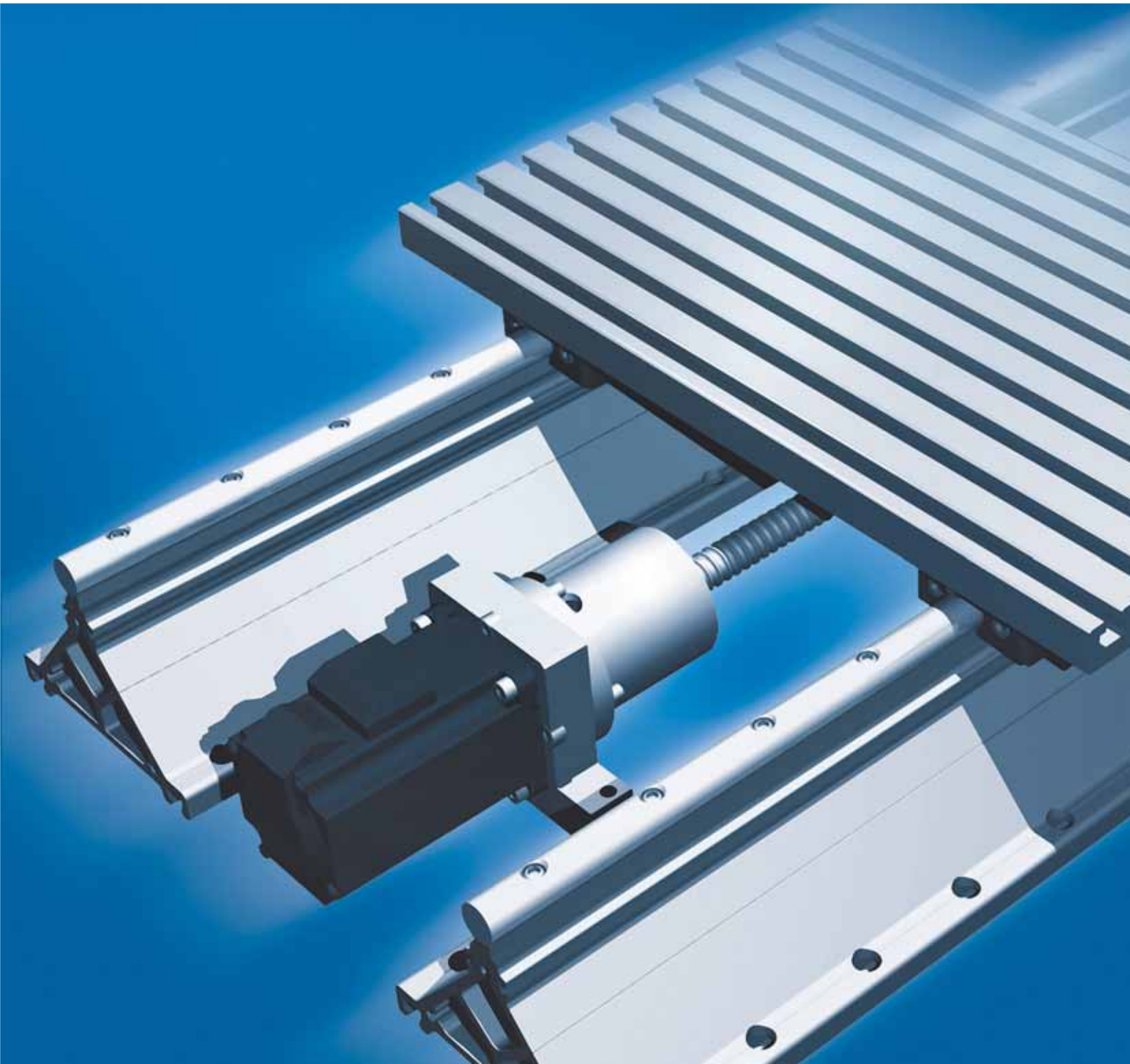
iselautomation

AUTOMATION 2004

Mechanics • Electronics • Software • Systems



GENERAL

MECHANICS

ELECTRONICS

SOFTWARE

SYSTEMS

From Components to Systems.

This general catalogue presents the complete production and sales programme of **iselautomation KG.**
The product philosophy "From components to Systems" is shown in its total variety on the following pages.

In case the presented products do not fully meet your demands, please contact us - we find a solution to almost any problem.

We'd be delighted to advise you.

iselautomation

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Table of Contents

GENERAL

MECHANICS

ELECTRONICS

SOFTWARE

SYSTEMS

The Company

Plant Eichenzell

Plant Dermbach

In 1972, **iselautomation KG**, the core company of the internationally operating **isel group**, was founded under the name *Isert-Elektronik.*

The company develops, manufactures, sells and maintains components used for automation, automation systems, robots and CNC machines as OEM versions.

The company works the global market and its activities include almost any groups of customers and problems within the isel product range.

iselautomation KG is located in Eichenzell, Hessen, and in Dermbach, Thuringia.

Our company's aims

The main target of **iselautomation KG** is to provide products that have a favourable price-performance ratio, a market-orientated technical level, and high quality.

By means of consulting, development, project planning, production, sales, training and service, **iselautomation KG** comprehensively covers the field of industrial automation with components and automation solutions.

The modular orientation of all **isel** components in the areas MECHANICS, ELECTRONICS, SOFTWARE plays an important role in the project planning and the later extension by means of additional components and functions.

Open interfaces of the used CNC controls and software ensure the flexibility that is necessary for customer-orientated adaptations to existing customer solutions provided by other suppliers.

iselautomation KG develops and produces CNC machines and CNC multi-axis units for the **isel groups' partner companies**. These product groups are the basis for the construction and extension of complete plants and systems.

The field of business also includes contract works for OEM customers outside the **isel group** and allows the implementation of most different machine superstructures for almost any possible applications and technologies.

From Components to Systems.

Exhibition

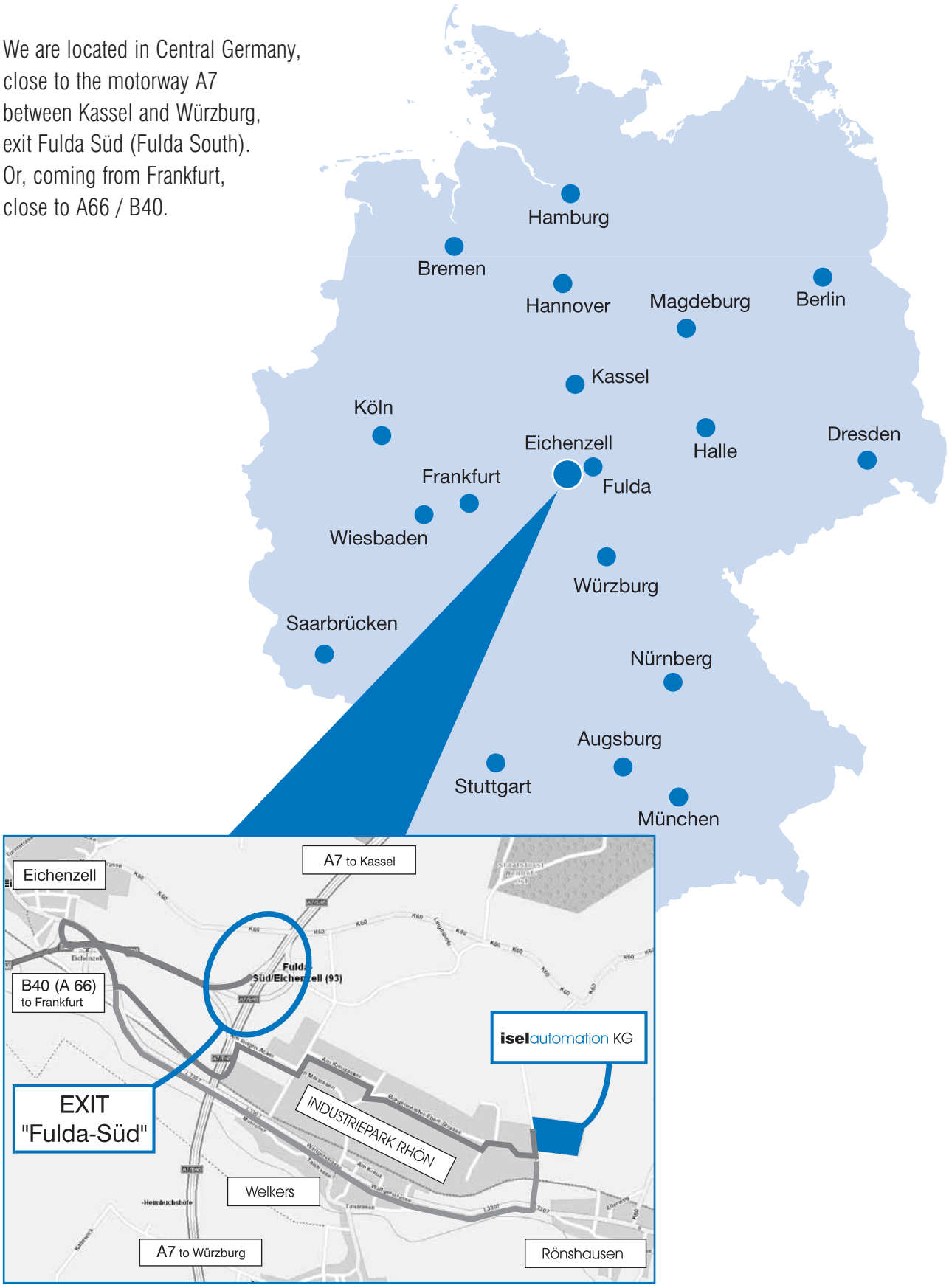
A permanent exhibition in our plant Eichenzell, which is located in Central Germany, is open on all working days. Of course, we also present our products at important fairs.

In our showroom, we present a cross section of our product range and offer you the possibility of related-to-practice demonstrations.

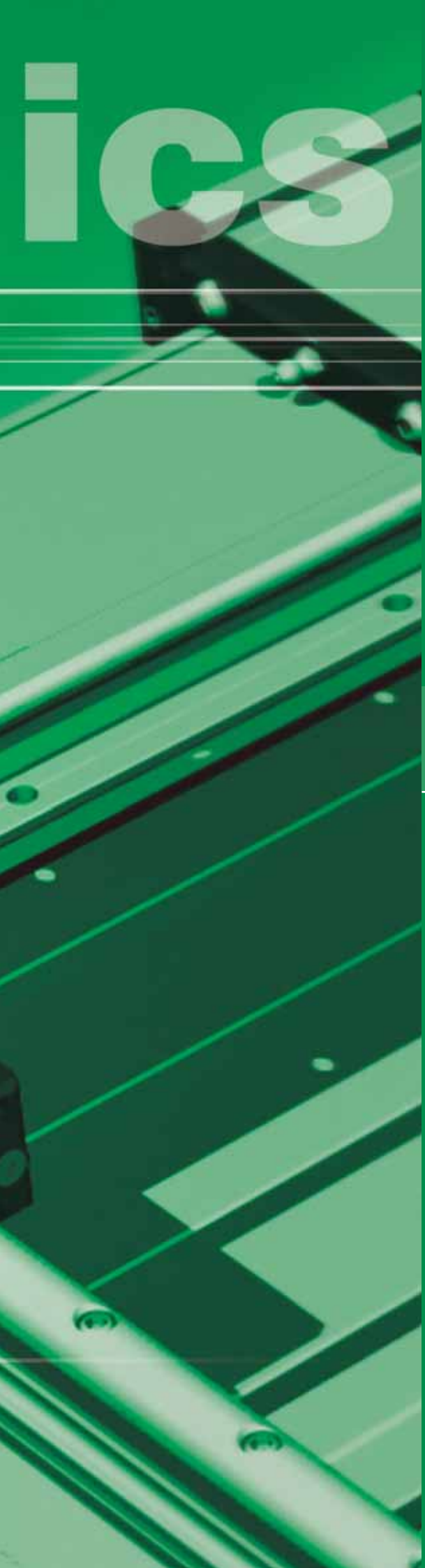
Ask for an appointment with one of our technical advisors. We look forward to your visit.

How to Find Us

We are located in Central Germany,
close to the motorway A7
between Kassel and Würzburg,
exit Fulda Süd (Fulda South).
Or, coming from Frankfurt,
close to A66 / B40.



mechan



MECHANICS

Aluminium Profiles Overview

Aluminium Profiles

Overview

Panel Profiles

PP-Profiles

Features

- for fast and easy assembly of housings, tables and frames
- aluminium, anodized
- made according to DIN 17615
- light, very solid
- lengthwise especially suitable for use as supporting panelling
- with our profile connections very firm, stress, reversion and bending resistant connections are produced by means of profile bore holes and hexagon socket screws in connection with PS-Profiles
- cut to size on request

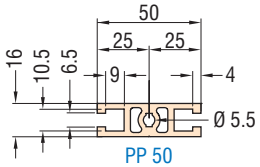
Technical Data

	PP 50	PP 100	PP 150	PP 200	PP 250
dimensions (W x H)	50 x 16 mm	100 x 16 mm	150 x 16 mm	200 x 16 mm	250 x 16 mm
length	up to 3 m (special lenghts upon request)				
weight	1,140 g/m	1,890 g/m	2,640 g/m	3,390 g/m	4,140 g/m
	hollow indention Ø 5.5 mm for M6	2 hollow indentions Ø 5.5 mm for M6 in a grid of 50	3 hollow indentions Ø 5.5 mm for M6 in a grid of 50	4 hollow indentions Ø 5.5 mm for M6 in a grid of 50	5 hollow indentions Ø 5.5 mm for M6 in a grid of 50
inertia moment I_x	8.13 cm^4	67.27 cm^4	213.92 cm^4	482.77 cm^4	908.52 cm^4
inertia moment I_y	1.37 cm^4	2.46 cm^4	3.55 cm^4	4.64 cm^4	5.74 cm^4
moment of resistance W_x	3.25 cm^3	13.45 cm^3	28.52 cm^3	48.27 cm^3	72.68 cm^3
moment of resistance W_y	1.71 cm^3	3.08 cm^3	4.44 cm^3	5.80 cm^3	7.17 cm^3

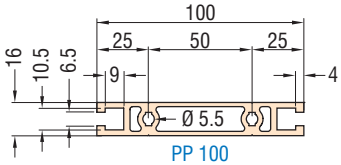
Ordering Data

profile designation	Art. No: **L = 1000** Art. No: **L = 3000**
PP 50 W 50 x H 16 mm	201 040 **1000** 201 040 **3000**
PP 100 W 100 x H 16 mm	201 041 **1000** 201 041 **3000**
PP 150 W 150 x H 16 mm	201 042 **1000** 201 042 **3000**
PP 200 W 200 x H 16 mm	201 043 **1000** 201 043 **3000**
PP 250 W 250 x H 16 mm	201 009 **1000** 201 009 **3000**

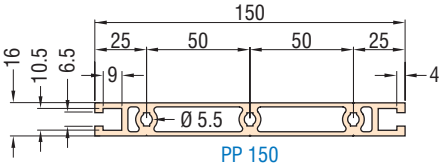
Dimension Drawings



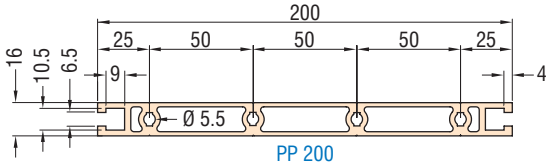
PP 50



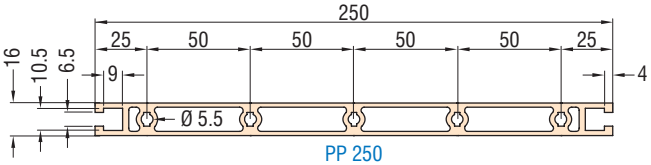
PP 100



PP 150



PP 200



PP 250

T-Groove Plates

PT-Profiles

Features

- universal precision, clamping and working surface
- aluminium, anodized
- made according to DIN 17615
- face-milled on both sides
- applicable with all machines
- thick walled, resistant to warping and extremly solid
- cut to size on request

Technical Data

	PT 25			PT 50	
dimensions (W x H)	125 x 20 mm	250 x 20 mm	375 x 20 mm	250 x 20 mm	375 x 20 mm
length	up to 3 m (special lenghts upon request)				
weight	4,810 g/m	9,560 g/m	13,710 g/m	10,020 g/m	14,840 g/m
T-groove indentions	one-sided in a grid of 25 mm			two-sided in a grid of 50 mm	
inertia moment I_x	243.36 cm^4	1,848.57 cm^4	5,996.01 cm^4	2,062.99 cm^4	6,745.96 cm^4
inertia moment I_y	6.46 cm^4	12.77 cm^4	17.90 cm^4	13.85 cm^4	20.63 cm^4
moment of resistance W_x	38.94 cm^3	147.88 cm^3	319.79 cm^3	165.04 cm^3	359.78 cm^3
moment of resistance W_y	6.46 cm^3	12.77 cm^3	17.90 cm^3	13.85 cm^3	20.63 cm^3

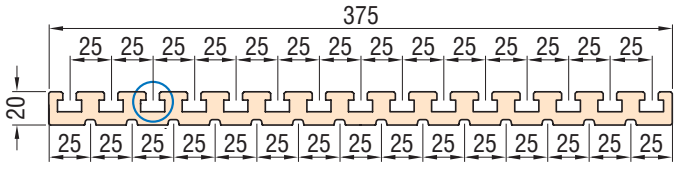
Ordering Data

profile designation	Art. No: **L = 1000** Art. No: **L = 3000**
PT 25 W 125 x H 20 mm	201 014 **1000** 201 014 **3000**
PT 25 W 250 x H 20 mm	201 018 **1000** 201 018 **3000**
PT 25 W 375 x H 20 mm	201 020 **1000** 201 020 **3000**
PT 50 W 250 x H 20 mm	201 016 **1000** 201 016 **3000**
PT 50 W 375 x H 20 mm	201 019 **1000** 201 019 **3000**
ordering data with all the standard lengths on page 21	

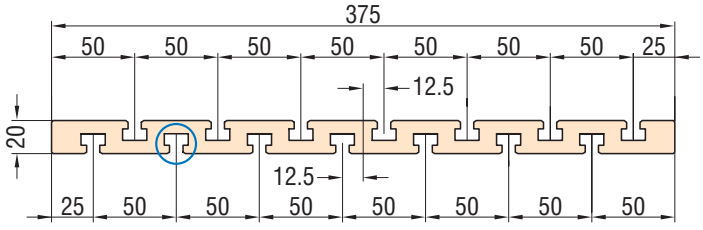
for further lengths refer to the ordering overview on page B25

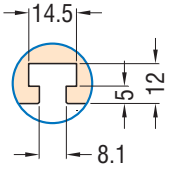
Dimension Drawings

PT 25



PT 50





mechanics

Rectangular Profiles

RE-Profiles

Features

- for use as stabilizer when constructing machine frames
- aluminium, anodized
- made according to DIN 17615
- light, very solid
- RE 175 x 30 and RE 250 x 30 face-milled on both sides
- in combination with the accessory numerous applications are possible
- cut to size on request

Technical Data

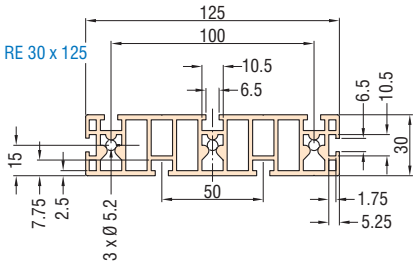
	RE 15				RE 30			
dimensions (W x H) [mm]	75 x 15	125 x 15	175 x 15	250 x 15	75 x 30	125 x 30	175 x 30	250 x 30
length	up to 3 m (special lenghts upon request)							
weight [g/m]	1,430	2,360	3,300	4,670	2,350	3,710	5,050	6,510
	several hollow sections and T-groove-indentions for slide nuts resp. threaded strips M6 as well as front sided indentions for M4				several hollow sections and T-groove-indentions for slide nuts resp. threaded strips M6 as well as front sided indentions for M6			
inertia moment I_x [cm⁴]	25.68	116.59	316.94	905.35	49.27	205.11	528.25	1,320.20
inertia moment I_y [cm⁴]	1.41	2.35	3.29	4.75	8.65	14.02	19.40	24.50
moment of resistance W_x [cm³]	6.85	18.65	36.22	72.43	13.14	32.82	60.37	105.62
moment of resistance W_y [cm³]	1.88	3.13	4.39	6.33	5.77	9.35	12.93	16.33

Ordering Data

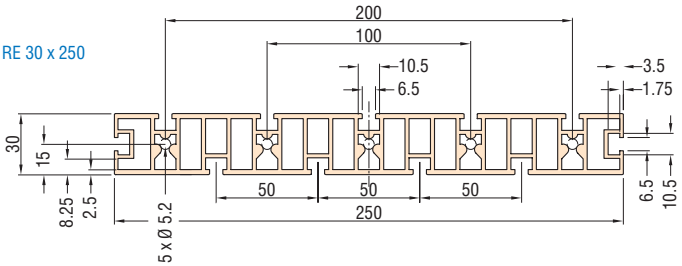
profile designation	Art. No: **L = 1000** Art. No: **L = 3000**
RE 15 W 75 x H 15 mm	201 001 **1000** 201 001 **3000**
RE 15 W 125 x H 15 mm	201 003 **1000** 201 003 **3000**
RE 15 W 175 x H 15 mm	201 005 **1000** 201 005 **3000**
RE 15 W 250 x H 15 mm	201 007 **1000** 201 007 **3000**
RE 30 W 75 x H 30 mm	201 002 **1000** 201 002 **3000**
RE 30 W 125 x H 30 mm	201 004 **1000** 201 004 **3000**
RE 30 W 175 x H 30 mm	201 006 **1000** 201 006 **3000**
RE 30 W 250 x H 30 mm	201 008 **1000** 201 008 **3000**

Dimension Drawings

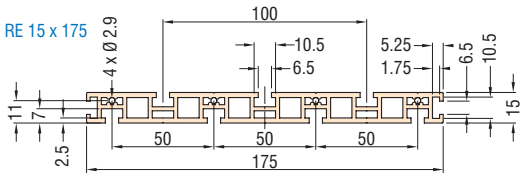
RE 30 x 125



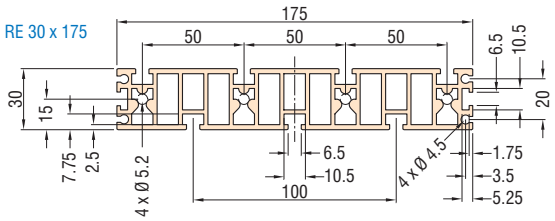
RE 30 x 250



RE 15 x 175



RE 30 x 175



Rectangular Profiles

RE-Profiles

Features

- universal precision, clamping and working surface
- for use as stabilizer when constructing machine frames
- aluminium, anodized
- made according to DIN 17615
- light, very solid
- face-milled on both sides
- in combination with the accessory numerous applications are possible
- cut to size on request

Technical Data

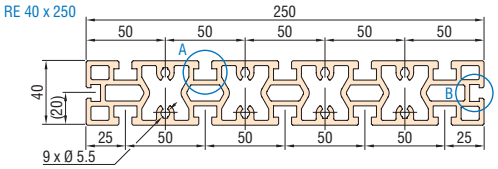
	RE 40		RE 65	
dimensions (W x H)	250 x 40 mm	350 x 40 mm	250 x 65 mm	350 x 65 mm
length	up to 3 m (special lenghts upon request)			
weight	9,670 g/m	13,380 g/m	12,420 g/m	17,030 g/m
	several hollow sections and T-groove-indentions for slide nuts resp. threaded strips M6 as well as front sided indentions for M6			
inertia moment I_x	2,107.21 cm^4	5,626.00 cm^4	2,658.48 cm^4	6,953.91 cm^4
inertia moment I_y	69.66 cm^4	97.45 cm^4	243.85 cm^4	338.52 cm^4
moment of resistance W_x	168.57 cm^3	321.48 cm^3	212.68 cm^3	397.37 cm^3
moment of resistance W_y	34.83 cm^3	48.5 cm^3	75.03 cm^3	104.16 cm^3

Ordering Data

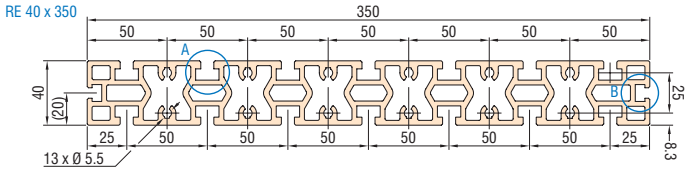
profile designation	Art. No: **L = 1000** Art. No: **L = 3000**
RE 40 W 250 x H 40 mm	201 030 **1000** 201 030 **3000**
RE 40 W 350 x H 40 mm	201 031 **1000** 201 031 **3000**
RE 65 W 250 x H 65 mm	201 032 **1000** 201 032 **3000**
RE 65 W 350 x H 65 mm	201 033 **1000** 201 033 **3000**

Dimension Drawings

RE 40 x 250



RE 40 x 350



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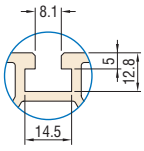
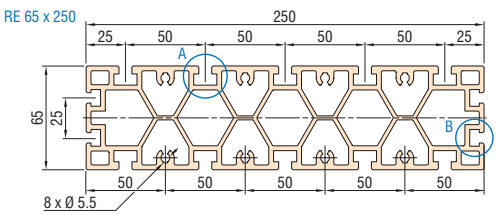
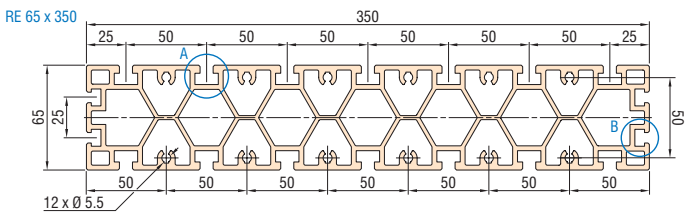


RE 65 x 250



RE 65 x 350



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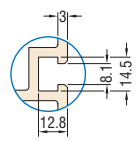


Universal Profiles

PU-Profiles

Features

- for fast and easy assembly of housings, tables and frames
- aluminium, anodized
- made according to DIN 17615
- light, compact, solid
- universally applicable
- high stress-resistance
- with our fast-clamped connections very firm, stress, reversion and bending resistant profile connections are produced by means of profile bore holes and clamping pieces
- cut to size on request

Technical Data

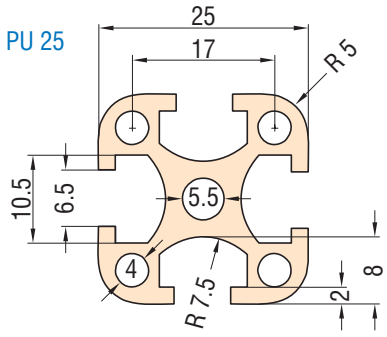
	PU 25	PU 50
dimensions (W x H)	25 x 25 mm	50 x 25 mm
length	up to 3 m (special lenghts upon request)	
weight	690 g/m	1,270 g/m
	4 T-groove indentions for slide nuts M6 hollow indention, Ø 5.5 mm for M6	4 T-groove indentions for slide nuts M6 2 hollow indentions, Ø 5.5 mm for M6
inertia moment I_x	1.43 cm⁴	10.99 cm⁴
inertia moment I_y	1.43 cm⁴	2.81 cm⁴
moment of resistance W_x	1.14 cm³	4.40 cm³
moment of resistance W_y	1.14 cm³	2.25 cm³

Ordering Data

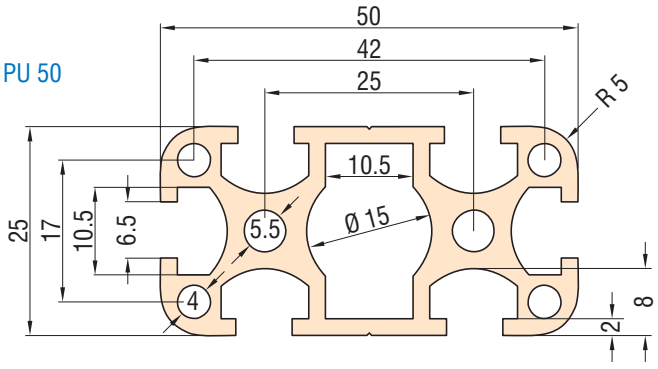
profile designation	Art. No: **L = 1000** Art. No: **L = 3000**
PU 25 W 25 x H 25 mm	200 001 **1000** 200 001 **3000**
PU 50 W 50 x H 25 mm	200 002 **1000** 200 002 **3000**

Dimension Drawings

PU 25



PU 50



Lightweight Frame Profiles

PL-Profiles

Features

- for fast and easy assembly of housings, tables and frames
- aluminium, anodized
- made according to DIN 17615
- light, compact, solid
- high stress-resistance
- with our fast-clamped connections very firm, stress, reversion and bending resistant profile connections are produced by means of profile bore holes and clamping pieces
- cut to size on request

Technical Data

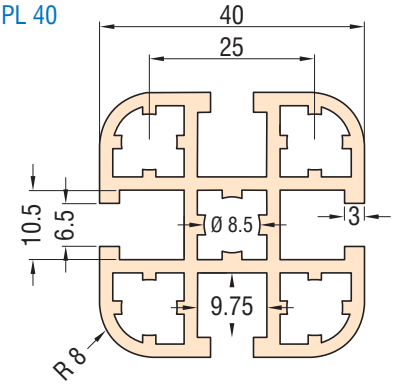
	PL 40	PL 80
dimensions (W x H)	40 x 40 mm	80 x 40 mm
length	up to 3 m (special lenghts upon request)	
weight	1,530 g/m	2,900 g/m
	4 T-groove indentions for T-groove blocks M6 5 hollow indentions, Ø 8.5 mm for M10	6 T-groove indentions for T-groove blocks M6 6 hollow indentions, Ø 8.5 mm for M10 hollow indention, Ø 10.2 mm for M12
inertia moment I_x	8.38 cm^4	64.40 cm^4
inertia moment I_y	8.38 cm^4	16.36 cm^4
moment of resistance W_x	4.19 cm^3	16.10 cm^3
moment of resistance W_y	4.19 cm^3	8.18 cm^3

Ordering Data

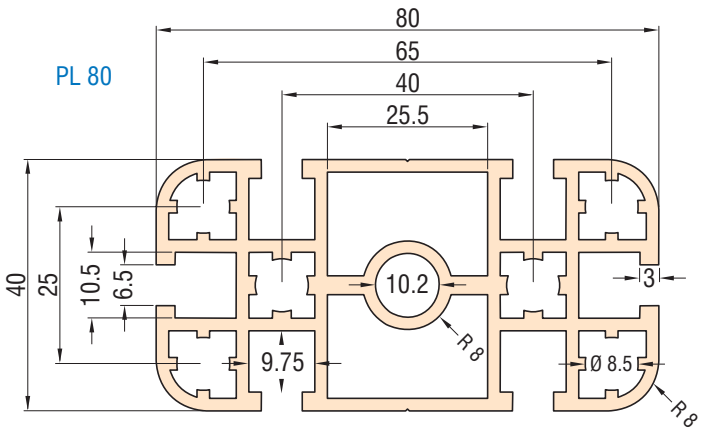
profile designation	Art. No: **L = 1000** Art. No: **L = 3000**
PL 40 W 40 x H 40 mm	200 008 **1000** 200 008 **3000**
PL 80 W 80 x H 40 mm	200 009 **1000** 200 009 **3000**

Dimension Drawings

PL 40



PL 80



Fair Profiles

PM-Profiles

Features

- for fast and easy assembly of e. g. exhibition stands etc.
- aluminium, anodized
- made according to DIN 17615
- light, solid, nice design
- enables angular connections
- with our fast-clamped connections very firm, stress, reversion and bending resistant profile connections are produced by means of profile bore holes and clamping pieces
- cut to size on request

Technical Data

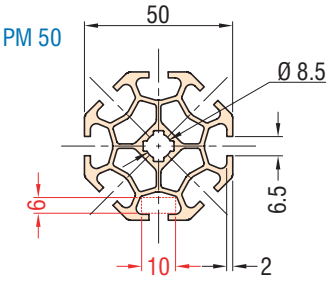
	PM 50	PM 100
dimensions (W x H)	50 x 50 mm	100 x 100 mm
length	up to 3 m (special lenghts upon request)	
weight	1,700 g/m	3,270 g/m
	8 T-groove indentions in an angle of 45° hollow indention, Ø 8.5 mm for M10	8 T-groove indentions in an angle of 45° hollow indention, Ø 8.5 mm for M10
inertia moment I_x	12.27 cm^4	107.20 cm^4
inertia moment I_y	12.27 cm^4	107.20 cm^4
moment of resistance W_x	4.91 cm^3	21.44 cm^3
moment of resistance W_y	4.91 cm^3	21.44 cm^3

Ordering Data

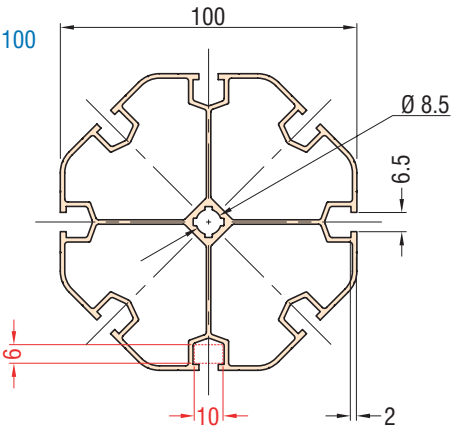
profile designation	Art. No: **L = 1000** Art. No: **L = 3000**
PM 50 W 50 x H 50 mm	200 004 **1000** 200 004 **3000**
PM 100 W 100 x H 100 mm	200 005 **1000** 200 005 **3000**

Dimension Drawings

PM 50



PM 100



Stand Profiles

PS-Profiles

Features

- for fast and easy assembly of housings, tables and frames
- aluminium, anodized
- made according to DIN 17615
- light, compact, solid
- high stress-resistance
- with our fast-clamped connections very firm, stress, reversion and bending resistant profile connections are produced by means of profile bore holes and clamping pieces
- cut to size on request

Technical Data

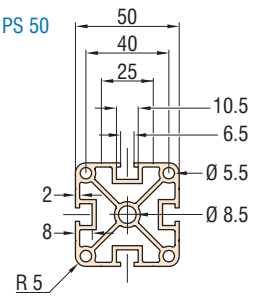
	PS 50	PS 80	PS 100	PS 140
dimensions (W x H)	50 x 50 mm	80 x 80 mm	100 x 100 mm	140 x 140 mm
length	up to 3 m (special lenghts upon request)			
weight	2,300 g/m	5,390 g/m	5,100 g/m	8,990 g/m
	4 T-groove indentions for slide nuts M6 4 hollow indentions, Ø 5.5 mm for M6 hollow indention, Ø 8.5 mm for M10	4 T-groove indentions for slide nuts M6 4 hollow indentions, Ø 8.5 mm for M10 hollow indention, Ø 10.2 mm for M12	4 T-groove indentions for slide nuts M6 4 hollow indentions, Ø 5.55 mm for M6 hollow indention, Ø 14 mm for M16	4 T-groove indentions for slide nuts M6 4 hollow indentions, Ø 8.5 mm for M10 hollow indention, Ø 14 mm for M16
inertia moment I_x	22.06 cm⁴	135.95 cm⁴	163.00 cm⁴	594.74 cm⁴
inertia moment I_y	22.06 cm⁴	135.95 cm⁴	163.00 cm⁴	594.74 cm⁴
moment of resistance W_x	8.82 cm³	33.99 cm³	32.60 cm³	84.96 cm³
moment of resistance W_y	8.82 cm³	33.99 cm³	32.60 cm³	84.96 cm³

Ordering Data

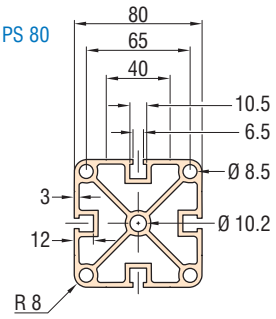
profile designation	Art. No: **L = 1000** Art. No: **L = 3000**
PS 50 W 50 x H 50 mm	200 003 **1000** 200 003 **3000**
PS 80 W 80 x H 80 mm	200 014 **1000** 200 014 **3000**
PS 100 W 100 x H 100 mm	200 015 **1000** 200 015 **3000**
PS 140 W 140 x H 140 mm	200 016 **1000** 200 016 **3000**

Dimension Drawings

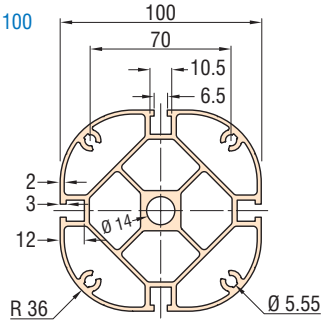
PS 50



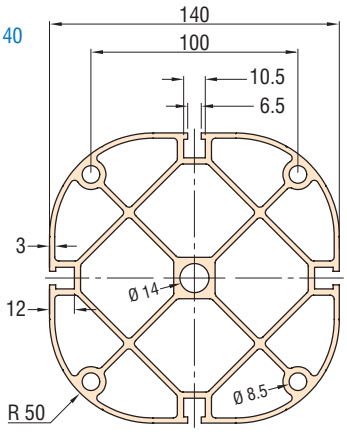
PS 80



PS 100

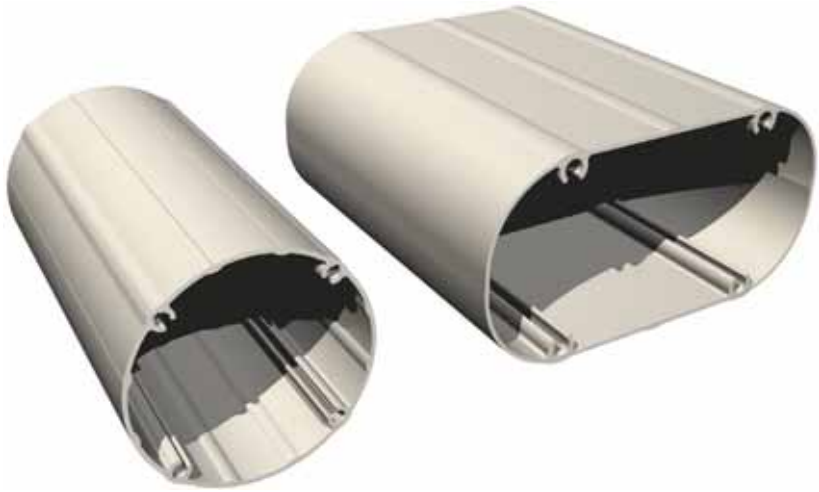


PS 140



Pillar Profiles

SP-Profiles



Features

- for the assembly of any type of frames, tables etc.
- aluminium, anodized or powder-coated (RAL-colours)
- made according to DIN 17615
- light, nice design
- cut to size on request

Technical Data

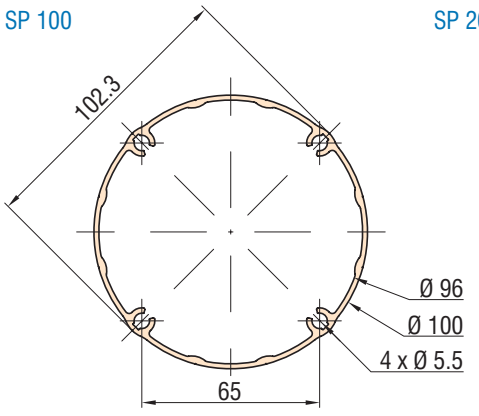
	SP 100	SP 200
dimensions (W x H)	Ø 102.3 mm	194.6 x 102 mm
length	up to 3 m (special lenghts upon request)	
weight	2,090 g/m	3,600 g/m
	4 hollow indentions, Ø 5.55 mm for M6	4 hollow indentions, Ø 9 mm
inertia moment I_x	91.18 cm^4	537.57 cm^4
inertia moment I_y	91.18 cm^4	235.79 cm^4
moment of resistance W_x	18.24 cm^3	53.76 cm^3
moment of resistance W_y	18.24 cm^3	4.72 cm^3

Ordering Data

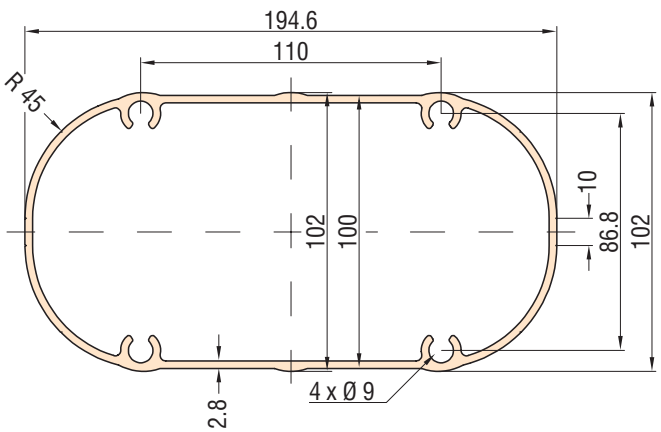
profile designation	Art. No: **L = 1000** Art. No: **L = 3000**
SP 100 natural anodized	208 007 **1000** 208 007 **3000**
SP 100 light grey	208 007 **1001** 208 007 **3001**
SP 100 anthracite	208 007 **1002** 208 007 **3002**
SP 200 natural anodized	208 004 **1000** 208 004 **3000**
SP 200 light grey	208 004 **1001** 208 004 **3001**
SP 200 anthracite	208 004 **1002** 208 004 **3002**

Dimension Drawings

SP 100



SP 200



Multi-Equipment Carrier Profile PG-Profiles

Features

- for the assembly of consistant multi-equipment carriers
- aluminium, anodized or powder-coated (RAL-colours)
- made according to DIN 17615
- solid, nice design
- cut to size on request

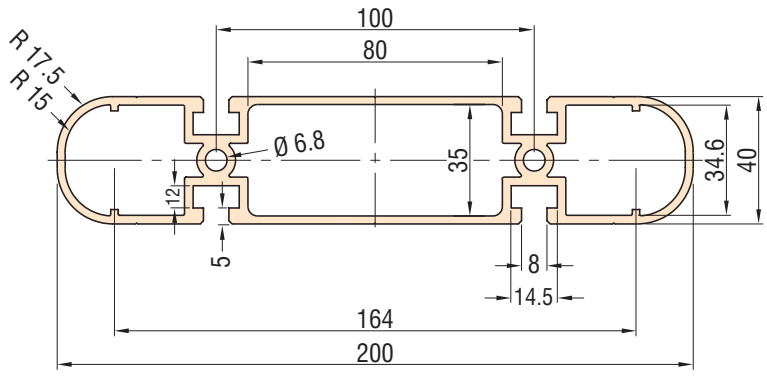
Technical Data

	PG 200
dimensions (W x H)	200 x 40 mm
length	up to 3 m (special lenghts upon request)
weight	4,600 g/m
	4 T-groove indentions for slide nuts M6
inertia moment I_x	597.59 cm^4
inertia moment I_y	38.64 cm^4
moment of resistance W_x	59.76 cm^3
moment of resistance W_y	19.32 cm^3

Ordering Data

profile designation	Art. No: **L = 1000** Art. No: **L = 3000**
PG 200 natural anodized	208 050 **1000** 208 050 **3000**
PG 200 light grey	208 052 **1000** 208 052 **3000**
PG 200 anthracite	208 051 **1000** 208 051 **3000**

Dimension Drawings



mechanics

Accessory

Threaded Strips

Threaded Strip M6
- 13 x 6 mm
- galvanized
- M6 grid 50
- 3 pieces à 1 m
- suitable for PT / RE 40, 65 / PG

Item no.: **209 010**

Threaded Strip M6
- 10 x 4 mm
- galvanized
- M6 grid 50
- 3 pieces à 1 m
- suitable for PT / RE 40, 65 / SP / PG

Item no.: **209 011**

Slide Nuts

Slide Nut M6 (fig. 1)
- L 25 x W 10 x H 3,5
- galvanized
- 100 pieces
- for all except PT / RE 40, 65 / PS 50 / SP / PG

Item no.: **209 001 0005**

Slide Nut M6 (fig. 1)
- L 25 x W 13 x H 5
- galvanized
- 50 pieces
- suitable for PT / RE 40, 65 / PG

Item no.: **209 004 0001**

Slide Nut 2 x M6 (fig. 2)
- L 45 x W 10 x H 3,5
- galvanized
- 50 pieces
- for all except PT / RE 40, 65 / SP / PG

Item no.: **209 002 0004**

Slide Nut 2 x M6 (fig. 2)
- L 45 x W 13 x H 6
- galvanized
- 2 x M6 grid 25 mm
- 25 pieces
- suitable for PT / RE 40, 65 / PG

Item no.: **209 005 0001**

Slide Nut M5
- L 25 x W 10 x H 3,5
- galvanized
- 20 pieces

Item no.: **209 006 0001**

Angular Slide Nut 2 x M6 (fig. 3)
- galvanized
- 25 pieces
- for all except PT / RE 40, 65 / SP / PG

Item no.: **209 021 0003**

Special Slide Nut 3 x M6 (fig. 4)
- galvanized
- 25 pieces
- for all except PT / RE 40, 65 / SP / PG

Item no.: **209 022 0003**

T-Groove Blocks

T-Groove Block M6
- DIN 508
- hardened
- 20 pieces
- suitable for PT / RE 40, 65 / PG

Item no.: **209 119 0003**

Clamping Vices

Clamping Vice 1 (see figure)
- L 152 x W 130 x H 45 mm
- grid 100
- suitable for RE / PT

Item no.: **290 055**

Clamping Vice 2 (without figure)
- L 215 x W 175 x H 75 mm
- grid 125
- suitable for RE / PT

Item no.: **290 056**

Clamping Blocks

Clamping Block SE
- with adjustable screw M6
- 2 pieces
- suitable for all except PP / PT / PM / SP

item no.: **290 051**

Clamping Devices

Hand Lever Clamping Device SH 1
- for all except PP / PT / RE 40, 65 / SP / PG

Item no.: **290 001**

Hand Lever Clamping Device SH 2
- for all except SP

Item no.: **290 002**

Pneumatic Clamping Device SP 1
- lift 10 mm
- L 65 x W 10 x H 10 mm
- grid 50
- suitable for PT / RE

Item no.: **290 010**

Pneumatic Clamping Device SP 2
- lift 5 mm
- L 65 x W 12 x H 50 mm
- grid 50
- suitable for PT / RE

Item no.: **290 011**

Stop Rails

Stop Rail
- W 20 x H 10
- grid 50
- 2 pieces + mounting material
- suitable for all except SP

L 125 mm
Item no.: **290 021 0125**

L 175 mm
Item no.: **290 021 0175**

L 225 mm
Item no.: **290 021 0225**

Accessory

Panel Guide Strips/Profiles

Panel Guide Strip black 1-part

- for Plates 3 - 6 mm
- 1 piece à 10 m
- suitable for all except PT / SP / PG

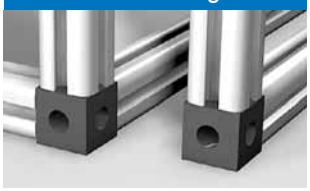
Item no.: **209 202 0001**

Panel Guide Profile black 2-part

- for Plates 3 - 6 mm
- 1 piece à 3 m
- suitable for all exceptPT / SP / PG

Item no.: **209 212 3000**

Profile Connecting Cubes



Profile Connecting Cube black

- 10 pieces + mounting material
- suitable for PU 25

2-fold
Item no.: **209 104 0002**
3-fold
Item no.: **209 103 0002**

Profile Connecting Cube black

- 10 pieces + mounting material
- suitable for PU 25

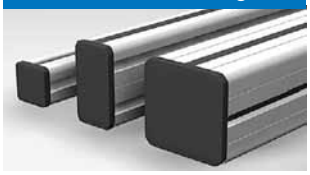
3-fold
Item no.: **209 106 0002**
4-fold
Item no.: **209 107 0002**

Profile Connecting Cube black

- 10 pieces + mounting material
- suitable for PU 25

4-fold
Item no.: **209 108 0002**
5-fold
Item no.: **209 109 0002**

Profile Coverings



Profile Coverings black

- PU 25 - 25 x
  Item no.: **209 105 0003**
- PU 50 - 25 x
  Item no.: **209 126 0003**
- PL 40 - 20 x
  Item no.: **209 127 0003**
- PL 80 - 20 x
  Item no.: **209 128 0003**
- PS 50 - 25 x
  Item no.: **209 129 0003**
- PS 80 - 20 x
  Item no.: **209 130 0003**
- PS 140 - 10 x
  Item no.: **209 130 1001**
- PG 200 - 10 x
  Item no.: **209 130 2000**

Aluminium Cast Pedestals

Aluminium Cast Pedestals

- 2 pieces + mounting material
- suitable for PG

anthracite
Item no.: **248 700 1000**
light grey
Item no.: **248 700 2000**

Plastic Rollers

Plastic Rollers Ø 50 black (M6)

- 4 pieces
- 2 with and 2 without locks

for PU 25
Item no.: **209 040 0012**
for PU 50
Item no.: **209 040 0011**

Steering Rollers

Ruberized Steering Rollers Ø 75 (M10)

- 4 pieces
- 2 with and 2 without locks
- for PL 40 / PS 50

Item no.: **209 043 0011**

mechanics

Accessory

Plastic Pedestals

Plastic Pedestals
with rubber plate
- 4 pieces + adjusting screws
- black

for PU 25
- Ø 40
- adjusting screws M6 x 15 mm

Item no.: **209 029 0003**

for PL 40 / PS 50
- Ø 60
- adjusting screws M10 x 45

Item no.: **209 032 0003**

for PL 40 / PS 50
- Ø 80
- adjusting screws M10 x 45

Item no.: **209 031 0013**

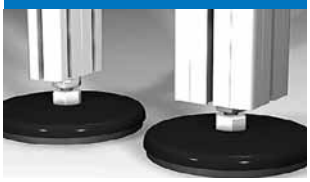
for PL 80 / PS 80
- Ø 80
- adjusting screws M12 x 45

Item no.: **209 034 0001**

for PL 80 / PS 80
- Ø 120
- adjusting screws M12 x 45

Item no.: **209 033 0003**

Aluminium Pedestals



Aluminium Pedestals
with rubber plate
- 4 pieces + adjusting screws

for PU 50
- Ø 50
- adjusting screws M16 x 30
- natural

Art.-Nr.: **209 030 0000**

for PS 100 / 140
- Ø 170
- adjusting screws M16 x 100
- black

Art.-Nr.: **209 035 0001**

T-Groove Coverings

T-Groove Covering
- 30 m
- (turquoise = similar RAL 5018)
- for all except PT / RE 40, 65 / SP / PG

black

Item no.: **209 201 0004**

turquoise

Item no.: **209 201 0003**

Aluminium Corner Connection

Aluminium Corner Connection
- L 25 x W 25 x H 15
- 10 pieces + mounting material
- suitable for RE / PU / PS 50

natural

Item no.: **209 114 0101**

black

Item no.: **209 114 0111**

Aluminium Corner Connection
- L 40 x W 40 x H 22
- 10 pieces + mounting material
- suitable for PP / PL / PS 80 / PS 140

natural

Item no.: **209 115 0101**

black

Item no.: **209 115 0111**

Aluminium Corner Connection
- L 50 x W 50 x H 15
- 10 pieces + mounting material
- suitable for RE / PM / PU / PS 50

natural

Item no.: **209 116 0101**

black

Item no.: **209 116 0111**

Aluminium Corner Connection
- L 80 x W 80 x H 22
- 10 pieces + mounting material
- suitable for PP / PL / PM / PS

natural

Item no.: **209 117 0101**

black

Item no.: **209 117 0111**

Aluminium Floor Mounting

Aluminium Floor Mounting
- L 120 x W 40 x H 75
- 2 bore holes Ø 11, grid 90 mm
- suitable for PL / PG

Item no.: **209 300 0002**

Cross Member out of PP 50

Cross Member out of PP 50
- L 490 mm
- miter sawed
- bore holes M6
- for all except PT / RE 40, 65 / SP / PG

Item no.: **209 300 0000**

Strap Hinge

Plastic Strap Hinge
- L 65 x W 40
- 10 pieces + mounting material
- grid 43 x 20
- suitable for PL

Item no.: **209 050 0012**

Aluminium Strap Hinge
- L 40 x W 40 mm
- 10 pieces + mounting material
- grid 25 x 25
- for all except PT / RE 40, 65 / SP / PG

Item no.: **209 050 0011**

Accessory

Strap Hinge
- L 80 x W 40 mm
- zinc diecast
- 2 pieces
- grid 24 x 53 mm
- for all except PT / RE 40, 65 / SP / PG

Item no.: **209 050 0021**

Aluminium Mounting Angle

Aluminium Mounting Angle
- 2 pieces
- Angle of gradient adjustable
- suitable for RE / PG

Item no.: **209 300 0004**

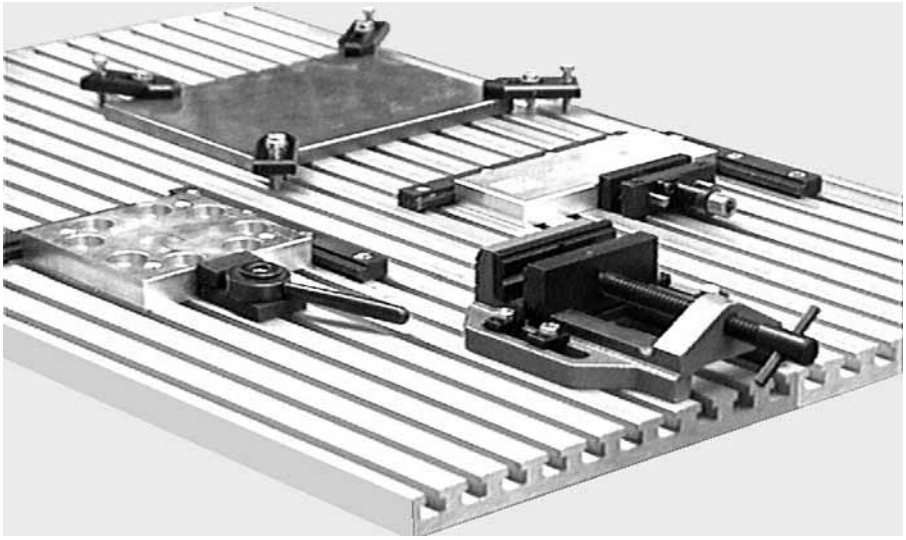
Mounting Bracket

Mounting Bracket
for pedestal / rollers
- steel galvanized
- 2 pieces
- H 33 mm
- suitable for all except SP

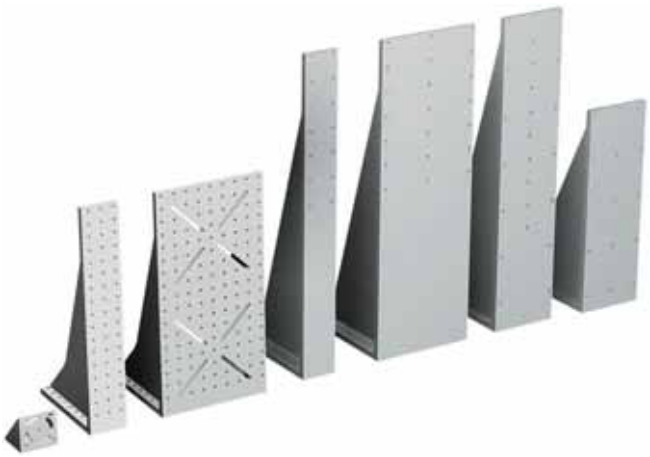
Item no.: **209 300 0003**

Application Sample

Clamping set



Connecting L-Brackets with face-milled surface

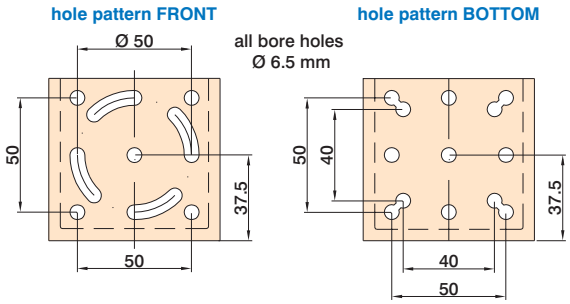


Coverings

Connecting L-Bracket **WV 1**

- blank
- Cast Aluminium, 0.15 kg
- L 71 x W 75 x H 71 mm

Item no.: **209 110 0010**



Connecting L-Bracket **WV 2**

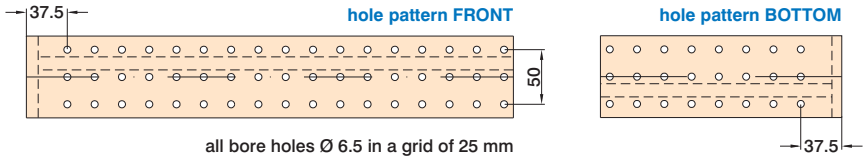
- blank
- Cast aluminium, 2.58 kg
- L 221 x W 75 x H 446 mm

Item no.: **209 110 0022**

Covering for **WV 2**

- anodized
- Aluminium plate, 0.78 kg

Item no.: **209 110 0021**



Connecting L-Bracket **WV 3**

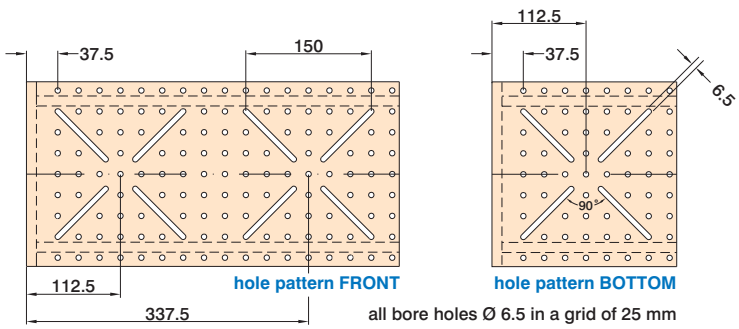
- blank
- Cast aluminium, 6.04 kg
- L 221 x W 221 x H 446 mm

Item no.: **209 110 0032**

Covering for **WV 3**

- anodized
- Aluminium plate, 1.15 kg

Item no.: **209 110 0031**



Connecting L-Brackets with face-milled surface

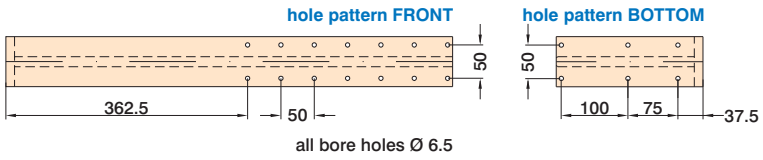
Connecting L-Bracket **WV 5**

- blank
- Aluminium, welded, 5.26 kg
- L 220 x W 75 x H 670 mm

Covering for **WV 5**

- anodized
- Aluminium plate, 1.20 kg

Item no.: **209 110 0051**



Connecting L-Bracket **WV 6**

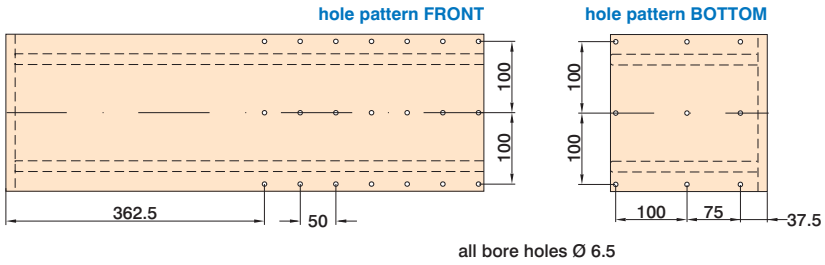
- blank
- Aluminium, welded, 13.28 kg
- L 220 x W 220 x H 670 mm

Item no.: **209 110 0060**

Covering for **WV 6**

- anodized
- Aluminium plate, 1.80 kg

Item no.: **209 110 0061**



Connecting L-Bracket **WV 7**

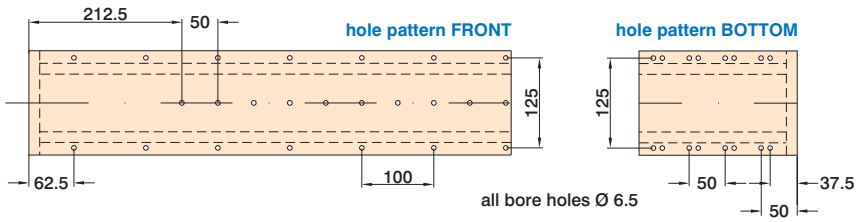
- blank
- Aluminium, welded, 10.81 kg
- L 220 x W 145 x H 670 mm

Item no.: **209 110 0070**

Covering for **WV 7**

- anodized
- Aluminium plate, 1.48 kg

Item no.: **209 110 0071**



Connecting L-Bracket **WV 8**

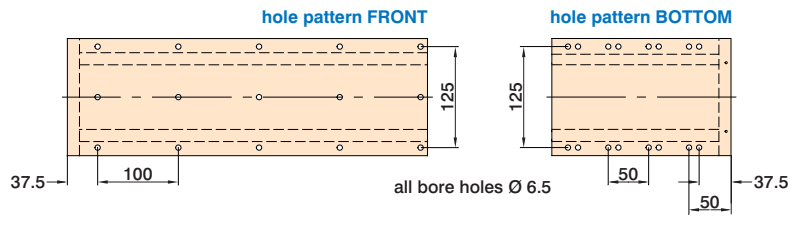
- blank
- Aluminium, welded, 7.40 kg
- L 222 x W 145 x H 446

Item no.: **209 110 0080**

Covering for **WV 8**

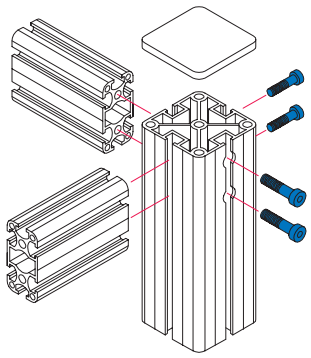
- anodized
- Aluminium plate, 1.02 kg

Item no.: **209 110 0081**

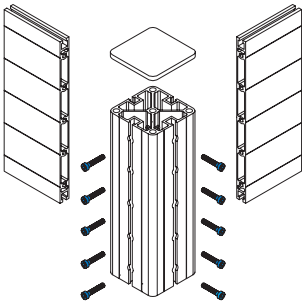


Profile Connections

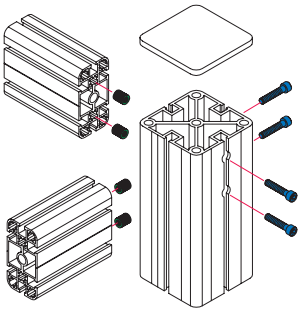
Example:
PS 50 with PU 50



Example:
PS 50 mit PP 250



Example:
PS 80 mit PL 80



Hexagon-Socket Screws

Hexagon-Socket Screws
M6 x 25 mm

- 10 pieces
  Item no.: **209 147 0009**
- 50 pieces
  Item no.: **209 147 0010**

Hexagon-Socket Screws
M6 x 50 mm

- 10 pieces
  Item no.: **209 147 0003**
- 50 pieces
  Item no.: **209 147 0004**

Hexagon-Socket Screwdriver
SW 5

- DIN 911
- 1 piece

Item no.: **931 152**

Threaded Bushes

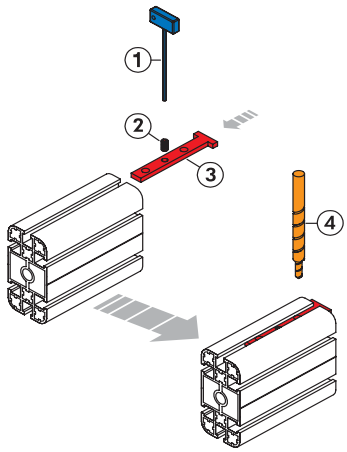
Threaded Bushes
M9 / M6

- 10 pieces
  Item no.: **209 147 0001**
- 50 pieces
  Item no.: **209 147 0002**

Threaded Bushes
M10 / M6

- 10 pieces
  Item no.: **209 147 0124**
- 50 pieces
  Item no.: **209 147 0125**

Example:
PL 80



① Hexagon-Socket Screwdriver
② Grub Srew
③ Drilling Template
④ Twist Drill
Ø 6 mm / Ø 10.4 mm

Example: PL 80

Drilling Template 1
Art.-Nr.: **290 015 0001**

Drilling Template 2
Art.-Nr.: **290 015 0002**

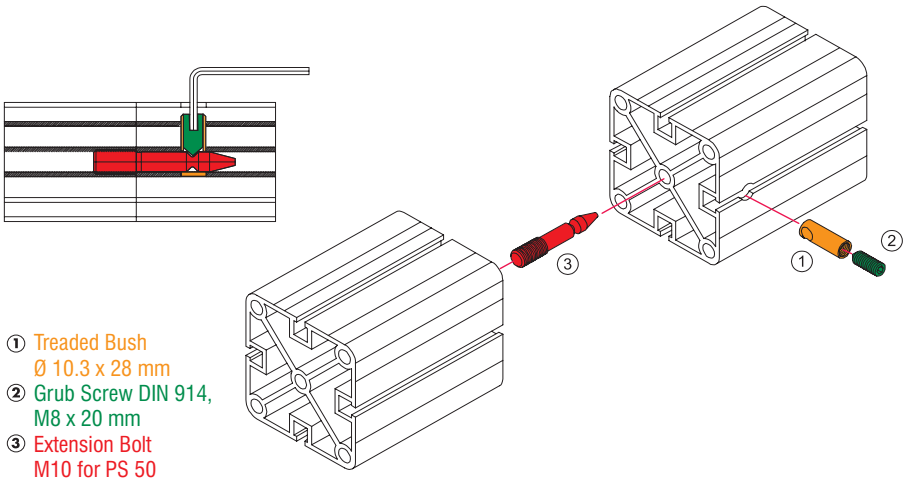
Twist Drill
- Ø 6 / Ø 10,4 mm

Art.-Nr.: **400 090**

Profile Fast-Clamped Extension

Example:

Profile Fast-Clamped Extension for PS 50



① Treaded Bush
Ø 10.3 x 28 mm
② Grub Screw DIN 914,
M8 x 20 mm
③ Extension Bolt
M10 for PS 50

for PS 50 / PL 40 (M10)

- threaded bush, grub screw, extension bolt

- 10 sets
  Item no.: **209 147 0120**
- 50 sets
  Item no.: **209 147 0121**

for PS 80 / PL 80 (M12)

- threaded bush, grub screw, extension bolt

- 10 sets
  Item no.: **209 147 0122**
- 50 sets
  Item no.: **209 147 0123**

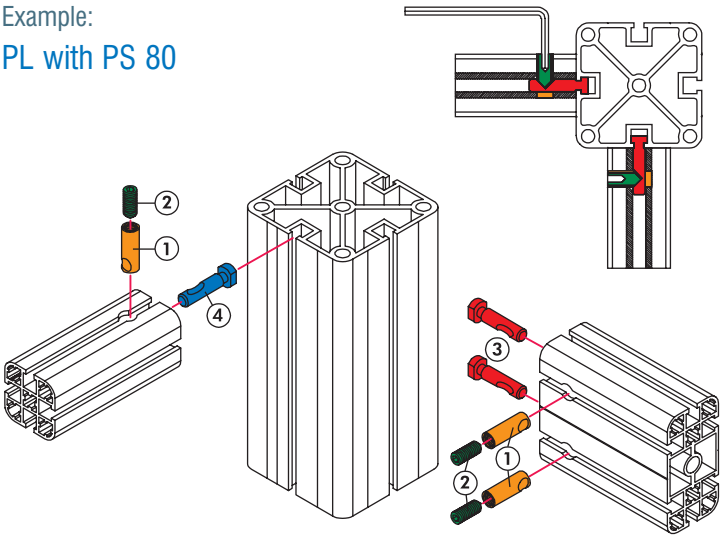
matching Drilling Template 2

Item no.: **290 015 0002**

Profile Fast-Clamped Connections

Example:

PL with PS 80



① Treaded Bush Ø 10.3 x 28 mm
② Grub Screw DIN 914, M6 x 20 mm
③ Connection Bolt 0° for PL 40 and PL 80
④ Connection Bolt 90° for PL 40 and PL 80

Fast-Clamped Connection 0°

for PL / PS 80

- threaded bush, grub screw, bolt 0°
- 10 sets
  Item no.: **209 147 0102**
- 50 sets
  Item no.: **209 147 0103**

Twist Drill
- Ø 6 mm / Ø 10,4 mm

Item no.: **400 090**

matching Drill Template 2

Item no.: **290 015 0002**

Hexagon-Socket Screwdriver SW 3
- DIN 911

Item no.: **931 150**

Fast-Clamped Connection 90°

für PL / PS 80

- threaded bush, grub screw, bolt 90°
- 10 sets
  Item no.: **209 147 0112**
- 50 sets
  Item no.: **209 147 0113**

Twist Drill
- Ø 6 mm / Ø 10,4 mm

Item no.: **400 090**

matching Drill Template 2

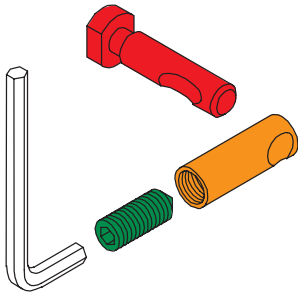
Item no.: **290 015 0002**

Hexagon-Socket Screwdriver SW 3
- DIN 911

Item no.: **931 150**

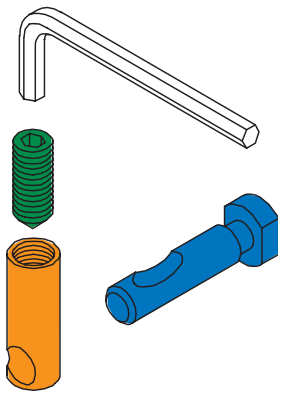
Fast-Clamped Connection 0°

for PL / PS 80



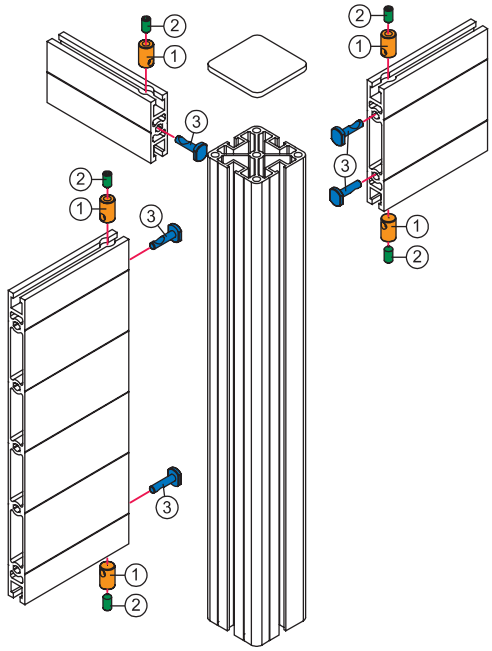
Fast-Clamped Connection 90°

for PL / PS 80



Profile Fast-Clamped Connections

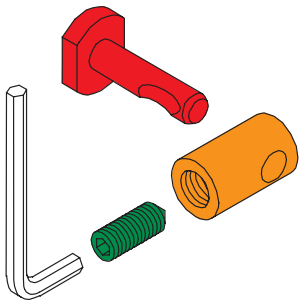
Example:
PP with PS 50



① Treaded Bush Ø 10.3 x 16,5 mm
② Grub Screw DIN 914, M6 x 12 mm
③ Connection Bolt 90°

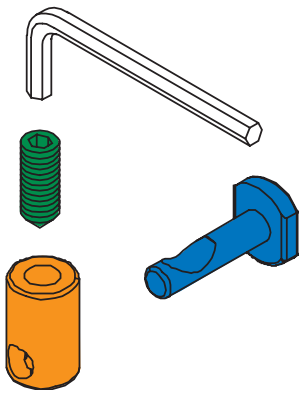
Fast-Clamped Connection 0°

for PP / PU / PS



Fast-Clamped Connection 90°

for PP / PU / PS



Fast-Clamped Connection 0°

for PP / PU / PS
- threaded bush, grub screw, bolt 0°
- 10 sets
  Item no.: **209 147 0100**
- 50 sets
  Item no.: **209 147 0101**

Twist Drill
- Ø 6 mm / Ø 10,4 mm

Item no.: **400 090**

Matching Drill Template 2

Item no.: **290 015 0002**

Hexagon-Socket Screwdriver SW 3
- DIN 911

Item no.: **931 150**

Fast-Clamped Connection 90°

for PP / PU / PS
- threaded bush, grub screw, bolt 90°
- 10 sets
  Item no.: **209 147 0110**
- 50 sets
  Item no.: **209 147 0111**

Twist Drill
- Ø 6 mm / Ø 10,4 mm

Item no.: **400 090**

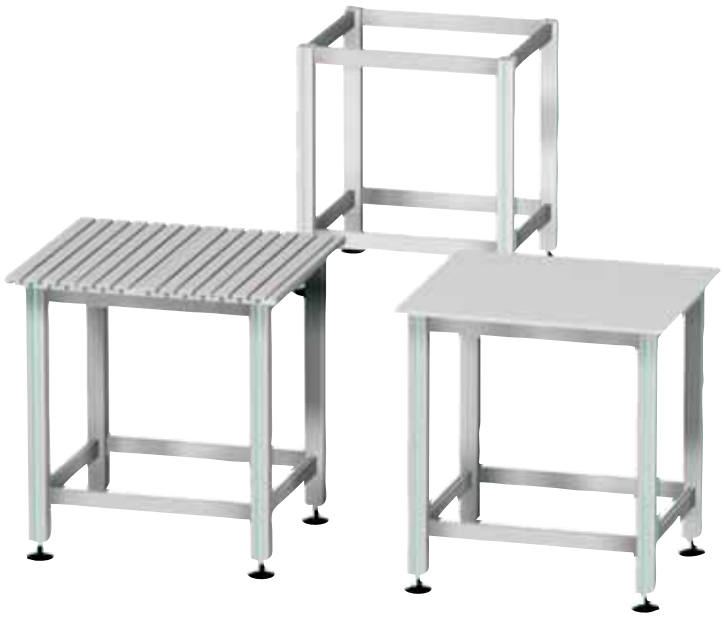
Matching Drill Template 2

Item no.: **290 015 0002**

Hexagon-Socket Screwdriver SW 3
- DIN 911

Item no.: **931 150**

Work Tables / Underframes TA



Features

- for all processes whereby workpieces must be clamped precise and safe (measuring, analyzing, testing etc.)
- worktop (T-Groove Profile): two T-Groove Profiles PT 50 / 375, face-milled and anodized
- worktop (melamine coated): light grey coating (colour: RAL 7035), worktop is mounted from below as a consequence there are no hampering bore holes
- T-Groove indention for T-Groove blocks according to DIN 508 (M6 x 8) in a grid of 100 resp. 50 mm
- underframe consisting of PS 50 with cross member consisting of PP 50
- pedestals Ø 80 mm for the needed stability, with rubber plate, singly vertically adjustable
- optional: special sizes

Work Table TA 11
L 1150 x W 750 x H 770 mm

underframe
- without worktop

Item no.: **248 530 1150**

with worktop (T-groove profile)
- underframe and worktop (H 20 mm)

Item no.: **248 527 1150**

with worktop (melamine coated)
- underframe and worktop (H 25 mm)

Item no.: **248 528 1150**

rubberized steering rollers Ø 70
- applicable instead of pedestals (refer to page B 15)

Item no.: **209 043 0011**

Work Table TA 7
L 750 x W 750 x H 770 mm

underframe
- without worktop

Item no.: **248 530 0750**

with worktop (T-groove profile)
- underframe and worktop (H 20 mm)

Item no.: **248 527 0750**

with worktop (melamine coated)
- underframe and worktop (H 25 mm)

Item no.: **248 528 0750**

rubberized steering rollers Ø 75
- applicable instead of pedestals (refer to page B 15)

Item no.: **209 043 0011**

Work Table TA 5
L 550 x W 750 x H 770 mm

underframe
- without worktop

Item no.: **248 530 0550**

with worktop (T-groove profile)
- underframe and worktop (H 20 mm)

Item no.: **248 527 0550**

with worktop (melamine coated)
- underframe and worktop (H 25 mm)

Item no.: **248 528 0550**

rubberized steering rollers Ø 75
- applicable instead of pedestals (refer to page B 15)

Item no.: **209 043 0011**

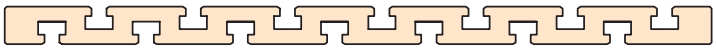
Ordering Data PT 25 / PT 50

PT-Profiles

PT 25 - W 125 x H 20	
L [mm]	Art. No
400	201 014 0400
500	201 014 0500
600	201 014 0600
700	201 014 0700
800	201 014 0800
900	201 014 0900
1000	201 014 1000
1100	201 014 1100
1200	201 014 1200
1300	201 014 1300
1400	201 014 1400
1500	201 014 1500
1800	201 014 1800
2000	201 014 2000
2500	201 014 2500
3000	201 014 3000

PT 25 - W 250 x H 20	
L [mm]	Art. No
400	201 018 0400
500	201 018 0500
600	201 018 0600
700	201 018 0700
800	201 018 0800
900	201 018 0900
1000	201 018 1000
1100	201 018 1100
1200	201 018 1200
1300	201 018 1300
1400	201 018 1400
1500	201 018 1500
1800	201 018 1800
2000	201 018 2000
2500	201 018 2500
3000	201 018 3000

PT 25 - W 375 x H 20	
L [mm]	Art. No
400	201 020 0400
500	201 020 0500
600	201 020 0600
700	201 020 0700
800	201 020 0800
900	201 020 0900
1000	201 020 1000
1100	201 020 1100
1200	201 020 1200
1300	201 020 1300
1400	201 020 1400
1500	201 020 1500
1800	201 020 1800
2000	201 020 2000
2500	201 020 2500
3000	201 020 3000



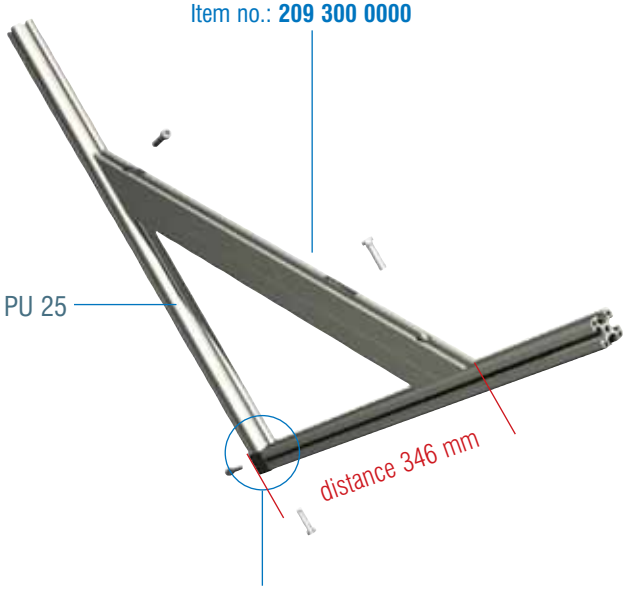
PT 50 - W 250 x H 20	
L [mm]	Art. No
400	201 016 0400
500	201 016 0500
600	201 016 0600
700	201 016 0700
800	201 016 0800
900	201 016 0900
1000	201 016 1000
1100	201 016 1100
1200	201 016 1200
1300	201 016 1300
1400	201 016 1400
1500	201 016 1500
1800	201 016 1800
2000	201 016 2000
2500	201 016 2500
3000	201 016 3000

PT 50 - W 375 x H 20	
L [mm]	Art. No
400	201 019 0400
500	201 019 0500
600	201 019 0600
700	201 019 0700
800	201 019 0800
900	201 019 0900
1000	201 019 1000
1100	201 019 1100
1200	201 019 1200
1300	201 019 1300
1400	201 019 1400
1500	201 019 1500
1800	201 019 1800
2000	201 019 2000
2500	201 019 2500
3000	201 019 3000

Application Samples

cross member consisting of PP 50
- L 490 mm
- miter sawed
- bore holes for M6

Item no.: **209 300 0000**

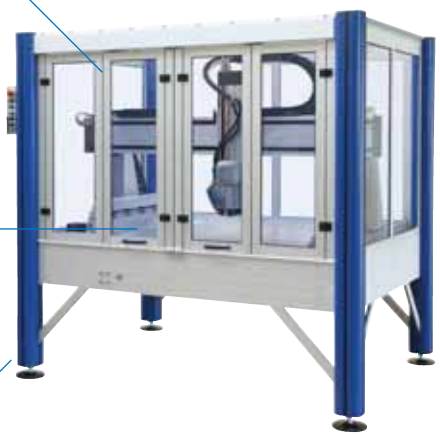


profile connecting cubes for PU 25
- 2-fold
- 10 pieces

Item no.: **209 104 0002**

hood and frame construction
consisting of panel profiles PP

mounting surface
consisting of
T-groove-plates PT



stand profiles PS 140
with aluminium pedestals

figure: isel-flat bed machine of the GFV-S-series

profile coverings for PS 80
- black
- 20 pieces

Item no.: **209 130 0003**

info-pillar
for PS 80
- struttings consisting of PP 100
- in between aluminium plates

plastic pedestals
for PS 80
- Ø 80 mm
- 4 pieces

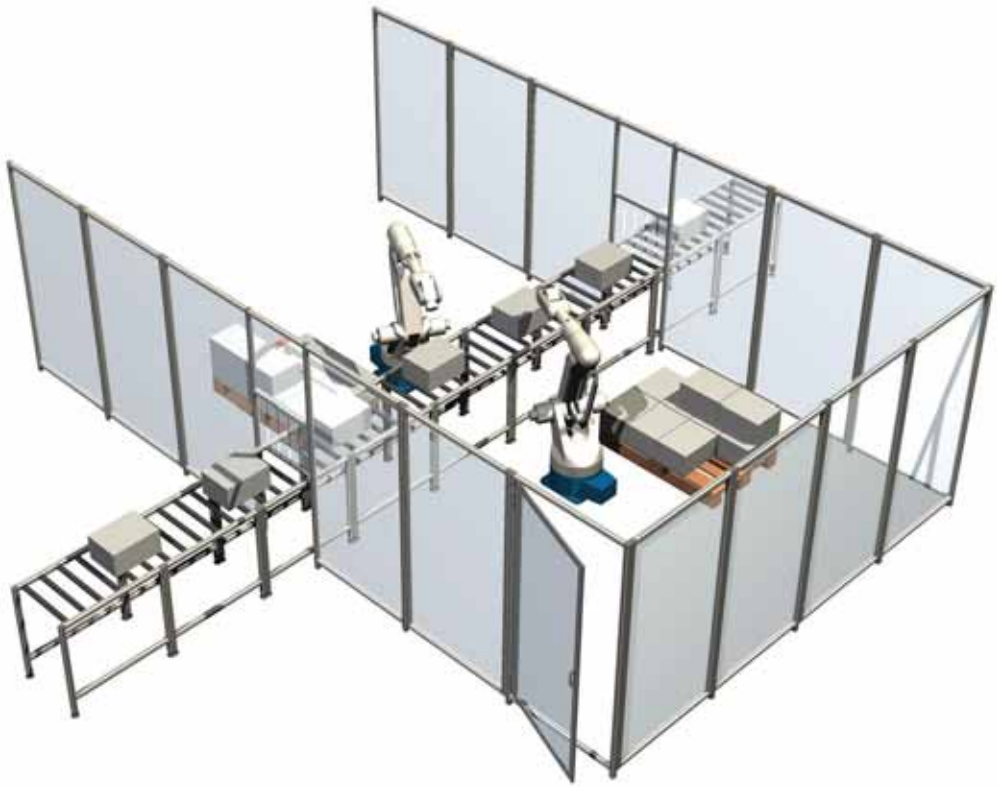
Item no.: **209 034 0001**

hood construction
out of PU 25,
profile connecting cubes
and perspex-flat elements

upgrade in work safety:

the isel-Profile system enables the assembly of individual safety hoods and protective lattices in the twinkling of an eye

Application Samples



protection and divider walls

By the combination of different modules protection walls are assembled that comply with valid safety standards and at the same time can be customized to the current requirements. These protection walls secure, that nobody interferes in ongoing production processes resp. get endangered by these processes.

We also offer complete protection wall elements (500/750/1000 x 2000 mm) with protective lattices, sight glass or folding door. Contact us!

fair stand 4 x 4 m

consisting of PS 50, PP 50, PP 200, as well as melamine coated plates, 2 cabins, 1 x 1 m, and a bar ..

individual constructions upon request ...

roller table / roll stand

- adjustable height
- consisting of PL 40 and corner connections

corner connection for PL 40

- 10 pieces
- natural

Item no.: **209 115 0101**

mechanics

Linear Guides

Overview

Linear Guides

Overview

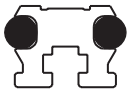
mechanics

Linear Guide Rail

MLF 1

Features

- W 30 x H 20 mm
- 2 precision steel shafts Ø 8
- Stress-resistant
- Aluminium shaft profile, anodized
- Bottom-up mounting by means of thread rails M6 in the T-groove indentation
- Conditionally cantilevered
- Arbitrary guide rail length
- Weight: 1.61 kg/m
- Option: stainless version



Profile available up to 6.000 mm without butt joint, steel shafts separated...

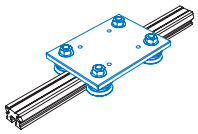
MLF 1

L [mm]	Item no.
298	235 000 0029
398	235 000 0039
498	235 000 0049
598	235 000 0059
698	235 000 0069
798	235 000 0079
898	235 000 0089
998	235 000 0099
1098	235 000 0109
1198	235 000 0119
1298	235 000 0129
1398	235 000 0139
1498	235 000 0149
1598	235 000 0159
1698	235 000 0169
1798	235 000 0179
1898	235 000 0189
1998	235 000 0199
2498	235 000 0249
2998	235 000 0299
Steel shaft length = L - 3 mm	

MLF 1 - stainless

L [mm]	Item no.
298	235 001 0029
398	235 001 0039
498	235 001 0049
598	235 001 0059
698	235 001 0069
798	235 001 0079
898	235 001 0089
998	235 001 0099
1098	235 001 0109
1198	235 001 0119
1298	235 001 0129
1398	235 001 0139
1498	235 001 0149
1598	235 001 0159
1698	235 001 0169
1798	235 001 0179
1898	235 001 0189
1998	235 001 0199
2498	235 001 0249
2998	235 001 0299
Steel shaft length = L - 3 mm	

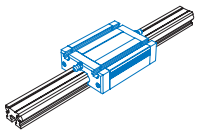
with roller carriage **LW 6**



- L 125 x W 90 x H 7,7 mm
- Polished steel plate
- 4 rollers Ø 31, life-time lubrication
- Clearance-free adjustable
- Weight: 1.03 kg

Item no.: **223 011**

with aluminium bearing carriage **WS 1**



- L 96 x W 72 x H 28,5 mm
- Milled clamping surface
- M6 T-grooves
- Central lubrication
- Clearance-free adjustable
- Weight: 0.35 kg
- Option: stainless version

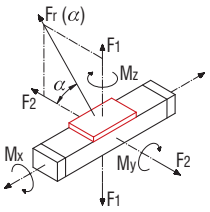
Item no.: **223 100 0070**
stainless: **223 101 0070**

Linear Guide Rail MLF 1

Load Data

$$Fr(\alpha) = \frac{F2}{\cos \alpha}$$

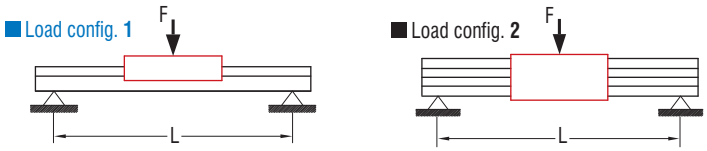
$$Fr(\alpha) = \frac{F1}{\sin \alpha}$$

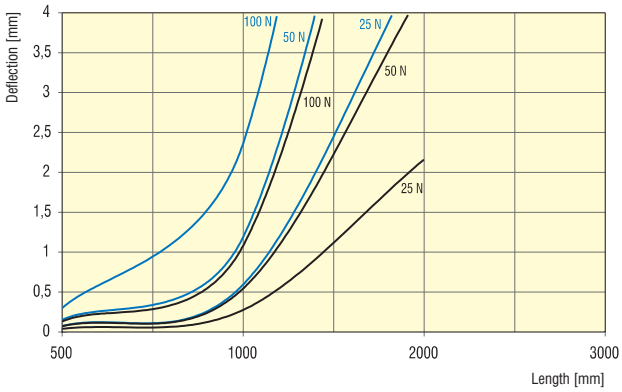


Roller Carriage LW 6	
C_0	2160 N
C	4000 N
F_1 stat.	4320 N
F_1 dyn.	3792 N
F_2 stat.	2160 N
F_2 dyn.	4000 N
M_x stat.	121.1 Nm
M_y stat.	194.4 Nm
M_z stat.	97.2 Nm
M_x dyn.	106.3 Nm
M_y dyn.	170.6 Nm
M_z dyn.	180.0 Nm

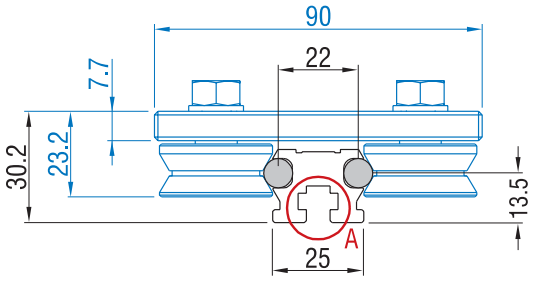
Bearing Carriage WS 1	
C_0	3114 N
C	1846 N
F_1 stat.	2659 N
F_1 dyn.	1576 N
F_2 stat.	3114 N
F_2 dyn.	1846 N
M_x stat.	37,3 Nm
M_y stat.	100.5 Nm
M_z stat.	117.6 Nm
M_x dyn.	22.1 Nm
M_y dyn.	59.5 Nm
M_z dyn.	69.7 Nm

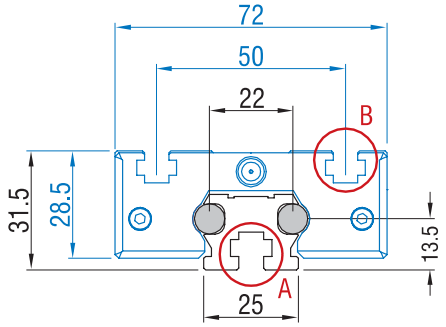
Deflection

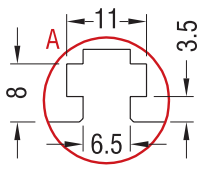


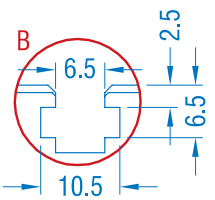


Scaled Drawings

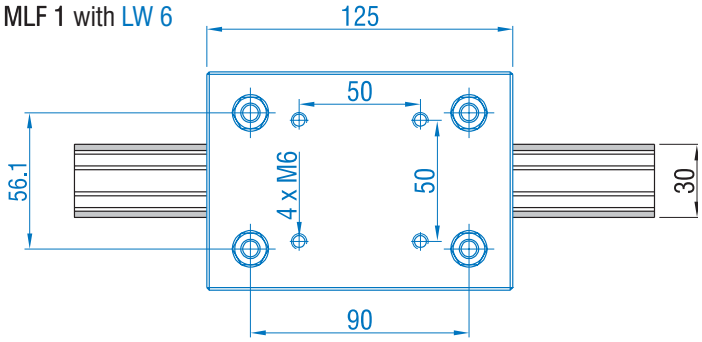




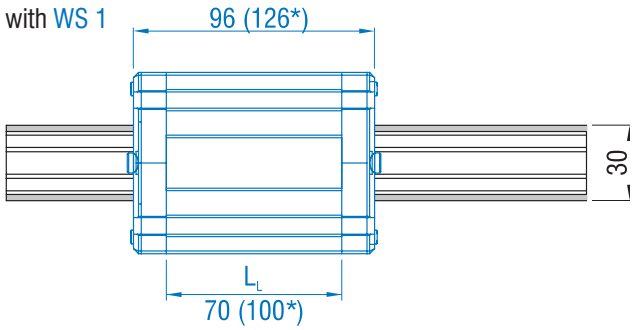




MLF 1 with LW 6



MLF 1 with WS 1



* = available upon request

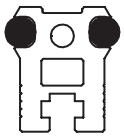
mechanics

Linear Guide Rail

MLF 2

Features

- W 30 x H 32,5 mm
- 2 precision steel shafts Ø 8
- Stress-resistant
- Aluminium shaft profile, anodized
- Bottom-up mounting by means of thread rails M6 in the T-groove indentation
- Conditionally cantilevered
- Arbitrary guide rail length
- Weight: 2.01 kg/m
- Option: stainless version



Profile available up to 6.000 mm without butt joint, steel shafts separated...

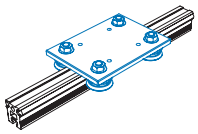
MLF 2

L [mm]	Item no.
298	235 002 0298
398	235 002 0398
498	235 002 0498
598	235 002 0598
698	235 002 0698
798	235 002 0798
898	235 002 0898
998	235 002 0998
1098	235 002 1098
1198	235 002 1198
1298	235 002 1298
1398	235 002 1398
1498	235 002 1498
1598	235 002 1598
1698	235 002 1698
1798	235 002 1798
1898	235 002 1898
1998	235 002 1998
2498	235 002 2498
2998	235 002 2998
Steel shaft length = L - 3 mm	

MLF 2 - stainless

L [mm]	Item no.
298	235 003 0298
398	235 003 0398
498	235 003 0498
598	235 003 0598
698	235 003 0698
798	235 003 0798
898	235 003 0898
998	235 003 0998
1098	235 003 1098
1198	235 003 1198
1298	235 003 1298
1398	235 003 1398
1498	235 003 1498
1598	235 003 1598
1698	235 003 1698
1798	235 003 1798
1898	235 003 1898
1998	235 003 1998
2498	235 003 2498
2998	235 003 2998
Steel shaft length = L - 3 mm	

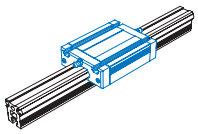
with roller carriage **LW 6**



- L 125 x W 90 x H 7,7 mm
- Polished steel plate
- 4 rollers Ø 31, life-time lubrication
- Clearance-free adjustable
- Weight: 1.03 kg

Item no.: **223 011**

with auminum bearing carriage **WS 1**



- L 96 x W 72 x H 28,5 mm
- Milled clamping surface
- M6 T-grooves
- Central lubrication
- Clearance-free adjustable
- Weight: 0.35 kg
- Option: stainless version

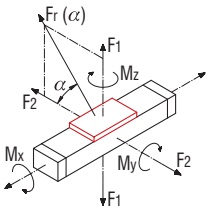
Item no.: **223 100 0070**
stainless: **223 101 0070**

Linear Guide Rail MLF 2

Load Data

$$Fr(\alpha) = \frac{F2}{\cos \alpha}$$

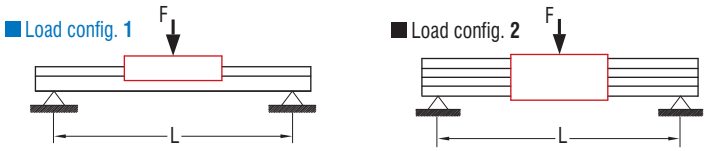
$$Fr(\alpha) = \frac{F1}{\sin \alpha}$$

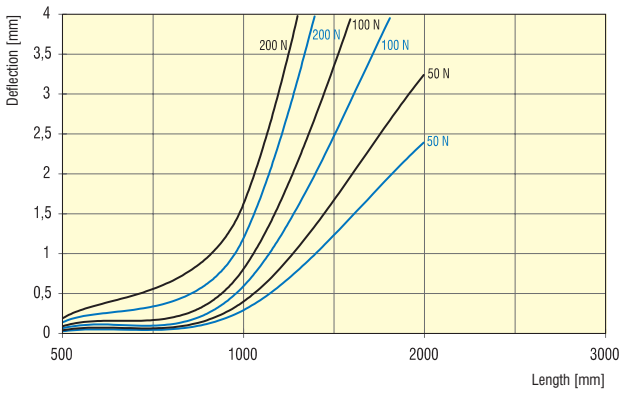


Roller Carriage LW 6	
C_0	2160 N
C	4000 N
F_1 stat.	4320 N
F_1 dyn.	3792 N
F_2 stat.	2160 N
F_2 dyn.	4000 N
M_x stat.	121.1 Nm
M_y stat.	194.4 Nm
M_z stat.	97.2 Nm
M_x dyn.	106.3 Nm
M_y dyn.	170.6 Nm
M_z dyn.	180.0 Nm

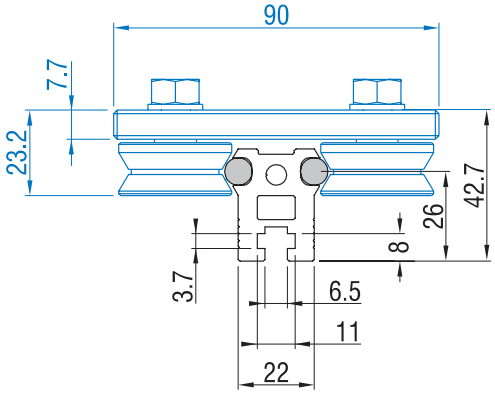
Bearing Carriage WS 1	
C_0	3114 N
C	1846 N
F_1 stat.	2659 N
F_1 dyn.	1576 N
F_2 stat.	3114 N
F_2 dyn.	1846 N
M_x stat.	37,3 Nm
M_y stat.	100.5 Nm
M_z stat.	117.6 Nm
M_x dyn.	22.1 Nm
M_y dyn.	59.5 Nm
M_z dyn.	69.7 Nm

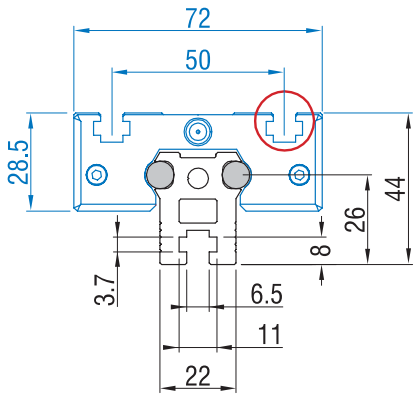
Deflection



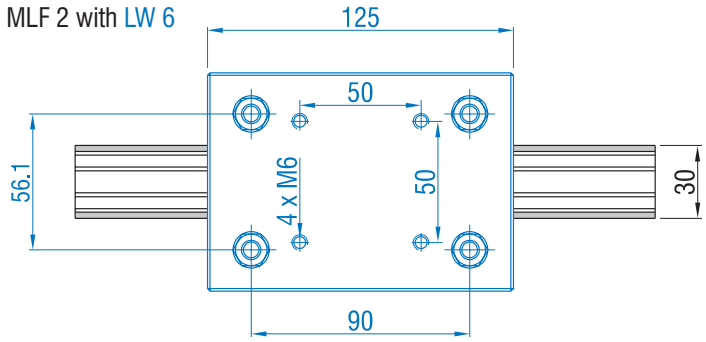


Scaled Drawings

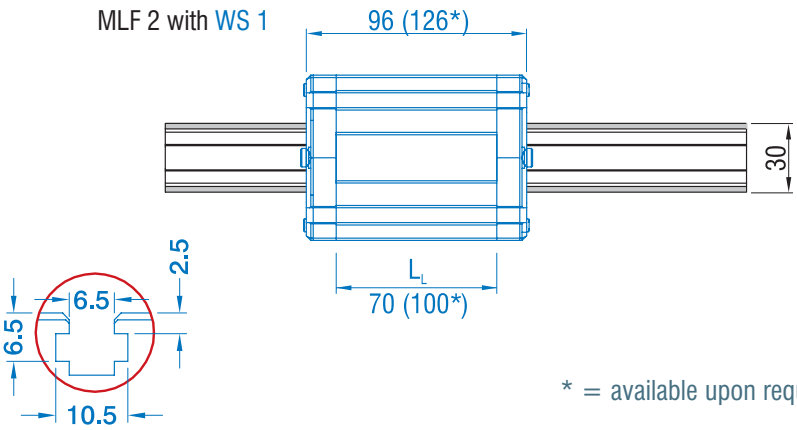




MLF 2 with LW 6



MLF 2 with WS 1



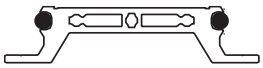
* = available upon request

Linear Guide Rail

MLF 3

Features

- W 115 x H 25,5 mm
- 2 precision steel shafts Ø 8
- Stress-resistant
- Aluminium shaft profile, anodized
- Top-down mounting by means of through holes for M6 in a 100 mm raster
- Conditionally cantilevered
- Arbitrary guide rail length
- Weight: 3.22 kg/m
- Option: stainless version



Profile available up to 6.000 mm without butt joint, steel shafts separated...

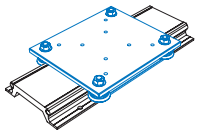
MLF 3

L [mm]	Item no.
296	235 004 0029
396	235 004 0039
496	235 004 0049
596	235 004 0059
696	235 004 0069
796	235 004 0079
896	235 004 0089
996	235 004 0099
1096	235 004 0109
1196	235 004 0119
1296	235 004 0129
1396	235 004 0139
1496	235 004 0149
1596	235 004 0159
1696	235 004 0169
1796	235 004 0179
1896	235 004 0189
1996	235 004 0199
2496	235 004 0249
2996	235 004 0299
Steel shaft length = L - 1 mm	

MLF 3 - stainless

L [mm]	Item no.
296	235 005 0029
396	235 005 0039
496	235 005 0049
596	235 005 0059
696	235 005 0069
796	235 005 0079
896	235 005 0089
996	235 005 0099
1096	235 005 0109
1196	235 005 0119
1296	235 005 0129
1396	235 005 0139
1496	235 005 0149
1596	235 005 0159
1696	235 005 0169
1796	235 005 0179
1896	235 005 0189
1996	235 005 0199
2496	235 005 0249
2996	235 005 0299
Steel shaft length = L - 1 mm	

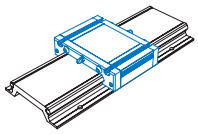
with roller carriage **LW 7**



- L 175 x W 150 x H 7,7 mm
- Polished steel plate
- 4 rollers Ø 31, life-time lubrication
- Clearance-free adjustable
- Weight: 2.03 kg

Item no.: **223 012**

with aluminium bearing carriage **WS 3**



- L 96 x W 130 x H 32 mm
- Milled clamping surface
- M6 T-grooves
- Central lubrication
- Clearance-free adjustable
- Weight: 0.50 kg
- Option: stainless version

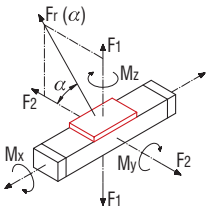
Item no.: **223 103 0070**
stainless: **223 103 1070**

Linear Guide Rail MLF 3

Load Data

$$Fr(\alpha) = \frac{F2}{\cos \alpha}$$

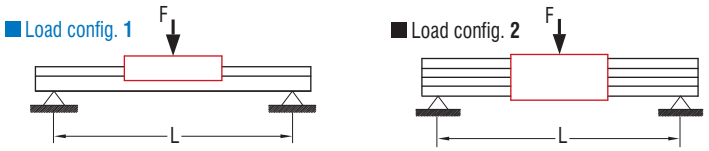
$$Fr(\alpha) = \frac{F1}{\sin \alpha}$$

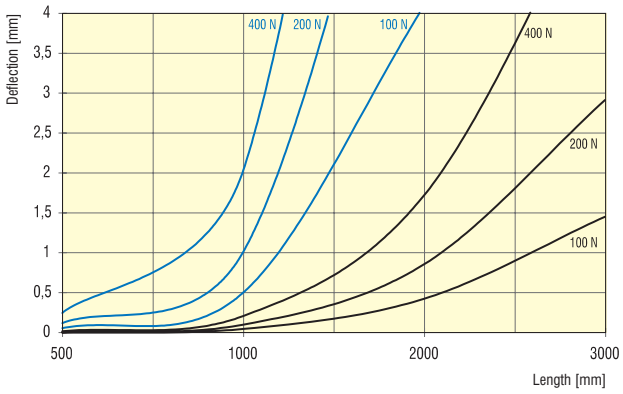


Roller Carriage LW 7	
C_0	2160 N
C	4000 N
F_1 stat.	4320 N
F_1 dyn.	3792 N
F_2 stat.	2160 N
F_2 dyn.	4000 N
M_x stat.	246.8 Nm
M_y stat.	302.4 Nm
M_z stat.	151.2 Nm
M_x dyn.	216.7 Nm
M_y dyn.	265.4 Nm
M_z dyn.	280.0 Nm

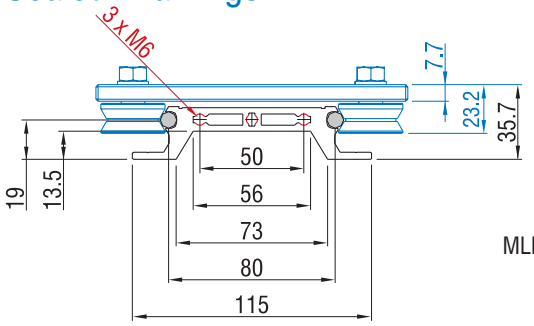
Bearing Carriage WS 3	
C_0	3141 N
C	1879 N
F_1 stat.	2682 N
F_1 dyn.	1604 N
F_2 stat.	3141 N
F_2 dyn.	1879 N
M_x stat.	115.7 Nm
M_y stat.	105.3 Nm
M_z stat.	123.3 Nm
M_x dyn.	69.2 Nm
M_y dyn.	62.9 Nm
M_z dyn.	73.7 Nm

Deflection

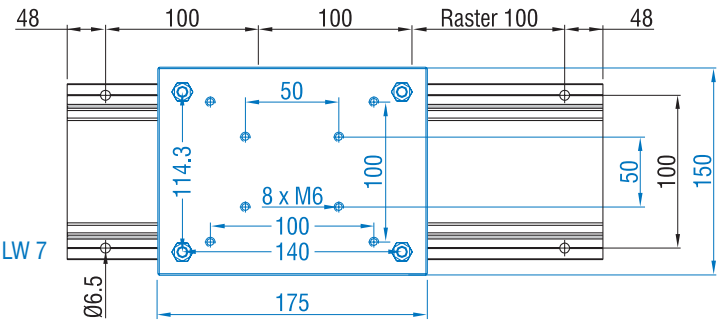


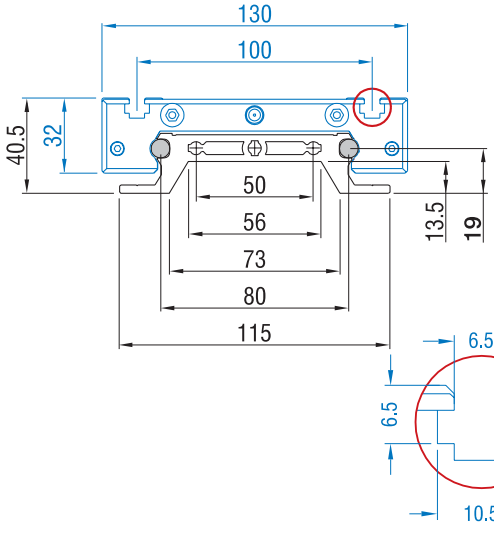


Scaled Drawings

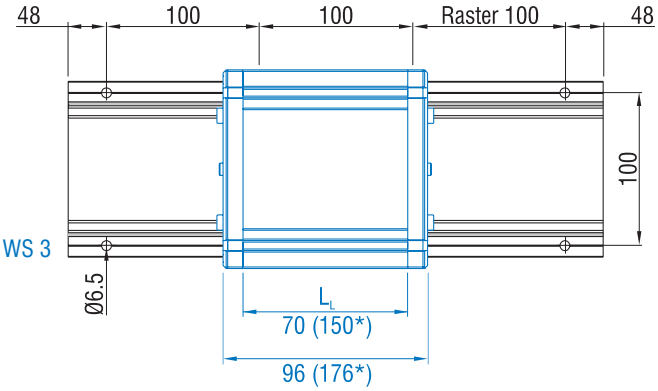


MLF 3 with LW 7





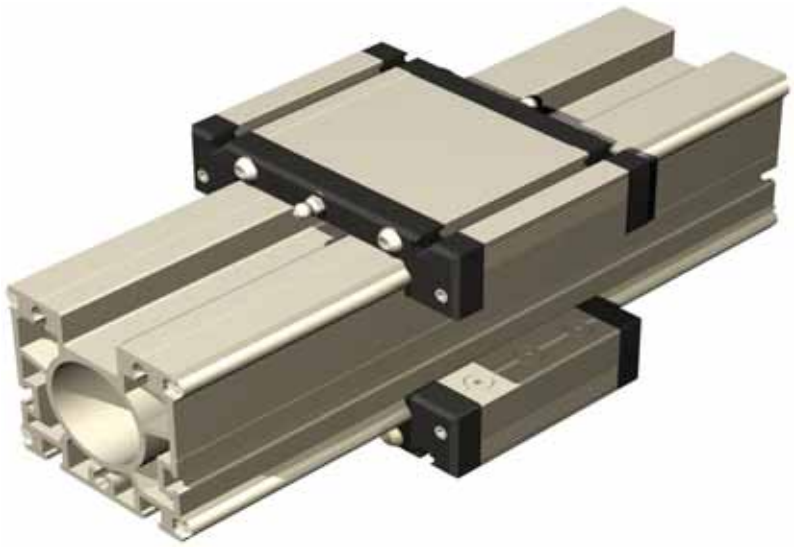
MLF 3 with WS 3



* = available upon request

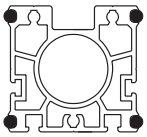
Linear Guide Rail

MLF 4



Features

- W 80 x H 80 mm
- 4 precision steel shafts Ø 8
- Stress-resistant
- Aluminium shaft seat profile, anodized
- Bottom-up mounting by means of thread rails M6 in the T-grooves or top-down mounting by means of holes for M8
- Lateral T-grooves for limit switch attachment
- Conditionally cantilevered
- Arbitrary guide rail length
- Weight: 7.15 kg/m
- Option: stainless version



Profile available up to 6.000 mm without butt joint, steel shafts separated...

