

# 04

## LINEAR ACTUATORS WITH INTEGRATED REDUCTION AND COMPACT GEARBOX

**FHM Series: Steel tube**

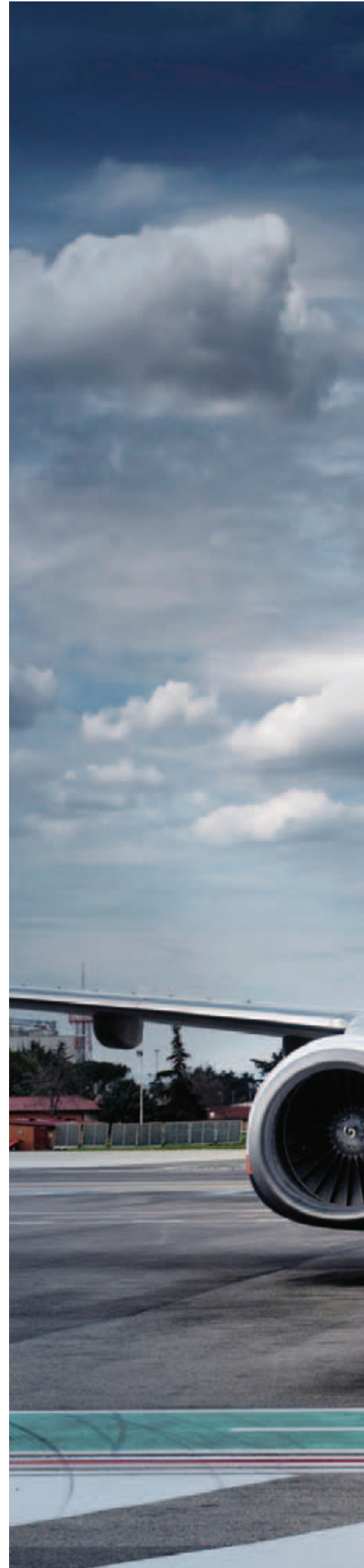
**AHM Series: Aluminum tube**





**“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

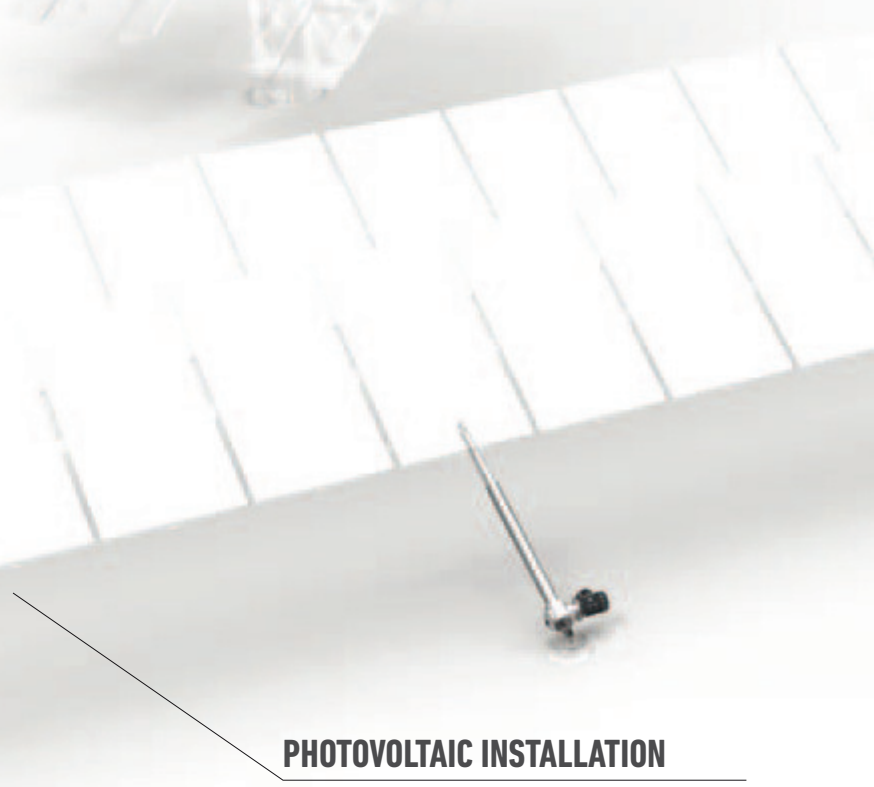
### STIRLING TRACKER

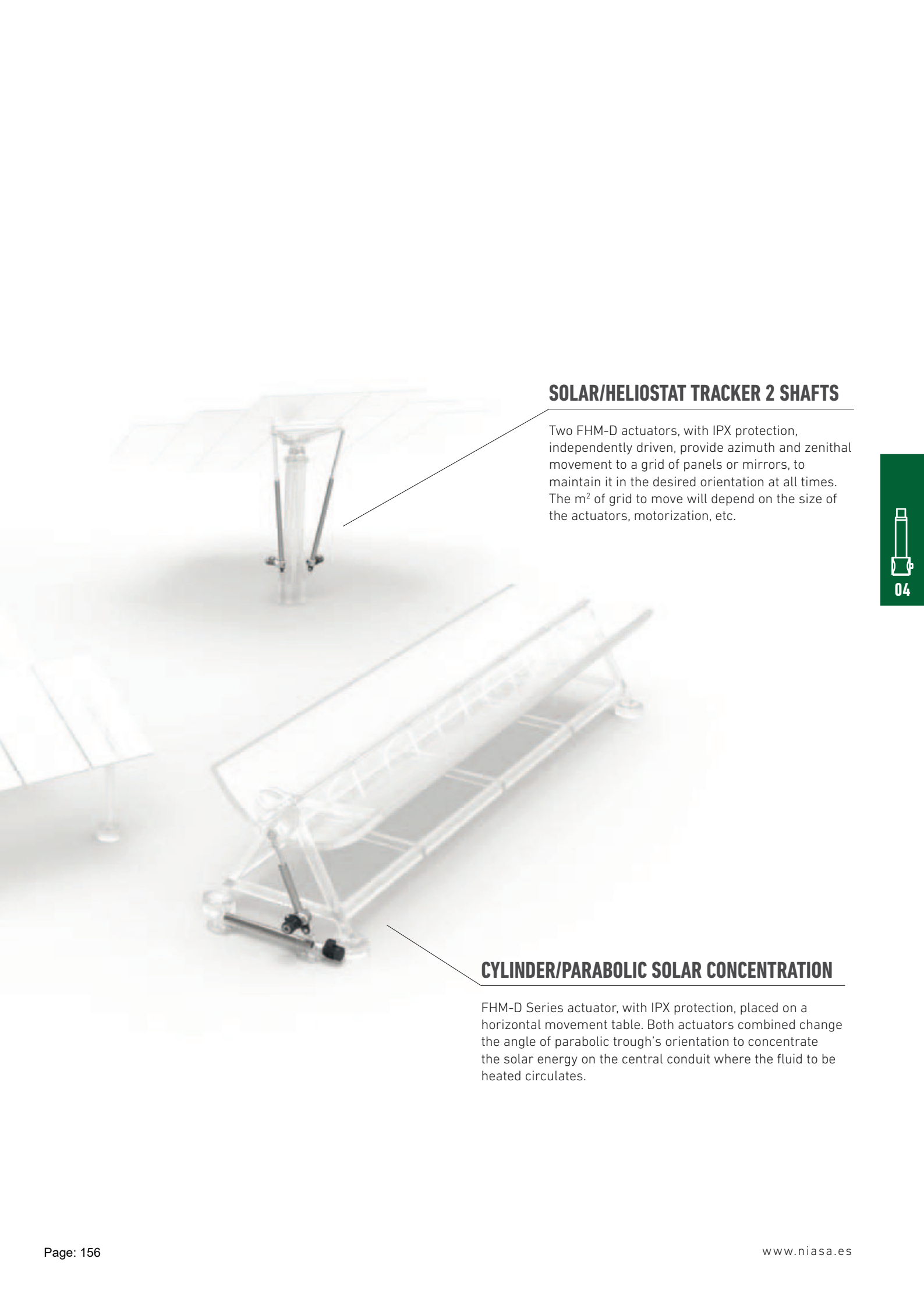
FHM-D Series actuator, with IPX protection, that produces the zenithal orientation movement of a parabolic mirror grid, whose purpose is to concentrate the Sun's rays on a Stirling motor joined to them. The actuator size depends on the total surface of the mirrors, the tilt of the Stirling, etc.



