# Automation 2012/E

**Mechanics**

Linear units
Rotation units
Basis units

**Electronics**

Motors
Controllers
Sensors

**Software**

Applications
CAD / CAM
Drivers

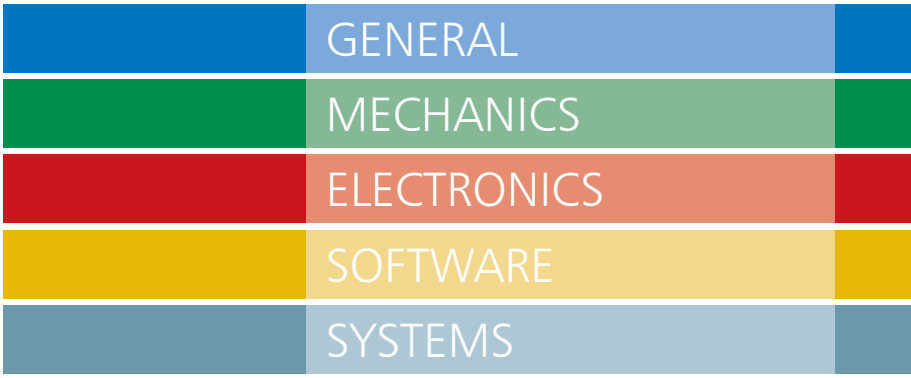
**Systems**

Automation
Handling
Robotics

*From Components to Systems*

isel®

**As at:** July 2012




isel®

isel®

## Business hours

### Dermbach plant
- Sales, order processing and registry
  Monday - Thursday 7 a.m. - 5 p.m.
  Friday 7:00 a.m. - 2 p.m.

### Eichenzell plant
- Shipping and receiving
  Monday - Thursday 7 a.m. - 3 p.m.
  Friday 7 a.m. - 12:30 p.m.

### Eichenzell plant
- Personal collection
  Monday - Thursday 8 a.m. - 1 p.m.
  Friday 8 a.m. - 11 a.m.

## Switchboard

Tel: +49(0) 6659 / 981-700 | Telefax: +49 (0) 6659 / 981-776 | E-Mail: automation@isel.com

## Shipment: national and international

Tel: +49(0) 6659 / 981-790 | Telefax: +49(0) 6659 / 981-782 | E-Mail: versand@isel.com

| | | |
|---|---|---|
| Doreen Göpfert | (International) | -741 |
| Ingo Giebel | (National) | -746 |
| Marcus Walter-Krisch | (Shipping department) | -740 |

## Accounts receivable department

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Doris Wolf

# Automation Division

## Sales and consultancy

Tel: +49(0) 6659 / 981-790
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Email: tech-sales@isel.com

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Fred Reinhard (Sales department)

Katja Henkel (Team assistant)

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Rene Saal (Support department)

Ina Jost (Team assistant)

# Robotics Division

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Email: iselrobotikeurope@isel.com

Andreas Trabert (Divisional management and sales)

Alice Mebus (Team assistant)

## Customer support

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Fax: +49(0) 6659 / 981-776
Email: robotik-service@isel.com

Thomas Völlinger
Michael Raschke

## Customer support hotline

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**isel Germany AG**
Untere Röde 2 | D-36466 Dermbach | Telephone +49 (0) 6659 / 981-700 | Telefax +49 (0) 6659 / 981-776
Email: automation@isel.com | www.isel-germany.de

# Contents

## The Company

isel Germany AG was founded in 1972 in Eiterfeld (Hessen) as isert-Elektronik and is the core business of the isel group of companies.

The company object is the development, production, sales and servicing of components and systems for automation.

The product range from system components to the entire system made by isel includes CNC units, CNC machines, automation, handling and robotics with multiphase, servo, linear and torque motors, including controllers.

isel Germany AG has facilities in Germany at Eichenzell (Hesse), Eiterfeld (Hesse) and Dermbach (Thuringia) covering a total of 33,000 m² production, warehousing and office space

### Corporate objectives

The objective of isel Germany AG is to provide high quality goods and services at a favourable price-performance ratio.

The industrial automation sector is covered by isel Germany AG through its development, production, sales and service businesses, together with consultancy, training and project planning.

The modular arrangement of isel components for the ELECTRONICS, MECHANICS, SOFTWARE and SYSTEMS also plays an important role. Open interfaces with the CNC controllers used, plus software allow flexibility for customized adaptations.

The business field also includes commissions and project planning for OEM clients in all sectors of industry.



Technical data is accurate to the best of our knowledge and belief. Future developments are subject to change without notice.
This catalogue supersedes all previous versions.

# isel Group locations in Germany

**Eiterfeld plant** (Hesse)
with approx. 8,000 m² of production, warehousing and office space

**Eichenzell plant** (Hesse)
with approx. 11,000 m² of production, warehousing and office space

**Dermbach plant** (Thuringia)
with approx. 14,000 m² of production, warehousing and office space

# Certification in accordance with DIN ISO 9001

ZERTIFIKAT

Hiermit wird bescheinigt, dass

isel®
From Components to Systems

**ISEL Germany AG**
Untere Rode 2
36456 Dermbach

**ISEL Germany AG**
Bürgermeister-Ebert-Straße 40
36124 Eichenzell

mit der nebenstehenden Unternehmenseinheit

ein **Qualitätsmanagementsystem** eingeführt hat und anwendet.

Geltungsbereich:
Entwicklung, Produktion, Vertrieb und Service von Komponenten und Systemen für die Automatisierung

Durch ein Audit, dokumentiert in einem Bericht, wurde der Nachweis erbracht, dass das Managementsystem die Forderungen des folgenden Regelwerks erfüllt:

**ISO 9001 : 2008**

Zertifikat-Registrier-Nr. 492657 QM08
Zertifizierungsdatum 2011-06-17
Gültig bis 2014-06-16

TGA-ZM-02-90

**DQS GmbH**

Michael Drechsel
Geschäftsführer

Jan Böge
Geschäftsführer

Akkreditierte Stelle: DQS GmbH, August-Schanz-Straße 21, 60433 Frankfurt am Main

IQNet

THE INTERNATIONAL CERTIFICATION NETWORK

CERTIFICATE

**IQNet** and
**DQS GmbH** Deutsche Gesellschaft zur Zertifizierung von Managementsystemen
hereby certify that the company

**ISEL Germany AG**
Untere Rode 2
36456 Dermbach

**ISEL Germany AG**
Bürgermeister-Ebert-Straße 40
36124 Eichenzell

with the following business unit:

has implemented and maintains a **Quality Management System**

Scope:
Design, production, sales and service of components and systems for automation

Through an audit, documented in a report, it was verified that the management system fulfills the requirements of the following standard:

**ISO 9001 : 2008**

Date of certification 2011-06-17
Valid until 2014-06-16

Registration Number: 492657 QM08

Michael Drechsel
President of IQNet

Jan Böge
Managing Director of DQS GmbH

IQNet Partners*

AENOR Spain AFNOR Certification France AIB-Vincotte International Belgium ANCE Mexico APCER Portugal CCC Cyprus CISQ Italy CQC China CQM China CQS Czech Republic Cro Cert Croatia DQS Holding GmbH Germany DS Denmark ELOT Greece FCAV Brazil FONDONORMA Venezuela ICONTEC Colombia IMNC Mexico Inspecta Certification Finland IRAM Argentina JQA Japan KFQ Korea MSZT Hungary Nemko AS Norway NSAI Ireland PCBC Poland Quality Austria Austria RR Russia SII Israel SIQ Slovenia SIRIM QAS International Malaysia SQS Switzerland SRAC Romania TEST St Petersburg Russia TSE Turkey YUQS Serbia

IQNet is represented in the USA by: AFNOR Certification, CISQ, DQS Holding GmbH and NSAI Inc.

* The list of IQNet partners is valid at the time of issue of this certificate. Updated information is available under www.iqnet-certification.com

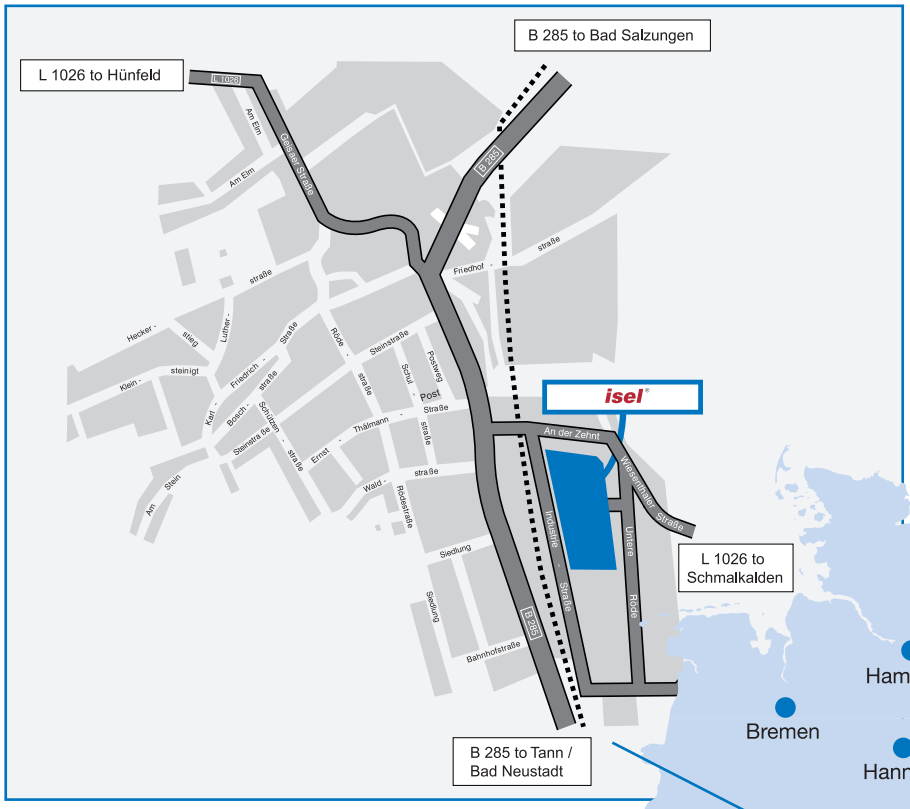
# Exhibition


A permanent exhibition and a training room in our Dermbach plant invite you to visit us on any weekday in addition to the presentation of our products at all important exhibitions.

In our display room, we will show you a selection of our product portfolio and offer you demonstrations under virtually real conditions.

Make an appointment with our technical advisor. We are looking forward to your visit.

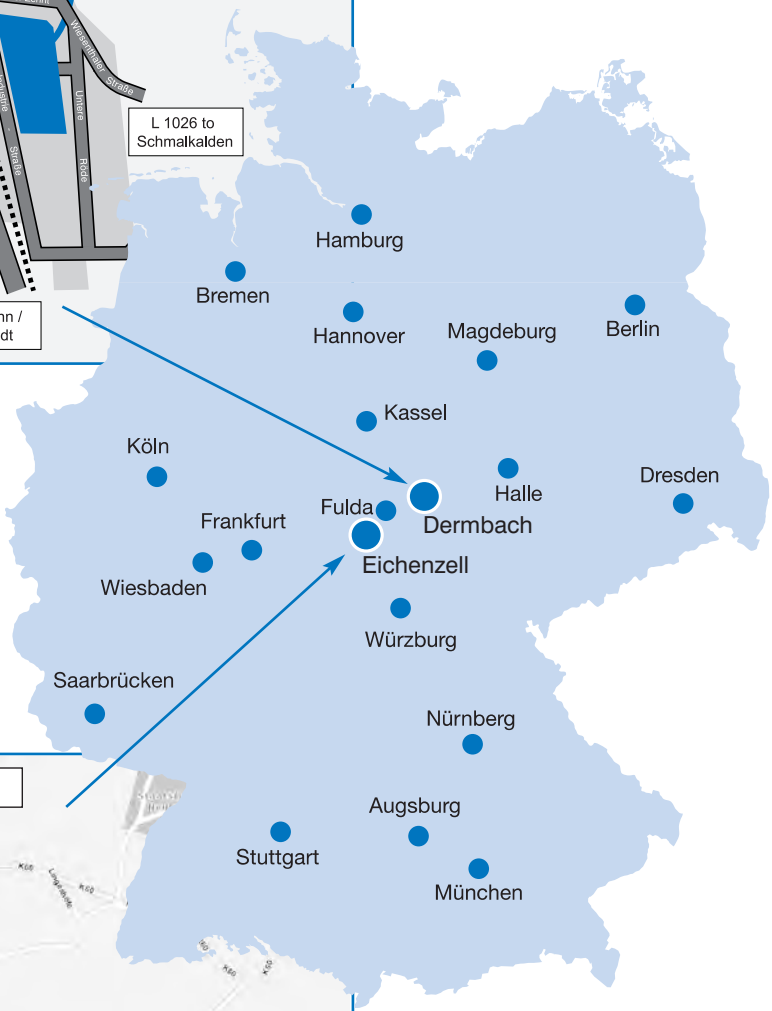
# How to find us



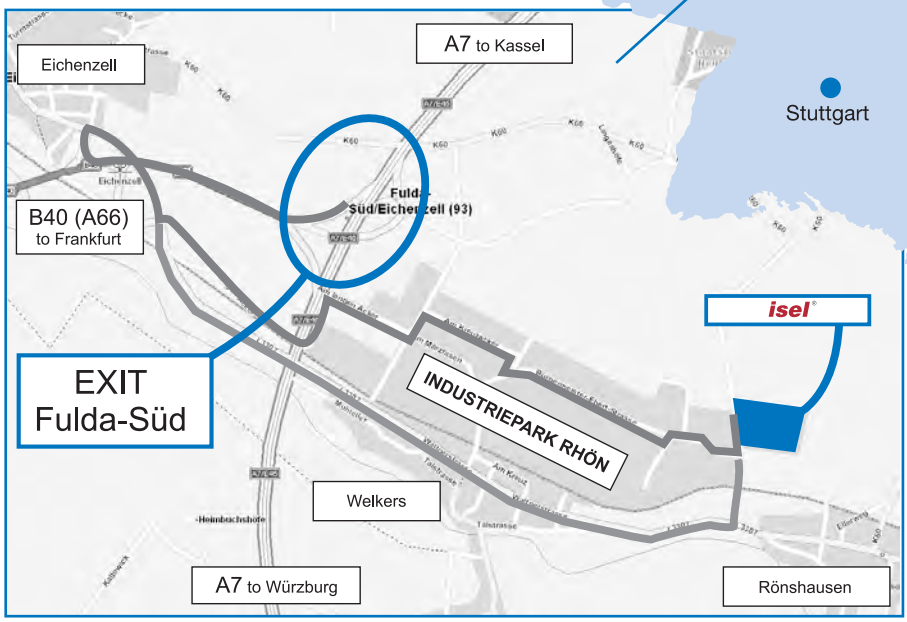

Dermbach

We are located in central Germany.

Dermbach is located on the B 285 between Bad Neustadt/Saale and Bad Salzungen or on the L 1026 between Hünfeld and Schmalkalden.




Eichenzell




Eichenzell is located on the A7 between Kassel and Würzburg, Fulda Süd exit, or from Frankfurt on the A66/B40.

# Quality Assurance in accordance with international standards …

The QA system for our products includes all sectors which contribute to achieving quality objectives. It is based on statutory requirements, customer needs and isel Germany AG's internal quality criteria.
The QA system ensures that the production processes are running in a controlled manner and that only products are moved to the next processing step that meet the relevant specifications

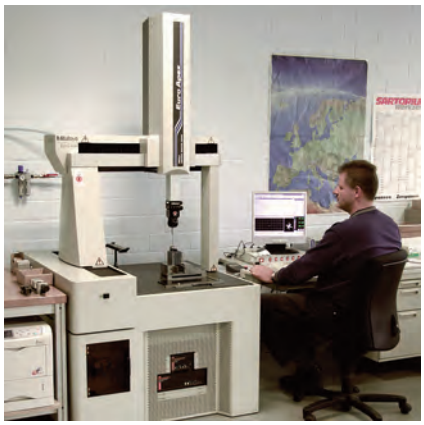
## Coordinate measuring equipment

**Mitutoyo BHN-715S**

Specifications: X-axis = 700 mm
Y-axis = 1,500 mm
Z-axis = 600 mm
Key system: TP 200
Change magazine: SCR 200
Length tolerance:
MPE = (5.0+5.5*L/1000) µm

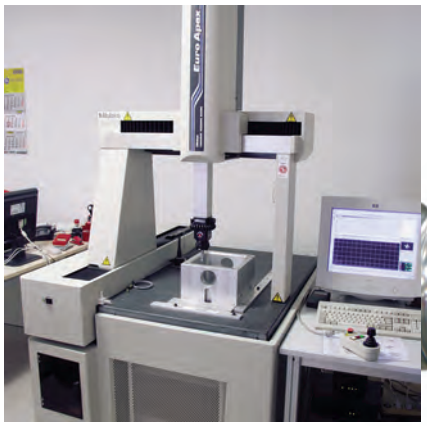
**Mitutoyo Euro C 544 Apex**

Specifications: X-axis = 500 mm
Y-axis = 400 mm
Z-axis = 400 mm
Key system: TP 200
Change magazine: SCR 200
Length tolerance:
MPE = (2.9+4.0*L/1000) µm



**Mitutoyo Euro C 574 Apex**

Specifications: X-axis = 500 mm
Y-axis = 700 mm
Z-axis = 400 mm
Key system: TP 200
Change magazine: SCR 200
Length tolerance:
MPE = (2.9+4.0*L/1000) µm



Subject to technical changes.

# ... and the quality criteria of our customers and of isel Germany AG

**Surface roughness test equipment Mitutoyo**

**Type: SJ - 201 P**
Test procedures: Ra, Ry, Rz, Rq, Rt

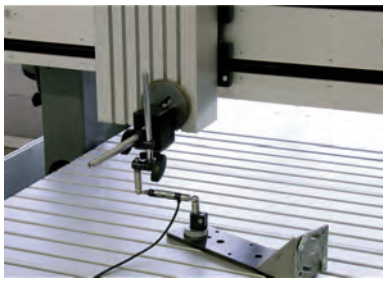
**Hardness test equipment Wolpert**

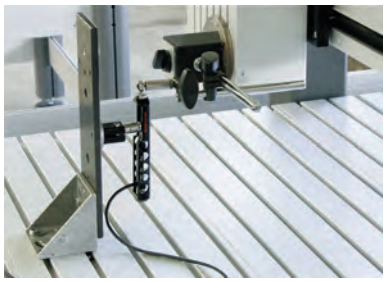
**Type:**
**Dia Testor 2 Rc**
Test procedures: Vickers, Brinell and Rockwell

**Layer thickness measuring equipment Electro-Physik**

**Type: Minitest 600 B**
Probe for steel and non-ferrous metal measurements.

## Machine accuracy (with QC 10)





Renishaw's QC 10 system is used to check machine accuracy. This system determines the relative accuracy of the axes of a machine tool. Circular dimensions are controlled using a simple CNC program. The form of the circles generated gives information about any potential faults present.

## XL-80 laser interferometer

**We use a laser system for calibrating machine tools and coordinate measuring equipment for ...**

### ... Position measurement

Position measurement is the most frequent measurement made on machines. The system records the positioning and repeat accuracy by comparing the position value shown by the machine and the actual position recorded by the laser interferometer system.

### ... Tilt angle measurement

In machine tools and coordinate measuring equipment, the cause of a positional error is frequently tilting of the axes. The Abbe'schen effect makes the error larger and larger with increasing distance from the axial guide.

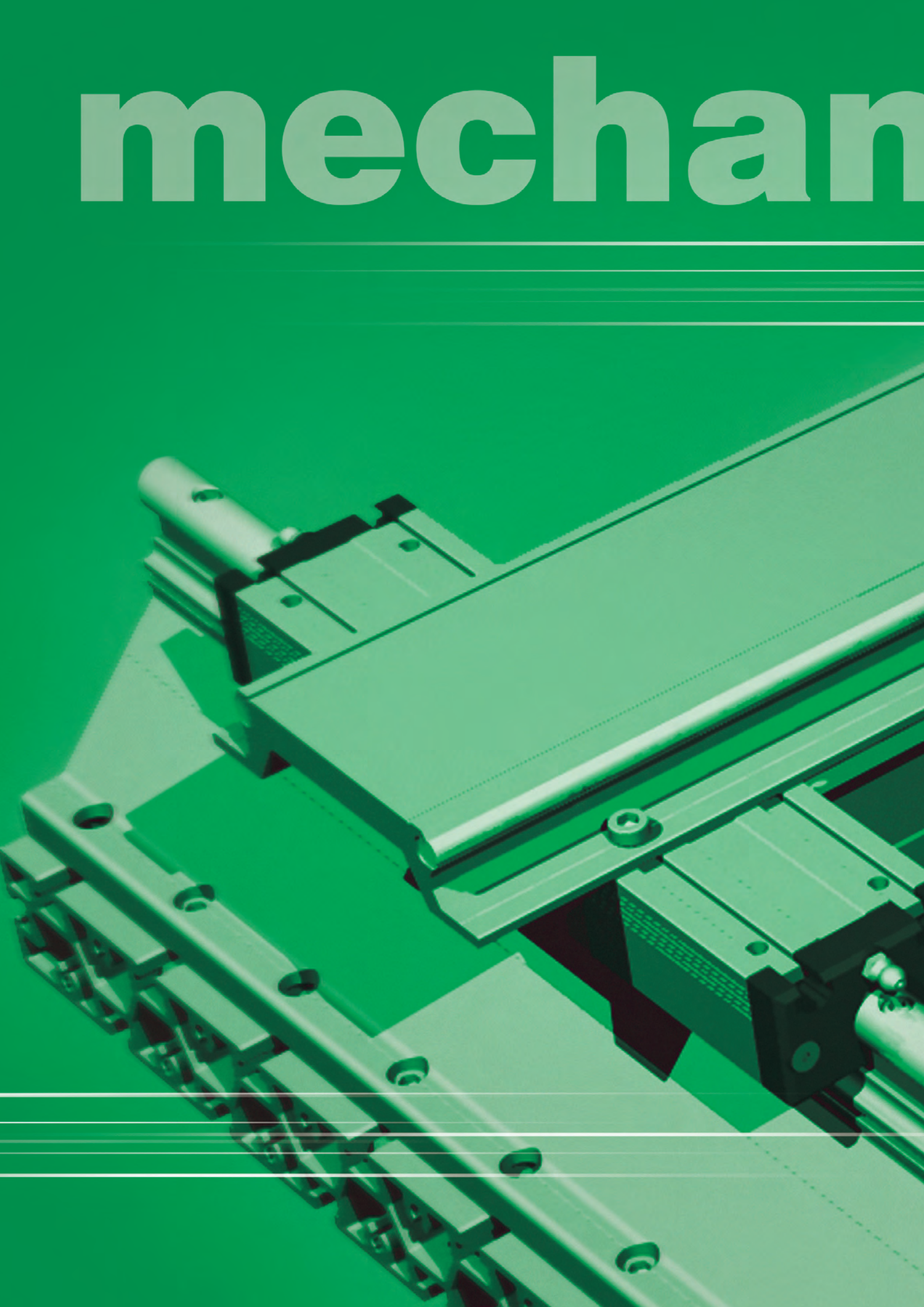
### ... Measurement of the dynamic response

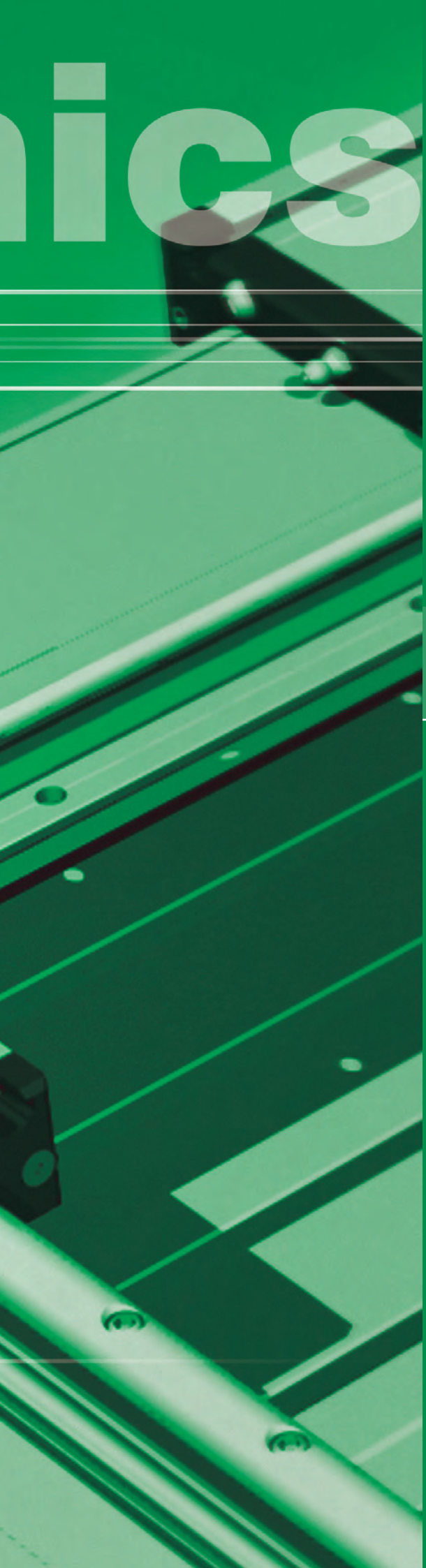
The software for dynamic measurements can compute movement cycles, speeds, accelerations, vibrations and the performance of servo drives.



Subject to technical changes.

# mechan





## MECHANICS

# Aluminium profiles Overview

# Aluminium profiles Overview



CAD data on our website **www.isel-germany.de**

# Panel profiles

# PP profiles

## Features

- For fast and easy erection of frames, benches and racks
- Aluminium, naturally anodised
- Produced to DIN EN 12020-2
- Easy, very strong under load
- Top edge particularly suitable as a load-bearing cladding, also takes very high loads
- The drilled holes and PS profile socket head screws of our profile linkages offer extremely rigid connections, resistant to tension, distortion and bending.
- Profile cutting to order
- Extensive range of accessories (see page 2-14)

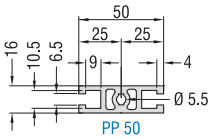
## Technical specification

| | PP 50 L | PP 50 | PP 100 | PP 150 | PP 200 | PP 250 |
|---|---|---|---|---|---|---|
| Dimensions (W × H) | 50 x 50 mm | 50 x 16 mm | 100 x 16 mm | 150 x 16 mm | 200 x 16 mm | 250 x 16 mm |
| Length | up to 3 metres (special lengths upon request) | | | | | |
| Weight | approx. 1.7 kg/m | approx. 1.1 kg/m | approx. 1.9 kg/m | approx. 2.6 kg/m | approx. 3.4 kg/m | approx. 4.1 kg/m |
| | 2 cavity inserts Ø 5.5 mm für M6 screw | 1 cavity insert Ø 5.5 mm für M6 screw | 2 cavity inserts Ø 5.5 mm for M6 screw in 50 mm raster | 3 cavity inserts Ø 5.5 mm for M6 screw in 50 mm raster | 4 cavity inserts Ø 5.5 mm for M6 screw in 50 mm raster | 5 cavity inserts Ø 5.5 mm for M6 screw in 50 mm raster |
| Moment of inertia $I_x$ | 13.25 cm$^4$ | 8.13 cm$^4$ | 67.27 cm$^4$ | 213.92 cm$^4$ | 482.77 cm$^4$ | 908.52 cm$^4$ |
| Moment of inertia $I_y$ | 13.25 cm$^4$ | 1.37 cm$^4$ | 2.46 cm$^4$ | 3.55 cm$^4$ | 4.64 cm$^4$ | 5.74 cm$^4$ |
| Moment of resistance $W_x$ | 4.39 cm$^3$ | 3.25 cm$^3$ | 13.45 cm$^3$ | 28.52 cm$^3$ | 48.27 cm$^3$ | 72.68 cm$^3$ |
| Moment of resistance $W_y$ | 4.39 cm$^3$ | 1.71 cm$^3$ | 3.08 cm$^3$ | 4.44 cm$^3$ | 5.80 cm$^3$ | 7.17 cm$^3$ |

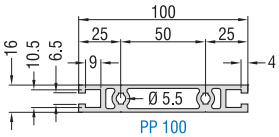
## Ordering data

| | | | | | | |
|---|---|---|---|---|---|---|
| Part no. for L=**1000 mm** | **201 045 1000** | **201 040 1000** | **201 041 1000** | **201 042 1000** | **201 043 1000** | **201 009 1000** |
| Part no. for L=**3000 mm** | **201 045 3000** | **201 040 3000** | **201 041 3000** | **201 042 3000** | **201 043 3000** | **201 009 3000** |

## Dimensioned drawings



PP 50



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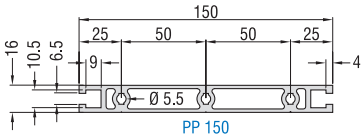
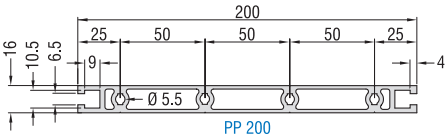
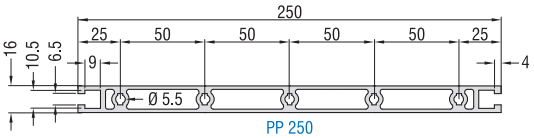


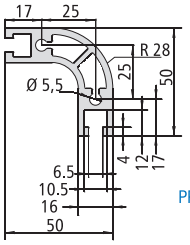
PP 150



PP 200



PP 250



PP 50 L

# Universal profiles

# PU 25/PU 50

## Features

- For the fast and simple erection of frames, benches and racks
- Aluminium, naturally anodised
- Produced in accordance with DIN EN 12020-2
- Light, compact & stable
- For universal use
- Suitable for very high loads
- The clamping elements and drilled holes of our clamped linkages produce very rigid connections, resistant to tension, distortion and inter-profile bending.
- Profile cutting to order
- Extensive range of accessories (see page 2-14)

Option: - powder coatings in anthracite and light grey

## Technical specification

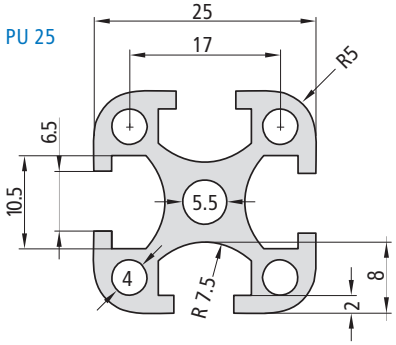
| | PU 25 | PU 50 |
|---|---|---|
| Dimensions (W × H) | 25 x 25 mm | 50 x 25 mm |
| Length | up to 3 metres (special lengths upon request) | |
| Weight | approx. 0.7 kg/m | approx. 1.3 kg/m |
| | 4 T-key inserts for M6 sliding nuts<br>Cavity insert, Ø 5.5 mm for M6 | 4 T-key inserts for M6 sliding nuts<br>2 cavity inserts, Ø 5.5 mm for M6 |
| Moment of inertia $I_x$ | 1.43 $cm^4$ | 10.99 $cm^4$ |
| Moment of inertia $I_y$ | 1.43 $cm^4$ | 2.81 $cm^4$ |
| Moment of resistance $W_x$ | 1.14 $cm^3$ | 4.40 $cm^3$ |
| Moment of resistance $W_y$ | 1.14 $cm^3$ | 2.25 $cm^3$ |

## Ordering data

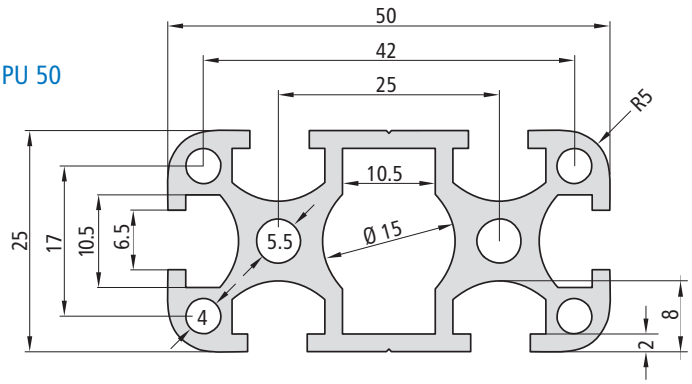
| Profile description | Part no.: L=**1000 mm**<br>Part no.: L=**3000 mm** |
|---|---|
| **PU 25**<br>W 25 x H 25 mm | 200 001 **1000**<br>200 001 **3000** |
| **PU 50**<br>W 50 x H 25 mm | 200 002 **1000**<br>200 002 **3000** |

## Dimensioned drawings

PU 25




PU 50



# T-slot plates

# PT 25

## Features

- Universal precision, clamping and machining surface
- Aluminium, naturally anodised
- Produced in accordance with DIN EN 12020-2
- Milled flat on both sides
- For use with any machine
- Thick walled, distortion-free and extremely form-retaining
- Profile cutting to order
- Extensive range of accessories (see page 2-14)
- Option:
  - Drainage channel for small quantities of liquid

## Technical specification

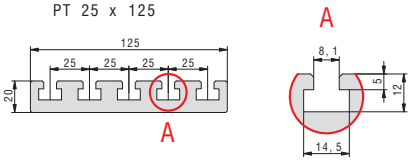
| | PT 25 | | |
|---|---|---|---|
| Dimensions (W × H) | 125 x 20 mm | 250 x 20 mm | 375 x 20 mm |
| Length | up to 3 metres (special lengths upon request) | | |
| Weight | appr. 4.8 kg/m | appr. 9.6 kg/m | appr. 13.7 kg/m |
| T-slots | one-sided in 25 mm raster | | |
| Moment of inertia $I_x$ | 243.36 $cm^4$ | 1848.57 $cm^4$ | 5996.01 $cm^4$ |
| Moment of inertia $I_y$ | 6.46 $cm^4$ | 12.77 $cm^4$ | 17.90 $cm^4$ |
| Moment of resistance $W_x$ | 38.94 $cm^3$ | 147.88 $cm^3$ | 319.79 $cm^3$ |
| Moment of resistance $W_y$ | 6.46 $cm^3$ | 12.77 $cm^3$ | 17.90 $cm^3$ |

## Ordering data

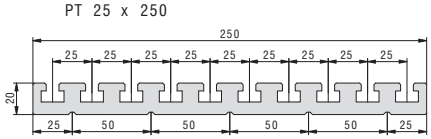
| L [mm] | **PT 25** W 125 x H 20 mm | **PT 25** W 250 x H 20 mm | **PT 25** W 375 x H 20 mm |
|---|---|---|---|
| | Part no. | Part no. | Part no. |
| **400** | 201 014 **0400** | 201 018 **0400** | 201 020 **0400** |
| **500** | 201 014 **0500** | 201 018 **0500** | 201 020 **0500** |
| **600** | 201 014 **0600** | 201 018 **0600** | 201 020 **0600** |
| **700** | 201 014 **0700** | 201 018 **0700** | 201 020 **0700** |
| **800** | 201 014 **0800** | 201 018 **0800** | 201 020 **0800** |
| **900** | 201 014 **0900** | 201 018 **0900** | 201 020 **0900** |
| **1000** | 201 014 **1000** | 201 018 **1000** | 201 020 **1000** |
| **1100** | 201 014 **1100** | 201 018 1100 | 201 020 **1100** |
| **1200** | 201 014 **1200** | 201 018 **1200** | 201 020 **1200** |
| **1300** | 201 014 **1300** | 201 018 **1300** | 201 020 **1300** |
| **1400** | 201 014 **1400** | 201 018 **1400** | 201 020 **1400** |
| **1500** | 201 014 **1500** | 201 018 **1500** | 201 020 **1500** |
| **1800** | 201 014 **1800** | 201 018 **1800** | 201 020 **1800** |
| **2000** | 201 014 **2000** | 201 018 **2000** | 201 020 **2000** |
| **2500** | 201 014 **2500** | 201 018 **2500** | 201 020 **2500** |
| **3000** | 201 014 **3000** | 201 018 **3000** | 201 020 **3000** |

## Dimensioned drawings

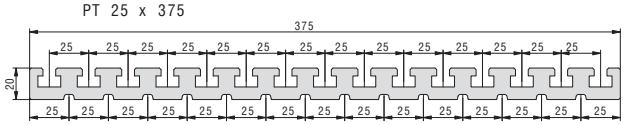
PT 25 x 125




PT 25 x 250




PT 25 x 375




T-nuts - see accessories for aluminium profiles

# T-slot plates

# PT 50

## Features

- Universal precision, clamping and machining surface
- Aluminium, naturally anodised
- Produced in accordance with DIN EN 12020-2
- Milled flat on both sides
- For use with any machine
- Thick walled, distortion-free and extremely form-retaining
- Profile cutting upon request
- Extensive range of accessories (see page 2-14)

## Technical specification

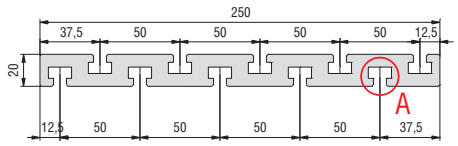
| | PT 50 | |
|---|---|---|
| Dimensions (W × H) | 250 x 20 mm | 375 x 20 mm |
| Length | up to 3 metres (special lengths upon request) | |
| Weight | approx. 10.0 kg/m | approx. 14.8 kg/m |
| T-slots | both-sided in 50 mm raster | |
| Moment of inertia $I_x$ | 2062.99 $cm^4$ | 6745.96 $cm^4$ |
| Moment of inertia $I_y$ | 13.85 $cm^4$ | 20.63 $cm^4$ |
| Moment of resistance $W_x$ | 165.04 $cm^3$ | 359.78 $cm^3$ |
| Moment of resistance $W_y$ | 13.85 $cm^3$ | 20.63 $cm^3$ |

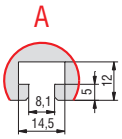
## Ordering data

| L [mm] | **PT 50** W 250 x H 20 mm | **PT 50** W 375 x H 20 mm |
|---|---|---|
| | Part no. | Part no. |
| **400** | 201 016 **0400** | 201 019 **0400** |
| **500** | 201 016 **0500** | 201 019 **0500** |
| **600** | 201 016 **0600** | 201 019 **0600** |
| **700** | 201 016 **0700** | 201 019 **0700** |
| **800** | 201 016 **0800** | 201 019 **0800** |
| **900** | 201 016 **0900** | 201 019 **0900** |
| **1000** | 201 016 **1000** | 201 019 **1000** |
| **1100** | 201 016 **1100** | 201 019 **1100** |
| **1200** | 201 016 **1200** | 201 019 **1200** |
| **1300** | 201 016 **1300** | 201 019 **1300** |
| **1400** | 201 016 **1400** | 201 019 **1400** |
| **1500** | 201 016 **1500** | 201 019 **1500** |
| **1800** | 201 016 **1800** | 201 019 **1800** |
| **2000** | 201 016 **2000** | 201 019 **2000** |
| **2500** | 201 016 **2500** | 201 019 **2500** |
| **3000** | 201 016 **3000** | 201 019 **3000** |

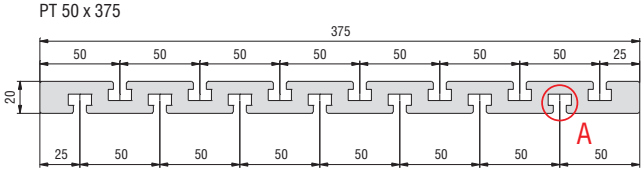
## Dimensioned drawings

PT 50 x 250




PT 50 x 375




T-nuts - see accessories for aluminium profiles

# Rectangular profiles

# RE 40

## Features

- Universal precision, clamping and machining surface
- As a stabiliser for machine and subframe constructions
- Aluminium, naturally anodised
- Produced in accordance with DIN EN 12020-2
- Light & very stable
- Numerous applications with the accessories are possible
- Profile cutting upon request
- Extensive range of accessories (see page 2-14)

## Technical specification

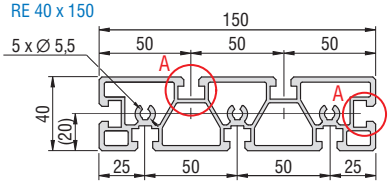
| | RE 40 | | |
|---|---|---|---|
| Dimensions (W × H) | 150 x 40 mm | 250 x 40 mm | 350 x 40 mm |
| Length | up to 3 metres (special lengths upon request) | | |
| Weight | approx. 4.8 kg/m | approx. 7.6 kg/m | approx. 13.380 g/m |
| | various cavities and T-key inserts for sliding nuts or M6 tapped strips for frontal inserts for M6 screws | | |
| Moment of inertia $I_x$ | 393.7 cm⁴ | 1654.53 cm⁴ | 5,626.00 cm⁴ |
| Moment of inertia $I_y$ | 33.42 cm⁴ | 54.18 cm⁴ | 97.45 cm⁴ |
| Moment of resistance $W_x$ | 52.49 cm³ | 131.64 cm³ | 321.48 cm³ |
| Moment of resistance $W_y$ | 16.71 cm³ | 27.09 cm³ | 48.5 cm³ |

## Ordering data

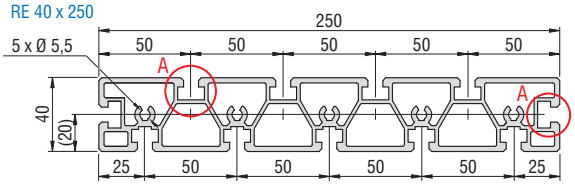
| Profile description | Part no.: L = **1000 mm**<br>Part no.: L = **3000 mm** |
|---|---|
| **RE 40**<br>W 150 x H 40 mm | 201 035 **1000**<br>201 035 **3000** |
| **RE 40**<br>W 250 x H 40 mm | 201 030 **1000**<br>201 030 **9000** |
| **RE 40**<br>W 350 x H 40 mm | 201 031 1000<br>201 031 3000 |

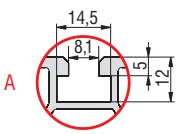
## Dimensioned drawings

RE 40 x 150

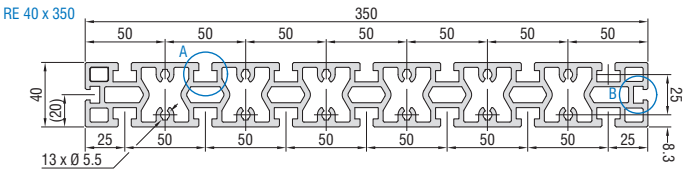



RE 40 x 250




RE 40 x 350



# Rectangular profiles

# RE 65

## Features

- Universal precision, clamping and machining surface
- As a stabiliser for machine and subframe constructions
- Aluminium, naturally anodised
- Produced in accordance with DIN EN 12020-2
- Light & very stable
- Milled flat on both sides
- Numerous applications with the accessories are possible
- Profile cutting upon request
- Extensive range of accessories (see page 2-14)

## Technical specification

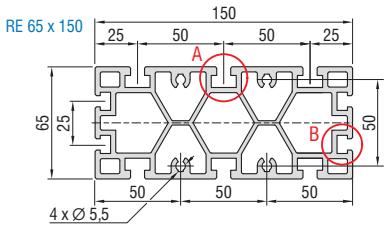
| | RE 65 | |
|---|---|---|
| Dimensions (W × H) | 150 x 65 mm | 250 x 65 mm |
| Length | up to 3 metres (special lengths to order) | |
| Weight | approx. 7.7 kg/m | approx. 12.4 kg/m |
| | various cavities and T-key inserts for sliding nuts or M6 tapped strips for frontal inserts for M6 screws | |
| Moment of inertia $I_x$ | 633.47 cm⁴ | 2,658.48 cm⁴ |
| Moment of inertia $I_y$ | 148.87 cm⁴ | 243.85 cm⁴ |
| Moment of resistance $W_x$ | 84.46 cm³ | 212.68 cm³ |
| Moment of resistance $W_y$ | 45.83 cm³ | 75.03 cm³ |

## Ordering data

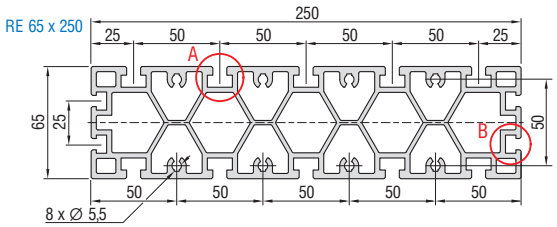
| Profile description | Part no.: L=**1000 mm**<br>Part no.: L=**3000 mm** |
|---|---|
| **RE 65**<br>W 150 x H 65 mm | 201 034 **1000**<br>201 034 **3000** |
| **RE 65**<br>W 250 x H 65 mm | 201 032 **1000**<br>201 032 **3000** |

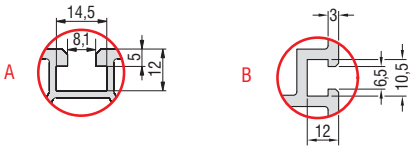
## Dimensioned drawings

RE 65 x 150



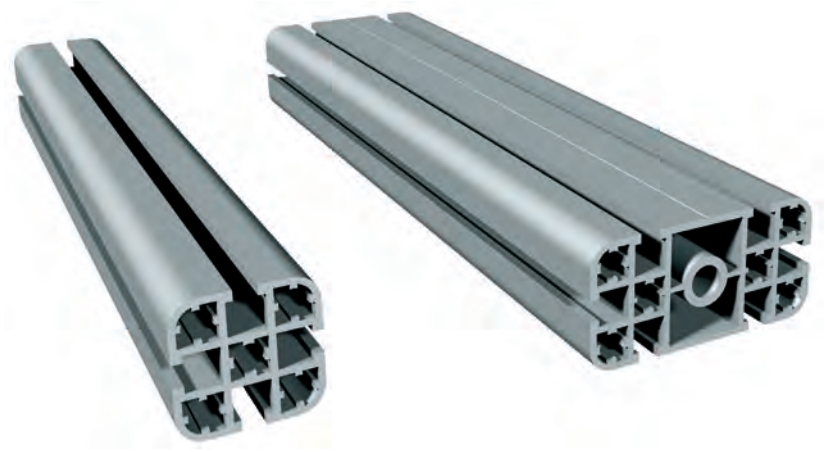

RE 65 x 250



# Light frame profiles

# PL 40/PL 80



## Features

- For the fast and simple erection of frames, benches and racks
- Aluminium, naturally anodised
- Produced in accordance with DIN EN 12020-2
- Light, compact & stable
- Suitable for very high loads
- The clamping elements and drilled holes of our clamped linkages produce very rigid connections, resistant to tension, distortion and bending between the profiles.
- Profile cutting upon request
- Extensive range of accessories (see page 2-14)

Option: - powder coatings in anthracite and light grey

## Technical specification

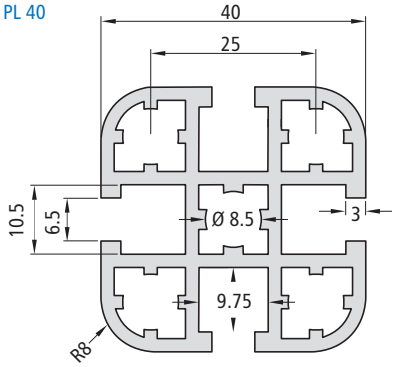
| | PL 40 | PL 80 |
|---|---|---|
| Dimensions (W × H) | 40 x 40 mm | 80 x 40 mm |
| Length | up to 3 metres (special lengths to order) | |
| Weight | approx. 1.5 kg/m | approx. 2.9 kg/m |
| | 4 T-key inserts for M6 sliding nuts<br>5 cavity inserts, Ø 8.5 mm for M10 | 6 T-key inserts for M6 sliding nuts<br>6 cavity inserts, Ø 8.5 mm for M10<br>Cavity insert, Ø 10.2 mm for M12 |
| Moment of inertia $I_x$ | 8.38 cm⁴ | 64.40 cm⁴ |
| Moment of inertia $I_y$ | 8.38 cm⁴ | 16.36 cm⁴ |
| Moment of resistance $W_x$ | 4.19 cm³ | 16.10 cm³ |
| Moment of resistance $W_y$ | 4.19 cm³ | 8.18 cm³ |

## Ordering data

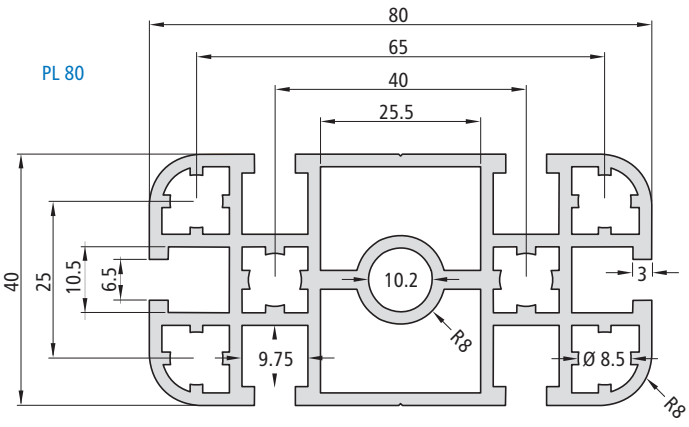
| Profile description | Part no.: L=**1000 mm**<br>Part no.: L=**3000 mm** |
|---|---|
| **PL 40**<br>W 40 x H 40 mm | 200 008 **1000**<br>200 008 **3000** |
| **PL 80**<br>W 80 x H 40 mm | 200 009 **1000**<br>200 009 **3000** |

## Dimensioned drawings

PL 40




PL 80



# Stand profiles

# PS 50/PS 80

## Features

- For the fast and simple erection of frames, benches and racks
- Aluminium, naturally anodised
- Produced in accordance with DIN EN 12020-2
- Light, compact & stable
- Suitable for high loads
- Our clamped linkages produce very rigid connections, resistant to tension, distortion and bending, between profiles
- Profile cutting upon request
- Extensive range of accessories (see page 2-14)

Option: - powder coatings in anthracite and light grey

## Technical specification

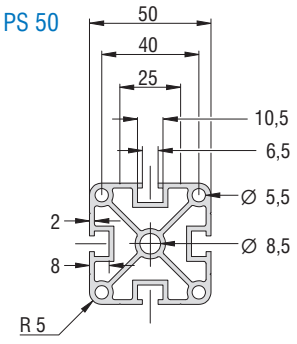
| | PS 50 | PS 80 |
|---|---|---|
| Dimensions (W × H) | 50 x 50 mm | 80 x 80 mm |
| Length | up to 3 metres (special lengths upon request) | |
| Weight | approx. 2.3 kg/m | approx. 4.5 kg/m |
| | 4 T-key inserts for M6 sliding nuts<br>4 cavity inserts, Ø 5.5 mm for M6<br>Cavity insert, Ø 8.5 mm for M10 | 4 T-key inserts for M6 sliding nuts<br>4 cavity inserts, Ø 5.5 mm for M6<br>Cavity insert, Ø 10.2 mm for M12 |
| Moment of inertia $I_x$ | 22.06 cm$^4$ | 111.8 cm$^4$ |
| Moment of inertia $I_y$ | 22.06 cm$^4$ | 111.8 cm$^4$ |
| Moment of resistance $W_x$ | 8.82 cm$^3$ | 27.95 cm$^3$ |
| Moment of resistance $W_y$ | 8.82 cm$^3$ | 27.95 cm$^3$ |

## Ordering data

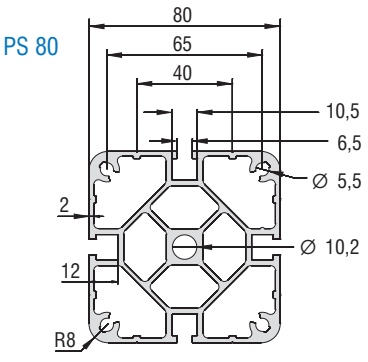
| Profile description | Part no.: L=**1000 mm**<br>Part no.: L=**3000 mm** |
|---|---|
| **PS 50**<br>W 50 x H 50 mm | 200 003 **1000**<br>200 003 **3000** |
| **PS 80**<br>W 80 x H 80 mm | 200 014 **1000**<br>200 014 **3000** |

## Dimensioned drawings

PS 50




PS 80



# Stand profiles

# PS100

## Features

- For fast and easy erection of frames, benches and racks
- Aluminium, naturally anodised
- Produced in accordance with DIN EN 12020-2
- Light, compact & stable
- Suitable for high loads
- Our clamped linkages produce very rigid connections, resistant to tension, distortion and bending, between profiles
- Profile cutting upon request
- Extensive range of accessories (see page 2-14)

Option: - powder coatings in anthracite and light grey

## Technical specification

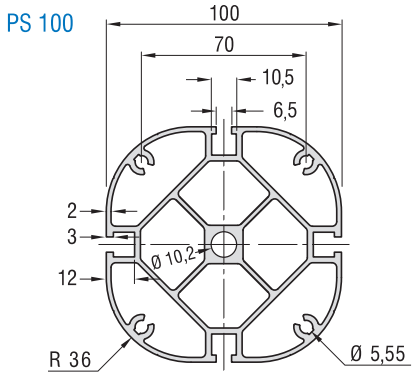
| | PS 100 |
|---|---|
| Dimensions (W × H) | 100 x 100 mm |
| Length | up to 3 metres (special lengths to order) |
| Weight | approx. 5.1 kg/m |
| | 4 T-key inserts for M6 sliding nuts<br>4 cavity inserts, Ø 5.55 mm for M6<br>Cavity insert, Ø 10.2 mm for M12 |
| Moment of inertia $I_x$ | 163.00 $cm^4$ |
| Moment of inertia $I_y$ | 163.00 $cm^4$ |
| Moment of resistance $W_x$ | 32.60 $cm^3$ |
| Moment of resistance $W_y$ | 32.60 $cm^3$ |

## Ordering data

| Profile description | Part no.: L=**1000 mm**<br>Part no.: L=**3000 mm** |
|---|---|
| **PS 100**<br>W 100 x H 100 mm | 200 015 **1000**<br>200 015 **3000** |

## Dimensioned drawings

PS 100



# Workbenches

# AT


**AT 2**
Figure with insert base option

## Features

Workbenches AT for clamping devices, clamping means, for measurement, checking, testing, etc.

