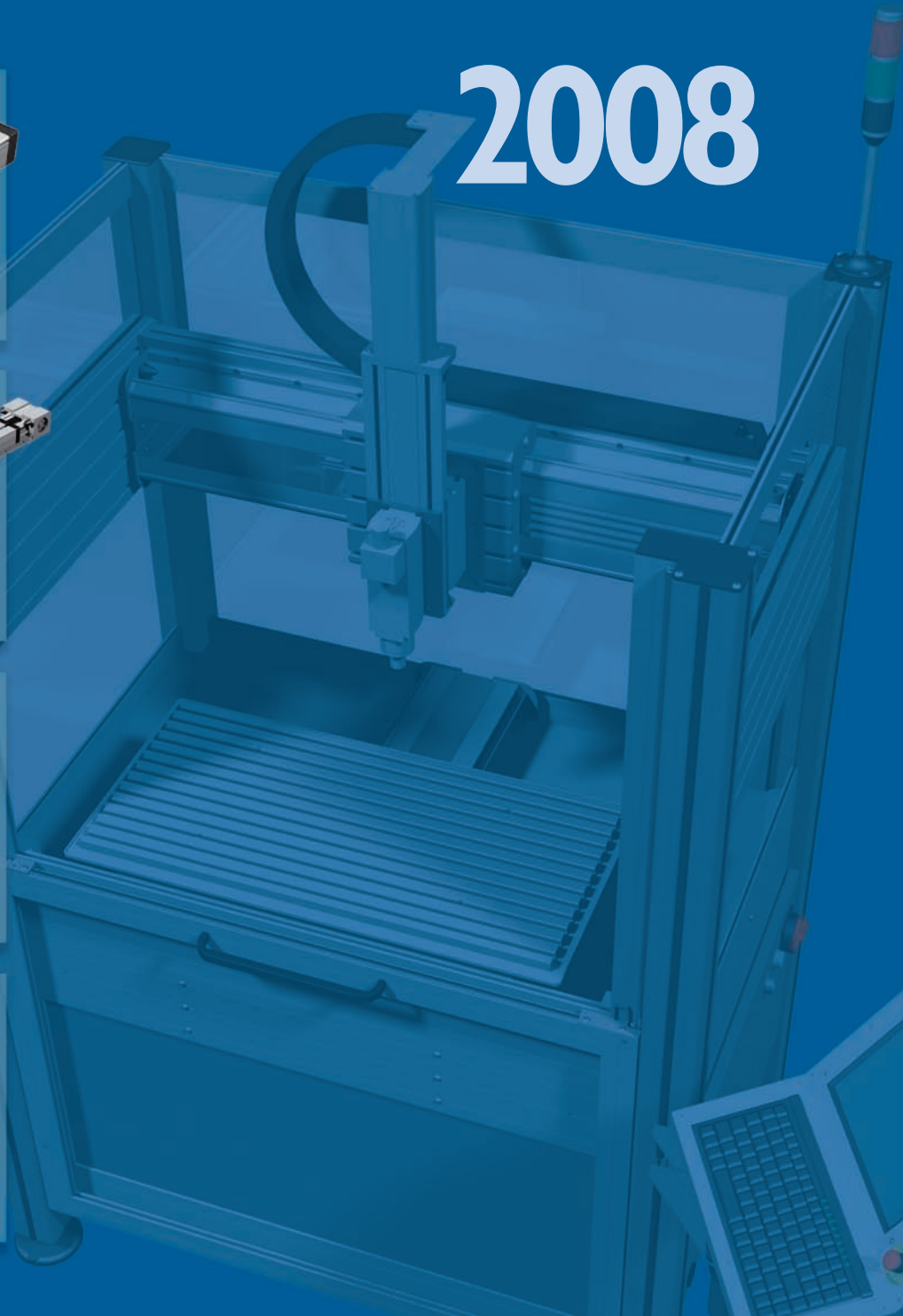
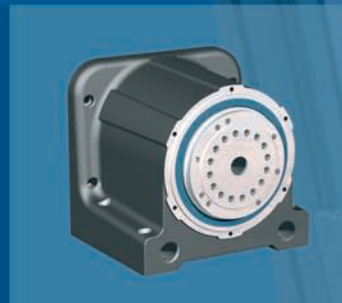
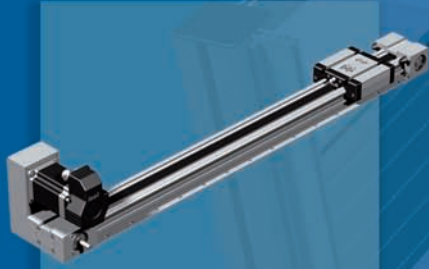
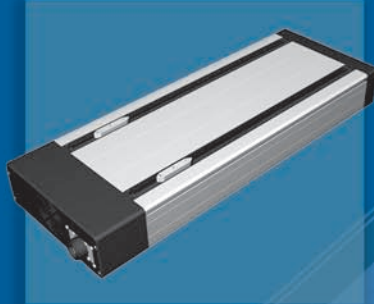


# AUTOMATION

ELECTRONICS | MECHANICS | SOFTWARE | SYSTEMS

# 2008



	GENERAL	
	ELECTRONICS	
	MECHANICS	
	SOFTWARE	
	SYSTEMS	

# **isel**automation

This general catalogue presents the complete production and sales programme of **iselautomation GmbH & Co. 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.

# **isel**automation

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All technical details and information are to the best of our knowledge. Within the scope of development we reserve the right to technical changes.  
All former catalogues are becoming invalid with the publication of this catalogue.

# The Company



Plant Dermbach



Plant Eichenzell

In 1972, **iselautomation GmbH & Co. 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 application fields using the isel product range.

**iselautomation GmbH & Co. KG** is located in Eichenzell, Hessen, and in Dermbach, Thuringia.

## Our company's aims

The main target of **iselautomation GmbH & Co. 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 GmbH & Co. KG** comprehensively covers the field of industrial automation with components and automation solutions.

The modular orientation of all **isel** components in the areas ELECTRONICS, MECHANICS, 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 GmbH & Co. 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.

**isel**automation

# 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.

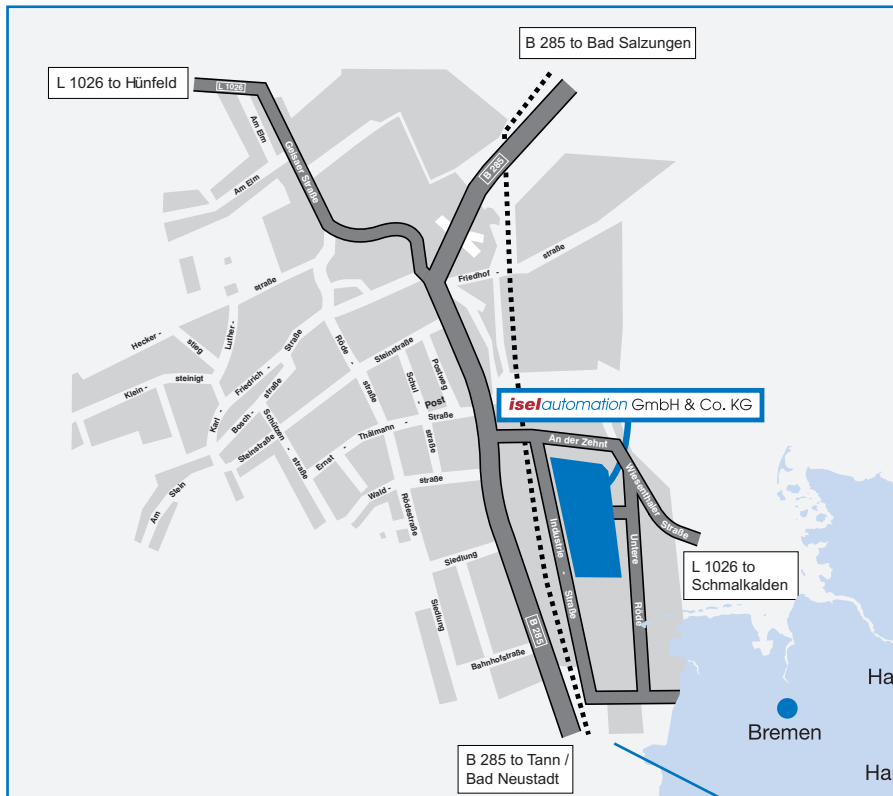
Ask for an appointment with one of our technical advisors. We look forward to your visit.



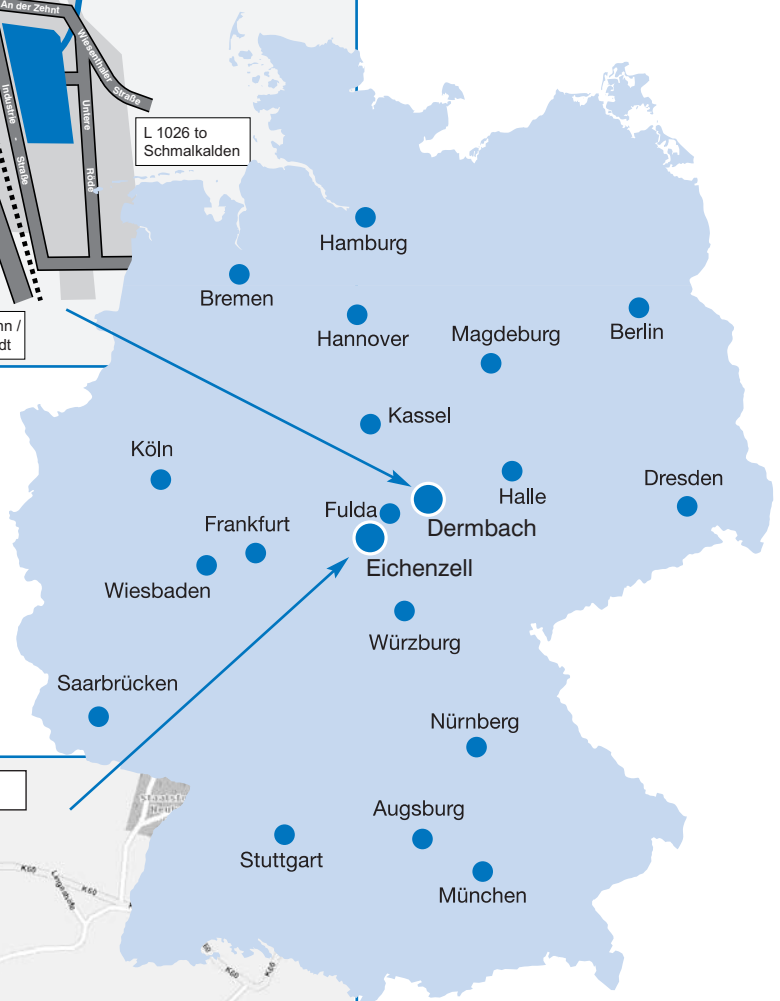
# How to Find Us

You can find us in the heart of Germany.

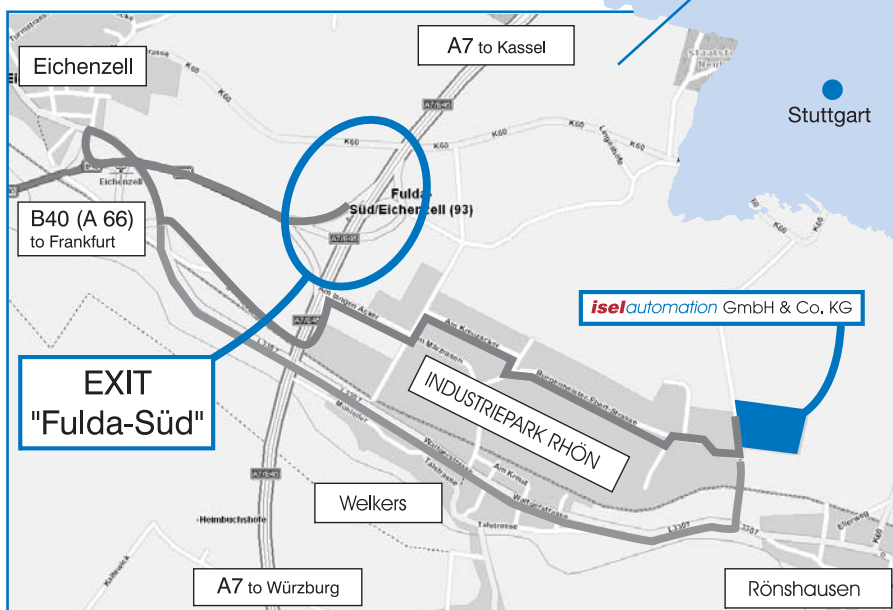
Dermbach is located at the B 285 between Bad Neustadt/Saale and Bad Salzungen, respectively at the L 1026 between Hünfeld and Schmalkalden.



Dermbach

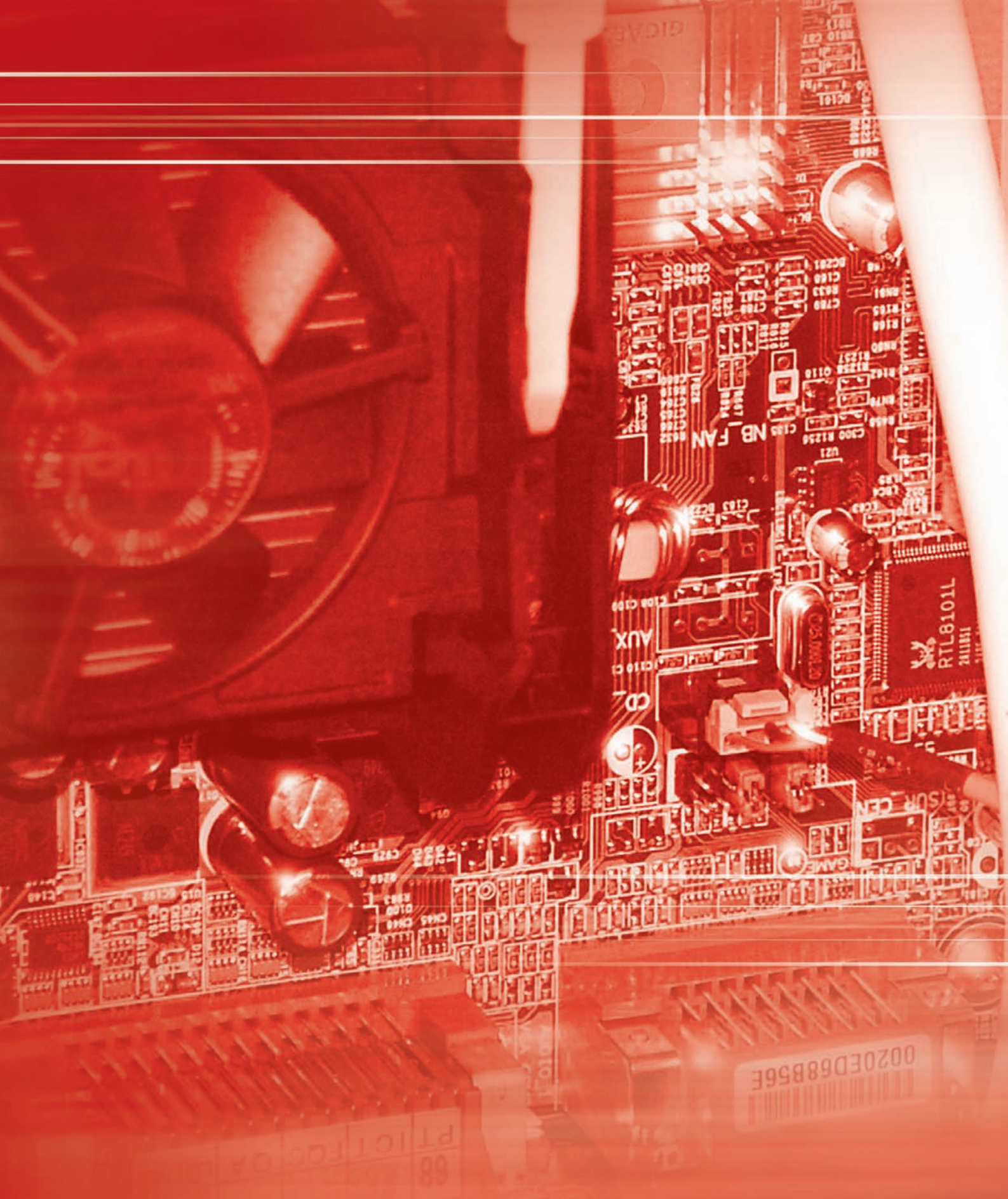


Eichenzell



Eichenzell is located at the A7 between Kassel and Würzburg, exit Fulda-Süd, if you are coming from Frankfurt at the A 66/B 40.

# electron



# ios

## ELECTRONICS

Motors .....	B2
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# Drive Electronics

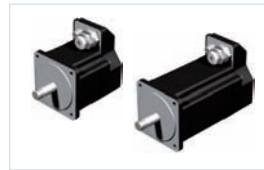
# Overview

## Three-Phase Stepping Motor

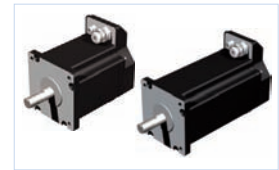
B 4



ST 56 S ST 56 L



ST 86 S ST 86 L



ST 110 S ST 110 L

## Hybrid Two-Phase Stepping Motor

B 7



MS 026 / 026 Z



MS 160 / 110



MS 300

## High-Torque Stepping Motor

B 10



MS 045/032/019 HT



MS 200/135/058 HT



MS 900/600/300 HT

## EC Servo Motor

B 13



EC 60



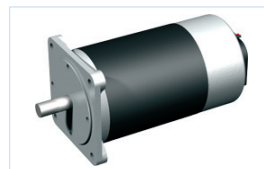
EC 86

## DC Servo Motor

B 15



DC 100



DC 300

B 16



MV 040



MV 120

















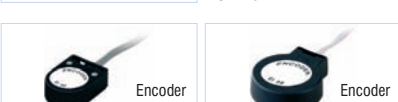
MV 300



MV 500

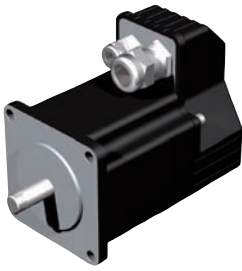
# Control Technology/Sensors

# Overview

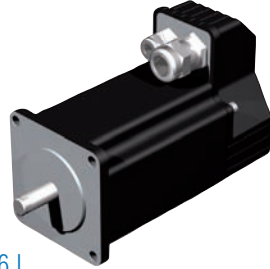
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# Three-Phase Stepping Motors

## ST 56



ST 56 S



ST 56 L



IMD 30

**isel-Controller  
see Electronics  
(Controllers)**

### Features

- Step angle 1,2°, microstep mode for higher resolution
- Very high torque due to rare-earth magnets
- High power density, optimal relationship of torque and size
- 6-wire connection
- Star or delta connection
- Minor step angle error, not cumulative
- Optimised for application in positioning control units

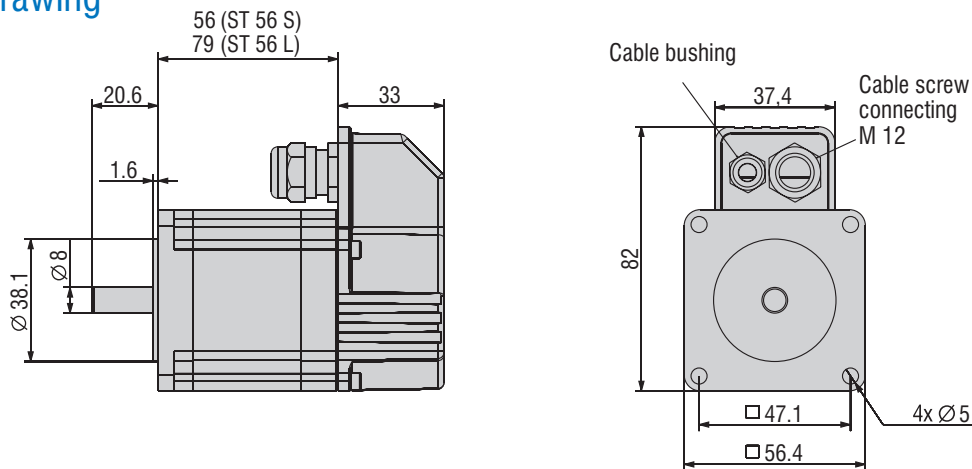
### Technical Data

Description	Holding torque Nm	Winding current per phase A	Winding voltage per phase V	Winding inductance per phase mH	Step angle °	Connecting wires	Weight kg	Flange dimension mm	Overall length (without shaft) mm	Ø / length shaft A-side mm	Resistance per phase Ohm
ST 56 S	0.9	6.3	3.34	1.3	1.2°	6	0.79	56.4	56	8 / 20.6	0.53
ST 56 L	1.5	6.3	5.04	2.1	1.2°	6	1.32	56.4	79	8 / 20.6	0.8

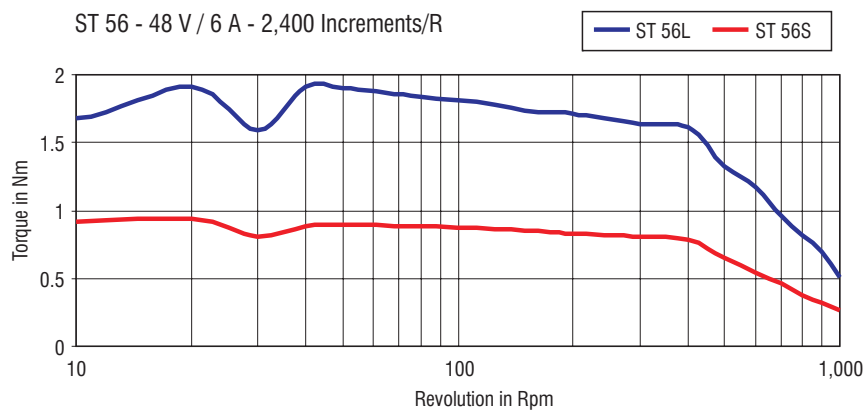
**ST 56 S** – Item no. **396 700 5000**

**ST 56 L** – Item no. **396 701 5000**

### Scale Drawing

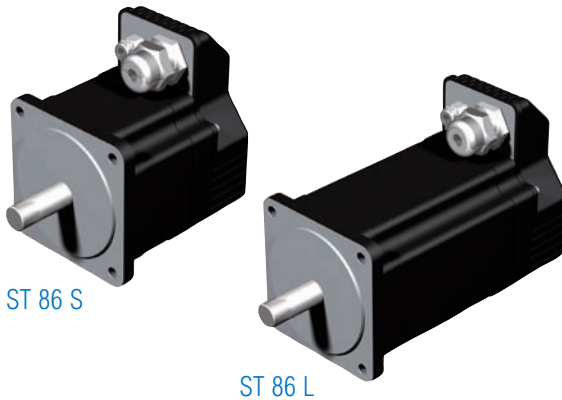


### Torque Curves



# Three-Phase Stepping Motors

## ST 86



ST 86 S

ST 86 L



isel-Controller  
see Electronics  
(Controllers)

### Features

- Step angle 1,2°, microstep mode for higher resolution
- Very high torque due to rare-earth magnets
- High power density, optimal relationship of torque and size
- 6-wire connection
- Star or delta connection
- Minor step angle error, not cumulative
- Optimised for application in positioning control units

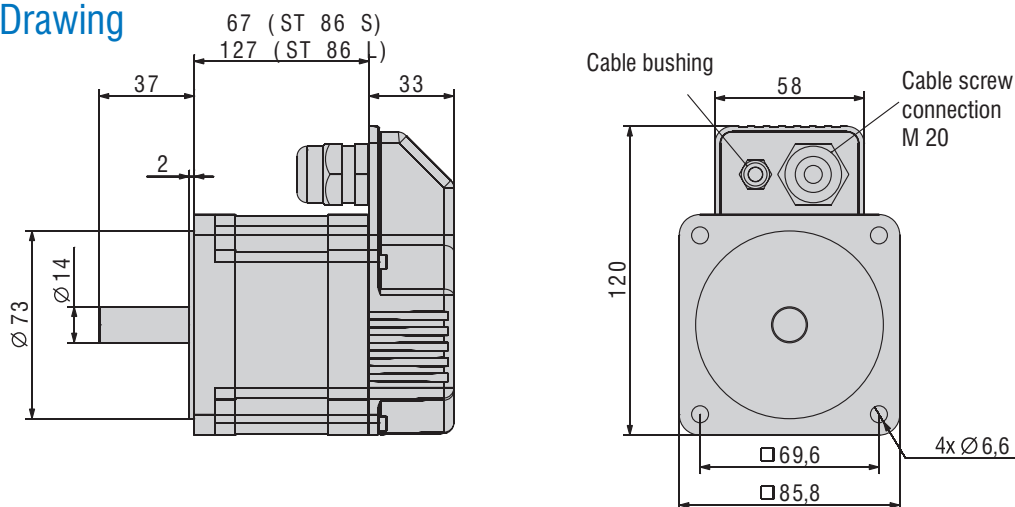
### Technical Data

Description	Holding torque Nm	Winding current per phase A	Winding voltage per phase V	Winding inductance per phase mH	Step angle °	Connecting wires	Weight kg	Flange dimension mm	Overall length (without shaft) mm	Ø / length shaft A-side mm	Resistance per phase Ohm
ST 86 S	2.26	6.36	3.7	1.6	1.2°	6	1.65	85.8	67	14 / 37	0.58
ST 86 L	6.4	9.47	5.4	2.34	1.2°	6	3.8	85.8	127	14 / 37	0.57

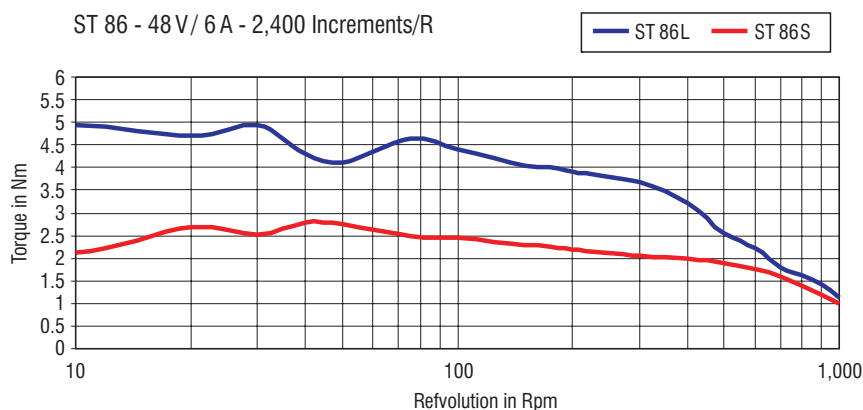
ST 86 S – Item no. 396 702 5000

ST 86 L – Item no. 396 703 5000

### Scale Drawing

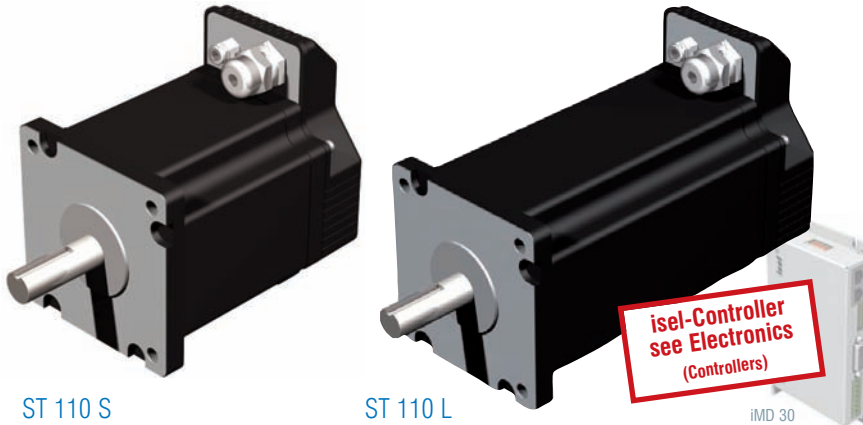


### Torque Curves



# Three-Phase Stepping Motors

## ST 110



ST 110 S

ST 110 L

### Features

- Step angle 1,2°, microstep mode for higher resolution
- Very high torque due to rare-earth magnets
- High power density, optimal relationship of torque and size
- 6-wire connection
- Star or delta connection
- Minor step angle error, not cumulative
- Optimised for application in positioning control units

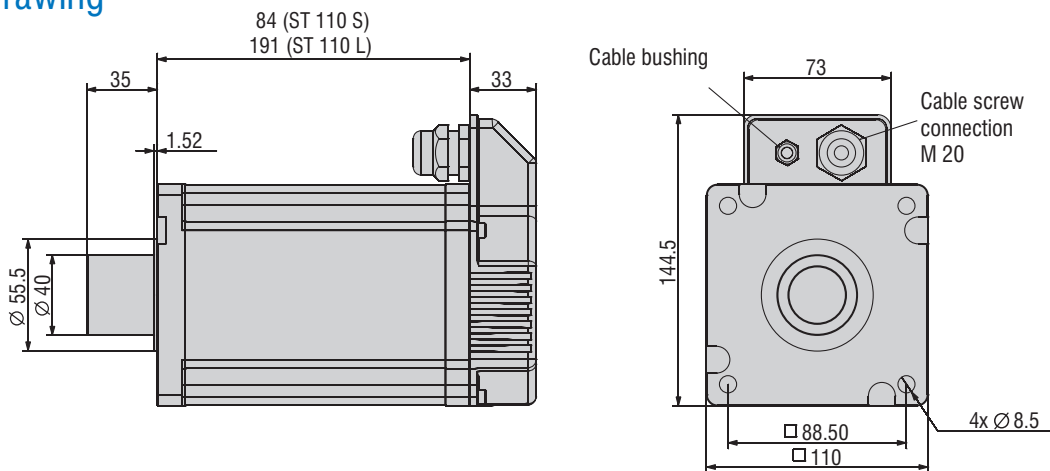
### Technical Data

Description	Holding torque Nm	Winding current per phase A	Winding voltage per phase V	Winding inductance per phase mH	Step angle °	Connecting wires	Weight kg	Flange dimension mm	Overall length (without shaft) mm	Ø / length shaft A-side mm	Resistance per phase Ohm
ST 110 S	5	10	7	5.3	1.2°	6	5	110	99	19 / 55	0.7
ST 110 L	20	10	17.5	19.7	1.2°	6	11.7	110	201	19 / 55	1.75

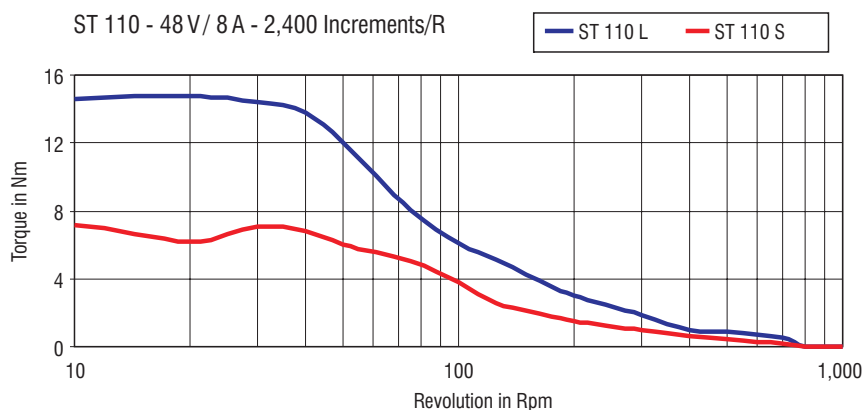
ST 110-S – Item no. 396 704 5000

ST 110-L – Item no. 396 705 5000

### Scale Drawing



### Drehmoment-Kurven



# Hybrid Two-Phase Stepping Motor MS 026



MS 026



MS 026 Z

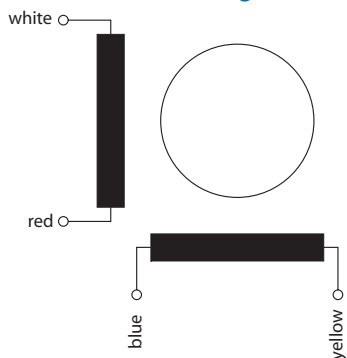
## Features

- 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)

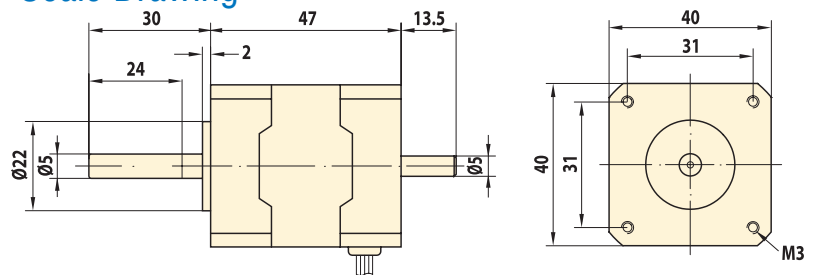
## Technical Data

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

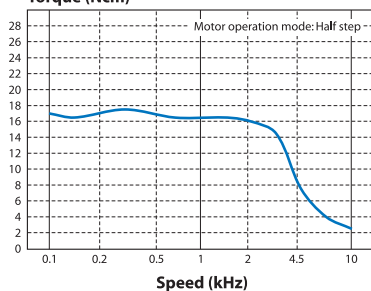


Type MS 026 Z: Shaft gearing Type M  
Pitch 2.032 mm = 0.08 inch  
Number of teeth = 10  
Shaft length = 30 mm

## Torque Curve

### MS 026 / MS 026 Z

Torque (Ncm)



# Hybrid Two-Phase Stepping Motor MS 110 / 160



MS 160 Z

MS 160

MS 110

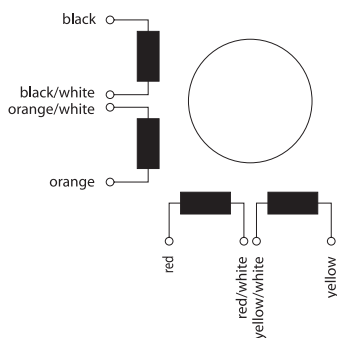
## Features

- 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)

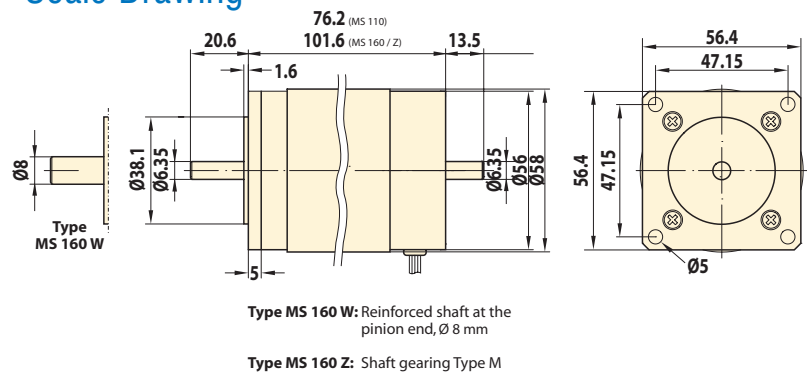
## Technical Data

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	473030	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	8 / 20.6	6.35 / 18.6
MS 160W	473043	1.3 / 1.6	4.1	1.1	1.0	1.8	8	1.4				

## Connection Diagram



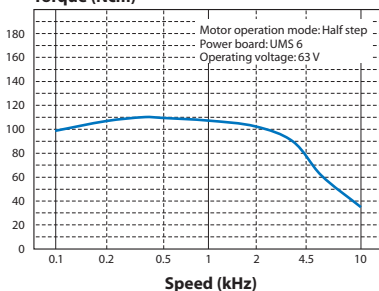
## Scale Drawing



## Torque Curves

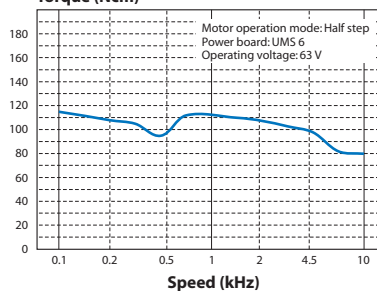
### MS 110

Torque (Ncm)



### MS 160 / MS 160 Z

Torque (Ncm)



# Hybrid Two-Phase Stepping Motor MS 300



MS 300

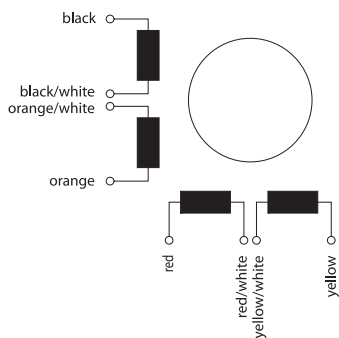
## Features

- 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)

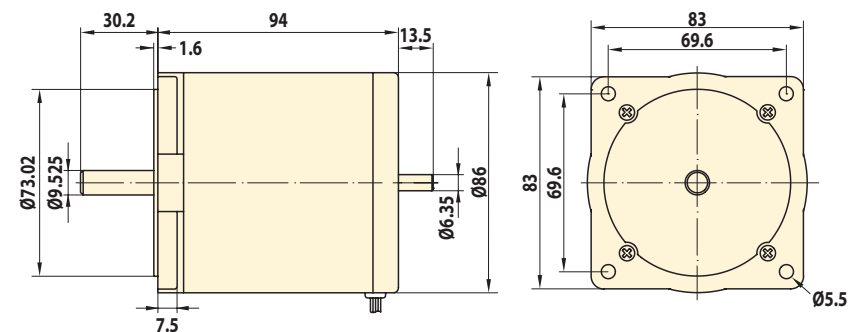
## Technical Data

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
<b>MS 300</b>	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



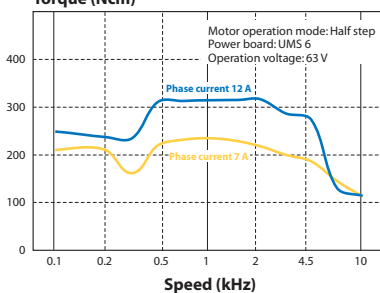
## Scale Drawing



## Torque Curve

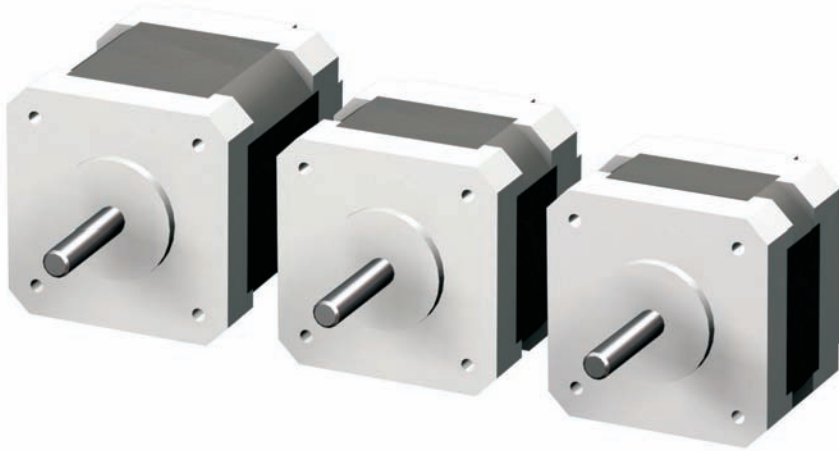
### MS 300

#### Torque (Ncm)



# High-Torque Stepping Motor

## MS 019/032/045 HT



MS 045 HT

MS 032 HT

MS 019 HT

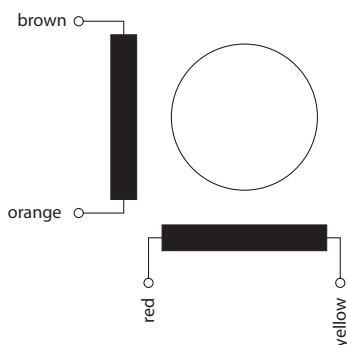
### Features

- 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
- optional: 2nd shaft end

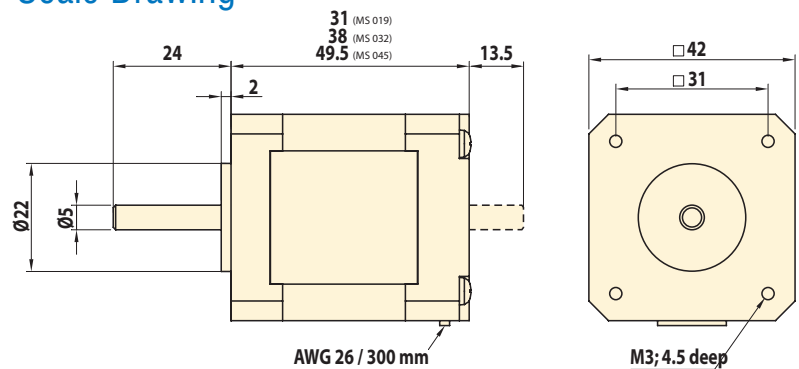
### Technical Data

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	42	31	5 / 24	5 / 13.5
MS 032 HT	470450	- / 0.32	1.8	2.0	1.85	1.8	4	0.27		38		
MS 045 HT	470480	- / 0.45	1.8	3.2	5.4	1.8	4	0.37		49.5		

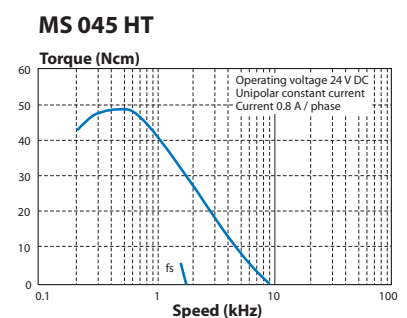
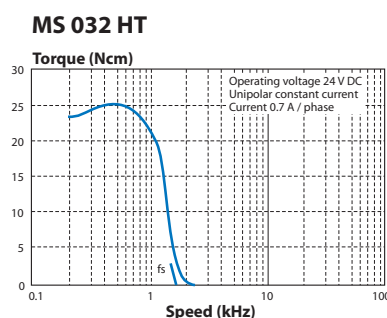
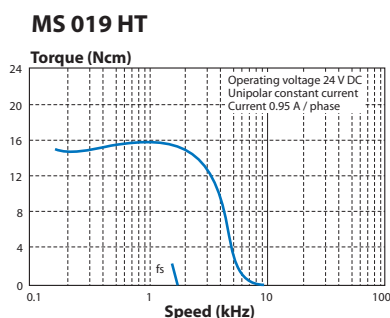
### Connection Diagram



### Scale Drawing



### Torque Curves



# High-Torque Stepping Motor

## MS 058/135/200 HT



MS 200 HT

MS 135 HT

MS 058 HT

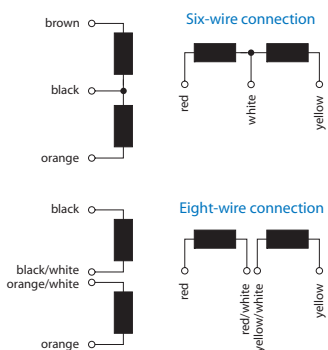
### Features

- 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
- optional: 2nd shaft end

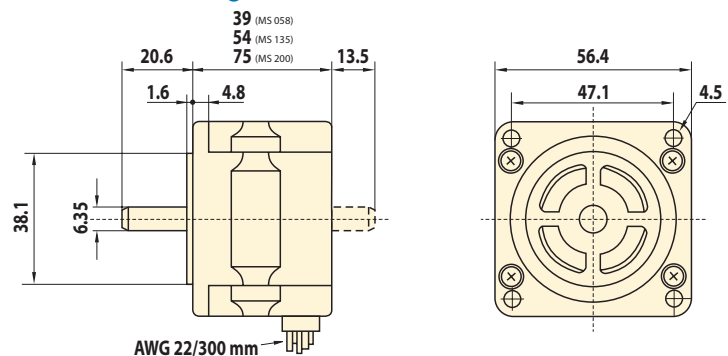
### Technical Data

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
<b>MS 058 HT</b>	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
<b>MS 135 HT</b>	470550	0.97 / 1.35	3.6	1.5	1.8	1.8	8	0.6		54		
<b>MS 200 HT</b>	470580	1.43 / 2	2.85	1.7	3.1	1.8	8	0.97		75		

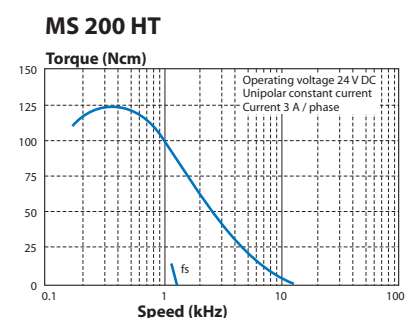
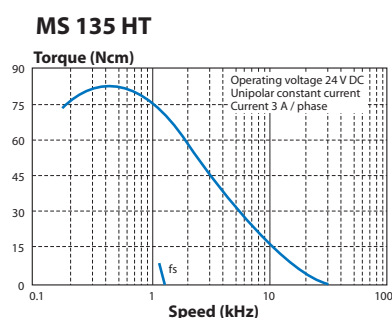
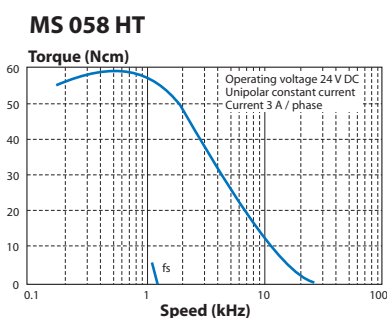
### Connection Diagram



### Scale Drawing

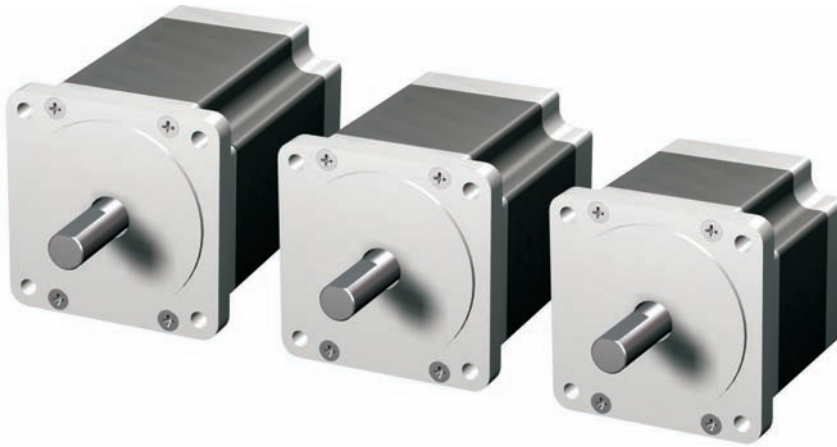


### Torque Curves



# High-Torque Stepping Motor

## MS 300/600/900 HT



MS 900 HT

MS 600 HT

MS 300 HT

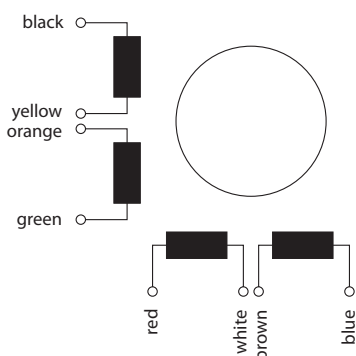
### Features

- 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
- optional: 2nd shaft end

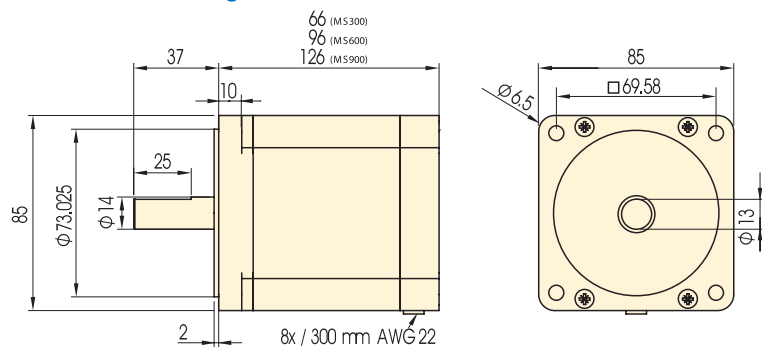
### Technical Data

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

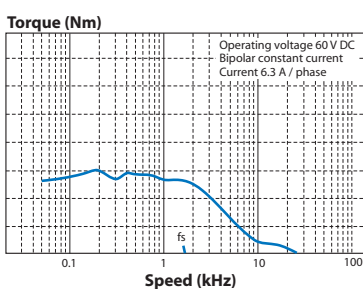


### Scale Drawing

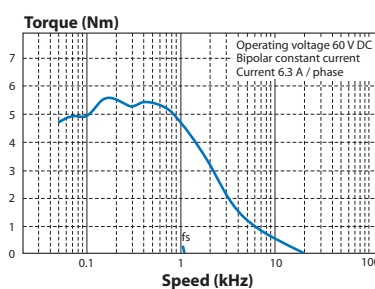


### Torque Curves

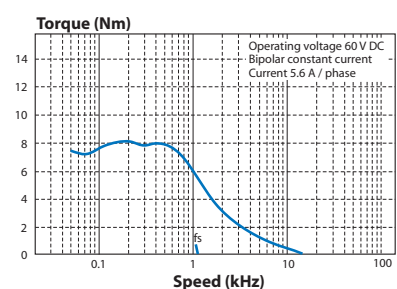
#### MS 300 HT



#### MS 600 HT



#### MS 900 HT



# Servo Motor

# EC 60



isel-Controller  
see B 3

## Features

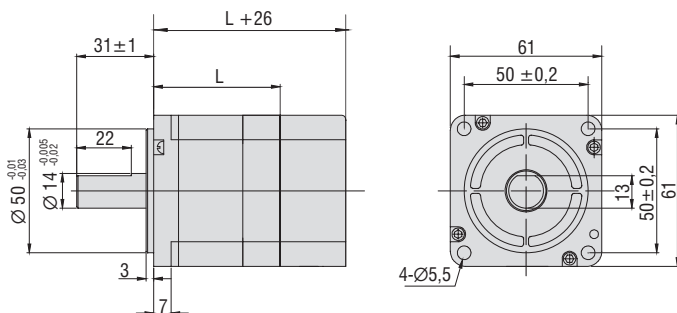
- Electronically commutated three-phase servo motor
- Brushless drive
- High power output and compact design at the same time
- Incremental encoder
- Hall sensors
- Application: Positioning and speed control
- Connection via circular connector

## Technical Data

Description	Power (shaft) at Nominal Speed W	Nominal Voltage V DC	Current A	Number of Pole	Nominal Speed U/min.	Torque at Nominal Speed Nm	Peak Torque Nm	Torque Constant Nm/A	Length L mm	Weight kg	Encoder P/R
<b>EC 60</b>	156	48	4.33	8	3,000	0.5	1.5	0.12	73	1.25	1,000

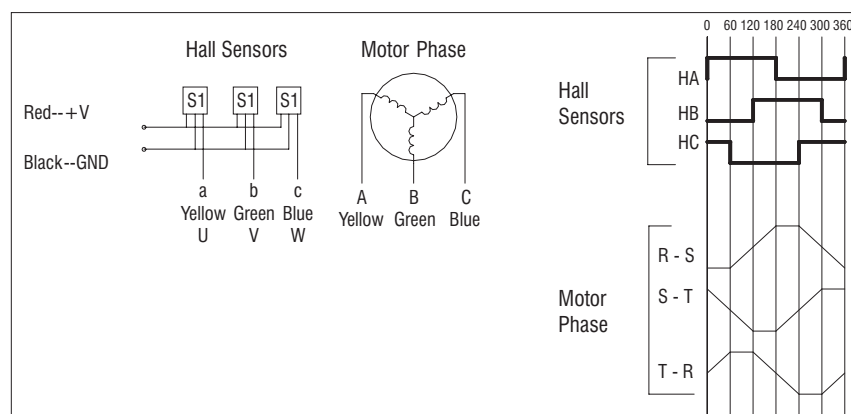
Item no. **474 156**

## Scale Drawing



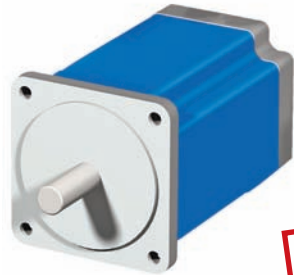
Type	Shaft Diameter	Shaft Form
EC 60	$\varnothing 14$ mm	Flat 1 x 25

## Connector Pin Assignments



# Servo Motor

# EC 86



**isel-Controller  
see B 3**

## Features

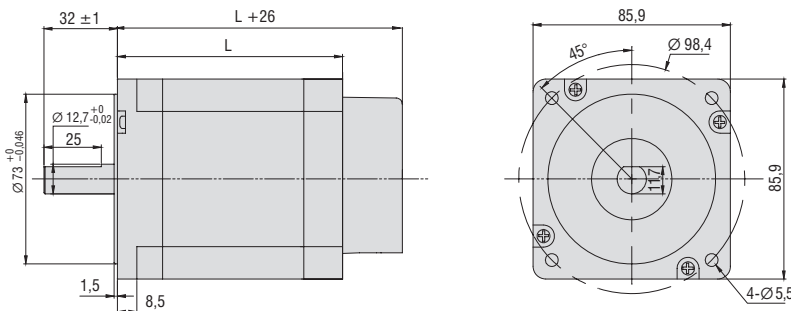
- Electronically commutated three-phase servo motor
- Brushless drive
- High power output and compact design at the same time
- Incremental encoder
- Hall sensors
- Application: Positioning and speed control
- Connection via circular connector

## Technical Data

Description	Power (shaft) at Nominal Speed W	Nominal Voltage V DC	Current A	Number of Pole	Nominal Speed U/min.	Torque at Nominal Speed Nm	Peak Torque Nm	Torque Constant Nm/A	Length L mm	Weight kg	Encoder P/R
<b>EC 86</b>	440	48	12.2	8	3,000	1.4	4.2	0.74	100	2.6	1,000

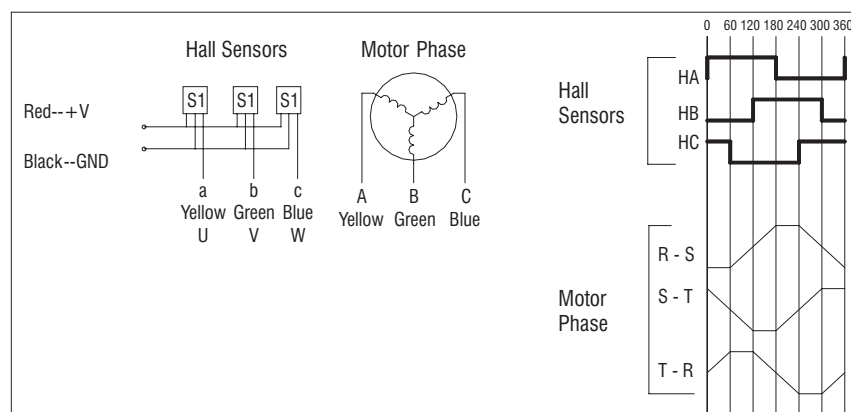
Item no. **474 440**

## Scale Drawing



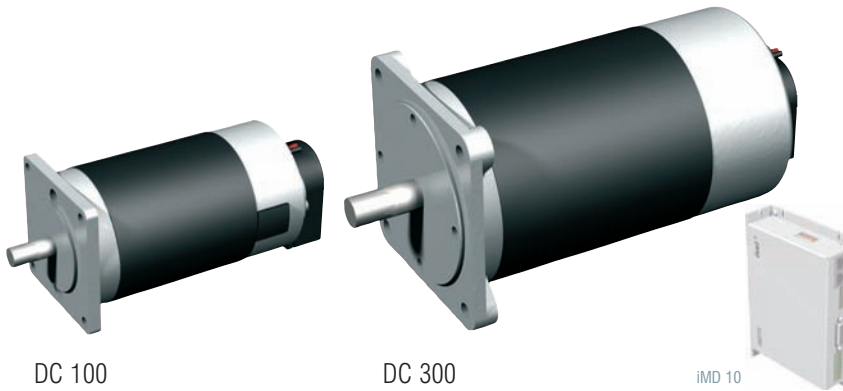
Type	Shaft Diameter	Shaft Form
EC 86	$\varnothing 12,7$ mm	Flat 1 x 25

## Connector Pin Assignments



# Servo Motors

# DC 100 / 300



## Features

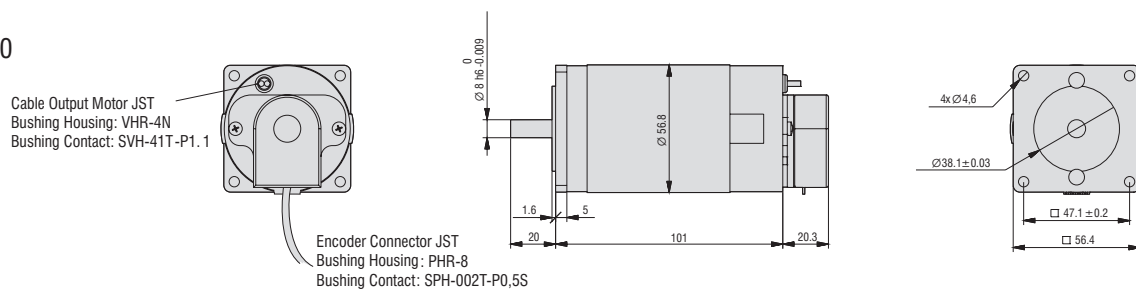
- Brushless Servo Motor
- Coil layout of low resistance
- Good dynamics
- Two-finger brush (high durability)
- Incremental encoder with 512 pulses/revolution (DC 300: optionally 1,000 pulses)

## Technical Data

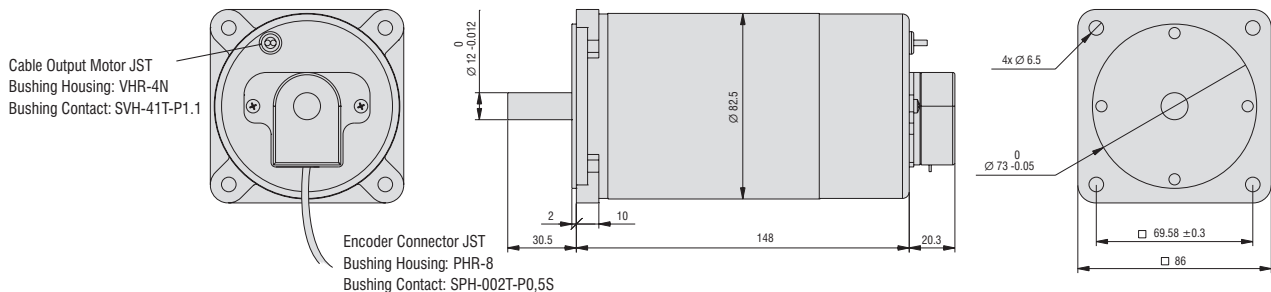
Description	Item no.	Voltage V	Idle Speed 1/min	Idle Voltage A	Nominal Speed 1/min	Nominal Torque Ncm	Nominal Current A	Capacity W
DC 100	471022 0020	48	3,400	0.25	3,000	30	2.8	95
DC 300	471024	48	3,200	1	3,000	100	9	315

## Scale Drawing

### DC 100



### DC 300



## Connector Pin Assignments

Cable Code	1	2	3	4	5	6	7	8
Cable Color	Black	Red	Green	Brown	Grey	White	Yellow	Orange
Line Driver Output	0V	Vcc	SIG A	SIG $\bar{A}$	SIG $\bar{B}$	SIG B	SIG Z	SIG $\bar{Z}$

# DC Servo Motor

# MV 040



## Features

- Brush-type DC servo motor (power 40 W)
- High torque thanks to 4-pole, low-resistance winding design
- Wide control range at high short-time current carrying capacity
- Linear course of the current-torque characteristic
- Insulation class B, 130°C
- Operating range -10°C... +50°C
- Smooth shaft  $\varnothing$  6.35 mm
- Radial play < 0.03 mm  
Axial play < 0.01 mm
- Encoder with 1,000 pulses/rev. Phase A, phase B and index track (symmetrical signal drivers according to RS 422)

## Technical Data

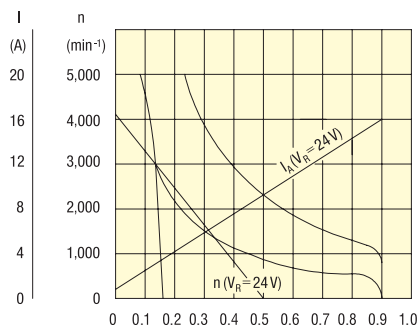
	MV 040
Item no.	471000
Nominal power (S1 operation) W	40
Nominal voltage V	24
Nominal torque Nm	0.135
Peak torque Nm	0.405
Nominal speed min <sup>-1</sup>	3,000
Max idle speed min <sup>-1</sup>	5,000
Nominal current A	2.9
Peak current A	8.7
Voltage constant V/1,000 min <sup>-1</sup>	5.85
Torque constant Nm/A	0.057
Electrical time constant ms	0.397
Mechanical time constant ms	4.0
Thermal time constant min	8
Armature moment of inertia Kgm <sup>2</sup> x10 <sup>-5</sup>	0.725

	MV 040
Item no.	471000
Armature inductance mH	0.69
Armature resistance Ohm	1.74
Weight without brake kg	0.47
Weight with brake kg	–
Max. axial load N	20
Max. radial load N	59
ISO category	F
Protection class motor / encoder	IP 50 / IP 40
Ambient temperature	0° C ... + 40° C
Insulating resistance	10 M.Ω / 500 VDC
Voltage supply encoder	5 VDC (±5%) / 200 mA
Resolution	1,000 Incr. / Rev.
Signal output	Rectangle (max. 70 kHz), RS 422

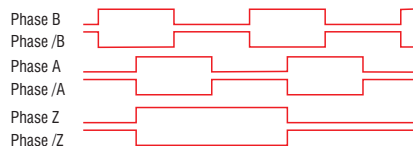
# DC Servo Motor

# MV 040

## Characteristics



## Encoder Output



## Connector Pin Assignment

Wire colour  
of the encoder cable

Function	Colour	Pin JST PHR-8
Gnd	black	1
Vcc + 5V	red	2
Sig. A	green	3
Sig. $\bar{A}$	red / black	4
Sig. B	orange	5
Sig. $\bar{B}$	white / black	6
Sig. Z	white	7
Sig. $\bar{Z}$	blue	8

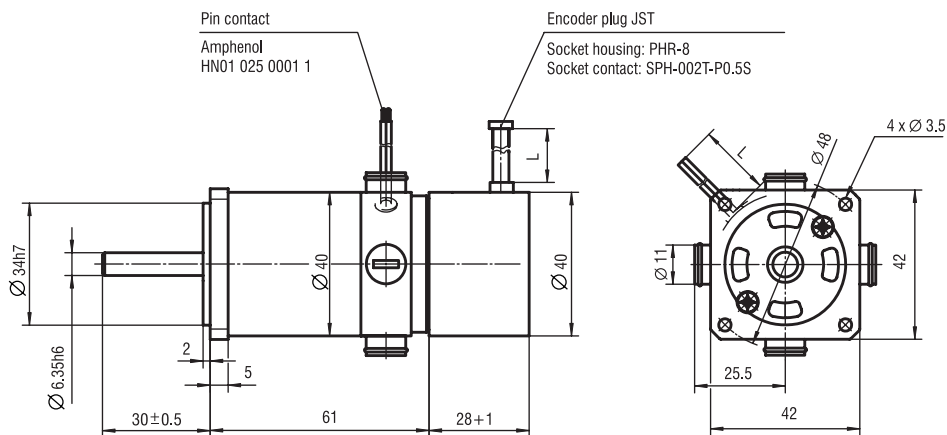
Colour of the  
motor conductor

Function	Colour
+ U Motor	red
- U Motor	blue

The encoder signals are differential signals according to RS 422. For evaluation, appropriate receiver modules must be used, e.g. AM26LS32C, Motorola MC3486 or National DS26LS32M.

The encoder interconnecting cable is shielded. The shield is to be connected to the housing on the control side.

## Scale Drawing



# DC Servo Motor

# MV 120



## Features

- Brush-type DC servo motor (power 120 W)
- High torque thanks to 4-pole, low-resistance winding design
- Wide control range at high short-time current carrying capacity
- Linear course of the current-torque characteristic
- Insulation class B, 130°C
- Operating range -10°C... +50°C
- Smooth shaft  $\varnothing$  8 mm
- Radial play < 0.03 mm  
Axial play < 0.01 mm
- Encoder with 1,000 pulses/rev. Phase A, phase B and index track (symmetrical signal drivers according to RS 422)

## Technical Data

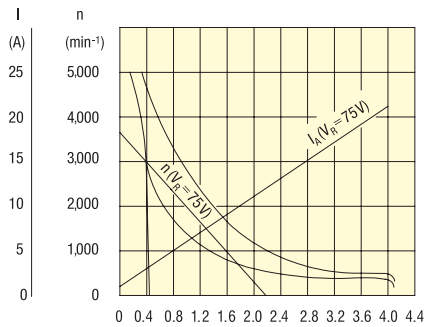
	MV 120
Item no.	
Shaft 30 mm	471012
Shaft 20 mm	471012 0020
Shaft 20 mm with brake	471012 0021
Nominal power (S1 operation) W	120
Nominal voltage V	75
Nominal torque Nm	0.39
Peak torque Nm	1.17
Nominal speed min <sup>-1</sup>	3,000
Max idle speed min <sup>-1</sup>	5,000
Nominal current A	2.3
Peak current A	6.9
Voltage constant V/1,000 min <sup>-1</sup>	20.30
Torque constant Nm/A	0.197
Electrical time constant ms	0.64
Mechanical time constant ms	4.2
Thermal time constant min	20
Armature moment of inertia Kgm <sup>2</sup> x10 <sup>-5</sup>	4.806

	MV 120
Item no.	
Shaft 30 mm	471012
Shaft 20 mm	471012 0020
Shaft 20 mm with brake	471012 0021
Armature inductance mH	2.64
Armature resistance Ohm	4.1
Weight without brake kg	1.18
Weight with brake kg	1.43
Max. axial load N	30
Max. radial load N	89
ISO category	F
Protection class motor / encoder	IP 50 / IP 40
Ambient temperature	0° C ... + 40° C
Insulating resistance	10 M $\Omega$ / 500 VDC
Voltage supply encoder	5 VDC ( $\pm$ 5%) / 200 mA
Resolution	1,000 Incr. / Rev.
Signal output	Rectangle (max. 70 kHz), RS 422

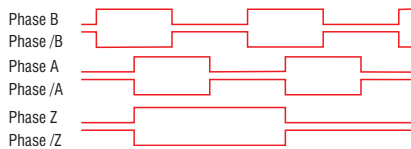
# DC Servo Motor

# MV 120

## Characteristics



## Encoder Output



## Connector Pin Assignment

Wire colour  
of the encoder cable

Function	Colour	Pin JST PHR-8
Gnd	black	1
Vcc + 5V	red	2
Sig. A	green	3
Sig. $\bar{A}$	red / black	4
Sig. B	orange	5
Sig. $\bar{B}$	white / black	6
Sig. Z	white	7
Sig. $\bar{Z}$	blue	8

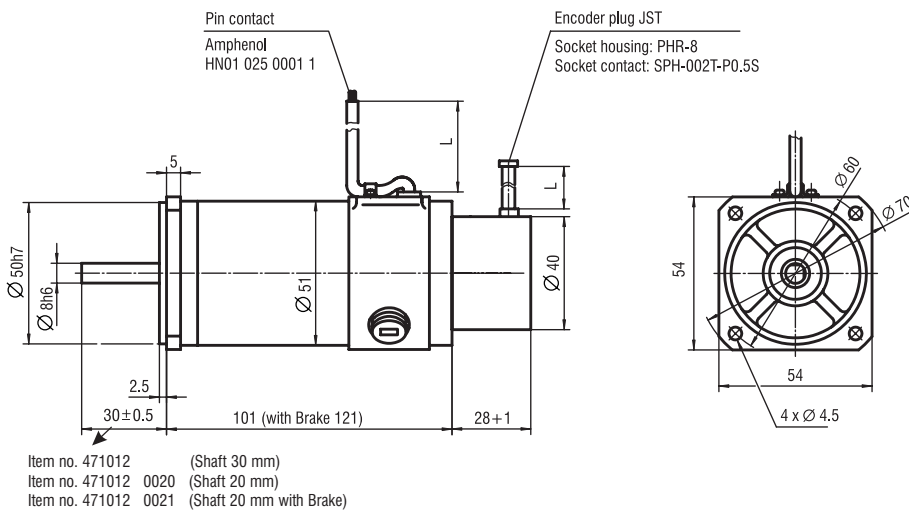
Colour of the  
motor conductor

Function	Colour
+ U Motor	black
- U Motor	white

The encoder signals are differential signals according to RS 422. For evaluation, appropriate receiver modules must be used, e.g. AM26LS32C, Motorola MC3486 or National DS26LS32M.

The encoder interconnecting cable is shielded. The shield is to be connected to the housing on the control side.

## Scale Drawing



# DC Servo Motor

# MV 300



## Features

- Brush-type DC servo motor (power 300 W)
- High torque thanks to 4-pole, low-resistance winding design
- Wide control range at high short-time current carrying capacity
- Linear course of the current-torque characteristic
- Insulation class B, 130°C
- Operating range -10°C... +50°C
- Radial play < 0.03 mm  
Axial play < 0.01 mm
- Encoder with 1,000 pulses/rev. Phase A, phase B and index track (symmetrical signal drivers according to RS 422)

## Technical Data

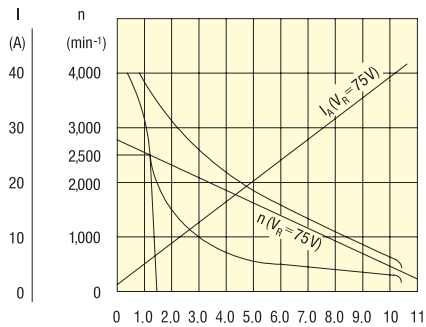
		MV 300
Item no.	with Brake without Brake	471014 0001 471014
Nominal power (S1 operation) W		300
Nominal voltage V		75
Nominal torque Nm		1.20
Peak torque Nm		3.60
Nominal speed min <sup>-1</sup>		2,500
Max idle speed min <sup>-1</sup>		4,000
Nominal current A		5.1
Peak current A		15.3
Voltage constant V/1,000 min <sup>-1</sup>		27.52
Torque constant Nm/A		0.268
Electrical time constant ms		1.27
Mechanical time constant ms		4.7
Thermal time constant min		25
Armature moment of inertia Kgm <sup>2</sup> x10 <sup>-5</sup>		24.13

		MV 300
Item no.	with Brake without Brake	471014 0001 471014
Armature inductance mH		1.35
Armature resistance Ohm		1.35
Weight without brake kg		2.92
Weight with brake kg		3.58
Max. axial load N		40
Max. radial load N		150
ISO category		F
Protection class motor / encoder		IP 50 / IP 40
Ambient temperature		0° C ... + 40° C
Insulating resistance		10 MΩ / 500 VDC
Voltage supply encoder		5 VDC (±5%) / 200 mA
Resolution		1,000 Incr. / Rev.
Signal output		Rectangle (max. 70 kHz), RS 422

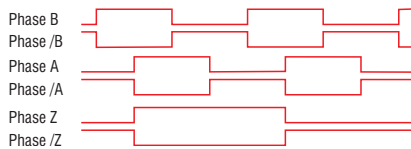
# DC Servo Motor

# MV 300

## Characteristics



## Encoder Output



## Connector Pin Assignment

Wire colour  
of the encoder cable

Function	Colour	Pin JST PHR-8
Gnd	black	1
Vcc + 5V	red	2
Sig. A	green	3
Sig. $\bar{A}$	red / black	4
Sig. B	orange	5
Sig. $\bar{B}$	white / black	6
Sig. Z	white	7
Sig. $\bar{Z}$	blue	8

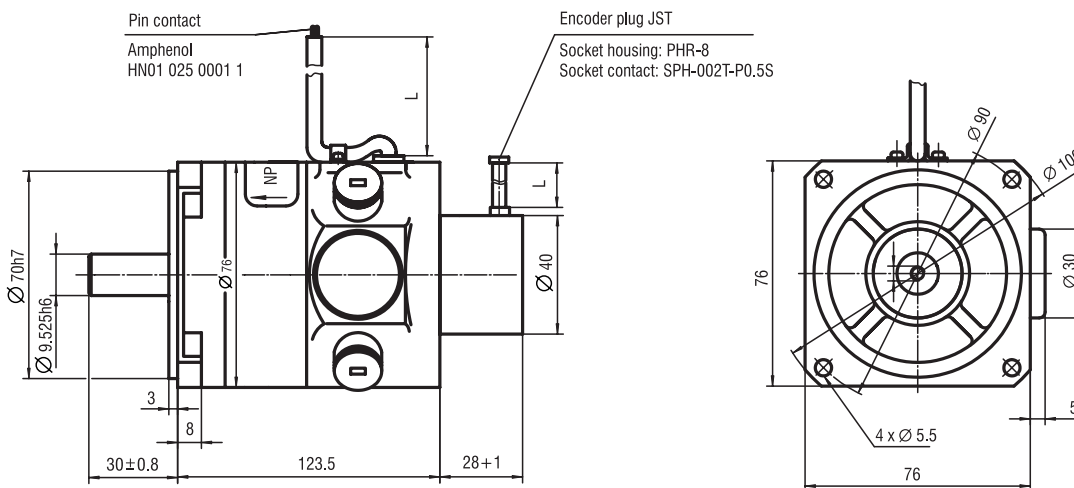
Colour of the  
motor conductor

Function	Colour
+ U Motor	black
- U Motor	weiß

The encoder signals are differential signals according to RS 422. For evaluation, appropriate receiver modules must be used, e.g. AM26LS32C, Motorola MC3486 or National DS26LS32M.

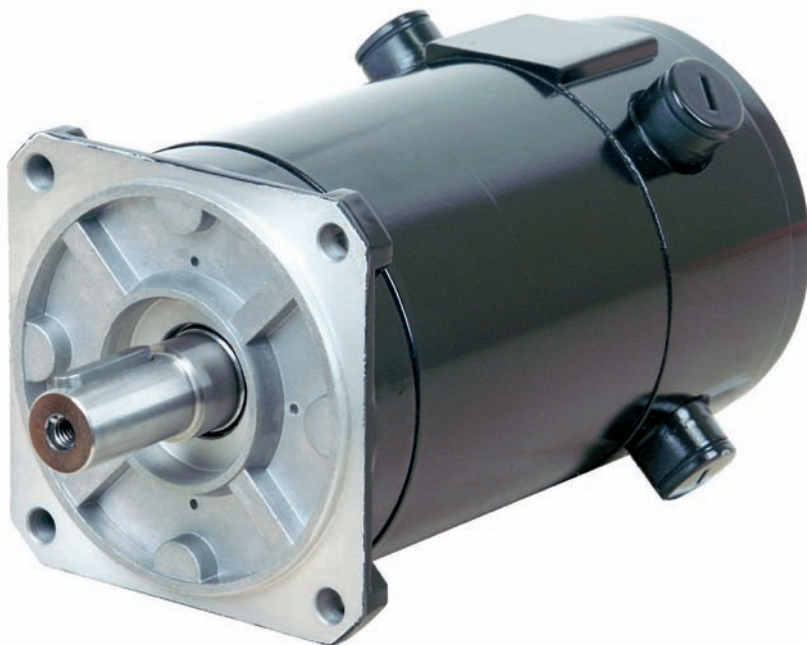
The encoder interconnecting cable is shielded. The shield is to be connected to the housing on the control side.

## Scale Drawing



# DC Servo Motor

# MV 500



## Features

- Brush-type DC servo motor (power 500 W)
- High torque thanks to 4-pole, low-resistance winding design
- Wide control range at high short-time current carrying capacity
- Linear course of the current-torque characteristic
- Insulation class B, 130°C
- Operating range -10°C... +50°C
- Radial play < 0.03 mm  
Axial play < 0.01 mm
- Encoder with 1,000 pulses/rev. Phase A, phase B and index track (symmetrical signal drivers according to RS 422)

## Technical Data

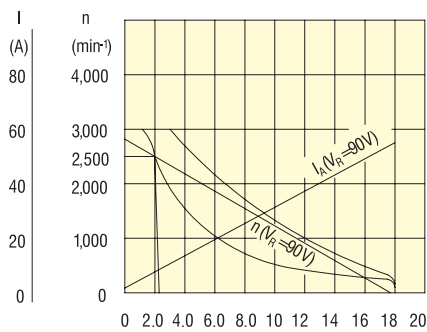
	MV 500
Item no.	471005
Nominal power (S1 operation) W	500
Nominal voltage V	90
Nominal torque Nm	2.0
Peak torque Nm	6.0
Nominal speed min <sup>-1</sup>	2,500
Max idle speed min <sup>-1</sup>	3,000
Nominal current A	6.6
Peak current A	19.8
Voltage constant V/1,000 min <sup>-1</sup>	34.4
Torque constant Nm/A	0.335
Electrical time constant ms	2.17
Mechanical time constant ms	3.55
Thermal time constant min	30
Armature moment of inertia Kgm <sup>2</sup> x10 <sup>-5</sup>	54.05

	MV 500
Item no.	471005
Armature inductance mH	1.54
Armature resistance Ohm	0.71
Weight without brake kg	4.55
Weight with brake kg	–
Max. axial load N	100
Max. radial load N	175
ISO category	F
Protection class motor / encoder	IP 50 / IP 40
Ambient temperature	0° C ... + 40° C
Insulating resistance	10 M.Ω / 500 VDC
Voltage supply encoder	5 VDC (±5%) / 200 mA
Resolution	1,000 Incr. / Rev.
Signal output	Rectangle (max. 70 kHz), RS 422

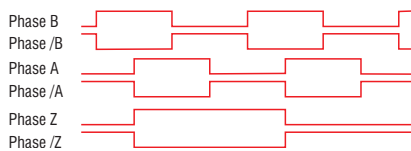
# DC Servo Motor

# MV 500

## Characteristics



## Encoder Output



## Connector Pin Assignment

Wire colour  
of the encoder cable

Function	Colour	Pin JST PHR-8
Gnd	white/green	1
Vcc + 5V	brown/green	2
Sig. A	brown	3
Sig. $\bar{A}$	green	4
Sig. B	grey	5
Sig. $\bar{B}$	pink	6
Sig. Z	red	7
Sig. $\bar{Z}$	black	8

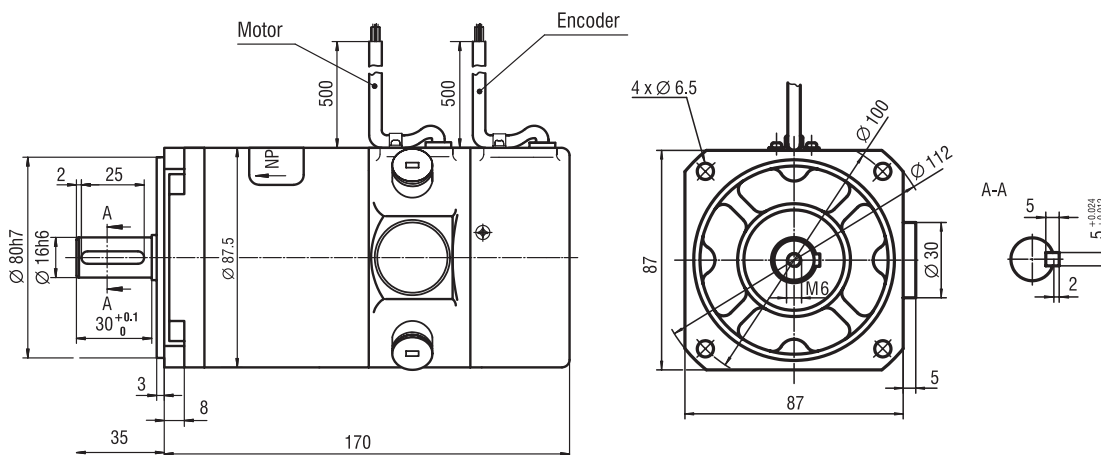
Colour of the  
motor conductor

Function	Colour
+ U Motor	black
- U Motor	weiß

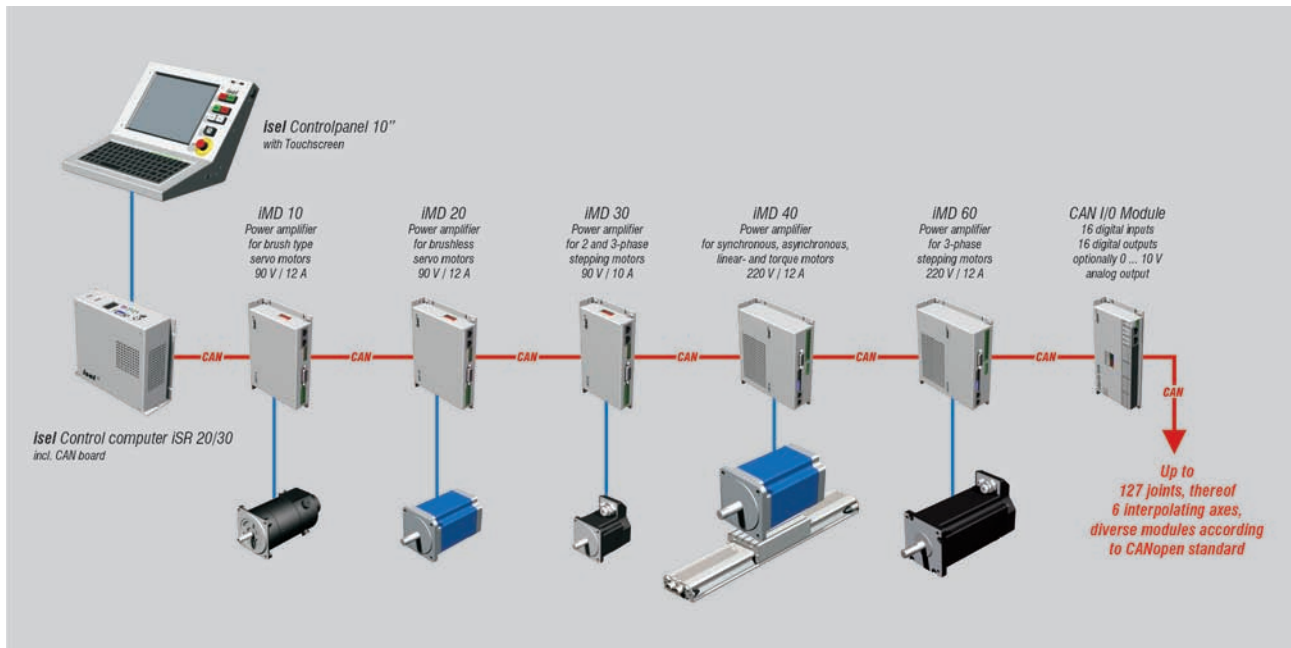
The encoder signals are differential signals according to RS 422. For evaluation, appropriate receiver modules must be used, e.g. AM26LS32C, Motorola MC3486 or National DS26LS32M.

The encoder interconnecting cable is shielded. The shield is to be connected to the housing on the control side.

## Scale Drawing



# CAN-CNC Control



*iseI*/automation KG supplies a high standard computer based **CAN-CNC control** for intelligent positioning/drive units I/O modules, consequently using **CANopen** standards of CiA.

This **CAN-CNC control** supports the interpolation (linear, circular, helix) of up to six positioning gears per machine as well as up to 127 supporting axis respectively CAN modules.

The accurate timing that a CNC control unit demands is ensured by *iseI* developed Windows WDM driver. An additional real-time operating system for Windows is not necessary. This ensures the compatibility to future Windows versions.

The CAN control is a software solution solely for computers with Windows NT/2000/XP. The CANopen PCI boards iCC10/20 serves as interface.

Due to the offered functionalities, the **CAN-CNC control unit** is perfectly suited to machining tasks, such as milling engraving, drilling, turning, laser and water-jet cutting, and to the automation technique.

For this purpose, **ProNc** is available as a universal programming environment.

## Features

- machine control according to **CANopen** standard as software solution solely for PC's with Windows NT/2000/XP
- CiA-Standard, DS 301, DSP 401, DSP 402
- Supports up to six positioning axis and 127 supporting axis respectively CAN modules
- 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
- Software tools to adjust and optimize the motor output stages/positioning modules
- PC-Interface
  - CANopen PCI boards iCC 10/20

# CANopen PCI Boards



## General

It is the CANopen-PCI-board out of the iCC-series, that provides a simple solution to connect the CAN-bus to the PCI-bus system of the iSR20/30 series. Together with the board comes a driver software that will completely assume the communication with the application interface (i.e. ProNC).

Additionally, the software package includes a set up program (CANset) that can be used to do the basic settings of the CAN-parameters.

## iCC 10



### CANopen PCI Board (Single channel)

- Mechanical dimensions: 119.5x47.3 mm
- Compliant with PCI V2.2
- 32-bit, 33 MHz Target Interface Chip
- 1 CAN channel connector RJ45, screened
- CAN bus, optically isolated
- Transfer rate up to 1 MBaud
- Drivers for NT/2000/XP/Vista
- Driver software for isel CAN-CNC control

Item no. **320310**

## iCC 20



### CANopen PCI Board (Double channel)

- Mechanical dimensions: 119.5x47.3 mm
- Compliant with PCI V2.2
- 32-bit, 33 MHz Target Interface Chip
- 2 CAN channel connector RJ45, screened
- CAN bus, optically isolated
- Transfer rate up to 1 MBaud
- Drivers for NT/2000/XP/Vista
- Driver software for isel CAN-CNC control

Item no. **320311**

# CAN-CNC Control Components

## iMD 10



### Features

Power amplifier / Positioning module for brush type DC servo motors

- Supply voltage 40 V to 95 V
- Motor current: Constant current 12 A, peak current up to 25 A
- CAN bus interface according to CanOpen DS301 V4.0 / DS402 V1.0
- RS232 interface
- Input  $\pm 10$  Volt-Eingang
- Digital control of current, speed and position
- Inputs for limit switch and separate reference switch
- Motor current monitor (short circuit,  $I^2t$ ), temperature monitor
- Encoder signal monitor
- Update of the firmware through RS232
- Protection against short circuit, overvoltage, undervoltage and excess temperature
- Simple startup through RS232 and CAN-bus, respectively
- Includes functionalities relevant to the safety circuit
- Control cabinet module
- Size: 180 mm x 35 mm x 110 mm

Item no.: 314 020

## iMD 20



### Features

Power amplifier for brushless DC-servomotors

- Supply voltage 50V - 100V
- Motor current: constant current 12A, peak current up to 25A
- CAN-bus interface according to CANOpen DS301 V4.0 and DS402 V1.0
- RS232 interface
- Digital control for current, revolution speed and position
- Inputs for limit switch/reference switch
- Inputs for hall sensors
- Motor current monitor (short circuit,  $I^2t$ ), temperature monitor
- Encoder signal monitor
- Update of the firmware through RS232
- Protection against short circuit, overvoltage, undervoltage and excess temperature
- Simple startup through RS232 and CAN-bus, respectively
- Size: 180 mm x 35 mm x 120 mm

Item no.: 314 030

## iMD 30



### Features

Power amplifier for 3 phase stepper motor

- Supply voltage 50V – 100V
- For isel motor drive system IMD
- Motor current up to 20A
- CAN-bus interface according to CANOpen DS301 V4.0 and DS402 V1.0
- RS232 interface
- Digital current control, optimization of phase current
- Inputs for limit switch and reference switch
- Input for step/direction
- Motor current monitor (short circuit,  $I^2t$ ), temperature monitor
- Protection against short circuit, overvoltage, undervoltage and excess temperature
- Simple startup through RS232 and CAN-bus, respectively

### Options

- Supply voltage 230V AC, motor current up to 10A
- Digital monitoring of revolution speed and position
- Encoder signal monitor
- Size: 180 mm x 35 mm x 110 mm

Item no.: 317 001

# CAN-CNC Control Components

## iMD 40



### Features

Power amplifier for servo synchronous and servo asynchronous motors

- Supply voltage 230V
- Motor current: constant current 12A, peak current up to 25A
- CAN-bus interface
- RS232 interface
- Digital control for current, revolution speed and position
- Inputs for limit switch/reference switch
- Inputs for hall sensors
- Motor current monitor (short circuit, I<sup>2</sup>t), temperature monitor
- Encoder signal monitor
- Update of the firmware through RS232
- Protection against short circuit, overvoltage, undervoltage and excess temperature
- Simple startup through RS232 and CAN-bus, respectively
- Size: 180 mm x 50 mm x 150 mm

Item no.: **314 040**

## iMD 60



### Features

Power amplifier for 3 phase stepper motor or voltage/frequency converter for asynchronous motors. Different applications for stepper motor or frequency converter can be implemented through software.

- Supply voltage 230V
- Nominal current 7A, peak current 12A
- Maximum overload 150%
- Output frequency 0 to 800Hz
- Nominal input 0 to 10V
- CANOpen interface (DS301 V4.0 and DS402 V1.0)
- RS232 interface
- Integrated brake chopper
- 4 digital inputs
- Protection against short circuit, overvoltage, undervoltage and excess temperature
- Parameter setting through serial interface and CANopen
- Includes safety relevant functionalities
- Control cabinet module
- Simple startup through RS232 and CAN-bus, respectively
- Size: 180 mm x 50 mm x 150 mm

Item no.: **314 050**

# CAN-CNC Control Components



## Universal CAN Position Module with +/- 10 V Output

- Digital position control with cycle time 500  $\mu$ s
- Power requirement + 24 V DC
- CANopen DS 301, DSP 402, transfer rate 20 kBit/s / 1 Mbd
- Signal input: limitation-/final position switch, encoder (RS 422), release
- Control from limit Switch of Positioning axes with emergency stop button
- Adequate as activation of any servo actuator and frequency converter, e.g. for AC motors or controlled stepping motors
- Optional as multiple axis solution at control box

Item no.: **320 210**



## isel-CAN-I/O Module 16/16

- Supply voltage 24V DC
- 16 digital inputs through optoelectronic coupler
- 16 digital outputs, 8 x relais, 8x electrical
- 1 analog output 0V to 10V through 8-bit-D/A converter (when using the analog output the electrical outputs are blocked)
- Case size: 85 mm x 180 mm x 28 mm

Item no.: **321002**



## isel-CAN-I/O Module 8/12-4/1

- Supply voltage 24V DC
- 8 digital inputs through optoelectronic coupler
- 12 digital outputs, 4 x relais, 8x electrical
- 1 analog output 0V to 10V through 8-bit-D/A converter (when using the analog output the electrical outputs are blocked)
- Case size: 85 mm x 180 mm x 28 mm

Item no.: **321004**

# Accessory

## CNC Joystick



### General Information

The isel CNC Joystick is the ideal complement for the operation and the set-up of isel machines and systems. It possesses a durable and ergonomically formed plastic housing. Up to four axes can be traversed by using the control stick. This stick has a central position and eight motion directions per level, whereat wear-free mechanical contact elements are used. The integrated LC display shows the axis positions, the preset incrementations and the current override. When approaching positions, it is no longer necessary to watch the graphic surface of the control program. The CNC Joystick is connected to the control box by a pin-and-socket connector. Furthermore all important and safety-relevant control elements are already integrated as pushbuttons or switches. The software integration of the CNC Joystick into the control surface (ProNC, Remote) is made by the isel standard software interface (module DLL).

### Technical Data

- Connection via USB bus without extra software driver
- Up to 4 axes
- 8 motion directions per level
- Automatic resetting to the central position
- Wear-free mechanical contact elements
- Integrated changeover switch for continuous/stepwise axis movement
- Defined traversing widths and override adjustable by the Joystick
- Clear, well readable LC display
- Supply voltage +5V via USB bus
- Emergency stop button, cover and acknowledge button integrated

Item no.: [359 008](#)  
for isel Controlbox

**CNC Joystick with Adapterbox**  
for external CNC Controller  
Item no.: [359 009](#)

# CNC Control Units

**Control-Console 17**  
with 17" Touchscreen



**Control-Panel 10**  
with 10,4" Touchscreen

**Control-Panel 17**  
with 17" Touchscreen

## Features

- Robust and interference-proof steel case
  - Aluminium front plate in stainless steel look
  - Pivoted and ready for being mounted at isel machines and machine tables
- Option:
- Optical mouse

The Control Panels and Control Consoles are powerful and robust control units for isel machines and machine tables. Control Consoles are already equipped with an integrated control computer. Only power supply and communication cables have to be connected. The software can easily be operated by the touch screens.

The Control Panels serve as display units. They are always being used when the control computer is already installed in the control box (control cabinet).

Operation takes place by the integrated touchscreen and optionally by an optical mouse and/or a keyboard. In addition to that they feature control pushbuttons that can directly be connected to the drive control being used.

## Order Data

		Item Number
Control Console 17	17" with german keyboard layout 17" with english keyboard layout	371 051 0102 371 051 0112
Control Panel 10	10,4" with german keyboard layout 10,4" with english keyboard layout	371 054 1202 371 054 1212
Control Panel 17	17" with german keyboard layout 17" with english keyboard layout	371 052 0102 371 052 0112
Swivelling Arm for Control Panel	Wall or rack mounting	371 050 0003
Swivelling Arm for Control Panel	Rack mounting at PS 140	371 050 0008
Swivelling Arm for Control Panel	Rack mounting at PS 80	371 050 0009
Swivelling Arm for Control Panel	Rack mounting at PS 100	371 050 0010

# CNC Control Units

## Technical Data TFT Monitor

Driver	10.4" TFT active matrix
Pixel Size	0.264 x 0.264 mm
Viewing Angle	CR ≥ 10° vertical
Visible Surface	211.2 x 158.4 mm
Max. Number of Pixels	800 x 600
Colours	24 Bit colour depth (16.7 million)

Driver	17" TFT active matrix
Pixel Size	0.264 x 0.264 mm
Viewing Angle	75° horizontal, 60° vertical
Visible Surface	337 x 270 mm
Max. Number of Pixels	1,280 x 1,024
Colours	24 Bit colour depth (16.7 million)

## Technical Data Input Devices

Mouse	Three-button mouse with scrollwheel PS/2 optical mouse
Keyboard	MF102 keys, black, PS/2 connector
Touchscreen (optionally)	10.4" / 17"

## Options

Splash-proof keyboard
Optical mouse
Control computer iSR 20 and iSR 30, for control box installation, see B32, B33

# Control Computer

# iSR 20



## Merkmale

- Control computer for control box installation
- Robust and interface-proof aluminium housing
- Connectors for PS/2 mouse and PS/2 keyboard
- Serial port COM1, RS232 type
- LTP connector
- VGA monitor connector
- 1 x RJ45 network socket
- 4 x USB 2.0 interfaces for connecting peripheral devices
- Integrated CAN-PCI interface board with RJ45 connector (single or double channel)

### Options:

- Windows XP, Windows Vista
- CAN-PCI interface with 2xRJ45

## Control Computer iSR 20/30 for Control Box Installation

Control computers of the iSR series are designed for the installation in control boxes and suchlike. The combination of control computers and isel control panels result in functional combinations for controlling and operating machines and systems.

The computing power can be increased by the installation of more powerful components. Thus also higher demands on the control computer like for CAD/CAM or simulation software applications can be met. The main memory can be upgraded from 512 MB up to 2 GB.

The iSR 20/30 are capable of using Intel processors of most different performance classes. The housing design of the iSR series assures long-term compatibility with all PC components to be released within the next years.

All connectors of the PC are located at the housing front. The connecting cables are led directly to the control panel by using a cable hose. Therefore it is possible to place the iSR directly next to other control box components.

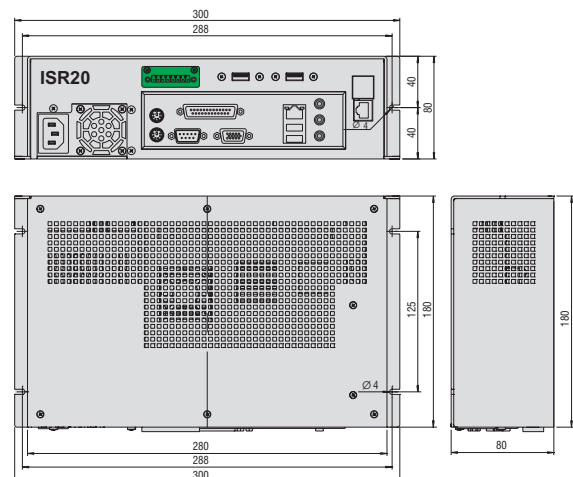
All control computers of the iSR series possess a CAN-PCI interface board by default. CAN bus components can be connected and operated by using the RJ45 CAN connector.

## Technical Data

CPU	Intel Celeron 220, 1.2 GHz
Form factor	mITX
Main memory	DDR2-RAM ≥512MB
Extension slot	CAN-PCI interface board
Hard disk	2,5" HDD ≥60 GB, S-ATA
Power supply	180 Watt
Supply voltage	AC 115/230 V, 60/50 Hz
Humidity	max. 90% (not condensing)
Ambient temperature	0° C to 55° C
Dimensions (W x H x D)	300 x 180 x 80 mm
Weight	2,6 kg

Item no. **371 057** (without operating system)

## Scale Drawing



# Control Computer

# iSR 30



## Merkmale

- Control computer for control box installation
- Robust and interface-proof aluminium housing
- Connectors for PS/2-Maus and PS/2 keyboard
- Serial port COM1, RS232 type
- LPT connector
- VGA monitor connector
- 1 x RJ45 network socket
- 4 x USB 2.0 interfaces for connecting peripheral devices
- Integrated CAN-PC interface board with RJ45 connector (single or double channel)

### Options:

- Windows XP, Windows Vista
- CAN-PCI interface board with 2xRJ45

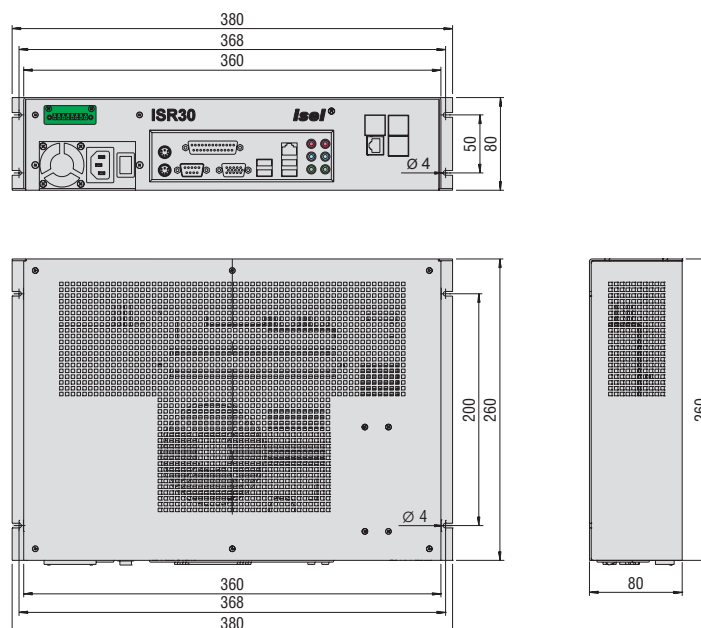
## Technical Data

CPU	Intel Celeron D, Socket 775, 1,8 GHz
Form factor	mATX
Main memory	DDR2-RAM ≥512MB
Extension slots	CAN-PCI interface boards
Hard disk	3,5" HDD ≥80 GB, S-ATA
Power supply	360 Watt

Supply voltage	AC 90 - 264 V, 47 - 63 Hz
Humidity	max. 90 % (not condensing)
Ambient temperature	0° C to 55° C
Dimensions (W x H x D)	380 x 260 x 80 mm
Weight	4,8 kg

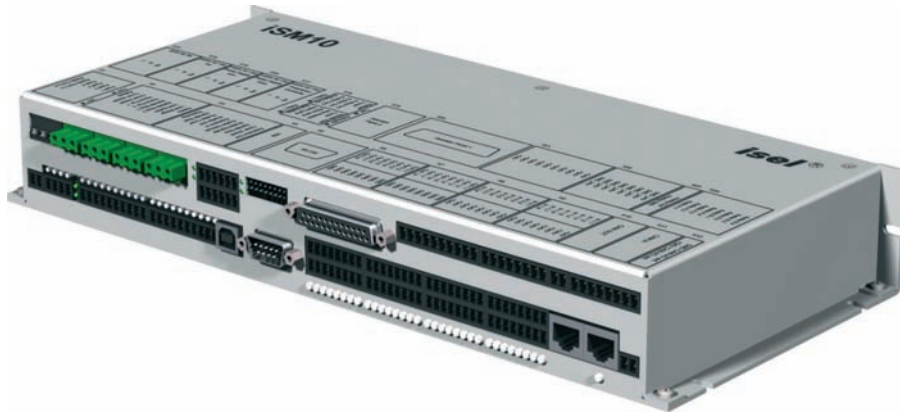
Item no. **371 058** (without operating system)

## Scale Drawing



# isel System Module

# iSM 10



## General

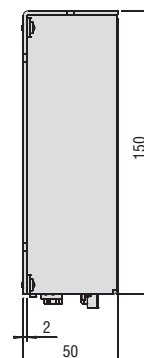
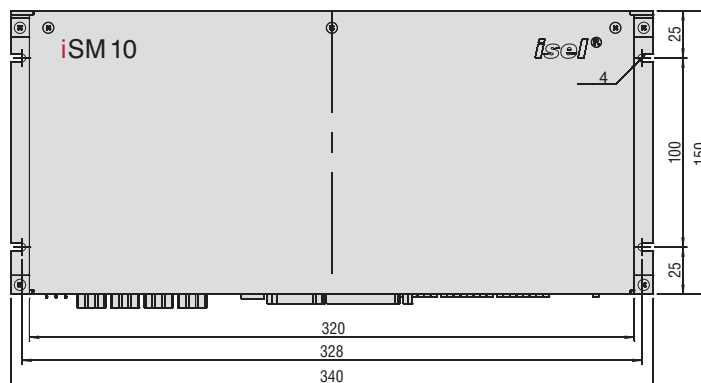
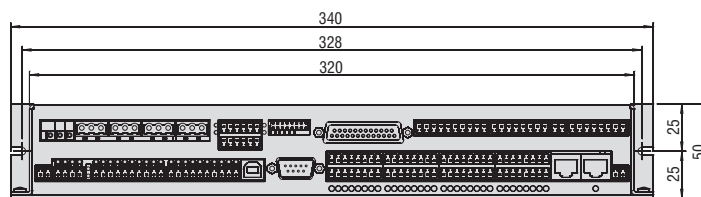
The ISM 10 module includes functions as follows : 24V-supply voltage, safety circuit (VDE113, EN 60204-1), error analysis and I/O module. Thus, all peripheral basic functions of a CNC-machine are available with this highly compact module, even including the monitoring of

the door and the connected ball screw spindle drive in one component.

