

alpha

More flexible More efficient More productive

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alpha Mechatronic Systems Product catalog



alpha

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More flexible More efficient More productive

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Dear Business Associates,

The world of industrial manufacturing has never before been so complex, nor has it offered so many opportunities. The secured productivity of each and every customer requires machines which are flexible, reliable and energy efficient. New modular machine concepts are required for efficient multivariant production with fast module changes, which offer maximum flexibility and adaptation.

Our mechatronic drive systems have the potential to positively influence all the relevant performance parameters, and to do so reliably, 24/7, worldwide. The alpha Mechatronic systems are more than the sum of their intelligently designed individual components. Owing to their compactness, they can also be used in extremely confined installation spaces. Low moments of inertia increase the productivity of your machine and optimize energy efficiency.

With experience, know-how, system expertise and industry knowledge, we deliver on the quality pledge behind all of our system solutions.

Whatever alpha solution you opt for: with us, you always reach the goal quickly and easily. We offer integrated mechanical and mechatronic drive solutions for all types of axis. On demand we also provide complete solutions from a single source – complete systems including actuators – also for linear systems.

Miniaturization, integration suitability, networkability and intelligence are the principal focus during the development of our products. Our top priority is our customers' success. We understand this, and make it our daily motivation.

Take our word for it!

Erik Roßmeißl Managing Director WITTENSTEIN alpha GmbH

alpha Mechatronic Systems HIGHLIGHTS



HIGHEST POWER DENSITY

The complete power unit comprised of motor and gearbox provides high performance in a significantly smaller installation space.



LOW MASS MOMENT OF INERTIA

The significantly lower moment of inertia increases productivity and reduces energy consumption.



HIGH RIGIDITY

The high torsional and tilting rigidity of the drive bearings ensure improved control quality of the servo actuator.



LOW BACKLASH

The precision of the system can be effectively increased through the minimal backlash.



ABSOLUTE SCALABILITY

The technical properties of the unit can be scaled in accordance with the application requirements.



HIGH CONNECTIVITY

The electrical interface enables high connectivity to many different servo controllers.





With premo[®] absolute precision meets perfect motion. The platform for scalable machine concepts can be flexibly used at all interfaces and can be mechanically and electrically adapted to customer requirements. Productive, efficient, precise – these attributes characterize the proven TPM^+ servo actuator family with drive flange. This is valid everywhere: from robotics to machine tools, from dynamic to high-load applications.

YOUR WORLD IS OUR DRIVE. FOR MORE THAN 30 YEARS.



PERFORMANCE

Performance where it counts:

High torque, outstanding precision and high power density – essential for our products and systems.

FUTURE PROOF

We live processes:

Only those who know the exact details of customer processes and requirements are in a position to develop solutions that offer added value in the short and long term.

SCALABILITY

You never make compromises: Whatever the performance area – we offer solutions that grow with your requirements.



WITTENSTEIN

alpha

It is good to know today what will be needed tomorrow. Applying it in practice is even better. We develop technology that shapes the future – ENGINEERING FUTURE SOLUTIONS.

EFFICIENCY

We like it "lean":

We offer products and systems that are energy-efficient and require minimal installation space in machines.

AVAILABILITY

You need reliability:

We have the widest range of products on the market and can implement your application "just in time".

CONNECTIVITY

We think in terms of interfaces: All of our systems can be integrated in a wide range of peripherals.

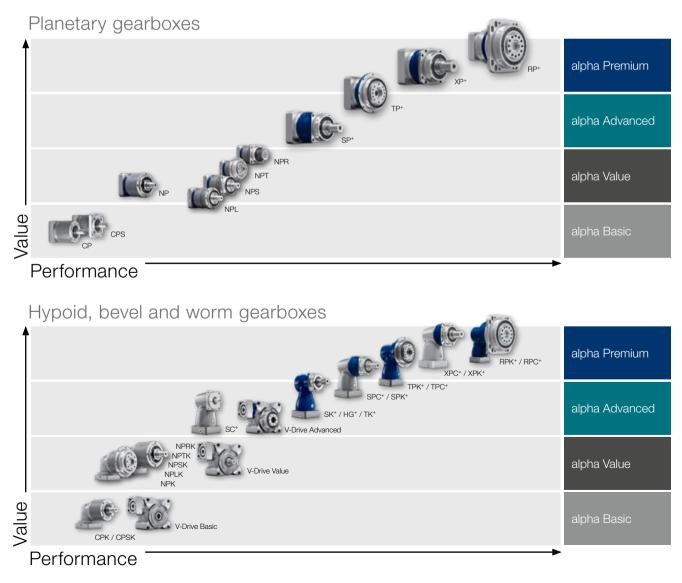


WITTENSTEIN alpha in all axes

Complete drive solutions under one roof

We offer the best solutions for almost every application. In addition to gearboxes, our product portfolio includes a wide range of drive solutions with linear systems and servo actuators. Adapted accessories such as couplings and shrink discs round off the product portfolio.

Our products are divided into the Basic, Value, Advanced and Premium Segments in terms of "Performance" and "Value". We want to make it even easier for our customers to find the right solution from our large portfolio for each specific application.



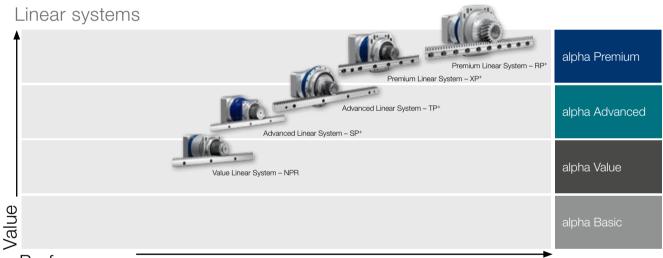
Overview of our product portfolio:

Know-how in every sector

Our solutions range from high-precision axes in manufacturing systems to packaging machines that must operate with maximum productivity in the smallest installation space.

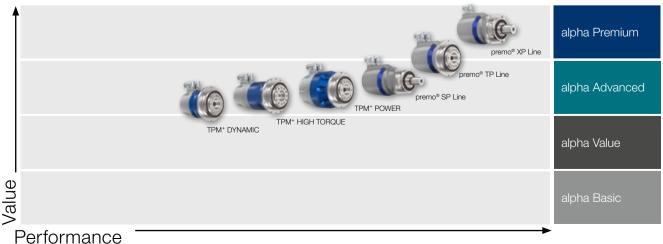
Overview:

- Machine tools and production technology
- · Food and packaging machines
- · Wood working machinery
- · Printing and paper machines
- \cdot Robotics and automation



Performance

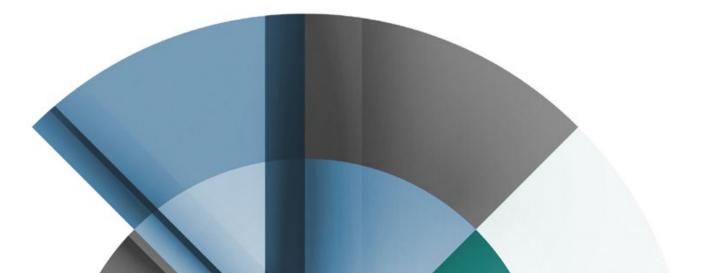
Servo actuators



We live mechatronics

Our servo actuators for greater efficiency and precision

Our customers' challenges are our own. For this reason, mechatronics has a very creative dimension for us: To custom-integrate sensors, software, gearbox, motor and electronics to the greatest possible extent in order to produce **intelligent**, **highly efficient and controllable drive systems** – even for extreme environmental conditions. To meet these requirements, we think ahead, laterally and in networks. The objective during the development of our servo actuators is always the **reduction of complexity** for the customer – with **optimal efficiency, reliability, con-nectivity and innovation.** This is the measurable added value that counts.





Sector-specific high performance



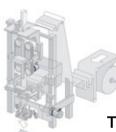
Maximum efficiency and reliability, as well as comprehensive compatibility in the various application areas: Thanks to their high dynamics, our servo actuators ensure high productivity. The high power density reduces energy consumption and the compact installation dimension also permits the use in difficult, confined spaces. Whatever the requirements: WITTENSTEIN alpha offers sector-specific, high-performance solutions – as cost-effective serial solutions and customized high-end developments.



Wide-ranging applications

The WITTENSTEIN alpha servo actuators can be used in numerous applications. Here are a few examples:

Folding box packaging (incl. assembly / folding, filling valve)

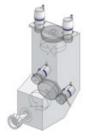


Tubular bag packaging (incl. jaw stroke, sealing jaw, blade)



Delta robot (axis 1–3, swivel axis)

Handling gantry (Z-axis, swivel / rotating axis)



Machine tool milling (rotating axes A–C, tool changer)

Plastic thermoform (tool axis)

Intralogistics (driverless transport systems)

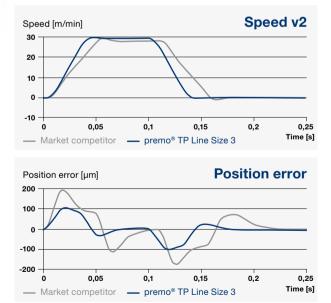
More efficient in the application

Due to the high power density, the low mass moment of inertia, the high rigidity and the low backlash of the WITTENSTEIN alpha servo actuators, two important objectives can be achieved:

1. Increased productivity with comparable energy requirement

To increase the productivity of a system, it is most important to reduce the cycle time of the time-critical axis. This is achieved through increased acceleration torques allowing for a reduction in the dynamic time components as well as through increased torsional rigidity for improved response times and tighter control loops.

The following example of a packaging machine shows that a premo® TP Line Size 3 with 20 % higher acceleration torque and 30 % more torsional rigidity with comparable energy requirement achieves a significant increase in productivity. The movement path of 50 mm in the time-critical axis is completed 50 ms faster, which corresponds to a production increase of 29 %.

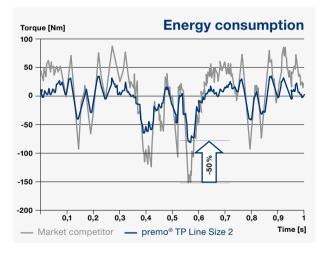




2. Reduced energy consumption with the same productivity

By using a smaller, more efficient actuator with lower inertia and higher rigidity, a smaller servo controller can also be used, thus saving upfront cost as well as operating costs in the form of lower energy consumption while achieving the same productivity. The solution here is a combination of a lower mass moment of inertia and a higher degree of rigidity.

Example Delta robot: Using a premo® TP Line Size 2, the same result is achieved as with the significantly larger motor of a market competitor. The high rigidity of the servo actuator together with the lower moment of inertia enables the use of a smaller motor. At 6.5 A, the power consumption of the Size 2 premo® is approx. 50 % below the power consumption of the comparable product. This enables the selection of servo controller and supply module that are one level smaller, which involves significant savings potential in the 3-axis application.



Perfect dimensioning of servo actuators: **cymex**[®] **5**

With cymex[®] 5, the dimensioning and sizing of complete drive trains (application + transformation + gearbox + motor) is now fast, simple and reliable.

Calculation is made much easier using predefined standard applications. Consideration of all major influencing factors guarantees an optimal design and increases the efficiency of your machine.

Free download in 11 languages

The basic version of the cymex[®] 5 sizing software is available as a free download.



www.wittenstein-cymex.com





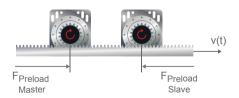
Cymex[®] 5 has a unique optimization calculator*

During the design process, cymex[®] 5 provides optimization suggestions for the selected servo actuator, which increase reliability and efficiency while ensuring your servo actuator has the perfect dimensions e.g. through downsizing. This allows you to save costs and reduces the installation space in the machine.



 \mathcal{C} cymex $^{\circ}$ 5 offers comprehensive documentation

Following the geometry comparison, cymex[®] 5 creates calculation documentation and generates data sheets for gearbox and motor on request. Furthermore, the 2D and 3D CAD data of selected components can be retrieved.



C cymex[®] 5 incorporates the completely new Master / Slave function*

The Master / Slave function enables the electrically preloaded configuration of two drives. The preload between master and slave eliminates the backlash in the drive train and offers a high degree of rigidity in the machine.

*Premium function, on request.

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Cymex® 5 has an extremely comprehensive database

More than 17,500 motors from the 50 most prominent motor manufacturers are stored in the design tool. Continuously updated, always state-of-the-art. Moreover, more than 10,000 gearbox and 700 servo actuator versions from WITTENSTEIN alpha and over 200 combinations of linear systems with all relevant technical specifications can be found here.





The optimized software offers many options for the individual sizing of the drive train. These have been integrated to supplement the previously existing applications in cymex[®] 3: the crank, conveyor, center winder and feed roll.

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In contrast to other design tools, $cymex^{\circ}$ 5 can define any number of axes at the same time. The version calculation is up to 60 % quicker as a result.

premo[®] servo actuators





premo[®] – the powerful servo actuator platform

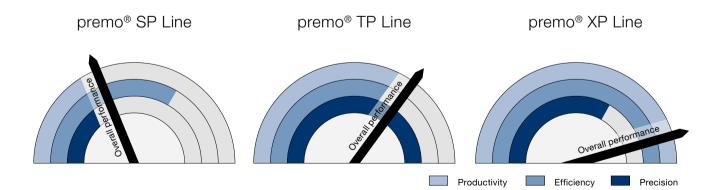
Absolute precision meets perfect motion: premo[®] combines precision with motion – more efficiently than ever.

The central idea **behind the first fully scalable servoactuator platform** from WITTENSTEIN alpha is uncompromising flexibility from the viewpoint of the user. Motors and gearboxes with application-related graduated performance characteristics can be configured modularly **to individual motor / gearbox units.** The result is a modular system that is significantly more versatile and more individual with regard to performance for the most diverse applications, that meets almost all the challenges of drive technology, integration and industry specification. Thanks to the **modular platform concept**, premo[®]servo actuators can also be quickly manufactured and made available for the relevant task.

The core of the motor / gearbox unit is a **torsionally rigid precision gearbox** with low backlash and excellent torque density in combination with the equally powerful, **permanent magnet synchronous servo motor**, which guarantees low cogging and minimal velocity ripple thanks to the split winding.

Due to the intelligent design principle implemented for the first time, premo® not only sets **completely new standards with regard to flexibility and sustainability** – the premo® servo actuator generation also opens up new dimensions in performance: **doubled power with minimal increase in size**, increased productivity and optimized energy efficiency thanks to digital, single-cable technology provide more freedom during planning, design and storage as well as lower investment costs.

All **three lines** of this innovative servo actuator generation can be equipped with **the latest digital encoder technology** and are characterized by a particularly easy-to-clean and maintenance friendly design without exposed screws.



Flexible mechanical and electrical interfaces for high scalability

premo[®] SP Line – the entry level class

Optimum performance for all positioning tasks

- Short cycle times thanks to low backlash and extreme rigidity
- Very good positioning accuracy
- Basic configuration with smooth output shaft and resolver

premo® TP Line – the dynamic class

Precision for positioning and processing tasks

- High torsional rigidity and low backlash allow high acceleration and tight control
- Basic configuration with output flange and HIPERFACE[®] absolute encoder singleturn, SIL 2

premo[®] XP Line – the extra class

Versatile in almost all sectors

- Maximum power density with high torsional rigidity and radial load capacity
- Basic configuration with smooth output shaft and HIPERFACE DSL® absolute encoder singleturn, SIL 2

Individual upgrading of all lines possible due to a variety of options:

- Analog and digital rotary encoders as well as reliable encoders according to SIL 2
- One and two-connector versions
- Permanent magnet holding brake
- Reduced backlash
- Various output types



premo® – clearly superior in performance

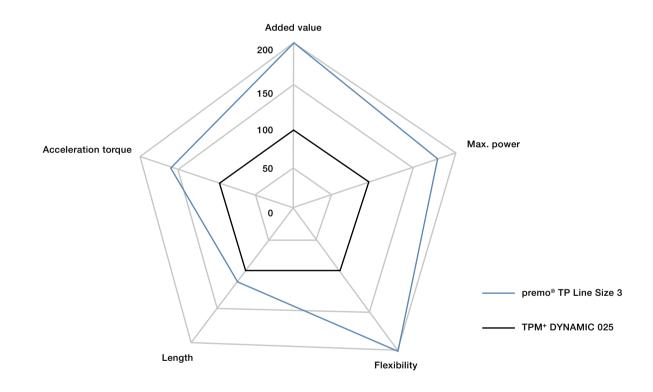
- Higher machine performance thanks to higher acceleration torque
- High torque density **combined with a compact design** allow for the realization of higher performance machines with significant space saving
- Improved connectivity to next generation controllers from leading system providers due to the use of digital encoders (EnDat 2.2, DSL, HIPERFACE DSL[®], DRIVE-CLiQ) and compatibility for high operating voltage up to 750 V DC
- Reduced wiring requirement due to single-connector technology
- Improved reliability and safety thanks to the use of more powerful brakes and SIL 2 encoders
- Use in washdown and food applications thanks to hygienic housing design with smooth surfaces

premo® - the new energy-efficiency class

Utilizing planetary gearboxes with a wide range of gear ratios **and an efficiency up to 97** %, combined with servo motors with an **efficiency of up to 92** % – the premo® platform utilizes the entire experience of WITTENSTEIN alpha in the energy-efficient design of servo actuators. The power requirement during acceleration is reduced thanks to lower inertia due to the elimination of the motor shaft coupling, as well as through a design to optimize current saturation losses.

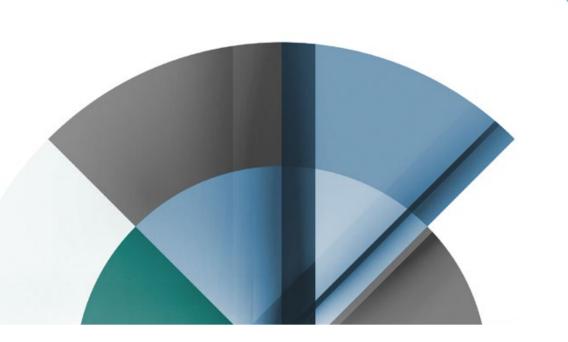
Moreover, the digital single-cable technology for the power supply and data transmission between motor and controller requires the use of **only one** connector and connection cable. This **reduces the wiring requirement by half** and also saves weight for moving drives. This also reduces the energy consumption in the integration of premo[®] in robots or moving machine structures. Overall, top class energy efficiency is achieved.

premo[®] – absolute flexibility in all cases

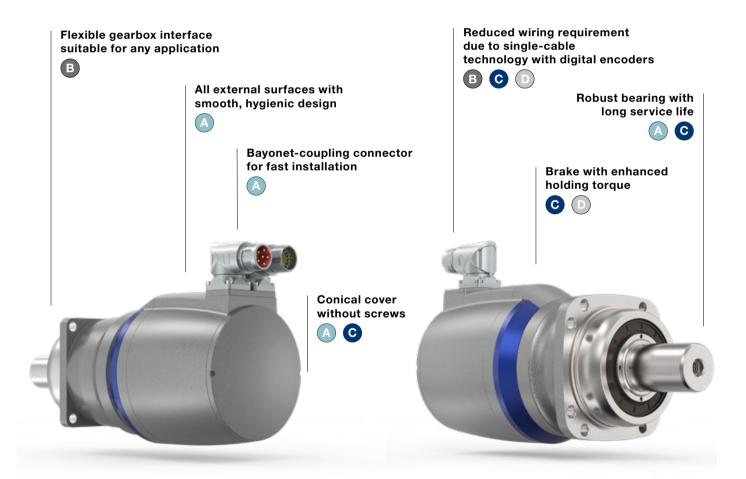


In comparison with the proven TPM⁺ series, the new premo[®] servo actuators exhibit significantly greater flexibility and performance potential. The mechanical interface to the machine can be designed in multiple versions.

The interface to the servo controller offers almost unlimited connection options through the voltage range up to 750 V DC and the wide selection of analog and digital encoders.



Our know-how – your benefit



Your requirement	Our solution
Resistant and easy-to-clean actuator surface	High-quality design without screw heads for optimum cleaning conditions and high value stability
High operating voltage and absolute connectivity to system providers	Enhanced performance through intermediate operating voltage up to 750 V DC, interfaces for EnDat 2.2, HIPERFACE DSL®, DRIVE-CLiQ, partly in single-cable technology for the greatest flexibility in adapting to external controllers and maximum productivity
Maximum individual freedom in design	Intelligent premo [®] modular system with various gearbox outputs, short lengths as optimal design basis, for example in the case of restricted installation space, simplified design for reduced interference contour even on smaller machines, savings in the drive train through improved energy efficiency and single-cable connection, a maximum of design freedom thanks to a wide choice of rotary sensors for different applications
Maximum machine reliability and investment protection	Intelligent, energy-efficient product concept: higher reliability through the elimination of the shaft coupling, minimized electrical component size due to low current requirements allowing reduction in size of the servo drive, cables, fuses and electrical contacts. The single-cable solution offers less wiring and smaller cable tracks while higher braking torques offer faster emergency stopping and improved reliability for vertical axes. Greater reliability thanks to the functional safety in the mechanical connection of the encoder.



Increased productivity / higher OEE*



B Simplified machine design



C Reliability / service life

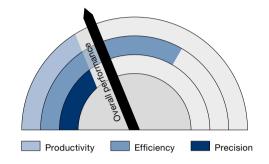


premo® SP Line

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The entry level class

- Especially suitable for positioning tasks
- Short cycle times
- Special benefits with moving axes: the low weight and the short overall length
- Mechanical interface with output shaft
- Ideal for connecting couplings, toothed belt pulleys and pinions
- In addition to the smooth shaft version, key and splined shaft versions are also available
- Electric interface with resolver as standard

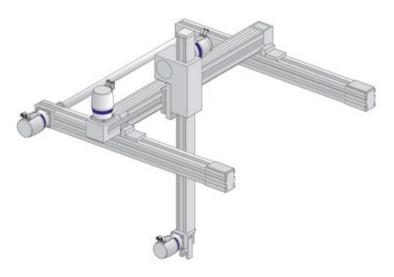


- Precision adequate for most applications
- Optionally extendable with all available encoders and connector versions

Application example

Handling gantries are useful aids if pallets, crates, trays or similar are transported from A to B – the faster, the better.

premo[®] SP Line copes with this task thanks to its high power-to-weight ratio and excellent dynamics.



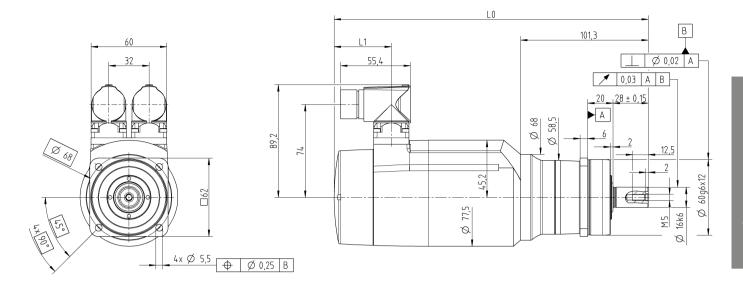
premo® SP Line Size 1 2-stage

							2-stage				
Ratio	i		16	20	25	28	35	40	50	70	100
Operating voltage	UD	V DC					560				
Max. acceleration torque	-	Nm	41.6	42	42	42	42	42	42	42	32
(max. 1000 cycles per hour)	T _{2B}	in.lb	368	372	372	372	372	372	372	372	283
Statia autout targua	T	Nm	16.5	20.8	26	26	26	19.9	25	26	17
Static output torque	T ₂₀	in.lb	146	184	230	230	230	176	221	230	150
Brake holding torque	-	Nm	20.8	26	32.5	36.4	45.5	20.8	26	36.4	52
(at 120 °C)	T _{2Br}	in.lb	184	230	288	322	403	184	230	322	460
Max. speed at output	n _{2max}	rpm	375	300	240	214	171	150	120	85.7	60
Speed limit for T _{2B}	n _{2B}	rpm	375	300	240	214	171	150	120	85.7	60
May mater appalaration targue	-	Nm	2.84	2.84	2.84	2.84	2.84	1.4	1.4	1.4	1.4
Max. motor acceleration torque	T _{1max}	in.lb	25	25	25	25	25	12	12	12	12
Max. motor acceleration current	I _{MaxDyn}	A _{eff}	4.47	4.47	4.47	4.47	4.47	2.52	2.52	2.52	2.52
Static motor current	I _o	A _{eff}	1.71	1.71	1.71	1.71	1.71	1	1	1	1
Max. backlash	j _t	arcmin	Standard ≤ 6 Reduced ≤ 4								
Torsional rigidity	0	Nm/arcmin	3.5								
(Gearbox)	C ₁₂₁	in.lb/arcmin	31								
Max. axial force ^{a)}	E	N					2400				
	F _{2AMax}	lb,	540								
Max. lateral force a)	E	N	2800								
	F _{2QMax}	lb _f	630								
Max tilting moment	NA	Nm					152				
Max. tilting moment	M _{2KMax}	in.lb	1345								
Service life	L _h	h					> 20000				
Weight	m	kg	3.2 to 3.6								
(without brake)		lb _m					7.1 to 8				
Ambient temperature		°C	0 to +40								
Ambient temperature		°F					+32 to +10	4			
Lubrication						Lut	oricated for	life			
Insulating material class							F				
Protection class							IP 65				
Paint					F	Pearl dark g	rey and inn	ovation blu	le		
Metal bellows coupling (recommended product type – validate sizing with cymex®)			BC2-00060AA016.000-X								
Bore diameter of coupling on the application side		mm				X = 0	12.000 - 03	5.000			
Mass moment of inertia	Ι.	kgcm²	0.37	0.37	0.36	0.36	0.36	0.22	0.22	0.22	0.22
(relates to the drive)	J_1	10 ⁻³ in.lb.s ²	0.33	0.33	0.32	0.32	0.32	0.19	0.19	0.19	0.19

 $\label{eq:please} Please use our sizing software cymex^{\circledast} \mbox{ for a detailed sizing - www.wittenstein-cymex.com}$

^{a)} Refers to center of the output shaft or flange





without brake

Ratio	Encoder	Length L0 in mm	Length L1 in mm	
	Resolver	226.6	22.8	
. 10.05	HIPERFACE®	040.4	45.0	
i = 16 – 35	EnDat	249.1	45.3	
	DRIVE-CLiQ	279.5	75.7	
	Resolver	211.6	22.8	
: 40, 100	HIPERFACE®	234.1	45.0	
i = 40 – 100	EnDat	234.1	45.3	
	DRIVE-CLiQ	264.5	75.7	

with brake

Ratio	Encoder	Length L0 in mm	Length L1 in mm	
	Resolver	262.6	22.8	
: 10 05	HIPERFACE®	285.1	45.3	
i = 16 – 35	EnDat	285.1	40.3	
	DRIVE-CLiQ	315.5	75.7	
	Resolver	239.1	22.8	
i = 40 - 100	HIPERFACE®	261.6	45.3	
i = 40 – 100	EnDat	201.0	40.0	
	DRIVE-CLiQ	292	75.7	

