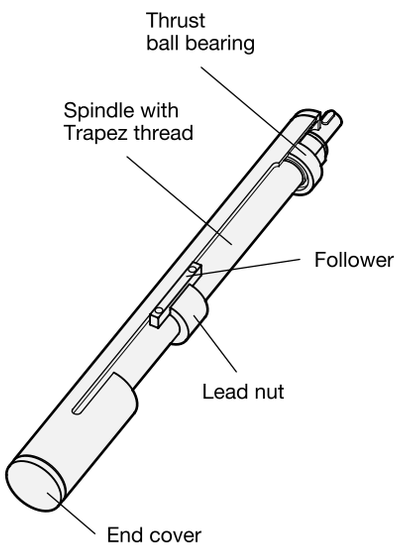
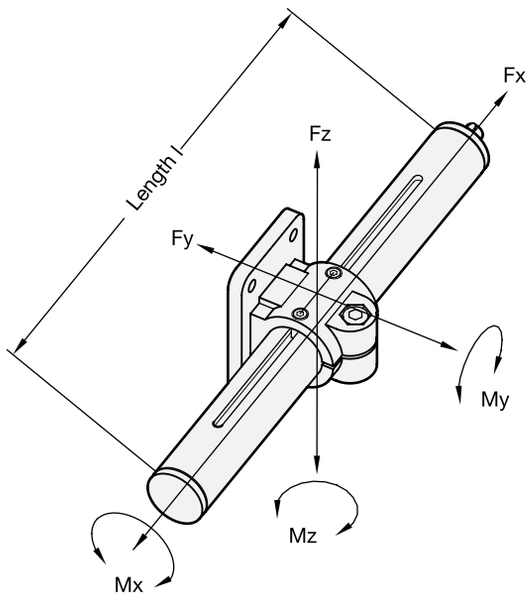
Technical data and load data of linear actuators





Ø Linear actuator	Fx in N	Fy in N			Fz in N			Mx in Nm	My in Nm	Mz in Nm
		l = 500	l = 1000	l = 1500	l = 500	l = 1000	l = 1500			
18	400	80	15	-	65	10	-	1.5	4.5	4.5
30	850	500	70	15	550	55	10	6.5	15	15
40	1100	2150	250	65	1900	150	50	15	42	42
50	1750	3100	650	150	3100	650	150	29	69	69
60	2600	4550	1500	400	4550	1400	350	45	125	125

The load data are applicable to linear actuators GN 291, GN 292, GN 293 Steel (SCR) or Stainless Steel (NI). At the values indicated above, a temporary linear tube deformation of approximately 0.5 mm will occur.

Description

The lead screw with a trapezoidal thread mounted on a thrust ball bearing at both ends is fitted with a follower nut. The follower nut carries an adaptor bar that protrudes through the tube slot thus preventing the follower nut from rotating. The adaptor bar is linked to sliding units. Linear actuators have been designed for hand operation (handwheel).

The positioning accuracy is 0.2 mm at 300 mm travel, the backlash is max. 0.1 mm.

Guide tubes are available in chrome plated steel (SCR) or Stainless Steel (NI). They are produced within the tolerance band of precision steel tubes DIN 2391 and DIN 2462 respectively.

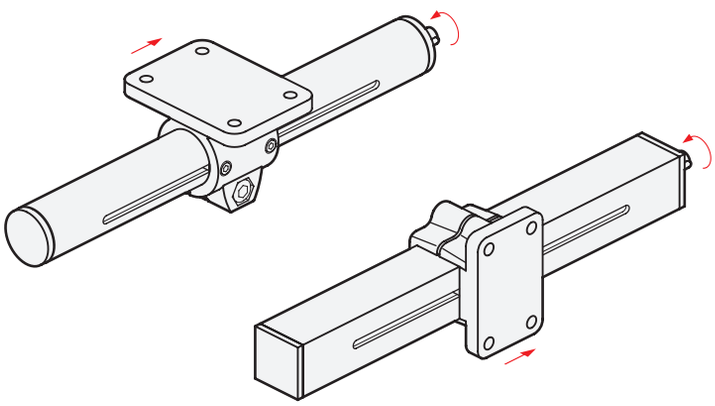
Within the extensive range of tube clamping connectors, there are numerous components available for constructing jigs and fixtures which are designed to perform linear operations.

In addition digital position indicators (DD52R / DD51) can be added to monitor the movement and positioning.

For applications with high torsional moments Mx it is recommended to use square linear actuators or linear actuators with pipe-in-pipe system.