### 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<sup>2</sup> 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.



04









# 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.

	<b>HM1</b> 5 kN	<b>HM2</b> 10 kN	<b>HM3</b> 25 kN
<b>F</b> Steel exterior tube	 page 156	 page 157	 page 158
<b>A</b> 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**



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**HM5**  
**100 kN**



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**HJ1**  
**150 kN**



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**HJ3**  
**250 kN**



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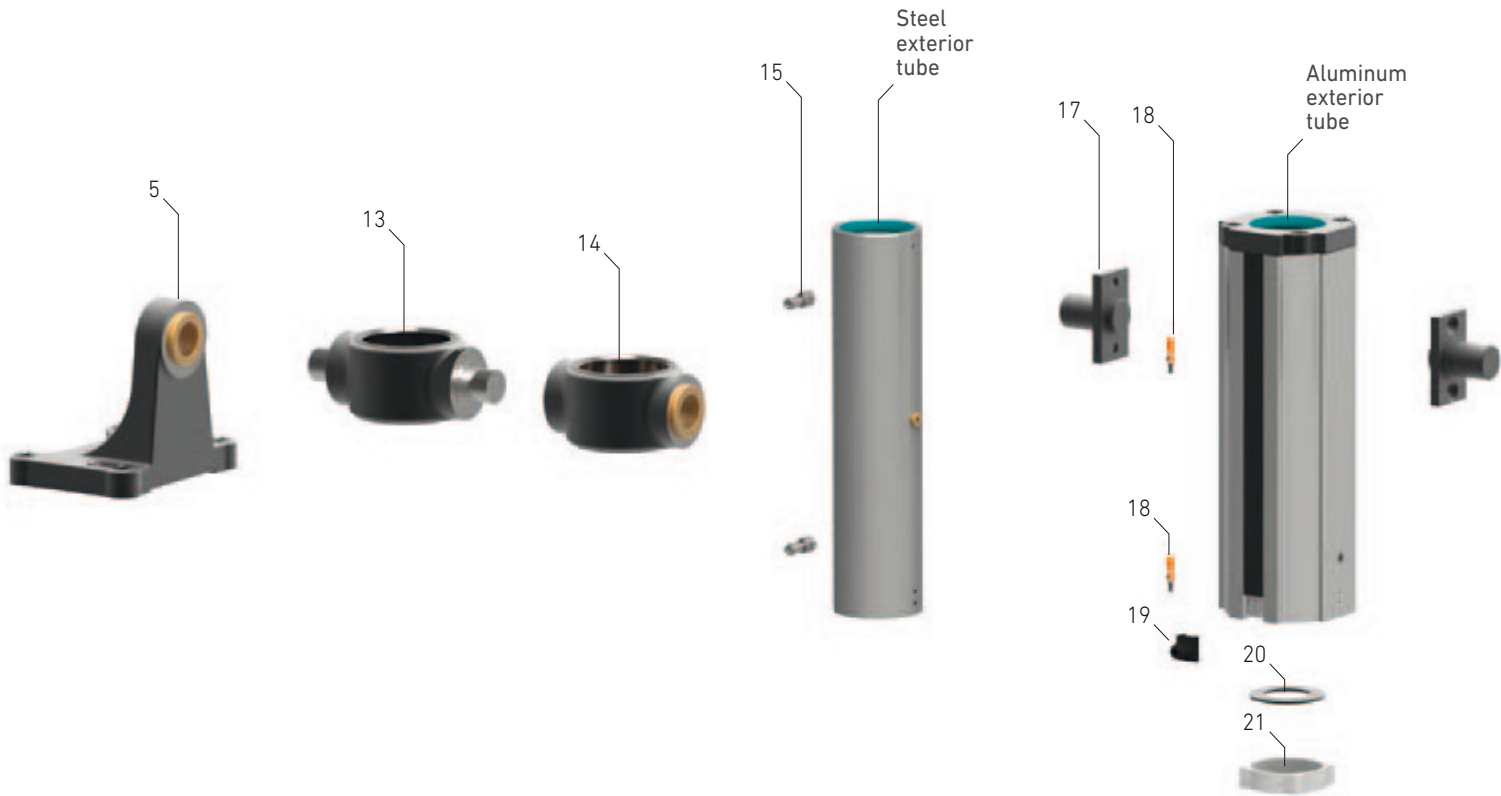


