

TECNOTION®

direct drive in motion



Iron core & ironless linear motor series



WE DIRECT DRIVE YOUR MOTION TECHNOLOGY

Tecnotion is the global authority on direct drive motor technology. We are the world's only unbundled manufacturer of linear and torque motors. As a former part of Philips, we specialize solely in the development and production of linear and torque motors. Because of this, our expertise, customer service and product quality are unmatched.

We have a global presence, with production plants in the Netherlands and China and local representation around the world. This ensures short delivery times and high quality support, wherever you are located.

When you do business with Tecnotion, you have a team of highly skilled sales and application engineers at your disposal. They help you from your initial prototype all the way to the application of our products and beyond.

Sales support

At Tecnotion we understand that each application of our motors is a unique case with specific requirements and demands.

Our sales and application engineers have extensive experience with a wide range of application types and collaborate on a high level with our customers to make sure you get the solution that best fits your requirements.

Additionally our specialized simulation tool is available to help you find your way through our wide range of motors and analyze/test out different motor types within your application specifications.



Innovation

We have an in-house R&D department, which is continuously pushing the boundaries of technology and taking our products to the next level. This translates directly to our high level of understanding of manufacturing processes.

Apart from our "off-the-shelf" range of standard linear motors, we can also design and manufacture custom made motors for high profile projects or OEM applications that require a tailor-made solution.

All our custom motors are built to the same high standards that characterize our standard range of products.



Manufacturing

Manufacturing of our standard range of motors takes place at our modern plant in China, where we are able to produce in high volume at very competitive rates.

At our competence centre and headquarters in the Netherlands we specialize in advanced technology. This is where we do our research and development and where custom motors are built with extreme accuracy in our special state of the art clean room environment.

Tecnotion is committed to excellence. Both of our plants are ISO 9001 certified and comply to the highest quality standards possible.



Global logistics

We always have our most popular products in stock in our warehouses in both the Netherlands and China.

Our logistics department can ship to you from both locations, making short delivery times possible across the globe, even when markets are ramping.



Iron core motors



T	L	06	S
U	M	12	N

T = Iron core
 U = Ironless
 L M = Series type
 06 12 = Number of coils
 S N = Winding type

See P.14

See P.12

See P.10

See P.8

TBW series

Fu 2700-6750N Fc 1140-2850N

The TBW series is the water cooled variant of the TB series. It features a fully integrated, highly efficient cooling system which enables the TBW to reach even higher continuous forces than the standard version and sustain extreme accelerations while maintaining its sub micron position accuracy. Since heat is not dissipated into the machine's construction, it is especially suited for applications where thermal management is an issue.

TB series

Fu 1800-4500N Fc 760-1900N

The high-end TB motors are heavy duty workhorses that combine high acceleration and speed, sub micron positioning accuracy and low power consumption with a superb force density. They excel in applications where high loads and long duty cycles are the order of the day. When you require a motor that takes your application to new levels, the TB more than delivers.

TL series

Fu 450-3600N Fc 200-1600N

The mid-range TL is our most popular iron core motor. It features an extremely low attraction force between the coils and the magnets and stands out for its small size, high acceleration, high speed and accuracy. The TL is also available in long versions, which makes this all-rounder suited for nearly any application, including those with long travel lengths, like printers for large digital formats.

TM series

Fu 120-720N Fc 60-360N

For applications that do not require high forces, it is often more effective to use a smaller and less costly motor. Over the years, the TM series has proven to be a very versatile, reliable and efficient motor for a wide range of applications. To enhance its effectiveness, the TM linear motor is equipped with a long flexible servo cable which makes the use of additional connectors superfluous and reduces total cost of ownership even further.

Ironless motors



T	L	06	S
U	M	12	N

T = Iron core
 U = Ironless
 L M = Series type
 06 12 = Number of coils
 S N = Winding type

See P.24

See P.22

See P.20

See P.18

See P.16

UXX / UXA series

Fp 615-4200N Fc 120-846N

The UXX is the most powerful standard ironless motor we have to offer. It is ideal for heavy duty industrial applications that demand ultra precision and maximum force output. The UXA is the economical alternative to the UXX. It's slightly less powerful, but makes up for this with a smaller footprint and an attractive price tag.

UL series

Fp 240-1200N Fc 70-350N

The high-end UL ironless motors are available in various configurations that can easily be adapted to application specific requirements. Because of their high speed, positioning accuracy, zero cogging and attraction force, many UL motors are successfully applied throughout the semiconductor industry.

UM series

Fp 100-400N Fc 29-116N

The mid-range UM ironless motors stand out for their extremely high speed and exceptional thermal characteristics which are the result of our unique production techniques. This makes the compact UM motors especially suited for applications in which highly accurate measuring is required.

UF series

Fp 42.5-85N Fc 19.5-39N

The UF series is built specifically to sustain very high continuous forces for its footprint, which is only marginally larger than that of the UC. It is exceptionally suited for applications with high duty cycles, for instance in the medical and semiconductor markets or for pick & place systems.

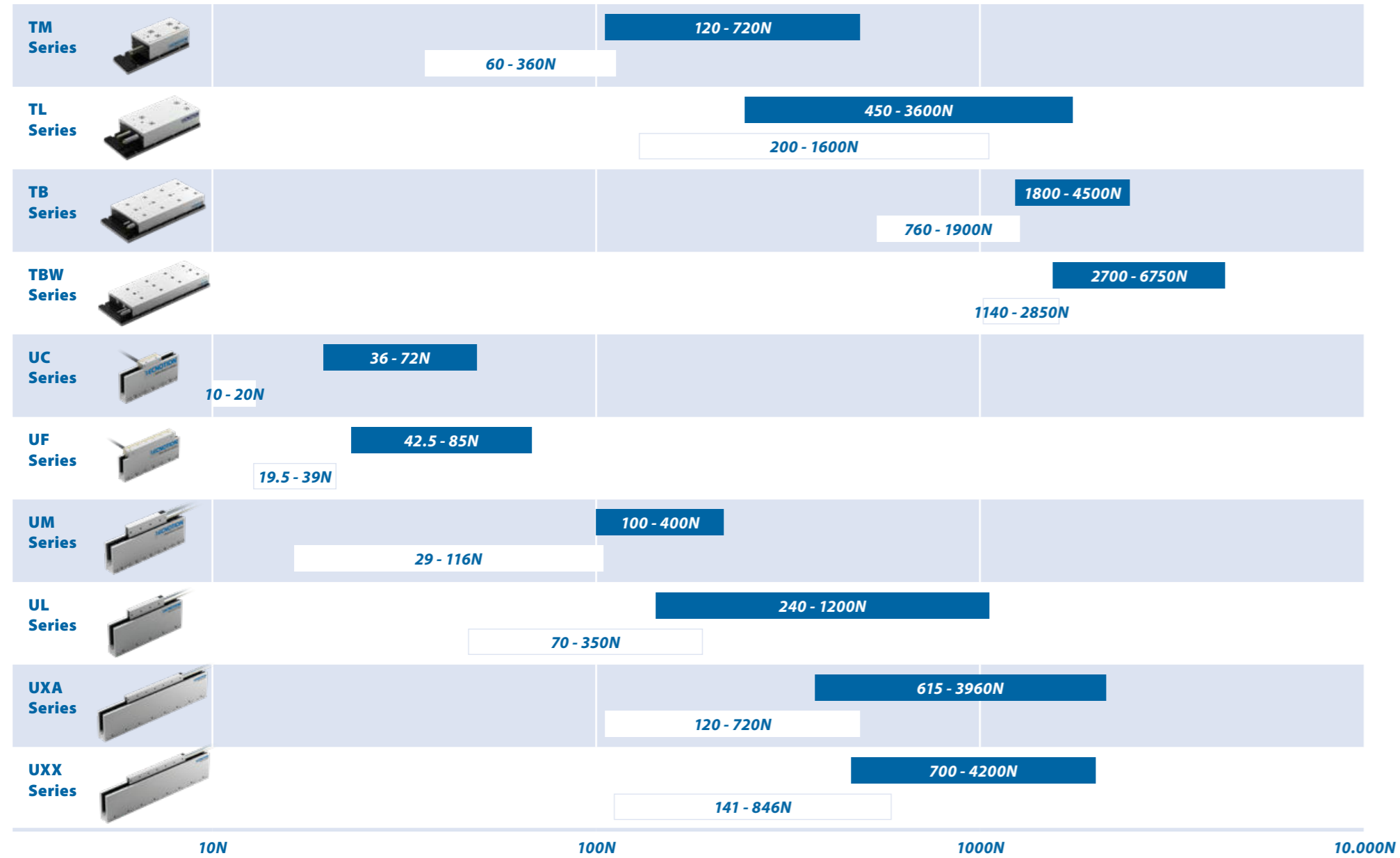
UC series

Fp 36-72N Fc 10-20N

The UC is our smallest "off the shelf" motor. Weighing in at just a few grams, this versatile, compact and affordable motor is still able to sustain a continuous force of 10 or 20N. Due to its low weight it is also suited to operate in a vertical application environment.

Linear motor force range

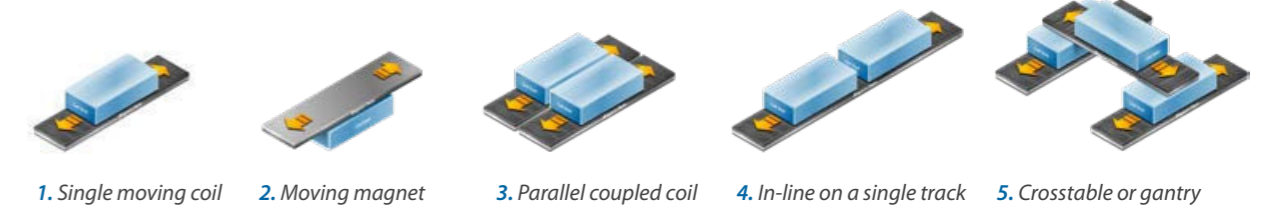
Peak force Continuous force



Features

Tecnotion's linear motor performance advantages

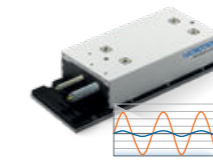
Modular system. All motors can be used in various configurations:



The direct drive technology of linear motors is a perfect way to enhance productivity, accuracy, and dynamic performance. Linear motors eliminate the need for mechanical transmissions like rack and pinion, belts and speed reducers. Between coil unit and magnets there is no contact, this means no mechanical wear. The technology makes designs slimmer, modular and reduces costs.



High force density
More force in a smaller packing means lowering footprint and fits better in small(er) spaces.



Low cogging
Optimized iron core motor design, for smooth motion and position accuracy in your application.



Approved for CSA and CE, RoHS
Iron core motors are approved for CE, CSA and ROHS.



Aluminium housed design
Housed design with integrated water cooling for TBW- and TL series.



High acceleration and dynamics
The outstanding force to mass ratio of the ironless coils enables unmatched system dynamics.



No cogging, extremely low force ripple
Ironless motors have no cogging effects. Offering smooth motion and position accuracy in your application.



Approved for CE and RoHS
Ironless motors are CE and RoHS approved.



Low thermal resistance
Allowing good heat transfer, achieving an extremely high continuous force for all motors when using a decent size heatsink or active cooling.



TM3 on 144mm magnet plate shown

TM Series iron core

Parameter	Remarks	Symbol	Unit	TM3	TM6	TM12	TM18			
Winding type				S Z S Z S N S						
Motor type, max voltage ph-ph				3-phase synchronous Iron core, 400V _{ac,rms} (565 V _{dc})						
Ultimate force @ 10°C/s increase	magnet @ 25°C	F _u	N	120	240	480	720			
Peak force @ 6°C/s increase	magnet @ 25°C	F _p	N	105	210	420	630			
Continuous force*	coils @ 100°C	F _c	N	60	120	240	360			
Maximum speed**	@ 600 V	v _{max}	m/s	12	36.6	12	36.5	12	4.5	10.0
Motor force constant	mount. sfc. @ 20°C	K	N/A _{rms}	39	12.9	39	12.9	39	79	39
Motor constant	coils @ 25°C	S	N ² /W	95		190		380		570
Ultimate current	magnet @ 25°C	I _u	A _{rms}	4.1	12.6	8.2	25.1	16.4	12.3	25.1
Peak current	magnet @ 25°C	I _p	A _{rms}	3.1	9.5	6.2	18.9	12.4	9.2	18.9
Maximum continuous current*	coils @ 100°C	I _c	A _{rms}	1.5	4.7	3	9.3	6	4.5	9.3
Back EMF phase-phase _{peak}		B _{emf}	V/m/s	32	11	32	11	32	65	32
Resistance per phase*	coils @ 25°C ex. cable	R _{ph}	Ω	5.4	0.56	2.7	0.28	1.35	3.6	0.85
Induction per phase	I < 0.6 I _p	L _{ph}	mH	35	3.65	17	1.83	9	23	5.5
Electrical time constant*	coils @ 25°C	τ _e	ms				6.5			
Maximum continuous power loss	all coils	P _c	W	49	99	197	296			
Thermal resistance	coils to mount. sfc.	R _{th}	°C/W	1.5	1.5	0.75	0.38	0.25		
Thermal time constant*	up to 63% max. coiltemp.	τ _{th}	s				75			
Temperature cut-off / sensor				PTC 1kΩ / KTY 83-122						
Coil unit weight	ex. cables	W	kg	0.6	0.9	1.6	2.3			
Coil unit length	ex. cables	L	mm	93	143	143	241	336		
Motor attraction force	rms @ 0 A	F _a	N	300	500	900	1300			
Magnet pitch NN		τ	mm				24			
Cable mass		m	kg/m				0.18			
Cable Type (power FLEX)	length 3 m	d	mm (AWG)				8.3 (≥18)			
Cable type (sensor)	length 3 m	d	mm (AWG)				4.3 (26)			
Cable Life (power FLEX)***	minimum						5,000,000 cycles			
Bending Radius Static	minimum						4x cable diameter			
Bending Radius Dynamic (power FLEX)	minimum						10x cable diameter			

All specifications ±10%

* These values are only applicable when the mounting surface is at 20°C and the motor is driven at maximum continuous current. If these values differ in your application, please check our simulation tool.

