TECNOTION®

THE LINEAR MOTOR COMPANY

Ironless vacuum linear motor series

QUALITY AND SERVICE
DELIVERED WORLDWIDE

[TECNOTION]

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.

Whatever your needs, you can rely on Tecnotion as a solid, reliable partner.

TECNOTION
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Ironless vacuum motor series

Vacuum technology

1		3	
U	LV	09	S
U	MV	12	N
	2		4

1. U = Ironless
2. Series type/vacuum
3. Number of coils
4. Winding type

Vacuum technology

Tecnotion is *the* specialist for vacuum linear motors. Many years of experience is used in designing and building vacuum coils and magnets. Tecnotion can supply a vacuum linear motor that can match even the strictest vacuum requirements but can also provide vacuum products for smaller budgets.

A growing amount of high tech applications require vacuum solutions to minimize the chance of unwanted chemical reactions or pollution of the process or surrounding equipment. Vacuum applications may be: positioning stages & gantries, inspection, scribing, encapsulation, lithography, de-position processes, sputtering & e-beam.
Motion is one of the main challenges within a vacuum environment. Serviceability, reliability, versatility and outgassing are critical factors in a vacuum application and failure of one of them could mean long downtimes. Total cost of ownership should be considered over the initial investment.

Maintenance costs of motion systems in vacuum are potentially high. Linear vacuum rated motors have no moving parts and are frictionless making the motors maintenance free. Additionally Tecnotion's linear motors can be placed into vacuum as a whole and therefore do not require a feed trough saving costs.

High outgassing of the motion system can influence the production process. Tecnotion´s vacuum rated ironless linear motor is a dedicated and specially designed coil unit and magnet yoke for use in high vacuum, down to 10^{-8}, and the lowest achievable outgassing for a series product.

UXXV Series

Fp 4020 N Fc 427 N

The UXXV coil is the most powerful and efficient coil in the vacuum rated linear motor series. The UXXV series is ideal for heavy duty applications that demand ultra precision and maximum force output. It's efficiency and high motor constant allow for a low heat output while generating a high force.

ULV Series

Fp 720 N Fc 120 N

The ULV coils are the high end coils in the vacuum rated linear motor series. The ULV series is commonly used for applications demanding peak force or low heat output. In longer strokes ULV coils can be combined to save magnet material but still achieve high performance.

UMV Series

Fp 400 N Fc 62 N

The UMV coils are the smallest coils in the vacuum rated linear motor series.

This series is ideal for postioning, e.g. in gantries, or high dynamic, lightweight applications which require extreme accuracy.

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Ironless vacuum motor series

Features

Capabilities

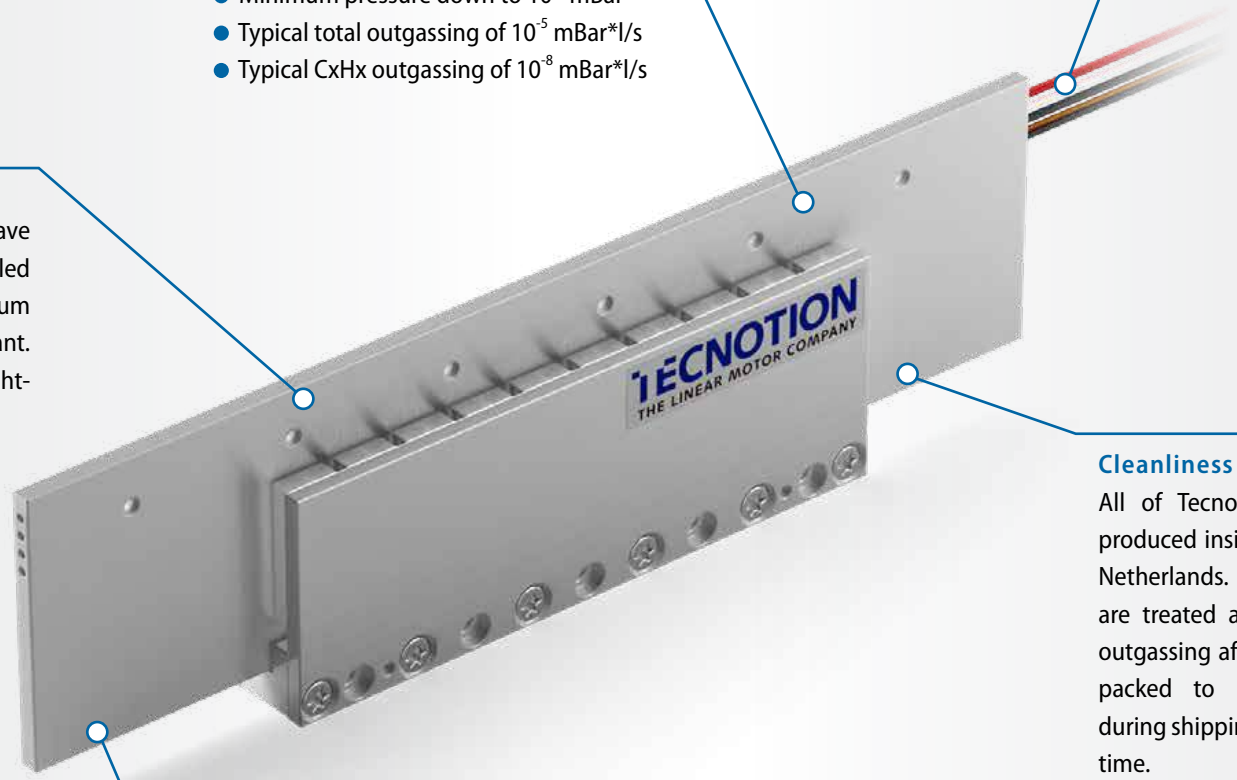
- Coil unit and yoke are completely vacuum compatible
- Minimum pressure down to 10^{-8} mBar
- Typical total outgassing of 10^{-5} mBar*l/s
- Typical CxHx outgassing of 10^{-8} mBar*l/s

