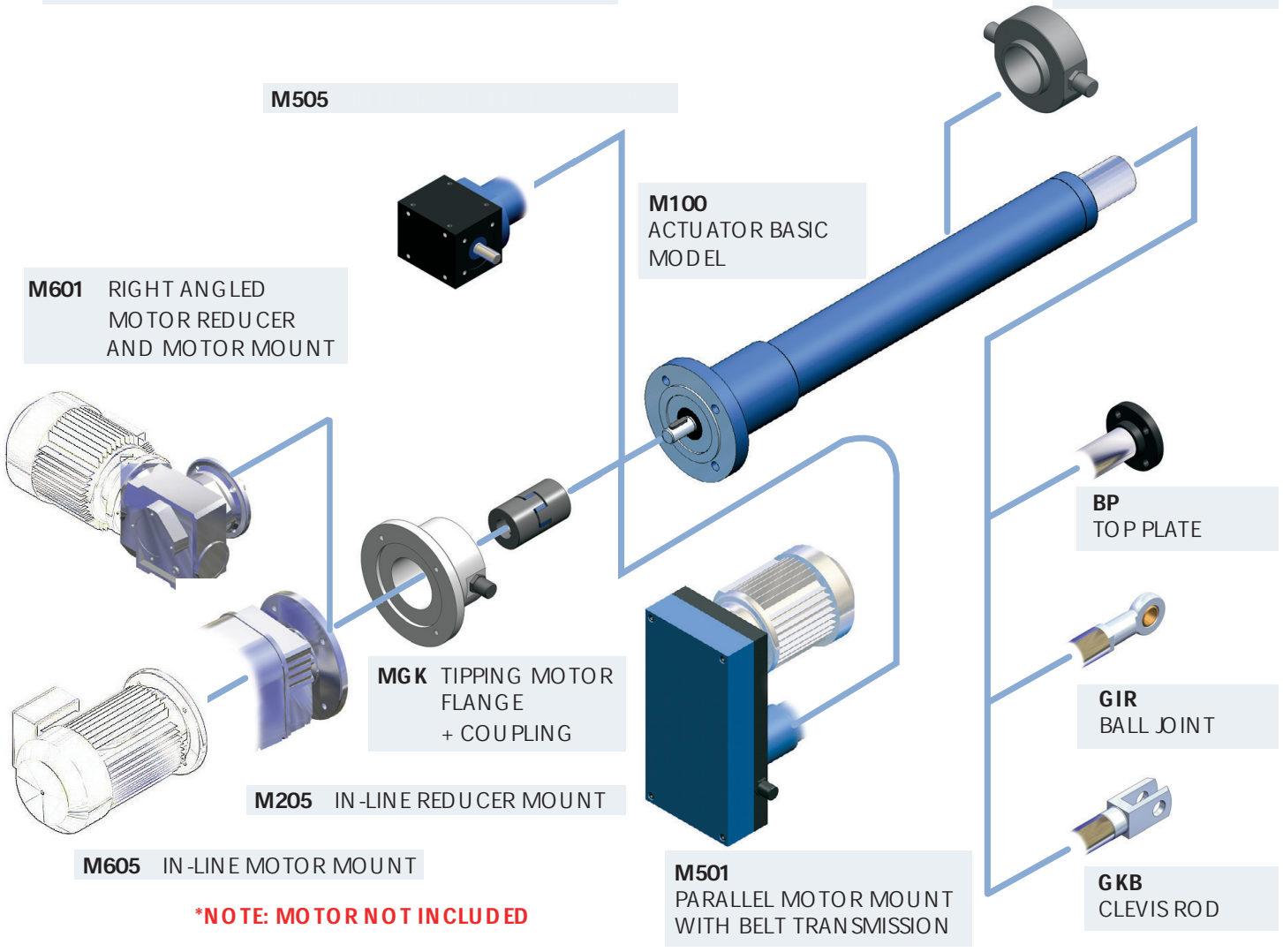
VERSARAM ELECTROMECHANICAL LINEAR ACTUATORS AND SCREW SUPPORTS

PRECISION TECHNOLOGY

The Art of Linear Thinking™

ELECTRO MECHANICAL LINEAR ACTUATORS

OVERVIEW OF THE PRODUCT



*NOTE: MOTOR NOT INCLUDED

ORDER CODE

1. Model
- M100 - Basic model
- M205 - In line reducer mount
- M501 - Parallel motor mount
- M505 - Integrated bevel gear box
- M601 - Right angle gear box and mount
- M605 - In-line motor mount

2. Size
- F16 - 16 mm dia. screw
- F20 - 20 mm dia. screw
- F30 - 30 mm dia. screw
- F40 - 40 mm dia screw
- F50 - 50 mm dia screw

