

Linear Motion Systems

THOMSON[™]
Linear Motion. Optimized.

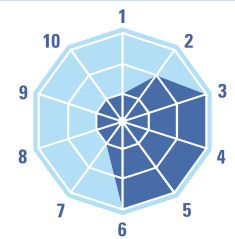
Product Overview

Thomsons linear motion systems are divided in to seven different categories to make the selection process of an unit easier.

Ball screw driven - ball guided units

Units designed for high thrust, payload, precision and stiffness.

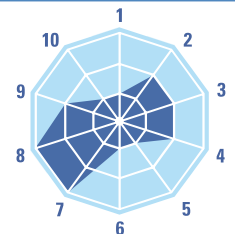
- Force up to 12000 N
- Repeatability down to 0,005mm



Ball screw driven - slide guided units

Low cost units for high thrust applications and demanding environments.

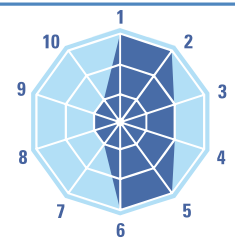
- Durable guide system
- Washdown protected version



Belt driven - ball guided units

Smooth running units for high speed, acceleration and load requiring a long lifetime.

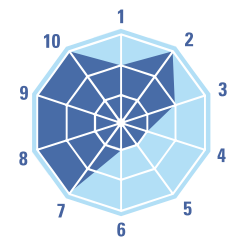
- Speed up to 5 m/s
- Acceleration up to 40 m/s²



Belt driven - slide guided units

Units for applications requiring smooth travel, high speed, high acceleration and low maintenance.

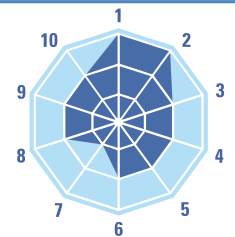
- Cost efficient guide system
- Chemically protected versions



Belt driven - wheel guided units

Units for high speed, high acceleration, smooth motion and medium to high loads.

- Speed up to 10 m/s
- Acceleration up to 40 m/s²



Linear lifting systems

Linear lifting systems are often used in X-Y configurations in combination with other linear motion systems.

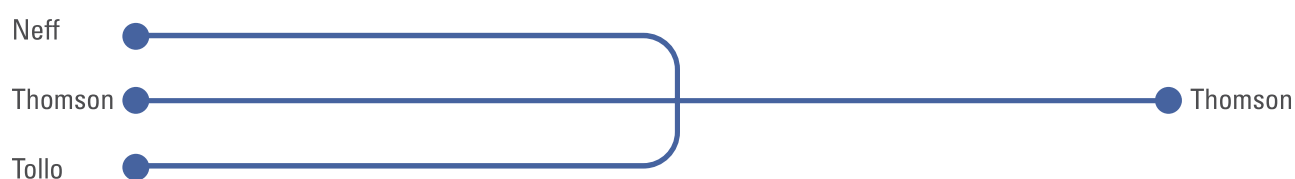
Linear rod units

Units designed for lifting applications or for the replacement of hydraulic and pneumatic cylinders.

1. Velocity
2. Acceleration
3. Repeatability
4. Force
5. Load torque
6. Stiffness
7. Guide robustness
8. Cost
9. Maintenance
10. Noise

The History of Linear Motion Systems is our History

The unmatched breadth of the Thomson linear motion system product line comes from the consolidation of three world-reknowned brands: Thomson, Neff and Tollo. We are product innovators with decades of application experience. Unbiased ownership of the multiple motion system technologies enable Thomson to provide you with the optimal balance of performance versus installed cost for your application.



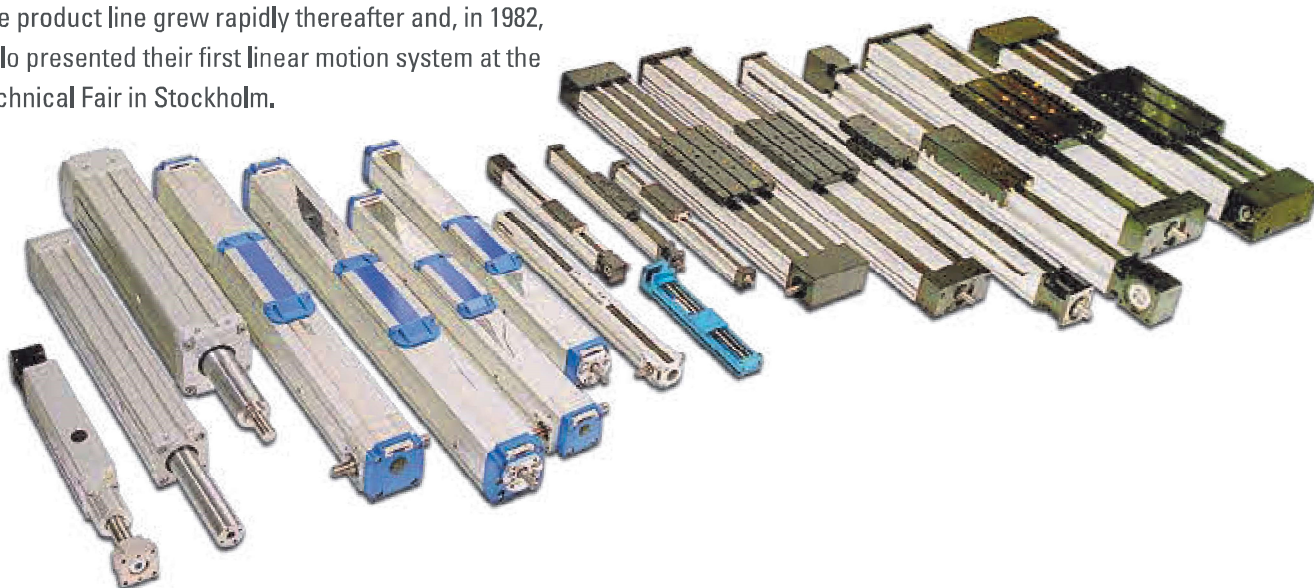
Founded in 1905, Neff offered products for the linear motion market and, over the decades, became a market leader in ball screw technology. The first linear motion system from Neff was presented in 1981 at the FAMETA show in Stuttgart.

