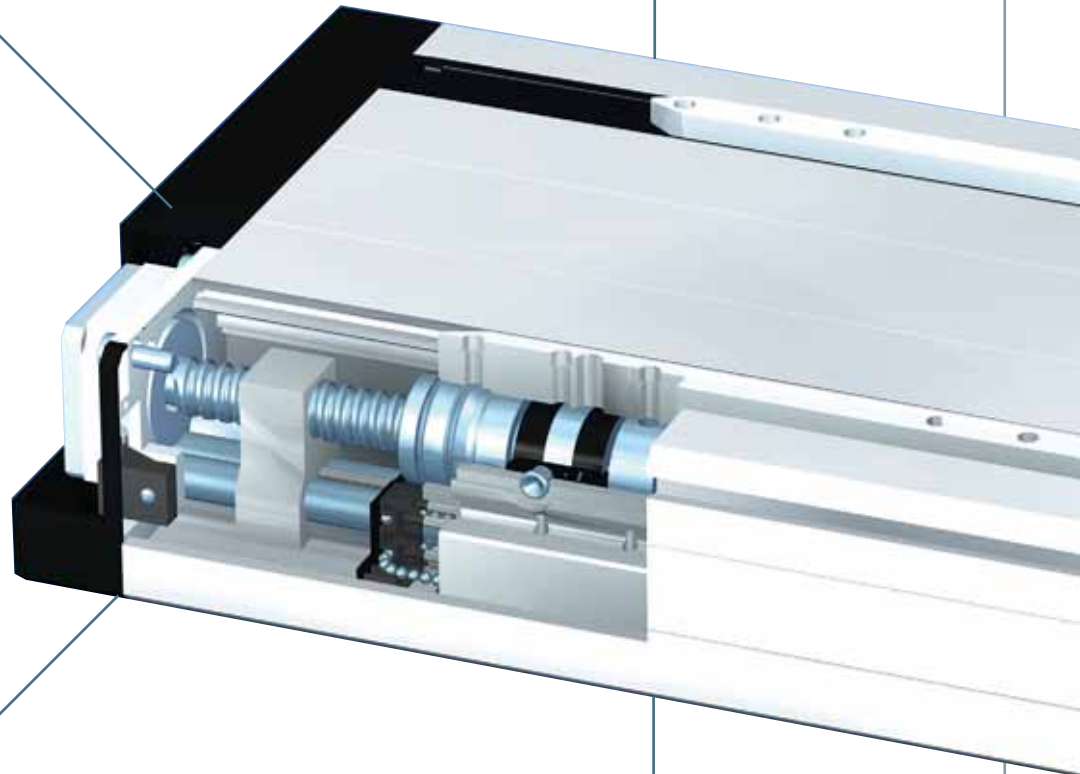


Functions

LF 5 (as an example)

Synthetic protective cap
electromagnetically shielded

Clamping surface
plan-milled



Shaft-holding shape
precisely milled

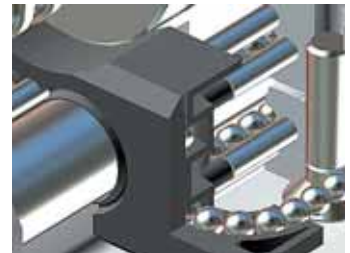
Profile's bottom side
plan-milled



- two-sided end-bearing buffering by means of soft-PVC parabolic springs
- counter bearing with 2 needle bearings



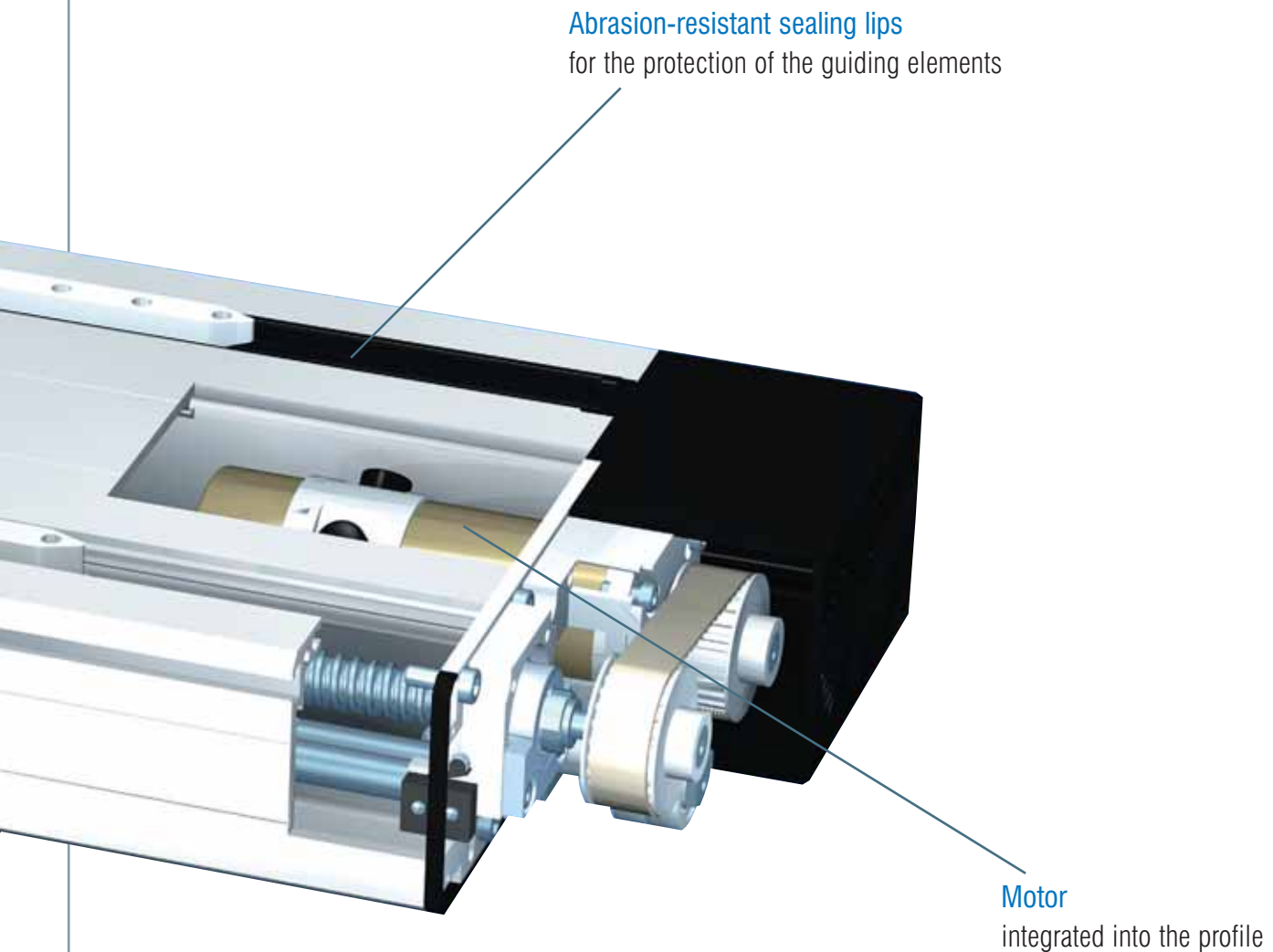
- spindle support from a profile length of 1,500 mm up without restricting the travel range



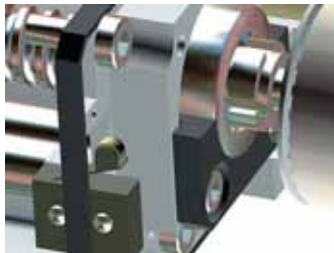
- ball circulation in the patented aluminium linear slide
- glass-fibre reinforced redirection parts with wipers

Functions LF 5

LF 5 (as an example)



- clearance-free pre-adjusted ball screw nut with wipers
- central lubrication for ball screw nuts and tracks



- integrated over-travel limit switch
- spindle bearing with angular contact ball bearings
- axial clearance-free due to self-locking special slotted nut



- Reversing belt and connection electronics completely covered by protective cap

Ball Screw Feed Axis

LF 4



LF 4 prepared for flange-mounted direct drive modules

LF 4 with lateral belt drive module

Features

- aluminium shaft profile W 75 x H 75 mm, anodized
- clamping surface and profile bottom side plan-milled
- 2 precision steel shafts Ø 12 h6, material Cf53, hardness 60 ± 2 HRC
- aluminium slide blocks WS 5/70, 2 x WS 5/70 (70 mm long) or WS 5/200 (200 mm long), clearance-free adjustable, central lubrication
- ball screw pitch 2.5/4/5/10/20 mm
- profile sealing by abrasion-resistant sealing lips
- aluminium die-cast end plates
- 2 limit and/or reference switches, repeatability ± 0.02 mm
- driving steel collar with sealed angular contact ball
- bearings prepared either for flange-mounted direct drive modules or lateral belt drive modules

Options

- black aluminium profile black, powder-coated
- electromagnetic brake
- steel slide block LS2
- assembly kit for limit switch (page B 128)

Order key

2 3 4 **X X X** **0 X X X**

Motor

- 0 = preparation direct drive module
1 = preparation belt drive module

Shaft slide block

- 0 = 1 shaft slide block 70 mm
1 = 1 shaft slide block 200 mm
2 = 2 shaft slide blocks 70 mm

Ballscrew feed drive

- 0 = without
1 = pitch 2.5 mm
2 = pitch 4.0 mm
3 = pitch 5.0 mm
4 = pitch 10 mm
5 = pitch 20 mm

Profile length

- e.g. 029 = 290 mm
299 = 2990 mm
(shortened by the last digit)

Drive Components

Preparation - direct drive

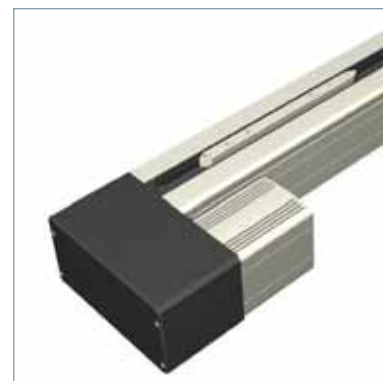


Direct drive module 1



Direct drive module 2

Preparation - belt drive



Belt drive module

Scale drawings of the motor modules 1 and 2 on page B 111
(You can find the ordering data of all motor modules on page B 110)

see scale drawing (page B 103)

Ball Screw Feed Axis

LF 4

Nominal torques

Nominal torque [Ncm]					
Revolutions [1/min] per minute	Spindle pitch				
	2,5	4	5	10	20
500	15	15	16	17	18
1500	19	19	19	20	21
3000	23	24	24	25	26

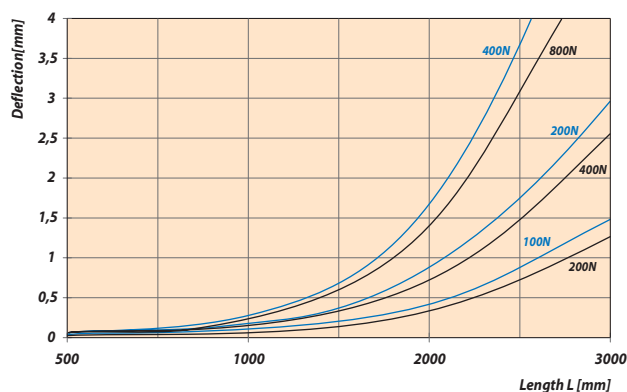
Technical Data

Aluminium profile

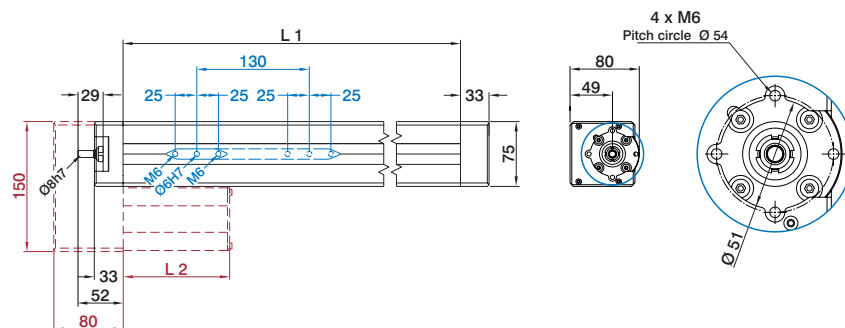
Aluminium profile LF 4	
Moment of inertia I_x	107,711 cm⁴
Moment of inertia I_y	125,843 cm⁴
Moment of resistance W_x	24,873 cm³
Moment of resistance W_{y1}	38,130 cm³
Moment of resistance W_{y2}	29,960 cm³
Cross-sectional area	18,81 cm²
Material	AlMgSi0,5F22
Anodization	E6/EV1
Weight with steel shafts	6,2 kg/m
Weight with steel shafts and spindle	7,6 kg/m
Max. deviation from the straight line	0,8 mm / 3 m
Max. torsion	1,5 mm / 3 m
Convex, concave	0,15 mm

Travel range at WS 5/70 = L1 - 150 mm		
Travel range at WS 5/200 = L1 - 280 mm		
Length L2 [mm]	with ventilator	without ventilator
Stepping motor MS 135 H	-	107,5
Stepping motor MS 160	187,5	157,5
DC servo motor MV 120	217,5	187,5
Technical data of the motors can be found on page B 112!		