- Sub-frame from aluminium profiles PS series with braces made from aluminium panel profiles PP series
- Aluminium bench plate RE series of rectangular profiles 40 × 250 mm with T-slots

### Options

- Length up to 2 m
- Various accessories

## Accessories

Insert base for AT 1
Part no.: **248551 0010**

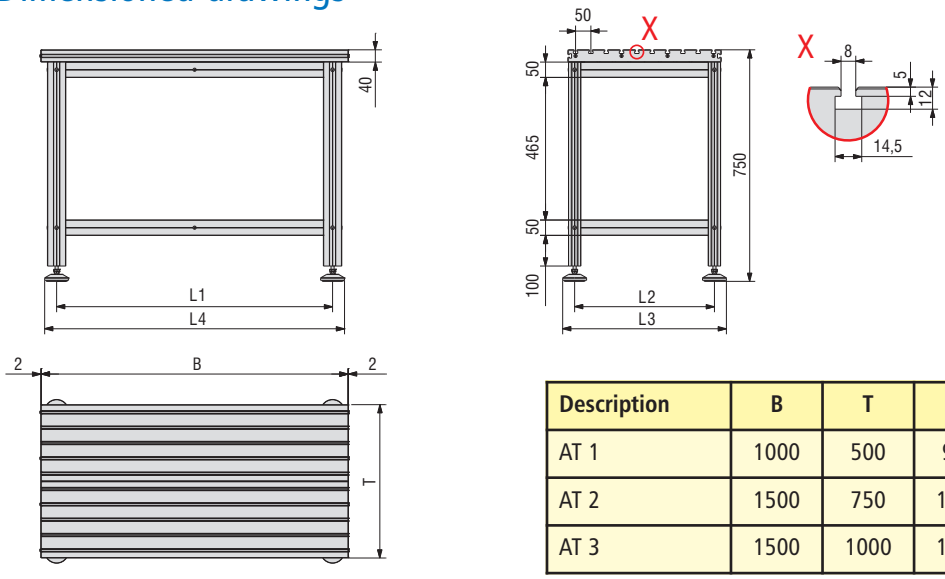
Insert base for AT 2
Part no.: **248551 0012**

Insert base for AT 3
Part no.: **248551 0013**

## Ordering data

| Part no. | Description | Load: Surface load | Weight | suitable for |
|---|---|---|---|---|
| 248 550 0010 | AT 1, W 1000 x D 500 x H 750 mm | 200 kg | approx. 30 kg | |
| 248 550 0012 | AT 2, W 1500 x D 750 x H 750 mm | 400 kg | approx. 60 kg | ICP 3020 |
| 248 550 0013 | AT 3, W 1500 x D 1000 x H 750 mm | 400 kg | approx. 75 kg | ICP/ICV 4030 |

## Dimensioned drawings




| Description | B | T | L 1 | L 2 | L 3 | L 4 |
|---|---|---|---|---|---|---|
| AT 1 | 1000 | 500 | 900 | 456 | 536 | 980 |
| AT 2 | 1500 | 750 | 1380 | 660 | 780 | 1500 |
| AT 3 | 1500 | 1000 | 1380 | 910 | 1030 | 1500 |

# Accessories

## Tapped rails

### M6 tapped rail
• 13 x 6 mm • Galvanised
• M6 Ra 50 mm • VE 3 units at 1 m
• For PT/RE 40, 65
Part no.: 209010

### M6 tapped rail
• 10 x 4 mm • Galvanised
• M6 Ra 50 mm • VE 3 units at 1 m
• For all except PT/RE 40, 65/SP
Part no.: **209011**

## Sliding nuts


### M6 sliding nut (Figure 1)
• L25 × W10 × H3.5 • Galvanised
• VE 100 units
• All except PT/RE 40, 65
Part no.: **209001 0005**

### M6 sliding nut (Figure 1)
• L 25 × W 13 × H 5 • Galvanised
• VE 50 units
• For PT/RE 40, 65
Part no.: **209004 0001**

### 2 × M6 sliding nuts (Figure 2)
• L45 x W10 x H3.5 • Galvanised
• VE 50 units
• For all except PT/RE 40, 65
Part no.: **209002 0004**

### 2 × M6 sliding nuts (Figure 2)
• L 45 × W 13 × H 6 • Galvanised
• 2xM6 Ra 25mm • VE 25 units
• For PT/RE 40, 65
Part no.: **209005 0001**

### M5 sliding nut
• L25 × W10 × H3.5 • Galvanised
• VE 20 units
• For all except PT/RE 40, 65
Part no.: **209006 0001**

### Angle sliding nut 2 × M6 (Figure 3)
• Galvanised • VE 25 units
• For all except PT/RE 40, 65
Part no.: **209021 0003**

### Special angle sliding nut 3 x M6 (Figure 4)
• Galvanised • VE 25 units
• For all except PT/RE 40, 65
Part no.: **209022 0003**

## Sliding nuts


### M5/M6 sliding nuts
• Galvanised • VE 20 units
• for PT25 , PT 50, PS 200, RE 40 and RE 65 (securing only possible at the top)
with spring
Part no.: **209005 0002** (M5/Figure 1)
Part no.: **209005 0003** (M6/Figure 2)
with large chamfer
Part no.: **209005 0004** (M6/Figure 3)
in rhombus shape
Part no.: **209005 0005** (M5/Figure 4)
Part no.: **209005 0006** (M6/Figure 5)

## Tension rods

### Tension rods SE
• With M6 setting screw
• VE 2 units
• For RE/PT
Part no.: **290051**

## Clamping devices


### Hand lever clamping device SH 1
• for RE/PT
Part no.: **290001**

### Hand lever clamping device SH 2
• For RE/PT
Part no.: **290002**

## Stop rails

### Stop rail (galvanised)
• W 20 × H 10 • Ra 50
• VE 2 units + fixing material
L 125 mm
Part no.: **290021 0125**
L 175 mm
Part no.: **290021 0175**
L 225 mm
Part no.: **290021 0225**

## T-keys

### M6 T-keyways
• DIN 508 • Hardened
• VE 20 units
• For PT/ RE 40, 65
Part no.: **209119 0003**

## Edging strip

### Black edging strip 1-part
• For plate thicknesses 3 - 4 mm
• VE 10 m
Part no.: **209202 0002** (PU profiles)
Part no: **209202 0001**
(PP-/ RE- and PS profiles)

## PP 50 cross-braces

### PP 50 cross-braces
• L 490 mm
• Mitred
• M6 drillings
• for all except PT/RE 40, 65
Part no.: **209300 0000**

## Hinge strip

### Plastic hinge strip
• L 65 × W 40
• VE 10 units + fixing
• Ra 43 × 20 mm
• For PL
Part no.: **209050 0012**

### Aluminium hinge strip
• L 40 x W 40 mm
• VE 10 units + fixing
• Ra 25 x 25 mm
• For all except PT/RE 40, 65
Part no.: **209050 0011**

# Accessories

## Profile connection cubes

### Profile connection cubes black

- VE 10 units + fixing material
- For PU 25

2 x Part no.: **209104 0002**
Part no.: Part no.: **209103 0002**

### Profile connection cubes, black

- VE 10 units + fixing material
- For PU 25

Part no.: Part no.: **209106 0002**
Part no.: Part no.: **209107 0002**

### Profile connection cubes black

- VE 10 units + fixing material
- For PU 25

Four-fold Part no.: **209108 0002**
Five-fold Part no.: **209109 0002**

## T-slot cover

### T-slot cover

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

black Part no.: **209201 0004**
turquoise Part no.: **209201 0003**
light grey Part no.: **209201 0007**

## Profile covers

### Profile covers, black

- PU 25 - 25 units
  Part no.: **209105 0003**
- PU 50 - 25 units
  Part no.: **209126 0003**
- PL 40 - 20 units
  Part no.: **209127 0003**
- PL 80 - 20 units
  Part no.: **209128 0003**
- PS 50 - 25 units
  Part no.: **209129 0003**
- PS 80 - 20 units
  Part no.: **209130 0003**
- PS 140 - 10 units
  Part no.: **209130 1001**

## Aluminium corner connector

### Aluminium corner connector

- L 25 × W 25 × H 15 mm
- VE 10 units + fixing material
- For PL, PS, PU, PP

natural
Part no.: **209114 0101**
black
Part no.: **209114 0111**

- L 40 × W 40 × H 22 mm
- VE 10 units + fixing material
- For PP/PL/PS/PU

natural
Part no.: **209115 0101**
black
Part no.: **209115 0111**

- L 50 x W 50 x H 15
- VE 10 units + fixing material
- For RE/PU/PS

natural
Part no.: **209116 0101**
black
Part no.: **209116 0111**

- L 80 x W 80 x H 22
- VE 10 units + fixing material
- For PP/PL/PS/PU

natural
Part no.: **209117 0101**
black
Part no.: **209117 0111**

## Plastic equipment bases

### Plastic equipment bases
with rubber plate

- VE 4 units + setting screws
- Black

For PL 40/PS 50
- Ø 60
- M10 × 50 setting screws

Part no.: **209032 0003**

for PL 80 / PS 80
- Ø 80
- M12 × 50 setting screws

Part no.: **209034 0001**

for PL 80 / PS 80
- Ø 120
- Setting screws M12 × 50
- Black

Part no.: **209033 0003**

## Guide rollers

### Rubber-tired guide rollers Ø 75 (M10)

- VE 4 units
- 2 with and 2 without locking device
- for PL 40/PS 50

Part no.: **209043 0011**

## Aluminium equipment bases

### Aluminium equipment bases
with rubber plate

for PU 50
- VE 4 units, with setting screws and reducing bushings
- Ø 50
- M6 × 30 setting screws
- Natural

Part no.: **209030 0000**

for PS 100/140
- Ø 170
- M16 × 100 setting screws
- Black

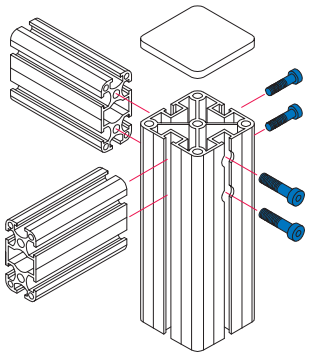
Part no.: **209035 0001**

Subject to technical changes.

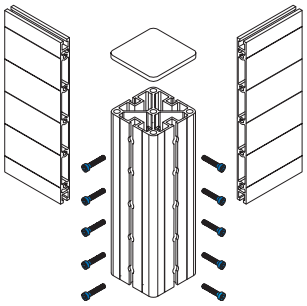
# Profile connections

Examples:

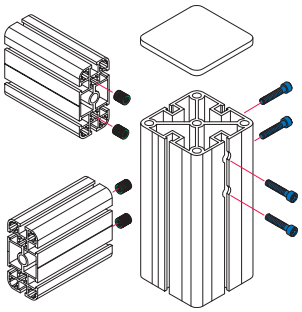
## PS 50 with PU 50



## PS 50 with PP 250



## PS 80 with PL 80



### Allen screws

**Allen screws**
**M6 × 25 mm**

- VE 10 units
  Part no.: **209147 0009**
- VE 50 units
  Part no.: **209147 0010**

**Allen screws**
**M6 x 50 mm**

- VE 10 units
  Part no.: **209147 0003**
- VE 50 units
  Part no.: **209147 0004**

**Allen key**
**SW 5**

- DIN 911
- VE 1 unit

Part no.: **931152**

### Tapped bushings

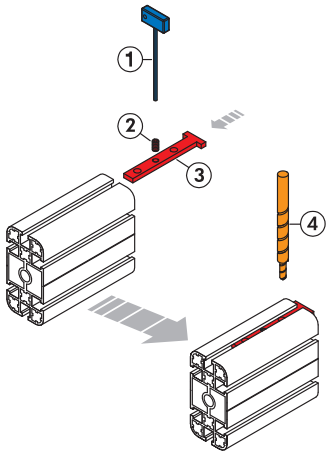
**Tapped bushings**
**M9/M6**

- VE 10 units
  Part no.: **209147 0001**
- VE 50 units
  Part no.: **209147 0002**

**Tapped bushings**
**M10/M6**

- VE 10 units
  Part no.: **209147 0124**
- VE 50 units
  Part no.: **209147 0125**

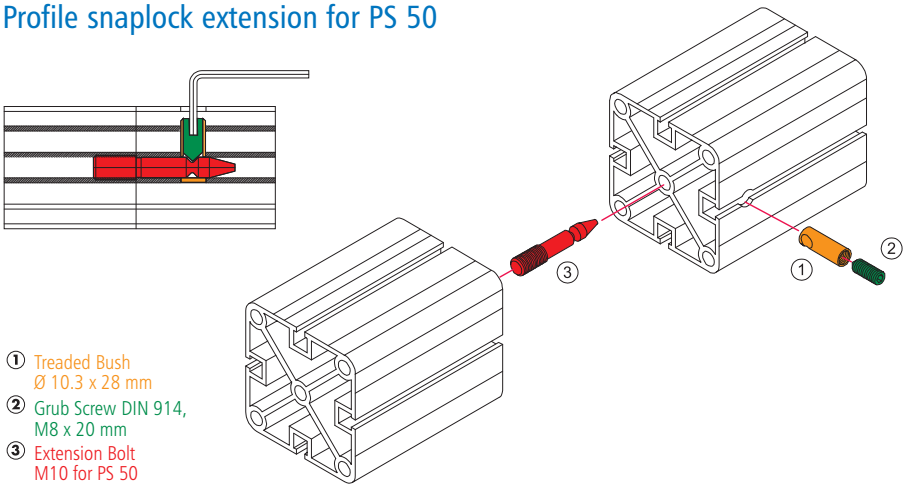
### Example PL 80




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

Example:

## Profile snaplock extension for PS 50




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

**for PS 50/PL 40 (M10)**

- Locking bush, tapped pin, extension bolts

Part no.: **209147 0120**

- 50 sets
  Part no.: **209147 0121**

**for PS 80/PL 80 (M12)**

- Locking bush, tapped pin, extension bolts
- 10 sets
  Part no.: **209147 0122**
- 50 sets
  Part no.: **209147 0123**

**matching drill pattern 2**
Part no.: **290015 0002**

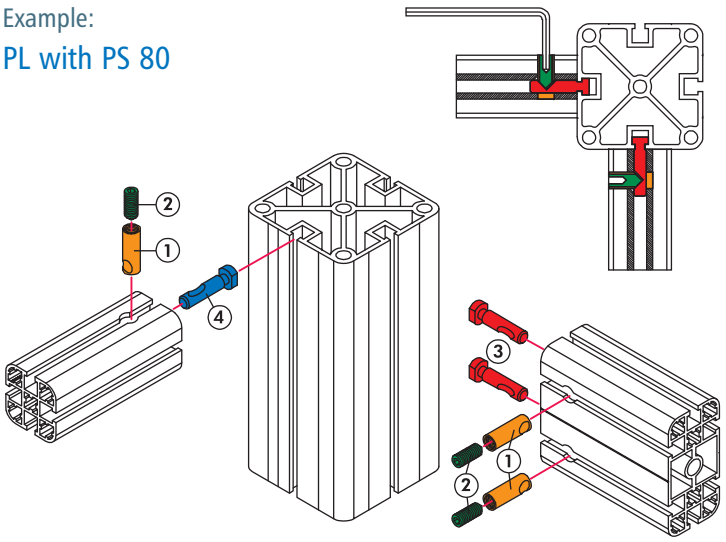
**Stepped drill**

- Ø 6/Ø 10.4 mm
  Part no.: **400090**

# Profile snaplock connections

Example:

## PL with PS 80

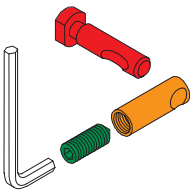



① Treaded Bush Ø 10.3 x 28 mm
② Grub Screw DIN 914, M6 x 20 mm
③ Connection Bolt 0° for PL 40 and PL 80
④ Connection Bolt 90° for PL 40 and PL 80

## Snaplock connection 0 degrees

e.g. for

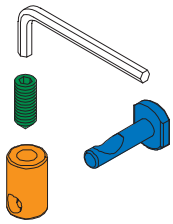
PL / PS 80



## Snaplock connection 90 degrees

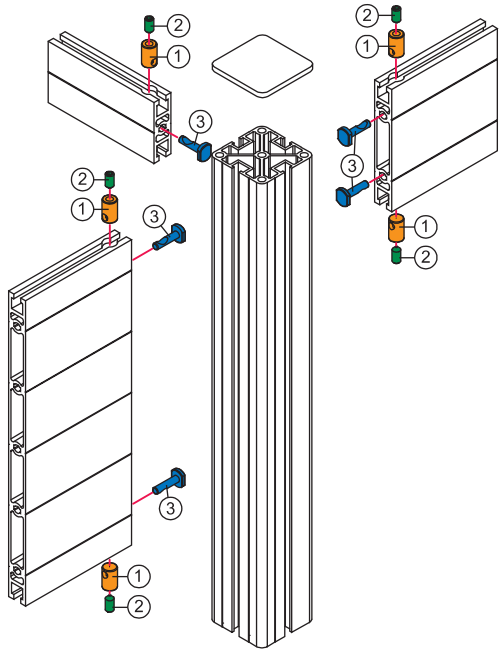
e.g. for

PP / PU / PS



Example:

## PP with PS 50




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

## Snaplock connection

### for PL

- Locking bush, tapped pin and bolts 0°
- 10 sets:
  Part no.: **209147 0102**
- 50 sets:
  Part no.: **209147 0103**

### for PL

- Locking bush, tapped pin and bolts 90°
- 10 sets:
  Part no.: **209147 0112**
- 50 sets:
  Part no.: **209147 0113**

### for PP/PU

- Locking bush, tapped pin and bolts 0°
- 10 sets:
  Part no.: **209147 0100**
- 50 sets:
  Part no.: **209147 0101**

### for PP/PU

- Locking bush, tapped pin and bolts 90°
- 10 sets:
  Part no.: **209147 0110**
- 50 sets:
  Part no.: **209147 0111**

### Stepped drill

- Ø 6 mm/Ø 10.4 mm

Part no.: **400090**

### matching drill pattern 2

Part no.: **290015 0002**

### Allen key SW 3

- DIN 911

Part no.: **931150**

# Linear guides

## Overview



CAD data on our website **www.isel-germany.de**

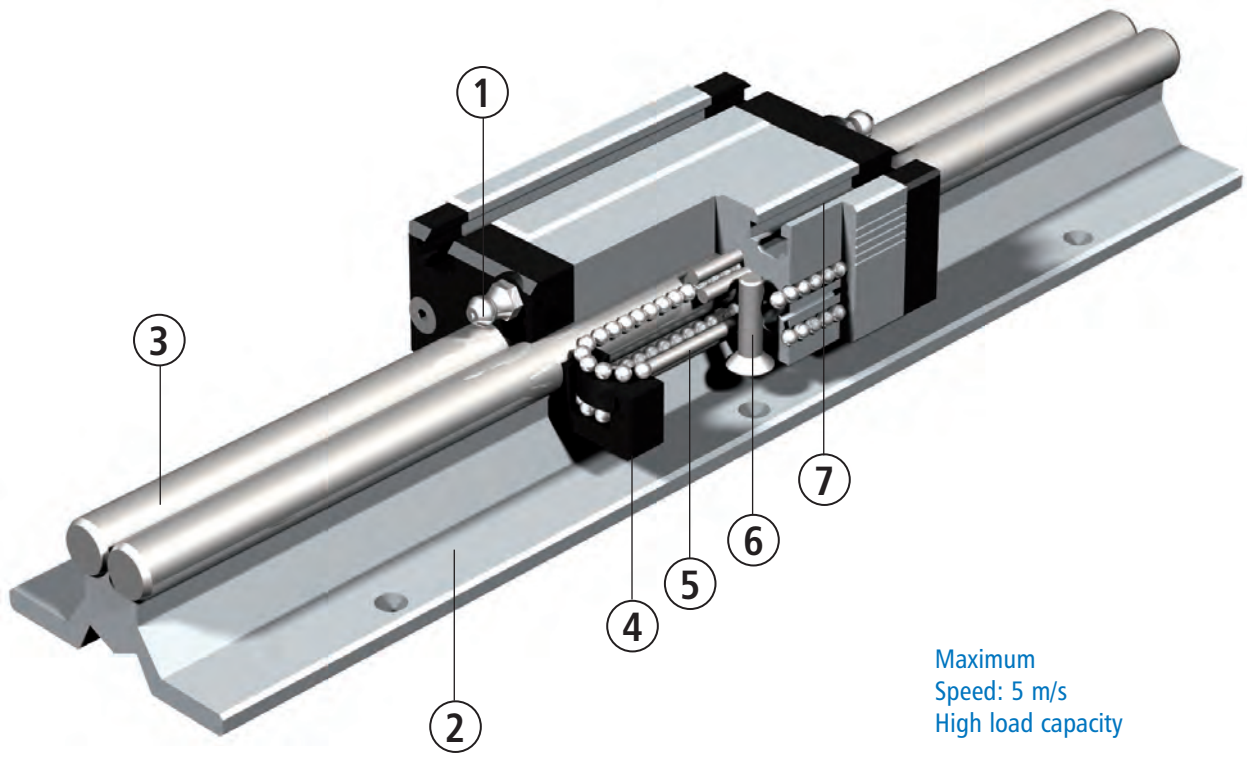
# Linear guides

## Overview



CAD data on our website **www.isel-germany.de**

# Linear guide slide function




Maximum
Speed: 5 m/s
High load capacity

## Aluminium shaft slides

The patented shaft slides are perfectly suited for assembling of complex multiple axis systems for handling and machining.

The wide range of models covers a multitude of applications.

All models can be produced to order with various profile lengths (70, 100, 150 and 200 mm).

1. Lubrication options to both sides for the recirculating balls.

2. The basic supports for all linear guides are extruded aluminium profiles compliant with DIN EN 12020-2, which are provided with T-slot inserts for fastening in the body of the profile or with drilled hole fixing points.

3. Precision steel shafts with a hardness of 60 ± 2 HRC are used as guide rails. All LFS-8 versions are optionally available with stainless steel shafts.

4. The recirculating ball steering systems are glass fibre reinforced.

5. There are patented recirculating balls in the linear slide. Ball bearings run in each case between two ground steel pins and the guidance shaft.

6. The slide is adjusted with self-lokking setting screws. This is how the rows of balls and shafts or pins are used with each other and thus prestressed. The slide are preset in the factory to the correct stress. All shaft slides are optionally available in a stainless version.

7. To secure transport loads, slot plates, etc., the shaft slide are provided with T-slot inserts or fixing borings.

# General notes

## Load capacity and working life

### Installation site

In principal, the installation site for linear guides can be chosen anywhere. You merely have to consider whether all the forces and moments arising are below the maximum values for the relevant axes.

### Temperatures

All linear guides are designed for continuous operation at ambient temperatures of up to 60 °C. In short-term operation, maximum temperatures of 80 °C are permissible.

Linear guides are unsuitable for temperatures below freezing.

### Straightness/Warping

The aluminium profiles used are extruded profiles, which exhibit divergences regarding straightness and may be warped, owing to the manufacturing process.
The tolerance of this deviation is set out in DIN EN 12020-2.
In the worst case, the linear guide deviations equal these limits, but typically they are lower.

In order to achieve the desired guidance accuracy, the guide must be aligned using shims or clamped to a bearing service machined to the corresponding accuracy. This achieves tolerances of at least 0.1 mm/1000 mm.

### Principles Load capacity and working life

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

- the dynamic load factor C
- the static load factor C0
- the static torques M0X, M0Y and M0Z

The basis of the dynamic load factors according to DIN is a nominal working life of 100,000 m displacement path. Far East suppliers often quote load factors for a nominal working life of 50,000 m displacement path; this produces load factor figures which are approximately 20% higher than those according to DIN.

### Dynamic load capacity

The fatigue characteristics of the material determine the dynamic load capacity. The working life - the fatigue period - also depends on:

- the stress on the linear guide
- the speed at which the linear guide moves
- the statistical randomness of the first damage occurring

### Useful life

Useful life means the working life actually achieved by a linear guide.
The useful life may differ from the computed working life.

The following can lead to premature failure through wear or fatigue:

- Misalignments between guide rails or guidance elements
- Contamination of the guide rails
- Insufficient lubrication
- Oscillating motion with very small lifts (formation of grooves)
- Vibrations at rest (formation of grooves)

Owing to the multiplicity of installation and operating relationships, it is impossible to determine the useful life of a linear guide exactly in advance. The safest way to make an accurate estimate of the useful life is, as before, a comparison with similar installations.

mechanics

# Linear guide rails

# LFS-8-1
# LFS-8-2

Figure:
LFS-8-1 with
aluminium slide WS 1/70

Figure:
LFS-8-2 with
aluminium slide WS 1/70

## Features

- W 30 x H 20 mm (LFS-8-1)
  W 30 x H 32.5 mm (LFS-8-2)
- 2 precision steel shafts Ø 8
- Anti-twist lock
- Aluminium shaft housing profile, naturally anodised
- Fixing from below with M6 tapped rails in the T-key insert
- Conditionally self-supporting
- Special lengths to order
- Weights: approx. 1.6 kg/m (LFS-8-1)
  approx. 2.0 kg/m (LFS-8-2)

Options:

- Stainless steel version
- Drilled for M6 (LFS-8-1 only)

## Ordering key

**235 00X XXXX**

LFS-8-1/standard = **0**
LFS-8-1/stainless = **1**
LFS-8-2/standard = **2**
LFS-8-2/stainless = **3**

Length in mm (in 100 mm raster)
e.g. **0029** = Length 298
**0299** = Length 2998

Steel shaft length: total length L - 3 mm

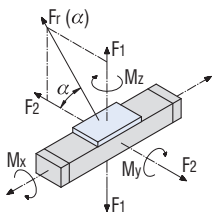
Profile up to 6000 mm available without impact connection, steel shafts divided.

## Load data

| Shaft slide WS 1/70 | |
|---|---|
| $C_o$ | 3114 N |
| C | 1846 N |
| $F_1$ static | 2659 N |
| $F_1$ dynamic | 1576 N |
| $F_2$ static | 3114 N |
| $F_2$ dynamic | 1846 N |
| $M_x$ static | 37.3 Nm |
| $M_y$ static | 100.5 Nm |
| $M_z$ static | 117.6 Nm |
| $M_x$ dynamic | 22.1 Nm |
| $M_y$ dynamic | 59.5 Nm |
| $M_z$ dynamic | 69.7 Nm |

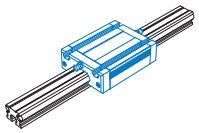
| Shaft slide WS 1 | |
|---|---|
| $C_o$ | 4590 N |
| C | 2390 N |
| $F_1$ static | 3920 N |
| $F_1$ dynamic | 2041 N |
| $F_2$ static | 4590 N |
| $F_2$ dynamic | 2390 N |
| $M_x$ static | 55.0 Nm |
| $M_y$ static | 148.1 Nm |
| $M_z$ static | 173.4 Nm |
| $M_x$ dynamic | 28.6 Nm |
| $M_y$ dynamic | 77.1 Nm |
| $M_z$ dynamic | 90.2 Nm |

| Trolley LW 6 | |
|---|---|
| $C_o$ | 2160 N |
| C | 4000 N |
| $F_1$ static | 4320 N |
| $F_1$ dynamic | 3792 N |
| $F_2$ static | 2160 N |
| $F_2$ dynamic | 4000 N |
| $M_x$ static | 121.1 Nm |
| $M_y$ static | 194.4 Nm |
| $M_z$ static | 97.2 Nm |
| $M_x$ dynamic | 106.3 Nm |
| $M_y$ dynamic | 170.6 Nm |
| $M_z$ dynamic | 180.0 Nm |




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

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

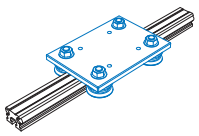


### Aluminium slide

- With recirculating ball guide
- Clamping surface plane milled
- M6 T-key inserts
- Central lubrication option
- Adjustable for no play
- Option: stainless steel version

L 96 × W 72 × H 28.5 mm (WS 1/70)
(weight: approx. 0.4 kg)
Part no.: **223100 0070**
Stainless steel: **223101 0070**

L 126 × W 72 × H 28.5 mm (WS 1)
(weight: approx. 0.5 kg)
Part no.: **223100**
Stainless steel: **223101**



### Trolley LW 6

- L 125 x W 90 x H 7.7 mm
- ground steel plate
- 4 rollers Ø 31, sealed for life
- adjustable for no play
- weight: approx. 1 kg

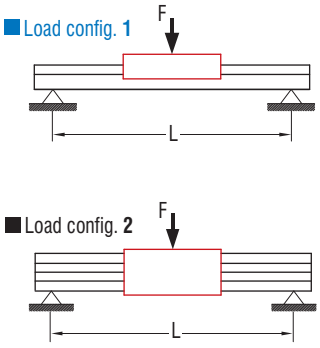
Part no.: **223011**

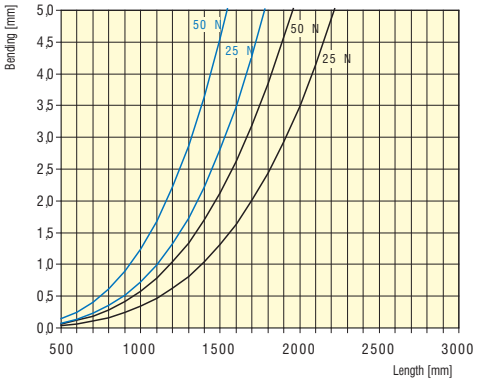
# Linear guide rails

# LFS-8-1
# LFS-8-2

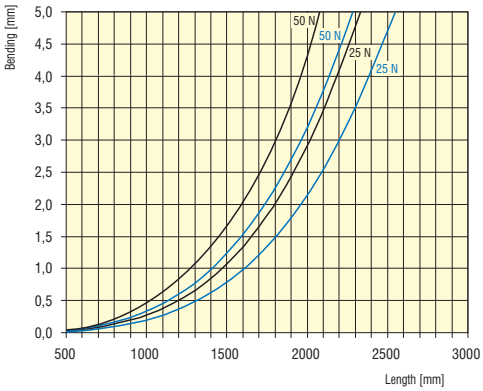


## Bending



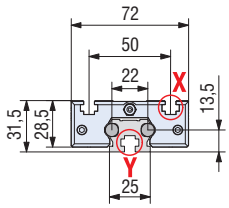




LFS-8-1

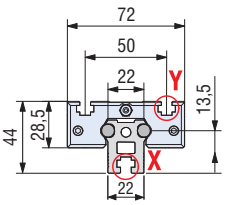



LFS-8-2

## Dimensioned drawings

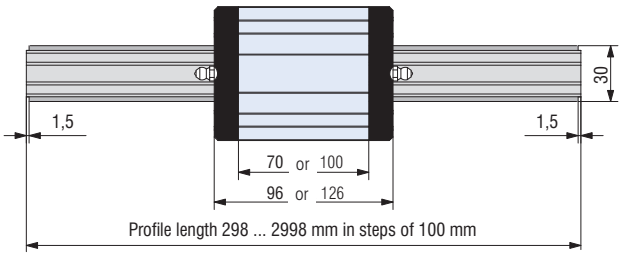


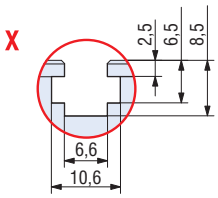

LFS-8-1

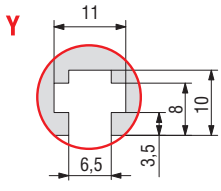



LFS-8-2

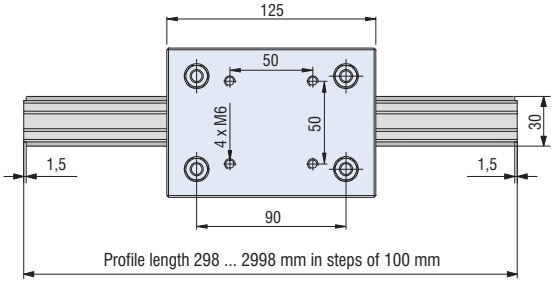
**LFS-8-1** or **LFS-8-2** with aluminium slide **WS 1/70** or **WS 1**

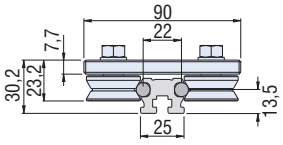


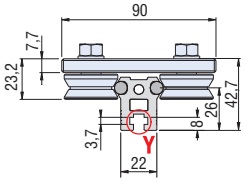




**LFS-8-1** or **LFS-8-2** with trolley **LW 6**



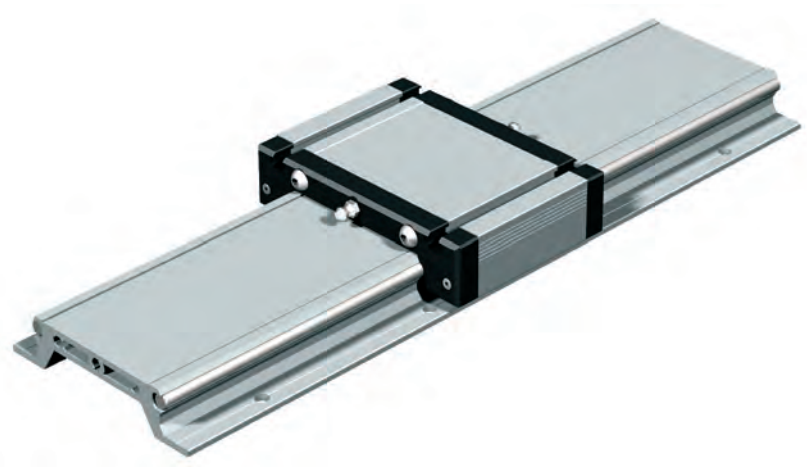

LFS-8-1




LFS-8-2

# Linear guide rails

# LFS-8-3



## Features

- W 115 x H 25.5 mm
- 2 precision steel shafts Ø 8
- Particularly resistant to twisting
- Aluminium shaft housing profile, naturally anodised
- Fixing from above through M6 drillings in the raster 100 mm
- Conditionally self-supporting
- Special lengths to order
- Weight: approx. 3.2 kg/m
- Option: stainless steel version

## Ordering key

**235 00X XXXX**

Standard = **4**
Stainless = **5**

Length in mm (in 100 mm raster)
e.g. **0029** = Length 296
**0299** = Length 2996

Length overall L -1 mm

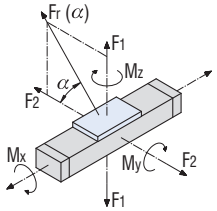
Profile up to 6000 mm available without impact connection, steel shafts divided.

## Load data

| Shaft slide WS 3/70 | |
|---|---|
| $C_o$ | 3141 N |
| C | 1879 N |
| $F_1$ static | 2682 N |
| $F_1$ dynamic | 1604 N |
| $F_2$ static | 3141 N |
| $F_2$ dynamic | 1879 N |
| $M_x$ static | 115.7 Nm |
| $M_y$ static | 105.3 Nm |
| $M_z$ static | 123.3 Nm |
| $M_x$ dynamic | 69.2 Nm |
| $M_y$ dynamic | 62.9 Nm |
| $M_z$ dynamic | 73.7 Nm |

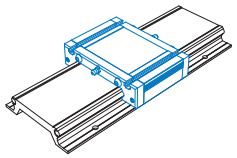
| Shaft slide WS 3 | |
|---|---|
| $C_o$ | 6945 N |
| C | 3190 N |
| $F_1$ static | 5931 N |
| $F_1$ dynamic | 2724 N |
| $F_2$ static | 6945 N |
| $F_2$ dynamic | 3190 N |
| $M_x$ static | 255.9 Nm |
| $M_y$ static | 232.8 Nm |
| $M_z$ static | 272.5 Nm |
| $M_x$ dynamic | 117.5 Nm |
| $M_y$ dynamic | 106.9 Nm |
| $M_z$ dynamic | 125.1 Nm |

| Trolley LW 7 | |
|---|---|
| $C_o$ | 2160 N |
| C | 4000 N |
| $F_1$ static | 4320 N |
| $F_1$ dynamic | 3792 N |
| $F_2$ static | 2160 N |
| $F_2$ dynamic | 4000 N |
| $M_x$ static | 246.8 Nm |
| $M_y$ static | 302.4 Nm |
| $M_z$ static | 151.2 Nm |
| $M_x$ dynamic | 216.7 Nm |
| $M_y$ dynamic | 265.4 Nm |
| $M_z$ dynamic | 280 Nm |




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

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

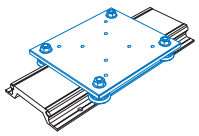


### Aluminium slide

- With recirculating ball guide
- Clamping surface plane milled
- M6 T-key inserts
- Central lubrication option
- Adjustable for no play
- Option: stainless steel version

L 96 x W 130 x H 32 mm (WS 3/70)
(weight: approx. 0.5 kg)
Part no.: **223103 0070**
Stainless steel: **223103 1070**

L 176 x W 130 x H 32 mm (WS 3)
(weight: approx. 0.9 kg)
Part no.: **223103**
Stainless steel: **223103 1000**



### Trolley LW 7

- L 175 x W 150 x H 7.5 mm
- ground steel plate
- 4 rollers Ø 31, sealed for life
- adjustable for no play
- weight: approx. 2 kg

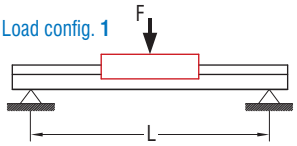
Part no.: **223012**

# Linear guide rails LFS-8-3

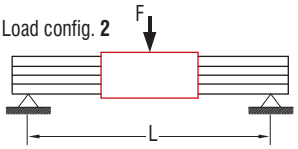


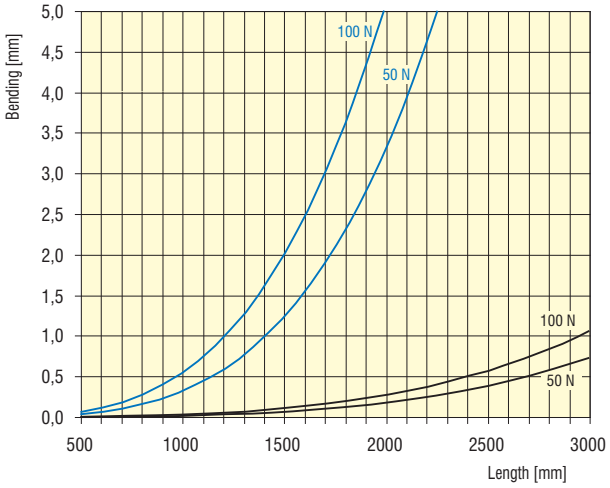
## Bending

■ Load config. **1**

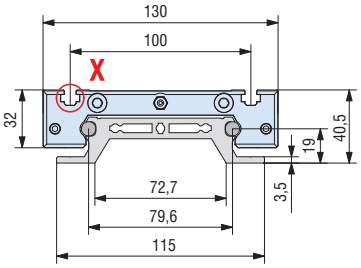


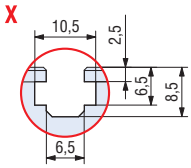

■ Load config. **2**



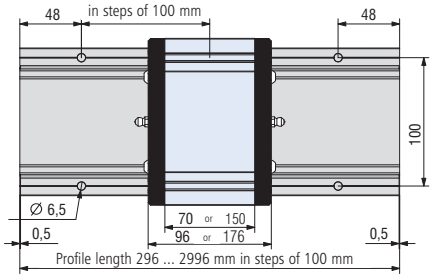




## Dimensioned drawings

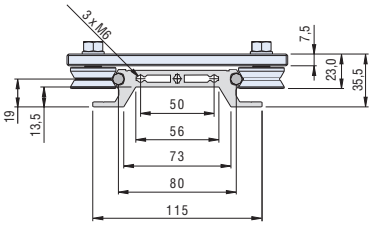


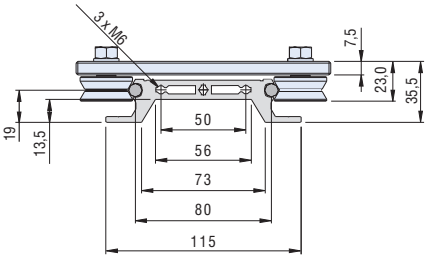




**LFS-8-3** with aluminium slide **WS 3/70 or WS 3**




**LFS-8-3** with trolley **LW7**



# Linear guide rails

# LFS-8-4

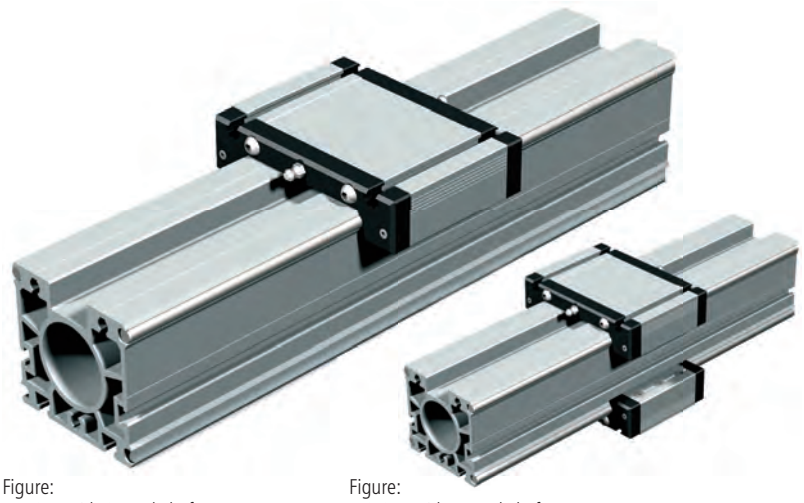


Figure:
LFS-8-4 with 2 steel shafts
and an aluminium slot

Figure:
LFS-8-4 with 4 steel shafts
and two aluminium slide (optional)

## Features

- W 80 x H 80 mm
- 4 precision steel shafts Ø 8
- anti-twist
- aluminium shaft housing profiles, naturally anodised
- fixing from below with M6 tapped rails in the T-slot inserts or in the head side through M8 drillings
- side T-key inserts for limit switch securing
- conditionally self-supporting
- special lengths to order
- weight: approx. 7.2 kg/m
- options: stainless steel version
  with 2 steel shafts
  2 slide or trolley

## Ordering key

**235 00X XXXX**

Standard = **6**
Stainless = **7**

Length in mm (in 100 mm raster)
e.g. **0029** = Length 298
**0299** = Length 2998

Steel shaft length: total length L - 3 mm

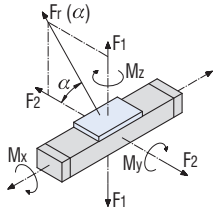
Profile up to 6000 mm available without impact connection, steel shafts divided.

