ABOUT US





ecMot started its activities in 2017 by designing Screw Jack and Linear Actuator in a 25 m2 design office.

Since 2018, MecMot's Screw Jacks and Linear Actuators have been successfully produced for leading machine manufacturers and companies in various sectors in Turkey.

In 2018, MecMot Bevel Gearbox designs were completed and took their place in the product portfolio. In 2019, exports to many European countries has been starting.

In 2021, MecMot continues on its way by expanding its machine space and capacity in its 1500 m2 facility.

MecMot, which exports to nearly 24 countries today and has reached an important point in its own market in Turkey, continues on its way with confident and fast steps with its customer-oriented approach and technical expert team.

MecMot has been starting its activity based on the principle of "offering world-class solutions to its customers by using the latest technologies".

It has created value in its sector in a short time and has become one of the leading companies, MecMot consistently continues to deliver the highest quality products to its customers at the most affordable price.

MecMot continuously develops its own infrastructure with its R&D policy and offers environmentally friendly and user-friendly products.

It has the ability to produce all its products easily and quickly and sends products to the fastest way anywhere in the world. Focus on "human" benefits with 100% customer satisfaction.

Scope of application:

Our motivation, which has helped us to achieve the goals we have set in mind since the day we started, is constantly increasing.

MecMot, as a company whose priority is always quality and functionality, serves to facilitate your work with its knowledge and experience in many fields such as Steel Industry, Solar Energy Systems, Defense Industry, Movable Platforms, Aerospace, Hydroelectric Systems.

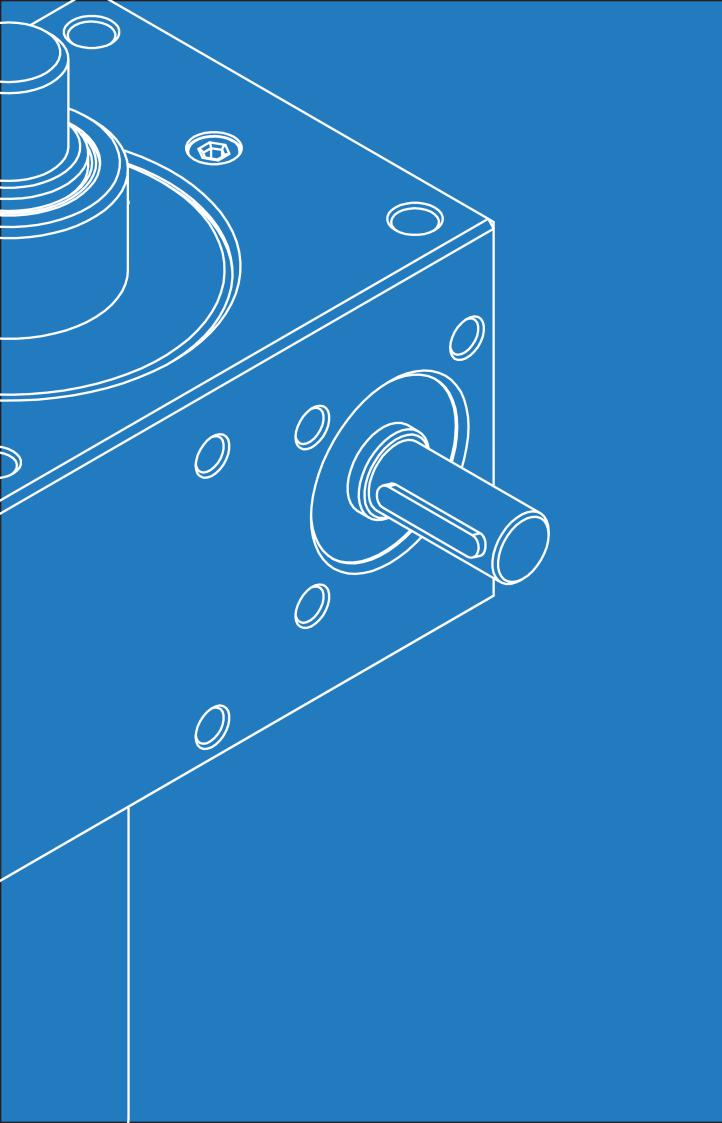


General Catalogue Version 2.1



CONTENTS

About Us	01
Screw Jacks	04
Screw Jacks Accessories	36
Bevel Gear Box	42
Linear Actuator	66



SCREW JACK

OVER VIEW SIZES/TYPES

Screw Translting (VH)	Ŷ	Ŷ	Ŷ	
Series	VK5	VK10	VK25	VK50
Load	5kN	10kN	25kN	50kN
Ratio	4:1 16:1	4:1 16:1	6:1 24:1	7:1 28:1
Housing Material	C45	C45	GGG-50	GGG-50
Screw	Tr18x4	Tr20x4	Tr30x6	Tr40x7

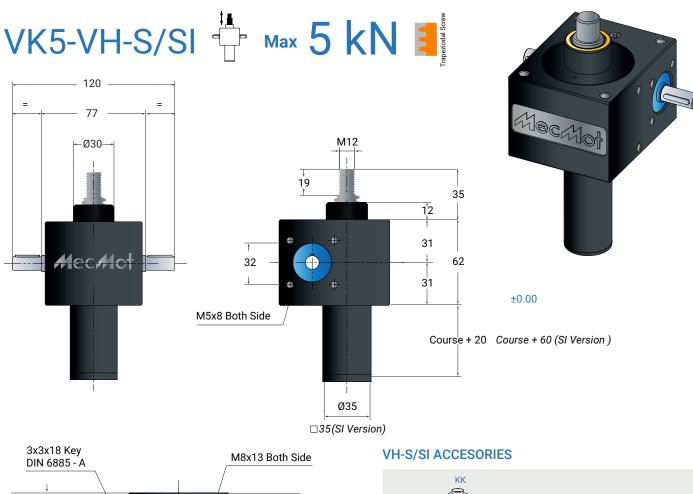
Screw TransIting (SH)	Ĵ.	Å		
Series	VK5	VK10	VK25	VK50
Load	5kN	10kN	25kN	50kN
Ratio	4:1 16:1	4:1 16:1	6:1 24:1	7:1 28:1
Housing Material	C45	C45	GGG-50	GGG-50
Screw	Tr18x4	Tr20x4	Tr30x6	Tr40x7

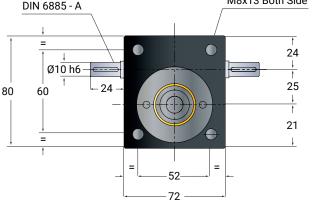
-

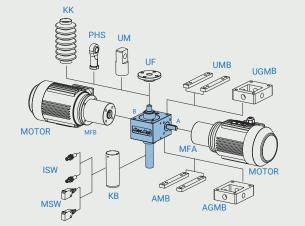
OVER VIEW SIZES/TYPES

VK100	VK150	VK250	VK350
100kN	100kN	250kN	350kN
9:1	9:1	10:1	10:1
36:1	36:1	40:1	40:1
GGG-50	GGG-50	GGG-50	GGG-50
Tr55x9	Tr60x9	Tr80x10	Tr100x10

VK100	VK150	VK250	VK350
100kN	100kN	250kN	350kN
9:1	9:1	10:1	10:1
36:1	36:1	40:1	40:1
GGG-50	GGG-50	GGG-50	GGG-50
Tr55x9	Tr60x9	Tr80x10	Tr100x10





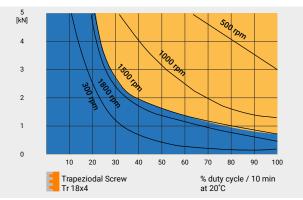


Туре	Version	Speed	Standart screw	i	Stroke per drive shaft rotation
VK5-VH-A	Translating	Normal	Tr 18x4	4:1	1.00 mm
VK5-VH-B	screw	Low speed	11 1074	16:1	0.25 mm
VK5-SH-A	Rotating screw	Normal	Tr 18x4	4:1	1.00 mm
VK5-SH-B		Low speed	11 10,4	16:1	0.25 mm

General Features

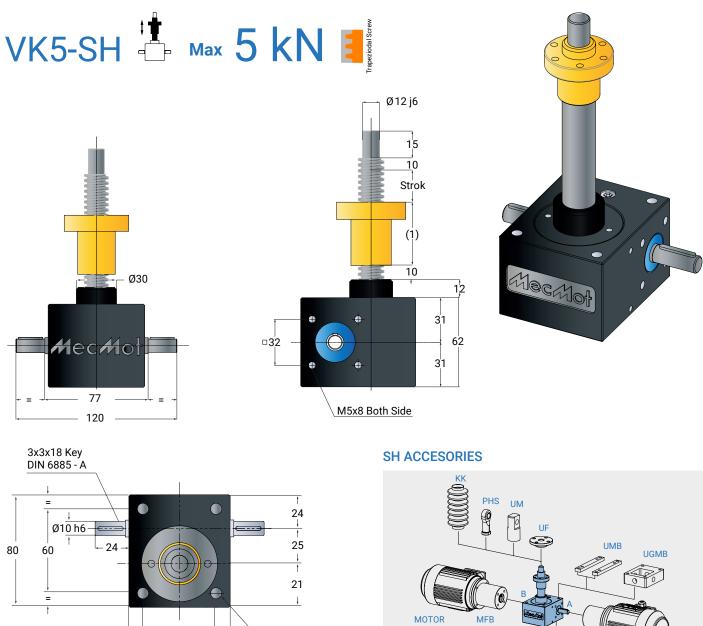
Max static load: 5 kN Max dynamic load: See duty cycle curves Nominal speed: 1500 rpm Max speed: 3000 rpm (depending force and duty cycle) Screw size: Tr 18x4 Operation temperature: -10/60C Screw lubrication: Grease lubrication Input torque: Max 4.5 Nm (A) max 1.5 Nm (B) Drive-through torque: Max 40 Nm

Duty cycle thermal limit, for S+R

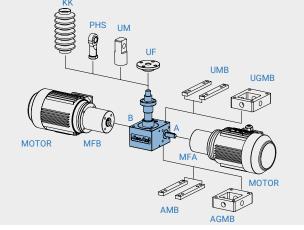


These curves above represents the thermally safe operating time of the product in percent. These values are valid for the normal operating conditions of the system (lubrication, ambient temperature, environmental conditions, etc.). Otherwise, please contact Mecmot Engineering department





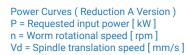
_ 52 M8x13 Both Side _ 72 -

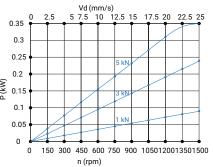


Limit load 1 (red) - 2 (blue) - 3 (green) F = Load [kN] L = Overall trapezoidal screw lenght [mm] 2.5 5.00 0.35 0.3 4.75 0.25 4.50 0.2 4.25 P (kW) 0.15 4.00 0.1 3.75 0.05 3.50 0 L 000 006 8 200 300 400 500 600 200 800 0 0 MecMot

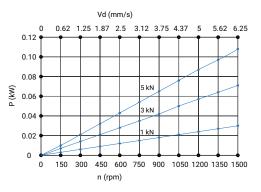
Euler's law (safety factor = 2 dynamic compres-

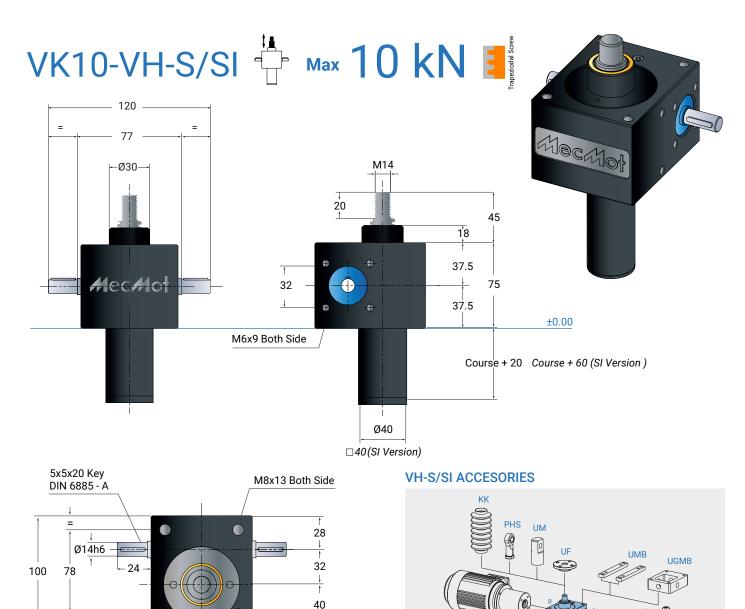
sion load)



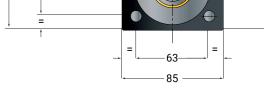


Power Curves (Reduction A Version) P = Requested input power [kW] n = Worm rotational speed [rpm] Vd = Spindle translation speed [mm/s]





ł



Standard Ratios

Туре	Version	Speed	Standart screw	i	Stroke per drive shaft rotation
VK10-VH-A	Translating	Normal	Tr 20x4	4:1	1.00 mm
VK10-VH-B	screw	Low speed	11 2024	16:1	0.25 mm
VK10-SH-A	Rotating screw	Normal	Tr 20x4	4:1	1.00 mm
VK10-SH-B		Low speed	11 2084	16:1	0.25 mm

General Features

Max static load: 10 kN Max dynamic load: See duty cycle curves Nominal speed: 1500 rpm Max speed: 3000 rpm (depending force and duty cycle) Screw size: Tr 20x4 Operation temperature: -10/60C Screw lubrication: Grease lubrication Input torque: Max 13 Nm (A) max 7 Nm (B) Drive-through torque: Max 55 Nm

Duty cycle thermal limit, for S+R

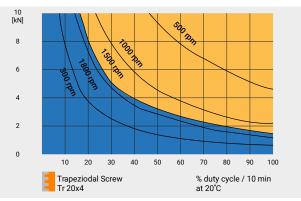
KB

MOTOR

ISW

MSW

f



é é

AMB

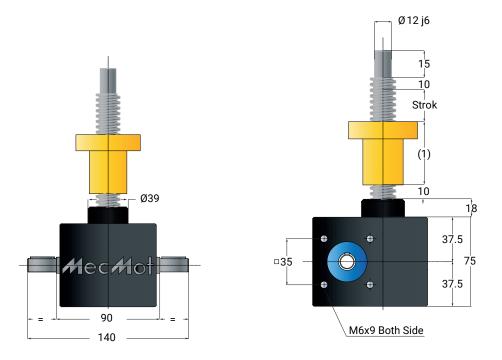
These curves above represents the thermally safe operating time of the product in percent. These values are valid for the normal operating conditions of the system (lubrication, ambient temperature, environmental conditions, etc.). Otherwise, please contact Mecmot Engineering department.



MOTOR

AGMB

VK10-SH 🗄 Max 10 kN 📕



=

e----

28

↓ †

32

Ļ

40 ţ

M8x15 Both Side

G

63

85

=

5x5x20 Key

DIN 6885 - A

Ø10 h6 ------

- 24

t

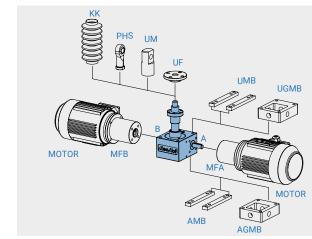
=

78

100



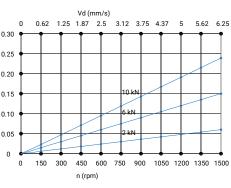
SH ACCESORIES

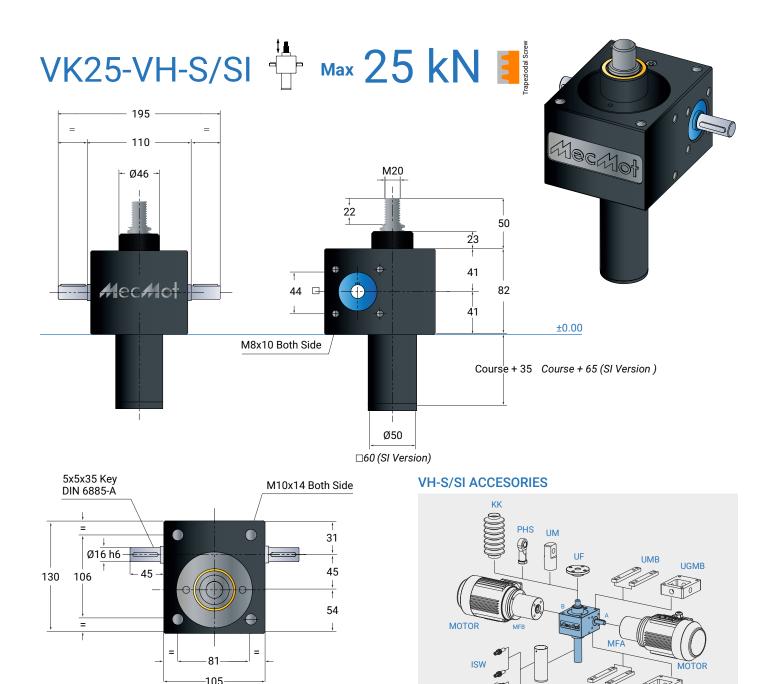


Euler's law (safety factor = 2 dynamic compres-Power Curves (Reduction A Version) P = Requested input power [kW] sion load) Limit load 1 (red) - 2 (blue) - 3 (green) n = Worm rotational speed [rpm] F = Load [kN] Vd = Spindle translation speed [mm/s] L = Overall trapezoidal screw lenght [mm] Vd (mm/s) 10 12.5 15 17.5 20 22.5 25 0 5 0 2.5 7.5 0.30 0.90 10.0 0.25 0.75 9.0 0.60 0.20 8.0 (∭) 0.45 10 kN (kw) 0.15 7.0 0.30 0.10 6.0 0.15 0.05 kΝ 5.0 0 125 T 000 375 250 125 250 375 00 625 750 450 600 750 900 1050 1200 1350 1500 0 150 300 0 150 300 0 n (rpm) MecMot 11

Power Curves (Reduction B Version) P = Requested input power [kW] n = Worm rotational speed [rpm]

Vd = Spindle translation speed [mm/s]





Туре	Version	Speed	Standart screw	i	Stroke per drive shaft rotation
VK25-VH-A	Translating	Normal	Tr 30x6	6:1	1.00 mm
VK25-VH-B	screw	Low speed	11 30x0	24:1	0.25 mm
VK25-SH-A	Rotating screw	Normal	Tr 30x6	6:1	1.00 mm
VK25-SH-B		Low speed	11 3020	24:1	0.25 mm

105

General Features

- Max static load: 25 kN Max dynamic load: See duty cycle curves Nominal speed: 1500 rpm Max speed: 3000 rpm (depending force and duty cycle) Screw size: Tr 30x6 Operation temperature: -10/60C Screw lubrication

- Screw lubrication: Grease lubrication Input torque: Max 18 Nm (A) max 10 Nm (B) Drive-through torque: Max 100 Nm

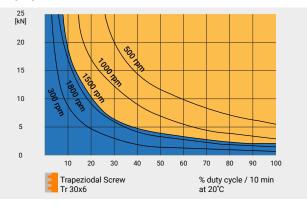
Duty cycle thermal limit, for S+R

ľ

f

MSW

KB



These curves above represents the thermally safe operating time of the product in percent. These values are valid for the normal operating conditions of the system (lubrication, ambient temperature, environmental conditions, etc.). Otherwise, please contact Mecmot Engineering department.