Deflection

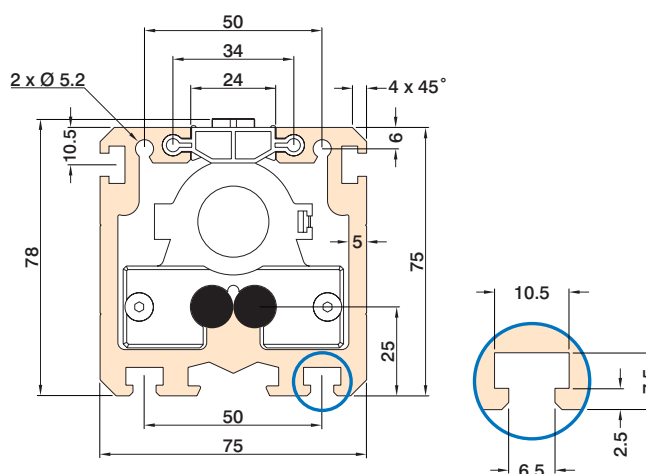


Scale Drawing



Scale Drawing

Aluminium profile



Ball Screw Feed Axis

LF 6



LF 6 prepared for flange-mounted direct drive modules

LF 6 with lateral belt drive module

Features

- aluminium shaft profile W 150 x H 75 mm, anodized
- clamping surface and profile bottom side plan-milled
- 4 precision steel shafts Ø 12 h6, material Cf53, hardness 60 ± 2 HRC
- aluminium slide blocks WS 5/70, 2 x WS 5/70 (70 mm long) or WS 5/200 (200 mm long), clearance-free adjustable, central lubrication
- ball screw pitch 2.5/4/5/10/20 mm
- profile sealing by abrasion-resistant sealing lips
- aluminium die-cast end plates
- 2 limit and/or reference switches, repeatability ± 0.02 mm
- driving steel collar with sealed angular contact ball bearings
- prepared either for flange-mounted direct drive modules or lateral belt drive modules

Options

- black aluminium profile, powder-coated
- electromagnetic brake
- steel slide block LS2 assembly kit for limit switch (page B 128)

Order key

2 3 4 **X X X** **0 X X X**

Motor

- 6** = preparation Direct drive modules
7 = preparation Belt drive module

Shaft slide block

- 0** = 2 shaft slide blocks 70 mm
1 = 2 shaft slide blocks 200 mm
2 = 4 shaft slide blocks 70 mm

Ballscrew feed drive

- 0** = without
1 = pitch 2.5 mm
2 = pitch 4.0 mm
3 = pitch 5.0 mm
4 = pitch 10 mm
5 = pitch 20 mm

Profile length

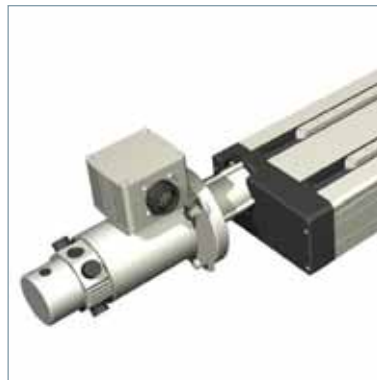
- e.g. **029** = 290 mm
299 = 2990 mm
 (shortened by the last digit)

Drive Modules

Preparation - direct drive



Direct drive module 1



Direct drive module 2

Preparation - belt drive



Belt drive module

Scale drawings of the motor modules 1 and 2 on page B 111
 (You can find the ordering data of all motor modules on page B 110)

see scale drawing (page B 105)

Ball Screw Feed Axis

LF 6

Nominal torques

Nominal torque [Ncm]					
Revolutions per minute	Spindle pitch				
	2,5	4	5	10	20
500	17	17	18	20	21
1500	20	20	22	24	25
3000	24	25	26	29	30

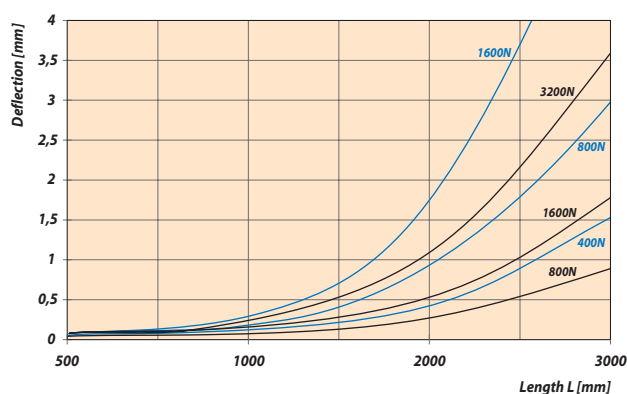
Technical Data

Aluminium profile

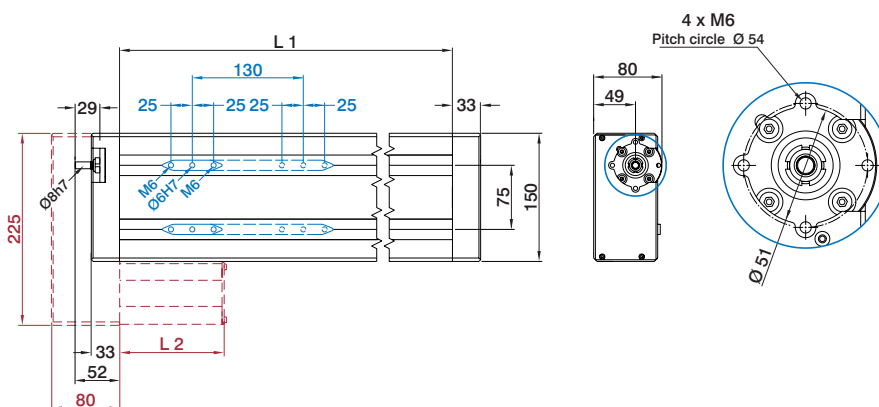
Aluminium profile LF 6	
Moment of inertia I_x	707,100 cm ⁴
Moment of inertia I_y	212,200 cm ⁴
Moment of resistance W_x	96,280 cm ³
Moment of resistance W_{y1}	49,580 cm ³
Moment of resistance W_{y2}	66,300 cm ³
Cross-sectional area	30,07 cm ²
Material	AlMgSi0,5F22
Anodization	E6/EV1
Weight with steel shafts	11,4 kg/m
Weight with steel shafts and spindle	12,8 kg/m
Max. deviation from the straight line	0,8 mm / 3 m
Max. torsion	1,5 mm / 3 m
Convex, concave	0,15 mm

Travel range at WS 5/70 = L1 - 150 mm		
Travel range at WS 5/200 = L1 - 280 mm		
Length L2 [mm]	with ventilator	without ventil.
Stepping motor MS 135 H	-	107,5
Stepping motor MS 160	187,5	157,5
DC servo motor MV 120	217,5	187,5
Technical data of the motors can be found on page B 112!		

Deflection

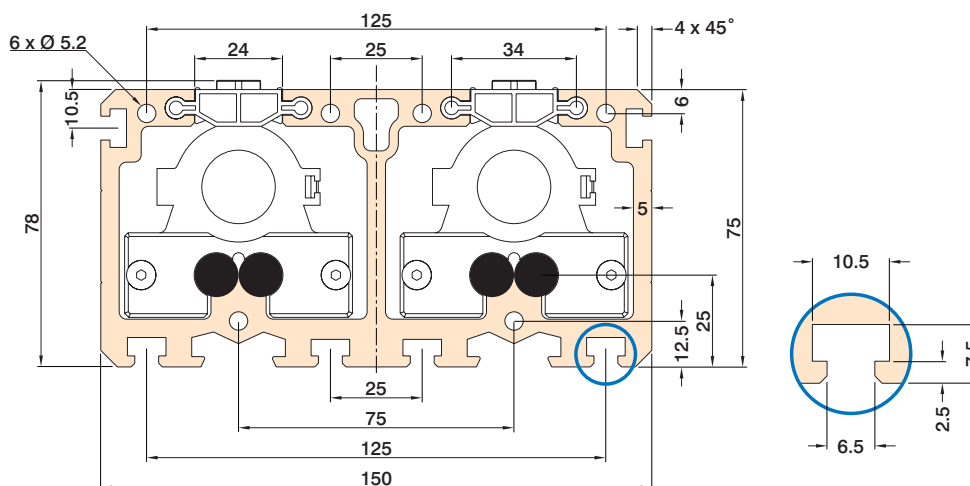


Scale Drawing



Scale Drawing

Aluminium profile



Ball Screw Feed Axis

LF 5



LF 5 prepared for flange-mounted direct drive modules

LF 5 with integrated drive module

Features

- aluminium shaft profile W 225 x H 75 mm, anodized
- clamping surface and profile bottom side plan-milled
- 4 precision steel shafts Ø 12 h6, material Cf53, hardness 60 ± 2 HRC
- aluminium slide blocks WS 5/70, 2 x WS 5/70 (70 mm long) or WS 5/200 (200 mm long), clearance-free adjustable, central lubrication
- ball screw pitch 2.5/4/5/10/20 mm
- profile sealing by abrasion-resistant sealing lips
- aluminium die-cast end plates
- 2 limit and/or reference switches, repeatability ± 0.02 mm
- driving steel collar with sealed angular contact ball bearings
- prepared either for flange-mounted direct drive modules or lateral belt drive modules

Options

- black aluminium profile, powder-coated
- electromagnetic brake
- steel slide block LS2 assembly kit for limit switch (page B 128)

Order key

234 XXX 0XXX

Motor

- 3** = preparation Direct drive modules
4 = preparation Belt drive module

Shaft slide block

- 0** = 2 shaft slide blocks 70 mm
1 = 2 shaft slide blocks 200 mm
2 = 4 shaft slide blocks 70 mm

Ballscrew feed drive

- 0** = without
1 = pitch 2.5 mm
2 = pitch 4.0 mm
3 = pitch 5.0 mm
4 = pitch 10 mm
5 = pitch 20 mm

Profile length

- e.g. **029** = 290 mm
299 = 2990 mm
 (shortened by the last digit)

Drive Modules

Preparation - direct drive



Direct drive module 1



Direct drive module 2

Preparation - belt drive



Belt drive module

Scale drawings of the motor modules 1 and 2 on page B 111
 (You can find the ordering data of all motor modules on page B 110)

see scale drawing (page B 107)

LF 5

B107

Load rates

with WS 5/70 or WS 5/200



WS 5/70

Item no.: 223 030 0070

Shaft slide block WS 5/70	
C_0	2576,65 N
C	1461,14 N
F_1 stat.	2200,67 N
F_1 dyn.	1247,93 N
F_2 stat.	2576,65 N
F_2 dyn.	1461,14 N
M_x stat.	36,45 Nm
M_y stat.	82,16 Nm
M_z stat.	96,20 Nm
M_x dyn.	20,67 Nm
M_y dyn.	46,59 Nm
M_z dyn.	54,55 Nm



WS 5/200

Item no.: 223 030 0200

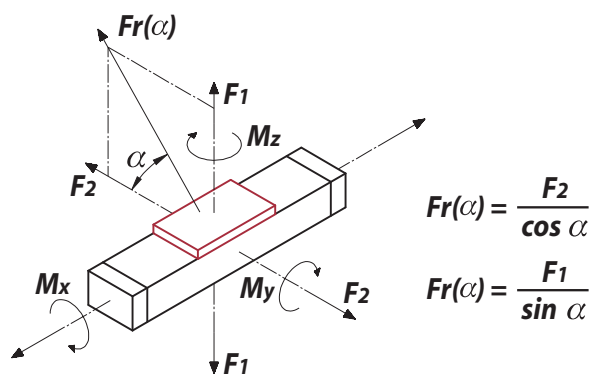
Shaft slide block WS 5/200	
C_0	7594,34 N
C	3003,64 N
F_1 stat.	6486,18 N
F_1 dyn.	2565,35 N
F_2 stat.	7594,34 N
F_2 dyn.	3003,64 N
M_x stat.	107,43 Nm
M_y stat.	242,15 Nm
M_z stat.	283,52 Nm
M_x dyn.	49,49 Nm
M_y dyn.	95,78 Nm
M_z dyn.	112,13 Nm



LF 4

with two WS 5/70

LF 4 with two WS 5/70	
C_0	5153,30 N
C	2319,41 N
F_1 stat.	4401,33 N
F_1 dyn.	1980,96 N
F_2 stat.	5153,30 N
F_2 dyn.	2319,14 N
M_x stat.	46,49 Nm
M_y stat.	182,08 Nm
M_z stat.	213,18 Nm
M_x dyn.	20,92 Nm
M_y dyn.	81,95 Nm
M_z dyn.	95,95 Nm



LF 6

with two WS 5/70

LF 6 with two WS 5/70	
C_0	5153,30 N
C	2319,41 N
F_1 stat.	4401,33 N
F_1 dyn.	1980,96 N
F_2 stat.	5153,30 N
F_2 dyn.	2319,14 N
M_x stat.	211,54 Nm
M_y stat.	164,31 Nm
M_z stat.	192,39 Nm
M_x dyn.	95,21 Nm
M_y dyn.	73,95 Nm
M_z dyn.	86,59 Nm