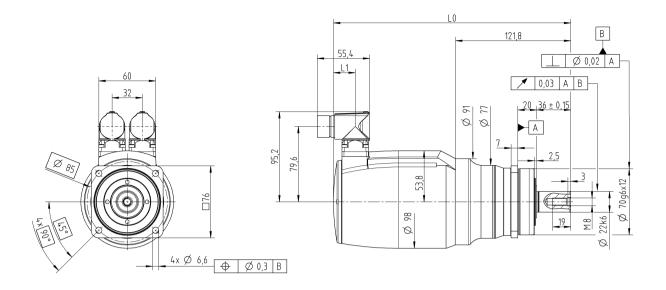
premo® SP Line Size 2 2-stage

							2-stage				
Ratio	i		16	20	25	28	35	40	50	70	100
Operating voltage	U _D	V DC					560				
	- D	Nm	81.5	102	110	110	110	102	110	110	90
Max. acceleration torque (max. 1000 cycles per hour)	T _{2B}	in.lb	721	903	974	974	974	903	974	974	797
		Nm	30	37.9	47.8	53.7	67.3	39.1	49.2	69.2	52
Static output torque	T ₂₀	in.lb	266	335	423	475	596	346	435	612	460
		Nm	37.4	46.8	58.5	65.5	81.9	52	65	91	130
Brake holding torque (at 120 °C)	T _{2Br}	in.lb	331	414	518	580	725	460	575	805	1151
Max. speed at output	n _{2max}	rpm	375	300	240	214	171	150	120	85.7	60
Speed limit for T ₂₈	n _{2max}	rpm	269	215	184	176	155	119	104	85.7	60
	11 _{2B}	Nm	5.53	5.53	5.53	5.53	5.53	2.76	2.76	2.76	2.76
Max. motor acceleration torque	T _{1max}	in.lb	49	49	49	49	49	2.70	2.70	2.70	2.70
Max. motor acceleration current	1	A _{eff}	6.94	6.94	6.94	6.94	6.94	4.45	4.45	4.45	4.45
Static motor current	I _{MaxDyn}	A _{eff}	2.33	2.33	2.33	2.33	2.33	1.58	1.58	1.58	1.58
Max. backlash	j _t	arcmin	2.00	2.00	2.00				1.00	1.00	1.00
	Jt	Nm/arcmin									
Torsional rigidity (Gearbox)	C ₁₂₁	in.lb/arcmin	89								
		N	3350								
Max. axial force a)	F _{2AMax}	lb _f	754								
		N	4200								
Max. lateral force ^{a)}	F _{2QMax}	lb _f	945								
		Nm					236				
Max. tilting moment	M _{2KMax}	in.lb	2089								
Service life	L _n	h					> 20000				
Weight		kg					5.1 to 5.6				
(without brake)	m	lb _m		-			11 to 12				
		°C 0 to +40									
Ambient temperature		°F					+32 to +10	4			
Lubrication						Lui	pricated for	life			
Insulating material class							F				
Protection class							IP 65				
Paint					F	earl dark g	rey and inn	ovation blu	le		
Metal bellows coupling (recommended product type – validate sizing with cymex [®])						BC2-0	0150AA022	2.000-X			
Bore diameter of coupling on the application side		mm				X = 0	19.000 - 04	2.000			
Mass moment of inertia	Ι,	kgcm ²	0.9	0.87	0.87	0.85	0.85	0.47	0.47	0.47	0.47
(relates to the drive)	J_1	10 ⁻³ in.lb.s ²	0.8	0.77	0.77	0.75	0.75	0.42	0.42	0.42	0.42

 $\label{eq:please} Please use our sizing software cymex^{\tiny (\! \ensuremath{\$})} for a detailed sizing - www.wittenstein-cymex.com$

^{a)} Refers to center of the output shaft or flange





without brake

Ratio	Encoder	Length L0 in mm	Length L1 in mm	
	Resolver	250.8	23	
. 10.05	HIPERFACE®	070.4	45.0	
i = 16 – 35	EnDat	273.1	45.3	
	DRIVE-CLiQ	303.3	75.5	
	Resolver	235.8	23	
: 40, 100	HIPERFACE®	258.1	45.0	
i = 40 – 100	EnDat	236.1	45.3	
	DRIVE-CLiQ	288.3	75.5	

with brake

Ratio	Encoder	Length L0 in mm	Length L1 in mm	
	Resolver	289.8	23	
. 10 05	HIPERFACE®	010.1	45.0	
i = 16 – 35	EnDat	312.1	45.3	
	DRIVE-CLiQ	342.3	75.5	
	Resolver	251.6	23	
: 10 100	HIPERFACE®	273.9	45.3	
i = 40 – 100	EnDat	213.9	40.3	
	DRIVE-CLiQ	304.1	75.5	

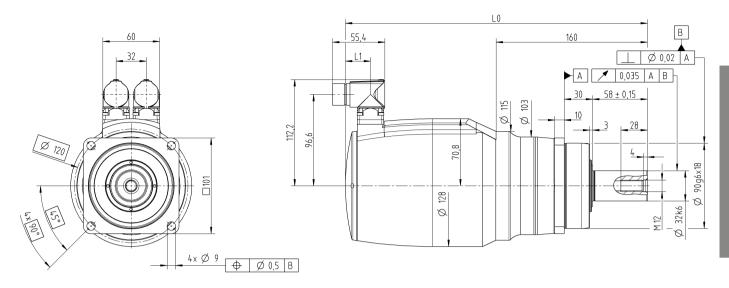
premo® SP Line Size 3 2-stage

			2-stage								
Ratio	i		16	20	25	28	35	40	50	70	100
Operating voltage	UD	V DC					560				
Max. acceleration torque (max. 1000 cycles per hour)	T _{2B}	Nm	248	310	315	315	315	226	283	315	235
		in.lb	2195	2744	2788	2788	2788	2000	2505	2788	2080
Static output torque	T ₂₀	Nm	93	117	146	164	175	89.4	112	158	120
		in.lb	823	1036	1292	1452	1549	791	991	1398	1062
Brake holding torque (at 120 °C)	T _{2Br}	Nm	116	146	182	204	255	93.6	117	164	234
		in.lb	1027	1292	1611	1806	2257	828	1036	1452	2071
Max. speed at output	n _{2max}	rpm	375	300	240	214	171	150	120	85.7	60
Speed limit for T _{2B}	п _{2В}	rpm	322	257	220	205	171	108	86.4	70	60
N.	-	Nm	16.7	16.7	16.7	16.7	16.7	6.09	6.09	6.09	6.09
Max. motor acceleration torque	T _{1max}	in.lb	148	148	148	148	148	54	54	54	54
Max. motor acceleration current	I _{MaxDyn}	A _{eff}	19.8	19.8	19.8	19.8	19.8	7.7	7.7	7.7	7.7
Static motor current	I _o	A _{eff}	7.05	7.05	7.05	7.05	7.05	2.77	2.77	2.77	2.77
Max. backlash	j _t	arcmin	Standard ≤ 5 Reduced ≤ 3								
Torsional rigidity		Nm/arcmin	31								
(Gearbox)	C _{t21}	in.lb/arcmin	274								
Max. axial force ^{a)}	F _{2AMax}	N	5650								
		lb,	1271								
Max. lateral force a)	F _{2QMax}	N	6600								
		lb,	1485								
Max. tilting moment	M _{2KMax}	Nm	487								
		in.lb	4310								
Service life	L _h	h	> 20000								
Weight (without brake)	m	kg	10 to 11.7								
		lb _m	22 to 26								
Ambient temperature		°C	0 to +40								
		°F	+32 to +104								
Lubrication			Lubricated for life								
Insulating material class			F								
Protection class			IP 65								
Paint			Pearl dark grey and innovation blue								
Metal bellows coupling (recommended product type – validate sizing with cymex®)			BC2-00300AA032.000-X								
Bore diameter of coupling on the application side		mm	X = 024.000 - 060.000								
Mass moment of inertia (relates to the drive)	J ₁	kgcm ²	4.42	4.32	4.31	4.23	4.22	1.62	1.61	1.61	1.61
		10 ⁻³ in.lb.s ²	3.9	3.8	3.8	3.7	3.7	1.4	1.4	1.4	1.4

 $\label{eq:please} Please use our sizing software cymex^{\tiny (\! \ensuremath{\$})} for a detailed sizing - www.wittenstein-cymex.com$

^{a)} Refers to center of the output shaft or flange





without brake

Ratio	Encoder	Length L0 in mm	Length L1 in mm	
i = 16 - 35	Resolver		26.5	
	HIPERFACE®	319.2		
	EnDat			
	DRIVE-CLiQ	351.2	58.5	
i = 40 – 100	Resolver		26.5	
	HIPERFACE®	295.1		
	EnDat			
	DRIVE-CLiQ	327.1	58.5	

with brake

Ratio	Encoder	Length L0 in mm	Length L1 in mm	
i = 16 – 35	Resolver		26.5	
	HIPERFACE®	364.7		
	EnDat	-		
	DRIVE-CLiQ	396.7	58.5	
i = 40 – 100	Resolver		26.5	
	HIPERFACE®	319.1		
	EnDat			
	DRIVE-CLiQ	351.1	58.5	

premo® TP Line

The dynamic class

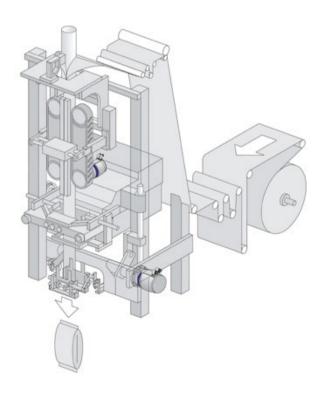
- Ideal for challenging positioning and processing tasks
- Minimal backlash and maximum torsional rigidity allow for the shortest cycle times and excellent surface finish
- Mechanical interface with output flange
- Ideal for connecting lever arms or pinions
- Electric interface with absolute encoder HIPERFACE[®] singleturn for high positioning accuracy as standard
- Optionally extendable with all available encoders and connector versions



Application example

Tubular bag machines continuously package bulk material of all types – including foodstuffs such as chips or candy. The aim here is to achieve maximum throughput. It is particularly important that all the bags are clean and tightly sealed.

premo® TP Line solves this challenge thanks to its exceptional precision and power density.

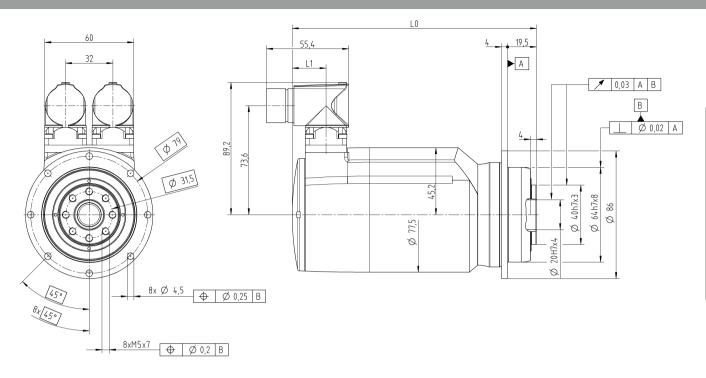


premo® TP Line Size 1 2-stage

							2-stage				
Ratio	i		16	20	25	28	35	40	50	70	100
Operating voltage		V DC	10	20	20	20	560	-10		10	100
		Nm	41.6	52.3	55	55	55	50.2	55	55	35
Max. acceleration torque (max. 1000 cycles per hour)	T _{2B}	in.lb	368	463	487	487	487	444	487	487	310
	-	Nm	16.5	20.9	26.2	29.3	37	20.1	25.3	35.5	18
Static output torque	T ₂₀	in.lb	146	185	232	259	327	178	23.3	314	159
		Nm	20.8	26	32.5	36.4	45.5	20.8	224	36.4	52
Brake holding torque (at 120 °C)	T _{2Br}	in.lb	184	230	288	322	403	184	230	322	460
Max. speed at output		rpm	375	300	200	214	171	150	120	85.7	60
Speed limit for T ₂₈	n _{2max}	rpm	375	300	240	214	171	150	120	85.7	60
	п _{2В}	Nm	2.84	2.84	2.84	2.84	2.84	1.4	1.4	1.4	1.4
Max. motor acceleration torque	T _{1max}	in.lb	2.64	2.64	2.84	2.64	2.04	1.4	1.4	1.4	1.4
Max. motor acceleration current		A _{eff}	4.47	4.47	4.47	4.47	4.47	2.52	2.52	2.52	2.52
Static motor current	I _{MaxDyn}	A _{eff}	1.71	1.71	1.71	1.71	1.71	1	1	1	1
Max. backlash	j _t	arcmin					rd ≤ 4 Redu		•		
	C _{t21}	Nm/arcmin	12	12	12	12	12	11	12	11	8
Torsional rigidity (Gearbox)		in.lb/arcmin	106	106	106	106	106	97	106	97	71
		Nm/arcmin	100	100	100	100	85	0,	100	0,	
Tilting rigidity	С _{2К}	in.lb/arcmin					752				
		N	1630								
Max. axial force a)	F _{2AMax}	lb _f	367								
		Nm	110								
Max. tilting moment	M _{2KMax}	in.lb					974				
Service life	L	h					> 20000				
Weight		kg					2.7 to 3.1		-		
(without brake)	m	lb _m					6 to 6.9				
		°C					0 to +40				
Ambient temperature		°F					+32 to +10	4			
Lubrication						Lui	oricated for	life			
Insulating material class							F				
Protection class							IP 65				
Paint					F	earl dark g	rey and inn	ovation blu	le		
Metal bellows coupling (recommended product type – validate sizing with cymex [®])			BCT-00015AAX-031.500								
Bore diameter of coupling on the application side		mm	X = 012.000 - 028.000								
Mass moment of inertia	1,	kgcm²	0.37	0.37	0.36	0.36	0.36	0.22	0.22	0.22	0.22
(relates to the drive)	J_1	10 ⁻³ in.lb.s ²	0.33	0.33	0.32	0.32	0.32	0.19	0.19	0.19	0.19

 $\label{eq:please} Please use our sizing software cymex^{\circledast} \mbox{ for a detailed sizing - www.wittenstein-cymex.com}$





Ratio	Encoder	Length L0 in mm	Length L1 in mm	
	Resolver	164.8	22.8	
	HIPERFACE®	107.0	45.0	
i = 16 – 35	EnDat	187.3	45.3	
	DRIVE-CLiQ	217.7	75.7	
	Resolver	149.8	22.8	
i = 40 - 100	HIPERFACE®	172.3	45.0	
1 = 40 - 100	EnDat	172.3	45.3	
	DRIVE-CLiQ	202.7	75.7	

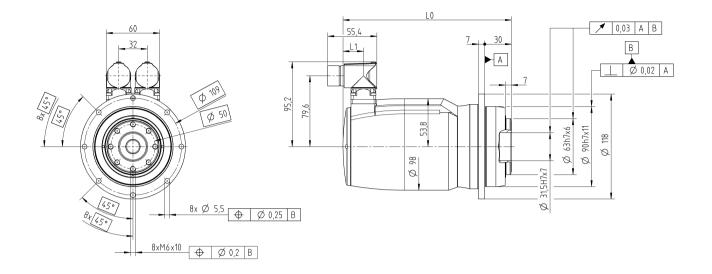
Ratio	Encoder	Length L0 in mm	Length L1 in mm
	Resolver	200.8	22.8
i 10 05	HIPERFACE®	000.0	45.3
i = 16 – 35	EnDat	223.3	40.3
	DRIVE-CLiQ	253.7	75.7
	Resolver	177.3	22.8
i = 40 - 100	HIPERFACE®	199.8	45.3
1 = 40 - 100	EnDat	199.0	40.3
	DRIVE-CLiQ	230.2	75.7

premo® TP Line Size 2 2-stage

			2-stage								
Ratio	i		16	20	25	28	35	40	50	70	100
Operating voltage	U_D	V DC					560				
Max. acceleration torque	-	Nm	81.3	102	128	143	143	102	127	143	105
(max. 1000 cycles per hour)	T _{2B}	in.lb	720	903	1133	1266	1266	903	1124	1266	929
		Nm	29.9	37.7	47.3	53.2	67.3	38.7	48.4	68.8	60
Static output torque	T ₂₀	in.lb	265	334	419	471	596	343	428	609	531
Brake holding torque		Nm	37.4	46.8	58.5	65.5	81.9	52	65	91	130
(at 120 °C)	T _{2Br}	in.lb	331	414	518	580	725	460	575	805	1151
Max. speed at output	n _{2max}	rpm	375	300	240	214	171	150	120	85.7	60
Speed limit for T _{2B}	n _{2B}	rpm	269	215	172	154	138	119	95.2	78	60
		Nm	5.53	5.53	5.53	5.53	5.53	2.76	2.76	2.76	2.76
Max. motor acceleration torque	notor acceleration torque T_{1max}	in.lb	49	49	49	49	49	24	24	24	24
Max. motor acceleration current	I _{MaxDyn}	A _{eff}	6.94	6.94	6.94	6.94	6.94	4.45	4.45	4.45	4.45
Static motor current	I _o	A _{eff}	2.33	2.33	2.33	2.33	2.33	1.58	1.58	1.58	1.58
Max. backlash	j _t	arcmin				Standa	rd ≤ 3 Redu	uced ≤ 1			
Torsional rigidity		Nm/arcmin	32	32	32	31	32	30	30	28	22
(Gearbox)	C ₁₂₁	in.lb/arcmin	283	283	283	274	283	266	266	248	195
		Nm/arcmin	225								
Tilting rigidity	С _{2К}	in.lb/arcmin					1991				
		N					2150				
Max. axial force a)	F _{2AMax}	lb,	484								
		Nm	270								
Max. tilting moment	M _{2KMax}	in.lb					2390				
Service life	L	h					> 20000				
Weight		kg					5.1 to 5.6				
(without brake)	m	lb _m					11 to 12				
		°C					0 to +40				
Ambient temperature		°F					+32 to +10	4			
Lubrication						Lui	oricated for	life	-		
Insulating material class							F				
Protection class							IP 65				
Paint					F	earl dark g	rey and inn	ovation blu	le		
Metal bellows coupling (recommended product type – validate sizing with cymex®)			BCT-00060AAX-050.000								
Bore diameter of coupling on the application side		mm	X = 014.000 - 035.000								
Mass moment of inertia		kgcm²	0.91	0.88	0.87	0.85	0.85	0.48	0.47	0.47	0.47
(relates to the drive)	J_1	10 ⁻³ in.lb.s ²	0.81	0.78	0.77	0.75	0.75	0.42	0.42	0.42	0.42

 $\label{eq:please} Please use our sizing software cymex^{\tiny (\! \ensuremath{\$})} for a detailed sizing - www.wittenstein-cymex.com$





Ratio	Encoder	Length L0 in mm	Length L1 in mm	
	Resolver	189.5	23	
	HIPERFACE®	011.0	45.0	
i = 16 – 35	EnDat	211.8	45.3	
	DRIVE-CLiQ	242	75.5	
	Resolver	174.5	23	
i = 40 - 100	HIPERFACE®	196.8	45.0	
1 = 40 - 100	EnDat	190.0	45.3	
	DRIVE-CLiQ	227	75.5	

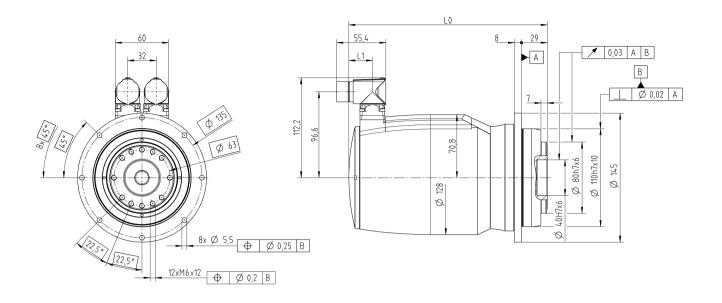
Ratio	Encoder	Length L0 in mm	Length L1 in mm	
	Resolver	228.5	23	
: 10 05	HIPERFACE®	050.0	45.3	
i = 16 – 35	EnDat	250.8	40.3	
	DRIVE-CLiQ	281	75.5	
	Resolver	190.3	23	
i = 40 - 100	HIPERFACE®	212.6	45.3	
1 = 40 - 100	EnDat	212.0	45.3	
	DRIVE-CLiQ	242.8	75.5	

premo® TP Line Size 3 2-stage

							2-stage				
Ratio	i		16	20	25	28	35	40	50	70	100
Operating voltage	U_D	V DC					560				
Max. acceleration torque	-	Nm	247	310	380	350	380	226	283	330	265
(max. 1000 cycles per hour)	T _{2B}	in.lb	2186	2744	3363	3098	3363	2000	2505	2921	2345
2	-	Nm	92.6	116	146	164	206	89.1	112	158	120
Static output torque	T ₂₀	in.lb	820	1027	1292	1452	1823	789	991	1398	1062
Brake holding torque	-	Nm	116	146	182	204	255	93.6	117	164	234
(at 120 °C)	T _{2Br}	in.lb	1027	1292	1611	1806	2257	828	1036	1452	2071
Max. speed at output	n _{2max}	rpm	375	300	240	214	171	150	120	85.7	60
Speed limit for T _{2B}	n _{2B}	rpm	322	257	206	197	166	108	86.4	68	60
Max. motor acceleration torque	-	Nm	16.7	16.7	16.7	16.7	16.7	6.09	6.09	6.09	6.09
Max. motor acceleration torque	eration torque T _{1max}	in.lb	148	148	148	148	148	54	54	54	54
Max. motor acceleration current	I _{MaxDyn}	A _{eff}	19.8	19.8	19.8	19.8	19.8	7.7	7.7	7.7	7.7
Static motor current	I _o	A _{eff}	7.05	7.05	7.05	7.05	7.05	2.77	2.77	2.77	2.77
Max. backlash	j _t	arcmin				Standa	rd ≤ 3 Redu	iced ≤ 1			
Torsional rigidity	0	Nm/arcmin	81	81	83	80	82	76	80	71	60
(Gearbox)	C _{t21}	in.lb/arcmin	717	717	735	708	726	673	708	628	531
Tilting rigidity C _{2K}		Nm/arcmin	550								
	C _{2K}	in.lb/arcmin	in 4868								
	E	N					4150				
Max. axial force a)	F _{2AMax}	lb,	934								
		Nm	440								
Max. tilting moment	M _{2KMax}	in.lb	3894								
Service life	L	h					> 20000				
Weight		kg					8.8 to 10.5				
(without brake)	m	lb _m					19 to 23				
A		°C					0 to +40				
Ambient temperature		°F					+32 to +104	4			
Lubrication						Lui	pricated for	life			
Insulating material class							F				
Protection class							IP 65				
Paint					F	earl dark g	rey and inn	ovation blu	ie		
Metal bellows coupling (recommended product type – validate sizing with cymex®)			BCT-00150AAX-063.000								
Bore diameter of coupling on the application side		mm	X = 019.000 - 042.000								
Mass moment of inertia	1.	kgcm²	4.46	4.35	4.33	4.24	4.23	1.62	1.62	1.61	1.61
(relates to the drive)	J_1	10 ⁻³ in.lb.s ²	3.9	3.8	3.8	3.8	3.7	1.4	1.4	1.4	1.4

 $\label{eq:please} Please use our sizing software cymex^{\tiny (\! \ensuremath{\$})} for a detailed sizing - www.wittenstein-cymex.com$





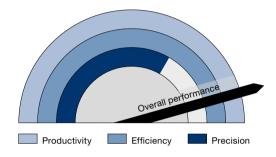
Ratio	Encoder	Length L0 in mm	Length L1 in mm	
	Resolver			
. 10 05	HIPERFACE®	223.2	26.5	
i = 16 – 35	EnDat			
	DRIVE-CLiQ	255.2	58.5	
	Resolver			
i = 40 – 100	HIPERFACE®	199.1	26.5	
1 = 40 - 100	EnDat			
	DRIVE-CLiQ	231.1	58.5	

Ratio	Encoder	Length L0 in mm	Length L1 in mm	
	Resolver			
. 10 05	HIPERFACE®	268.7	26.5	
i = 16 – 35	EnDat	-		
	DRIVE-CLiQ	300.7	58.5	
	Resolver			
i = 40 – 100	HIPERFACE®	223.1	26.5	
I = 40 - 100	EnDat			
	DRIVE-CLiQ	255.1	58.5	

premo® XP Line

The extra class

- Particularly high power density and load capacity
- Extremely low backlash, high torsional rigidity and maximum load capacity of the output bearing enable a highly compact servo actuator platform for enhanced machine performance
- Mechanical interface with output shaft, ideal for connecting couplings or pinions
- In addition to the smooth shaft version, key and splined shaft versions are also available
- Electric interface with absolute encoder HIPERFACE DSL[®], singleturn as standard incl. functional safety and single-cable connection

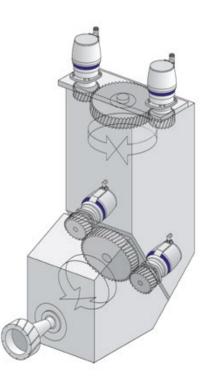


- Safety requirements are united with the latest connection technology
- Optionally extendable with all available encoders and connector versions

Application example

Especially in the milling head of a machining center, high disturbing forces occur due to the material processing.

Due to the restricted installation space, actuators with the highest power density and load capacity are required here. premo[®] XP Line offers the ideal solution.