3. Screw
- KGT - Ballscrew x Pitch
- TR - Trapezoidal x Pitch

4. Stroke
- (mm) - specials upon request

5. Accessories
- SA - Without any
- BP - Top plate
- GKB/GK - Clevis rod
- GIR - Ball joint

6. Other
- MGK - Tipping motor flange + coupling
- BB - Tipping flange (confirm position)
- SB - Tipping supports

7. Special
- 0 - None
- S - Special

GENERAL TECHNICAL DATA

LIFE DEFINITION

The life of an actuator is dependant on the life of the screw. It is the number of complete cycles in time that an actuator can perform. It is represented by Lc.

DEFINITION OF THE AVERAGE LOAD

It is the load that corresponds to the average of the different loads during one cycle. It is represented by Cm.

AVERAGE LOAD ESTIMATE

The load C can vary during the cycle and the distance the load is applied for varies (S). In order to calculate the average load the following formula is used:

$$Cm = \sqrt[3]{\frac{C1^3 \times S1 + C2^3 \times S2 + \ldots}{S1 + S2 + \ldots}}$$

Where: C1, C2, ... = Constant load in N, for travel S1, S2, ...

S = Travel in mm.

LIFE ESTIMATES

The life of a screw in complete cycles, i.e. both directions, will be primarily determined by the screw's pitch, the travel, the dynamic load and the average load.

The life of a ball-screw can be calculated from the dynamic load and the travel.

$$Lc = \frac{500.000 \times P}{S} \times \left(\frac{C}{Cm}\right)^3$$

Where: Lc = Life in complete cycles (one cycle is defined as movement in both directions)
P = Screw pitch in mm.
S = Travel in mm.
C = Dynamic load of the screw in N.
(Actuator size: F-15 = 3.000N; F-20 = 14.000N; F-30 = 24.000N; F-40 = 42.000N; F-50 = 78.000N)
Cm = Constant average load in N.

EXAMPLES OF LIFE CALCULATION

An M501 F-20 with a stroke of 300 mm a pitch of 5 mm and a load of 3.000N in one direction and of 2.000N in the other.

We calculate the average load that will be applied during one cycle and then the life of the screw in cycles.

These calculations use the following average load formula:

$$Cm = \sqrt[3]{\frac{C1^3 \times S1 + C2^3 \times S2 + \ldots}{S1 + S2 + \ldots}} \qquad Cm = \sqrt[3]{\frac{2.000^3 \times 300 + 3.000^3 \times 300}{300 + 300}} = 2.597N$$

Knowing the average load the life can be calculated, using the following formula:

$$Lc = \frac{500.000 \times P}{S} \times \left(\frac{C}{Cm}\right)^3 \qquad Lc = \frac{500.000 \times 5}{3.000} \times \left(\frac{14.000}{2.597}\right)^3 = 1.300.000 \text{ cycles}$$

LUBRICATION OF THE ACTUATORS

The electromechanical linear actuators require a similar lubrication to that used for ball bearings. In normal working conditions, the actuators should be greased between 800 and 2.000 operating hours (factors such as the load, the number of cycles and the screws revolutions must be taken into account).

The unit is delivered lubricated with KLUBER ISOFLEX TOPAS NLGI grease type 2, (DIN 51818). When using the unit at high speeds choose type 1, and for heavy loads type 3.

Continuous lubrication is not advised because the alternating motion deposits too much grease on the screw filling the spindle tube and reducing the available stroke together. There will also be an increase in temperature.

GENERAL TECHNICAL DATA

COMMENTS

This general data is applicable to all the electromechanical actuators, specific technical data is shown for each model.

DUTY CYCLE

The duty cycle can be defined as the relation between the running time, under load, and the total cycle time.

$$Fc = \text{Duty cycle} = \frac{T}{T + R} \times 100$$

Where: T = On-time with load.
R = Idle time.
T + R = Total cycle time.

MAXIMUN LOAD ALLOWABLE

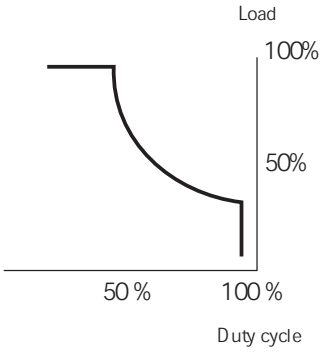
The maximun load allowable is defined as the load advised by the manufacturer. It should not be exceeded as the life of the units will be adversly effected.