LF 6

with two WS 5/200

LF 6 with two WS 5/200	
C_0	15188,67 N
C	4767,89 N
F_1 stat.	12972,35 N
F_1 dyn.	4072,24 N
F_2 stat.	15188,67 N
F_2 dyn.	4767,98 N
M_x stat.	623,49 Nm
M_y stat.	484,30 Nm
M_z stat.	567,04 Nm
M_x dyn.	195,73 Nm
M_y dyn.	152,03 Nm
M_z dyn.	178,00 Nm



LF 5

with two WS 5/70

LF 5 with two WS 5/70	
C_0	5153,30 N
C	2319,41 N
F_1 stat.	4401,33 N
F_1 dyn.	1980,96 N
F_2 stat.	5153,30 N
F_2 dyn.	2319,14 N
M_x stat.	376,59 Nm
M_y stat.	164,31 Nm
M_z stat.	192,39 Nm
M_x dyn.	169,49 Nm
M_y dyn.	73,95 Nm
M_z dyn.	86,59 Nm



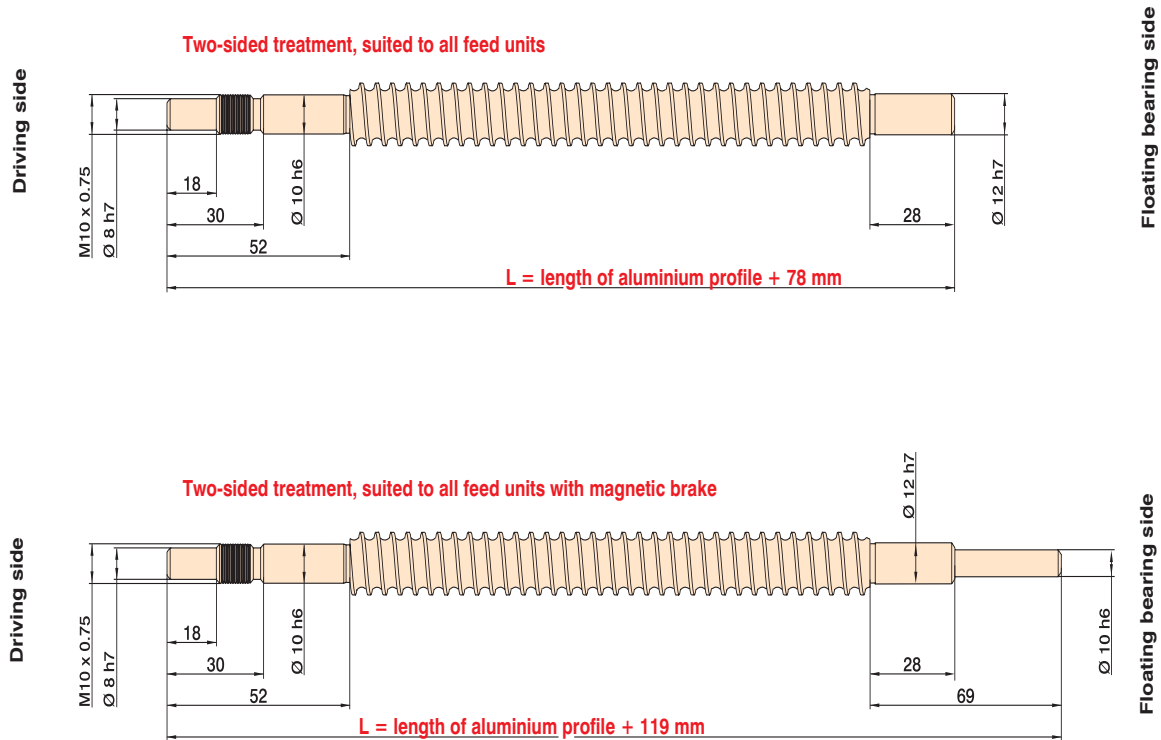
LF 5

with two WS 5/200

LF 5 with two WS 5/200	
C_0	15188,67 N
C	4767,89 N
F_1 stat.	12972,35 N
F_1 dyn.	4072,24 N
F_2 stat.	15188,67 N
F_2 dyn.	4767,98 N
M_x stat.	1109,95 Nm
M_y stat.	848,30 Nm
M_z stat.	567,04 Nm
M_x dyn.	348,43 Nm
M_y dyn.	152,03 Nm
M_z dyn.	178,00 Nm

Ball Screw Spindles

Scale Drawings



Order key

211 13X XXXX

Spindle pitch

- 2 = 2.5 mm
- 3 = 4.0 mm
- 4 = 5 mm
- 5 = 10 mm
- 6 = 20 mm

Treatment of shaft ends

- 5 = two-sided treatment, suited to all feed units
(length of aluminium profile + 78 mm)
- 6 = two-sided treatment, suited to all feed units with magnetic brake
(length of aluminium profile + 119 mm)

Spindle lengths

- e.g. 086 = 868 mm
- 100 = 1,009 mm
(shortened by the last digit)

Motor Modules

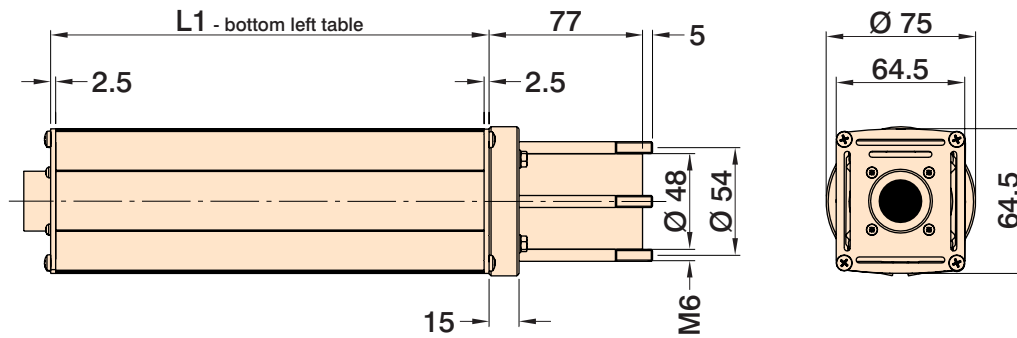
Ordering Data

Direct Drive	Plant / circular connector	Z-axis / circular connector	Plant / circular connector with brake	Z-axis / circular connector with brake
Stepping motor MS 135 HT	396 055 0020	396 055 0120	396 055 0220	396 055 0320
Stepping motor MS 160	396 341 0020	396 341 0120	396 341 0220	396 341 0320
Stepping motor MS 300	396 361 0020	396 361 0120	396 361 0220	396 361 0320
EC servo motor MD 200	396 451 0050	adjustable via software	upon request	upon request
EC servo motor MD 400	396 452 0050	adjustable via software	upon request	upon request
EC servo motor MD 750	396 481 0050	adjustable via software	upon request	upon request
DC servo motor MV 120	396 102 0020	adjustable via software	396 102 0220	adjustable via software
DC servo motor MV 330	396 104 0020	adjustable via software	not possible	not possible
AC servo motor MY 054	396 554 0020	adjustable via software	396 554 0220	adjustable via software
AC servo motor MY 073	396 573 0020	adjustable via software	396 573 0220	adjustable via software
LF 4 / LF 6 lateral assembly	Plant / circular connector	Z-axis / circular connector	Plant / circular connector with brake	Z-axis / circular connector with brake
Stepping motor MS 135 HT	396 055 2020	396 055 2120	396 055 2220	396 055 2320
Stepping motor MS 160	396 341 2020	396 341 2120	396 341 2220	396 341 2320
EC servo motor MD 100	396 443 2050	adjustable via software	upon request	upon request
DC servo motor MV 120	396 102 2020	adjustable via software	396 102 2220	adjustable via software
AC servo motor MY 054	396 554 2020	adjustable via software	396 554 2220	adjustable via software
LF 5 integrated	Plant / circular connector	Z-axis / circular connector	Plant / circular connector with brake	Z-axis / circular connector with brake
Stepping motor MS 135 HT	396 055 1020	396 055 1120	396 055 1220	396 055 1320
Stepping motor MS 160	396 341 1020	396 341 1120	396 341 1220	396 341 1320
EC servo motor MD 100	396 443 1050	adjustable via software	upon request	upon request
DC servo motor MV 120	396 102 1020	adjustable via software	396 102 1220	adjustable via software
AC servo motor MY 054	396 554 1020	adjustable via software	396 554 1220	adjustable via software

Motor Modules

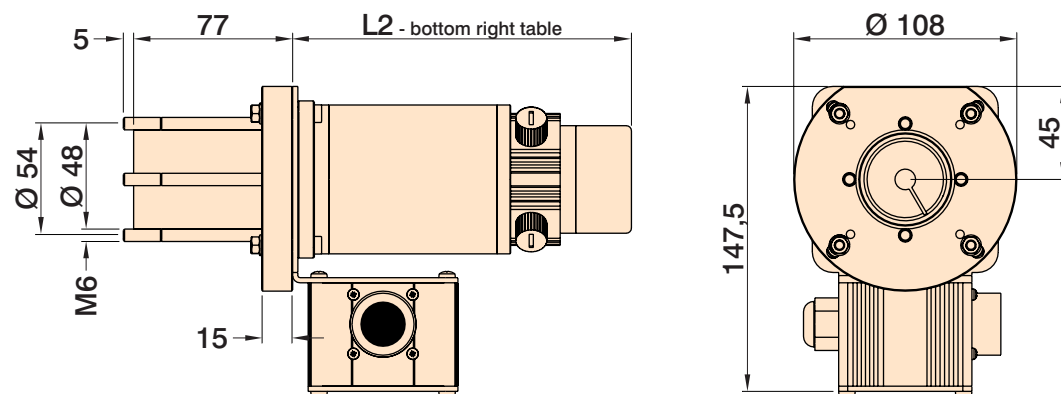
Scale Drawing

Motor module 1



Scale Drawing

Motor module 2



Profile Length $L1$ und Motor length $L2$

Motor module 1	Length $L1$	
	without ventilator	with ventilator
Stepping motor MS 135 H	105 mm	135 mm
Stepping motor MS 160	155 mm	185 mm
DC servo motor MV 120	185 mm	215 mm
AC servo motor MY 054	200 mm	230 mm

Motor module 2	Length $L2$	
	without brake	with brake
Stepping motor MS 300	100 mm	-
DC servo motor MV 330	163 mm	-
AC servo motor 073	227 mm	255 mm

Motor Data & Torque Curves / Characteristic Curves



Important Data

Stepping Motor	Bipolar Holding Torque	Winding Torque per Phase	Winding Torque per Phase
Stepping Motor MS 135HT	1,35 Nm	3,60 / 5,20 A	0,42 Ohm
Stepping Motor MS 160	1,60 Nm	2,85 / 4,10 A	1,20 Ohm
Stepping Motor MS 300	3,50 Nm	8,50 / 12,0 A	0,39 Ohm

DC Servo Motor	Performance	Nominal Speed	Nominal Torque
DC Servo Motor MV 120	120 W	3000 1/min	0,38 Nm
DC Servo Motor MV 330	330 W	3300 1/min	1,00 Nm

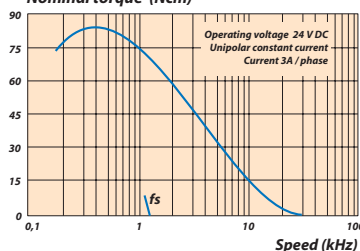
AC Servo Motor	Performance	Nominal Speed	Nominal Torque
AC Servo Motor MY 054	500 W	6000 1/min	0,80 Nm
AC Servo Motor MY 073	830 W	4000 1/min	2,00 Nm

Torque Curves / Characteristic Curves

Stepping motor

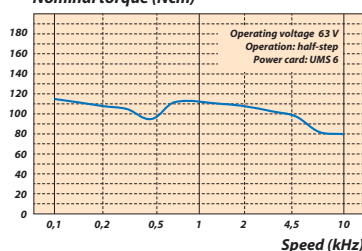
MS 135 HT

Nominal torque (Ncm)



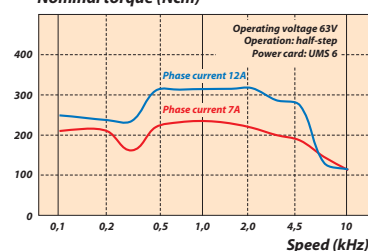
MS 160

Nominal torque (Ncm)



MS 300

Nominal torque (Ncm)

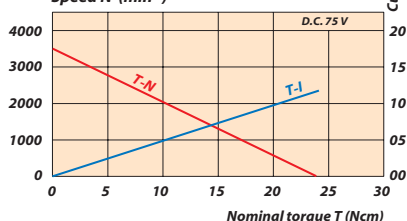


Torque Curves / Characteristic Curves

DC servo motor

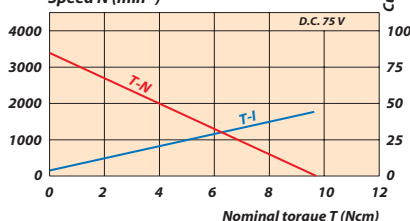
MV 120

Speed N (min^{-1})



MV 330

Speed N (min^{-1})

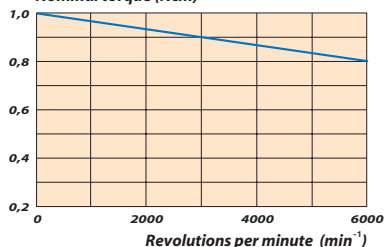


Torque Curves / Characteristic Curves

AC servo motor

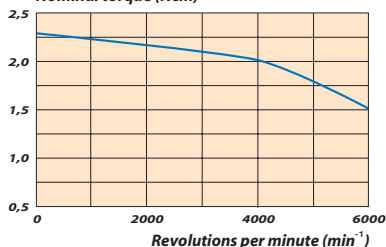
MY 054

Nominal torque (Ncm)



MY 073

Nominal torque (Ncm)



Maintenance (Lubrication) & Pin Configuration

Maintenance

Maintenance

The shaft slide blocks have to be lubricated via the grease nipples after 300 hours of operation, however after 3 months latest. They are located at the slides' fronts.