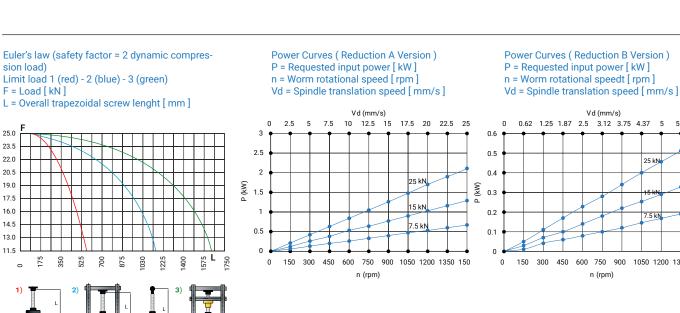


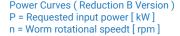
AGMB

Ì

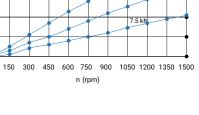
AMB





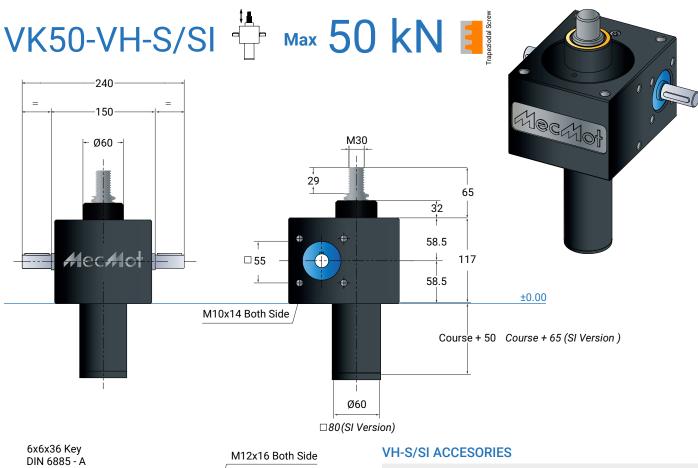


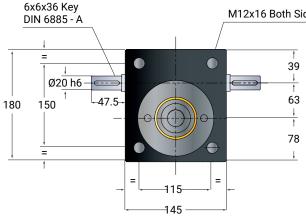
AGMB

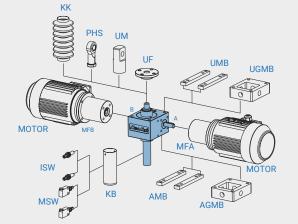


MecMot

5.62 6.25





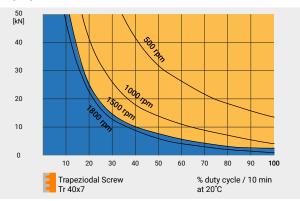


Туре	Version	Speed	Standart screw	i	Stroke per drive shaft rotation
VK50-VH-A	Translating screw	Normal	Tr 40x7	7:1	1.00 mm
VK50-VH-B		Low speed		28:1	0.25 mm
VK50-SH-A	Rotating screw	Normal	Tr 40x7	7:1	1.00 mm
VK50-SH-B		Low speed	11 40x7	28:1	0.25 mm

General Features

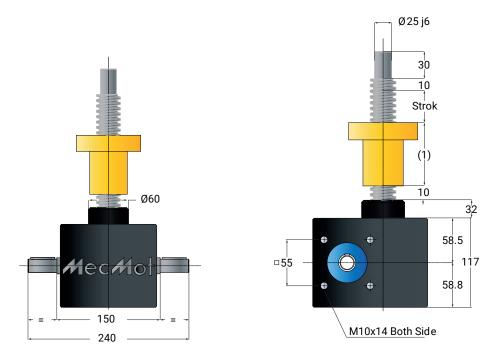
Max static load: 50 kN Max dynamic load: See duty cycle curves Nominal speed: 1500 rpm Max speed: 1800 rpm (depending force and duty cycle) Screw size: Tr 40x7 Operation temperature: -10/60C Screw lubrication: Grease lubrication Input torque: Max 31 Nm (A) max 10.5 Nm (B) Drive-through torque: Max 250 Nm

Duty cycle thermal limit, for S+R



These curves above represents the thermally safe operating time of the product in percent. These values are valid for the normal operating conditions of the system (lubrication, ambient temperature, environmental conditions, etc.). Otherwise, please contact Mecmot Engineering department.

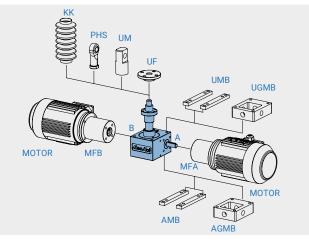
VK50-SH [‡] Max 50 kN ∎





6х6х36 Кеу DIN 6885 - A = 24 ŧ. Ø20 h6 ____ 1 25 -47.5-150 180 t 21 ļ M12x16 Both Side _ 115 = -145

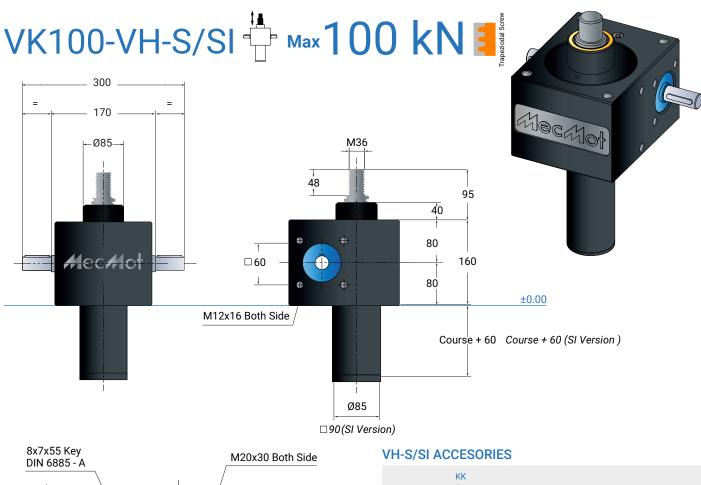
SH ACCESORIES

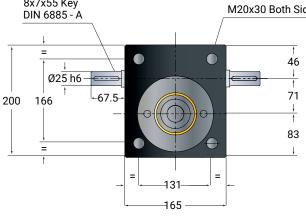


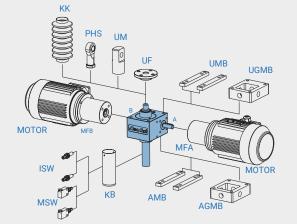
Euler's law (safety factor = 2 dynamic compres-Power Curves (Reduction A Version) Power Curves (Reduction B Version) P = Requested input power [kW] sion load) P = Requested input power [kW] Limit load 1 (red) - 2 (blue) - 3 (green) n = Worm rotational speed [rpm] n = Worm rotational speed [rpm] F = Load [kN]Vd = Spindle translation speed [mm/s] Vd = Spindle translation speed [mm/s] L = Overall trapezoidal screw lenght [mm] Vd (mm/s) Vd (mm/s) 0.62 1.25 1.87 2.5 3.12 3.75 4.37 5 5 7.5 10 12.5 15 17.5 20 22.5 25 0 0 2.5 50 4.5 0.6 46 3.75 0.5 25 kN 42 0.4 3 38 50 kN P (kW) 0.3 34 30 kN 1.5 02 30 7.5 ki 26 0.1 0.75 0 kN 22 0 1050 1200 1350 1500 500 1750 2000 ō 150 300 450 600 750 900 000 250 2500 T 500 750 0 150 300 450 600 750 900 1050 1200 1350 1500 250 0 n (rpm) n (rpm)

MecMot

5.62 6.25







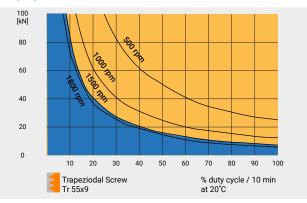
Туре	Version	Speed	Standart screw	i	Stroke per drive shaft rotation
VK100-VH-A	Translating	Normal	Tr 55x9	9:1	1.00 mm
VK100-VH-B	screw	Low speed	11 3389	36:1	0.25 mm
VK100-SH-A	Rotating screw	Normal	Tr 55x9	9:1	1.00 mm
VK100-SH-B		Low speed	11 3389	36:1	0.25 mm

General Features

- Max static load: 100 kN Max dynamic load: See duty cycle curves Nominal speed: 1500 rpm Max speed: 1800 rpm (depending force and duty cycle) Screw size: Tr 55x9 Operation temperature: -10/60C

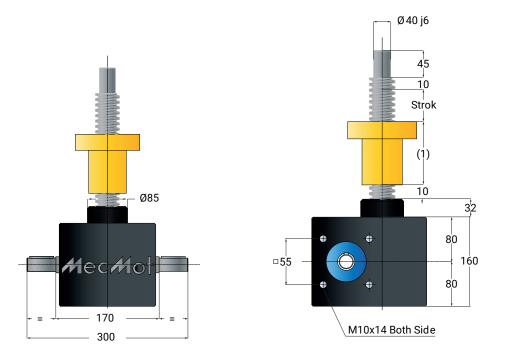
- Screw lubrication: Grease lubrication Input torque: Max 52 Nm (A) max 14 Nm (B) Drive-through torque: Max 540 Nm

Duty cycle thermal limit, for S+R



These curves above represents the thermally safe operating time of the product in percent. These values are valid for the normal operating conditions of the system (lubrication, ambient temperature, environmental conditions, etc.). Otherwise, please contact Mecmot Engineering department

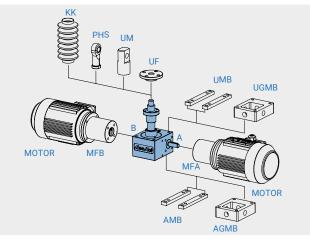
VK100-SH Amax 100 kN





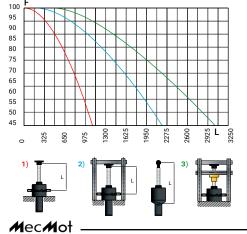
8x7x56 Key DIN 6885 - A = 46 ł Ø25 h6 - €===∋ ____ t 71 -67.5 200 166 ļ t 83 ţ = 131 M20x30 Both Side = -165

SH ACCESORIES

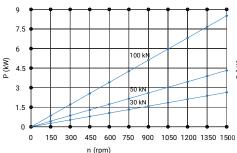


Euler's law (safety factor = 2 dynamic compression load)

- Limit load 1 (red) 2 (blue) 3 (green)
- F = Load [kN]
- L = Overall trapezoidal screw lenght [mm]



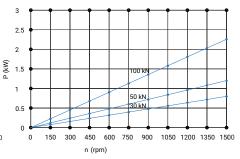
Power Curves (Reduction A Version) P = Requested input power [kW] n = Worm rotational speed [rpm] Vd = Spindle translation speed [mm/s]

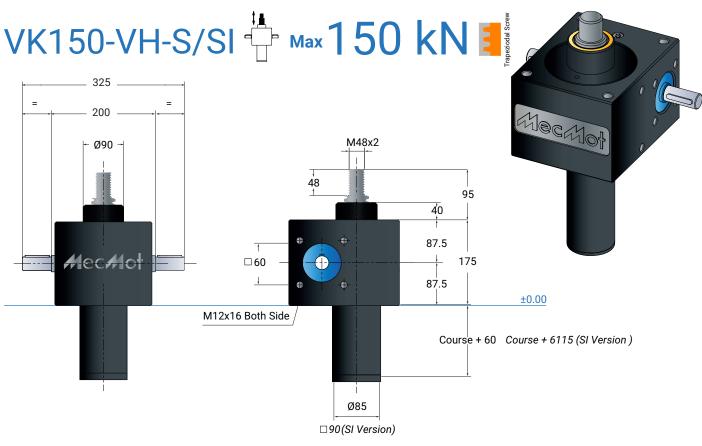


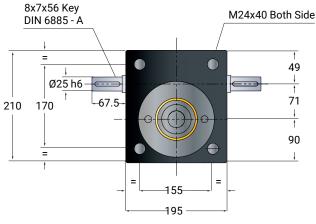
Power Curves (Reduction B Version) P = Requested input power [kW]

n = Worm rotational speed [rpm]

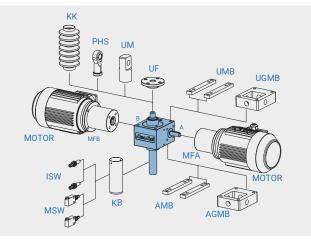
Vd = Spindle translation speed [mm/s]







VH-S/SI ACCESORIES



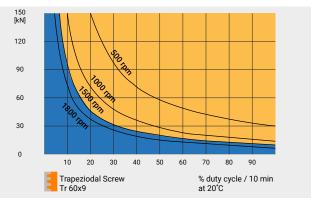
Туре	Version	Speed	Standart screw	i	Stroke per drive shaft rotation
VK150-VH-A	Translating	Normal	Tr 60x9	9:1	1.00 mm
VK150-VH-B	screw	Low speed	11 0029	36:1	0.25 mm
VK150-SH-A	Rotating screw	Normal	Tr 60x9	9:1	1.00 mm
VK150-SH-B		Low speed	11 0029	36:1	0.25 mm

General Features

- Max static load: 150 kN Max dynamic load: See duty cycle curves Nominal speed: 1500 rpm Max speed: 1800 rpm (depending force and duty cycle) Screw size: Tr 60x9 Operation temperature: -10/60C Screw (hytication): Crease (hytication)

- Screw lubrication: Grease lubrication Input torque: Max 75 Nm (A) max 20 Nm (B) Drive-through torque: Max 540 Nm

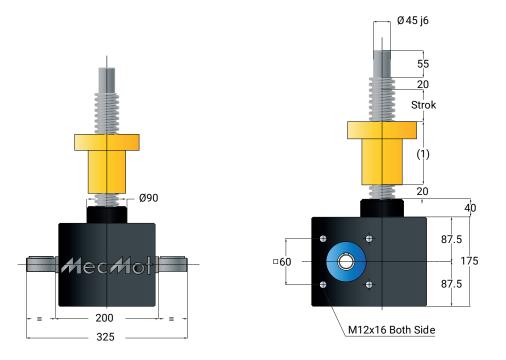
Duty cycle thermal limit, for S+R



These curves above represents the thermally safe operating time of the product in percent. These values are valid for the normal operating conditions of the system (lubrication, ambient temperature, environmental conditions, etc.). Otherwise, please contact Mecmot Engineering department.



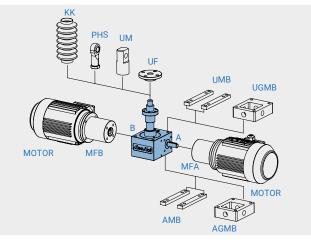
VK150-SH Amax 150 kN

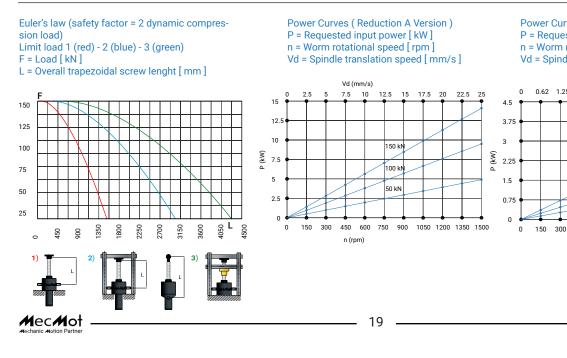




8x7x56 Key DIN 6885 - A = 49 Ļ Ø25 h6 - €===∋ ____ t 71 -67.5-210 170 ļ t 90 ţ 155 M24x40 Both Side = = -195 -

SH ACCESORIES

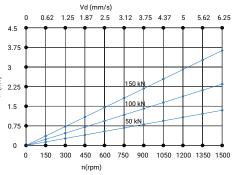




Power Curves (Reduction B Version) P = Requested input power [kW]

n = Worm rotational speed [rpm]

Vd = Spindle translation speed [mm/s]





Туре	Version	Speed	Standart screw	i	Stroke per drive shaft rotation
VK250-VH-A	Translating	Normal	Tr 80x10	10:1	1.00 mm
VK250-VH-B	screw	Low speed	11 00210	40:1	0.25 mm
VK250-SH-A	Rotating screw	Normal	Tr 80x10	10:1	1.00 mm
VK250-SH-B		Low speed	11 00010	40:1	0.25 mm

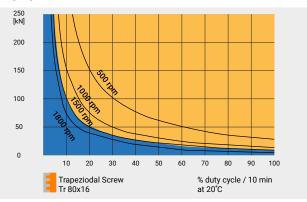
General Features

Max static load: 250 kN Max static load: 250 KN Max dynamic load: See duty cycle curves Nominal speed: 1500 rpm Max speed: 1800 rpm (depending force and duty cycle) Screw size: Tr 80x10 Operation temperature: -10/60C Screw lubrication: Creace lubrication Screw lubrication: Grease lubrication Input torque: Max 140 Nm (A) max 42 Nm (B) Drive-through torque: Max 760 Nm

Duty cycle thermal limit, for S+R

MSW

f

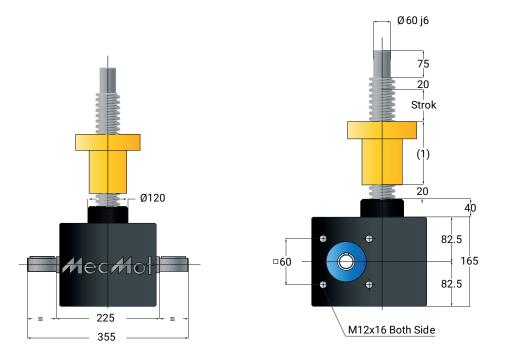


AGMB

These curves above represents the thermally safe operating time of the product in percent. These values are valid for the normal operating conditions of the system (lubrication, ambient temperature, environmental conditions, etc.). Otherwise, please contact Mecmot Engineering department.