Thomson introduced the first ball screw actuator into an aviation application in 1939 and invented the anti-friction Linear Ball Bushing® Bearing in 1945. Thomson has been a market lead with an increasing portfolio of linear motion technologies ever since.




Tollo began in 1981 as a lifting equipment manufacturer. The product line grew rapidly thereafter and, in 1982, Tollo presented their first linear motion system at the Technical Fair in Stockholm.





Thomson has consolidated the most competitive and complementary products from each brand into the most advanced, most comprehensive product portfolio available today. The range covers the smallest and most compact linear motion systems to the biggest and most robust. Our wide range of guide and drive systems can be configured economically and can also work in harsh environments, at high speeds, and in high precision applications.

Thomson is linear motion, optimized.



Performance Overview

		Ball Screw, Ball Guides	Ball Screw, Slide Guides	Belt Drive, Ball Guides	
					
Profile Size					
Smallest unit	[mm]	40 × 40	40 × 37	40 × 40	
Largest Unit	[mm]	240 × 85	108 × 100	240 × 85	
Stroke Length					
Maximum stroke length	[mm]	11000	6000	12000	
Speed					
Maximum speed	[m/s]	2,5	1,6	5	
Maximum acceleration	[m/s ²]	20	8	40	
Accuracy					
Maximum repeatability	[±mm]	0,01	0,05	0,05	
Load					
Maximum load, Fx	[N]	12000	5000	5000	
Maximum load, Fy	[N]	8000	3005	6400	
Maximum load, Fz	[N]	8000	3005	6400	
Maximum load torque, Mx	[Nm]	780	117	600	
Maximum load torque, My	[Nm]	900	279	720	
Maximum load torque, Mz	[Nm]	900	279	720	
Features					
Units with double carriages		•	•	•	
Units with left/right carriages		•	•		
Telescoping units					
Non driven units		•	•	•	
Units with cover band		•	•	•	
Wash down protected units		•	•	•	
Chemically protected units					
Accessories					
Mounting kits		•	•	•	
Gear boxes		•	•	•	
Servo motors		•	•	•	
Limit switch / sensor brackets		•/•	•/•	•/•	
Feedback devices / brackets		•/•	• /•	•/•	

	Belt Drive, Slide Guides	Belt Drive, Wheel Guides	Linear Lifting Systems	Linear Rod Units
				
	50 × 50 108 × 100	50 × 50 240 × 85	50 × 50 188 × 150	60 × 60 80 × 80
	12000	11000	3000	500
	5 40	10 40	10 40	1,5 20
	0,2	0,05	0,05	0,02
	1250 3005 3005 117 279 279	5000 5000 9300 500 930 500	1480 882 7500 2000 2000 330	3500 3000 3000 150 - -
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	•/•	•/•	•/•	•/•

Thomson Linear Motion System Features

Thomson offers five main categories of linear motion systems, a series of linear lifting units and linear rod units plus our long expertise in building customized units. The unmatched product range makes Thomson the only linear motion system partner you need to configure the optimal solution for your application.

Drive and guide technology advantages:

- **Screw driven units with ball guides** - for high loads and high precision
- **Screw driven units with prism guides** - for medium to high load and durable guide system
- **Belt driven units with ball guides** - for high load and dynamics
- **Belt driven units with wheel guides** - for applications requiring extreme speed and acceleration
- **Belt driven units with prism guides** - for low cost and durable guide system.

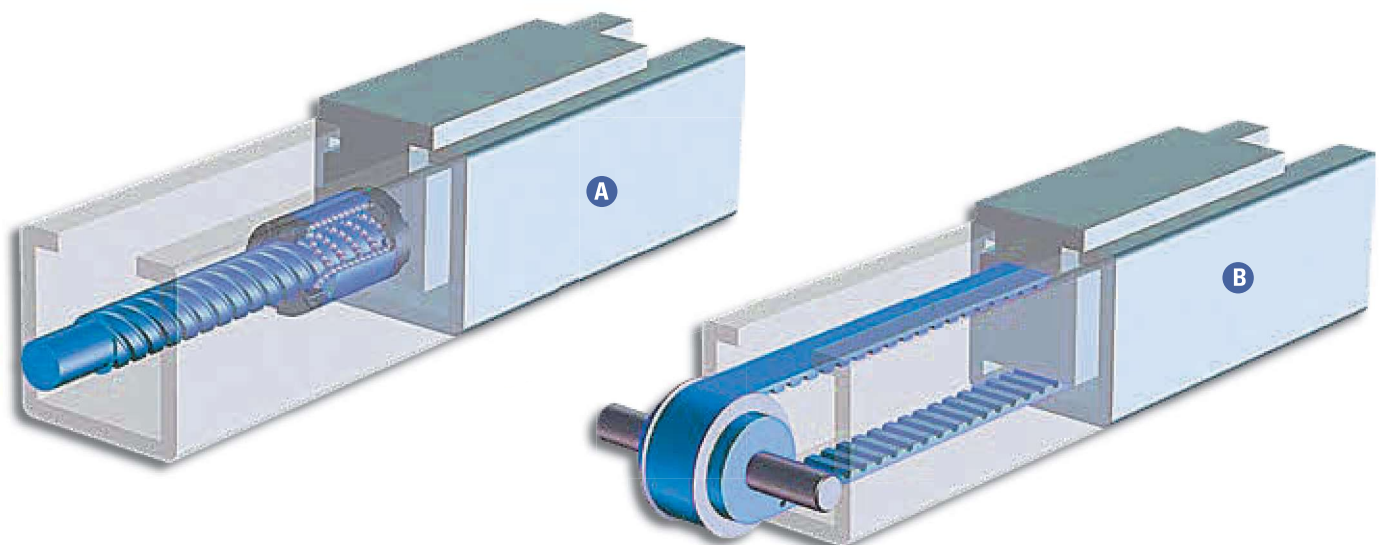
Screw or belt drive

Thomson linear motion systems can be driven by either a screw system or a tooth belt system. We use a broad variety of screw and belt types to meet the specification for all possible applications.