The factory-made presetting is designed with regard to the information given in the respective product descriptions. It describes a mean value of the load data.

Lubricant

Sodium-saponified grease based on mineral oil, recommend ISO viscosity type: ISO-VG 100 (original grease: gear grease 4223 produced by Siebert GmbH)

Lubricants made by iselautomation:

[isel-lubricant](#)

Item no.: 299 031

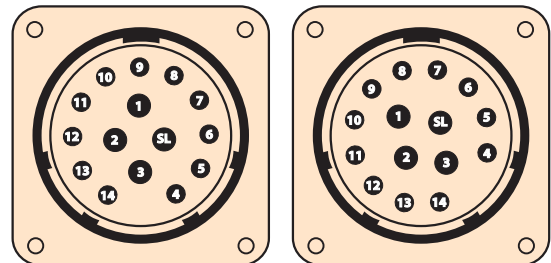
[isel-lubricator](#)

Item no.: 931 170

Pin Configuration

Pin	Pin Configuration	
	Stepping Motors Amphenol, C16-3, 14+1	Servo Motors Amphenol, C16-3, 14+1
1	phase 2B	+rev. motor
2	phase 2A	-rev. motor
3	phase 1B	limit switch 1
SL	phase 1A	PE shield
4	+24V brake	+24V brake, ventilator
5	CMV switch	ground - encoder
6	ground - brake	ground - brake
7	PE shield, housing	limit switch 2
8	not assigned	CMV encoder 5V
9	reference switch	reference switch (option)
10	not assigned	encoder phase / A
11	not assigned	encoder phase / B
12	not assigned	encoder phase / A
13	not assigned	encoder phase / B
14	not assigned	+24V voltage switch

Step-Amphenol-Servo



Cable box
(amphenol counter connection)

Item no.: 391 002

Motor lead wires

- for stepping motors
- for DC servo motors
- for AS servo motors (option)

in the lengths 3, 5, 8, 10 m
upon request

Coupling casings

Drive Components

Connectivity

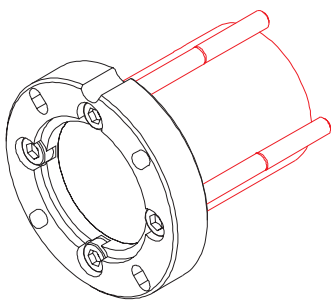
Preparation - direct drive

Connectivity	LF 4	LF 6	LF 5	Angular gear Fixing 0°	Angular gear Fixing 90°
Direct drive					
MS 160 MV 120 MY 054	Connection via coupling casing 1 short sleeve with adequate shaft coupling				Coupling casing 1 long sleeve
MS 300 MV 330 MY 073	Connection via coupling casing 2 short sleeve with adequate shaft coupling				Coupling casing 2 long sleeve
Angular gear Fixing 0°	split coupling casing short sleeve with adequate shaft coupling			Connection via transmission shaft set (see page B 118)	
Angular gear Fixing 90°	split coupling casing short sleeve with adequate shaft coupling				

Ordering Data

Coupling casings

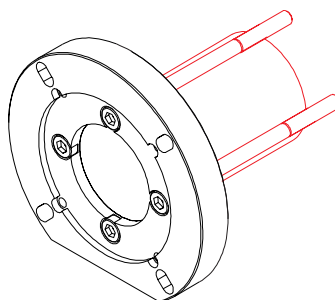
Coupling casing 1



Short sleeve
Item no.: 218 100 0001

Long sleeve
Item no.: 218 100 0002

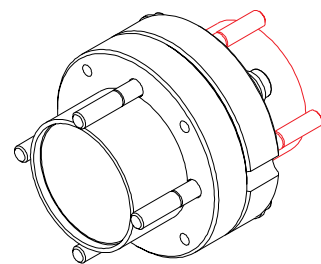
Coupling casing 2



Short sleeve
Item no.: 218 100 1001

Long sleeve
Item no.: 218 100 1002

Split coupling casing



Short sleeve
Item no.: 218 100 2001

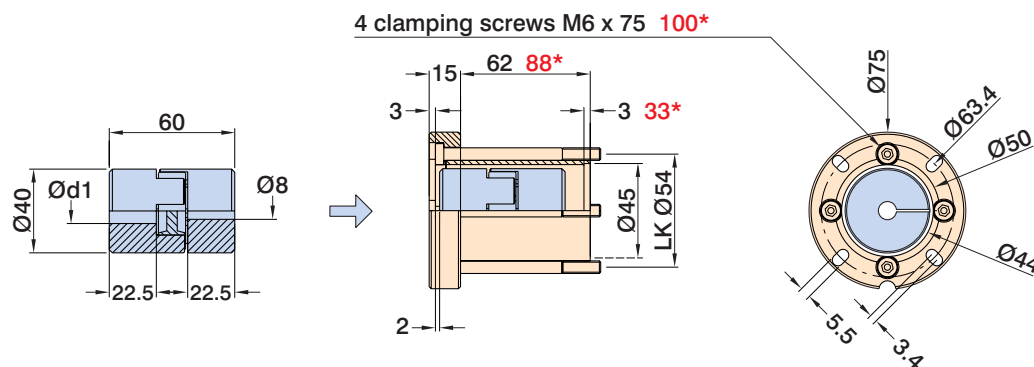
Long sleeve
Item no.: 218 100 2002

Coupling casings

Drive Components

Scale Drawing

Coupling casing 1



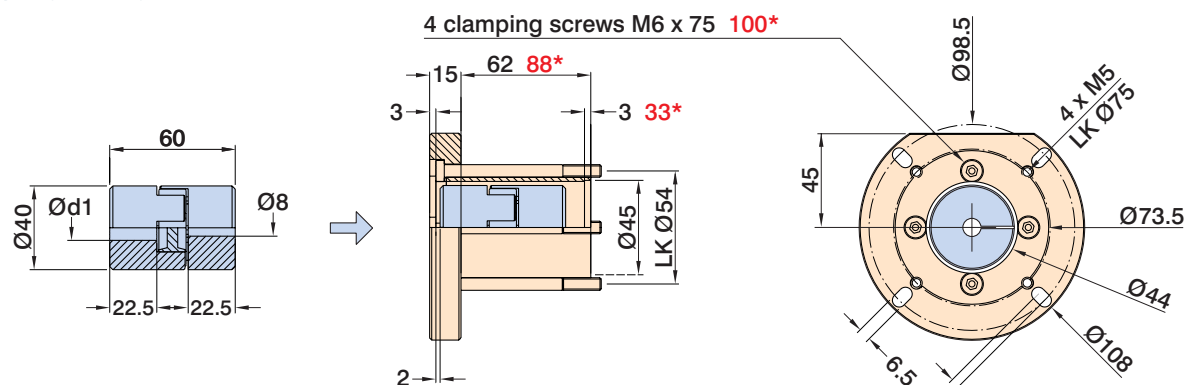
**) Measures refer to the dimensions with long sleeves*

d1 = engine shaft diameter 6.35/8/9 mm

Suitable shaft coupling WK 40/60 on page B 117 (not included in scope of delivery)

Scale Drawing

Coupling casing 2



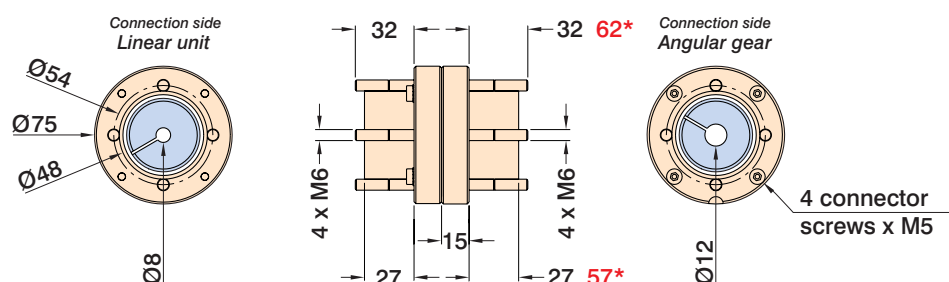
**) Measures refer to the dimensions with long sleeves*

d1 = engine shaft diameter 6.35/8/9 mm

Suitable shaft coupling WK 40/60 on page B 117 (not included in scope of delivery)

Scale Drawing

split coupling casing



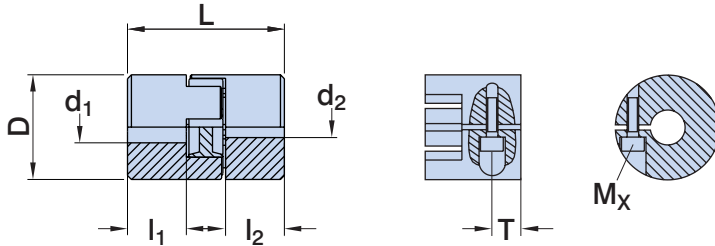
**) Measures refer to the dimensions with long sleeves*

Suitable shaft coupling WK 40/60 on page B 117 (not included in scope of delivery)

Shaft Couplings

Drive Components

Scale Drawing

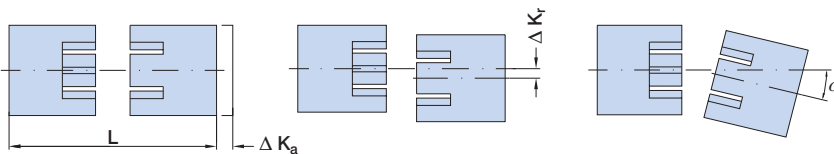


Size	Dimensions [mm]				Clamping screw		
	D	L	l_1 / l_2	d_1 / d_2	M_x	T	Screwing-down torque [Ncm]
20/30	20	30	10	4 - 7	M3	5	0,76
30/40	30	40	14	6 - 13	M4	5	1,34
40/60	40	60	22,5	8 - 18	M5	12	3,05

Definitions

- T_{Ksp} [Nm] = Coupling torque clearance-free
- T_{KN} [Nm] = Nominal coupling torque
- T_{Kmax} [Nm] = Maximal coupling torque
- T_N [Nm] = Nominal plant torque
- T_{AS} [Nm] = Maximal drive torque
- T_S [Nm] = Maximal torque
- J_A [kgm²] = Moment of inertia - motor side
- J_L [kgm²] = Moment of inertia - load side
- S_A = Jolt factor
- S_t = Temperature factor

Displacement compensation



Size	Toothed rim Shore hardness	Displacements		
		axial ΔK_a	radial ΔK_r	angle α [°]
20/30	86	0,8	0,16	1
	92		0,13	
	98		0,08	
30/40	86	0,1	0,18	1
	92		0,15	
	98		0,09	
40/60	86	1,2	0,125	1
	92		0,10	
	98		0,06	

$$T_{Ksp} > T_S \quad S_t$$

$$T_{KN} > T_N \quad S_t$$

$$T_{Kmax} > T_S \quad S_t$$

$$T_S = T_{AS} \quad S_A \quad \frac{J_L}{J_A + J_L}$$

Shaft Couplings

Drive Components

Jolt factor / temperature factor

Toothed rim Shore hardness	Permanent temperature	Max. temperature (temporary)
86	- 50 bis + 80 °C	- 60 bis + 120 °C
92	- 40 bis + 90 °C	- 50 bis + 120 °C
98	- 30 bis + 90 °C	- 40 bis + 120 °C

Jolt factor	S_A
Minor jolts	1.5
Medium jolts	1.8
Major jolts	2.2

Ambient temperat. [°C]	-30 bis +30	+40	+60	+80	+90
Temperature factor	1,0	1,2	1,4	1,8	2,2

Technical Data

Size	Shore hardness	Revolutions per minute $V=30 \text{ m/s}$	Torque			Static torsion spring stiffness [Nm/rad]	Torsion spring stiffness [N/mm]	Mass moment of inertia [kgm ²]	
			T_{Ksp}	T_{KN}	T_{Kmax}			per hub	toothed rim
20/30	86	28.000	0,45	2,2	4,5	22,6	183	0,49 - 10 ⁻⁶	0,079 - 10 ⁻⁶
	92			3,0	6,0	31,5	262		
	98			5,0	10,0	51,6	518		
30/40	86	19.000	1,0	5,5	11,0	82,4	226	2,8 - 10 ⁻⁶	0,457 - 10 ⁻⁶
	92			7,5	15,0	114,6	336		
	98			12,5	25,0	171,9	604		
40/60	86	14.000	2,5	6,9	14,0	415,0	780	20,4 - 10 ⁻⁶	1,49 - 10 ⁻⁶
	92			10,0	20,0	573,0	1120		
	98			17,0	34,0	859,5	2010		

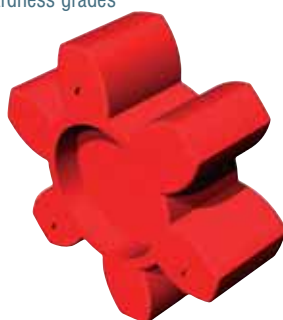
Ordering Data

Shaft couplings



PUR toothed rims

all hardness grades



coupling	Item no.:	d_1	d_2
20/30	218 001 5060	5,0	6,0
	218 001 9999	from 4 to 7 mm	
30/40	218 002 6380	6,35	8,0
	218 002 8080	8,0	8,0
	218 002 9999	from 6 to 13 mm	
40/60	218 003 9580	9,52	8,0
	218 003 9999	from 8 to 18 mm	

Scope of delivery: 2 aluminium blocks, 3 PUR toothed rims (86°, 92° and 98° shore) and appropriate clamping screws

Item no. - see table

für WK 20/30
für WK 30/40
für WK 40/60

Item no.: 217 011 00**

Item no.: 217 012 00**

Item no.: 217 013 00**

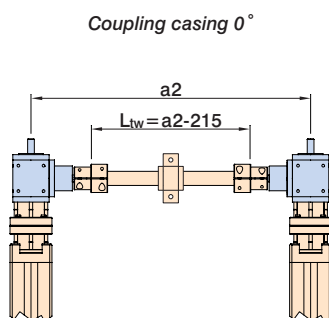
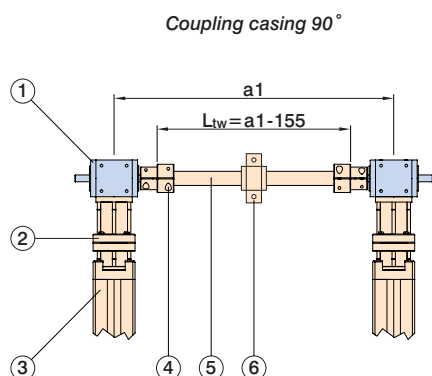
for **, insert the shore hardness

Further couplings upon request!