** Actual values depend on bus voltage. Please check the F/v diagram in our simulation tool.

*** Depending on bending radius, velocity and acceleration.

FLEX Cable

The TM series comes standard with a 3m long FLEX power cable.

Magnet plate dimensions

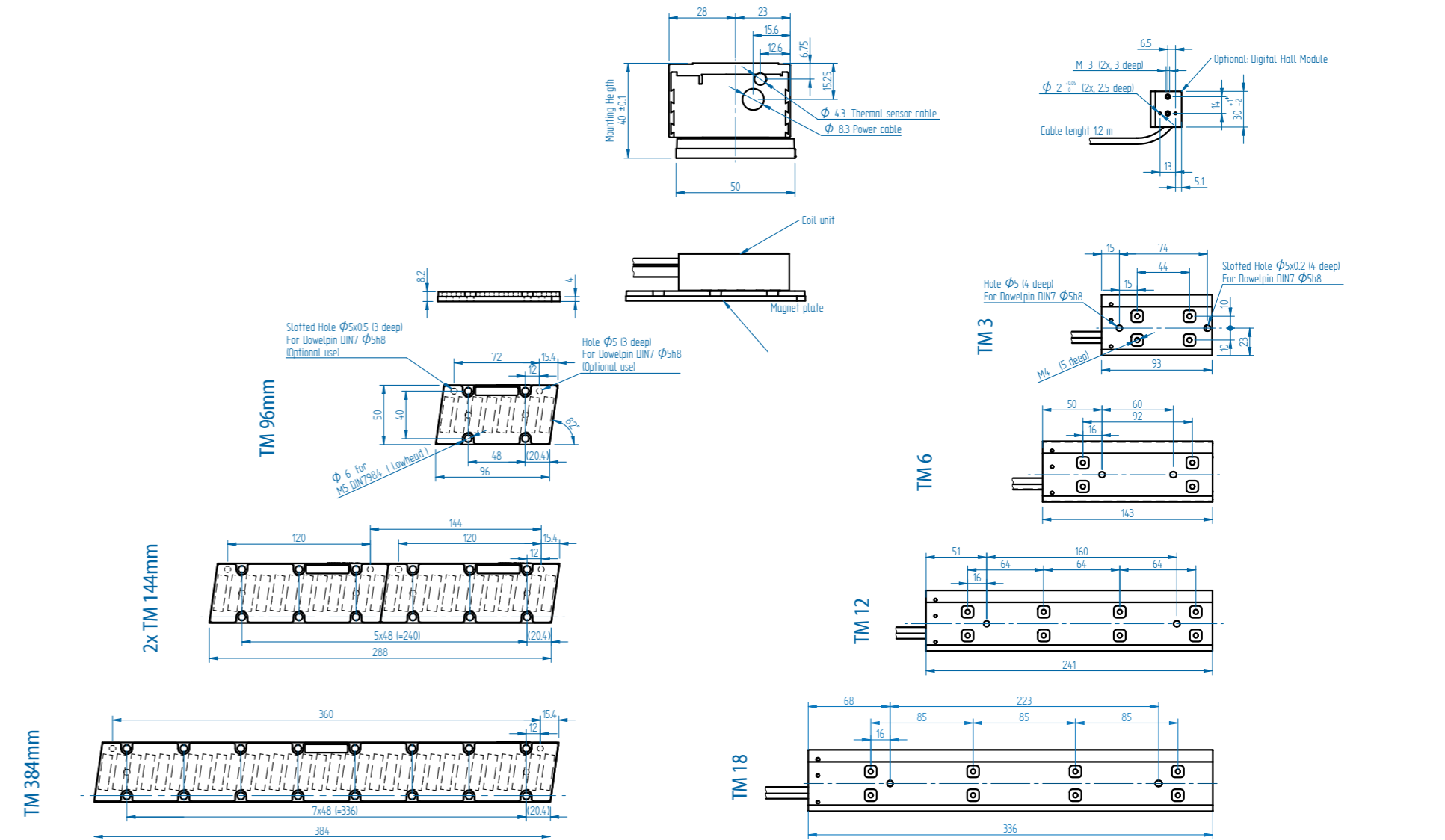
Le (mm)	96	144	384
M5 bolts	4	6	16
Mass (kg/m)	2.1		

Magnet plates can be butted together.



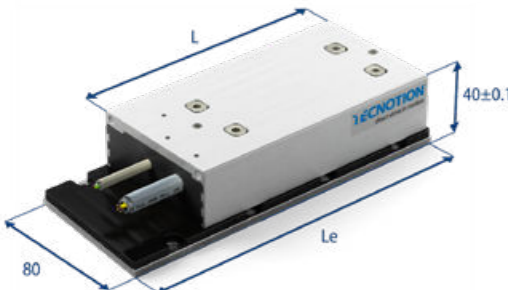
Magnet plates

Coil units



Mounting instructions and flatness or parallelism requirements can be found in the iron core installation manual. CAD files, 3D models and the manual can be downloaded from our website.

* All sizes are in mm



TL6 on 192mm magnet plate shown

TL Series iron core

Parameter	Remarks	Sym	Unit	TL6		TL9		TL12		TL15		TL18		TL24		TL48			
				N	S	N	S	N	S	N	S	N	S	N	S	N	S	Q	
Winding type				3-phase synchronous Iron core, 400V _{ac,rms} (565 V _{dc})															
Motor type, max voltage ph-ph				3-phase synchronous Iron core, 400V _{ac,rms} (565 V _{dc})															
Ultimate force @ 10°C/s increase	magnet @ 25°C	F _u	N	450	675	900	1125	1350	1800	3600									
Peak force @ 6°C/s increase	magnet @ 25°C	F _p	N	400	600	800	1000	1200	1600	3200									
Continuous force watercooled*	coils @ 100°C	F _{cw}	N	210	315	420	525	630	840	1680									
Continuous force	coils @ 100°C	F _c	N	200	300	400	500	600	800	1600									
Maximum speed**	@ 560 V	v _{max}	m/s	3.5	7	2.5	7	3.5	7	3.5	7	3.5	7	3.5	7	1.7			
Motor force constant	mount. sfc. @ 20°C	K	N/A _{rms}	93	46.5	140	46.5	93	46.5	112	46.5	93	44.9	93	46.5	180			
Motor constant	coils @ 25°C	S	N ² /W	380	570	760	950	1140	1520	3040									
Ultimate current	magnet @ 25°C	I _u	A _{rms}	6.5	13.1	6.5	19.6	13.1	26.2	13.5	32.7	19.6	41	26.2	52	27.1			
Peak current	magnet @ 25°C	I _p	A _{rms}	5.0	10.0	5.0	15.0	10.0	20.0	10.4	25.0	15.0	31.0	20.0	40.0	20.7			
Continuous current watercooled*	coils @ 100°C	I _{cw}	A _{rms}	2.26	4.5	2.26	6.8	4.5	9.0	4.7	11.3	6.8	14.0	9.0	18.1	9.4			
Back EMF phase-phase_{peak}		B _{emf}	V/m/s	76	38	114	38	76	38	92	38	76	38	76	38	147			
Resistance per phase*	coils @ 25°C ex. cable	R _{ph}	Ω	7.2	1.80	10.8	1.21	3.6	0.90	4.3	0.72	2.41	0.59	1.81	0.46	3.45			
Induction per phase	I < 0.6 I _p	L _{ph}	mH	54	14	81	9.0	27	7.0	32	5.4	18	4.4	14	3.4	25.9			
Electrical time constant*	coils @ 25°C	τ _e	ms	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5				
Maximum continuous power loss	all coils	P _c	W	150	225	300	375	450	600	1200									
Thermal resistance	coils to mount. sfc.	R _{th}	°C/W	0.48	0.32	0.24	0.19	0.16	0.12	0.06									
Thermal Time constant*	up to 63% max. coiltemp.	τ _{th}	s	77	77	77	77	77	77	77									
Watercooling flow	for ΔT=3K	Φ _w	l/min	0.7	1.1	1.4	1.8	2.2	2.9	5.7									
Watercooling pressure-drop	order of magnitude	ΔP _w	bar	1	1	2	2	2	3	7									
Temperature cut-off / sensor				PTC 1kΩ / KTY 83-122															
Coil unit weight	ex. cables	W	kg	1.5	2.0	2.6	3.2	3.8	5.2	9.75									
Coil unit length	ex. cables	L	mm	146	194	244	290	336	468	855									
Motor attraction force	rms @ 0 A	F _a	N	950	1325	1700	2075	2450	3400	6400									
Magnet pitch NN		τ	mm	24	24	24	24	24	24	24									
Cable mass		m	kg/m	0.18	0.18	0.18	0.18	0.18	0.30	0.18									
Cable type (power)	length 1 m	d	mm (AWG)					9.6 (18)				11.9 (14)		11.4 (14)					
Cable type (sensor)	length 1 m	d	mm (AWG)					4.3 (26)				4.3 (26)		4.3 (26)					

All specifications ±10%

* These values are only applicable when the mounting surface is at 20°C and the motor is driven at maximum continuous current. If these values differ in your application, please check our simulation tool.
 ** Actual values depend on bus voltage. Please check the F/v diagram in our simulation tool.

Water cooling

All TL motors feature integrated cooling channels that allow for the easy setup of a liquid cooled system, at no additional cost.

Magnet plate dimensions

Le (mm)	192	288
M5 bolts	8	12
Mass (kg/m)	3.8	

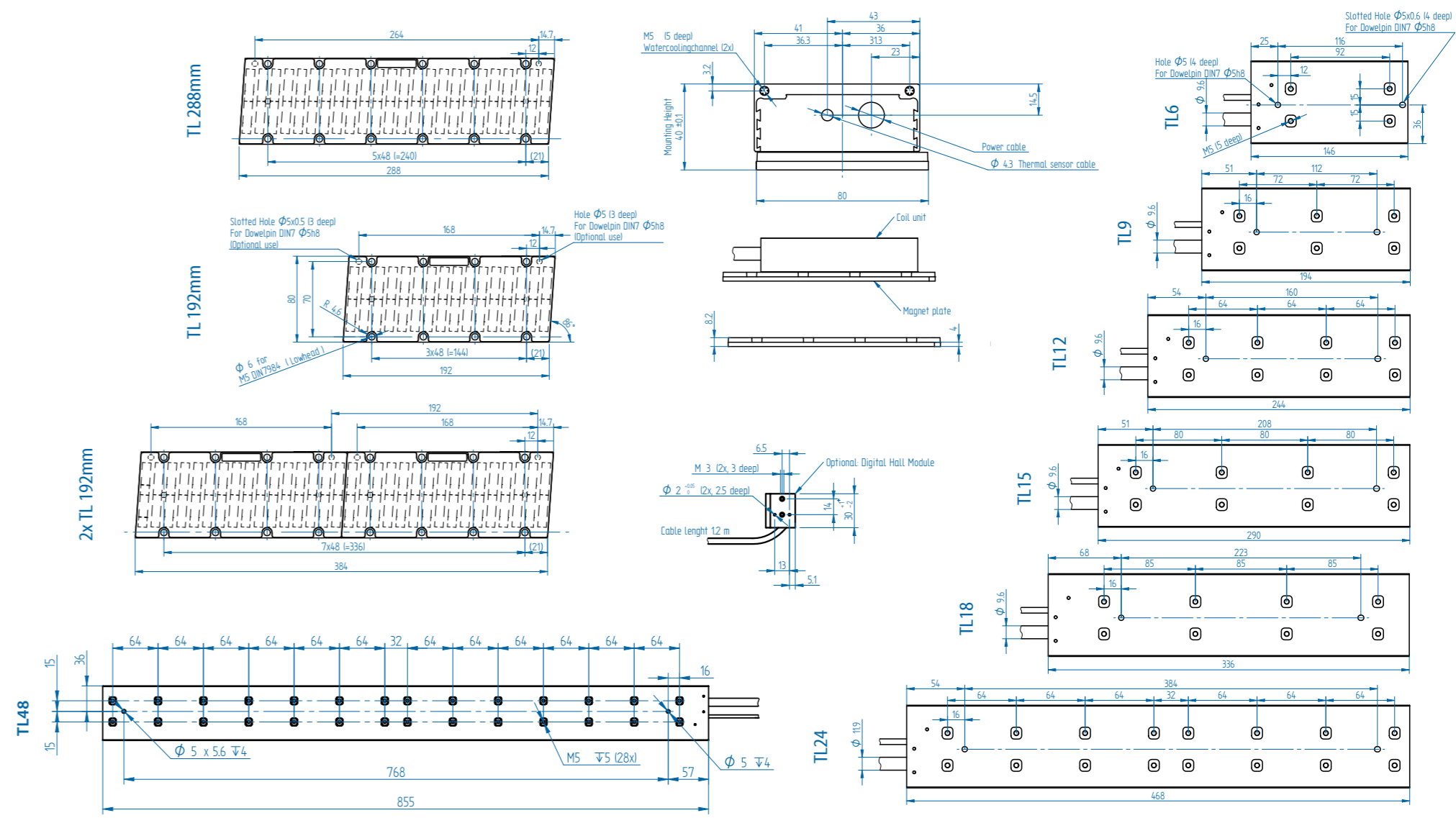
Magnet plates can be butted together.

