THE WORLD IS MOVEMENT

NIASA®

02
LINEAR ACTUATORS

F series: Steel tube
A series: Aluminum tube

“WE ARE WHAT WE REPEATEDLY DO. EXCELLENCE, THEN, IS NOT AN ACT, BUT A HABIT.”

ARISTOTLE
PHILOSOPHY

LINEAR ACTUATORS

F SERIES: STEEL TUBE | A SERIES: ALUMINUM TUBE

INTRODUCTION

NIASA F/A Series linear actuators are electro-mechanical cylinders in which a round stem moves inside a second tube, of either steel or aluminum.

The lengthwise movement of the stem is achieved with the combination of an interior screw/nut which drags it, and an electrical motor that drives the screw/nut. The power transmission from the motor may be direct or by means of different gear solutions and toothed belts.

Against solutions with exposed screws, protecting them with an external stem means that the equipment is very highly sealed and can operate in the most aggressive conditions, with the presence of dust or liquid of almost any type in the environment. The stem provides an extraordinary capacity for buckle load against axial compression loads.

These types of actuators are the best solution in practically any application that requires precise and safe linear movement, whether it is for transfer or for elevation and regardless of the speed required. Their main advantages against other systems, such as pneumatic or hydraulic cylinders, are the following:

- ... Greater movement and positioning precision.
- ... Superior energy efficiency, as their parts offer high/very high performance, especially with the ball screws, low transmission ratios and high speeds
- ... Easier and faster assembly, since hydraulic or pneumatic groups are not required, just an electric motor mounted on the unit itself.
- ... Greater reliability and duration, and less maintenance, due to the mechanical robustness and construction simplicity.
- ... Lower size for the same load capacity.
- ... ...

The screw supports also characterize for offering an extensive range of:

- ... Axial load capacities, from 3.5 kN up to 86 kN.
- ... Stem advance speeds depending on the screw pitch and the transmission used.
- ... Trapezoidal and ball screws, depending on the performance required, precision of the desired movement and positioning, etc.
- ... Outer tube of steel or extruded aluminum profile. The latter is, in general, the lightest and enables immobilization in the stem's rotation and a magnetic sensor to be integrated.
- ... Fastening accessories and elements, for optimal adaptation to the most varied systems that may be designed.
- ... Drives, with different reduction ratios and positions with respect to the cylinder, enable the best solution to be offered for any speed and configuration problem. Among these are the following as standard:
  - · In line Motors / Motoreducers.
  - · Motors / Motoreduc. in parallel with the toothed belt.
  - · Motors / Motoreducers at 90º.
  - · ...
- ... Control and safety systems (inductive/magnetic stroke limit switches, absolute/incremental encoders, etc.).
- ... Materials and surface coverings, depending on the environmental conditions in which the unit will be installed.

Please do not hesitate to contact NIASA if you require actuators (and their drive mechanisms) with specifications other than those covered in this chapter. The NIASA technical department will specifically develop the special units that best meet your requirements.

LINEAR ACTUATORS

F SERIES: STEEL TUBE | A SERIES: ALUMINUM TUBE

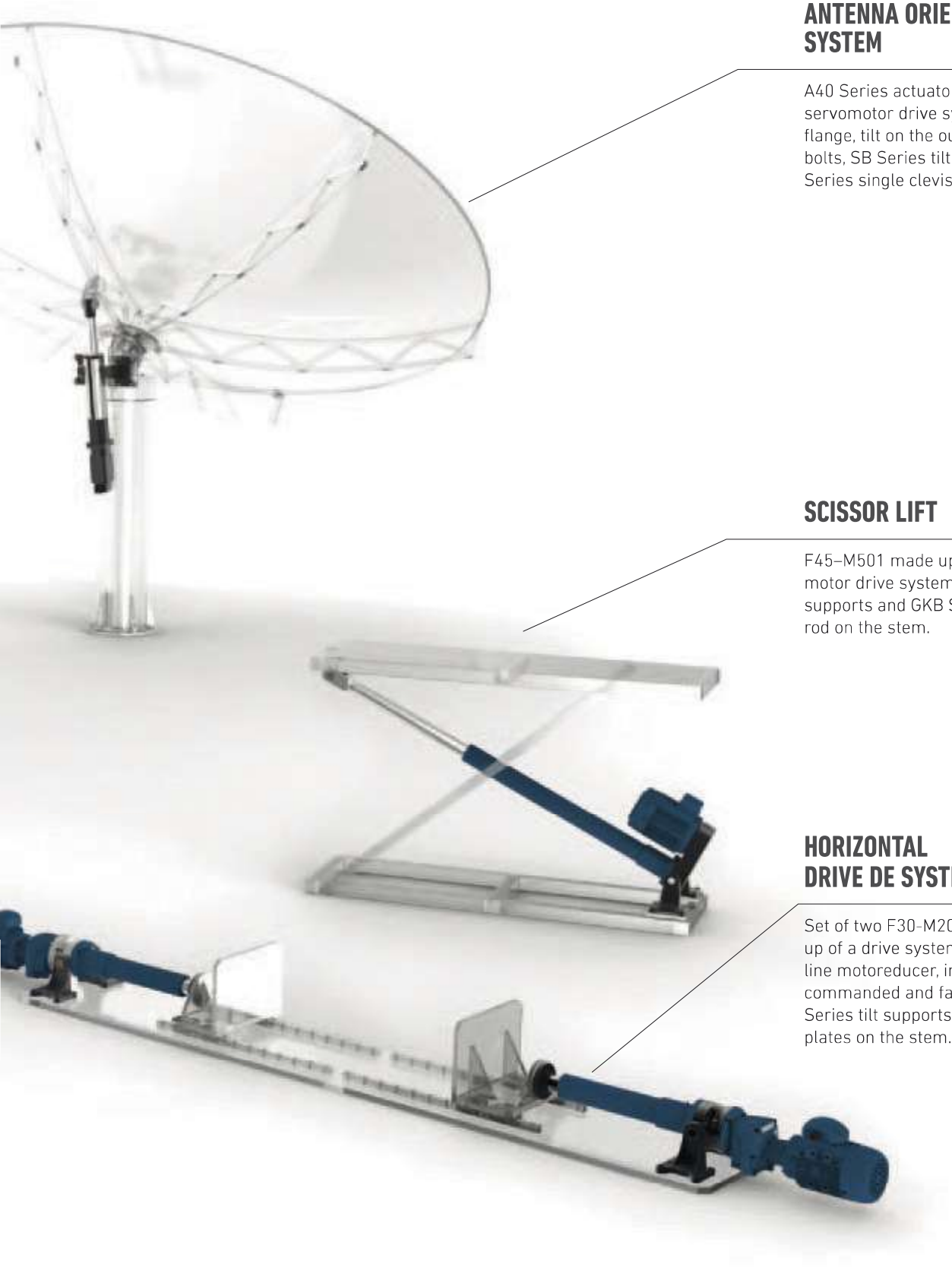
APPLICATIONS

VERTICAL DRIVE DE SYSTEM

Set of two F30-M505 actuators made up of a servomotor drive system, a special drive union flange and joined together with a GX universal joint shaft. Inductive sensor, clevis rod with GIR Series ball joint and protection bellow for the FB Series stem.

SHUTTER SYSTEM

A30 Series actuator made up of a three-phase motor drive system, tilt on the outside with BA Series bolts, SB Series tilt support, clevis rod with GIR Series ball joint on the stem and integrated position magnetic sensor.



ANTENNA ORIENTATION SYSTEM

A40 Series actuator made up of a servomotor drive system, drive union flange, tilt on the outside with BA Series bolts, SB Series tilt support and GK Series single clevis rod on the stem.

SCISSOR LIFT

F45–M501 made up of a three-phase motor drive system, SB Series tilt supports and GKB Series double clevis rod on the stem.

HORIZONTAL DRIVE DE SYSTEM

Set of two F30-M205 actuators, made up of a drive system of a three-phase line motoreducer, independently commanded and fastened with SB Series tilt supports and BP Series plates on the stem.

LINEAR ACTUATORS

F SERIES: STEEL TUBE | A SERIES: ALUMINUM TUBE

SIZES

F SERIES: Steel outside tube.
SERIES A: Aluminum outside tube (stem anti-rotation and magnetic sensor optional).

For further information about M205/M501/M505/M605 A Series configurations, please contact NIASA.
There are trapezoidal and ball screw options on all sizes (see chapter 07 about screws for more details).

Up to	F16 / A16 6 kN	F20 / A20 10.5 kN
M100 Basic configuration	 page 78	 page 80
M205 In line motoreducer		 page 88
M501 Parallel drive	 page 90	 page 90
M505 For drive at 90°	 page 92	 page 92
M601 Motoreducer at 90°		 page 93
M605 In line motor	 page 94	 page 94

In addition to the standard range of F/A Series linear actuators, NIASA can specifically develop the unit that best meets your application requirements. Contact NIASA.

F30 / A30 23.5 kN	F40 / A40 38 kN	F45 78 kN	F50 86 kN
 page 82	 page 84	 page 86	 page 87
 page 88	 page 88	 page 88	 page 88
 page 90	 page 90	 page 90	 page 90
 page 92			
 page 93	 page 93	 page 93	 page 93
 page 94	 page 94	 page 94	 page 94

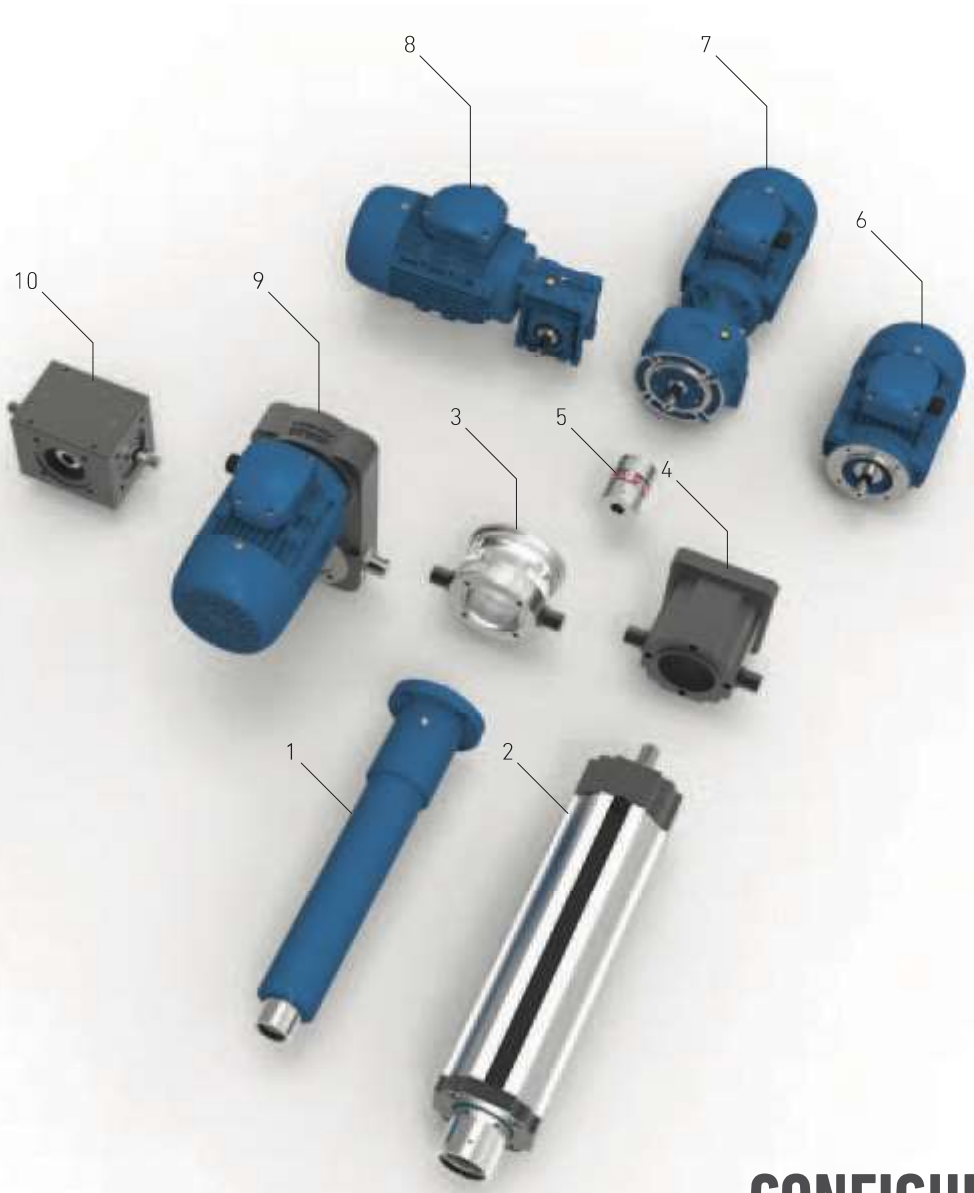
LINEAR ACTUATORS

F SERIES: STEEL TUBE | A SERIES: ALUMINUM TUBE

GENERAL PRODUCT OVERVIEW

ACCESSORIES

	Name	Page
01	VE wheel	300
02	SB tilt support	276
03	BB flanges with bolts for steel tube	272
04	Flanges with bearings for BH steel tube	273
05	BB flanges with bolts for aluminum tube	274
06	BPS flange	278
07	GIR clevis rod	282
08	GKB double clevis rod	281
09	GK single clevis rod	280
10	Inductive limit switch FCI	307
11	FCG magnetic limit switch	308
12	Connection sensor input adapter	308
13	Position sensor magnet	308
14	Anti-rotation system	



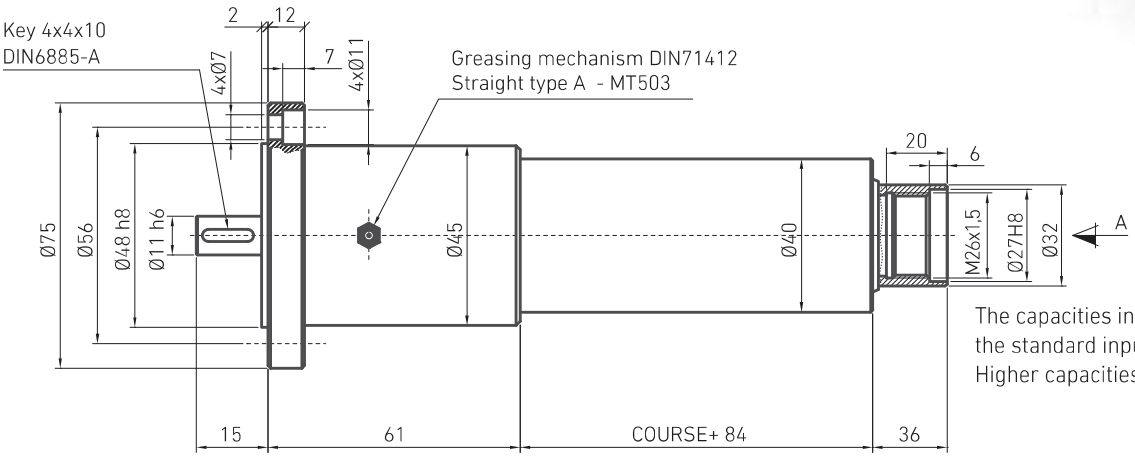
CONFIGURATIONS

		M205		M501		M505		M601		M605	
	Name	F	A	F	A	F	A	F	A	F	A
01	F-M100 series linear actuator	•		•		•		•		•	
02	A-M100 series linear actuator		•		•		•		•		•
03	F flange	•						•		•	
04	Flange A		•						•		•
05	EK coupling	•	•					•	•	•	•
06	Motor									•	•
07	In line motoreducer	•	•								
08	Motoreducer at 90°							•	•		
09	Parallel drive			•	•						
10	Bevel gearbox at 90°					•	•				

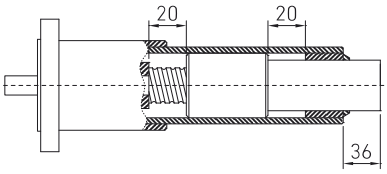
F16-M100 LINEAR ACTUATORS

UP TO 6 kN

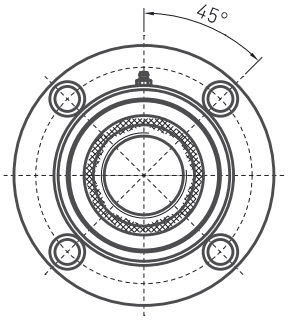
The capacities indicated correspond to
the standard input shaft configurations.
Higher capacities are available on request.



The capacities indicated correspond to
the standard input shaft configurations.
Higher capacities are available on request.



SAFETY MARGIN



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Screw diameter and step (mm)	Maximum axial strength (kN)	Travel (mm/ revol. input)	Performance (%)	Drive torque, M_D (Nm) F (kN), load to move in dynamic	Stroke weight 0 (kg)	Approx. weight each 100 mm of Stroke (kg)
Tr 16x4	3.5	4	40	(1.59 x F) + 0.38	2	0.75
KGS 1605	6	5	81	(0.98 x F) + 0.25	2	0.75

... Power required: P_D (kW) = 0,157x M_D (Nm).

... Contact NIASA if the dynamic load exceeds the critical values indicated, in order to avoid over-heating, buckling and resonance of the unit. See calculations chapter at the end of the chapter (page 97).

A16-M100 LINEAR ACTUATORS

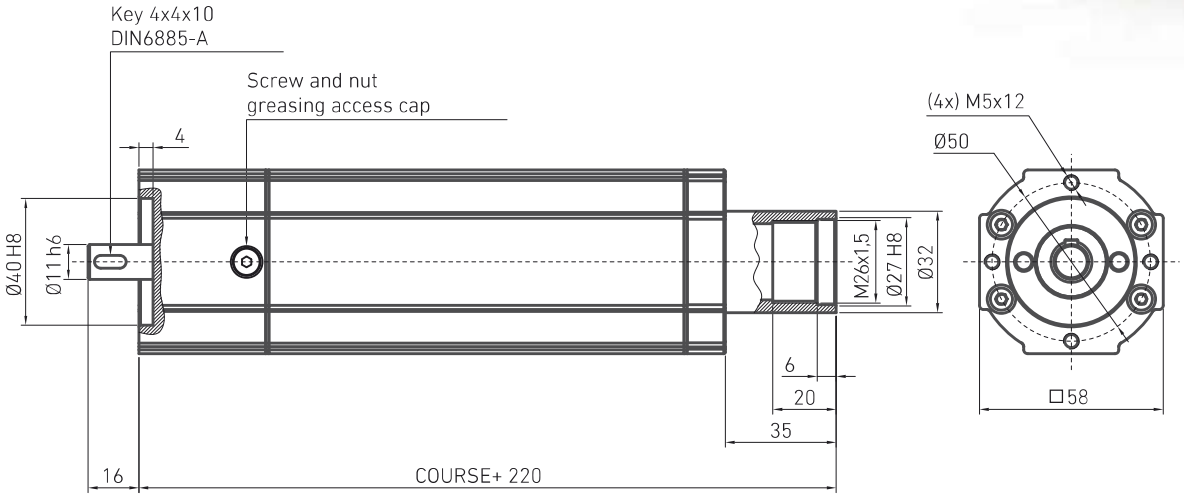
UP TO 6 kN

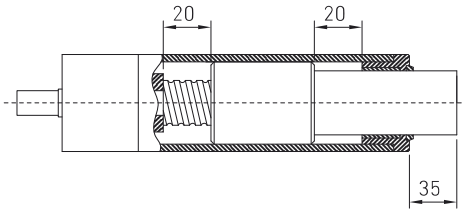
TRAPEZ. KGS BALLS

The capacities indicated correspond to
the standard input shaft configurations.
Higher capacities are available on request.

A

02



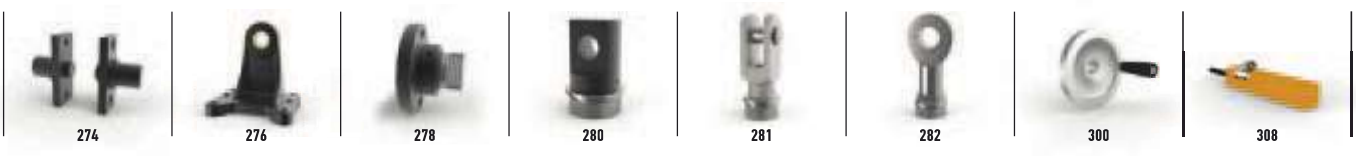


SAFETY MARGIN

Screw diameter and step (mm)	Maximum axial strength (kN)	Travel (mm/ revol. input)	Performance (%)	Drive torque, M_D (Nm) F (kN), load to move in dynamic	Stroke weight 0 (kg)	Approx. weight each 100 mm of Stroke (kg)
Tr 16x4	3.5	4	40	(1.59 x F) + 0.38	1.7	0.7
KGS 1605	6	5	81	(0.98 x F) + 0.25	1.6	0.7

... Power required: P_D (kW) = 0,157x M_D (Nm).

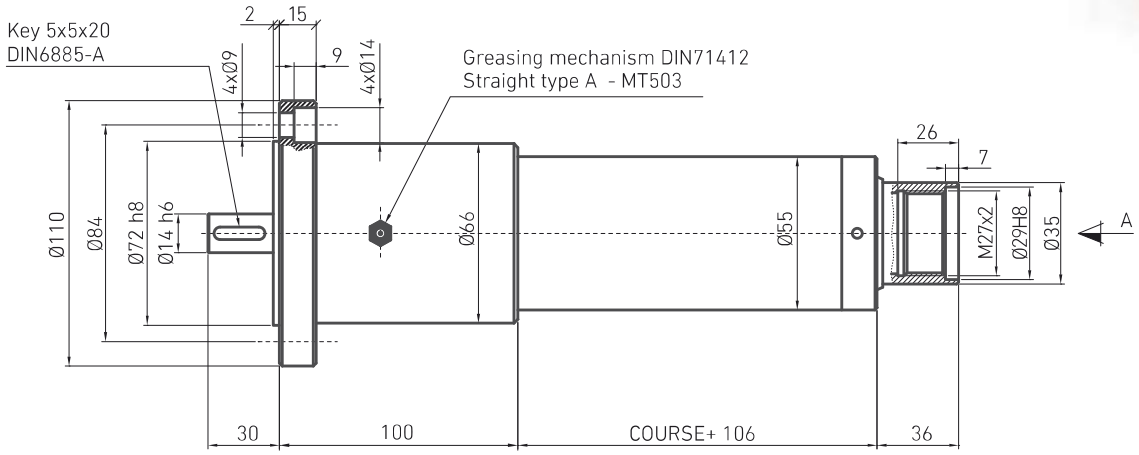
... Contact NIASA if the dynamic load exceeds the critical values indicated, in order to avoid over-heating, buckling and resonance of the unit. See calculations chapter at the end of the chapter (page 97).

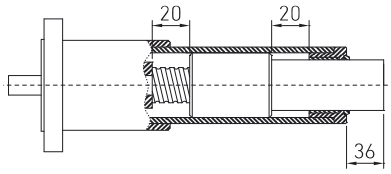


F20-M100 LINEAR ACTUATORS

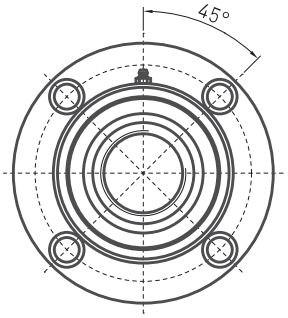
UP TO 10.5 kN

The capacities indicated correspond to
the standard input shaft configurations.
Higher capacities are available on request.





SAFETY MARGIN



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Screw diameter and step (mm)	Maximum axial strength (kN)	Travel (mm/ revol. input)	Performance (%)	Drive torque, M_D (Nm) F (kN), load to move in dynamic	Stroke weight 0 (kg)	Approx. weight each 100 mm of Stroke (kg)
Tr 24x5	9.5	5	35	(2.27 x F) + 0.52	3	1.7
KGS 2005	10.5	5	81	(0.98 x F) + 0.42	3	1.25
KGS 2020	5.5	20	81	(3.93 x F) + 0.48	3	1.25

... Power required: P_D (kW) = 0,157x M_D (Nm).

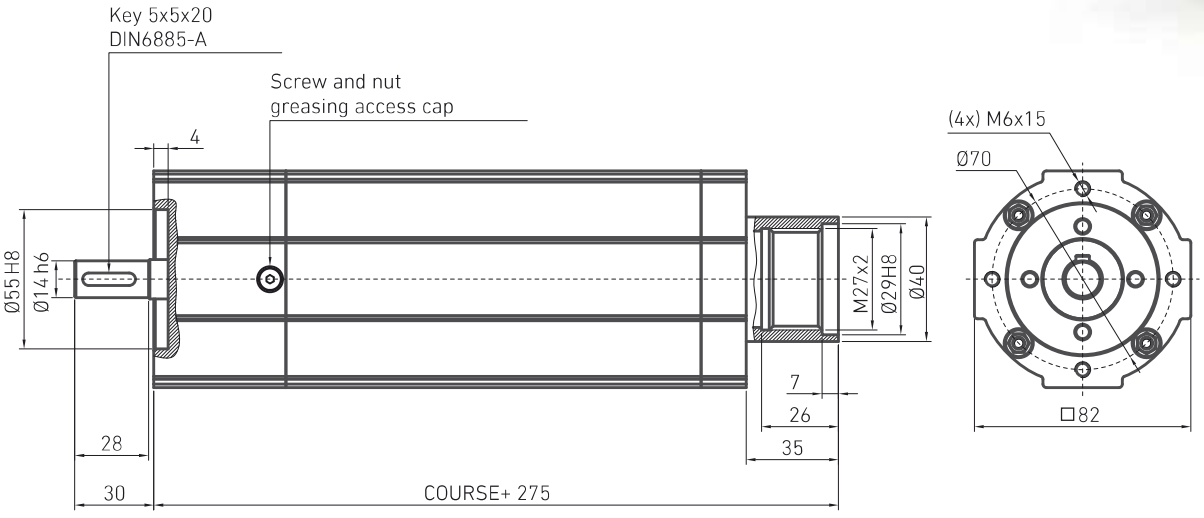
... Contact NIASA if the dynamic load exceeds the critical values indicated, in order to avoid over-heating, buckling and resonance of the unit. See calculations chapter at the end of the chapter (page 97).

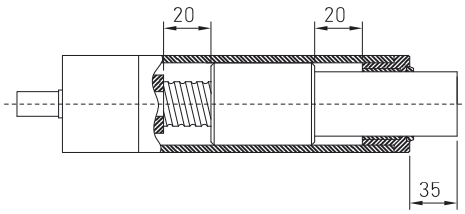
A20-M100 LINEAR ACTUATORS

UP TO 10.5 kN

TRAPEZ. KGS BALLS

The capacities indicated correspond to
the standard input shaft configurations.
Higher capacities are available on request.



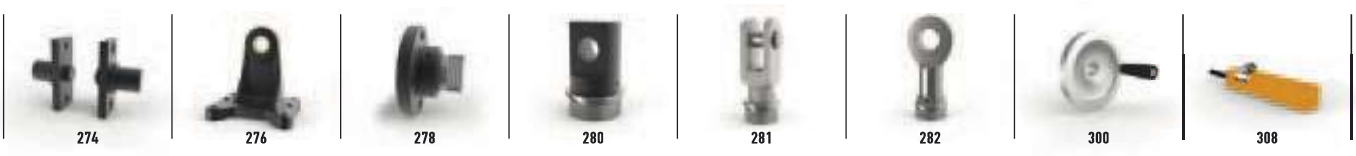


SAFETY MARGIN

Screw diameter and step (mm)	Maximum axial strength (kN)	Travel (mm/ revol. input)	Performance (%)	Drive torque, M_D (Nm) F (kN), load to move in dynamic	Stroke weight 0 (kg)	Approx. weight each 100 mm of Stroke (kg)
Tr 24x5	9.5	5	35	(2.27 x F) + 0.52	3.85	1.25
KGS 2005	10.5	5	81	(0.98 x F) + 0.42	3.65	1.15
KGS 2020	5.5	20	81	(3.93 x F) + 0.48	3.65	1.15

... Power required: P_D (kW) = 0,157x M_D (Nm).

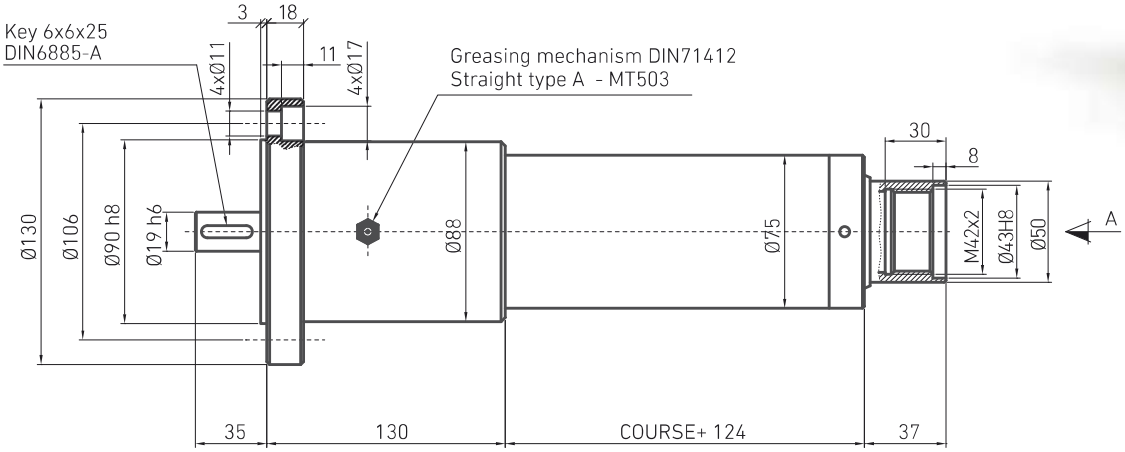
... Contact NIASA if the dynamic load exceeds the critical values indicated, in order to avoid over-heating, buckling and resonance of the unit. See calculations chapter at the end of the chapter (page 97).

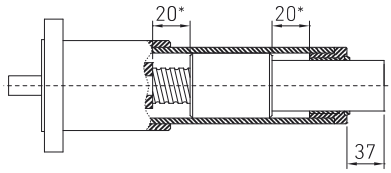


F30-M100 LINEAR ACTUATORS

UP TO 23.5 kN

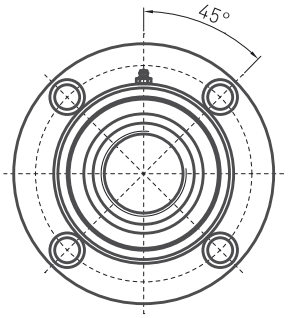
The capacities indicated correspond to
the standard input shaft configurations.
Higher capacities are available on request.





SAFETY MARGIN

(*) If incorporating a KGM 3220 nut,
the safety margin is 15 mm.



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Screw diameter and step (mm)	Maximum axial strength (kN)	Travel (mm/ revol. input)	Performance (%)	Drive torque, M_D (Nm) F (kN), load to move in dynamic	Stroke weight 0 (kg)	Approx. weight each 100 mm of Stroke (kg)
Tr 36x6	15	6	31	(3.08 x F) + 1.6	8	2.6
KGS 3205	21.5	5	81	(0.98 x F) + 1.3	8	2.6
KGS 3210	23.5	10	81	(1.96 x F) + 1.3	8	2.6
KGS 3220	12	20	81	(3.93 x F) + 1.3	8	2.6
KGS 3240	6	40	81	(7.86 x F) + 1.3	8	2.6

... Power required: P_D (kW) = 0,157x M_D (Nm).