A screw driven unit (A) is normally recognised by high thrust and stiffness and can be based on a low cost lead

screw with preloaded nut, through to a standard commercial rolled ball screw or even a state of the art high precision ground ball screw.

A belt driven unit (B) is chosen when acceleration and speed are the most important criteria. Our belt driven units use a wide range of different belts from leading belt manufacturers.

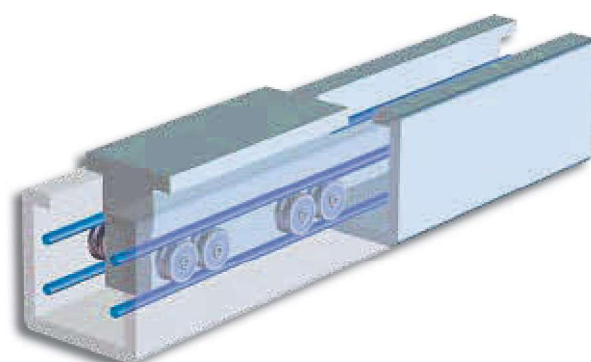


Thomson Linear Motion System Features

Thomson offers three major types of guiding technologies allowing you to identify the “just right” configuration in terms of performance, cost, robustness or life for your needs whether it may be in a machine tool, packaging, handling, assembly, measuring, medical, robotics or a general automation application.

Fast wheel guides

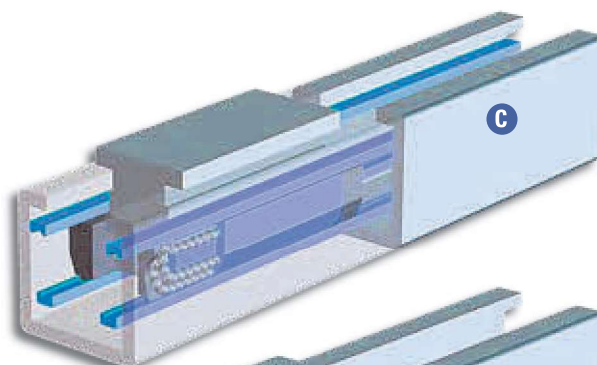
A wheel guided system offers an excellent combination of stiffness and dynamics. With high load capacity and unmatched speed and acceleration, wheel guides are the perfect choice for a dynamic application. Decades of experience ensure that you get the best in class technology when choosing a Thomson wheel guided linear motion system.



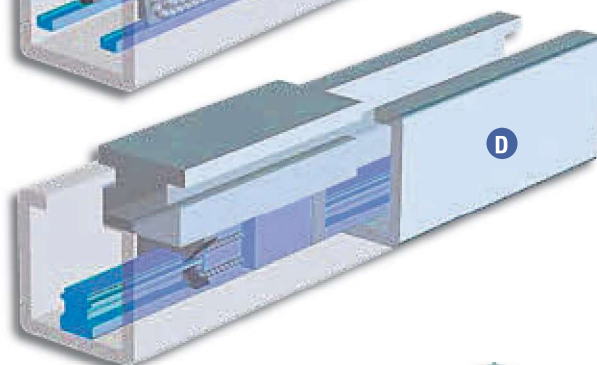
High precision ball guides

Thomson ball guided linear motion systems come in two different versions.

The first version (C) has a unique ball guide developed by Thomson. This integrated ball guide system is used in some of the ball guided units and offers outstanding load carrying performance along with high accuracy and a long life expectancy.

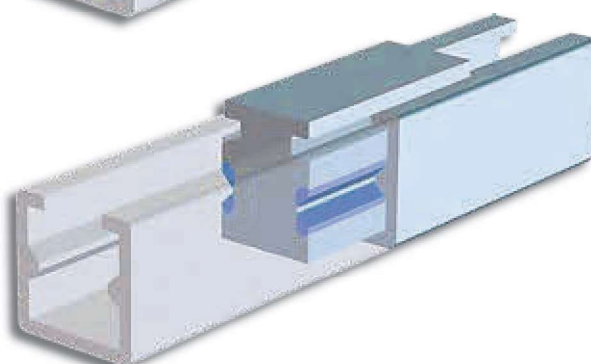


The second version (D) are based on a commercial type of ball guide which offers smooth and quiet travel and the highest precision. These ball guided systems offer the best performance on the ball guide market today.



Robust prism guides

The unique self aligning prism guide system uses prism shaped polymer bushings running directly on the anodised profile surface. The prism guides offers a cost efficient, smooth, reliable and maintenance free guiding system. Resistant to shock loads, dust and dirt it is the best choice for applications in demanding environments.



Thomson Linear Motion System Features

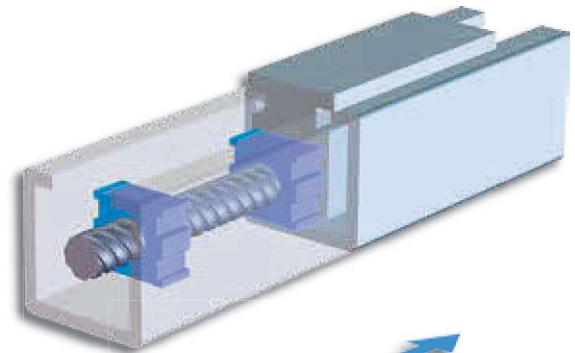
Thomson linear motion systems range from very small units to the largest ones available. Profile sizes range from as small as 25 mm up to 130 mm in height and up to almost 240 mm in width. We can offer linear motion systems with stroke lengths from only a few hundred millimeters up to as much as 12 meters as standard.