For this type there are also a numerous components within the tube clamp connectors range available. The slide units of the square linear actuators are built of split elements. Therefore there are no special requirements regarding the tolerance of the square tubes.

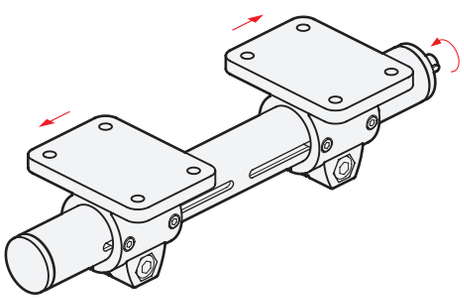
Types of linear actuators



Description

Linear actuator GN 291 (see page 119) with left or right hand thread, with protruding shaft at either one or both ends with one linear actuator connector GN 146.1 (see page 134).

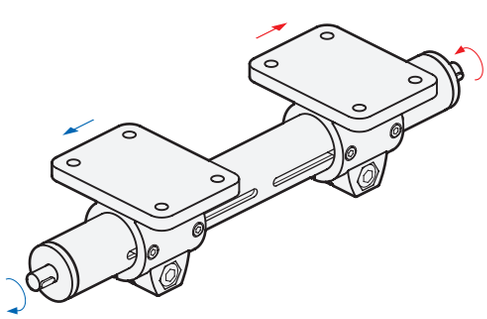
Square linear actuator GN 291.1 (see page 146) with left or right hand thread, with protruding shaft at either one or both ends with one linear actuator connector GN 147.1 (see page 149).



Description

Linear actuator GN 292 (see page 124) with left and right hand thread, with protruding shaft at either one or both ends and two linear actuator connectors, both sliders move in symmetry GN 146.1 (see page 134).

Square linear actuators GN 292.1 on request.



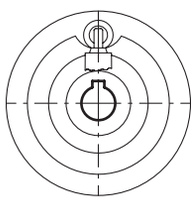
Description

Linear actuator GN 293 (see page 125) with two separate spindles, each with right or left-hand thread, with two linear actuator connectors GN 146.1 (see page 134), both sliders move independently of each other.

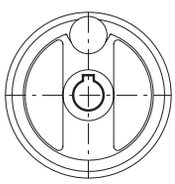
Square linear actuators GN 293.1 on request.

Technical Data

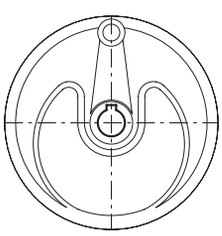
Orientation of keyways



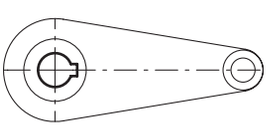
Solid handwheels



Spoked handwheels



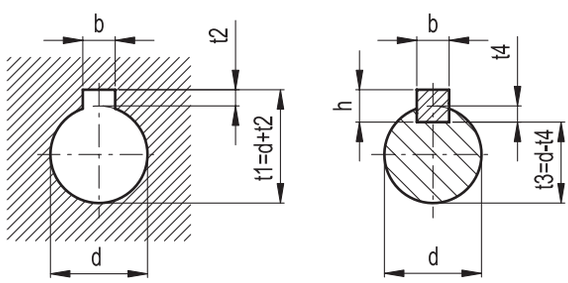
Monospoke handwheels



Crank handles

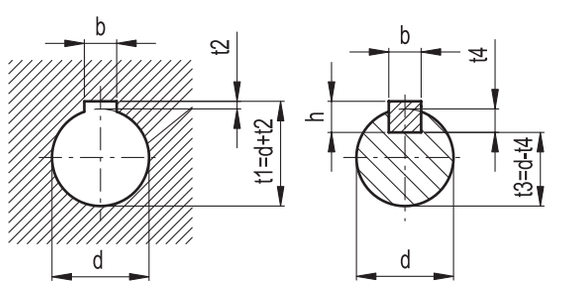
DIN 6885/1 KEYWAYS					
d	b P9/JS9 Hub keyway	b P9/N9 Shaft-keyway	h	t2	t4
from 6 to 8	2	2	2	1 $^{+0.1}$	1.2 $^{+0.1}$
over 8 to 10	3	3	3	1.4 $^{+0.1}$	1.8 $^{+0.1}$
over 10 to 12	4	4	4	1.8 $^{+0.1}$	2.5 $^{+0.1}$
over 12 to 17	5	5	5	2.3 $^{+0.1}$	3 $^{+0.1}$
over 17 to 22	6	6	6	2.8 $^{+0.1}$	3.5 $^{+0.1}$
over 22 to 30	8	8	7	3.3 $^{+0.2}$	4 $^{+0.2}$
over 30 to 38	10	10	8	3.3 $^{+0.2}$	5 $^{+0.2}$
over 38 to 44	12	12	8	3.3 $^{+0.2}$	5 $^{+0.2}$
over 44 to 50	14	14	9	3.8 $^{+0.2}$	5.5 $^{+0.2}$