This component, combining above mentioned components in a robust and fail-safe aluminum housing, is thus replacing the classical wiring inside the isel

control cabinet. Communication between the I/O-module and superior hardware is realized through a CAN-bus interface according to CANopen standards. Inputs as well as outputs are galvanically isolated (except: analog output)

## Scale Drawings



# isel System Module

# iSM 10

## Technical Data

Size (W x H x D)	170 x 340 x 50 mm
Weight	1685 g
Ambient temperature	+5° C to +40° C
Humidity	max. 90%
Supply voltage	AC 85/264 V, 47/63 Hz
Output voltage	DC 24V / approx. 2A (maximum for external devices)

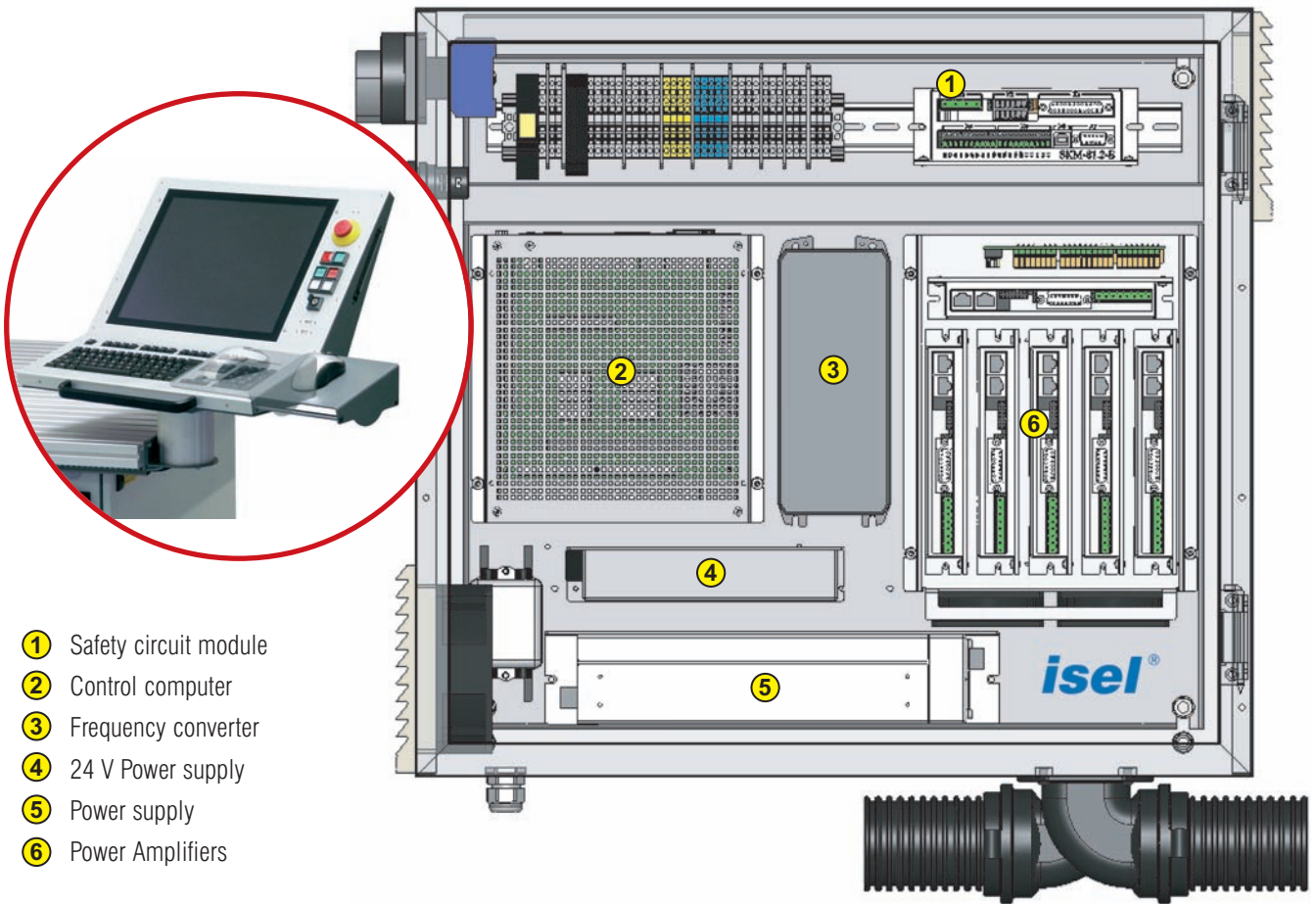
Digital inputs	16
Digital outputs	16  (8x relais at analog outputs) (8x relais, I <sub>max</sub> < 5A) (8x semiconductor, I <sub>max</sub> < 350 mA)
Output 0V to 10V	1
CAN-Bus	CAN Ver. 2.0 b
CAN-Bus-Baudrate	up to 1 MBit/sec.
CAN-Bus-Standard	DS 301 V4.0, DS 401 V2.0

Error analysis	4 inputs 1 output (converter)
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Safety class	3 (EN954)
Stop class	1 (EN 60204)
With falling delay (for stop class 1)	approx. 7s
Diagnostic interface	RS 232
Set up mode	Automatic mode Set up operation
Outputs	1x ball screw spindle 6A AC (safety class 3)  1x power block 6A AC (safety class 3)  1 x PC  10 x 24V DC
Inputs	Home position switch Door locking Limit switch Ball screw spindle control Divers
Additional features	Door control
	Spindle control
	Connection for isel operating console
	Connection for additional operating console / Joystick

Item no. **321233**

# Control Box



- ① Safety circuit module
- ② Control computer
- ③ Frequency converter
- ④ 24 V Power supply
- ⑤ Power supply
- ⑥ Power Amplifiers

## Control Box with isel Motor Drive Technology IMD

Apart from the solid mechanical construction, the multiple axis control plays a decisive role as the connecting link between the production and the automation software.

### The features of the isel Motor Drive Technology are:

- Efficient drive control for the operation of up to 6 axes
- **isel** Motors with optimal matched modular power output stages
- Compact control cabinet, easy to service
- High torque at a motor current comparable to common motor currents
- Great running smoothness and low noise level compared to common systems
- Adjustable phase currents up to 10 A at supply voltages up to 200 V
- Position supervision (optional)
- Phase current optimisation
- Integrated main spindle control
- I/O module for digital and analogue inputs and outputs
- Regulated power supply with PFC and wide input voltage range
- Integrated safety circuit control according to safety category 4
- Easy-to-integrate superior safety circuits
- Type of enclosure IP44 (high-level types of enclosure on request)
- Compact control cabinet design (W x D x H): 600 x 550 x 210 mm
- Control software: **isel** ProNc, **isel** Remote

### Options:

- Joystick control box
  - Up to 4 axes, emergency stop switch, protection switch, adjustable travel speed and stepwidth, controller interface via USB

# Control Box

## Power Amplifier iMD 10



### Features

Power amplifier / Positioning module for brush type DC servo motors

- Supply voltage 40 V to 95 V
- Motor current: Constant current 12 A, peak current up to 25 A
- CAN bus interface according to CanOpen DS301 V4.0 / DS402 V1.0
- RS232 interface
- Input  $\pm 10$  Volt-Eingang
- Digital control of current, speed and position
- Inputs for limit switch and separate reference switch
- Motor current monitor (short circuit,  $I^2t$ ), temperature monitor
- Encoder signal monitor
- Update of the firmware through RS232
- Protection against short circuit, overvoltage, undervoltage and excess temperature
- Simple startup through RS232 and CAN-bus, respectively
- Includes functionalities relevant to the safety circuit
- Control cabinet module
- Size: 180 mm x 35 mm x 110 mm

Item no.: **314 020**

## Input/Output Module USB I/O 8/8



### General Information

The USB-I/O is intended as an expansion module for the inputs/outputs of isel machines and systems. It possesses eight digital inputs and eight digital outputs and is powered via the USB bus. The I/O module is connected via a standard USB cable. In addition, the supply voltage (+24V) for the inputs/outputs must be connected. The module is installed on the top-hat rail in the control cubicle. The robust steel-sheet case and terminals brought out to the front side allow the sensors / actuators to be connected to the module in a straightforward manner. The input/output module is integrated into the user interface (ProNC, Remote) of the CNC via the standard isel software interface (module DII).

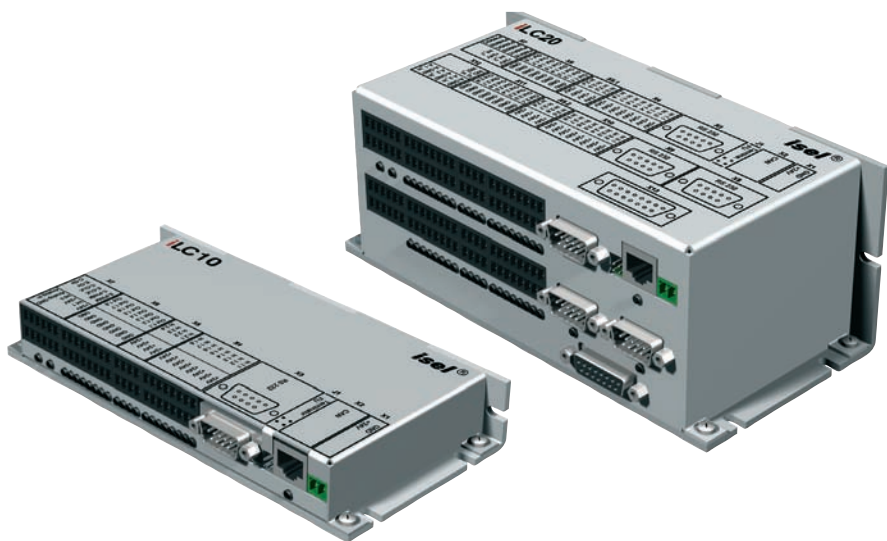
### Technical Data

- Data transfer via USB bus without special software driver
- +5V supply voltage, approx. 120mA via USB
- 8 electrically isolated outputs (max. output power 0.7A / 24V per output)
- 8 electrically isolated inputs (10mA, 24V)
- Status display for the active inputs/outputs by way of LEDs

Item no.: **321 030**

# PLC Controller

# iLC 10/20



## Features

- Compact SPS
- CAN Bus Interface according to CANopen for connecting power amplifiers and other equipment
- Programming according to IEC 61131 with the programming system from CoDeSys
- Visualization of the application

The main goal of designing drive solutions is the flexibility of the actuators and the control. With the product family iLC we provide an appropriate and flexible solution for your automation devices.

The design of the iLC modules fits seamlessly into the design concept of isel and is suitable for a control box installation. The general mechanical design is kept to a large extent.

The integrated CAN-bus interface allows access to the amplifier series iMD 10 to iMD 60, the CAN I/O modules of isel and the world of CANopen devices. The iLC's can be used as masters or as slaves within the CAN Bus and/or your existing system. The numerous inputs and outputs as well as serial interfaces of the iLC 20 enable to deal with almost every problem.

## CoDeSys

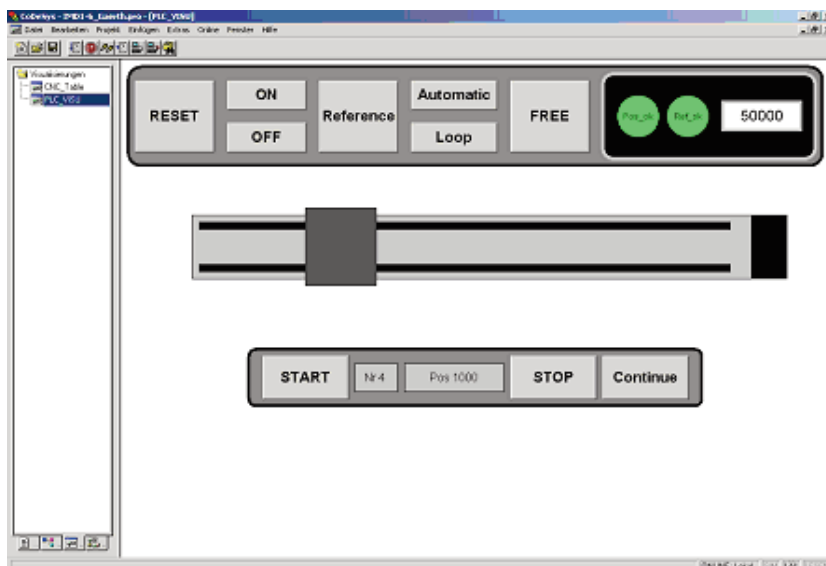


For the graphical visualization of your application, a comprehensive graphically programmable visualization editor is available in CoDeSys.

Programming of the application is done by using the software tool CoDeSys (**C**ontroller **D**evelopment **S**ystem) from 3S. CoDeSys is the most widely used programming system on the market and is used by more than 150 leading companies. The CoDeSys programming system is the heart of the 3S Automation Suite and possesses the full functionality of a modern development tool. This development environment is standardized for professional application development in accordance with IEC 61131-3 and features fast and flexible application programming by using the integrated libraries. By means of our supplied Motion Control Library and the extensive examples you can control our power amplifiers of the iMD series according to your desires without much programming effort. Various debugging tools are available for the startup.



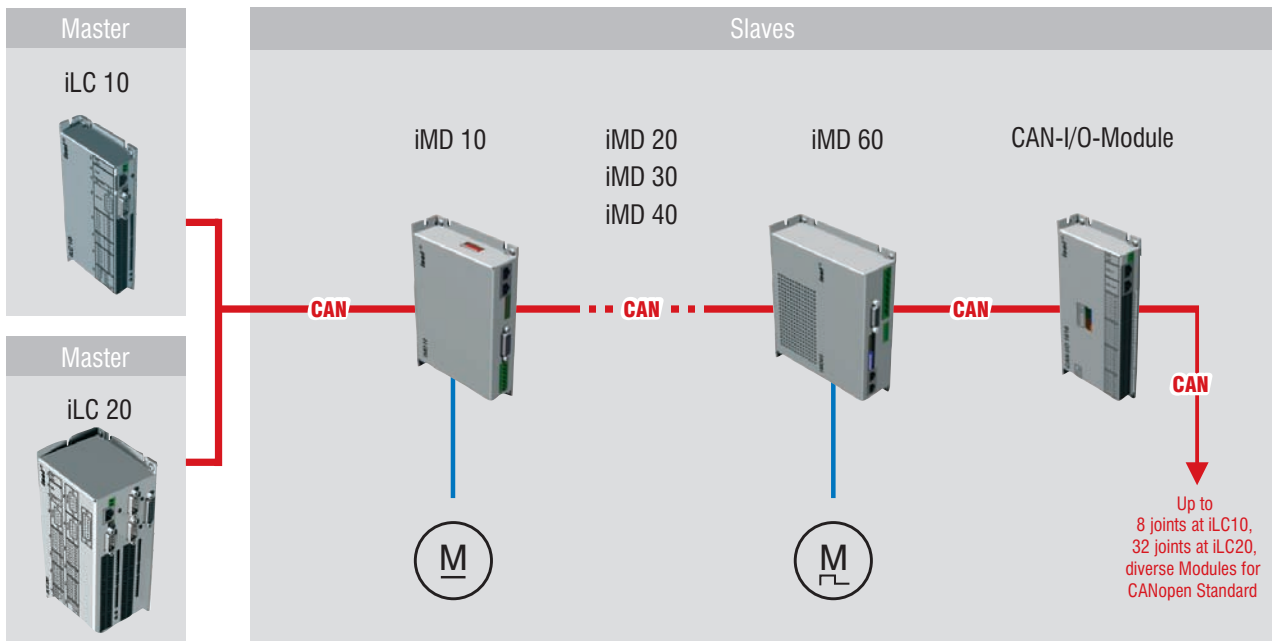
Programming



Visualization

# PLC Controller

# iLC 10/20



## Technical Data

	iLC 10	iLC 20
Item number	321239	321249 (available as of 3rd quarter 2008)
Dimensions	85 x 180 x 28 mm (W x H x D)	90 x 190 x 70 mm (W x H x D)
Protection class		IP 20
Logic voltage		24 V DC
Process voltage		24 V DC
Current drain	160 mA	500 mA (Logic)
Ambient temperature		+5° C ... +40° C
Storage temperature		-25° C ... +70° C
Relative humidity		Max. 95 %
CPU	16 Bit CPU Kernel	16 Bit CPU Kernel (80C167)
Programm memory	16 KByte	256 KByte
Data memory	32 KByte	256 KByte
Flash memory	4 KByte	4 KByte
Cyclo time	250 instructions/ms	2,000 instructions/ms
Digital inputs	12 (DC-isolated) 11 when using the analog input	24 (DC-isolated) 21 when using all three analog inputs
Digital outputs	8 Transistor outputs (DC-isolated) $I_{max} = 350 \text{ mA}$ thermal protection, short-circuit protection	16 Transistor outputs (DC-isolated) $I_{max} = 350 \text{ mA}$ thermal protection, short-circuit protection
Analog input	1 Analog input (0 V ... 10 V) 10 Bit resolution, $R_i = 2 \text{ KOhm}$	3 Analog inputs (0 V ... 10 V) 10 Bit resolution, $R_i = 2 \text{ KOhm}$
Interrupt inputs		2
Special I/O	1 clock output + direction output for connecting a power amplifier with clock/direction input, 1 PWM output	1 Watchdog output Connector for LC display (SubD 15)
Interfaces	1 COM programming and visualizing interface SubD9 (up to 57,600 Baud) 1 CAN Bus Rj45 (up to 1 Mbaud) according to CAN specification V2.0, up to 8 slaves	3 COM SubD9 interfaces for programming, visualizing and connecting external equipment 1 CAN Bus Rj45 (up to 1 Mbaud) according to CAN specification V2.0, up to 32 slaves
Movement axes	1	Max. 10
Software		CoDeSys (IEC61131) incl. special libraries for connecting isel-iMDxx power amplifiers

# 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

## 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
- 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.

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-/under-voltage 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 CANopen PCI board, 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.

# Servo Motor CAN Controller

# CVC 496

## Technical Data

Item number	<b>352056 00x0</b> ** Tabletop Unit	<b>352055 00x0</b> ** 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 apparatus 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

**CANopen PCI Board iCC 10**  
Item no.: **320310**

**CAN I/O Module**  
Item no.: **321002**  
Item no.: **321004**

**CNC Joystick with adapter box**  
for external CNC Controller  
Item no.: **359009**

**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-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-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-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**

# CNC-Controller

# C 142-4



## 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.

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
- 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

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**

### 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 DC power supply unit NT24  
Item no.: **316 301** Item no.: **301 040**

Interface card UI5.C-E/A Powerblock PB600-C  
Item no.: **325 551** Item no.: **308 059**

### 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

- 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

## 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 (W480xD415xH187 mm)
- 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 2.1: programming software (Windows)

Attention! Motor connection cables must be ordered separately.

# 4-Axis Stepping Motor Controller

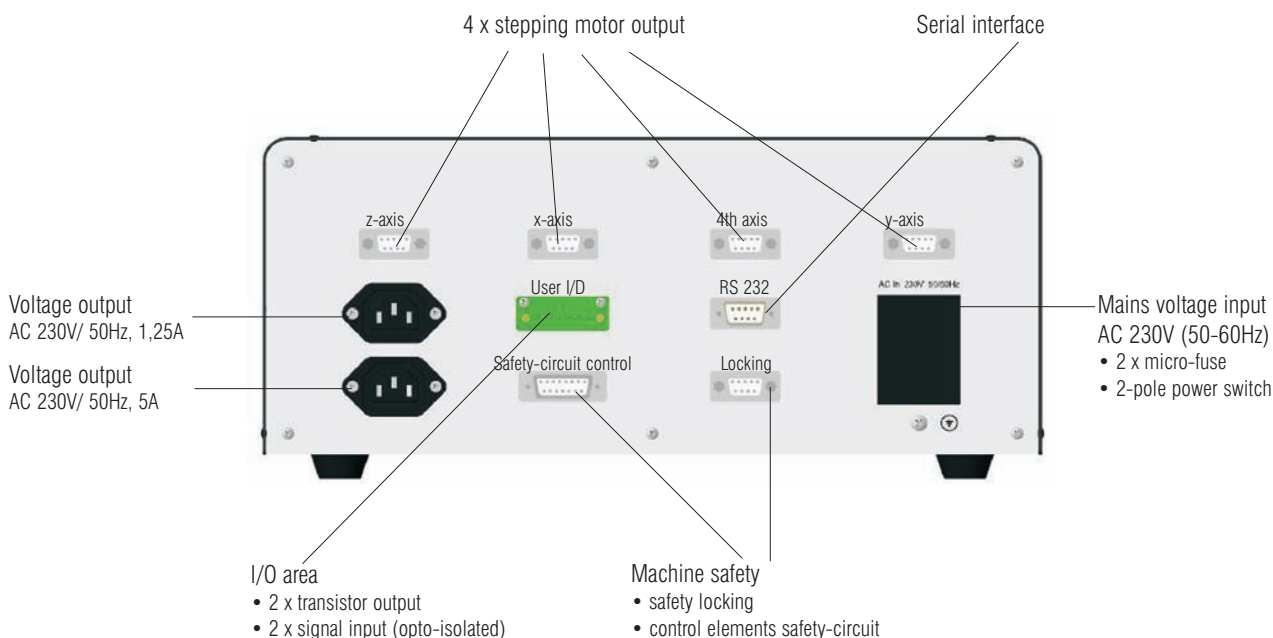
# CSD 405-IMC

## Technical Data

Item no.	<b>383025 1000</b>
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, 250 mA 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



# CNC Controller

# IT 142C



## 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)

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.

- 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 PAL-PC, IR5DRV, etc.

### 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

## 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

- 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)

# Single Axis Controller

# MC 1-10 / 1-20



MC 1-10  
Front view



MC 1-10  
Rear view

**MC 1-10** for brush-type DC servo motors

**MC 1-20** for brushless DC/EC servo motors

The new, powerful single axis controller with LC display is offered in two versions:

MC 1-10 with integrated power amplifier iMD 10 for brush-type DC servo motors (Nominal motor voltage 48 VDC)

MC 1-20 with integrated power amplifier iMD 20 für brushless DC-/EC servo motors (Nominal motor voltage 48 VDC)

The parameterization of the linear or rotary units that are equipped with DC or EC servo motors is done PC-based with the setup program "DC Setup" (MC 1-10) or "AC Setup" (MC 1-20)

## Technical Data

- Dot matrix LC display with 4 lines of 20 character each, english character set (alphanumeric) as operator interface
- Keypad with four keys for soft key programming, additionally: Start, Stop, ESC, Enter
- Power supply for intermediate circuit voltage (48 V DC / 500 W with PFC)
- Digital current, speed and position control with short cycle times (100  $\mu$ s, 244  $\mu$ s and 488  $\mu$ s)
- Motor current: nominal 12 A, peak up to 25 A
- Supervision of the motor current (short-circuit, I2t)
- Supervision of the encoder signals
- Software supervision by the internal watchdog timer
- Galvanic isolation of processor, power and I/O section
- Simple iMD 10/20 firmware upgrade via RS232
- Digital signal processor (DSP, 60 MIPS), flash memory (firmware update by manufacturer)
- Protection against short-circuit, over- and undervoltage and overtemperature
- Internal safety circuit with interface to superior safety circuits on the back side
- Additional connections for external program start/stop (SPS interface) on the back side

## Item numbers

MC 1-10 **381518 0010**

MC 1-20 **381518 0020**

MC 1-30 **381518 0030** (in preparation)

# Single Axis Controller

# MC 1-10/1-20

## Digital Inputs

- External Start/Stop
- Positive/negative limit switch, reference switch (for micro pushbutton or initiator -NCC-)
- 8 vacant user inputs (24 V) with LED bar graph

## Operating modes

- Standard mode: CNC mode (standalone, program download in data flash)
- Additional mode: DNC mode (operating with PC, optional: setpoint setting CANopen)

## Download Memory for the PAL-PC User Program (CNC mode)

- Flash memory for approx. 650 instructions and 100 LCD text lines with 20 ASCII characters each

## Digital Outputs

- Motor brake
- 8 vacant user outputs (24 V / 700 mA) with LED bar graph

## Software

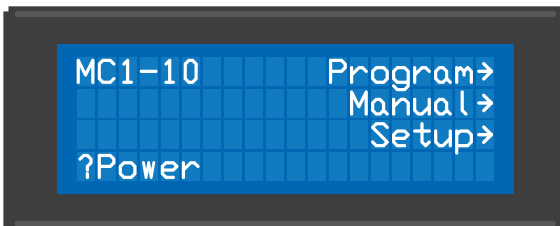
- PAL-PC 2.1 for programming in CNC mode
- ProNC/Remote Win (option) for operating in DNC mode
- Instruction set download compatible to IMC4-M

## Communication Interfaces

- RS232 interface for program download or send/wait instruction in PAL-PC
- CANopen (option)

## Display Examples

### Basis Menu

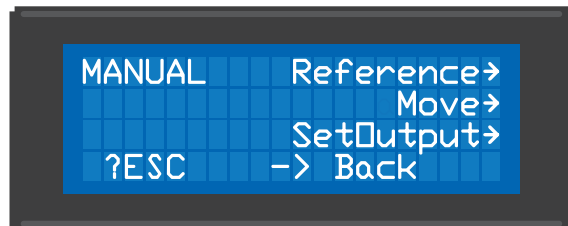


After switching on the mains switch, this menu is displayed at the controllers LC display after the first start-up of the motor power amplifier iMD 10.

Incorrect communication between master processor (embedded controller with download memory) and motor out-put stage iMD 10 is diagnosed.

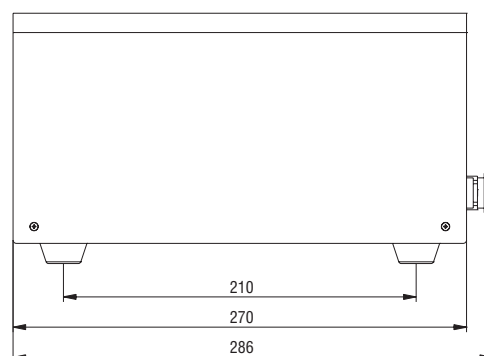
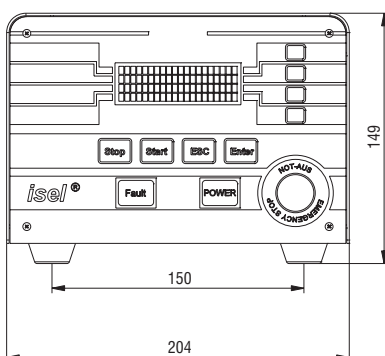
In this mode, the download of a user-specific program from the PAL-PC user interface to the flash memory of the single axis controller is possible.

### Manual operating mode: Manual operation (simple mode)



The setup mode enables the basic functions of the controller (reference travel, absolute and relative positioning, set and reset of outputs) by operating the pushbuttons of the foil keyboard (use of the soft-keys right beside the LC display)

## Scale Drawings



## Encoder

## EI 30



## Features

- No signal adjustment required
- Low cost
- Resolutions 512 counts per revolution
- Small size
- -40° C to 100° C operating temperature
- TTL compatible

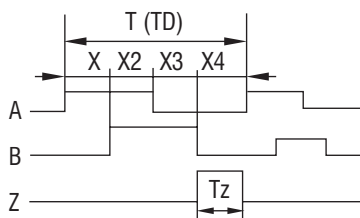
The EI 30 are high performance, low cost, three channel optical incremental encoders. The encoder contains a lensed LED source, an integrated circuit with detectors and circuitry, and a code-wheel which rotates between the emitter and detector IC. These encoders may be quickly and easily mounted to a motor. A driver module transmits the signals to an 8-pole round cable, which represents the interface to your application.

## Applications

The EI 30 provide motion detection at a low cost, making them ideal for high volume applications. Typical applications include printers, plotters, tape drives, positioning tables and automatic handlers.

## Output waveform

90° Output phase difference, CW rotation (CW rotation as seen from fit surface)



Square-wave accuracy:

$$X_1 + X_2 = 1/2T \pm 1/12T$$

$$X_3 + X_4 = 1/2T \pm 1/12T$$

Pitch error of period:  $\pm 0,01T$

Pitch error of phase position:  $\leq 1/18T$

Period of pulses:  $T = 360^\circ / N$  (N: output pulses).

A leads B clockwise when viewing the encoder shaft end, the position of Z phase against A, B phase is not specified.

Item-Nr. **397 911 2356**

## Terminal assignment

Cable Code	1	2	3	4	5	6	7	8
Cable Color	Black	Red	Green	Brown	Grey	White	Yellow	Orange
Line driver output	0V	Vcc	SIG A	SIG $\bar{A}$	SIG $\bar{B}$	SIG B	SIG Z	SIG $\bar{Z}$

## Encoder

## EI 30

## Technical Data

## Electrical Specifications

Output wave	Square wave
Output signals	A, /A, B, /B, Z, /Z phase
Current consumption	≤ 40 mA
Output current	0 - 5 mA
Response Frequency	0 - 100 KHz
Output phase difference	90° ± 45°
Supply voltage	5 V DC
Signal level	$V_H \geq 85\% V_{CC}$ , $V_L \leq 0.3 V$
Number of pulses	512
Output circuit	Line driver AM26LS31

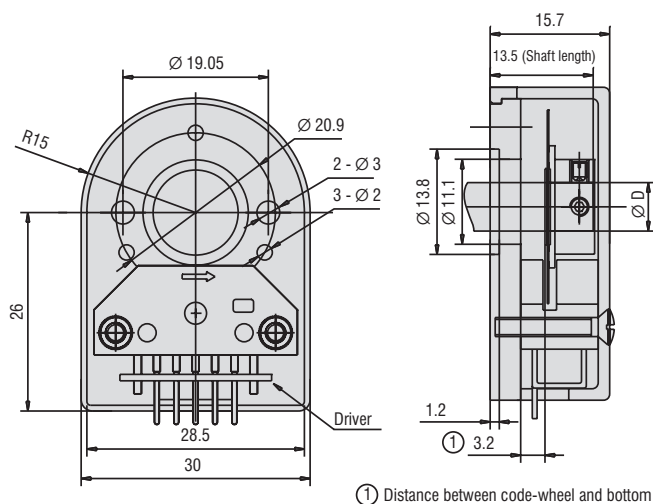
## Mechanical Specifications

Rotor inertia of code-wheel	Appr. $6.0 \times 10^{-8}$ Kgm <sup>2</sup>
Hollow shaft diameter	6.35
Shock resistance	980 m/s <sup>2</sup> , 6 ms, 2 times each on XYZ
Vibration proof	50 m/s <sup>2</sup> , 10 - 200 Hz, 2 hours each on XYZ
Working life	MTBF ≥ 50,000 h (+25° C, 2,000 rpm)
Weight	Appr. 20 g (with 0.5 meter cable)

## Environmental Specifications

Working humidity	30 - 85% (No condensation)
Storage temperature	-40° C - 110° C
Working temperature	-25° C - 100° C
Weld temperature	≤ 260° C
Protection class	IP 50

## Scale Drawings



## Encoder

## EI 56



## Features

- Three channel quadrature output with index pulse
- TTL compatible
- 100° C operating temperature
- Easy assembly
- No signal adjustment necessary
- Resolutions: 1000 counts per revolution
- Maximum shaft diameter of 6,35 mm

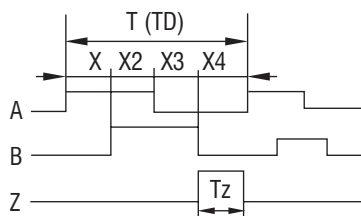
The EI 56 are high performance optical incremental encoders. These encoders emphasize high reliability, high resolution and easy assembly. Each encoder contains a lensed LED source (emitter), an integrated circuit with detectors and output circuitry, and a code-wheel which rotates between the emitter and detector integrated circuit. This index is an "active high" pulse that occurs once every full rotation of the code-wheel.

## Applications

The EI 56 provide motion detection to high resolution.

## Output waveform

90° Output phase difference, CW rotation (CW rotation as seen from fit surface)



Square-wave accuracy:

$$X_1 + X_2 = 1/2T \pm 1/12T$$

$$X_3 + X_4 = 1/2T \pm 1/12T$$

Pitch error of period:  $\pm 0,01T$

Pitch error of phase position:  $\leq 1/18T$

Period of pulses:  $T = 360^\circ / N$  (N: output pulses).

A leads B clockwise when viewing the encoder shaft end, the position of Z phase against A, B phase is not specified.

Item-Nr. **397 911 2306**

## Terminal assignment

Cable Code	1	2	3	4	5	6	7	8
Cable Color	Black	Red	Green	Brown	Grey	White	Yellow	Orange
Line driver output	0V	Vcc	SIG A	SIG $\bar{A}$	SIG $\bar{B}$	SIG B	SIG Z	SIG $\bar{Z}$

## Encoder

## EI 56

## Technical Data

## Electrical Specifications

Output wave	Square wave
Output signals	A, /A, B, /B, Z, /Z phase
Current consumption	≤ 40 mA
Output current	0 - 5 mA
Response Frequency	0 - 100 KHz
Output phase difference	90° ± 45°
Supply voltage	5 V DC
Signal level	$V_H \geq 85\% V_{CC}$ , $V_L \leq 0.3 V$
Number of pulses	1,000
Output circuit	Line driver AM26LS31

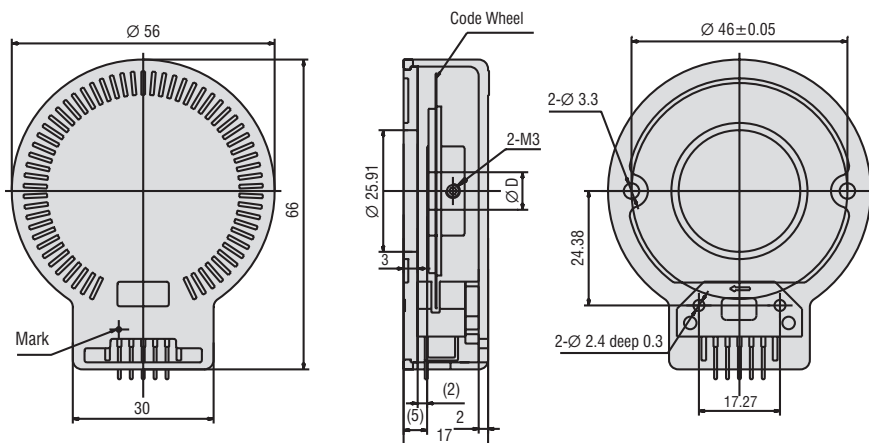
## Mechanical Specifications

Rotor inertia of code-wheel	Appr. $6.0 \times 10^{-8}$ Kgm <sup>2</sup>
Hollow shaft diameter	6.35
Shock resistance	980 m/s <sup>2</sup> , 6 ms, 2 times each on XYZ
Vibration proof	50 m/s <sup>2</sup> , 10 - 200 Hz, 2 hours each on XYZ
Working life	MTBF ≥ 50,000 h (+25° C, 2,000 rpm)
Weight	Appr. 25 g (with 0.5 meter cable)

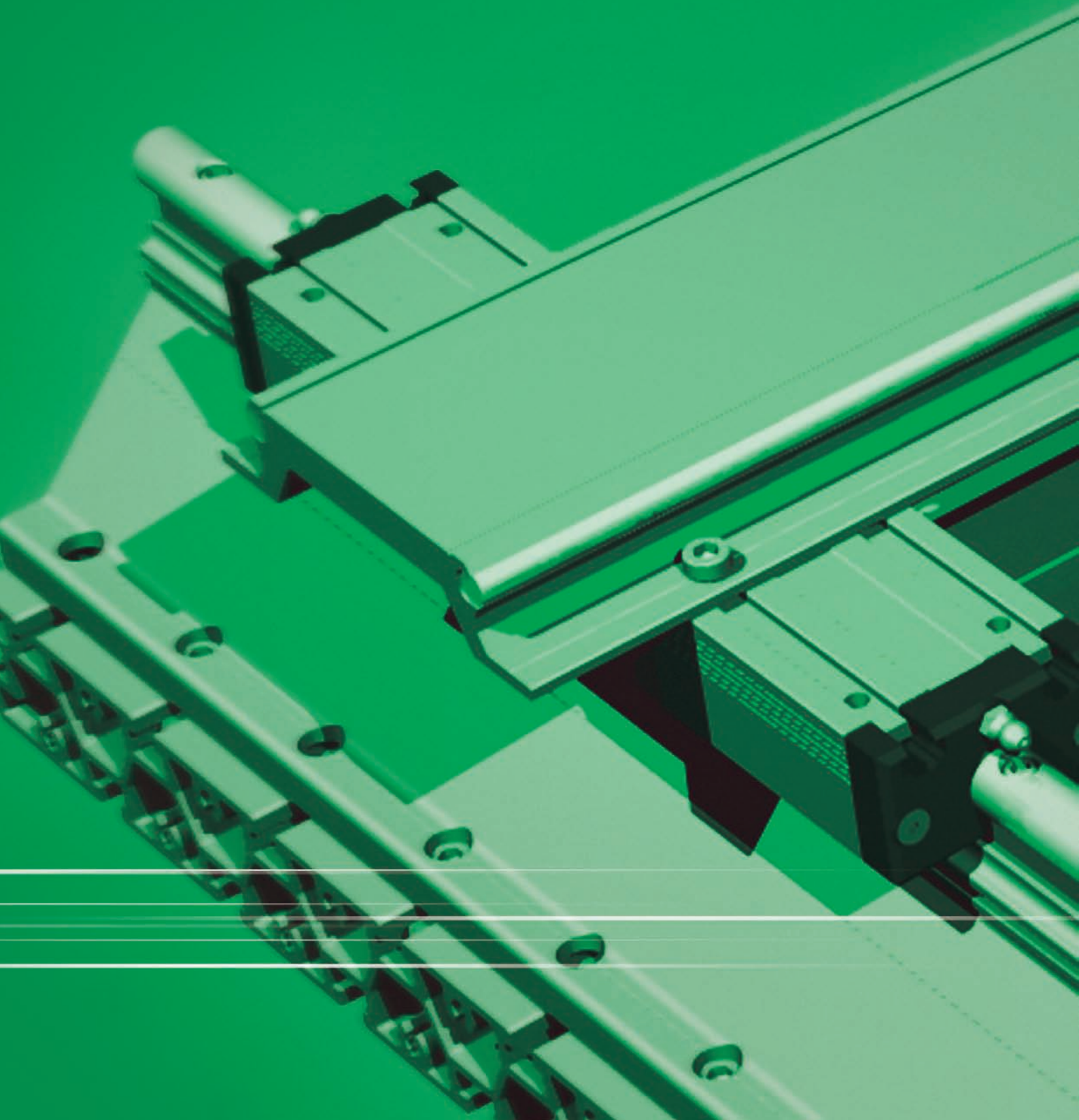
## Environmental Specifications

Working humidity	30 - 85% (No condensation)
Storage temperature	-40° C - 110° C
Working temperature	-25° C - 100° C
Weld temperature	≤ 260° C
Protection class	IP 50

## Scale Drawings



# mechan



The logo for 'ics' is displayed in a large, white, lowercase sans-serif font. It is positioned in the upper left corner of the page, overlaid on a background image of industrial machinery. The background image shows a close-up of a metal structure with various components, including what appears to be a ball screw and a timing belt, all rendered in a monochromatic green color scheme. The 'ics' text is semi-transparent, allowing the underlying image to be visible through it.

# ics

## MECHANICS

Aluminium Profiles ..... C2

Worktables/Mountingtables ..... C20

Linear Guides / Drives ..... C24

Drive Components ..... C64

### Linear Units

with / without Positioning Motors

with Ball Screw Feed Axes ..... C70

with Timing Belt Feed Axes ..... C112

Rotary and Lifting Units ..... C156

# Aluminium Profiles

# Overview

## PP-Profiles Panel Profiles

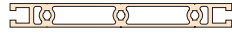
C 4



PP 50



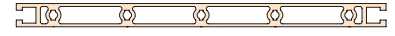
PP 100



PP 150



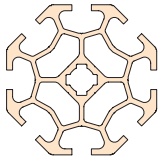
PP 200



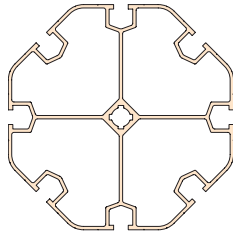
PP 250

## PM-Profiles Fair Profiles

C 5



PM 50



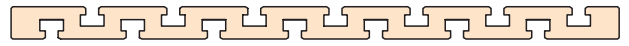
PM 100

## PT-Profiles T-Groove Plates

C 6



PT 25



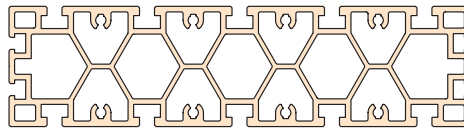
PT 50

## RE-Profiles Rectangular Profiles

C 8



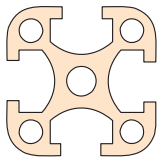
RE40



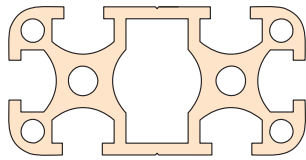
RE65

## PU-Profiles Universal Profiles

C 10



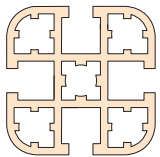
PU 25



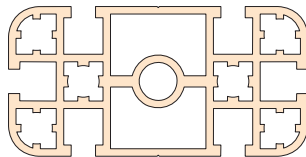
PU 50

## PL-Profiles Lightweight Frame Profiles

C 11



PL 40



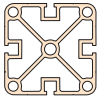
PL 80

# Aluminium Profiles

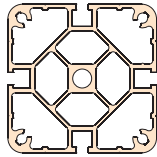
## Overview

### PS-Profiles Stand Profiles

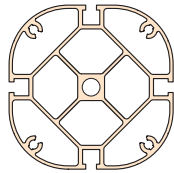
C 12



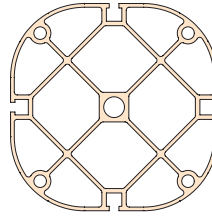
PS 50



PS 80



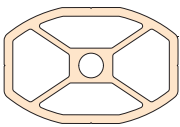
PS 100



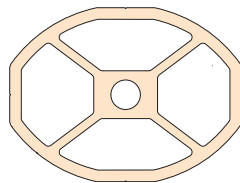
PS 140

### PS-Profiles Stand Profiles

C 14



PS 60x40



PS 80x60

### Accessory

C 15

### Profil Connections

C 18

### Profile Fast-Clamped Connections

C 19

### AT Working Tables

C 20

### MT Mounting Tables

C 21

### Aluminium T-Slot Plates

C 22

### Aluminium T-Slot Plates

C 23

CAD Data: [www.iselautomation.net](http://www.iselautomation.net)

# Panel Profiles

# PP-Profiles



## Features

- for fast and easy assembly of housings, tables and frames
- aluminium, anodized
- made according to DIN EN 12020-2
- 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

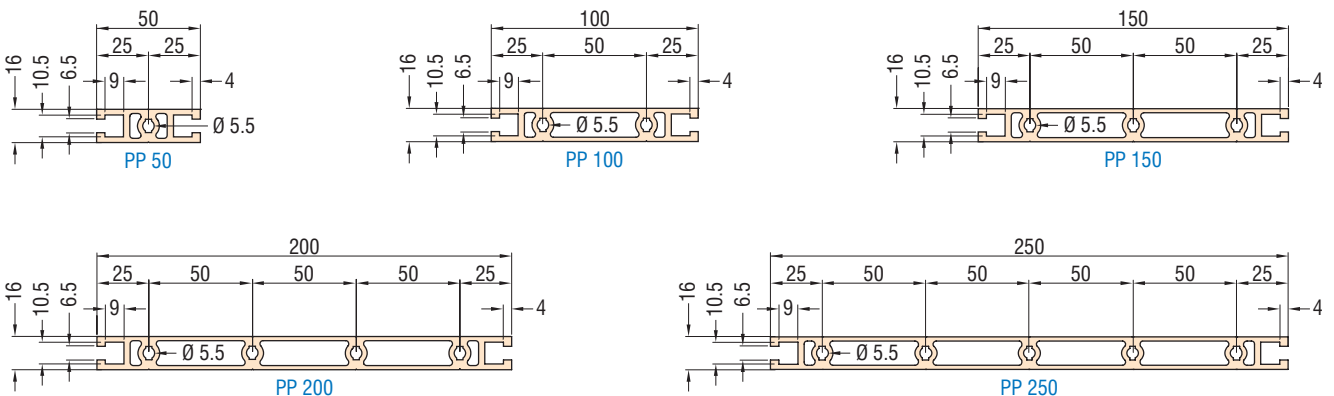
## Technical Data

	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 lengths upon request)				
weight	1,140 g/m	1,890 g/m	2,640 g/m	3,390 g/m	4,140 g/m
	hollow indentation 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 <sup>4</sup>	67.27 cm <sup>4</sup>	213.92 cm <sup>4</sup>	482.77 cm <sup>4</sup>	908.52 cm <sup>4</sup>
inertia moment $I_y$	1.37 cm <sup>4</sup>	2.46 cm <sup>4</sup>	3.55 cm <sup>4</sup>	4.64 cm <sup>4</sup>	5.74 cm <sup>4</sup>
moment of resistance $W_x$	3.25 cm <sup>3</sup>	13.45 cm <sup>3</sup>	28.52 cm <sup>3</sup>	48.27 cm <sup>3</sup>	72.68 cm <sup>3</sup>
moment of resistance $W_y$	1.71 cm <sup>3</sup>	3.08 cm <sup>3</sup>	4.44 cm <sup>3</sup>	5.80 cm <sup>3</sup>	7.17 cm <sup>3</sup>

## Ordering Data

Profile designation	Item no.: L = 3000 mm
<b>PP 50</b> W 50 x H 16 mm	201 040 <b>3000</b>
<b>PP 100</b> W 100 x H 16 mm	201 041 <b>3000</b>
<b>PP 150</b> W 150 x H 16 mm	201 042 <b>3000</b>
<b>PP 200</b> W 200 x H 16 mm	201 043 <b>3000</b>
<b>PP 250</b> W 250 x H 16 mm	201 009 <b>3000</b>

## Dimension Drawings



## Fair Profiles

## PM-Profiles



### Features

- For fast and easy assembly of e. g. exhibition stands etc.
- Aluminium, anodized
- Made according to DIN EN 12020-2
- 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

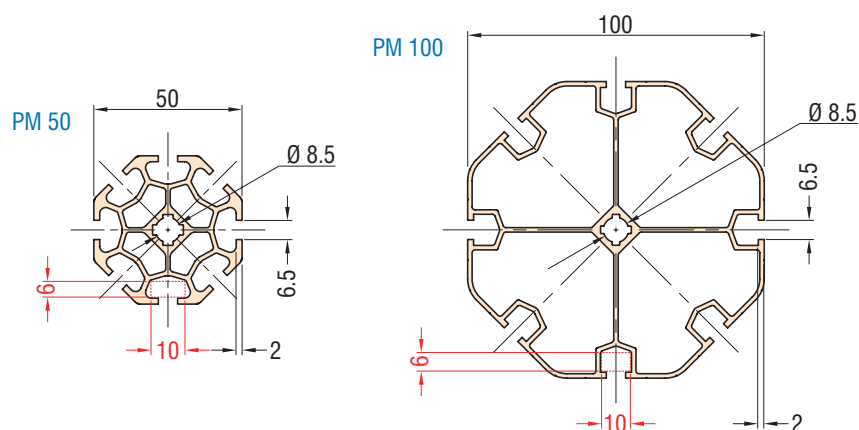
### Technical Data

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

### Ordering Data

Profile designation	Item no.: L = 2500 mm Item no.: L = 3000 mm
<b>PM 50</b> W 50 x H 50 mm	200004 <b>2500</b>
<b>PM 100</b> W 100 x H 100 mm	200005 <b>3000</b>

### Dimension Drawings



# T-Groove Plates

# PT-Profiles



## Features

- universal precision, clamping and working surface
- aluminium, anodized
- made according to DIN EN 12020-2
- face-milled on both sides
- applicable with all machines
- thick walled, resistant to warping and extremely solid
- cut to size on request

Option:

- Unmachined Height 22 mm

## Technical Data

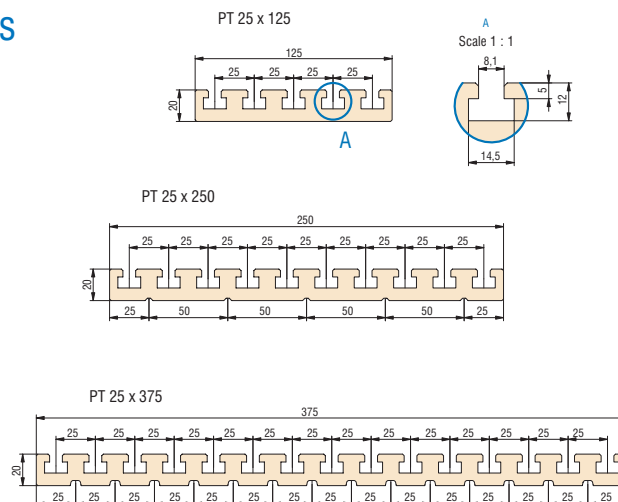
	PT 25		
	125 x 20 mm	250 x 20 mm	375 x 20 mm
dimensions (W x H)	125 x 20 mm	250 x 20 mm	375 x 20 mm
length	up to 3 m (special length upon request)		
weight	4,810 g/m	9,560 g/m	13,710 g/m
T-grooves	one-sided in steps of 25 mm		
inertia moment $I_x$	243.36 cm <sup>4</sup>	1848.57 cm <sup>4</sup>	5996.01 cm <sup>4</sup>
inertia moment $I_y$	6.46 cm <sup>4</sup>	12.77 cm <sup>4</sup>	17.90 cm <sup>4</sup>
Moment of resistance $W_x$	38.94 cm <sup>3</sup>	147.88 cm <sup>3</sup>	319.79 cm <sup>3</sup>
Moment of resistance $W_y$	6.46 cm <sup>3</sup>	12.77 cm <sup>3</sup>	17.90 cm <sup>3</sup>

## Ordering Data

Profile designation	Item no.: L = 1000 mm Item no.: L = 3000 mm
<b>PT 25</b> W 125 x H 20 mm	201 014 <b>1000</b> 201 014 <b>3000</b>
<b>PT 25</b> W 250 x H 20 mm	201 018 <b>1000</b> 201 018 <b>3000</b>
<b>PT 25</b> W 375 x H 20 mm	201 020 <b>1000</b> 201 020 <b>3000</b>

In steps of 100 mm,  
400 – 3000 mm available

## Dimension Drawings



T-Groove Blocks see Accessories Aluminium Profiles

# T-Groove Plates

# PT-Profiles



## Features

- universal precision, clamping and working surface
- aluminium, anodized
- made according to DIN EN 12020-2
- face-milled on both sides
- applicable with all machines
- thick walled, resistant to warping and extremely solid
- cut to size on request

Option:

- Unmachined Height 22 mm

## Technical Data

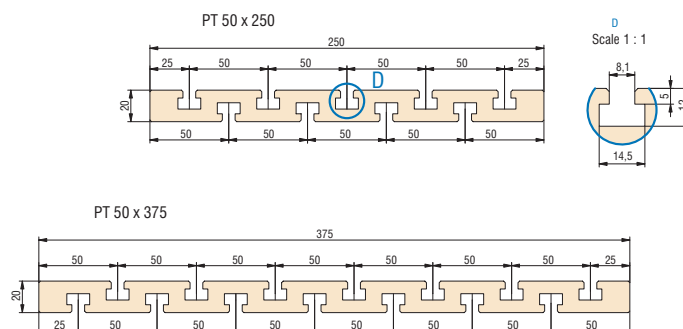
	PT 50	
dimensions (W x H)	250 x 20 mm	375 x 20 mm
length	up to 3 m (special length upon request)	
weight	10,020 g/m	14,840 g/m
T-grooves	tow-sided in steps of 50 mm	
inertia moment $I_x$	2062.99 cm <sup>4</sup>	6745.96 cm <sup>4</sup>
inertia moment $I_y$	13.85 cm <sup>4</sup>	20.63 cm <sup>4</sup>
Moment of resistance $W_x$	165.04 cm <sup>3</sup>	359.78 cm <sup>3</sup>
Moment of resistance $W_y$	13.85 cm <sup>3</sup>	20.63 cm <sup>3</sup>

## Ordering Data

Profilbezeichnung	Art.-Nr.: L = 1000 mm Art.-Nr.: L = 3000 mm
<b>PT 50</b> B 250 x H 20 mm	201 016 <b>1000</b> 201 016 <b>3000</b>
<b>PT 50</b> B 375 x H 20 mm	201 019 <b>1000</b> 201 019 <b>3000</b>

In steps of 100 mm,  
400 – 3000 mm available

## Dimension Drawings



T-Groove Blocks see Accessories Aluminium Profiles

# 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 EN 12020-2
- light, very solid
- in combination with the accessory numerous applications are possible
- cut to size on request

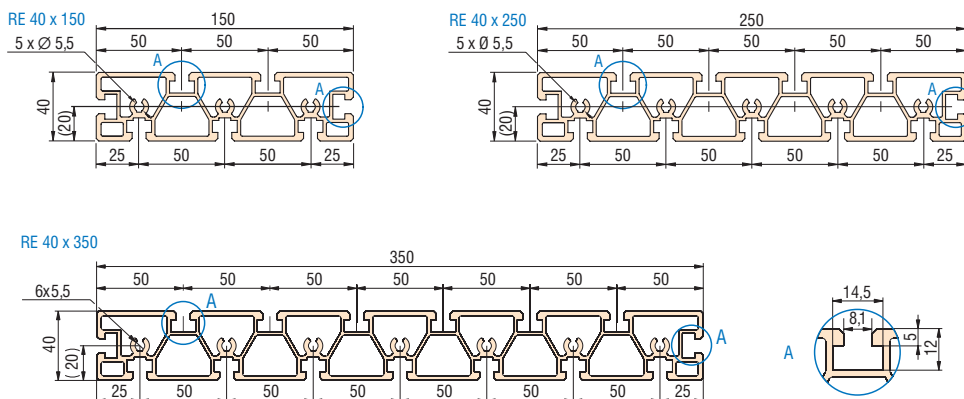
## Technical Data

	RE 40		
	150 x 40 mm	250 x 40 mm	350 x 40 mm
dimensions (W x H)	150 x 40 mm	250 x 40 mm	350 x 40 mm
length	up to 3 m (special length upon request)		
weight		7,593 g/m	10,417 g/m
	several hollow sections and T-groove-indentations for slide nuts resp. threaded strips M6 as well as front sided indentions for M6		
inertia moment $I_x$		1,654.53 cm <sup>4</sup>	4,306.69 cm <sup>4</sup>
inertia moment $I_y$		54.18 cm <sup>4</sup>	75.00 cm <sup>4</sup>
moment of resistance $W_x$		131.64 cm <sup>3</sup>	246.1 cm <sup>3</sup>
moment of resistance $W_y$		27.09 cm <sup>3</sup>	37.5 cm <sup>3</sup>

## Ordering Data

Profile designation	Item no.: L = 3000 mm
<b>RE 40</b> W 150 x H 40 mm	201 035 <b>3000</b>
<b>RE 40</b> W 250 x H 40 mm	201 030 <b>9300</b>
<b>RE 40</b> W 350 x H 40 mm	201 031 <b>3000</b>

## Dimension Drawings



# 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 EN 12020-2
- light, very solid
- face-milled on both sides
- in combination with the accessory numerous applications are possible
- cut to size on request

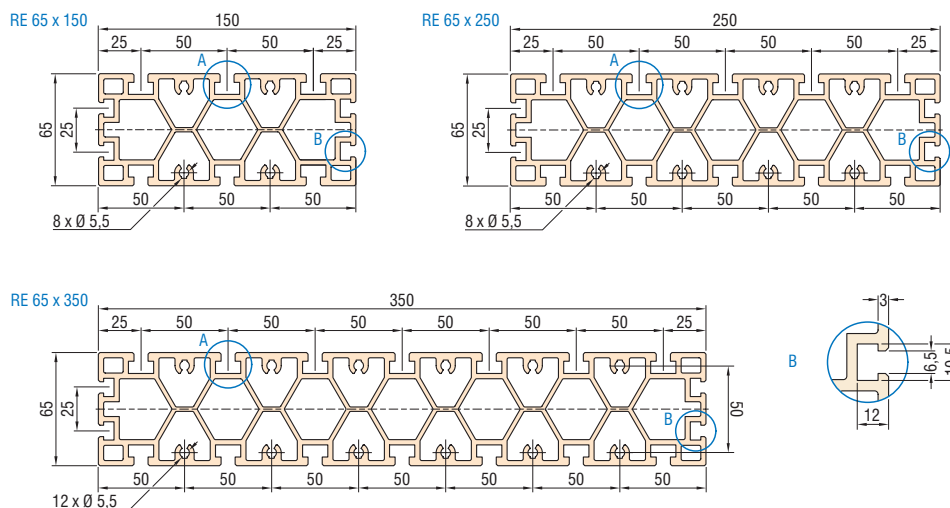
## Technical Data

	RE 65		
dimensions (W x H)	150 x 65 mm	250 x 65 mm	350 x 65 mm
length	up to 3 m (special length upon request)		
weight	7,725 g/m	12,420 g/m	17,030 g/m
	several hollow sections and T-groove-indentations for slide nuts resp. threaded strips M6 as well as front sided indentations for M6		
inertia moment $I_x$	633.47 cm <sup>4</sup>	2,658.48 cm <sup>4</sup>	6,953.91 cm <sup>4</sup>
inertia moment $I_y$	148.87 cm <sup>4</sup>	243.85 cm <sup>4</sup>	338.52 cm <sup>4</sup>
moment of resistance $W_x$	84.46 cm <sup>3</sup>	212.68 cm <sup>3</sup>	397.37 cm <sup>3</sup>
moment of resistance $W_y$	45.83 cm <sup>3</sup>	75.03 cm <sup>3</sup>	104.16 cm <sup>3</sup>

## Ordering Data

Profile designation	Item no.: L = 3000 mm
RE 65 W 150 x H 65 mm	201 034 3000
RE 65 W 250 x H 65 mm	201 032 3000
RE 65 W 350 x H 65 mm	201 033 3000

## Dimension Drawings



## Universal Profiles



## PU-Profiles

### Features

- for fast and easy assembly of housings, tables and frames
- aluminium, anodized
- made according to DIN EN 12020-2
- 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

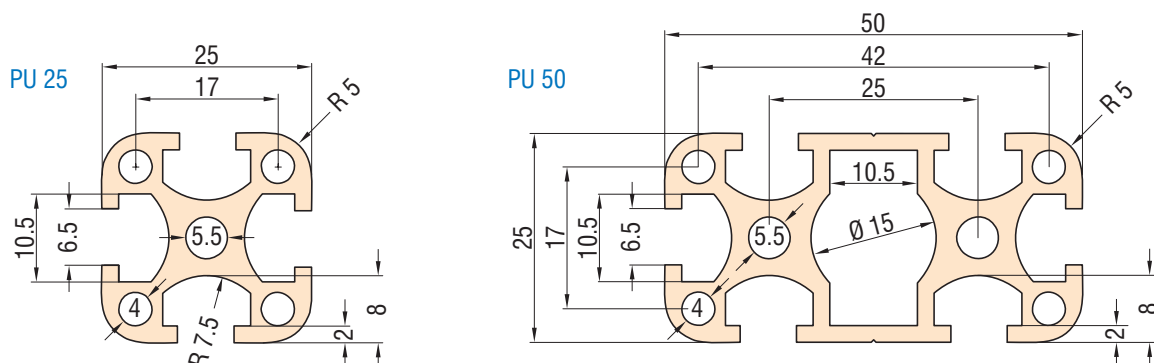
### Technical Data

	PU 25	PU 50
dimensions (W x H)	25 x 25 mm	50 x 25 mm
length	up to 3 m (special lengths upon request)	
weight	690 g/m	1,270 g/m
	4 T-groove indentions for slide nuts M6 hollow indentation, 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 cm <sup>4</sup>	10.99 cm <sup>4</sup>
inertia moment $I_y$	1.43 cm <sup>4</sup>	2.81 cm <sup>4</sup>
moment of resistance $W_x$	1.14 cm <sup>3</sup>	4.40 cm <sup>3</sup>
moment of resistance $W_y$	1.14 cm <sup>3</sup>	2.25 cm <sup>3</sup>

### Ordering Data

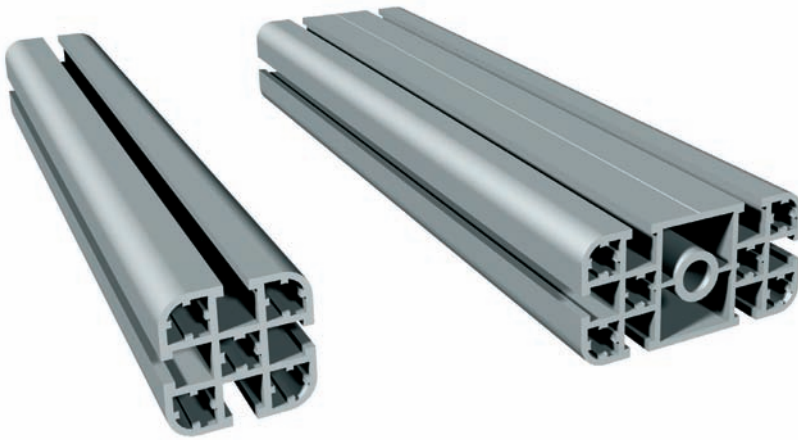
Profile designation	Item no.: L = 3000 mm
<b>PU 25</b> W 25 x H 25 mm	200 001 <b>3000</b>
<b>PU 50</b> W 50 x H 25 mm	200 002 <b>3000</b>

### Dimension Drawings



# Lightweight Frame Profiles

# PL-Profiles



## Features

- for fast and easy assembly of housings, tables and frames
- aluminium, anodized
- made according to DIN EN 12020-2
- 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

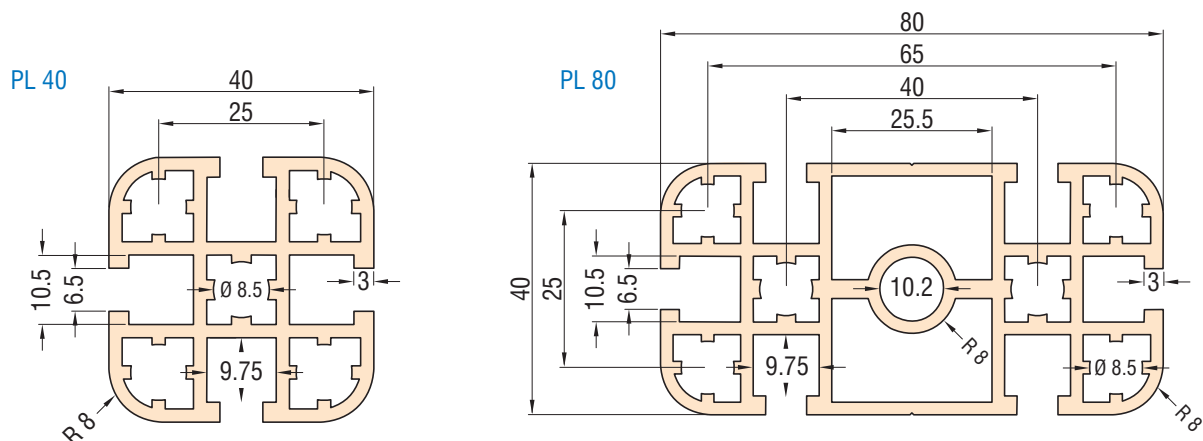
## Technical Data

	PL 40	PL 80
dimensions (W x H)	40 x 40 mm	80 x 40 mm
length	up to 3 m (special lengths 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 indentation, Ø 10.2 mm for M12
inertia moment $I_x$	8.38 cm <sup>4</sup>	64.40 cm <sup>4</sup>
inertia moment $I_y$	8.38 cm <sup>4</sup>	16.36 cm <sup>4</sup>
moment of resistance $W_x$	4.19 cm <sup>3</sup>	16.10 cm <sup>3</sup>
moment of resistance $W_y$	4.19 cm <sup>3</sup>	8.18 cm <sup>3</sup>

## Ordering Data

Profile designation	Item no.: L = 3000 mm
<b>PL 40</b> W 40 x H 40 mm	200 008 <b>3000</b>
<b>PL 80</b> W 80 x H 40 mm	200 009 <b>3000</b>

## Dimension Drawings



# Stand Profiles



# PS-Profiles

## Features

- For fast and easy assembly of housings, tables and frames
- Aluminium, anodized
- Made according to DIN EN 12020-2
- 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

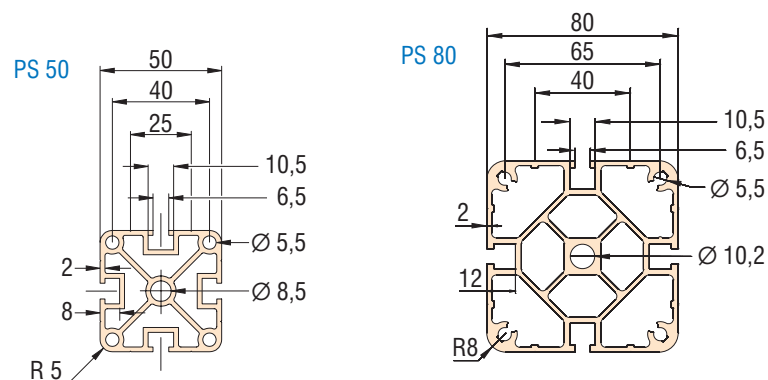
## Technical Data

	PS 50	PS 80
dimensions (W x H)	50 x 50 mm	80 x 80 mm
length	up to 3 m (special lengths upon request)	
weight	2,300 g/m	4,483 g/m
	4 T-groove indentions for slide nuts M6 4 hollow indentions Ø 5.5 mm for M6 hollow indentation Ø 8.5 mm for M10	4 T-groove indentions for slide nuts M6 4 hollow indentions Ø 5.5 mm for M6 hollow indentation Ø 10.2 mm for M12
inertia moment $I_x$	22,06 cm <sup>4</sup>	111.8 cm <sup>4</sup>
inertia moment $I_y$	22,06 cm <sup>4</sup>	111.8 cm <sup>4</sup>
moment of resistance $W_x$	8.82 cm <sup>3</sup>	27.95 cm <sup>4</sup>
moment of resistance $W_y$	8.82 cm <sup>3</sup>	27.95 cm <sup>4</sup>

## Ordering Data

Profile designation	Item no.: L = 3000 mm
<b>PS 50</b> W 50 x H 50 mm	200 003 <b>3000</b>
<b>PS 80</b> W 80 x H 80 mm	200 014 <b>3000</b>

## Dimension Drawings



# Stand Profiles

# PS-Profiles



## Features

- For fast and easy assembly of housings, tables and frames
- Aluminium, anodized
- Made according to DIN EN 12020-2
- 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

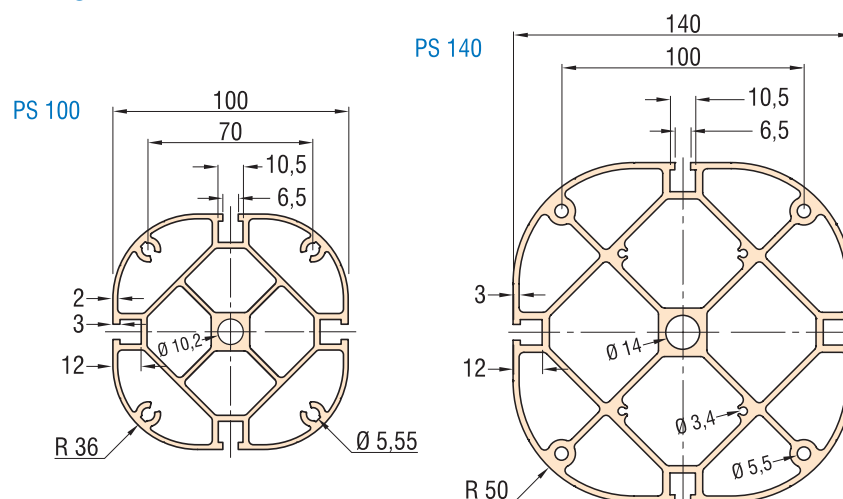
## Technical Data

	PS 100	PS 140
dimensions (W x H)	100 x 100 mm	140 x 140 mm
length	up to 3 m (special lengths upon request)	
weight	5,100 g/m	9,215 g/m
	4 T-groove indentions for slide nuts M6 4 hollow indentions $\varnothing$ 5.55 mm for M6 hollow indentation $\varnothing$ 10.2 mm for M12	4 T-groove indentions for slide nuts M6 4 hollow indentions $\varnothing$ 5.5 mm for M6 4 hollow indentions $\varnothing$ 3.4 mm for M4 hollow indentation $\varnothing$ 14 mm for M16
inertia moment $I_x$	163.00 cm <sup>4</sup>	601.80 cm <sup>4</sup>
inertia moment $I_y$	163.00 cm <sup>4</sup>	598.11 cm <sup>4</sup>
moment of resistance $W_x$	32.60 cm <sup>3</sup>	85.97 cm <sup>3</sup>
moment of resistance $W_y$	32.60 cm <sup>3</sup>	85.44 cm <sup>3</sup>

## Ordering Data

Profile designation	Item no.: L = 3000 mm
<b>PS 100</b> W 100 x H 100 mm	200 015 <b>3000</b>
<b>PS 140</b> W 140 x H 140 mm	200 016 <b>3000</b>

## Dimension Drawings



# Stand Profiles

# PS-Profiles



## Features

- For fast and easy assembly of housings, tables and frames
- Aluminium, anodized
- Light, compact, solid
- Smooth, soil-resisting surface
- Cut to size on request
- Made according to DIN EN 12020-2

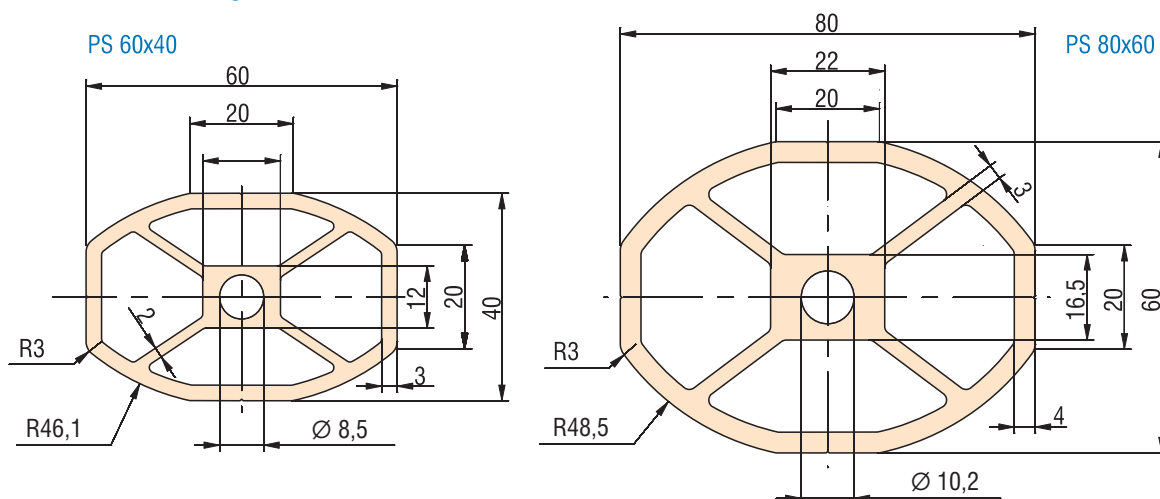
## Technical Data

	PS 60x40	PS 80x60
dimensions (W x H)	60 x 40 mm	80 x 60 mm
length	up to 3 m (special lengths upon request)	
weight	1.96 kg/m	3.71 kg/m
	hollow indentation $\varnothing$ 8.5 mm for M10	hollow indentation $\varnothing$ 10.2 mm for M12
inertia moment $I_x$	22.56 cm <sup>4</sup>	70.19 cm <sup>4</sup>
inertia moment $I_y$	11.28 cm <sup>4</sup>	42.96 cm <sup>4</sup>
moment of resistance $W_x$	7.5 cm <sup>3</sup>	17.55 cm <sup>3</sup>
moment of resistance $W_y$	5.6 cm <sup>3</sup>	14.32 cm <sup>3</sup>

## Ordering Data

Profile designation	Item no.: L = 3000 mm
<b>PS 60 x 40</b> W 60 x H 40 mm	200 006 <b>3000</b>
<b>PS 80 x 60</b> W 80 x H 80 mm	200 007 <b>3000</b>

## Dimension Drawings



# 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

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

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

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

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

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

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

Item no.: **209 022 0003**

## T-Groove Blocks



### T-Groove Block M6

- DIN 508
- hardened
- 20 pieces
- suitable for PT / RE 40, 65

Item no.: **209 119 0003**

## Clamping Vices



### Clamping Vice 1 (see figure)

- L 152 x W 130 x H 45 mm
- grid 100 mm
- suitable for RE / PT

Item no.: **290 055**

### Clamping Vice 2 (without figure)

- L 215 x W 175 x H 75 mm
- grid 125 mm
- suitable for RE / PT

Item no.: **290 056**

## Clamping Blocks



### Clamping Block SE

- with adjustable screw M6
- 2 pieces
- suitable vor all except PP / PT

Item no.: **290 051**

## Clamping Devices



### Hand Lever Clamping Device SH 1

- for all except PP / PT / RE 40, 65

Item no.: **290 001**

### Hand Lever Clamping Device SH 2

Item no.: **290 002**

## Stop Rails



### Stop Rail

- W 20 x H 10
- grid 50
- 2 pieces + mounting material

L 125 mm

Item no.: **290 021 0125**

L 175 mm

Item no.: **290 021 0175**

L 225 mm

Item no.: **290 021 0225**

## Panel Guide Strips/Profiles



### Panel Guide Strip black 1-part

- for Plates 3 - 6 mm
- 1 piece à 10 m
- suitable vor all except PT

Item no.: **209 202 0001**

### Panel Guide Profile black 2-part

- for Plates 3 - 6 mm
- 1 piece à 3 m
- suitable vor all except PT

Item no.: **209 212 3000**

# Accessory

## Profil Connecting Cubes



### Profile Connecting Cube black

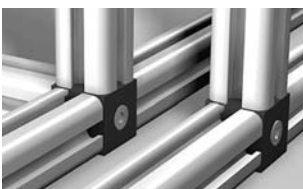
- 10 pieces + mounting material
- suitable for PU 25

2-fold

Item no.: **209 104 0002**

3-fold

Item no.: **209 103 0002**



### Profile Connecting Cube black

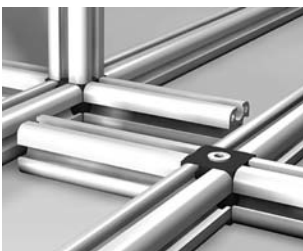
- 10 pieces + mounting material
- suitable for PU 25

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

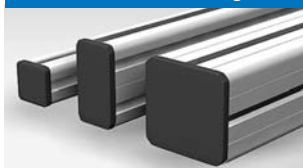
4-fold

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**
- PS 200 - 10 x  
Item no.: **209 130 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**

## 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**

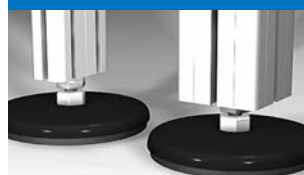
for PL 80 / PS 80

- Ø 80
  - adjusting screws M12 x 45
- Item no.: **209 034 0001**

for PL 80 / PS 80

- Ø 120
  - adjusting screws M12 x 45
  - black
- Item no.: **209 033 0003**

## Aluminium Pedestals



### Aluminium Pedestals with rubber plate

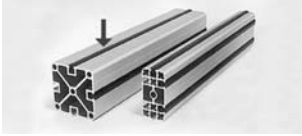
- for PU 50
- 4 pieces + adjusting screws
  - Ø 50
  - adjusting screws M6 x 30
  - natural
- Item no.: **209 030 0000**

for PS 100 / 140

- Ø 170
  - adjusting screws M6 x 100
  - black
- Item no.: **209 035 0001**

# Accessory

## T-Groove Coverings



### T-Groove Covering

- 30 m
- (turquoise = similar RAL 5018)
- for all except PT / RE 40, 65

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

Item no.: **209 300 0000**

## Strap Hinge



### Plastic Strap Hinge

- L 65 x W 40
- 10 pieces + mounting material
- grid 43 x 20 mm
- for PL

Item no.: **209 050 0012**

### Aluminium Strap Hinge

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

Art.-Nr.: **209 050 0011**



### Strap Hinge

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

Item no.: **209 050 0021**

## Aluminium Mounting Angle



### Aluminium Mounting Angle

- 2 pieces
- Angle of gradient adjustable
- for RE

Item no.: **209 300 0004**

## Mounting Bracket



### Mounting Bracket for pedestal / rollers

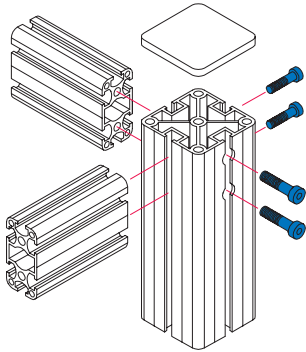
- steel galvanized
- 2 pieces
- H 33 mm

Item no.: **209 300 0003**

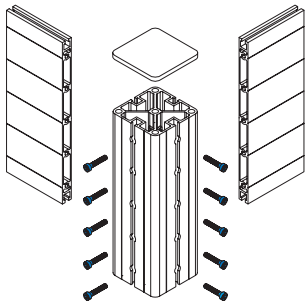
# Profile Connections

Example:

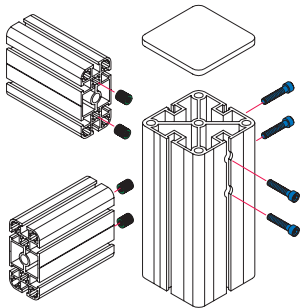
PS 50 mit PU 50



PS 50 mit PP 250



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 Screws  
SW 5

- DIN 911
- 1 piece  
Item no.: **931 152**

## Threaded Bushes

Threaded Bushes  
M9 / M6

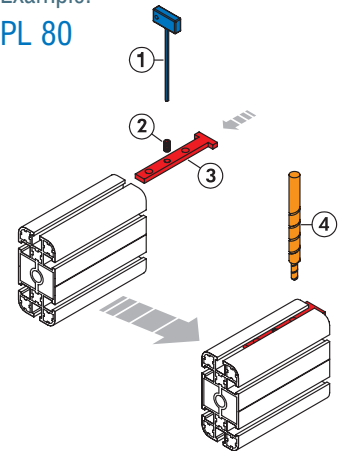
- 10 pieces  
Item no.: **209 147 0001**
- 50 pieces  
Item no.: **209 147 0002**

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 Screw
- ③ Drilling Template
- ④ Twist Drill  
Ø 6 mm / Ø 10.4 mm

## Example PL 80

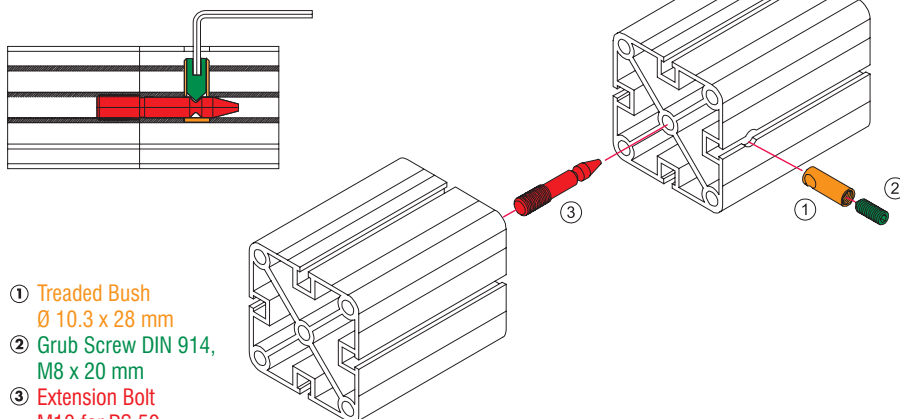
Drilling Template 1  
Item no.: **290 015 0001**

Drilling Template 2  
Item no.: **290 015 0002**

Twist Drill  
• Ø 6 / Ø 10.4 mm  
Item no.: **400 090**

Example:

Profile Fast-Clamped Extension for PS 50



- ① Threaded 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**

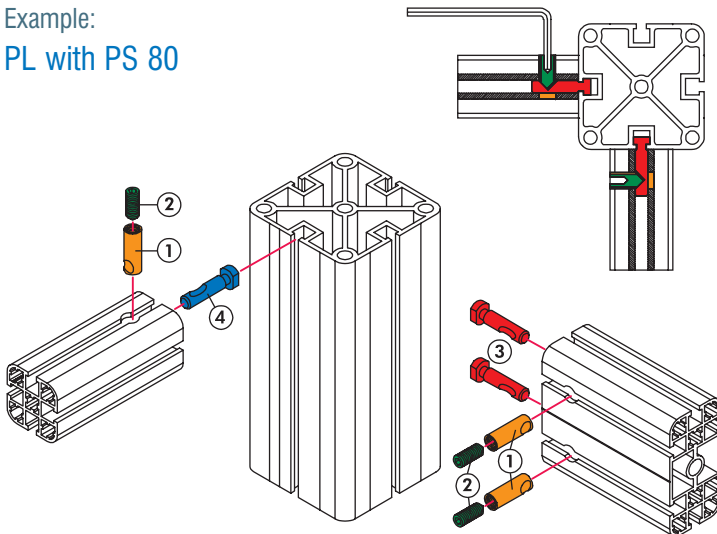
für PS 80 / PL 80 (M12)

- 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 Extension

Example:  
PL with PS 80



- ① Treaded Bush  $\varnothing$  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

for PP / PU / PS

- threaded bush, grub screw, bolt 0°
- 10 sets  
Item no.: 209 147 0100
- 50 sets  
Item no.: 209 147 0101

## Fast Clamped Connection 90°

for PL / PS 80

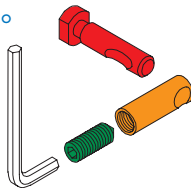
- threaded bush, grub screw, bolt 90°
- 10 sets  
Item no.: 209 147 0112
- 50 sets  
Item no.: 209 147 0113

für PP / PU / PS

- threaded bush, grub screw, bolt 90°
- 10 sets  
Item no.: 209 147 0110
- 50 sets  
Item no.: 209 147 0111

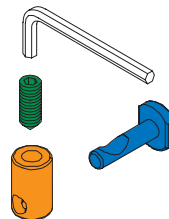
Fast-Clamped Connection 0°

e.g. for  
PL / PS 80

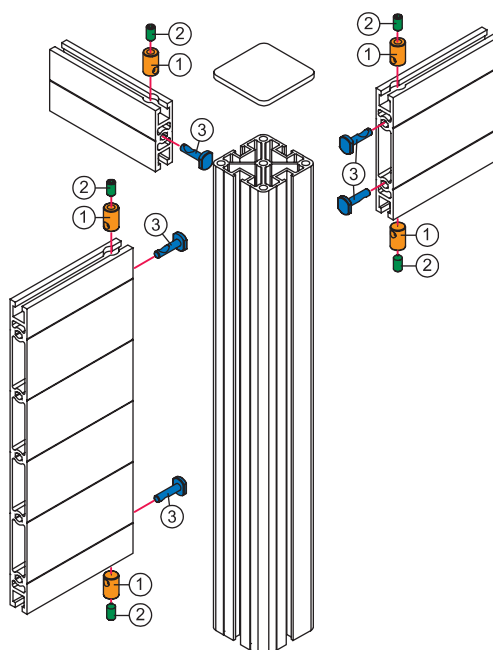


Fast-Clamped-Connection 90°

e.g. for  
PP / PU / PS



Example:  
PP with PS 50



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

Twist Drill

- $\varnothing$  6 mm /  $\varnothing$  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 Table

# AT



Image with optional tray

## Features

Work Table AT for clamping fixtures and clamping devices for measuring, checking, testing, etc.

- Underframe built of PS series aluminium profiles with PP series aluminium panel profile struts
- Table top built of RE series aluminium rectangular profiles, 40 x 250 mm, with T-slots

## Options

- Sheet metal tray with profile struts
- Length up to 2 m
- Miscellaneous accessories



Table 1

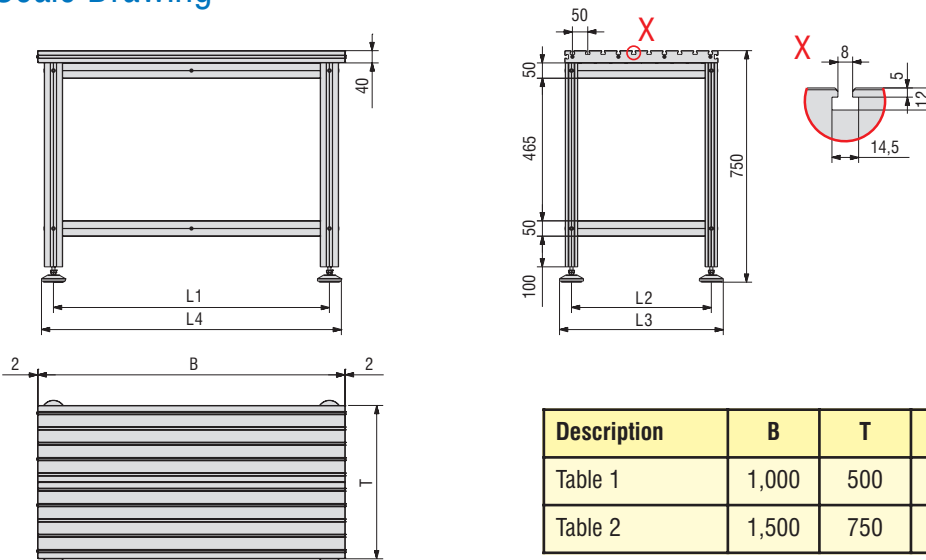


Table 2

## Order Data

Item No.	Descriptions	Load: Distributed load	Weight
248 550 0010	Table 1, W 1000 x D 500 x H 750 mm	200 kg	approx. 30 kg
248 550 0012	Table 2, W 1500 x D 750 x H 750 mm	400 kg	approx. 60 kg

## Scale Drawing



Description	B	T	L 1	L 2	L 3	L 4
Table 1	1,000	500	900	456	536	980
Table 2	1,500	750	1,380	680	800	1,500

# Mounting Table

# MT



Image with optional tray



## Features

Mounting Table MT for clamping fixtures, machining parts, etc.

- Underframe built of PS series aluminium profiles with PP series aluminium panel profile struts
- Table top and portal board built of RE series aluminium rectangular profiles, 40x350 mm (250, 150 mm), with T-slots

## Options

- Sheet metal tray with profile struts
- Length up to 2 m
- Miscellaneous accessories



MT 1

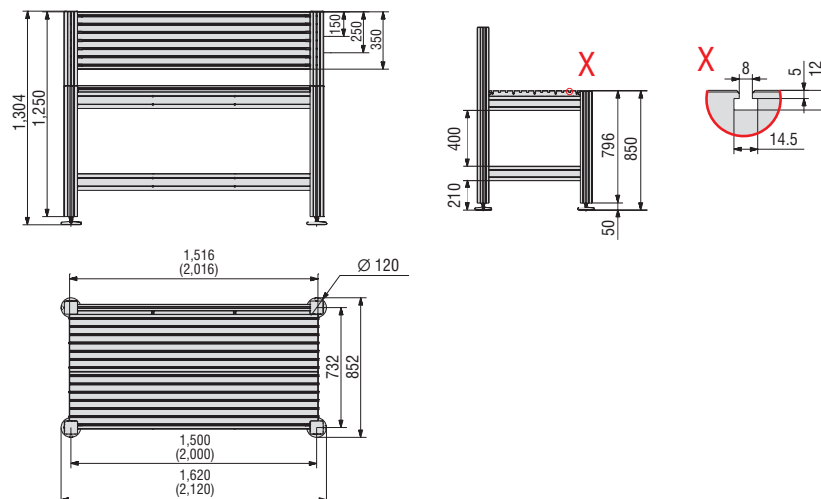


MT 2

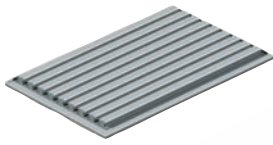
## Order Data

Item No.	Description	Load: Distributed load	Weight
248 553 0001	MT 1, W 1,500 x D 732 x H 1,304 mm / Portalplatte 150 mm	250 kg	approx. 80 kg
248 553 0002	MT 1, W 1,500 x D 732 x H 1,304 mm / Portalplatte 250 mm	250 kg	approx. 85 kg
248 553 0003	MT 1, W 1,500 x D 732 x H 1,304 mm / Portalplatte 350 mm	250 kg	approx. 90 kg
248 553 0004	MT 2, W 2,000 x D 732 x H 1,304 mm / Portalplatte 150 mm	400 kg	approx. 100 kg
248 553 0005	MT 2, W 2,000 x D 732 x H 1,304 mm / Portalplatte 250 mm	400 kg	approx. 108 kg
248 553 0006	MT 2, W 2,000 x D 732 x H 1,304 mm / Portalplatte 350 mm	400 kg	approx. 110 kg

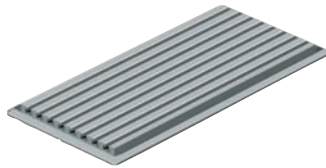
## Scale Drawing



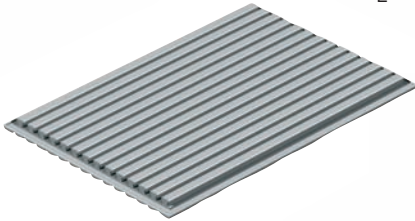
# Aluminium T-Groove Plates



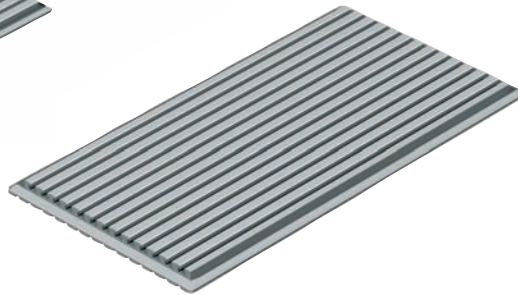
PT 25 x 250  
L = 375 mm



PT 25 x 250  
L = 550 mm



PT 25 x 375  
L = 550 mm



PT 25 x 375  
L = 750 mm

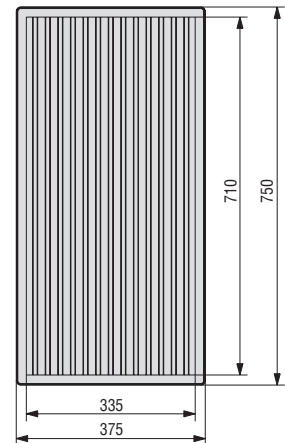
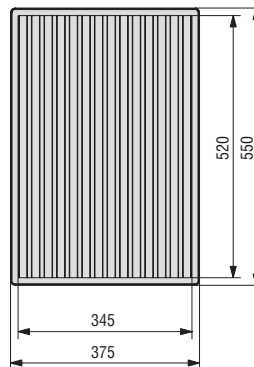
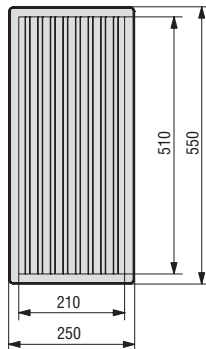
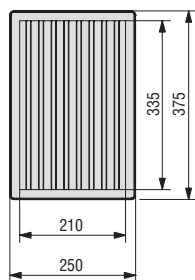
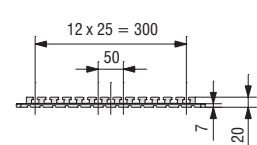
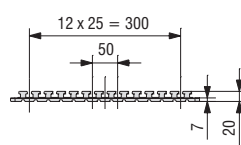
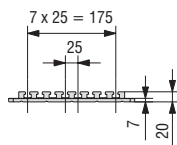
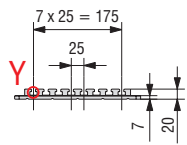
## Features

- Universal precision clamping and working surface
- Aluminium anodized
- Surface-milled on both sides
- T-slots in a 25 mm raster for T-slot blocks and slide nuts M6
- With drain gutter for liquids
- Applicable with all machines
- Thick-walled and extremely dimensionally stable
- Very light, sleek design

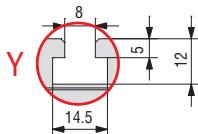
## Options

- Versatile accessories like stop rails, T-slot clamping devices, isel vacuum suckers (VakuFit), vices
- Scratch-resistant, durable surface (hard-coated)
- Customer-specific fixing holes
- Other dimensions on request

## Scale Drawing



Scale 1 : 2



## Order Data

PT 25 x 250, L = 375  
Item no. **269053 2537**

PT 25 x 250, L = 550  
Item no. **269053 2555**

PT 25 x 375, L = 550  
Item no. **269053 3755**

PT 25 x 375, L = 750  
Item no. **269053 3775**

# Aluminium T-Groove Disk



PT 25  
Ø 250 mm



PT 25  
Ø 350 mm



PT 25 x 375  
Ø 550 mm



PT 25 x 375  
Ø 750 mm

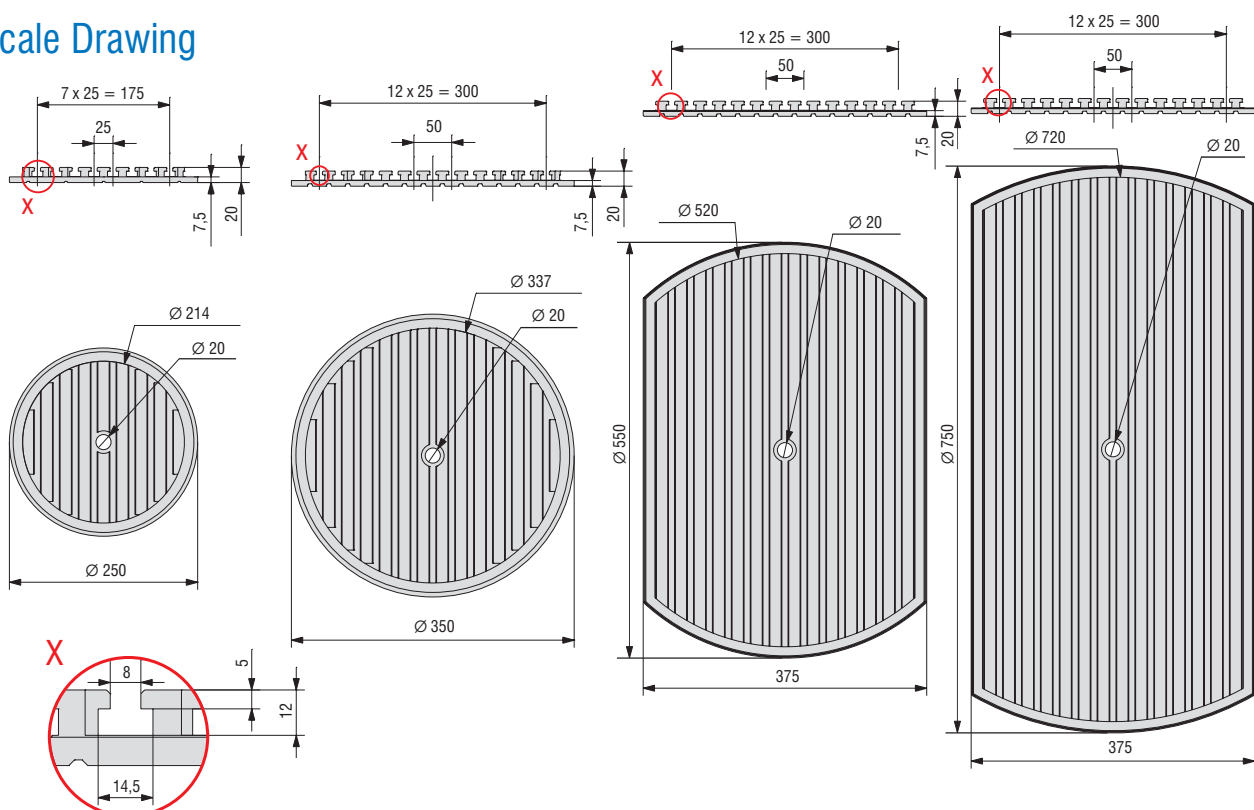
## Features

- Universal precision clamping and working surface
- For rotational applications
- Aluminium anodized
- Surface-milled on both sides
- T-slots in a 25 mm raster for T-slot blocks and slide nuts M6
- With drain gutter for liquids
- Applicable with all machines
- Thick-walled and extremely dimensionally stable
- Very light, sleek design

## Options

- Versatile accessories like stop rails, T-slot clamping devices, isel vacuum suckers (VakuFit), vices
- Scratch-resistant, durable surface (hard-coated)
- Customer-specific fixing holes
- Other dimensions on request

## Scale Drawing



## Order Data

PT 25, Ø 250 mm  
Item no. **269052 0250**












PT 25, Ø 350 mm  
Item no. **269052 0350**

PT 25 x 375, Ø 550 mm  
Item no. **269052 0550**

PT 25 x 375, Ø 750 mm  
Item no. **269052 0750**

# Linear Guides

# Overview

<p>Function Overview FSK</p>		<p>C 26</p>
<p>Linear Guide Carriage Versions FSK // FSG // FSR by way of example of the LFS-12-2</p>		<p>C 27</p>
<p>LFS-8-1 Linear Guide Rail (MLF 1)</p>		<p>C 28 with roller carriage LW 6 with aluminium carriage FSK-8-1, FSG-8-1, FSR-8-1</p>
<p>LFS-8-2 Linear Guide Rail (MLF 2)</p>		<p>C 30 with roller carriage LW 6 with aluminium carriage FSK-8-1, FSG-8-1, FSR-8-1</p>
<p>LFS-8-3 Linear Guide Rail (MLF 3)</p>		<p>C 32 with roller carriage LW 7 with aluminium carriage FSK-8-2, FSG-8-2, FSR-8-2</p>
<p>LFS-8-4 Linear Guide Rail (MLF 4)</p>		<p>C 34 with 2 x roller carriage LW 7 with 2 x aluminium carriage WS 3/70</p>
<p>LFS-8-5 Linear Guide Rail (MLF 5)</p>		<p>C 36 with roller carriage LW 7 with aluminium carriage WS 3/70</p>
<p>LFS-8-6 Linear Guide Rail (MLF 6)</p>		<p>C 37 with roller carriage LW 7 with aluminium carriage WS 3/70</p>
<p>LFS-8-7 Linear Guide Rail (MLF 7)</p>		<p>C 38 with roller carriage LW 10 with aluminium carriage FSK-8-3, FSG-8-3, FSR-8-3</p>
<p>LFS-8-8 Linear Guide Rail (MLF 8)</p>		<p>C 40 with roller carriage LW 7 with aluminium carriage WS 3/70</p>
<p>LFS-8-9 Linear Guide Rail (MLF 9)</p>		<p>C 41 with roller carriage LW 10 with aluminium carriage WS 11/70</p>

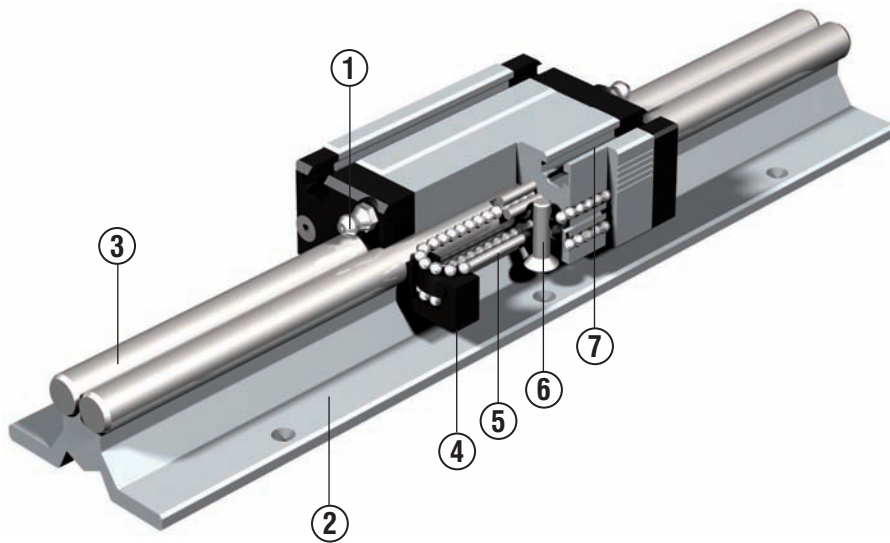
# Linear Guides

# Overview

Shaft Carriage and Roller Bearing LFS-12-21		C 42 with linear guide carriage FSR-12-21
Shaft Carriage and Roller Bearing LFS-12-22		C 43 with linear guide carriage FSR-12-22
LFS-12-1 Linear Guide Rail (LF 1)		C 44 with roller carriage LW 3 with aluminium carriage WS 4/70 with steel carriage LS 1
LFS-12-11 Linear Guide Rail (ELF 1)		C 46 with roller carriage LW 5 with aluminium carriage FSK-12-1, FSG-12-1, FSR-12-1
LFS-12-2 Linear Guide Rail (LF 2)		C 48 with roller carriage LW 3 with aluminium carriage FSK-12-2, FSG-12-2, FSR-12-2
LFS-12-3 Linear Guide Rail (LF 3)		C 50 with roller carriage LW 8 with aluminium carriage WS 7/70
LFS-12-7 Linear Guide Rail (LF 7)		C 52 with aluminium carriage FSK-12-7, FSG-12-7, FSR-12-7
LFS-12-10 Linear Guide Rail (DSF 1)		C 54 with roller carriage LW 4 with aluminium carriage WS 8
LFS-16-1 Linear Guide Rail (ILF 1)		C 56 with roller carriage ILW 1 with aluminium carriage IWS 1 mit Stahl-Schlitten ILS 1
LFS-16-2 Linear Guide Rail (ILF 2)		C 58 with roller carriage ILW 1 with aluminium carriage IWS 1 with steel carriage ILS 1
Accessory, General References		C 60
Calculation of Working Loads		C 62

CAD Data: [www.iselautomation.net](http://www.iselautomation.net)

# Functions Overview FSK



## Aluminium Bearing Carriage FSK

Maximum speed: 5 m/s  
High loading capacity

### Aluminium 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 EN 12020-2, which are provided with T-groove slots and/or mounting holes.
3. Precision steel shafts with a hardness of  $60 \pm 2$  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.

# Linear Guide Carriage Versions

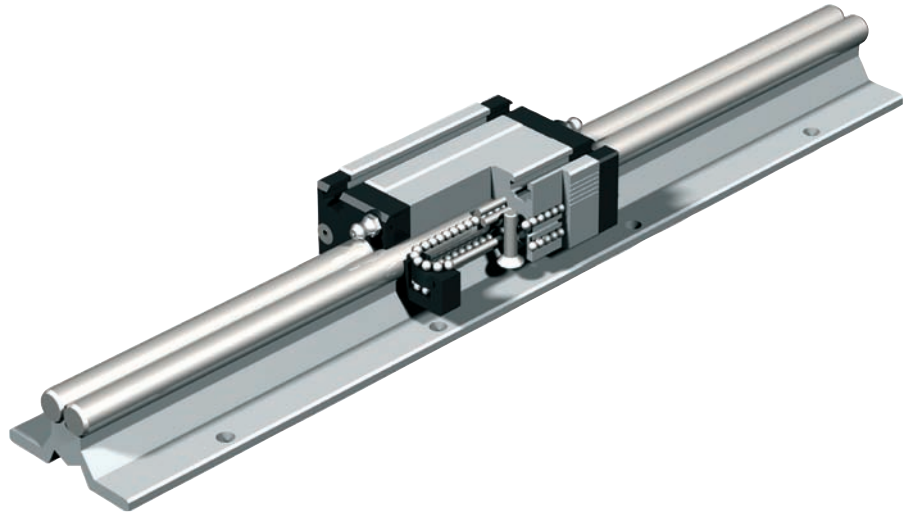
## Linear guides with float-free adjustable carriage variants FSK // FSG // FSR by way of example of the LFS-12-2 ...

... with ball-recirculation carriage

### FSK

The patented isel-FSK-carriage with ball recirculation is being used for heavy loads since several years. It is particularly suitable for the assembly of complex multi-axes systems for light-weight machine building, handling purposes and industrial automation.

Maximum speed at 5m/s

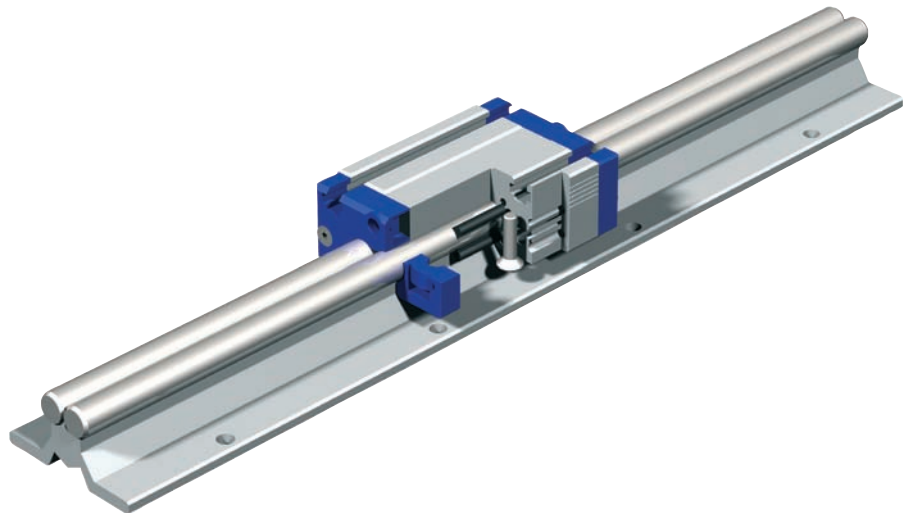


... with slide carriage

### FSG

The slide carriage FSG is particularly silent, maintenance-free, free from any kind of lubricants and therefore excellently suitable for machines and plants in clean room, food and laboratory areas.

Maximum speed at 2m/s

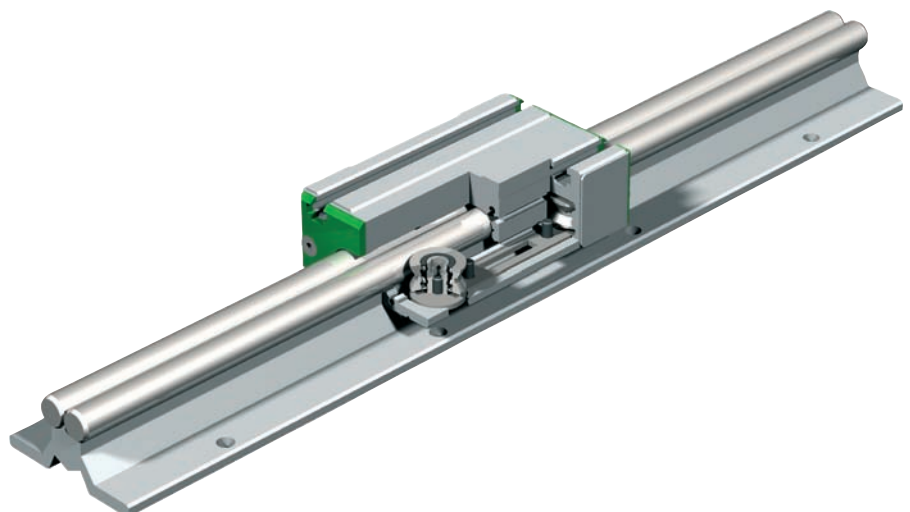


... with roller carriage

### FSR

The FSR-carriage is a roller bearing-based design for linear transport units which are preferably used when it comes to quickly position light and medium-weight loads.