## Load data

| Shaft slide WS 3/70 | |
|---|---|
| $C_o$ | 3141 N |
| C | 1879 N |
| $F_1$ static | 2682 N |
| $F_1$ dynamic | 1604 N |
| $F_2$ static | 3141 N |
| $F_2$ dynamic | 1879 N |
| $M_x$ static | 115.7 Nm |
| $M_y$ static | 105.3 Nm |
| $M_z$ static | 123.3 Nm |
| $M_x$ dynamic | 69.2 Nm |
| $M_y$ dynamic | 62.9 Nm |
| $M_z$ dynamic | 73.7 Nm |

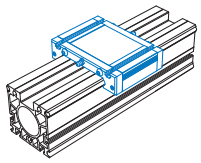
| Shaft slide WS 3 | |
|---|---|
| $C_o$ | 6945 N |
| C | 3190 N |
| $F_1$ static | 5931 N |
| $F_1$ dynamic | 2724 N |
| $F_2$ static | 6945 N |
| $F_2$ dynamic | 3190 N |
| $M_x$ static | 255.9 Nm |
| $M_y$ static | 232.8 Nm |
| $M_z$ static | 272.5 Nm |
| $M_x$ dynamic | 117.5 Nm |
| $M_y$ dynamic | 106.9 Nm |
| $M_z$ dynamic | 125.1 Nm |

| Trolley LW 7 | |
|---|---|
| $C_o$ | 2160 N |
| C | 4000 N |
| $F_1$ static | 4320 N |
| $F_1$ dynamic | 3792 N |
| $F_2$ static | 2160 N |
| $F_2$ dynamic | 4000 N |
| $M_x$ static | 246.8 Nm |
| $M_y$ static | 302.4 Nm |
| $M_z$ static | 151.2 Nm |
| $M_x$ dynamic | 216.7 Nm |
| $M_y$ dynamic | 265.4 Nm |
| $M_z$ dynamic | 280 Nm |




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

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

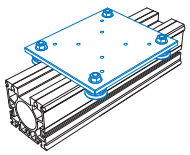


### Aluminium slide

- Clamping surface plane milled
- M6 T-slot inserts
- Central lubrication option
- Adjustable for no play
- Option: stainless steel version

L 96 x W 130 x H 32 mm (WS 3/70)
(weight: approx. 0.5 kg)
Part no.: **223103 0070**
Stainless steel: **223103 1070**

L 176 x W 130 x H 32 mm (WS 3)
(weight: approx. 0.9 kg)
Part no.: **223103**
Stainless steel: **223103 1000**



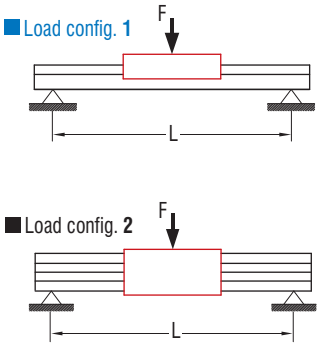
### Trolley LW 7

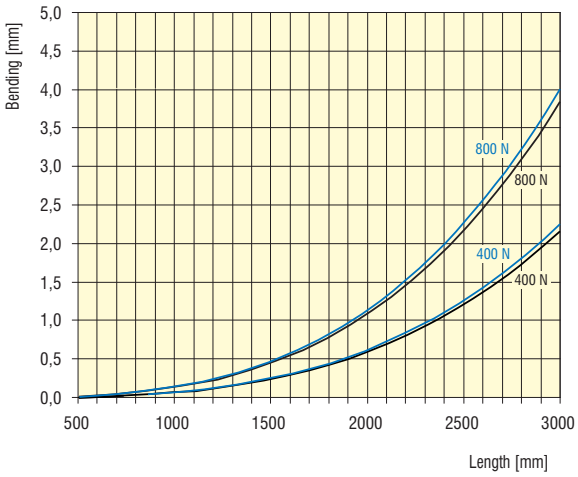
- L 175 x W 150 x H 7.5 mm
- ground steel plate
- 4 rollers Ø 31, sealed for life
- adjustable for no play
- weight: approx. 2 kg

Part no.: **223012**

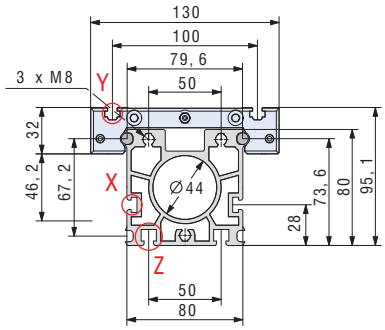
# Linear guide rails LFS-8-4

## Bending

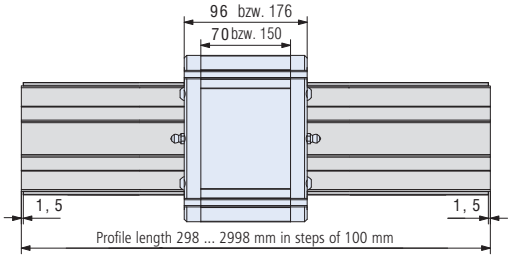


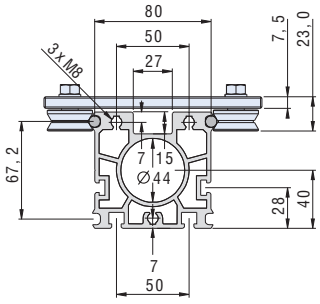

## Dimensioned drawings

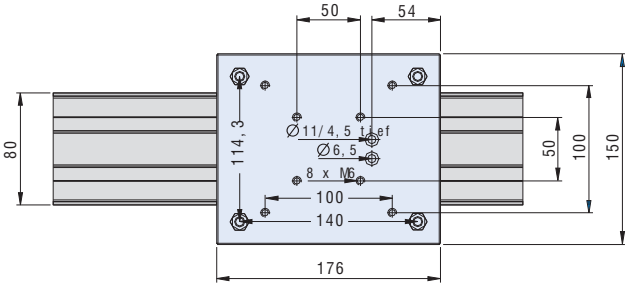



LFS-8-3 with aluminium slide **WS 3/70 or WS 3**

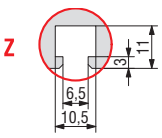



**LFS-8-4** with trolley **LW 7**







# Linear guide rails

# LFS-12-1

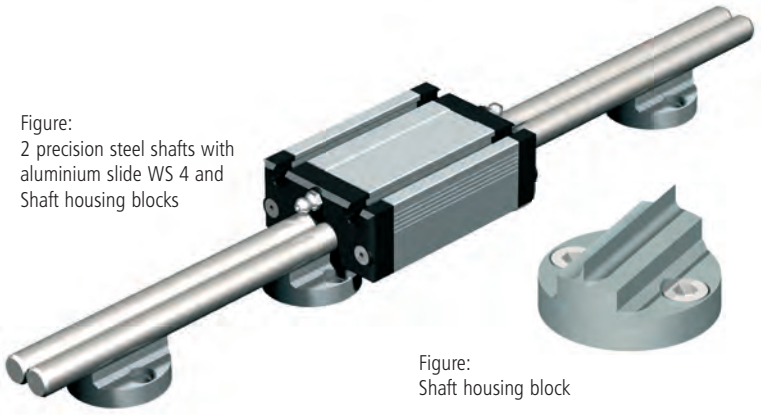


Figure:
2 precision steel shafts with aluminium slide WS 4 and Shaft housing blocks

Figure:
Shaft housing block

## Features

- W 40 x H 27 mm
- 2 precision steel shafts Ø 12
- anti-twist
- aluminium shaft housing blocks
- securing from above or below with M6 drillings in the housing blocks
- guide any length up to 3m
- special lengths to order
- weight: approx. 1.9 kg/m

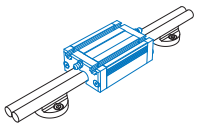
## Ordering key

**227 312 XXXX**

Length in mm (in 100 mm raster)
e.g. **0298** = Length 298
**2998** = Length 2998

Special lengths to order

**N.B.!**
**The part no. refers to one steel shaft only !**

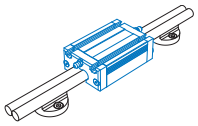


### Aluminium slide

- clamping surface plane milled
- weight: approx. 0.3 kg
- option: stainless steel version

L 94 x W 62 x H 31.5 mm (WS 4/70)
Part no.: **223104 0070**
Stainless steel: **223104 1070**

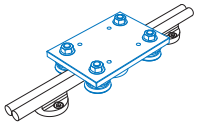
L 124 x W 62 x H 31.5 mm (WS 4)
Part no.: **223104**
Stainless steel: **223104 1000**



### Steel slide LS 1

L 91 x W 60 x H 32 mm
- clamping surface ground
- weight: approx. 0.8 kg

Part no.: **223006**



### Trolley LW 3

L 125 x W 85 x H 7.7 mm
- ground steel plate
- weight: approx. 0.9 kg

Part no.: **223008**

### Shaft housing blocks

- Ø 40 mm, hole spacing 28 mm
- cast zinc, VE 10 units

Part no.: **221501**

## Load data

| Shaft slide WS 4/70 | |
|---|---|
| $C_o$ | 3003 N |
| C | 1873 N |
| $F_1$ static | 2821 N |
| $F_1$ dynamic | 1599 N |
| $F_2$ static | 3303 N |
| $F_2$ dynamic | 1873 N |
| $M_x$ static | 29.8 Nm |
| $M_y$ static | 105.3 Nm |
| $M_z$ static | 123.3 Nm |
| $M_x$ dynamic | 16.8 Nm |
| $M_y$ dynamic | 59.7 Nm |
| $M_z$ dynamic | 69.9 Nm |

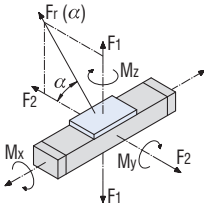
| Shaft slide WS 4 | |
|---|---|
| $C_o$ | 4868 N |
| C | 2426 N |
| $F_1$ static | 4157 N |
| $F_1$ dynamic | 2071 N |
| $F_2$ static | 4868 N |
| $F_2$ dynamic | 2426 N |
| $M_x$ static | 43.9 Nm |
| $M_y$ static | 155.2 Nm |
| $M_z$ static | 181.7 Nm |
| $M_x$ dynamic | 21.8 Nm |
| $M_y$ dynamic | 77.3 Nm |
| $M_z$ dynamic | 90.5 Nm |

| Steel slide LS 1 | |
|---|---|
| $C_o$ | 3508 N |
| C | 2105 N |
| $F_1$ static | 3549 N |
| $F_1$ dynamic | 2130 N |
| $F_2$ static | 3508 N |
| $F_2$ dynamic | 2105 N |
| $M_x$ static | 36.2 Nm |
| $M_y$ static | 129.0 Nm |
| $M_z$ static | 127.5 Nm |
| $M_x$ dynamic | 21.7 Nm |
| $M_y$ dynamic | 77.4 Nm |
| $M_z$ dynamic | 76.5 Nm |

| Trolley LW 8 | |
|---|---|
| $C_o$ | 2160 N |
| C | 4000 N |
| $F_1$ static | 4320 N |
| $F_1$ dynamic | 3846 N |
| $F_2$ static | 2160 N |
| $F_2$ dynamic | 4000 N |
| $M_x$ static | 109.5 Nm |
| $M_y$ static | 194.4 Nm |
| $M_z$ static | 97.2 Nm |
| $M_x$ dynamic | 97.4 Nm |
| $M_y$ dynamic | 173.0 Nm |
| $M_z$ dynamic | 180.0 Nm |

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

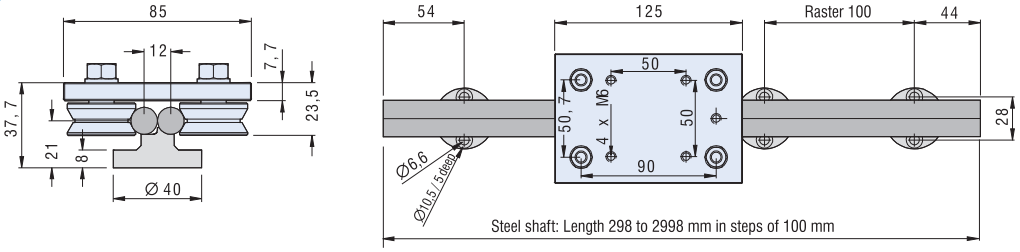
$$Fr(\alpha) = \frac{F1}{\sin \alpha}$$



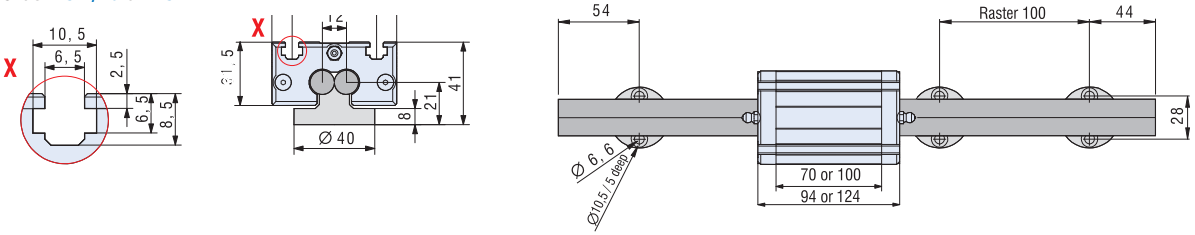
# Linear guide rails LFS-12-1

## Dimensioned drawings

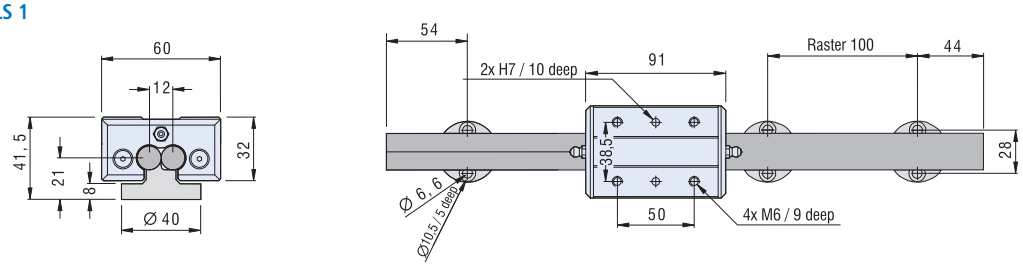
**LFS-12-1** with trolley **LW 3**



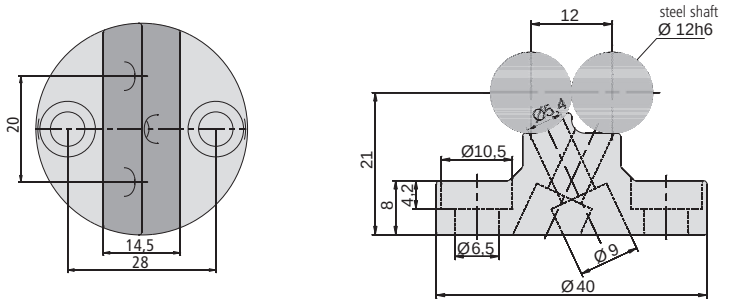

**LFS-12-1** with
Shaft slide **WS 4/70** or **WS 4**




**LFS-12-1** with steel slide **LS 1**




Shaft housing block



mechanics

# Linear guide rail

# LFS-12-11

## Features

- W 20 x H 31 mm
- Precision steel shaft ∅ 12
- Aluminium shaft housing profile, naturally anodised
- Securing from below with M6 tapped rail in T-slot insert on flat surface
- Special lengths available on request
- Weight: approx. 1.3 kg/m

## Ordering key

**220 002 XXXX**

Length in mm
e.g. **0298** = Length 298
**0998** = Length 998

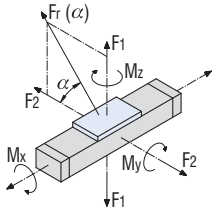
Profile length = Length overall L -2 mm

## Load data

| Shaft slides WS 6/70 | |
|---|---|
| $C_o$ | 3303 N |
| C | 1873 N |
| $F_1$ static | 2821 N |
| $F_1$ dynamic | 1599 N |
| $F_2$ static | 3303 N |
| $F_2$ dynamic | 1873 N |
| $M_x$ static | - |
| $M_y$ static | 105.3 Nm |
| $M_z$ static | 123.3 Nm |
| $M_x$ dynamic | - |
| $M_y$ dynamic | 59.7 Nm |
| $M_z$ dynamic | 69.9 Nm |

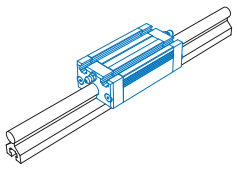
| Shaft slides WS 6 | |
|---|---|
| $C_o$ | 4868 N |
| C | 2426 N |
| $F_1$ static | 4157 N |
| $F_1$ dynamic | 2071 N |
| $F_2$ static | 4868 N |
| $F_2$ dynamic | 2426 N |
| $M_x$ static | - |
| $M_y$ static | 155.2 Nm |
| $M_z$ static | 181.7 Nm |
| $M_x$ dynamic | - |
| $M_y$ dynamic | 77.3 Nm |
| $M_z$ dynamic | 90.5 Nm |

| Trolley LW 5 | |
|---|---|
| $C_o$ | 2160 N |
| C | 4000 N |
| $F_1$ static | 4320 N |
| $F_1$ dynamic | 3846 N |
| $F_2$ static | 2160 N |
| $F_2$ dynamic | 4000 N |
| $M_x$ static | - |
| $M_y$ static | 162.0 Nm |
| $M_z$ static | 81.0 Nm |
| $M_x$ dynamic | - |
| $M_y$ dynamic | 144.2 Nm |
| $M_z$ dynamic | 150.0 Nm |




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

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

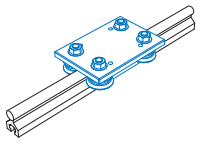


### Aluminium slides

- With recirculating ball guide
- M6 T-slot inserts
- Central lubrication system option
- Adjustable for no play
- Option: stainless steel version

L 96 x W 50 x H 31.5 mm (WS 6/70)
(weight: approx. 0.3 kg)
Part no.: **223106 0070**
Stainless steel: **223106 1070**

L 126 x W 50 x H 31,5 mm (WS 6)
(weight: approx. 0.5 kg)
Part no.: **223106**
Stainless steel: **223106 1000**



### Trolley LW 5

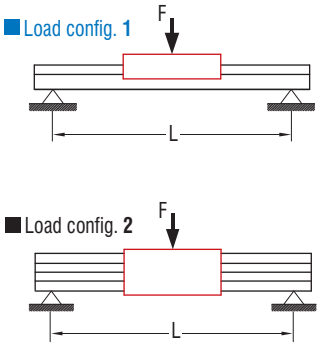
- L 110 x W 75 x H 7.7 mm
- Ground steel plate
- 4 rollers ∅ 31, sealed for life
- Adjustable for no play
- Weight: 0.81 kg

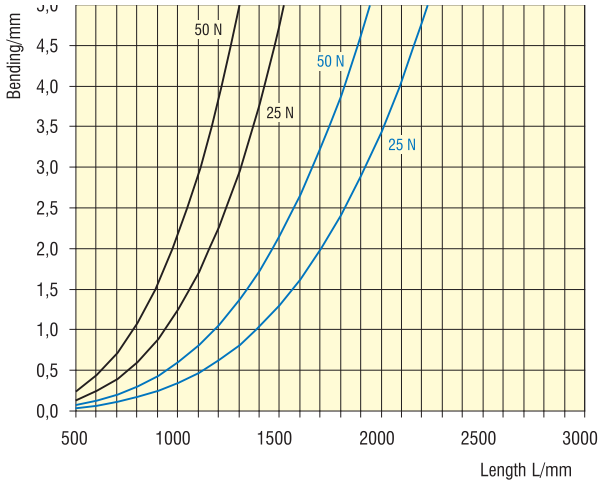
Part no.: **223010**

# Linear guide rail LFS-12-11

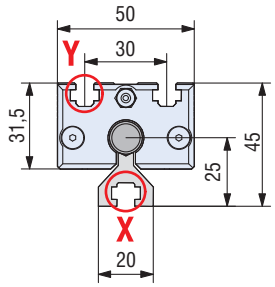


## Bending

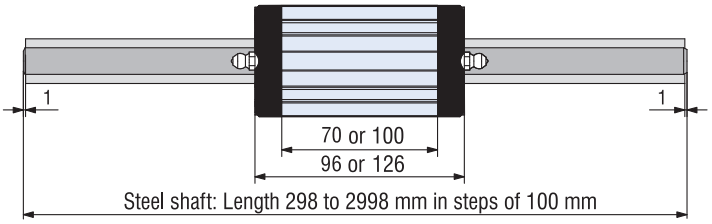


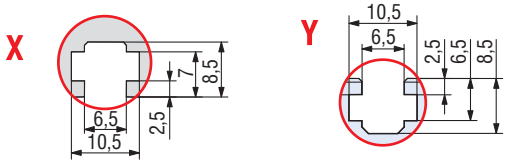




## Dimensioned drawings

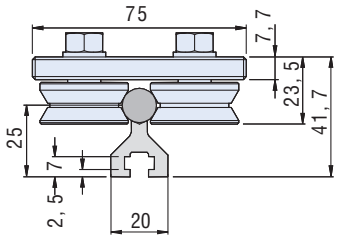


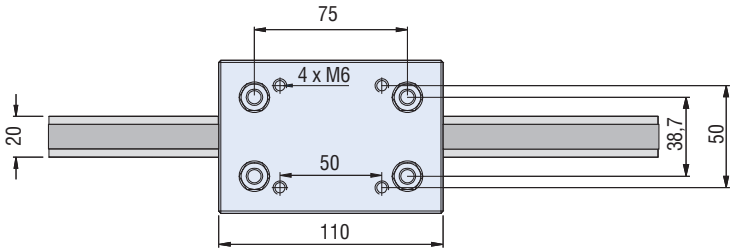

**LFS-12-11** with aluminium slides **WS 6/70 or WS 6**




**LFS-12-11** with trolley **LW5**



mechanics

# Linear guide rail

# LFS-12-2

## Features

- W 62 x H 31 mm
- 2 precision steel shafts ∅ 12
- Anti-twist lock
- Aluminium shaft housing profile, naturally anodised
- High parallelism through patented shaft housing outline
- High guidance accuracy
- Securing from above or below using drilled holes ∅ 6.5 in 100 mm raster on flat surface
- Lengths in 100 mm raster
- Max. length up to 2998 mm
- Special lengths to order
- Weight: approx. 3.3 kg/m

## Ordering key

**235 200 XXXX**

Length in mm
e.g. **0298** = Length 298
**0998** = Length 998

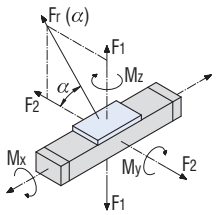
Profile length = Length overall L -2 mm

## Load data

| Shaft slides WS 4/70 | |
|---|---|
| $C_o$ | 3003 N |
| C | 1873 N |
| $F_1$ static | 2821 N |
| $F_1$ dynamic | 1599 N |
| $F_2$ static | 3303 N |
| $F_2$ dynamic | 1873 N |
| $M_x$ static | 29.8 Nm |
| $M_y$ static | 105.3 Nm |
| $M_z$ static | 123.3 Nm |
| $M_x$ dynamic | 16.8 Nm |
| $M_y$ dynamic | 59.7 Nm |
| $M_z$ dynamic | 69.9 Nm |

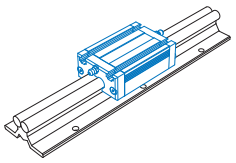
| Shaft slides WS 4 | |
|---|---|
| $C_o$ | 4868 N |
| C | 2426 N |
| $F_1$ static | 4157 N |
| $F_1$ dynamic | 2071 N |
| $F_2$ static | 4868 N |
| $F_2$ dynamic | 2426 N |
| $M_x$ static | 43.9 Nm |
| $M_y$ static | 155.2 Nm |
| $M_z$ static | 181.7 Nm |
| $M_x$ dynamic | 21.8 Nm |
| $M_y$ dynamic | 77.3 Nm |
| $M_z$ dynamic | 90.5 Nm |

| Trolley LW 3 | |
|---|---|
| $C_o$ | 2160 N |
| C | 4000 N |
| $F_1$ static | 4320 N |
| $F_1$ dynamic | 3846 N |
| $F_2$ static | 2160 N |
| $F_2$ dynamic | 4000 N |
| $M_x$ static | 109.5 Nm |
| $M_y$ static | 194.4 Nm |
| $M_z$ static | 97.2 Nm |
| $M_x$ dynamic | 97.4 Nm |
| $M_y$ dynamic | 173.0 Nm |
| $M_z$ dynamic | 180.0 Nm |




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

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

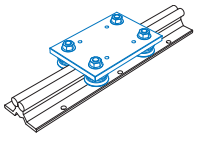


### Aluminium slides

- With recirculating ball guide
- Clamping surface plane milled
- Option: stainless steel version

L 94 x W 62 x H 31.5 mm (WS 4/70)
(weight: approx. 0.33 kg)
Part no.: **223104 0070**
Stainless steel: **223104 1070**

L 124 x W 62 x H 31.5 mm (WS 4)
(weight: approx. 0.46 kg)
Part no.: **223104**
Stainless steel: **223104 1000**



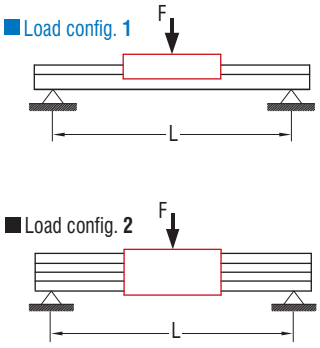
### Trolley LW 3

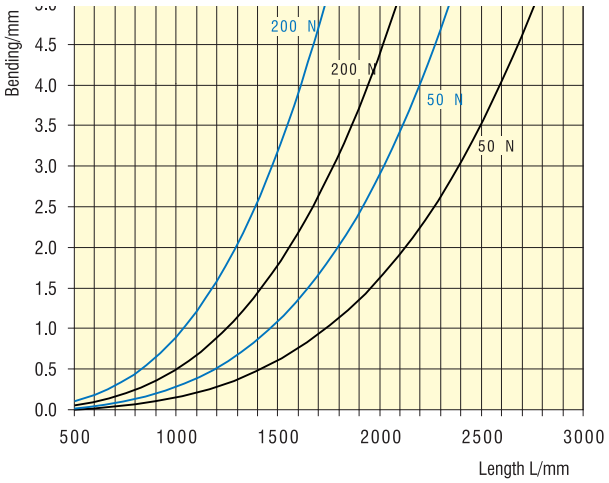
- L 125 x W 85 x H 7.7 mm
- Ground steel plate
- Weight: 0.93 kg

Part no.: **223008**

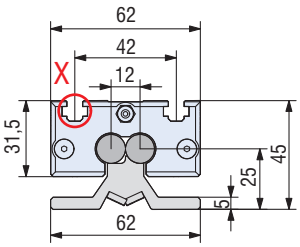
# Linear guide rail LFS-12-2

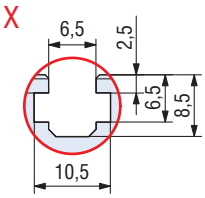
## Bending



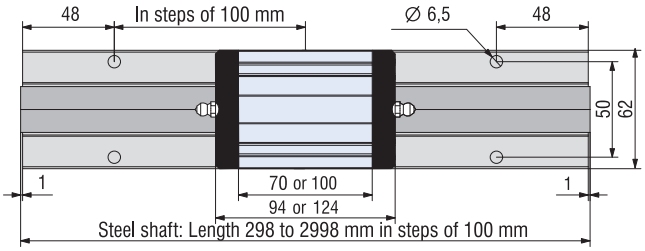



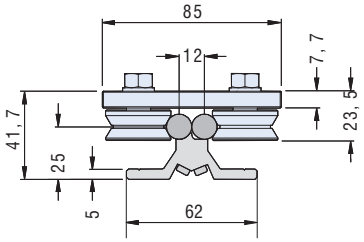

## Dimensioned drawings



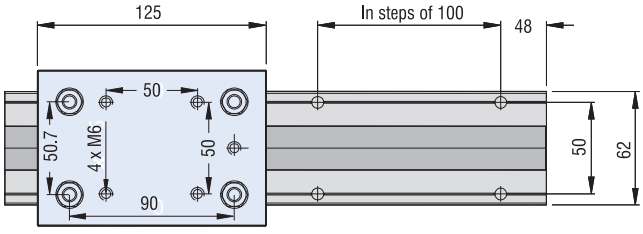




LFS-12-2 with aluminium slides **WS 4/70 or WS 4**



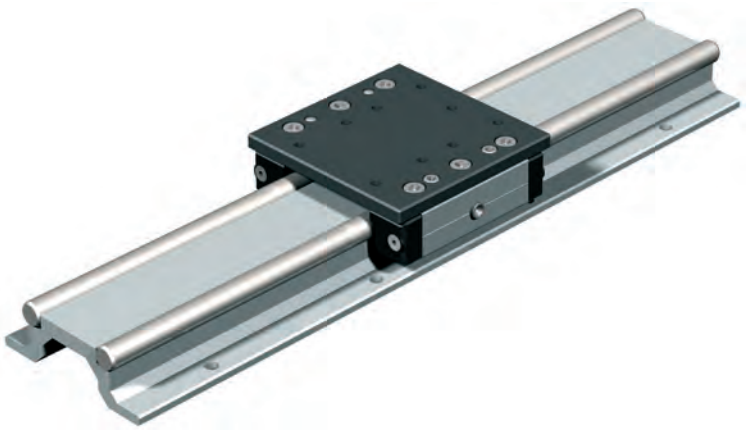




LFS-12-2 with trolley LW3



# Linear guide rail

# LFS-12-3



## Features

- W 90 x H 31 mm
- 2 precision steel shafts Ø 12
- Anti-twist
- Aluminium shaft housing profile, naturally anodised
- increased shaft spacing allows higher torques to be absorbed
- Securing from above or below with M6 drillings in 100 mm raster
- Any guide length
- Weight: approx. 3.9 kg/m

## Ordering key

**235 300 XXXX**

Length in mm (in 100 mm raster)
e.g. **0029** = Length 298
**0299** = Length 2998

Profile length = Length overall L -2 mm

Special lengths over 3000 mm with rod linkage to order.

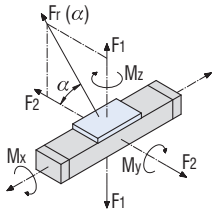
## Load data

| Shaft slides WS 7/70 | |
|---|---|
| $C_o$ | 3303 N |
| C | 1873 N |
| $F_1$ static | 2821 N |
| $F_1$ dynamic | 1599 N |
| $F_2$ static | 3303 N |
| $F_2$ dynamic | 1873 N |
| $M_x$ static | 82.0 Nm |
| $M_y$ static | 105.3 Nm |
| $M_z$ static | 123.3 Nm |
| $M_x$ dynamic | 46.4 Nm |
| $M_y$ dynamic | 59.7 Nm |
| $M_z$ dynamic | 69.9 Nm |

| Shaft slides WS 7 | |
|---|---|
| $C_o$ | 7303 N |
| C | 3179 N |
| $F_1$ static | 6237 N |
| $F_1$ dynamic | 2715 N |
| $F_2$ static | 7303 N |
| $F_2$ dynamic | 3179 N |
| $M_x$ static | 181.2 Nm |
| $M_y$ static | 232.8 Nm |
| $M_z$ static | 272.5 Nm |
| $M_x$ dynamic | 78.8 Nm |
| $M_y$ dynamic | 101.3 Nm |
| $M_z$ dynamic | 118.6 Nm |

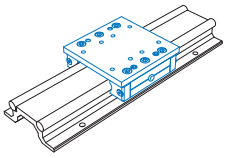
| Trolley LW 2 | |
|---|---|
| $C_o$ | 3114 N |
| C | 1846 N |
| $F_1$ static | 2659 N |
| $F_1$ dynamic | 1576 N |
| $F_2$ static | 3114 N |
| $F_2$ dynamic | 1846 N |
| $M_x$ static | 216.0 Nm |
| $M_y$ static | 100.5 Nm |
| $M_z$ static | 108.0 Nm |
| $M_x$ dynamic | 168.4 Nm |
| $M_y$ dynamic | 192.3 Nm |
| $M_z$ dynamic | 200.0 Nm |

| Trolley LW 8 | |
|---|---|
| $C_o$ | 2160 N |
| C | 4000 N |
| $F_1$ static | 4320 N |
| $F_1$ dynamic | 3846 N |
| $F_2$ static | 2160 N |
| $F_2$ dynamic | 4000 N |
| $M_x$ static | 189.2 Nm |
| $M_y$ static | 248.4 Nm |
| $M_z$ static | 124.2 Nm |
| $M_x$ dynamic | 168.4 Nm |
| $M_y$ dynamic | 221.1 Nm |
| $M_z$ dynamic | 230.0 Nm |




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

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

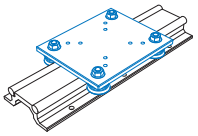


### Slides

- Ground steel plate
- Central lubrication system option
- Adjustable for no play

L 100 x W 100 x H 32 mm (WS 7/70)
(weight: approx. 0.8 kg)
Part no.: **223107 0070**

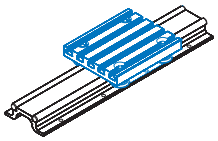
L 200 x W 100 x H 32 mm (WS 7)
(weight: approx. 1.7 kg)
Part no.: **223107**



### Trolley LW 8

- L 150 x W 125 x H 7.5 mm
- Ground steel plate
- 4 rollers Ø 31, sealed for life
- Adjustable for no play
- Weight: 1.51 kg

Part no.: **223013**



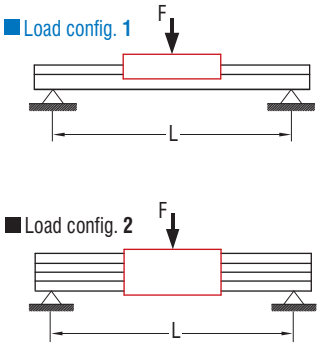
### Trolley LW 2

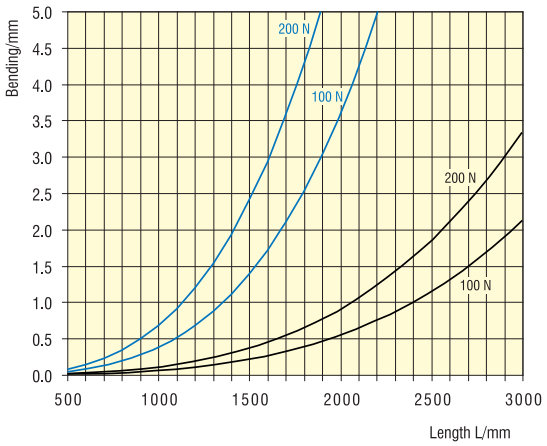
- L 150 x W 125 x H 34.5 mm
- Aluminium T-slot plate
- 4 rollers Ø 31, sealed for life
- Adjustable for no play
- Weight: 0.97 kg

Part no.: **223005**

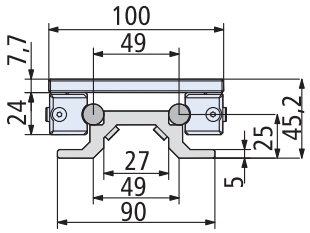
# Linear guide rail LFS-12-3

## Bending

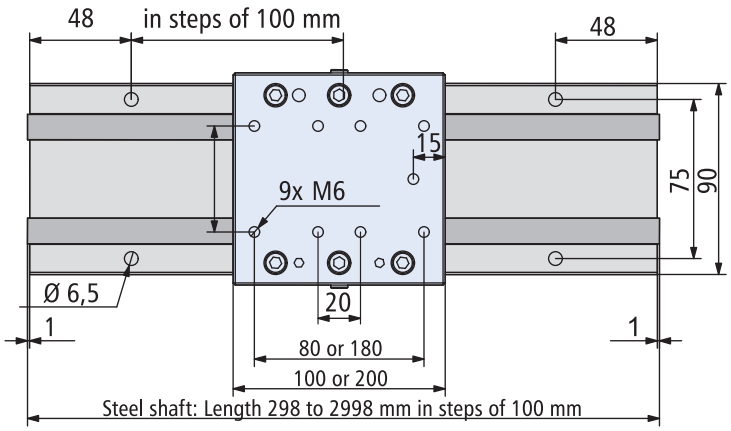


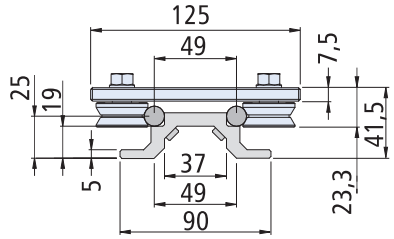



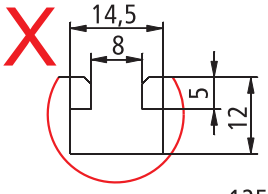

## Dimensioned drawings

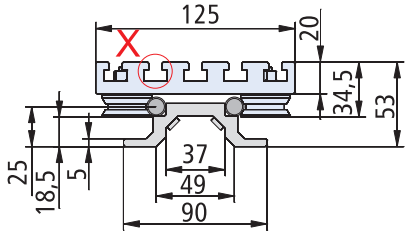



**LFS-12-3** with aluminium slides **WS 7**

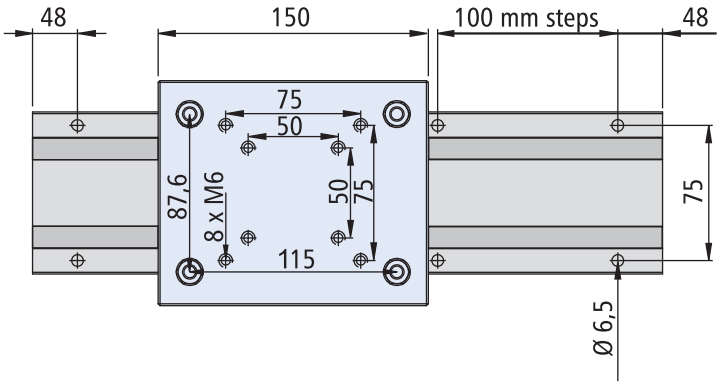


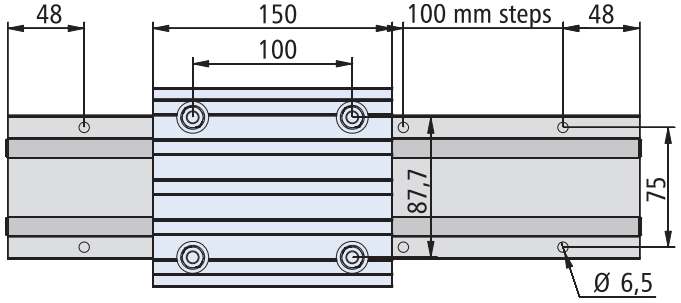




**LFS-12-3** with Carriage **LW 8**



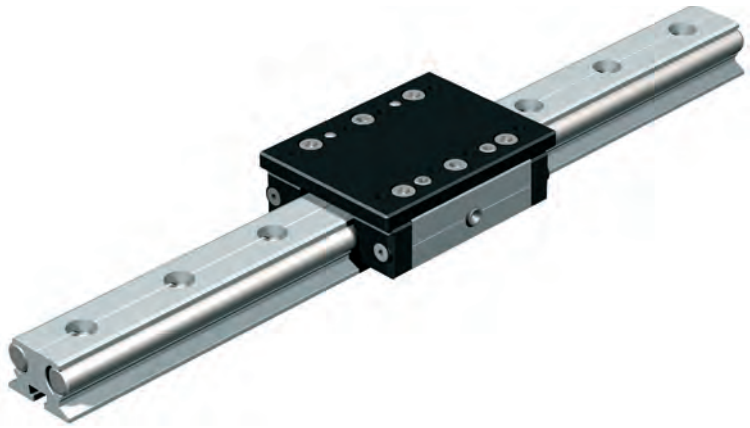

**LFS-12-3** with Carriage **LW 2**



mechanics

# Linear guide rail

# LFS-12-10



## Features

- W 36 x H 24.5 mm
- 2 precision steel shafts Ø 12
- Anti-twist
- Aluminium shaft housing profile, naturally anodised
- Fixing from below with M6 tapped rail in T-slot insert and from above M6 drillings in the Raster 50 mm
- Conditionally self-supporting
- Special lengths to order
- Weight: approx. 2.9 kg/m

## Ordering key

**220 001 XXXX**

Length in mm (in 100 mm raster)
e.g. **0300** = Length 296
**3000** = Length 2996

Profile length = Length overall L -1 mm

Special lengths over 3000 mm with rod linkage to order.

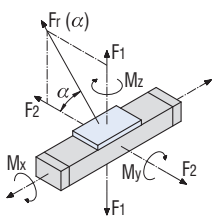
## Load data

| Slides WS 8/70 | |
|---|---|
| $C_o$ | 3303 N |
| C | 1873 N |
| $F_1$ static | 2821 N |
| $F_1$ dynamic | 1599 N |
| $F_2$ static | 3303 N |
| $F_2$ dynamic | 1873 N |
| $M_x$ static | 46.7 Nm |
| $M_y$ static | 105.3 Nm |
| $M_z$ static | 123.3 Nm |
| $M_x$ dynamic | 26.4 Nm |
| $M_y$ dynamic | 59.7 Nm |
| $M_z$ dynamic | 69.9 Nm |

| Slides WS 8 | |
|---|---|
| $C_o$ | 4868 N |
| C | 2426 N |
| $F_1$ static | 4157 N |
| $F_1$ dynamic | 2071 N |
| $F_2$ static | 4868 N |
| $F_2$ dynamic | 2426 N |
| $M_x$ static | 68.8 Nm |
| $M_y$ static | 155.2 Nm |
| $M_z$ static | 181.7 Nm |
| $M_x$ dynamic | 34.2 Nm |
| $M_y$ dynamic | 77.3 Nm |
| $M_z$ dynamic | 90.5 Nm |

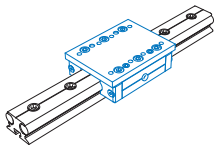
| Trolley LW 4 | |
|---|---|
| $C_o$ | 2160 N |
| C | 4000 N |
| $F_1$ static | 4320 N |
| $F_1$ dynamic | 3846 N |
| $F_2$ static | 2160 N |
| $F_2$ dynamic | 4000 N |
| $M_x$ static | 135.4 Nm |
| $M_y$ static | 194.4 Nm |
| $M_z$ static | 97.2 Nm |
| $M_x$ dynamic | 120.5 Nm |
| $M_y$ dynamic | 173.0 Nm |
| $M_z$ dynamic | 180.0 Nm |

| | Dual track set 1 | Dual track set 2 |
|---|---|---|
| $C_o$ | 645 N | 1905 N |
| C | 600 N | 1125 N |
| $F_1$ static | 652 N | 1927 N |
| $F_1$ dynamic | 607 N | 1138 N |
| $F_2$ static | 645 N | 1905 N |
| $F_2$ dynamic | 600 N | 1125 N |
| $M_x$ static | 16.0 Nm | 46.0 Nm |
| $M_y$ static | 13.0 Nm | 119 Nm |
| $M_z$ static | 13.0 Nm | 118 Nm |
| $M_x$ dynamic | 15.0 Nm | 27.0 Nm |
| $M_y$ dynamic | 12.0 Nm | 71.0 Nm |
| $M_z$ dynamic | 12.0 Nm | 70.0 Nm |




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

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

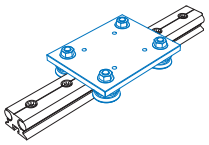


### Slides

- Ground steel plate
- Lubrication system option
- Adjustable for no play

L 100 x W 75 x H 31.5 mm (WS 8/70)
(weight: approx. 0.7 kg)
Part no.: **223108 0070**

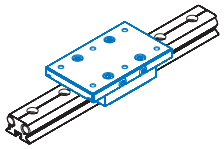
L 150 x W 75 x H 31.5 mm (WS 8)
(weight: approx. 1,0 kg)
Part no.: **223108**



### Trolley LW 4

- L 125 x W 97 x H 7.7 mm
- Ground steel plate
- 4 rollers Ø 31, sealed for life
- Adjustable for no play
- Weight: 1.02 kg

Part no.: **223009**



For steel shafts Ø 12 mm

### Dual track set 1

- L75 x W75 x H30.2 mm
- With 2 SMALL linear ball bearings

Part no.: **223001**

### Dual track set 2

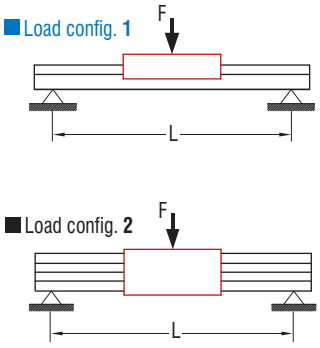
- L125 x W75 x H30.2 mm
- With 2 LARGE linear ball bearings

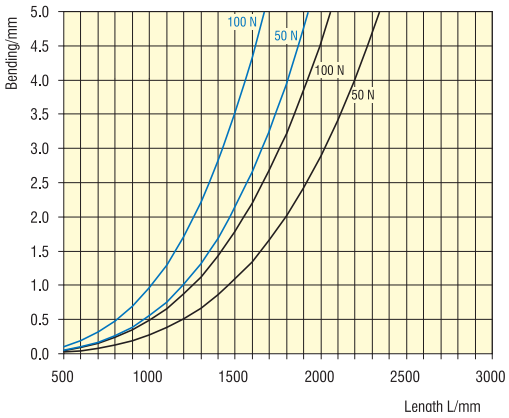
Part no.: **223002**

# Linear guide rail

# LFS-12-10

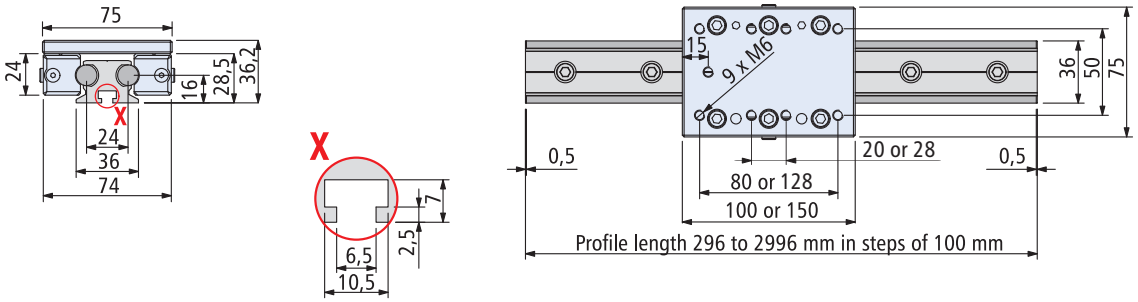
## Bending



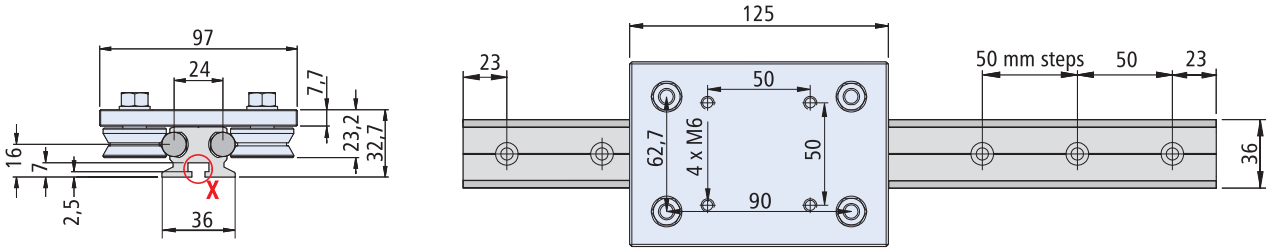




## Dimensioned drawings

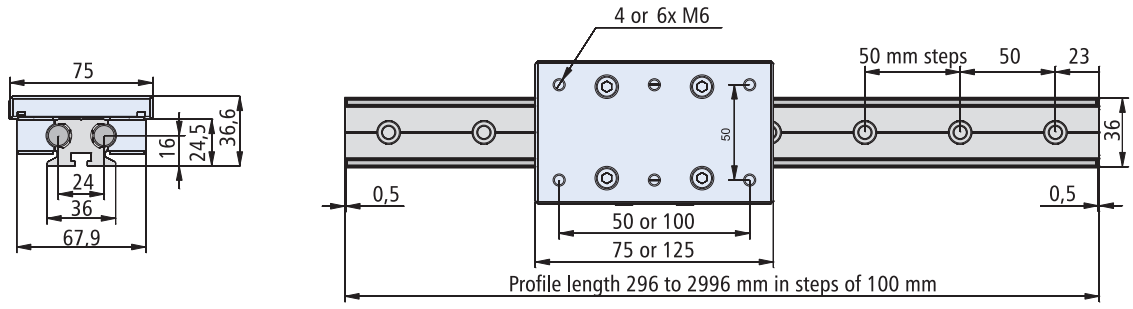
**LFS-12-10** with slides **WS 8**



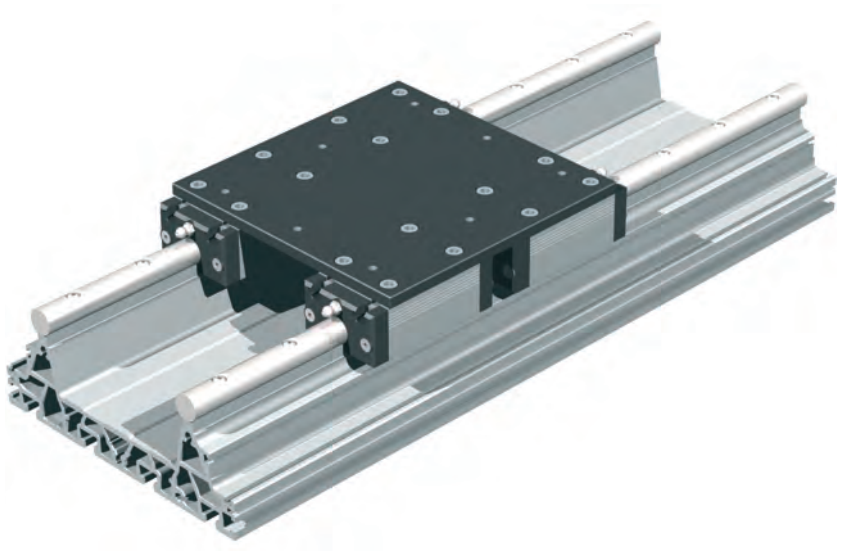

**LFS-12-10** with trolley LW 4




**LFS-12-10** with dual track set



# Linear guide rail LFS-16-120



## Features

- W 190 x H 61 mm
- 2 precision steel shafts Ø 16
- Anti-twist
- Aluminium shaft housing profile naturally anodised
- Securing from below with M6 tapped rail in T-slot profile
- Conditionally self-supporting
- Any guide length
- Weight: 10.2 kg/m

## Ordering key

**220 008 XXXX**

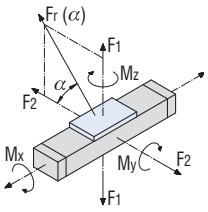
Length in mm (in 100 mm raster)
e.g. **0029** = Length 298
**0299** = Length 2998

Profile length = Length overall L -2 mm
Special lengths available on request!

## Load data

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

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



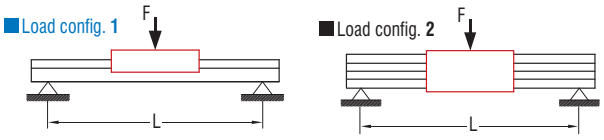

| Einheit mit 2x IWS 1 | |
|---|---|
| $C_0$ | 4929 N |
| C | 2660 N |
| $F_1$ stat. | 4209 N |
| $F_1$ dyn. | 2271 N |
| $F_2$ stat. | 4929 N |
| $F_2$ dyn. | 2660 N |
| $M_x$ stat. | 253 Nm |
| $M_y$ stat. | 147 Nm |
| $M_z$ stat. | 173 Nm |
| $M_x$ dyn. | 136 Nm |
| $M_y$ dyn. | 79 Nm |
| $M_z$ dyn. | 93 Nm |

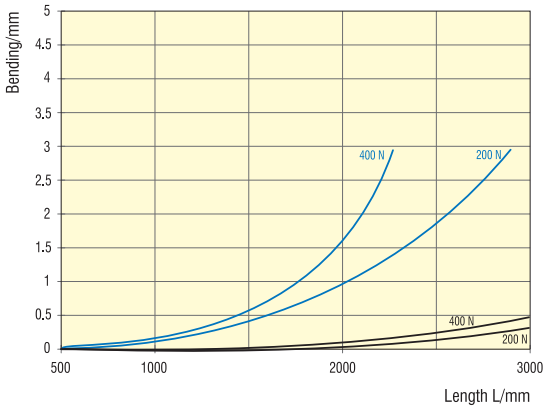
| Einheit mit 2x ILS 1 | |
|---|---|
| $C_0$ | 7598 N |
| C | 4857 N |
| $F_1$ stat. | 6488 N |
| $F_1$ dyn. | 4148 N |
| $F_2$ stat. | 7598 N |
| $F_2$ dyn. | 4857 N |
| $M_x$ stat. | 389 Nm |
| $M_y$ stat. | 195 Nm |
| $M_z$ stat. | 228 Nm |
| $M_x$ dyn. | 249 Nm |
| $M_y$ dyn. | 124 Nm |
| $M_z$ dyn. | 146 Nm |

| Einheit mit 4x IWS 1 | |
|---|---|
| $C_0$ | 6572 N |
| C | 3546 N |
| $F_1$ stat. | 5612 N |
| $F_1$ dyn. | 3028 N |
| $F_2$ stat. | 6572 N |
| $F_2$ dyn. | 3546 N |
| $M_x$ stat. | 337 Nm |
| $M_y$ stat. | 309 Nm |
| $M_z$ stat. | 361 Nm |
| $M_x$ dyn. | 182 Nm |
| $M_y$ dyn. | 167 Nm |
| $M_z$ dyn. | 195 Nm |

| Einheit mit 4x ILS 1 | |
|---|---|
| $C_0$ | 10130 N |
| C | 6476 N |
| $F_1$ stat. | 8650 N |
| $F_1$ dyn. | 5530 N |
| $F_2$ stat. | 10130 N |
| $F_2$ dyn. | 6476 N |
| $M_x$ stat. | 519 Nm |
| $M_y$ stat. | 476 Nm |
| $M_z$ stat. | 557 Nm |
| $M_x$ dyn. | 332 Nm |
| $M_y$ dyn. | 304 Nm |
| $M_z$ dyn. | 356 Nm |

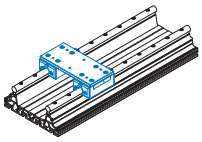
## Bending



# Linear guide rail LFS-16-120

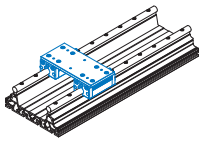
**Slide unit**
**with 2 × steel slides**
**ILS 1** (kit)



- L 84 x W 178 x H 8 mm
- Ground steel plate
- 2 x ILS 1,
  central lubrication option
- Adjustable for no play
- Total weight: 2.30 kg

Part no.: **223240 0009**

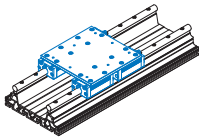
**Slide unit**
**with 2 × aluminium slides**
**IWS 1** (kit)



- L 84 x W 178 x H 8 mm
- Ground steel plate
- 2 × IWS 1,
  central lubrication option
- Adjustable for no play
- Total weight: 1.50 kg

Part no.: **223240 0007**

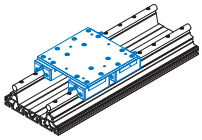
**Slide unit**
**with 4 × aluminium slides**
**IWS 1** (kit)



- L 180 x W 178 x H 8 mm
- Ground steel plate
- 4 x IWS 1,
  central lubrication option
- Adjustable for no play

Part no.: **223240 0008**

**Slide unit**
**with 4 × steel slides**
**ILS 1** (kit)

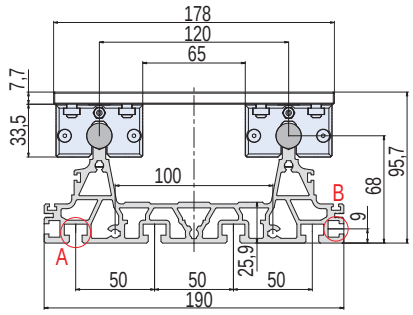


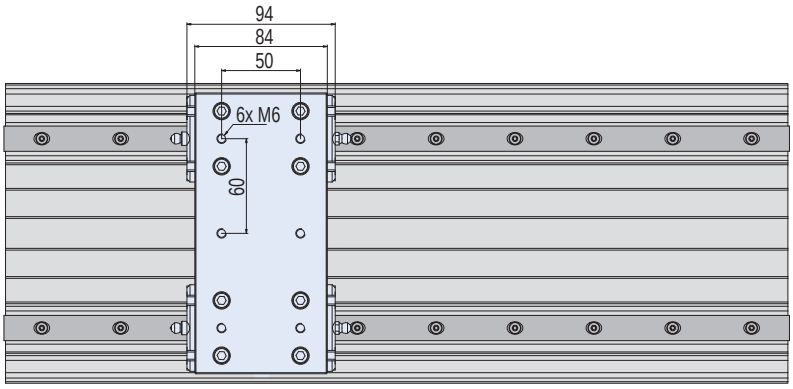
- L 180 x W 178 x H 8 mm
- ground steel plate
- 4 x ILS 1,
  central lubrication option
- Adjustable for no play

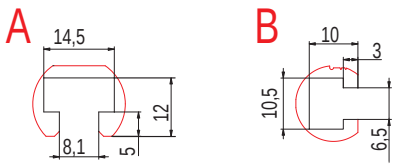
Part no.: **223240 0010**

## Dimensioned drawings

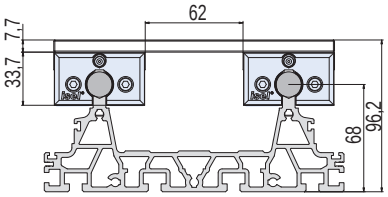
Aluminium slides IWS 1

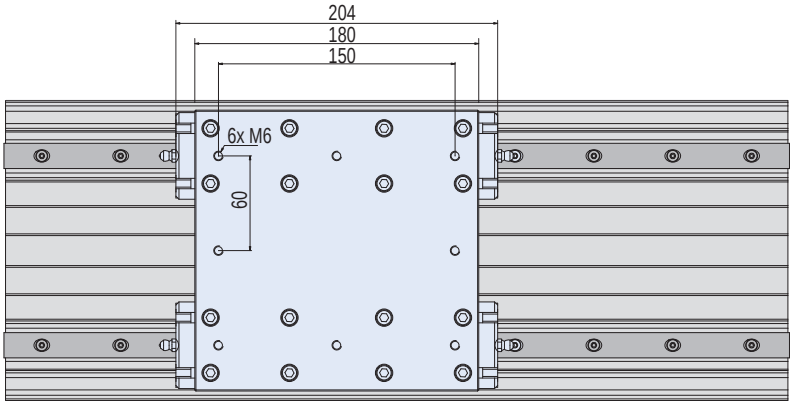



Steel slides ILS 1



mechanics

# Accessories

## Tapped rail

### M6 tapped rail
- 10 x 4 mm
- Galvanised
- M6 Ra 50 mm
- VE 3 units at 1 m

Part no.: **209 011**

## Sliding nuts


### M6 sliding nut (Figure 1)
- L 25 × W 10 × H 3.5 mm
- Galvanised
- VE 100 unit
- All except PT/RE 40, 65

Part no.: **209 001 0005**

### 2 × M6 sliding nuts (Figure 2)
- L 45 x W 10 x H 3.5
- Galvanised
- VE 50 unit
- For all except PT/RE 40, 65

Part no.: **209 002 0004**

### 2 × M6 sliding nuts (Figure 2)
- L 45 × W 13 × H 6 mm
- Galvanised
- 2 × M6 Ra 25 mm
- VE 25 unit
- For PT/RE 40, 65

Part no.: **209 005 0001**

### Angle sliding nut 2 × M6 (Figure 3)
- Galvanised
- VE 25 units
- For all except PT/RE 40, 65

Part no.: **209 021 0003**

### Special angle sliding nut 3 x M6 (Figure 4)
- Galvanised, VE 25 unit
- For all except PT/RE 40, 65

Part no.: **209 022 0003**

## Sliding nuts


### M5 sliding nuts
- Galvanised • VE 20 unit
- For all except PT25, PT 50, PS 200, RE 40 and RE 65

(Securing only possible from above)

**with spring**
Part no.: **209005 0002**
(M5/Figure 1)
Part no.: **209005 0003**
(M6/Figure 2)

**with large chamfer**
Part no.: **209005 0004**
(M6/Figure 3)

**in rhombus shape**
Part no.: **209005 0005**
(M5/Figure 4)
Part no.: **209005 0006**
(M6/Figure 5)

## Linear ball bearing

For steel shafts Ø 12 mm

### Linear ball bearing **large**
- L80 × W20 × H19 mm, VE 2 units

Part no.: **222 002 0001**

### Linear ball bearing **medium**
- L60 × W20.5 × H17.8 mm, VE2 units

Part no.: **222 000**

### Linear ball bearing **small**
- L40 x W20 x H19 mm, VE 2 units

Part no.: **222 001**

## Grease/grease gun

### Grease
Part no.: **299 032 0002**

### Impact press for grease and oil
Part no.: **299 032 0003**

## Guide shafts

### Guide shaft SF 12/SF 16
- Precision steel shafts Ø 12 or 16 mm, length 3 m
- Hardened and ground
- With M5 blind hole tapping (SF12) or M6 (SF16) in 100 mm raster or with drilled holes for M4 (SF 12) or M5 (SF 16) in 100 mm raster

Part no.: **220019 0299**
(SF12, 3m, with blind holes for M5)
Part no.: **220020 0299**
(SF12, 3m, with stepped holes for M4)
Part no.: **220023 0299**
(SF16, 3m, with stepped holes for M5)
Part no.: **220024 0299**
(SF16, 3m, with blind holes for M6)

## Rollers

### Roller Ø 20 mm for SF 12
- With M4 tapped drilling
- VE 2 units

Part no.: **222 010**

## Rollers

### Roller Ø 21 mm
- Concentric
- VE 2 units

Part no.: **222 003**
- Eccentric
- VE 2 units

Part no.: **222 004**

### Roller Ø 31 mm
- Concentric
- VE 2 units

Part no.: **222 006**
- Eccentric
- VE 2 units

Part no.: **222 007**

# Operating loads calculation

## Effective loading calculation

Various factors affect the calculation of the loading of isel guides. This includes the position of the
C of G of the load, tensile and compressive forces, torques, load and acceleration forces.