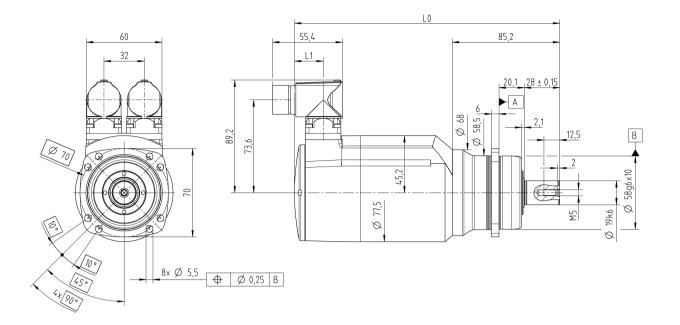


premo® XP Line Size 1 2-stage

							2-stage				
Ratio	i		16	20	25	28	35	40	50	70	100
Operating voltage	UD	V DC		1		1	560				
Max. acceleration torque	_	Nm	41.8	52.3	65.3	73.4	80	50.3	62.9	60	35
(max. 1000 cycles per hour)	T _{2B}	in.lb	370	463	578	650	708	445	557	531	310
	-	Nm	16.6	20.9	26	29.4	36.9	20.3	25.3	35.5	20
Static output torque	T ₂₀	in.lb	147	185	230	260	327	180	224	314	177
Brake holding torque	-	Nm	20.8	26	32.5	36.4	45.5	20.8	26	36.4	52
(at 120 °C)	T _{2Br}	in.lb	184	230	288	322	403	184	230	322	460
Max. speed at output	n _{2max}	rpm	375	300	240	214	171	150	120	85.7	60
Speed limit for T _{2B}	n _{2B}	rpm	375	300	240	214	171	150	120	85.7	60
Max. motor acceleration torque	7	Nm	2.84	2.84	2.84	2.84	2.84	1.4	1.4	1.4	1.4
Max. motor acceleration torque	notor acceleration torque T_{1max}	in.lb	25	25	25	25	25	12	12	12	12
Max. motor acceleration current	I _{MaxDyn}	A _{eff}	4.47	4.47	4.47	4.47	4.47	2.52	2.52	2.52	2.52
Static motor current	I _o	A _{eff}	1.71	1.71	1.71	1.71	1.71	1	1	1	1
Max. backlash	j _t	arcmin				Standa	rd ≤ 5 Redu	uced ≤ 3			
Torsional rigidity	C ₁₂₁	Nm/arcmin	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	5
(Gearbox)		in.lb/arcmin	58	58	58	58	58	58	58	58	44
Aax. axial force ^{a)}	E	N	3600								
	P 2AMax	lb _f	810								
Max. lateral force a)	F	N	3800								
	F _{2QMax}	lb _f	855								
Max tilting moment		Nm 339									
Max. tilting moment	M _{2KMax}	in.lb					3000				
Service life	L	h					> 20000				
Weight	m	kg					2.9 to 3.3				
(without brake)		lb _m					6.4 to 7.3				
Ambient temperature		°C					0 to +40				
		°F					+32 to +10	4			
Lubrication						Lu	pricated for	life			
Insulating material class							F				
Protection class							IP 65				
Paint					F	earl dark g	rey and inn	ovation blu	ie		
Metal bellows coupling (recommended product type – validate sizing with cymex®)			BC3-00150AA019.000-X								
Bore diameter of coupling on the application side		mm	X = 015.000 - 038.000								
Mass moment of inertia	,	kgcm²	0.38	0.37	0.37	0.36	0.36	0.22	0.22	0.22	0.22
(relates to the drive)	J_1	10 ⁻³ in.lb.s ²	0.34	0.33	0.33	0.32	0.32	0.19	0.19	0.19	0.19

 $\label{eq:please} Please use our sizing software cymex^{\circledast} \mbox{ for a detailed sizing - www.wittenstein-cymex.com}$





Ratio	Encoder	Length L0 in mm	Length L1 in mm	
	Resolver	210.3	22.8	
	HIPERFACE®	000 0	45.0	
i = 16 – 35	EnDat	232.8	45.3	
	DRIVE-CLiQ	263.2	75.7	
	Resolver	195.3	22.8	
i = 40 - 100	HIPERFACE®	217.8	45.0	
1 = 40 - 100	EnDat	217.0	45.3	
	DRIVE-CLiQ	248.2	75.7	

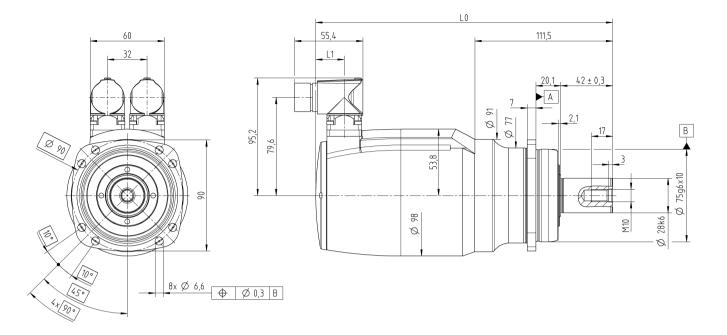
Ratio	Encoder	Length L0 in mm	Length L1 in mm	
	Resolver	246.3	22.8	
: 10 05	HIPERFACE®	000 0	45.3	
i = 16 – 35	EnDat	268.8	40.3	
	DRIVE-CLiQ	299.2	75.7	
	Resolver	222.8	22.8	
i = 40 – 100	HIPERFACE®	245.3	45.3	
1 = 40 - 100	EnDat	240.3	45.3	
	DRIVE-CLiQ	275.7	75.7	

premo® XP Line Size 2 2-stage

			2-stage								
Ratio	i		16	20	25	28	35	40	50	70	100
Operating voltage	UD	V DC		1		1	560				
Max. acceleration torque	_	Nm	81.9	103	128	144	180	102	128	165	105
(max. 1000 cycles per hour)	T _{2B}	in.lb	725	912	1133	1275	1593	903	1133	1460	929
	-	Nm	30.5	38.4	47.8	54	67.5	39.1	49	68.8	60
Static output torque	T ₂₀	in.lb	270	340	423	478	597	346	434	609	531
Brake holding torque	-	Nm	37.4	46.8	58.5	65.5	81.9	52	65	91	130
(at 120 °C)	T _{2Br}	in.lb	331	414	518	580	725	460	575	805	1151
Max. speed at output	n _{2max}	rpm	375	300	240	214	171	150	120	85.7	60
Speed limit for T _{2B}	n _{2B}	rpm	269	215	172	154	123	119	95.2	70.1	60
May mater appalaration targue	-	Nm	5.53	5.53	5.53	5.53	5.53	2.76	2.76	2.76	2.76
Max. motor acceleration torque	T _{1max}	in.lb	49	49	49	49	49	24	24	24	24
Max. motor acceleration current	I _{MaxDyn}	A _{eff}	6.94	6.94	6.94	6.94	6.94	4.45	4.45	4.45	4.45
Static motor current	I _o	A _{eff}	2.33	2.33	2.33	2.33	2.33	1.58	1.58	1.58	1.58
Max. backlash	j _t	arcmin				Standa	rd ≤ 4 Redu	uced ≤ 2			
Torsional rigidity		Nm/arcmin	19.5	19.5	19.5	19.5	19.5	19.5	19.5	18	15
(Gearbox)	<i>C</i> _{<i>t</i>21}	in.lb/arcmin	173	173	173	173	173	173	173	159	133
Max. axial force a)	_	N					4000				
	F _{2AMax}	lb,	900								
Max. lateral force a)	-	N	6000								
	F _{2QMax}	lb,	1350								
		Nm					675				
Max. tilting moment	M _{2KMax}	in.lb					5974				
Service life	L	h					> 20000				
Weight		kg	5 to 5.5								
(without brake)	m	lb _m					11 to 12				
		°C					0 to +40				
Ambient temperature		°F					+32 to +10	4			
Lubrication						Lui	pricated for	life			
Insulating material class							F				
Protection class							IP 65				
Paint			Pearl dark grey and innovation blue								
Metal bellows coupling (recommended product type – validate sizing with cymex®)			BC3-00300AA028.000-X								
Bore diameter of coupling on the application side		mm	X = 024.000 - 056.000								
Mass moment of inertia	Ι.	kgcm²	0.91	0.88	0.87	0.85	0.85	0.48	0.47	0.47	0.47
(relates to the drive)	J_1	10 ⁻³ in.lb.s ²	0.81	0.78	0.77	0.75	0.75	0.42	0.42	0.42	0.42

 $\label{eq:please} Please use our sizing software cymex^{\tiny (\! \ensuremath{\$})} for a detailed sizing - www.wittenstein-cymex.com$





Ratio	Encoder	Length L0 in mm	Length L1 in mm	
	Resolver	240.5	23	
: 10.05	HIPERFACE®	000 0	45.0	
i = 16 – 35	EnDat	262.8	45.3	
	DRIVE-CLiQ	293	75.5	
	Resolver	225.5	23	
i = 40 – 100	HIPERFACE®	247.8	45.3	
	EnDat	247.8	40.3	
	DRIVE-CLiQ	278	75.5	

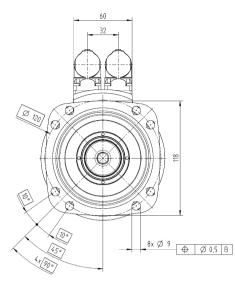
Ratio	Encoder	Length L0 in mm	Length L1 in mm	
	Resolver	279.5	23	
. 10 05	HIPERFACE®	001.0	45.0	
i = 16 – 35	EnDat	301.8	45.3	
	DRIVE-CLiQ	332	75.5	
	Resolver	241.3	23	
i = 40 – 100	HIPERFACE®	263.6	45.3	
	EnDat	203.0	45.3	
	DRIVE-CLiQ	293.8	75.5	

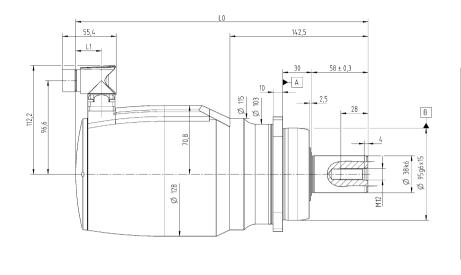
premo® XP Line Size 3 2-stage

			2-stage								
Ratio	i		16	20	25	28	35	40	50	70	100
Operating voltage	UD	V DC		1			560				
Max. acceleration torque (max. 1000 cycles per hour)	_	Nm	248	310	388	435	450	226	283	350	275
	T _{2B}	in.lb	2195	2744	3434	3850	3983	2000	2505	3098	2434
0	-	Nm	93.3	117	147	164	206	89.3	112	158	130
Static output torque	T ₂₀	in.lb	826	1036	1301	1452	1823	790	991	1398	1151
Brake holding torque	-	Nm	116	146	182	204	255	93.6	117	164	234
(at 120 °C)	T _{2Br}	in.lb	1027	1292	1611	1806	2257	828	1036	1452	2071
Max. speed at output	n _{2max}	rpm	375	300	240	214	171	150	120	85.7	60
Speed limit for T _{2B}	n _{2B}	rpm	322	257	206	184	157	108	86.4	65.7	60
	-	Nm	16.7	16.7	16.7	16.7	16.7	6.09	6.09	6.09	6.09
Max. motor acceleration torque	T _{1max}	in.lb	148	148	148	148	148	54	54	54	54
Max. motor acceleration current	I _{MaxDyn}	A _{eff}	19.8	19.8	19.8	19.8	19.8	7.7	7.7	7.7	7.7
Static motor current	I _o	A _{eff}	7.05	7.05	7.05	7.05	7.05	2.77	2.77	2.77	2.77
Max. backlash	j _t	arcmin				Standa	rd ≤ 4 Redu	iced ≤ 2			
Torsional rigidity	0	Nm/arcmin	45	45	45	45	45	45	45	42	35
(Gearbox)	C _{t21}	in.lb/arcmin	398	398	398	398	398	398	398	372	310
Max. axial force a)	F	N					5700				
	F _{2AMax}	lb,					1283				
May lateral force a	_	N	9000								
Max. lateral force a)	F _{2QMax}	lb,	2025								
		Nm	1296								
Max. tilting moment	M _{2KMax}	in.lb					11471				
Service life	L	h					> 20000				
Weight		kg	9.7 to 11.4								
(without brake)	m	lb _m					21 to 25				
A		°C					0 to +40				
Ambient temperature		°F					+32 to +104	4			
Lubrication						Lui	pricated for	life			
Insulating material class							F				
Protection class							IP 65				
Paint			Pearl dark grey and innovation blue								
Metal bellows coupling (recommended product type – validate sizing with cymex®)			BC3-00500AA038.000-X								
Bore diameter of coupling on the application side		mm	X = 024.000 - 056.000								
Mass moment of inertia	,	kgcm²	4.46	4.35	4.33	4.24	4.23	1.62	1.62	1.61	1.61
(relates to the drive)	J_1	10 ⁻³ in.lb.s ²	3.9	3.8	3.8	3.8	3.7	1.4	1.4	1.4	1.4

 $\label{eq:please} Please use our sizing software cymex^{\tiny (\! \ensuremath{\$})} for a detailed sizing - www.wittenstein-cymex.com$







Ratio	Encoder	Length L0 in mm	Length L1 in mm	
	Resolver			
: 10 05	HIPERFACE®	301.7	26.5	
i = 16 – 35	EnDat			
	DRIVE-CLiQ	333.7	58.5	
	Resolver			
i = 40 – 100	HIPERFACE®	277.6	26.5	
	EnDat			
	DRIVE-CLiQ	309.6	58.5	

Ratio	Encoder	Length L0 in mm	Length L1 in mm	
	Resolver			
: 10 05	HIPERFACE®	347.2	26.5	
i = 16 – 35	EnDat			
	DRIVE-CLiQ	379.2	58.5	
	Resolver			
i = 40 – 100	HIPERFACE®	301.6	26.5	
	EnDat			
	DRIVE-CLiQ	333.6	58.5	

premo® options

Electrical connection

Straight or right-angled version, alignment of outlets to gearbox flange (XP Line) and single-cable connection for DSL protocol and EnDAT 2.2 available.

For a number of servo controllers, we offer special pin assignments for power and signal.

Operating voltage

Depending on the application

and servo controller, windings for

320 and 560 V DC are available.

Pin assignment

Temperature sensor

Encoder

Choose from PTC for temperature switch functionality or KTY for a linear reading of operating temperature.

In addition to the standard version in the

respective product line, optional encoder

EnDat 2.2, HIPERFACE®, HIPERFACE DSL®

systems with the protocols EnDat 2.1,

and DRIVE-CLiQ are available.

Holding brake

A suitable permanent-magnet holding brake adapted to the motor power is available.

Lubrication

Select from the standard lubrication with oil or grease as well as food-grade grease and oil.

Backlash

To improve precision, the gearbox backlash can be reduced.

Gearbox model

Within the respective product line, there are different versions of output and housing flange.

premo® options

Gearbox model

Several mechanical interface versions are available:

Version	SP Line	TP Line	XP Line
Output	- Smooth shaft (standard) - Key (option) - Splined (option)	- Flange (standard) - System output (option)	- Smooth shaft (standard) - Key (option) - Splined (option) - System output (option)
Housing	Round through bore (standard)	Round through bore (standard)	- Round through bore (standard) - Slotted through bore (option)

Lubrication

Depending on the application, the requirements regarding the lubricant in the gearbox change.

The following lubricants are available for our servo actuators:

- Oil lubricant (Standard)
- Grease lubricant (Reduction of output torque by up to 20 %)
- Food-grade oil lubricant (Reduction of output torque by up to 20 %)
- Food-grade grease lubricant (Reduction of output torque by up to 40 %)

Operating voltage

The premo[®] servo actuators are available for operating voltages of 320 V and 560 V. The dielectric strength goes up to 750 V, so the use with servo controllers with the appropriate operating voltage is possible.

Temperature sensor

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

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

Encoder

Connectivity is the magic word. Here, WITTENSTEIN alpha offers its customers maximum flexibility.

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

Resolver

- 2 poles, one sine / cosine cycle per revolution (standard SP Line)

HIPERFACE® absolute encoder, safety acc. to SIL 2

- Singleturn, resolution 4096 positions per revolution, 128 sine/cosine (standard TP Line)
- Multiturn, resolution 4096 positions per revolution, 128 sine/cosine, 4096 revolutions

HIPERFACE DSL® absolute encoder, safety acc. to SIL 2

- Singleturn, resolution 20 bits per revolution, (standard XP Line)
- Multiturn, resolution 20 bits per revolution, 4096 revolutions

EnDat 2.1, absolute encoder

- Singleturn, resolution 8192 positions per revolution, 512 sine/cosine
- Multiturn, resolution 8192 positions per revolution, 512 sine/cosine, 4096 revolutions

EnDat 2.2, absolute encoder, safety acc. to SIL 2

- Singleturn, resolution 23 bits per revolution
- Multiturn, resolution 23 bits per revolution, 4096 revolutions

DRIVE-CLiQ, absolute encoder, safety acc. to SIL 2

- Singleturn, resolution 24 bits per revolution
- Multiturn, resolution 24 bits per revolution, 4096 revolutions

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 and unlimited duty cycles at zero speed.

		Size 1		Size 2		Size 3	
Ratio		16 - 35	40 – 100	16 – 35	40 – 100	16 - 35	40 – 100
Static holding torque at 120 °C ¹⁾	Nm	1.3	0.52	2.34	1.3	7.28	2.34
Supply voltage	V DC	24	24	24	24	24	24
Current at nominal voltage and 20 °C	A DC	0.46	0.42	0.5	0.46	0.71	0.5
Connection time	ms	≤ 8	≤ 10	≤ 20	≤ 8	-	≤ 20
Separation time	ms	≤ 35	≤ 18	≤ 50	≤ 35	≤ 60	≤ 50

¹⁾ Please refer to our project planning note on the brake.

For the precise holding torques at the output, please refer to the relevant data tables for the servo actuators, e.g. premo[®] TP Line Size 3. In the case of transmission ratios in which the holding torque at the output is above T_{2B} , the brake can be used max. 1000 times on the rotating motor.

Electrical connection

In addition to the conventional connection via two integral sockets for power and signal, a version for a single-cable connection in conjunction with EnDat 2.2 or HIPERFACE DSL[®] is available.

Integral sockets used:

Single-cable connection	Power and signal	Integral power socket M23 Bayonet coupling, 13/9-pin
Two-cable	Power	Integral power socket M23 Bayonet coupling, 6/9-pin
connection	Signal	Integral signal socket M23 Bayonet coupling, 9/12/17-pin

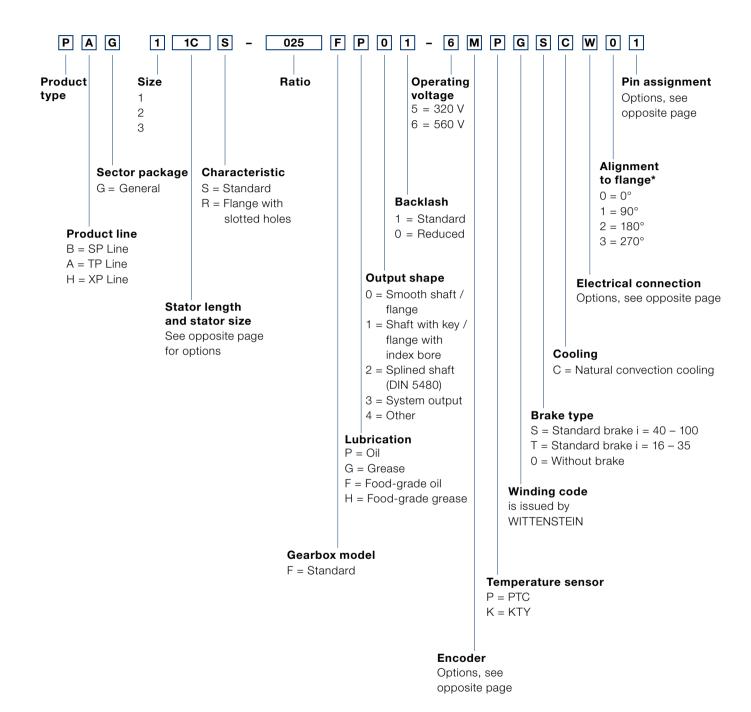
Pin assignment

The great flexibility of the new premo[®] servo actuator platform is also demonstrated by the pin assignments. In addition to two standard WITTENSTEIN pin assignments, a number of compatible connections are available for various servo controller suppliers.

Pin assignment 1	WITTENSTEIN alpha-Standard, temperature sensor in signal cable Resolver, DRIVE-CLiQ
Pin assignment 2	Siemens-compatible (except DRIVE-CLiQ), temperature sensor in signal cable Resolver, EnDat 2.1
Pin assignment 4	WITTENSTEIN alpha-Standard, temperature sensor in power cable HIPERFACE [®] , EnDat 2.2
Pin assignment 5	Rockwell compatible HIPERFACE®, HIPERFACE DSL® (single-cable)

Pin assignment 6	B&R compatible Resolver, EnDat 2.2 (single-cable)
Pin assignment 8	Schneider compatible HIPERFACE®
Pin assignment 9	Beckhoff compatible HIPERFACE DSL® (single-cable)

premo® Ordering code



* The position of the electrical connection with respect to the flange is relevant for XP Line with characteristic R (flange with slotted holes). This information relates to the offset of the integral sockets to the slotted holes as seen on the servo actuator from the rear.

Electrical connection options

R	Angled integral socket, 1-cab
w	Angled integral socket, 2-cab
S	Straight integral socket, 1-cab
G	Straight integral socket, 2-cab

Pin assignment options

1	WITTENSTEIN alpha Standard with temperature sensor in signal line
2	Siemens compatible w/o DRIVE-CLiQ
4	WITTENSTEIN alpha Standard with temperature sensor in power cable
5	Rockwell compatible
6	B&R compatible
8	Schneider compatible
9	Beckhoff compatible

Encoder options

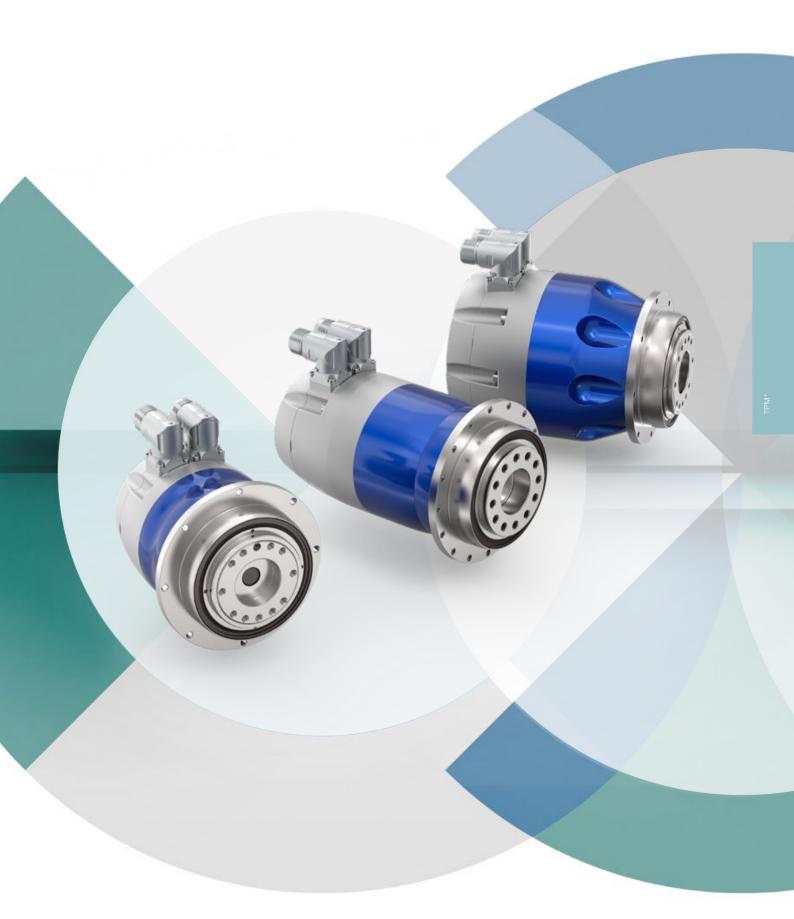
R	Resolver, 2 poles
s	EnDat 2.1 absolute, singleturn
м	EnDat 2.1 absolute, multiturn
F	EnDat 2.2 absolute, singleturn
w	EnDat 2.2 absolute, multiturn
Ν	HIPERFACE® absolute, singleturn
к	HIPERFACE [®] absolute, multiturn
G	HIPERFACE DSL® absolute, singleturn
н	HIPERFACE DSL [®] absolute, multiturn
L	DRIVE-CLiQ absolute, singleturn
D	DRIVE-CLiQ absolute, multiturn
Е	Rockwell absolute, singleturn
v	Rockwell absolute, multiturn
J	Rockwell DSL absolute, singleturn
Р	Rockwell DSL absolute, multiturn

Stator length and stator size options

	Ratio 16 to 35	Ratio 40 to 100
Size 1	2C	1C
Size 2	2D	1D
Size 3	3F	1F

TPM⁺ servo actuators





Overview of the TPM+ product family

The TPM⁺ product family is convincing. With its dynamics, torque and torsional rigidity. Extremely compact, high power density and superior smooth-running operation. Combined with its practice oriented performance graduation always an economic advantage in your production.

Product declarations

Servo actuator

The TPM⁺ product family is above all dynamic and compact. Servo motors and gearboxes merge seamlessly into a single versatile unit. The benefit: maximum power density in a smaller footprint allows for design flexibility.

Motor

Outstanding performance: permanently activated synchronous motor with highest power density thanks to rare earth magnets, a high pole count and a high fill factor with very low cogging (pole cogging torque).

Gearbox

The planetary gearboxes offer minimal backlash while achieving a high degree of torsional and tilting rigidity. The smooth-running helical toothing guarantees silent operation.

More productive. More efficient. More precise.

More productive ...

The benefits: A servo actuator with a low moment of inertia and an extremely rigid drive train provides for maximum precision and power. A decisive increase in productivity.

More efficient ...

Low torsional backlash, an output bearing with a high degree of tilting rigidity and integration of the gearbox 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 toothing and outstanding control properties ensure greater precision in your machines and plants. The result: genuinely economical products.

Additional features

- Various encoders and permanent magnet holding brake available.
- Direct attachment of drive components (pinion, belt pulley, indexing table) to standardized output flange.
- UL version as standard.
- Pre-assembled cables for selected servo controllers available.
- Simple commissioning thanks to special instructions for numerous servo controllers.
- 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. Servo actuator with two-stage gearbox designed primarily for rotary applications.

TPM⁺ HIGH TORQUE

Stronger – More compact – Higher torsional rigidity

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

TPM⁺ POWER

Stronger - Quieter - More compact

Extra power: high torque, compact dimensions. Single or two-stage servo actuator gearbox combination for linear and rotary applications.

TPM⁺ DYNAMIC

Dynamic. Shorter. Quieter.

Experience extraordinary dynamics thanks to 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 gearbox and the space-saving attachment of motor instruments make the TPM⁺ DYNAMIC over 50 % more compact than conventional gearbox motors. Helical-toothed precision planetary gearboxes ensure low-vibration and silent operation.

Size	Installation length in mm	Max. acceleration torque in Nm	Max. power in kW
004	from 113	up to 40	up to 1
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

Application example

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

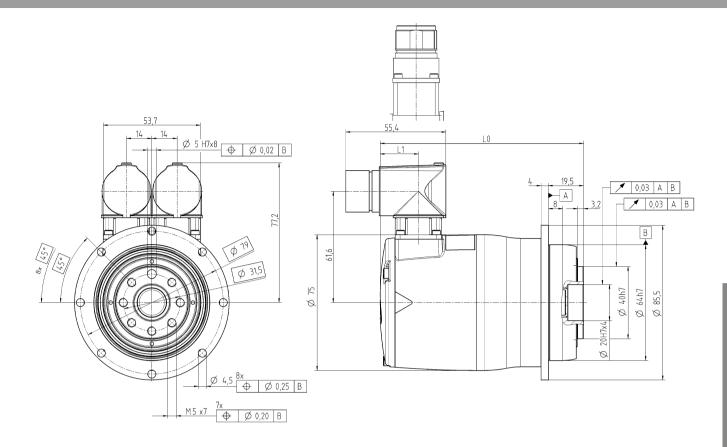


Source: Hastamat Verpackungstechnik

TPM+ DYNAMIC 004 2-stage

			2-stage						
Ratio	i		16	21	31	61	64	91	
Operating voltage	U	V DC			50	60			
Max. acceleration torque	-	Nm	30	32	40	32	32	32	
(max. 1000 cycles per hour)	T _{2B}	in.lb	266	283	354	283	283	283	
Static output torque	-	Nm	8	11	17	15	15	15	
	T ₂₀	in.lb	71	97	150	133	133	133	
Brake holding torque	-	Nm	18	23	34	67	70	100	
(at 120 °C)	T _{2Br}	in.lb	159	204	301	593	620	885	
Max. speed at output	n _{2max}	rpm	375	286	194	98	94	66	
Speed limit for T _{2B}	п _{2В}	rpm	313	262	189	98	94	66	
Max. motor acceleration torque	-	Nm	2	2	2	1	1	1	
	T _{1max}	in.lb	18	18	18	9	9	9	
Max. motor acceleration current	I _{MaxDyn}	A _{eff}	3.2	3.2	3.2	2.4	2.4	2.4	
Static motor current	I _o	A _{eff}	1.1	1.1	1.1	0.8	0.8	0.8	
Max. backlash	j,	arcmin	Standard ≤ 4 Reduced ≤ 2						
Torsional rigidity (Gearbox)	C ₁₂₁	Nm/arcmin	-	10	9	9	-	7	
		in.lb/arcmin	-	89	80	80	-	62	
		Nm/arcmin	85						
Tilting rigidity	С _{2К}	in.lb/arcmin	in 752						
	_	N	1630						
Max. axial force ^{a)}	F _{2AMax}	lb,	367						
		Nm	110						
Max. tilting moment	M _{2KMax}	in.lb			9	74			
Service life	L	h			> 20	0000			
Weight		kg			2 to	2.2			
(without brake)	m	lb _m			4.4 t	o 4.9			
A 12 11 1		°C	0 to +40						
Ambient temperature		°F			+32 to	o +104			
Lubrication					Lubricate	ed for life			
Insulating material class						F			
Protection class					IP	65			
Paint				Blue r	netallic 250 and	natural cast alun	ninium		
Metal bellows coupling (recommended product type – validate sizing with cymex®)			BCT-00015AAX-031.500						
Bore diameter of coupling on the application side		mm	X = 012.000 - 028.000						
Mass moment of inertia	,	kgcm²	0.21	0.2	0.2	0.12	0.11	0.12	
(relates to the drive)	J_1	10 ⁻³ in.lb.s ²	0.19	0.18	0.18	0.11	0.1	0.11	

 $\label{eq:please use our sizing software cymex $\ensuremath{^{\otimes}}$ for a detailed sizing - www.wittenstein-cymex.com $\ensuremath{^{\otimes}}$ to a detailed size \en



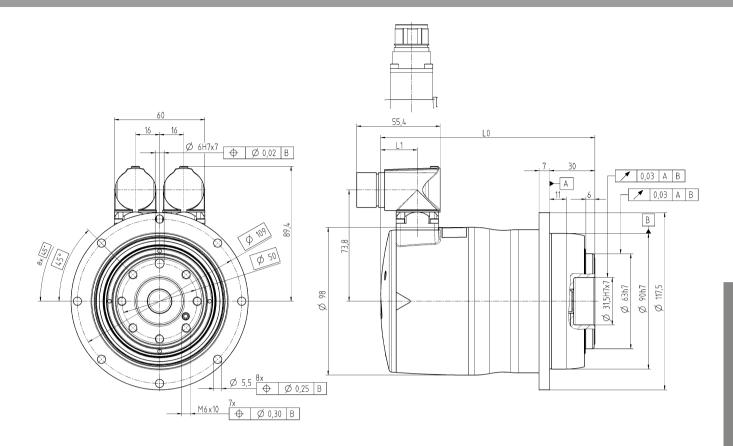
Ratio	Encoder	Length L0 in mm	Length L1 in mm
	Resolver	128	22
i = 16/21/31	HIPERFACE®	153	47
	EnDat	157	51
	Resolver	113	22
i = 61/64/91	HIPERFACE®	138	47
	EnDat	142	51