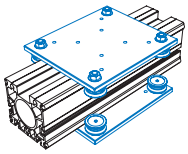
MLF 4

L [mm]	Item no.
298	235 006 0029
398	235 006 0039
498	235 006 0049
598	235 006 0059
698	235 006 0069
798	235 006 0079
898	235 006 0089
998	235 006 0099
1098	235 006 0109
1198	235 006 0119
1298	235 006 0129
1398	235 006 0139
1498	235 006 0149
1598	235 006 0159
1698	235 006 0169
1798	235 006 0179
1898	235 006 0189
1998	235 006 0199
2498	235 006 0249
2998	235 006 0299
Steel shaft length = L - 3 mm	

MLF 4 - stainless

L [mm]	Item no.
298	235 007 0029
398	235 007 0039
498	235 007 0049
598	235 007 0059
698	235 007 0069
798	235 007 0079
898	235 007 0089
998	235 007 0099
1098	235 007 0109
1198	235 007 0119
1298	235 007 0129
1398	235 007 0139
1498	235 007 0149
1598	235 007 0159
1698	235 007 0169
1798	235 007 0179
1898	235 007 0189
1998	235 007 0199
2498	235 007 0249
2998	235 007 0299
Steel shaft length = L - 3 mm	

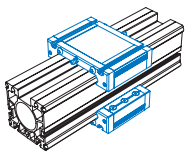
with 2 x roller carriage **LW 7**



- L 175 x W 150 x H 7,7 mm
- Polished steel plate
- 4 rollers Ø 31, life-time lubrication
- Clearance-free adjustable
- Weight: 2.03 kg

Item no.: **223 012**

with 2 x bearing carriage **WS 3**



- L 96 x W 130 x H 32 mm
- Milled clamping surface
- M6 T-grooves
- Central lubrication
- Clearance-free adjustable
- Weight: 0.50 kg
- Option: stainless version

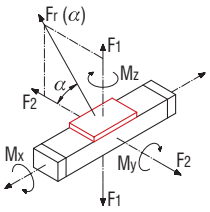
Item no.: **223 103 0070**
stainless: **223 103 1070**

Linear Guide Rail MLF 4

Load Data

$$Fr(\alpha) = \frac{F2}{\cos \alpha}$$

$$Fr(\alpha) = \frac{F1}{\sin \alpha}$$

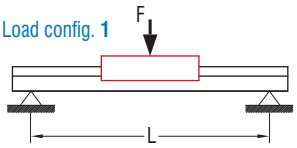


Roller Carriage LW 7	
C_0	2160 N
C	4000 N
F_1 stat.	4320 N
F_1 dyn.	3792 N
F_2 stat.	2160 N
F_2 dyn.	4000 N
M_x stat.	246.8 Nm
M_y stat.	302.4 Nm
M_z stat.	151.2 Nm
M_x dyn.	216.7 Nm
M_y dyn.	265.4 Nm
M_z dyn.	280.0 Nm

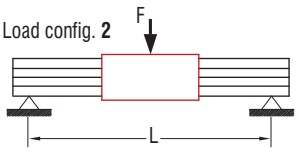
Bearing Carriage WS 3	
C_0	3141 N
C	1879 N
F_1 stat.	2682 N
F_1 dyn.	1604 N
F_2 stat.	3141 N
F_2 dyn.	1879 N
M_x stat.	115.7 Nm
M_y stat.	105.3 Nm
M_z stat.	123.3 Nm
M_x dyn.	69.2 Nm
M_y dyn.	62.9 Nm
M_z dyn.	73.7 Nm

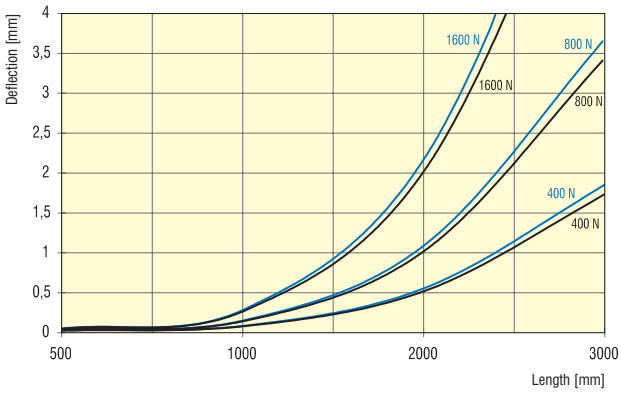
Deflection

■ Load config. **1**

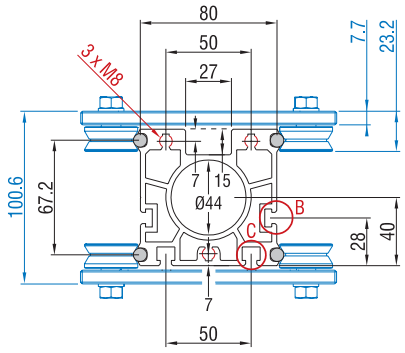


■ Load config. **2**

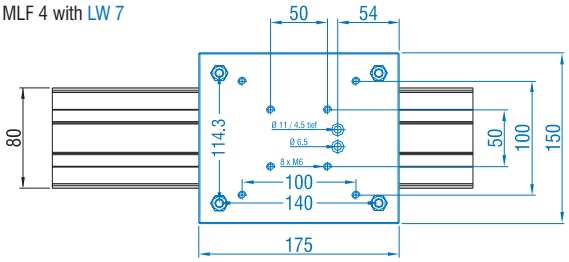




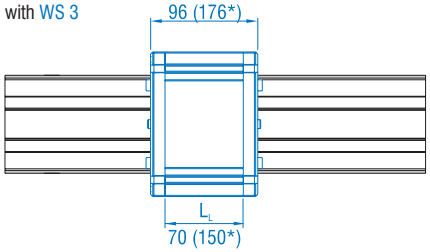
Scaled Drawings

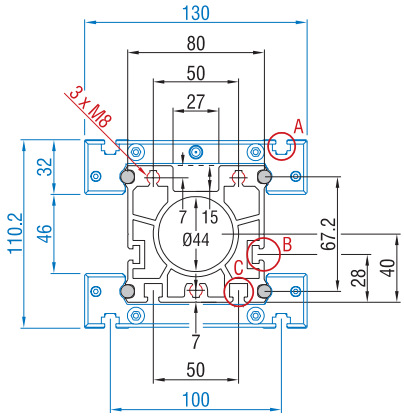


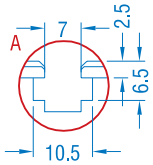
MLF 4 with LW 7

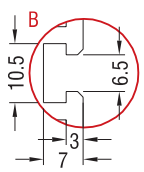


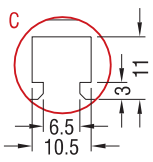
MLF 4 with WS 3











* = available upon request

Linear Guide Rail

DSF 1

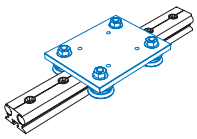
Features

- W 36 x H 24,5 mm
- 2 precision steel shafts Ø 12
- Stress-resistant
- Aluminium shaft profile, anodized
- Bottom-up mounting by means of thread rails M6 in the T-grooves and top-down mounting by menas of holes for M6 in a 50 mm raster
- Conditionally cantilevered
- Arbitrary guide rail length
- Weight: 2.90 kg/m

DSF 1

L [mm]	Item no.
296	220 001 0300
396	220 001 0400
496	220 001 0500
596	220 001 0600
696	220 001 0700
796	220 001 0800
896	220 001 0900
996	220 001 1000
1096	220 001 1100
1196	220 001 1200
1296	220 001 1300
1396	220 001 1400
1496	220 001 1500
1696	220 001 1700
1746	235 300 1750
1996	220 001 2000
2096	220 001 2100
2496	220 001 2500
2596	220 001 2600
2996	220 001 3000
Steel shaft length = L - 1 mm	

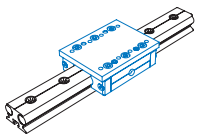
with roller carriage **LW 4**



- L 125 x W 97 x H 7,7 mm
- Polished steel plate
- 4 rollers Ø 31, life-time lubrication
- Clearance-free adjustable
- Weight: 1.02 kg

Item no.: **223 009**

with sledge **WS 8**



- L 100 x W 75 x H 32 mm
- Milled clamping surface
- Lubrication possibility
- Clearance-free adjustable
- Weight: 0.70 kg

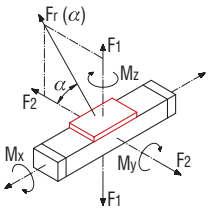
Item no.: **223 108 0070**

Linear Guide Rail DSF 1

Load Data

$$Fr(\alpha) = \frac{F2}{\cos \alpha}$$

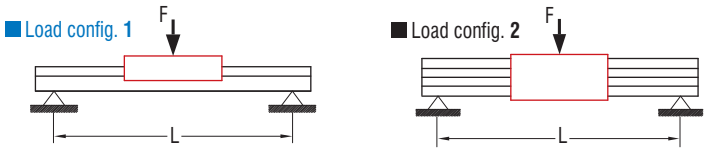
$$Fr(\alpha) = \frac{F1}{\sin \alpha}$$

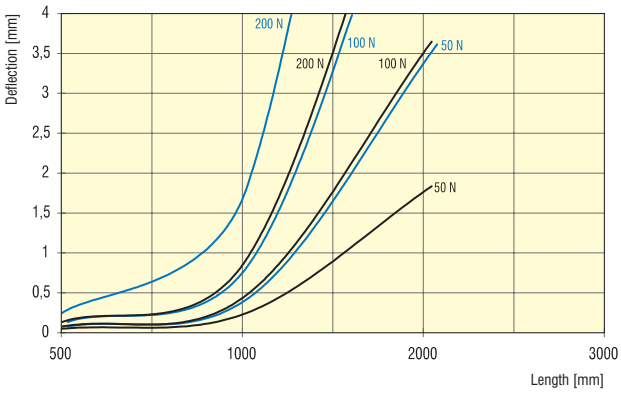


Roller Carriage LW 4	
C_0	2160 N
C	4000 N
F_1 stat.	4320 N
F_1 dyn.	3846 N
F_2 stat.	2160 N
F_2 dyn.	4000 N
M_x stat.	135.4 Nm
M_y stat.	194.4 Nm
M_z stat.	97.2 Nm
M_x dyn.	120.5 Nm
M_y dyn.	173.0 Nm
M_z dyn.	180.0 Nm

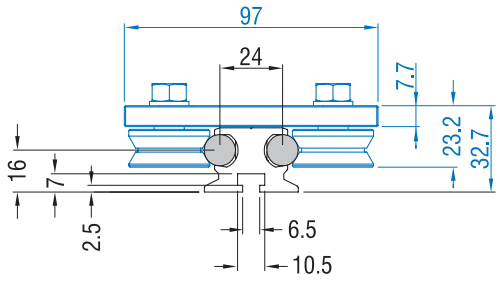
Sledge WS 8	
C_0	3303 N
C	1873 N
F_1 stat.	2821 N
F_1 dyn.	1599 N
F_2 stat.	3303 N
F_2 dyn.	1873 N
M_x stat.	46.7 Nm
M_y stat.	105.3 Nm
M_z stat.	123.3 Nm
M_x dyn.	26.4 Nm
M_y dyn.	59.7 Nm
M_z dyn.	69.9 Nm

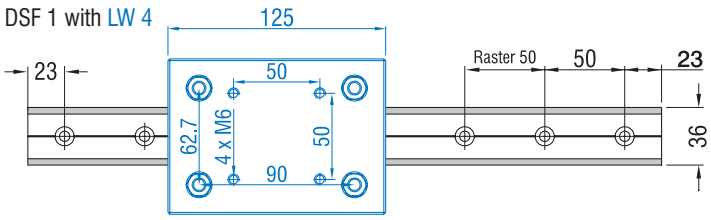
Deflection

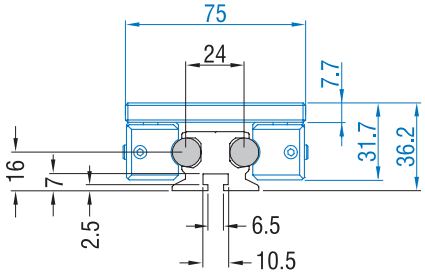


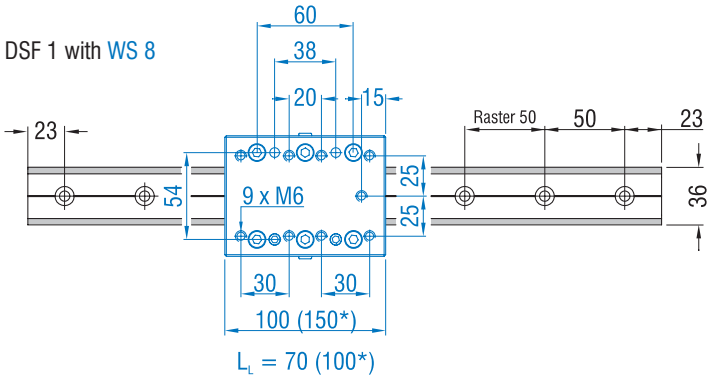


Scaled Drawings









* = available upon request

Linear Guide Rail

ELF 1

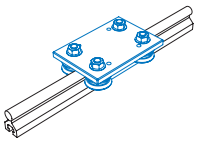
Features

- W 20 x H 31 mm
- Precision steel shaft Ø 12
- Aluminium shaft profile, anodized
- Bottom-up mounting on a plane surface by means of thread rails M6 in the T-grooves
- Arbitrary guide rail length
- Weight: 1.26 kg/m

ELF 1

L [mm]	Item no.
298	220 002 0298
398	220 002 0398
498	220 002 0498
598	220 002 0598
698	220 002 0698
798	220 002 0798
898	220 002 0898
998	220 002 0998
1098	220 002 1098
1198	220 002 1198
1298	220 002 1298
1398	220 002 1398
1498	220 002 1498
1598	220 002 1598
1798	220 002 1798
1998	220 002 1998
2098	220 002 2098
2498	220 002 2498
2598	220 002 2598
2998	220 002 2998
Profile length = L - 2 mm	

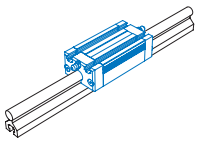
with roller carriage **LW 5**



- L 110 x W 75 x H 7,7 mm
- Polished steel plate
- 4 rollers Ø 31, life-time lubrication
- Clearance-free adjustable
- Weight: 0.81 kg

Item no.: **223 010**

with bearing carriage **WS 6**



- L 100 x W 50 x H 31,5 mm
- T-grooves M6
- Central lubrication
- Clearance-free adjustable
- Weight: 0.30 kg
- Option: stainless version

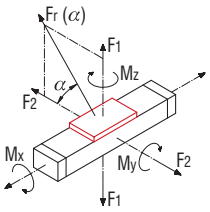
Item no.: **223 106 0070**
stainless: **223 106 1070**

Linear Guide Rail ELF 1

Load Data

$$Fr(\alpha) = \frac{F2}{\cos \alpha}$$

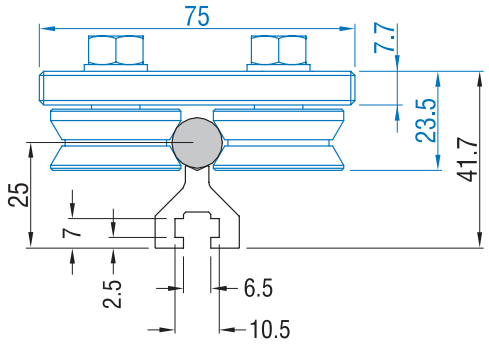
$$Fr(\alpha) = \frac{F1}{\sin \alpha}$$



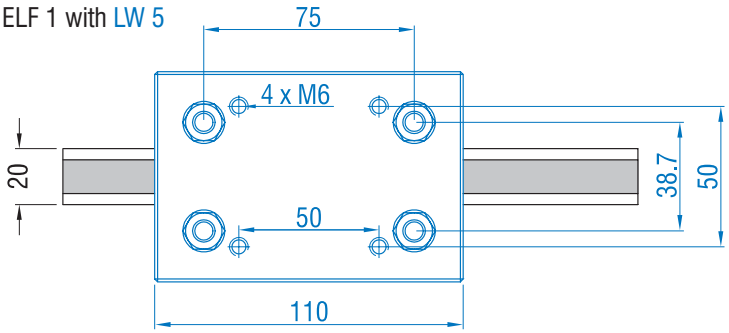
Roller Carriage LW 5	
C_0	2160 N
C	4000 N
F_1 stat.	4320 N
F_1 dyn.	3846 N
F_2 stat.	2160 N
F_2 dyn.	4000 N
M_x stat.	-
M_y stat.	162.0 Nm
M_z stat.	81.0 Nm
M_x dyn.	-
M_y dyn.	144.2 Nm
M_z dyn.	150.0 Nm

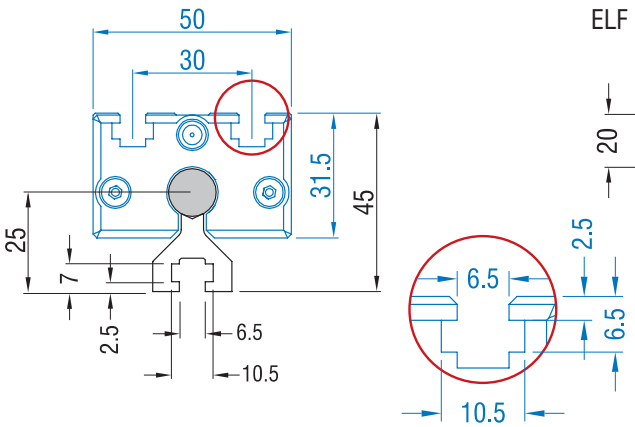
Bearing Carriage WS 6	
C_0	3303 N
C	1873 N
F_1 stat.	2821 N
F_1 dyn.	1599 N
F_2 stat.	3303 N
F_2 dyn.	1873 N
M_x stat.	-
M_y stat.	105.3 Nm
M_z stat.	123.3 Nm
M_x dyn.	-
M_y dyn.	59.7 Nm
M_z dyn.	69.9 Nm

Scaled Drawings

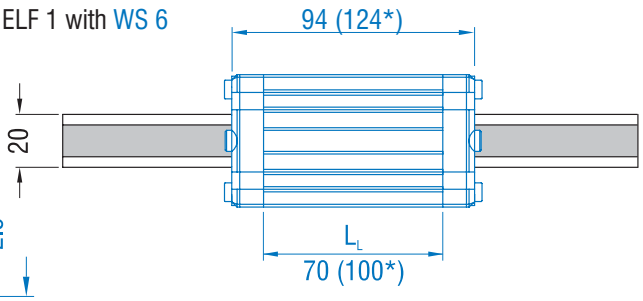


ELF 1 with LW 5





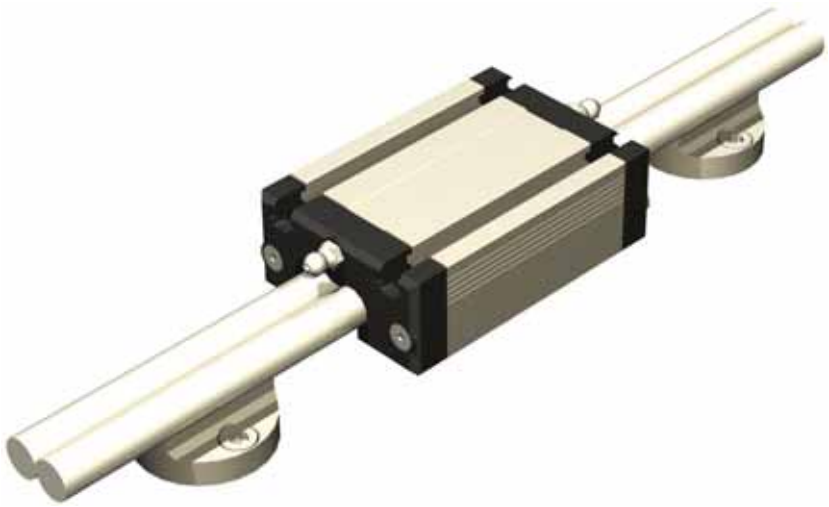
ELF 1 with WS 6



* = available upon request

Linear Guide Rail

LF 1



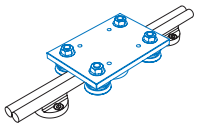
Features

- W 40 x H 27 mm
- 2 precision steel shafts Ø 12
- Stress-resistant
- Aluminium shaft blocks
- Bottom-up or top-down mounting by means of through holes for M6 in the seat blocks
- Arbitrary guide rail length
- Weight: 1.93 kg/m

LF 1 (single steel shafts!)

L [mm]	Item no.
298	227 312 0298
398	227 312 0398
498	227 312 0498
598	227 312 0598
698	227 312 0698
798	227 312 0798
898	227 312 0898
998	227 312 0998
1098	227 312 1098
1198	227 312 1198
1298	227 312 1298
1398	227 312 1398
1498	227 312 1498
1598	227 312 1598
1798	227 312 1798
1998	227 312 1998
2098	227 312 2098
2498	227 312 2498
2998	227 312 2998

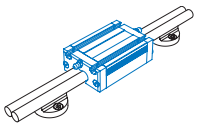
with Roller Carriage **LW 3**



- L 125 x W 85 x H 7,7 mm
- Polished steel plate
- Weight: 0.93 kg

Item No.: **223 008**

with Aluminium Sledge **WS 4**



- L 94 x W 62 x H 31,5 mm
- Milled clamping surface
- Weight: 0.33 kg
- Option: stainless version

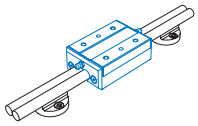
Item no.: **223 104 0070**
stainless: **223 104 1070**

Shaft supporting blocks

- Ø40 mm, hole center distance 28 mm
- Zinc cast
- Packing unit: 10 pieces

Item no.: **221 501**

with Steel Sledge **LS 1**



- L 91 x W 60 x H 32 mm
- Polished clamping surface
- Weight: 0.80 kg

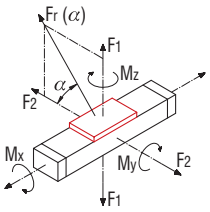
Item no.: **223 006**

Linear Guide Rail LF 1

Load Data

$$Fr(\alpha) = \frac{F2}{\cos \alpha}$$

$$Fr(\alpha) = \frac{F1}{\sin \alpha}$$

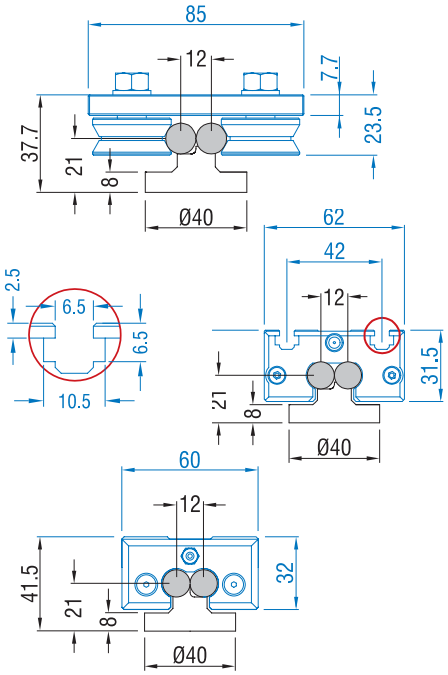


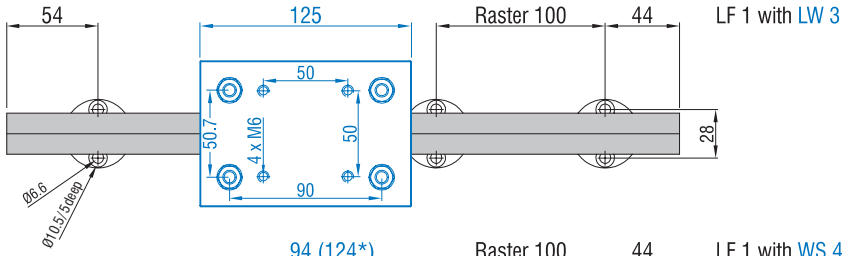
Roller Carriage LW 3	
C_0	2160 N
C	4000 N
F_1 stat.	4320 N
F_1 dyn.	3846 N
F_2 stat.	2160 N
F_2 dyn.	4000 N
M_x stat.	109.5 Nm
M_y stat.	194.4 Nm
M_z stat.	97.2 Nm
M_x dyn.	97.4 Nm
M_y dyn.	173.0 Nm
M_z dyn.	180.0 Nm

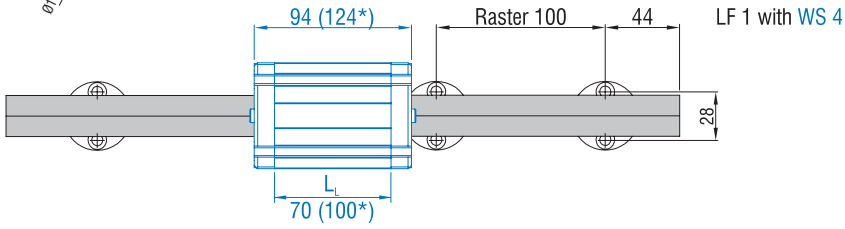
Bearing Carriage WS 4	
C_0	3303 N
C	1873 N
F_1 stat.	2821 N
F_1 dyn.	1599 N
F_2 stat.	3303 N
F_2 dyn.	1873 N
M_x stat.	29.8 Nm
M_y stat.	105.3 Nm
M_z stat.	123.3 Nm
M_x dyn.	16.8 Nm
M_y dyn.	59.7 Nm
M_z dyn.	69.9 Nm

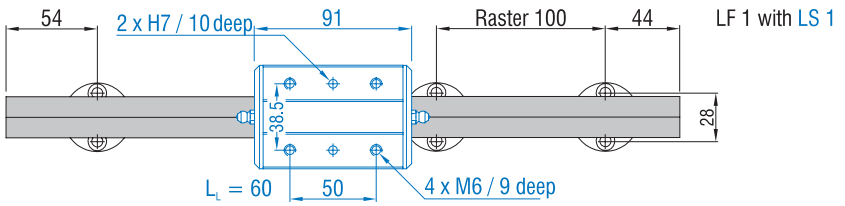
Bearing Carriage LS 1	
C_0	3508 N
C	2105 N
F_1 stat.	3549 N
F_1 dyn.	2130 N
F_2 stat.	3508 N
F_2 dyn.	2105 N
M_x stat.	36.2 Nm
M_y stat.	129.0 Nm
M_z stat.	127.5 Nm
M_x dyn.	21.7 Nm
M_y dyn.	77.4 Nm
M_z dyn.	76.5 Nm

Scaled Drawings





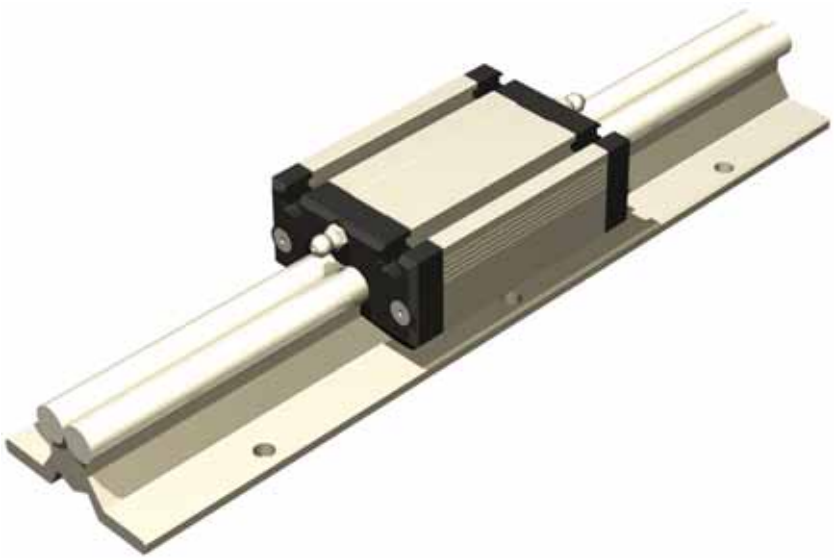




* = available upon request

Linear Guide Rail

LF 2



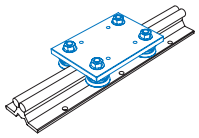
Features

- W 62 x H 31 mm
- 2 precision steel shafts Ø 12
- Stress-resistant
- Aluminium shaft profile, anodized
- High parallelism due to patented shaft seat contour
- High guiding precision
- Bottom-up or top-down mounting on a plane surface by means of through holes
  Ø 6,5 in a 100 mm raster
- Arbitrary guide rail length
- Weight: 3.29 kg/m

LF 2

L [mm]	Item no.
298	235 200 0298
398	235 200 0398
498	235 200 0498
598	235 200 0598
698	235 200 0698
798	235 200 0798
898	235 200 0898
998	235 200 0998
1098	235 200 1098
1198	235 200 1198
1298	235 200 1298
1398	235 200 1398
1498	235 200 1498
1598	235 200 1598
1798	235 200 1798
1998	235 200 1998
2098	235 200 2098
2498	235 200 2498
2598	235 200 2598
2998	235 200 2998
Profile length = L - 2 mm	

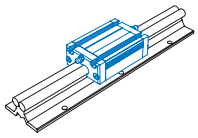
with roller carriage **LW 3**



- L 125 x W 85 x H 7,7 mm
- Polished steel plate
- Weight: 0.93 kg

Item no.: **223 008**

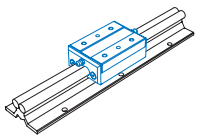
with aluminium bearing carriage **WS 4**



- L 94 x W 62 x H 31,5 mm
- Milled clamping surface
- Weight: 0.33 kg
- Option: stainless version

Item no.: **223 104 0070**
stainless: 223 104 1070

with steel bearing carriage **LS 1**



- L 91 x W 60 x H 32 mm
- Polished clamping surface
- Weight: 0.80 kg

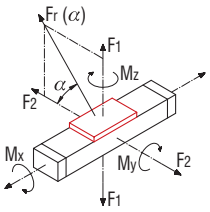
Item no.: **223 006**

Linear Guide Rail LF 2

Load Data

$$Fr(\alpha) = \frac{F2}{\cos \alpha}$$

$$Fr(\alpha) = \frac{F1}{\sin \alpha}$$



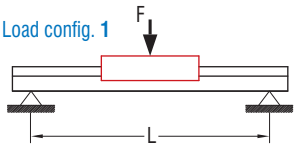
Roller Carriage LW 3	
C_0	2160 N
C	4000 N
F_1 stat.	4320 N
F_1 dyn.	3846 N
F_2 stat.	2160 N
F_2 dyn.	4000 N
M_x stat.	109.5 Nm
M_y stat.	194.4 Nm
M_z stat.	97.2 Nm
M_x dyn.	97.4 Nm
M_y dyn.	173.0 Nm
M_z dyn.	180.0 Nm

Bearing Carriage WS 4	
C_0	3303 N
C	1873 N
F_1 stat.	2821 N
F_1 dyn.	1599 N
F_2 stat.	3303 N
F_2 dyn.	1873 N
M_x stat.	29.8 Nm
M_y stat.	105.3 Nm
M_z stat.	123.3 Nm
M_x dyn.	16.8 Nm
M_y dyn.	59.7 Nm
M_z dyn.	69.9 Nm

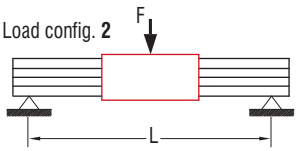
Bearing Carriage LS 1	
C_0	3508 N
C	2105 N
F_1 stat.	3549 N
F_1 dyn.	2130 N
F_2 stat.	3508 N
F_2 dyn.	2105 N
M_x stat.	36.2 Nm
M_y stat.	129.0 Nm
M_z stat.	127.5 Nm
M_x dyn.	21.7 Nm
M_y dyn.	77.4 Nm
M_z dyn.	76.5 Nm

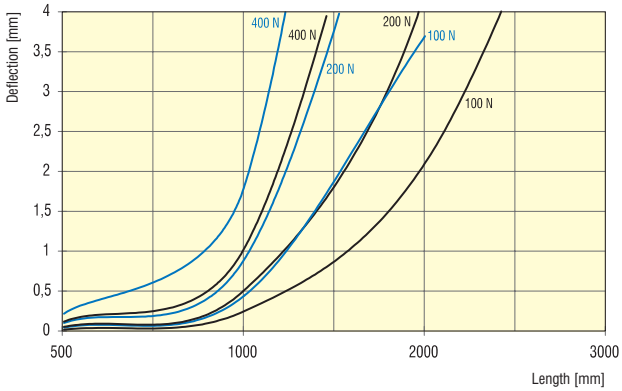
Deflection

■ Load config. **1**

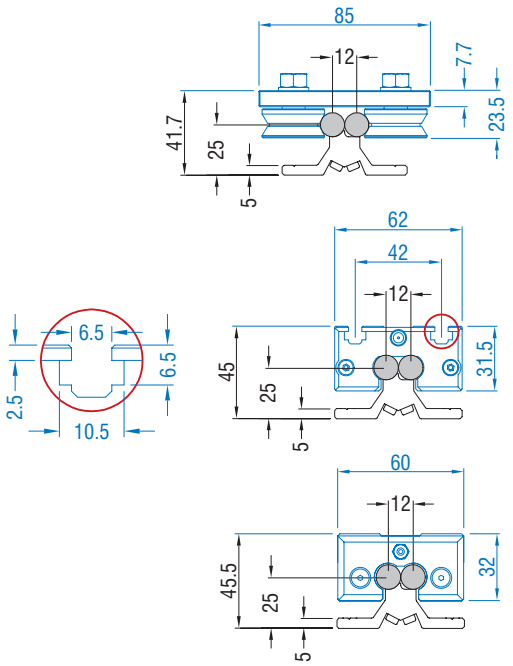


■ Load config. **2**

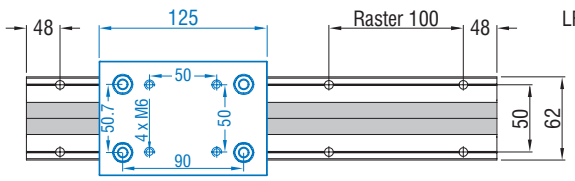




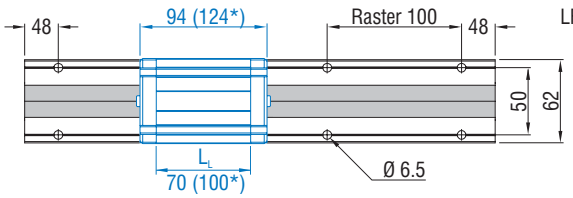
Scaled Drawings



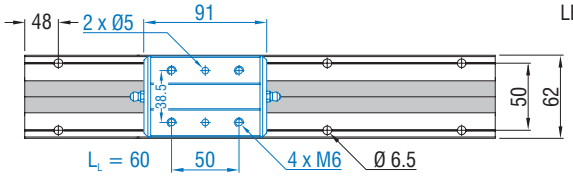
LF 2 with LW 3



LF 2 with WS 4



LF 2 with LS 1

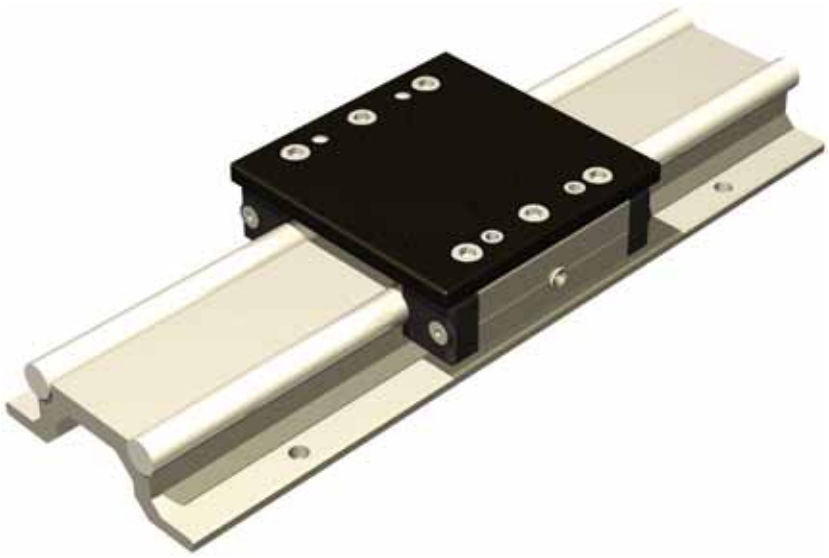


* = available upon request

mechanics

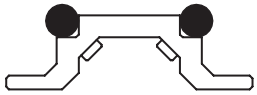
Linear Guide Rail

LF 3



Features

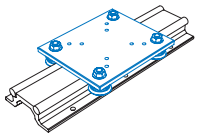
- W 90 x H 31 mm
- 2 precision steel shafts Ø 12
- Stress-resistant
- Aluminium shaft profile, anodized
- Increased shaft distance allows for taking up higher forces
- Bottom-up or top-down mounting by means of through holes for M6 in a 100 mm raster
- Arbitrary guide rail length
- Weight: 3.90 kg/m



LF 3

L [mm]	Item no.
298	235 300 0029
398	235 300 0039
498	235 300 0049
598	235 300 0059
698	235 300 0069
798	235 300 0079
898	235 300 0089
998	235 300 0099
1098	235 300 0109
1198	235 300 0119
1298	235 300 0129
1398	235 300 0139
1498	235 300 0149
1598	235 300 0159
1798	235 300 0179
1998	235 300 0199
2098	235 300 0209
2498	235 300 0249
2598	235 300 0259
2998	235 300 0299
Profile length = L - 2 mm	

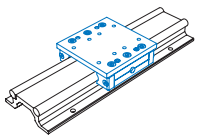
with roller carriage **LW 8**



- L 150 x W 125 x H 7,7 mm
- Polished steel plate
- 4 rollers Ø 31, life-time lubrication
- Clearance-free adjustable
- Weight: 1.51 kg

Item no.: **223 013**

mit bearing carriage **WS 7**



- L 100 x W 100 x H 32 mm
- Polished steel plate
- Central lubrication
- Clearance-free adjustable
- Weight: 1.67 kg

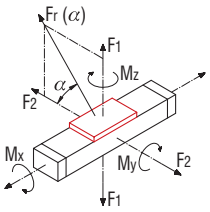
Item no.: **223 107 0070**

Linear Guide Rail LF 3

Load Data

$$Fr(\alpha) = \frac{F2}{\cos \alpha}$$

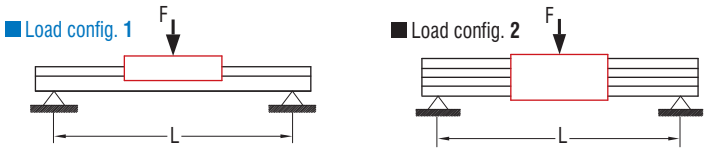
$$Fr(\alpha) = \frac{F1}{\sin \alpha}$$

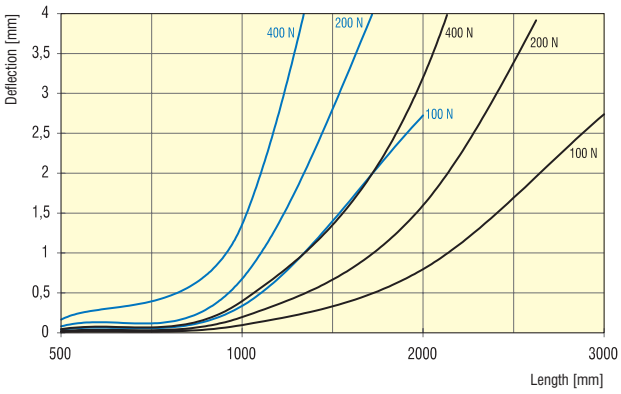


Roller Carriage LW 8	
C_0	2160 N
C	4000 N
F_1 stat.	4320 N
F_1 dyn.	3846 N
F_2 stat.	2160 N
F_2 dyn.	4000 N
M_x stat.	189.2 Nm
M_y stat.	248.4 Nm
M_z stat.	124.2 Nm
M_x dyn.	168.4 Nm
M_y dyn.	221.1 Nm
M_z dyn.	230.0 Nm

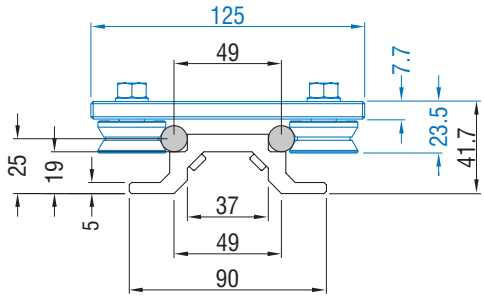
Bearing Carriage WS 7	
C_0	3303 N
C	1873 N
F_1 stat.	2821 N
F_1 dyn.	1599 N
F_2 stat.	3303 N
F_2 dyn.	1873 N
M_x stat.	82.0 Nm
M_y stat.	105.3 Nm
M_z stat.	123.3 Nm
M_x dyn.	46.4 Nm
M_y dyn.	59.7 Nm
M_z dyn.	69.9 Nm

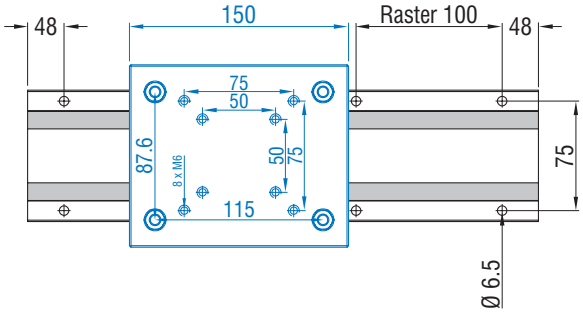
Deflection



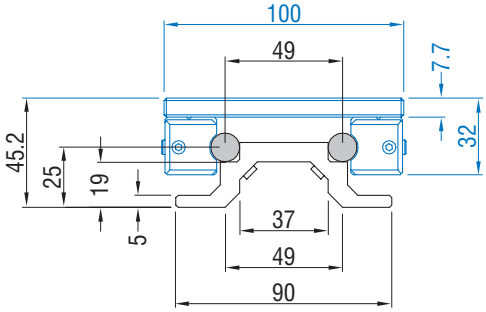


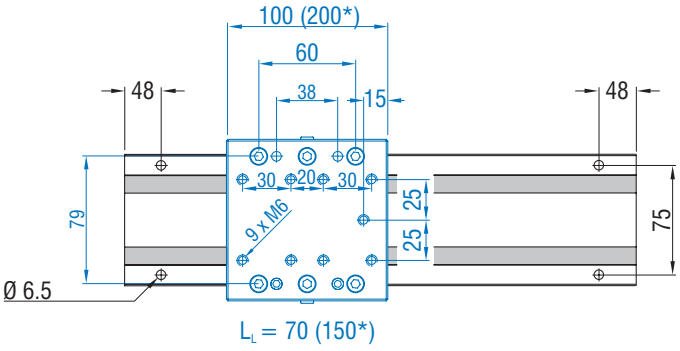
Scaled Drawings





LF 3 with LW 8





LF 3 with WS 7

* = available upon request

Linear Guide Rail

LF 7

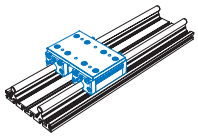
Features

- W 128 x H 40 mm
- 2 precision steel shafts Ø 12
- Stress-resistant
- Aluminium shaft profile, anodized
- Attachment from below by thread rails in the T-groove extrusion,
- Conditionally cantilevered
- Arbitrary Guide Rail length
- Weight: 5.63 kg/m

LF 7

L [mm]	Item no.
298	220 006 0029
398	220 006 0039
498	220 006 0049
598	220 006 0059
698	220 006 0069
798	220 006 0079
898	220 006 0089
998	220 006 0099
1098	220 006 0109
1198	220 006 0119
1298	220 006 0129
1398	220 006 0139
1498	220 006 0149
1598	220 006 0159
1798	220 006 0179
1998	220 006 0199
2098	220 006 0209
2498	220 006 0249
2598	220 006 0259
2998	220 006 0299
Profile length = L - 2 mm	

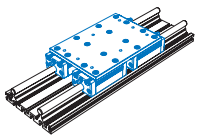
with 2 x aluminium bearing carriage **WS 6**



- L 84 x W 126 x H 8 mm
- Polished steel plate
- 2 x IWS 1, central lubrication
- Clearance-free adjustable
- Total Weight: 1.19 kg

Item no.: **223 240 0001**

with 4 x aluminium bearing carriage **WS 6**



- L 180 x W 126 x H 8 mm
- Polished steel plate
- 4 x IWS 1, central lubrication
- Clearance-free adjustable
- Total Weight: 2.48 kg

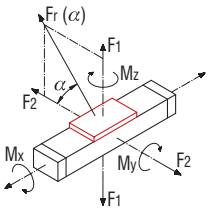
Item no.: **223 240 0002**

Linear Guide Rail LF 7

Load Data

$$Fr(\alpha) = \frac{F2}{\cos \alpha}$$

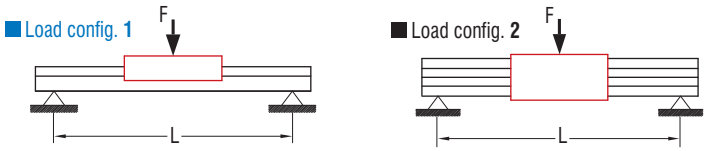
$$Fr(\alpha) = \frac{F1}{\sin \alpha}$$

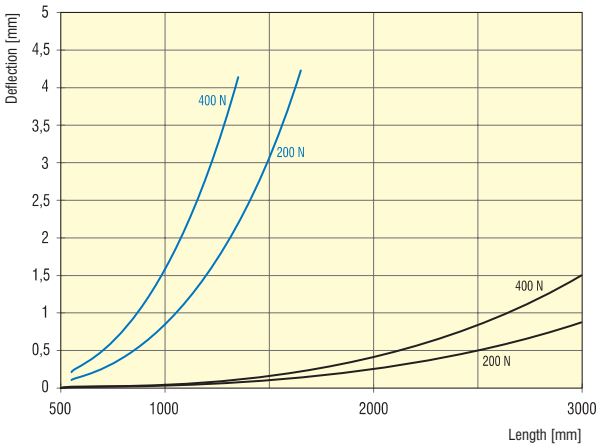


Unit with 2x WS 6	
C_0	4955 N
C	2810 N
F_1 stat.	4232 N
F_1 dyn.	2399 N
F_2 stat.	4955 N
F_2 dyn.	2810 N
M_x stat.	159 Nm
M_y stat.	148 Nm
M_z stat.	173 Nm
M_x dyn.	90 Nm
M_y dyn.	84 Nm
M_z dyn.	98 Nm

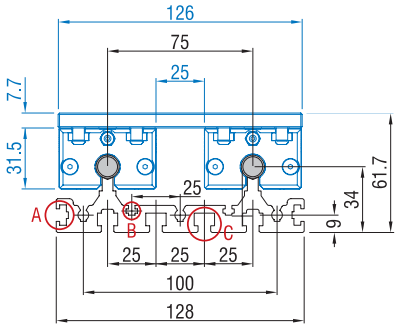
Unit with 4x WS 6	
C_0	6606 N
C	3746 N
F_1 stat.	5642 N
F_1 dyn.	3198 N
F_2 stat.	6606 N
F_2 dyn.	3746 N
M_x stat.	212 Nm
M_y stat.	310 Nm
M_z stat.	363 Nm
M_x dyn.	120 Nm
M_y dyn.	176 Nm
M_z dyn.	206 Nm

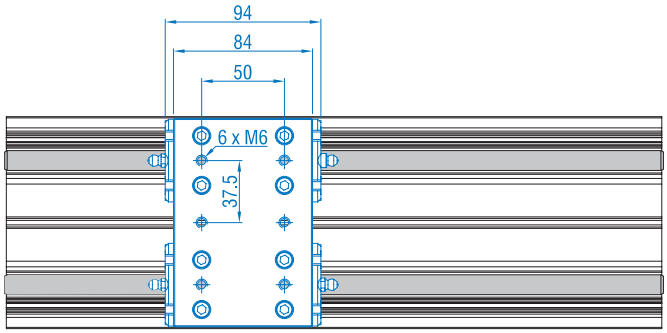
Deflection

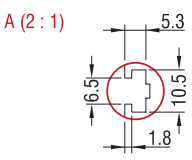


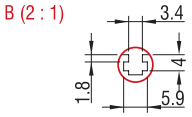


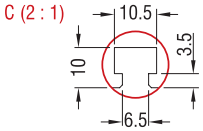
Scaled Drawings

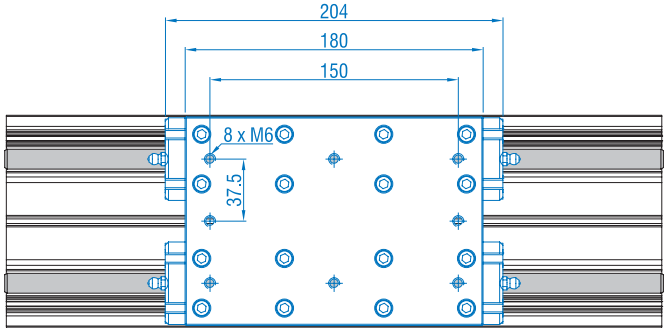








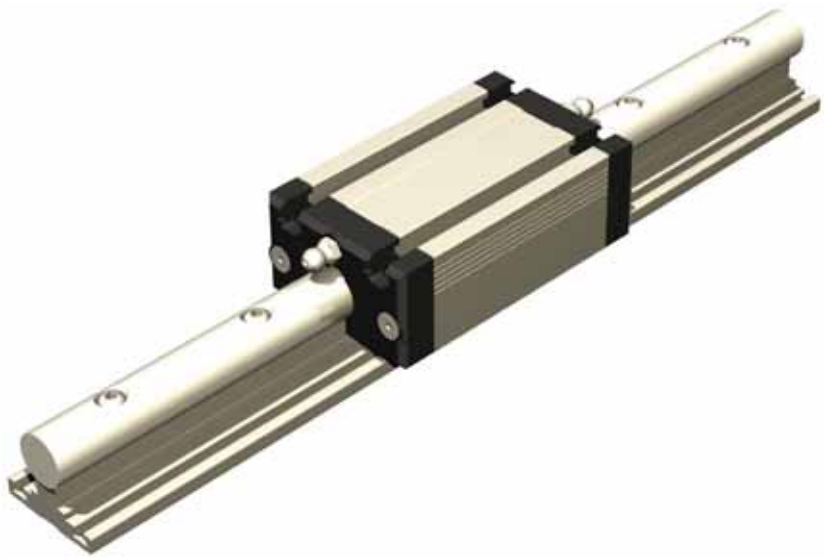




* = available upon request

Linear Guide Rail

ILF 1



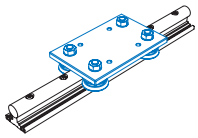
Features

- W 34,5 x H 30 mm
- Precision steel shaft Ø 16
- Aluminium shaft profile, anodized
- Top-down mounting in a 100 mm raster on a plane surface by means of provided special screws M5
- Arbitrary guide rail length
- Weight: 2.2 kg/m

ILF 1

L [mm]	Item no.
298	220 003 0029
398	220 003 0039
498	220 003 0049
598	220 003 0059
698	220 003 0069
798	220 003 0079
898	220 003 0089
998	220 003 0099
1098	220 003 0109
1198	220 003 0119
1298	220 003 0129
1398	220 003 0139
1498	220 003 0149
1598	220 003 0159
1798	220 003 0179
1998	220 003 0199
2098	220 003 0209
2498	220 003 0249
2598	220 003 0259
2998	220 003 0299
Profile length = L - 2 mm	

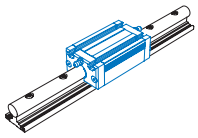
with roller carriage **ILW 1**



- L 125 x W 80 x H 7,7 mm
- Polished steel plate
- Weight: 0.87 kg

Item no.: **223 230**

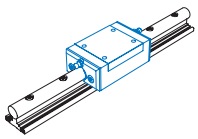
with aluminium bearing carriage **IWS 1**



- L 94 x W 55 x H 33,5 mm
- Milled clamping surface
- Weight: 0.32 kg
- Option: stainless version

Item no.: **223 220**
stainless: **223 220 0001**

with steel bearing carriage **ILS 1**



- L 94 x W 58 x H 33,7 mm
- Milled clamping surface
- Weight: 0.72 kg

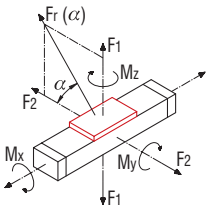
Item no.: **223 210**

Linear Guide Rail ILF 1

Load Data

$$Fr(\alpha) = \frac{F2}{\cos \alpha}$$

$$Fr(\alpha) = \frac{F1}{\sin \alpha}$$

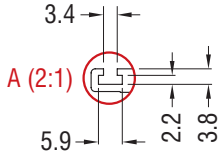


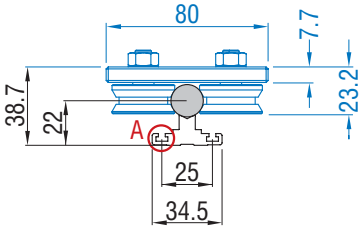
Roller Carriage ILW 1	
C_0	2160 N
C	4000 N
F_1 stat.	4320 N
F_1 dyn.	3897 N
F_2 stat.	2160 N
F_2 dyn.	4000 N
M_x stat.	-
M_y stat.	194.4 Nm
M_z stat.	97.2 Nm
M_x dyn.	-
M_y dyn.	175.3 Nm
M_z dyn.	180.0 Nm

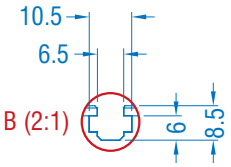
Bearing Carriage IWS 1	
C_0	3286 N
C	1773 N
F_1 stat.	2806 N
F_1 dyn.	1514 N
F_2 stat.	3286 N
F_2 dyn.	1773 N
M_x stat.	--
M_y stat.	104.7 Nm
M_z stat.	122.6 Nm
M_x dyn.	--
M_y dyn.	56.4 Nm
M_z dyn.	66.1 Nm

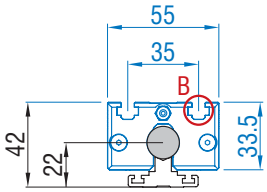
Bearing Carriage ILS 1	
C_0	5065 N
C	3238 N
F_1 stat.	4325 N
F_1 dyn.	2765 N
F_2 stat.	5065 N
F_2 dyn.	3238 N
M_x stat.	-
M_y stat.	113.4 Nm
M_z stat.	132.8 Nm
M_x dyn.	-
M_y dyn.	72.4 Nm
M_z dyn.	84.8 Nm

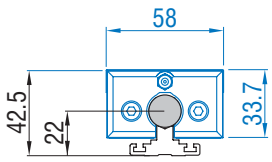
Scaled Drawings



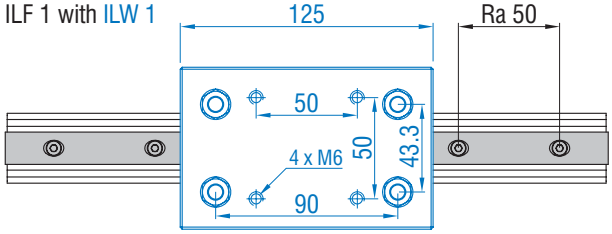




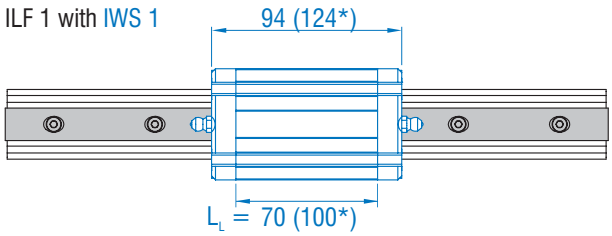




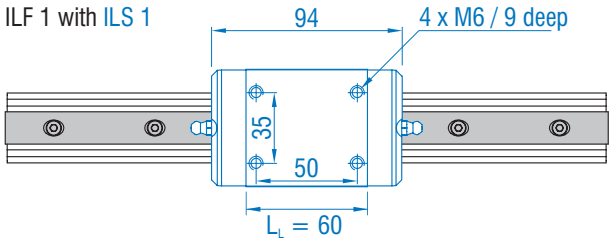
ILF 1 with ILW 1



ILF 1 with IWS 1



ILF 1 with ILS 1

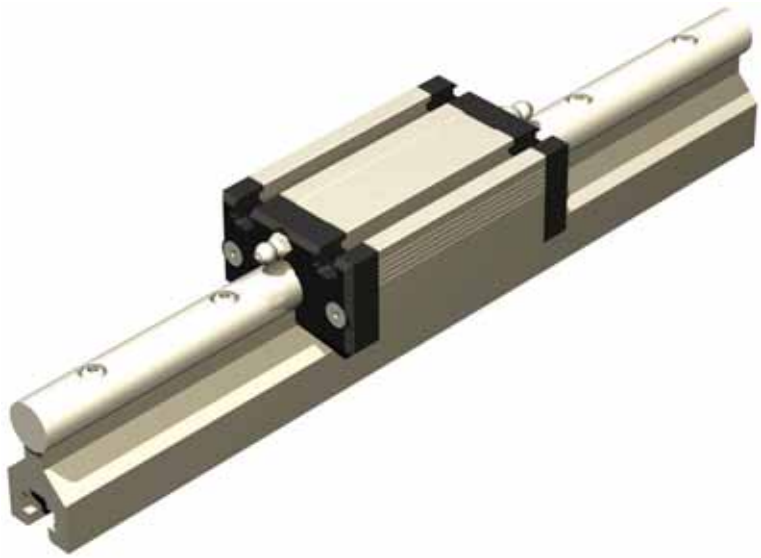


* = available upon request

mechanics

Linear Guide Rail

ILF 2



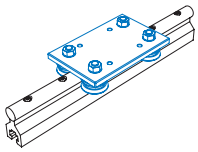
Features

- W 25 x H 47,5 mm
- Precision steel shaft Ø 16
- Aluminium shaft profile, anodized
- Bottom-up mounting on a plane surface by means of thread bars M6 in the T-groove indentation
- Not cantilevered
- Arbitrary guide rail length
- Weight: 2.70 kg/m

ILF 2

L [mm]	Item no.
298	220 004 0029
398	220 004 0039
498	220 004 0049
598	220 004 0059
698	220 004 0069
798	220 004 0079
898	220 004 0089
998	220 004 0099
1098	220 004 0109
1198	220 004 0119
1298	220 004 0129
1398	220 004 0139
1498	220 004 0149
1598	220 004 0159
1798	220 004 0179
1998	220 004 0199
2098	220 004 0209
2498	220 004 0249
2598	220 004 0259
2998	220 004 0299
Profile length = L - 2 mm	

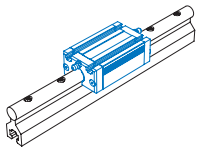
with roller carriage **ILW 1**



- L 125 x W 80 x H 7,7 mm
- Polished steel plate
- Weight: 0.87 kg

Item no.: **223 230**

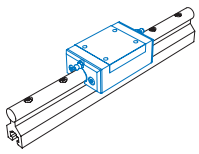
with aluminium bearing carriage **IWS 1**



- L 94 x W 55 x H 33,5 mm
- Milled clamping surface
- Weight: 0.32 kg
- Option: stainless version

Item no.: **223 220**
stainless: **223 220 0001**

with steel bearing carriage **ILS 1**



- L 94 x W 58 x H 33,7 mm
- Milled clamping surface
- Weight: 0.72 kg

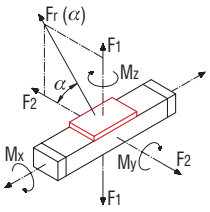
Item no.: **223 210**

Linear Guide Rail ILF 2

Load Data

$$Fr(\alpha) = \frac{F2}{\cos \alpha}$$

$$Fr(\alpha) = \frac{F1}{\sin \alpha}$$

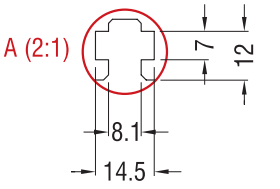


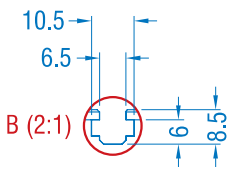
Roller Carriage ILW 1	
C_0	2160 N
C	4000 N
F_1 stat.	4320 N
F_1 dyn.	3897 N
F_2 stat.	2160 N
F_2 dyn.	4000 N
M_x stat.	-
M_y stat.	194.4 Nm
M_z stat.	97.2 Nm
M_x dyn.	-
M_y dyn.	175.3 Nm
M_z dyn.	180.0 Nm

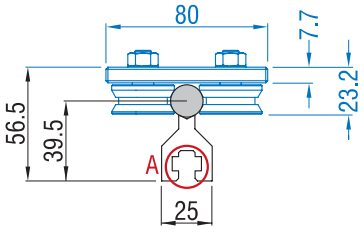
Bearing Carriage IWS 1	
C_0	3286 N
C	1773 N
F_1 stat.	2806 N
F_1 dyn.	1514 N
F_2 stat.	3286 N
F_2 dyn.	1773 N
M_x stat.	--
M_y stat.	104.7 Nm
M_z stat.	122.6 Nm
M_x dyn.	--
M_y dyn.	56.4 Nm
M_z dyn.	66.1 Nm

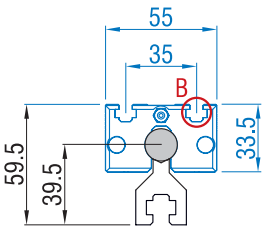
Bearing Carriage ILS 1	
C_0	5065 N
C	3238 N
F_1 stat.	4325 N
F_1 dyn.	2765 N
F_2 stat.	5065 N
F_2 dyn.	3238 N
M_x stat.	-
M_y stat.	113.4 Nm
M_z stat.	132.8 Nm
M_x dyn.	-
M_y dyn.	72.4 Nm
M_z dyn.	84.8 Nm

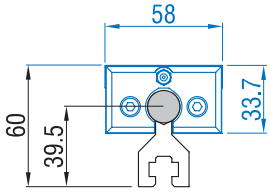
Scaled Drawings



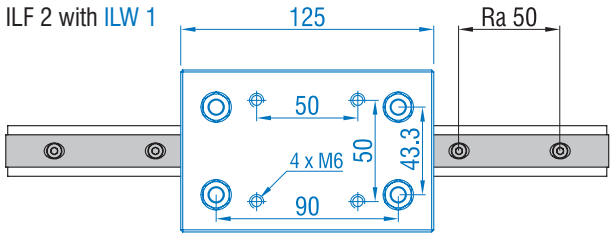




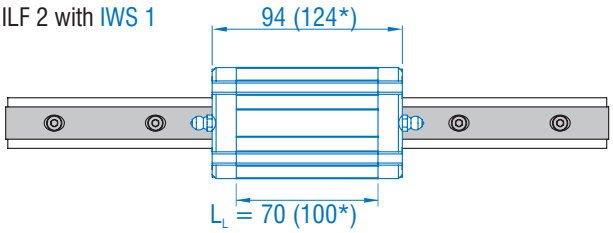




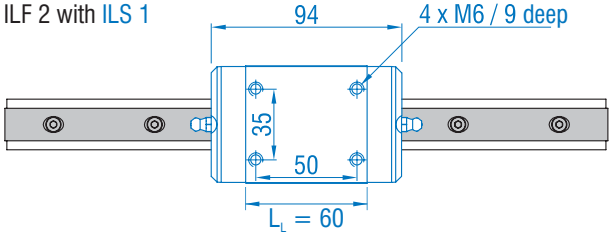
ILF 2 with ILW 1



ILF 2 with IWS 1



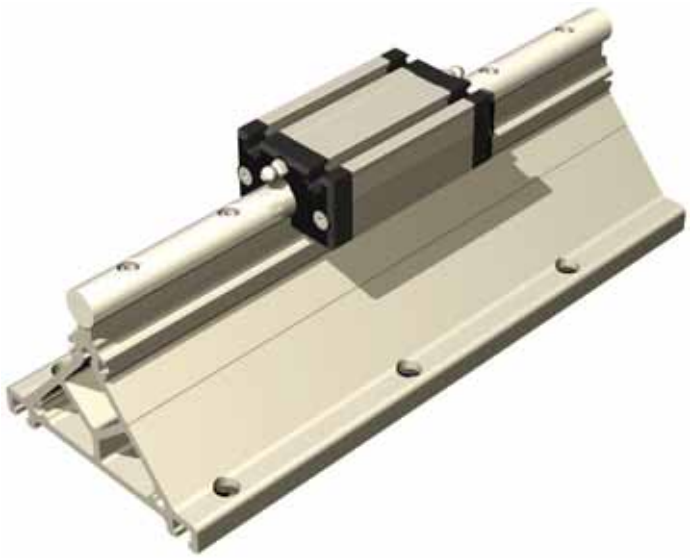
ILF 2 with ILS 1



* = available upon request

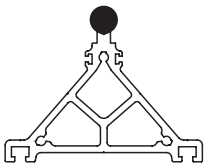
Linear Guide Rail

ILF 3



Features

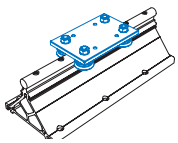
- W 118 x H 93,7 mm
- Precision steel shaft Ø 16
- Aluminium shaft profile, anodized
- Milled shaft seat contour
- Bottom-up mounting by means of thread rails in the T-groove indentation or top-down mounting by means of hole raster bar and screws M6
- Conditionally cantilevered
- Arbitrary guide rail length
- Weight: 6.5 kg/m



ILF 3

L [mm]	Item no.
298	220 005 0029
398	220 005 0039
498	220 005 0049
598	220 005 0059
698	220 005 0069
798	220 005 0079
898	220 005 0089
998	220 005 0099
1098	220 005 0109
1198	220 005 0119
1298	220 005 0129
1398	220 005 0139
1498	220 005 0149
1598	220 005 0159
1798	220 005 0179
1998	220 005 0199
2098	220 005 0209
2498	220 005 0249
2598	220 005 0259
2998	220 005 0299
Profile length = L - 2 mm	

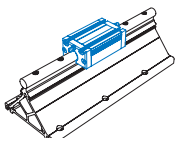
with roller carriage **ILW 1**



- L 125 x W 80 x H 7,7 mm
- Polished steel plate
- Weight: 0.87 kg

Item no.: **223 230**

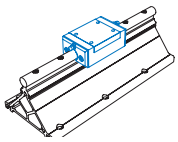
with aluminium bearing carriage **IWS 1**



- L 94 x W 55 x H 33,5 mm
- Milled clamping surface
- Weight: 0.32 kg
- Option: Stainless version

Item no.: **223 220**
stainless: **223 220 0001**

with steel bearing carriage **ILS 1**



- L 94 x W 58 x H 33,7 mm
- Polished clamping surface
- Weight: 0.72 kg

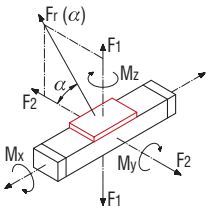
Item no.: **223 210**

Linear Guide Rail ILF 3

Load Data

$$Fr(\alpha) = \frac{F2}{\cos \alpha}$$

$$Fr(\alpha) = \frac{F1}{\sin \alpha}$$

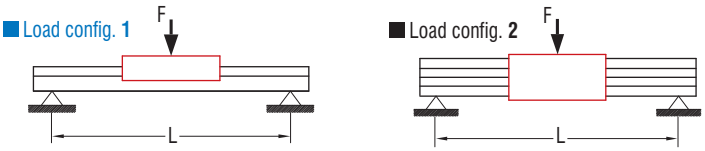


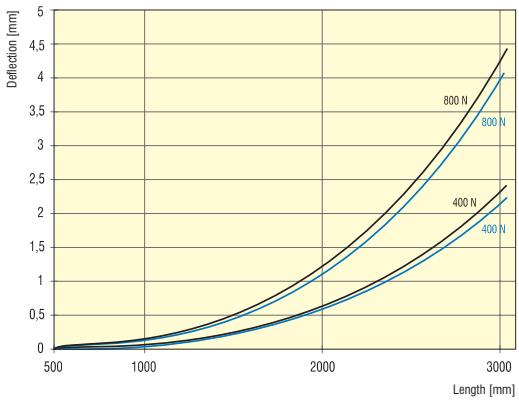
Roller Carriage ILW 1	
C_0	2160 N
C	4000 N
F_1 stat.	4320 N
F_1 dyn.	3897 N
F_2 stat.	2160 N
F_2 dyn.	4000 N
M_x stat.	-
M_y stat.	194.4 Nm
M_z stat.	97.2 Nm
M_x dyn.	-
M_y dyn.	175.3 Nm
M_z dyn.	180.0 Nm

Bearing Carriage IWS 1	
C_0	3286 N
C	1773 N
F_1 stat.	2806 N
F_1 dyn.	1514 N
F_2 stat.	3286 N
F_2 dyn.	1773 N
M_x stat.	--
M_y stat.	104.7 Nm
M_z stat.	122.6 Nm
M_x dyn.	--
M_y dyn.	56.4 Nm
M_z dyn.	66.1 Nm

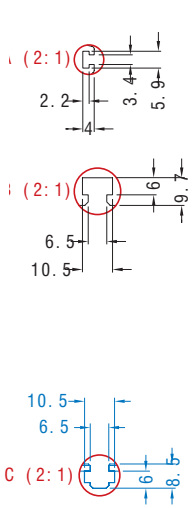
Bearing Carriage ILS 1	
C_0	5065 N
C	3238 N
F_1 stat.	4325 N
F_1 dyn.	2765 N
F_2 stat.	5065 N
F_2 dyn.	3238 N
M_x stat.	-
M_y stat.	113.4 Nm
M_z stat.	132.8 Nm
M_x dyn.	-
M_y dyn.	72.4 Nm
M_z dyn.	84.8 Nm

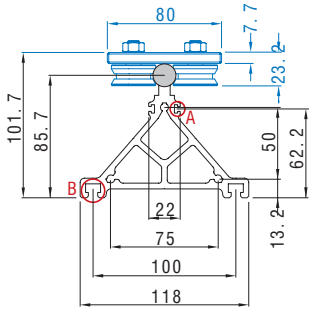
Deflection

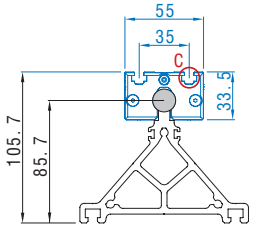


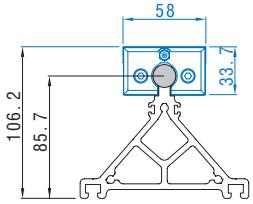


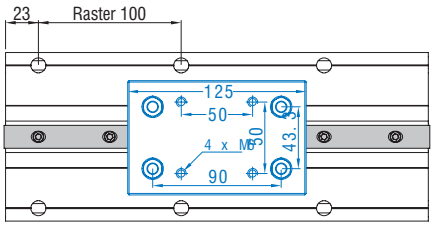
Scaled Drawings



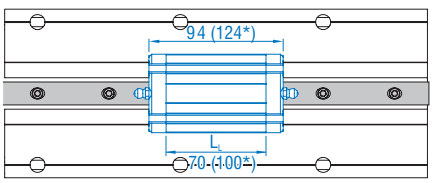




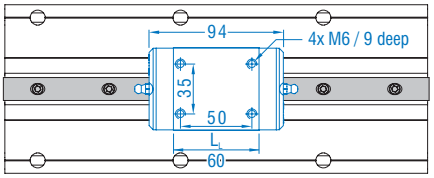




ILF 1 with ILW 1



ILF 1 with IWS 1



ILF 1 with ILS 1

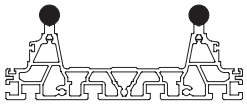
* = available upon request

Linear Guide Rail

ILF 6

Features

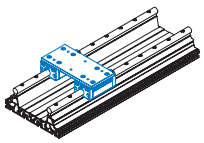
- W 190 x H 61 mm
- 2 precision steel shafts Ø 16
- Stress-resistant
- Aluminium shaft profile, anodized
- Bottom-up mounting by means of thread rails M6 in the T-groove indentation
- Conditionally cantilevered
- Arbitrary guide rail length
- Weight: 10.17 kg/m



ILF 6

L [mm]	Item no.
298	220 008 0029
398	220 008 0039
498	220 008 0049
598	220 008 0059
698	220 008 0069
798	220 008 0079
898	220 008 0089
998	220 008 0099
1098	220 008 0109
1198	220 008 0119
1298	220 008 0129
1398	220 008 0139
1498	220 008 0149
1598	220 008 0159
1798	220 008 0179
1998	220 008 0199
2098	220 008 0209
2498	220 008 0249
2598	220 008 0259
2998	220 008 0299
Profile Length = L - 2 mm	

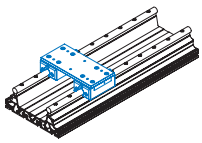
with 2 x aluminium bearing carriage **IWS 1**



- L 84 x W 183 x H 8 mm
- Polished steel plate
- 2 x IWS 1, central lubrication possibility
- Clearance-free adjustable
- Total weight: 1.50 kg

Item no.: **223 240 0007**

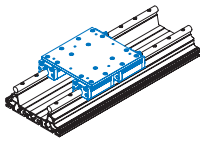
with 2 x steel bearing carriage **ILS 1**



- L 84 x W 183 x H 8 mm
- Polished steel plate
- 2 x IWS 1, central lubrication possibility
- Clearance-free adjustable
- Total weight: 2.30 kg

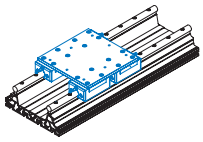
Item no.: **223 240 0009**

with 4 x aluminium bearing carriage **IWS 1**



Item no.: **223 240 0008**

with 4 x steel bearing carriage **ILS 1**



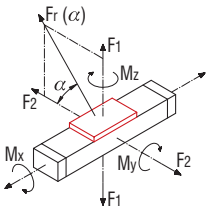
Item no.: **223 240 0010**

Linear Guide Rail ILF 6

Load Data

$$Fr(\alpha) = \frac{F2}{\cos \alpha}$$

$$Fr(\alpha) = \frac{F1}{\sin \alpha}$$



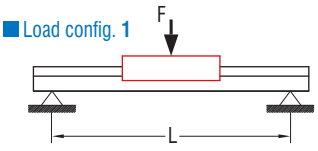
Unit with 2 x IWS 1	
C_0	4929 N
C	2660 N
F_1 stat.	4209 N
F_1 dyn.	2271 N
F_2 stat.	4929 N
F_2 dyn.	2660 N
M_x stat.	253 Nm
M_y stat.	147 Nm
M_z stat.	173 Nm
M_x dyn.	136 Nm
M_y dyn.	79 Nm
M_z dyn.	93 Nm

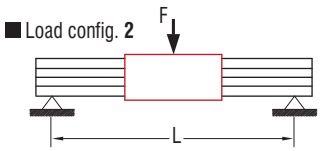
Unit with 2 x ILS 1	
C_0	7598 N
C	4857 N
F_1 stat.	6488 N
F_1 dyn.	4148 N
F_2 stat.	7598 N
F_2 dyn.	4857 N
M_x stat.	389 Nm
M_y stat.	195 Nm
M_z stat.	228 Nm
M_x dyn.	249 Nm
M_y dyn.	124 Nm
M_z dyn.	146 Nm

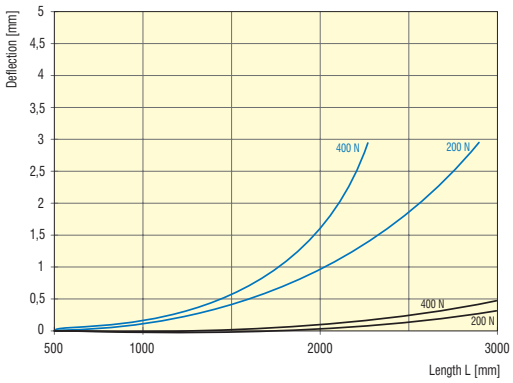
Unit with 4 x IWS 1	
C_0	6572 N
C	3546 N
F_1 stat.	5612 N
F_1 dyn.	3028 N
F_2 stat.	6572 N
F_2 dyn.	3546 N
M_x stat.	337 Nm
M_y stat.	309 Nm
M_z stat.	361 Nm
M_x dyn.	182 Nm
M_y dyn.	167 Nm
M_z dyn.	195 Nm

Unit with 4 x ILS 1	
C_0	10130 N
C	6476 N
F_1 stat.	8650 N
F_1 dyn.	5530 N
F_2 stat.	10130 N
F_2 dyn.	6476 N
M_x stat.	519 Nm
M_y stat.	476 Nm
M_z stat.	557 Nm
M_x dyn.	332 Nm
M_y dyn.	304 Nm
M_z dyn.	356 Nm

Deflection

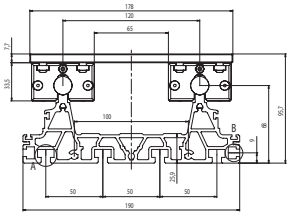


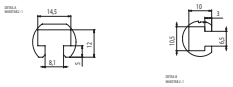


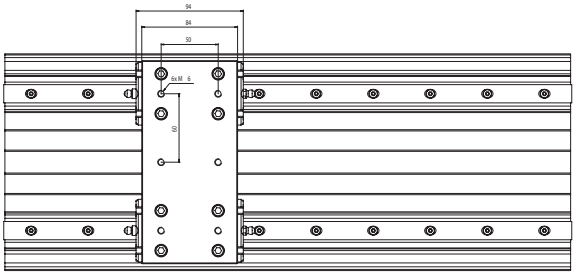


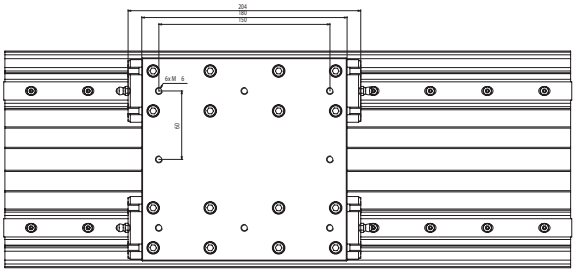
Scaled Drawings

IWS 1

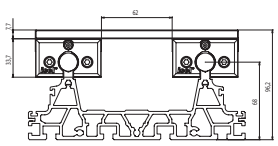






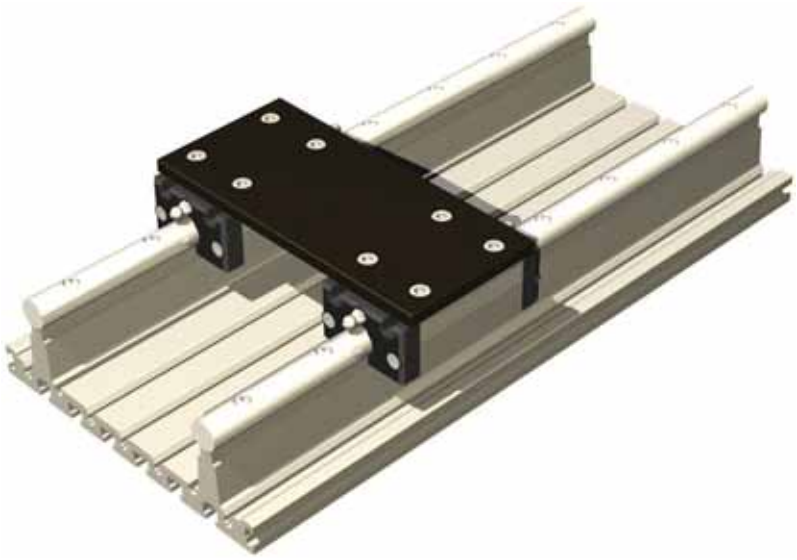


ILS 1



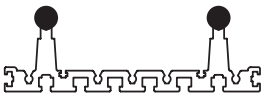
Linear Guide Rail

ILF 7



Features

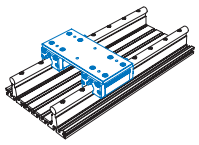
- W 185 x H 61 mm
- 2 precision steel shafts Ø 16
- Stress-resistant
- Aluminium shaft profile, anodized
- Bottom-up mounting by means of thread rails M6 in the T-groove indentation
- Conditionally cantilevered
- Arbitrary guide rail length
- Weight: 10.27 kg/m



ILF 7

L [mm]	Item no.
298	220 007 0029
398	220 007 0039
498	220 007 0049
598	220 007 0059
698	220 007 0069
798	220 007 0079
898	220 007 0089
998	220 007 0099
1098	220 007 0109
1198	220 007 0119
1298	220 007 0129
1398	220 007 0139
1498	220 007 0149
1598	220 007 0159
1798	220 007 0179
1998	220 007 0199
2098	220 007 0209
2498	220 007 0249
2598	220 007 0259
2998	220 007 0299
Profile length = L - 2 mm	

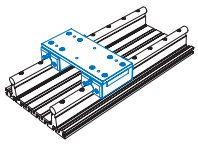
with 2 x aluminium bearing carriage **IWS 1**



- L 84 x W 183 x H 8 mm
- Polished steel plate
- 2 x IWS 1, central lubrication possibility
- Clearance-free adjustable
- Total weight: 1.52 kg

Item no.: **223 240 0003**

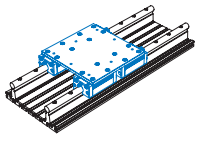
with 2 x steel bearing carriage **ILS 1**



- L 84 x W 183 x H 8 mm
- Polished steel plate
- 2 x IWS 1, central lubrication possibility
- Clearance-free adjustable
- Total weight: 2.32 kg

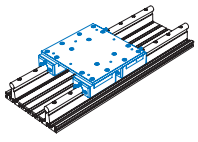
Item no.: **223 240 0005**

with 4 x aluminium bearing carriage **IWS 1**



Item no.: **223 240 0004**

with 4 x steel bearing carriage **ILS 1**



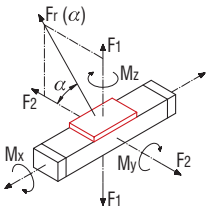
Item no.: **223 240 0006**

Linear Guide Rail ILF 7

Load Data

$$Fr(\alpha) = \frac{F2}{\cos \alpha}$$

$$Fr(\alpha) = \frac{F1}{\sin \alpha}$$



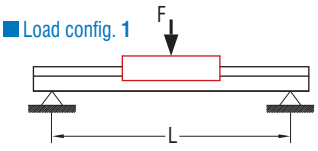
Unit with 2x IWS 1	
C_0	4929 N
C	2660 N
F_1 stat.	4209 N
F_1 dyn.	2271 N
F_2 stat.	4929 N
F_2 dyn.	2660 N
M_x stat.	263 Nm
M_y stat.	147 Nm
M_z stat.	173 Nm
M_x dyn.	142 Nm
M_y dyn.	79 Nm
M_z dyn.	93 Nm

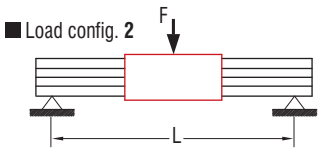
Unit with 2x ILS 1	
C_0	7598 N
C	4857 N
F_1 stat.	6488 N
F_1 dyn.	4148 N
F_2 stat.	7598 N
F_2 dyn.	4857 N
M_x stat.	405 Nm
M_y stat.	195 Nm
M_z stat.	228 Nm
M_x dyn.	259 Nm
M_y dyn.	124 Nm
M_z dyn.	146 Nm

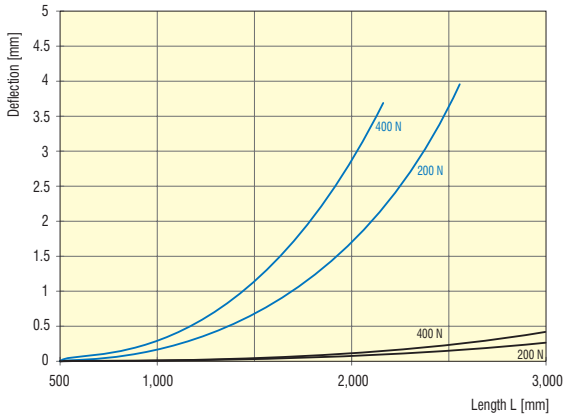
Unit with 4x IWS 1	
C_0	6572 N
C	3546 N
F_1 stat.	5612 N
F_1 dyn.	3028 N
F_2 stat.	6572 N
F_2 dyn.	3546 N
M_x stat.	351 Nm
M_y stat.	309 Nm
M_z stat.	361 Nm
M_x dyn.	189 Nm
M_y dyn.	167 Nm
M_z dyn.	195 Nm

Unit with 4x ILS 1	
C_0	10130 N
C	6476 N
F_1 stat.	8650 N
F_1 dyn.	5530 N
F_2 stat.	10130 N
F_2 dyn.	6476 N
M_x stat.	541 Nm
M_y stat.	476 Nm
M_z stat.	557 Nm
M_x dyn.	346 Nm
M_y dyn.	304 Nm
M_z dyn.	356 Nm

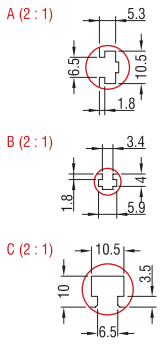
Deflection

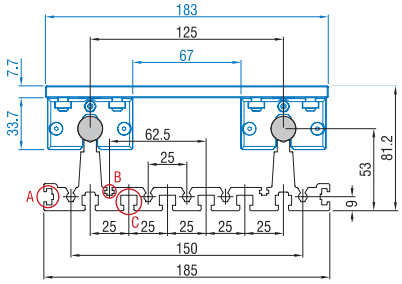


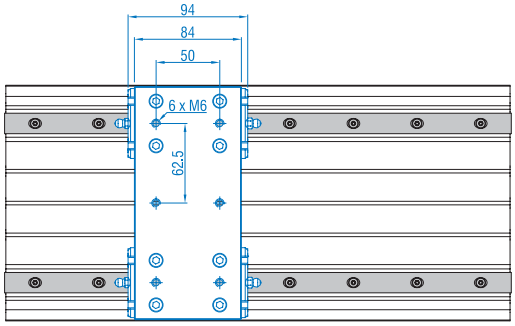


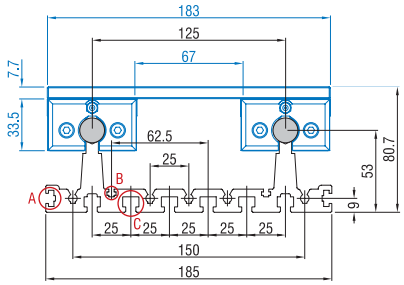


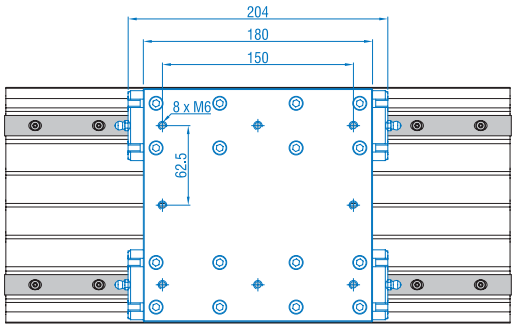
Scaled Drawings





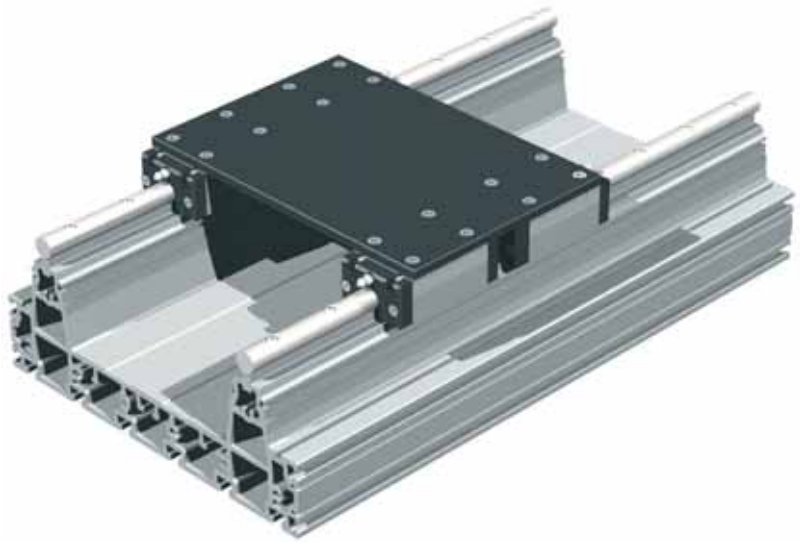






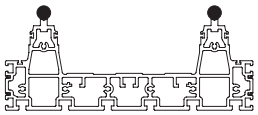
Linear Guide Rail

ILF 9



Features

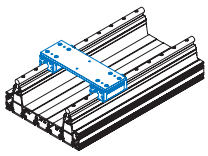
- W 290 x H 61 mm
- 2 precision steel shafts Ø 16
- Stress-resistant
- Aluminium shaft profile, anodized
- Bottom-up mounting by means of thread rails M6 in the T-groove indentation
- Conditionally cantilevered
- Arbitrary guide rail length
- Weight: 19.78 kg/m



ILF 9

L [mm]	Item no.
298	220 009 0029
398	220 009 0039
498	220 009 0049
598	220 009 0059
698	220 009 0069
798	220 009 0079
898	220 009 0089
998	220 009 0099
1098	220 009 0109
1198	220 009 0119
1298	220 009 0129
1398	220 009 0139
1498	220 009 0149
1598	220 009 0159
1798	220 009 0179
1998	220 009 0199
2098	220 009 0209
2498	220 009 0249
2598	220 009 0259
2998	220 009 0299
Profile Length= L - 2 mm	

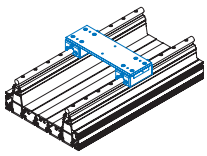
with 2 x aluminium bearing carriage **IWS 1**



- L 84 x W 183 x H 8 mm
- Polished steel plate
- 2 x IWS 1, central lubrication possibility
- Clearance-free adjustable
- Total weight: 1.90 kg

Item no.: **223 240 0011**

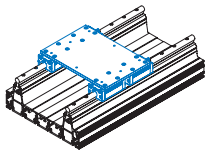
with 2 x steel bearing carriage **ILS 1**



- L 84 x W 183 x H 8 mm
- Polished steel plate
- 2 x IWS 1, central lubrication possibility
- Clearance-free adjustable
- Total weight: 2.70 kg

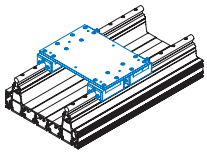
Item no.: **223 240 0013**

with 4 x aluminium bearing carriage **IWS 1**



Item no.: **223 240 00012**

with 4 x steel bearing carriage **ILS 1**



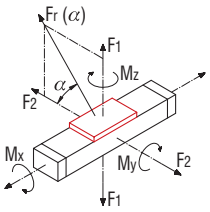
Item no.: **223 240 0014**

Linear Guide Rail ILF 9

Load Data

$$Fr(\alpha) = \frac{F2}{\cos \alpha}$$

$$Fr(\alpha) = \frac{F1}{\sin \alpha}$$



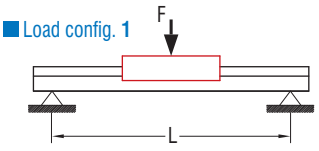
Unit with 2 x IWS 1	
C_0	4929 N
C	2660 N
F_1 stat.	4209 N
F_1 dyn.	2271 N
F_2 stat.	4929 N
F_2 dyn.	2660 N
M_x stat.	253 Nm
M_y stat.	147 Nm
M_z stat.	173 Nm
M_x dyn.	136 Nm
M_y dyn.	79 Nm
M_z dyn.	93 Nm

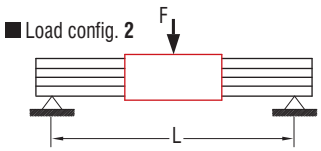
Unit with 2 x ILS 1	
C_0	7598 N
C	4857 N
F_1 stat.	6488 N
F_1 dyn.	4148 N
F_2 stat.	7598 N
F_2 dyn.	4857 N
M_x stat.	649 Nm
M_y stat.	195 Nm
M_z stat.	228 Nm
M_x dyn.	415 Nm
M_y dyn.	124 Nm
M_z dyn.	146 Nm

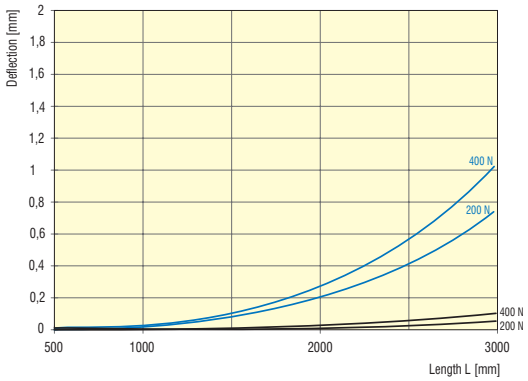
Unit with 4 x IWS 1	
C_0	6572 N
C	3546 N
F_1 stat.	5612 N
F_1 dyn.	3028 N
F_2 stat.	6572 N
F_2 dyn.	3546 N
M_x stat.	337 Nm
M_y stat.	309 Nm
M_z stat.	361 Nm
M_x dyn.	182 Nm
M_y dyn.	167 Nm
M_z dyn.	195 Nm

Unit with 4 x ILS 1	
C_0	10130 N
C	6476 N
F_1 stat.	8650 N
F_1 dyn.	5530 N
F_2 stat.	10130 N
F_2 dyn.	6476 N
M_x stat.	865 Nm
M_y stat.	476 Nm
M_z stat.	557 Nm
M_x dyn.	553 Nm
M_y dyn.	304 Nm
M_z dyn.	356 Nm

Deflection

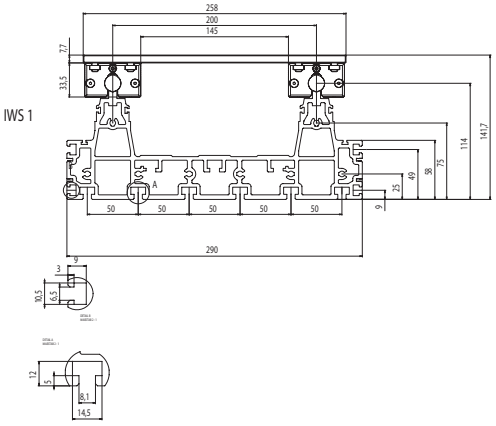




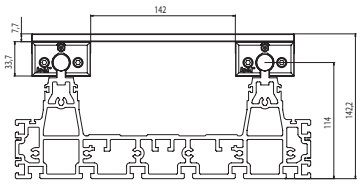


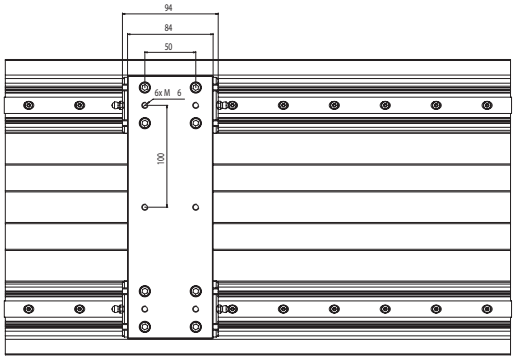
Scaled Drawings

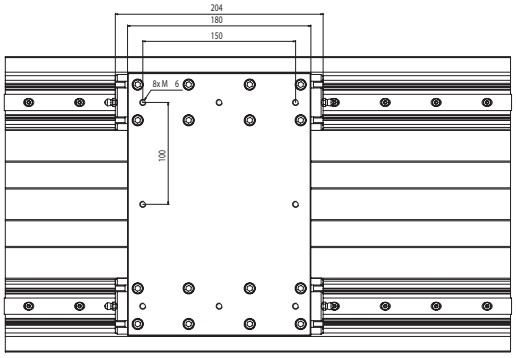
IWS 1



ILS 1

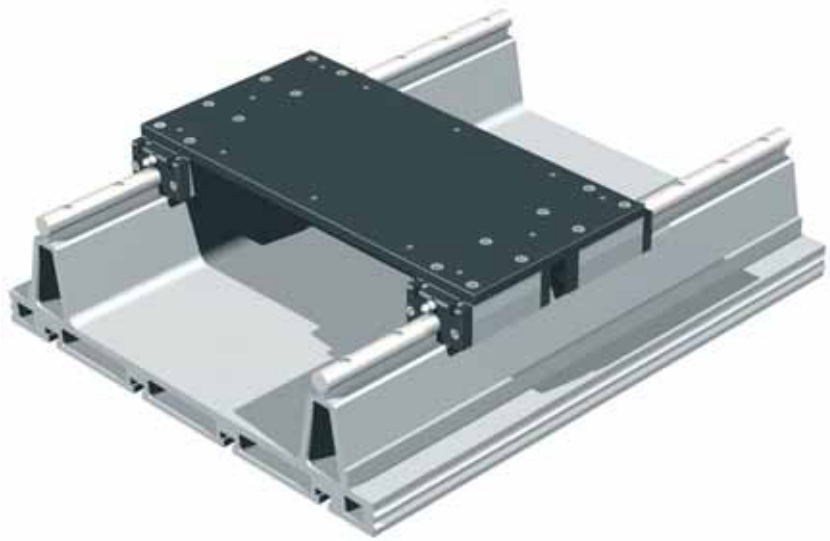






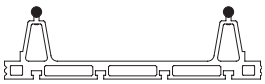
Linear Guide Rail

ILF 10



Features

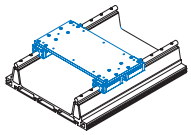
- W 400 x H 113 mm
- 2 precision steel shafts Ø 16
- Stress-resistant
- Aluminium shaft profile, anodized
- Bottom-up mounting by means of thread rails M6 in the T-groove indentation
- Conditionally cantilevered
- Arbitrary guide rail length
- Weight: 25.48 kg/m



ILF 10

L [mm]	Item no.
298	220 010 0029
398	220 010 0039
498	220 010 0049
598	220 010 0059
698	220 010 0069
798	220 010 0079
898	220 010 0089
998	220 010 0099
1098	220 010 0109
1198	220 010 0119
1298	220 010 0129
1398	220 010 0139
1498	220 010 0149
1598	220 010 0159
1798	220 010 0179
1998	220 010 0199
2098	220 010 0209
2498	220 010 0249
2598	220 010 0259
2998	220 010 0299
Profile Length = L - 2 mm	

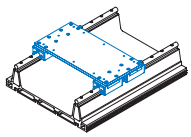
with 4 x aluminium bearing carriage **IWS 1**



- L 84 x W 183 x H 8 mm
- Polished steel plate
- 4 x IWS 1, central lubrication possibility
- Clearance-free adjustable
- Total weight: 6,06 kg

Item no.: **223 240 0015**

with 4 x steel bearing carriage **ILS 1**



- L 84 x W 183 x H 8 mm
- Polished steel plate
- 4 x IWS 1, central lubrication possibility
- Clearance-free adjustable
- Total weight: 7,66 kg

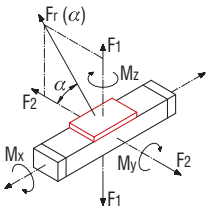
Item no.: **223 240 0016**

Linear Guide Rail ILF 10

Load Data

$$Fr(\alpha) = \frac{F2}{\cos \alpha}$$

$$Fr(\alpha) = \frac{F1}{\sin \alpha}$$

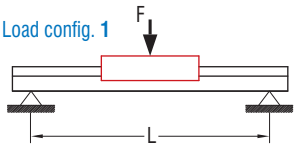


Unit with 4 x IWS 1	
C_0	6572 N
C	3546 N
F_1 stat.	5612 N
F_1 dyn.	3028 N
F_2 stat.	6572 N
F_2 dyn.	3546 N
M_x stat.	842 Nm
M_y stat.	309 Nm
M_z stat.	361 Nm
M_x dyn.	454 Nm
M_y dyn.	167 Nm
M_z dyn.	195 Nm

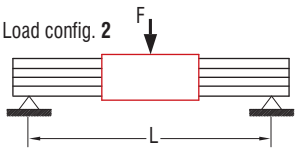
Unit with 4 x ILS 1	
C_0	10130 N
C	6476 N
F_1 stat.	8650 N
F_1 dyn.	5530 N
F_2 stat.	10130 N
F_2 dyn.	6476 N
M_x stat.	1298 Nm
M_y stat.	476 Nm
M_z stat.	557 Nm
M_x dyn.	830 Nm
M_y dyn.	304 Nm
M_z dyn.	356 Nm

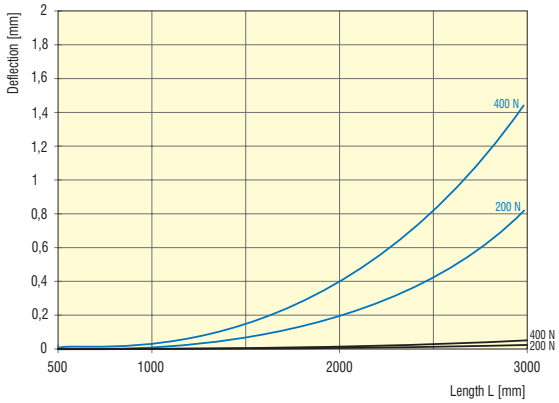
Deflection

■ Load config. **1**



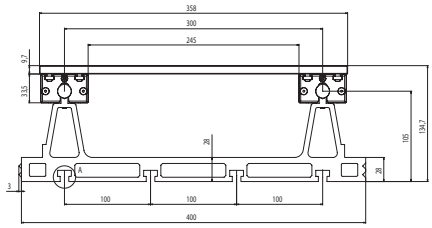
■ Load config. **2**

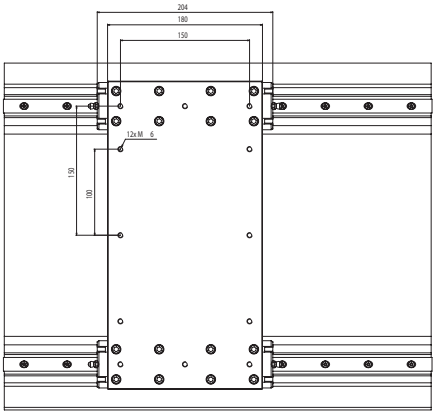




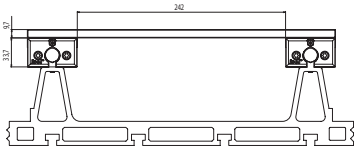
Scaled Drawings

IWS





ILS



mechanics

Accessory

Thread Rails

Thread Rail M6
- 10 x 4 mm
- galvanized
- M6 Ra 50 mm
- VE 3 pc. of 1 m
- for all except of PT / RE 40, 65 / SP / PG

Item no.: **209 011**

Slide Nuts

Slide Nut M6 (fig. 1)
- L 25 x W 10 x H 3,5
- galvanized
- PU 100 pieces
- for all except of PT / RE 40, 65 / PS 50 / SP / PG

Item no.: **209 001 0005**

Slide Nut M6 (fig. 1)
- L 25 x W 13 x H 5
- galvanized
- PU 50 pieces
- for all except of PT / RE 40, 65 / PG

Item no.: **209 004 0001**

Slide Nut 2 x M6 (fig. 2)
- L 45 x W 10 x H 3,5
- galvanized
- PU 50 pieces
- for all except of PT / RE 40, 65 / SP / PG

Item no.: **209 002 0004**

Slide Nut 2 x M6 (fig. 2)
- L 45 x W 13 x H 6
- galvanized
- 2 x M6 Ra 25 mm
- PU 25 pieces
- for PT / RE 40, 65 / PG

item no.: **209 005 0001**

Angle Slide Nut 2 x M6 (fig. 3)
- galvanized
- PU 25 pieces
- for all except of PT / RE 40, 65 / SP / PG

Item no.: **209 021 0003**

Special Angle Slide Nut 3 x M6 (fig. 4)
- galvanized
- PU 25 pieces
- for all except of PT / RE 40, 65 / SP / PG

item no.: **209 022 0003**

Linear Bearings

Linear Bearing LARGE
- L80 x W20 x H19 mm
- PU 2 pieces

Item no.: **222 002 0001**

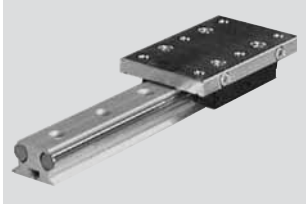
Linear Bearing MEDIUM
- L60 x W20,5 x H17,8 mm
- PU 2 pieces

Item no.: **222 000**

Linear Bearing SMALL
- L40 x W20 x H19 mm
- PU 2 pieces

Item no.: **222 001**

Dual Track Set



Dual Track Set 1 for DSF 1
- L75 x W75 x H30,2 mm
- with 2 linear bearings SMALL

Item no.: **223 001**

Dual Track Set 2 for DSF 1
- L125 x W75 x H30,2 mm
- with 2 linear bearings LARGE

Item no.: **223 002**

Roller Carriage LW 2

Roller Carriage LW 2 for LF 3
- with aluminium T-groove plate
- L150 x W125, 4 rollers Ø 31 mm

Item no.: **223 005**

Rollers

Roller Ø 21 mm
- concentric
- PU 2 pieces

Item no.: **222 003**
- eccentric
- PU 2 pieces

Item no.: **222 004**

Roller Ø 31 mm
- concentric
- PU 2 pieces

Item no.: **222 006**
- eccentric
- PU 2 pieces

Item no.: **222 007**

Lubricating Grease / Grease Gun

Lubricating grease

Item no.: **299 031**

Rush-type hand gun
for grease and oil

Item no.: **931 170**

General References

Bearing Capacity and Life Time

Fitting Position

Basically, the fitting position of the linear guides is arbitrarily selectable. It simply has to be considered that all arising forces and moments are below the maximum values of the respective axes.

Temperatures

All linear guides are designed for ambient temperatures of up to 60 °C in continuous operation. For a short time of operation, temperatures of up to 80 °C are admissible. The linear guides are not suitable for temperatures below the freezing point.

Straightness/Torsion

The used aluminium profiles are extruded shapes that deviate with regard to straightness and torsion due to the manufacturing processes. The tolerance of this deviation is determined in the DIN 17615. In the worst case, the deviations of the linear guides correspond to these limit values, however they usually remain below those values. In order to achieve the desired linear guide precision, it is necessary to align the guide by using levelling plates and/or by clamping it on a precisely machined bearing surface. Thereby, tolerances of at least 0.1 mm/1000 mm are achieved.

Basic facts - bearing capacity and life time

The dimensioning of a linear guide is based on the bearing capacity of the individual elements. The bearing capacity is described by:

- the dynamic load rating C
- the static load rating C_0
- the static moments M_{0X}, M_{0Y} and M_{0Z}

According to DIN, the basis of the dynamic load rating is a nominal life time of 100.000 m traverse way. Far Eastern suppliers frequently indicate the load ratings for a nominal life time of 50.000 m; that results in load ratings that are more than 20% higher than the ones according to DIN.

Dynamic Bearing Capacity

The fatigue behaviour of the material determines the dynamic bearing capacity. The life time - the fatigue period - depends on:

- the load of the linear guide
- the traverse speed of the linear guide
- the statistic eventuality of the first case of damage

Working Life

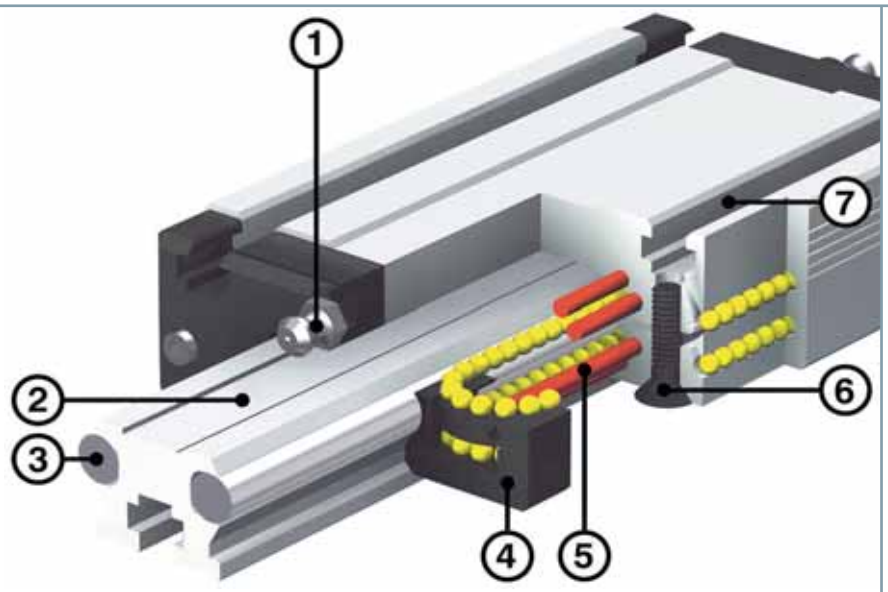
The definition of the working life is the actually reached life time. The working life can be different from the calculated life time.

Premature failure by wear or fatigue can be caused by:

- misalignments between guiding rails or guiding elements
- soiling of the guiding rails
- insufficient lubrication
- oscillating movement with very small strokes (rippling)
- vibrations while standing still (rippling)

Due to the variety of the installation and operation conditions, it is not possible to exactly determine the working life of a linear guide in advance. The safest way to get an applicable estimation of the working life still is the comparison with similar cases of installation.

Functions Overview



Aluminium Bearing Carriage

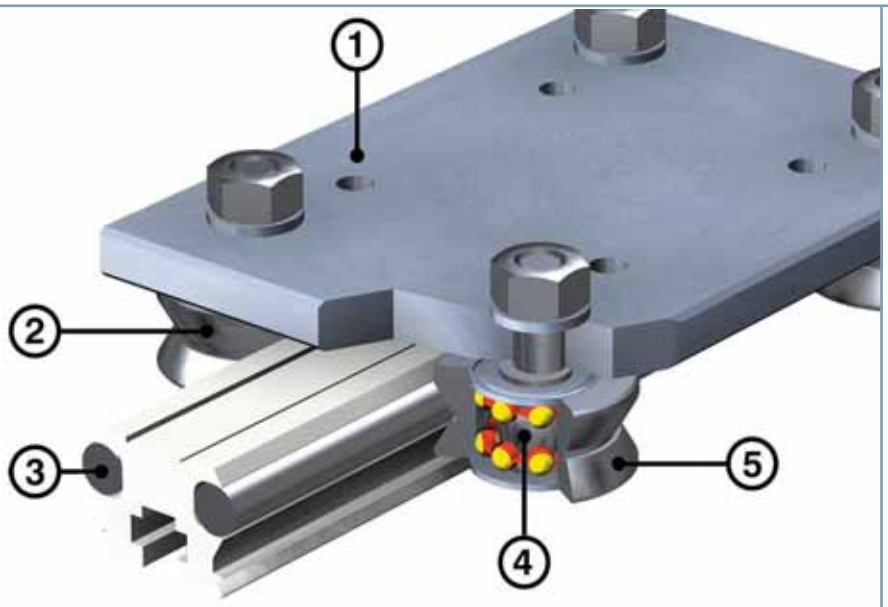
Maximum speed: 5 m/s
High loading capacity

Bearing Carriage.

The patented bearing carriages are especially applicable for constructing complex multi-axis systems for handling and machining. A wide range of models makes it possible to cover many fields of application. Each model can be manufactured with different profile lengths (70, 100, 150 and 200 mm).

1. Lubrication possibilities for the recirculating balls on both sides.
2. The basic carriers of all linear guides are extruded aluminium profiles according to DIN 17615, which are provided with T-groove slots and/or mounting holes.
3. Precision steel shafts with a hardness of 60 ± 2 HRC are used as guide rails. All MLF types are optionally available with stainless steel shafts.
4. The ball recirculation is fibre reinforced.
5. Inside the linear carriage there are patented ball recirculations. Each supporting ball runs between two polished steel pins and the guiding shaft.
6. The adjustment of the carriage takes place by means of self-locking set screws: the ball rows and shafts and/or pins are screwed down and thus prestressed. The carriages are factory-adjusted to the respective prestress. All bearing carriages are optionally available in stainless design.
7. For the attachment of transportation loads, carriage plates etc., the Bearing Carriages are provided with T-groove slots and/or mounting holes.

Functions Overview



Roller Carriage

Maximum speed: 10 m/s
Medium loading capacity

Roller Carriage.

The roller carriages are high-quality transportation linear units, preferably used for the fast positioning of light-weight up to medium-weight loads.