Assembly Kit with Angular Gear

Drive Components

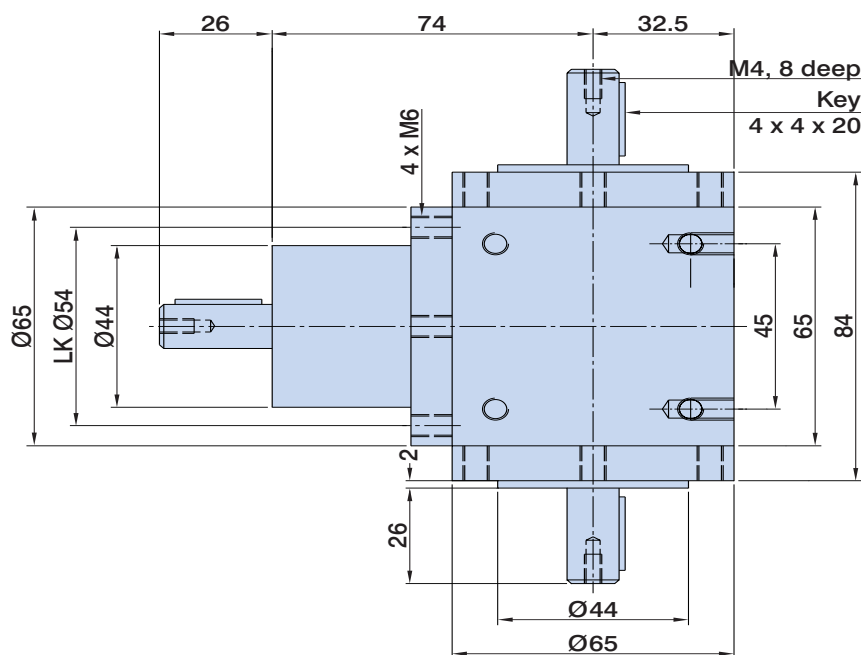
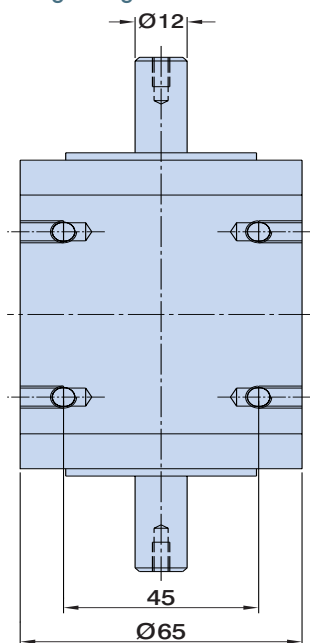
Mounting variants



- ① Angular gear
- ② Split coupling casing with shaft coupling WK 40/60
- ③ LF 4, LF 6 or LF 5 (preparation for direct drive)
- ④ Coupling for transmission shaft Ø 25
- ⑤ Transmission shaft Ø 25
- ⑥ Pedestal bearing - recommendable from a transmission shaft length of 1,500 mm up

Scale Drawing

Angular gear



Ordering data

Assembly kit with angular gear

H-construction connected to LF 4/LF 6/LF 5, fixing 90°

Scope of delivery: 2 x ①, 2 x ②, 2 x ④

Item no.: **216 150 0002**

H-construction connected to LF 4/LF 6/LF 5, Fixing 0°

Scope of delivery: 2 x ①, 2 x ②, 2 x ④

Item no.: **216 150 0001**

Transmission shaft

Quill Ø 25 mm x 4 mm, blank 1,000 mm

Item no.: **219 001 0125**

Quill Ø 25 mm x 4 mm, blank 2,000 mm

Item no.: **219 001 0225**

Coupling/pedestal bearing

Coupling for transmission shaft
Conversion from 12 to 25 mm,
packaging unit: 2 pieces

Item no.: **218 050 0002**

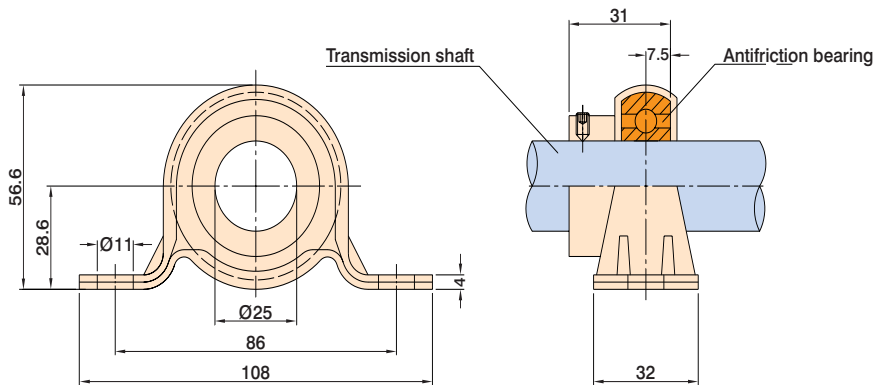
Pedestal bearing for transmission shaft
packaging unit: 1 piece

Item no.: **896 202 5562**

Assembly Kit with Angular Gear

Drive Components

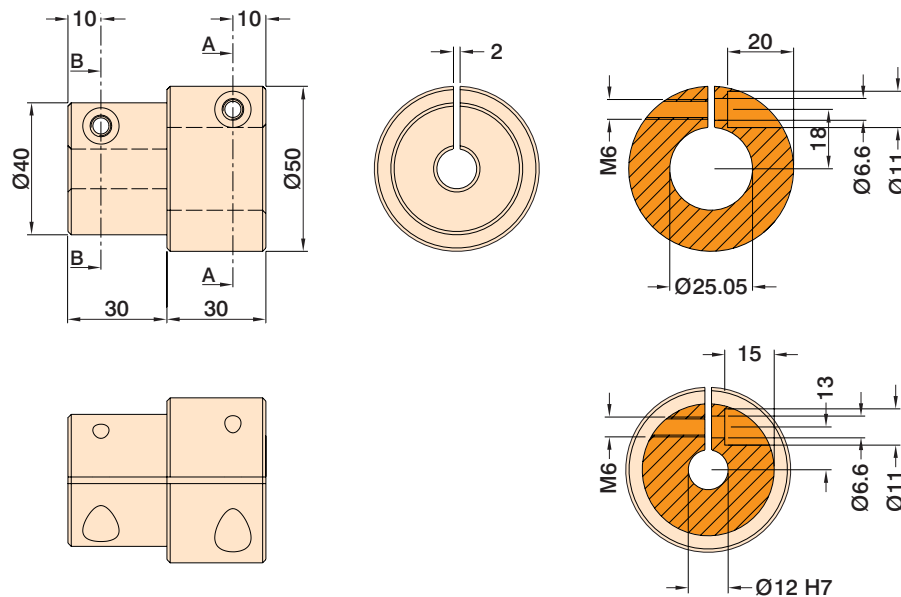
Scale drawing and technical data



<i>Pedestal bearing</i> - to avoid vibrations/to support the transmission shaft (recommendable from a transmission shaft length of 1,500 mm up)	
<i>Transmissible torque</i>	18 Nm
<i>Weight of coupling</i>	0,205 kg
<i>Weight of shaft</i>	0,540 kg/m
<i>Moment of inertia of both couplings</i>	1,340 10⁻⁴ kgm²
<i>Moment of inertia of shaft</i>	8,171 10⁻⁶ kgm² /100 mm

Scale Drawing

Coupling



Matching motor modules

Motor modules

suited to assembly kit with angular gear

With stepping motor MS 430 HT
[600 Ncm]

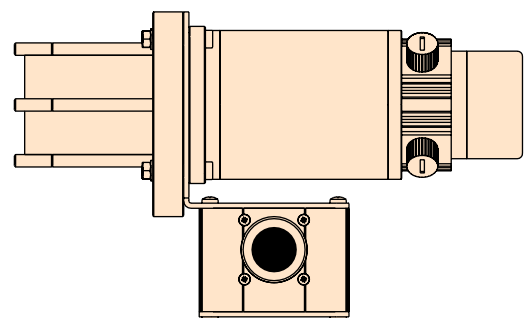
Item no.: 396 085 0193

With AC servo motor MY 073
[830 W]

Item no.: 396 573 0020

With DC servo motor MV 330
[330 W]