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

TPM+ DYNAMIC 010 2-stage

			2-stage						
Ratio	i		16	21	31	61	64	91	
Operating voltage	UD	V DC		I	56	50			
Max. acceleration torque	-	Nm	57	75	100	80	80	80	
(max. 1000 cycles per hour)	T _{2B}	in.lb	504	664	885	708	708	708	
Static output torque	-	Nm	13	18	27	29	28	35	
	T ₂₀	in.lb	115	159	239	257	248	310	
Brake holding torque	-	Nm	18	23	34	67	70	100	
(at 120 °C)	T _{2Br}	in.lb	159	204	301	593	620	885	
Max. speed at output	n _{2max}	rpm	375	286	194	98	94	66	
Speed limit for T _{2B}	п _{2В}	rpm	256	195	132	81	78	54	
Max. motor acceleration torque	-	Nm	3.8	3.8	3.8	1.9	1.9	1.9	
	T _{1max}	in.lb	34	34	34	17	17	17	
Max. motor acceleration current	I _{MaxDyn}	A _{eff}	5.2	5.2	5.2	3	3	3	
Static motor current	I _o	A _{eff}	1.3	1.3	1.3	0.9	0.9	0.9	
Max. backlash	j,	arcmin	Standard ≤ 3 Reduced ≤ 1						
Torsional rigidity (Gearbox)	C ₁₂₁	Nm/arcmin	-	26	24	24	-	21	
		in.lb/arcmin	-	230	212	212	-	186	
		Nm/arcmin	225						
Tilting rigidity	С _{2К}	in.lb/arcmin	nin 1991						
	_	N	2150						
Max. axial force ^{a)}	F _{2AMax}	lb,	484						
	Nm		270						
Max. tilting moment	M _{2KMax}	in.lb			23	90			
Service life	L	h			> 20	0000			
Weight		kg			4.3 t	o 4.8			
(without brake)	m	lb _m	9.5 to 11						
		°C			0 to	+40			
Ambient temperature		°F			+32 to	o +104			
Lubrication					Lubricate	ed for life			
Insulating material class					I	=			
Protection class					IP	65			
Paint				Blue r	metallic 250 and	natural cast alun	ninium		
Metal bellows coupling (recommended product type – validate sizing with cymex®)			BCT-00060AAX-050.000						
Bore diameter of coupling on the application side		mm	X = 014.000 - 035.000						
Mass moment of inertia	,	kgcm²	0.32	0.32	0.32	0.17	0.17	0.17	
(relates to the drive)	J_1	10 ⁻³ in.lb.s ²	0.28	0.28	0.28	0.15	0.15	0.15	

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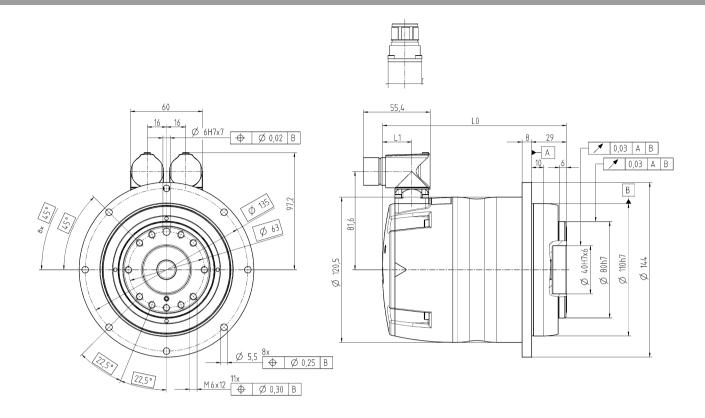
Ratio	Encoder	Length L0 in mm	Length L1 in mm
	Resolver	157	24
i = 16/21/31	HIPERFACE®	178	45
	EnDat	182	49
	Resolver	142	24
i = 61/64/91	HIPERFACE®	163	45
	EnDat	167	49

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

TPM+ DYNAMIC 025 2-stage

			2-stage					
Ratio	i		16	21	31	61	64	91
Operating voltage	UD	V DC			50	60		I
Max. acceleration torque	-	Nm	182	239	300	250	250	250
(max. 1000 cycles per hour)	T _{2B}	in.lb	1611	2115	2655	2213	2213	2213
Static output torque	_	Nm	74	97	146	87	83	100
	T ₂₀	in.lb	655	859	1292	770	735	885
Brake holding torque	-	Nm	72	94	140	274	288	410
(at 120 °C)	T _{2Br}	in.lb	637	832	1239	2425	2549	3629
Max. speed at output	n _{2max}	rpm	375	286	194	98	94	66
Speed limit for T _{2B}	n _{2B}	rpm	244	185	125	59	56	39
		Nm	12.1	12.1	12.1	4.4	4.4	4.4
	T _{1max}	in.lb	107	107	107	39	39	39
Max. motor acceleration current	I _{MaxDyn}	A _{eff}	17	17	17	6	6	6
Static motor current	I _o	A _{eff}	5.7	5.7	5.7	1.9	1.9	1.9
Max. backlash	j _t	arcmin	Standard ≤ 3 Reduced ≤ 1					
Torsional rigidity (Gearbox)	C ₁₂₁	Nm/arcmin	-	70	54	61	-	55
		in.lb/arcmin	-	620	478	540	-	487
		Nm/arcmin	550					
Tilting rigidity	С _{2К}	in.lb/arcmin						
		N 4150						
Max. axial force ^{a)}	F _{2AMax}	lb,	934					
		Nm	440					
Max. tilting moment	M _{2KMax}	in.lb			38	94		
Service life	L	h			> 20	0000		
Weight		kg			7.1 t	o 8.5		
(without brake)	m	lb _m			16 t	o 19		
		°C			0 to	+40		
Ambient temperature		°F			+32 to	o +104		
Lubrication					Lubricate	ed for life		
Insulating material class					I	F		
Protection class					IP	65		
Paint				Blue r	metallic 250 and	natural cast alun	ninium	
Metal bellows coupling (recommended product type – validate sizing with cymex®)			BCT-00150AAX-063.000					
Bore diameter of coupling on the application side		mm	X = 019.000 - 042.000					
Mass moment of inertia		kgcm²	2.16	2.16	2.17	0.77	0.76	0.76
(relates to the drive)	J_1	10 ⁻³ in.lb.s ²	1.9	1.9	1.9	0.68	0.67	0.67

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

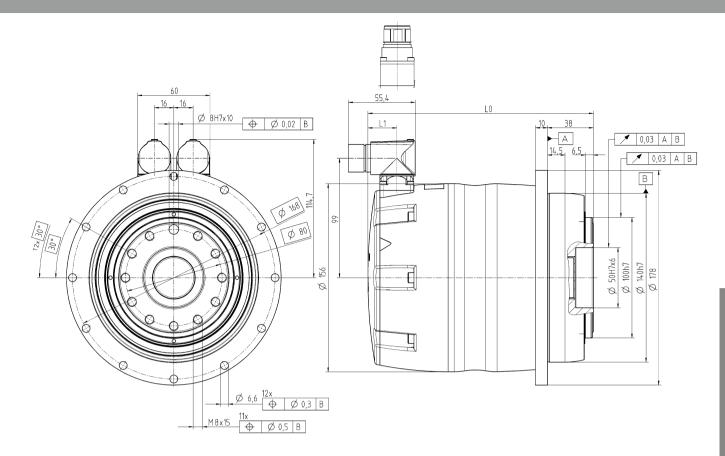
Ratio	Encoder	Length L0 in mm	Length L1 in mm	
	Resolver	202	24	
i = 16/21/31	HIPERFACE®	223	45	
	EnDat	227	49	
	Resolver	172	24	
i = 61/64/91	HIPERFACE®	193	45	
	EnDat	197	49	

TPM+ DYNAMIC 050 2-stage

			2-stage					
Ratio	i		16	21	31	61	64	91
Operating voltage	UD	V DC	560					
Max. acceleration torque	-	Nm	435	500	650	447	469	500
(max. 1000 cycles per hour)	T _{2B}	in.lb	3850	4425	5753	3956	4151	4425
	-	Nm	185	220	370	173	166	220
Static output torque	T ₂₀	in.lb	1637	1947	3275	1531	1469	1947
Brake holding torque	-	Nm	208	273	403	793	832	1183
(at 120 °C)	T _{2Br}	in.lb	1841	2416	3567	7019	7364	10470
Max. speed at output	n _{2max}	rpm	312	238	161	82	78	55
Speed limit for T _{2B}	n _{2B}	rpm	225	171	116	59	56	39
May mater appalantics to serve	-	Nm	28.9	28.9	28.9	7.8	7.8	7.8
Max. motor acceleration torque	T _{1max}	in.lb	256	256	256	69	69	69
Max. motor acceleration current	I _{MaxDyn}	A _{eff}	40	40	40	12	12	12
Static motor current	I _o	A _{eff}	13.7	13.7	13.7	3.8	3.8	3.8
Max. backlash	j _t	arcmin	Standard ≤ 3 Reduced ≤ 1					
Torsional rigidity	C ₁₂₁	Nm/arcmin	-	145	130	123	-	100
(Gearbox)		in.lb/arcmin	-	1283	1151	1089	-	885
	С _{2К}	Nm/arcmin	560					
Tilting rigidity		in.lb/arcmin	4956					
	F _{2AMax}	N	6130					
Max. axial force a)		lb,	1379					
	M _{2KMax}	Nm	1335					
Max. tilting moment		in.lb	11816					
Service life	L	h			> 20	0000		
Weight		kg			14.7 t	o 18.5		
(without brake)	m	lb _m	32 to 41					
		°C	0 to +40					
Ambient temperature		°F	+32 to +104					
Lubrication					Lubricate	ed for life		
Insulating material class						F		
Protection class					IP	65		
Paint			Blue metallic 250 and natural cast aluminium					
Metal bellows coupling (recommended product type – validate sizing with cymex®)			BCT-00300AAX-080.000					
Bore diameter of coupling on the application side		mm	X = 024.000 - 060.000					
Mass moment of inertia	,	kgcm²	9.07	9.07	8.94	2.51	2.49	2.49
(relates to the drive)	J_1	10 ⁻³ in.lb.s ²	8	8	7.9	2.2	2.2	2.2

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Ratio	Encoder	Length L0 in mm	Length L1 in mm		
	Resolver	232	24		
i = 16/21/31	HIPERFACE®	253	45		
_	EnDat	257	49		
	Resolver	187	24		
i = 61/64/91	HIPERFACE®	208	45		
	EnDat	212	49		

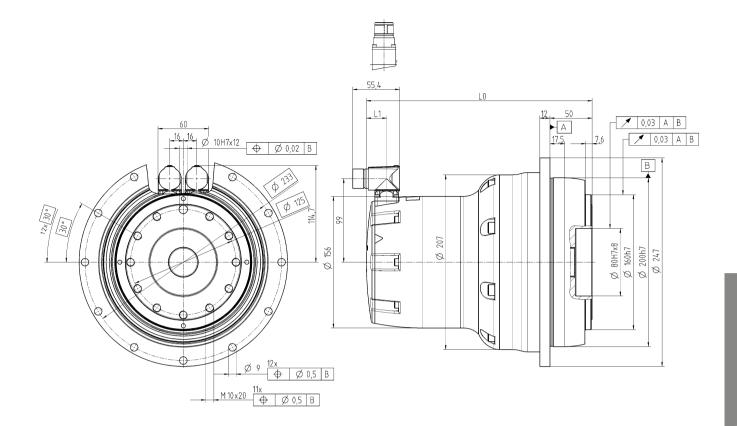
Ratio	Encoder	Length L0 in mm	Length L1 in mm	
	Resolver	256	24	
i = 16/21/31	HIPERFACE®	278	45	
	EnDat	281	49	
	Resolver	211	24	
i = 61/64/91	HIPERFACE®	233	45	
	EnDat	236	49	

TPM⁺ DYNAMIC 110 2-stage

			2-stage						
Ratio	i		16	21	31	61	64	91	
Operating voltage	UD	V DC	560						
Max. acceleration torque	-	Nm	660	867	1279	1300	1300	1300	
(max. 1000 cycles per hour)	T _{2B}	in.lb	5842	7674	11320	11506	11506	11506	
	-	Nm	208	278	419	700	700	700	
Static output torque	T ₂₀	in.lb	1841	2461	3708	6196	6196	6196	
Brake holding torque	-	Nm	208	273	403	793	832	1183	
(at 120 °C)	T _{2Br}	in.lb	1841	2416	3567	7019	7364	10470	
Max. speed at output	n _{2max}	rpm	312	238	161	82	78	55	
Speed limit for T _{2B}	n _{2B}	rpm	206	157	106	59	56	39	
Max mater analysis to the	-	Nm	43.9	43.9	43.9	28.9	28.9	28.9	
Max. motor acceleration torque	T _{1max}	in.lb	389	389	389	256	256	256	
Max. motor acceleration current	I _{MaxDyn}	A _{eff}	70	70	70	40	40	40	
Static motor current	I _o	A _{eff}	16.7	16.7	16.7	13.7	13.7	13.7	
Max. backlash	j _t	arcmin	Standard ≤ 3 Reduced ≤ 1						
Torsional rigidity	C ₁₂₁	Nm/arcmin	-	465	440	415	-	360	
(Gearbox)		in.lb/arcmin	-	4116	3894	3673	-	3186	
Tillion of all the	С _{2К}	Nm/arcmin	1452						
Tilting rigidity		in.lb/arcmin	12851						
	F _{2AMax}	N	10050						
Max. axial force ^{a)}		lb _f	2261						
	M _{2KMax}	Nm	3280						
Max. tilting moment		in.lb	29031						
Service life	L	h			> 20	0000			
Weight		kg	35.9 to 37.1						
(without brake)	m	lb _m	79 to 82						
A		°C	0 to +40						
Ambient temperature		°F	+32 to +104						
Lubrication					Lubricate	ed for life			
Insulating material class					l	F			
Protection class			IP 65						
Paint			Blue metallic 250 and natural cast aluminium						
Metal bellows coupling (recommended product type – validate sizing with cymex®)			BCT-01500AAX-125.000						
Bore diameter of coupling on the application side		mm	X = 050.000 - 080.000						
Mass moment of inertia	,	kgcm²	13.14	13.14	12.84	8.89	8.83	8.83	
(relates to the drive)	J ₁	10 ⁻³ in.lb.s ²	12	12	11	7.9	7.8	7.8	

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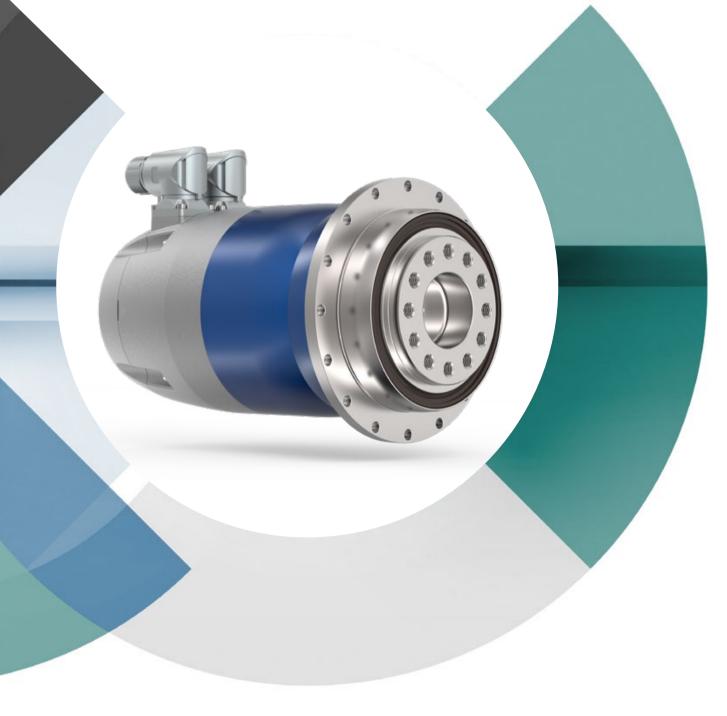




Ratio	Encoder	Length L0 in mm	Length L1 in mm
	Resolver	283	24
i = 16/21/31	HIPERFACE®	304	45
	EnDat	308	49
	Resolver	268	24
i = 61/64/91	HIPERFACE®	289	45
	EnDat	293	49

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

TPM⁺ HIGH TORQUE



Stronger. More compact. Higher torsional rigidity.

This servo actuator brings you even further: with 50% more torque and improved performance. Even better power transmission due to the more rigid drive train offers 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 servo actuator. The coupling-free integration of motor and gearbox and the efficient attachment of motor instruments is the formula for success.

Size	Installation length in mm	Max. 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

Application example

Thanks to the TPM⁺ HIGH TORQUE, machine tools 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.

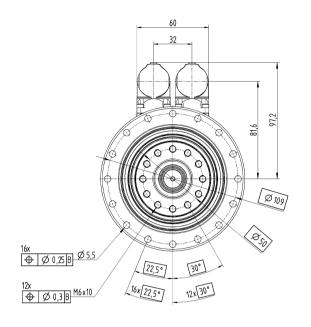


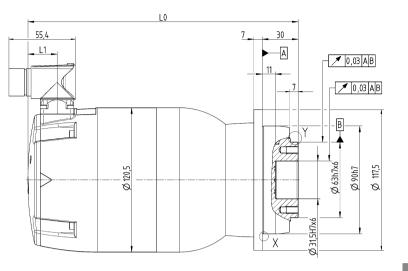
TPM+ HIGH TORQUE 010 2-/3-stage

				2-st	age			3-st	age	
Ratio	i		22	27,5	38,5	55	88	110	154	220
Operating voltage	UD	V DC		1		56	60			
Max. acceleration torque	_	Nm	230	230	230	230	230	230	230	230
(max. 1000 cycles per hour)	T _{2B}	in.lb	2036	2036	2036	2036	2036	2036	2036	2036
2	-	Nm	79	99	139	110	180	180	180	180
Static output torque	T ₂₀	in.lb	699	876	1230	974	1593	1593	1593	1593
Brake holding torque	-	Nm	99	124	173	248	396	495	277	396
(at 120 °C)	T _{2Br}	in.lb	876	1097	1531	2195	3505	4381	2452	3505
Max. speed at output	n _{2max}	rpm	220	176	126	88	55	44	31	22
Speed limit for T _{2B}	п _{2В}	rpm	187	163	126	88	55	44	31	22
Maria and a second second second	-	Nm	12	12	12	12	12	12	4.4	4.4
Max. motor acceleration torque	T _{1max}	in.lb	106	106	106	106	106	106	39	39
Max. motor acceleration current	I _{MaxDyn}	A _{eff}	17	17	17	17	17	17	6	6
Static motor current	I _o	A _{eff}	5	5	5	5	5	5	1.9	1.9
Max. backlash	j _t	arcmin				≤	1			
Torsional rigidity	C ₁₂₁	Nm/arcmin	43	43	43	42	42	42	42	42
(Gearbox)		in.lb/arcmin	381	381	381	372	372	372	372	372
Tilain e vienialia :		Nm/arcmin	225							
Tilting rigidity	С _{2К}	in.lb/arcmin	1991							
Max. axial force a)	F	N	2150							
	F _{2AMax}	lb,	484							
		Nm 400								
Max. tilting moment	M _{2KMax}	in.lb				35	40			
Service life	L _h	h				> 20	0000			
Weight		kg				6.5	to 8			
(without brake)	m	lb _m				14 t	o 18			
		°C				0 to	+40			
Ambient temperature		°F				+32 to	o +104			
Lubrication						Lubricate	ed for life			
Insulating material class						F	F			
Protection class						IP	65			
Paint					Blue meta	allic 250 and	natural cast	aluminium		
Metal bellows coupling (recommended product type – validate sizing with cymex®)			BCT-00150AAX-050.00A							
Bore diameter of coupling on the application side		mm	X = 016.000 - 038.000							
Mass moment of inertia	,	kgcm²	2.06	2.03	2.01	1.99	2.01	2	0.68	0.67
(relates to the drive)	J_1	10 ⁻³ in.lb.s ²	1.8	1.8	1.8	1.8	1.8	1.8	0.6	0.59

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

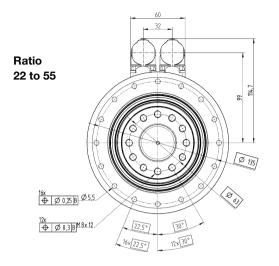
Ratio	Encoder	Length L0 in mm	Length L1 in mm
	Resolver	226	24
i = 22/27.5/38.5/55	HIPERFACE®	247	45
	EnDat	251	49
	Resolver	232	24
i = 88/110	HIPERFACE®	253	45
	EnDat	257	49
	Resolver	202	24
i = 154/220	HIPERFACE [®]	223	45
	EnDat	227	49

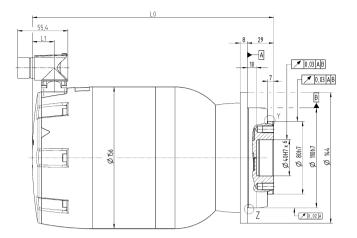
TPM+ HIGH TORQUE 025 2-/3-stage

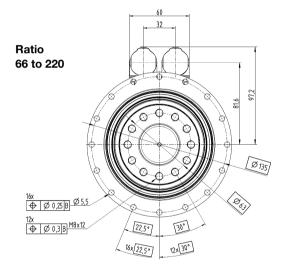
				2-st	age				3-stage		
Ratio	i		22	27,5	38,5	55	66	88	110	154	220
Operating voltage	UD	V DC					560				
Max. acceleration torque . (max. 1000 cycles per hour)	-	Nm	530	530	530	530	480	480	480	480	480
	T _{2B}	in.lb	4691	4691	4691	4691	4248	4248	4248	4248	4248
o	-	Nm	232	291	375	375	260	260	260	260	260
Static output torque	T ₂₀	in.lb	2053	2576	3319	3319	2301	2301	2301	2301	2301
Brake holding torque	-	Nm	286	358	500	715	297	396	495	693	990
(at 120 °C)	T _{2Br}	in.lb	2531	3169	4425	6328	2629	3505	4381	6134	8762
Max. speed at output	n _{2max}	rpm	220	176	126	88	73	55	44	31	22
Speed limit for T _{2B}	п _{2В}	rpm	177	155	122	88	70	55	44	31	22
	-	Nm	28.9	28.9	28.9	28.9	12	12	12	12	12
Max. motor acceleration torque	T _{1max}	in.lb	256	256	256	256	106	106	106	106	106
Max. motor acceleration current	I _{MaxDyn}	A _{eff}	40	40	40	40	17	17	17	17	17
Static motor current	I _o	A _{eff}	13.1	13.1	13.1	13.1	5.8	5.8	5.8	5.8	5.8
Max. backlash	j _t	arcmin					≤ 1				
Torsional rigidity		Nm/arcmin	105	105	105	100	95	95	95	95	95
(Gearbox)	C ₁₂₁	in.lb/arcmin	929	929	929	885	841	841	841	841	841
		Nm/arcmin	550								
Tilting rigidity	C _{2K}	in.lb/arcmin	4868								
	_	N	4150								
Max. axial force ^{a)}	F _{2AMax}	lb,	934								
		Nm	550								
Max. tilting moment	M _{2KMax}	in.lb					4868				
Service life	L	h		-		-	> 20000				
Weight		kg					10 to 14.8				
(without brake)	m	lb _m					22 to 33				
		°C					0 to +40				
Ambient temperature		°F					+32 to +10	4			
Lubrication				-		Lul	oricated for	life			
Insulating material class							F				
Protection class							IP 65				
Paint					Blue r	metallic 250) and natur	al cast alun	ninium		
Metal bellows coupling (recommended product type – validate sizing with cymex®)			BCT-00300AAX-063.00A								
Bore diameter of coupling on the application side		mm	X = 030.000 - 056.000								
Mass moment of inertia	1.	kgcm²	9.01	8.83	8.74	8.69	2.03	1.96	1.93	1.91	1.89
(relates to the drive)	J_1	10 ⁻³ in.lb.s ²	8	7.8	7.7	7.7	1.8	1.7	1.7	1.7	1.7

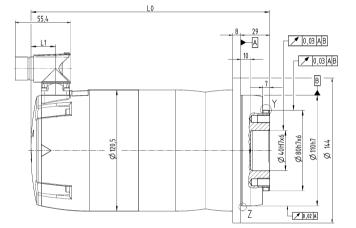
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with brake

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

without brake

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

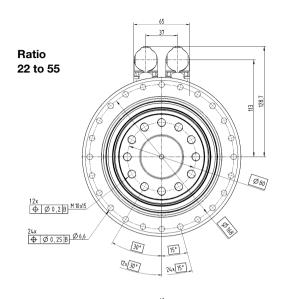
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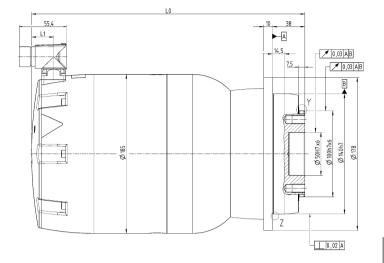
TPM+ HIGH TORQUE 050 2-/3-stage

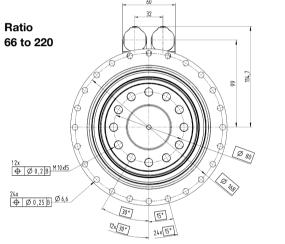
				2-st	age		3-stage				
Ratio	i		22	27.5	38.5	55	66	88	110	154	220
Operating voltage	UD	V DC					560				
Max. acceleration torque		Nm	950	950	950	950	950	950	950	950	950
(max. 1000 cycles per hour)	T _{2B}	in.lb	8408	8408	8408	8408	8408	8408	8408	8408	8408
o	-	Nm	406	513	650	675	675	675	675	675	675
Static output torque	T ₂₀	in.lb	3593	4540	5753	5974	5974	5974	5974	5974	5974
Brake holding torque	-	Nm	506	632	886	1265	858	1144	1430	2002	2375
(at 120 °C)	T _{2Br}	in.lb	4479	5594	7842	11196	7594	10125	12657	17719	21021
Max. speed at output	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
	-	Nm	56.6	56.6	56.6	56.6	28.9	28.9	28.9	28.9	28.9
Max. motor acceleration torque	T _{1max}	in.lb	501	501	501	501	256	256	256	256	256
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 _o	A _{eff}	17.9	17.9	17.9	17.9	12.6	12.6	12.6	12.6	12.6
Max. backlash	j _t	arcmin					≤ 1		L		
Torsional rigidity		Nm/arcmin	220	220	220	220	205	205	205	205	205
(Gearbox)	C _{t21}	in.lb/arcmin	1947	1947	1947	1947	1814	1814	1814	1814	1814
Tible a stateth		Nm/arcmin	560								
Tilting rigidity	C _{2K}	in.lb/arcmin	4956								
	_	N					6130				
Max. axial force a)	F _{2AMax}	lb,	1379								
		Nm	1335								
Max. tilting moment	M _{2KMax}	in.lb					11816				
Service life	L	h					> 20000				
Weight		kg				:	21.8 to 25.3	3			
(without brake)	m	lb _m					48 to 56				
A		°C					0 to +40				
Ambient temperature		°F				-	+32 to +10	4			
Lubrication						Luk	pricated for	life			
Insulating material class							F				
Protection class							IP 65				
Paint					Blue r	netallic 250) and natur	al cast alun	ninium		
Metal bellows coupling (recommended product type – validate sizing with cymex®)			BCT-00300AAX-080.00A								
Bore diameter of coupling on the application side		mm	X = 045.000 - 056.000								
Mass moment of inertia		kgcm ²	23.8	23.35	22.99	22.81	9.23	9.04	8.84	8.74	8.69
(relates to the drive)	J_1	10 ⁻³ in.lb.s ²	21	21	20	20	8.2	8	7.8	7.7	7.7

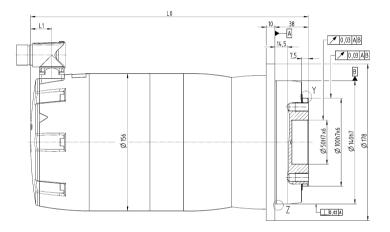
 $\label{eq:please} Please use our sizing software cymex^{\circledast} \mbox{ for a detailed sizing - www.wittenstein-cymex.com}$