Connection and sensors

The coil units are equipped with a temperature measurement and cut-off sensor to enable monitoring and overheat protection of the coil unit at all times. The sensors and three phases of the coil unit are connected through vacuum compatible cables. These are the only necessary connection to the outside world.

Design

The ironless vacuum rated motors have a unique metal housing that is sealed to prevent outgassing into the vacuum and make the coil high-vacuum resistant. Despite this housing the coil is still light-weight which allows for high dynamics.



Cleanliness

All of Tecnotion's vacuum products are produced inside our own cleanroom in the Netherlands. Before shipping the products are treated and cleaned to reduce initial outgassing after which they are cleanroom packed to prevent any contamination during shipping and installation at the same time.

Thermal

Thermal management is one of the main challenges in vacuum. Therefore the coil units have been designed to achieve a low thermal resistance (R_{th}) to enable the coil unit to quickly conduct heat away from the coil.

Equal to the standard linear motors, the vacuum linear motors have a high efficiency. This means a lower coil temperature and therefore a higher continuous force.

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MOUNTING / APPLICATION EXAMPLES

WHY CHOOSE FOR IRONLESS VACUUM RATED?

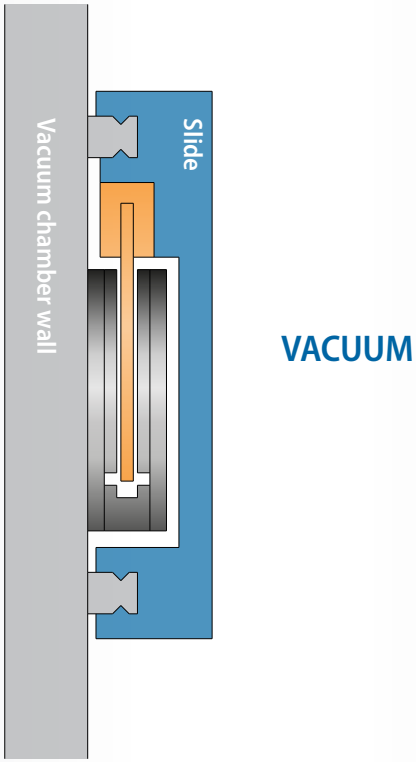
- Defined low outgassing
- No particulation
- Low thermal resistance
- High cleanliness
- No large cable feed-through required
- Can be positioned anywhere in the vacuum chamber

APPLICATIONS

- Positioning stage & gantry
- Inspection
- Scriber
- Encapsulation
- Lithography
- Deposition processes
- E-beam
- Sputtering

Moving coil application

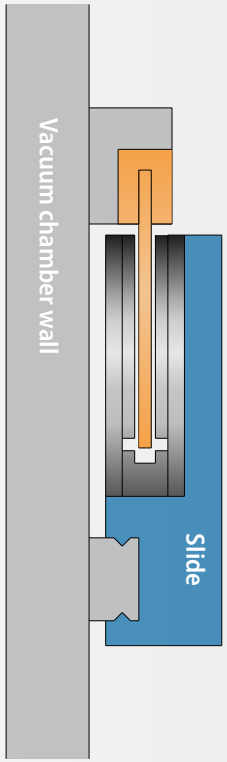
The moving coil application is ideal for dynamic applications or low masses. Multiple coils can be placed on one magnet track to move individually or work together.