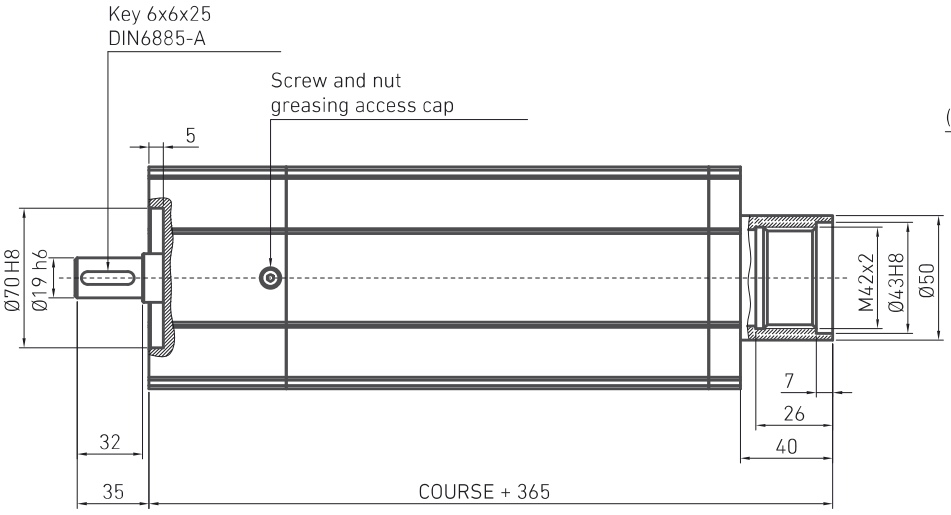
... Contact NIASA if the dynamic load exceeds the critical values indicated, in order to avoid over-heating, buckling and resonance of the unit. See calculations chapter at the end of the chapter (page 97).

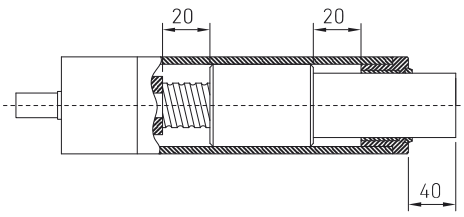
A30-M100 LINEAR ACTUATORS

UP TO 23.5 kN

TRAPEZ. KGS BALLS

The capacities indicated correspond to the standard input shaft configurations. Higher capacities are available on request.





SAFETY MARGIN

Screw diameter and step (mm)	Maximum axial strength (kN)	Travel (mm/ revol. input)	Performance (%)	Drive torque, M_D (Nm) F (kN), load to move in dynamic	Stroke weight 0 (kg)	Approx. weight each 100 mm of Stroke (kg)
Tr 36x6	15	6	31	(3.08 x F) + 1.6	8	2.3
KGS 3205	21.5	5	81	(0.98 x F) + 1.3	8	2.1
KGS 3210	23.5	10	81	(1.96 x F) + 1.3	8	2.1
KGS 3220	12	20	81	(3.93 x F) + 1.3	8	2.1
KGS 3240	6	40	81	(7.86 x F) + 1.3	8	2.1

... Power required: P_D (kW) = 0,157x M_D (Nm).

... Contact NIASA if the dynamic load exceeds the critical values indicated, in order to avoid over-heating, buckling and resonance of the unit. See calculations chapter at the end of the chapter (page 97).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300


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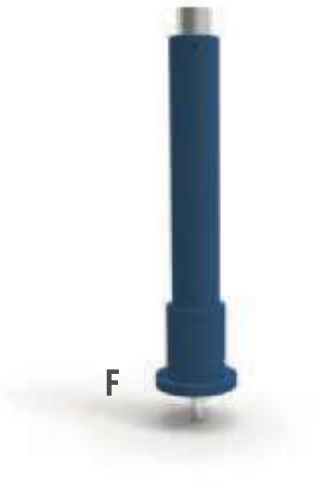
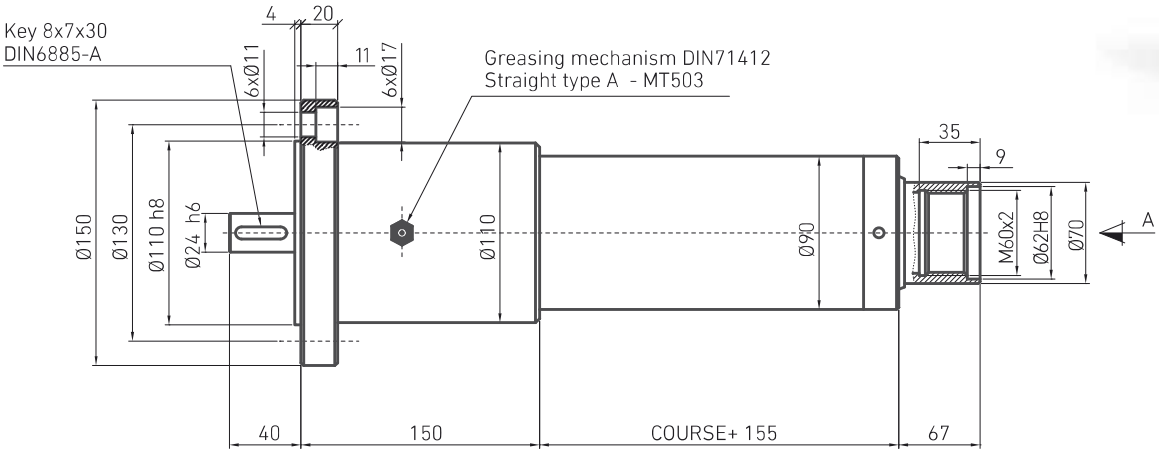
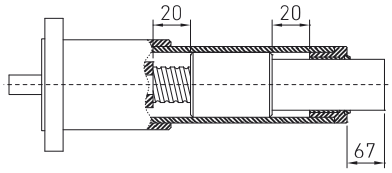
F40-M100 LINEAR ACTUATORS

UP TO 38 kN

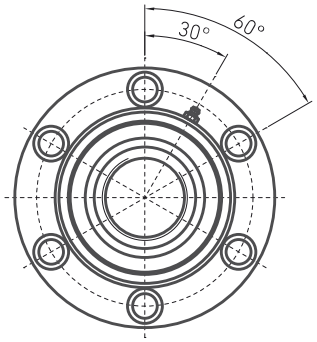


The capacities indicated correspond to
the standard input shaft configurations.
Higher capacities are available on request.





SAFETY MARGIN



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Screw diameter and step (mm)	Maximum axial strength (kN)	Travel (mm/ revol. input)	Performance (%)	Drive torque, M_D (Nm) F (kN), load to move in dynamic	Stroke weight 0 (kg)	Approx. weight each 100 mm of Stroke (kg)
Tr 45x7	22	7	29	(3.84 x F) + 1.9	17.1	4.9
KGS 4010	38	10	81	(1.96 x F) + 1.6	16.8	4.2
KGS 4020	21.5	20	81	(3.93 x F) + 1.7	16.8	4.2
KGS 4040	11	40	81	(7.86 x F) + 1.7	16.8	4.2

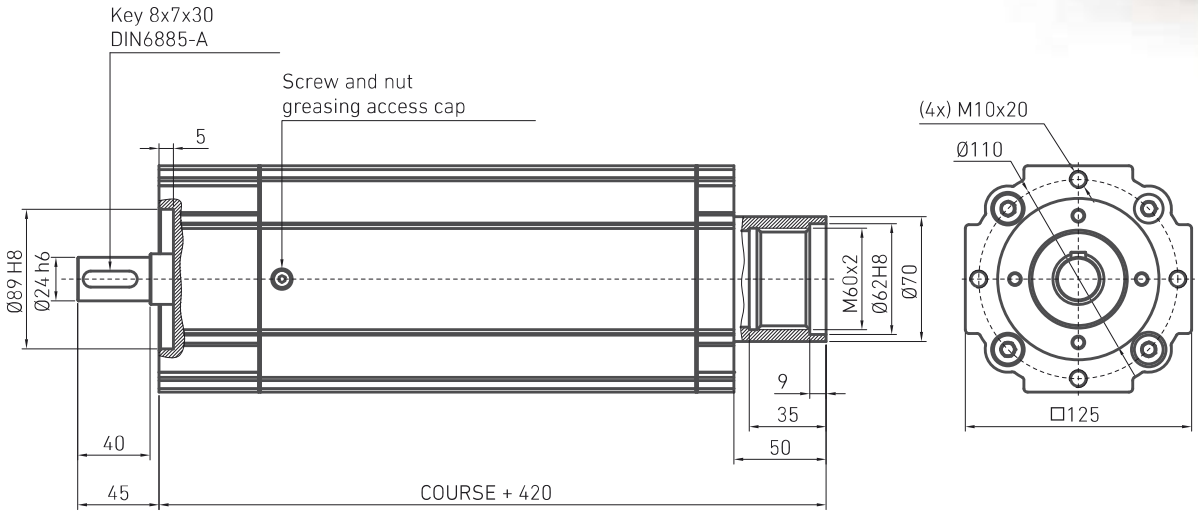
... Power required: P_D (kW) = 0,157x M_D (Nm).

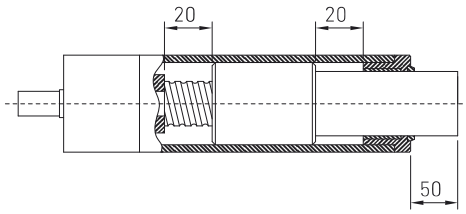
... Contact NIASA if the dynamic load exceeds the critical values indicated, in order to avoid over-heating, buckling and resonance of the unit. See calculations chapter at the end of the chapter (page 97).

A40-M100 LINEAR ACTUATORS

UP TO 38 kN

The capacities indicated correspond to
the standard input shaft configurations.
Higher capacities are available on request.





SAFETY MARGIN

Screw diameter and step (mm)	Maximum axial strength (kN)	Travel (mm/ revol. input)	Performance (%)	Drive torque, M_D (Nm) F (kN), load to move in dynamic	Stroke weight 0 (kg)	Approx. weight each 100 mm of Stroke (kg)
Tr 45x7	22	7	29	(3.84 x F) + 1.9	17.1	3.45
KGS 4010	38	10	81	(1.96 x F) + 1.6	16.8	3.3
KGS 4020	21.5	20	81	(3.93 x F) + 1.7	16.8	3.3
KGS 4040	11	40	81	(7.86 x F) + 1.7	16.8	3.3

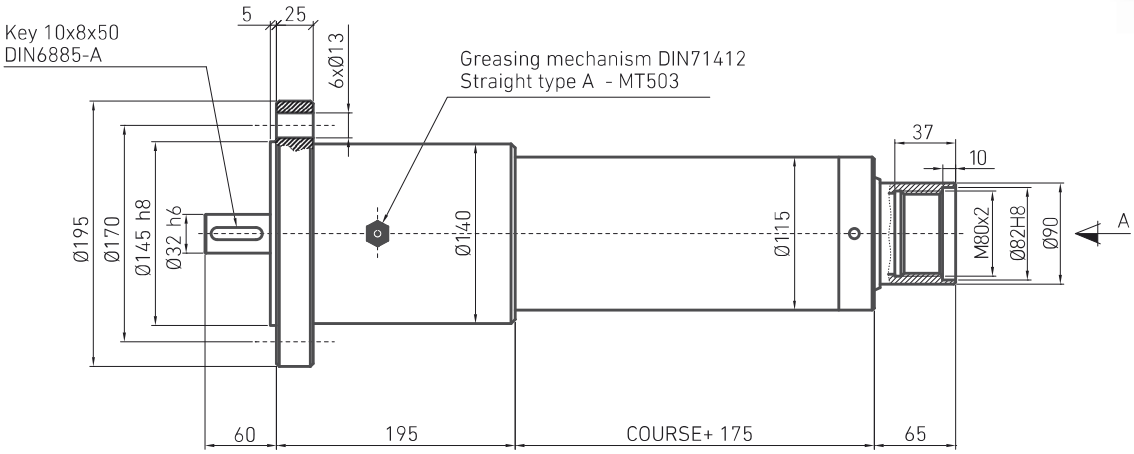
... Power required: P_D (kW) = 0,157x M_D (Nm).

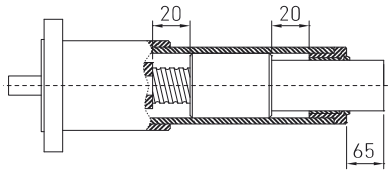
... Contact NIASA if the dynamic load exceeds the critical values indicated, in order to avoid over-heating, buckling and resonance of the unit. See calculations chapter at the end of the chapter (page 97).

F45-M100 LINEAR ACTUATORS

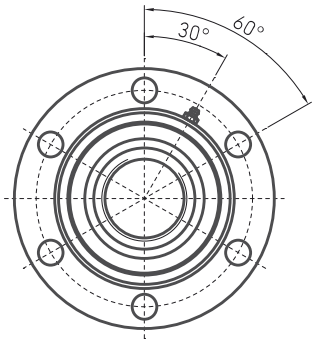
UP TO 78 kN

The capacities indicated correspond to
the standard input shaft configurations.
Higher capacities are available on request.





SAFETY MARGIN



CHECKED BY -A-

Screw diameter and step (mm)	Maximum axial strength (kN)	Travel (mm/ revol. input)	Performance (%)	Drive torque, M_D (Nm) F (kN), load to move in dynamic	Stroke weight 0 (kg)	Approx. weight each 100 mm of Stroke (kg)
Tr 50x8	47.5	8	30	(4.24 x F) + 2.1	28.3	5.2
KGS 5010	78	10	81	(1.96 x F) + 1.7	28.3	5.2

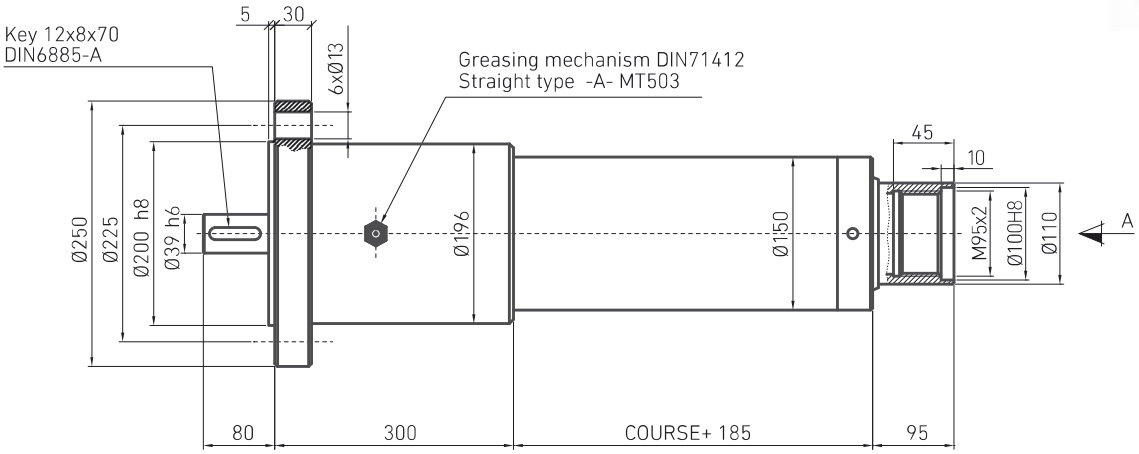
... Power required: P_D (kW) = 0,157x M_D (Nm).

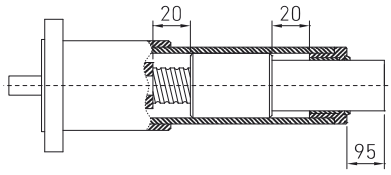
... Contact NIASA if the dynamic load exceeds the critical values indicated, in order to avoid over-heating, buckling and resonance of the unit. See calculations chapter at the end of the chapter (page 97).

F50-M100 LINEAR ACTUATORS

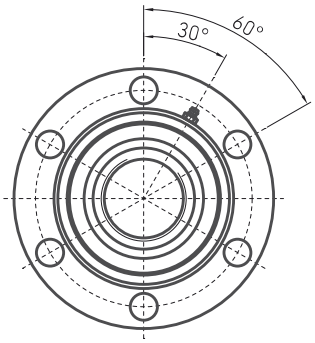
UP TO 86 kN

The capacities indicated correspond to
the standard input shaft configurations.
Higher capacities are available on request.





SAFETY MARGIN



CHECKED BY -A-

Screw diameter and step (mm)	Maximum axial strength (kN)	Travel (mm/ revol. input)	Performance (%)	Drive torque, M_D (Nm) F (kN), load to move in dynamic	Stroke weight 0 (kg)	Approx. weight each 100 mm of Stroke (kg)
Tr 70x10	60.5	10	27	(5.89 x F) + 2.1	75	7.2
KGS 6310	86	10	81	(1.96 x F) + 1.5	77	8.1

... Power required: P_D (kW) = 0,157x M_D (Nm).

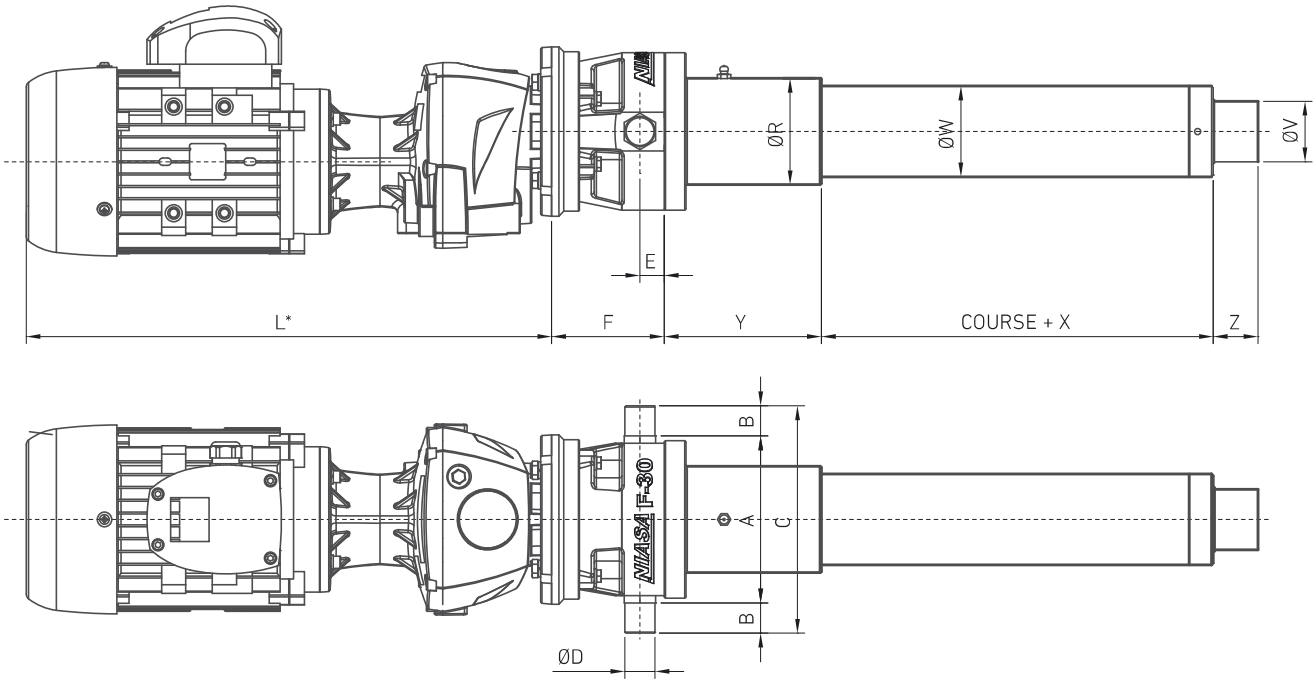
... Contact NIASA if the dynamic load exceeds the critical values indicated, in order to avoid over-heating, buckling and resonance of the unit. See calculations chapter at the end of the chapter (page 97).

ES LINEAR ACTUATOR F/A – CONFIGURATION M205

UP TO **86 kN** TRAPEZ. KGS BALLS

In line motoreducer

There is a large range of reductions available for the M205 configuration.



*Depends on the motoreducer selected and the manufacturer.
For further information, please contact the NIASA technical department.

	M205 configuration dimensions						M100 configuration general dimensions						
	A	B	C	ØD f8	E	F	X	Y	Z	ØV	ØW	ØR	More dimensions
F20	116	20	156	20	15	86	106	100	36	35	55	66	Page 80
F30	138	25	188	25	20	93	124	130	37	50	75	88	Page 82
F40	160	40	240	35	30	110	155	150	67	70	90	110	Page 84
F45	200	40	280	40	35	134	175	195	65	90	115	140	Page 86
F50	260	50	360	45	40	186	185	300	95	110	150	196	Page 87

... See calculations chapter (page 98) for calculating the drive and start-up torque, and the required power.

... Ensure that the dynamic load of the application does not surpass the critical values, in order to avoid overheating and buckling of the unit. Please contact NIASA

Maximum axial strength

	Screw diameter and pitch (mm)	Load (kN)
F20 /A20	Tr 24x5	9.5
	KGS 2005	10.5
	KGS 2020	5.5
F30 / A30	Tr 36x6	15
	KGS 3205	21.5
	KGS 3210	23.5
	KGS 3220	12
	KGS 3240	6
F40 / A40	Tr 45x7	22
	KGS 4010	38
	KGS 4020	21.5
	KGS 4040	11
F45	Tr 50x8	47.5
	KGS 5010	78
F50	Tr 70x10	60.5
	KGS 6310	86

Standard drives

The standard drives of the M205 F-configuration are implemented by means of in line reducers driven by Ac motors. The following table shows the powers available for each size actuator/reducer and the type of flange.

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

If using ball screws, the actuator is reversible. In general, it is always recommended using motors with brake. In most cases, standard brakes for each motor size are sufficient. This will ensure the stem does not loose position when it stops or if there are vibrations, etc.

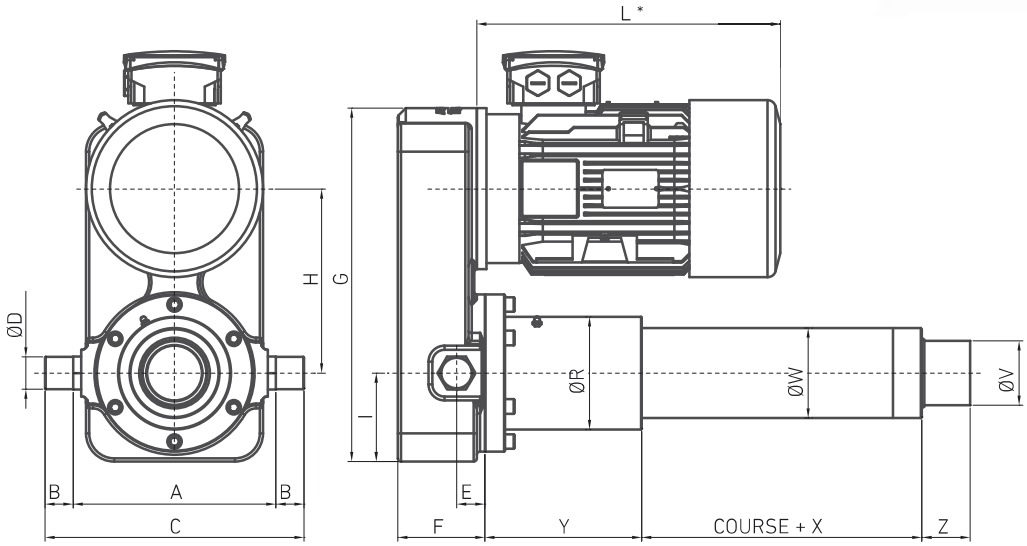
	Ø Reducer input shaft	Flange reducer		MOTOR GROUP															
				56		63		71		80		90		100		112		132		160	
				POWER (kW)															
				A	B	A	B	A	B	A	B	A	B	A	B	A	A	B	A
				0.06	0.09	0.12	0.18	0.25	0.37	0.55	0.75	1.1	1.5	2.2	3	4	5.5	7.5	11
F20 / A20	20	B5	Ø140	•		•		•		•									
F30 / A30	20	B5	Ø140			•		•		•		•							
F40 / A40	25	B5	Ø160					•		•		•		•		•			
F45	30	B5	Ø200							•		•		•		•	•	•	
F50	40	B5	Ø250									•		•		•	•	•	•

ES LINEAR ACTUATOR F/A – CONFIGURATION M501

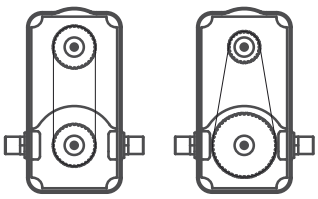
UP TO **86 kN** TRAPEZ. KGS BALLS

Parallel drive

There is a possibility of mounting a coaxial motoreducer into the gearbox instead of the motor, or modifying the ratio between the pulleys, with the aim of achieving the desired transmission ratio.



Standard transmission ratio



1:1 1:2

*Depends on the motor selected and the manufacturer.
For further information, please contact the NIASA technical department.

	M501 configuration dimensions									M100 configuration general dimensions						
	A	B	C	ØD f8	E	F	G	H	I	X	Y	Z	ØV	ØW	ØR	More dimensions
F16	134	15	164	15	12	45	200	100	50	84	61	36	32	40	45	Page 78
F20	148	20	188	20	15	55	250	130	60	106	100	36	35	55	66	Page 80
F30	178	25	228	25	20	65	300	160	70	124	130	37	50	75	88	Page 82
F40	227	40	307	35	30	85	356	180	90	155	150	67	70	90	110	Page 84
F45	252	40	332	40	35	108	440	230	110	175	195	65	90	115	140	Page 86
F50	336	50	436	45	40	138	560	280	150	185	300	95	110	150	196	Page 87

Maximum axial strength

	Screw diameter and pitch (mm)	Load (kN)
F16 / A16	Tr 16x4	3.5
	KGS 1605	6
F20 / A20	Tr 24x5	9.5
	KGS 2005	10.5
	KGS 2020	5.5
F30 / A30	Tr 36x6	15
	KGS 3205	21.5
	KGS 3210	23.5
	KGS 3220	12
	KGS 3240	6
F40 / A40	Tr 45x7	22
	KGS 4010	38
	KGS 4020	21.5
	KGS 4040	11
F45	Tr 50x8	47.5
	KGS 5010	78
F50	Tr 70x10	60.5
	KGS 6310	86

Standard drives

The standard drive of M501 F/A configuration linear actuators is implemented by means of Ac motors and aluminum pulleys with polyurethane toothed strap. The following table shows the powers available for each actuator size.

For another size or different type of drive, please contact NIASA. NIASA can supply other kind of motors with sensors of any type, etc.

If using ball screws, the actuator is reversible. In general, it is always advisable that the motors have brakes. In most cases, standard brakes for each motor size are sufficient. This will ensure the stem does not loose position when it stops or if there are vibrations, etc.

	MOTOR GROUP															
	56		63		71		80		90		100		112		132	160
	POWER (kW)															
	A	B	A	B	A	B	A	B	A	B	A	B	A	A	B	A
	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
F16 / A16	•		•		•											
F20 / A20			•		•		•									
F30 / A30					•		•		•							
F40 / A40							•		•		•		•			
F45									•		•		•	•		
F50											•		•	•	•	

All the motors have B14 flange.

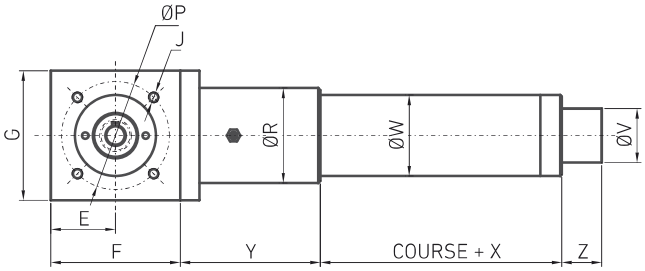
ES LINEAR ACTUATOR F/A - CONFIGURATION M505

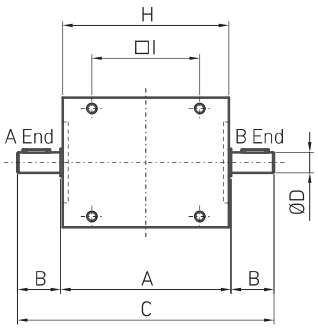
UP TO 23.5 kN

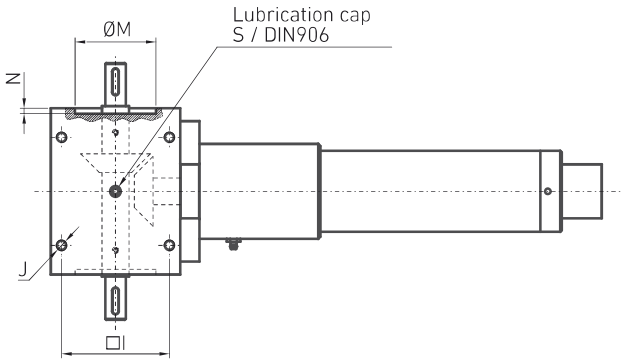
For drive at 90°

The transmission ratio of the bevel gearboxes with helical conical gears is 1:1.

There is a possibility, at the customer's request, of supplying the M505 configuration with one of the sides of the shaft cut (A, B).







	M505 configuration dimensions													
	A	B	C	ØD h6	E	F	G	H	I	ØM H7	N	ØP	K	J
F16	86	25	136	14	32.5	65	70	84	45	58	2	75	5x5x20	M6x10
F20	112.5	34	180.5	16	45	89	90	110	70	62	3	75	5x5x25	M8x14
F30	158	40	238	19	60	120	120	154	100	75	5	100	6x6x25	M10x18

	M100 configuration general dimensions						
	X	Y	Z	ØV	ØW	ØR	More dimensions
F16	84	61	36	32	40	45	Page 78
F20	106	100	36	35	55	66	Page 80
F30	124	130	37	50	75	88	Page 82

Maximum axial strength

	Diameter and pitch screw (mm)	Load (kN)
F16 / A16	Tr 16x4	3.5
	KGS 1605	6
F20 / A20	Tr 24x5	9.5
	KGS 2005	10.5
	KGS 2020	5.5
F30 / A30	Tr 36x6	15
	KGS 3205	21.5
	KGS 3210	23.5
	KGS 3220	12
	KGS 3240	6

... Contact the NIASA technical department for the different drive possibilities.

... If using ball screws, the actuator is reversible. In general, it is always advisable that the motors have brakes. In most cases, standard brakes for each motor size are sufficient. This will ensure the stem does not loose position when it stops or if there are vibrations, etc.