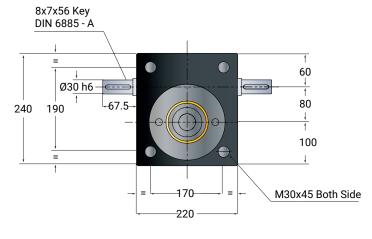


VK250-SH 🗄 Max 250 kN 📕



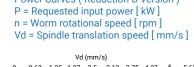


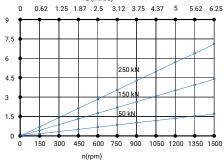
SH ACCESORIES



PHS UM P 0 UF 6 UMB UGMB MOTOR MFB MOTOR 0 AMB AGMB

Euler's law (safety factor = 2 dynamic compres-Power Curves (Reduction A Version) Power Curves (Reduction B Version) P = Requested input power [kW] sion load) Limit load 1 (red) - 2 (blue) - 3 (green) n = Worm rotational speed [rpm] F = Load [kN]Vd = Spindle translation speed [mm/s] L = Overall trapezoidal screw lenght [mm] Vd (mm/s) Vd (mm/s) 0 12.5 15 17.5 20 22.5 ٥ 25 75 10 25 5 30 9 25 7.5 20 6 250 kN P(kw) P (kw) 4.5 15 150 kM 10 3 5 1.5 0 1 ¹⁵⁰⁰ 150 300 450 0 000 500 2000 2500 3000 3500 1000 000 150 300 450 600 750 900 1050 1200 1350 1500 0 006 0 n(rpm) n(rpm)





250

225

200

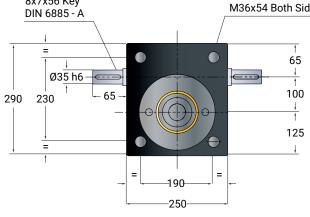
175

150

125

100





Туре	Version	Speed	Standart screw	i	Stroke per drive shaft rotation
VK350-VH-A	Translating	Normal	Tr 100x10	10:1	1.00 mm
VK350-VH-B	screw	Low speed	11 1002.0	40:1	0.25 mm
VK350-SH-A	Rotating	Normal	Tr 100x10	10:1	1.00 mm
VK350-SH-B	screw	Low speed		40:1	0.25 mm

General Features

Max static load: 350 kN Max dynamic load: See duty cycle curves Nominal speed: 1500 rpm Max speed: 1800 rpm (depending force and duty cycle) Screw size: Tr 100x10 Operation temperature: -10/60C Screw lubrication: Grease lubrication Input torque: Max 257 Nm (A) max 100 Nm (B) Drive-through torque: Max 1600 Nm

Duty cycle thermal limit, for S+R

PHS UM

P

MOTOR

ISW

MSW

f

0

KΒ

UF

Ċ

AMB

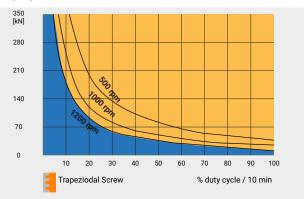
Ì

UMB

0

AGMB

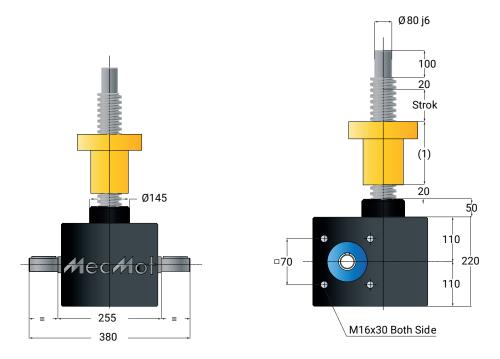
UGMB



These curves above represents the thermally safe operating time of the product in percent. These values are valid for the normal operating conditions of the system (lubrication, ambient temperature, environmental conditions, etc.). Otherwise, please contact Mecmot Engineering department

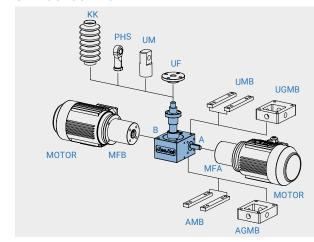


VK350-SH 🗄 Max 350 kN 📑





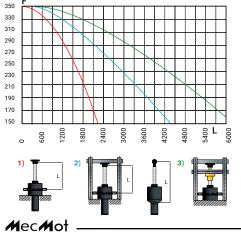
SH ACCESORIES



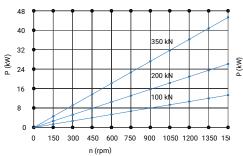
10x8x56 Key DIN 6885 - A = 65 ŧ Ø35 h6 ------t. 100 - 65 290 230 + † 125 ŧ = 190 M36x54 Both Side = 250

Euler's law (safety factor = 2 dynamic compres-

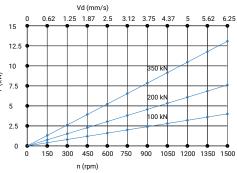
- sion load) Limit load 1 (red) - 2 (blue) - 3 (green)
- F = Load [kN]
- L = Overall trapezoidal screw lenght [mm]

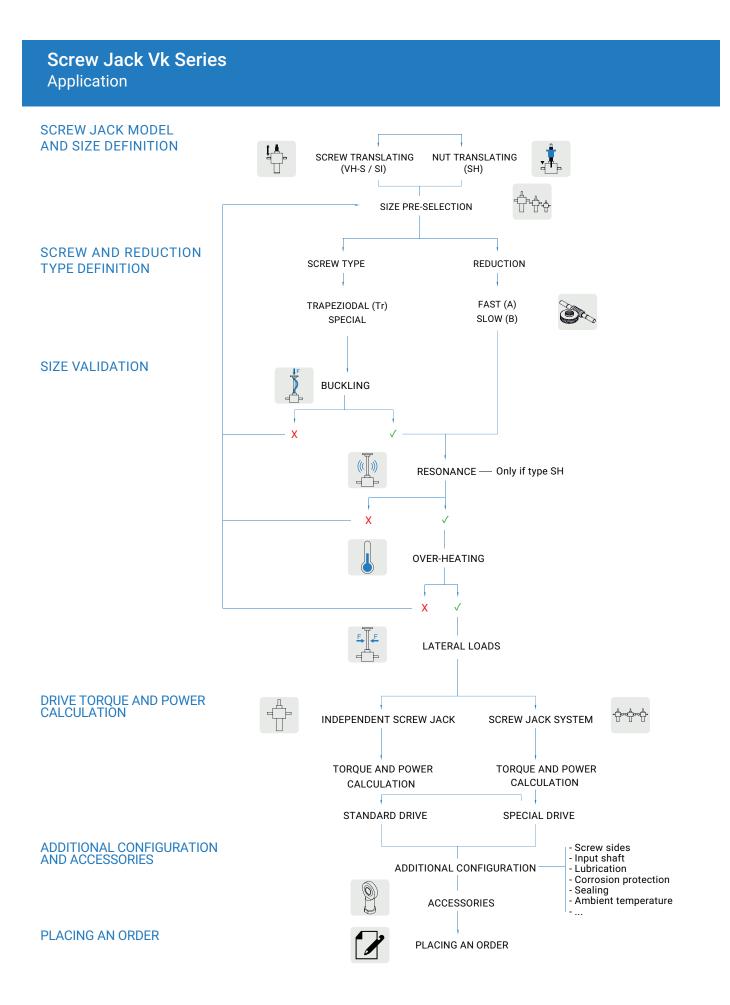


- Power Curves (Reduction A Version) P = Requested input power [kW] n = Worm rotational speed [rpm]
- Vd = Spindle translation speed [mm/s]



- Power Curves (Reduction B Version) P = Requested input power [kW]
- n = Worm rotational speed [rpm]
- Vd = Spindle translation speed [mm/s]





Critical Compression Buckling Load Of a Screw Jack

When there are compression loads on the screw, it may fail due to buckling, before reaching its static load capacity.

If the critical compression buckling load calculated is lower than the actual compression buckling load applied, a screw jack with a larger diameter screw must be selected and its suitability checked.

Check it using the following steps:

1. Compression Buckling Length and Corrector Factor

Select the length L (mm) and the factor K, to be considered in the buckling critical load calculation.

Do this based on the type of support on the sides of the screw jack, according to the figures shown on the right.

2. Buckling Critical Load

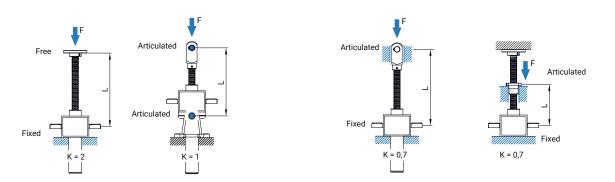
 $F \operatorname{crit} (kN) = 33,91 \times \frac{d^4}{(KxL)^2}$

- d Screw core diameter (mm)
- L Buckling length (mm)
- K Length corrector factor.

Important

In general, the load applied on the screw jack, including possible impacts, must not surpass the calculated value.

The safety factor considered is 3; reconsider this if so considered opportune for the specific application. As a recommendation, when a hypothetical screw jack failure may involve injuries to people, multiply the critical load calculated by an additional factor of 0.6 (final safety factor, 5).



d - Screw o	d - Screw core diameter (mm)								
			Trapezoidal s	crew (Tr)					
18x4	20x4	30x6	40x7	55x9	60x9	80x10	100x10		
13	14,5	22,3	31,24	44	96	7,9	87,9		

Critical Resonance Speed Of a Screw Jack

Applicable to the R version (the screw rotates and the nut moves).

With reduced diameter and long length screws, there is a risk of having considerable vibration on turning if this occurs at speeds close to the first vibration frequency (the second and highest correspond to very high speeds, at which the screws never work). In the worst cases, the screw may break and, additionally, the risk of collapse due to side buckling considerably increases. For these reasons, be sure that the screw jack screw works at considerably lower rotation speeds than resonance speeds. If not, select a screw of a larger diameter and/or reduce its turning speed and/or modify the screw jack end supports.

1. Length, resonance and corrector factor

Select the length L and the correction factor M to consider. Do this based on the types of supports on the sides of the screw jack, according to the figures shown on the right.

2. Maximum admissible speed

n adm (rpm) = M x \underline{d} x 10⁸

- d Screw core diameter (mm).
- L Length between supports (mm).
- M Corrector factor according to supports.

Important

The safety factor considered is 1.25 (maximum admissible speed = 80% of the critical resonance speed).



d - Screw core diameter (mm)

Trapezoidal screw (Tr)									
18x4	20x4	30x6	40x7	55x9	60x9	80x10	100x10		
13	14,5	22,3	31,24	44	96	7,9	87,9		

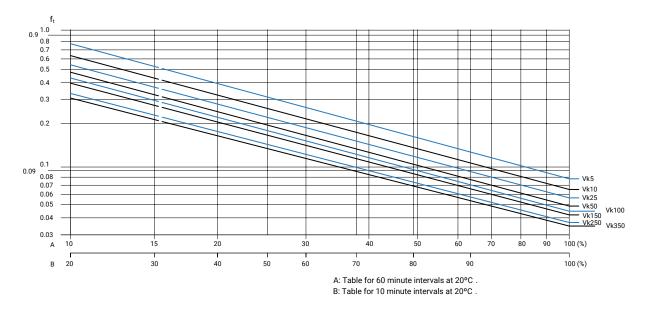
Overheating Of a Screw Jack.

Applicable to the R version (the screw rotates and the nut moves).

With the aim of avoiding overheating due to internal friction of the screw jacks, the axial strength and the advance speed must be controlled. To do this, check the unit selected with the following formula. If it does not comply, choose a larger screw jack and/or reduce the load and/or reduce the speed. For very small strokes, please contact the MecMot technical department.

F x V ≤ F max x V max x ft F Axial strength on the screw (kN). V Advance speed of the screw (mm/min). Fmax Axial load capacity of the screw jack (kN). ft Temperature factor, according to the diagram. Vmax V max (mm) = 1,500 (1) x advance (mm) min rev

For input speeds over 1,500 rpm, please contact the MecMot technical department.



Lateral load of a screw jack

MecMot recommends that, if they exist, the lateral loads on the screw must be supported by guide systems designed for this purpose, in addition to the guide for the gearbox, so that the screw or the nut exclusively support axial traction / compression loads. If there are side loads, the life of the screw jack will be notably reduced, as there will be premature wear of the screw and the nut, which is often the origin of faults.

Important

If it is essential that the screw jack is subject to lateral loads, please contact the MecMot design department for correct design of the unit. This includes the horizontal mountings, on which the screw can flex when subject to the action of its own weight.

Drive Torque and Power Of An İndependent Screw Jack

After pre - selecting the suitable screw jack for the application, select the drive motor, following the steps below.

1. Drive torque

 $M_D(Nm) = FxP + M_I$

 $2 \times \pi \times \eta \text{Dg} \times \eta \text{Ds} \times \dot{I}$

- F Load to elevate in dynamic (kN)
- P Screw pitch (mm)
- Mı Idle torque (Nm)
- i Screw jack gearbox

 η_{DG} Gearbox dynamic efficiency

n_{Ds} Screw dynamic efficiency

2. Power required

 $P_{D} (kW) = \frac{M_{D} \times n}{9550}$

M_D Drive torque (Nm)

n Screw jack input speed (rpm)

Important

In general, it is advisable to multiply the power value calculated for a safety coefficient of 1.3 to 1.5; or for small installations, a factor of 2.

When the load to move is lower than 10% of the elevator's nominal load, consider that value for the previous calculations.

3. Start-up torque

For loads between 25% and 100% of the screw jack's nominal value, calculate the start-up torque with this formula: M_D (Nm) = F x P

2 x π x ηsa **x i**

ηsa Screw jack static efficiency (gearbox + screw)

Important

For loads under 25% of the screw jack's nominal value, select the start-up torque by multiplying the drive torque by 2.

Screw Jack Vk Series Product Selection

η _{DG} Gearbox dy	ynamic efficiency	1						
rpm				A version (Fast)				
input	Vk5	Vk10	Vk25	Vk50	Vk100	Vk150	Vk250	Vk350
3,000	0,91	0,9	0,92					
1,500	0,88	0,89	0,9	0,9	0,9	0,9	0,9	
1.000	0,87	0,88	0,88	0,88	0,87	0,89	0,89	0,9
750	0,85	0,87	0,87	0,87	0,86	0,88	0,89	0,9
500	0,84	0,85	0,85	0,85	0,84	0,87	0,88	0,89
100	0,79	0,79	0,79	0,79	0,78	0,81	0,84	0,85
rpm				B version (Slow)				
input	Vk5	Vk10	Vk25	Vk50	Vk100	Vk150	Vk250	Vk350
3,000	0,75	0,77	0,76					
1,500	0,69	0,71	0,71	0,74	0,72	0,68	0,77	
1.000	0,67	0,69	0,68	0,69	0,67	0,67	0,76	0,77
750	0,64	0,66	0,67	0,68	0,65	0,65	0,75	0,77
500	0,61	0,64	0,63	0,64	0,62	0,64	0,74	0,76
100	0,54	0,56	0,54	0,55	0,53	0,55	0,66	0,69

η_{Ds} Screw dynamic efficiency

Trapezoidal screw (Tr)								
18x4	20x4	30x6	40x7	55x9	60x9	80x10	100x10	
0.41	0,38	0,38	0,35	0,33	0,31	0,27	0,23	

Mi Idle torque										
	A version (Fast)									
Vk5	Vk10	Vk25	Vk50	Vk100	Vk150	Vk250	Vk350			
0.08	0,22	0,3	0,7	1,68	1,8	2.6	3.2			
			B version (Slo	ow)						
Vk5	Vk10	Vk25	Vk50	Vk100	Vk150	Vk250	Vk350			
0.06	0,14	0,24	0,5	1,02	1,15	1,9	2,2			

η _{sa} Screw jack static eff	iciency							
			A vers	ion (Fast)				
	Vk5	Vk10	Vk25	Vk50	Vk100	Vk150	Vk250	Vk350
Trapeziodal	0,24	0,22	0,22	0,19	0,18	0,18	2,17	0,13
			B versi	ion (Slow)				
	Vk5	Vk10	Vk25	Vk50	Vk100	Vk150	Vk250	Vk350
Trapeziodal	0.15	0,14	0,13	0,12	0,11	0,11	0,12	0,1

Important

The values indicated in the tables correspond to the lubrication conditions established by Mecmot for gearbox and screw, and will be reached after a small period of operation. In the case of low temperatures, these can be reduced considerably.

MecMot -

Planning Installations With Screw Jack

For the application of screw jacks in installations with several units, the following criteria must be taken into account:

1. Define the number, position and orientation of the screw jacks.

2. Select the drag components (couplings, transmission shafts, supports, bevel gearboxes, motors, etc.) taking the following recommendations into account:

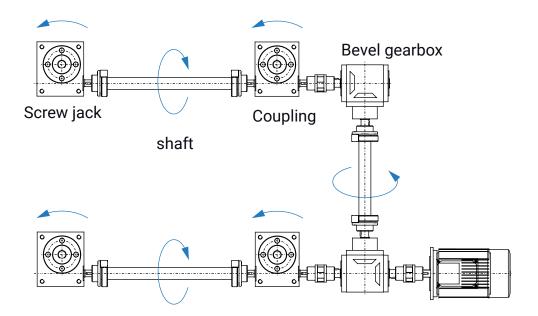
Ensure that the total load is distributed uniformly between all the installation's screw jacks. The lowest possible number of transmission parts is recommended. The transmission shafts should be as short as possible. Try to protect the overall installation with a safety torque limiter.

3. If during the design of the installation a problem arises in defining the turning sense of the different elements, it is advised to apply the following method:

Indicate the orientation of the screw jack elements. Mark the screw turning sense on each screw jack to "lift". Show the position of the bevel gearboxes and the transmission shafts in a diagram.

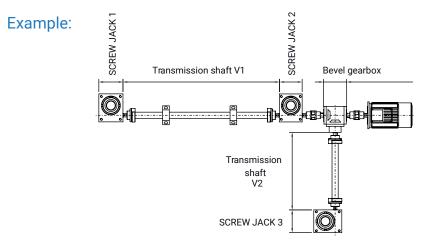
Example:

Elevation system with four screw jacks and two bevel gearboxes.



Drive Torque Of a Screw Jack System

The drive torque of a system made up of several screw jacks connected to each other depends on the torque required for the individual drive of each one and the efficiency of the transmission parts that connect them.



1. System drive torque

Mbs (Nm) = Mb1 + Mb2 + Mb3 x 1 η_{v1} η_{v2} η_k Mb1 / Mb2 / Mb3 Screw jack drive torque 1 / 2 / 3 (Nm) η_{v1} / η_{v2} Gearbox efficiency V1 / V2 (0.90 - 0.95 approx.) η_k Distribution gearbox efficiency (0.90 approx.)

Important

In general, it is advisable to multiply the value calculated for a safety coefficient of 1.3 to 1.5; or for small installations, a factor of 2.

When the load to move is lower than 10% of the elevator's nominal load, consider that value for the previous calculations.

To help the calculation, some frequent arrangements are shown for those for which the system's drive torque can be calculated approximately using the formula below.

It is assumed that the load distribution is uniform between all the units and that they are all the same size.

M_{DS} (Nm) = MD x fs

Mb Independent screw jack drive torque fs Factor, depending on system (see figures next page)

2. System start-up torque

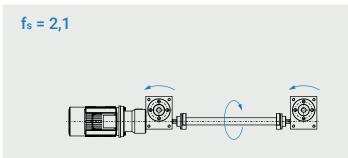
For loads by screw jack between 25% and 100% of the screw jack's nominal value, calculate the start-up torque with this formula: **MDS (Nm) = M**_{DS}

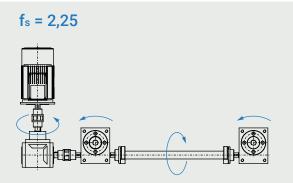
nsj

Mos System drive torque (Nm) ηsJ Elevator static efficiency

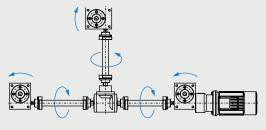
Important

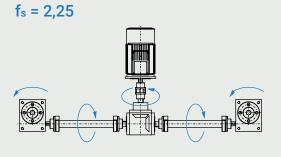
For loads by elevator lower than 25% of its nominal value, multiply the system drive torque by 2.