Maximum speed at 10m/s



# Linear Guide Rail

# LFS-8-1 (MLF 1)



### Features

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

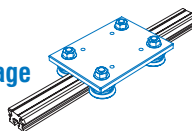
### Order Key 235 00X XXXX

Standard = 0 Length in mm (in steps of 100 mm)  
 Stainless = 1 e.g. 0029 = Length 298  
 0299 = Length 2998

Steel shaft length:  
 Total length L -3 mm

Profile length till 6000 mm without end to end available, steel shaft shared.

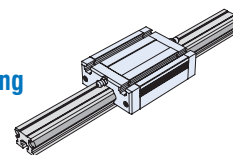
### Roller Carriage LW 6



- L 125 x W 90 x H 7.7 mm
- polished steel plate
- 4 rollers Ø 31, life-time lubrication
- adjustable free of clearance
- Weight: 1.03 kg

Item no.: 223 011

### Aluminium Bearing Carriage FSK-8-1



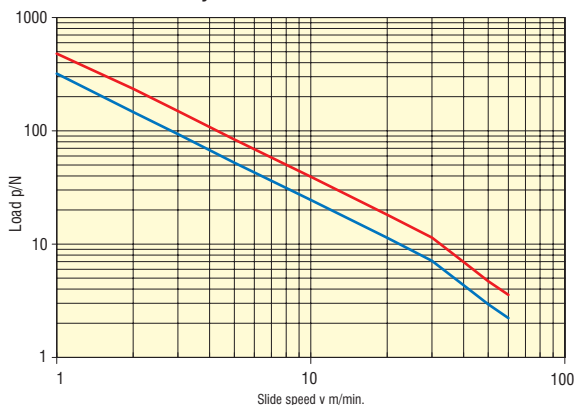
- L 96 x W 72 x H 28,5 mm
- with ball recirculation guide
- milled clamping surface
- M6 T-grooves
- central lubrication
- adjustable free of clearance
- Weight: 0.35 kg
- Option: Stainless design

Item no.: 223 100 0070  
 Stainless: 223 101 0070

### Load Data

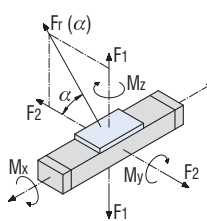
Bearing Carriage FSK-8-1		Bearing Carriage FSG-8-1		Bearing Carriage FSR-8-1		Roller Carriage LW 6	
C <sub>0</sub>	3114 N	C <sub>0</sub>	361 N	C <sub>0</sub>	4425 N	C <sub>0</sub>	2,160 N
C	1846 N	C	-	C	1950 N	C	4,000 N
F <sub>1</sub> stat.	2659 N	F <sub>1</sub> stat.	577 N	F <sub>1</sub> stat.	150 N	F <sub>1</sub> stat.	4,320 N
F <sub>1</sub> dyn.	1576 N	F <sub>1</sub> dyn. (10m/min.)	39 N	F <sub>1</sub> dyn.	90 N	F <sub>1</sub> dyn.	3,792 N
F <sub>2</sub> stat.	3114 N	F <sub>2</sub> stat.	361 N	F <sub>2</sub> stat.	300 N	F <sub>2</sub> stat.	2,160 N
F <sub>2</sub> dyn.	1846 N	F <sub>2</sub> dyn. (10m/min.)	25 N	F <sub>2</sub> dyn.	180 N	F <sub>2</sub> dyn.	4,000 N
M <sub>x</sub> stat.	37.3 Nm	M <sub>x</sub> stat.	8.35 Nm	M <sub>x</sub> stat.	6 Nm	M <sub>x</sub> stat.	121.1 Nm
M <sub>y</sub> stat.	100.5 Nm	M <sub>y</sub> stat.	20.20 Nm	M <sub>y</sub> stat.	5.25 Nm	M <sub>y</sub> stat.	194.4 Nm
M <sub>z</sub> stat.	117.6 Nm	M <sub>z</sub> stat.	12.62 Nm	M <sub>z</sub> stat.	10.5 Nm	M <sub>z</sub> stat.	97.2 Nm
M <sub>x</sub> dyn.	22.1 Nm	M <sub>x</sub> dyn.	-	M <sub>x</sub> dyn.	3.6 Nm	M <sub>x</sub> dyn.	106.3 Nm
M <sub>y</sub> dyn.	59.5 Nm	M <sub>y</sub> dyn.	-	M <sub>y</sub> dyn.	3.15 Nm	M <sub>y</sub> dyn.	170.6 Nm
M <sub>z</sub> dyn.	69.7 Nm	M <sub>z</sub> dyn.	-	M <sub>z</sub> dyn.	6.3 Nm	M <sub>z</sub> dyn.	180.0 Nm

Dyn. Load Limit FSG-8-1

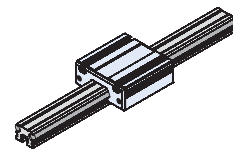


$$F_r(\alpha) = \frac{F_2}{\cos \alpha}$$

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



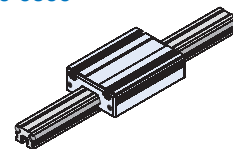
### Aluminium bearing carriage FSG-8-1



- L 76 x W 72 x H 28,5 mm
- guide slide bearing
- milled clamping surface
- M6 T-grooves
- adjustable free of clearance
- Weight: 0.27 kg
- friction coefficient: 0.2-0.4

Item no.: 223 250 0800

### Aluminium bearing carriage FSR-8-1



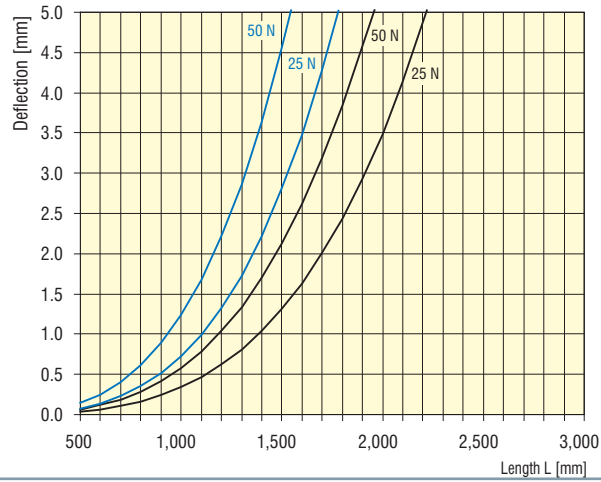
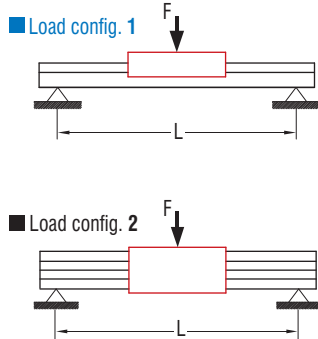
- L 106 x W 72 x H 28,5 mm
- with roller guide
- milled clamping surface
- M6 T-grooves
- adjustable free of clearance
- Weight: 0.40 kg

Item no.: 223 260 0800

# Linear Guide Rail

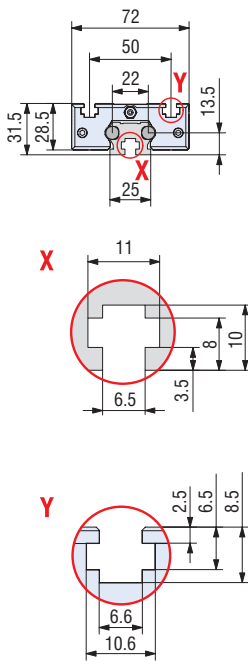
# LFS-8-1 (MLF 1)

## Deflection

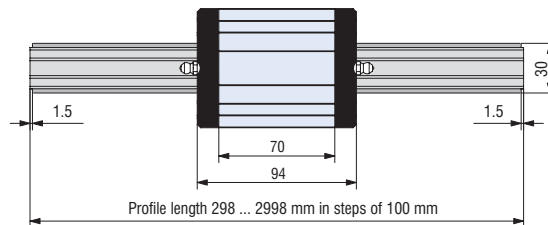


## Scale Drawings

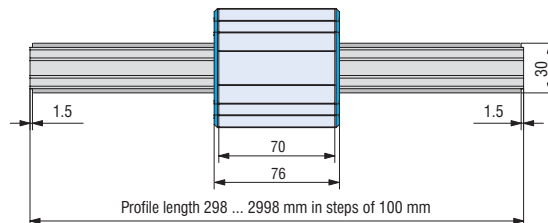
### Detail (FSK/FSG/FSR)



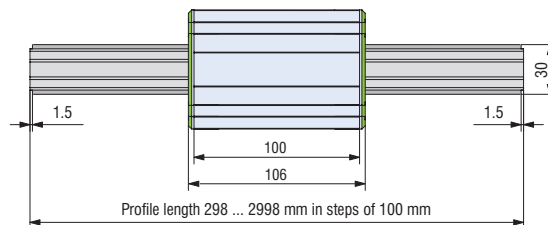
### LFS-8-1 with ball recirculation guide carriage FSK



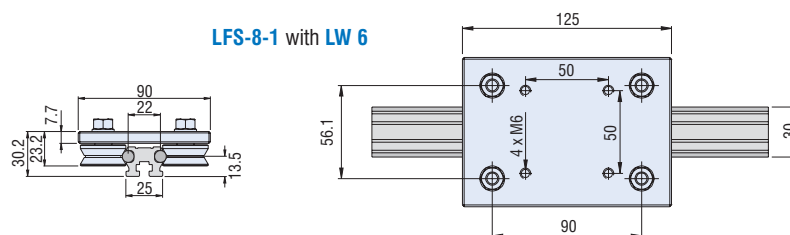
### LFS-8-1 with guide slide bearing carriage FSG



### LFS-8-1 with roller carriage guide FSR



### LFS-8-1 with LW 6



# Linear Guide Rail

# LFS-8-2 (MLF 2)



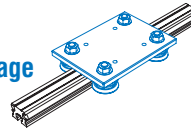
## Features

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

## Order Key 235 00X XXXX

Standard = 2 Length in mm (in steps of 100 mm)  
 Stainless = 3 e.g. 0298 = Length 298  
 2998 = Length 2998  
 Steel shaft length:  
 Total length L -3 mm  
 Profile length till 6000 mm without end to end available, steel shaft shared.

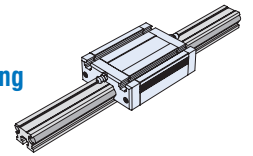
## Roller Carriage LW 6



- L 125 x W 90 x H 7.7 mm
- polished steel plate
- 4 rollers Ø 31, life-time lubrication
- adjustable free of clearance
- Weight: 1.03 kg

Item no.: **223 011**

## Aluminium Bearing Carriage FSK-8-1



- L 96 x W 72 x H 28,5 mm
- with ball recirculation guide
- milled clamping surface
- M6 T-grooves
- central lubrication
- adjustable free of clearance
- Weight: 0.35 kg
- Option: Stainless design

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

## Load Data

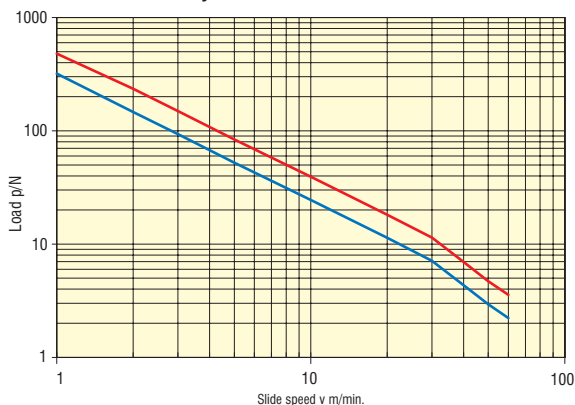
Bearing carriage FSK-8-1	
C <sub>0</sub>	3,114 N
C	1,846 N
F <sub>1</sub> stat.	2,659 N
F <sub>1</sub> dyn.	1,576 N
F <sub>2</sub> stat.	3,114 N
F <sub>2</sub> dyn.	1,846 N
M <sub>x</sub> stat.	37.3 Nm
M <sub>y</sub> stat.	100.5 Nm
M <sub>z</sub> stat.	117.6 Nm
M <sub>x</sub> dyn.	22.1 Nm
M <sub>y</sub> dyn.	59.5 Nm
M <sub>z</sub> dyn.	69.7 Nm

Bearing carriage FSG-8-1	
C <sub>0</sub>	361 N
C	-
F <sub>1</sub> stat.	577 N
F <sub>1</sub> dyn. (10m/min.)	39 N
F <sub>2</sub> stat.	361 N
F <sub>2</sub> dyn. (10m/min.)	25 N
M <sub>x</sub> stat.	8.35 Nm
M <sub>y</sub> stat.	20.20 Nm
M <sub>z</sub> stat.	12.62 Nm
M <sub>x</sub> dyn.	-
M <sub>y</sub> dyn.	-
M <sub>z</sub> dyn.	-

Bearing carriage FSR-8-1	
C <sub>0</sub>	4,425 N
C	1,950 N
F <sub>1</sub> stat.	150 N
F <sub>1</sub> dyn.	90 N
F <sub>2</sub> stat.	300 N
F <sub>2</sub> dyn.	180 N
M <sub>x</sub> stat.	6 Nm
M <sub>y</sub> stat.	5.25 Nm
M <sub>z</sub> stat.	10.5 Nm
M <sub>x</sub> dyn.	3.6 Nm
M <sub>y</sub> dyn.	3.15 Nm
M <sub>z</sub> dyn.	6.3 Nm

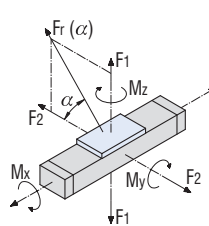
Roller Carriage LW 6	
C <sub>0</sub>	2,160 N
C	4,000 N
F <sub>1</sub> stat.	4,320 N
F <sub>1</sub> dyn.	3,792 N
F <sub>2</sub> stat.	2,160 N
F <sub>2</sub> dyn.	4,000 N
M <sub>x</sub> stat.	121.1 Nm
M <sub>y</sub> stat.	194.4 Nm
M <sub>z</sub> stat.	97.2 Nm
M <sub>x</sub> dyn.	106.3 Nm
M <sub>y</sub> dyn.	170.6 Nm
M <sub>z</sub> dyn.	180.0 Nm

**Dyn. Load Limit FSG-8-1**

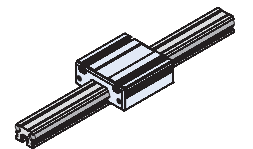


$$Fr(\alpha) = \frac{F_2}{\cos \alpha}$$

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



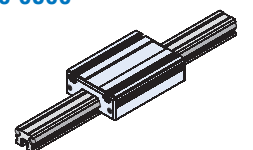
## Aluminium bearing carriage FSG-8-1



- L 76 x W 72 x H 28,5 mm
- guide slide bearing
- milled clamping surface
- M6 T-grooves
- adjustable free of clearance
- Weight: 0.27 kg
- friction coefficient: 0.2-0.4

Item no.: **223 250 0800**

## Aluminium bearing carriage FSR-8-1



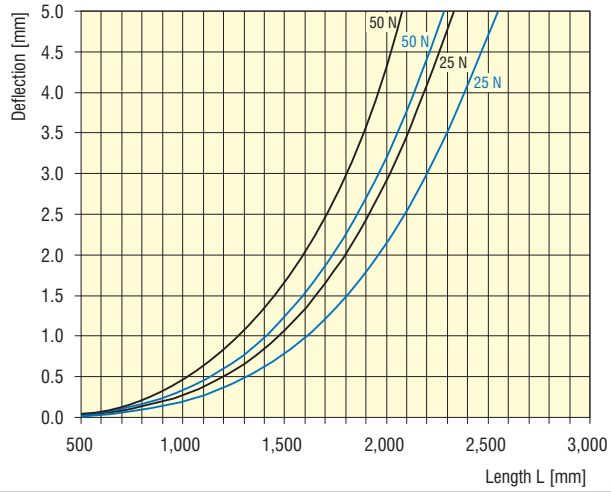
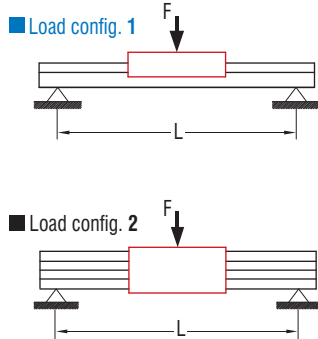
- L 106 x W 72 x H 28,5 mm
- with roller guide
- milled clamping surface
- M6 T-grooves
- adjustable free of clearance
- Weight: 0.40 kg

Item no.: **223 260 0800**

# Linear Guide Rail

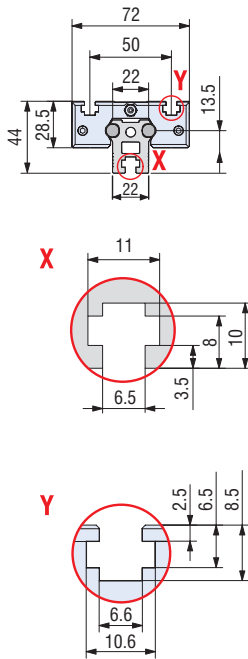
# LFS-8-2 (MLF 2)

## Deflection

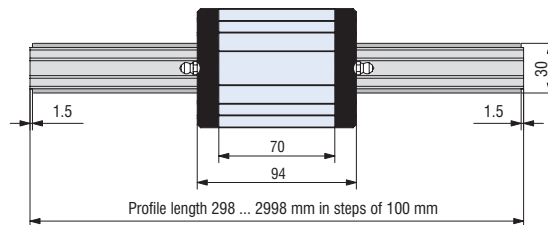


## Scale Drawings

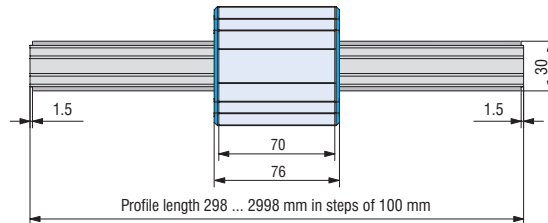
### Detail (FSK/FSG/FSR)



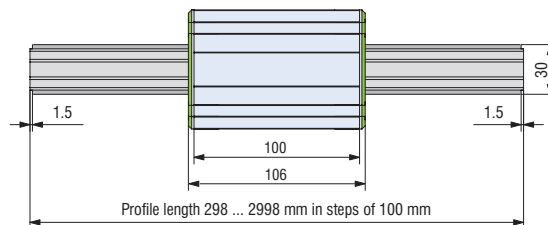
### LFS-8-2 with ball recirculation guide carriage FSK



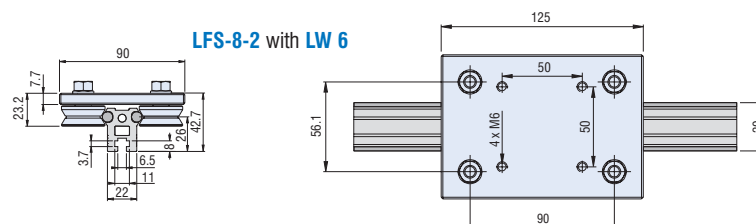
### LFS-8-2 with guide slide bearing FSG



### LFS-8-2 with roller carriage guide FSR

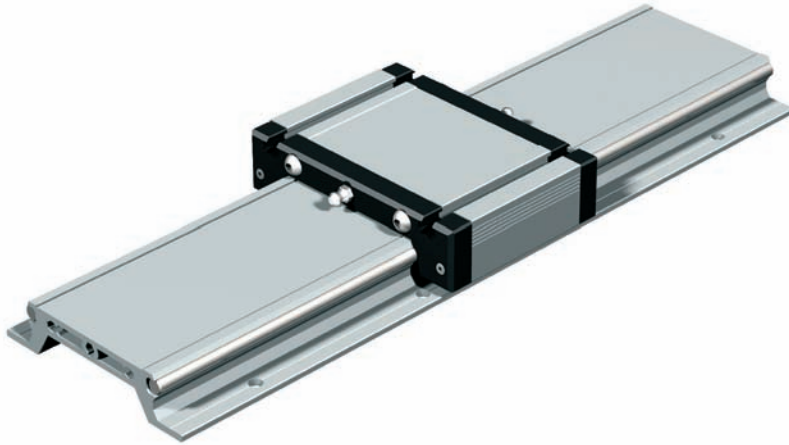


### LFS-8-2 with LW 6



# Linear Guide Rail

# LFS-8-3 (MLF 3)



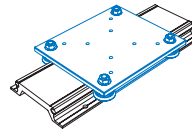
## Features

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

## Order Key 235 00X XXXX

Standard = 4 Length in mm (in steps of 100 mm)  
 Stainless = 5 e.g. 0029 = Length 296  
 0299 = Length 2996  
 Steel shaft length:  
 Total length L -1 mm  
 Profile length till 6000 mm without end to end available, steel shaft shared.

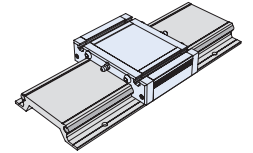
## Roller Carriage LW 7



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

Item no.: 223 012

## Aluminium Bearing Carriage FSK-8-2



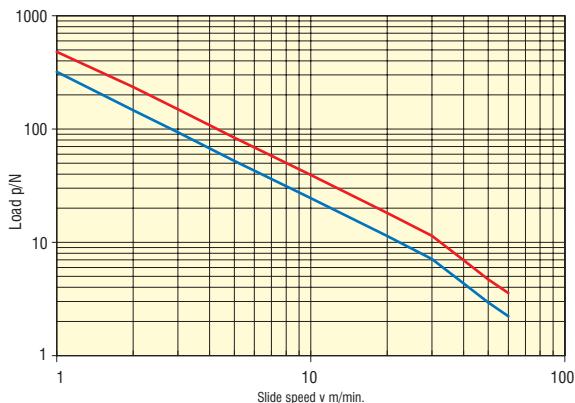
- L 96 x W 130 x H 32 mm
- with ball recirculation guide
- milled clamping surface
- M6 T-grooves
- central lubrication
- adjustable free of clearance
- Weight: 0.50 kg
- Option: Stainless design

Item no.: 223 103 0070  
 Stainless: 223 103 1070

## Load Data

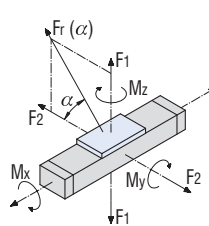
Bearing carriage FSK-8-2		Bearing carriage FSG-8-2		Bearing carriage FSR-8-2		Roller Carriage LW 7	
C <sub>0</sub>	3,141 N	C <sub>0</sub>	361 N	C <sub>0</sub>	4,425 N	C <sub>0</sub>	2,160 N
C	1,879 N	C	-	C	1,950 N	C	4,000 N
F <sub>1</sub> stat.	2,682 N	F <sub>1</sub> stat.	577 N	F <sub>1</sub> stat.	150 N	F <sub>1</sub> stat.	4,320 N
F <sub>1</sub> dyn.	1,604 N	F <sub>1</sub> dyn. (10m/min.)	39 N	F <sub>1</sub> dyn.	90 N	F <sub>1</sub> dyn.	3,792 N
F <sub>2</sub> stat.	3,141 N	F <sub>2</sub> stat.	361 N	F <sub>2</sub> stat.	300 N	F <sub>2</sub> stat.	2,160 N
F <sub>2</sub> dyn.	1,879 N	F <sub>2</sub> dyn. (10m/min.)	25 N	F <sub>2</sub> dyn.	180 N	F <sub>2</sub> dyn.	4,000 N
M <sub>x</sub> stat.	115.7 Nm	M <sub>x</sub> stat.	23.08 Nm	M <sub>x</sub> stat.	6 Nm	M <sub>x</sub> stat.	246.8 Nm
M <sub>y</sub> stat.	105.3 Nm	M <sub>y</sub> stat.	20.20 Nm	M <sub>y</sub> stat.	5.25 Nm	M <sub>y</sub> stat.	302.4 Nm
M <sub>z</sub> stat.	123.3 Nm	M <sub>z</sub> stat.	12.62 Nm	M <sub>z</sub> stat.	10.5 Nm	M <sub>z</sub> stat.	151.2 Nm
M <sub>x</sub> dyn.	69.2 Nm	M <sub>x</sub> dyn.	-	M <sub>x</sub> dyn.	3.6 Nm	M <sub>x</sub> dyn.	216.7 Nm
M <sub>y</sub> dyn.	62.9 Nm	M <sub>y</sub> dyn.	-	M <sub>y</sub> dyn.	3.15 Nm	M <sub>y</sub> dyn.	265.4 Nm
M <sub>z</sub> dyn.	73.7 Nm	M <sub>z</sub> dyn.	-	M <sub>z</sub> dyn.	6.3 Nm	M <sub>z</sub> dyn.	280.0 Nm

Dyn. Load Limit FSG-8-2

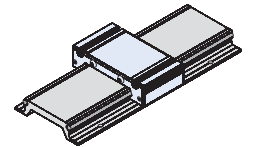


$$F_r(\alpha) = \frac{F_2}{\cos \alpha}$$

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



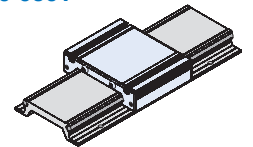
## Aluminium bearing carriage FSG-8-2



- L 76 x W 130 x H 32 mm
- guide slide bearing
- milled clamping surface
- M6 T-grooves
- adjustable free of clearance
- Weight: 0.42 kg
- friction coefficient: 0.2-0.4

Item no.: 223 250 0801

## Aluminium bearing carriage FSR-8-2



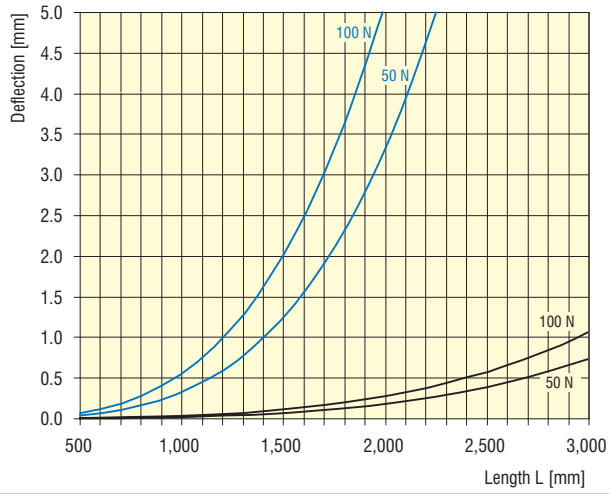
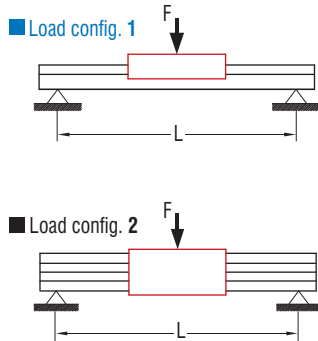
- L 106 x W 130 x H 32 mm
- with roller guide
- milled clamping surface
- M6 T-grooves
- adjustable free of clearance
- Weight: 0.55 kg

Item no.: 223 260 0801

# Linear Guide Rail

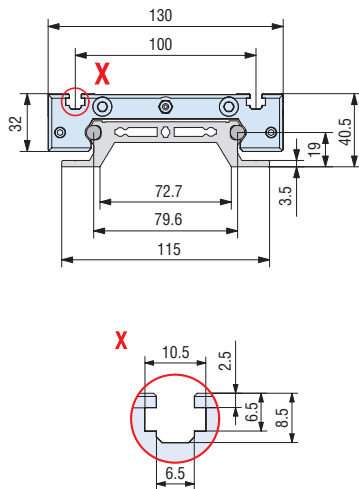
# LFS-8-3 (MLF 3)

## Deflection

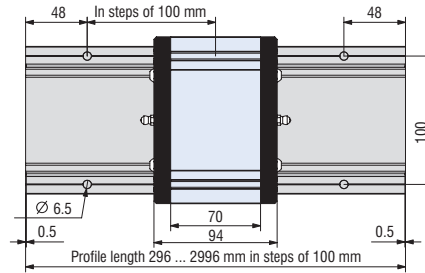


## Scale Drawings

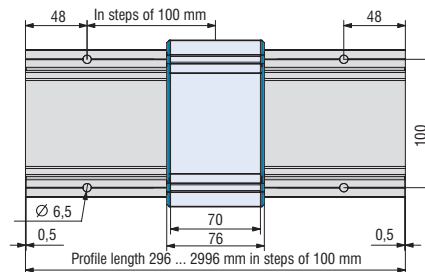
### Detail (FSK/FSG/FSR)



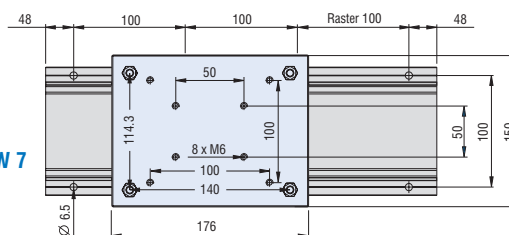
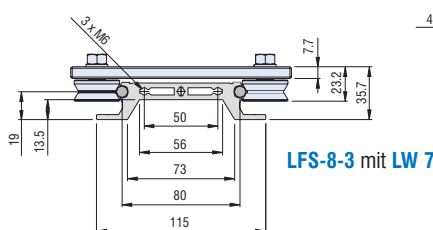
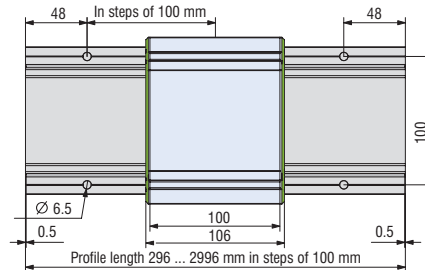
### LFS-8-3 with ball recirculation guide carriage FSK



### LFS-8-3 with guide slide bearing FSG



### LFS-8-3 with roller carriage guide FSR



# Linear Guide Rail

# LFS-8-4 (MLF 4)



### Features

- W 80 x H 80 mm
- 4 precision steel shafts  $\varnothing$  8 mm
- Twist-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 cantilever
- Arbitrary guide rail length
- Weight: 7.15 kg/m
- Option: stainless design

### Load Data

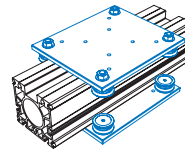
Roller Carriage LW 7	
C <sub>0</sub>	2,160 N
C	4,000 N
F <sub>1</sub> stat.	4,320 N
F <sub>1</sub> dyn.	3,792 N
F <sub>2</sub> stat.	2,160 N
F <sub>2</sub> dyn.	4,000 N
M <sub>x</sub> stat.	246.8 Nm
M <sub>y</sub> stat.	302.4 Nm
M <sub>z</sub> stat.	151.2 Nm
M <sub>x</sub> dyn.	216.7 Nm
M <sub>y</sub> dyn.	265.4 Nm
M <sub>z</sub> dyn.	280.0 Nm

Bearing Carriage WS 3	
C <sub>0</sub>	3,141 N
C	1,879 N
F <sub>1</sub> stat.	2,682 N
F <sub>1</sub> dyn.	1,604 N
F <sub>2</sub> stat.	3,141 N
F <sub>2</sub> dyn.	1,879 N
M <sub>x</sub> stat.	115.7 Nm
M <sub>y</sub> stat.	105.3 Nm
M <sub>z</sub> stat.	123.3 Nm
M <sub>x</sub> dyn.	69.2 Nm
M <sub>y</sub> dyn.	62.9 Nm
M <sub>z</sub> dyn.	73.7 Nm

#### With 2 x Roller Carriage LW 7

- L 175 x W 150 x H 7,7 mm
- Polished steel plate
- 4 rollers  $\varnothing$  31, life-time lubrication
- Adjustable free of clearance
- Weight: 2.03 kg

Item no.: **223 012** (1x LW 7)

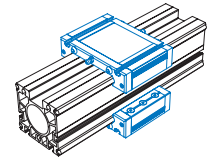


#### With 2 x Bearing Carriage WS 3/70

- L 96 x W 130 x H 32 mm
- Milled clamping surface
- M6 T-grooves
- Central lubrication
- Adjustable free of clearance
- Weight: 0.50 kg
- Option: stainless design

Item no.: **223 103 0070** (1xWS 3/70)

Stainless: **223 103 1070** (1xWS 3/70)



### Order Key

#### 235 00X XXXX

Standard = 6      Length in mm (in steps of 100 mm)

Stainless = 7      e.g. 0029 = Length 298  
    0299 = Length 2998

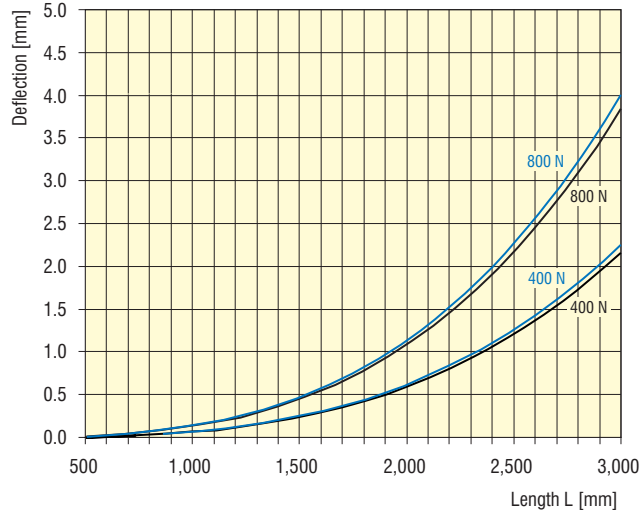
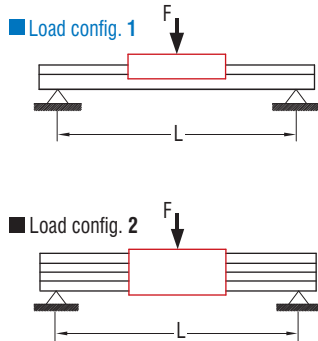
Steel shaft length:  
 Total length L - 3 mm

Profile length till 6000 mm without end to end available, steel shaft shared.

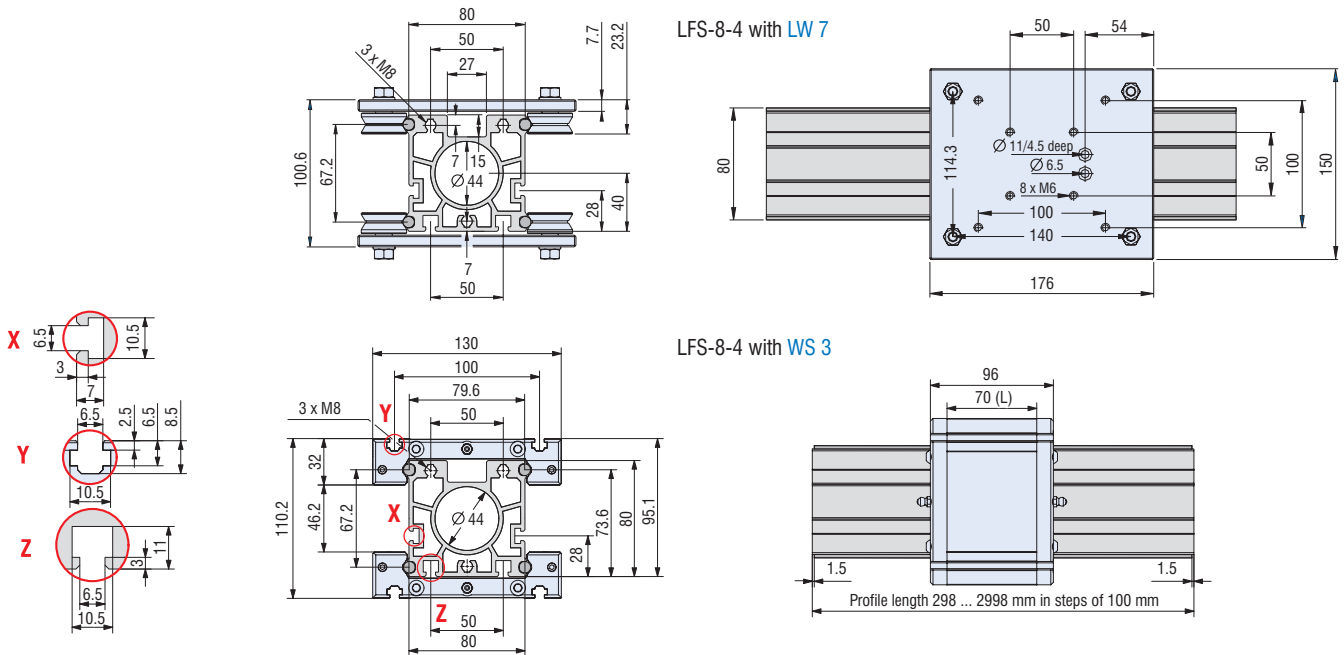
# Linear Guide Rail

# LFS-8-4 (MLF 4)

## Deflection



## Scale Drawings



# Linear Guide Rail

# LFS-8-5 (MLF 5)



## Features

- W 115 x H 40 mm
- 2 precision steel shafts Ø 8 mm
- Twist-resistant
- Aluminium shaft profile, anodized
- Top-down mounting by means of through holes for M6 in a 100 mm raster
- Conditionally cantilever
- Arbitrary guide rail length
- Weight: 4.7 kg/m

## Load Data

Roller Carriage LW 7	
C <sub>0</sub>	2,160 N
C	4,000 N
F <sub>1</sub> stat.	4,320 N
F <sub>1</sub> dyn.	3,792 N
F <sub>2</sub> stat.	2,160 N
F <sub>2</sub> dyn.	4,000 N
M <sub>x</sub> stat.	246.8 Nm
M <sub>y</sub> stat.	302.4 Nm
M <sub>z</sub> stat.	151.2 Nm
M <sub>x</sub> dyn.	216.7 Nm
M <sub>y</sub> dyn.	265.4 Nm
M <sub>z</sub> dyn.	280.0 Nm

Bearing Carriage WS 3	
C <sub>0</sub>	3,141 N
C	1,879 N
F <sub>1</sub> stat.	2,682 N
F <sub>1</sub> dyn.	1,604 N
F <sub>2</sub> stat.	3,141 N
F <sub>2</sub> dyn.	1,879 N
M <sub>x</sub> stat.	115.7 Nm
M <sub>y</sub> stat.	105.3 Nm
M <sub>z</sub> stat.	123.3 Nm
M <sub>x</sub> dyn.	69.2 Nm
M <sub>y</sub> dyn.	62.9 Nm
M <sub>z</sub> dyn.	73.7 Nm

Force sketch of the load table see page 37

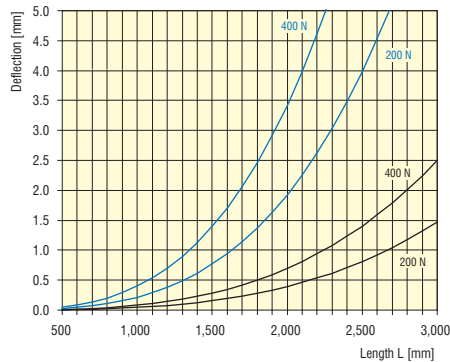
## Order Key

### 235 00X XXXX

Standard = 8    Length in mm (in steps of 100 mm)  
 Stainless = 9    e.g. 0029 = Length 296  
                           0299 = Length 2996

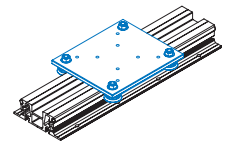
Steel shaft length:  
 Total length L - 1 mm

## Deflection



Force sketch of the deflection diagrams see page 37

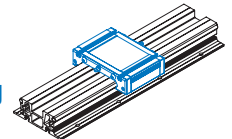
## Roller Carriage LW 7



- L 175 x W 150 x H 7,7 mm
- Milled clamping surface
- 4 rollers Ø 31, life-time lubrication
- Adjustable free of clearance
- Weight: 2.03 kg

Item no.: **223 012**

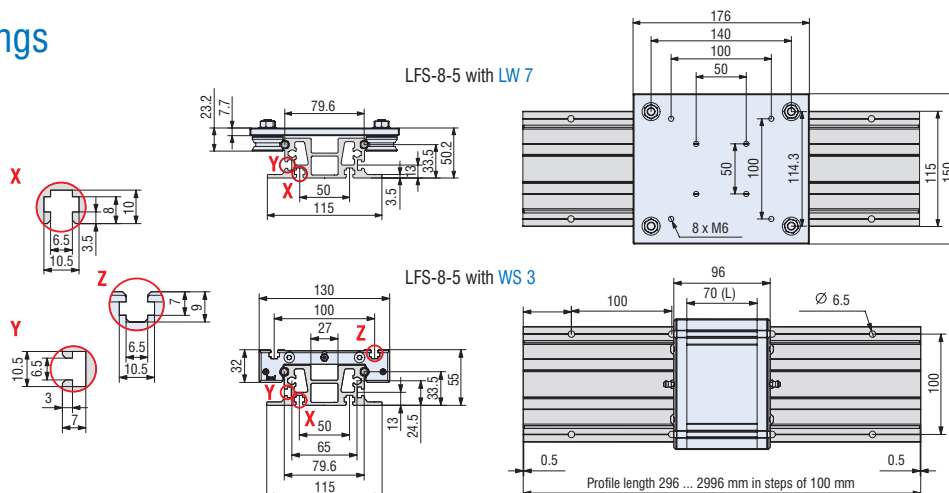
## Aluminium Bearing Carriage WS 3/70



- L 96 x W 130 x H 32 mm
- Milled clamping surface
- M6 T-grooves
- Central lubrication
- Adjustable free of clearance
- Weight: 0.50 kg
- Option: stainless construction

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

## Scale Drawings



# Linear Guide Rail

# LFS-8-6 (MLF 6)



## Features

- W 118 x H 68,8 mm
- 2 precision steel shafts Ø 8 mm
- Twist-resistant
- Aluminium shaft profile, anodized
- Attachment from below by means of thread rails in the T-groove indentation profile
- Conditionally cantilever
- Arbitrary guide rail length
- Weight: 5.39 kg/m
- Option: stainless design

## Load Data

Roller Carriage LW 7	
C <sub>0</sub>	2,160 N
C	4,000 N
F <sub>1</sub> stat.	4,320 N
F <sub>1</sub> dyn.	3,792 N
F <sub>2</sub> stat.	2,160 N
F <sub>2</sub> dyn.	4,000 N
M <sub>x</sub> stat.	246.8 Nm
M <sub>y</sub> stat.	302.4 Nm
M <sub>z</sub> stat.	151.2 Nm
M <sub>x</sub> dyn.	216.7 Nm
M <sub>y</sub> dyn.	265.4 Nm
M <sub>z</sub> dyn.	280.0 Nm

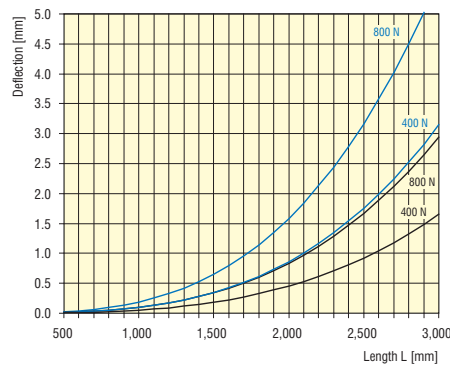
Bearing Carriage WS 3	
C <sub>0</sub>	3,141 N
C	1,879 N
F <sub>1</sub> stat.	2,682 N
F <sub>1</sub> dyn.	1,604 N
F <sub>2</sub> stat.	3,141 N
F <sub>2</sub> dyn.	1,879 N
M <sub>x</sub> stat.	115.7 Nm
M <sub>y</sub> stat.	105.3 Nm
M <sub>z</sub> stat.	123.3 Nm
M <sub>x</sub> dyn.	69.2 Nm
M <sub>y</sub> dyn.	62.9 Nm
M <sub>z</sub> dyn.	73.7 Nm

Force sketch of the load table see page 37

## Order Key 235 01X XXXX

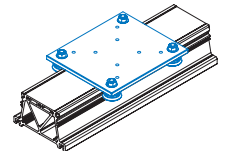
Standard = 0 Length in mm (in steps of 100 mm)  
 Stainless = 1 e.g. 0029 = Length 298  
 0299 = Length 2998

## Deflection



Force sketch of the deflection diagrams see page 37

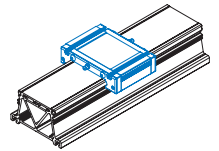
## Roller Carriage LW 7



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

Item no.: **223 012**

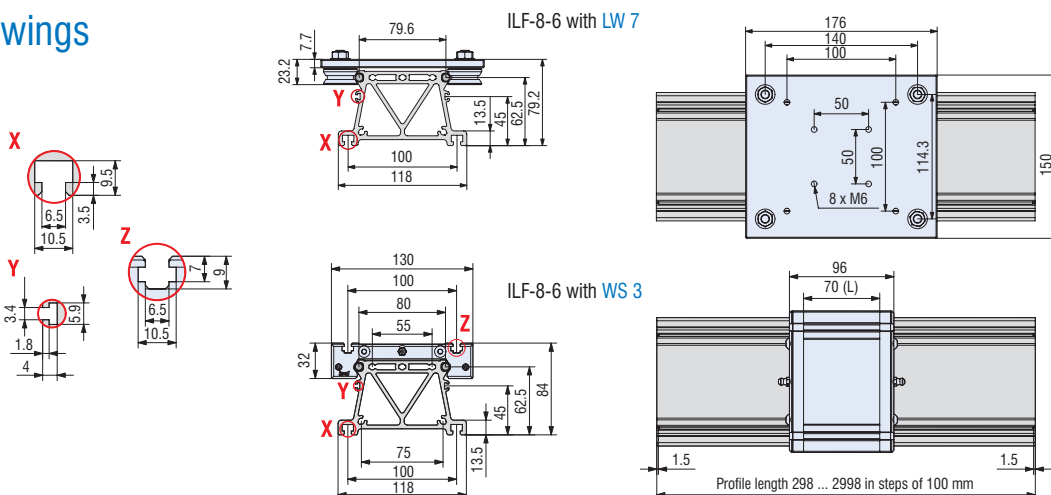
## Aluminium Bearing Carriage WS 3/70



- L 96 x W 130 x H 32 mm
- Milled clamping surface
- M6 T-grooves
- Central lubrication
- Adjustable free of clearance
- Weight: 0.50 kg
- Option: stainless construction

Item no.: **--223 103 0070**  
 Stainless: **223 103 1070**

## Scale Drawings



# Linear Guide Rail

# LFS-8-7 (MLF 7)



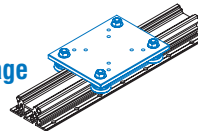
## Features

- W 78 x H 36 mm
- 2 precision steel shafts Ø 8 mm
- Twist-resistant
- Aluminium shaft profile, anodized
- Top-down mounting by means of through holes for M6 in a 100 mm raster
- Conditionally cantilever
- Arbitrary guide rail length
- Weight: 2.9 kg/m
- Option: stainless design

## Order Key 235 01X XXXX

Standard = 2 Length in mm (in steps of 100 mm)  
 Stainless = 3 e.g. 0029 = Length 296  
 0299 = Length 2996

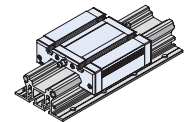
### Roller Carriage LW 10



- L 150 x W 115 x H 7,7 mm
- Polished steel plate
- 4 rollers Ø 31,
- life-time lubrication
- Adjustable free of clearance
- Weight: 1.47 kg

Item no.: 223 014

### Aluminium Bearing Carriage FSK-8-3



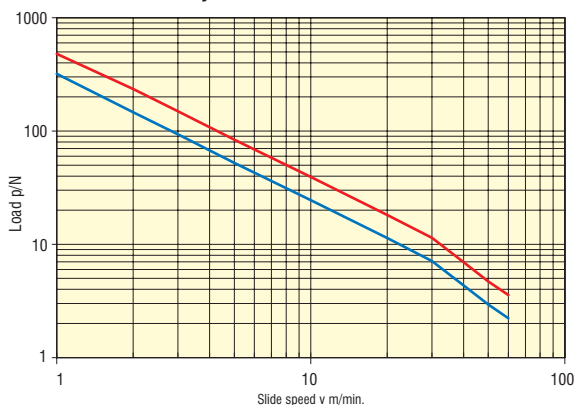
- L 95 x W 96 x H 32 mm
- with ball recirculation guide
- milled clamping surface
- M6 T-grooves
- central lubrication
- adjustable free of clearance
- Weight: 0.4 kg
- Option: Stainless design

Item no.: 223 111 0070  
 Stainless: 223 111 1070

## Load Data

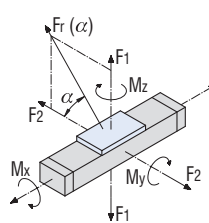
Bearing Carriage FSK-8-3		Bearing Carriage FSG-8-3		Bearing Carriage FSR-8-3		Roller Carriage LW 10	
C <sub>0</sub>	3,114 N	C <sub>0</sub>	361 N	C <sub>0</sub>	4,425 N	C <sub>0</sub>	2,160 N
C	1,846 N	C	-	C	1,950 N	C	4,000 N
F <sub>1</sub> stat.	2,659 N	F <sub>1</sub> stat.	577 N	F <sub>1</sub> stat.	150 N	F <sub>1</sub> stat.	4,320 N
F <sub>1</sub> dyn.	1,576 N	F <sub>1</sub> dyn. (10m/min.)	39 N	F <sub>1</sub> dyn.	90 N	F <sub>1</sub> dyn.	3,792 N
F <sub>2</sub> stat.	3,114 N	F <sub>2</sub> stat.	361 N	F <sub>2</sub> stat.	300 N	F <sub>2</sub> stat.	2,160 N
F <sub>2</sub> dyn.	1,846 N	F <sub>2</sub> dyn. (10m/min.)	25 N	F <sub>2</sub> dyn.	180 N	F <sub>2</sub> dyn.	4,000 N
M <sub>x</sub> stat.	67.3 Nm	M <sub>x</sub> stat.	12.87 Nm	M <sub>x</sub> stat.	3.345 Nm	M <sub>x</sub> stat.	170.4 Nm
M <sub>y</sub> stat.	100.5 Nm	M <sub>y</sub> stat.	20.20 Nm	M <sub>y</sub> stat.	5.25 Nm	M <sub>y</sub> stat.	248.4 Nm
M <sub>z</sub> stat.	117.6 Nm	M <sub>z</sub> stat.	12.62 Nm	M <sub>z</sub> stat.	10.5 Nm	M <sub>z</sub> stat.	124.2 Nm
M <sub>x</sub> dyn.	39.9 Nm	M <sub>x</sub> dyn.	-	M <sub>x</sub> dyn.	2.007 Nm	M <sub>x</sub> dyn.	149.5 Nm
M <sub>y</sub> dyn.	59.5 Nm	M <sub>y</sub> dyn.	-	M <sub>y</sub> dyn.	3.15 Nm	M <sub>y</sub> dyn.	218.0 Nm
M <sub>z</sub> dyn.	69.7 Nm	M <sub>z</sub> dyn.	-	M <sub>z</sub> dyn.	6.3 Nm	M <sub>z</sub> dyn.	230.0 Nm

Dyn. Load Limit FSG-8-3

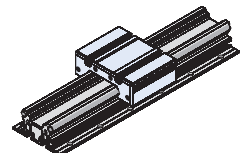


$$F_r(\alpha) = \frac{F_2}{\cos \alpha}$$

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



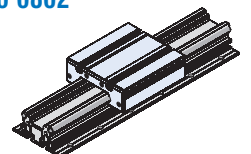
### Aluminium bearing carriage FSG-8-3



- L 76 x W 95 x H 32 mm
- guide slide bearing
- milled clamping surface
- M6 T-grooves
- adjustable free of clearance
- Weight: 0.32 kg
- friction coefficient: 0.2-0.4

Item no.: 223 250 0802

### Aluminium bearing carriage FSR-8-3



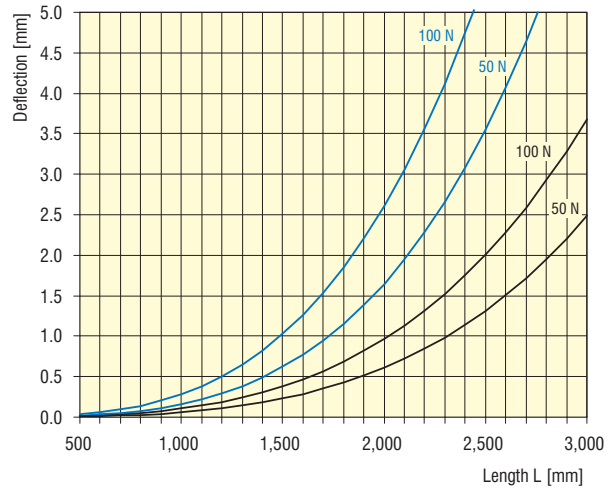
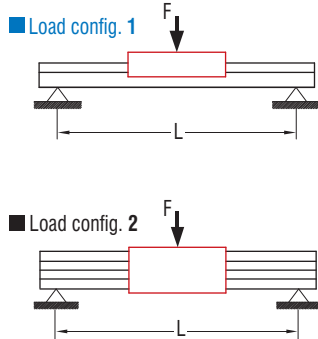
- L 106 x W 95 x H 32 mm
- with roller guide
- milled clamping surface
- M6 T-grooves
- adjustable free of clearance
- Weight: 0.45 kg

Item no.: 223 260 0802

# Linear Guide Rail

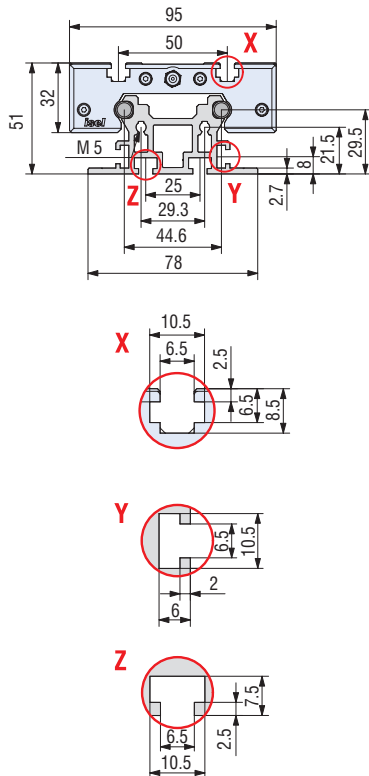
# LFS-8-7 (MLF 7)

## Deflection

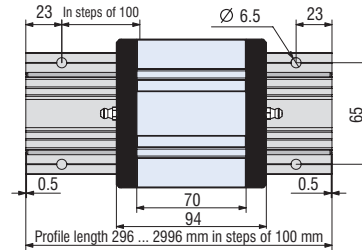


## Scale Drawings

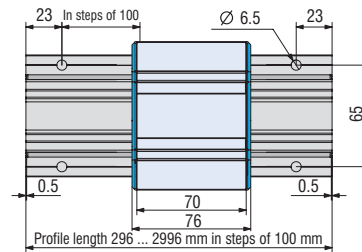
### Detail (FSK/FSG/FSR)



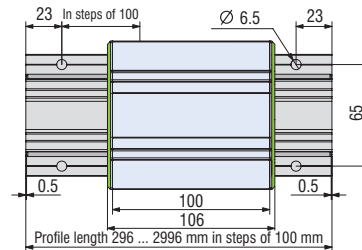
### LFS-8-7 with ball recirculation guide carriage FSK



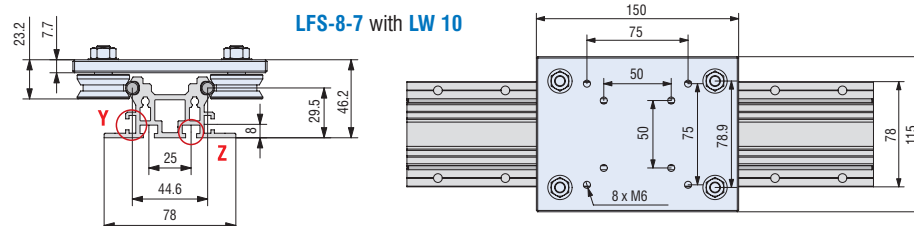
### LFS-8-7 with guide slide bearing FSG



### LFS-8-7 with roller carriage guide FSR

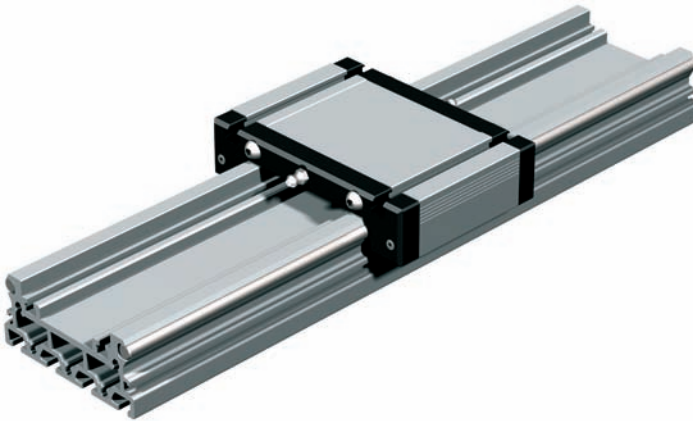


### LFS-8-7 with LW 10



# Linear Guide Rail

# LFS-8-8 (MLF 8)



## Features

- W 91 x H 40 mm
- 2 precision steel shafts Ø 8 mm
- especial Twist-resistant
- Aluminium shaft profile, anodized
- Attachment from below by means of thread rails in the T-groove indentation profile
- Conditionally cantilever
- Arbitrary guide rail length
- Weight: 3.9 kg/m

## Load Data

Roller Carriage LW 7	
C <sub>0</sub>	2,160 N
C	4,000 N
F <sub>1</sub> stat.	4,320 N
F <sub>1</sub> dyn.	3,792 N
F <sub>2</sub> stat.	2,160 N
F <sub>2</sub> dyn.	4,000 N
M <sub>x</sub> stat.	246.8 Nm
M <sub>y</sub> stat.	302.4 Nm
M <sub>z</sub> stat.	151.2 Nm
M <sub>x</sub> dyn.	216.7 Nm
M <sub>y</sub> dyn.	265.4 Nm
M <sub>z</sub> dyn.	280.0 Nm

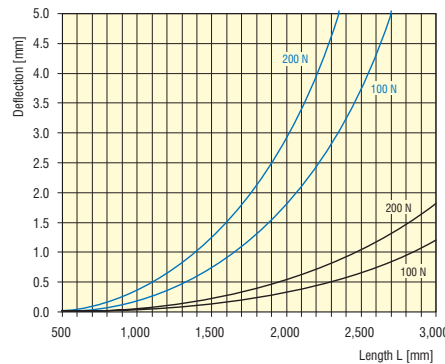
Bearing Carriage WS 3	
C <sub>0</sub>	3,141 N
C	1,879 N
F <sub>1</sub> stat.	2,682 N
F <sub>1</sub> dyn.	1,604 N
F <sub>2</sub> stat.	3,141 N
F <sub>2</sub> dyn.	1,879 N
M <sub>x</sub> stat.	115.7 Nm
M <sub>y</sub> stat.	105.3 Nm
M <sub>z</sub> stat.	123.3 Nm
M <sub>x</sub> dyn.	69.2 Nm
M <sub>y</sub> dyn.	62.9 Nm
M <sub>z</sub> dyn.	73.7 Nm

Force sketch of the load table see page 37

## Order Key 235 0XX XXXX

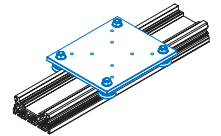
Standard = 14 Length in mm (in steps of 100 mm)  
Stainless = 15 e.g. 0029 = Length 296  
0299 = Length 2996

## Deflection



Force sketch of the deflection diagrams see page 37

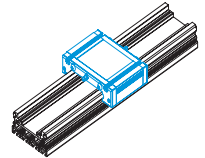
## Roller Carriage LW 7



- L 176 x W 150 x H 7,7 mm
- Polished steel plate
- 4 rollers Ø 31,
- life-time lubrication
- Adjustable free of clearance
- Weight: 2.03 kg

Item no.: 223 012

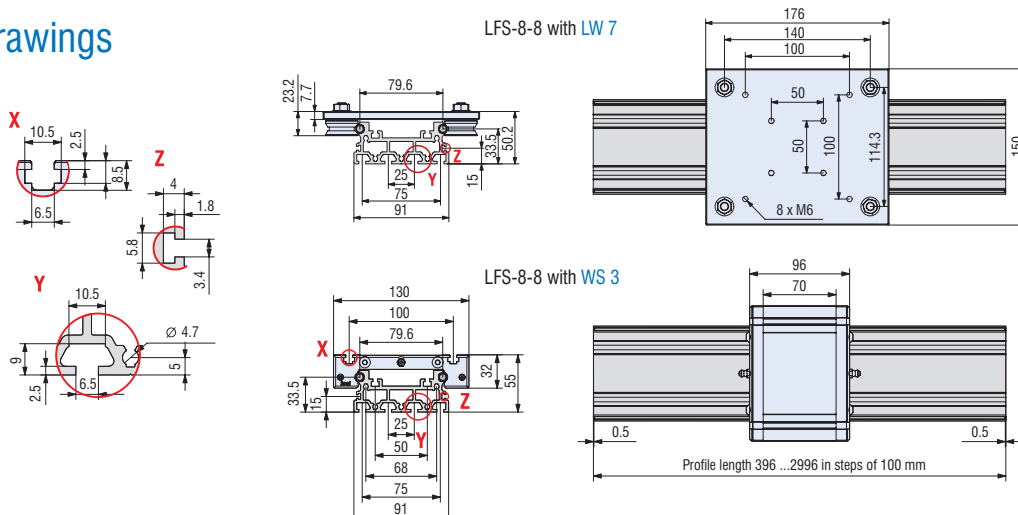
## Aluminium Bearing Carriage WS 3/70



- L 96 x W 130 x H 32 mm
- Milled clamping surface
- M6 T-grooves
- Central lubrication
- Adjustable free of clearance
- Weight: 0.50 kg
- Option: stainless design

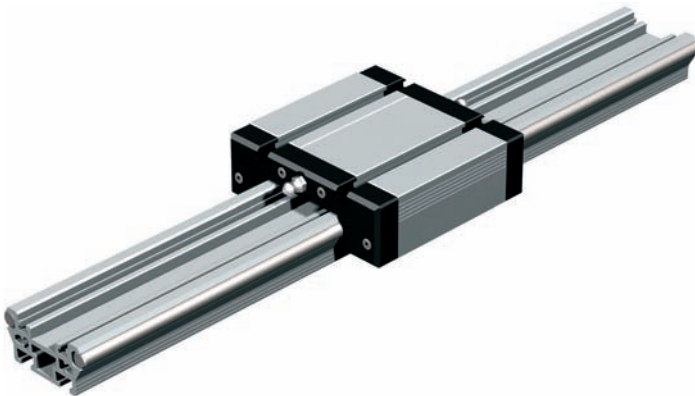
Item no.: 223 103 0070  
Stainless: 223 103 1070

## Scale Drawings



# Linear Guide Rail

# LFS-8-9 (MLF 9)



## Features

- W 53 x H 25 mm
- 2 precision steel shafts Ø 8 mm
- especial Twist-resistant
- Aluminium shaft profile, anodized
- Bottom-up mounting by means of thread rails in the T-groove profile
- Conditionally cantilever
- Arbitrary guide rail length
- Weight: 1.96 kg/m

## Load Data

Roller Carriage LW 10	
C <sub>0</sub>	2,160 N
C	4,000 N
F <sub>1</sub> stat.	4,320 N
F <sub>1</sub> dyn.	3,792 N
F <sub>2</sub> stat.	2,160 N
F <sub>2</sub> dyn.	4,000 N
M <sub>x</sub> stat.	170.4 Nm
M <sub>y</sub> stat.	248.4 Nm
M <sub>z</sub> stat.	124.2 Nm
M <sub>x</sub> dyn.	149.5 Nm
M <sub>y</sub> dyn.	218.0 Nm
M <sub>z</sub> dyn.	230.0 Nm

Bearing Carriage WS 11	
C <sub>0</sub>	3,114 N
C	1,846 N
F <sub>1</sub> stat.	2,659 N
F <sub>1</sub> dyn.	1,576 N
F <sub>2</sub> stat.	3,114 N
F <sub>2</sub> dyn.	1,846 N
M <sub>x</sub> stat.	67.3 Nm
M <sub>y</sub> stat.	100.5 Nm
M <sub>z</sub> stat.	117.6 Nm
M <sub>x</sub> dyn.	39.9 Nm
M <sub>y</sub> dyn.	59.5 Nm
M <sub>z</sub> dyn.	69.7 Nm

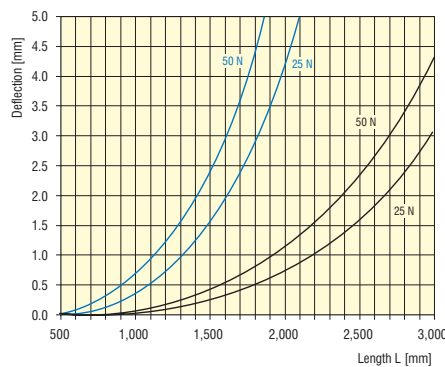
Force sketch of the load table see page 37

## Order Key

### 235 0XX XXXX

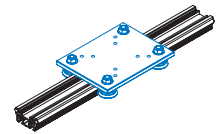
Standard = 16 Length in mm (in steps of 100 mm)  
 Stainless = 17 e.g. 0029 = Length 296  
 0299 = Length 2996

## Deflection



Force sketch of the deflection diagrams see page 37

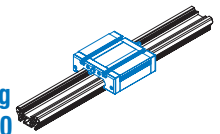
## Roller Carriage LW 10



- L 150 x W 115 x H 7,7 mm
- Polished steel plate
- 4 rollers Ø 31, life-time lubrication
- Adjustable free of clearance
- Weight: 1.47 kg

Item no.: 223 014

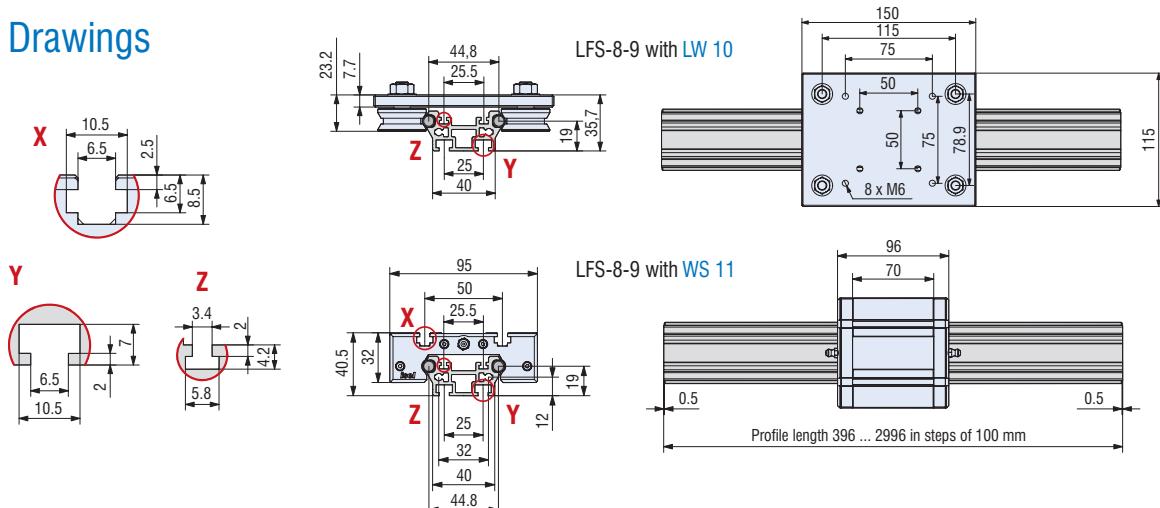
## Aluminium Bearing Carriage WS 11/70



- L 95 x W 96 x H 32 mm
- Milled clamping surface
- M6 T-grooves
- Central lubrication
- Adjustable free of clearance
- Weight: 0.40 kg
- Option: Stainless design

Item no.: 223 111 0070  
 Stainless: 223 111 1070

## Scale Drawings



# Linear Guide Rail

# LFS-12-21



## Features

- Precision steel shaft  $\varnothing$  12 mm
- Mounting
  - bottom thread: M4 Raster 50 mm
  - from the top: special screw M4 Raster 50 mm
- Easy, flat, universal
- Not twist resistant
- Shipment including fixing bolt Torx T15 M4x20

## Order Key

**220 0XX 0XXX**

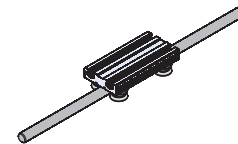
Type:  
 19=Thread M4  
 20=Counterbore  
 M4

Steel shaft "L":  
 Length in mm (in 100 mm Raster)  
 e. g. 0019= Length 198 (min)  
 0299= Length 2998 (max)

## Load Data

LFS-12-21	
FSR-12-21	
$C_0$	4425 N
C	1950 N
$F_1$ stat.	150 N
$F_1$ dyn.	90 N
$F_2$ stat.	300 N
$F_2$ dyn.	180 N
$M_x$ stat.	0.00 Nm
$M_y$ stat.	5.25 Nm
$M_z$ stat.	10.5 Nm
$M_x$ dyn.	0.00 Nm
$M_y$ dyn.	3.15 Nm
$M_z$ dyn.	6.3 Nm

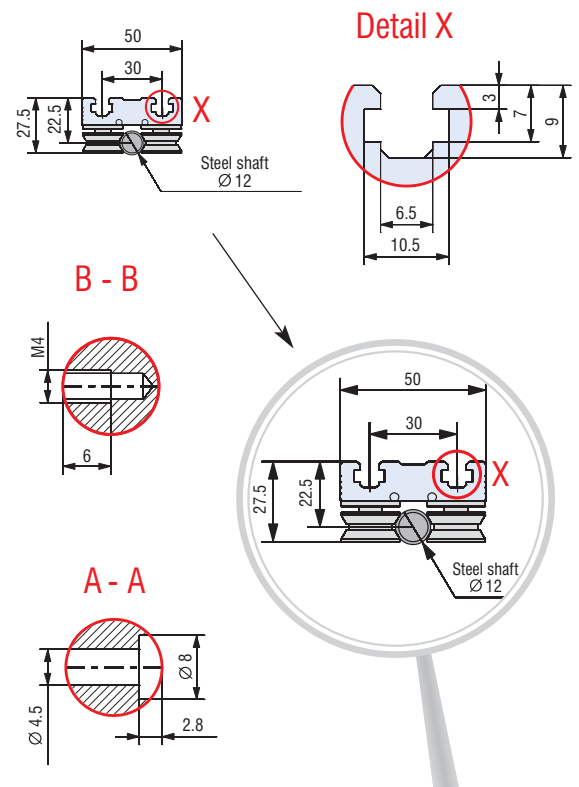
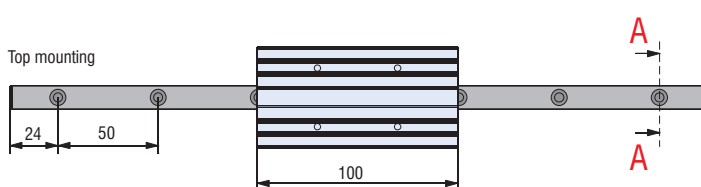
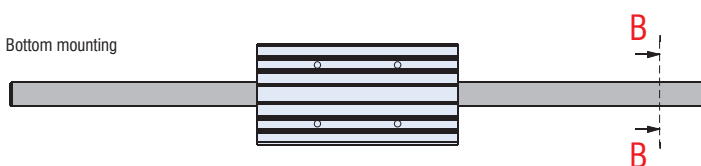
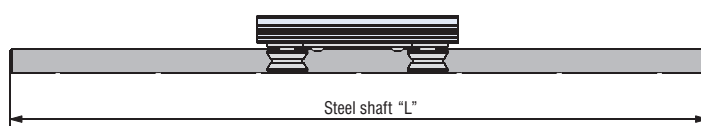
## Guide Carriage FSR-12-21



- L 100 x W 50 x H 27.5 mm
- Clamping area plan-milled
- Weight: 0.23 kg

Item no.: **223 260 1203**

## Scale Drawings



# Linear Guide Rail

# LFS-12-22



## Features

- Precision steel shaft  $\varnothing$  12 mm
- Mounting
  - bottom thread: M4 Raster 50 mm
  - from the top: special screw M4 Raster 50 mm
- Easy, flat, universal
- Twist resistant
- Shipment including fixing bolt Torx T15 M4x20

## Order Key

**220 OXX OXXX**

Type:

- 21 = Thread M4
- 22 = Counterbore M4

2 Steel shaft

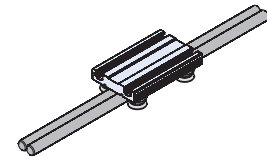
Steel shaft "L":

Length in mm (in 100 mm Raster)  
e.g. 0019 = Length 198 (min)  
0299 = Length 2998 (max)

## Load Data

LFS-12-22	
FSR-12-22	
$C_0$	4425 N
C	1950 N
$F_1$ stat.	150 N
$F_1$ dyn.	90 N
$F_2$ stat.	300 N
$F_2$ dyn.	180 N
$M_x$ stat.	0.9 Nm
$M_y$ stat.	5.25 Nm
$M_z$ stat.	10.5 Nm
$M_x$ dyn.	0.54 Nm
$M_y$ dyn.	3.15 Nm
$M_z$ dyn.	6.3 Nm

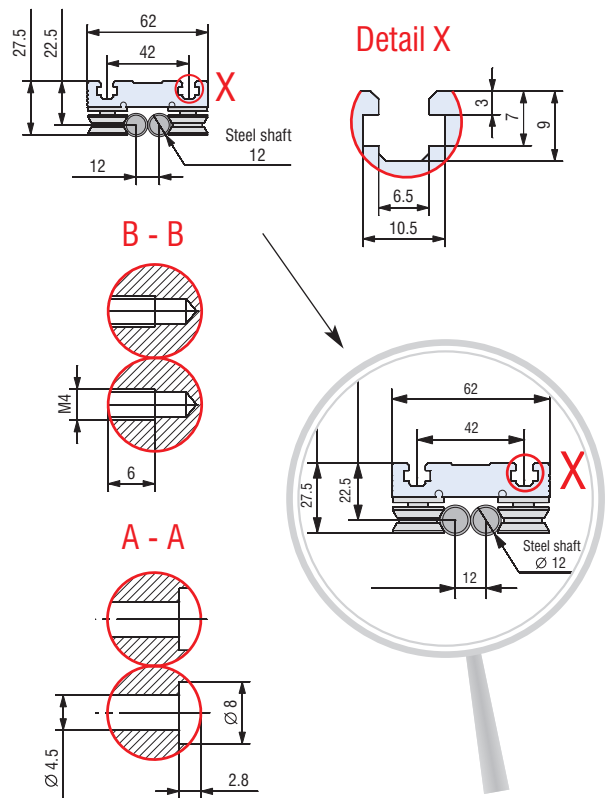
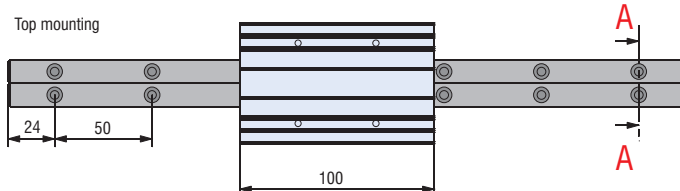
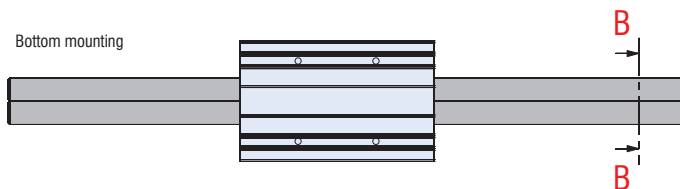
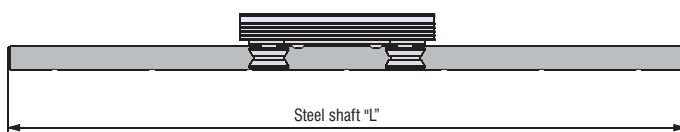
## Guide carriage FSR-12-22



- L 100 x W 62 x H 27.5 mm
- Clamping areas plan-milled
- Weight: 0.27 kg

Item no.: **223 260 1204**

## Scale Drawings



# Linear Guide Rail

# LFS-12-1 (LF 1)



## Features

- W 40 x H 27 mm
- 2 precision steel shafts Ø 12
- Twist-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

## Order Data

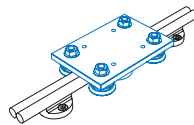


LFS-12-1 (Single Steel Shaft!)

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
Aluminum shaft seat blocks 10 pieces, item no. 221 501	

**Please note:**  
The item number just refers to the steel shaft !

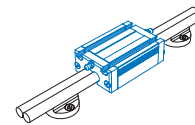
### Roller Carriage LW 3



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

Item No.: **223 008**

### Aluminium Bearing Carriage WS 4/70



- 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**

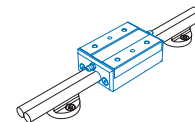


### Shaft Supporting Blocks

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

Item no.: **221 501**

### Steel Sledge LS 1



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

Item no.: **223 006**

Special length on request

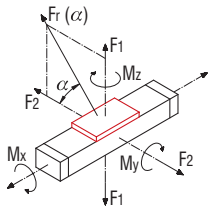
# Linear Guide Rail

# LFS-12-1 (LF 1)

## Load Data

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

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



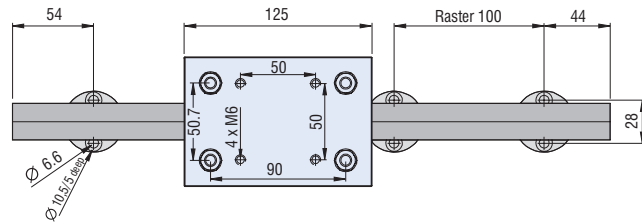
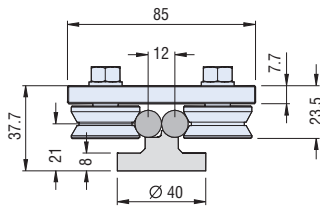
Roller Carriage LW 3	
C <sub>0</sub>	2,160 N
C	4,000 N
F <sub>1</sub> stat.	4,320 N
F <sub>1</sub> dyn.	3,846 N
F <sub>2</sub> stat.	2,160 N
F <sub>2</sub> dyn.	4,000 N
M <sub>x</sub> stat.	109.5 Nm
M <sub>x</sub> dyn.	194.4 Nm
M <sub>y</sub> stat.	97.2 Nm
M <sub>y</sub> dyn.	97.4 Nm
M <sub>z</sub> stat.	173.0 Nm
M <sub>z</sub> dyn.	180.0 Nm

Bearing Carriage WS 4	
C <sub>0</sub>	3303 N
C	1873 N
F <sub>1</sub> stat.	2821 N
F <sub>1</sub> dyn.	1599 N
F <sub>2</sub> stat.	3303 N
F <sub>2</sub> dyn.	1873 N
M <sub>x</sub> stat.	29.8 Nm
M <sub>x</sub> dyn.	105.3 Nm
M <sub>y</sub> stat.	123.3 Nm
M <sub>y</sub> dyn.	16.8 Nm
M <sub>z</sub> stat.	59.7 Nm
M <sub>z</sub> dyn.	69.9 Nm

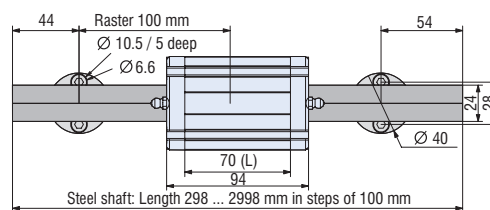
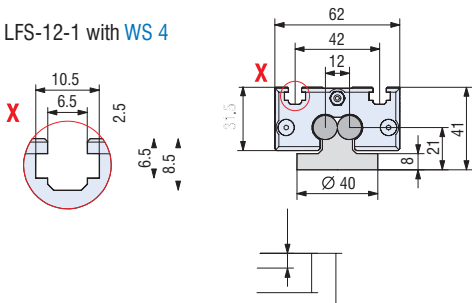
Bearing Carriage LS 1	
C <sub>0</sub>	3508 N
C	2105 N
F <sub>1</sub> stat.	3549 N
F <sub>1</sub> dyn.	2130 N
F <sub>2</sub> stat.	3508 N
F <sub>2</sub> dyn.	2105 N
M <sub>x</sub> stat.	36.2 Nm
M <sub>x</sub> dyn.	129.0 Nm
M <sub>y</sub> stat.	127.5 Nm
M <sub>y</sub> dyn.	21.7 Nm
M <sub>z</sub> stat.	77.4 Nm
M <sub>z</sub> dyn.	76.5 Nm

## Scale Drawings

LFS-12-1 with LW 3

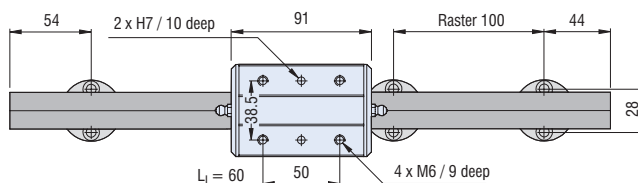
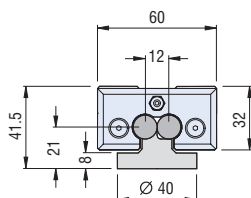


LFS-12-1 with WS 4



(L) 100 = on request

LFS-12-1 with LS 1



# Linear Guide Rail

# LFS-12-11 (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

## Order Key

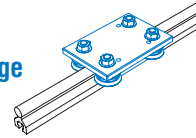
**220 002 XXXX**

Length in mm

e.g. 0029 = Length 298  
0998 = Length 998

Profile length = total length L - 2 mm

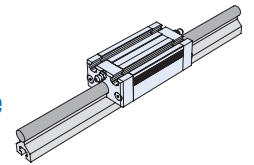
### Roller Carriage LW 5



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

Item no.: **223 010**

### Aluminium Bearing Carriage FSK-12-1



- L 100 x W 50 x H 31.5 mm
- with ball recirculation guide
- M6 T-grooves
- central lubrication
- adjustable free of clearance
- Weight: 0.30 kg
- Option: Stainless design

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

## Load Data

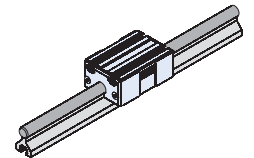
Bearing Carriage FSK-12-1	
C <sub>0</sub>	3,303 N
C	1,873 N
F <sub>1</sub> stat.	2,821 N
F <sub>1</sub> dyn.	1,599 N
F <sub>2</sub> stat.	3,303 N
F <sub>2</sub> dyn.	1,873 N
M <sub>x</sub> stat.	-
M <sub>y</sub> stat.	105.3 Nm
M <sub>z</sub> stat.	123.3 Nm
M <sub>x</sub> dyn.	-
M <sub>y</sub> dyn.	59.7 Nm
M <sub>z</sub> dyn.	69.9 Nm

Bearing Carriage FSG-12-1	
C <sub>0</sub>	400 N
C	-
F <sub>1</sub> stat.	550 N
F <sub>1</sub> dyn. (10m/min.)	38 N
F <sub>2</sub> stat.	400 N
F <sub>2</sub> dyn. (10m/min.)	27 N
M <sub>x</sub> stat.	0.00 Nm
M <sub>y</sub> stat.	19.27 Nm
M <sub>z</sub> stat.	14.00 Nm
M <sub>x</sub> dyn.	-
M <sub>y</sub> dyn.	-
M <sub>z</sub> dyn.	-

Bearing Carriage FSR-12-1	
C <sub>0</sub>	4,425 N
C	1,950 N
F <sub>1</sub> stat.	150 N
F <sub>1</sub> dyn.	90 N
F <sub>2</sub> stat.	300 N
F <sub>2</sub> dyn.	180 N
M <sub>x</sub> stat.	0.00 Nm
M <sub>y</sub> stat.	5.25 Nm
M <sub>z</sub> stat.	10.5 Nm
M <sub>x</sub> dyn.	0.00 Nm
M <sub>y</sub> dyn.	3.15 Nm
M <sub>z</sub> dyn.	6.3 Nm

Roller Carriage LW 5	
C <sub>0</sub>	2,160 N
C	4,000 N
F <sub>1</sub> stat.	4,320 N
F <sub>1</sub> dyn.	3,846 N
F <sub>2</sub> stat.	2,160 N
F <sub>2</sub> dyn.	4,000 N
M <sub>x</sub> stat.	-
M <sub>y</sub> stat.	162.0 Nm
M <sub>z</sub> stat.	81.0 Nm
M <sub>x</sub> dyn.	-
M <sub>y</sub> dyn.	144.2 Nm
M <sub>z</sub> dyn.	150.0 Nm

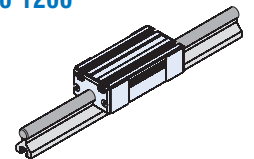
### Aluminium bearing carriage FSG-12-1



- L 76 x W 50 x H 31.5 mm
- guide slide bearing
- milled clamping surface
- M6 T-grooves
- adjustable free of clearance
- Weight: 0.22 kg
- friction coefficient: 0.2-0.4

Item no.: **223 250 1200**

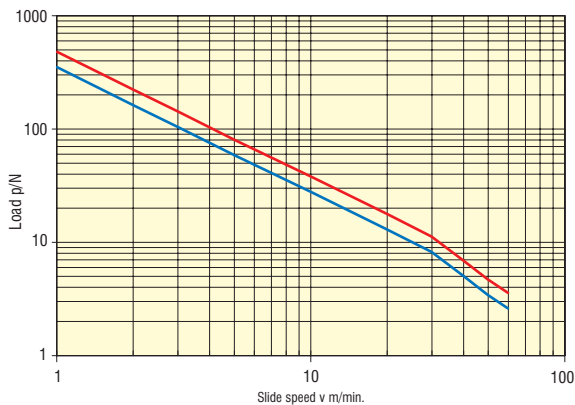
### Aluminium bearing carriage FSR-12-1



- L 106 x W 52 x H 31.5 mm
- with roller guide
- milled clamping surface
- M6 T-grooves
- adjustable free of clearance
- Weight: 0.35 kg

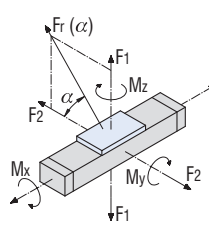
Item no.: **223 260 1200**

**Dyn. Load Limit FSG-12-1**



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

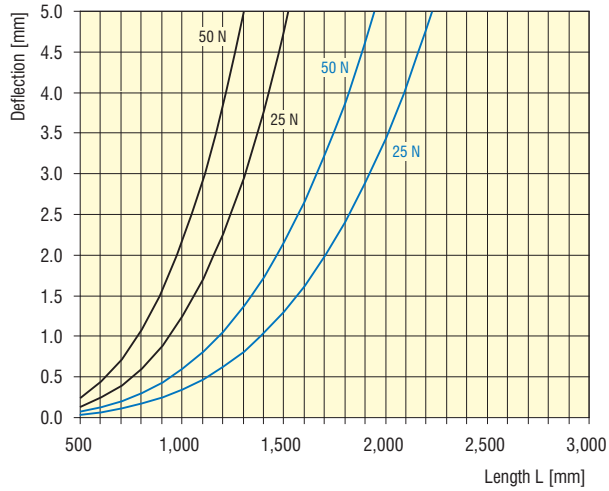
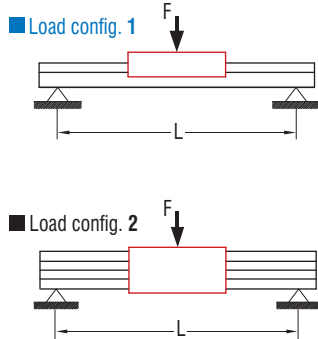
$$F_r(\alpha) = \frac{F_1}{\sin \alpha}$$



# Linear Guide Rail

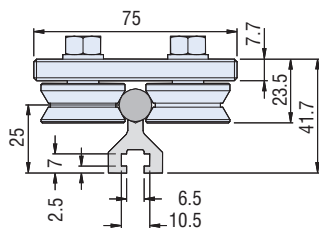
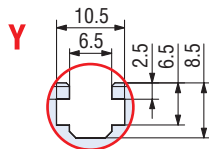
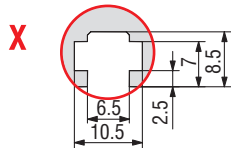
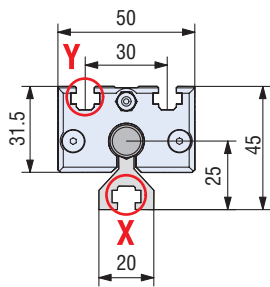
# LFS-12-11 (ELF 1)

## Deflection

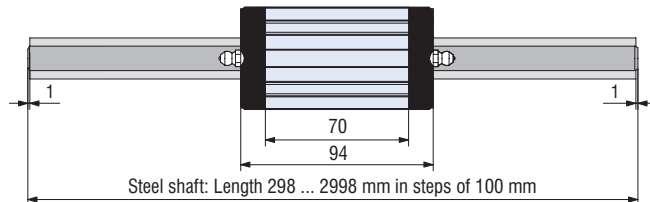


## Scale Drawings

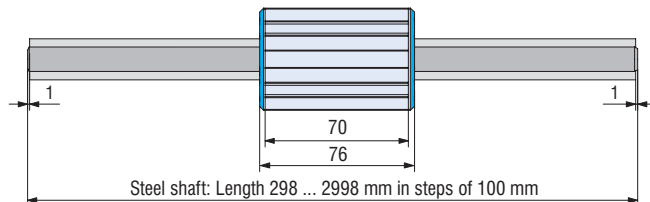
### Detail (FSK/FSG/FSR)



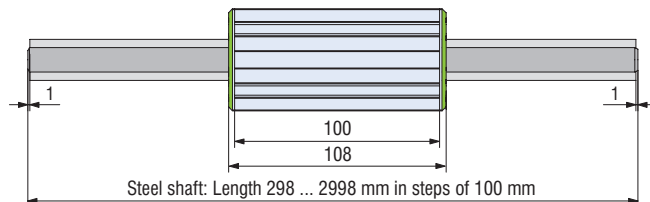
### LFS-12-11 ball recirculation guide carriage FSK



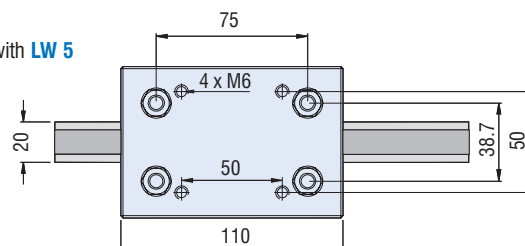
### LFS-12-11 with guide slide carriage FSG



### LFS-12-11 with roller carriage guide FSR



### LFS-12-11 with LW 5



# Linear Guide Rail

# LFS-12-2 (LF 2)



## Features

- W 62 x H 31 mm
- 2 precision steel shafts Ø 12
- Twist-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
- Length in steps of 100 mm
- Max. Length to 2998 mm
- Arbitrary guide rail length
- Weight: 3.29 kg/m

## Order Key

**235 200 XXXX**

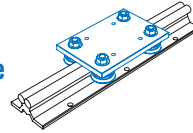
Length in mm

e.g. 0029 = Length 298

0998 = Length 998

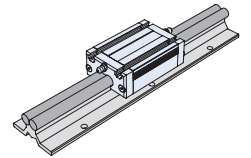
Profile length = total length L - 2 mm

## 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**

## Aluminium Bearing Carriage FSK-12-2



- L 94 x W 62 x H 31.5 mm
- with ball recirculation guide
- milled clamping surface
- Weight: 0.33 kg
- Option: Stainless design

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

## Load Data

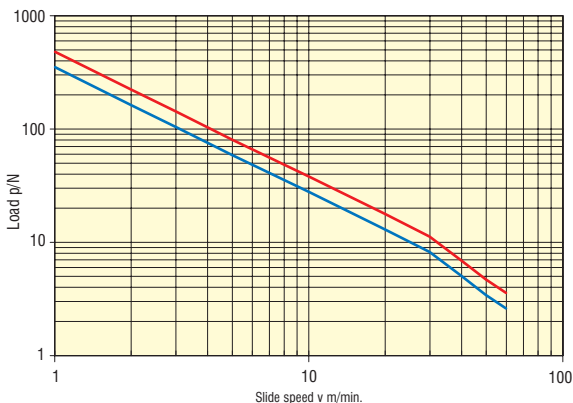
Bearing Carriage FSK-12-2	
C <sub>0</sub>	3,303 N
C	1,873 N
F <sub>1</sub> stat.	2,821 N
F <sub>1</sub> dyn.	1,599 N
F <sub>2</sub> stat.	3,303 N
F <sub>2</sub> dyn.	1,873 N
M <sub>x</sub> stat.	29,8 Nm
M <sub>y</sub> stat.	105,3 Nm
M <sub>z</sub> stat.	123,3 Nm
M <sub>x</sub> dyn.	16,8 Nm
M <sub>y</sub> dyn.	59,7 Nm
M <sub>z</sub> dyn.	69,9 Nm

Bearing Carriage FSG-12-2	
C <sub>0</sub>	400 N
C	-
F <sub>1</sub> stat.	550 N
F <sub>1</sub> dyn. (10m/min.)	38 N
F <sub>2</sub> stat.	400 N
F <sub>2</sub> dyn. (10m/min.)	27 N
M <sub>x</sub> stat.	3,30 Nm
M <sub>y</sub> stat.	19,27 Nm
M <sub>z</sub> stat.	14,00 Nm
M <sub>x</sub> dyn.	-
M <sub>y</sub> dyn.	-
M <sub>z</sub> dyn.	-

Bearing Carriage FSR-12-2	
C <sub>0</sub>	4,425 N
C	1,950 N
F <sub>1</sub> stat.	150 N
F <sub>1</sub> dyn.	90 N
F <sub>2</sub> stat.	300 N
F <sub>2</sub> dyn.	180 N
M <sub>x</sub> stat.	0,9 Nm
M <sub>y</sub> stat.	5,25 Nm
M <sub>z</sub> stat.	10,5 Nm
M <sub>x</sub> dyn.	0,54 Nm
M <sub>y</sub> dyn.	3,15 Nm
M <sub>z</sub> dyn.	6,3 Nm

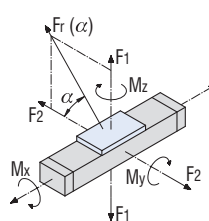
Roller Carriage LW 3	
C <sub>0</sub>	2,160 N
C	4,000 N
F <sub>1</sub> stat.	4,320 N
F <sub>1</sub> dyn.	3,846 N
F <sub>2</sub> stat.	2,160 N
F <sub>2</sub> dyn.	4,000 N
M <sub>x</sub> stat.	109,5 Nm
M <sub>y</sub> stat.	194,4 Nm
M <sub>z</sub> stat.	97,2 Nm
M <sub>x</sub> dyn.	97,4 Nm
M <sub>y</sub> dyn.	173,0 Nm
M <sub>z</sub> dyn.	180,0 Nm

**Dyn. Load Limit FSG-12-2**

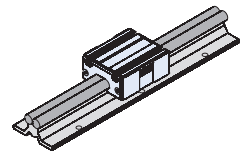


$$F_r(\alpha) = \frac{F_2}{\cos \alpha}$$

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



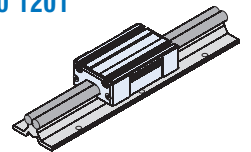
## Aluminium bearing carriage FSG-12-2



- L 76 x W 62 x H 31.5 mm
- guide slide bearing
- milled clamping surface
- M6 T-grooves
- adjustable free of clearance
- Weight: 0.25 kg
- friction coefficient: 0.2-0.4

Item no.: **223 250 1201**

## Aluminium bearing carriage FSR-12-2



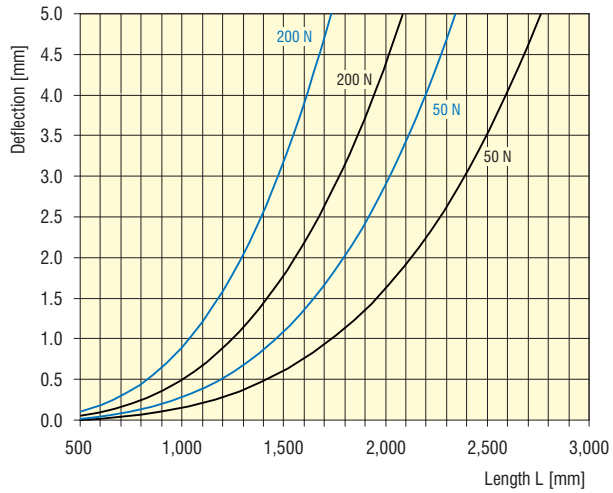
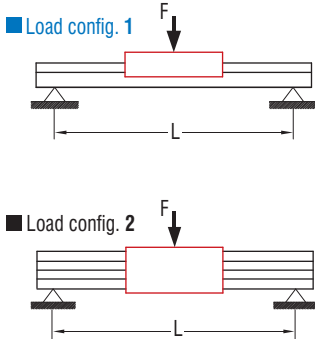
- L 108 x W 64 x H 31.5 mm
- with roller guide
- milled clamping surface
- M6 T-grooves
- adjustable free of clearance
- Weight: 0.38 kg

Item no.: **223 260 1201**

# Linear Guide Rail

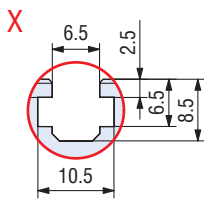
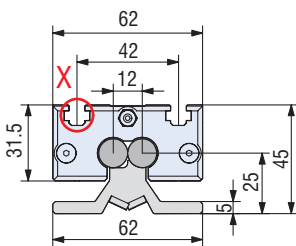
# LFS-12-2 (LF 2)

## Deflection

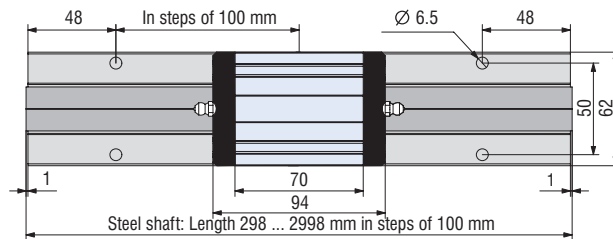


## Scale Drawings

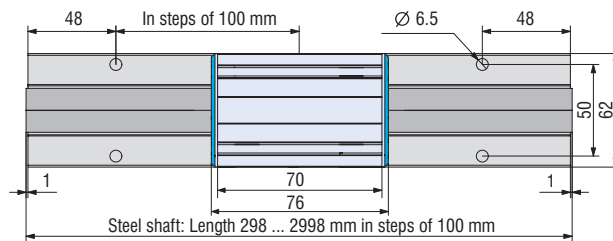
Detail (FSK/FSG/FSR)



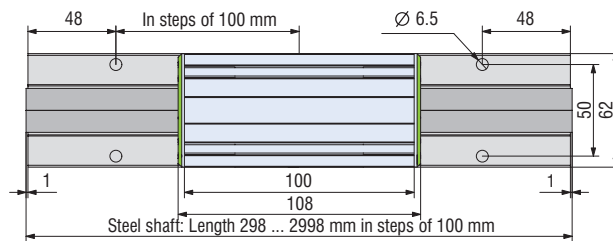
### LFS-12-2 with recirculation guide carriage FSK



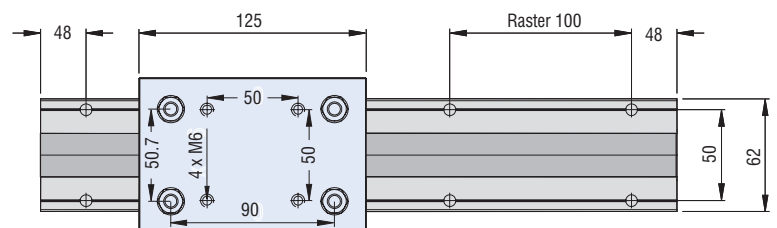
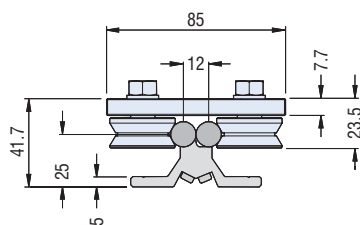
### LFS-12-2 with guide slide bearing FSG



### LFS-12-2 with roller carriage guide FSR

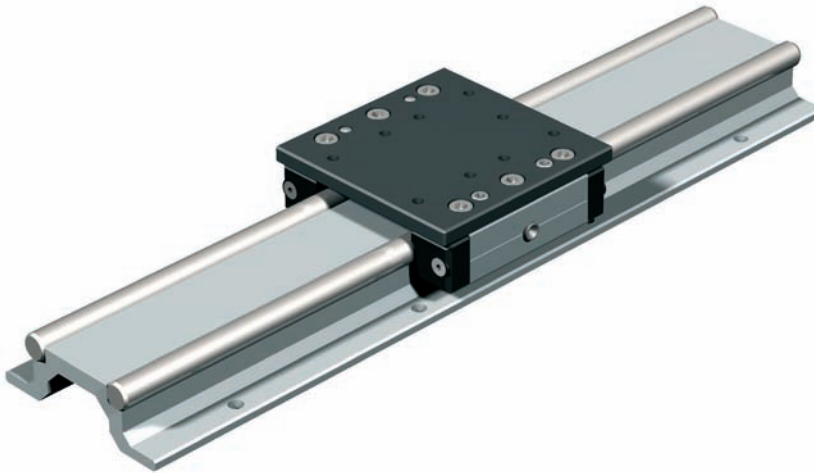


### LFS-12-2 with LW 3



# Linear Guide Rail

# LFS-12-3 (LF 3)



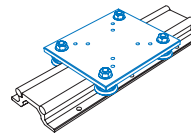
## Features

- W 90 x H 31 mm
- 2 precision steel shafts Ø 12
- Twist-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

## Load Data

Roller Carriage LW 8	
$C_0$	2,160 N
C	4,000 N
$F_1$ stat.	4,320 N
$F_1$ dyn.	3,846 N
$F_2$ stat.	2,160 N
$F_2$ dyn.	4,000 N
$M_x$ stat.	189.2 Nm
$M_x$ stat.	248.4 Nm
$M_x$ stat.	124.2 Nm
$M_x$ dyn.	168.4 Nm
$M_x$ dyn.	221.1 Nm
$M_x$ dyn.	230.0 Nm

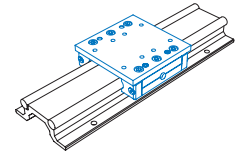
Bearing Carriage WS 7	
$C_0$	3,303 N
C	1,873 N
$F_1$ stat.	2,821 N
$F_1$ dyn.	1,599 N
$F_2$ stat.	3,303 N
$F_2$ dyn.	1,873 N
$M_x$ stat.	82.0 Nm
$M_x$ stat.	105.3 Nm
$M_x$ stat.	123.3 Nm
$M_x$ dyn.	46.4 Nm
$M_x$ dyn.	59.7 Nm
$M_x$ dyn.	69.9 Nm



### Roller Carriage LW 8

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

Item no.: **223 013**



### Bearing Carriage WS 7/70

- L 100 x W 100 x H 32 mm
- Polished steel plate
- Central lubrication
- Adjustable free of clearance
- Weight: 1.67 kg

Item no.: **223 107 0070**

## Order Key

### 235 300 XXXX

Length in mm (in steps of 100 mm)  
 e.g. 0029 = Length 298  
 0299 = Length 2998

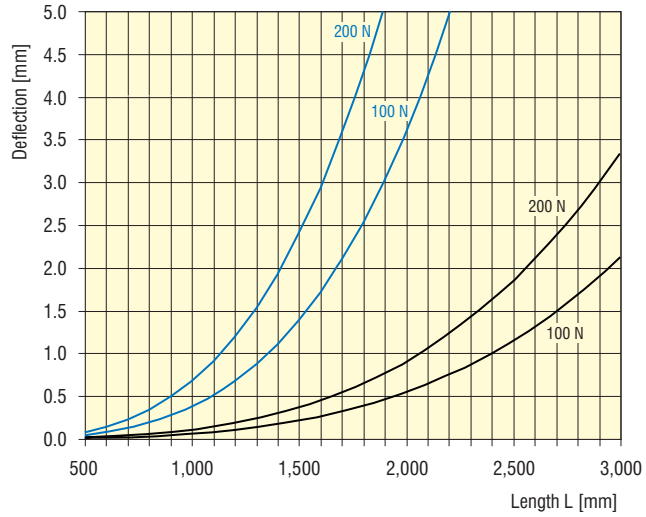
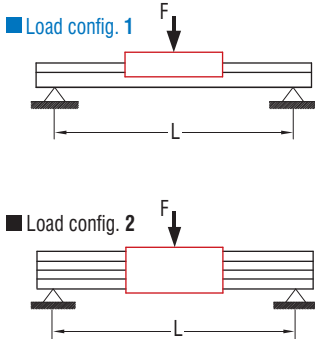
Profile Length = Total Length L - 2 mm