BASIC ELEMENT OF MODEL

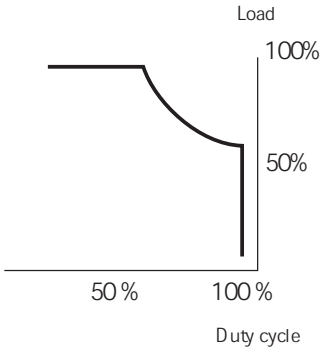
The screw is the basic drive element and can be either ball-screw or trapezoidal. Depending on the load applied the following graphs show the maximum duty cycle.

DUTY CYCLE DIAGRAM

TRAPEZOIDAL SCREW



BALL-SCREW



RELATIONSHIP BETWEEN LOAD AND DUTY CYCLE

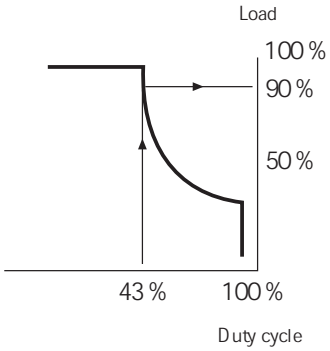
The maximum allowable load depends on the duty cycle. The load should be reduced when the duty cycles increases. If the advised duty is exceeded the actuator can be damaged.

GENERAL TECHNICAL DATA

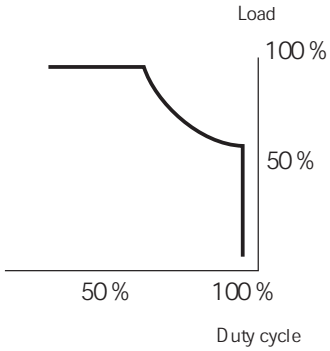
EXAMPLE

An M205 actuator with a trapezoidal screw moves for 15 seconds stops for 20 seconds then repeats this cycle.

TRAPEZOIDAL SCREW



BALL-SCREW



$$Fc = \text{Duty cycle} = \frac{T}{T+R} \times 100$$

$$\frac{15}{15+20} \times 100 = 43\ \%$$

If we enter a duty cycle of 43% on the trapezoidal screw graph we obtain a maximum allowable load of 90%.
For this load we apply the appropriate percentage to the maximum dynamic load.
If we utilise the basic actuator F-30, we have a maximum dynamic load of 10.000N.

Maximum load = 10.000N, (each basic model has a specific maximum load see page 11)

Therefore the maximum allowable load is 0.9 x 10.000N = 9.000N

DEFINITION OF THE REQUIRED TORQUE

The required torque is defined as the force required in order to move actuator under load.

THE REQUIRED TORQUE CALCULATION

In order to calculate the required torque the following formula will be used:

$$\text{Torque} = \frac{P \times F}{2.000 \times \pi \times C}$$

P = The screw's pitch in mm.
F = Force required in N.
C = The efficiency constant; 0.8 for the ball-screw and 0.2 for the trapezoidal screw.

EXAMPLE OF A TORQUE CALCULATION

An electromechanical actuator F-30 with a ball screw having a pitch of 5 has to move a load of 250 Kg. in a vertical plane. What would be the required torque?.

$$\text{Force} = M \times g = 250 \times 9.81 = 2.500N$$

$$\text{Torque} = \frac{2.500 \times 5}{2.000 \times \pi \times 0.8} = 2.486\ Nm$$ (C = 0.8 because it is a ball screw)

SELECTION CRITERIA

We must take into account the fact that with the same actuator, for example with a screw actuator of ø 32, several different speeds can be achieved dependant on the screw's pitch (in this case it could be of 5, 10 or 40 mm/revolution).
Equally the gear ratio of the gear box affects the achievable travel speed.

SPECIFIC MODELS

M100 BASIC MODEL ACTUATOR

The basic model actuator has been designed to easily attach several types of drive i.e. manual, electrical, mechanical, etc.
The linear speed is determined by the RPM of the motor and the pitch of the screw.
The thrust depends on the screw pitch and motor power.

Technical features

Model	Screw-pitch	ø	Load kN
M100-F16	KGT 5	16	2,5
	Tr 4	16	2,5
M100-F20	KGT 5	20	5
	KGT 20	20	5
	Tr 5	24	5

Model	Screw-pitch	ø	Load kN
M100-F30	KGT 5	32	10
	KGT 10	32	15
	KGT 40	32	10
	Tr 6	36	10

Model	Screw-pitch	ø	Load kN
M100-F40	KGT 10	40	25
	KGT 20	40	25
	KGT 40	40	20
	Tr 7	44	25