VACUUM

Stationary coil application

A stationary coil application can be used in less dynamic applications. The stationary coil, mounted on a solid coil mount enhances passive cooling through conduction significantly.



VACUUM

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TECNOTION THE LINEAR MOTOR COMPANY | Vacuum ironless series

Tecnotion | www.tecnotion.com | sales@tecnotion.com

	Parameter	Remarks	Symbol	Unit	UMV12		ULV9		UXXV18
Performance	Winding type				N	S	N	S	N
	Motortype, max voltage ph-ph				3-phase synchronous ironless, 230 $V_{ac\,rms}$ (300 V_{dc})				
	Peak force @ 20°C/s	magnet @ 25°C	F_p	N	400		720		4020
	Continuous force passive cooled*	@ T_{max}	F_c	N	12		25		81
	Continuous force active cooled**	@ T_{max}	F_c	N	62		120		427
	Maximum speed***	@ 300 V	v_{max}	m/s	10	16	5	12	2.7
	Motor force constant	coils @ 20°C	K	N/A_{rms}	36.3	19.9	68	27.5	117.5
	Motor constant	coils @ 25°C	S	N^2/W	95		290		1742
Electrical	Peak current	magnet @ 25°C	I_p	A_{rms}	11.0	20.0	10.6	26	34.2
	Max. cont. current passive cooled*		I_c	A_{rms}	0.32	0.58	0.37	0.92	0.69
	Max. cont. current active cooled**		I_c	A_{rms}	1.71	3.10	1.74	4.35	3.64
	Back EMF phase-phase		B_{emf}	V_{dc} / m/s	30	16	55.5	22.5	96
	Resistance per phase	coils @ 25°C ex. cable	R_f	Ω	4.6	1.4	5.3	0.85	2.6
	Induction per phase	I < 0.6 Ip	L_f	mH	1.5	0.4	4.2	0.7	3.6
	Electrical time constant	coils @ 25°C	τ_e	ms	0.3		0.8		1.4
	Maximum continuous power loss	all coils	P_c	W	49		59		118
Thermal	Maximum coil temperature		T_{max}	°C	80		80		60
	Thermal resistance	coils to mount. sfc.	R_{th}	°C/W	1.2		1.0		0.32
	Thermal time constant*	to max. coil temp.	τ_{th}	s	96		180		290
	Temperature cut-off / sensor				PTC 1kΩ / NTC				2 x PTC 1kΩ / NTC
Mechanical	Coil unit weight	ex. cables	W	kg	0.330		0.720		3.3
	Coil unit length	ex. cables	L	mm	260		272		701
	Motor attraction force		F_a	N	0		0		0
	Magnet pitch NN		τ	mm	30		42		57
	Cable mass		m	kg/m	0.060		0.060		0.18
	Cable type (power)	length 1 m	d	mm (AWG)	3x 1.6mm (20)				5.5 (18)
	Cable type (sensor)	length 1 m	d	mm (AWG)	4x 0.8mm (26)				5.5 (18)

All specifications ±10%

UMV12 in 150mm magnet yoke shown

** Depends on environmental conditions in the application. Continuous force noted has been determined with a typical thermal resistance value for passive cooling, and a vacuum chamber wall of 40°C.*

*** Depends on environmental conditions in the application. Continuous force noted has been determined with a thermal resistance of 0.02 K/W and a mounting surface of 20°C when the motor is driven at max. continuous current.*

****Actual values depend on bus voltage.*

Outgassing

Information and specifications concerning outgassing of the UXXV, UMV and ULV series are available on request. Since these values depend on materials and environmental conditions, please contact us directly so we can advise you about your specific vacuum application. The knowledge and experience we have gained from designing and implementing custom vacuum motors for large OEMs enable us to provide a fitting solution for any application.