Special length at 3000 mm  
 with bar connection on request

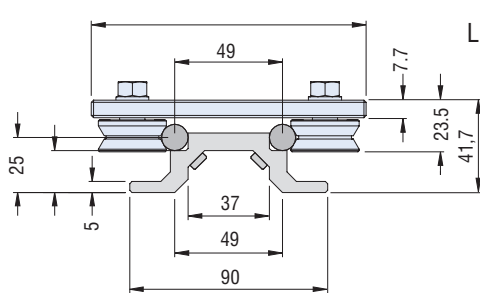
# Linear Guide Rail

# LFS-12-3 (LF 3)

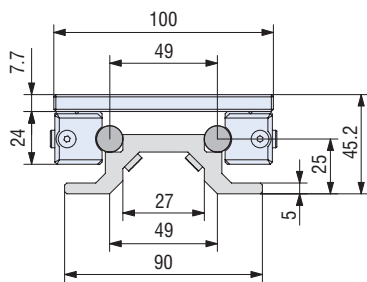
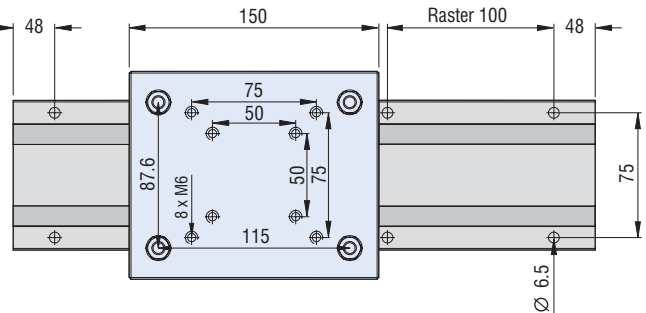
## Deflection



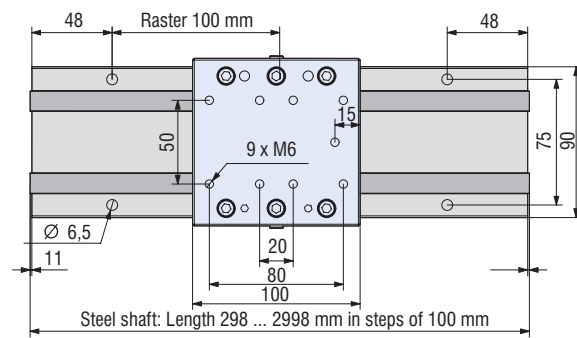
## Scale Drawings



LFS-12-3 with LW 8



LFS-12-3 with WS 7



# Linear Guide Rail

# LFS-12-7 (LF 7)



## Features

- W 128 x H 40 mm
- 2 precision steel shafts Ø 12
- Twist-resistant
- Aluminium shaft profile, anodized
- Attachment from below by means of thread rails in the T-groove indentation profile
- Conditionally cantilever
- Arbitrary Guide Rail length
- Max. Length 2998 mm
- Weight: 5.63 kg/m

## Order Key

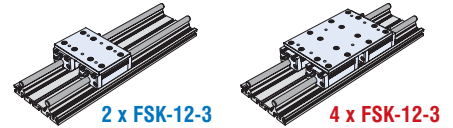
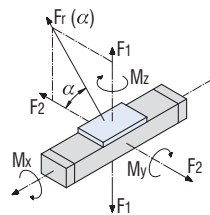
**220 006 XXXX**

Length in mm (in steps of 100 mm)  
e.g. 0029 = Length 298  
0299 = Length 2998

Profile length = Total Length L - 2 mm

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

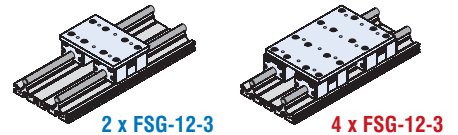
$$F_r(\alpha) = \frac{F_1}{\sin \alpha}$$



## Aluminium Bearing Carriage FSK-12-3

- L 84 x W 126 x H 8 mm
- L 180 x W 126 x H 8 mm
- with ball recirculation guide
- ground steel plate
- central lubrication
- adjustable free of clearance
- Total Weight: 1.19 kg / 2.48 kg

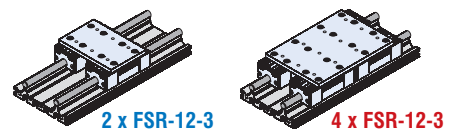
Item no. : 223 240 0001 / 223 240 0002



## Aluminium Bearing Carriage FSG-12-3

- L 84 x W 126 x H 8 mm
- L 180 x W 126 x H 8 mm
- guide slide bearing
- ground steel plate
- thread of screw M6
- adjustable free of clearance
- Weight: 1.0 kg / 2.10 kg
- friction coefficient: 0.2-0.4

Item no. : 223 250 1202 / 223 250 1203



## Aluminium Bearing Carriage FSR-12-3

- L 84 x W 126 x H 8 mm
- L 180 x W 126 x H 8 mm
- with roller guide
- ground steel plate
- thread of screw M6
- adjustable free of clearance
- Weight: 1.30 kg / 2.70 kg

Item no. : 223 260 1202 / 223 260 1203

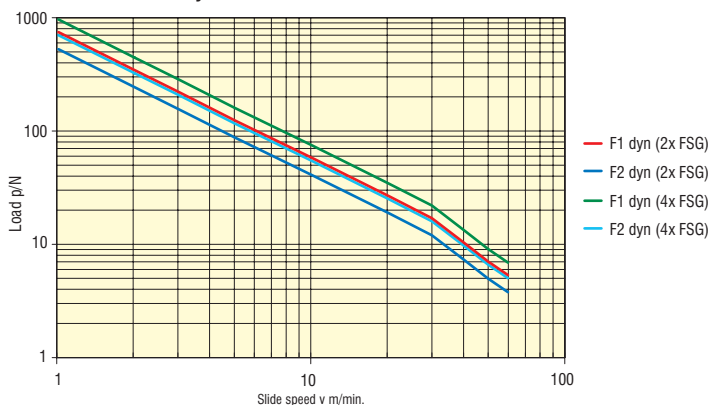
## Load Data

	Bearing Carriage FSK-12-3	
	2xFSK-12-3	4xFSK-12-3
C <sub>0</sub>	4,955 N	3,303 N
C	2,810 N	1,873 N
F <sub>1</sub> stat.	4,232 N	2,821 N
F <sub>1</sub> dyn.	2,399 N	1,599 N
F <sub>2</sub> stat.	4,955 N	3,303 N
F <sub>2</sub> dyn.	2,810 N	1,873 N
M <sub>x</sub> stat.	212 Nm	29.8 Nm
M <sub>y</sub> stat.	148 Nm	105.3 Nm
M <sub>z</sub> stat.	173 Nm	123.3 Nm
M <sub>x</sub> dyn.	120 Nm	16.8 Nm
M <sub>y</sub> dyn.	84 Nm	59.7 Nm
M <sub>z</sub> dyn.	98 Nm	69.9 Nm

	Bearing Carriage FSG-12-3	
	2xFSG-12-3	4xFSG-12-3
C <sub>0</sub>	600 N	800 N
C	-	-
F <sub>1</sub> stat.	826 N	1,101 N
F <sub>1</sub> dyn. (10m/min.)	56 N	75 N
F <sub>2</sub> stat.	600 N	800 N
F <sub>2</sub> dyn. (10m/min.)	41 N	55 N
M <sub>x</sub> stat.	30.96 Nm	41.28 Nm
M <sub>y</sub> stat.	28.90 Nm	60.55 Nm
M <sub>z</sub> stat.	21.00 Nm	43.99 Nm
M <sub>x</sub> dyn.	-	-
M <sub>y</sub> dyn.	-	-
M <sub>z</sub> dyn.	-	-

	Bearing Carriage FSR-12-3	
	2xFSR-12-3	4xFSR-12-3
C <sub>0</sub>	5,900 N	8,850 N
C	2,600 N	3,900 N
F <sub>1</sub> stat.	225 N	300 N
F <sub>1</sub> dyn.	135 N	180 N
F <sub>2</sub> stat.	450 N	600 N
F <sub>2</sub> dyn.	270 N	360 N
M <sub>x</sub> stat.	8.4375 Nm	11.25 Nm
M <sub>y</sub> stat.	4.875 Nm	16.5 Nm
M <sub>z</sub> stat.	15.75 Nm	33 Nm
M <sub>x</sub> dyn.	5.0625 Nm	6.75 Nm
M <sub>y</sub> dyn.	4.725 Nm	9.9 Nm
M <sub>z</sub> dyn.	9.45 Nm	19.8 Nm

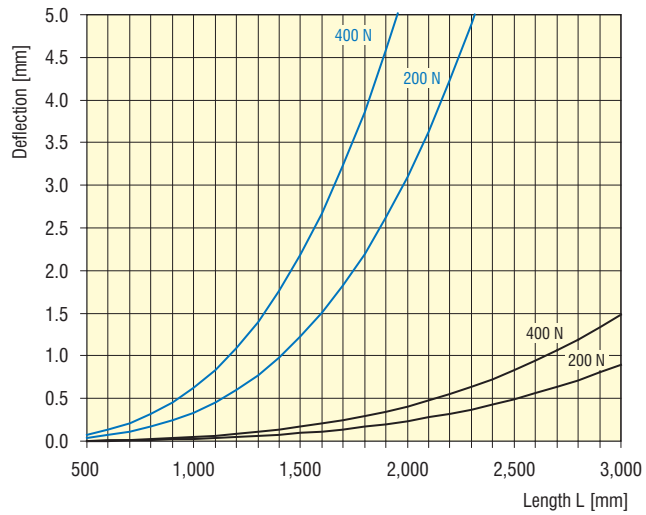
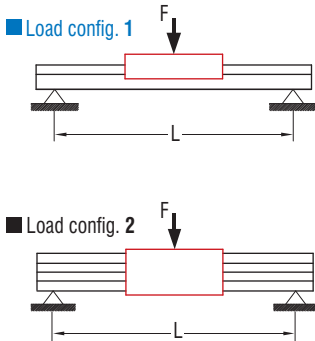
Dyn. Load Limit FSG-12-3



# Linear Guide Rail

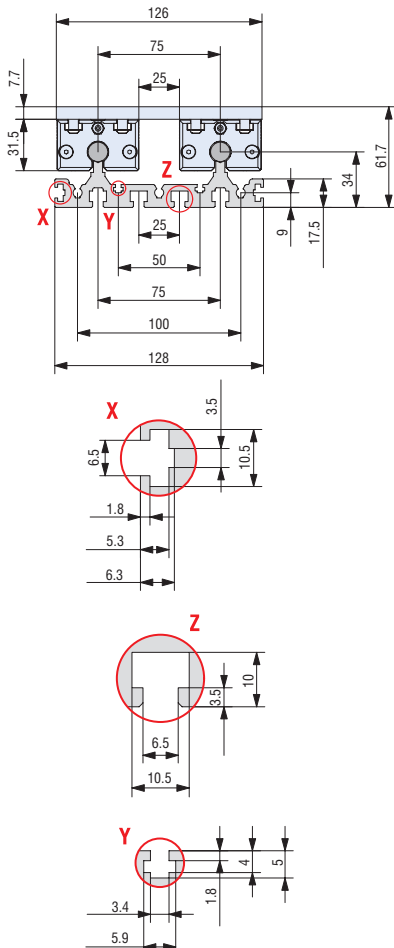
# LFS-12-7 (LF 7)

## Deflection

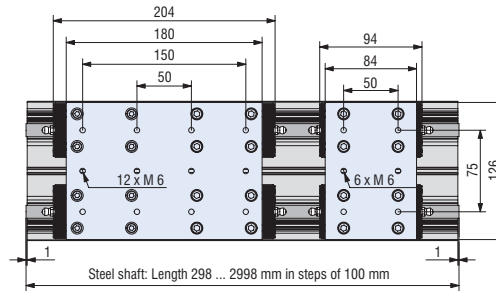


## Scale Drawings

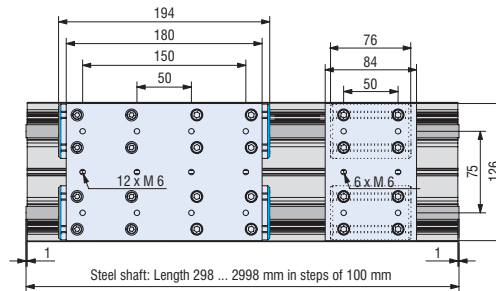
### Detail (FSK/FSG/FSR)



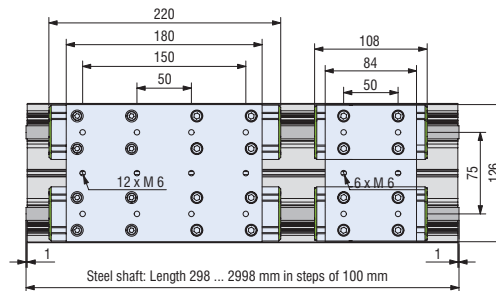
### LFS-12-7 with ball recirculation guide carriage FSK



### LFS-12-7 with guide slide bearing FSG

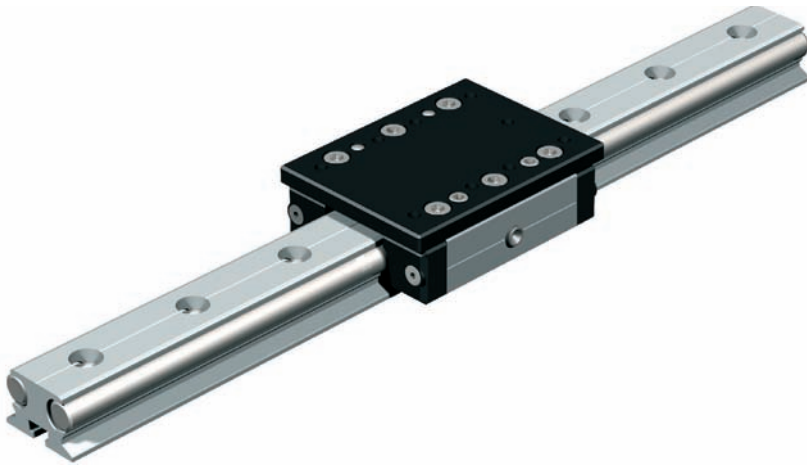


### LFS-12-7 with roller carriage guide FSR



# Linear Guide Rail

# LFS-12-10 (DSF 1)



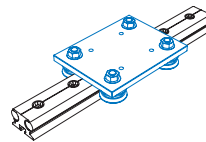
## Features

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

## Load Data

Roller Carriage LW 4	
$C_0$	2,160 N
C	4,000 N
$F_1$ stat.	4,320 N
$F_1$ dyn.	3,846 N
$F_2$ stat.	2,160 N
$F_2$ dyn.	4,000 N
$M_x$ stat.	135.4 Nm
$M_x$ stat.	194.4 Nm
$M_y$ stat.	97.2 Nm
$M_x$ dyn.	120.5 Nm
$M_y$ dyn.	173.0 Nm
$M_z$ dyn.	180.0 Nm

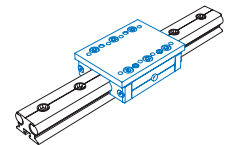
Sledge WS 8	
$C_0$	3,303 N
C	1,873 N
$F_1$ stat.	2,821 N
$F_1$ dyn.	1,599 N
$F_2$ stat.	3,303 N
$F_2$ dyn.	1,873 N
$M_x$ stat.	46.7 Nm
$M_y$ stat.	105.3 Nm
$M_z$ stat.	123.3 Nm
$M_x$ dyn.	26.4 Nm
$M_y$ dyn.	59.7 Nm
$M_z$ dyn.	69.9 Nm



### Roller Carriage LW 4

- L 125 x W 97 x H 7.7 mm
- Polished steel plate
- 4 rollers  $\varnothing$  31, life-time lubrication
- Adjustable free of clearance
- Weight: 1.02 kg

Item no.: **223 009**



### Bearing Carriage WS 8

- L 100 x W 75 x H 32 mm
- Milled clamping surface
- Lubrication possibility
- Adjustable free of clearance
- Weight: 0.70 kg

Item no.: **223 108 0070**

## Order Key

**220 001 XXXX**

Length in mm

e.g. 0300 = Length 296

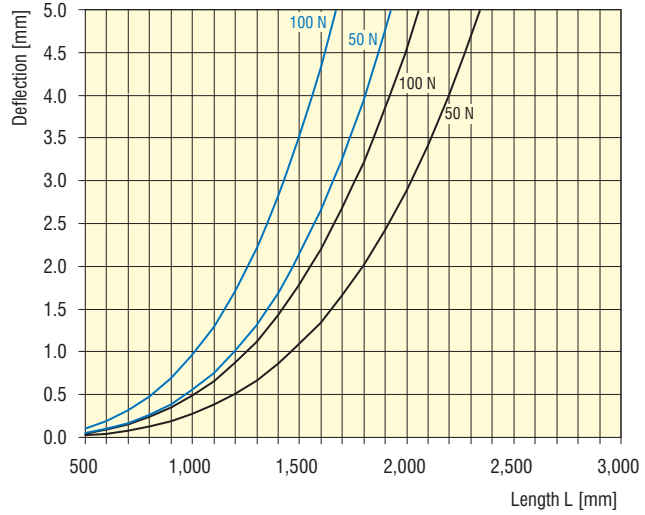
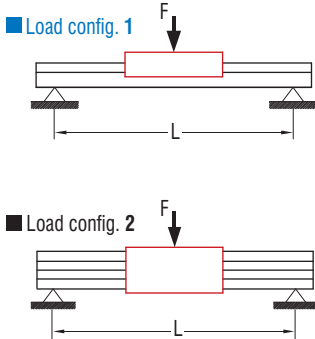
0900 = Length 896

Length steel shaft = total length L - 1 mm

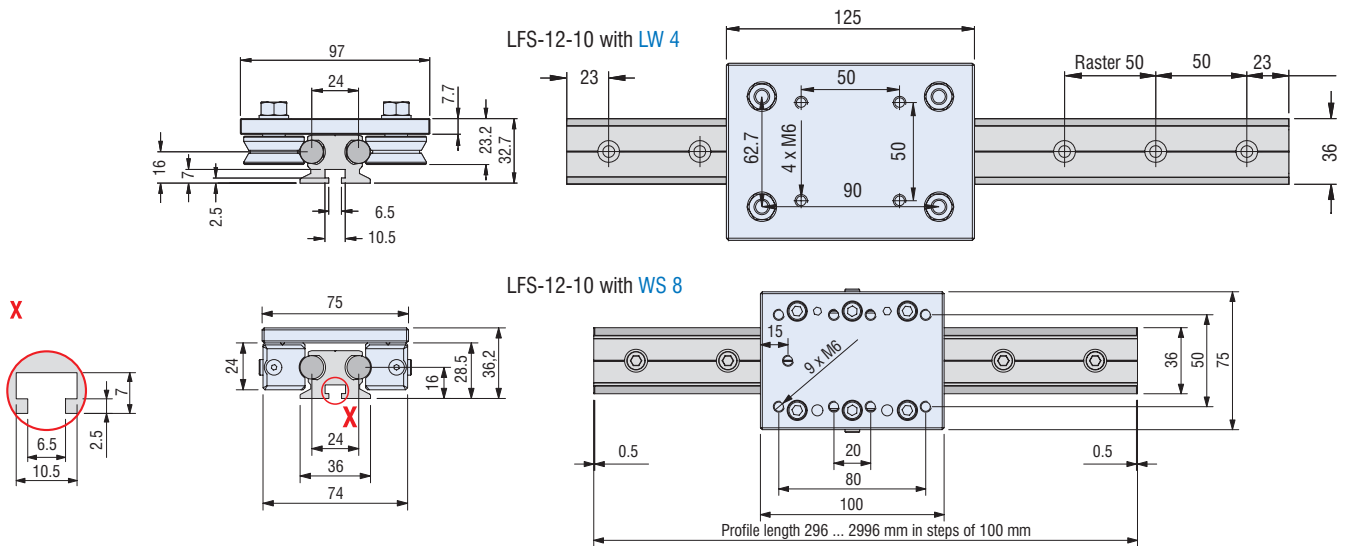
# Linear Guide Rail

# LFS-12-10 (DSF 1)

## Deflection



## Scale Drawings



# Linear Guide Rail

# LFS-16-1

(ILF 1)



## Features

- W 34,5 x H 30 mm
- Precision steel shaft  $\varnothing$  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

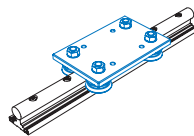
## Order Data



LFS-16-1

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	

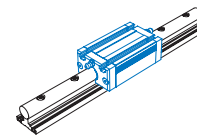
### Roller Carriage ILW 1



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

Item no.: **223 230**

### Aluminium Bearing Carriage IWS 1

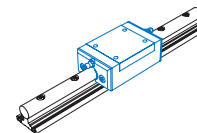


- L 94 x W 55 x H 33,5 mm
- Milled clamping surface
- Weight: 0.32 kg
- Option: stainless version

Item no.: **223 220**

Stainless: **223 220 0001**

### 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**

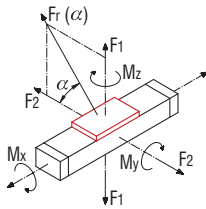
# Linear Guide Rail

# LFS-16-1 (ILF 1)

## Load Data

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

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

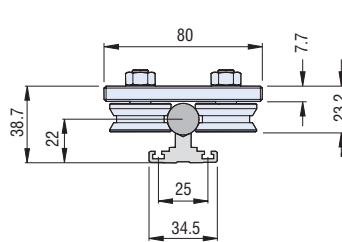


Roller Carriage ILW 1	
C <sub>0</sub>	2160 N
C	4000 N
F <sub>1</sub> stat.	4320 N
F <sub>1</sub> dyn.	3897 N
F <sub>2</sub> stat.	2160 N
F <sub>2</sub> dyn.	4000 N
M <sub>1</sub> stat.	-
M <sub>1</sub> dyn.	194.4 Nm
M <sub>2</sub> stat.	97.2 Nm
M <sub>2</sub> dyn.	-
M <sub>3</sub> stat.	175.3 Nm
M <sub>3</sub> dyn.	180.0 Nm

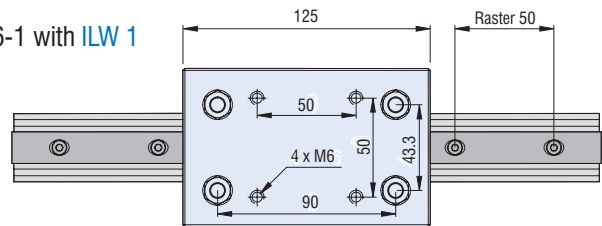
Bearing Carriage IWS 1	
C <sub>0</sub>	3286 N
C	1773 N
F <sub>1</sub> stat.	2806 N
F <sub>1</sub> dyn.	1514 N
F <sub>2</sub> stat.	3286 N
F <sub>2</sub> dyn.	1773 N
M <sub>1</sub> stat.	--
M <sub>1</sub> dyn.	104.7 Nm
M <sub>2</sub> stat.	122.6 Nm
M <sub>2</sub> dyn.	--
M <sub>3</sub> stat.	56.4 Nm
M <sub>3</sub> dyn.	66.1 Nm

Bearing Carriage ILS 1	
C <sub>0</sub>	5065 N
C	3238 N
F <sub>1</sub> stat.	4325 N
F <sub>1</sub> dyn.	2765 N
F <sub>2</sub> stat.	5065 N
F <sub>2</sub> dyn.	3238 N
M <sub>1</sub> stat.	-
M <sub>1</sub> dyn.	113.4 Nm
M <sub>2</sub> stat.	132.8 Nm
M <sub>2</sub> dyn.	-
M <sub>3</sub> stat.	72.4 Nm
M <sub>3</sub> dyn.	84.8 Nm

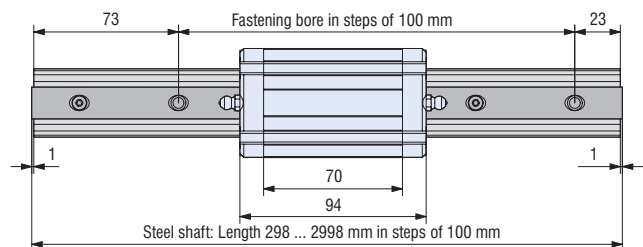
## Scale Drawings



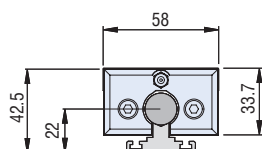
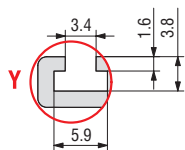
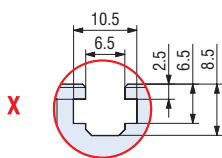
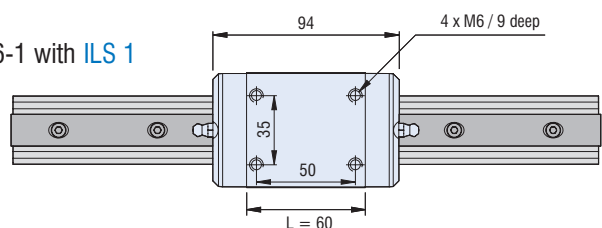
LFS-16-1 with ILW 1



LFS-16-1 with IWS 1



LFS-16-1 with ILS 1



# Linear Guide Rail

# LFS-16-2 (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 cantilever
- Length in steps of 100 mm
- max. Length 2998 mm
- Special length on request
- Weight: 2.70 kg/m

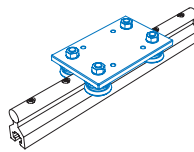
## Order Data



LFS-16-2

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	

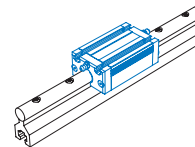
### Roller Carriage ILW 1



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

Item no.: **223 230**

### Aluminium Bearing Carriage IWS 1

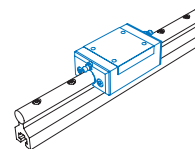


- L 94 x W 55 x H 33,5 mm
- Milled clamping surface
- Weight: 0.32 kg
- Option: stainless version

Item no.: **223 220**

Stainless: **223 220 0001**

### 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**

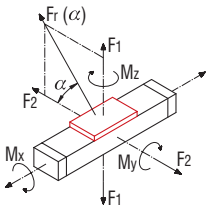
# Linear Guide Rail

# LFS-16-2 (ILF 2)

## Load Data

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

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

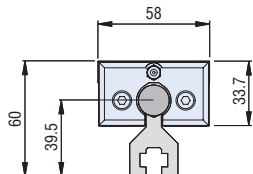
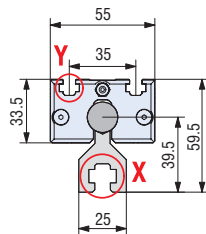
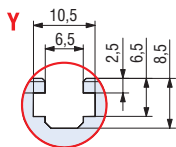
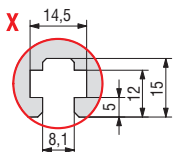
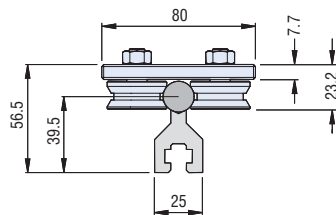


Roller Carriage ILW 1	
C <sub>0</sub>	2160 N
C	4000 N
F <sub>1 stat.</sub>	4320 N
F <sub>1 dyn.</sub>	3897 N
F <sub>2 stat.</sub>	2160 N
F <sub>2 dyn.</sub>	4000 N
M <sub>1 stat.</sub>	-
M <sub>1 stat.</sub>	194.4 Nm
M <sub>2 stat.</sub>	97.2 Nm
M <sub>1 dyn.</sub>	-
M <sub>1 dyn.</sub>	175.3 Nm
M <sub>2 dyn.</sub>	180.0 Nm

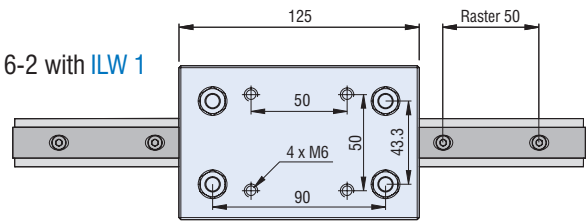
Bearing Carriage IWS 1	
C <sub>0</sub>	3286 N
C	1773 N
F <sub>1 stat.</sub>	2806 N
F <sub>1 dyn.</sub>	1514 N
F <sub>2 stat.</sub>	3286 N
F <sub>2 dyn.</sub>	1773 N
M <sub>1 stat.</sub>	--
M <sub>1 stat.</sub>	104.7 Nm
M <sub>2 stat.</sub>	122.6 Nm
M <sub>1 dyn.</sub>	--
M <sub>1 dyn.</sub>	56.4 Nm
M <sub>2 dyn.</sub>	66.1 Nm

Bearing Carriage ILS 1	
C <sub>0</sub>	5065 N
C	3238 N
F <sub>1 stat.</sub>	4325 N
F <sub>1 dyn.</sub>	2765 N
F <sub>2 stat.</sub>	5065 N
F <sub>2 dyn.</sub>	3238 N
M <sub>1 stat.</sub>	-
M <sub>1 stat.</sub>	113.4 Nm
M <sub>2 stat.</sub>	132.8 Nm
M <sub>1 dyn.</sub>	-
M <sub>1 dyn.</sub>	72.4 Nm
M <sub>2 dyn.</sub>	84.8 Nm

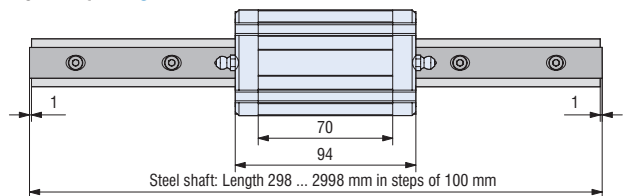
## Scale Drawings



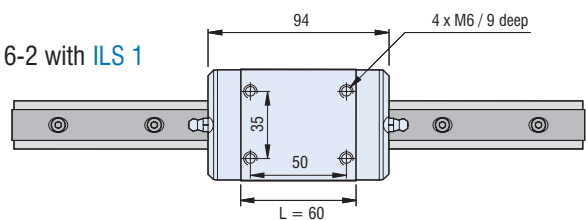
LFS-16-2 with ILW 1



LFS-16-2 with IWS 1

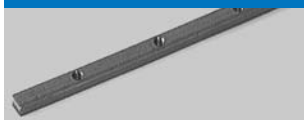


LFS-16-2 with ILS 1



# Accessory

## Thread Rails



### Thread Rail M6

- 10 x 4 mm
- galvanized
- M4, M5, M6 Ra 50 mm
- VE 3 pc. of 1 m
- for all except of PT / RE 40, 65

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

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

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

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

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

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

item no.: **209 022 0003**

## Linear Bearings



For Steelshafts  $\varnothing$  12 mm

### 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

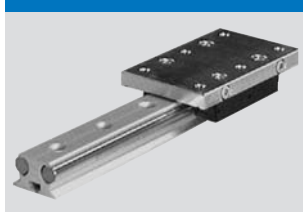
Item no.: **222 000**

### Linear Bearing SMALL

- L40 x W20 x H19 mm
- PU 2 pieces

Item no.: **222 001**

## Dual Track Set



For Steelshafts  $\varnothing$  12 mm

### 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  $\varnothing$  31 mm

Item no.: **223 005**

## Rollers



### Roller $\varnothing$ 20 mm

- with thread boring M4
- PU 2 pieces

Item no.: **222 010**

## Rollers



### Roller $\varnothing$ 21 mm

- concentric
- PU 2 pieces

Item no.: **222 003**

- eccentric
- PU 2 pieces

Item no.: **222 004**

### Roller $\varnothing$ 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.: **299 032 0002**

Hand Lever Grease Gun  
for grease and oil  
Item no.: **299 032 0003**

# 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.

# 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.

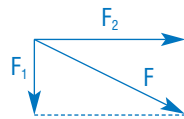
The calculation is also applicable to a carriage arrangement of 2 carriages.

$L_L/2$  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:

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

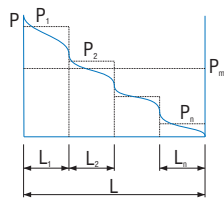
- $P$  [N] dynamic equivalent load
- $F$  [N] applying force =  $\sqrt{F_1^2 + F_2^2}$
- $F_1$  [N] vertical component, see sketch (4)
- $F_2$  [N] horizontal component, see sketch (4)
- $C_0$  [N] static load rating
- $M$  [Nm] applying moment
- $M_{0(XYZ)}$  [Nm] static moment towards the applying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

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

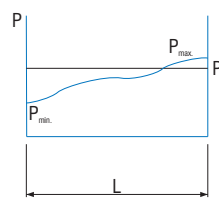
## Calculation of the Equivalent Load

### Operating Conditions

#### A Gradual change



#### B Homogeneous change



### Equivalent Load

$$P = \sqrt[3]{\frac{1}{L} \cdot (P_1^3 \cdot L_1 + P_2^3 \cdot L_2 + P_3^3 \cdot L_3 + \dots + P_n^3 \cdot L_n)}$$

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

- $P$  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

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.

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

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

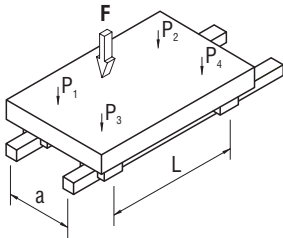
$$L_h = \frac{1666}{v} \cdot \left(\frac{C}{P}\right)^3$$

- $L$  [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
- $n_{osz}$  [min] number of double strokes per minute
- $v$  [m/min] average traverse speed

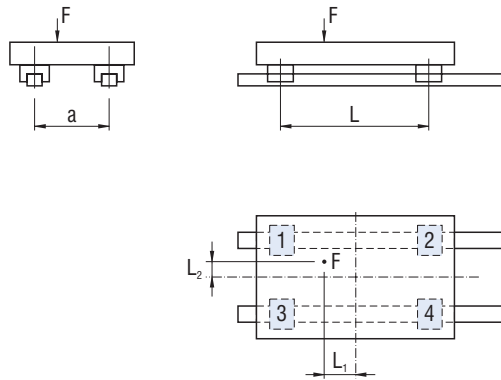
# Calculation of Working Loads

## Load Normal to the Table Surface

Load Application



Scale Drawing



Load on one carriage

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

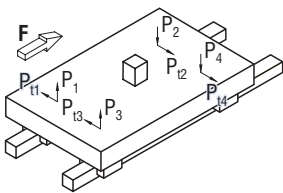
$$P_2 = \frac{F}{4} - \frac{F \cdot L_1}{2L} + \frac{F \cdot L_2}{2a}$$

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

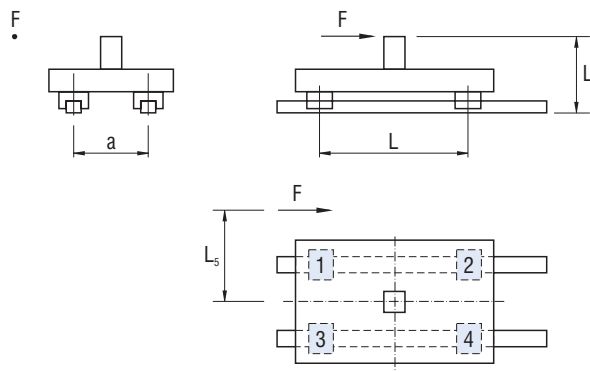
$$P_4 = \frac{F}{4} - \frac{F \cdot L_1}{2L} - \frac{F \cdot L_2}{2a}$$

## Load in Traversing Direction

Load Application



Scale Drawing



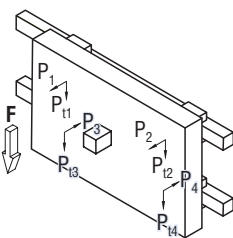
Load on one Carriage

$$P_{1...P_4} = \frac{F \cdot L_6}{2L}$$

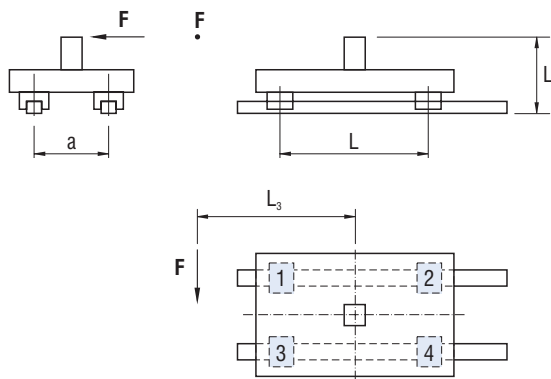
$$P_{11...P_{14}} = \frac{F \cdot L_5}{2L}$$

## Load Across the Traversing Direction

Load Application



Scale Drawing



Load on one Carriage

$$P_{1...P_4} = \frac{F \cdot L_4}{2a}$$

$$P_{11}=P_{13} = \frac{F}{4} + \frac{F \cdot L_3}{2L}$$

$$P_{12}=P_{14} = \frac{F}{4} - \frac{F \cdot L_3}{2L}$$

# Drive Components

## Overview

Functions Overview	C 64
Ball Screw Spindle Ø 16	C 65
Ball Screw Spindle Ø 25	C 65
Ball Screw Nut 2	C 67
Ball Screw Nut 3	C 67
Clamping Blocks for Nut Version 3	C 68
Flange Bearings for Spindle Ø 16	C 69
Flange Bearings for Spindle Ø 25	C 69

### 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.

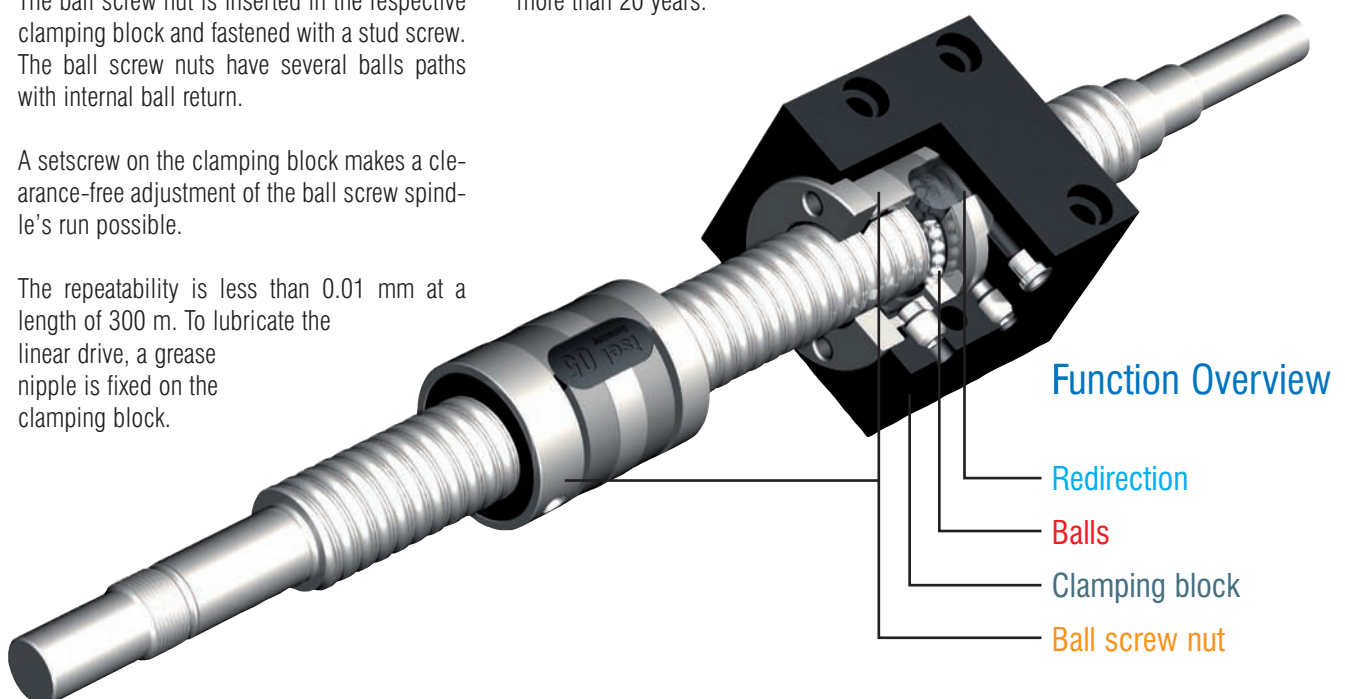
The ball screw nut is inserted in the respective clamping block and fastened with a stud screw. The ball screw nuts have several balls paths with internal ball return.

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.

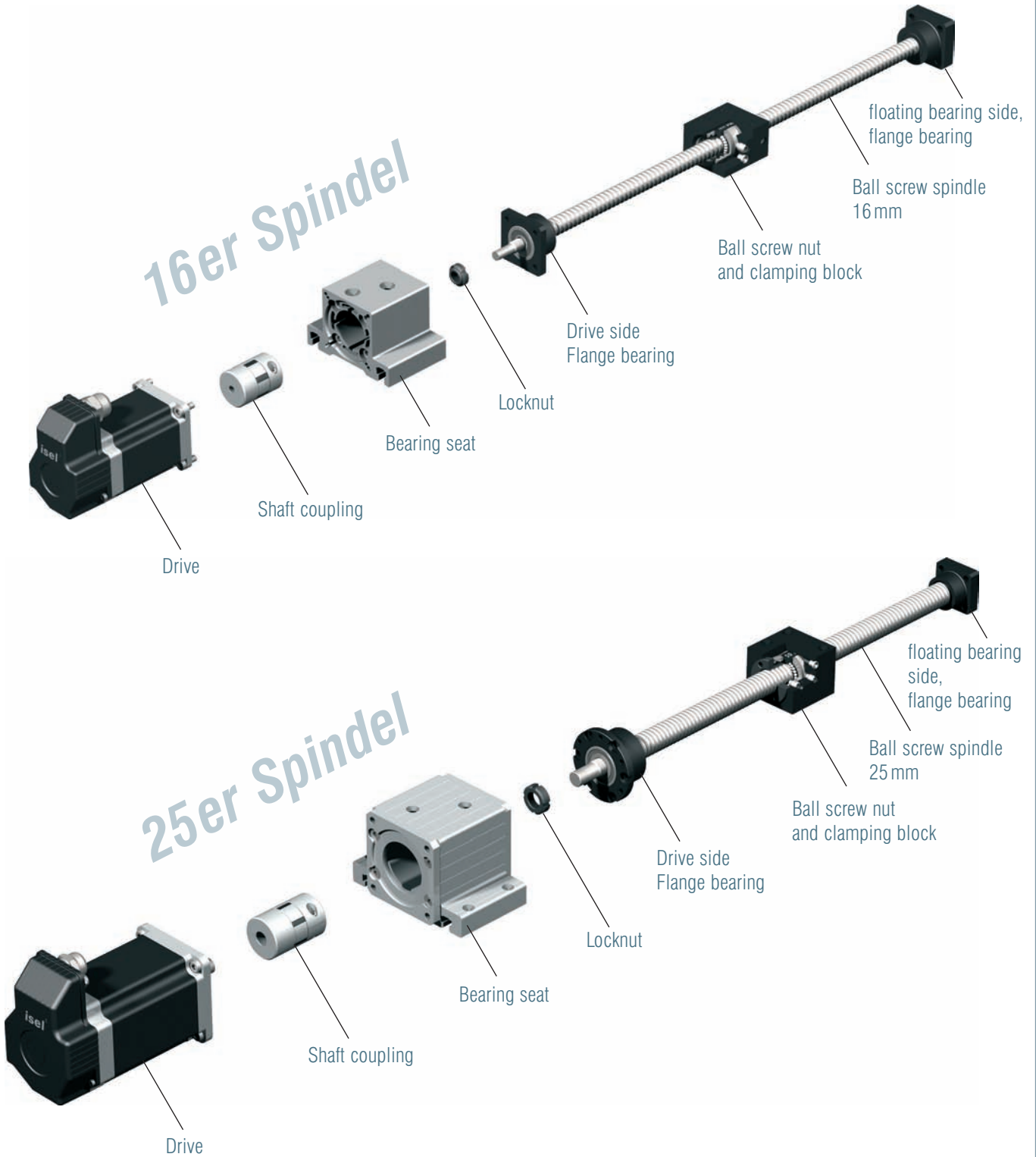


# Drive Components

# Overview

## Linear Drives

The most commonly used type of drive for a linear unit is a directly or by a tooth belt driven ball screw spindle.



# Ball Screw Spindle

## Features

- Ø 16 mm, rolled, hardened and polished
- material CF 53, inductively hardened (HRC 60±2); (for more detailed information, see DIN EN 12020-2)
- 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 in steps of 100 mm

- 452 ... 1052 mm
- 1252 mm • 1552 mm
- 1752 mm • 2052 mm
- 2252 mm • 2752 mm
- 3052 mm

Special length according to Drawing: 211 13X 0998

Shaft ends treated on both sides in steps of 100 mm

- 368 mm ... 3068 mm

Special length according to Drawing: 211 13X 5999

## 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 treatment suited to all feed units (length of aluminium profile +78 mm)

### Length

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

Permissible combinations, see "available lengths"!

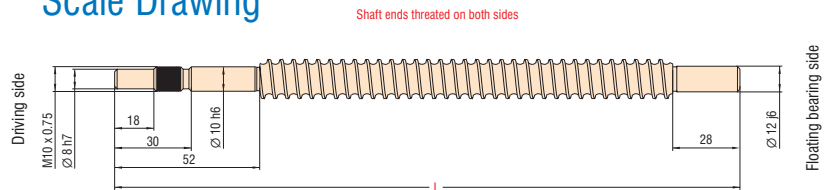
## Ordering Data

### Groove Nut

- self-locking
- M 10 x 0.75 mm

Item no.: 890257 0011

## Scale Drawing



## Features

- Ø 25 mm, rolled, hardened and polished
- material CF 53, inductively hardened (HRC 60 ± 2); (for more detailed information, see DIN EN 12020-2)
- 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 Length

Shaft ends not treated in steps of 100 mm

- 500 ... 3000 mm
- Special length according to drawing: 211 14X 0999

Shaft ends treated on both sides in steps of 100 mm

- 295 ... 2995 mm

## Order Key

211 14X XXXX

### Pitch

- 4 = 5 mm
- 5 = 10 mm
- 6 = 20 mm

### Treatment of shaft ends

- 0 = unbearbeitet
- 2 = zweiseitig

### Lengths

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

Permissible combinations, see "available lengths"!

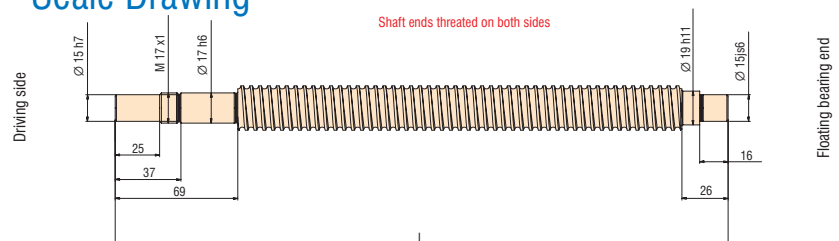
## Ordering Data

### Groove Nut

- self-locking
- M 17 x 1.0 mm

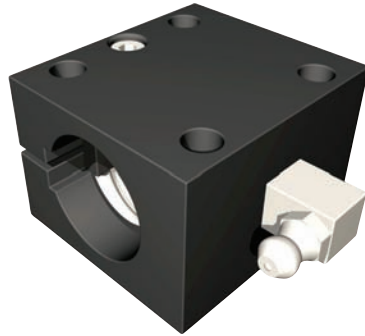
Item no.: 890259 0011

## Scale Drawing



# 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 90°, 0°

### 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

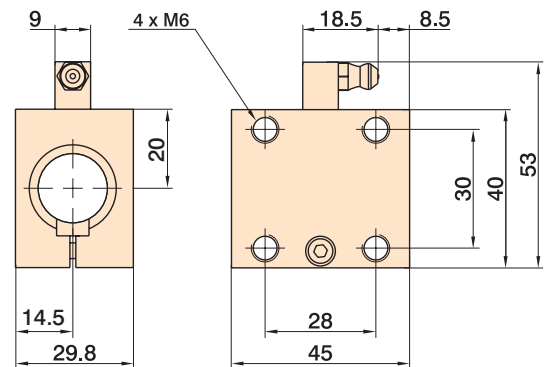
for Spindle Ø16 only

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



## Version 3 – Ø16 Ø 25



### 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 (Ø 16 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 (mm)	Major diameter (mm)	dyn. load rate (N)	static load rate (N)
2.5	16	3,500	5,500
4	16	4,600	7,200
5	16	4,600	7,200
10	16	4,200	6,500
20	16	1,900	2,500
5	25	5,100	12,600
10	25	5,100	12,600
20	25	3,570	8,800

### 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

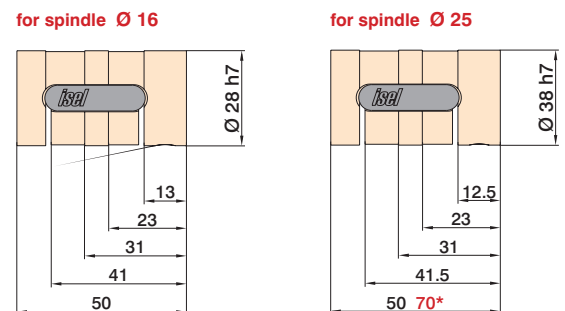
Pitch	Item no.
2,5	213 503
4	213 514
5	213 505
10	213 510
20	213 520

Matching:

**Wipers**

- Packaging unit: 2 pieces
- Item no.: **613 502**

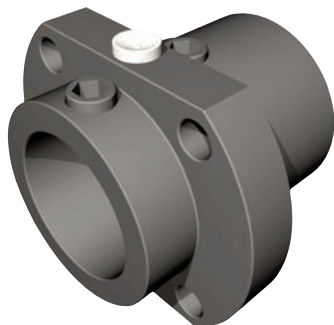
### Scale Drawings



\*) 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  $\varnothing 16$  and  $\varnothing 25$  mm
- nut pitches:  
5 / 10 and 20 mm ( $\varnothing 25$  mm)  
2,5 / 4 / 5 / 10 and 20 mm ( $\varnothing 16$  mm)
- ball screw nuts are clearance-free adjustable
- separate clamping blocks for foot and flange mounting

## Ordering Data

Clamping Block 1  $\varnothing 16$   
Foot mounting

Pitch	Item no.
all	213 500

Clamping Block 2  $\varnothing 16$   
Flange mounting

Pitch	Item no.
all	213 501

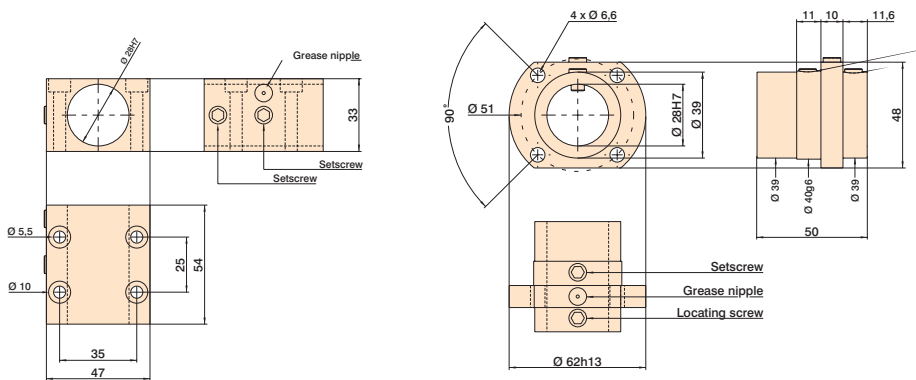
Clamping Block 1  $\varnothing 25$   
Foot mounting

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

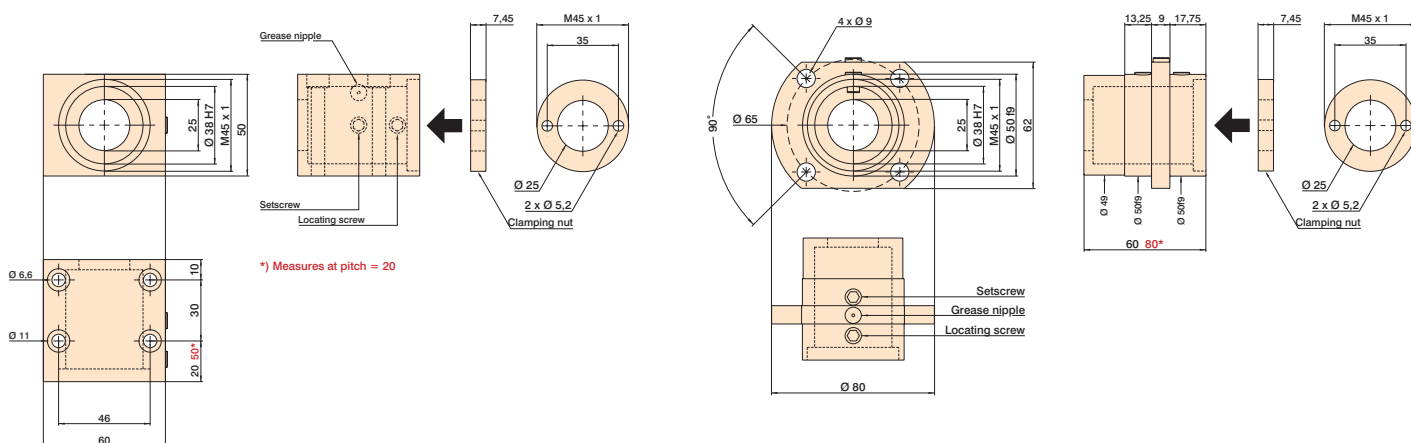
Clamping Block 2  $\varnothing 25$   
Flange mounting

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

## Scale Drawings Clamping Blocks for Spindle $\varnothing 16$

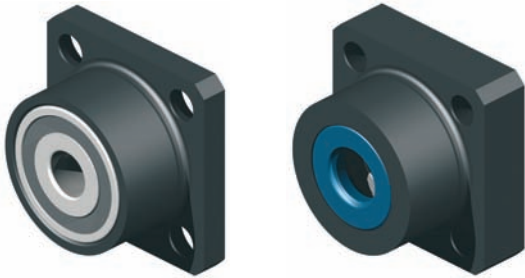


## Scale Drawings Clamping Blocks for Spindle $\varnothing 25$



# Flange Bearings

## For Spindle $\varnothing$ 16 mm



Flange bearing driving side

Flange bearing floating bearing end

### Ordering Data

Flange bearing driving site

Item no.: **216 504 0001**

Flange bearing floating bearing end

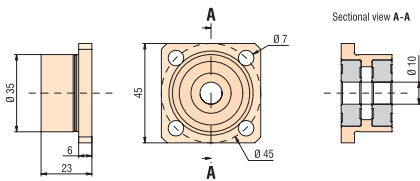
Item no.: **216 504 0002**

### Features

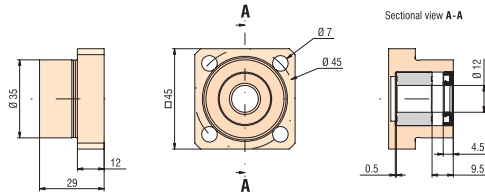
- bearing of the spindle's driving side (fixed bearing end) and the spindle's floating bearing end
- **flange bearing - driving side:** bearing bush with two angular contact ball bearings in an "O" arrangement
- **flange bearing - floating bearing end (counter bearing):** bearing bush with driven-in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

## Scale Drawings

Flange bearing driving side



Flange bearing floating bearing end



## for Spindle $\varnothing$ 25 mm



Flange bearing driving side

Flange bearing floating bearing end

### Ordering Data

Flange bearing driving site

Item no.: **216 504 0006**

Flange bearing floating bearing end

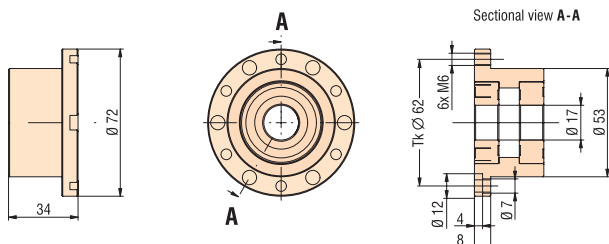
Item no.: **216 504 0005**

### Features

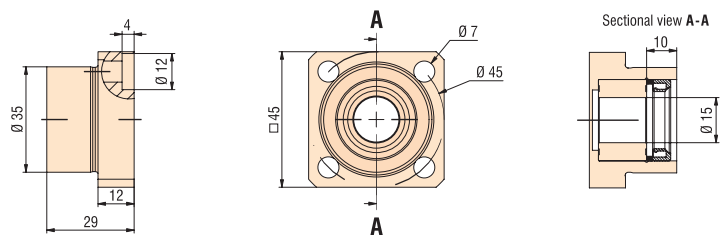
- bearing of the spindle's driving side (fixed bearing end) and the spindle's floating bearing end
- **flange bearing - driving side:** bearing bush with two driven-in angular contact ball bearings in an "O" arrangement
- **flange bearing - floating bearing end (counter bearing):** bearing bush with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

## Scale Drawings

Flange bearing floating bearing end







Flange bearing floating bearing end



# Linear Units

# Overview

■	Functions		C 72
■	LES 4 (LF 4)	Ball Screw Feed Axis	C 74
			
■	LES 6 (LF 6)	Ball Screw Feed Axis	C 76
			
■	LES 5 (LF 5)	Ball Screw Feed Axis	C 78
			
■	LES 8 (LF 8)	Ball Screw Feed Axis	C 80
			
■	Load Rates <small>with WS 5/70</small>		C 82
■	Combination Samples		C 83
■	Motor Modules		C 86
■	Motor Data, Torques		C 88
■	Maintenance and Pin Config.		C 89
■	Coupling Casings		C 90

# Linear Units

## Overview

Shaft Couplings		C 92
Assembly <small>Kit with Angular Gear</small>		C 94
Tops for Slides and Compound Tables		C 96
Connecting L-Brackets		C 99
Accessory		C 102
General Hints		C 103
Calculations		C 104
<b>LES 1</b> (Double-Track Feeding Unit 1)		C 106
<b>LES 3</b> (Double-Track Unit)		C 108
<b>Compound Table 1</b>		C 110
<b>Compound Table 2</b>		C 111

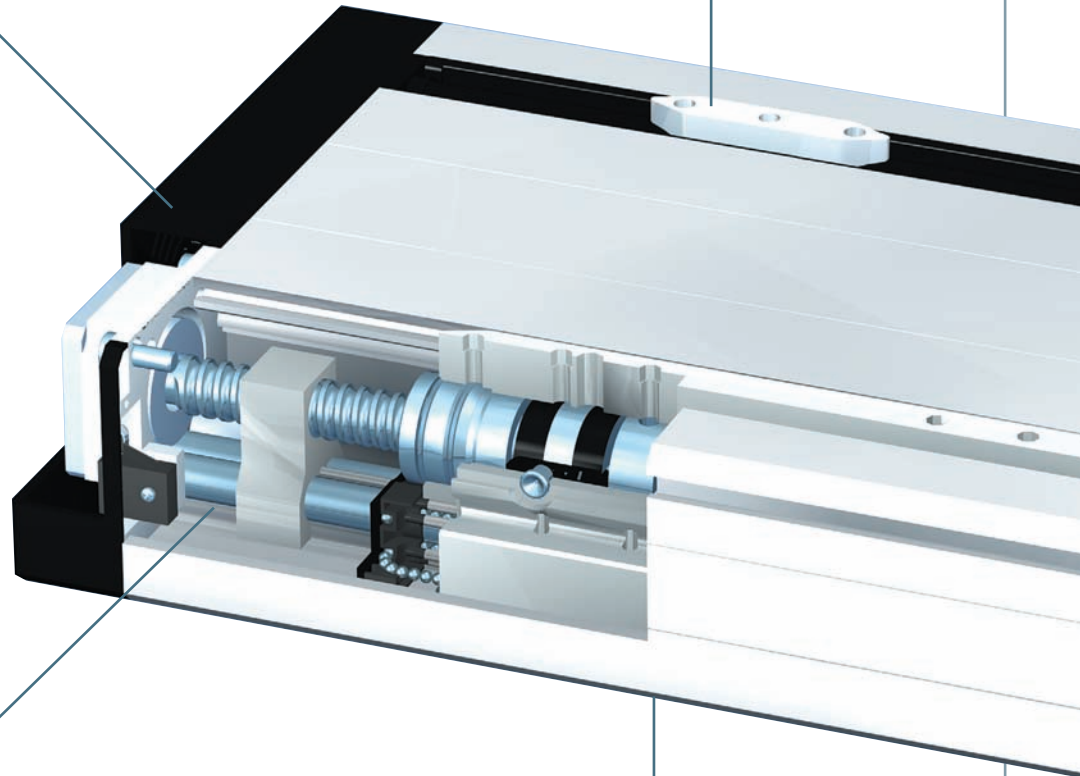
CAD Data: [www.iselautomation.net](http://www.iselautomation.net)

# Functions

## LES 5 (as an Example)

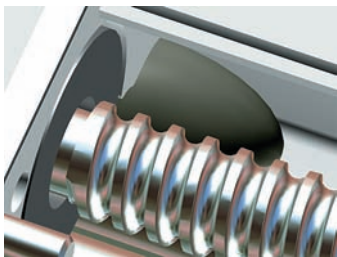
Synthetic Protective Cap  
electromagnetically shielded

Clamping Surface  
plan-milled

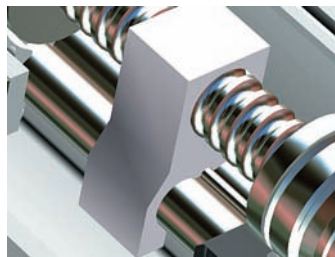


Shaft-Holding Shape  
precisely milled

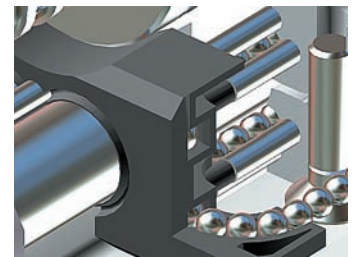
Profile's Bottom Side  
plan-milled



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



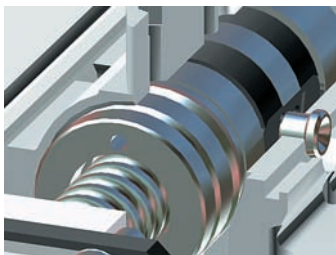
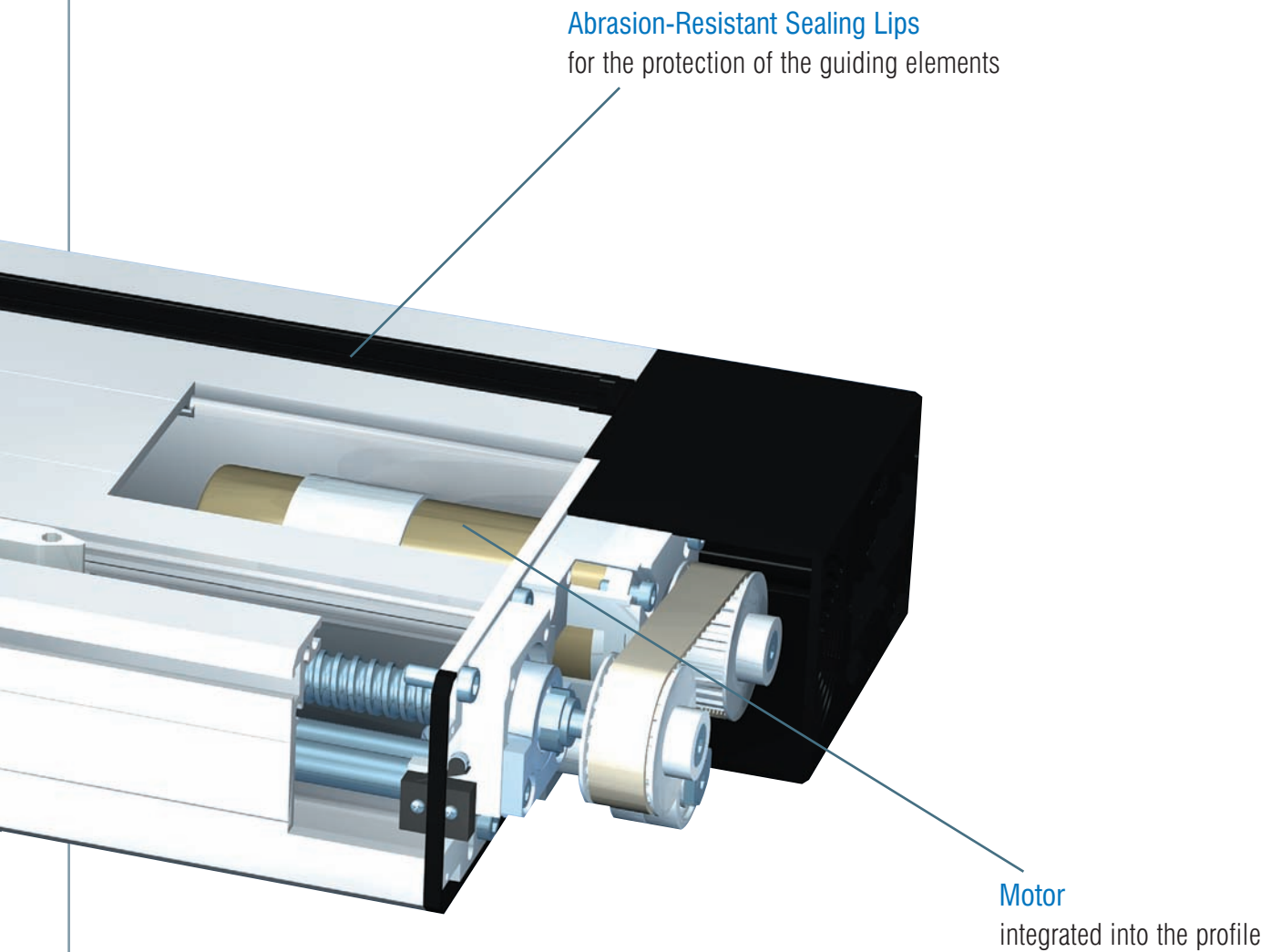
- Spindle support from a profile length of 1,500 mm up without restricting the travel range



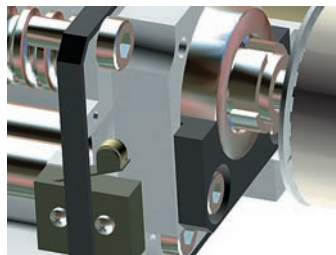
- Ball circulation in the patented aluminium linear slide
- Glass-fibre reinforced redirection parts with wipers

# Functions

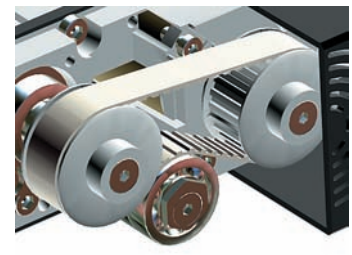
## LES 5 (as an Example)



- Clearance-free pre-adjusted ball screw nut with wipers
- Central lubrication for ball screw nuts and tracks



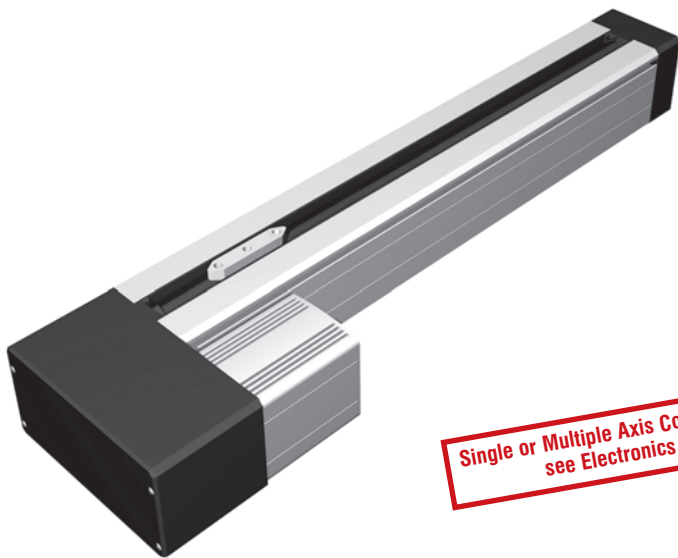
- Integrated over-travel limit switch
- Spindle bearing with angular contact ball bearings
- Axial clearance-free due to self-locking special slotted nut



- Reversing belt and connection electronics completely covered by protective cap

# Ball Screw Feed Axis

# LES 4 (LF 4)



Single or Multiple Axis Controllers  
see Electronics

LES 4 with lateral belt drive module

## Features

- aluminium shaft profile W 75 x H 75 mm, anodized
- clamping surface and profile bottom side plan-milled
- 2 precision steel shafts Ø 12 h6, material Cf53, hardness 60 ± 2 HRC
- aluminium slide blocks WS 5/70, 2 x WS 5/70 (70 mm long), adjustable free of clearance, 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

## Order Key

234 XXX 0XXX

### Antrieb

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

### Shaft Slide Block

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

### Profile Length

e.g. 029 = 290 mm (min.)  
299 = 2990 mm (max.)  
(shortened by the last digit)  
Possibility to order standard length with 100 mm-grid space

### Ballscrew feed drive

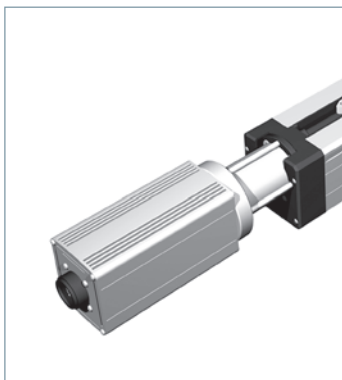
- 0 = without
- 1 = pitch 2.5 mm
- 2 = pitch 4.0 mm
- 3 = pitch 5.0 mm
- 4 = pitch 10 mm
- 5 = pitch 20 mm

## Options

- black aluminium profile, powder-coated
- electromagnetic brake
- steel slide block LS2 [Item no. 051000 000](#)
- assembly kit for limit switch (see Accessories)

## Drive Components

### Preparation - Direct Drive



Direct Drive Module 1

## Nominal Torques

Nominal torques (Ncm)					
Revolutions (1/min)	Spindle pitch				
	2.5	4	5	10	20
500	15	15	16	17	18
1,500	19	19	19	20	21
3,000	23	24	24	25	26

## Technical Data

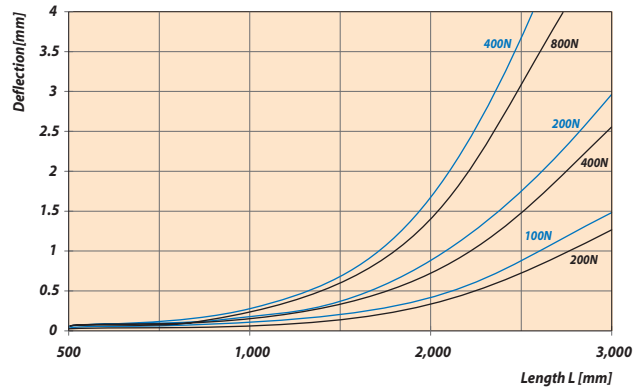
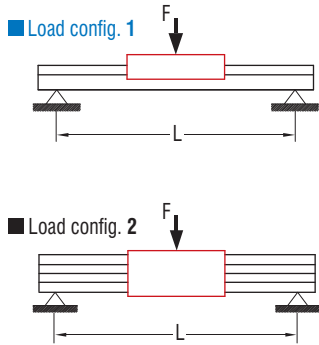
### Aluminium Profile

Aluminium profile LES 4	
Moment of inertia I <sub>x</sub>	107.711 cm <sup>4</sup>
Moment of inertia I <sub>y</sub>	125.843 cm <sup>4</sup>
*Centre of gravity <sup>see Scale Drawing</sup>	33.23 mm
Cross section surface	18.81 cm <sup>2</sup>
Material	AlMgSiO, 5F22
Anodization	E6/EV1
Weight with steel shafts	6.2 kg/m
Weight with steel shafts and spindle	7.6 kg/m

# Ball Screw Feed Axis

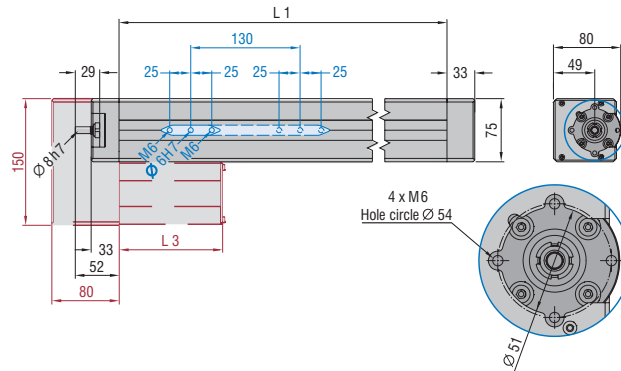
# LES 4 (LF 4)

## Deflection

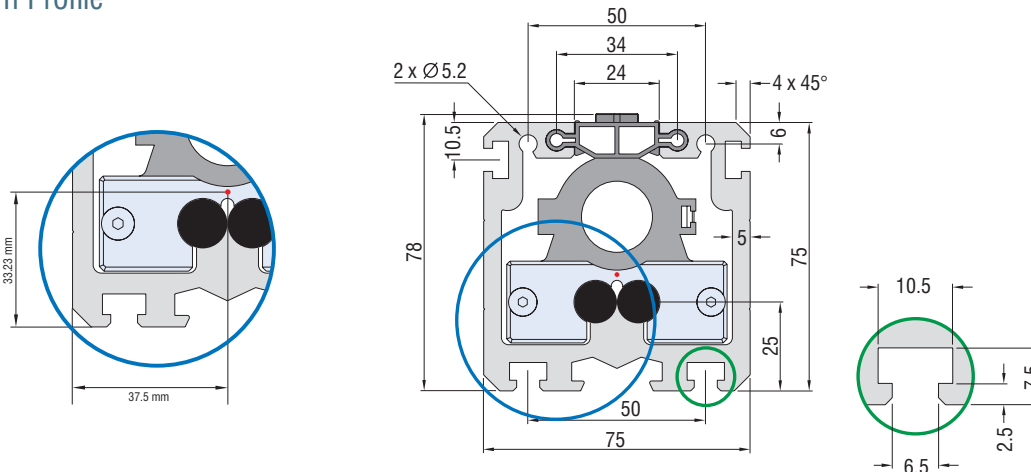


Travel range  
 at WS 5/70 = L1 -150 mm  
 at 2xWS 5/70 = L1 -280 mm

## Scale Drawing



## Scale Drawing Aluminium Profile



# Ball Screw Feed Axis

# LES 6 (LF 6)



Single or Multiple Axis Controllers  
see Electronics

LES 6 with lateral belt drive module

## Features

- aluminium shaft profile  
W 150 x H 75 mm, anodized
- clamping surface and profile bottom side plan-milled
- 4 precision steel shafts  $\varnothing$  12 h6, material Cf53, hardness  $60 \pm 2$  HRC
- aluminium slide blocks WS 5/70, 2 x WS 5/70 (70 mm long), adjustable free of clearance, 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  $\pm 0.02$  mm
- driving steel collar with sealed angular contact ball bearings

## Order Key

234 XXX 0XXX

### Motor

- 6 = preparation direct drive module
- 7 = preparation belt drive module

### Shaft Slide Block

- 0 = 2 shaft slide block 70 mm
- 2 = 4 shaft slide blocks 70 mm

### Profile Length

e.g. 029 = 290 mm (min.)  
299 = 2990 mm (max.)  
(shortened by the last digit)  
Possibility to order standard length with 100 mm-grid space

### Ball screw feed drive

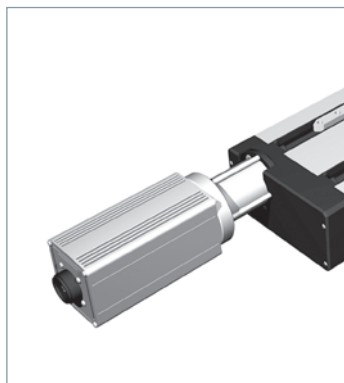
- 0 = without
- 1 = pitch 2.5 mm
- 2 = pitch 4.0 mm
- 3 = pitch 5.0 mm
- 4 = pitch 10 mm
- 5 = pitch 20 mm

## Options

- black aluminium profile, powder-coated
- electromagnetic brake
- steel slide block LS2 [Item-No.051000 0000](#)
- assembly kit for limit switch (see Accessories)

## Drive Modules

Preparation - direct drive



Direct Drive Module 1

## Nominal Torques

Nominal torques (Ncm)					
Revolutions (1/min)	Spindle pitch				
	2.5	4	5	10	20
500	17	17	18	20	21
1,500	20	20	22	24	25
3,000	24	25	26	29	30

## Technical Data

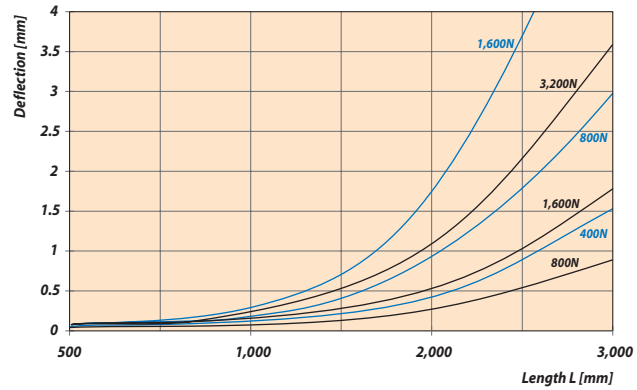
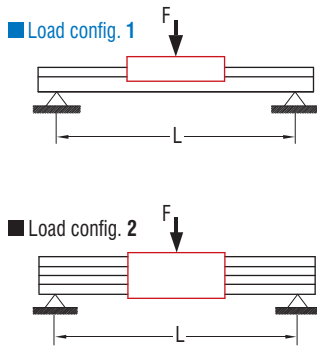
Aluminium Profile

Aluminium profile LES 6	
Moment of inertia $I_x$	707.100 cm <sup>4</sup>
Moment of inertia $I_y$	212.200 cm <sup>4</sup>
*Centre of gravity <small>see scale drawing</small>	32.78 mm
Cross section surface	30.07 cm <sup>2</sup>
Material	AlMgSiO, 5F22
Anodization	E6/EV1
Weight with steel shafts	11.4 kg/m
Weight with steel shafts and spindle	12.8 kg/m

# Ball Screw Feed Axis

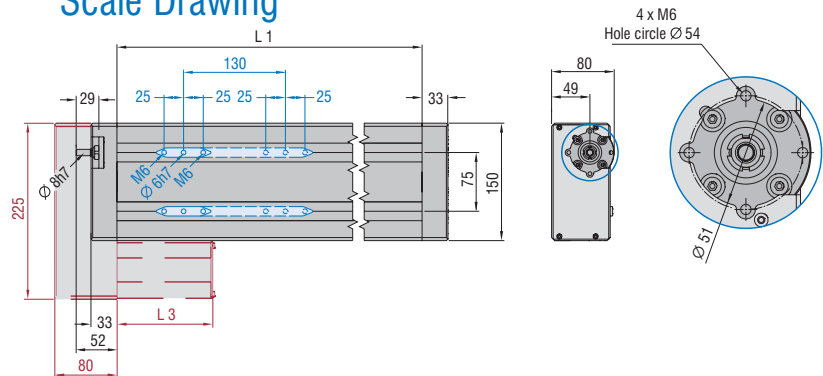
# LES 6 (LF 6)

## Deflection

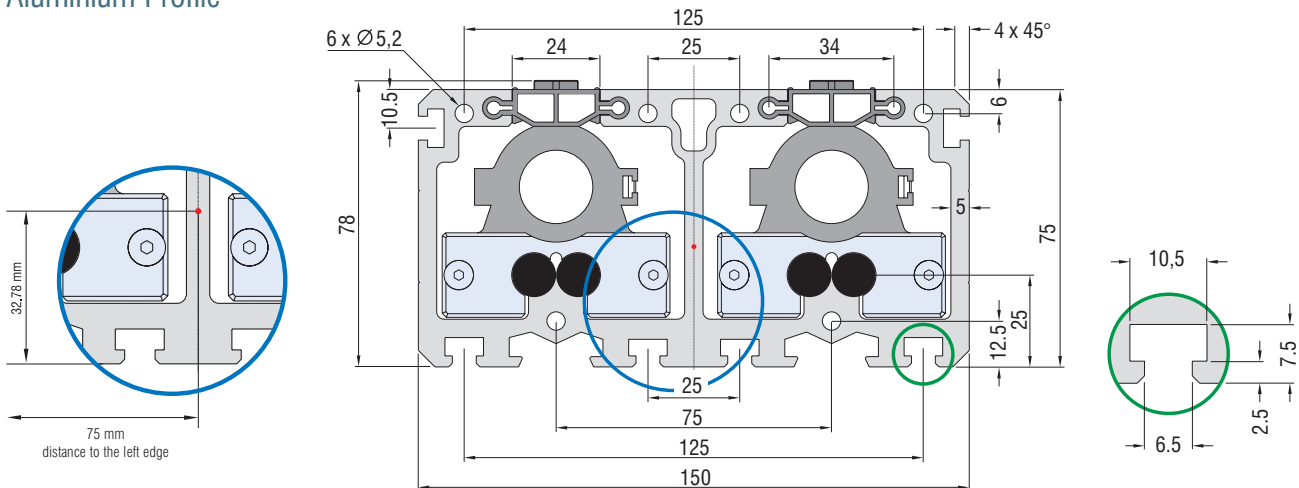


Travel range  
 at WS 5/70 = L1 -150 mm  
 at 2xWS 5/70 = L1 -280 mm

## Scale Drawing



## Scale Drawing Aluminium Profile



# Ball Screw Feed Axis

# LES 5 (LF 5)



Single or Multiple Axis Controllers  
see Electronics

LES 5 with integrated drive module

## Features

- aluminium shaft profile  
W 225 x H 75 mm, anodized
- clamping surface and profile bottom side plan-milled
- 4 precision steel shafts  $\varnothing$  12 h6, material Cf53, hardness  $60 \pm 2$  HRC
- aluminium slide blocks WS 5/70, 2 x WS 5/70 (70 mm long), adjustable free of clearance, 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  $\pm 0.02$  mm
- driving steel collar with sealed angular contact ball bearings

## Order Key

234 XXX 0XXX

### Motor

- 3 = preparation direct drive module
- 4 = preparation belt drive module

### Shaft Slide Block

- 0 = 2 shaft slide block 70 mm
- 2 = 4 shaft slide blocks 70 mm

### Profile Length

e.g. 029 = 290 mm (min.)  
299 = 2990 mm (max.)  
(shortened by the last digit)  
Possibility to order standard length with 100 mm-grid space

### Ball screw feed drive

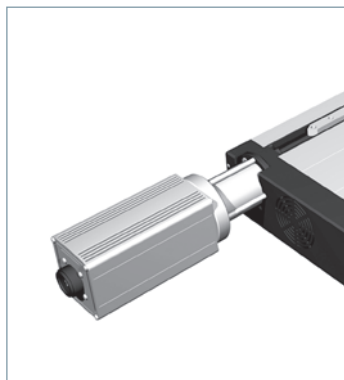
- 0 = without
- 1 = pitch 2.5 mm
- 2 = pitch 4.0 mm
- 3 = pitch 5.0 mm
- 4 = pitch 10 mm
- 5 = pitch 20 mm

## Options

- black aluminium profile, powder-coated
- electromagnetic brake
- steel slide block LS2 [Item-No.051000 0000](#)
- assembly kit for limit switch (see Accessories)

## Drive Modules

Preparation - Direct Drive



Direct Drive Module 1

## Nominal Torques

Nominal torques (Ncm)					
Revolutions (1/min)	Spindle pitch				
	2.5	4	5	10	20
500	15	15	16	17	18
1,500	19	19	19	20	21
3,000	23	24	24	25	26

## Technical Data

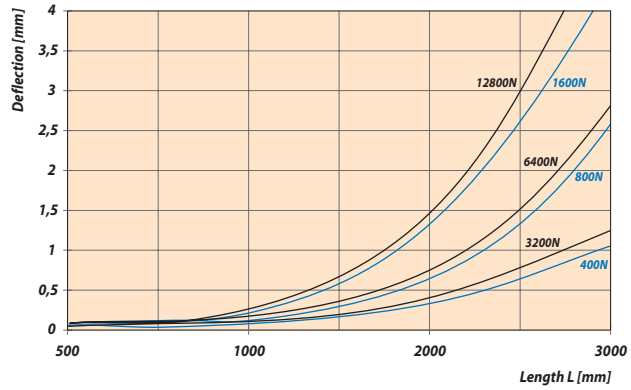
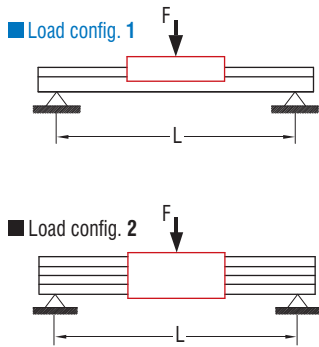
Aluminium Profiles

Aluminium profiles LES 5	
Moment of inertia $I_x$	2361.654 cm <sup>4</sup>
Moment of inertia $I_y$	298.925 cm <sup>4</sup>
*Centre of gravity <small>see scale drawing</small>	33.39 mm
Cross section surface	42.49 cm <sup>2</sup>
Material	AlMgSiO, 5F22
Anodization	E6/EV1
Weight with steel shafts	13.8 kg/m
Weight with steel shafts and spindle	15.2 kg/m

# Ball Screw Feed Axis

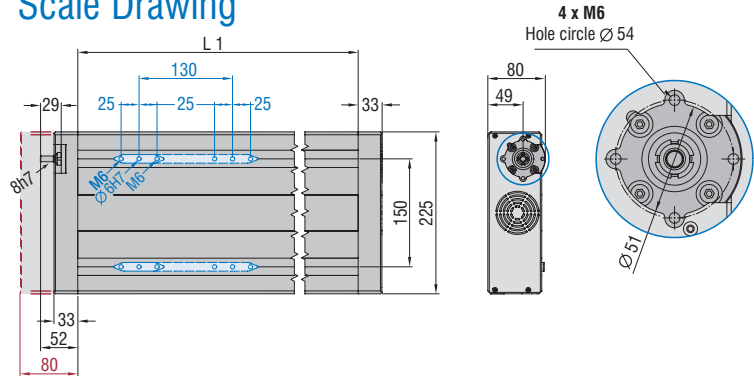
# LES 5 (LF 5)

## Deflection

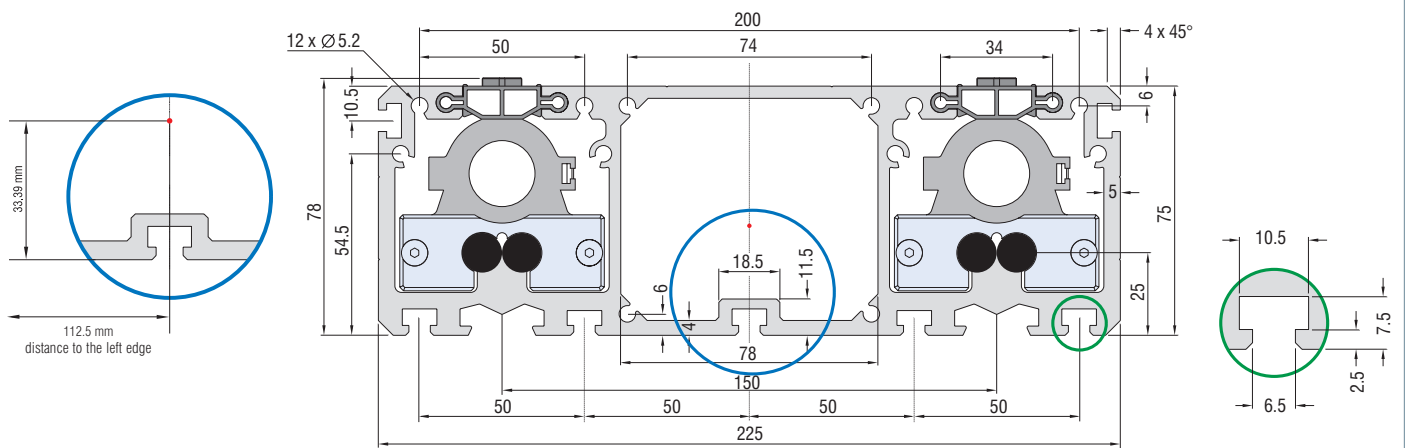


Travel range  
 at WS 5/70 = L1 -150 mm  
 at 2xWS 5/70 = L1 -280 mm

## Scale Drawing

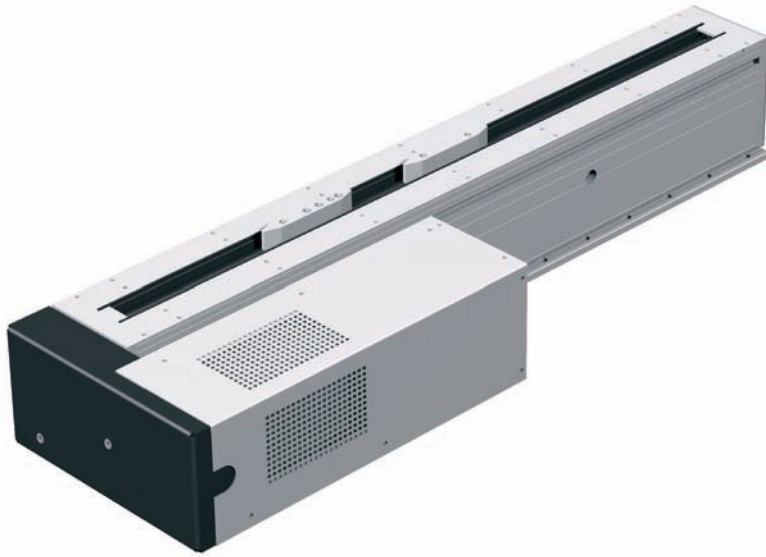


## Scale Drawing Aluminium Profile



# Ball Screw Feed Axis

# LES 8 (LF 8)



LES 8 with laterally timing belt drive module

## Features

- aluminium shaft profile  
W 118 x H 105 mm, anodized
- 2 precision steel shafts Ø 12 h6, material Cf53, hardness 60 ± 2 HRC
- steel slide, free from backlash blocks
- ball screw pitch Ø 25 mm with 5 / 10 / 20 mm pitch
- profile sealing by means abrasion-resistant sealing lips
- 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
- assembly kit for limit switch (see Accessories)
- Aluminium handwheel or plastic rotary button for manual activity

## Order Key

**2361 XX 0XXX**

### Profile Length

e.g. 029 = 290 mm (min.)  
349 = 3490 mm (max.)  
(shortened by the last digit)  
Possibility to order standard length with 100 mm-grid space

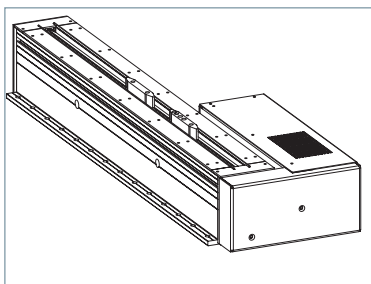
### Steel Slide

- 1 = 1 steel slide LS 3
- 2 = 2 steel slide LS 3

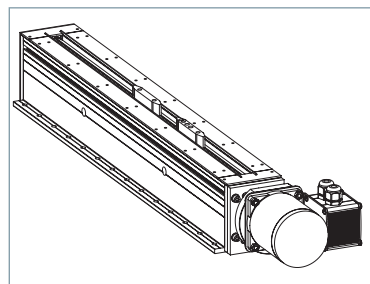
### Ballscrew Feed Drive

- 0 = without
- 1 = 5 mm
- 2 = 10 mm
- 3 = 20 mm

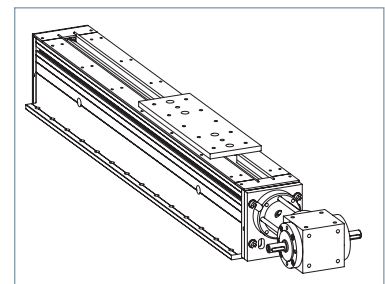
## Drive Modules



LES 8 Timing Belt Drive



LES 8 Direct Drive



LES 8 Corner Gear

Appoint Overview of all motor moduls on reverse side.  
More information: [www.iselautomation.net](http://www.iselautomation.net)

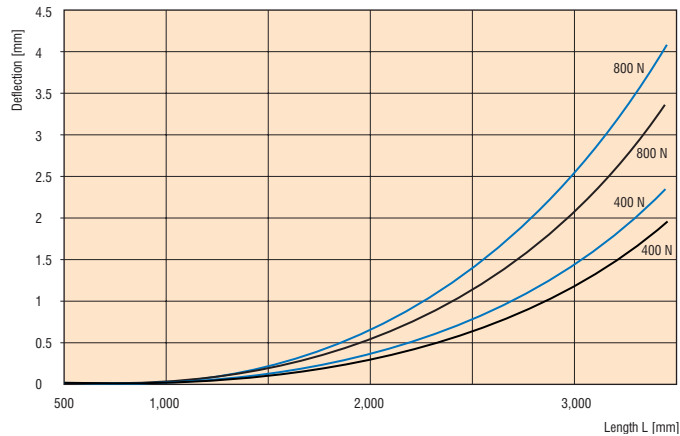
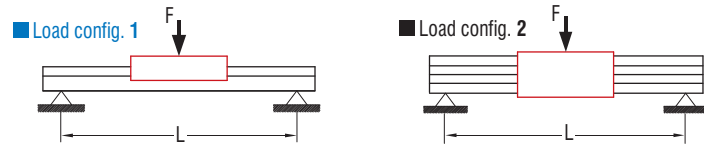
# Ball Screw Feed Axis

# LES 8 (LF 8)

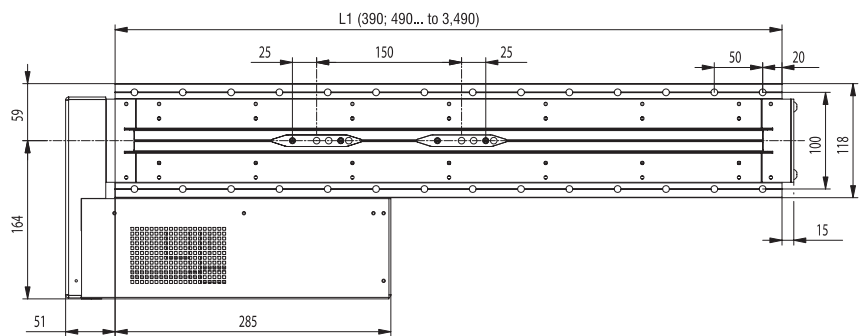
## Technical Data Aluminium Profile

Aluminium profile LES 5	
Moment of inertia $I_x$	316.908 cm <sup>4</sup>
Moment of inertia $I_y$	259.466 cm <sup>4</sup>
*Centre of gravity <small>see scale drawing</small>	35.35 mm
Cross section surface	24.720 cm <sup>2</sup>
Material	AlMgSiO, 5F22
Anodization	E6/EV1
Weight with steel shafts	8.345 kg/m
Weight with steel shafts and spindle	11.585 kg/m

## Deflection



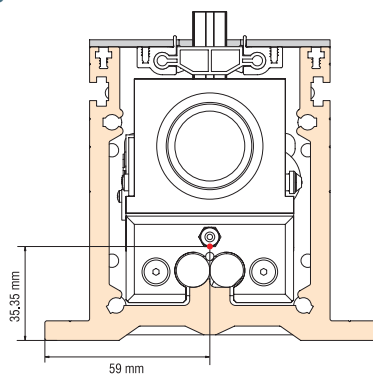
## Scale Drawing



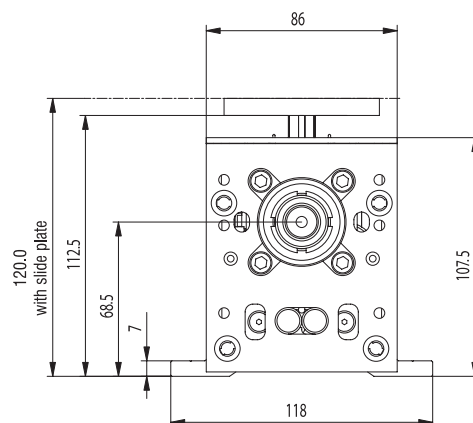
Travel range  
at 1 x LS 3 = L1 -210 mm

Travel range  
at 2 x LS 3 = L1 -410 mm

## Scale Drawing Aluminium Profile

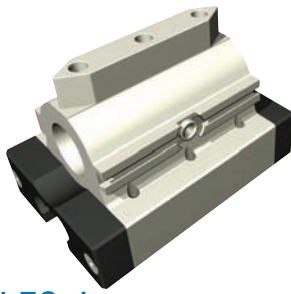


\* see Table



# Load rates

with WS 5/70

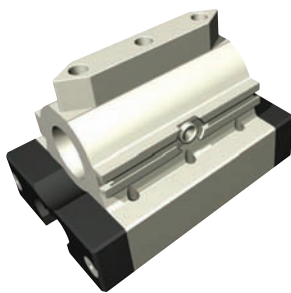


**LES 4**  
With one WS 5/70

LES4 with one WS 5/70	
$C_0$	2,576.65 N
$C$	1,461.14 N
$F_1$ stat.	2,200.67 N
$F_1$ dyn.	1,247.93 N
$F_2$ stat.	2,576.65 N
$F_2$ dyn.	1,461.14 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

**LES 4**  
With two WS 5/70

LES 4 with two WS 5/70	
$C_0$	4,954.5 N
$C$	2,809.5 N
$F_1$ stat.	4,231.5 N
$F_1$ dyn.	2,398.5 N
$F_2$ stat.	4,954.5 N
$F_2$ dyn.	2,809.5 N
$M_x$ stat.	44.7 Nm
$M_y$ stat.	126.945 Nm
$M_z$ stat.	148.635 Nm
$M_x$ dyn.	25.2 Nm
$M_y$ dyn.	71.955 Nm
$M_z$ dyn.	84.285 Nm

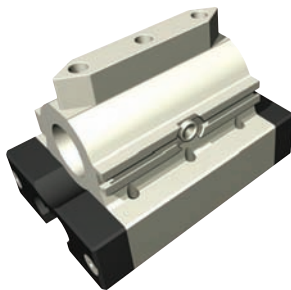


**LES 6**  
With two WS 5/70

LES 6 with two WS 5/70	
$C_0$	5,153.30 N
$C$	2,319.41 N
$F_1$ stat.	4,401.33 N
$F_1$ dyn.	1,980.96 N
$F_2$ stat.	5,153.30 N
$F_2$ dyn.	2,319.14 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

**LES 6**  
With four WS 5/70

LES 6 with four WS 5/70	
$C_0$	6,606 N
$C$	3,746 N
$F_1$ stat.	5,642 N
$F_1$ dyn.	3,198 N
$F_2$ stat.	6,606 N
$F_2$ dyn.	3,746 N
$M_x$ stat.	211.575 Nm
$M_y$ stat.	366.73 Nm
$M_z$ stat.	429.39 Nm
$M_x$ dyn.	119.925 Nm
$M_y$ dyn.	207.87 Nm
$M_z$ dyn.	243.49 Nm

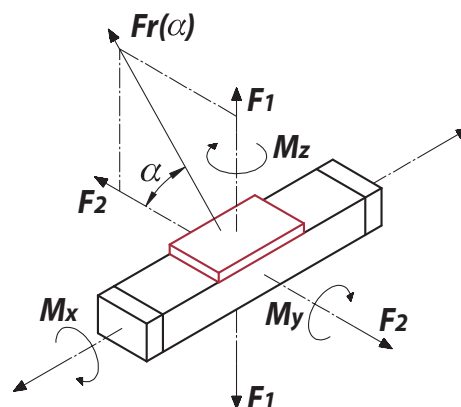


**LES 5**  
With two WS 5/70

LES 5 with two WS 5/70	
$C_0$	5,153.30 N
$C$	2,319.41 N
$F_1$ stat.	4,401.33 N
$F_1$ dyn.	1,980.96 N
$F_2$ stat.	5,153.30 N
$F_2$ dyn.	2,319.14 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

**LES 5**  
With four WS 5/70

LES 5 with four WS 5/70	
$C_0$	6,606 N
$C$	3,746 N
$F_1$ stat.	5,642 N
$F_1$ dyn.	3,198 N
$F_2$ stat.	6,606 N
$F_2$ dyn.	3,746 N
$M_x$ stat.	423.15 Nm
$M_y$ stat.	366.73 Nm
$M_z$ stat.	429.39 Nm
$M_x$ dyn.	239.85 Nm
$M_y$ dyn.	207.87 Nm
$M_z$ dyn.	243.49 Nm



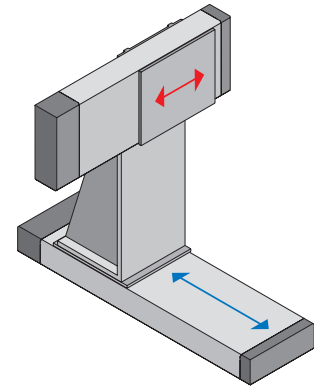
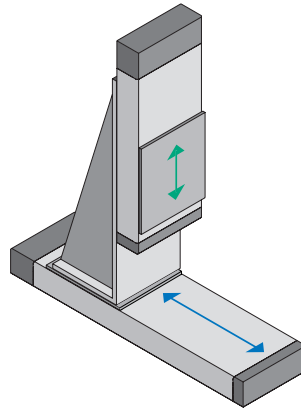
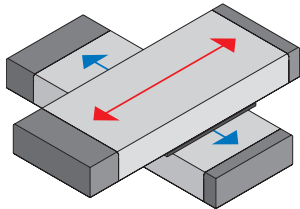
$$Fr(\alpha) = \frac{F_2}{\cos \alpha}$$

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

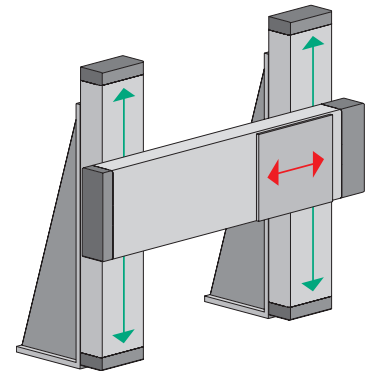
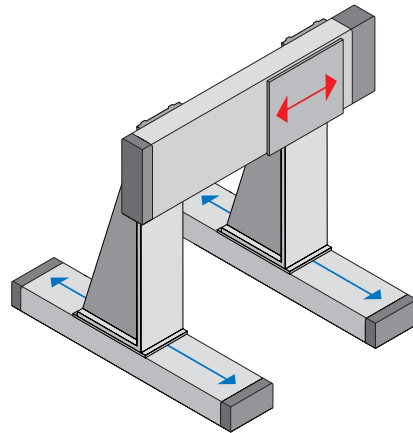
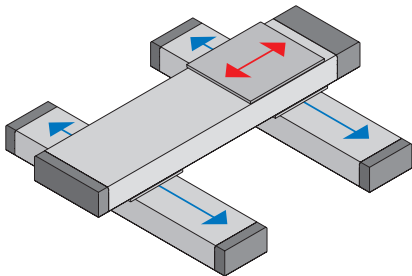
# Combination Samples

X/Y Base Units  
 X/Z Base Units  
 Y/Z Base Units

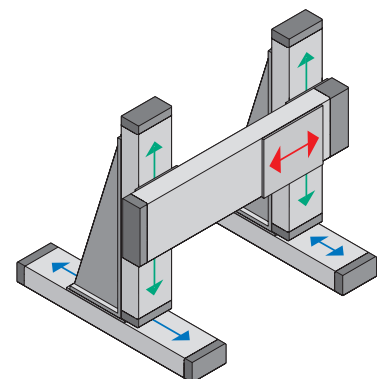
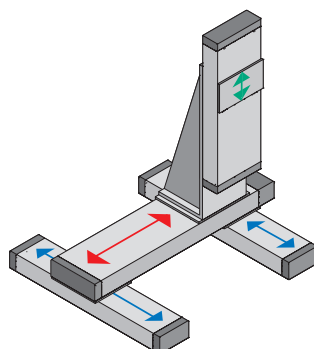
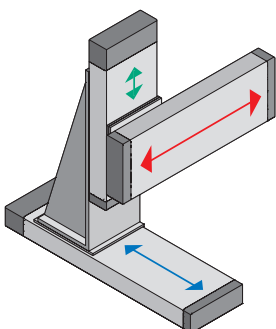
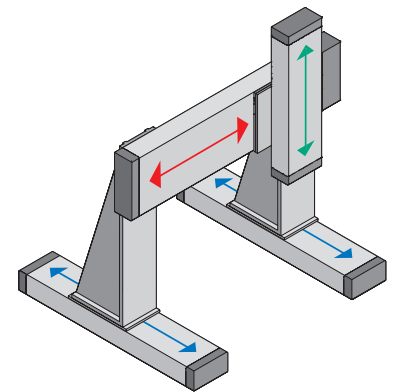
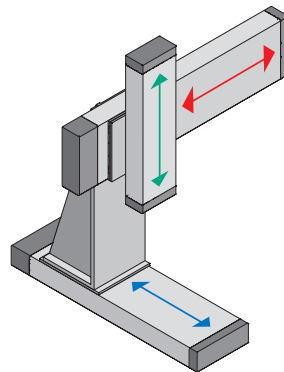
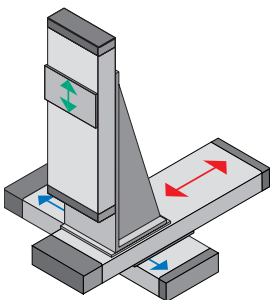
Compound Tables  
 (2 Axes)



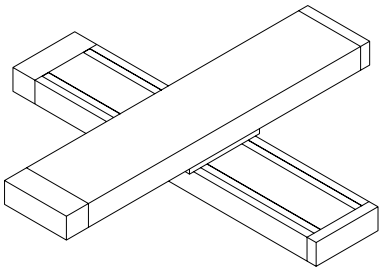
H-Constructions  
 (2 Axes)