1. The polished fastening steel plate with a thickness of 8 mm is used for taking up the rollers as well as the transportation load. To this purpose it is provided with M6 mounting threads.

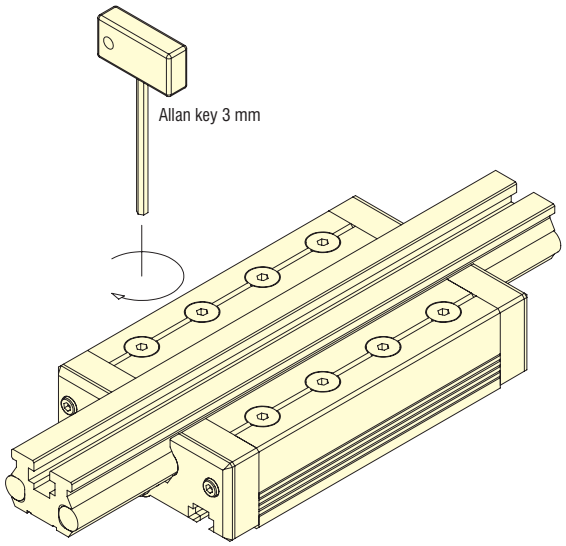
2. Firmly standing centric rollers.

3. All guide rails can be equipped with bearing carriages as well as with roller carriages (for more information, refer to "Bearing Carriages).

4. The roller principle corresponds to a similar double-row ball bearing with gothic track, life-time lubricated, with an axial play of max. 0.01 mm.

5. Eccentric rollers for adjusting the roller carriage. The delivery takes place with factory-presetting. If necessary, the roller carriages can be adjusted according to the desired application.

Adjustments



Aluminium Bearing Carriage

The bearing carriages are adjusted by crosswise tightening the set screws at the bottom side.

The desired prestress depends on the application. Together with the prestress, rigidity, moment loading capacity, guiding precision and traverse resistance increase. The life time decreases.

Maintenance

The cearing carriages must be lubricated once in 300 operating hours, however at least quarterly by using the lubrication nipples located at both faces of the carriages.

The factory presetting is appropriate for the respective data in the concerned product descriptions and describes an average value of the load data.

Note: The sliding onto the guiding rail takes place by slightly pushing forwards and back during the slide-on movement.

Lubricant

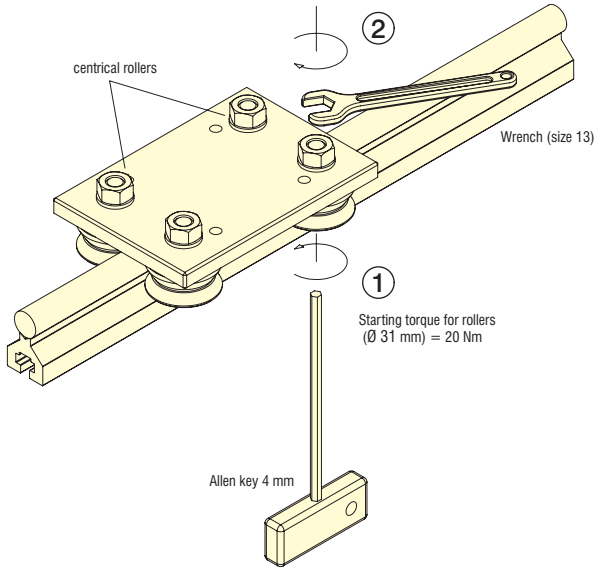
Sodium saponified lubrication grease based on mineral oil, recommended ISO viscosity class: ISO-VG 100 (original grease: gear grease 4223 of the manufacturer Siebert GmbH)

In case of too much prestress, the life time decreases.

Characteristic: The bearing carriage runs sluggishly and can be slided onto the guiding rail only with difficulty.

Lubricants available at
iselautomation KG:
Lubricating grease: item no. **299 031**
Grease gun: item no. **931 170**

Adjustments



Roller Carriage

Step 1:

Adjustment of the eccentric rollers

Using an Allan key, rotate the roller in such a way that the conical tracks are set to the steel shaft of the linear guide. Select the torque in such a way that zero backlash and smooth running between the opposite rollers are ensured.

Step 2:

Tightening of the hexagon nuts

Tighten the hexagon nut with a torque of 20 Nm.
While doing so, keep the rollers in the adjusted position by using an Allan key.

Verification

The roller carriage is adjusted correctly, if all rollers rotate when traversing and the roller carriage runs smoothly.

In case of too much prestress, which results from adjusting the rollers too tightly, the life time decreases.

Characteristic: The roller carriage runs sluggishly and can be slided onto the guiding rail only with difficulty.

Calculation of Working Loads

Calculation of the Effective Load

Different factors have an influence on the load calculation of isel Linear Guides. These are the position of the load center, pull- and push forces, force origins, load- and acceleration forces.

For a linear table on 4 bearings, the bearing forces are determined as a function of the force origins at different load directions.

The calculation is also applicable to a carriage arrangement of 2 carriages.

$L_L/2$ is used then instead of the dimension figure L (see dimensional drawings of the respective Linear Guides).

The load rating for this application is $C_0/2$.

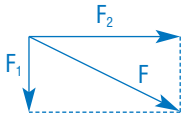
Combined Load

If the load direction of an element does not coincide with one of the main load directions, the equivalent load is calculated as:

$$P = |F_1| + |F_2|$$

If a force F and a moment M load an element at the same time, the following applies for the dynamic equivalent load:

$$P = |F| + |M| \cdot \frac{C_0}{M_{0(XYZ)}}$$



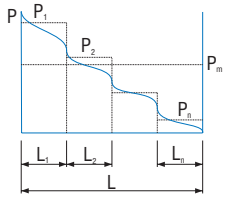
P [N]	dynamic equivalent load
F [N]	applicating force = $\sqrt{F_1^2 + F_2^2}$
F_1 [N]	vertical component, see sketch (4)
F_2 [N]	horizontal component, see sketch (4)
C_0 [N]	static load rating
M [Nm]	applicating moment
$M_{0(XYZ)}$ [Nm]	static moment towards the applicating moment

According to DIN, the dynamic equivalent load should not exceed the value P = 0,5 · C.

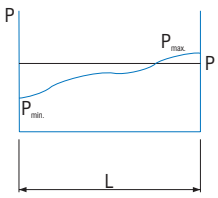
Calculation of the Equivalent Load

Operating conditions

A Gradual change



B Homogeneous change



Equivalent load

$$P = \sqrt[3]{\frac{1}{L} \cdot (P_1^3 \cdot L_1 + P_2^3 \cdot L_2 + P_3^3 \cdot L_{3.....} + P_n^3 \cdot L_n)}$$

$$P = \frac{1}{3} \cdot (P_{min} + 2 \cdot P_{max})$$

P	dynamical equivalent load [N]
$P_{1...n}$	individual load [N]
L	total travel [m]
$L_{1...n}$	individual travel [m]
P_{min}	minimum load [N]
P_{max}	maximum load [N]

Static Safety

Operating conditions	S_0
Normal movement	1,0 - 3,0
High speed	2,0 - 4,0
With jerks and vibrations	3,0 - 5,0

$$S_0 = \frac{C_0}{P_0} = \frac{M_0}{M}$$

S_0	static bearing safety
C_0	static load rating [N]
P_0	static equivalent bearing stress [N]
M_0	static bearing moment [Nm]
M	equivalent static moment [Nm]

Nominal Life Time

90% of a sufficient large quantity of the same bearings reach or exceed the nominal life time, before the first signs of metal fatigue can be seen.

$$L = \left(\frac{C}{P}\right)^3$$

$$L_h = \frac{833}{H \cdot n_{0SZ}} \cdot \left(\frac{C}{P}\right)^3$$

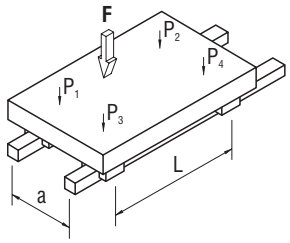
$$L_h = \frac{1666}{V} \cdot \left(\frac{C}{P}\right)^3$$

L [m]	nominal life time in 100.000 m
L_h [h]	nominal life time in operating hours
C [N]	dynamic load rating
P [N]	dynamic equivalent bearing
H [m]	single stroke length of the oscillating movement
n_{0SZ} [min]	number of double strokes per minute
v [m/min]	average traverse speed

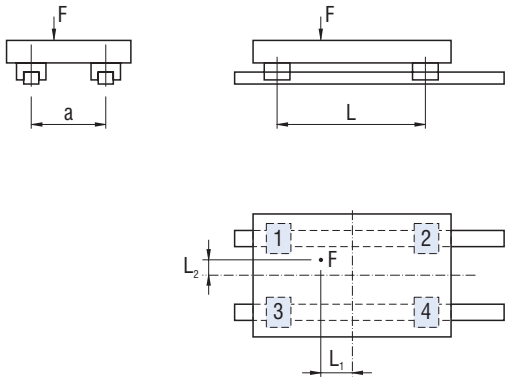
Calculation of Working Loads

Load normal to the table surface

Load applikation



Scale drawing



Load on one carriage

$$P_1 = \frac{F}{4} + \frac{F \cdot L_1}{2L} + \frac{F \cdot L_2}{2a}$$

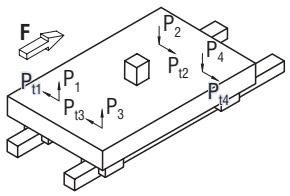
$$P_2 = \frac{F}{4} - \frac{F \cdot L_1}{2L} + \frac{F \cdot L_2}{2a}$$

$$P_3 = \frac{F}{4} + \frac{F \cdot L_1}{2L} - \frac{F \cdot L_2}{2a}$$

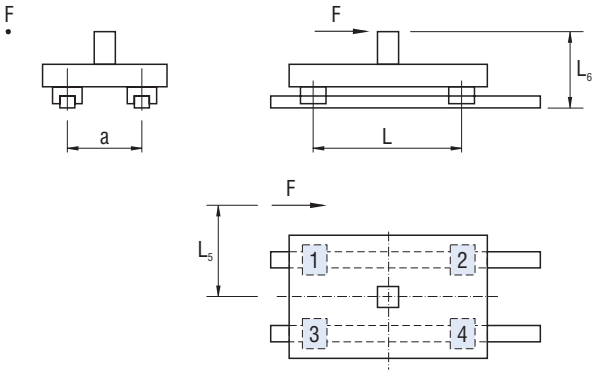
$$P_4 = \frac{F}{4} - \frac{F \cdot L_1}{2L} - \frac{F \cdot L_2}{2a}$$

Load in traversing direction

Load applikation



Scale drawing



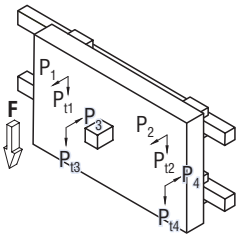
Load on one carriage

$$P_1 \ldots P_4 = \frac{F \cdot L_6}{2L}$$

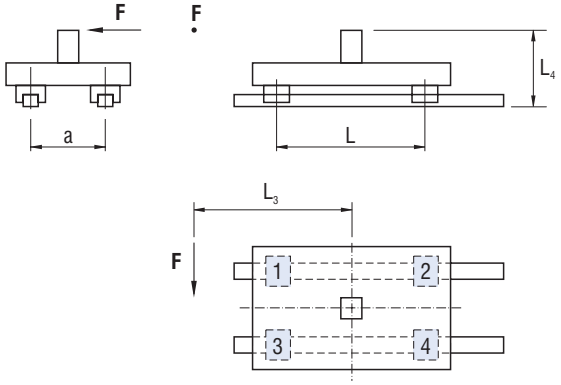
$$P_{t1} \ldots P_{t4} = \frac{F \cdot L_5}{2L}$$

Load across the traversing direction

Load applikation



Scale drawing



Load on one carriage

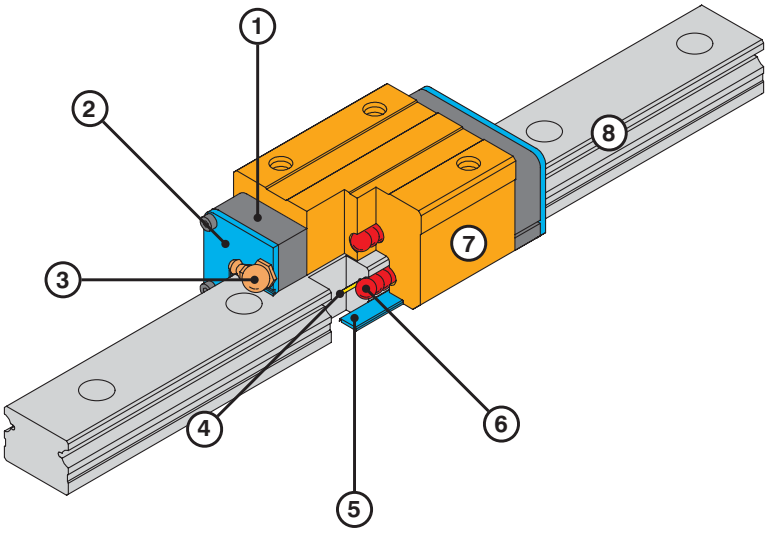
$$P_1 \ldots P_4 = \frac{F \cdot L_4}{2a}$$

$$P_{t1} = P_{t3} = \frac{F}{4} + \frac{F \cdot L_3}{2L}$$

$$P_{t2} = P_{t4} = \frac{F}{4} - \frac{F \cdot L_3}{2L}$$

Steel Profile Rail Guides Overview

Steel Profile Rail Guides



Functions

1. End plate
2. Seal
3. Grease nipple
4. Support ledge
5. Seal
6. Balls
7. Slides
8. Profile rail

Balls

Modern manufacturing methods allow the use of balls that are larger than usual. Due to the redirection units' space-saving construction, more bearing balls can be used. Thus, higher load ratings and a longer lifetime are achieved.

Redirection

The patented redirection system with large redirection radii allows a smooth motion. Due to the longer return way, there are more unloaded balls in the unit, which is positive with regard to the lifetime.

Profile rail

The profile rail guides use a gothic profile. At unloaded state, the balls work with four-point contact.

High precision

The tracks of the steel profile rail guides are drilled in one setting at one go. This procedure ensures maximum precision. During the drilling process, the profile guides are already clamped with the tightening torque that has to be used later. As the same way of fixing is applied when the profile rail guide is used later, there are no additional tolerances to be expected.

Profile rail guides consist of a rail with drilled ball tracks and a slide. Continuously circulating balls ensure a low friction and conclusively connect the slide with the profile guide in two dimensions.

The balls are hold in the slide's track by means of a ledge, so that the units' mounting is possible without any additional means.
On every side, the slide is sealed up against dirt by scraper ledges. The unit is greased by grease nipples that can be mounted on both sides.

mechanics

Steel Profile Rail Guide

LGR 15 R

with slide LGW 15 CA

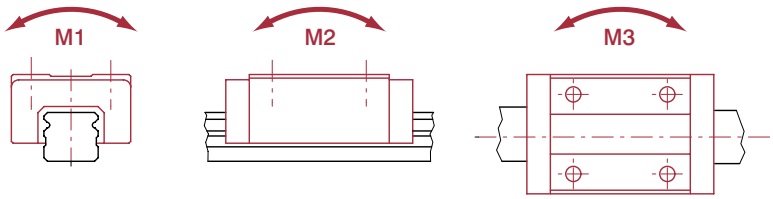
with slide LGH 15 CA

Features

profile rail guide
- W 15 x H 14 mm
- gothic profile
- long lifetime
- high precision
- minimal lubrication
- top-down mounting

Slides
top-down mounting,
at LGW also bottom-up
sealed on every side

	Dynamic load rate [N]	Static load rate [N]	Maximum torque load [Nm]			Mass Carriage [kg]	Mass Rail [kg/m]
	C_{dyn}	C_0	M1	M2	M3	m_w	m_s
LGW15CA	10.400	16.800	135	110	110	0,20	1,46
LGH15CA	10.400	16.800	135	110	110	0,21	1,46



Ordering data

Lengths L [mm]	Item no.
298	235 115 0029
478	235 115 0047
658	235 115 0065
958	235 115 0095
1498	235 115 0149
1918	235 115 0191

Matching:

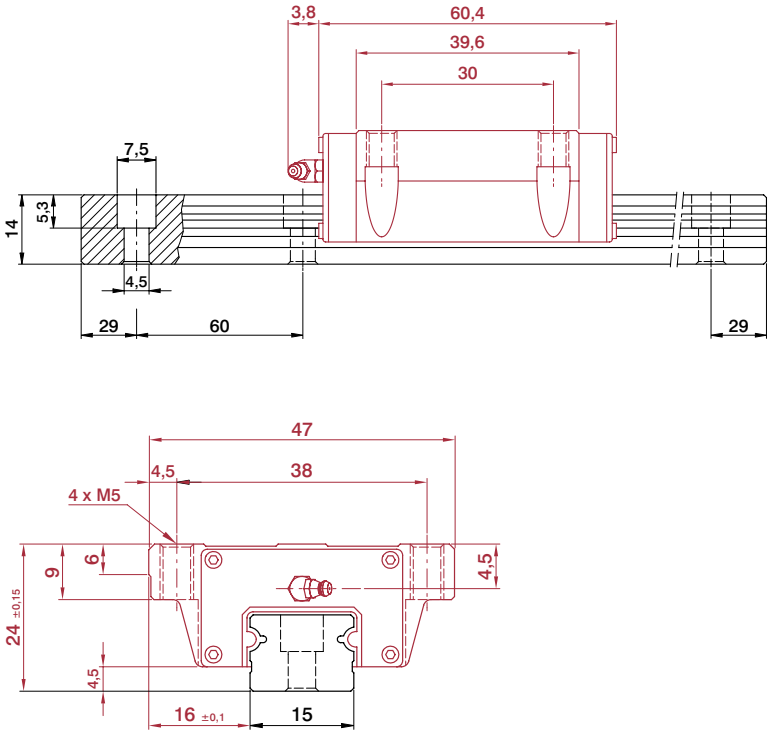
Slide LGW 15 CA
Item no.: **223 500 0150**

Slide LGH 15 CA
Item no.: **223 500 0151**

Steel Profile Rail Guide LGR 15 R

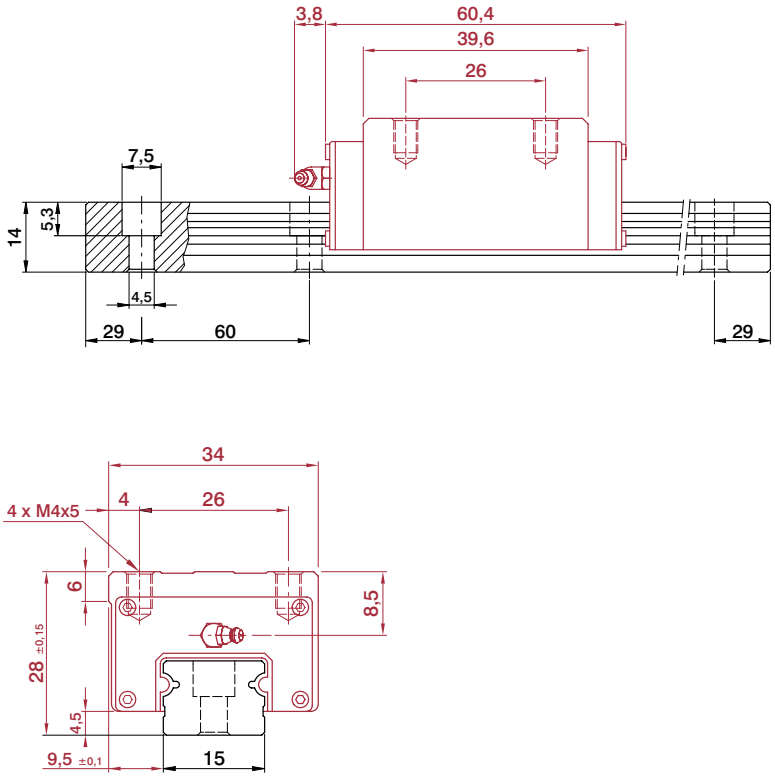
Slide LGW 15 CA

Flange design



Slide LGH 15 CA

Tall design



mechanics

Steel Profile Rail Guide

LGR 20 R

with slide LGW 20 CA

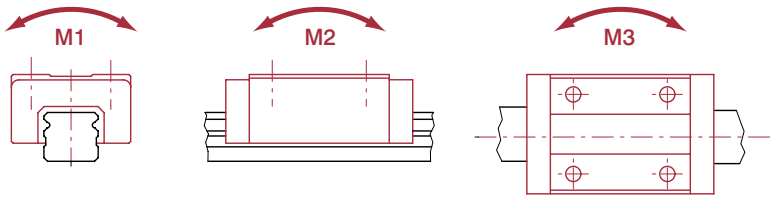
with slide LGH 20 CA

Features

profile rail guide
W 20 x H 15 mm
- gothic profile
- long lifetime
- high precision
- minimal lubrication
- top-down mounting

Slides
top-down mounting,
at LGW also bottom-up
sealed on every side

	Dynamic load rate [N]	Static load rate [N]	Maximum torque load [Nm]			Mass Carriage [kg]	Mass Rail [kg/m]
	C_{dyn}	C_0	M1	M2	M3	m_w	m_s
LGW20CA	16.500	26.700	281	228	228	0,46	2,07
LGH20CA	16.500	26.700	281	228	228	0,37	2,07



Ordering data

Lengths L [mm]	Item no.
298	235 120 0029
478	235 120 0047
658	235 120 0065
958	235 120 0095
1498	235 120 0149
1918	235 120 0191

Matching:

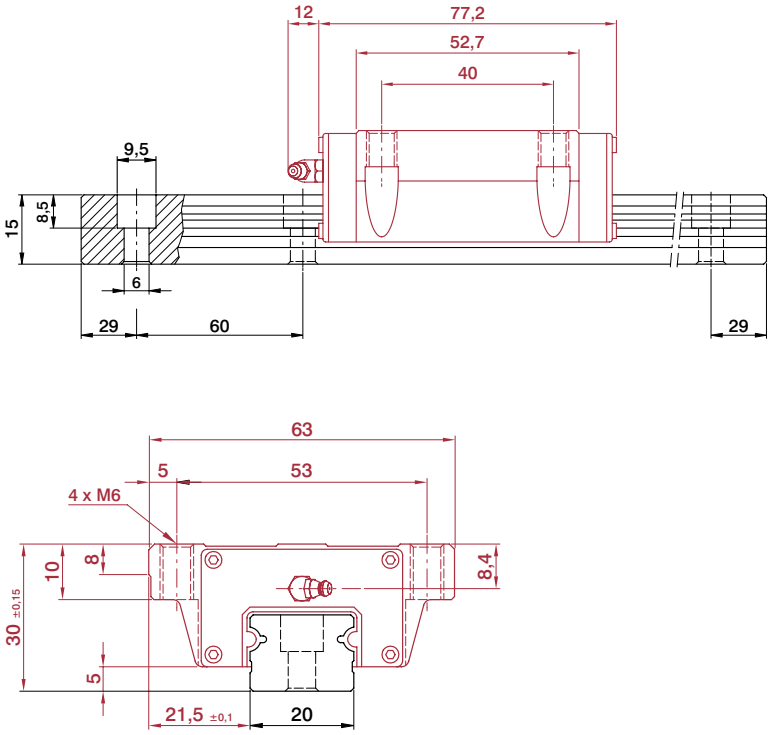
Slide LGW 20 CA
Item no.: **223 500 0200**

Slide LGH 20 CA
Item no.: **223 500 0201**

Steel Profile Rail Guide LGR 20 R

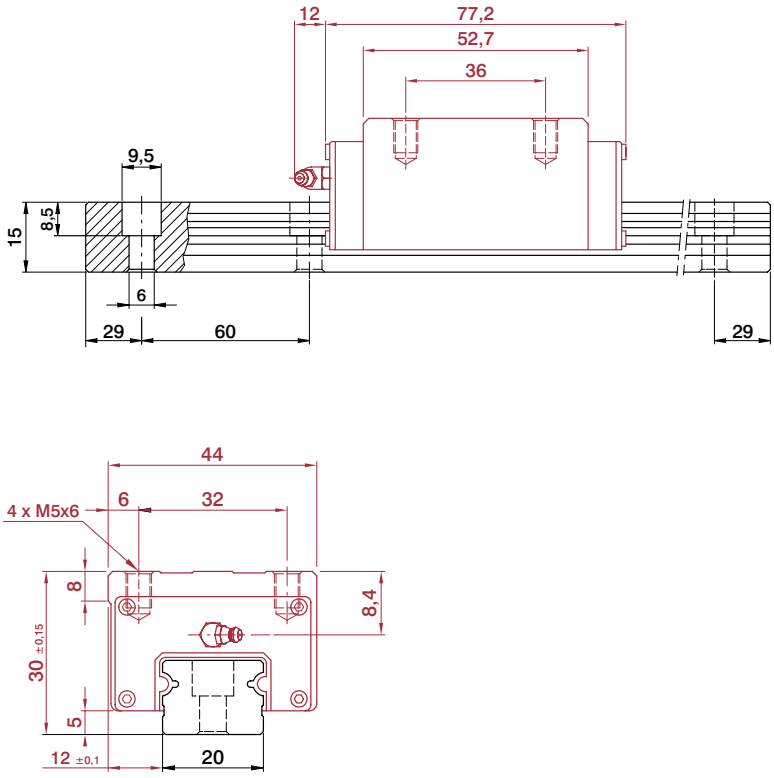
Slide LGW 20 CA

Flange design



Slide LGH 20 CA

Tall design



mechanics

Steel Profile Rail Guide

LGR 25 R

with slide LGW 25 CA

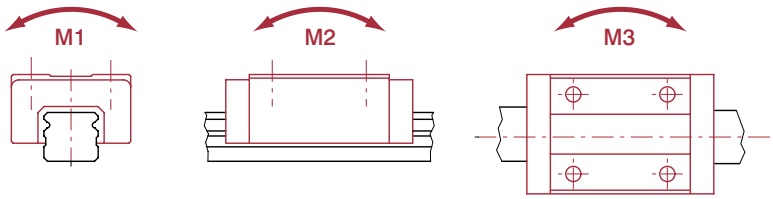
with slide LGH 25 CA

Features

profile rail guide
W 23 x H 20 mm
- gothic profile
- long lifetime
- high precision
- minimal lubrication
- top-down mounting

Slides
top-down mounting,
at LGW also bottom-up
sealed on every side

	Dynamic load rate [N]	Static load rate [N]	Maximum torque load [Nm]			Mass Carriage [kg]	Mass Rail [kg/m]
	C_{dyn}	C_0	M1	M2	M3	m_w	m_s
LGW25CA	24.100	38.800	466	372	372	0,64	3,13
LGH25CA	24.100	38.800	466	372	372	0,59	3,13



Ordering data

Lengths L [mm]	Item no.
298	235 125 0029
478	235 125 0047
658	235 125 0065
958	235 125 0095
1498	235 125 0149
1978	235 125 0197
2998	235 125 0299

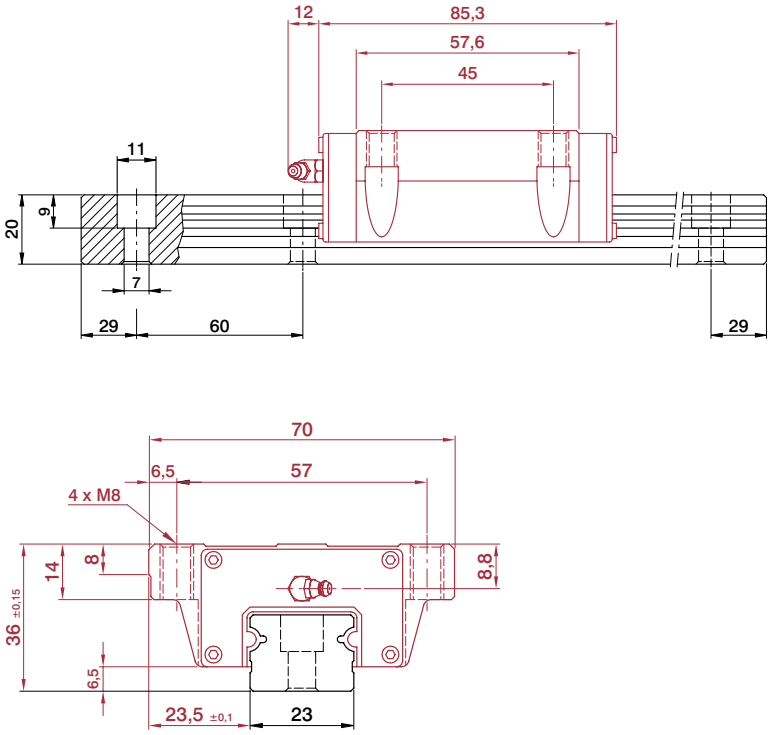
Matching:

Slide LGW 25 CA
Item no.: **223 500 0250**

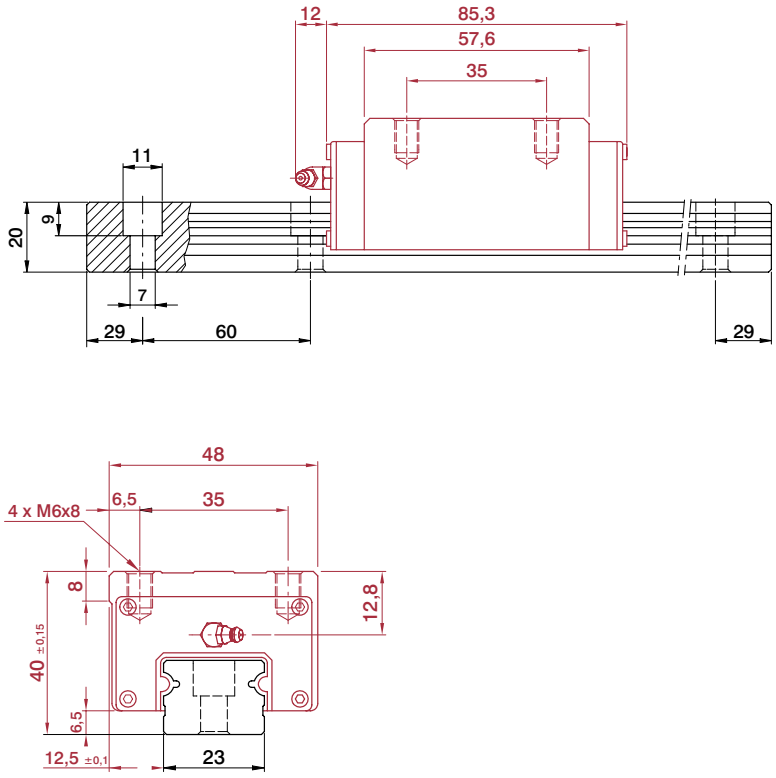
Slide LGH 25 CA
Item no.: **223 500 0251**

Steel Profile Rail Guide LGR 25 R

Slide LGW 25 CA
Flange design



Slide LGH 25 CA
Tall design



mechanics

Steel Profile Rail Guide

LGR 30 R

with slide LGW 30 CA

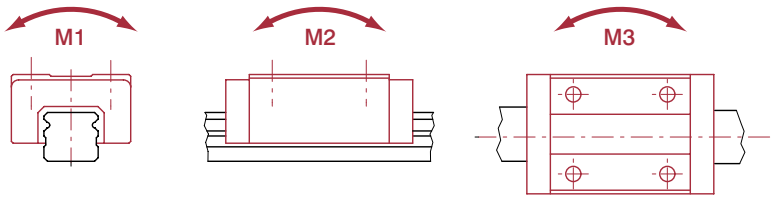
with slide LGH 30 CA

Features

profile rail guide
W 28 x H 23 mm
- gothic profile
- long lifetime
- high precision
- minimal lubrication
- top-down mounting

Slides
top-down mounting,
at LGW also bottom-up
sealed on every side

	Dynamic load rate [N]	Static load rate [N]	Maximum torque load [Nm]			Mass Carriage [kg]	Mass Rail [kg/m]
	C_{dyn}	C_0	M1	M2	M3	m_w	m_s
LGW30CA	33.800	54.600	793	612	612	1,20	4,39
LGH30CA	33.800	54.600	793	612	612	1,04	4,39



Ordering data

Lengths L [mm]	Item no.
238	235 130 0023
478	235 130 0047
638	235 130 0063
958	235 130 0095
1518	235 130 0151
1998	235 130 0199
3038	235 130 0303

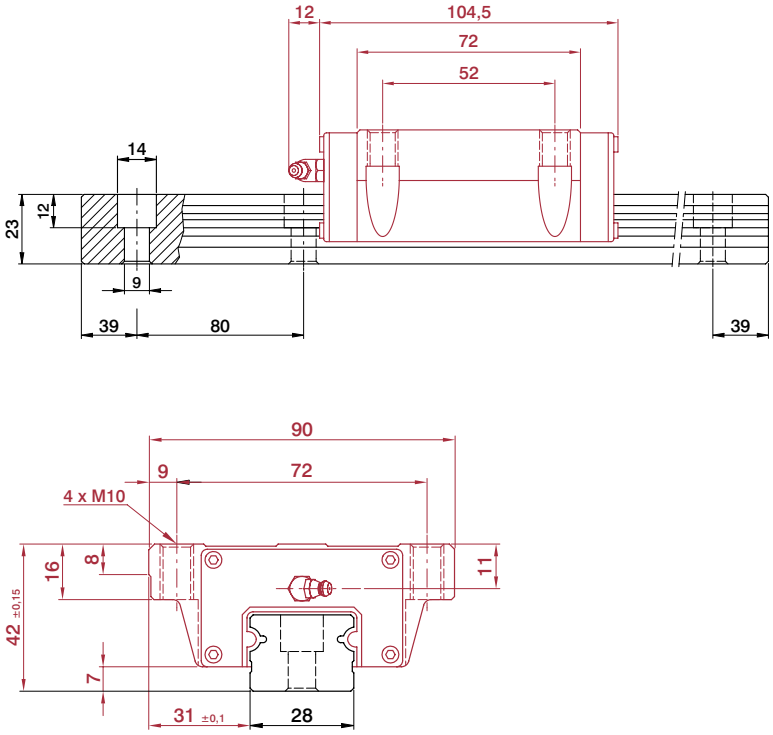
Matching:

Slide LGW 30 CA
Item no.: **223 500 0300**

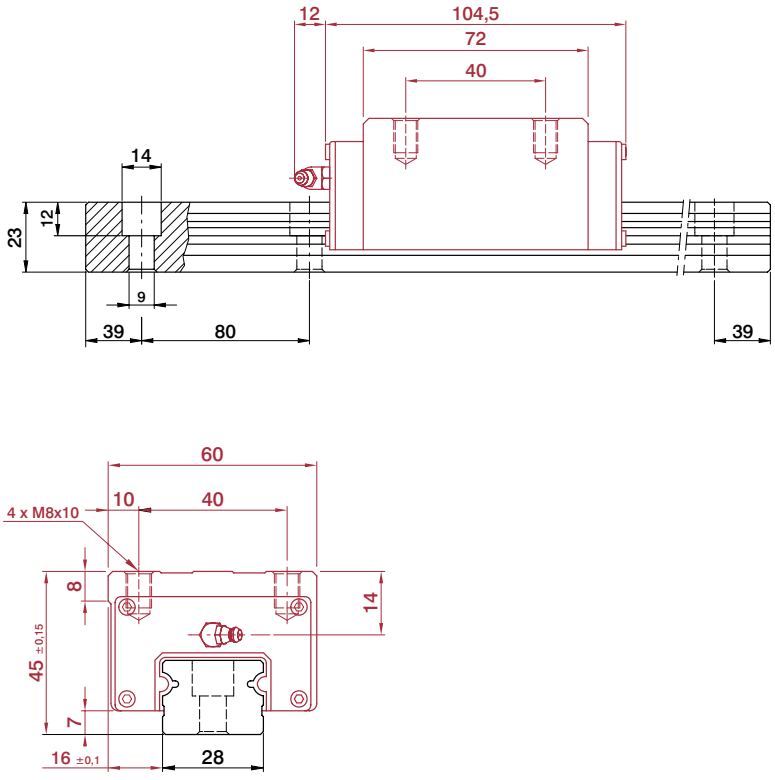
Slide LGH 30 CA
Item no.: **223 500 0301**

Steel Profile Rail Guide LGR 30 R

Slide LGW 30 CA
Flange design



Slide LGH 30 CA
Tall design



General Hints

Load Rates and Lifetime

Static load rate C_0

At normal load, a temporary deformation occurs between the track and the balls. At excessive loads, the tracks are permanently deformed.
The permanent deformation affects the guide's running characteristics.

The static load rate is that load which causes a permanent deformation of 0.0001 x steel roller diameter between track and steel roller at the most loaded spot.

You can learn the static load rate from the tables on the pages B 74 to B 80.
The maximal static load must not exceed the static load rate. Load factors (fw) that correspond to the load have to be considered.
See picture 1C.

Table 1: Static load security

OPERATING CONDITIONS	S_0
Normal movement	1,0 - 3,0
High speed	2,0 - 4,0
With jolts and vibrations	3,0 - 5,0

Formula 1: Static load security

$$S_0 = \frac{C_0}{P_0} = \frac{M_0}{M}$$

S_0 Static load security
C_0 Static load rate [N]
P_0 Statically equivalent bearing load [N]
M_0 Static load torque [Nm]
M Equivalent load torque [Nm]

Dynamic load rate C_{dyn}

The dynamic load rate is that load at which the profile rail guide ensures a travel range of 50 km.

You can learn the dynamic load rate from the tables on the pages B 68 to B 74.

Lifetime

Because of the rolling partners' load, the guides and balls show symptoms of fatigue. The results are pitting as well as flaking of the track surface.

The durability of a profile rail guide is defined as the overall distance covered until the first symptoms of fatigue occur.

Nominal lifetime L

The lifetime that can be reached in practice can be different even at identical loads.
Therefore, the nominal lifetime is used as criterion to predict a profile rail guide's lifetime.

The nominal lifetime is that lifetime which 90% of a large number of identical profile rail guides reach.

The nominal lifetime is calculated according to formula 2.

Formula 2:
Nominal lifetime without consideration of operating factors

$$L = \frac{C_{dyn}}{P}$$

L Nominal lifetime in 50.000 m
C_{dyn} Dynamic load rate [N]
P Dynamically equivalent load [N]

At special environmental factors, the operating factors have to be considered.

Formula 3:
Static load security

$$L = \left(\frac{f_H \cdot f_T \cdot C_{dyn}}{f_W \cdot P}\right)^3$$

L Nominal lifetime in 50.000 m
C_{dyn} Dynamic load rate [N]
P Dynamically equivalent load [N]
fH Hardness factor (picture 1A)
fT Temperature factor (picture 1B)
fW Jolt factor (picture 1C)

General Hints

Calculation of Lifetime

Operating loads

Hardness factor

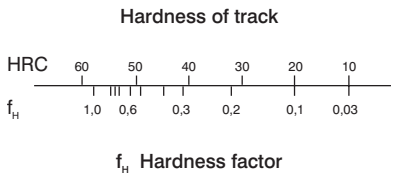
The profile rail guides' tracks have a hardness of 58 HRC.
A hardness factor of 1.0 is applied to this.
At a divergent hardness, the hardness factor according to picture 1A has to be considered.
In case the specified hardness is not reached, the permissible load is reduced. In this case, the dynamic and the static load have to be multiplied by the hardness factor.

Temperature factor

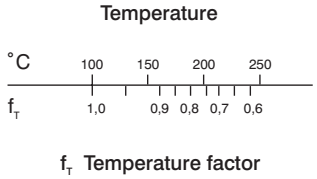
In case the operating temperature of a profile rail guide
exceeds 100 °C, the temperature factor according to picture 1B has to be considered.
In this case, the dynamic and the static load have to be multiplied by the temperature factor.

Load factor

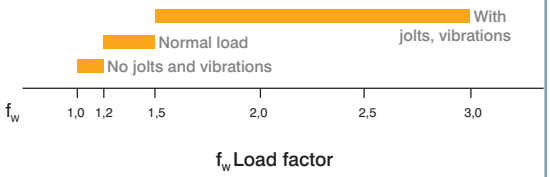
With the load factor, different operating conditions are considered.
At constant loads without any jolts (measuring machines), the load factor is between 1 and 1.2. In case of major vibrations or jolts, a load factor according to picture 1C has to be considered.



picture 1A



picture 1B



picture 1C

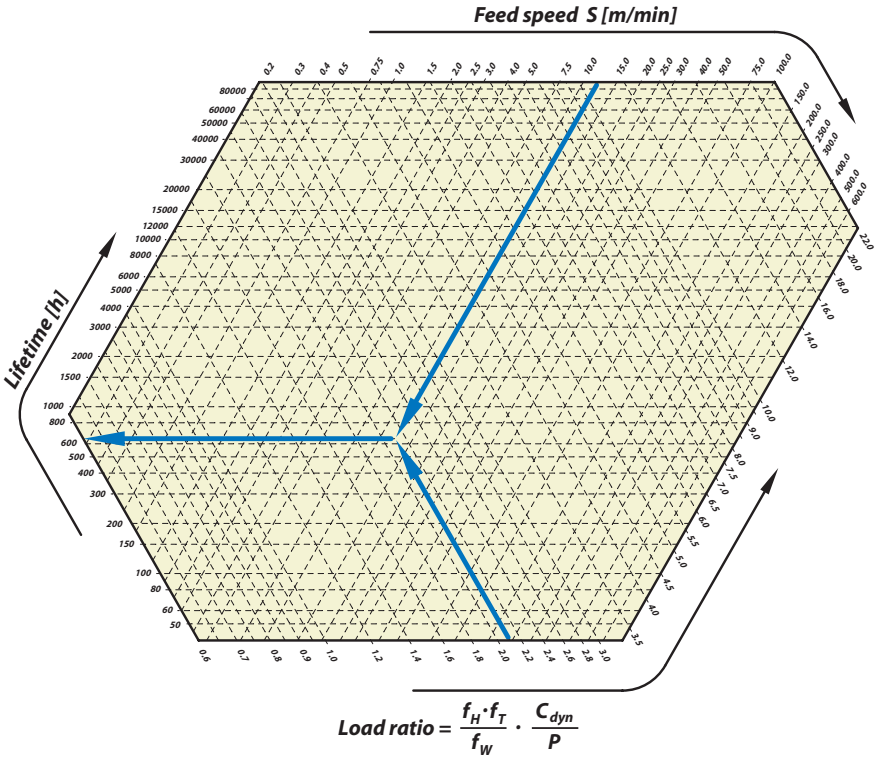
Calculation of lifetime L_h

Picture 2 serves to estimate the lifetime.

Formula 4:
Lifetime of a profile rail guide in hours.

$$L_h = \frac{50.000}{v.60}$$

Lh Lifetime in hours [h]
L Nominal lifetime in 50 km
v Average speed [m/min]
C_{dyn}/P Load rate/load ratio



Drive Components

Overview

Information

The ball screw nuts from iselautomation are of high quality, precise and abrasion-resistant (hardened and polished). Together with the ball screw spindles, they convert rotations into linear movements most friction-poorly.

The ball screw nut is inserted in the respective clamping block and fastened with a stud screw. The ball screw nuts have several ball paths with internal ball return.

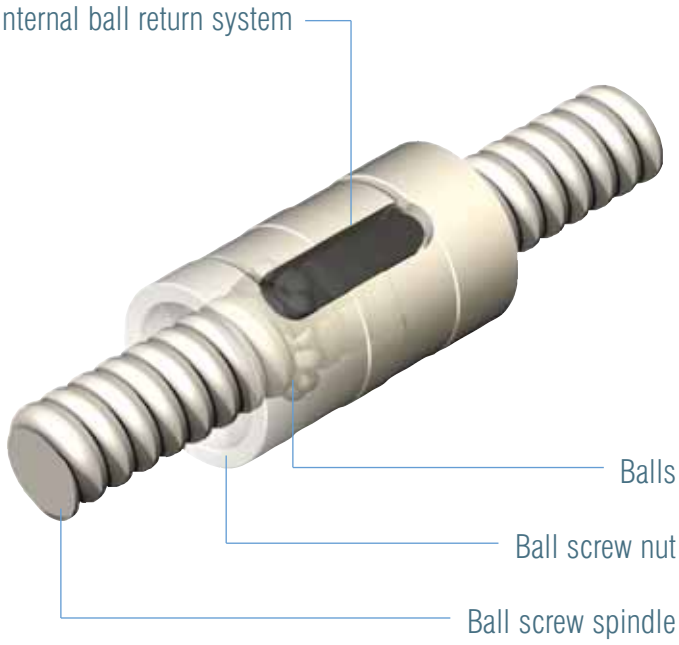
A setscrew on the clamping block makes a clearance-free adjustment of the ball screw spindle's run possible.

The repeatability is less than 0.01 mm at a length of 300 m.
To lubricate the linear drive, a grease nipple is fixed on the clamping block.

The ball screw spindles are produced with modern machines; they are rolled, hardened and polished.

Our linear drives are technically mature and have stood the test in practice for more than 20 years.

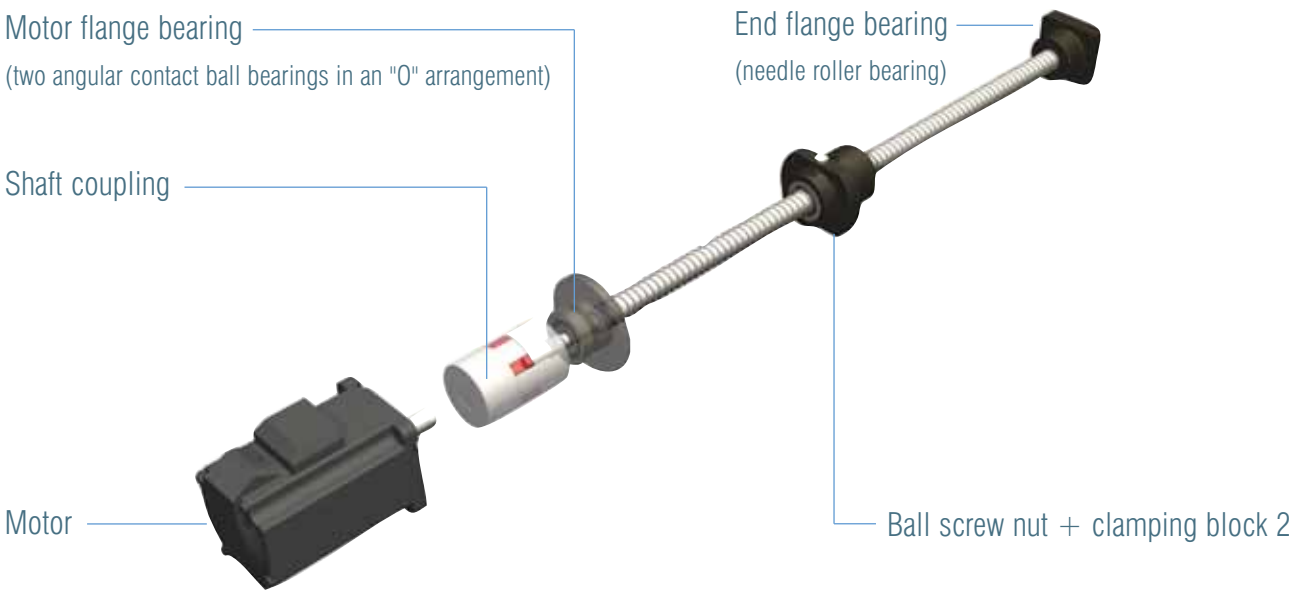
Ball screw nut, ball screw spindle, clamping block, clearance-free adjustment, repeatability, lubrication, production.



Drive Components Overview

Linear Drives

At the employment of linear drives, the directly or via a toothed belt driven spindle is the most frequently applied variant.



Accessory

Shaft coupling: compensation of mismatching shaft ends (see page B 117)
Flange bearing: linear drive bearing (see page B 96)

Shaft couplings

Set consisting of two aluminium shaft coupling parts, three PUR toothed rims (86°, 92°, 98° shore) and corresponding clamping screws.

WK 30/40
for shaft diameters from 6 to 13 mm

WK 40/60
for shaft diameters from 8 to 18 mm

Motor flange bearing

Bearing of the spindle's driving side (fixed bearing end).

Bearing bush with two angular contact ball bearings in an "O" arrangement.

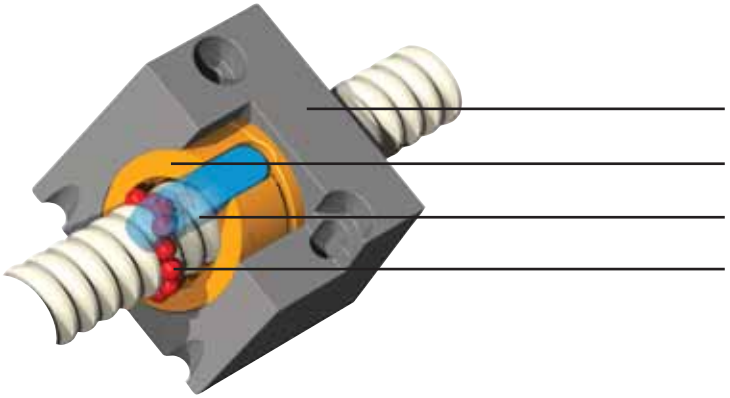
Flange bearing

Bearing of the spindle's floating bearing end.

Bearing bush with to needle roller bearings.

Ball Screw Feed Drives

Functions



isel-ball screw nuts are of high quality, they are precise and abrasion-resistant threaded nuts that, together with the isel-ball screw spindles, convert rotations into linear movements most friction-poorly.

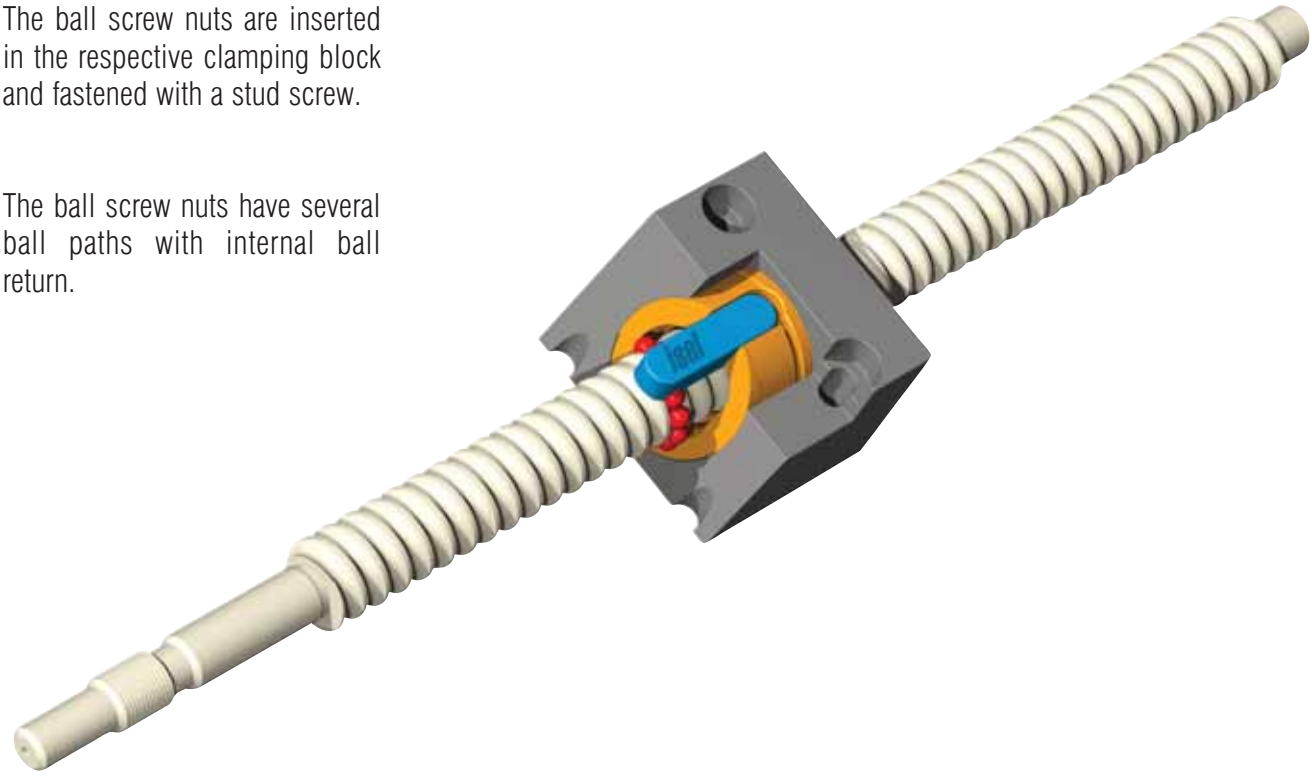
The ball screw nuts are inserted in the respective clamping block and fastened with a stud screw.

The ball screw nuts have several ball paths with internal ball return.

The ball screw nuts make a clearance-free adjustment of the ball screw spindle's run possible.

The repeatability is less than 0.01 mm at a length of 300 m.

To lubricate the linear drive, a grease nipple is fixed on the clamping block.



Ball Screw Feed Drives

Treatment of shaft ends

1

2

1 Shaft ends not treated
2 Shaft ends treated on both sides

Ball screw nut

Clamping blocks

Housing block

Flange housing

Ball Screw Spindle Ø16

Features

- Ø 16 mm, rolled, hardened and polished
- material CF 53, inductively hardened (HRC 60±2); (for more detailed information, see DIN 17212)
- pitches: 2,5 / 4 / 5 / 10 and 20 mm
- available in lengths up to 3,052 mm
- shaft ends treated according to the isel-standards or customer-specifically (see "available lengths")
- made according to DIN 69051, part 3, type of tolerance 7

Options

- customer-specific treatment of shaft ends

Available lengths

Shaft ends not treated

- 452 mm
- 552 mm
- 652 mm
- 752 mm
- 852 mm
- 952 mm
- 1052 mm
- 1252 mm
- 1552 mm
- 1752 mm
- 2052 mm
- 2252 mm
- 2752 mm
- 3052 mm

Special lengths according to drawing: 211 13X 0998

Shaft ends treated on both sides

- 368 mm
- 468 mm
- 568 mm
- 668 mm
- 768 mm
- 868 mm
- 968 mm
- 1068 mm
- 1168 mm
- 1268 mm
- 1368 mm
- 1468 mm
- 1568 mm
- 1668 mm
- 1768 mm
- 1868 mm
- 1968 mm
- 2068 mm
- 2168 mm
- 2268 mm
- 2368 mm
- 2468 mm
- 2568 mm
- 2668 mm
- 2768 mm
- 2868 mm
- 2968 mm
- 3068 mm

Special lengths according to drawing: 211 13X 5999

Ordering data

Groove Nut

- self-locking
- M 10 x 0,75 mm

Item no.: **890257 0011**

Order key

211 13X XXXX

Pitch
2 = 2,5 mm
3 = 4 mm
4 = 5 mm
5 = 10 mm
6 = 20 mm

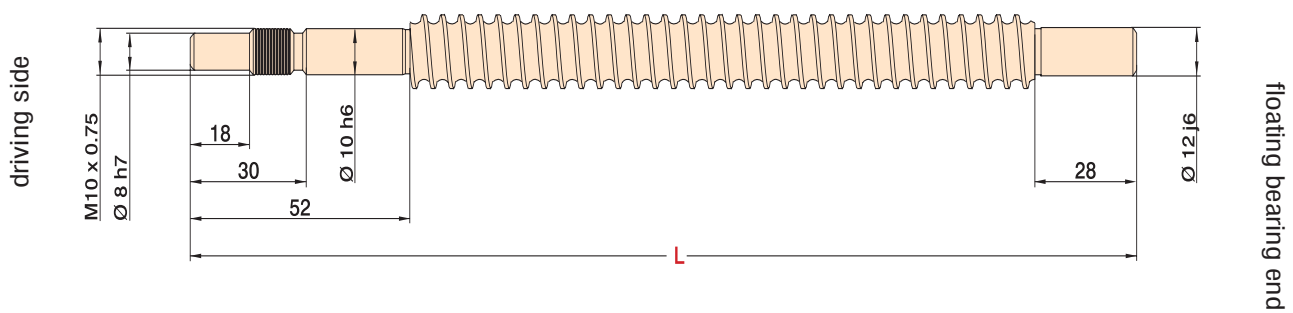
Treatment of shaft ends
0 = not treated
5 = two-sided

Lengths
e.g. 045 = 452 mm
086 = 868 mm
305 = 3052 mm
(reduced by the last digit)

Permissible combinations, see "available lengths"!

Scale Drawing

Shaft ends treated on both sides



Ball Screw Spindle Ø25

Features

- Ø 25 mm, rolled, hardened and polished
- material CF 53, inductively hardened (HRC 60 ± 2); (for more detailed information, see DIN 17212)
- pitches: 5 / 10 and 20 mm
- available in lengths up to 3,052 mm
- shaft ends treated according to the isel-standards or customer-specifically (see "available lengths")
- made according to DIN 69051, part 3, type of tolerance 7

Options

- customer-specific treatment of shaft ends

Available lengths

Shaft ends not treated

- 500 mm
- 1000 mm
- 1500 mm
- 2000 mm
- 2500 mm
- 3000 mm

Special lengths according to drawing: 211 14X 0999

Shaft ends treated on both sides

- 295 mm
- 395 mm
- 495 mm
- 595 mm
- 695 mm
- 795 mm
- 895 mm
- 995 mm
- 1095 mm
- 1195 mm
- 1295 mm
- 1395 mm
- 1495 mm
- 1595 mm
- 1695 mm
- 1795 mm
- 1895 mm
- 1995 mm
- 2095 mm
- 2195 mm
- 2295 mm
- 2395 mm
- 2495 mm
- 2595 mm
- 2695 mm
- 2795 mm
- 2895 mm
- 2995 mm

Ordering data

Groove Nut

- self-locking
- M 17 x 1,0 mm

Item no.: **890259 0011**

Order key

211 14X XXXX

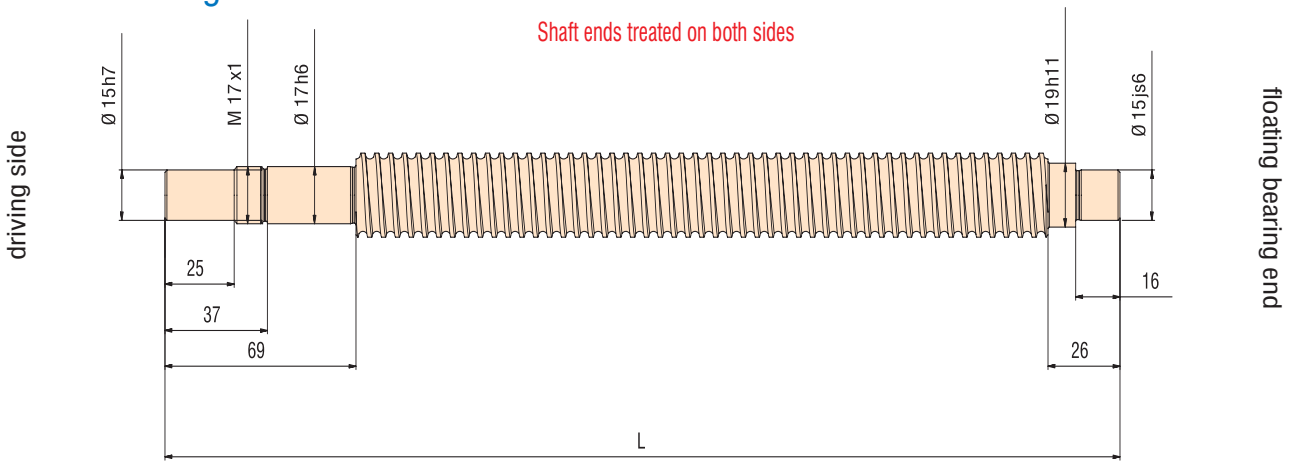
Pitch
4 = 5 mm
5 = 10 mm
6 = 20 mm

Treatment of shaft ends
0 = not treated
2 = two-sided

Lengths
e.g. 050 = 500 mm
100 = 1000 mm
289 = 2895 mm
(shortened by the last digit)

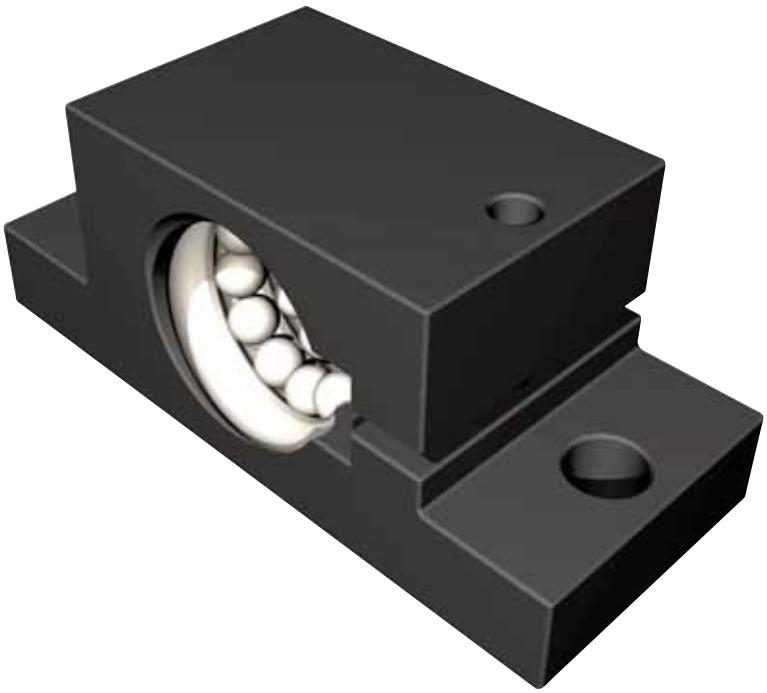
Permissible combinations, see "available lengths"!

Scale Drawing



Ball Screw Nut

Version 1a - Ø16



Features

- material 20MnCr5, ground
- versions for
  ball screw spindle Ø 16
- nut pitch: 5 mm
- balls are redirected internally
- with foot mounting

Load rates

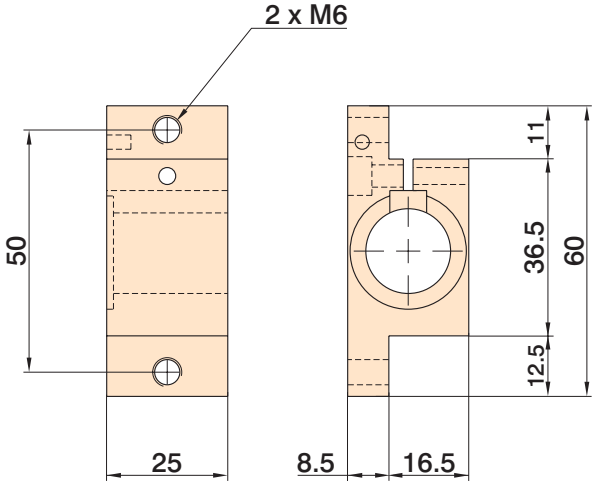
Pitch	Major diameter	Dynamic load rate	Static load rate
5 mm	16 mm	4600 N	7200 N
4 mm	16 mm	2600 N	4200 N

Ordering data

for spindle Ø 16 only

Pitch	Item no.
5	213 001 1000
4	213 002 1000

Scale Drawings



Ball Screw Nut

Version 1b - Ø16

Features

- material 20MnCr5, rolled, hardened and polished
- versions for ball screw spindle Ø 16 mm
- nut pitch: 5/10/20 mm
- balls are redirected internally
- with foot mounting

Load rates

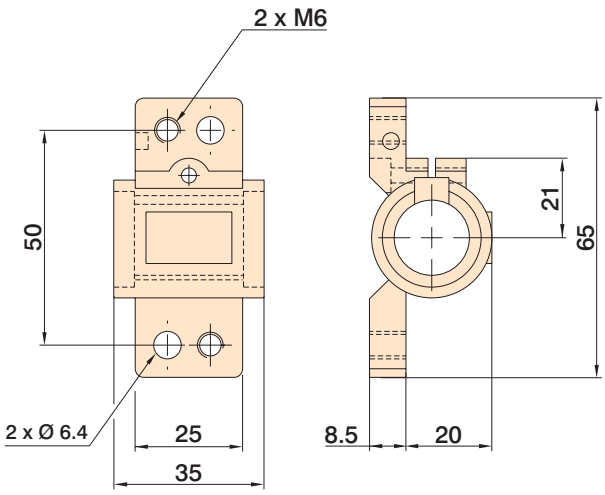
Pitch	Major diameter	Dynamic load rate	Static load rate
5 mm	16 mm	4600 N	7200 N
10 mm	16 mm	4200 N	6500 N
20 mm	16 mm	1900 N	2500 N

Ordering data

for spindle Ø 16 only

Pitch	Item no.
5	213 005 9999
10	213 010
20	213 020

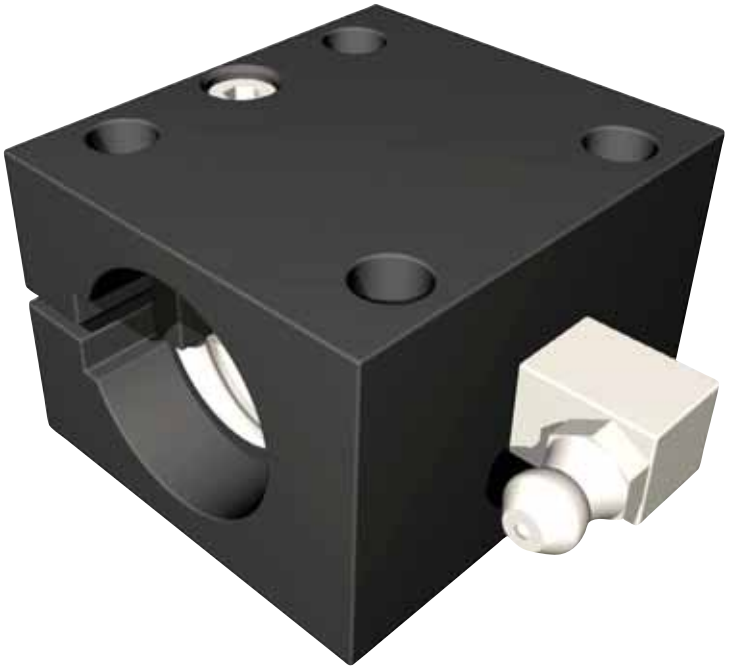
Scale Drawings



mechanics

Ball Screw Nut

Version 2 - Ø16



Features

- material 20MnCr5, ground
- versions for ball screw spindle Ø 16 mm
- nut pitch: 2.5/4/5/10 mm
- balls are redirected internally
- as casing with foot mounting
- additional lubrication by grease nipples

Load rates

Pitch	Major diameter	Dynamic load rate	Static load rate
2,5 mm	16 mm	3500 N	5500 N
4 mm	16 mm	4600 N	7200 N
5 mm	16 mm	4600 N	7200 N
10 mm	16 mm	4200 N	6500 N

Ordering data

for spindle Ø 16 only

Pitch	Item no.
2,5	213 003 1003
4	213 003 1004
5	213 003 1005
10	213 003 1010

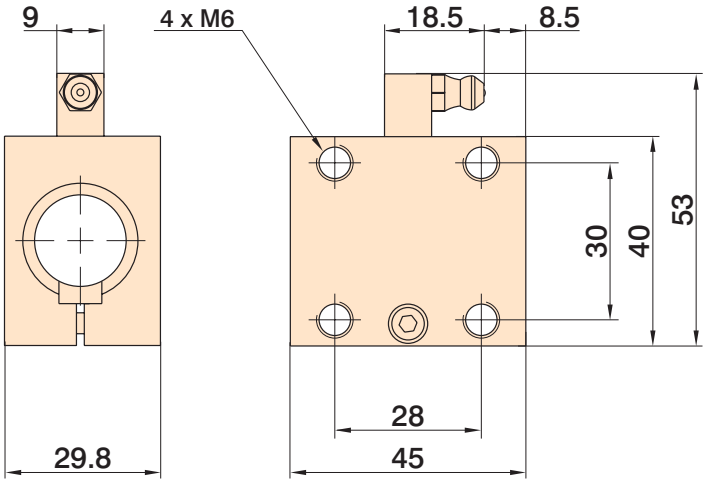
Matching:

Wipers

- Packaging unit: 2 pieces

Item no.: **613 502**

Scale Drawings



Ball Screw Nut

Version 3 - Ø16 Ø25

Features

- material 16MnCr5, ground
- versions for ball screw spindles Ø 16 and Ø 25 mm
- nut pitches: 2,5 / 4 / 5 / 10 and 20 mm (Ø16 mm) 5 / 10 and 20 mm(Ø 25 mm)
- balls are redirected internally
- separate clamping blocks for foot and flange mounting
- the version with nut pitch 20 is delivered with wipers

Load rates

Pitch	Major diameter	Dynamic load rate	Static load rate
2,5 mm	16 mm	3500 N	5500 N
4 mm	16 mm	4600 N	7200 N
5 mm	16 mm	4600 N	7200 N
10 mm	16 mm	4200 N	6500 N
20 mm	16 mm	1900 N	2500 N
5 mm	25 mm	12600 N	5100 N
10 mm	25 mm	12600 N	5100 N
20 mm	25 mm	8800 N	3570 N

Ordering data

for spindle Ø 25 only

Pitch	Item no.
5	213 700 0005
10	213 700 0010
20	213 700 0020

Matching:

Wipers
- Packaging unit: 2 pieces

Item no.: **613 503**

for spindle Ø 16 only

Pitch	Item no.
2,5	213 503
4	213 514
5	213 505
10	213 510
20	213 520

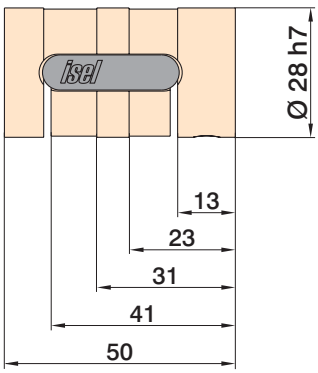
Matching:

Wipers
- Packaging unit: 2 pieces

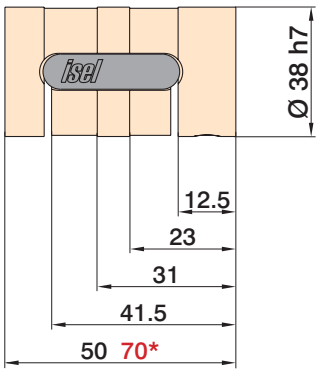
Item no.: **613 502**

Scale Drawings

for spindle Ø 16



for spindle Ø 25



*) At pitch = 20

Clamping Blocks

for Nut Version 3

Flange mounting

Foot mounting

Features

- material 16MnCr5, rolled, hardened and polished
- versions for ball screw spindles Ø 16 and Ø 25 mm
- nut pitches:
  5 / 10 and 20 mm (Ø25 mm)
  2,5 / 4 / 5 / 10 and 20 mm (Ø16 mm)
- ball screw nuts are clearance-free adjustable
- separate clamping blocks for foot and flange mounting

Ordering data

Clamping block 1 Ø16
Foot mounting

Pitch	Item no.
all	213 500

Clamping block 2 Ø16
Flange mounting

Pitch	Item no.
all	213 501

Clamping block 1 Ø25
Foot mounting

Pitch	Item no.
5 / 10	213 700 9001
20	213 700 9002

Clamping block 2 Ø25
Flange mounting

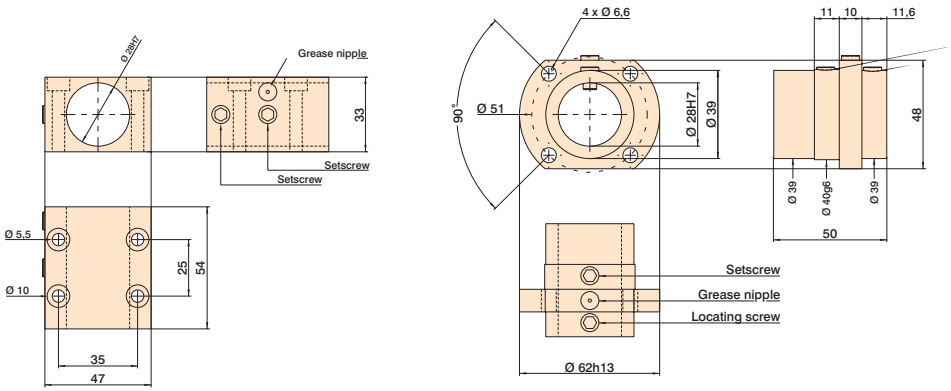
Pitch	Item no.
5 / 10	213 700 9003
20	213 700 9004

Clamping Blocks

for Nut Version 3

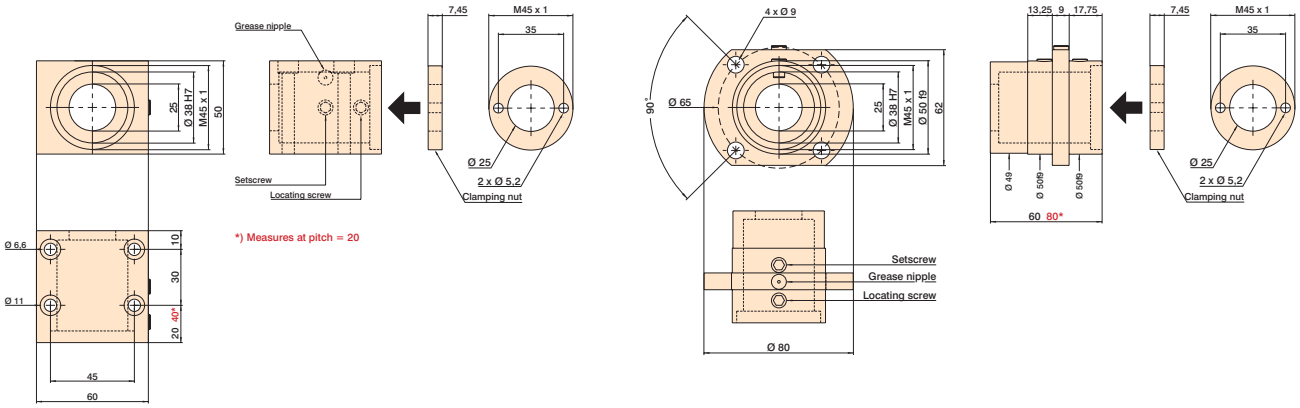
Scale Drawings

Clamping blocks for spindle Ø 16



Scale Drawings

Clamping blocks for spindle Ø 25



Flange Bearings

for Spindle Ø16 mm

Flange bearing
driving side

Flange bearing
floating bearing end

Features

- bearing of the spindle's driving side (fixed bearing end) and the spindle's floating bearing end
- flange bearing - driving side: bearing bush with to angular contact ball bearings in an "O" arrangement
- flange bearing - floating bearing end (counter bearing): bearing bush with driven-in needle bearing

Ordering data

Flange bearing driving site

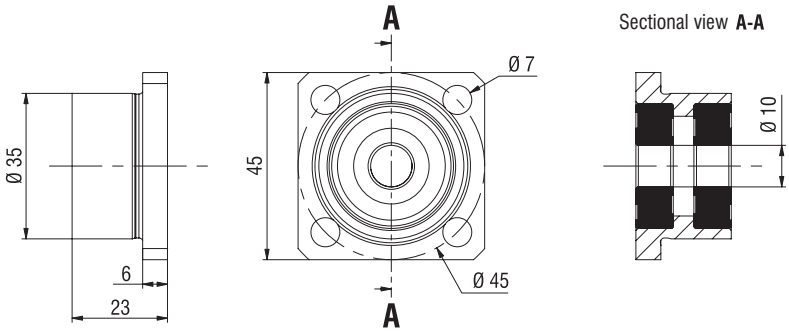
Item no.: **216 504 0001**

Flange bearing floating bearing end

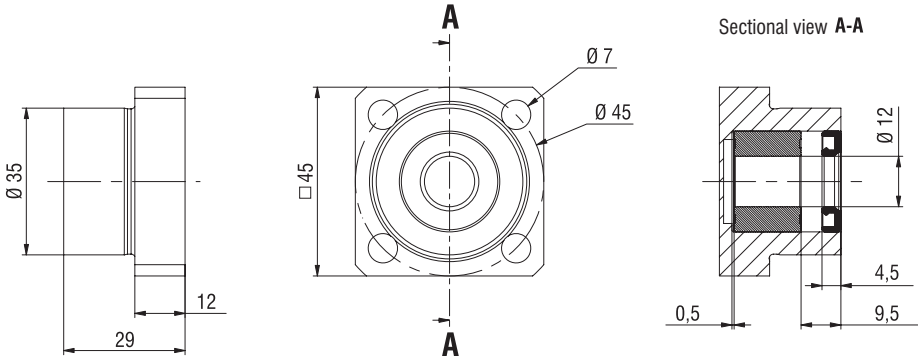
Item no.: **216 504 0002**

Scale Drawings

Flange bearing
driving side



Flange bearing
floating bearing end



Flange Bearings

for Spindle Ø25 mm

Flange bearing
driving side

Flange bearing
floating bearing end

Features

- bearing of the spindle's driving side (fixed bearing end) and the spindle's floating bearing end
- flange bearing - driving side: bearing bush with two driven-in angular contact ball bearings in an "O" arrangement
- flange bearing - floating bearing end (counter bearing): bearing bush with driven-in needle bearing

Ordering data

Flange bearing driving site

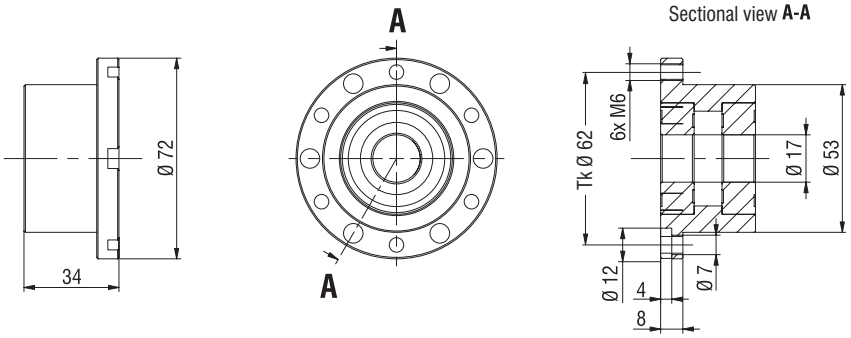
Item no.: **216 504 0006**

Flange bearing floating bearing end

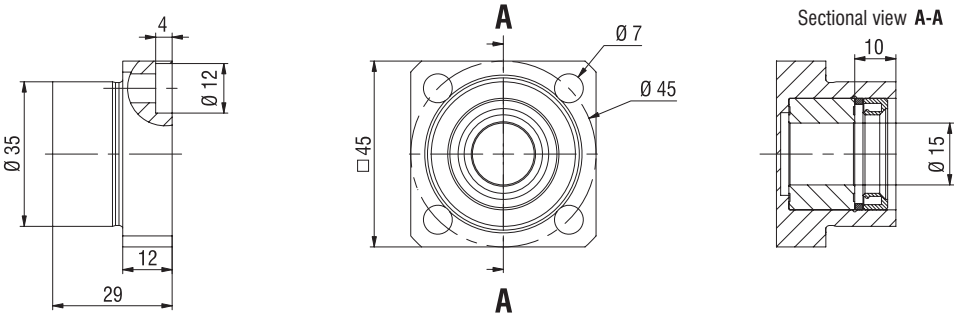
Item no.: **216 504 0005**

Scale Drawings

Flange bearing
driving side



Flange bearing
floating bearing end



mechanics

Linear Units

Overview

Linear Units

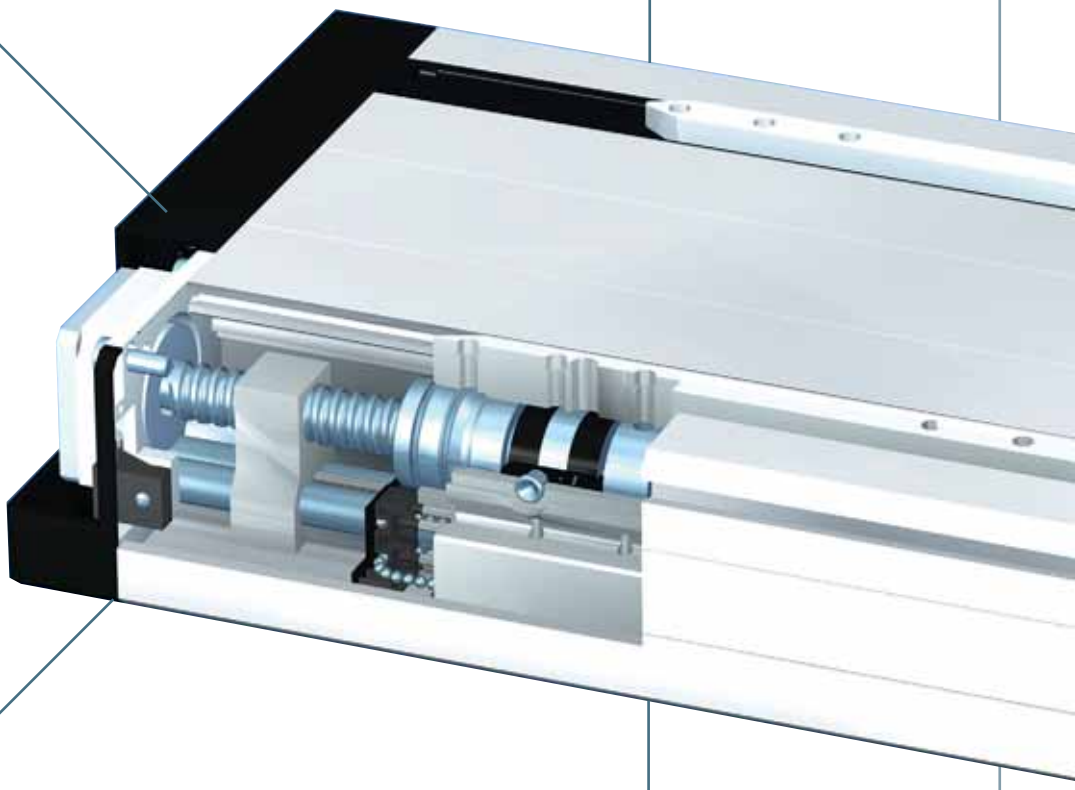
Overview

Functions

LF 5 (as an example)

Synthetic protective cap
electromagnetically shielded

Clamping surface
plan-milled

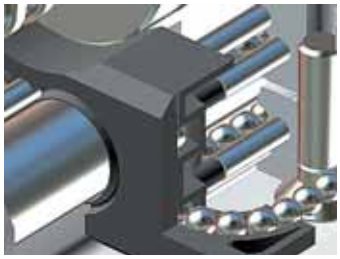


Shaft-holding shape
precisely milled

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

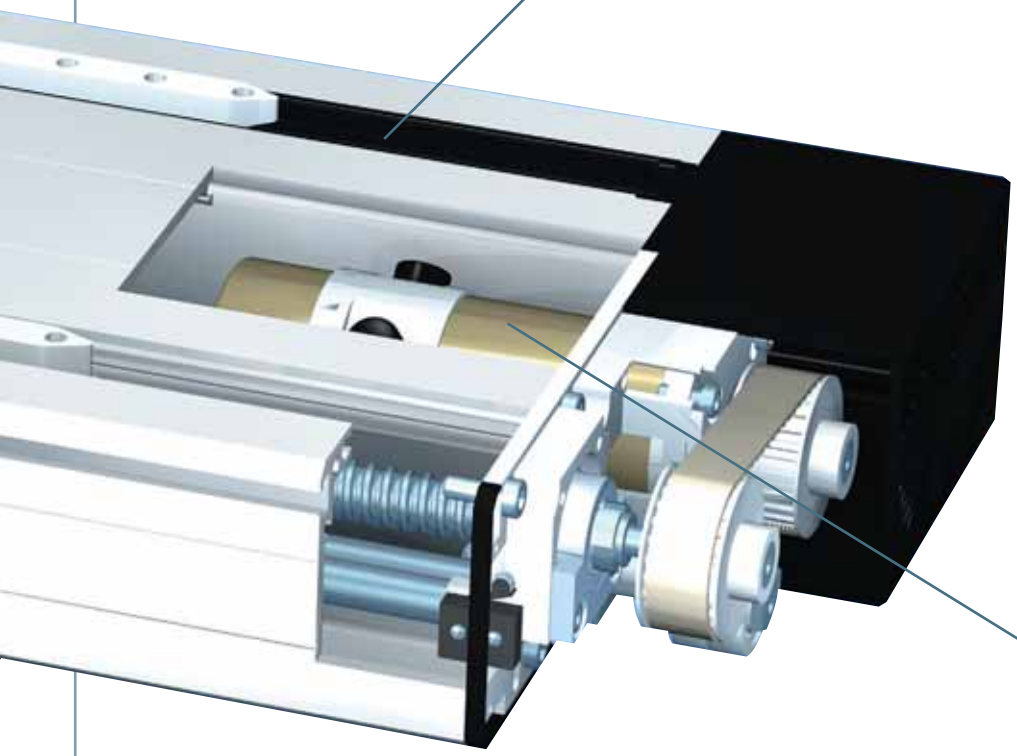


- ball circulation in the patented aluminium linear slide
- glass-fibre reinforced redirection parts with wipers

Functions LF 5

LF 5 (as an example)

Abrasion-resistant sealing lips
for the protection of the guiding elements



Motor
integrated into the profile

- 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

- Rreversing belt and connection electronics completely covered by protective cap

mechanics

Ball Screw Feed Axis

LF 4

LF 4 prepared for flange-mounted direct drive modules

LF 4 with lateral belt drive module

Order key

234 XXX 0XXX

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

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

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

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)

Drive Components

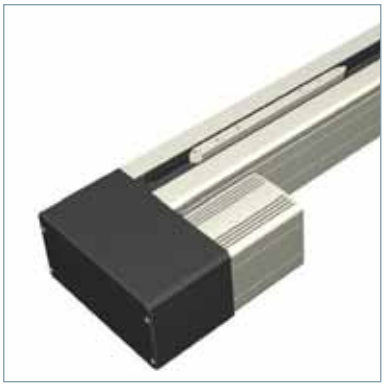
Preparation - direct drive

Direct drive module 1

Direct drive module 2

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)

Preparation - belt drive



Belt drive module

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

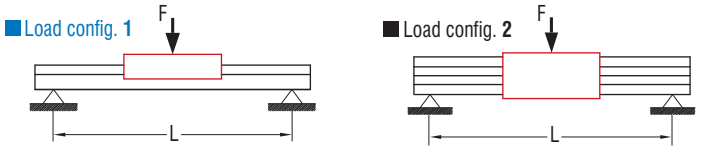
Technical Data

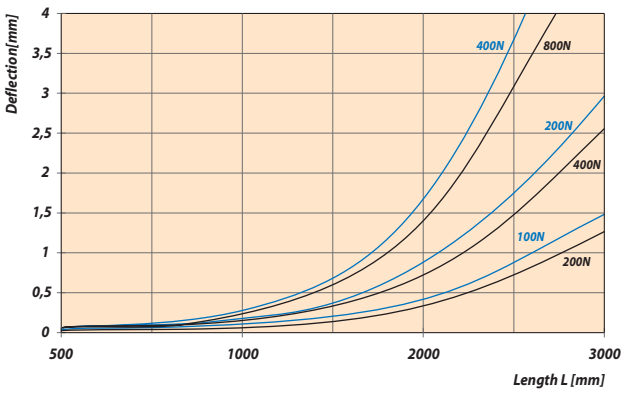
Aluminium profile

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	AlMgSiO, 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

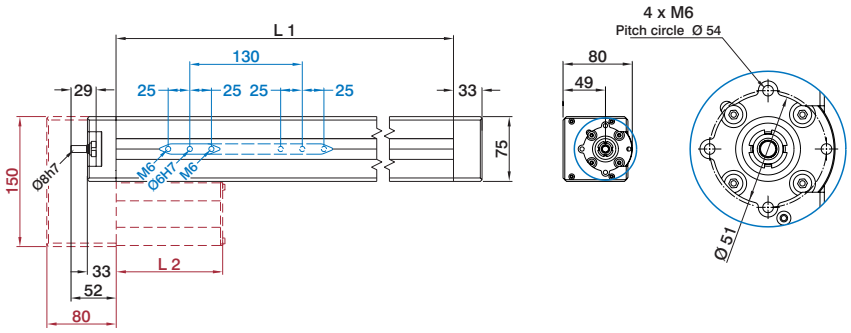
Travel range at WS 5/70 = L1 - 150 mm Travel range at WS 5/200 = L1 - 280 mm		
Length L2 [mm]	with ventilator	without ventil.
Stepping motor MS 135 H	-	107,5
Stepping motor MS 160	187,5	157,5
DC servo motor MV 120	217,5	187,5
Technical data of the motors can be found on page B 112!		

Deflection



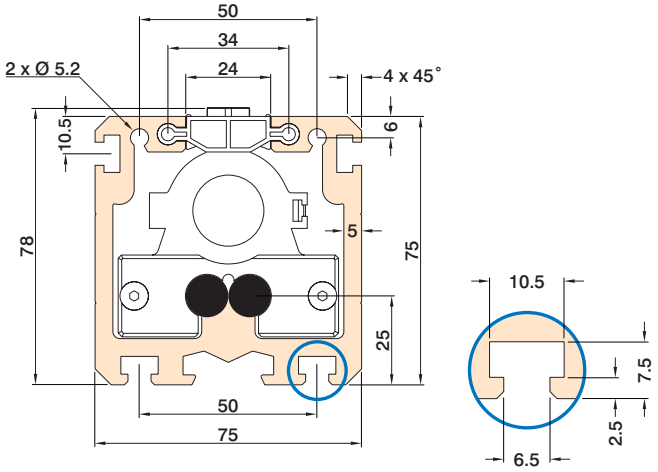


Scale Drawing



Scale Drawing

Aluminium profile



mechanics

Ball Screw Feed Axis

LF 6

LF 6 prepared for flange-mounted direct drive modules

LF 6 with lateral belt drive module

Order key

234 XXX 0XXX

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

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

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

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)

Drive Modules

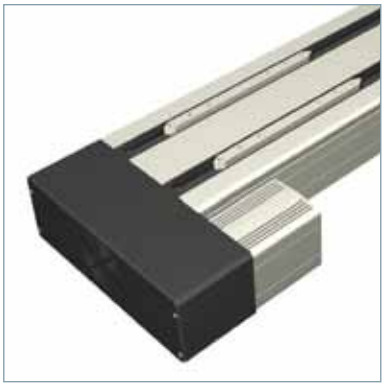
Preparation - direct drive

Direct drive module 1

Direct drive module 2

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)

Preparation - belt drive



Belt drive module

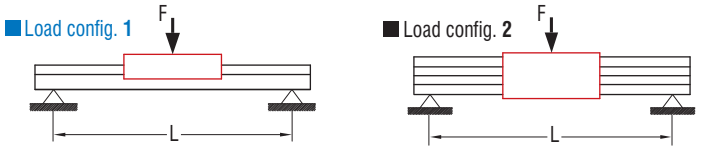
see scale drawing (page B 105)

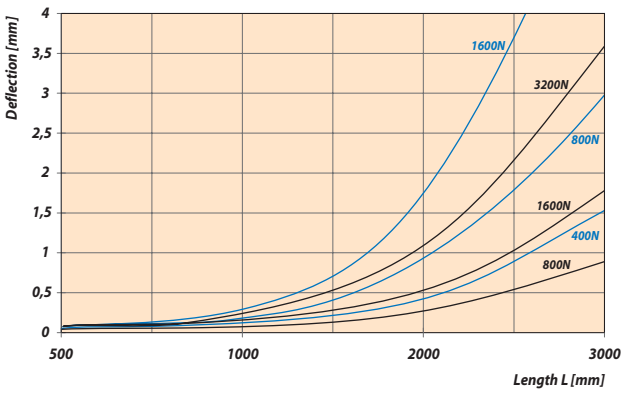
Ball Screw Feed Axis LF 6

Nominal torques

Nominal torque [Ncm]					
Revolutions [1/min] 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

Deflection





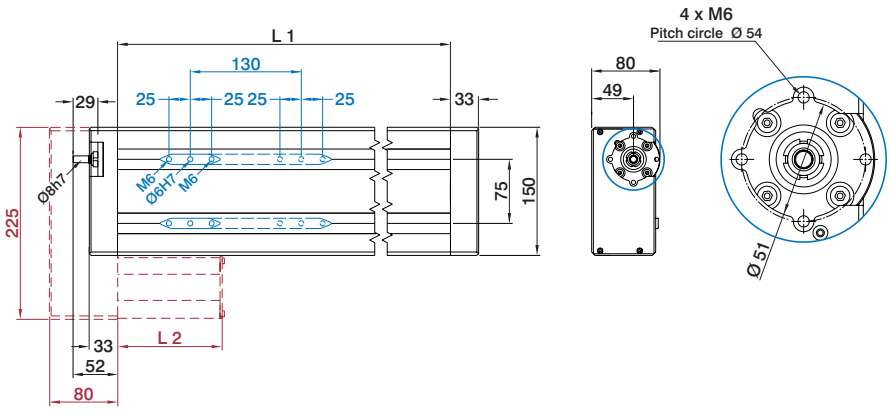
Technical Data

Aluminium profile

Aluminium profile LF 6	
Moment of inertia I_x	707,100 cm⁴
Moment of inertia I_y	212,200 cm⁴
Moment of resistance W_x	96,280 cm³
Moment of resistance W_{y1}	49,580 cm³
Moment of resistance W_{y2}	66,300 cm³
Cross-sectional area	30,07 cm²
Material	AlMgSiO, 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

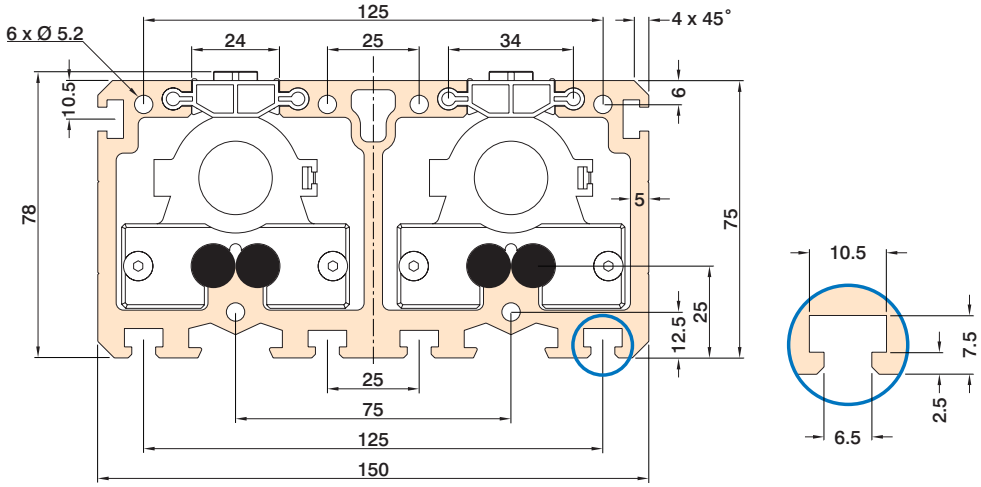
Travel range at WS 5/70 = L1 - 150 mm Travel range at WS 5/200 = L1 - 280 mm		
Length L2 [mm]	with ventilator	without ventil.
Stepping motor MS 135 H	-	107,5
Stepping motor MS 160	187,5	157,5
DC servo motor MV 120	217,5	187,5
Technical data of the motors can be found on page B 112!		

Scale Drawing



Scale Drawing

Aluminium profile



mechanics

Ball Screw Feed Axis

LF 5

LF 5 prepared for flange-mounted direct drive modules

LF 5 with integrated drive module

Order key

234 XXX 0XXX

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

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

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

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)

Drive Modules

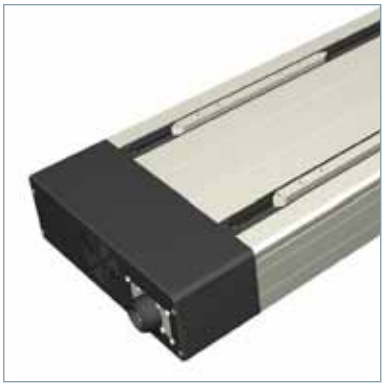
Preparation - direct drive

Direct drive module 1

Direct drive module 2

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)

Preparation - belt drive



Belt drive module

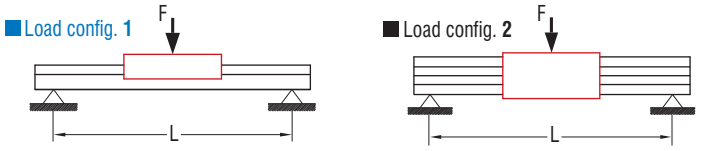
see scale drawing (page B 107)

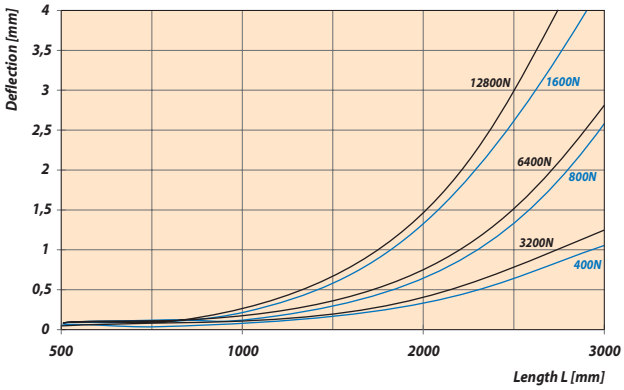
Ball Screw Feed Axis LF 5

Nominal torques

Nominal torque [Ncm]					
Revolutions [1/min] per minute	Spindle pitch				
	2,5	4	5	10	20
500	18	17	20	21	22
1500	20	22	24	25	26
3000	24	27	29	30	32

Deflection





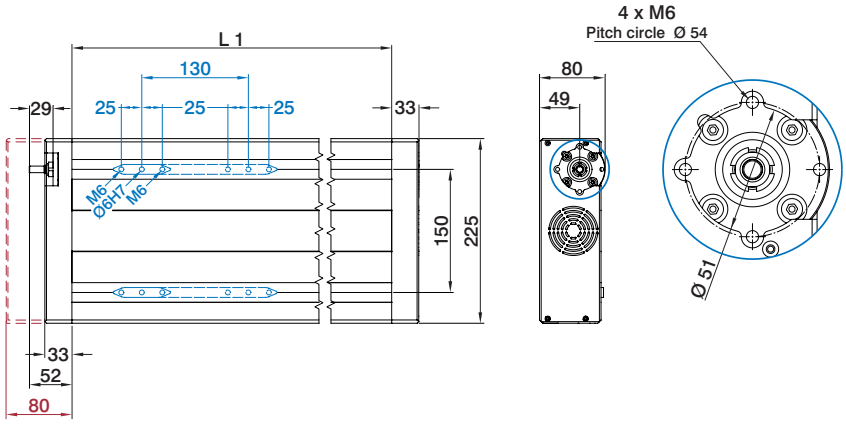
Technical Data

Aluminium profile

Aluminium profile LF 5	
Moment of inertia I_x	2361,654 cm⁴
Moment of inertia I_y	289,925 cm⁴
Moment of resistance W_x	209,883 cm³
Moment of resistance W_{y1}	88,860 cm³
Moment of resistance W_{y2}	69,030 cm³
Cross-sectional area	42,49 cm²
Material	AlMgSiO, 5F22
Anodization	E6/EV1
Weight with steel shafts	13,8 kg/m
Weight with steel shafts and spindle	15,2 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

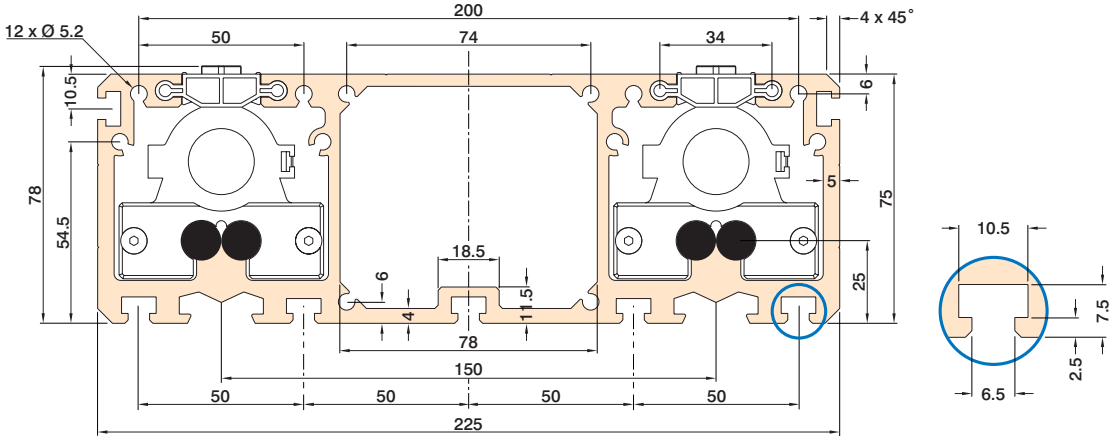
Travel range at WS 5/70 = L1 - 150 mm
Travel range at WS 5/200 = L1 - 280 mm

Scale Drawing



Scale Drawing

Aluminium profile



mechanics

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

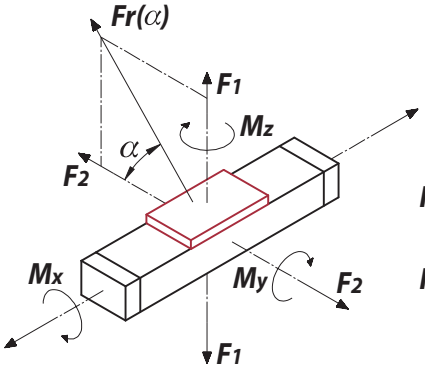
Item no.: 223 030 0200

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



$$Fr(\alpha) = \frac{F_2}{\cos \alpha}$$

$$Fr(\alpha) = \frac{F_1}{\sin \alpha}$$

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

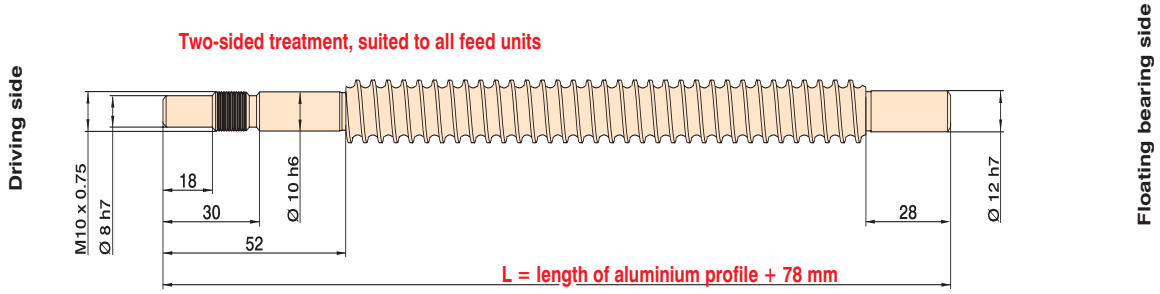
LF 5

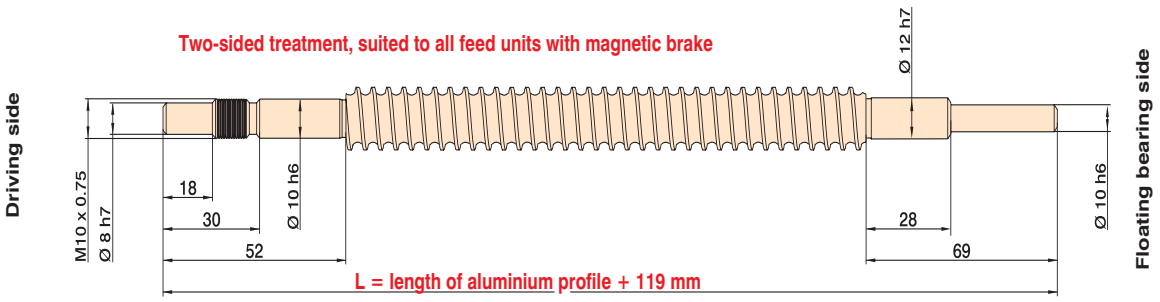
with two WS 5/200

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

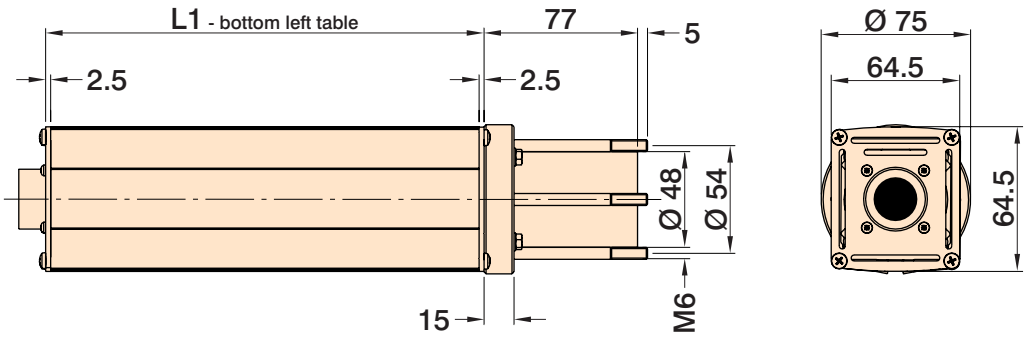
LF 4 / LF 6 lateral assembly	Plant / circular connector	Z-axis / circular connector	Plant / circular connector with brake	Z-axis / circular connector with brake
Stepping motor MS 135 HT	396 055 2020	396 055 2120	396 055 2220	396 055 2320
Stepping motor MS 160	396 341 2020	396 341 2120	396 341 2220	396 341 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

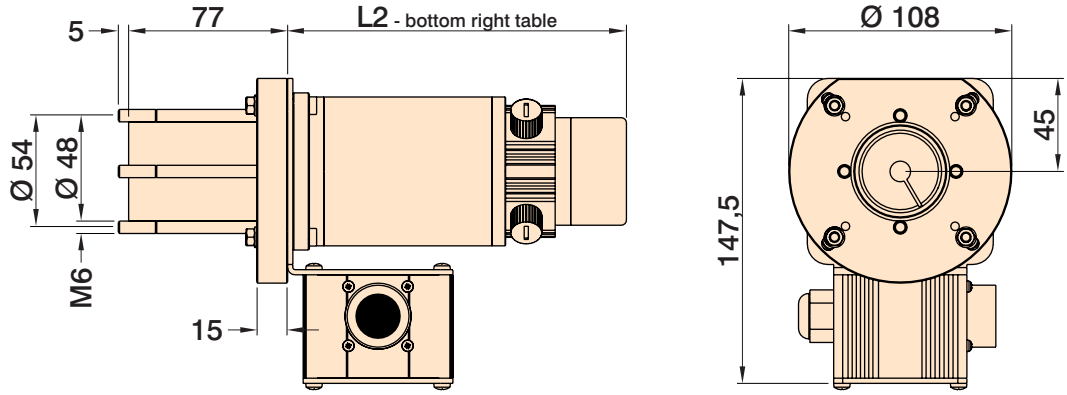
Scale Drawing

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

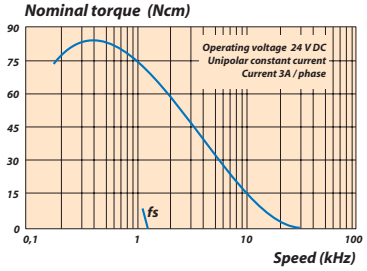
DC Servo Motor	Performance	Nominal Speed	Nominal Torque
DC Servo Motor MV 120	120 W	3000 1/min	0,38 Nm
DC Servo Motor MV 330	330 W	3300 1/min	1,00 Nm

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

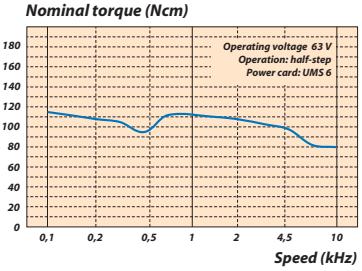
Torque Curves / Characteristic Curves

Stepping motor

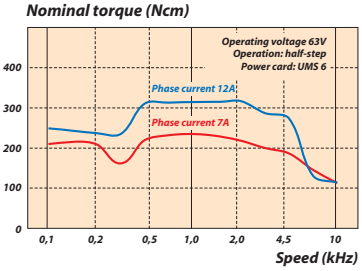
MS 135 HT



MS 160



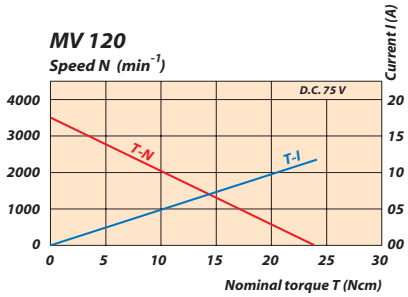
MS 300



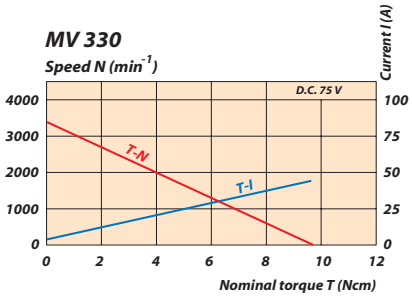
Torque Curves / Characteristic Curves

DC servo motor

MV 120



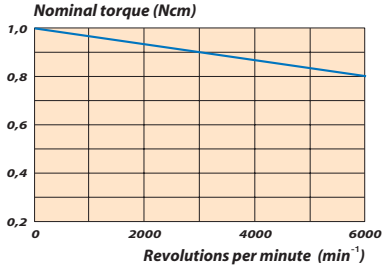
MV 330



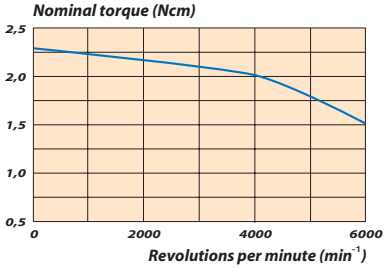
Torque Curves / Characteristic Curves

AC servo motor

MY 054



MY 073



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:

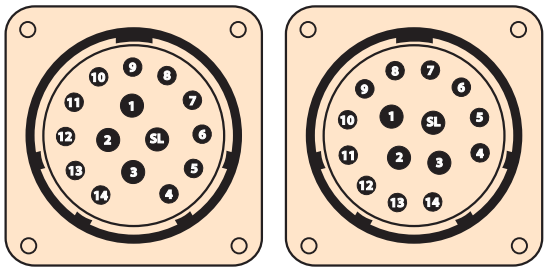
isel-lubricant
Item no.: 299 031

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

mechanics

Coupling casings

Drive Components

Connectivity

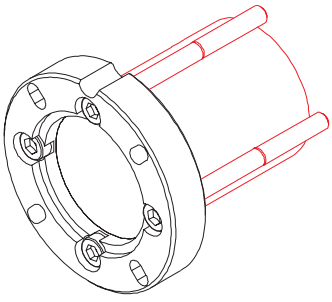
Preparation - direct drive

Connectivity Direct drive	LF 4	LF 6	LF 5	Angular gear Fixing 0°	Angular gear Fixing 90°
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

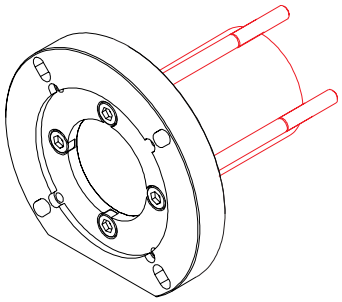
Coupling casing 1



Short sleeve
Item no.: 218 100 0001

Long sleeve
Item no.: 218 100 0002

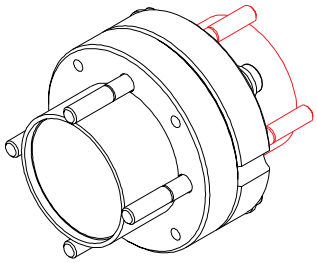
Coupling casing 2



Short sleeve
Item no.: 218 100 1001

Long sleeve
Item no.: 218 100 1002

Split coupling casing



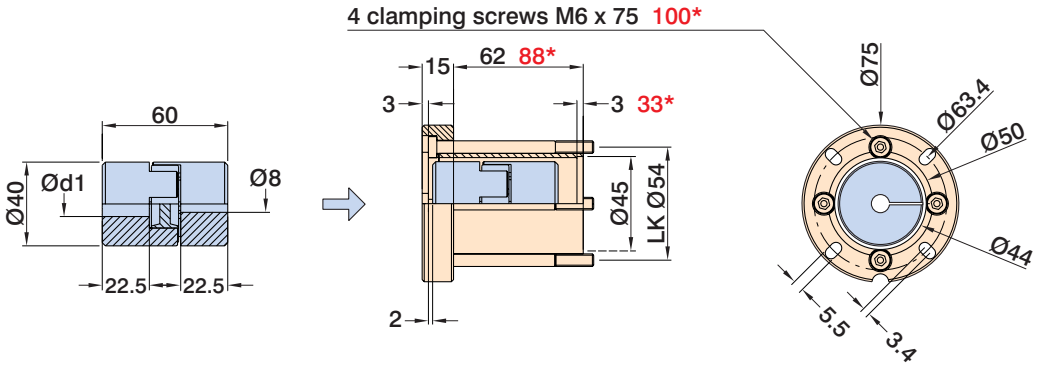
Short sleeve
Item no.: 218 100 2001

Long sleeve
Item no.: 218 100 2002

Coupling casings

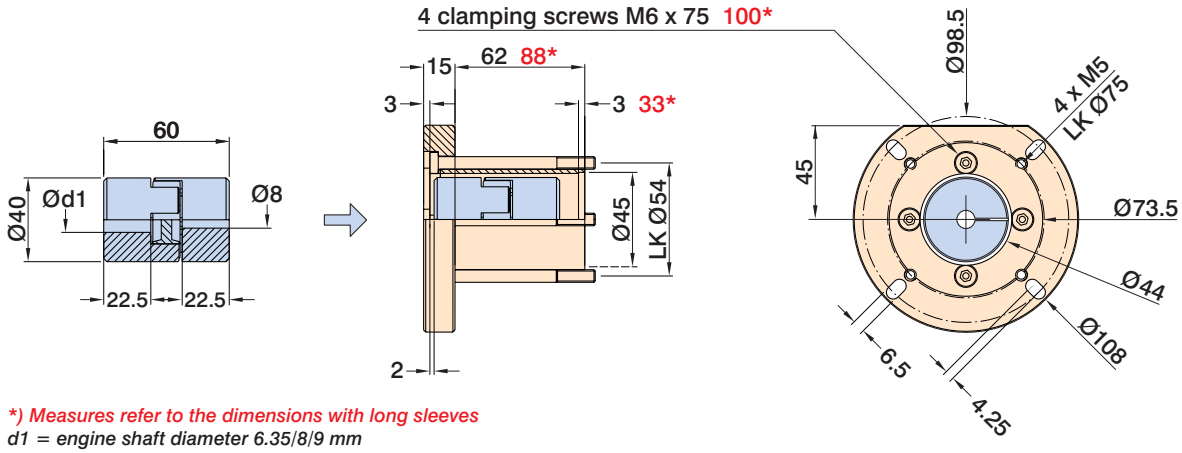
Drive Components

Scale Drawing
Coupling casing 1



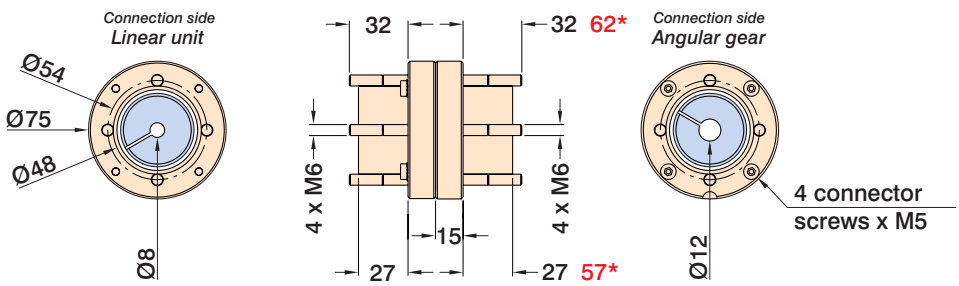
*) Measures refer to the dimensions with long sleeves
d1 = engine shaft diameter 6.35/8/9 mm
Suitable shaft coupling WK 40/60 on page B 117 (not included in scope of delivery)

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



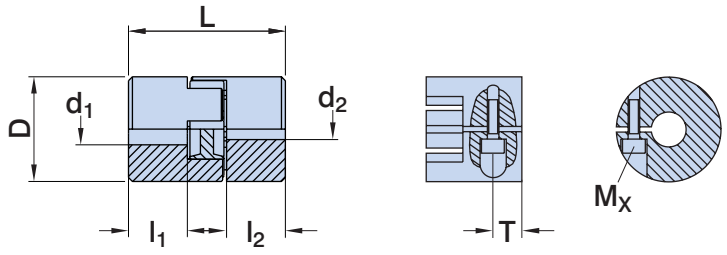
*) Measures refer to the dimensions with long sleeves
Suitable shaft coupling WK 40/60 on page B 117 (not included in scope of delivery)

mechanics

Shaft Couplings

Drive Components

Scale Drawing

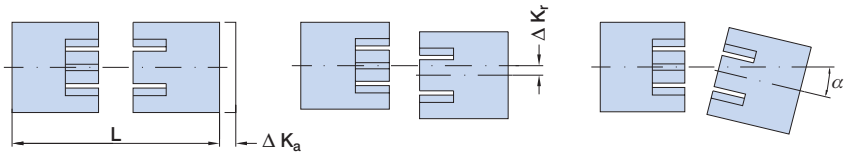


Size	Dimensions [mm]				Clamping screw		
	D	L	l_1 / l_2	d_1 / d_2	M_x	T	Screwing-down torque [Ncm]
20/30	20	30	10	4 - 7	M3	5	0,76
30/40	30	40	14	6 - 13	M4	5	1,34
40/60	40	60	22,5	8 - 18	M5	12	3,05

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 Δ K_a	radial Δ K_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	

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

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

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

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

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

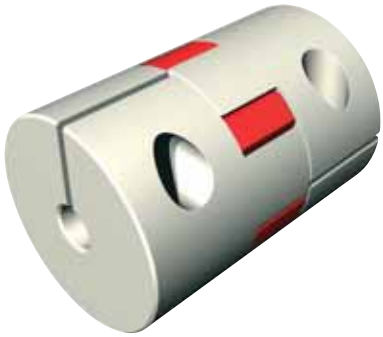
Ambient temperat. [°C]	-30 bis +30	+40	+60	+80	+90
Temperature factor	1,0	1,2	1,4	1,8	2,2

Technical Data

Size	Shore hardness	Revolutions per minute V=30 m/s	Torque			Static torsion spring stiffness [Nm/rad]	Torsion spring stiffness [N/mm]	Mass moment of inertia [kgm²]	
			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

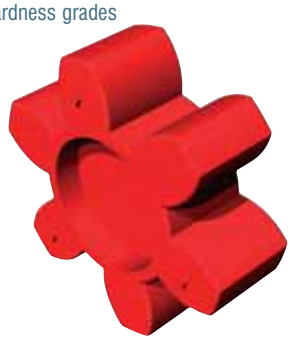


Scope of delivery: 2 aluminium bloks, 3 PUR toothed rims (86°, 92° and 98° shore) and appropriate clamping screws

Item no. - see table

PUR toothed rims

all hardness grades



für WK 20/30	Item no.: 217 011 00**
für WK 30/40	Item no.: 217 012 00**
für WK 40/60	Item no.: 217 013 00**

for **, insert the shore hardness

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	

Further couplings upon request!