Linear motion system features:

- All units based on anodized, corrosion resistant aluminium profiles
- Units with left and right moving carriages available
- Play free screw driven units available
- Linear motion systems with single or double carriages available

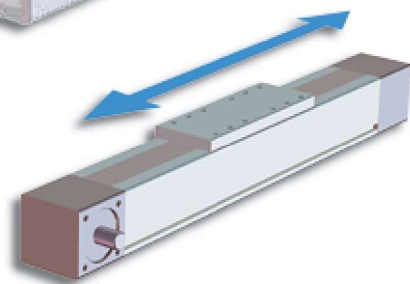
Patented screw support technology

All screw driven units can be delivered with screw supports to ensure high speed at long strokes. Some screw supported units have a unique patented screw support system offering full speed up to strokes of 11 meters. This option adds on less length to the unit than other screw support systems on the market due to its outstanding stroke to total-length-of-unit ratio.



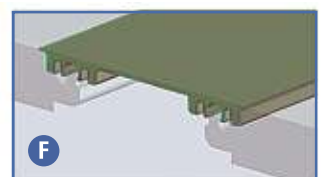
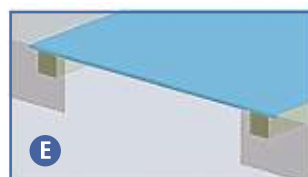
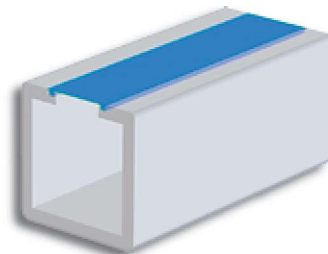
Long stroke lengths

Thomson offers the longest stroke lengths in the industry with stroke lengths up to 12 meters for belt driven units and up to 11 meters for screw driven units.



Unique cover band technologies

Sealing the units from water, dust and other contamination is essential for a long and trouble free life. Thomson offers two best-in-class sealing technologies. One is stainless cover band (E) kept in place with magnet strips. The other a plastic cover band (F) that is self-locking to the aluminium profile. A unique feature is the cover band stretching function that eliminates any cover band slack, thus increasing the life of the cover band.



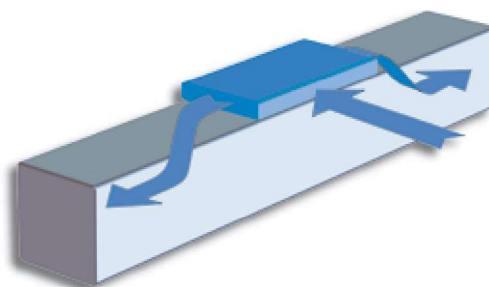
Thomson Linear Motion System Features

Thomson offers an unmatched selection of accessories such as gearboxes, sensors, feedback devices and mounting kits to allow easy installation of the linear motion systems to any machine or application. We also offer predefined motor and drive packages as well as accessories for multi axis applications, making it possible to create complete automation, handling and robotic systems.

- Modern design means fast and easy installation
- Little or no maintenance required
- High quality and modern production ensures long and reliable life.

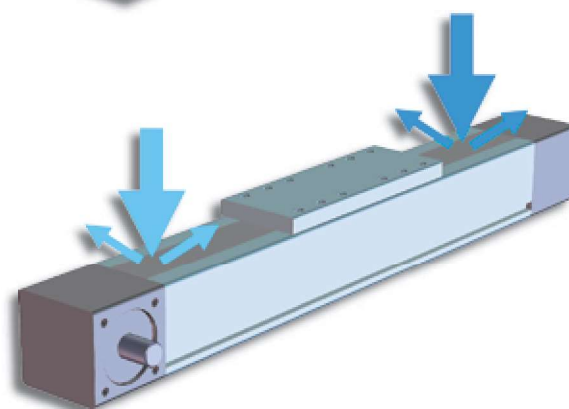
Central lubrication

Units with central lubrication have one point where lubrication is applied. This is an easy way to ensure that guides and the drive screw are well lubricated throughout the expected lifetime of the unit.



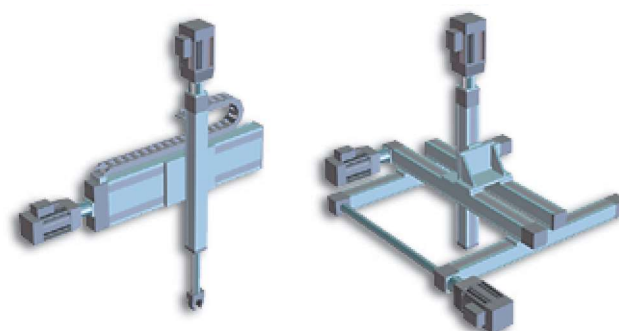
Stainless units

There are two types of stainless units; washdown or chemically protected. Washdown protected units are screw or belt driven prism guided units upgraded so that they can operate in wet and humid environments such as food, dairy and slaughter plants. Chemically protected units are belt driven prism guided units that are further upgraded to tolerate basic and acid liquids, making them suitable for paper mills, galvanising plants and the chemical industry in general.



Packages and multi axis solutions

By combining the unique linear motion systems from Thomson and utilizing the predefined mounting components it is easy to create multi-axis systems. Combine this with our range of servo motors, servo drives and motion controls to build a state-of-the-art motion



Applications

Linear motion systems are the right solution for many types of manual and automatic machines. The large range of models and sizes makes it easy to find the perfect linear motion system for your particular application.

Advantages:

- State of the art technology
- Easy to use sizing & selection software
- Free to use 3D CAD blocks available
- World wide sales, support and service
- Large network of system houses and integrators
- One of the largest suppliers in the world.

General Automation



Combining Thomson linear products enables you to solve any automation application. Our products are well known among car manufacturers and system houses around the world.