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# LINEAR ACTUATORS

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

## GENERAL PRODUCT OVERVIEW



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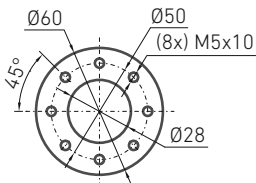
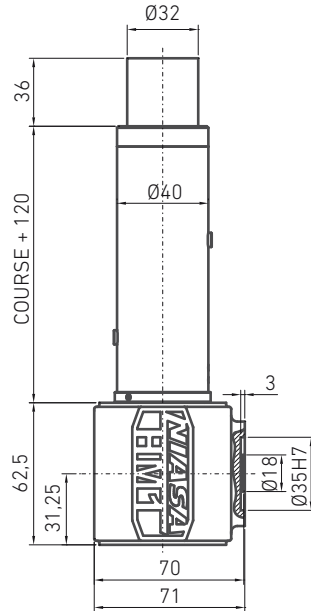
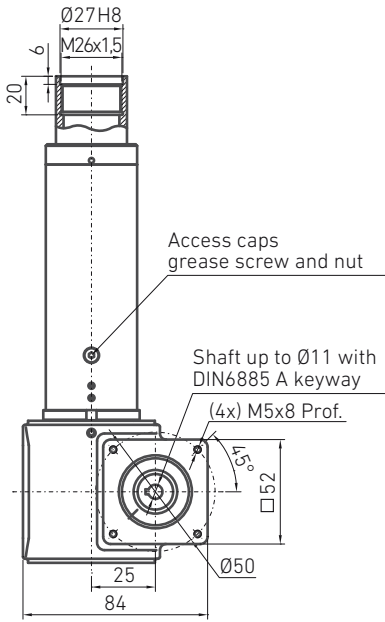
17 BA bolts for aluminum tube	274
18 FCG magnetic limit switch	308
19 Connection sensor input adapter	308
20 Position sensor magnet	308
21 Anti-rotation system	
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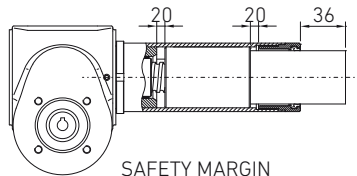
# FHM1/AHM1 LINEAR ACTUATOR

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)
		S	H	S	H	S	H	F (kN), load to move in dynamic		S	H		
								S	H				
Tr 16x4	5	4:1	16:1	1.00	0.25	35	27	$(0.46 \times F) + 0.17$	$(0.15 \times F) + 0.08$	$0.80 \times F$	$0.34 \times F$	1.9	0.5
KGS 1605	5	4:1	16:1	1.25	0.31	71	56	$(0.28 \times F) + 0.14$	$(0.09 \times F) + 0.08$	$0.39 \times F$	$0.16 \times F$	1.9	0.5

... Power required:  $P_D$  (kW) =  $0,157 \times M_D$  (Nm).

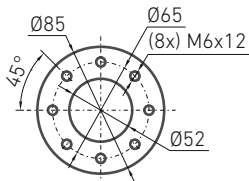
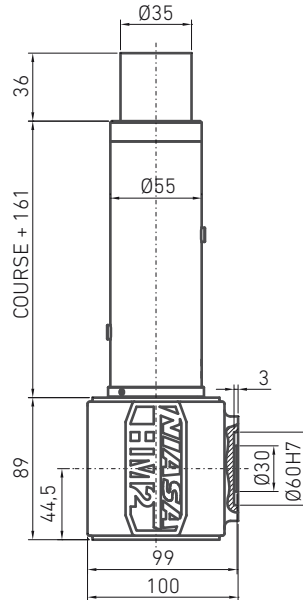
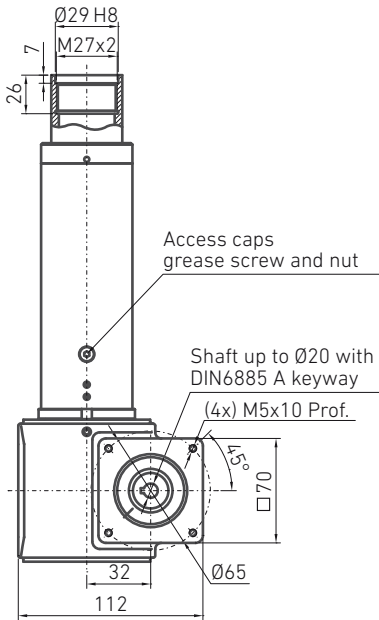
... All the data in the table correspond to an input speed of 1,500 rpm. For other speeds, please see the calculation chapter (page 166).

... 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).

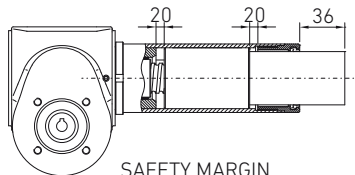


# FHM2/AHM2 LINEAR ACTUATOR

UP TO **10 kN** **Tr** **KGS BALLS**



LOWER GEARBOX FASTENING



SAFETY MARGIN

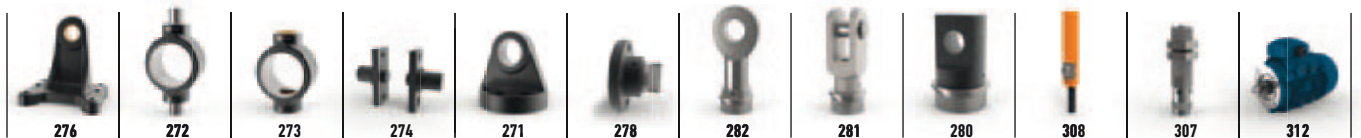


Screw diameter and step (mm)	Maximum axial strength (kN)	Reduction		Travel (mm/revol. input)		Performance (%)		Drive torque, M <sub>D</sub> (Nm)		Start-up torque, M <sub>0</sub> (Nm)		Weight stroke 0 (kg)	Approx. weight each 100mm of stroke (kg)
								F (kN), load to move in dynamic					
		S	H	S	H	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<sub>D</sub> (kW) = 0,157x M<sub>D</sub> (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).