Suited for pressures down to 10^{-8} mbar, due to:

- Custom stainless steel coil unit housing
- Special high vacuum cables
- Low outgassing yoke design
- Cleanroom manufacturing process

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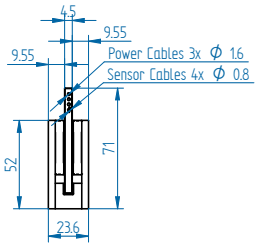
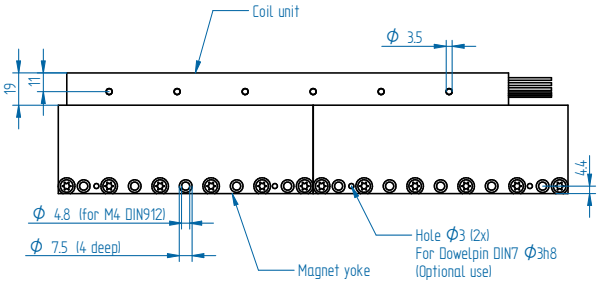
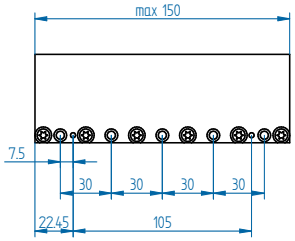
Mounting instructions and flatness or parallelism requirements can be found in the Ironless installation manual. 3D CAD files can be downloaded from our website.

UMV

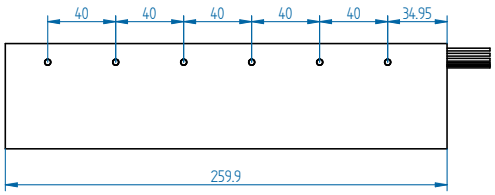




MAGNET YOKE



COIL UNIT



UMV Magnet yoke dimensions	
Le (mm)	150
M4 bolts	5
Mass (kg/m)	6.7
Magnet yokes can be butted together.	

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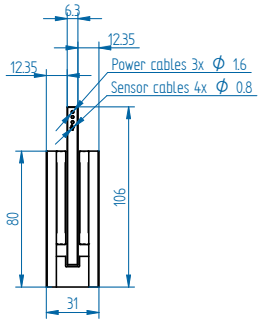
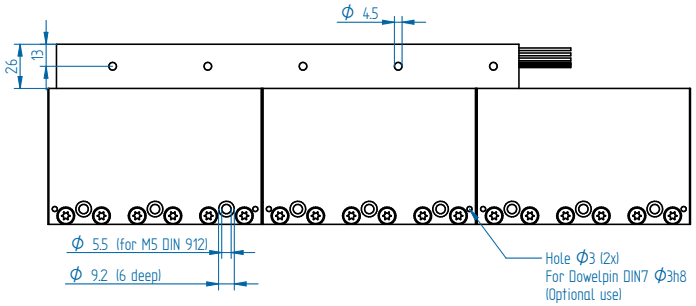
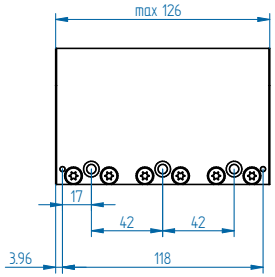
ULV

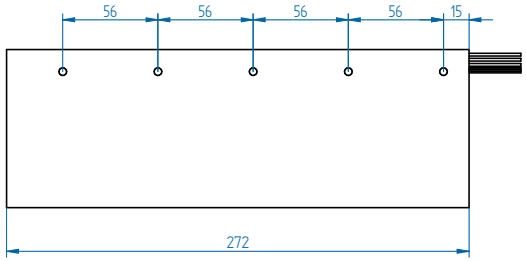




MAGNET YOKE



COIL UNIT



ULV Magnet yoke dimensions	
Le (mm)	126
M5 bolts	3
Mass (kg/m)	12.3
Magnet yokes can be butted together.	