Machine Tools



High performance Thomson screw driven and ball guided products allow great flexibility of design and efficiency of operation. Also available are servomotors, gearboxes and drives to build a complete motion solution.

Assembly



High precision screw system and ball guide system enables you to solve high precision pick and place applications as well as soldering and inspection tasks.

Applications

Thomson has over 100 years of linear motion experience and our application engineers are just a phone call away. Contact us today to learn more about how we can help you making linear motion easy.

- Large range of accessories
- Multi axis kits
- Customised units
- ISO 9001 certified production
- Short delivery times.

Packaging and Palletizing



Our wheel guided and prism guided linear motion systems were specifically developed to suit the needs for the packaging, printing and scanning industry. The food, beverage and paper industries are also long-time customers.

Robotics



The wide range of linear and lifting units, gear boxes, motors and drives, enables you to easily and quickly create many different types of robotic systems for advanced applications.

Materials Handling



Combining Thomson overhead rail products with the linear lifting units enables you to solve any material handling application. Preconfigured lifting units are available as well as individual components which can be combined easily to fit your specific needs.

Rodless Actuator LM80-H

12 and 24 Vdc - load up to 2000 N



Standard Features and Benefits

- Rodless actuator for horizontal operation
- For use in domestic, office or medical applications
- Rigid self supporting extruded aluminum profile
- Durable and corrosion free
- Lightweight and quiet operation
- Safety nut on ball screw versions
- Easy and fast T-slot mounting
- Maintenance free

General Specifications

Parameter	LM80-H
Screw type	trapezoidal or ball
Internally restrained	yes
Manual override	no
Dynamic braking	no
Holding brake	no
End of stroke protection	spring loaded soft stop
Mid stroke protection	no
Motor protection	no
Motor connection with motor enclosure no motor enclosure	cable no cable, clips on motor
Motor connector with motor enclosure no motor enclosure	8-pole Molex mini-fit jr clips on motor
Certificates	CE
Options	<ul style="list-style-type: none"> • no motor enclosure • manual override • alternative motor positions • stroke over 1500 mm* • encoder *

* Contact customer support

» Ordering Key - see page 82

» Glossary - see page 85

» Electric Wiring Diagram - see page 57

Performance Specifications

Parameter		LM80-H
Maximum load (Fb)	[N]	2000
Maximum load torque (Mb)	[Nm]	
DT••-T68M ••••• H		250
DT••-B61M ••••• H		400
DT••-B62M ••••• H		180
DT••-B65M ••••• H		750
Speed, at no load / at maximum load	[mm/s]	
DT••-T68M ••••• H		44 / 37
DT••-B61M ••~•• H		55 / 50
DT12 -B62M ••~•• H		110 / 73
DT24 -B62M ••~•• H		110 / 87
DT••-B65M ••~•• H		28 / 28
Available input voltages	[Vdc]	12, 24
Standard stroke lengths	[mm]	500, 600, 700, 800, 900, 1000, 1100, 1200, 1300, 1400, 1500
Operating temperature limits	[°C]	0 – +40
Full load duty cycle @ 20 °C	[%]	15
Maximum on time	[s]	120
End play, maximum	[mm]	1,0
Restraining torque	[Nm]	0
Lead cross section with / without motor enclosure	[mm ²]	1,5 / –
Cable length with / without motor enclosure	[mm]	2000 / –
Protection class with / without motor enclosure		IP44 / IP33

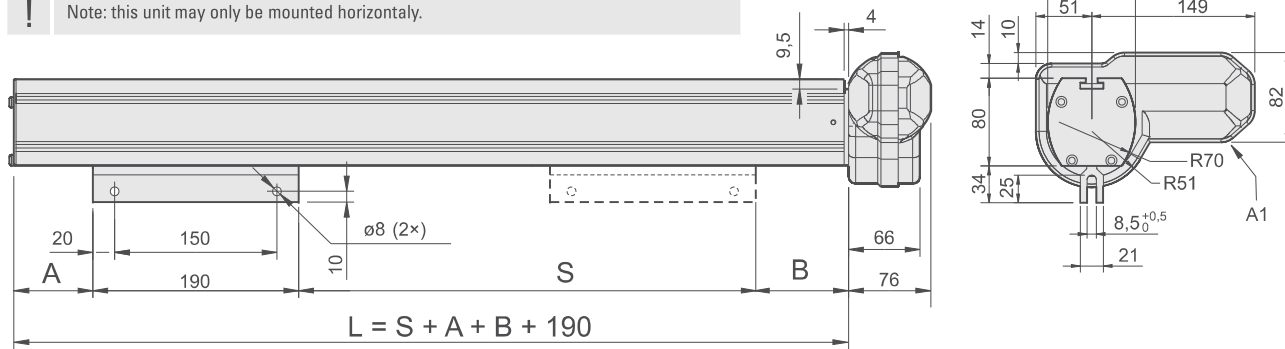
Compatible Controls

Control model	See page
DPDT switch	61
DCG-170	66
AC-247 ELS	64

Rodless Actuator LM80-H

12 and 24 Vdc - load up to 2000 N

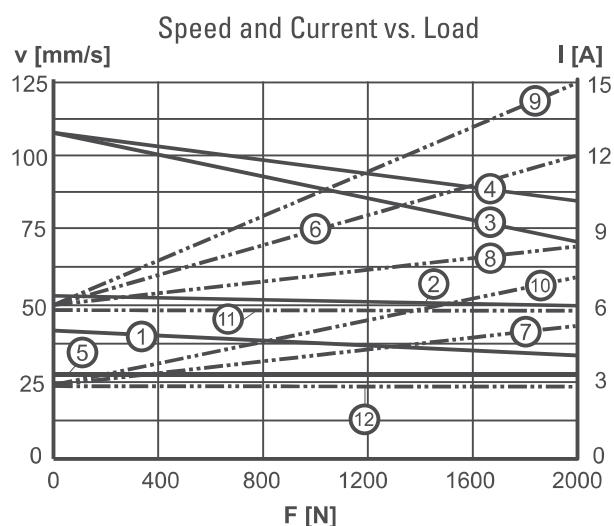
! Note: this unit may only be mounted horizontally.