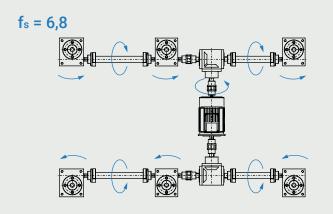


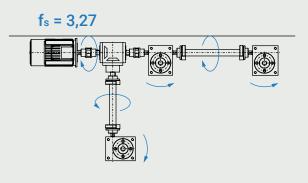


fs = 3,34

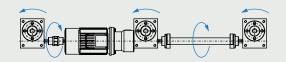


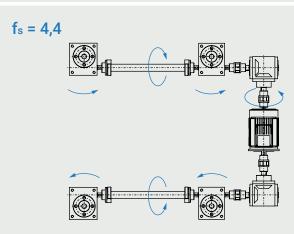


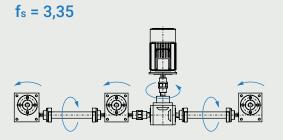


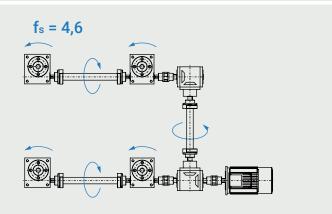


fs = 3,1







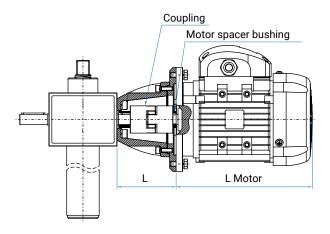


Standart Drive

The standard drive of the screw jacks is made using AC motors. The following table shows the powers available for each screw jack size and the type of flange on the motor, in addition to the length of its fastening flange to the gearbox.

For another size or different type of drive, please contact MecMot. MecMot can supply alternating or stepper motors with sensors of any type, etc.

								Moto	Group										
	5	6	63	}	71		80		90		100		112		132	1	60	18	30
Motor flange								Pewe	r (kW)										
wotor nange	А	В	А	В	А	В	А	В	А	В	А	В	А	А	В	А	В	А	В
	0,06	0,09	0,12	0,18	0,25	0,37	0,55	0,75	1,1	1,5	2,2	3	4	5,5	7,5	11	15	18,5	22
Vk5	L			57		60		67											
VKJ	Moto	or flang	je	B14		B14	E	814											
Vk10	L					63		70	83	3									
VICTO	Moto	or flang	je			B14	E	814	B1	4									
Vk25	L							91	10	1	113		123						
	Moto	or flang	je					B5	B1	4	B14		B14						
Vk50	L							91	10	1	113		123						
	Moto	or flang	je					B5	B	5	B14		B14						
Vk100	L								12	5	135		145		167	2	201		
	Moto	or flang	je						B	5	B5		B14		B14	I	314		
Vk150	L												145		165		199		
	Moto	or flang	je										B14		B14		314		
Vk250	L										135		145		167		201		03
	Moto	or flang	je								B5		B5		B5		B5	E	35



In general, it is always advisable that the motors incorporate a brake, standard brakes are sufficient for each motor size in most cases. This will ensure the screw does not loose position when it stops or if there are vibrations, etc.

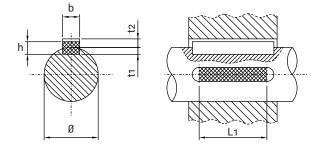
Maximum Transferable Torque Depending On Shaft / Paralel Cotter Pin (DIN 6885)

The following table shows the maximum transferable torque for a shaft and its keys. It is considered that the shaft is subject exclusively to torsional forces.

Important

Never apply to the input shaft of a screw jack torques over those indicated for its shaft and keys (see plans in the sub-chapter "sizes").

Shaft diameter		Key dimensions		Maxi	mum transfe	erable torque	e Md (Nm) K	ey effective	length, L1 (I	mm)
Ø (mm)	b x h (mm)	t1 (mm)	t2 (mm)	10	16	20	28	40	50	70
8 - 10	3 x 3	1.8	1.4	5	9	12	-	-	-	-
10 - 12	4 x 4	2.5	1.8	9	13	17	-	-	-	-
12 - 17	5 x 5	3	2.3	15	24	30	42	-	-	-
17 - 22	6 x 6	3.5	2.8	25	40	50	70	100	-	-
22 - 30	8 x 7	4	3.3	39	63	78	109	157	195	-
30 - 38	10 x 8	5	3.3	50	82	102	143	204	255	357
38 - 44	12 x 8	5	3.3	62	98	123	173	247	308	432
44 - 50	14 x 9	5.5	3.8	82	132	164	230	330	412	575



Material: C45 (1.1191) according to EN 10083-1 Load type: Drive - Uniform / Load - Light knocks Assembly: tight Cycles: >1,000,000 Safety factor: 1.5 - 2.5 IMPORTANT For other conditions, please contact the MecMot technical department.

Lubrication

For further information, please contact the MecMot technical department. A complete cleaning and change of grease is recommended after five years. The greasing interval depends on the type of work and its cycle. It is advisable to lubricate from 30 to 50 hours after start-up and approximately every six months. It is important to avoid over-lubricating.

Gearbox	Total Multis Complex SHD 220 Synthetic Litium Grease
Trapeziodal Screw	Sentinel SL-OG Synthetic Open Gear Grease

Projection Against Corrosion, Sealing and Ambient Temperature

Projection against corrosion

Select the environment in which the equipment will work, using the atmospheric corrosion categories classification established in the DIN EN ISO 12944-2 standard (protection against the corrosion of steel structures using painted systems). Also establish the durability required before carrying out the first maintenance of the exterior surfaces (durability does not imply a "time" guarantee). If the corrosion category is higher than "C3" for your application and/or higher than "average" durability is required, please contact MecMot so that the technical department can select the surface protection system and select the most suitable components.

Corro	sion	ENVIRO	NMENT
Categ	Jory	Outdoors	Indoors
C1	Very low		Buildings with heating and clean atmospheres.
C2	Low	Atmospheres with low levels of pollution. Rural areas.	Buildings with no heating and possible condensation.
C3	Medium	Urban and industrial at- mospheres, with moderate SO2 pollution. Coastal areas with low salinity.	Manufacturing plants with high humidity and some pollution.
C4	High	Industrial areas and coastal areas with moderate salinity.	Chemical and swimming pool industries.
C5-I	Very hig (industrial)	Industrial areas with high humidity and aggressive atmosphere.	Buildings or areas with almost permanent condensation and high contamination.
C5-M	Very hig (maritime)	Coastal and maritime areas with high salinity.	Buildings or areas with permanent condensation and high contamination.

LEVEL OF PROTECTION "IP", AGA	INST THE INPUT OF

Solid	particles: "X"	Liquids: "Y"					
5	Protection against dust residues (the dust that may penetrate the inside does not imply incorrect operation of the equipment).	3	Protection against spray water (from angle up to 60° with vertical).				
6	Total protection against the penetration of any kind of solid body (sealing).	4	Protection against water splashes (from any direction).				
		5	Protection against water streams from any direction with hose.				
		6	Protection against sporadic floods (example: tidal wave).				

	DURABILITY								
Low	L	2 to 5 years							
Medium	Μ	5 to 15 years							
High	н	More than 15 years							

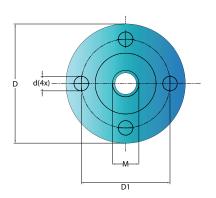
MecMot screw jacks offer, as standard, an IP54 protection index to prevent solid and liquid particles from entering the inside, which may damage them or reduce their designed service life. Use the following table, according to the DIN EN IEC 60529 standard, if the level of protection must be higher than that indicated. MecMot supplies, on request, specially designed units to withstand the most aggressive environments.The protection levels are defined with a code made up of the letters "IP" and two numbers "XY".

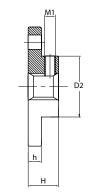
Ambient Temperature

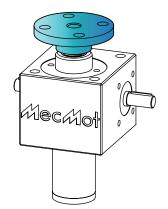
Contact MecMot if your unit will be installed in an environment that may reach temperatures below -20°C. MecMot technical department will prescribe the most suitable materials and sealing components for the specific conditions of the application. Also do this if ambient temperatures over 40°C are expected.

Screw Jack Vk Series Accessories

UF - Fixing Flange

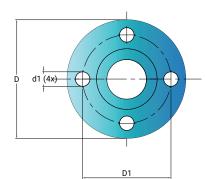


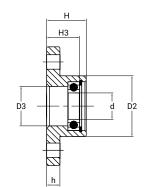


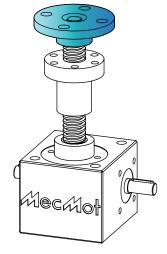


Part no.	D	D1	D2	М	d	h	Н	M1	kg
UP07.03.01	65	48	29	M12	9	7	20	5	0.21
UP07.03.02	80	60	38	M14	11	8	21	6	0.38
UP07.03.03	90	67	46	M20	11	10	23	8	0.57
UP07.03.04	110	85	60	M30	13	15	30	8	1.20
UP07.03.05	150	117	85	M36	17	20	50	10	3.50
UP07.03.06	170	130	90	M42X2	21	25	50	10	4.70
UP07.03.07	210	165	120	M56X2	26	30	60	12	9.50
UP07.03.08	260	205	145	M72X3	32	40	80	16	18.4

UFS - Opposed Bearing Plate



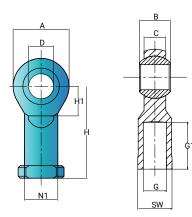


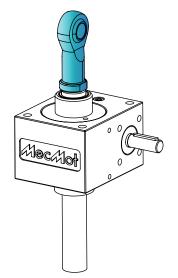


Part no.	0D	0D1	0D2	0D3	0d	0d1	h	Н	H3	Larger	Si ring	kg
UP07.06.01	65	48	29	20	12	9	7	20	13	61901.2RS	J 24	0.17
UP07.06.02	80	60	39	28	15	11	8	21	17	6002.2RS	J 32	0.30
UP07.06.03	90	67	46	32	20	11	10	23	19	61904.2RS	J 37	0.48
UP07.06.04	110	85	60	42	25	13	15	30	22	6005.2RS	J 47	1.05
UP07.06.05	150	117	85	60	40	17	20	50	35	6008.2RS	J 68	3.10
UP07.06.06	170	130	90	68	45	21	25	50	31	6009.2RS	J 75	3.70
UP07.06.07	210	165	120	85	60	26	30	60	50	2x6012.2RS	J 95	6.90
UP07.06.08	265	205	145	95	80	26	32	65	54	2x6016.2RS	J 125	11.50

Screw Jack Vk Series Accessories

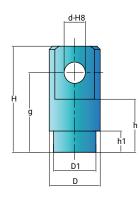
PHS - Rod

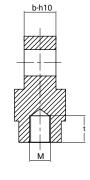


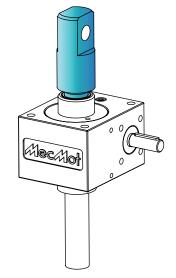


Part no.	А	В	С	D	G	G1	Н	H1	SW	N1	kg
HM13.01.01	34	10	8	12	M12	23	50	17.5	18	17	0.10
HM13.01.02	40	12	10	15	M14	30	61	20	21	20	0.16
HM13.01.03	53	16	13	20	M20	40	77	27.5	30	27.5	0.32
HM13.01.04	73	22	19	30	M30	56	110	37	41	40	1.00
HM13.01.05	92	28	24	40	M36	65	142	46	60	52	1.90
HM13.01.06	112	35	31	50	M42x2	68	160	56	70	62	3.60
HM13.01.07	160	49	43	70	M56x2	80	200	80	85	80	8.30

UM - Pivot Bearing





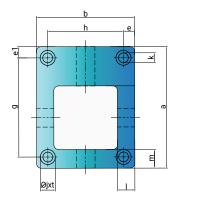


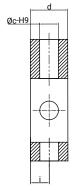
Part no.	Н	D	D1	d	М	g	b	h	h1	t	kg
UP07.04.01	65	30	29	12	M12	48	18	25	20	22	0.25
UP07.04.02	80	40	39	14	M14	56	24	25	20	25	0.56
UP07.04.03	110	50	46	20	M20	80	30	45	25	25	1.20
UP07.04.04	130	65	60	30	M30	92	35	50	-	33	2.10
UP07.04.05	144	90	85	35	M36	108	40	65	-	55	4.40
UP07.04.06	210	100	90	50	M42x2	155	57	90	50	70	8.00
UP07.04.07	260	125	120	80	M56x2	180	80	85	40	63	16.00
UP07.04.08	280	145	145	95	M72x3	195	100	105	-	83	24.00

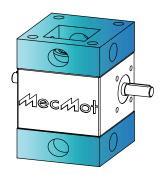


Screw Jack Vk Series Accessories

GMB - Pivot Bearing Plate

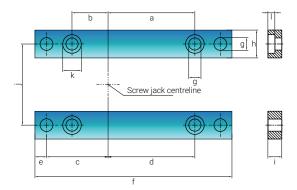


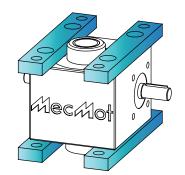




Part no.	а	b	с	d	е	e1	g	h	i	j	k	I.	m	t	kg
UP07.02.01	80	72	16	30	10	10	60	52	15	15	9	18	10	9	0.80
UP07.02.02	100	85	16	30	11	11	78	63	15	15	9	16	11	9	1.15
UP07.02.03	130	105	20	40	12	12	106	81	20	18	11	25	25	11	2.80
UP07.02.04	180	145	30	50	15	15	150	115	25	20	13	24	30	13	5.30
UP07.02.05	200	175	40	70	22	17	166	131	35	26	17	40	30	18	11.1

MB - Fixing Strips

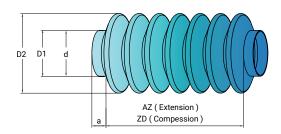


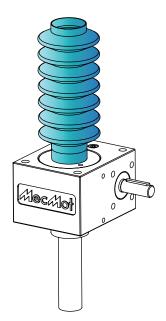


Part no.	а	b	с	d	е	f	g	h	i	j	k	1	kg
UP07.01.01	39	21	41	59	10	120	9	20	10	52	14	6	0.32
UP07.01.02	49	29	50	70	10	140	9	20	14	63	14	6	0.50
UP07.01.03	64	42	64	86	10	170	11	25	12	81	17	7.5	0.75
UP07.01.04	87	63	90	114	13	230	13	30	20	115	19	7	2.00
UP07.01.05	100	66	101	135	17	270	18	40	25	131	26	11	3.70

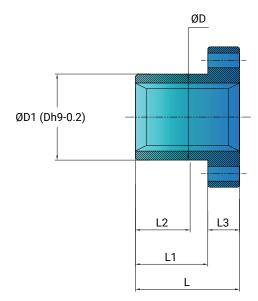
Screw Jack Vk Series Accessories

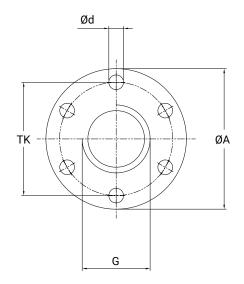
KK - Bellows





Part no.	а	d	ZD	AZ	Stroke	D1	D2	kg
HM14.01.01	10	29	35	300	265	40	76	0.15
HM14.01.02	10	39	80	420	340	40	80	0.21
HM14.01.03	15	46	70	370	300	50	83	0.25
HM14.01.04	18	60	85	475	390	66	102	0.43
HM14.01.05	15	85	75	360	285	85	118	0.29
HM14.01.06	15	90	50	400	350	92	141	0.44
HM14.01.07	15	120	90	480	390	125	166	1.10
HM14.01.08	15	145	100	700	600	172	236	2.40

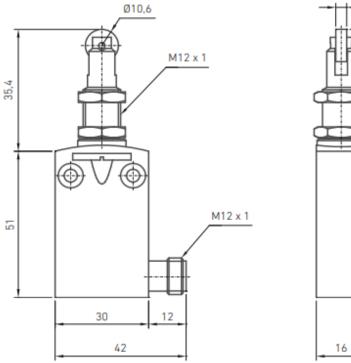


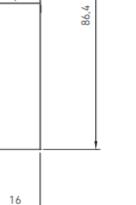


Part no	0	D1 Dh9	ΤK	А	d (6x1)	L	L1	L2	L3	kg
VK5-HRS	Tr 18x4	28	38	48	6	35	23	15	12	0,23
VK10-HRS	Tr 20x4	32	45	55	7	44	32	24	12	0,35
VK25-HRS	Tr 30x6	38	50	62	7	46	32	24	14	0,41
VK50-HRS	Tr 40x7	63	78	95	9	66	50	38	16	1,71

MSW - Mechanical Limit Switch

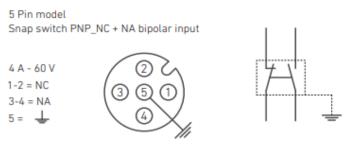


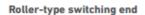


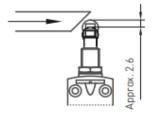


4

M12x1 connector specifications







_

1-4 1-2 1-4

0

3,1 (A) 7 (P)

1,4

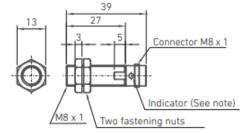
4

mm

ISW - Inductive Limit Switch

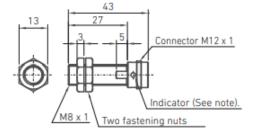


M8x1 inductive detector with M8x1 connector



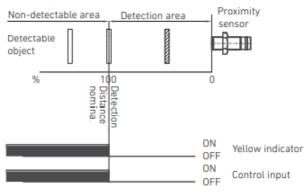
Note: Operation indicator (yellow LED, 4x90°)

Inductive detector M8x1 with connector M12x1 (optional)



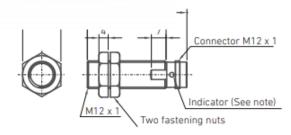
Note: Operation indicator (yellow LED, 4x90°)

Operating diagram





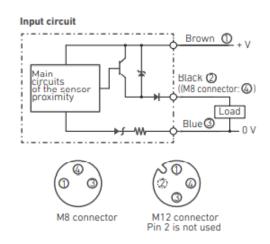
nnector M12x1

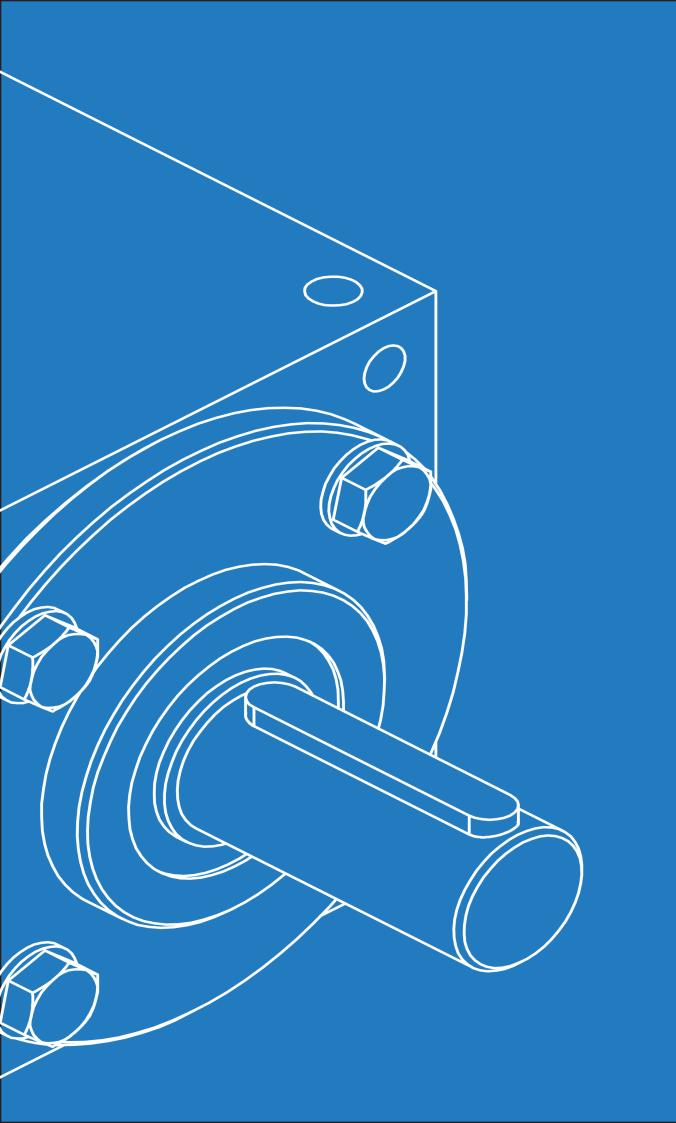


Note: Operation indicator (yellow LED, 4x90°)

Connector specifications

CC Model 3-wire PNP-NC input





BEVEL GEARBOX

Materials and components

Housing

- Cubic shape
- Material: GGG 40
- All sides machine finished.
- On request: Stainless steel.