For a linear bench on 4 bearings, the bearing forces are calculated according to the force application point for various load directions.

The calculation can also be applied to a slide configuration with 2 slides.

The dimension LL/2 is used as the dimension L (see dimensioned drawings for the relevant guides).

The load factor in this case is CO/2.

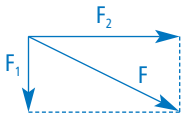
## Combined load

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

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

If a force F and a torque M load an element simultaneously, then the dynamically equivalent load is:

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



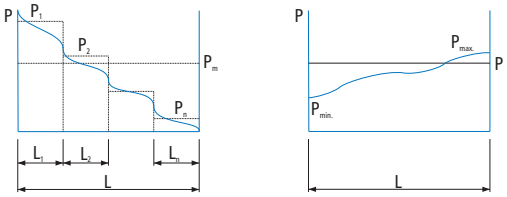

| | |
|---|---|
| P [N] | dynamically equivalent load |
| F [N] | opposing force $= \sqrt{1^2 + F_2^2}$ |
| F1 [N] | vertical component see sketch (4) |
| F2 [N] | horizontal component see sketch (4) |
| C0 [N] | static load factor |
| M [Nm] | opposing torque |
| M0(XYZ) [Nm] | static torque in the direction of the opposing torque |

According to DIN, the dynamically equivalent load should not exceed the value P = 0.5 · C.

## Equivalent load calculation

### Operating conditions

**A** incremental change **B** uniform change




### Equivalent load

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

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

| | |
|---|---|
| P | dynamically equivalent load [N] |
| $P_{1...n}$ | Individual load [N] |
| L | Total travel [m] |
| $L_{1...n}$ | Individual travel [m] |

| | |
|---|---|
| $P_{min}$ | smallest load [N] |
| $P_{max}$ | largest load [N] |

## Static safety

| Operating conditions | $S_0$ |
|---|---|
| Normal motion | 1.0 - 3.0 |
| High speed | 2.0 - 4.0 |
| With impacts and vibration | 3.0 - 5.0 |

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

| | |
|---|---|
| $S_0$ | static load safety |
| $C_0$ | static load factor [N] |
| $P_0$ | statically equivalent bearing loading [N] |
| $M_0$ | static loading torque [Nm] |
| M | equivalent static torque [Nm] |

## Nominal working life

**The nominal working life is achieved or exceeded by 90% of an adequately large quantity of identical bearings, before the first signs of material fatigue become apparent.**

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

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

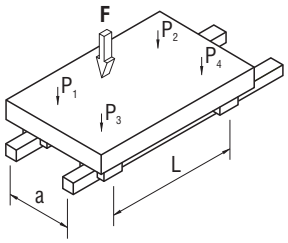
$$L_h = \frac{1666}{V} \cdot \left(\frac{C}{P}\right)^3$$

| | |
|---|---|
| L [m] | nominal working life in units of 100,000 m |
| $L_h$ [h] | nominal working life in hours run |
| C [N] | dynamic load factor |
| P [N] | dynamically equivalent load |
| H [m] | single stroke of the oscillating motion |
| $n_{OSZ}$ [min] | Number of double strokes per minute |
| v [m/min] | average speed of movement |

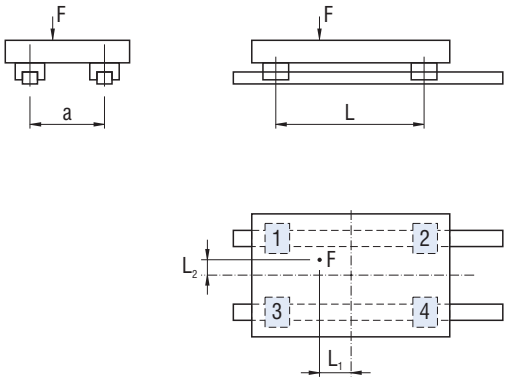
# Operating loads calculation

## Load vertical on the **bench surface**

### Loading




### Dimensioned figure




### Load on a trolley

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

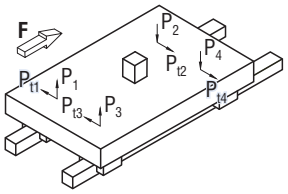
$$P_2 = \frac{F}{4} - \frac{F \cdot L_1}{2L} + \frac{F \cdot L_2}{2a}$$

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

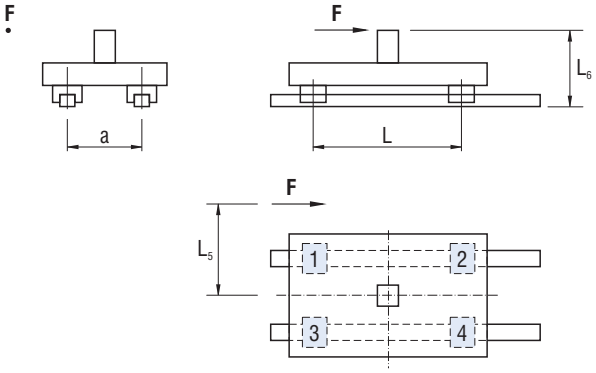
$$P_4 = \frac{F}{4} - \frac{F \cdot L_1}{2L} - \frac{F \cdot L_2}{2a}$$

## Load in **direction of motion**

### Loading




### Dimensioned figure



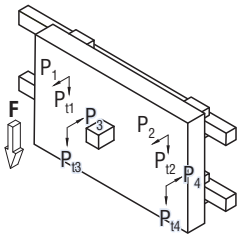

### Load on a trolley

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

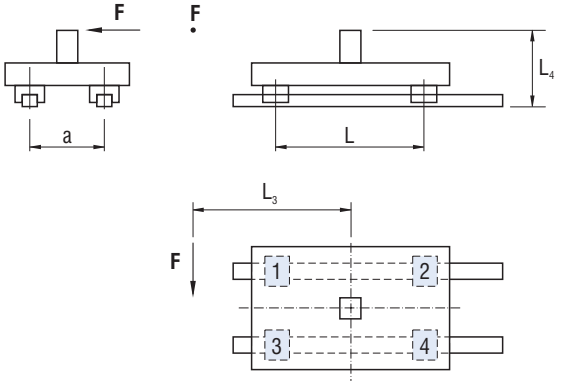
$$P_{t1} \ldots P_{t4} = \frac{F \cdot L_5}{2L}$$

## Load at right angles to the **direction of motion**

### Loading




### Dimensioned figure




### Load on a trolley

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

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

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

Space for your notes

# Drive elements

## Overview



Ball screw nuts supplied by isel Germany are high-quality, precise and wear-free (hardened and ground). Combined with ball screw spindles, ball screw nuts ensure that rotary motion is converted into linear motion at extremely low values of friction.

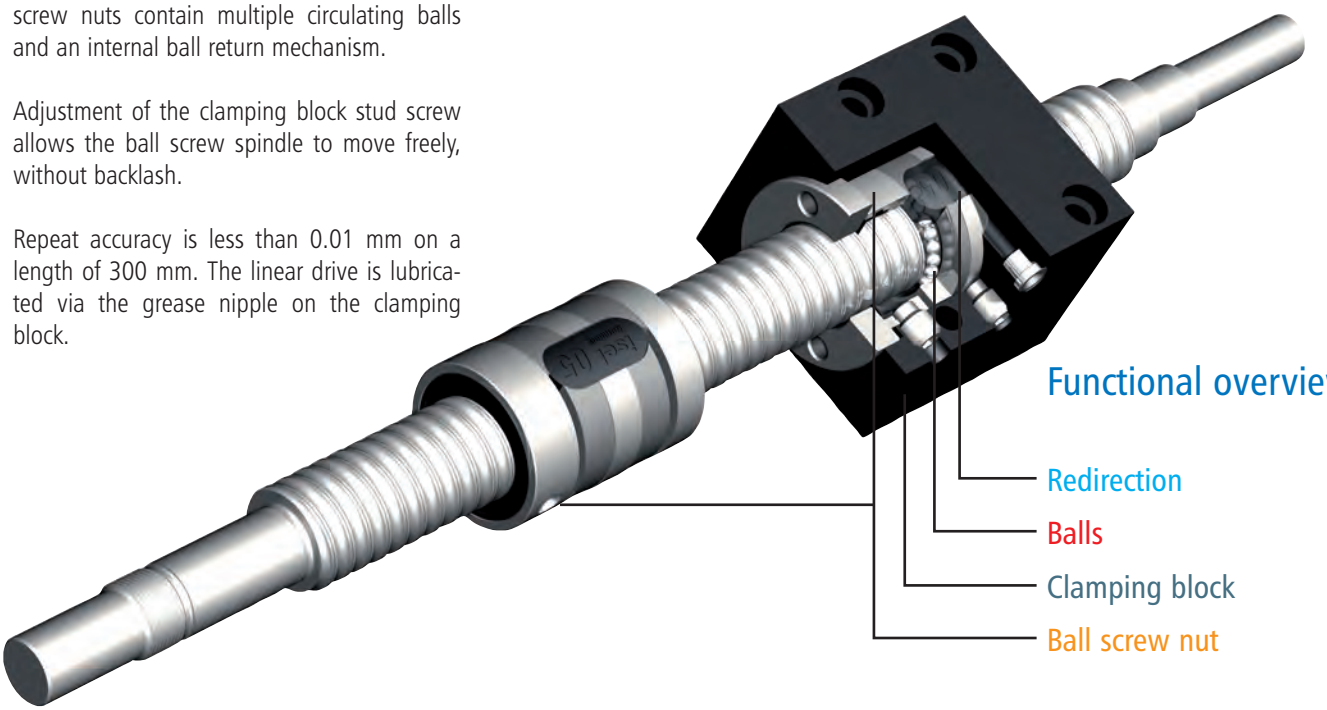
The ball screw nut is positioned and held in the clamping block using a stud screw. The ball screw nuts contain multiple circulating balls and an internal ball return mechanism.

Adjustment of the clamping block stud screw allows the ball screw spindle to move freely, without backlash.

Repeat accuracy is less than 0.01 mm on a length of 300 mm. The linear drive is lubricated via the grease nipple on the clamping block.

Ball screw spindles are roll manufactured using modern machines prior to hardening and polishing.

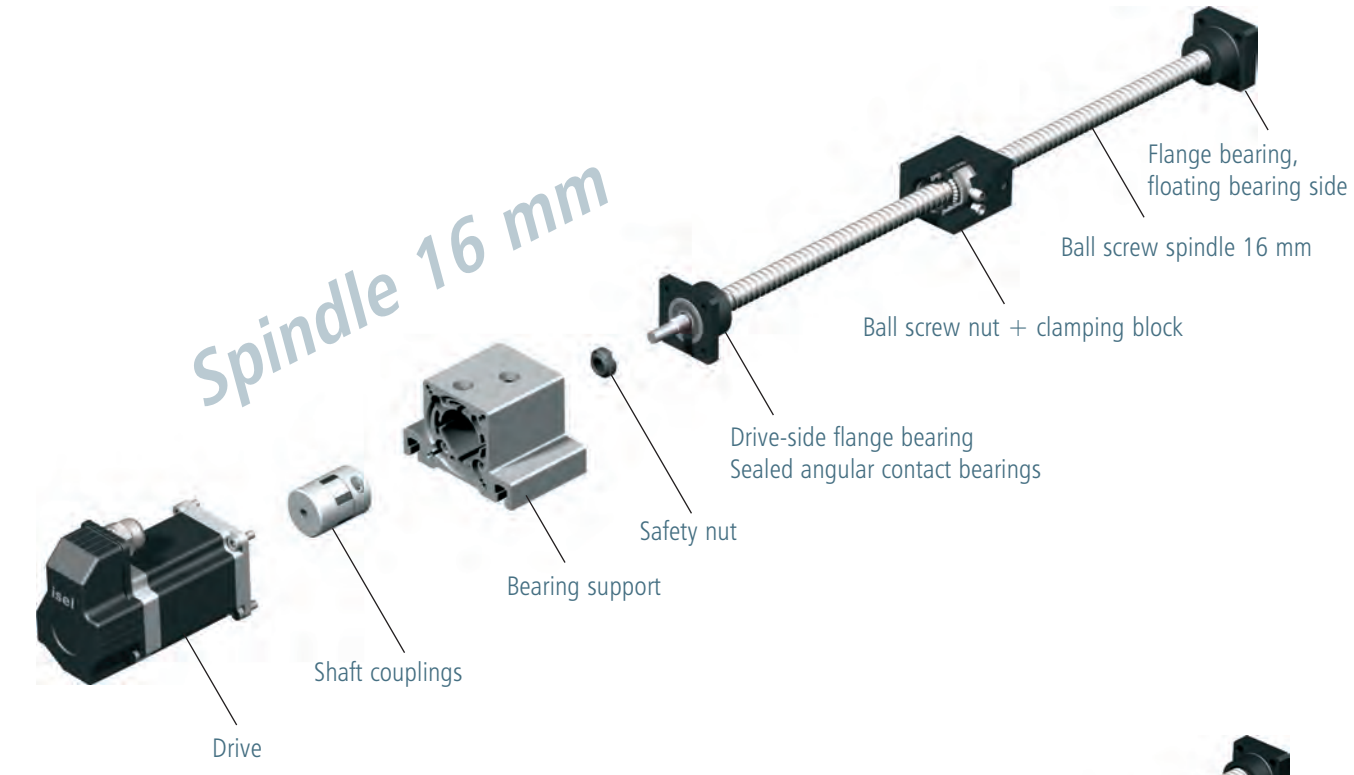
Our linear drives are technically advanced and have proven themselves over a period of more than 20 years of practical application.

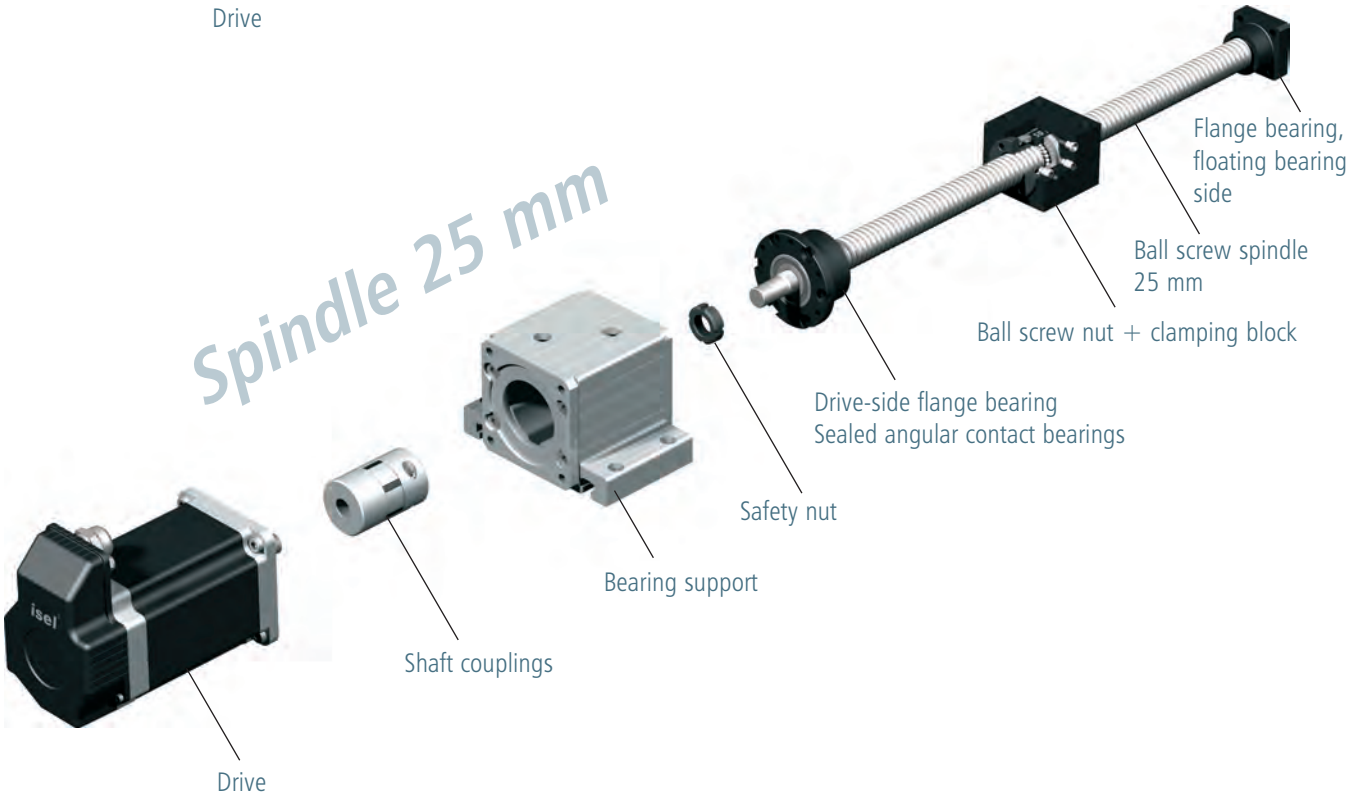


# Drive elements Overview

## Linear drive

The most common variable when using linear drives is whether the spindles are driven directly or via toothed-belt.



mechanics

# Recirculating ball spindles Ø 16, 25 mm

## Ø 16 features

- Ø16 mm, rolled, hardened and polished
- Material CF 53, inductively hardened (HRC 60 ± 2); (for detailed information see DIN 17212)
- Spindle pitches: 2.5 / 4 / 5 / 10 and 20 mm
- Lengths up to max. 3052 mm available
- End machining to isel standard or according to customer specification (see "Available lengths")
- Produced to DIN 69051, Part 3, Tolerance class 7

**Options**
- **End machining according to customer specification**
- **Available in other lengths**

## Available lengths

**Without end machining**
in 100 mm raster
- 352 to 3052 mm

**Two-sided end machining**
in 100 mm raster
- 368 mm to 3068 mm

Special length to dimensioned drawing: 211 13X XXXX

Special length to Drawing: 211 13X 0998

## Ordering key

**211 13X XXXX**

**Spindle pitch**
**2** = 2.5 mm
**3** = 4 mm
**4** = 5 mm
**5** = 10 mm
**6** = 20 mm

**End machining**
**0** = not machined
**5** = both-sided machining suitable for all feeds (aluminium profile length 78 mm)

**Lengths**
e.g. **045** = 452 mm
**086** = 868 mm
**305** = 3052 mm
(rounded to the final digit)

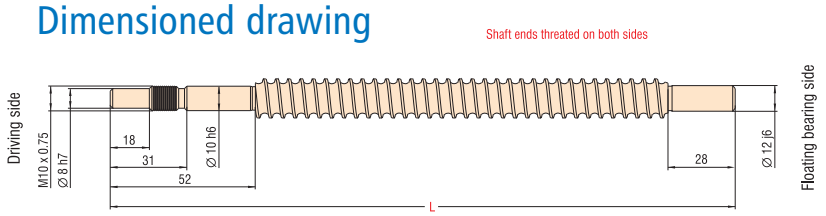
See "Available lengths" for permissible combinations.

## Ordering data

**Slotted nut**
- Self-locking
- M 10 × 0.75 mm

Part no.: **890257 0011**

## Dimensioned drawing




## Ø 25 features

- Ø 25 mm, hardened and polished
- Material CF 53, inductively hardened (HRC 60 ± 2); (for detailed information see DIN 17212)
- Spindle pitches: 5/10 and 20 mm
- Lengths up to max. 3000 mm available
- End machining to isel standard or according to customer specification (see "Available lengths")
- Produced in accordance with DIN 69051, Part 3, Tolerance class 7

**Option**
- **End machining to order**

## Available lengths

**Without end machining**
in 100 mm raster
- 500 to 3000 mm

Special length in accordance with drawing: 211 14X 0999

**Two-sided end machining**
in 100 mm raster
- 295 to 2995 mm

Special length in accordance with drawing: 21114X XXXX

## Ordering key

**211 14X XXXX**

**Spindle pitch**
**4** = 5 mm
**5** = 10 mm
**6** = 20 mm

**End machining**
**0** = not machined
**2** = both sides

**Lengths**
e.g. **050** = 500 mm
**100** = 1000 mm
**289** = 2895 mm
(rounded to the last digit)

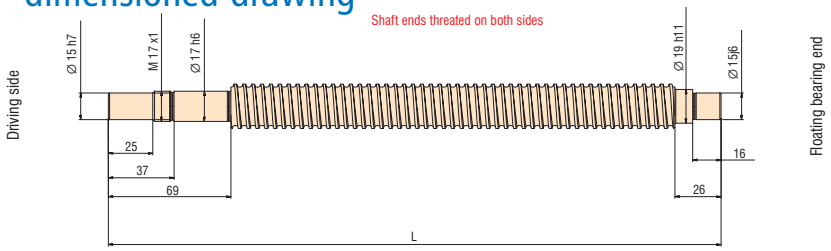
See "Available lengths" for permissible combinations.

## Ordering data

**Slotted nut**
- Self-locking
- M 17 x 1.0 mm

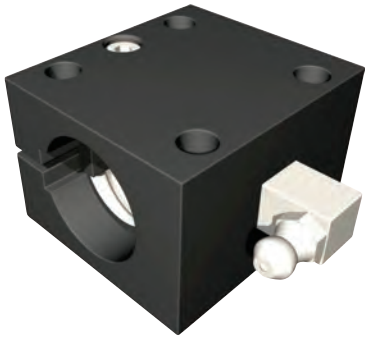
Part no.: **890259 0011**

## dimensioned drawing



# Ball nuts

## Version 2–Ø16



### Features

- Material 16MnCr5 or 20MnCr5, pressed, hardened, polished
- Versions for recirculating ball spindle Ø16 mm
- Nut pitches: 2.5 / 4 / 5 / 10 mm
- Balls are rerouted internally
- As block housing with base fixing
- Regreasing through grease nipples 90°, 0°

### Load factors

| Pitch | Nominal Ø | dynamic load factor | static load factor |
|---|---|---|---|
| 2.5 mm | 16 mm | 3500 N | 5500 N |
| 4.0 mm | 16 mm | 4600 N | 7200 N |
| 5.0 mm | 16 mm | 4600 N | 7200 N |
| 10.0 mm | 16 mm | 4200 N | 6500 N |

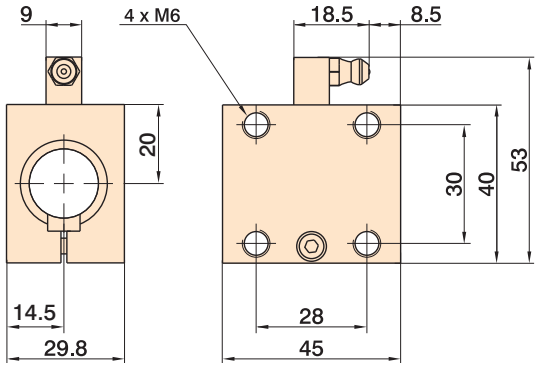
### Ordering data

only for spindles Ø16

| Pitch | Part no. |
|---|---|
| 2.5 mm | 213 003 1003 |
| 4.0 mm | 213 003 1004 |
| 5.0 mm | 213 003 1005 |
| 10.0 mm | 213 003 1010 |

with matching:
dirt scraper
- VE 2 unit Part no.: 213500 0001

### Dimensioned drawings




## Version 3–Ø16 Ø25

### Features

- Material 16MnCr5, ground
- Versions for recirculating ball spindles Ø16 and Ø25 mm
- Nut pitches: 2.5 / 4 / 5 / 10 mm 20 mm (Ø 16 mm), 5/10 and 20 mm (Ø25 mm)
- Balls are rerouted internally
- The version with nut pitch 20 mm is supplied with scrapers

### Load factors

| Pitch (mm) | Nominal Ø (mm) | Dyn. load factor (N) | Static load factor (N) |
|---|---|---|---|
| 2.5 | 16 | 3500 | 5500 |
| 4.0 | 16 | 4600 | 7200 |
| 5.0 | 16 | 4600 | 7200 |
| 10.0 | 16 | 4200 | 6500 |
| 5.0 | 25 | 5100 | 12600 |
| 10.0 | 25 | 5100 | 12600 |
| 20 | 25 | 3570 | 8800 |

### Ordering data

only for spindles Ø25

| Pitch | Part no. |
|---|---|
| 5.0 mm | 213 700 0005 |
| 10.0 mm | 213 700 0010 |
| 20.0 mm | 213 700 0020 |

with matching:
dirt scraper
- VE 2 unit

Part no.: 213700 9000

only for spindles Ø16

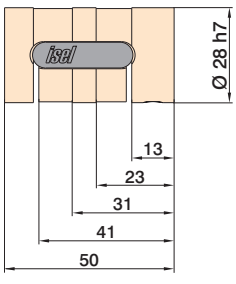
| Pitch | Part no. |
|---|---|
| 2.5 mm | 213 503 |
| 4.0 mm | 213 514 |
| 5.0 mm | 213 505 |
| 10.0 mm | 213 510 |
| 20.0 mm | 213 520 |

with matching:
dirt scraper
- VE 2 unit

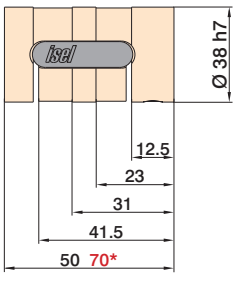
Part no.: 213500 0001

### Dimensioned drawings

for spindle Ø 16




for spindle Ø 25




*) At pitch = 20

# Clamping blocks for nut version 3

Flange securing

Base securing

## Features

- Material steel, gunmetal finish
- Versions for recirculating ball spindles Ø 25 and Ø 16 mm
- Nut pitches
  5/10 and 20 mm (Ø 25 mm)
  2.5/4/5/10 and 20 mm (Ø 16 mm)
- Recirculating ball nuts are adjustable for no-play
- Clamping blocks for base and flange securing

## Ordering data

### Clamping block 2 Ø16

Flange securing

| Pitch | Part no. |
|---|---|
| all | 213 501 |

### Clamping block 1 Ø16

Base securing

| Pitch | Part no. |
|---|---|
| all | 213 500 |

### Clamping block 2 Ø25

Flange securing

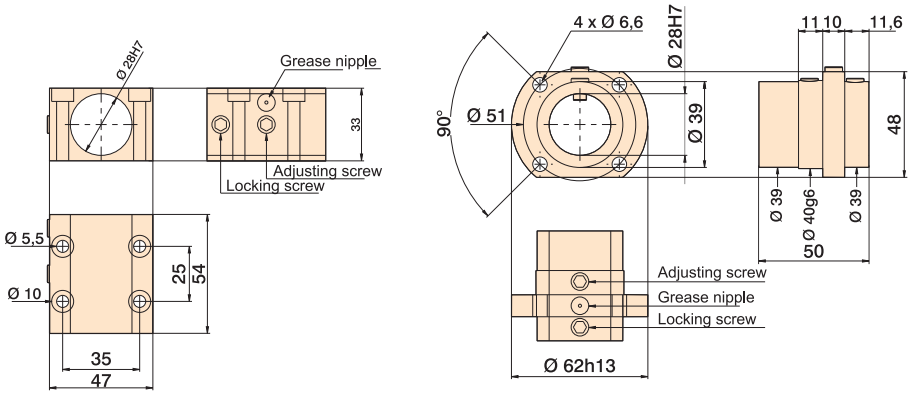
| Pitch | Part no. |
|---|---|
| 5 / 10 | 213 700 9003 |
| 20 | 213 700 9004 |

### Clamping block 1 Ø25

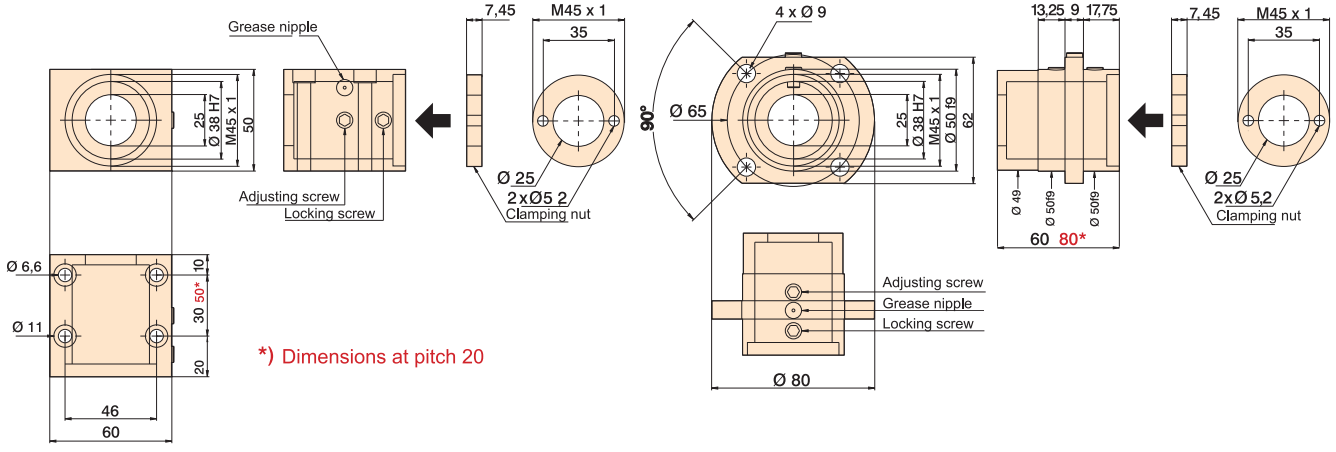
Base securing

| Pitch | Part no. |
|---|---|
| 5 / 10 | 213 700 9001 |
| 20 | 213 700 9002 |

## Dimensioned drawings - spindle clamping blocks Ø 16




## Dimensioned drawings - spindle clamping blocks Ø 25



# Flange bearing

## for spindle ∅ 16 mm

Flange bearing
drive side

Flange bearing
floating bearing side

### Ordering data

Flange bearing, drive side

Part no.: 216 504 0001

Flange bearing, floating bearing side

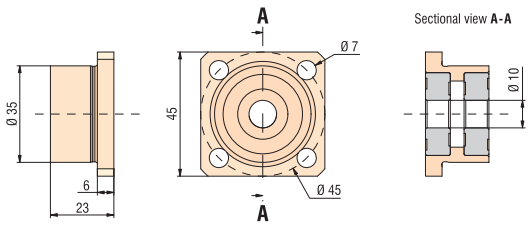
Part no.: 216 504 0002

### Features

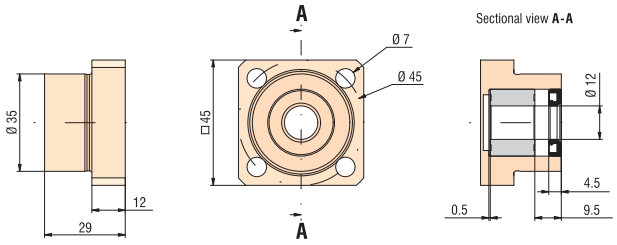
- Bearing, spindle drive side (fixed bearing side) and the spindle floating bearing side
- Flange bearing, drive side: bushing with two pressed angular contact ball bearings in an O-configuration
- Flange bearing, floating bearing side (counter-bearing): bushing with pressed needle bearing

### Dimensioned drawings

Flange bearing
drive side




Flange bearing
floating bearing side




## for spindle ∅ 25 mm

Flange bearing
drive side

Flange bearing
floating bearing side

### Ordering data

Flange bearing, drive side

Part no.: 216 504 0006

Flange bearing, floating bearing side

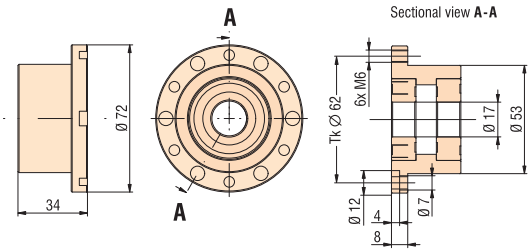
Part no.: 216 504 0005

### Features

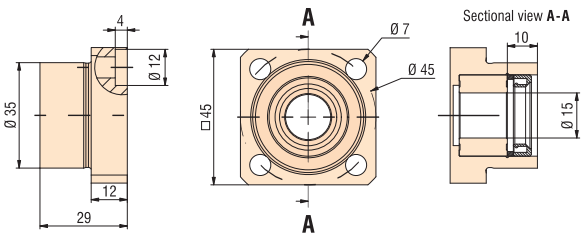
- Bearing, spindle drive side (fixed bearing side) and the spindle floating bearing side
- Flange bearing, drive side: bushing with two pressed angular contact ball bearings in an O-configuration
- Flange bearing, floating bearing side (counter-bearing): bushing with pressed needle bearing

### Dimensioned drawings

Flange bearing
drive side




Flange bearing
floating bearing side

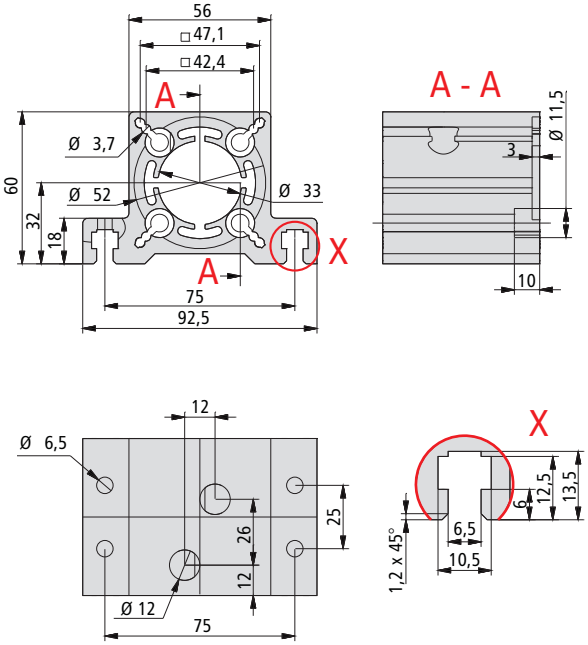


# Bearing supports

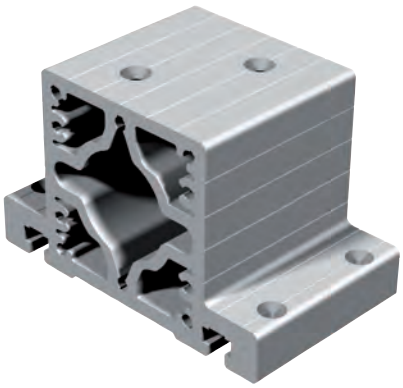
## Bearing support 1

- Aluminium profile compliant with DIN EN 12020-2
- As a parallel connection between the flange bearing and motor flange
- Flat milled securing surfaces
- Version for recirculating ball spindle Ø 16 mm
- Universal securing options

Part no.: **216504 0007**

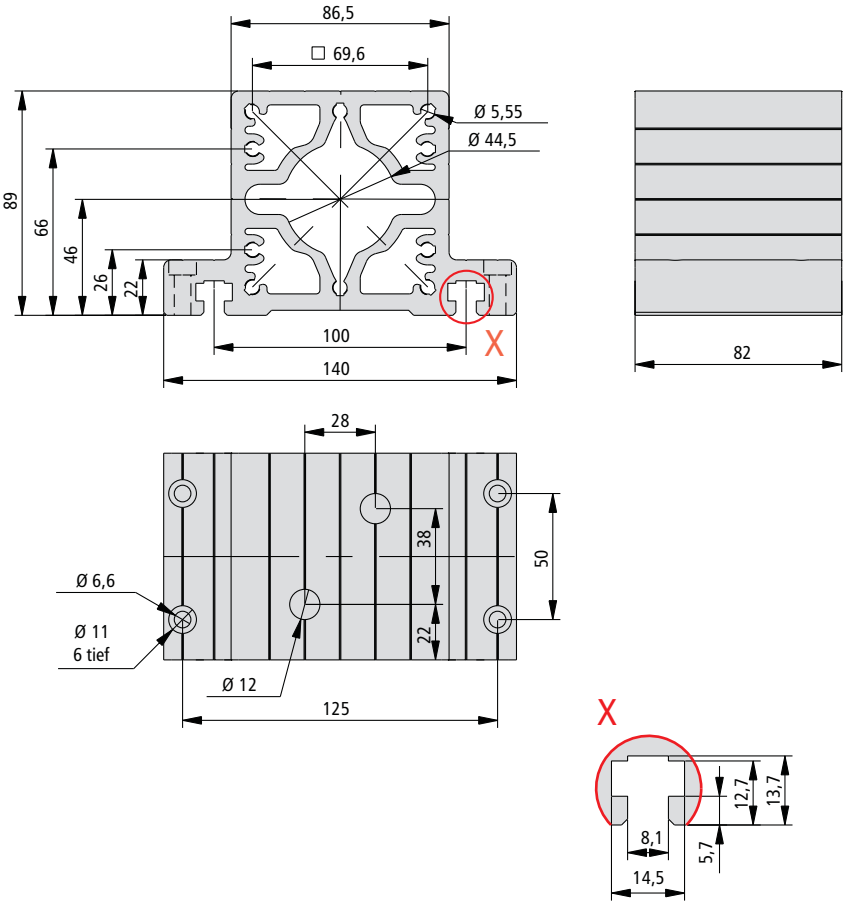



## Bearing support 2



- Aluminium profile compliant with DIN EN 12020-2
- As a parallel connection between the flange bearing and motor flange
- Version for recirculating ball spindle Ø 25 mm
- Universal securing options

Part no.: **216504 0008**



Space for your notes

# Linear units

## Overview

# Linear units

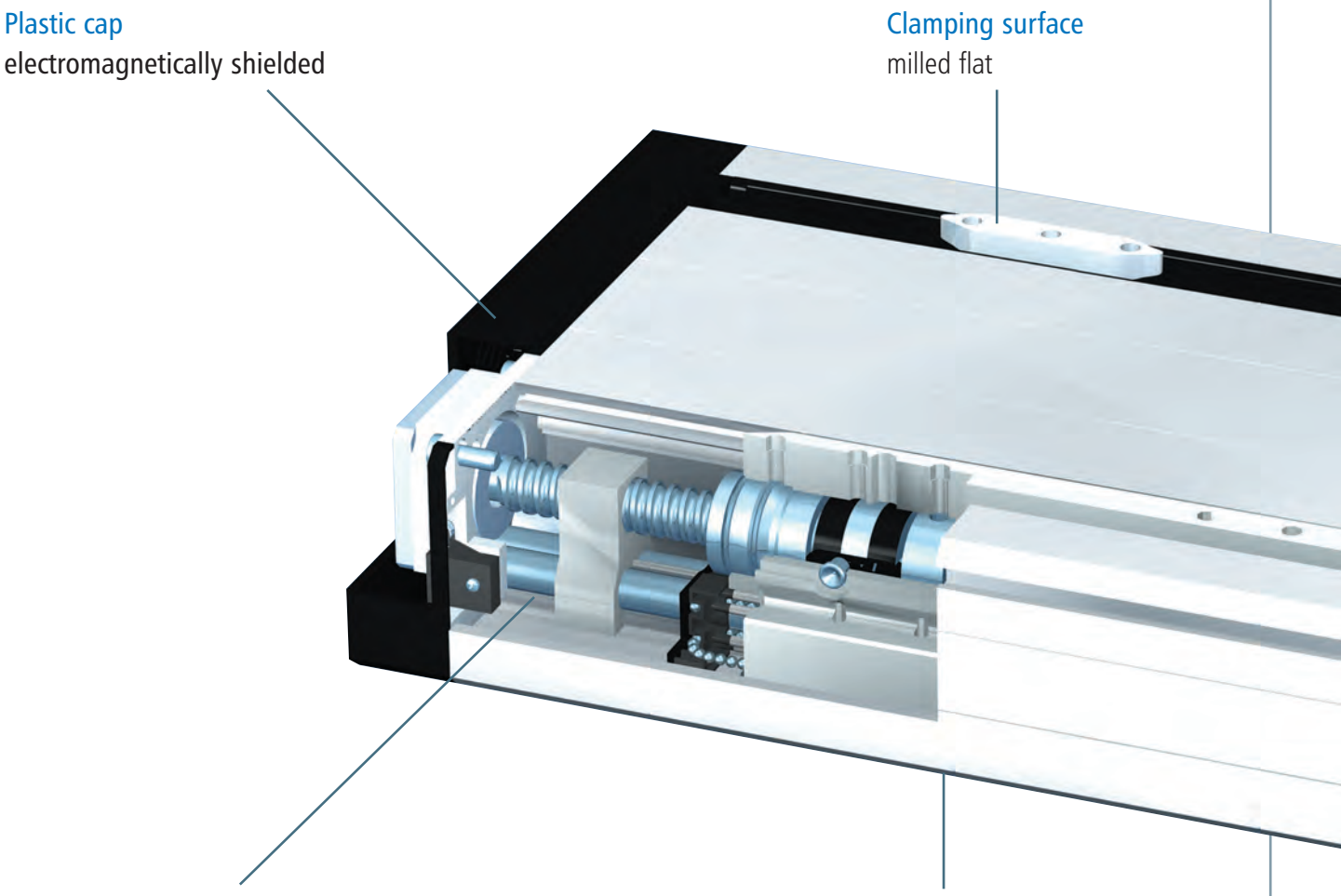
## Overview

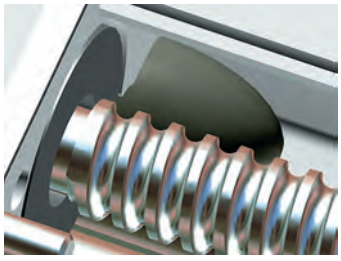


CAD data on our website **www.isel-germany.de**

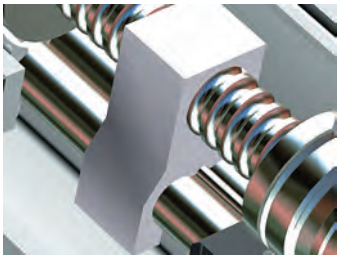
# Functional overview

at example LES 5

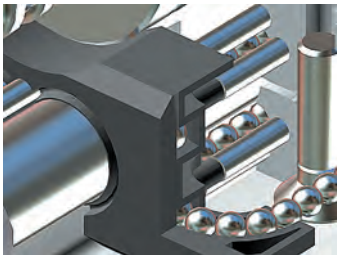


- End position buffering both sides with soft PVC parabolic springs
- Counter-bearing with 2 needle sleeves



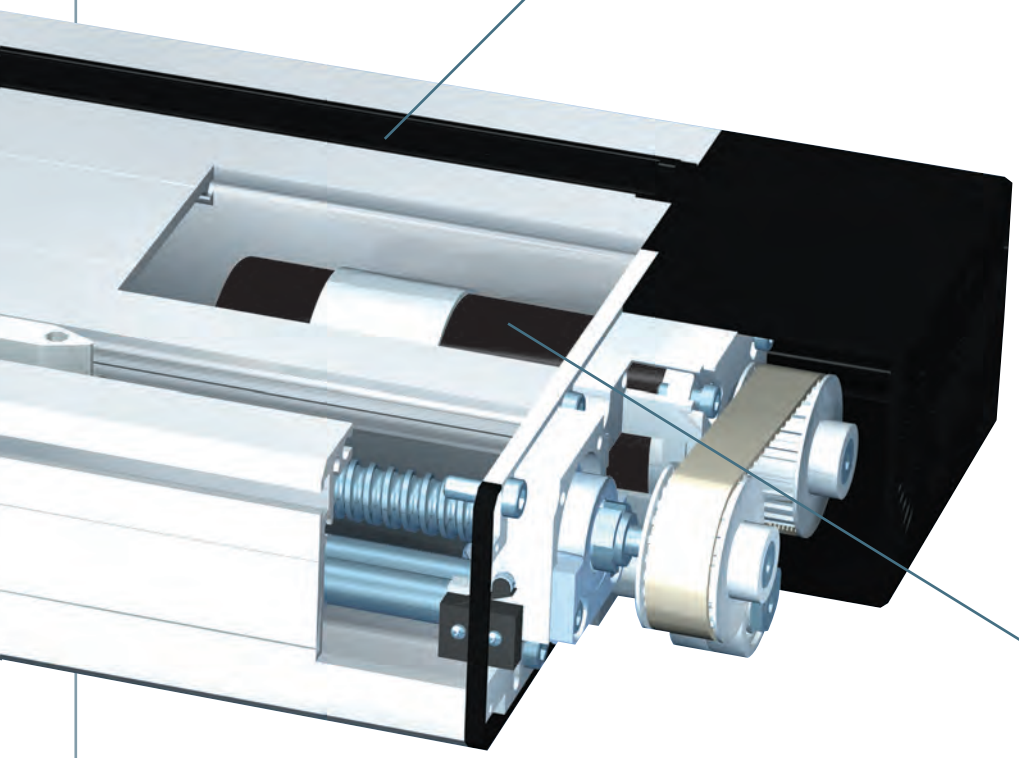
- Spindle support from a profile length of 1500 mm without limiting the process range

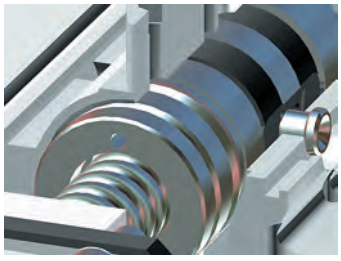


- Recirculating ball in patented aluminium linear slides
- Glass fibre reinforced loop components with scrapers

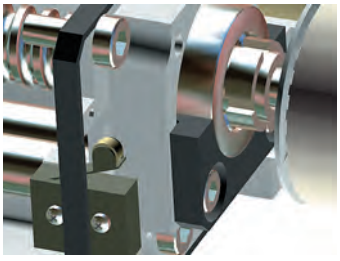
# Functional overview

at example LES 5

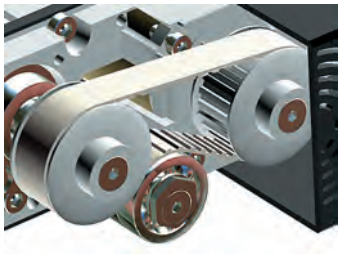


- Preset play-free recirculating ball nut with scrapers
- Central lubrication system for recirculating ball nut and circulations



- Integrated overrun limit switch
- Spindle bearing with angular contact bearings
- Axially free from play by means of self-locking special nuts