S: stroke
L: length of profile
A1: motor shown in position A (standard position)

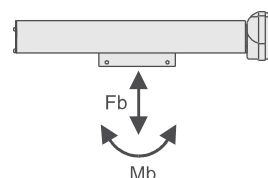
Stroke (S)	[mm]	500	600	700	800	900	1000	1100	1200	1300	1400	1500
Dimensions (A) / (B)	[mm]											
DT••-T68M•••••H		54,0 / 77,0										
DT••-B61M•••••H		102,0 / 77,0										
DT••-B62M•••••H		102,0 / 77,0										
DT••-B65M•••••H		79,0 / 77,0										
Weight	[kg]											
DT••-T68M•••••H		11,2	13,1	14,8	16,6	18,1	20,2	22,0	23,8	25,5	27,4	29,1
DT••-B61M••~••H		12,1	13,9	15,7	17,5	19,3	21,0	22,9	24,6	26,3	28,2	30,0
DT••-B62M••~••H		12,1	13,9	15,7	17,5	19,3	21,0	22,9	24,6	26,3	28,2	30,0
DT••-B65M••~••H		11,7	13,5	15,3	17,1	18,9	20,6	22,4	24,2	26,0	27,8	29,6

Performance Diagrams

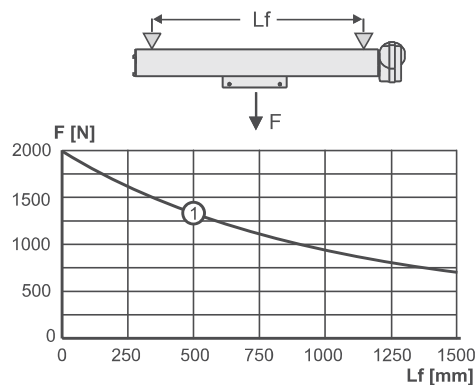


- V: speed I: current F: load
- 1: speed DT••-T68M••~••H
 - 2: speed DT••-B61M••~••H
 - 3: speed DT12-B62M••~••H
 - 4: speed DT24-B62M••~••H
 - 5: speed DT••-B65M••~••H
 - 6: current DT12-T68M••~••H
 - 7: current DT24-T68M••~••H and DT24-B61M••~••H
 - 8: current DT12-B61M••~••H
 - 9: current DT12-B62M••~••H
 - 10: current DT24-B62M••~••H
 - 11: current DT12-B65M••~••H
 - 12: current DT24-B65M••~••H

Definition of Forces



Deflection of Profile



F: load Lf: distance between mounting points
1: maximum allowed deflection

Rodless Actuator LM80-V

12 and 24 Vdc - load up to 2000 N



Standard Features and Benefits

- Rodless actuator for vertical operation with motor down
- For use in domestic, office or medical applications
- Rigid self supporting extruded aluminum profile
- Durable and corrosion free
- Holding brake prevents downward motion at power off
- Lightweight and quiet operation
- Safety nut on ball screw versions
- Easy and fast T-slot mounting
- Optional spline safety function
- Maintenance free

General Specifications

Parameter	LM80-V
Screw type	trapezoidal or ball
Internally restrained	yes
Manual override	no
Dynamic braking	no
Holding brake	yes
End of stroke protection	spring loaded soft stop
Mid stroke protection	no
Motor protection	no
Motor connection with motor enclosure no motor enclosure	cable no cable, clips on motor
Motor connector with motor enclosure no motor enclosure	8-pole Molex mini-fit jr clips on motor
Certificates	CE
Options	<ul style="list-style-type: none"> • no motor enclosure • manual override • alternative motor positions • spline safety function • stroke over 1500 mm* • encoder *

* Contact customer support

» Ordering Key - see page 82
 » Glossary - see page 85
 » Electric Wiring Diagram - see page 57

Performance Specifications

Parameter		LM80-V
Maximum load (Fa)	[N]	
DT•• -T68M ••••• V(F)		650
DT•• -B61M ••••• V(F)		1000
DT•• -B62M ••••• V(F)		450
DT•• -B65M ••••• V(F)		2000
Maximum load torque (Ma)	[Nm]	
DT•• -T68M ••••• V(F)		250
DT•• -B61M ••••• V(F)		400
DT•• -B62M ••••• V(F)		180
DT•• -B65M ••••• V(F)		750
Speed, at no load / at maximum load	[mm/s]	
DT12 -T68M ••••• V(F)		44 / 29
DT24 -T68M ••••• V(F)		44 / 35
DT12 -B61M ••••• V(F)		55 / 37
DT24 -B61M ••••• V(F)		55 / 43
DT12 -B62M ••••• V(F)		110 / 67
DT24 -B62M ••••• V(F)		110 / 83
DT12 -B65M ••••• V(F)		28 / 19
DT24 -B65M ••••• V(F)		28 / 22
Available input voltages	[Vdc]	12, 24
Standard stroke lengths	[mm]	500, 600, 700, 800, 900, 1000, 1100, 1200, 1300, 1400, 1500
Operating temperature limits	[°C]	0 – +40
Full load duty cycle @ 20 °C	[%]	15
Maximum on time	[s]	120
Restraining torque	[Nm]	0
Lead cross section with / without motor enclosure	[mm ²]	1,5 / –
Cable length with / without motor enclosure	[mm]	2000 / –
Protection class with / without motor enclosure		IP44 / IP33