Model	Screw-pitch	ø	Load kN
M100-F50	KGT 10	50	65
	KGT 20	50	70
	Tr 9	60	70

Dimensions

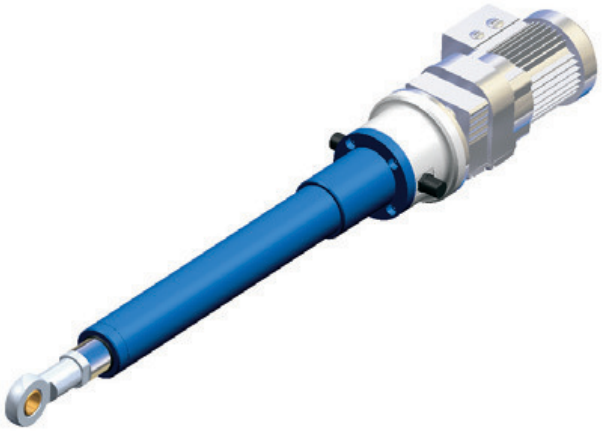
Model	d	d_1	d_2	d_3	D	D_1	D_2	D_3	D_4	G	G_1	L	Standard strokes	L_1	L_2	L_3	L_4
M100-F16	11	M26 x 1,5	32	7(4x)	48	56	75	40	45	12	2	45 + Stroke	100, 200, 300, 400	15	61	21	20
M100-F20	14	M27 x 2	35	9(4x)	72	84	110	55	66	15	2	65 + Stroke	100, 200, 300, 500	30	100	16	25
M100-F30	19	M42 x 2	50	11(4x)	90	106	130	75	88	18	3	82 + Stroke	200, 400, 600, 1000	35	130	17	30
M100-F40	24	M60 x 2	70	11(6x)	110	130	150	90	110	20	4	115 + Stroke	250, 500, 750, 1000	40	150	48	35
M100-F50	35	M80 x 2	90	13(6x)	200	225	250	150	200	30	5	220 + Stroke	300, 600, 1000, 1500	60	300	75	40

SPECIFIC MODELS

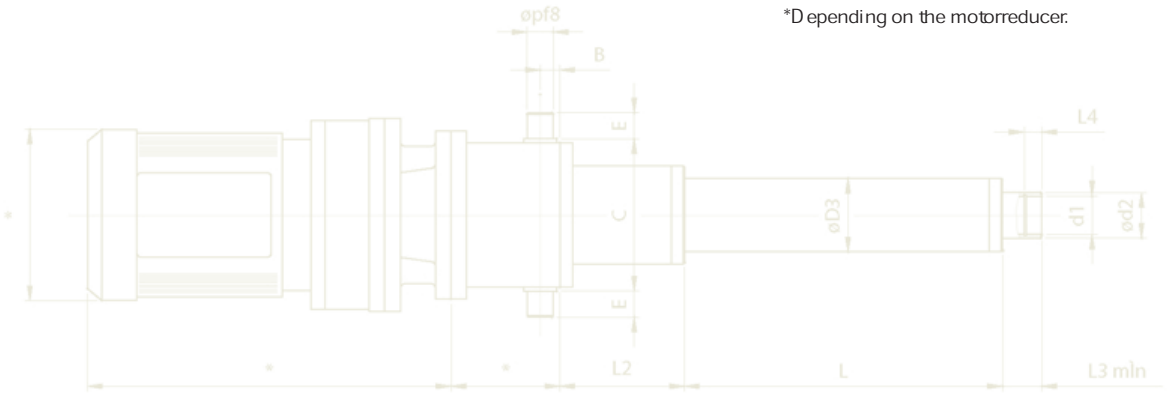
M205 ACTUATOR WITH IN LINE GEARBOX FOR MOTOR DRIVE

The M205 actuator has been designed for handling high loads with low to medium speeds.

Components of the actuator
- Actuator: Basic model.
- Fixing: Trunnion mount.
- Drive: Geared motor with a wide range of gear ratios. Supply voltage 220/380V A.C.
- Braked motor (optional).



*Depending on the motorreducer.



Technical features

Model	Screw-pitch	ø	Load kN	Model	Screw-pitch	ø	Load kN	Model	Screw-pitch	ø	Load kN	Model	Screw-pitch	ø	Load kN
M205-F20	KGT 5	20	5	M205-F30	KGT 5	32	10	M205-F40	KGT 10	40	25	M205-F50	KGT 10	50	65
	KGT 20	20	5		KGT 10	32	15		KGT 20	40	25		KGT 20	50	70
	Tr 5	24	5		KGT 40	32	10		KGT 40	40	20		Tr 9	60	70
					Tr 6	36	10		Tr 7	44	25				