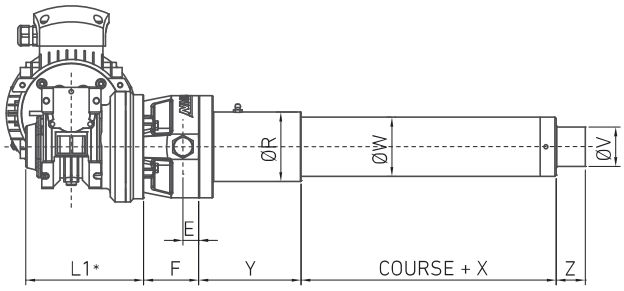
ES LINEAR ACTUATOR F/A – CONFIGURATION M601

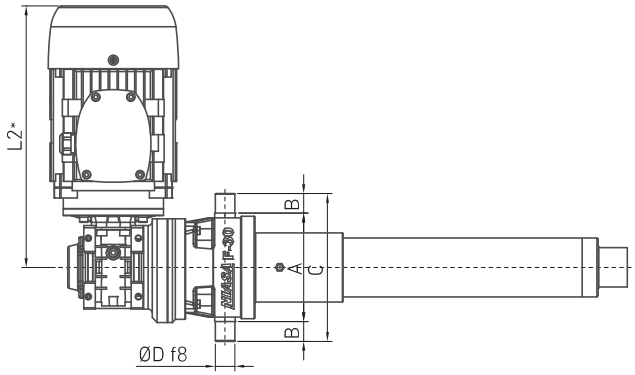
UP TO 86 kN

TRAPEZ. KGS BALLS

Motoreducer at 90°

There is a large range of reductions available for the M601 configuration.





*Depends on the motoreducer selected and the manufacturer.
For further information, please contact the NIASA technical department.

	M601 configuration dimensions						M100 configuration general dimensions						
	A	B	C	ØD f8	E	F	X	Y	Z	ØV	ØW	ØR	More dimensions
F20	116	20	156	20	15	55	106	100	36	35	55	66	Page 80
F30	138	25	188	25	20	70	124	130	37	50	75	88	Page 82
F40	160	40	240	35	30	75	155	150	67	70	90	110	Page 84
F45	200	40	280	40	35	105	175	195	65	90	115	140	Page 86
F50	260	50	360	45	40	130	185	300	95	110	150	196	Page 87

Maximum axial strength

	Diameter and pitch screw (mm)	Load (kN)
F20 / A20	Tr 24x5	9.5
	KGS 2005	10.5
	KGS 2020	5.5
F30 / A30	Tr 36x6	15
	KGS 3205	21.5
	KGS 3210	23.5
	KGS 3220	12
	KGS 3240	6
F40 / A40	Tr 45x7	22
	KGS 4010	38
	KGS 4020	21.5
	KGS 4040	11
F45	Tr 50x8	47.5
	KGS 5010	78
F50	Tr 70x10	60.5
	KGS 6310	86

... Contact the NIASA technical department for the different drive possibilities.

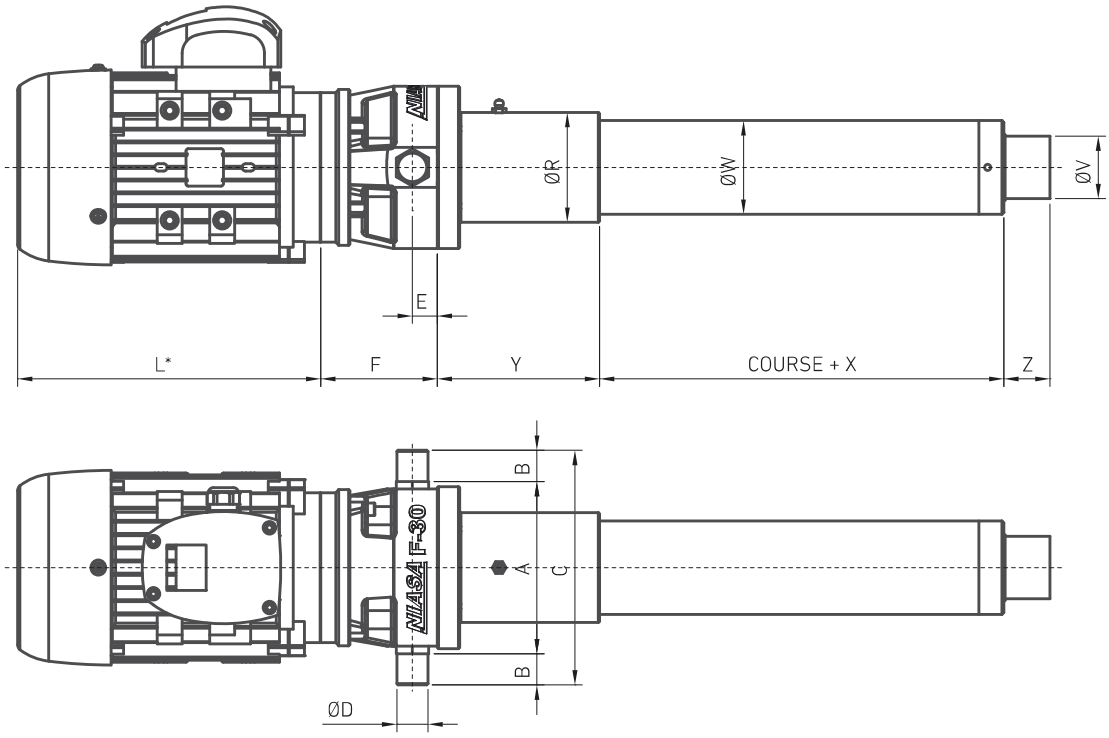
... If using ball screws, the actuator is reversible. In general, it is always advisable that the motors have brakes. In most cases, standard brakes for each motor size are sufficient. This will ensure the stem does not when it stops or if there are vibrations, etc.

ES LINEAR ACTUATOR F/A - CONFIGURATION M605

UP TO **86 kN** TRAPEZ. KGS BALLS

In line motor

There is a large range of reductions available for the M605 configuration.



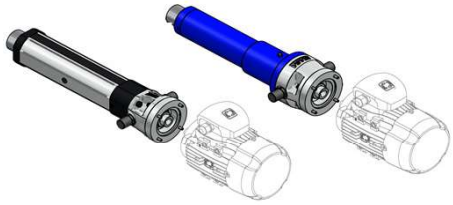
*Depends on the motor group selected and the manufacturer.
For further information, please contact the NIASA technical department

	M205 configuration dimensions					M100 configuration general dimensions						
	A	B	C	ØD f8	E	X	Y	Z	ØV	ØW	ØR	More dimensions
F16	82	15	112	15	12	84	61	36	32	40	45	Page 78
F20	116	20	156	20	15	106	100	36	35	55	66	Page 80
F30	138	25	188	25	20	124	130	37	50	75	88	Page 82
F40	160	40	240	35	30	155	150	67	70	90	110	Page 84
F45	200	40	280	40	35	175	195	65	90	115	140	Page 86
F50	260	50	360	45	40	185	300	95	110	150	196	Page 87

Maximum axial strength

	Diameter and pitch screw (mm)	Load (kN)
F16 / A16	Tr 16x4	3.5
	KGS 1605	6
F20 / A20	Tr 24x5	9.5
	KGS 2005	10.5
	KGS 2020	5.5
F30 / A30	Tr 36x6	15
	KGS 3205	21.5
	KGS 3210	23.5
	KGS 3220	12
	KGS 3240	6
F40 / A40	Tr 45x7	22
	KGS 4010	38
	KGS 4020	21.5
	KGS 4040	11
F45	Tr 50x8	47.5
	KGS 5010	78
F50	Tr 70x10	60.5
	KGS 6310	86

ACCESORIES



MOTOR BELL AMB

The standard drive of Linear Actuators is made using asynchronous AC motors. The following table shows the available motor flanges (IEC type and size) for each actuators size. For other types/sizes of motors, please contact NIASA. We can supply adapters for any kind of electrical motor (AC single phase, AC with integrated inverter, DC, BLDC, stepper, ...).

Ensure motor is not overdimensioned for the selected linear actuator size. It may cause damage, or even breakage, of it. For powers higher than the indicated ones in the next table, contact NIASA.

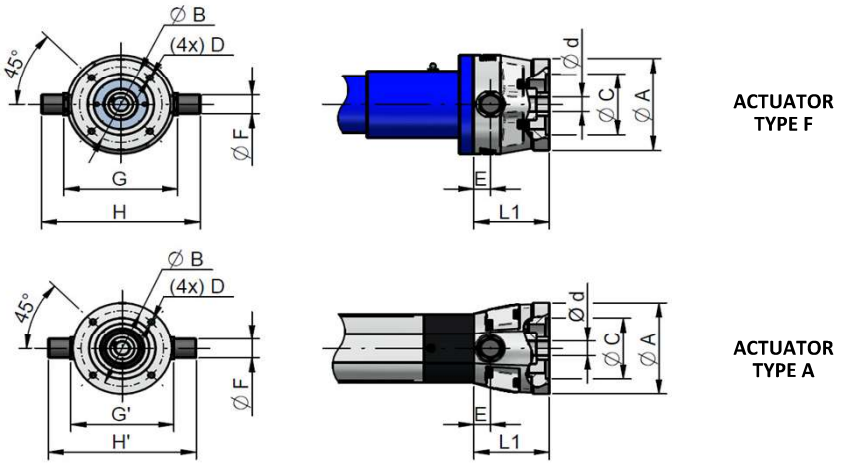
DIMENSIONS AND WEIGHTS

Linear actuat. size	Motor flange (IEC type & size)	Power (kW) Option A	Power (kW) Option B	Bell [1] ØA (mm)	ØB (mm)	ØC (mm)	D (mm)	Ød [2] (mm)	E (mm)	ØF f8 (mm)	G (mm) Type F	H (mm) Type F	G' (mm) Type A	H' (mm) Type A	L_1 (mm)	Weight (kg)
F16	56 B14A	0,06	0,09	80	65	50	Ø5.5	9							48	0,5
A16	63 B14A	0,12	0,18	90	75	60	Ø5.5	11	12	15	82	118	85	121	50	0,5
	71 B14A	0,25	0,37	105	85	70	Ø6.5	14							57	0,7
F20	63 B14A	0,12	0,18	90	75	60	Ø5.5	11							71	1,3
A20	71 B14A	0,25	0,37	105	85	70	Ø6.5	14	15	20	116	160	100	144	73	1,4
	80 B14A	0,55	0,75	120	100	80	Ø6.5	19							86	1,8
F30	71 B14A	0,25	0,37	105	85	70	Ø6.5	14							81	2
A30	80 B14A	0,55	0,75	120	100	80	Ø6.5	19	20	25	138	192	125	179	91	2,3
	90 B14A	1,1	1,5	140	115	95	Ø8.5	24							101	2,7
F40	80 B14A	0,55	0,75	130	100	80	Ø6.5	19							98	3,6
A40	90 B14A	1,1	1,5	140	115	95	Ø8.5	24	30	35	160	224	160	224	108	3,9
	100 B14A	2,2	3	160	130	110	Ø8.5	28							118	4,4
	112 B14A	4														
F45	90 B14A	1,1	1,5	160	115	95	Ø8.5	24							125	6,9
	100 B14A	2,2	3	160	115	95	Ø8.5	28	35	45	200	294	-	-	135	7,3
	112 B14A	4														
	132 B14A	5,5	7,5	200	165	130	Ø11	38							155	9,5
F50	100 B14A	2,2	3	200	130	110	Ø8.5	28							160	13,5
	112 B14A	4							40	50	260	364	-	-		
	132 B14A	5,5	7,5	200	165	130	Ø11	38							180	14,8
	160 B14A	11	15	250	215	180	Ø13	42							214	20,3

AMB - F30 - 71 B14A - 1 - IN

- **F30** — Linear actuat. size
- **71 B14A** — Motor flange
- **Trunnions**: **1** Yes; **0** No [3]
- **Application**: **IN** Indoor; **OU** Outdoor; **SP** Special category to ISO 12944

[1] It includes coupling and fasteners to fix motor
[2] Coupling key way according to DIN 6885
[3] The motor bell is supplied with plastic cups to protect trunnions threaded holes



ACTUATOR TYPE F

ACTUATOR TYPE A

MATERIALS AND SURFACE TREATMENTS

	Indoor applications [1]	Outdoor applications [2]
Bell (aluminium):	Anodizing (8~12 µm)	Anodizing (15~20 µm)
Fastenings:	Black oxide coating	Stainless steel

[1] Approx. C2-Medium durability (ISO 12944).
[2] Approx. C3-Medium durability (ISO 12944).
Special coatings on request, until C5 (ISO 12944)

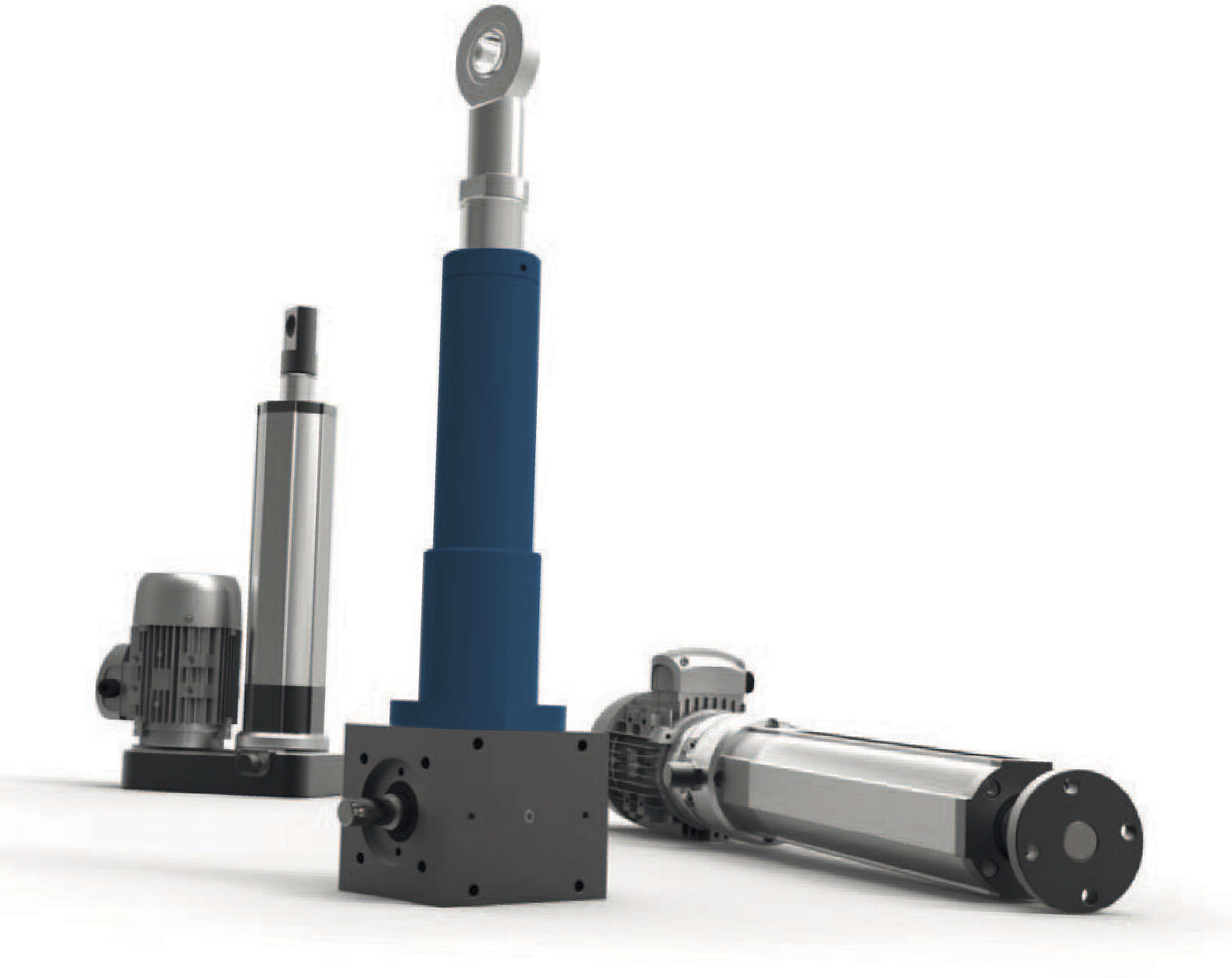
LINEAR ACTUATORS

F SERIES: STEEL TUBE | A SERIES: ALUMINUM TUBE

PRODUCT SELECTION

To select the correct F/A Series linear actuator, please follow this flow diagram.

If you would like to know the expected service life of a unit for your application, please send the relevant data to the NIASA service department.



1 F/A ACTUATOR MODEL AND SIZE DEFINITION

APPLICATION

M100 BASE CONFIGURATION Page 74

Page 74 OTHER CONFIGURATION

SIZE PRE-SELECTION Page 74

2 SCREW AND REDUCTION TYPE DEFINITION

SCREW TYPE Page 78

Page 78 REDUCTION

BALL (KGS)
TRAPEZOIDAL (Tr)
SPECIAL

3 DRIVE TORQUE AND POWER CALCULATION

INDEPENDENT ACTUATOR

ACTUATOR SYSTEM

Page 99 TORQUE AND POWER CALCULATION

TORQUE AND POWER CALCULATION

Page 74 STANDARD DRIVE

SPECIAL DRIVE

4 ADDITIONAL CONFIGURATION AND ACCESSORIES

ADDITIONAL CONFIGURATION

- Stem end
- Input shaft
- Lubrication
- Corrosion protection
- Sealing
- Ambient temperature
- ...

Page 100

ACCESSORIES Page 260

5 PLACING AN ORDER

PLACING AN ORDER Page 104

6 DESIGN VALIDATION (NIASA)

SIZE VALIDATION AND CONFIGURATION

BUCKLING

LATERAL LOADS

RESONANCE

OVER-HEATING

...

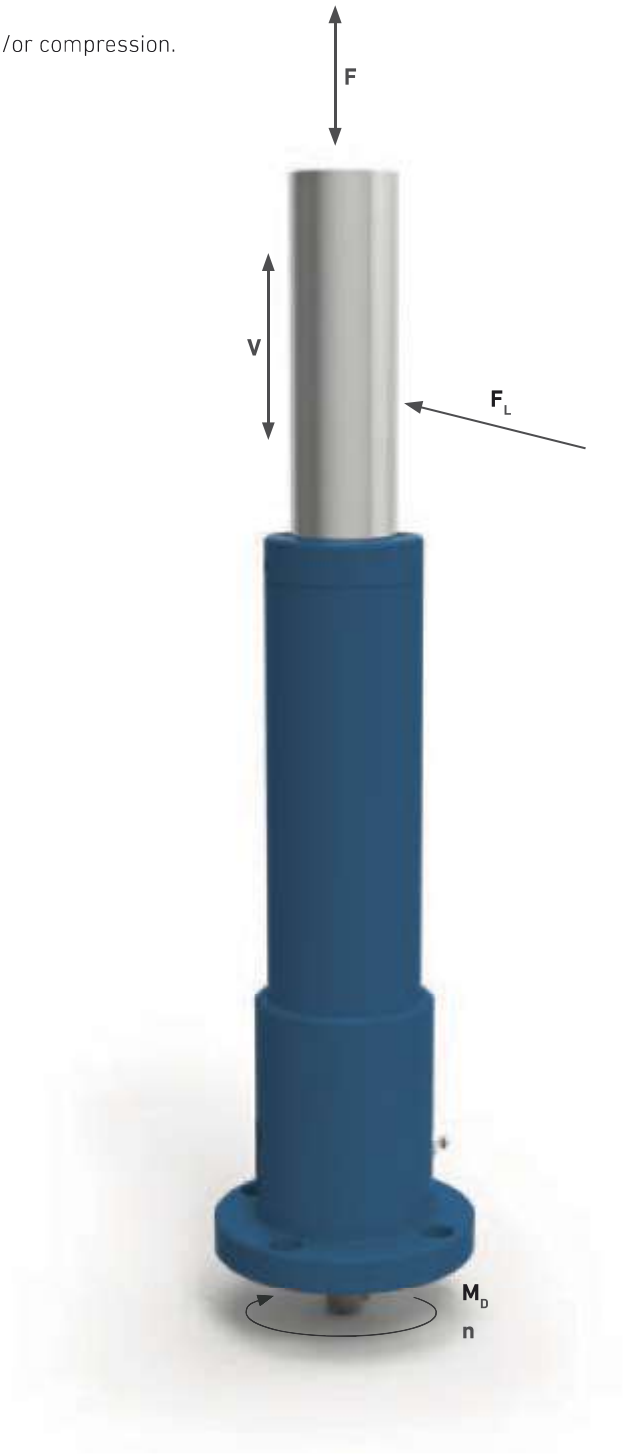
CONFIRMATION SIZE

RE-SIZING PROPOSAL

PRODUCT SELECTION

STRENGTH AND TORQUE ACTING ON AN F/A SERIES LINEAR ACTUATOR

F Load to move at traction and/or compression.
F_L Lateral load on the stem.
V Stem travel speed.
M_D Torque on the input shaft.
n Speed on the input shaft.



PRODUCT SELECTION

TORQUE AND POWER OF A LINEAR ACTUATOR

After pre-selecting the suitable linear actuator for the application, select the drive motor, following the steps below:

1. DRIVE TORQUE

$$M_D\ (Nm) = \left(\frac{F \times P}{2 \times \pi \times 0{,}9 \times \eta_{DS}} + M_i\right) \times \frac{1}{\eta_{DR} \times i_R}$$

- M_D Drive torque (kN)
- F Load to move in dynamic (kN)
- P Screw pitch (mm)
- M_i Idle torque (Nm)
- i_R Input reduction, see for configurations M205, M501, M505 and M601; i = 1 for M605 and M100
- **0.9** Cylinder dynamic efficiency
- η_{DS} Screw dynamic efficiency
- η_{DR} Reduction element dynamic efficiency:
  - M205: η_{DR} = 0,95 (coaxial reducer)
  - M501: η_{DR} = 0,97 (toothed strap)
  - M505: η_{DR} = 0,90 (90° bevel gearbox)
  - M601: η_{DR}, according to reduction (worm wheel and shaft)
  - M605 and M100 = 1, without reducer

2. A 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 2; the smaller the installation the higher the coefficient

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

3. START-UP TORQUE

In general, it must be calculated by multiplying the drive torque by two.

η_{DS} Screw dynamic efficiency

Trapezoidal screw (Tr)					
16 x 4	24 x 5	36 x 6	45 x 7	50 x 8	70 x 10
0.44	0.39	0.34	0.32	0.33	0.30

Ball screw (KGS)
0.9 (for all sizes)

M_i Idle Torque

F16 / A16		F20 / A20		F30 / A30	
Tr 16×4	0.38	Tr 24×5	0.52	Tr 36×6	1.6
KGS 1605	0.25	KGS 2005	0.42	KGS 3205	1.3
		KGS 2020	0.48	KGS 3210	1.3
				KGS 3220	1.3
				KGS 3240	1.3

F40 / A40		F45		F50	
Tr 45×7	1.9	Tr 50×8	2.1	Tr 70×10	2.1
KGS 4010	1.6	KGS 5010	1.7	KGS 6310	1.5
KGS 4020	1.7				
KGS 4040	1.7				

IMPORTANT

... The values indicated in the tables correspond to the lubrication conditions established by NIASA and will be reached after a small period of operation.

... In the case of low temperatures, these can be reduced considerably.

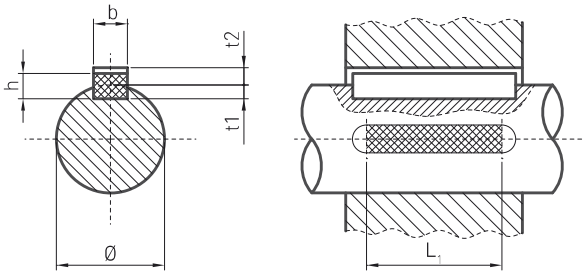
PRODUCT SELECTION

MAXIMUM TRANSFERABLE TORQUE ACCORDING TO SHAFT/ PARALLEL COTTER PIN (DIN 6885)

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

IMPORTANT

... Never subject the input of a screw jack to torque over that indicated for its shaft and keys (see plans in the chapter "sizes", page 74).



Shaft diameter Ø (mm)	Key dimensions			Maximum transferrable torque, M_D (Nm) Key effective length, L_1 (mm)							
	b x h (mm)	t1 (mm)	t2 (mm)	10	16	20	28	40	50	70	100
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	-

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 NIASA technical department

PRODUCT SELECTION

LUBRICATION

The lineal actuator is supplied with G421 DIVINOL LITHOGREASE for all applications with trapezoidal screws and L152 KLUBER ISOFLEX TOPAS class 2, DIN51818 for ball screws. For high speeds it is recommended to choose class 1 and heavy loads class 3.

A change of grease type may affect the correct operation of the equipment.

Specifications

A complete cleaning and change of grease is recommended

Lithium compound semi-synthetic grease DIVINOL LITHOGREASE G421	
Working temperature	-35 to +160ºC
Density at 15ºC	0.9 kg/dm^3
Cinematic viscosity (s/DIN 51 562)	130 mm^2/s at 40ºC 15 mm^2/s at 100ºC
Dropping point (s/DIN ISO 2176)	>220ºC
Water resistance (s/DIN 51 807/T1)	Level 1

Synthetic hydrocarbon grease with lithium soap KLUBER ISOFLEX TOPAS L152	
Working temperature	-50 to +150ºC
Density at 20ºC	0.9 kg/dm^3
Cinematic viscosity (s/DIN 51 562)	100 mm^2/s at 40ºC 14.5 mm^2/s at 100ºC
Dropping point (s/DIN ISO 2176)	>185ºC
Water resistance (s/DIN 51 807/T1)	Level 1

A complete cleaning and change of grease is recommended after five years.
The greasing interval...
For further information, please contact the NIASA technical department.

The greasing interval depends on the type of work and its cycle. Under normal conditions it is recommended to lubricate every 800 - 2,000 hours of operation. It is important to avoid over-lubricating.

A group lubricator is recommended for automatic lubrication, which feeds the lubrication point. Depending on the type of group lubricator, the lubrication may last up to two years.

NIASA supplies its actuators with the following type of hydraulic lubricating mechanism:

- Straight lubricator DIN 71412 type A (Actuator F).
- Brass cap with O-ring (Actuator A).
- As a greasing nozzle for the nipples, the 515/G – 516/G hydraulic connector is recommended.
  For its protection and conservation, the use of plastic caps is advised.

There is a possibility to supply F Series actuators with a brass lubrication cap with an O-ring, and vice versa for A Series. See the lubrication chapter in accessories.

PRODUCT SELECTION

PROTECTION AGAINST CORROSION, SEALING AND AMBIENT TEMPERATURE

PROTECTION 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 NIASA so that the technical department can select the surface protection system and select the most suitable components.

CORROSION CATEGORY		ENVIRONMENT	
		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 atmospheres, with moderate SO_2 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 high (industrial)	Industrial areas with high humidity and aggressive atmosphere.	Buildings or areas with almost permanent condensation and high contamination.
C5-M	Very high (maritime)	Coastal and maritime areas with high salinity.	Buildings or areas with permanent condensation and high contamination.

DURABILITY		
LOW	L	2 to 5 years
MEDIUM	M	5 to 15 years
HIGH	H	More than 15 years

PROTECTION AGAINST THE INPUT OF SOLIDS AND LIQUIDS

NIASA actuators offer, as standard, an IP65 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. NIASA 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".

LEVEL OF PROTECTION "IP", AGAINST 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).
		...	...

AMBIENT TEMPERATURE

Contact NIASA if your unit will be installed in an environment that may reach temperatures below -20°C and/or above +40°C.

NIASA's technical department will prescribe the most suitable materials and sealing components for the specific conditions of the application.

PRODUCT SELECTION

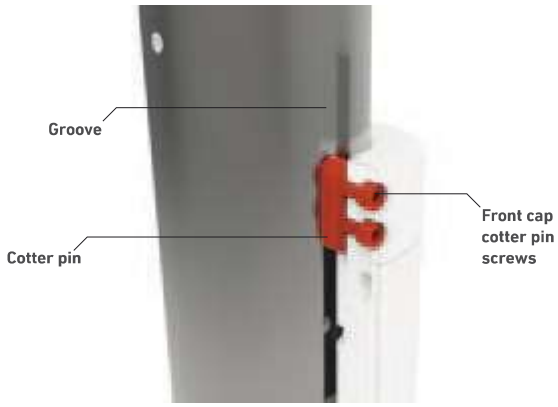
OPTIONAL CONFIGURATIONS

Optionally, NIASA may adapt your F/A actuator, modifying the different parts of it to your preferences.

Some examples are shown below.
See sub-section "Placing an order".

Immobilizations

The F Series electro-mechanical actuators, on request, can be supplied with the immobilized stem in rotation. This is achieved by mounting a key on the upper cap and machining a groove along the stem.

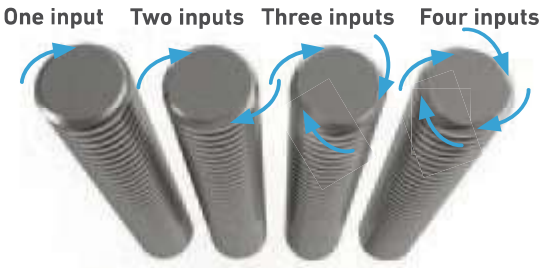


With this configuration, the scraper for the stem cannot be mounted on the front cap. To avoid the possible entry of particles or liquid through the stem, it is recommended to mount a bellow to protect it.

For further information, please contact the NIASA technical department.

Special configurations

At the customer's request, the linear actuators can be supplied with a screw of several inputs so that higher speeds can be obtained.