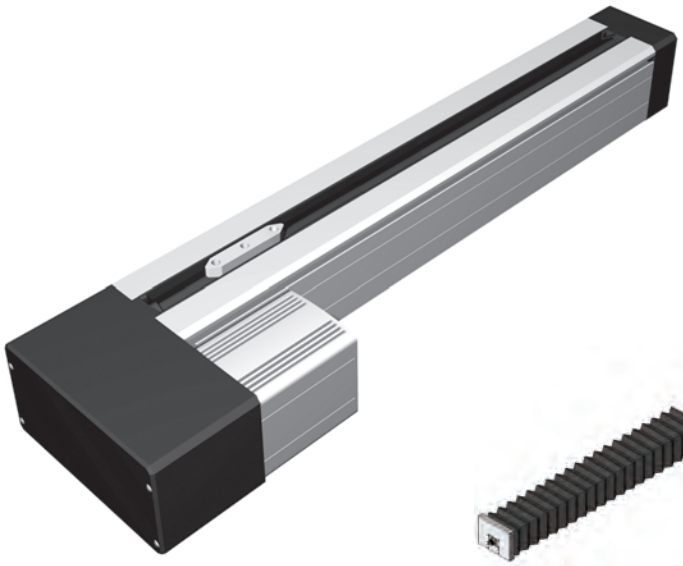


- Belt return and connecting electronics covered completely by protective cap

mechanics

# Linear units
## with spindle drive

# LES 4



LES 4 with side-mounted belt drive module



LES 4 - bellows gaiter option

## Features

- Aluminium shaft housing profile W75 × H75 mm, naturally anodised
- Clamping area and profile underside milled flat
- with 2 precision steel shafts Ø 12 h6, material Cf53, Hardness 60 ± 2 HRC
- Aluminium shaft slides WS 5/70, 2 x WS 5/70 (70 mm long), adjustable for no play, central lubrication system
- Recirculating ball drive 2.5/4/5/10 and 20 mm pitches
- Profile sealing with friction-resistant lip seals
- Cast aluminium end plates
- With 2 limit or reference switches, Repeat accuracy ± 0.02 mm
- Sealed angular contact bearings in drive - steel flange

Options:
- Black powder-coated aluminium profile
- Electromagnetic brakes in the motor module or in drive spindle extension
- Steel slide LS2 (Part no. 223007)
- External limit switch attachment set (see accessories)

Available on request:
- Length measuring system
- Bellows gaiter cover
- Assembly left of the motor module

## Ordering key

**234 XXX 0XXX**

**Drive**
0 = Preparation Direct drive modules
1 = Preparation Belt drive module

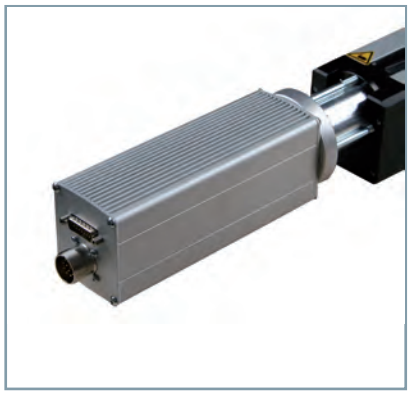
**Shaft slides**
0 = 1 Shaft slides 70 mm
2 = 2 Shaft slides 70 mm

**Recirculating ball drive**
0 = without
1 = Pitch 2.5 mm
2 = Pitch 4.0 mm
3 = Pitch 5.0 mm
4 = Pitch 10 mm
5 = Pitch 20 mm

**Profile length (L1)**
e.g. 029 = 290 mm (min.)
299 = 2990 mm (max.)
(rounded to the last digit)
Standard profile lengths available in 100 mm raster

## Drive modules

see pages 2-66 et seq. of the catalogue



## Technical specification
### Aluminium profile

| Aluminium profile LES 4 | |
|---|---|
| Moment of inertia $I_x$ | 107.711 cm⁴ |
| Moment of inertia $I_y$ | 125.843 cm⁴ |
| *Centre of gravity see dimensioned drawing | 33.23 mm |
| Cross-sectional area | 18.81 cm² |
| Material | AlMgSiO, 5F22 |
| Anodising | E6/EV1 |
| Weight with steel shafts | 6.2 kg/m |
| Weight with steel shafts and spindles | 7.6 kg/m |

## No load running torques

| No load torques (Ncm) | | | | | |
|---|---|---|---|---|---|
| Speed (rpm) | Spindle pitch | | | | |
| | 2.5 | 4 | 5 | 10 | 20 |
| 500 | 15 | 15 | 16 | 17 | 18 |
| 1500 | 19 | 19 | 19 | 20 | 21 |
| 3000 | 23 | 24 | 24 | 25 | 26 |

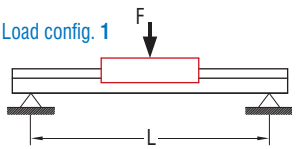
# Linear units
## with spindle drive

# LES 4

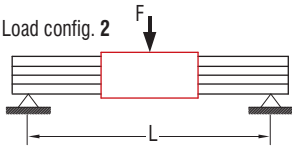


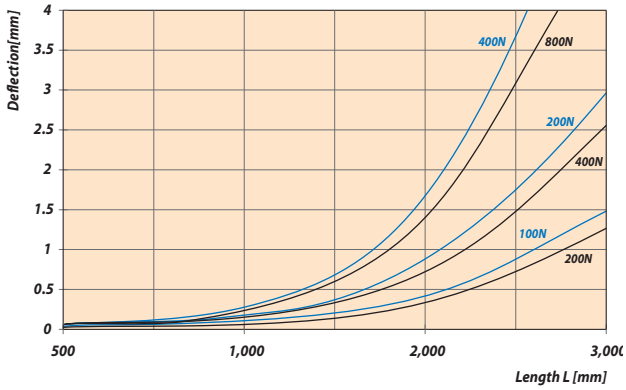
## Bending

■ Load config. **1**




■ Load config. **2**

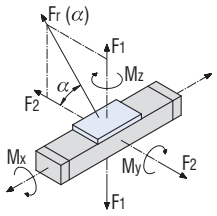



## Load factors

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

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




| LES 4 with one WS 5/70 | |
|---|---|
| $C_0$ | 2576.65 N |
| $C$ | 1461,14 N |
| $F_1$ stat. | 2200.67 N |
| $F_1$ dyn. | 1247.93 N |
| $F_2$ stat. | 2576.65 N |
| $F_2$ dyn. | 1461.14 N |
| $M_x$ stat. | 36.45 Nm |
| $M_y$ stat. | 82.16 Nm |
| $M_z$ stat. | 96.20 Nm |
| $M_x$ dyn. | 20.67 Nm |
| $M_y$ dyn. | 46.59 Nm |
| $M_z$ dyn. | 54.55 Nm |

| *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*** |

## permissible spindle speeds

| LES 4 / 5 / 6 | Spindle pitch p [mm] | 2.5 | 4 | 5 | 10 | 20 |
|---|---|---|---|---|---|---|
| Profile length L [mm] | max. permissible spindle speed n [rpm] | max. permissible feed speed v permissible [mm/s] | | | | |
| 490 | 4000 | 167 | 267 | 333 | 667 | 1333 |
| 990 | 3000 | 125 | 200 | 250 | 500 | 1000 |
| 1390 | 1500 | 63 | 100 | 125 | 250 | 500 |
| 1490 * | 3000 | 125 | 200 | 250 | 500 | 1000 |
| 1990 * | 1650 | 69 | 110 | 138 | 275 | 550 |
| 2490 * | 1050 | 44 | 70 | 88 | 175 | 350 |
| 2990 * | 750 | 31 | 50 | 63 | 125 | 250 |

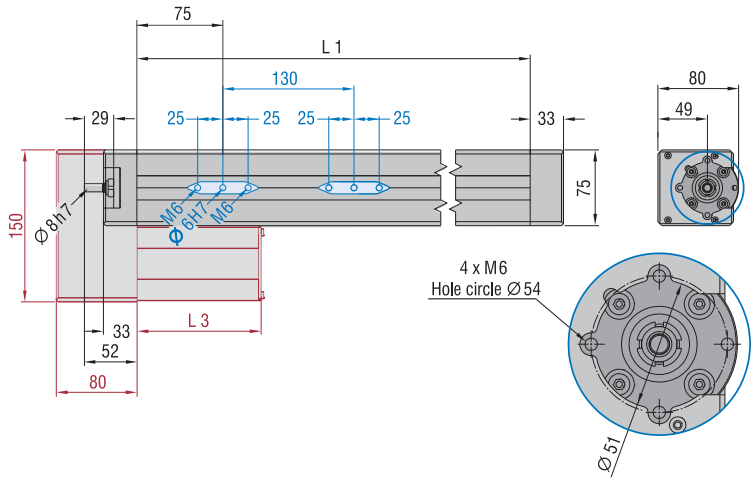
* with spindle support

## dimensioned drawing

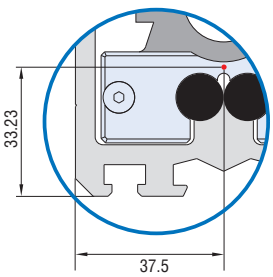
process travel

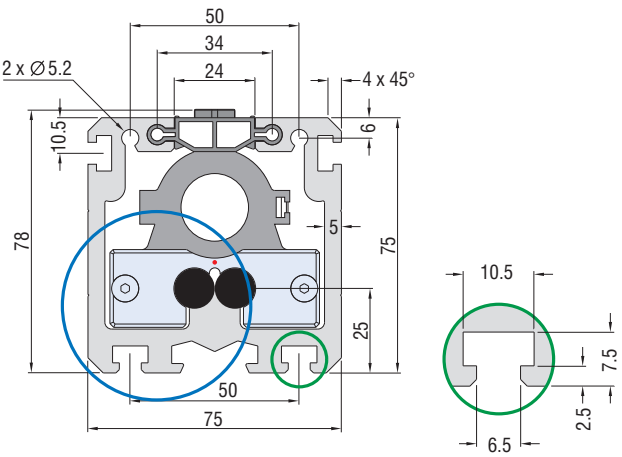
at 1 × WS 5/70 = L1 -150 mm
at 2 × WS 5/70 = L1 -280 mm

external limit switches see pages **2-83**




## dimensioned drawing
### Aluminium profile

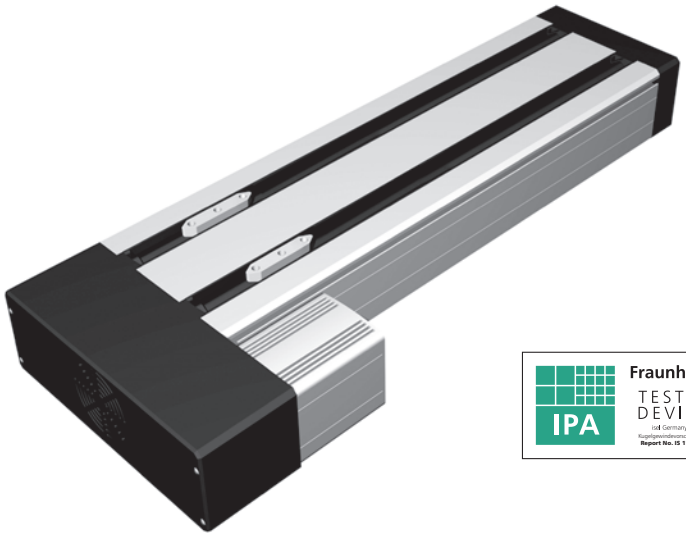


mechanics

# Linear units
## with spindle drive

# LES 6



LES 6 with side belt drive module

## Features

- Aluminium shaft housing profile W150 × H75 mm, naturally anodised
- Clamping area and profile underside milled flat
- With 4 precision steel shafts Ø 12 h6, material Cf53, Hardness 60 ± 2 HRC
- Aluminium shaft slides WS 5/70, 2 x WS 5/70 (70 mm long), adjustable for no play, central lubrication system
- Recirculating ball drive 2.5/4/5/10 and 20 mm pitches
- Profile sealing with friction-resistant lip seals
- Cast aluminium end plates
- With 2 limit or reference switches, Repeat accuracy ± 0.02 mm
- Sealed angular contact bearings in drive - steel flange

Options:
- Black powder-coated aluminium profile
- Electromagnetic brake
- Steel slides LS2 (Part no. 223007)
- Limit switch attachment kit (see accessories)

To order:
- Length measuring system
- Bellows gaiter cover
- Assembly left of the motor module

## Ordering key

**234 XXX 0XXX**

**Profile length (L1)**
e.g. 029 = 290 mm (min.)
299 = 2990 mm (max.)
(rounded to the last digit)
Standard profile lengths available in 100 mm raster

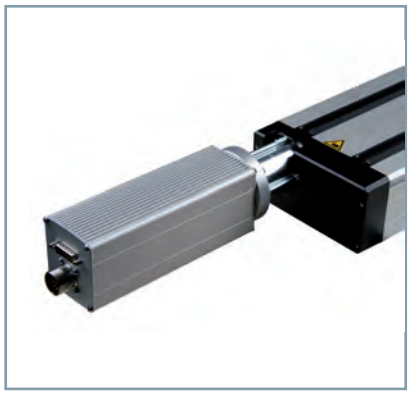
**Recirculating ball drive**
0 = without
1 = Pitch 2.5 mm
2 = Pitch 4.0 mm
3 = Pitch 5.0 mm
4 = Pitch 10 mm
5 = Pitch 20 mm

**Drive**
6 = Preparation Direct drive modules
7 = Preparation Belt drive module

**Shaft slides**
0 = 2 Shaft slides 70 mm
2 = 4 Shaft slides 70 mm

## Drive modules

see pages 2-68 et seq. of the catalogue



## Technical specification
### Aluminium profile

| Aluminium profile LES 6 | |
|---|---|
| Moment of inertia $I_x$ | 707.100 cm$^4$ |
| Moment of inertia $I_y$ | 212.200 cm$^4$ |
| *Centre of gravity see dimensioned drawing | 32.78 mm |
| Cross-sectional area | 30.07 cm$^2$ |
| Material | AlMgSiO, 5F22 |
| Anodising | E6/EV1 |
| Weight with steel shafts | 11.4 kg/m |
| Weight with steel shafts and spindles | 12.8 kg/m |

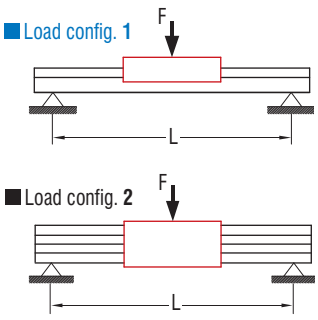
## No load running torques

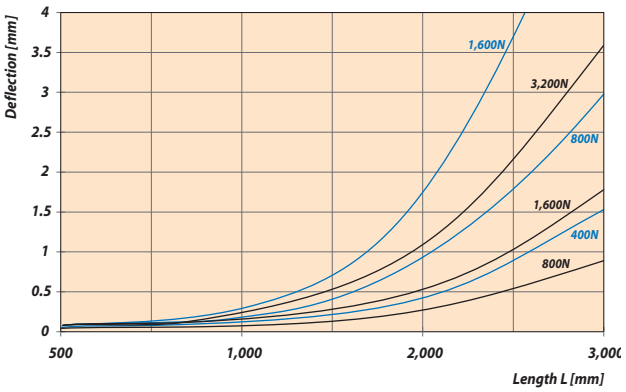
| No load torques (Ncm) | | | | | |
|---|---|---|---|---|---|
| Speed (rpm) | Spindle pitch | | | | |
| | 2.5 | 4 | 5 | 10 | 20 |
| 500 | 17 | 17 | 18 | 20 | 21 |
| 1500 | 20 | 20 | 22 | 24 | 25 |
| 3000 | 24 | 25 | 26 | 29 | 30 |

# Linear units
## with spindle drive

# LES 6

## Bending

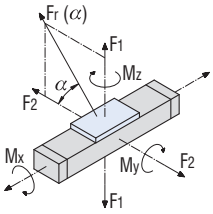



## Load factors

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

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




| LES 6 with two WS 5/70 | |
|---|---|
| $C_0$ | 5153.30 N |
| C | 2319.41 N |
| $F_1$ stat. | 4401.33 N |
| $F_1$ dyn. | 1980.96 N |
| $F_2$ stat. | 5153.30 N |
| $F_2$ dyn. | 2319.14 N |
| $M_x$ stat. | 211.54 Nm |
| $M_y$ stat. | 164.31 Nm |
| $M_z$ stat. | 192.39 Nm |
| $M_x$ dyn. | 95.21 Nm |
| $M_y$ dyn. | 73.95 Nm |
| $M_z$ dyn. | 86.59 Nm |

| 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 |

## permissible spindle speeds

| LES 4 / 5 / 6 | Spindle pitch [mm] | 2.5 | 4 | 5 | 10 | 20 |
|---|---|---|---|---|---|---|
| Profil length L [mm] | max. permissible feed speed [rpm] | max. permissible feed speed v permissible [mm/s] | | | | |
| 490 | 4000 | 167 | 267 | 333 | 667 | 1333 |
| 990 | 3000 | 125 | 200 | 250 | 500 | 1000 |
| 1390 | 1500 | 63 | 100 | 125 | 250 | 500 |
| 1490 * | 3000 | 125 | 200 | 250 | 500 | 1000 |
| 1990 * | 1650 | 69 | 110 | 138 | 275 | 550 |
| 2490 * | 1050 | 44 | 70 | 88 | 175 | 350 |
| 2990 * | 750 | 31 | 50 | 63 | 125 | 250 |

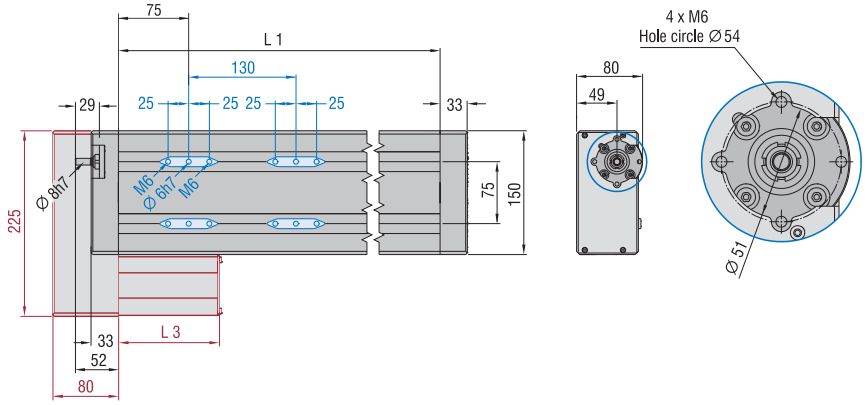
* with spindle support

## dimensioned drawing

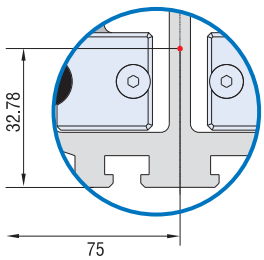
process travel

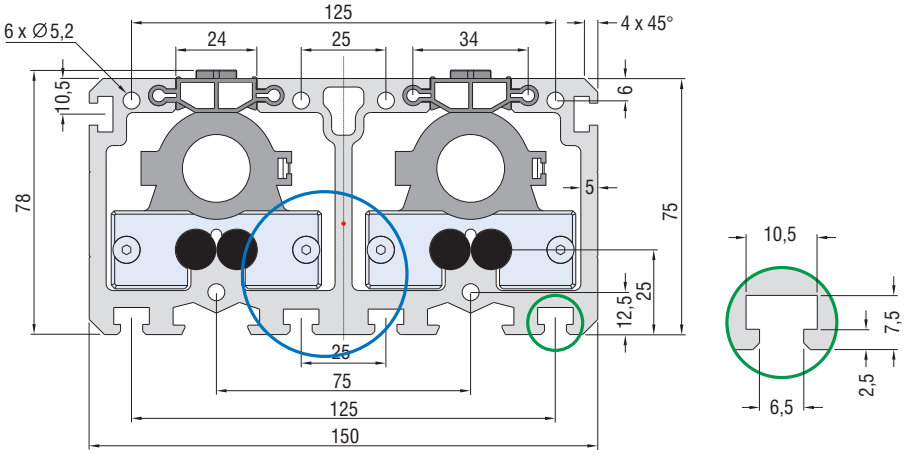
at 2xWS 5/70 = L1 -150 mm
at 4xWS 5/70 = L1 -280 mm

external limit switches see page **2-83**




## dimensioned drawing
### Aluminium profile



mechanics

# Linear units
## with spindle drive

# LES 5


LES 5 with integrated belt drive module

## Features

- Aluminium shaft housing profile W225 × H75 mm, naturally anodised
- Clamping area and profile underside milled flat
- With 4 precision steel shafts Ø 12 h6, material Cf53, Hardness 60 ± 2 HRC
- Aluminium shaft slides WS 5/70, 2 x WS 5/70 (70 mm long), adjustable for no play, central lubrication system
- Recirculating ball drive 2.5/4/5/10 and 20 mm pitches
- Profile sealing with friction-resistant lip seals
- Cast aluminium end plates
- With 2 limit or reference switches, Repeat accuracy ± 0.02 mm
- Sealed angular contact bearings in drive - steel flange

## Ordering key

**234 XXX 0XXX**

**Drive**
3 = Preparation Direct drive modules
4 = Preparation Belt drive module

**Shaft slides**
0 = 2 Shaft slides 70 mm
2 = 4 Shaft slides 70 mm

**Recirculating ball drive**
0 = without
1 = Pitch 2.5 mm
2 = Pitch 4.0 mm
3 = Pitch 5.0 mm
4 = Pitch 10 mm
5 = Pitch 20 mm

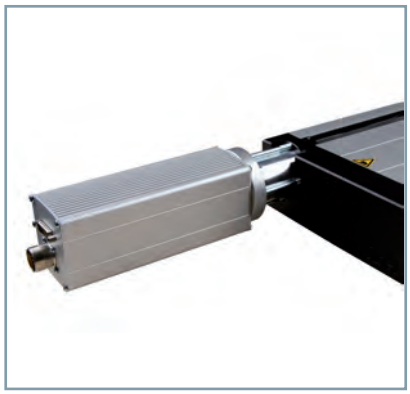
**Profile length (L1)**
e.g. 029 = 290 mm (min.)
299 = 2990 mm (max.)
(rounded to the last digit)
Standard profile lengths available in 100 mm raster

Options:
- Black powder-coated aluminium profile
- Electromagnetic brake
- Steel slides LS2 (Part no. 223007)
- Limit switch attachment kit (see accessories)

Available on request:
- Length measuring system
- Bellows gaiter cover

## Drive modules

see pages 2-66 et seq. of the catalogue



## Technical specification
### Aluminium profile

| Aluminium profile LES 5 | |
|---|---|
| Moment of inertia $I_x$ | 2,361.654 cm$^4$ |
| Moment of inertia $I_y$ | 298.925 cm$^4$ |
| *Centre of gravity see dimensioned drawing | 33.39 mm |
| Cross-sectional area | 42.49 cm$^2$ |
| Material | AlMgSiO, 5F22 |
| Anodising | E6/EV1 |
| Weight with steel shafts | 13.8 kg/m |
| Weight with steel shafts and spindles | 15.2 kg/m |

## No load running torques

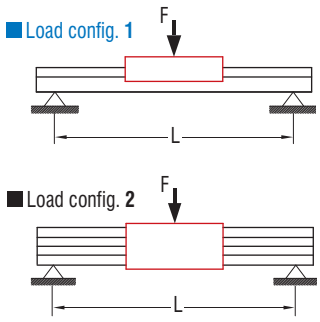
| No load torques (Ncm) | | | | | |
|---|---|---|---|---|---|
| Speed (rpm) | Spindle pitch | | | | |
| | 2.5 | 4 | 5 | 10 | 20 |
| 500 | 15 | 15 | 16 | 17 | 18 |
| 1500 | 19 | 19 | 19 | 20 | 21 |
| 3000 | 23 | 24 | 24 | 25 | 26 |

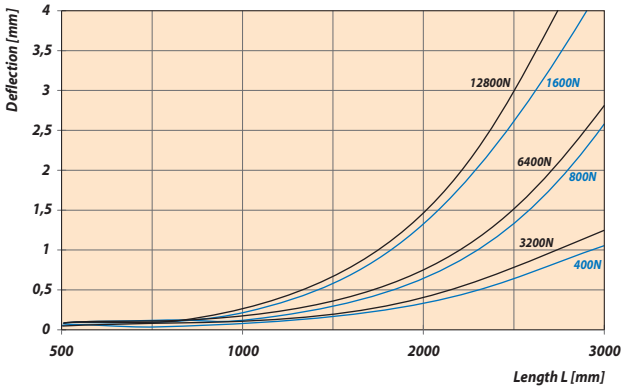
# Linear units
## with spindle drive

# LES 5



## Bending

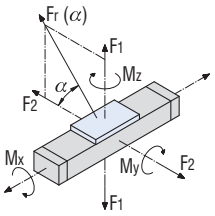



## Load factors

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

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




| LES 5 with two WS 5/70 | |
|---|---|
| $C_0$ | 5153.30 N |
| C | 2319.41 N |
| $F_1$ stat. | 4401.33 N |
| $F_1$ dyn. | 1980.96 N |
| $F_2$ stat. | 5153.30 N |
| $F_2$ dyn. | 2319.14 N |
| $M_x$ stat. | 376.59 Nm |
| $M_y$ stat. | 164.31 Nm |
| $M_z$ stat. | 192.39 Nm |
| $M_x$ dyn. | 169.49 Nm |
| $M_y$ dyn. | 73.95 Nm |
| $M_z$ dyn. | 86.59 Nm |

| 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 |

## Permissible spindle speeds

| LES 4 / 5 / 6 | Spindle pitch p [mm] | 2.5 | 4 | 5 | 10 | 20 |
|---|---|---|---|---|---|---|
| Profil length L [mm] | max. permissible spindle speed n [rpm] | max. permissible feed speed v permissible [mm/s] | | | | |
| 490 | 4000 | 167 | 267 | 333 | 667 | 1333 |
| 990 | 3000 | 125 | 200 | 250 | 500 | 1000 |
| 1390 | 1500 | 63 | 100 | 125 | 250 | 500 |
| 1490 * | 3000 | 125 | 200 | 250 | 500 | 500 |
| 1990 * | 1650 | 69 | 110 | 138 | 275 | 550 |
| 2490 * | 1050 | 44 | 70 | 88 | 175 | 350 |
| 2990 * | 750 | 31 | 50 | 63 | 125 | 250 |

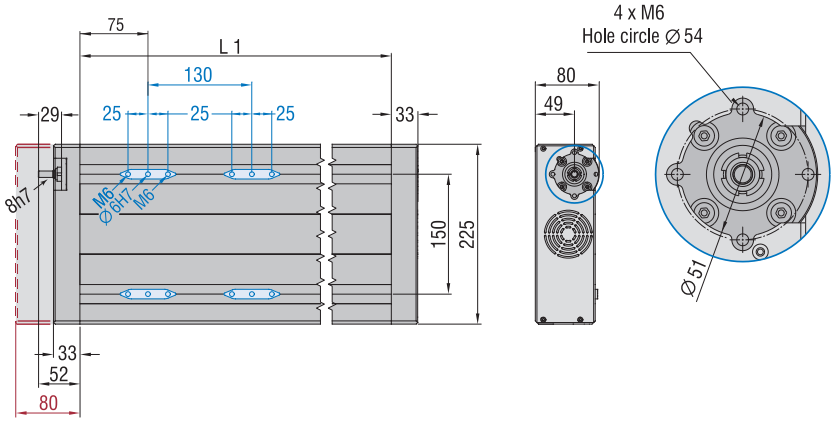
* with spindle support

## Dimensioned drawing

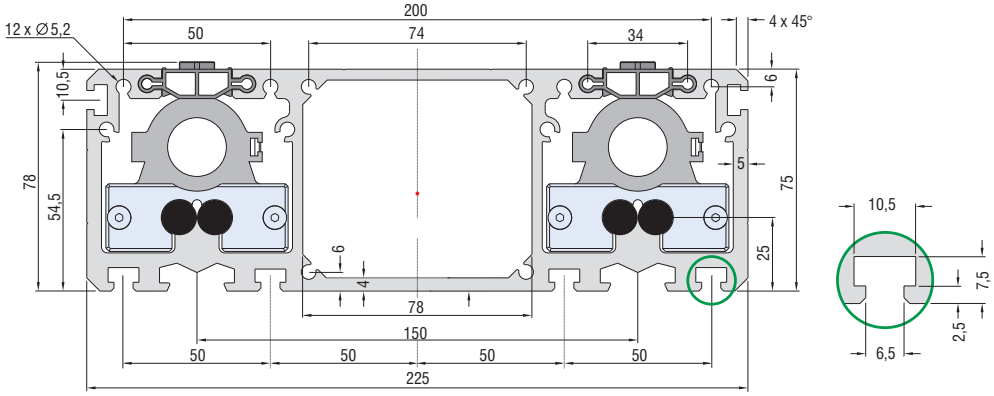
Process travel

at 2xWS 5/70 = L1 -150 mm
at 4xWS 5/70 = L1 -280 mm

external limit switches see pages **2-81**

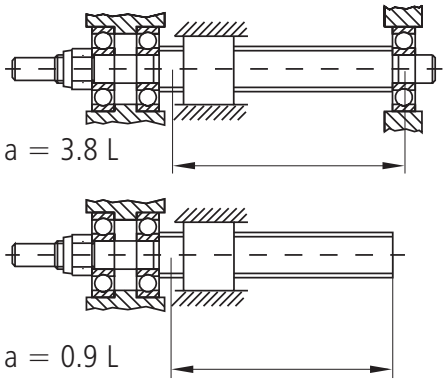



## Dimensioned drawing
### Aluminium profile



# Theoretically critical speed

## Calculations




### Definitions

| | | |
|---|---|---|
| $n_{perm.}$ | [$min^{-1}$] | maximum permissible speed |
| a | | Installation coefficient |
| $d_2$ | [mm] | Spindle core diameter |
| L | [mm] | Spindle length between the spindle bearings and spindle ends |

## Critical speed

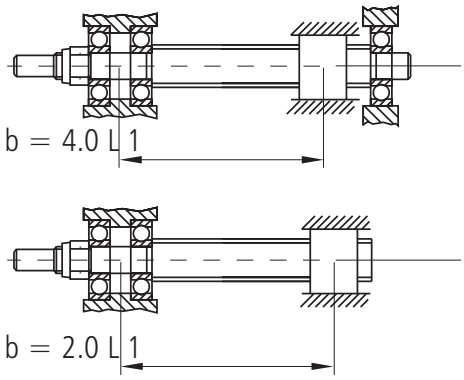
In most applications, you need to check tapped spindles at their critical speed.

The critical speed is that speed which causes resonance oscillations of this spindle.

This critical speed depends on the core diameter, the free load-bearing length and on the way the tapped spindle is constructed.

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

$$n_{perm} = 392 \bullet \frac{a \bullet d_2}{L^2} 10^5$$




### Definitions

| | | |
|---|---|---|
| $F_{perm}$ | [N] | permissible compressive loading |
| $d_2$ | [mm] | Spindle core diameter |
| $L_1$ | [mm] | free buckling length, i.e. the maximum distance between the central bearing and the centre of the tapped nut |
| b | | Installation coefficient |

## Buckling load

The recirculating ball spindle should as far as possible be subjected only to tensile stress. If it is subjected to compressive loads, then the spindle may buckle.

With a safety factor of 3.0 against buckling, the result is

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

# Drive dimensioning

## Calculations

### Drive torque calculation

The required drive torque is made up of
- Load torque $M_{load}$
- Acceleration torques $M_{trans}$ and $M_{rot}$
- No load torque $M_{no\ load}$

$$M_A = M_{load} + M_{trans} + M_{rot} + M_{no\ load}$$

### Load torque

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

with feed force $F_X = m \bullet g \bullet \mu$

### Translational Acceleration torque

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

with feed force $F_a = m \bullet a$

If used vertically, the mass acceleration a must be added to the acceleration due to gravity g (9.81 $m/s^2$).

### Rotational acceleration torque

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

### Drive power

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

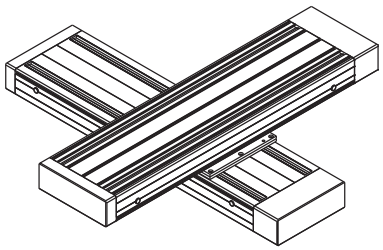
### Definitions

| | | |
|---|---|---|
| $M_A$ | [Nm] | required drive torque |
| $M_{leer}$ | [Nm] | Torque, resulting from the various loads |
| $M_{leer}$ | [Nm] | No load torque |
| $M_{rot}$ | [Nm] | Rotational acceleration torque |
| $M_{trans}$ | [Nm] | translational acceleration torque |
| Fx | [N] | Feed force |
| g | [$m/s^2$] | Acceleration due to gravity |
| $v_{max}$ | [m/s] | maximum process speed |
| m | [kg] | The weight tob e conveyed |
| a | [m/s2] | Acceleration |
| p | [mm] | Spindle pitch |
| P | [kW] | Power |
| L | [mm] | Lenght |
| $n_{max}$ | [rpm] | maximum speed |
| $\mu$ | | coefficient of friction |
| $J_{sp}$ | [$kgm^2/m$] | Inertial torque of inertia of the spindle per meter |
| $F_a$ | [N] | Accelerating force |

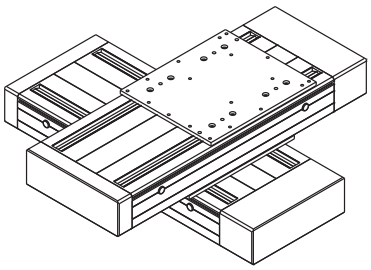
### Mechanical specification

| Linear unit | LES 4 | LES 5 | LES 6 |
|---|---|---|---|
| Aluminium profile WxH (mm) | 75 x 75 | 225 x 75 | 150 x 75 |
| Guide weight (kg/m) | 6.2 | 13.8 | 11.4 |
| Moment of inertia $I_x$ ($cm^4$) | 126 | 299 | 212 |
| Moment of inertia $I_y$ ($cm^4$) | 107 | 2362 | 707 |
| Weight with spindle (kg/m) | 7.6 | 15.2 | 12.8 |
| Guide slides | 1x WS 5-70<br>2x WS 5-70 | 2x WS 5-70<br>4x WS 5-70 | |
| Slide weight (kg) | 0.34 / 0.68 | 0.68 / 1.36 | |
| Spindle pitch (mm) | 2.5 / 4 / 5 / 10 / 20 | | |
| Max. permissible feed force (N) | 2626 / 3450 / 3450 / 3150 / 1425 | | |
| Repeat accuracy (mm) | ± 0.02 | | |
| Process path (mm) | L 1 - 150 / L 1 - 280 | | |
| Noise level (dBA) | < 85 | | |
| Storage temperature range (°C) | 0 – 40 | | |
| Operating temperature range (°C) | 0 – 60 (80) | | |
| Relative air humidity (%) | < 90 | | |

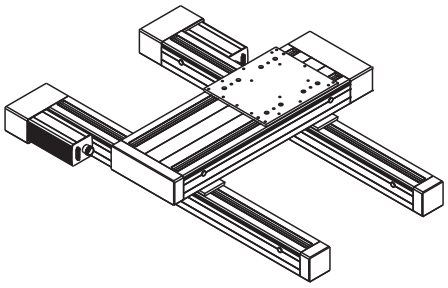
# Combination examples



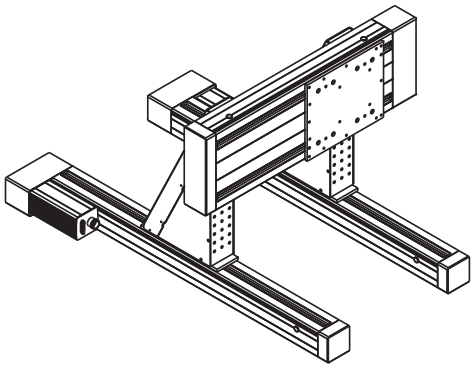
## Crossbench
2 × LES 5
PS 4 with VP 2
Slide on slide assembly



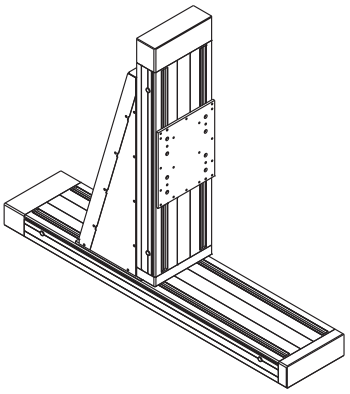
## Crossbench
2 × LES 5
VP 2 with PS 4



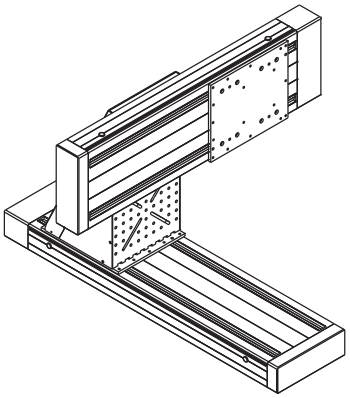
## 2-axis H-design
2 x LES 4, LES 5, 2 x PS 6, PS 4,
gantry mode



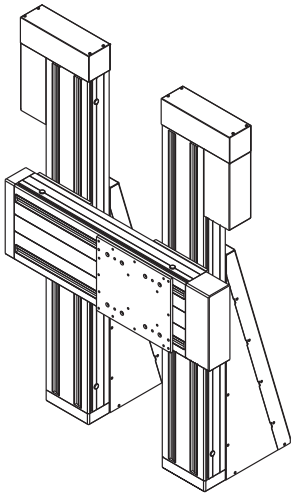
## 2-axis flatbed configuration
2 x LES 4, LES 5, 2 X PS 2
2 x WV 2, PS 4, gantry mode



## 2-axis lifting configuration
2 × LES 5, 2 × PS 4
WV 6

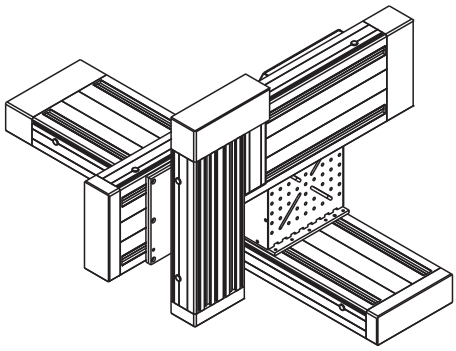


## 2-axis boom configuration
2 × LES 5
2 × PS 4
WV 3



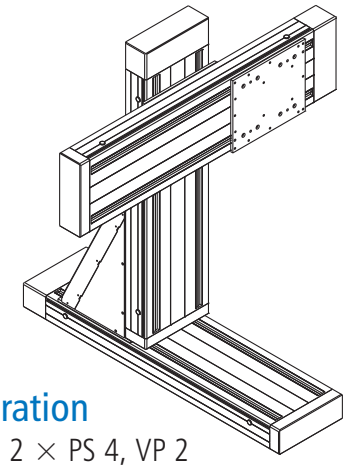
## 2-axis H-design
LES 5, 2 x LES 6, 2 x WV 7,
2 x PS 12, PS 4, gantry mode

# Combination examples



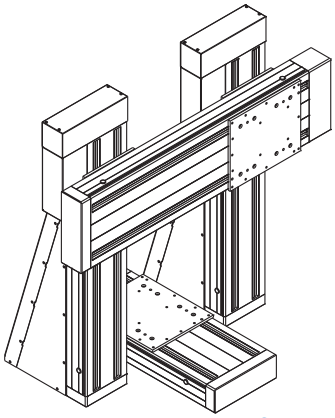
## 3 axis boom configuration

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



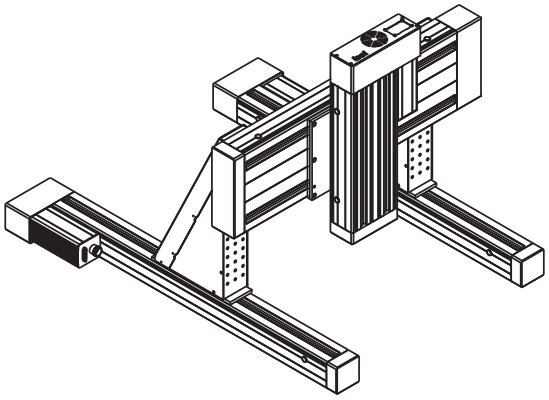
## 3-axis raised boom configuration

3 × LES 5, WV 3, 2 × PS 4, VP 2



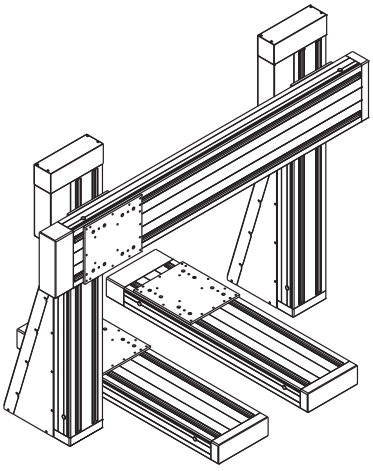
## 3-axis portal configuration

2 x LES 5, 2 x LES 6, 2 x WV 7,
2 x PS 4, PS 12, gantry mode



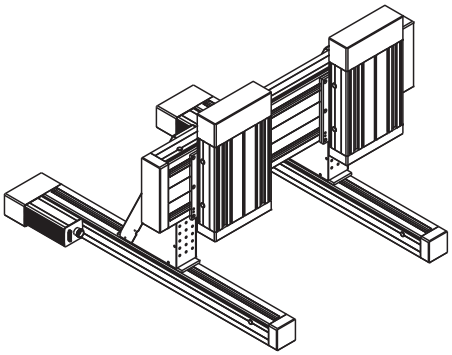
## 3-axis flatbed configuration

2 x LES 4, LES 5, LES 6, 2 x PS 2, 2 x WV 2,
PS 4, PS 7, gantry mode



## 4-axis portal configuration

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



## 5-axis flatbed configuration

2 x LES 5 (Z-axis), LES 5 (2 spindle drives)
2 x LES 4, 2 x PS 2, 2 x WV 2,
2 x PS 4 with VP 2

# Motor modules

## Ordering overview

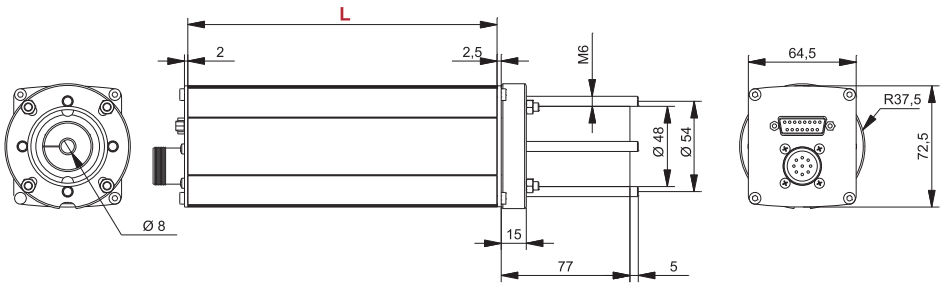
| LES 4/5/6 direct drives | Circular plug | Circular plug with brake | Single axis controller | Multiple axis controller |
|---|---|---|---|---|
| DC servomotor DC 100 | 396112 0060 | - | MC 1-10 | iCU-DC / iPU-DC |
| Stepper motor MS 200 HT - 2 | 396058 0060 | 396058 0260 | IT 116 Flash | iMC-P / iMC-S8 |
| EC servomotor EC 60S | 396415 0060 | 396415 0260 | MC 1-20 | iCU-EC / iPU-EC |
| EC servomotor EC 60L 48V | 396423 0060 | - | MC 1-20 | iCU-EC / iPU-EC |
| EC servomotor EC 60L 310V | 396423 0070 | 396423 0270 | MC 1-40 | iCU-EC / iPU-EC |
| EC servomotor EC 86L | 396466 0070 | - | MC 1-40 | Switching cabinet |
| EC servomotor EC 86S | 396444 0070 | - | MC 1-40 | Switching cabinet |
| Stepper motor MS 300 HT - 2 | 396082 0060 | 396082 0260 | iMC-S8 | iMC-S8 |
| Stepper motor MS 600 HT | 396085 0060 | - | iMC-S8 | iMC-S8 |
| Stepper motor MS 900 HT | 396088 0060 | - | iMC-S8 | iMC-S8 |
| **LES 5 integrated** | **Circular plug** | **Circular plug with brake** | **Single axis controller** | **Multiple axis controller** |
| Stepper motor MS 200 HT - 2 | 396058 1060 | 396058 1260 | IT 116 Flash | iMC-P / iMC-S8 |
| DC servomotor DC 100 | 396112 1060 | - | MC 1-10 | iCU-DC / iPU-DC |
| EC servomotor EC 60S | 396415 1060 | 396415 1260 | MC 1-20 | iCU-EC / iPU-EC |
| EC servomotor EC 60L 48V | 396423 1060 | - | MC 1-20 | iCU-EC / iPU-EC |
| EC servomotor EC 60L 310V | 396423 1070 | 396423 1270 | MC 1-40 | Switching cabinet |
| **LES 4/LES 6**<br>side mounting | **Circular plug** | **Circular plug with brake** | **Single axis controller** | **Multiple axis controller** |
| Stepper motor MS 200 HT - 2 | 396058 2060 | 396058 2260 | IT 116 Flash | iMC-P |
| DC servomotor DC 100 | 396112 2060 | - | MC 1-10 | iCU-DC |
| EC servomotor EC 60S | 396415 2060 | 396415 2260 | MC 1-20 | iCU-EC |
| EC servomotor EC 60L 48V | 396423 2060 | - | MC 1-20 | iCU-EC |
| EC servomotor EC 60L 310V | 396423 2070 | 396423 2270 | MC 1-40 | iCU-EC |

# Motor modules

## dimensioned drawing

### Motor module 1

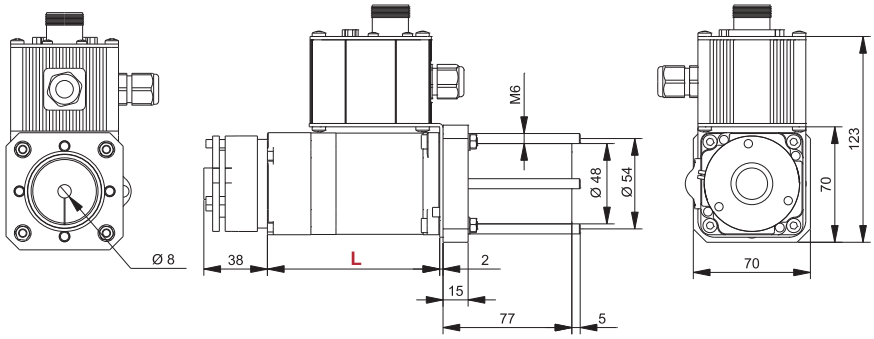
| Part no. | Motor module | Length L |
|---|---|---|
| 396112 0060 | DC 100 | 185 mm |
| 396058 0360 | MS 200 HT-2 with brake | 165 mm |
| 396058 0060 | MS 200 HT-2 without brake | 105 mm |




## dimensioned drawing

### EC 60

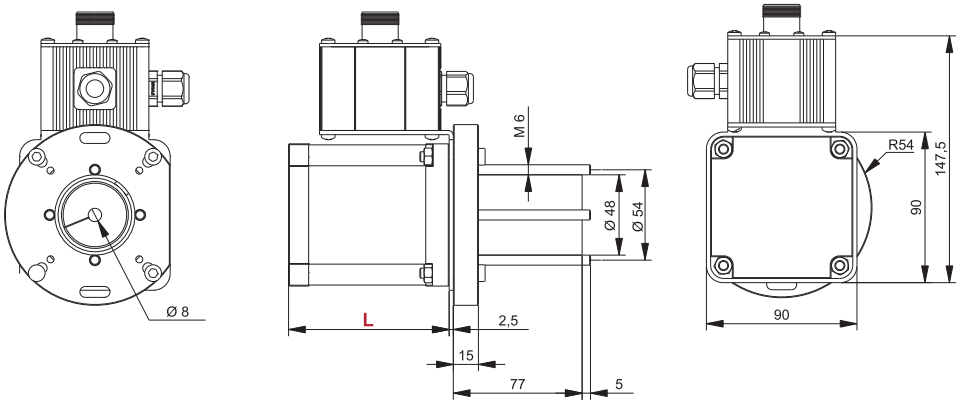
| Part no. | Motor module | Length L |
|---|---|---|
| 396415 0260 | EC 60S with brake | 99 mm |
| 396415 0060 | EC 60S without brake | 99 mm |
| 396423 0060 | EC 60L 48V | 120 mm |
| 396423 0070 | EC 60L 310V | 120 mm |




## dimensioned drawing

### Motor module 2

| Part no. | Motor module | Length L |
|---|---|---|
| 396466 0070 | EC 86L | 151 mm |
| 396444 0070 | EC 86S | 126 mm |
| 396085 0060 | MS 600HT | 96 mm |
| 396088 0060 | MS 900 HT | 126 mm |



# Clutch housing

Drive element accessories

## Connection options

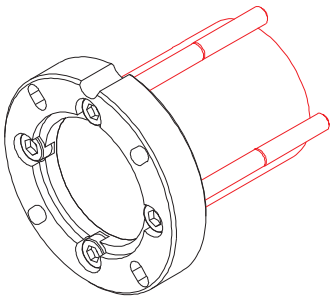
Direct drive preparation

| Connecting options Direct drive | LES 4 | LES 6 | LES 5 | Angular gear fixing 0° | Angular gear fixing 90° |
|---|---|---|---|---|---|
| MS 200 HT-2<br>DC 100<br>EC 60 | Connection via coupling casing 1<br>short sleeve<br>with adequate shaft coupling | | | | Coupling casing 1<br>long sleeve |
| MS 600 HT<br>MS 900 HT<br>EC 86 | Connection via coupling casing 2<br>short sleeve<br>with adequate shaft coupling | | | | Coupling casing 2<br>long sleeve |
| Angular gear fixing 0° | split coupling casing<br>short sleeve<br>with adequate shaft coupling | | | Connection via transmission shaft set | |
| Angular gear fixing 90° | split coupling casing<br>short sleeve<br>with adequate shaft coupling | | | | |

## Ordering overview

Clutch housing

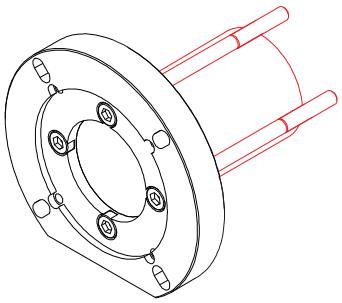
### Clutch housing 1



short sleeve
Part no.: 218 100 0001

long sleeve
Part no.: 218 100 0002

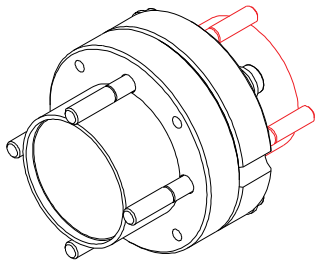
### Clutch housing 2



short sleeve
Part no.: 218 100 1001

long sleeve
Part no.: 218 100 1002

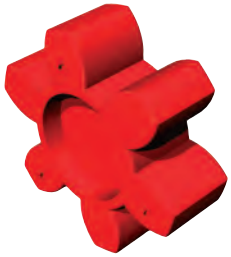
### Split clutch housing



short sleeve
Part no.: 218 100 2001

long sleeve
Part no.: 218 100 2002

## Clutches

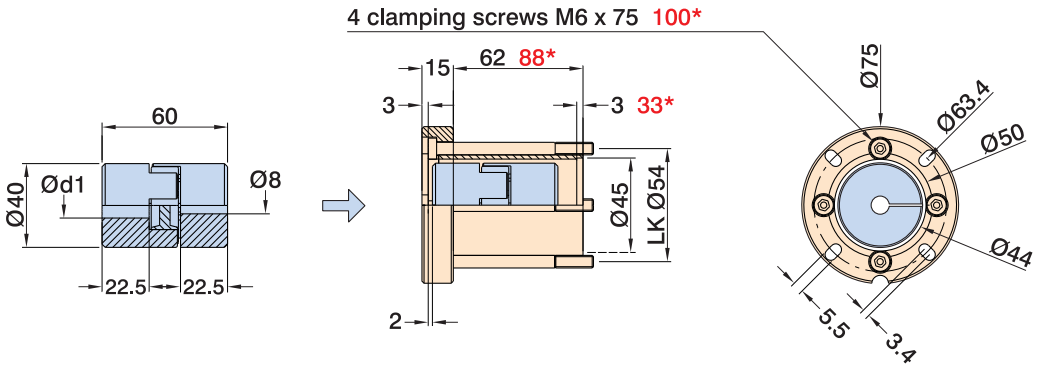


| coupling | Item no.: | $d_1$ | $d_2$ |
|---|---|---|---|
| 20/30 | 218 001 5060 | 5,0 | 6,0 |
| | 218 001 9999 | from 4 to 7 mm | |
| 30/40 | 218 002 6380 | 6,35 | 8,0 |
| | 218 002 8080 | 8,0 | 8,0 |
| | 218 002 9999 | from 6 to 13 mm | |
| 40/60 | 218 003 9580 | 9,52 | 8,0 |
| | 218 003 9999 | from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

# Clutch housing

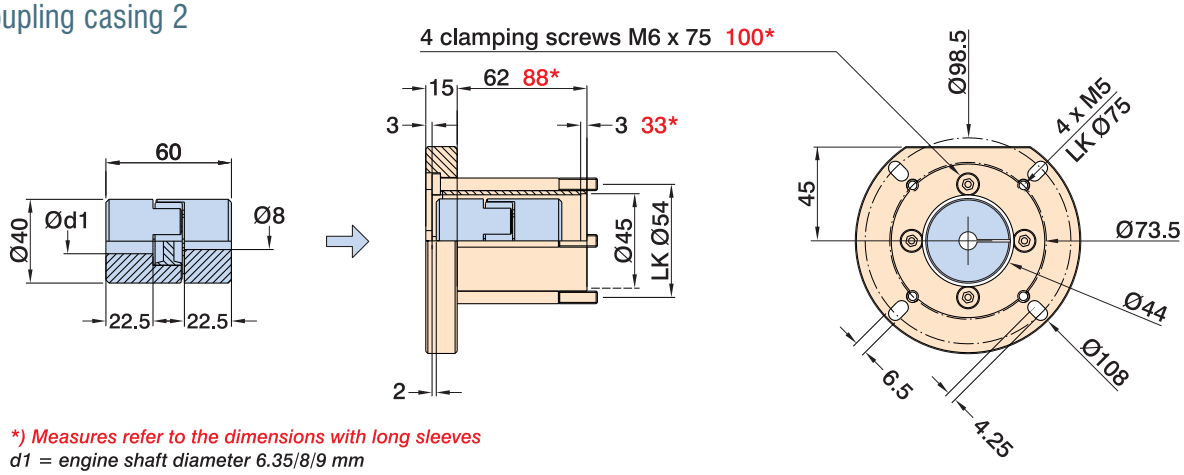
## Drive element accessories

### dimensioned drawing
Coupling casing 1



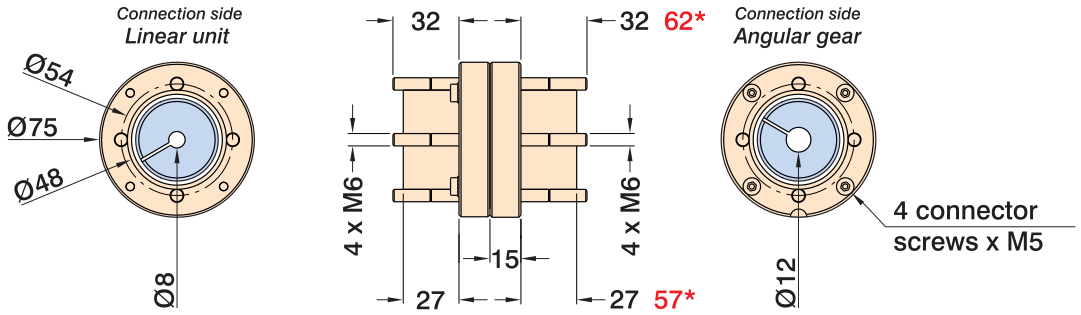

*) Measures refer to the dimensions with long sleeves
d1 = engine shaft diameter 6.35/8/9 mm
Suitable shaft coupling WK 40/60 on page 2-68 (not included in scope of delivery)

### dimensioned 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 2-68 (not included in scope of delivery)

### dimensioned drawing
Split coupling casing

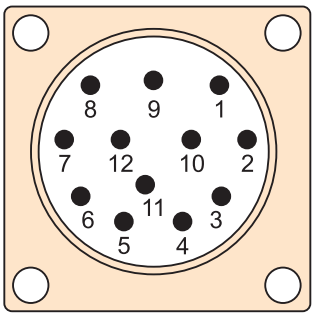



*) Measures refer to the dimensions with long sleeves
Suitable shaft coupling WK 40/60 on page 2-68 (not included in scope of delivery)

# Motor pin assignments

## Pin assignment for stepper motors

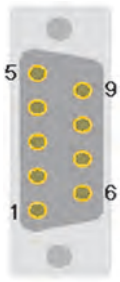
Motor connection




View of pin insert at the insertion side

| M23 12-pin Pin | |
|---|---|
| 1 | Motor phase 1A |
| 2 | Motor phase 1B |
| 3 | Motor phase 2A |
| 4 | Motor phase 2B |
| 5 | +24V switch |
| 6 | +24V brake |
| 7 | GND switch |
| 8 | GND brake |
| 9 | Limit switch 1 |
| 10 | Limit switch 2 |
| 11 | --- |
| 12 | --- |
| Housing - cable shield | |

Motor connection

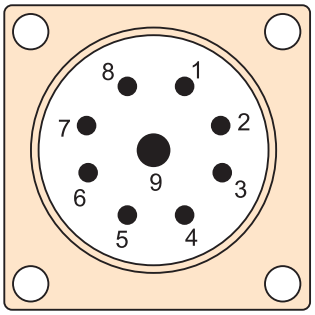



View of pin insert
on the socket side

| Sub-D 9-pin Pin | |
|---|---|
| 1 | Motor phase 1A |
| 2 | Motor phase 1B |
| 3 | Motor phase 2A |
| 4 | Motor phase 2B |
| 5 | +24V switch |
| 6 | +24V brake |
| 7 | Limit switch 2 |
| 8 | GND brake |
| 9 | Limit switch 1 |
| Housing - cable shield | |

## Pin assignment for DC servo motors with brushes (BDC)

Motor connection

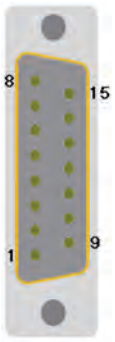



View of pin insert on the socket side

| M23 9-pol. (8+1) pin | |
|---|---|
| 1 | Motor phase 1 (V+) |
| 2 | Motor phase 1 (V-) |
| 3 | Motor phase 1 (V+)* |
| 4 | Motor phase 1 (V-)* |
| 5 | +24V brake |
| 6 | GND brake |
| 7 | --- |
| 8 | --- |
| 9 | Earthing lead |
| Housing - cable shield | |

* Part motor phase connection
also by means of 2 wires.