Covers and hubs

- Material: GGG 40
- Machining: İnternal centring tolerance h7, outher centring tolerance f7.
- On request: Stainless steel.

Solid Shafts

- Material: Carbon steel C45E + H + QT (UNI EN 10083-2), hardened and tempered.
- Machining: Cylindrical end, ground in tolerance j6, with key according to DIN 6885 part 1.
- On request: Stainless steel.
 - Shaft end with spline profile according to DIN 5480.
 - Shaft end machined to drawing.

Hollow Shafts

- Material: Input hollow shaft carbon steel C45E + QT (UNI EN 10083-2), hardened and tempered.
 Output hollow shaft alloy steel 39 NICrMo 3 (UNI EN 10083-3), hardened and tempered.
- Machining: Cylindrical end, ground in tolorance H7, with keyway according to DIN 6885 Part 1.
- On request: Stainless steel.

Bore with spline profile according to ISO 14.

Bevel gears

- Material: Alloy steel 20 MnCr 5 (UNI EN 10084), case-hardened and tempered.
- Toothing: GLEASON, with spiroidal tooth.
- Running in with lapping.

Seals

- · Oil seals in NBR, on request in VITON.
- O-rings in NBR.

Bearings

- Taper roller bearings on solid output shaft and input shafts.
- Ball bearings on hollow input shaft for motor flange.
- On request: Larger bearings for higher radial and / or axial load capacity.

Bevel gearbox selection

The selection of a bevel gearbox depends on several application factors:

• The kinematic scheme of the application to determine the design form, the kinematic scheme of the gear assembling and the shafts rotation directions.

- Torque and rotation speed required by the load (operating machine)
- Load variability, regarding the operating machine and its inertia.
- Working cycle: Number of starts-up per hour, operating time in hours per day duty cycle.
- · Environmental conditions, ambsent temperature, presence of aggressive agents.
- Service life requirements in terms of operating hours of the application.
- Type of engine or type of drive on the bevel gearbox input, available or required by the aplication.

The avove mentioned points are all very important to determine the right size and the type of suitable bevel gearbox for customer's application.

To simplify the selection, some factors, which take into consideration the variability of the above mentioned conditions, are introduced. Applying these factors on the performance required by the application, we obtain recalculated reference performances which should be considered as a starting base for the selection by consulting the table of **Nominal performances** given for each bevel gearbox size.

The nominal data required by the application or by the operating machine are:

- Rotation speed , *n* [rpm]
- Torque, *M*_{tn} [Nm]

These data allow to calculate the required nominal power P_n [kW]:

 $P_n = M_{tn} \mathbf{x}_n$ 9550

It is then necessary to determine the **recalculated referance power** *P*, defined by the following formula:

 $P_n = P_n x f_c x f_u x f_d$

Where:

- *P_n* required nominal power
- fe load factor
- *f*^{*u*} daily operating time factor
- f_d service life factor

The load factor f_c regards the load variability and the number of stars-up per hour; for its quantification and explanation please refer to the description and the table below. The load factor f_c , regarding the load variability is defined as follows:

*f*_c*1* Light overloads: Load variation not exceeding 10% of the required nominal load no mass to be accelerated.

 f_{c2} Medium overloads : Load variation not exceeding 25% of the required nominal load with mass to be accelerated.

 f_{c3} heavy overload: Load variation up to 100% of the required nominal load, with large mass to be accelerated.

Number of starts-up per hour	1	5	60	120	240	1000	1800
fc1	1	1	1.1	1.2	1.25	1.3	2
fc2	1.2	1.2	1.3	1.4	1.45	1.5	1.6
fc3	1.5	15	1.6	1.7	1.75	1.8	2

Materials and components

Housing

Cubic shape Material: Grey cast iron EN-GJL-250 (UNI EN 1561) All sides machine finished. On request: Stainless steel.

Covers and hubs

Material: Grey cast iron EN-GJL-250 (UNI EN 1561) Machining: İnternal centring tolerance h7, outher centring tolerance f7. On request: Stainless steel.

Solid Shafts

Material: Carbon steel C45E + H + QT (UNI EN 10083-2), hardened and tempered. Machining: Cylindrical end, ground in tolerance **j6**, with key according to DIN 6885 part 1. On request: Stainless steel.

Shaft end with spline profile according to DIN 5480. Shaft end machined to drawing.

Hollow Shafts

Material: Input hollow shaft - carbon steel C45E + QT (UNI EN 10083-2), hardened and tempered. Output hollow shaft - alloy steel 39 NICrMo 3 (UNI EN 10083-3), hardened and tempered. Machining: Cylindrical end, ground in tolorance H7, with keyway according to DIN 6885 Part 1. On request: Stainless steel.

Bore with spline profile according to ISO 14.

Bevel gears

Material: Alloy steel 20 MnCr 5 (UNI EN 10084), case-hardened and tempered. Toothing: GLEASON, with spiroidal tooth. Running in with lapping in paris.

Seals

Oil seals in NBR, on request in VITON. O-rings in NBR.

Bearings

Taper roller bearings on solid output shaft and input shafts. Ball bearings on hollow input shaft for motor flange. On request: Larger bearings for higher radial and / or axial load capacity.

Bevel gearbox selection

The selection of a bevel gearbox depends on several application factors:

• The kinematic scheme of the application to determine the design form, the kinematic scheme of the gear assembling and the shafts rotation directions.

- Torque and rotation speed required by the load (operating machine)
- · Load variability, regarding the operating machine and its inertia.
- Working cycle: Number of starts-up per hour, operating time in hours per day duty cycle.
- Environmental conditions, ambsent temperature, presence of aggressive agents.
- Service life requirements in terms of operating hours of the application.
- Type of engine or type of drive on the bevel gearbox input, available or required by the aplication.

The avove mentioned points are all very important to determine the right size and the type of suitable bevel gearbox for customer's application.

To simplify the selection, some factors, which take into consideration the variability of the above mentioned conditions, are introduced. Applying these factors on the performance required by the application, we obtain recalculated reference performances which should be considered as a starting base for the selection by consulting the table of **Nominal performances** given for each bevel gearbox size.

The nominal data required by the application or by the operating machine are:

Rotation speed , *n* [rpm]

• Torque, *M*_{tm} [Nm]

These data allow to calculate the required nominal power P_n [kW]:

 $P_n = M_{tn} x_n$ 9550

It is then necessary to determine the **recalculated referance power** *P*, defined by the following formula:

 $P_n = P_n x f_c x f_u x f_d$

Where:

- **P**_n required nominal power
- *f*_c load factor
- f_u daily operating time factor
- *f*_d service life factor

The **load factor** f_c regards the load variability and the number of stars-up per hour; for its quantification and explanation please refer to the desciption and the table below. The load factor f_c , regarding the load variability is defined as follows:

*f*_c*1* Light overloads: Load variation not exceeding 10% of the required nominal load no mass to be accelerated.

 f_{c2} Medium overloads : Load variation not exceeding 25% of the required nominal load with mass to be accelerated.

 f_{c3} heavy overload: Load variation up to 100% of the required nominal load, with large mass to be accelerated.

Number of starts-up per hour	1	5	60	120	240	1000	1800
fcı	1	1	1,1	1,2	1,25	1,3	1,4
fc2	1,21	1,21	1,3	1,4	1,45	1,5	1,6
fc3	1,51	1,51	1,6	1,7	1,75	1,8	2

The **daily operating factor** f_u considers the number of operating hours per day reffering to operating under load with duty cycle required by the application:

Operating hours / day	1	2	4	8	16	24
fu	0.7	0.8	0.9	1	1.15	1.3

The **service life factor** f_d considers the life time required by the application compared to the life time calculated with performances shown in the tables (average value 10.000 hours) reference to the gears.

Theoretic service life [hours]	20.000	15.000	10.000	5.000	3.000
fu	1.2	1.1	1	0.9	0.8

With the calculated input power P: $P=P_n x f_c x f_u x f_d$

It is possible to calculate the **torque** M_{t2} **reguired on the gearbox output**, considering the rotation speed required by the operating machine or the load: $M_{t2} = \frac{Px9550}{n_2}$

Based on **nominal performances** table on page 12-13, using M_{t2} and n_2 , it is possible to determine the bevel gearbox size for an initial selection. Then evaluating the gearbox ratios and the characteristics of the rotation speeds avaiable or required by the application, it is possible to select easily a ratio and determine the bevel gearbox input speed. The **input power** P_1 [kW] **required on the bevel gearbox**, shown in the table, already takes into account the **total bevel gearbox efficiency** η , with the ratio and the considered input speed:

$P_1 = Mt_2 x n_2$

9550xη

Usually, the ratio selection implies a modification of the real gearbox output speed regards to the previously calculated one unless it is possible to vary and adjust the bevel gearbox input speed.

Thermal power limit (P_T)

After the gearbox size has been determined, it is necessary to verify the thermal operating conditions, which means toverify if the selected gearbox can operate in the required conditions without risk of overheating of the oil lubricant and of the componets.

Each gearbox has a **thermal power limit** P_{T} , which is determined based on continuous operating duty cycle over max. 3 hours at 20°C environment temperature, value stated in the table at the bottom of this page, which must not be exceeded without a controlled and forced cooling.

In case of risk of exceeding the thermal power limit, the bevel gearbox should be always lubricated exclusively with oil instead of grease.

In order to consider the real environment conditions, if diffrent from 20°C, and the duty cycle if diffrent from the reference one (continuous operating over max. 3 hours) two factors are introduced which modify the thermal power limit, allowing the calculation of the **corrected thermal power limit** P_{TC} :

 $\boldsymbol{P}_{TC} = \boldsymbol{P}_T \boldsymbol{x} \boldsymbol{f}_T \boldsymbol{x} \boldsymbol{f}_i$

Where:

 P_{T} thermal power limit

 f_{T} ambient temperature factor

 f_i duty cycle factor referred to continuous operating over 3 hours (period of time considered to determine the thermal power limit)

Ambient temperature factor *f*_{*r*}:

T [°C]	0	10	20	30	40	50	60
f_i	1.3	1.15	1	0.85	0.7	0.55	0.5

Duty cycle facor fi:

Operating time over 3 hours [%]	100	80	60	40	20	10
f_i	1	1.2	1.3	1.5	1.6	1.8

Therefore, the continuous power used over 3 hours in the selected bevel gear box must not exceed the value of the **corrected thermal power** P_{Tc} referred to the same gearbox, otherwise the oil lubricant should be cooled.

Thermal powet limit (*P_r*) forcontinuous operating over 3 hour at 20°C ambient temperature:

SIZE	86	110	134	166	200	250
$P_{^{T}}$ [kW]	3.4	5.5	8	12.2	17.9	26.5

Bevel gearboxes YD Series Technical features summary YD85 YD110 YD135 SIZE Housing side dimensions [mm] 85 110 135 Ratio 1:1.5 1:2 1:3 1:4 1:1 Total efficiency (n) $0.90 \le \eta \le 0.93$ (*) Input: solid shaft cylindrical with key Ø 16 j6 Ø 20 j6 Ø 24 j6 STANDARD diameter [mm] Input: solid shaft cylindrical with key Ø 24 j6 Ø 26 j6 Ø 32 j6 LARGER diameter [mm] IEC 80 B5 IEC 90 B5 IEC 71 B5 IEC 80 B14 Input: IEC 80 B5 IEC 100-112 B5 IEC motor flange IEC 90 B5 IEC 80 B14 IEC 100-112 B14 IEC 90 B14 Output: solid shaft Ø 24 j6 Ø 25 j6 Ø 32 j6 cylindrical with key Output: hollow shaft Ø 16 H7 Ø 20 H7Ø 24 H7 cylindrical with keyway Output: solid shaft with hub cylindrical with key Ø 16 j6 Ø 20 j6 Ø 24 j6 STANDARD diameter [mm] Output: solid shaft with hub cylindrical with key Ø 24 j6 Ø 25 j6 Ø 32 j6 LARGE diameter [mm] Gearbox housing, shaft hub GGG - 40 and covers material Solid input shaft material Steel C45E + H +QT (UNI EN 10083-2) hardened and tempered Hollow input shaft material Steel C45E + H +QT (UNI EN 10083-2) hardened and tempered Solid output shaft material Steel C45E + H +QT (UNI EN 10083-2) hardened and tempered Steel 39 NiCrMo 3 (UNI EN 10083-3) hardened and tempered Hollow output shaft material Toothing: Spiral GLEASON Bevel gears Material: Steel 20 MnCr 5 (UNI EN 10084) case-hardened lapped Gearbox mass [kg]

* Value referred to bevel gearbox without additional output.

(gearbox with solid input shaft

and solid output shaft on both

sides)

3.59

18

Technical features summary

Technical features	s summary		
YD165	YD200	YD250	SIZE
165	200	250	Housing side dimensions [mm]
	1:1 1:1.5 1:2 1:3 1:	4	Ratio
	0.90 ≤ η ≤ 0.93 (*)		Total efficiency (η)
Ø 32 j6	Ø 42 j6	Ø 55 j6	Input: solid shaft cylindrical with key STANDARD diameter [mm]
Ø 45 j6	Ø 55 j6	Ø 70j6	Input: solid shaft cylindrical with key LARGER diameter [mm]
90 B5	100-112 B5	132 B5	Input:
100-112 B5 100-112 B14	132 B5 132 B14	160 B5	IEC motor flange
Ø 45 j6	Ø 55 j6	Ø 70 j6	Output: solid shaft cylindrical with key
Ø 32 H7	Ø 42 H7	Ø 55 H7	Output: hollow shaft cylindrical with keyway
Ø 32 j6	Ø 42 j6	Ø 55 j6	Output: solid shaft with hub cylindrical with key STANDARD diameter [mm]
Ø 45 j6	Ø 55 j6	Ø 70 j6	Output: solid shaft with hub cylindrical with key LARGE diameter [mm]
	GGG - 40		Gearbox housing, shaft hub and covers material
Steel C45E +	H +QT (UNI EN 10083-2) hardened	d and tempered	Solid input shaft material
Steel C45E +	H +QT (UNI EN 10083-2) hardened	d and tempered	Hollow input shaft material
Steel C45E +	H +QT (UNI EN 10083-2) hardened	d and tempered	Solid output shaft material
Steel 39 NiC	rMo 3 (UNI EN 10083-3) hardened	and tempered	Hollow output shaft material
Ma	Toothing: Spiral GLEASON aterial : Steel 20 MnCr 5 (UNI EN 10 case-hardened lapped	0084)	Bevel gears
32	60	145	Gearbox mass [kg] (gearbox with solid input shaft and solid output shaft on both sides)

* Value referred to bevel gearbox without additional output.

Nominal Performances - Torque and Power

SIZE		YD	85	YD	110	Y	D135
n ₁ rpm	n₂ rpm	P₁max [kW]	T₂max [Nm]	P₁max [kW]	T₂max [Nm]	P₁max [kW]	T₂max [Nm]
Ratio R 1							
50 250 500 1000 1500 2000 3000	50 250 500 1000 1500 2000 3000	0.32 0.94 1.62 2.7 3.24 3.89 5.18	60 35 30 25 20 18 16	0.97 3.78 6.21 10.3 13.0 16.2 22.7	180 140 115 95 80 75 70	1.62 7.85 13.0 21.1 28.1 34.3 45.6	300 291 241 196 173 159 141
Ratio R 1.5							
50 250 500 1000 1500 2000 3000	33 167 333 667 1000 1333 2000	0.23 0.72 1.08 1.80 2.48 2.88 3.89	65 40 30 25 23 20 18	0.49 2.25 4.32 6.84 9.18 11.5 15.1	135 125 120 95 85 80 70	0.81 3.95 7.75 14.7 20.6 25.2 33.4	225 220 215 204 191 175 155
Ratio R 2							
50 250 500 1000 1500 2000 3000	25 125 250 500 750 1000 1500	0.15 0.54 0.94 1.62 2.02 2.38 3.24	55 40 35 30 25 22 20	0.31 1.42 2.70 5.13 7.29 9.18 12.1	115 105 100 95 90 85 75	0.51 2.44 4.71 9.02 13.0 16.7 23.4	190 181 175 167 160 155 144
Ratio R 3							
50 250 500 1000 1500 2000 3000	17 83 167 333 500 667 1000	0.06 0.29 0.54 1.01 1.40 1.58 2.16	35 32 30 28 26 22 20	0.14 0.63 1.17 2.19 3.16 4.07 5.94	80 70 65 61 59 57 55	0.23 1.07 2.04 3.91 5.66 7.30 10.3	126 119 113 109 105 101 95
Ratio R 4							
50 250 500 1000 1500 2000 3000	12.5 62.5 125 250 375 500 750	0.04 0.18 0.34 0.65 0.93 1.19 1.62	30 26 25 24 23 22 20	0.09 0.37 0.67 1.21 1.75 2.26 3.24	65 55 50 45 43 42 40	0.14 0.59 1.11 2.12 3.08 3.98 5.63	104 84 82 79 76 74 70
Thermal powe	r limit [kW]	3	.4	5	.5		8

P_{1max} The torque and power values stated in the Nominal peformances table refer to a minimum service life of 10 000 hours at following opera ting conditions:

·Applied load: uniform and without variations

•Driving unit: electric motor

·Rotation direction: one-way

 \cdot 1 (one) start-up per hour

· Operating hours per day 8

· Ambient temperature: 20C

Thermal power limit value calculated considering a

continuous operating time over 3 hours at nominal performances.