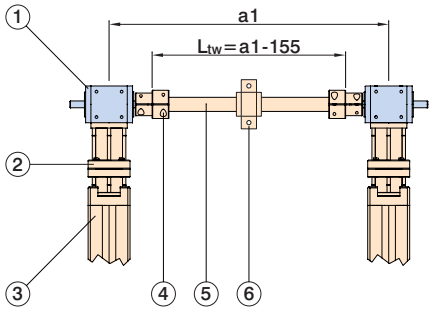
mechanics

Assembly Kit with Angular Gear

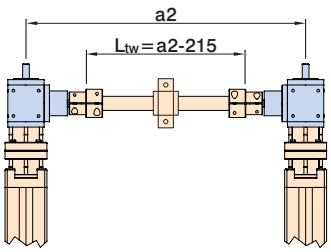
Drive Components

Mounting variants

Coupling casing 90°



Coupling casing 0°



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)

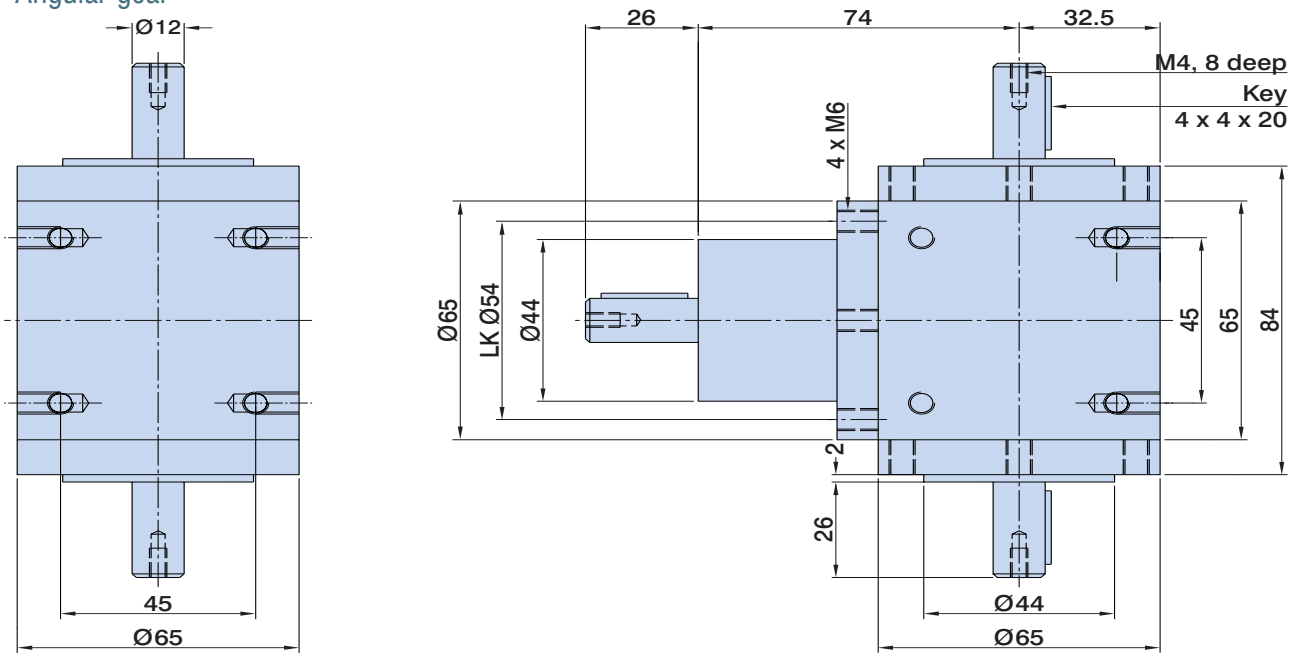
④ Coupling for transmission shaft Ø 25

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

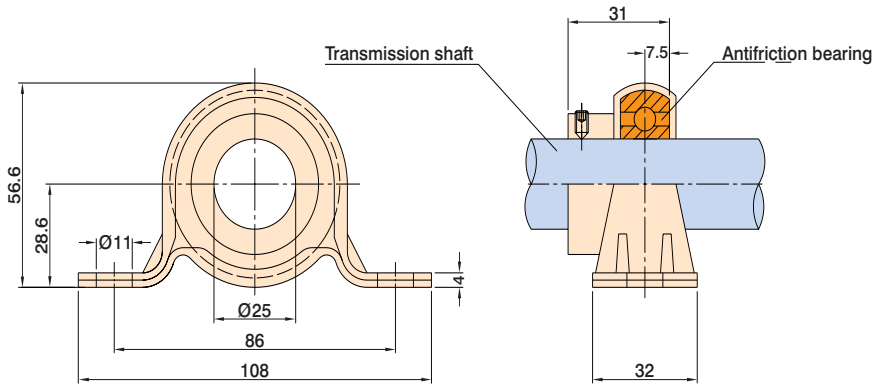
Coupling for transmission shaft Conversion from 12 to 25 mm, packaging unit: 2 pieces
Item no.: 218 050 0002

Pedestal bearing for transmission shaft packaging unit: 1 piece
Item no.: 896 202 5562

Assembly Kit with Angular Gear

Drive Components

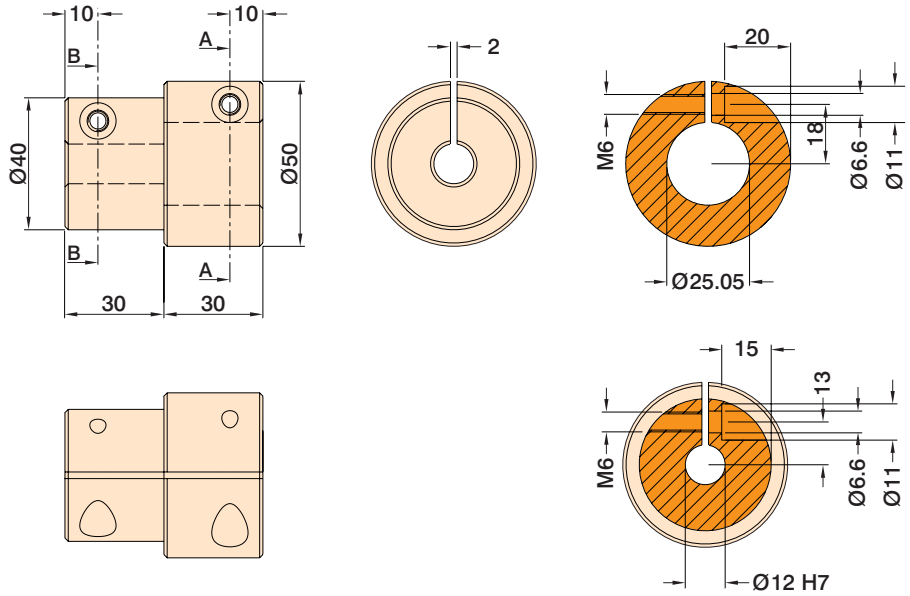
Scale drawing and technical data



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

Scale Drawing

Coupling



Matching motor modules

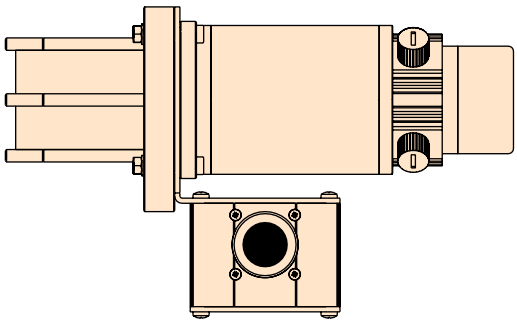
Motor modules

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**

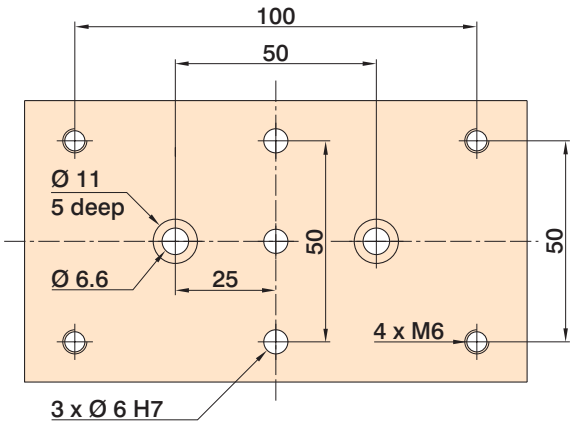
With DC servo motor MV 330
[330 W]
Item no.: **396 104 0093**



mechanics

Tops for Slides / Compound Tables Connecting Elements

Hole pattern
Slide top PS 1



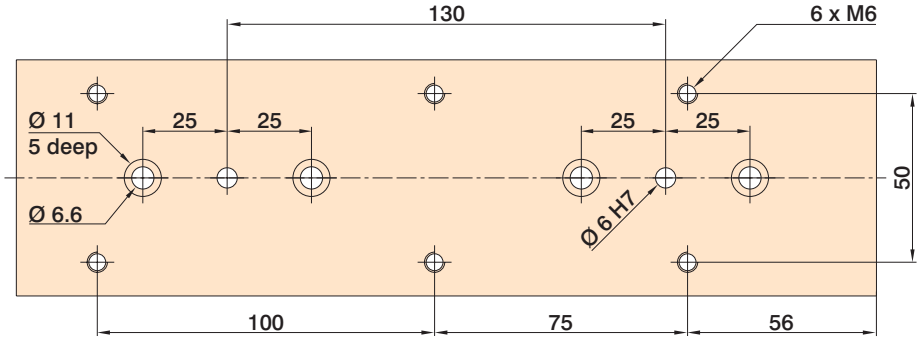
Slide top **PS 1**

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**

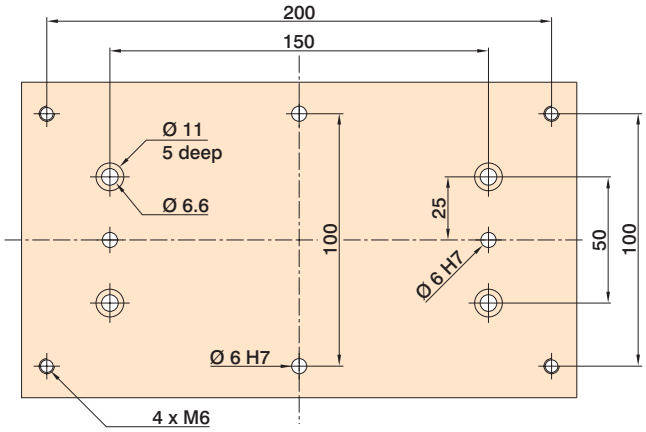
L255 x W70 x H8 mm

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**

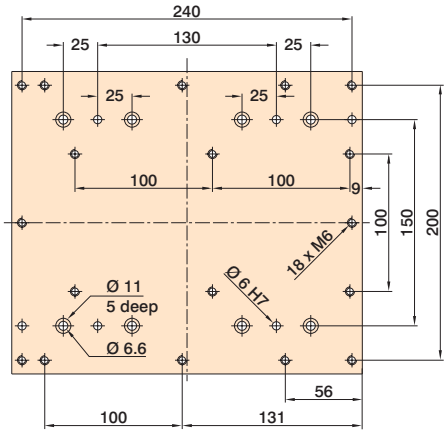
L220 x W125 x H8 mm

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

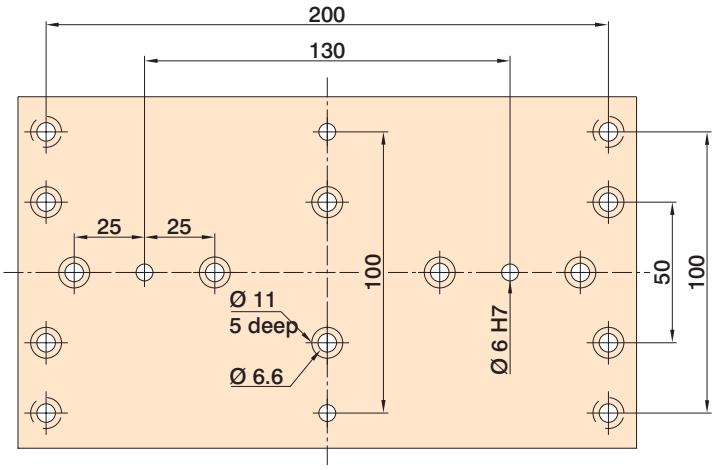
Connection to:
LF 5 with 2 x WS 5/200

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

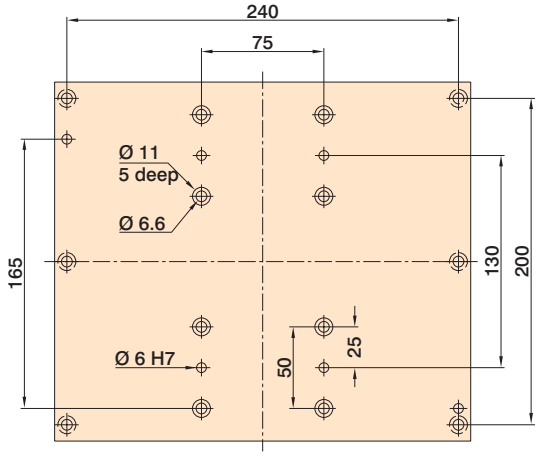
Connection to:
LF 4 with 1 x WS 5/200

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

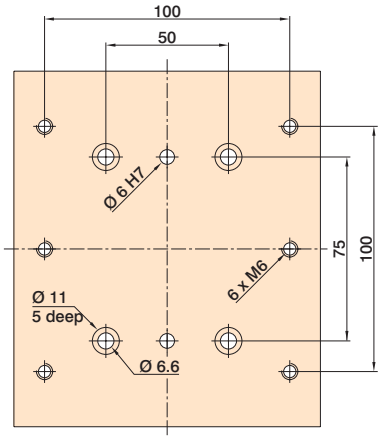
Mounting of compound table:
LF 6 with LF 5 (in connection with PS 4)

Item no.: **277 016**

mechanics

Tops for Slides / Compound Tables Connecting Elements

Hole pattern
Slide top PS 8



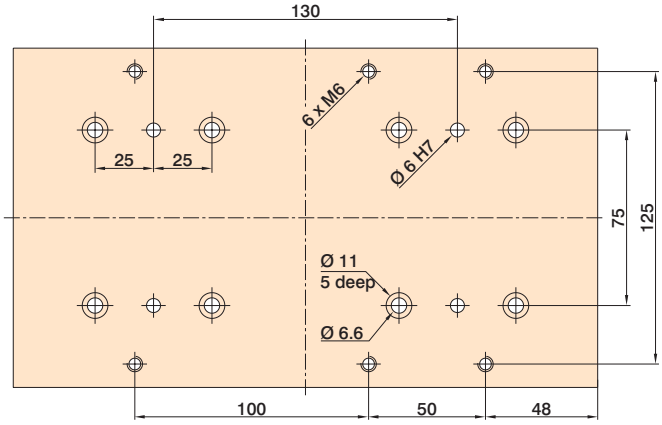
Slide top **PS 8**

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**

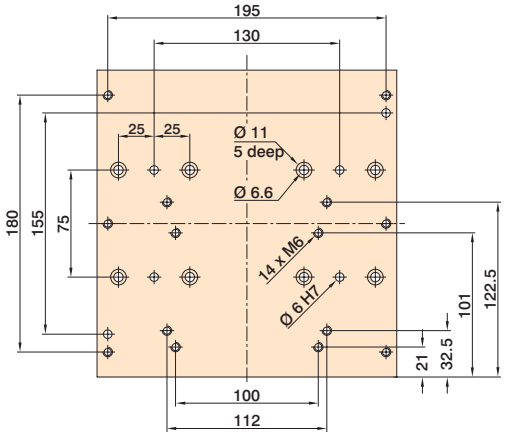
L250 x W145 x H8 mm

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

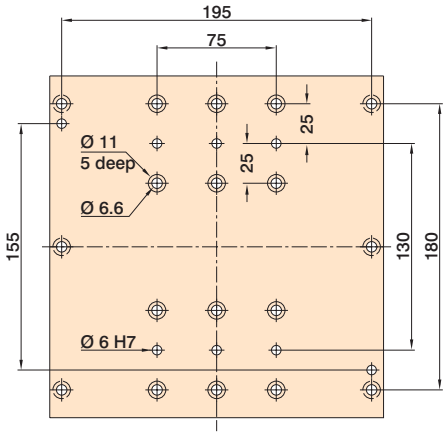
Mounting of compound table:
LF 6 with LF 6 (in connection with PS 11)

Connectivity:
Spindle motors MA

Item no.: **277 019**

Tops for Slides / Compound Tables Connecting Elements

Hole pattern
Slide top PS 11



Slide top **PS 11**

L210 x W215 x H8 mm

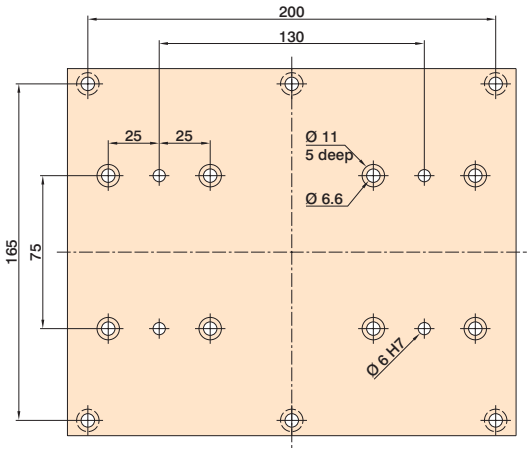
Connection to:
LF 6 with 2 x WS 5/200

Mounting of compound table:
LF 6 with LF 4 (in connection with PS 10)

Connectivity:
LF 6

Item no.: **277 020**

Hole pattern
Slide top PS 12



Slide top **PS 12**

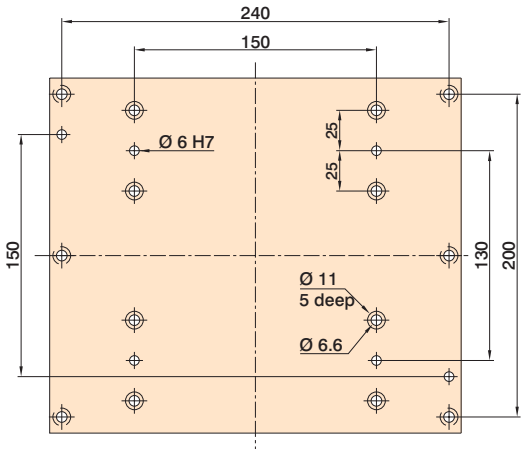
L220 x W180 x H8 mm

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

Connectivity:
LF 5

Item no.: **277 021**

Hole pattern
Connecting plate VP 2



Connecting plate **VP 2**

L255 x W220 x H8 mm

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

Connectivity:
LF 5

Item no.: **277 006**

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

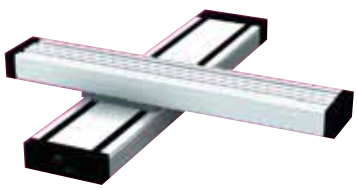
Connecting plates
for compound tables 2

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

WV 8 WV 7 WV 6 WV 5 WV 3 WV 2 WV 1

Angle bracket **WV 8**
- blank
- Aluminium, welded, 7.40 kg
- L222 x W145 x H446

Item no.: **209 110 0080**

Angle bracket **WV 7**
- blank
- Aluminium, welded, 10.81 kg
- L220 x W145 x H670

Item no.: **209 110 0070**

Angle bracket **WV 6**
- blank
- Aluminium, welded, 13.28 kg
- L220 x W220 x H670

Item no.: **209 110 0060**

Angle bracket **WV 5**
- blank
- Aluminium, welded, 5.26 kg
- L220 x W75 x H670

Item no.: **209 110 0050**

Angle bracket **WV 3**
- blank
- Cast aluminium, 1.06 kg
- L221 x W221 x H446

Item no.: **209 110 0032**

Angle bracket **WV 2**
- blank
- Cast aluminium, 2.58 kg
- L221 x W75 x H446

Item no.: **209 110 0022**

Angle bracket **WV 1**
- blank
- Cast aluminium, 0.15 kg
- L71 x W75 x H71

Item no.: **209 110 0010**

Matching cover plates

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

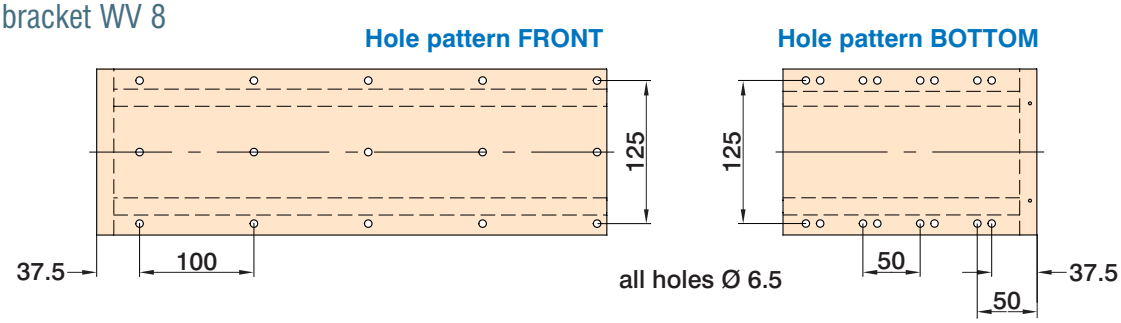
Item no.: **209 110 0021**

Angle Brackets

Connecting Elements

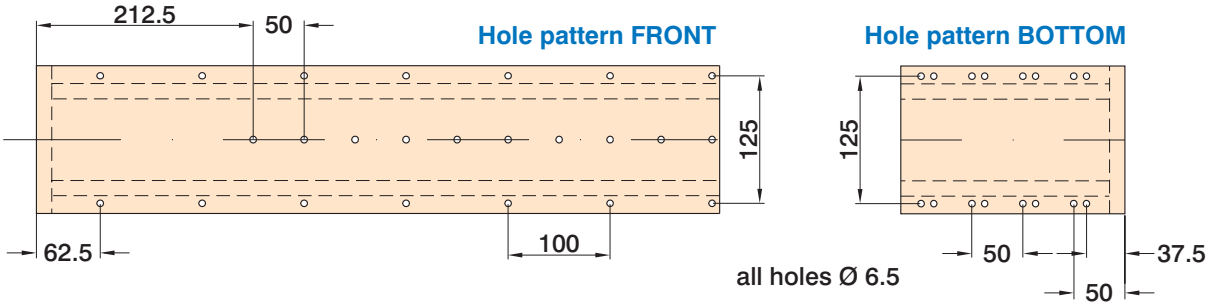
Hole pattern

Angle bracket WV 8



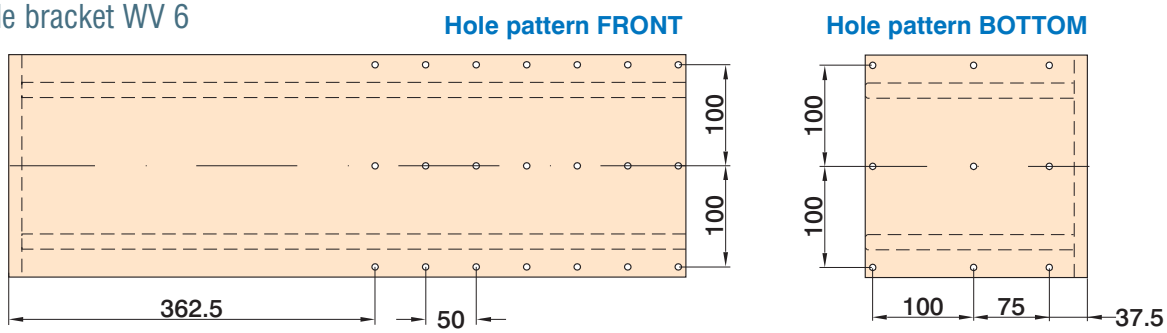
Hole pattern

Angle bracket WV 7



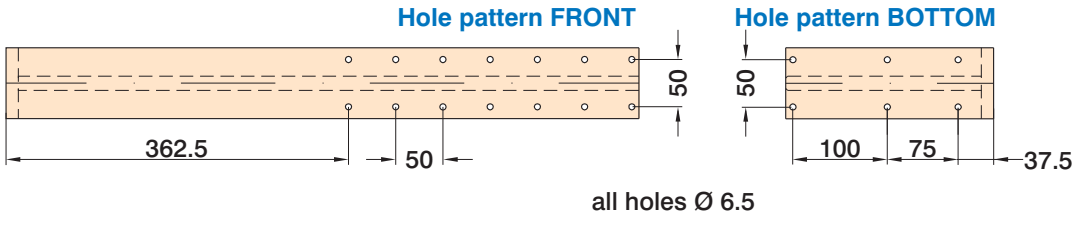
Hole pattern

Angle bracket WV 6



Hole pattern

Angle bracket WV 5

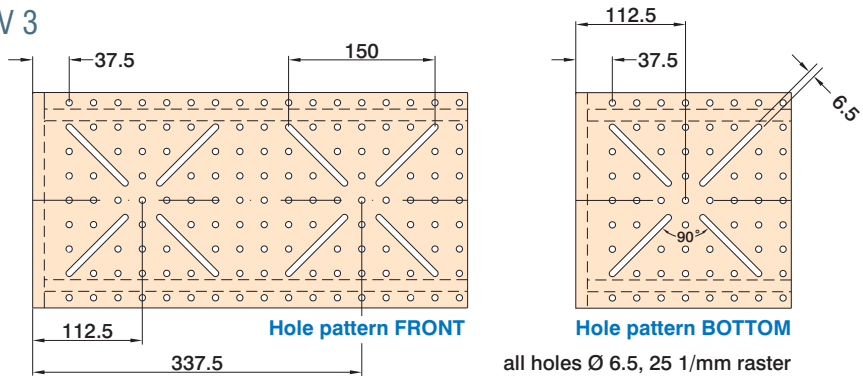


Angle Brackets

Connecting Elements

Hole pattern

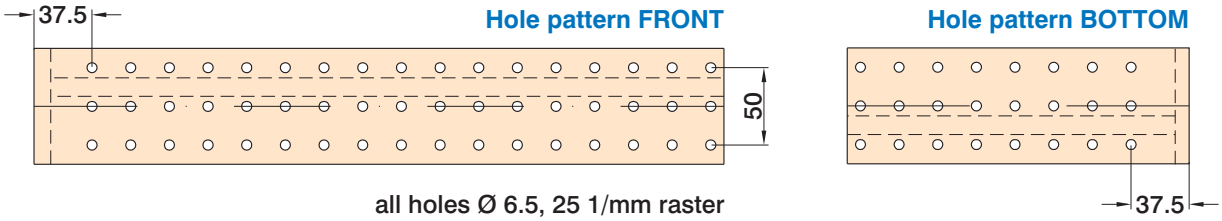
Angle bracket WV 3



all holes Ø 6.5, 25 1/mm raster

Hole pattern

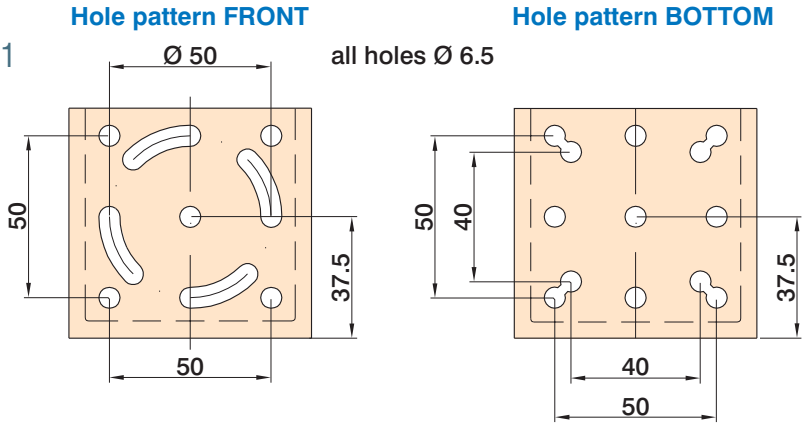
Angle bracket WV 2



all holes Ø 6.5, 25 1/mm raster

Hole pattern

Angle bracket WV 1



Ordering data

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

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

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

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

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

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

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

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

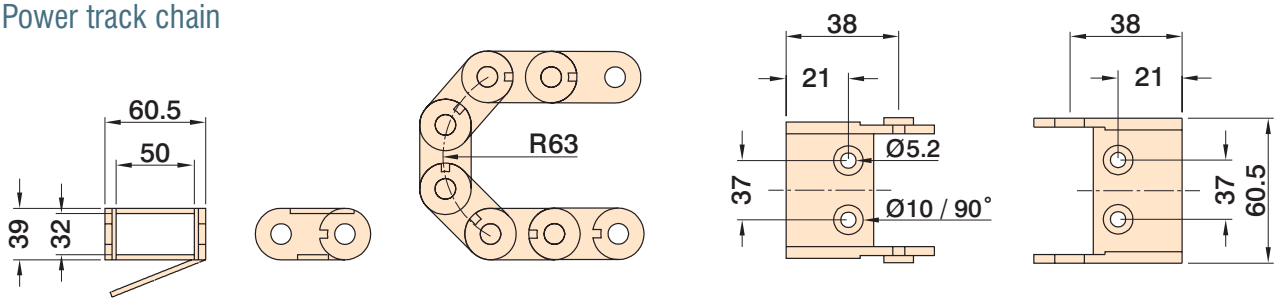
Item no.: **277 014**

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

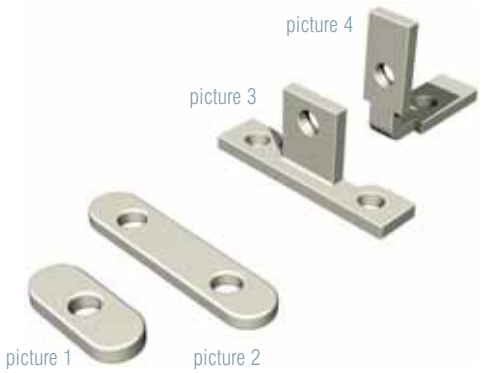
Item no.: **277 022**

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**

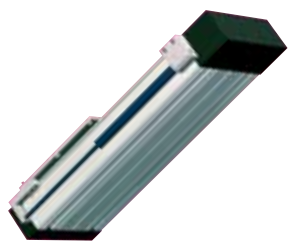
Special angular slide nut
3 x M6 (picture 3)
- galvanized
- packaging unit: 25 pieces

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

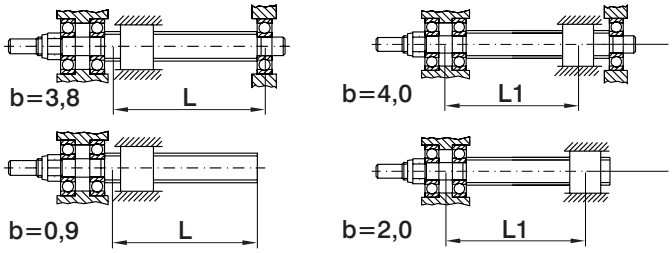
"Repeatability" means the ability of a linear drive to reach a once driven to actual position under the same conditions again.

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:

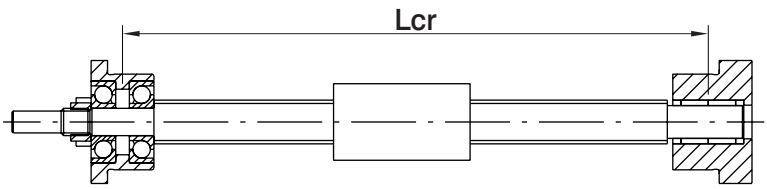
$$n_{zul} = 392 \frac{a \cdot d_2}{L^2} 10^5$$

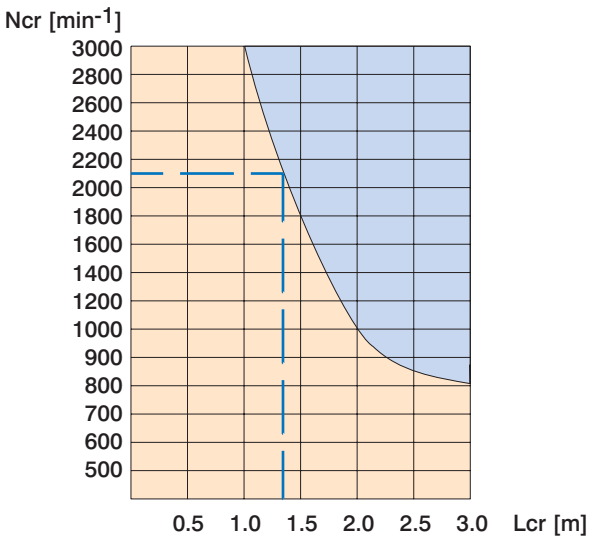
Buckling load

Under load, the ball screw spindle should only be strained subject to tension. In case pressure loads occur, the spindle's bukkling 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}

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

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 $g = 9{,}81 m/s^2$ has to be added to the mass acceleration a.

Rotator. Acceleration torque

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

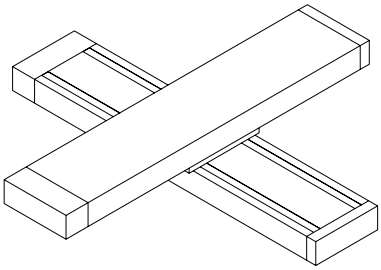
Rotator. Acceleration torque

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

Definitionen

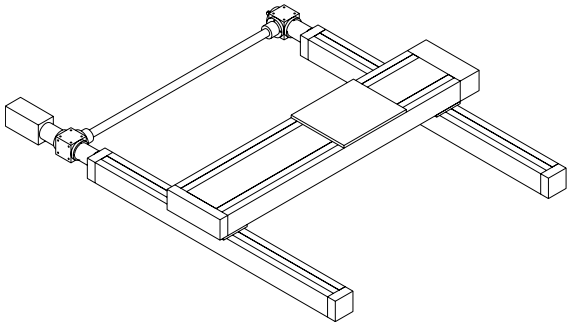
M_A	[Nm]	Necessary drive torque
M_{last}	[Nm]	Moment resulting from the different loads
M_{leer}	[Nm]	Rotatory acceleration torque
M_{trans}	[Nm]	Translatory acceleration torque
Fx	[N]	Feed force
g	[m/s^2]	Gravity
v_{max}	[m/s]	Maximum traverse speed
m	[kg]	The mass to be transported
a	[m/s2]	Acceleration
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

Combination Samples



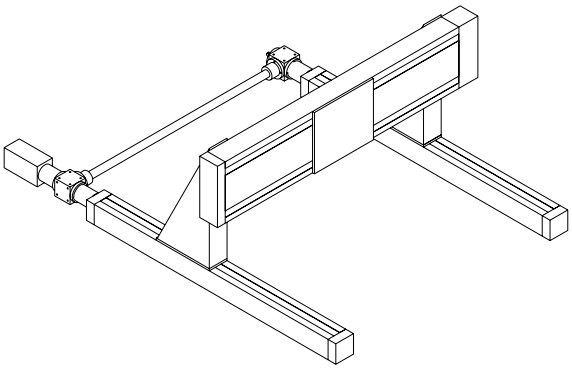
Compound table

2 x LF 5
PS 4 with VP 2



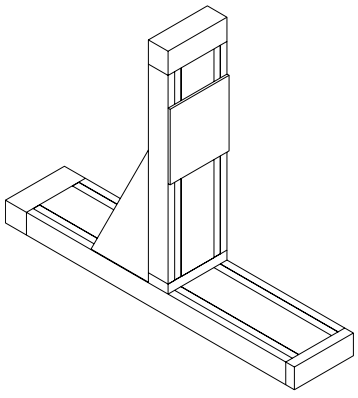
2-axis H-construction

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



2-axis flatbed layout

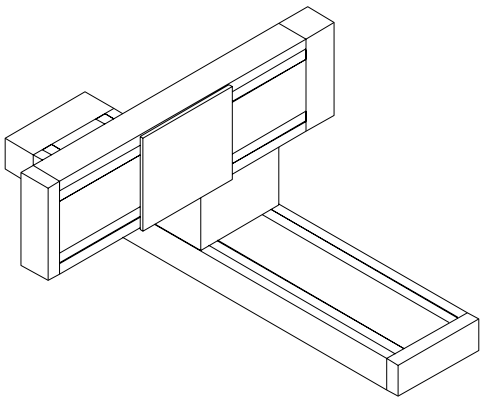
2 x LF 4
LF 5
Angular gear kit
2 X PS 2
2 x WV 2
PS 4



2-axis stroke layout

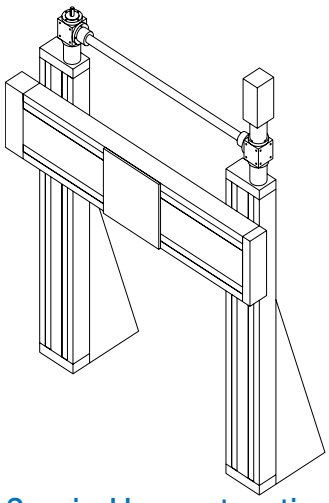
2 x LF 5
2 x PS 4
WV 6

Combination Samples



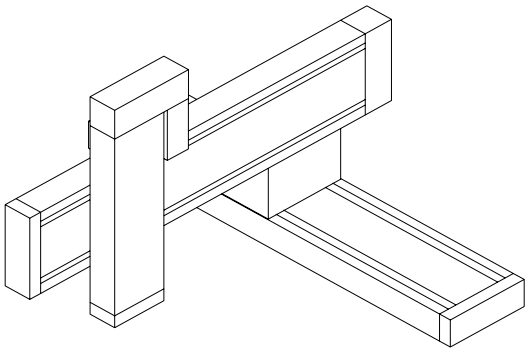
2-axis bracket layout

2 x LF 5
2 x PS 4
WV 3



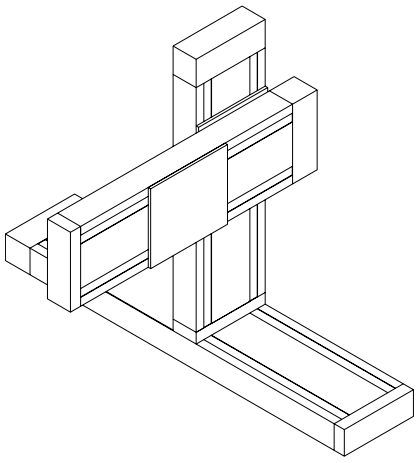
2-axis H-construction

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



3-axis bracket layout

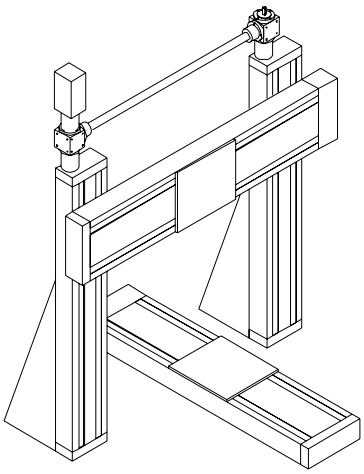
2 x LF 5
LF 6
WV 3
2 x PS 4
PS 7



3-axis stroke/bracket layout

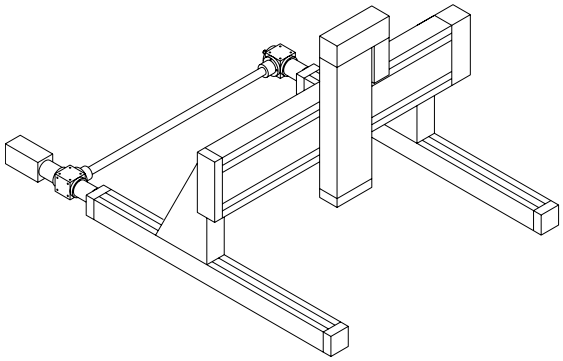
3 x LF 5
WV 3
2 x PS 4
VP 2

Combination Samples



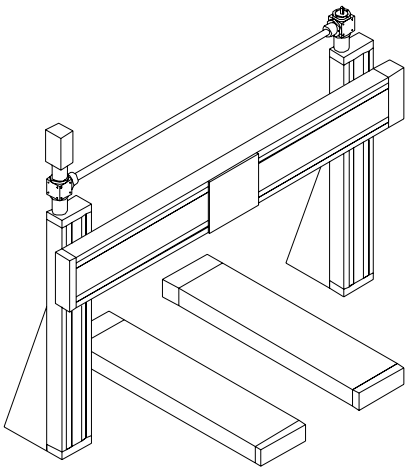
3-axis flatbed layout

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



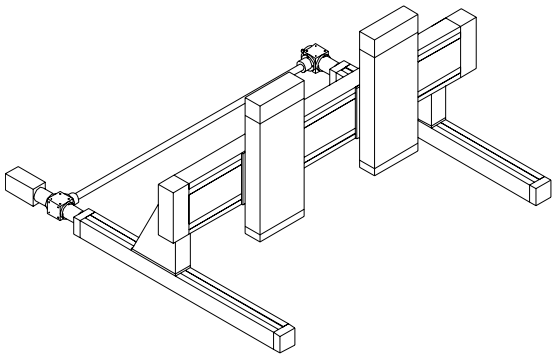
3-axis flatbed layout

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

234 XXX 0XXX

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

Double-Track Feed Unit 1

Features

- precision feed units from L = 300 up to L = 1,500 mm
- clearance-free feed devices with stepping motors
- NC coupling via a 15-pole amphenol plug on the stepping motor
- ball spindle drive 16 x 5 mm with four flange bearings
- repeatability ± 0.01 mm (reproducibility)
- clamping surfaces L 220 x B 175 x H 8 mm, with holes
- face-milled surfaces, accuracy < 0.05 mm
- great stiffness and high load capacity due to eight linear bearings
- lip seal with teflon coat
- limit and/or reference position at 5 mm pitch > 0.0125 mm
- Options:
  - feed from 75 to 1,250 mm (Ø 25mm)
  - pitches: 2.5/4/10 and 20 mm

The double-track feed unit 1 from isel is available in closed design with stepping motor and ball screw drive up to a length of 1.5 metre.

The feed units consist of aluminium rectangular profiles (W 175 x H 30 mm) in different lengths with two double-track feed guides. On the top of it, a clearance-free and torsion-resistant precision feed with eight clearance-free linear ball bearings is mounted

The feed has a face-milled clamping surface (L 220 x W 175 x H 8 mm) with clamping and centre holes. Two eight-millimetre thick aluminium covers serve as fixing elements for the flange bearing and the stepping motor.

The stepping motor drive consists of a stepping motor with coupling, hand wheel and limit switch. The stepping motor drives a clearance-free ball screw drive (16 x 5 mm) with a repeatability of ± 0.01 mm (reproducibility).
Stroke = L - 243 mm.

Double-Track Feed Unit 1

Ordering data

Double-track feed unit 1

- with ball spindle drive 16 x 5 mm

Item no.	Length (mm)
230 601 0300	300
230 601 0400	400
230 601 0500	500
230 601 0600	600
230 601 0700	700
230 601 0850	850
230 601 1000	1000
230 601 1100	1100
230 601 1250	1250
230 601 1350	1350
230 601 1500	1500

Double-track feed unit 1

- epping motor ball screw drive 16 x 5 mm

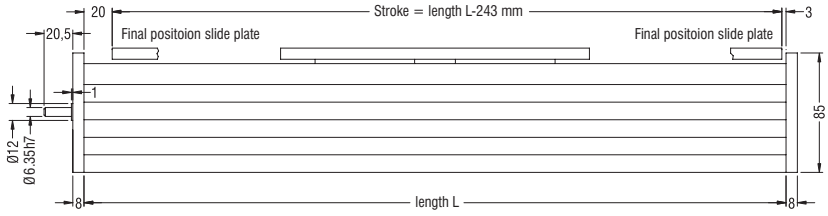
Item no.	Length (mm)
230 101 0300	300
230 101 0400	400
230 101 0500	500
230 101 0600	600
230 101 0700	700
230 101 0850	850
230 101 1000	1000
230 101 1100	1100
230 101 1250	1250
230 101 1350	1350
230 101 1500	1500

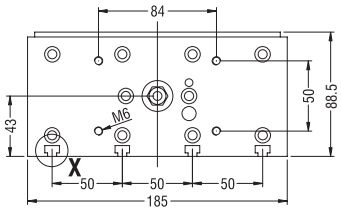
Double-track feed unit 1

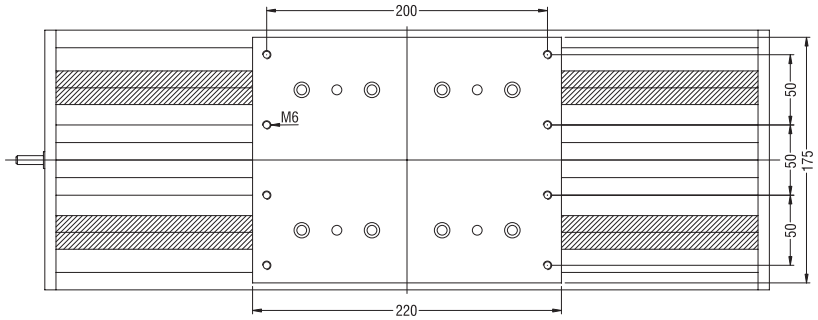
- without ball screw drive

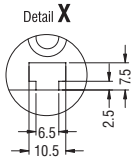
Item no.	Length (mm)
230 201 0300	300
230 201 0400	400
230 201 0500	500
230 201 0600	600
230 201 0700	700
230 201 0850	850
230 201 1000	1000
230 201 1100	1100
230 201 1250	1250
230 201 1350	1350
230 201 1500	1500

Scale Drawings









Double-Track Unit

Features

- aluminium profile W 92 x H 70 mm with double-track feed
- clearance-free feed with stepping motor drive
- NC coupling via a 15-pole amphenol plug on the stepping motor
- ball spindle drive 16 x 5 mm with 4 flange bearings
- double-track set 125 x W 85 mm with 2 linear bearings 2
- repeatability ± 0.01 mm (reproducibility)
- lip seal with teflon coat
- limit and/or reference position at 5 mm pitch > 0.0125 mm
- Options:
  - feed 50-1,300 mm
  - pitches: 4, 10 and 20 mm

The double-track feed unit from isel is available in a completely closed design with stepping motor and ball screw drive (16 x 15 mm) up to a length of 1.5 metre.

The linear unit consists of a rectangular aluminium profile with integrated double-track feed guide and four T-slot tracks. On the top of the double-track feed guide, a double-track set with clearance-free, pre-stressed linear ball bearings is mounted. The set includes an aluminium clamping surface (L 125 x W 65 x H 8 mm) with six threaded holes M 6.

Two eight-millimetre thick aluminium covers serve as fixing elements for the flange bearings and the stepping motor drive.

The stepping motor drive consists of a stepping motor with coupling, hand wheel and limit switch. The stepping motor drives a clearance-free ball screw drive (16 x 5 mm) with a repeatability of ± 0.01 mm (reproducibility).
The maximum torque (approx. 1 Nm) and the maximum speed (approx. 250 mm/s) depend on the applied stepping motor.
Stroke = L - 200 mm.

Double-Track Unit

Ordering data

Double-track unit
- with ball spindle drive

Item no.	Length (mm)
230 501 0300	300
230 501 0400	400
230 501 0500	500
230 501 0600	600
230 501 0700	700
230 501 0850	850
230 501 1000	1000
230 501 1100	1100
230 501 1250	1250
230 501 1350	1350
230 501 1500	1500

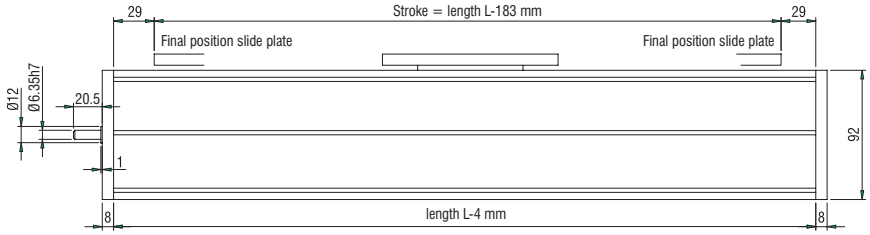
Double-track unit
- ball spindle drive with stepping motor

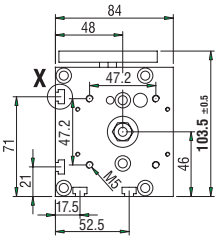
Item no.	Length (mm)
230 001 0300	300
230 001 0400	400
230 001 0500	500
230 001 0600	600
230 001 0700	700
230 001 0850	850
230 001 1000	1000
230 001 1100	1100
230 001 1250	1250
230 001 1350	1350
230 001 1500	1500

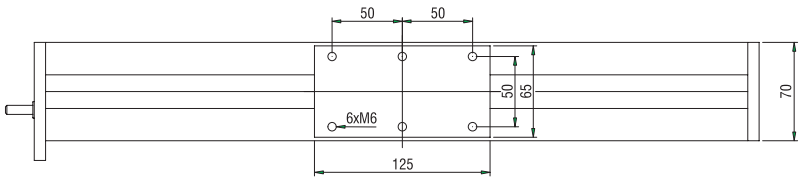
Double-track unit
- without ball screw drive

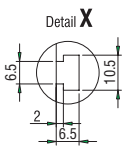
Item no.	Length (mm)
236 001 0300	300
236 001 0400	400
236 001 0500	500
236 001 0600	600
236 001 0700	700
236 001 0850	850
236 001 1000	1000
236 001 1100	1100
236 001 1250	1250
236 001 1350	1350
236 001 1500	1500

Scale Drawings









Double-Track Lifting Unit

Features

- precision feed units
  L 300, W 175 und H 88 mm
- precision lifting unit
  L 300 x W 175 x H 88 mm
- stroke clearance-free, max. 70 mm, with stepping motor
- NC coupling via a 15-pole amphenol plug on the stepping motor
- ball spindle drive, 16 x 5 mm, with two flange bearings
- repeatability ± 0.1 mm (reproducibility)
- clamping surface L 220 x W 175 x H 8 mm with holes
- face-milled surfaces, accuracy < 0.05 mm
- great stiffness and capacity due to eight linear bearings
- lip seal with teflon coat
- limit and/or reference position at 5 mm pitch > 0.0125 mm
- Options:
  - pitches: 2,5 and 4 mm

The double-track lifting unit from isel is available in closed design with ball screw drive and stepping motor drive.

The lifting unit consists of a rectangular aluminium profile (L 300 x W 175 x H 30 mm) with two double-track feed guides. On the top of it, a clearance-free and torsion-resistant precision feed with eight clearance-free linear ball bearings is mounted. The feed has a face-milled clamping surface (L 220 x W 175 x H 8 mm) with clamping and centre holes. Two eight-millimetre thick aluminium covers serve as fixing elements for the flange bearings and the stepping motor drive.

With regard to a vertical operation, the lifting unit is delivered with an integrated magnetic brake.

The stepping motor drive consists of a stepping motor with coupling, hand wheel and limit switch. The stepping motor drives a clearance-free ball screw drive (16 x 5 mm) with a repeatability of ± 0,01mm mm (reproducibility).
The maximum torque (approx. 1 Nm) and the maximum speed (approx. 250 mm/s) depend on the applied stepping motor.

Double-Track Lifting Unit

Ordering data

Lifting unit
- vertical
- stepping motor/ball screw drive 16 x 5 mm, stroke 70 mm
- with magnetic brake

Item no.: **230 512 0300**

Lifting unit
- horizontal
- stepping motor/ball screw drive 16 x 5 mm, stroke 70 mm
- without magnetic brake

Item no.: **230 511**

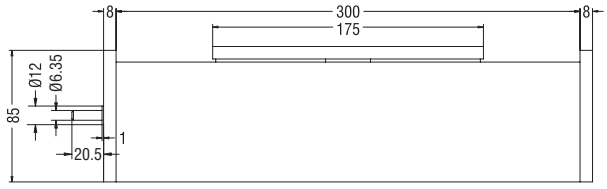
Stepping motor drive
- individual
- 110 Ncm

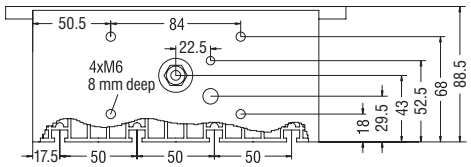
item no.: **396 330 8001**

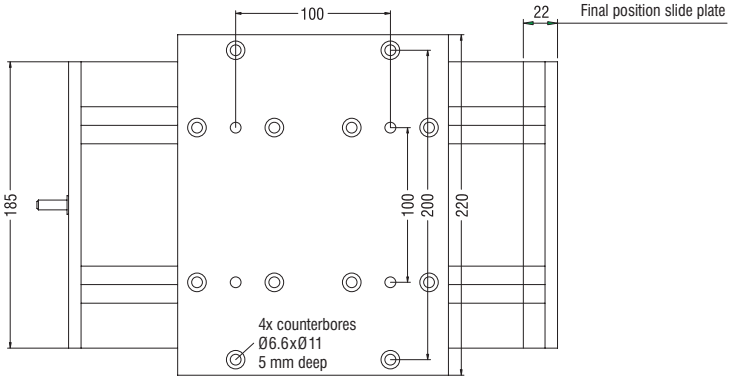
- 160 Ncm

Item no.: **396 341 8001**

Scale Drawings







Compound table 1

Features

- travel ranges: x-axis: 420 mm
  y-axis: 420 mm
- two linear guides LF 5, 225 x 75 mm, with integrated stepping motor MS 160 and/or servo motor MV 120 and ball screw drive, pitch 5 mm
- connecting plates for compound tables, made of ground steel
- individual assembly of a compound table by combining different linear guides LF 5

- Options:
  - other travel ranges
    - pitch: 2.5, 4, 10 and 20 mm
    - T-slot plate 250 mm
    - T-slot plate 375 mm

The compound table 1 from isel consists of two linear guides LF 5 that are connected in rectangular way by two ground steel plates. In this basic version, the linear guides have a travel range of 420 mm. The individual axes are driven by a stepping motor and a ball screw drive with a pitch of 5 mm.

In order to reach very high load capacities, each axis is provided with four linear slides.

In addition to this basic version, it is possible to combine all linear guides LF 5 by means of connecting plates for compound tables from isel. You can choose from different travel ranges, pitches and drive motors to assemble an individual compound table.

The face-milled aluminium T-slot plates form isel are available in the widths 250 mm und 375 mm and in the lengths 592 mm, 692 mm, 792 mm and 1,092 mm. The scope of delivery includes the complete fastening material necessary.

Ordering data

Compound table 1-S
- travel range 420 x 420 mm
- with stepping motor drive

Item no.: **272 014 0606**

Compound table 1-V
- travel range 420 x 420 mm
- with servo motor drive

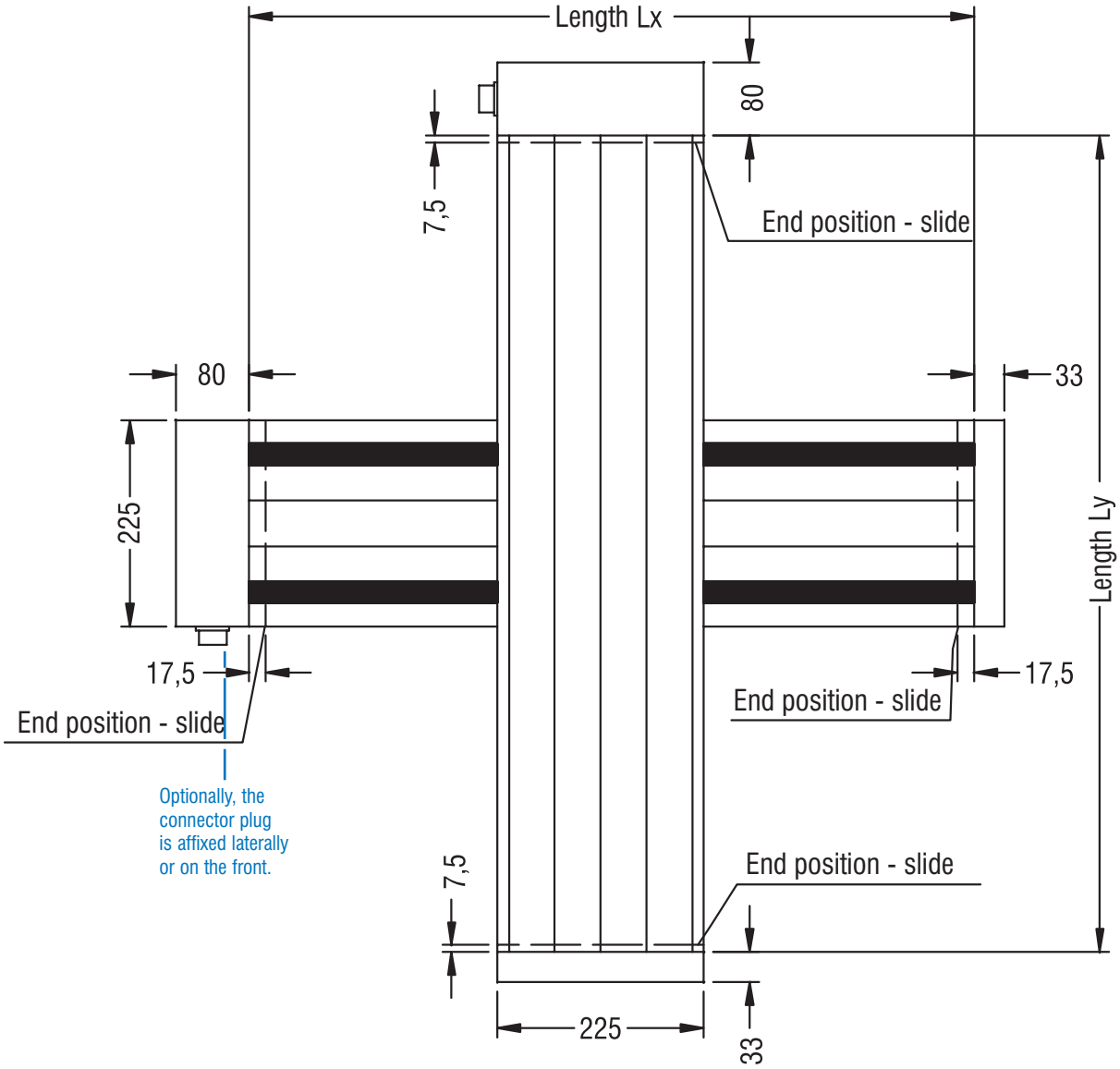
Item no.: **272 024 0606**

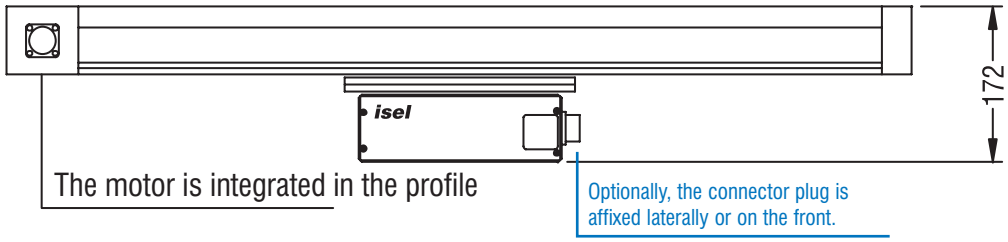
Compound table 1 connecting plates
- 220 x 255 x 8 mm
- packaging unit: 2 pieces

Item no.: **277 010**

Compound table 1

Scale Drawing

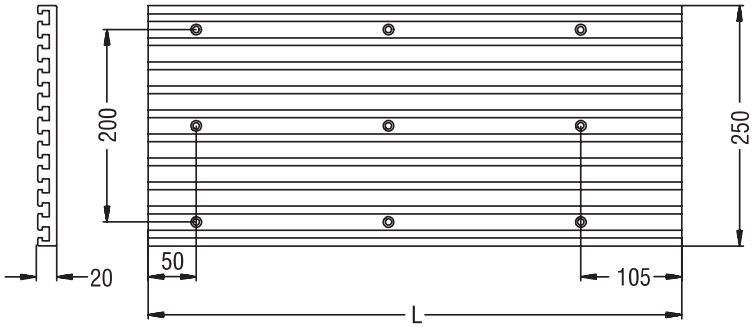




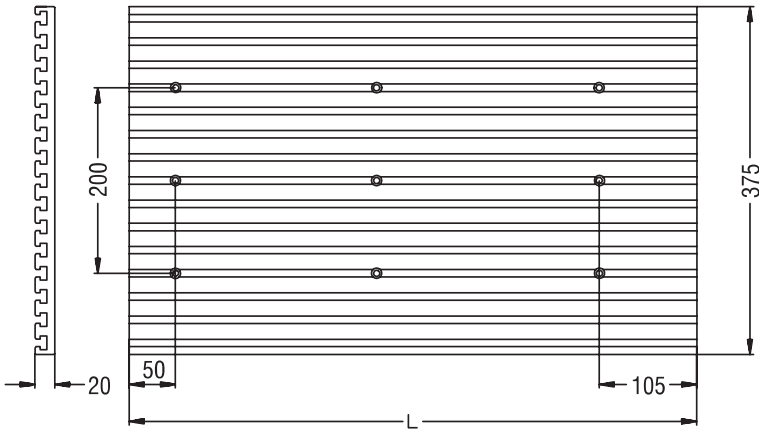
Compound Table 1

T-Slot Plates

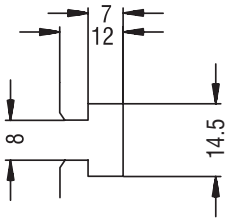
Scale Drawing - T-Slot Plates



holes Ø6.5



holes Ø6.5



Ordering data

Aluminium T-slot plates

- W 250 mm
- with fixing holes for compound tables

Length (mm)	Item no.
592	277 100 0592
692	277 100 0692
792	277 100 0792
1092	277 100 1092

Aluminium T-slot plates

- W 375 mm
- with fixing holes for compound tables

Length (mm)	Item no.
592	277 101 0592
692	277 101 0692
792	277 101 0792
1092	277 101 1092

Notes and Sketches

Compound table 2

Features

- travel ranges: x-axis: 450 mm
  y-axis: 220 mm
- linear guides with ball screw feed axes, pitch 5 mm
- connecting plates for compound tables made of ground steel
- individual assembly of a compound table by combining different linear guides

- Options:
  - other travel ranges
    - pitches: 2.5, 4, 10 and 20 mm

The compound table 2 from isel consists of two linear guides that are connected in rectangular way by two ground steel plates.

The x-axis consists of a linear unit LF 5 with a motor drive that is integrated in an aluminium profile. It has a travel range of 450 mm. The y-axis consists of linear guide LF 4, and has a travel range of 220 mm. Both axes have a ball screw drive with a pitch of 10 mm. The compound table 2 can be equipped both with a stepping motor (160 Ncm) and a servo motor (120 W).
Both linear guides have two linear slides.

In addition to this basic version, it is possible to combine all linear guides by means of connecting plates for compound tables from isel.
You can choose from different travel ranges, pitches and drive motors to assemble an individual compound table.

Ordering data

Compound table 2
- travel range 420 x 220 mm
- with stepping motor drive (160 Ncm)

Item no.: **272 314 0504**

Compound table 2
- travel range 420 x 220 mm
- with servo motor drive (120 W)

Item no.: **272 324 0504**

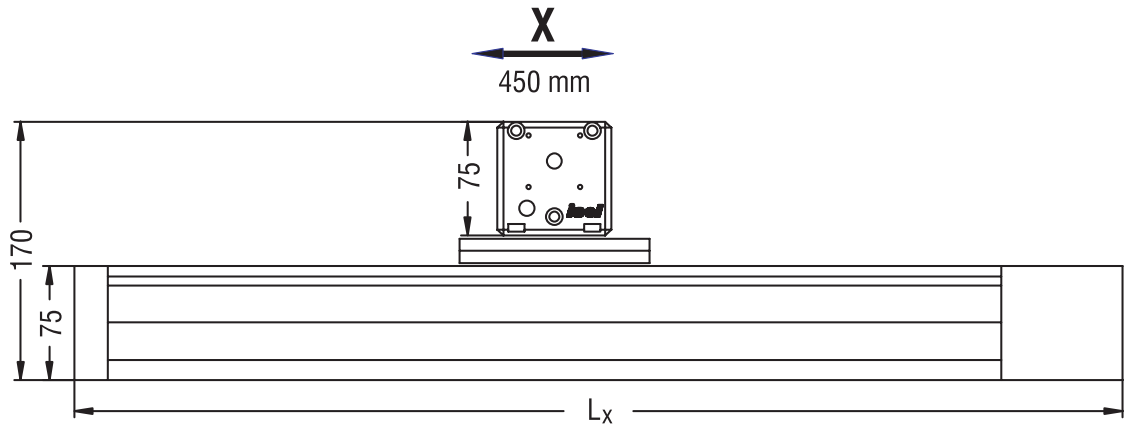
Options: motor fixed laterally

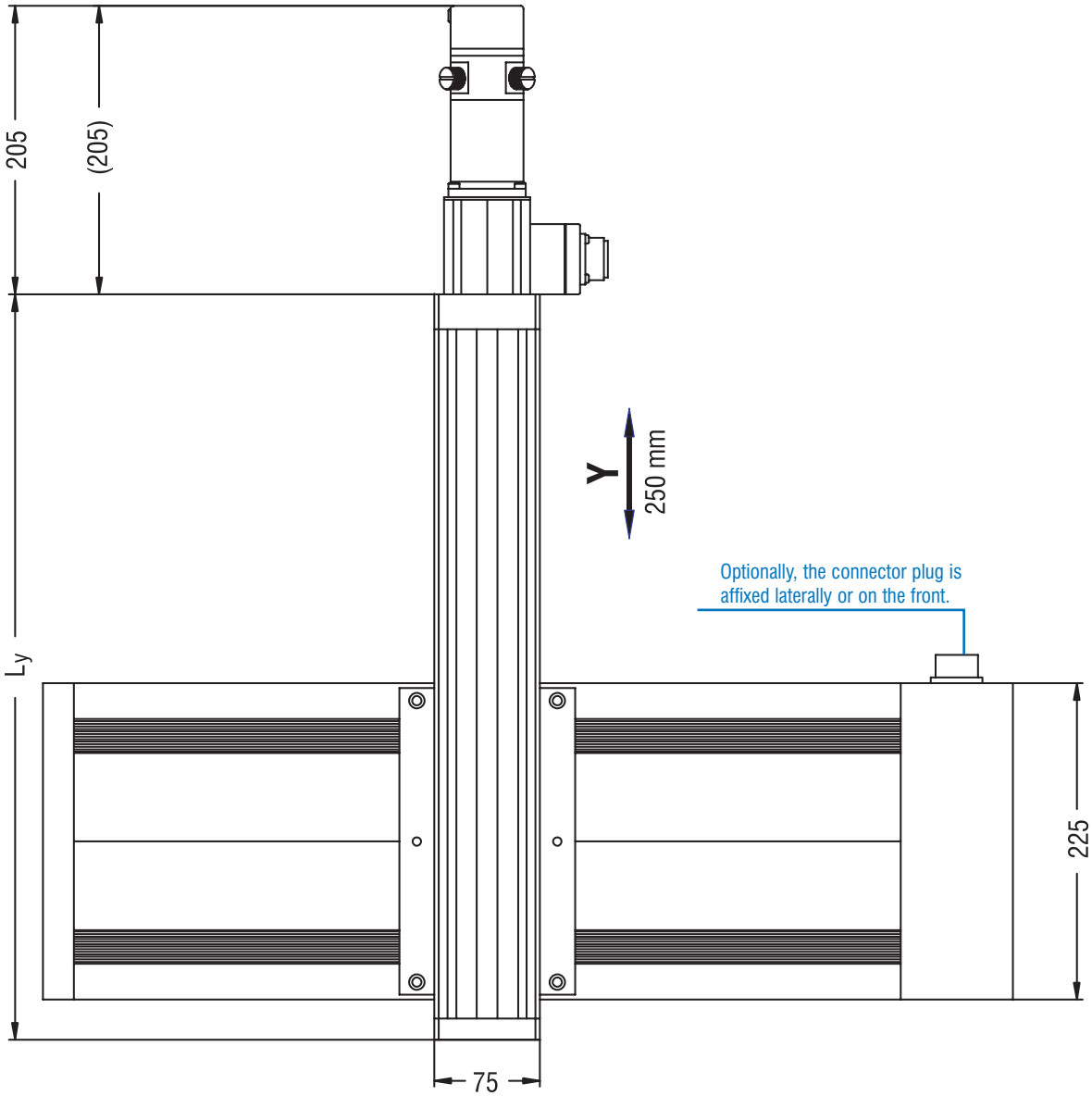
Compound table 2 connecting plates
- 220 x 125 x 8 mm
- packaging unit: 2 pieces

Item no.: **277 012**

Compound table 2

Scale Drawing





Double-track compound table 1

Features

- two precision feed units LF 1, L 500 and L 600 mm
- feed units shifted at an angle of 90°, stroke 270 x 370 mm
- clearance-free feed devices with stepping motor drives 110 Ncm
- NC coupling via a 15-pole amphenol plug on the stepping motor
- ball spindle drive 16 x 5 mm with eight flange bearings
- repeatability ± 0.01 mm (reproducibility)
- face-milled surfaces, accuracy < 0.05 mm
- great stiffness and capacity due to 16 linear bearings
- lip seal with teflon coat
- limit and/or reference position at 5 mm pitch > 0.0125 mm
- Options:
  - stroke from 50 to 1,250 mm
  - pitches: 2.5, 4, 10 and 20 mm

The double-track feed unit 1 from isel is available in closed design with stepping motor and ball screw drive up to a length of 1.5 metre.

The compound table 1 consists of two feed units 1 - which are shifted at an angle of 90° - that are connected and fixed by their face-milled clamping surfaces L 200 x W 175 x H 8 mm. The compound table 1, which is adjusted clearance-free, features pre-stressed linear ball bearings.
The table has a face-milled clamping surface (L 500 x W 175 mm) with four T-slots.

The respective stepping motor drive consists of a stepping motor with coupling, hand wheel and limit switch. The stepping motor drives a clearance-free ball screw drive (16 x 5 mm) with a repeatability of ± 0.01 mm (reproducibility).

Ordering data

Double-track compound table 1

- Stepping motor / ball screw drive 16 x 5 mm
- stroke 270 x 370 mm

Item no.: **242 001**

Double-track compound table 1

- with ball spindle drive 16 x 5 mm
- stroke 270 x 370 mm

Item no.: **241 001**

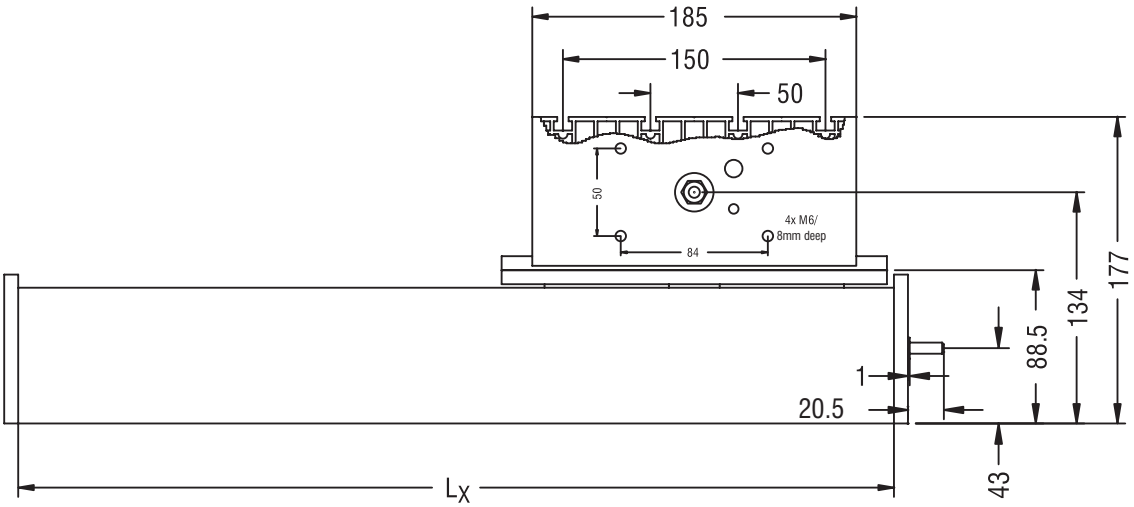
Double-track compound table 1

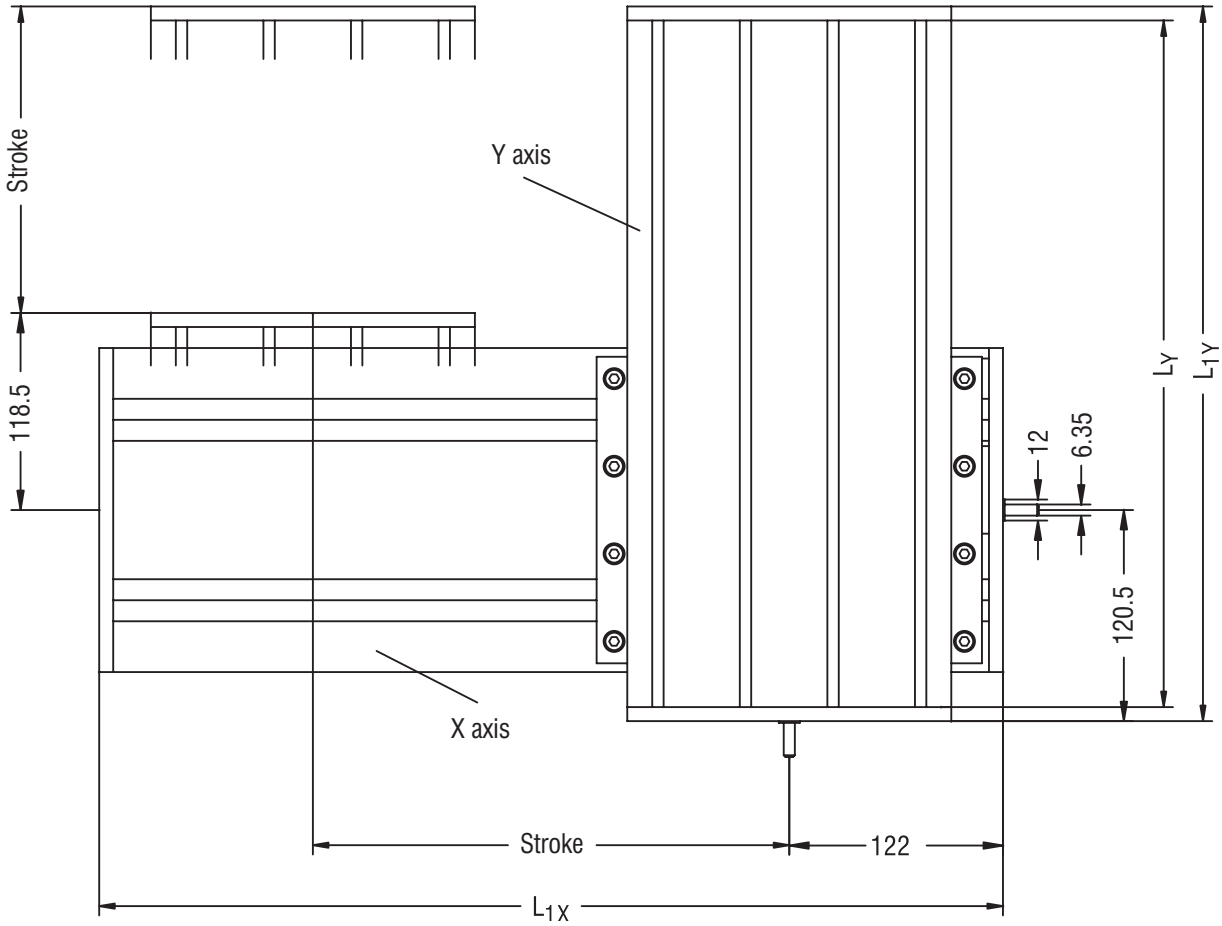
- without ball screw drive
- stroke 270 x 370 mm

Item no.: **240 001**

Double-track compound table 1

Scale Drawing





Timing Belt Feed Axes

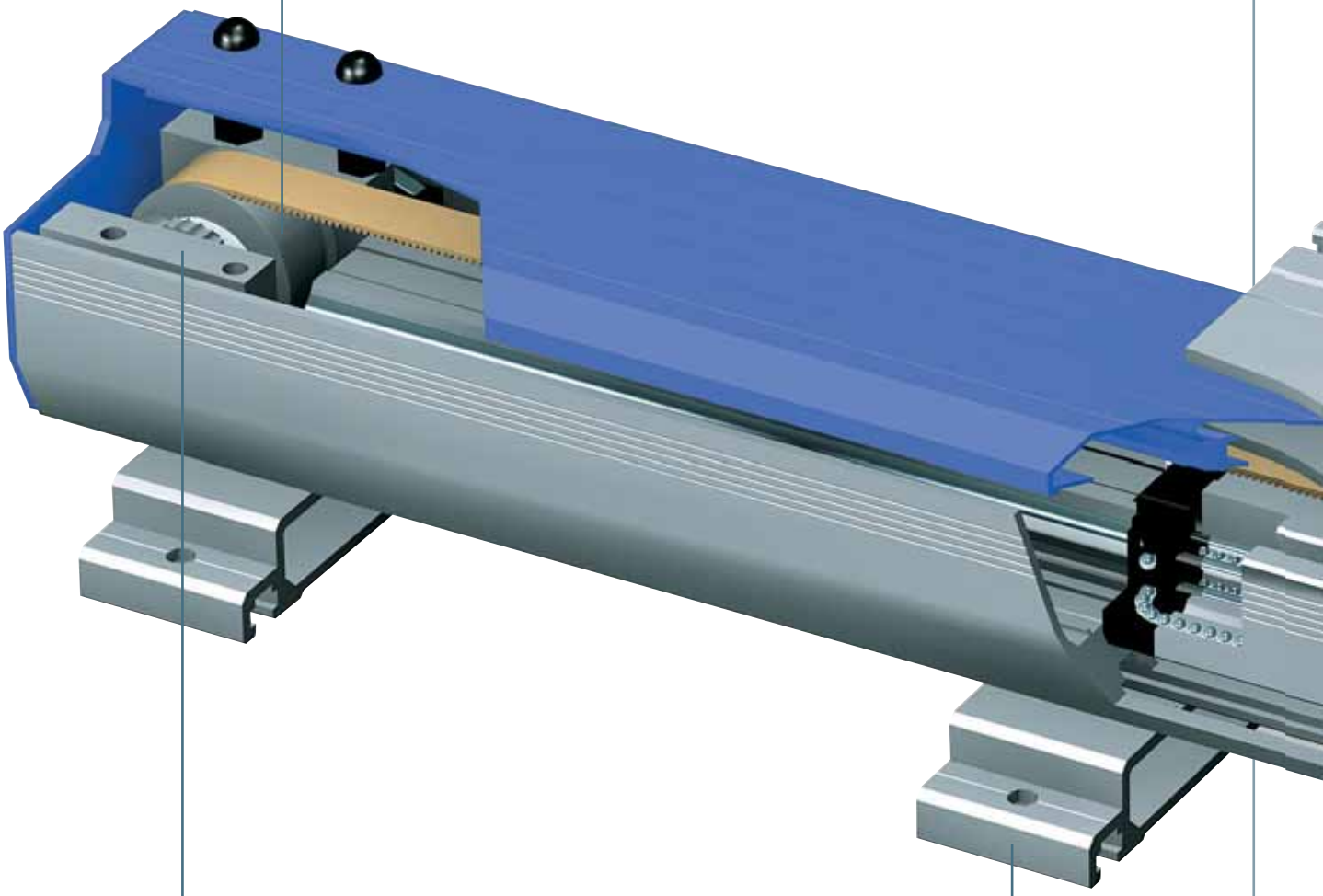
Overview

Timing Belt Feed Axes

Overview

Functions

BlueLine Series 1 and BlueLine Series 3

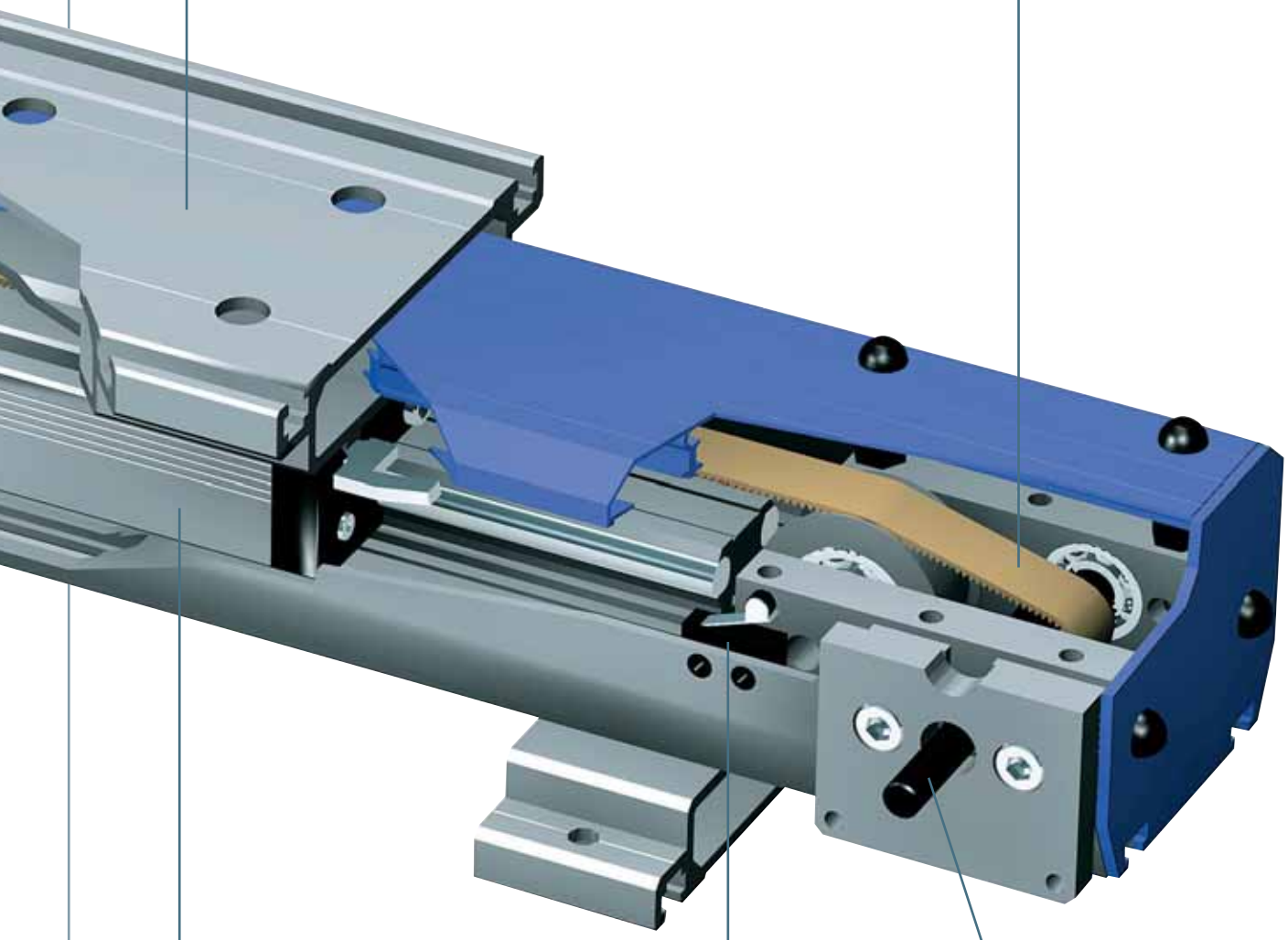


Functions

BlueLine Series 1 and BlueLine Series 3

Aluminium profile slide plate with T-slots

BL 1: Timing belt HTD 3M
BL 3: Timing belt HTD 5M



Patented shaft slide from isel

Integrated referen-ce/limit switch

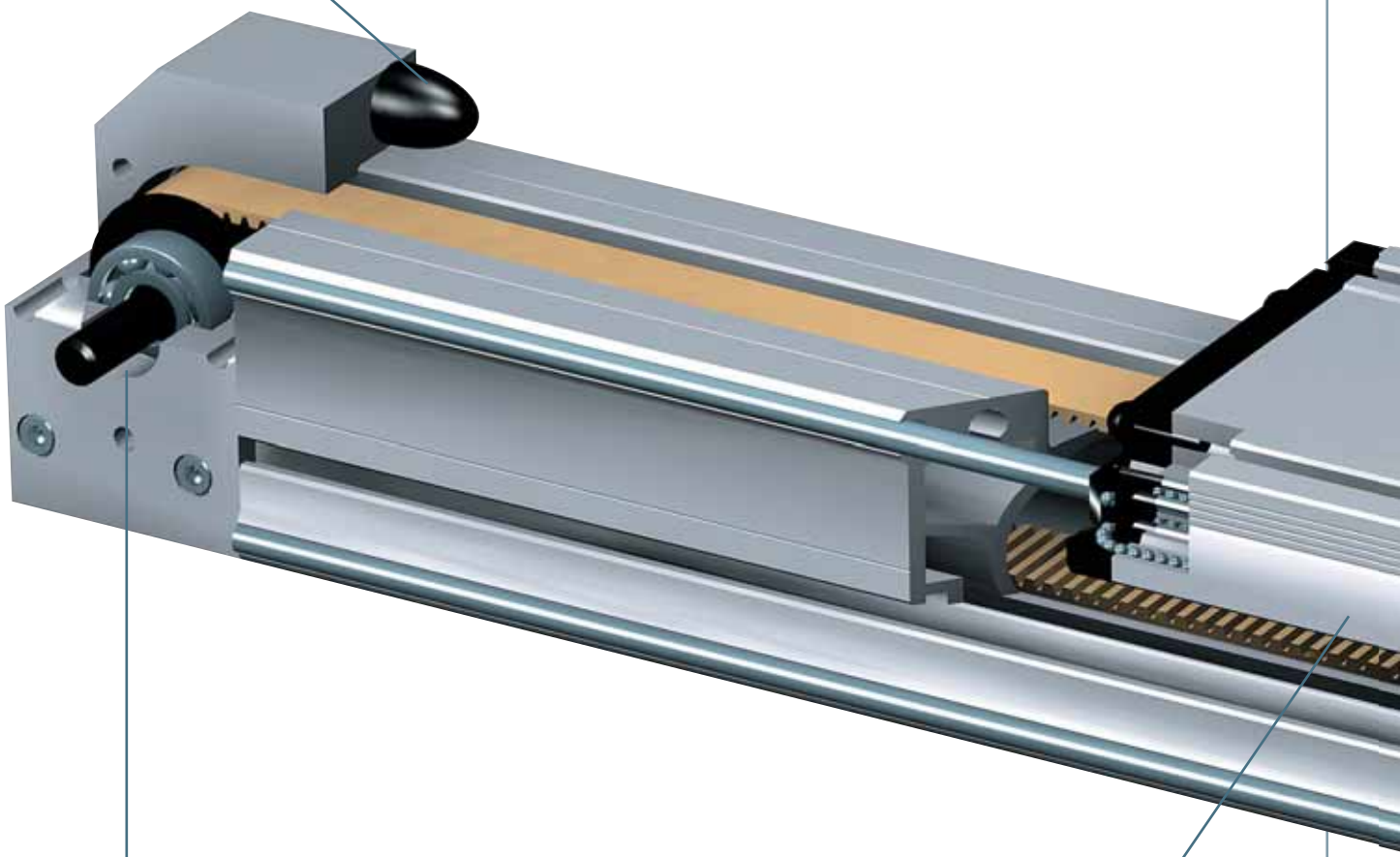
Ball bearing steel pinion

Motor can be mounted on both sides

Functions

Timing Belt Feed Axes ZF 2 and ZF 3

Bilateral limit position buffer
with parabola springs



ZF 3: Motor can be flanged
in any position

Patented shaft slide from isel

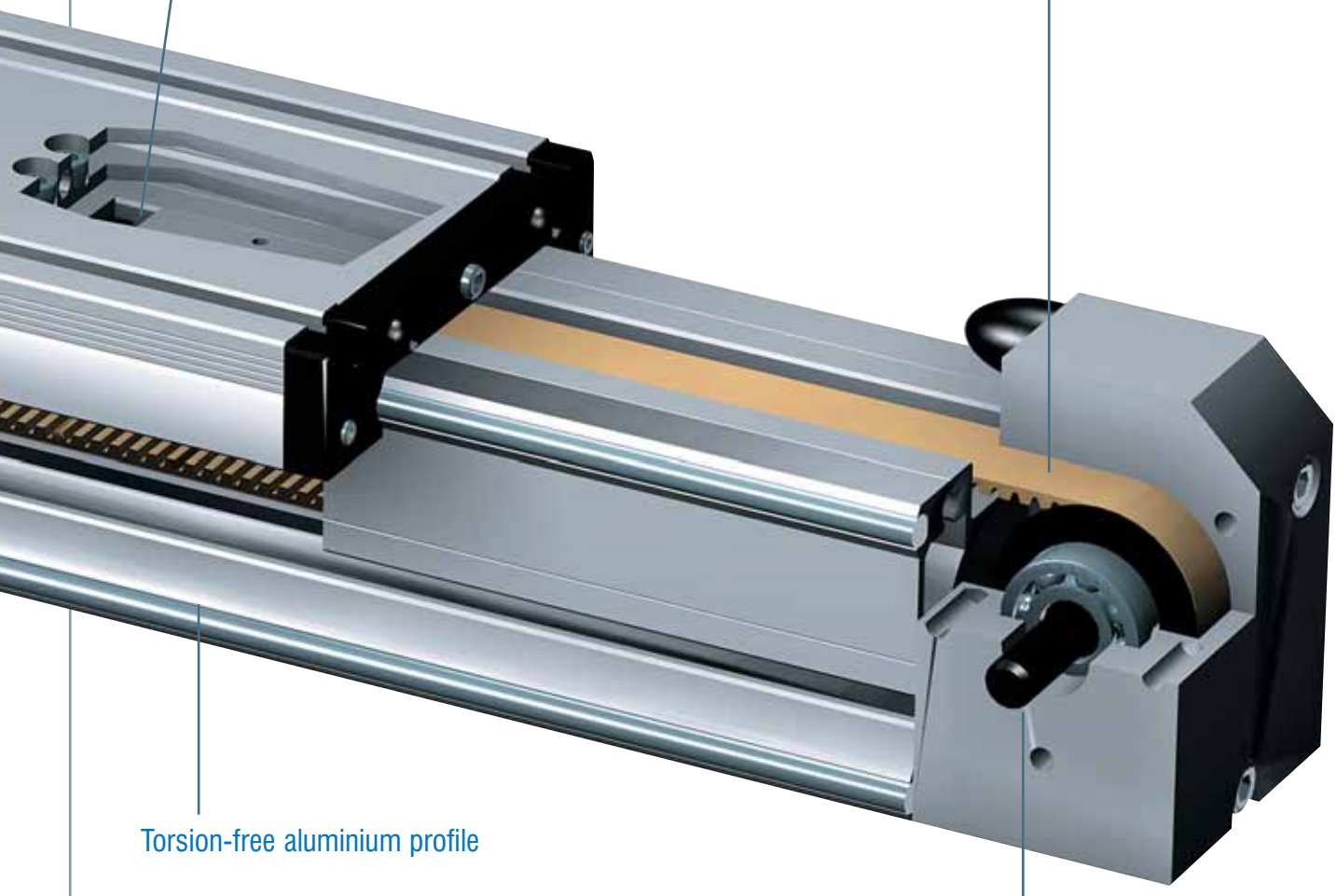
ZF 3: two slides - either shaft slides
or carriages - can be mounted

Functions

Timing Belt Feed Axes ZF 2 and ZF 3

Clamp bolt below the slide
enables an easy tensing
of the belt

Timing belt HTD 5M,
25 mm wide



Torsion-free aluminium profile

available in lengths up to 6 m

ZF 2: 2 steel shafts 8 mm,
moulded in the profile and calibrated

ZF 3: 4 steel shafts 8 mm,
moulded in the profile and calibrated

Steel pinions supported on
both sides

BlueLine Series 1

Closed timing belt feed axis

Feeds and shaft slides are also available in rust-proof designs!

- Aluminium profile with midget linear guide MLF 1
- Clearance-free feed with timing belt feed axis
  - timing belt with 3 mm pitch, width 15 mm
- Feed 2.4 m/s, at the most
- Shaft slide WS 1 L 126 x W 72 mm
- Repetitive accuracy less or equal ± 0.2 mm
- Limit and/or reference switch Accuracy < 0.1 mm
- Available in lengths up to 2.05 m
- Motor can be mounted on both sides due to an extended shaft end on the driving side
- Numerous combination possibilities due to additional special and angle profiles
- Integrated reference switch

BlueLine Series 1

Technical data

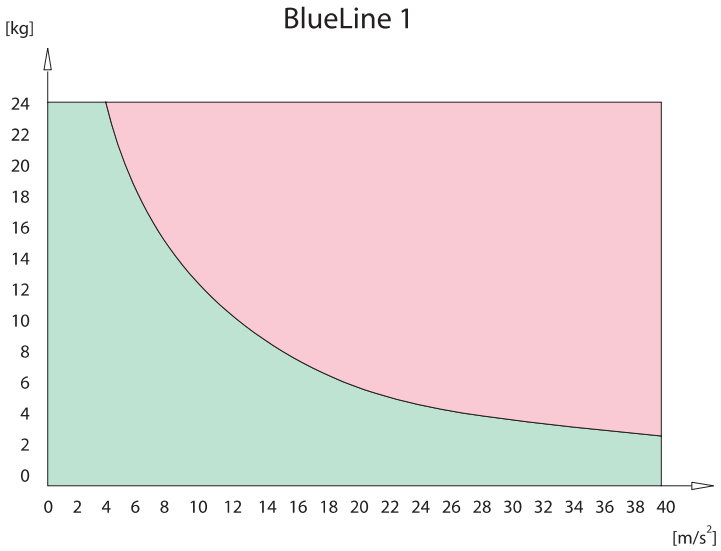
Belt version	HTD 3M, width 15 mm
Mass of slide	0.730 kg
Weight without drive module	1,000 mm ≙ 6.25 kg
Nominal mass of timing belt	0.0375 kg/m
Nominal weight of feed axis	0.440 kg/100 mm
Effective diameter of the synchronized pulleys	Ø 15.28 mm
Moment of inertia of the synchronized pulleys	$1.461 \cdot 10^{-6}$ kgm²
Feed per revolution	48 mm

Idle torques

Revolution [1/min]	Idle torque [Nm]
500	0.06
1,500	0.09
3,000	0.13

Load diagram

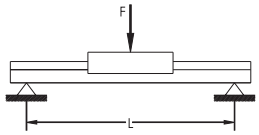
Permissible accelerated masses related to belt strength*



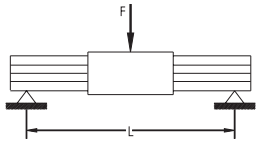
*At vertical assembly, the acceleration due to gravity (g = 9.81 m/s²) has to be taken into account

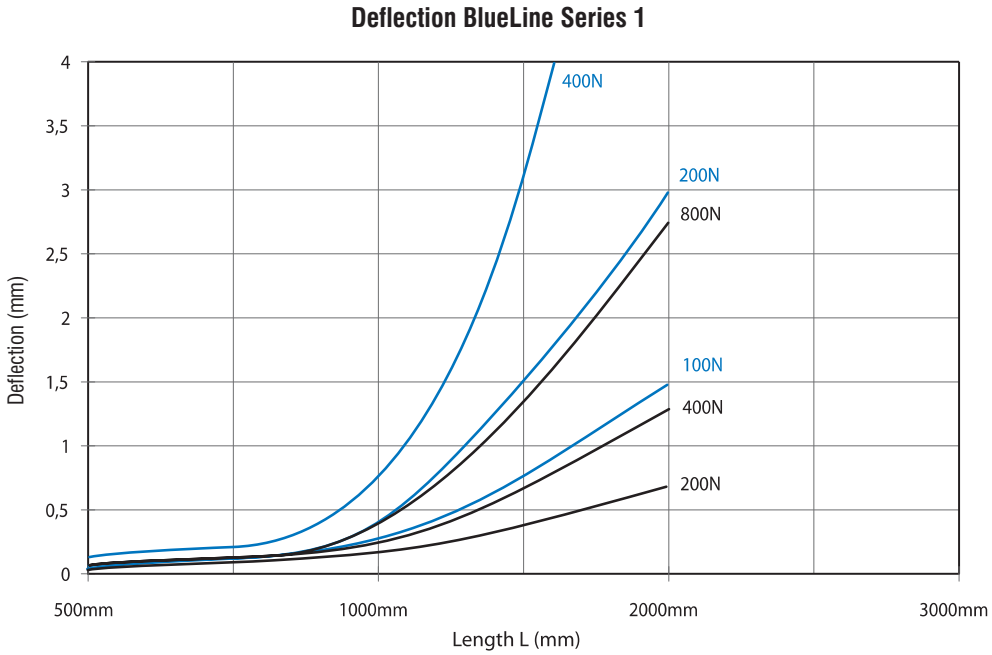
Deflection

Load - example 1



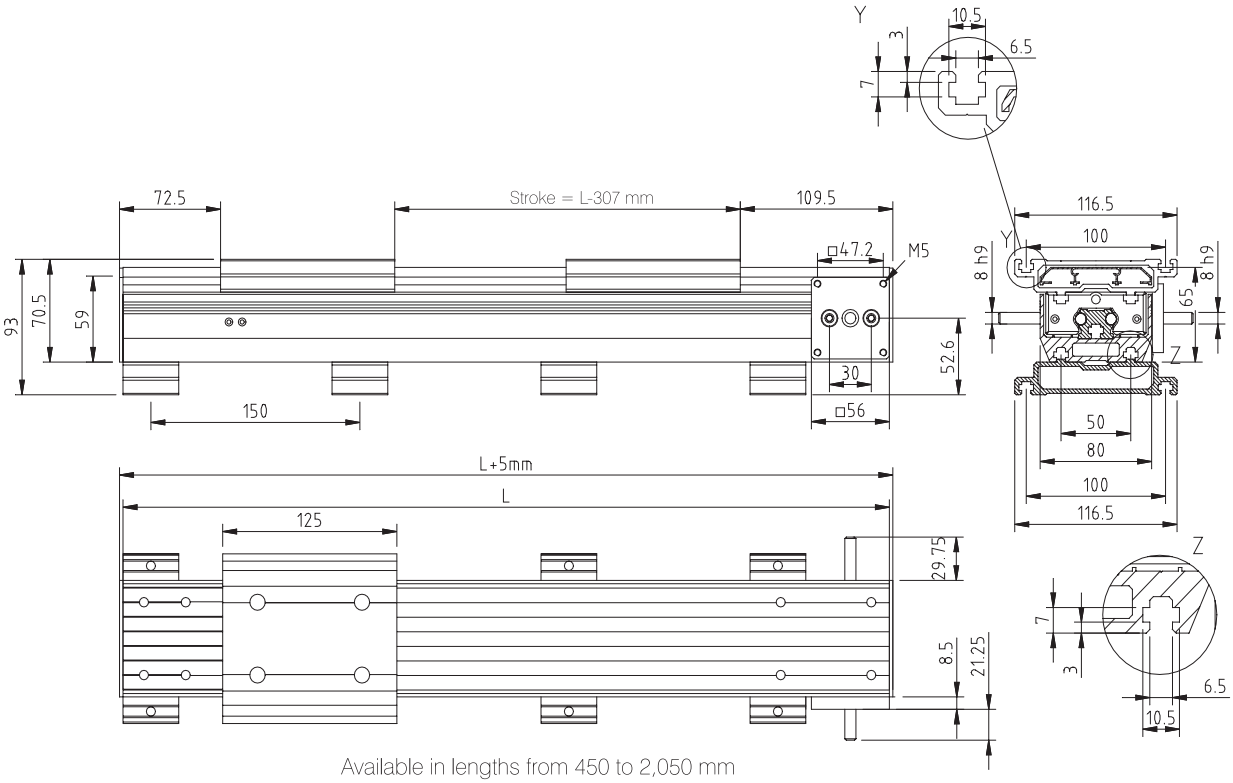
Load - example 2





BlueLine Series 1

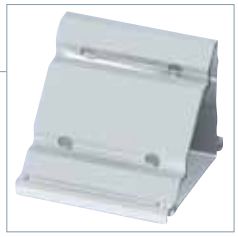
Timing Belt Feed Axis

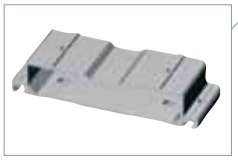


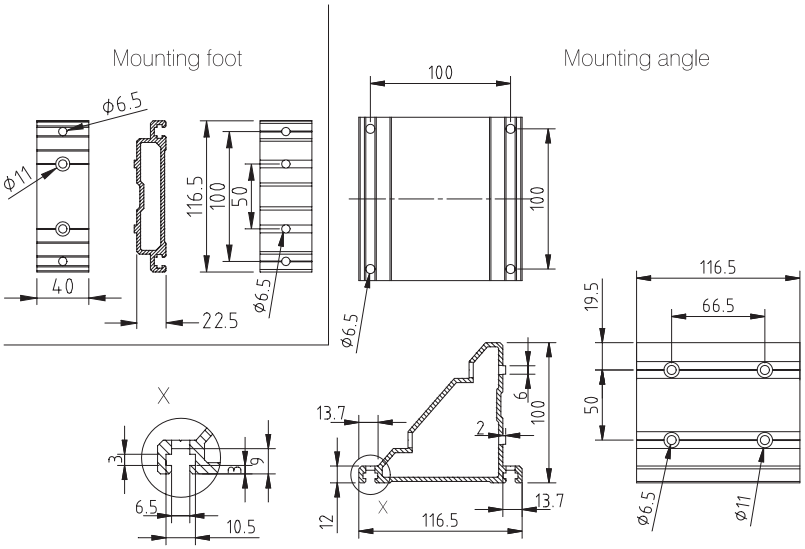
Available in lengths from 450 to 2,050 mm

BlueLine Series 1

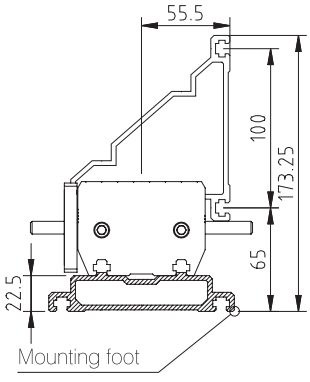
Mounting foot and mounting angle







Mounting angle as angle slide



BlueLine Series 1

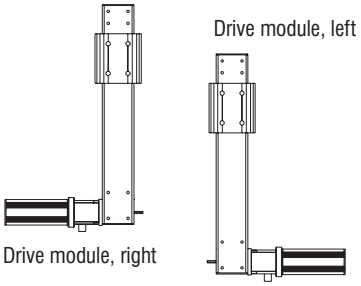
Drive Modules

DC servo motor MV 120

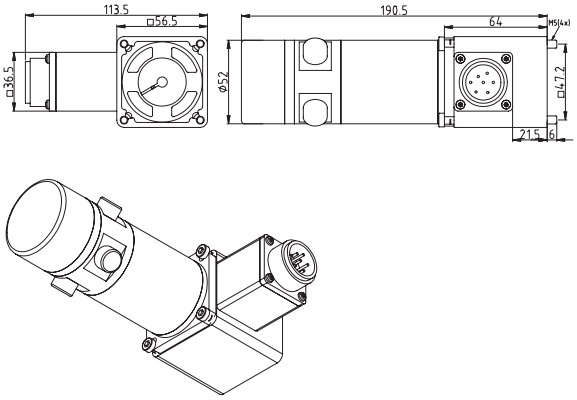
Nominal power.....120 W
Nominal speed.....3,000 rpm
Nominal torque.....38 Ncm
Current at nominal torque.....2.8 A
Nominal voltage.....65 V
Max. torque.....220 Ncm
Current at max. torque.....13 A
Ambient temperature.....0 - 40 °C

Stepping motor MS 160

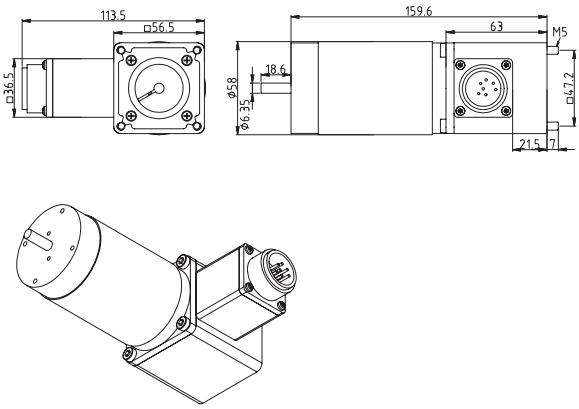
Holding torque – bipolar..... 160 Ncm
Stepping angle, full step..... 1.8 degree
half step..... 0.9 degree
Nominal voltage – bipolar..... 1.7 V
Resistance of winding..... 1.2 Ω
Inductance of winding..... 2.2 mH
Current of winding – bipolar....4.1 A



Drive module with DC servo motor MV 120



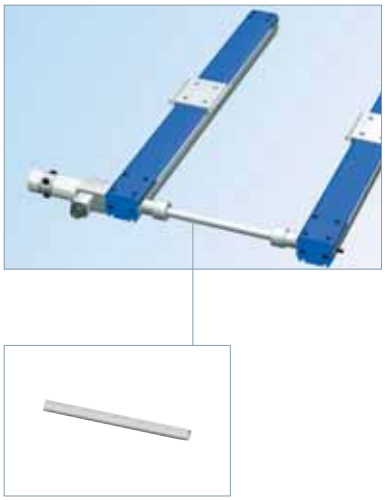
Drive module with stepping motor MS 160

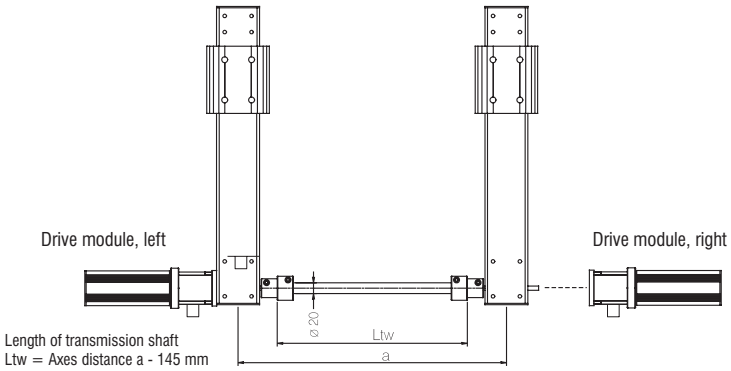


BlueLine Series 1

Connection of two timing belt feed axes

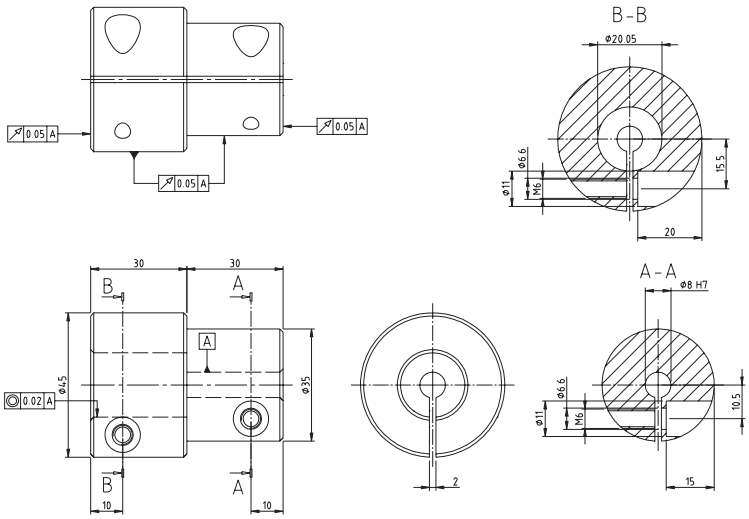
Transmission shaft





Connection of two timing belt feed axes

Coupling for transmission shaft



Moments of inertia

for coupling and transmission shaft

Coupling

$J_k = 4.258\ 10^{-5}\ kgm^2$

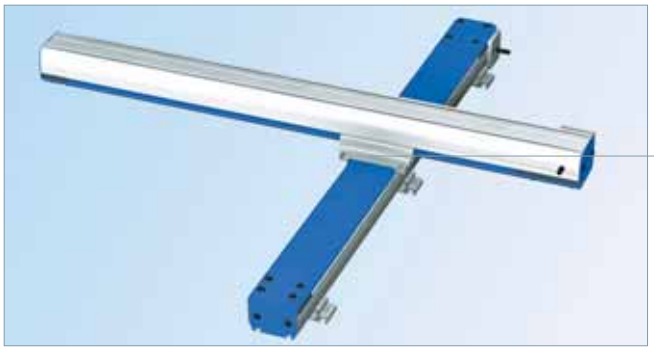
Transmission shaft (per 100 mm)

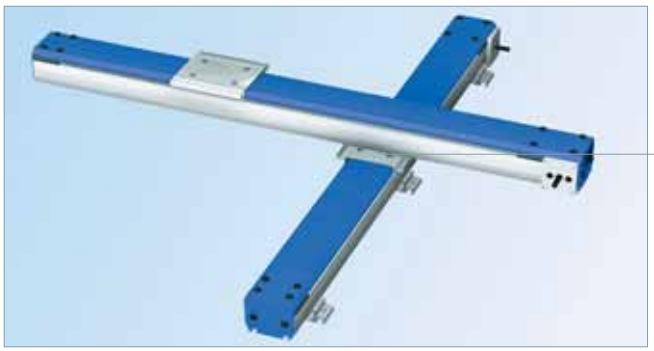
$J_{Trs} = 2.513\ 10^{-6}\ kgm^2/100\ mm$

BlueLine Series 1

Compound table construction

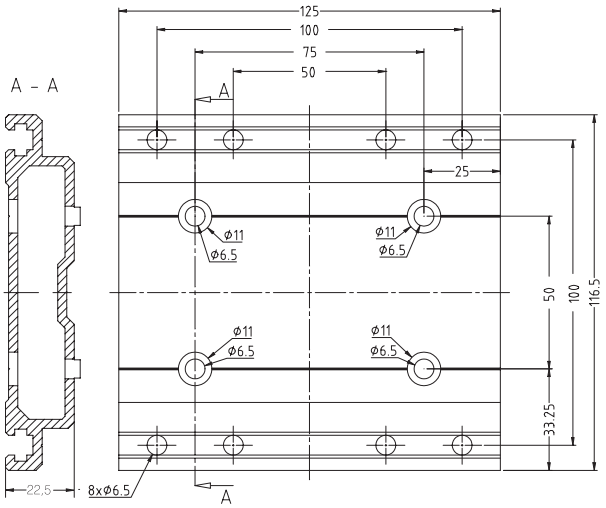
Connecting slides for compound tables





One of the timing belt feed axes has to be supplied with a connecting slide for compound tables in order to make the compound table construction possible.

