return system R = Resolver, 2-pole I = Incremental encoder, optical M = EnDat absolute encoder* K = Hiperface absolute encoder* T = incremental encoder with hall signal																										

* Multiturn and singleturn cables are identical

Controller manufacturer

Cable for pin assignment 1 (temperature sensor in signal cable)

Manufacturer	Controller	Signal cable manufacturer	Power cable manufacturer
B&R	Acopos	BURACO	STD000
ELAU	PacDrive MC4	ELAMC4	ELAMC4
Bosch Rexroth	IndraDrive	BRCIND	STD000
Control techniques	UniDrive SP	CT_SP_	STD001
Siemens	Sinamics S120	SIEMEN*	STD001
	SimoDrive 611	SIEMEN	STD001
	Masterdrive MC	SIEMEN	STD001

* not available for DRIVECLiQ

Cable for pin assignment 4 (temperature sensor in power cable)

Manufacturer	Controller	Signal cable manufacturer	Power cable manufacturer
ELAU	PacDrive MC4	ELAUP4	ELAUP4
Bosch Rexroth	IndraDrive	BRC_I4	STD_P4
Beckhoff	AX5000	BHAX54	STD_P4

Other cable versions available on request

Motor manufacturer and cable cross sections

Stator	Cable cross section mm ²	Power plug connection
053A	1.5	Size 1 M23
053B	1.5	Size 1 M23
064A	1.5	Size 1 M23
064B	1.5	Size 1 M23
094A	1.5	Size 1 M23
094C	1.5	Size 1 M23
130A	1.5	Size 1 M23
130D	2.5	Size 1 M23
130E	2.5	Size 1 M23
155A	1.5	Size 1 M23
155D	2.5	Size 1 M23
220B	4	Size 1.5 M40
220D	10	Size 1.5 M40
220H	16	Size 1.5 M40

Recommended cable cross sections according to EN 60204-1, ambient temperature 40°C, laying system C.

The selection of cable cross section depends on the motor size and stator length.

Project planning

Servo controllers

TPM⁺ actuators can be operated using many different servo controllers. The table below contains a selection of servo controllers already tested with the TPM⁺. It also provides information to assist in selecting the correct options. You can request a set of quick start instructions containing all the most important information for parametrizing the servo controller. Please observe the current consumption of the actuator during selection of the servo controller used.

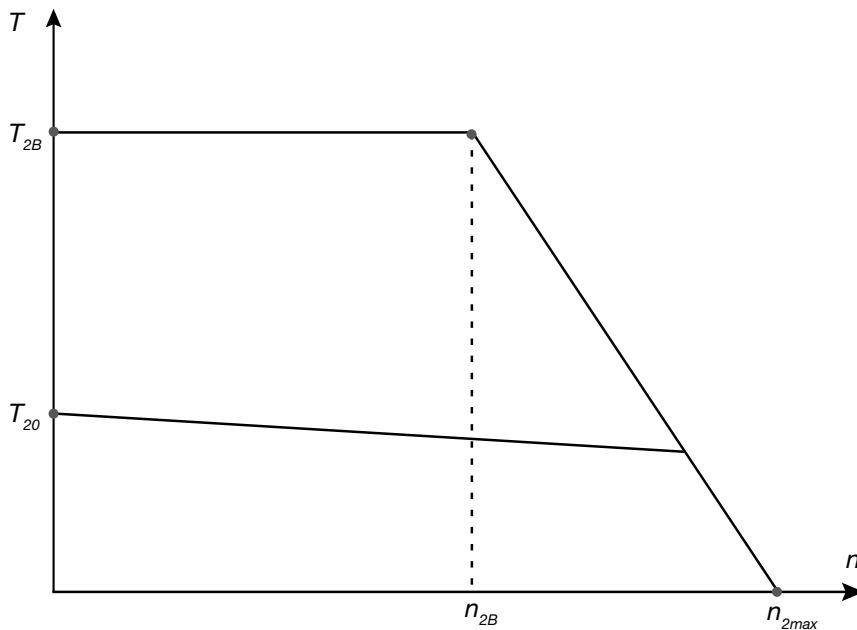
Manufacturer	Version/Type	Motor feedback				Temperature sensor		DC bus voltage		
		Resolver	EnDat	Hiperface	TTL encoder	PTC	KTY	48 V DC	320 V DC	560 V DC
Bosch Rexroth	IndraDrive	x	x	x	–	x	x	–	x	x
Beckhoff	AX5000	x	x	x	–	x	x	–	x	x
B & R	AcoPos	x	x	x ¹	–	x	x	–	x ²	x
Control techniques	UniDrive SP	x	x	x	x	x	–	–	–	x
Kollmorgen	Servostar 300	x	x	x	x	x	–	–	x	x
	Servostar 700	x	x	x	x	x	–	–	x	x
	AKD	x	x	x	–	x	–	–	x	x
ESR Pollmeier	TrioDrive D/xS	x	x	x	–	x	x	–	x	–
	MidiDrive D/xS	x	x	x	–	x	x	–	–	x
Parker	Compax 3	x	x	x	x	x	–	–	x	x
KEB	Combivert F5-Servo	x	x	x	–	x	–	–	x	x
	Combivert F5-A Servo	x	–	–	–	x	–	–	x	x
Lenze	Global Drive 93xxx	x	–	x	–	x	x	–	–	x
	Global Drive 94xx	x	x	x	–	x	x	–	x	x
	ECS Servosystem	x	–	x	–	x	–	–	x	x
NUM	MDLU 3	–	–	x	–	x	–	–	–	x
Rockwell	Ultra 3000	–	–	x	–	x	–	–	x	x
	Kinetix 6000	–	–	x	–	x	–	–	x	x
	Kinetix 6200	–	–	x	–	x	–	–	x	x
	Kinetix 6500	–	–	x	–	x	–	–	x	x
Siemens	SimoDrive 611U	x	x	–	–	–	x	–	–	x
	SimoDrive 611D	–	x	–	–	–	x	–	–	x
	Masterdrive MC	x	x	–	–	x	x	–	–	x
	Sinamics S120	x	x	–	–	–	x	–	–	x
Schneider Electric	PacDrive MC-4	–	–	x	–	x	–	–	x	x
	PacDrive 3	–	–	x	–	x	–	–	x	x
WITTENSTEIN motion control	simco	x	x	–	–	–	x	x ³	–	–