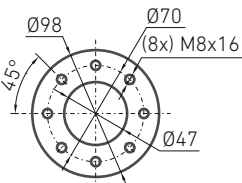
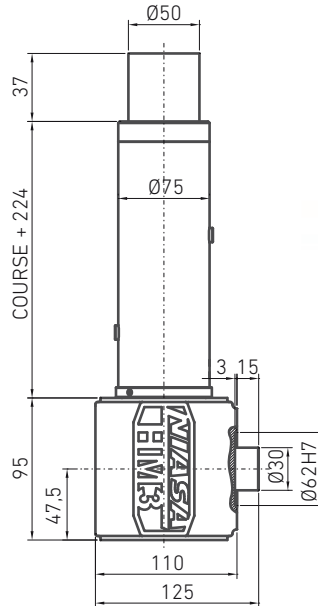
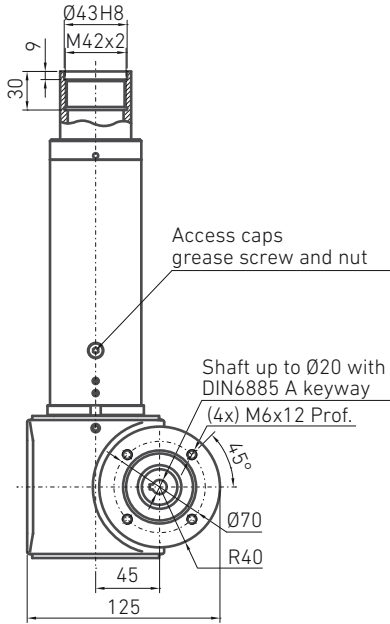




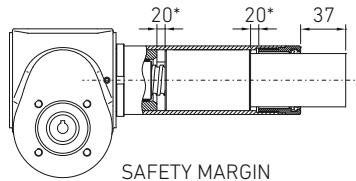
# FHM3/AHM3 LINEAR ACTUATOR

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 <sub>0</sub> (Nm)		Start-up torque, M <sub>0</sub> (Nm)		Weight stroke 0 (kg)	Approx. weight each 100mm of stroke (kg)
		S	H	S	H	S	H	F (kN), load to move in dynamic		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<sub>0</sub> (kW) = 0,157x M<sub>0</sub> (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

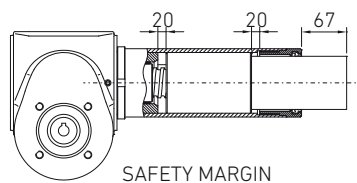
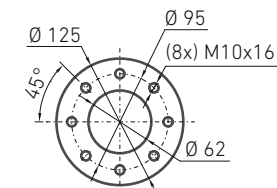
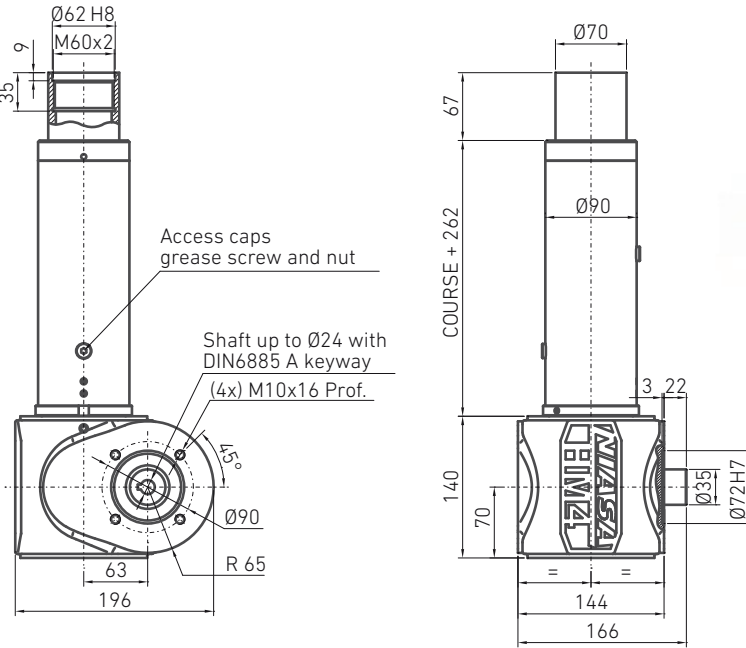


FHM

AHM

NOTE:

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



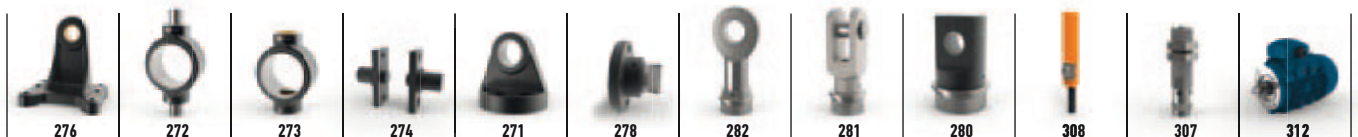
Screw diameter and pitch (mm)	Maximum axial strength (kN)	Reduction			Travel (mm/revol. input)		
		S	H	D	S	H	D
Tr 45x7	50	7:1	28:1	84:1	1.00	0.25	0.08
KGS 4010	42	7:1	28:1	84:1	1.43	0.36	0.12
KGS 4020	37	7:1	28:1	84:1	2.86	0.71	0.24
KGS 4040	35	7:1	28:1	84:1	5.71	1.43	0.48

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	$(0.61 \times F) + 0.97$	$(0.19 \times F) + 0.57$	$(0.076 \times F) + 0.19$	$1.18 \times F$	$0.44 \times F$	$0.155 \times F$	26	3.3	2.5
KGS 4010	73	60	49	$(0.31 \times F) + 0.93$	$(0.09 \times F) + 0.56$	$(0.038 \times F) + 0.19$	$0.45 \times F$	$0.18 \times F$	$0.063 \times F$	26	3.3	2.5
KGS 4020	73	60	49	$(0.62 \times F) + 0.94$	$(0.19 \times F) + 0.56$	$(0.077 \times F) + 0.19$	$0.90 \times F$	$0.36 \times F$	$0.127 \times F$	26	3.3	2.5
KGS 4040	73	60	49	$(1.25 \times F) + 0.94$	$(0.38 \times F) + 0.56$	$(0.154 \times F) + 0.19$	$1.80 \times F$	$0.72 \times F$	$0.253 \times F$	26	3.3	2.5

... Power required:  $P_D$  (kW) =  $0,157 \times M_D$  (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).