Dimensions

Model	d_1	d_2	D_3	L	Standard strokes	L_2	L_3	L_4	B	C	E	p
M205-F20	M27 x 2	35	55	65 + Stroke	100, 200, 300, 500	100	16	25	15	116	20	20
M205-F30	M42 x 2	50	75	82 + Stroke	200, 400, 600, 1000	130	17	30	20	138	25	25
M205-F40	M60 x 2	70	90	115 + Stroke	250, 500, 750, 1000	150	48	35	30	160	35	35
M205-F50	M80 x 2	90	150	220 + Stroke	300, 600, 1000, 1500	300	75	40	40	260	45	45

SPECIFIC MODELS

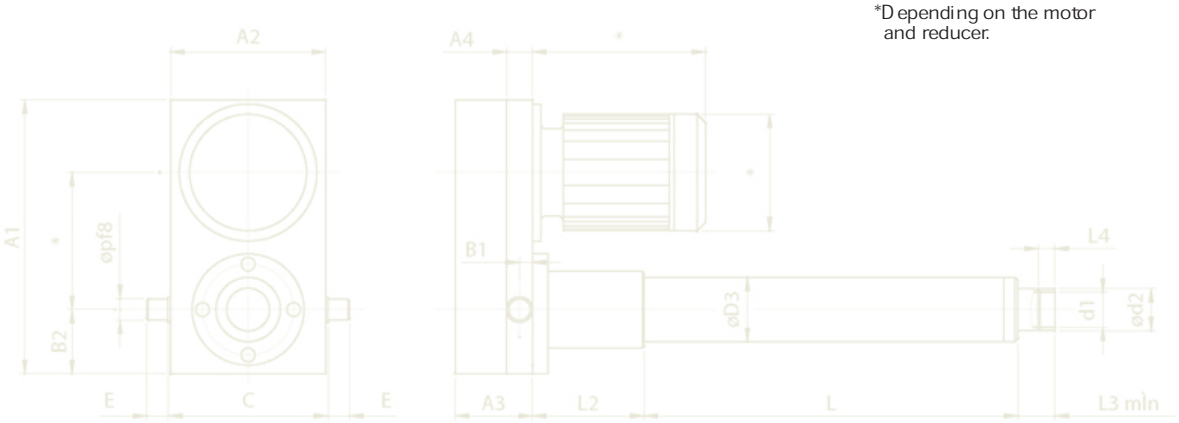
M501 ACTUATOR WITH RIGHT ANGLED BELT DRIVE FOR PARALLEL MOTOR MOUNT

This actuator has been designed for medium loads and a wide range of speeds.
It needs to be mounted with a motor or motor gearbox combination and a toothed belt drive. A braked motor can be supplied if needed.

Components of the actuator

- Actuator: Basic model.
- Fixing: Trunnion / clevis mount.
- Driving: Any kind of motor and toothed belt drive.
- Braked motor (optional).

*Depending on the motor and reducer.



Technical features

Model	Screw-pitch	ø	Load kN	Model	Screw-pitch	ø	Load kN	Model	Screw-pitch	ø	Load kN	Model	Screw-pitch	ø	Load kN
M501-F16	KGT 5	16	1,8	M501-F30	KGT 5	32	9	M501-F40	KGT 10	40	25	M501-F50	KGT 10	50	30
	Tr 4	16	1		KGT 10	32	4,5		KGT 20	40	15		KGT 20	50	15
					KGT 40	32	1,2		KGT 40	40	7		Tr 9	60	8
	KGT 5	20	5		Tr 6	36	2		Tr 7	44	10				
M501-F20	KGT 20	20	1,3												
	Tr 5	24	1,2												

Dimensions

Model	d_1	d_2	D_3	L	Standard strokes	L_2	L_3	L_4	A_1	A_2	A_3	A_4	B_1	B_2	C	E	p
M501-F16	M26 x 1,5	32	40	45 + Stroke	100, 200, 300, 400	61	21	20	245	130	70	20	10	50	138	18	12
M501-F20	M27 x 2	35	55	65 + Stroke	100, 200, 300, 500	100	16	25	300	150	85	25	12,5	65	160	20	20
M501-F30	M42 x 2	50	75	82 + Stroke	200, 400, 600, 1000	130	17	30	320	180	90	30	15	90	192	25	25
M501-F40	M60 x 2	70	90	115 + Stroke	250, 500, 750, 1000	150	48	35	490	250	135	40	20	135	270	35	35
M501-F50	M80 x 2	90	150	220 + Stroke	300, 600, 1000, 1500	300	75	40	600	300	182	50	25	135	320	45	45

SPECIFIC MODELS

M505 ACTUATOR WITH INTEGRATED RIGHT ANGLED BEVEL GEAR BOX

The M505 actuator has been designed for mounting several units in parallel and the drive to be at 90°.