(3 Axes)

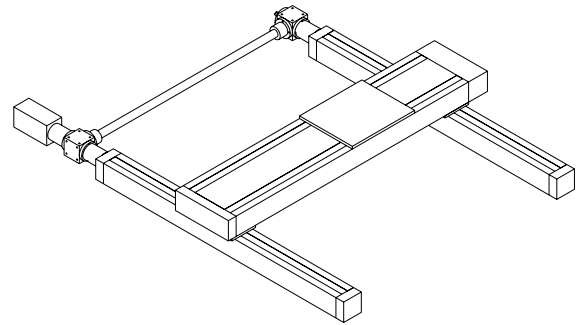


# Combination Samples



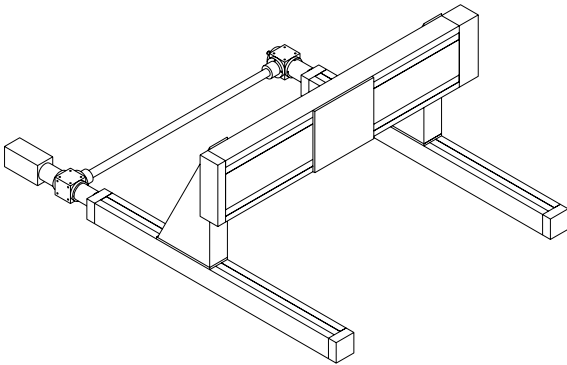
## Compound Table

2 x LES 5  
PS 4 with VP 2



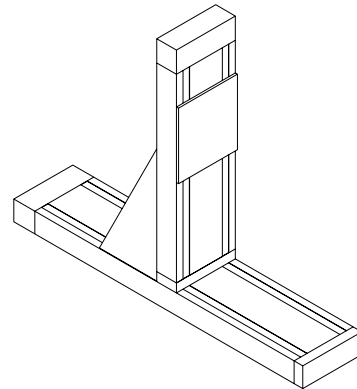
## 2-Axis H-Construction

2 x LES 4, LES 5, Angular gear sentence, 2 x PS 6  
PS 4



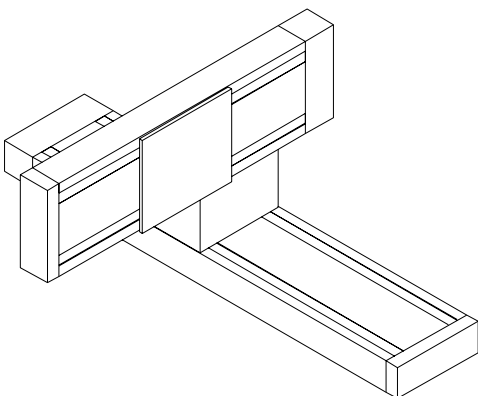
## 2-Axis Flatbed Layout

2 x LES 4, LES 5, Angular gear sentence, 2 X PS 2  
2 x WV 2, PS 4



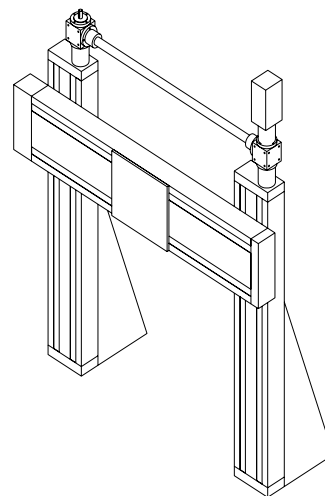
## 2-Axis Stroke Layout

2 x LES 5, 2 x PS 4  
WV 6



## 2-Axis Bracket Layout

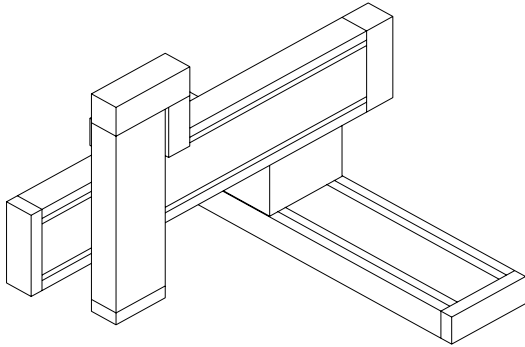
2 x LES 5  
2 x PS 4  
WV 3



## 2-Axis H-Construction

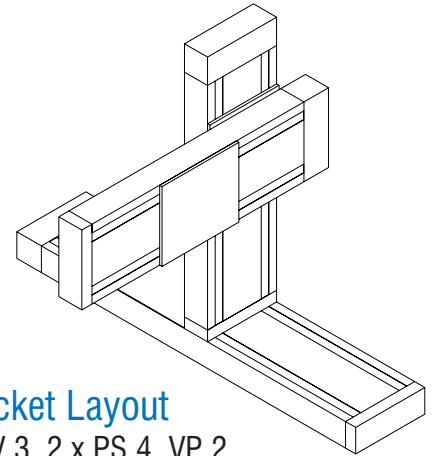
LES 5, 2 x LES 6, 2 x WV 7  
Angular gear sentence, 2 x PS 12  
PS 4

# Combination Samples



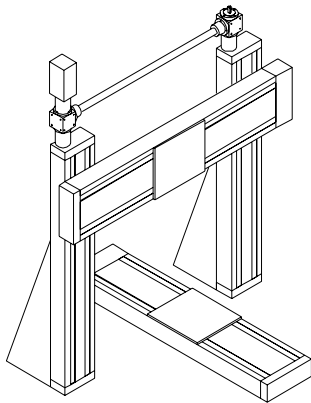
## 3-Axis Bracket Layout

2 x LES 5, LES 6, WV 3, 2 x PS 4, PS 7



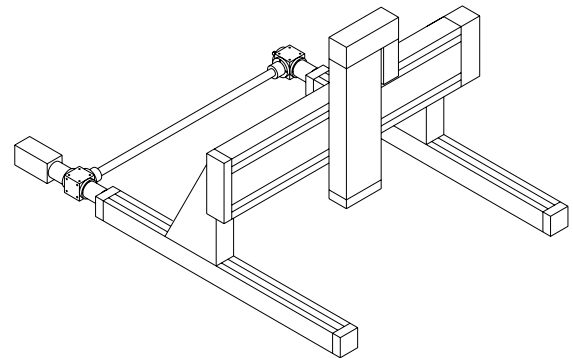
## 3-Axis Stroke/Bracket Layout

3 x LES 5, WV 3, 2 x PS 4, VP 2



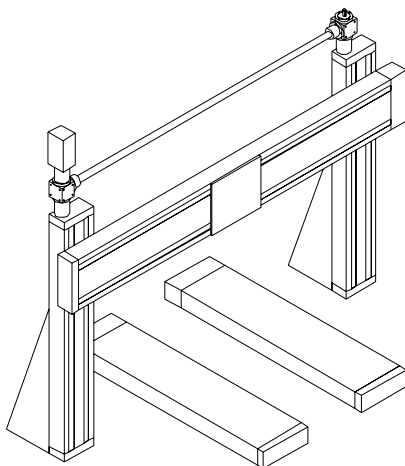
## 3-Axis Portal Layout

2 x LES 5, 2 x LES 6, 2 x WV 7  
Angular gear sentence, 2 x PS 4, PS 12



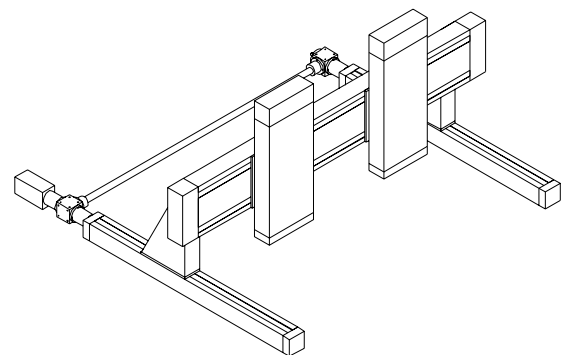
## 3-Axis Flatbed Layout

2 x LES 4, LES 5, LES 6, 2 x PS 2, 2 x WV 2  
Angular gear sentence, PS 4, PS 7



## 4-Axis Portal Layout

3 x LES 5, 2 x LES 6, 2 x WV 7  
Angular gear sentence  
3 x PS 4  
2 x PS 12



## 5-Axis Flatbed Layout

2 x LES 5 (Z-Axes)  
LES 5 (2 Spindle gear)  
2 x LES 4, 2 x PS 2, 2 x WV 2  
Angular gear sentence, 2 x PS 4 with VP 2

# 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
DC servo motor MV 120	396 102 0020	adjustable via software	396 102 0220	adjustable via software
DC servo motor MV 300	396 104 0020	adjustable via software	396 104 0220	adjustable via software
AC servo motor MY 054	396 554 0020	adjustable via software	396 554 0220	adjustable via software
AC servo motor MV 073	396 573 0020	adjustable via software	396 573 0220	adjustable via software

LES 4 / LES 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
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

LES 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
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

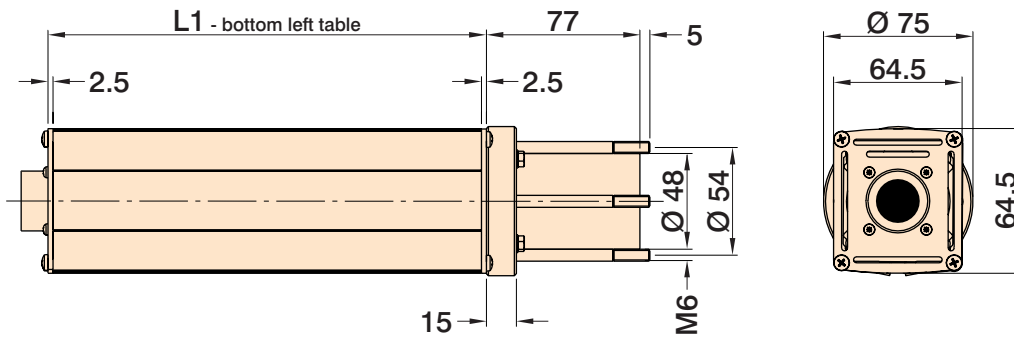
LES 8 - Direkt Drive				
DC servo motor MV 300	398 720 0001			
Stepping motor MS 600 HT	398 721 0001			
AC servo motor MY 073	398 722 0001			

LES 8 Lateral Assembly				
DC servo motor MV 300	398 720 0001			
Stepping motor MS 600 HT	398 721 0001			
AC servo motor MY 073	398 722 0001			

# Motor Modules

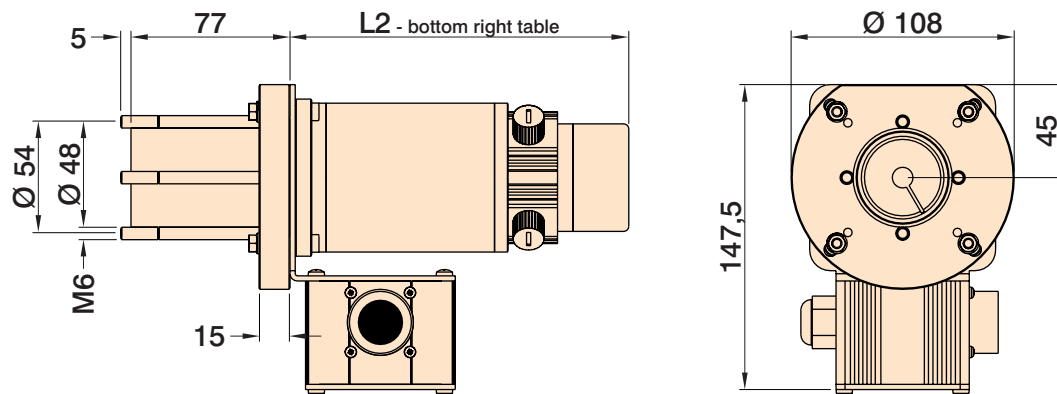
## Scale Drawing

### Motor Module 1



## Scale Drawing

### Motor Module 2



## Profile Length L1 and Motor Length L2

Motor module 1 with direct drive	Length L1	
	without brake	with brake
Stepping motor MS 135 HT	110 mm	170 mm
Stepping motor MS 160	170 mm	200 mm
DC servo motor MV 120	210 mm	240 mm
AC servo motor MY 054	183 mm	207 mm

Motor module 2 with direct drive	Length L2	
	without brake	with brake
Stepping motor MS 300	128 mm	133 mm
DC servo motor MV 300	154 mm	183 mm
AC servo motor MY 073	227 mm	255 mm

Motor module 1 laterally	Length L3	
	without brake	with brake
Stepping motor MS 135 HT	110 mm	160 mm
Stepping motor MS 160	160 mm	190 mm
DC servo motor MV 120	170 mm	200 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	4.10 / 5.80 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	0.39 Nm
DC Servo Motor MV 300	300 W	2500 1/min	1.20 Nm

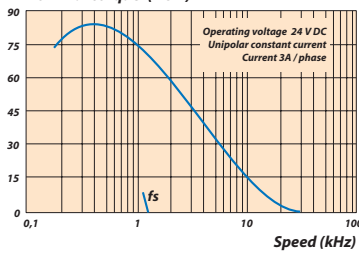
AC Servo Motor	Performance	Nominal Speed	Nominal Torque
AC Servo Motor MY 054	500 W	6000 1/min	0.80 Nm
AC Servo Motor MY 073	830 W	4000 1/min	2.00 Nm

## Torque Curves / Characteristic Curves

### Stepping Motor

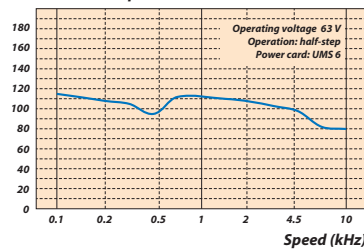
#### MS 135 HT

Nominal torque (Ncm)



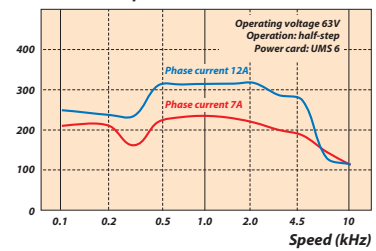
#### MS 160

Nominal torque (Ncm)



#### MS 300

Nominal torque (Ncm)

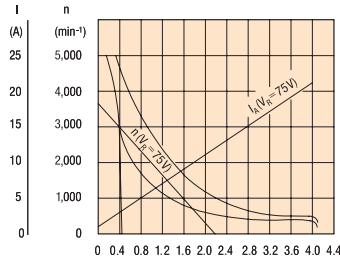


## Torque Curves / Characteristic Curves

### DC Servo Motor

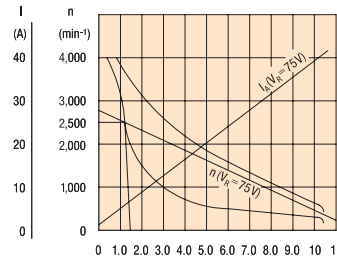
#### MV 120

Speed N (min<sup>-1</sup>)



#### MV 300

Speed N (min<sup>-1</sup>)

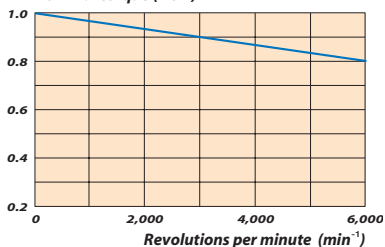


## Torque Curves / Characteristic Curves

### AC Servo Motor

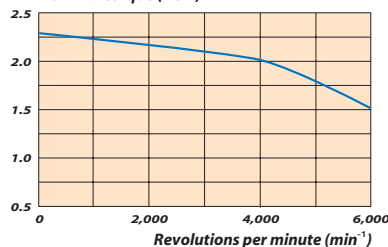
#### MY 054

Nominal torque (Ncm)



#### MY 073

Nominal torque (Ncm)



# Maintenance (Lubrication) & Pin Configuration

## 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

isel special grease is characterised by the following properties:

- Enormous reduction of wear and tear
- Clearly less consumption
- Mixable with lithium and calcium greases
- Water-repellent
- Highly resistant against cold, hot and salt water as well as against solvents

- Temperature rating: -25° C up to 200° C
- Dry running > 300° C
- Lifetime extendable up to six times
- Extremely good adhesion on metal surfaces

Lubricants made by iselautomation:

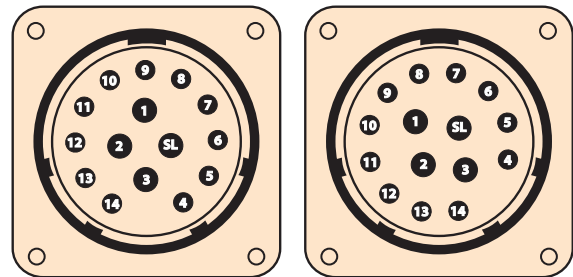
isel-lubricant  
Item no.:  
**299 032 0002**

isel-lubricator  
Item no.:  
**299 032 0003**

## 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

## Overview Motor Lead Wires

Item no.	Description:
392780 0301	3 meter step motor conductor plug Sub-D 9 – bushing Sub-D 9
392775 0009	5 meter step motor conductor plug Sub-D 9 – bushing Sub-D 9
392102 0500	5 meter step motor conductor plug Sub-D 9 – bushing Amphenol
392711	5 meter step motor conductor plug Amphenol – bushing Sub-D 9
392713 0504	5 meter step motor conductor plug Amphenol – bushing Amphenol
392754 0500	5 meter step motor conductor plug Amphenol – bushing M 23
392755 0500	5 meter step motor conductor plug Sub-D 9 – bushing M 23
392715 0500	5 meter DC servo motor conductor plug Amphenol – bushing Amphenol
392737 1500	5 meter DC servo motor conductor plug Amphenol – bushing Sub-D 25
392738 1500	5 meter DC servo motor conductor plug Amphenol – bushing Sub-D 15
392761 0500	5 meter DC servo motor conductor plug Amphenol – bushing M 23
392717 0500	5 meter DC servo motor conductor plug XLR 4 pol./Sub-D 15 – bushing Amphenol
392728 0500	5 meter DC servo motor conductor controller-sided open – bushing Amphenol
392303 0500	5 meter AC servo motor conductor
392321 0500	5 meter AC encoder conductor

# Coupling casings

## Drive Components

### Connectivity

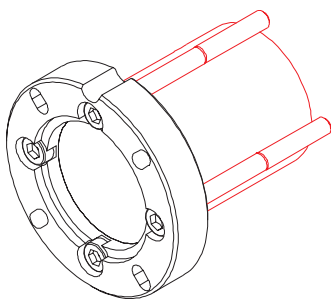
Preparation - Direct Drive

Connectivity <i>Direct drive</i>	LES 4	LES 6	LES 5	Angular gear Fixing 0°	Angular gear Fixing 90°
MS 160 MV 120 MY 054	Connection via coupling casing 1 <i>short sleeve</i> with adequate shaft coupling			Coupling casing 1 <i>long sleeve</i>	
MS 300 MV 300 MY 073	Connection via coupling casing 2 <i>short sleeve</i> with adequate shaft coupling			Coupling casing 2 <i>long sleeve</i>	
Angular gear Fixing 0°	split coupling casing <i>short sleeve</i> with adequate shaft coupling			Connection via transmission shaft set	
Angular gear Fixing 90°	split coupling casing <i>short sleeve</i> with adequate shaft coupling				

### Ordering Data

Coupling Casings

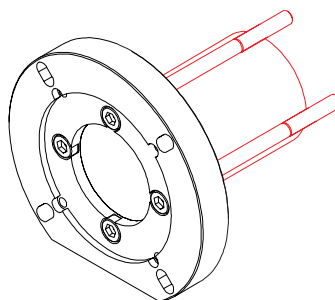
Coupling casing 1



Short sleeve  
Item no.: 218 100 0001

Long sleeve  
Item no.: 218 100 0002

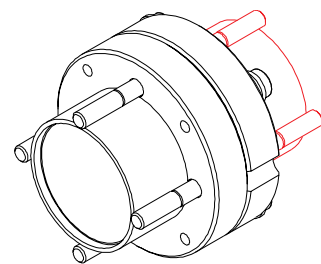
Coupling casing 2



Short sleeve  
Item no.: 218 100 1001

Long sleeve  
Item no.: 218 100 1002

Split coupling casing



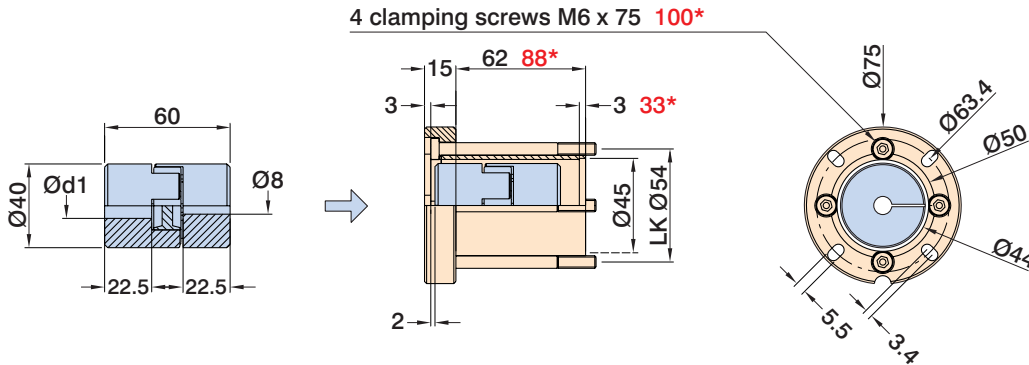
Short sleeve  
Item no.: 218 100 2001

Long sleeve  
Item no.: 218 100 2002

# Coupling casings

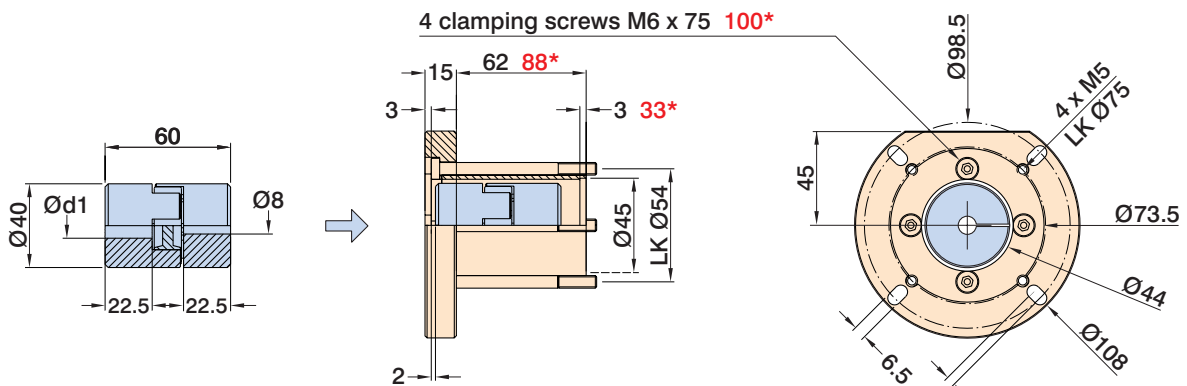
# Drive Components

## Scale Drawing Coupling Casing 1



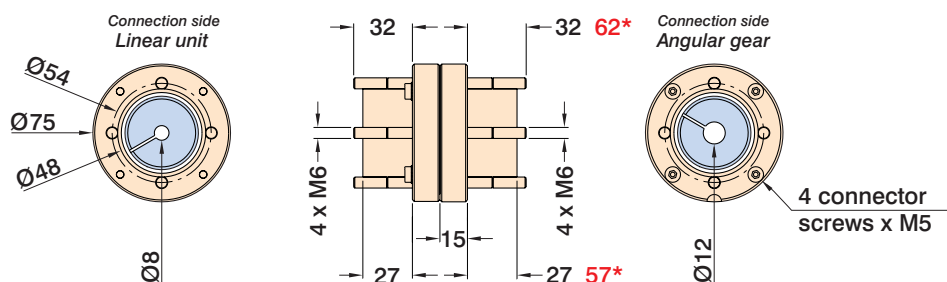
*\*) Measures refer to the dimensions with long sleeves*  
 d1 = engine shaft diameter 6.35/8/9 mm  
 Suitable shaft coupling WK 40/60 on page B 117 (not included in scope of delivery)

## Scale Drawing Coupling Casing 2



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

## Scale Drawing Split Coupling Casing

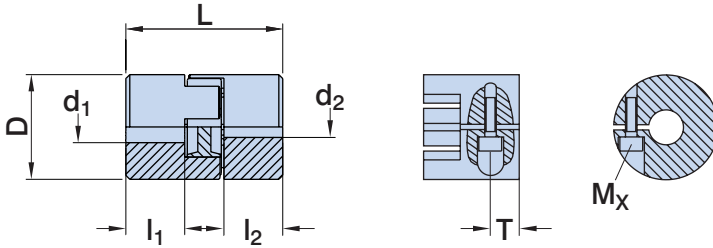


*\*) Measures refer to the dimensions with long sleeves*  
 Suitable shaft coupling WK 40/60 on page B 117 (not included in scope of delivery)

# Shaft Couplings

# Drive Components

## Scale Drawing

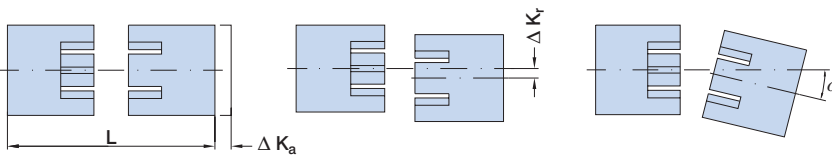


Size	Dimensions [mm]				Clamping screw		
	D	L	$l_1 / l_2$	$d_1 / d_2$	$M_x$	T	Screwing-down torque [Ncm]
20/30	20	30	10	4 - 7	M3	5	0,76
30/40	30	40	14	6 - 13	M4	5	1,34
40/60	40	60	22,5	8 - 18	M5	12	3,05

### Definitions

- $T_{Ksp}$  [Nm] = Coupling torque clearance-free
- $T_{KN}$  [Nm] = Nominal coupling torque
- $T_{Kmax}$  [Nm] = Maximal coupling torque
- $T_N$  [Nm] = Nominal plant torque
- $T_{AS}$  [Nm] = Maximal drive torque
- $T_S$  [Nm] = Maximal torque
- $J_A$  [kgm<sup>2</sup>] = Moment of inertia - motor side
- $J_L$  [kgm<sup>2</sup>] = Moment of inertia - load side
- $S_A$  = Jolt factor
- $S_t$  = Temperature factor

## Displacement Compensation



Size	Toothed rim Shore hardness	Displacements		
		axial $\Delta K_a$	radial $\Delta K_r$	angle $\alpha$ [°]
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

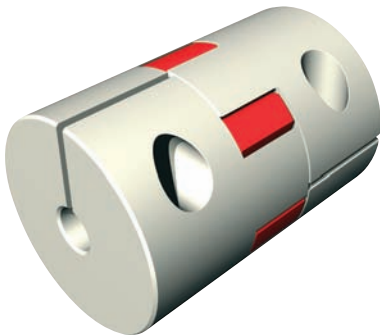
Ambient temperat. [°C]	-30 bis +30	+40	+60	+80	+90
Temperature factor	1,0	1,2	1,4	1,8	2,2

### Technical Data

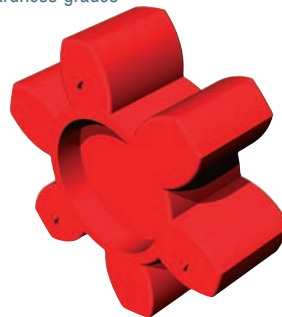
Size	Shore hardness	Revolutions per minute $V=30$ m/s	Torque			Static torsion spring stiffness [Nm/rad]	Torsion spring stiffness [N/mm]	Mass moment of inertia [kgm <sup>2</sup> ]	
			$T_{Ksp}$	$T_{KN}$	$T_{Kmax}$			per hub	toothed rim
20/30	86	28.000	0,45	2,2	4,5	22,6	183	0,49 - 10 <sup>-6</sup>	0,079 - 10 <sup>-6</sup>
	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 <sup>-6</sup>	0,457 - 10 <sup>-6</sup>
	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 <sup>-6</sup>	1,49 - 10 <sup>-6</sup>
	92			10,0	20,0	573,0	1120		
	98			17,0	34,0	859,5	2010		

### Ordering Data

#### Shaft couplings



#### PUR toothed rims all hardness grades



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

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

Item no. - see table

for WK 20/30  
for WK 30/40  
for WK 40/60

Item no.: 217 011 00\*\*

Item no.: 217 012 00\*\*

Item no.: 217 013 00\*\*

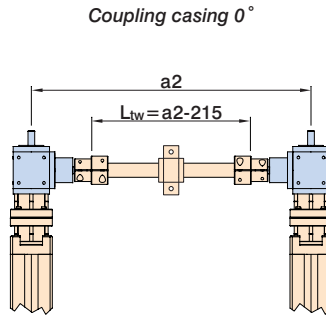
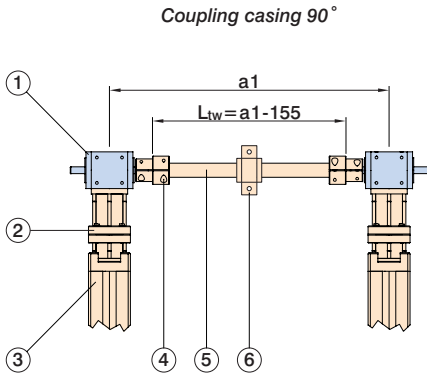
for \*\*, insert the shore hardness

Further couplings upon request!

# Assembly Kit with Angular Gear

## Drive Components

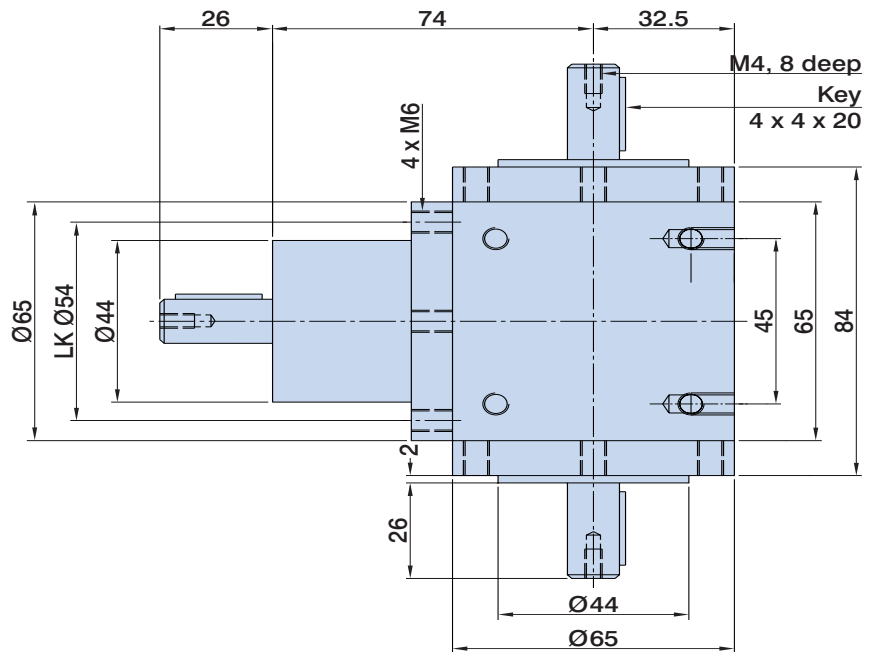
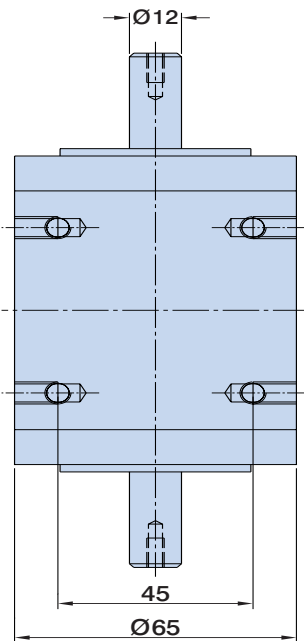
### Mounting Variants



- ① Angular gear
- ② Split coupling casing with shaft coupling WK 40/60
- ③ LES 4, LES 6 or LES 5 (preparation for direct drive)
- ④ Coupling for transmission shaft  $\varnothing 25$
- ⑤ Transmission shaft  $\varnothing 25$
- 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 LES4/LES6/LES 5, fixing 90°

Scope of delivery: 2 x ①, 2 x ②, 2 x ④  
Item no.: **216 150 0002**

H-construction connected to LES4/LES6/LES 5, Fixing 0°

Scope of delivery: 2 x ①, 2 x ②, 2 x ④  
Item no.: **216 150 0001**

Adequate Motor Modules C 86 / C 87

#### Transmission shaft

Quill  $\varnothing 25$  mm x 4 mm, blank 1,000 mm

Item no.: **219 001 0125**

Quill  $\varnothing 25$  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**

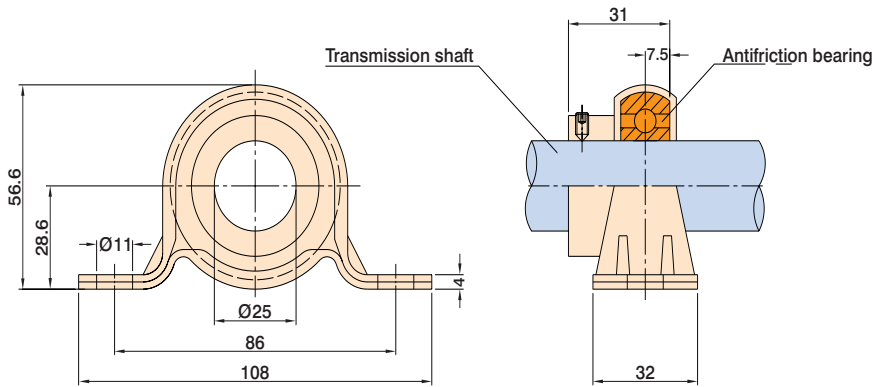
Pedestal bearing for transmission shaft packaging unit: 1 piece

Item no.: **896 202 5562**

# Assembly Kit with Angular Gear

## Drive Components

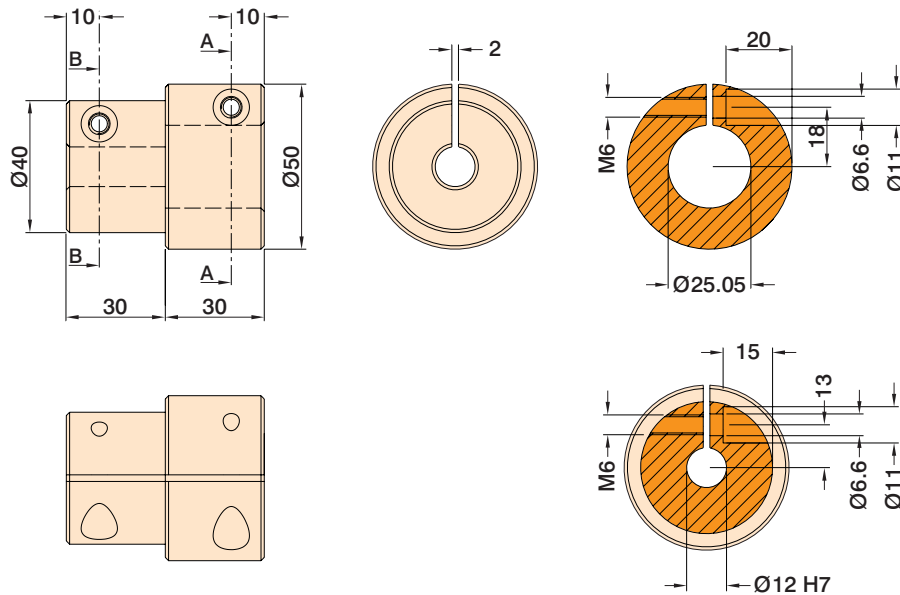
### Scale Drawing and Technical Data



**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	$1,340 \cdot 10^{-4} \text{ kgm}^2$
Moment of inertia of shaft	$8,171 \cdot 10^{-6} \text{ kgm}^2 / 100 \text{ mm}$

### Scale Drawing Coupling



# Tops for Slides / Compound Tables Connecting Elements

## Hole Pattern Slide Top PS 1

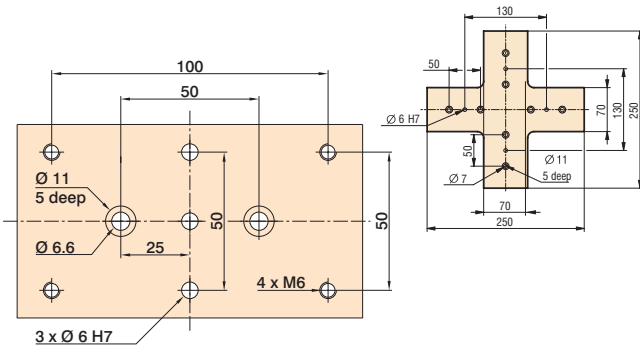
L125 x W70 x H8 mm

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

Item no.: **277 001**

Connection Cross  
2 x LES 4

Item no.: **277 007**



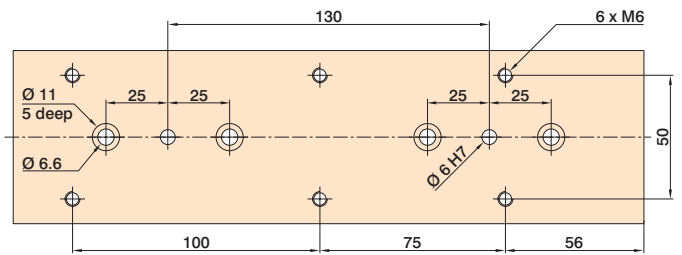
## Hole Pattern Slide Top PS 2

L255 x W70 x H8 mm

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

Connectivity:  
Angle bracket WV 2 / WV 5

Item no.: **277 002**

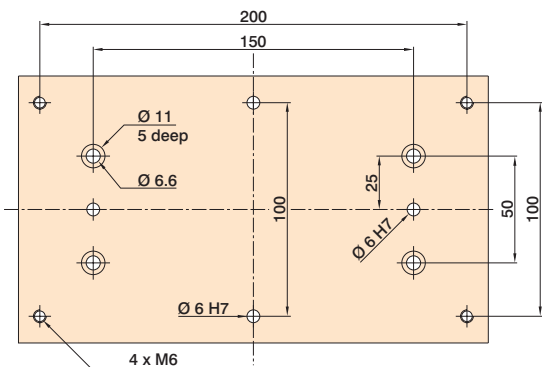


## Hole Pattern Slide Top PS 3

L220 x W125 x H8 mm

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

Item no.: **277 003**

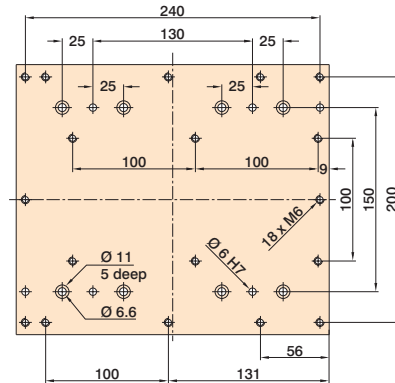


## Hole Pattern Slide Top PS 4

L255 x W220 x H8 mm

Mounting in: LES 5 with 2 x WS 5/200. Mounting of Compound table: LES 5 with LES 5 (in connection with VP 2)  
Connectivity: Angle brackets WV 3 / WV 6

Item no.: **277 004**



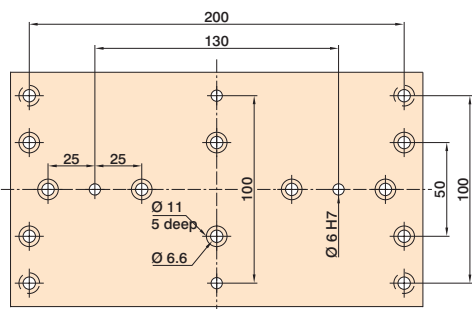
## Hole Pattern Slide Top PS 6

L220 x W125 x H8 mm

Connection to: LES 4 with 1 x WS 5/200  
Mounting of compound table: LES 4 with LES 5 (in connection with PS3).

Connectivity: LES 4 / LES 5

Item no.: **277 011**

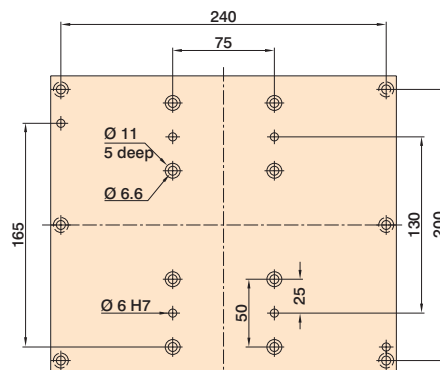


## Hole Pattern Slide Top PS 7

L255 x W220 x H8 mm

Connection to: LES 6 with 2 x WS 5/200  
Mounting of compound table: LES 6 mit LES 5 (in connection with PS 4)

Item no.: **277 016**



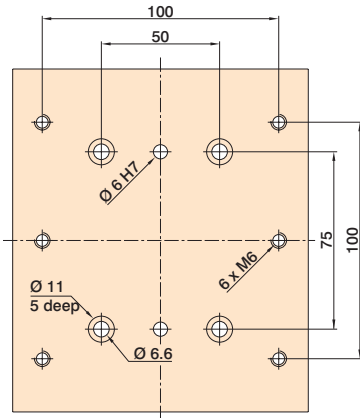
# Tops for Slides / Compound Tables Connecting Elements

## Hole Pattern Slide Top PS 8

L125 x W145 x H8 mm

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

Item no.: **277 017**

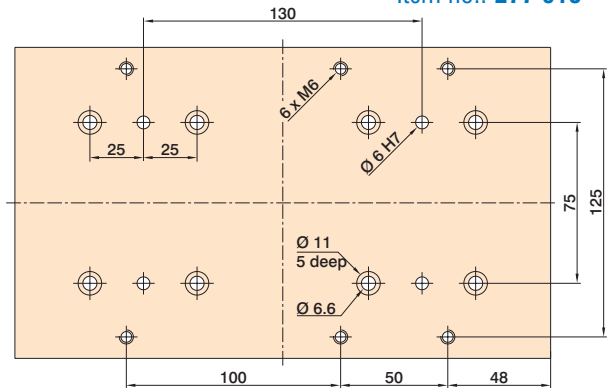


## Hole Pattern Slide Top PS 9

L250 x W145 x H8 mm

Connection to: LES 6 with 2 x WS 5/200  
Connectivity: Angle bracket WV 7

Item no.: **277 018**



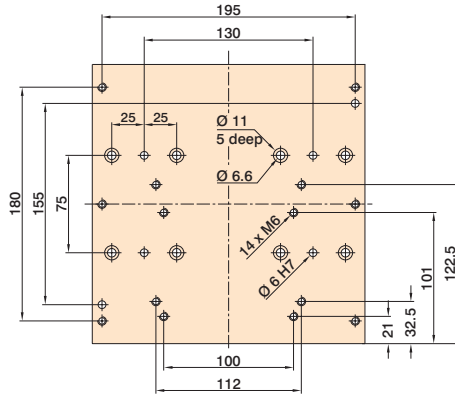
## Hole Pattern Slide Top PS 10

L210 x W215 x H8 mm

Connection to: LES 6 with 2 x WS 5/200. Mounting of compound table: LES 6 mit LES 6 (in connection with PS 11)

Connectivity: Spindle motors MA

Item no.: **277 019**



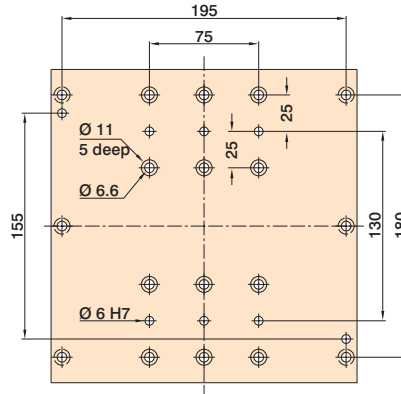
## Hole Pattern Slide Top PS 11

L210 x W215 x H8 mm

Connection to: LES 6 with 2 x WS 5/200. Mounting of compound table: LES 6 with LES 4 (in connection with PS 10)

Connectivity: LES 6

Item no.: **277 020**

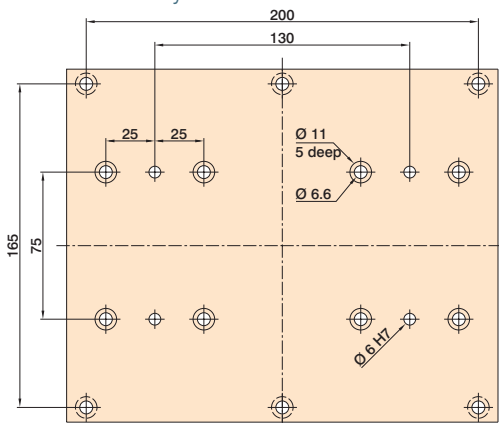


## Hole Pattern Slide Top PS 12

L220 x W180 x H8 mm

Connection to: LES 6 with 2 x WS 5/200  
Connectivity: LES 5

Item no.: **277 021**

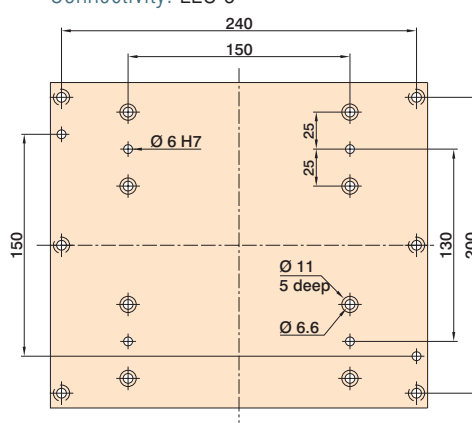


## Hole Pattern Connecting Plate VP 2

L255 x W220 x H8 mm

Connection to: LES 5 with 2 x WS 5/200  
Connectivity: LES 5

Item no.: **277 006**



# Tops for Slides / Compound Tables Connecting Elements

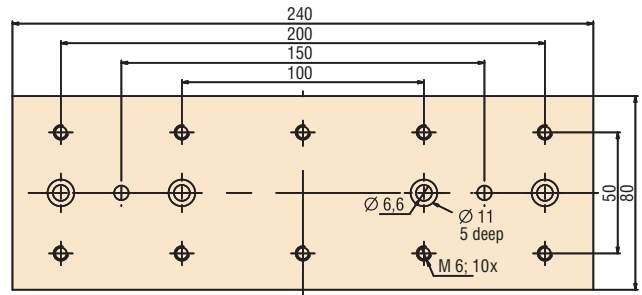
## Hole Pattern Slide Top PS 18

L 240 x W 80 x H 8 mm

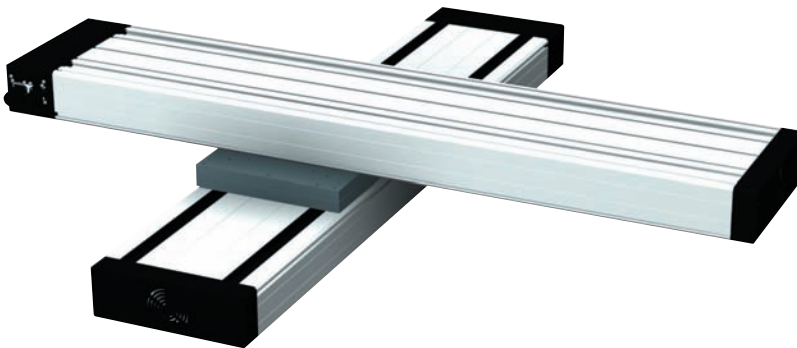
Connection to: LES 8 mit

Connectivity: LES 8

Item no.: **277 030**



## Connecting Plates for Compound Tables 1



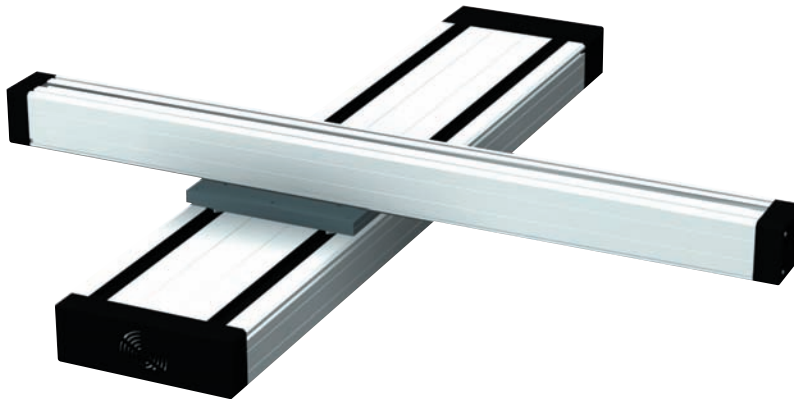
### Connecting Plates for Compound Tables 1

2 x L255 x W220 x H8 mm

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

Item no.: **277 010**

## Connecting Plates for Compound Tables 2



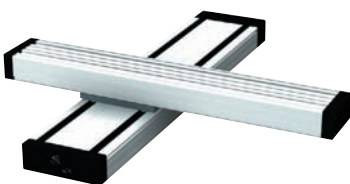
### Connecting Plates for Compound Tables 2

2 x L220 x W125 x H8 mm

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

Item no.: **277 012**

## Further Compound Tables



Compound Tables LES 5 and LES 6  
PS 4 and PS 7



Compound Tables 2 x FES 6  
PS 10 and PS 11

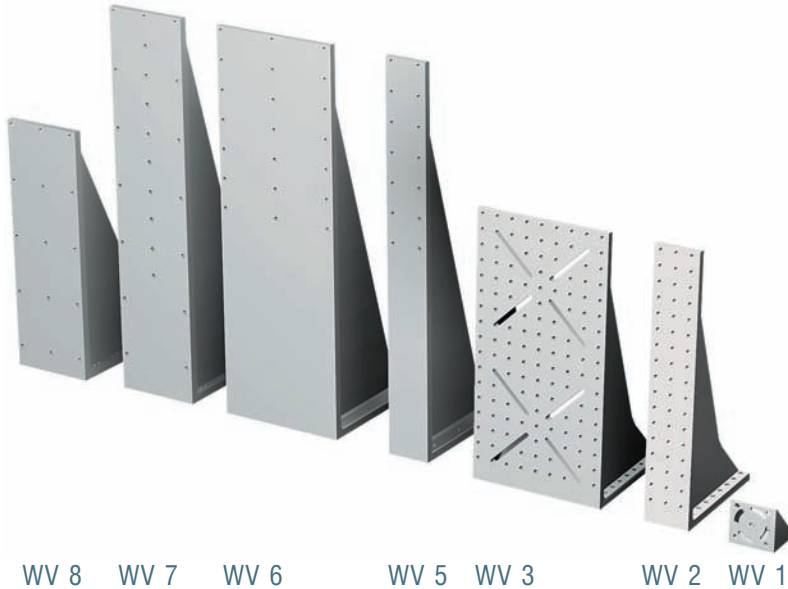


Compound Tables LES 4 and LES 6  
PS 11 and PS 10

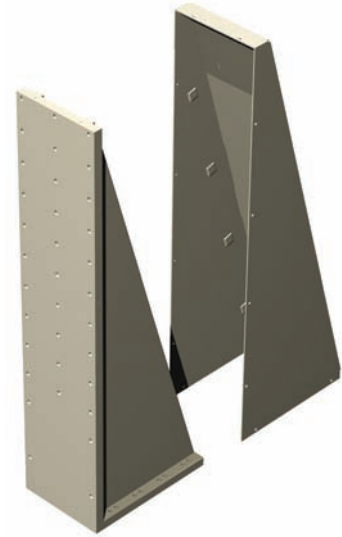
# Angle Brackets

# Connecting Elements

## Angle Brackets with face-milled Clamping Surfaces



## Matching Cover Plates



### Angle Bracket **WV 8**

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

Item no.: **209 110 0080**

### Angle Bracket **WV 3**

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

Item no.: **209 110 0032**

### Angle Bracket **WV 7**

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

Item no.: **209 110 0070**

### Angle Bracket **WV 2**

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

Item no.: **209 110 0022**

### Angle Bracket **WV 6**

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

Item no.: **209 110 0060**

### Angle Bracket **WV 1**

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

Item no.: **209 110 0010**

### Angle bracket **WV 5**

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

Item no.: **209 110 0050**

### Cover Plate for **WV 8**

- anodized
- Aluminium plate, 1.02 kg

Item no.: **209 110 0081**

### Cover Plate for **WV 7**

- anodized
- Aluminium plate, 1.48 kg

Item no.: **209 110 0071**

### Cover Plate for **WV 6**

- anodized
- Aluminium plate, 1.80 kg

Item no.: **209 110 0061**

### Cover Plate for **WV 5**

- anodized
- Aluminium plate, 1.20 kg

Item no.: **209 110 0051**

### Cover Plate for **WV 3**

- anodized
- Aluminium plate, 1.15 kg

Item no.: **209 110 0031**

### Cover Plate for **WV 2**

- anodized
- Aluminium plate, 0.78 kg

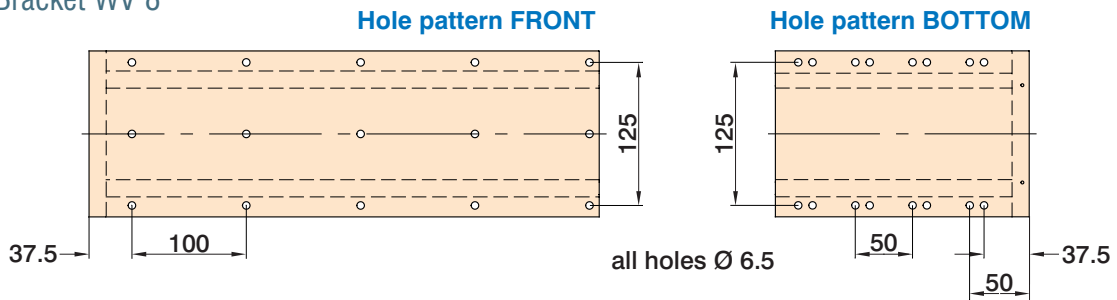
Item no.: **209 110 0021**

# Angle Brackets

## Connecting Elements

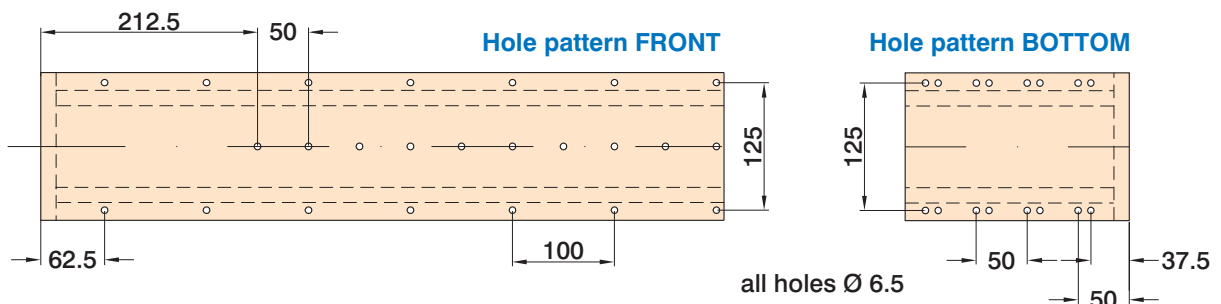
### Hole Pattern

Angle Bracket WV 8



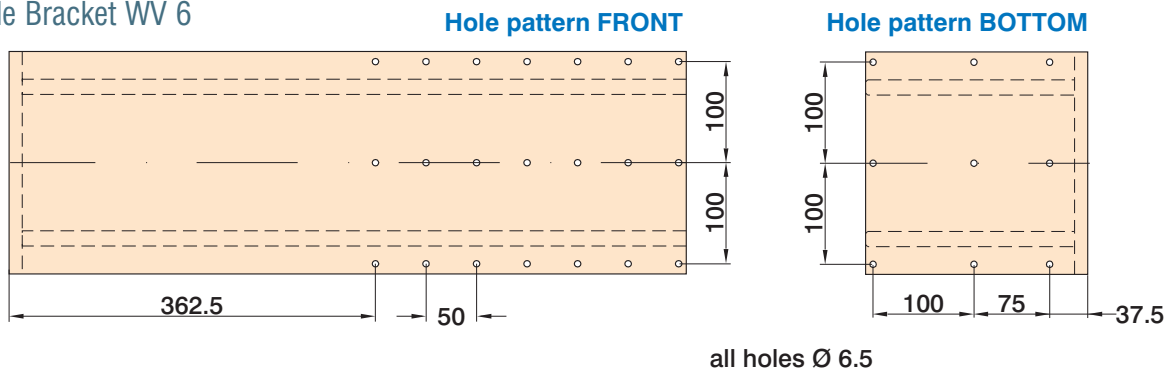
### Hole Pattern

Angle Bracket WV 7



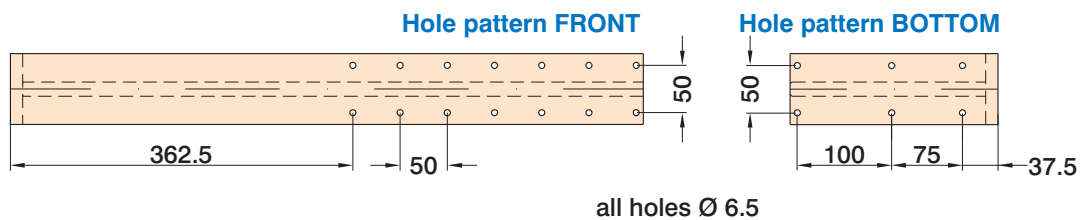
### Hole Pattern

Angle Bracket WV 6



### Hole Pattern

Angle Bracket WV 5

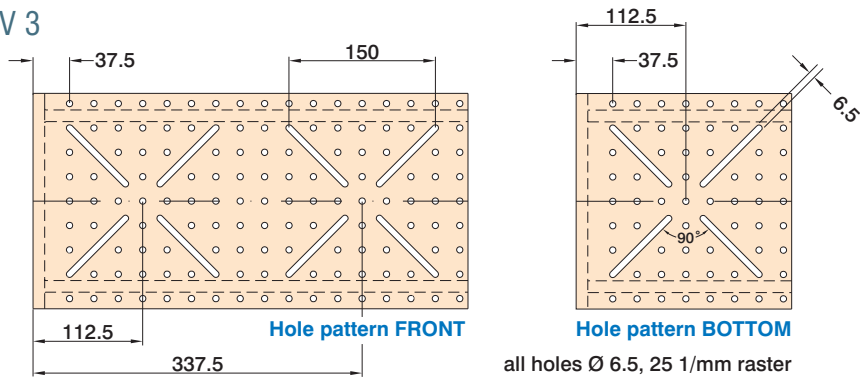


# Angle Brackets

## Connecting Elements

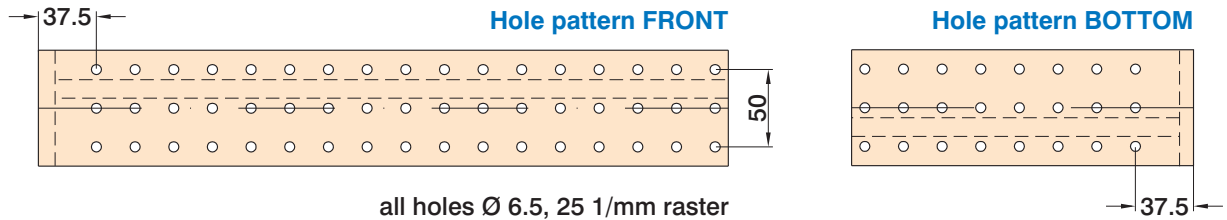
### Hole Pattern

Angle Bracket WV 3



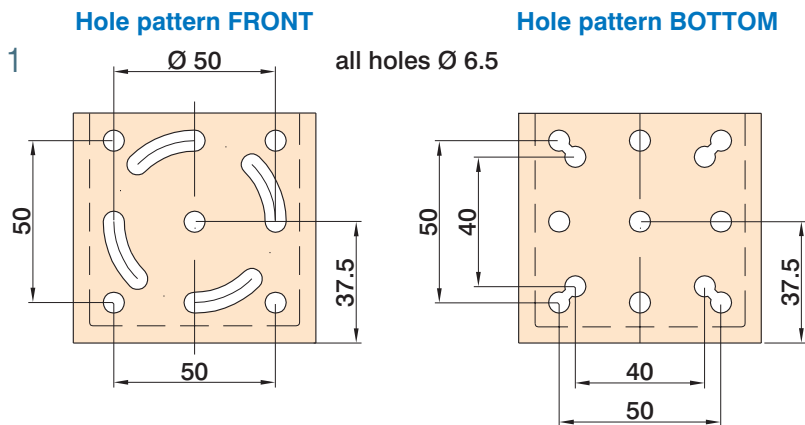
### Hole Pattern

Angle Bracket WV 2



### Hole Pattern

Angle Bracket WV 1



# 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**

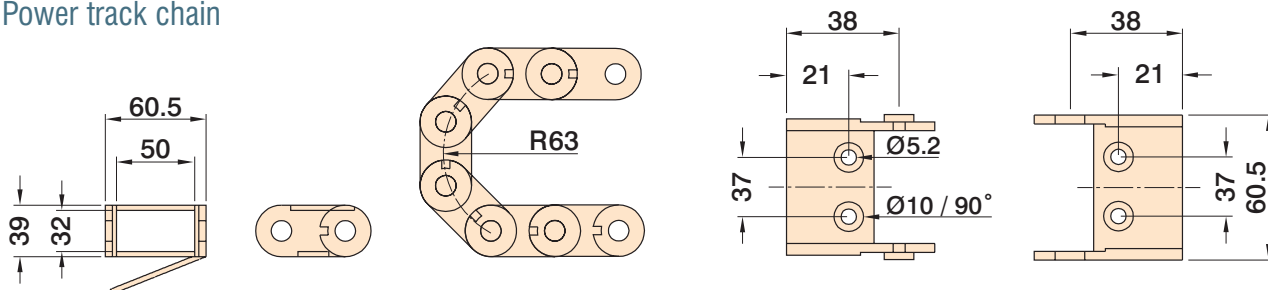
## Adapter Plate

**Adapter plate**  
 • for spindle motors MA connected to LES 5  
 • incl. fastening  
**Item no.: 277 014**

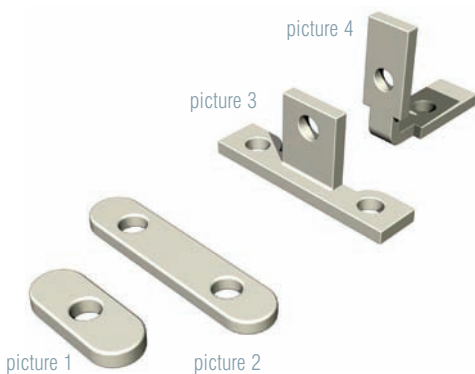
**Adapter plate**  
 • for motor 500 W / 1.1 kW connected to LES 6  
 • incl. incl. fastening  
**Item no.: 277 022**

## 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**

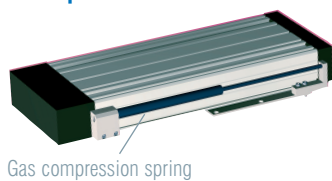
**Slide nut 2 x M6** (picture 2)  
 • galvanized  
 • packaging unit: 50 pieces  
**Item no.: 209 002 0004**

**Angular slide nut 2 x M6** (picture 4)  
 • galvanized  
 • packaging unit: 25 pieces  
**Item no.: 209 021 0003**

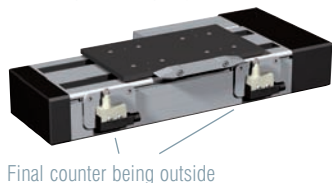
**Special angular slide nut 3 x M6** (picture 3)  
 • galvanized  
 • packaging unit: 25 pieces  
**Item no.: 209 022 0003**

**Gleitmutter M5** (without illustration)  
 • galvanized  
 • packaging unit: 20 pieces  
**Item no.: 209 006 0001**

## Adapter Kits



Gas compression spring



Final counter being outside

**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 LES 4 and LES 5**  
 • for outside limit switches  
 • Reduction of travel range about 40 mm  
**Item no.: 216 460 0001**

**Adapter kit for limit switches LES 5**  
 • for outside limit switches  
 • Reduction of travel range about 40 mm  
**Item no.: 216 460 0002**

**Adapter kit for limit switches LES 6**  
 • for outside limit switches  
 • Reduction of travel range about 40 mm  
**Item no.: 216 460 0003**

**Assembly kit for seal gas**  
 • for LES 4 - LES 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.

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.

## 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 EN 12020-2.

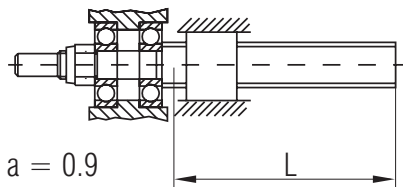
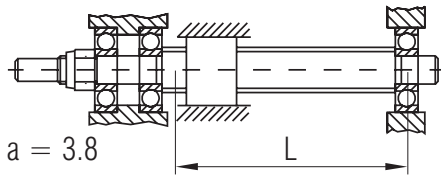
At the worst, the deviations of the isel-linear axes come up to these limits, however, they normally are below them.

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.

# Theoretically Critical Speed



## Definitions

$n_{zul}$ [min <sup>-1</sup> ]	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

## Calculations

### Critical Speed

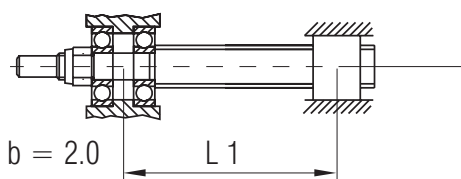
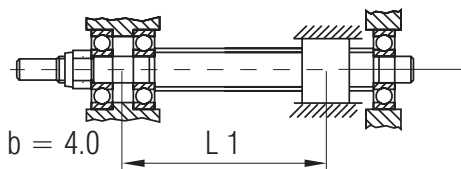
In most application cases, it is necessary to check the threaded spindles with regard to their critical speed.

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:

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



## Definitions

$F_{zul}$ [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

### Buckling Load

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

Considering a safety factor of 3.0, the following results:

$$F_{zul} = \frac{34,000 \cdot b \cdot d_2^4}{L_1^2}$$

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

### Rotator. Acceleration Torque

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

### Rotator. Acceleration torque

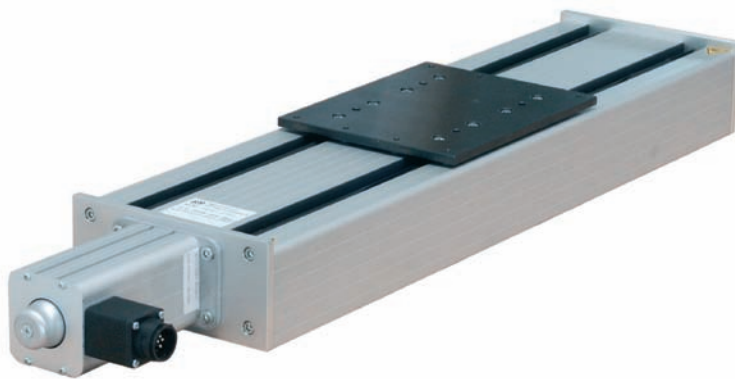
$$P = \frac{M_A \cdot n_{max}}{9550}$$

### Definitionen

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

# Double-Track Feed Unit 1

# LES 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  $\pm 0.01$  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 ( $\varnothing 25$ 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 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  $\pm 0.01$  mm (reproducibility).  
Stroke = L - 243 mm.

# Double-Track Feed Unit 1

# LES 1

## Ordering Data



### Double-Track Feed Unit 1

- with ball spindle drive 16 x 5 mm

Item no.:	Length (mm)
230601 0300	300
230601 0400	400
230601 0500	500
230601 0600	600
230601 0700	750
230601 0850	850
230601 1000	1,000
230601 1100	1,100
230601 1250	1,250
230601 1350	1,350
230601 1500	1,500

### Double-Track Feed Unit 1

- epping motor ball screw drive 16 x 5 mm

Item no.:	Length (mm)
230101 0300	300
230101 0400	400
230101 0500	500
230101 0600	600
230101 0700	750
230101 0850	850
230101 1000	1,000
230101 1100	1,100
230101 1250	1,250
230101 1350	1,350
230101 1500	1,500

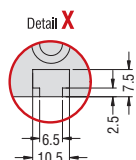
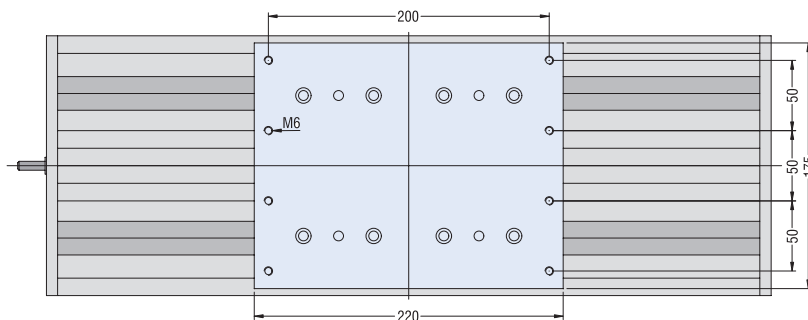
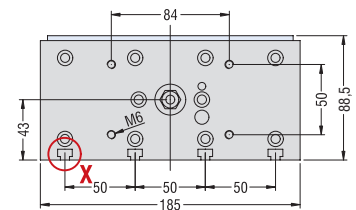
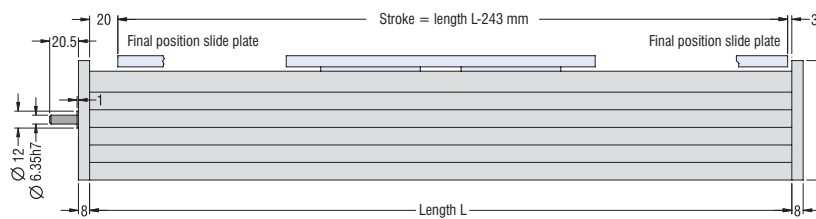
### Double-Track Feed Unit 1

- without ball screw drive

Item no.:	Length (mm)
230201 0300	300
230201 0400	400
230201 0500	500
230201 0600	600
230201 0700	750
230201 0850	850
230201 1000	1,000
230201 1100	1,100
230201 1250	1,250
230201 1350	1,350
230201 1500	1,500

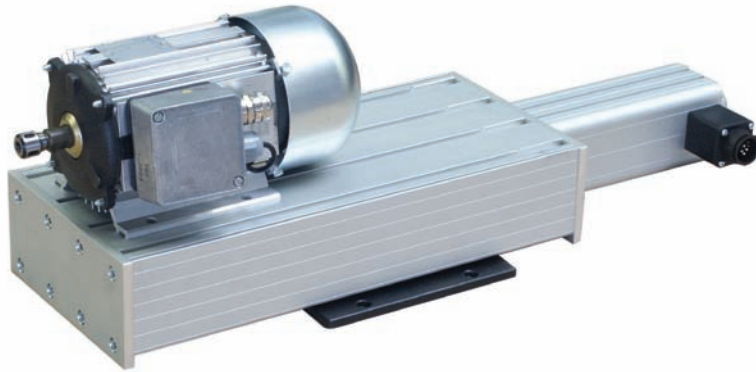
Option: 991106 for Compound Table Mounting

## Scale Drawings



# Double-Track Lifting Unit

# LES 3



## Features

- precision feed units  
L 300, W 175 and 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  $\pm 0.1$  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.

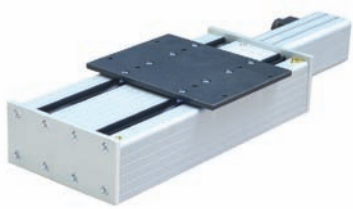
The stepping motor drive consists of a stepping motor with coupling, hand wheel and limit switch. The stepping motor drives a clearance-free ball screw drive (16 x 5 mm) with a repeatability of  $\pm 0,01$ mm mm (reproducibility).

The maximum torque (approx. 1 Nm) and the maximum speed (approx. 250 mm/s) depend on the applied stepping motor.

# Double-Track Lifting Unit

# LES 3

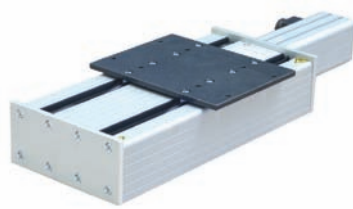
## Ordering Data



### 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

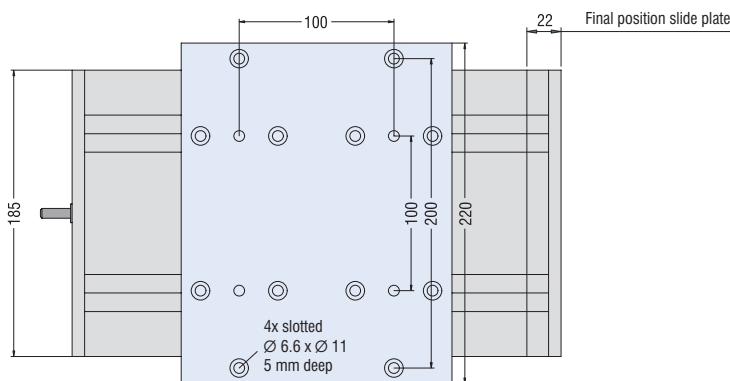
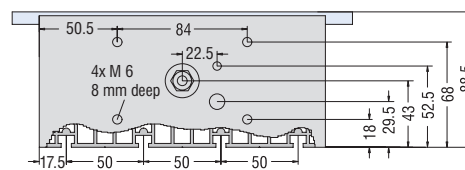
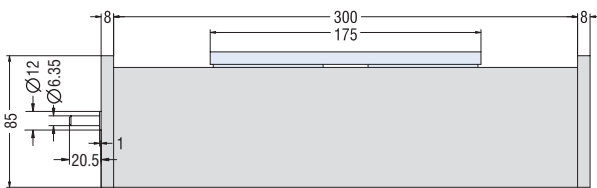
- individual
- 110 Ncm

item no.: **396 330 8001**

- 160 Ncm

Item no.: **396 341 8001**

## Maßzeichnungen



# Compound Table 1



## Features

- travel ranges: x-axis: 410 mm  
y-axis: 410 mm
- two linear guides LES 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 LES 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 LES 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 LES 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 from isel are available in the widths 250 mm and 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 410 x 410 mm
- with stepping motor drive

Item no.: **272 014 0606**

### Compound Table 1-V

- travel range 410 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**



### Aluminium T-Slot plates

- W 250 mm
- with fixing holes for compound tables

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

### T-Slot Plates

### Aluminium T-Slot plates

- W 375 mm
- with fixing holes for compound tables

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

# 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 LES 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**

# Timing Belt Feed Axes

## Overview

<p>Functions</p> <p>BlueLine Series 1 and BlueLine Series 3</p>	<p>C 114</p>
<p>LEZ 1 G (BlueLine Series 1)</p>  <p>Closed Timing Belt Feed Axis</p>	<p>C 116</p>
<p>LEZ 3 G (BlueLine Series 3)</p>  <p>Closed Timing Belt Feed Axis</p>	<p>C 122</p>
<p>LEZ 1 (ZF 1)</p>  <p>Open Timing Belt Feed Axis</p>	<p>C 128</p>
<p>LEZ 2 (ZF 2)</p>  <p>Open Timing Belt Feed Axis</p>	<p>C 132</p>
<p>LEZ 3 (ZF 3)</p>  <p>Open Timing Belt Feed Axis</p>	<p>C 138</p>

# Timing Belt Feed Axes

## Overview

Functions

C 144

Timing Belt Feed Axis LEZ 9

LEZ 6

C 146



Open Timing Belt Feed Axis

LEZ 7

C 148



Open Timing Belt Feed Axis

LEZ 8

C 150



Open Timing Belt Feed Axis

LEZ 9

C 152



Open Timing Belt Feed Axis

Drive Dimensioning

C 154

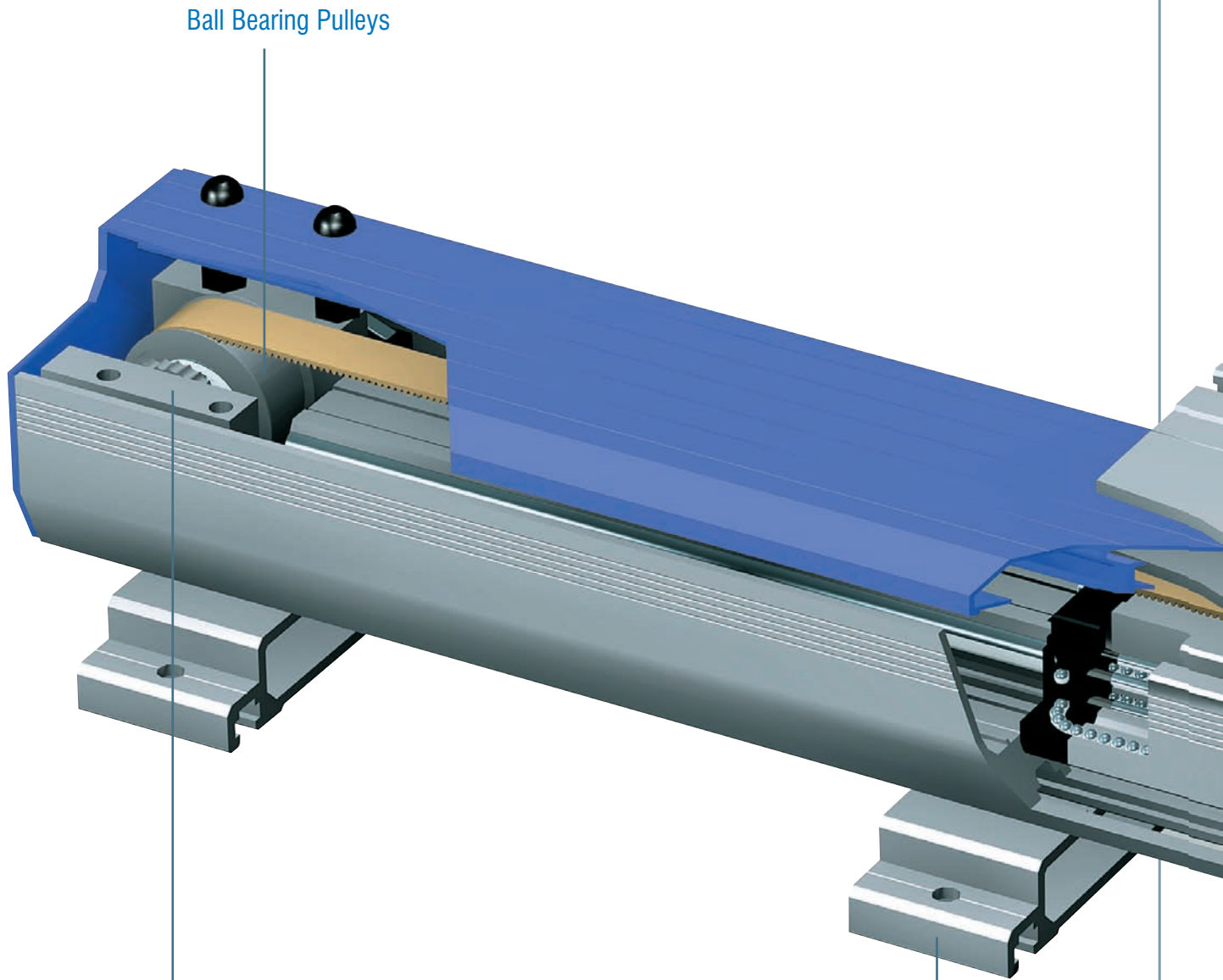
Application Samples

C 155

CAD Data: [www.iselautomation.net](http://www.iselautomation.net)

# Functions

LEZ 1 G and LEZ 3 G



Ball Bearing Pulleys

Eccentric Spanner enables an easy tensing of the Belt

Foot Mounting, optional

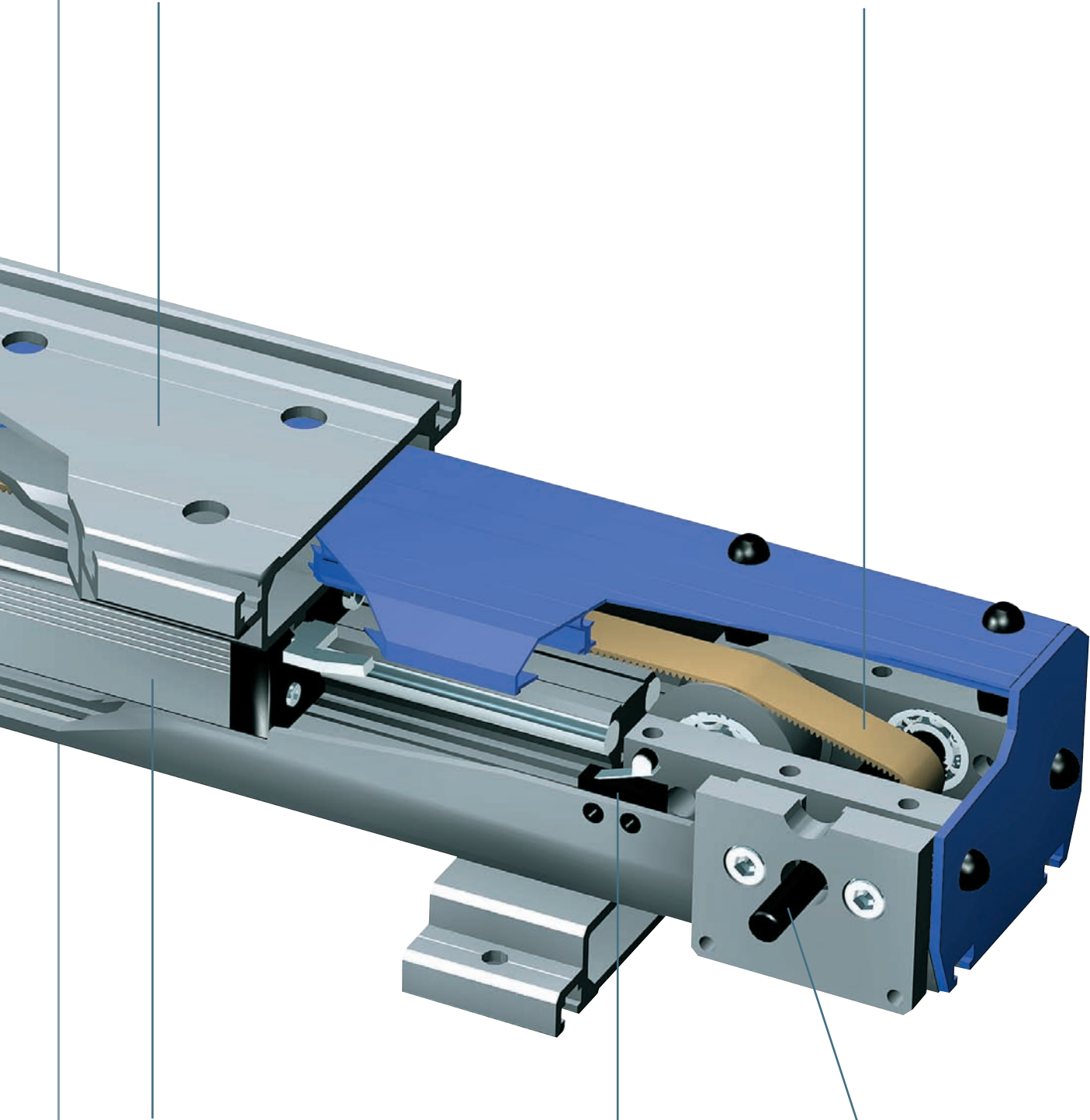
Assembly and Quantity as required

# Functions

## LEZ 1 G and LEZ 3 G

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 Reference/Limit Switch

Ball Bearing Steel Pinion

Motor can be mounted on Both Sides

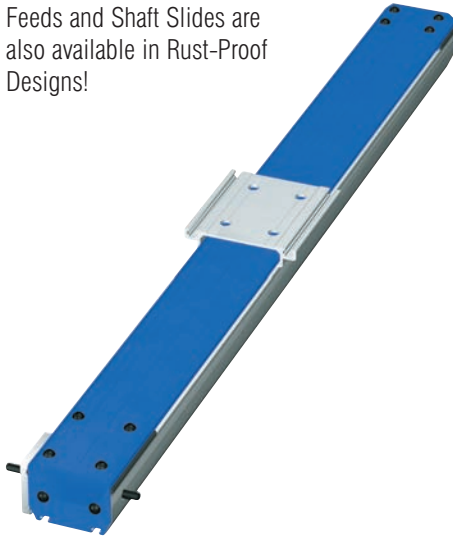
# Timing Belt Feed Axis

## Closed Timing Belt Feed Axis

# LEZ 1 G

## (BlueLine-Series 1)

Feeds and Shaft Slides are also available in Rust-Proof Designs!



### Features

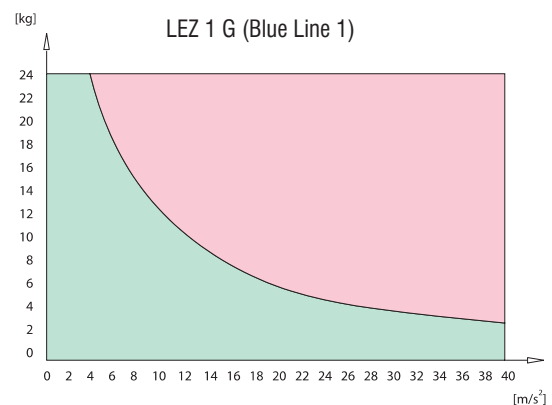
- Aluminium profile with midjet linear guide LFS-8-1
- Clearance-free feed with timing belt feed axis - timing belt with 3 mm pitch, width 15 mm
- Feed 2.4 m/s, at the most
- Shaft slide WS 1 L 126 x W 72 mm
- Repetitive accuracy less or equal  $\pm 0.2$  mm
- Limit and/or reference switch Accuracy  $< 0.1$  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

### Technical Data

Belt version.....	HTD 3M, width 15 mm
Mass of slide.....	0.730 kg
Weight without drive module.....	1,000 mm $\cong$ 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... $\varnothing$	15.28 mm
Moment of inertia of the synchronized pulleys...	$1.461 \cdot 10^{-6}$ kgm <sup>2</sup>
Feed per revolution.....	48 mm

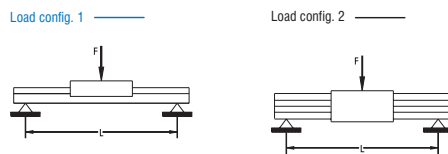
### Load Diagram

Permissible accelerated masses related to belt strength\*

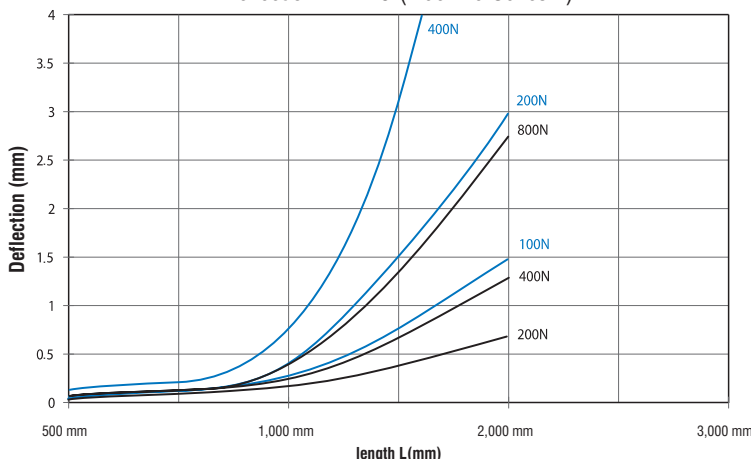


\*At vertical assembly, the acceleration due to gravity ( $g = 9.81$  m/s<sup>2</sup>) has to be taken into account

### Deflection



Deflection LEZ 1 G (BlueLine-Series 1)



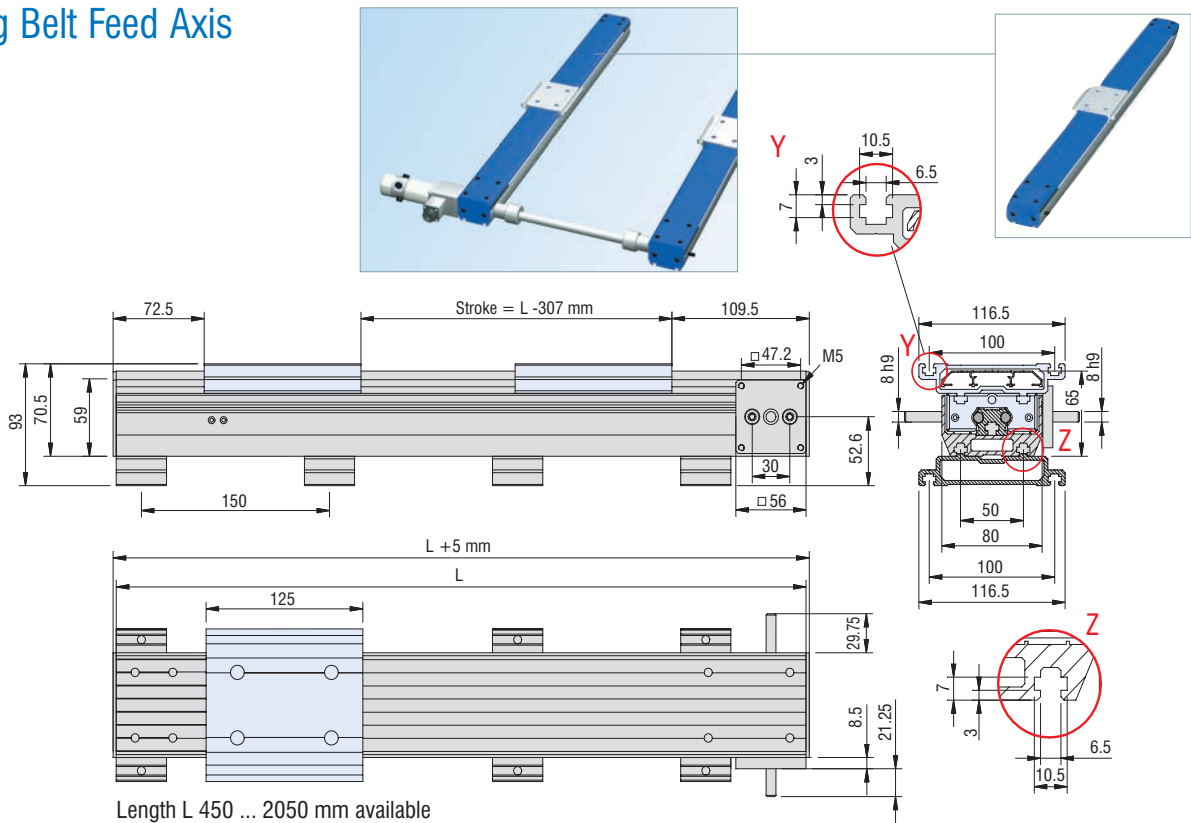
### Idle Torques

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

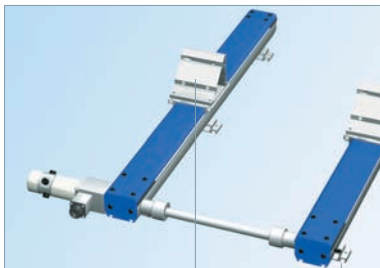
# Timing Belt Feed Axis

# LEZ 1 G (BlueLine-Series 1)

## Timing Belt Feed Axis



## Mounting Foot and Mounting Angle

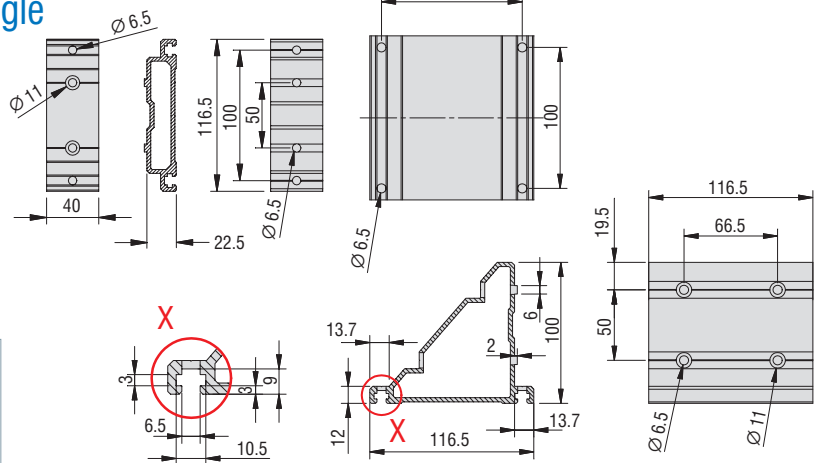


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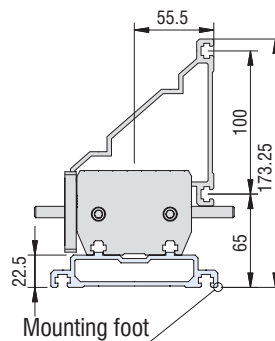
Item no.: 232199 0001

Mounting foot

Mounting bracket



## Mounting Angle as Angle Slide



# Timing Belt Feed Axis

# LEZ 1 G

(BlueLine-Series 1)

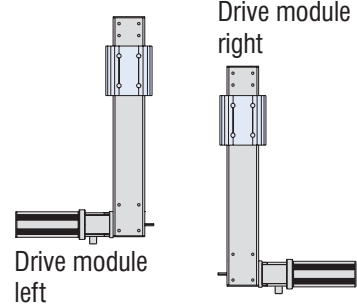
## Drive Modules

### DC Servo Motor MV 120

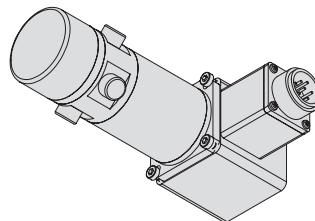
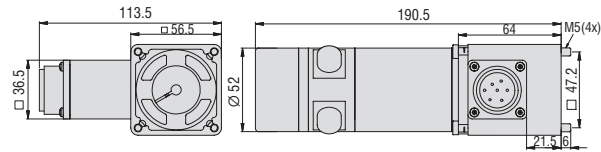
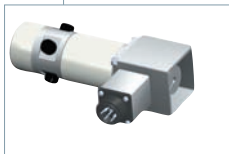
Nominal power.....120 W  
 Nominal speed.....3,000 rpm  
 Nominal torque.....38 Ncm  
 Current at nominal torque.....2.8 A  
 Nominal voltage.....65 V  
 Max. torque.....220 Ncm  
 Current at max. torque.....13 A  
 Ambient temperature.....0 - 40 °C

### Stepping Motor MS 160

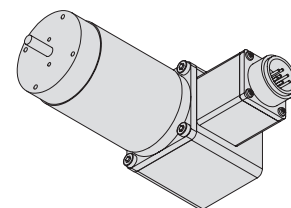
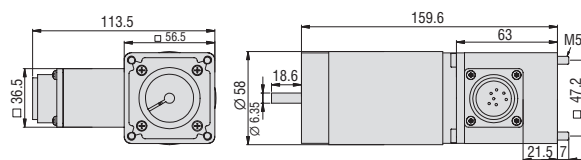
Holding torque – bipolar.....160 Ncm  
 Stepping angle, full step.....1.8 degree  
                                   half step.....0.9 degree  
 Nominal voltage – bipolar.....1.7 V  
 Resistance of winding.....1.2 Ω  
 Inductance of winding.....2.2 mH  
 Current of winding – bipolar...4.1 A



## Drive Module with DC Servo Motor MV 120



## Drive Module with Stepping Motor MS 160



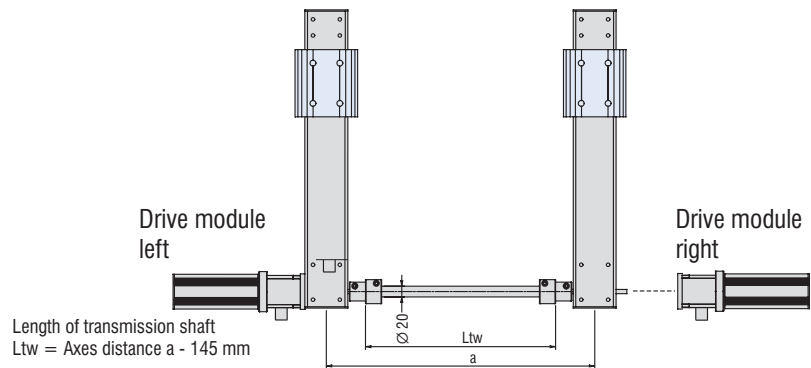
# Timing Belt Feed Axis

# LEZ 1 G

(BlueLine-Series 1)

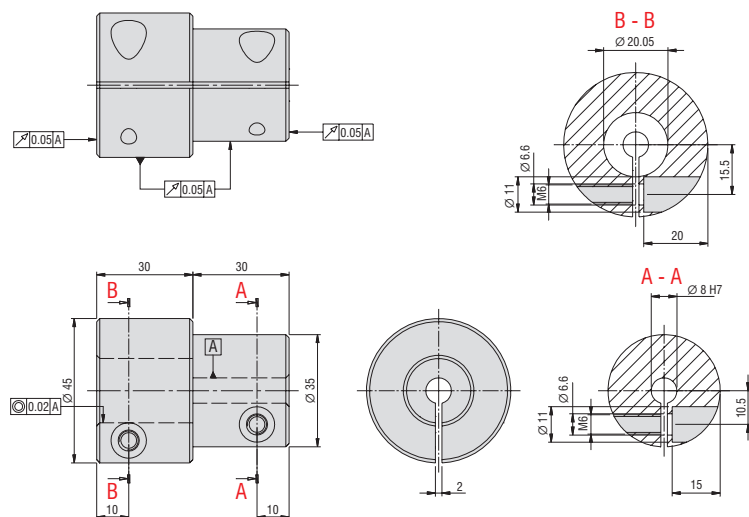
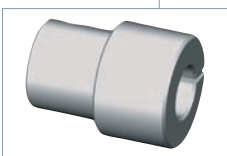
## Connection of two Timing Belt Feed Axes

### Transmission Shaft



## Connection of two Timing Belt Feed Axes

### Coupling for Transmission Shaft



## Moments of Inertia

### for Coupling and Transmission Shaft

#### Coupling

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

#### Transmission shaft (per 100 mm)

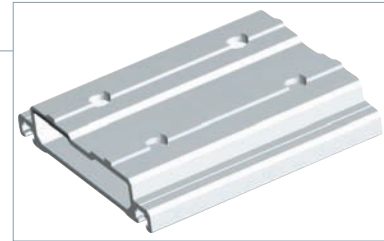
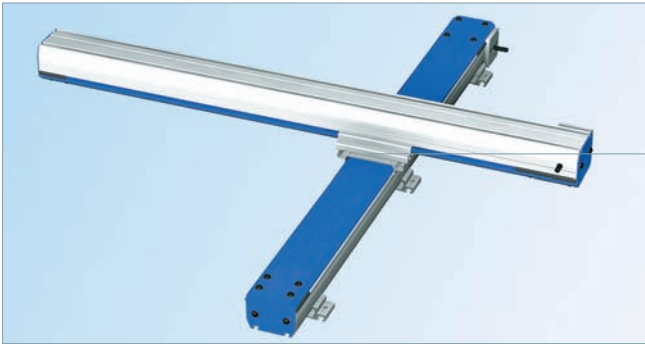
$$J_{Trs} = 2.513 \cdot 10^{-6} \text{ kgm}^2/100 \text{ mm}$$

# Timing Belt Feed Axis

## LEZ 1 G (BlueLine-Series 1)

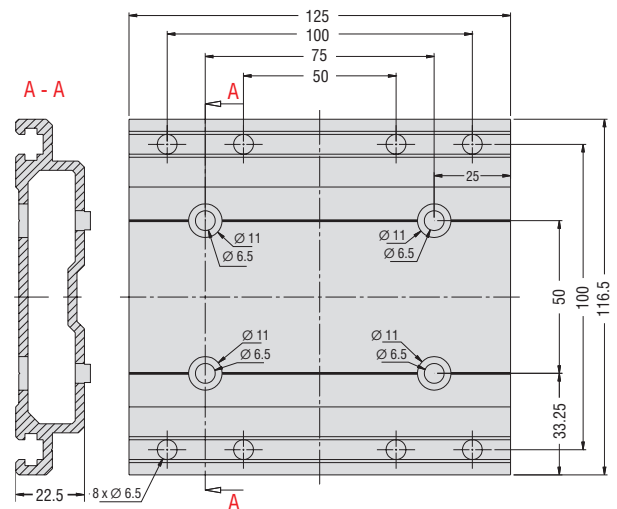
### Compound Table Construction

#### 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.



# Timing Belt Feed Axis

# LEZ 1 G

(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)

Travel = L -307 mm

## Order Samples



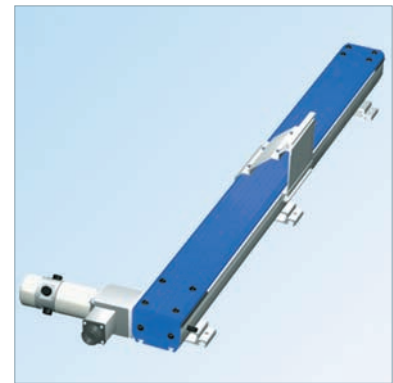
- without motor
- motor connection, left
- with standard slide profile
- basic profile length 750 mm

Item no.: **232101 0075**



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

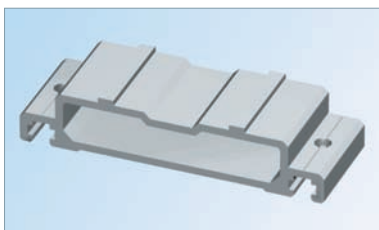
Item no.: **232111 0075**



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

Item no.: **232121 2075**

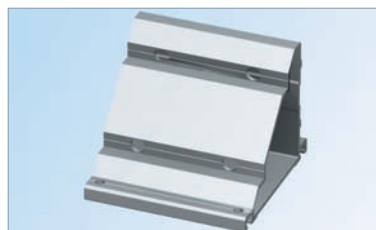
## Accessory



### Feet

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

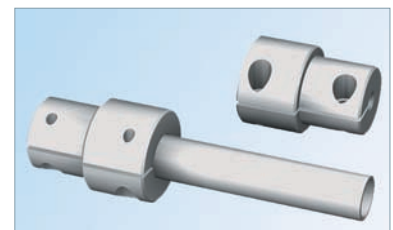
Item no.: **232199 0001**



### 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-Series 1

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

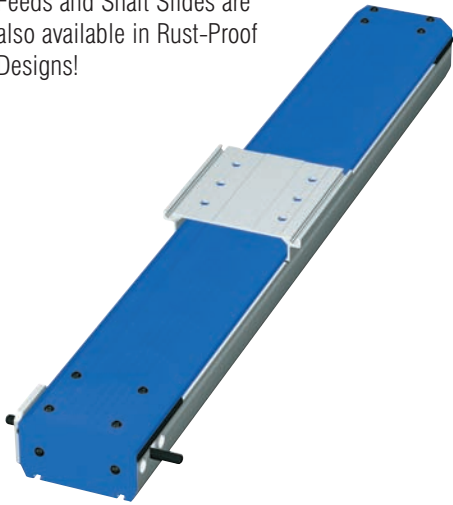
# Timing Belt Feed Axis

## Closed Timing Belt Feed Axis

# LEZ 3 G

## (BlueLine-Series 3)

Feeds and Shaft Slides are also available in Rust-Proof Designs!