LINEAR ACTUATORS

F SERIES: STEEL TUBE | A SERIES: ALUMINUM TUBE

ORDER DESIGNATION

01 SIZE

F16 / A16
F20 / A20
F30 / A30
F40 / A40
F45
F50

02 CONFIGURATION

M100 Base
M205 In line motoreducer
M501 Parallel drive
M505 For drive at 90°
M601 Motoreducer at 90°
M605 In line motor

03 REDUCTION

Configuration M501
01 Reduction 1:1
02 Reduction 1:2
SR Special reduction

Configuration M205/M601
SR To be defined

Other configurations
00 No reduction

04 EQUIPMENT GENERAL PROTECTION

IPS Standard IP protection level
IPX Special IP protection level

05 SCREW TYPE (DIAMETER x PITCH)

TRS Trapezoidal
KGS Ball

06 STROKE

0000 Equipment usable stroke in mm

07 IMMOBILISATION IN ROTATION

00 No immobilization
01 Immobilized

Example	01	02	03	04	05
	F30	M205	SR	IPS	KGS3205

08 STEM FASTENING ACCESSORY

BPS Flange
GKS Single rod
GKB Double rod
GIR Ball joint
FES Special end fastening
000 No accessory

09 EXTERIOR TUBE FASTENING ACCESSORY

Actuator F
BB Trunnion mount with tipper studs
BH Trunnion mount with bearings

Actuator A
BA Trunnion mount

F/A Actuator
00 No accessory

10 TILT ACCESSORY

SB With tilt support
00 No tilt support

11 LIMIT SWITCH ACCESSORY

Actuator F
FCI Inductive limit switches
FCR Inductive limit switches with regulation

Actuator A
FCG Magnetic limit switches

F/A Actuator
000 No limit switches

12 STEM PROTECTION ACCESSORY

Actuator F
FB Bellow type protector

F/A Actuator
00 No protector

13 DRIVE ADAPTATION

Configuration M100/M505
VE Wheel
00 No adaptation

Configuration M205/M501/M601/M605
MK Default adaptation corresponding to configuration
MS Special adaptation
00 No adaptation

14 MOTOR (ONLY IF CONFIGURATION M205/M501/M605)

MK drive adaptation
080 Group size
A Power-1 / **B** Power-2

MS drive adaptation
1111 Non-standard drive

Both adaptations
0000 Without drive

15 LUBRICANT

GRA Standard lubricant
GRX Lubricant for low extreme temperatures
GRS Other lubricant

16 LUBRICATION ACCESSORIES

ERT Straight lubricator (standard F Series)
ETP Sealed lubrication cap (standard A Series)
AGR Automatic lubricating accessory
000 Other lubricating accessory

17 EQUIPMENT GENERAL COLOUR

RAZ Blue RAL5017 (standard F Series)
RGG Graphite grey RAL7024
RGP Silver grey RAL9006
RSP Special colour indicated by the customer
CIP Only grey 411 priming
000 Not painted (standard A Series)

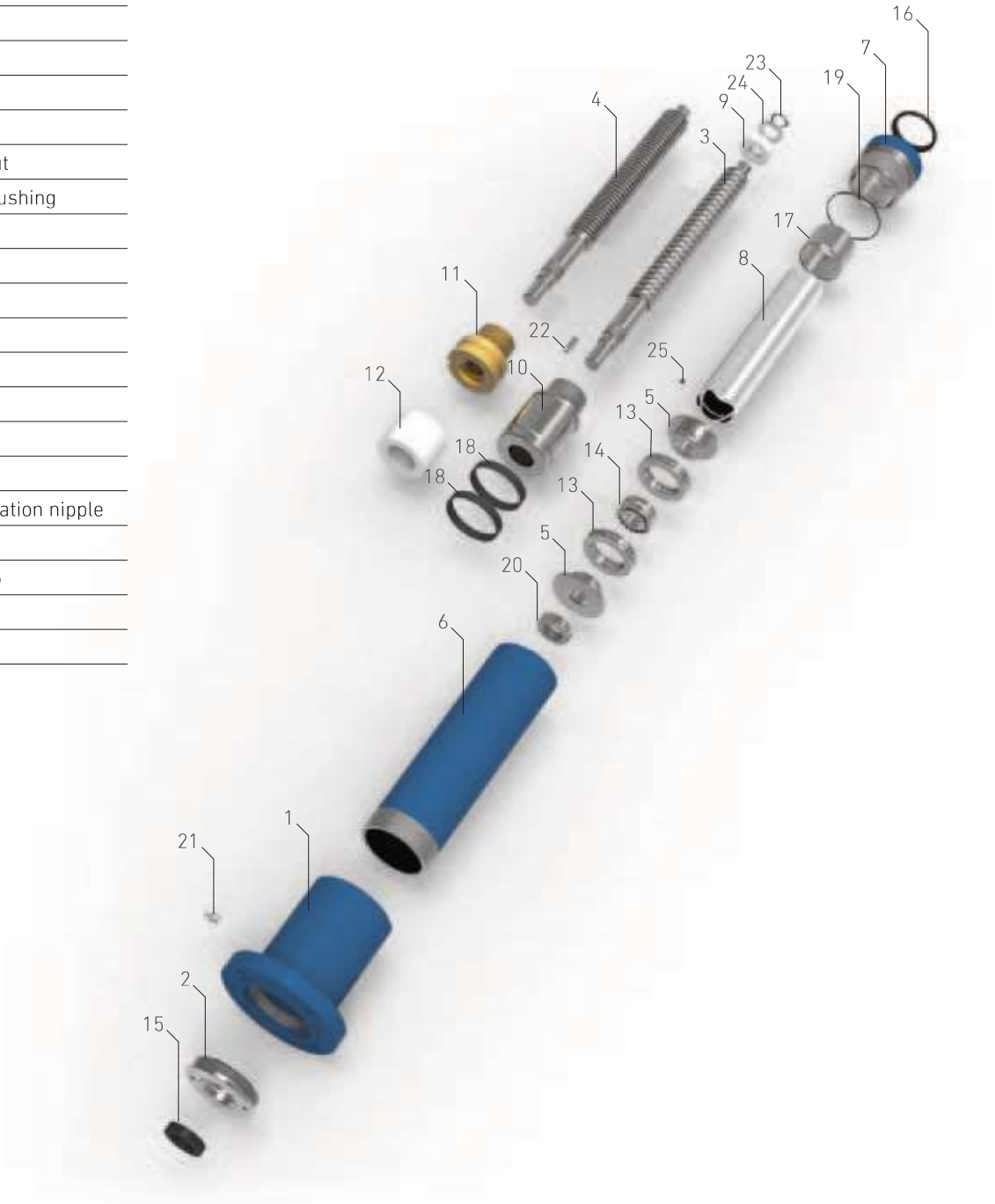
06	07	08	09	10	11	12	13	14	15	16	17
0300	00	BPS	00	SB	FCI	FB	MK	GR080A	GRA	ERT	RAZ

LINEAR ACTUATORS

F SERIES: STEEL TUBE | A SERIES: ALUMINUM TUBE

F SERIES DISASSEMBLED

	Name
01	Body
02	Back cap
03	Ball screw
04	Trapezoidal screw
05	Bearing-holder disc
06	Exterior tube
07	Front cap
08	Stem
09	Front support
10	Ball nut
11	Trapezoidal nut
12	Supplement bushing
13	Axial bearing
14	Radial bearing
15	Seal
16	Scraper
17	Bearing
18	Guide ring
19	O-Ring
20	Grooved nut
21	Straight lubrication nipple
22	Straight key
23	Exterior circlip
24	Flat washer
25	Flat stud



LINEAR ACTUATORS

F SERIES: STEEL TUBE | A SERIES: ALUMINUM TUBE

A SERIES DISASSEMBLED

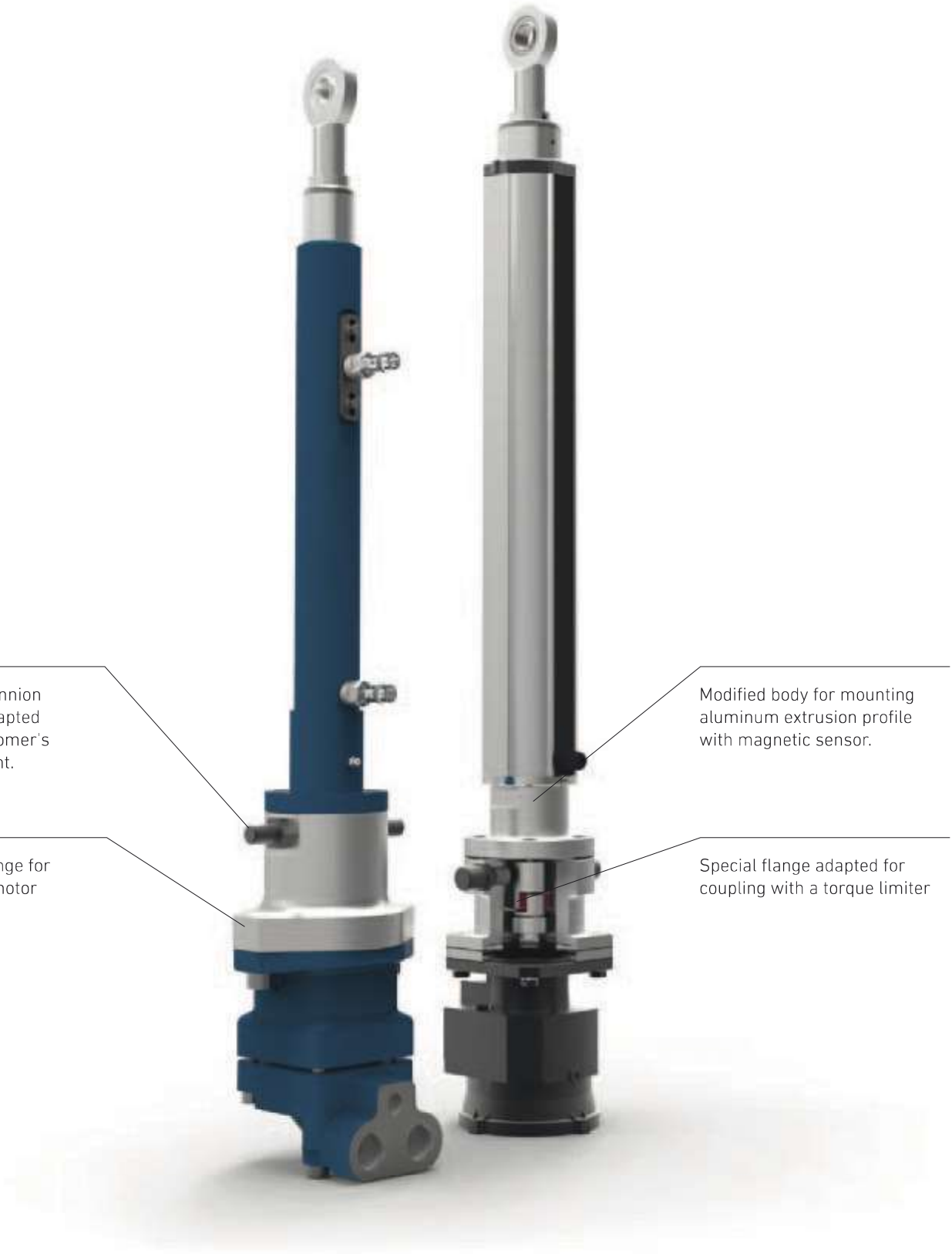
	Name
01	Exterior tube
02	Axial package support body
03	Posterior end carriage
04	Back cap
05	Front cap
06	Stem
07	Front support
08	Ball screw
09	Trapezoidal screw
10	Ball nut
11	Trapezoidal nut
12	Guide ring
13	Supplement bushing
14	Bearing-holder disc
15	Sealed joint
16	Profile closure band
17	Lubrication cap
18	Axial bearing
19	Radial bearing
20	Bearing
21	Seal
22	Scraper
23	Grooved nut
24	Flat washer
25	Exterior circlip
26	Straight key
27	Flat stud
28	Straight stud
29	Allen screw
30	Allen screw
31	O-Ring

LINEAR ACTUATORS

F SERIES: STEEL TUBE | A SERIES: ALUMINUM TUBE

SPECIAL CONFIGURATIONS

If the standard product range does not meet your requirements, please contact NIASA for modification to any unit. With complete safety, it will be adapted to your requirements.




Special size stem union adapted to customer's accessory
Compact unit, just 5 mm of safety margin in both directions
Special flange for coupling with a torque limiter
Special flange adapted to NEMA type servomotor
Flange adapted to motor flange defined by the customer.

03
LINEAR ACTUATORS WITH INTEGRATED REDUCTION AND CUBIC GEARBOX

FM Series: Steel tube
AM Series: Aluminum tube

“SUSTAINABILITY IS INDUSTRIALISED ECOLOGY.”

DAVID GARCÍA

HOME-THERME

NIASA ACTUATORS IN THE TONOPAH THERMO-SOLAR PLANT, NEVADA, USA.

LINEAR ACTUATORS

WITH INTEGRATED REDUCTION AND CUBIC GEARBOX. FM SERIES: STEEL TUBE | AM SERIES: ALUMINUM TUBE

INTRODUCTION

NIASA FM/AM Series electro-mechanical actuators combine the sleeve and stem system of the F/A Series linear actuators with the gearbox of the screw jacks, thus obtaining the most interesting features of both types of product.

This way, the FM/AM Series electro-mechanical actuators become the optimal technical solution for applications that require the movement specifications of a screw jack, with the additional advantage of being able to work under the most demanding environmental conditions.

Their main advantages against other systems, such as pneumatic or hydraulic cylinders, are the following:

- ... Greater movement and positioning precision.
- ... Greater safety, due to its irreversibility in many configurations (ask NIASA) and/or the incorporation of different braking devices.
- ... Superior energy efficiency, as their parts offer high/very high performance, especially with the ball screws, low transmission ratios and high speeds.
- ... Easier and faster assembly, since hydraulic or pneumatic groups are not required, just an electric motor on the unit itself.
- ... Greater reliability and duration, and less maintenance, due to the mechanical robustness and construction simplicity.
- ... Modular design and the possibility to operate in multiple positions.
- ... Easier to obtain synchronized advance movements of several actuators, including under different loads.
- ... Lower size for the same load capacity.
- ... ...

The screw supports also characterized for offering an extensive range of:

- ... Axial load capacities, from 5 kN up to 250 kN.
- ... Advance speeds; depending on the screw pitch and the gearbox, two possible reductions are offered depending on the size of the actuator, from 4:1 to 40:1.
- ... Trapezoidal and ball screws, depending on the performance required, precision of movement and positioning, etc.
- ... Fastening accessories and elements, for optimal adaptation to the most varied systems that may be designed.
- ... Control and safety systems (mechanical/inductive limit switches, absolute/incremental encoders, etc.).
- ... Materials and surface coverings, depending on the environmental conditions in which the unit will be installed.
- ... Two types of external sleeve for the stem:
  - · Steel round tube.
  - · Aluminum extrusion profile (magnetic sensors, anti-rotation system).
- ... ...

Please do not hesitate to contact NIASA if you require FM/AM actuators (and their drive mechanisms) with specifications other than those covered in this chapter. The NIASA technical department will specifically develop the special units that best meet your requirements.


M-3
M-3

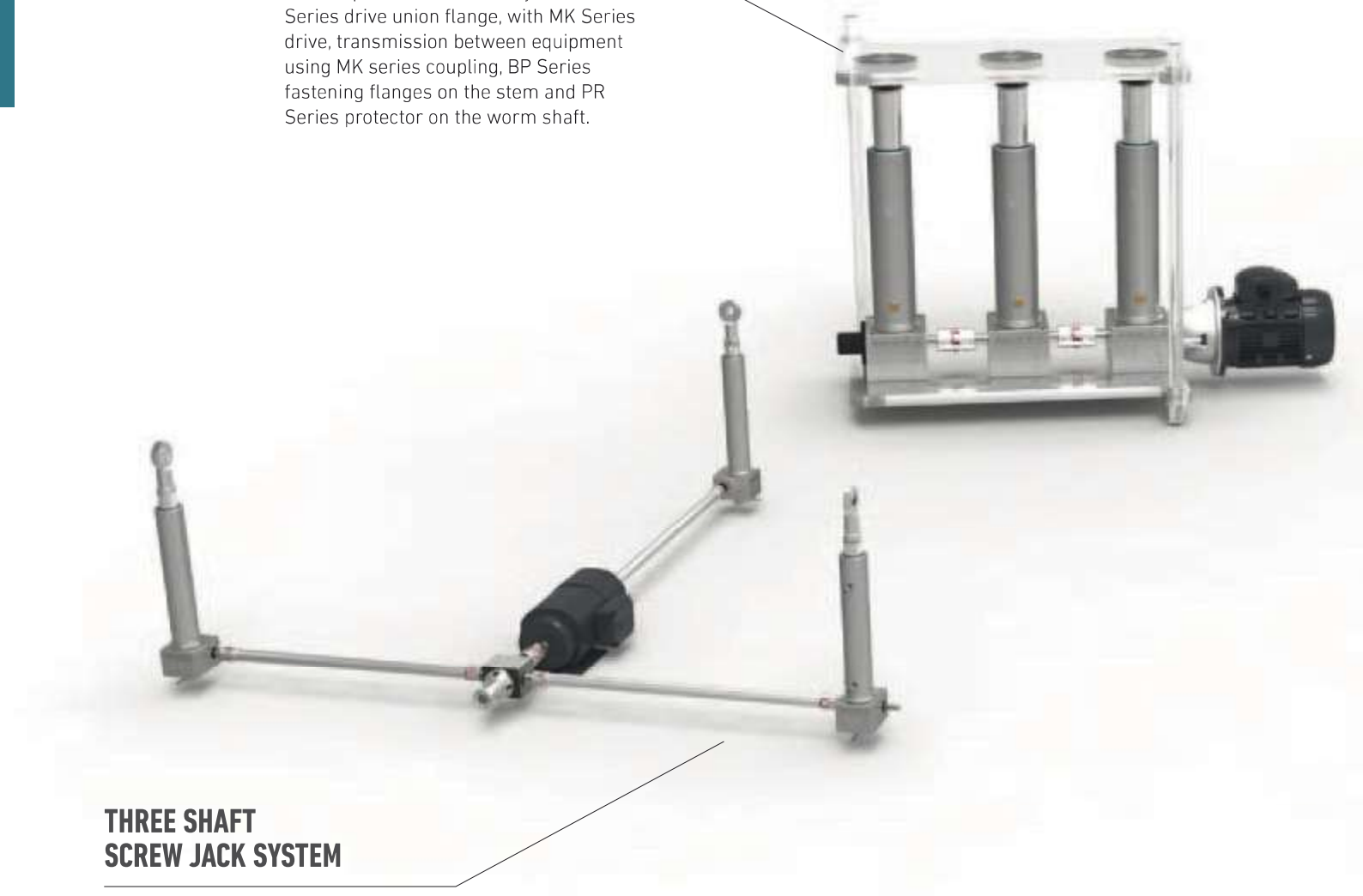
LINEAR ACTUATORS

WITH INTEGRATED REDUCTION AND CUBIC GEARBOX. FM SERIES: STEEL TUBE | AM SERIES: ALUMINUM TUBE

APPLICATIONS

PRESS TYPE SYSTEM

Three FM3 Series actuators made up of a three-phase motor drive system, MK Series drive union flange, with MK Series drive, transmission between equipment using MK series coupling, BP Series fastening flanges on the stem and PR Series protector on the worm shaft.



THREE SHAFT SCREW JACK SYSTEM

Three FM3 series actuators made up of a double-shaft, three-phase drive system, transmission between units with EZ series joint shafts, FCI series inductive sensor with a position encoding system underneath the gearbox, bevel gearbox with encoder adapted and GIR series ball with joint fastening on the stem.

CONVEYOR BELT ELEVATION SYSTEM

Two FJ1 Series actuators made up of a three-phase drive system with brake, MK Series drive union flange, transmission between units with EZ Series joint shafts, support structure with protection for the transmission shaft, GIR series ball joint on the stem and HFM Series gearbox fastening.

ELEVATION SYSTEM WITH INTEGRATED MAGNETIC SENSOR.

Two AM2 Series actuators made up of a three-phase motor drive system, drive union flange, transmission between units with EZ Series joint shafts, exterior aluminum tube with anti-turning system and an FCG Series integrated magnetic sensor, tilt fastening on the BA Series tube, GKB Series ball joint fastening on the stem.

LINEAR ACTUATORS

WITH INTEGRATED REDUCTION AND CUBIC GEARBOX. FM SERIES: STEEL TUBE | AM SERIES: ALUMINUM TUBE

SIZES

There are trapezoidal and ball screw options on all the sizes (see chapter on screws for further information), as well as normal speed (S) and slow speed (H) gearboxes.

	M1	M2	M3
Up to	5 kN	10 kN	25 kN
F Steel exterior tube	 page 122	 page 123	 page 124
A Aluminum exterior tube With anti-rotation on the stem (optional) With magnetic sensor integrated on the aluminum tube (optional)	 page 122	 page 123	 page 124

In addition to the standard range of linear actuators, NIASA can specifically develop the unit that best meets your application requirements. Contact NIASA.

IMPORTANT All the technical data included in this chapter correspond to the configuration with steel tube and to the aluminum tube configuration.
For further information about the latter, please contact the NIASA technical department.

M4	M5	J1	J3
50 kN	100 kN	150 kN	250 kN
			
page 125	page 126	page 127	page 128
			
page 125			

LINEAR ACTUATORS

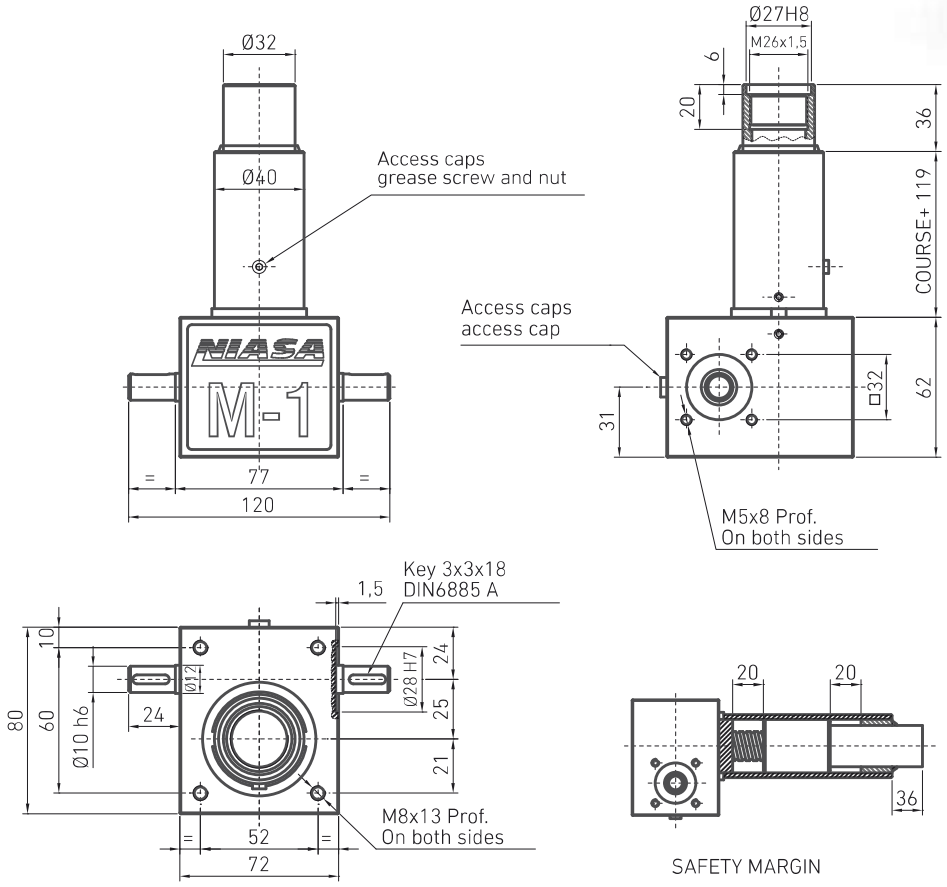
WITH INTEGRATED REDUCTION AND CUBIC GEARBOX. FM SERIES: STEEL TUBE | AM SERIES: ALUMINUM TUBE

GENERAL PRODUCT OVERVIEW


13
12
11
10
3
2
Steel exterior tube
22
Aluminium exterior tube
24
24
25
22
25
1
15
14
26
27
28

FM1/AM1 LINEAR ACTUATOR

UP TO 5 kN



Diameter and step screw (mm)	Maximum axial strength (kN)	Reduction		Advance (mm/revol. input)		Performance (%)		Drive torque, M_D (Nm)		Start-up torque, M_0 (Nm)		Weight stroke 0 (kg)	Approx. weight each 100 mm of stroke (kg)
								F (kN), load to move in dynamic					
		S	H	S	H	S	H	S	H	S	H		
Tr 16x4	5	4:1	16:1	1.00	0.25	35	27	(0,46xF)+0.17	(0,15xF)+0.08	0.80xF	0.34xF	1.8	0.5
KGS 1605	5	4:1	16:1	1.25	0.31	71	56	(0.28xF)+0.14	(0.09xF)+0.08	0.39xF	0.16xF	1.8	0.5

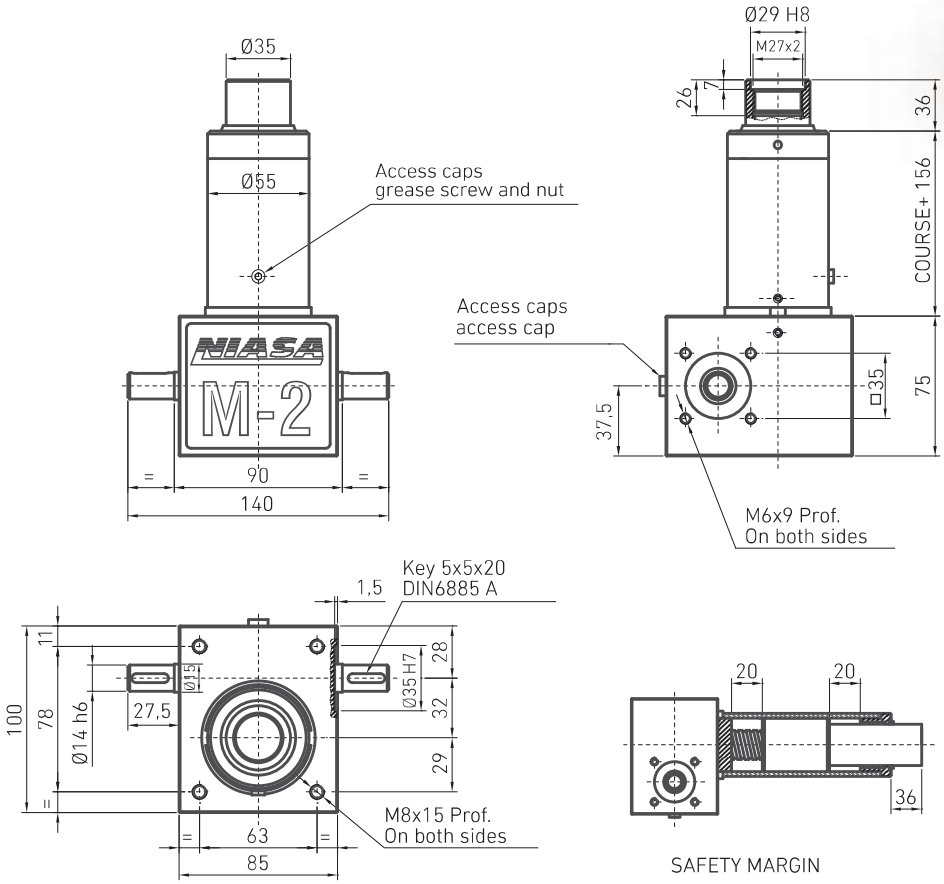
... Power required: P_D (kW) = 0,157x M_D (Nm).

... All the data in the table correspond to an input speed of 1,500 rpm. For other speeds, please see the calculation chapter (page 130).

Ensure that the application's dynamic load does not exceed the critical values indicated, in order to avoid overheating of the unit and buckling and resonance. See calculations chapter (page 130).

FM2/AM2 LINEAR ACTUATOR

UP TO 10 kN

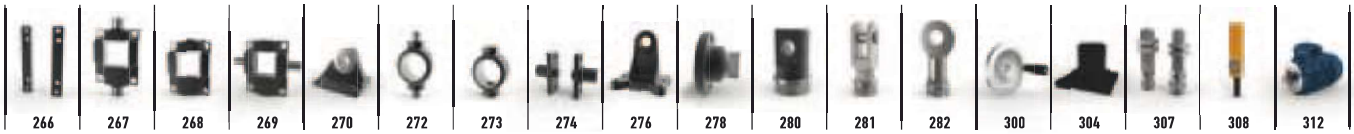


Diameter and step screw (mm)	Maximum axial strength (kN)	Reduction		Advance (mm/revol. input)		Performance (%)		Drive torque M_D (Nm)		Start-up torque, M_0 (Nm)		Weight stroke 0 (kg)	Approx. weight each 100 mm of stroke (kg)
								F (kN), load to move in dynamic					
		S	H	S	H	S	H	S	H	S	H		
Tr 24x5	10	4:1	16:1	1.25	0.31	0.31	0.25	(0.64xF)+0.35	(0.20xF)+0.17	1.11xF	0.43xF	4.6	1
KGS 2005	10	4:1	16:1	1.25	0.31	0.72	0.58	(0.28xF)+0.33	(0.09xF)+0.17	0.39xF	0.15xF	4.6	1
KGS 2020	7.5	4:1	16:1	5.00	1.25	0.72	0.58	(1.10xF)+0.33	(0.35xF)+0.17	1.55xF	0.6xF	4.6	1

... Power required: P_D (kW) = 0,157x M_D (Nm).

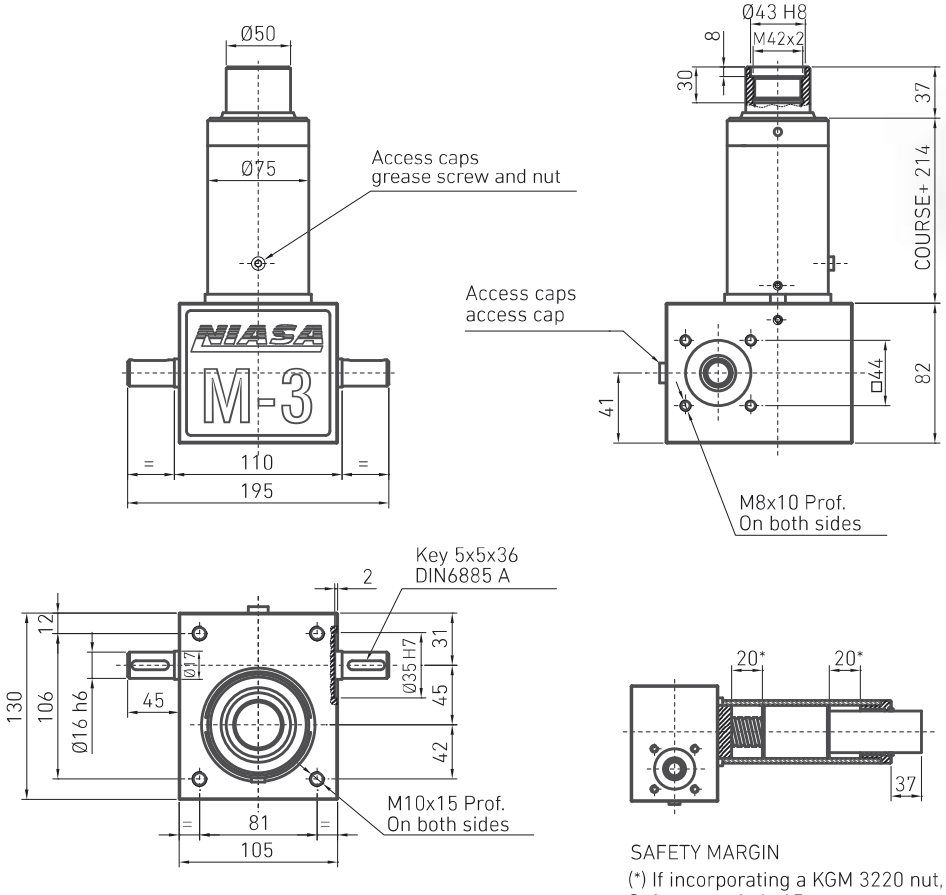
... All the data in the table correspond to an input speed of 1,500 rpm. For other speeds, please see the calculation chapter (page 130).

... Ensure that the application's dynamic load does not exceed the critical values indicated, in order to avoid overheating of the unit and buckling and resonance. See calculations chapter (page 130).