The assembly takes place in the factory.



BlueLine Series 1

Order key

232 1XX XXXX

Motor
0 = without motor
1 = with stepping motor MS 160
2 = with DC servo motor MV 120

Driving side
0 = motor connection, right*
1 = motor connection, left*
* Motor flange for drive is mounted on the right resp. left side

Slide / connection
0 = with standard slide profile
1 = with connecting slides for compound tables
2 = with angle slide, right
3 = with angle slide, left

Basic profile lengths (mm)
450, 550 , 650, 750, 850, 950, 1,050, 1,150, 1,250, 1,350, 1,450, 1,550, 1,650, 1,750, 1,850, 1,950, 2,050
(e. g. 450 mm = 045
2,050 mm = 205)

Order samples

- without motor
- motor connection, left
- with standard slide pofile
- basic profile length 750 mm

Item no.: 232101 0075

- with stepping motor MS 160
- motor connection, left
- with standard slide profile
- basic profile length 750 mm

Item no.: 232111 0075

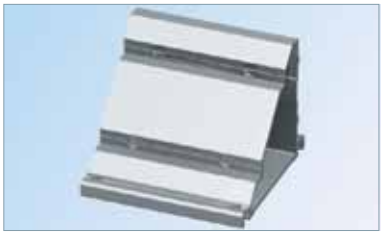
- with DC servo motor MV 120
- motor connection, left
- with angle slide, right
- basic profile length 750 mm

Item no.: 232121 2075

Accessory

Feet
- for BlueLine series 1
- 116.5 x 40 x 22.5 mm
- packing unit: 2 pieces

Item no.: 232199 0001



Angle slide as angle bracket
- for BlueLine series 1
- incl. fastening

Item no.: 232199 0002

Coupling for transmission shaft
- for BlueLine series 1
- packaging unit: 2 couplings

Item no.: 218050 0001

Transmission shaft Ø 20 mm
- for BlueLine-Serie 1

Length 1 m, item no.: 219001 0120
Length 2 m, item no.: 219001 0220

BlueLine Series 3

Closed timing belt feed axis

Feeds and shaft slides are also available in rust-proof designs!

- Aluminium profile with midget linear guide MLF 3
- Clearance-free feed with timing belt feed axis
  - timing belt with 5 mm pitch, width 25 mm
- Feed 5 m/s, at the most
- Shaft slide WS 3, L 176 x W 130 mm
- Repeatability less or equal ± 0.2 mm
- Limit and/or reference switch, accuracy < 0.1 mm
- Available in lengths up to 3 m
- Motor can be mounted on both sides due to an extended shaft end on the driving side
- Numerous combination possibilities due to additional special and angle profiles
- Integrated reference switch
- Option: special lengths (100 1/mm raster) upon request, max. 3,000 mm

BlueLine Series 3

Technical specifications

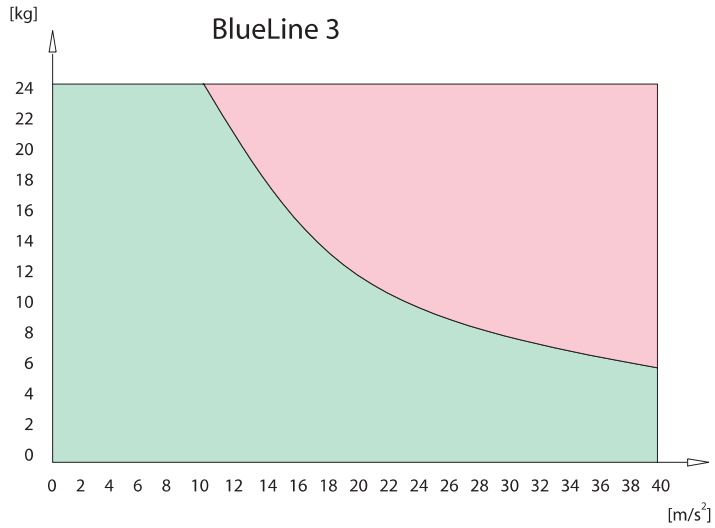
Belt version	HTD 5M, width 25 mm
Mass of slide	1.753 kg
Weight without drive module	1,000 mm ≙ 12 kg
Nominal mass of timing belt	0.09 kg/m
Nominal weight of feed axis	0.850 kg/100 mm
Effective diameter of the synchronized pulleys	Ø 22.28 mm
Moment of inertia of the synchronized pulleys	$8.542 \cdot 10^{-5}$ kgm²
Feed per revolution	70 mm

Idle torques

Revolution [1/min]	Idle torque [Nm]
500	0.16
1500	0.24
3000	0.36

Load diagram

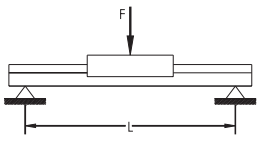
Permissible accelerated masses related to belt strength*



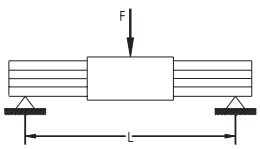
* At vertical assembly, the acceleration due to gravity (g = 9.81 m/s²) has to be taken into account

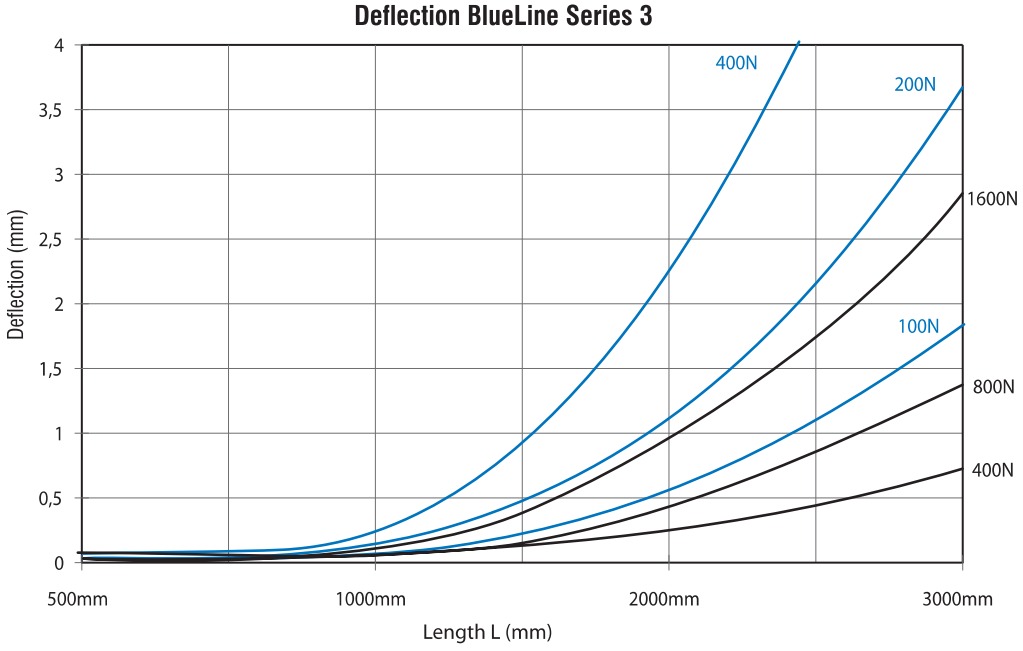
Deflection

Load - example 1



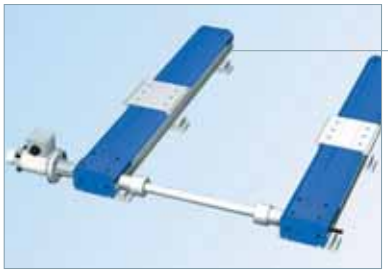
Load - example 2

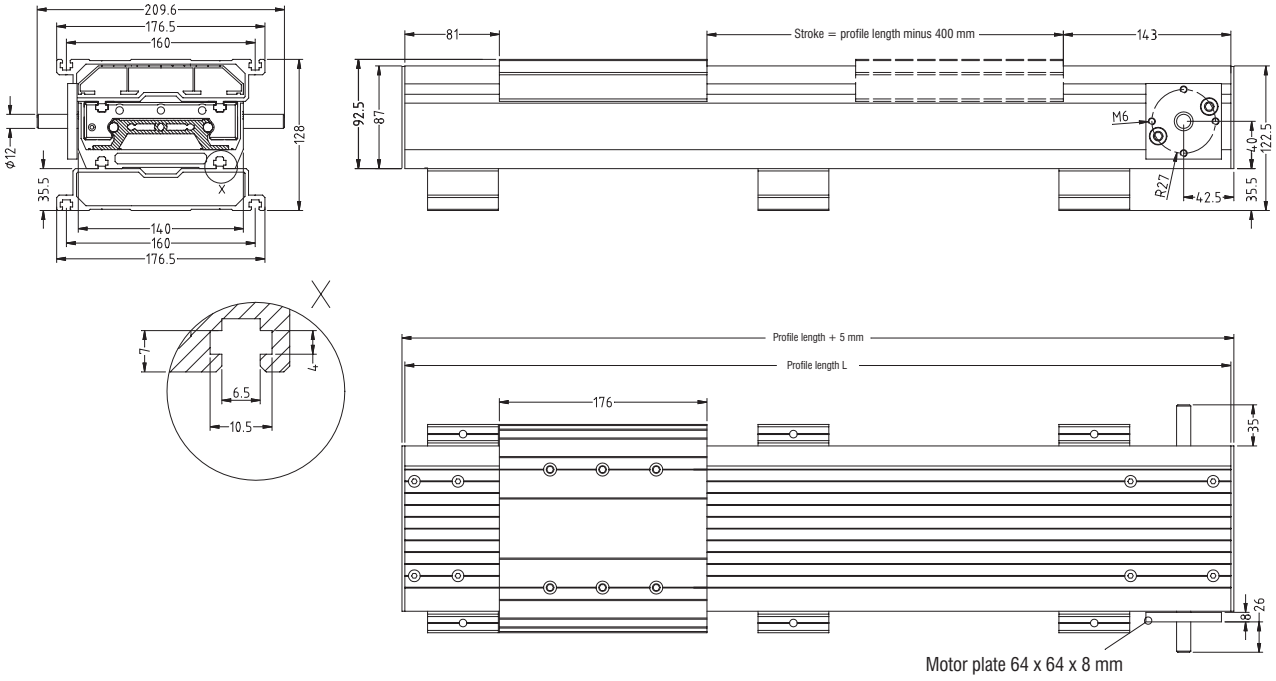




BlueLine Series 3

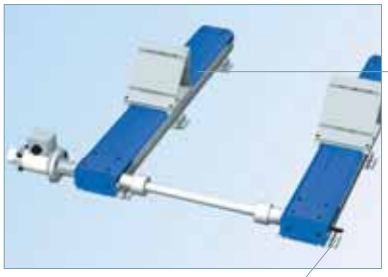
Timing Belt Feed Axis

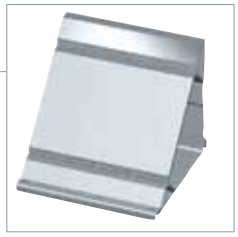




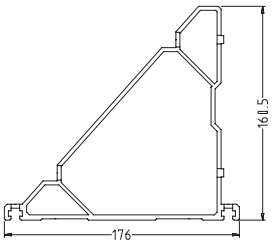
BlueLine Series 3

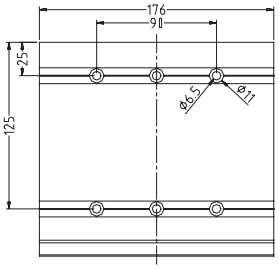
Mounting foot and mounting angle

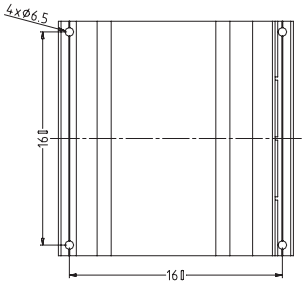




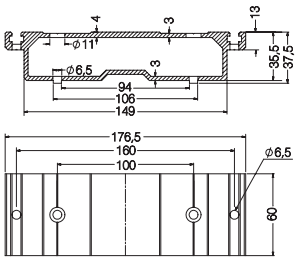
Mounting angle



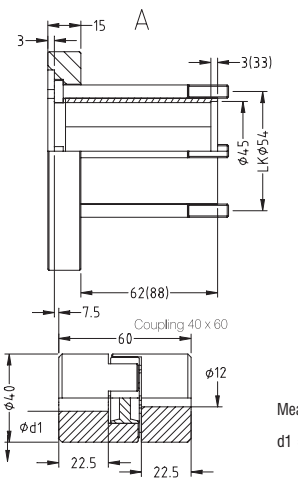


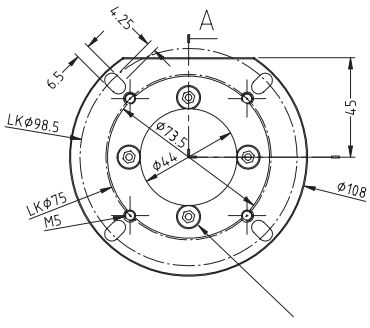


Mounting foot



Coupling casing set 2





4 clampinng bolts M6x75 (100)

Measures in brackets refer to dimensions with distance sleeve 2

d1 = motor shaft diameter 9.52 mm or 11 mm

BlueLine Series 3

Drive modules

Stepping motor MS 430 HT

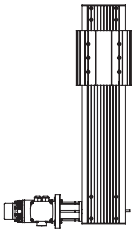
Holding torque – bipolar	600 Ncm
Stepping angle, full step	1.8 deg
half step	0.9 deg
Nominal voltage – bipolar	2.8 V
Resistance of winding	0.66 Ω
Inductance of winding	2.5 mH
Current of winding – bipolar	5.9 A

DC servo motor MV 330

Nominal power	330 W
Nominal speed	3,000 rpm
Nominal torque	100 Ncm
Current at nominal torque	6.5 A
Nominal voltage	65 V
Peak torque	539 Ncm
Current at peak torque	30 A
Ambient temperature	0 - 40 °C

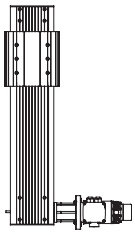
AC servo motor MY 073

Nominal power	830 W
Nominal speed	4,000 rpm
Nominal permanent torque	200 Ncm
Nominal permanent current	4.7 A
Voltage constant	26.3 V/1000
Moment of inertia of rotor	0.57 kgcm²

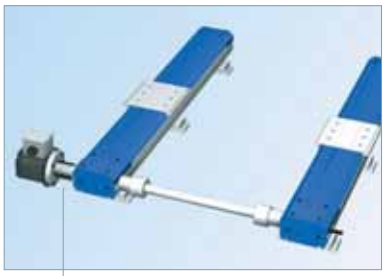


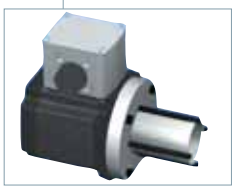
Drive module, left

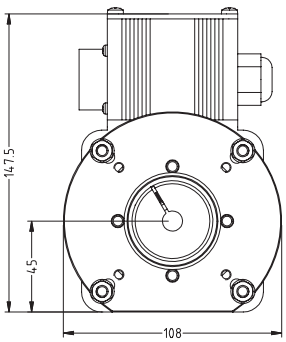
Drive module, right

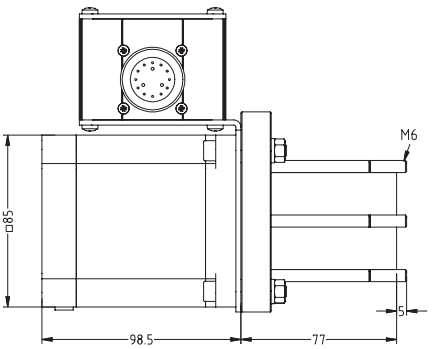


Drive module with stepping motor MS 430 HT



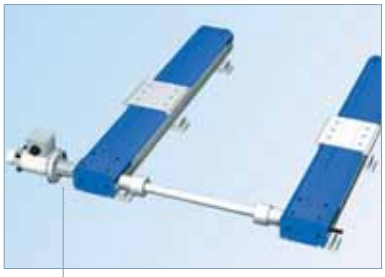


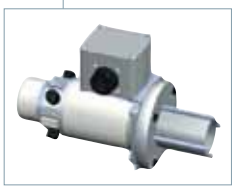


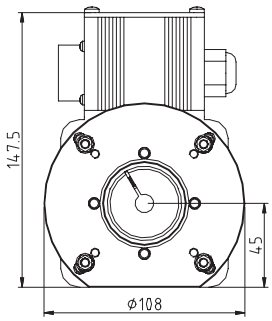


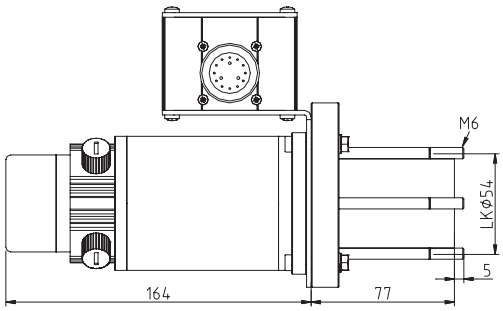
BlueLine Series 3

Drive module with DC servo motor MV 330

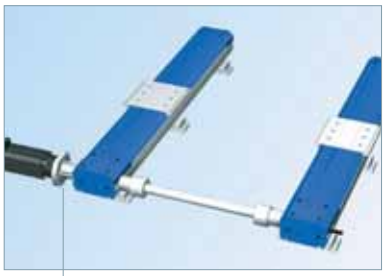


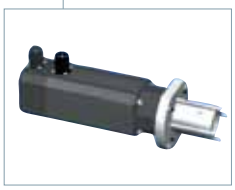


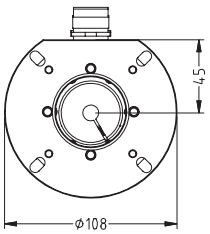


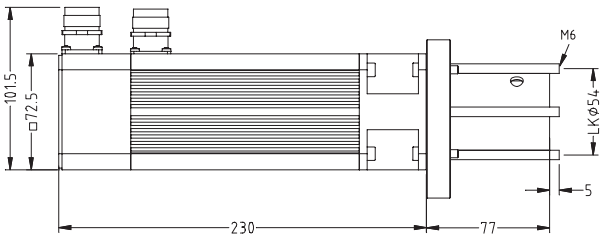


Drive module with AC servo motor MY 073







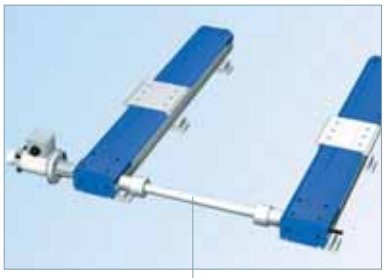


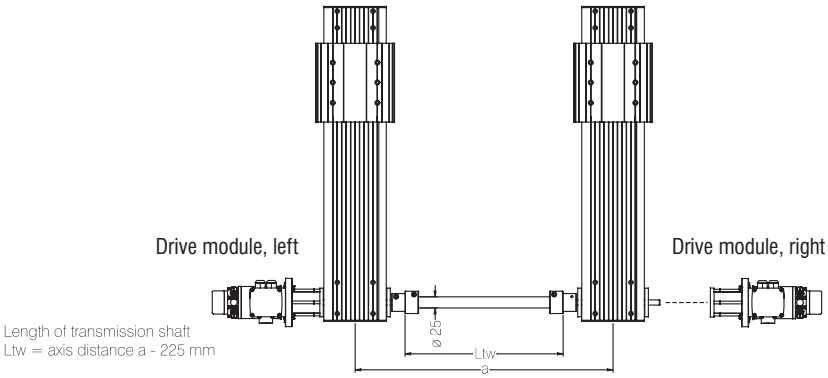
mechanics

BlueLine Series 3

Connection of two timing belt feed axes

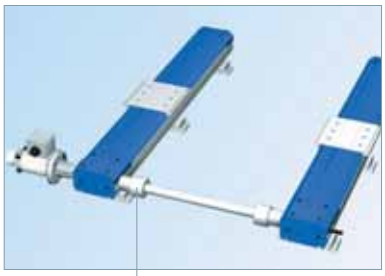
Transmission shaft

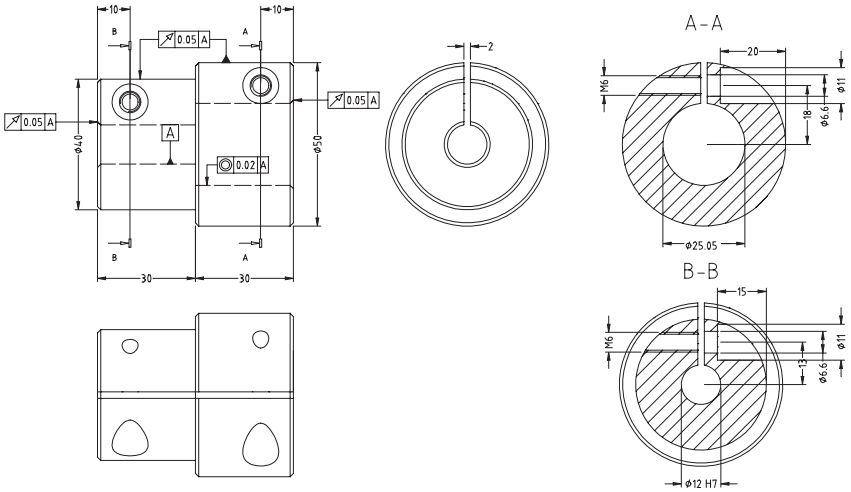




Connection of two timing belt feed axes

Coupling for transmission shaft





Moments of inertia

for coupling and transmission shaft

Coupling

$J_k = 6.643\ 10^{-5}\ kgm^2$

Transmission shaft (per 100 mm)

$J_{Trs} = 5.218\ 10^{-6}\ kgm^2/100\ mm$

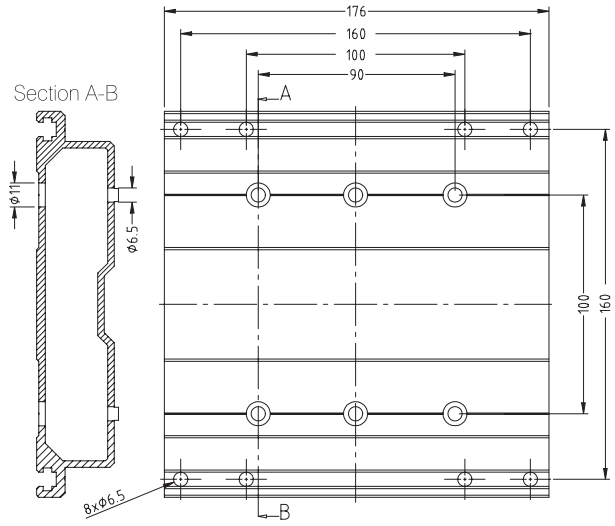
BlueLine Series 3

Compound table construction

Cross-table junction slide

One of the timing belt feed axes has to be supplied with a connecting slide for compound tables in order to make the compound table construction possible.

The assembly takes place in the factory.



BlueLine Series 3

Order key

232 30X XXXX

Driving side
0 = motor connection, right
1 = motor connection, left

Slide / connection
0 = with standard slide profile
1 = with connecting slides for compound tables

Basic profile lengths (mm)

800	(item no.: ..... .075)
1,100	(item no.: ..... .105)
1,200	(item no.: ..... .115)
1,600	(item no.: ..... .155)
2,100	(item no.: ..... .205)
2,600	(item no.: ..... .255)
2,900	(item no.: ..... .285)
3,000	(item no.: ..... .295)

Drives*		Drive on the right side	Drive on the left side
		Item no.	Item no.
Stepping motor	MS 430 HT	396085 0193	396085 0020
DC servo motor	MV 330	396104 0093	396104 0020
AC servo motor	MY 073	396573 0020	396573 0020

* Please, order the drive modules separately; use the above-stated item numbers for this purpose.
Do not forget to specify whether the delivery should take place with or without extension.
Regarding the AC servo motor MY 073, the driving side has to be stated separately.

Order samples

- with stepping motor MS 430 HT
- motor connection, left
- with standard slide profile
- basic profile length 800 mm

Item no.: 232301 0075 (feed)
Item no.: 396085 0020 (drive)

- with DC servo motor MV 330
- motor connection, left
- with angle bracket, right
- basic profile length 800 mm

Item no.: 232301 0075 (feed)
Item no.: 396104 0020 (drive)

- with AC servo motor MY 073
- motor connection, left
- with standard slide profile
- basic profile length 800 mm

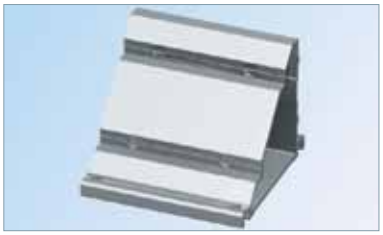
Item no.: 232301 0075 (feed)
item no.: 396573 0020 (drive)

BlueLine Series 3

Accessory

Feet
- for BlueLine series 3
- 176.5 x 60 x 35.5 mm,
- packing unit: 2 pieces

Item no.: **232399 0001**



Angle Brackets
- for BlueLine series 3
- incl. fastening

Item no.: **232399 0002**

Coupling for transmission shaft
- for BlueLine series 3
- packing unit: 2 couplings

Item no.: **218050 0002**

Transmission shaft Ø 25 mm
- for BlueLine series 3

Length 1 m, item no.: **219001 0125**

Length 2 m, item no.: **219001 0225**

Timing Belt Feed Axis ZF 1

Open timing belt feed axis

Feeds and shaft slides are also available in rust-proof designs!

- Aluminium profile with midget linear guide MLF 2
- Clearance-free feed with timing belt feed axis
  - timing belt with 3 mm pitch, width 9 mm
- Feed per revolution: 60 mm
- Repeatability less or equal ± 0.2 mm
- Feed 1.5 m/s, at the most
- Limit and/or reference switch accuracy < 0.1 mm (with drive modules)
- Option:
  special lengths (100 1/mm raster) upon request, max. 6,000 mm

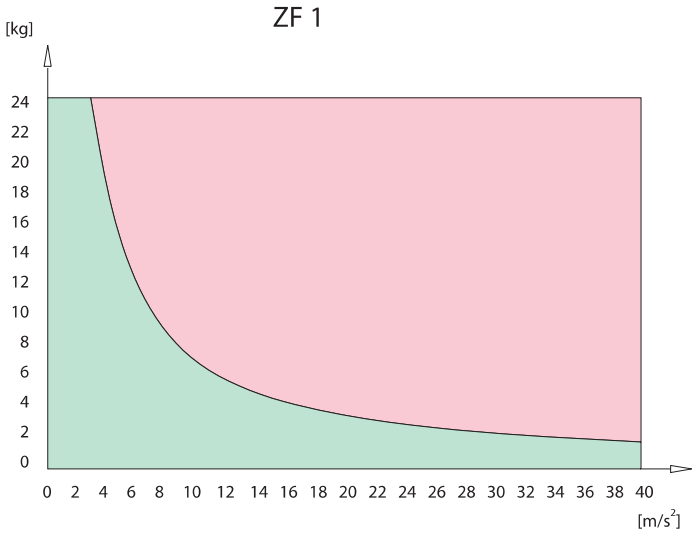
Timing Belt Feed Axis ZF 1

Technical specifications

Belt version	HTD 3M, width 9 mm
Weight of slide	0.430 kg
Weight without drive module	1000 mm ≙ 3 kg
Nominal mass of timing belt	0.0225 kg/m
Weight of carriage	1.03 kg
Nominal weight of guide	0.200 kg/100 mm
Effective diameter of the synchronized pulleys	Ø 19.10 mm
Moment of inertia of the synchronized pulleys	$5.585 \cdot 10^{-7}$ kgm²
Feed per revolution	60 mm

Load diagram

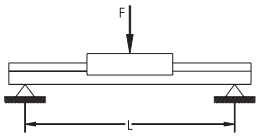
Permissible accelerated masses related to belt strength*



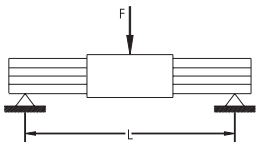
* At vertical assembly, the acceleration due to gravity (g = 9.81 m/s²) has to be taken into account

Deflection

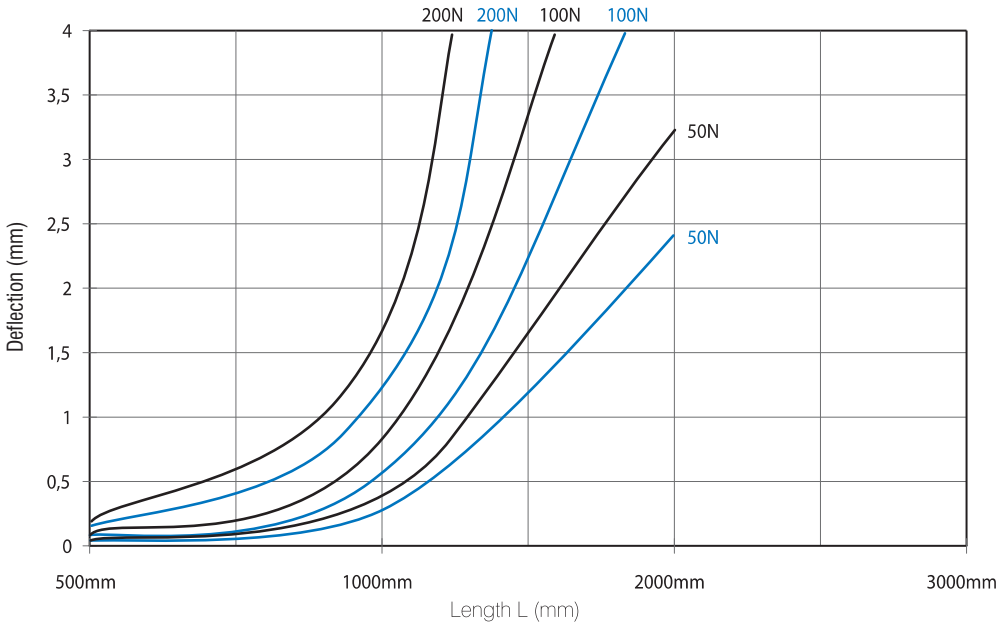
Load - example 1



Load - example 2



Deflection Timing Belt Feed Axis ZF 1



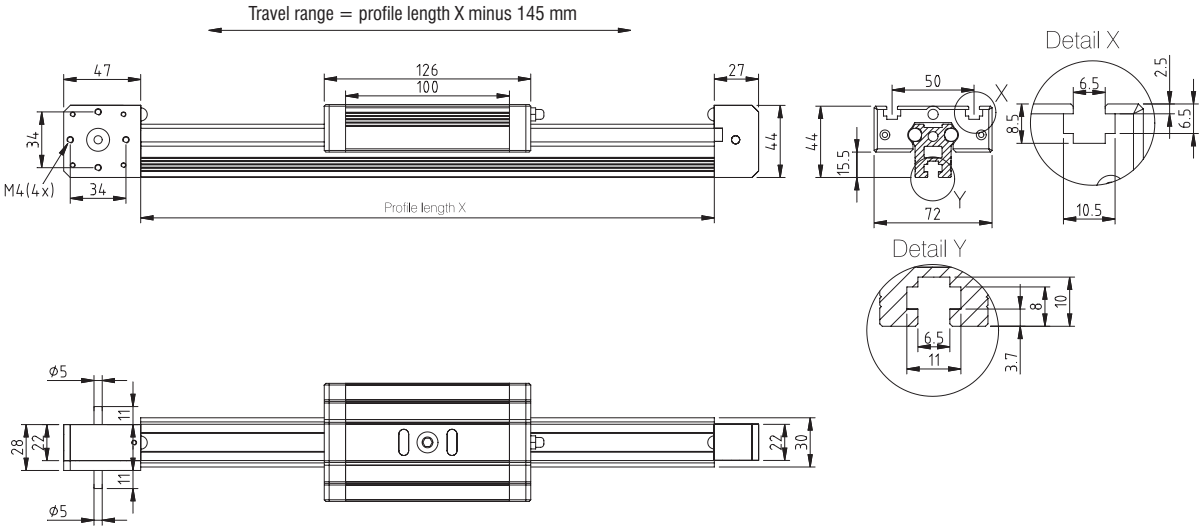
mechanics

Timing Belt Feed Axis ZF 1

Timing belt feed axis

without motor

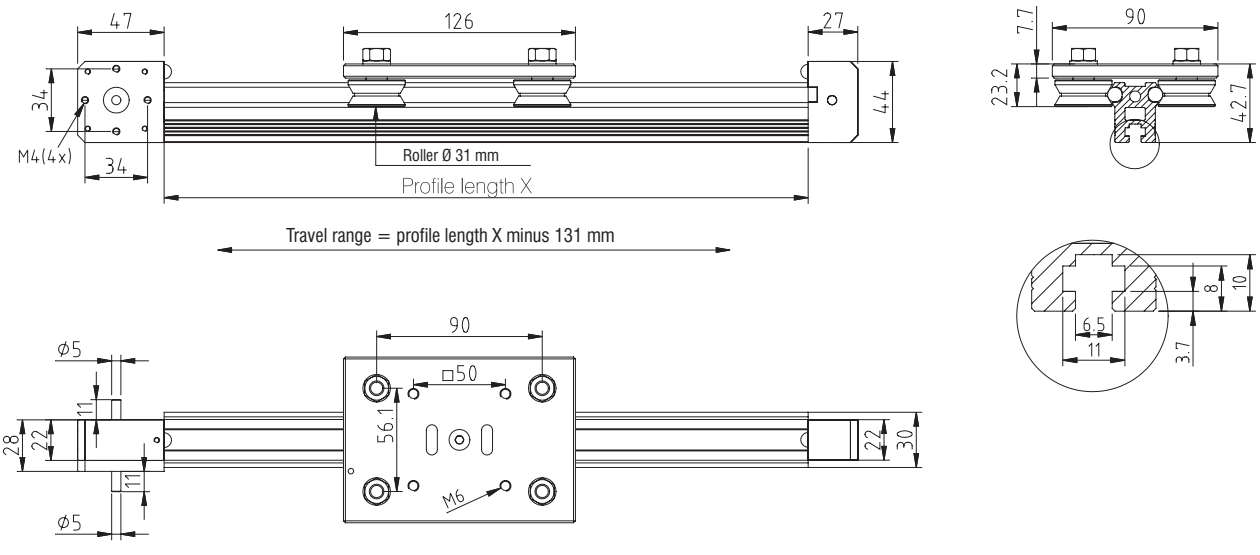
with shaft slide



Timing belt feed axis

without motor

with carriage



Timing Belt Feed Axis ZF 1

Drive modules

Stepping motor MS 050 HT

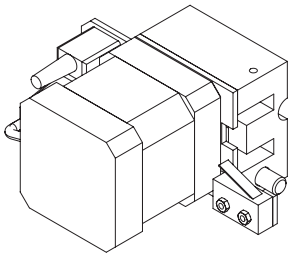
Holding torque - bipolar..... 50 Ncm
Stepping angle, full step..... 1.8 deg
Stepping angle, half step.....0.9 deg
Nominal voltage – bipolar .....3.2 V
Resistance of winding..... 1.1 Ω
Inductance of winding.....1.85 mH
Current of winding - bipolar.....1.8 A

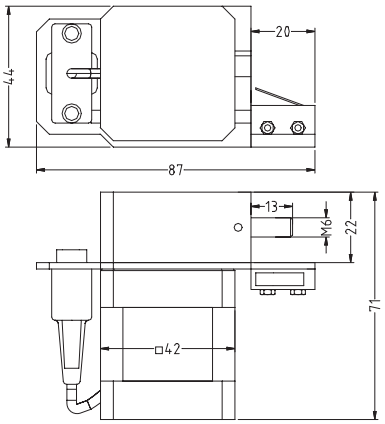
Stepping motor MS 160

Holding torque – bipolar.....160 Ncm
Stepping angle, full step..... 1.8 deg
Stepping angle, half step.....0.9 deg
Nominal voltage – bipolar.....1.7 V
Resistance of winding..... 1.2 Ω
Inductance of winding.....2.2 mH
Current of winding - bipolar.....4.1 A

Drive module with stepping motor MS 050 HT (ratio 1:1)

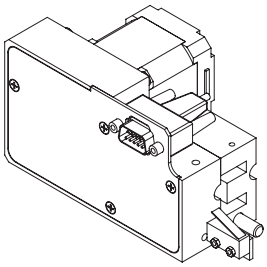
Feed: 60 mm/revolution

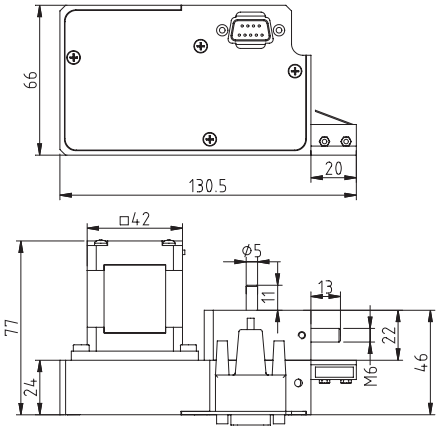




Drive module with stepping motor MS 050 HT (ratio 2:1)

Feed: 30 mm/revolution



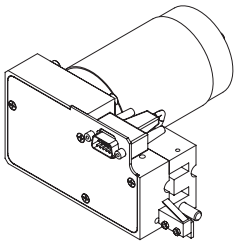


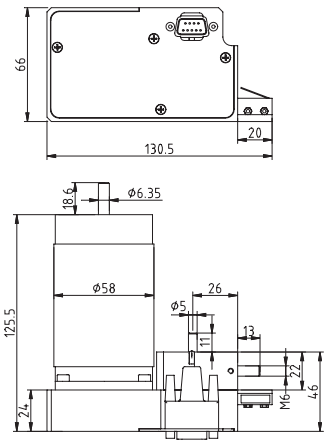
Timing Belt Feed Axis ZF 1

Drive module with stepping motor MS 160 (ratio 2:1)

Feed: 30 mm/revolution *

* upon request: gear ratio 1:1, 60 mm/revolution





Timing Belt Feed Axis ZF 1

Order key

232 005 XXXX

Drives, slides, carriages			Profile lengths MLF 2 (mm)
0 = stepping motor MS 050 HT	(ratio 1:1)	with shaft slide	298, 398, 498, 598, 675,
1 = stepping motor MS 050 HT	(ratio 1:1)	with carriage	698, 798, 998, 1498, 1798,
2 = stepping motor MS 050 HT	(ratio 2:1)	with shaft slide	1998, 2498, 2998
3 = stepping motor MS 050 HT	(ratio 2:1)	with carriage	(e. g. 398 mm = 040
4 = stepping motor MS 160	(ratio 2:1)	with shaft slide	675 mm = 068)
5 = stepping motor MS 160	(ratio 2:1)	with carriage	
6 = DC servo motor MV 120	(ratio 1:1)	with shaft slide	Options: up to 6,000 mm
7 = stepping motor MS 135 HT	(ratio 2:1)	with shaft slide	
8 = without motor		with shaft slide	
9 = without motor		with carriage	
Y = stepping motor MS 160, motor on the right side	(ratio 1:1)	with shaft slide	
Z = stepping motor MS 160 motor on the left side	(ratio 1:1)	with shaft slide	

Order samples

- with stepping motor MS 050 HT*
- ratio 1:1
- with shaft slide
- profile length 675 mm

Item no.: 232005 0068

- with stepping motor MS 050 HT*
- ratio 2:1
- with shaft slide
- profile length 675 mm

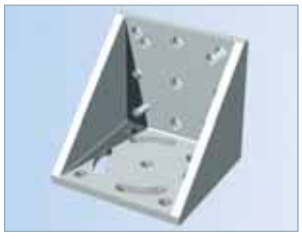
Item no.: 232005 2068

- with stepping motor MS 160*
- ratio 2:1
- with shaft slide
- profile length 675 mm

Item no.: 232005 4068

* Set-up of motor according to picture

Accessory



Angle brackets
- for ZF 1

Item no.: 204110 0010

Coupling 20/30
- for ZF 1
- 1 packaging unit = 1 coupling

Item no.: 218001 5080

Limit switch set
- Option: second limit switch
- for ZF1

Item no.: 632125 0002

Timing Belt Feed Axis ZF 2

Open timing belt feed axis

Feeds and shaft slides are also available in rust-proof designs!

- Aluminium profile with midget linear guide MLF 5
- Clearance-free feed with timing belt feed axis
  - timing belt with 5 mm pitch, width 25 mm
- Feed 5 m/s, at the most
- Shaft slide WS 3
  L 176 x W 130 mm
- Feed per revolution: 70 mm
- Repeatability less or equal ± 0.2 mm
- Limit and/or reference switch, accuracy < 0.1 mm
- available in lengths up to 6,000 mm
- at direct drives, motor modules can be flange-mounted on the right or left side
- Options:
  Special lengths (100 1/mm raster) upon request, max. 6,000 mm
- Available also as direct drive with
  - drive module with stepping motor MS 430 HT*
  - drive module with DC servo motor MV 330*
  - drive module with AC servo motor MY 073*

  * in connection with motor mounting plate, item no.: 232199 0004
- Limit switch with connecting cable
  (only integrated in connection with drive module)

Timing Belt Feed Axis ZF 2

Technical data

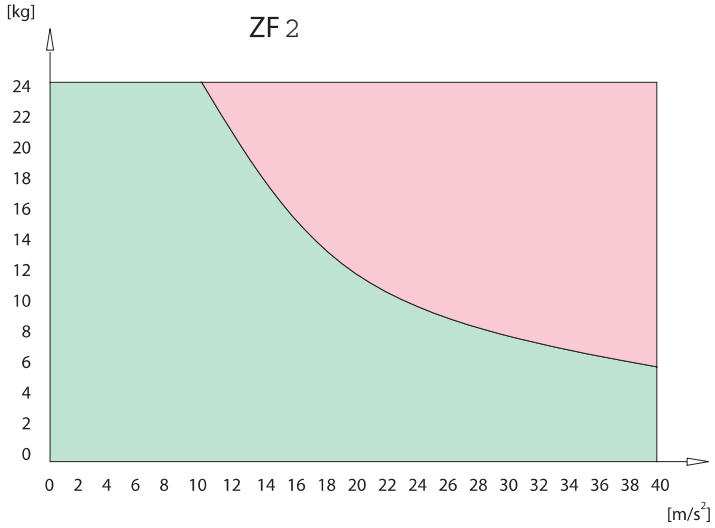
Belt version	HTD 5M, width 25 mm
Weight of slide	0.430 kg
Weight without drive module	1,000 mm ≙ 7.9 kg
Nominal mass of timing belt	0.09 kg/m
Weight of slide	2.03 kg
Nominal weight of guide	0.472 kg/100 mm
Effective diameter of the synchronized pulleys	Ø 22.28 mm
Moment of inertia of the synchronized pulleys	$5.58 \cdot 10^{-6}$ kgm²
Feed per revolution	70 mm

Idle torques

Speed [1/min]	Idle torque [Nm]
500	0,16
1500	0,24
3000	0,36

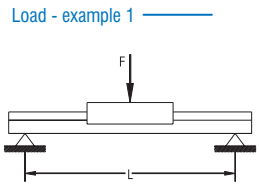
Load diagramm

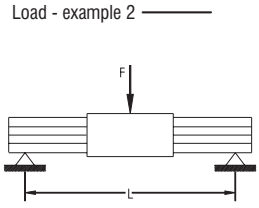
Permissible accelerated masses related to belt strength*



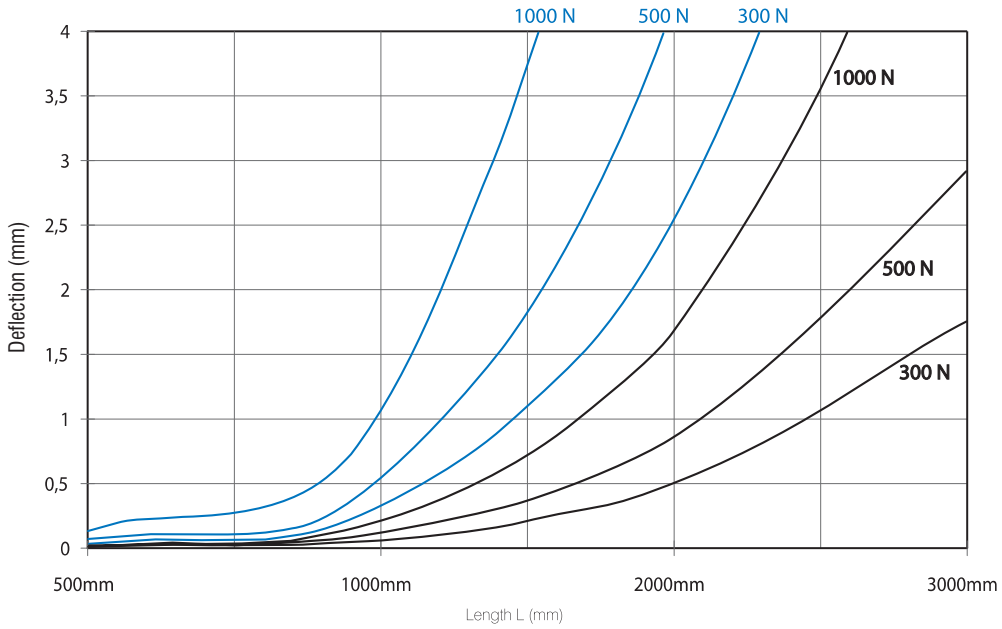
* At vertical assembly, the acceleration due to gravity (g = 9.81 m/s²) has to be taken into account

Deflection





Deflection Timing Belt Feed Axis ZF 2



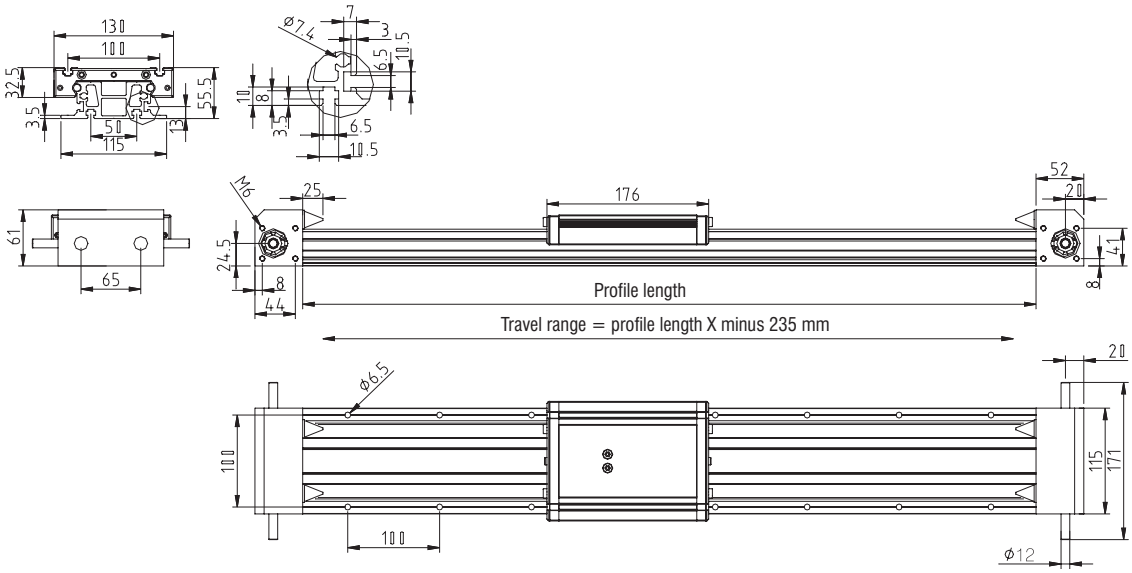
mechanics

Timing Belt Feed Axis ZF 2

Timing belt feed axis

without motor

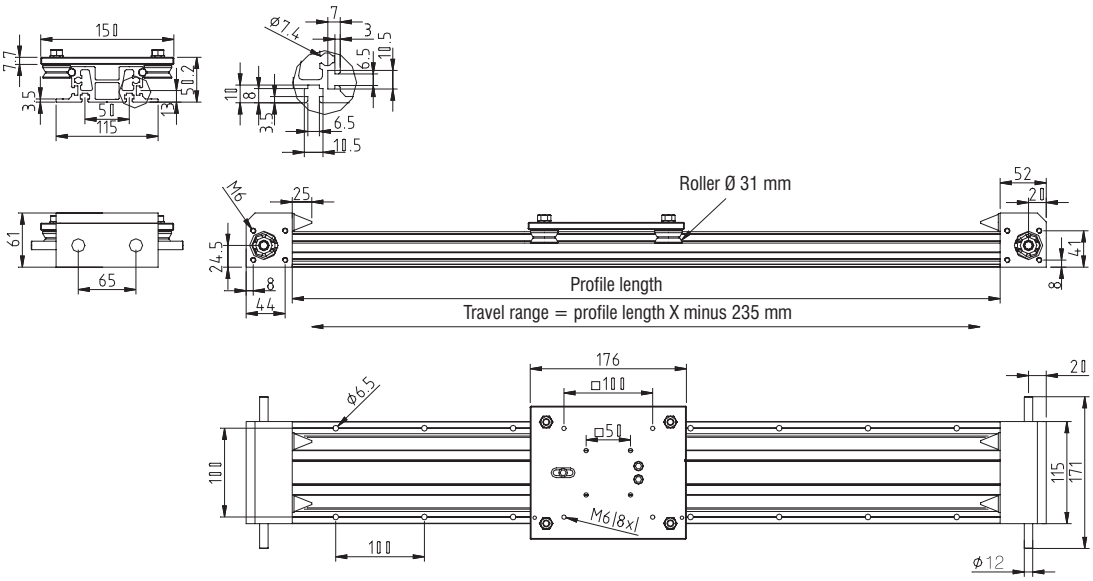
with shaft slide



Timing belt feed axis

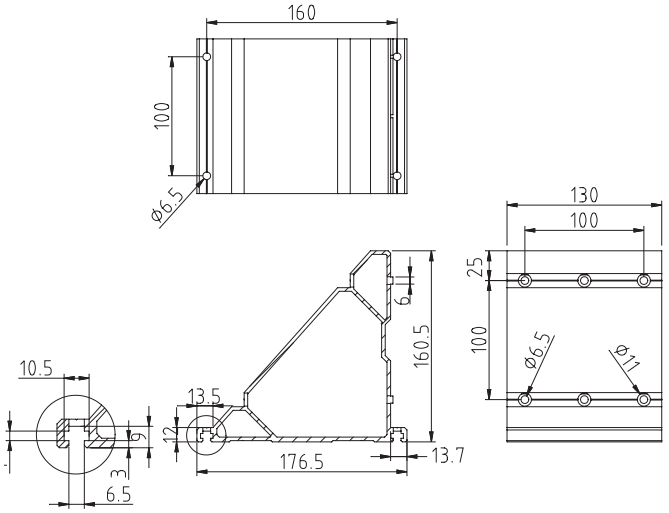
without motor

with carriage

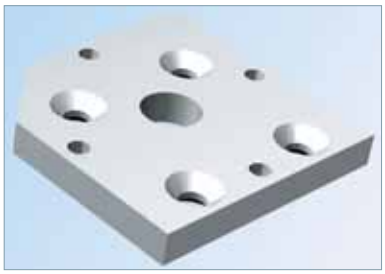


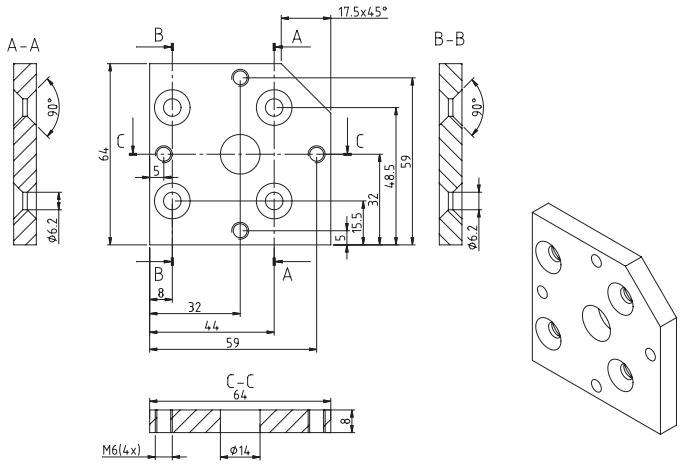
Timing Belt Feed Axis ZF 2

Mounting angle

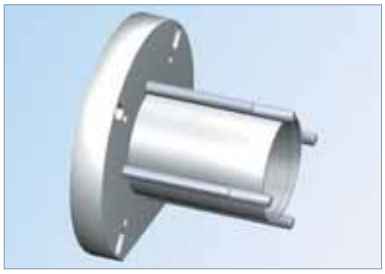


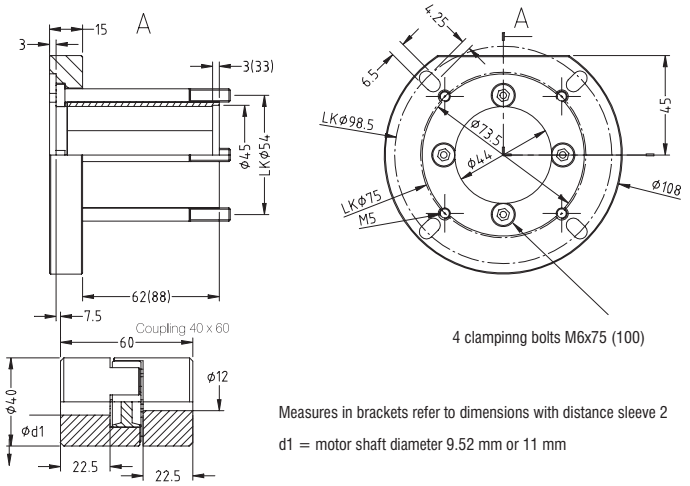
Motor mounting plate (option)





Coupling casing set 2





4 clampinng bolts M6x75 (100)

Measures in brackets refer to dimensions with distance sleeve 2

d1 = motor shaft diameter 9.52 mm or 11 mm

mechanics

Timing Belt Feed Axis ZF 2

Drive modules

Stepping motor MS 430 HT

Holding torque – bipolar.....600 Ncm
Stepping angle, full step.....1.8 deg
half step.....0.9 deg
Nominal voltage – bipolar.....2.8 V
Resistance of winding..... 0.66 Ω
Inductance of winding.....2.5 mH
Current of winding – bipolar....5.9 A

DC servo motor MV 330

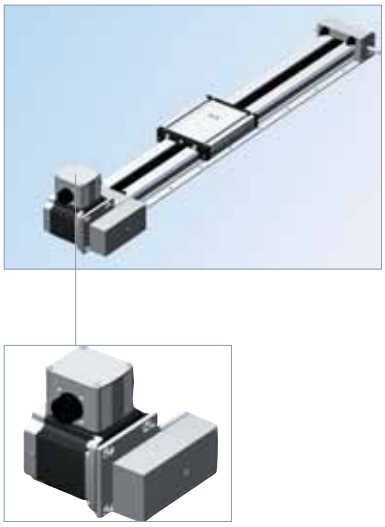
Nominal power.....330 W
Nominal speed.....3,000 rpm
Nominal torque.....100 Ncm
Current at nominal torque.....6.5 A
Nominal voltage.....65 V
Peak torque.....539 Ncm
Current at peak torque..... 30 A
Ambient temperature.....0 - 40 °C

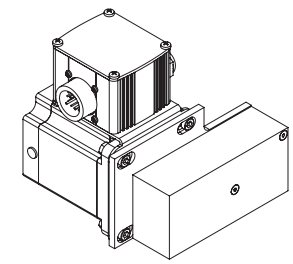
AC servo motor MY 054

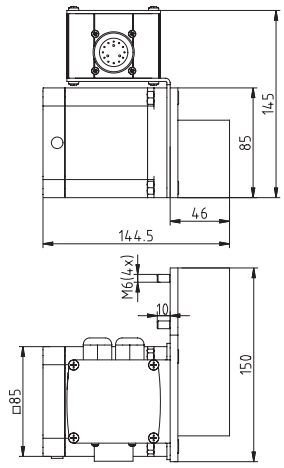
Nominal power.....500 W
Nominal speed.....6,000 rpm
Nominal permanent torque..... 100 Ncm
Nominal permanent current..... 3.2 A
Voltage constant.....20.0 V/1,000
Moment of inertia of rotor.....0.45 kgcm²

Drive module with stepping motor MS 430 HT

(reduction 2:1)
Feed: 35 mm/revolution





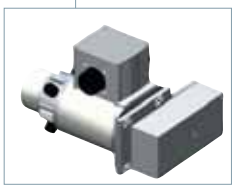


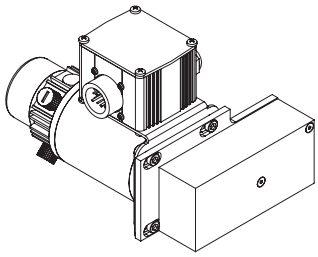
Timing Belt Feed Axis ZF 2

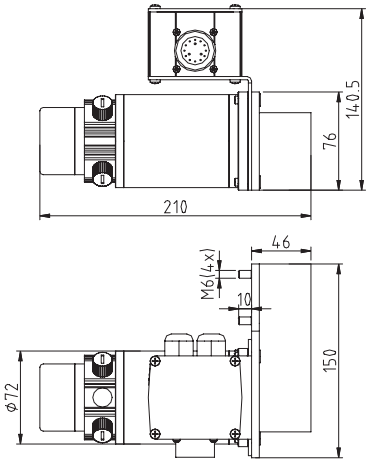
Drive module with DC servo motor MV 330

(reduction 2:1)

Feed: 35 mm/revolution



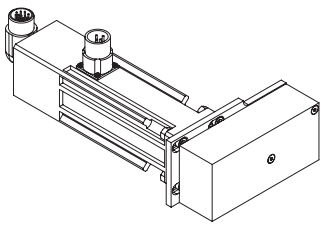


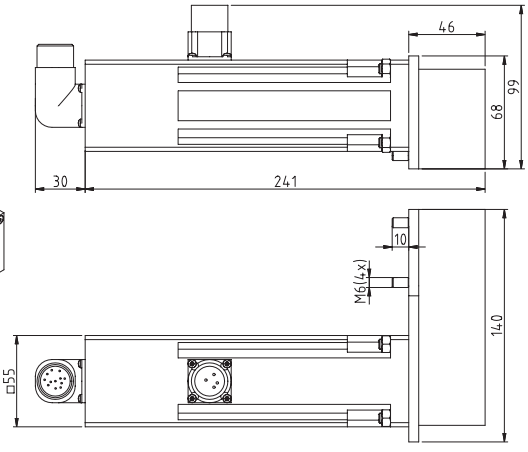


Drive module with AC servo motor MY 054

(reduction 2:1)

Feed: 35 mm/revolution





mechanics

Timing Belt Feed Axis ZF 2

Order key

232 002 XXXX

Drives/slides, carriage

0 =	Stepping motor MS 430 HT	(ratio 2:1)	with shaft slide
1 =	Stepping motor MS 430 HT	(ratio 2:1)	with carriage
2 =	DC servo motor MV 330	(ratio 2:1)	with shaft slide
3 =	DC servo motor MV 330	(ratio 2:1)	with carriage
4 =	DC servo motor MY 054	(ratio 2:1)	with shaft slide
5 =	AC servo motor MY 054	(ratio 2:1)	with carriage
8 =	Without motor		with shaft slide
9 =	Without motor		with carriage

Profile lengths (mm)

698, 998, 1,498, 1,998, 2,498, 2,998

(e. g. 698 mm = 070
1,498 mm = 150)

Option: up to 6,000 mm

Order samples

- With stepping motor MS 430 HT
- Ratio 2:1
- With shaft slide
- Profile length 698 mm

Item no.: 232002 0070

- With DC servo motor MV 330
- Ratio 2:1
- With shaft slide
- Profile length 698 mm

Item no.: 232002 2070

- with AC servo motor MY 054
- Ratio 2:1
- With shaft slide
- Profile length 698 mm

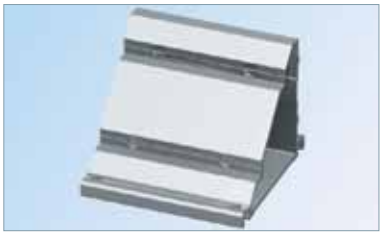
Item no.: 232000 4070

Timing Belt Feed Axis ZF 2

Accessory

Motor mounting plate
- for ZF 2
- incl. fastening
- for direct drive, see drive modules

Item no.: **232199 0004**



Angle brackets
- for ZF 2
- incl. fastening

Item no.: **232199 0005**

Coupling for transmission shaft
- for ZF 2
- packaging unit = 2 couplings

Item no.: **218050 0002**

Transmission shaft Ø 25 mm
- for ZF 2

Length 1 m, item no.: **219001 0125**

Length 2 m, item no.: **219001 0225**

Timing Belt Feed Axis ZF 2

Open timing belt feed axis

Feeds and shaft slides are also available in rust-proof designs!

- Aluminium profile with midget linear guide MLF 4
- Clearance-free feed with timing belt feed axis
  - timing belt with 5 mm pitch, width 25 mm
- Feed 5 m/s, at the most
- Shaft slide WS 3
  L 176 x W 130 mm
- Feed per revolution: 70 mm or 150 mm
- Repeatability
  lower or equal ± 0.2 mm
- Limit and/orreference switch, accuracy < 0.1 mm
- Available in lengths up to 6,000 mm
- Motor modules can be flange-mounted on the right or left side
- Option:
  - special lengths (100 1/mm raster) upon request, max. 6,000 mm
  - limit switch with connecting cable (only integrated in connection with drive module)

Timing Belt Feed Axis ZF 3

Technical data

Belt version..... HTD 5M, width 25 mm
Weight of slide.....0.940 kg
Weight without drive module.....1,000 mm ≙ 10.5 kg
Nominal mass of timing belt.....0.09 kg/m
Weight of slide.....2.03 kg
Nominal weight of guide.....0.472 kg/100 mm
Feed per revolution.....70 mm

Effective diameter of the synchronized pulleys
- Feed 70 mm/revolution..... 22.28 mm
- Feed 150 mm/revolution..... 47.75 mm

Moment of inertia of the synchronized pulleys
- Feed 70 mm/revolution..... 5.58 x 10^{-6} kgm^2
- Feed 150 mm/revolution..... 1.796 x 10^{-4} kgm^2

Idle torques

70 mm/revolution

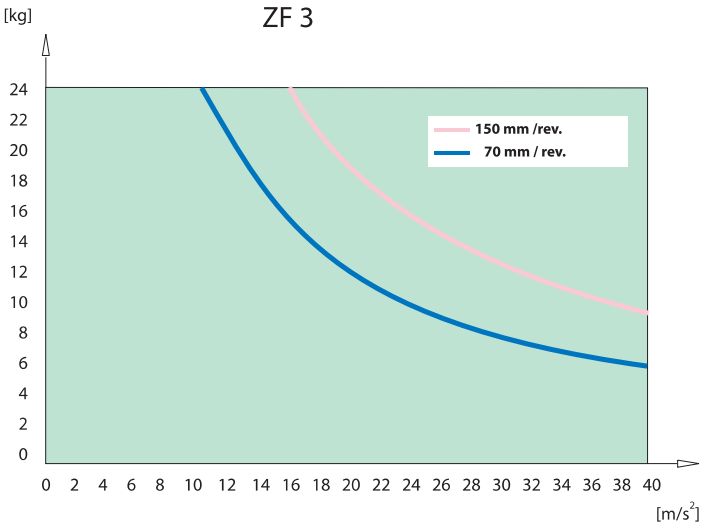
Revolution [1/min]	Idle torque [Nm]
500	0.16
1,500	0.24
3,000	0.36

150 mm/revolution

Speed [1/min]	No-load torque [Nm]
500	0.60
1,500	0.70
3,000	0.80

Load diagram

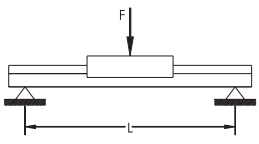
Permissible accelerated masses related to belt strength*



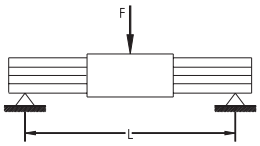
* At vertical assembly, the acceleration due to gravity (g = 9.81 m/s^2) has to be taken into account

Deflection

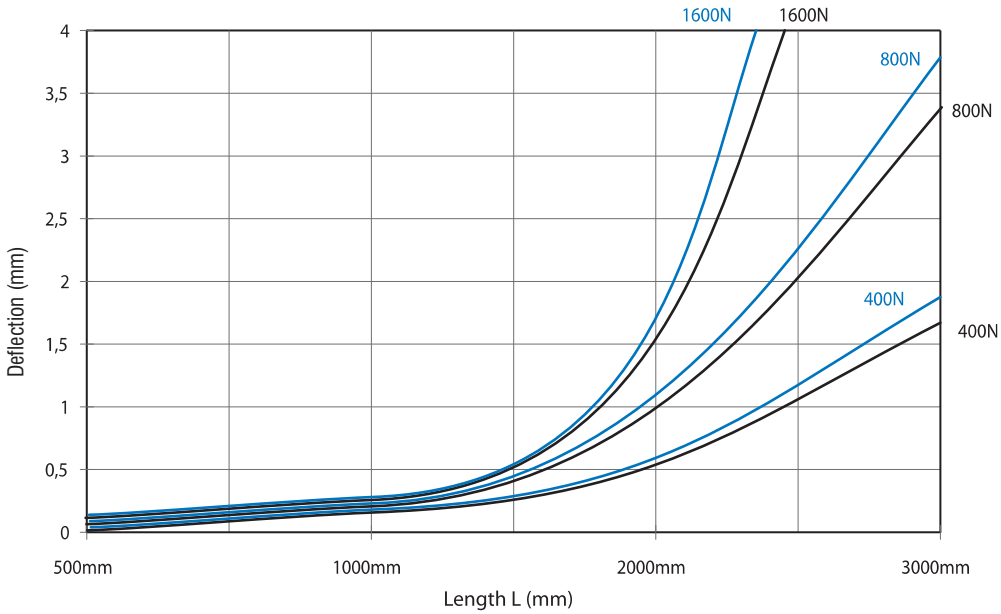
Load - example 1



Load - example 2



Deflection Timing Belt Feed Axis ZF 3



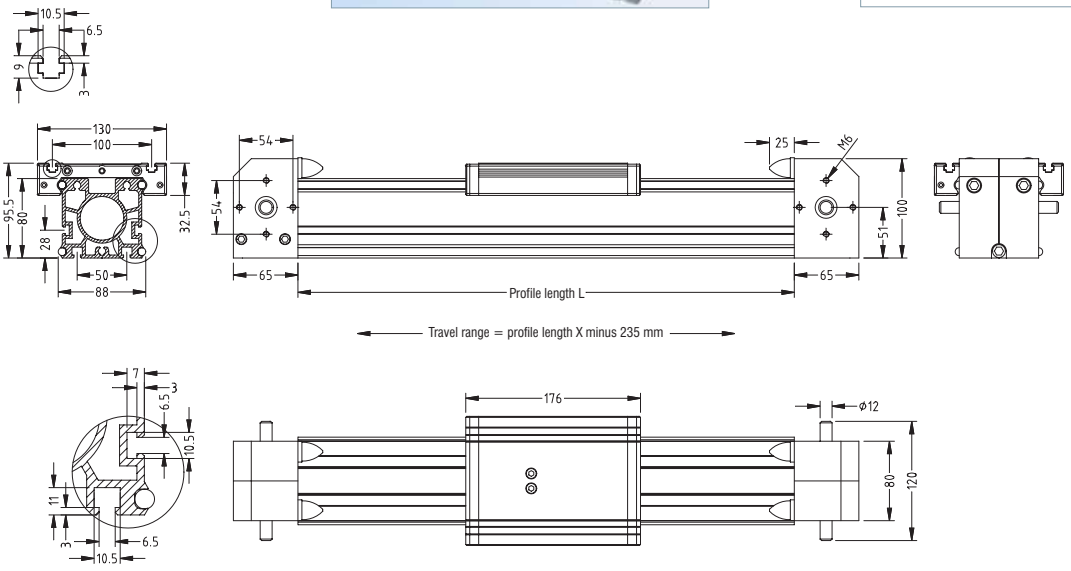
mechanics

Timing Belt Feed Axis ZF 3

Timing belt feed axis

with shaft slide

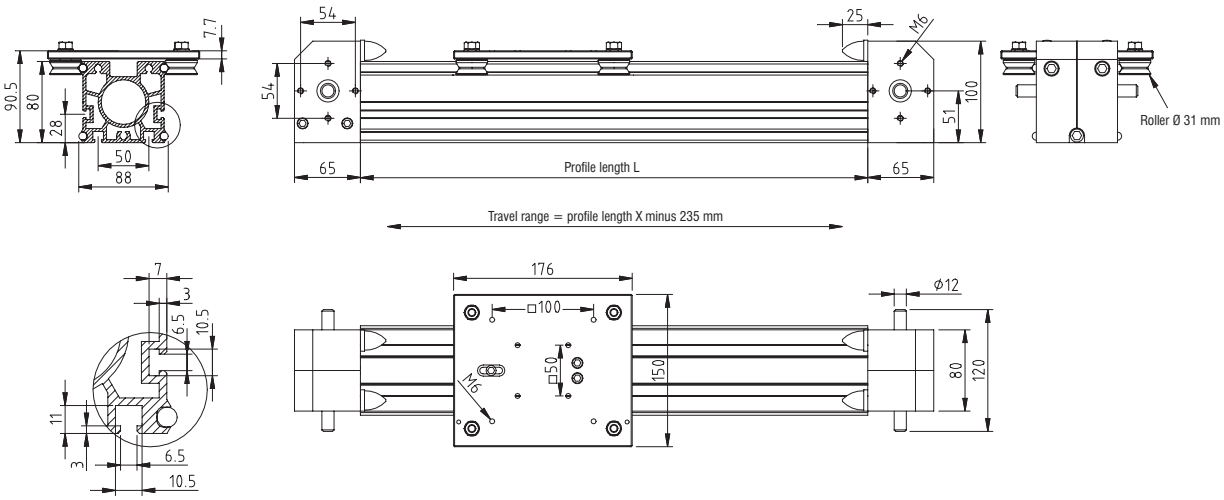
Feed: 150 mm/revolution



Timing belt feed axis

with carriage

Feed: 150 mm/revolution

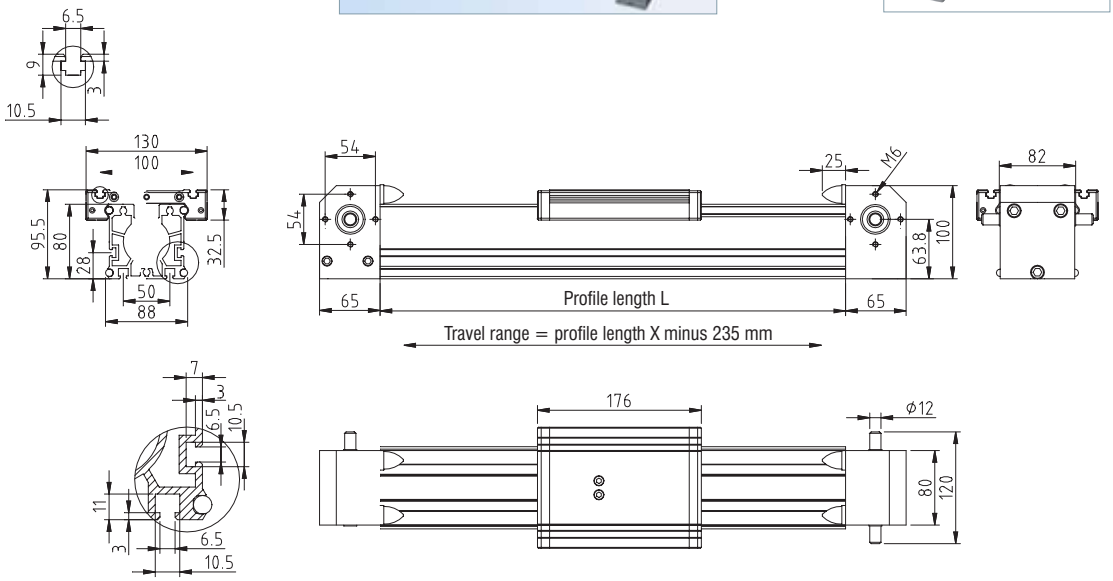


Timing Belt Feed Axis ZF 3

Timing belt feed axis

with shaft slide

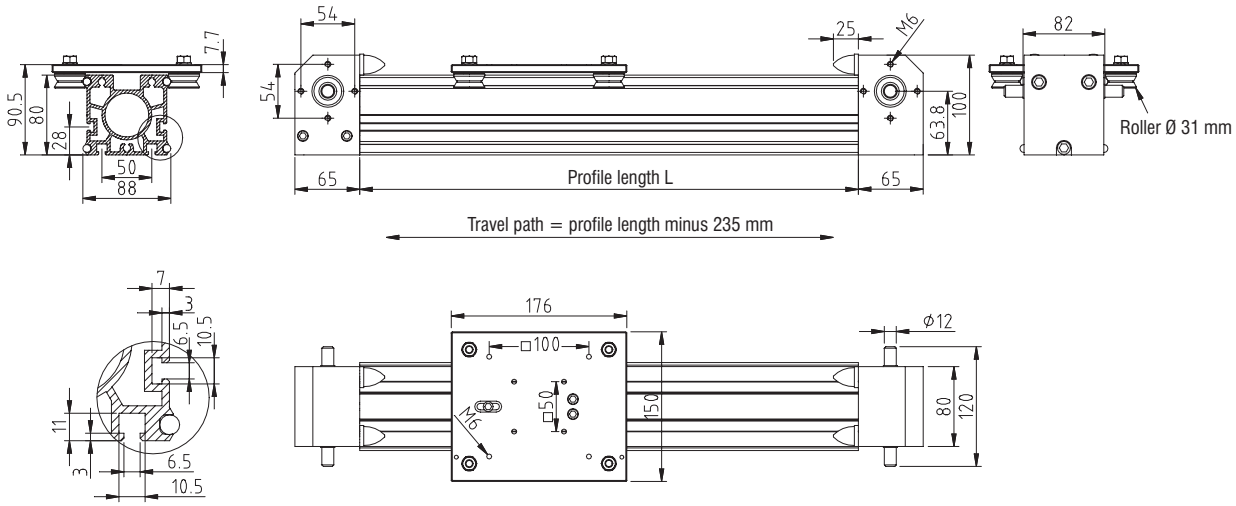
Feed: 70 mm/revolution



Timing belt feed axis

with carriage

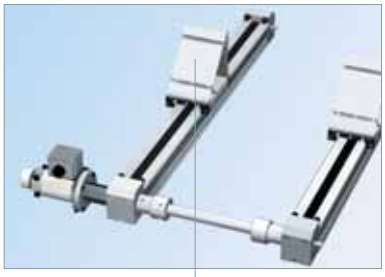
Feed: 70 mm/revolution

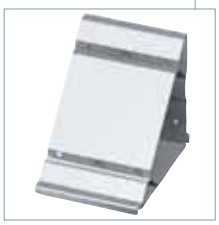


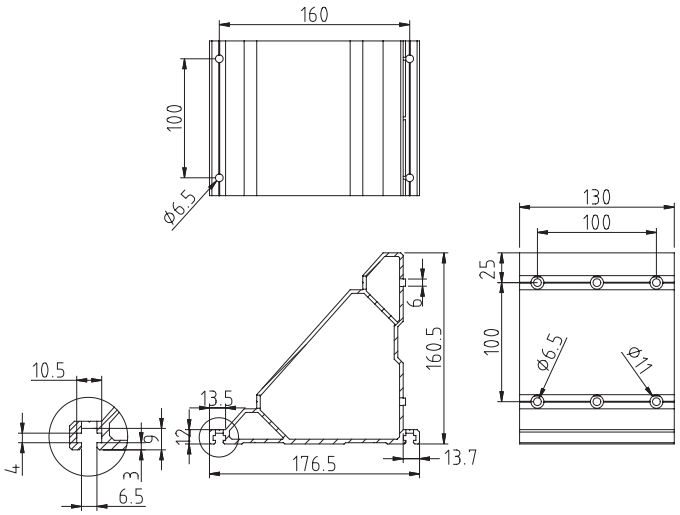
mechanics

Timing Belt Feed Axis ZF 3

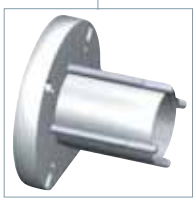
Mounting angle

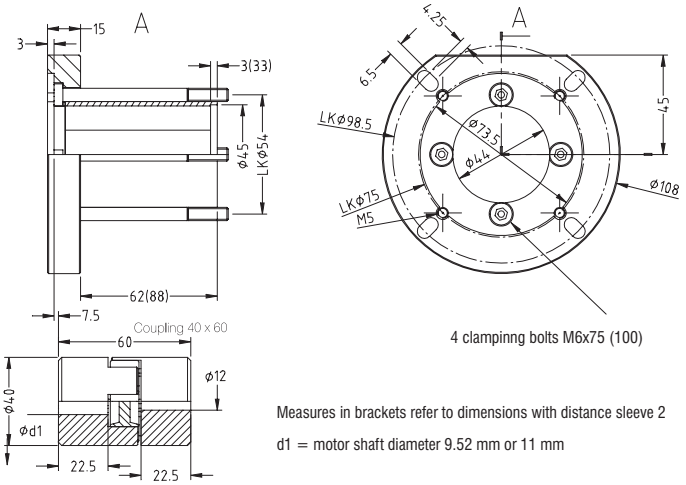






Coupling casing set 2

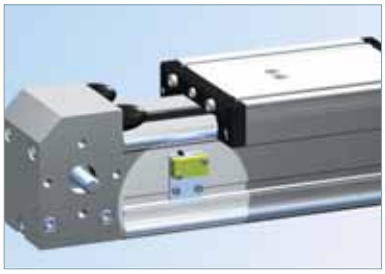


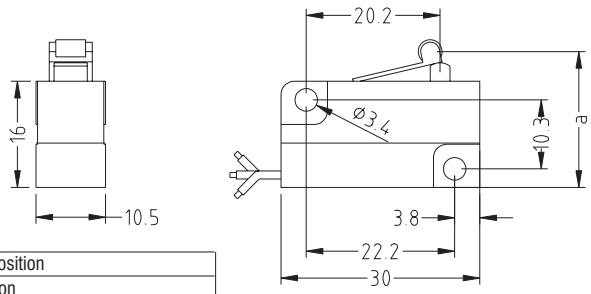


Measures in brackets refer to dimensions with distance sleeve 2

d1 = motor shaft diameter 9.52 mm or 11 mm

Limit switch





Dimensions a (mm)	Actuator position
21.9 ± 0.3	Rest position
20.7 ± 0.4	Switching point
21.0 ± 0.4	Back-switch point
18.9 ± max.	End position (minimum measure)

Timing Belt Feed Axis ZF 3

Drive modules

Stepping motor MS 430 HT

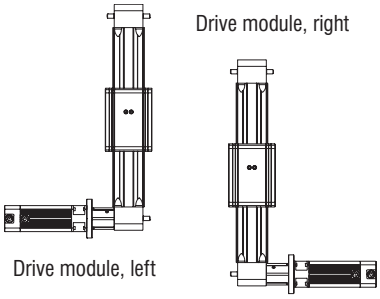
Holding torque – bipolar..... 600 Ncm
Stepping angle, full step..... 1.8 degree
Stepping angle, half-step.....0.9 degree
Nominal voltage – bipolar.....2.8 V
Resistance of winding..... 0.66 Ω
Winding inductivity.....2.5 mH
Current of winding – bipolar....5.9 A

DC servo motor MV 330

Nominal power.....330 W
Nominal speed.....3,000 rpm
Nominal torque.....100 Ncm
Current at nominal torque.....6.5 A
Nominal voltage.....65 V
Peak torque.....539 Ncm
Current at peak torque..... 30 A
Ambient temperature.....0 - 40 °C

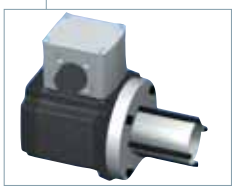
AC servo motor MY 073

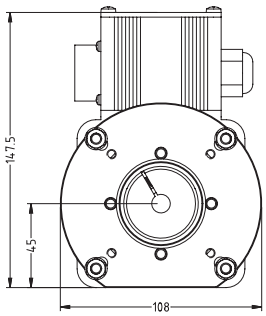
Nominal power.....830 W
Nominal speed.....4,000 rpm
Nominal permanent torque..... 200 Ncm
Nominal permanent current..... 4.7 A
Voltage constant.....26.3 V/1,000
Moment of inertia of rotor.....0.57 kgcm²

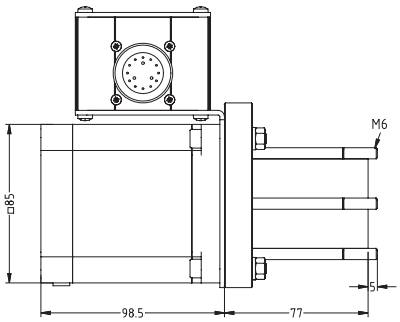


Drive module with stepper motor MS-430 HT

Feed: 70 mm / rev.





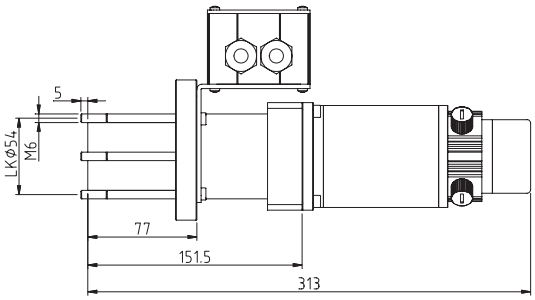


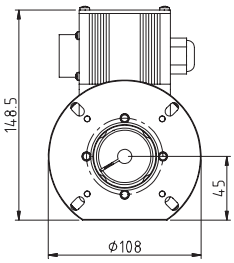
mechanics

Timing Belt Feed Axis ZF 3

Drive module with DC servo motor MV 330

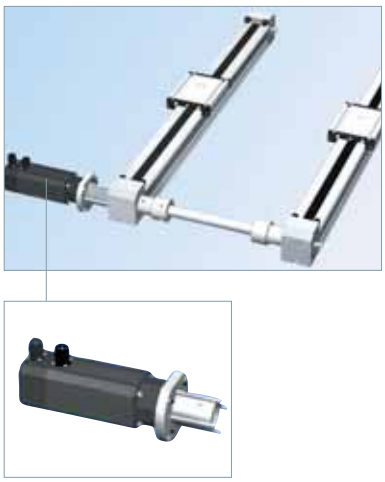
Feed: 70 mm/revolution

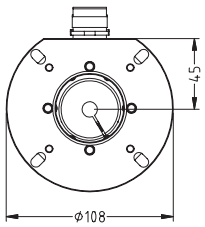


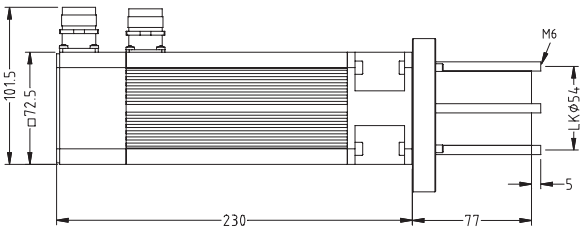


Drive module with AC servo motor MY 073

Feed: 70 mm/revolution

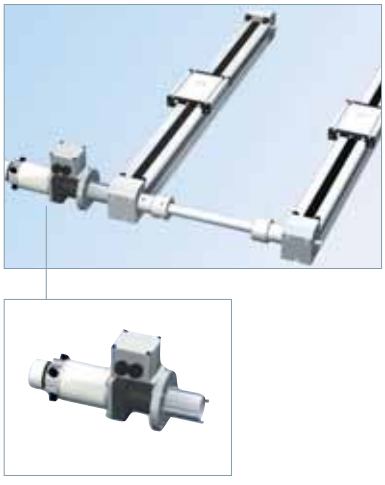


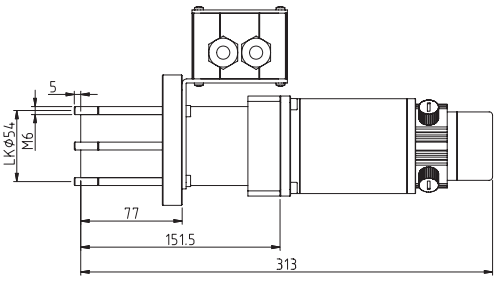


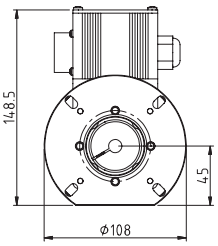


Drive module with DC servo motor MV 330 (reduction 3:1)

Feed: 150 mm/revolution



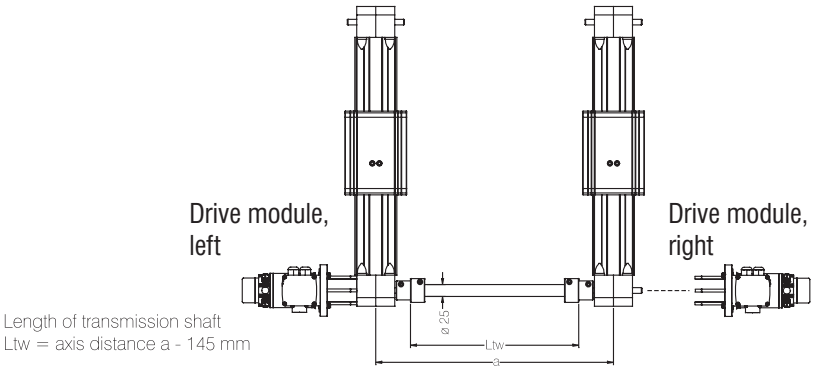




Timing Belt Feed Axis ZF 3

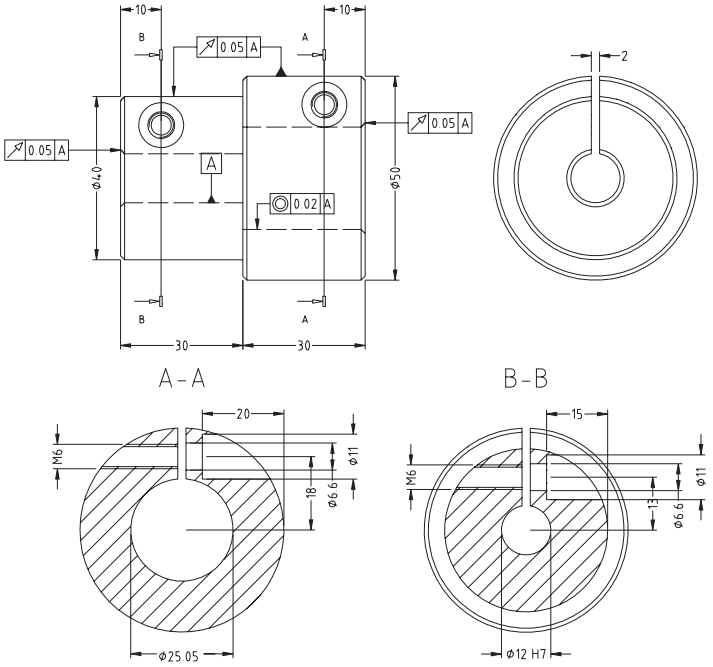
Connection of two timing belt feed axes

Transmission shaft



Connection of two timing belt feed axes

Coupling for transmission shaft



Moments of inertia

for coupling and transmission shaft

Coupling

$J_k = 6.643\ 10^{-5}\ kgm^2$

Transmission shaft (per 100 mm)

$J_{Trs} = 5.218\ 10^{-6}\ kgm^2/100\ mm$

mechanics

Timing Belt Feed Axis ZF 3

Order key

23200 X X XXX

Feed
6 = 150 mm/revolution
7 = 70 mm/revolution

Slide, carriages
0 = with shaft slide
1 = with carriage

Profile lengths (mm)
698; 998; 1,498; 1,998; 2,498; 2,998
(e. g. 698 mm = 070
1,498 mm = 150)

Drives *

		Drive on the right side Item no.	Drive on the left side Item no.
Stepping motor	MS 430 HT	396085 0193	396085 0020
DC servo motor	MV 330	396104 0093	396104 0020
DC servo motor	MV 330 (ratio 3:1)	396134 0093	396134 0020
AC servo motor	MY 073	396573 0020	396573 0020

* Please, order the drive modules separately; use the above-stated item numbers for this purpose. Do not forget to specify whether the delivery should take place with or without extension. Regarding the AC servo motor MY 073, the driving side has to be stated separately.

Order samples

- with stepping motor MS 430 HT
- feed 70 mm/revolution
- motor connection, left
- with shaft slide
- basic profile length 698 mm

Item no.: **232007 0070** (feed)
item no.: **396085 0020** (drive)

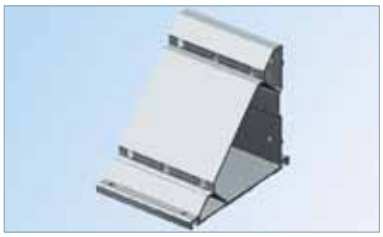
- with DC servo motor MV 330
- feed 70 mm/revolution
- motor connection, left
- with shaft slide
- basic profile length 698 mm

Item no.: **232007 0070** (feed)
item no.: **396104 0020** (drive)

- with AC servo motor MY 073
- feed 70 mm/revolution
- motor connection, left
- with shaft slide
- basic profile length 698 mm

Item no.: **232007 0070** (feed)
item no.: **396573 0020** (drive)

Accessory



Angle brackets
- for ZF 3
- incl. fastening

Item no.: **232199 0005**

Coupling for transmission shaft
- for ZF 3
- packaging unit: 2 couplings

Item no.: **218050 0002**

Transmission shaft Ø 25 mm
- for ZF 3

Length 1 m, item no.: **219001 0125**
Length 2 m, item no.: **219001 0225**

Drive Dimensioning

Calculation of the drive torques

Basically, the necessary drive torque consists of "load moment", "acceleration torque" and "idle torque".

Definitions

M_A [Nm]	Necessary drive torque
M_{Last} [Nm]	Moment resulting from the different loads
M_{Leer} [Nm]*	Idle torque
M_{rot} [Nm]	Rotatory acceleration torque
M_{trans} [Nm]	Translatory acceleration torque
F_x [N]	Feed force
F_a [N]	G force
g [m/s²]	Gravity = 9.81
V_{max} [m/s]*	Maximum traverse speed
m [kg]	Total mass to be moved
a [m/s²]	Acceleration
d_0 [mm]*	Effective diameter of the synchronized pulley
P [kW]	Drive capacity
J_{syn} [kgm²]*	Moment of inertia of the synchronized pulleys
n_{max} [1/min]	Maximum speed
μ	Friction factor = 0.1
[kg/m]*	Specific mass of timing belt
i	Transmission ratio

m = transport mass
+mass of the slide
+mass of the timing belt

Mass of the timing belt =

$$\frac{\text{Specific mass} \cdot 2 \cdot \text{Length of feed profile}}{1000}$$

* The particulars are stated on the respective data sheets.

Feed force F_x

$$F_x = m \cdot g \cdot \mu$$

G force F_a

$$F_a = m \cdot a$$

At vertical operation, the gravity g has to be added to the mass acceleration a. (g = 9,81 m/s²).

Drive capacity P

$$P = \frac{M_A \cdot n_{max} \cdot 2 \cdot \pi}{2 \cdot 1000}$$

Resulting moment M_{Last}

$$M_{Last} = \frac{F_x \cdot d_0}{2 \cdot 1000}$$

Translatory acceleration torque M_{trans}

$$M_{Trans} = \frac{F_a \cdot d_0}{2 \cdot 1000}$$

Rotary acceleration torque M_{rot}

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

$$\mathbf{M_A = M_{Last} + M_{trans} + M_{rot} + M_{leer}}$$

Double-Track Timing Belt Feed Axis

Features

- Aluminium profile H 92 x W 70 mm with double-track guide
- Clearance-free feed with timing belt feed axis
- Feed 2 m/s, at the most, with stepping motor 160 Ncm at full-step operation
- Double-track set L 125 x W 85 mm with two flange bearings 2
- Repeatability ± 0.05 mm (reproducibility)
- Lip seal with teflon coat
- Limit and/or reference switch, accuracy < 0.1 mm

Order Information

Double-track timing belt feed axis- with stepping motor 160 Ncm

Item no.	Length (mm)
232 003 0300	300
232 003 0400	400
232 003 0500	500
232 003 0600	600
232 003 0700	700
232 003 0850	850
232 003 1000	1000
232 003 1100	1100
232 003 1250	1250
232 003 1350	1350
232 003 1500	1500
232 003 1750	1750
232 003 2000	2000
232 003 2250	2250
232 003 2500	2500
232 003 2750	2750
232 003 3000	3000

Feed = length (L) minus 150 mm

Double-track timing belt feed axis

Item no.	Length (mm)
232 004 0300	300
232 004 0400	400
232 004 0500	500
232 004 0600	600
232 004 0700	700
232 004 0850	850
232 004 1000	1000
232 004 1100	1100
232 004 1250	1250
232 004 1350	1350
232 004 1500	1500
232 004 1750	1750
232 004 2000	2000
232 004 2250	2250
232 004 2500	2500
232 004 2750	2750
232 004 3000	3000

Feed = length (L) minus 150 mm

Stepping motor drive module
Stepping motor 160 Ncm

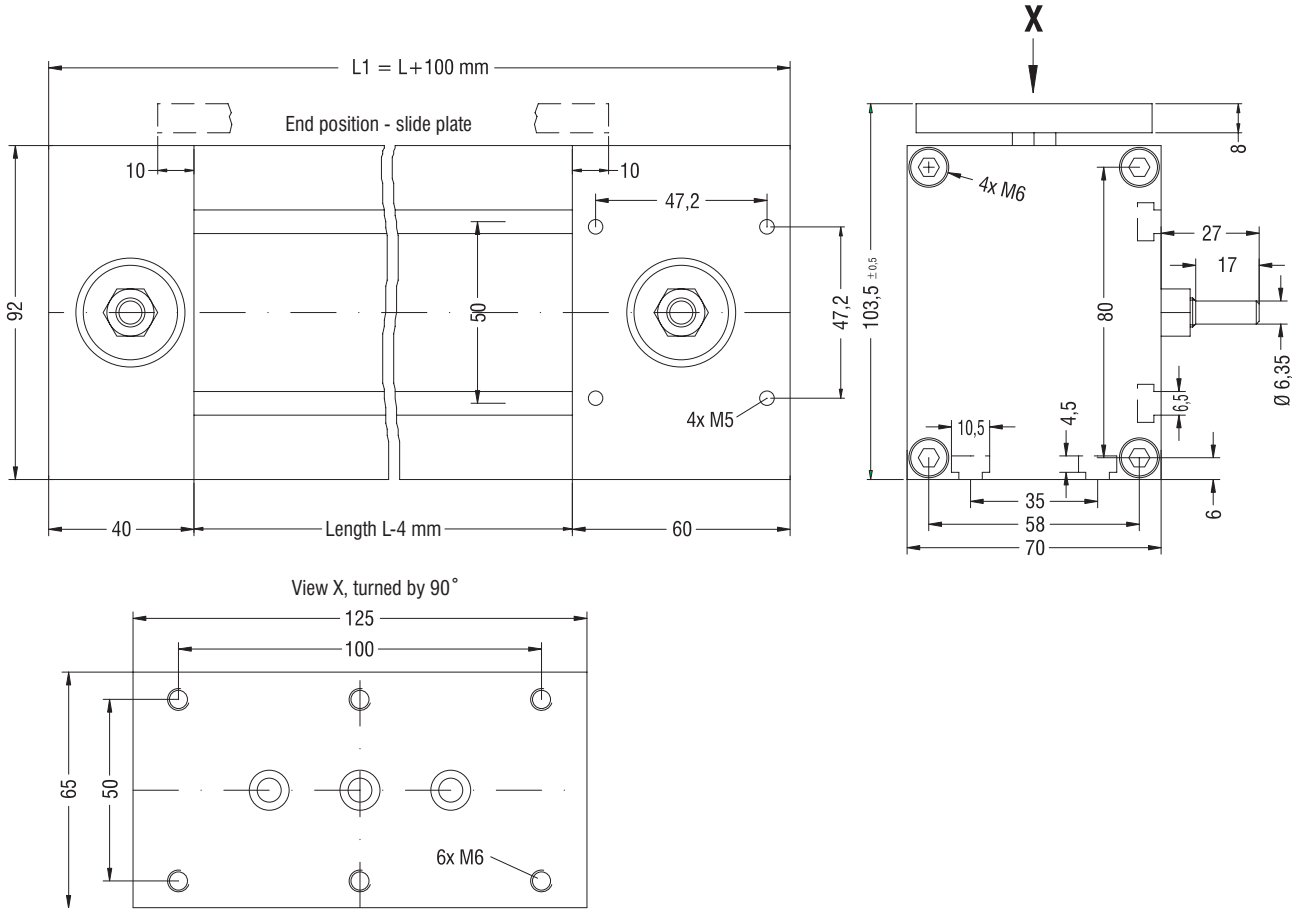
Item no.: **396341 3100**

Servo motor drive module
DC-Servo motor 120 W

Item no.: **396102 3000**

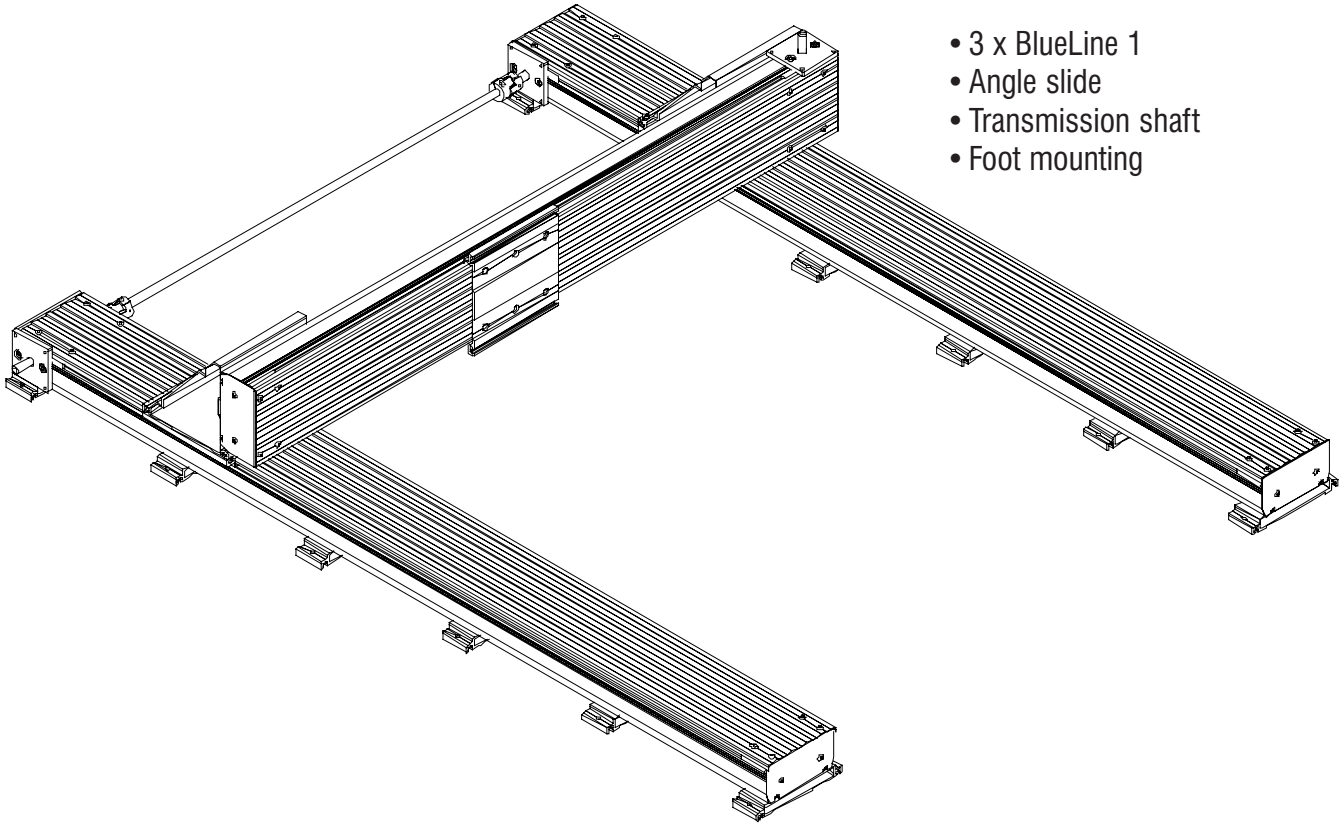
Double-Track Timing Belt Feed Axis

Scaled Drawings



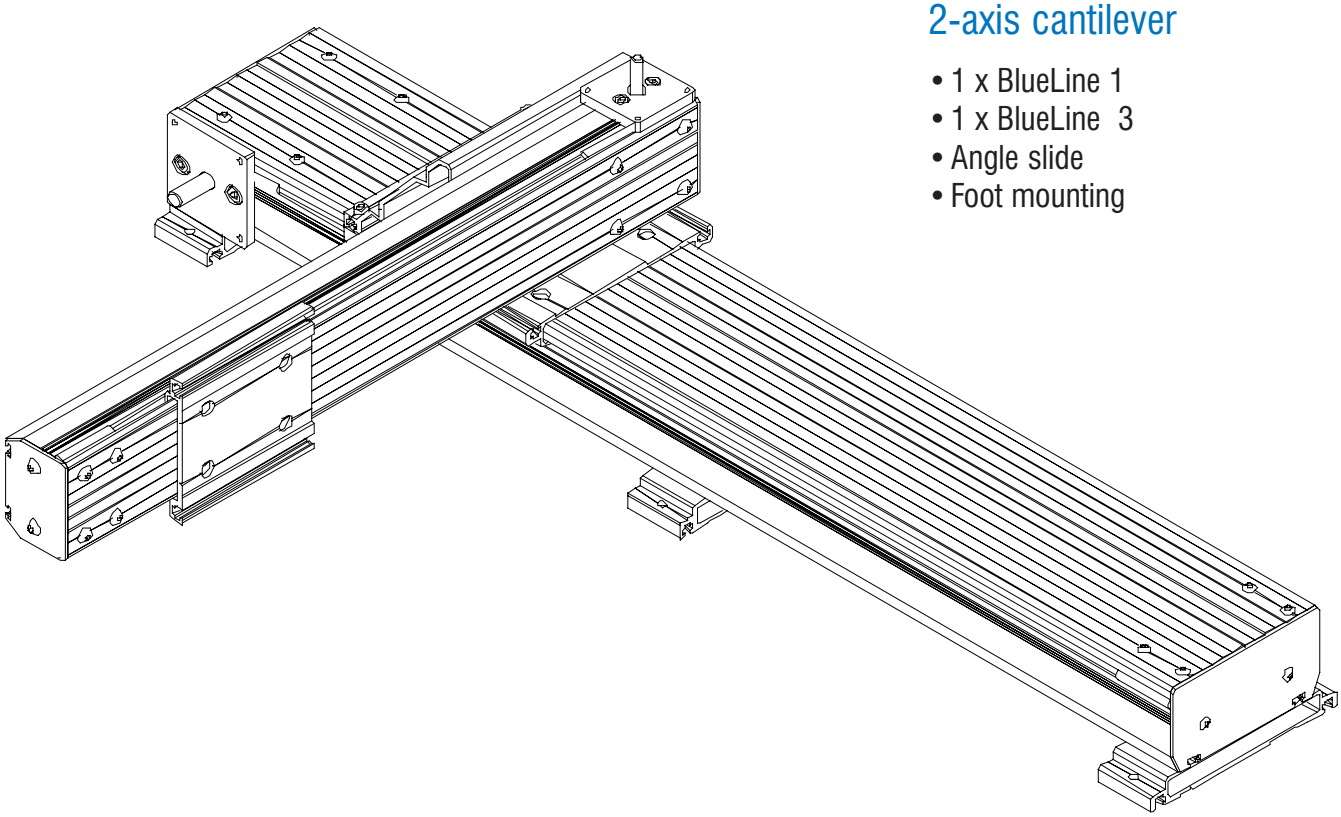
Application Samples

2-axis H-construction



- 3 x BlueLine 1
- Angle slide
- Transmission shaft
- Foot mounting

2-axis cantilever

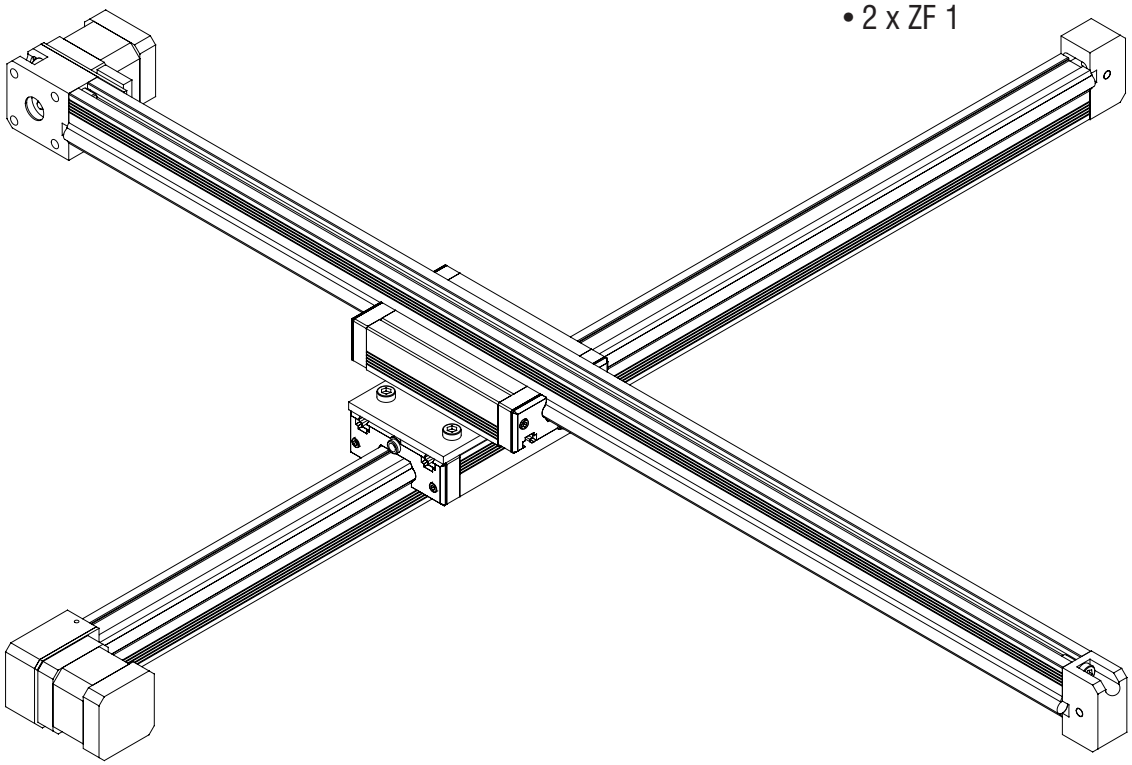


- 1 x BlueLine 1
- 1 x BlueLine 3
- Angle slide
- Foot mounting

Application Samples

Compound table ZF 1

- 2 x ZF 1



Linear Stepping Motor ML

MLL motor linear rotor
MLS motor linear stator

MLS 210

MLL 642

2 x MLL 642
1 x MLS 210

MLS 105

MLL 302

1 x MLL 302
1 x MLS 105

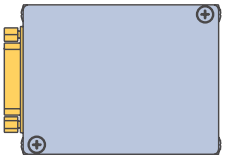
Features

- High precision due to non-contact and abrasion-resistant guide with air bearing
- High dynamic due to direct force action between rotor and stator element
- Feed force approx. 100 N/dm^2 (active motor surface)
- Hardly any control problems as there is no mechanical clearance, elasticity or friction
- Hardly any warming due to a small air gap and due to air cooling of the active motor surface
- Motion control of several, independent rotors on a stator is possible
- Increased life expectation due to abrasion resistance
- Suitable for operation in clean rooms and food industry
- Easy positioning operation in open control chain (without linear measuring system) is possible
- Precision of the drive +/- 50 μm (independent of the power electronics' step precision)
- Precision 1 ... 5 μm (depending on the power electronics' step precision)
- Position and step monitoring due to an optional linear measuring system
- Integrated echo sensor as reference switch
- Integrated Hall sensor as reference switcho rotor protection type IP 54

Linear Stepping Motor ML

condition on delivery

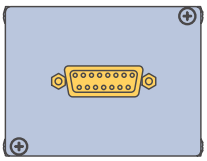
left connection



Standard condition on delivery is "left connection".
This applies to delivery both with cable and with connector.

connection possibilities

front connection



right connection

The customer can easily change the standard "left connection" to the "front" or "right connection".