*For sizes F40 & F50 get in touch with Precision Technology.

Technical features

Model	Screw-pitch	ø	Load kN
M505-F16	KGT 5	16	2,5
	Tr 4	16	2,5
M505-F20	KGT 5	20	5
	KGT 20	20	5
	Tr 5	24	5
M505-F30	KGT 5	32	10
	KGT 10	32	15
	KGT 40	32	10
	Tr 6	36	10

Dimensions

Model	d	d_1	d_2	D_3	L	Standard strokes	L_2	L_3	L_4	A	B	C	D	F	G	H	a	b	g	i
M505-F16	14	M26 x 1,5	32	40	45 + Stroke	100, 200, 300, 400	61	21	20	65	70	84	58	86	25	32,5	45	75	2	M6 x 10
M505-F20	16	M27 x 2	35	55	65 + Stroke	100, 200, 300, 500	100	16	25	90	90	110	62	112	34	45	70	75	3	M10 x 18
M505-F30	19	M42 x 2	50	75	82 + Stroke	200, 400, 600, 1000	130	17	30	120	120	154	75	158	40	60	100	100	5	M10 x 18

SPECIFIC MODELS

M601 ACTUATOR FOR MOTOR AND RIGHT ANGLED GEAR DRIVE

The M601 actuator has been designed for loads up to 750.000N and speeds ranging from 1 and 200 mm/sec.

Components of the actuator

- Actuator: Basic model.
- Fixing: Via motor housing.
- Driving: Low profile gearbox. Wide range of gear ratios.
- Brake-motor (optional).

*Depending on the motorreducer.

Technical features

Model	Screw-pitch	ø	Load kN	Model	Screw-pitch	ø	Load kN	Model	Screw-pitch	ø	Load kN	Model	Screw-pitch	ø	Load kN
M601-F20	KGT 5	20	5	M601-F30	KGT 5	32	10	M601-F40	KGT 10	40	25	M601-F50	KGT 10	50	65
	KGT 20	20	5		KGT 10	32	15		KGT 20	40	25		KGT 20	50	70
	Tr 5	24	5		KGT 40	32	10		KGT 40	40	20		Tr 9	60	70
					Tr 6	36	10		Tr 7	44	25				

Dimensions

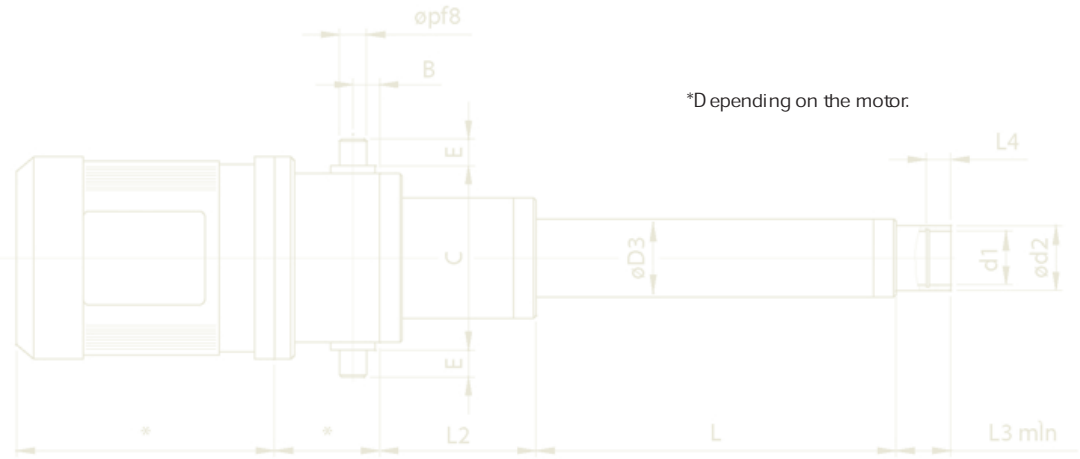
Model	d_1	d_2	D_3	L	Standard strokes	L_2	L_3	L_4	B	C	E	p
M601-F20	M27 x 2	35	55	65 + Stroke	100, 200, 300, 500	100	16	25	15	116	20	20
M601-F30	M42 x 2	50	75	82 + Stroke	200, 400, 600, 1000	130	17	30	20	138	25	25
M601-F40	M60 x 2	70	90	115 + Stroke	250, 500, 750, 1000	150	48	35	30	160	35	35
M601-F50	M80 x 2	90	150	220 + Stroke	300, 600, 1000, 1500	300	75	40	40	260	45	45

SPECIFIC MODELS

M605 ACTUATOR FOR MOTOR DRIVE AND IN-LINE ARRANGEMENT

The M605 actuator has been designed to work at high travel speed with low-medium loads.