¹ No programming of the electronic identification plate possible

² up to 3.6 A_{eff} rated current

³ up to 10 A_{eff} rated current

Technical data



Symbol	Designation	Unit
T_{2dyn}	Dynamic load torque	Nm
T_{2Pr}	Process load torque	Nm
T_{2b}	Total load torque at gearhead output	Nm
T_{1b}	Total load torque at motor	Nm
T_{Mmax}	Maximum acceleration torque of motor	Nm
T_{2B}	Maximum permissible acceleration torque at gearhead output	Nm
T_{20}	Permanent static torque at gearhead output	Nm
M_{2k}	Tilting torque at gearhead output	Nm
$M_{2k, max}$	Maximum permissible tilting torque at gearhead output	Nm
J_L	Mass moment of inertia of external load	kgm ²
J_1	Mass moment of inertia of drive (motor side)	kgm ²
i	Gearhead ratio	–
η	Gearhead efficiency (1-stage 0.97 / 2-stage 0.94)	–
α	Acceleration of external load	rad/s ²
n_{2B}	Speed limit* for T_{2B}	rpm
n_{2max}	Maximum permitted output speed	rpm

* The maximum acceleration torque available at the gearhead output decreases if speed limit n_{2B} is exceeded.

Project planning

Acceleration and tilting torque design instructions

To fully utilize gearhead actuators from the TPM+ product range, please check the maximum permissible acceleration torques with reference to the following points:

Calculate the maximum acceleration torque required at the gearhead output:

$$T_{2dyn} = \alpha * J_L$$

Identify additional process loads and calculate the total load torque at the gearhead output:

$$T_{2b} = T_{2dyn} + T_{2Pr}$$

Then calculate the total load torque required at the motor:

$$T_{1b} = (\alpha * J_L + T_{2Pr}) * \frac{1}{\eta * i} + \alpha * i * J_1$$

To fully utilize the gearhead actuator during acceleration, the following conditions must be adhered to:

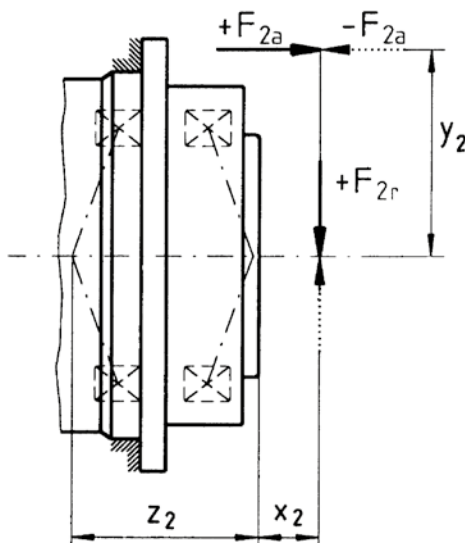
Condition for the total load torque at the gearhead output:

$$T_{2b} \leq T_{2B}$$

Condition for the total load torque at the motor:

$$T_{1b} \leq T_{1max}$$

In addition, the tilting torque produced from prevalent radial and axial forces must be determined and compared with the permissible value:



$$M_{2k} = \frac{F_{2a} * y_2 + F_{2r} * (x_2 + z_2)}{1000}$$

$$M_{2k} \leq M_{2K max}$$

Please refer to the table below for values corresponding to z_2 :

TPM* dynamic	004	010	025	050	110
Z_2 [mm]	57.6	82.7	94.5	81.2	106.8

TPM* high torque		010	025	050	110
Z_2 [mm]		82.7	94.5	81.2	106.8

TPM* power	004	010	025	050	110
Z_2 [mm]	57.6	82.7	94.5	81.2	106.8

TPM* endurance		010		050	
Z_2 [mm]		82.7		81.2	

If you require a more complex design, in particular the thermal characteristics of our drives, we recommend analyzing the drive train using our design software cymex®.

Project planning note on brakes

The holding brakes installed in the actuators are subject to various influencing factors, e.g. the oxidation of abrasion particles, the flattening of friction surfaces in the case of frequent brake action at the same position, or the wear-dependent changes to the air gap. This can result in a reduction of the available holding torques. All the holding torques indicated therefore apply for the ideal state under optimal conditions, without damaging influences.

Such influences can be countered by means of a regular brake refresh cycle. For detailed information on the recommended refresh cycles, please refer to our Instructions for Use. For critical applications, it is recommended to ensure sufficient design safeguards with regard to holding torque in order to take into account the above-mentioned uncertainty factors. Our in-house engineering department will be pleased to assist you with the application sizing.



motion control

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