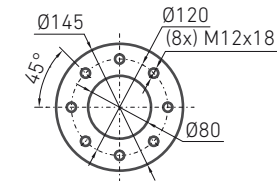
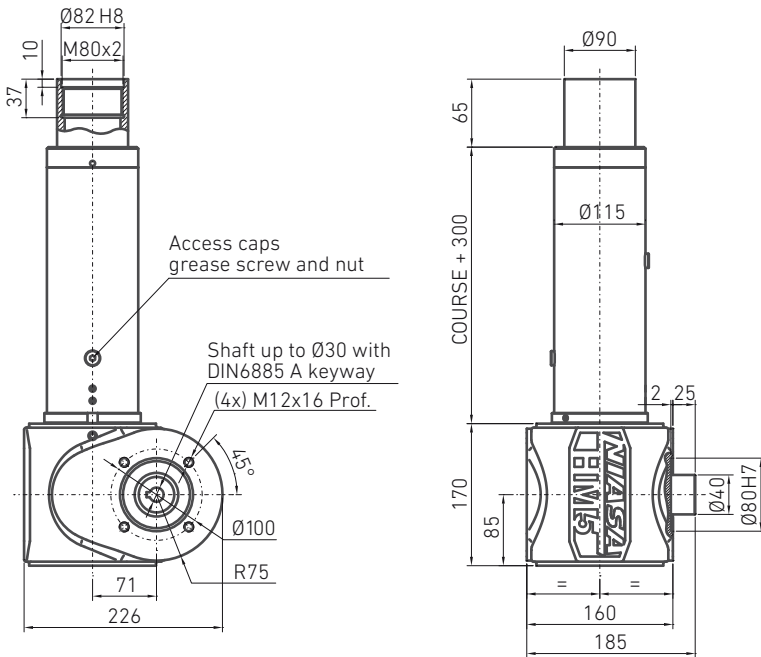


# FHM5 ACTUATOR

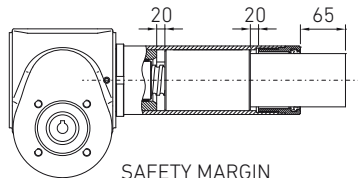
UP TO **100 kN**



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



LOWER GEARBOX FASTENING



SAFETY MARGIN

NOTE:

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

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

... Power required:  $P_0$  (kW) =  $0.157 \times M_0$  (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).

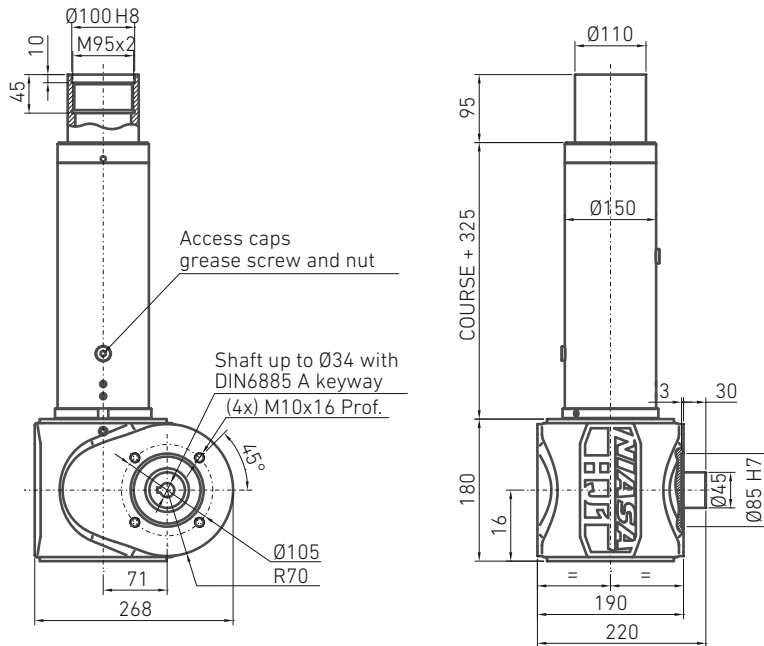


# FHJ1 ACTUATOR

UP TO **150 kN**

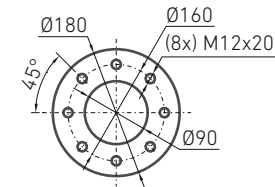


The capacity indicated corresponds to the basic configuration. Higher capacities are available on request.

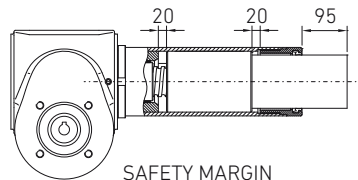


NOTE:

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, $M_0$ (Nm)			Weight stroke 0 (kg)	Approx. weight each 100 mm of stroke (kg)	DR accessory weight (kg)
	S	H	D	F (kN), load to move in dynamic			S	H	D			
				S	H	D						
Tr 70x10	24	18	16	$(0.73 \times F) + 2.03$	$(0.24 \times F) + 1.21$	$(0.09 \times F) + 0.4$	$1.31 \times F$	$0.49 \times F$	$0.172 \times F$	79.5	9	3.8
KGS 6310	73	55	49	$(0.24 \times F) + 1.97$	$(0.08 \times F) + 1.19$	$(0.03 \times F) + 0.4$	$0.33 \times F$	$0.14 \times F$	$0.048 \times F$	81.5	9	3.8

... Power required:  $P_D$  (kW) =  $0,157 \times M_D$  (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).