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

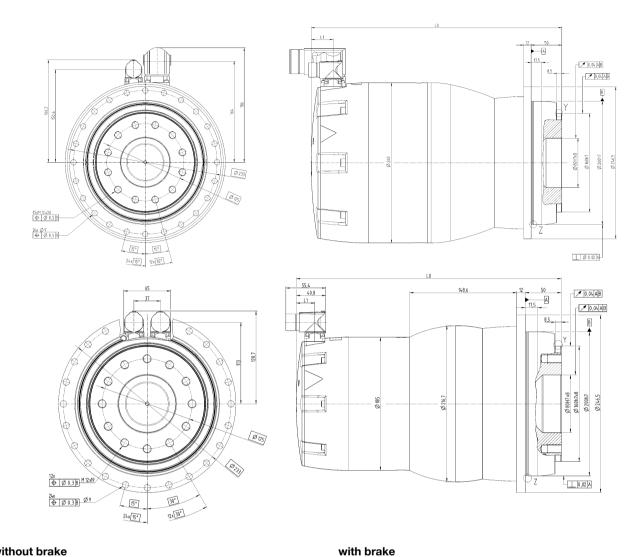
Ratio	Encoder	Length L0 in mm	Length L1 in mm
	Resolver	319	26
i = 22/27.5/38.5/55	HIPERFACE®	344	50
	EnDat	344	50
	Resolver	316	24
i = 66/88/110/154/220	HIPERFACE®	337	45
	EnDat	341	49

TPM+ HIGH TORQUE 110 2-/3-stage

			2-stage			3-stage						
Ratio	i		22	27.5	38.5	55	66	88	110	154	220	
Operating voltage	U	V DC		1			560					
Max. acceleration torque		Nm	3100	3100	3100	2000	2600	2600	2600	2600	2600	
(max. 1000 cycles per hour)	T _{2B}	in.lb	27437	27437	27437	17702	23012	23012	23012	23012	23012	
	_	Nm	1368	1600	1650	1400	1600	1750	1750	1750	1750	
Static output torque	T ₂₀	in.lb	12108	14161	14604	12391	14161	15489	15489	15489	15489	
Brake holding torque	-	Nm	1584	1980	2772	3960	4752	6336	2530	3542	5060	
(at 120 °C)	T _{2Br}	in.lb	14020	17525	24534	35049	42059	56079	22393	31350	44785	
Max. speed at output	n _{2max}	rpm	189	151	108	75	63	47	41	29	20	
Speed limit for T _{2B}	п _{2В}	rpm	154	135	106	75	63	47	38	29	20	
	-	Nm	164.5	164.5	164.5	164.5	88	88	56.6	56.6	56.6	
Max. motor acceleration torque	T _{1max}	in.lb	1456	1456	1456	1456	779	779	501	501	501	
Max. motor acceleration current	I _{MaxDyn}	A _{eff}	160	160	160	160	100	100	63.5	63.5	63.5	
Static motor current	I _o	A _{eff}	53.7	53.7	53.7	53.7	40.9	40.9	20.5	20.5	20.5	
Max. backlash	j _t	arcmin					≤ 1					
Torsional rigidity		Nm/arcmin	730	725	715	670	650	650	650	650	650	
(Gearbox)	C ₁₂₁	in.lb/arcmin	6461	6417	6328	5930	5753	5753	5753	5753	5753	
		Nm/arcmin					1452					
Tilting rigidity	С _{2К}	in.lb/arcmin	12851									
	-	N 10050										
Max. axial force a)	F _{2AMax}	lb,	2261									
		Nm 3280										
Max. tilting moment	M _{2KMax}	in.lb					29031					
Service life	L	h					> 20000					
Weight		kg					45.5 to 76.8	3				
(without brake)	m	lb _m					101 to 170					
A		°C					0 to +40					
Ambient temperature		°F					+32 to +10	4				
Lubrication						Lul	oricated for	life				
Insulating material class							F					
Protection class							IP 65					
Paint					Blue r	metallic 250) and natur	al cast alun	ninium			
Metal bellows coupling (recommended product type – validate sizing with cymex®)			BCT-01500AAX-125.00A									
Bore diameter of coupling on the application side		mm	X = 055.000 - 070.000									
Mass moment of inertia	,	kgcm²	220.4	218.9	217.6	216.9	111.8	108.2	22.9	22.5	22.3	
(relates to the drive)	J_1	10 ⁻³ in.lb.s ²	195	194	193	192	99	96	20	20	20	

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

Length L0 in mm Ratio Encoder i = 22/27.5/38 i = 66/88

EnDat

	Resolver	467	36
i = 22/27.5/38.5/55	HIPERFACE®	491	60
	EnDat	491	60
	Resolver	407	36
i = 66/88	HIPERFACE®	431	60
	EnDat	431	60
	Resolver	368	26
i = 110/154/220	HIPERFACE®	393	50

393

Length L1 in mm

50

TPM⁺ POWER

Stronger. More compact. Quieter.

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

Size	Installation length in mm	Max. 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

Application example

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

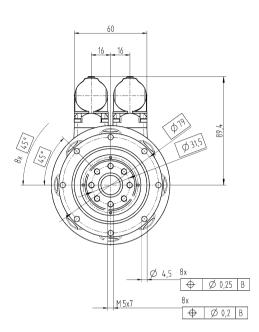


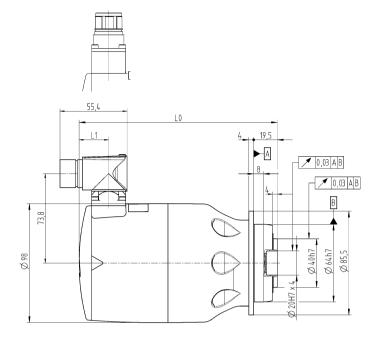
Source: Schmale Maschinenbau GmbH

TPM⁺ POWER 004 1-stage

Ratio	i		4	5	7	10		
Operating voltage	UD	V DC		56	60	I		
Max. acceleration torque		Nm	15	18	26	26		
(max. 1000 cycles per hour)	T _{2B}	in.lb	133	159	230	230		
		Nm	4	6	8	12		
Static output torque	T ₂₀	in.lb	35	53	71	106		
Brake holding torque		Nm	4	6	8	11		
(at 120 °C)	T _{2Br}	in.lb	35	53	71	97		
Max. speed at output	n _{2max}	rpm	1500	1200	857	600		
Speed limit for T _{2B}	n _{2B}	rpm	1040	830	590	460		
	_	Nm	3.8	3.8	3.8	3.8		
Max. motor acceleration torque	T _{1max}	in.lb	34	34	34	34		
Max. motor acceleration current	I _{MaxDyn}	A _{eff}	5.2	5.2	5.2	5.2		
Static motor current	I _o	A _{eff}	1.6	1.6	1.6	1.6		
Max. backlash	j _t	arcmin		Standard ≤ 4	Reduced ≤ 2	1		
Torsional rigidity	C ₁₂₁	Nm/arcmin	12	12	11	8		
Gearbox)		in.lb/arcmin	106	106	97	71		
		Nm/arcmin	85					
Tilting rigidity	С _{2К}	in.lb/arcmin	752					
	-	N	1630					
Max. axial force a)	F _{2AMax}	lb,	367					
		Nm	110					
Max. tilting moment	M _{2KMax}	in.lb		97	74			
Service life	L	h		> 20	0000			
Weight		kg		3.	.6			
(without brake)	m	lb _m		ξ	3			
		°C		0 to	+40			
Ambient temperature		°F		+32 to	o +104			
Lubrication				Lubricate	ed for life			
Insulating material class				F	=			
Protection class				IP	65			
Paint				Blue metallic 250 and	natural cast aluminium			
Metal bellows coupling (recommended product type – validate sizing with cymex®)			BCT-00015AAX-031.500					
Bore diameter of coupling on the application side		mm	X = 012.000 - 028.000					
Mass moment of inertia		kgcm²	0.39	0.36	0.33	0.31		
(relates to the drive)	J_1	10 ⁻³ in.lb.s ²	0.35	0.32	0.29	0.27		

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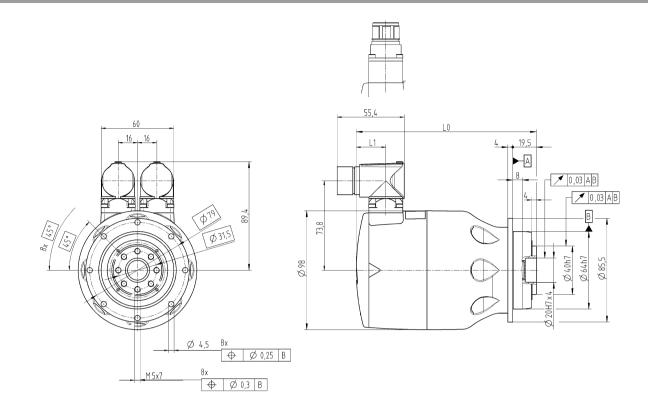
Ratio	Encoder	Length L0 in mm	Length L1 in mm	
	Resolver	164	24	
i = 4/5/7/10	HIPERFACE®	185	45	
	EnDat	189	49	

Ratio	Encoder	Length L0 in mm	Length L1 in mm
	Resolver	184	24
i = 4/5/7/10	HIPERFACE®	205	45
	EnDat	209	49

TPM⁺ POWER 004 2-stage

			2-stage								
Ratio	i		16	20	25	28	35	40	50	70	100
Operating voltage	UD	V DC					560				
Max. acceleration torque		Nm	50	50	50	50	50	50	50	50	35
(max. 1000 cycles per hour)	T _{2B}	in.lb	443	443	443	443	443	443	443	443	310
		Nm	18	23	28	32	40	24	30	40	18
Static output torque	T ₂₀	in.lb	159	204	248	283	354	212	266	354	159
Brake holding torque		Nm	18	22	28	31	38	44	55	77	110
(at 120 °C)	T _{2Br}	in.lb	159	195	248	274	336	389	487	682	974
Max. speed at output	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
	_	Nm	3.8	3.8	3.8	3.8	3.8	1.9	1.9	1.9	1.9
Max. motor acceleration torque	T _{1max}	in.lb	34	34	34	34	34	17	17	17	17
Max. motor acceleration current	I _{MaxDyn}	A _{eff}	5.2	5.2	5.2	5.2	5.2	3	3	3	3
Static motor current	I _o	A _{eff}	1.6	1.6	1.6	1.6	1.6	1	1	1	1
Max. backlash	j _t	arcmin				Standa	rd ≤ 4 Redu	iced ≤ 2			
Torsional rigidity	0	Nm/arcmin	12	12	12	12	12	11	12	11	8
(Gearbox)	<i>C</i> _{t21}	in.lb/arcmin	106	106	106	106	106	97	106	97	71
This and shall all a	0	Nm/arcmin	85								
Tilting rigidity	C _{2K}	in.lb/arcmin	752								
May avial force a	F	N					1630				
Max. axial force a)	F _{2AMax}	lb,	367								
May tilting moment		Nm 110									
Max. tilting moment	M _{2KMax}	in.lb	974								
Service life	L	h					> 20000				
Weight	m	kg					3.3 to 3.7				
(without brake)		lb _m					7.3 to 8.2				
Ambient temperature		°C	0 to +40								
Ambient temperature		°F					+32 to +104	4			
Lubrication						Lut	oricated for	life			
Insulating material class							F				
Protection class							IP 65				
Paint					Blue r	metallic 250) and natur	al cast alur	ninium		
Metal bellows coupling (recommended product type – validate sizing with cymex®)			BCT-00015AAX-031.500								
Bore diameter of coupling on the application side		mm	X = 012.000 - 028.000								
Mass moment of inertia		kgcm ²	0.32	0.31	0.31	0.31	0.31	0.16	0.16	0.16	0.16
(relates to the drive)	J_1	10 ⁻³ in.lb.s ²	0.28	0.27	0.27	0.27	0.27	0.14	0.14	0.14	0.14

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

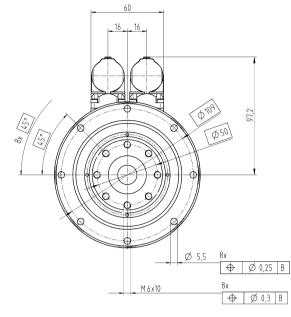
Ratio	Encoder	Length L0 in mm	Length L1 in mm
	Resolver	184	24
i = 16/20/25/28/35	HIPERFACE®	205	45
	EnDat	209	49
	Resolver	169	24
i = 40/50/70/100	HIPERFACE®	190	45
	EnDat	194	49

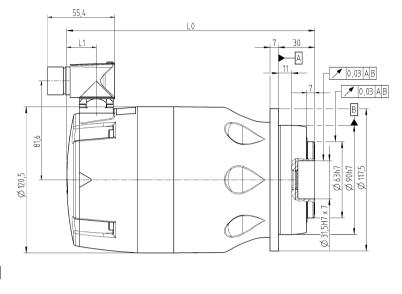
TPM+ POWER 010 1-stage

			1-stage						
Ratio	i		4	5	7	10			
Operating voltage	UD	V DC		56	60				
Max. acceleration torque	-	Nm	44 56 80						
(max. 1000 cycles per hour)	T _{2B}	in.lb	389	496	708	752			
	-	Nm	14	18	27	40			
Static output torque	T ₂₀	in.lb	124	159	239	354			
Brake holding torque	-	Nm	18	22	32	45			
(at 120 °C)	T _{2Br}	in.lb	159	195	283	398			
Max. speed at output	n _{2max}	rpm	1500	1200	857	600			
Speed limit for T _{2B}	п _{2В}	rpm	980	780	560	440			
Maria and a second and the design of	-	Nm	12.1	12.1	12.1	12.1			
Max. motor acceleration torque	T _{1max}	in.lb	107	107	107	107			
Max. motor acceleration current	I _{MaxDyn}	A _{eff}	17	17	17	17			
Static motor current	I _o	A _{eff}	5.4	5.4	5.4	5.4			
Max. backlash	j _t	arcmin		Standard ≤ 3	Reduced ≤ 1				
Torsional rigidity		Nm/arcmin	32	33	30	23			
(Gearbox)	C _{t21}	in.lb/arcmin	283	292	266	204			
The second states	0	Nm/arcmin	225						
Tilting rigidity	С _{2К}	in.lb/arcmin	1991						
	_	N	2150						
Max. axial force a)	F _{2AMax}	lb _f	484						
		Nm	270						
Max. tilting moment	M _{2KMax}	in.lb	2390						
Service life	L	h		> 20	0000				
Weight		kg		7.	.2				
(without brake)	m	lb _m		1	6				
		°C		0 to	+40				
Ambient temperature		°F		+32 to	o +104				
Lubrication				Lubricate	ed for life				
Insulating material class				F	=				
Protection class				IP	65				
Paint				Blue metallic 250 and	natural cast aluminium				
Metal bellows coupling (recommended product type – validate sizing with cymex [®])			BCT-00060AAX-050.000						
Bore diameter of coupling on the application side		mm	X = 014.000 - 035.000						
Mass moment of inertia	1.	kgcm ²	2.38	2.22	2.08	2			
(relates to the drive)	J_1	10 ⁻³ in.lb.s ²	2.1	2	1.8	1.8			

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Ratio	Encoder	Length L0 in mm	Length L1 in mm
	Resolver	205	24
i = 4/5/7/10	HIPERFACE®	226	45
	EnDat	230	49

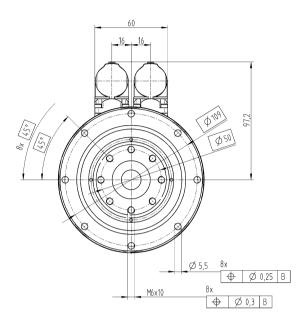
Ratio	Encoder	Length L0 in mm	Length L1 in mm
	Resolver	224	24
i = 4/5/7/10	HIPERFACE®	245	45
	EnDat	249	49

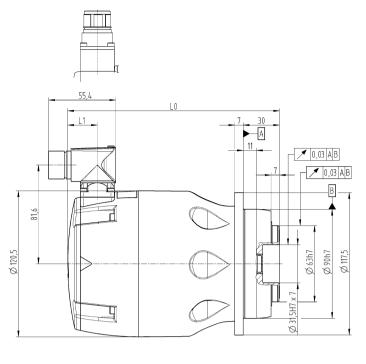
TPM⁺ POWER 010 2-stage

			2-stage								
Ratio	i		16	20	25	28	35	40	50	70	100
Operating voltage	U	V DC		1		1	560				
Max. acceleration torque		Nm	130	130	130	130	130	130	130	130	100
(max. 1000 cycles per hour)	T _{2B}	in.lb	1151	1151	1151	1151	1151	1151	1151	1151	885
•	_	Nm	66	84	90	90	90	48	62	86	60
Static output torque	T ₂₀	in.lb	584	743	797	797	797	425	549	761	531
Brake holding torque	_	Nm	72	90	112	126	158	180	225	250	180
(at 120 °C)	T _{2Br}	in.lb	637	797	991	1115	1398	1593	1991	2213	1593
Max. speed at output	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
	_	Nm	12.1	12.1	12.1	12.1	12.1	4.4	4.4	4.4	4.4
Max. motor acceleration torque	T _{1max}	in.lb	107	107	107	107	107	39	39	39	39
Max. motor acceleration current	I _{MaxDyn}	A _{eff}	17	17	17	17	17	6	6	6	6
Static motor current	I _o	A _{eff}	5.4	5.4	5.4	5.4	5.4	1.9	1.9	1.9	1.9
Max. backlash	j _t	arcmin				Standa	rd ≤ 3 Redu	uced ≤ 1			
Torsional rigidity		Nm/arcmin	32	32	32	31	32	30	30	28	22
(Gearbox)	C _{t21}	in.lb/arcmin	283	283	283	274	283	266	266	248	195
	С _{2К}	Nm/arcmin					225				
Tilting rigidity		in.lb/arcmin					1991		-		
	-	N	2150								
Max. axial force a)	F _{2AMax}	lb,	484								
		Nm	270								
Max. tilting moment	M _{2KMax}	in.lb					2390				
Service life	L	h					> 20000				
Weight		kg					6 to 7.4				
(without brake)	m	lb _m					13 to 16				
		°C					0 to +40				
Ambient temperature		°F					+32 to +10	4			
Lubrication						Lui	pricated for	life			
Insulating material class							F				
Protection class				-			IP 65				
Paint					Blue r	netallic 250) and natur	al cast alun	ninium		
Metal bellows coupling (recommended product type – validate sizing with cymex®)			BCT-00060AAX-050.000								
Bore diameter of coupling on the application side		mm	X = 014.000 - 035.000								
Mass moment of inertia		kgcm ²	2.02	1.99	1.98	1.96	1.96	0.72	0.72	0.72	0.72
(relates to the drive)	J_1	10 ⁻³ in.lb.s ²	1.8	1.8	1.8	1.7	1.7	0.64	0.64	0.64	0.64

 $\label{eq:please use our sizing software cymex $\ensuremath{^{\scriptscriptstyle (0)}}\ for a detailed sizing - www.wittenstein-cymex.com $\ensuremath{^{\scriptscriptstyle (0)}}\ for a detailed size \ensur







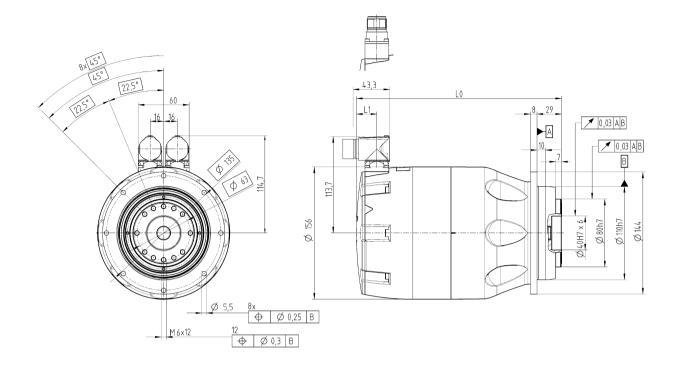
Ratio	Encoder	Length L0 in mm	Length L1 in mm
	Resolver	205	24
i = 16/20/25/28/35	HIPERFACE®	226	45
	EnDat	230	49
	Resolver	175	24
i = 40/50/70/100	HIPERFACE®	196	45
	EnDat	200	49

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

TPM+ POWER 025 1-stage

Ratio	i		4	5	7	10		
Operating voltage	UD	V DC						
Max. acceleration torque	_	Nm	112 141 199					
(max. 1000 cycles per hour)	T _{2B}	in.lb	991	1248	1761	1770		
	_	Nm	43	55	78	113		
Static output torque	T ₂₀	in.lb	381	487	690	1000		
Brake holding torque	_	Nm	52	65	91	130		
(at 120 °C)	T _{2Br}	in.lb	460	575	805	1151		
Max. speed at output	n _{2max}	rpm	1500	1200	857	600		
Speed limit for T _{2B}	п _{2В}	rpm	900	720	520	420		
•• • • • •	-	Nm	28.9	28.9	28.9	28.9		
Max. motor acceleration torque	T _{1max}	in.lb	256	256	256	256		
Max. motor acceleration current	I _{MaxDyn}	A _{eff}	40	40	40	40		
Static motor current	I _o	A _{eff}	13.7	13.7	13.7	13.7		
Max. backlash	j _t	arcmin		Standard ≤ 3	Reduced ≤ 1			
Torsional rigidity (Gearbox)	0	Nm/arcmin	80	86	76	62		
	C _{t21}	in.lb/arcmin	708	761	673	549		
Tildin e vizialite.		Nm/arcmin	550					
Tilting rigidity	С _{2К}	in.lb/arcmin	4868					
Max. axial force a)	-	N	4150					
	F _{2AMax}	^{2AMax} <i>Ib</i> , 934						
		Nm	440					
Max. tilting moment	M _{2KMax}	in.lb	3894					
Service life	L	h		> 20	0000			
Weight		kg		1	4			
(without brake)	m	lb _m		3	1			
		°C		0 to	+40			
Ambient temperature		°F		+32 to	o +104			
Lubrication				Lubricat	ed for life			
Insulating material class				I	F			
Protection class				IP	65			
Paint				Blue metallic 250 and	natural cast aluminium			
Metal bellows coupling (recommended product type – validate sizing with cymex®)			BCT-00150AAX-063.000					
Bore diameter of coupling on the application side		mm	X = 019.000 - 042.000					
Mass moment of inertia		kgcm ²	9.98	9.5	9.07	8.84		
(relates to the drive)	J_1	10 ⁻³ in.lb.s ²	8.8	8.4	8	7.8		

 $\label{eq:please} Please \ \text{use our sizing software } cymex^{\circledast} \ \text{for a detailed sizing} - www.wittenstein-cymex.com$



Ratio	Encoder	Length L0 in mm	Length L1 in mm
	Resolver	242	24
i = 4/5/7/10	HIPERFACE®	263	45
	EnDat	267	49

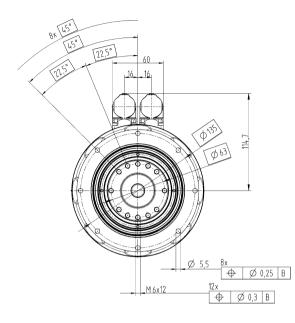
Ratio	Encoder	Length L0 in mm	Length L1 in mm
	Resolver	266	24
i = 4/5/7/10	HIPERFACE®	287	45
	EnDat	291	49

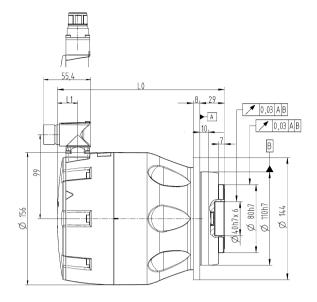
TPM⁺ POWER 025 2-stage

			2-stage								
Ratio	i		16	20	25	28	35	40	50	70	100
Operating voltage	U_D	V DC					560				
Max. acceleration torque	_	Nm	350	350	380	350	380	305	380	330	265
(max. 1000 cycles per hour)	T _{2B}	in.lb	3098	3098	3363	3098	3363	2699	3363	2921	2345
2	-	Nm	181	210	200	210	220	113	142	200	120
Static output torque	T ₂₀	in.lb	1602	1859	1770	1859	1947	1000	1257	1770	1062
Brake holding torque	-	Nm	208	260	325	364	455	520	625	625	600
(at 120 °C)	T _{2Br}	in.lb	1841	2301	2877	3222	4027	4602	5532	5532	5310
Max. speed at output	n _{2max}	rpm	375	300	240	214	171	150	120	86	60
Speed limit for T _{2B}	п _{2В}	rpm	260	220	185	170	140	90	70	65	50
	_	Nm	28.9	28.9	28.9	28.9	28.9	7.8	7.8	7.8	7.8
Max. motor acceleration torque	T _{1max}	in.lb	256	256	256	256	256	69	69	69	69
Max. motor acceleration current	I _{MaxDyn}	A _{eff}	40	40	40	40	40	12	12	12	12
Static motor current	I _o	A _{eff}	13.7	13.7	13.7	13.7	13.7	4	4	4	4
Max. backlash	j _t	arcmin		1		Standa	rd ≤ 3 Redu	iced ≤ 1			
Torsional rigidity		Nm/arcmin	81	81	83	80	82	76	80	71	60
(Gearbox)	C _{t21}	in.lb/arcmin	717	717	735	708	726	673	708	628	531
	С _{2К}	Nm/arcmin		1			550				
Tilting rigidity		in.lb/arcmin					4868		-		
	_	N	4150								
Max. axial force a)	F _{2AMax}	lb,	934								
		Nm	440								
Max. tilting moment	M _{2KMax}	in.lb					3894				
Service life	L	h					> 20000				
Weight		kg					10.3 to 14.	5			
(without brake)	m	lb _m					23 to 32				
		°C	0 to +40								
Ambient temperature		°F					+32 to +10	4			
Lubrication						Lui	pricated for	life			
Insulating material class							F				
Protection class							IP 65				
Paint					Blue r	netallic 250) and natur	al cast alun	ninium		
Metal bellows coupling (recommended product type – validate sizing with cymex®)			BCT-00150AAX-063.000								
Bore diameter of coupling on the application side		mm	X = 019.000 - 042.000								
Mass moment of inertia	1.	kgcm²	8.94	8.83	8.81	8.72	8.71	2.48	2.48	2.48	2.47
(relates to the drive)	J_1	10 ⁻³ in.lb.s ²	7.9	7.8	7.8	7.7	7.7	2.2	2.2	2.2	2.2

 $\label{eq:please use our sizing software cymex $\ensuremath{^{\scriptscriptstyle (0)}}\ for a detailed sizing - www.wittenstein-cymex.com $\ensuremath{^{\scriptscriptstyle (0)}}\ for a detailed size \ensur







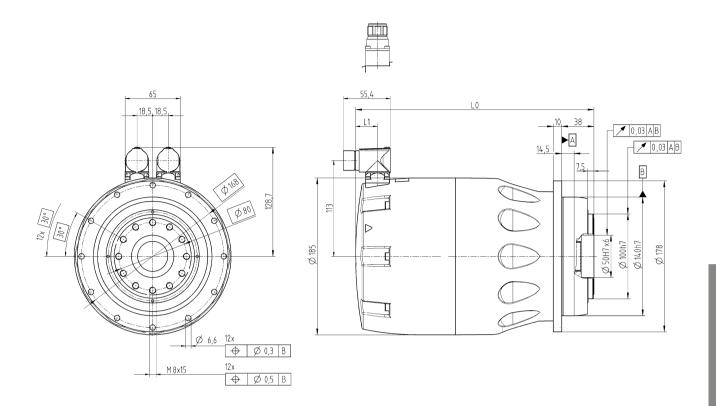
Ratio	Encoder	Length L0 in mm	Length L1 in mm
	Resolver	242	24
i = 16/20/25/28/35	HIPERFACE®	263	45
	EnDat	267	49
	Resolver	197	24
i = 40/50/70/100	HIPERFACE®	218	45
	EnDat	222	49