Item no.: 396 104 0093

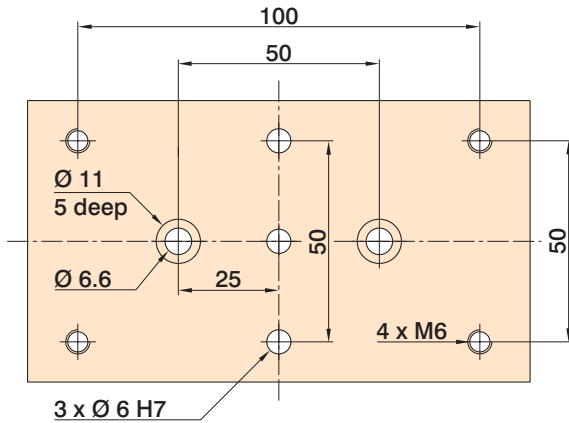


Tops for Slides / Compound Tables

Connecting Elements

Hole pattern

Slide top PS 1



Slide top **PS 1**

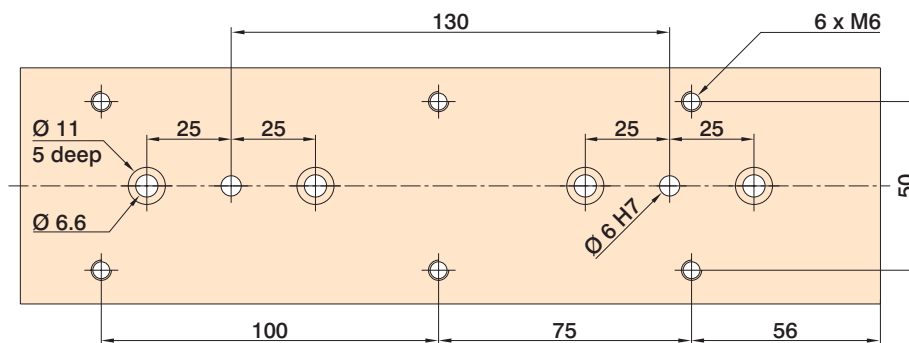
L125 x W70 x H8 mm

Connection to:
LF 4 with 1 x WS 5/70

Item no.: **277 001**

Hole pattern

Slide top PS 2



Slide top **PS 2**

L255 x W70 x H8 mm

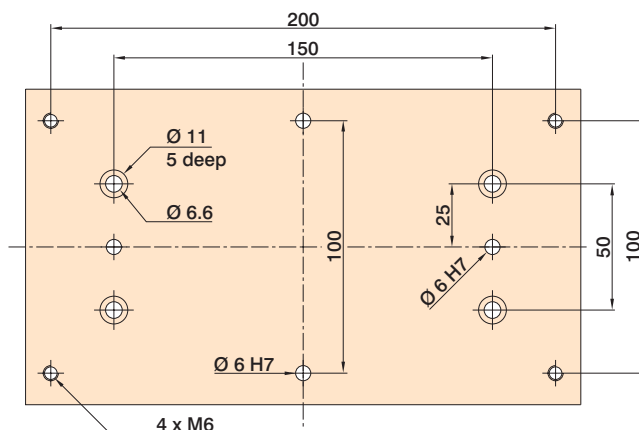
Connection to:
LF 4 with 1 x WS 5/200

Connectivity:
Angle brackets WV 2/WV 5

Item no.: **277 002**

Hole pattern

Slide top PS 3



Slide top **PS 3**

L220 x W125 x H8 mm

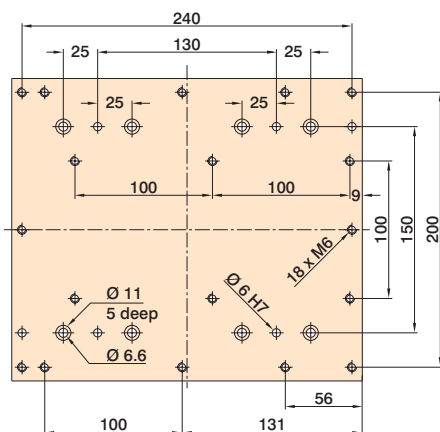
Connection to:
LF 5 with 2 x WS 5/70

Item no.: **277 003**

Tops for Slides / Compound Tables Connecting Elements

Hole pattern

Slide top PS 4



Slide top **PS 4**

L255 x W220 x H8 mm

Connection to:
LF 5 with 2 x WS 5/200

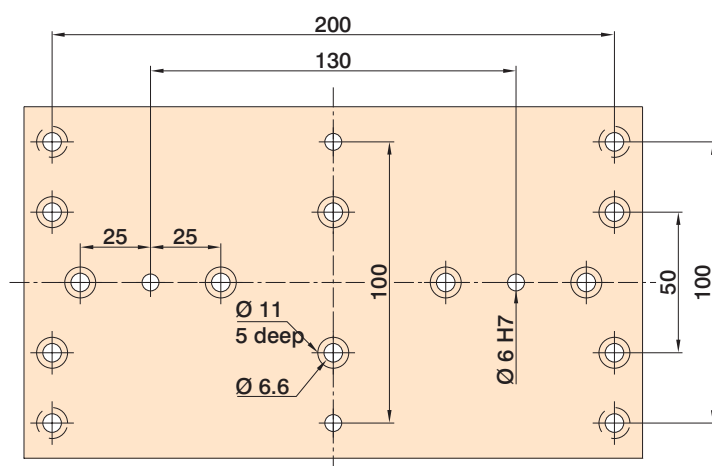
Mounting of compound table:
LF 5 with LF 5 (in connection with VP 2)

Connectivity:
Angle brackets WV 3/WV 6

Item no.: **277 004**

Hole pattern

Slide top PS 6



Slide top **PS 6**

L220 x W125 x H8 mm

Connection to:
LF 4 with 1 x WS 5/200

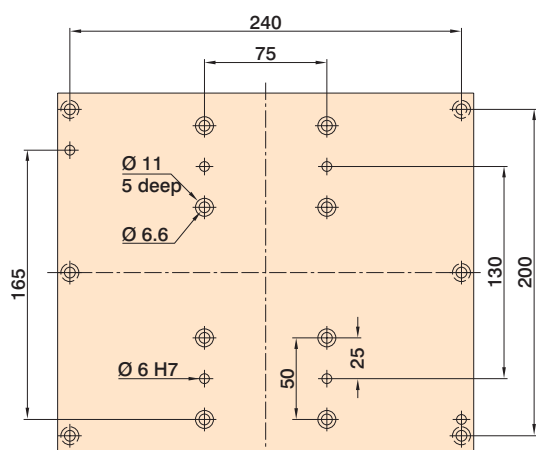
Mounting of compound table:
LF 4 with LF 5 (in connection with PS 3)

Connectivity:
LF 4/LF 5

Item no.: **277 011**

Hole pattern

Slide top PS 7



Slide top **PS 7**

L255 x W220 x H8 mm

Connection to:
LF 6 with 2 x WS 5/200

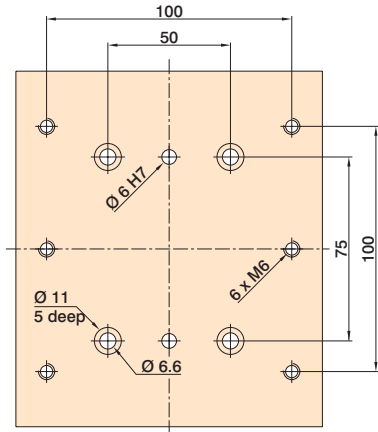
Mounting of compound table:
LF 6 with LF 5 (in connection with PS 4)

Item no.: **277 016**

Tops for Slides / Compound Tables Connecting Elements

Hole pattern

Slide top PS 8



Slide top **PS 8**

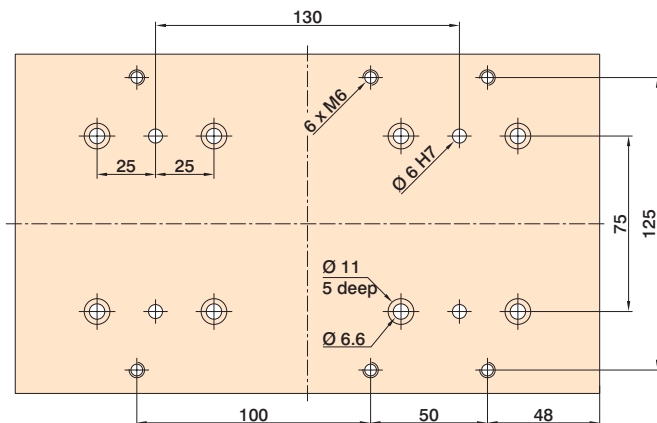
L125 x W145 x H8 mm

Connection to:
LF 6 with 2 x WS 5/70

Item no.: **277 017**

Hole pattern

Slide top PS 9



Slide top **PS 9**

L250 x W145 x H8 mm

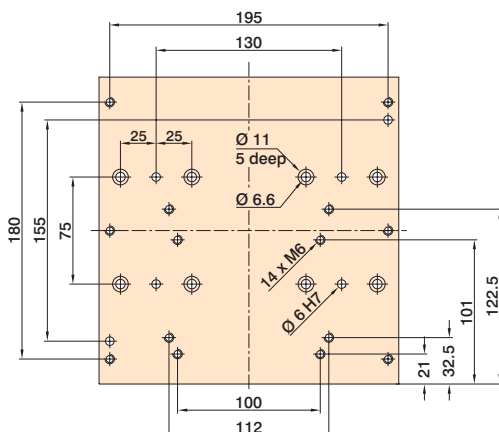
Connection to:
LF 6 with 2 x WS 5/200

Connectivity:
Angle bracket WV 7

Item no.: **277 018**

Hole pattern

Slide top PS 10



Slide top **PS 10**

L210 x W215 x H8 mm

Connection to:
LF 6 with 2 x WS 5/200

Mounting of compound table:
LF 6 with LF 6 (in connection with PS 11)

Connectivity:
Spindle motors MA

Item no.: **277 019**

Tops for Slides / Compound Tables Connecting Elements

Connecting plates for compound tables 1



Connecting plates
for compound tables 1

2 x L255 x W220 x H8 mm

Set consisting of PS 4 and VP 2,
for the rectangular connection
of two linear guides LF 5

Item no.: **277 010**

Connecting plates for compound tables 2



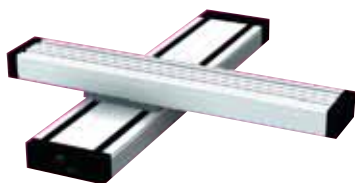
Connecting plates
for compound tables 2

2 x L220 x W125 x H8 mm

Set consisting of PS 3 and PS 6,
for the rectangular connection
of a linear guide LF 5 with a
linear guide LF 4