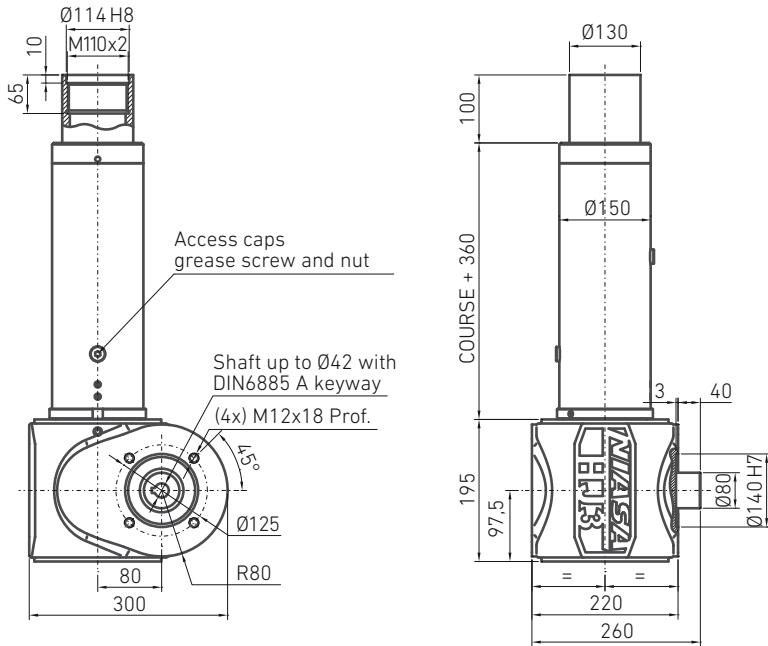
... Ensure that the dynamic load of the application does not surpass the critical values indicated, in order to avoid overheating of the unit and buckling and resonance of the screw. See calculations chapter (page 166).



# FHJ3 ACTUATOR

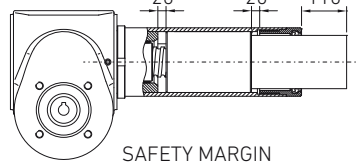
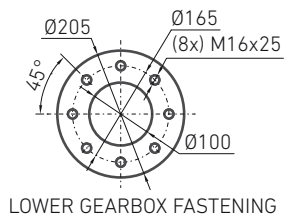
UP TO **250 kN** 

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.



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	$(0.73 \times F) + 2.81$	$(0.21 \times F) + 1.95$	$(0.058 \times F) + 0.49$	$1.18 \times F$	$0.40 \times F$	$0.106 \times F$	109.5	14	5		

... Power required:  $P_D$  (kW) =  $0,157 \times M_D$  (Nm).

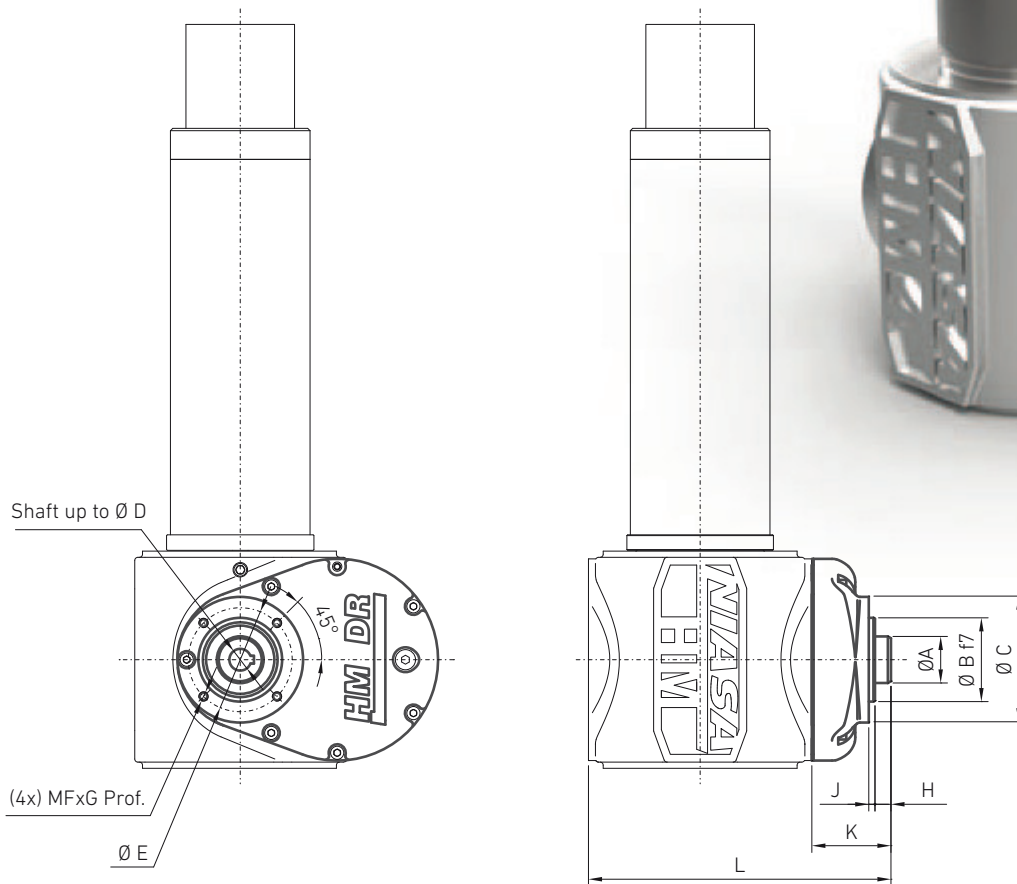
... All the data in the table correspond to an input speed of 1,500 rpm. For other speeds, please see the calculation chapter (page 166).

... 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	MFxG	H	J	K	L
<b>HM4</b>	30	54	81	22	67	M 6x12	10	4	51	195
<b>HM5</b>	40	72	110	28	90	M 6x12	15	4	60	220
<b>HJ1</b>	50	85	130	38	105	M 8x16	15	4	104	294
<b>HJ3</b>	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

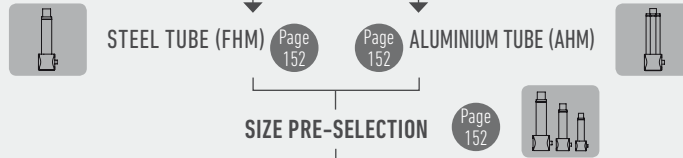
To select the correct HM Series linear actuator, please follow this flow diagram.

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.