FM3/AM3 LINEAR ACTUATOR

UP TO 25 kN



Diameter and step screw (mm)	Maximum axial strength (kN)	Reduction		Advance (mm/revol. input)		Performance (%)		Drive torque M_D (Nm)		Start-up torque, M_0 (Nm)		Weight stroke 0 (kg)	Approx. weight each 100 mm of stroke (kg)
								F (kN), load to move in dynamic					
		S	H	S	H	S	H	S	H	S	H		
Tr 36x6	25	6:1	24:1	1.00	0.25	0.28	0.22	(0.58xF)+0.57	(0.18xF)+0.31	1.04xF	0.4xF	12	2.1
KGS 3205	20	6:1	24:1	0.83	0.21	0.73	0.58	(0.18xF)+0.52	(0.06xF)+0.29	0.26xF	0.11xF	12	2.1
KGS 3210	25	6:1	24:1	1.67	0.42	0.73	0.58	(0.36xF)+0.52	(0.12xF)+0.29	0.52xF	0.21xF	12	2.1
KGS 3220	20	6:1	24:1	3.33	0.83	0.73	0.58	(0.73xF)+0.52	(0.23xF)+0.29	1.03xF	0.42xF	12	2.1
KGS 3240	10	6:1	24:1	6.67	1.67	0.73	0.58	(1.46xF)+0.52	(0.46xF)+0.29	2.07xF	0.84xF	12	2.1

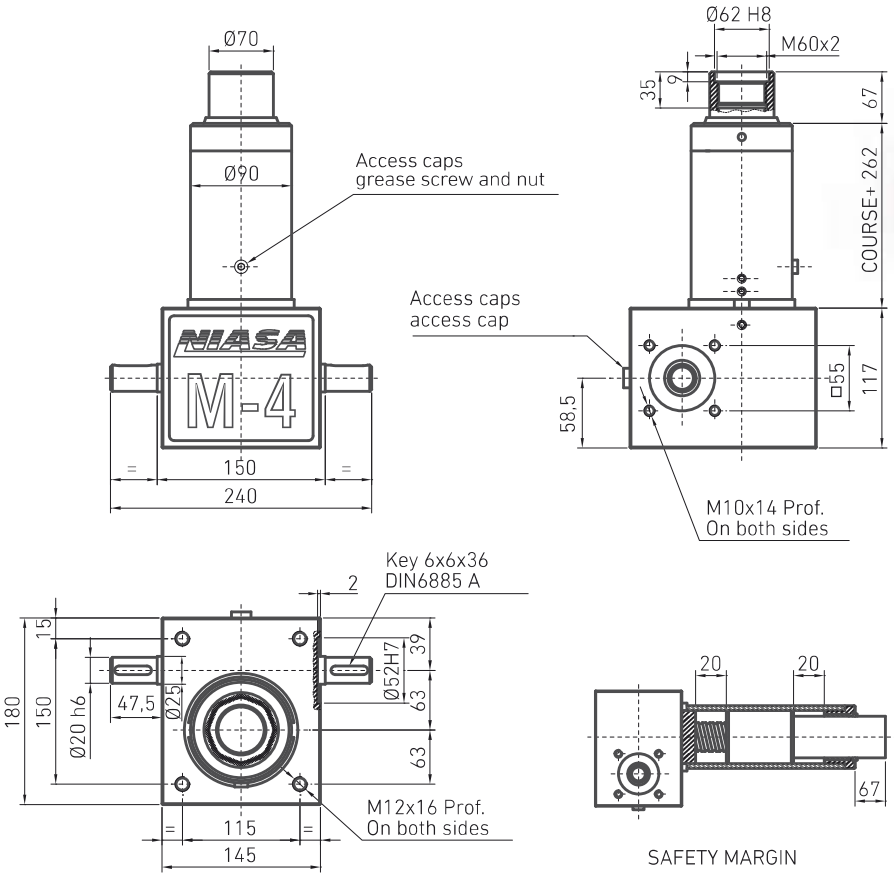
... Power required: P_D (kW) = 0,157x M_D (Nm).

... All the data in the table correspond to an input speed of 1,500 rpm. For other speeds, please see the calculation chapter (page 130).

... Ensure that the application's dynamic load does not exceed the critical values indicated, in order to avoid overheating of the unit and buckling and resonance. See calculations chapter (page 130).

FM4/AM4 LINEAR ACTUATOR

UP TO **50 kN** TRAPEZ. KGS BALLS



Diameter and step screw (mm)	Maximum axial strength (kN)	Reduction		Advance (mm/revol. input)		Performance (%)		Drive torque, M_D (Nm) F (kN), load to move in dynamic		Start-up torque, M_0 (Nm)		Weight stroke 0 (kg)	Approx. weight each 100 mm of stroke (kg)
		S	H	S	H	S	H	S	H	S	H		
Tr 45x7	50	7:1	28:1	1.00	0.25	0.26	0.21	(0.61xF)+0.97	(0.19xF)+0.57	1.18xF	0.44xF	27.3	3.3
KGS 4010	42	7:1	28:1	1.43	0.36	0.73	0.60	(0.31xF)+0.93	(0.09xF)+0.56	0.45xF	0.18xF	27.3	3.3
KGS 4020	37	7:1	28:1	2.86	0.71	0.73	0.60	(0.62xF)+0.93	(0.19xF)+0.56	0.9xF	0.36xF	27.3	3.3
KGS 4040	35	7:1	28:1	5.71	1.43	0.73	0.60	(1.25xF)+0.93	(0.38xF)+0.56	1.8xF	0.72xF	27.3	3.3

... Power required: P_D (kW) = 0,157x M_D (Nm).

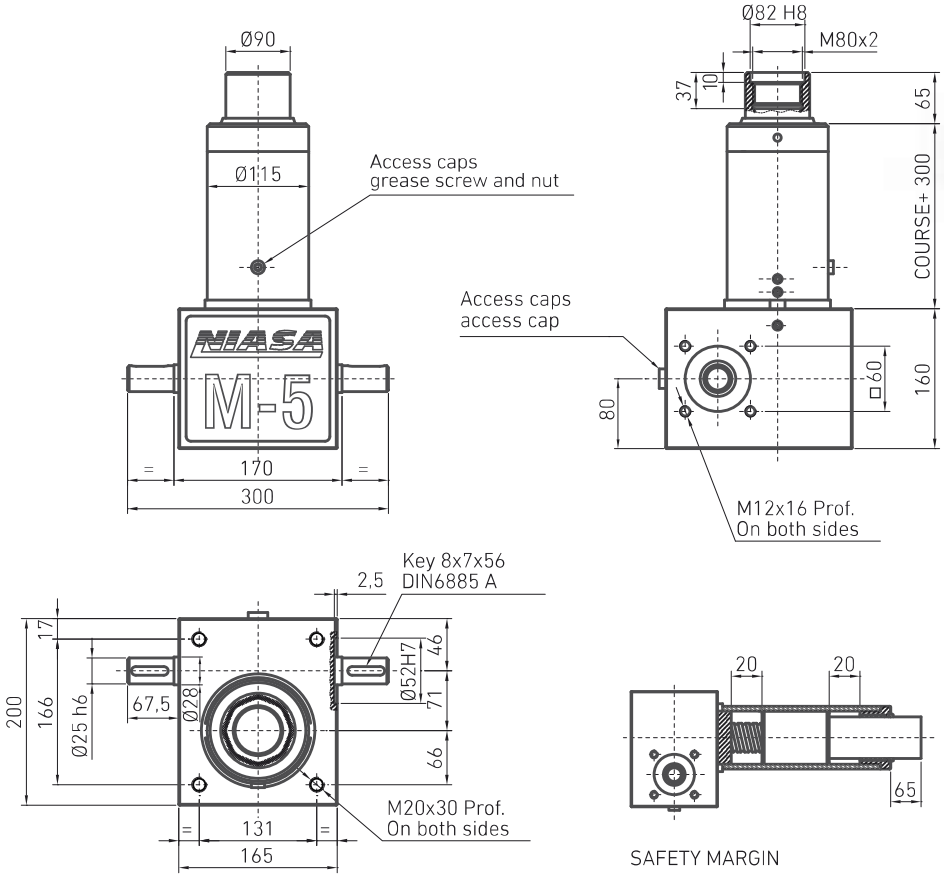
... All the data in the table correspond to an input speed of 1,500 rpm. For other speeds, please see the calculation chapter (page 130).

... Ensure that the application's dynamic load does not exceed the critical values indicated, in order to avoid overheating of the unit and buckling and resonance. See calculations chapter (page 130).

FM5 LINEAR ACTUATOR

UP TO 100 kN

The capacity indicated corresponds to the basic configuration. There is a possibility for higher capacities on request.



Diameter and step screw (mm)	Maximum axial strength (kN)	Reduction		Advance (mm/revol. input)		Performance (%)		Drive torque, M_D (Nm)		Start-up torque, M_0 (Nm)		Weight stroke 0 (kg)	Approx. weight each 100 mm of stroke (kg)
								F (kN), load to move in dynamic					
		S	H	S	H	S	H	S	H	S	H		
Tr 50x8	100	9:1	36:1	0.89	0.22	0.27	0.21	(0.53xF)+1.91	(0.17xF)+1.08	0.98xF	0.39xF	45.2	4.9
KGS 5010	65	9:1	36:1	1.11	0.28	0.73	0.58	(0.24xF)+1.87	(0.08xF)+1.07	0.36xF	0.15xF	45.2	4.9

... Power required: P_D (kW) = 0,157x M_D (Nm).

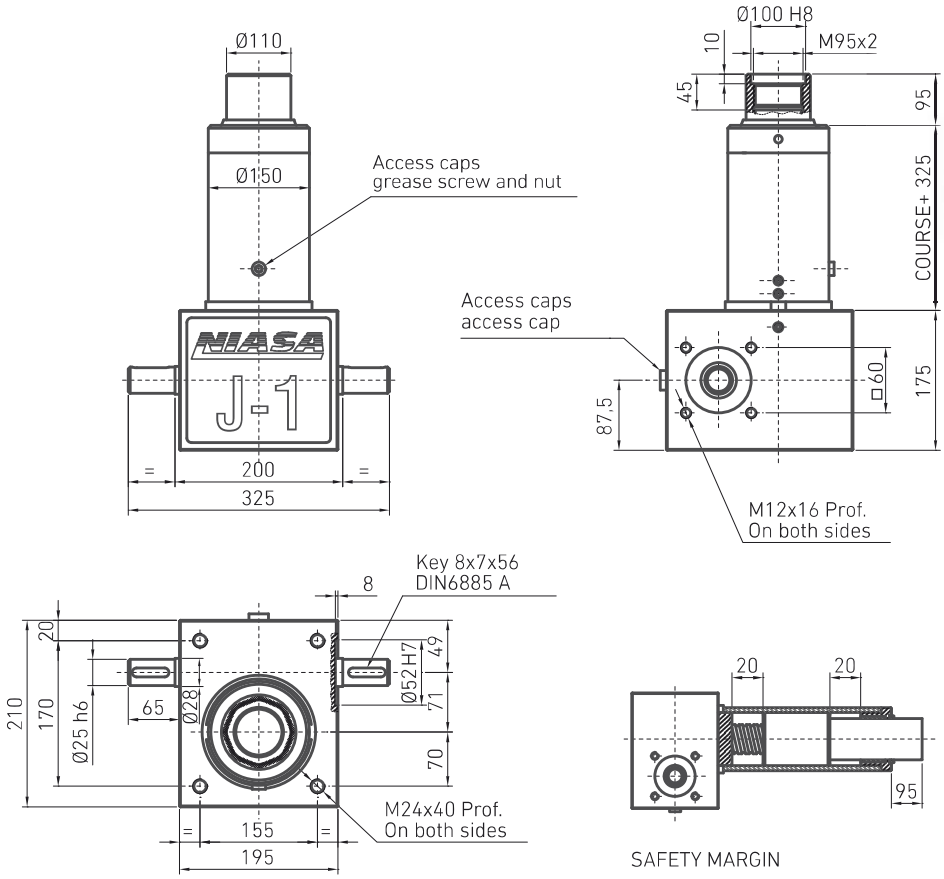
... All the data in the table correspond to an input speed of 1,500 rpm. For other speeds, please see the calculation chapter (page 130).

... Ensure that the application's dynamic load does not exceed the critical values indicated, in order to avoid overheating of the unit and buckling and resonance. See calculations chapter (page 130).

FJ1 LINEAR ACTUATOR

UP TO 150 kN

The capacity indicated corresponds to the basic configuration. There is a possibility for higher capacities on request.



Diameter and step screw (mm)	Maximum axial strength (kN)	Reduction		Advance (mm/revol. input)		Performance (%)		Drive torque, M_D (Nm)		Start-up torque, M_0 (Nm)		Weight stroke 0 (kg)	Approx. weight each 100 mm of stroke (kg)
								F (kN), load to move in dynamic					
		S	H	S	H	S	H	S	H	S	H		
Tr 70x10	150	9:1	36:1	1.11	0.28	0.24	0.18	(0.73xF)+2.3	(0.24xF)+1.21	1.31xF	0.49xF	84.8	9
KGS 6310	65	9:1	36:1	1.11	0.28	0.73	0.55	(0.24xF)+1.97	(0.08xF)+1.19	0.33xF	0.14xF	86.8	9

... Power required: P_D (kW) = 0,157x M_D (Nm).

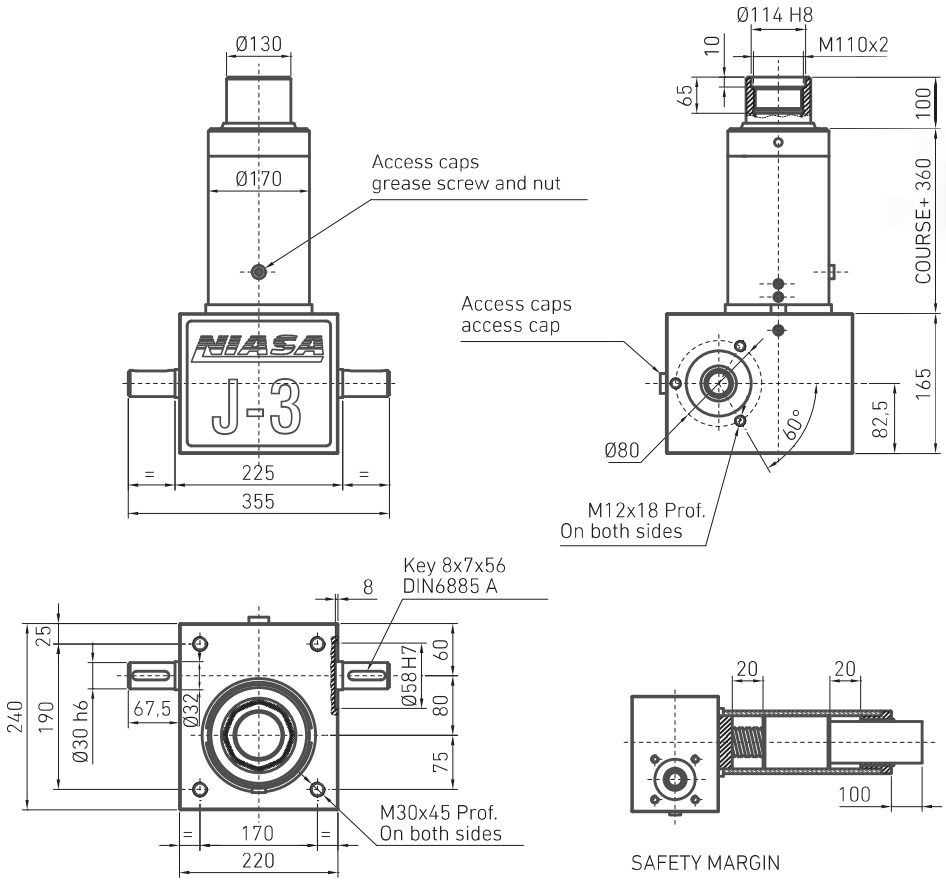
... All the data in the table correspond to an input speed of 1,500 rpm. For other speeds, please see the calculation chapter (page 130).

... Ensure that the application's dynamic load does not exceed the critical values indicated, in order to avoid overheating of the unit and buckling and resonance. See calculations chapter (page 130).

FJ3 LINEAR ACTUATOR

UP TO 250 kN

Contact versions with ball screw.



Diameter and step screw (mm)	Maximum axial strength (kN)	Reduction		Advance (mm/revol. input)		Performance (%)		Drive torque, M_D (Nm)		Start-up torque, M_0 (Nm)		Weight stroke 0 (kg)	Approx. weight each 100 mm of stroke (kg)
								F (kN), load to move in dynamic					
		S	H	S	H	S	H	S	H	S	H		
Tr 80x10	250	10:1	40:1	1.00	0.25	0.22	0.19	(0.73xF)+2.81	(0.21xF)+1.95	1.18xF	0.4xF	100	14

... Power required: P_D (kW) = 0,157x M_D (Nm).

... All the data in the table correspond to an input speed of 1,500 rpm. For other speeds, please see the calculation chapter (page 130).

... Ensure that the application's dynamic load does not exceed the critical values indicated, in order to avoid overheating of the unit and buckling and resonance. See calculations chapter (page 130).

LINEAR ACTUATORS

WITH INTEGRATED REDUCTION AND CUBIC GEARBOX. FM SERIES: STEEL TUBE | AM SERIES: ALUMINUM TUBE

PRODUCT SELECTION

To select the correct FM/AM Series linear actuator, please follow this flow diagram.

If you would like to know the expected service life of a unit for your application, please send the relevant data to the NIASA service department.

1 FM/AM ACTUATOR MODEL AND SIZE DEFINITION

APPLICATION

STEEL TUBE (FM) Page 118 Page 118 ALUMINIUM TUBE (AM)

SIZE PRE-SELECTION Page 118

2 SCREW AND REDUCTION TYPE DEFINITION

SCREW TYPE Page 122

BALL (KGS)
TRAPEZOIDAL (Tr)
SPECIAL

Page 122 REDUCTION

NORMAL (S)
REDUCED (H)

3 DRIVE TORQUE AND POWER CALCULATION

INDEPENDENT ACTUATOR

Page 130

TORQUE AND POWER CALCULATION

Page 136

STANDARD DRIVE

ACTUATOR SYSTEM

TORQUE AND POWER CALCULATION Page 130

SPECIAL DRIVE

4 ADDITIONAL CONFIGURATION AND ACCESSORIES

ADDITIONAL CONFIGURATION

- Stem sides
- Input shaft
- Lubrication
- Corrosion protection
- Sealing
- Ambient temperature
- ...

Page 137

ACCESSORIES Page 260

5 PLACING AN ORDER

PLACING AN ORDER Page 140

6 DESIGN VALIDATION (NIASA)

SIZE VALIDATION AND CONFIGURATION

BUCKLING | LATERAL LOADS | RESONANCE | OVER-HEATING | ...

SIZE CONFIRMATION

RE-SIZING PROPOSAL

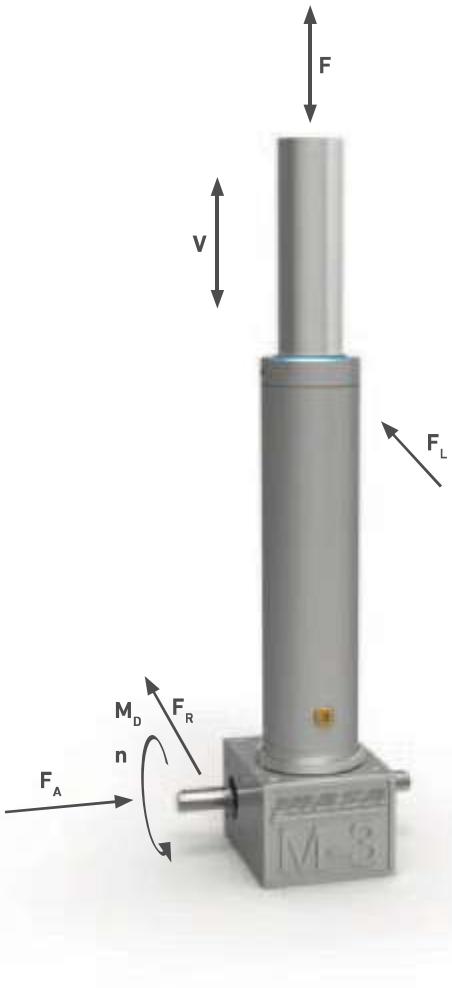
LINEAR ACTUATORS

WITH INTEGRATED REDUCTION AND CUBIC GEARBOX. FM SERIES: STEEL TUBE | AM SERIES: ALUMINUM TUBE

PRODUCT SELECTION

FORCE AND TORQUE ACTING ON AN FM /AM SERIES ACTUATOR

F Load to move at traction and/or compression.
F_L Lateral load on the stem.
V Stem travel speed.
F_A Axial load on the input shaft.
F_R Radial load on the input shaft.
M_D Torque on the input shaft.
n Speed on the input shaft.



TORQUE AND POWER OF A LINEAR ACTUATOR INDEPENDENT FM/AM SERIES

After pre-selecting the suitable FM/AM Series linear actuator for the application, select the drive motor following the steps below:

1. DRIVE TORQUE

$$M_D\ (Nm) = \frac{F \times P}{2 \times \pi \times 0.9 \times \eta_{DG} \times \eta_{DS} \times i} + M_i$$

M_D Drive torque (kN)
F Load to move in dynamic (kN)
P Screw pitch (mm)
M_i Idle torque (Nm)
i Actuator reduction
0.9 Cylinder dynamic efficiency
η_{DG} Gearbox dynamic efficiency
η_{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 2; the smaller the installation the higher the coefficient

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

3. START-UP TORQUE

For loads between 25% and 100% of the actuator's nominal value, calculate the start-up torque with this formula:

$$M_0\ (Nm) = \frac{F \times P}{2 \times \pi \times 0.9 \times \eta_{SA} \times i}$$

η_{SA} Actuator static efficiency (gearbox + screw)

IMPORTANT

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

η_{DG} Gearbox dynamic efficiency

S gearbox version (normal speed)

input rpm	FM1/ AM1	FM2/ AM2	FM3/ AM3	FM4/ AM4	FM5	FJ1	FJ3
3,000	0.91	0.90	0.92		Non-standard		
1,500	0.88	0.89	0.90	0.90	0.90	0.90	0.90
1000	0.87	0.88	0.88	0.88	0.87	0.89	0.89
750	0.85	0.87	0.87	0.87	0.86	0.88	0.89
500	0.84	0.85	0.85	0.85	0.84	0.87	0.88
100	0.79	0.79	0.79	0.79	0.78	0.81	0.84

H gearbox version (slow speed)

input rpm	FM1/ AM1	FM2/ AM2	FM3/ AM3	FM4/ AM4	FM5	FJ1	FJ3
3,000	0.75	0.77	0.76		Non-standard		
1,500	0.69	0.71	0.71	0.74	0.72	0.68	0.77
1000	0.67	0.69	0.68	0.69	0.67	0.67	0.76
750	0.64	0.66	0.67	0.68	0.65	0.65	0.75
500	0.61	0.64	0.63	0.64	0.62	0.64	0.74
100	0.54	0.56	0.54	0.55	0.53	0.55	0.66

η_{DS} Screw dynamic efficiency

Trapezoidal screw (Tr)						
16x4	24x5	36x6	45x7	50x8	70x10	80x10
0.44	0.39	0.34	0.32	0.33	0.30	0.27

Ball screw (KGS)
0.9 (for all sizes)

M_i Idle Torque

S gearbox version (normal speed)

	FM1/ AM1	FM2/ AM2	FM3/ AM3	FM4/ AM4	FM5	FJ1	FJ3
Trapezoidal	0.17	0.35	0.57	0.97	1.91	2.03	2.81
Balls	0.14	0.33	0.52	0.93	1.87	1.97	2.75

H gearbox version (slow speed)

	FM1/ AM1	FM2/ AM2	FM3/ AM3	FM4/ AM4	FM5	FJ1	FJ3
Trapezoidal	0.08	0.17	0.31	0.57	1.08	1.21	1.95
Balls	0.08	0.17	0.29	0.56	1.07	1.19	1.94

η_{SA} Actuator static efficiency

S gearbox version (normal speed)

	FM1/ AM1	FM2/ AM2	FM3/ AM3	FM4/ AM4	FM5	FJ1	FJ3
Trapezoidal	0.22	0.20	0.17	0.15	0.16	0.15	0.15
Balls	0.57	0.57	0.57	0.56	0.55	0.59	0.64

H gearbox version (slow speed)

	FM1/ AM1	FM2/ AM2	FM3/ AM3	FM4/ AM4	FM5	FJ1	FJ3
Trapezoidal	0.13	0.13	0.11	0.10	0.10	0.10	0.11
Balls	0.35	0.37	0.35	0.35	0.32	0.36	0.45

IMPORTANT

- ... The values indicated in the tables correspond to the lubrication conditions established by NIASA, 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.

LINEAR ACTUATORS

WITH INTEGRATED REDUCTION AND CUBIC GEARBOX. FM SERIES: STEEL TUBE | AM SERIES: ALUMINUM TUBE

PRODUCT SELECTION

DESIGNING INSTALLATIONS WITH FM/AM SERIES LINEAR ACTUATORS

For the application of FM/AM Series linear actuators in installations with several units, the following criteria must be taken into account:

1. Define the number, position and orientation of the equipment.

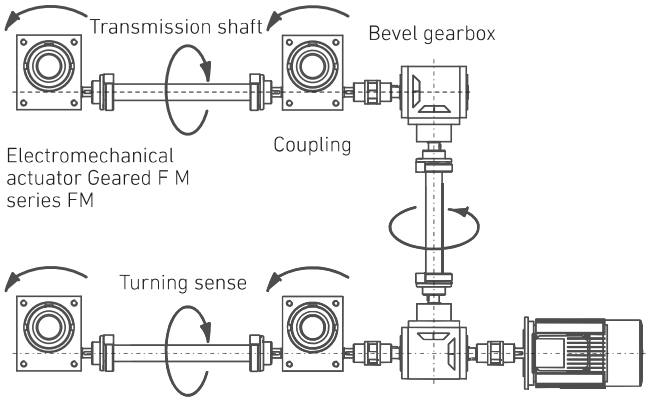
2. Select the drag components (couplings, transmission shafts, supports, bevel gearboxes, motors, etc.) taking the following recommendations into account:

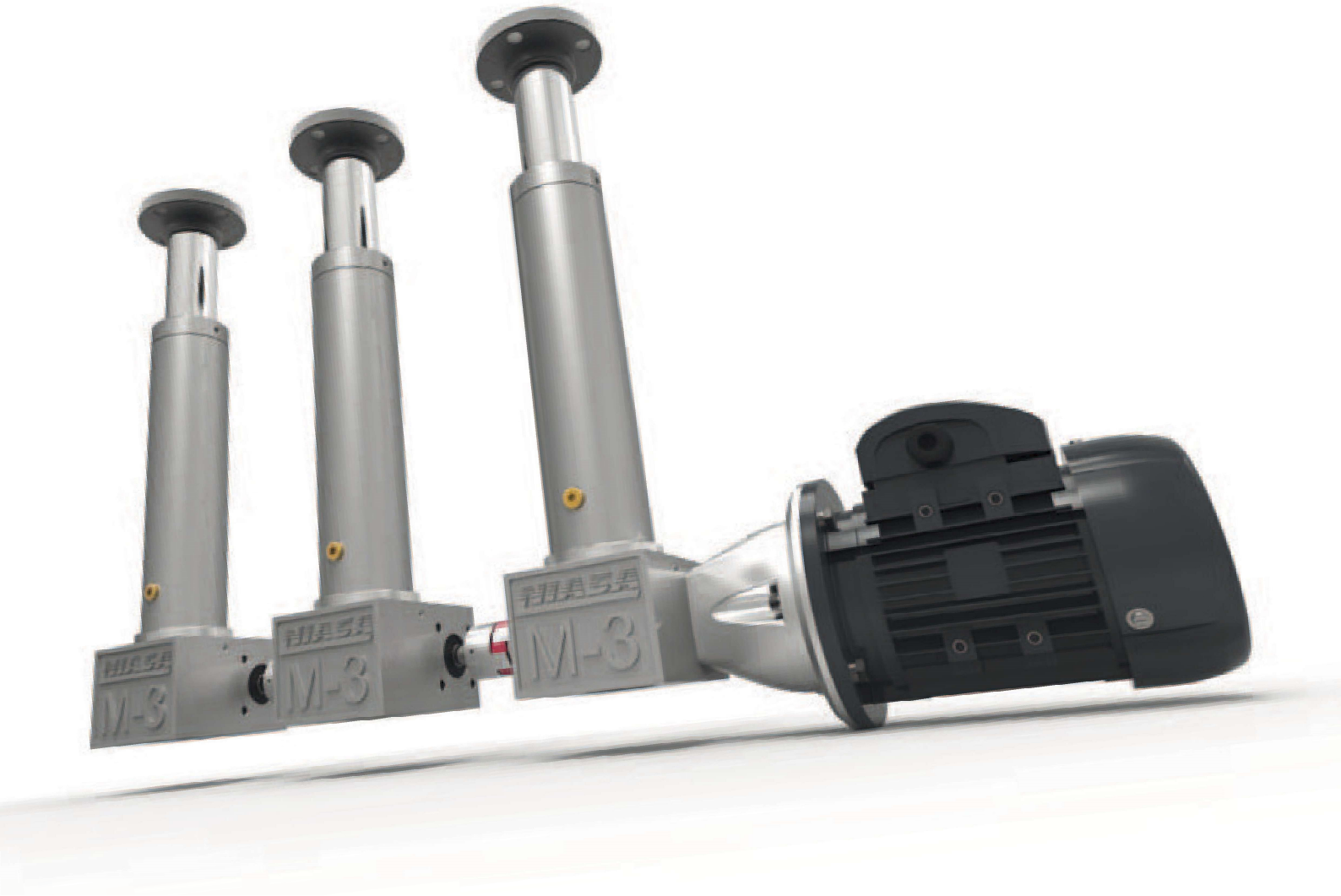
- ... Ensure that the total load is distributed uniformly between all the installation's actuators.
- ... The lowest possible number of transmission parts is recommended.
- ... The transmission shafts should be as short as possible.
- ... Try to protect the overall installation with a safety torque limiter.

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

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

Example:
Elevation system with four FM linear actuators and two bevel gearboxes.

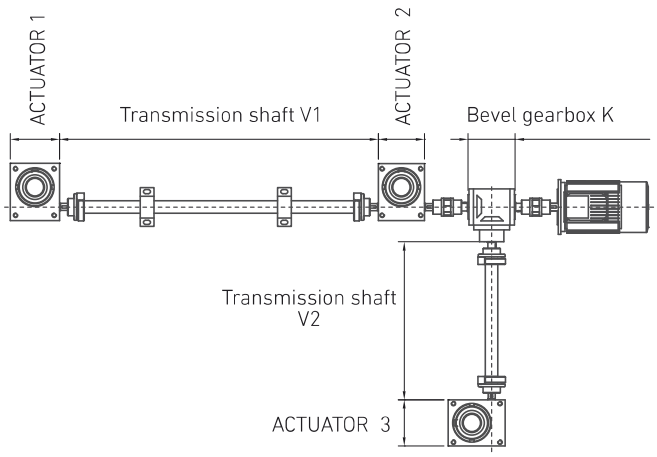



M-3
M-3
M-3

DRIVE TORQUE OF AN FM/AM SERIES LINEAR ACTUATOR SYSTEM

The drive torque of a system made up of several FM/AM Series linear actuators 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.

Example:



1. SYSTEM DRIVE TORQUE

$$M_{DS}\ (Nm) = \frac{M_{D1}}{\eta_{V1}} + M_{D2} + \left(\frac{M_{D3}}{\eta_{V2}} \times \frac{1}{\eta_k}\right)$$

$M_{D1}/M_{D2}/M_{D3}$	Actuator drive torque 1 / 2 / 3 (Nm)
η_{V1}/η_{V2}	Gearbox efficiency V1/V2 (0.90-0.95 approx.)
η_K	Bevel 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 following formula.