### Features

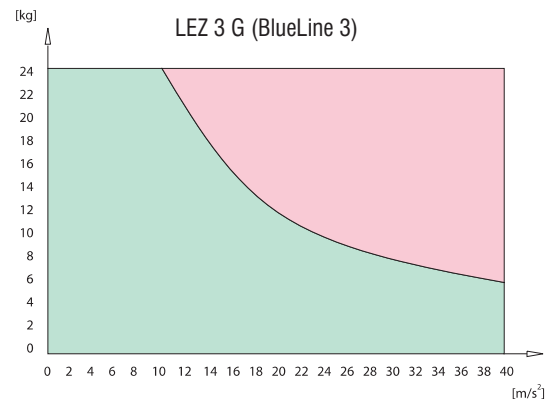
- Aluminium profile with midjet linear guide LFS-8-3
- Clearance-free feed with timing belt feed axis - timing belt with 5 mm pitch, width 25 mm
- Feed 5 m/s, at the most
- Shaft slide WS 3, L 176 x W 130 mm
- Repeatability less or equal  $\pm 0.2$  mm
- Limit and/or reference switch, accuracy  $< 0.1$  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

### Technical Data

Belt version..... HTD 5M, width 25 mm  
 Mass of slide..... 1.753 kg  
 Weight without drive module..... 1,000 mm  $\hat{=}$  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..  $\varnothing$  22.28 mm  
 Moment of inertia of the synchronized pulleys..  $8.542 \cdot 10^{-5}$  kgm<sup>2</sup>  
 Feed per revolution..... 70 mm

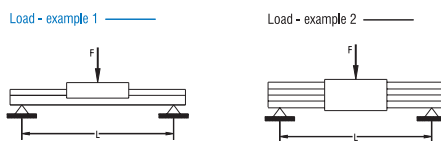
### Load Diagram

Permissible accelerated masses related to belt strength\*

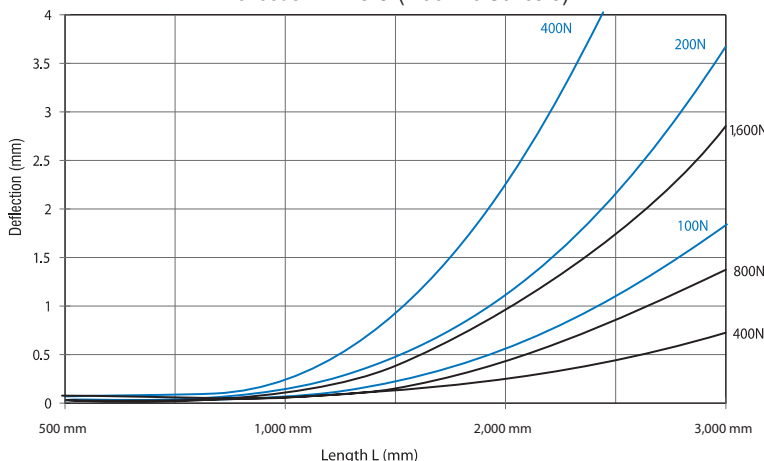


\* At vertical assembly, the acceleration due to gravity ( $g = 9.81$  m/s<sup>2</sup>) has to be taken into account

### Deflection



Deflection LEZ 3 G (BlueLine Series 3)



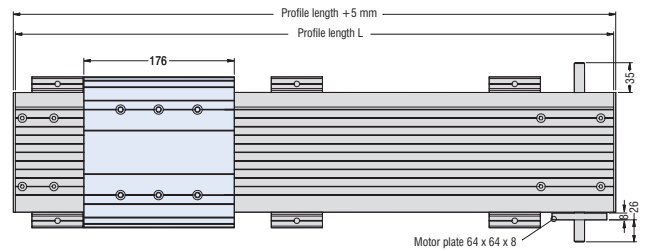
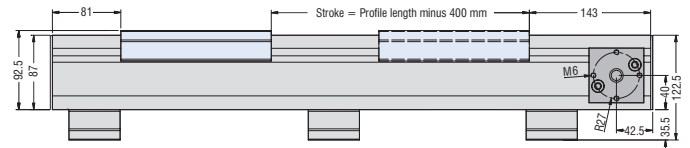
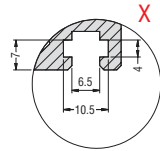
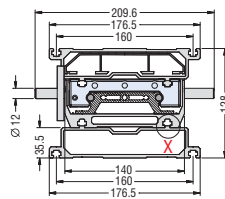
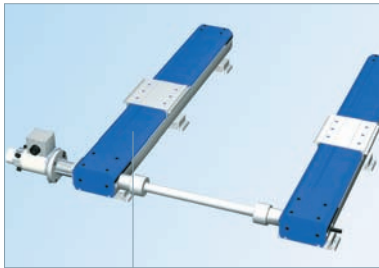
### Idle Torques

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

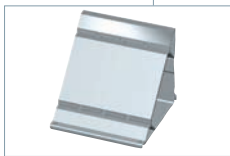
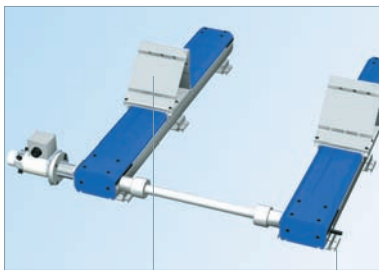
# Timing Belt Feed Axis

# LEZ 3 G (BlueLine-Series 3)

## Timing Belt Feed Axis

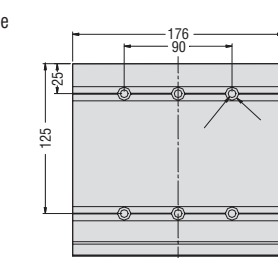
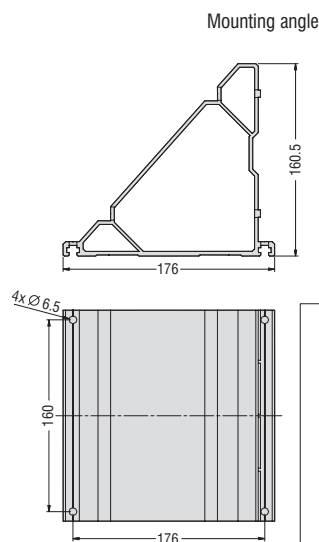


## Mounting Foot and Mounting Angle

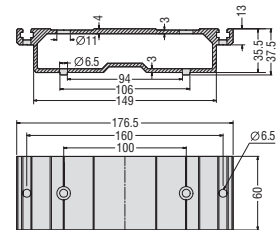


Item no.: 232399 0002

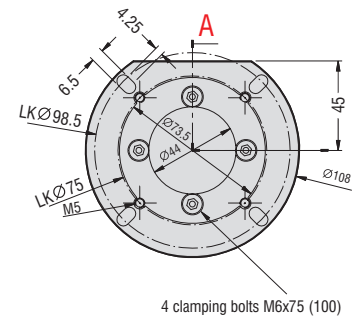
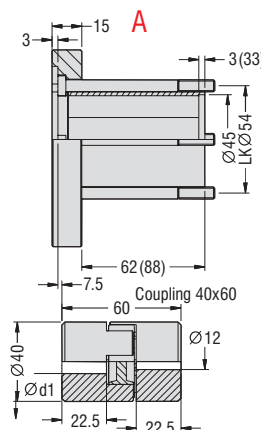
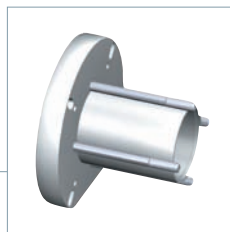
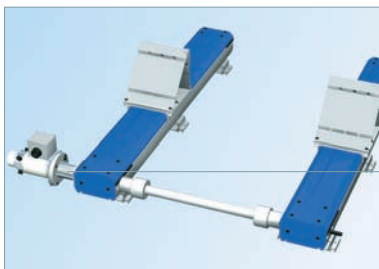
Item no.: 232399 0001



Mounting foot



## Coupling Casing set 2



Measure in brackets refer to dimensions with distance sleeve 2  
d1 = motor shaft diameter 9.52 mm or 11 mm

# Timing Belt Feed Axis

## LEZ 3 G (BlueLine-Series 3)

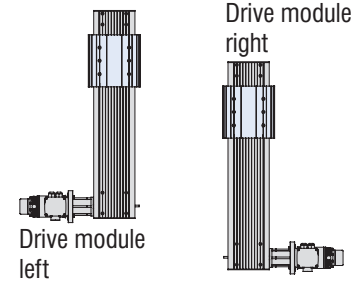
### Drive Modules

#### Stepping Motor MS 430 HT

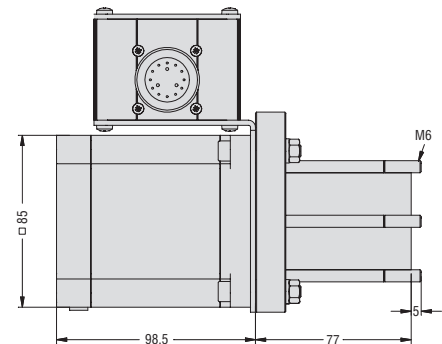
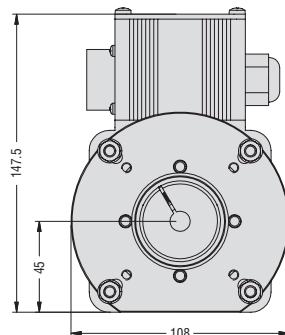
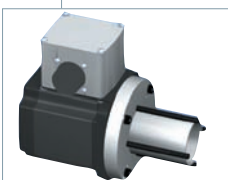
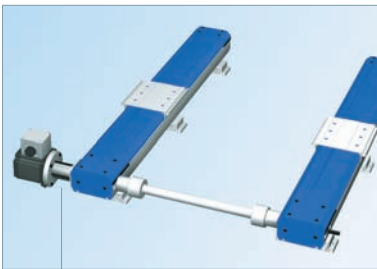
Holding torque – bipolar.....	600 Ncm
Stepping angle, full step.....	1.8 deg
half step.....	0.9 deg
Nominal voltage – bipolar.....	2.8 V
Resistance of winding.....	0.66 $\Omega$
Inductance of winding.....	2.5 mH
Current of winding – bipolar....	5.9 A

#### DC Servo Motor MV 300

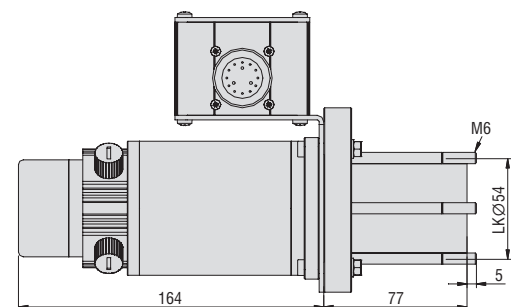
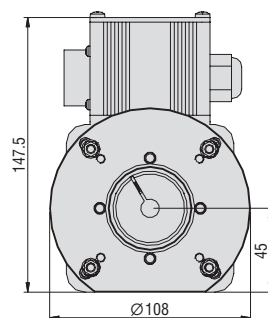
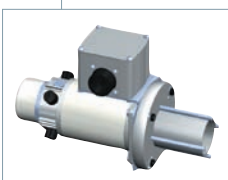
Nominal power.....	300 W
Nominal speed.....	2,500 rpm
Nominal torque.....	1,20 Nm
Nominal current.....	5.1 A
Nominal voltage.....	75 V
Peak torque.....	3,60 Nm
Current at peak torque.....	15,3 A
Ambient temperature.....	0 - 40 °C



### Drive Module with Stepping Motor MS 430 HT



### Drive Module with DC Servo Motor MV 300

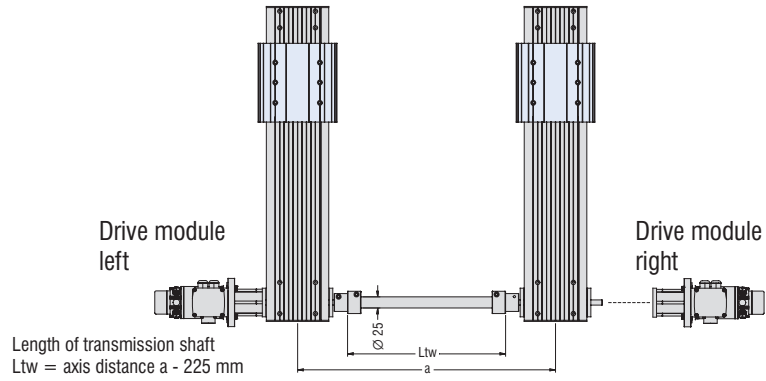
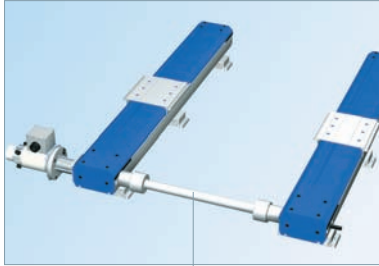


# Timing Belt Feed Axis

# LEZ 3 G (BlueLine-Series 3)

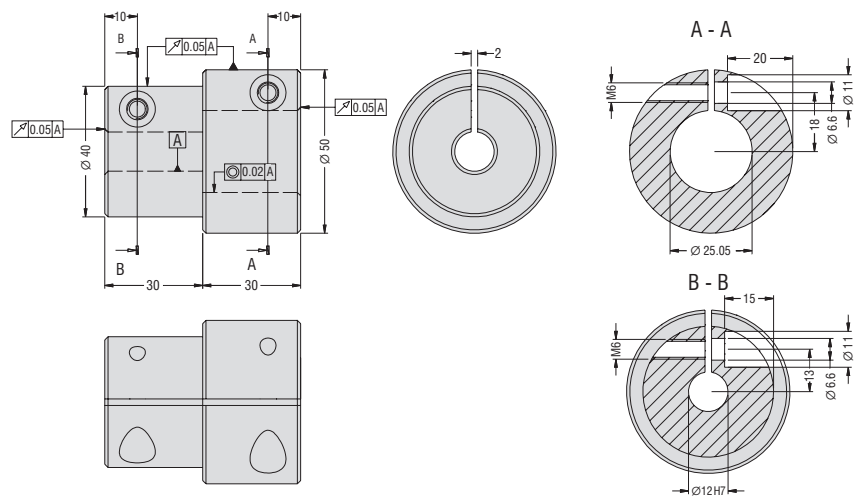
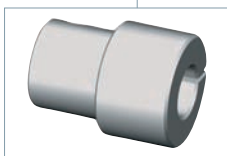
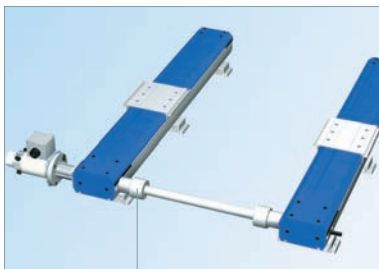
## Connection of two Timing Belt Feed Axes

### Transmission Shaft



## Connection of two Timing Belt Feed Axes

### Coupling for Transmission Shaft



# Timing Belt Feed Axis

## LEZ 3 G (BlueLine-Series 3)

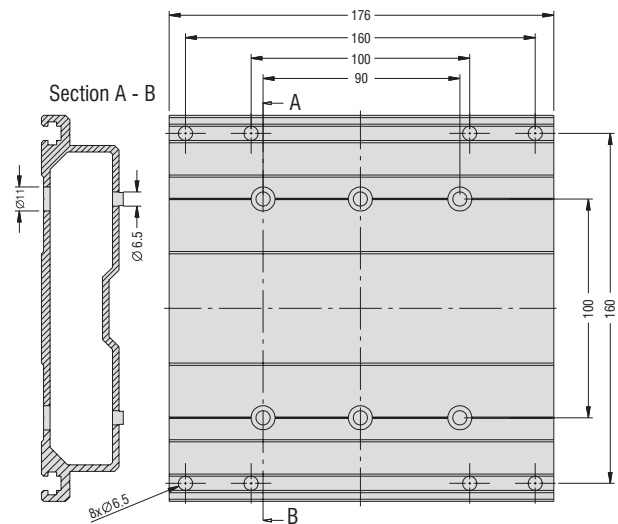
### Compound Table Construction

#### 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.



### Moments of Inertia

for Coupling and Transmission Shaft

Coupling

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

Transmission Shaft (per 100 mm)

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

# Timing Belt Feed Axis

## Order Key

232 30X XXXX

### Driving Side

- 0 = motor connection, right
- 1 = motor connection, left

Travel = L -400 mm

### 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\*

Stepping motor MS 430 HT  
DC servo motor MV 330

### Drive on the right Side Drive on the left Side

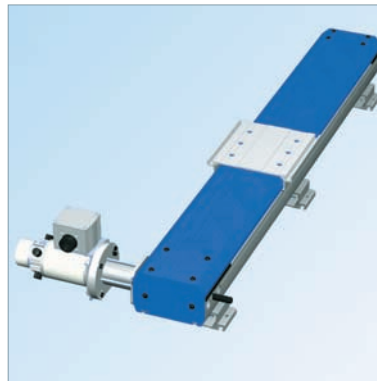
Item no. 396085 0193 396104 0093  
Item no. 396085 0093 396104 0020

\* 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

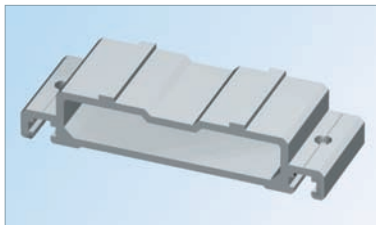


- with stepping motor MS 430 HT
  - motor connection, left
  - with standard slide profile
  - basic profile length 800 mm
- Item no.: **232301 0075** (feed)  
Item no.: **396085 0020** (drive)



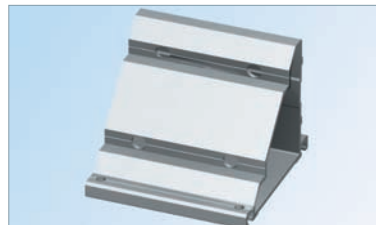
- with DC servo motor MV 330
  - motor connection, left
  - with angle bracket, right
  - basic profile length 800 mm
- Item no.: **232301 0075** (feed)  
Item no.: **396104 0020** (drive)

## Accessory



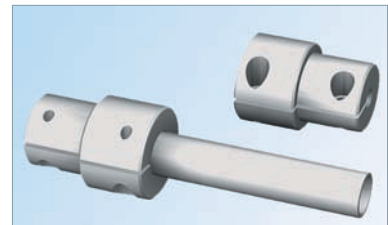
### Feet

- for LEZ 3G
  - 176.5 x 60 x 35.5 mm
  - packing unit: 2 pieces
- Item no.: **232399 0001**



### Angl brackets

- incl. fastening
  - for LEZ 3G
- Item no.: **232399 0002**



### Coupling for transmission shaft

- for LEZ 3G
  - packing unit: 2 couplings
- Item no.: **218050 0002**

### Transmission shaft Ø 25 mm

- for LEZ 3G
- Length 1 m Item no.: **219001 0125**  
Length 2 m Item no.: **219001 0225**

# Timing Belt Feed Axis

(Open Timing Belt Feed Axis)

# LEZ 1

(ZF 1)

Feeds and Shaft Slides are also available in Rust-Proof Designs!



- Option: Special length in steps of 100 mm on request, max. 6000 mm
- Connection about integrated thread rails M6, in steps of 50 mm

## Features

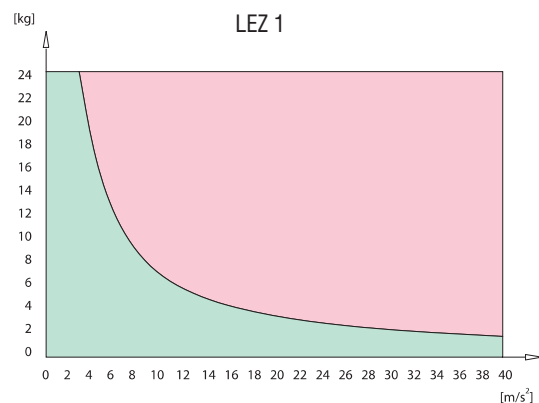
- Aluminium profile with midget linear guide LFS-8-2
- Clearance-free feed with timing belt feed axis
  - timing belt with 3 mm pitch, width 9 mm
- Feed per revolution: 60 mm
- Repeatability less or equal  $\pm 0.2$  mm
- Feed 1.5 m/s, at the most
- Limit and/or reference switch accuracy  $< 0.1$  mm (with drive modules)

## Technical Data

Belt version.....	HTD 3M, width 9 mm
Weight of slide.....	0.430 kg
Weight without drive module.....	1000 mm $\cong$ 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..	$\varnothing 19.10$ mm
Moment of inertia of the synchronized pulleys..	$5.585 \cdot 10^{-7}$ kgm <sup>2</sup>
Feed per revolution.....	60 mm

## Load Diagram

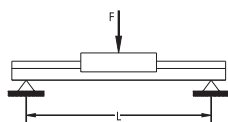
Permissible accelerated masses related to belt strength\*



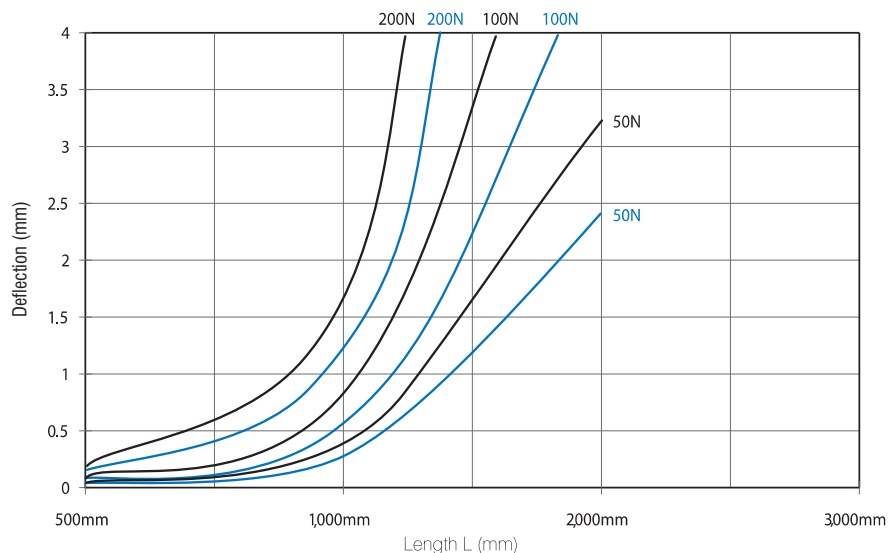
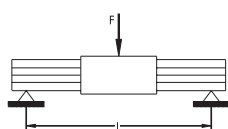
## Deflection

Deflection Timing Belt Feed Axis LEZ 1

Load - example 1



Load - example 2

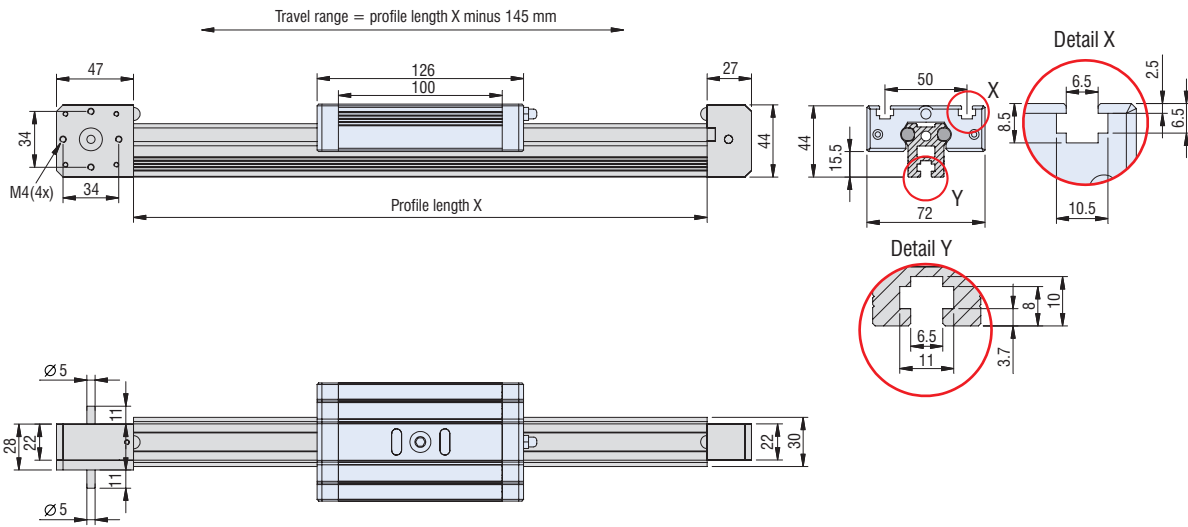
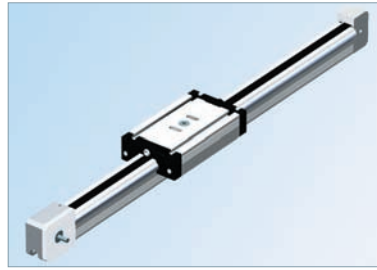


# Timing Belt Feed Axis

# LEZ 1 (ZF 1)

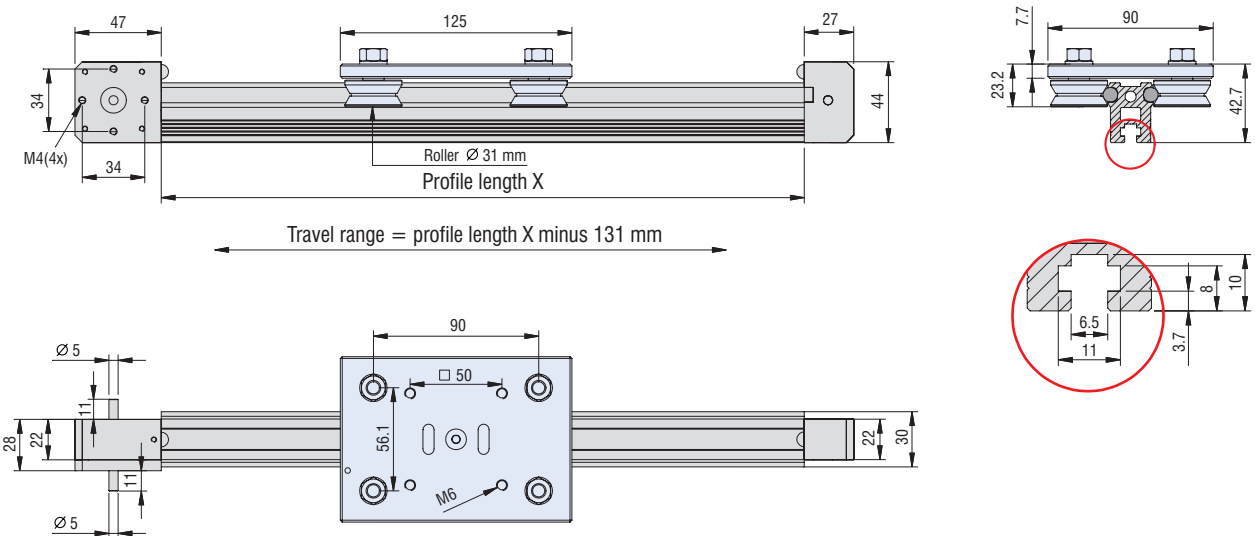
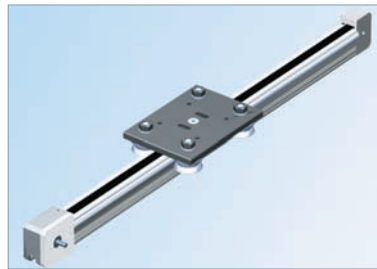
## Timing Belt Feed Axis

without Motor  
with Shaft Slide



## Timing Belt Feed Axis

without Motor  
with Carriage



# Timing Belt Feed Axis

# LEZ 1 (ZF 1)

## Drive Modules

### Stepping Motor MS 050 HT

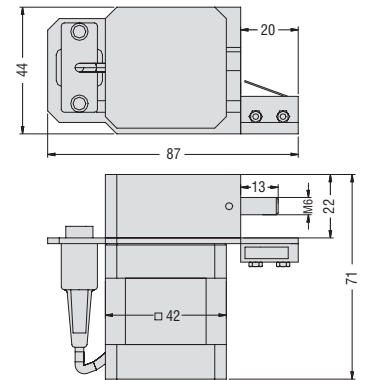
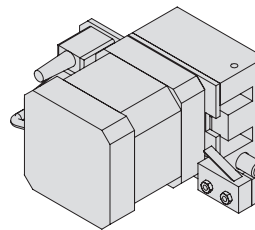
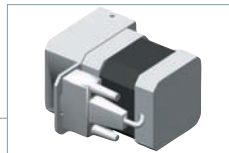
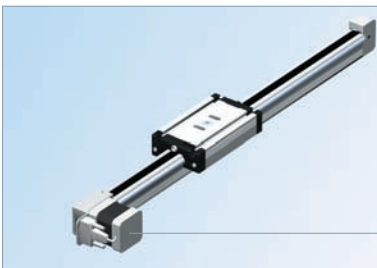
Holding torque - bipolar..... 50 Ncm  
 Stepping angle, full step..... 1.8 deg  
 Stepping angle, half step..... 0.9 deg  
 Nominal voltage – bipolar ..... 3.2 V  
 Resistance of winding..... 1.1 Ω  
 Inductance of winding..... 1.85 mH  
 Current of winding - bipolar..... 1.8 A

### 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

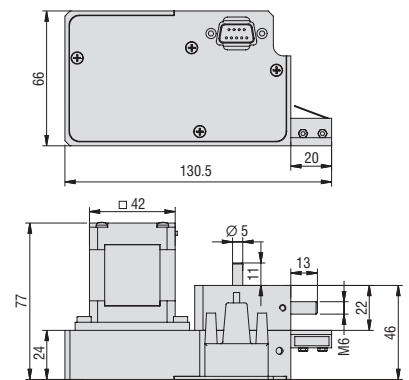
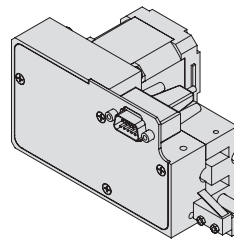
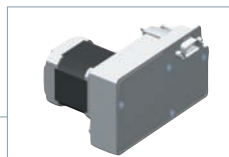
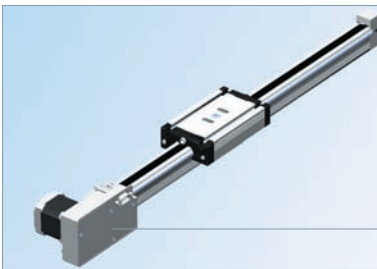
## Drive Module with Stepping Motor MS 050 HT (Ratio 1:1)

Feed: 60 mm/Revolution



## Drive Module with Stepping Motor MS 050 HT (Ratio 2:1)

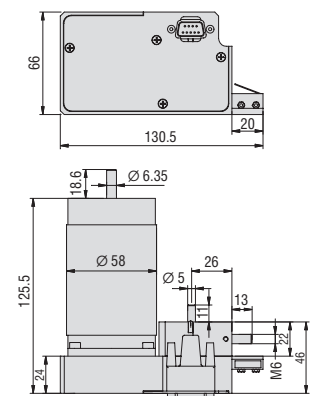
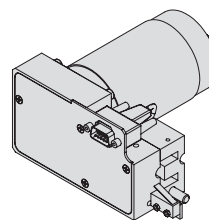
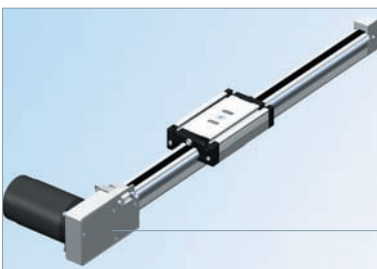
Feed: 30 mm/Revolution



## 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

# LEZ 1

(ZF 1)

## Order Key

232 005 XXXX

### Drives, Slides, Carriages

0 = stepping motor MS 050 HT	(ratio 1:1)	with shaft slide
1 = stepping motor MS 050 HT	(ratio 1:1)	with carriage
2 = stepping motor MS 050 HT	(ratio 2:1)	with shaft slide
3 = stepping motor MS 050 HT	(ratio 2:1)	with carriage
4 = stepping motor MS 160	(ratio 2:1)	with shaft slide
5 = stepping motor MS 160	(ratio 2:1)	with carriage
6 = DC servo motor MV 120	(ratio 1:1)	with shaft slide
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

### Profile Lengths MLF 2 (mm)

298, 398, 498, 598, 675,  
698, 798, 998, 1498, 1798,  
1998, 2498, 2998

(e. g. 398 mm = 040  
675 mm = 068)

Options: up to 6,000 mm

## 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**

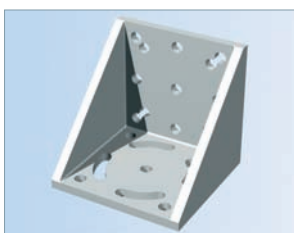


- with stepping motor MS 160\*
- ratio 2:1
- with shaft slide
- profile length 675 mm

Item no.: **232005 4068**

\* Set-up of motor according to picture

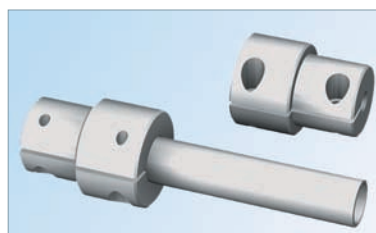
## Accessory



### Angle Brackets

- for LEZ 1

Item no.: **209110 0010**



### Coupling 20/30

- for LEZ 1
- 1 packaging unit = 1 coupling

Item no.: **218001 5080**

### Aluminum Bearing Carriage WS 1/70

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

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

### Limit switch set

- Option: second limit switch
- for LEZ 1

Item no.: **632125 0002**

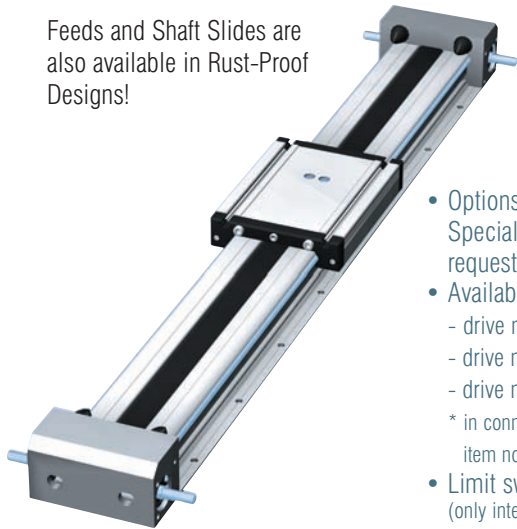
# Timing Belt Feed Axis

(Open Timing Belt Feed Axis)

# LEZ 2

(ZF 2)

Feeds and Shaft Slides are also available in Rust-Proof Designs!



- 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 300\*
  - 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)

## Features

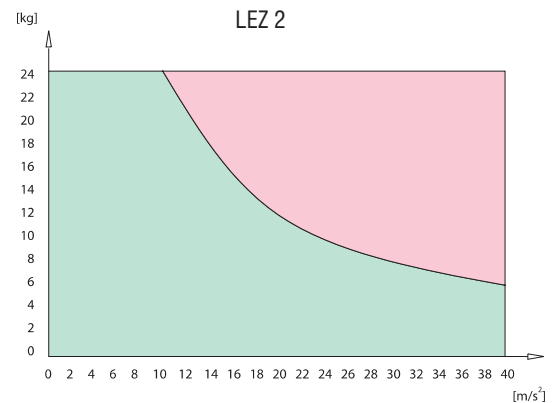
- Aluminium profile with midjet linear guide LFS-8-5
- Clearance-free feed with timing belt feed axis
  - timing belt with 5 mm pitch, width 25 mm
- Feed 5 m/s, at the most
- Shaft slide WS 3, L 176 x W 130 mm
- Feed per revolution: 70 mm
- Repeatability less or equal  $\pm 0.2$  mm
- Limit and/or reference 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

## Technical Data

Belt version..... HTD 5M, width 25 mm  
 Weight of slide.....0.430 kg  
 Weight without drive module.....1,000 mm  $\cong$  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..  $\varnothing$  22.28 mm  
 Moment of inertia of the synchronized pulleys..  $5.58 \cdot 10^{-6}$  kgm<sup>2</sup>  
 Feed per revolution.....70 mm

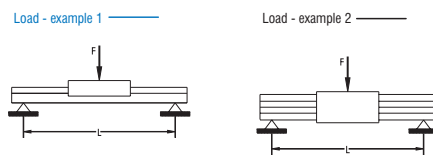
## Load Diagramm

Permissible accelerated masses related to belt strength\*

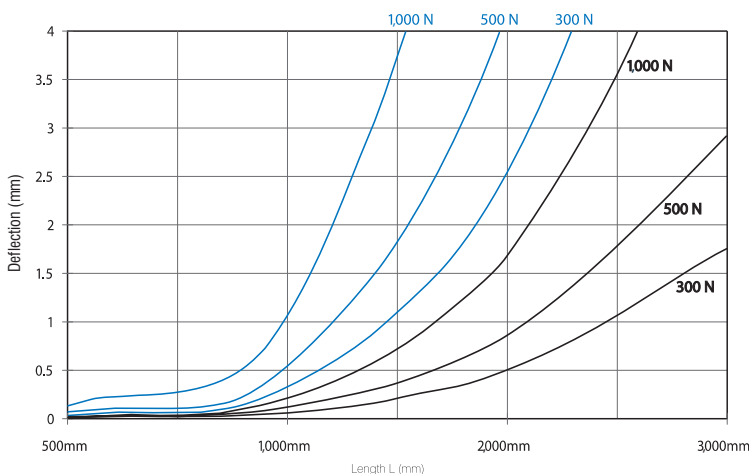


\* At vertical assembly, the acceleration due to gravity ( $g = 9.81 \text{ m/s}^2$ ) has to be taken into account

## Deflection



Deflection Timing Belt Feed Axis LEZ 2



## Idle Torques

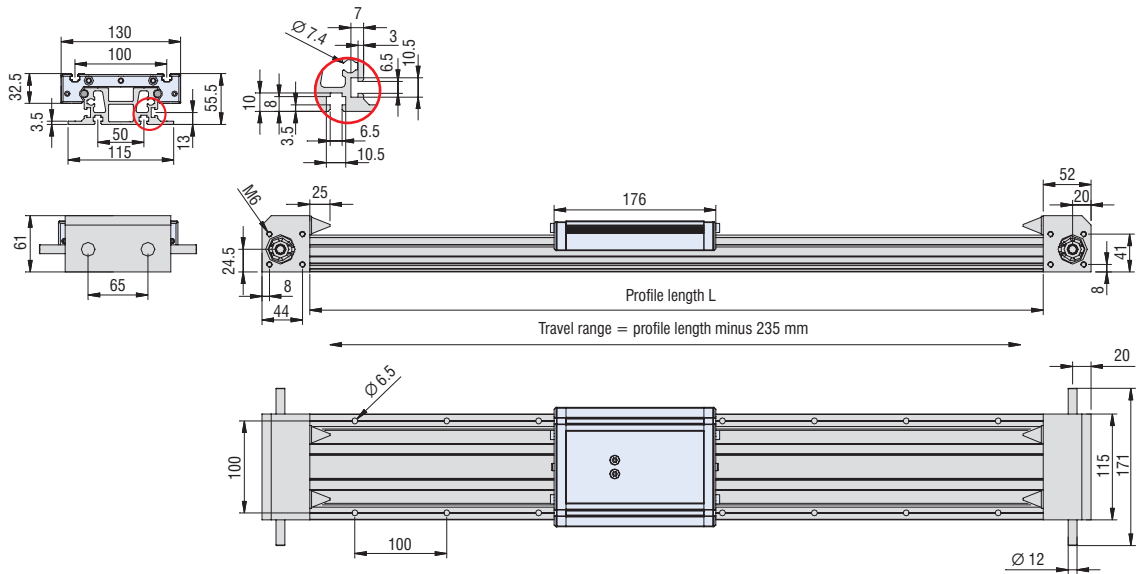
Speed [1/min]	Idle torque [Nm]
500	0.16
1,500	0.24
3,000	0.36

# Timing Belt Feed Axis

# LEZ 2 (ZF 2)

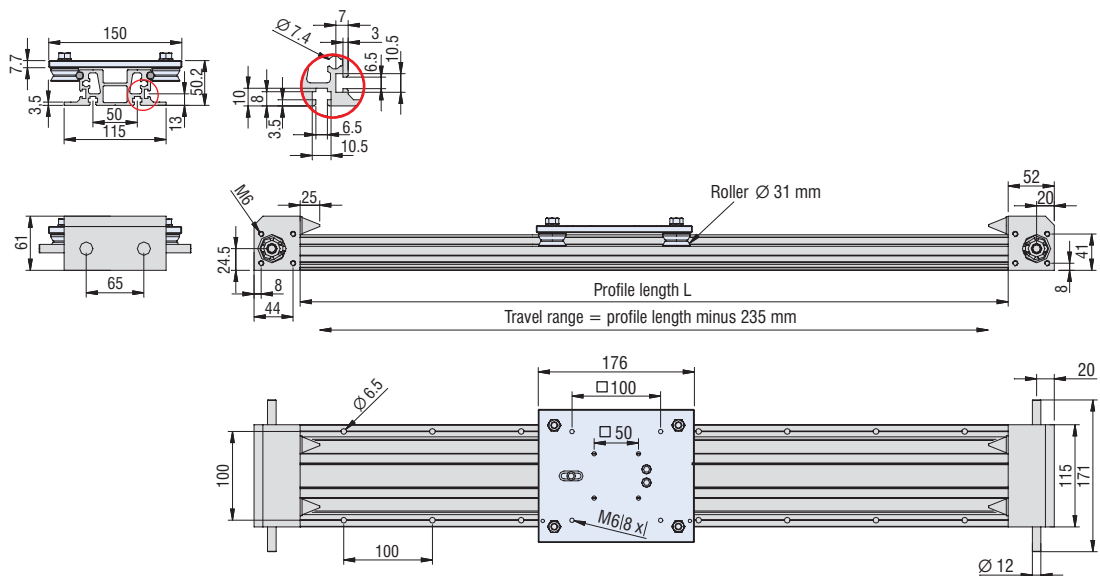
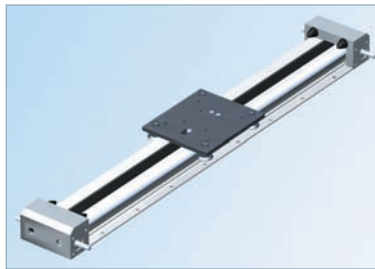
## Timing Belt Feed Axis

without Motor  
with Shaft Slide



## Timing Belt Feed Axis

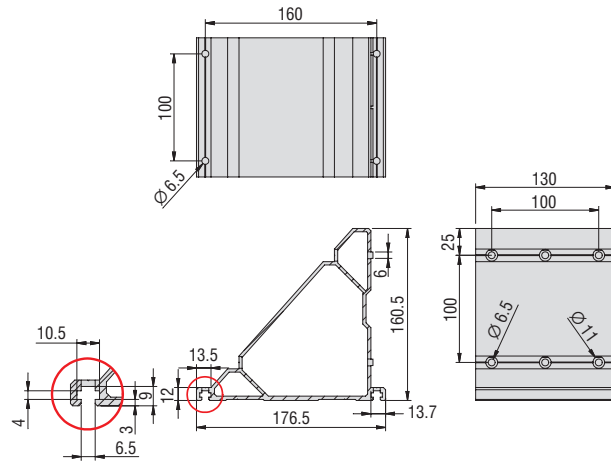
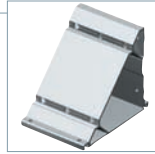
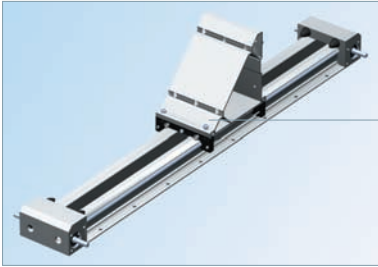
without Motor  
with Carriage



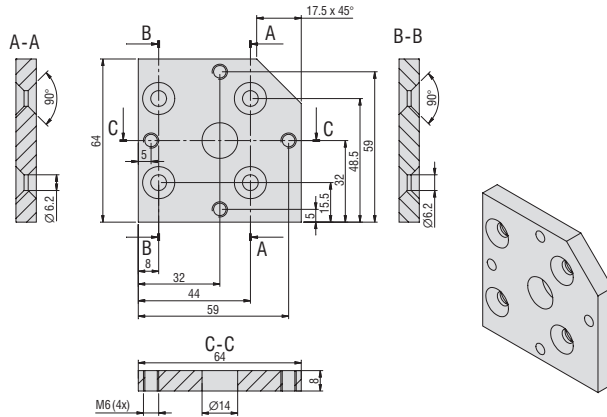
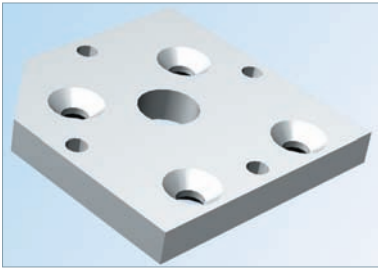
# Timing Belt Feed Axis

# LEZ 2 (ZF 2)

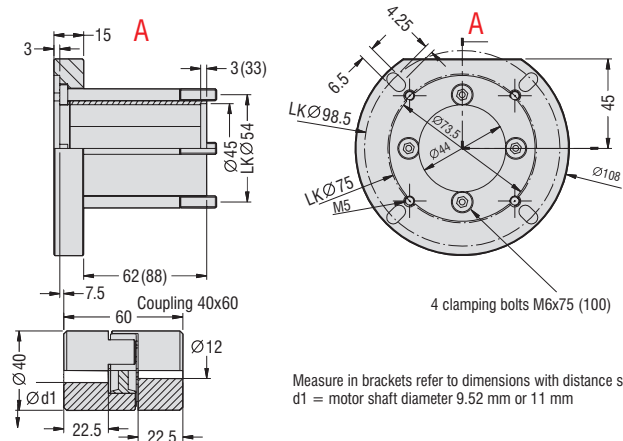
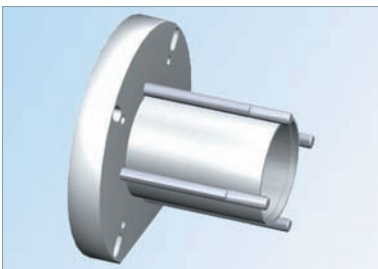
## Mounting Angle



## Motor Mounting Plate (Option)



## Coupling Casing Set 2



Measure in brackets refer to dimensions with distance sleeve 2  
d1 = motor shaft diameter 9.52 mm or 11 mm

## 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 300

- 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

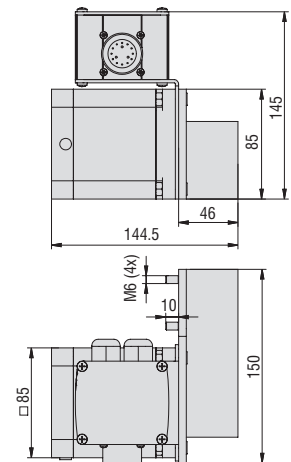
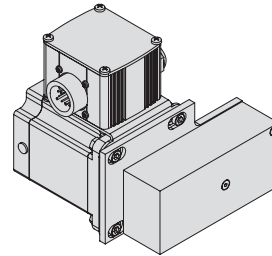
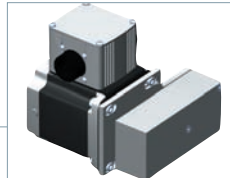
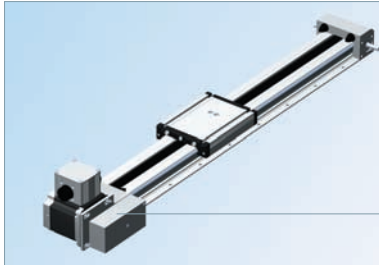
# Timing Belt Feed Axis

## LEZ 2 (ZF 2)

### Drive Module with Stepping Motor MS 430 HT

(Reduction 2:1)

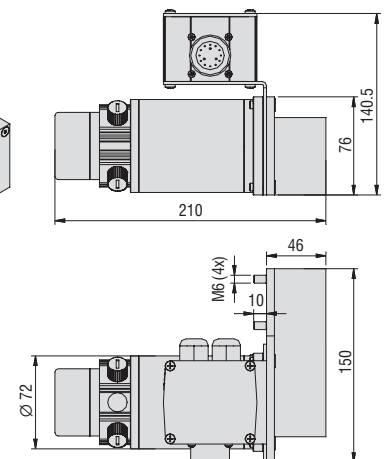
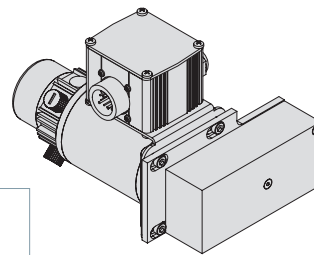
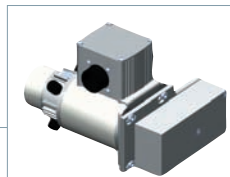
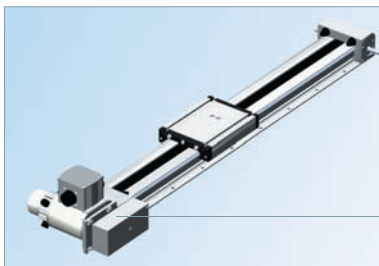
Feed: 35 mm/Revolution



### Drive Module with DC Servo Motor MV 300

(Reduction 2:1)

Feed: 35 mm/Revolution



# Timing Belt Feed Axis

## LEZ 2 (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**

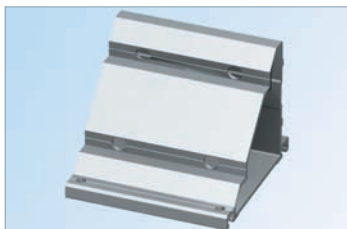
### Accessory



#### Motor Mounting Plate

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

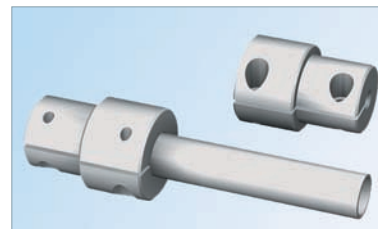
Item no.: **232199 0004**



#### 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

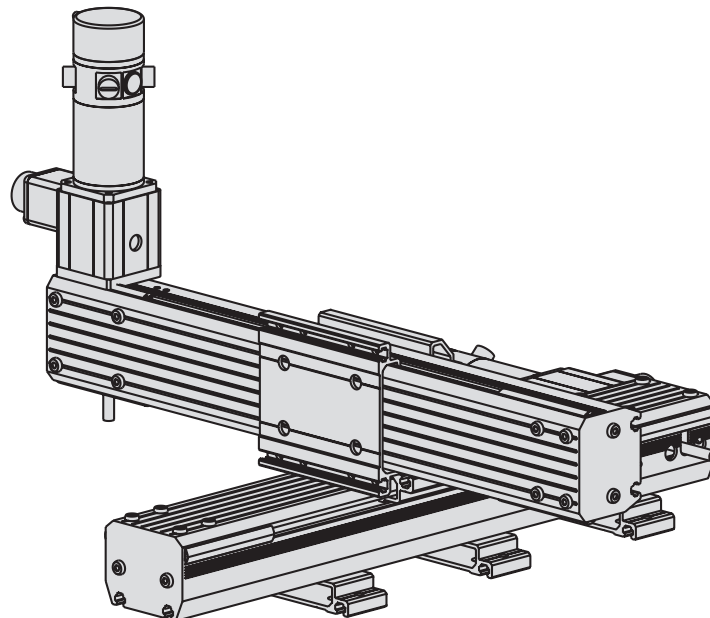
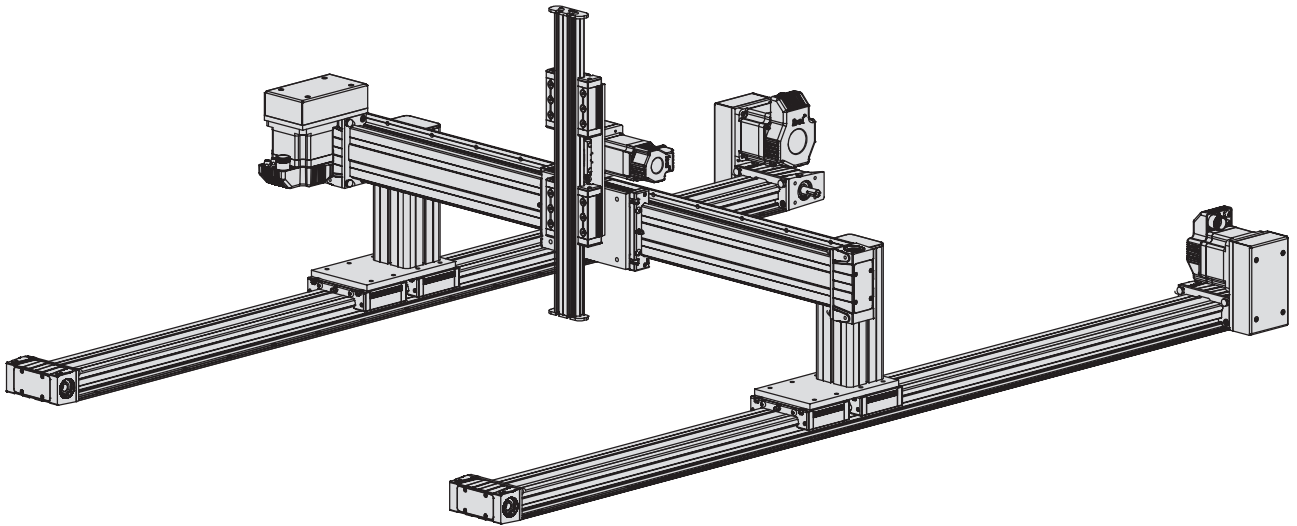
- for ZF 2

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

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

# Timing Belt Feed Axis

## Combination Samples



# Timing Belt Feed Axis

(Open Timing Belt Feed Axis)

# LEZ 3

(ZF 3)

Feeds and Shaft Slides are also available in Rust-Proof Designs!



- 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)

## Features

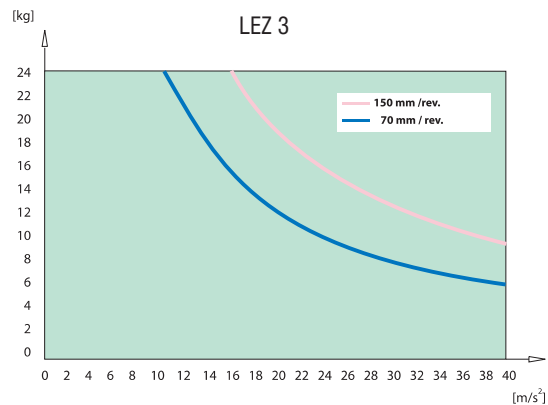
- Aluminium profile with midget linear guide LFS-8-4
- Clearance-free feed with timing belt feed axis
  - timing belt with 5 mm pitch, width 25 mm
- Feed 5 m/s, at the most
- Shaft slide WS 3, L 176 x W 130 mm
- Feed per revolution: 70 mm or 150 mm
- Repeatability lower or equal  $\pm 0.2$  mm
- Limit 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

## Technical Data

Belt version.....	HTD 5M, width 25 mm
Weight of slide.....	0.940 kg
Weight without drive module.....	1,000 mm $\hat{=}$ 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.....	$5.58 \times 10^{-6}$ kgm <sup>2</sup>
Feed 150 mm/revolution.....	$1.796 \times 10^{-4}$ kgm <sup>2</sup>

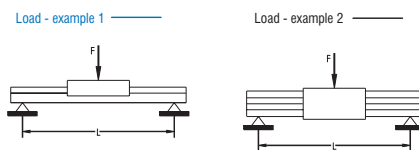
## Load Diagram

Permissible accelerated masses related to belt strength\*

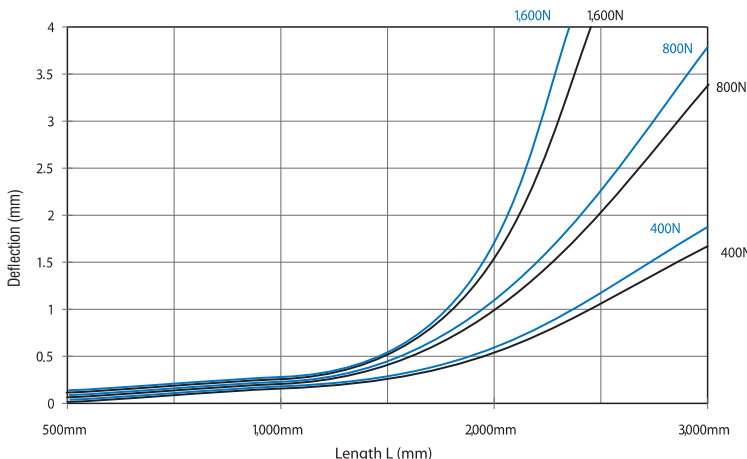


\* At vertical assembly, the acceleration due to gravity ( $g = 9.81 \text{ m/s}^2$ ) has to be taken into account

## Deflection



Deflection Timing Belt Feed Axis LEZ 3



## Idle Torques

### 70 mm/revolution

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

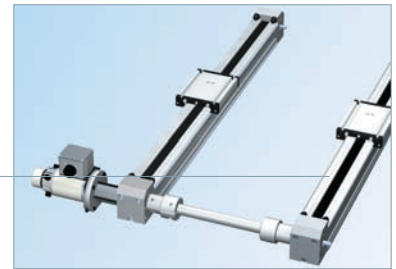
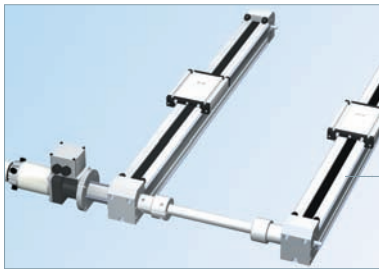
### 150 mm / Revolution

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

# Timing Belt Feed Axis

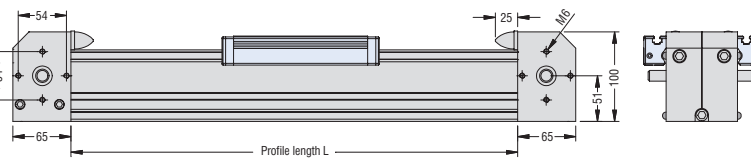
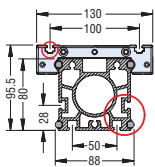
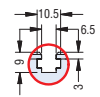
# LEZ 3 (ZF 3)

## Timing Belt Feed Axis with Shaft Slide

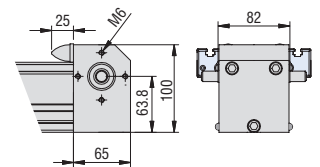


Feed: 150 mm / Revolution  
70 mm / Revolution

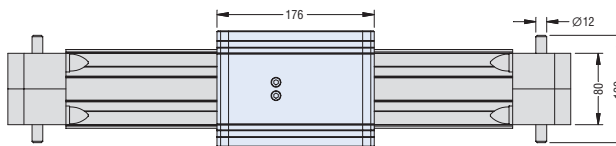
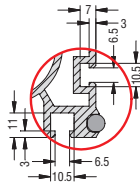
Feed: 70 mm / Revolution



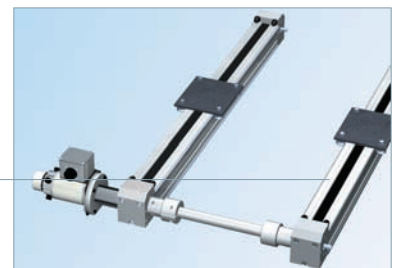
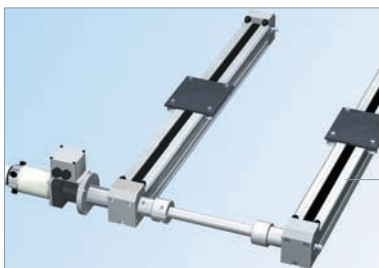
Feed: 70 mm / Revolution



Travel range = profile length L minus 235 mm

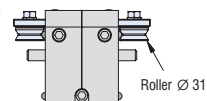
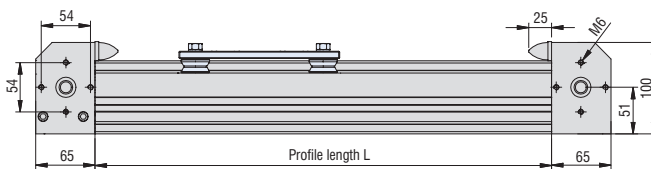
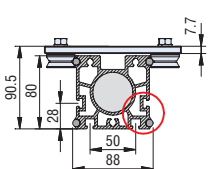


## Timing Belt Feed Axis with Carriage



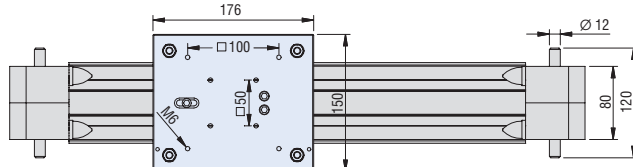
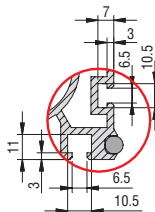
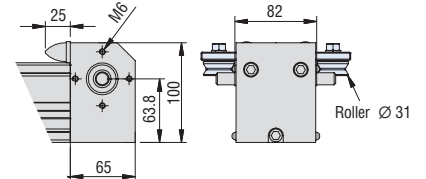
Feed: 150 mm / Revolution  
70 mm / Revolution

Feed: 70 mm / Revolution



Travel range = profile length L minus 235

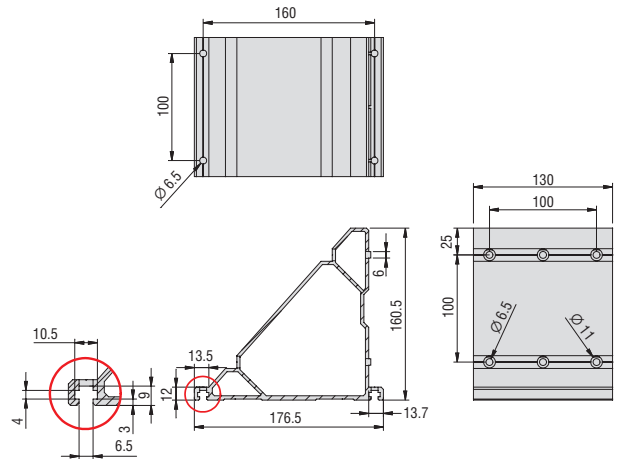
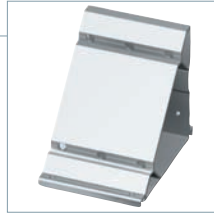
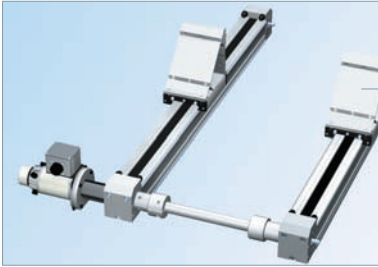
Feed: 70 mm / Revolution



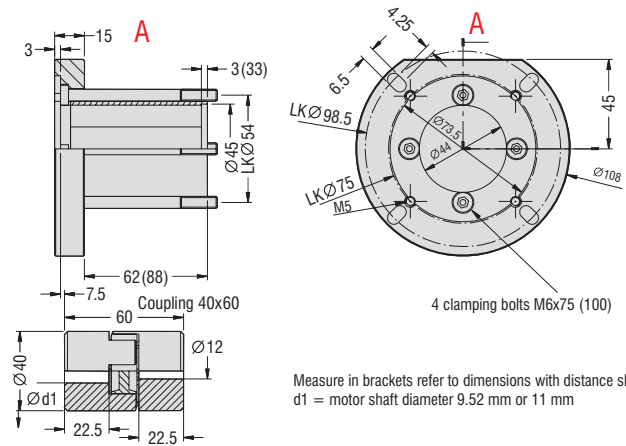
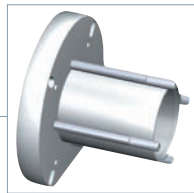
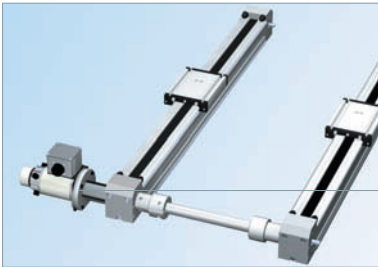
# Timing Belt Feed Axis

## LEZ 3 (ZF 3)

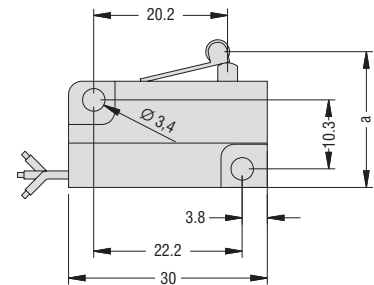
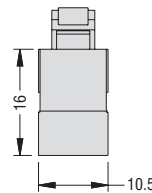
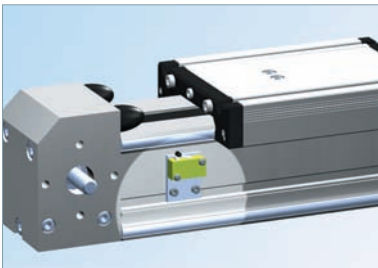
### Mounting Angle



### Coupling Casing Set 2



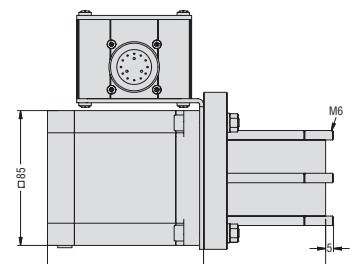
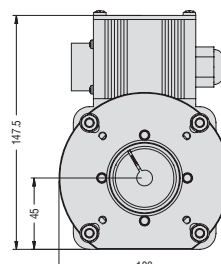
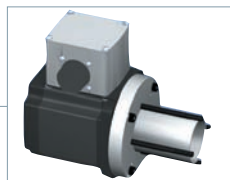
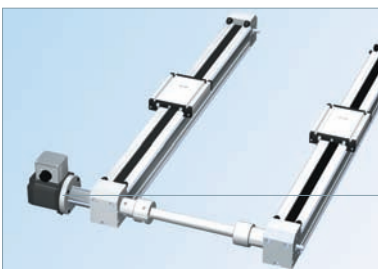
### Limit Switch



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)

### Drive Module with Stepper Motor MS-430 HT

Feed: 70 mm / rev.



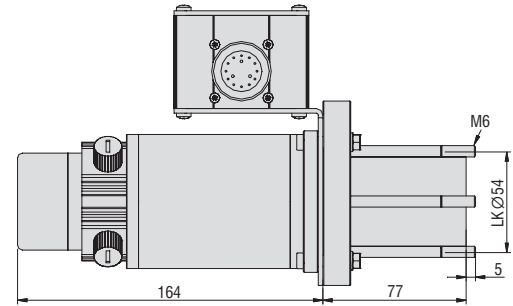
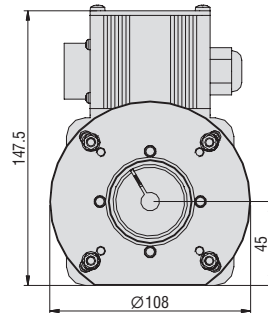
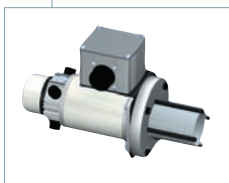
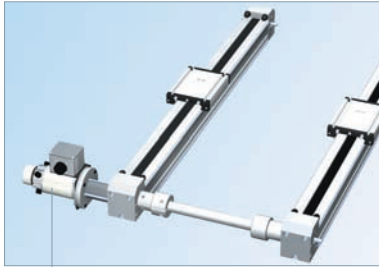
# Timing Belt Feed Axis

# LEZ 3

(ZF 3)

## Drive Module with DC Servo Motor MV 300

Feed: 70 mm/Revolution



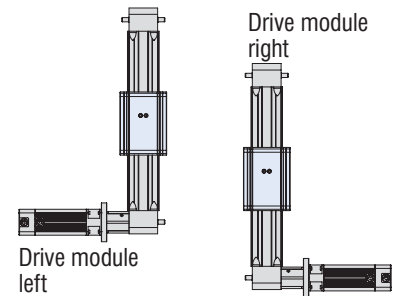
## Drive Modules

### 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 W  
 Winding inductivity..... 2.5 mH  
 Current of winding – bipolar...5.9 A

### DC Servo Motor MV 300

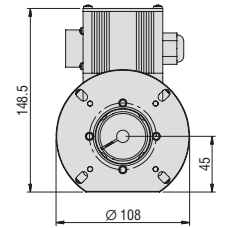
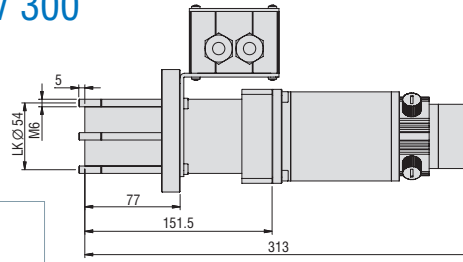
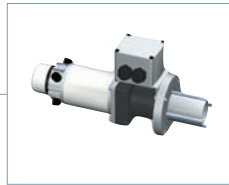
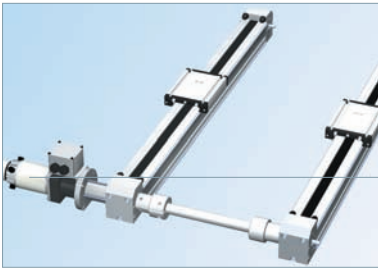
Nominal power..... 300 W  
 Nominal speed..... 2,500 rpm  
 Nominal torque..... 1,20 Nm  
 Nominal Current ..... 5.1 A  
 Nominal voltage..... 75 V  
 Peak torque..... 3,60 Nm  
 Current at peak torque..... 15,3 A  
 Ambient temperature..... 0 - 40 °C



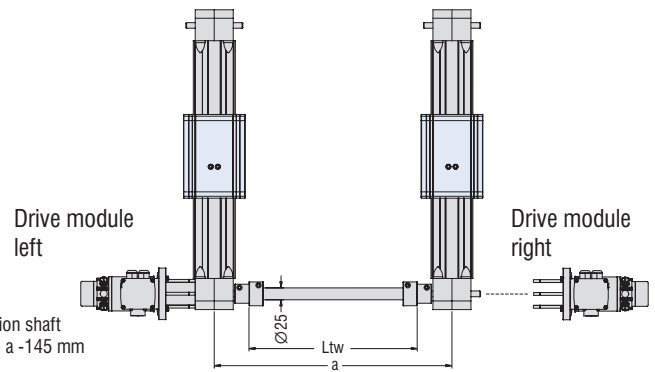
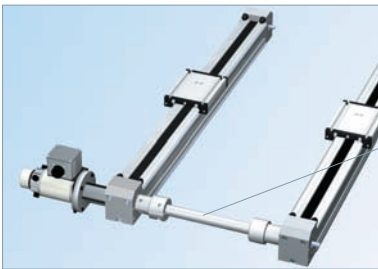
# Timing Belt Feed Axis

# LEZ 3 (ZF 3)

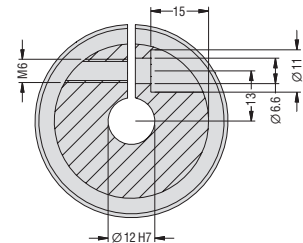
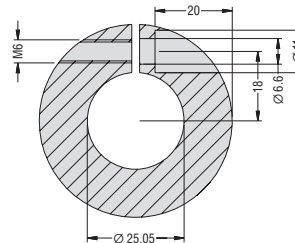
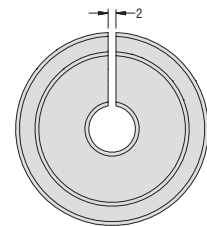
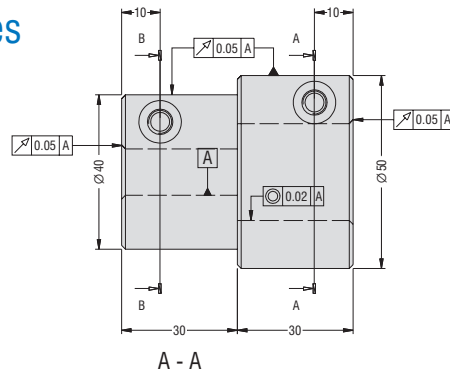
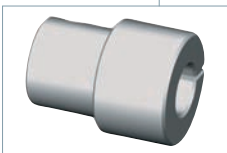
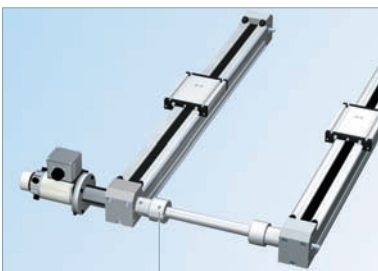
Drive Module with DC Servo Motor MV 300  
(Reduction 3:1)  
Feed: 150 mm/Revolution



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

Transmission Shaft (per 100 mm)

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

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

# Timing Belt Feed Axis

# LEZ 3

(ZF 3)

## Order Key

23200 X X XXX

### Feed

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

### Drives \*

Stepping motor MS 430 HT  
DC servo motor MV 300  
DC servo motor MV 300 (ratio 3:1)

### Slide, Carriages

0 = with shaft slide  
1 = with carriage

Drive on the right side	Drive on the left side
Item no.	Item no.
396085 0193	396085 0093
396104 0093	396104 0020
396134 0093	396134 0020

### Profile Lengths (mm)

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

\* 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.

## Order Samples



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

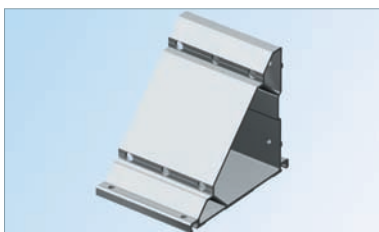
Item no.: **232007 0070** (feed)  
item no.: **396085 0093** (drive)



- with DC servo motor MV 300
- 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)

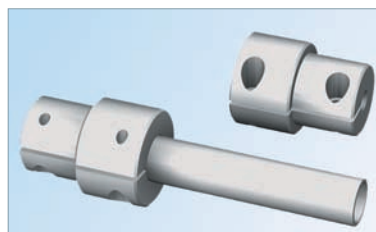
## Accessory



### Angle Brackets

- for LEZ 3
- incl. fastening

Item no.: **232199 0005**



### Coupling for Transmission shaft

- for LEZ 3
- packaging unit: 2 couplings

Item no.: **218050 0002**

### Transmission shaft Ø 25 mm

- for LEZ 3

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

### Limit Switch set

Motor side

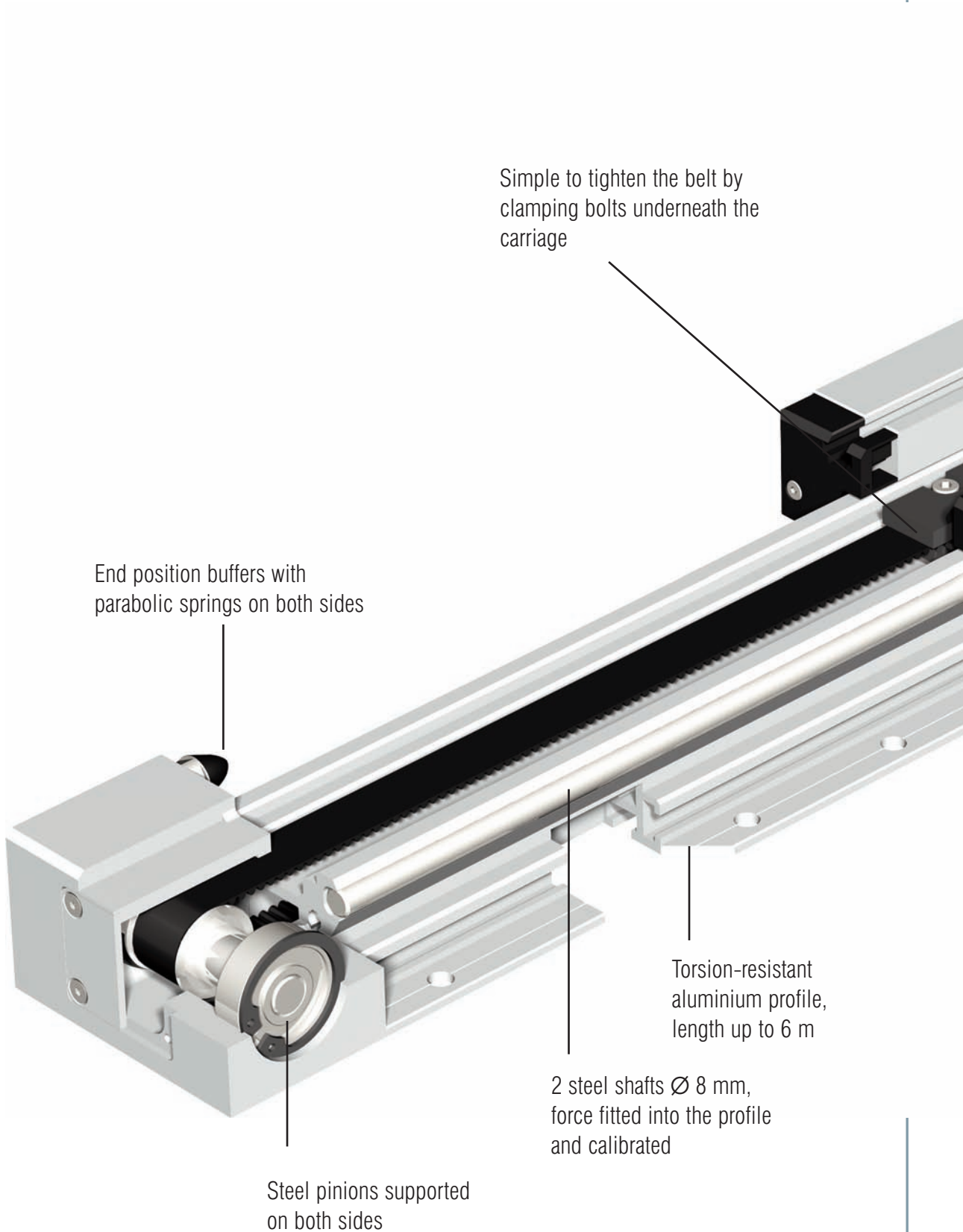
Item no. **397201 0000**

to turn round side

Item no. **397201 XXXX**

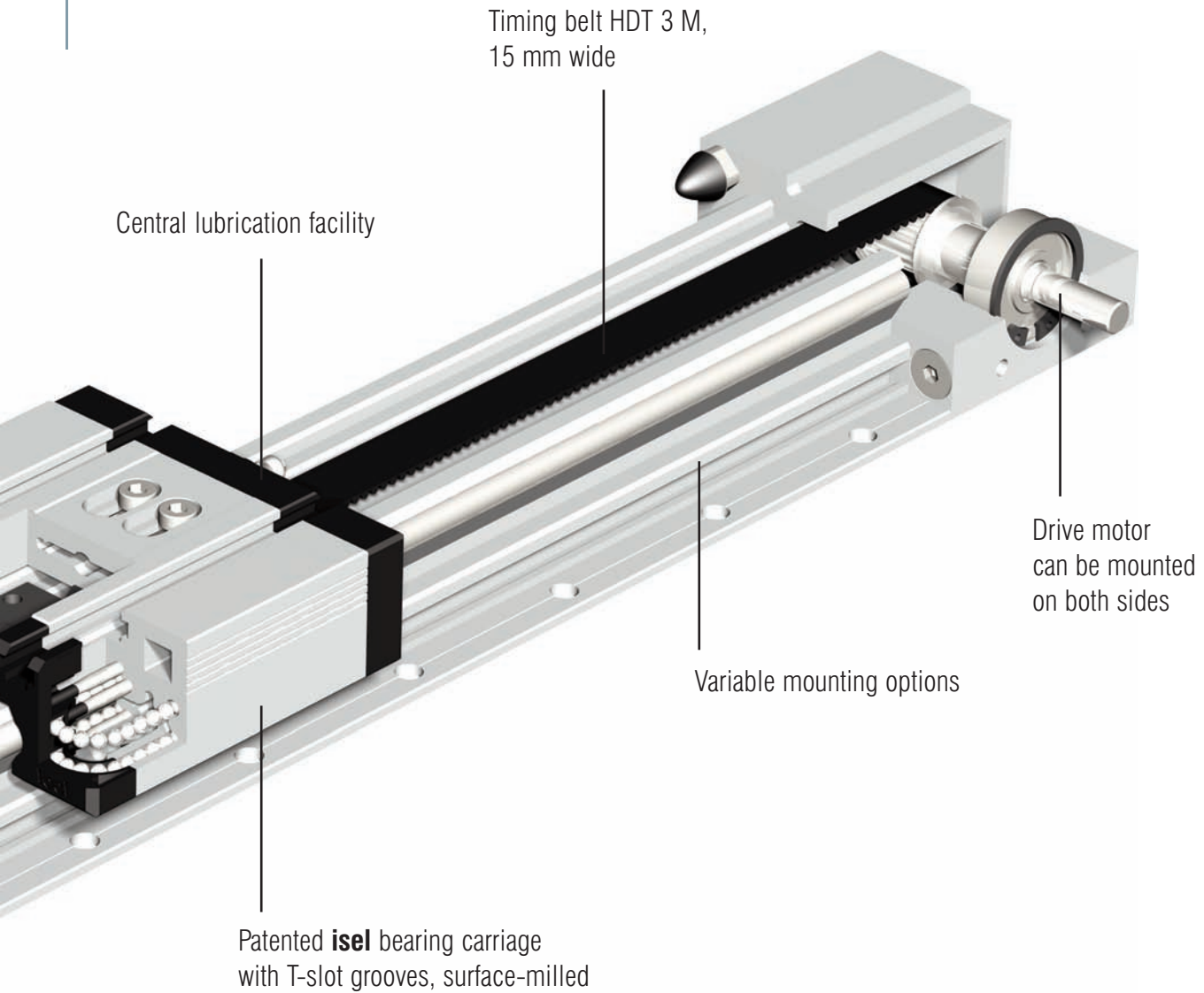
# Functions

## Timing Belt Feed Axis LEZ 9



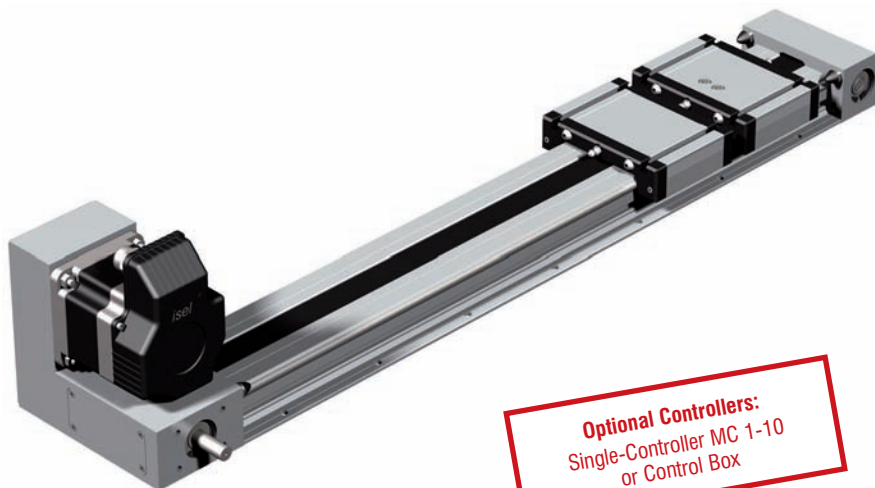
# Functions

## Timing Belt Feed Axis LEZ 9



# Timing Belt Feed Axis

# LEZ 6



**Optional Controllers:**  
Single-Controller MC 1-10  
or Control Box

## Features

- Aluminium profile with midjet linear guide LFS-8-5
- Clearance-free feed with timing belt feed axis
- timing belt with 5 mm toothing, width 25 mm
- Feed max. 2 m/s
- Bearing carriage WS 3 L 96 x W 130 mm
- Feed per revolution: 70 mm
- Repeatability less or equal  $\pm 0.2$  mm
- Limit and/or reference switch, accuracy  $< 0.1$  mm
- Servo motor
  - Options:
    - Special lengths in steps of 100 mm upon request, max. 6,000 mm
    - Drive modules attachable on both sides
    - Overtravel limit switch with connection cable (only in combination with drive module)
- Stepping motor

## Technical Data

Belt version	HTD 5M, width 25 mm
Weight of slide	0.500 kg
Weight without drive module	1,000 mm $\cong$ 7.9 kg
Nominal mass of timing belt	0.09 kg/m

Nominal weight of guide	0.472 kg/100 mm
Effective diameter of the synchronized pulleys	$\varnothing 22.28$ mm
Moment of inertia of the synchronized pulleys	$5.58 \cdot 10^{-6}$ kgm <sup>2</sup>
Feed per revolution	70 mm

## Order Data (without drive motor)

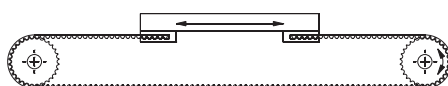
Item no.: **232 011 0050** L = 496 mm  
 Item no.: **232 011 0100** L = 996 mm  
 Item no.: **232 011 0150** L = 1496 mm  
 Item no.: **232 011 0200** L = 1996 mm  
 Item no.: **232 011 0250** L = 2496 mm  
 Item no.: **232 011 0300** L = 2996 mm  
 DC Servo module 300 W  
 Item no.: **396 104 5060**

## Idle Torques

Speed [1/min]	Idle torque [Nm]
500	0.16
1,500	0.25
3,000	0.36

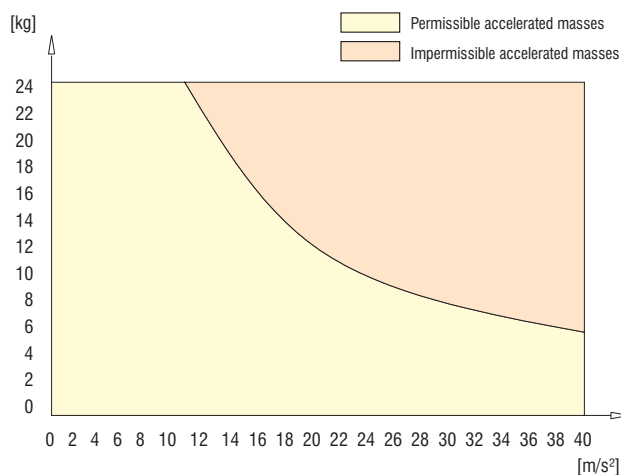
## Functional principle

Standard - Two pulley drive



## Load Diagramm

Permissible accelerated masses related to belt strength\*



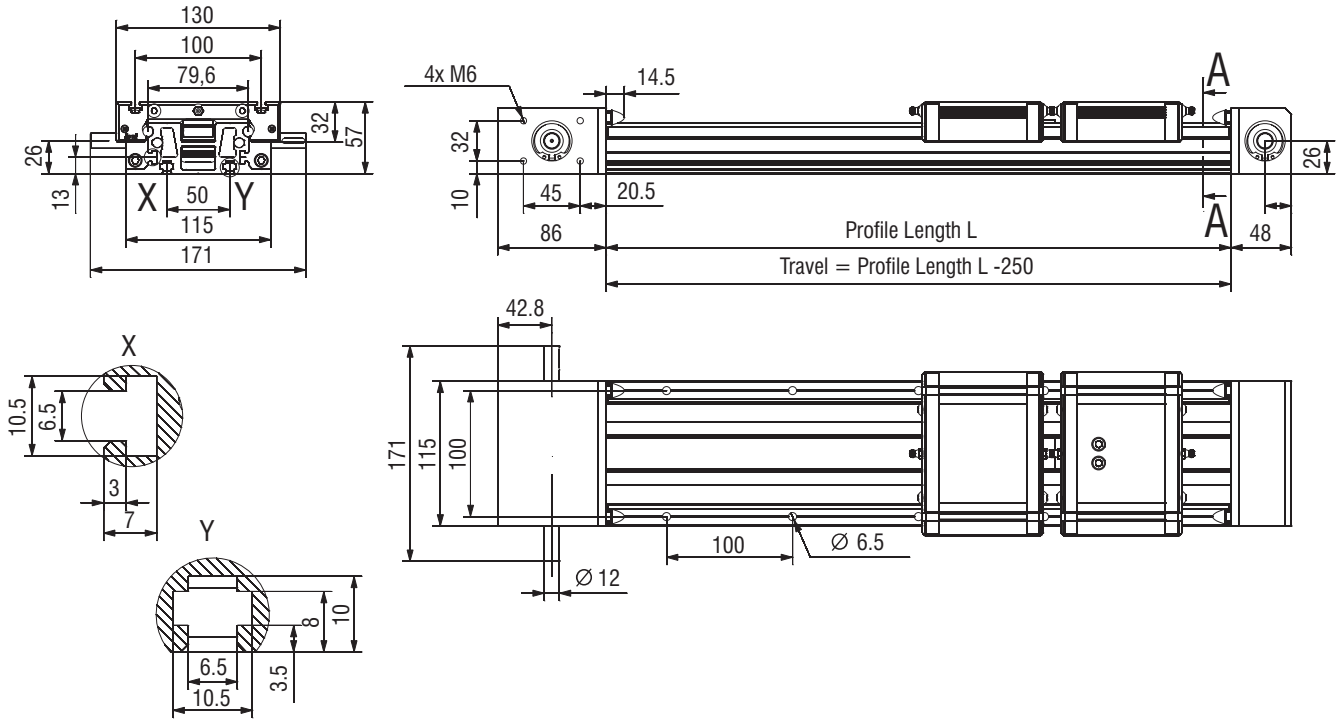
\* At vertical assembly, the acceleration due to gravity ( $g = 9.81$  m/s<sup>2</sup>) has to be taken into account

# Timing Belt Feed Axis

# LEZ 6

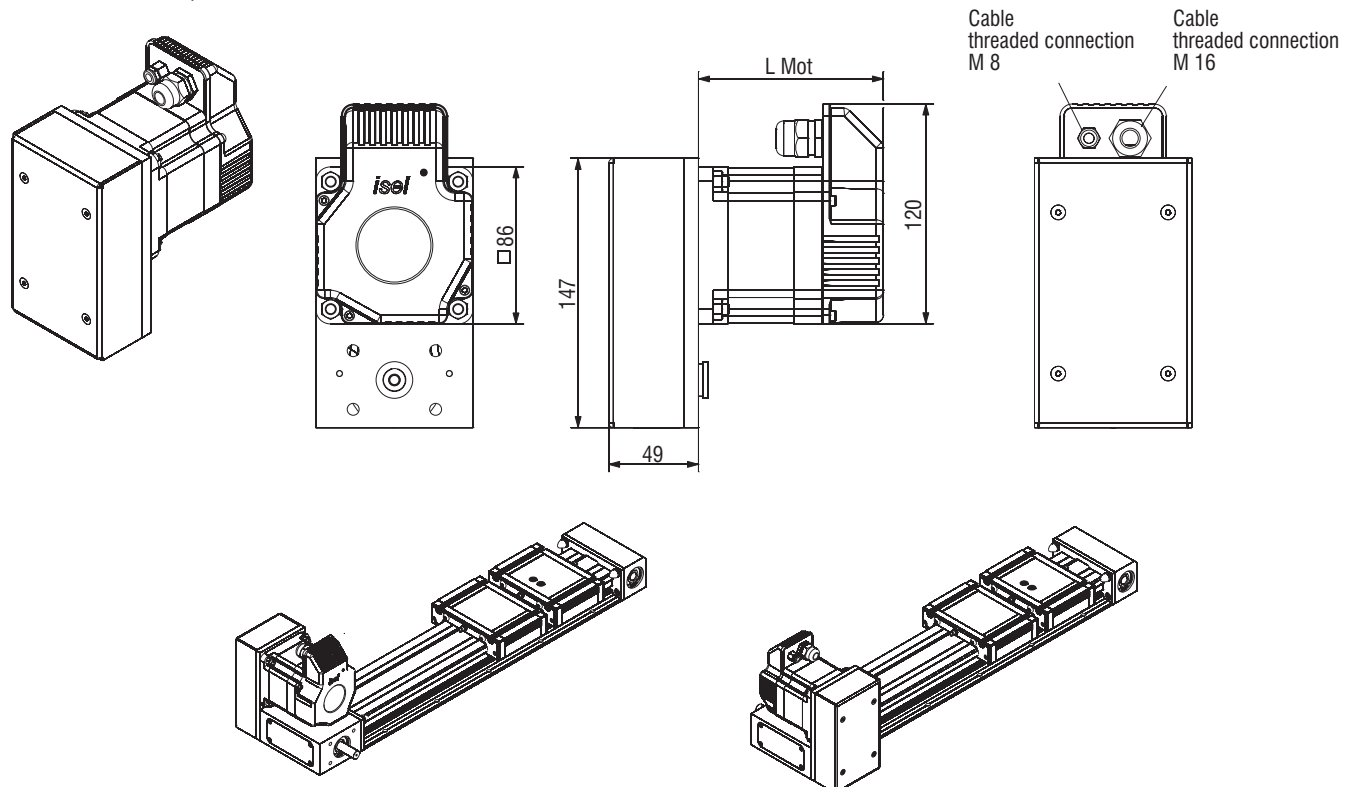
## Timing Belt Feed Axis

Without Motor  
With Bearing Carriages



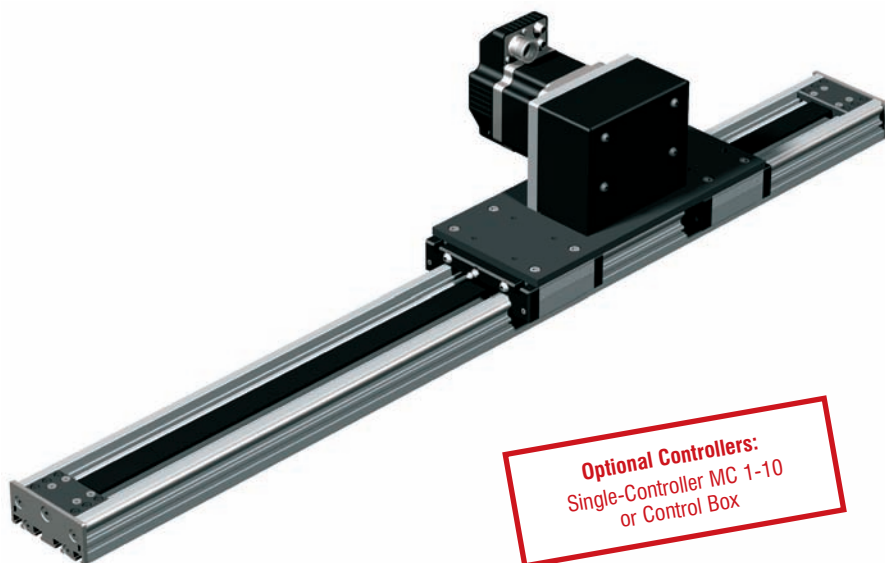
## Drive Module

(Reduction 2:1)  
Infeed: 35 mm/Revolutions



# Timing Belt Feed Axis

# LEZ 7



## Features

- Fixed timing belt
  - Aluminium profile with midget linear guide LFS-8
  - Clearance-free feed with timing belt feed axis
  - timing belt with 5 mm toothing, width 25 mm
  - Feed max. 1 m/s
  - 2 x bearing carriage WS 3 L 96 x W 130 mm
  - Feed per revolution: 70 mm
  - Repeatability less or equal  $\pm 0.2$  mm
  - Limit and/or reference switch, accuracy  $< 0.1$  mm
  - Servo motor
- Options:
- Special lengths in steps of 100 mm upon request
  - Overtravel limit switch with connection cable
  - Stepping motor

## Technical Data

Belt version	HTD 5M, width 25 mm
Weight of slide (without motor)	2.5 kg
Weight of guide	3.95 kg/m

Specific masses of the timing belt	0.09 kg/m
Feed per revolution	70 mm

## Order Data (without drive motor)

Item no.: **232 008 0050** L = 496 mm

Item no.: **232 008 0060** L = 596 mm

Item no.: **232 008 0070** L = 696 mm

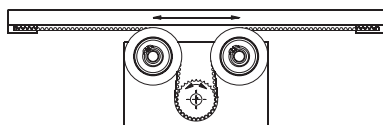
Item no.: **232 008 0080** L = 796 mm

DC-Servo module 300 W, Item no. **396 104 5060**

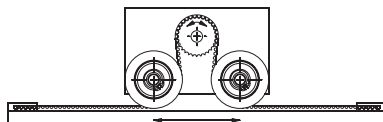
## Idle Torques

Speed [1/min]	Idle torque [Nm]
500	0.16
1,500	0.25

## Functional principle



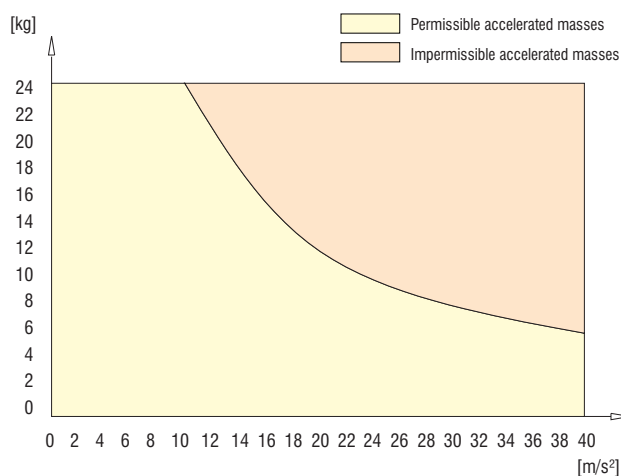
Fixed drive



Travelling drive (for big distances)

## Load Diagramm

Permissible accelerated masses related to belt strength\*

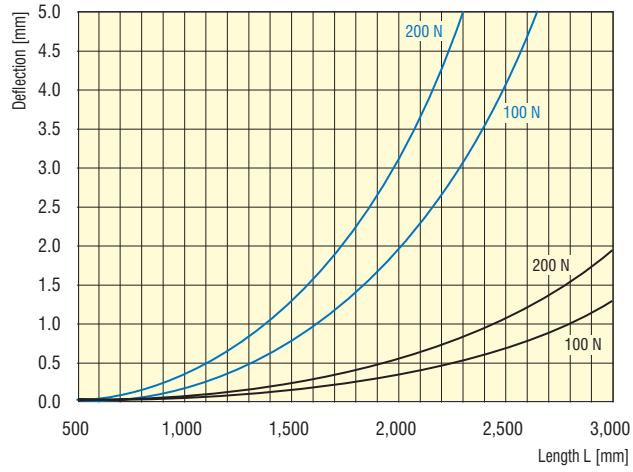
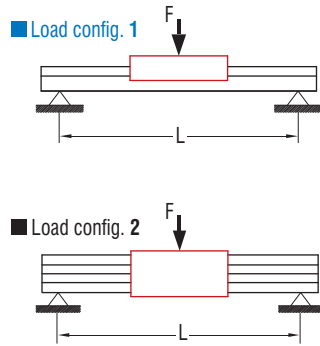


\* At vertical assembly, the acceleration due to gravity ( $g = 9.81$  m/s<sup>2</sup>) has to be taken into account

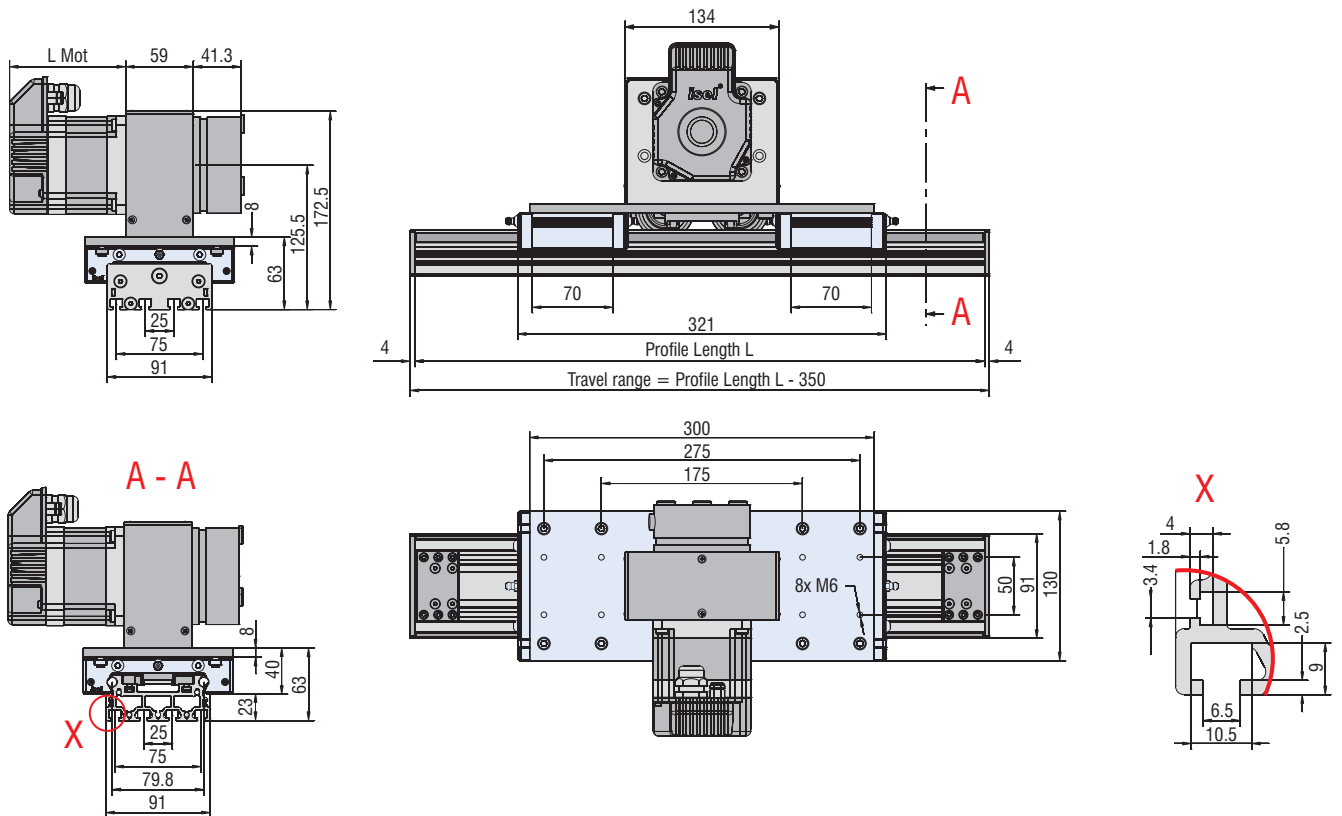
# Timing Belt Feed Axis

# LEZ 7

## Deflection



## Scale Drawing



# Timing Belt Feed Axis

# LEZ 8



**Optional Controllers:**  
Single-Controller MC 1-10  
or Control Box

## Features

- Stationärer timing belt
  - Aluminium profile with midjet linear guide LFS-8
  - Clearance-free feed with timing belt feed axis
  - timing belt with 3 mm pitch, width 15 mm
  - Feed 1 m/s, at the most
  - 2 x bearing carriage WS 11 L 96 x W 95 mm
  - Feed per revolution: 48 mm
  - Repeatability less or equal  $\pm 0.2$  mm
  - Limit and/or reference switch, accuracy  $< 0.1$  mm
  - Servo motor
- Options:
- Special lengths in steps of 100 mm upon request
  - Overdrive limit switch with connection cable
  - Stepping motor

## Technical Data

Belt version	HTD 3M, width 15 mm
Weight of slide (without motor)	2.0 kg
Weight of guide	1.95 kg/m

Specific masses of the timing belt	0.04 kg/m
Feed per revolution	48 mm

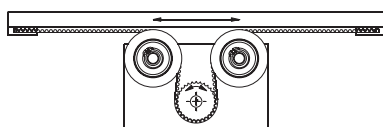
## Order Data (without drive motor)

Item no.: **232 009 0040** L = 396 mm  
 Item no.: **232 009 0050** L = 496 mm  
 Item no.: **232 009 0060** L = 596 mm  
 Item no.: **232 009 0070** L = 696 mm  
 DC Servo module 120 W with Brake, **398719 0003**

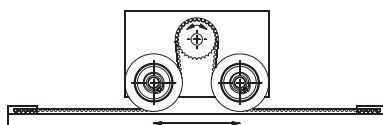
## Idle Torques

Speed [1/min]	Idle torque [Nm]
500	0.16
1,500	0.25

## Functional principle



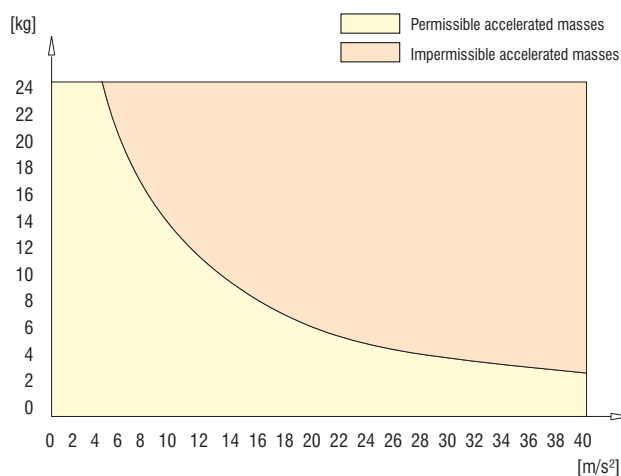
Fixed drive



Travelling drive (for big distances)

## Load Diagramm

Permissible accelerated masses related to belt strength\*

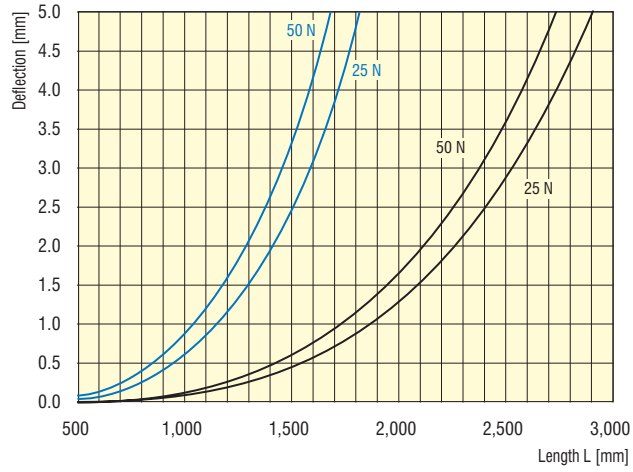
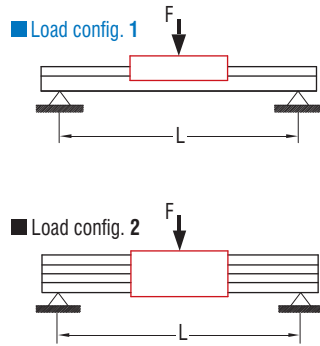


\* At vertical assembly, the acceleration due to gravity ( $g = 9.81$  m/s<sup>2</sup>) has to be taken into account

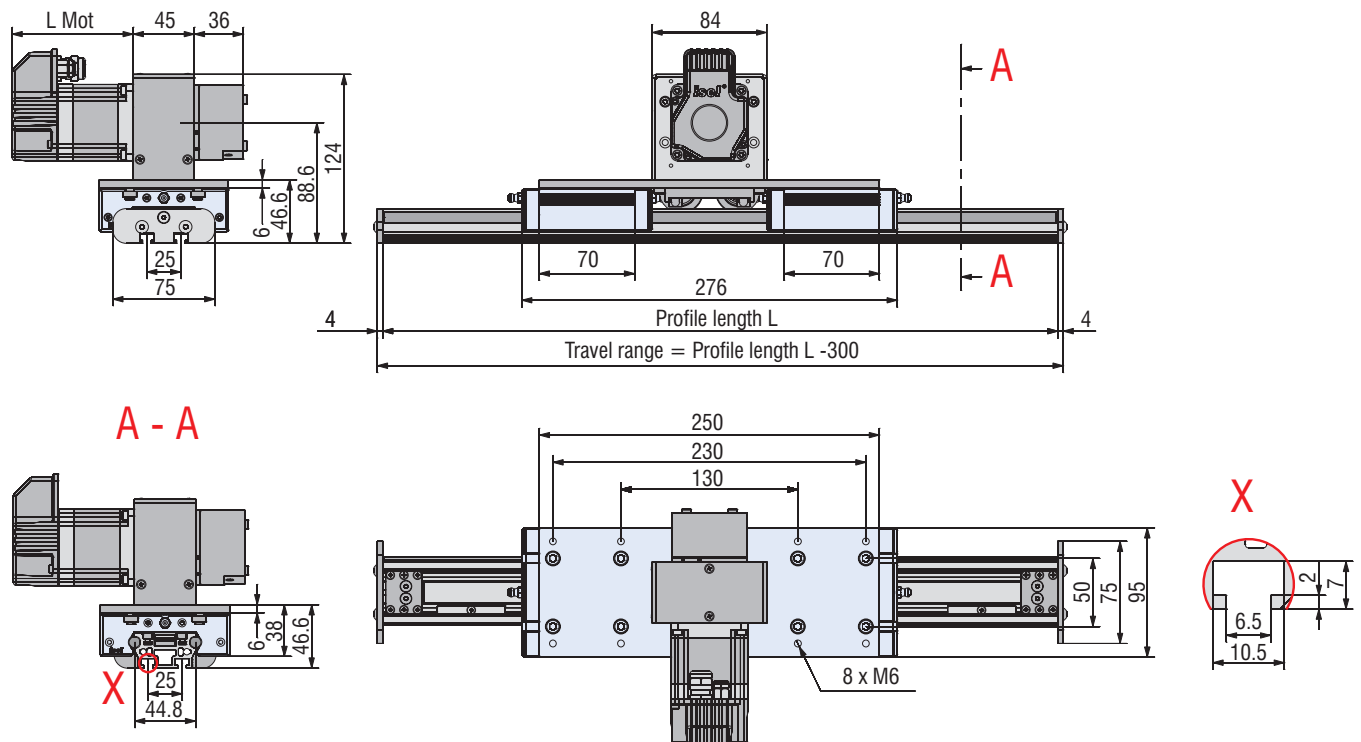
# Timing Belt Feed Axis

# LEZ 8

## Deflection



## Scale Drawing



# Timing Belt Feed Axis

# LEZ 9



**Optional Controllers:**  
Single-Controller MC 1-10  
or Control Box

## Features

- Aluminium profile, linear guide LFS-8-7
- Clearance-free feed with timing belt feed axis
- timing belt with 3 mm toothing, width 15 mm
- Feed max. 2 m/s
- Bearing carriage WS 11 L 96 x W 95 mm
- Feed per revolution: 60 mm
- Repeatability less or equal  $\pm 0.2$  mm
- Limit and/or reference switch, accuracy  $< 0.1$  mm
- Servo motor

### Options:

- Special lengths in steps of 100 mm upon request
- Stepping motor

## Technical Data

Belt version	HTD 3M, width 15 mm
Weight of slide	0.4 kg
Weight without drive module	1,000 mm $\cong$ 4.4 kg
Nominal mass of timing belt	0.04 kg/m

Nominal weight of guide	0.29 kg/100 mm
Effective diameter of the synchronized pulleys	$\varnothing 19.1$ mm
Moment of inertia of the synchronized pulleys	$5.86 \cdot 10^{-6}$ kgm <sup>2</sup>
Feed per revolution	60 mm

## Order Data (without drive motor)

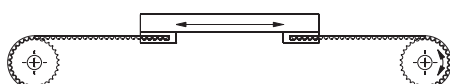
Item no.: <b>232 010 0050</b>	L = 496 mm
Item no.: <b>232 010 0100</b>	L = 996 mm
Item no.: <b>232 010 0150</b>	L = 1496 mm
Item no.: <b>232 010 0200</b>	L = 1996 mm
Item no.: <b>232 010 0250</b>	L = 2496 mm
Item no.: <b>232 010 0300</b>	L = 2996 mm

## Idle Torques

Speed [1/min]	Idle torque [Nm]
500	0.06
1,500	0.09

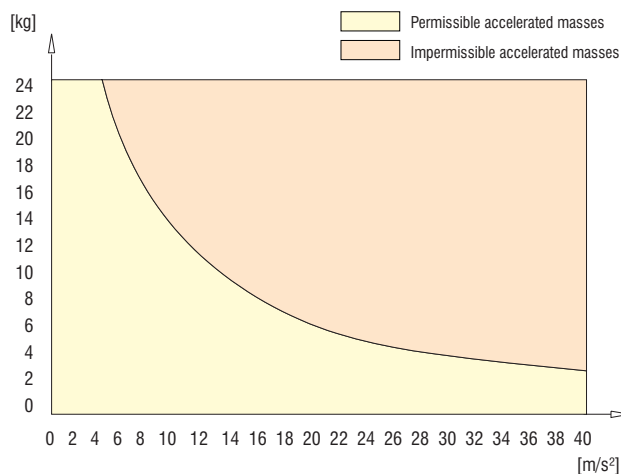
## Functional principle

Standard - Two pulley drive



## Load Diagramm

Permissible accelerated masses related to belt strength\*



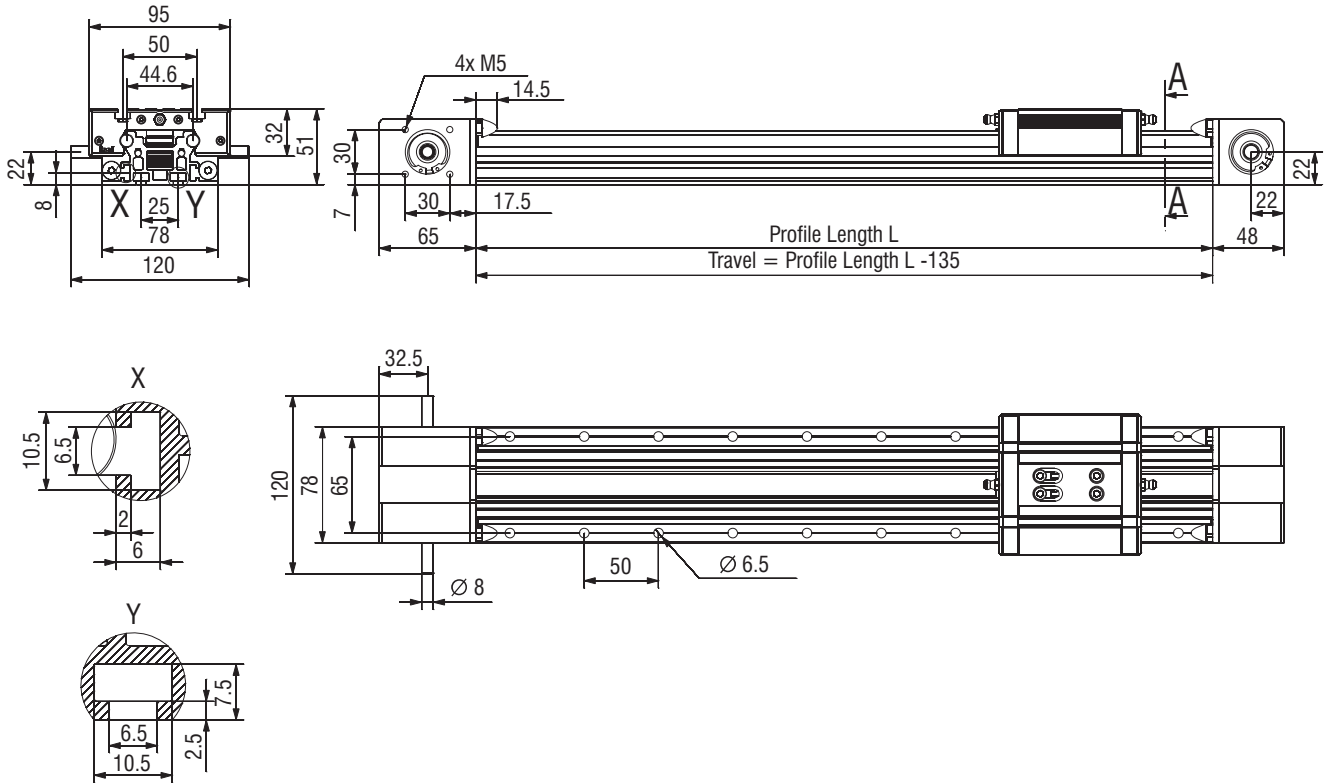
\* At vertical assembly, the acceleration due to gravity ( $g = 9.81$  m/s<sup>2</sup>) has to be taken into account

# Timing Belt Feed Axis

# LEZ 9

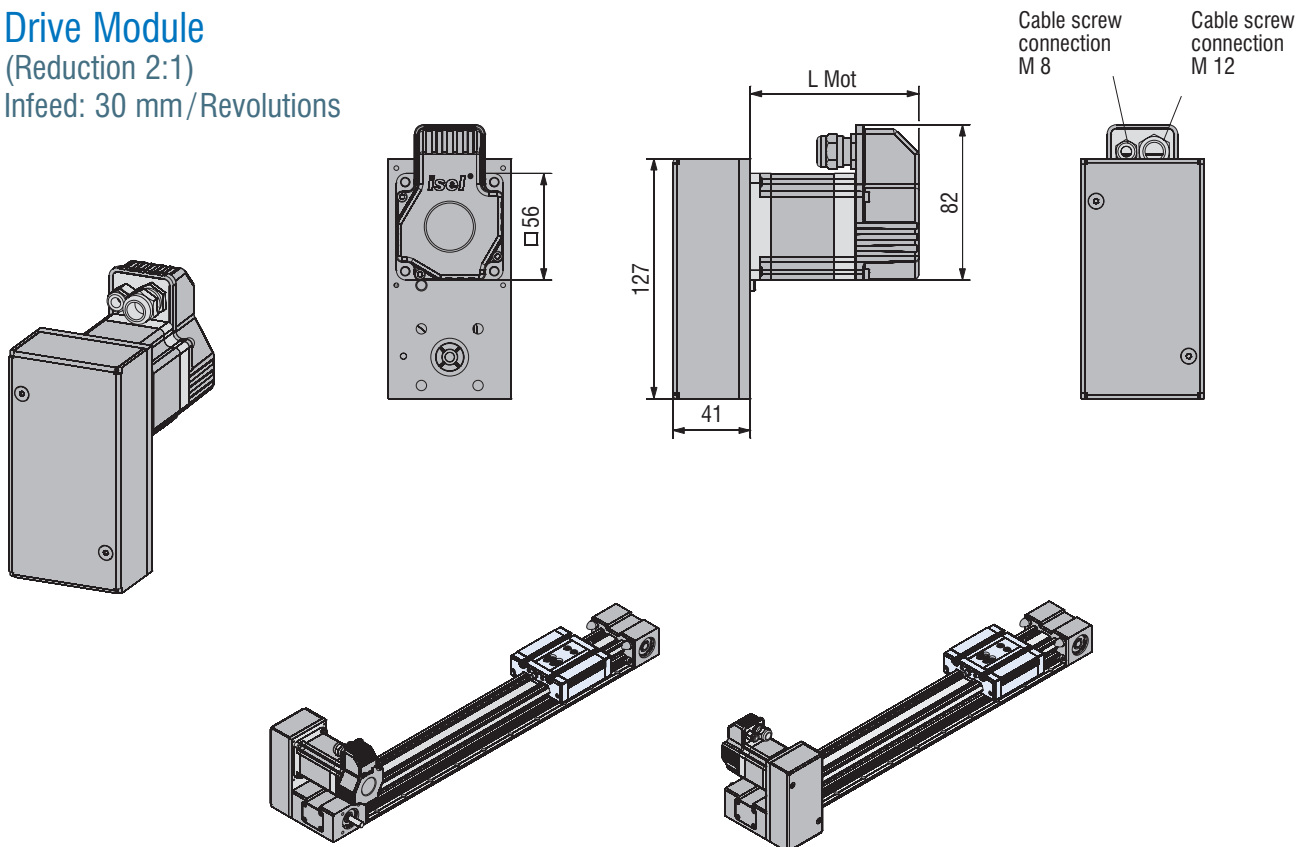
## Timing Belt Feed Axis

Without Motor  
With Bearing Carriages



## Drive Module

(Reduction 2:1)  
Infeed: 30 mm/Revolutions



# 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/s <sup>2</sup> ]	Gravity = 9.81
$V_{max}$ [m/s]*	Maximum traverse speed
$m$ [kg]	Total mass to be moved
$a$ [m/s <sup>2</sup> ]	Acceleration
$d_0$ [mm]*	Effective diameter of the synchronized pulley
$P$ [kW]	Drive capacity
$J_{syn}$ [kgm <sup>2</sup> ]*	Moment of inertia of the synchronized pulleys
$n_{max}$ [1/min]	Maximum speed
$\mu$	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  $a$ . ( $g = 9,81 \text{ m/s}^2$ ).