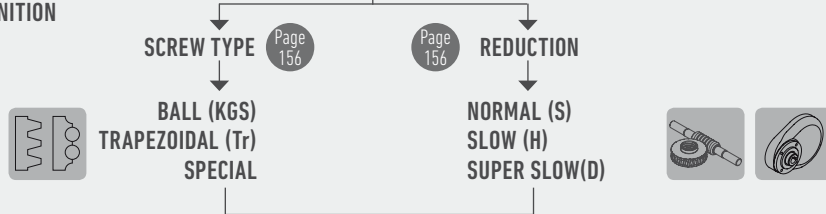


**1 FHM/AHM ACTUATOR MODEL AND SIZE DEFINITION**

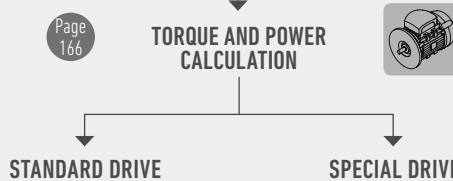
**APPLICATION**



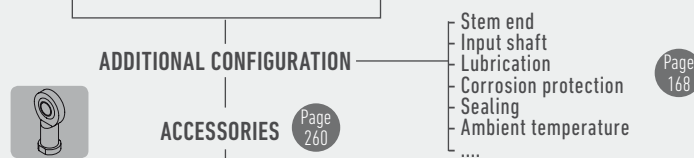
**2 SCREW AND REDUCTION TYPE DEFINITION**



**3 DRIVE TORQUE AND POWER CALCULATION**



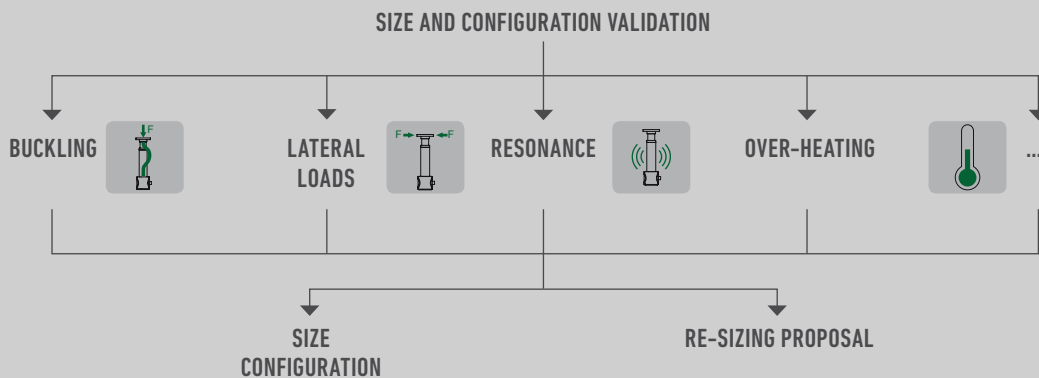
**4 ADDITIONAL CONFIGURATION AND ACCESSORIES**



**5 PLACING AN ORDER**



**6 DESIGN VALIDATION (NIASA)**



# 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<sub>L</sub>** Lateral load on the stem.
- V** Stem advance speed.
- M<sub>D</sub>** 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

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

- F** Load to move in dynamic (kN)
- P** Screw pitch (mm)
- M<sub>I</sub>** Drive idle torque (Nm)
- i** Actuator reduction
- 0.9** Cylinder dynamic efficiency
- η<sub>DG</sub>** Gearbox dynamic efficiency
- η<sub>DS</sub>** Screw dynamic efficiency

#### 2. POWER REQUIRED

$$P_D \text{ (kW)} = \frac{M_D \times n}{9550}$$

- M<sub>D</sub>** 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:

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

- η<sub>SA</sub>** 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.

### $\eta_{DG}$ 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

### $\eta_{DS}$ 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

### $\eta_{SA}$ 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

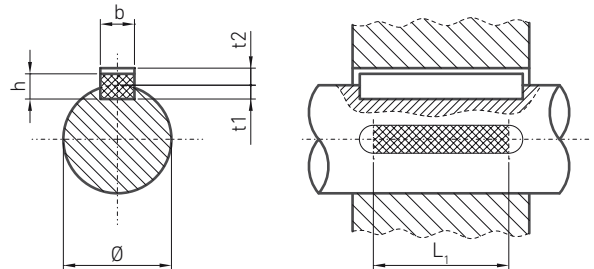
## PRODUCT SELECTION

### 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)						
	b x h (mm)	t1 (mm)	t2 (mm)	Key effective length, $L_1$ (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 +160°C
Density at 15°C	0.9 kg/dm <sup>3</sup>
Cinematic viscosity (s/DIN 51 562)	130 mm <sup>2</sup> /s at 40°C 15 mm <sup>2</sup> /s at 100°C
Dropping point (s/DIN ISO 2176)	>220°C
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 45° 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 COMPACT GEARBOX. FHM SERIES: STEEL TUBE | AHM 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 <sub>2</sub> 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

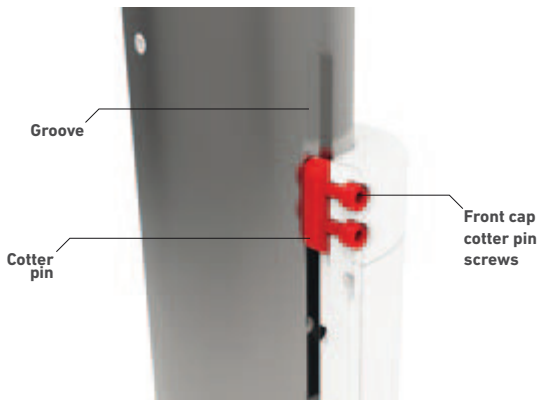
### OPTIONAL CONFIGURATIONS

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.



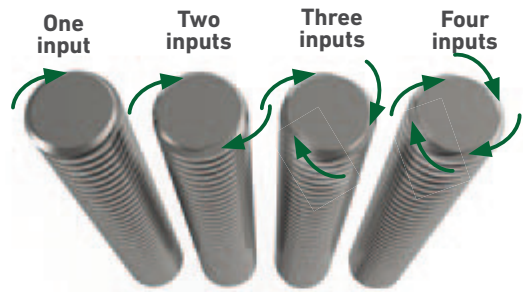
With this configuration, the scraper for the stem cannot be mounted on the front cap. To avoid the possible input of particles or liquid through the stem, it is recommended to mount a bellow to protect it.