Approvals

CE UK CA RoHS

TECNOTION
direct drive in motion

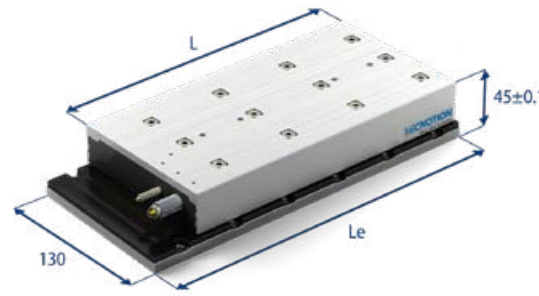
Magnet plates



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* All sizes are in mm

TB Series iron core



TB12 on 288mm magnet plate shown

Parameter	Remarks	Symbol	Unit	TB12	TB15	TB18	TB24	TB30			
Winding type				N	S	N	S	N	S		
Motor type, max voltage ph-ph				3-phase synchronous Iron core, 400V _{ac rms} (565 V _{dc})							
Ultimate force @ 10°C/s increase	magnet @ 25°C	F _u	N	1800	2250	2700	3600	4500			
Peak force @ 6°C/s increase	magnet @ 25°C	F _p	N	1600	2000	2400	3200	4000			
Continuous force*	coils @ 100°C	F _c	N	760	950	1140	1520	1900			
Maximum speed**	@ 560 V	v _{max}	m/s	3	6	2.5	6	3	2.5	2.5	6
Motor force constant	mount. sfc. @ 20°C	K	N/A _{rms}	186	93	225	93	186	232	225	93
Motor constant	coils @ 25°C	S	N ² /W	1750	2150	2640	3520	4300			
Ultimate current	magnet @ 25°C	I _u	A _{rms}	13.0	26	13.5	33	20	21	27	66
Peak current	magnet @ 25°C	I _p	A _{rms}	10.0	20	10.0	25	15.0	16.0	20	50
Maximum continuous current	coils @ 100°C	I _c	A _{rms}	4.1	8.2	4.2	10.2	6.1	6.6	8.5	20.5
Back EMF phase-phase _{peak}		B _{emf}	V/m/s	152	76	183	76	152	189	183	76
Resistance per phase*	coils @ 25°C ex. cable	R _{ph}	Ω	6.3	1.6	7.6	1.3	4.2	5.0	3.8	0.65
Induction per phase	I < 0.6 I _p	L _{ph}	mH	51	13	60	10	34	40	30	5
Electrical time constant*	coils @ 25°C	τ _e	ms	8	8	8	8	8	8		
Maximum continuous power loss	all coils	P _c	W	430	530	640	853	1060			
Thermal resistance	coils to mount. sfc.	R _{th}	°C/W	0.15	0.12	0.11	0.08	0.06			
Thermal Time constant*	up to 63% max. coiltemp.	τ _{th}	s	90	90	90	90	90			
Temperature cut-off / sensor				PTC 1kΩ / KTY 83-122							
Coil unit weight	ex. cables	W	kg	4.9	5.9	6.9	9.4	11.6			
Coil unit length	ex. cables	L	mm	244	290	336	434	562			
Motor attraction force	rms @ 0 A	F _a	N	3400	4150	4900	6800	8300			
Magnet pitch NN		τ	mm	24	24	24	24	24			
Cable mass		m	kg/m	0.3	0.3	0.3	0.3	0.3			
Cable type (power)	length 1 m	d	mm (AWG)					11.9 (14)			
Cable type (sensor)	length 1 m	d	mm (AWG)					4.3 (26)			

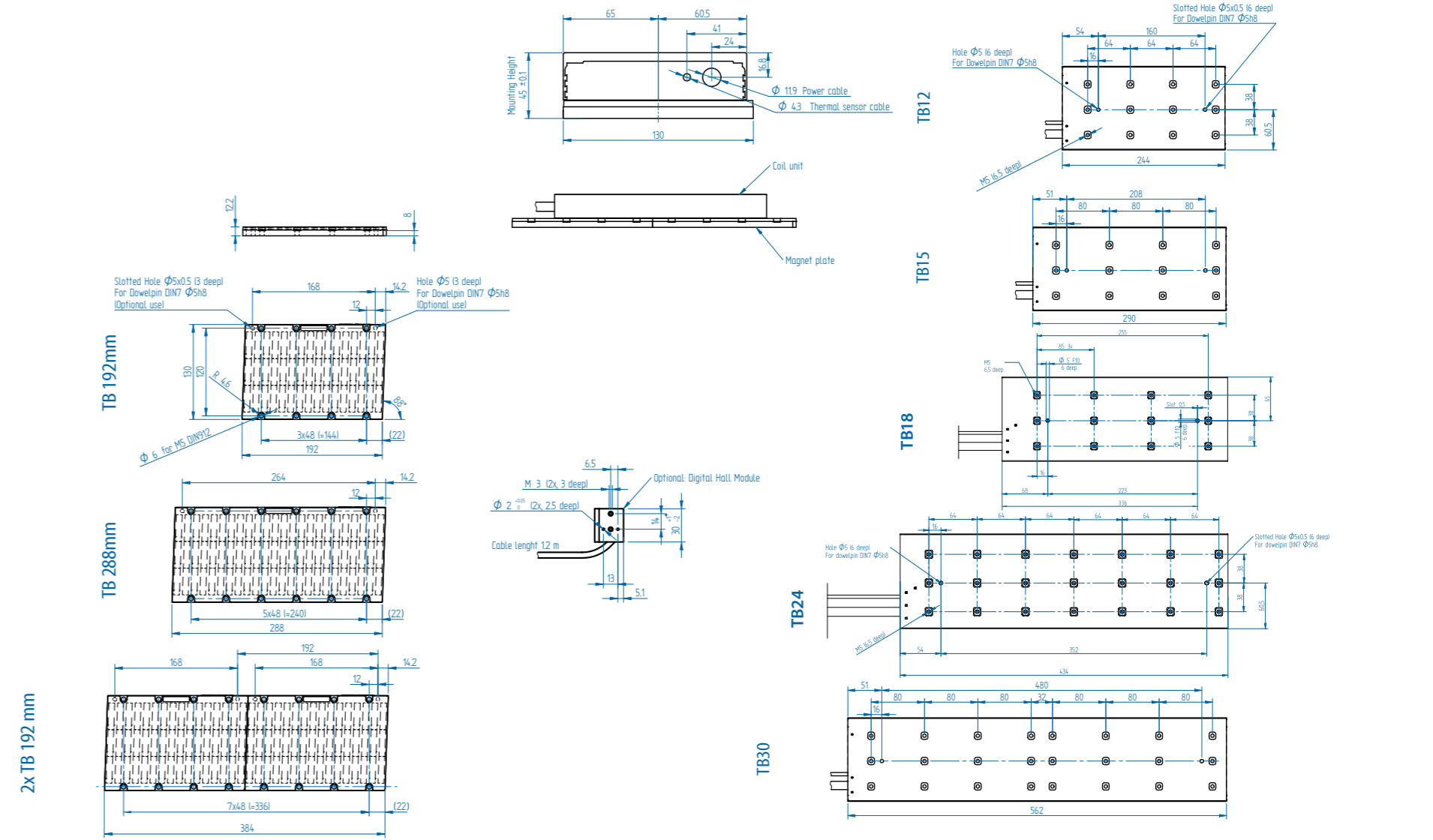
All specifications ±10%

* These values are only applicable when the mounting surface is at 20°C and the motor is driven at maximum continuous current. If these values differ in your application, please check our simulation tool.
 ** Actual values depend on bus voltage. Please check the F/v diagram in our simulation tool.

Magnet plate dimensions		
Le (mm)	192	288
M5 bolts	8	12
Mass (kg/m)	10.5	
Magnet plates can be butted together.		

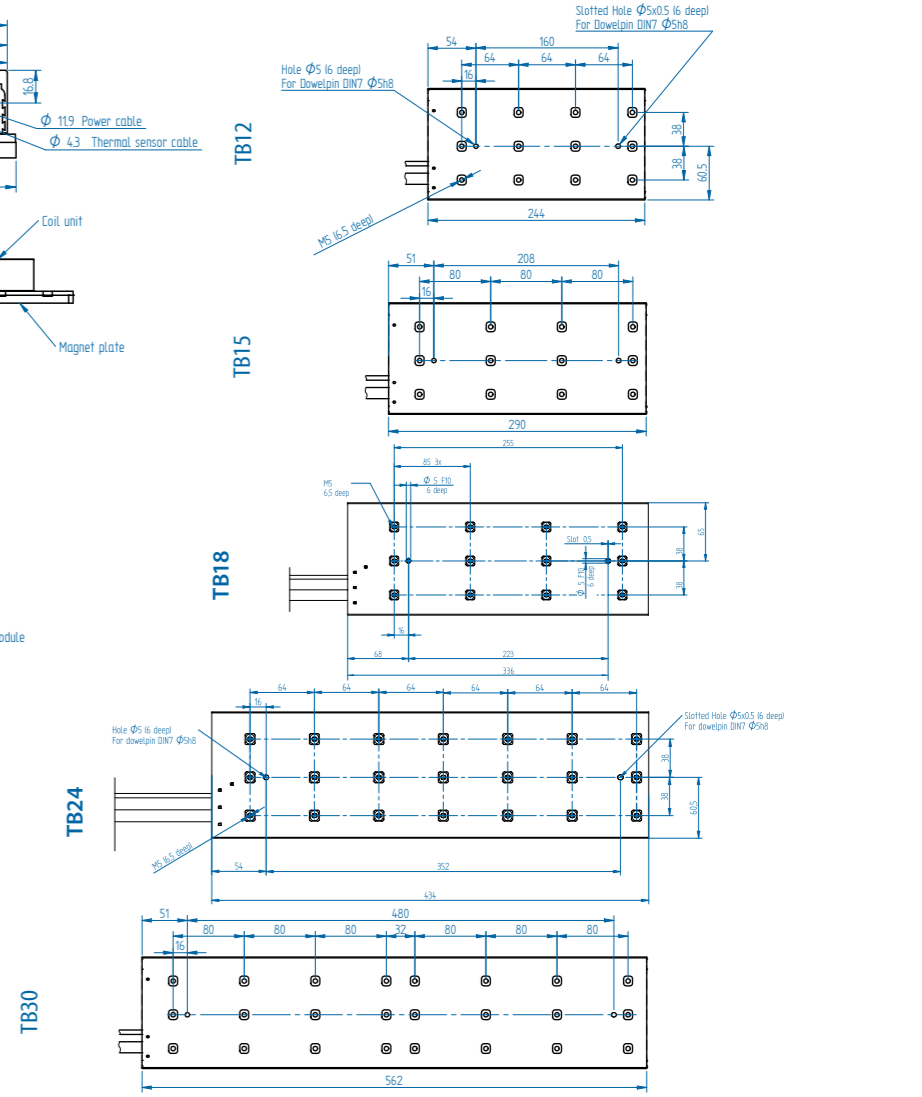


Magnet plates

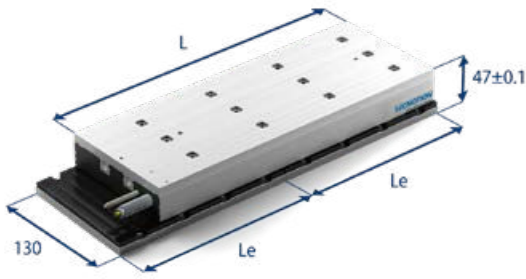


Mounting instructions and flatness or parallelism requirements can be found in the iron core installation manual. CAD files, 3D models and the manual can be downloaded from our website. * All sizes are in mm