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

TPM+ POWER 050 1-stage

				1-st	age		
Ratio	i		4	5	7	10	
Operating voltage	UD	V DC	560				
Max. acceleration torque		Nm	221 278 340				
(max. 1000 cycles per hour)	T _{2B}	in.lb	1956	2461	3009	3098	
•	_	Nm	72	91	130	188	
Static output torque	T ₂₀	in.lb	637	805	1151	1664	
Brake holding torque		Nm	92	115	161	230	
(at 120 °C)	T _{2Br}	in.lb	814	1018	1425	2036	
Max. speed at output	n _{2max}	rpm	1250	1000	714	500	
Speed limit for T _{2B}	n _{2B}	rpm	780	620	450	370	
	_	Nm	56.6	56.6	56.6	56.6	
Max. motor acceleration torque	T _{1max}	in.lb	501	501	501	501	
Max. motor acceleration current	I _{MaxDyn}	A _{eff}	63.5	63.5	63.5	63.5	
Static motor current	I _o	A _{eff}	19	19	19	19	
Max. backlash	j,	arcmin		Standard ≤ 3	Reduced ≤ 1	1	
Torsional rigidity (Gearbox)		Nm/arcmin	190	187	159	123	
	C _{t21}	in.lb/arcmin	1682	1655	1407	1089	
		Nm/arcmin	560				
Tilting rigidity	С _{2К}	in.lb/arcmin	4956				
	_	N	6130				
Max. axial force ^{a)}	F _{2AMax}	lb,	1379				
		Nm	1335				
Max. tilting moment	M _{2KMax}	in.lb	11816				
Service life	L _h	h		> 20	0000		
Weight		kg		23	3.6		
(without brake)	m	lb _m		5	2		
		°C		0 to	+40		
Ambient temperature		°F		+32 to	o +104		
Lubrication				Lubricate	ed for life		
Insulating material class				I	=	·	
Protection class				IP	65	·	
Paint				Blue metallic 250 and	natural cast aluminium		
Metal bellows coupling (recommended product type – validate sizing with cymex®)			BCT-00300AAX-080.000				
Bore diameter of coupling on the application side		mm	X = 024.000 - 060.000				
Mass moment of inertia	Ι,	kgcm²	26.4	24.8	23.3	22.5	
(relates to the drive)	J_1	10 ⁻³ in.lb.s ²	23	22	21	20	

 $\label{eq:please} Please \ \text{use} \ \text{our sizing software cymex}^{\circledast} \ \text{for a detailed sizing} \ - \ www.wittenstein-cymex.com$



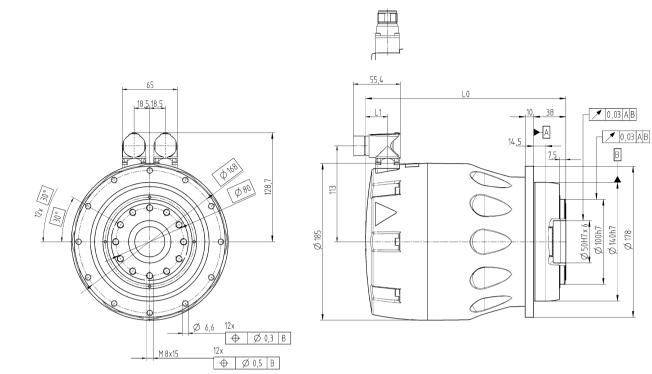
Ratio	Encoder	Length L0 in mm	Length L1 in mm
	Resolver	281	26
i = 4/5/7/10	HIPERFACE®	306	50
	EnDat	306	50

Ratio	Encoder	Length L0 in mm	Length L1 in mm
	Resolver	321	26
i = 4/5/7/10	HIPERFACE®	346	50
	EnDat	346	50

TPM⁺ POWER 050 2-stage

			2-stage								
Ratio	i		16	20	25	28	35	40	50	70	100
Operating voltage	UD	V DC					560				
Max. acceleration torque (max. 1000 cycles per hour)	_	Nm	750	750	750	750	750	607	750	700	540
	T _{2B}	in.lb	6638	6638	6638	6638	6638	5372	6638	6196	4779
	-	Nm	293	371	400	400	400	199	250	354	240
Static output torque	T ₂₀	in.lb	2593	3284	3540	3540	3540	1761	2213	3133	2124
Brake holding torque	-	Nm	368	460	575	644	805	920	1150	1250	1100
(at 120 °C)	T _{2Br}	in.lb	3257	4071	5089	5700	7125	8143	10178	11064	9736
Max. speed at output	n _{2max}	rpm	312	250	200	179	143	125	100	71	50
Speed limit for T _{2B}	п _{2В}	rpm	210	180	155	145	125	90	80	65	50
	_	Nm	56.6	56.6	56.6	56.6	56.6	15.6	15.6	15.6	15.6
Max. motor acceleration torque T_{η}	T _{1max}	in.lb	501	501	501	501	501	138	138	138	138
Max. motor acceleration current	I _{MaxDyn}	A _{eff}	63.5	63.5	63.5	63.5	63.5	33	33	33	33
Static motor current	I _o	A _{eff}	19	19	19	19	19	7.5	7.5	7.5	7.5
Max. backlash	j _t	arcmin				Standa	rd ≤ 3 Redu	iced ≤ 1			
Torsional rigidity	C ₁₂₁	Nm/arcmin	180	185	180	180	175	175	175	145	115
(Gearbox)		in.lb/arcmin	1593	1637	1593	1593	1549	1549	1549	1283	1018
		Nm/arcmin					560	I			
Tilting rigidity	С _{2К}	in.lb/arcmin	4956								
		N	6130								
Max. axial force a)	F _{2AMax}	lb,	1379								
		Nm	1335								
Max. tilting moment	M _{2KMax}	in.lb	11816								
Service life	L	h					> 20000				
Weight		kg					19.4 to 25. ⁻				
(without brake)	m	lb _m					43 to 55				
		°C					0 to +40				
Ambient temperature		°F					+32 to +104	1			
Lubrication						Lui	pricated for	life			
Insulating material class							F				
Protection class							IP 65				
Paint					Blue r	netallic 250) and natura	al cast alun	ninium		
Metal bellows coupling (recommended product type – validate sizing with cymex®)			BCT-00300AAX-080.000								
Bore diameter of coupling on the application side		mm	X = 024.000 - 060.000								
Mass moment of inertia	1.	kgcm ²	23.1	22.6	22.6	22.2	22.2	6.3	6.3	6.3	6.3
(relates to the drive)	J_1	10 ⁻³ in.lb.s ²	20	20	20	20	20	5.6	5.6	5.6	5.6

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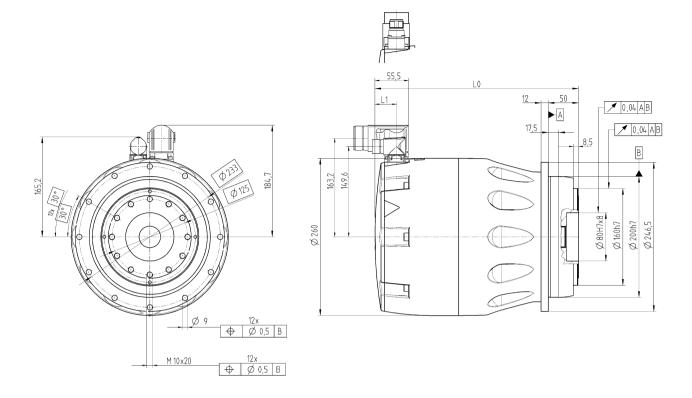
Ratio	Encoder	Length L0 in mm	Length L1 in mm
	Resolver	281	26
i = 16/20/25/28/35	HIPERFACE®	306	50
	EnDat	306	50
	Resolver	236	26
i = 40/50/70/100	HIPERFACE®	261	50
	EnDat	261	50

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

TPM⁺ POWER 110 1-stage

				age			
Ratio	i		4	5	7	10	
Operating voltage	UD	V DC		56	60		
Max. acceleration torque	_	Nm	340	428	603	555	
(max. 1000 cycles per hour)	T _{2B}	in.lb	3009	3788	5337	4912	
		Nm	136	172	246	356	
Static output torque	T ₂₀	in.lb	1204	1522	2177	3151	
Brake holding torque		Nm	288	360	504	720	
(at 120 °C)	T _{2Br}	in.lb	2549	3186	4461	6373	
Max. speed at output	n _{2max}	rpm	1050	840	643	450	
Speed limit for T _{2B}	п _{2В}	rpm	950	750	540	450	
		Nm	88	88	88	88	
Max. motor acceleration torque	T _{1max}	in.lb	779	779	779	779	
Max. motor acceleration current	I _{MaxDyn}	A _{eff}	100	100	100	100	
Static motor current	I _o	A _{eff}	38.6	38.6	38.6	38.6	
Max. backlash	j _t	arcmin		Standard ≤ 3	Reduced ≤ 1		
Torsional rigidity (Gearbox)	C _{t21}	Nm/arcmin	610	610	550	445	
		in.lb/arcmin	5399	5399	4868	3939	
Tilting rigidity		Nm/arcmin	1452				
	С _{2К}	in.lb/arcmin	12851				
	_	N	10050				
Max. axial force ^{a)}	F _{2AMax}	lb,		22	61		
		Nm		32	80		
Max. tilting moment	M _{2KMax}	in.lb		290)31		
Service life	L	h		> 20	0000		
Weight		kg		58	3.8		
(without brake)	m	lb _m		1:	30		
		°C		0 to	+40		
Ambient temperature		°F		+32 tc	o +104		
Lubrication				Lubricate	ed for life		
Insulating material class				F	=		
Protection class				IP	65		
Paint				Blue metallic 250 and	natural cast aluminium		
Metal bellows coupling (recommended product type – validate sizing with cymex®)			BCT-01500AAX-125.000				
Bore diameter of coupling on the application side		mm	X = 050.000 - 080.000				
Mass moment of inertia		kgcm²	142	132	123	118	
(relates to the drive)	J_1	10 ⁻³ in.lb.s ²	126	117	109	104	

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Ratio	Encoder	Length L0 in mm	Length L1 in mm
	Resolver	337	36
i = 4/5/7/10	HIPERFACE®	361	60
	EnDat	361	60

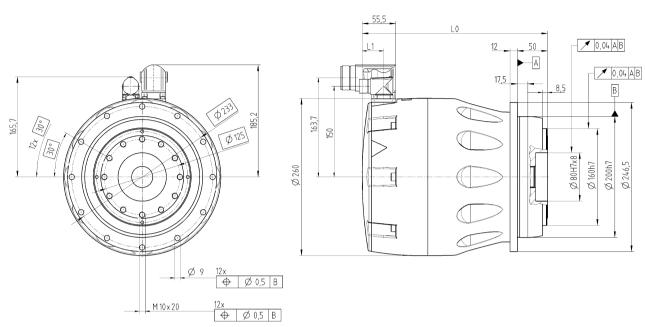
Ratio	Encoder	Length L0 in mm	Length L1 in mm
	Resolver	387	36
i = 4/5/7/10	HIPERFACE®	411	60
	EnDat	411	60

TPM⁺ POWER 110 2-stage

			2-stage								
Ratio	i		16	20	25	28	35	40	50	70	100
Operating voltage	UD	V DC		1			560				
Max. acceleration torque (max. 1000 cycles per hour)	_	Nm	1375	1600	1600	1600	1600	1600	1600	1600	1400
	T _{2B}	in.lb	12170	14161	14161	14161	14161	14161	14161	14161	1239
Chetia autout tarrena	-	Nm	558	705	886	999	1250	794	997	900	800
Static output torque	T ₂₀	in.lb	4939	6240	7842	8842	11064	7028	8824	7966	7081
Brake holding torque	-	Nm	1152	1440	1800	2016	2520	2750	2750	1750	2500
(at 120 °C)	T _{2Br}	in.lb	10196	12745	15931	17843	22304	24340	24340	15489	2212
Max. speed at output	n _{2max}	rpm	281	225	180	161	129	112	90	64	45
Speed limit for T _{2B}	п _{2В}	rpm	230	190	170	160	135	95	85	65	50
Man and a standard and a standard st		Nm	88	88	88	88	88	44.2	44.2	44.2	44.2
Max. motor acceleration torque	T _{1max}	in.lb	779	779	779	779	779	391	391	391	391
Max. motor acceleration current	I _{MaxDyn}	A _{eff}	100	100	100	100	100	50	50	50	50
Static motor current	I _o	A _{eff}	38.6	38.6	38.6	38.6	38.6	21.9	21.9	21.9	21.9
Max. backlash	j _t	arcmin		1		Standa	rd ≤ 3 Redu	iced ≤ 1	I		
Torsional rigidity	C ₁₂₁	Nm/arcmin	585	580	570	560	560	520	525	480	395
(Gearbox)		in.lb/arcmin	5178	5133	5045	4956	4956	4602	4647	4248	3496
		Nm/arcmin					1452				
Tilting rigidity	С _{2К}	in.lb/arcmin					12851				
	F _{2AMax}	N	10050								
Max. axial force a)		lb _f	2261								
		Nm	3280								
Max. tilting moment	M _{2KMax}	in.lb	29031								
Service life	L _h	h					> 20000				
Weight		kg				:	52.3 to 59.6	6			
(without brake)	m	lb _m	116 to 132								
A		°C	0 to +40								
Ambient temperature		°F				-	+32 to +104	4			
Lubrication						Lut	pricated for	life			
Insulating material class							F				
Protection class							IP 65				
Paint					Blue r	netallic 250) and natur	al cast alun	ninium		
Metal bellows coupling (recommended product type – validate sizing with cymex*)			BCT-01500AAX-125.000								
Bore diameter of coupling on the application side		mm	X = 050.000 - 080.000								
Mass moment of inertia		kgcm²	117	117	116	115	115	60	60	60	60
(relates to the drive)	J_1	10 ⁻³ in.lb.s ²	104	104	103	102	102	53	53	53	53

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

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

TPM⁺ options

Electrical connection Straight or angled version.

Encoder

In addition to the standard version with resolver, optional encoder systems with the protocols EnDat 2.1 and HIPERFACE® are available.

Temperature sensor

Choose from PTC for temperature switch functionality or KTY for a linear reading of operating temperature.

Pin assignment

For a number of servo controllers, we offer special pin assignments for power and signal.

Operating voltage

Lubrication

grade grease and oil.

Depending on the application and servo regulator, windings for 48, 320 and 560 V DC are available.

Select from the standard lubrication

with oil or grease as well as food-

Holding brake

A suitable permanent-magnet holding brake adapted to the motor power is available.

Backlash

To improve precision, the gearbox backlash can be reduced.

Increased corrosion protection

For applications with requirements in terms of resistance to water and cleaning agents a version with greater corrosion protection and protection class IP 66 is available.

TPM⁺ options

Lubrication

Depending on the application, the requirements regarding the lubricant in the gearbox change.

The following lubricants are available for our servo actuators:

- Oil (Standard)
- Grease (Reduction of output torque by up to 20 %)
- Food-grade oil (Reduction of output torque by up to 20 %)
- Food-grade grease (Reduction of output torque by up to 40 %)

Operating voltage

The TPM⁺ servo actuators are available for operating voltages of 48 V (only TPM⁺ DYNAMIC 004 and 010, TPM⁺ POWER 004), 320 V and 560 V.

Temperature sensor

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

- PTC resistor, type STM 160 according to DIN 44081/82

- KTY 84-130

Encoder

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

Resolver

- 2-pin, one sine/cosine cycle per rotation

HIPERFACE® absolute encoder

- Singleturn, resolution 4096 positions per revolution, 128 sine/cosine
- Multiturn, resolution 4096 positions per revolution, 128 sine/cosine, 4096 revolutions

EnDat 2.1, absolute encoder

- Singleturn, resolution 8192 positions per revolution, 512 sine/cosine
- Multiturn, resolution 8192 positions per revolution, 512 sine/cosine, 4096 revolutions

HIPERFACE DSL®, EnDat 2.2 or DRIVE-CLiQ upon request

Holding brake

A compact permanent magnet brake is fitted to secure the motor shaft when the actuator is disconnected from the power. Characteristics include holding without torsional backlash, no residual torque when the brake is released and unlimited power-on time at zero speed.

Size DYNAMIC	004 and 010				025				050 and 110				
Size DTNAMIC		004 and 010				025				050 and 110			
Holding torque at 120 °C	Nm	1.1				4.5				13			
Supply voltage	V DC					24 + 6 % / -10 %							
Current	A	0.42				0.42			0.71				
Size POWER	004		010		025			050		110			
Holding torque at 120 °C	Nm	1.1	4.5		4.5		1	13		23		72	
Supply voltage	V DC					24 + 6 % / -10 %							
Current	А	0.42			0.42	0.51			1			1.2	
Size HIGH TORQUE		1	10		25			50		50		110	
Rations		22 – 110	154 – 2	220	22 – 55	6	6 – 220	22 – 55	6	6 – 220	22	- 88	110 – 220
Holding torque at 120 °C	Nm	4.5	1.8	;	13		4.5	23		13		72	23
Supply voltage	V DC					24 + 6% / -10%							
Current	A	0.42	0.42	2	0.71		0.42	1		0.71		1.2	1

In the case of high ratios, a brake with a reduced holding torque is partly used 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. In the case of transmission ratios in which the holding torque at the output is above T_{2B} , the brake can be used max. 1000 times for emergency stopping on the rotating motor.

TPM+ options

Electrical connection

The conventional connection via two integral sockets for power and signal is available, as well as a version for a single-cable connection, which is available upon request.

Integral sockets used:

Two-cable	Power	Integral power socket M23 Bayonet coupling, 6/9-pin
connection	Signal	Integral signal socket M23 Bayonet coupling, 9/12/17-pin

Pin assignment

In addition to two standard WITTENSTEIN pin assignments, a number of compatible connections are available for various servo controller suppliers.

Pin assignment 1	WITTENSTEIN alpha-Standard, temperature sensor in signal cable Resolver, HIPERFACE®, EnDat 2.1	Pin assignment 6	B&R compatible Resolver, EnDat 2.1
Pin assignment 4	WITTENSTEIN alpha-Standard, temperature sensor in power cable Resolver, HIPERFACE [®] , EnDat 2.1	Pin assignment 8	Schneider compatible HIPERFACE®
Pin assignment 5	Rockwell compatible HIPERFACE®	Pin assignment 9	Beckhoff compatible Resolver, EnDat 2.1

Increased corrosion protection

All actuators of the "TPM⁺" product range (except Size 004 DYNAMIC) 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 stainless steel screws.
- 4 Additional U-seals on the external screws.
- **5** Base (chemically nickel plated) for integral socket with laser-marking of identification plate.
- 6 All versions are generally equipped with straight integral socket only.
- The TPM⁺ is completely painted with a highly resistant, two-component epoxy resin based material. Colors: - Ultramarine blue silk matte (RAL 5002)
 - Papyrus white silk matte (RAL 9018)

Fields of application

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

Resistance

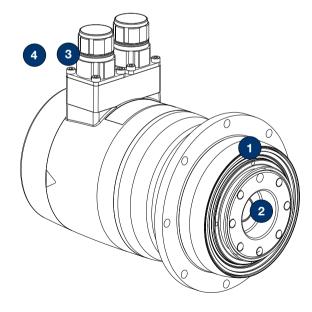
- to water and moisture.
- restricted due to cleaning agents, especially under extended exposure period.

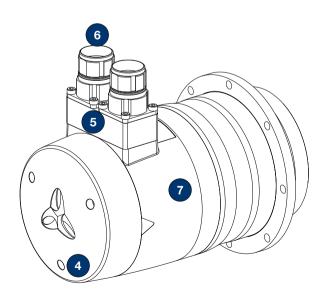
Successful tests with Oxofoam VF5L (Johnson Diversey) and Ultraclean VK3 (Johnson Diversey).

- Further cleaning agents can be qualified on request.

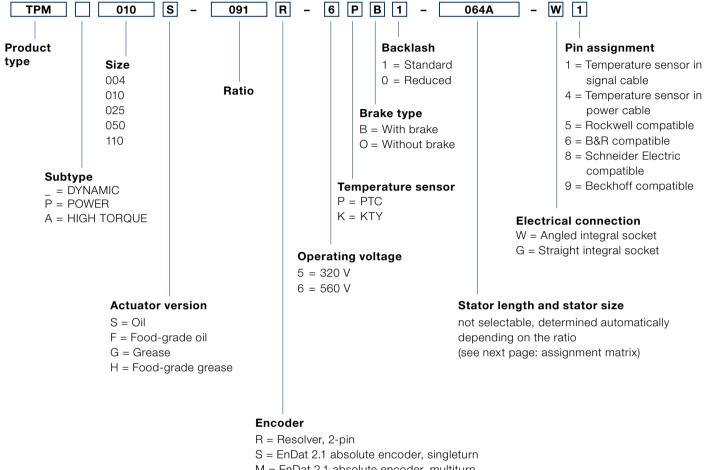
Protection class

Against spray water: IP 66





TPM⁺ Ordering code

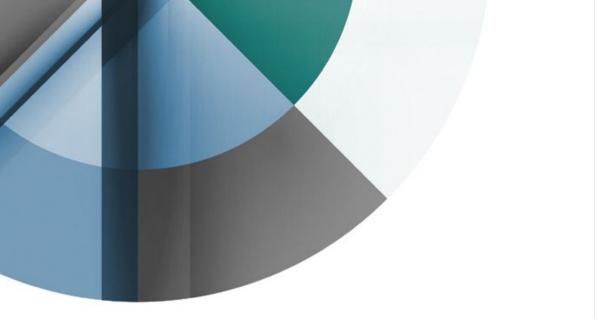


- M = EnDat 2.1 absolute encoder, multiturn
- N = HIPERFACE[®] absolute encoder, singleturn
- K = HIPERFACE[®] absolute encoder, multiturn
- T = 5V-TTL incremental encoder with hall signal
- E = Absolute encoder, singleturn, Rockwell compatible
- V = Absolute encoder, multiturn, Rockwell compatible

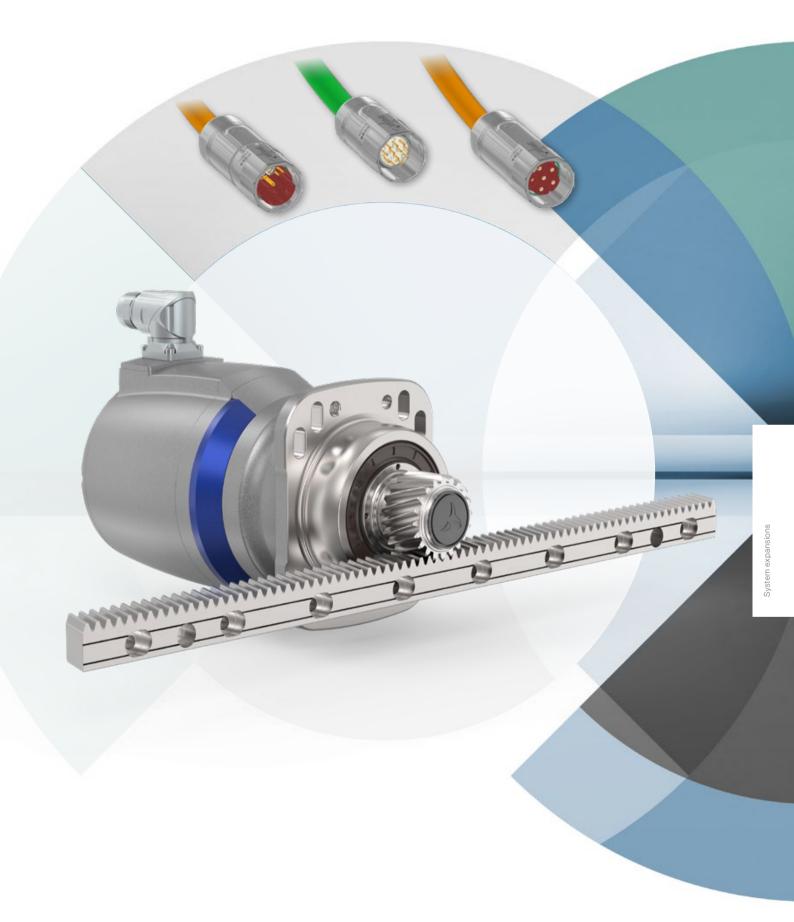
	Size	004		Size 010			Size 025			Size 050			Size 110	
Ratio	DYNAMIC	POWER	DYNAMIC	POWER	HIGH TORQUE									
4	x	64B	x	94C	x	x	130D	x	x	155D	x	x	220D	x
5	x	64B	x	94C	x	x	130D	x	x	155D	x	x	220D	x
7	x	64B	x	94C	x	x	130D	x	x	155D	х	x	220D	x
10	x	64B	x	94C	x	x	130D	x	x	155D	х	x	220D	x
16	53B	64B	64B	94C	x	94C	130D	x	130D	155D	х	130E	220D	x
20	x	64B	x	94C	x	x	130D	x	x	155D	х	x	220D	x
21	53B	х	64B	х	x	94C	х	x	130D	х	х	130E	х	x
22	x	х	x	х	94C	x	х	130D	x	х	155D	x	х	220H
25	x	64B	x	94C	x	x	130D	x	x	155D	x	x	220D	x
27,5	x	х	x	х	94C	x	х	130D	x	х	155D	x	х	220H
28	x	64B	x	94C	x	x	130D	x	x	155D	х	x	220D	x
31	53B	x	64B	x	x	94C	х	x	130D	x	х	130E	x	x
35	x	64B	x	94C	x	x	130D	x	x	155D	х	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	х	x	220B	x
50	x	64A	x	94A	x	x	130A	x	x	155A	х	x	220B	x
55	x	x	x	х	94C	x	х	130D	x	x	155D	x	x	220H
61	53A	x	64A	x	x	94A	х	x	130A	x	х	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	х	x	х	94A	x	х	94C	x	х	130D	x	х	155D

Motor / gearbox assignment matrix

x = no standard combination



System expansions premo® / TPM+



System expansions Cable

The range of high-performance servo actuators is completed by the appropriate connection technology:

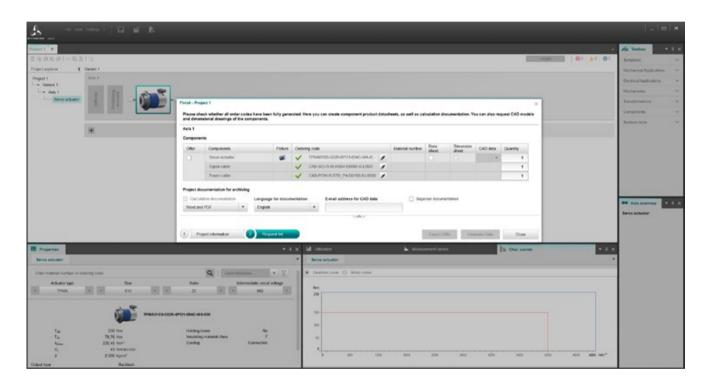
Our special system cables support the high performance of the machine most effectively and therefore represent the optimal system expansion "directly from the manufacturer".

All the cables are characterized by excellent quality and are compatible with drag chains using highly flexible lines according to DIN VDE 0295, class 6. They are also oil and flame-resistant as well as halogen, silicone and CFC-free.

Power and signal cables as well as hybrid cables for singlecable connections are available.

In the version with separate cables, a distinction is also made as to whether the temperature signal is transmitted in the power or signal cable.

The cable cross sections are adapted to the relevant power requirement of the servo actuators and range from 1.5 to 16 mm^2 .



We offer numerous pre-assembled cables for a variety of servo actuator and controller versions, e.g. from Siemens upon request. The available versions can be found using cymex[®] 5.





System expansions Rack&Pinion System

Strong performance in the advanced segment

Advanced Linear Systems are adapted to applications with average to high demands in terms of smooth running, positioning accuracy and feed force. Different gearbox variants and options such as HIGH TORQUE or HIGH SPEED can be selected to produce the best system for the application. Typical fields of application include wood, plastic and composite machining, machining centers and automation.

The alpha preferential linear system – The best from each segment

Our preferential linear systems in the advanced segment are always comprised of the perfect combination of gearbox, pinion, rack and lubrication system. The systems have been optimized to achieve the required feed force, feed speed, rigidity and degree of utilization of the individual components.



Please refer to our alpha Linear Systems catalog and the website for more information: www.wittenstein-alpha.com/ linear-systems

For a wide range of applications

Linear systems from WITTENSTEIN alpha are suitable for a wide range of applications and industries. New standards and advantages have been achieved in the following areas:

- \cdot Smooth running
- · Positioning accuracy
- \cdot Feed force
- \cdot Power density
- Rigidity
- · Easy assembly
- · Design options
- · Scalability

Together with a comprehensive range of services, we pledge to support you from the initial concept to the design, installation and commissioning phase.