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

$$M_{DS}\ (Nm) = M_D + f_S$$

M_D	Independent elevator drive torque
f_S	Factor, according to 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:

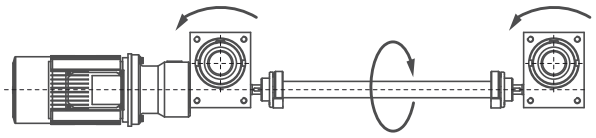
$$M_{DS}\ (Nm) = \frac{M_{DS}}{\eta_{SA}}$$

M_{DS}	System drive torque (Nm)
η_{SJ}	Elevator static efficiency

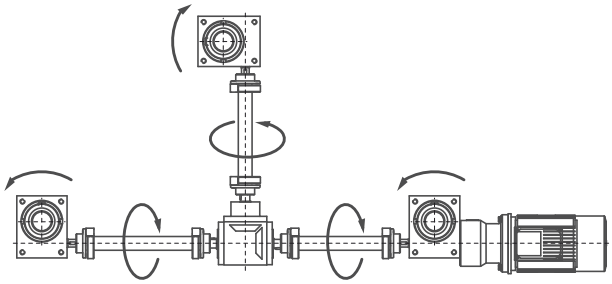
IMPORTANT

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

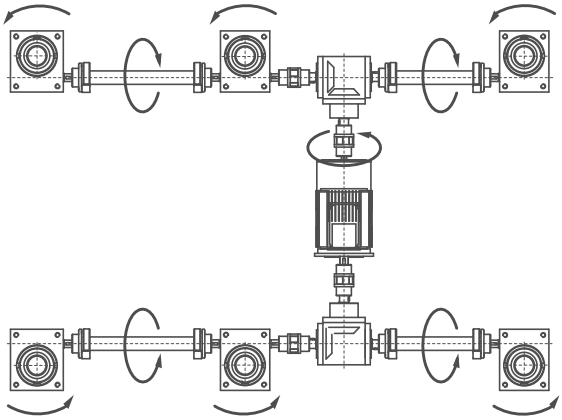
f_S = 2.1



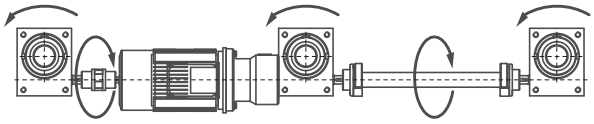
f_S = 3.34



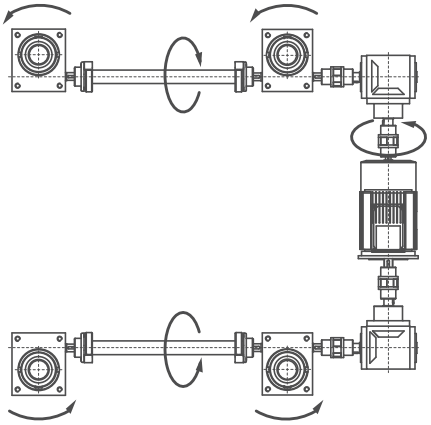
f_S = 6.8



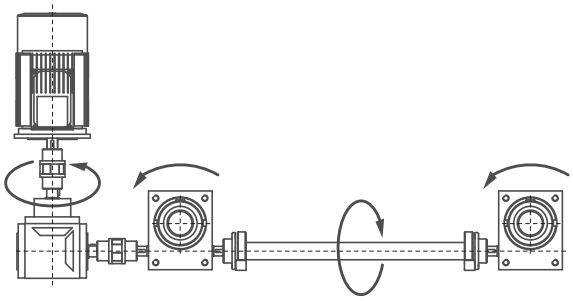
f_S = 3.1



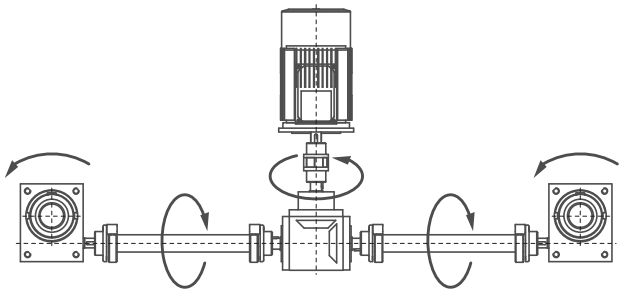
f_S = 4.4



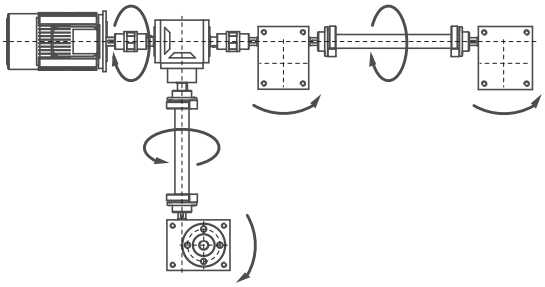
f_S = 2.25



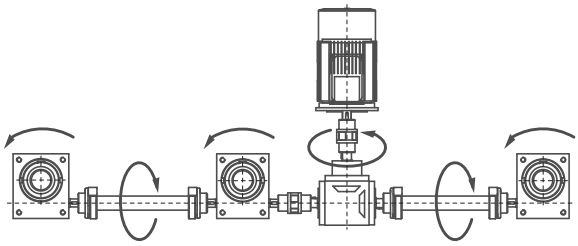
f_S = 2.25



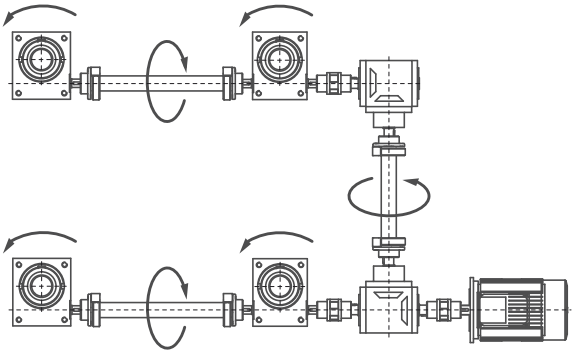
f_S = 3.27



f_S = 3.35



f_S = 4.6



LINEAR ACTUATORS

WITH INTEGRATED REDUCTION AND CUBIC GEARBOX. FM SERIES: STEEL TUBE | AM SERIES: ALUMINUM TUBE

PRODUCT SELECTION

STANDARD DRIVE

The standard drive of the FM/AM Series linear actuators is made using Ac motors.

The following table shows the powers available for each actuator size and the type of flange on the motor, in addition to the length of its fastening flange to the gearbox.

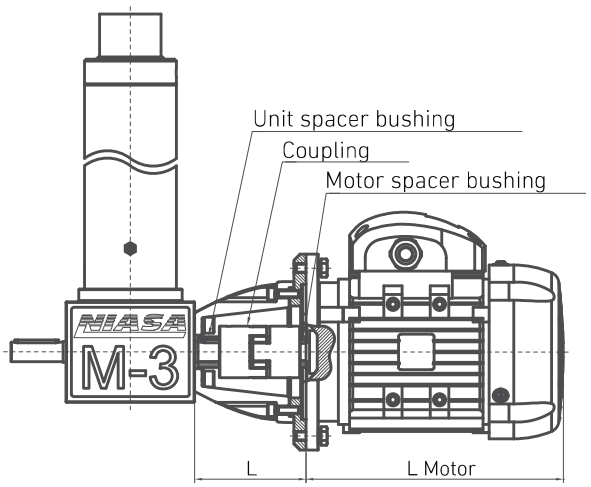
For another size or different type of drive, please contact NIASA. NIASA can supply alternating or stepper motors with sensors of any type, etc.

	Motor flange	MOTOR GROUP																			
		56		63		71		80		90		100		112	132		160		180		
		POWER (kW)																			
		A	B	A	B	A	B	A	B	A	B	A	B	A	A	B	A	B	A	B	
		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	
FM1 / AM1	L	57		60		67															
	Motor flange	B14		B14		B14															
FM2 / AM2	L			63		70		83													
	Motor flange			B14		B14		B14													
FM3 / AM3	L					91		101		113		123									
	Motor flange					B5		B14		B14		B14									
FM4 / AM4	L					91		101		113		123									
	Motor flange					B5		B5		B14		B14									
FM5	L							125		135		145			167		201				
	Motor flange							B5		B5		B14			B14		B14				
FJ1	L											145			165		199				
	Motor flange											B14			B14		B14				
FJ3	L									135		145			167		201		203		
	Motor flange									B5		B5			B5		B5		B5		

For asynchronous motor specifications, see the motorization chapter (page 312).

If using ball screws (or trapezoidal screws with more than one input), together with the normal speed gearboxes (S) the FM/AM linear actuator may be reversible. Contact the NIASA technical department for the most suitable brake selection for your application.

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.



LINEAR ACTUATORS

WITH INTEGRATED REDUCTION AND CUBIC GEARBOX. FM SERIES: STEEL TUBE | AM SERIES: ALUMINUM TUBE

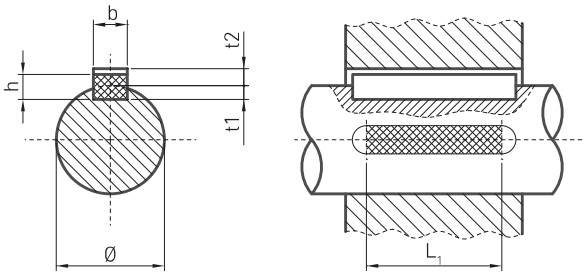
PRODUCT SELECTION

MAXIMUM TRANSFERABLE TORQUE ACCORDING TO SHAFT/ PARALLEL COTTER PIN (DIN 6885)

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

IMPORTANT

... Never subject the input of an FM Series actuator to torque over that indicated for its shaft and keys (see plans in the sub-chapter "sizes", page 118).



Shaft diameter Ø (mm)	Key dimensions			Maximum transferrable torque, M_D (Nm) / Effective key length, L_1 (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

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

LUBRICATION

NIASA FM/AM Series linear actuators are supplied lubricated with DIVINOL LITHOGREASE G421 type grease.
This is a semi-synthetic grease with a lithium compound with the following specifications,.

Specifications

G421 DIVINOL LITHOGREASE	
Working temperature	-35 to +160ºC
Density at 15ºC	0.9 kg/dm^3
Cinematic viscosity (s/DIN 51 562)	130 mm^2/s at 40ºC 15 mm^2/s at 100ºC
Dropping point (s/DIN ISO 2176)	>220ºC
Water resistance (s/DIN 51 807/T1)	Level 1

For further information, please contact the NIASA technical department.

NIASA supplies its FM/AM Series actuators with a brass lubrication cap with O-ring, on the gearbox and on the tube, to ensure it is sealed.

A change of grease type may affect the correct operation of the actuator.

There is a possibility of supplying FM/AM Series actuators with an angled grease nipple at 45º DIN 71412 type B for the gearbox, and a straight grease nipple
DIN 71412 type A for the tube.

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.

A group lubricator is recommended for automatic lubrication of the units. Depending on the type of group lubricator, the lubrication may last up to two years. See lubrication chapter in accessories.

LINEAR ACTUATORS

WITH INTEGRATED REDUCTION AND CUBIC GEARBOX. FM SERIES: STEEL TUBE | AM SERIES: ALUMINUM TUBE

PRODUCT SELECTION

PROTECTION AGAINST CORROSION, SEALING AND AMBIENT TEMPERATURE

PROTECTION 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 NIASA so that the technical department can select the surface protection system and select the most suitable components.

CORROSION CATEGORY		ENVIRONMENT	
		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 atmospheres, with moderate SO_2 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 high (industrial)	Industrial areas with high humidity and aggressive atmosphere.	Buildings or areas with almost permanent condensation and high contamination.
C5-M	Very high (maritime)	Coastal and maritime areas with high salinity.	Buildings or areas with permanent condensation and high contamination.

DURABILITY		
LOW	L	2 to 5 years
MEDIUM	M	5 to 15 years
HIGH	H	More than 15 years

PROTECTION AGAINST THE INPUT OF SOLIDS AND LIQUIDS

NIASA actuators offer, as standard, an IP65 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. NIASA 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".

LEVEL OF PROTECTION "IP", AGAINST 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).
		...	...

AMBIENT TEMPERATURE

Contact NIASA if your unit will be installed in an environment that may reach temperatures below -20°C and/or above +40°C.

NIASA's technical department will prescribe the most suitable materials and sealing components for the specific conditions of the application.

LINEAR ACTUATORS

WITH INTEGRATED REDUCTION AND CUBIC GEARBOX. FM SERIES: STEEL TUBE | AM SERIES: ALUMINUM TUBE

PRODUCT SELECTION

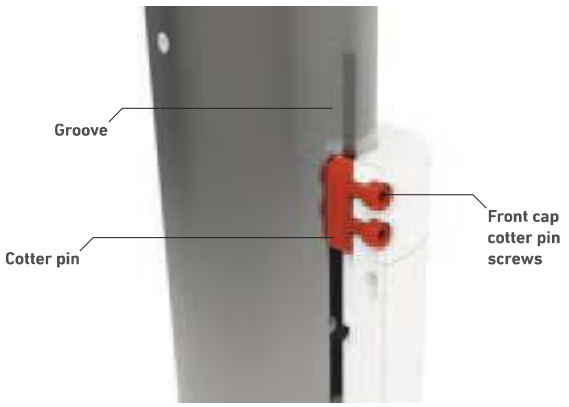
OPTIONAL CONFIGURATIONS

Optionally, NIASA may adapt your FM/AM linear actuator, modifying the different parts of it to your preferences.

Some examples are shown below.
See sub-chapter "Placing an order".

Immobilizations

The FM Series electro-mechanical actuators, on request, can be supplied with the immobilized stem in rotation. This is achieved by mounting a key on the upper cap and machining a groove along the stem.

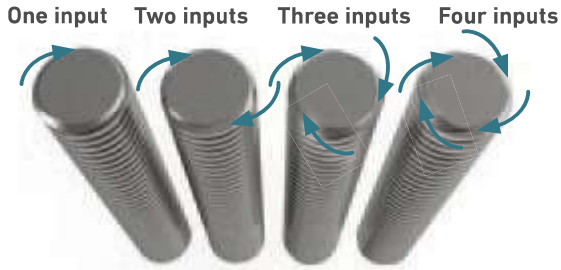


With this configuration, the scraper for the stem cannot be mounted on the front cap. To avoid the possible input of particles or liquid through the stem, it is recommended to mount a bellow to protect it.

For further information, please contact the NIASA technical department.

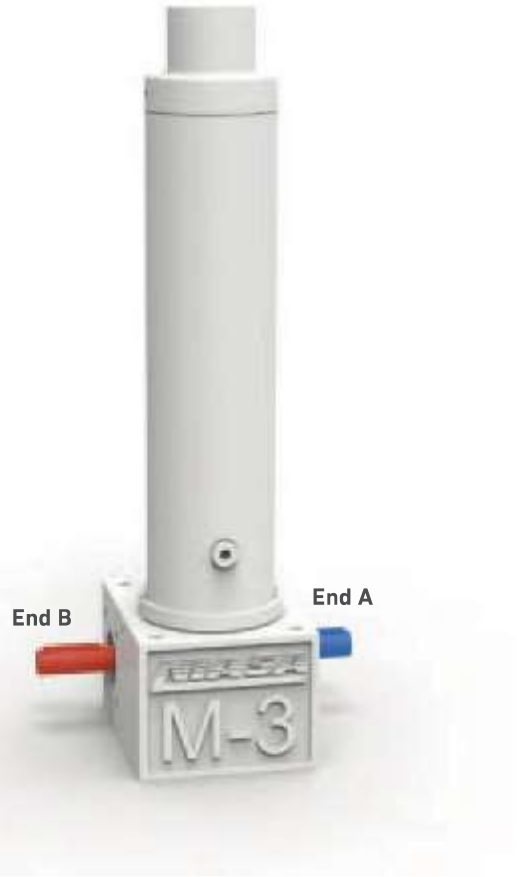
Special configurations

At the customer's request, the FM/AM Series linear actuators can be supplied with a screw of several inputs so that higher speeds can be obtained.



Worm gear

At the customer's request, the FM/AM linear actuators can be supplied with one of the sides of the worm shaft cut.



LINEAR ACTUATORS

WITH INTEGRATED REDUCTION AND CUBIC GEARBOX. FM SERIES: STEEL TUBE | AM SERIES: ALUMINUM TUBE

PLACING AN ORDER

01 SIZE
FM1/AM1
FM2/AM2
FM3/AM3
FM4/AM4
FM5
FJ1
FJ3

02 GEARBOX
S Normal speed
H Slow speed

03 EQUIPMENT GENERAL PROTECTION
IPS Standard IP protection level
IPX Special IP protection level

04 SCREW TYPE (DIAMETER x PITCH)
TRS Steel trapezoidal screw
KGS Ball screw

05 STROKE
0000 Equipment usable stroke in mm

06 IMMOBILISATION IN ROTATION
00 No immobilization
01 Immobilized

07 STEM FASTENING ACCESSORY
BPS Screw flange
GKS Single rod
GKB Double rod
GIR Ball joint
FES Special end fastening
000 No accessory

08 BOX FASTENING ACCESSORY
Always on the back of the box
HFM Gearbox fastening rod
LCM Gearbox mounting feet
ZKM ZK gearbox fastening with bolts
ZKH ZK gearbox fastening with bearings
ZKV ZK gearbox fastening with 90° bolts
FMS Special gearbox fastening
000 No accessory

09 EXTERIOR TUBE FASTENING ACCESSORY
Exterior tube configuration F
BB Trunnion mount with studs
BH Trunnion mount with ball bearings

Exterior tube configuration A
BA Trunnion mount with studs

All models
FS Special fastening
00 No accessory

10 tilt ACCESSORY
SB With tilt support
00 No tilt support

11 LIMIT SWITCH ACCESSORY
Exterior tube configuration F
FCI Inductive limit switches
FCR Inductive limit switches with regulation

Exterior tube configuration A
FCG Magnetic limit switches

All models
000 No limit switches

Example	01	02	03	04	05	06	07	08	09	10	11
	FM3	H	IPS	TRS3606	1000	00	BPS	HFM	00	00	FCI

12 STEM PROTECTION ACCESSORY

Exterior tube configuration F

FB Bellow type protector
00 No protector

13 DRIVE ADAPTATION

MK Standard flange
MS Special drive union
VE Wheel
00 No adaptation

14 DRIVE POSITION ON GEARBOX

A Worm shaft side A
B Worm shaft side B

15 STANDARD MOTOR

MK drive adaptation

080 Group size
A Power-1 / **B** Power-2

MS drive adaptation

1111 Non-standard drive

Both adaptations

0000 Without drive

16 WORM SHAFT END

A Side A end suppressed
B Side B end suppressed
0 Both sides maintained

17 WORM SHAFT PROTECTION ACCESSORY

PR With protector
00 No protector

18 LUBRICANT

GRA Standard lubricant
GRX Lubricant for low extreme temperatures
GRS Other lubricant

19 LUBRICATION ACCESSORIES

ETP Sealed lubrication cap (standard)
EMT Angled lubricator on gearbox or straight on tube
AGR Automatic lubricating accessory
000 No lubricating accessory

20 EQUIPMENT GENERAL COLOUR

With type A configuration, only the gearbox is painted

RGG Graphite grey RAL7024 (standard)
RAZ Blue RAL5017
RGP Silver grey RAL9006
RSP Special colour indicated by the customer
CIP Only grey 411 priming
000 Not painted

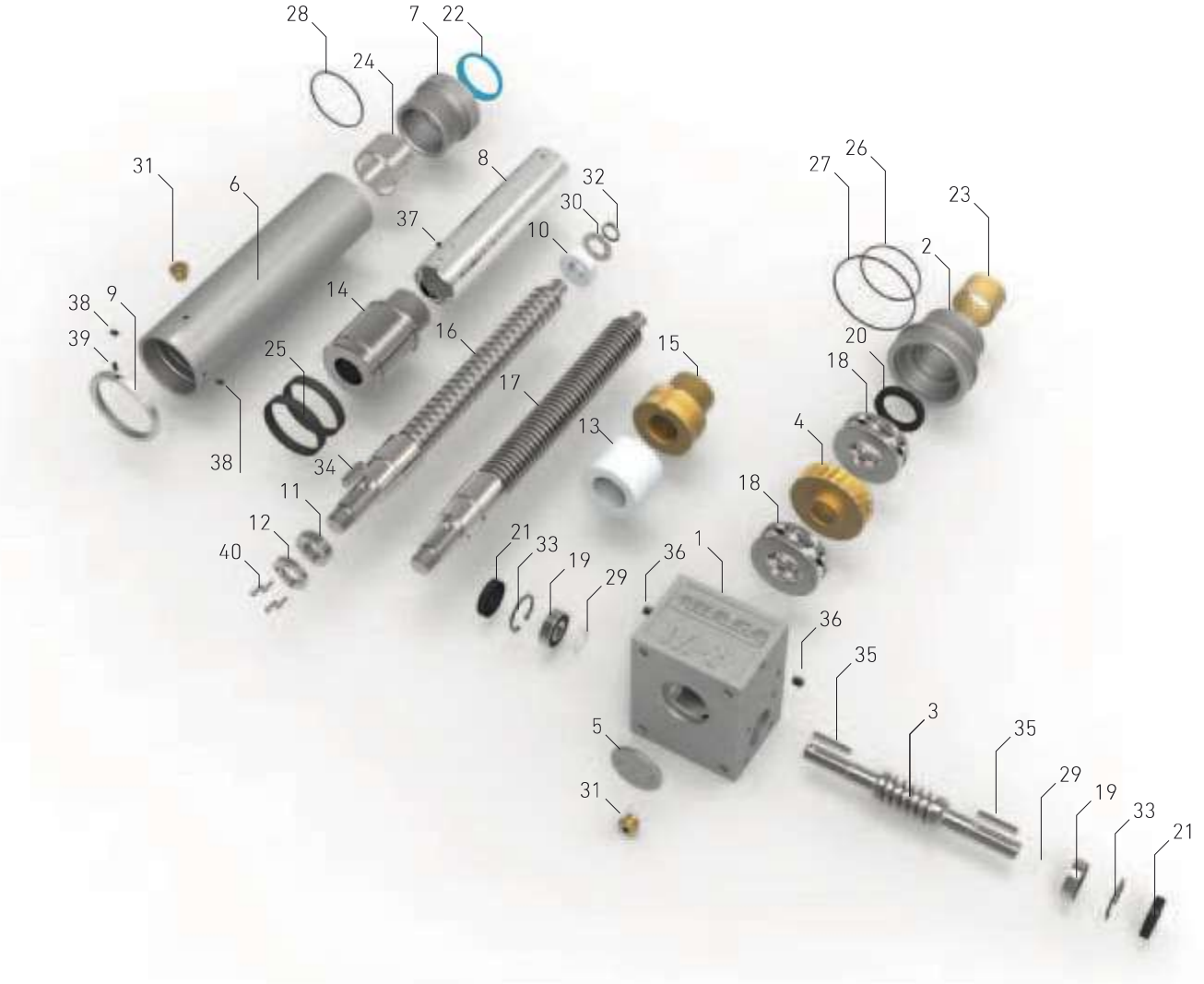
12	13	14	15	16	17	18	19	20
FB	MK	A	GR080A	B	00	GRA	AGR	RGG

LINEAR ACTUATORS

WITH INTEGRATED REDUCTION AND CUBIC GEARBOX. FM SERIES: STEEL TUBE | AM SERIES: ALUMINUM TUBE

DISASSEMBLY

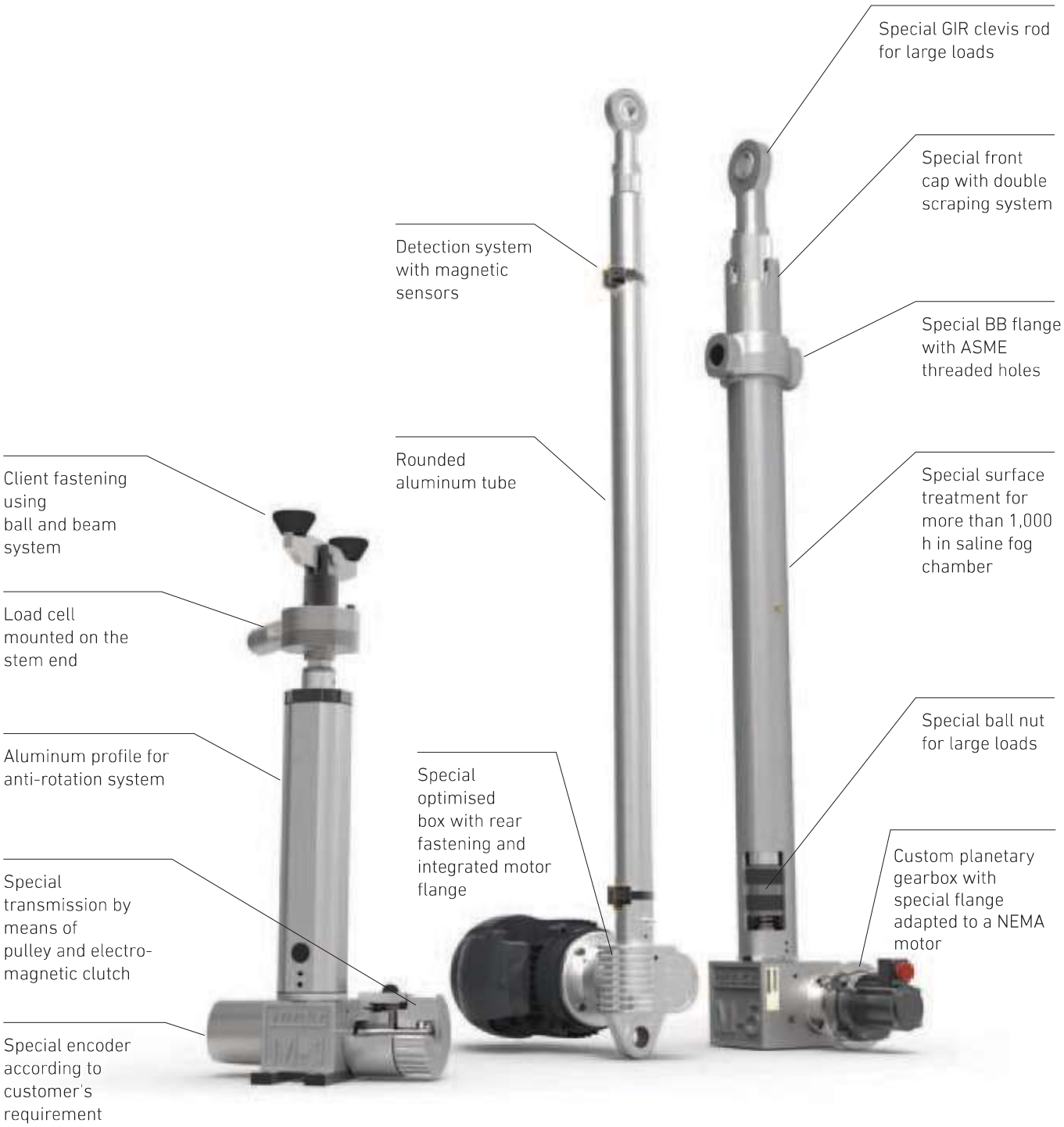
	Name
01	M series box
02	Top cap
03	Worm gear
04	Worm wheel
05	Lower cap
06	Exterior tube
07	Front cap
08	Stem
09	Tube position nut
10	Front support
11	Lock nut
12	Lock nut
13	Supplement bushing
14	Ball nut
15	Trapezoidal nut
16	Ball screw
17	Trapezoidal screw
18	Axial bearing
19	Radial bearing
20	Seal
21	Seal
22	Scraper
23	Bearing
24	Bearing
25	Guide ring
26	O-Ring
27	O-Ring
28	O-Ring
29	Adjustment washer
30	Flat washer
31	Brass lubrication cap
32	Exterior Circlip
33	Inside circlip
34	Straight key
35	Straight key
36	Stud with point
37	Flat stud
38	Stud with point
39	Flat stud
40	Allen screw



LINEAR ACTUATORS

WITH INTEGRATED REDUCTION AND CUBIC GEARBOX. FM SERIES: STEEL TUBE | AM SERIES: ALUMINUM TUBE

SPECIAL CONFIGURATIONS



04
LINEAR ACTUATORS WITH INTEGRATED REDUCTION AND COMPACT GEARBOX

FHM Series: Steel tube
AHM Series: Aluminum tube

“WE HAVE A STRATEGIC PLAN. IT'S CALLED DOING THINGS.”

HERB KELLEHER
SOUTHWEST AIRLINES

LINEAR ACTUATORS

WITH INTEGRATED REDUCTION AND COMPACT GEARBOX. FHM SERIES: STEEL TUBE | AHM SERIES: ALUMINUM TUBE

INTRODUCTION

NIASA FHM/AHM Series electro-mechanical actuators have evolved from the FM/AM Series, aimed at specific requirements in the solar energy generation sector (photovoltaic, thermo-solar, etc.). They can also be used in any other kind of application with demanding environmental conditions.

The gearbox is round and not cubic, and the input shaft offers the possibility to connect directly to any type of drive. Additionally, the D variant includes a second reduction, thus avoiding the use of reducers in solar tracking or similar applications, where very slow advance speeds are required.

Their main advantages against other systems, such as pneumatic or hydraulic cylinders, are the following:

- ... Greater movement and positioning precision.
- ... Greater safety, due to their irreversibility in many configurations (ask NIASA) and/or the incorporation of different braking devices.
- ... Superior energy efficiency, as their parts offer high/very high performance, especially with the ball screws, low transmission ratios and high speeds.
- ... Easier and faster assembly, since hydraulic or pneumatic groups are not required, just an electric motor on the unit itself.
- ... Greater reliability and duration, and less maintenance, due to the mechanical robustness and construction simplicity.
- ... Possibility to operate in multiple positions.
- ... Lower size for the same load capacity.
- ... ...