Coil units



TBW Series iron core



TBW18 on 2x192mm magnet plate shown

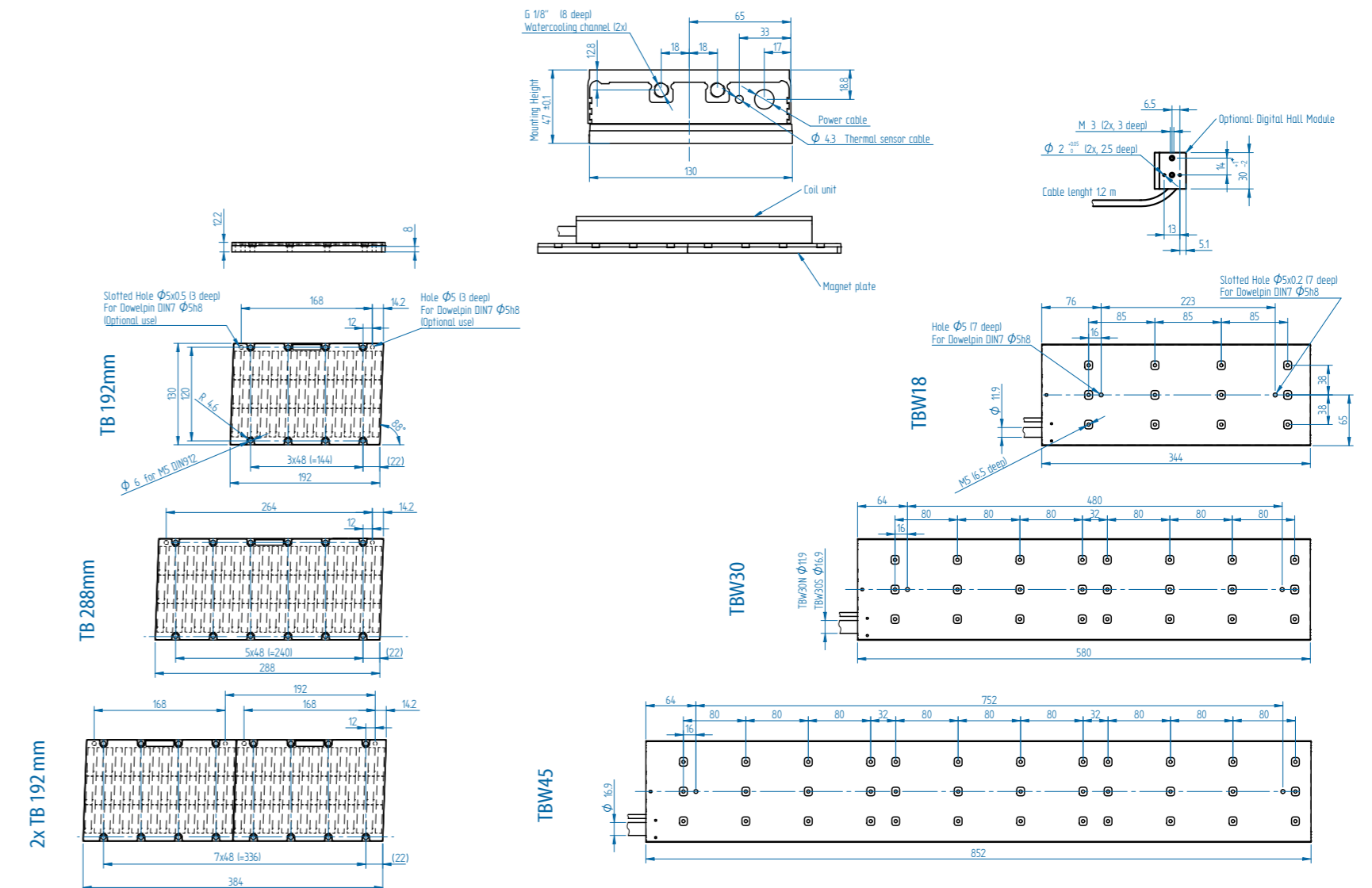
Parameter	Remarks	Symbol	Unit	TBW18		TBW30		TBW45	
				N	S	N	S	N	S
Performance									
Winding type				3-phase synchronous Iron core, 400V _{ac rms} (565 V _{dc})					
Motor type, max voltage ph-ph				3-phase synchronous Iron core, 400V _{ac rms} (565 V _{dc})					
Ultimate force @ 10°C/s increase	magnet @ 25°C	F _u	N	2700		4500		6750	
Peak force @ 6°C/s increase	magnet @ 25°C	F _p	N	2400		4000		6000	
Continuous force watercooled*	coils @ 100°C	F _{cw}	N	1200		2000		3000	
Continuous force aircooled*	coils @ 100°C	F _c	N	1140		1900		2850	
Maximum speed**	@ 560 V	V _{max}	m/s	3	6	2.5	6	2.5	6
Motor force constant	mount. sfc. @ 20°C	K	N/A _{rms}	186	90	225	93	225	93
Motor constant	coils @ 25°C	S	N ² /W	2580		4300		6450	
Electrical									
Ultimate current	magnet @ 25°C	I _u	A _{rms}	19.6	41	27	65	41	98
Peak current	magnet @ 25°C	I _p	A _{rms}	15.0	31.1	20.7	50	31	75
Continuous current watercooled*	coils @ 100°C	I _{cw}	A _{rms}	6.5	13.4	8.9	21.5	13.4	32.3
Back EMF phase-phase _{peak}		B _{emf}	V/m/s	152	76	183	76	183	76
Resistance per phase*	coils @ 25°C ex. cable	R _{ph}	Ω	4.4	1.0	3.9	0.66	2.6	0.44
Induction per phase	l < 0.6 I _p	L _{ph}	mH	35	8	31	5	21	3
Electrical time constant*	coils @ 25°C	τ _e	ms	8		8		8	
Thermal									
Maximum continuous power loss	all coils	P _c	W	726		1209		1804	
Thermal resistance	coils to mount. sfc.	R _{th}	°C/W	0.10		0.06		0.04	
Thermal time constant*	up to 63% max. coiltemp.	τ _{th}	s	87		87		87	
Watercooling flow	for ΔT=3K	Φ _w	l/min	3.1		5.2		7.8	
Watercooling pressure-drop	order of magnitude	ΔP _w	bar	1.0		1.5		2.5	
Temperature cut-off / sensor				PTC 1kΩ / KTY 83-122					
Mechanical									
Coil unit weight	ex. cables	W	kg	7.3		12.3		18.2	
Coil unit length	ex. cables	L	mm	344		580		852	
Motor attraction force	rms @ 0 A	F _a	N	4900		8300		12450	
Magnet pitch NN		τ	mm	24		24		24	
Cable mass		m	kg/m	0.3		0.6			
Cable type (power)	length 1 m	d	mm (AWG)	11.9 (14)		16.9 (10)			
Cable type (sensor)	length 1 m	d	mm (AWG)			4.3 (26)			

All specifications ±10%

* These values are only applicable when the mounting surface is at 20°C and the motor is driven at maximum continuous current. If these values differ in your application, please check our simulation tool.
 ** Actual values depend on bus voltage. Please check the F/v diagram in our simulation tool.

Magnet plates

Coil units



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* All sizes are in mm

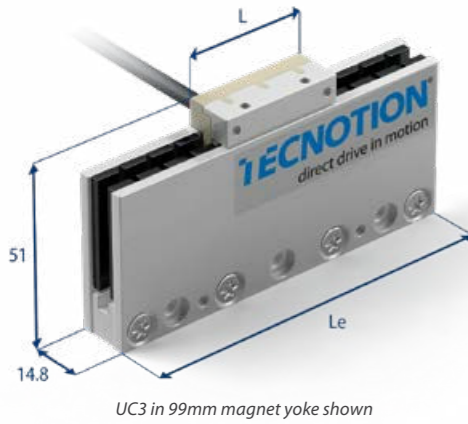
Water cooling

All TBW motors feature integrated cooling channels that allow for the easy setup of a liquid cooled system, at no additional cost.

Magnet plate dimensions

Le (mm)	192	288
M5 bolts	8	12
Mass (kg/m)	10.5	
Magnet plates can be butted together.		





UC3 in 99mm magnet yoke shown

UC Series ironless

Parameter	Remarks	Symbol	Unit	UC3 + UC3 inline	UC6	
Performance	Motor type, max voltage ph-ph			3-phase synchronous ironless, 45V _{ac,rms} (60V _{dc})		
Peak force @ 20°C/s increase	magnet @ 25°C	F _p	N	36	72	
Continuous force*	coils @ 80°C	F _c	N	10	20	
Maximum speed**	@ 60 V	v _{max}	m/s	5	5	
Motor force constant	mount. sfc. @ 20°C	K	N/A _{rms}	11.4	11.4	
Motor constant	coils @ 25°C	S	N ² /W	9.2	18.3	
Electrical	Peak current	magnet @ 25°C	I _p	A _{rms}	3.1	6.2
Maximum continuous current	coils @ 80°C	I _c	A _{rms}	0.87	1.75	
Back EMF phase-phase _{peak}		B _{emf}	V/m/s	9.3	9.3	
Resistance per phase*	coils @ 25°C ex. cable	R _{ph}	Ω	4.7	2.4	
Induction per phase		L _{ph}	mH	0.75	0.38	
Electrical time constant*	coils @ 25°C	τ _e	ms	0.16	0.16	
Thermal	Maximum continuous power loss	all coils	P _c	W	13	26
Thermal resistance	coils to mount. sfc.	R _{th}	°C/W	3.6	1.8	
Thermal time constant*	up to 63% max. coiltemp.	τ _{th}	s	25	25	
Temperature sensors				none	none	
Mechanical	Coil unit weight	ex. cables	W	kg	0.031	0.062
Coil unit length	ex. cables	L	mm	34	67	
Motor attraction force		F _a	N	0	0	
Magnet pitch NN		τ	mm	16.5	16.5	
Cable mass		m	kg/m	0.07	0.07	
Cable type (power)	length 1 m	d	mm (AWG)	4.3 (24)		
Cable type (sensor)				N/A		
Cable life (Power FLEX)***	minimum			15,000,000 cycles		
Bending radius static	minimum			5x cable diameter		
Bending radius dynamic	minimum			8x cable diameter		

All specifications ±10%

* These values are only applicable when the mounting surface is at 20°C and the motor is driven at maximum continuous current. If these values differ in your application, please check our simulation tool.

** Actual values depend on bus voltage. Please check the F/v diagram in our simulation tool.

*** Depending on bending Radius, velocity and acceleration.

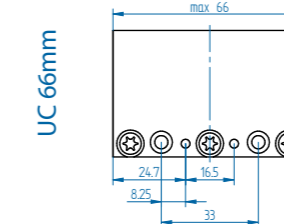
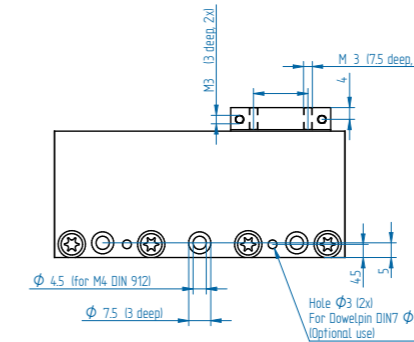
Magnet yoke dimensions

Le (mm)	66	99	264
M4 bolts	2	3	8
Mass (kg/m)	3.2		

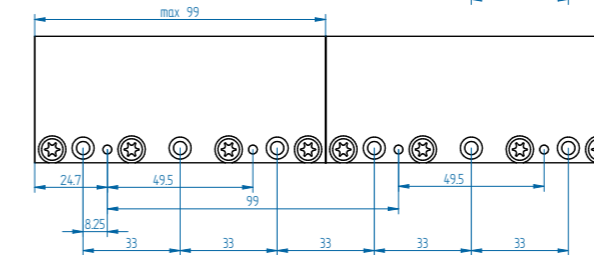
Magnet yokes can be butted together.



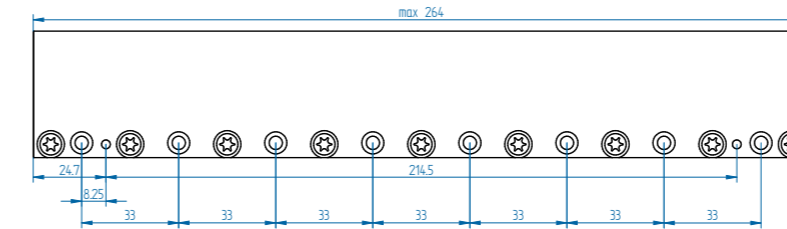
Magnet yokes



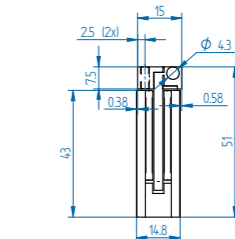
2x UC 99mm



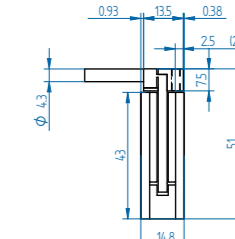
UC 264mm



Coil units

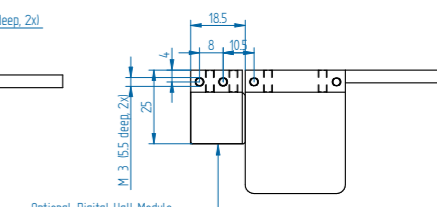
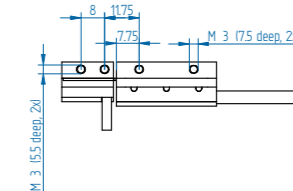


UC 3 inline

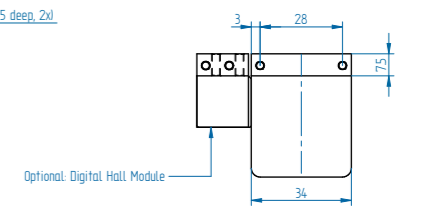
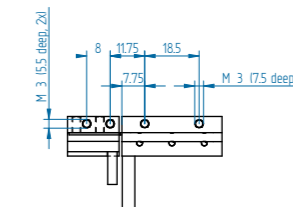


UC 3 / UC 6

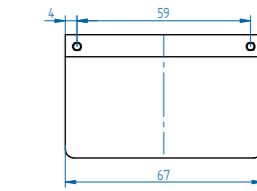
UC 3 inline



UC 3

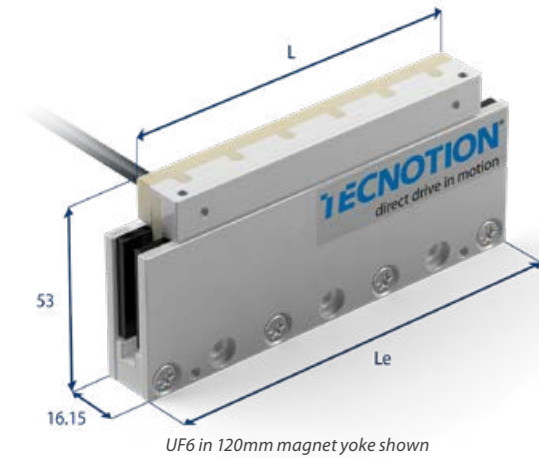


UC 6



Mounting instructions and flatness or parallelism requirements can be found in the ironless installation manual. CAD files and 3D models can be downloaded from our website.