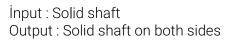
Nominal Performances - Torque and Power

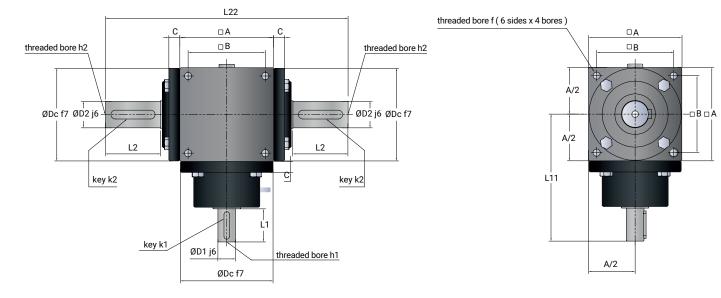
YD	165	YD2	200	YD	250		SIZE
P₁max [kW]	T₂max [Nm]	P₁max [kW]	T₂max [Nm]	P₁max [kW]	T₂max [Nm]	n₁ rpm	n₂ rpm
							Ratio R 1
3.02 11.4 18.4 30.2 40.5 50.0 64.8	560 420 340 280 250 230 200	5.24 22.1 36.2 59.4 77.7 95.0 126	970 820 670 550 480 440 390	10.7 37.2 60.5 98.2 131 160 214	1980 1380 910 810 740 660	50 250 500 1000 1500 2000 3000	50 250 500 1000 1500 2000 3000
							Ratio R 1.5
1.51 7.38 13.3 21.6 29.2 36.0 47.5	420 410 370 300 270 250 220	2.63 13.0 24.8 43.2 57.2 70.5 92.8	730 720 690 600 530 490 430	5.33 26.1 45.3 73.4 98.2 119 160	1480 1450 1260 1020 910 830 740	33 167 333 667 1000 1333 2000	50 250 500 1000 1500 2000 3000
							Ratio R 2
0.97 4.72 9.18 17.3 22.7 28.1 37.3	360 350 340 320 280 260 230	1.67 8.23 16.2 30.8 44.5 55.1 72.9	620 610 600 570 550 510 450	3.45 17.0 33.2 57.8 76.9 93.9 125	1280 1260 1230 1070 950 870 770	25 125 250 500 750 1000 1500	50 250 500 1000 1500 2000 3000
							Ratio R 3
0.43 2.07 3.96 7.56 10.8 14.0 20.0	240 230 220 210 200 195 185	0.76 3.60 7.02 13.3 19.4 25.2 35.6	420 400 390 370 360 350 330	1.53 7.42 14.6 28.1 40.5 52.5 74.5	850 825 810 780 750 730 690	17 83 167 333 500 667 1000	50 250 500 1000 1500 2000 3000
							Ratio R 4
0.27 1.15 2.16 4.18 6.07 7.83 11.4	200 170 160 155 150 145 140	0.46 1.96 3.78 7.29 10.5 13.5 19.4	340 290 280 270 260 250 240	0.94 4.18 8.10 15.7 22.7 29.1 42.1	700 620 580 560 540 520	12.5 62.5 125 250 375 500 750	50 250 500 1000 1500 2000 3000
12	2	17	.9	26	ö.5	Therm	al power limit [kW]

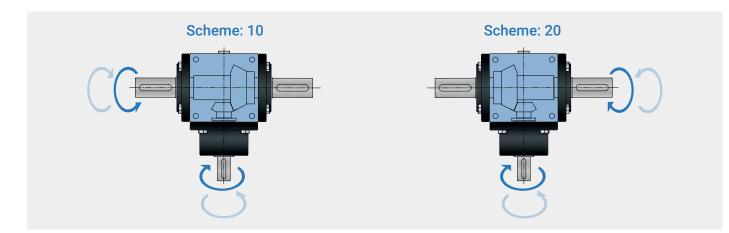
n1 - input shaft speed n2 - output shaft speed

P_{1max} - max. input power T_{2max} - max. output torque

Bevel Gearbox MMC Type 😹







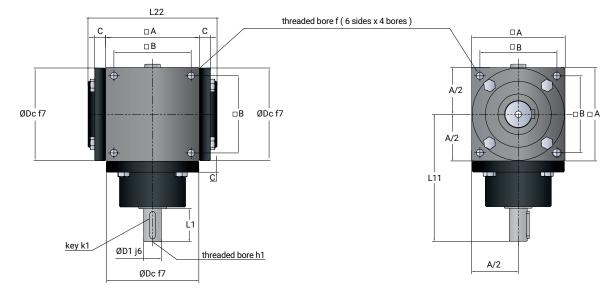
SIZE	YD85	YD 110	YD 135	YD 165	YD 200	YD 250
cube A	85x85x85	110x100x100	135x135x135	165x165x165	200x200x200	250x250x250
Ø D1	16	20	24	32	42	55
Ø D2	24	25	32	45	55	70
Ø Dc	84	100	122	156	185	230
□B	70x70	90x90	115x115	144x144	175x175	215x215
L1	30	40	50	65	85	100
L11	116	150	182	217	267	318
L2	50	55	65	90	110	140
L22	220	254	304	392	470	580
С	10	8	9	11	11	11
f	M8, depth 20	M10, depth 25	M10, depth 25	M12, depth 30	M14, depth 35	M16, depth 40
h1	M6, depth 12	M8, depth 20	M8, depth 20	M10, depth 25	M10, depth 25	M12, depth 25
h2	M6, depth 12	M8, depth 20	M8, depth 20	M10, depth 25	M10, depth 25	M12, depth 25
k1	5x5x25	6x6x35	8x7x45	10x8x60	12x8x80	116x10x90
k2	8x7x40	8x7x45	10x8x55	14x9x80	16x10x100	20x12x120
44 44 - 1			5.4			

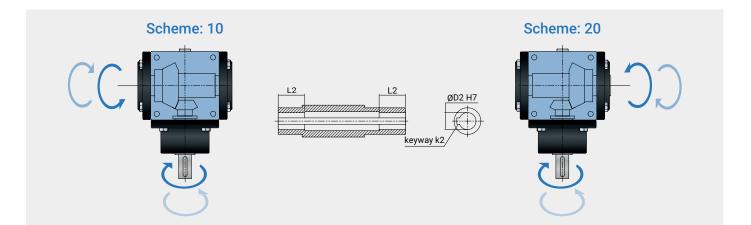
_

Bevel Gearbox MD Type 😹

İnput : Solid shaft Output : Hollow shaft



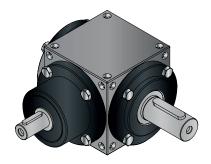


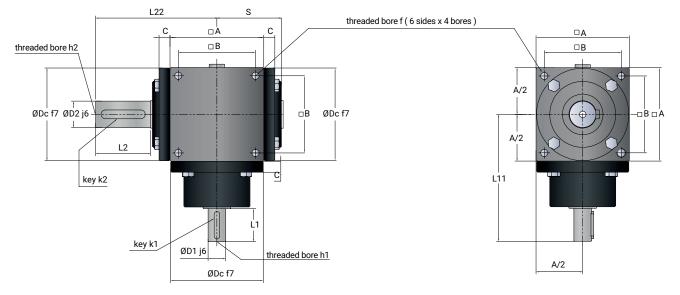


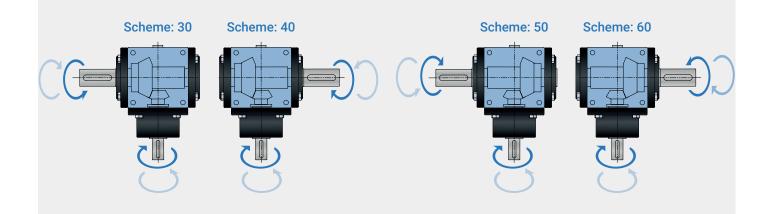
SIZE	YD 85	YD 110	YD 135	YD 165	YD 200	YD 250
cube A	85x85x85	110x110x110	135x135x135	165x165x165	200x200x200	250x250x250
Ø D1	16	20	24	32	42	55
Ø D2	16	20	24	32	42	55
ØDc	84	100	122	156	185	230
□B	70x70	90x90	114x114	144x144	175x175	215x215
L1	30	40	50	65	85	100
L11	116	150	182	217	267	318
L2	30	30	35	45	50	55
L22	120	144	174	212	250	300
С	10	8	9	11	11	11
f	M8, depth 20	M10, depth 25	M10, depth 25	M12, depth 30	M14, depth 35	M16, depth 40
h1	M6, depth 12	M8, depth 20	M8, depth 20	M10, depth 25	M10, depth 25	M12, depth 25
k1	5x5x25	6x6x35	8x7x45	10x8x60	12x8x80	12x8x80
k2	5x5	6x6	8x7	10x8	12x8	16x10

Bevel Gearbox MM Type

İnput : Solid shaft Output : Solid shaft on one side







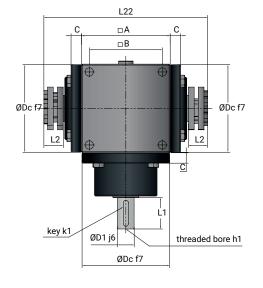
SIZE	YD 85	YD 110	YD 135	YD 165	YD 200	YD 250
cube A	85x85x85	110x110x110	135x135x135	165x165x165	200x200x200	250x250x250
S	58	70	75	104	123	145
Ø D1	16	20	24	32	42	55
Ø D2	24	26	32	45	55	70
ØDc	84	100	122	156	185	230
□B	70x70	90x90	114x114	114x114	175x175	215x215
L1	30	40	50	65	85	100
L11	116	150	182	217	267	318
L2	50	55	65	90	110	140
L22	110	127	152	196	235	290
С	10	8	9	11	11	11
f	M8, depth 20	M10, depth 25	M10, depth 25	M12, depth 30	M14, depth 35	M16, depth 40
h1	M6, depth 12	M8, depth 20	M8, depth 20	M10, depth 25	M10, depth 25	M12, depth 25
h2	M6, depth 12	M8, depth 20	M8, depth 20	M10, depth 25	M10, depth 25	M12, depth 25
k1	5x5x25	6x6x35	8x7x45	10x8x60	12x8x80	16x10x90
k2	8x7x40	8x7x45	10x8x55	14x9x80	16x10x100	20x12x120

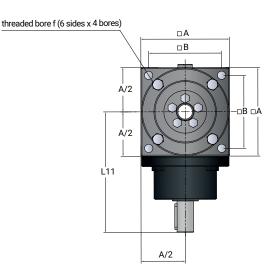
_

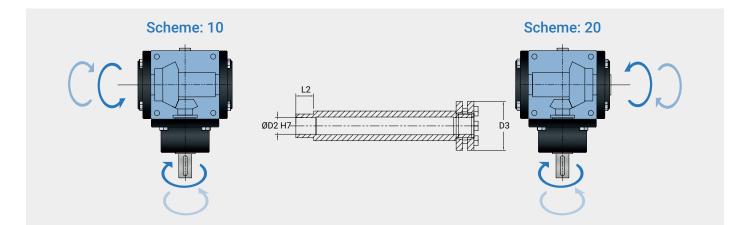
Bevel Gearbox MH Type

İnput : Solid shaft Output : Solid shaft on one side





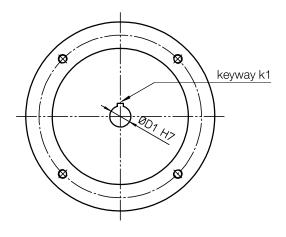


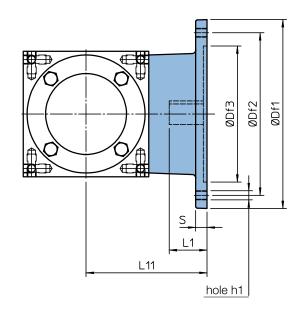


SIZE	YD 85	YD 110	YD 135	YD 165	YD 200	YD 250
cube A	85x85x85	110x110x110	135x135x135	165x165x165	200x200x200	250x250x250
S	58	70	75	104	123	145
Ø D1	16	20	24	32	42	55
Ø D2	24	26	32	45	55	70
Ø Dc	84	100	122	156	185	230
□B	70x70	90x90	114x114	114x114	175x175	215x215
L1	30	40	50	65	85	100
L11	116	150	182	217	267	318
L2	23	23	25	30	32	35
L22	166	190	224	272	314	370
С	10	8	9	11	11	11
f	M8, depth 20	M10, depth 25	M10, depth 25	M12, depth 30	M14, depth 35	M16, depth 40
h1	M6, depth 12	M8, depth 20	M8, depth 20	M10, depth 25	M10, depth 25	M12, depth 25
h2	M6, depth 12	M8, depth 20	M8, depth 20	M10, depth 25	M10, depth 25	M12, depth 25
k1	5x5x25	6x6x35	8x7x45	10x8x60	12x8x80	16x10x90
ØD3	50	50	60	80	90	115

Overall dimensions: YD - MF

İnput: IEC motor flange and hollow shaft with keyway





Size	IEC Motor	Ø D1	Ø Df1	Ø Df2	Ø Df3	L1	L11	h1	k1	S
	71 B5	14	160	130	110	30	90	M8	5 x 5	13
YD 85	80 B5	19	200	165	130	40	100	M10	6 x 6	13
	80 B14	19	120	100	80	40	100	07	6 x 6	13
	80 B5	19	200	165	130	40	105	M10	6 x 6	13
YD 110	80 B14	19	120	100	80	40	105	07	6 x 6	13
IDIIO	90 B5	24	200	165	130	50	115	M10	8 x 7	13
	90 B14	24	140	115	95	50	115	09	8 x 7	13
	90 B5	24	200	165	130	50	125	M10	8 x 7	13
YD 135	100 - 112 B5	28	250	215	180	60	135	M12	8 x 7	13
	100 - 112 B14	28	160	130	110	60	135	09	8 x 7	13
	90 B5	24	200	165	130	50	160	M10	8 x 7	15
YD 165	100 - 112 B5	28	250	215	180	60	160	M12	8 x 7	15
	100 - 112 B14	28	160	130	110	60	160	09	8 x 7	15
	100 - 112 B5	28	250	215	180	60	220	M12	8 x 7	23
YD 200	132 B5	38	300	256	230	80	220	M12	10 x 8	23
	132 B14	38	200	165	130	80	220	011	10 x 8	23
YD 250	132 B5	38	300	265	230	80	250	M12	10 x 8	25
10 200	160 B5	42	350	300	250	110	250	M16	12 x 8	25

Bevel gearbox efficiency (η)

The efficiency of the bevel gears with GLEASON spiral toothing, lapped in pairs, basically is not influenced by the ratio and / or by the rotation input speed.

Furthermore, it has no remarkable varitions by varying the gearbox size.

The value η = 0.97, result of calculated average values, is assumed as a reasonable average value. On the contrary, the efficency of bearings and oil seals, mounted on the input and output shafts depends on the rotation speed and the ratio.

Generally, it varies from 0.96 to 0.93 by changing from the minimum rotation speed of the shafts up to the maximum speed, referring to the **Nominal performances**.

The obove considerations bring to everage values of the bevel gearbox total efficiency in a range within 0.90 ... 0.93

Angular backlash

The standard angular on the output shaft, with input shaft locked, is lower than or aqual to 10 arcmin. Therefore, 10 arcmin is assumed as maximum value of the standard backlash.

On request bevel gears with the gear set to obtain a lower backlash on the output shafts can be supplied.

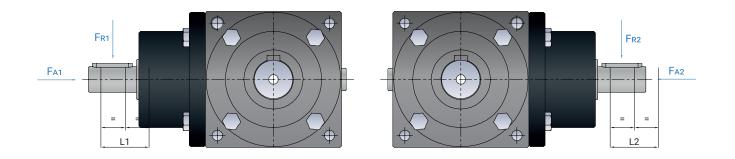
The value of the reduced backlash is lower than (5 ... 6) arcmin.

Radial and axial forces on the shafts

The following table shows the maximum permissible radial (F_{R1}, F_{R2}) an axial (F_{A1}, F_{R2}) forces on the bevel gearbox input and output shafts, with referance to 1500 rpm input speed and the performances shown in the **Nominal performances** table.

Operating conditions different from the indicated reference conditions require a specific verification.

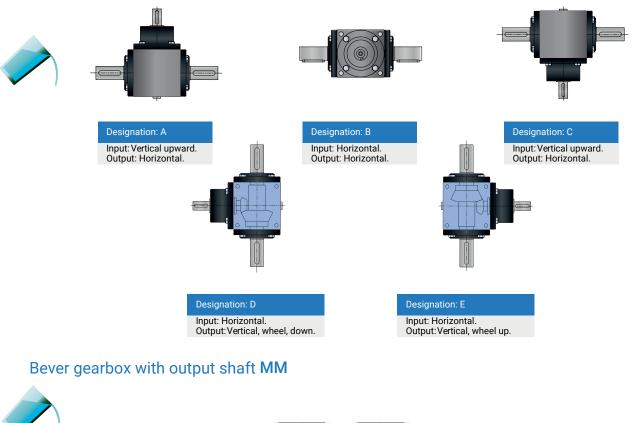
SIZE	INPUT	SHAFT	OUTPUT SHAFT		
SIZE	Fr1 [N]	Fa1 [N]	Fr2 [N]	Fa2 [N]	
YD 86	510	45	600	180	
YD 110	600	180	1800	540	
YD 134	1200	360	2500	750	
YD 166	1800	540	3500	100	
YD 200	2500	750	4500	1350	
YD 250	3800	1150	6500	1900	



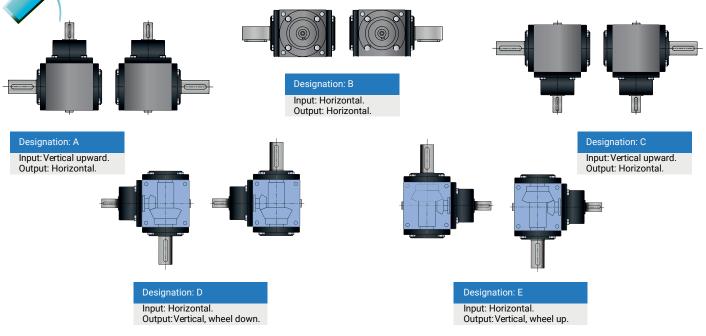
Mounting and operating position

The operating position of the bevel gearbox is important for an optimal lubrication of gears and bearings, as well as for the right definition of the oil plug and air breather position (if present).

Following schemes show the bevel gearbox with input solid shaft but they can also be applied for gearboxes with IEC motor flange (**MF**). In case of gearboxes with additional output shafts, please refer to the same schemes to define the input and main output position of the gearbox the position of the addinotial output shaft can be identified consequently.