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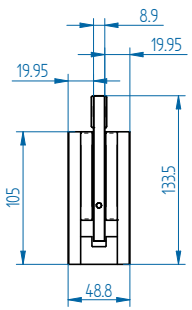
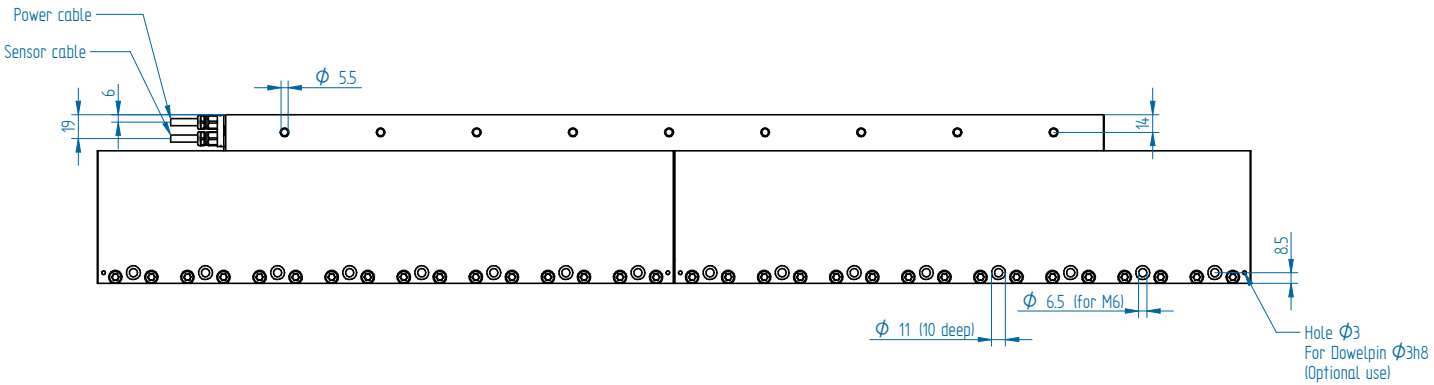
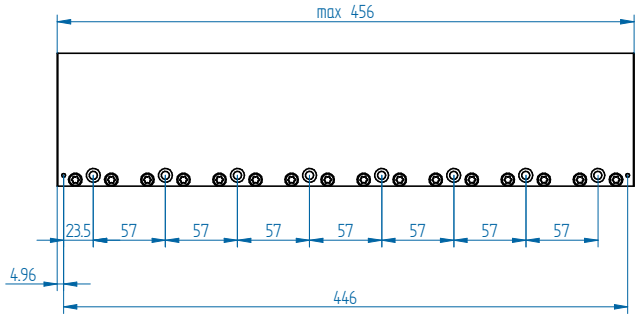
UXXV

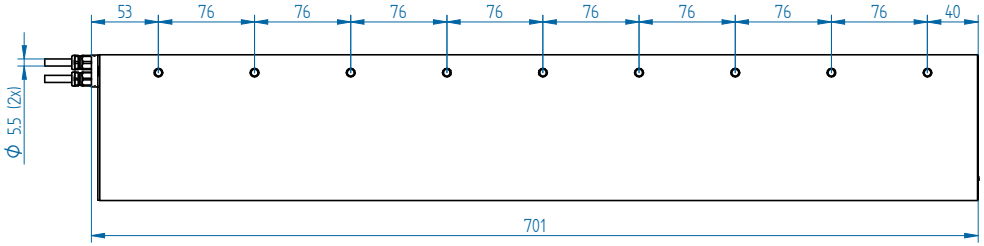




MAGNET YOKE



COIL UNIT



UXXV 18 Magnet yoke dimensions	
Le (mm)	456
M6 bolts	8
Mass (kg/m)	26
Magnet yokes can be butted together.	

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Additional products

To download our CAD files, installation manuals, product specifications and more, visit our website at:

www.tecnotion.com

Linear motor series

Iron core & ironless motor series

Tecnotion's linear motor series rely on 30 years of linear motor development experience. All motors excel in their force density ratings. They offer continuous forces in a range of 10 Newton to 3000 Newton in a surprisingly small package.

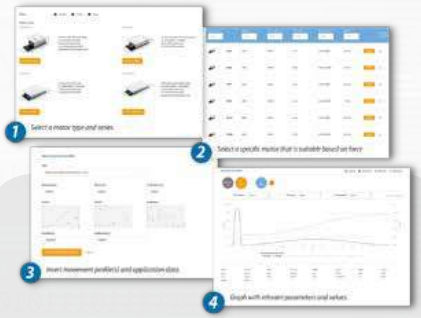
Tecnotion can provide linear solutions for most applications which require a strong iron core linear motor or a highly dynamic ironless type linear motor.

Torque motor series

QTR-A and QTL-A frameless motor series

The QTR series suits applications in markets such as semiconductor, medical, machine tool, printing, rotary tables, factory automation and robotics.

The series consist of different sized motor series, QTR-A 65 - 78, QTR 105 - 133 - 160 and QTL-A 210/290, 230/310. They offer an ultimate torque ranging from 0.64 - 778 Nm and a continuous torque from 0.29 - 331 Nm.



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, torque vs. velocity and more. 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.

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