### 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 $M_{trans}$

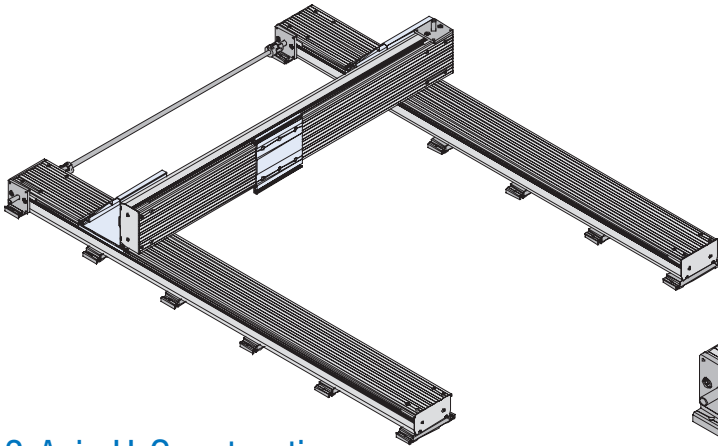
$$M_{Trans} = \frac{F_a \cdot d_0}{2 \cdot 1000}$$

### Rotary Acceleration Torque $M_{rot}$

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

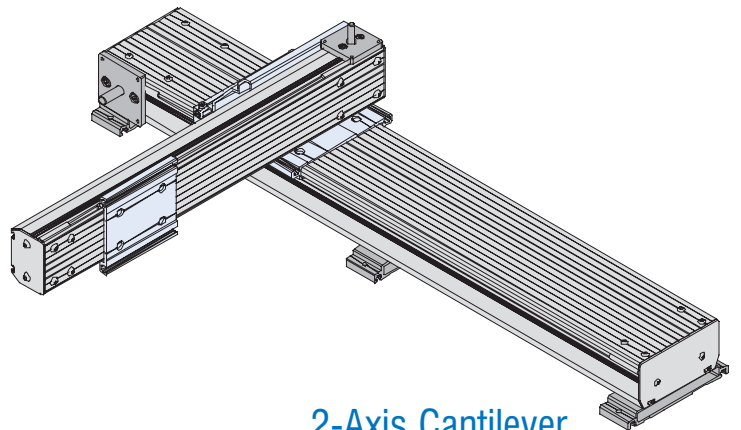
$$M_A = M_{Last} + M_{trans} + M_{rot} + M_{leer}$$

# Application Samples



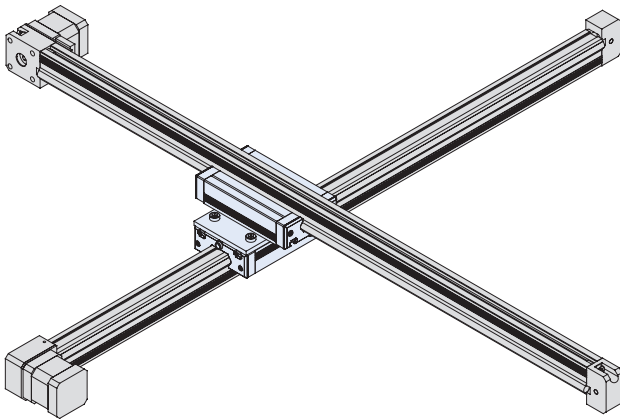
## 2-Axis H-Construction

- 3 x LEZ 1 G
- Angle Slide
- Transmission Shaft
- Foot mounting



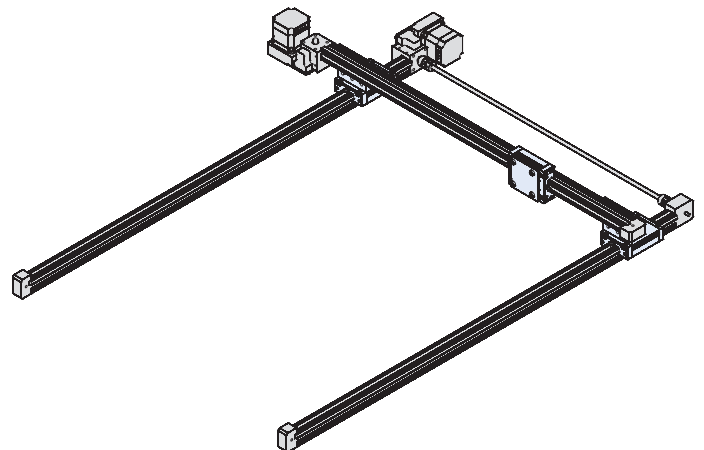
## 2-Axis Cantilever

- 1 x LEZ 1 G
- 1 x LEZ 3 G
- Angle Slide
- Foot Mounting



## Compound Table LEZ 1

- 2 x LEZ 1



## LEZ 1

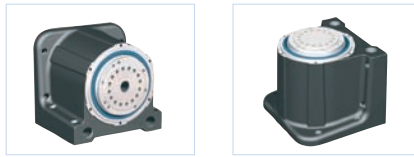
- 2-Axis Flat Bed Unit

## Rotary and Lifting Units

## Overview

RDH-M Indexing Table / Rotary Axis

C 158



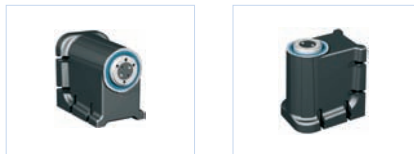
RDH-S Indexing Table / Rotary Axis

C 160



RDH-XS Indexing Table / Rotary Axis

C 162



DSH-S Rotary Swivelling Unit

C 164



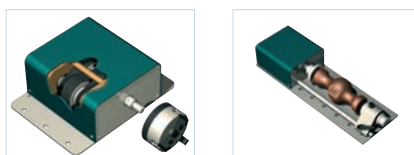
RF 1 Indexing Table

C 166



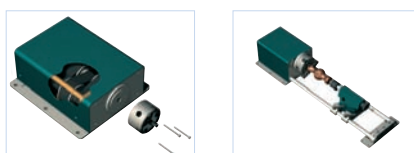
D 1 Rotary Axis

C 168



D 2 Rotary Axis

C 170



# Rotary and Lifting Units

## Overview

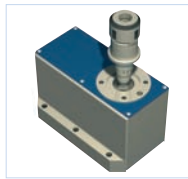
MD 1 Midget Rotary Axis

C 172



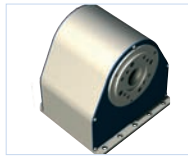
ZR 20 Indexing Table

C 174



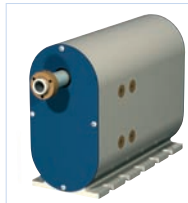
ZD 30 Rotary Axis

C 176



MH 1 Midget Lifting Unit

C 178



Transport Loads,  
Processing Forces, Feed

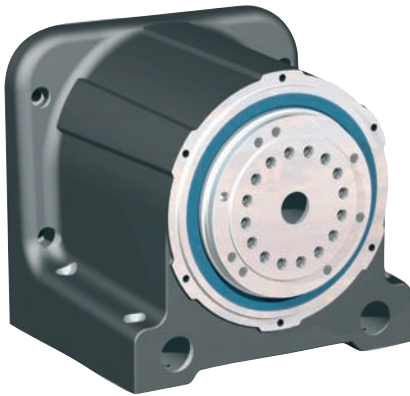
C 180

Permissible Moment of  
Inertia  $J_z$

C 183

# Indexing Table/Rotary Axis

# RDH-M



RDH-M as rotary axis  
(hollow shaft)

RDH-M as indexing table  
(solid shaft)



## Features

- with precision gear
  - extremely loadable and stiff drive bearing
  - zero backlash and high torsion stiffness
- reduction 1:51 or 1:101
- Servo motor
- protection type IP 65
- rust-proof design
- transmission accuracy < 1 arcmin
- repeatability <math>\pm 6</math> arcsec
- optionally, in solid or hollow shaft design
- maintenance-free
- Options:
  - stepping motor
  - other drive motors
  - own motor adaptation upon request

with servo motor MV 120 (brush-type) upon request

## 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 (brushless)
- 2 = DC servo motor (brush-type)

0 = Standard

## Accessory



### Chuck

3-jaw chuck Ø 80  
Item no.: 269060 1080

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

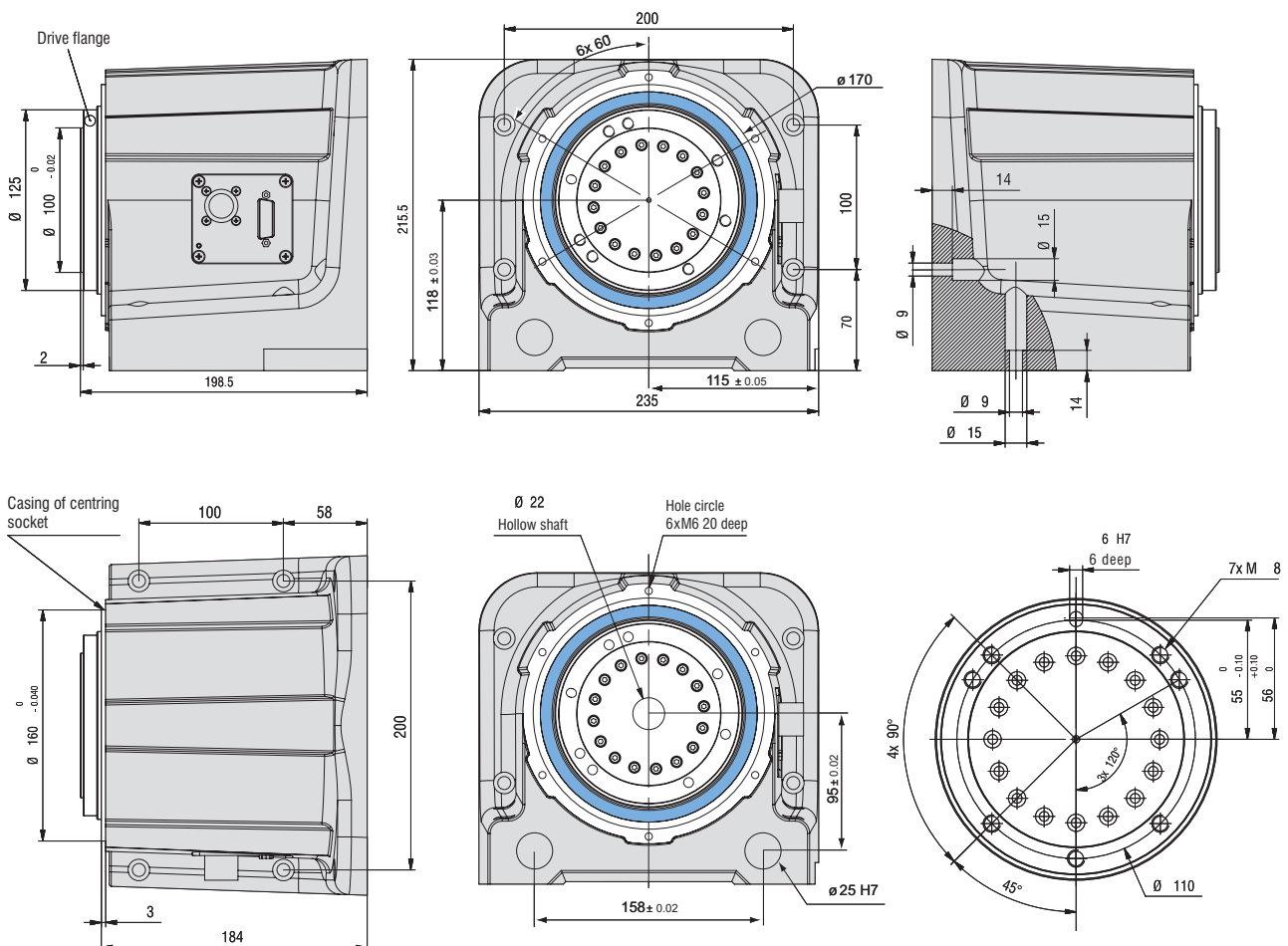
# RDH-M

## Technical Data

	Stepping Motor MS 200 HT *		EC Servo Motor MD 200 (brushless)	
Reduction ratio	1:51	1:101	1:51	1:101
Nominal drive revolution [1/min]	4	2	22	11
Max. drive revolution [1/min]	at 1500 Hz (225 1/min)		at 1100 1/min	
	24	12	59	30
Nominal torque [Nm]	at 8000 Hz		15	29
	24	46		
Max. torque (temporary) [Nm]	at 1500 Hz		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			

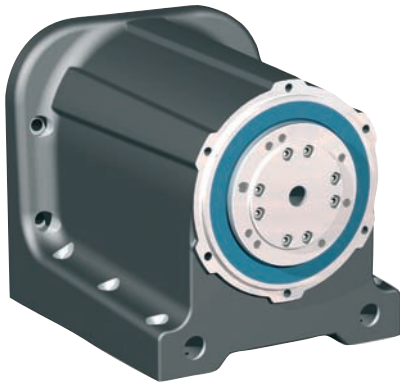
\* Values at half-step operation

## Scale Drawings



# Indexing Table/Rotary Axis

# RDH-S



RDH-S as rotary axis  
(hollow shaft)

RDH-S as indexing table  
(solid shaft)



## Features

- with precision gear
  - extremely loadable and stiff drive bearing
  - zero backlash and high torsion stiffness
- reduction 1:51 or 1:101
- Servo motor
- 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:
  - stepping motor
  - other drive motors
  - own motor adaptation upon request

## 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

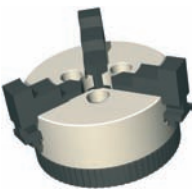
0 = Standard

### Motors

- 0 = Stepping motor
- 1 = DC servo motor (brushless)
- 2 = DC servo motor (brush-type)

0 = Standard

## Accessory



### Clamping Chuck

3-jaw chuck Ø 65

Item no.: 269060 3065



### Clamping Chuck

3-jaw chuck Ø 80

Item no.: 269060 2080



### 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

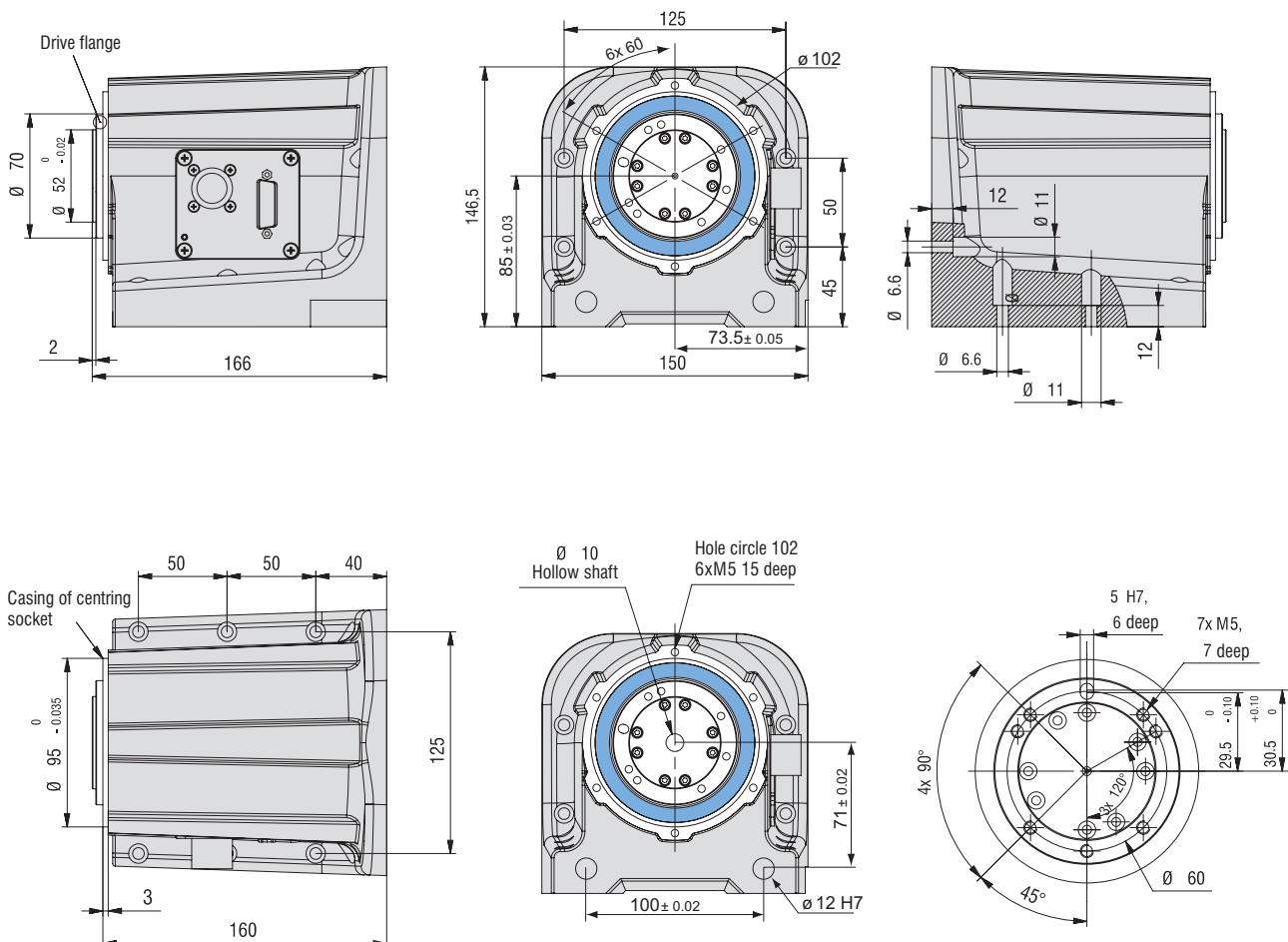
# RDH-S

## Technical Data

	Stepping Motor MS 045 HT *		EC Servo Motor MD 100 (brushless)		DC Servo Motor RE 40 (brush-type)	
<b>Reduction ratio</b>	1:51	1:101	1:51	1:101	1:51	1:101
<b>Nominal drive revolution</b> [1/min]	4	2	22	11	22	11
<b>Max. drive revolution</b> [1/min]	at 1500 Hz (225 1/min)		at 1100 1/min		at 1100 1/min	
	24	12	59	30	69	35
<b>Nominal torque</b> [Nm]	at 8000 Hz				--	
	7	11	7	11	4,6	9
<b>Max. torque</b> (temporary) [Nm]	at 1500 Hz				--	
	--	--	7	11	7	11
<b>Nominal holding torque</b> (static load) [Nm]	7	11	7	11	7	11
<b>Max. load capacity of the gear</b> [Nm]	18	28	18	28	18	28
<b>Dynamic load rate C</b> [N]	Limit for repeatable peak torque					
	5800					
<b>Static load rate C<sub>0</sub></b> [N]	8600					

\* Values at half-step operation

## Scale Drawings



# Indexing Table/Rotary Axis

# RDH-XS



RDH-XS as rotary axis

RDH-XS as indexing table



## Features

- with precision gear
  - extremely loadable and stiff drive bearing
  - zero backlash and high torsion stiffness
- reduction 1:50 or 1:100
- Servo motor
- protection type IP 65
- rust-proof design
- transmission accuracy < 2,0 arcmin
- repeatability < ± 1,0 arcmin
- maintenance-free
- Options:
  - stepping motor
  - other drive motors
  - own motor adaptation upon request

## Order Key

2 6 6 0 0 X X X X X

### Gear reduction

- 0 = 101
- 1 = 51

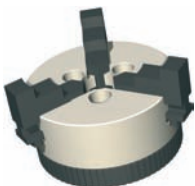
0 = Standard

### Motors

- 0 = Stepping motor
- 1 = DC servo motor (brushless)
- 2 = DC servo motor (brush-type)

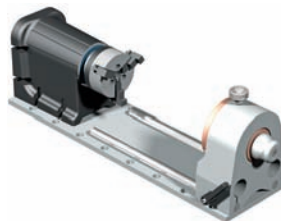
0 = Standard

## Accessory



### Clamping Chuck

3-jaw chuck Ø 65  
incl. adapter  
Item no.: 269060 3065



### Tailstock Unit RE XS

for RDH-XS  
Item no.: 269100 0020 (200 mm)  
Item no.: 269100 0030 (300 mm)  
Item no.: 269100 0040 (400 mm)  
Item no.: 269100 0050 (500 mm)

Image: RDH-XS  
with Tailstock unit RE XS  
and 3-jaw chuck

# Indexing Table/ Rotary Axis

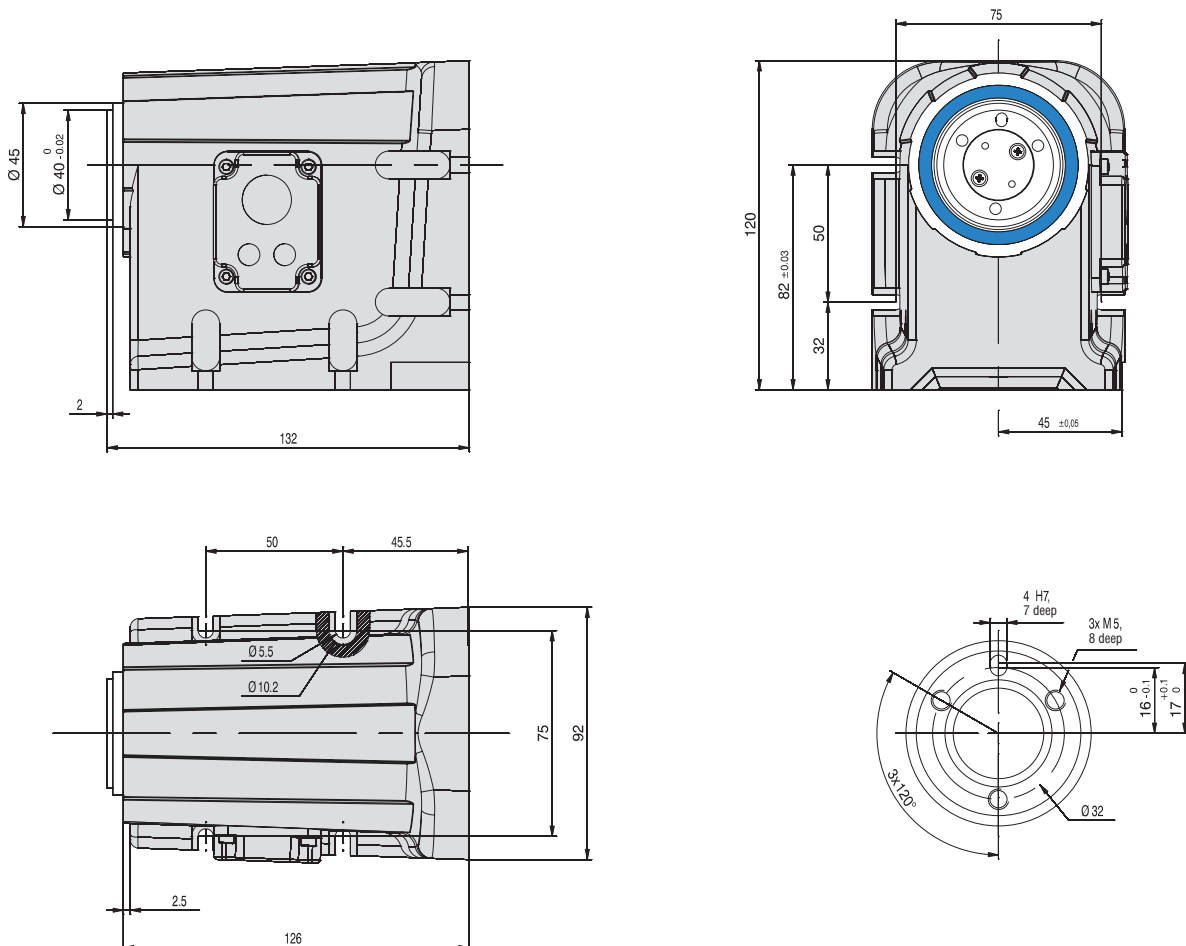
# RDH-XS

## Technical Data

	Stepping Motor MS 045 HT *		EC Servo Motor MD 100		DC Servo Motor RE 40	
<b>Reduction ratio</b>	1:50	1:100	1:50	1:100	1:50	1:100
<b>Nominal drive revolution</b> [1/min]	5	2	60	30	60	30
<b>Max. drive revolution</b> [1/min]	at 1500 Hz (225 1/min)		at 1100 1/min		at 1100 1/min	
	24	12	70	35	70	35
	at 8000 Hz (1200 1/min)		--		--	
<b>Nominal torque</b> [Nm]	5	7	5	7	5	7
	at 1500 Hz (225 1/min)		--		--	
<b>Max. torque</b> (temporary) [Nm]	--	--	5	7	5	7
<b>Nominal holding torque</b> (static load) [Nm]	5	7	5	7	5	7
<b>Max. load capacity of the gear</b> [Nm]	9	14	9	14	9	14
	Limit for repeatable peak torque					
<b>Dynamic load rate C</b> [N]	392					
<b>Static load rate C<sub>0</sub></b> [N]	392					

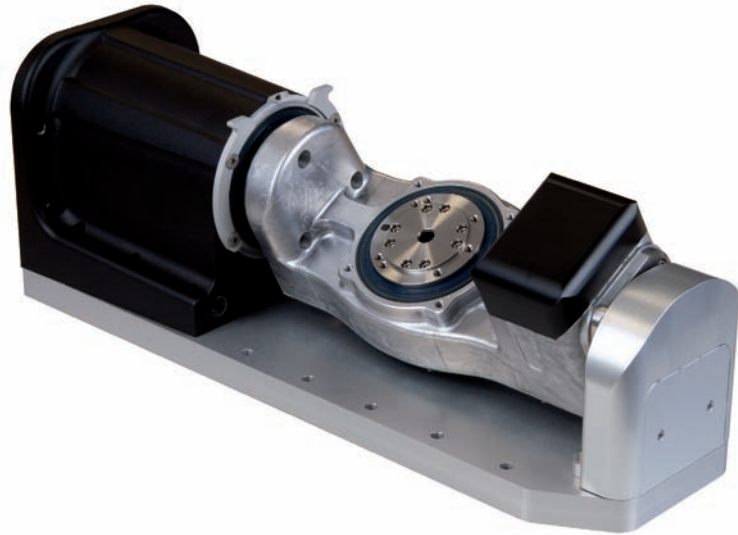
\* Values at half-step operation

## Scale Drawings



# Rotary Swivelling Unit

## DSH-S



### Features

- with precision gear
  - extremely loadable and stiff drive bearing
  - zero backlash and high torsion stiffness
- with rotary axis RDH-S
- reduction 1:51 or 1:101
- Servo motor
- protection type IP 65
- rust-proof design
- transmission accuracy  $< 1.5$  arcmin
- repeatability  $< \pm 6$  arcmin
- maintenance-free
- swivelling area stepless adjustable

#### Options:

- Stepping motor
- Hollow shaft design  
(prepared with pneumatic and signal circuit)

### Order Key

26541X X000

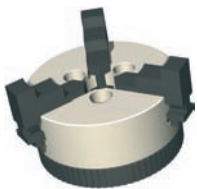
#### Motors

- 0 = Stepping motor
- 1 = DC servo (brushless)
- 2 = DC servo (brush-type)

#### Gear reduction

- 0 = 1 : 101
- 1 = 1 : 51

### Accessories



#### Clamping Chuck

3-jaw chuck  $\varnothing 65$

Item no.: 269 060 3065



#### T-groove plate

$\varnothing 150$

Item no.: 269 060 0150

# Rotary Swivelling Unit

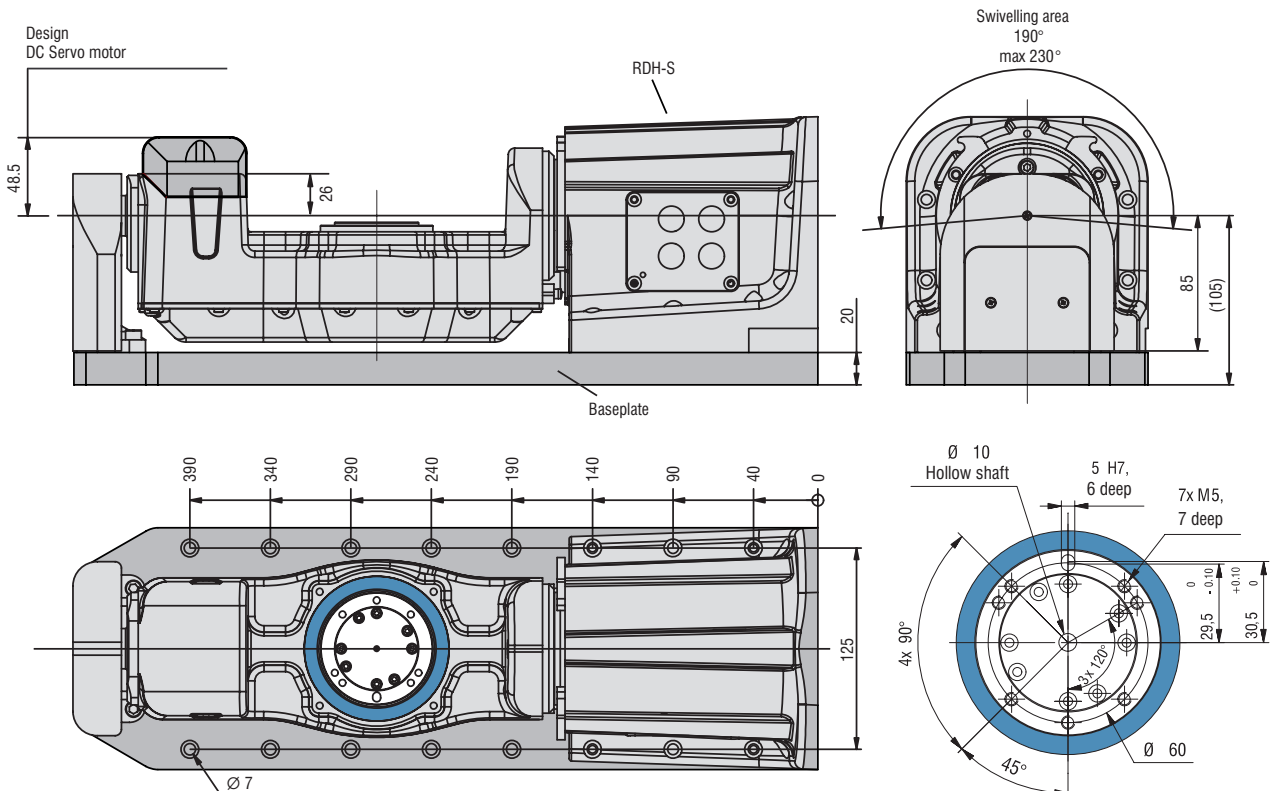
# DSH-S

## Technical Data

	Stepping Motor MS 045 HT *		DC Servo Motor MD 100		DC Servo Motor RE 40	
<b>Reduction ratio</b>	1:51	1:101	1:51	1:101	1:51	1:101
<b>Nominal drive revolution</b> [1/min]	4	2	22	11	22	11
	at 1500 Hz (225 1/min)		at 1100 1/min		at 1100 1/min	
<b>Max. drive revolution</b> [1/min]	24	12	59	30	69	35
	at 8000 Hz		--			
<b>Nominal torque</b> [Nm]	7	11	7	11	4.6	9
	at 1500 Hz		--			
<b>Max. torque</b> (temporary) [Nm]	--	--	7	11	7	11
<b>Nominal holding torque</b> (static load) [Nm]	7	7	7	11	7	11
<b>Max. load capacity of the gear</b> [Nm]	18	28	18	28	18	28
	Limit for repeatable peak torque					
<b>Dynamic load rate C</b> [N]	5800					
<b>Static load rate C<sub>0</sub></b> [N]	8600					

\* Values at half-step operation

## Scale Drawings



# Indexing Table

## RF 1



### Features

- Clearance-free timing belt feed axis with stepping or DC servo motor
- 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

2 6 0 2 4 X X 0 0 0

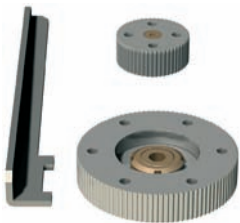
#### Motors

- 1 = Stepping motor
- 2 = DC servo motor

#### Brake

- 0 = Without brake
- 1 = Permanent magnetic

### Accessory



#### Assembly Kit

For reduction 1:52

Item no.: 269077 0001

For reduction 1:100

Item no.: 269077 0002



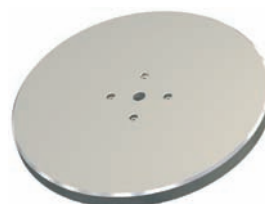
#### Aluminium T-Groove Plate

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

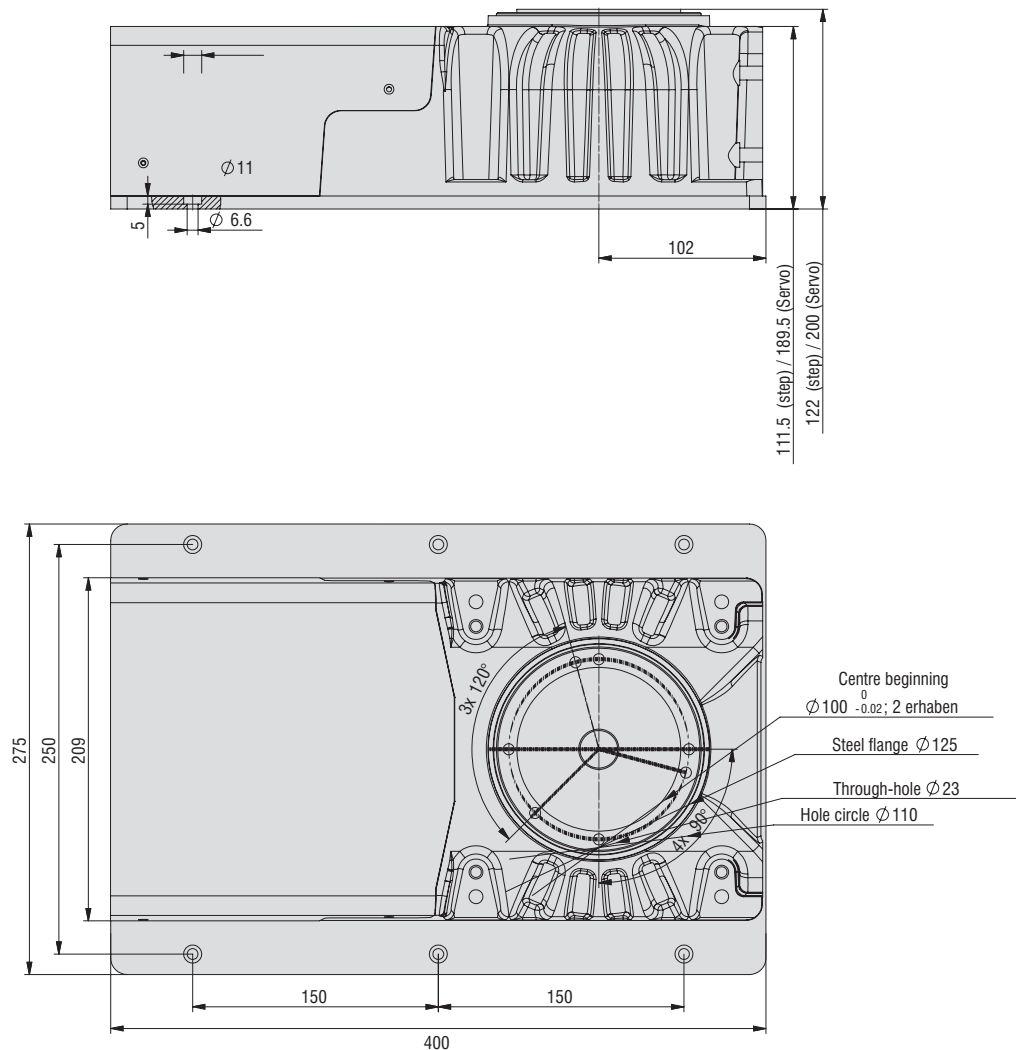
# RF 1

## Technical Data

	Stepping Motor MS 200 HT *			DC Servo Motor MV 120		
	1:24	1:52	1:100	1:24	1:52	1:100
Reduction ratio	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
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
Nominal holding torque (static load) [Nm]	37	75	75	10	23	44
Min. increment (positioning accuracy) [arcmin]	2.5	2	2	2	2	2

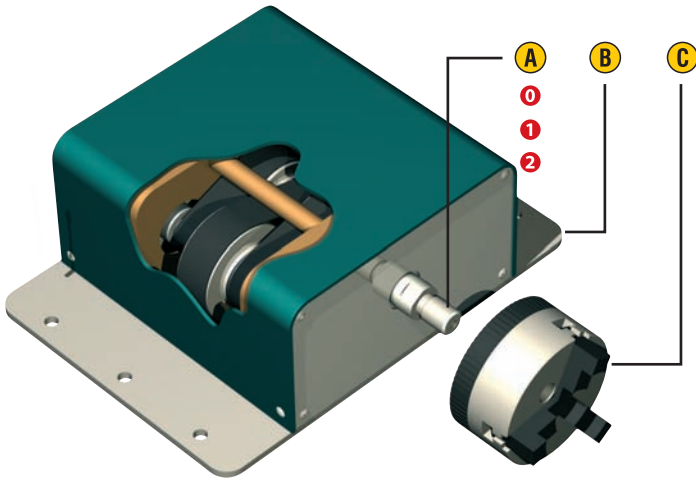
\* Values at half-step operation

## Scale Drawings



# 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

## Order Key

2 6 3 X X X 0 0 0 1

### 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

- 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)

## 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

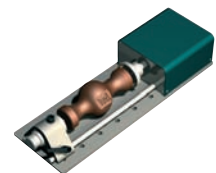
Item no.: 218003 9999



### 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

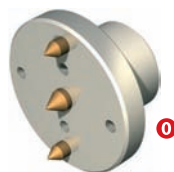
Item no.: 269073



### Tangential Knife

to cut any contours (sharp angles) out of foils (up to 4 mm thick)

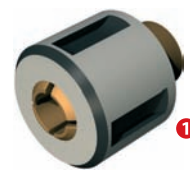
Item no.: 259010



### Lathe Plate

Lathe plate Ø 60 mm to clamp wood and plastics

Item no.: 269075



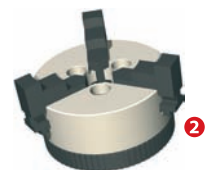
### Clamping Nut

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

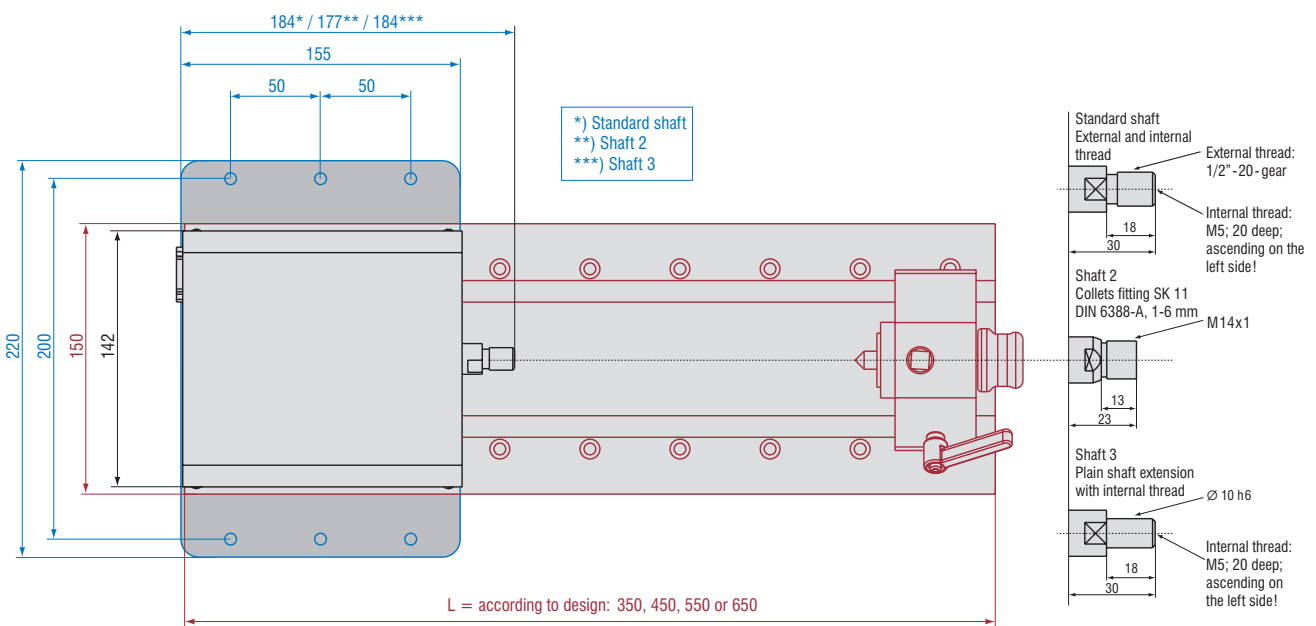
## Technical Data

	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

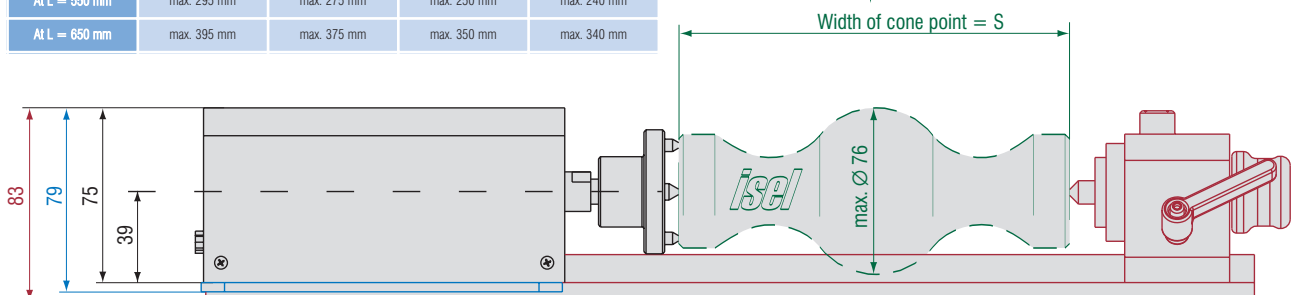
\* Values at half-step operation

\*\* exact data:  $16 \frac{3}{7} \approx 16,429$   
 $49 \frac{113}{315} \approx 49,359$

## Scale Drawings

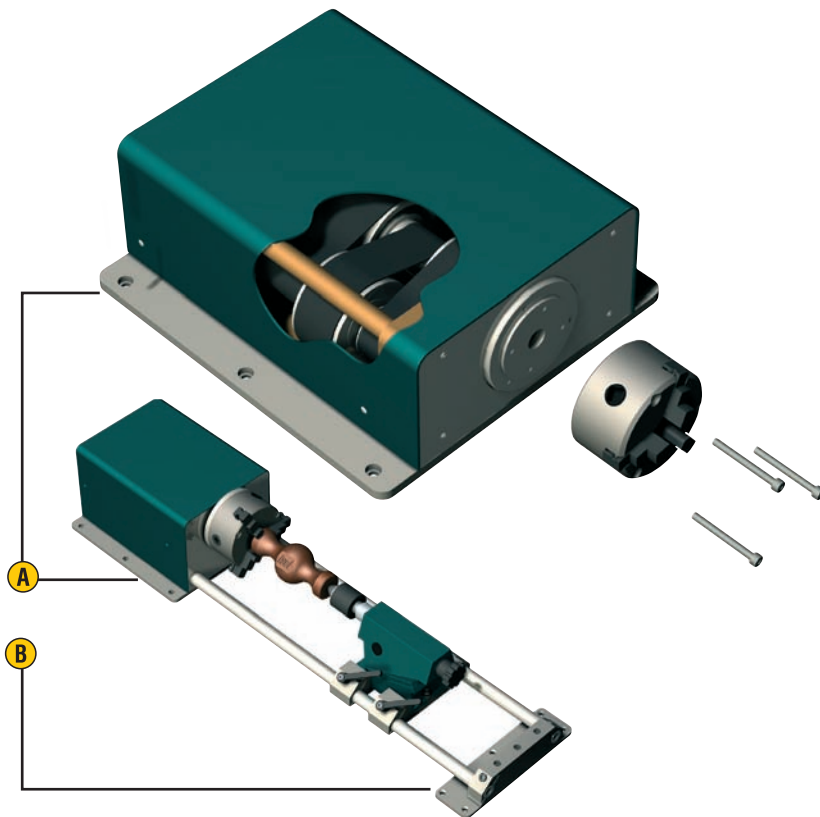


Width of cone point = S	with collets SK 11	with lathe plate	with quick-change chuck	with chuck $\varnothing 65$
At L = 350 mm	max. 95 mm	max. 75 mm	max. 50 mm	max. 40 mm
At L = 450 mm	max. 195 mm	max. 175 mm	max. 150 mm	max. 140 mm
At L = 550 mm	max. 295 mm	max. 275 mm	max. 250 mm	max. 240 mm
At L = 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  $\varnothing$  86 mm,  $56 \pm 3$  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

2 6 4 0 X 0 X 0 X 1

#### Motors

0 = Stepping motor  
1 = DC servo motor  
2 = AC servo motor

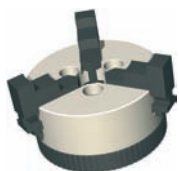
#### Brake

0 = Without brake  
1 = Permanent magnet  
2 = Electro magnet

#### 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  $\varnothing$  80

Item no.: 269060 0080



#### Chuck

3-jaw chuck  $\varnothing$  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

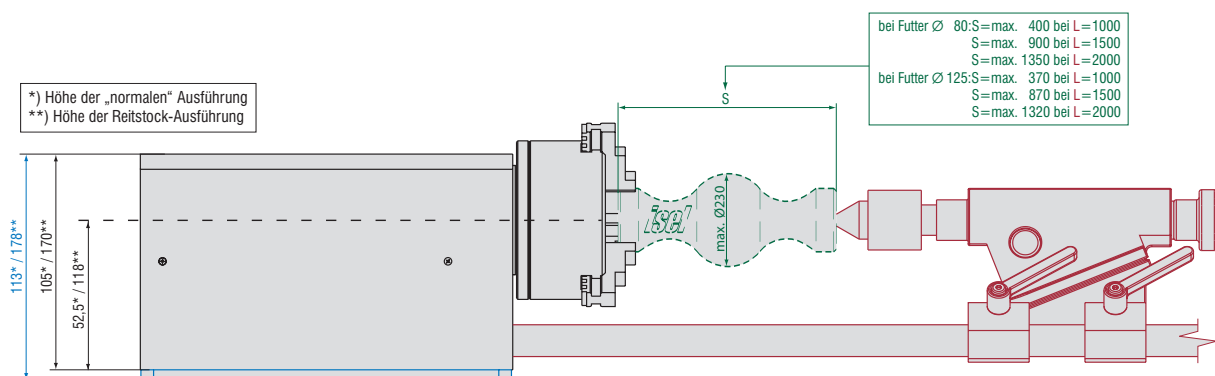
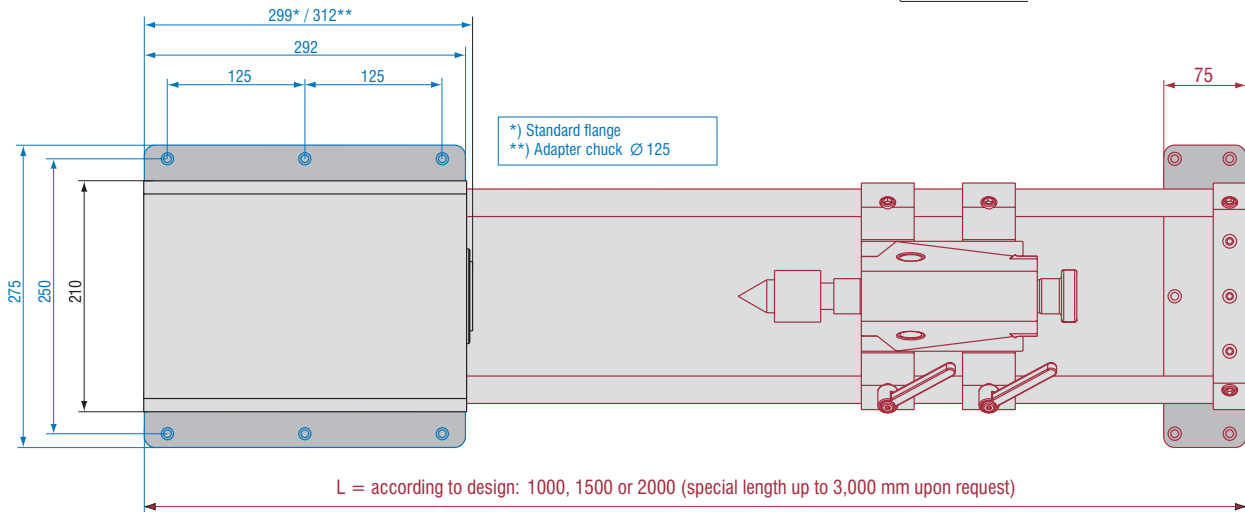
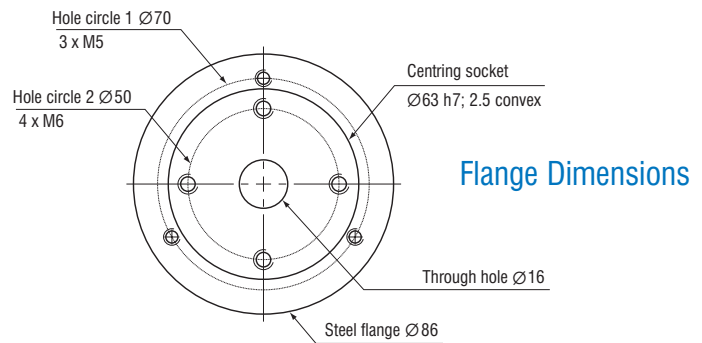
## D 2

### Technical Data

	Stepping Motor MS 200 HT *	DC Servo Motor MV 120
<b>Reduction ratio</b>	1:40	1:40
<b>Drive revolution [1/min]</b> [1/min]	0 - 30	0 - 60
<b>Operating moment</b> (0 to 500/500 to 1,000 Hz) [Nm]	35 / 30	--
<b>Nominal torque</b> [Nm]	--	12
<b>Nominal holding torque</b> (static load) [Nm]	55	18
<b>Min. increment</b> (positioning accuracy) [arcmin]	2	2

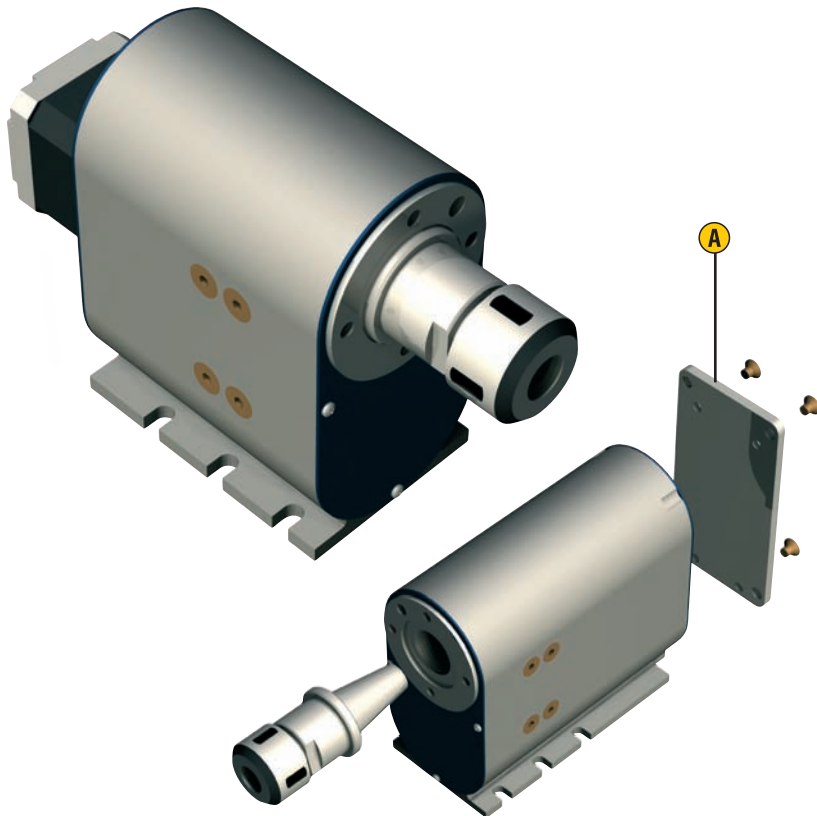
\* Values at half-step operation

### Scale Drawings



# Midget Rotary Axis

## MD 1



### Features

- play-less timing belt drive with stepping, or DC servo motor
- reduction 1:20
- shaft with through hole  $\varnothing 9$
- 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**

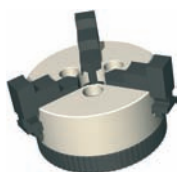
#### Motors

- 0 = Stepping motor  
1 = DC servo motor  
(only in closed design)

#### Design

- 0 = "open" design  
1 = "closed" design

### Accessory



#### Chuck

3-jaw chuck  $\varnothing 65$   
Item no.: 269060 2065



#### Collets Fitting

Collets SK 20  
for tools  $\varnothing 3-10$  mm,  
with mounting ring  
Item no.: 239122 0001

for tools  $\varnothing 3-12.7$  mm,  
with mounting ring  
Item no.: 239122 9001

# Midget Rotary Axis

# MD 1

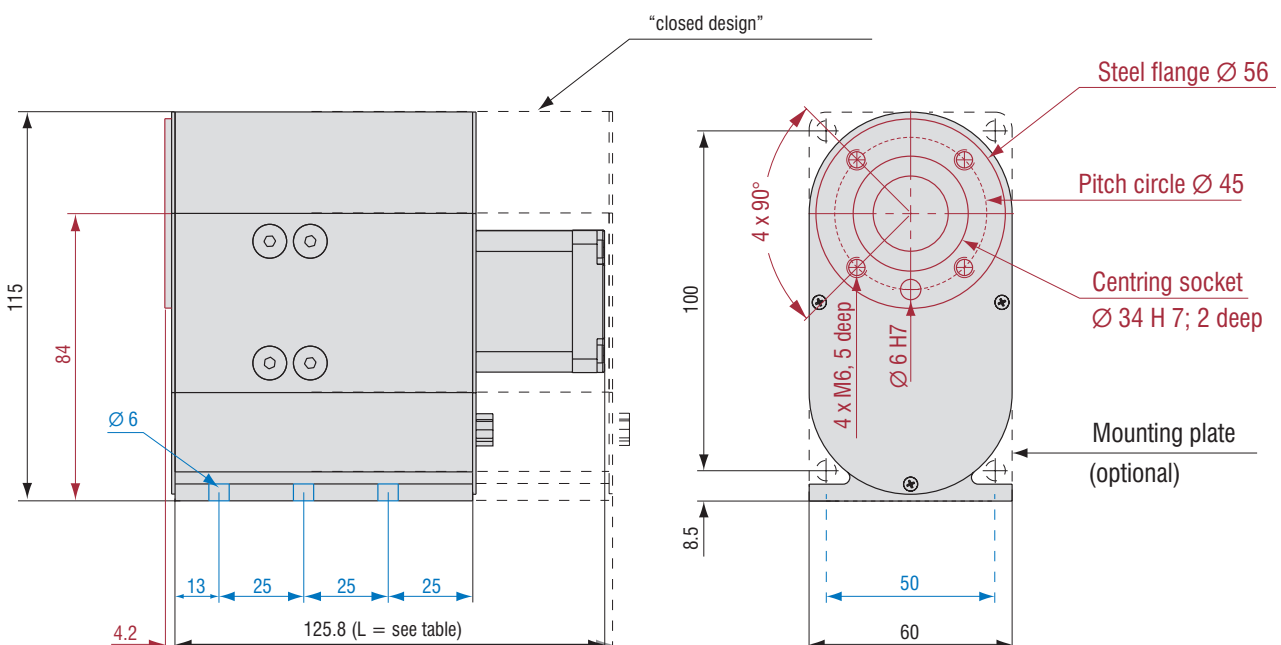
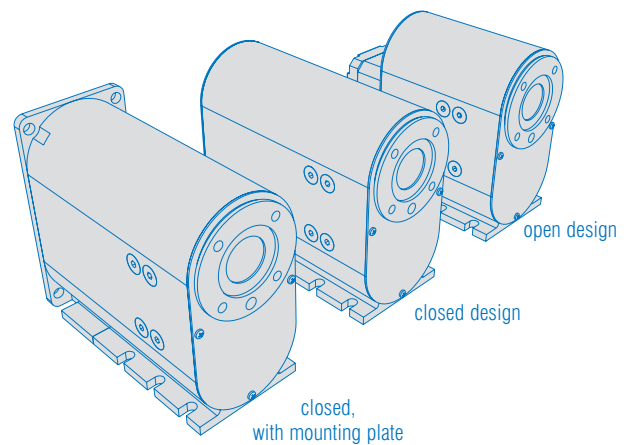
## Technical Data

	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

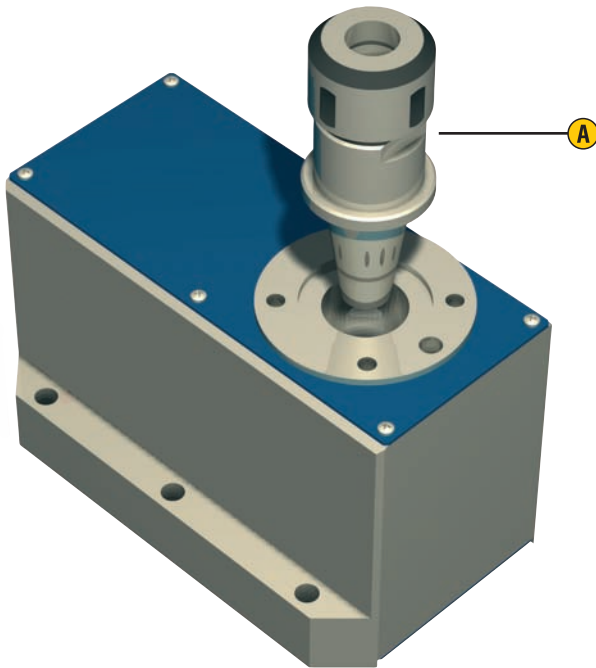
## Scale Drawings

	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:

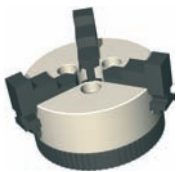
- CNC control via Sub D

- A **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



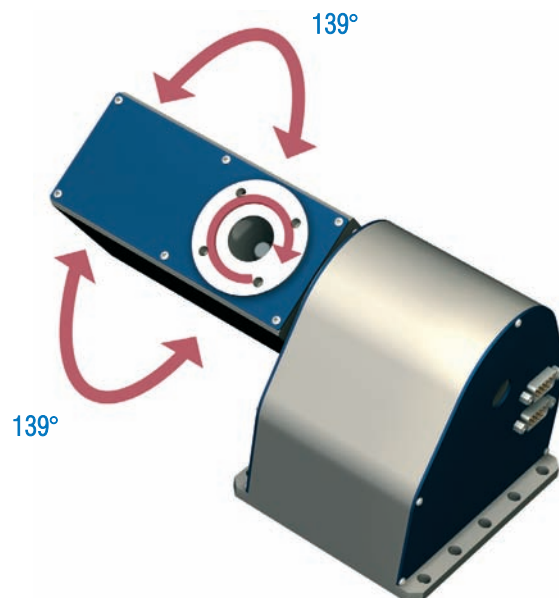
## Collets Fitting

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/or free-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

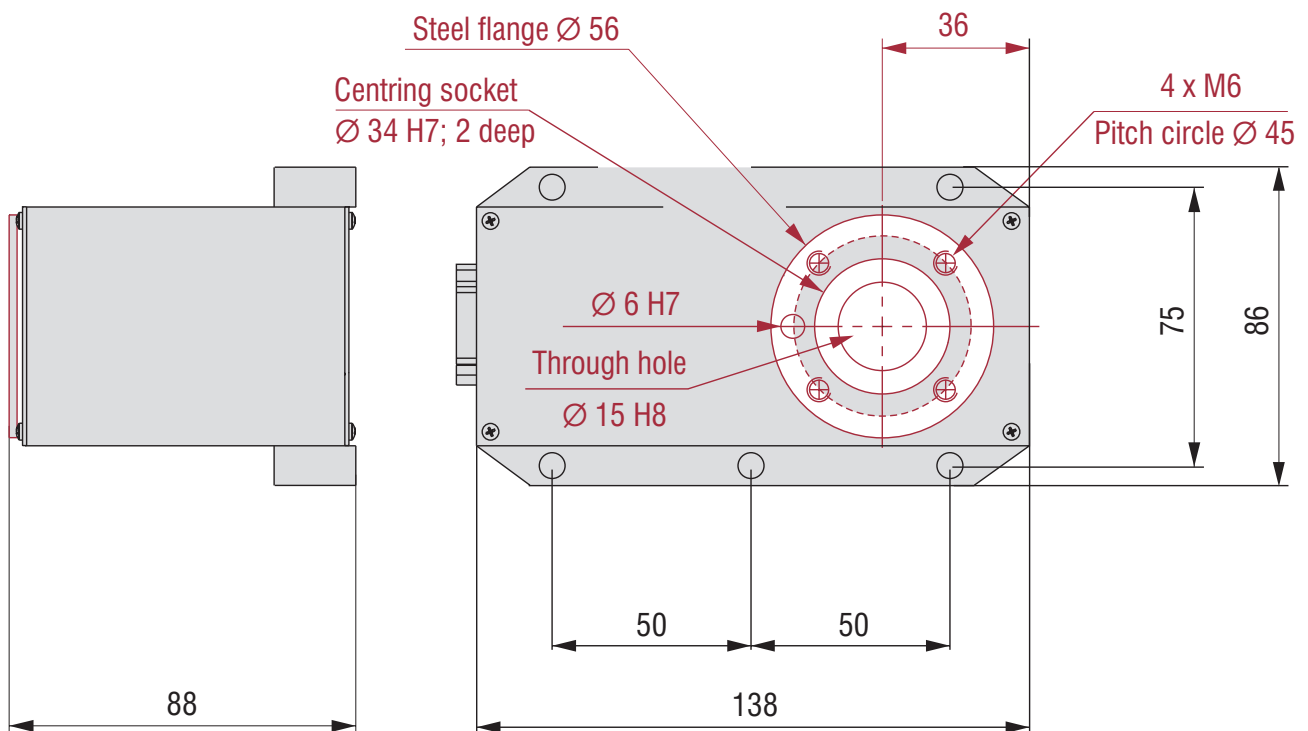
## ZR 20

## 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

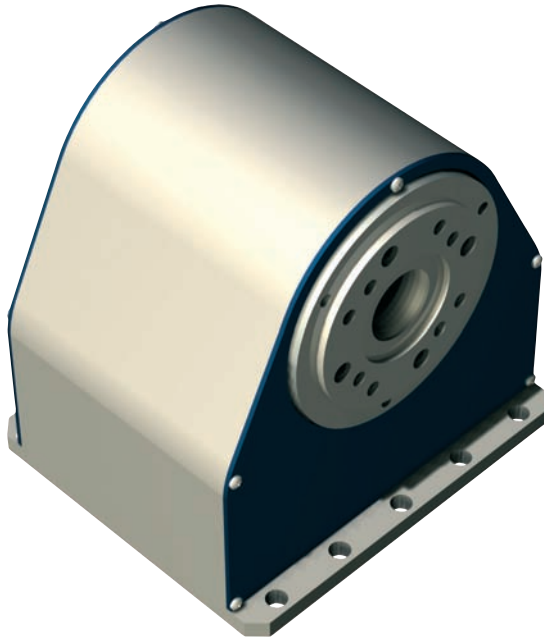
\* Values at half-step operation

## Scale Drawing



# Rotary Axis

# ZD 30



## Features

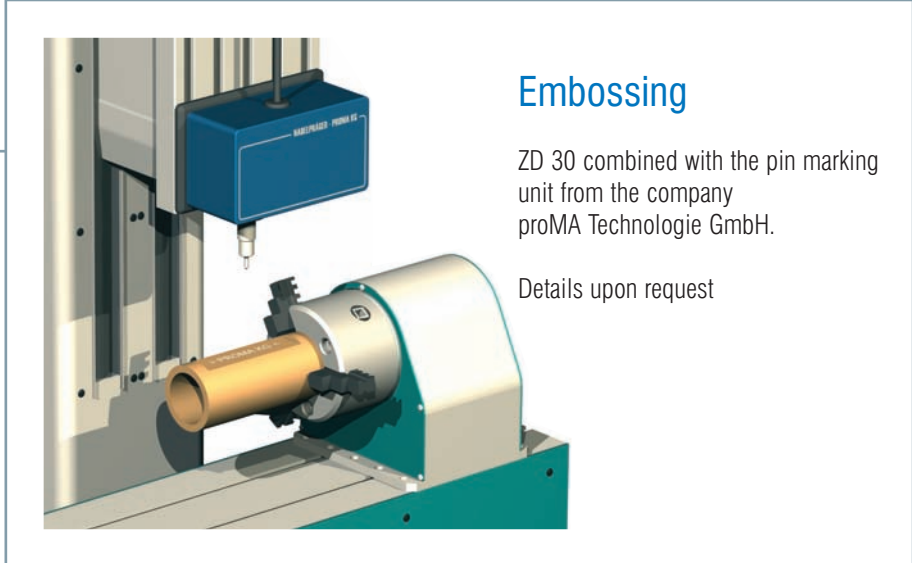
- play-less timing belt drive with stepping motor
- reduction 1:30
- shaft with through hole Ø 15
- reception flange with internal cone SK 20
- weight: 2,9 kg

### Options:

- CNC control via Sub D

## Ordering Data

Rotary axis ZD 30  
Item no.: 261100 0000

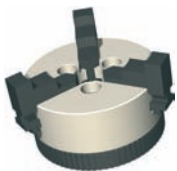


## Embossing

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

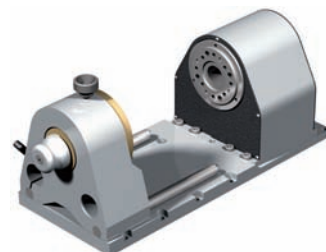


### Collets Fitting

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



### Tailstock Unit RE-ZD30

200 mm	Item no.: 269 100 1060	L 331
300 mm	Item no.: 269 100 1070	L 431
400 mm	Item no.: 269 100 1080	L 531
500 mm	Item no.: 269 100 1090	L 631

# Rotary Axis

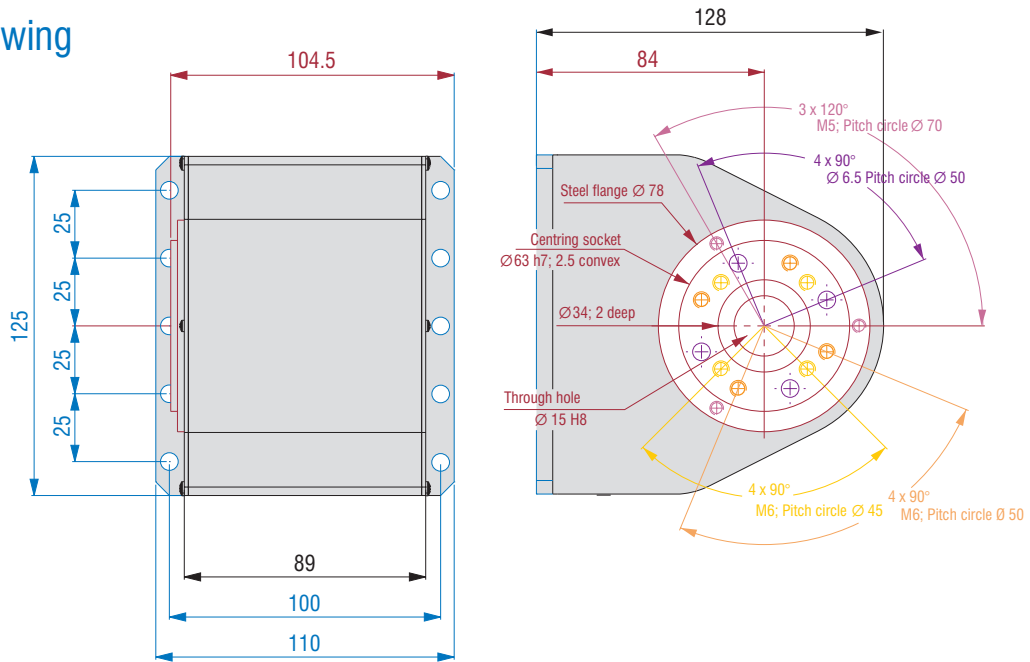
# ZD 30

## Technical Data

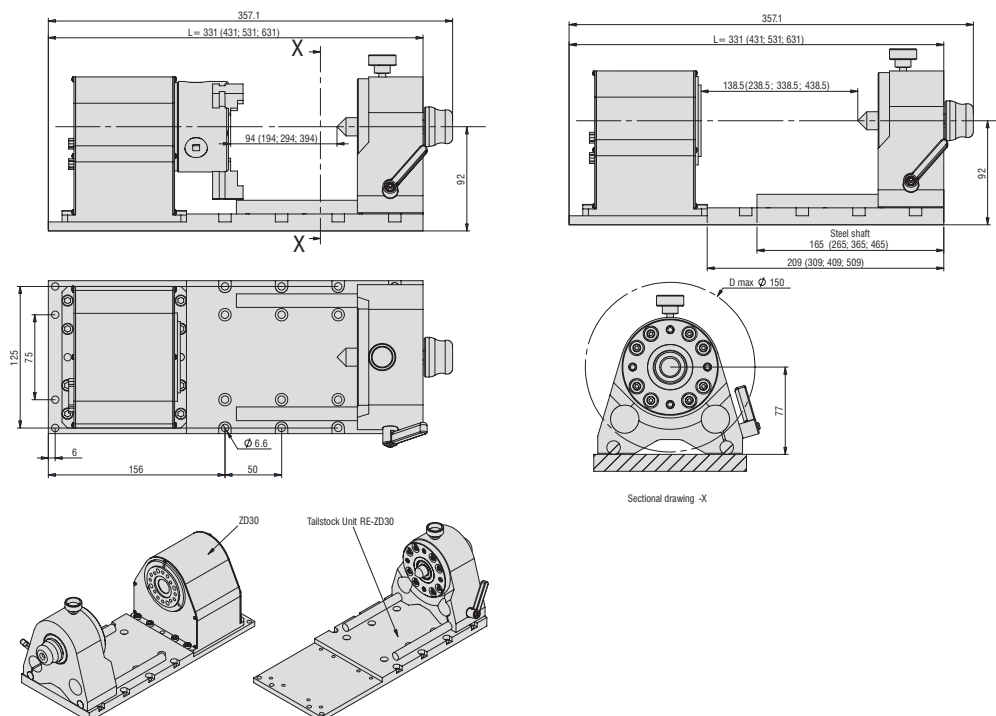
		Stepping Motor MS 045 HT*
Reduction ratio		1:30
Drive revolution	[1/min]	0 - 40
Operating moment (0 - 1600 Hz)	[Nm]	12
Nominal holding torque (static forces)	[Nm]	20
Min. increment (positioning accuracy)	[arcmin]	2.5

\* Values at half-step operation

## Scale Drawing

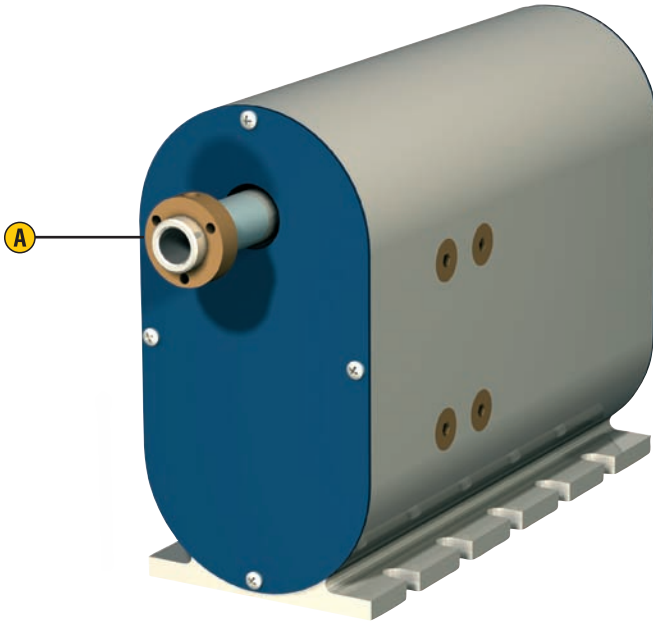


## Tailstock Unit RE-ZD30



# 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  $\varnothing 8$
- 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

- 0 = stepping motor
- 1 = DC servo motor

#### Spindle Pitch

- 2 = 2,5 mm
- 5 = 5 mm

#### Stroke Length

- 0 = 30 mm
- 2 = 60 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

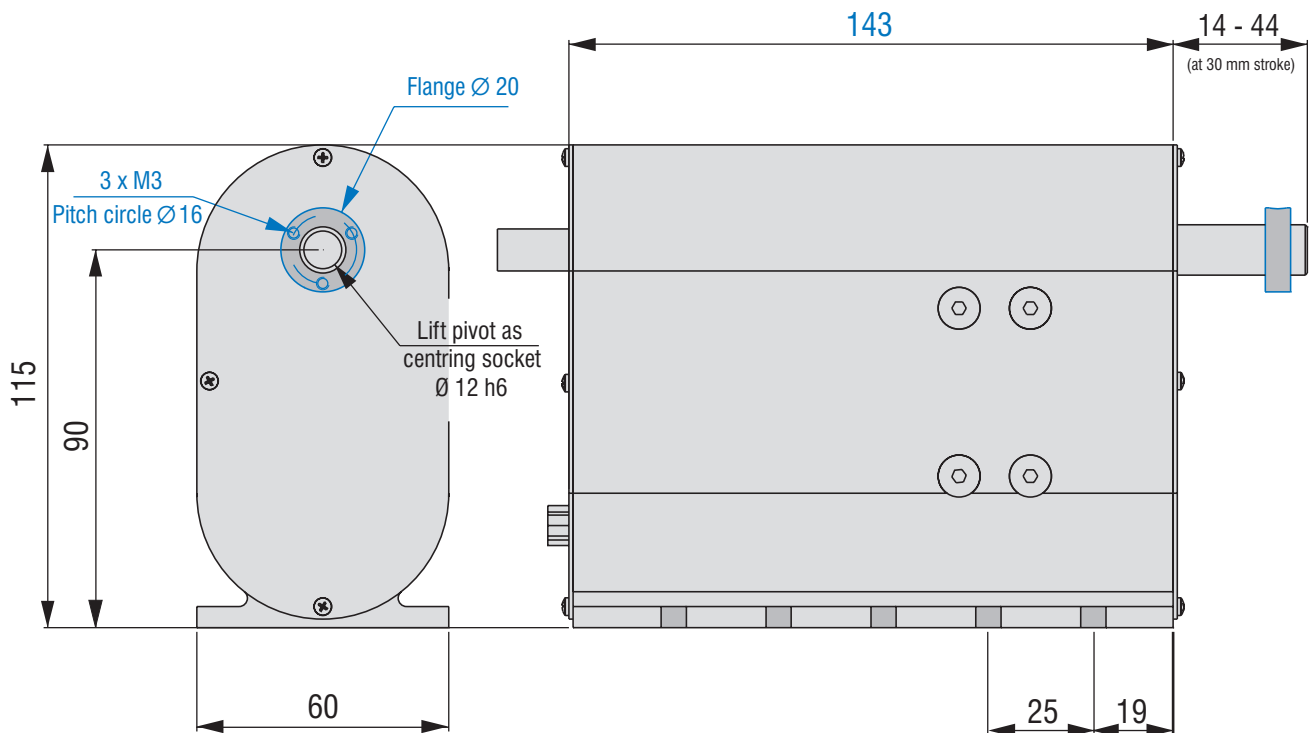
\* Values at half-step operation

\*\* Please, pay attention to the information provided under "order key".

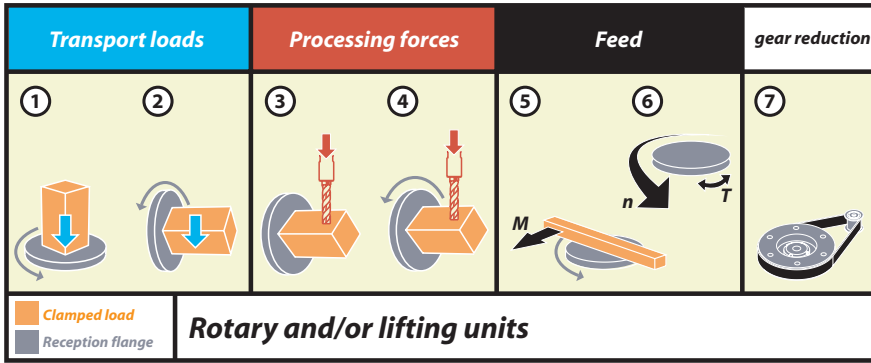
### Servo Motor MV 030

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

## Scale Drawing



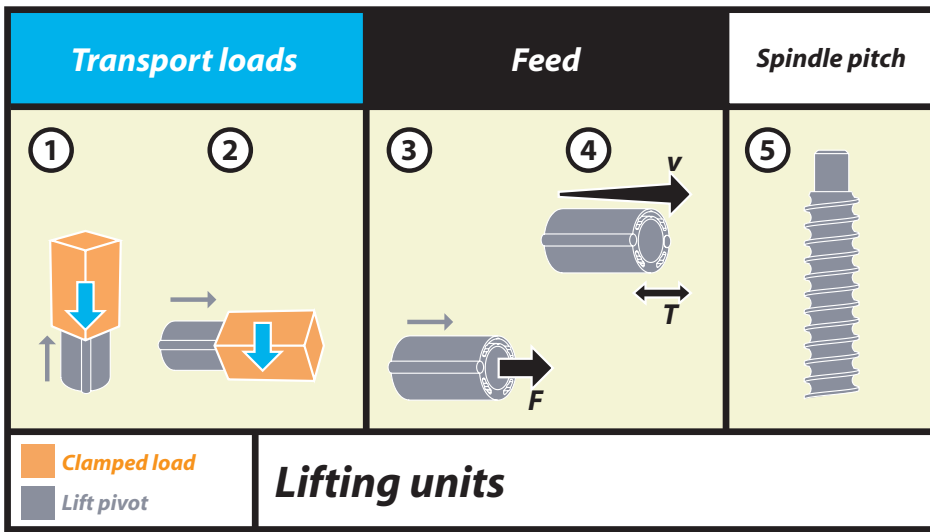
# Rotary and Lifting Units: Transport Loads, Processing Forces, Feed



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
RDH-XS (step)	30 kg	10 kg	5 Nm	5 Nm	5 Nm	24 rpm	1:50
RDH-XS (step)	30 kg	10 kg	7 Nm	7 Nm	7 Nm	12 rpm	1:100
RDH-XS (DC servo without brushes)	30 kg	10 kg	5 Nm	5 Nm	5 Nm	70 rpm	1:50
RDH-XS (DC servo without brushes)	30 kg	10 kg	7 Nm	7 Nm	7 Nm	35 rpm	1:100
RDH-XS (DC servo)	30 kg	10 kg	5 Nm	5 Nm	5 Nm	70 rpm	1:50
RDH-XS (DC servo)	30 kg	10 kg	7 Nm	7 Nm	7 Nm	35 rpm	1:100
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
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

\*)Guide values that vary according to application!! \*\*) Pick & place cycle

# Lifting Units: Transport Loads and Feed



Lifting units	1*	2*	3	4	5
MH 1 (step)	7 kg	2 kg	500 N	1.4 s <sup>**</sup>	2.5 mm
MH 1 (step)	3.5 kg	2 kg	300 N	0.8 s <sup>**</sup>	5 mm
MH 1 (step)	2 kg	2 kg	150 N	0.5 s <sup>**</sup>	10 mm
MH 1 (servo)	8 kg	2 kg	125 N	0.8 s <sup>**</sup>	2.5 mm
MH 1 (servo)	4 kg	2 kg	75 N	0.6 s <sup>**</sup>	5 mm

\*) Guide values that vary according to application !! \*\*) Pick & place cycle

Notes and Sketches

# Permissible Moment of Inertia $J_z$

## Calculation

It is important to calculate the permissible moment of inertia  $J_z$  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" [ $J_e$ ] does not exceed the permissible moment of inertia.

T-Groove Plate  $\varnothing$  240: 43.9 kgcm<sup>2</sup>

T-Groove Plate  $\varnothing$  365: 262.9 kgcm<sup>2</sup>

Aluminium Rotary Plate  $\varnothing$  490: 662.9 kgcm<sup>2</sup>

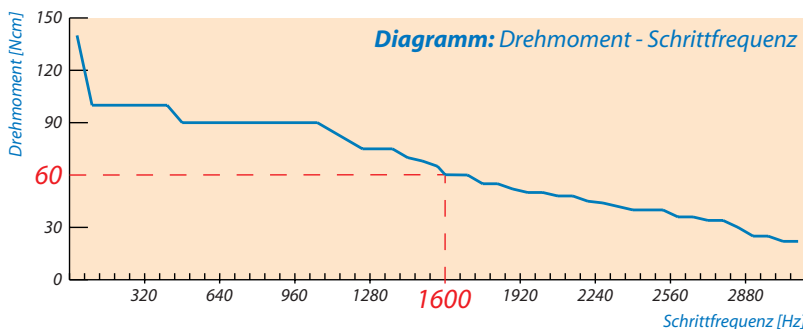
**Moments of Inertia of the Plates**

The Calculation Example refers to the Indexing Table RF 1 with Stepping Motor!

$J_z$ [kgcm <sup>2</sup> ]	Max. permissible moment of inertia
$J_e$ [kgcm <sup>2</sup> ]	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 [ $t_b$ ] 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!

$$J_z \approx 0,5 \cdot 60 \cdot \frac{0,5}{1600} \cdot 6366 \cdot 24$$

$$J_z \approx 1432 \text{ kgcm}^2$$

# Software



Features by PC 3.0

Block: 10 (Gewindeloehrer)

ZOOM=+16;7112;-7;5049;1827;1163;499;...



## SOFTWARE

### Software for Complete Controllers and System Solutions

Software and Drive Structure ..... D2

### CAD / CAM Software

isy-CAM 2.5 ..... D4

### Interpretive Software

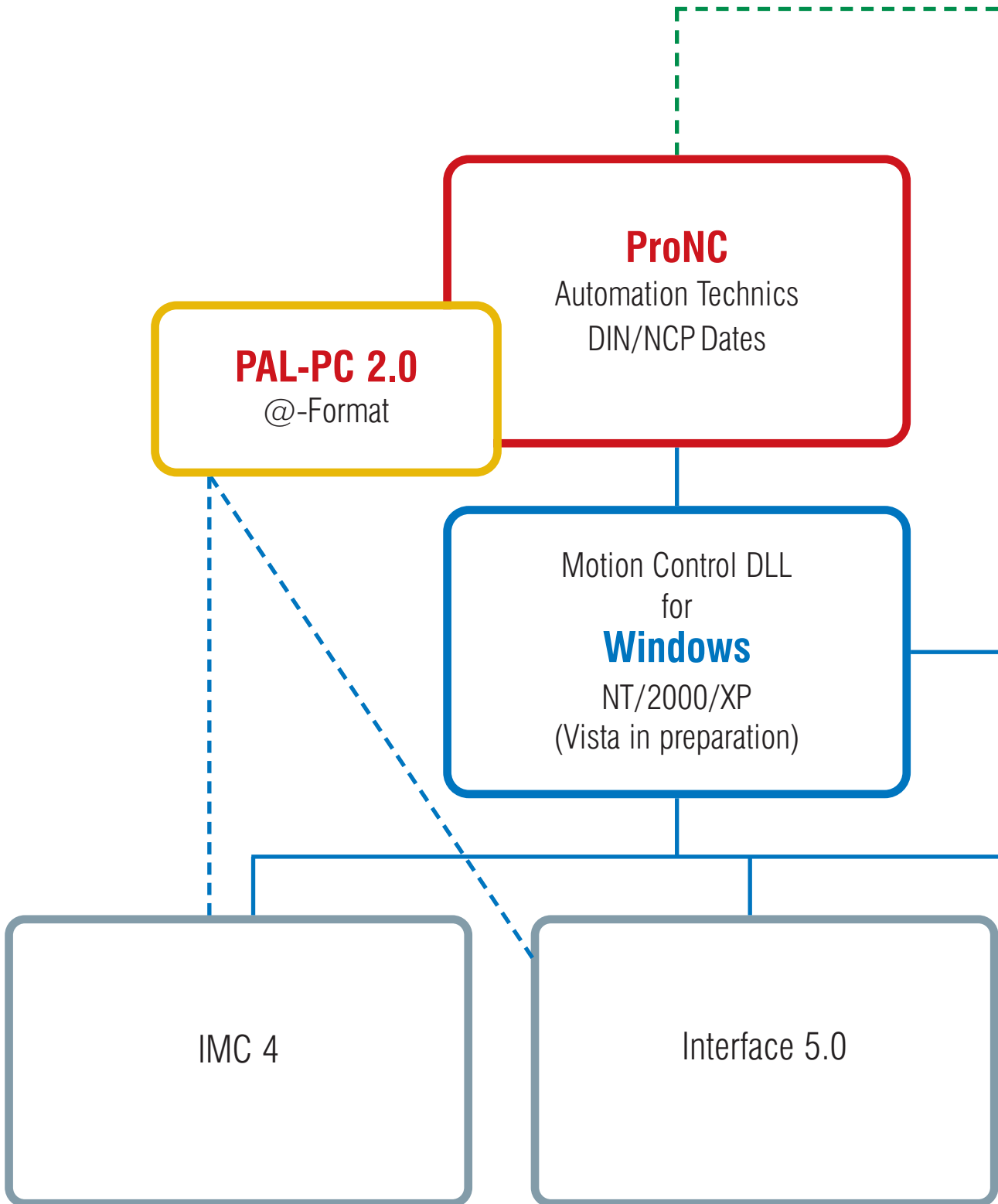
RemoteWin ..... D8

### Programming Software

ProNC ..... D12

PAL-PC 2.1 ..... D16

# Software and Control Structure



# Software and Control Structure

**isy-CAM 2.5 light/3.0**  
**incl. RemoteWin**  
with Import-Filter

**RemoteWin**  
Output Program  
for NCP Dates

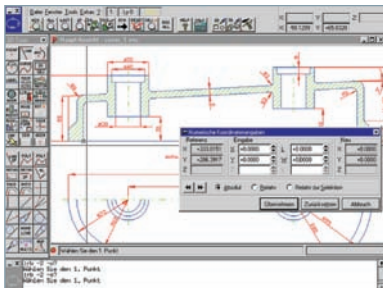
PCI-Board

# isy-CAM 2.5 light

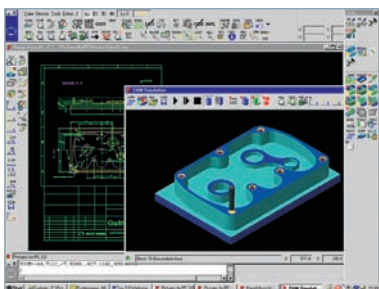


a complete Package with:

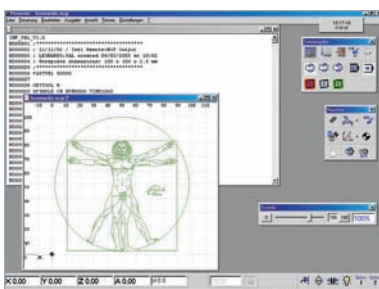
- 2D CAD / Design
- 2,5D CAM up to 4 axes
- Integrated machine control software
- Service



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 from the construction to the production by means of isel controllers and isel machines.

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.

The **CAD part** includes all functions that are necessary for 2D constructions.

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.

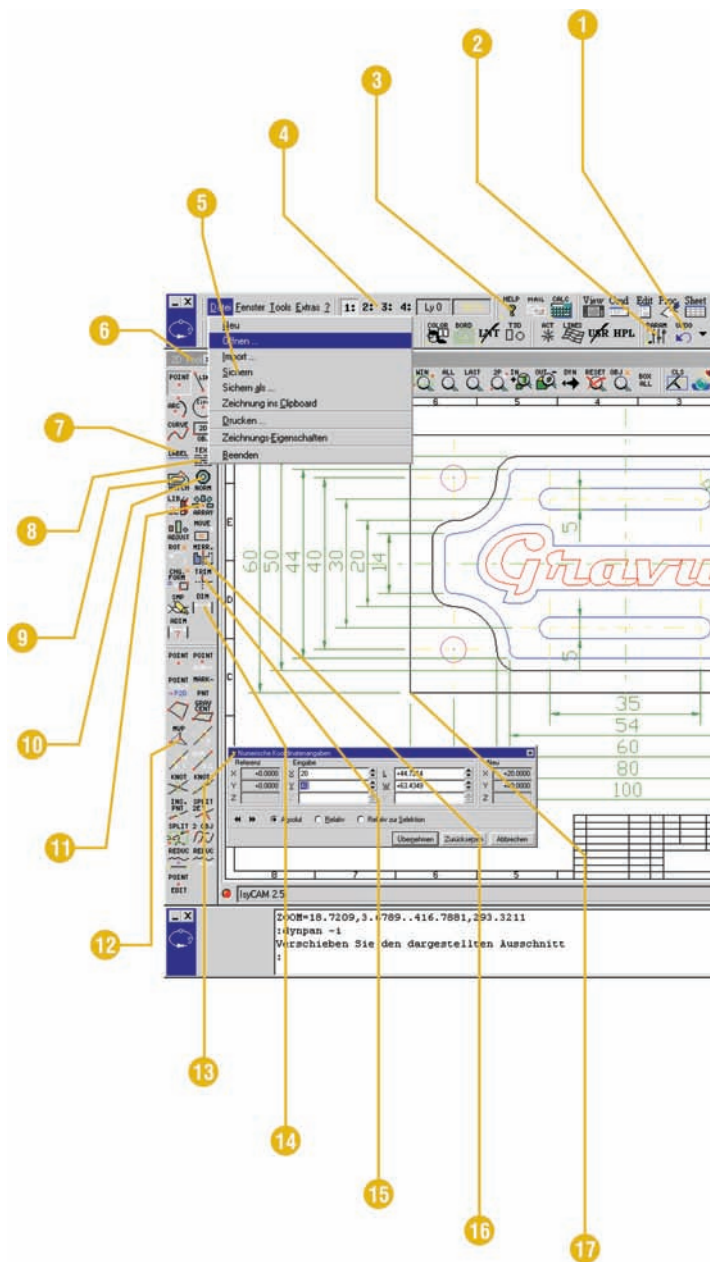
Therefore you get a universal solution to easily realize your ideas.

## Range of Application

- General construction
- Mechanical engineering
- Tool manufacture
- Electrical engineering
- Engraving technology
- Artistic design
- ...