The screw supports also characterized for offering an extensive range of:

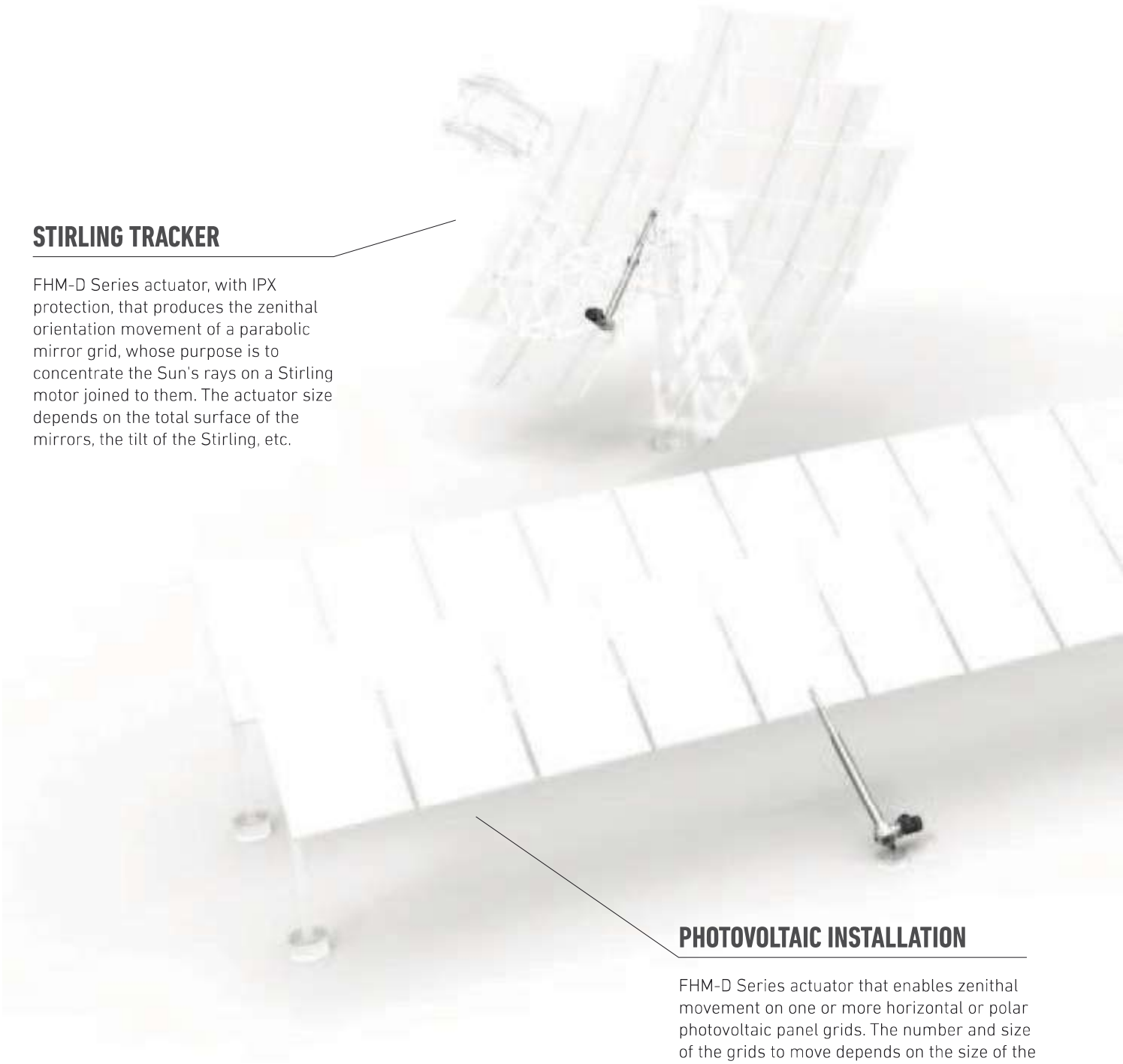
- ... Axial load capacities, from 5 kN up to 250 kN.
- ... Advance speeds, depending on the screw pitch and gearbox. Three possible reductions per actuator size are offered, from 4:1 up to 160:1.
- ... Trapezoidal and ball screws, depending on the performance required, precision of movement and positioning, etc.
- ... Fastening accessories and elements, for optimal adaptation.
- ... Control and safety systems (mechanical/inductive limit switches, absolute/incremental encoders, etc.).
- ... Materials and surface coverings, depending on the environmental conditions in which the unit will be installed.
- ... Two types of external sleeve for the stem
  - · Steel round tube.
  - · Aluminum extrusion profile.
  - · ...

Please do not hesitate to contact NIASA if you require FHM/AHM actuators (and their drive mechanisms) with specifications other than those covered in this chapter. The NIASA technical department will specifically develop the special units that best meet your requirements.

LINEAR ACTUATORS

WITH INTEGRATED REDUCTION AND COMPACT GEARBOX. FHM SERIES: STEEL TUBE | AHM SERIES: ALUMINUM TUBE

APPLICATIONS

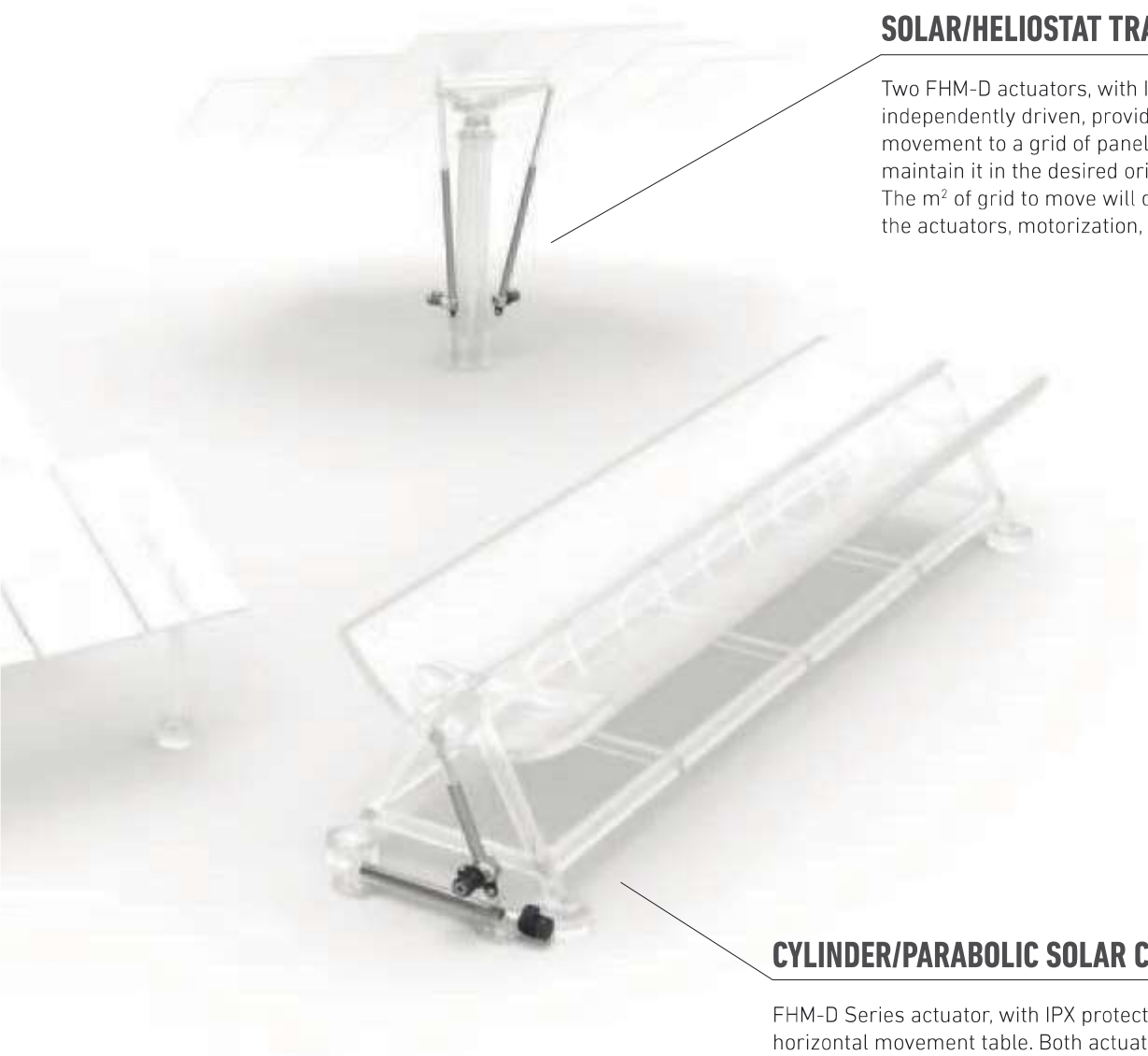


STIRLING TRACKER

FHM-D Series actuator, with IPX protection, that produces the zenithal orientation movement of a parabolic mirror grid, whose purpose is to concentrate the Sun's rays on a Stirling motor joined to them. The actuator size depends on the total surface of the mirrors, the tilt of the Stirling, etc.

PHOTOVOLTAIC INSTALLATION

FHM-D Series actuator that enables zenithal movement on one or more horizontal or polar photovoltaic panel grids. The number and size of the grids to move depends on the size of the actuator, motorization, etc.



SOLAR/HELIOSTAT TRACKER 2 SHAFTS

Two FHM-D actuators, with IPX protection, independently driven, provide azimuth and zenithal movement to a grid of panels or mirrors, to maintain it in the desired orientation at all times. The m^2 of grid to move will depend on the size of the actuators, motorization, etc.

CYLINDER/PARABOLIC SOLAR CONCENTRATION

FHM-D Series actuator, with IPX protection, placed on a horizontal movement table. Both actuators combined change the angle of parabolic trough's orientation to concentrate the solar energy on the central conduit where the fluid to be heated circulates.

LINEAR ACTUATORS

WITH INTEGRATED REDUCTION AND COMPACT GEARBOX. FHM SERIES: STEEL TUBE | AHM SERIES: ALUMINUM TUBE

SIZES

On all the sizes there are trapezoidal and ball screw options (see chapter on screws for further information), as well as normal speed (S) and slow speed (H) gearboxes. A third reduction with super slow speed (D) is also available from size HM4.

	HM1	HM2	HM3
Up to	5 kN	10 kN	25 kN
F Steel exterior tube	 page 156	 page 157	 page 158
A Aluminum exterior tube With anti-corrosion on the stem (optional) With magnetic sensor integrated on the aluminum tube (optional)	 page 156	 page 157	 page 158

In addition to the standard range of HM Series linear actuators, NIASA can specifically develop the unit that best meets your application requirements. Contact NIASA.

IMPORTANT All the technical data included in this chapter correspond to the configuration with steel tube and to the aluminum tube configuration.
For further information, please contact the NIASA technical department.

HM4 50 kN	HM5 100 kN	HJ1 150 kN	HJ3 250 kN
			
page 159	page 160	page 161	page 162
			
page 159			

LINEAR ACTUATORS

WITH INTEGRATED REDUCTION AND COMPACT GEARBOX. FHM SERIES: STEEL TUBE | AHM SERIES: ALUMINUM TUBE

GENERAL PRODUCT OVERVIEW

	Name	Page
01	HM series gearbox	152
02	Screw + Trapezoidal nut + Stem	156
03	Screw + Ball nut + Stem	156
04	HFR ball joint	271
05	SB tip supports	276
06	GIR clevis rod	282
07	GKB double clevis rod	281
08	BPS flange	278

09	GKS single clevis rod	280
10	Motor flange	312
11	Motorization	312
13	Flanges with bolts for BB Series steel tube	272
14	Flanges with bearings for BH steel tube	273
15	FCI inductive limit switch	307

17	BA bolts for aluminum tube	274
18	FCG magnetic limit switch	308
19	Connection sensor input adapter	308
20	Position sensor magnet	308
21	Anti-rotation system	
22	D reduction	163


8
9
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3
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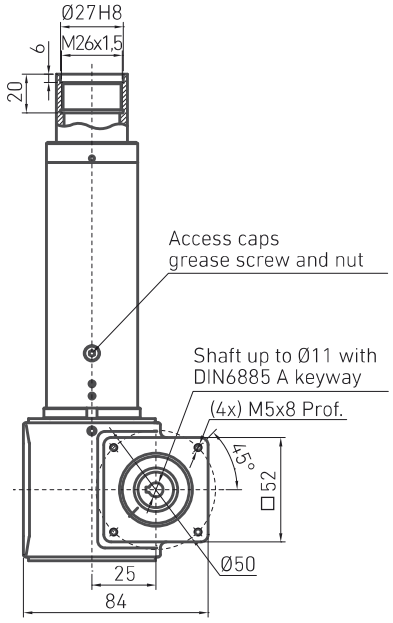
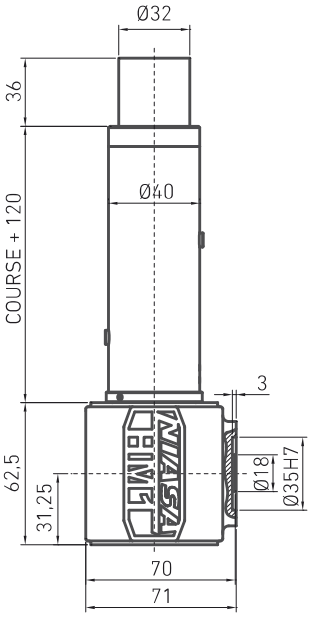
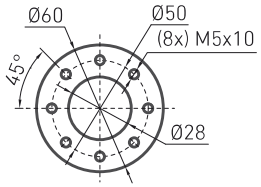
1
22
10
11
4

FHM1/AHM1 LINEAR ACTUATOR

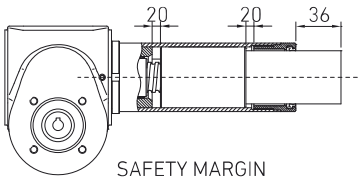
UP TO 5 kN







LOWER GEARBOX FASTENING



SAFETY MARGIN

Screw diameter and step (mm)	Maximum axial strength (kN)	Reduction		Travel (mm/revol. input)		Performance (%)		Drive torque, M_D (Nm)		Start-up torque, M_0 (Nm)		Weight stroke 0 (kg)	Approx. weight each 100mm of stroke (kg)
								F (kN), load to move in dynamic					
		S	H	S	H	S	H	S	H	S	H		
Tr 16x4	5	4:1	16:1	1.00	0.25	35	27	(0.46 x F) + 0.17	(0.15 x F) + 0.08	0.80 x F	0.34 x F	1.9	0.5
KGS 1605	5	4:1	16:1	1.25	0.31	71	56	(0.28 x F) + 0.14	(0.09 x F) + 0.08	0.39 x F	0.16 x F	1.9	0.5

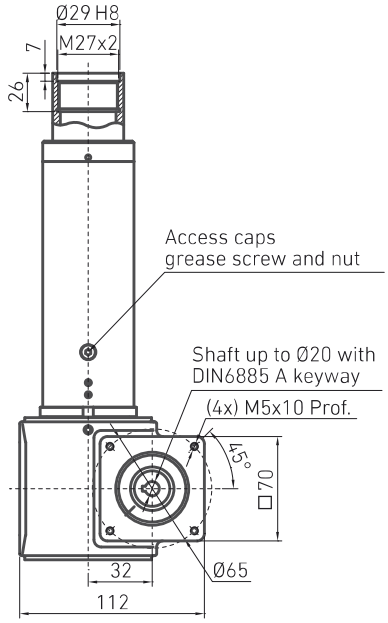
... Power required: P_D (kW) = 0,157x M_D (Nm).

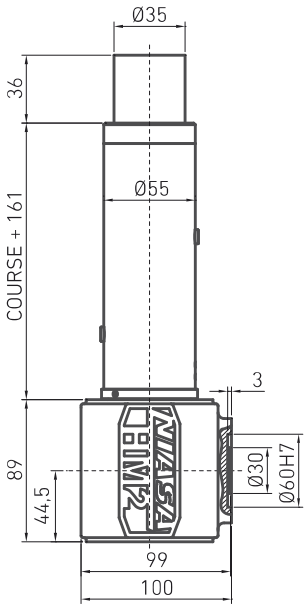
... All the data in the table correspond to an input speed of 1,500 rpm. For other speeds, please see the calculation chapter (page 166).

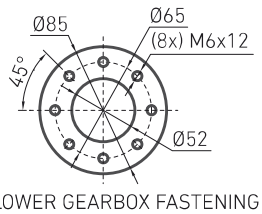
... Ensure that the dynamic load of the application does not surpass the critical values indicated, in order to avoid overheating of the unit and buckling and resonance of the screw. See calculations chapter (page 166).

FHM2/AHM2 LINEAR ACTUATOR

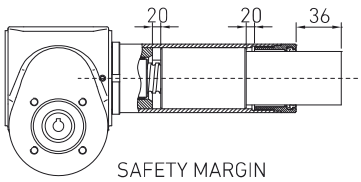
UP TO 10 kN







LOWER GEARBOX FASTENING



SAFETY MARGIN

Screw diameter and step (mm)	Maximum axial strength (kN)	Reduction		Travel (mm/revol. input)		Performance (%)		Drive torque, M_D (Nm)		Start-up torque, M_0 (Nm)		Weight stroke 0 (kg)	Approx. weight each 100mm of stroke (kg)
								F (kN), load to move in dynamic					
		S	H	S	H	S	H	S	H	S	H		
Tr 24x5	10	4:1	16:1	1.25	0.31	31	25	(0.64 x F) + 0.35	(0.20 x F) + 0.17	1.11 x F	0.43 x F	4.7	1
KGS 2005	10	4:1	16:1	1.25	0.31	72	58	(0.28 x F) + 0.32	(0.09 x F) + 0.17	0.39 x F	0.15 x F	4.7	1
KGS 2020	7.5	4:1	16:1	5.00	1.25	72	58	(1.10 x F) + 0.34	(0.35 x F) + 0.17	1.55 x F	0.60 x F	4.7	1

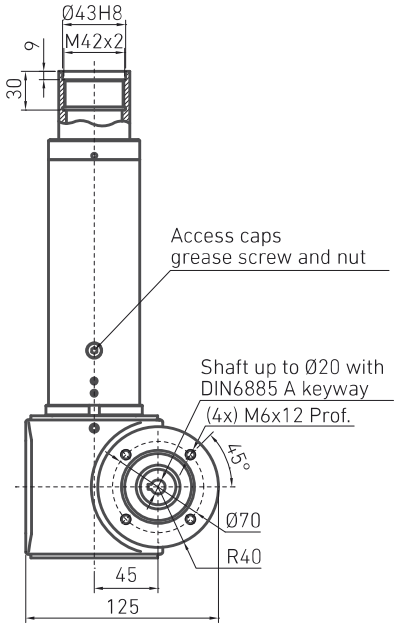
... Power required: P_D (kW) = 0,157x M_D (Nm).

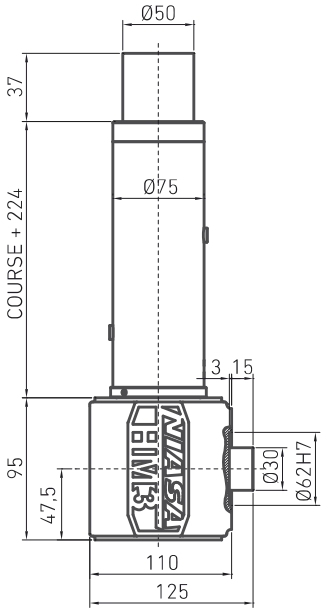
... All the data in the table correspond to an input speed of 1,500 rpm. For other speeds, please see the calculation chapter (page 166).

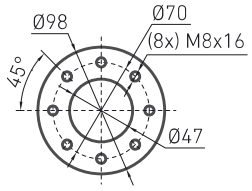
... Ensure that the dynamic load of the application does not surpass the critical values indicated, in order to avoid overheating of the unit and buckling and resonance of the screw. See calculations chapter (page 166).

FHM3/AHM3 LINEAR ACTUATOR

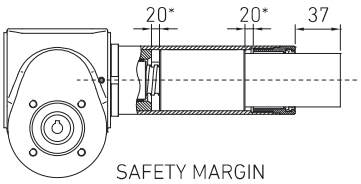
UP TO 25 kN







LOWER GEARBOX FASTENING



SAFETY MARGIN
(*) If incorporating a KGM 3220 nut,
the safety margin is 15 mm.

Screw diameter and step (mm)	Maximum axial strength (kN)	Reduction		Travel (mm/revol. input)		Performance (%)		Drive torque, M_D (Nm)		Start-up torque, M_0 (Nm)		Weight stroke 0 (kg)	Approx. weight each 100mm of stroke (kg)
								F (kN), load to move in dynamic					
		S	H	S	H	S	H	S	H	S	H		
Tr 36x6	25	6:1	24:1	1.00	0.25	28	22	(0.58 x F) + 0.57	(0.18 x F) + 0.31	1.04 x F	0.40 x F	11.5	2.1
KGS 3205	20	6:1	24:1	0.83	0.21	73	58	(0.18 x F) + 0.52	(0.06 x F) + 0.29	0.26 x F	0.11 x F	11.5	2.1
KGS 3210	25	6:1	24:1	1.67	0.42	73	58	(0.36 x F) + 0.52	(0.12 x F) + 0.29	0.52 x F	0.21 x F	11.5	2.1
KGS 3220	20	6:1	24:1	3.33	0.83	73	58	(0.73 x F) + 0.52	(0.23 x F) + 0.29	1.03 x F	0.42 x F	11.5	2.1
KGS 3240	10	6:1	24:1	6.67	1.67	73	58	(1.46 x F) + 0.52	(0.46 x F) + 0.29	2.07 x F	0.84 x F	11.5	2.1

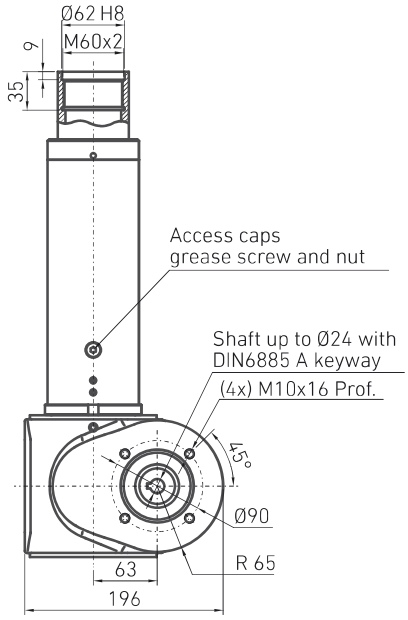
... Power required: P_D (kW) = 0,157x M_D (Nm).

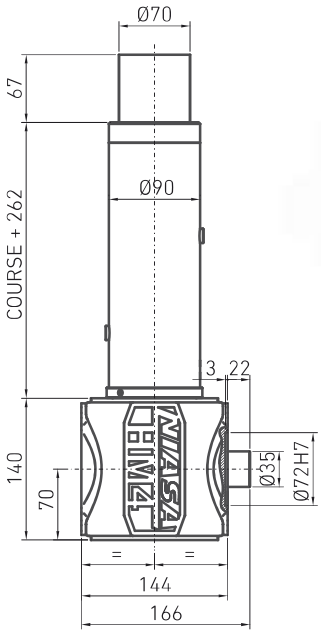
... All the data in the table correspond to an input speed of 1,500 rpm. For other speeds, please see the calculation chapter (page 166).

... Ensure that the dynamic load of the application does not surpass the critical values indicated, in order to avoid overheating of the unit and buckling and resonance of the screw. See calculations chapter (page 166).

FHM4/AHM4 LINEAR ACTUATOR

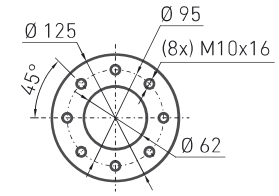
UP TO 50 kN



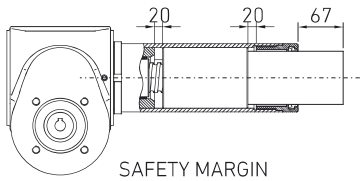


NOTE:

See dimensions of the D configuration at the end of this chapter.



LOWER GEARBOX FASTENING



SAFETY MARGIN

Screw diameter and pitch (mm)	Maximum axial strength (kN)	Reduction			Travel (mm/revol. input)		
		S	H	D	S	H	D
Tr 45x7	50	7:1	28:1	84:1	1.00	0.25	0.08
KGS 4010	42	7:1	28:1	84:1	1.43	0.36	0.12
KGS 4020	37	7:1	28:1	84:1	2.86	0.71	0.24
KGS 4040	35	7:1	28:1	84:1	5.71	1.43	0.48

Screw diameter and step (mm)	Performance (%)			Drive torque, M_D (Nm)			Start-up torque, M_0 (Nm)			Weight stroke 0 (kg)	Approx. weight each 100 mm of stroke (kg)	DR accessory weight (kg)
				F (kN), load to move in dynamic								
	S	H	D	S	H	D	S	H	D			
Tr 45x7	26	21	18	(0.61 x F) + 0.97	(0.19 x F) + 0.57	(0.076 x F) + 0.19	1.18 x F	0.44 x F	0.155 x F	26	3.3	2.5
KGS 4010	73	60	49	(0.31 x F) + 0.93	(0.09 x F) + 0.56	(0.038 x F) + 0.19	0.45 x F	0.18 x F	0.063 x F	26	3.3	2.5
KGS 4020	73	60	49	(0.62 x F) + 0.94	(0.19 x F) + 0.56	(0.077 x F) + 0.19	0.90 x F	0.36 x F	0.127 x F	26	3.3	2.5
KGS 4040	73	60	49	(1.25 x F) + 0.94	(0.38 x F) + 0.56	(0.154 x F) + 0.19	1.80 x F	0.72 x F	0.253 x F	26	3.3	2.5

... Power required: P_D (kW) = 0,157x M_D (Nm).

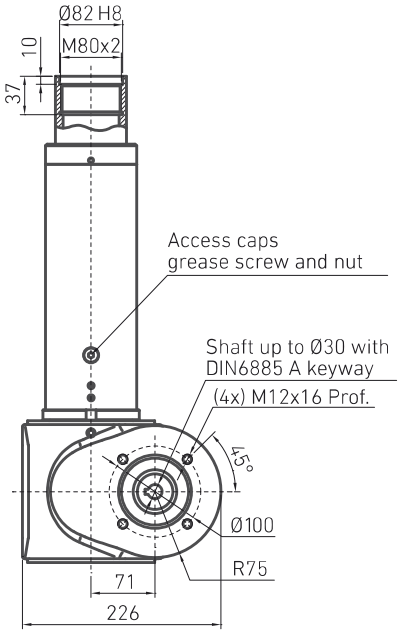
... All the data in the table correspond to an input speed of 1,500 rpm. For other speeds, please see the calculation chapter (page 166).

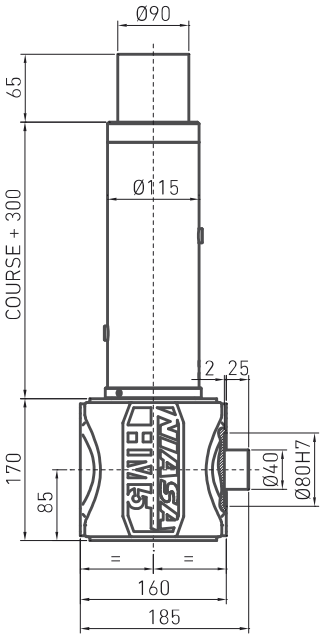
... Ensure that the dynamic load of the application does not surpass the critical values indicated, in order to avoid overheating of the unit and buckling and resonance of the screw. See calculations chapter (page 166).

FHM5 ACTUATOR

UP TO 100 kN

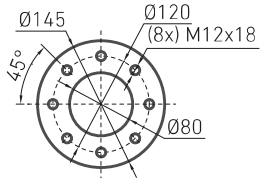
The capacity indicated corresponds to the basic configuration.
Higher capacities are available on request.



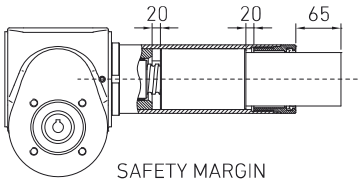


NOTE:

See dimensions of the D configuration at the end of this chapter.



LOWER GEARBOX FASTENING



SAFETY MARGIN

Screw diameter and pitch (mm)	Maximum axial strength (kN)	Reduction			Travel (mm/revol. input)		
		S	H	D	S	H	D
Tr 50x8	100	9:1	36:1	108:1	0.89	0.22	0.07
KGS 5010	65	9:1	36:1	108:1	1.11	0.28	0.09

Screw diameter and step (mm)	Performance (%)			Drive torque, M_D (Nm)			Start-up torque, M_0 (Nm)			Weight stroke 0 (kg)	Approx. weight each 100 mm of stroke (kg)	DR accessory weight (kg)
				F (kN), load to move in dynamic								
	S	H	D	S	H	D	S	H	D			
Tr 50x8	27	21	17	(0.53 x F) + 1.91	(0.17 x F) + 1.08	(0.067 x F) + 0.36	0.98 x F	0.39 x F	0.138 x F	40.2	4.9	3
KGS 5010	73	58	48	(0.24 x F) + 1.87	(0.08 x F) + 1.07	(0.031 x F) + 0.36	0.36 x F	0.15 x F	0.054 x F	40.2	4.9	3

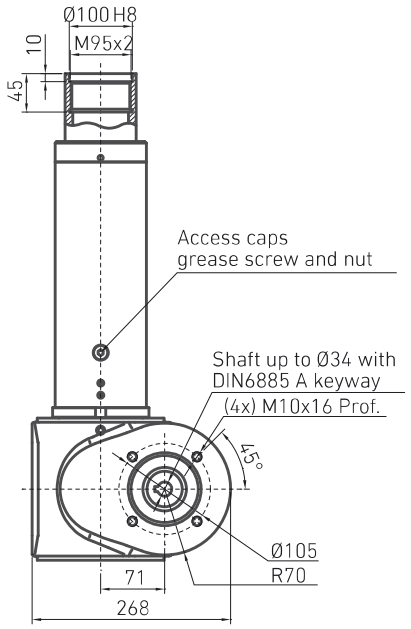
... Power required: P_D (kW) = 0,157x M_D (Nm).

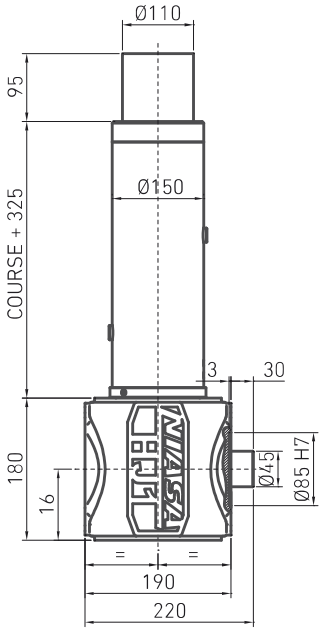
... All the data in the table correspond to an input speed of 1,500 rpm. For other speeds, please see the calculation chapter (page 166).

... Ensure that the dynamic load of the application does not surpass the critical values indicated, in order to avoid overheating of the unit and buckling and resonance of the screw. See calculations chapter (page 166).

FHJ1 ACTUATOR
UP TO 150 kN

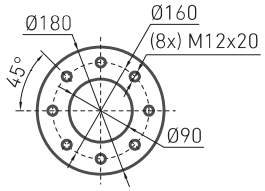
The capacity indicated corresponds to the basic configuration.
Higher capacities are available on request.



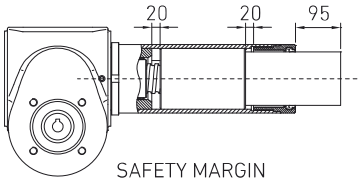


NOTE:

See dimensions of the D configuration at the end of this chapter.



LOWER GEARBOX FASTENING



SAFETY MARGIN

Screw diameter and pitch (mm)	Maximum axial strength (kN)	Reduction			Travel (mm/revol. input)		
		S	H	D	S	H	D
Tr 70x10	150	9:1	36:1	108:1	1.11	0.28	0.09
KGS 6310	65	9:1	36:1	108:1	1.11	0.28	0.09

Screw diameter and step (mm)	Performance (%)			Drive torque, M_D (Nm)			Start-up torque, M_O (Nm)			Weight stroke 0 (kg)	Approx. weight each 100 mm of stroke (kg)	DR accessory weight (kg)
				F (kN), load to move in dynamic								
	S	H	D	S	H	D	S	H	D			
Tr 70x10	24	18	16	(0.73 x F) + 2.03	(0.24 x F) + 1.21	(0.09 x F) + 0.4	1.31 x F	0.49 x F	0.172 x F	79.5	9	3.8
KGS 6310	73	55	49	(0.24 x F) + 1.97	(0.08 x F) + 1.19	(0.03 x F) + 0.4	0.33 x F	0.14 x F	0.048 x F	81.5	9	3.8

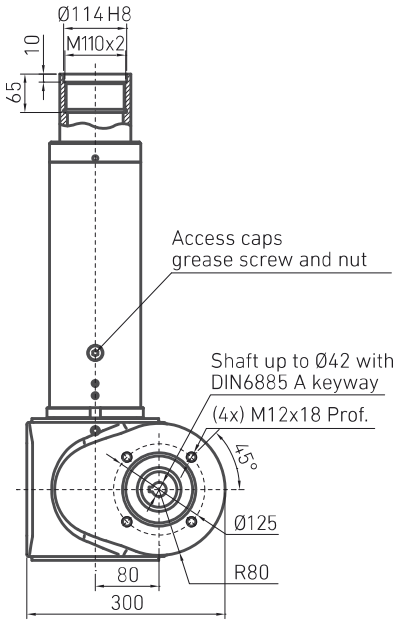
... Power required: P_D (kW) = 0,157x M_D (Nm).