Components of the actuator
- Actuator: Basic model.
- Fixing: Trunnion mount.
- Drive: A.C. motor.
- Brake motor (optional).



*Depending on the motor.

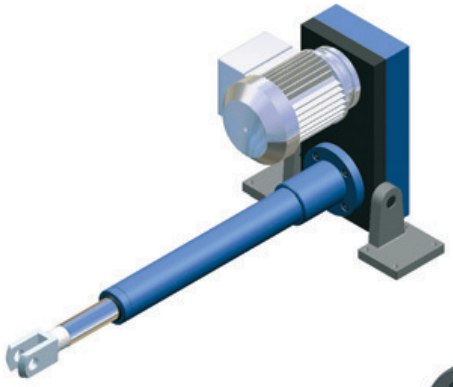
Technical features

Model	Screw-pitch	ø	Load kN	Model	Screw-pitch	ø	Load kN	Model	Screw-pitch	ø	Load kN	Model	Screw-pitch	ø	Load kN
M605-F16	KGT 5	16	2,5	M605-F30	KGT 5	32	10	M605-F40	KGT 10	40	25	M605-F50	KGT 10	50	65
	Tr 4	16	2,5		KGT 10	32	15		KGT 20	40	25		KGT 20	50	70
					KGT 40	32	10		KGT 40	40	20		Tr 9	60	70
	KGT 5	20	5		Tr 6	36	10		Tr 7	44	25				
M605-F20	KGT 20	20	5												
	Tr 5	24	5												

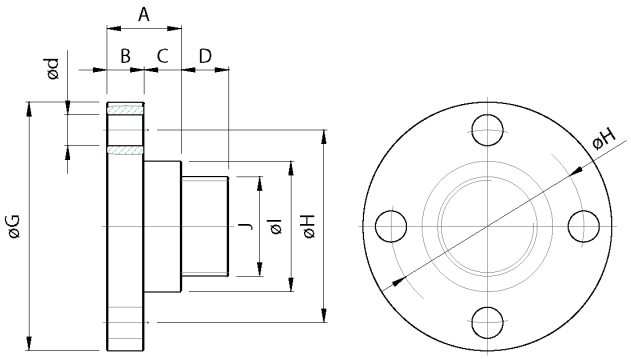
Dimensions

Model	d_1	d_2	D_3	L	Standard strokes	L_2	L_3	L_4	B	C	E	p
M605-F16	M26 x 1,5	32	40	45 + Stroke	100, 200, 300, 400	61	21	20	12	82	18	12
M605-F20	M27 x 2	35	55	65 + Stroke	100, 200, 300, 500	100	16	25	15	116	20	20
M605-F30	M42 x 2	50	75	82 + Stroke	200, 400, 600, 1000	130	17	30	20	138	25	25
M605-F40	M60 x 2	70	90	115 + Stroke	250, 500, 750, 1000	150	48	35	30	160	35	35
M605-F50	M80 x 2	90	150	220 + Stroke	300, 600, 1000, 1500	300	75	40	40	260	45	45

ACCESSORIES



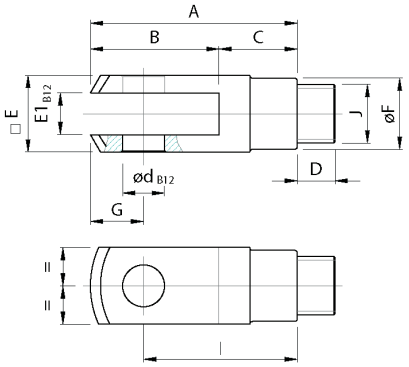
BP TOP PLATES

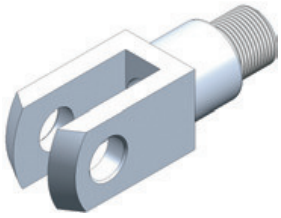


Dimensions in mm.

Size	A	B	C	D	d	G	H	I	J
BP-16	21	8	13	18	11	80	60	38,7	M26 x 1,5
BP-20	23	10	13	23	11	90	67	46	M27 x 2
BP-30	30	15	15	27	13	110	85	60	M42 x 2
BP-40	50	20	30	33	17	150	117	85	M60 x 2
BP-50	60	30	30	38	25	200	155	105	M80 x 2

GKB CLEVIS ROD

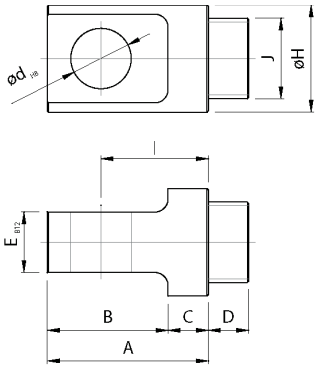


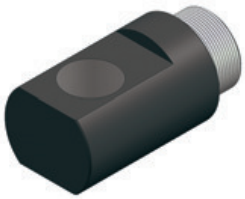


Dimensions in mm.