Controlling with 1-Axis Positioning Module ECOSTEP:

ECOSTEP 100 Item no.: 384001 4100
ECOSTEP 200 Item no.: 384001 4200

Linear motors based on the stepping motor concept
Linear movement without spindle

The linear motors ML are based on the concept of the permanently energized reluctance stepping motor.

The drive consists of two components - the active rotor (prime part) and the passive, mostly immotile stator (secondary part).

The secondary part is made out of a stainless, ground steel body.
The contact surface has a very precise, rectangular teeth structure (tooth pitch 1.28 mm). The tooth spaces are encapsulated by a polymer.
In order to guide the rotor, an air-bearing surface is worked at right angles with the active motor surface.

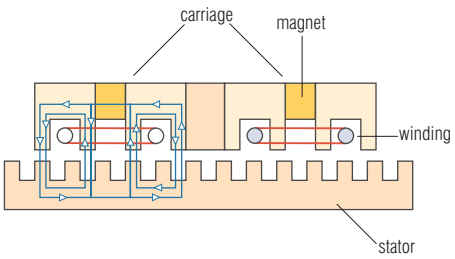
The prime part (rotor) integrates the coil systems, the permanent magnets, as well as the linear motor's nozzle bodies.

Between the rotor and the stator, a magnetic force action, which is counteracted by compressed air, occurs (prestressed air bearing). The resulting air cushion
(approx. 15 μm) abrasion-freely guides the rotor to the stator.

The linear motors are available in different engine-power classes and are delivered ready for connection (with plug-in connector).

In order to control the linear motor, a high-resolution power electronics is necessary. Due to the stepping motor concept, an open-loop control is sufficient for positioning tasks.

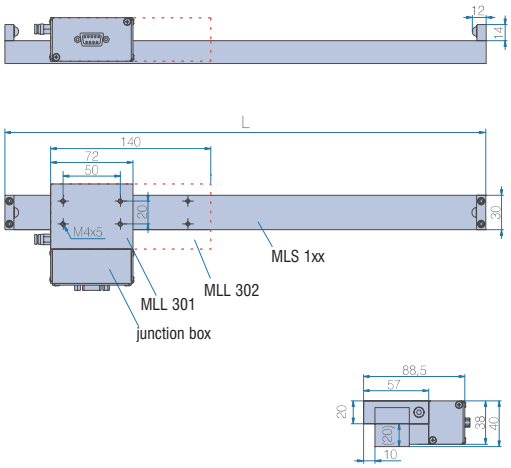
In order to increase the accuracy, a linear measuring system can be attached to the linear motor.
This system can be connected with a positioning drive (e.g. ECOSTEPP 200 closed loop).



mechanics

Linear Stepping Motor ML

ML 30x



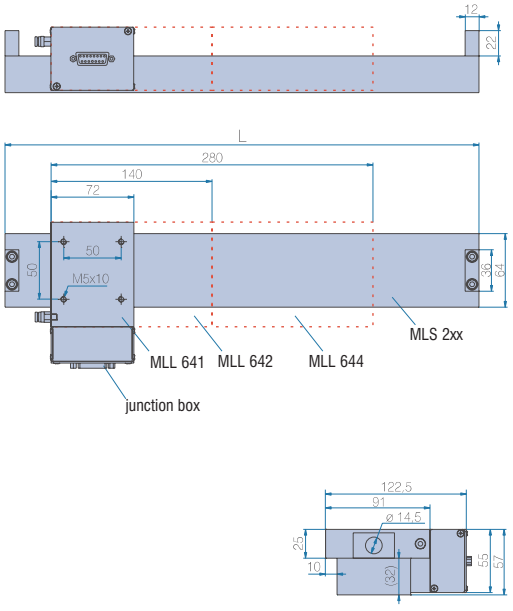
Ordering Information

		MLS 105	MLS 110
construction length L *1	mm	500	1.000
weight	kg	2,35	4,7
Item no.		4 72000 1 005	4 72000 1 010

		MLL 301	MLL 302
max. shear force	N	15	30
max. speed	m/s	1,8	1,8
max. accerleration	m/s²	50	60
permitted limit load	N	20	50
max. current	A	3	6
resolution *2	µ m	1 - 5	1 - 5
repetition accuracy	µ m	+/- 2	+/- 2
air consumption	l/min	5	10
Item no. *3		472000 2 10x	472000 220x

*1 further lengths on request
*2 this value depends on the stepper resolution of the stepper motor controller
*3 x – 1 - cable connection (5 m)
2 -SubD-9 connection

ML 64x



Ordering Information

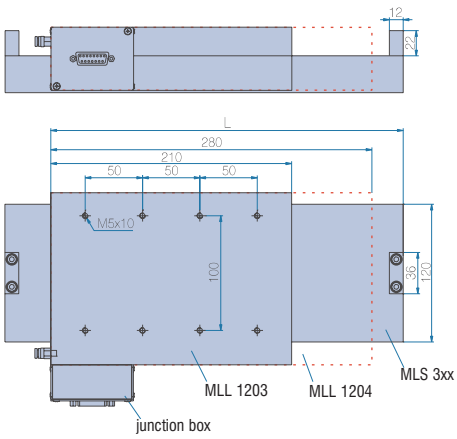
		MLS 210	MLS 220
construction length L *1	mm	1.000	2.000
weight	kg	16	32
Item no.		472001 1 010	472001 1020

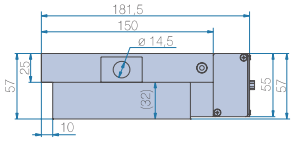
		MLL 641	MLL 642	MLL 644
max. shear force	N	45	90	180
max. speed	m/s	2	2	3
max. accerleration	m/s²	75	90	90
permitted limit load	N	100	300	600
max. current	A	3	6	12
resolution *2	µ m	1 - 5	1 - 5	1 - 5
repetition accuracy	µ m	+/- 2	+/- 2	+/- 2
air consumption	l/min	11	13	20
Item no. *3		472001 2 10x	472001 220x	472001 240x

*1 further lengths on request
*2 this value depends on the stepper resolution of the stepper motor controller
*3 x – 1 - cable connection (5 m)
3 - SubD-15 connection

Linear Stepping Motor ML

ML 120x





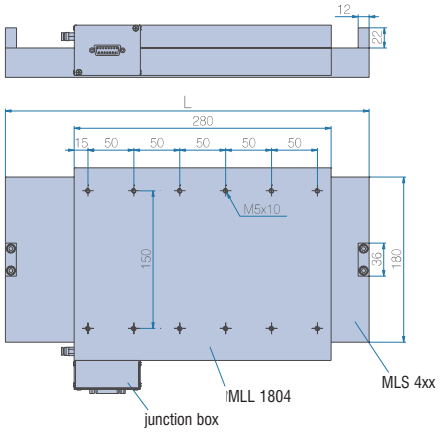
Ordering Information

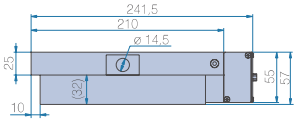
		MLS 310	MLS 320
construction length L *1	mm	1.000	2.000
weight	kg	30	60
Item no.		472002 1 010	472002 1020

		MLL 1203	MLL 1204
max. shear force	N	270	360
max. speed	m/s	3	3
max. accerleration	m/s²	90	90
permitted limit load	N	700	800
max. current	A	9	12
resolution *2	µ m	1 - 5	1 - 5
repetition accurracy	µ m	+/- 2	+/- 2
air consumption	l/min	25	30
Item no. *3		472002 2 30x	472002 240x

*1 further lengths on request
*2 this value depends on the stepper resolution of the stepper motor controller
*3 x – 1 - cable connection (5 m)
3 - SubD-15 connection

ML 180x





Ordering Information

		MLS 410	MLS 420
construction length L *1	mm	1.000	2.000
weight	kg	45	90
Item no.		472003 1 010	472003 1020

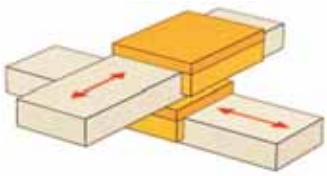
		MLL 1804
max. shear force	N	540
max. speed	m/s	3
max. accerleration	m/s²	90
permitted limit load	N	1.200
max. current	A	12
resolution *2	µ m	1 - 5
repetition accuracy	µ m	+/- 2
air consumption	l/min	35
Item no.*3		472003 2 40x

*1 further lengths on request
*2 this value depends on the stepper resolution of the stepper motor controller
*3 x – 1 - cable connection (5 m)
3 - SubD-15 connection

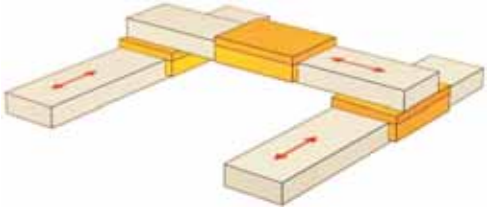
Linear Stepping Motor ML

Configuration Samples

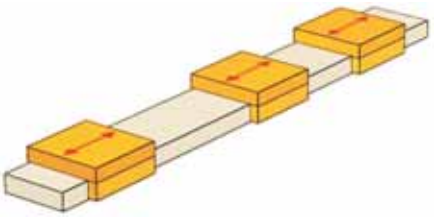
Mechanical stage
(2 x MLS 410, 2 x MLL 1804)



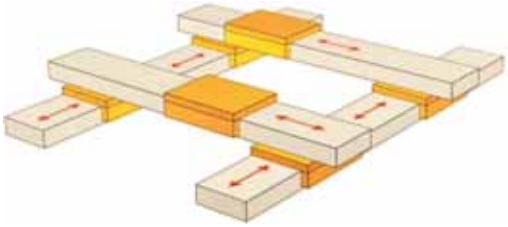
H-Construction (portal)
(3 x MLS 410, 3 x MLL 1804)



Linear configuration
(1 x MLS 210, 3 x MLL 641)



Double H-construction
(4 x MLS 410, 6 x MLL 1804)



Upon request, you recieve these and other possibilities of application ready-made and tested.
We will be happy to advise you !

Notes and Sketches

mechanics

Rotary and Lifting Units

Overview

Rotary and Lifting Units

Overview

mechanics

Indexing Table/Rotary Axis RDH-M

RDH-M as rotary axis
(hollow shaft)

RDH-M as indexing table
(solid shaft)

Features

- with HarmonicDrive® gear
  - extremely loadable and stiff drive bearing
  - zero backlash and high torsion stiffness
- reduction 1:51 or 1:101
- drive motors selectable
  - stepping motor (with encoder) or
  - DC servo motor (without brushes)
- protection type IP 65
- rust-proof design
- transmission accuracy < 1 arcmin
- repeatability < ± 6 arcsec
- optionally, in solid or hollow shaft design
- maintenance-free

- Options:
  - other drive motors
  - own motor adaptation
  - upon request, different gear reductions available

Order key

2 6 6 2 X X X X X X

Stub shaft
0 = Solid shaft
1 = Hollow shaft

Gear reduction
0 = 101
1 = 51

0 = Standard

Motors
0 = Stepping motor
1 = DC servo motor (without brushes)

0 = Standard

Accessory

Chuck
3-jaw chuck Ø 125
Item no.: **269060 0125**

Aluminium T-groove plate
Ø240 mm / PT 25
Item no.: **269050 0240**

Ø365 mm / PT 25
Item no.: **269050 0365**

Aluminium rotary plate
Ø 490 mm, customer-specific
Fixing holes are possible at extra charge
Item no.: **269051 0500**

Tailstock unit RE M
Item no.: **269100 2100** (1,000 mm)
Item no.: **269100 2150** (1,500 mm)
Item no.: **269100 2200** (2,000 mm)

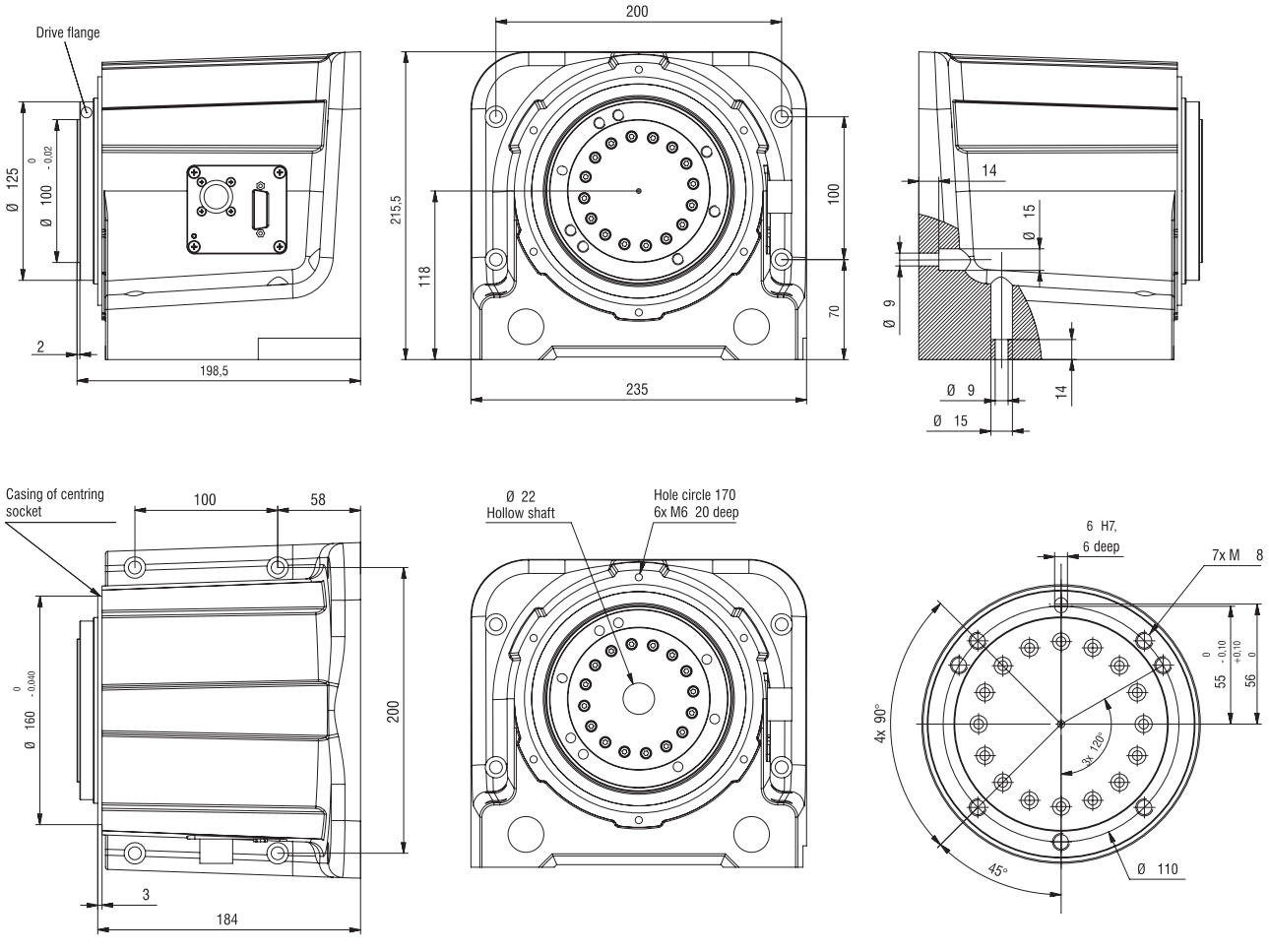
Indexing Table/Rotary Axis RDH-M

Technical data

		Stepping motor Ms 200 HT *		DC-servo motor MUMS 02	
Reduction ratio		1:51	1:101	1:51	1:101
Nominal drive revolution	[1/min]	4	2	22	11
		at 1500 Hz (225 1/min)		at 1100 1/min	
Max. drive revolution	[1/min]	24	12	59	30
		at 8000 Hz			
Nominal torque	[Nm]	24	46	15	29
		at 1500 Hz			
Max. torque (temporary)	[Nm]	--	--	46	88
Nominal holding torque (static load)	[Nm]	55	108	33	65
Max. load capacity of the gear	[Nm]	98	157	98	157
		Limit for repeatable peak torque			
Dynamic load rate C	[N]	21800			
Static load rate C0	[N]	35800			

* Values at half-step operation

Scale Drawings



Indexing Table/Rotary Axis RDH-S

RDH-S as rotary axis
(hollow shaft)

RDH-S as indexing table
(solid shaft)

Features

- with HarmonicDrive® gear
  - extremely loadable and stiff drive bearing
  - zero backlash and high torsion stiffness
- reduction 1:51 or 1:101
- drive motors selectable
  - stepping motor (with encoder) or
  - DC servo motor (without brushes) or
  - DC servo motor (with brushes)
- protection type IP 65
- rust-proof design
- transmission accuracy < 1,5 arcmin
- repeatability < 6 arcsec
- optionally, in solid shaft or quill design
- maintenance-free

- Options:
  - other drive motors
  - own motor adaptation
  - upon request, different gear reductions available

Order key

2 6 6 1 X X X X X X

Stub shaft
0 = Solid shaft
1 = Hollow shaft

Gear reduction
0 = 101
1 = 51

0 = Standard

Motors
0 = Stepping motor
1 = DC servo motor (without brushes)
2 = DC servo motor (with brushes)

0 = Standard

Accessory

Clamping chuck
3-jaw chuck Ø 65
Item no.: 269060 3065

Tailstock unit RE S
for RDH-S
Item no.: 269100 1020 (200 mm)
Item no.: 269100 1030 (300 mm)
Item no.: 269100 1040 (400 mm)
Item no.: 269100 1050 (500 mm)

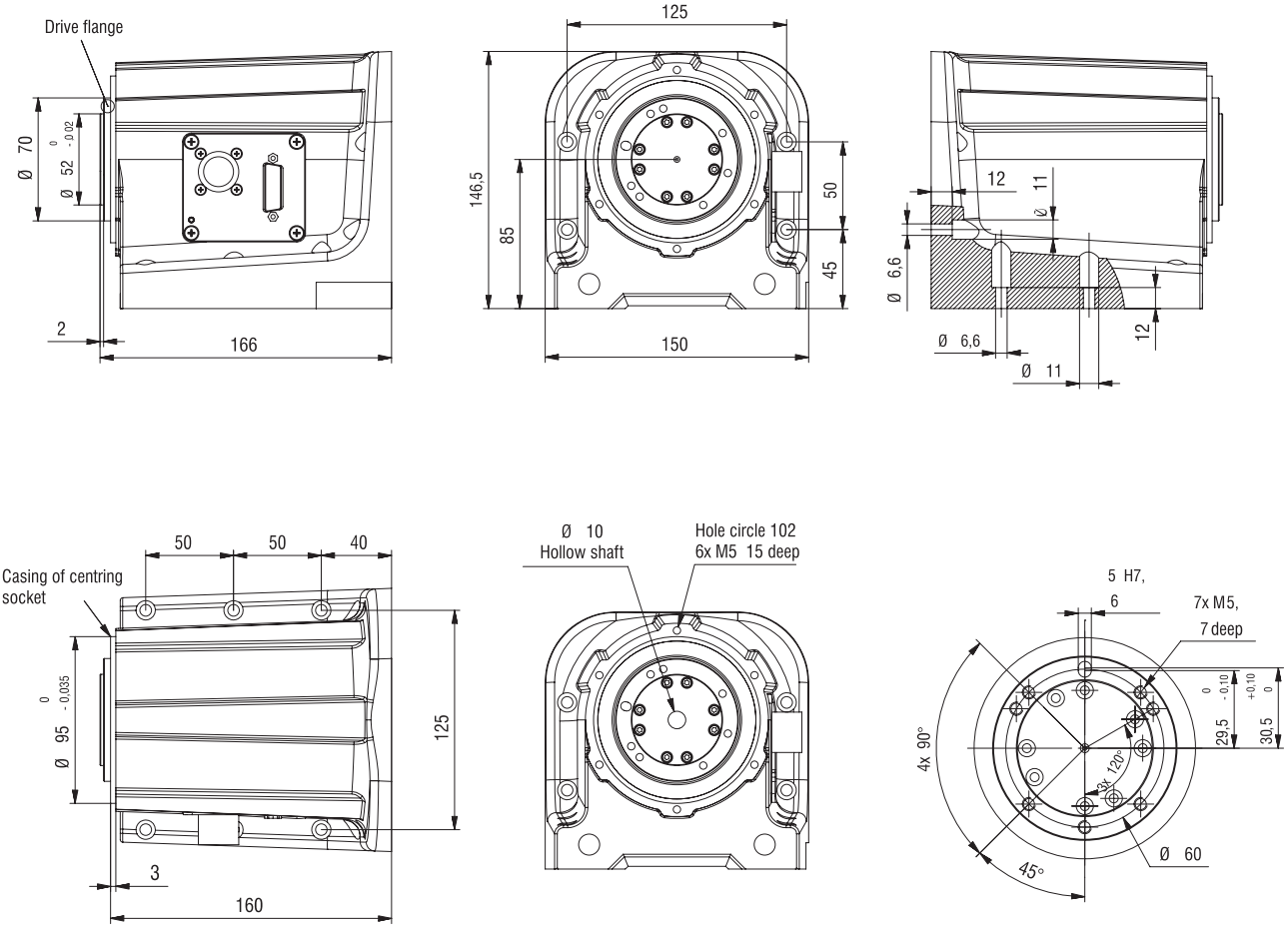
Indexing Table/Rotary Axis RDH-S

Technical data

		Stepping motor MS 045 HT *		DC-servo motor MD 100		DC-servo motor RE 40	
Reduction ratio		1:51	1:101	1:51	1:101	1:51	1:101
Nominal drive revolution	[1/min]	4	2	22	11	22	11
		at 1500 Hz (225 1/min)		at 1100 1/min		at 1100 1/min	
Max. drive revolution	[1/min]	24	12	59	30	69	35
		at 8000 Hz		--			
Nominal torque	[Nm]	7	11	7	11	4,6	9
		at 1500 Hz		--			
Max. torque (temporary)	[Nm]	--	--	7	11	7	11
Nominal holding torque (static load)	[Nm]	7	11	7	11	7	11
Max. load capacity of the gear	[Nm]	18	28	18	28	18	28
		Limit for repeatable peak torque					
Dynamic load rate C	[N]	5800					
Static load rate C_0	[N]	8600					

* Values at half-step operation

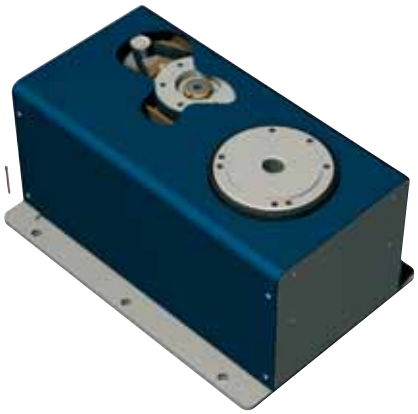
Scale Drawings



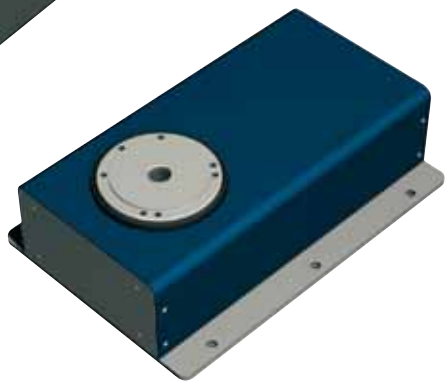
mechanics

Indexing Table

RF 1



RF 1 with servo motor drive



RF 1 with stepping motor drive

Features

- reduction assembly kit 1:52 and/or 1:100
- reduction 1:24 (standard)
- weight: 14.6 kg

Options:

- reduction assembly kit 1:52 and/or 1:100
- electromagnetic brake [60 Nm]
- stepping motor drive with encoder
- CNC control via amphenol

Order key

26024X X000

Motors
1 = Stepping motor
2 = DC servo motor
3 = AC servo motor

Brake
0 = without brake
1 = magnetic brake

Accessory

Assembly kit

For reduction 1:52

Item no.: **269077 0001**

For reduction 1:100

Item no.: **269077 0002**

Aluminium T-groove plate

Ø240 mm / PT 25

Item no.: **269050 0240**

Ø365 mm / PT 25

Item no.: **269050 0365**

Aluminium rotary plate

Ø490 mm, customer-specific
Fixing holes are possible at extra charge

Item no.: **269051 0500**

Chuck

3-jaw chuck Ø 125

Item no.: **269060 1125**

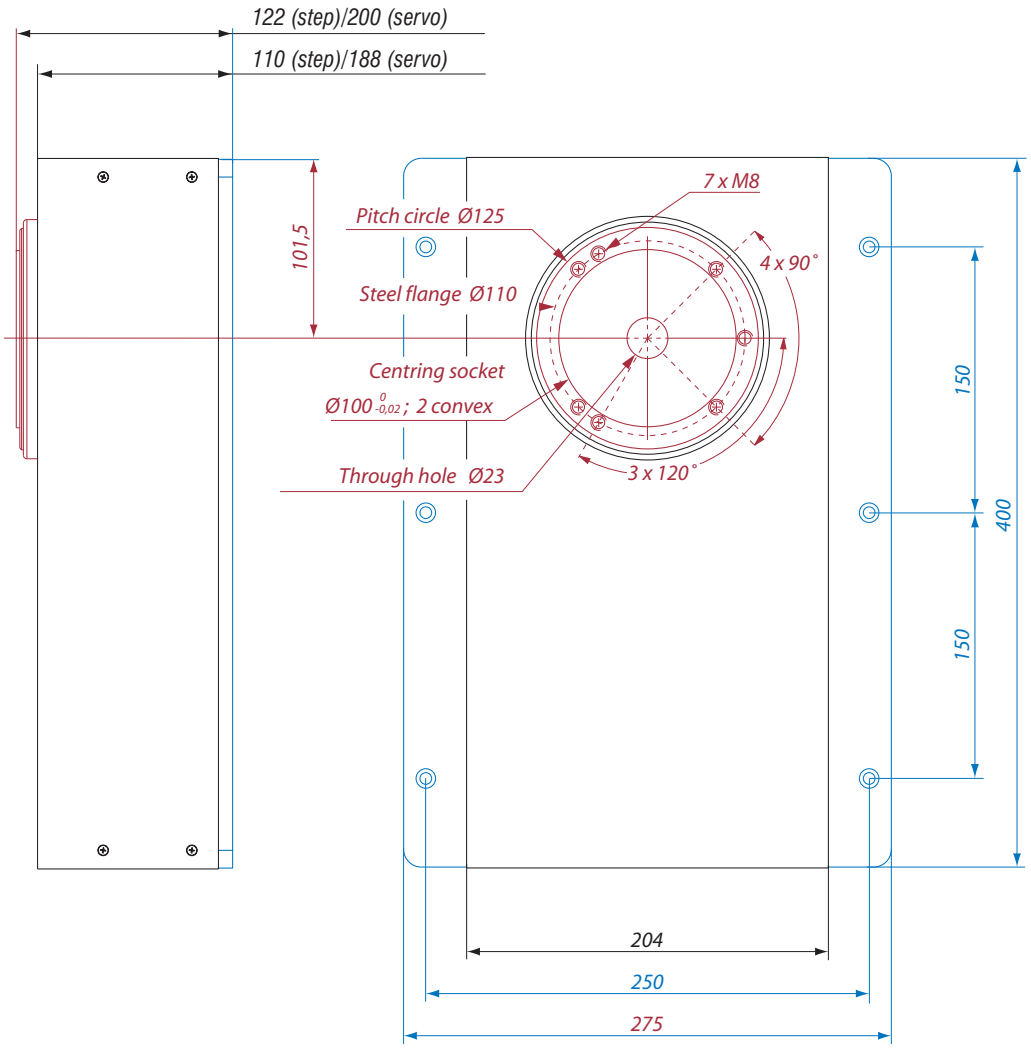
Indexing Table RF 1

Technical data

		Stepping motor MS 200 HT *			DC-servo motor MV 120			AC-servo motor MY 051		
Reduction ratio		1:24	1:52	1:100	1:24	1:52	1:100	1:24	1:52	1:100
Drive revolution	[1/min]	0 - 50	0 - 23	0 - 12	0 - 100	0 - 46	0 - 24	0 - 250	0 - 115	0 - 60
Operating moment (0 to 500 Hz)	[Nm]	20	42	75	--			--		
Operating moment (500 to 1000 Hz)	[Nm]	18	38	75	--			--		
Nominal torque	[Nm]	--			8	17	32	7	14	27
Nominal holding torque (static load)	[Nm]	37	75	75	10	23	44	9	19	37
Min. increment (positioning accuracy)	[arcmin]	2.5	2	2	2	2	2	2	2	2

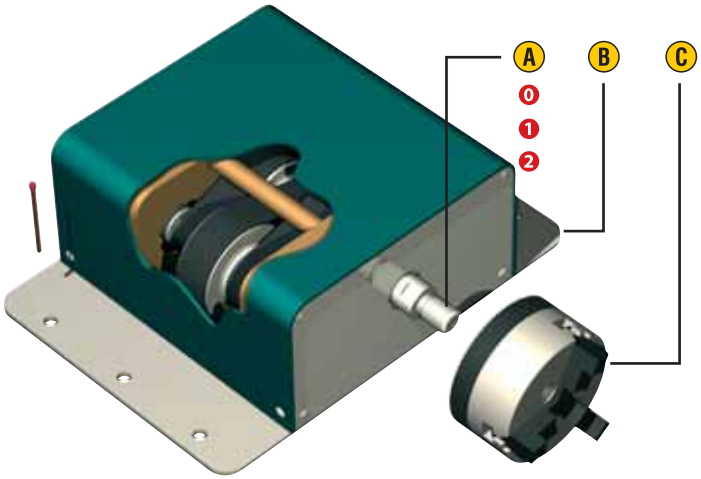
* Values at half-step operation

Scale Drawings



mechanics

Rotary Axis D 1



Features

- play-less timing belt drive with stepping, or DC servo motor
- reduction 1:16 and/or 1:50
- weight: 2.6 kg
- 3 different shaft designs

Options:
- mounting plate
- tailstock unit
- stepping motor drive with encoder
- CNC control via Sub D

A 3 different shafts! 0 1 2
See scale drawing

B Mounting plate
(including fastening)
Item no.: 277023

C 3-jaw chuck Ø 65 (see accessory)

Order key

263XXX 0001

Stub shaft
0 = Standard shaft
1 = Shaft 2
2 = Shaft 3

Motors
0 = Stepping motor
1 = DC servo motor

Gear reduction
2 = 50
3 = 16

Accessory

0 = for standard shaft

1 = for shaft 2

2 = for shaft 3

Shaft coupling
Shaft coupling WK 40/60 for a clearance-free power transmission/in order to compensate a small shaft offset
Item no.: 218003 9999

Adjusting aid D 1
to exactly bring the rotary axis D 1 into line with machines
Item no.: 280110 9005

Tailstock unit RE 1
Length 350 mm; further designs up to a length of 650 mm upon request
Item no.: 269071

Quick-change chuck
for tools Ø 1.5-13 mm
Item no.: 269073

Tangential knife
to cut any contours (sharp angles) out of foils (up to 4 mm thick)
Item no.: 259010

Lathe plate
Lathe plate Ø 60 mm to clamp wood and plastics
Item no.: 269075

Clamping nut
Clamping nut SK 11
Item no.: 239111
Matching collets for tools Ø 1-6.35 mm
Item no.: 239110 XXXX

Chuck
3-jaw chuck Ø 65
Item no.: 269060 1065

Rotary Axis D 1

Technical data

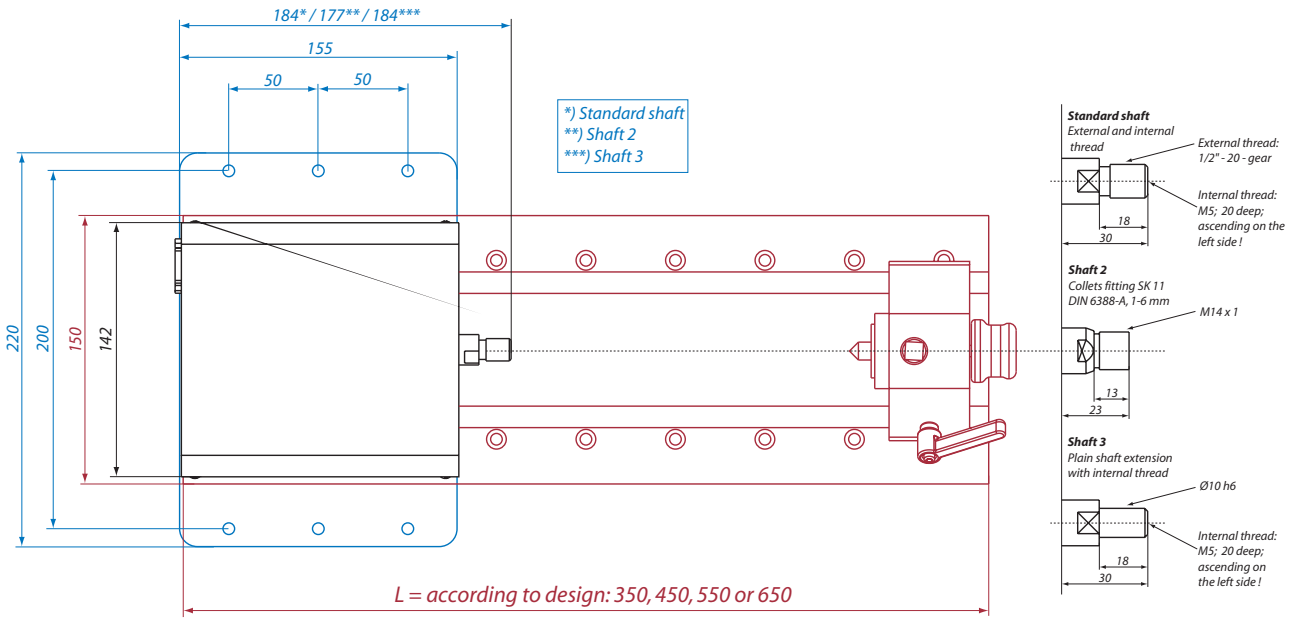
		Stepping motor MS 045 HT *		DC-servo motor MV 030	
Reduction ratio		1:16**	1:50**	1:16**	1:50**
Drive revolution	[1/min]	0 - 75	0 - 24	0 - 150	0 - 48
Operating moment (0 - 1600 Hz)	[Nm]	6	16	--	--
Nominal torque	[Nm]	--	--	1,5	4
Nominal holding torque (static load)	[Nm]	12	38	1,8	6
Min. increment (positioning accuracy)	[arcmin]	3,5	2	2	2

* Values at half-step operation

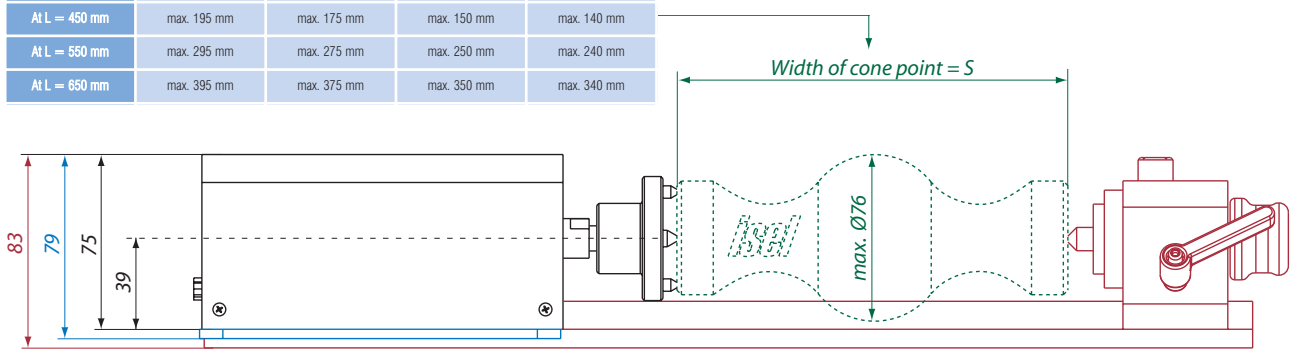
**) exact value: $16\frac{3}{7} \approx 16{,}429$

$49\frac{113}{315} \approx 49{,}359$

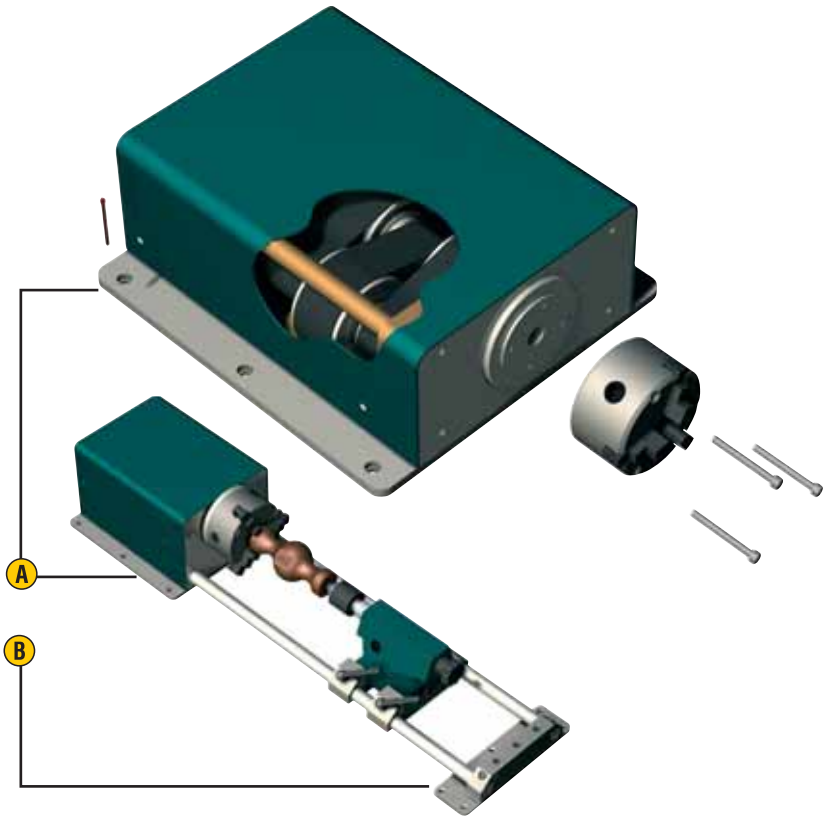
Scale Drawings



Width of cone point = S	with collets SK 11	with lathe plate	with quick-change chuck	with chuck Ø 65
At L = 350 mm	max. 95 mm	max. 75 mm	max. 50 mm	max. 40 mm
At L = 450 mm	max. 195 mm	max. 175 mm	max. 150 mm	max. 140 mm
At L = 550 mm	max. 295 mm	max. 275 mm	max. 250 mm	max. 240 mm
At L = 650 mm	max. 395 mm	max. 375 mm	max. 350 mm	max. 340 mm



Rotary Axis D 2



Features

- play-less timing belt drive with stepping, DC or AC servo motor
- reduction 1:40
- steel flange Ø 86 mm, 56 ± 3 HRC
- weight: 10.6 kg

Options:
- mounting plate, set 1 or set 2
- tailstock unit
- permanent magnetic brake 24 V [10 Nm] (locked in zero-current state)
- electromagnetic brake 24 V [15 Nm] (locked at impressed voltage)
- stepping motor drive with encoder
- CNC control via amphenol

A Mounting plate, set 1
(including fastening)
Item no.: 277024

B Mounting plate, set 2
(including fastening)
Item no.: 277024 1000

Order key

2640X0 X0X1

Motors
0 = stepping motor
1 = DC servo motor
2 = AC servo motor

Brake
0 = without brake
1 = permanent magnet
2 = electromagnet

Tailstock
0 = without tailstock
1 = RE 2, L=1000 mm
2 = RE 2, L=1500 mm
3 = RE 2, L=2000 mm

Accessory

Chuck
3-jaw chuck Ø 80
Item no.: 269060 0080

Chuck
3-jaw chuck Ø 125
(only for D 2 + tailstock RE 2)
Item no.: 269060 1125

no image

Adjusting aid D 2
to exactly bring the rotary axis D 2 into line with machines
- setting of parallelism/workpiece zero points (reproducible alignment by demountable fittings)
Item no.: 269076 0002

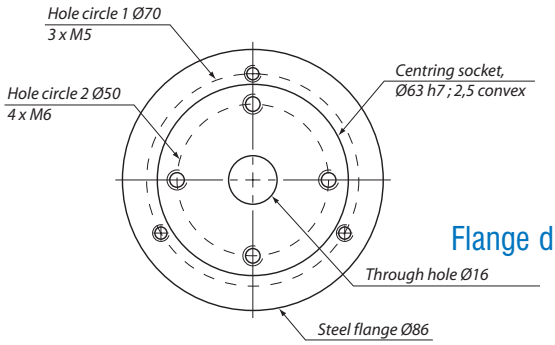
Rotary Axis D 2

Technical data

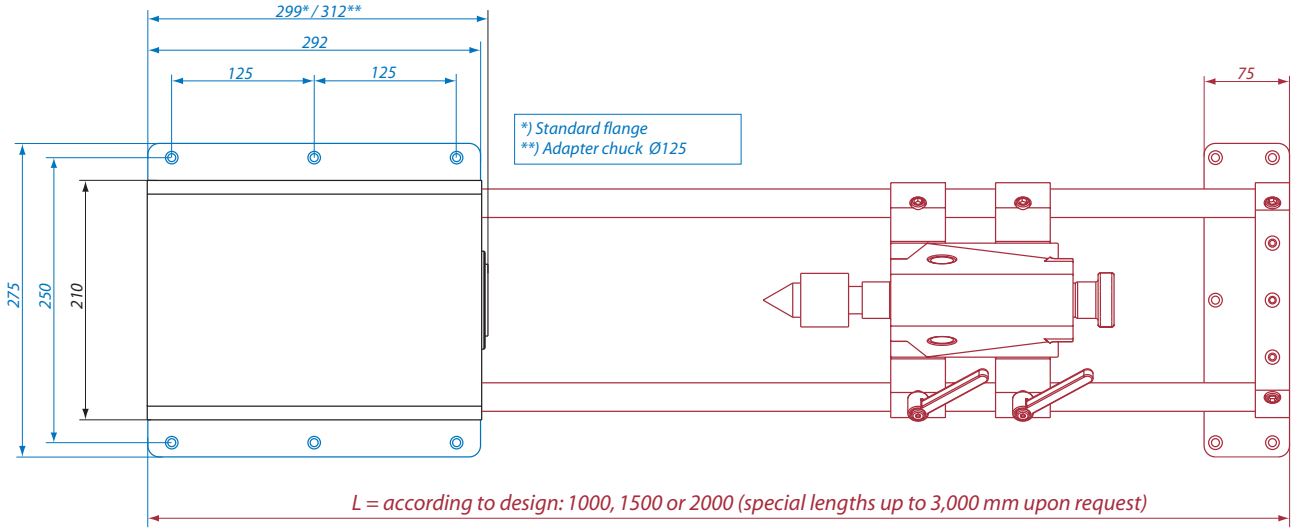
		Stepping motor MS 200 HT *	DC servo motor MV 120	AC servo motor MY 054
Reduction ratio		1:40	1:40	1:40
Drive revolution [1/min]	[1/min]	0 - 30	0 - 60	0 - 150
Operating moment (0 to 500/500 to 1,000 Hz)	[Nm]	35 / 30	--	--
Nominal torque	[Nm]	--	12	25
Nominal holding torque (static load)	[Nm]	55	18	40
Min. increment (positioning accuracy)	[arcmin]	2	2	2

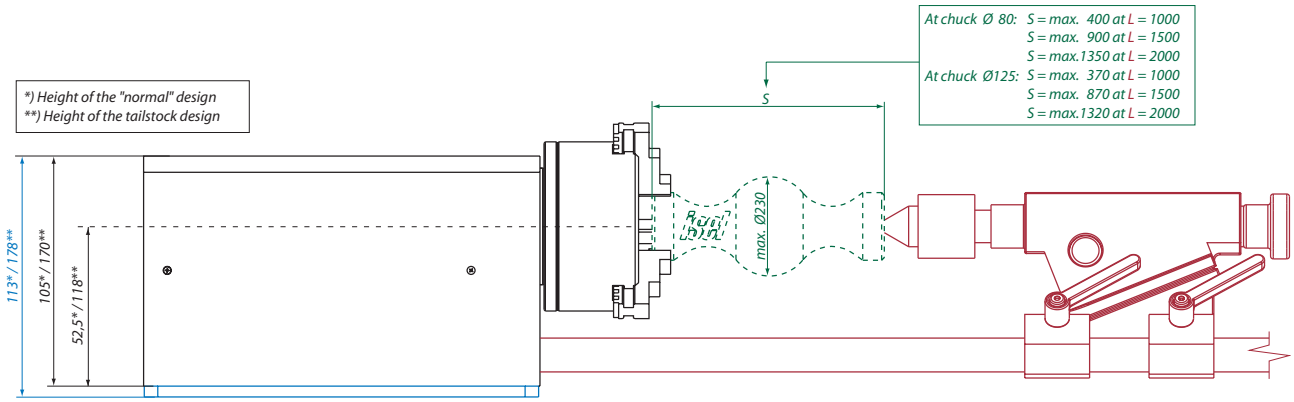
* Values at half-step operation

Scale Drawings



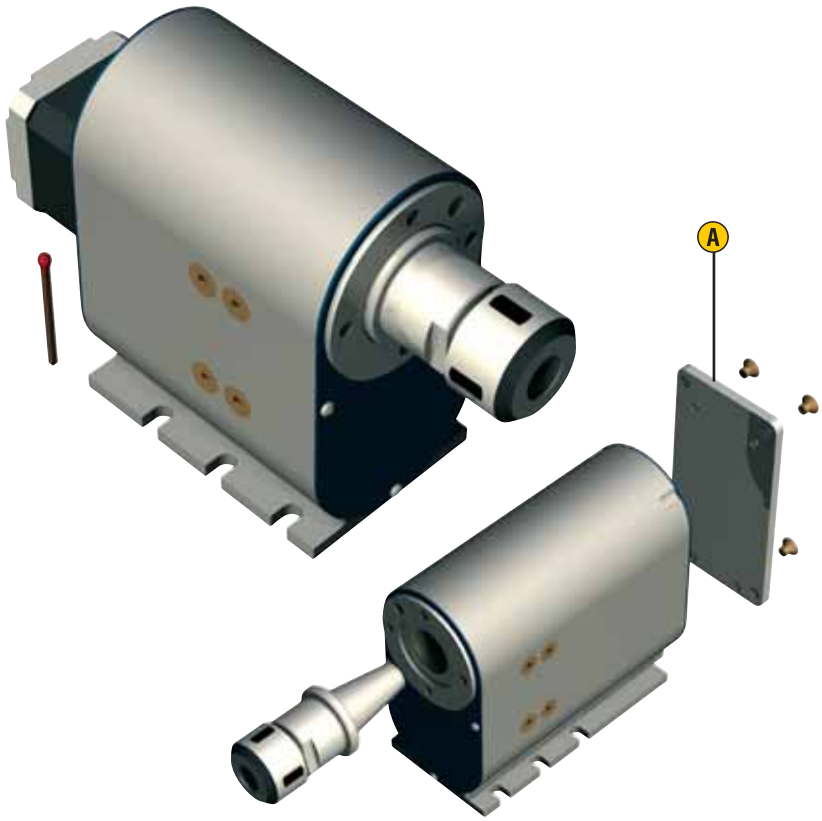
Flange dimensions





Midget Rotary Axis

MD 1



Features

- play-less timing belt drive with stepping, or DC servo motor
- reduction 1:20
- shaft with through hole Ø 9
- reception flange with internal cone SK 20
- weight: according to design from 1.35 kg upwards

Options:
- "closed" design
- additional mounting plate (vertical mounting possible)
- CNC control via Sub D

A **Mounting plate**
(vertical mounting of the closed design)
Item no.: 277 026

Order key

261010 0XX0

Motors
0 = stepping motor
1 = DC servo motor
(only in closed design)

Design
0 = „open“ design
1 = „closed“ design

Accessory

Chuck
3-jaw chuck Ø 65
Item no.: 269060 2065

Collets fitting
Collets SK 20
for tools Ø 3-10 mm,
with mounting ring
Item no.: 239122 0001

for tools Ø 3-12.7 mm,
with mounting ring
Item no.: 239122 9001

Midget Rotary Axis MD 1

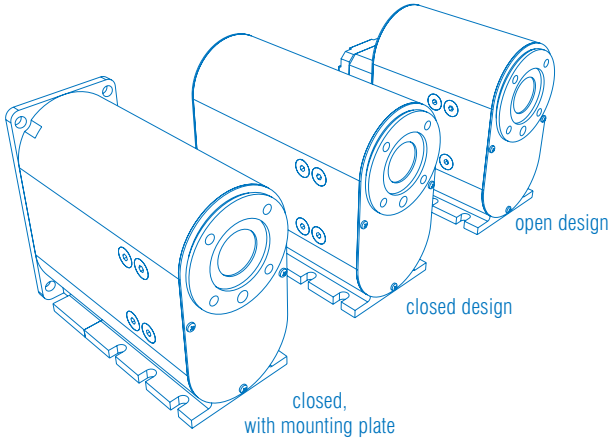
Technical data

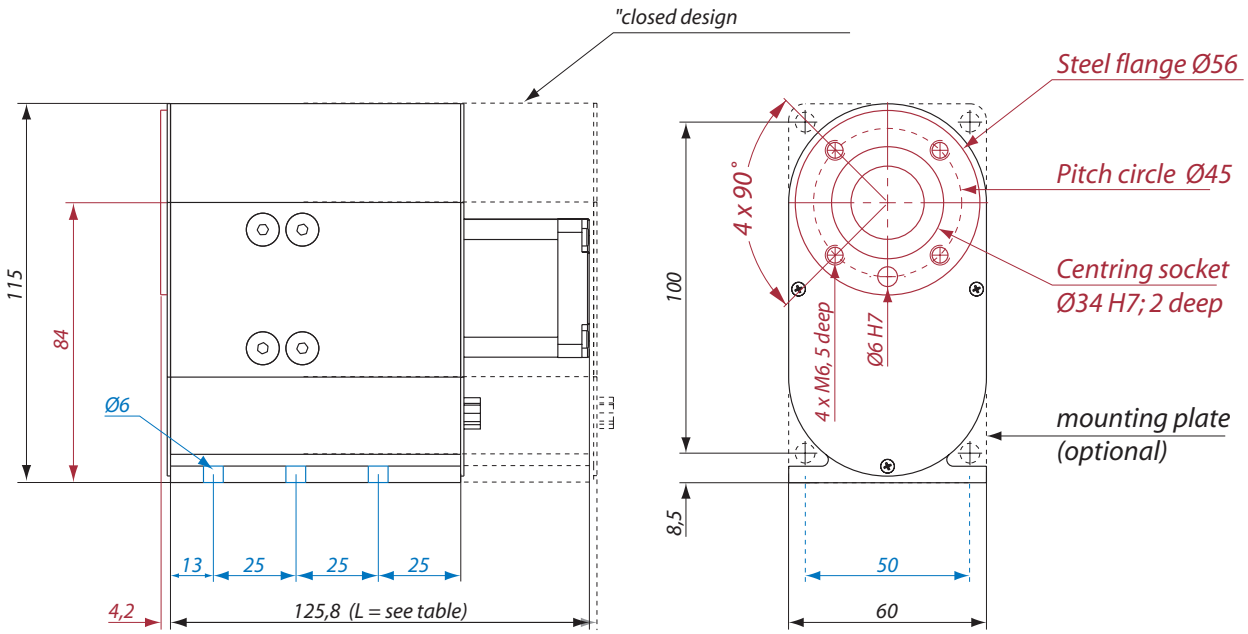
		Stepping motor MS 045 HT *	DC servo motor MV 030
Reduction ratio		1:20	1:20
Drive revolution	[1/min]	0 - 60	0 - 120
Operating moment (0 - 1600 Hz)	[Nm]	8	--
Nominal torque	[Nm]	--	2
Nominal holding torque (static load)	[Nm]	14	3
Min. increment (positioning accuracy)	[arcmin]	3,5	2

* Values at half-step operation

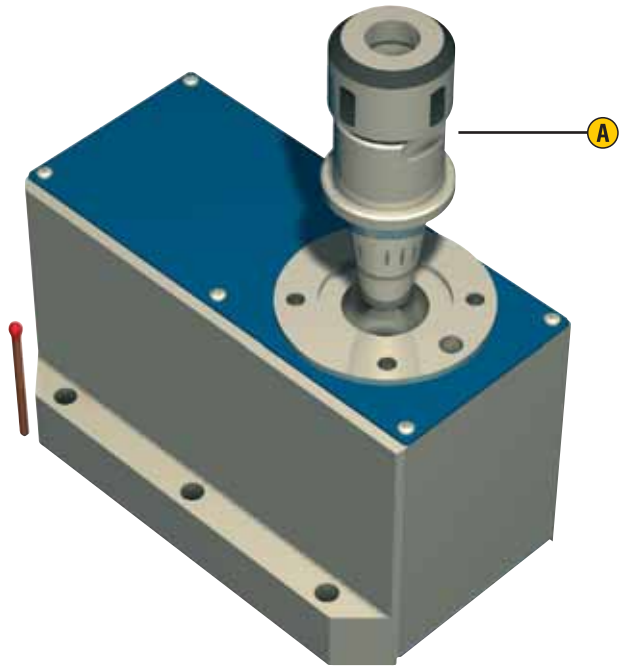
Scale Drawings

	Length L at step	Length L at DC servo
open design	125,8 mm	-
closed design	129 mm	180 mm
closed, with mounting plate	133 mm	184 mm





Indexing Table ZR 20



Features

- play-less timing belt drive with stepping motor
- reduction 1:20
- shaft with through hole Ø 15
- reception flange with internal cone SK 20
- weight: 2,1 kg

Options:
- CNC control via Sub D

Ⓐ **Collets fitting SK 20**
(accessory)

Ordering data

Indexing table ZR 20
Item no.: **260300 0000**

Accessory

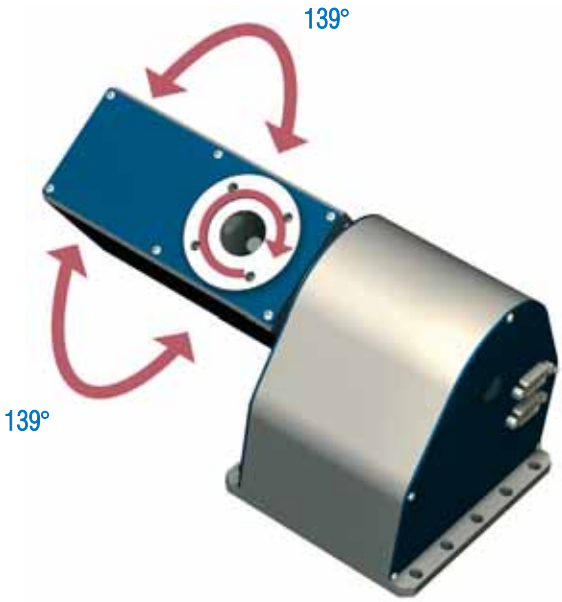
Chuck

3-jaw chuck Ø 65
Item no.: **269060 2065**

Collets fitting

Collets fitting SK 20
for tools Ø 3-10 mm,
with mounting ring
Item no.: **239122 0001**

for tools Ø 3-12.7 mm,
with mounting ring
Item no.: **239122 9001**



The rotary/swivelling unit ZDS 2030 can be used as fourth/fifth axis in CNC machines in the fields of precision engineering or handling. It is a combination of ZD 30 and the modified version of ZR 20.
The ZDS 2030 enables a conventional 3-axis plant to treat five sides and/orfree-form surfaces of easy to machine materials (e.g. plastics).
The pivoting angle is 139° in both directions.

Rotary/swivelling unit ZDS 2030
Item no.: **265 000 0000**

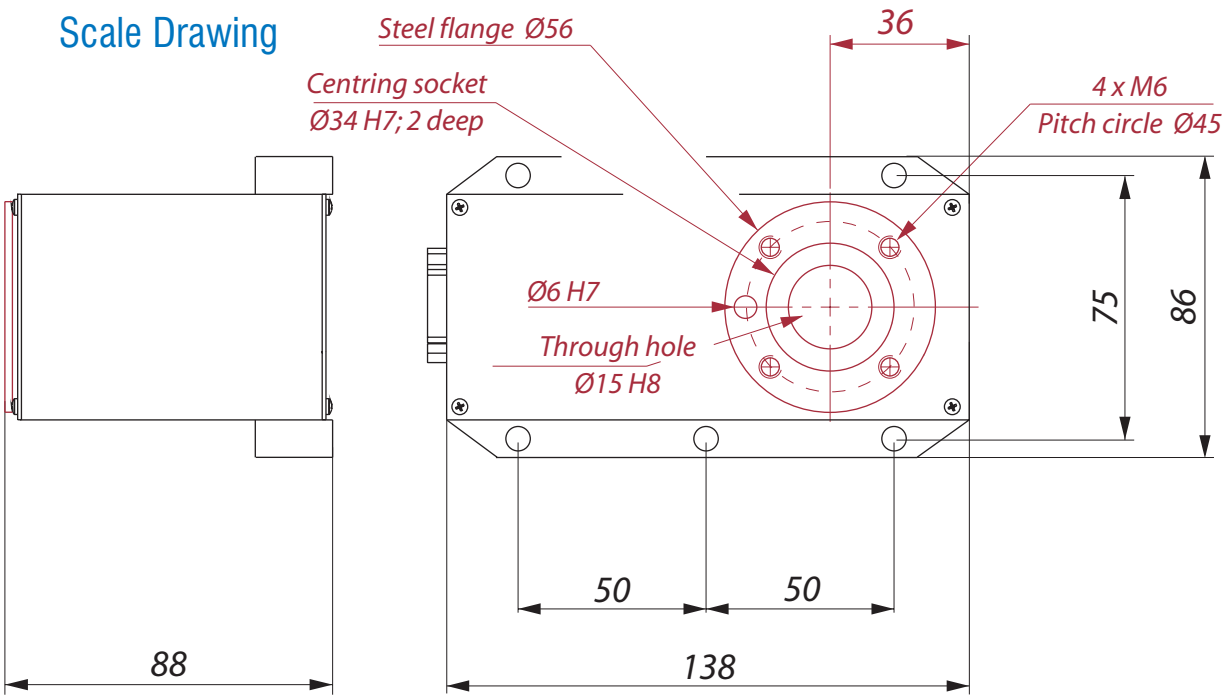
Indexing Table ZR 20

Technical data

		Stepping motor MS 045 HT *
Reduction ratio		1:20
Drive revolution	[1/min]	0 - 60
Operating moment (0 - 1600 Hz)	[Nm]	8
Nominal holding torque (static load)	[Nm]	14
Min. increment (positioning accuracy)	[arcmin]	3,5

* Values at half-step operation

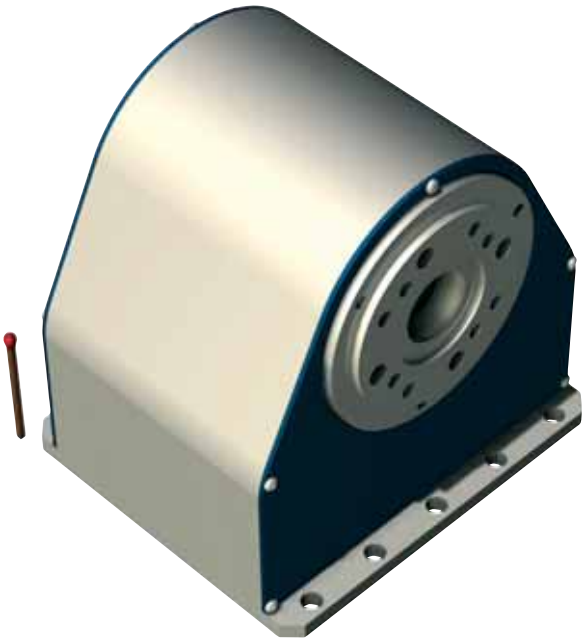
Scale Drawing



mechanics

Rotary Axis

ZD 30



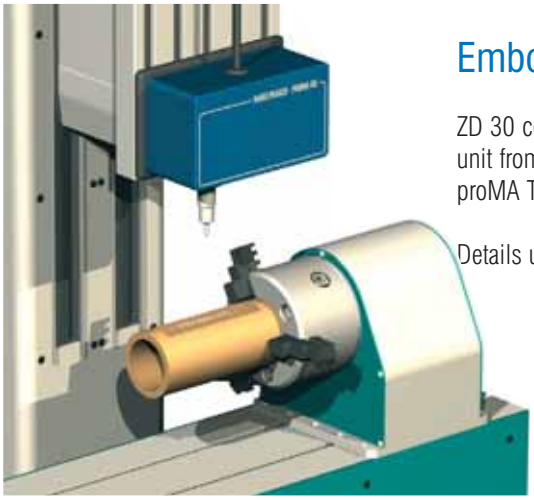
Features

- play-less timing belt drive with stepping motor
- reduction 1:30
- shaft with through hole Ø 15
- reception flange with internal cone SK 20
- weight: 2,9 kg

Options:
- CNC control via Sub D

Ordering data

Rotary axis ZD 30
Item no.: **261100 0000**



Embossing

ZD 30 combined with the pin marking unit from the company proMA Technologie GmbH.

Details upon request

Accessory

Chuck
3-jaw chuck Ø 65
Item no.: **269060 2065**

Chuck
3-jaw chuck Ø 80
Item no.: **269060 0080**

Collets fitting
Collets fitting SK 20
for tools Ø 3-10 mm,
with mounting ring
Item no.: **239122 0001**

for tools Ø 3-12.7 mm,
with mounting ring
Item no.: **239122 9001**

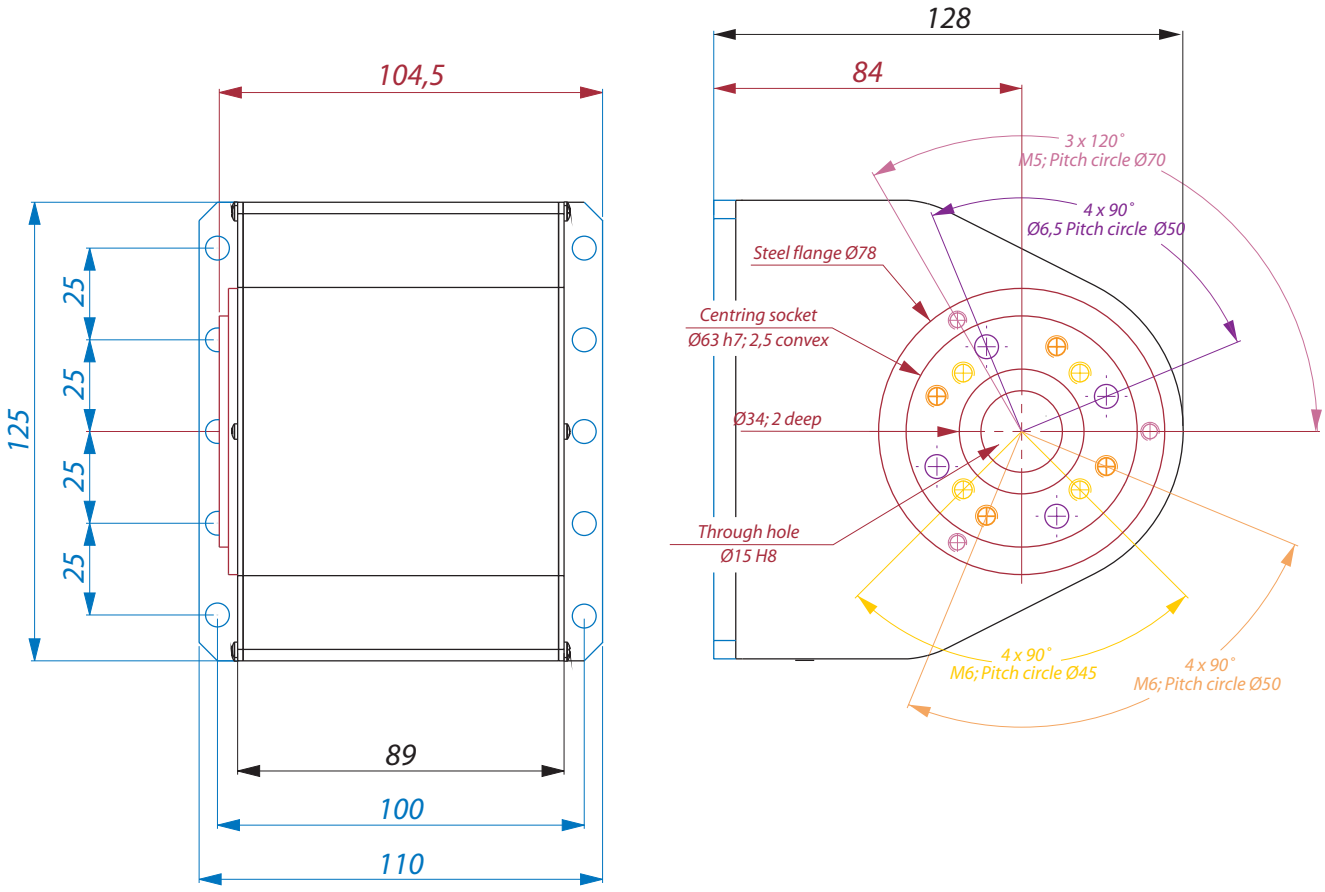
Rotary Axis ZD 30

Technical data

	Stepping motor MS 045 HT*
Reduction ratio	1:30
Drive revolution [1/min]	0 - 40
Operating moment (0 - 1600 Hz) [Nm]	12
Nominal holding torque (statische Belastung) [Nm]	20
Min. increment (positioning accuracy) [arcmin]	2,5

* Values at half-step operation

Scale Drawing



Midget Lifting and Rotary Unit MHD 1 / MHD 2

Features

- drive via two kinematically coupled stepping motors
- 50 mm stroke/100 mm stroke
- lift pivot with fastening screw set M 6
- weight: 1.3 kg/3.5 kg

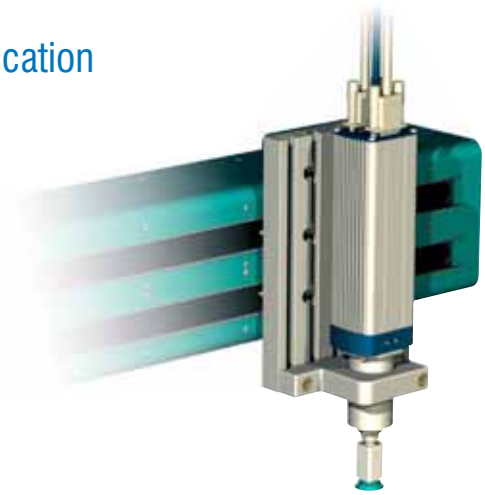
Options:
- pneumatic feed line
- CNC control via 2 x Sub D

Ordering data

MHD 1
Item no.: **230014 0005**

MHD 2
Item no.: **230014 0010**

Application

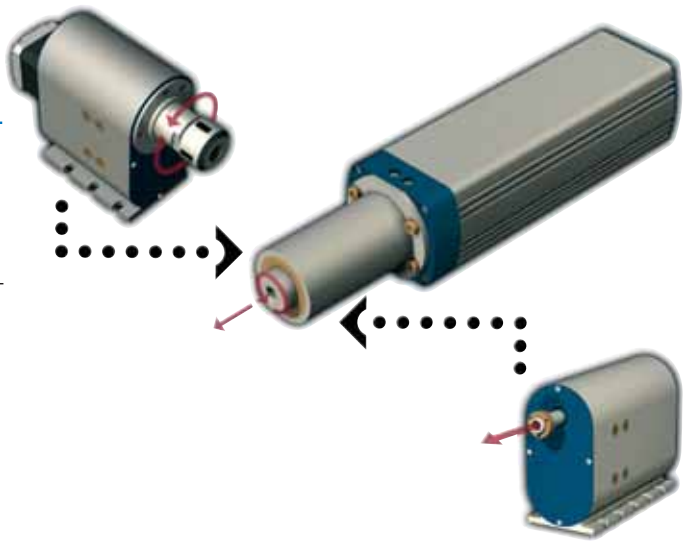


Information

**You can choose -
a lifting and/or rotary unit of a unit with combined lifting/rotary motion …**

Midget lifting and rotary unit MHD 1/MHD 2

The drive takes place via two kinematically coupled stepping motors According to the rotating direction and the revolution difference (between the motor), a combinable lifting/rotary motion results. For the lifting motion, a spindle with 20 mm/30 mm pitch is used; the rotary motion takes place via a radially active guiding element. The system is maintenance-free.



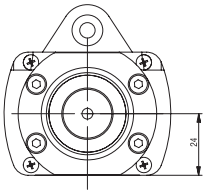
Midget Lifting and Rotary Unit MHD 1 / MHD 2

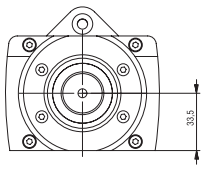
Technical data

	MHD 1	MHD2
Repeatability linear	≤ 0,1 mm	≤ 0,1 mm
Repeatability circular	≤ 0,25°	≤ 0,4°
Pick&Place-cycle speed linear	≤ 0,7 s / double stroke (50 mm)	≤ 0,9 s / double stroke (100 mm)
Pick&Place-cycle speed circular	≤ 0,4 s / double stroke (180°)	≤ 0,4 s / double stroke (180°)
Handling weight (max.)	100 g	400 g
Stroke (max.)	50 mm	100 mm
Weight	1,3 Kg	3,5 Kg
Dimensions (L/B/H)	237,5(+50)/65/66,5 mm	385(+100)/90/84 mm

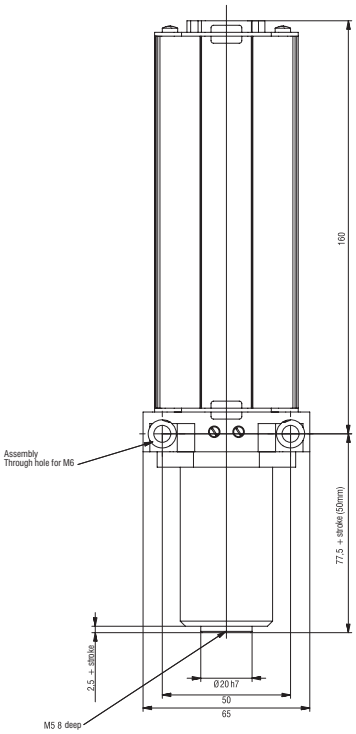
* Values at half-step operation

Scale Drawings

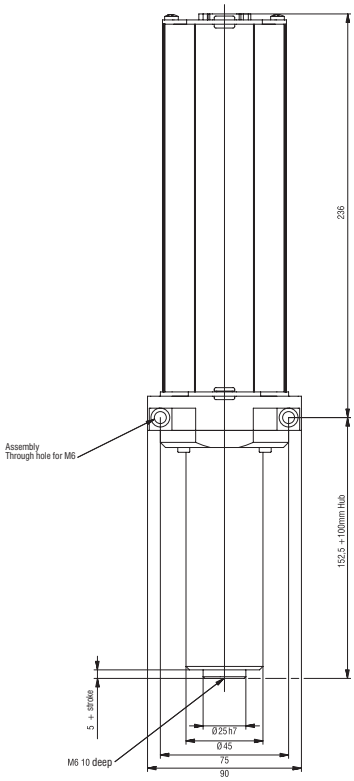


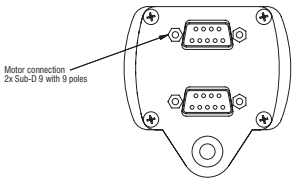


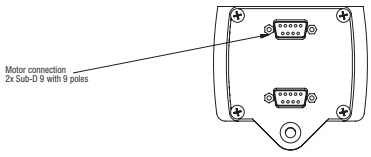
MHD 1



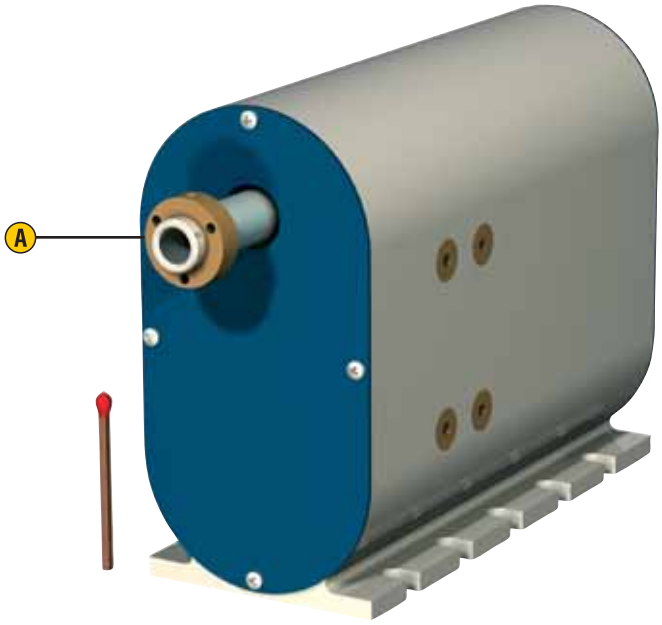
MHD 2







Midget Lifting Unit MH 1



Features

- play-less ball screw drive with stepping or DC servo motor
- spindle pitch: (pitch of 10 only with 90 mm stroke and stepping motor MS 050 HT)
- lift pivot with through hole Ø 8
- demountable reception flange
- weight: according to design from 1.9 kg upwards

Options:
- different stroke lengths, 30, 60 and 90 mm
- CNC control via Sub D

(A) **Demountable reception flange**
(see scale drawing)

Order key

230012 X1XX

Motors	Spindle pitch	Stroke length
0 = stepping motor	2 = 2,5 mm	0 = 30 mm
1 = DC servo motor	5 = 5 mm	2 = 60 mm
	0 = 10 mm	4 = 90 mm

Midget Lifting Unit MH 1

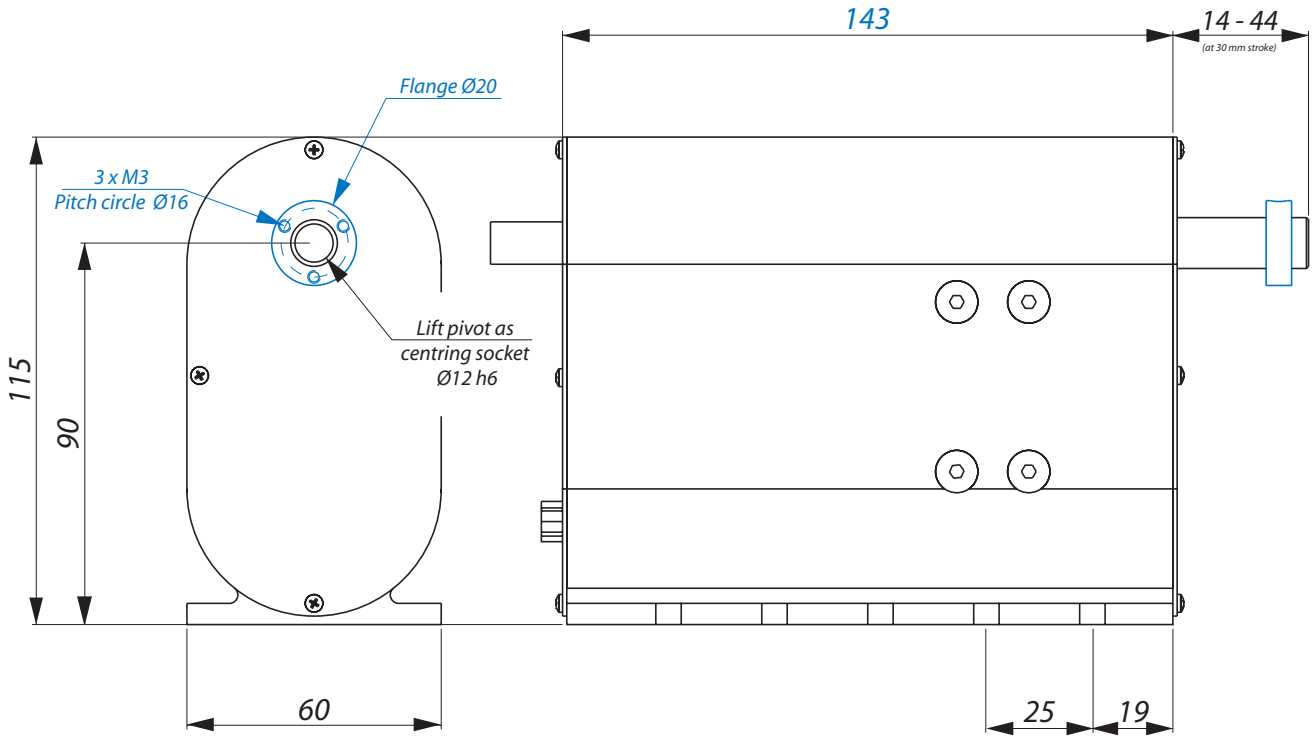
Technical data

Stepping motor MS 045 HT *				
Spindle pitch	[mm]	2,5	5	10 **
Pick & place cycle	[s]	1,4	0,8	0,5
Feed force (0 - 1600 Hz)	[N]	500	275	150
Positioning accuracy	[mm]	0,05	0,07	0,15
Repeatability	[mm]	0,025	0,05	0,1

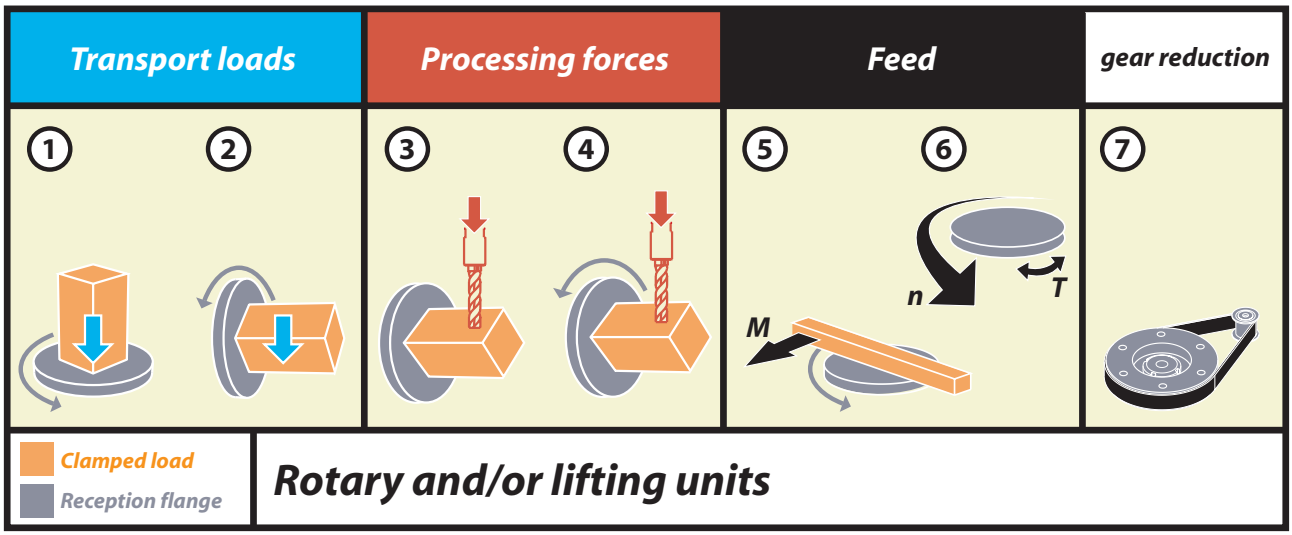
Servo motor MV 030			
Spindle pitch	[mm]	2,5	5
Pick & place cycle	[s]	0,8	0,6
Feed force	[N]	125	75
Positioning accuracy	[mm]	0,04	0,06
Repeatability	[mm]	0,02	0,03

* Values at half-step operation
** Please, pay attention to the information provided under "order key".

Scale Drawing



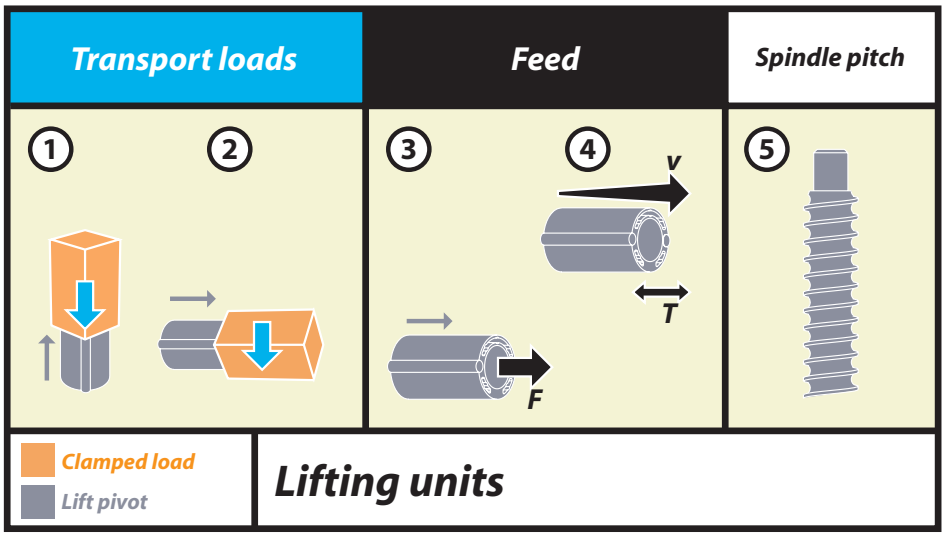
Rotary and Lifting Units:
Transport Loads, Processing Forces, Feed



Rotary and/or lifting units	1*	2*	3	4	5	6	7
RDH-M (step)	100 kg	45 kg	55 Nm	24 Nm	24 Nm	4 rpm	1:51
RDH-M (step)	160 kg	70 kg	108 Nm	45 Nm	45 Nm	2 rpm	1:101
RDH-M (DC servo without brushes)	110 kg	50 kg	32 Nm	15 Nm	15 Nm	22 rpm	1:51
RDH-M (DC servo without brushes)	180 kg	80 kg	64 Nm	29 Nm	29 Nm	11 rpm	1:101
RDH-S (step)	30 kg	15 kg	6,9 Nm	6,9 Nm	6,9 Nm	4 rpm	1:51
RDH-S (step)	48 kg	24 kg	11 Nm	11 Nm	11 Nm	2 rpm	1:101
RDH-S (DC servo without brushes)	30 kg	15 kg	6,9 Nm	6,9 Nm	6,9 Nm	22 rpm	1:51
RDH-S (DC servo without brushes)	48 kg	24 kg	11 Nm	11 Nm	11 Nm	11 rpm	1:101
RDH-S (DC servo)	25 kg	13 kg	6,9 Nm	4,6 Nm	4,6 Nm	22 rpm	1:51
RDH-S (DC-servo)	40 kg	20 kg	11 Nm	8,7 Nm	8,7 Nm	11 rpm	1:101
RF 1 (step)	60 kg	30 kg	37 Nm	17,5 Nm	17,5 Nm	50 rpm	1:24
RF 1 (step)	100 kg	50 kg	75 Nm	38 Nm	38 Nm	23 rpm	1:52
RF 1 (step)	150 kg	75 kg	75 Nm	75 Nm	75 Nm	12 rpm	1:100
RF 1 (DC-servo)	70 kg	35 kg	10 Nm	7,5 Nm	7,5 Nm	100 rpm	1:24
RF 1 (DC-servo)	110 kg	55 kg	23 Nm	17 Nm	17 Nm	46 rpm	1:52
RF 1 (DC-servo)	160 kg	80 kg	44 Nm	32 Nm	32 Nm	24 rpm	1:100
RF 1 (AC-servo)	90 kg	45 kg	9 Nm	6,5 Nm	6,5 Nm	250 rpm	1:24
RF 1 (AC-servo)	130 kg	65 kg	19 Nm	14 Nm	14 Nm	115 rpm	1:52
RF 1 (AC-servo)	180 kg	90 kg	37 Nm	27 Nm	27 Nm	60 rpm	1:100
D 1 (step)	8 kg	4 kg	12 Nm	6 Nm	6 Nm	75 rpm	1:16
D 1 (step)	10 kg	5 kg	38 Nm	16 Nm	16 Nm	24 rpm	1:50
D 1 (DC-servo)	8 kg	4 kg	1,8 Nm	1,5 Nm	1,5 Nm	150 rpm	1:16
D 1 (DC-servo)	10 kg	5 kg	6 Nm	4 Nm	4 Nm	48 rpm	1:50
D 2 (step)	40 kg	20 kg	55 Nm	30 Nm	30 Nm	30 rpm	1:40
D 2 (DC-servo)	60 kg	30 kg	18 Nm	12 Nm	12 Nm	60 rpm	1:40
D 2 (DC-servo)	80 kg	40 kg	40 Nm	25 Nm	25 Nm	150 rpm	1:40
MD 1 (step)	5 kg	2,5 kg	14 Nm	8 Nm	8 Nm	60 rpm	1:20
MD 1 (DC-servo)	6 kg	3 kg	2 Nm	3 Nm	3 Nm	120 rpm	1:20
ZR 20 (step)	10 kg	5 kg	14 Nm	8 Nm	8 Nm	60 rpm	1:20
ZD 30 (step)	14 kg	8 kg	20 Nm	12 Nm	12 Nm	40 rpm	1:30
MHD 1 (rotary)	0,1 kg	-	-	-	0,05 Nm	1 s** (1000 U/min.)	-
MHD 2 (rotary)	0,4 kg	-	-	-	0,01 Nm	1 s** (1000 U/min.)	-

*)Guide values that vary according to application!! **) Pick & place cycle

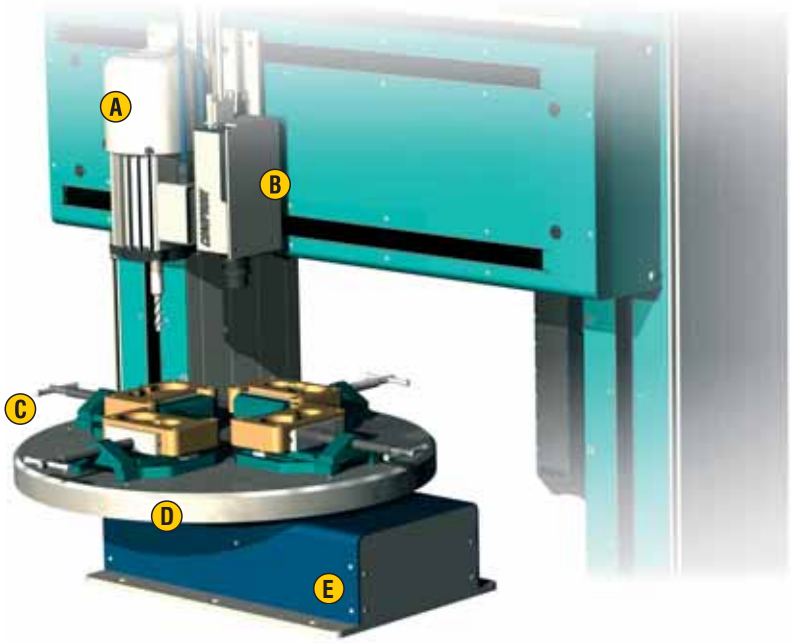
Lifting Units:
Transport Loads and Feed

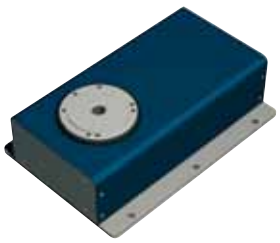


Lifting units	1*	2*	3	4	5
MHD 1 (lift)	0,1 kg	-	10 N	0,7 s**	20 mm
MHD 2 (servo)	0,4 kg	-	15 N	0,9 s**	30 mm
MH 1 (step)	7 kg	2 kg	500 N	1,4 s**	2,5 mm
MH 1 (step)	3,5 kg	2 kg	300 N	0,8 s**	5 mm
MH 1 (step)	2 kg	2 kg	150 N	0,5 s**	10 mm
MH 1 (servo)	8 kg	2 kg	125 N	0,8 s**	2,5 mm
MH 1 (servo)	4 kg	2 kg	75 N	0,6 s**	5 mm

*) Guide values that vary according to application !! **) Pick & place cycle

Application Samples





Try out a combination!

- **A** 500 W **spindle motor MAH 2.05-S from isel**
- **B** **Three-dimensional laser digitalisation system**
- **C** **Vice 1 from isel** (L152 x B130 x H45)
- **D** **Aluminium rotary plate** Ø 490 mm from isel
- **E** **Indexing table RF 1** from isel (step/servo)
- **F** **CNC basic units from isel**

Permissible Moment of Inertia J_z

Calculation

It is important to calculate the permissible moment of inertia Jz in order to ensure the desired values also at "external load" (rotary table and accessory) - e.g. the stepping motor should not lose steps.
In this connection, it is important the calculated moment of inertia of the "external load" [Je] does not exceed the permissible moment of inertia.

T-groove plate ø 240: 43.9 kgcm²

T-groove plate ø 365: 262.9 kgcm²

Aluminium rotary plate ø 490: 662.9 kgcm²

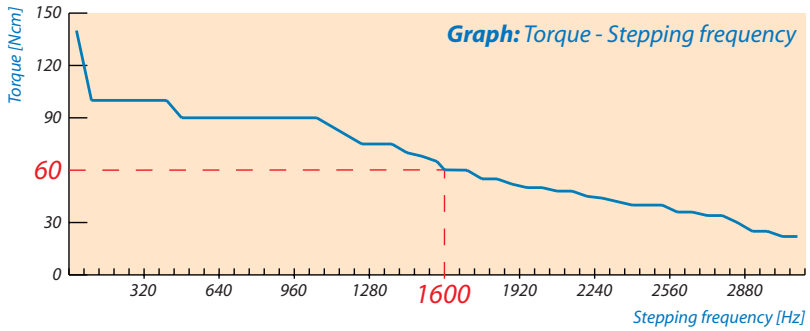
Moments of inertia of the plates

The calculation example refers to the indexing table RF 1 with stepping motor!

J_z [kgcm²]	Max. permissible moment of inertia
J_e [kgcm²]	Moment of inertia of the "external load"
t_b [s]	Acceleration and/or braking time
f [Hz]	Operating frequency
M [Ncm]	Torque
i	reduction factor
G_f	Specific gear factor: for RF 1 = 0.5

$$J_z \approx G_f \cdot M \cdot \frac{t_b}{f} \cdot 6366 \cdot i$$

Only for 2-phase stepping motors



Now, we calculate the permissible moment of inertia at a stepping frequency of **1,600** Hz. We learn the torque (**60** Ncm) from the line graph (see above) and set the acceleration time [tb] for 0.5 seconds.
The reduction ratio is 1: 24, and thus the reduction factor [i] is **24**.

Please keep in mind that the rotary plate is an "external load" and that its moment of inertia must be included in the calculation!

$$J_z \approx 0{,}5 \cdot 60 \cdot \frac{0{,}5}{1600} \cdot 6366 \cdot 24$$

$$J_z \approx 1432 \text{ kgcm}^2$$

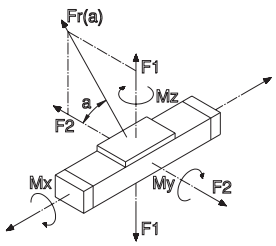
mechanics

Rack Feed

ZAF 3

Features

- stress-resistant rack feed for medium to heavy applications in the field of handling
- bending- and torsion-resistant guide made of aluminium and steel
- very high bearing capacity due to shaft slide WS 3 from isel WS 3
- end position buffered
- numerous combination possibilities via transmission shafts and connecting profiles
- high-performance AC servo motors with and without integrated brake
- compact worm gear with 11 transmission steps from 5/1 to 80/1



$$Fr(a) = \frac{F2}{\cos a}$$

$$Fr(a) = \frac{F1}{\sin a}$$

Shaft slide block WS 3

Load data			
Co		(N)	7,049
C		(N)	3,190
F1	static	(N)	6,087
F1	dynamic	(N)	2,759
F2	static	(N)	7,049
F2	dynamic	(N)	3,190

Mx	static	(Nm)	262.3
My	static	(Nm)	227.6
Mz	static	(Nm)	263.1
Mx	dynamic	(Nm)	118.7
My	dynamic	(Nm)	103
Mz	dynamic	(Nm)	119.1
Weight:	0.94 kg		

Technical data

- worm gear:
  i = 5/1 to 80/1
- maximum traverse speed at i = 5/1:
  0.75 m/s
- transport load:
  up to 280 kg

Order key

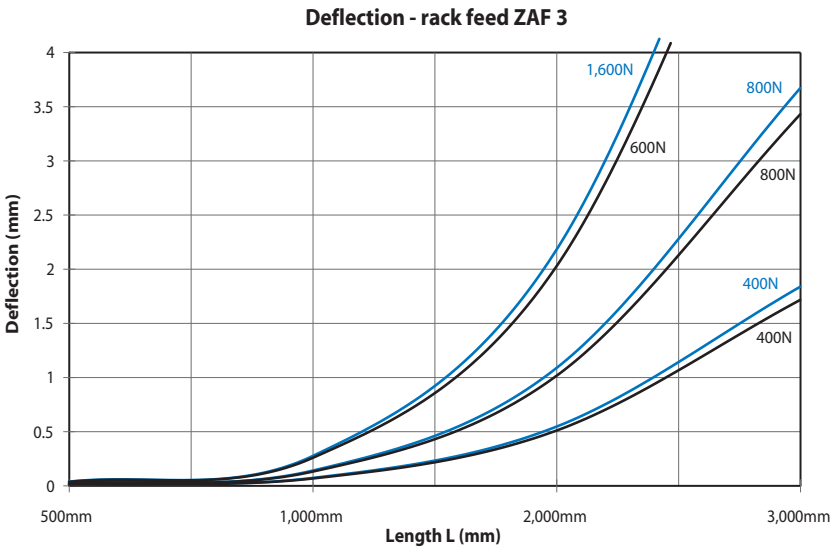
232 071 XXXX

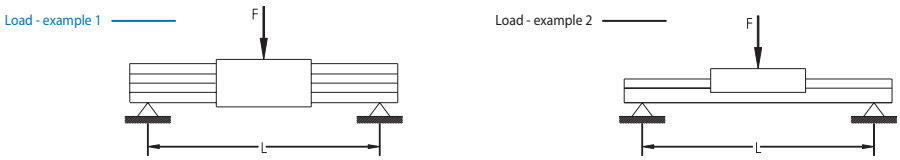
0 = with gear i=5
1 = with gear i=10

Profile lengths (mm)
398 to 5998
(in steps of 100 mm)
(e.g. 398 mm = 040
5,998 mm = 600)

Rack Feed ZAF 3

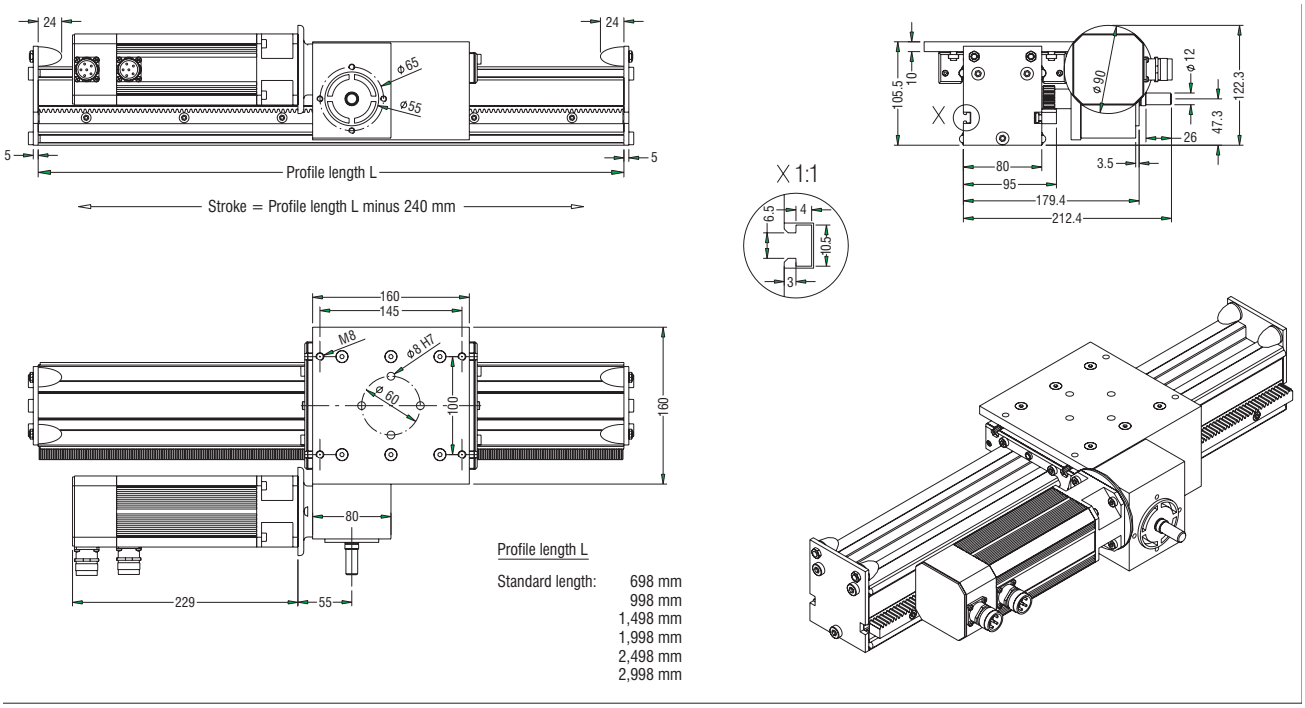
Deflection





Scale Drawing

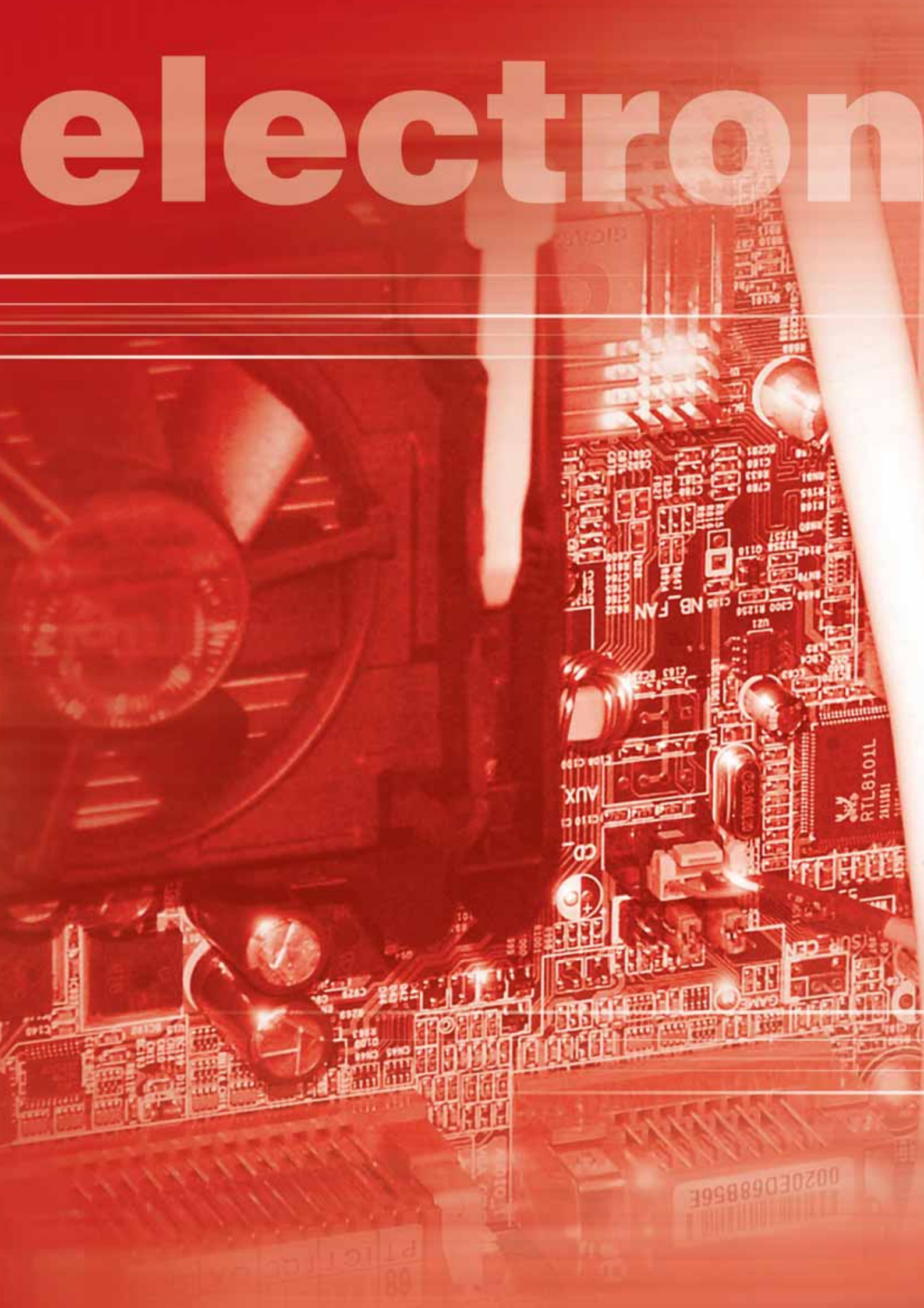
ZAF 1 with shaft slide WS 3



Profile length L

Standard length:	698 mm
	998 mm
	1,498 mm
	1,998 mm
	2,498 mm
	2,998 mm

electron



ELECTRONICS

Single- and Multi-Axis Control Units

Control Technology

Overview

Control Technology

Overview

CAN-CNC Control

General

PCs with high computing power as well as with a field bus technology that features an unprecedented flexibility and an uncomplex wiring make the production of powerful, yet inexpensive CNC control units possible.
We are proud that we are able to offer you one of few open CNC control units available on the market.

The CAN bus, which isel developed by consequently using the CANopen standard from CiA, is a high-quality PC-based CNC control unit with drive units, I/O modules, operation terminal, etc. Via the CAN bus, also components from other suppliers can be integrated quikkly into the control.

This CNC control unit can control up to four CNC machines at the same time from one PC. Each CNC machine can command up to six interpolation axes (linear, circular and helix), which are driven by CANopen drive units, as well as up to 127 auxiliary axes and/or CAN modules (I/O, HF converters for machining spindles).

The modern features of a CNC control unit are part of the motion control:

- look-ahead path machining with a freely defined number of motion segments that are anticipatorily treated by the control
- rate-of-change limiting to eliminate mechanical vibrations
- pilot controlled speed for a highly dynamic machining without lag errors
- multi-channel technique

The CNC control unit from isel is a pure software solution for PCs operating with Windows NT/2000/XP.

A CAN dongle at the parallel port or a PCI plug-in card serve as an interface between the PC and the CAN modules. Each PC that has a parallel port or a PCI slot can be used for this CNC control unit.

The accurate timing that a CNC control unit demands is ensured by a home-developed Windows WDM driver.
An additional real-time operating system for Windows or the use of a very risky hardware solution - that only works with ISA slot - with a NMI are not necessary.

Thus, the compatibility with future Windows versions is guaranteed.

The control unit's implementation under Windows-PC ensures user-friendliness, network integration, and an absolute openness with regard to software developed by other suppliers. For customers that want to develop an own operator guidance, we provide software (DLL) interfaces.
By means of certain functions, even CAN modules that do not have CANopen as a standard can be integrated. Moreover, our customers can integrate own DLLs into the CNC control unit from isel, e.g. in order to compensate mechanical inaccuracies or temperature errors, or to realise the transformation of the axes.

Due to the offered functionalities, the CNC control unit from isel is perfectly suited to machining tasks, such as milling, engraving, drilling, turning, laser and water-jet cutting, and to the automation technique.
The control unit's openness enables the customers to buy either complete systems or individual components that afterwards can be integrated into an own system.

We offer a user-friendly implementing software for digital drive units so that the user can easily bring his operating machine on stream.

The software tool DCsetup (CAN bus or RS-232 point-to-point connection) makes it possible to position and to optimise the motors' output stages in no time. By means of CANset, the CNC control unit is optimised, tested and diagnosed as a complex.

CAN-CNC Control

Complete systems of the GFV-SW series
Complete systems with flatbed and gantry units

The flatbed units of the GFV-SW series offer an exceptional price-performance ratio. They are designed to machine light metals, wood, plastics, PCB material, etc.

According to demand, the axes can be driven by controlled stepping, DC or AC servo motors of different engine-power classes.
Additionally, matching main spindle drives with 6.8 kW, at the most, and revolutions up to 40.000 rpm as well as a matching tool changer are available.

All electronic components for the CNC control unit, the spindle motor, the safety circuit as well as all peripheral devices are built in a control box in a clearly arranged and easy-to-maintain manner.

The plant is controlled by a PC machine terminal that features Windows NT/2000/XP as operating system and a built-in CAN-PCI control card.

The user-friendly, high-performance operating and programming surface ProNC does not only enable the handling of CAD/CAN data but also the development of any desired programme for the automation technology.
For special applications (dosing, gluing, measuring…), the flatbed units of the GFV-SW series are also available without protection cover.