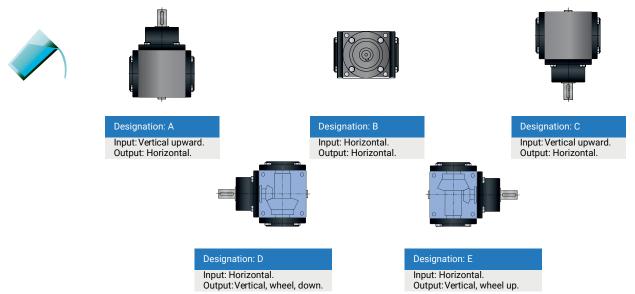
Bevel gearbox with output shaft MMC



MecMot Mechanic Motion Partner

Mounting and operating position

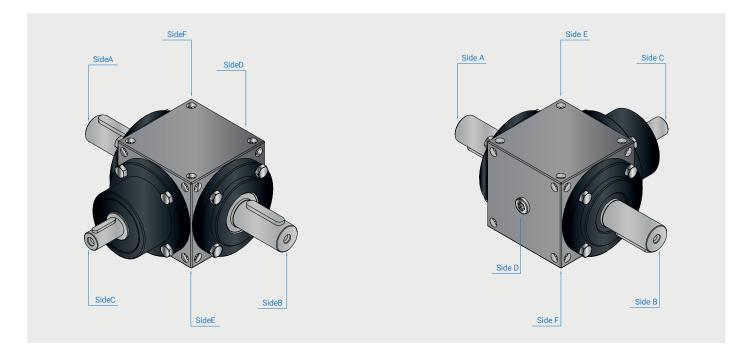
Bever gearbox with output shaft MD



Indentification Of Bevel Gearbox Housing Sides

To decribe and define a bevel gearbox accurately, to indicate the mounting side of the bevel gear on the external structure or to determine the side of the oil plugs and air breather, it is necessary to identify each side of the gearbox housing.

In the following scheme, each side of the gearbox housing is identified with a letter and a colour. These references are used hereafter to show the direction of shafts rotation and the mounting operating position of the bevel gearbox.



Side C is the side of the main input (solid shaft or IEC motor flange). Side A and side B correspond to the main output axis of the gearbox (solid shaft, cylindrical with key, on one or both sides, or hollow shaft with cylindrical hole and keyway). On side D and / or side E and / or side F it is possible to mount asolid shaft with hub, cylindrical with key, as additional output.

Moment of inertia of rotating mass

Following tables show the moment of inertia of the bevel gearbox rotating mass, referred to the input axis, expressed in kg·cm².

Design : Standard solid input shaft output shaft on both sides.

		Moment of inertia referred to input axis [kg·cm ²]						
DESIGN	SIZE	Ratio R 1	Ratio R 1.5	Ratio R 2	Ratio R 3	Ratio R 4		
	YD 85	3.5	2.0	1.5	1.2	1.1		
	YD 110	7.6	3.4	2.3	1.5	1.3		
000	YD 135	21	11	7.5	5.6	4.9		
	YD 165	73	37	27	20	17		
	YD 200	176	92	67	50	43		
YD MMC-MM-MD-MH	YD 250	595	317	233	177	158		

Design : Connection for IEC motor (MF) as input - output shaft on both sides.

		Moment of inertia referred to input axis [kg·cm ²]						
DESIGN	SIZE	Ratio R 1	Ratio R 1.5	Ratio R 2	Ratio R 3	Ratio R 4		
	YD 85	5.1	4.8	4.7	4.7	4.6		
	YD 110	11.1	6.9	5.8	5.0	4.8		
	YD 135	24	14	11	8.9	8.2		
	YD 165	73	36	26	19	16		
	YD 200	174	90	65	48	41		
YD MF-MMC-MM-MD-MH	YD 250	594	311	226	170	151		

Ordering Code

	85	R1	ММС	Design 10	EH	0	
YD	1	2	3	4	5	6	7

1 - Bevel gearbox size 85 - 110 - 135 - 165 - 200 - 250

2 - Ratio R1 - R1.5 - R2 - R3 - R4

3 - Gearbox type

MMC - Input solid shaft, output solid shaft on both sides.MM - Input solid shaft, output solid shaft on one side.MD - Input solid shaft, output hollow shaft.MH - Input solid shaft, output hollow shaft with shrink disk.

4 - Kinematic type

5 - Mounting side

A - B - C - D - E - F

6 - Operating position

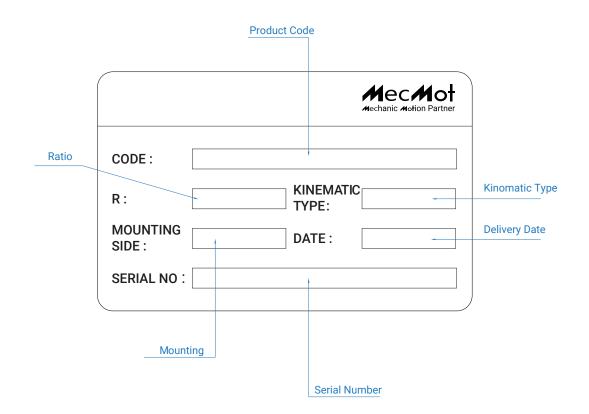
A - B - C - D - E

7 - Other specifications

Example: Lubricant type - **grease** (standard) or **oil** (on request) Example: Corrosion resist Example: YD 85 R1 MMC 10 E A

Product Label

Each Mecmot bevel gearbox is supplied with an identification label, as shown below which allows to identify the gearbox and contains technical information about the product.



Product Code: Alphanumeric code which identifies the size and the execution of the bevel gearbox.

Ratio: Ratio of the gearbox.

Kinematic Type: Kinematic type related to the direction of the shafts rotation.

Mounting Side: Mounting and working postion of the bevel gearbox.

Delivery Date: Date of assembling, expressed in week and year.

Serial Number: Identification number of the bevel gearbox which ensures the individuation of the product even after a long time; the serial number must be indicated in case of spare parts orders.

Lubrication and Maintenance

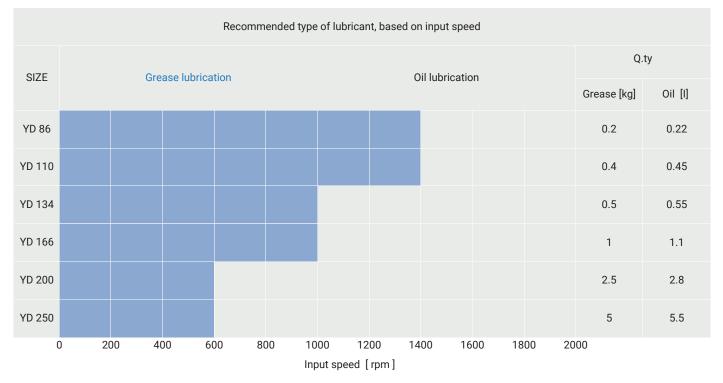
Mecmot bevel gearboxes YD series are supplied already lubricated.

Standart lubrication with grease, suitable for applications with low input speed and low daily duty cycle.

For applications with hign speeds and / or high daily duty cycle oil lubrication is recommended. In such cases, the gearbox housing is equipped with oil plugs and visual oil level indicator, while the air breather is supplied as separate component and must be fitted by the customer on the top upon installation.

Grease - lubricated gearboxes are maintenance - free. With no occasional seals damage nor disassembling of components due to maintenance, an inspection every 4 years, in case of daily operation up to 8 hours is sufficient.

Oil - lubricated gearbox require the first oil change after 500 operating hours and thereafter every 3000 operating hours.



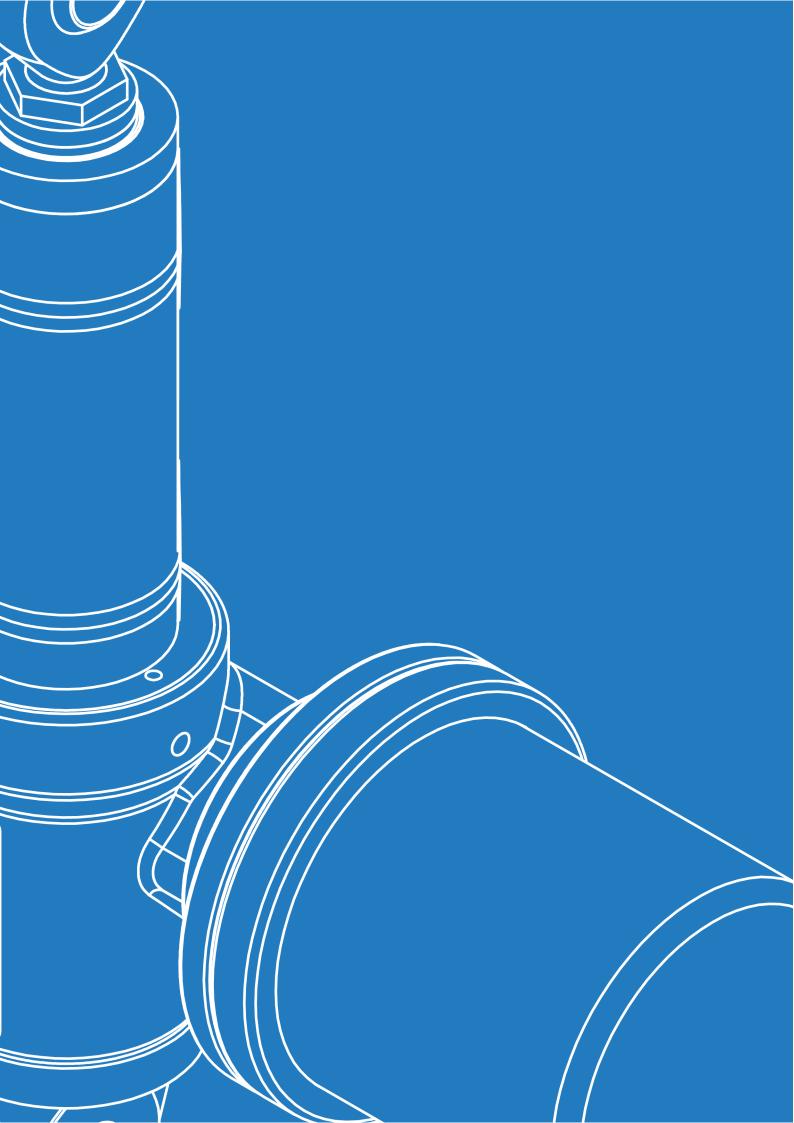
NOTE : The quantity of oil lubricant, expressed in litres, is approximate; please refer to the oil level for a correct filling.

Operating conditions different from the above should be specified for a correct evalution and choice of lubricant type and quantity.

Mounting positions where input and output shafts are not all on the horizontal plane should be specified to evaluate the correct lubrication of the bearings and the shafts mounted on the vertical top position.

By ordering, please specify lubrication requirements: **Grease** or **oil**. **Recommended lubricants**; **Grease** : SHELL Gadus S5 V142W

Oil : SHELL Omala S4 GX



LINEAR ACTUATOR

2.1 MANUFACTURING FEATURES

Input drive: worm gear, geometric design for high performance.

Low angular backlash. Worm in case hardened steel 20 MnCr 5, with thread and input shafts ground. Helical wormwheel in bronze CuSn12-C.

Housing: designed and manufactured in monobloc form to obtain a compact body able to sustain heavy axial loads and high machining accuracy. High quality materials are used:

Castings in hardened aluminium alloy AC-AlSi10Mg T6. Castings in spheroidal graphite cast iron EN-GJS-500-7 (UNI EN 1563).

Acme screw:

ISO trapezoidal thread ISO 2901 ... ISO 2904. Material: Steel C 43 (UNI 7847). Rolled or whirled. Subjected to straightening, to ensure accurate alignment in operation. Max. pitch error + 0.05 mm over 300 mm length.

Bronze nut:

ISO trapezoidal thread ISO 2901 ... ISO 2904. Material: bronze EN 1982 – CuAl9-C (1-start thread). Material: bronze EN 1982 – CuSn12-C (multiple start thread) Max. axial backlash for new nut (0.10 ... 0.12) mm

Outer tube:

Material: aluminium alloy EN AW-6060 thick cold-drawn tube anodized ARC 20 (UNI 4522/66) inner diameter tolerance ISO H9

Steel St 52.2 (DIN 2391) cold-drawn tube inner diameter tolerance ISO H10 ... H11

Bearings:

On motor axis: radial ball bearings or taper roller bearings On actuator axis: angular contact ball bearings or taper roller bearings, to avoid axial backlash and to assure high push-pull load capacity.

Front attachment:

Standard – with threaded hollow bore, in stainless steel AISI 303 or steel C 43 (UNI 7847) Rear bracket:

In aluminium alloy for EP6, EP10

In spheroidal graphite cast iron for EP25, EP50, EP100

Pin in stainless steel AISI 303

Electric stroke length limit device ASW:

Electric switches activated by a shaped sleeve, for EP25, EP50, EP100 Magnetic stroke end switches FCM:

Magnetic switches activated by a magnetic ring, for EP6, EP10

Proximity stroke end switches FCP:

Proximity switches activated by the nut, for EP25, EP50, EP100

GENERAL WARNING

Actuators and gear boxes are devices meant to be installed into larger machines therefore **they cannot be considered as safety devices**.

INSTALLATION, USE, MAINTENANCE AND WASTE GUIDELINES

Mecmot recommendations:

Actuators and gear boxes being installed by qualified and authorised technicians

Electrical connections done by qualified personnel; during installation main electric power supply shall be turned off so to run safely all these operations (wearing also protection suits, gloves and glasses) Actuators and gear boxes need very few maintenance operations: Cleaning and eventually greasing (ac-

cording to instruction manuals)

Scheduled inspections to working actuator or gear box in order to detect in time possible problems: in case of doubts contact Mecmot.

If something wrong is detected do not try to fix it without Mecmot's technical advise: its after-sales dept. Will be at your complete disposal to solve it out.

All products are delivered with proper packing, according to customer needs and goods dimensions / weight. We recommend a safe product handling, using for example forklifts, safety belts...

Package, as well as the actuators themselves, shall be disposed / wasted according to laws in force in the user's Country.

INTRODUCTION

Linear actuators are independent systems used to obtain linear movements: Basically, they are made up by an electric motor, rotating a lead screw directly or by means of a gearbox.

A nut is then allowed to move along the lead screw carrying in and out a push rod connected to the nut itself.

Load shall be axial only, but it can be tensile or pushing, no matter what push rod direction is. Actuators can work both with or without load. Self-locking or not self-locking behaviour depend on the gearing ratio and load value. In any case, self-locking is always possible with additional components.

According to type of actuator and driving / control system used with it, we can have a simple ON / OFF device (pushing and / or pulling or aservo-mechanism.

Electric actuators main advantages towards pneumatic and hydraulic ones are basically following: they can easily stop in intermediate positions all along their stroke, the power consumption happens only while the actuator is working (not necessary to keep it in position for example), the power supply is clean and easy to find, with no need of tubes.

Thus, wirings on applications frameworks will be easier to build and no dluids (i.e.oil) can accidentally be spared. This last feature is necessary in food and textile environments.

ACTUATOR MAIN COMPONENTS

Linear actuators consist in an electric motor directly connected to lead-screw / nut or by means of a worm gearbox, a belt / pulleys system or planetary gearings (1 or 2 stages). The system turns out to be a rigid chain.

Running against mechanical stops causes serious damages to actuator's internal parts!

Actuators can host diffrent kinds of motors: AC theree or single phase, with brake, inverter-friendly DC, brushless and stepper-motors.

Many options are available such as second shafts, manual brake release and so on.

Selection of motor performances (torque, speed, service...) is done according to duty cycle requested to actuators.

Linear actuator

GEAR-BOXES

Two kinds of gear-boxes are basically used on actuators too:

Steel worm-screw (1 or 2 stages) and plastic or bronze worm-wheel's material is chosen according to needed main performances such as low noise, lifetime, reduced backlash.

LEAD SCREW

Basically steel made and featuring cold-rolled profile, they are coupled with bronze or plastic polymer in order to grant safety and sturdiness against loads.

PUSH ROD

Push rods can be aluminium made for actuators whose loads are low, thick chrome-plated steel for those who stand high loads or stainless steel for special applications like in food industries.

ACTUATOR AND GEAR BOX APPLICATION FIELDS

Actuators and gear boxes can be used in several fields and various machineries. To give an example of how different can be the applications needing actuators we can list a few like: adjusting brushes height in floor-sweeping machines, positioning blades for wood-cutting machines, textile industries, paint and chemical plants, medical equipment (diffrent movements in X-ray machines) equipments for disable / aged people, solar panels, etc..

PARAMETERS FOR ACTUATOR OR GEAR BOX SELECTION PROCESS

The mainfeatures for actuator or gear box selection are: Load dynamics (load trend along stroke) Speed (linear speed trend along stroke) Duty cycle Environmental conditions Stroke lenght Power supply Output rpm (gear box) Output torque (gear box) The configuration we get will be self-locking or non-self-locking according to its global efficiency.

LOAD AND LINEAR SPEED

These two parameters shall be evaluated both separately and together since they may effect each other during actuator working cycle, especially if additional elements like inertial phenomena, vibrations...are involved. For example, if an heavy load has to be moved with changing speeds involving sharp accelerations and slowdowns,

inertial load has to be added to physical load, thus affecting actuator choice.

In these cases please contact our Technical Dept.

Temperature working range can also be widened using special materials for some of the actuator components, special lubricants and seals (the same happens for aggressive environments). Of Course under-rating of actuator and duty cycle must also be taken under consideration.

In general, ball-screw units are non-self-locking therefore additional devices, such as brakes, can be necessary to lock actuators.

Duty cycle and environmental conditions

These parameters also need to be analyzed as linked together.

Duty cycle is defined as percentage rate between on-time and idle-time, on a timeframe of 5 min.

Environment is mainly related to temperature and occasional aggressive agents affecting materials (humidity, dust, acids...) Standard actuators duty cycle is rated in S3-30%, at 30°C ambient temp.

Working temperature range allowed for standard actuators is 10°C / +60°C.

However duty cycle can be raised building up high-efficiency actuators featuring ball-screws and planetary gearboxes, or over sizing the actuator whose ratings will therefore become higher.

Temperature working range can also be widened using special materials for some of the actuator components, special lubricants and seals (the same happens for aggressive environments.) Of course under- rating of actuator and duty cycle must also be taken under consideration.

In general, ball-screw units are non-self-locking therefore additional devices, such as brakes, can be necessary to lock actuators.



ACTUATOR WORKING STROKE

This feature (standard each 50 mm step) shall be chosen taking under consideration:

-Limits tied to high rotation speeds of internal lead screw and to its own weight (in case the actuator is mounted horizontally).

-Limits linked to lead screw length to avoid buckling problems.

Actuator shall than perform its job within its nominal stroke: while designing application / framework, 10mm extra-stroke on both stroke-ends (in and out) shall be included to decrease possibility of going at mechanical stroke. **Running against actuator's mechanical stops causes serious damages to its internal components!** In case of strokes 20 times longer than lead screw diameter, 150 mm extra stroke shall be included in the design of the actuator so that,

when push rod is completely extracted, it has still 150mm more to go: this will give more stiffness to the unit preventing radial backlash.