* All sizes are in mm



UF6 in 120mm magnet yoke shown

UF Series ironless

Parameter	Remarks	Symbol	Unit	UF3	UF6	
Performance	Motortype, max voltage ph-ph			3-phase synchronous ironless, 45V _{ac,rms} (60V _{dc})		
Peak force @ 20°C/s increase	magnet @ 25°C	F _p	N	42.5	85	
Continuous force*	coils @ 110°C	F _c	N	19.5	39	
Maximum speed**	@ 60 V	V _{max}	m/s	5.1	5.1	
Motor force constant	mount. sfc. @ 20°C	K	N/A _{rms}	12.3	12.3	
Motor constant	coils @ 25°C	S	N ² /W	14.6	29.2	
Electrical	Peak current	magnet @ 25°C	I _p	A _{rms}	3.5	6.9
Maximum continuous current	coils @ 110°C	I _c	A _{rms}	1.58	3.17	
Back EMF phase-phase _{peak}		B _{emf}	V/m/s	10.1	10.1	
Resistance per phase*	coils @ 25°C ex. cable	R _{ph}	Ω	3.5	1.8	
Induction per phase		L _{ph}	mH	1.24	0.62	
Electrical time constant*	coils @ 25°C	τ _e	ms	0.36	0.36	
Thermal	Maximum continuous power loss	all coils	P _c	W	35	70
Thermal resistance	coils to mount. sfc.	R _{th}	°C/W	2.4	1.2	
Thermal time constant*	up to 63% max. coiltemp.	τ _{th}	s	34	34	
Temperature sensor				NTC	NTC	
Mechanical	Coil unit weight	ex. cables	W	kg	0.045	0.087
Coil unit length	ex. cables	L	mm	49	97	
Motor attraction force		F _a	N	0	0	
Magnet pitch NN		τ	mm	24	24	
Cable mass		m	kg/m	0.07	0.07	
Cable type (power and sensor)	length 1 m	d	mm (AWG)	4.3 (24)		
Cable life (FLEX)***	minimum			15,000,000 cycles		
Bending radius static	minimum			5x cable diameter		
Bending radius dynamic	minimum			8x cable diameter		

All specifications ±10%

* These values are only applicable when the mounting surface is at 20°C and the motor is driven at maximum continuous current. If these values differ in your application, please check our simulation tool.

** Actual values depend on bus voltage. Please check the F/v diagram in our simulation tool.

*** Depending on bending radius, velocity and acceleration.

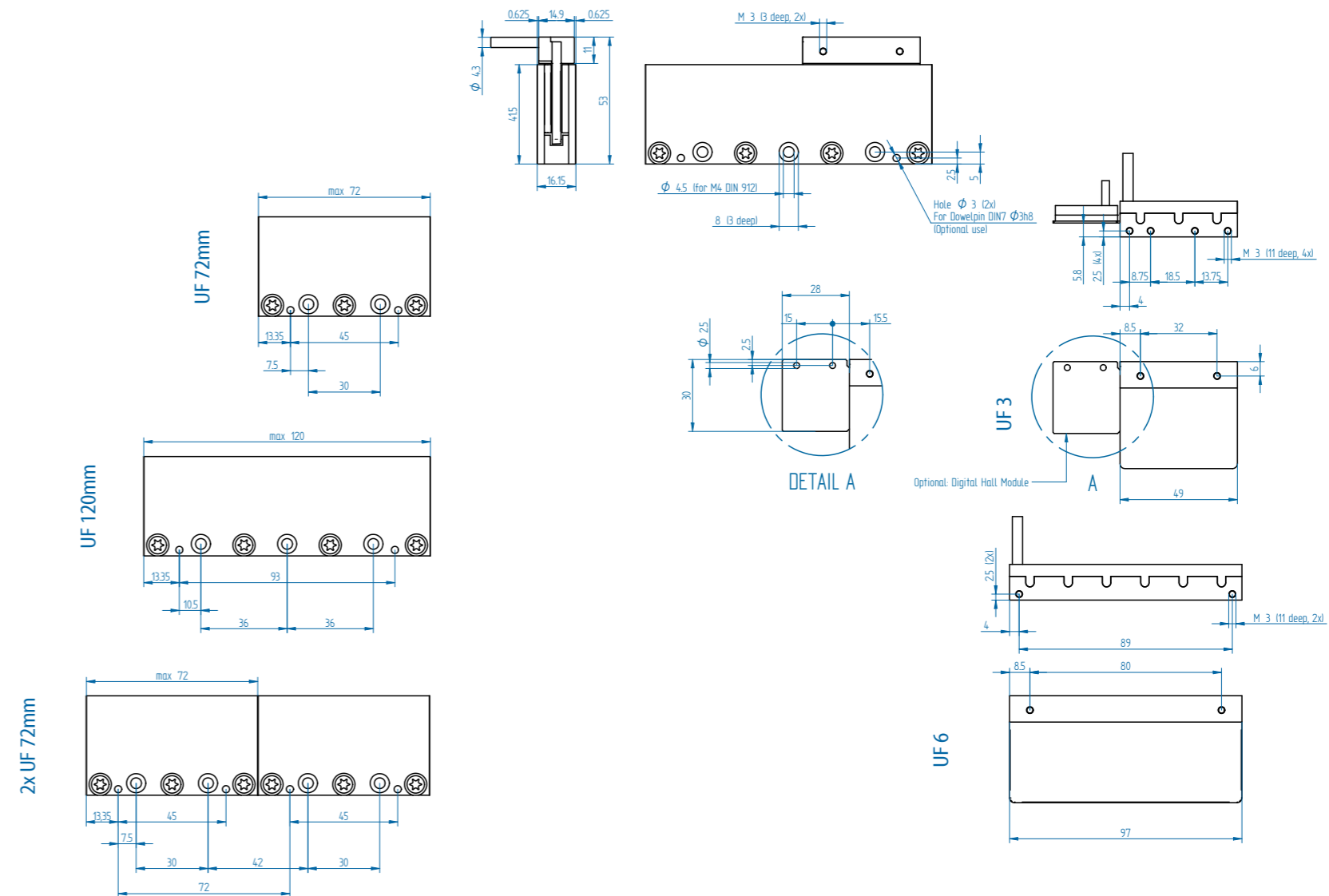
Magnet yoke dimensions

Le (mm)	72	120
M4 bolts	2	3
Mass (kg/m)	3.2	

Magnet yokes can be butted together.

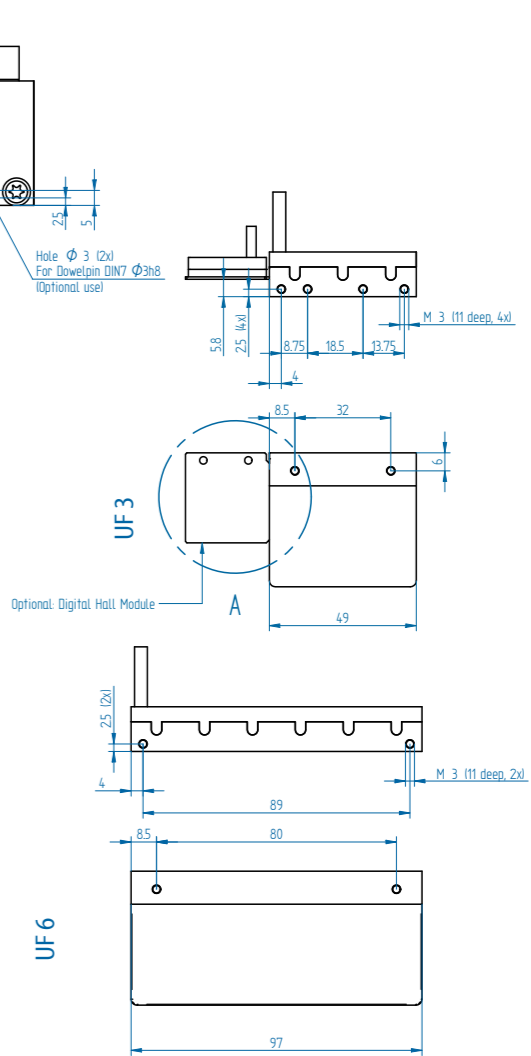


Magnet yokes

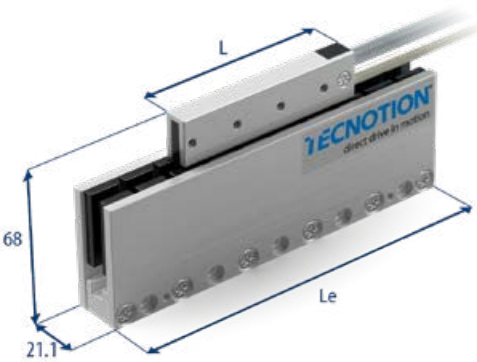


Mounting instructions and flatness or parallelism requirements can be found in the ironless installation manual. CAD files and 3D models can be downloaded from our website.

Coil units



* All sizes are in mm



UM3 in 150mm magnet yoke shown

UM Series ironless

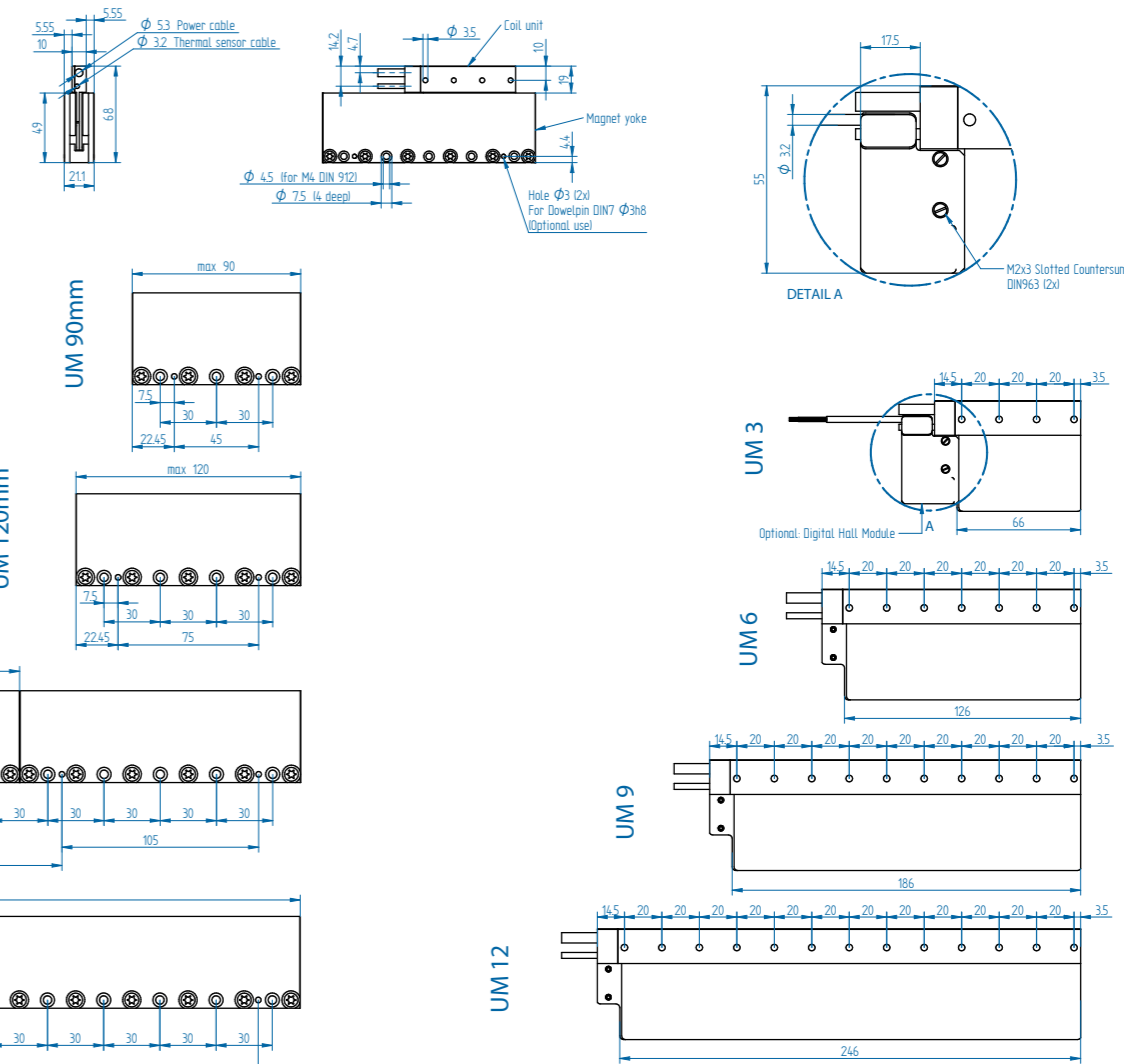
Parameter	Remarks	Symbol	Unit	UM3		UM6		UM9		UM12	
				N	S	N	S	N	S	N	S
Winding type				3-phase synchronous ironless, 230V _{ac rms} (325V _{dL})							
Motor type, max voltage ph-ph				3-phase synchronous ironless, 230V _{ac rms} (325V _{dL})							
Peak force @ 20°C/s increase	magnet @ 25°C	F _p	N	100		200		300		400	
Continuous force*	coils @ 110°C	F _c	N	29		58		87		116	
Maximum speed**	@ 300 V	V _{max}	m/s	10	18	10	18	10	17	10	16
Motor force constant	mount. sfc. @ 20°C	K	N/A _{rms}	36.3	19.9	36.3	19.9	36.3	19.9	36.3	19.9
Motor constant	coils @ 25°C	S	N ² /W	24		48		71		95	
Peak current	magnet @ 25°C	I _p	A _{rms}	2.8	5.0	5.5	10.0	8.3	15.0	11.0	20.0
Maximum continuous current	coils @ 110°C	I _c	A _{rms}	0.8	1.5	1.6	2.9	2.4	4.4	3.2	5.8
Back EMF phase-phase _{peak}		B _{emf}	V/m/s	30	16	30	16	30	16	30	16
Resistance per phase*	coils @ 25°C ex. cable	R _{ph}	Ω	18.5	5.5	9.3	2.8	6.2	1.8	4.6	1.4
Induction per phase		L _{ph}	mH	6	1.8	3	0.9	2	0.6	1.5	0.4
Electrical time constant*	coils @ 25°C	τ _e	ms	0.35		0.35		0.35		0.35	
Maximum continuous power loss	all coils	P _c	W	47		95		142		190	
Thermal resistance	coils to mount. sfc.	R _{th}	°C/W	1.8		0.9		0.6		0.45	
Thermal time constant*	up to 63% max. coiltemp.	τ _{th}	s	36		36		36		36	
Temperature cut-off / sensor				PTC 1kΩ / NTC							
Coil unit weight	ex. cables	W	kg	0.084		0.162		0.240		0.318	
Coil unit length	ex. cables	L	mm	78		138		198		258	
Motor attraction force		F _a	N	0		0		0		0	
Magnet pitch NN		τ	mm	30		30		30		30	
Cable mass		m	kg/m	0.08		0.08		0.08		0.08	
Cable type (power)	length 1 m	d	mm (AWG)	5.3 (22)							
Cable type (sensor)	length 1 m	d	mm (AWG)	3.2 (26)							