We will also ensure a consistent supply of spare parts.

Your benefits at a glance

Perfectly adapted linear systems available with planetary, right-angle and worm gearboxes or as a servo actuator

Optionally with INIRA®

Large individual configuration space due to numerous pinion / gearbox combinations





Simply scan the QR code using your smartphone to see INIRA® in action.

INIRA®: The revolution in rack installation

INIRA® combines our existing innovative concepts for the simple, safe and efficient installation of racks. INIRA® clamping, INIRA® adjusting and INIRA® pinning have already made the installation process much faster, more accurate and more ergonomic. Available for the Advanced and Premium Linear Systems.

INIRA[®] clamping: Simply faster and more ergonomic

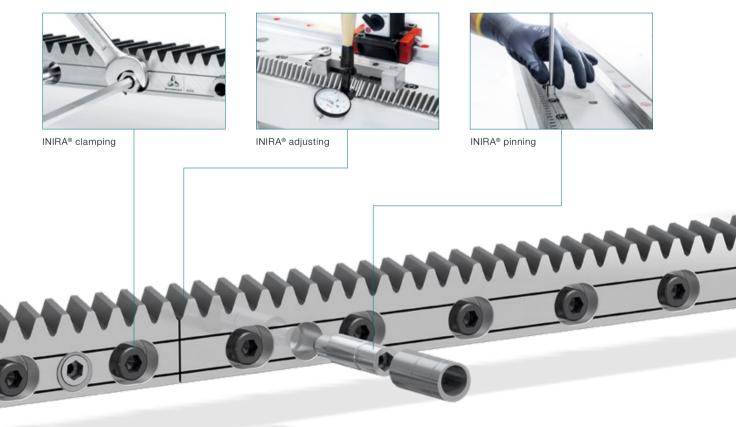
Previously, enormous effort was required to clamp racks to the machine bed using screw clamps. INIRA® clamping integrates the clamping device in the rack. The rack incorporates a mounting sleeve which is guided over the head of the fastening screw to ensure quick and ergonomic clamping.

INIRA[®] adjusting: Simply safer and more precise

In combination with INIRA® clamping, INIRA® adjusting is the ideal solution for perfectly adjust the transition between two rack segments. The innovative adjustment tool can adjust the transition extremely reliable and precise, accurate to the micrometer.

INIRA[®] pinning: Simply better and more efficient

The previous method used for pinning racks was extremely time-consuming. Precision bores had to be drilled and the chips generated must be carefully removed from the assembly. INIRA® pinning now offers a completely new solution for the chipless pinning of racks, which reduces installation times considerably (time spent on each rack ~ 1 min).



WITTENSTEIN alpha – compatible with all axes

We offer complete drive solutions for each axis from a single source. The fields of application of our linear systems are virtually unlimited, ranging from automation solutions to high-precision axes in machine tools and manufacturing systems that are required to achieve maximum productivity. We always stand as a synonym for the highest quality and reliability, extremely smooth running and high positioning accuracy and feed force combined with maximum power density and outstanding rigidity. Our linear systems offer innovative drive and assembly solutions.

premo® XP Line

User-friendly assembly solutions

References across all segments



7. Axis Source: YASKAWA Nordic AB

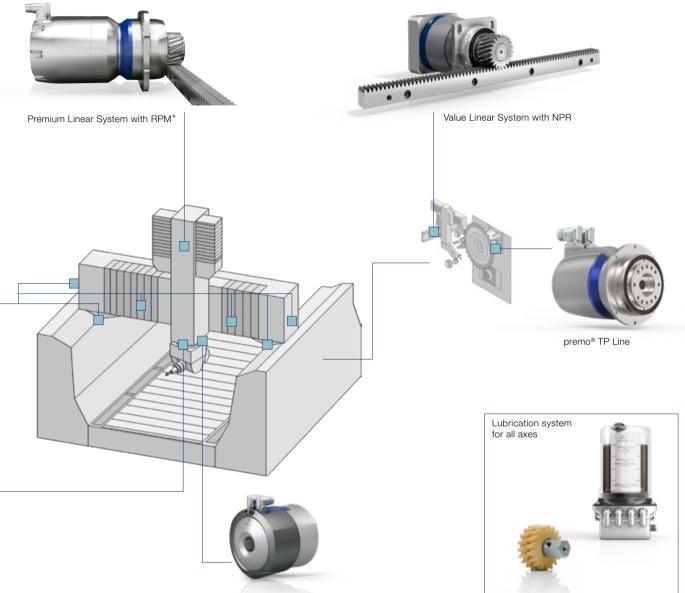


Pipe bending machine Source: Wafios AG



CNC machining centers for wood, plastic and composite materials Source: MAKA Systems GmbH

Exemplary product solutions in a portal milling machine



Galaxie[®] drive system



Flatbed laser Source: Yamazaki Mazak Corporation





HSC portal milling machine Source: F. Zimmermann GmbH

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Information



Glossary - the alphabet

Ambient temperature

It describes the temperature of the air for the operation of servo actuators according to DIN EN 60204-1.

cymex®

cymex[®] is the calculation software developed by our company for dimensioning complete drive trains. The software enables the precise simulation of motion and load variables. The software is available for download from our website (www.wittenstein-cymex.de). We can also provide training to enable you to make full use of all the possibilities provided by the software.

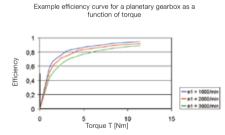
DRIVE-CLiQ

Protocol for transmitting absolute values and parameters, developed by Siemens.

Efficiency (η)

Efficiency [%] η is the ratio of output power to input power. Power lost through friction reduces efficiency to less than 1 or 100%.

$$\eta = P_{\text{off}} / P_{\text{on}} = (P_{\text{on}} - P_{\text{loss}}) / P_{\text{on}}$$



WITTENSTEIN alpha always measures the efficiency of a gearbox / servo actuator during operation at full load. If the input power or torque are lower, the efficiency rating is also lower due to the constant no-load torque. Power losses do not increase as a result. A lower efficiency is also expected at high speeds (see illustration).

Encoder

The rotary encoder represents an important part of the servo system, which determines the current speed and position for control purposes. Different measuring methods are used here: Electromagnetic induction (resolver) or optical sensing of an encoder disc (absolute encoder).

EnDat

Protocol for transmitting absolute values and parameters, developed by Heidenhain.

HIPERFACE®

Protocol for transmitting absolute values and parameters, developed by Sick Stegmann.

Holding brake

The holding brake serves to lock an axis when stationary. In contrast to a service brake, it is not used to reduce the speed, except in emergency stop situations. The number of possible emergency stops can be calculated based on the speed and moved mass information.

Insulation class

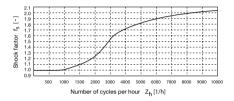
The motor insulation class defines the maximum operating temperatures of the insulation materials used. At Class F, this is 155 °C.

Jerk

Jerk is derived from acceleration and is defined as the change in acceleration within a unit of time. The term impact is used if the acceleration curve changes abruptly and the jerk is infinitely large.

Load factor (f)

The maximum permissible acceleration torque during cyclic operation specified in the catalog applies for a cycle rate of less than 1,000/h. Higher cycle rates combined with short acceleration times can cause vibrations in the drive train. Use the load factor f_s to include the resulting excess torque values in calculations. The load factor f_s can be determined with reference to the curve.



This calculated value is multiplied by the actual acceleration torque $T_{\rm 2b}$ and then compared with the maximum permissible acceleration torque

 T_{2B} . $(T_{2b} \cdot f_s = T_{2b, fs} < T_{2B})$

Mass inertia ratio (λ = Lambda)

The mass inertia ratio λ is the ratio of external inertia (application side) to internal inertia (motor and gearbox side). It is an important parameter determining the controllability of an application. Accurate control of dynamic processes becomes more difficult with differing mass moments of inertia and as λ becomes greater. Conversely, the energy consumption can be reduced through a higher lambda value.

A gearbox reduces the external mass moment of inertia by a factor of 1/i².

$$\lambda = \frac{J_{external}}{J_{internal}}$$

 $J_{external}$ reduced at input: $J'_{external} = J_{external} / i^2$ The increased rigidity of the servo actuators permits higher lambda values compared to standard motor / gearbox combinations:

Simple applications ≤ 20 Dynamic applications ≤ 10 Highly dynamic applications ≤ 2

Mass moment of inertia (J)

The mass moment of inertia J [kgm²] is a measure of the effort applied by an object to maintain its momentary condition (at rest or moving).

Max. acceleration current

Depending on the application, a distinction is made between a static and a dynamic acceleration current / acceleration torque. Please refer to the chapter Compendium on page 136 for more detailed information.

OEE

Acronym for the "Overall Equipment Effectiveness" value. After subtraction of the planned downtimes, it is a measure for the added value of a system and is calculated based on the factors of availability, performance and quality. The value is between 0% and 100%.

Operating voltage

The motor windings are available for various operating voltages. The operating voltage (intermediate circuit voltage) corresponds to the rectified peak value of the supply voltage from the grid.

Pin assignment

It defines the assignment of the individual pins in the mounting socket. The supply voltage for the motor and brake, the temperature signal and the motor encoder signals are applied via these pins.

Safety note

For applications with special safety requirements (e.g. vertical axes, clamped drives), we recommend exclusive use of our Premium and Advanced products (excluding V-Drive).

Servo actuator

In addition to a high-precision planetary gearbox, the servo actuator is fitted with a powerful, permanently energized synchronous servo motor with a distributed winding that guarantees a high power density and a constant speed. As a result, linear drives that are even more compact and powerful can be implemented. By using a smaller, more efficient actuator with lower inertia and higher rigidity, a smaller servo controller can also be used, thus saving upfront cost as well as operating costs in the form of lower energy consumption while achieving the same productivity. The solution here is a combination of a lower mass moment of inertia and a higher degree of rigidity.

SIL

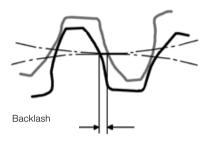
Stands for the safety integrity level from the area of functional safety and is referred to as safety level or safety integrity level in accordance with the IEC 61508 / IEC61511 standard. There are 4 levels. Up to level 2, the manufacturers can make the hazard assessments on their own authority, from level 3 upwards, this must be carried out by an independent, accredited body.

Tilting moment (M_{2K})

The tilting moment $M_{\rm 2K}$ is a result of the axial and lateral forces applied and their respective points of application in relation to the inner radial bearing on the output side.

Torsional backlash (j,)

Torsional backlash j_t [arcmin] is the maximum angle of torsion of the output shaft in relation to the input. Simply put, the torsional backlash represents the gap between two tooth flanks.



Torsional backlash is measured with the input shaft locked.

The output is then loaded with a defined test torque, to overcome the internal gearbox friction. The main factor affecting torsional backlash is the face clearance between the gear teeth. The low torsional backlash of WITTENSTEIN alpha gearboxes is due to their high manufacturing accuracy and the specific combination of gears.

Glossary – Formulary

Formulary

Torque [Nm]	$T = J \cdot \alpha$	J = Mass moment of inertia [kgm ²] α = Angular acceleration [1/s ²]
Torque [Nm]	T=F·I	F = Force [N] / = Lever, length [m]
Acceleration force [N]	F _b =m·a	m = Mass [kg] a = Linear acceleration [m/s ²]
Frictional force [N]	$F_{\text{Reib}} = m \cdot g \cdot \mu$	g = Acceleration due to gravity 9.81 m/s ² μ = Coefficient of friction
Angular speed [1/s]	$\omega = 2 \cdot \pi \cdot n / 60$	n = Speed [rpm] $\pi = $ Pl = 3.14
Linear speed [m/s]	$V = \omega \cdot r$	v = Linear speed [m/s] h = Radius [m]
Linear speed [m/s] (Ballscrew)	$v = \omega \cdot h / (2 \cdot \pi)$	h = Screw pitch [m]
Linear acceleration [m/s ²]	$a = v/t_{\rm b}$	t = Acceleration time [s]
Angular acceleration [1/s ²]	$\alpha = \omega / t_{\rm b}$	$t_{\rm b}$ = Acceleration time [s]
Pinion path [mm]	$s = m_n \cdot z \cdot \pi / \cos \beta$	$m_n =$ Normal module [mm] z = Number of teeth [-] $\beta =$ Helix angle [°]

Conversion table

1 mm	= 0.039 in
1 Nm	= 8.85 in.lb
1 kgcm ²	= 8.85 x 10 ⁻⁴ in.lb.s ²
1 N	= 0.225 lb _f
1 kg	= 2.21 lb _m

Initials

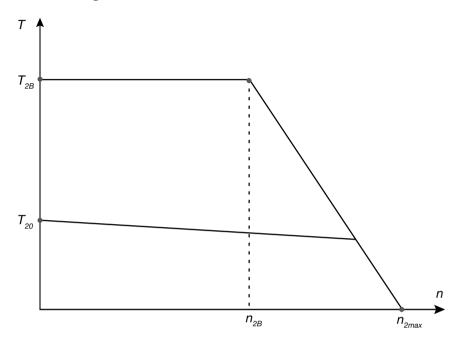
Initials	Unit	Name
а	m/s ²	Linear acceleration
С	Nm/arcmin	Rigidity
ED	%, min	Power-on time
F	N	Force
f _s	-	Load factor
f _e	-	Factor for duty cycle
h	m	Ballscrew pitch
i	-	Ratio
1	A _{eff}	Effective current
j _t	arcmin	Backlash
J	kgm ²	Mass moment of inertia
K1	Nm	Factor for bearing calculation
L	h	Service life
L _{PA}	dB(A)	Operating noise
1	m	(Lever) length
m	kg	Weight
m _n	mm	Normal module
М	Nm	Torque
n	rpm	Speed
ρ	-	Exponent for bearing calculation
Р	W	Power
r	m	Radius
s	m	Dist.
t	S	Time
Т	Nm	Torque
V	m/min	Linear speed
Ζ	1/h	Number of cycles
α	rad/s ²	Angular acceleration
β	0	Helix angle
η	%	Efficiency
λ	-	Ratio of mass moment of inertia, coupling factor
μ	-	Coefficient of friction
ω	rad/s	Angular speed

Index

Index	Name
Capital letter	Permissible values
Small letter	Actual values
1	Drive
2	Output
A/a	axial
out	Output side
B/b	Acceleration
С	constant
d	Delay
dyn	Dynamic
е	Dwell
in	Input side
ext	External
h	Hour(s)
int	Internal
K/k	Tilting
L	Load. load side
m	Mean
Max./max.	maximum
M, Mot	Motor
N	Nominal
Not/not	Emergency stop
0	No load
opt	Optimized
Pr	Process side
Q/q	Lateral
Reib	Friction
stat	Stationary
t	Torsional
Т	Tangential
Total	Total, overall
Loss	Loss

Project planning

Basic design instructions



General graph for a servo actuator characteristic curve

To fully utilize the servo actuators, please check the maximum permissible acceleration torques with regard to the following points:

Calculate the maximum acceleration torque required at the gearbox output:

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

Then calculate the total load torque required at the motor:

$$\mathsf{T}_{_{2\text{dyn}}} = \alpha \cdot \mathsf{J}_{_{L}}$$

$$\mathsf{T}_{_{2b}}=\mathsf{T}_{_{2dyn}}+\mathsf{T}_{_{2Pr}}$$

$$\mathsf{T}_{1\mathsf{b}} = (\alpha \cdot \mathsf{J}_{\mathsf{L}} + \mathsf{T}_{2\mathsf{Pr}}) \cdot \frac{1}{\eta \cdot \mathsf{i}} + \alpha \cdot \mathsf{i} \cdot \mathsf{J}_{1}$$

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

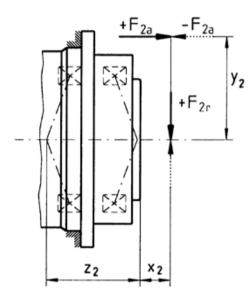
Condition for the total load torque at the gearbox output:

 $\boldsymbol{T}_{_{2b}} \leq \boldsymbol{T}_{_{2B}}$

Condition for the total load torque at the motor:

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

When using a flange at the servo actuator output, the tilting torque produced from prevailing radial and axial forces must be determined and compared with the permissible value:



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

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

Project planning

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
					I
TPM ⁺ POWER	004	010	025	050	110
Z ₂ [mm]	57.6	82.7	94.5	81.2	106.8
premo [®] TP Line	1	2	3		
Z ₂ [mm]	57.6	82.7	94.5		

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

Project planning note on brakes

The holding brakes used in the servo actuators are subject to various factors, e.g. oxidation of abraded particles, flattening of friction surfaces due to frequent application of the brakes in the same position or air gap changes due to wear.

This may result in a reduction of available holding torques. The specified holding torques apply under optimal conditions without detrimental 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 operating instructions.

For critical applications we recommend dimensioning for an adequately large holding torque to take account of these factors of uncertainty. Our internal technical service is available to help you with the appropriate dimensioning.

Depending on the ratio configured for the event of an emergency stop, the brakes used in the servo actuators can generate a dynamic braking torque at the output which exceeds the maximum permissible acceleration torque $T_{_{2B}}$. In this case, the number of dynamic braking procedures must be limited to 1,000 over the entire service life of the servo actuator.

Compatibility of servo actuator and servo controller

The premo servo actuators and TPM⁺ actuator can be operated using many different servo controllers. The following table provides information to assist in selecting the correct options. Please observe the current consumption of the servo actuator during selection of the servo controller used.

				Enc	oder			Temperate	ure sensor	Op	perating volta	age
Manufacturer	Version / Type	Resolver	EnDat 2.1	EnDat 2.2	HIPER- FACE [®]	HIPER- FACE DSL®	DRIVE- CLiQ	PTC	KTY	48 V DC	320 V DC	560 V DC
Bosch Rexroth	IndraDrive	x	x	-	x	-	-	x	x	-	x	x
Beckhoff	AX5000	х	x	х	x	x	-	х	x	-	x	х
B & R	AcoPos	х	x	x	x	-	-	x	x	-	x	х
Control Techniques	UniDrive M	x	x	x	x	-	-	x	-	-	x	x
Kollmorgen	Servostar 700	x	x	x	x	-	-	x	-	-	x	x
Kolimorgen	AKD	х	x	x	x	-	-	x	-	-	x	х
	Global Drive 94xx	x	x	-	x	-	-	x	x	-	x	x
Lenze	TopLine 8400	x	-	-	x	-	-	x	x	-	-	-
	ECS Servosystem	x	-	-	x	-	-	x	-	-	-	-
	Kinetix 5500	-	-	-	x	x	-	x	-	-	x	х
	Kinetix 5700	-	-	-	x	x	-	x	-	-	-	х
Rockwell	Kinetix 6000	-	-	-	x	-	-	x	-	-	x	x
	Kinetix 6200	-	-	-	x	-	-	x	-	-	x	х
	Kinetix 6500	-	-	-	x	-	-	x	-	-	x	х
Siemens	Sinamics	x	x	x	-	-	x	-	x	-	-	х
Schneider	PacDrive MC-4	-	-	-	x	-	-	x	-	-	x	x
electric	PacDrive 3	-	-	-	x	-	-	x	-	-	x	x
WITTENSTEIN cyber motor	simco [®] drive	x	-	x	-	-	-	-	x	x	-	-

Compendium

Influence of the coupling factor λ on the energy efficiency in the drive train

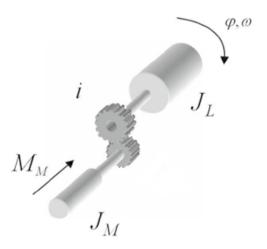
Considerations regarding the energy efficiency in drive trains have increasingly gained in significance during recent years. The fundamental relationships based upon which optimization of the influencing factors can take place are therefore listed below.

Simplified modeling of the common mechatronic drive trains in which gearboxes or servo actuators are installed, is based on the description of two different mass moments of inertia. One of these is the mass moment of inertia of the driving electric motor $J_{\rm M}$. The mass moment of inertia attributable to the gearbox output of the application is also used.

Physical variable	Designation
Motor torque	$M_{_{M}}$
Drive torque	M _{ab}
Angle coordinate at output	φ
Angular speed at output	ω

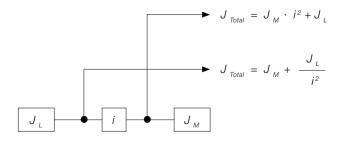
The latter is the result of the corresponding conversion of the moving masses or external mass moments of inertia (levers, adjustment wheels, rotary tables etc.) to the coordinates of the axis of rotation at the gearbox or servo actuator output and is consequently referred to as the load moment of inertia J_{i} .

The conceptually assumed gearbox is described by the ratio i. The following variables from the diagram below are also relevant:



The following examination of the energy efficiency now also includes the ratio between the external mass moment of inertia and the mass moment of inertia of the motor. For this purpose, the external mass moment of inertia and the mass moment of the motor must first be converted with respect to a reference coordinate. The figure below shows the possible approaches

In both cases, the transmission ratio i is squared in the conversion.



The coupling factor λ describes the ratio of the external mass moments of inertia to the mass moment of inertia of the drive. In this example, the reference coordinate is defined as the motor shaft. In accordance with the equation, the following applies to the coupling factor λ :

$$\lambda = \frac{J_{ext}}{J_{int}} = \frac{J_{L}}{J_{M}} \vartriangleright J_{M} = \frac{J_{L}}{i^{2} \cdot \lambda}$$

Here, the square influence of the gearbox ratio again becomes clear, which shows that a wide-reaching influence can be taken on the coupling ratio in the drive train by means of this sizing variable. The following conversion and calculation of the total mass moment of inertia in the drive train results in the following equation:

$$J_{Total} = \frac{J_{L}}{i^{2} \cdot \lambda} \quad \cdot \quad i^{2} + J_{L} = J_{L} \cdot \left(\frac{1}{\lambda} + 1\right)$$

The distribution of the consumed power *P* during accelerations in the drive train is directly proportional to the distribution of the mass moments of inertia. This means that the share of the power consumed by the application can be described as the same function of the coupling factor.

$$P_{Total} = P_{L} \cdot \left(\frac{1}{\lambda} + 1\right)$$

The efficiency, described as η as a parameter for efficiency is derived on the basis of the quotient from the total converted power and the actual power required for acceleration of the application.

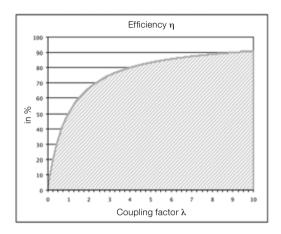
$$\eta = \frac{P_{L}}{P_{Total}}$$

The following equation thus results for the efficiency dependent on the coupling factor:

$$\eta = \frac{P_{L}}{P_{L}} \left(1 + \frac{1}{\lambda}\right) = \frac{\lambda}{\lambda + 1}$$

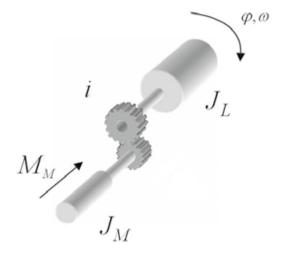
Compendium

A graphic representation illustrates the resulting relationship and the relevant ranges in which the coupling factor has a significant influence on energy consumption in accelerated drive trains.



Influence of the ratio *i* on the dynamics in the drive train

In addition to examination of the energy efficiency, the requirements of short cycle times in conjunction with high acceleration capability are often a priority from a design point of view. Here again, the coupling factor has a major influence. By way of illustration, a simplified model of the drive train is shown here:



For the acceleration α as a function depending on the ratio *i* in the drive train, the following applies:

$$\alpha = \varphi^{\mu} = \frac{i \cdot M_M}{J_L + i^2 \cdot J_M}$$

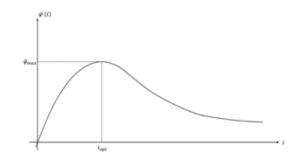
Once again, the coupling factor is defined as follows:

$$\lambda = \frac{J_{L}}{J_{M} \cdot i^{2}}$$

To obtain the optimal acceleration of the application, an optimal value is determined for the ratio by setting the first derivation to zero according to *i*:

$$\frac{d \alpha}{d i} = 0 \Rightarrow i_{opt} = \sqrt{\frac{J_{L}}{J_{M}}}$$

For all the optimal ratios possible as solutions, it applies that the coupling factor must always be $\lambda = 1$, regardless of the mass moment of inertia of the load, to achieve the highest accelera-tion characteristics in the application. This local extremum in the acceleration function dependent on the ratio *i* is shown in the graph below.

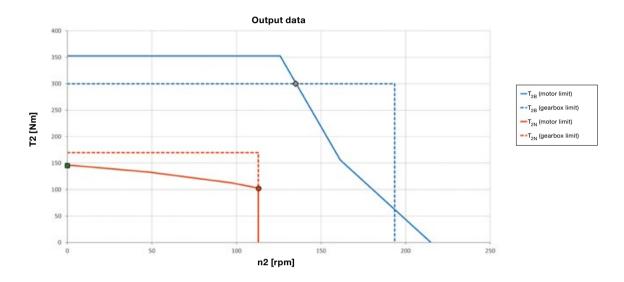


For this purpose the conflict of interests arising from the obser-vations on the energy efficiency and the dynamics in drive trains is again worthy of mention. It should be noted here that the approaches described resort to simplified models and that the requirements with regard to energy efficiency and dynamics must be assessed on a case-by-case basis during drive configuration. The simple and quick evaluation enabled by the cymex[®] sizing software allows for targeted optimization of the drive train so that this conflict of objectives can beeffectively resolved

Compendium

Evaluation of stationary and dynamic load cases for servo actuators

During basic configuration for the use of servo actuators, the indi-vidual components have different limits in virtually all cases, which can be limited to the maximum and continuous currents to be set in the servo controllers. The figure below shows an example of available torques at the servo actuator output.



The dotted characteristic curves apply to the torque / speed limits of the gearbox used in the servo actuator. The solid characteristic curves show the maximum and permanent torgues supplied by the motor in relation to the servo actuator output. Owing to the various motor and gearbox pairings, depending on the transmission ratio, the operating limits of both components cannot always be fully harmonized. This is not, however, restricted to the servo actuators, but also generally applies to the separately mounted gearboxes and servo motors offered by various manufacturers. The case described shows a relationship in which the maximum torque of the integrated servo motor is higher than the drive torque transmittable by the mechanical gearbox components. For this reason a distinction must be made in this case in relation to the relevant cycle as to whether the load on the drive train is more stationary or whether the application cycle is characterized by a high level of dynamics.

In the following case, when a maximum load occurs, which is short-term but stationary in character, the maximum current to be set in the servo controller must be selected such that overloading of the gearbox components is prevented. For this purpose, WITTENSTEIN alpha specifies a permissible maximum current for short-term stationary loads $I_{max, stat}$ in the relevant data sheets.

In the second case, in which the application cycle is characterized by a high level of dynamics and a coupling factor is present, the motor also requires a correspondingly high torque for its own acceleration. Consequently, in this case, a higher maximum current can be set in the servo controller parameterization so that no over-loading of the gearbox components occurs as a result.

For this case, WITTENSTEIN alpha specifies a permissible maximum dynamic current $I_{max, dyn}$, which is overload limited through the motor in its default configuration.

The distinction between the character of the application and the resulting differing limitations of the maximum current limits to be set in the servo controller also applies to the limitations during parametrization of the servo controller with regard to the permissible continuous currents.

For this purpose, a distinction is made between two current limits in the data sheets, i.e., I_o and $I_{o. stat.}$

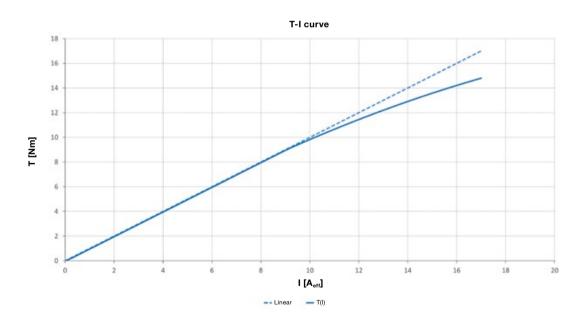
For limitation of the acting continuous currents it must be examined which averaged torque portions tend to burden the motor owing to dynamic processes in the application and that the gearbox is not fully utilized in terms of its available nominal torque. In this case, a higher permissible continuous current setting to the specified value of I_0 for the motor would be permissible. If, however the application has a stationary character with regard to the required permanent torque, the gearbox should transmit the available permanent torque of the motor. For this reason, additional limitation to the value I_0 may have to be performed during para-meterization of the servo controller.