Excessive radial backlashes lead to side-forces on actuator's axis, thus unexpected wear and lubricant loss, non regular workouts.

POWER SUPPLY

To choose a suitable actuator it is important to start finding out which kind of electric power supply is available. Not all actuators are prepared for all voltages.

SELF-LOCKING

There is not a sharp thereshold between self locking and non self locking conditions, because this feature is affected by gears wear, type of load, presence of vibrations, mounting position etc... When in doubt the only way of being sure of actuator behaviour is testing it on the application. When actuator is not self-locking, its positioning precision and repeatability features are lower: in this case, some additional elements are required, such as brakemotors, control/ feedback systems or motor short-circuit to achieve magnetic braking effect (for DC motors without brake only).

ACTUATOR AND GEAR BOX INSTALLATION

During machine designing it is extremely important to forsee proper mounting points so that actuator won't have to stand radial forces but axial ones only.

Than, when physically installing actuator into machinery, an accurate aligment of the connecting points is very important to avoid grease losses and nut wear due to radial forces.

Axis of front and back connecting points must always be parallel.

Actuators shall work within their nominal stroke.

When framework is being designed, 10mm extra stroke (in both directions) must be considered to have less possibilities of mechanical end-stops.

Also when stroke is 20 times longer than lead screw diameter, at least 150mm extra stroke (in extracted position) shall be included in order to prevent the actuator from having radial forces when push rod is completely out.

Running against mechanical stop causes serious damages to actuator components!

Off-set load lead to side-forces on actuator axis causing unexpected wear, lubricant loss and non-regular operation. Before starting the actuators or gear box up, following checkings shall be performed:

If actuator is equipped with limit switches devices, before starting the motor, ensure they are connected and working, in order to avoid any mechanical end-stops.

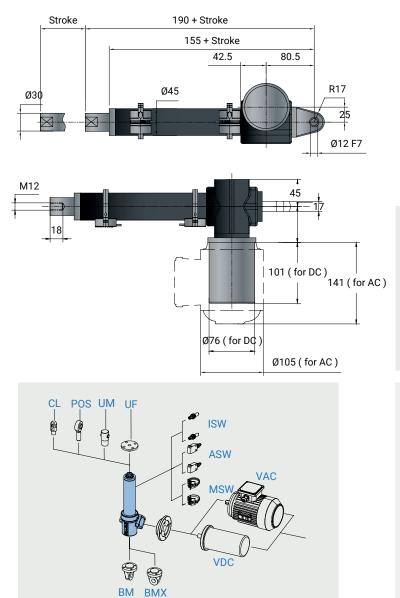
Make sure push rod will start travelling in the correct direction and limit swiches are correctly adjusted. Start motor "step-by-step" to check all this.

All wirings of actuator (motor and stroke control devices) must be done with power switched off. If not, both operator and actuator are at risk.

When actuators are equipped with single-phase motors, capaciotors must be discharged before ant operation. In case limit switches are already adjusted, be careful because manual rotation of push-rod will cause adjusment loss!

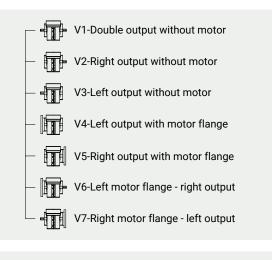
For a correct selection of actuators it is absolutely necessary to refer to above reported instructions and technical advises. Mecmot declines any responsibility releted to demanges caused to things and persons due to not proper use of the technical information given on this catalouge or incorrect use of actuators and gear boxes. More information about installation of the actuators are reported in the use and maintenance manual.

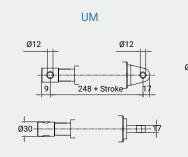
EP6-AC/DC Max 8 kN



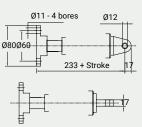
GENERAL FEATURES

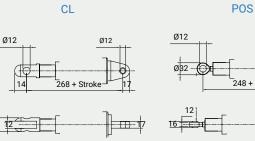
Permanent magnet DC motor Three phase or single phase motor Worm gearbox Acme Lead Screw Crome plated push rod Working temperature range -10 C - +60 C Potentiometer and encoder on request Duty %30 (5 min) a +30 C

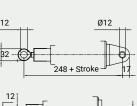




UF







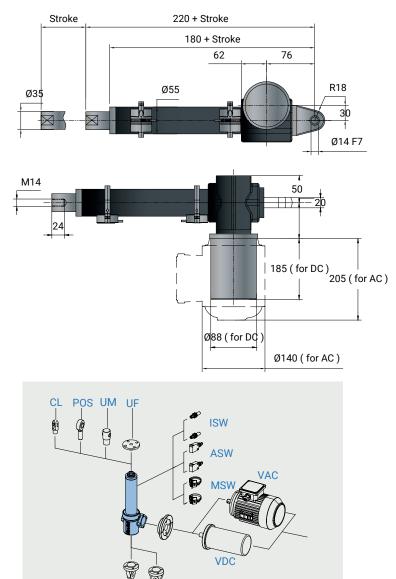
	EP6 (Vac 3-phase)									
Fmax (N)	Speed (mm/s)	Version	Motor Size	Motor Power (KW)	Motor Speed (KW)					
500	46	A01	IEC56	0,09	2800					
900	30	A02	IEC56	0,09	2800					
1800	15	A03	IEC56	0,09	2800					
3850	7,5	A04	IEC56	0,09	2800					
8000	3,7	A05	IEC56	0,09	2800					

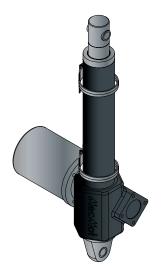
EP6 (Vdc)							
Fmax (N)	Speed (mm/s)	Version	Motor Size	Motor Power	Motor Speed (rpm)	Max Current for F max (A) 24 Vdc	
500	46	A11	IEC56	0,09	2800	12	
900	30	A21	IEC56	0,09	2800	12	
1800	15	A31	IEC56	0,09	2800	12	
3850	7,5	A41	IEC56	0,09	2800	12	
8000	3,7	A51	IEC56	0,09	2800	12	



24

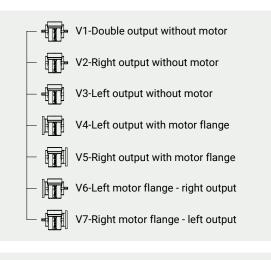
EP10-AC/DC Max 12 kN

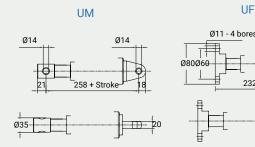




GENERAL FEATURES

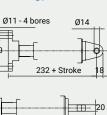
Permanent magnet DC motor Three phase or single phase motor Worm gearbox Acme Lead Screw Crome plated push rod Working temperature range -10 C - +60 C Potentiometer and encoder on request Duty %30 (5 min) a +30 C

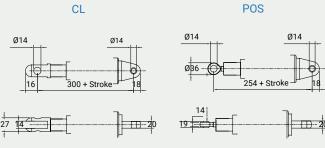




8

BM BMX



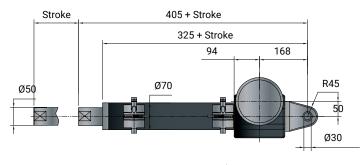


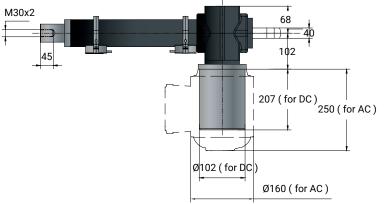
EP10 (Vac 3-phase)										
Fmax (N)	Speed (mm/s)	Version	Motor Size	Motor Power (KW)	Motor Speed (KW)					
1200	46	A01	IEC63	0,37	2800					
5000	11	A02	IEC63	0,37	2800					
8000	7,5	A03	IEC63	0,37	2800					
12000	5,5	A04	IEC63	0,37	2800					

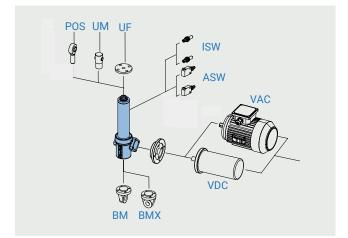
EP10 (Vdc)							
Fmax (N)	Speed (mm/s)	Version	Motor Size	Motor Power	Motor Speed (rpm)	Max Current for F max (A) 24 Vdc	
1200	46	A11	IEC63	0,25	2800	12	
5000	11	A21	IEC63	0,25	2800	12	
8000	7,5	A31	IEC63	0,25	2800	12	
12000	5,5	A41	IEC63	0,25	2800	12	

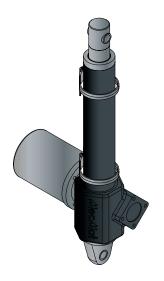


EP25-AC/DC



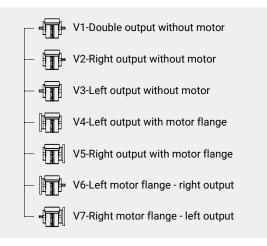




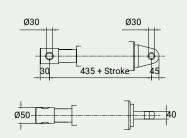


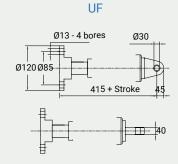
GENERAL FEATURES

Permanent magnet DC motor Three phase or single phase motor Worm gearbox Acme Lead Screw Crome plated push rod Working temperature range -10 C - +60 C Potentiometer and encoder on request Duty %30 (5 min) a +30 C

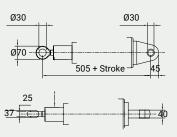


UM





POS

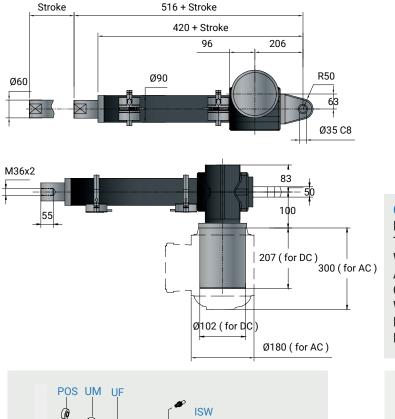


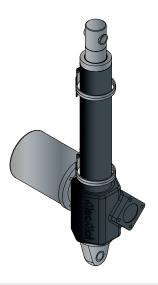
EP25 (Vac 3-phase)									
Fmax (N)	Speed (mm/s)	Version	Motor Size	Motor Power (KW)	Motor Speed (KW)				
5000	46	A01	IEC80	1,1	2800				
15000	15	A02	IEC80	1,1	2800				
25000	11,5	A03	IEC80	1,1	2800				
35000	6	A04	IEC80	1,1	2800				

	EP25 (Vdc)								
Fmax (N)	Speed (mm/s)	Version	Motor Size	Motor Power	Motor Speed (rpm)	Max Current for F max (A) 24 Vdc			
2800	46	A11	IEC80	0,5	2800	12			
8500	15	A21	IEC80	0,5	2800	12			
1200	11,5	A31	IEC80	0,5	2800	12			
20000	6	A41	IEC80	0,5	2800	12			

MecMot Mechanic Metion Partner

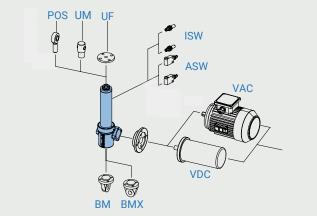
EP50-AC/DC 60 kN

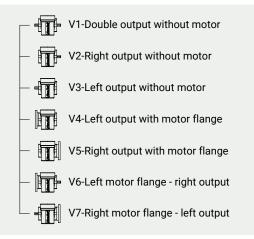




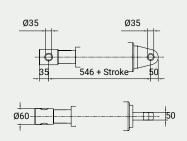
GENERAL FEATURES

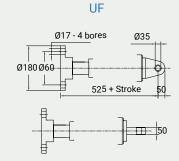
Permanent magnet DC motor Three phase or single phase motor Worm gearbox Acme Lead Screw Crome plated push rod Working temperature range -10 C - +60 C Potentiometer and encoder on request Duty %30 (5 min) a +30 C



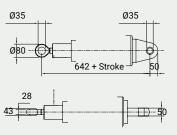


UM





POS

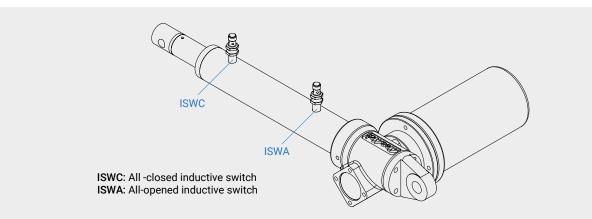


EP10 (Vac 3-phase)					EP10 (Vdc)						
Fmax (N)	Speed (mm/s)	Version	Motor Size	Motor Power (KW)	Motor Speed (KW)	Fmax (N)	Speed (mm/s)	Version	Motor Size	Motor Power	Motor Speed (rpm)
10000	46	A01	IEC90	2,2	2800	4000	46	A11	IEC80	0,5	2800
20000	23	A02	IEC11	2,2	2800	8000	23	A21	IEC80	0,5	2800
40000	11,5	A03	IEC11	2,2	2800	17000	11,5	A31	IEC80	0,5	2800
60000	8	A04	IEC11	2,2	2800	24000	8	A41	IEC80	0,5	2800

Max Current for F max (A) 24 Vdc 12 12 12 12 12

Linear actuator

INDUCTIVE SENSORS ISW

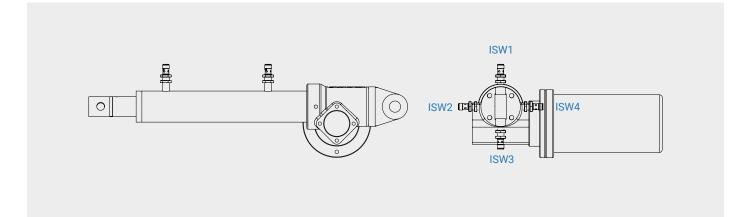


ISW INDUCTIVE LIMIT SWITCHES					
DC Voltage	5 ÷ 40 Vdc				
Temperature Range	25° ÷ 75°				
Proction Level	IP67				
Switch Status Indicator	YELLOW LED				

ORDERING KEY REFERENCES

Inductive sensors: 2ISW = 2 Sensors NO+NC

ISW POSITION



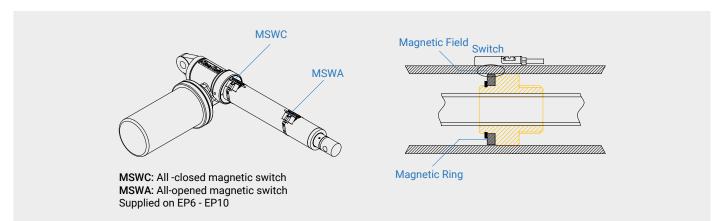
Linear actuator Accssories and Options

Magnetic limit switches MSW

Magnetic sensors are activated by a magnetic field generated by a magnetic ring fixed to the nut. These reads are mounted on outer tube with brackets; outer tube shall therefore be built with non-magnetic materials.

The magnetic switches are fixed as shown in the figure, the customer can rotate at will by adjusting the bracket.

Due to the size of the magnetic switches and to the so called switching band generated by the internal magnet the maximum working stroke is reduced by a few milimetres. This switching band width differs according to actuators size.



	MSW MAGNETIC LIMIT SWITCHES							
Performance	Type Reed NC	Type Reed NO	PNP					
DC voltage	3/110 V	3/30 V	6/30 V					
AC voltage	3/110 V	3/30 V	/					
25°C Current	0,5 A	0,1 A	0,20 A					
Power	20 VA	6 VA	4 W					
Supply Cable	PVC 2 x 0,14 mm	PVC 2 x 0,14 mm	PVC 3 x 0,14 mm					
Cablenght		2500 mm						
Protection		IP67						

Circuit Reed NC

Circuit with normally closed Reed switch protected by a varistor against overvoltages caused when switching off, with LED indicator.

Circuit PNP

Circuit with Hall-effect switch and PNP outlet.

Protected against overvoltage spikes and reverse of polarity.

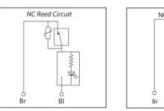
With LED indicator.

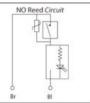
Circuit Reed NO

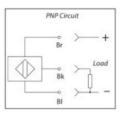
Circuit with normally open Reed switch protected by a varistor against overvoltages caused when swiching off, with LED indicator.

Ordering Key References

Magnetic limit switches: 2MSW0=2 Sensors circuit Reed NC (standart version without prior information) 2MSW1=2 Sensors circuit Reed NO 2MSW2=2 Sensors PNP







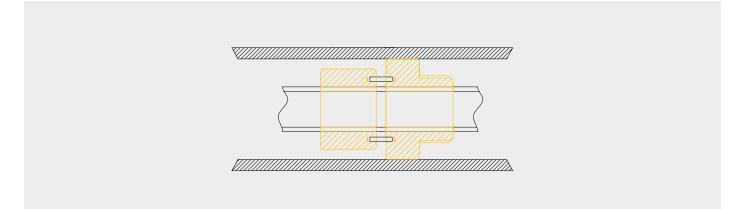


SAFETY NUT

The safety nut has been designed to start working only in case of main nut maximum wear. This safety nut is connected to the main bronze nut and travels with it along the stroke.

When the bronze nut is completely worn out, the steel nut starts working on acme screw until it comes to a complete grip to acme screw.

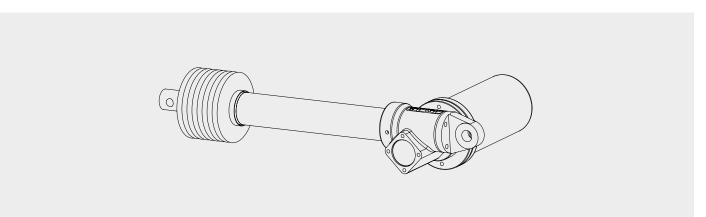
This kind of nut can work in both directions and that is integral with the load in both compression or traction (pushing / pulling).



Bellows Boot

Option "KK"

Bellows boot protectspush rods: pharmaceuntical and food industries or aggressive environments are typical examples of applications where this option can be required.



Ordering Code

	10	A01	200	UM	BM	MSW	V6	КК		
EP	1	2	3	4	5	6	7	8	9	

1 - Linear actuator size

6 - 10 - 25 - 50

2 - Version A01 - A02 - A03 - A04 - A05 - A11 - A21 - A31 - A41 - A51

<mark>3 - Stroke</mark> 100 - 200 - 300 -400 - 500 - 600 - 700 - 800

4 - Front attachment UM - UF - CR - POS

5 - Rear attachment position BM - Standart BMX - 90°

6 - Stroke end switches ISW - Inductive proximity switches MSW - Magnetic switches ASW - Electric switches

7 - Actuator input

V1-Double output without motor
V2-Right output without motor
V3-Left output without motor
V4-Left output with motor flange
V5-Right output with motor flange
V6-Left motor flange - right output
V7-Right motor flange - left output

8- Accessories SN - Safety nut

KK - Bellow

9- Other specifications

Example: Low noise Push rod stainless steel