Encoder connection

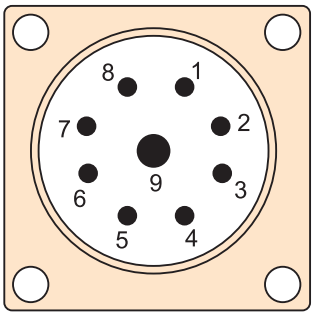



View of pin insert
on the socket side

| Sub-D 15-pin Pin | |
|---|---|
| 1 | --- |
| 2 | +5V encoder |
| 3 | Encoder track/Z |
| 4 | Encoder track/B |
| 5 | Encoder track/A |
| 6 | +24V switch |
| 7 | Limit switch 1 |
| 8 | GND switch |
| 9 | --- |
| 10 | GND encoder |
| 11 | Encoder track Z |
| 12 | Encoder track B |
| 13 | Encoder track A |
| 14 | Reference switch |
| 15 | Limit switch 2 |
| Housing - cable shield | |

## Pin assignment for brushless EC servo motors (BLDC) 48V

Motor connection




View of pin insert on the socket side

| M23 9-pol. (8+1) pin | |
|---|---|
| 1 | Motor phase U |
| 2 | Motor phase V |
| 3 | Motor phase W |
| 4 | --- |
| 5 | +24V brake |
| 6 | GND brake |
| 7 | --- |
| 8 | --- |
| 9 | Earthing lead |
| Housing - cable shield | |

Encoder connection

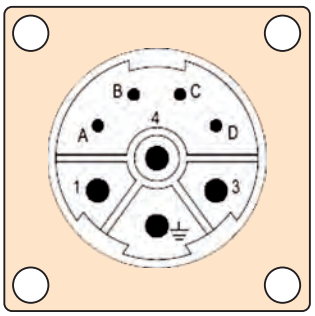

View of pin insert
on the socket side

| Sub-D 15-pin Pin | |
|---|---|
| 1 | Hall signal A |
| 2 | +5V encoder/Hall |
| 3 | Encoder track/Z |
| 4 | Encoder track/B |
| 5 | Encoder track/A |
| 6 | +24V switch |
| 7 | Limit switch 1 |
| 8 | GND switch |
| 9 | Hall signal B |
| 10 | GND encoder |
| 11 | Encoder track Z |
| 12 | Encoder track B |
| 13 | Encoder track A |
| 14 | Hall signal C |
| 15 | Limit switch 2 |
| Housing - cable shield | |

# Motor leads

## Pin assignment for brushless EC servomotors (BLDC) 310V

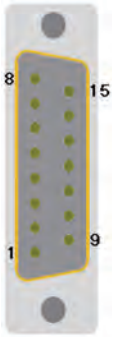
### Motor connection




View of pin insert at the insertion side

| M23 9-pol. (4+3+1) pin | |
|---|---|
| 1 | Motor phase U |
| PE | Earthing lead |
| 3 | Motor phase W |
| 4 | Motor phase V |
| A | +24V brake |
| B | GND brake |
| C | Temp + |
| D | Temp - |
| Housing - cable shield | |

### Encoder connection




View of pin insert
at the insertion side

| Sub-D 15-pin Pin | |
|---|---|
| 1 | Hall signal A |
| 2 | +5V encoder/Hall |
| 3 | Encoder track/Z |
| 4 | Encoder track/B |
| 5 | Encoder track/A |
| 6 | +24V switch |
| 7 | Limit switch 2 |
| 8 | GND switch |
| 9 | Hall signal B |
| 10 | GND encoder |
| 11 | Encoder track Z |
| 12 | Encoder track B |
| 13 | Encoder track A |
| 14 | Hall signal C |
| 15 | Limit switch 2 |
| Housing - cable shield | |

## Overview of motor leads for stepper, DC servo and EC motors*

| Part number | Description |
|---|---|
| 392750 0500 | 5-metre stepper motor lead M23 12-pin plug - socket 1:1 |
| 392755 0500 | 5-metre stepper motor lead D-sub 9-pin plug - M23 12-pin socket |
| 392781 0500 | 5-metre stepper motor lead D-sub 9-pin plug - socket 1:1 |
| 392759 0500 | 5-metre DC/EC servo motor lead M23 9-pin (8 + PE) plug - socket 1:1 |
| 392760 0500 | 5-metre DC/EC servo motor lead M23 9-pin (8+PE) socket - wire end ferrules |
| 392740 0500 | 5-metre encoder lead D-sub 15-pin plug - socket 1:1 |
| 392325 0500 | 5-metre encoder lead M23 17-pin socket - D-sub 15-pin plug |
| 392305 0500 | 3-metre EC/AC servo motor lead M23 310V (4+3+PE) socket - wire end ferrules |
| 392307 0500 | 5-metre EC servo motor lead M23 (4+3+PE) plug - socket 1:1 |

All listed motor and encoder leads are fit for use with tow chains.

* Different lengths available on request!

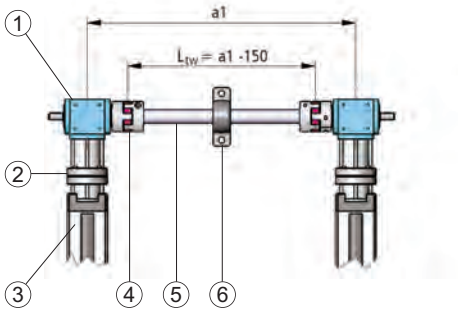
mechanics

# Installation kit with angular transmission

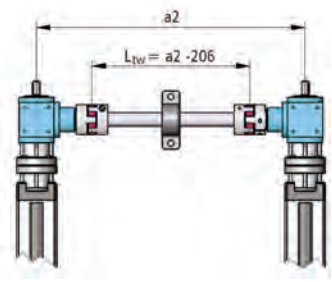
Drive element accessories

## Installation alternatives

Clutch housing kit 90°




Clutch housing kit 0°




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)

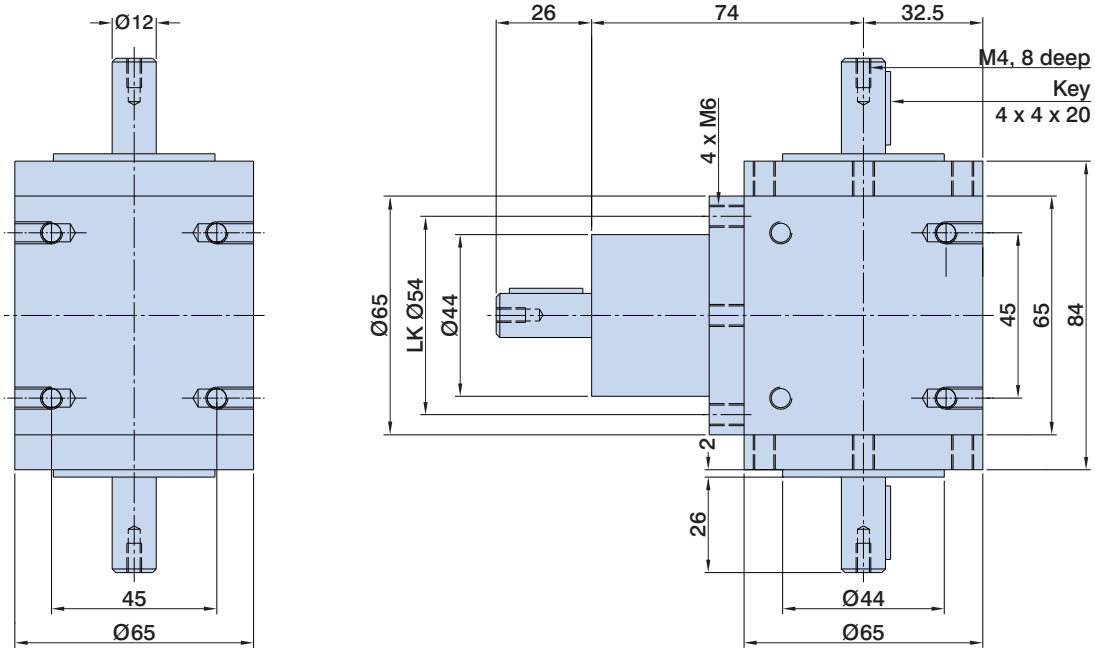
④ Coupling for transmission shaft Ø 25

⑤ Transmission shaft Ø 25

⑥ Pedestal bearing - recommendable from a transmission shaft length of 1,500 mm up

## dimensioned drawing

### Angular transmission




## Ordering overview

### Installation kit with angular transmission

for H-design on LES 4/LES 6/LES 5, 0° mounting
Scope of delivery: 2 x①, 2 x②, 2 x④
Part no.: 216150 0001

for H-design on LES 4/LES 6/LES 5, 90° mounting
Scope of delivery: 2 x①, 2 x②, 2 x④
Part no.: 216150 0002

### Transmission shaft

Hollow shaft Ø 25 mm × 4 mm, blank 1000 mm
Part no.: 219001 0125

Hollow shaft Ø 25 mm × 4 mm, blank 2000 mm
Part no.: 219001 0225

### Coupling/stationary bearing

Coupling for transmission shaft 12 to 25 mm adaptor, VE 2 units
Part no.: 218050 0002

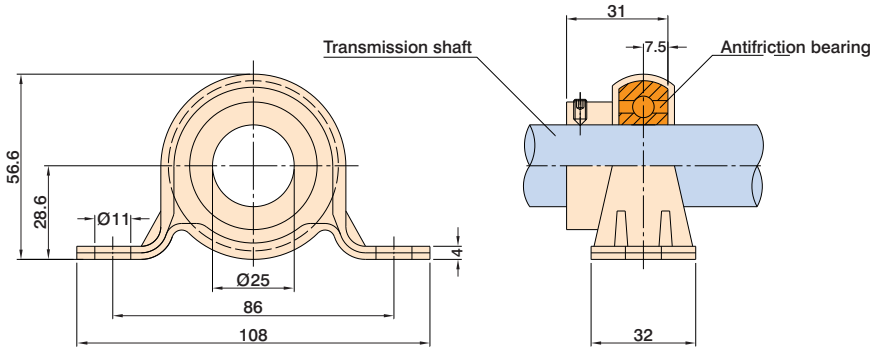
Stationary bearing for transmission shaft VE 1 unit
Part no.: 896202 5562

For matching direct drive modules LES 4/5/6 see table on page 2-66

# Installation kit with angular transmission

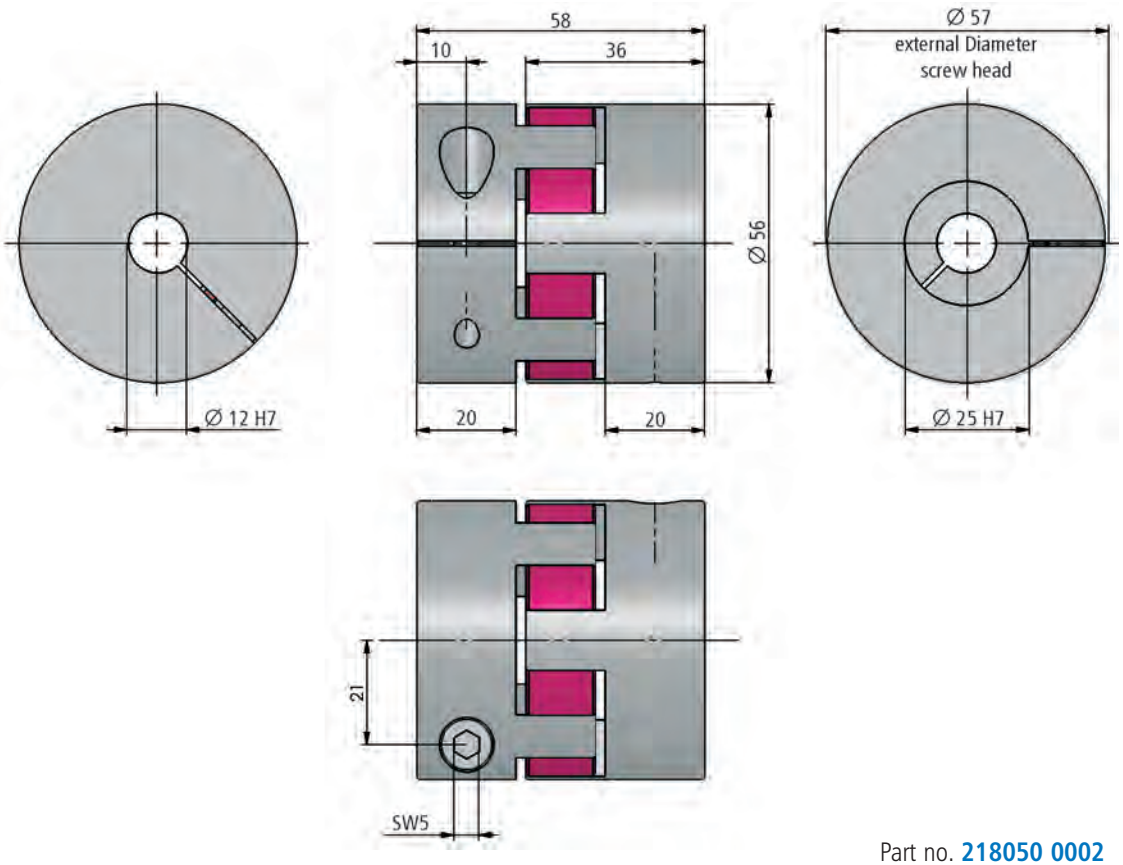
## Drive element accessories

## Dimensioned drawing and technical specification




| Pedestal bearing- to avoid vibrations/to support the transmission shaft (recommendablefrom a transmission shaft length of 1,500 mm up) | |
|---|---|
| Transmissible torque | 18 Nm |
| Weight of coupling | 0.3 kg |
| Weight of shaft | 0.540 kg/m |
| Moment of inertia of both couplings | 2.68 " $10^{-4}$ kgm² |
| Moment of inertia of shaft | 8.171 " $10^{-6}$ kgm²/100 mm |

## Dimensioned drawing - coupling




Part no. **218050 0002**

mechanics

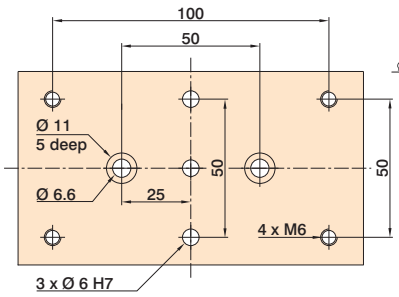
# Slide/crossbench plates

## Connectors

### Hole diagram, slide plate PS 1
L 125 x W 70 x H 7.7 mm

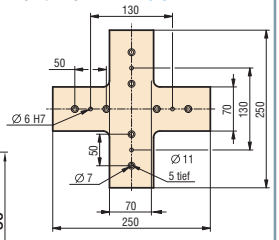
Mounting on:
LES 4 with 1 x WS 5/70

Part no.: **277001**




### Connecting cross 2 x LES 4

Part no.: **277007**

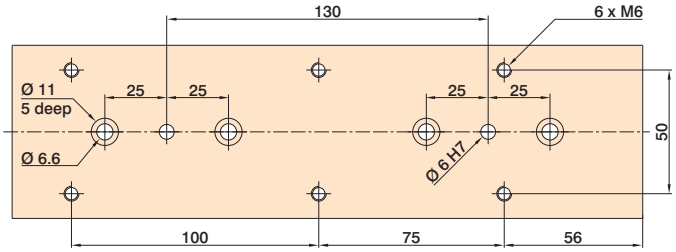



### Hole diagram, slide plate PS 2
L 255 x W 70 x H 7.7 mm

Mounting on:
LES 4 with 2 x WS 5/70

Fixing option for:
Angle bracket WV 2 / WV 5

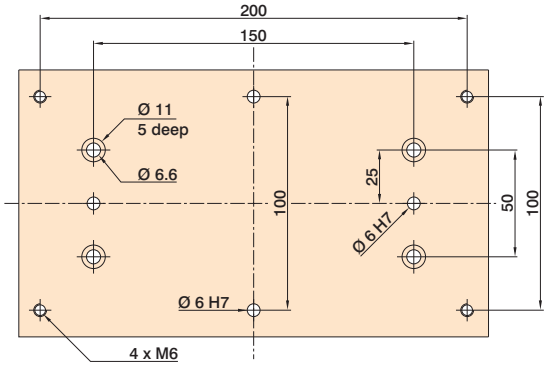
Part no.: **277002**




### Hole diagram, slide plate PS 3
L 220 x W 125 x H 7.5 mm

Mounting on:
LES 5 with 2 x WS 5/70

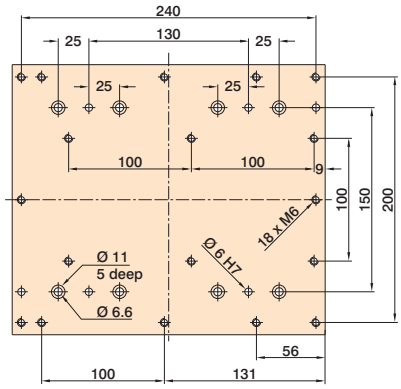
Part no.: **277003**




### Hole diagram, slide plate PS 4
L 225 x W 220 x H 7.5 mm

Mounting on: LES 5 with 4 x WS 5/70
Mounting on crossbench: LES 5 with LES 5 (in conjunction with VP 2) Fixing option for: Angle bracket WV 3 / WV 6

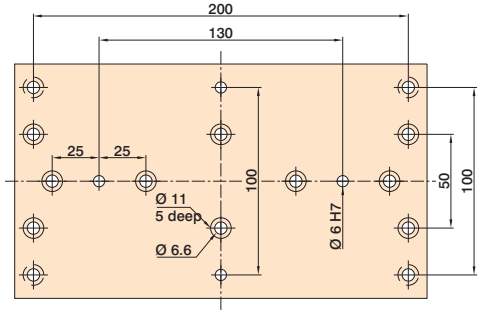
Part no.: **277004**




### Hole diagram, slide plate PS 6
L 220 × W 125 × H 7.5 mm

Mounting on: LES 4 with 2 × WS 5/70
Mounting on crossbench: LES 4 with LES 5 (in conjunction with PS 3). Fixing **option for: LES 4/LES 5**

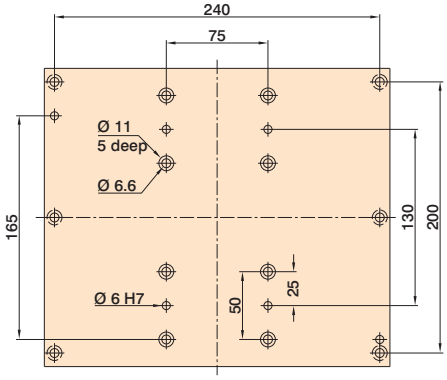
Part no.: **277011**




### Hole diagram, slide plate PS 7
L 255 × W 220 × H 7.5 mm

Mounting on: LES 6 with 4 × WS 5/70
Mounting on crossbench: **LES 6 with LES 5**
**(in conjunction with PS 4)**

Part no.: **277016**



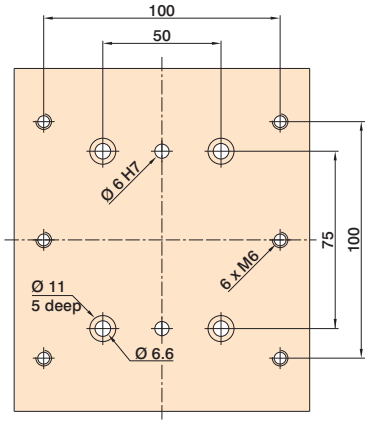
# Slide/crossbench plates

## Connectors

### Hole diagram, slide plate PS 8

L 125 × W 145 × H 7.7 mm

Mounting on:
LES 6 with 2 × WS 5/70 Part no.: **277017**

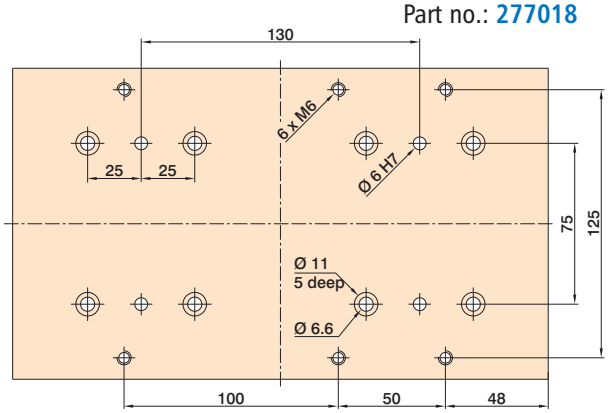



### Hole diagram, slide plate PS 9

L 250 × W 145 × H 7.5 mm

Mounting on: LES 6 with 4 × WS 5/70
Fixing option for: Angle bracket WV 7

Part no.: **277018**

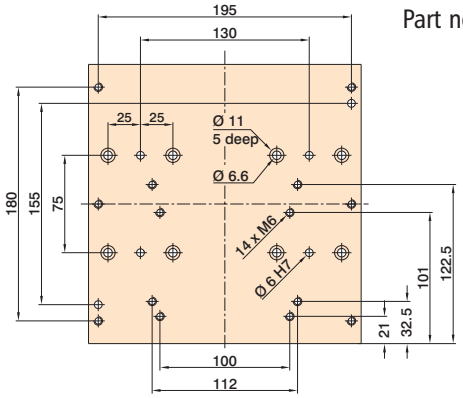



### Hole diagram, slide plate PS 10

L 210 × W 215 × H 7.5 mm

Mounting on: LES 6 with 4 × WS 5/70
Mounting on crossbench: LES 6 with LES 6 (in conjunction with PS 11)

Part no.: **277019**

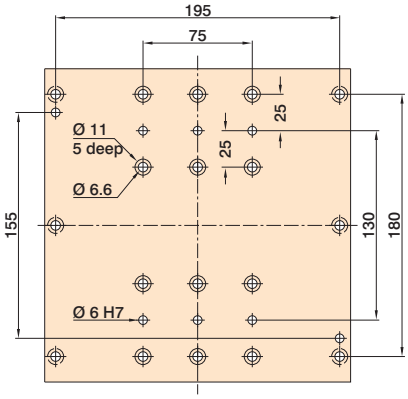



### Hole diagram, slide plate PS 11

L 210 × W 215 × H 7.5 mm

Mounting on: LES 6 with 4 × WS 5/70
Mounting on crossbench: LES6 with LES4 (in conjunction with PS10) Fixing option for: LES 6

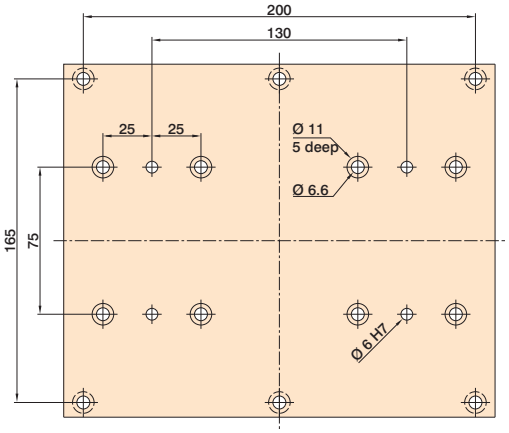
Part no.: **277020**




### Hole diagram, slide plate PS 12

L 220 × W 180 × H 7.5 mm

Mounting on: LES 6 with 4 × WS 5/70
Fixing option for: LES 5 Part no.: **277021**

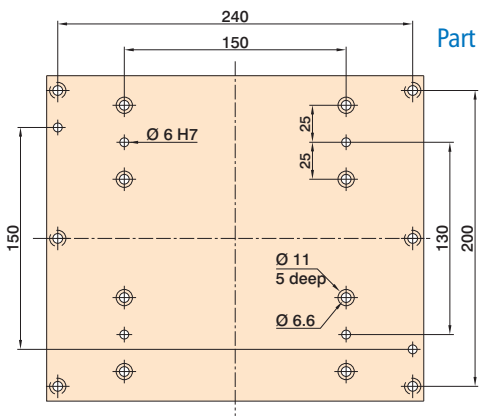



### Hole diagram, connection plate VP 2

L 255 × W 220 × H 7.5 mm

Mounting on: LES 5 with 4 × WS 5/70
Fixing option for: LES 5

Part no.: **277006**



# Slide/crossbench plates

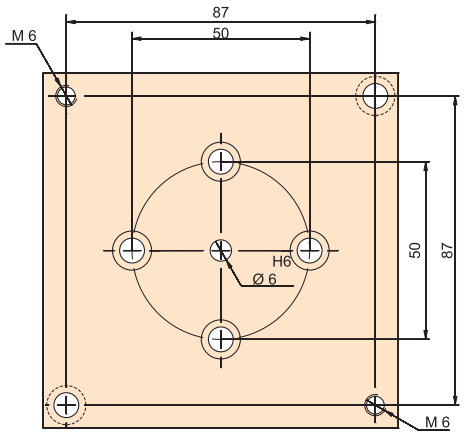
## Connectors

### Hole diagram, slide plate set for crossbench LES 4

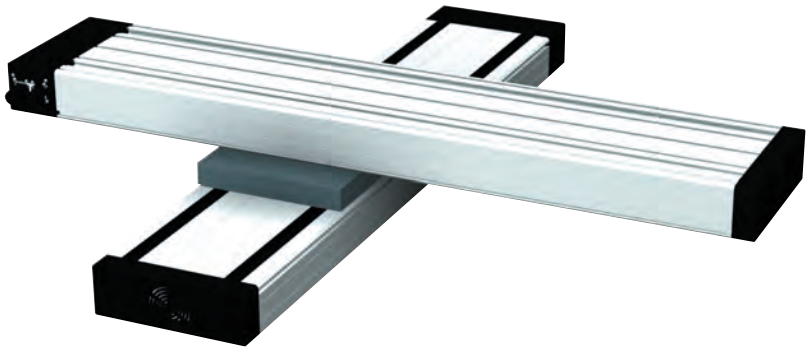
L 100 x W 100 x H 8 mm

Mounting on: LES 4
Fixing option for: LES 4

Part no.: **277008**




## Crossbench connection plates 1



### Crossbench connection plates 1

2 × L 255 × W 220 x H 8 mm

one set from PS 4 and VP 2,
for right-angled connection
two linear guides LES 5

Part no.: **277010**

## Crossbench connection plates 2

### Crossbench connection plates 2

2 x L 220 x W 125 x H 8 mm

one set from PS 3 and PS 6,
for right-angled connection
one linear guide LES 5 with one
linear guide LES 4

Part no.: **277012**

## Additional combination examples

Crossbench LES 5 and LES 6
PS 4 and PS 7

Crossbench 2 × LES 6
PS 10 and PS 11

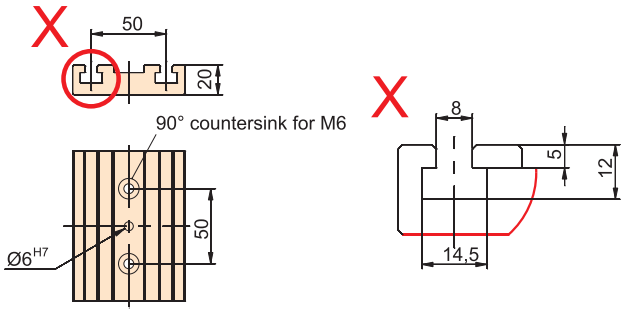
Crossbench LES 4 and LES 6
PS 11 and PS 10

# T-slot slide plates

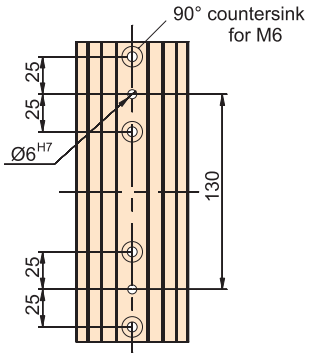
## Connectors

### Hole pattern T-slot plate PT 25 × 250 for LES 4

L 100 x W 75 x H 20 mm
Mounting on: LES 4 with 1 x WS 5/70
Part no.: **277030 0001**

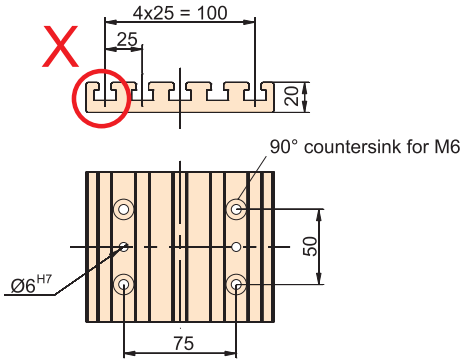



L 200 x W 75 x H 20 mm
Mounting on: LES 4 with 2 x WS 5/70
Part no.: **277030 0002**

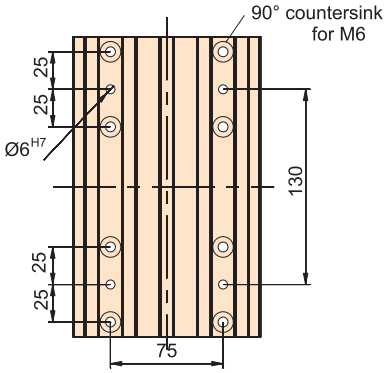



### Hole pattern T-slot plate PT 25 × 250 for LES 6

L 100 x W 125 x H 20 mm
Mounting on: LES 6 with 2 x WS 5/70
Part no.: **277030 0003**

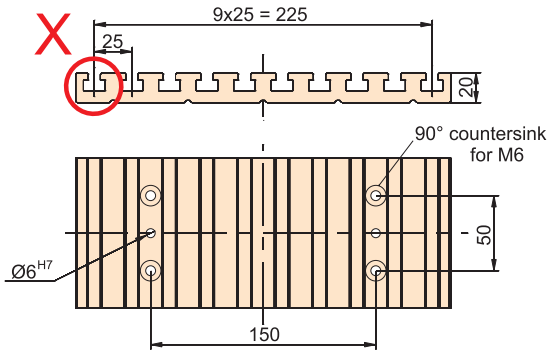



L 200 x W 125 x H 20 mm
Mounting on: LES 6 with 4 x WS 5/70
Part no.: **277030 0004**

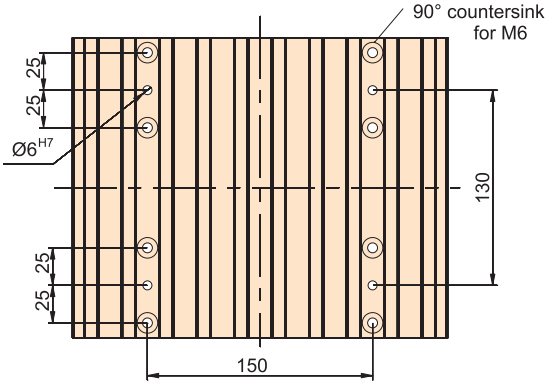



### Hole pattern T-slot plate PT 25 × 250 for LES 5

L 100 x W 250 x H 20 mm
Mounting on: LES 5 with 2 x WS 5/70
Part no.: **277030 0005**



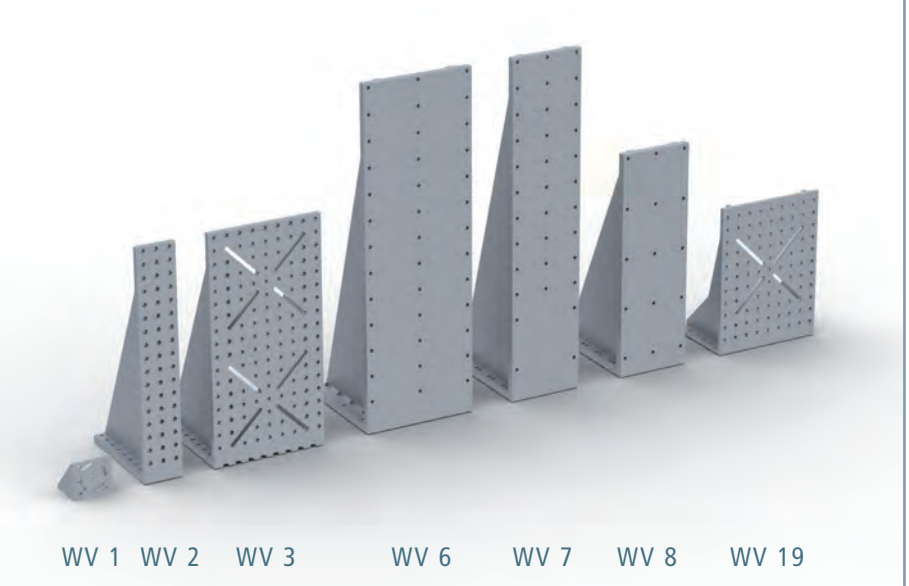

L 200 x W 250 x H 20 mm
Mounting on: LES 5 with 4 x WS 5/70
Part no.: **277030 0006**



# Angle brackets

## Connectors

## Angle bracket with clamping surfaces milled flat



WV 1 WV 2 WV 3 WV 6 WV 7 WV 8 WV 19

Angle bracket **WV 1**
- blank
- Aluminium casting (0.2 kg)
- L71 × W75 × H71

Part no.: **209110 0010**

Angle bracket **WV 2**
- blank
- Aluminium casting (2.6 kg)
- L221 × W75 × H446

Part no.: **209110 0022**

Angle bracket **WV 3**
- blank
- Aluminium casting (5.8 kg)
- L221 × W221× H446

Part no.: **209110 0032**

Angle bracket **WV 6**
- blank
- Aluminium, welded (13.3 kg)
- L220 × W220 × H670

Part no.: **209110 0060**

Angle bracket **WV 7**
- blank
- Aluminium, welded (10.8 kg)
- L220 × W145 × H670

Part no.: **209110 0070**

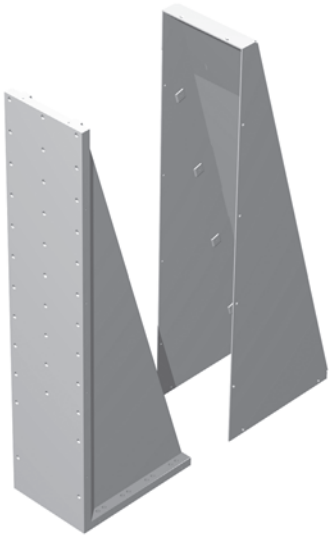
Angle bracket **WV 8**
- blank
- Aluminium, welded (7.4 kg)
- L222 × W145 × H446

Part no.: **209110 0080**

Angle bracket **WV 19**
- blank
- Aluminium, welded (2.5 kg)
- L150 × W221× H300

Part no.: **209110 0190**

## matching cover plates



Cover plate for **WV 2**
- Naturally anodised
- Aluminium sheet, weight 0.8 kg

Part no.: **209110 0021**

Cover plate for **WV 3**
- Naturally anodised
- Aluminium sheet, weight 1.15 kg

Part no.: **209110 0031**

Cover plate for **WV 6**
- Naturally anodised
- Aluminium sheet, weight 1.8 kg

Part no.: **209110 0061**

Cover plate for **WV 7**
- Naturally anodised
- Aluminium sheet, weight 1.5 kg

Part no.: **209110 0071**

Cover plate for **WV 8**
- Naturally anodised
- Aluminium sheet, weight 1 kg

Part no.: **209110 0081**

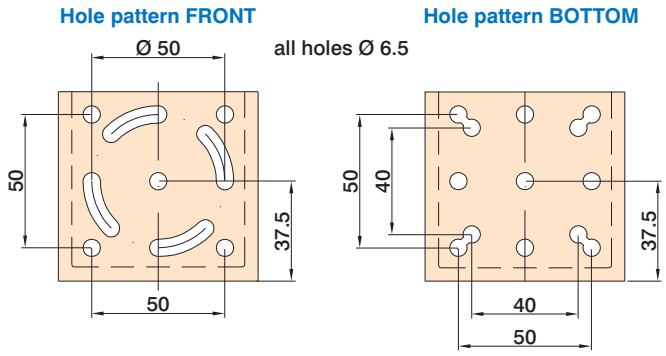
# Angle bracket

## Connectors

### Hole diagram

Angle bracket WV 1

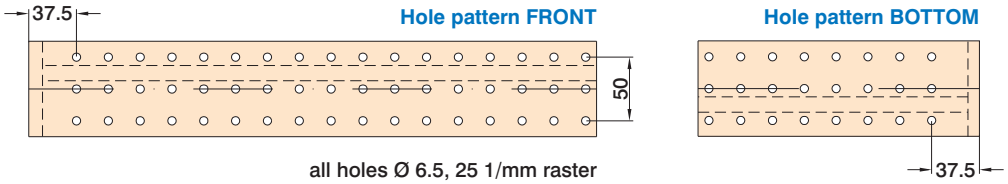
L 71 x W 75 x H 71 mm




### Hole diagram

Angle bracket WV 2

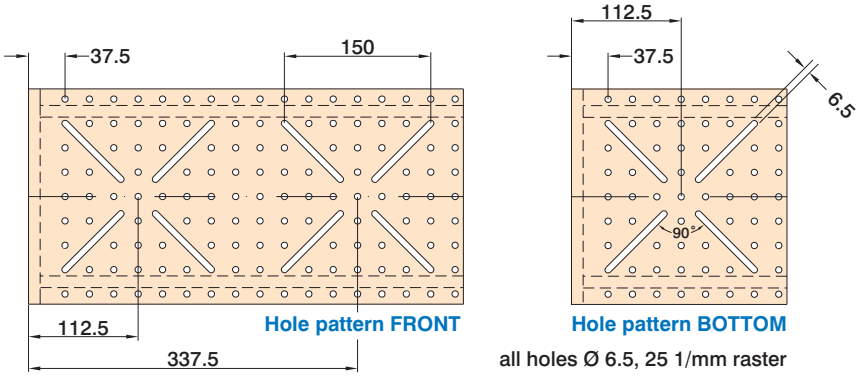
L 221 x W 75 x H 446 mm




### Hole diagram

Angle bracket WV 3

L 221 x W 221 x H 446 mm

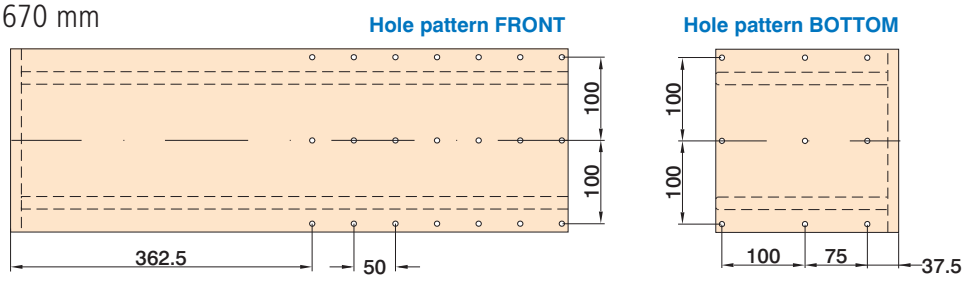


# Angle brackets

Connectors

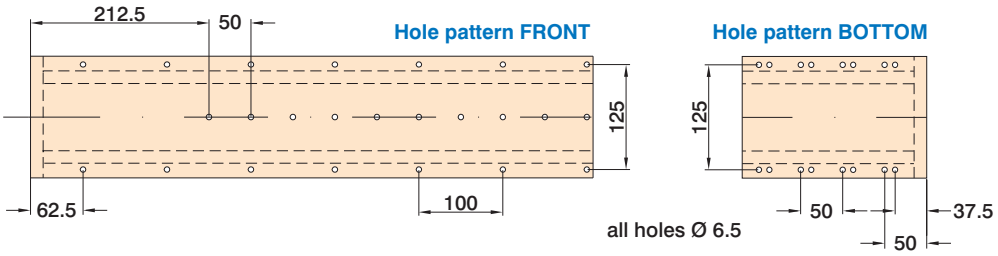
## Hole diagram

Angle bracket WV 6
L 220 x W 220 x H 670 mm



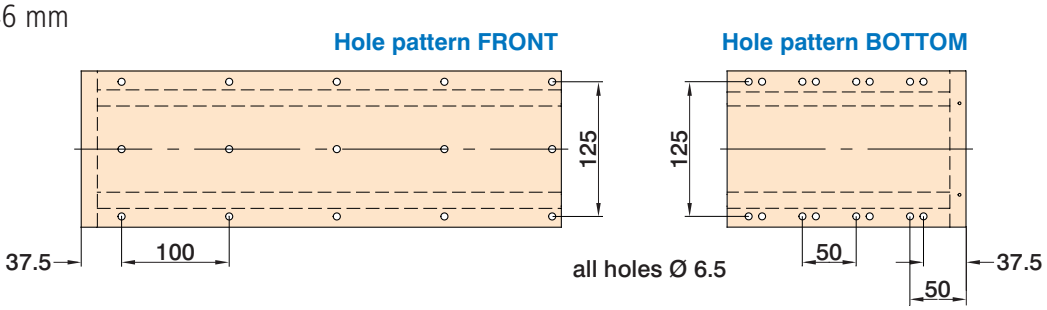

## Hole diagram

Angle bracket WV 7
L 220 x W 145 x H 670 mm



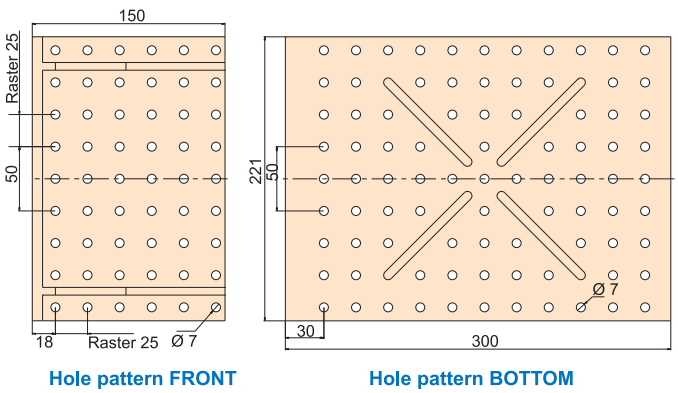

## Hole diagram

Angle bracket WV 8
L 222 x W 145 x H 446 mm




## Hole diagram

Angle bracket WV 19
L 150 x W 221 x H 300 mm



# Accessories

## Energy guidance chain

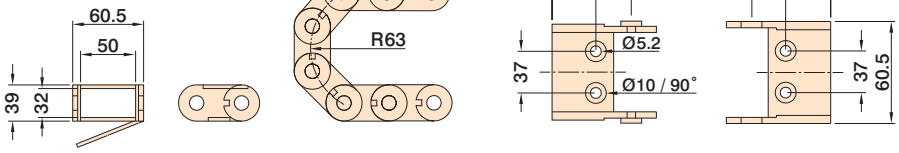
### Energy guide chain 3
- VE 1 unit at 1 m

Part no.: **219204 1000**

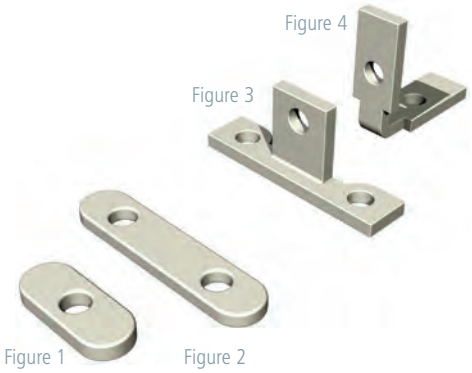
### Connectors for energy chain 3
- with strain relief
- VE 1 kit

Part no.: **219205 0002**

### Dimensioned drawing
Energy guidance chain




## Tapped strips/sliding nuts




### Tapped strips M6 (no figure)
- Galvanised
- Ra 50 mm
- 3 x VE 1 m piece

Part no.: **209011**

### Sliding nut 2 × M6 (Figure 2)
- Galvanised
- VE 50 pieces

Part no.: **209002 0004**

### Special angle sliding nut 3 x M6 (Figure 3)
- Galvanised
- VE 25 pieces

Part no.: **209022 0003**

### Sliding nut M6 (Figure 1)
- Galvanised
- VE 100 pieces

Part no.: **209001 0005**

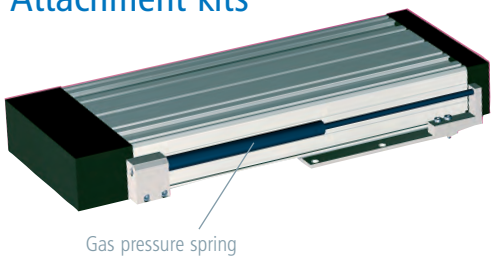
### Angle sliding nut 2 × M6 (Figure 4)
- Galvanised
- VE 25 pieces

Part no.: **209021 0003**

### Sliding nut M5 (no figure)
- Galvanised
- VE 20 pieces

Part no.: **209006 0001**

## Attachment kits

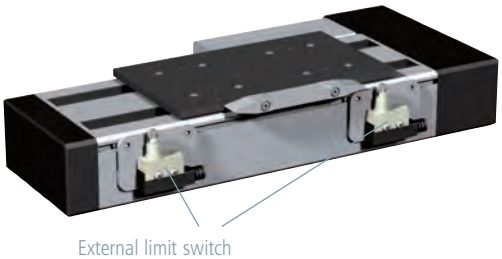



### Gas strut attachment kit
- Hub 220 mm
- Nominal length 490 mm

Part no.: **216450 0001**

### Gas strut attachment kit
- Stroke 300 mm
- Nominal length 690 mm

Part no.: **216451 0001**




### Limit switch attachment kit for LES 4
- for external limit switches
- Process path reduction by approx. 40 mm

Part no.: **216460 0001**

### Limit switch attachment kit LES 6
- for external limit switches
- Process path reduction by approx. 40 mm

Part no.: **216460 0003**

### Limit switch attachment kit LES 5
- for external limit switches
- Process path reduction by approx. 40 mm

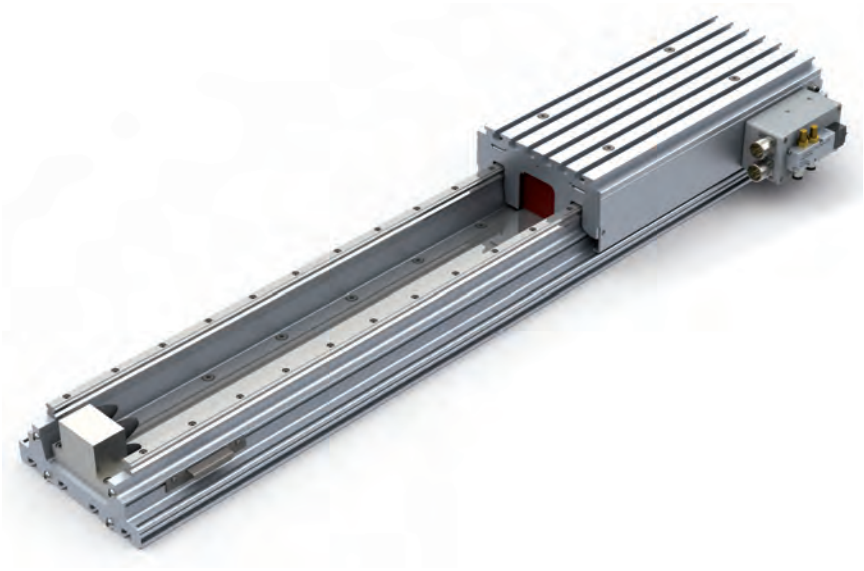
Part no.: **216460 0002**

### Mounting set for sealing air
- for LES4 - LES6

Part no.: **216460 0006**

# Linear unit
## with linear motor

# iLD 50-6



## General

Linear units with linear motors are advantageous in precisely those areas where linear units with typical spindle drives are limited - they achieve high values of acceleration, offer pinpoint positioning and operate practically wear-free due to the absence of mechanical linkages.