Size	A	B	C	D	E	E_1	F	d	G	I	J
GKB-16	83	51	32	18	32	16	30	16	19	64	M26x1,5
GKB-20	105	65	40	23	40	20	37	20	25	80	M27x2
GKB-30	148	92	56	27	55	30	51	30	38	110	M42x2

GK CLEVIS ROD

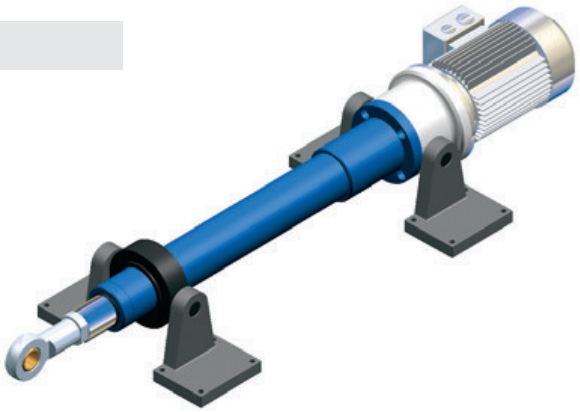




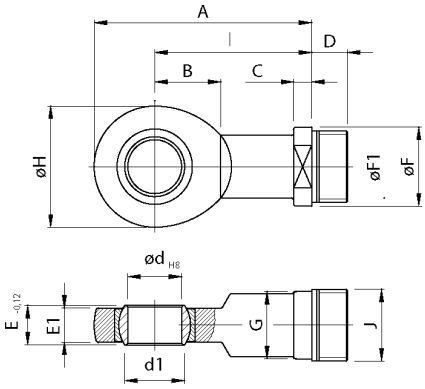
Dimensions in mm.

Size	A	B	C	D	E	H	d	I	J
GK-40	120	90	30	33	60	80	45	80	M60 x 2
GK-50	150	110	40	38	70	100	60	100	M80 x 2

ACCESSORIES

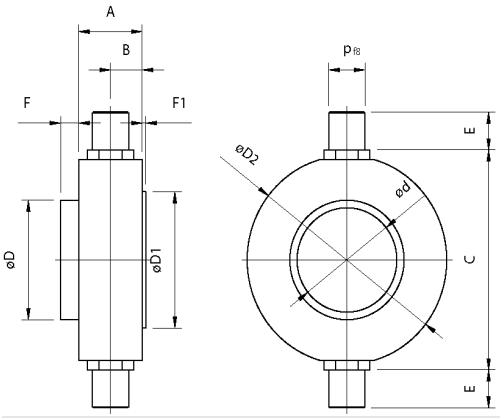


GIR BALL JOINTS



Size	A	B	C	D	E	E_1	F	F_1	G	H	d	d_1	l	J
GIR-16	81	20	8	18	12	10	26	21	22	40	15	18,4	61	M26 x 1,5
GIR-20	103,5	27	10	23	16	13	35	27,5	32	53	20	24,1	77	M27 x 2
GIR-30	146,5	37	15	27	22	19	50	40	41	73	30	34,2	110	M42 x 2
GIR-40	196	52	20	33	32	27	70	58	60	102	45	50,7	145	M60 x 2
GIR-50	242,5	75	20	38	44	38	88	70	75	135	60	66,8	175	M80 x 2

BB TRUNNION MOUNT



Size	A	B	C	d	D	D_1	D_2	E	F	F_1	p
BB-16	30	15	82	40	48	48	75	18	10	2	12
BB-20	35	17,5	116	55	63	72	110	20	10	2	20
BB-30	40	20	138	75	85	90	130	25	12	3	25
BB-40	50	25	160	90	102	110	150	35	14	4	35
BB-50	60	30	260	150	170	200	250	45	20	5	45

SB TIP SUPPORT

Size	A	B	C	D	E	F	G	H	H_1	d
SB-16	80	60	65	12	45	18	12	80	65	7
SB-20	100	80	80	20	60	20	15	107	85	9
SB-30	130	110	100	25	80	25	20	137	110	9
SB-40	200	170	150	35	120	35	30	188	150	11
SB-50	240	210	180	45	150	45	35	222	175	13