Item no.: **277 012**

Further compound tables



Compound tables LF 5 and LF 6
PS 4 and PS 7



Compound tables 2 x FL 6
PS 10 and PS 11

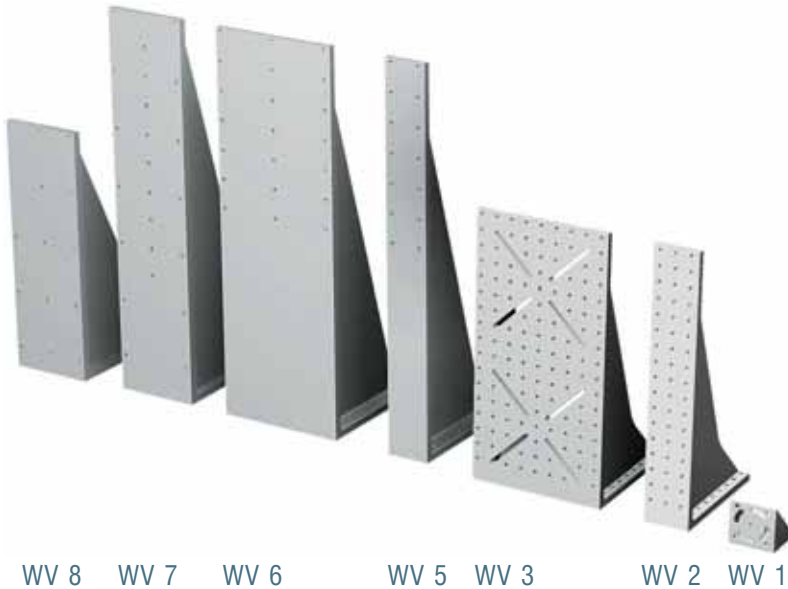


Compound tables LF 4 and LF 6
PS 11 and PS 10

Angle Brackets

Connecting Elements

Angle brackets with face-milled clamping surfaces



Matching cover plates



Angle bracket **WV 8**

- blank
- Aluminium, welded, 7.40 kg
- L222 x W145 x H446

Item no.: **209 110 0080**

Angle bracket **WV 3**

- blank
- Cast aluminium, 1.06 kg
- L221 x W221 x H446

Item no.: **209 110 0032**

Angle bracket **WV 7**

- blank
- Aluminium, welded, 10.81 kg
- L220 x W145 x H670

Item no.: **209 110 0070**

Angle bracket **WV 2**

- blank
- Cast aluminium, 2.58 kg
- L221 x W75 x H446

Item no.: **209 110 0022**

Angle bracket **WV 6**

- blank
- Aluminium, welded, 13.28 kg
- L220 x W220 x H670

Item no.: **209 110 0060**

Angle bracket **WV 1**

- blank
- Cast aluminium, 0.15 kg
- L71 x W75 x H71

Item no.: **209 110 0010**

Angle bracket **WV 5**

- blank
- Aluminium, welded, 5.26 kg
- L220 x W75 x H670

Item no.: **209 110 0050**

Cover plate for **WV 8**

- anodized
- Aluminium plate, 1.02 kg

Item no.: **209 110 0081**

Cover plate for **WV 7**

- anodized
- Aluminium plate, 1.48 kg

Item no.: **209 110 0071**

Cover plate for **WV 6**

- anodized
- Aluminium plate, 1.80 kg

Item no.: **209 110 0061**

Cover plate for **WV 5**

- anodized
- Aluminium plate, 1.20 kg

Item no.: **209 110 0051**

Cover plate for **WV 3**

- anodized
- Aluminium plate, 1.15 kg

Item no.: **209 110 0031**

Cover plate for **WV 2**

- anodized
- Aluminium plate, 0.78 kg

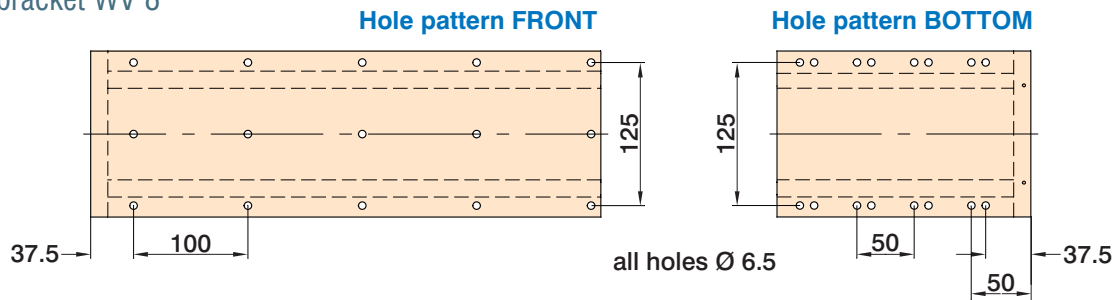
Item no.: **209 110 0021**

Angle Brackets

Connecting Elements

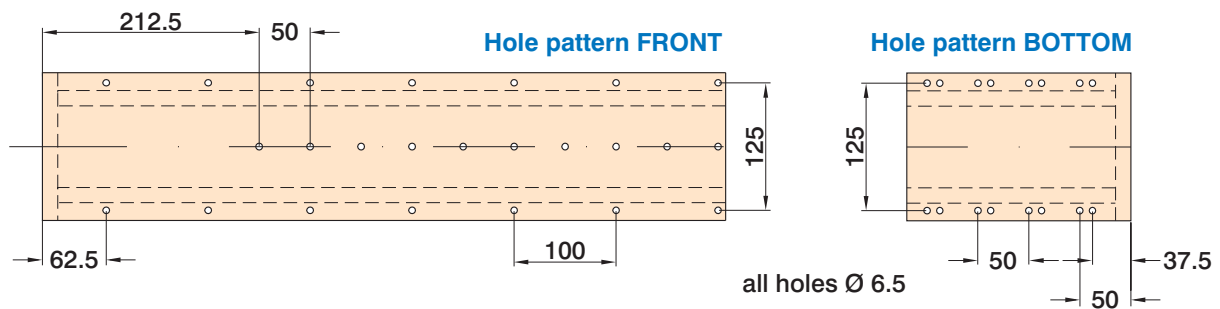
Hole pattern

Angle bracket WV 8



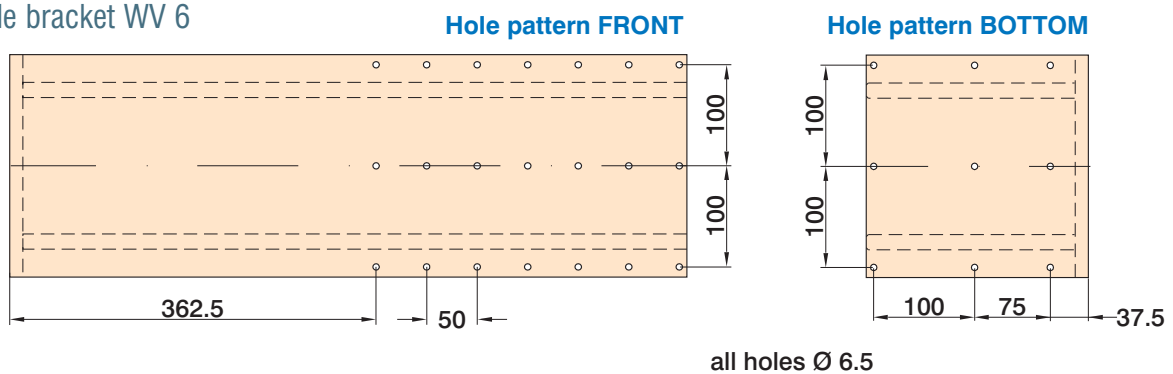
Hole pattern

Angle bracket WV 7



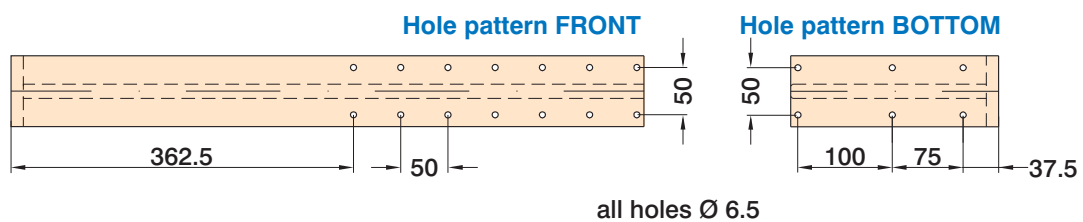
Hole pattern

Angle bracket WV 6



Hole pattern

Angle bracket WV 5

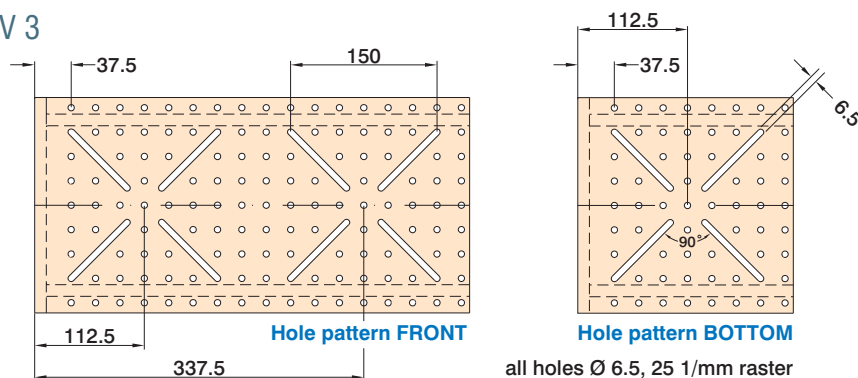


Angle Brackets

Connecting Elements

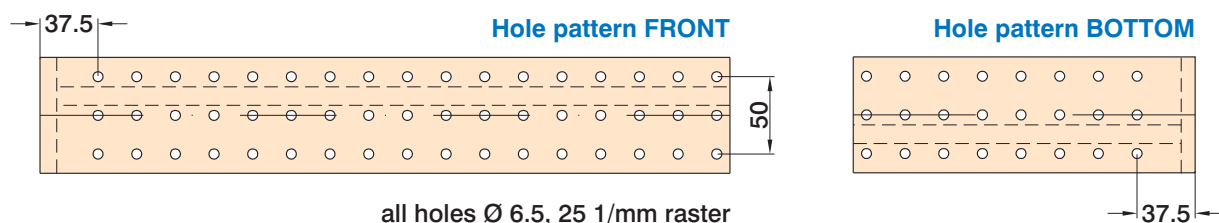
Hole pattern

Angle bracket WV 3



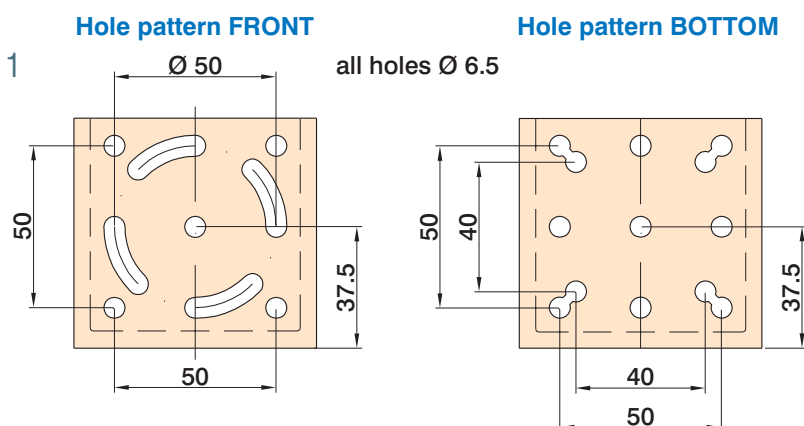
Hole pattern

Angle bracket WV 2



Hole pattern

Angle bracket WV 1



Ordering data

Angle bracket WV 8
Item no.: **209 110 0080**

Angle bracket WV 5
Item no.: **209 110 0050**

Angle bracket WV 1
Item no.: **209 110 0010**

Angle bracket WV 7
Item no.: **209 110 0070**

Angle bracket WV 3
Item no.: **209 110 0032**

Angle bracket WV 6
Item no.: **209 110 0060**

Angle bracket WV 2
Item no.: **209 110 0022**

Accessory

Power track chain



Power track chain 3

- packaging unit: 1 piece at 1 m

Item no.: **219 204 1000**

Connecting element for power track chain 3

- with strain relief
- packaging unit: 1 set

Item no.: **219 205 0002**

Adapter plate

Adapter plate

- for spindle motors MA connected to LF 5
- incl. fastening

Item no.: **277 014**

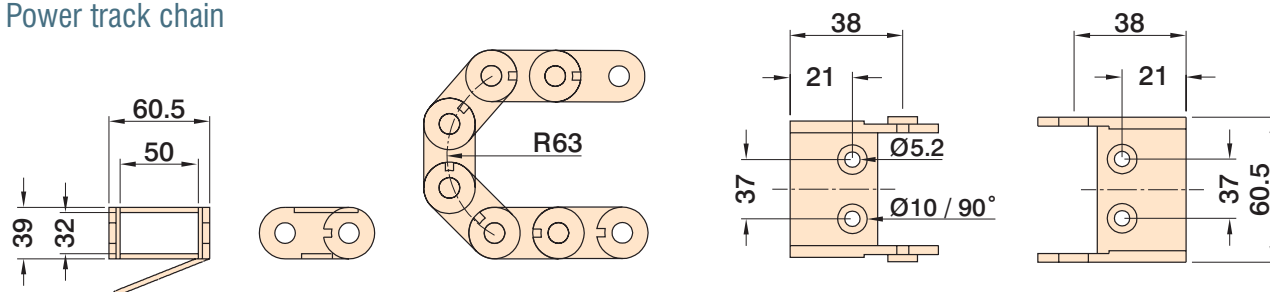
Adapter plate

- for motor 500 W / 1.1 kW connected to LF 6
- incl. incl. fastening

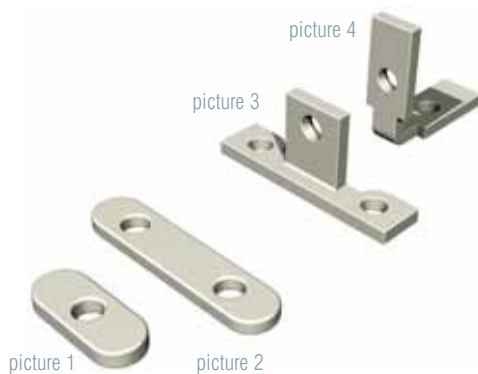
Item no.: **277 022**

Scale Drawing

Power track chain



Threaded rail / slide nut



Threaded rail

M6 (without illustration)

- galvanized
- raster 50 mm
- packaging unit: 3 pc. at 1 m each

Item no.: **209 011**

Slide nut

M6 (picture 1)

- galvanized
- packaging unit: 100 pieces

Item no.: **209 001 0005**

Slide nut

2 x M6 (picture 2)

- galvanized
- packaging unit: 50 pieces

Item no.: **209 002 0004**

Angular slide nut

2 x M6 (picture 4)

- galvanized
- packaging unit: 25 pieces

Item no.: **209 021 0003**

Special angular

slide nut

3 x M6 (picture 3)

- galvanized
- packaging unit: 25 pieces

Item no.: **209 022 0003**

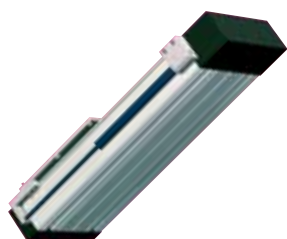
Gleitmutter

M5 (without illustration)

- galvanized
- packaging unit: 20 pieces

Item no.: **209 006 0001**

Adapter kits



Adapter kit for pneumatic springs

- stroke 220 mm
- nominal length 490 mm

Item no.: **216 450 0001**

Adapter kit for pneumatic springs

- stroke 300 mm
- nominal length 690 mm

Item no.: **216 451 0001**

Adapter kit for limit switches LF 4

- for outside limit switches

Item no.: **216 460 0001**

Adapter kit for limit switches LF 5

- for outside limit switches

Item no.: **216 460 0002**

Adapter kit for limit switches LF 6

- for outside limit switches

Item no.: **216 460 0003**

Assembly kit for seal gas

- for LF 4-LF 6

Item no.: **216 460 0006**

General Hints

Installation position

Principally, the installation positions of the linear axes can be chosen freely.

However, it has to be taken into account that all forces and moments that occur have to be below the maximum values of the respective axes.

Self-locking

Irrespective of the linear axis, the ball screw feed axes generally are not self-locking.

Especially in the event of the axes being vertically installed, it is necessary to attach motors with a holding brake, a separate holding brake or a suitable counterweight for the linear unit.

Environmental conditions

All linear units are construed for ambient temperatures up to 60 °C. Temporarily, temperatures up to, at most, 80 °C are permissible.

The linear axes are not suitable for temperatures below zero.

Dust, splinters and direct wetness have to be kept away from spindles, bearings, guide rods, as well as from motors and their electronic devices.

Straightness/torsion

The deployed aluminium profiles are extruded aluminium profiles that, due to the manufacturing process, show deviations concerning straightness and torsion.

The tolerance of this deviation is defined by DIN 17615.

At the worst, the deviations of the isel-linear axes come up to these limits, however, they normally are below them.

To achieve the desired accuracy, it is necessary to adjust the linear unit by means of levelling plates and/or to clamp it on a bearing surface that is treated precisely. Thus, tolerances of at least 0.1 mm/1,000 mm are achieved.

Repeatability

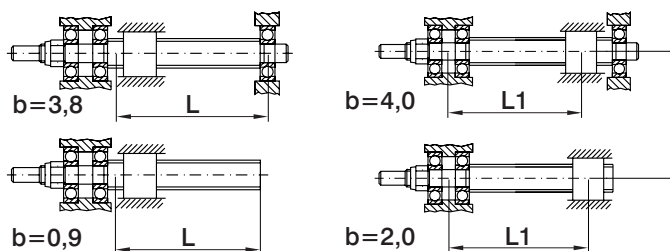
"Repeatability" means the ability of a linear drive to reach a once driven to actual position under the same conditions again.

When operating in an aggressive environment (acids, bases, abrasives, etc.), it has to be taken care to guide and drive elements being protected.

Improper use may lead to increased maintenance rates, susceptibility to failure and failure.

Theoretically Critical Speed

Calculations



Definitions

n_{zul} [min ⁻¹]	Maximum permissible speed
a	Installation coefficient
d_2 [mm]	Core diameter of the spindle
L [mm]	Centre-to-centre distance between the spindle bearings and the nut
F_{zul} [N]	Permissible pressure load
d_2 [mm]	Core diameter of the thread
L_1 [mm]	Free effective length, i.e. the maximum distance between bearing's and the nut's centre
b	Installation coefficient

Critical speed

In most application cases, it is necessary to check the threaded spindles with regard to their critical speed.

The critical speed of a threaded spindle is that speed which is caused by the spindle's resonance vibration.

This critical speed depends on the spindle's core diameter, self-supporting length and on the installation mode.