Linear motors are increasingly used in linear technology machine tool applications, positioning systems and handling systems. Linear units with profile guides are particularly suitable for use in both machine tools and positioning systems.

isel iLD series linear units are constructed from rigid aluminium profiles. Guides consist of proven guide rails and recirculating ball shaft slots. A magnetic length-measuring system is also included. In this regard, isel linear motor units have the advantage of greater acceleration and higher traverse velocity. Iron-core linear motors can produce very high forces. An integrated brake is offered as an option, to allow the iLD to also be used in the vertical mode. The "made by isel" concept stands for optimum price/performance-ratio. This in turn means very short amortisation periods for customers.

## Ordering data

| Part number | L | L1 |
|---|---|---|
| **237110 0069** | 691 | 181 |
| **237110 0089** | 892 | 382 |
| **237110 0109** | 1094 | 584 |
| **237110 0129** | 1296 | 786 |
| **237110 0149** | 1497 | 987 |
| **237110 0169** | 1699 | 1189 |
| **237110 0190** | 1900 | 1390 |
| **237110 0210** | 2102 | 1592 |
| **237110 0230** | 2304 | 1794 |
| **237110 0250** | 2505 | 1995 |
| **237110 0270** | 2707 | 2197 |
| **237110 0290** | 2908 | 2398 |
| **237110 0311** | 3110 | 2600 |
| **237110 0331** | 3312 | 2802 |
| **237110 0351** | 3513 | 3003 |

## Features

- Robust design in industrial quality
- Pinpoint positioning accuracy
- Wear-free design with no mechanical connecting links
- high dynamic acceleration up to 30 m/s$^2$
- Multi-motor operation with multiple, separately moveable slides
- Extendable to 15 m travel

Options:

- Complete linear unit (see Order Information Table)
- Energy guide chain + guide plate to required length
- Brake MBPS1512ES1
- Motor cable, lengths 3, 5, 10 m
- Encoder cable, lengths 3, 5, 10 m, Linear motor to Metronix output stage
- Control package Metronix ARS 2310 (3-phase, 6 kVA, incl. configuration software)
- Control package Metronix ARS 2105 (1-phase, 2 kVA, incl. configuration software)
- Package B&R ACOPOS 1045 (3-phase, 2 kVA)
- Package B&R ACOPOS 1090 (3-phase, 4kVA)
- Package B&R ACOPOS 1180 (3-phase, 6 kVA)
- Switching unit Metronix output stage
- Drive controller ISEL iMD 40
- CAN CPC 12 positioning module
- Cable set iLD 50-6 for ISEL iMD 40

# Linear unit

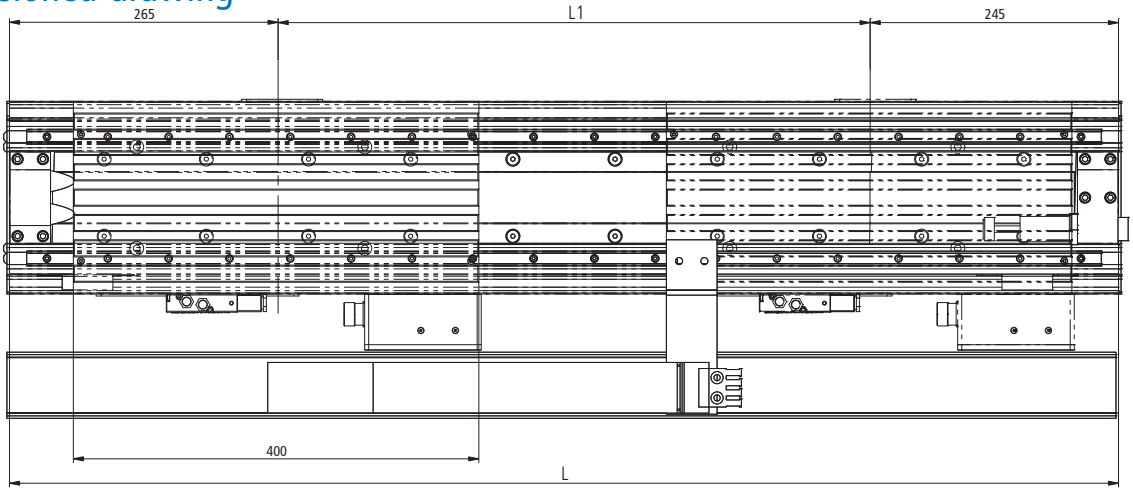
## with linear motor

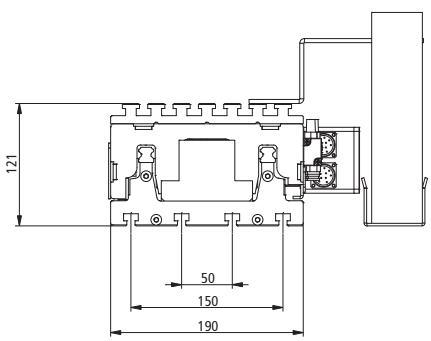
# iLD 50-6

## Technical specification

| | |
|---|---|
| **General** | |
| **Areas of application** | Positioning axes for the semiconductor industry and for general industrial applications, CNC machine axis |
| **Processing speed** (m/s) | to 4.5 |
| **Acceleration** (m/s) | to 30 |
| **Repeatability** (mm) | < 0.01 |
| **Process path** (mm) | 181 to 3003, optionally extendible to 15000 |
| **Drive electronics** | Servo amplifier, communication via CAN bus or analogue input (+/- 10 V) |
| **Maintenance** | Maintenance-free, rapid component replacement (MTTR approx. 2 hours) |
| **Mechanics** | |
| **Profile** | Bend-proof hollow chamber profile (isel ILF 6), straightness of 0.1 mm per 1 m length, Bending max. 0.2 mm per 1 m length under 50 kg load, max. load 100 kg |
| **Guides** | Profile rail guide Series 15 to DIN EN 120/20 |
| **Mechanical brake** (optional) | Profile guide brake, pneumatically operated, Braking power Z-axis < 0.1 mm stationary, 50 mm at full speed |
| **Stop position damping** | Adjustable or parabolic spring for opposite side + pneumatic spring respectively |
| **Installation options** | X-axis, X,Y-axis, Z-axis |
| **Maximum adjustment force** | 285 N |
| **Electronics** | |
| **Limit position switch** | inductive with adjustable limit position, circular plug connection (8x8x40) |
| **Magnetic strip** | isel MS 50 |
| **Linear motor** | isel LS 50, iron core linear motor with magnetic rails, with or without audio signal, nominal current 6 A, peak current 15 A, max. feed force 600 N |
| **Length measuring system** | isel IMS, incremental measuring system |
| **Motor / encoder connection** | Protection type IP 67, M23 connecting socket for motor and encoder cable |
| **Energy chain** | Optional |
| **Supported interfaces** | Standard RS422 A,/A, B, /B optional z, /z, Option SIN/COS 1Vss +20%, -40%, Z and /Z Right-sign |

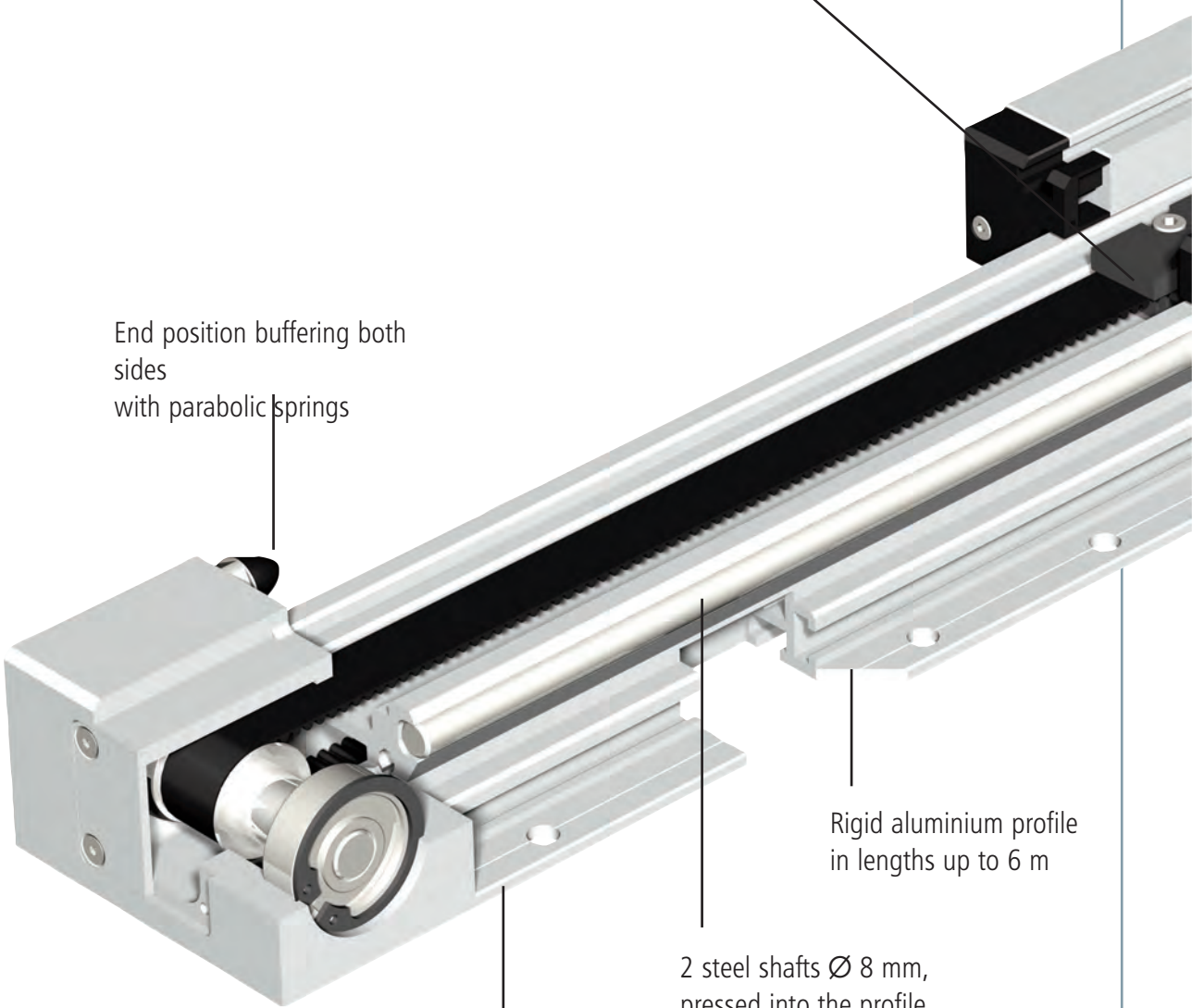
## Dimensioned drawing



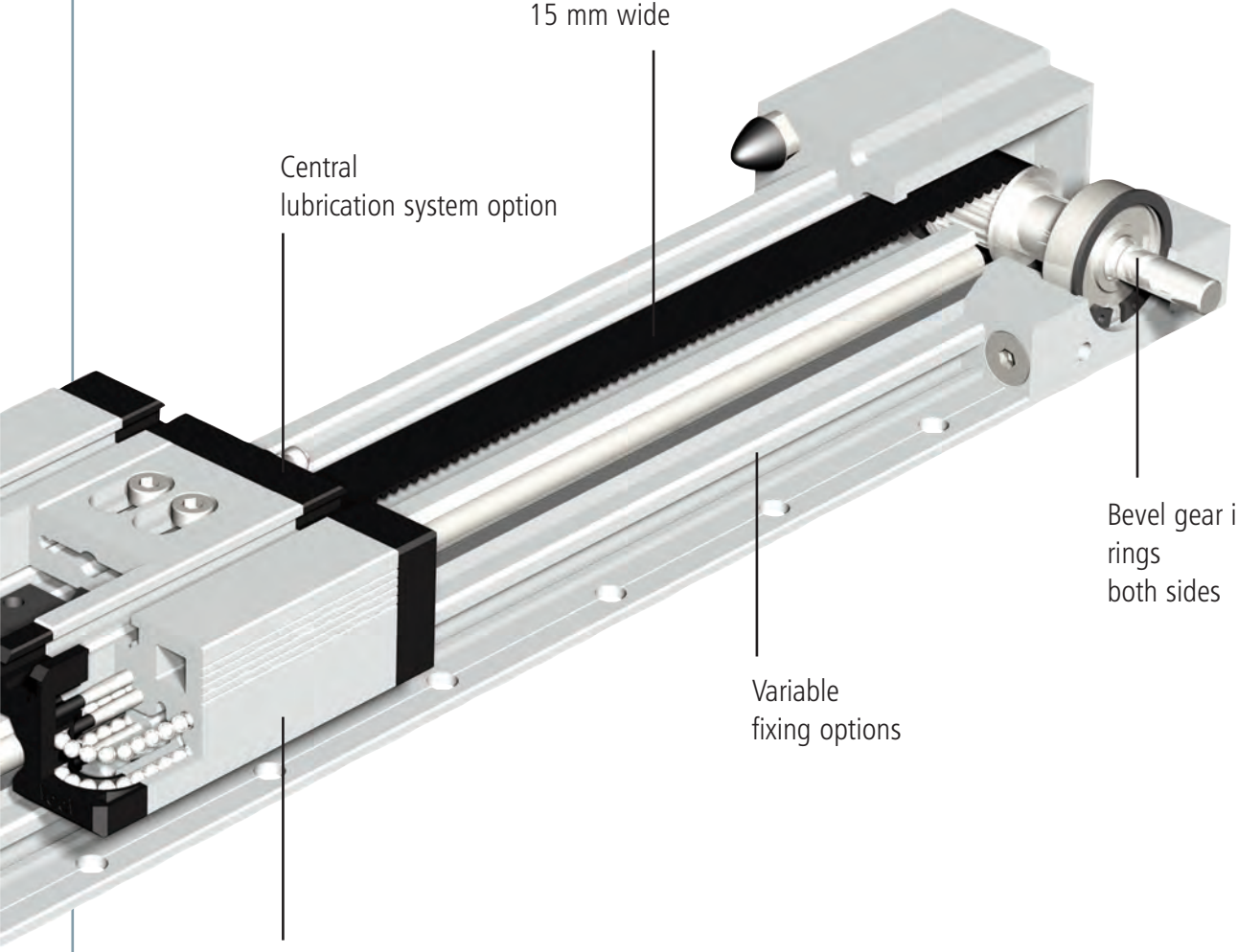
# Functional overview

## Linear unit with toothed belt drive



# Functional overview

## Linear unit with toothed belt drive



mechanics

# Linear units
## with toothed belt drive

# LEZ 1

Guides and shaft slides also available stainless.

with shaft slide

with trolley

## Features

- Aluminium profile, miniature linear guide LFS-8-2
- No-play feed with toothed belt drive
  - toothed belt with 3 mm interval, width 9 mm
- Feed per turn: 60 mm
- Repeatability less than or equal to ± 0.2 mm
- Max. feed. 1.5 m/s

Accessories can be found on pages **2-94.**

Options:
- Special 100 mm raster lengths to order, max. 6000 mm
- Securing with integrated M6 tapped rail, raster 50 mm

## Ordering key

232 005 XXXX

**Drives/Slides Trolley**
8 = without motor, with shaft slide
9 = without motor, with trolley

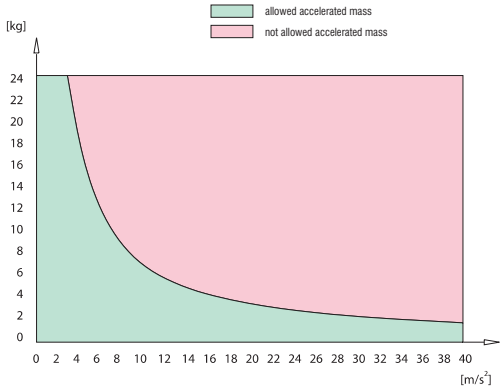
**Profile lengths LFS-8-2** (mm)
298, 398, 498, 598, 675, 698, 798, 998, 1498, 1798, 1998, 2498, 2998
(e. g. 398 mm = 040
675 mm = 068)
Option: up to 6000 mm

## Technical specification

| | |
|---|---|
| Belt type | HTD 3M, width 9 mm |
| Slide weight | 0.430 kg |
| Weight without drive module | 1000 mm = 3 kg |
| specific weight of the toothed belt | 0.0225 kg/m |
| Trolley weight | 1.03 kg |
| specific guide weight | 0.200 kg/100 mm |
| Effective Ø of the synchronous disks | 19.10 mm |
| Moment of inertia of the synchronous discs | $5.585 \times 10^{-7}$ kgm² |
| Feed per turn | 60 mm |

## Load diagram

Permitted accelerated weights relative to the belt strength.*




* with vertical construction, the acceleration due to gravity (g = 9.81 m/s2) must be taken into account

Bending data is on page **2-23.**

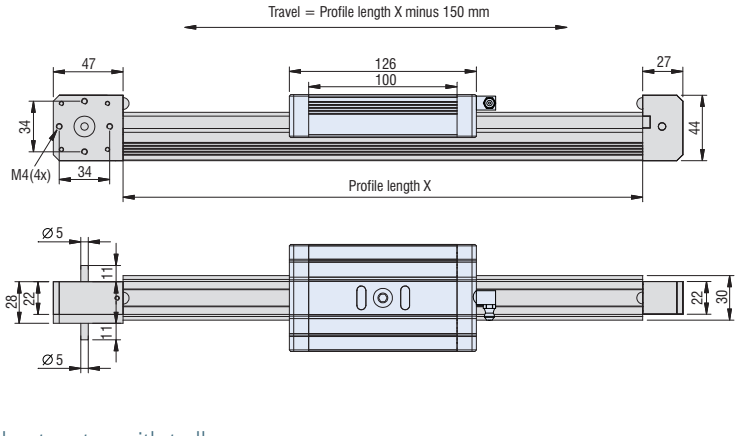
Drive module with stepper motor MS-045 HT

Drive module with stepper motor MS-135 HT

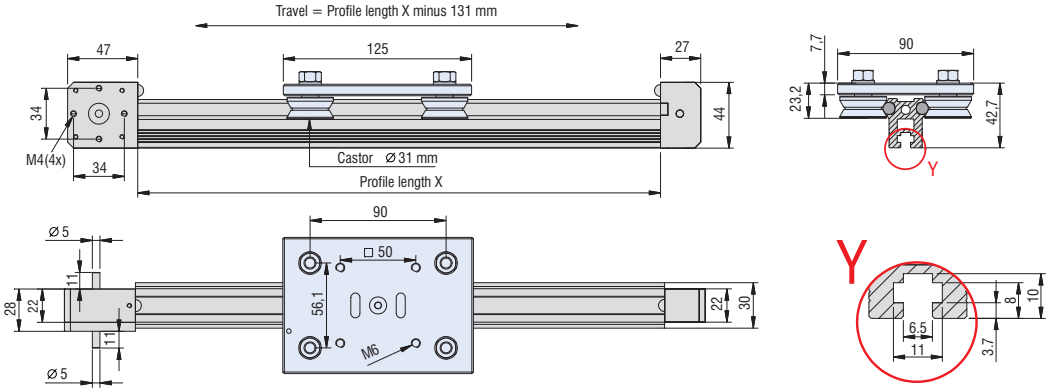
# Linear units
## with toothed belt drive

# LEZ 1

## Dimensioned drawings
without motor, with shaft slides



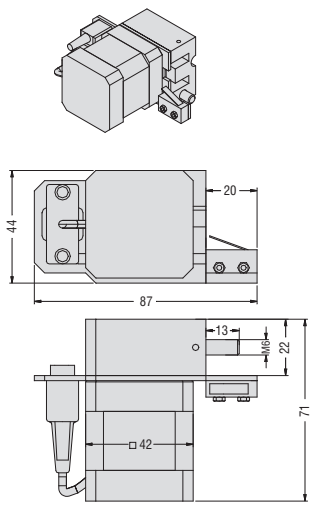

without motor, with trolley




## Motor modules (Motor pin assignments are on Page 2-70.)

Drive module with stepper motor
MS-045 HT (direct drive)
Feed: 60 mm / turn

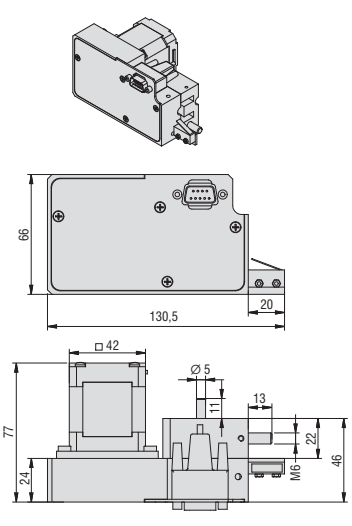
Part no.: **396048 3015**




Total length with motor module: profile length +94 mm

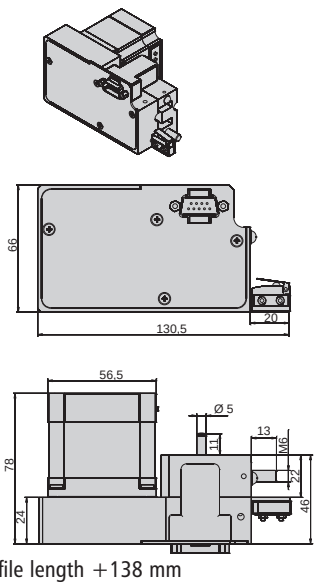
Drive module with stepper motor
MS-045 HT (reduction 2:1)
Feed: 30 mm / turn

Part no.: **396049 3015**




Drive module with stepper motor
MS-135 HT (reduction 2:1)
Feed: 30 mm / turn

Part no.: **396056 3015**




Total length with motor module: profile length +138 mm

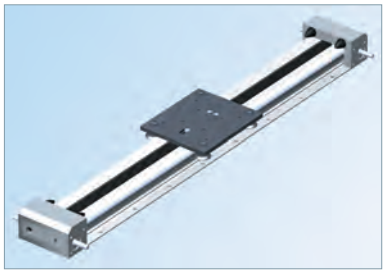
mechanics

# Linear units
## with toothed belt drive

# LEZ 2

Guides and shaft slides also available in a stainless version

with shaft slide



with trolley

## Features

- Aluminium profile with miniature linear guide LFS-8-5
- No-play feed with toothed belt drive - toothed belt with 5 mm interval, width 25 mm
- Max. feed. 5 m/s
- Shaft slides WS 3, L 176 × W 130 mm
- Feed per turn: 70 mm
- Repeat accuracy less than or equal to ± 0.2 mm
- available in lengths up to 6,000 mm

Accessories can be found on pages **2-92**

Options:
- Special 100 mm raster lengths available to order, max. 6000 mm
- Also as direct drive with
  - stepper motor
  - Servomotor
- Overrun limit switch with lead (only integrated in conjunction with drive module)

## Ordering key

232 002 XXXX

**Drives/Slides, Trolley**

8 = without motor, with shaft slides

9 = without motor, with trolley

**Profile lengths** (mm)

696, 996, 1496, 1996, 2496, 2996

(e. g. 696 mm = 070
1496 mm = 150)

Option: up to 6000 mm

## Technical specification

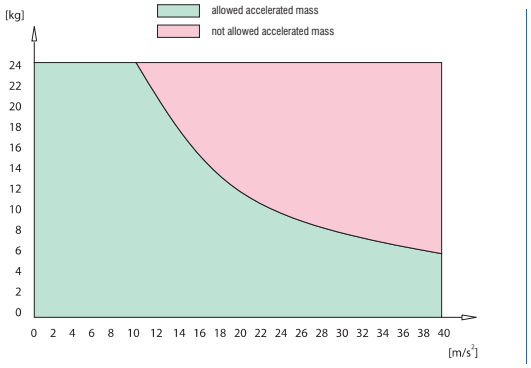
| | |
|---|---|
| Belt type | HTD 5M, width 25 mm |
| Slide weight | 0,940 kg |
| Weight without drive module | 1000 mm ≙ 7.9 kg |
| specific weight of the toothed belt | 0.09 kg/m |
| Roller carriage weight | 2.03 kg |
| specific guide weight | 0.472 kg/100 mm |
| Effective diameter of the synchronous disks | Ø 22.28 mm |
| Moment of inertia of the synchronous disks | 5.58·10-6 kgm$^2$ |
| Feed per turn | 70 mm |

### Linear guide rail LFS-8-5

| | |
|---|---|
| Moment of inertia $I_x$ | 137,48 cm$^4$ |
| Moment of inertia Iy | 27,98 cm$^4$ |
| Resistance torque $W_x$ | 23,91 cm$^3$ |
| Resistance torque Wy | 13,09 cm$^3$ |

## Load diagram

Permitted accelerated weights relative to the belt strength.*




* with vertical construction, the acceleration due to gravity (g = 9.81 m/s2) must be taken into account

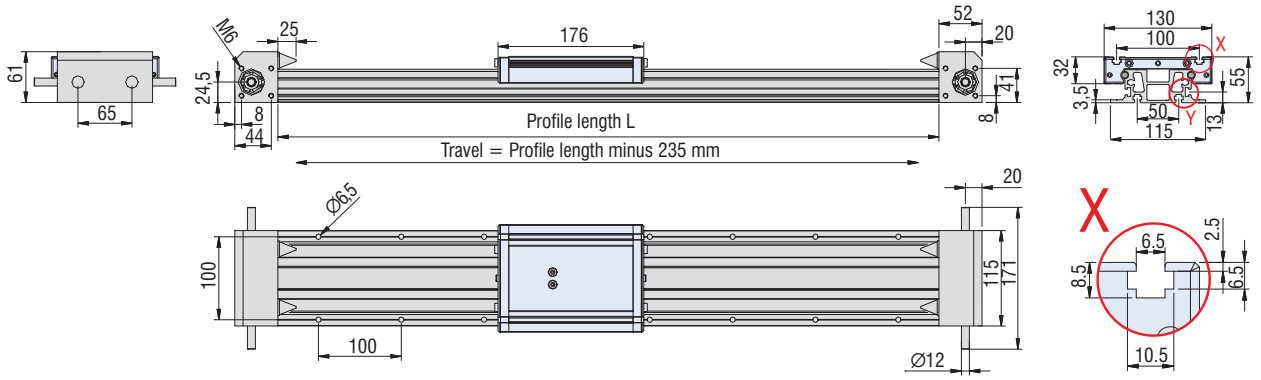
Drive module with servo motor EC 60 L

# Linear units
## with toothed belt drive

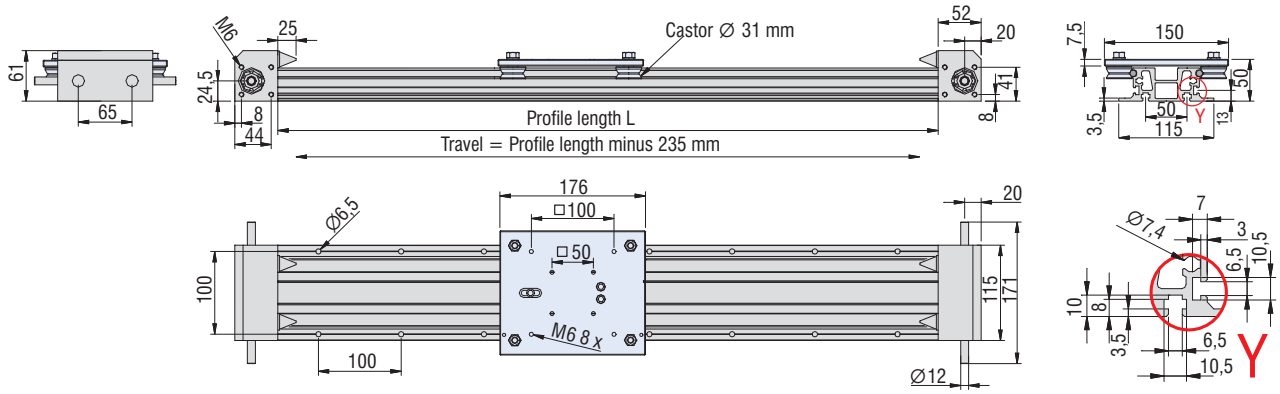
# LEZ 2

## Dimensioned drawings

without motor, with shaft slides




without motor, with trolley



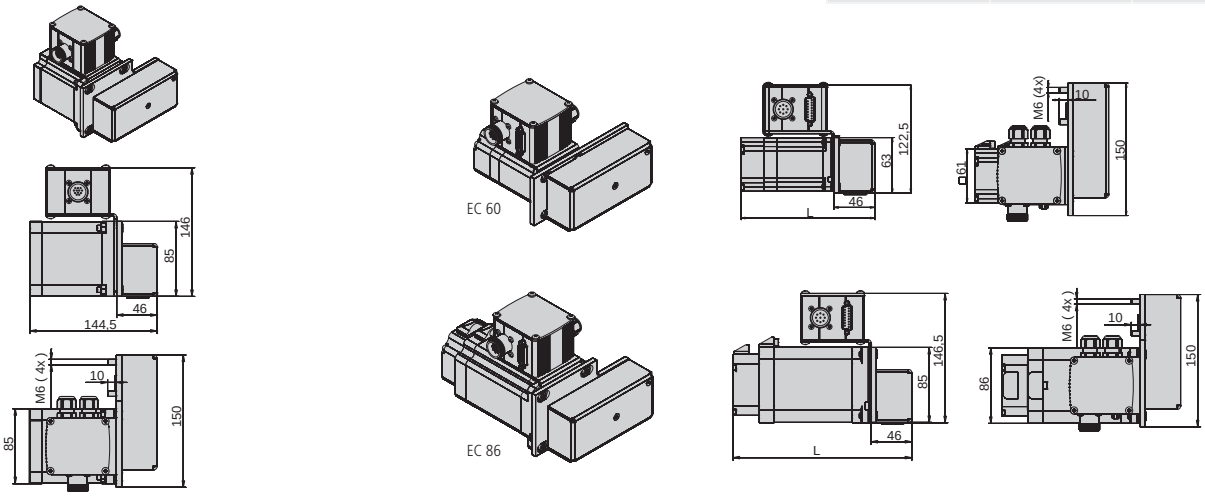

## Motor modules (Motor pin assignments are on Page 2-70)

Drive module with stepper motor
MS-600 HT (reduction 2:1)
Feed: 35 mm / turn

Part no.: **396086 3060**

Drive module with EC servomotors
(Reduction 2:1)
Feed: 35 mm / turn

| Part number | Motor module | Length L |
|---|---|---|
| 396 415 3260 | EC 60S with brake | 151.5 mm |
| 396 415 3060 | EC 60S without brake | 198.5 mm |
| 396 423 3060 | EC 60L | 186.5 mm |
| 396 444 3070 | EC 86S | 177.5 mm |
| 396 466 3070 | EC 86L | 202.5 mm |



mechanics

# Linear units
## with toothed belt drive

# LEZ 3

Guides and shaft slides also available stainless.

with shaft slide

with trolley

## Features

- Aluminium profile, miniature linear guide LFS-8-4
- No-play feed with toothed belt drive, toothed belt with 5 mm interval, width 25 mm
- Max. feed. 5 m/s
- Shaft slides WS3, L176 × W130 mm
- Feed per turn: 70 mm or 150 mm
- Repeat accuracy less than or equal to ± 0.2 mm
- Limit or reference switch accuracy < 0.1 mm
- Available in lengths up to 6,000 mm
- Motor modules can be flange-mounted on left or right side

Accessories can be found on page **2-92**.

Options:
- Special 100 mm raster lengths available to order, max. 6000 mm

## Ordering key

23200X XXXX

**Profile lengths** (mm)
698, 998, 1498, 1998, 2498, 2998
(e. g. 698 mm = 070
1498 mm = 150)

**Feed**
6 = 150 mm / turn
7 = 70 mm / turn

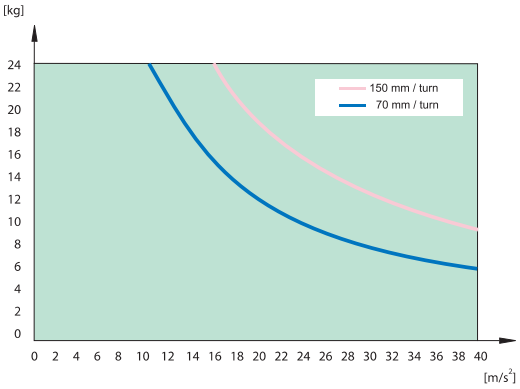
**Slides, trolley**
0 = with shaft slides
1 = with trolley

## Technical specification

| | |
|---|---|
| Belt type | HTD 5M, width 25 mm |
| Slide weight | 0.940 kg |
| Weight without drive module | 1000 mm = 10.5 kg |
| specific weight of the toothed belt | 0.09 kg/m |
| Roller carriage weight | 2.03 kg |
| specific guide weight | 0.648 kg/100 mm |
| Feed per turn | 70 mm or 150 mm |
| Effective diameter of the synchronous disks | |
| Feed 70 mm/turn | 22.28 mm |
| Feed 150 mm/turn | 47.75 mm |
| Moment of inertia of the synchronous disks | |
| Feed 70 mm/turn | 5.58E-6 kgm$^2$ |
| Feed 150 mm/turn | 1,796.10$^{-4}$ kgm$^2$ |

## Load diagram

Permitted accelerated weights relative to the belt strength.*



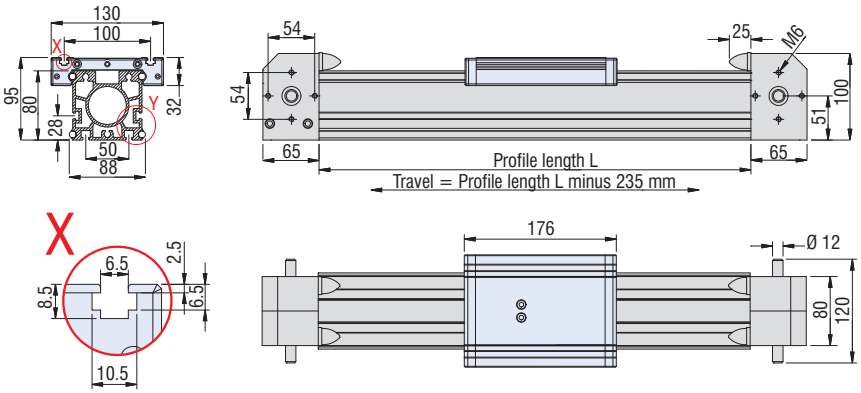

* with vertical construction, the acceleration due to gravity (g=9.81 m/s2) must be considered

Bending data can be found on page **2-27**.

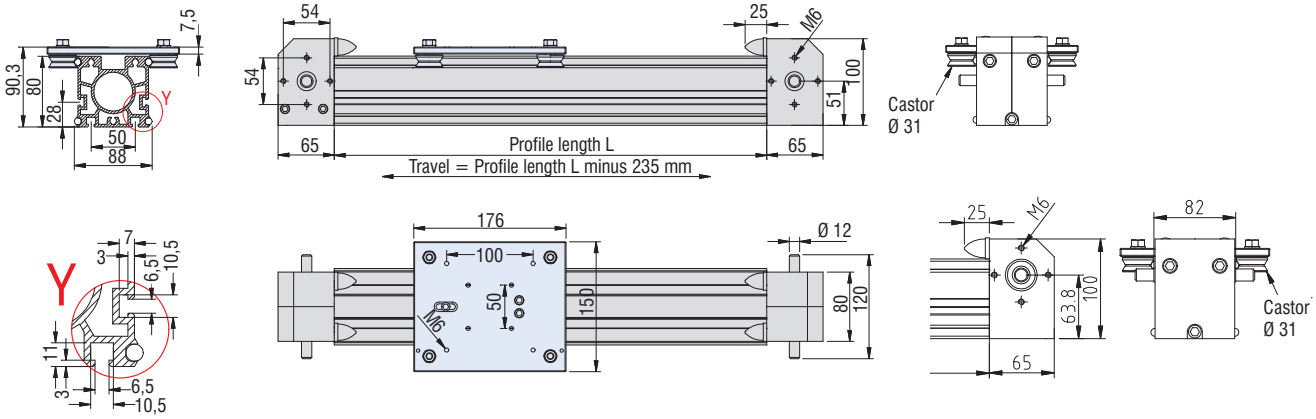
# Linear units
## with toothed belt drive

# LEZ 3

## Dimensioned drawings
with shaft slides

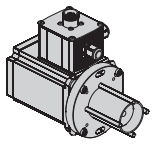



with trolley



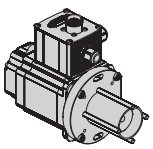

## Motor modules
(Motor pin assignments are on Page **2-72**)

### Drive module with stepper motor (direct drive)

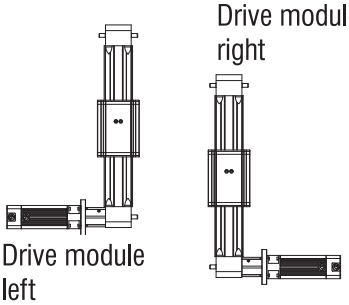


| Part number | Motor module | |
|---|---|---|
| 396 085 0060 | MS 600 HT | right |
| 396 085 0061 | MS 600 HT | left |
| 396 088 0060 | MS 900 HT | right |
| 396 088 0061 | MS 900 HT | left |

### Drive module with EC servomotor EC 60 and EC 86 (direct drive)

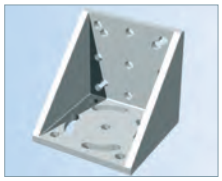


| Part number | Motor module |
|---|---|
| 396 423 006012 | EC 60L |
| 396 444 0070 | EC 86S |
| 396 466 0070 | EC 86L |



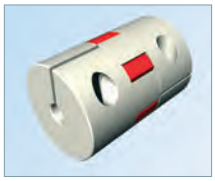
# Accessories

## LEZ 1



Angle bracket
- for LEZ 1

Part no.: 209110 0010



20/30 coupling
- for LEZ 1
- 1 VE = 1 coupling

Part no.: 218001 5081

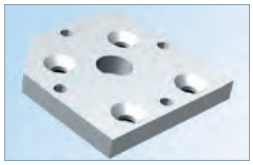
Shaft slides 1/70
- L 96 x W 72 x H 28.5mm
- Clamping surface plane milled, T-slide thread M6
- Central greasing option, adjustable for no-play
- Weight: 0.35 kg
- Option: stainless steel version

Part no.: 223 100 0070
stainless steel: 223 101 0070

Transmission shaft

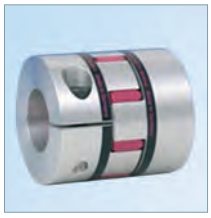
Length 1 m
Part no.: 227008 1000

## LEZ 2



Motor fixing plate
- for LEZ 2
- incl. fixing material
- for direct drive see page C78 et seq.

Part no.: 232199 0004



Coupling for Transmission shaft
- for LEZ 2
- 1 VE = 2 unit couplings

Part no.: 218050 0002

Transmission shaft ø 25 mm

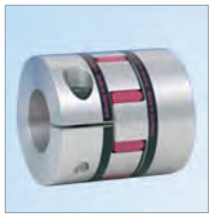
Length 1 m
Part no.: 219001 0125

Length 2 m
Part no.: 219001 0225

Stationary bearing for transmission shaft

VE 1 unit
Part no.: 896202 5562

## LEZ 3



Coupling for transmission shaft
- for LEZ 3
- 1 VE = 2 unit couplings

Part no.: 218050 0002

Transmission shaft ø 25 mm

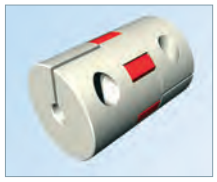
Length 1 m
Part no.: 219001 0125

Length 2 m
Part no.: 219001 0225

Stationary bearing for transmission shaft

VE 1 unit
Part no.: 896202 5562

## LEZ 9



30/40 coupling
- for LEZ 9
- 1 VE = 1 coupling

Part no.: 218002 8081

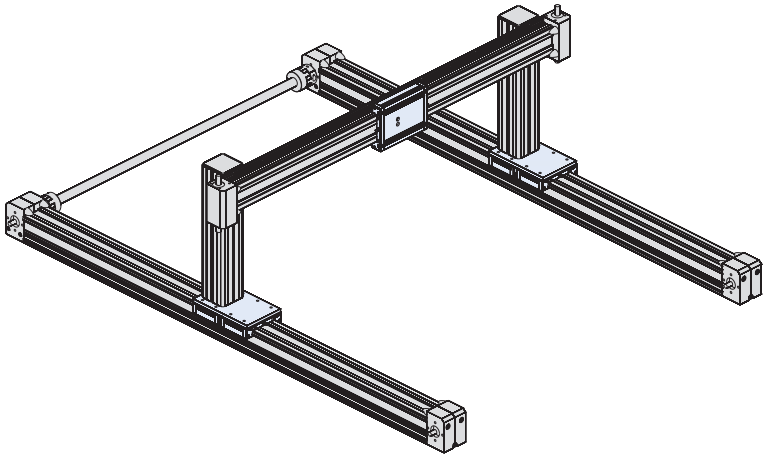
Shaft slides WS 11/70
- L 96 x W 96 x H 32 mm
- Clamping surface plane milled, T-slide thread M6
- Central greasing option, adjustable for zero play
- Weight: 0.4 kg
- Option: stainless steel version

Part no.: 223111 0070
Stainless steel: 223111 1070

Transmission shaft

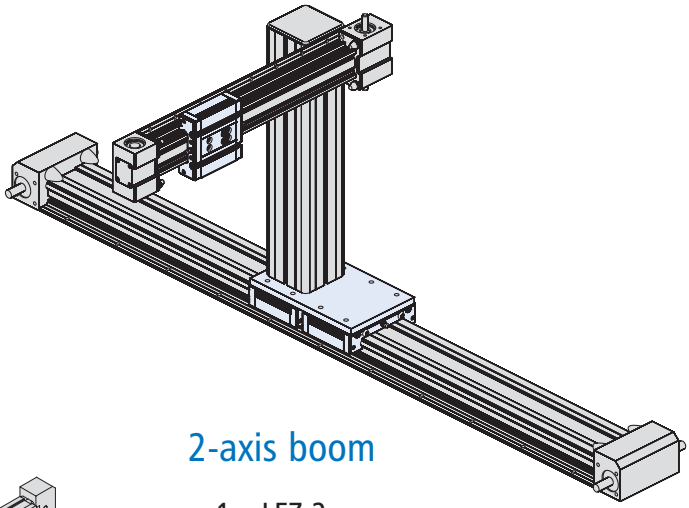
Length 1 m
Part no.: 227008 1000

# Examples in use



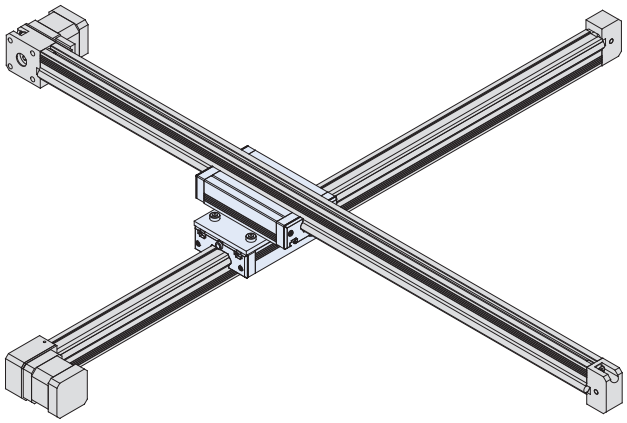
## 2-axis H-design

- 2 x LEZ 3
- 1 x LEZ 2
- Transmission shaft



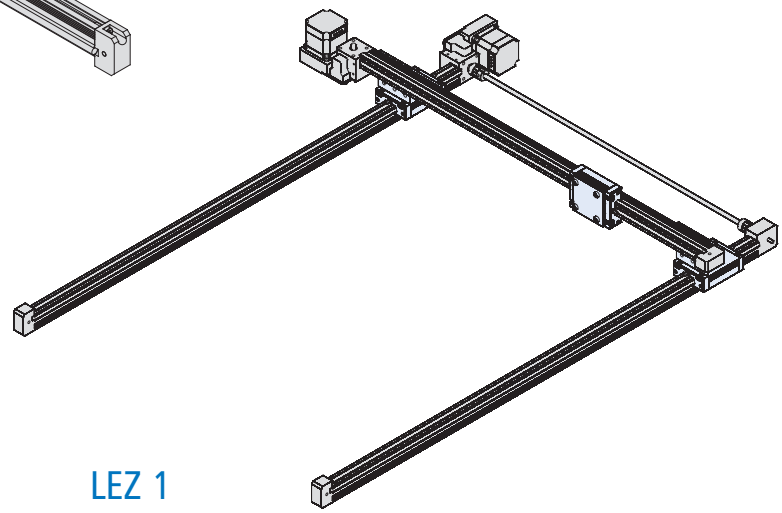
## 2-axis boom

- 1 x LEZ 2
- 1 x LEZ 9 (discontinued)



## Crossbench LEZ 1

- 2 x LEZ 1



## LEZ 1

- 2-axis flatbed configuration

# Rotational units

## Overview

# Rotational units

## Overview



CAD data on our website **www.isel-germany.de**

# Indexing table / Rotary unit RDH-M

RDH-M as Rotary unit
(hollow shaft design)

RDH-M as Indexing table
(solid shaft design)

## Features

- With precision transmission
  - High load capacity, rigid drive bearing
  - Absence of play and high torsional rigidity
- Reduction 1:51 or 1:101
- Stepper or servomotor
- Protection class IP 65
- Stainless design
- Transfer accuracy <1 minute of arc
- Repeatability < ± 6 seconds of arc
- Available in solid or hollow shaft design
- No maintenance

For pin assignment see page 2-112
For transport loads see page 2-113

## Ordering key

**2 6 6 2 X X 0 X 0 0**

**Flanged shaft**
0 = solid shaft
1 = hollow shaft

**Transmission reduction**
0 = 101
1 = 51

**Motors**
0 = Stepper motor MS 200 HAT with encoder (400 imp., 3-channel, RS422)
3 = brushless EC servomotor EC 60S
4 = brushed DC servomotor DC 100
5 = Stepper motor without encoder

## Accessories

### Chuck assembly

3-jaw chuck Ø 125
Part no.: 269063 2125
* including flange

### Aluminium T-slot plate

Ø 240 mm/PT 25
Part no.: 269050 0240

Ø 365 mm/PT 25
Part no.: 269050 0365

### Tailstock unit RE M

Part no.: 269100 2100
(1000 mm)
Part no.: 269100 2150
(1500 mm)
Part no.: 269100 2200
(2000 mm)