All specifications ±10%

* These values are only applicable when the mounting surface is at 20°C and the motor is driven at maximum continuous current. If these values differ in your application, please check our simulation tool.
 ** Actual values depend on bus voltage. Please check the F/v diagram in our simulation tool.

Magnet yokes

Coil units

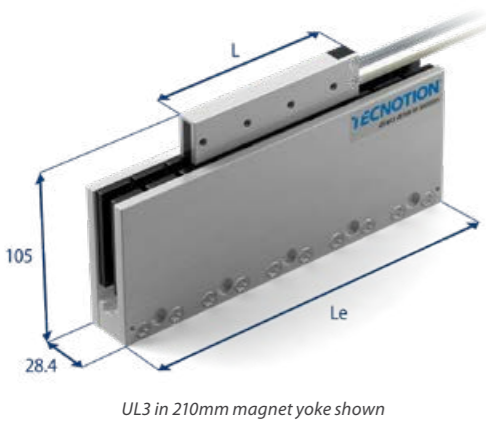


Magnet yoke dimensions				
Le (mm)	90	120	150	390
M4 bolts	3	4	6	13
Mass (kg/m)	4.8			
Magnet yokes can be butted together.				



Mounting instructions and flatness or parallelism requirements can be found in the ironless installation manual. CAD files and 3D models can be downloaded from our website.

* All sizes are in mm



UL Series ironless

Parameter	Remarks	Symbol	Unit	UL3	UL6	UL9	UL12	UL15
Winding type				N S	N S	N S	N S	N S
Motor type, max voltage ph-ph				3-phase synchronous ironless, 230V _{ac rms} (325V _{dc})				
Peak force @ 20°C/s increase	magnet @ 25°C	F _p	N	240	480	720	960	1200
Continuous force*	coils @ 110°C	F _c	N	70	140	210	280	350
Maximum speed**	@ 300 V	v _{max}	m/s	5 12	5 12	5 12	5 12	5 12
Motor force constant	mount. sfc. @ 20°C	K	N/A _{rms}	68 27.5	68 27.5	68 27.5	68 27.5	67.5 27.5
Motor constant	coils @ 25°C	S	N ² /W	97	195	290	390	485
Peak current	magnet @ 25°C	I _p	A _{rms}	3.5 8.7	7 17.5	10.5 26.2	14.1 35	17.8 44
Maximum continuous current	coils @ 110°C	I _c	A _{rms}	1.03 2.6	2.1 5.1	3.1 7.6	4.2 10.2	5.2 12.9
Back EMF phase-phase _{peak}		B _{emf}	V/m/s	55.5 22.5	55.5 22.5	55.5 22.5	55.5 22.5	55.5 22.5
Resistance per phase*	coils @ 25°C ex. cable	R _{ph}	Ω	15.9 2.6	8.0 1.28	5.3 0.85	4.0 0.64	3.3 0.53
Induction per phase		L _{ph}	mH	13 2.0	6.5 1.0	4.2 0.7	3.2 0.5	3 0.4
Electrical time constant*	coils @ 25°C	τ _e	ms	0.8	0.8	0.8	0.8	0.8
Maximum continuous power loss	all coils	P _c	W	67	134	200	270	335
Thermal resistance	coils to mount. sfc.	R _{th}	°C/W	1.3	0.65	0.43	0.32	0.26
Thermal time constant*	up to 63% max. coiltemp.	τ _{th}	s	72	72	72	72	72
Temperature cut-off / sensor				PTC 1kΩ / NTC				
Coil unit weight	ex. cables	W	kg	0.25	0.47	0.69	0.91	1.13
Coil unit length	ex. cables	L	mm	106	190	274	358	442
Motor attraction force		F _a	N	0	0	0	0	0
Magnet pitch NN		τ	mm	42	42	42	42	42
Cable mass		m	kg/m	0.09	0.09	0.09	0.105	0.105
Cable type (power)	length 1 m	d	mm (AWG)		5.8 (20)		6.4 (18)	
Cable type (sensor)	length 1 m	d	mm (AWG)		4.3 (26)		4.3 (26)	

All specifications ±10%

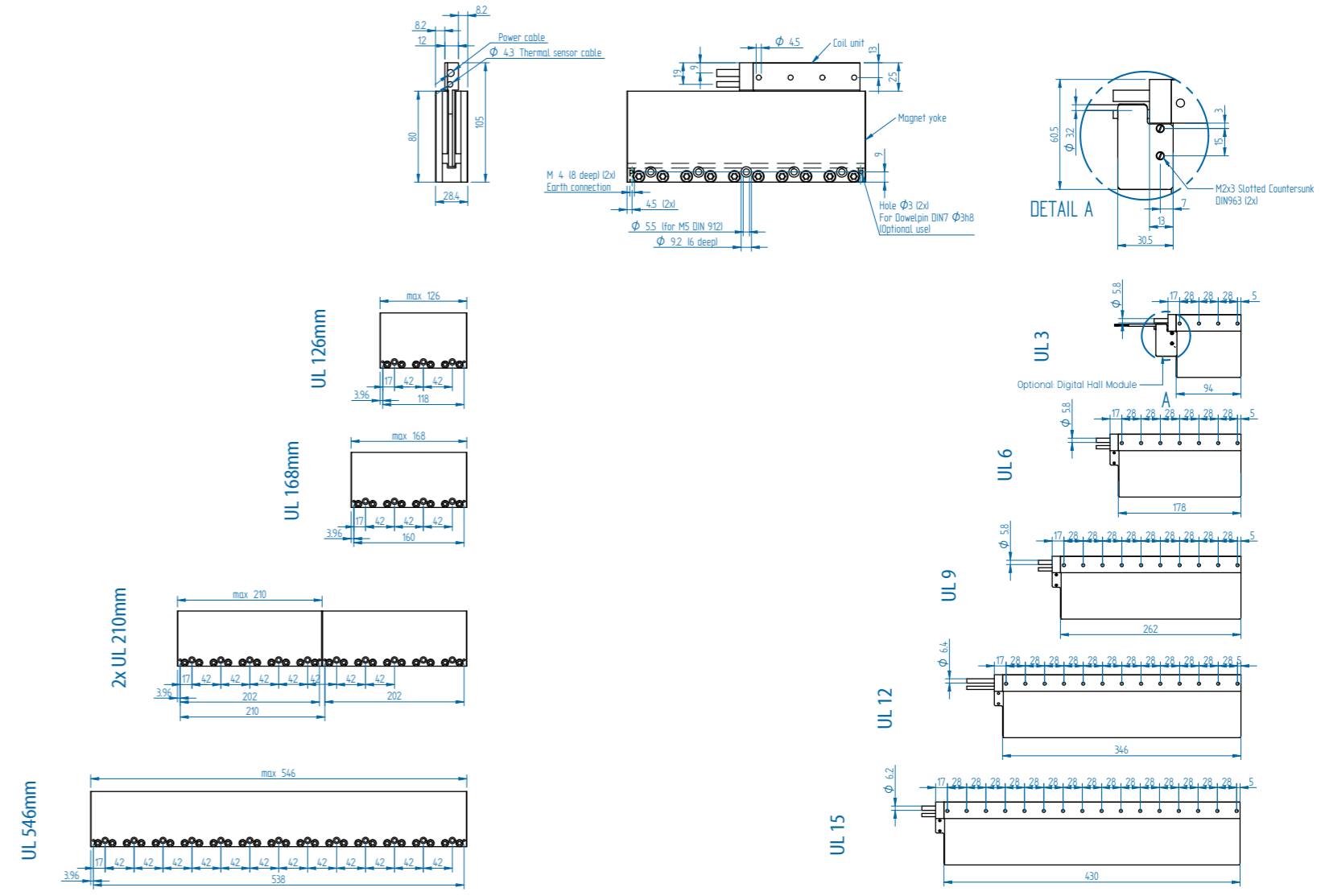
* These values are only applicable when the mounting surface is at 20°C and the motor is driven at maximum continuous current. If these values differ in your application, please check our simulation tool.
 ** Actual values depend on bus voltage. Please check the F/v diagram in our simulation tool.

Magnet yoke dimensions				
Le (mm)	126	168	210	546
M5 bolts	3	4	5	13
Mass (kg/m)	11.2			
Magnet yokes can be butted together.				



Magnet yokes

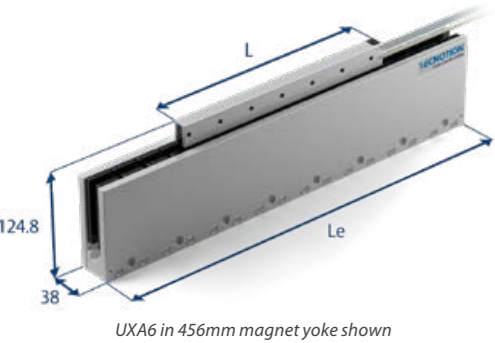
Coil units



Mounting instructions and flatness or parallelism requirements can be found in the ironless installation manual. CAD files and 3D models can be downloaded from our website.

* All sizes are in mm

UXA Series ironless



UXA6 in 456mm magnet yoke shown

UXA3S Power Cable (FLEX cable of 3m)

Cable Type	9.0 (21) mm (AWG)
Cable Life****	5,000,000 cycles
Bending Radius Static	4x cable diameter
Bending Radius Dynamic	10x cable diameter

**** Depending on Bending Radius, Velocity and Acceleration.

Magnet yoke dimensions

Le (mm)	114	171	456
M6 bolts	2	3	8
Mass (kg/m)	19		

Magnet yokes can be butted together.