Width of keyway:
P9 tight fit (standard design)
JS or N9 loose fit (requires agreement in writing)



DIN 6885/2 KEYWAYS					
d	b P9/JS9 Hub keyway	b P9/N9 Shaft-keyway	h	t2	t4
from 10 to 12	4	4	4	1.1 $^{+0.1}$	3 $^{+0.1}$
over 12 to 17	5	5	5	1.3 $^{+0.1}$	3.8 $^{+0.1}$
over 17 to 22	6	6	6	1.7 $^{+0.1}$	4.4 $^{+0.1}$
over 22 to 30	8	8	7	1.7 $^{+0.2}$	5.4 $^{+0.2}$
over 30 to 38	10	10	8	2.1 $^{+0.2}$	6 $^{+0.2}$
over 38 to 44	12	12	8	2.1 $^{+0.2}$	6 $^{+0.2}$
over 44 to 50	14	14	9	2.6 $^{+0.2}$	6.5 $^{+0.2}$

Width of keyway:
P9 tight fit (standard design)
JS or N9 loose fit (requires agreement in writing)



This ISO Standard represents the basic for a system of nominal dimensions and sizes whereby the table mirrors the calculated values of basic tolerances relating to basic dimensions.

The use of this table is limited to smooth circular cylindrical workpieces or such with two parallel fitting planes or contact areas.

The values attributed to an ISO tolerance grade (IT) specify the tolerance value and hence the tolerance area. With ascending numbers, the size of the tolerance increases.

For identification purpose of the position of the tolerance area in relation to the nominal dimension (zero), the number chosen as tolerance grade IT is preceeded by a letter.

Tolerance area H is the most common value for bores. It specifies that the minimum dimension of the bore corresponds to the nominal dimension.

The permissible maximum dimension corresponds to the nominal dimension plus the IT tolerance.

Examples:

bore 20 H7 = 20 +0.021/0 **bore 8 H11 = 8 +0.090/0**

min. dimens.: 20.000 **min. dimens.: 8.000**

max. dimens.: 20.021 **min. dimens.: 8.090**

ISO-Fundamental tolerance series DIN ISO 286

Tol. (µm)	Nominal sizes												
Grades	-	>3	>6	>10	>18	>30	>50	>80	>120	>180	>250	>315	>400
IT	... 3	... 6	... 10	... 18	... 30	... 50	... 80	... 120	... 180	... 250	... 315	... 400	... 500
01	0.3	0.4	0.4	0.5	0.6	0.6	0.8	1	1.2	2	2.5	3	4
0	0.5	0.6	0.6	0.8	1	1	1.2	1.5	2	3	4	5	6
1	0.8	1	1	1.2	1.5	1.5	2	2.5	3.5	4.5	6	7	8
2	1.2	1.5	1.5	2	2.5	2.5	3	4	5	7	8	9	10
3	2	2.5	2.5	3	4	4	5	6	8	10	12	13	15
4	3	4	4	5	6	7	8	10	12	14	16	18	20
5	4	5	6	8	9	11	13	15	18	20	23	25	27
6	6	8	9	11	13	16	19	22	25	29	32	36	40
7	10	12	15	18	21	25	30	35	40	46	52	57	63
8	14	18	22	27	33	39	46	54	63	72	81	89	97
9	25	30	36	43	52	62	74	87	100	115	130	140	155
10	40	48	58	70	84	100	120	140	160	185	210	230	250
11	60	75	90	110	130	160	190	220	250	290	320	360	400
12	100	120	150	180	210	250	300	350	400	460	520	570	630
13	140	180	220	270	330	390	460	540	630	720	810	890	970
14	250	300	360	430	520	620	740	870	1000	1150	1300	1400	1550
15	400	480	580	700	840	1000	1200	1400	1600	1850	2100	2300	2500
16	600	750	900	1100	1300	160	1900	2200	2500	2900	3200	3600	4000
17	1000	1200	1500	1800	2100	2500	3000	3500	4000	4600	5200	5700	6300
18	1400	1800	2200	2700	3300	3900	4600	5400	6300	7200	8100	8900	9700