For a targeted evaluation of the prevailing relationships in the application, use of the cymex[®] sizing software is recommended.

Consideration of saturation effects

Depending on their size and design, the motors from the applied product range display different saturation behaviors. As a result, the linear correlation between the acting motor current and the generated torque is lost above a certain current.

The graph below shows an example of the saturation characteristic of a synchronous servo motor and the effects that this has on the available torque.



Here, it becomes clear that, starting at a motor current of 14 A_{eff} the saturation already leads to a 10 % deviation to the proportional torque / current characteristic. The torque constant usually taken as a variable K_{τ} is therefore reduced by half within the usable current range through the saturation

during the following curve, which must be taken into account when subsequently selecting the required servo controller. We will be glad to help you with the configuration and selection of a servo actuator for your application.

Product portfolio & company



Basic Line gearbox overview

Version MF MF Ratio ^{ci} min. i = 3 3 max. i = 100 100 100	CPK MF 3 100 ≤ 13 - x x x x - - - - - -	CPSK MF 3 100 ≤ 15 - x x x x - -	CVH MF / MT 7 40 ≤ 15 - - - - - -	CVS MF/MT 7 40 ≤15 - - x x x -
min. $i =$ 33Ratio °max. $i =$ 100100Max. torsional backlash [arcmin] °Standard ≤ 12 ≤ 12 ≤ 12 ReducedOutput typeSmooth shaftxx	3 100 ≤ 13 - x x x -	3 100 ≤ 15 - - x x x - -	7 40 ≤ 15 - - - - - -	7 40 ≤ 15 - × x
Ratio e)max. $i =$ 100100Max. torsional backlash [arcmin] e)Standard ≤ 12 ≤ 12 ≤ 12 ReducedOutput typeSmooth shaftxx	100 ≤ 13 - x x x -	100 ≤ 15 - X X x - -	40 ≤ 15 - - - -	40 ≤ 15 - x x
max. i =100100Max. torsional backlash [arcmin] \circ Standard \leq 12 \leq 12 \leq ReducedOutput typeSmooth shaftxx	≤ 13 - x x -	≤ 15 - - - - -	≤ 15 - - - - -	≤ 15 - x x
Max. torstorial backlash Reduced - - [arcmin] ° Reduced - - - Output type x x x x	- x x -	- x x - -	- - - -	- x x
Output type Smooth shaft x x	x x -	x x - -		x
Smooth shaft x x	x -	x - -	- - -	x
	x -	x - -	- - -	x
Shaft with key d x x	-	-		
	- - -	-	-	-
Splined shaft (DIN 5480) – –	- - -	-	-	_
Blind hollow shaft – –	-	-		1
Hollow shaft interface – –	-		х	-
Keyed hollow shaft		-	x	-
Flanged hollow shaft	-	-	-	-
Flange – –	-	-	-	-
System output – –	-	-	-	-
Output on both sides – –	-	-	x	x
Input type				
Motor-mounted x x	х	х	x	x
Self-contained version ^{b)} – –	-	-	-	-
Characteristic				
Flange with slotted holes – –	-	-	-	-
ATEX a)	-	-	-	-
Food-grade lubrication ^{a) b)} x x	х	х	x	x
Corrosion resistant ^{a) b)} – –	-	_	-	-
Optimized mass inertia a) – –	-	-	-	-
System solutions				
Linear system (rack/pinion) – –	-	-	-	-
Servo actuator – –	-	-	-	-
Accessories (please refer to the product pages for further options)				
Coupling x x	x	x	-	x
Shrink disc – –	-	-	x	-
Mounting ring – –	-	-	-	-

^{a)} Power reduction: technical data available on request
 ^{b)} Please contact WITTENSTEIN alpha
 ^{c)} In relation to reference sizes
 ^{d)} Power reduction: Please use our sizing software cymex[®] for a detailed sizing – www.wittenstein-cymex.com

Value Line gearbox overview

		2	Ê	2	9		C (C		10.6	<u>A</u> C	C C			
Product type		NP	NPL	NPS	NPT	NPR	NPK	NPLK	NPSK	NPTK	NPRK	NVH	NVS	HDV
Version		MF / MA	MF / MA	MF / MA	MF / MA	MF / MA	MF	MF	MF	MF	MF	MF	MF	MF / MT
	min. <i>i</i> =	3	3	3	3	3	3	3	3	3	3	4	4	4
Ratio ^{c)}	max. <i>i</i> =	100	100	100	100	100	100	100	100	100	100	400	400	400
Max. torsional	Standard	≤ 8	≤ 8	≤ 8	≤ 8	≤ 8	≤ 11	≤ 11	≤ 11	≤ 11	≤ 11	≤ 6	≤ 6	≤ 10
backlash [arcmin] °)	Reduced	-	-	-	-	-	-	-	-	-	-	-	-	-
Output type														
Smooth shaft		х	x	х	-	x	x	х	x	-	x	-	х	х
Shaft with key ^{d)}		х	x	х	-	x	x	х	x	-	x	-	х	х
Splined shaft (DIN 5480	D)	-	x	x	-	x	-	х	x	-	x	-	-	-
Blind hollow shaft		-	-	-	-	-	-	-	-	-	-	-	-	-
Hollow shaft interface		-	-	-	-	-	-	-	-	-	-	х	-	-
Keyed hollow shaft		-	-	-	-	-	-	-	-	-	-	х	-	-
Flanged hollow shaft		-	-	-	-	-	-	-	-	-	-	-	-	-
Flange		-	-	-	x	-	-	-	-	х	-	-	-	-
System output		-	-	-	-	-	-	-	-	-	-	-	-	-
Output on both sides		-	-	-	-	-	-	-	-	-	-	х	х	-
Input type														
Motor-mounted		х	x	х	x	x	x	х	x	х	x	x	х	х
Self-contained version t	b)	-	-	-	-	-	-	-	-	-	-	-	-	-
Characteristic														
Flange with slotted hole	es	-	-	-	-	x	-	-	-	-	x	-	-	-
ATEX a)		-	-	-	-	-	-	-	-	-	-	-	-	-
Food-grade lubrication	a) b)	х	x	х	x	x	x	х	x	х	x	x	х	х
Corrosion resistant a) b)		-	-	-	-	-	-	-	-	-	-	x	х	х
Optimized mass inertia	a)	-	-	-	-	-	-	-	-	-	-	-	-	-
System solutions														
Linear system (rack/pinion)		x	x	x	-	x	x	x	x	-	x	-	x	-
Servo actuator		-	-	-	-	-	-	-	-	-	-	-	-	х
Accessories (please refer to the produ	uct pages for furt	her options	3)											
Coupling		x	x	x	-	x	x	х	x	-	x	-	x	-
Shrink disc		-	-	-	-	-	-	-	-	-	-	x	-	-
Mounting ring		_	_	_	_	_	_	_	_	_	_	_	_	_

^{a)} Power reduction: technical data available on request
 ^{b)} Please contact WITTENSTEIN alpha
 ^{c)} In relation to reference sizes
 ^{a)} Power reduction: Please use our sizing software cymex[®] for a detailed sizing – www.wittenstein-cymex.com

Advanced Line gearbox overview

						9		Se-	
Product type		SP+	SP ⁺ HIGH SPEED	SP ⁺ HIGH SPEED friction optimized	TP ⁺	TP ⁺ HIGH TORQUE	HG⁺	SK+	SPK+
Version		MF	MC	MC-L	MF	MA	MF	MF	MF
	min. <i>i</i> =	3	3	3	4	22	3	3	12
Ratio ^{c)}	max. <i>i</i> =	100	100	10	100	302.5	100	100	10000
Max. torsional backlash	Standard	≤ 3	≤ 4	≤ 4	≤ 3	≤ 1	≤ 4	≤ 4	≤ 4
[arcmin] °	Reduced	≤ 1	≤ 2	≤ 2	≤ 1	-	-	-	≤2
Output type									
Smooth shaft		х	x	x	-	-	-	x	x
Shaft with key d		x	x	x	-	-	_	x	x
Splined shaft (DIN 5480)		x	x	x	-	-	-	x	x
Blind hollow shaft		х	x	x	-	-	-	-	х
Hollow shaft interface		-	-	-	-	-	х	-	-
Keyed hollow shaft		-	-	-	-	-	-	-	-
Flanged hollow shaft		-	-	-	-	-	-	-	-
Flange		-	-	-	x	x	-	-	-
System output		-	-	-	x	x	-	-	_
Output on both sides		-	-	-	-	-	х	x	х
Input type									
Motor-mounted		x	x	x	x	x	х	x	x
Self-contained version b)		х	-	-	x	-	-	-	-
Characteristic									
Flange with slotted holes		х	-	-	-	-	-	-	-
ATEX a)		x	x	-	-	-	x	x	-
Food-grade lubrication ^{a) b)}		x	x	x	x	x	х	x	х
Corrosion resistant a) b)		x	x	x	x	x	х	x	x
Optimized mass inertia a)		х	x	x	x	x	-	-	-
System solutions									
Linear system (rack/pinion)		х	x	-	x	x	-	x	x
Servo actuator		x	-	-	x	x	_	-	-
Accessories (please refer to the product	pages for further	options)							
Coupling		х	x	x	x	x	-	x	x
Shrink disc		x	x	x	-	-	х	-	х
Mounting ring		-	-	-	x	x	-	-	-

^{a)} Power reduction: technical data available on request
 ^{b)} Please contact WITTENSTEIN alpha
 ^{c)} In relation to reference sizes
 ^{d)} Power reduction: Please use our sizing software cymex[®] for a detailed sizing – www.wittenstein-cymex.com



















тк⁺	ТРК⁺	TPK⁺ HIGH TORQUE	SC ⁺	SPC ⁺	TPC⁺	VH⁺	VS⁺	VT⁺	DP+	HDP+
MF	MF	MA	MF	MF	MF	MF	MF	MF	MF / MA	MA
3	12	66	1	4	4	4	4	4	16	22
100	10000	5500	2	20	20	400	400	400	55	55
≤ 4	≤ 4	≤ 1.3	≤ 4	≤ 4	≤ 4	≤ 3	≤ 3	≤ 3	≤ 3	≤ 1
-	≤ 2	-	-	≤ 2	≤ 2	≤ 2	≤ 2	≤ 2	≤ 1	-
_	-	-	x	x	-	-	х	-	-	-
-	-	-	x	x	-	-	х	-	-	-
-	-	-	-	x	-	-	х	-	-	-
_	-	-	-	x	-	-	-	-	-	-
_	-	-	-	-	-	x	-	-	-	-
-	-	-	-	-	-	x	-	-	-	-
x	-	-	-	-	-	-	-	х	-	-
_	x	x	-	-	x	-	-	-	x	x
_	x	x	-	-	x	-	-	-	-	-
х	x	x	-	-	-	x	х	-	-	-
x	x	x	х	x	x	x	x	x	x	х
-	-	-	-	-	-	-	-	-	-	-
_	-	-	-	-	-	-	-	-	-	-
x	-	-	-	-	-	-	-	-	-	-
x	x	x	х	x	x	x	x	х	x	х
x	x	x	-	-	-	x	x	x	x	x
-	-	-	-	-	_	-	-	-	х	х
				I						
x	x	x	x	x	x	-	x	x	-	-
-	-	-	-	-	_	-	-	-	_	-
x	x	x	х	x	x	-	x	x	-	-
-	-	-	-	x	-	х	-	-	-	-
-	-	-	-	-	-	-	-	-	x	-

Premium Line gearbox overview

		4		20	10	(¢	<u>I</u> C
Product type		XP ⁺	RP ⁺	XPK ⁺	RPK⁺	XPC ⁺	RPC ⁺
Version		MF / MC	MF / MA	MF	MA	MF	MA
Ratio ©	min. <i>i</i> =	3	22	12	48	4	22
nalio *	max. <i>i</i> =	100	220	1000	5500	20	55
Max. torsional backlash	Standard	≤ 3	≤1	≤ 4	≤ 1.3	≤ 4	≤ 1.3
[arcmin] ^{c)}	Reduced	≤ 1	-	≤ 2	-	≤ 2	-
Output type							
Smooth shaft		х	-	х	-	х	-
Shaft with key ^{d)}		х	-	х	-	x	-
Splined shaft (DIN 5480)		х	-	х	-	х	-
Blind hollow shaft		х	-	х	-	х	-
Hollow shaft interface		-	-	-	-	-	-
Keyed hollow shaft		-	-	-	-	-	-
Flanged hollow shaft		-	-	-	-	-	-
Flange		-	x	-	х	-	x
System output		х	x	x	х	x	x
Output on both sides		-	-	-	-	-	-
Input type	I						
Motor-mounted		х	x	х	х	х	x
Self-contained version ^{b)}		х	-	-	-	-	-
Characteristic	Į						
Flange with slotted holes		х	x	х	х	x	x
ATEX a)		-	-	-	-	-	-
Food-grade lubrication a) b)		x	x	x	x	x	х
Corrosion resistant a) b)		-	-	-	-	-	-
Optimized mass inertia a)		х	x	-	-	-	-
System solutions	I						
Linear system (rack/pinion)	(rack/pinion)		x	x	х	x	х
Servo actuator		x	x	-	-	-	-
Accessories (please refer to the product p	bages for further op	otions)					
Coupling		x	-	x	-	x	-
Shrink disc		x	-	x	-	x	_
Mounting ring		-	-	-	-	-	-

^{a)} Power reduction: technical data available on request
 ^{b)} Please contact WITTENSTEIN alpha
 ^{c)} In relation to reference sizes
 ^{d)} Power reduction: Please use our sizing software cymex[®] for a detailed sizing – www.wittenstein-cymex.com

Servo actuator overview









Product type		PBG	PAG	PHG	RPM⁺	TPM ⁺ DYNAMIC	TPM⁺ HIGH TORQUE	TPM ⁺ POWER		
Version		Standard	Standard	Standard	Customer specific	Standard	Standard	Standard		
Catalog page		28	36	44	148	62	74	84		
Ratio ^{c)}	min. <i>i</i> =	16	16	16	22	16	22	4		
nalio "	max. <i>i</i> =	100	100	100	220	91	220	100		
Max. torsional backlash °)	Standard	≤ 6	≤ 3	≤ 3	≤ 1	≤ 3	≤ 1	≤ 3		
[arcmin]	Reduced	≤ 3	≤ 1	≤ 1	-	≤ 1	≤ 1	≤ 1		
Output shape										
Smooth shaft	х	-	x	-	-	-	-			
Shaft with key d)		х	-	x	-	-	-	-		
Splined shaft (DIN 5480)		х	-	x	-	-	-	-		
Blind hollow shaft		-	-	-	-	-	-	-		
Hollow shaft interface		-	-	-	-	-	-	-		
Keyed hollow shaft		-	-	-	-	-	_	-		
Flanged hollow shaft		-	-	-	-	_	_	-		
Flange		-	x	-	x	x	х	x		
System output		-	х	x	x	x	х	х		
Output on both sides		-	-	_	-	-	_	-		
Input type						1				
Motor-mounted		-	-	-	-	-	_	-		
Self-contained version		-	-	-	-	_	_	-		
Characteristic										
Flange with slotted holes		х	-	x	x	-	_	-		
ATEX a)		-	-	-	-	-	_	-		
Food-grade lubrication a) b)		х	х	x	x	x	x	x		
Corrosion resistant a) b)		-	-	-	-	x	х	x		
Optimized mass Inertia a)		-	-	-	-	-	_	-		
System solutions										
Linear system (rack / pinion))	x	x	x	x	x	х	х		
Accessories (please refer to the product page	ages for further o	ptions)		1				I.		
Coupling		x	x	x	-	x	х	x		
Shrink disc		x	-	-	-	-	-	-		
Power cable, signal cable, h	yprid cable	х	x	x	x	x	х	x		

^{a)} Power reduction: technical data available on request

^{b)} Please contact WITTENSTEIN alpha

^a In relation to reference sizes
 ^d Power reduction: Please use our sizing software cymex[®] for a detailed sizing – www.wittenstein-cymex.com

Customized solutions

SPM+/TPM+ endurance

Motor + housing + gearbox = optimal combination for your application

The SPM⁺ and TPM⁺ endurance system ranges demonstrate the level of customization and optimization that is possible in drive technology today: A number of gearboxes can be inte-grated to suit the various motors. Therefore the highly compact WITTENSTEIN alpha format opens up completely new degrees of design freedom for customers.

All in all, an optimum symbiosis of different disciplines is created. Or as we would say: mechatronics as it should be today – for the full benefit of the customer.





Maximum efficiency High power density. Extremely short cycle times.

Utilizing the innovative stainless steel cooling technology of the SPM⁺/TPM⁺ endurance servo actuators, the motor surface only reaches a temperature of approx. 50 °C, even during continuous operation.

- Increasing energy efficiency
- Increased productivity
- Greater availability

Particularly during use in open cooling circuits, the stainless steel cooling system ensures a durable and low-maintenance drive solution.



A significantly increased benefit can be achieved with the technological substitution of asynchronous and hydro motors: The highly compact design opens up numerous degrees of freedom in design. And through the significantly increased performance and productivity enhancements, the machine footprint is reduced considerably, so that the energy saving potential is significantly greater.

Customized solutions

Premium Linear System

with RPM⁺ servo actuator

More dynamic. More compact. More precise.

The RPM⁺ servo actuator is particularly dynamic, extremely compact and perfectly adapted for rack and pinion applications. In the RPM⁺, maximum power density – through the special design of the integrated motor – and functional design are combined in one unit. This offers effective dimensional benefits for an even more compact design!



$4 \times 1 = ONE$ Motor, gearbox, rack and pinion from a single source

The servo actuator guarantees outstanding performance – thanks to its special design, it ensures maximum power density.

- If your drive requires maximum power.
- If the system needs to be even more compact.
- If precision is required in your application.
- If you value superior consulting.

Customized solutions

axenia value

More resistant. More compact. More compatible.

The compact axenia value servo actuator was specially developed and produced for challenging applications. It is manufactured with highly resistant stainless steel and therefore offers long-term resistance to numerous corrosive substances, such as cleaning agents and disinfectants Furthermore, it provides a highly precise and dynamic connection between motor and gearbox.

Your technical benefits

- Hygienic design: Cavity-free design
- Long service life due to the use of CIP-compatible materials
- Integrated, optimized servo actuator sealing concept
- Resistant against aggressive cleaning agents and disinfectants
- Food-grade lubrication
- Powerful motor performance
- Low gearbox torsional backlash

Your benefits

- Simple and hygienic cleaning
- Smaller machines possible
- No complicated encapsulation
- Fewer wearing parts in the machine
- Low drive failure probability
- Low maintenance and repair costs

At a glance

- Three sizes
- Max. acceleration torque up to 200 Nm
- Ratios: 16 to 100
- Large selection of encoder systems
- With or without brake
- Protection class IP 69K (at 30 bar)

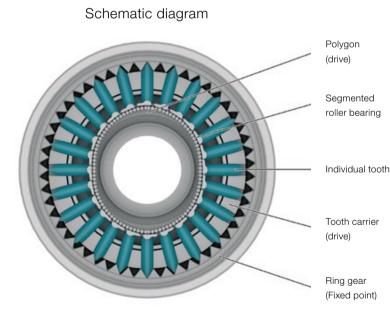


Galaxie[®] drive system A new dimension in performance

This award-winning innovation by Wittenstein surpasses all previous drives in terms of torsional backlash, torque density, rigidity and compactness. The innovative core of the Galaxie[®] drive is the nearly full surface contact during power transmission, which produces a defined torque density as well as exceptional torsional rigidity and zero backlash – even at the zero crossing.







Product highlights

- High torsional rigidity
- No backlash –
- even at the zero crossing
- Hydrodynamic surface contact
- Maximum torque density
- High robustness
- Hollow shaft

Options

- Integrated holding brake
- Different feedback systems
- Additional encoder system at the input



An ingenious concept in four variants and five sizes



Galaxie® D

Hollow-shaft compact drive, axially integrated permanently energized synchronous motor with standard sensor systems.

Galaxie® DF

Ultra-flat hollow-shaft compact drive, radially integrated permanently energized synchronous motor with standard sensor systems.



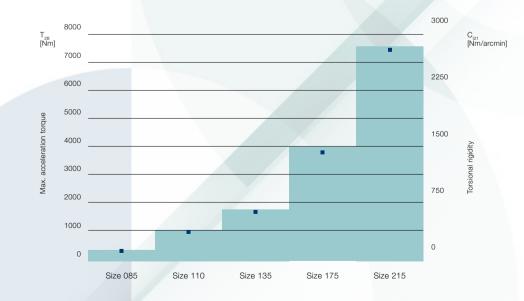
Galaxie® G

Backlash-free gearbox with optional coaxial planetary input stage and adapter plate for mounting on standard industrial servo motors.



Galaxie® GH

Galaxie® Right-angle gear-boxes with hypoid input stage and adapter plate for mounting on standard industrial servo motors.



Acceleration torque and torsional rigidity of the individual Galaxie® sizes

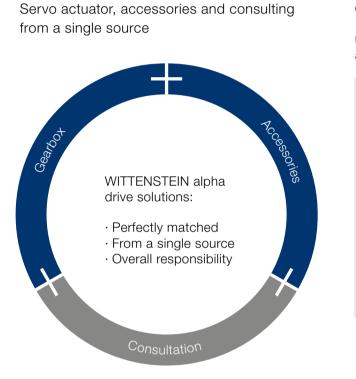
Torsional rigidity
Acceleration torque

Accessories - smart additions for intelligent performance

In addition to gearboxes, servo actuators, and linear systems, we offer our customers an extensive portfolio of matching accessories.

The alpha Premium Line and alpha Advanced

Line servo actuators can be further optimized by using metal bellows couplings. Perfectly matched with the servo actuator, they meet the expectations of customers.



Optimization of your added value chain

Use the combination of servo actuator and accessories in a complete package to streamline your internal processes.

Servo actuator process costs	Accessory process costs									
Two suppliers										
100 %	100 %									
Complete delivery by WITTEN	NSTEIN alpha									
Up to 80 % process cost savings										
The savings in process the value of the access										

Couplings

Our innovative couplings, which are used in various drive technology sectors, ensure efficiency and process reliability in the applications.

Our couplings have the following properties:

- · Completely backlash-free torque transmission
- · Maintenance free
- · Durable
- · Compensation of shaft misalignments (axial, angular, lateral)





Preferred coupling series

The technical dimensional sheets for the gearboxes include a preselection of couplings. These are based on the maximum transmittable torque of the gearbox. Standard industrial conditions for the number of cycles (1000/h) and ambient temperature were adopted.

Please note that the coupling load is based on the torque the gearbox can transmit and not the torque in your application. For a detailed sizing we recommend using our cymex[®] 5 design software.

You can find detailed information about our couplings at www.wittenstein-alpha.com

Support at each interaction stage

With the WITTENSTEIN alpha service concept, we are also setting new standards in the field of customer support.

DESIGN



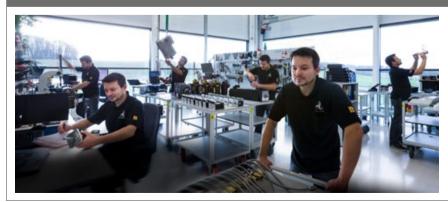
We offer the right sizing methodology for every requirement. Whether easy downloading of CAD data, quick and easy calculation, or precise sizing of the drive train.





Our service experts are happy to support you in the installation and startup of complex mechatronic systems, guaranteeing maximum availability of your plant.

SERVICING



WITTENSTEIN alpha guarantees fast repairs of the highest quality and precision.

In addition, we will provide you with information about various measurements, material analyses, and condition monitoring inspections.

Consultation

- · Personal contact on site
- · Professional application calculations and drive design

Engineering Catalog gearboxes:

- · Advanced software tools for accurate calculation, simulation, and analysis of the drive train
- · Optimization of your productivity

Special gearboxes:

- · Development and production of special gearboxes
- · Toothing design and development
- · Send all enquiries to:

sondergetriebe@wittenstein.de

YOUR SMART CATALOG SIZING ASSISTANT YOUR GEARBOX WITHIN SECONDS

CAD POINT



See pages 18 –19 for more information about cymex[®] 5

Delivery of speedline®**

- Tel. +49 7931 493-10444
- · Delivery of standard series in 24 or 48 hours ex works*
- · Fast deliveries at short notice

Installation on site**

- · Professional installation
- · Optimal application integration
- · Introduction to the operation of the drive

* Non-binding delivery time depending on part availability

Operating and installation instructions

- · Detailed description of how to use the product
- · Installation and motor mounting videos

Pick-up & return service

- · Minimization of downtimes
- · Professional logistics organization
- · Reduction of transport risks

24 h service hotline

Tel. +49 7931 493-14900

Maintenance and inspection

- · Documentation regarding condition
- and expected service life
- · Customer-specific maintenance schedules

Repairs

- · Restoring to nominal condition
- · Immediate response in time-critical situations

cymex[®] statistics

- · Systematic field data entry
- · Reliability calculations (MTBF)

Modernization

- · Professional retrofitting
- · Reliable compatibility testing of existing solutions

** Not available for servo actuators

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The WITTENSTEIN group – The company and its fields of business

With approximately 2,600 employees worldwide, WITTENSTEIN SE stands for innovation, precision and excellence in the world of mechatronic drive technology, both nationally and internationally. The group is active in six innovative fields of business.

Furthermore, WITTENSTEIN SE is represented by some 60 subsidiaries in around 40 countries in all important technology and sales markets worldwide.

Our fields of expertise

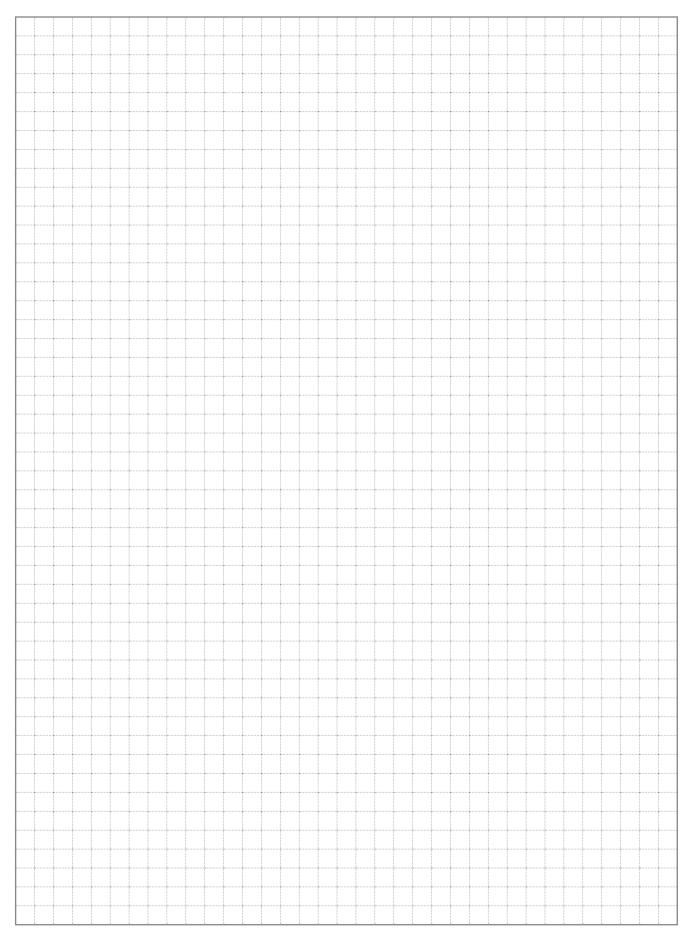
- Machine and plant construction
- · Software development
- · Aerospace
- · Automotive & E-mobility
- · Energy

- · Oil & Gas Exploration
- · Medical technology
- Measurement and testing technology
- · Nanotechnology
- \cdot Simulation





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WITTENSTEIN alpha – Intelligent drive systems

www.wittenstein-alpha.com

The entire world of drive technology – Catalogs available on request or online at www.wittenstein-alpha.com/catalogs