## isy-CAM 2.5 light

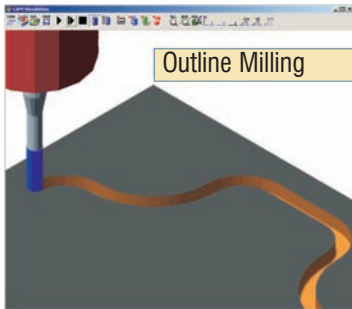
## CAD-Funktionen



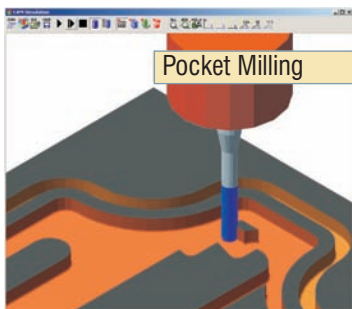
- 1 Arbitrary "Undo" function (backward steps)
- 2 Freely definable line types and colours
- 3 Integrated online support, configurable control surface
- 4 Parallel and independent working on several drawings
- 5 Import/export functions
  - Import: DXF, HPGL, AI, EPS, TIFF, BMP, NC, NCP
  - Export: DXF, 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 editing functions
- 9 Hatch and freely definable types of hatch
- 10 Standard parts
- 11 Automatic arrangement and orientation functions
- 12 Sketch and interactive change of outlines
- 13 Numeric input opportunity for absolute, relative and polar coordinates
- 14 Extensive measuring and dimensioning 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

## isy-CAM 2.5 light

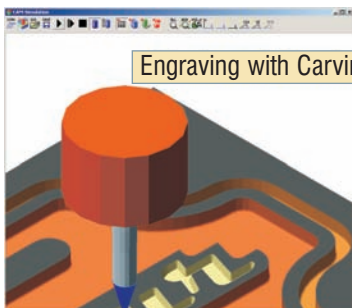
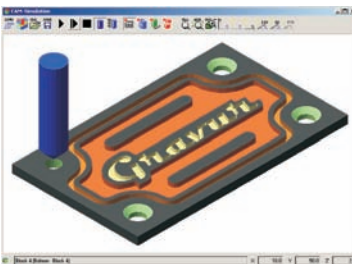
## CAM-Funktionen



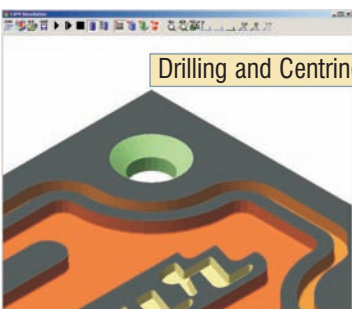
Outline Milling



Pocket Milling



Engraving with Carving



Drilling and Centring

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
- Smoothing with cut-out of the corners for tools with opening angle via 3D movements
- Automatic recognition of inner and outer contours

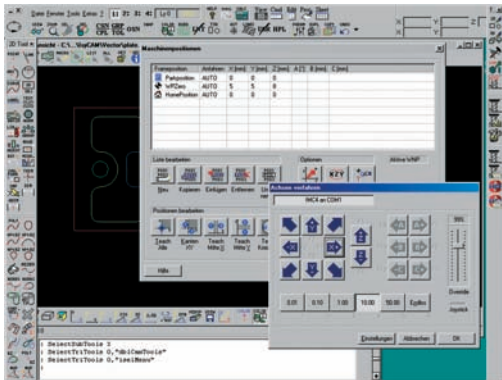
### Drilling and Centring

- 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.

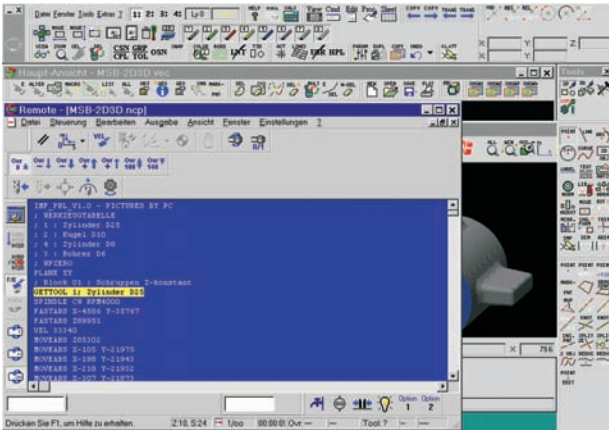
### Features of Performance:

- 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	Z13-337020
Update isy-CAM 2.0 to isy-CAM 2.5 light	Z13-337020-0001
isy-CAM 2.5 light (secondary licence)	Z13-337020-0300
Update isy 2.5 light → isy 3.0	Z13-337020-0900
School licence for 10 additional places (addition to main licence)	Z13-337000-0140
User Manual	970 Z13 HD001
isy-CAM 2.5 plus	Z13-337030
Update isy-CAM 2.5 to isy-CAM 2.5 plus	Z13-337030-0001
isy-CAM 2.5 plus (secondary licence)	Z13-337030-1000

# RemoteWin



## ... the powerful Interpretive Software for modern isel Controllers

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 accessible in two ways - by keyboard (short keys or hot keys) as well as by mouse (symbol bars and dialog boxes).

The menu 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).

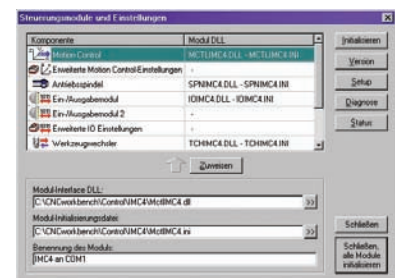
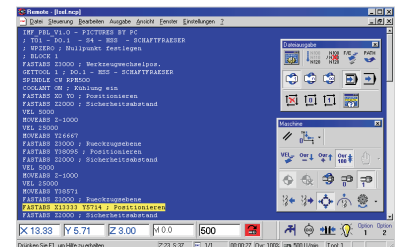
For additional adjustments of the output files, RemoteWin has an integrated editor, which is also suitable for editing larger files. Standard editor functions like "search and replace", "cut", "copy" and "paste" are supported.

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.

## Interpreter and Control Program for isel Machines and Controllers

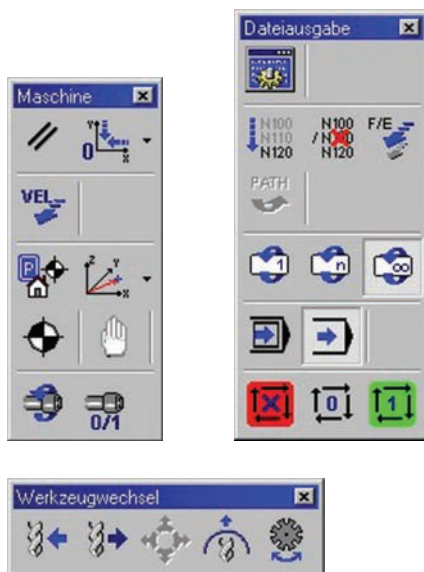
- Interpretation of NCP files and CNC files for the output to or the control of isel machines
- Interpretation of ISO files possible (G-Code)

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, Windows XP and Vista.



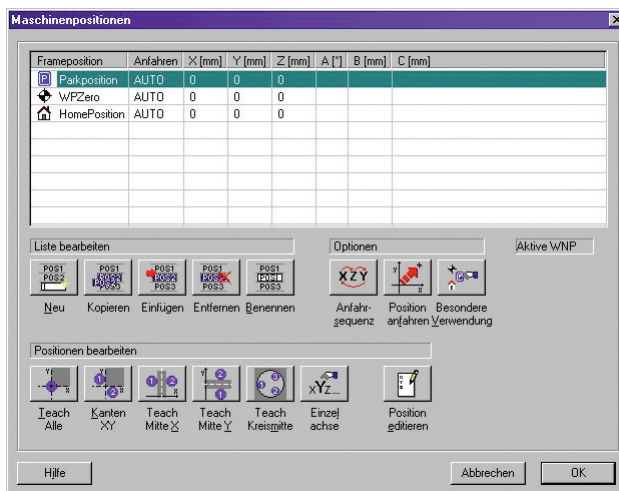
# RemoteWin

# Operation

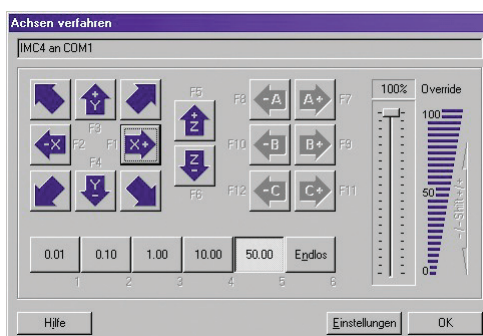


## Operation Panels with Buttons

- 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 repetitions
- Selection of the operation mode (Single step mode, automatic mode)
- Start, stop and abort the user program
- Get/deposit/clamp tool
- Tool magazine

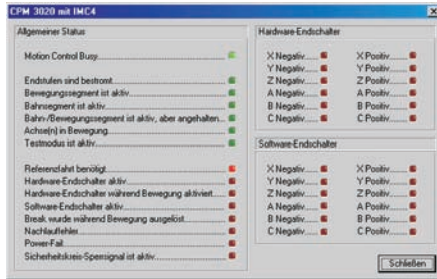


- Dialog supported machine configuration
- Set, correct, test the machine position
- Access to symbolic machine positions in the CNC user program



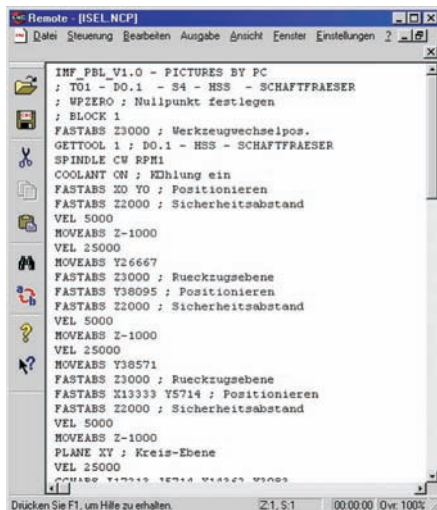
- Manual jogging (up to 6 axes)
- Teach-In with function keys, mouse click or via operating panel
- Step mode (Jog) or axis travel, slant travel

# 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

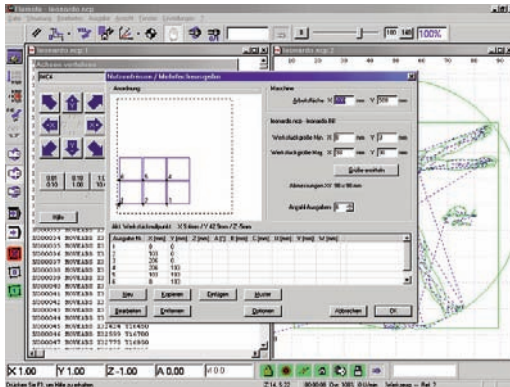
- Direct call out of isy-CAM 3.0
- Text editor for NCP user programs with Windows standard functions (search, replace, ...)
- Editing window for correcting NCP files in NCP syntax
- Immediate processing without conversion or translation after storing
- The functional possibilities of the interpreter 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



Example for the dialogue  
„Setup copy milling / batch machining“

## Remote Operation

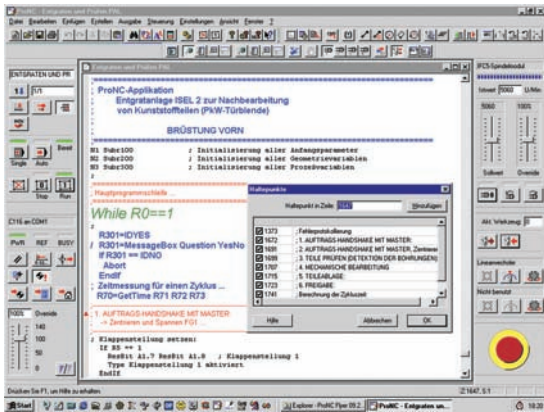
### Input support and programmed machining

- Dialog supported menu prompt
- Simple operation by mouse and/or keyboard
- Direct access of all control functions for test, start-up or manual machinings
- Dataset forerun, suppression, quick motion overlay
- Processing of files of any size

## Ordering Data

RemoteWin	Z12-334312	for isel CAN CNC Controller Win NT, 2000, XP, Vista
RemoteWin–Update	Z12-334312-0001	
ISO/NPC-Interpreter Remote	Z12-334312-1000	
RemoteWin	Z12-334112	for isel Controller C 142 Win 98, NT, 2000, XP, Vista
RemoteWin–Update	Z12-334112-0001	
ISO/NPC-Interpreter Remote	Z12-334112-1000	
RemoteWin	Z12-334111	for isel Controller IMC 4, CSD 405 IMC (for CPM and GFM Machines) Win 98, NT, 2000, XP, Vista
RemoteWin–Update	Z12-334111-0001	
ISO/NPC-Interpreter Remote	Z12-334111-1000	

# ProNC



- 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, Vista in preparation
- Interactive machine configuration
- Flexible due to the use of interface DLLs
- Expandable by customized DLLs

## The Universal Software for Modern isel Controllers

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).

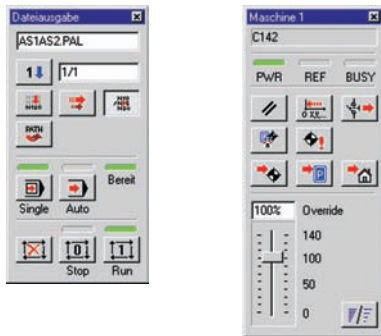
To use ProNC efficiently for the purpose of start-up / optimization of the user programs, inter alia, the following characteristics were implemented:

- 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 work-piece 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.

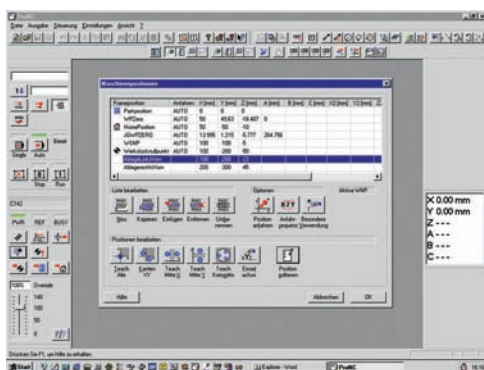
# ProNC

# Operation



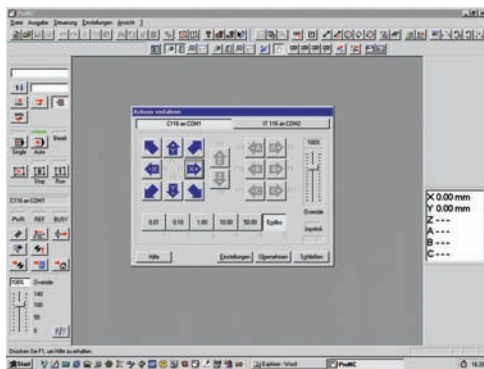
## Operating Panels with Buttons

- Starting, interrupting and cancelling the user program
- Selection of the operation mode
- Approaching selected machine positions
- Workpiece zero point on / off
- Axis override



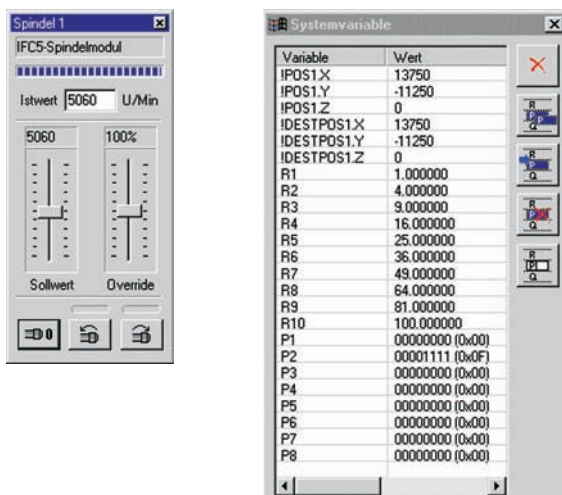
## Machine Positions

- 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

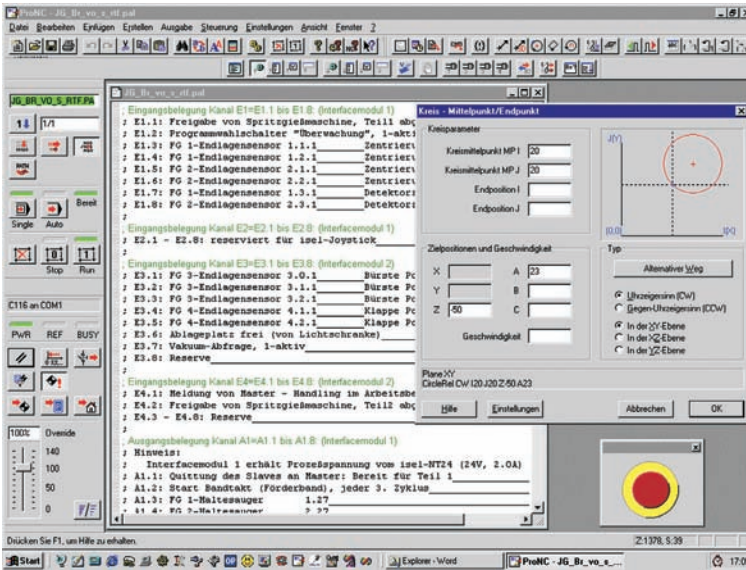
- for up to 4 spindles

# 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)



## 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

## 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

## ProNC

## Übersicht

Controller	Movement type	Axes	Runs under	Item no.
<b>IMC 4</b>	linear, circular, helix	4 ●	Win 98, NT 4, 2000, XP	Z11-333 111 Software Update Z11-333 111-0001
<b>C 142/4</b> Interface card I5 // I5.0C // I5.0C E/A	linear, circular	3 ●	Win 98, NT 4, 2000, XP	Z11-333 112 Software Update Z11-333 112-0001
<b>IT 116 G</b>	linear	1 ●	Win 98, NT 4, 2000, XP	Z11-333 112 Software Update Z11-333 112-0001
<b>CAN Dongle</b> (for printer interface)	linear, circular, helix, Look-Ahead-Bahn	6 ● + by 121 Handling axis	Win NT 4, 2000, XP	Z11-333 312 Software Update Z11-333 312-0001
<b>CAN PCI Board</b> (for PCI-Slot)	linear, circular, helix, Look-Ahead-Bahn	6 ● + by 121 Handling axis	Win NT 4, 2000, XP	Z11-333 312 Software Update Z11-333 312-0001

Training courses and application solutions upon request!

● = Servo motor

● = Stepping motor

Vista in preparation!

# PAL-PC 2.1



## 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, XP and Vista
- 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.

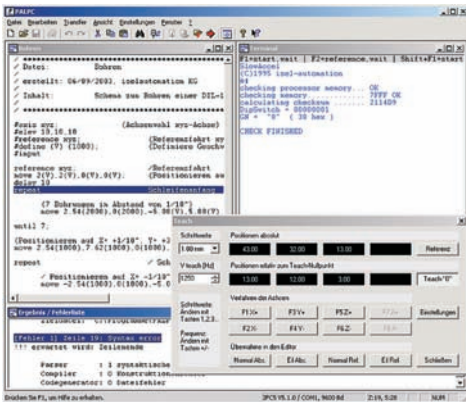
[Under preparation: G-Code extension \(programming according to DIN 66025\)](#)

# PAL-PC 2.1

# The operation

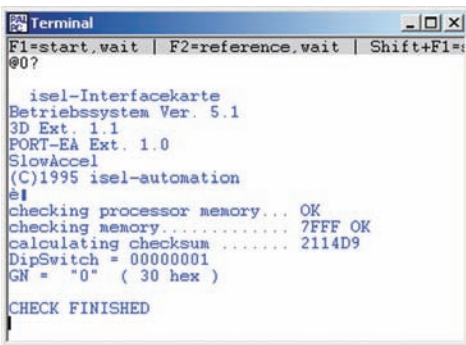
## Program Features

- 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



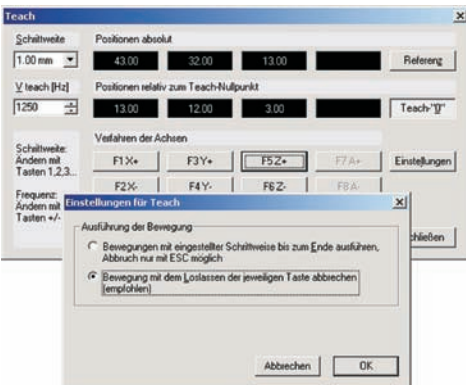
## Terminal Window

- Test of communication with the interface card
- Query of information for service and diagnostic functions
- Controller self-test



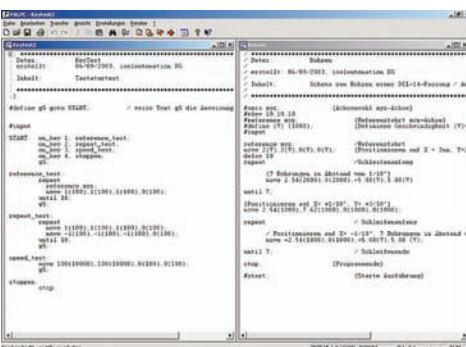
## Moving Axes

- 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



# PAL-PC 2.1

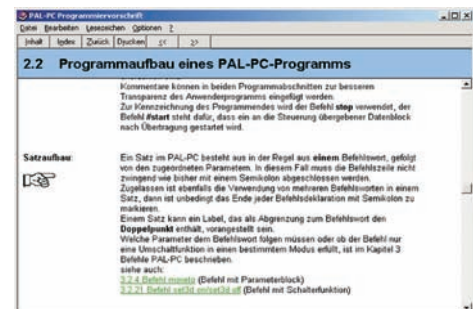
## The programming

### 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 2.1

Z11-331810






Update

PAL-PC 1.5 to PAL-PC 2.1

Z11-331810-0001

# PAL-PC 2.1

## Overview of Controllers/Control Units

Control Unit	Interpolation	Axes	CNC Mode	Runs under
IMC 4 CSD 405-IMC 	linear, circular	4 ●	yes <sup>1)</sup> <small>(available from version V2.5.00 onwards)</small>	Windows 98, NT 4, 2000, XP, Vista
C 142/4 Interface card UI5.0//C//E/A 	linear, circular	3 ●	yes <sup>2)</sup>	
IT 116 G 	linear	1 ●	yes <sup>2)</sup>	
IT 142 C 	linear	1 ●	yes <sup>2)</sup>	
MC 1-10 	linear	1 ●	yes <sup>1)</sup>	

1) Data logger of CNC programs with flash EPROM

2) Data logger of CNC programs with 32 kb RAM (extendible with optional battery backup)

● = Stepping motor

● = DC Servo motor



GFM 4433

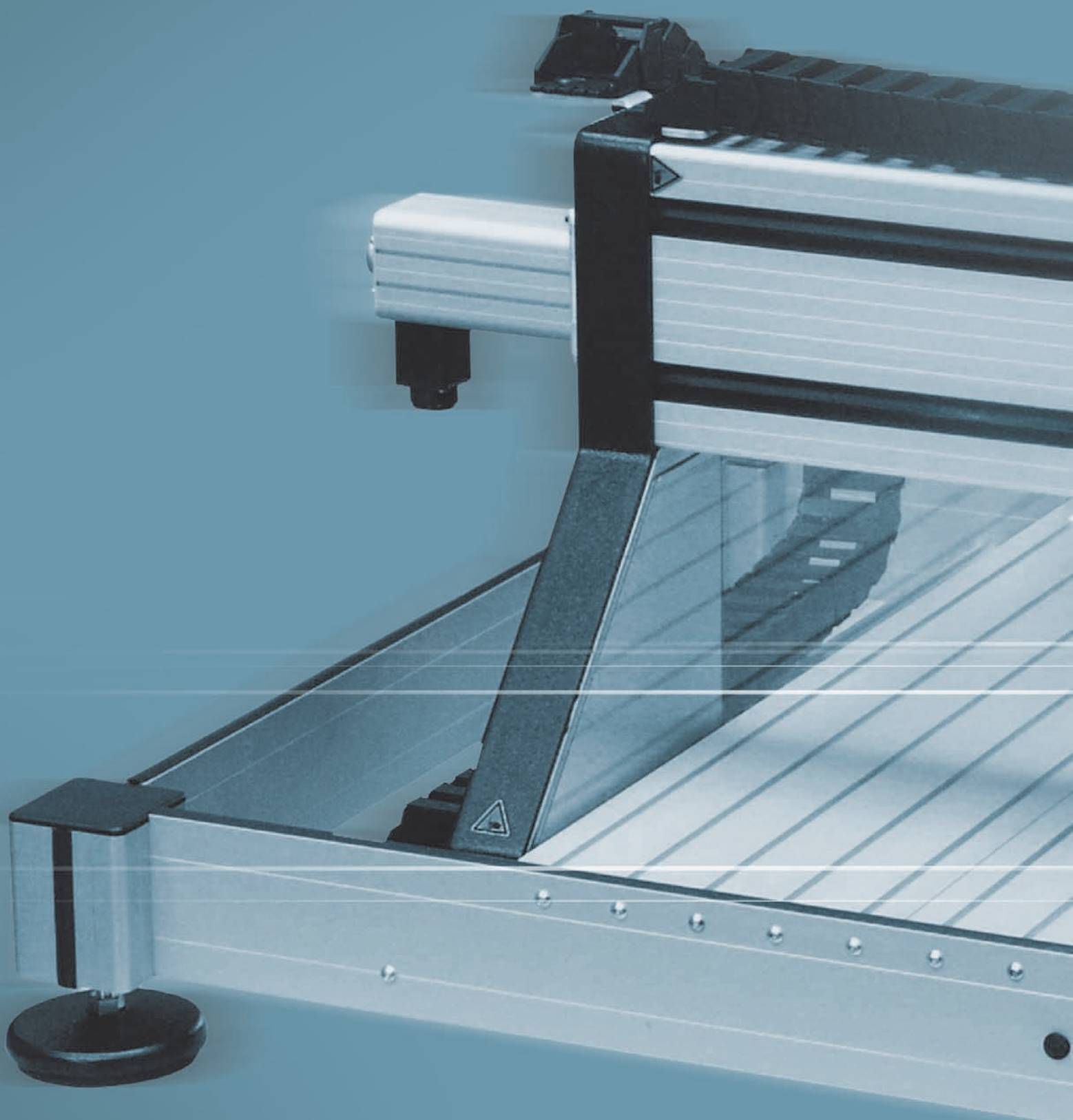


ICP 2015

### Machines

- for all machines of the CPM and ICP series (IMC4 controller for up to 4 stepping motors)
- GFM 4433 (IMC4 controller)

# system





ms

## SYSTEMS

Multi-Axis CNC Base Units ..... E2  
incl. Control

Wafer Handling Components ..... E 34

# CNC Base Machines

## Overview

X/Y/Z CNC Base Machine  
Series ICP

E 4



X/Y/Z CNC Base Machine  
ICV 4030

E 6



Flat Bed and Gantry Units  
FB2 / PA1 / PA2

E 8



X/Y/Z CNC Base Machine  
GFM 4433

E 10



X/Y/Z CNC Base Machine  
EuroMod

E 12



X/Y/Z CNC Base Machine  
FlatCom

E 14



# CNC Base Machines

# Overview

## X/Y/Z CNC Base Machine Series GFV/GFY

E 18



## ModuStar

E 20



## ModuFix

E 22



## Accessory

E 23

Main Spindle Drives  
HSA 2.07 SC-P  
HSA 2.11 SC-P  
HSA 2.22 SC-P

Main Spindle Drives - Asynchronous  
HSAW 2.05-SDF  
HSAW 2.11-KF  
HSA 2.22-KF  
HSA 4.22-KF  
HSA 2.22-K3SC

Main Spindle Drives - Accessory



MAV 2.075 S



MAV 2.11 S



MAV 2.22 S



MAHV 2.04 S



MAHV 2.04 SC



MAW 2.05-SD



MA 4.05-S



MAW 2.11-K

MAW 2.22-K  
MAW 4.22-K

MAW 2.22-K3S

## Tool Kit Cooling System

E 27



## VakuFit

E 32



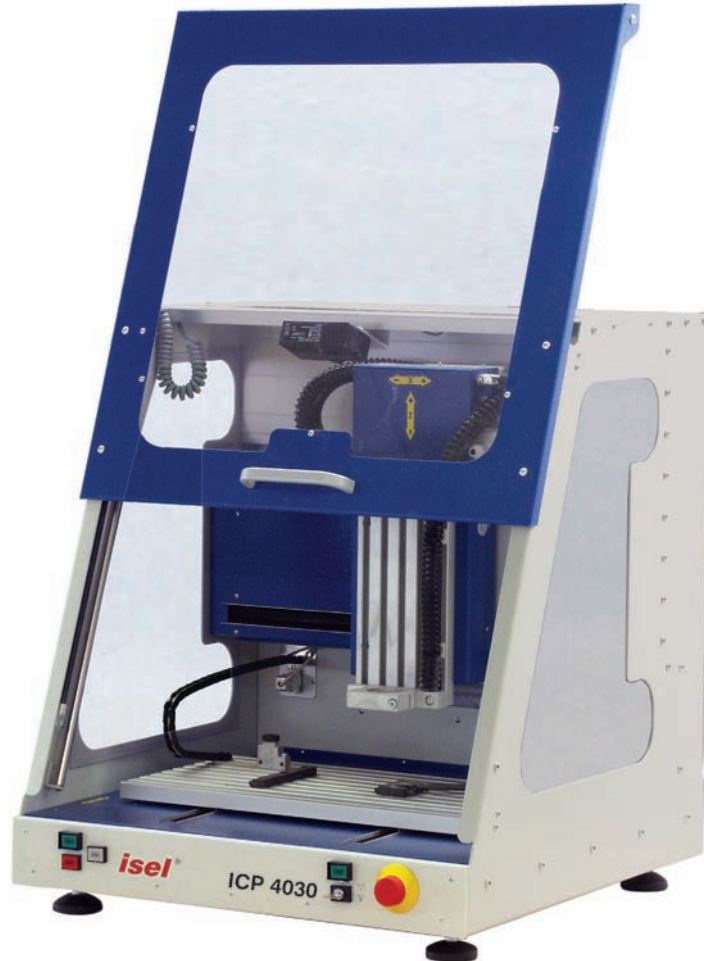
## ROBOTIK

E 34



# X/Y/Z CNC Base Machine

## Series ICP



CNC base machines 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 Machine

# Series ICP



## Technical Data

	ICP 4030	ICP 3020	ICP 2015
<b>Construction type</b>	Chassis construction with protective hood	Chassis construction with protective hood	Chassis construction with protective hood
<b>Design</b>	Gantry unit	Gantry unit	Gantry unit
<b>Travel ranges (X/Y/Z)</b>	400/300/140 mm	300/200/90 mm	200/150/90 mm
<b>Travel speeds (X/Y/Z)</b>	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
<b>Guides</b>	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
<b>Passage height (from lower edge z-axis)</b>	170 mm	115 mm	100 mm
<b>Clamping table surface (W x D)</b>	600 x 375 mm	500 x 250 mm	400 x 250 mm
<b>Dimensions (W x D x H)</b>	780 x 850 x 810 mm	610 x 650 x 715 mm	535 x 600 x 690 mm
<b>Weight (basic configuration)</b>	Approx. 120 kg	Approx. 102 kg	Approx. 95 kg
<b>Mode of drive</b>	2-phase high-torque stepping motors	2-phase high-torque stepping motors	2-phase high-torque stepping motors
<b>Control</b>	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

## 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

# X/Y/Z CNC Base Machine

## ICV 4030 with DC Servo Motor Drive



- Complete solution with
  - DC servo motors
  - DC power electronics
  - Control program
- Perfect for training and small series production
- For basic machinings like drilling, milling and engraving, customer applikations like dosing, measuring, Positioning, etc.
- For machining light metal, plastic, wood and printed circuit board materials
- Prepared for an exhauster
- integrated DC-power electronics for 3 axes, 4th axis is projected
- control through CAN-bus from the integrated control PC
- 16 inputs, 16 outputs
- Complete solution from construction up to production by the optional CAD/CAM software package isy-CAM 2.5

The ICV 4030 is a further development of the proven ready-to-use 3D capable CNC machine CPV 4030.

The redeveloped, upward opening sliding hood can now be operated comfortably from sitting position.

As a consequence of the completely bolted chassis higher precision is the result of the structure of the machine as well as an improved ease of servicing compared to the welded chassis of the CPM series.

Furthermore the resonance and vibration behaviour could be optimized and thus a smaller noise development be achieved.

The only preconditions that are needed for working with the ICV 4030 are basic knowledge in CNC technology, general PC knowledge as well as basic knowledge in graphic programs!

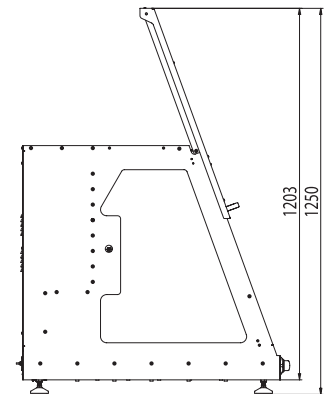
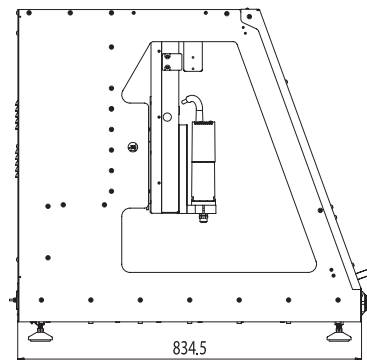
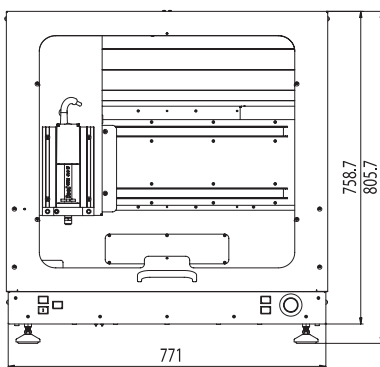
# X/Y/Z CNC Base Machine

**ICV 4030**  
with DC Servo Motor Drive

## Technical Data

Type of construction	Chassis construction with protective hood
Design	Gantry system
Traversing range (X/Y/Z)	400/300/110 mm
Traverse rate (X/Y/Z)	>80/80/80 mm/s with spindle 16 x 10 mm
Guides	Play-free precision steel shaft guides with bearing carriage
Passage height (lower edge Z axis)	150 mm
Clamping table surface (W x T)	600 x 375 mm
Weight (standard equipment)	approx. 150 kg
Control	Integrated 3 axis servo controller with CAN BUS, Axis 4 in preparation
Mode of drive	DC Servo motors

## Dimensions



## Order Data

280230 4405	ICV4030 as described below, however equipped with a ball screw drive <b>16 x 10 mm</b> , Z-axis <b>16 x 4 mm</b>
280231 4405	ICV4030 with integrated power electronics, ball screw drive <b>16 x 4 mm</b> , without main spindle drive, without software, housing RAL 7035/5022
280110 9001	Exhauster for ICV 4030
280120 9012	Cooling/spraying device for ICV 4030
280120 9003	Engraving mat for ICV 4030
280120 9010	Length measuring sensor for ICV 4030
280120 9004	Workspace illumination for ICV 4030
420003 0500	Milling motor 500 W, 11.000...25.000 min <sup>-1</sup>
420003 1050	Milling motor 1050 W, 11.000...25.000 min <sup>-1</sup>
290903	Clamping block for drilling/milling machines
Z13-337020	isy-CAM 2.5 (light) 2,5D-CAD/CAM software
Z13-337030	isy-CAM 2.5 plus, 2,5D-CAD/CAM-Software
310704 1611	Main spindle drive HSA-2.04 SC EM with collet ER 11; 0,4 kW, bis 30.000 R/min., self-ventilation
310707 1611	Main spindle drive HSA-2.07 SC EM with collet ER 16; 0,75 kW, bis 24.000 R/min., self-ventilation
310705 2511	Main spindle drive HSAW 2.05 SDF, 500 W, 300...24.000 R/min., Converter F5
On request	Tool changing station, tenfold; isy-CAM 2.5 light; ProNC; RemoteWIN; control panel, monitor, keyboard

## 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 play-free ballscrew drives with a repetition accuracy of  $\pm 0.01$  mm (positioning reproducibility) 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  $\pm 0.01$  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 components 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 and 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)
- without motors, with input shaft extension
- different ball screw thread pitches (2,5 mm or 5 mm)
- Underframe
- Enclosed hood
- Other accessories see page E23 – E 31



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	1100 x 750	750 x 530	190
246 203 2054	246 208 2054	1350 x 750	1000 x 530	190
246 203 2067	246 208 2067	1350 x 1000	850 x 780	190
246 203 2130	246 208 2130	1750 x 1250	1250 x 1030	190
246 203 3027	246 208 3027	850 x 750	500 x 530	300
246 203 3040	246 208 3040	1100 x 750	750 x 530	300
246 203 3054	246 208 3054	1350 x 750	1000 x 530	300
246 203 3067	246 208 3067	1350 x 1000	850 x 780	300
246 203 3130	246 208 3130	1750 x 1250	1250 x 1030	300
246 203 5027	246 208 5027	850 x 750	500 x 530	500
246 203 5040	246 208 5040	1100 x 750	750 x 530	500
246 203 5054	246 208 5054	1350 x 750	1000 x 530	500
246 203 5067	246 208 5067	1350 x 1000	850 x 780	500
246 203 5130	246 208 5130	1750 x 1250	1250 x 1030	500

All flat bed units are equipped with a **16 x 4 mm ball screw** as standard

## 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	1100 x 750
248 500 0054	1350 x 750
248 500 0067	1350 x 1000
248 500 0130	1750 x 1250

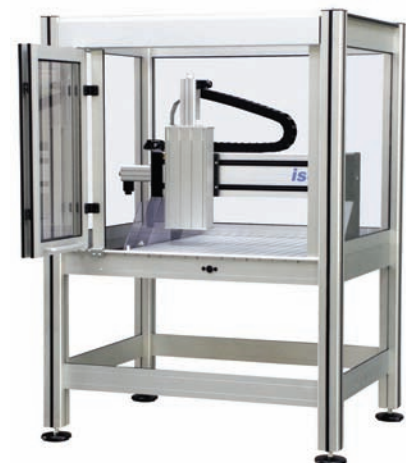


## Z axes for the Flat Bed Units

Item No.	Stroke (mm)	
230 514	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

## 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	1100 x 750
248 200 2054	1100 x 750
248 200 2067	1350 x 1000
248 200 2130	1750 x 1250



Attention: The matching underframe has to be ordered separately.

## 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.	
213-33 7020	isy-CAM 2.5 light (only available in combination with an unit)

# X/Y/Z CNC Base Machine

# GFM 4433



The isel-CNC base machines of the series GFM 4433 are stable C-frame-type CNC machines made of lightweight 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 locking.

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 machines 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 Machine

# GFM 4433

## 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 machines are also available as OEM version without hood.

... K-Series with the Types EuroMod 30, 45, 65



Image: **EuroMod 45**  
Enclosed design with opened hood and optional special equipment

## Fields of Application

**EUROMOD** base machines constitute the basis for the composition of machines and constructions for:

- assembling and mounting
- printing and engraving
- drilling and milling
- dosing and screwing
- forming and modelling
- pasting and casting
- laser and water jet cutting
- soldering and welding
- measuring and verifying
- sawing and cutting
- ... and other applications

## Options

- Main spindle with frequency converter
- Tool changing station
- Cooling/spray units
- Exhaustion
- Rotary Axis (4th axis)
- Rotary-/swivelling unit (4th/5th axis)
- Covering
- Closed design
- Vakuum clamping system
- CNC Joystick
- CNC Control-Panel 17"

**EuroMod** base machines are ready-to-use CNC systems with a great ease of use for a large number of tasks and applications that can be automated.

Rigid, low vibration steel and aluminium constructions made of isel system profiles and system elements are the mechanical basis for the **EuroMod** base machines. The isel ball screw drives with steel spindles 16 x 5 mm, used in the positioning axes, provide for high precision.

When developing the **EuroMod** base machines, the focus was especially put on a small space requirement. All base machines need a floor width of only 1,160 mm. The dimensions in depth are: 800 mm, 1,100 mm and 1,510 mm.

Like the mechanics, the electronics of the **EuroMod** is also "cast from the same mould". The employed servo motors are optimally matched to the mechanics, the power electronics

and the control. As a result of this, high power, quiet running and sufficient reserves are provided to the user.

The complete electronics of the **EuroMod** is accommodated in a control box. Operation takes place by a control panel with 10" display and touchscreen.

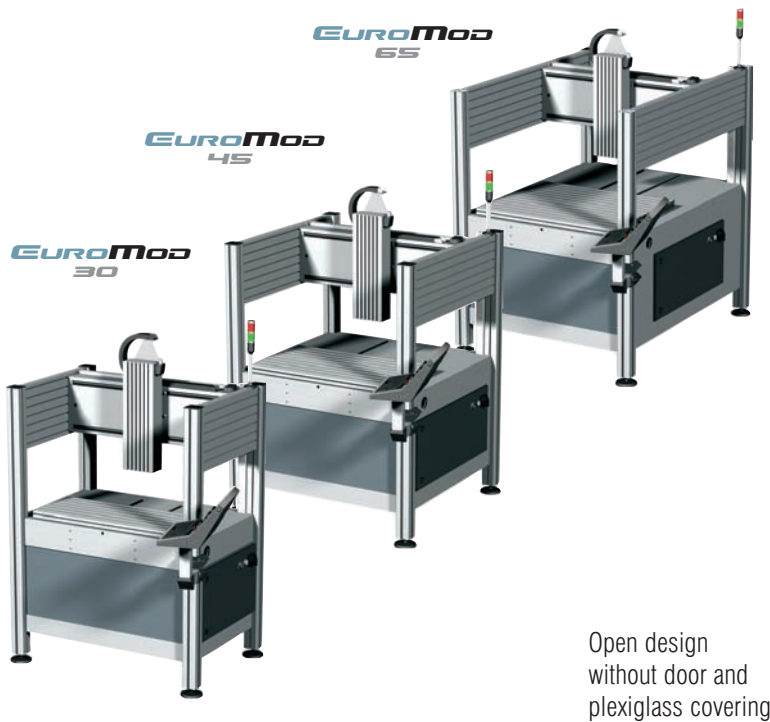
The **EuroMod** base machines are available with or without housing. The housing version comes with an undivided door cutout.

In case of the **EuroMod** the portal section is fixed and the workpiece is being moved within this rigid section. As a consequence, this design is particularly suitable for the precise, machine cutting treatment and for multi-axis machining.

Functional accessories of our own development and manufacturing are also available for the **EuroMod** base machines.

**EUROMOD**<sup>®</sup>**Base Machine for Systems**

systems

**Order Data****EuroMod 30**

open design

Item no. **275202 34552**

closed design

Item no. **275203 34552****EuroMod 45**

open design

Item no. **275212 34552**

closed design

Item no. **275213 34552****EuroMod 65**

open design

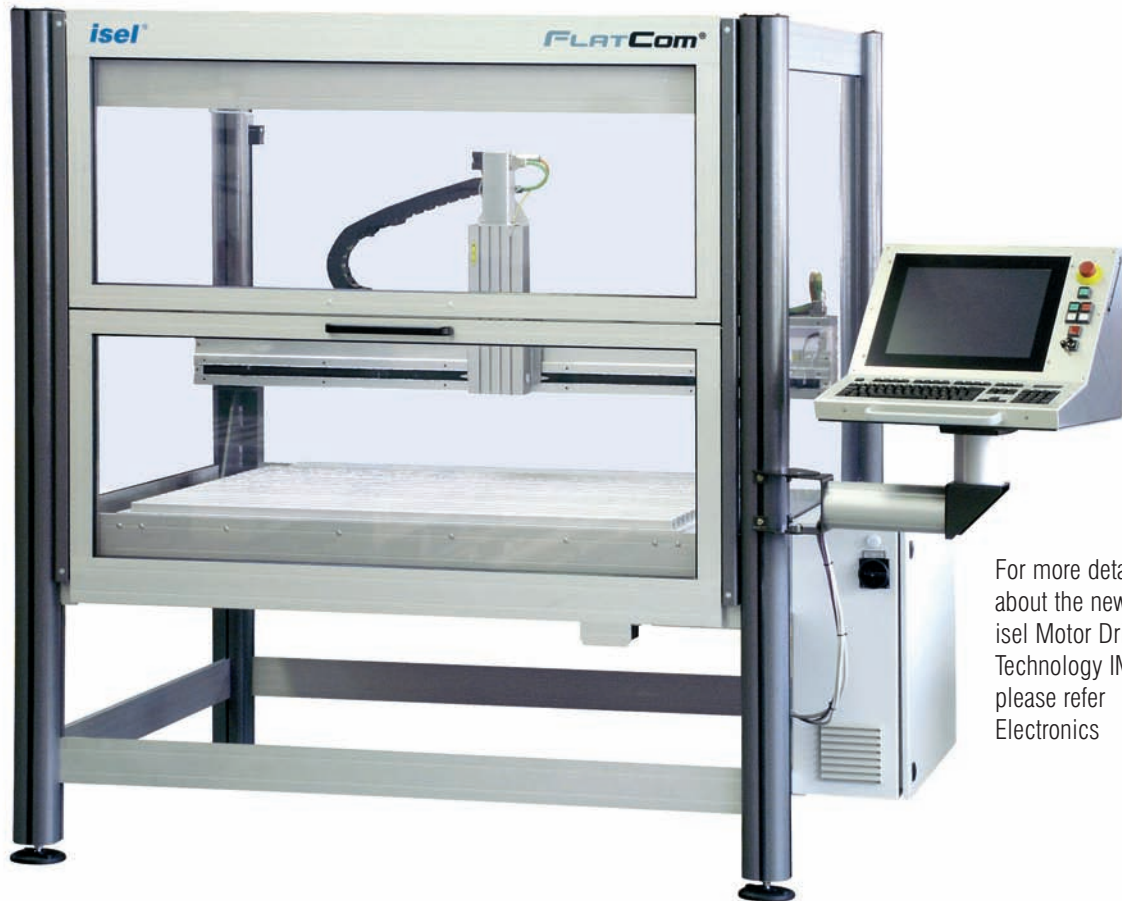
Item no. **275222 34552**

closed design

Item no. **275223 34552****Technical Data**

	<b>EUROMOD</b> 30	<b>EUROMOD</b> 45	<b>EUROMOD</b> 65
<b>Feed range (X/Y/Z) [mm]</b>	650/300/275	650/450/275	650/650/275
<b>Clamping table surface [mm]</b>	900x350	900x500	900x700
<b>Z-throughput [mm]</b>	320		
<b>Dimensions (Rack) [mm]</b>	1,160x800x1,550 (2,000)	1,160x1,110x1,550 (2,000)	1,160x1,510x1,550 (2,000)
<b>Max. traverse rate (X/Y) [mm/s]</b>	250 (Ballscrew 16x5)		
<b>Max. traverse rate (Z) [mm/s]</b>	125 (Ballscrew 16x2,5)		
<b>Repeat accuracy [mm]</b>	0.02		
<b>Drive motors</b>	DC servo motors		
<b>Drive elements (X/Y/Z)</b>	Ballscrew 16x5		
<b>Control</b>	CANOpen CNC control (LookAhead path machining, jerk limitation, pilot control up to 127 knots), basic version for 3 axes, upgradable to 6 axes, ISR controller with CAN bus, I/O module with digital inputs and outputs (24 V) and analog output (0...10 V), safety control, external interfaces: 2x USB, PS/2, VGA		
<b>Software</b>	CAD/CAM software isy 2.5 light, including control software		
<b>Operation</b>	CNC Control Panel 10" with touchscreen		

Technical subject to modifications

**FLATCOM**<sup>®</sup>**Base Machine K-Series**... with **isel** Motor Drive Technologie **IMD**

FLATCOM with closed cover

For more details about the new isel Motor Drive Technologie IMD, please refer Electronics

**FLATCOM** base machines are vibration-low multi-axes units, based on a modular design with up to 5 axes. These axes are designed as machining and positioning units with traverse paths from 600 up to 1400mm.

The portal aperture comes to 200mm as a standard (optionally 300mm).

Design engineers have chosen special isel-profiles made from anodized aluminum which offer considerable rigidity at low weight.

The z-axis with T-slot profile (grid dimension 25mm) directly allows the mounting of different applications.

The **FLATCOM** base machines are delivered in five basic rack design sizes. They are available with or without protecting cover, with add-on control cabinet as well as the isel CNC control panel and arm unit.

Space-saving vertically opening doors are installed as protecting covers.

Ballscrews with isel motors offering a positional repeatability of  $\pm 0.01$  mm serve as axis drives for the K series

The linear units are highly accurate with high torsion resistance with preloaded linear bearings and anti-backlash ballscrews assemblies.

All units are fitted with two limit switches per-axis.

The standard **FLATCOM** base machines as well as custom made solutions are constructed with isel range of components, offering smooth and high speed travel.

## General applications

**FLATCOM GANTRY** base machines are constructed for examples:

- Assembling and mounting operations
- Printing and engraving
- Drilling and milling
- Dispensing and screw fixing
- Shape forming and modelling
- Pasting and casting
- Laser and water jet cutting
- Soldering and welding
- Measuring and test reporting
- Sawing and cutting

and many other possible applications

## Options available for the FLATCOM GANTRY Base Unit

- DVD drive
- Ball threaded spindle, pitches 2,5 mm or 10 mm (standard: 5 mm)
- Milling and engraving spindles
- Tool changing station
- Tool levelling
- Cooling/spray units
- Vacuum clamping table
- Exhaust device (in preparation)
- Safety light curtain

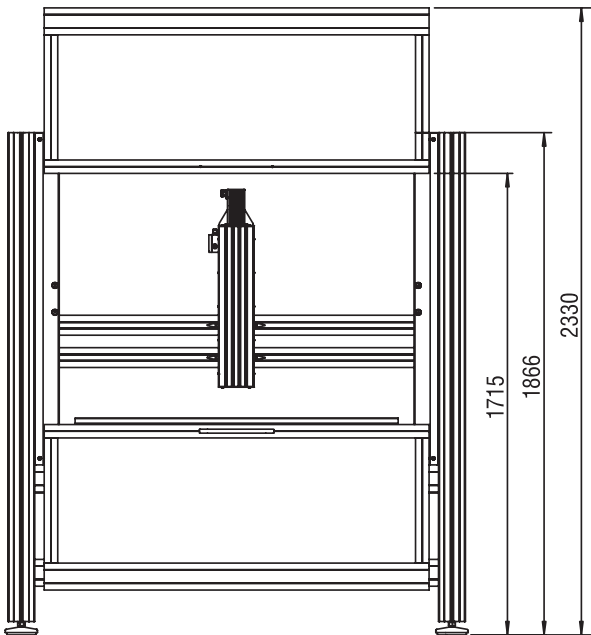


FLATCOM 40-H with undercarriage, protection cover and machine operating console

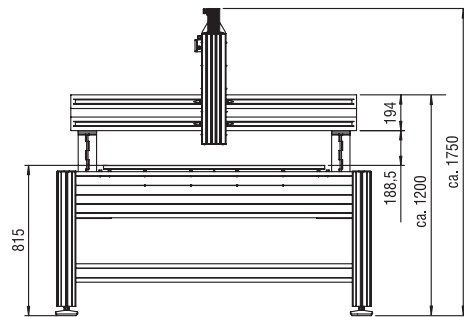


FLATCOM 40-U with undercarriage, without Cover

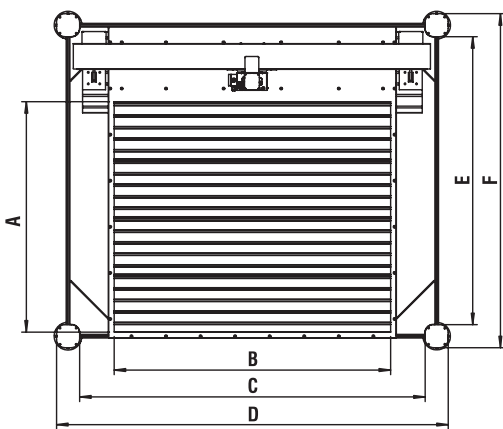
Scale Drawing / Dimensions



FLATCOM with Undercarriage and Cover



FLATCOM with Undercarriage, without Cover



	A	B	C	D	E	F
<b>FLATCOM 1/20</b>	750	750	1,000	1,200	950	1,150
<b>FLATCOM 1/30</b>	1,000	750	1,000	1,200	1,250	1,450
<b>FLATCOM 1/40</b>	1,000	1,250	1,500	1,700	1,250	1,450
<b>FLATCOM 1/50</b>	1,500	1,250	1,500	1,700	1,750	1,950

Technical Data

	FLATCOM 1/20	FLATCOM 1/30	FLATCOM 1/40	FLATCOM 1/50
<b>Feed range (X/Y) [mm]</b>	700 / 600	700 / 900	1,200 / 900	1,200 / 1,400
<b>Surface clamping table [mm]</b>	750 / 750	750 / 1,000	1,250 / 1,000	1,250 / 1,500
<b>Z-travel [mm]</b>	150 (optionally 250, each without machining facility)			
<b>Z-throughput [mm]</b>	200 (optionally 300, each without machining facility)			
<b>Dimensions with control cabinet and cover [mm]</b>	W = 1,420 D = 1,150 H = 1,870	W = 1,420 D = 1,450 H = 1,870	W = 1,920 D = 1,450 H = 1,870	W = 1,920 D = 1,950 H = 1,870

## FlatCom

### Servo Motor Drive Technology

Item no.	Description
<b>275023 32355</b>	CNC base unit <b>FLATCOM 20-VH</b> , with undercarriage and protecting cover, feed range 700 x 600 mm
<b>275033 32355</b>	CNC base unit <b>FLATCOM 30-VH</b> , with undercarriage and protecting cover, feed range 700 x 900 mm
<b>275043 32355</b>	CNC base unit <b>FLATCOM 40-VH</b> , with undercarriage and protecting cover, feed range 1200 x 900 mm
<b>275053 32355</b>	CNC base unit <b>FLATCOM 50-VH</b> , with undercarriage and protecting cover, feed range 1200 x 1400 mm
<b>275022 32355</b>	CNC base unit <b>FLATCOM 20-VU</b> , with undercarriage, without protecting cover, feed range 700 x 600 mm
<b>275032 32355</b>	CNC base unit <b>FLATCOM 30-VU</b> , with undercarriage, without protecting cover, feed range 700 x 900 mm
<b>275042 32355</b>	CNC base unit <b>FLATCOM 40-VU</b> , with undercarriage, without protecting cover, feed range 1200 x 900 mm
<b>275052 32355</b>	CNC base unit <b>FLATCOM 50-VU</b> , with undercarriage, without protecting cover, feed range 1200 x 1400 mm

## Accessory

Item no.	Description
<b>320 310</b>	CAN PCI Standard PC Board
<b>314 020</b>	IMD 10 V1 Power amplifier
<b>321 000</b>	CAN I/O Module
<b>321 030</b>	Input/Output module USB I/O 8/8
<b>371 051 0102</b>	PC Control console 17" Monitor, german keyboard
<b>371 051 0112</b>	PC Control console 17" Monitor, english keyboard
<b>371 054 1202</b>	PC Control Panel 10,4" Monitor, german keyboard
<b>371 054 1212</b>	PC Control Panel 10,4" Monitor, english keyboard
<b>371 052 0102</b>	PC Control Panel 17" Monitor, german keyboard
<b>371 052 0112</b>	PC Control Panel 17" Monitor, english keyboard

# X/Y/Z CNC Base Machines

# Series GFV/GFY



Illustration: CNC base machine as milling application

The isel-CNC base machines 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 used 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 devices. 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 machines 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/2000/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 Machine

# Series GFV/GFY

## Common Data/Characteristics of the X/Y/Z CNC Base Machines

<b>Effective travel ranges:</b>	from 440 x 480 mm to 1,380 x 2,480 mm, z-axis 220 or 300 mm
<b>Clamping surface:</b>	from 625 x 1,100 mm to 1,500 x 3,050 mm
<b>Portal passage:</b>	optionally 235 mm or 435 mm
<b>Drive system:</b>	DC (series GFV) or AC (series GFY) servo drives, precision ball screw spindle
<b>Travel speeds:</b>	8 m/min (series GFV); 12 m/min (series GFY)
<b>Repeatability depending:</b>	on the assembly of the plants; on average approx. 0.02 mm
<b>Weight:</b>	450 kg to 650 kg

### CNC Control (optional)

The isel-CAN-CNC control is used for the isel-CNC base machines 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.

### CNC Control Console/CNC Control Panel (optional)

Ideally, the machine is operated by means of an isel-CNC Control Console/CNC Console Panel with integrated PC.

- Light curtain (optional)

### 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

# MODU**STAR**

## isel-CNC-Machine with High Traverse Rates



### isel CNC router ModuStar, a basis for diverse applications

iselautomation's CNC router ModuStar is offering mechanical and plant engineers many and diverse applications, such as: drilling, milling, engraving, dosing, water jet or laser cutting, welding, tipping, installing, glueing, encapsulating, measuring, examining and other applications.

Different driving concepts as well as various available dimensions provide a unique machine.

All axes can be equipped with linear drives or spindle drives respectively, without affecting the machine's design. The use of long tools, rotary machines, rotary swivelling units and other components are made possible by variable machining heights.

All axes and components are being developed, manufactured and tested at isel in Germany at a constant high quality level. Also electronics like amplifiers, safety circuits and software are provided by isel. Mechanical hardware, electronics and software being coordinated with in the best way enable a comprehensive service out from one hand.

### The CNC router's structure

The machine frame is made of tight screwed together anodized aluminum profiles. Since long the use of aluminum, as a basis for the bodywork of the isel machine-line, stands for the resistance of our products. For the lack of rust or paint coats, isel machines are well suited for different environments, such as laboratories and food

stuff. The axis profiles have been computed, optimized and tested in accordance to the occurring loads. By the use of T-slots in all profiles and a bore hole grid of 50mm, the framework provides a wide variety of arrangements for the axes and holds good conditions for all kinds of extensions. The enclosure's panes show a high impact strength and are shatterproofed. The sliding safety hood covering the tipping and working area easily can be moved by hand or by automatic controlled motor drive. As a special feature, the front part can be pushed in under the rear part of the safety hood, giving access to the tipping area from three sides. If requested, alternate tipping and machining can be realized through a two-piece work table.

The standard version holds an x-axis that is arranged crosswise over the working area and which is fixed to the machine framework. However, optionally, it's height can be altered (Gantry mode), thus providing more possibilities of use. Holding two Z axes that can be moved independently from each other in X direction is another special feature of the x-axis.

As a result an operation of both Z axes can be carried out with an independent tool change at both tool changers. Doors make the tool changers easily accessibly from outside, thus user-oriented.

### High traverse rates offer a wide range of application

The high traverse rates for the X axis of up to 2,000 mm, the Y axis of up to 3,000 mm and the Z axis of up to 500 mm grant this machine-line a wide range of application.

# ModuSTAR

## Axis motion by spindle or linear motor drive

Axis motions are realized by ball screw spindles or linear motor drives from our own development and manufacturing. Precise ball bearings, adjustable free from backlash are guiding the axis' carriages. There is a favourable load distribution as result of a wide bearing surface of the carriage's rollers running on a rolled in stainless steel strip. It is easy to manufacture, thus considerably reducing the costs of the the guiding rail. The axes can be run at extremely high velocities without any problems by using ball bearings. Therefore, they are excellently suitable for linear drives.

## Two driving concepts – one guiding profile

Preferably servo motors are put in, according to the axis size, when ball screw spindle drives are being used for the ModuStar. Also other motor types are possible but have to be coordinated with the control system. The favoured spindle pitch for all axes is 5 mm, however other pitches, such as 10 mm or 20 mm optionally can be used.

The isel linear motor drive does not show any reverse play and is free from float with regard to positioning and repeating accuracy. The high traverse rate of this type of drive is to be adjusted within the bounds of the machine concept and the kind of application.

## Control unit

The control unit includes all control keys necessary for the functioning and operating of the machine. It is possible to operate the control with very dirty hands under rough conditions due to the use of a touch screen and a rubber coated keyboard. Control PCs can be connected to a network and internet. They still hold plenty of available space for user-specific software applications. Online service can be ensured any time through the internet connection.

## Control functions

Machine control is directly performed by the control PC, thus eliminating all unnecessary hardware components. A variety of functions is put at user's disposal when using Remote or ProNC as

control software, partially mentioned as follows.

Standard functions are:

- reset of all axes simultaneously or individually
- moving axes manually at defined speed and defined steps
- axis' feed rate and speed of revolution of the milling spindle can be selected individually
- position of axis is always visible
- programs will be displayed graphically
- programs can be executed in single steps or automatically
- in / out ports of the control can be adapted to the requirements of the user
- G-code as well as isel-NCP-format can be executed

## Control cabinet

Control cabinets including all electronic components necessary for the control system are being developed and manufactured at isel. The interior design of the control cabinet is clear, cabling is minimized and all components can be replaced servicing-oriented.

The ModuStar meets the safety requirements of different branches of industry and different countries through a standstill monitoring of the axes and the milling spindle.

During the machining process all doors and the safety hood are locked.

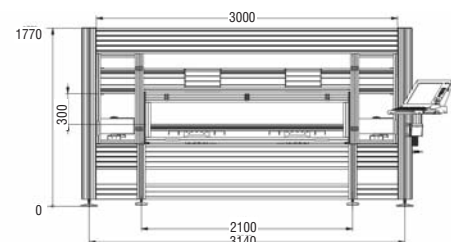
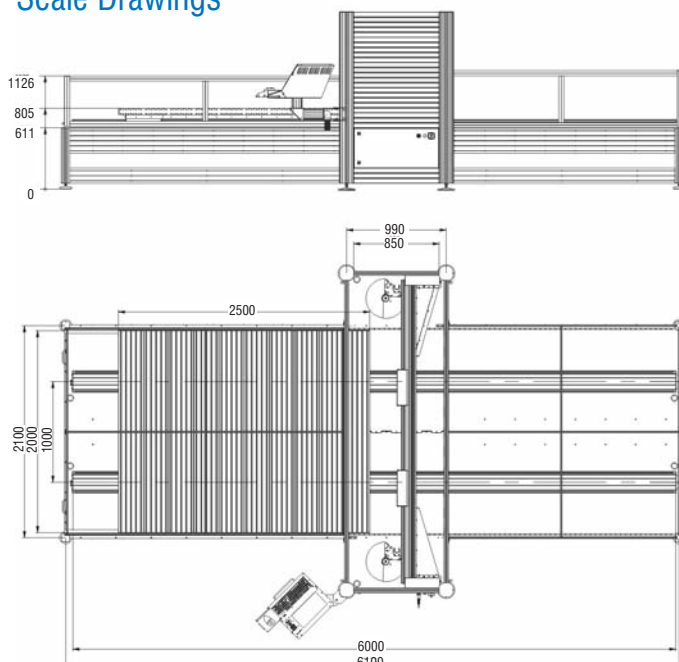
## Options

The ModuStar can be delivered optionally with different components out of the factory, such as:

Two tool changers, VakuFit clamping system, suction device at the tool point of the milling spindle, CoolMin cold air cooling system (-20°C) at the tool, rotary unit, rotary swivelling unit, T-slot clamping systems.

Components, such as the milling spindle and the vacuum pump are coordinated with the isel system. Suitable milling spindles up to 8 KW are available for the ModuStar. For vacuum pumps we recommend jet pumps.

## Scale Drawings



# ModuFix 1



## General Information

The flexible ModuFix system is based on proven and new isel drive components. Depending on the customer requirements, well-priced linear units with timing belt or ball screw drive can be used. High-power direct drives (without transmission) are available for fast and precise tasks with positioning requirements in the  $\mu\text{m}$  range. The ModuFix system can also be combined with isel rotary axis units and rotary/swiveling units. In this case, torques up to 240 Nm can be requisitioned. The variety of possibilities enables our customers to find their specific problem solution in line with the cost effectiveness, that isel is well-known for.

## Features

- Optimal in the combination of different drive concepts
- Basic configurations with control boxes for up to 5 axes
- Economical solution for alternating positioning tasks
- Ideal also for pick and place, dispensing, testing and inspection tasks
- Vacuum clamping system **isel VakuFit** (optional)

## Dimensions

ModuFix Type	Description
1/10	W 1,150 x D 750 x H 750 mm
1/20	W 1,500 x D 750 x H 750 mm
1/30	W 2,000 x D 750 x H 750 mm
1/40	W 2,500 x D 750 x H 750 mm

# Spindle Motor

# MAV 2.075 S



## Features

- Robust two-pole AC motor (asynchronous motor)
- Rectangular design, protection class IP54, isolation class F
- Casting bearing plate on A-side
- Aluminium diecasting B-side
- Special shaft for holding drills and milling tools
- Nominal output 0.75 kW (S6-40% mode)
- Speed range 3,000 - 24,000 rpm
- Manual tool change
- Clamping range  $\varnothing$  3 mm –  $\varnothing$  8 mm
- Self-ventilation on B-side
- Speed control by frequency converter
- Spindle bearing:
  - 2 bearings on A-side,
  - 1 bearing on B-side

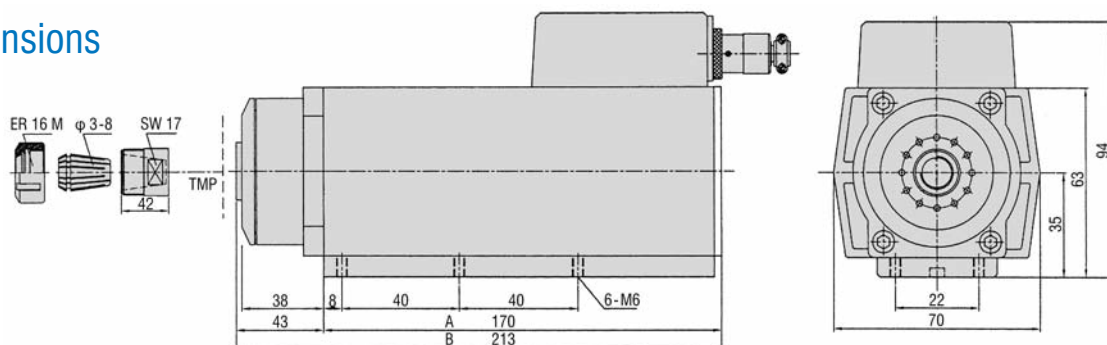
## Technical Data Spindle Motor

Description	MAV 2.075 S
Torque at nominal speed 24,000 rpm	0.30 Nm
Speed rpm	3,000 bis 24,000
Poles	2
Nominal voltage	3 x 220 V
S 6 = 40 % Nominal power	0.75 kW
1/100 mm concentricity	1.0
Weight kg	3.2
Collets Type ER 16	3 - 8 mm

## Frequency Converter FC 1500-CT

- Output power 1500 VA
- Intrated operating modules with control keys and LC display
- Remote control via analog setpoint and sps compatible I/O signals
- Brake choppers/resistance integrated
- Input voltage AC 230 V
- Protection class IP 20

## Dimensions



## Main Spindle Drive

### HSA-2.07 SC-P

Consisting of a spindle drive motor MAV 2.075 S, frequency converter FC 1500-CT, 8 m of connecting cable, a chuck  $\varnothing$  6 mm and chuck tools

Item no. **310707 1611**

## Spindle Motor

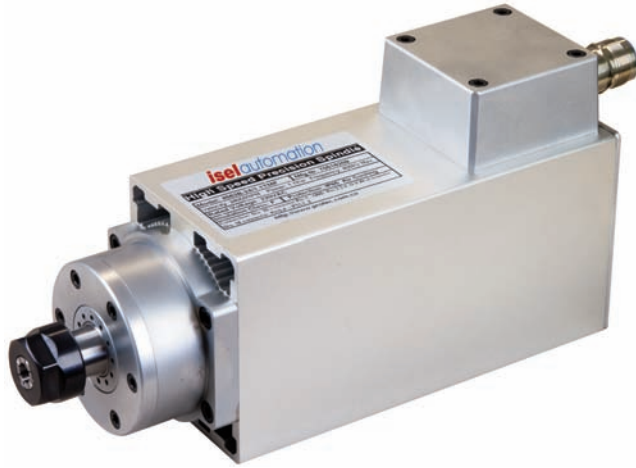
### MAV 2.075 S

Asynchronous motor, 2-pole with chuck  $\varnothing$  6 mm and accessories  
Item no. **477007 3124** (chuck ER16, page E13)

**isel-coolMin-cooling system still in progress**

# Spindle Motor

# MAV 2.11 S



## Features

- Robust two-pole AC motor (asynchronous motor)
- Rectangular design, protection class IP54, isolation class F
- Casting bearing plates A- and B-side
- Special shaft for holding drills and milling tools
- Nominal output 1.1 kW (S6-40% mode)
- Speed range 3,000 - 24,000 rpm
- Manual tool change
- Clamping range  $\varnothing$  3 mm – 12,7 mm
- Self-ventilation on B-side
- Speed control by frequency converter
- Spindle bearing:
  - 2 bearings on A-side,
  - 2 bearings on B-side

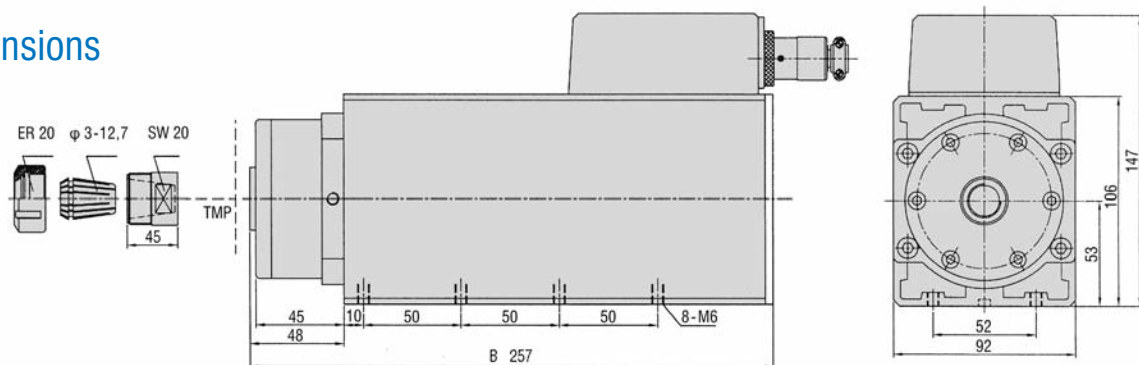
## Technical Data Spindle Motor

Description	MAV 2.11 S
Torque at nominal speed 24,000 rpm	0.44 Nm
Speed rpm	3,000 bis 24,000
Poles	2
Nominal voltage	3 x 220 V
S 6 = 40 % Nominal power	1.1 kW
1/100 mm concentricity	1.0
Weight kg	9.5
Collets Type ER 20	3 - 12.7 mm

## Frequency Converter FC 1500-CT

- Output power 1500 VA
- Intrated operating modules with control keys and LC display
- Remote control via analog setpoint and sps compatible I/O signals
- Brake choppers/resistance integrated
- Input voltage AC 230 V
- Protection class IP 20

## Dimensions



## Main Spindle Drive

### HSA-2.11 SC-P

Consisting of a spindle drive motor MAV 2.11 S, frequency converter FC 1500-CT, 8 m of connecting cable, a chuck  $\varnothing$  6 mm and chuck tools

Item no. **310712 1611**

## Spindle Motor

### MAV 2.11 S

Asynchronous motor, 2-pole with chuck  $\varnothing$  6 mm and accessories  
Item no. **477011 3124** (Spannzangen ER 20 Seite E31)

**isel-coolMin-cooling system still in progress**

# Spindle Motor

# MAV 2.22 S



## Features

- Robust two-pole AC motor (asynchronous motor)
- Rectangular design, protection class IP54, isolation class F
- Casting bearing plates A- and B-side
- Special shaft for holding drills and milling tools
- Nominal output 2.2 kW (S6-40% mode)
- Speed range 3,000 - 24,000 rpm
- Manual tool change
- Clamping range  $\varnothing$  3 mm – 12,7 mm
- Self-ventilation on B-side
- Speed control by frequency converter
- Spindle bearing:
  - 2 bearings on A-side,
  - 2 bearings on B-side

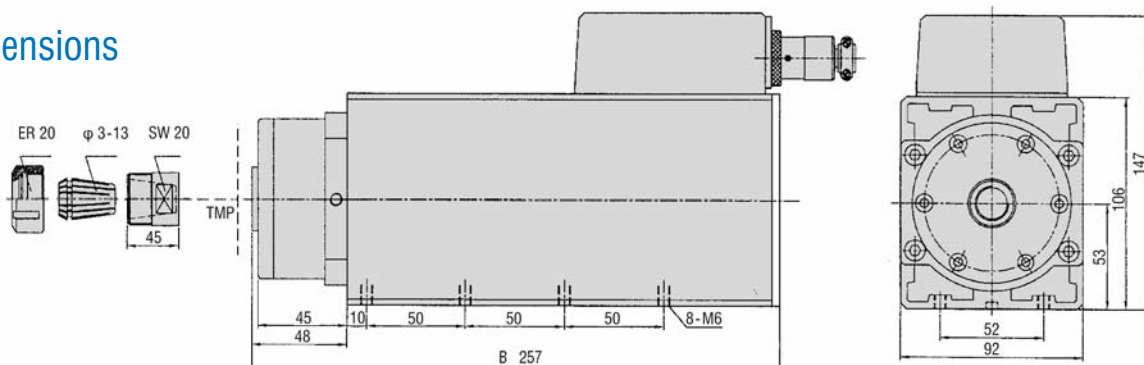
## Technical Data Spindle Motor

Description	MAV 2.22 S
Torque at nominal speed 24,000 rpm	0.89 Nm
Speed rpm	3,000 bis 24,000
Poles	2
Nominal voltage	3 x 220 V
S 6 = 40 % Nominal power	2.2 kW
1/100 mm concentricity	1.0
Weight kg	9.5
Collets Type ER 20	3 - 12.7 mm

## Frequency Converter FC 1500-CT

- Output power 1500 VA
- Intrated operating modules with control keys and LC display
- Remote control via analog setpoint and sps compatible I/O signals
- Brake choppers/resistance integrated
- Input voltage AC 230 V
- Protection class IP 20

## Dimensions



## Main Spindle Drive

### HSA-2.22 SC-P

Consisting of a spindle drive motor MAV 2.22 S, frequency converter FC 1500-CT, 8 m of connecting cable, a chuck  $\varnothing$  6 mm and chuck tools

Item no. **310723 1611**

## Spindle Motor

### MAV 2.22 S

Asynchronous motor, 2-pole with chuck  $\varnothing$  6 mm and accessories  
Item no. **477022 3124** (Spannzangen ER 20 Seite E31)

**isel-coolMin-cooling system still in progress**

# Spindle Motor

with manual Tool changing  
with CoolMin Tool Cooling System

## MAHV 2.04 S MAHV 2.04 SC



MAHV 2.04 S with manual Tool changing



MAHV 2.04 SC with CoolMin Tool Cooling System

### Features

#### MAHV 2.04 S MAHV 2.04 SC

- Robust two-pole AC motor (asynchronous motor)
- Rectangular design, protection class IP54, isolation class F
- Casting bearing plate on A-side
- Aluminium diecasting B-side
- Special shaft for holding drills and milling tools
- Nominal output 0.5 kW (S6-40% mode)
- Speed range 5,000 - 30,000 rpm
- Manual tool change
- Clamping range  $\varnothing 3 \text{ mm} - \varnothing 6,35 \text{ mm} = 1/8''$
- Self-ventilation on B-side
- Speed control by frequency converter
- Spindle bearing:  
2 bearings on A-side,  
1 bearing on B-side

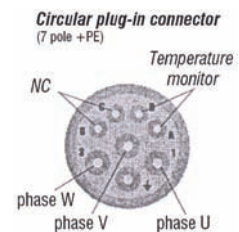
#### MAHV 2.04 SC

- With isel Low Temperature Cooling System CoolMin

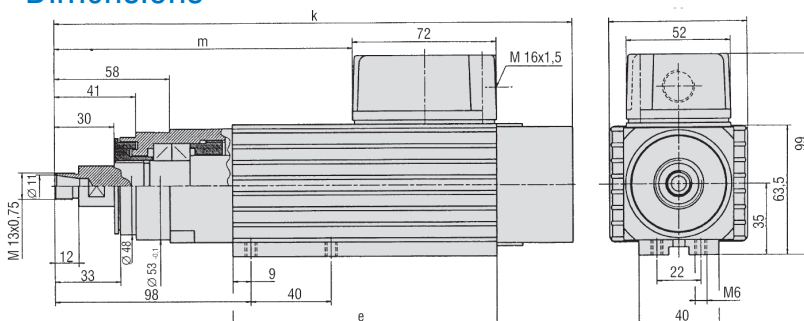
### Technical Data Spindle Motor

Description	MAHV 2.04 S MAHV 2.04 SC
Torque at nominal speed 18,000 rpm	0.21 Nm
Speed rpm	5,000 bis 30,000
Poles	2
Nominal voltage	3 x 220 V
S 6 = 40 % Nominal power	0.5 kW
1/100 mm concentricity	1.0
Weight kg	3.0

### Motor Connection



### Dimensions



Type	e	m	k
MAHV 2.04 S + SC	132	144	258

Asynchronous motor 2 pole with collet  $\varnothing 6 \text{ mm}$  and accessory

<b>MAHV-2.04 S</b>	Item no. <b>477004 3130</b>
<b>MAHV-2.04 SC</b>	Item no. <b>477004 5130</b>
<b>Main spindle drive</b>	Item no. <b>310704 1611</b>
<b>Main spindle drive</b>	Item no. <b>310704 1631</b>

#### Collets

**Type ER 11**  
(Item numbers)

$\varnothing 3.0 \text{ mm}$	<b>239170 3000</b>
$\varnothing 3.175 \text{ mm}$	<b>239170 3175</b>
$\varnothing 4.0 \text{ mm}$	<b>239170 4000</b>
$\varnothing 5.0 \text{ mm}$	<b>239170 5000</b>
$\varnothing 6.0 \text{ mm}$	<b>239170 6000</b>
$\varnothing 6.350 \text{ mm}$	<b>230170 6375</b>

# COOLMin Tool Cooling System

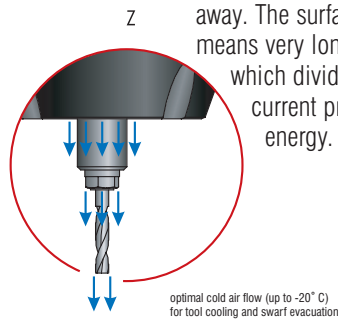
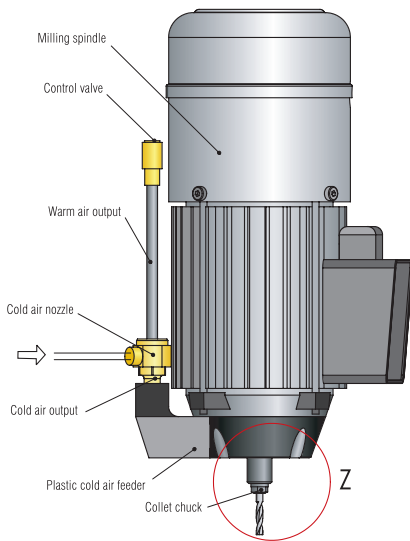


## isel Asynchronous Spindle Motor

- Rated power 500 W
- Speed max. 24,000 rpm
- **isel** low temperature cooling system can be integrated (down to -20°C, **isel** patent)
- Tools with internal cooling can be used
- Very good concentricity by means of a new bearing technology
- **isel** frequency converters are matched to the asynchronous motors

500 W – Item no. **310 705 2631** Direct changer

## isel Low Temperature Cooling System

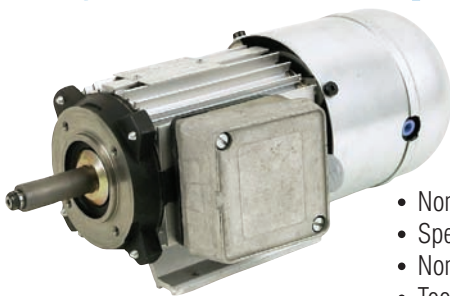


Dry cutting machining is the first choice wherever material, wear of the tool and surface quality permit. The above-mentioned criteria, however, often require cooling. And cooling has meant to date: Humidity. Even the lowest-volume spray cooling involves unpleasant secondary effects: Contamination and sticking chips on the tool or on the surface, and - depending on the material - also negative effects for the structure of the material. Thanks to the patented low temperature cooling, which provides for optimum cooling of tool and surface, any secondary effects can be neglected. The chips are dry and - depending on the material - easy to suck or blow away. The surface is handled gently, and the direct cooling of the tool means very long service lives of the tools, thanks to a cold-air nozzle which divides the air flow into hot and cold air according to the eddy current principle. Only compressed air ( 6 ... 10 bar) is required as energy.

### Technical data:

Compressed-air input: 6 ... 10 bar  
 Cooling air: down to approx. -20 °C  
 Installation: optional integration with isel asynchronous spindle Motor  
 Externally as an add-on for existing spindles.

## Asynchronous Spindle Motor



MAW 2.05-SD

- Nominal power output **500 W**
- Speed range **300...24,000 min<sup>-1</sup>**
- Nominal torque **0.26 Nm**
- Tool changing **directly with pneumatic lifting cylinder (MAW 2.05-SD)**
- Overall size **56**

## Main Spindle Drive

Description	Item no.
<b>Main Spindle Drive HSAW 2.05-SDF</b>	310705 2611

The scope of delivery includes:

- spindle motor **MAW 2.05-SD**
- frequency converter (1500 VA)
- connecting line converter-motor (L=8 m)
- throttle
- connecting panel
- collets (d=3 mm)
- maintenance unit with pressure control
- air hose
- turn screws

## Technical Data

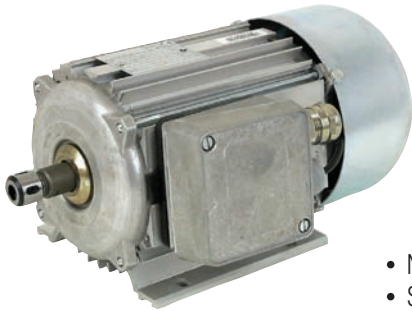
Description	Item no. (PG Screwing)	Item no. (Circular plug-in connector)	Speed range min <sup>-1</sup>	Poles	Nominal voltage	Nominal power output kW (S6-40%)	Nominal speed min <sup>-1</sup>	Continuous output S1 kW	Concentricity 1/100 mm	Weight kg
<b>MAW 2.05-SD</b>	477505 1224	477505 3224	300-24,000	2	3 x 210 V	0.50	18,000	0.30	2.0	4.0

Collet 3 mm are included in the spindles scope of delivery (Collets side E31)

# Main Spindle Drives - Asynchronous

**HSA 4.05-SF**  
**HSAW 2.11-KF**

## Spindle Motor



MA 4.05-S

- Nominal power output **400 W**
- Speed range **200...9,000 min<sup>-1</sup>**
- Nominal torque **3.0 Nm** (4 pole)
- Tool changing **manually with collet**
- Overall size **63**

## Main Spindle Drive

Description	Item no.
<b>Main spindle drive HSA 4.05-SF</b>	310706 1612

The scope of delivery includes:

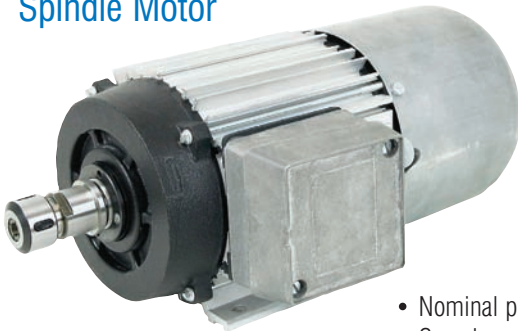
- spindle motor **MA 4.05-S**
- frequency converter (1500 VA)
- connecting line converter-motor (L=8 m)
- hook spanner (width 16-20)
- wrench (SW-15)
- Collet (d=6 mm)
- box nut

## Technical Data

Description	Item no. (PG Screwing)	Item no. (Circular plug-in connector)	Speed range min <sup>-1</sup>	Poles	Nominal voltage	Nominal power output kW (S6-40%)	Nominal speed min <sup>-1</sup>	Continuous output S1 kW	Concentri- city 1/100 mm	Weight kg
<b>MA 4.05-S</b>	477605 1106	477605 3106	200-6,000	4	3 x 210 V	0.40	1,270	0.36	2.0	5.8

Collet 6 mm are included in the spindles scope of delivery

## Spindle Motor



MAW 2.11-K

- Nominal power output **1,100 W**
- Speed range **300...15,000 min<sup>-1</sup>**
- Nominal torque **2.8 Nm**
- Tool changing **and/or automatically (SK 20)**
- Overall size **71**

## Main Spindle Drive

Description	Item no.
<b>Main spindle drive HSAW 2.11-KF</b>	310711 3611

The scope of delivery includes:

- spindle motor **MAH 2.11-KF**
- frequency converter (1500 VA)
- connecting line converter-motor (L=8 m)
- throttle
- maintenance unit
- connecting panel
- air hose
- hook spanner
- wrench
- collet (d=6 mm)
- collets holder

## Technical Data

Description	Item no. (PG Screwing)	Item no. (Circular plug-in connector)	Speed range min <sup>-1</sup>	Poles	Nominal voltage	Nominal power output kW (S6-40%)	Nominal speed min <sup>-1</sup>	Continuous output S1 kW	Concentri- city 1/100 mm	Weight kg	Tool holder K=collet holder S=collet
<b>MAW 2.11-K**</b>	477711 1313	477711 3313	300-15,000	2	3 x 210 V	1.1	4,200	0.75	2.0	11.0	K (ø 3-12.7 mm)*

\* Collets holder SK20 with collet 6 mm is included in the spindles scope of delivery.

\*\* Also by 20,000 rpm available (special bearing). (Collets Side E31)

# Main Spindle Drives - Asynchronous

**HSA 2.22-KF**  
**HSA 4.22-KF**  
**HSAW 2.22-K3SC**

## Spindle Motor



**MAW 2.22-K**  
**MAW 4.22-K**

- Nominal power output **2,200 W**
- Speed range **300...15,000 min<sup>-1</sup> / 200...7,500 min<sup>-1</sup> \***
- Nominal torque **7.5 / 15.1 Nm \***
- Tool changing **automatically (SK20)**
- Overall size **80**

\* first value for MAW 2.22-K  
 second value for MAW 4.22-K

## Main Spindle Drive

Description	Item no.
Main spindle drive HSAW 2.22-KF	310722 3611
Main spindle drive HSAW 4.22-KF	310722 3612

The scope of delivery includes:

- spindle motor  
**MAW 2.22-K/MAW 4.22-K**
- frequency converter (4,000 VA)
- connecting line converter-motor (L=8 m)
- throttle
- maintenance unit
- connecting panel
- air hose
- hook spanner
- wrench
- collet (d=6 mm)
- collets holder

## Technical Data

Description	Item no. (PG Screwing)	Artikel-Nr. (Circular plug-in connector)	Speed range min <sup>-1</sup>	Poles	Nominal voltage	Nominal power output kW (S6-40%)	Nominal speed min <sup>-1</sup>	Continuous output S1 kW	Concentri- city 1/100 mm	Weight kg	Tool holder K=collets holder (SK20) S=collet
<b>MAW 2.22-K</b>	477822 1313	477822 3313	300-15,000	2	3 x 400 V	2.2	4,500	1.5	2.0	18.0	K (ø 3-12.7 mm)*
<b>MAW 4.22-K</b>	477822 1307	477822 3307	200-7,500	4	3 x 400 V	2.2	2,250	1.5	2.0	18.0	K (ø 3-12.7 mm)*

\* Collets holder SK20 with collet 6 mm is included in the spindles scope of delivery

## Spindle Motor



**MAW 2.22-K3S**

- Nominal power output **2,200 W**
- Speed range **300...15,000 min<sup>-1</sup>**
- Tool changing **automatically (SK 30)**
- Overall size **80**
- Threefold bearing (Spindle bearing)

## Main Spindle Drive

Description	Item no.
Main spindle drive HSAW 2.22-K3SC	310730 3615

The scope of delivery includes:

- spindle motor **MAH 2.22-K3S**
- frequency converter (4000 VA)
- throttle
- maintenance unit
- connecting panel
- air hose
- collet (d=6 mm)
- collets holder
- collets accessory

## Technical Data

Item no.	Item no.	Speed range min <sup>-1</sup>	Poles	Nominal voltage	Nominal power output kW (S6-40%)	Nominal speed min <sup>-1</sup>	Continuous output S1 kW	F <sub>axial</sub> / F <sub>radial</sub> N	Concentri- city 1/100 mm	Weight kg
<b>Spindle motor MAW 2.22-K3S</b>	<b>Main spindle drive HSAW 2.22-K3SC</b>									
477822 1515	310730 3615	300-15,000	2	3 x 400 V	2.2	4,500	1.5	400/350	2.0	18.5

Main spindle drives **HSAW** to be made up of spindle motor, a adapted frequency converter as soon as accessory.  
 (Collets Side E31)

# Main Spindle Drives - Accessory

**UFM 500**  
**UFM 1050**

## Universal Milling/Drilling Motors



UFM 500

UFM 1050

### UFM 500

- Input power 500 W
- Output power 345 W
- Torque 0.14 Nm

### UFM 1050

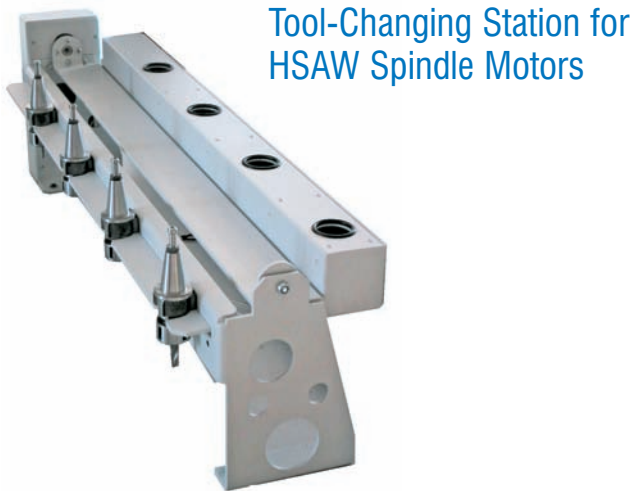
- Input power 1,050 W
- Output power 720 W
- Torque 0.32 Nm

## Technical Data

	Item no.	Load speed min <sup>-1</sup>	Voltage V	Degree of efficiency %	Input power W	Output power W	Torque Nm
<b>UFM 500</b>	420003 0500	22,600	230	68	500	345	0.14
<b>UFM 1050</b>	420003 1050	21,000	230	71	1050	720	0.32
<b>UFM 500-11</b>	420003 0501	22,600	115	68	500	345	0.14
<b>UFM 1050-11</b>	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



## 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

**Direct changer for HSAW 2.05-SDF on Request.**

## Dust Exhaust ...



Dust barrier closed



Dust barrier open

### ... for Spindle

#### MAW 2.11 K, MAW 2.22 K

- with pneumatic opening of the dust cover

Item no. **239 011 0120**

### ... for Spindle

#### MAV 2.11 S, MAV 2.22 S

- with manually actuated opening of the dust cover

Item no. **239 011 0121**

# 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 -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

## Collets Type ER 11

MAHV 2.04 S

Ø (mm)	Item no.
3.0	239170 3000
3.175	239170 3175
4.0	239170 4000
5.0	239170 5000
6.0	239170 6000
6.350	239170 6375

## Collets Type ER 16

MAV 2.075 S

Ø (mm)	Artikel-Nr.
3.0	239171 3000
3.175	239171 3175
4.0	239171 4000
5.0	239171 5000
6.0	239171 6000
8.0	239171 8000

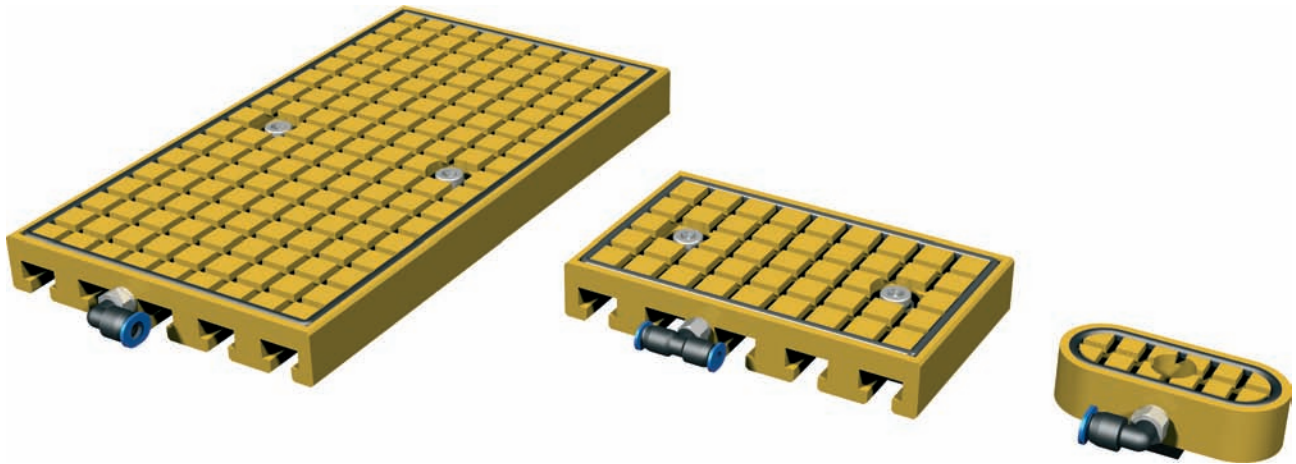
## Collets Type ER 20

MAV 2.11 S, MAV 2.22 S

Ø (mm)	Item no.
3.0	239172 3000
3.175	239172 3175
4.0	239172 4000
5.0	239172 5000
6.0	239172 6000
8.0	239172 8000
10.0	239172 0100
12.0	239172 0120
12.7	239172 0127

**VAKUFIT<sup>®</sup>**

## isel VakuFit Clamping System with Vacuum Clamping Plates



With the isel-VakuFit clamping system solves clamping problems easily and quickly. It can be used on all T-groove plates and does not depend on rasters.

All isel-machines can be upgraded and backfitted with this vacuum clamping technology in a very cost-saving way. It can also interact with different clamping technologies of all kinds.

It is recommended to use an injection pump to create the vacuum. The pump is maintenance free and uses regular compressed air between 4 and 6 bar. One injector pump is sufficient to supply 6 to 8 vacuum plates at the same time. If the material to be clamped is air permeable, the number of vacuum plates, which can be supplied, is reduced accordingly. If there is a need for more than 8 vacuum plates or if an increased flow rate is necessary for the vacuum (e.g. in case of uncoated wooden plates), additional injector pumps or conventional vacuum pumps can also be used. The system is completely open here and can be adapted to the clamping situation.

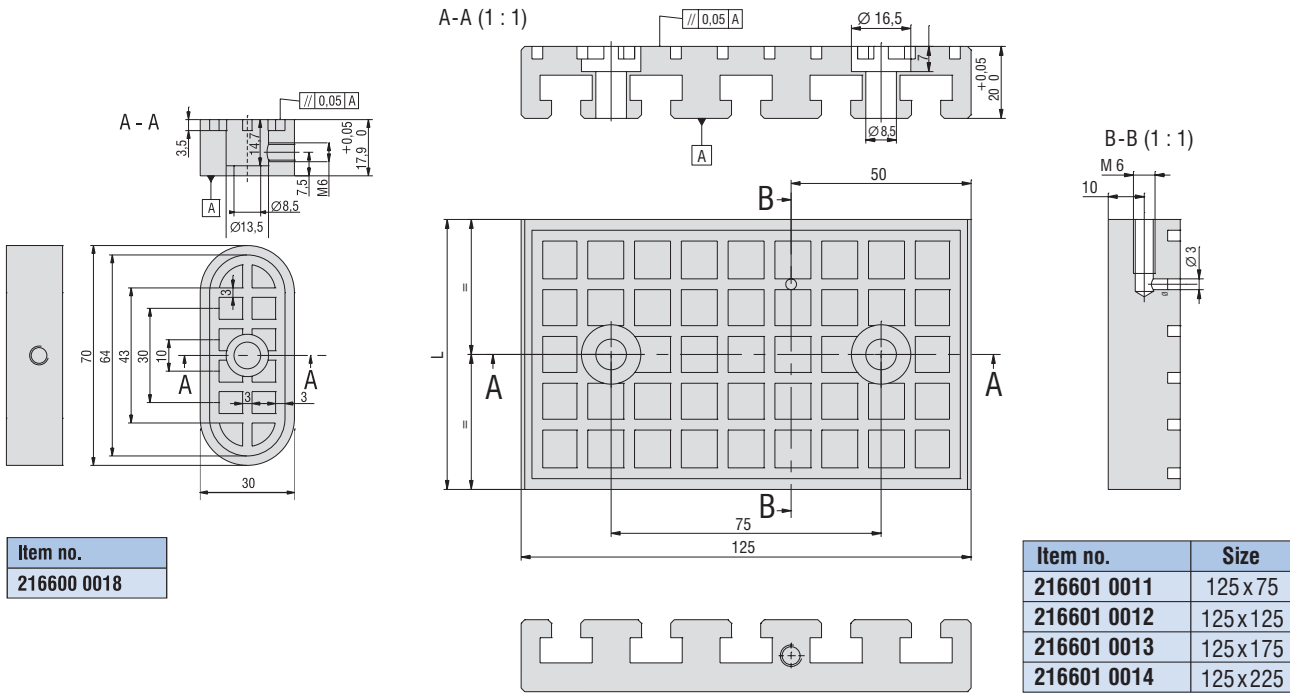
The vacuum plates are pluggable connected by a 6 mm vacuum hose and can thus be arranged in any order. A sealing band, matched to the vacuum plates, can be passed freely, so that parts to be moulded can be held down and unevennesses are well tolerated. If worn, the sealing band can be simply replaced.

The VakuFit clamping system can produce a vacuum of approx. 85 %. This equals a retaining weight of approx. 95 kg when using four square vacuum plates (125 x 75 mm). Therefore a safe holding even in case of high machining forces can be achieved with the VakuFit clamping system.

The evenness of the VakuFit vacuum plates is lower than 0.05 mm and thus enables a very effective clamping of workpieces.



### Scale Drawings



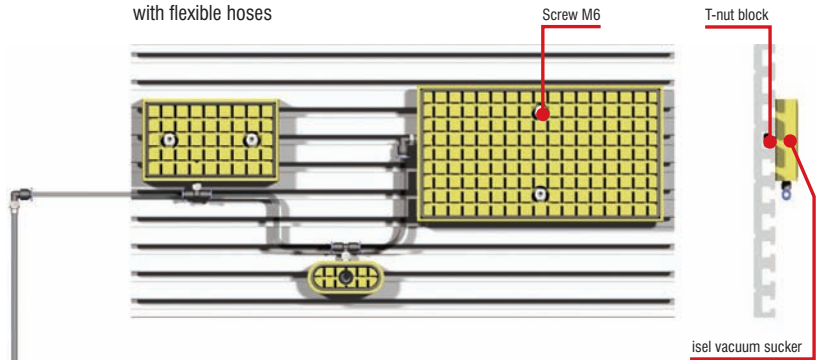
**Pneumatic vacuum pump with energy saving system**  
incl. vacuum gauge, compressed air regulator, maintenance unit with filter, tube, vacuum filter  
Item no.: **216600 0008**



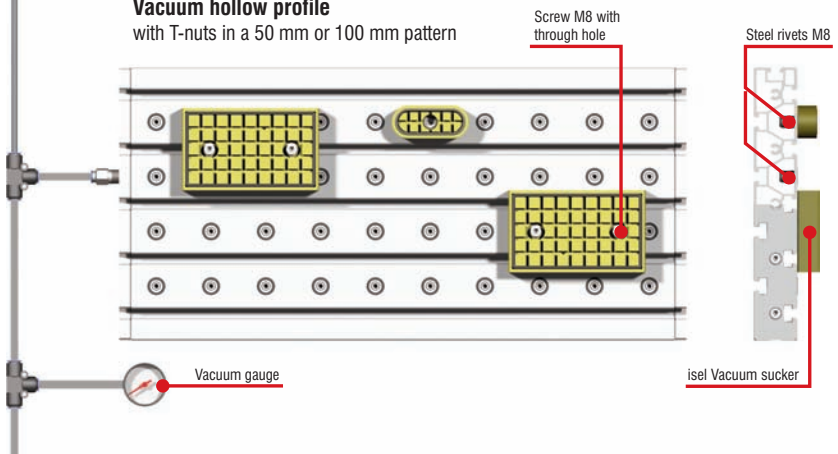
**Pneumatic vacuum pump**  
incl. vacuum gauge, compressed air regulator, maintenance unit with filter, tube, vacuum filter  
Item no.: **216600 0009**

### System Overview

**T-slot plate**  
with vacuum suckers, pattern-independent, with flexible hoses



**Vacuum hollow profile**  
with T-nuts in a 50 mm or 100 mm pattern



# Automation Components for the Semiconductor Industry



## Automation Components for the Semiconductor Industry

Based on the competency of iselautomation GmbH & Co. KG iselROBOTIK offers automation components and peripheral equipment for the semiconductor industry as follows:

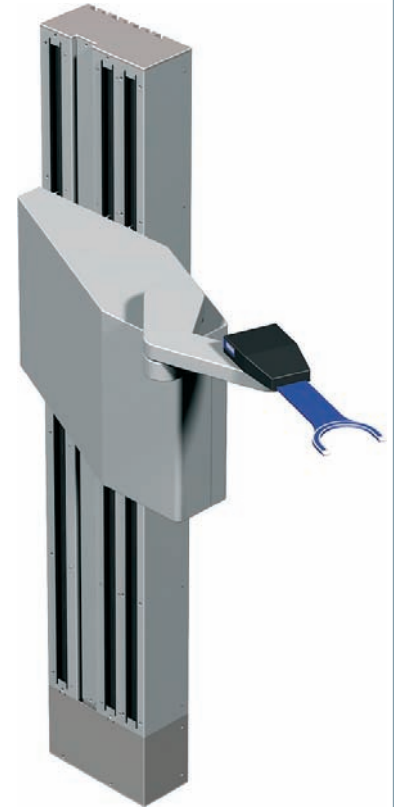
- Wafer handler in different sizes and types
- Prealigner, for example as standalone systems
- Linear tracks with different drive conceptions and procedures
- Miscellaneous accessory like end effectors, mapping sensors
- Special kinematics

and many others.

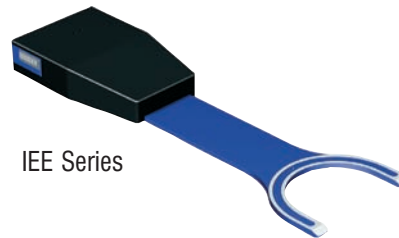
Please feel free to approach us we would be glad to make an appointment to give you further details or to send you detailed information about this range of products.



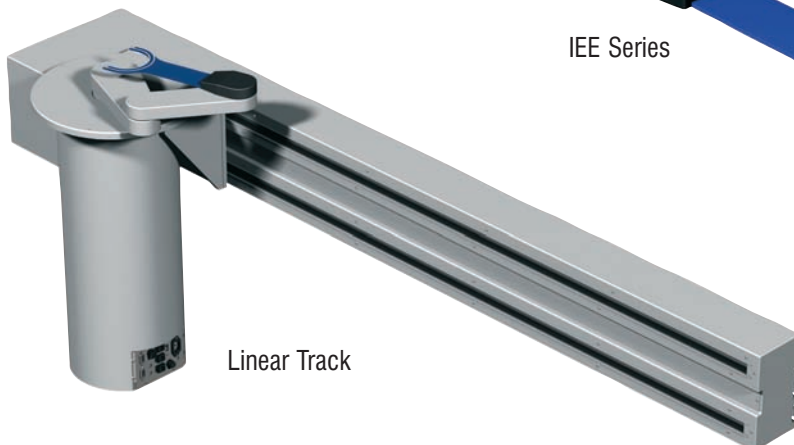
Wafer Handling Robots



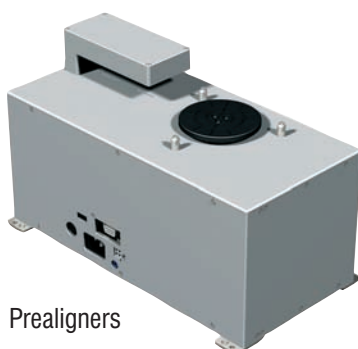
Vertical Robot



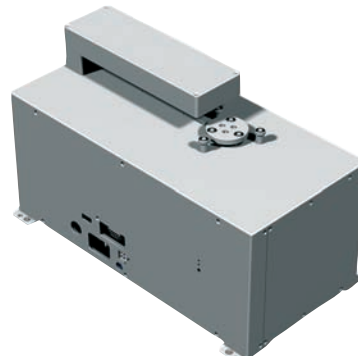
IEE Series



Linear Track



Prealigners



### Key Features

- Innovative All-In-One designs
- Excellent structural rigidity
- Modular construction
- High throughput
- Maximum reliability and precision
- Real time motion control
- Brushless, maintenance free servo motors with low inertia
- Various communication interfaces
- Class 1 clean room compatible

[www.iselrobotik.com](http://www.iselrobotik.com)

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For falsities and misprints we are exempt from liability.



# 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 proprietary 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 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 100 EURO (excl. VAT) at home, and 500 EURO abroad. For retail dispatches and/or orders below the minimum order value, handling expenses amounting to 50 EURO (excl. VAT), in addition to packing and delivery costs, are charged. Dispatch orders abroad that are below the above-mentioned 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 arrears 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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