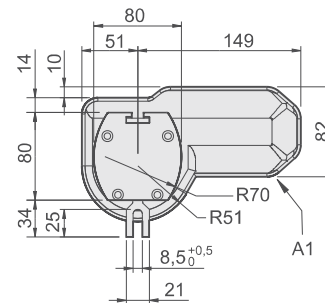
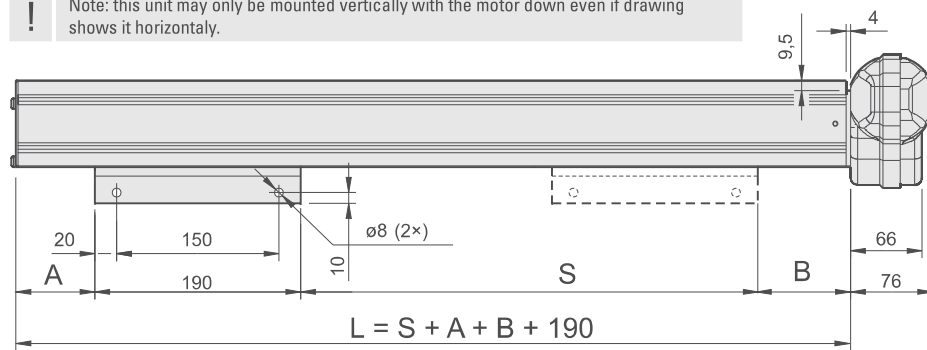
Compatible Controls

Control model	See page
DPDT switch	61
DCG-160	66
AC-247 ELS	64

Rodless Actuator LM80-V

12 and 24 Vdc - load up to 2000 N

! Note: this unit may only be mounted vertically with the motor down even if drawing shows it horizontally.



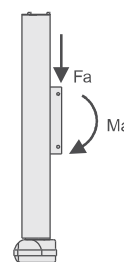
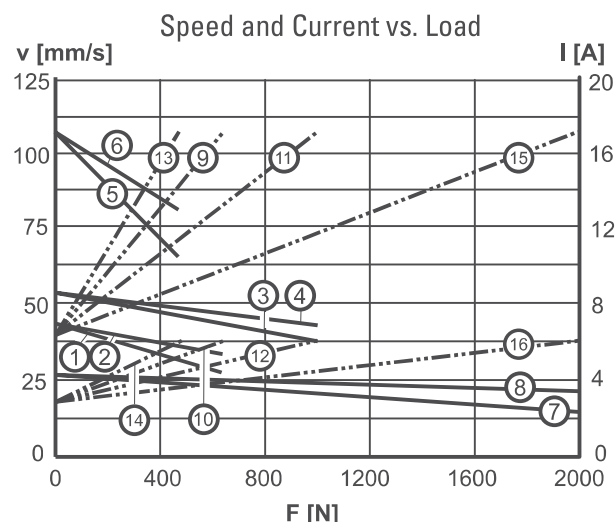
S: stroke
L: length of profile
A1: motor shown in position A (standard position)

Stroke (S)	[mm]	500	600	700	800	900	1000	1100	1200	1300	1400	1500
Dimensions (A) / (B)	[mm]											
DT••-T68M•••••V		50,0 / 71,0										
DT••-B61M•••••V		53,0 / 120,0										
DT••-B62M•••••V		53,0 / 120,0										
DT••-B65M•••••V		53,0 / 97,0										
DT••-T68M•••••F		50,0 / 90,0										
DT••-B61M•••••F		53,0 / 144,0										
DT••-B62M•••••F		53,0 / 144,0										
DT••-B65M•••••F		53,0 / 126,0										
Weight*	[kg]	11,1	12,9	14,7	16,5	18,2	20,0	21,8	23,6	25,4	27,2	28,9
DT••-T68M•••••V		11,6	13,4	15,2	17,0	18,7	20,5	22,3	24,1	25,9	27,7	29,5
DT••-B61M•••••V		11,6	13,4	15,2	17,0	18,7	20,5	22,3	24,1	25,9	27,7	29,5
DT••-B62M•••••V		12,0	13,8	15,6	17,6	19,3	21,1	22,9	24,7	26,5	28,2	30,1

* Add 0,5 kg to the below weights to get the weights for DT••-T68M•••••F, DT••-B61M•••••F, DT••-B62M•••••F and DT••-B65M•••••F.

Performance Diagrams

Definition of Forces



- V: speed I: current F: load
- 1: speed DT12-T68M•••••V(F)
 - 2: speed DT24-T68M•••••V(F)
 - 3: speed DT12-B61M•••••V(F)
 - 4: speed DT24-B61M•••••V(F)
 - 5: speed DT12-B62M•••••V(F)
 - 6: speed DT24-B62M•••••V(F)
 - 7: speed DT12-B65M•••••V(F)
 - 8: speed DT24-B65M•••••V(F)
 - 9: current DT12-T68M•••••V(F)
 - 10: current DT24-T68M•••••V(F)
 - 11: current DT12-B61M•••••V(F)
 - 12: current DT24-B61M•••••V(F)
 - 13: current DT12-B62M•••••V(F)
 - 14: current DT24-B62M•••••V(F)
 - 15: current DT12-B65M•••••V(F)
 - 16: current DT24-B65M•••••V(F)

Rodless Actuator LM80-I

24 Vdc - load up to 2000 N



Standard Features and Benefits

- Rodless actuator for vertical operation with motor down
- For use in domestic, office or medical applications
- Rigid self supporting extruded aluminum profile
- Durable and corrosion free
- Holding brake prevents downward motion at power off
- Lightweight and quiet operation
- Safety nut on ball screw versions
- Easy and fast T-slot mounting
- Maintenance free

General Specifications

Parameter	LM80-I
Screw type	trapezoidal or ball
Internally restrained	yes
Manual override	no
Dynamic braking	no
Holding brake	yes
End of stroke protection	spring loaded soft stop
Mid stroke protection	no
Motor protection	no
Motor connection	cable
Motor connector	8-pole Molex mini-fit jr
Certificates	CE
Options	<ul style="list-style-type: none"> • manual override • encoder • stroke over 1500 mm*