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

<b>01</b>	<p><b>SIZE</b>  <b>FHM1 / AHM1</b>  <b>FHM2 / AHM2</b>  <b>FHM3 / AHM3</b>  <b>FHM4 / AHM4</b>  <b>FHM5</b>  <b>FHJ1</b>  <b>FHJ3</b></p>	<b>10</b>	<p><b>TIP ACCESSORY</b>  <b>SB</b> With tip support  <b>00</b> No tip support</p>														
<b>02</b>	<p><b>GEARBOX</b>  <b>All sizes</b>  <b>S</b> Normal speed  <b>H</b> Reduced speed</p> <p><b>Only sizes HM4 / HM5 / HJ1 / HJ3</b>  <b>D</b> Super-slow speed</p>	<b>11</b>	<p><b>LIMIT SWITCH ACCESSORY</b>  <b>Exterior tube configuration F</b>  <b>FCI</b> Inductive limit switches  <b>FCR</b> Inductive limit switches with regulation</p> <p><b>Exterior tube configuration A</b>  <b>FCG</b> Magnetic limit switches</p> <p><b>All models</b>  <b>000</b> No limit switches</p>														
<b>03</b>	<p><b>EQUIPMENT GENERAL PROTECTION</b>  <b>IPS</b> Standard IP protection level  <b>IPX</b> Special IP protection level</p>	<b>12</b>	<p><b>STEM PROTECTION ACCESSORY</b>  <b>Exterior tube configuration F</b>  <b>FB</b> Bellow type protector  <b>00</b> No protector</p>														
<b>04</b>	<p><b>SCREW TYPE (DIAMETER x PITCH)</b>  <b>TRS</b> Steel trapezoidal screw  <b>KGS</b> Ball screw</p>	<b>13</b>	<p><b>DRIVE ADAPTATION</b>  <b>MB</b> Adaptation flange  <b>00</b> No adaptation</p>														
<b>05</b>	<p><b>STROKE</b>  <b>0000</b> Equipment usable stroke in mm</p>	<b>14</b>	<p><b>STANDARD MOTOR</b>  <b>MK drive adaptation</b>  <b>080</b> Group size  <b>A</b> Power-1 / <b>B</b> Power-2</p> <p><b>MS drive adaptation</b>  <b>1111</b> Non-standard drive</p> <p><b>Both adaptations</b>  <b>0000</b> Without drive</p>														
<b>06</b>	<p><b>IMMOBILISATION IN ROTATION</b>  <b>00</b> No immobilization  <b>01</b> Immobilized</p>	<b>15</b>	<p><b>LUBRICANT</b>  <b>GRA</b> Standard lubricant  <b>GRX</b> Lubricant for low extreme temperatures  <b>GRS</b> Other lubricant</p>														
<b>07</b>	<p><b>STEM FASTENING ACCESSORY</b>  <b>BPS</b> Screw flange  <b>GKS</b> Single rod  <b>GKB</b> Double rod  <b>GIR</b> Clevis rod  <b>FES</b> Special end fastening  <b>000</b> No accessory</p>	<b>16</b>	<p><b>LUBRICATION ACCESSORIES</b>  <b>ETP</b> Sealed lubrication cap (standard)  <b>EMT</b> Angled lubricator on gearbox or straight on tube  <b>AGR</b> Automatic lubricating accessory  <b>000</b> No lubricating accessory</p>														
<b>08</b>	<p><b>GEARBOX FASTENING ACCESSORY</b>  <b>Always on the back of the gearbox</b>  <b>HFR</b> Gearbox fastening rod  <b>FMS</b> Special gearbox fastening  <b>000</b> No accessory</p>	<b>17</b>	<p><b>EQUIPMENT GENERAL COLOUR</b>  <b>With type A configuration, only the gearbox is painted</b>  <b>RGG</b> Graphite grey RAL7024 (standard)  <b>RAZ</b> Blue RAL5017  <b>RGP</b> Silver grey RAL9006  <b>RSP</b> Special colour indicated by the customer  <b>CIP</b> Only grey 411 priming  <b>000</b> Not painted</p>														
<b>09</b>	<p><b>EXTERIOR TUBE FASTENING ACCESSORY</b>  <b>Exterior tube configuration F</b>  <b>BB</b> Trunnion mount with studs  <b>BH</b> Trunnion mount with ball bearings</p> <p><b>Exterior tube configuration A</b>  <b>BA</b> Trunnion mount with studs</p> <p><b>All models</b>  <b>FS</b> Special fastening  <b>00</b> No accessory</p>																
<b>Example</b>	<b>01</b> HM3	<b>02</b> H	<b>03</b> IPS	<b>04</b> TRS3606	<b>05</b> 1000	<b>06</b> 00	<b>07</b> BPS	<b>08</b> HFR	<b>09</b> 00	<b>10</b> 00	<b>11</b> FCI	<b>12</b> FB	<b>13</b> MB	<b>14</b> GR080A	<b>15</b> GRA	<b>16</b> AGR	<b>17</b> RGG



# LINEAR ACTUATORS

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

## DISASSEMBLY

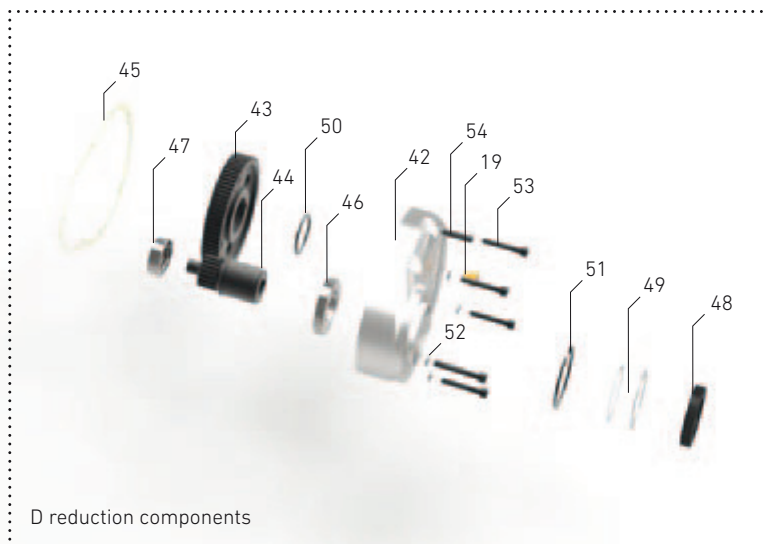
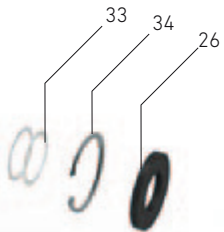


Name

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