Considering the general safety factor of 0.8, the maximum permissible speed can be calculated as follows:

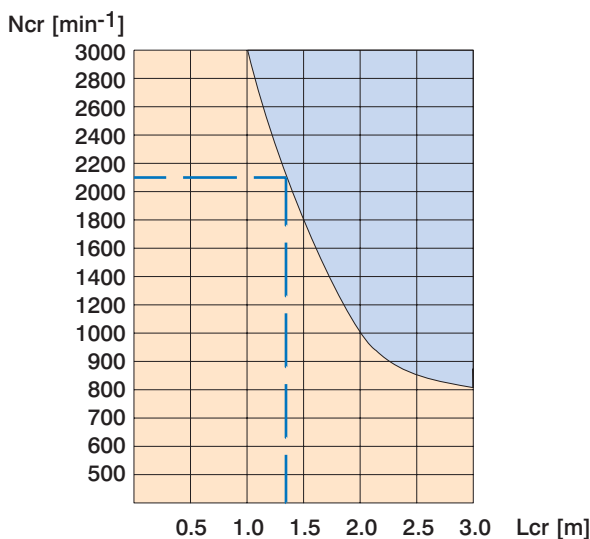
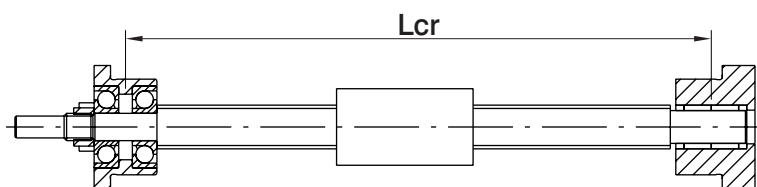
$$n_{zul} = 392 \frac{a \cdot d_2}{L^2} 10^5$$

Buckling load

Under load, the ball screw spindle should only be strained subject to tension. In case pressure loads occur, the spindle's buckling has to be included into the calculation.

Considering a safety factor of 3.0, the following results:

$$F_{zul} = \frac{3400 \cdot b \cdot d_2^4}{L_1^2}$$



Drive Dimensioning

Calculations

Calculation of the drive torque

The necessary drive torque consists of:

- load torque M_{last}
- acceleration torques M_{trans} and M_{rot}
- nominal torque M_{leer}

$$M_A = M_{last} + M_{trans} + M_{rot} + M_{leer}$$

Definitionen

M_A	[Nm]	Necessary drive torque
M_{last}	[Nm]	Moment resulting from the different loads
M_{leer}	[Nm]	Rotatory acceleration torque
M_{trans}	[Nm]	Translatory acceleration torque
F_X	[N]	Feed force
g	[m/s ²]	Gravity
v_{max}	[m/s]	Maximum traverse speed
m	[kg]	The mass to be transported
a	[m/s ²]	Acceleration
p	[mm]	Spindle pitch
P	[kW]	Power
L	[mm]	Length
n_{max}	[min ⁻¹]	Maximum speed
μ		Coefficient of friction
J_{sp}	[kgm ² /m]	The spindle's mass moment of inertia per metre
F_a	[N]	G force

Load torque

$$M_{last} = \frac{F_X \cdot p}{2 \cdot \pi \cdot 1000}$$

With feed force $F_X = m \cdot g \cdot \mu$

Translator. Acceleration torque

$$M_{trans} = \frac{F_a \cdot p}{2 \cdot \pi \cdot 1000}$$

With feed force $F_a = m \cdot a$

At vertical operation, the gravity $g = 9,81\text{m/s}^2$ has to be added to the mass acceleration a .

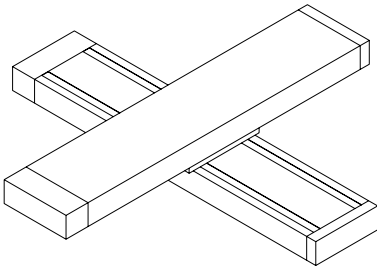
Rotator. Acceleration torque

$$M_{rot} = \frac{J_{sp} \cdot L \cdot n_{max} \cdot a \cdot 2 \cdot \pi}{V_{max} \cdot 60 \cdot 1000}$$

Rotator. Acceleration torque

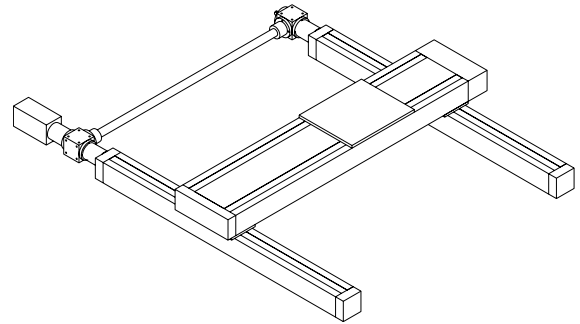
$$P = \frac{M_A \cdot n_{max}}{9550}$$

Combination Samples



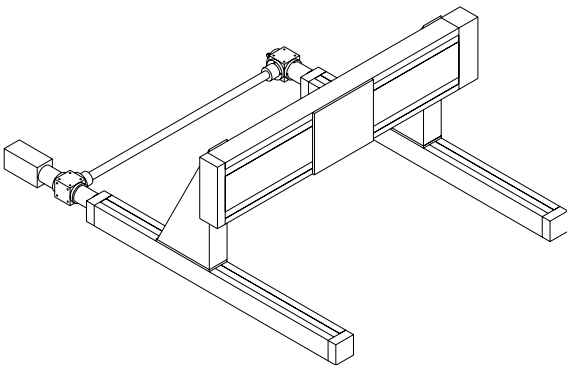
Compound table

2 x LF 5
PS 4 with VP 2



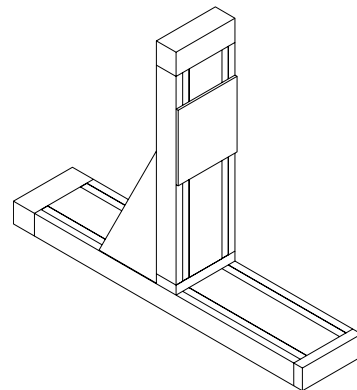
2-axis H-construction

2 x LF 4
LF 5
Angular gear kit
2 x PS 6
PS 4



2-axis flatbed layout

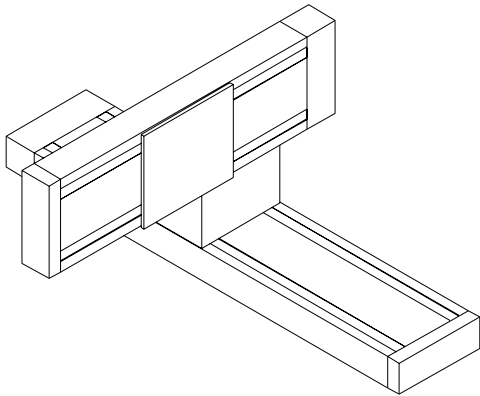
2 x LF 4
LF 5
Angular gear kit
2 X PS 2
2 x WV 2
PS 4



2-axis stroke layout

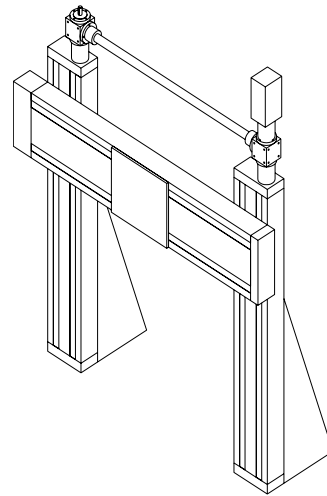
2 x LF 5
2 x PS 4
WV 6

Combination Samples



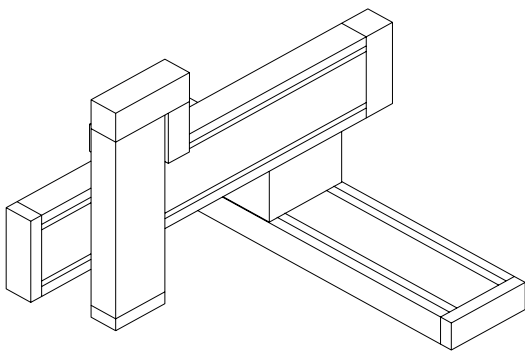
2-axis bracket layout

2 x LF 5
2 x PS 4
WV 3



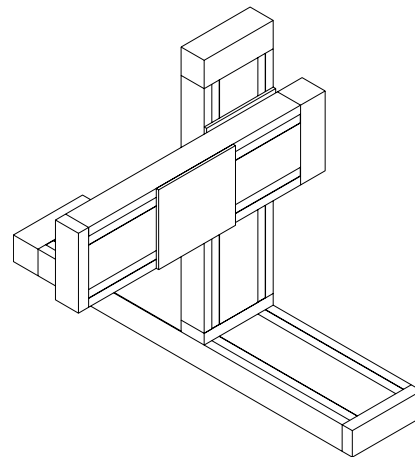
2-axis H-construction

LF 5
2 x LF 6
2 x WV 7
Angular gear kit
2 x PS 12
PS 4



3-axis bracket layout

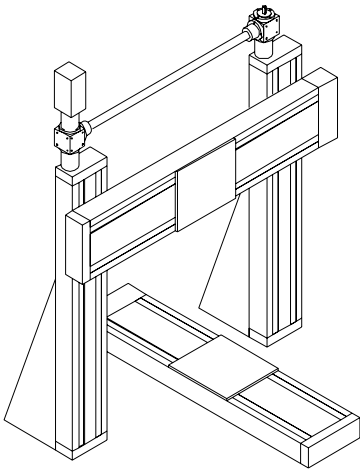
2 x LF 5
LF 6
WV 3
2 x PS 4
PS 7



3-axis stroke/bracket layout

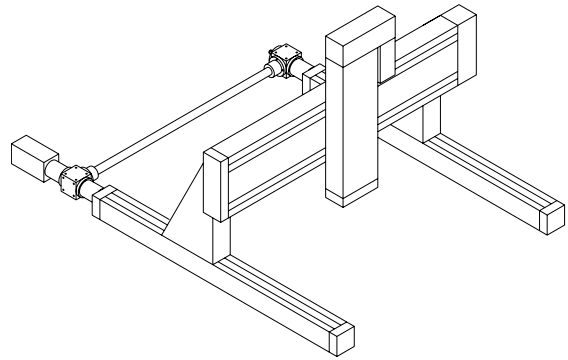
3 x LF 5
WV 3
2 x PS 4
VP 2

Combination Samples



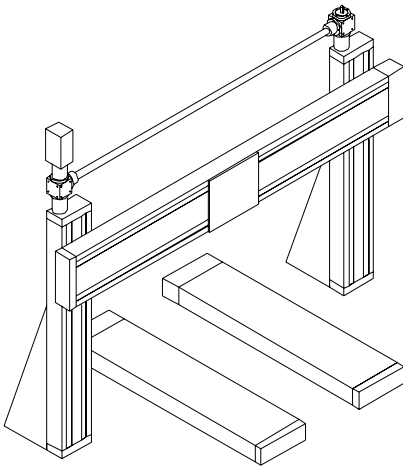
3-axis flatbed layout

2 x LF 5
 2 x LF 6
 2 x WV 7
 Angular gear kit
 2 x PS 4
 PS 12



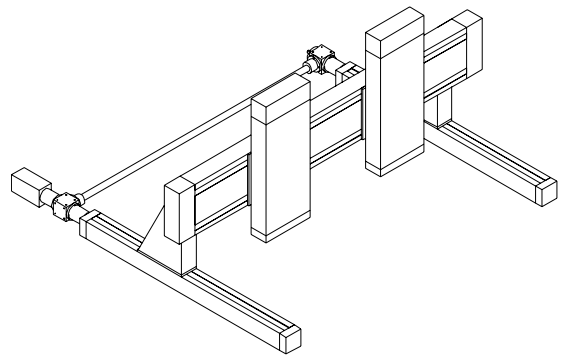
3-axis flatbed layout

2 x LF 4
 LF 5
 LF 6
 2 x PS 2
 2 x WV 2
 Angular gear kit
 PS 4
 PS 7



4-axis portal layout

3 x LF 5
 2 x LF 6
 2 x WV 7
 Angular gear kit
 3 x PS 4
 2 x PS 12



5-axis flatbed layout

2 x LF 5 (z-axes)
 LF 5 (2 spindle drives)
 2 x LF 4
 2 x PS 2
 2 x WV 2
 Angular gear kit
 2 x PS 4 with VP 2

Order Key

LF 4, LF 5 and LF 6

Order key

2 3 4 X X X 0 X X X

- 0 = LF 4 preparation
Direct drive modules
- 1 = LF 4 preparation
Belt drive module
- 3 = LF 5 preparation
Direct drive modules
- 4 = LF 5 preparation
Belt drive module
- 6 = LF 6 preparation
Direct drive modules
- 7 = LF 6 preparation
Belt drive module

- 0 = 1 / 2 shaft slides
70 mm
- 1 = 1 / 2 shaft slides
200 mm
- 2 = 2 / 4 shaft slides
70 mm

- 029 = profile length 290 mm
- 299 = profile length 2,990 mm
(shortened by the last digit)

- 0 = without
- 1 = pitch 2.5 mm
- 2 = pitch 4.0 mm
- 3 = pitch 5.0 mm
- 4 = pitch 10 mm
- 5 = pitch 20 mm