* Contact customer support

» Ordering Key - see page 83

» Glossary - see page 85

» Electric Wiring Diagram - see page 57

Performance Specifications

Parameter	LM80-I
Maximum load (Fa) [N]	
DT24-T68M ••• GCV	650
DT24-B61M ••• GCV	1000
DT24-B62M ••• GCV	450
DT24-B65M ••• GCV	2000
Maximum load torque (Ma) [Nm]	
DT24-T68M ••• GCV	250
DT24-B61M ••• GCV	400
DT24-B62M ••• GCV	180
DT24-B65M ••• GCV	750
Speed, at no load / at maximum load [mm/s]	
DT24-T68M ••• GCV	24 / 22
DT24-B61M ••• GCV	31 / 27
DT24-B62M ••• GCV	61 / 55
DT24-B65M ••• GCV	15 / 13
Available input voltages [Vdc]	24
Standard stroke lengths [mm]	500, 600, 700, 800, 900, 1000, 1100, 1200, 1300, 1400, 1500
Operating temperature limits [°C]	0 – +40
Full load duty cycle @ 20 °C [%]	15
Maximum on time [s]	120
Restraining torque [Nm]	0
Lead cross section [mm ²]	1,5
Cable length [mm]	2000
Protection class	IP44

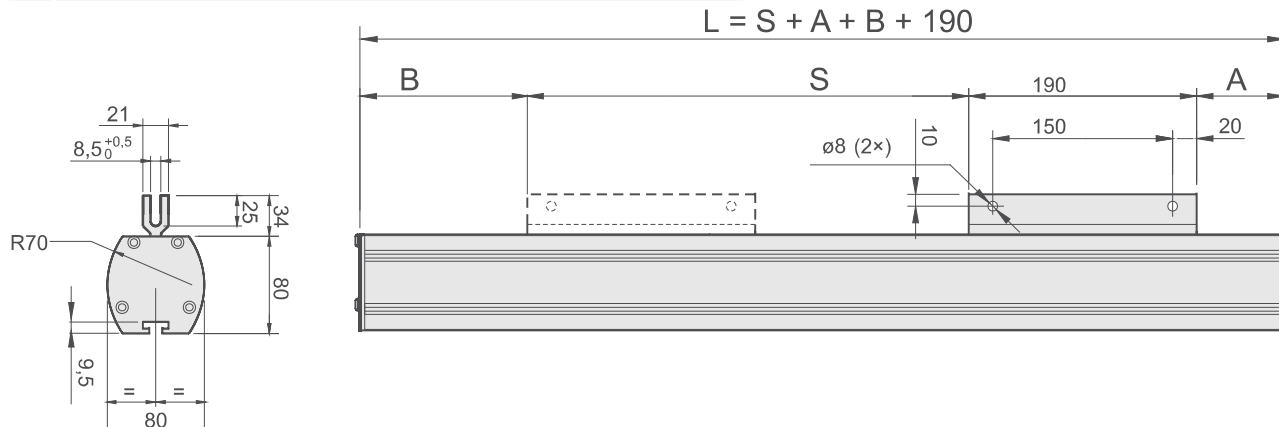
Compatible Controls

Control model	See page
DPDT switch	61
DCG-180	66
DCG-260	66
AC-247 ELS	64

Rodless Actuator LM80-I

24 Vdc - load up to 2000 N

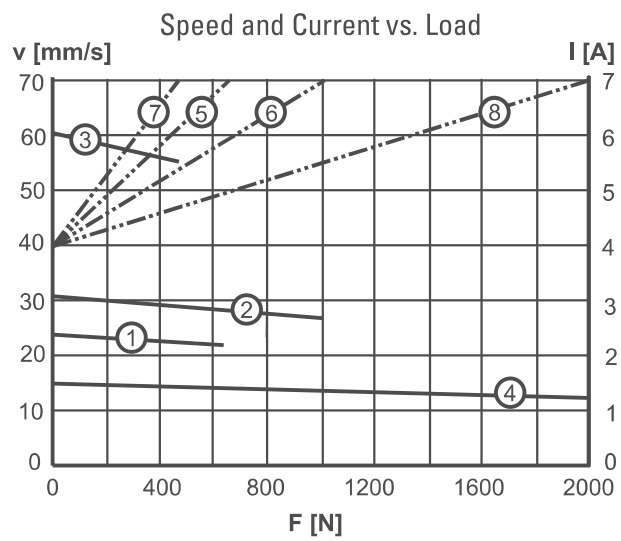
! Note: this unit may only be mounted vertically with the motor down even if drawing shows it horizontally.



S: stroke
L: length of profile
A: non motor side
B: motor side

Stroke (S)	[mm]	500	600	700	800	900	1000	1100	1200	1300	1400	1500
Dimensions (A) / (B)	[mm]											
DT24-T68M ••• GCV		50,0 / 238,0										
DT24-B61M ••• GCV		53,0 / 287,0										
DT24-B62M ••• GCV		53,0 / 287,0										
DT24-B65M ••• GCV		53,0 / 264,0										
Weight	[kg]											
DT24-T68M ••• GCV		11,1	12,9	14,7	16,5	18,2	20,0	21,8	23,6	25,4	27,2	28,9
DT24-B61M ••• GCV		11,6	13,4	15,2	17,0	18,7	20,5	22,3	24,1	25,9	27,7	29,5
DT24-B62M ••• GCV		11,6	13,4	15,2	17,0	18,7	20,5	22,3	24,1	25,9	27,7	29,5
DT24-B65M ••• GCV		12,0	13,8	15,6	17,6	19,3	21,1	22,9	24,7	26,5	28,2	30,1

Performance Diagrams



V: speed I: current F: load
 1: speed DT24-T68M ••• GCV
 2: speed DT24-B61M ••• GCV
 3: speed DT24-B62M ••• GCV
 4: speed DT24-B65M ••• GCV
 5: current DT24-T68M ••• GCV
 6: current DT24-B61M ••• GCV
 7: current DT24-B62M ••• GCV
 8: current DT24-B65M ••• GCV

Definition of Forces