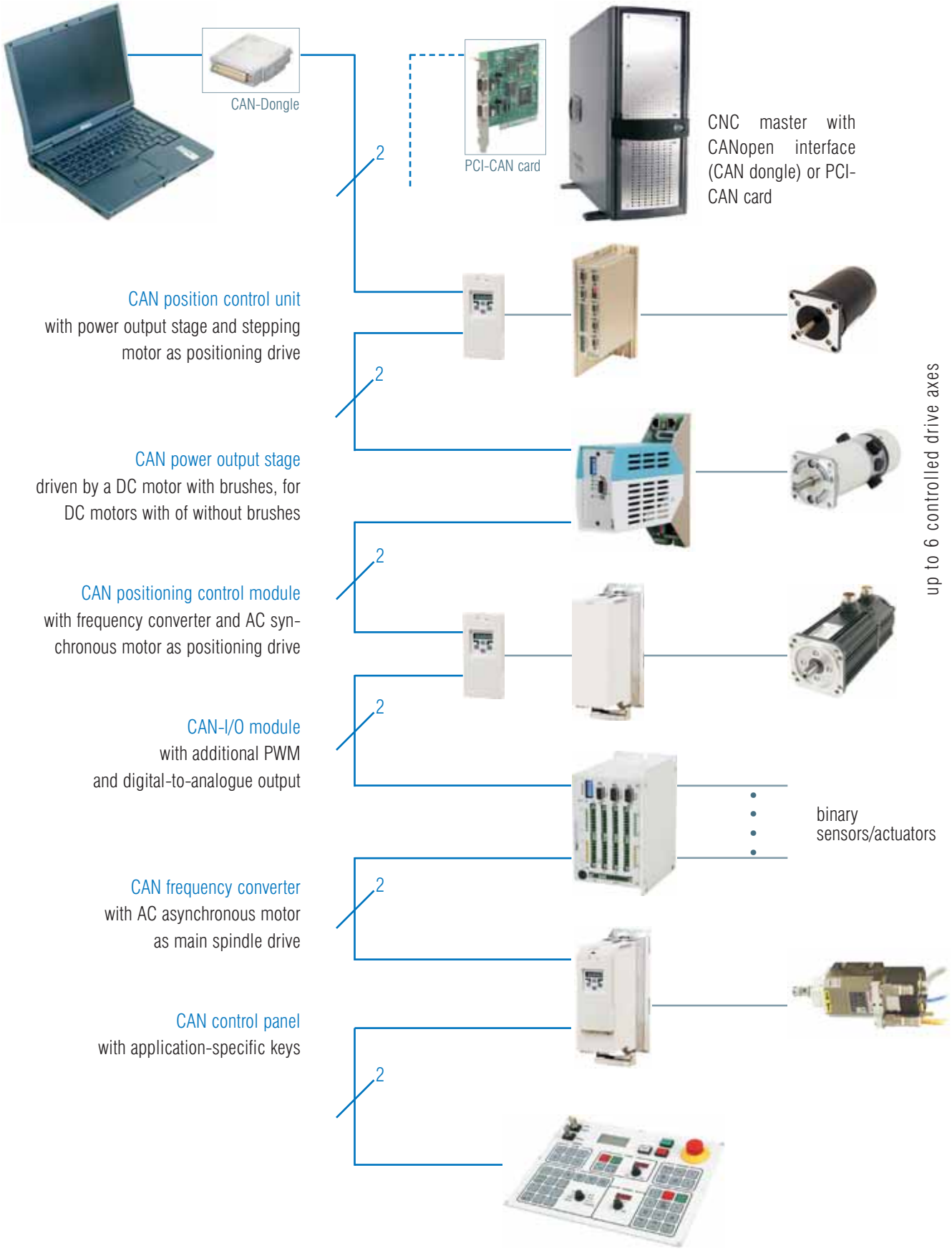
Together with the CAN-CNC control unit and the CAN servo controller CVC 496 from isel, the flatbed and gantry units offer an unprecedented price-performance ratio for high-quality machining or complex handling tasks.

The ready-for-connection servo controller includes the complete power electronics for up to four axes driven by DC servo motors.

Via the CAN ports, further CAN components such as I/O modules, converters, etc. can easily be connected.

CAN-CNC-Control

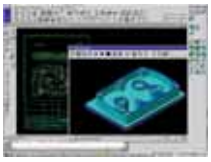
Example for a topology with the CAN-CNC control from isel



CAN-CNC-Control

CAD/CAM software package isy-CAM 2.5

CAD



CAM

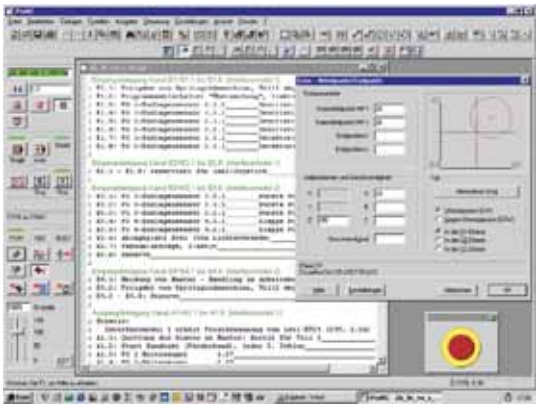
REMOTE

With isy-CAM 2.5, the isel-group provides its customers with a "light" version of the Windows®-based CAD/CAM package. It is directly coupled to isel controllers and offers a universal solution for construction to production tasks executed by means of isel controllers and isel machines.

This software package is optimal for those who want to enter the world of CAD/CAM.

The operating software REMOTE, which is integrated into the software package is perfectly suited to export CAD/CAM data to working machines.

Operating and programming surface ProNC



ProNC - the new, powerful operating and programming surface under MS Windows® (98, NT 4.x, 2000, XP) - integrates the control software Remote, Pro-DIN and Pro-PAL, which iselautomation implemented for the operating system MS-DOS, into one software.

All NC programmes that were previously applied by the users for Remote (isel-NCP format), Pro-DIN (DIN/ISO format) and/or Pro-PAL (isel-PAL format) can be executed by means of ProNC.

ProNC is suited both for the output of CAD/CAM data and for the realisation of highly complex motion sequences at working machines and handling plants.

For details on isy-CAM 2.5 and ProNC, see page D 2 ff., our respective individual brochures, or the "Info Centre" on www.iselautomation.net!

CAN-CNC Contol

CAN-PCI card

6-axis interpolation

- Up to 120 CAN nodes as auxiliary axes
- Online und look-ahead path processing
- Rate-of-change limiting for high-speed processing and robot control
- Cross-system operation of different motor types
- Absolute compatibility with MS-Windows due the own real-time extension
- Operating surfaces: ProNC for complex automation tasks. REMOTE for machining technologies
- IIntegration of the teach-in by means of standard or user-specific frame file
- Operation via PC keyboard, mouse or operating panel with CAN interface

1-channel technique
Item no.: 320 220 1000

1-channel technique
Item no.: 320 220 2000

CAN-CNC Contol

Control of multi-axis systems by means of the CAN-PCI card

With its 2 CAN ports, the CAN-PCI card can control up to 2 CNC machines.

The CAN-CNC control from isel supports the operation of up to 2 CAN-PCI cards.

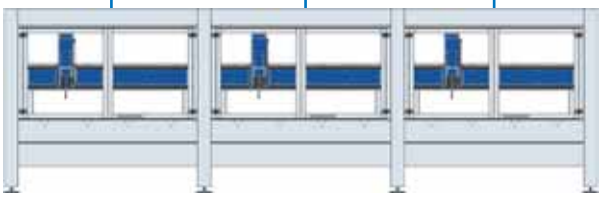
Thus, at the same time, up to 4 CNC machines can be controlled by one PC.

2x CAN-PCI...

...in one industrial PC...

Ethernet

...by means of which up to four 6-axis systems can be controlled



CNC Control via CAN Bus

isel-ProNC

User-friendly operating and programming surface for the machining and automation technique.

- Programming according to isel-PAL or DIN 66025
- Import of postprocessor files
- Runs under MS Windows NT 4.0 and 2000, XP
- File output also via the integrated isel-Remote-WIN functionality

Item no.: Z11-333312

CAN-Dongle

Interface converter to couple devices with a CAN interface to the EPP parallel port of IBM-compatible processors (PC104 and PCI-CAN interface in preparation).

Easy extension and linking due to the CAN bus technique (up to 127 CAN modules).

Dimensions: W 115 x H 30 x D 125 mm

Item no.: 320 200 1001

Driver software for MS Windows NT 4.0, 2000 and XP

- Complete CNC control software
- Six-axis interpolation (linear, circular, helix)
- Online look-ahead path processing (unlimited number of the path segments)
- Rate-of-change limiting for high-speed processing
- DLL programming interface
- CANopen-Standard

CNC Control via CAN Bus

I/O-modules

Dimensions: W 95 x H 140 x D 130 mm

- Supply voltage: +24 V (DC)
- 16 binary input units, opto-isolated: +24 V logic, 10 mA
- 16 binary output units
- PWM output unit, digital-to-analogue output unit, 8 bit
- Autodiagnosis, monitoring of process voltage, supply voltage and CAN bus
- CANopen according to DS 401
- Transfer rate 1 MBaud, adjustable via DIP switch
- Temperature range: 0 °C up to 40 °C, IP 20

Item no.: **321 000**

CAN-Kit SVM1

Optional safety module for servo plants that can be integrated into the safety circuit of the CAN controller.

- Monitoring/controlling of protective devices (e.g. bonnet switches)
- Automatic and trial operating mode

Dimensions: W 95 x H 140 x D 130 mm

Item no.: **389 160 7000**

Main spindle drive

In general, all main spindle drives from isel can be controlled.

- Nominal power: 0,65 kW
- Speed range: 18.000 min^{-1}
- Control: CAN-Bus
- Protection type: IP 20

Item no.: **310 706 1511**

Servo Motor CAN Controller CVC 496

19-inch rack CVC 496-E
482,60 x 177 x 402

Tabletop unit CVC 496-D
475 x 186 x 415

The servo motor CAN controller CVC 496 is a powerful drive controller for DC servo motors with brushes up to 700 VA

The compact control unit integrates up to four power output stages as 19-inch racks. The fully digital, four-quadrant output stages (UVE 8112) provide an output current of 12 A (25 A peak). They have protective circuits against overcurrent of the motor outputs, over-/undervoltage and elevated temperature of the cooling element, as well as for the recognition of encoder errors and error conditions of the CAN bus.

For the power supply, the power cards can make use of a 1200 VA toroidal power supply unit 70 V (DC).

A 2-channel emergency-stop relay according to EN 60204 (category 4, EN 954-1) cuts off the supply voltage of the output stages in a case of emergency.

As interface to the NC control, the CVC 496 features a CANopen interface, which works according to the bus protocol DS 301 and DSP 402.
Using the optional CAN dongle, the control unit makes the interpolation (linear, circular and helix) of all four axes as well as an online and look-ahead track processing possible.
Another special feature is an automatic rate-of-change limiting of the individual drive axes.
Thus, CVC 496 is suited to be used as CNC machine control unit as well as in applications used in the automation technique.

Features

- drive control for up to four DC servo motors with brushes
- modular number of axes due to 19-inch power output stages
- NC control via CANopen interface (DS 301 and DSP 402), 1 Mbit/s
- start-up and parametising of the output stages via serial interface (RS 232)
- 4-quadrant power output stages 100 V, 12/25 A, fully digital, short-circuit-proof, monitoring of encoder signals, excess temperature, overcurrent
- scan times:
  - current control 0.1 ms
  - speed control 0.25 ms
  - bearing control 0.5 ms
- analysis of the encoder with RS 422 interface (Vs +5 V, track A,/A, B,/B, index,/index)
- 1200 VA power supply block with toroidal transformer, indirect voltage 70 V (DC)
- emergency-stop management by means of integrated emergency-stop relay according to EN 60204
- various protective circuits of the power electronics and the encoder signals and CAN bus
- connection of motors, encoder, CAN(in), CAN(out) and Remote emergency stop via connectors on the back side
- two types of casing
  - tabletop unit (W x H x D) 475 mm x 186 mm x 415 mm
  - 19-inch rack, 4HE
- CE-compliant according to industry standard A

- Options/additional components:
  - CAN dongle incl. driver software under Windows NT, 2000 and XP

- Available software products:

ProNC:	control software for machines, with operating and programming surface
RemoteWin:	control software for machines, with operating surface
isy CAM 2.5:	2-dimensional CAD with 4-axis CAM module (z-axes, rotation axes) and machine driver.

Servo Motor CAN Controller CVC 496

Technical data

Item number	352056 00x0 ** tabletop unit	352055 00x0 ** 19-inch rack
Supply voltage	AC 230 V / 50-60Hz (+-5%), [internally reversible to AC]	
Power supply unit	1200 VA transformer power supply Indirect voltage Approx. 70 VDC	
Motor output	12 A continuous current, 25 A peak current per output stage	
Protective circuits	Short-circuit protection of the output stages (output - ground, output - output, output - Vs) Monitoring of the output stages' temperature Emergency-stop at the front or external	
Ambient temperature	Operating temperature 0 °C … +30 °C Storage temperature -10 °C … + 60°C	
Interface	CANopen, 1 MBit/s, (DS301, DSP 402) Address setting at the front in UVE 8112	
Connector	RS 485 interface, 19.2 ... 115.2 kBd	
Mechanics	Motor output port: Neutrik, NC4FD-L-1 (2 x 2-pole) Encoder input port: Sub-D socket plug 15-pole CAN (in): Sub-D socket plug 9-pole CAN (out): Sub-D male connector 9-pole Control in-/output port: ribbon plug 50-pole Ext. emergency-stop circuit: Phoenix, MC 1.5/10-x-3.81 (10-pole) Power input port (AC 230 V): inlet connector for non-heating aparatus UVE 8112: Sub-D male connector 9-pole	
Weight:	Approx. 30 kg	Approx. 30 kg

**In the order key, the wild card in the item number is replaced by the number of the built-in output-stages!
E.g. 3-axis system --> 352056 0030

Accessory

CAN LPT dongle
- cartridge for the parallel EPP interface
- power supply via USB connector
- incl. CAN connecting line
- l=3m

Item no.: 320200 1001

Motor connecting line
- Neutrik (4-pole) + 15pol. SubST --> amphenol C16-3 Bu
- l=5m
- motor line and encoder line are guided separately

Item no.: 392718 0500

Order information

CVC 496-D3 (3-axis unit)
- servo motor CAN controller as tabletop unit
- complete with 1200 VA power supply unit
- emergency-stop relay
- start-up software
- null modem cable
- motor connecting lines (l=5m)

Item no.: 352056 0030

CVC 496-E3 (3-axis unit)
- servo motor CAN controller as 19-inch rack
- complete with 1200 VA power supply unit
- emergency-stop relay
- start-up software
- null modem cable
- motor connecting lines (l = 5 m)

Item no.: 352 055 0030

CVC 496-D4 (4-axis unit)
- servo motor CAN controller as tabletop unit
- complete with 1200 VA power supply unit
- emergency-stop relay
- start-up software
- null modem cable
- motor connecting lines (l = 5 m)

Item no.: 352056 0040

CVC 496-E4 (4-axis unit)
- servo motor CAN controller as 19-inch rack
- complete with 1200 VA power supply unit
- emergency-stop relay
- start-up software
- null modem cable
- motor connecting lines (l = 5 m)

Item no.: 352 055 0040

4-Axis Servo Motor Unit

CDS 405

CDS 405
270 x 160 x 350

CDS 405 is a compact drive controller for DC servo motors with or without brushes.

The control is designed in a modular way and equipped with up to four intelligent drive modules as wells as an I/O module.

The control takes place via a serial interface (RS 485) with a transmission rate of up to 115 kBd.

As power supply, the unit has a 300 VA transformer power supply with emergency-stop circuit.

A special feature of CDS 405 is that, besides the modules for servo motors, modules for stepping motors can also be integrated, which makes a mixed configuration realisable.

Features

- power unit to optionally control either up to four EC motors without brushes or DC servo motors with brushes
- modular number of axes due to intelligent power modules and internal bus concept
- individual configuration of the axes due to the optional integration of stepping motor or servo motor modules
- free choice of the motor drive due to cross-system operation of DC and EC servo motors (optionally also with step ping motors)
- positioning in absolute and relative measuring system, track data storage
- digital 32-bit position, revolution and acceleration controller
- serial communication via RS 485 interface, 1.2 ... 115.2 kBd (fully duplex)
- monitoring of motor output port, encoder errors, temperature
- 300 VA toroidal power supply with emergency-stop functions, indirect voltage 70 V DC, logic voltage +24 V/1.0 A
- integrated I/O module with
  - six signal inputs (active +24 V)
  - six transistor outputs (open emitter, max. 0.5 A, +24 V switching)
- control output for external spindle control
  - analogue output (0 ... +10 V)
  - release, revolution monitoring
- joystick function to manually control up to three axes
- relay circuit output AC 230 V/5 A
- monitoring of two limit switches at each drive axis
- control outputs for optional motor brakes (open collector 0.3 A)
- on the back, connector panel for motors, encoder, I/O channels, RS 485, etc.

- Available software products:

LDCN:	low-level programming software
LabView:	driver for LabView
PRONC:	control software for machines, with operating and programming surface

4-Achs-Servomotor-Leistungseinheit CDS 405

Technical data

Item no.	382410 1110	382410 1120	382410 1130	382410 1140
Supply voltage	AC 230 V / 50-60Hz (+-5%), [internally reversible to AC 115 V]			
Power supply unit	300 VA power supply Indirect voltage approx. 70 V DC Emergency-stop circuit			
Configuration	1 x drive module (LP-174)	2 x drive module (LP-174)	3 x drive module (LP-174)	4x drive module (LP-174)
Motor output	Max. 8 A per drive module, (max. continuous output power of the unit 500 VA)			
Protective circuits	Short-circuit protection of the drive modules (output - ground, output - output, output - Vs) Monitoring of the output stages' temperature Emergency-stop at the front or external			
I/O area	6 x signal input, active +24 V/6 mA, 6 x transistor output, open emitter, +24 V switching, 0.5 A (clamp diode to ground) 3 x analogue input (joystick function), 0 ... +5 V or 0...+10 V 1 x analogue output 0 ... +10 V			
Interface	RS 485 interface, 19.2 ... 115.2 kBd			
Connector	Motor output port: Encoder input port: Signal input port: Signal output port: Motor brakes: Serial interface: Ext. frequency converter: switch output AC 230V: Analogue input (x 3):	Neutrik, NC3FD-L-1 (3-pole) Sub-D socket plug 15-pole Phoenix, MC 1.5/10-x-3.81 (10-pole) Phoenix, MC 1.5/10-x-3.81 (10-pole) Phoenix, MC 1.5/8-x-3.81 (8-pole) RJ 45 Sub-D male connector 15-pole Hirschmann, Stakei 200 Binder, series 723, 8-pole		
Mechanics	Dimensions: w*d*h = 270 mm * 350 mm * 160 mm, weight: 9.5 kg			

Order information

CDS 405-2
- compact servo motor power unit
- 2 x output stage for BL servo motor
- 1 x I/O module
- 300 VA power supply unit with emergency-stop circuit
- signal converter RS 485 - RS 232
- interface cable RS 485

Item no.: 382410 1120

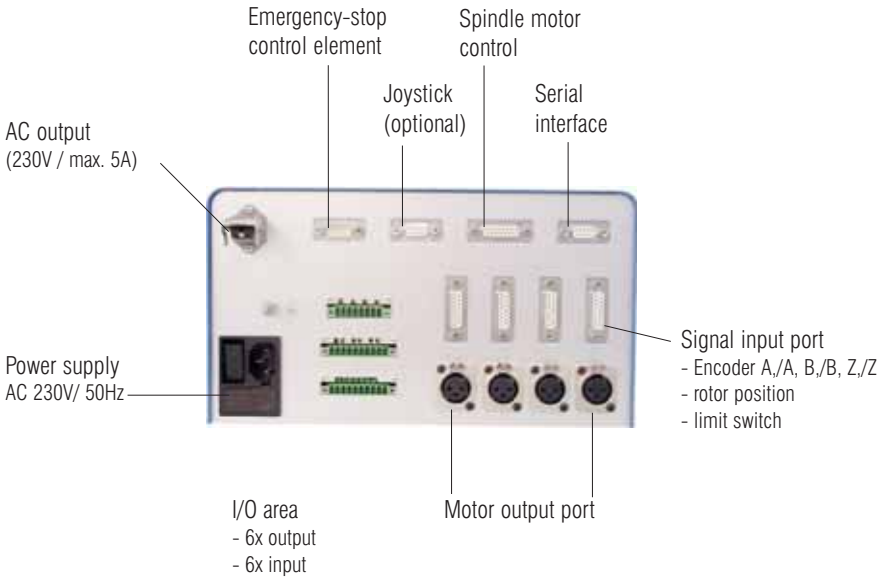
CDS 405-3
- compact servo motor power unit
- 3 x output stage for BL servo motor
- 1 x I/O module
- 300 VA power supply unit with emergency-stop circuit
- signal converter RS 485 - RS 232
- interface cable RS485

Item no.: 382410 1130

CDS 405-4
- compact servo motor power unit
- 4 x output stage for BL servo motor
- 1 x I/O module
- 300 VA power supply unit with emergency-stop circuit
- signal converter RS 485 - RS 232
- interface cable RS 485

Item no.: 382410 1140

Connectivity



SPS Controller

CVD-SPS

- Step5-compatible programming with additional commands for motion control
- use of SPS-typical characteristics (counter, timer)
- during operation, an additional con trol processor is not necessary: stand-alone operation
- complete development environment with debugger under Windows
- adaptable to different motor types; optimal and efficient applications that can be adapted to the respective employment case

Scope of delivery

- isel-SPS single controller CVD1-SPS
- flex/RS 232 cable
- development software "EASY-Step" for Windows
- start-up software for power output stage "DC Setup"
- documentation
- option: CAN extension module I/O

Order information

SPS controller CVD1-SPS
- table housing

Item no.: **381130 1110**

SPS-Controller CVE1-SPS
- 19-inch rack 4 HE

Item no.: **381130 2110**

Features

- programme memory for 500 com mands, free software is included in the scope of delivery
- I/O in 24 V technology (electrically isolated)
- 12 inputs and 8 buffered outputs
- I/O extension via CAN bus
- 4 integrated, freely programmable callipers
- CAN bus connection (baud rate up to 1 MBit/sec.)
- supply voltage 230 V
- short-circuit-proof output stages
- motor continuous current: up to 5 A
- motor peak current: up to 12 A
- motor voltage: 40-95 V
- CE-compliant according to
  - EN 50081-1; EN55011 B
  - EN 50082-2; IEC 801 (1-4)

CNC-Controller C 142-4

The isel-CNC controller C 142-4 is a powerful drive control unit for the three-dimensional machining of work pieces.

The integrated processor card enables the handling of the NC datasets both in the CNC mode (memory operation) and in the DNC mode (direct operation). Here, linear positioning commands are executed by the interpolation of all three drive axes and by circular movements on two selectable levels.

Overview of the commands

- Relative/absolute positioning commands

Standardised software modules (e.g. PAL-PC, IR5DRV, etc.) make it possible to programme complex CAD-CAM applications as well as simple sequencers.

Order information

Accumulator for memory backup

Item no.: **328120**

- 3-dimensional linear interpolation
- 2-dimensional circular interpolation
- nestable loops
- enforced branches
- time invariants
- single-step execution (trace mode)
- zero offset
- processing of signal in-/outputs
- external data memory

Components, individual

Table housing (incl. power block)
Item no.: 383 310 1000

Installation housing (incl. power block)
Item no.: 383 311 1000

Operation control card UME 7008
Item no.: 316 301

DC power supply unit NT24
Item no.: 301 040

Interface card UI5.C-E/A
Item no.: 325 551

Powerblock PB600-C
Item no.: 308 059

Memory card 32 KB
Item no.: 440 114

CNC-Controller C142-4

- table housing

Item no.: **383 310 2003**

- 19-inch rack 4 HE

Item no.: **383 311 2003**

Scope of delivery:

- housing with integrated power block PB600-C
- three stepping motor operation control cards UME 7008
- interface card UI5.C-E/A
- DC power supply unit NT24 for I/O signals
- three connecting lines for isel-stepping motors (Item no.: 392 713 0501)
- one connecting lines for IBM-compatible processors (Item no.: 392 782 0150)
- technical instructions

Features

- control of up to three stepping motors
- three bipolar power output stages 70 V/8 A (UME 7008)
- 8-bit interface card UI5.C-E/A
  - 3-dimensional linear interpolation
  - 2-dimensional circular interpolation
  - 32 KB programme memory
  - serial interface RS 232C
  - operating system for CNC and DNC programming
- power supply by isel-power block PB600-C VDE 6224
- additional + 24 V/2.6 A power supply unit for I/O signals
- 8 opto-isolated signal inputs (+24 V)
- 16 relay circuit outputs (+ 24 V/0.3 A)
- stepping motor connection via circular plug-in connectors on the back
- plug-in connector on the back for external programme start, stop and processor reset
- remote connector to connect external safety-circuit control
- compatible with isel-software products PAL-PC, IR5DRV, ProNC, RemoteWin, etc.
- housing
  - table housing W 475 x H 186 x D 410 mm
  - 19-inch rack 4HE
- CE-compliant according to
  - EN 50081-1; EN55011 B
  - EN 50082-2; IEC 801(1-4)

4-Axis Stepping Motor Controller CSI 464

Tabletop unit CSI 464-D
475 x 186 x 415

19-inch rack CSI 464-E
482,60 x 177 x 402

Features

- power controller to control up to four two-phase stepping motors
- bipolar power output stages, 70 V/8 (12) A, adjustable step precision (200, 400, 800,1600 steps/rev.)
- NC control by means of integrated processor card with DIMM-PC
- linear interpolation of all axes, circular interpolation xy, xz, zy and helix interpolation
- DNC operation (PC coupling)
- serial communication via RS 232 interface,19.200 Bd
- 8 opto-isolated signal outputs
- 8 opto-isolated transistor outputs (500 mA)
- control in-/output for an external safety-circuit module:
  - monitoring of bonnet switches
  - signal inputs for programme start/stop
  - mode-of-operation switch (automatic/trial)
- signal input of two limit switches at each drive axis
- control outputs for optional motor brake
- 1200 VA toroidal power supply unit with emergency-stop relay (VDE 0113, EN 60204, category 4), indirect voltage 70 V DC
- on the back, connector panel for motors, I/O area, etc.
- start-up and parametising software
- two types of casing:
  - tabletop unit (W 480 x D 415 x H 187mm)
  - 19-inch rack, 4HE
- CE-compliant according to EN 55011B, EN 50082-1, EN 50178
- Available software products:
  PRONC: control software for machi nes, with operating and program ming surface, incl. driver for CSI controller
- Options:
  control output for external spindle control - analogue output (0 V … +10 V), release

The stepping motor controller CSI 464 is a compact power unit for the bipolar operation of 2-phase stepping motors.
The controller is designed in a modular way and equipped with up to four power output stages, a processor card, as well as a 1200 VA power supply with emergency-stop relay according to EN 60204.
The processor card, which is based on a DIMM-PC module, features a serial RS 232 interface and interpolates (calculates) the step precision to the individual motors. At the same time, at each motor output stage, it monitors two separated limit switches and, depending on the NC programme, controls the individual functions of the machine safety and an optional frequency converter for spindle motors.

In the CS 464, the newly developed output stages UME 7108 are used as power output stages.

These output stages provide a phase current of 8 A, at the most, at an adjustable step precision of 200/400/800 or 1,600 steps/revolution.

The controller can be programmed via ProNC, the control software for machines, which makes its use in automation applications and, as NC control, in the field of CAD/CAM possible.

4-Axis Stepping Motor Controller CSI 464

Technical data

Item no.	383350 11x0 ** tabletop unit	383350 21x0 ** 19-inch rack
Supply voltage	AC 230 V / 50-60Hz (+-5%) [internally reversible to AC 115V]	
Power supply unit	1200 VA transformer power supply Indirect voltage approx. 70 Emergency-stop relay according to EN 60204	
Processor card	DIMM-PC (386), DNC operation Linear interpolation of all axes, circular interpolation xy, xz, yz and helix interpolation Processing of freely usable digital in-/outputs Option: set point output for spindle motor	
Power output stage	Phase current 8 A (12 A peak current) Adjustable step precision, 200/400/800/1600 steps/revolution	
Protective circuits	Short-circuit protection of the output stages (output - ground, output - output, output - Vs) Monitoring of the output stages' temperature Emergency-stop at the front or external	
I/O area	8 x signal input (opto-isolated), active +24 V/10 mA, 8 x transistor output (opto-isolated), +24 V switching, 0.5 A Option: 1 x analogue output 0 ... +10 V	
Interface	Serial interface RS 232	
Connector	Motor output port: 9-pole circular plug-in connector M 23x1 Signal input port: Phoenix, MC 1.5/10-x-3.81 (10-pole) Transistor output port: Phoenix, MC 1.5/10-x-3.81 (10-pole) Serial interface: Sub-D male connector 9-pole (at the front) Control in-/output port: Sub-D socket plug 37-pole Ext. emergency-stop circuit: Phoenix, MC 1.5/10-x-3.81 (10-pole)	
Ambient temperature	Operating temperature 0 °C ... +30 °C Storage temperature -10 °C ... +60 °C	
Weight	Approx. 30 kg	Approx. 30 kg

In the order key, the wild card in the item number is replaced by the number of the built-in output-stages!
E.g. 3-axis-system --> 383350 1130

Accessory

SK module SVM-1

Add-on module for the processing of safety-relevant inputs e.g. home position, motor stop, machine locking, etc.

Scope of delivery:
- plotting unit (category 1)
- operation panel with function keys

Item no.: 389160 9060

Motor connecting line

- M 23x1 (12-pole) male connector -> M 23x1 (12-pole) female connector
- l=5m

Item no.: 392750 0500

- M 23x1 (12-pole) male connector -> amphenol C 16 female connector
- l=5m

Item no: 392751 0500

- M 23x1 (12-pole) male connector -> 9-pole Sub-D female connector
- l=5m

Item no.: 392752 0500

Order information

CSI 464-D3 (3-axis unit)

- stepping motor controller as tabletop unit
- complete with 1200 VA power supply unit
- emergency-stop relay,
- null modem cable

Item no.: 383350 1130

CSI 464-D4 (4-axis unit)

- stepping motor controller as tabletop unit
- complete with 1200 VA power supply unit
- emergency-stop relay,
- null modem cable

Item no.: 383350 1140

CSI 464-E3 (3-axis unit)

- stepping motor controller as 19-inch rack
- complete with 1200 VA power supply unit
- emergency-stop relay
- null modem cable

Item no.: 383350 2130

CSI 464-E4 (4-axis unit)

- stepping motor controller as 19-inch rack
- complete with 1200 VA power supply unit
- emergency-stop relay,
- null modem cable

Item no.: 383350 2140

ProNC

- control software for machines with NC programme editor and import/export of CAD/CAM data

Item no.: Z11-333111

isy CAM 2.5

- Windows-based 2-dimensional CAD software with CAM module and control driver for CSI controller

Item no.: Z13-337020

4-Axis Stepping Motor Controller CSD 405-IMC

CSD 405-IMC
374 x 152 x 300

CSD 405-IMC is a compact stepping motor control unit for the bipolar control of up to four 2-phase stepping motors.

The control unit, which can be used in DNC operation (NCP data from CAD/CAM) as well as in CNC operation (stored sequence programme), integrates a micro-controller with flash data memory.

To control the motors, CSD 405-IMC provides a phase-current of 2.0 A at a motor voltage of 33 V. The micro-step control (1,600 steps/revolution) ensures a smooth and resonance-poor operation.
An RS 232 interface serves as communication interface.

Various software modules facilitate the programming and ensure an optimal handling of the controller.

Features

- compact control unit for the controlling of up to four two-phase stepping motors
- CNC operation
  (stand-alone applications)
  DNC operation
  (PC-coupled operation)
  by means of integrated micro controller and flash data memory
- linear, circular and helix interpolation of all axes involved
- serial communication via RS 232 interface, 9,600 Bd, 19,200 Bd
- 2 opto-isolated signal inputs
- 2 opto-isolated transistor switching outputs
- 2 switching outputs AC 230 V
  - 1 x relay output, 5 A
  - 1 x solid-state relay, 1.25 A
- control in-/output for external safety-circuit control elements
  - monitoring of bonnet switches
  - signal inputs for programme start /- stop
  - mode-of-operation switch (automatic/trial)
- signal input of two limit switches at each drive axis
- bipolar power output stages, 33 V/2 A, micro-step operation (1,600 steps/rev.)
- 300 VA toroidal power supply unit with emergency-stop circuit according to EN 60204, indirect voltage 30VDC
- on the back, connector panel for motors, I/O channels, etc.
- tabletop unit (W480xD415xH187mm)
- CE-compliant according to EN 55011B, EN 50082-1, EN 50178 (VDE 0160)

- Available software products:
  PRONC: control software for machines, with operating and programming surface
  RemoteWIN: NCP interpreter (data exchange from CAD/CAM software, e.g. isy-CAD/CAM)
  PAL-PC 2.0: programming software (Windows)

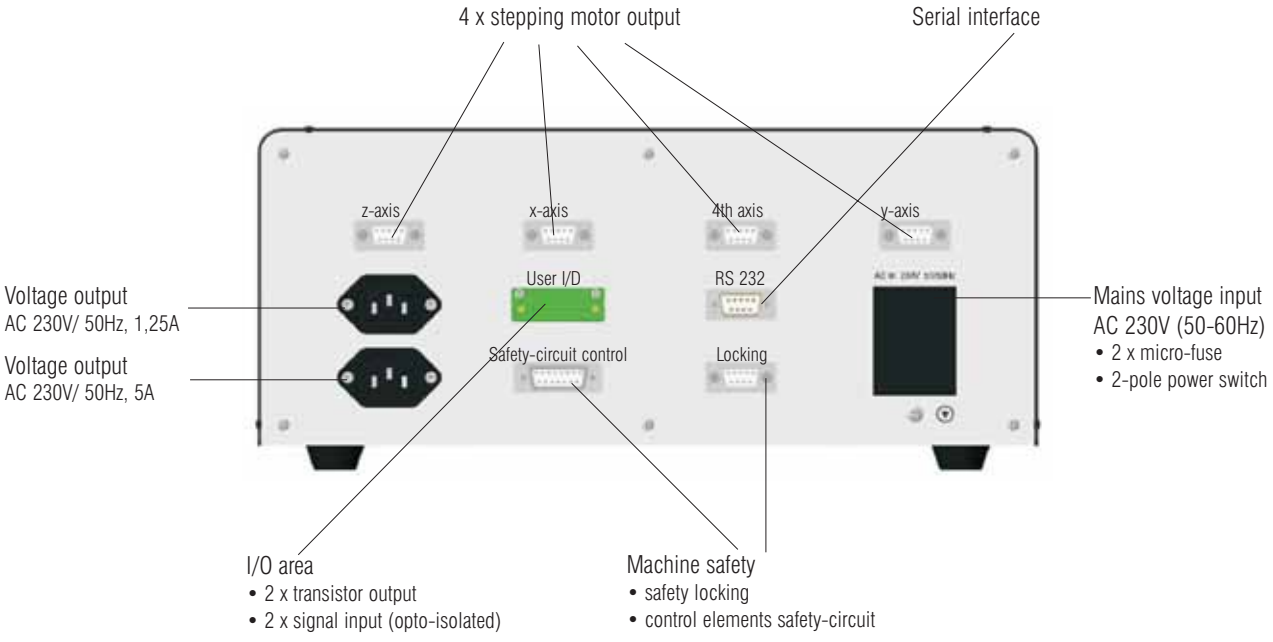
4-Axis Stepping Motor Controller CSD 405-IMC

Technical data

Item no.	383025 1000
Supply voltage	AC 230V/50-60 Hz (+/-5%), AC 115V, internally reversible
Power supply unit	300 VA power supply Indirect voltage approx. 30 V DC Emergency-stop according to EN 60204
Processor card	Linear interpolation of all axes circular interpolation xy, xz, zy and helix interpolation DNC / CNC operation Flash data memory Processing of freely usable signal in-/outputs Controlling and monitoring of machines' safety elements (safety-circuit control)
Power output stage	Phase current 2 A Step precision, 1,600 steps/revolution
Protective circuits	Monitoring of the output stage's temperature Emergency-stop at the front via remote plug-in connector
I/O area	2 x signal input (opto-isolated), active +24 V/10 mA, 2 x transistor output (opto-isolated), open emitter, +24V switching, 250mA 1 x relay output, AC 230V/5A 1 x electronic solid-state relay, AC 230V/1.25A
Interface	RS 232 interface; 9,600 Bd, 19,200 Bd
Connector	Motor output port: Sub-D socket plug 9-pole Signal in-/output port: Phoenix, MC 1.5/8-x-3.81 (8-pole) Serial interface: Sub-D male connector 9-pole Safety-circuit control: Sub-D socket plug 15-pole Bonnet switches: Sub-D socket plug 9-pole Switching outputs AC 230V: Installation socket
CE-compliant	Emitted interference: EN 50081-1; EN 55011 (part B) Interference resistance: EN 50082-1 Low-voltage directive: EN 50178 (VDE 0160)

Motor connecting line upon request

Back view



electronics

CNC Controller

IT 116

IT 116 N

IT 116 G

Isel-CNC control units are 1-axis stepping motor control units for the direct operation of a 2-phase stepping motor. On a Euro-card, they integrate, besides the control elements for the control of the bipolar stepping motor, a processor unit for the calculation of the stepping impulses and for the processing of, respectively, four signal in-/outputs.

The operating system makes both a DNC (online) programming and the employment in stand-alone applications in the CNC mode possible.

Whereas the rack version IT 116 needs a direct-current voltage of +40 V and +5V, the version IT 116 G is provided with these voltages by the integrated 100 VA power supply unit.

Overview of the commands

- relative/absolute positioning
- nestable loops
- enforced branches
- time invariant
- single-step execution (trace mode)
- zero offset
- signal in-/outputs

Ordering data

CNC control unit IT 116 N

- 230 V/50 Hz

Item no.: **381 010**

Scope of delivery:
- 22-TE Euro-rack with 44 V/3.5 A power output stage
- connecting line for serial interface
- manual

- incl. Memory backup

Item no.: **381 010 1001**

Memory backup

Item no.: **328 122**

CNC control unit IT 116 G

- 230 V/50 Hz
- 110 V/60 Hz

Item no.: **381 012** Item no.: **381 015**

Scope of delivery:
- Euro-radiator housing with 44 V/3.5 A power output stage
- 100 VA power supply unit
- connecting line for stepping motor
- connecting line for serial interface
- manual

- incl. Memory backup

Item no.: **381 012 1001**

Features

- power output stage 44 V/3.5 A
  - bipolar control of stepping motors
  - full- and half-step operation
  - output stages with protective circuit
- 8-bit micro-controller
  - 32 KB data memory with optional battery backup
  - serial communication to RS 232
- 4 opto-isolated signal inputs (signal voltage +24 V)
- 4 switching outputs
  - IT 116 (open collector, 50 V/300 mA)
  - IT 116G (relay, max. 50 V/300 mA)
- connection of the serial interface via 9-pole Sub-D connector
- compatible with isel-software products PRO-PAL, PAL-PC, IR5DRV, etc.
- control signals: programme start, stop, processor rest and switch-off of the output stages (on the back)
- assembly connector
  - IT 116: 1 x hybrid connector
  - IT 116G: screw-clamp connector
- housing
  - IT 116: 10 TE-rack
  - IT 116G: table housing W 105 x H 110 x D 165 mm
- CE-compliant according to
  - EN 50081-1; EN 55011B
  - EN 50082-2; IEC 5801 (1-4) (only at IT 116G)
- Option: Accumulator for memory backup

CNC Controller

IT 142C

IT 142C is a powerful control unit for the operation of a 2-phase stepping motor. The controller includes the power output stage UMS 6 with 420 VA output, the interface card UI 4.C E/A, as well as a 300 VA power supply unit with emergency-stop functions.

The processor card's operation system enables the handling of the serially transferred NC datasets both in the CNC mode (memory operation) and in the DNC mode (direct operation).

Standardised software modules (e.g. PAL-PC, IR5DRV, etc.) make it possible to programme complex CAD-CAM applications as well as a simple sequence control.

Overview of the commands

- relative/absolute positioning
- nestable loops
- enforced branches
- time invariant
- single-step execution (trace mode)
- zero offset
- processing of signal in-/outputs
- external data memory (memory card)

Ordering data

CNC-Controller IT 142C

- table housing

Item no.: 381 320 2001

- table housing with adapter card

Item no.: 381 321 2001

- table housing, without I/O processing

Item no.: 381 322 2001

- Memory backup

Item no.: 328 120

Scope of delivery:

- table housing with integrated power supply unit
- stepping motor control card UME 7008
- interface card UI4.C-E/A
- connecting line for *isel* stepping motor (item no. 392 713 0501)
- connecting line for serial interface RS 232 (item no. 392 782 0150)
- technical instructions

Features

- power output stages 70 V/8 A
  - bipolar control of stepping motors
  - full- to 1/8-step
  - IGBT-power output stage with protective circuits
- 8-bit interface card UI4.C-E/A
  - 32 KB programme memory
  - serial interface RS 232C
  - operating system 4.C for CNC and DNC programming
- opto-isolated signal inputs (+24 V)
- 16 relay switching outputs (+24 V/0.3 A)
- power supply by 300 VA power supply unit
- stepping motor connection via circular plug-in connectors on the back
- on the back, plug-in connector for external programme start, stop and processor reset
- remote connector to connect external safety-circuit control
- compatible with isel-software products products PAL-PC, IR5DRV, etc.
- housing
  - table housing W = 250 mm
H = 186 mm
D = 310 mm
  - 19-inch rack 4HE
- CE-compliant according to
  - EN 50081-1; EN55011 B
  - EN 50082-2; IEC 801(1-4)
  - EN 50178 (VDE 0160)

electronics

Stepping Motor Output Module TMM 4403

Features

- bipolar control of 2(4)-phase stepping motors
- separate supply voltages for micro-processor and signal in-/outputs are prepared
- programmable phase-currnet of 0.5 A to 2.8 A; continuous-current operation
- max. 12 kHz full-step frequency (stepping angle 1.8 degree), step precision floating up to 1/16-(micro-)step
- 4 opto-isolated signal inputs
- 8-bit micro-controller, EEPROM data memory for stand-alone applications (approx. 64 datasets)
- serial communication to RS 485/422 (fully duplex), up to 31 participants at bus
- aluminium profile housing 50 x 50 mm, length 85 mm
- CE-compliant accordingto EN50081-1, EN 55011 B, EN 50082-2, IEC 801 (1-4)
- LabVIEW

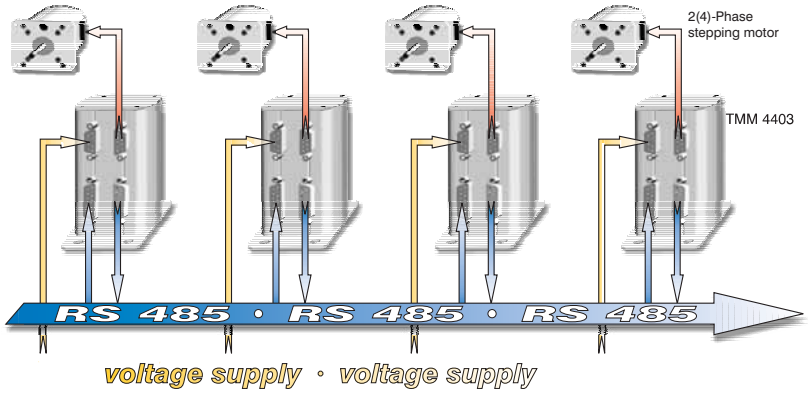
The isel-output module TMM 4403 is a very compact control unit with RS 485 interface for bipolar two-phase stepping motors.

In an aluminium profile, it integrates the complete control electronics as well as a micro-processor for the communication and processing of signal in-/outputs.

By means of this control unit, the step precision of the connected stepping motors is floatingly adjusted up to 1/16-(micro-)step, in doing so, a phase current of 0.5 A to 2.8 A is supplied.

The programming of the module takes place via an opto-isolated RS 458 interface. Via the interface, the motor parameters, the nominal values, as well as the in-/outputs are configurable. To store the operation data in the stand-alone applications, the module features an EEPROM.

The output module is available a compact version with housing as well as OEM version without housing.



Ordering data

TMM 4403
- Stepping motor output module

Item no.: **331020 4910**

Power supply unit
- to supply 2 modules

Item no.: **308040 1000**

RS 232/RS 485 converter
- interface converter

Item no.: **320101**

RS 485 connecting line
- 2 x SUBD15 connector, 3 m

Item no.: **392010 0300**

Bus terminating plug
- terminating plug for RS 485

Item no.: **320101 9000**

Motor connecting line
- SUBD9 female connector to SUBD9 connector, 2 m

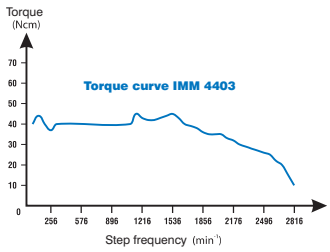
Item no.: **392780 0201**

Connecting line
- power supply unit ---> module, 2 m

Item no.: **392030 0300**

Intelligent Stepping Motor

IMM 4403/8803



Features

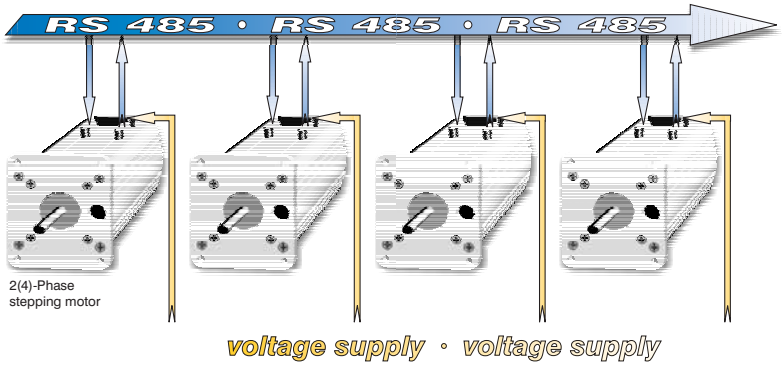
- aluminium profile housing 50 x 50 mm, length 183 mm
- 2(4)-phase stepping motor with floating step precision
- bipolar control of the motor, max. torque approx. 50 Ncm
- supply voltage +12 ...+45 V DC
- separate supply voltages for micro-processor and signal in-/outputs are prepared
- 4 opto-isolated signal inputs (+24 V) for the connection of limit/reference switches
- one opto-isolated switching output
- serial communication to RS 485/422 (fully duplex), max. 31 participants
- EEPROM data memory for stand-alone applications (approx. 64 datasets)
- isel-shaft coupling 8 mm
- CE-compliant according to EN 50081-1, EN 55011 B, 50082-2, EC 801 (1-4)

The intelligent stepping motor IMM 4403 is a compact drive control unit that consists of the "PICMIC" output module TMM 4403 and of a 2(4)-phase stepping motor.

As a micro-processors is used, this unit is programmable directly via a serial interface (RS 485). In doing so, a parallel operation of up to 31 units is possible.

The control electronics of the module consists of a bipolar output stage with a floating step precision of up to 1/16-(micro-)step and of a phase current from 0.5 A to 2.8 A.

Through this, the stepping motor develops a maximum torque of up to 50 Ncm. Due to the application of a EEPROM memory, simple sequences control can be stored in the IMM 4403.



Ordering data

IMM 4403
- intelligent stepping motor

Item no.: **38500 4010**

Power supply unit
- to supply 2 modules

Item no.: **308040 1000**

RS 232/RS 485 converter
- interface converter

Item no.: **320101**

RS 485 connecting line
- 2 x SUBD15 connector, 3 m

Item no.: **392010 0300**

Bus terminating plug
- terminating plug for RS 485

Item no.: **320101 9000**

Motor connecting line
- SUBD9 female connector to SUBD9 connector, 2 m

Item no.: **392780 0201**

Connecting line
- power supply unit ---> module, 2 m

Item no.: **392030 0300**

Virtual Instrumentation by means of LabVIEW

NATIONAL INSTRUMENTS™ LabVIEW™

LabView is a graphic programming language that enables you to quickly and easily create your applications in the field of measurement and automation technique.

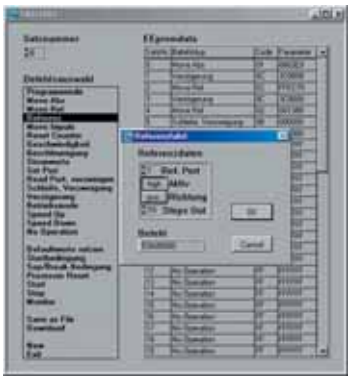
To integrate the TMO module range (TMM 4403 and IMM 4403/8803) into your LabView application, a library of drivers is at your disposal on

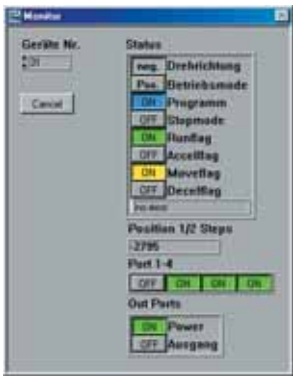
www.systro.de

as free download.

This library includes the complete range of functions of the TMO modules for the use in LabView.

Furthermore, you can freely download our "TMO Builder" for the fast and easy development of stand-alone solutions.





Notes and Sketches

Machine Terminal

- For mobile and stationary applications
- PC technology with application-dependent NC drive components
- 15" TFT monitor; 17"/19" TFT monitors can be used optionally
- MF 102 keyboard, ergonomically tilted; can optionally be replaced by an IP 67 keyboard; optical mouse

- Application panel to integrate an optional industrial keyboard with machine control functions, e.g. emergency stop, power ON
- Compact sheet-steel housing with brushed aluminium front

Machine Terminal

with Control Processor

Machine terminal with pivot arm, connected to an isel-CNC machine.

The machine terminal is an efficient control unit for CNC machine tools and CAD/CAM applications.

The terminal is based on a proven PC motherboard technology and offers the necessary power by using a fast Intel processor (1.7 GHz, at the least) for the computation and control of NC machines with simultaneous computing of CAD/CAM data.

This extends the usability of the terminal beyond the programming of NC data to a fully functional engineering workstation.

This functionality is supported by the arrangement and selection of keyboard and monitor. The keyboard used is an ergonomically tilted (10°) MF 102 keyboard with good switching characteristics. Furthermore, the terminal integrates a high-quality 15" TFT monitor with non-reflective glass screen as standard.

Due to the optional installation of an PP 67 keyboard and the assembly of a 17"/19" monitor, also great demands of workshop and construction can be met.

Depending on the intended use, the terminal is available in the following versions:

- with roller feet for the mobile employment
- with hinged arm for machine assembly
- with mounting foot for the table mounting
- with stand foot for the semi-stationary employment

The intelligent operating panel (optional)

is a technological keyboard for machine tools.
Divided into several sectors, it offers a multitude of function and control keys:

- manual movement of the axes (Teach-In) reversible x, y, z /4th, 5th, 6th axis
- tool zero points set/cancel, reference drive, reset
- application-dependent, freely programmable function keys
- override potentiometer for feed and spindle revolution
- mode-of-operation switch manual/programme
- integration into the control software RemoteWin, ProNC

The operating panel is integrated into the CNC control unit via a CANopen interface.

Machine Terminal

with Control Processor

Monitor

15" monitor with non-reflective, shatterproof galls screen and large visual angle. On request, also a 17" and/or 19" monitor can be inserted.

Control keys

As standard, the terminal includes an emergency-stop as well as a "Power ON" key, a mode-of-operation and a start key, and a hood key for the hood's control. These keys are directly connected with the drive control.

Control components

For the integration of NC drive components, the control processor features three PCI slots (half-size).
All connectors of the terminal, which are located beneath the housing, are easily accessible.

Mounting

As the machine terminal is mounted on a 16-HE floor cupboard, the machine control's power components and control unit form a compact unit.

Ordering data

Machine terminal, basic devise	without intelligent operating panel, with dummy plate, German keyboard, 15" monitor and German operating system	Item no.: 371050 0002
Machine terminal, basic devise	without intelligent operating panel, with dummy plate, English keyboard, 15" monitor and English operating system	Item no.: 371050 0012
Pivot arm for machine termina	15" monitor and English operating system	Item no.: 371050 0003
Pivot arm for machine terminal	for frame mounting on PS 140	Item no.: 371050 0008
Pivot arm for machine terminal	for frame mounting on PS 80	Item no.: 371050 0009
Pivot arm for machine terminal	for frame mounting on PS 100	Item no.: 371050 0010
Stand foot for machine terminal	(table terminal)	Item no.: 371050 0004
Stand foot for machine terminal	(stand terminal)	Item no.: 371050 0005
Roller foot for machine terminal	(stand terminal)	Item no.: 371050 0007

Machine Terminal

with Control Processor

Technical data

Monitor	
Visible angle	15"TFT Active Matrix
Viewing angle	65° horizontally, 55° vertically
Pixel size	0.297 x 0.297 mm
Visible surface	304 x 228 mm
Colour depth	Colours 24-bit colour depth (16.7 million)

Machine control	
Motherboard technique, ATX	
Drives floppy	CD-ROM, HD >40 GB
Interfaces	LAN, USB, RS 232, parallel EPP, optical mouse with horizontal and vertical level of movement
Access to control components due to demountable industrial keyboard	
Function keys for machine control (emergency-stop key, "Power ON", mode-of-operation key, security locking of machine)	

Industrial keyboard (optional)
Function keys for the hood control of CNC machines
Teach-in function by cursor keys, reversible levels
Reversible modes of operation (manually, programme mode)
Override potentiometer for feed and spindle revolution
Freely programmable special functions due to industrial keys
Short-stroke keys with front foil IP 67, flush assembled
Interpretation via CANopen interface

Mechanics	
Robust and fail-safe sheet-steel housing, powder-coated	
Brushed aluminium front plate	
Prepared for mounting to:	- mobile equipment rack - stand foot with stable base - machine swivel arm - control cabinet or desktop
Voltage supply	230 V AC

Drive Electronics

Overview

Drive Electronics

Overview

EC Servo Motor

C 44

MD 030/050/100

MD 200/400

MD 750

DC Servo Motor

C 50

MV 030 / 030 Z

MV 120 / 120 Z

MV 330

MV 500

AC Synchronous Motor

C 58

MY 051/052/053/054

MY 071/072/073

MY 091/092/093

Hybrid Two-Phase Stepping Motor MS 026

MS 026

MS 026 Z

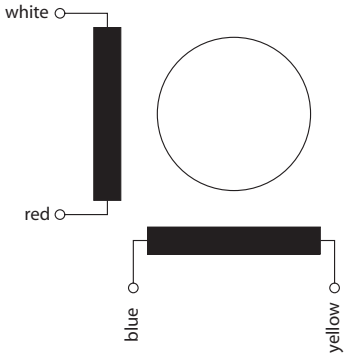
Features

- hybrid stepping motor with high energy density
- unipolar and bipolar mode of operation due to 8-wire connection
- revolution control via step-sequence frequency in open loop
- minor step angle error, not cumulative
- rotation angle of the motor shaft is directly proportional to the number of the input impulses
- second shaft end for the optional mounting of brake and encoder (type HEDS 55..., make: HP)
- Option: Gear stepping motor upon request

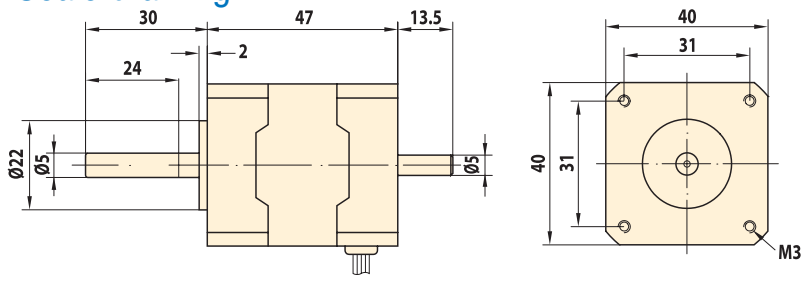
Technical data

Description	Item no.	Holding torque unipolar / bipolar Nm.	Winding torque per phase (unipolar) A	Coil voltage per phase V	Winding inductance per phase mH	Step angle °	Connecting lines	Weight kg	Flange dimension mm	Overall length (without shaft) mm	Ø / length shaft A-sided mm	Ø / length shaft B-sided mm
MS 026	473011	- / 0.26	1.7	2.9	27	1.8	4	0.3	40	47	5 / 30	5 / 13.6
MS 026 Z	473012	- / 0.26	1.7	2.9	27	1.8	4	0.3	40	47	5 / 30	5 / 13.6

Connection diagram



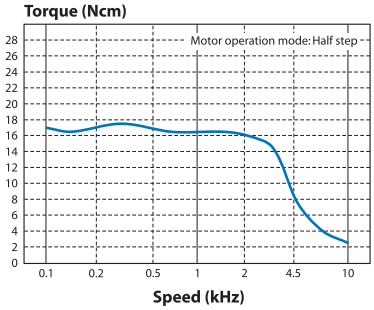
Scale drawing



Type MS 026 Z: Shaft gearing Type M
Pitch 2.032 mm = 0.08 inch
Number of teeth = 10
Shaft length = 30 mm

Torque curve

MS 026 / MS 026 Z



Hybrid Two-Phase Stepping Motor MS 110 / 160

MS 160 Z MS 160 MS 110

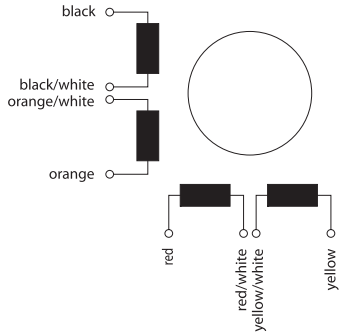
Features

- hybrid stepping motor with high energy density
- unipolar and bipolar mode of operation due to 8-wire connection
- revolution control via step-sequence frequency in open loop
- minor step angle error, not cumulative
- rotation angle of the motor shaft is directly proportional to the number of the input impulses
- second shaft end for the optional mounting of brake and encoder (type HEDS 55..., make: HP)
- Option: Gear stepping motor upon request

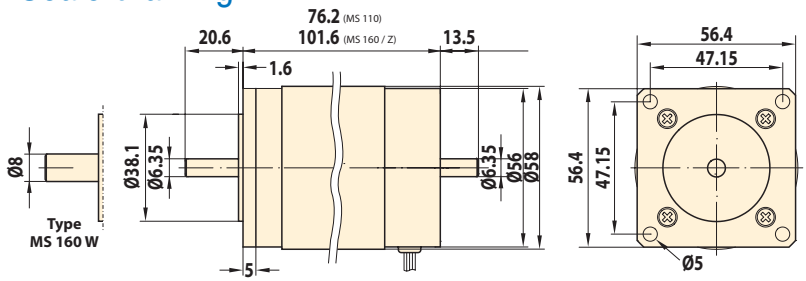
Technical data

Description	Item no.	Holding torque unipolar/bipolar Nm.	Winding torque per phase (unipolar) A	Coil voltage per phase V	Winding inductance per phase mH	Step angle °	Connecting lines	Weight kg	Flange dimension mm	Overall length (without shaft) mm	Ø / length shaft A-sided mm	Ø / length shaft B-sided mm
MS 110	473031	0.88 / 1.1	2.8	2.8	1.9	1.8	8	1.0	56.4	76.2	6.35 /20.6	6.35 /18.6
MS 160	473041	1.3 / 1.6	2.85	1.7	2.2	1.8	8	1.4				
MS 160Z	473042	1.3 / 1.6	2.85	1.7	2.2	1.8	8	1.4		101.6		
MS 160W	473043	1.3 / 1.6	4.1	1.1	1.0	1.8	8	1.4			8 / 20.6	6.35 / 18.6

Connection diagram



Scale drawing

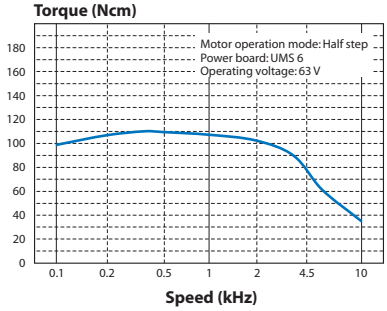


Type MS 160 W: Reinforced shaft at the pinion end, Ø 8 mm

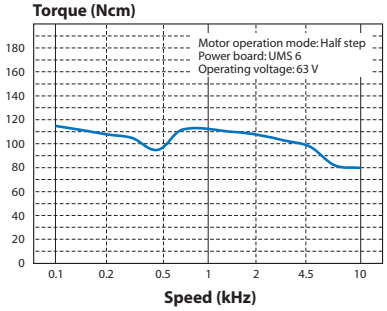
Type MS 160 Z: Shaft gearing Type M

Torque curves

MS 110



MS 160 / MS 160 Z



electronics

Hybrid Two-Phase Stepping Motor MS 300

MS 300

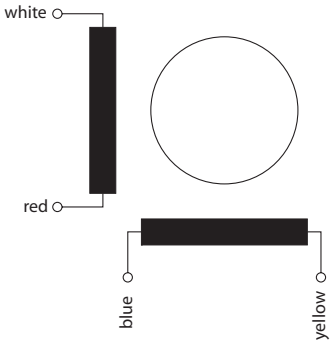
Features

- hybrid stepping motor with high energy density
- unipolar and bipolar mode of operation due to 8-wire connection
- revolution control via step-sequence frequency in open loop
- minor step angle error, not cumulative
- rotation angle of the motor shaft is directly proportional to the number of the input impulses
- second shaft end for the optional mounting of brake and encoder (type HEDS 55..., make: HP)
- Option: gear stepping motor upon request

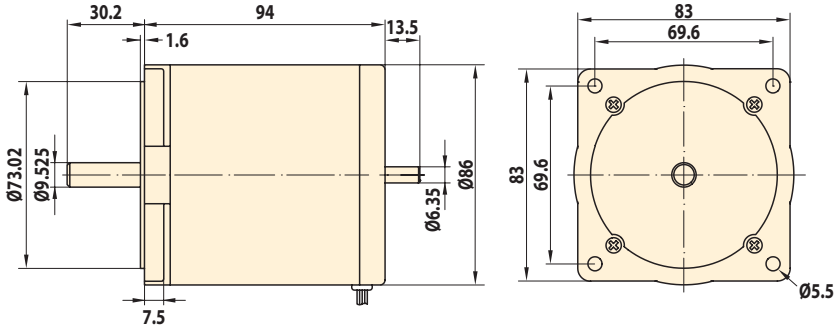
Technical data

Description	Item no.	Holding torque unipolar/bipolar Nm.	Winding torque per phase (unipolar) A	Coil voltage per phase V	Winding inductance per phase mH	Step angle °	Connecting lines	Weight kg	Flange dimension mm	Overall length (without shaft) mm	Ø / length shaft A-sided mm	Ø / length shaft B-sided mm
MS 300	473061	2.7 / 3.5	8.5	1.2	1.5	1.8	1.8	2.6	83	94	9.525 / 30.2	9.525 / 13.6

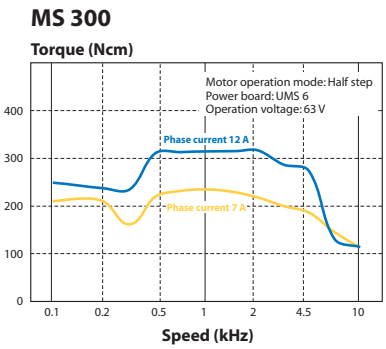
Connection diagram



Scale drawing



Torque curve



Gear Motor

MSG 020 / 050 S

MS 300

The worm gear transmission reduces the revolution of the flanged stepping motor by the factor "i" and, at the same time, increases the torque available at the motor shaft.

The gear itself consists of a zinc die-cast housing with cap. A high-quality toothed wheel, which is embedded in grease, and a drive shaft, which is embedded in sintered metal on both sides, complete the simple yet robust construction.

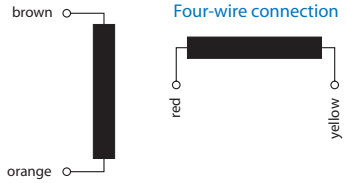
Fields of application:
- controlled tape drives
- indexing tables
- machine drives

Technical data

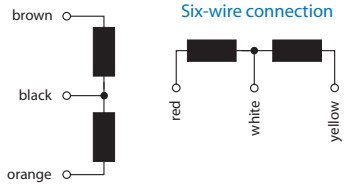
Description	Item no.	Item no. with second shaft end	Mounted stepping motor type	Reduction i	Nominal/peak torque Nm	Self-locking Nm	Axial load, push N	Axial load, pull N	Radial load N
MSG 020 S	470010 0480	470010 1480	MS 045 HT	62:1	2 / 9	7	10	15	40
MSG 050 S	470010 0520	470010 1520	MS 058 HT	69:1	5 / 25	15	10	15	40

Connection diagram

MSG 020 S



MSG 050 S



Linear Motor

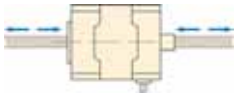
MS 015/028/130 L

MS 130 L MS 028 L MS 015 L

In order to achieve a linear movement, the twisting of the spindle has to be prevented.

Please keep in mind that lateral forces must not affect the spindle.

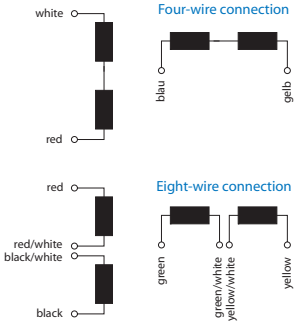
- Stroke depends on threaded spindle's length
- Self-locking (no brake at standstill)
- Micro-step control up to 0.001mm/step possible
- axial play (ISO DIN 13 - tolerance 6 G)



Technical data

Description	Item no.	Thrust N	Resolution mm/step	Feed mm/s	Winding current A	Winding resistance Ohm	Flange dimension mm	Overall length mm	Internal thread	Weight kg
MS 015 L	473341	50	0.005	30	1.2	2.8	40	33	M6 x 1	0.2
MS 028 L	473351	80	0.005	30	1.4	2.6	56.4	38.5	M6 x 1	0.38
MS 130 L	473381	200	0.00625	35	4.5	0.34	86	62	M8 x 1.25	1.45

Connection diagram

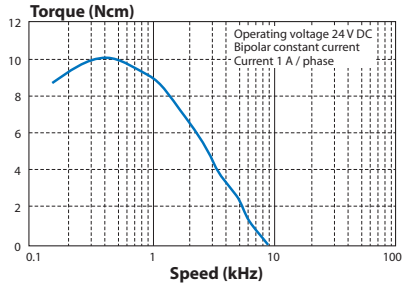


Spindles for linear motors

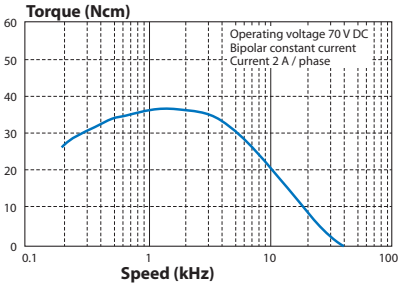
Item no.	Pitch	Length mm	suited to motor
473 390 9603	M6 x 1	300	MS 015/028 L
473 390 9803	M8 x 1	300	MS 130 L

Torque curves

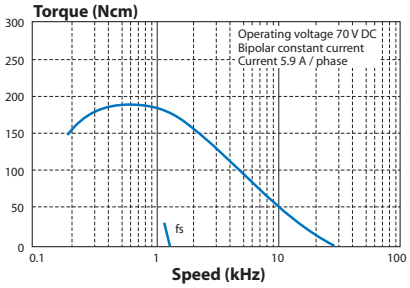
MS 015 L



MS 028 L



MS 130 L



High-Torque Stepping Motor

MS 019/032/045 HT

MS 045 HT MS 032 HT MS 019 HT

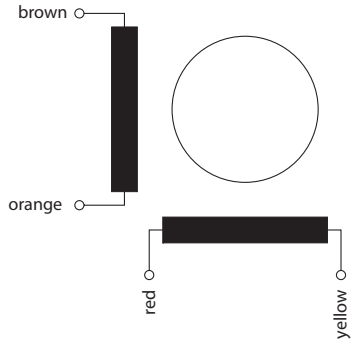
Features

- step angle 1.8°, less resolution due to micro-step operation
- very high torque due to rare-earth magnets
- optimised for application in positioning control units
- optimal torque/overall size ratio
- 6/8-wire connection for unipolar and bipolar operation
- minor step angle error, not cumulative
- second shaft end for the optional mounting of HP encoder

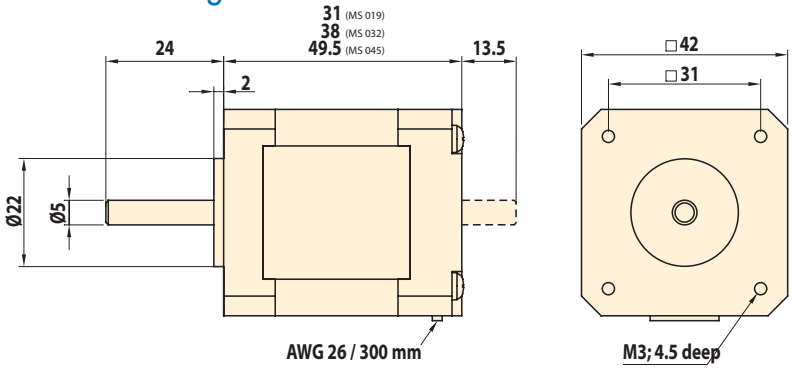
Technical data

Description	Item no.	Holding torque unipolar/bipolar Nm.	Winding torque per phase (unipolar) A	Coil voltage per phase V	Winding inductance per phase mH	Step angle °	Connecting lines	Weight kg	Flange dimension mm	Overall length (without shaft) mm	Ø / length shaft A-sided mm	Ø / length shaft B-sided mm
MS 019 HT	470420	- / 0.19	1.4	2.5	3.6	1.8	4	0.2		31		
MS 032 HT	470450	- / 0.32	1.8	2.0	1.85	1.8	4	0.27	42	38	5 / 24	5 / 13.5
MS 045 HT	470480	-/ 0.45	1.8	3.2	5.4	1.8	4	0.37		49.5		

Connection diagram

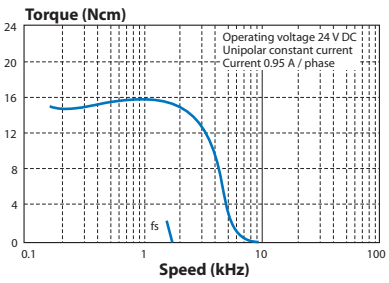


Scale drawing

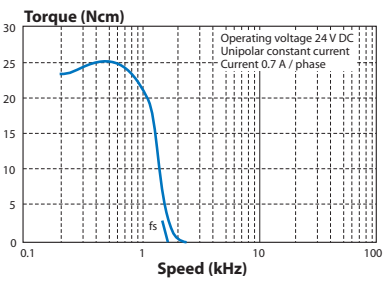


Torque curves

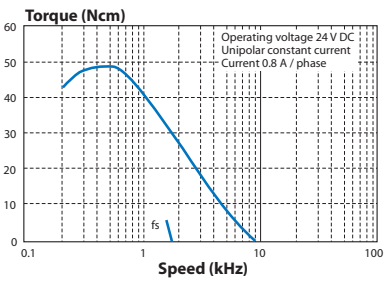
MS 019 HT



MS 032 HT



MS 045 HT



electronics

High-Torque Stepping Motor

MS 058/135/200 HT

MS 200 HT MS 135 HT MS 058 HT

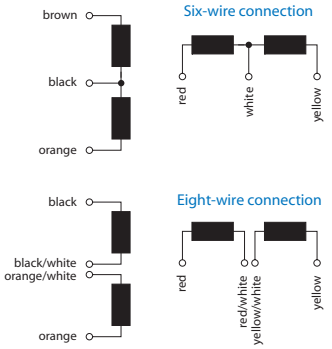
Features

- step angle 1.8°, less resolution due to micro-step operation
- very high torque due to rare-earth magnets
- optimised for application in positioning control units
- optimal torque/overall size ratio
- 6/8-wire connection for unipolar and bipolar operation
- minor step angle error, not cumulative
- second shaft end for the optional mounting of HP encoder

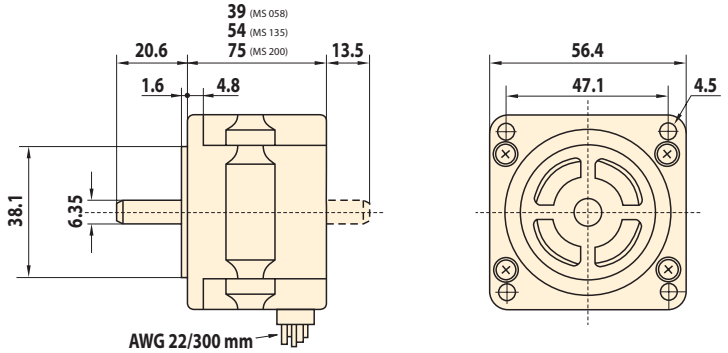
Technical data

Description	Item no.	Holding torque unipolar/bipolar Nm.	Winding torque per phase (unipolar) A	Coil voltage per phase V	Winding inductance per phase mH	Step angle °	Connecting lines	Weight kg	Flange dimension mm	Overall length (without shaft) mm	Ø / length shaft A-sided mm	Ø / length shaft B-sided mm
MS 058 HT	470520	0.42 / 0.58	2.6	1.8	1.6	1.8	8	0.4	56.4	39	6.35 / 20.6	6.35 / 13.5
MS 135 HT	470550	0.97 / 1.35	3.6	1.5	1.8	1.8	8	0.6		54		
MS 200 HT	470580	1.43 / 2	2.85	1.7	3.1	1.8	8	0.97		75		

Connection diagram

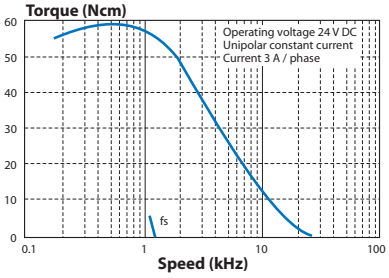


Scale drawing

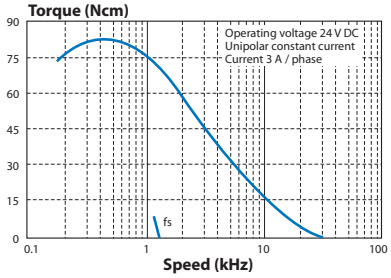


Torque curves

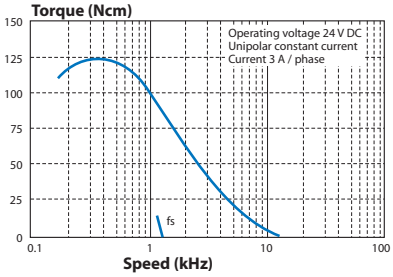
MS 058 HT



MS 135 HT



MS 200 HT



High-Torque Stepping Motor

MS 300/600/900 HT

MS 900 HT MS 600 HT MS 300 HT

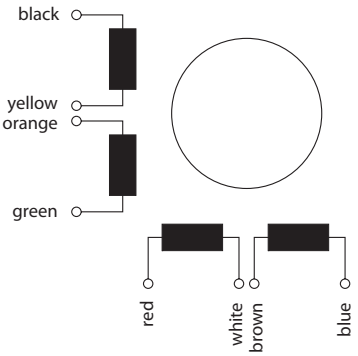
Features

- step angle 1.8°, less resolution due to micro-step operation
- very high torque due to rare-earth magnets
- optimised for application in positioning control units
- optimal torque/overall size ratio
- 6/8-wire connection for unipolar and bipolar operation
- minor step angle error, not cumulative
- second shaft end for the optional mounting of HP encoder

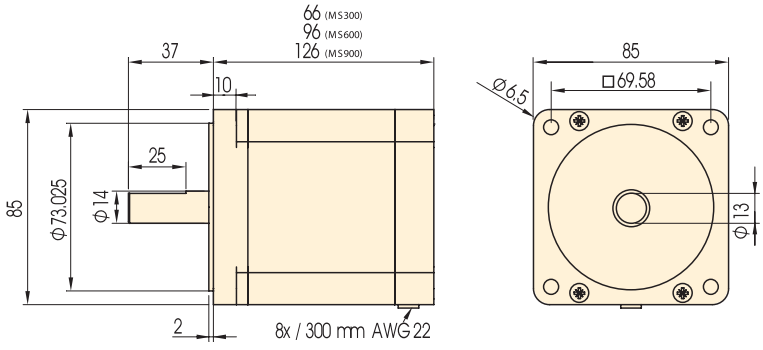
Technical data

Description	Item no.	Holding torque unipolar/bipolar Nm.	Winding torque per phase (unipolar) A	Coil voltage per phase V	Winding inductance per phase mH	Step angle °	Connecting lines	Weight kg	Flange dimension mm	Overall length (without shaft) mm	Ø / length shaft A-sided mm	Ø / length shaft B-sided mm
MS 300 HT	470820	2.15 / 3.01	4.5	2	1.5	1.8	8	1.7	85	66	14 / 37	-
MS 600 HT	470850	4.31 / 6	4.5	2.8	2.5	1.8	8	2.8		96		
MS 900 HT	470880	6.47 / 9	4	3.8	4.2	1.8	8	3.8		126		

Connection diagram

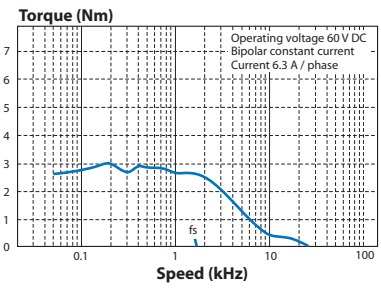


Scale drawing

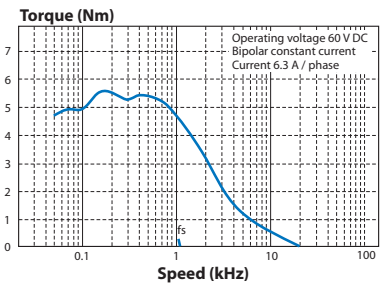


Torque curves

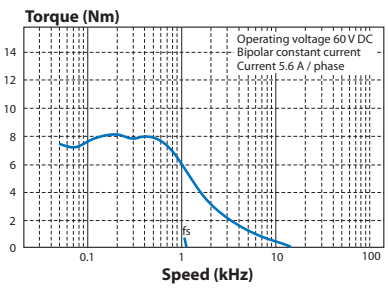
MS 300 HT



MS 600 HT



MS 900 HT



electronics

ServoStepper MS-J

Two-phase stepping motor with integrated measuring system

Features

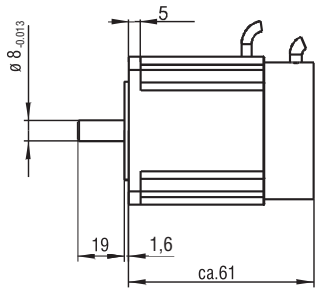
- two-phase stepping motor step angle 1.8°
- improved torque/overall installed size ratio due to optimised motor design
- torque range from 0.8 Nm to 20 Nm
- bipolar mode of operation (4-wire)
- construction type according to NEMA standard
- lintegrated incremental encoder 2000
- increments/revolution
- optionally with holding brake

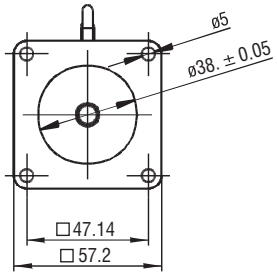
Technical data

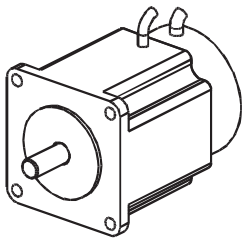
Motor type	MS 045-J	MS 100-J	MS 180-J	MS 220-J	MS 400-J	MS 600-J	MS 1100-J
Phase current (A)	5.6	5.6	6.5		6.0		
Winding resistance (Ohm)	0.28	0.41	0.29		0.75		
Winding inductance (mH)	0.30	0.54	0.8		3.5		
Holding torque (Nm)	0.45	1.0	1.8	2.37	4.0	6.27	13.0
Max. Indirect voltage (V)	60	60	60	120	120	120	150
Rotor inertia kg (cm²)	0.0077	0.002	0.034		0.12	0.18	0.56
Detent torque (Nm)	0.02	0.04	0.07		0.13		
Encoder							
Voltage supply				+5V (10%), 100mA			
Increments/revolution				2,000			
Output signal				RS 422 (A, /A, B, /B, N, /N)			
Dimensions							
Flange dimension (mm)	57.2	57.2	57.2	86	86	86	110
Overall length (mm)	61	88	111	105	105	161	135
Shaft diameter (mm)	8.0	8.0	8.0	12	12	12	19
Axial load (Nm)	80	80	80	130	130	130	560
Radial load (Nm)	100	100	100	180	180		
Weight (kg)	0.5	0.8	1.4	2.4	2.8	3.6	5.0
Item no.	4705200290	4705500290	4705800290	4708200290	4708300290	478500290	4709200290

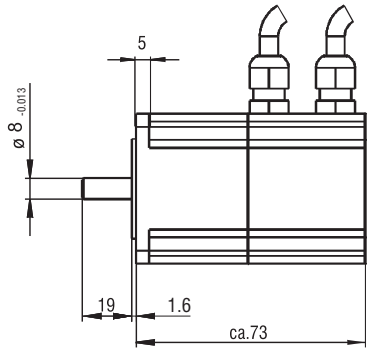
ServoStepper MS-J

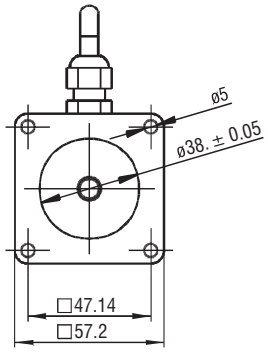
Scale drawings

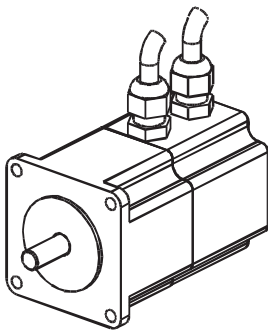












EC Servo Motor

MD 030/050/100

Features

- servo motors without brushes (6-pole)
- very good performance/volume ratio
- low motor inertia
- encoder with 2,500 impulses/revolution, RS 422

Technical data

		MD 030	MD 050	MD 100
Item no.		474410 0200	474420 0200	474430 0200
Item no.	with brake	474410 0201	474420 0201	474430 0201
Nominal power	W	30	50	100
Nominal voltage	V	100	100	100
Nominal/peak current	A	1.0 / 4.3	1.0 / 4.3	1.6 / 6.9
Nominal/peak torque	Nm	0.095 / 0.28	0.16 / 0.48	0.32 / 0.95
Nominal speed	min^{-1}	3,000	3,000	3,000
Voltage constant	$10V / min^{-1}$	3.63	5.66	7.35
Torque constant	Nm / A	0.103	0.16	0.21
Winding resistance	Ohm	3.50	3.70	2.90
Winding inductance	mH	2.40	2.80	2.30
Power rate	kW / s	5.8 (4.6)	9.9 (8.3)	23.4 (21.4)
Max. revolution	min^{-1}	5,000	5,000	5,000
Rotor inertia	$10 kg / m^2$	0.016 (0.020)	0.025 (0.030)	0.044 (0.048)
Electrical time constant	ms	0.69	0.76	0.79
Mechanical time constant	ms	1.5	1.1	0.86
Radial load (at 10 mm)	N	49.0	68.6	68.6
Shaft load, axial	N	29.4	58.8	58.8
Weight	kg	0.3 (0.5)	0.4 (0.6)	0.5 (0.7)
Protection class		IP 55		
Ambient temperature	°C	0 °C... + 40 °C		

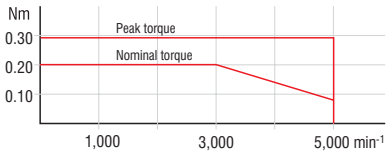
Values in brackets refer to motor with flanged brake

EC Servo Motor

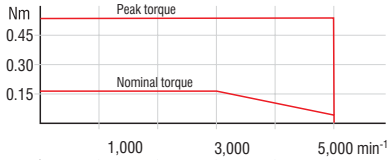
MD 030/050/100

Torque curves

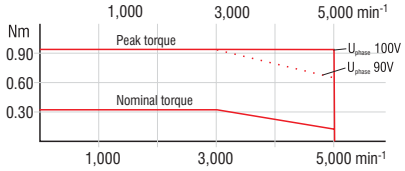
MD 030
(Motor voltage 90V)



MD 050
(Motor voltage 90V)



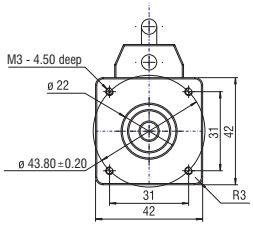
MD 100

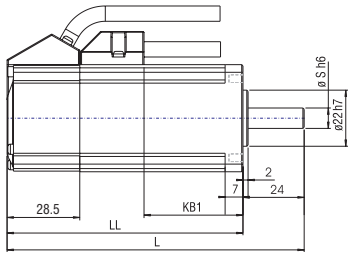


Connector pin assignment

Motor	red	phase U	1	AMP module (2 x 2) (housing 172330-1)
	white	phase V	2	
	black	phase W	3	
	yellow/green	motor housing	--	
Encoder	white	+5V	13	AMP Mini-Universal (3 x 5) (housing 172334- 1)
	black	ground	14	
	red	phase A	1	
	pink	phase /A	2	
	green	phase B	3	
	blue	phase /B	4	
	yellow	phase Z	5	
	orange	phase /Z	6	
	light blue	Rx+	11	
	violet	Rx-	12	
	Cable screen		15	

Scale drawing





	L	LL	KB 1	S
MD 030	91.5 (123.0)	67.5 (99.0)	13.8	7.0
MD 050	99.5 (131.0)	75.5 (107.0)	21.8	8.0
MD 100	116.5 (148.0)	92.5 (124.0)	38.8	8.0

Values in brackets refer to motor with flanged brake

electronics

EC Servo Motor

MD 200 / 400

Features

- servo motors without brushes (6-pole)
- very good performance/volume ratio
- low motor inertia
- encoder with 2,500 impulses/revolution, RS 422

Technical data

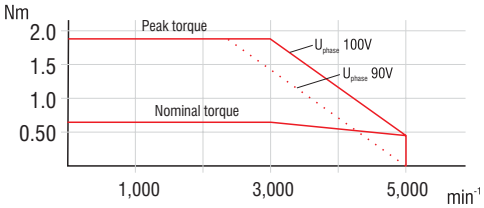
		MD 200	MD 400
Item no.		474510 0200	474520 0200
Item no.	with brake	474510 0201	474520 0201
Nominal power	W	200	400
Nominal voltage	V	100	100
Nominal/peak current	A	2.5 / 10.5	4.4 / 18.6
Nominal/peak torque	Nm	0.64 / 1.91	1.3 / 3.8
Nominal speed	min^{-1}	3,000	3,000
Voltage constant	$10V / min^{-1}$	9.40	10.6
Torque constant	Nm / A	0.27	0.30
Winding resistance	Ohm	1.20	0.58
Winding inductance	mH	3.80	2.04
Power rate	kW / s	41.4 (31.9)	97.4 (82.8)
Max. revolution	min^{-1}	5,000	4,500
Rotor inertia	10 kg / m^2	0.1 (0.13)	0.17 (0.20)
Electrical time constant	ms	3.5	6.2
Mechanical time constant	ms	0.31	0.37
Radial load (at 10 mm)	N	245.0	245.0
Shaft load, axial	N	98.0	98.8
Weight	kg	0.96 (1.36)	1.5 (1.9)
Protection class		IP 55	
Ambient temperature	°C	0 °C... + 40 °C	

Values in brackets refer to motor with flanged brake

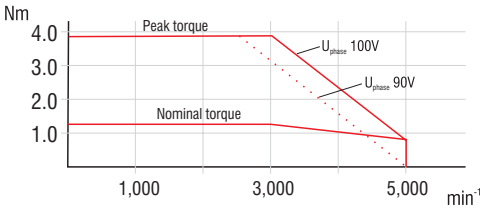
EC Servo Motor MD 200 / 400

Torque curves

MD 200
(Motor voltage 90V)



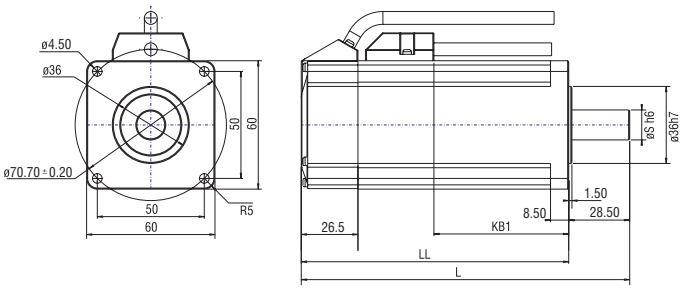
MD 400
(Motor voltage 90V)



Connector pin assignment

Motor	red	phase U	1	AMP module (2 x 2) (housing 172330- 1)
	white	phase V	2	
	black	phase W	3	
	yellow/green	motor housing	--	
Encoder	white	+5V	13	AMP Mini-Universal (3 x 5) (housing 172334- 1)
	black	ground	14	
	red	phase A	1	
	pink	phase /A	2	
	green	phase B	3	
	blue	phase /B	4	
	yellow	phase Z	5	
	orange	phase /Z	6	
	light blue	Rx+	11	
	violet	Rx-	12	
	Cable screen		15	

Scale drawing



	L	LL	KB 1	S
MD 200	126.0 (159.0)	97.5 (130.5)	35.5	11.0
MD 400	153.5 (186.5)	125.5 (158.0)	63.0	14.0

Values in brackets refer to motor with flanged brake

EC Servo Motor

MD 750

Features

- servo motors without brushes (6-pole)
- very good performance/volume ratio
- low motor inertia
- encoder with 2,500 impulses/revolution, RS 422

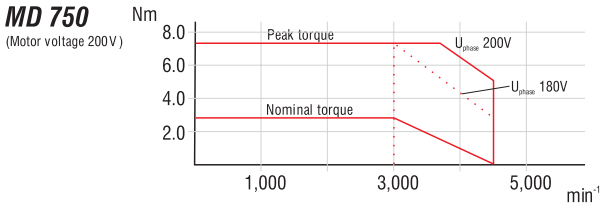
Technical data

		MD 750
Item no.		474810 0200
Item no.	with brake	474810 0201
Nominal power	W	750
Nominal voltage	V	200
Nominal/peak current	A	4.3 / 18.3
Nominal/peak torque	Nm	2.4 / 7.1
Nominal speed	min^{-1}	3,000
Voltage constant	$10V / min^{-1}$	--
Torque constant	Nm / A	0.61
Winding resistance	Ohm	0.71
Winding inductanc	mH	4.40
Power rate	kW / s	86.4 (77.2)
Max. revolution	min^{-1}	4,500
Rotor inertia	$10 kg / m^2$	0.67 (0.75)
Electrical time constant	ms	6.2
Mechanical time constant	ms	0.37
Radial load (at 10 mm)	N	392
Shaft load, axial	N	147.0
Weight	kg	3.1 (3.8)
Protection class		IP 55
Ambient temperature	°C	0 °C... + 40 °C

Values in brackets refer to motor with flanged brake

EC Servo Motor MD 750

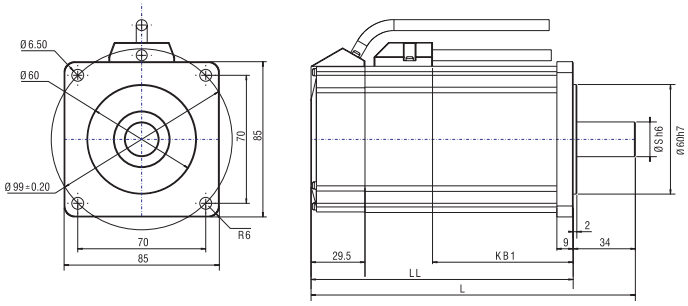
Torque curve



Connector pin assignment

Motor	red	phase U	1	AMP module (2 x 2) (housing 172330-1)
	white	phase V	2	
	black	phase W	3	
	yellow/green	motor housing	--	
Encoder	white	+5V	13	AMP Mini-Universal (3 x 5) (housing 172334-1)
	black	ground	14	
	red	phase A	1	
	pink	phase /A	2	
	green	phase B	3	
	blue	phase /B	4	
	yellow	phase Z	5	
	orange	phase /Z	6	
	light blue	Rx+	11	
	violet	Rx-	12	
	Cable screen		15	

Scale drawing



	L	LL	KB 1	S
MD 750	177.5 (211.5)	143.5 (177.5)	77.0	19.0

Values in brackets refer to motor with flanged brake

electronics

DC Servo Motor

MV 030 / 030Z

Features

- DC servo motors with brushes
- low-impedance coil
- 4-finger brush,
  lifetime approx. 3,000 hrs
- encoder with
  1,000 impulses/revolution, RS 422

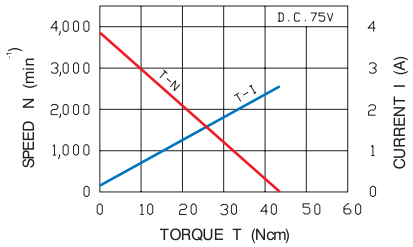
Technical data

		MV 030	MV 030Z
Item no.		471000	471001
Nominal power	W	30	
Nominal/peak speed	min^{-1}	3,000 / 4,000	
Nominal/peak torque	Ncm	10 / 53	
Nominal resistance	Ohm	1.0	
Nominal/peak current	A	0.8 / 3.4	
Torque constant	Nm / A	16.0	
E.m.f. constant	V / 1000 min^{-1}	16.1	
Armature inductanc	mH	6.3	
Rotor inertia	10 kg / cm^2	0.05	
Mechanical time constant	ms	4.6	
Electrical time constant	ms	0.29	
Max. axial load	N	19.6	
Max. radial load	N	58.8	
Weight	kg	0.45	
ISO category/protection class		B (130°) / IP 40	
Ambient temperature		0° C... +40° C	
Leakage resistance		10 MOhm / 500 VDC	
Voltage supply encoder		5 VDC (+-5%) / 200 mA	
Resolution		1,000 increments/revolution	
Signal output		rectangle (max. 70 kHz), RS 422	
Output voltage		V_{low} OV, V_{high} + 2.5 V	

DC Servo Motor

MV 030 / 030Z

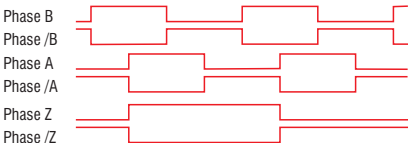
Characteristic curve



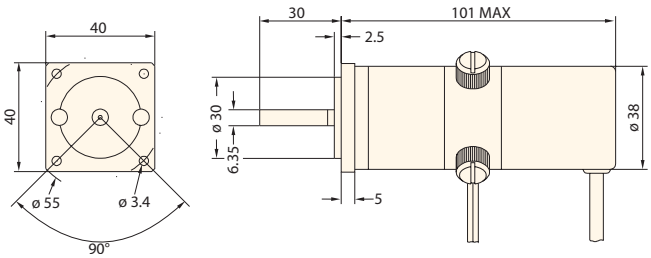
Anschlussbelegung

Motor	black	-
	red	+
Encoder	red/black	ground
	red	+ 5 VDC
	blue	phase A
	blue/black	phase /A
	yellow	phase B
	yellow/black	phase /B
	green	phase Z
	green/black	phase /Z

Encoder output



Scale drawing



Gearing (type MV-030Z)
Type M
Pitch 2.032 mm = 0.080 inch
Number of teeth z = 10

electronics

DC Servo Motor

MV 120 / 120Z

Features

- DC servo motors with brushes
- low-impedance coil
- 4-finger brush,
  lifetime approx. 3,000 hrs
- encoder with
  1,000 impulses/revolution, RS 422

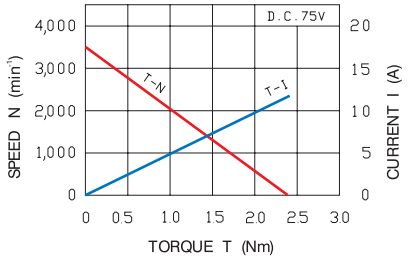
Technical data

		MV 120	MV 120Z
Item no.		471002	471003
Nominal power	W	120	
Nominal/peak speed	min^{-1}	3,000 / 4,000	
Nominal/peak torque	Ncm	38 / 220	
Nominal resistance	Ohm	3.0 - 4.5	
Nominal/peak current	A	2.8 / 13	
Torque constant	Nm / A	17.3	
E.m.f. constant	V / 1000 min^{-1}	17.8	
Armature inductance	mH	2.2	
Rotor inertia	10 kg / cm^2	0.35	
Mechanical time constant	ms	4.5	
Electrical time constant	ms	0.59	
Max. axial load	N	39.2	
Max. radial load	N	88.3	
Weight	kg	1.4	
ISO category/protection class		B (130°) / IP 40	
Ambient temperature		0° C... +40° C	
Leakage resistance		10 MOhm / 500 VDC	
Voltage supply encoder		5 VDC (+-5%) / 200 mA	
Resolution		1,000 increments/revolution	
Signal output		Rectangle (max. 70 kHz), RS 422	
Output voltage		V_{low} OV, V_{high} + 2.5 V	

DC Servo Motor

MV 120 / 120Z

Characteristic curve

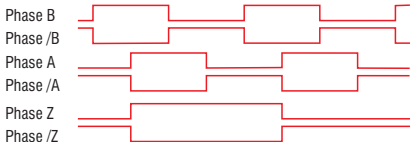


Connector pin assignment

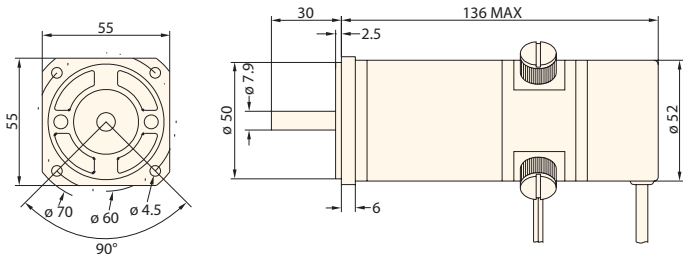
Motor	black	-
	red	+

Encoder	red/black	ground
	red	+ 5 VDC
	blue	phase A
	blue/black	phase /A
	yellow	phase B
	yellow/black	phase /B
	green	phase Z
	green/black	phase /Z

Encoder output



Scale drawing



Gearing (type MV-120Z)
Type M
Pitch 2.032 mm = 0.080 inch
Number of teeth z = 13

DC Servo Motor

MV 330

Features

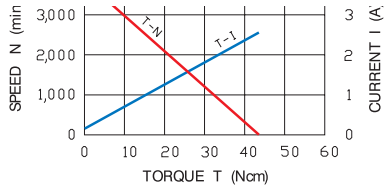
- DC servo motors with brushes
- low-impedance coil
- 4-finger brush,
  lifetime approx. 3,000 hrs
- encoder with
  1,000 impulses/revolution, RS 422

Technical data

		MV 330
Item no.		471004
Nominal power	W	330
Nominal/peak speed	min^{-1}	3,300 / 4,000
Nominal/peak torque	Ncm	100 / 539
Nominal resistance	Ohm	0.9
Nominal/peak current	A	6.5 / 30
Torque constant	Nm / A	18.1
E.m.f. constant	V / 1000 min^{-1}	18.6
Armature inductance	mH	0.8
Rotor inertia	10 kg / cm^2	2.51
Mechanical time constant	ms	7.4
Electrical time constant	ms	0.84
Max. axial load	N	40
Max. radial load	N	150
Weight	kg	3.1
ISO category/protection class		B (130°) / IP 40
Ambient temperature		0° C... +40° C
Leakage resistance		10 MOhm / 500 VDC
Voltage supply encoder		5 VDC (+-5%) / 200 mA
Resolution		1,000 increments/ revolution
Signal output		Rectangle (max. 70 kHz), RS 422
Output voltage		V_{low} OV, V_{high} + 2.5 V

DC Servo Motor MV 330

Characteristic curve

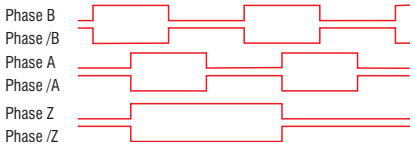


Connector pin assignment

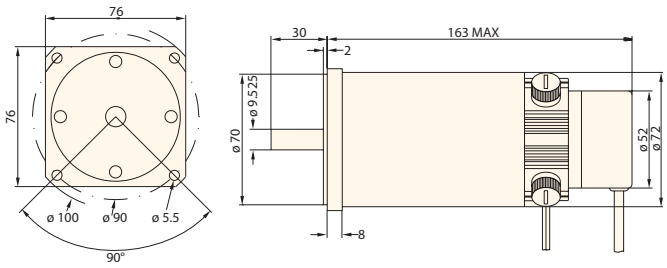
Motor	black	-
	red	+

Encoder	red/black	ground
	red	+ 5 VDC
	blue	phase A
	blue/black	phase /A
	yellow	phase B
	yellow/black	phase /B
	green	phase Z
	green/black	phase /Z

Encoder output



Scale drawing



electronics

DC Servo Motor

MV 500

Features

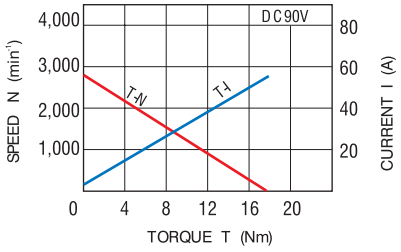
- DC servo motors with brushes
- high overload capability, low moment of inertia
- 4-finger brush, lifetime approx. 3,000 hrs
- encoder with 1,000 impulses/revolution, RS 422

Technical data

		MV 500
Item no.		471005
Nominal power	W	500
Nominal/peak speed	min^{-1}	2,500 / 3,000
Nominal/peak torque	Nm	2.0 / 6.0
Nominal resistance	Ohm	0.71
Nominal/peak current	A	6.6 / 19.8
Torque constant	Nm / A	0.335
E.m.f. constant	V / 1000 min^{-1}	34.4
Armature inductance	mH	1.54
Rotor inertia	10 kg / cm^2	54.05
Mechanical time constant	ms	3.55
Electrical time constant	ms	2.17
Max. axial load	N	--
Max. radial load	N	--
Weight	kg	4.55
ISO category/protection class		F / IP 50
Ambient temperature		0° C... +40° C
Leakage resistance		10 MOhm / 500 VDC
Voltage supply encoder		5 VDC (+-5%) / 200 mA
Resolution		1,000 increments/ revolution
Signal output		Rectangle (max. 70 kHz), RS 422
Output voltage		V_{low} OV, V_{high} + 2.5 V

DC Servo Motor MV 500

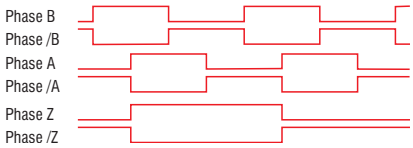
Characteristic curve



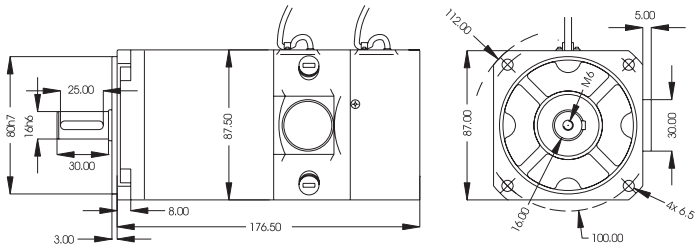
Connector pin assignment

Motor	black	-
	red	+
Encoder	red/black	ground
	red	+ 5 VDC
	blue	phase A
	blue/black	phase /A
	yellow	phase B
	yellow/black	phase /B
	green	phase Z
	green/black	phase /Z

Encoder output



Scale drawing



AC Synchronous Motor

MY 051/052/053/054

MY 054 MY 053 MY 052 MY 051

Features

- highly dynamic positioning motors without brushes
- compact design due to rare-earth magnets
- low moment of inertia due to optimised construction of the rotors
- good synchronisation characteristics due to 6-pole design
- high load capability (impulse torque up to 5-fold nominal torque)
- integrated temperature protection due to PTC thermal resistor
- protection type IP 65 (shaft lead-through IP 64)
- high-resolution sine/cosine encoder as measuring system
- connection via two circular plug-in connectors
- Options: integrated holding brake
  resolver

Technical data

			MY 051	MY 052	MY 053	MY 054
	Item no. *		475510 1300	475520 1300	475530 1300	475540 1300
	Holding torque	Nm	0.34	0.50	0.65	1.0
	Holding continuous current	A	1.2	1.5	2.0	3.2
Rated values	Torque	Nm	0.32	0.48	0.6	0.8
	Nominal voltage	V	270 ... 350			
	Current	A	1.3	1.7	2.3	3.4
	Nominal speed	min^{-1}	6,000			
	Power	W	200	300	375	500
	Voltage constant	V / 1000	20			
	Winding resistance	Ohm	21	8.7	6.1	3.3
	Winding inductance	mH	9.9	5.4	3.9	2.7
Peak values	Torque	Nm	1.7	2.5	3.2	5.0
	Current	A	10	12.8	15.3	24.0
	Revolution	min^{-1}	9,000			
Mechanics	Rotors' moment of inertia	$kgcm^2$	0.17	0.24	0.31	0.45
	Mass	kg	1.0	1.2	1.4	1.8

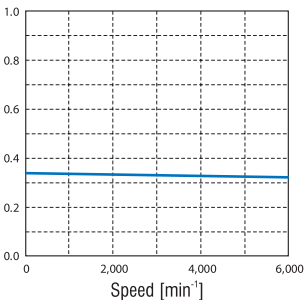
* If a brake is mounted, the item number's last figure changes to "1".