Parameter	Remarks	Symbol	Unit	Magnet yokes											
				UXA3		UXA6		UXA9		UXA12		UXA18			
Winding type				N	S	N	S	N	S	N	S	N	S	N	
Motor type, max voltage ph-ph				3-phase synchronous ironless, 230V _{ac rms} (325V _{dc})											
Peak force @ 20°C/s increase	magnet @ 25°C	F _p	N	615	1230	1845	2460	3690							
Continuous force*	coils @ 110°C	F _c	N	120	240	360	480	720							
Maximum speed**	@ 300 V	v _{max}	m/s	2.9	7.2	2.9	7.2	2.9	7.2	2.9	7.2	2.9	7.2	2.9	
Motor force constant	mount. sfc. @ 20°C	K	N/A _{rms}	107	43.4	107	43.4	107	43.4	107	43.4	107	43.4	107	
Motor constant	coils @ 25°C	S	N ² /W	244	488	732	976	1464							
Peak current	magnet @ 25°C	I _p	A _{rms}	5.6	13.9	11.3	28	16.9	42	22.6	56	34			
Maximum continuous current	coils @ 110°C	I _c	A _{rms}	1.14	2.80	2.27	5.6	3.4	8.4	4.5	11.2	6.8			
Back EMF phase-phase _{peak}		B _{emf}	V/m/s	87	35	87	35	87	35	87	35	87			
Resistance per phase*	coils @ 25°C ex. cable	R _{ph}	Ω	15.8	2.6	7.9	1.29	5.3	0.86	4.0	0.65	2.6			
Induction per phase		L _{ph}	mH	28	4.6	14	2.3	9	1.5	7	1.2	4.7			
Electrical time constant*	coils @ 25°C	τ _e	ms	1.8	1.8	1.8	1.8	1.8							
Maximum continuous power loss	all coils	P _c	W	82	165	247	330	494							
Thermal resistance	coils to mount. sfc.	R _{th}	°C/W	1.04	0.52	0.35	0.26	0.17							
Thermal time constant	up to 63% max. coiltemp.	τ _{th}	s	156	156	156	156	156							
Temperature cut-off / sensor*				PTC 1kΩ / NTC											
Coil unit weight	ex. cables	W	kg	0.55	0.95	1.35	1.75	2.55							
Coil unit length	ex. cables	L	mm	134	248	362	476	701							
Motor attraction force		F _a	N	0	0	0	0	0							
Magnet pitch NN		τ	mm	57	57	57	57	57							
Cable mass		m	kg/m	0.18	0.18	0.18	0.18	0.18							
Cable type (power)	length 1 m	d	mm (AWG)	6.4 (18) except UXA3S***											
Cable type (sensor)	length 1 m	d	mm (AWG)	4.3 (26)											

All specifications ±10%

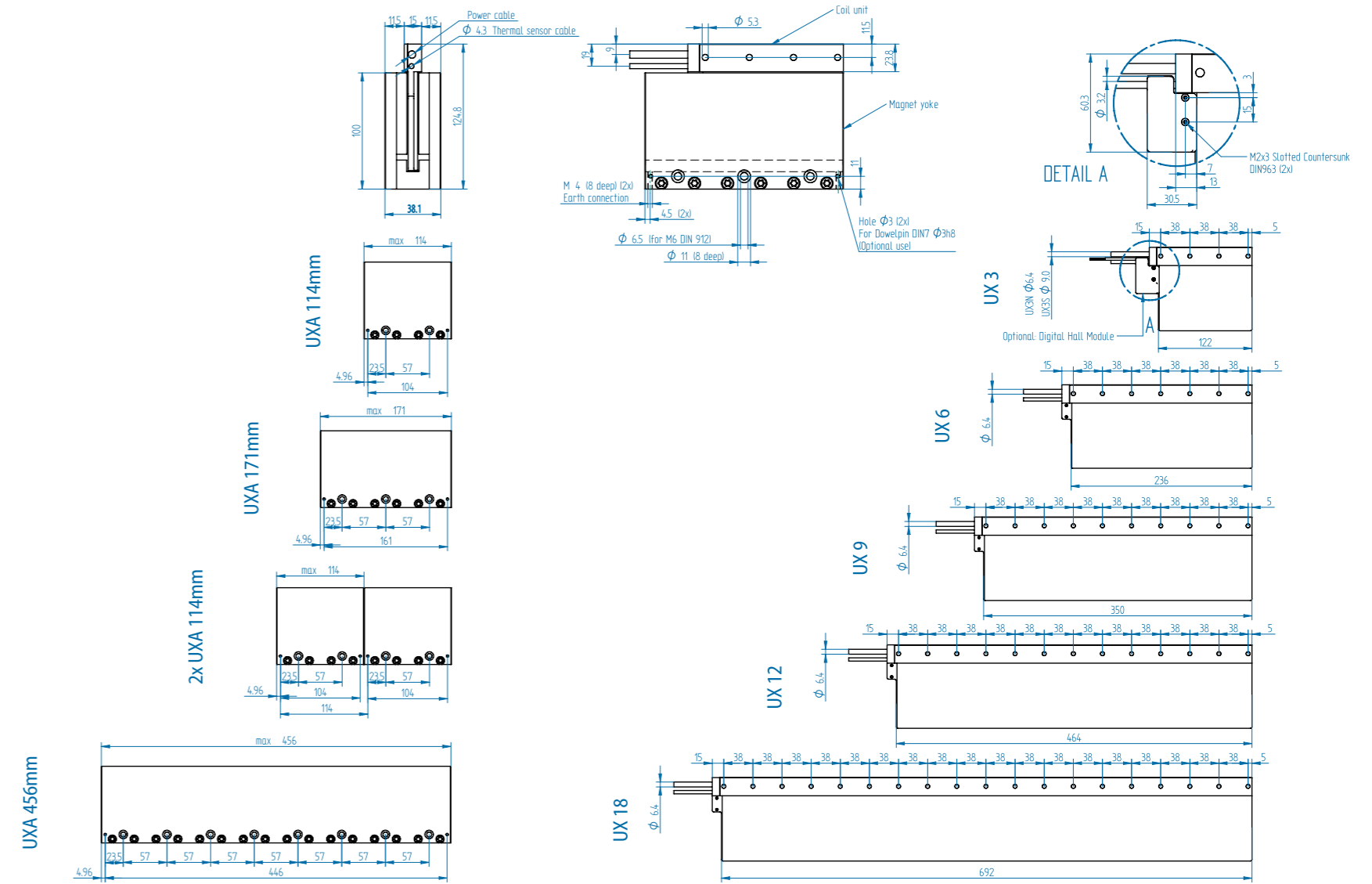
* These values are only applicable when the mounting surface is at 20°C and the motor is driven at maximum continuous current. If these values differ in your application, please check our simulation tool.

** Actual values depend on bus voltage. Please check the F/v diagram in our simulation tool.

*** The UXA3S is only available with a FLEX power cable. The specifications for this cable can be found in the table on the left side of this page.

Magnet yokes

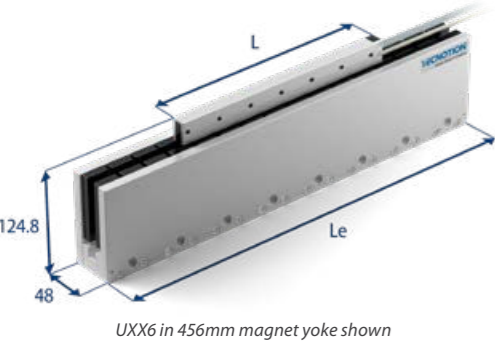
Coil units



Mounting instructions and flatness or parallelism requirements can be found in the ironless installation manual. CAD files and 3D models can be downloaded from our website.

* All sizes are in mm

UXX Series ironless



UXX6 in 456mm magnet yoke shown

UXX3S Power Cable (FLEX cable of 3m)

Cable Type	9.0 (21) mm (AWG)
Cable Life****	5,000,000 cycles
Bending Radius Static	4x cable diameter
Bending Radius Dynamic	10x cable diameter

**** Depending on Bending Radius, Velocity and Acceleration.

Magnet yoke dimensions

Le (mm)	114	171	456
M6 bolts	2	3	8
Mass (kg/m)	25		

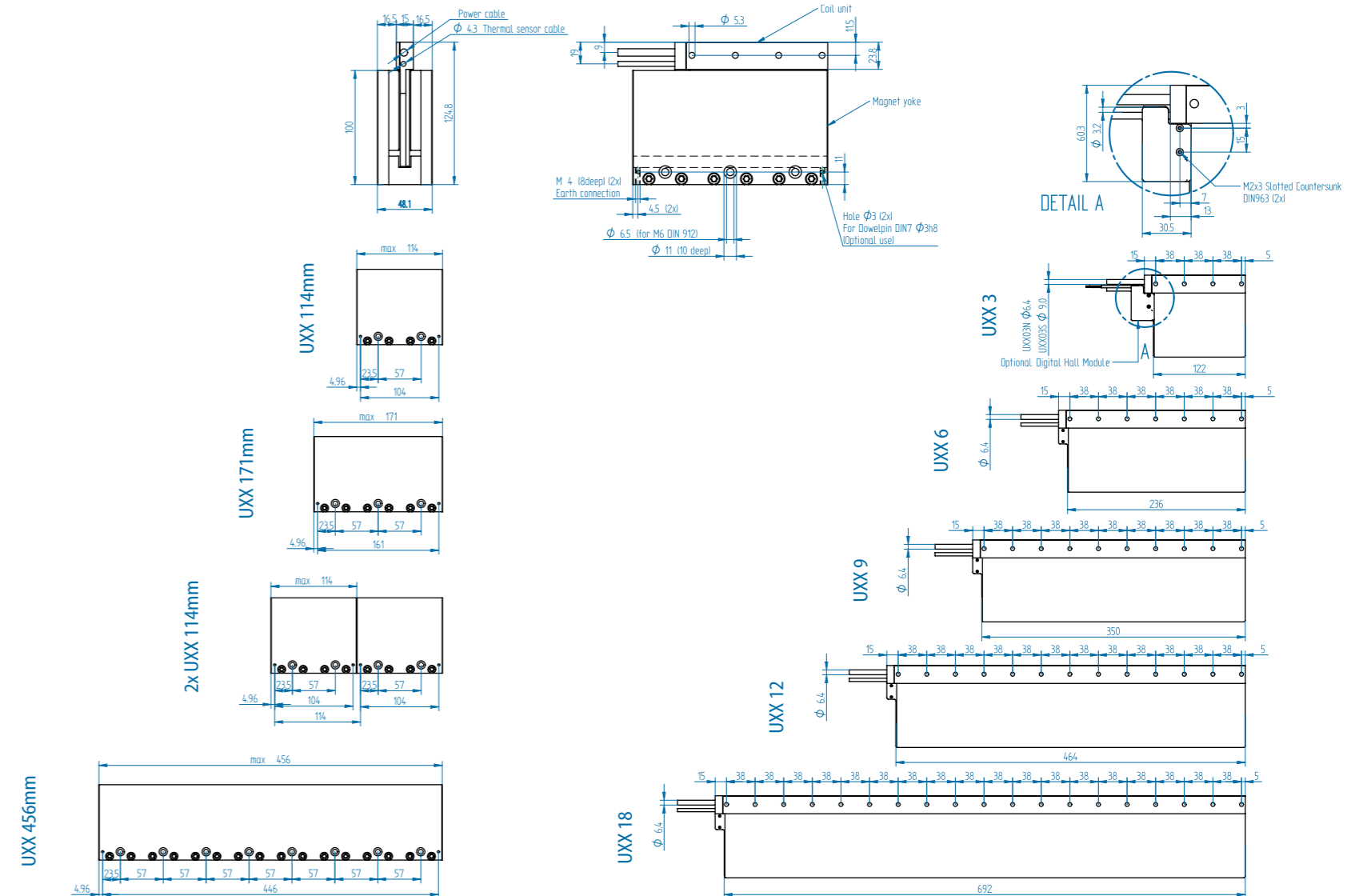
Magnet yokes can be butted together.



Parameter	Remarks	Symbol	Unit	UXX3		UXX6		UXX9		UXX12		UXX18
				N	S	N	S	N	S	N	S	N
Winding type				3-phase synchronous ironless, 230V _{ac rms} (325V _{dc})								
Motor type, max voltage ph-ph				3-phase synchronous ironless, 230V _{ac rms} (325V _{dc})								
Peak force @ 20°C/s increase	magnet @ 25°C	F _p	N	700		1400		2100		2800		4200
Continuous force*	coils @ 110°C	F _c	N	141		282		423		564		846
Maximum speed**	@ 300 V	v _{max}	m/s	2.7	6.6	2.7	6.6	2.7	6.6	2.7	6.6	2.7
Motor force Constant	mount. sfc. @ 20°C	K	N/A _{rms}	124	50.3	124	50.3	124	50.3	124	50.3	124
Motor constant	coils @ 25°C	S	N ² /W	323		647		970		1293		1940
Peak current	magnet @ 25°C	I _p	A _{rms}	5.6	13.9	11.3	28	16.9	42	22.6	56	34
Maximum continuous current	coils @ 110°C	I _c	A _{rms}	1.14	2.80	2.27	5.6	3.4	8.4	4.5	11.2	6.8
Back EMF phase-phase _{peak}		B _{emf}	V/m/s	101	41	101	41	101	41	101	41	101
Resistance per phase*	coils @ 25°C ex. cable	R _{ph}	Ω	15.8	2.6	7.9	1.29	5.3	0.86	4.0	0.65	2.6
Induction per phase		L _{ph}	mH	28	4.6	14	2.3	9	1.5	7	1.2	4.7
Electrical time constant*	coils @ 25°C	τ _e	ms	1.8		1.8		1.8		1.8		1.8
Maximum continuous power loss	all coils	P _c	W	82		165		247		330		494
Thermal resistance	coils to mount. sfc.	R _{th}	°C/W	1.04		0.52		0.35		0.26		0.17
Thermal time constant*	up to 63% max. coiltemp.	τ _{th}	s	156		156		156		156		156
Temperature cut-off / sensor				PTC 1kΩ / NTC								
Coil unit weight	ex. cables	W	kg	0.55		0.95		1.35		1.75		2.55
Coil unit length	ex. cables	L	mm	134		248		362		476		701
Motor attraction force		F _a	N	0		0		0		0		0
Magnet pitch NN		τ	mm	57		57		57		57		57
Cable mass		m	kg/m	0.18		0.18		0.18		0.18		0.18
Cable type (power)	length 1 m	d	mm (AWG)	6.4 (18) except UXX3S****								
Cable type (sensor)	length 1 m	d	mm (AWG)	4.3 (26)								