Tol. (µm)	Nominal sizes									
classes	...	>3	>6	>10	>18	>30	>50	>80	>120	>180
for bore	... 3	... 6	...10	...18	...30	...50	...80	...120	...180	...250
D9	+45	+60	+76	+93	+117	+142	+174	+207	+245	+285
	+20	+30	+40	+50	+65	+80	+100	+120	+145	+170
D12	+120	+150	+190	+230	+275	+330	+400	+470	+545	+630
	+20	+30	+40	+50	+65	+80	+100	+120	+145	+170
E8	+28	+38	+47	+59	+73	+89	+106	+126	+148	+172
	+14	+20	+25	+32	+40	+50	+60	+72	+85	+100
G6	+8	+12	+14	+17	+20	+25	+29	+34	+39	+44
	+2	+4	+5	+6	+7	+9	+10	+12	+14	+15
G7	+12	+16	+20	+24	+28	+34	+40	+47	+54	+61
	+2	+4	+5	+6	+7	+9	+10	+12	+14	+15
H7	+10	+12	+15	+18	+21	+25	+30	+35	+40	+46
	0	0	0	0	0	0	0	0	0	0
H8	+14	+18	+22	+27	+33	+39	+46	+54	+63	+72
	0	0	0	0	0	0	0	0	0	0
H9	+25	+30	+36	+43	+52	+62	+74	+87	+100	+115
	0	0	0	0	0	0	0	0	0	
H11	+60	+75	+90	+110	+130	+160	+190	+220	+250	+290
	0	0	0	0	0	0	0	0	0	
H12	+100	+120	+150	+180	+210	+250	+300	+350	+400	+460
	0	0	0	0	0	0	0	0	0	0
H13	+140	+180	+220	+270	+330	+390	+460	+540	+630	+720
	0	0	0	0	0	0	0	0	0	0
H14	+250	+300	+360	+430	+520	+620	+740	+870	+1000	+1150
	0	0	0	0	0	0	0	0	0	0
JS9	±12.5	±15	±18	±21.5	±26	±31	±37	±43.5	±50	±57.5
N9	-4	0	0	0	0	0	0	0	0	0
	-29	-30	-36	-43	-52	-62	-74	-87	-100	-115
P9	-6	-12	-15	-18	-22	-26	-32	-37	-43	-50
	-31	-42	-51	-61	-74	-88	-106	-124	-143	-165
for shaft										
f7	-6	-10	-13	-16	-20	-25	-30	-36	-43	-50
	-16	-22	-28	-34	-41	-50	-60	-71	-83	-96
h6	0	0	0	0	0	0	0	0	0	0
	-6	-8	-9	-11	-13	-16	-19	-22	-25	-29
h7	0	0	0	0	0	0	0	0	0	0
	-10	-12	-15	-18	-21	-25	-30	-35	-40	-46
h8	0	0	0	0	0	0	0	0	0	0
	-14	-18	-22	-27	-33	-39	-46	-54	-63	-72
h9	0	0	0	0	0	0	0	0	0	0
	-25	-30	-36	-43	-52	-62	-74	-87	-100	-115
h11	0	0	0	0	0	0	0	0	0	0
	-60	-75	-90	-110	-130	-160	-190	-220	-250	-290
h13	0	0	0	0	0	0	0	0	0	0
	-140	-180	-220	-270	-330	-390	-460	-540	-630	-720
h14	0	0	0	0	0	0	0	0	0	0
	-250	-300	-360	-430	-520	-620	-740	-870	-1000	-1150
js14	±125	±150	±180	±215	±260	±310	±370	±435	±500	±575
n6	+10	+16	+19	+23	+28	+33	+39	+45	+52	+60
	+4	+8	+10	+12	+15	+17	+20	+23	+27	+31
p6	+12	+20	+24	+29	+35	+42	+51	+59	+68	+79
	+6	+12	+15	+18	+22	+26	+32	+37	+43	+50