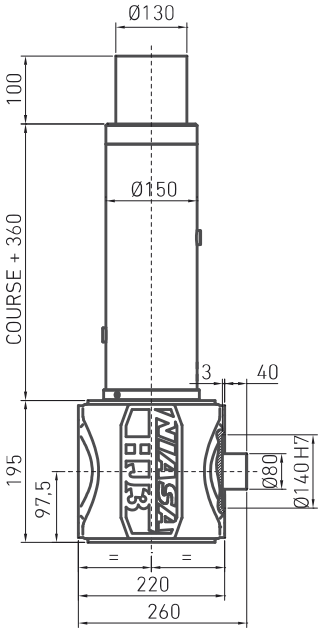
... All the data in the table correspond to an input speed of 1,500 rpm. For other speeds, please see the calculation chapter (page 166).

... Ensure that the dynamic load of the application does not surpass the critical values indicated, in order to avoid overheating of the unit and buckling and resonance of the screw. See calculations chapter (page 166).

FHJ3 ACTUATOR
UP TO 250 kN Tr TRAPEZ.

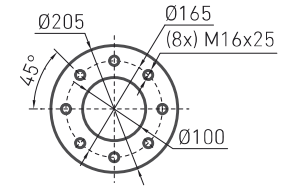
Contact versions with ball screw. The capacity indicated corresponds to the basic configuration. Higher capacities are available on request.



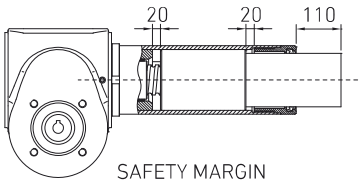


NOTE:

See dimensions of the D configuration at the end of this chapter.



LOWER GEARBOX FASTENING



SAFETY MARGIN

Screw diameter and pitch (mm)	Maximum axial strength (kN)	Reduction			Travel (mm/revol. input)		
		S	H	D	S	H	D
Tr 80x10	250	10:1	40:1	160:1	1.00	0.25	0.06
KGS 8010	80	10:1	40:1	160:1	1.00	0.25	0.06

Screw diameter and step (mm)	Performance (%)			Drive torque, M_D (Nm)			Start-up torque, M_0 (Nm)			Weight stroke 0 (kg)	Approx. weight each 100 mm of stroke (kg)	DR accessory weight (kg)
				F (kN), load to move in dynamic								
	S	H	D	S	H	D	S	H	D			
Tr 80x10	22	19	17	(0.73 x F) + 2.81	(0.21 x F) + 1.95	(0.058 x F) + 0.49	1.18 x F	0.40 x F	0.106 x F	109.5	14	5

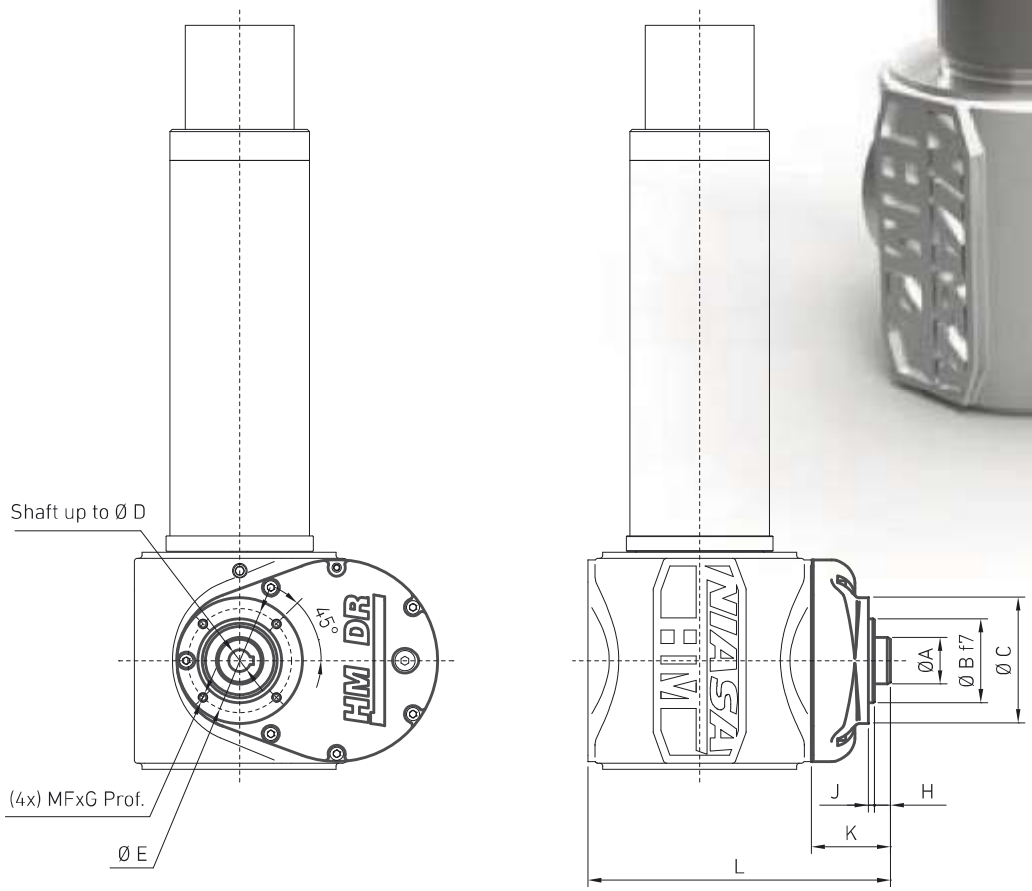
... Power required: P_D (kW) = 0,157x M_D (Nm).

... All the data in the table correspond to an input speed of 1,500 rpm. For other speeds, please see the calculation chapter (page 166).

... Ensure that the dynamic load of the application does not surpass the critical values indicated, in order to avoid overheating of the unit and buckling and resonance of the screw. See calculations chapter (page 166).

D REDUCTION

FHM4 / FHM5
FHJ1 / FHJ3
AHM4



	ø A	ø B	ø C	ø D	ø E	M FxG	H	J	K	L
HM4	30	54	81	22	67	M 6x12	10	4	51	195
HM5	40	72	110	28	90	M 6x12	15	4	60	220
HJ1	50	85	130	38	105	M 8x16	15	4	104	294
HJ3	65	115	150	50	130	M 10x18	18	6	107	305

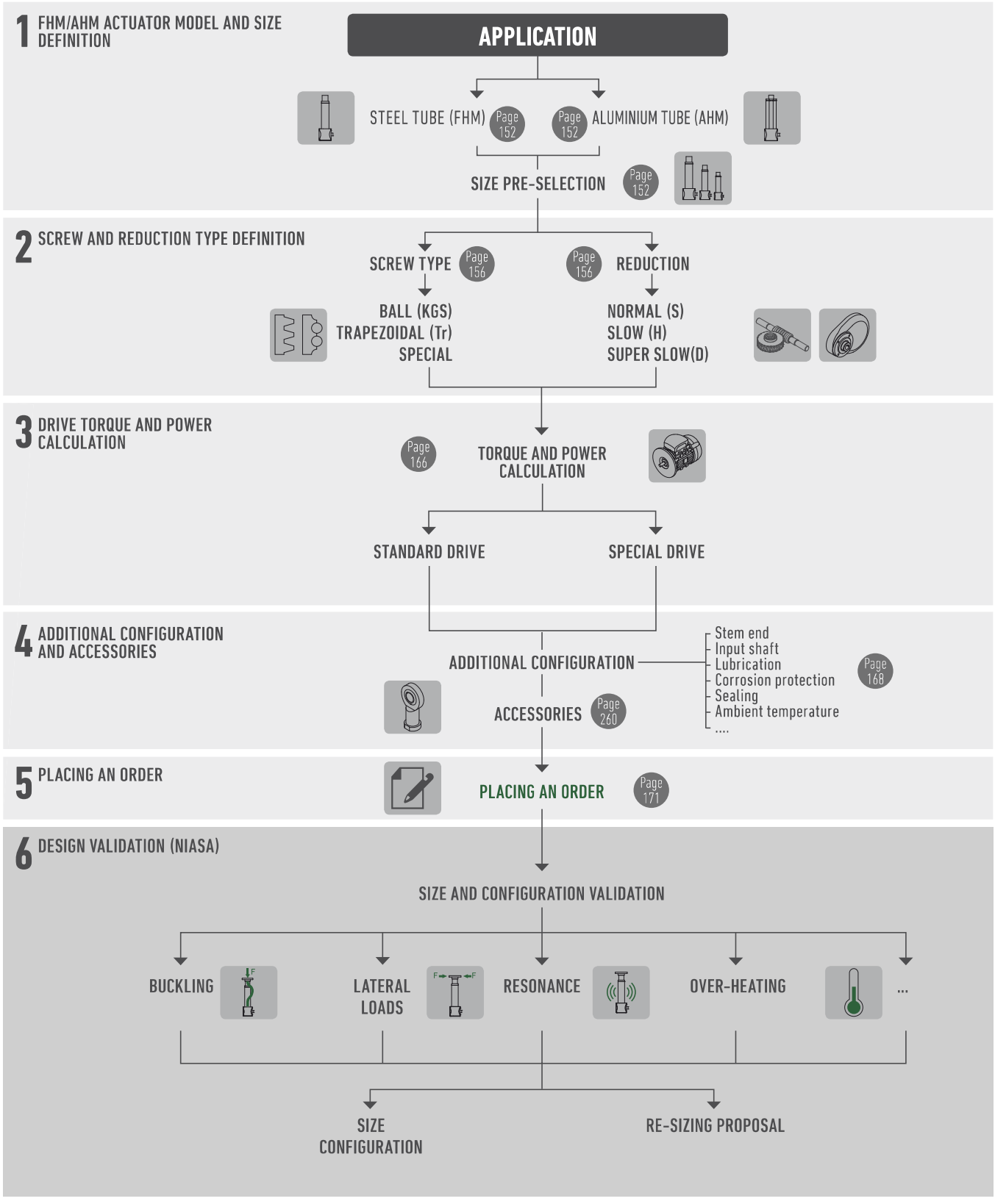
LINEAR ACTUATORS

WITH INTEGRATED REDUCTION AND COMPACT GEARBOX. FHM SERIES: STEEL TUBE | AHM SERIES: ALUMINUM TUBE

PRODUCT SELECTION

To select the correct HM Series linear actuator, please follow this flow diagram.

If you would like to know the expected service life of a unit for your application, please send the relevant data to the NIASA service department.


1 FHM/AHM ACTUATOR MODEL AND SIZE DEFINITION
APPLICATION
STEEL TUBE (FHM) Page 152
Page 152 ALUMINIUM TUBE (AHM)
SIZE PRE-SELECTION Page 152
2 SCREW AND REDUCTION TYPE DEFINITION
SCREW TYPE Page 156
Page 156 REDUCTION
BALL (KGS)
TRAPEZOIDAL (Tr)
SPECIAL
NORMAL (S)
SLOW (H)
SUPER SLOW(D)
3 DRIVE TORQUE AND POWER CALCULATION
Page 166
TORQUE AND POWER CALCULATION
STANDARD DRIVE
SPECIAL DRIVE
4 ADDITIONAL CONFIGURATION AND ACCESSORIES
ADDITIONAL CONFIGURATION
Stem end
Input shaft
Lubrication
Corrosion protection
Sealing
Ambient temperature
....
Page 168
ACCESSORIES Page 260
5 PLACING AN ORDER
PLACING AN ORDER Page 171
6 DESIGN VALIDATION (NIASA)
SIZE AND CONFIGURATION VALIDATION
BUCKLING
LATERAL LOADS
RESONANCE
OVER-HEATING
...
SIZE CONFIGURATION
RE-SIZING PROPOSAL

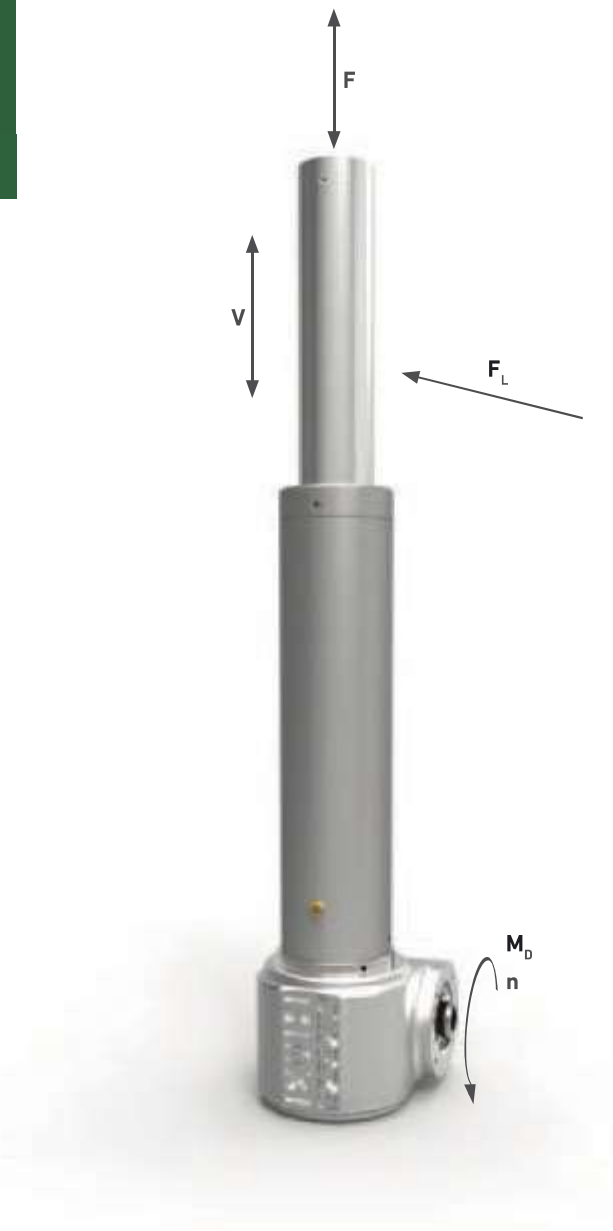
LINEAR ACTUATORS

WITH INTEGRATED REDUCTION AND COMPACT GEARBOX. FHM SERIES: STEEL TUBE | AHM SERIES: ALUMINUM TUBE

PRODUCT SELECTION

STRENGTH AND TORQUE ACTING ON AN HM SERIES LINEAR ACTUATOR

F Load to move at traction and/or compression.
F_L Lateral load on the stem.
V Stem advance speed.
M_D Torque on the input shaft.
n Speed on the input shaft.



TORQUE AND POWER OF A LINEAR ACTUATOR HM SERIES LINEAR

After pre-selecting the suitable HM Series linear actuator for the application, select the drive motor following the steps below:

1. DRIVE TORQUE

$$M_D\ (Nm) = \frac{F \times P}{2 \times \pi \times 0{,}9 \times \eta_{DG} \times \eta_{DS} \times i} + M_I$$

F Load to move in dynamic (kN)
P Screw pitch (mm)
M_I Drive idle torque (Nm)
i Actuator reduction
0.9 Cylinder dynamic efficiency
η_{DG} Gearbox dynamic efficiency
η_{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 2; the smaller the installation the higher the coefficient

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

3. START-UP TORQUE

For loads between 25% and 100% of the actuator's nominal value, calculate the start-up torque with this formula:

$$M_0\ (Nm) = \frac{F \times P}{2 \times \pi \times 0.9 \times \eta_{SA} \times i}$$

η_{SA} Actuator static efficiency (gearbox + stem)

IMPORTANT

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

η_{DG} Gearbox dynamic efficiency

input rpm	FHM1/AHM1		FHM2/AHM2		FHM3/AHM3		FHM4/AHM4			FHM5			FHJ1			FHJ3		
	S	H	S	H	S	H	S	H	D	S	H	D	S	H	D	S	H	D
3,000	0.91	0.75	0.90	0.77	0.92	0.76	Non-standard											
1,500	0.88	0.69	0.89	0.71	0.90	0.71	0.90	0.74	0.61	0.90	0.72	0.59	0.90	0.68	0.61	0.90	0.77	0.68
1000	0.87	0.67	0.88	0.69	0.88	0.68	0.88	0.69	0.57	0.87	0.67	0.55	0.89	0.67	0.57	0.89	0.76	0.66
750	0.85	0.64	0.87	0.66	0.87	0.67	0.87	0.68	0.55	0.86	0.65	0.54	0.88	0.65	0.55	0.89	0.75	0.64
500	0.84	0.61	0.85	0.64	0.85	0.63	0.85	0.64	0.53	0.84	0.62	0.51	0.87	0.64	0.53	0.88	0.74	0.63
100	0.79	0.54	0.79	0.56	0.79	0.54	0.79	0.55	0.51	0.78	0.53	0.49	0.81	0.55	0.51	0.84	0.66	0.61

η_{DS} Screw dynamic efficiency

Trapezoidal screw (Tr)						
16x4	24x5	36x6	45x7	50x8	70x10	80x10
0.44	0.39	0.34	0.32	0.33	0.30	0.27

Ball screw (KGS)
0.9 (for all sizes)

M_I Idle Torque (F/A)

S gearbox version (normal speed)

	HM1	HM2	HM3	HM4	HM5	HJ1	HJ3
Trapezoidal	0.17	0.35	0.57	0.97	1.91	2.03	2.81
Balls	0.14	0.33	0.52	0.93	1.87	1.97	2.75

H gearbox version (slow speed)

	HM1	HM2	HM3	HM4	HM5	HJ1	HJ3
Trapezoidal	0.08	0.17	0.31	0.57	1.08	1.21	1.95
Balls	0.08	0.17	0.29	0.56	1.07	1.19	1.94

D gearbox version (super-slow speed)

	HM1	HM2	HM3	HM4	HM5	HJ1	HJ3
Trapezoidal				0.19	0.36	0.40	0.49
Balls				0.19	0.36	0.40	0.48

η_{SA} Actuator static efficiency (F/A)

S gearbox box version (normal speed)

	HM1	HM2	HM3	HM4	HM5	HJ1	HJ3
Trapezoidal	0.22	0.20	0.17	0.15	0.16	0.15	0.15
Balls	0.57	0.57	0.57	0.56	0.55	0.59	0.64

H gearbox version (slow speed)

	HM1	HM2	HM3	HM4	HM5	HJ1	HJ3
Trapezoidal	0.13	0.13	0.11	0.10	0.10	0.10	0.11
Balls	0.35	0.37	0.35	0.35	0.32	0.36	0.45

D gearbox version (super-slow speed)

	HM1	HM2	HM3	HM4	HM5	HJ1	HJ3
Trapezoidal				0.10	0.10	0.10	0.10
Balls				0.33	0.30	0.34	0.43

IMPORTANT

- ... The values indicated in the tables correspond to the lubrication conditions established by NIASA, 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.

LINEAR ACTUATORS

WITH INTEGRATED REDUCTION AND COMPACT GEARBOX. FHM SERIES: STEEL TUBE | AHM SERIES: ALUMINUM TUBE

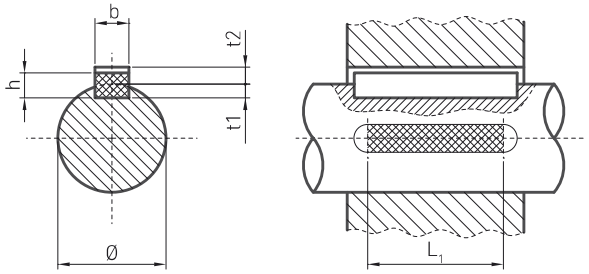
PRODUCT SELECTION

MAXIMUM TRANSFERABLE TORQUE ACCORDING TO SHAFT/ PARALLEL COTTER PIN (DIN 6885)

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

IMPORTANT

... Never subject the input of a screw jack to torque over that indicated for its shaft and keys (see plans in the chapter "sizes", page 152).



Shaft diameter Ø (mm)	Key dimensions			Maximum transferrable torque, M_D (Nm) Key effective length, L_1 (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 NIASA technical department

LUBRICATION

NIASA HM Series linear actuators are supplied lubricated with DIVINOL LITHOGREASE G421 type grease. This is a semi-synthetic grease with a lithium compound with the following specifications.

A change of grease type may affect the correct operation of the actuator.

Specifications

G421 DIVINOL LITHOGREASE	
Working temperature	-35 to +160ºC
Density at 15ºC	0.9 kg/dm^3
Cinematic viscosity (s/DIN 51 562)	130 mm^2/s at 40ºC 15 mm^2/s at 100ºC
Dropping point (s/DIN ISO 2176)	>220ºC
Water resistance (s/DIN 51 807/T1)	Level 1

For further information, please contact the NIASA technical department.

NIASA supplies its HM Series actuators with a brass lubrication cap with O-ring, on the gearbox and on the tube, to ensure it is sealed.

There is a possibility to supply HM Series actuators with a grease nipple angled at 45º DIN 71412 type B for the gearbox, and a straight grease nipple DIN 71412 type A for the tube.

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.

A group lubricator is recommended for automatic lubrication of the units. Depending on the type of group lubricator, the lubrication may last up to two years.
See lubrication chapter in accessories.

PRODUCT SELECTION

PROTECTION AGAINST CORROSION, SEALING AND AMBIENT TEMPERATURE

PROTECTION 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 NIASA so that the technical department can select the surface protection system and select the most suitable components.

CORROSION CATEGORY		ENVIRONMENT	
		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 atmospheres, with moderate SO_2 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 high (industrial)	Industrial areas with high humidity and aggressive atmosphere.	Buildings or areas with almost permanent condensation and high contamination.
C5-M	Very high (maritime)	Coastal and maritime areas with high salinity.	Buildings or areas with permanent condensation and high contamination.

DURABILITY		
LOW	L	2 to 5 years
MEDIUM	M	5 to 15 years
HIGH	H	More than 15 years

PROTECTION AGAINST THE INPUT OF SOLIDS AND LIQUIDS

NIASA actuators offer, as standard, an IP65 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. NIASA 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".

LEVEL OF PROTECTION "IP", AGAINST 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).
		...	...

AMBIENT TEMPERATURE

Contact NIASA if your unit will be installed in an environment that may reach temperatures below -20°C and/or above +40°C.

NIASA's technical department will prescribe the most suitable materials and sealing components for the specific conditions of the application.

LINEAR ACTUATORS

WITH INTEGRATED REDUCTION AND COMPACT GEARBOX. FHM SERIES: STEEL TUBE | AHM SERIES: ALUMINUM TUBE

PRODUCT SELECTION

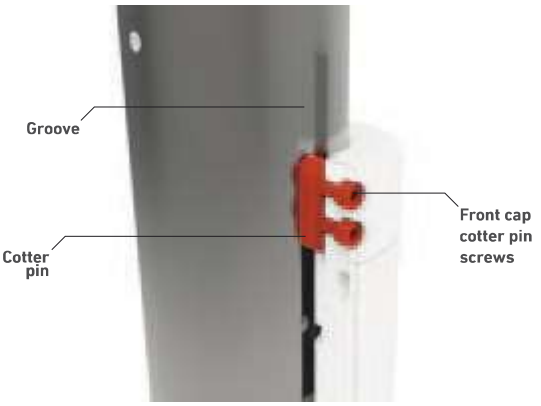
OPTIONAL CONFIGURATIONS

Optionally, NIASA may adapt your HM linear actuator, modifying the different parts of it to your preferences.

Some examples are shown below.
See sub-chapter "Placing an order".

Immobilizations

The FM Series electro-mechanical actuators, on request, can be supplied with the immobilized stem in rotation. This is achieved by mounting a key on the upper cap and machining a groove along the stem.

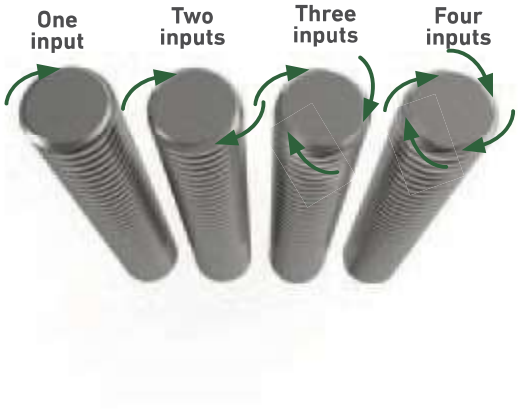


With this configuration, the scraper for the stem cannot be mounted on the front cap. To avoid the possible input of particles or liquid through the stem, it is recommended to mount a bellow to protect it.

For further information, please contact the NIASA technical department.

Special configurations

At the customer's request, the linear actuators can be supplied with a screw of several inputs so that higher speeds can be obtained.



LINEAR ACTUATORS

WITH INTEGRATED REDUCTION AND COMPACT GEARBOX. FHM SERIES: STEEL TUBE | AHM SERIES: ALUMINUM TUBE

PLACING AN ORDER

01 SIZE
FHM1 / AHM1
FHM2 / AHM2
FHM3 / AHM3
FHM4 / AHM4
FHM5
FHJ1
FHJ3

02 GEARBOX
All sizes
S Normal speed
H Reduced speed

Only sizes HM4 / HM5 / HJ1 / HJ3
D Super-slow speed

03 EQUIPMENT GENERAL PROTECTION
IPS Standard IP protection level
IPX Special IP protection level

04 SCREW TYPE (DIAMETER x PITCH)
TRS Steel trapezoidal screw
KGS Ball screw

05 STROKE
0000 Equipment usable stroke in mm

06 IMMOBILISATION IN ROTATION
00 No immobilization
01 Immobilized

07 STEM FASTENING ACCESSORY
BPS Screw flange
GKS Single rod
GKB Double rod
GIR Clevis rod
FES Special end fastening
000 No accessory

08 GEARBOX FASTENING ACCESSORY
Always on the back of the gearbox
HFR Gearbox fastening rod
FMS Special gearbox fastening
000 No accessory

09 EXTERIOR TUBE FASTENING ACCESSORY
Exterior tube configurationF
BB Trunnion mount with studs
BH Trunnion mount with ball bearings

Exterior tube configuration A
BA Trunnion mount with studs

All models
FS Special fastening
00 No accessory

10 TIP ACCESSORY
SB With tip support
00 No tip support

11 LIMIT SWITCH ACCESSORY
Exterior tube configuration F
FCI Inductive limit switches
FCR Inductive limit switches with regulation

Exterior tube configuration A
FCG Magnetic limit switches

All models
000 No limit switches

12 STEM PROTECTION ACCESSORY
Exterior tube configuration F
FB Bellow type protector
00 No protector

13 DRIVE ADAPTATION
MB Adaptation flange
00 No adaptation

14 STANDARD MOTOR
MK drive adaptation
080 Group size
A Power-1 / **B** Power-2

MS drive adaptation
1111 Non-standard drive

Both adaptations
0000 Without drive

15 LUBRICANT
GRA Standard lubricant
GRX Lubricant for low extreme temperatures
GRS Other lubricant

16 LUBRICATION ACCESSORIES
ETP Sealed lubrication cap (standard)
EMT Angled lubricator on gearbox or straight on tube
AGR Automatic lubricating accessory
000 No lubricating accessory

17 EQUIPMENT GENERAL COLOUR
With type A configuration, only the gearbox is painted
RGG Graphite grey RAL7024 (standard)
RAZ Blue RAL5017
RGP Silver grey RAL9006
RSP Special colour indicated by the customer
CIP Only grey 411 priming
000 Not painted

Example	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17
	HM3	H	IPS	TRS3606	1000	00	BPS	HFR	00	00	FCI	FB	MB	GR080A	GRA	AGR	RGG

LINEAR ACTUATORS

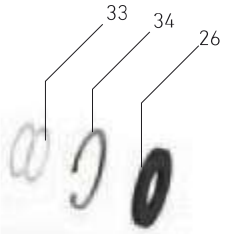
WITH INTEGRATED REDUCTION AND COMPACT GEARBOX. FHM SERIES: STEEL TUBE | AHM SERIES: ALUMINUM TUBE

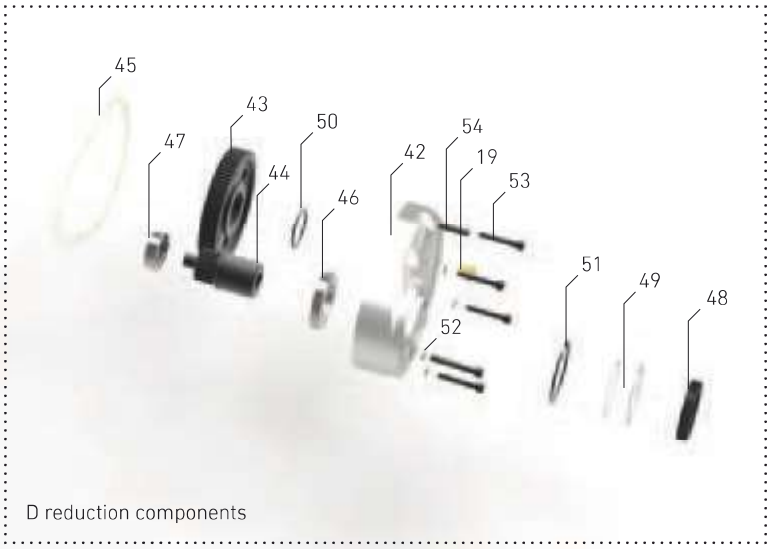
DISASSEMBLY

	Name
01	HM series gearbox
02	Top cap
03	Front cap
04	Exterior tube
05	Stem
06	Worm gear
07	Worm wheel
08	Ball screw
09	Trapezoidal screw
10	Ball nut
11	Trapezoidal nut
12	Guide ring
13	Supplement nut bushing
14	Front support

15	Screw support ring
16	Nut
17	Locknut
18	Tube position nut
19	Lubrication cap
20	Axial bearing
21	Radial bearing
22	Radial bearing
23	Bearing
24	Bearing
25	Double lip radial seal ring
26	Double lip radial seal ring
27	Obturator
28	Obturator

29	Dual-effect scraper
30	O-Ring
31	O-Ring
32	O-Ring
33	Adjustment washer
34	Inside circlip
35	Allen screw
36	Straight key
37	Straight key
38	Stud with point
39	Stud with point
40	Stud with point
41	Flat stud





D reduction components

	D reduction designation
42	Cap
43	Wheel
44	Pinion
45	Sealed joint
46	Radial bearing
47	Radial bearing
48	Double lip seal ring
49	Adjustment washer
50	Exterior circlip
51	Inside circlip
52	Grower washer
53	Allen screw
54	Extraction thread stud

LINEAR ACTUATORS

WITH INTEGRATED REDUCTION AND COMPACT GEARBOX. FHM SERIES: STEEL TUBE | AHM SERIES: ALUMINUM TUBE

SPECIAL CONFIGURATIONS