All specifications ±10%

Magnet yokes

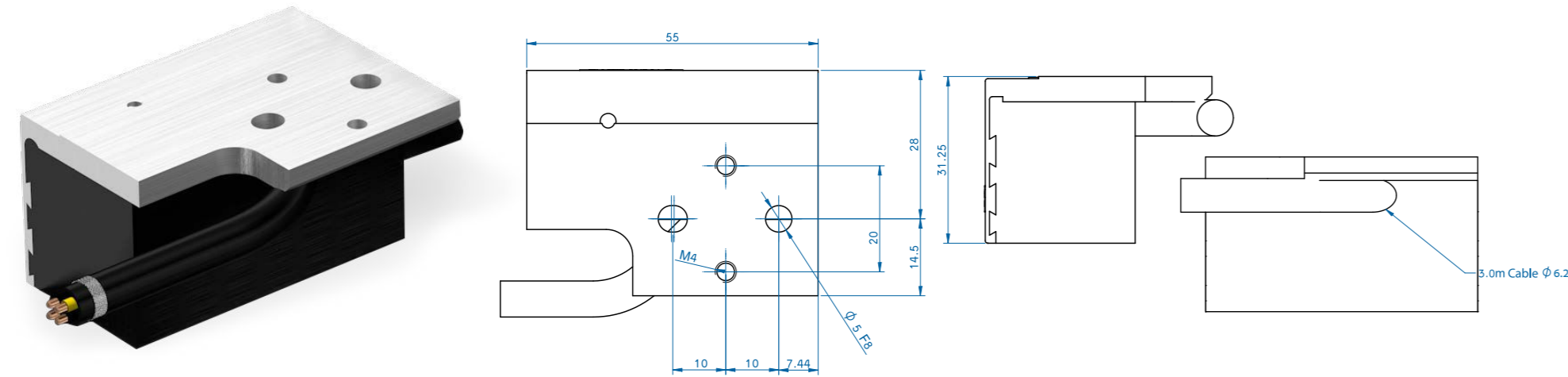


Coil units

Mounting instructions and flatness or parallelism requirements can be found in the ironless installation manual. CAD files and 3D models can be downloaded from our website.

* All sizes are in mm

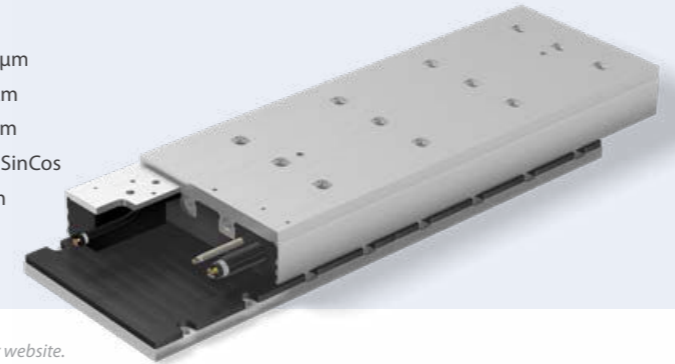
Analog Hall Module for T-series



Cost efficient positioning

Linear motors can be positioned extremely accurately by using optical encoders and rulers. If this is not required, this expensive setup can be replaced by an analog Hall module. This module uses the magnet track, as opposed to the ruler, as the linear scale. It can be easily mounted on our iron core motors and communicates with practically all standard servo controllers. The analog Hall module requires a standard 5V_{dc} power supply.

Absolute accuracy	± 100 µm
Repeatable accuracy	± 30 µm
Resolution	± 10 µm
Signal	1 Vpp SinCos
Signal period	24 mm



Mounting instructions and flatness or parallelism requirements can be found in the iron core installation manual. CAD files and 3D models can be downloaded from our website.

Additions

To use our motor simulation tool, download 3D & CAD files, installation manuals, product specifications and more, visit our website at:

www.tecnotion.com



Torque motors

Tu 0.64-2202 Nm Tc 0.27-907 Nm

Due to the extensive motor design knowledge within Tecnotion, we have developed a torque motor series that is characterized, among others, by an superior force density, low thermal resistance, low cogging and housed design.

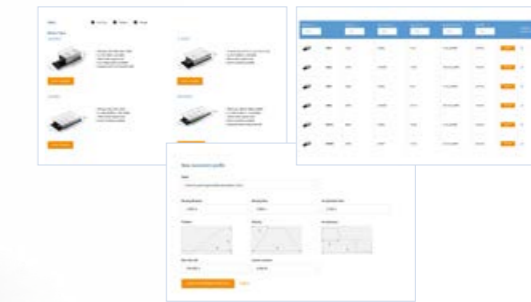
The torque series consists of different outer diameters ranging from 65mm to 485mm for the largest motor and various building heights ranging from 17mm up to 105mm.



Digital Hall module

For commutation

For commutation, we have an optional digital hall module that can be used with our entire range of linear motors. Its sensors provide 3 digital outputs, each phase shifted 120 degrees, to determine the electrical angle between coils and magnets. If you do not use a controller that allows you to commutate within the servo drive, this module can be a cost-effective alternative. The digital Hall module requires a 4 to 24V_{dc} power supply.



Simulation tool

Analyze your application

Save precious time by using our FREE online motor simulation tool. Our specialized software helps you find the best motor for the application and generate reports within seconds, without having to make time consuming calculations by hand.

The tool will provide you with diagrams for position, velocity, acceleration, jerk, torque, power, voltage, current, temperature and torque vs. velocity. Find the simulation tool at

www.tecnotion.com/simtool



Custom motors

Motor solutions

Besides the standard catalogue items we offer custom linear motor solutions. Some examples: custom windings, cable confection and vacuum motors for transport and positioning in vacuum.

Besides this Tecnotion offers moving magnet motors and linear solutions, completely designed toward your needs. For more information please contact Tecnotion.

Article numbers

Series	Article	Article code	Series	Article	Article code	Series	Article	Article code	Series	Article	Article code
TM Series			TB Series			UF Series			UL	Magnet yoke UL 168 mm	4022 368 5022
TM	Coil unit TM 3S FLEX	4022 368 5075	TB	Coil unit TB 12N	4022 368 5155	UF	Coil unit UF 3	4022 368 5298	UL	Magnet yoke UL 210 mm	4022 368 5023
TM	Coil unit TM 3Z FLEX	4022 368 5533	TB	Coil unit TB 12S	4022 368 5157	UF	Coil unit UF 6	4022 368 5372	UL	Magnet yoke UL 546 mm	4022 368 5024
TM	Coil unit TM 6S FLEX	4022 368 5076	TB	Coil unit TB 15N	4022 368 5122	UF	Magnet yoke UF 72 mm	4022 368 5382	UL	Digital Hall Module UL	4022 368 5145
TM	Coil unit TM 6Z FLEX	4022 368 5300	TB	Coil unit TB 15S	4022 368 5120	UF	Magnet yoke UF 120 mm	4022 368 5383	UXA Series		
TM	Coil unit TM 12S FLEX	4022 368 5078	TB	Coil unit TB 18N	111026	UF	Digital Hall Module UF	4022 368 5391	UXA	Coil unit UX 3N	4022 368 5105
TM	Coil unit TM 18N FLEX	4022 368 5500	TB	Coil unit TB 24N	111027	UM Series			UXA	Coil unit UX 3S FLEX	4022 368 5235
TM	Coil unit TM 18S FLEX	4022 368 5519	TB	Coil unit TB 30N	4022 368 5123	UM	Coil unit UM 3N	4022 368 5055	UXA	Coil unit UX 6N	4022 368 5106
TM	Magnet plate TM 96 mm	4022 368 5225	TB	Coil unit TB 30S	4022 368 5121	UM	Coil unit UM 3S	4022 368 5051	UXA	Coil unit UX 6S	4022 368 5101
TM	Magnet plate TM 144 mm	4022 368 5226	TB	Magnet plate TB 192 mm	4022 368 5221	UM	Coil unit UM 6N	4022 368 5056	UXA	Coil unit UX 9N	4022 368 5107
TM	Magnet plate TM 384 mm	4022 368 5227	TB	Magnet plate TB 288 mm	4022 368 5222	UM	Coil unit UM 6S	4022 368 5052	UXA	Coil unit UX 9S	4022 368 5102
TM	Analog Hall Module	4022 368 5139	TB	Analog Hall Module	4022 368 5139	UM	Coil unit UM 9N	4022 368 5057	UXA	Coil unit UX 12N	4022 368 5108
TM	Digital Hall Module T-Serie	4022 368 5418	TB	Digital Hall Module T-Serie	4022 368 5418	UM	Coil unit UM 9S	4022 368 5053	UXA	Coil unit UX 12S	4022 368 5103
TL Series			TBW Series			UM	Coil unit UM 12N	4022 368 5058	UXA	Coil unit UX 18N	4022 368 5111
TL	Coil unit TL 6N	4022 369 7458	TBW	Coil unit TBW 18N	4022 368 5263	UM	Coil unit UM 12S	4022 368 5054	UXA	Magnet yoke UX-A 114 mm	4022 368 5098
TL	Coil unit TL 6S	4022 368 5032	TBW	Coil unit TBW 18S	4022 368 5264	UM	Magnet yoke UM 90 mm	4022 368 5040	UXA	Magnet yoke UX-A 171 mm	4022 368 5093
TL	Coil unit TL 9N	4022 368 5311	TBW	Coil unit TBW 30N	4022 368 5242	UM	Magnet yoke UM 120 mm	4022 368 5041	UXA	Magnet yoke UX-A 456 mm	4022 368 5099
TL	Coil unit TL 9S	4022 368 5312	TBW	Coil unit TBW 30S	4022 368 5243	UM	Magnet yoke UM 150 mm	4022 368 5042	UXA	Digital Hall Module UX	4022 368 5154
TL	Coil unit TL 12N	4022 369 7459	TBW	Coil unit TBW 45N	4022 368 5244	UM	Magnet yoke UM 390 mm	4022 368 5043	UXX Series		
TL	Coil unit TL 12S	4022 368 5033	TBW	Coil unit TBW 45S	4022 368 5245	UM	Digital Hall Module UM	4022 368 5144	UXX	Coil unit UX 3N	4022 368 5105
TL	Coil unit TL 15N	4022 369 7460	TBW	Magnet plate TB 192 mm	4022 368 5221	UL Series			UXX	Coil unit UX 3S FLEX	4022 368 5235
TL	Coil unit TL 15S	4022 368 5034	TBW	Magnet plate TB 288 mm	4022 368 5222	UL	Coil unit UL 3N	4022 368 5025	UXX	Coil unit UX 6N	4022 368 5106
TL	Coil unit TL 18N	4022 368 5223	TBW	Analog Hall Module	4022 368 5139	UL	Coil unit UL 3S	4022 368 5045	UXX	Coil unit UX 6S	4022 368 5101
TL	Coil unit TL 18S	4022 368 5224	TBW	Digital Hall Module T-Serie	4022 368 5418	UL	Coil unit UL 6N	4022 368 5026	UXX	Coil unit UX 9N	4022 368 5107
TL	Coil unit TL 24N	4022 368 5014	UC Series			UL	Coil unit UL 6S	4022 368 5046	UXX	Coil unit UX 9S	4022 368 5102
TL	Coil unit TL 24S	4022 368 5035	UC	Coil unit UC 3	4022 368 5067	UL	Coil unit UL 9N	4022 368 5027	UXX	Coil unit UX 12N	4022 368 5108
TL	Coil unit TL 48Q	112547	UC	Coil unit UC 3 inline	4022 368 5516	UL	Coil unit UL 9S	4022 368 5047	UXX	Coil unit UX 12S	4022 368 5103
TL	Magnet plate TL 192 mm	4022 368 5193	UC	Coil unit UC 6	4022 368 5068	UL	Coil unit UL 12N	4022 368 5028	UXX	Coil unit UX 18N	4022 368 5111
TL	Magnet plate TL 288 mm	4022 368 5194	UC	Magnet yoke UC 66 mm	4022 368 5064	UL	Coil unit UL 12S	4022 368 5048	UXX	Magnet yoke UXX 114 mm	4022 368 5215
TL	Analog Hall Module	4022 368 5139	UC	Magnet yoke UC 99 mm	4022 368 5065	UL	Coil unit UL 15N	4022 368 5029	UXX	Magnet yoke UXX 171 mm	4022 368 5216
TL	Digital Hall Module T-Serie	4022 368 5418	UC	Magnet yoke UC 264 mm	4022 368 5066	UL	Coil unit UL 15S	4022 368 5049	UXX	Magnet yoke UXX 456 mm	4022 368 5217
			UC	Digital Hall Module UC	4022 368 5130	UL	Magnet yoke UL 126 mm	4022 368 5021	UXX	Digital Hall Module UX	4022 368 5154

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