AC Synchronous Motor

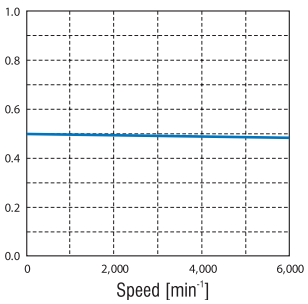
MY 051/052/053/054

Torque curves

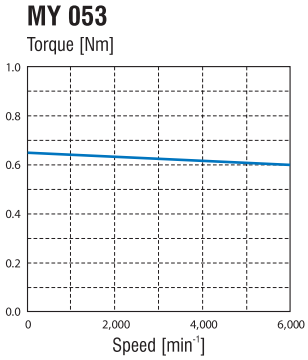
MY 051



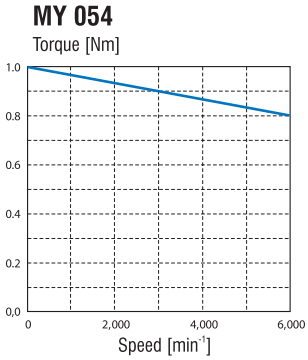
MY 052



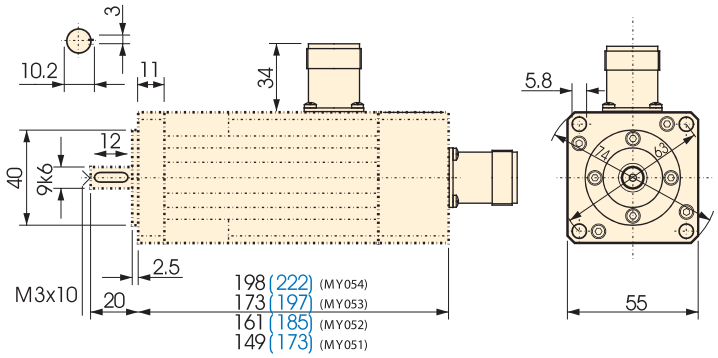
MY 053



MY 054



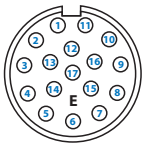
Scale drawing



Values in brackets refer to motors with brake

Connector pin assignment

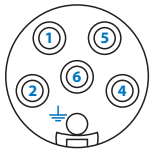
Connection of measuring system



Pin	Signal
1	A+
2	A -
3	R+
4	D -
5	C+
6	C+
7	0 V
8	temperature+
9	temperature -

Pin	Signal
10	+ 5 V
11	B +
12	B -
13	R -
14	D +
15	not assigned
16	not assigned
17	not assigned

Power connection



Pin	Signal
1	U 1
2	V 1
PE	PE

Pin	Signal
4	brake +*
5	brake -*
6	W 1

* optional

AC Synchronous Motor

MY 071/072/073

MY 073 MY 072 MY 071

Features

- highly dynamic positioning motors without brushes
- compact design due to rare-earth magnets
- low moment of inertia due to optimised construction of the rotors
- good synchronisation characteristics due to 6-pole design
- high load capability (impulse torque up to 5-fold nominal torque)
- integrated temperature protection due to PTC thermal resistor
- protection type IP 65 (shaft lead-through IP 64)
- high-resolution sine/cosine encoder as measuring system
- connection via two circular plug-in connectors
- Options: integrated holding brake
  resolver

Technical data

			MY 071	MY 072	MY 073
	Item no. *		475710 1300	475720 1300	475730 1300
	Holding torque	Nm	0.65	1.50	2.30
	Holding continuous current	A	1.9	3.2	5.5
Rated values	Torque	Nm	0.6	1.3	2.0
	Nominal voltage	V	270 ... 350		
	Current	A	2.0	2.9	4.7
	Nominal speed	min^{-1}	4,000		
	Power	W	250	540	830
	Voltage constant	V / 1000	20.8	27.7	26.3
	Winding resistance	Ohm	6.8	4.0	1.7
	Winding inductance	mH	11.5	11.5	5.6
Peak values	Torque	Nm	3.1	7.2	11.0
	Current	A	16.1	27.2	46.7
	Speed	min^{-1}	9,000		
Mechanics	Rotors' moment of inertia	$kgcm^2$	0.22	0.36	0.57
	Mass	kg	1.5	2.1	2.9

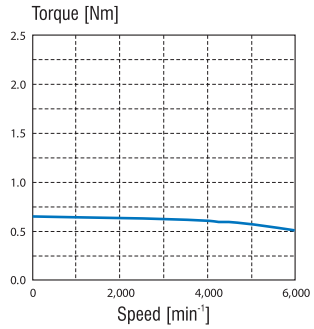
* If a brake is mounted, the item number's last figure changes to "1"

AC Synchronous Motor

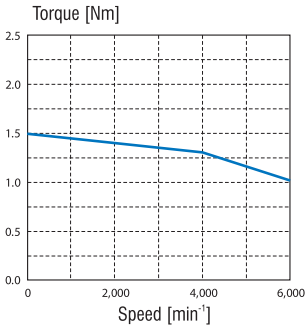
MY 071/072/073

Torque curves

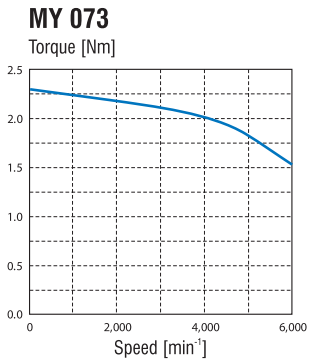
MY 071



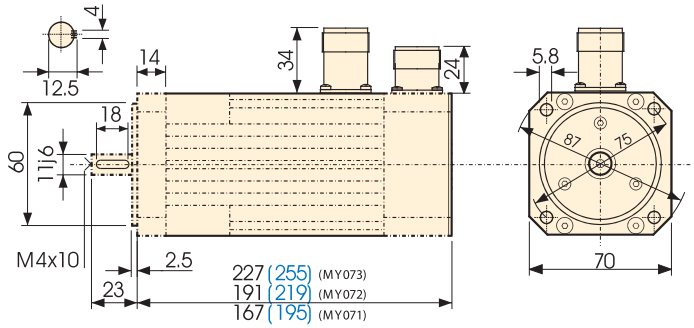
MY 072



MY 073



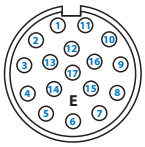
Scale drawing



Values in brackets refer to motors with brake

Connector pin assignment

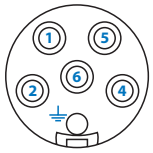
Connection of measuring system



Pin	Signal
1	A+
2	A -
3	R+
4	D -
5	C+
6	C+
7	0 V
8	temperature+
9	temperature -

Pin	Signal
10	+ 5 V
11	B +
12	B -
13	R -
14	D +
15	not assigned
16	not assigned
17	not assigned

Power connection



Pin	Signal
1	U 1
2	V 1
PE	PE

Pin	Signal
4	brake +*
5	brake -*
6	W 1

* optional

AC Synchronous Motor

MY 091/092/093

MY 093 MY 092 MY 091

Features

- highly dynamic positioning motors without brushes
- compact design due to rare-earth magnets
- low moment of inertia due to optimised construction of the rotors
- good synchronisation characteristics due to 6-pole design
- high load capability (impulse torque up to 5-fold nominal torque)
- integrated temperature protection due to PTC thermal resistor
- protection type IP 65 (shaft lead-through IP 64)
- high-resolution sine/cosine encoder as measuring system
- connection via two circular plug-in connectors
- Options: integrated holding brake
  resolver

Technical data

			MY 091	MY 092	MY 093
	Item no.*		475910 3300	475920 3300	475930 3300
	Holding torque	Nm	0.95	2.70	4.50
	Holding continuous current	A	1.1	2.5	6.7
Rated values	Torque	Nm	0.75	2.2	3.50
	Nominal voltage	V	510 ... 620		
	Current	A	0.9	2.1	3.1
	Nominal speed	min^{-1}	4,000		
	Power	W	310	920	1,470
	Voltage constant	V / 1000	50.2	59	64.2
	Winding resistance	Ohm	39.4	6.9	3.7
	Winding inductance	mH	57.6	19.3	12.2
Peak values	Torque	Nm	4.3	12.2	20.3
	Current	A	7.7	17.6	26.8
	Speed	min^{-1}	6,000		
Mechanics	Rotors' moment of inertia	$kgcm^2$	1.2	2.7	4.2
	Mass	kg	2.7	3.9	5.2

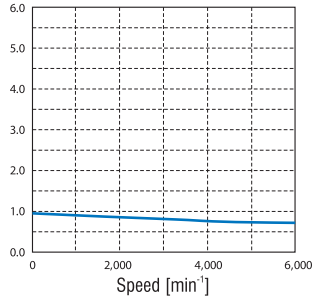
* If a brake is mounted, the item number's last figure changes to "1"

AC Synchronous Motor

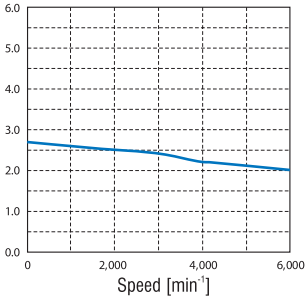
MY 091/092/093

Torque curves

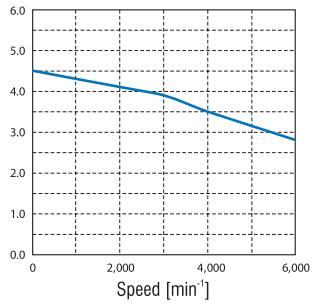
MY 091



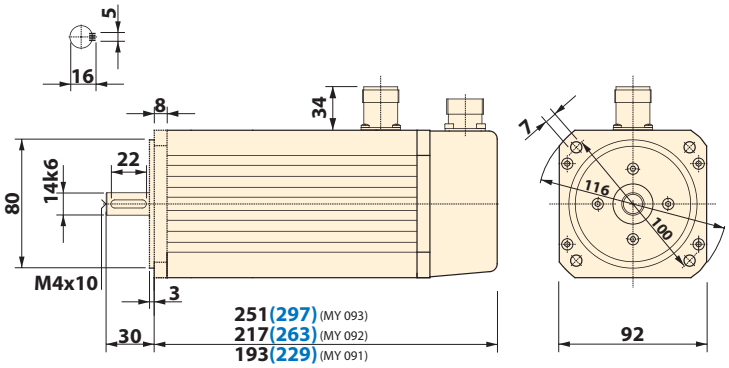
MY 092



MY 093



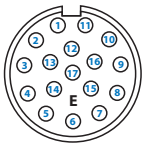
Scale drawing



Values in brackets refer to motors with brake

Connector pin assignment

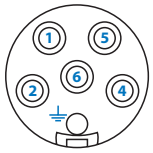
Connection of measuring system



Pin	Signal
1	A+
2	A -
3	R+
4	D -
5	C+
6	C+
7	0 V
8	temperature+
9	temperature -

Pin	Signal
10	+ 5 V
11	B +
12	B -
13	R -
14	D +
15	not assigned
16	not assigned
17	not assigned

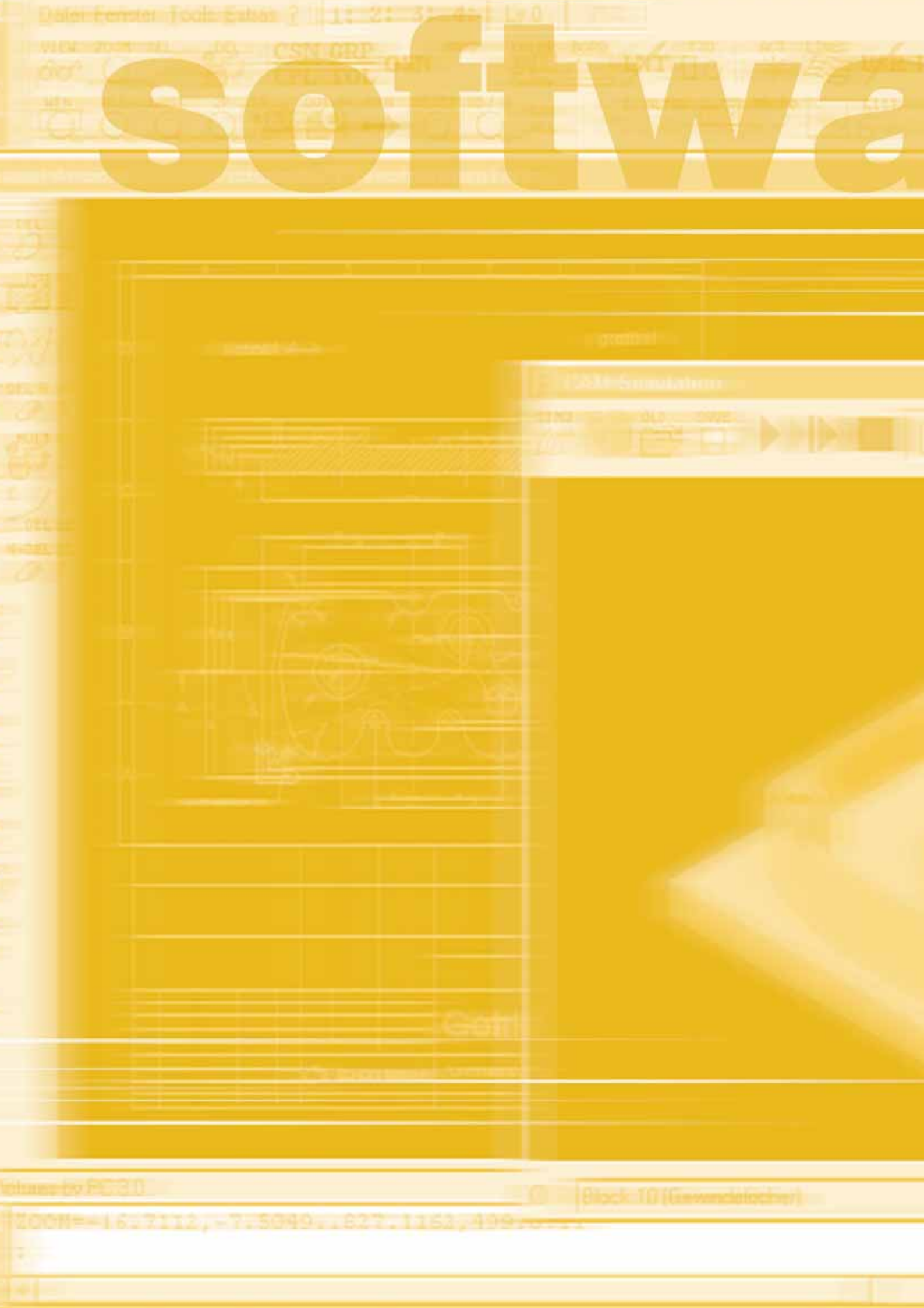
not assigned



Pin	Signal
1	U 1
2	V 1
PE	PE

Pin	Signal
4	brake +*
5	brake -*
6	W 1

* optional


softwa

SOFTWARE

Software for Complete Controllers and System Solutions

CAD / CAM-Software

Interpretive Software

Programming Software

software

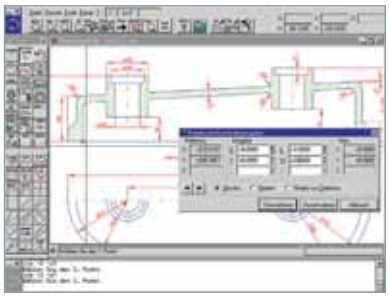
isy-CAM 2.5 light

With isy-CAM 2.5, the isel group provides it's customers with a “light” version of the Windows®-based CAD/CAM package.
It is directly coupled to isel controllers and offers a universal solution from the construction to the production by means of isel controllers and isel machines.

a complete package with:

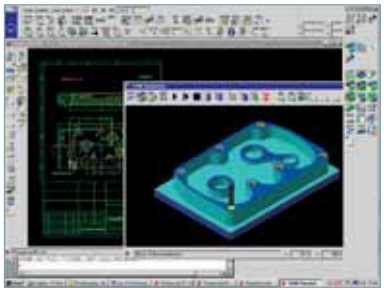
- 2D CAD / Design
- 2,5D CAM up to 4 axes
- 3D upgrade possibility
- Integrated machine control software
- Service

The offered software package is best suited for those who want to enter the world of CAD/CAM.
The operation takes place "windowslike" by means of graphic menus and dialogue boxes.



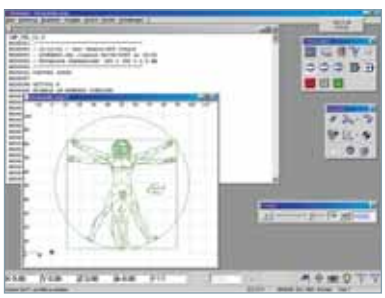
CAD

The CAD part includes all functions that are necessary for 2D constructions.



CAM

The CAM part makes it possible to create machining data simply and fast - directly from the design data.
With the integrated operating software RemoteWin, these machining data can be put out directly to the connected machine or controller.



REMOTE

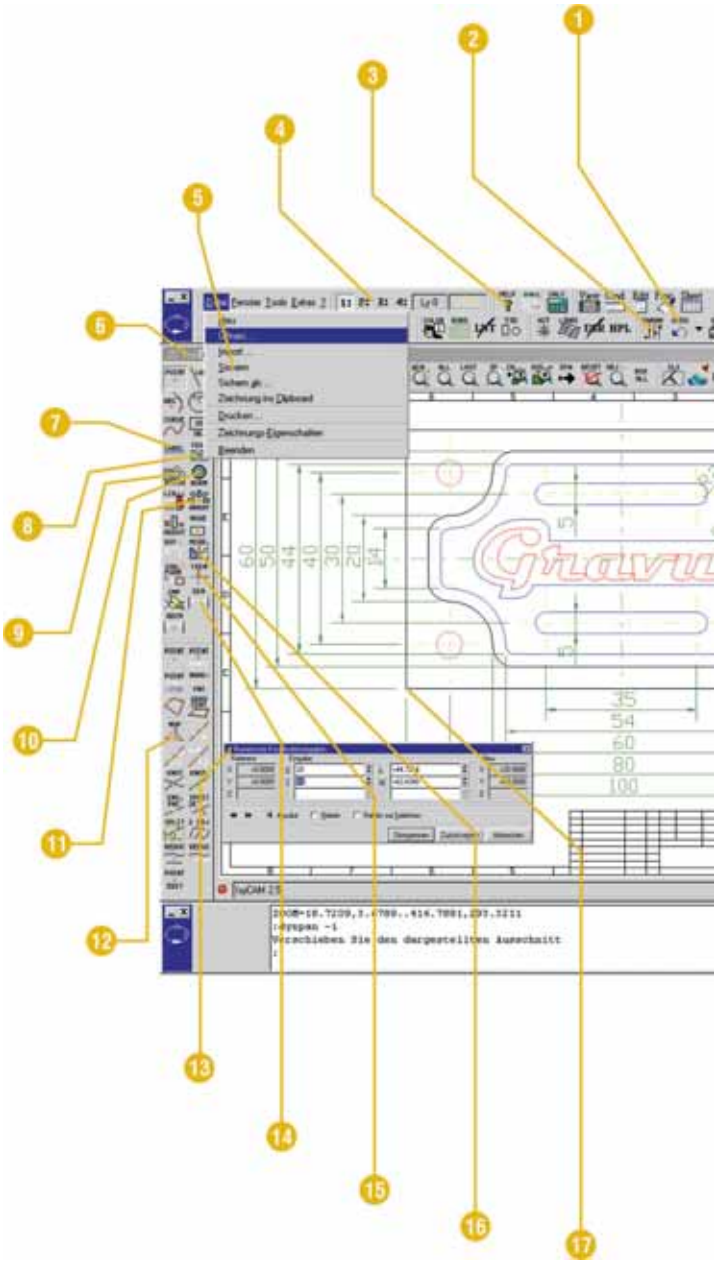
Therefore you get a universal solution to easily realize your ideas.

Range of Application

- General construction
- Mechanical engineering
- Tool manufacture
- Electrical engineering
- Engraving technology
- Artistic design
- ...

isy-CAM 2.5 light

CAD-Funktions



1 Arbitrary "Undo" function (backward steps)

2 Freely definable line types and colours

3 Integrated online support, configurable control surface

4 Parallel and independent working on several drawings

5 Import/export functions
- Import: DXF, HPGL, AI, EPS, TIFF, BMP, NC, NCP
- Export: DXF, HPGL, AI, WMF, EMF, TIFF, JPG, BMP

6 Extensive geometry elements such as points, lines, ellipses, circles, curves (polygons, splines, Bezier curves, NURBS)

7 Direct use of the Windows® fonts

8 Professional number and text edi ting functions

9 Hatch and freely definable types of hatch

10 Standard parts

11 Automatic arrangement and orien tation functions

12 Sketch and interactive change of outlines

13 Numeric input opportunity for absolute, relative and polar coor dinates

14 Extensive measuring and dimen-sioning functions, corresponding to DIN/ISO

15 Trimming, separating and pulling curves, conversions of different kinds of geometry

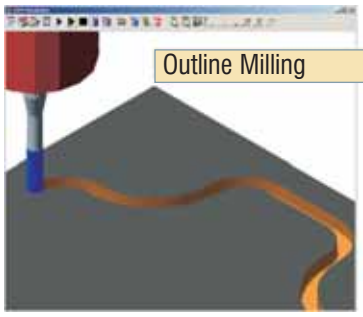
16 Geometry manipulation by shifting and copying like e.g. translation, rotation, scaling, mirroring

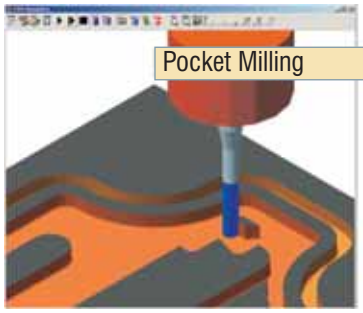
17 Intelligent object locking

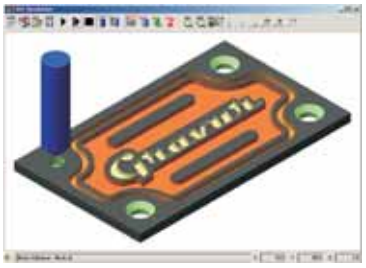
software

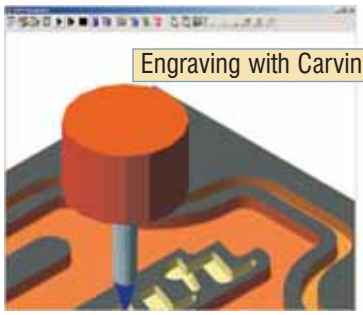
isy-CAM 2.5 light

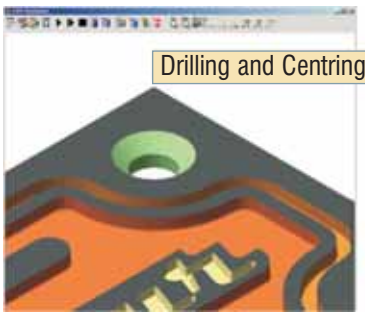
CAM-Funktions











The CAM functions of the software package provide the user with a practice-oriented and effective tool for the creation of machining data for all typical 2D and 2.5D production jobs with three-axis or four-axis machines.

In contrast to conventional numerical control programming, the workpiece geometry data are directly taken from the CAD system (designing instead of programming!) and transferred into numerical control data. In the CAM module, technological (material- and tool-dependent) machining instructions are assigned to the outline data. The integrated online simulation of the milling paths ensure an optimal supervision of the computed numerical control data.

- Tool list with selection and default of the tool geometry
- Machining feed motion and speed of the spindle
- Immersing variants/start-up strategy
- Automatic remaining material treatment
- Synchronism/reverse rotation
- Zero point shift and/or program zero point
- Feed reduction when immersing and in the full cut
- Roughing and smoothing with depth increment
- Treatment of oversize/undersize
- Computation tolerances
- Tool path distance
- Repeat functions e. g. for mass-production
- Arbitrary definition of the machining sequence of technology blocks
- Simulation of the milling paths
- Post-processor run for the generation of the NCP data for a three-axis machining or the developed view on a fourth axis (rotational axis)
- Possibility to edit NCP data

Outline Milling

- Tool correction by means of the CAM
- Closed outline, open outline, on the outline
- Start-up strategies - straight line, circle, tangential
- Special functions e.g. for water jet and laser cuttings, glue dispensing etc. (own functions and/or commands on arbitrary positions of the geometry that will be executed with the machining can be defined)

Pocket Milling

- Arbitrary geometry, automatic island recognition
- Clean out outline parallel or with parallel straight lines according to angle details
- Immerse through ramp, helix, or with pre-drilling

Engraving with Carving

(Die Manufacturing)

- On the outline
- Elimination of free, closed outlines with arbitrarily complex islands
- Smoothening with cut-out of the corners for tools with opening angle via 3D movements
- Automatic recognition of inner and outer contours

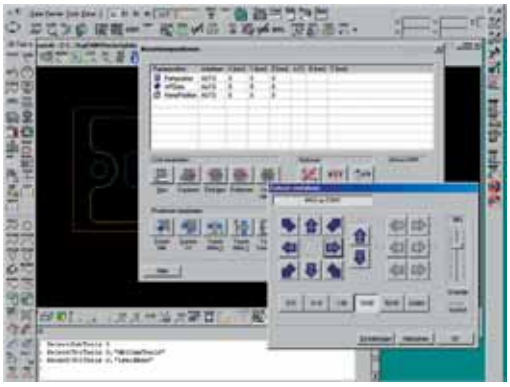
Drilling and Centring

- Deep hole drilling with chip removing or with chip breaking
- Rubbing, centring
- Thread milling

isy-CAM 2.5 light

REMOTE

REMOTE is the universal operating and output software for processing NCP files in the fields of milling, drilling, glueing, water jet cutting, laser cutting and laser welding - for all ideas that can be realized by means of isy-CAM 2.5.



Due to the high flexibility and expandability of isy-CAM and REMOTE, you can also automate complex processing procedures.
Due to various options and adjustment possibilities, REMOTE can also be integrated into superordinate manufacturing processes.

Features of Performance:

- Universal processing and control software
- Flexible and expandable
- Direct call and control by isy-CAM 2.5
- Stand-alone mode possible (shop manufacturing, network operation ...)
- Available for a large number of isel machines and isel controllers
- Operates under Win 98, 2000, NT and XP
- Intuitive program operation
- Integrated editor for comfortable handling of NC data
- Graphical representation of the milling data with measuring functions
- Dialogue-supported machine configuration
- Dialogue-oriented management of workpiece zero points, park positions, output positions
- Dialogue-supported management of copy manufacturing/multiple output
- "Set advance" (process restart at a break point)
- Online support system
- Extensive command line options

Ordering Data

isy-CAM 2.5 light	Z13-337 020
Update isy-CAM 2.0 on isy-CAM 2.5 light	Z13-337 020-0001
isy-CAM 2.5 light (second licence)	Z13-337 020-0300

isy-CAM 3.0

isy-CAM 3.0 is a further development of isy CAM 2.0, which has already been in successful use for some time, and now features Windows-based 32-bit technology.

isy-CAM 3.0 consits of a universal 2D/3D CAD and modelling program and a comprehensive CAD module for the technologies 2D/3D milling, drilling and engraving based on commercial PCs.

Operation is by way of graphical menus and dialog boxes.
In view of this comprehensive scope of services, the extraordinarily low price should be especially noted, since this software package is already included in the scope of supply of isel machines.

isy-CAM 3.0 can be used to solve 2D/3D design and engineering tasks, allowing the user to work either in the plane or in the space. Complete drawings or complex three-dimensional projects are thus possible quickly and easily on a uniform data basis, exactly as required.

The fields of application are complex constructions in mechanical engineering, toolmaking and mold making, electrical engineering and civil engineering, as well as artifical design. From the first beginnings of an idea, the program can be used to draw components and to modify them interactively.
An integrated worksheet with a huge number of mathematical functions provides comprehensive calculations, as well as professional preparation of numbers and text.

Compared with the previous version, isy-CAM 3.0 has been extended by a volume modeller (ACIS) with free-form integration so that now both comprehensive area and volume-based manipulation options are provided. The software is downwardly compatible, i.e. Data created with isy CAM 2.0 can also be processed, and the existing areas can be completed to volume bodies.

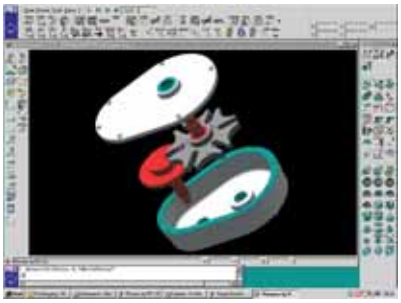
Features

- Easy installation and operation
- CAD/CAM software completely 32-bit based (Windows operation)
- Multi-tasking and network-enabled
- No limitations on the amount of data
- Dynamic zooming and rotation is shaded or contour representation
- linteractive call of the menu for the numercial input of coordinates with all CAD functions
- Extended export/import functions with vectorisation software
  Import: DXF, HPGL, STL, SAB, SAT, AI, EPS, TIFF, BMP, NC, NCP (IGES, VDA-FS optional)
  Export: DXF, HPGL, STL, SAB, SAT, EMF, WMF, BMP (IGES, VDA-FS optional)
- No contouring
- Intelligent object capturing
- Integrated ACIS core (volume and area-based)
- Multi-stage undo functions
- Direct use of the Windows fonts
- Configurable user interface
- Integrated online help
- Complete and extended 3D design possibilities
- Nurbs integration
- Conversion of areas into volume bodies and vice versa
- Compatibility with isy CAM 2.0
- Online simulation of the milling paths with unmachined part and tool in shading
- Substantially extended CAM functions
- Integrated tool database
- Windows-based machine control
- Copy milling
- CAM functionalities also directly for laser and water jet cutting

isy-CAM 3.0

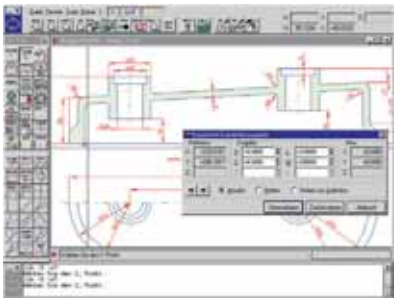
General CAD Functions

2D-CAD functions



- Comprehensive geometry elements, such as points, lines, ellipses, curves (polygons, splines, Bezier curves, NURBS),polygons
- Geometry manipulation by shifting and copying as a translation, rotation, scaling, mirroring
- Trimming, separation and drawing of curves, conversions of geometries of different kind
- Comprehensive DIN/ISO-conforming measuring and dimensioning functions
- Hatching with automatic isle recognition and freely defined types of hatching
- Various standard parts (DIN 931, DIN 933, DIN 934 etc.) Included in the standard scope of supply
- Absolute, relative and polar coordinates thanks to continous numerical input possibilities
- Definition of continuous grids
- 2D variants using sketch technology
- 2D movement analysis
- Angle design as radius or chamfer
- Freely defined line types and colours
- Intergrated computing and inquiry functions

3D-CAD functions



- Generation of a great variety of primitives, such as cuboid, sphere, cylinder, cone, truncated cone, torus
- Rotation areas / bodies
- Extrusion areas / bodies
- Sweeping (generation along 3D curve)
- Skinning (generation using cross-section curves), Boolean operations (unification, difference, intersection)
- Edge rouding with constant, linearly variable and cubically variable radius course, chamfer generation at straight edges
- Rounding via rolling-off sphere, also on spatially separated bodies
- Area generation from edging curves
- Combination of volume and area models Conversion of areas into volumes and vice versa
- Shifting and rotation of areas of a volume body
- Shifting, alignment, scaling, mirroring
- Volume-operable and trimmable areas
- Cuts on bodies and areas
- Projections
- 3D offset areas
- Inclined forms
- form separation Area roundings;
- Import of Bezier and NURBS curves and areas

CAM functions

The integrated professional CAM functions offer users in branches such as model and mold making, toolmaking, 3D design and CNC services, a professional, practical and effective CAM tool as a supplement to the CAD system.

Using this program, all typical 2D and 3D manufacturing tasks can be managed quickly and cost-effectively on 3, 4 or 5-axis machines from iselautomation.

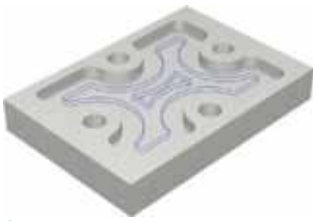
In contrast to conventional NC programming, the workpiece geometry data are accepted directly from the CAD system (designing instead of programming!) and converted to NC data quickly, reliably and with no effort whatsoever.

In the straightforward menu control of the CAM module, the contours, area or volume data are assigned technological (material and tool dependent) machining instructions.

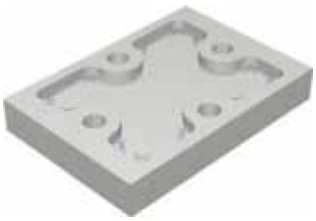
software

isy-CAM 3.0

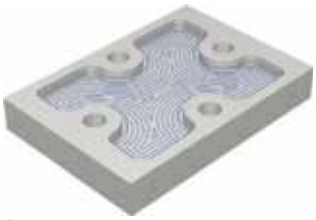
Scope of services 2D / 2,5D machining



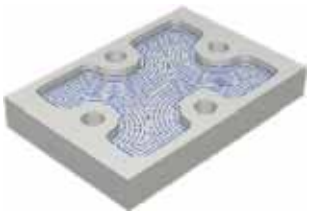
Contour-equidistant roughing



Re-roughing (residual material) with small milling tool



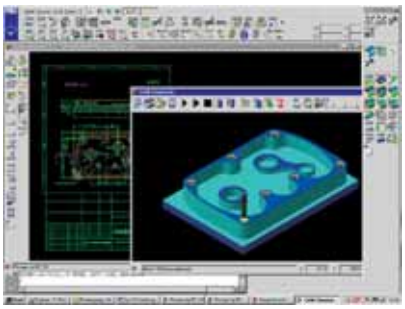
Contour-equidistant finishing



Paraxial finishing

Pocket milling

- Pocket milling (any geometries) with automatic isle recognition
- Solid machining parallel to the contour
- Solid machining with parallel straight lines with specified angles
- Automatic residual material handling
- Roughing and finishing
- Synchronised movement and opposed milling can be selected
- Zero offset
- Insertion: Ramp, helix, with pre-drilling, feedrate reduction when inserting and with full cut



Example of a 2D design drawing with simulation of the following milling path calculation

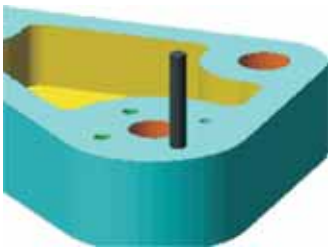
Contour milling

- Closed contour
- Open contour
- Along the contour
- Contour with tool compensation via CAM
- Approach strategies: Straight line, circle, ellipse, tangential

Complex engraving with picking out of the corners on an isel machine with 4th axis (rotary axis)

Engraving

- Engraving along the contour
- Solid machining of free, closed contours with any complex isles
- Automatic residual material recognition and machining
- Finishing with picking out of the corners (tool with aperture angle) M
- Scroll sawing (automatic recognition of internal and external contours)
- Free selection of the insertion angle
- Depth increments (machining layer by layer)



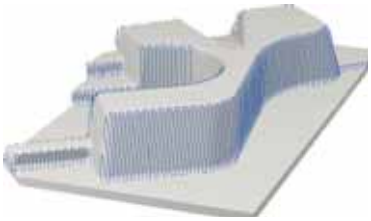
Drilling

- Drilling and centring
- Deephole drilling with swarf removal
- Deephole drilling with chipbreaking
- Reaming
- Rose countersinking
- Rose countersinking with / without increments
- Thread milling

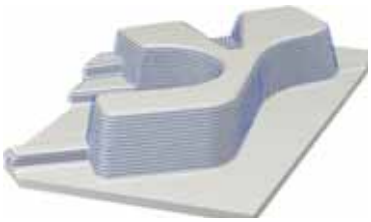
isy-CAM 3.0

Scope of services 3D machining

Line-by-line milling

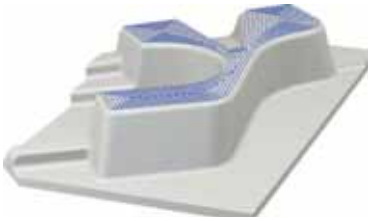


Steep edge machining
(by limit angle and/or selection)

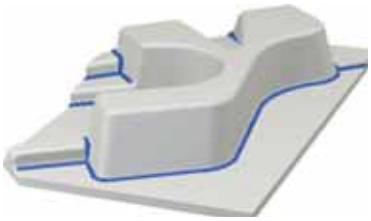


Z-constant finishing
(optionally with height limitation)

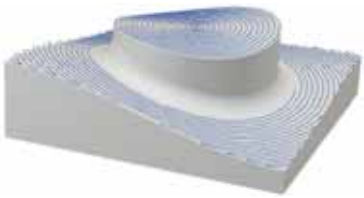
Finishing of flat areas
(by limit angle and/or selection)



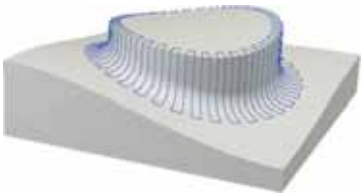
Contour-equidistant finishing
(individual area by selection)



Master-line milling
(hollow taper machining)



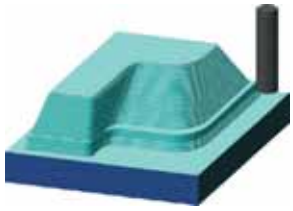
Finishing by contour
(areas by selection)



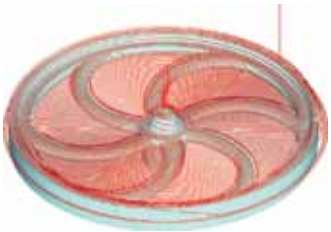
Radial finishing with circular approach
and retraction movement

- 3 and 4-axis machining (5-axis machining optional)
- 3D contours of surfaces or volume model, free form faces (Coon, Bezier, NURBS)
- residual material handling
- relief cut monitoring
- freely selectable sections to be machined
- plane roughing (X,Y or Z)
- roughing with path/angle specifications
- Z constant roughing with reverse rework step by step
- finishing acc. to path/angle specifications
- milling within a limit contour
- Z-constant finishing
- finishing with master curve (controlled residual material disposal)
- finishing with master curve and area limitation
- 3D tool compensation of comprehensive tool geometries
- milling along a specified 3D contour (centre path)
- 2D pockets on 3D areas
- solid machining with automatic residual material disposal
- selection of the surface quality as per error limit
- summarising of several technology blocks
- block repetition with specification of number, rotation and offset
- unmachined part definiton using any shape definition (bodies, area models, polygon meshes or contours with height indication)

Picking out on free-form areas



Optimised Z-constant roughing



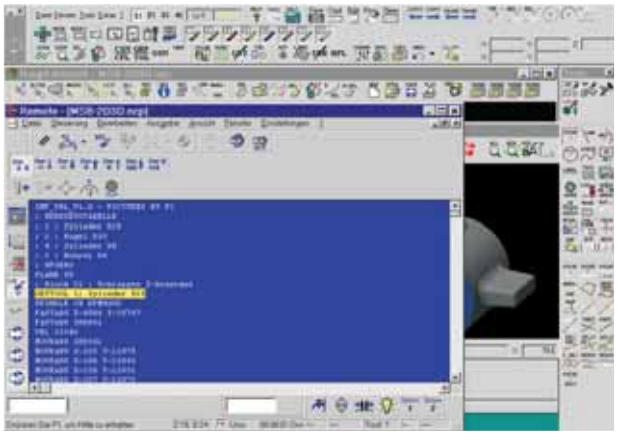
Contour-oriented finishing: spiral

Order information

Item no. / Price upon request
depending on control configuration

software

RemoteWin



... the powerful Interpretive Software for modern isel controllers

Interpreter and Control Program
for isel Machines and Controlers

- Interpretation of NCP files and CNC files for the output to or the control of isel machines

RemoteWin is a universal processing and control program for the machining technologies milling, drilling, glueing, water jet cutting and laser cutting/welding. Supported file formats are the isel NCP format (ASCII file with machining data, provided by a post processor) as well as the isel CNC format (ASCII files in a new format for the universal application within process automation, machining, milling etc.)

RemoteWin is used primarily for controlling isel machines with a variety of output files. For this reason, flexibility is a main feature of the program. A large variety of options makes a simple adaption to different requirements possible.

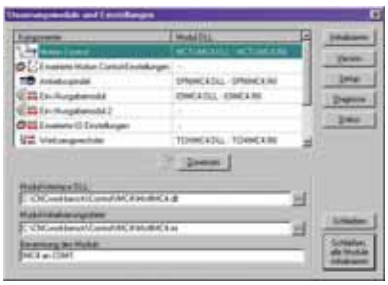
The extensive graphic user interface is designed in such a way, that the most important program functions are quickly accessable in two ways - by keyboard (short keys or hot keys) as well as by mouse (symbol bars and dialog boxes).

The menue structure is kept simple, in order to enable a quick operation. Optionally an operation can be performed using the isel control panel or via the CAN bus communication (CANopen).

For additional adjustments of the output files, RemoteWin has an integrated editor, which is also suitable for editing larger files. Standard editor functions like "search and replace", "cut", "copy" and "paste" are supported.

RemoteWin can be controlled remotely. By means of command line parameters, the appearance of the program, if called from other Windows applications, can be adapted. The parameterization of the program as well as the processing of the output file can be automated by using suitable parameters.

RemoteWin is a 32-bit Windows program. Under the condition, that a suitable driver software is employed for the machine type being used, it runs therefore under the operating systems Windows 98, Windows ME, Windows NT4.1, Windows 2000 and Windows XP.



RemoteWin

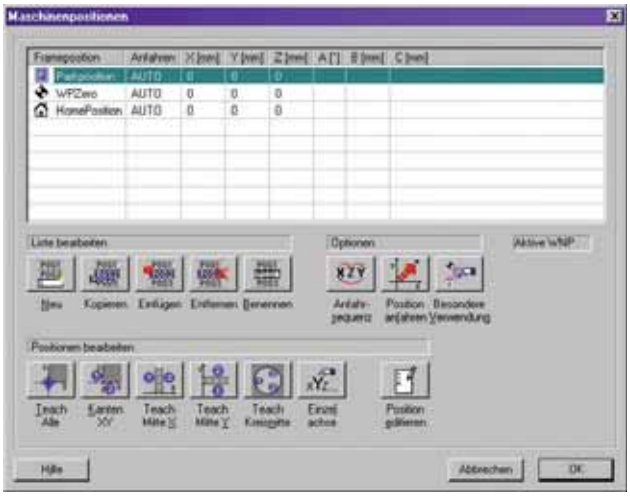
Operation

Operation panels with buttons

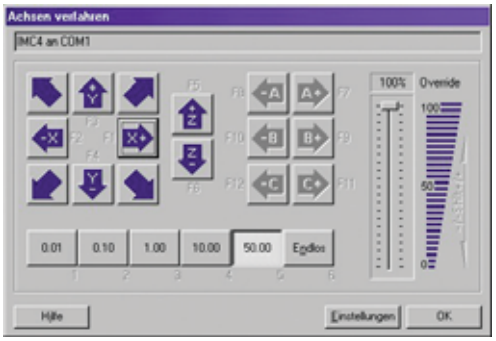
- Reset, reference run
- Speed setting
- Set/delete workpiece zero point
- Manual jogging
- Switch on/off spindle, set speed

- Block forward run, optional block skip, rapid motion overlay
- Selection of the output repititions
- Selection of the operation mode (Single step mode, automatic mode)
- Start, stop and abort the user program

- Get/deposit/clamp tool
- Tool magazine



- Dialog supported machine configuration
- Set, correct, test the machine position
- Access to symbolic machine positions in the CNC user program



- Manual jogging (up to 6 axes)
- Teach-In with function keys, mouse click or via operating panel
- Step mode (Jog) or axis travel, slant travel

software

RemoteWin

Display functions

- Controller status
  (hard- and software limit switches, ...)
- Speed indication
- Actual coordinates indication
- Machining time
- Override
- Spindle speed
- Current tool number

Instruction process / Output

- Direct call out of isy-CAM 3.0
- Text editor für NCP user programs with Windows standard functions (search, replace, ...)
- Editing window for correcting NCP files in NCP syntax
- Immediate processing without conversion or translation after storing
- The functional possibilities of the interpreter correspond to ProNC:
  - Definition and access possibility of selected machine positions via the geometry file
  - Parameter computing by means of real variables
  - Arithmetic, trigonometric functions
  - Parallelism of axis movement and binary outputs
  - Possibility of calling user's software

Files

NCP-Files	are generated by the post processor (isel CAD/CAM software) and interpreted by RemoteWin (processed line by line)
CNC-Files	are generated in ProNC by compiling PAL or ISO user programs

RemoteWin

Operating Panel (optional)

- Operating sections:

OPTION	Program selection, etc.
SPINDLE	Start, stop, override
PERIPHERY	Coolant, air extraction, clamp tool / workpiece
MANUAL	Reference, zero point, teach-in, etc.
PROGRAM	Start, stop, abort, single step

- User-friendly interface for CNC control (CAN bus, 1 MBit/s)
- Safety functions (emergency shut down, enable, lock)

Ordering data

RemoteWin	Z12-334 312	for isel-CAN-CNC-Controlers Win NT, 2000, XP
RemoteWin	Z12-334 112	for isel-Controlers C 142 Win 98, NT, 2000, XP
RemoteWin	Z12-334 111	for isel-Controlers IMC 4, CSD 405 IMC (for CPM and GFM Machines) Win 98, NT, 2000, XP

software

ProNC

The Universal Software for Modern isel Controllers

- Convenient operating and programming interface
- Programming according to isel PAL or DIN 66025
- Import of postprocessor files (NCP)
- Runs under Windows 98, NT 4, 2000 and XP
- Interactive machine configuration
- Flexible due to the use of interface DLLs
- Expandable by customized DLLs

ProNC is the integration of the control programmes Remote, implemented for the operating system MS-DOS by iselautomation, ProDIN and ProPAL into one software product as a new, powerful operating and programming interface under MS Windows (98, NT 4.x, 2000 and XP). All NC programs that were previously used by the operators for Remote (isel NCP format), ProDIN (DIN/ISO format) and/or ProPAL (isel PAL format) can be executed by ProNC.

ProNC consequently uses the MS Windows concept of dynamic linking (Dynamic Link Library = DLL) for the realization of the necessary module and/or device interfaces for the control of:

- controllers, motor control boards or intelligent output stages for motion axes / axes systems (motion control DLLs)
- frequency converters for machining spindles (spindle DLLs)
- hardware for binary/analogue input and output (I/O DLLs)
- tool changers (tool change DLLs)
- hardware for operating and safety functions, measuring technique and the CAN fieldbus interface

ProNC contains an extensive dialogue software for the configuration, parameterization, start-up and diagnostics of numerical axes/systems including the necessary periphery.
The application range of ProNC covers automation solutions particularly in the areas assembly, handling, loading and quality inspection, in which the user programs are predominantly created textually by using teach-in functions and/or by integrating contour data records (e. g. isel NCP format).

To use ProNC efficiently for the purpose of start-up / optimization of the user programs, inter alia, the following characteristics were implemented:

- single-step processing
- adjustment/teach-in as well as correction and test of arbitrary machine positions
- configurable system monitor for displaying the current values of real variables
- display window for speed and actual coordinates
- display of the movement control status (incl. hard- and software limit switches)
- self-sufficient spindle control panels for up to four spindles with speed override
- self-sufficient machine control panels for one or two axis systems with movement override, manual setting/deleting of workpiece zero points
- setting of breakpoints on arbitrary program lines / sets in the user program
- change of the values of real variables, e.g. for target coordinates, forward feeds, speeds and technological parameters (delay times, offset, copies, output values) while the program is executed
- teach-in and manual axis movement at the run-time of the user program
- extraction sets, set forerun, rapid traverse overlay

ProNC is an open software system. All interfaces are documented in the isel CNC API (Application Programming Interface). The activation of user software (as Windows EXE or Windows DLL) out of the NC program (DIN/ISO or PAL) is supported.

ProNC

Operation

Operating Panels with Buttons

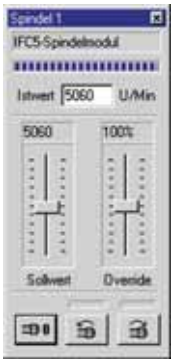
- Starting, interrupting and cancelling the user program
- Selection of the operation mode
- Approaching selected machine positions
- Workpiece zero point on / off
- Axis override

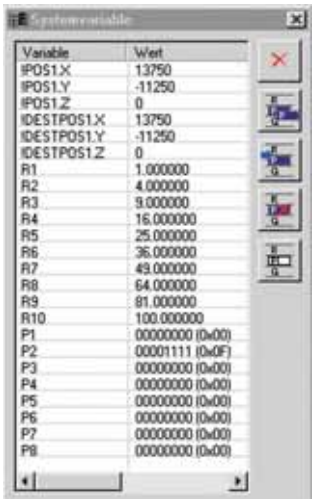
Machine Positions

- Setting, correcting and testing machine positions
- Access to symbolic machine positions in the ISO/PAL user program

Axes Actuation

- Manual axes actuation, alternatively in the first or second axis system
- Teach-in with function keys, mouse click or joystick
- Step-by-step mode (jog) or axis actuation, slantwise travel





ProNC System Monitor

- Axis status (limit switch)
- Speed indication
- Actual coordinates display
- Real variables (RX)
- Process variables (PX)

Spindle Operating Panels

- for up to 4 spindles

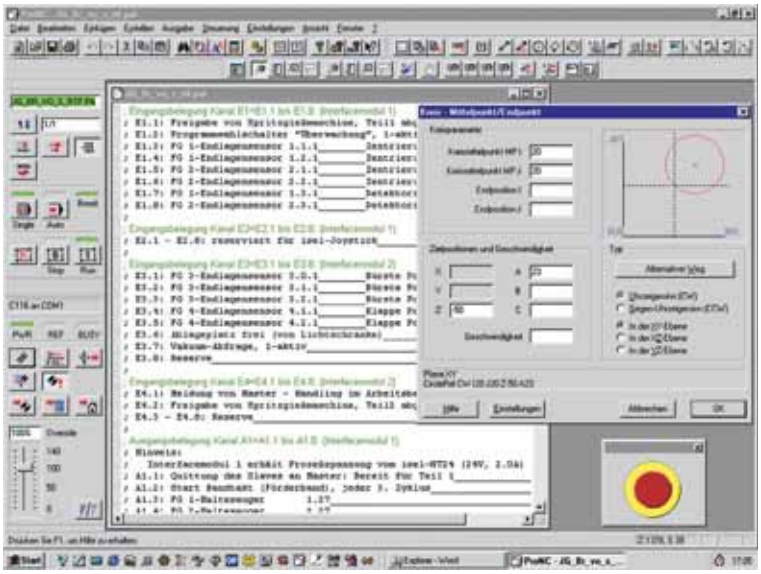
software

ProNC

Programming

Input Support

- Editing window for the source file
- Interactive windows for inserting commands and functions in ISO syntax or PAL syntax
- Compilation run with error list and correction references
- Debug functions (break points, trace)



File Types

Source file	user file in ISO syntax or PAL syntax
Geometry file	reading and writing of machine positions e. g. via teach-in, in the set-up or automatic mode
CNC target file:	compiled source file in the CNC format as output file for the interpreter
Error file:	list of the syntactic errors after the compiler run
Variables file:	reading of real variables at the program start and/or saving at the program end or abnormal termination or at run time of the user program

Range of Functions

- ProNC is the porting of the control programs Remote, ProDIN and ProPAL under Windows
- User programs in the NCP format (isy Remote), ISO format (pro DIN) or PAL format (pro PAL) are furthermore usable
- After the import with the text editor, NCP user programs are arbitrarily expandable
- Creation of the user programs alternatively in ISO syntax or PAL syntax
- Full function range analogous to ProDIN/ProPAL
- Definition and accessibility of selected machine positions by means of the geometry file
- Parameter calculation by real variables
- Boolean operations by process variables
- Arithmetic, trigonometric functions
- Alignment of axis motion and binary output units
- Possibility of calling user software (DOS Batch, WIN *.exe, WIN *.dll) for logging, communication and parameter exchange with external devices as proportioning, welding or laser controllers and/or intelligent sensors / actuators

ProNC

Overview

Controller	Movement type	Axes	Runs under	Item no.
IMC 4	linear, circular, helix	4 ●	Win 98, NT 4, 2000, XP	Z11-333 111
C 142/4 Interface board I5 // I5.0C // I5.0C E/A	linear, circular	3 ●	Win 98, NT 4, 2000, XP	Z12-333 112
IT 116 G	linear	1 ●	Win 98, NT 4, 2000, XP	Z12-333 112
CSI 464 D/E	linear, circular, helix, buffered mode	4 ●	Win 98, NT 4, 2000, XP	upon request
PS-PCI (for PCI slot)	linear, circular, helix	5 ●	Win NT 4, 2000, XP	upon request
UPMV 4/12 (for ISA slot)	linear, circular, helix	4 ●	Win 98, ME	Z12-333 211
PSK 4 (for parallel printer port)	linear, circular, helix, look-ahead path	4 ●	Win NT 4, 2000, XP	upon request
RS 485 (for COM interface)	linear, circular, helix, look-ahead path	6 ●	Win NT 4, 2000, XP	upon request
CAN Dongle (for parallel printer port)	linear, circular, helix, look-ahead path	6 ● + bis zu 121 Handling-Achsen	Win NT 4, 2000, XP	Z11-333 312
CAN PCI (for PCI slot)	linear, circular, helix, look-ahead path	2 x 6 ● + bis zu 2x121 Handling-Achsen	Win NT 4, 2000, XP	Z11-333 312

Training courses and application solutions upon request!

● = Servo motor ● = Stepping motor

PAL-PC 2.0

Process automation software for controllers with CNC mode

- Convenient user and programming interface
- Programming in accordance with PAL PC
- Runs under Windows 98, ME, NT 4, 2000 and XP
- Permits to control up to 3 (4) axes

General Overview

PAL PC The new version 2 of PAL PC permits the fast and easy realization of automation projects, such as drilling machines, handling systems, measuring and inspection systems, machines for individual and serial processing, etc.

PAL PC runs under the operating systems Windows 98, Windows ME, Windows NT 4, Windows 2000 and Windows XP.

PAL PC is the latest development of the programming environment for the isel interface card series, providing solutions for simple process controls. PAL PC can be used to control up to 4 axes (depending on the type of used control unit).

PAL PC can either be executed in the store-and-forward mode (CNC mode) or in the direct controller mode (DNC mode). This permits to realize both, applications in the stand-alone mode and applications with a supporting control PC.

If the CNC extension of the IMC4 controller is used, it is also possible to operate autonomous machines of the CPM series/GFM 4433.

In the CNC mode, the program is stored in the internal memory of the controller after transmitting (downloading) the application program to the target controller. It can be directly started via the controller or the machine (store-and-forward mode or stand-alone mode). The PC is only required for creating and testing the CNC program as well as for downloading the program.

In the DNC mode, the transmission of the CNC program is carried out order-wise/segment-wise with direct execution. In this mode, the program can only be started with the control PC being connected (direct mode).

PAL PC for Windows is the follow-up software of PAL PC for DOS. It comprises the complete scope of functions of the DOS version.

PAL PC was consistently realized with downward compatibility in mind to ensure that the already available source code of the preceding version can be freely used.

The user interface is designed in such a way that the most important program functions can be started via the buttons of the toolbar.

PAL PC has an integrated editor and compiler. Conventional editor functions, such as "Search" and "Replace", "Copy" and "Paste", as well as formatting functions for selecting specific colours and fonts, allow a convenient and fast program creation - even including the fault-free translation of the application program.

PAL PC supports functional extensions of different control units:

The hardware option "Battery Backup" (for interface cards and single-axis controllers) ensures the continuous availability of a CNC program, even after switching off the control unit.

A memory card allows to backup the translated application program and to reload it directly to the memory of the control unit - without PC.

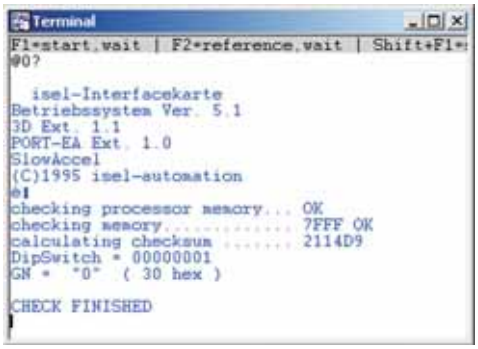
Under preparation: G-Code extension (programming according to DIN 66025)

PAL-PC 2.0

The operation

Program features

- Program operation via menus and short keys
- Editing in several source-text windows
- Display of compiler errors and navigation in the source code
- On-line help on programming and operation
- Auto-Detect of connected control units



Terminal window

- Test of communication with the interface card
- Query of information for service and diagnostic functions
- Controller self-test

Moving axes

- Moving axes manually
- Teach-in programming with function keys, mouse click or joy-stick
- Jog mode or axis travel, diagonal travel
- Take-over of target positions in the editor as formatted source code

PAL PC program editor

- MDI interface - Several files in several windows
- Search and replace
- Copy, cut and paste
- Multiple undo/redo function
- Use of program templates
- Teach-in programming
- Partial execution of programs, followed by teach-in

software

PAL-PC 2.0

The programming

Scope of functions

- PAL-PC for Windows the follow-up software of PAL-PC for DOS
- The scope of functions of the DOS version is included
- Syntactic simplifications and extensions
- Integrated editor for creating programs
- Compiler for the translation of the application program
- Path commands for the relative and absolute positioning
- Teach-in programming
- Software limit switches for programming in the teach-in mode
- 2D interpolation can be switched over to 3D interpolation
- Evaluation of input signals for process control
- Loops for repeating instruction blocks, unconditional and conditional branches, time delay
- Evaluation of the program selection unit
- Additional utilities for the automated processing of typical tasks
- Integration into own applications possible

Help

- Windows help for programming with PAL PC
- Help on the program operation
- Error list and correction instructions after compiler run
- Manuals on PAL PC as well as on different isel controllers in PDF format

Files

- Source file: User file in PAL PC syntax
- Include file: Additional source code file for the integration into the user file
- CNC target file: File translated in the CNC target format
- Error file: List of the syntactic errors after the compiler run

Ordering data

PAL-PC 2.0	Z11-331 810
Update PAL-PC 1.5 to PAL-PC 2.0	Z13-331 810-0001

PAL-PC 2.0

Overview of controllers/control units

Control unit	Interpolation	Axes	CNC-Mode	Runs under
IMC 4 CSD 405-IMC 	linear, circular	4 ●	yes[1)] (available from version V2.5.00 onwards)	Windows 98, NT 4, 2000, XP
C 142/4 Interface card UI5.0//C//E/A 	linear, circular	3 ●	yes[2), 3)]	
IT 116 G 	linear	1 ●	yes[2)]	
IT 142 C 	linear	1 ●	yes[2)]	
CSI 464 D/E 	linear, circular, buffered mode	4 ●	under preparation	
EP 1090 	linear, circular	3 ●	yes[2)]	

1) Data logger of CNC programs with flash EPROM
2) Data logger of CNC programs with 32 kb RAM (extendible with optional battery backup)
3) Optional use of a memory card as an external data logger Technical specifications subject to change.

● = stepping motor

GFM 4433

ICP 2015

Machines

- for all machines of the CPM and ICP series (IMC4 controller for up to 4 stepping motors)
- GFM 4433 (IMC4 controller)

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SYSTEMS

systems

CNC Base Units

Overview

CNC Base Units

Overview

X/Y/Z CNC Base Units

E 12

Series GFV/GFY
isy®-CAM 2.5 light

Accessory

E 14

Main Spindle Drives - Asynchronous
HSAH 2.05-SF
HSAW 2.05-SDF

MAH 2.05-S
MAW 2.05-SD

MA 2.05-SF
MA 4.05-SF

Main Spindle Drives - Asynchronous
HSA 2.11-SF
HSA 4.11-SF
HSAW 2.11-KF
HSAW 4.11-KF

MA 2.11-S
MA 4.11-S
MAW 2.11-K
MAW 4.11-K

MA 2.22-S
MA 4.22-S
MAW 2.22-K
MAW 4.22-K

Main Spindle Drives - HF
HSFW 150 - HSK 25

HSFW 150 - HSK 25

Main Spindle Drives - Accessory

X/Y/Z CNC Base Units

Series ICP
isy®-CAM 2.5 light

ICP 4030

CNC Base Units of the series ICP are further developments of the proven ready-to-use 3D-capable CNC machines of the series CPM.

Due to the newly developed sliding hood, the machines can now be operated from a sitting position, which, amongst others, results in decreased cycle times with regard to the hood's opening.

The chassis is completely screwed, and not welded like the forerunner models. This results in a more precise machine structure as well as in an improved maintainability.

Furthermore, the resonance and vibration behaviour could be optimised and thus a lower noise development could be achieved.

X/Y/Z CNC Base Units

Series ICP
isy®-CAM 2.5 light

Technical data

	ICP 4030	ICP 3020	ICP 2015
Construction type	Chassis construction with protective hood	Chassis construction with protective hood	Chassis construction with protective hood
Design	Gantry unit	Gantry unit	Gantry unit
Travel ranges (X/Y/Z)	400/300/140 mm	300/200/90 mm	200/150/90 mm
Travel speeds (X/Y/Z)	60/60/60 mm/s at spindle 16 x 10 mm	60/60/60 mm/s bei Spindel 16 x 10 mm	60/60/60 mm/s bei Spindel 16 x 10 mm
Guides	Clearance-free precision steel shaft guides with shaft slide	Clearance-free precision steel shaft guides with shaft slide	Clearance-free precision steel shaft guides with shaft slide
Passage height (from lower edge z-axis)	170 mm	115 mm	100 mm
Clamping table surface (W x D)	600 x 375 mm	500 x 250 mm	400 x 250 mm
Dimensions (W x D x H)	780 x 850 x 810 mm	610 x 650 x 715 mm	535 x 600 x 690 mm
Weight (basic configuration)	Approx. 120 kg	Approx. 102 kg	Approx. 95 kg
Mode of drive	2-phase high-torque stepping motors	2-phase high-torque stepping motors	2-phase high-torque stepping motors
Control	4-axis micro-step stepping motor control, integrated into the machine, with RS 232 communication interface	4-axis micro-step stepping motor control, integrated into the machine, with RS 232 communication interface	4-axis micro-step stepping motor control, integrated into the machine, with RS 232 communication interface

Option:
ICPV 4030 XYZ compact unit with DC motor and integrated DC control

Ordering data

Item no.	Description	Ball screw drive (mm)	Power electronics
280200 1404	ICP 2015 KG-TR	16 x 10	Integrated power electronics IMC4
280201 1404	ICP 2015 KG-TR	16 x 4	Integrated power electronics IMC4
280210 1406	ICP 3020 KG-TR	16 x 10	Integrated power electronics IMC4
280211 1406	ICP 3020 KG-TR	16 x 4	Integrated power electronics IMC4
280220 1405	ICP 4030 KG-TR	16 x 10	Integrated power electronics IMC4
280221 1405	ICP 4030 KG-TR	16 x 4	Integrated power electronics IMC4

Z13-337020	Software isy®-CAM 2.5 light (available only in combination with a unit)

Flat Bed and Gantry Units FB2 / PA1 / PA2

flat bed unit with Z axis

gantry unit with Z axis

isel X/Y/Z multiple axis units, handling units and positioning units with travels from 250 to 1250 mm are constructed on the basis of a modular system.

Stepper motors up to 300 Ncm and playfree ballscrew drives with a repitition accuracy of ± 0.01 mm (positioning reproductibility) are used as axis drives.

The linear guides that we use are the successful isel double track drives, proven for many years, with play-free linear ball bearings and ball screws with an accuracy of ± 0.01 mm.

In this redesigned version, all units are now equipped with two limit switches per axis.

The machining and positioning units are available in several constructions and different sizes and are characterised by low-friction running and high travel speeds. Low weight and high accuracy are achieved by using high quality aluminum compontnts with surfaces, trimmed by milling.

The isel X/Y/Z units are the ideal basis for the construction of machines for: automatic placement and mounting, printing and engraving, drilling and milling, dosing and screwing, forming and modelling, glueing und sealing, soldering and welding, measuring and checking, sawing and cutting, etc.

Options for the flat bed units

- adapted controllers for different application ranges
- Software modules for the operation in CAM, CNC and SPS applications
- DC servo motors instead of stepper motors (standard feature)
- intelligent stepper motors (with integrated power electronics)
- without motors, with input shaft extension
- different ball screw thread pitches (2,5 mm or 5 mm)
- Underframe (see picture on the left)
- Enclosed hood

Controller C-142
controlled by a Laptop

Ordering Data

FB2 / PA1 / PA2

X/Y-Flat bed units FB2

Item No.	Without Motor Item No.	Clamp. surface (mm)	Travel (mm)	Passage (mm)
246 203	246 208	850 x 750	500 x 530	190
246 203 2040	246 208 2040	1,100 x 750	750 x 530	190
246 203 2067	246 208 2067	1,350 x 1,000	850 x 780	190
246 203 2130	246 208 2130	1,750 x 1,250	1,250 x 1,030	190
246 203 3027	246 208 3027	850 x 750	500 x 530	300
246 203 3040	246 208 3040	1,100 x 750	750 x 530	300
246 203 3067	246 208 3067	1,350 x 1,000	850 x 780	300
246 203 3130	246 208 3130	1,750 x 1,250	1,250 x 1,030	300
246 203 5027	246 208 5027	850 x 750	500 x 530	500
246 203 5040	246 208 5040	1,100 x 750	750 x 530	500
246 203 5067	246 208 5067	1,350 x 1,000	850 x 780	500
246 203 5130	246 208 5130	1,750 x 1,250	1,250 x 1,030	500

All flat bed units are equipped with a **16 x 4 mm ball screw** as standard

Z axes for the flat bed units

Item No.	Stroke (mm)	
230 514 0300	75	with electromagnetic brake 24 V
230 514 0400	160	with electromagnetic brake 24 V
230 514 0500	260	with electromagnetic brake 24 V
230 514 0700	460	with electromagnetic brake 24 V

Gantry units PA1 / PA2

Item no.	Without Motor Item no.	Travel (mm)	Ball screw drive (mm)	Stroke (mm)
242 401	242 408	240 x 280	16 x 4	75
242 402	242 409	280 x 490	16 x 4	75
243 401	243 408	240 x 280	16 x 4	without Z axis
243 402	243 409	280 x 490	16 x 4	without Z axis

Software

Item no.	
Z13-33 7020	isy-CAM 2.5 light (only available in combination with an unit)

Underframes for the flat bed units

Item no.	suitable for flat bed unit with clamping surface:
248 500 0027	850 x 750
248 500 0040	1,100 x 750
248 500 0067	1,350 x 1,000
248 500 0130	1,750 x 1,250

Enclosed machine hood for the flat bed units

Item no.	suitable for flat bed unit with clamping surface:
248 200 0000	850 x 750
248 200 2040	1,100 x 750
248 200 2067	1,350 x 1,000
248 200 2130	1,750 x 1,250

Attention: The matching underframe has to be ordered separately.

X/Y/Z CNC Base Units

GFM 4433
isy®-CAM 2.5 light

The isel-CNC base units of the series GFM 4433 are stable C-frame-type CNC machines made of light-weight profiles.
All linear axes run on grinded steel shafts with linear ball bearings. Clearance-free ball screw drives with hardened and polished 5/8"-16 spindles with a pitch of, optionally, 5 or 10 mm are used as drives.
The linear axes are driven by powerful and robust stepping motors in easy-to-maintain drive modules.

The machine table, which is firmly screwed with the underframe, is made of plan-milled precision T-nut profiles.
It provides optimal clamping possibilities for the most different and workpiece holders and devises.
The protective hood, which features Perspex-lined glass and a swivelling door made of aluminium profiles, constitutes a closed working room with hood lokking.

The complete control and power electronics is integrated into the underframe, wired ready for connection.
The PC control under Windows with RS 232 interface is executable on each standard PC.
The control offers three relay switching outputs, AC 230 V/50 Hz.

The isel-CNC base units of the series GFM 4433 are ideal for individually assembling applications in the fields: positioning, milling/drilling, graving, dosing, screwing, measuring, etc.

X/Y/Z CNC Base Units

GFM 4433
isy®-CAM 2.5 light

Technical data

Travel range X-axis	Travel range Y-axis	Travel range Z-axis	Passage height (from lower edge z-axis)	Clamping table **(W x D)**	Dimensions **(W x D x H)**
330 mm	430 mm	160 mm	200 mm	375 x 900 mm	780 x 1,010 x 1,740 mm

Ordering data

Item no.	Description	Ball screw drive **(mm)**	Power electronics
274 400 1001	GFM 4433	16 x 10	Integrated power electronics IMC4
274 400 1002	GFM 4433	16 x 5	Integrated power electronics IMC4

Z13-337020	Software isy®-CAM 2.5 light (available only in combination with a unit)

Option: GFM 4433 base units are also available as OEM version without hood.

X/Y/Z CNC Base Units

GFS 4433/4473
GFV 4433/4473

The isel-CNC base units of the series GFM 4433/4473 and GFV 4433/4473 are stable C-frame-type CNC machines made of light-weight profiles.
All linear axes run on grinded steel shafts with linear ball bearings. Clearance-free ball screw drives with hardened and polished 5/8"-16 spindles with a pitch of, optionally, 5 or 10 mm are used as drives.
The linear axes are driven by powerful and robust stepping motors (series GFS) and DC servo motors (series GFV) in easy-to-maintain drive modules.
The machine table, which is firmly screwed with the underframe, is made of plan-milled precision T-nut profiles. It provides optimal clamping possibilities for the most different and workpiece holders and devises.

The protective hood, which features Perspex-lined glass and a swivelling door made of aluminium profiles, constitutes a closed working room with hood locking.
Ideally, the entire control and power electronics should be placed in a separate 16-HE control cabinet. The isel-CNC controller C142-4 with serial control via a RS 232 interface is used for the CNC base units of the series GFS with stepping motors. The isel-CAN-CNC controller is used for the base units of the series GFV with DC servo motors.
The isel-CNC base units of the series GFS 4433/4473 and GFV 4433/4473 are ideal for individually assembling applications in the fields: positioning, milling/drilling, graving, dosing, screwing, measuring, etc.

X/Y/Z CNC Base Units

GFS 4433/4473
GFV 4433/4473

Technical data

Type	Dimensions (W x D x H)	Travel ranges (X x Y x Z)	Passage height (from lower edge z-axis)	Clamping surface (W x D)	Motors
GFS 4433	780 x 1,010 x 1,815 mm	440 x 330 x 160 mm	210 mm	375 x 900 mm	Stepping motor 160 Ncm
GFS 4473	1,160 x 1,010 x 1,815 mm	440 x 730 x 160 mm	210 mm	750 x 900 mm	Stepping motor 160 Ncm
GFV 4433	780 x 1,010 x 1,815 mm	440 x 330 x 160 mm	210 mm	375 x 900 mm	DC servo motor 120 W
GFV 4473	1,160 x 1,010 x 1,815 mm	440 x 730 x 160 mm	210 mm	750 x 900 mm	DC servo motor 120 W

Ordering data

Item no.	Description	Ball screw drive (mm)	Notice
274400 8301	GFS 4433	16 x 10	-
274400 8302	GFS 4433	16 x 5	-
274400 8311	GFS 4433	16 x 10	Without protective hood (OEM version)
274400 8312	GFS 4433	16 x 5	Without protective hood (OEM version)
274401 0401	GFS 4473	16 x 10	-
274401 0402	GFS 4473	16 x 5	-
274401 0411	GFS 4473	16 x 10	Without protective hood (OEM version)
274401 0412	GFS 4473	16 x 5	Without protective hood (OEM version)
274400 8501	GFV 4433	16 x 5	-
274400 8511	GFV 4433	16 x 5	Without protective hood (OEM version)
274401 0001	GFV 4473	16 x 5	-
274401 0011	GFV 4473	16 x 5	Without protective hood (OEM version)

X/Y/Z CNC Base Units

Series GFV/GFY
isy®-CAM 2.5 light

Illustration: CNC base unit as milling application

The isel-CNC base units of the series GFV and GFY are stable C-frame-type CNC machines made of aluminium special profiles.
All linear axes of the linear units LF 5 (x- and z-axis) and LF 6 (y-axis) that are use here run on grinded steel shafts with linear ball bearings.
Clearance-free ball screw drives with hardened and polished 5/8"-16 spindles with a pitch of, optionally, 2.5/4/5 or 10 mm are used as drives. The linear axes are driven by powerful and robust DC or AC servo motors in easy-to-maintain drive modules.
The machine table, which is firmly screwed with the underframe, is made of plan-milled precision T-nut profiles. It provides optimal clamping possibilities for the most different and workpiece holders and devises.
The underframe is a honeycomb construction made of stable aluminium panel profiles and aluminium pillar profiles.
The protective hood, which features Perspex-lined glass and aluminium profiles, constitutes a closed working room.

When the sliding doors with security locking are open, the entire width of the working room can be used to load and unload.

The isel-CNC base units of the series GFV and GFY are ideal for individually assembling applications in the fields: positioning, milling/drilling, graving, laser beam processing, water jet cutting, dosing, screwing, measuring, etc.
The control cabinet which is attached to the machine provides enough space for the control of up to seven axes. An extension by means of additional modules is easily possible.

The modern PC-based CAN-CNC control for Windows NT/200/XP offers highest ease of use and performance. Because of the two-wire technique, the assembly of special machines with individual attachment parts is easily possible without great wiring effort.
The plant can be operated with the user-friendly isel-machine terminal with integrated PC.

X/Y/Z CNC Base Units

Series GFV/GFY
isy®-CAM 2.5 light

Common data/characteristics of the X/Y/Z CNC base units

Effective travel ranges:	from 440 x 480 mm to 1,380 x 2,480 mm, z-axis 220 or 300 mm
Clamping surface:	from 625 x 1,100 mm to 1,500 x 3,050 mm
Portal passage:	optionally 235 mm or 435 mm
Drive system:	DC (series GFV) or AC (series GFY) servo drives, precision ball screw spindle
Travel speeds:	8 m/min (series GFV); 12 m/min (series GFY)
Repeatability depending:	on the assembly of the plants; on average approx. 0.02 mm
Weight:	450 kg to 650 kg

CNC control (optional)
The isel-CAN-CNC control is used for the isel-CNC base units of the series GFV/GFY.

- PC-based CNC control for Windows NT/2000/XP
- CAN bus as field bus for the communication between CNC PC and drives as well as peripheral devices such as I/O, operating panel
- Midget dongle at the parallel port or PCI plug-in card serve as CAN interface
- Up to 6-axis interpolation (linear, circular, helix)
- Up to 127 CAN modules as auxiliary axis, I/O, frequency converter
- Look-ahead track handling
- Efficient and easy-to-use operating and programming surface WinRemote, ProNC
- Multi-channel technique (control of up to 4 CNC machines by means of one PC)

Control cabinet (optional)
The control cabinet with the isel-CAN-CNC control includes all drive components for the control of up to 7 CNC axes, a frequency converter, as well as all peripheral devices in a clearly arranged and easy-to maintain manner. Extensions are easily possible.

Machine terminal (optional)
Ideally, the machine is operated by means of an isel-machine terminal with integrated PC.

Further OEM options
Depending on the application, the following options can be offered together with the GFV-SW machine:

- milling motor/main spindle drive: power up to 2.2 kW and revolution up to 40,000 rpm
- automatic tool changer for up to 10 tools
- different cooling and spraying systems
- rotary axis for the cylinder machining or further auxiliary axes
- working room lighting
- machine without encasement
- outside-located limit switches

The control of all additional components is already integrated into our software.

Ordering data

	Item no..	Dimensions (W x D x H)	Travel ranges (X x Y x Z)	Passage height	Clamping surface (W x D at approx. 800 mm altitude)
GFV 48/52-SW with protective hood	274 551 0011	1,440 x 1,320 x 1,890 mm	480 x 520 x 220 mm	235 mm	625 x 1,100 mm
GFV 102/72-SW with protective hood	274 552 0011	2,084 x 1,584 x 1,890 mm	1,020 x 720 x 220 mm	235 mm	1,125 x 1,300 mm
GFV 102/112-SW with protective hood	274 553 0011	2,084 x 1,984 x 1,890 mm	1,020 x 1,120 x 220 mm	235 mm	1,125 x 1,700 mm
GFV 142/112-SW with protective hood	274 554 0011	2,459 x 1,984 x 1,890 mm	1,420 x 1,120 x 220 mm	235 mm	1,500 x 1,700 mm
GFV 142/162-SW with protective hood	274 555 0011	2,459 x 2,484 x 1,890 mm	1,420 x 1,620 x 220 mm	235 mm	1,500 x 2,200 mm
GFV 142/252-SW with protective hood	274 556 0011	2,459 x 3,384 x 1,890 mm	1,420 x 2,520 x 220 mm	235 mm	1,500 x 3,050 mm

Option: Series GFY upon request

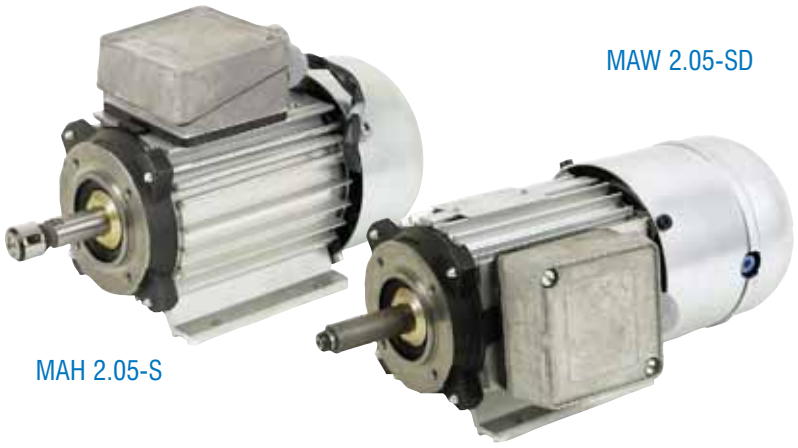
Passage height optionally 435 mm

systems

Main Spindle Drives - Asynchronous

HSAH 2.05-SF
HSAW 2.05-SDF

Spindle motor



MAW 2.05-SD

MAH 2.05-S

- Nominal power output **500 W**
- Speed range **300...24,000 min^{-1}**
- Nominal torque **0.26 Nm**
- Tool changing
  manually with collets (MAH 2.05-S)
  and/or directly with pneumatic lifting cylinder
  (MAW 2.05-SD)
- Overall size **56**

Technical data

Description	Item no. (high-strength cable gland)	Item no. (circular plug-in connector)	Speed range min^{-1}	Number of poles	Nominal voltage	Nominal power output kW (S6-40%)	Nominal speed min^{-1}	Continuous output S1 kW	Concentricity 1/100 mm	Weight kg	Recommended converter
MAH 2.05-S	477505 1124	477505 3124	300-24,000	2	3 x 210 V	0.50	18,000	0.30	2.0	4.0	F5 upon request
MAW 2.05-SD	477505 1224	477505 3224	300-24,000	2	3 x 210 V	0.50	18,000	0.30	2.0	4.0	F5 upon request

Collets 3 mm are included in the spindle's scope of delivery

Main spindle drive

Description	Item no..
Main spindle drive HSAH 2.05-SF	310705 1511

The scope of delivery includes:

- spindle motor **MAH 2.05-S**
- frequency converter F5
- connecting line converter-motor (length = 8 m)
- hook spanner (width = 16-20)
- wrench (SW 13)
- collets (diameter = 3 mm)
- box nut

Main spindle drive

Description	Item no.
Main spindle drive HSAW 2.05-SDF	310705 2511

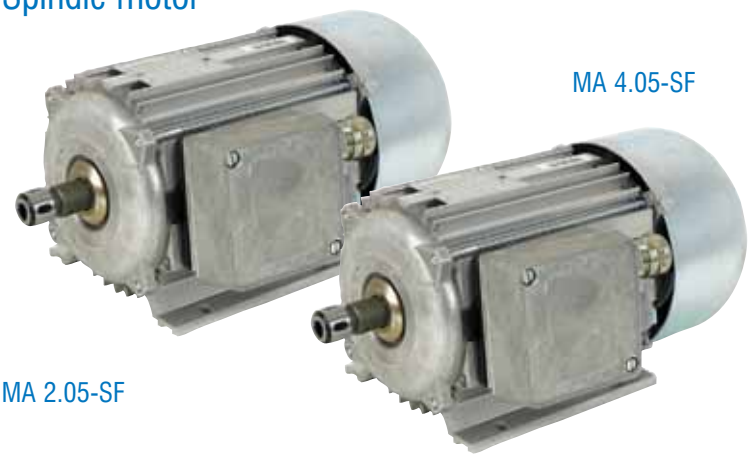
The scope of delivery includes:

- spindle motor **MAW 2.05-SD**
- frequency converter F5
- connecting line converter-motor (length = 8 m)
- throttle
- connecting panel
- collets (diameter = 3 mm)
- maintenance unit with pressure control
- air hose
- turn screws

Main Spindle Drives - Asynchronous

HSA 2.05-SF
HSA 4.05-SF

Spindle motor



- Nominal power output **650 / 400 W ***
- Speed range
  300...18,000 min^{-1} / 200...6,000 min^{-1} *
- Nominal torque **1.5 / 3.0 Nm ***
- Tool changing **manually with collets**
- Overall size **63**

* In each case, the first value applies for MA 2.05-S and the second value for MA 4.05-S

Technical data

Description	Item no. (high-strength cable gland)	Item no. (circular plug-in connector)	Speed range min^{-1}	Number of poles	Nominal voltage	Nominal power output kW (S6-40%)	Nominal speed min^{-1}	Continuous output S1 kW	Concentricity 1/100 mm	Weight kg	Recommended converter
MA 2.05-S	477605 1118	477605 3118	300-18,000	2	3 x 210 V	0.65	4,300	0.58	2.0	5.8	F5 upon request
MA 4.05-S	477605 1106	477605 3106	200-6,000	4	3 x 210 V	0.40	1,270	0.36	2.0	5.8	F5 upon request

Collets 6 mm are included in the spindle's scope of delivery

Main spindle drive

Description	Item no.
Main spindle drive HSA 2.05-SF	310706 1511

The scope of delivery includes:

- spindle motor **MA 2.05-S**
- frequency converter F5
- connecting line converter-motor (length = 8 m)
- hook spanner (width = 16-20)
- wrench (SW-13)
- collets (diameter = 6 mm)
- box nut

Main spindle drive

Description	Item no.
Main spindle drive HSA 4.05-SF	310706 1512

The scope of delivery includes:

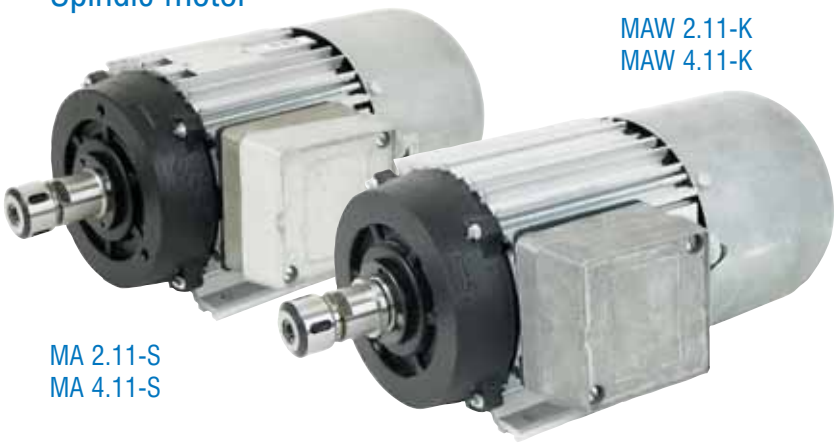
- spindle motor **MA 4.05-S**
- frequency converter F5
- connecting line converter-motor (length = 8 m)
- hook spanner (width = 16-20)
- wrench (SW-13)
- collets (diameter = 6 mm)
- box nut

systems

Main Spindle Drives - Asynchronous

HSA 2.11-SF HSAW 2.11-KF
HSA 4.11-SF HSAW 4.11-KF

Spindle motor



MAW 2.11-K
MAW 4.11-K

MA 2.11-S
MA 4.11-S

- Nominal power output **1,100 W**
- Speed range
  300...13,000 min^{-1} / 200...6,000 min^{-1} *
- Nominal torque **2.8 / 8.0 Nm ***
- Tool changing **manually with collets (-S)**
  and/or automatically (-K)
- Overall size **71**

* In each case, the first value applies for MA 2.11-S/MAW 2.11-K and the second value for MA 4.11-S/MAW 4.11-K

Technical data

Description	Item no. (high-strength cable gland)	Item no. (circular plug-in connector)	Speed range min^{-1}	Number of poles	Nominal voltage	Nominal power output kW (S 6-40%)	Nominal speed min^{-1}	Continuous output S1 kW	Concentricity 1/100 mm	Weight kg	Tool holder K=collets holder (SK 20) S=collets	Recommended converter
MA 2.11-S	477711 1113	477711 3113	300-13,000	2	3 x 210 V	1.1	4,200	0.75	2.0	11.0	S (ø 3-10 mm)*1	F5 upon request
MA 4.11-S	477711 1106	477711 3106	200-6,000	4	3 x 210 V	1.1	2,250	0.75	2.0	11.0	S (ø 3-10 mm)*1	F5 upon request
MAW 2.11-K	477711 1313	477711 3313	300-13,000	2	3 x 210 V	1.1	4,200	0.75	2.0	11.0	K (ø 3-12.7 mm)*2	F5 upon request
MAW 4.11-K	477711 1306	477711 3306	200-6,000	4	3 x 210 V	1.1	2,250	0.75	2.0	11.0	K (ø 3-12.7 mm)*2	F5 upon request

*1 Collets 6 mm are included in the spindle's scope of delivery

*2 Collets holder SK 20 with collets 6 mm is included in the spindle's scope of delivery

Main spindle drive

Description	Item no.
Main spindle drive HSA 2.11-SF	310711 1511
Main spindle drive HSA 4.11-SF	310711 1512

The scope of delivery includes:

- spindle motor **MA 2.11-S / MA 4.11-S**
- frequency converter F5
- connecting line converter-motor (length = 8 m)
- hook spanner
- wrench
- collets (diameter = 6 mm)
- box nut

Main spindle drive

Description	Item no.
Main spindle drive HSAW 2.11-KF	310711 3511
Main spindle drive HSAW 4.11-KF	310711 3512

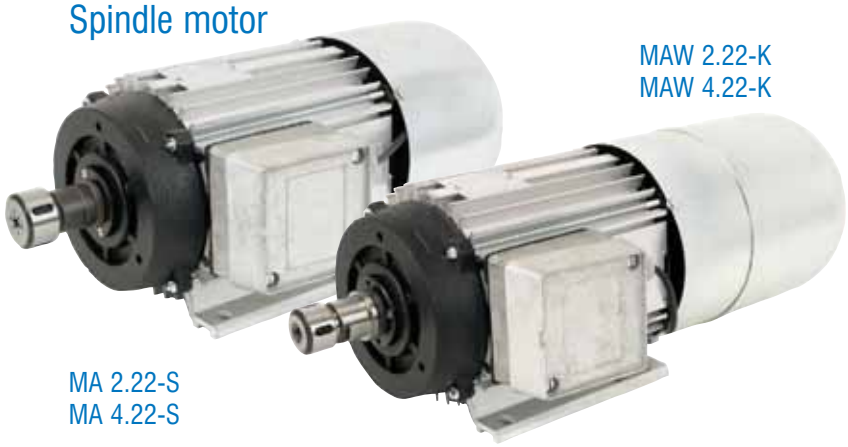
The scope of delivery includes:

- spindle motor **MAH 2.11-KF / MAW 4.11-K**
- frequency converter F5
- connecting line converter-motor (length = 8 m)
- throttle
- maintenance unit
- connecting panel
- air hose
- hook spanner
- wrench
- collets (diameter = 6 mm)
- collets holder

Main Spindle Drives - Asynchronous

HSA 2.22-SF HSAW 2.22-KF
HSA 4.22-SF HSAW 4.22-KF

Spindle motor



MAW 2.22-K
MAW 4.22-K

MA 2.22-S
MA 4.22-S

- Nominal power output **2,200 W**
- Speed range
  300...13,000 min^{-1} / 200...6,000 min^{-1} *
- Nominal torque **7.5 / 15.1 Nm ***
- Tool changing **manually with collets (-S)**
  and/or **automatically (-K)**
- Overall size **80**

* In each case, the first value applies for MA 2.22-S/MAW 2.22-K and the second value for MA 4.22-S/MAW 4.22-K

Technical data

Description	Item no. (high-strength cable gland)	Item no. (circular plug-in connector)	Speed range min^{-1}	Number of poles	Nominal voltage	Nominal power output kW (S6-40%)	Nominal speed min^{-1}	Continuous output S1 kW	Concentricity 1/100 mm	Weight kg	Tool holder K=collets holder (SK 20) S=collets	Recommended converter
MA 2.22-S	477822 1113	477822 3113	300-13,000	2	3 x 400 V	2.2	4,500	1.5	2.0	18.0	S (ø 3-12.7 mm)*1	F5 upon request
MA 4.22-S	477822 1107	477822 3107	200-6,000	4	3 x 400 V	2.2	2,250	1.5	2.0	18.0	S (ø 3-12.7 mm)*1	F5 upon request
MAW 2.22-K	477822 1313	477822 3313	300-13,000	2	3 x 400 V	2.2	4,500	1.5	2.0	18.0	K (ø 3-12.7 mm)*2	F5 upon request
MAW 4.22-K	477822 1307	477822 3307	200-6,000	4	3 x 400 V	2.2	2,250	1.5	2.0	18.0	K (ø 3-12.7 mm)*2	F5 upon request

*1 Collets 6 mm are included in the spindle's scope of delivery

*2 Collets holder SK 20 with collets 6 mm is included in the spindle's scope of delivery

Main spindle drive

Description	Item no.
Main spindle drive HSA 2.22-SF	310722 1511
Main spindle drive HSA 4.22-SF	310722 1512

The scope of delivery includes:

- spindle motor **MA 2.22-S / MA 4.22-S**
- frequency converter F5
- connecting line converter-motor (length = 8 m)
- hook spanner
- wrench
- collets (diameter = 6 mm)
- box nut

Main spindle drive

Description	Item no.
Main spindle drive HSAW 2.22-KF	310722 3511
Main spindle drive HSAW 4.22-KF	310722 3512

The scope of delivery includes:

- spindle motor **MAW 2.22-K / MAW 4.22-K**
- frequency converter F5
- connecting line converter-motor (length = 8 m)
- throttle
- maintenance unit
- connecting panell
- air hose
- hook spanner
- wrench
- collets (diameter = 6 mm)
- collets holder

systems

Main Spindle Drives HF

HSFW 150 - HSK 25

Spindle motor

HSFW 150 - HSK 25

Main spindle drive

Description	Item no.
Main spindle drive HSFW 150-HSK 25	310815 3511

The scope of delivery includes:

- spindle motor **ES 325**
- frequency converter
- connecting line converter-motor (length = 8 m)
- maintenance unit
- connecting panel
- throttle
- pressure reducing valve
- air hose (16 m)
- collets (diameter = 6 mm)
- strain relief

Technical data

Description	Item no. (high-strength cable gland)	Nominal speed **min⁻¹**	Nominal power output **kW** (S1)	Coil voltage **V**	Nominal current **A**	Max. power output **kW**	Cooling S=ram air	Weight **kg**	Tool holder Collets holder (SK30) Clamping range	Recommended converter
ES 325	478015	40,000	1.5	380 V	4.0	1.5	S	6.5	K (ø 1-10 mm)	F5 upon request

Main Spindle Drives - Accessory

UFM 500
UFM 1050

Universal milling/drilling motors

UFM 500

- Input power **500 W**
- Output power **345 W**
- Torque **0.14 Nm**

UFM 1050

- Input power **1050 W**
- Output power **720 W**
- Torque **0.32 Nm**

Technical data

	Item no.	Load speed min^{-1}	Voltage V	Degree of efficiency %	Input power W	Output power W	Torque Nm
UFM 500	420003 0500	22,600	230	68	500	345	0.14
UFM 1050	420003 1050	21,000	230	71	1050	720	0.32
UFM 500-11	420003 0501	22,600	115	68	500	345	0.14
UFM 1050-11	420003 1051	21,000	115	71	1050	720	0.32

Clamping blocks

Clamping blocks	Item no.
Fixings Ra 100 and Ra 150 mm	290 902
Fixing Ra 100 mm	290 903
Fixing Ra 125 mm	290 904

Main Spindle Drives - Accessory

Tool-changing station for HSAW spindle motors

Scope of delivery:

- pneumatic connecting panel
- hose, 3 m
- tool-changing station (without collets holder)

Tool-changing station	Item no.
Tool-changing station x4	239011 0040
Tool-changing station x5	239011 0050
Tool-changing station x10	239011 0100

Collets holding individually	Item no.
SK 20 (collets 3-10 mm)	239122
SK 20 (collets 3-12.7 mm)	239122 9000

Linear changer HSK 25 for HSFW-150 spindle motor

Scope of delivery:

- pneumatic connecting panel
- hose, 3 m
- tool-changing station (without collets holder)

Tool-changing station	Item no.
Tool-changing station x5	239011 0051
Tool-changing station x10	239011 0101

Collets holding individually	Item no.
HSK E25 (collets 1-10 mm)	477125

Direct tool changer for HSAW 2.05-SDF upon request

Main Spindle Drives - Accessory

Collets -S

MAH 2.05-S, MA 2.05-S, MA 4.05-S

Ø (mm)	Item no.
1.0	239110 1000
1.5	239110 1500
2.0	239110 2000
2.5	239110 2500
3.0	239110 3000
3.175 (1/8“)	239110 3175
3.5	239110 3500
4.0	239110 4000
4.5	239110 4500
5.0	239110 5000
5.08 (1/5“)	239110 5080
5.5	239110 5500
6.0	239110 6000
6.35 (1/4“)	239110 6350

MA 2.11-S, MA 4.11-S

Ø (mm)	Item no.
3.0	239120 3000
3.175 (1/8“)	239120 3175
4.0	239120 4000
5.0	239120 5000
6.0	239120 6000
8.0	239120 8000
10.0	239120 0100

MA 2.22-S, MA 4.22-S

Ø (mm)	Item no.
3.0	239115 3000
3.175 (1/8“)	239115 3175
4.0	239115 4000
5.0	239115 5000
6.0	239115 6000
8.0	239115 8000
10.0	239115 0100
12.0	239115 0120
12.7	239115 0127

Collets for collets holder HSK E25

Collets holder Item no. 477125

Ø (mm)	Item no.
1.0	477125 8010
1.5	477125 8015
2.0	477125 8020
2.5	477125 8025
3.0	477125 8030
4.0	477125 8040
5.0	477125 8050
6.0	477125 8060
7.0	477125 8070
8.0	477125 8080
9.0	477125 8090
10.0	477125 8100

Collets -SD

MAW 2.05-SD

Ø (mm)	Item no.
3.0	239140 3000
3.175 (1/8“)	239140 3175
6.0	239140 6000
6.35 (1/4“)	239140 6350

Collets for collets holder SK 20/SK 30

collets holder Item no. 239122

Ø (mm)	Item no.
3.0	239120 3000
3.175 (1/8“)	239120 3175
4.0	239120 4000
5.0	239120 5000
6.0	239120 6000
8.0	239120 8000
10.0	239120 0100

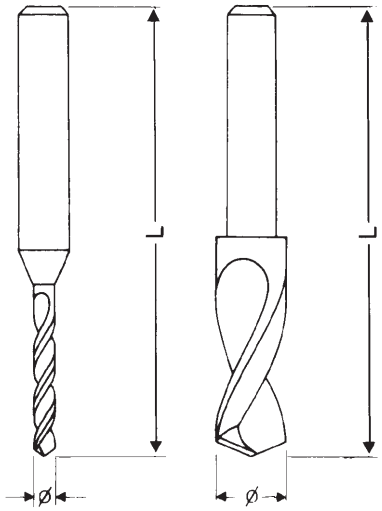
collets holder Item no. 239122 9000

Ø (mm)	Item no.
3.0	239115 3000
3.175 (1/8“)	239115 3175
4.0	239115 4000
5.0	239115 5000
6.0	239115 6000
8.0	239115 8000
10.0	239115 0100
12.0	239115 0120
12.7	239115 0127

collets holder Item no. 239130

Ø (mm)	Item no.
3.0	239130 3000
3.175 (1/8“)	239130 3175
4.0	239130 4000
5.0	239130 5000
6.0	239130 6000
6.35 (1/4“)	239130 6350
8.0	239130 8000
10.0	239130 0100
12.0	239130 0120
12.7	239130 0127
16.0	239130 0160

Full-carbide spiral drills



The full-carbide spiral drills are used for the handling of base material for printed circuit boards, especially for epoxy-glass reinforced laminate.

They offer a long service life, an outstanding cutting characteristics, as well as constant and unvarying hole quality and/or contours.

The full-carbide spiral drills have a high precision regarding the external diameter, a precise nose concentricity, and highest grinding quality regarding the external diameter, the chip flute as well as the nose angle.
The nose angle amounts to 130°; drills from Ø 3.1 mm upwards feature a nose angle of 165°. Midget drills up to Ø 3 mm are delivered with a reinforced cylindrical shank.

Drill

- Shank diameter 3 mm
- Overall length L = 38 mm

Unit package

Item no.	Ø mm	Item no.	Ø mm
400 100 5001	0.5	400 103 6001	3.6
400 100 6001	0.6	400 103 7001	3.7
400 100 7001	0.7	400 103 8001	3.8
400 100 8001	0.8	400 103 9001	3.9
400 100 9001	0.9	400 104 0001	4.0
400 101 0001	1.0	400 104 1001	4.1
400 101 1001	1.1	400 104 2001	4.2
400 101 2001	1.2	400 104 3001	4.3
400 101 3001	1.3	400 104 4001	4.4
400 101 4001	1.4	400 104 5001	4.5
400 101 5001	1.5	400 104 6001	4.6
400 101 6001	1.6	400 104 7001	4.7
400 101 7001	1.7	400 104 8001	4.8
400 101 8001	1.8	400 104 9001	4.9
400 101 9001	1.9	400 105 0001	5.0
400 102 0001	2.0	400 105 1001	5.1
400 102 1001	2.1	400 105 2001	5.2
400 102 2001	2.2	400 105 3001	5.3
400 102 3001	2.3	400 105 4001	5.4
400 102 4001	2.4	400 105 5001	5.5
400 102 5001	2.5	400 105 6001	5.6
400 102 6001	2.6	400 105 7001	5.7
400 102 7001	2.7	400 105 8001	5.8
400 102 8001	2.8	400 105 9001	5.9
400 102 9001	2.9	400 106 0001	6.0
400 103 0001	3.0		
400 103 1001	3.1		
400 103 2001	3.2		
400 103 3001	3.3		
400 103 4001	3.4		
400 103 5001	3.5		

Drill

- Shank diameter 1/8"
- Overall length L = 38 mm

Ten-package

Item no.	Ø mm	Item no.	Ø mm
400 200 5001	0.5	400 203 6001	3.6
400 200 6001	0.6	400 203 7001	3.7
400 200 7001	0.7	400 203 8001	3.8
400 200 8001	0.8	400 203 9001	3.9
400 200 9001	0.9	400 204 0001	4.0
400 201 0001	1.0	400 204 1001	4.1
400 201 1001	1.1	400 204 2001	4.2
400 201 2001	1.2	400 204 3001	4.3
400 201 3001	1.3	400 204 4001	4.4
400 201 4001	1.4	400 204 5001	4.5
400 201 5001	1.5	400 204 6001	4.6
400 201 6001	1.6	400 204 7001	4.7
400 201 7001	1.7	400 204 8001	4.8
400 201 8001	1.8	400 204 9001	4.9
400 201 9001	1.9	400 205 0001	5.0
400 202 0001	2.0	400 205 1001	5.1
400 202 1001	2.1	400 205 2001	5.2
400 202 2001	2.2	400 205 3001	5.3
400 202 3001	2.3	400 205 4001	5.4
400 202 4001	2.4	400 205 5001	5.5
400 202 5001	2.5	400 205 6001	5.6
400 202 6001	2.6	400 205 7001	5.7
400 202 7001	2.7	400 205 8001	5.8
400 202 8001	2.8	400 205 9001	5.9
400 202 9001	2.9	400 206 0001	6.0
400 203 0001	3.0	400 206 1001	6.1
400 203 1751	3.175	400 206 2001	6.2
400 203 2001	3.2		
400 203 3001	3.3		
400 203 4001	3.4		
400 203 5001	3.5		

Drill

- Shank diameter 3 mm
- Overall length L = 38 mm

Unit package

Item no.	Ø mm	Item no.	Ø mm
400 100 5002	0.5	400 101 1002	1.1
400 100 6002	0.6	400 101 2002	1.2
400 100 7002	0.7	400 101 3002	1.3
400 100 8002	0.8	400 101 4002	1.4
400 100 9002	0.9	400 101 5002	1.5
400 101 0002	1.0		

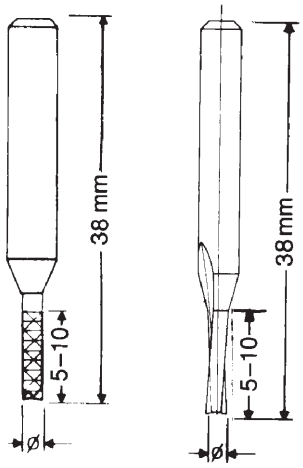
Drill

- Shank diameter 3 mm
- Overall length L = 38 mm

Ten-package

Item no.	Ø mm	Item no.	Ø mm
400 200 5002	0.5	400 201 1002	1.1
400 200 6002	0.6	400 201 2002	1.2
400 200 7002	0.7	400 201 3002	1.3
400 200 8002	0.8	400 201 4002	1.4
400 200 9002	0.9	400 201 5002	1.5
400 201 0002	1.0		

Full-carbide cutters



Full-carbide cutters are used for the contour and contact milling of base material and aluminium. They have a high concentricity, running smoothness and lifetime.

Spiral-geared cutters with five blades and cutting bit are primarily used for the contact milling (cutting) of printed circuit boards.

Cutters with two blades and spearhead are used for graving purposes (production of circuit paths, interruption of circuit paths). The milling width is fixed by the preset depth of the spearhead.

Spiral-grooved cutters with two blades and a cutting bit are primarily used for the contact milling (cutting) of aluminium plates. The service life of this cutter is nearly unlimited when spirit is used as lubricant.

Cutter

- Five edged
- Spiral-geared
- Shank diameter 3 mm
- Overall length L = 38 mm

Unit package

Item no.	Ø mm	Item no.	Ø mm
402 101 0001	1.0	402 102 0001	2.0
402 101 2001	1.2	402 102 4001	2.4
402 101 5001	1.5	402 103 0001	3.0

Ten-package

Item no.	Ø mm	Item no.	Ø mm
402 101 0002	1.0	402 102 0002	2.0
402 101 2002	1.2	402 102 4002	2.4
402 101 5002	1.5	402 103 0002	3.0

Cutter

- Two edged
- Spiral-grooved
- Shank diameter 3 mm
- Overall length L = 38 mm

Unit package

Item no.	Ø mm
403 102 0001	2.0
403 102 4001	2.4
403 103 0001	3.0

Ten-package

Item no.	Ø mm
403 102 0002	2.0
403 102 4002	2.4
403 103 0002	3.0

Cutter

- Two edged
- Spearhead
- Shank diameter 3 mm
- Overall length L = 30 mm

Unit package

Item no.	Ø mm
404 101 0001	1.0
404 101 2001	1.2
404 101 5001	1.5

Ten-package

Item no.	Ø mm
404 101 0002	1.0
404 101 2002	1.2
404 101 5002	1.5

Cutter

- Five edged
- Spiral-geared
- Shank diameter 1/8"
- Overall length L = 38 m

Unit package

Item no.	Ø mm	Item no.	Ø mm
402 201 0001	1.0	402 202 0001	2.0
402 201 2001	1.2	402 202 4001	2.4
402 201 5001	1.5	402 203 1751	3.175

Ten-package

Item no.	Ø mm	Item no.	Ø mm
402 201 0002	1.0	402 202 0002	2.0
402 201 2002	1.2	402 202 4002	2.4
402 201 5002	1.5	402 203 1752	3.175

Cutter

- Two edged
- Spiral-grooved
- Shank diameter 1/8"
- Overall length L = 38 mm

Unit package

Item no.	Ø mm
403 202 0001	2.0
403 202 4001	2.4
403 203 1751	3.175

Ten-package

Item no.	Ø mm
403 202 0002	2.0
403 202 4002	2.4
403 203 1751	3.175

Cutter

- Two edged
- Spearhead
- Shank diameter 1/8"
- Overall length L = 30 mm

Unit package

Item no.	Ø mm
404 201 0001	1.0
404 201 2001	1.2
404 201 5001	1.5

Ten-package

Item no.	Ø mm
404 201 0002	1.0
404 201 2002	1.2
404 201 5002	1.5

Index

Index

Index

M

O

P

Index

Order

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Order processing
Buergermeister-Ebert-Straße 40

D-36124 Eichenzell

Phone: +49 (0)6659/981-0
Fax: +49 (0)6659/981776

Sender

Customer no.:

Company

Department/name

Street

Post code/place

Your item number

Your telephone no.: Fax no.:

Your e-mail address:

Amount	Item no.	Item description	Unit price

I order the afore-mentioned articles according to your sales, order and payment conditions.

Date

Company stamp/signature

General Terms and Conditions

1. Scope
The following terms of delivery and payment settle the legal relations between our customers and us. In the event of a customer setting differing conditions, which we do not expressly acknowledge in writing, these are not binding, even though we may not explicitly raise an objection. Other agreements, modifications and accessory agreements all require our confirmation in writing.

2. Offer and confirmation of order
Our offers are non-binding. The scope of our service obligation is only fixed by means of our written confirmation of order. All data, such as illustrations, drawings, indications of dimensions and weight, that underlie the offer or the confirmation of order are normally to be understood as approximate values, except when they are expressly referred to as binding.

3. Copyright and property rights with respect to drawings, etc.
We reserve our propriety rights with respect to drawings, sketches, cost estimates and other data that are attached to our offers and confirmations of order. The customer shall only use them for the purpose agreed upon and he shall not reproduce them or make them available to a third party without our prior consent. The original data and all copies made of them shall be given back to us on demand.

4. Prices and terms of payment
Our prices are quoted ex works, including VAT corresponding to the current legal percentage, and excluding packaging costs. The packaging costs are calculated by us.
All orders underlie the prices and discounts that are valid at the time of delivery. Principally, the calculation takes place in Euro, and the invoices also have to be settled in Euro. Principally, deliveries only take place against payment on delivery or advance payment.
Deliveries on account have to be agreed upon expressly. Only those terms that have been agreed upon in the confirmation of order are valid. Payments are considered effected not before the day on which the seller is able to dispose of the invoice amount without loss.
At default of payment, reserving the claim of further damage, default charges in the amount of 5% above the discount rate of the Deutsche Bundesbank have to be paid.
All of our claims become due immediately if a payment date is not met, or if the purchaser breaches other contractual agreements, or if we become aware of any circumstances that could reduce the purchaser's creditworthiness. In addition, in such cases, we are entitled to execute outstanding deliveries only against advance payment or by way of security, and to withdraw from contract after the expiration of an appropriate extension of time, or to demand compensation for breach of contract.
Moreover, we are entitled to forbid the resale of goods that have been delivered subject to reservation of title, to claim their restitution or the assignment of the collateral property at the expense of the purchaser, or to countermand a direct debit mandate.
The above-mentioned discounts are not allowed in the event of the purchaser being in arrears with payment for previous deliveries.
The right to refuse performance on the part of the purchaser is excluded with regard to business transactions with traders. The purchaser has no right of retention. This does not apply with regard to business transactions with non-traders, as far as the counterclaim results from the same contract. An offset on the part of the purchaser is only valid as far as his counterclaims are expressly declared unquestionable or as far as they are legally justified.
We are not obliged to accept bills of exchange.

5. Reservation of title
Until all of the claims the seller is entitled to due to the sales contract are settled, the object of purchase remains the property of the seller.
In the event of the purchasers being corporate bodies under public law, funds assets subject to public law, or contractors that are exercising their commercial or independent functions at the completion of the contract, the reservation of title also continues to exist with regard to claims, resulting from the current business relationship, of the seller against the purchaser until the claims the seller is entitled to in connection with the purchase are settled.
On the purchaser's demand, the seller is obliged to abandon the reservation of title if the purchaser has unimpeachably settled all claims connected with the object of purchase and if an appropriate security with regard to the remaining claims resulting from current business relationships exists.
In the event of the purchaser being in arrears, the seller is entitled to withdraw from the sales contract.
If the seller is additionally entitled to claim for damages instead for performance and he takes back the object of purchase, the seller and the purchaser agree that the seller pays the usual sales value of the object of purchase on the date of redemption.
As long as the reservation of title exists, the purchaser shall neither dispose of the object of purchase nor, by contract, allow third parties to use it.

6. Dispatch and delivery
In the event of the goods being forwarded, we are entitled to choose the means of transportation and the dispatch route without any liability. This exemption is not valid if, in the course of a business transaction with traders, one of our executive employees, or, in the course of a business transaction with non-traders, one of our employees has acted with gross negligence.
When the objects of purchase are handed over to the forwarding agent, the carrier or the customer as collector, or when the objects of purchase leave the factory or the warehouse, any risk is transferred to the purchaser.
In the event of delivery including mounting or installation, the risks are transferred on the day of absorption in the purchaser's own factory, or, if agreed, after a flawless trial operation. In the event of the dispatch, delivery, start, execution of the mounting or installation, absorption in the own factory, or the trial operation being delayed due to reasons the purchaser is responsible for, or in the event of the purchaser defaulting the acceptance due to other reasons, the risk is transferred to the purchaser. Provided there is not any restraint on the part of the purchaser, we take out a transport insurance for all delivered goods, which is charged to the purchaser's account.
The minimum order value with respect to dispatch orders amounts to 50 EURO (excl. VAT) at home, and 500 EURO abroad. For retail dispatches and/or orders below the minimum order value, handling expenses amounting to 10 EURO (excl. VAT), in addition to packing and delivery costs, are charged. Dispatch orders abroad that are below the abovementioned minimum order value are not executed.
Orders of special models as well as orders including quantities and dimensions that are not listed in our catalogue shall be approved in writing. If necessary, an agreed down payment has to be made. In the event of orders of special models and in great quantities being accepted, we are not entitled to deliver less or more than an appropriate number of items ($\pm$ 10%, as a rule).
In principle, dispatch packages are calculated at cost price.

7. Delivery time
The terms of delivery are executed as soon as we confirm the order, but not before all realisation details are clarified.
The agreed terms of delivery are extended - irrespective of our rights resulting from the default of the purchaser - for the term the purchaser is in arrays with this transaction or another. This applies mutatis mutandis if a date of delivery is agreed upon.
In the event of a default on our part, the purchaser has to set an appropriate extension of time. After the expiration of this extension of time, the purchaser is entitled to withdraw from contract if he has not been notified that the goods are ready for delivery.
Damages for non-compliance with terms or dates of delivery are excluded.
This exemption is not valid if, in the course of a business transaction with traders, one of our executive employees, or, in the course of a business transaction with non-traders, one of our employees has acted with gross negligence.
Events due to force majeure enable us to delay the delivery for the time of the restraint and an appropriate starting time, or to withdraw from that part of the contract which has not yet been fulfilled. Events of force majeure also include strikes, lockouts, and other circumstances that make a delivery significantly difficult or impossible. This also applies to events of force majeure that take place at a sub-contractor level.
The purchaser is entitled to demand a further explanation from us as to whether we want to withdraw or still deliver within an appropriate period of time. In the event of us not offering an explanation, he is entitled to withdraw. Terms of delivery are considered met if the goods leave our factory at due date. Partial deliveries are allowed.

8. Impossibility, adjustment of contract
In the event of impossibility or an adjustment of contract, the following applies, if the contract party is a trader:
In the event of the supplier or the purchaser not being able to execute the delivery or the performance that is incumbent upon him, the following general principles of law apply:
In the event of the impossibility being attributed to the supplier's fault, the purchaser is entitled to claim damages. However, the purchaser's claim for damages is limited to 10% of that part of the delivered goods or the performance that cannot be taken into an adequate operation due to the impossibility.
Claims for damages on the part of the purchaser that exceed the mentioned limit of 10% are excluded.
This does not apply in instances of intention or gross negligence.
The purchaser's right to withdraw from contract is not affected by the impossibility of delivery or performance.

9. Warranty
With regard to contracts with non-traders (end consumers), we guarantee that our products will work flawlessly for a period of two years after delivery. As for contracts with traders and/or companies, we guarantee that our products will work flawlessly for a period of one year.
The guarantee period for our milling spindles is six months. This period of warranty also applies to milling spindles that are integrated into a machine system.
The purchaser has to claim his right of complaint by mail within ten days after arrival of the goods at the place of destination. This only applies to business transactions with non-traders as far as apparent defects are involved. Notices of defects are only considered if the goods are in the same condition as on the day of delivery. We replace goods that we accept as imperfect by flawless goods. We are also entitled to the option of making up the difference in price. In the event of a rework or a replacement failing, non-traders are entitled, according to their own choice, to lower the payment or to cancel the contract. Further claims, including those concerning consequential damages, are excluded as far as these do not result from a promised feature's fault. It is only fair that on such occasions, the purchaser gives the supplier the necessary time and opportunity. In the event of him refusing to give the necessary time and opportunity, the supplier is freed from the responsibility for defects. A return of the faulty goods is only permitted with our approval. The purchaser has to pay for the freight charges. A reimbursement only takes place in the event of a justified notice of defects. In the event of the customer arranging for the delivered goods to be tested, and states a defect for which we were liable, we will account a processing fee for each tested appliance if it turns out that no defect exists.
Irrespective of the legal basis, we are only liable in instances of intent and gross negligence. We provide application-orientated advice to the best of our knowledge. However, all information about the suitability and application of our goods is not binding and does not exempt the purchaser from own tests and trials. The purchaser is solely responsible for ensuring that usage of the goods complies with legal and official regulations.
We only provide the purchaser with a guarantee that certain goods are suited to certain purposes if this is expressly promised in writing.
Returns have to be made in the original packaging or equivalent packaging.

10. Repairs
In the event of the purchaser wishing an estimate before repairs are carried out, this has to be stated expressly. Forwarding and packing charges shall be borne by the purchaser. The invoice amount for repairs has to be settled immediately and is strictly net. In principle, repairs, and also those within the scope of guarantees, take place in our plant, except where otherwise stipulated in writing.

11. Returns
The return of delivered goods is only possible following consultation and agreement, and after adequate deductions are charged. In principle, special models and software products are excluded from return.
The bill of lading and/or the copy of invoice have to be enclosed to all replies or returns. The return charges shall be borne by the purchaser and/or returns have to be delivered free.

12. Installation
Unless otherwise stipulated in writing, installation works have to be paid for.
In particular, installation charges include travelling expenses, daily accommodation allowance, as well as the usual rates for working time and allowances for extra, night and Sunday work and for work performed on public holidays, for works on aggravated conditions, and for planning and monitoring. We charge lead, travelling and waiting times separately. In the event of assembly or activation being delayed through no fault of ours, the customer has to pay for the waiting time and for any further travels necessary. At his charge, the customer provides the necessary personnel as well as the proper tools in the amount required. Moreover, the customer must provide rooms that sufficiently large, dry and lockable for storing machine parts, apparatus, materials, tools, etc. For the protection of our property and of the installation personnel, he has to take those measures that he would take for the protection of his own property. In the event of the nature of the customer's factory demanding special protective clothing and safety devices for the installation personnel, it is the customer's responsibility to provide them too.
Our installation personnel and their assistants are not entitled to carry out works that are not connected with the performance of our obligation to deliver and to assemble or install the delivery item or that are arranged by the customer or a third party without consultation. We are not liable for such works that do not belong to our field of responsibility.
In the event of the installation being carried out by the customer or by a third party that he has commissioned, our current operation and installation instructions have to be observed.

13. Data protection
In due consideration of the Federal Data Protection Act ("Bundesdatenschutzgesetz"), the seller stores and processes all data that are necessary to carry out the business relationship.

14. Place of performance and jurisdiction
The place of performance is Eichenzell and/or the external office and/or the branch/plant that is stated in the confirmation of order. In the event of our contract party being a trader, the place of jurisdiction is Fulda. This also applies to legal proceedings according to the Cheques Act.

15. Supplementary clause
German Law is applied exclusively, even with respect to deliveries abroad. The application of the UN Sales Law is expressly excluded.
In the event of our customers exporting our goods to countries outside the Federal Republic of Germany, we assume no liability if property rights of third parties are violated by our products. The purchaser is obliged to make up for the damages that we suffer due to the export of goods that we do not expressly deliver for export purposes. Should individual provisions of these Terms and Conditions be void, the validity of the remaining provisions is not affected by this. Together with the customer, we will replace void provisions by valid ones that are permitted by law and come nearest to the intended legal and economic purpose of the void provisions.
Modifications to and amendments of these General Terms and Conditions must be made in writing.

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iselautomation

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