PROPERTIES OF METAL MATERIALS
STAINLESS STEELS

Description	AISI 303	AISI 304+Cu	AISI 304	AISI 316	AISI 316 LHC	AISI 301	AISI 302	AISI CF-8
Designation in accordance with EN 10088-1-2-3 EN 10283 (AISI CF-8) SINT C40 (AISI 316 LMC)	X 8 CrNiS 18-9	X 3 CrNiCu 18-9-4	X 5 CrNi 18-10	X 5 CrNiMo 17-12	Sint C40 X 2 CrNiMo 17-12-2	EN 100088-1;-2;-3 X10CrNi 18-8	X 10 CrNi 18-09	EN 10283 GX5CrNi 19-10
% components of alloy	C ≤ 0.10 Si ≤ 1.0 Mn ≤ 2.0 P ≤ 0.045 S ≤ 0.15 ÷ 0.35 Cr 17.0 ÷ 19.0 Ni 8.0 ÷ 10.0	C ≤ 0.04 Si ≤ 1.0 Mn ≤ 2.0 P ≤ 0.045 S ≤ 0.030 Cr 17.0 ÷ 19.0 Ni 8.5 ÷ 10.5	C ≤ 0.07 Si ≤ 1.0 Mn ≤ 2.0 P ≤ 0.045 S ≤ 0.030 Cr 17.0 ÷ 19.5 Ni 8.0 ÷ 10.5	C ≤ 0.08 Si ≤ 1.0 Mn ≤ 2.0 P ≤ 0.045 S ≤ 0.030 Cr 16.0 ÷ 18.5 Ni 10.0 ÷ 13.0	C ≤ 0.08 Si ≤ 0.9 Mn ≤ 0.1 Mo ≤ 2.0 ÷ 4.0 Cr 16.0 ÷ 19.0 Ni 10.0 ÷ 14.0	C ≤ 0.05 ÷ 0.15 Si ≤ 2.0 Mn ≤ 2.0 P ≤ 0.045 S ≤ 0.015 Cr 16.0 ÷ 19.0 Mo ≤ 0.8 Ni 6.0 ÷ 9.5	C ≤ 0.08 Si ≤ 0.6 Mn ≤ 1.2 Cr 18.0 Ni 9.0	C ≤ 0.07Si ≤ 2.0 Si ≤ 1.5 Mn ≤ 1.5 P ≤ 0.04 S ≤ 0.03 Cr 18.0 ÷ 20.0 Ni 8.0 ÷ 11.0
Minimum load at breakage Rm N/mm²	500 - 700	450 - 650	500 - 700	500 - 700	330	500 - 750	600 - 800	440 - 640
Yield point Rp 0.2 n/mm²	≥ 190	≥ 175	≥ 190	≥ 205	≥ 250	≥ 195	≥ 210	≥ 175
Machinability	Very good	Excellent	Fair	Fair	-	Poor	Good	Medium
Forgeability	Poor	Good	Good	Good	-	Good	Poor	-
Suitability for welding	Poor	Very good	Excellent	Good	-	Good	Poor	Good
Special features	Non-magnetic structure Excellent for machining on automatic machines	Non-magnetic structure suitable for low temperatures	Non-magnetic structure suitable for low temperatures may be used at up to 700 °C	Magnetic structure suitable for low temperatures	Non-magnetic structure	Austenitic structure	Magnetic structure suitable for low temperatures	Antimagnetc, austenitic structure
Corrosion resistance	Fair Due to sulphur content, use in environments containing acids or chlorides should be avoided.	Very good Resistant to corrosion in natural environments: water, urban or country climates with no significant concentrations of chlorides, in the food industry.	Good Resistant to corrosion in natural environments: water, urban or country climates with no significant concentrations of chlorides, in the food industry.	Excellent Resistant to corrosion also in marine environments or wet environments and in the presence of acids.	Medium By virtue of its coarser porosity the corrosion resistance is in general reduced as compared with stainless steel. Reservations especially in acid and salty environment.	Good Corrosion resistant in a natural environment; water, rural, urban and industrial atmosphere.	Fair	Good Corrosion resistant. Material is to a large extent comparable with AISI 304
Main fields of application	Construction of vehicles. Electronics. Furniture finishings.	Food, chemical and pharmaceutical industries. Agriculture. Construction of machines. Electronics. Shipping. Furniture finishings	Food, chemical and pharmaceutical industries. Agriculture. Construction of vehicles and machines. Building. Furniture finishings.	Food and chemical industries. Ship building and manufacture of components for marine environments or use in highly corrosive conditions.	Chemical, cellulose and paper industry. Paint, oil, soap and textile industry. Daires. Breweries.	Springs for temperature up to 300 °C. Tools (knives). Sheet metal for vehicles automotive industry. Chemical and food industry.	Used for the manufacture of springs in various fields of application.	Food, beverage and packing industry. Armatures. Pumps. Mixers.

The characteristics described should be treated as guidelines only. No guarantee is made.
The user is responsible for checking the exact operating conditions.