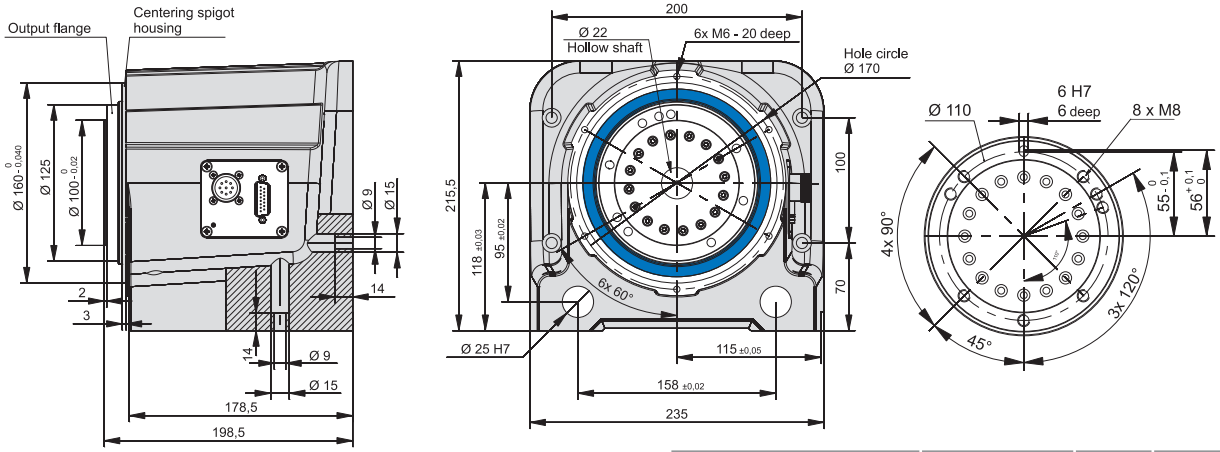
# Indexing table / Rotary unit RDH-M

## Technical specification

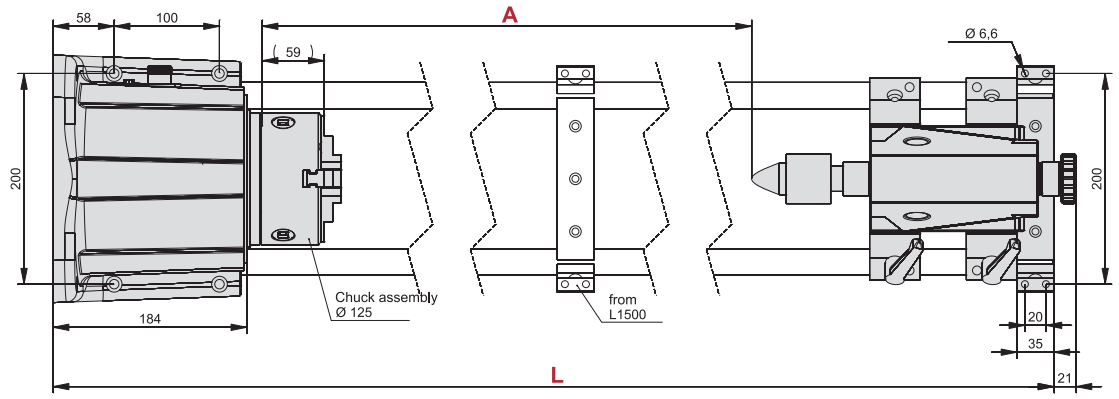
| | | stepper motor MS 200 HT * | | EC servomotor EC 60S (brushless) | | DC servo motor DC 100 (brushed) | |
|---|---|---|---|---|---|---|---|
| **Reduction ratio** | | 1:51 | 1:101 | 1:51 | 1:101 | 1:51 | 1:101 |
| **Nominal output speed** | [1/min] | 4 | 2 | 22 | 11 | 22 | 11 |
| | | at 1500 Hz (225 1/min) | | at 1100 1/min | | | |
| **Max. output speed** | [1/min] | 24 | 12 | 59 | 30 | 59 | 30 |
| | | at 8000 Hz | | -- | | | |
| **Nominal torque** | [Nm] | 24 | 46 | 9 | 17 | 7 | 14 |
| | | at 1500 Hz | | -- | | | |
| **Max. torque** (short term) | [Nm] | -- | -- | 42 | 80 | 39 | 73 |
| **Rated holding torque** (static load) | [Nm] | 55 | 108 | 26 | 51 | 15 | 30 |
| **Max. transmission load** | [Nm] | 98 | 157 | 98 | 157 | 98 | 157 |
| | | Limit for repeatable peak torque | | | | | |
| **Dynamic load factor C** | [N] | 21800 | | | | | |
| **Static load factor C0** | [N] | 35800 | | | | | |
| **Weight** | [kg] | 13.7 | | | | | |

* Values for half-step operation

## Dimensioned drawings




| Versions | Part no. | L | A |
|---|---|---|---|
| Tailstock unit RE-M 1000 mm | 269100 2100 | 1110 | 624.5 |
| Tailstock unit RE-M 1500 mm | 269100 2150 | 1610 | 1124.5 |
| Tailstock unit RE-M 2000 mm | 269100 2200 | 2110 | 1624.5 |



# Indexing table / Rotary unit RDH-S

RDH-S as Rotary unit
(hollow shaft design)

RDH-S as Indexing table
(solid shaft design)

## Features

- With precision transmission
  - High load capacity, rigid drive bearing
  - Absence of play and high torsional rigidity
- Reduction 1:51 or 1:101
- Stepper or servomotor
- Protection class IP 65
- Stainless design
- Transfer accuracy <1.5 minute of arc
- Repeatability < ± 6 seconds of arc
- Available in solid or hollow shaft design
- No maintenance

For pin assignment see page 2-112
For transport loads, see page 2-113

## Ordering key

**2 6 6 1 X X 0 X 0 0**

**Flanged shaft**
**0** = solid shaft
**1** = hollow shaft

**Transmission reduction**
**0** = 101
**1** = 51

**Motors**
**0** = Stepper motor MS 045 HT with encoder (400 imp., 3-channel, RS422)
**2** = brushless DC servomotor RE 40
**3** = brushless EC servomotor EC 42
**5** = Stepper motor without encoder

## Accessories

Chuck assembly
3-jaw chuck Ø 65
Part no.: **269060 3065***

3-jaw chuck Ø 80
Part no.: **269063 2080***

3-jaw chuck Ø 100
Part no.: **269063 2100***

* including flange

Circular plate
Ø 150
Part no.: **269 050 0150**

Tailstock unit RE S
for RDH-S
Part no.: **269100 1020** (200 mm)
Part no.: **269100 1030** (300 mm)
Part no.: **269100 1040** (400 mm)
Part no.: **269100 1050** (500 mm)

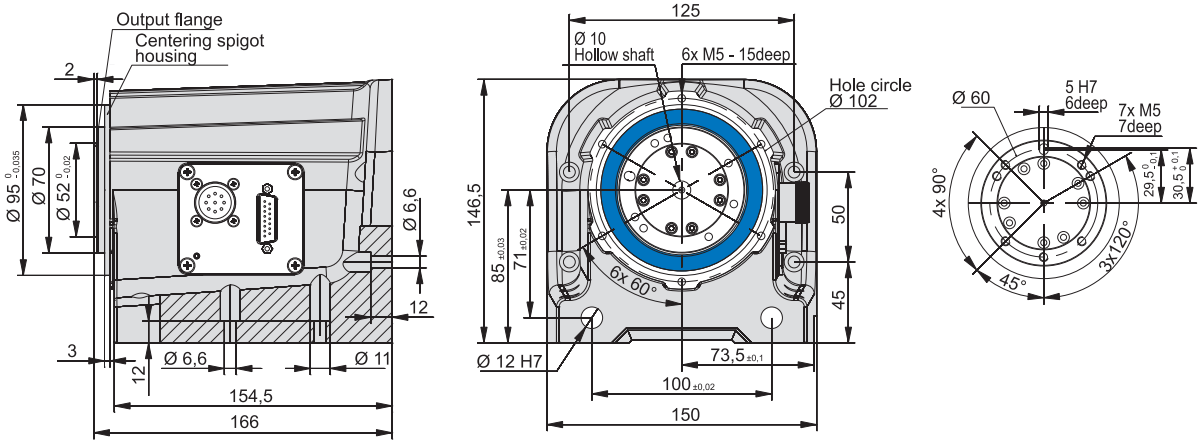
# Indexing table / Rotary unit RDH-S

## Technical specification

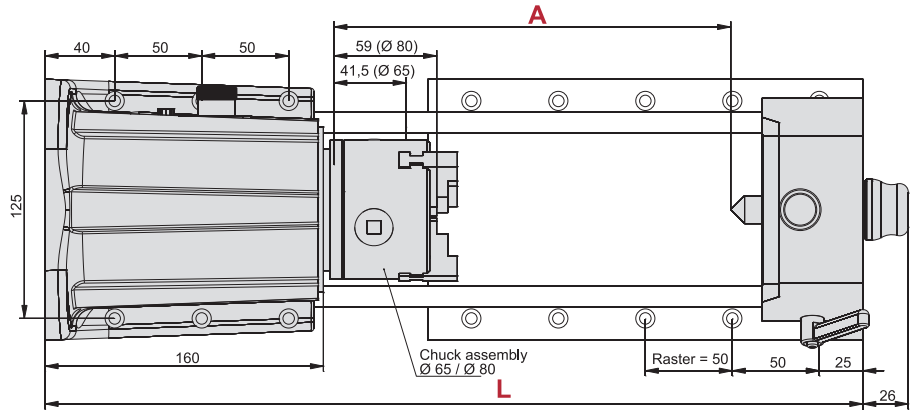
| | | stepper motor MS 045 HT * | | EC servomotor EC 42 (brushless) | | DC servo motor RE 40 (with brushes) | |
|---|---|---|---|---|---|---|---|
| **Reduction ratio** | | 1:51 | 1:101 | 1:51 | 1:101 | 1:51 | 1:101 |
| **Nominal output speed** | [1/min] | 4 | 2 | 22 | 11 | 22 | 11 |
| | | at 1500 Hz (225 1/min) | | at 1100 1/min | | at 1100 1/min | |
| **Max. output speed** | [1/min] | 24 | 12 | 59 | 30 | 69 | 35 |
| | | at 8000 Hz | | -- | | | |
| **Nominal torque** | [Nm] | 7 | 11 | 4.8 | 9.2 | 4.6 | 9 |
| | | at 1500 Hz | | -- | | | |
| **Max. torque** (short term) | [Nm] | -- | -- | 7 | 11 | 7 | 11 |
| **Rated holding torque** (static load) | [Nm] | 7 | 11 | 7 | 11 | 7 | 11 |
| **Max. transmission load** | [Nm] | 18 | 28 | 18 | 28 | 18 | 28 |
| | | Limit for repeatable peak torque | | | | | |
| **Dynamic load factor C** | [N] | 5800 | | | | | |
| **Static load factor $C_0$** | [N] | 8600 | | | | | |
| **Weight** | [kg] | 4.6 | | | | | |

* Values for half-step operation

## Dimensioned drawings




| Versions | Part no. | L | A |
|---|---|---|---|
| Tailstock unit RE-S 200 mm | 269100 1020 | 370 | 128 |
| Tailstock unit RE-S 300 mm | 269100 1030 | 470 | 228 |
| Tailstock unit RE-S 400 mm | 269100 1040 | 570 | 328 |
| Tailstock unit RE-S 500 mm | 269100 1050 | 670 | 428 |



# Indexing table/Rotary unit RDH-XS

RDH-XS as Rotary unit

RDH-XS as Indexing table

## Features

- With precision transmission
  - High load capacity, rigid drive bearing
  - Absence of play and high torsional rigidity
- Reduction 1:50 or 1:100
- Stepper or servomotor
- Protection class IP 65
- Stainless design
- Transfer accuracy <2 minutes of arc
- Repeatability < ± 1 minute of arc
- No maintenance

For pin assignment see page 2-112
For transport loads, see page 2-113

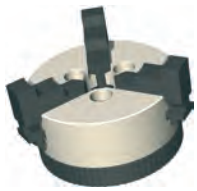
## Ordering key

**2 6 6 0 0 X  0 X 0 0**

**Transmission reduction**
**0** = 100
**1** = 50

**Motors**
**0** = Stepper motor MS 045 HT with encoder (400 imp., 3-channel, RS422)
**2** = brushed DC servomotor RE 40
**3** = brushless EC servomotor EC 42
**5** = Stepper motor without encoder

## Accessories



Chuck assembly
3-jaw chuck Ø 65
Part no.: **269060 4065***

* including flange

Tailstock unit RE XS
for RDH-XS
Part no.: **269100 0020** (200 mm)
Part no.: **269100 0030** (300 mm)
Part no.: **269100 0040** (400 mm)
Part no.: **269100 0050** (500 mm)

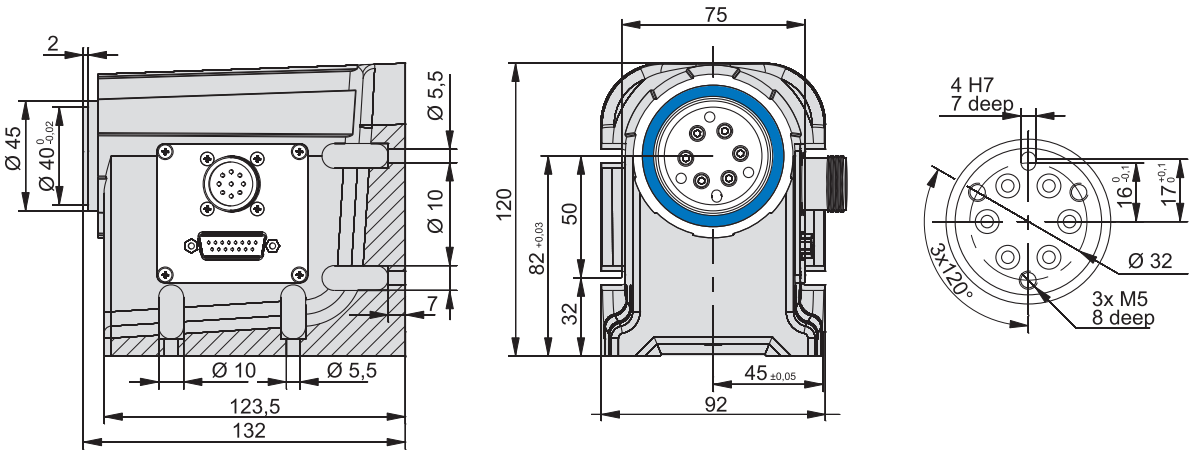
# Indexing table/Rotary unit RDH-XS

## Technical specification

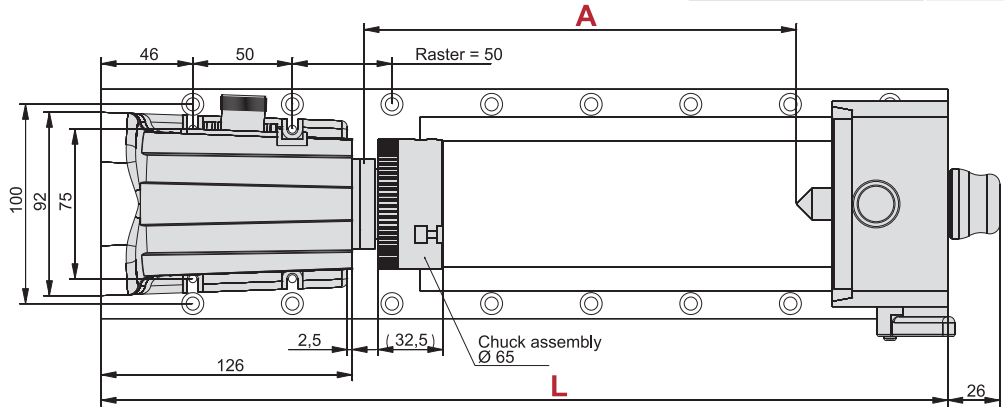
| | | stepper motor MS 045 HT * | | EC servomotor EC 42 | | DC servo motor RE 40 | |
|---|---|---|---|---|---|---|---|
| **Reduction ratio** | | 1:50 | 1:100 | 1:50 | 1:100 | 1:50 | 1:100 |
| **Nominal output speed** | [1/min] | 5 | 2 | 22 | 11 | 22 | 11 |
| | | at 1500 Hz (225 1/min) | | at 1100 1/min | | at 1100 1/min | |
| **Max. output speed** | [1/min] | 24 | 12 | 59 | 30 | 70 | 35 |
| | | at 8000 Hz (1200 rpm) | | -- | | | |
| **Nominal torque** | [Nm] | 5 | 7 | 5 | 7 | 5 | 7 |
| | | at 1500 Hz (225 1/min) | | -- | | | |
| **Max. torque** (short term) | [Nm] | -- | -- | 5 | 7 | 5 | 7 |
| **Rated holding torque** (static load) | [Nm] | 5 | 7 | 5 | 7 | 5 | 7 |
| **Max. transmission load** | [Nm] | 9 | 14 | 9 | 14 | 9 | 14 |
| | | Limit for repeatable peak torque | | | | | |
| **Dynamic load factor C** | [N] | 392 | | | | | |
| **Static load factor $C_0$** | [N] | 392 | | | | | |
| **Weight** | [kg] | 2.3 | | | | | |

* Values for half-step operation

## Dimensioned drawings




| Versions | Part no. | L | A |
|---|---|---|---|
| Tailstock unit RE-XS 200 mm | 269100 0020 | 325 | 117 |
| Tailstock unit RE-XS 300 mmm | 269100 0030 | 425 | 217 |
| Tailstock unit RE-XS 400 mmm | 269100 0040 | 525 | 317 |
| Tailstock unit RE-XS 500 mmm | 269100 0050 | 625 | 417 |



# Rotary tilting unit

# DSH-S

## Features

- With precision transmission
  - High load capacity, rigid drive bearing
  - Absence of play and high torsional rigidity
- With rotary unit RDH-S
- Reduction 1:51 or 1:101
- Stepper or servomotor
- Protection class IP 65
- Stainless design
- Transfer accuracy <1.5 minute of arc
- Repeatability < ± 6 seconds of arc
- No maintenance
- Swivel range continuously variable

For pin assignment see page **2-112**
For transport loads, see page **2-113**

## Ordering key

**2 6 5 4 1 X X 0 0 0**

**Motors**
**0** = Stepper motor MS 045 HT with encoder (400 imp., 3-channel, RS422)
**2** = brushed DC servomotor RE 40
**3** = brushless EC servomotor EC 42
**5** = Stepper motor without encoder

**Transmission reduction**
**0** = 1 : 101
**1** = 1 : 51

## Accessories

Chuck assembly
3-jaw chuck Ø 65
Part no.: **269060 3065***

3-jaw chuck Ø 80
Part no.: **269063 2080***

3-jaw chuck Ø 100
Part no.: **269063 2100***

* incl. Flange

Circular plate
Ø 150
Part no.: **269 050 0150**

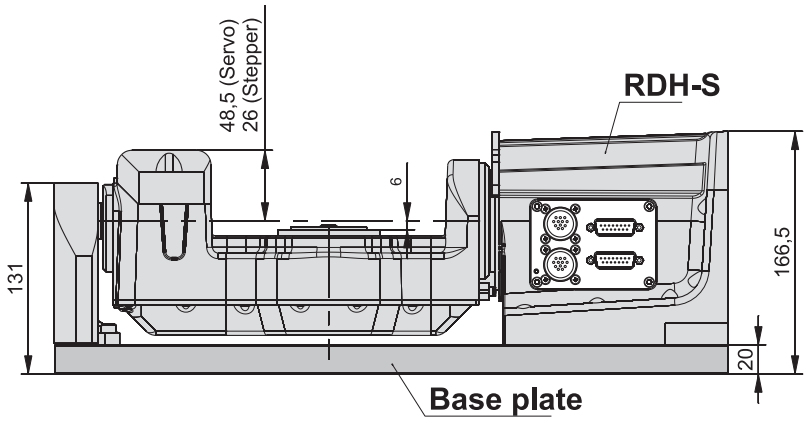
# Rotary tilting unit DSH-S

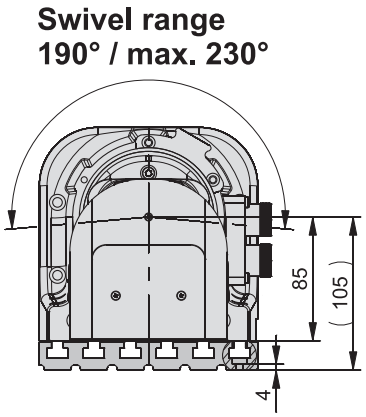
## Technical specification

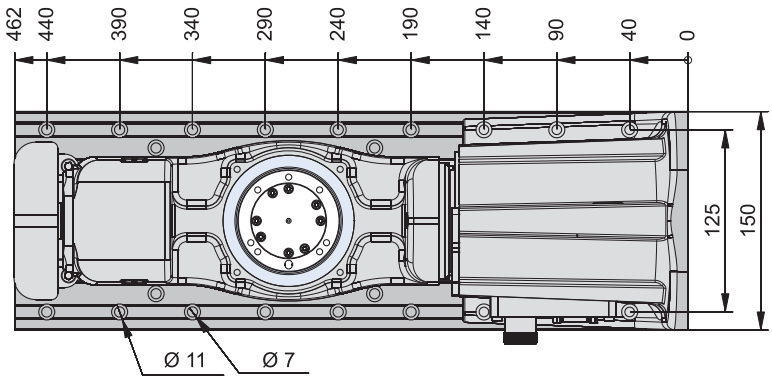
| | | stepper motor MS 045 HT * | | EC servomotor EC 42 | | DC servo motor RE 40 | |
|---|---|---|---|---|---|---|---|
| **Reduction ratio** | | 1:51 | 1:101 | 1:51 | 1:101 | 1:51 | 1:101 |
| **Nominal output speed** | [1/min] | 4 | 2 | 22 | 11 | 22 | 11 |
| | | at 1500 Hz (225 1/min) | | at 1100 1/min | | at 1100 1/min | |
| **Max. output speed** | [1/min] | 24 | 12 | 59 | 30 | 69 | 35 |
| | | at 8000 Hz | | -- | | | |
| **Nominal torque** | [Nm] | 7 | 11 | 4.8 | 9.2 | 4.6 | 9 |
| | | at 1500 Hz | | -- | | | |
| **Max. torque** (short term) | [Nm] | -- | -- | 7 | 11 | 7 | 11 |
| **Rated holding torque** (static load) | [Nm] | 7 | 11 | 7 | 11 | 7 | 11 |
| **Max. transmission load** | [Nm] | 18 | 28 | 18 | 28 | 18 | 28 |
| | | Limit for repeatable peak torque | | | | | |
| **Dynamic load factor C** | [N] | 5800 | | | | | |
| **Static load factor C0** | [N] | 8600 | | | | | |
| **Weight** | [kg] | 12 kg | | | | | |

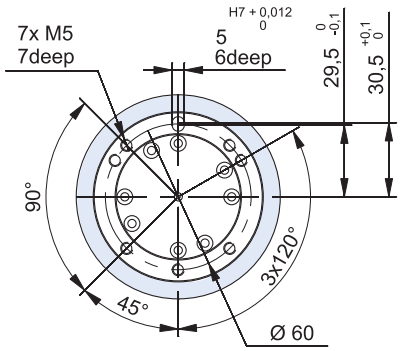
* Values for half-step operation

## Dimensioned drawings



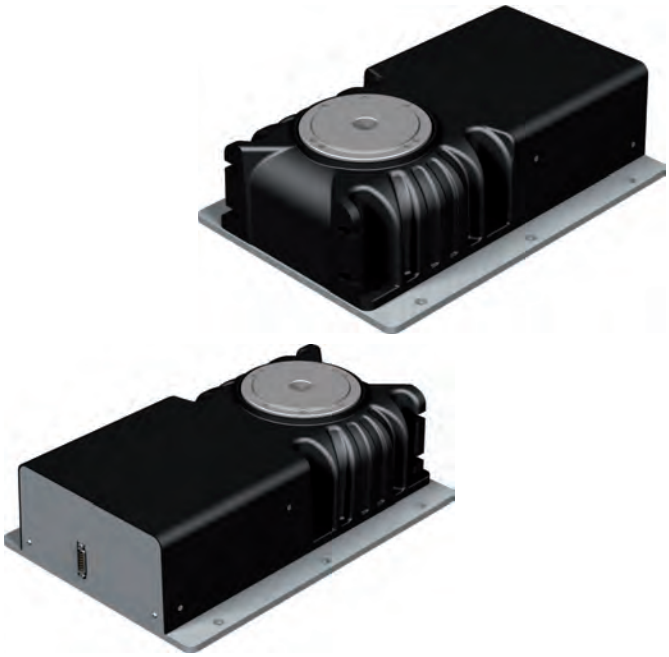



# Indexing table

# RF 1



## Features

- Low play toothed belt drive with stepper or DC servo motor
- Reduction 1: 24 (standard)
- Weight: 14.6 kg

For pin assignment see page **2-112**
For transport loads, see page **2-113**

Options:
- Reduction installation set 1 : 52 or 1 : 100
- Electromagnetic brake [60 Nm]
- Step motor drive with encoder
- CNC controller

## Ordering key

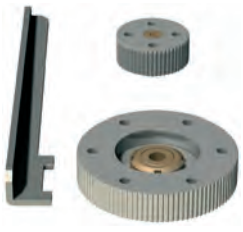
**2 6 0 2 4 X  X X 0 0**

**Motores**
**1** = Stepper motor MS 200 HT without encoder
**4** = brushed DC servomotor DC 100
**5** = brushless EC servomotor EC 60S

**Brake**
**0** = without brake
**1** = magnetic brake

**Plug**
**1** = servomotor: M23 + SubD15
**2** = Stepper motor: SubD9

## Accessories



Installation set
for reduction 1:52
Part no.: **269077 0001**
for reduction 1:100
Part no.: **269077 0002**

Aluminium T-slot plate
Ø 240 mm / PT 25
Part no.: **269050 0240**
Ø 365 mm / PT 25
Part no.: **269050 0365**

Chuck assembly
3-jaw chuck Ø 125
Part no.: **269063 2125**

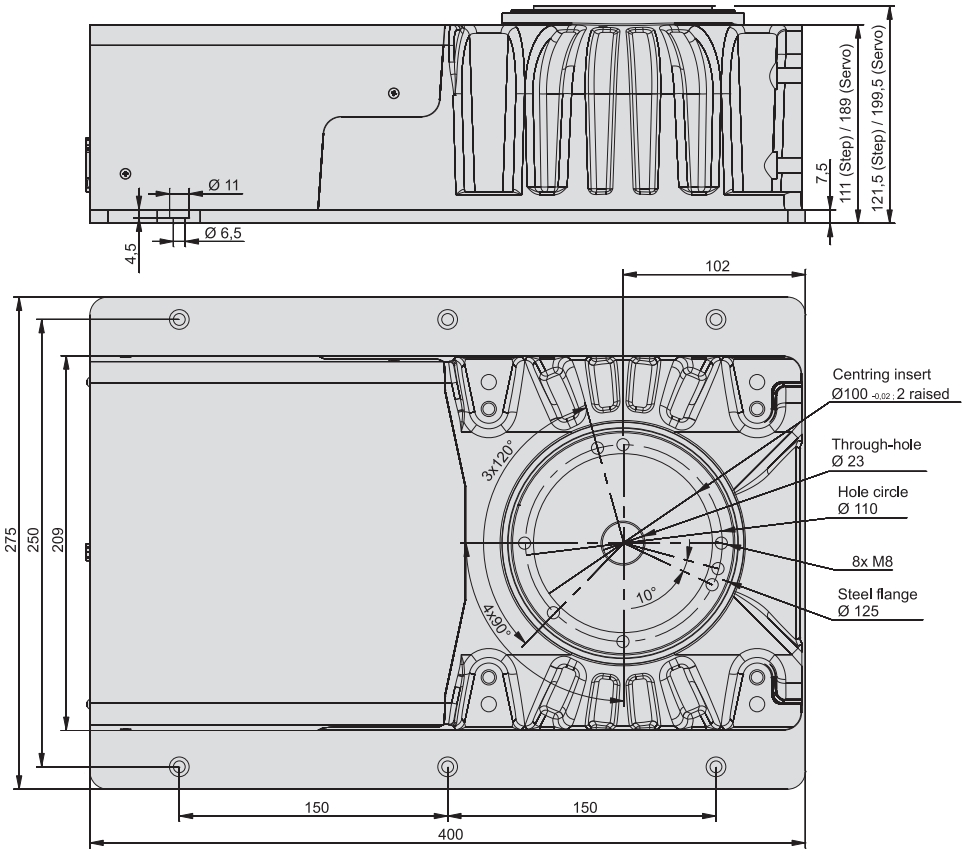
# Indexing table RF 1

## Technical specification

| | | stepper motor MS 200 HT * | | | Servomotor DC 100/EC 60S | | |
|---|---|---|---|---|---|---|---|
| **Reduction ratio** | | 1:24 | 1:52 | 1:100 | 1:24 | 1:52 | 1:100 |
| **Output speed** | [1/min] | 0 - 50 | 0 - 23 | 0 - 12 | 0 - 125 | 0 - 58 | 0 - 30 |
| **Operating torque** (0 - 500 Hz) | [Nm] | 20 | 42 | 75 | -- | | |
| **Operating torque** (500 - 1000 Hz) | [Nm] | 18 | 38 | 75 | -- | | |
| **Rated torque** | [Nm] | -- | | | 41070 | 13 / 22 | 25 /42 |
| **Rated holding torque** (static load) | [Nm] | 37 | 75 | 75 | 41102 | 16 / 26 | 30 /50 |
| **Angle accuracy** | [°] | 0.16 | | | | | |
| **Weight** | [kg] | 14.6 | | | | | |

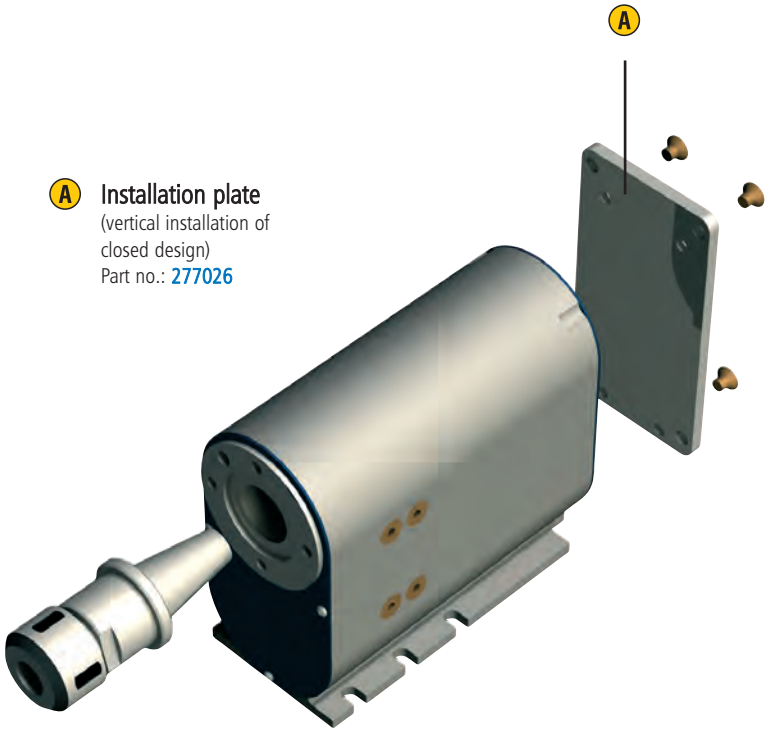
* Values for half-step operation

## Dimensioned drawings



# Mini rotary unit

# MD 1




A Installation plate
(vertical installation of closed design)
Part no.: 277026

## Features

- Low play toothed belt drive with stepper or DC servo motor
- Reduction 1 : 20
- Shaft Ø9 mm with boring
- Housing flange with inner cone SK 20
- Weight:
  depending on design, from 1.35 kg

For pin assignment see page 2-112
For transport loads, see page 2-113

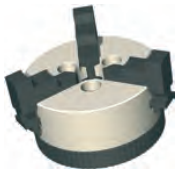
Options:
- Additional installation plate (vertical installation possible)
- CNC controller

## Ordering key

**261010 0X10**

**Motors**
**0** = MS 045 HT stepper motor
**2** = DC servomotor RE 40, with brushes
**3** = brushless EC servomotor EC 42

## Accessories



Chuck assembly
3-jaw chuck Ø 65
Part no.: **269060 2065***

* incl. Flange

Collet holder
Collet holder SK 20
for tools Ø 3 - 13 mm, with installation ring
Part no.: **239172 0020**

Collets are on page 5-32.

# Mini rotary unit MD 1

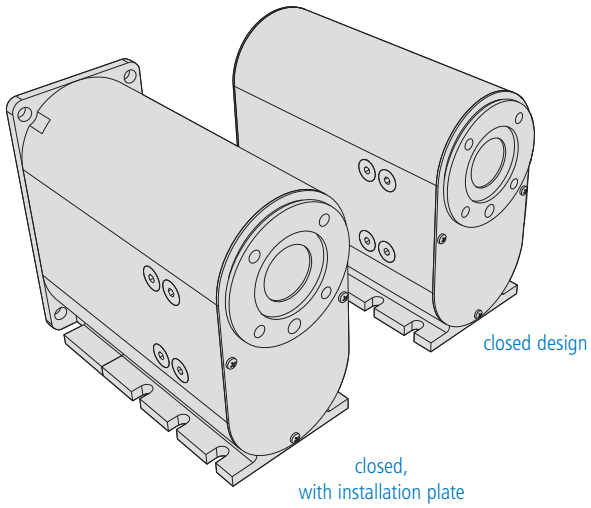
## Technical specification

| | | MS 045 HT stepper motor * | DC servomotor RE 40 | EC servomotor EC 42 |
|---|---|---|---|---|
| **Reduction ratio** | | 1:20 | 1:20 | 1:20 |
| **Output speed** | [1/min] | 0 - 60 | 0 - 175 | 0 - 150 |
| **Operating torque** (0 - 1600 Hz) | [Nm] | 8 | -- | -- |
| **Rated torque** | [Nm] | -- | 3 | 3.2 |
| **Rated holding torque** (static load) | [Nm] | 14 | 3.9 | 4 |
| **Min. step** (positional accuracy) | [arcmin] | 3.5 | 2 | 2 |
| **Gewicht** | [kg] | 1.35 | | |

* Values for half-step operation

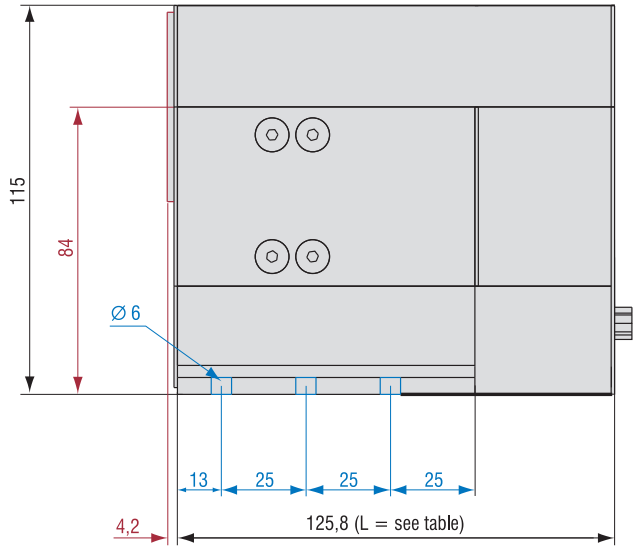
## Dimensioned drawings

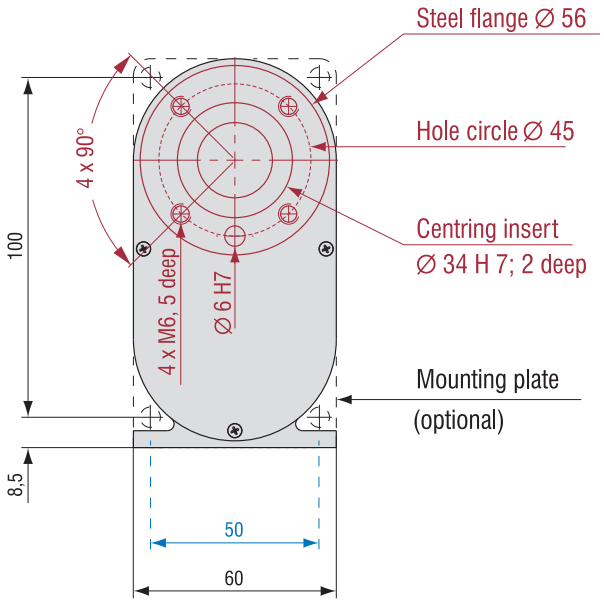
| | Length L per step | Length L for DC servo |
|---|---|---|
| **closed design** | 129 mm | 180 mm |
| **closed with installation plate** | 133 mm | 184 mm |



closed design

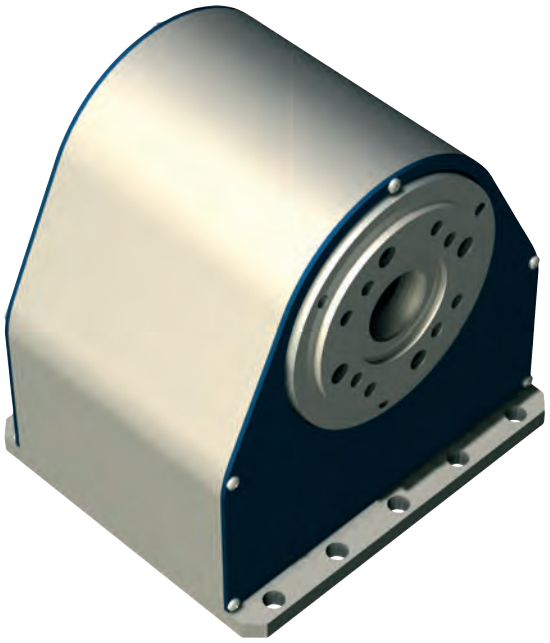
closed,
with installation plate



# Rotary unit

# ZD 30



## Features

- Low play toothed belt drive with Stepper motor
- Reduction 1 : 30
- Shaft with Ø 15 mm boring
- Housing flange with inner cone SK 20
- Weight: 2,9 kg

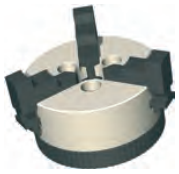
For pin assignment see page **2-112**
For transport loads, see page **2-113**

Options:
- CNC controller via Sub D

## Ordering data

ZD 30 rotary unit
Part no.: **261100 0000**

## Accessories



Chuck assembly
3-jaw chuck Ø 65
Part no.: **269060 2065***

Chuck assembly
3-jaw chuck Ø 80
Part no.: **269063 3080***

Collet holder
Clamping ring housing SK 20 for tools Ø 3 - 13 mm, with installation ring
Part no.: **239172 0020**

Clamping rings are on page 5-32.

Tailstock unit RE-ZD30
200 mm Part no.: **269 100 1060** L 331
300 mm Part no.: **269 100 1070** L 431
400 mm Part no.: **269 100 1080** L 531
500 mm Part no.: **269 100 1090** L 631

* including flange

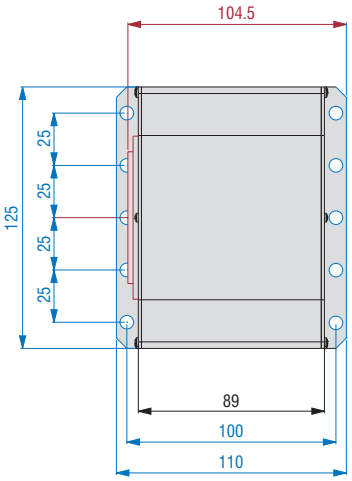
# Rotary unit ZD 30

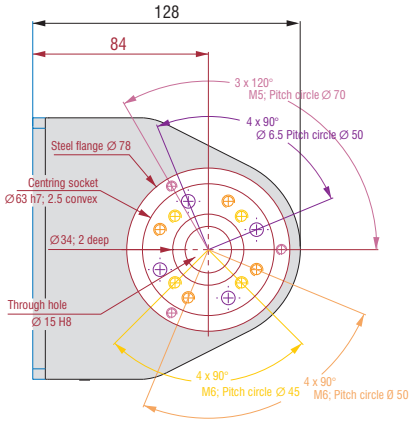
## Technical specification

| | | stepper motor MS 045 HT * |
|---|---|---|
| **Reduction ratio** | | 0.0625 |
| **Output speed** | [1/min] | 0 - 40 |
| **Operating torque** (0 - 1600 Hz) | [Nm] | 12 |
| **Rated holding torque** (static load) | [Nm] | 20 |
| **Min. step** (positional accuracy) | [arcmin] | 2.5 |
| **Weight** | [kg] | 2.9 |

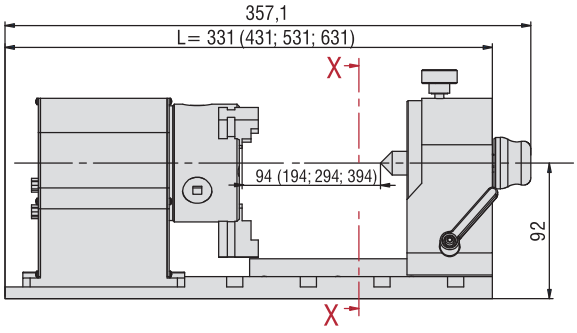
* Values for half-step operation

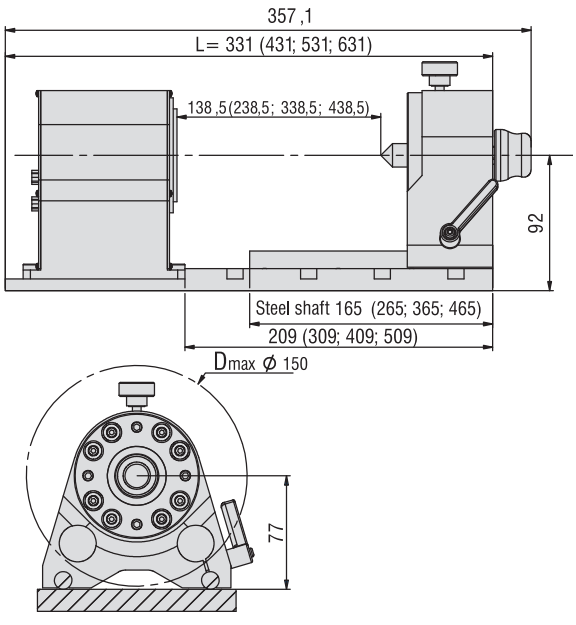
## Dimensioned drawings



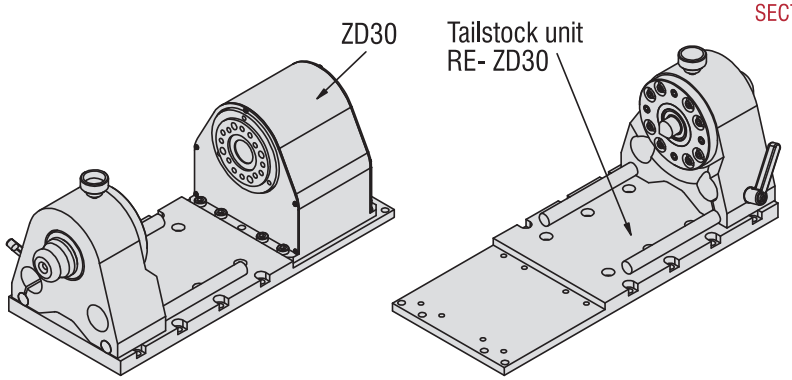




### Tailstock unit RE-ZD30

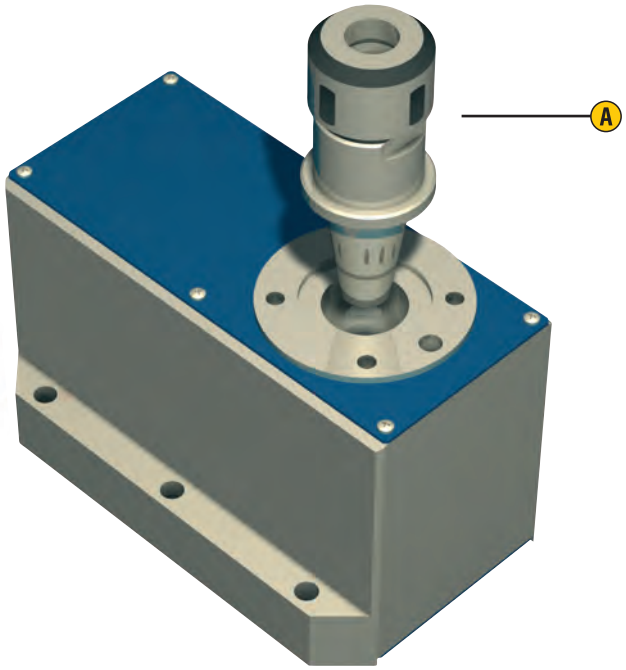



SECTIONAL DRAWING X-X



# Indexing table ZR 20




## Features

- Low play toothed belt drive with stepper motor
- Reduction 1 : 20
- Shaft with Ø 15 mm boring
- Housing flange with inner cone SK 20• Weight: 2,1 kg

For pin assignment see page **2-112**
For transport loads, see page **2-113**

Options:
- CNC controller via Sub D

Ⓐ **Collet holder SK 20**
(Accessories)

## Ordering data

ZR 20 Indexing table
Part no.: **260300 0000**

## Technical specification

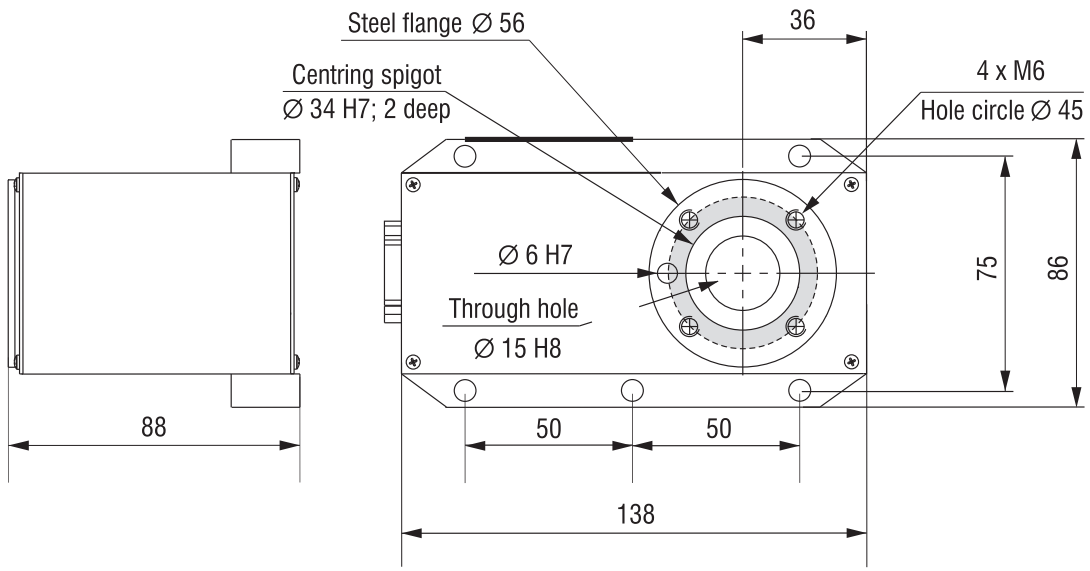
| | | stepper motor MS 045 HT * |
|---|---|---|
| **Reduction ratio** | | 1:20 |
| **Abtriebsdrehzahl** | [1/min] | 0 - 60 |
| **Operating torque** (0 - 1600 Hz) | [Nm] | 8 |
| **Rated holding torque** (static load) | [Nm] | 14 |
| **Min. step** (positional accuracy) | [arcmin] | 3.5 |
| **Weight** | [kg] | 2.1 |

* Values for half-step operation

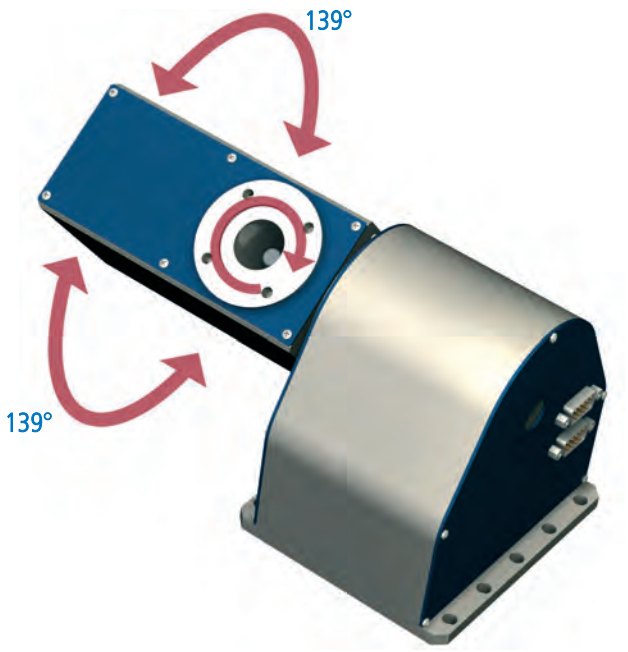
## Accessories

see rotary tilting unit ZDS 2030

## dimensioned drawing



# Rotary tilting unit ZDS 2030




## General

The **rotary tilting unit ZDS 2030** can be used as a 4th/5th axis in CNC machines for fine workshops or in the handling area.

It is a combination of ZD 30 and the modified version of ZR 20.

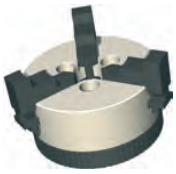
ZDS 2030 enables 5-side machining or free-form surface machining on a conventional 3-axis system of easily machinable materials (e.g. plastic).

The titling angle is 139° in both directions.

## Ordering data

Rotary tilting unit ZDS 2030
Part no.: **265000 0000**

## Accessories

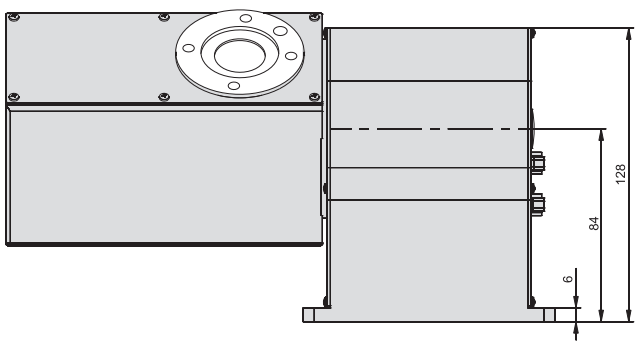


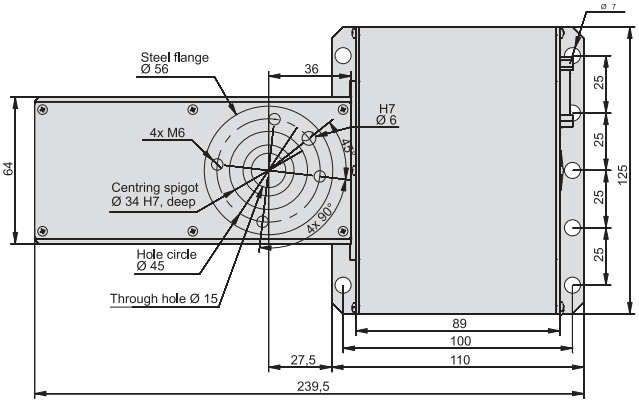
Chuck assembly
3-jaw chuck Ø 65
Part no.: **269060 2065***

* including flange

Clamping ring housing
SK 20 clamping ring housing for tools Ø 3 - 13 mm, with installation ring
Part no.: **239172 0020**
Clamping rings are on page 5-32.

## dimensioned drawing



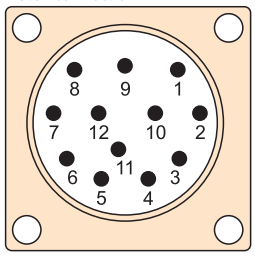



# Motor pin assignments

## Pin assignment for 12-pin stepper motors

(for RDH, DSH-S)

Motor connection



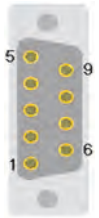

Plug side view of pin insert

| M23 12-pin Pin | |
|---|---|
| 1 | Motor phase 1A |
| 2 | Motor phase 1B |
| 3 | Motor phase 2A |
| 4 | Motor phase 2B |
| 5 | +24V switch |
| 6 | +24V brake |
| 7 | GND switch |
| 8 | GND brake |
| 9 | Limit switch 1 |
| 10 | Limit switch 2 |
| 11 | --- |
| 12 | --- |
| Housing - cable shield | |

## Pin assignment for 9-pin stepper motors

(for RF1, iZD 54, MD 1, ZD 30, ZR 20, ZDS 2030)

Motor connection



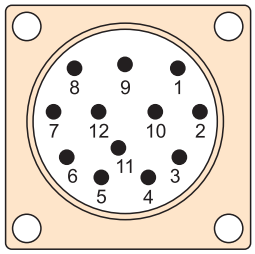

Plug side view of pin insert

| Sub-D 9-pin Pin | |
|---|---|
| 1 | Motor phase 1A |
| 2 | Motor phase 1B |
| 3 | Motor phase 2A |
| 4 | Motor phase 2B |
| 5 | +24V switch |
| 6 | +24V brake |
| 7 | Limit switch 2 |
| 8 | GND brake |
| 9 | Limit switch 1 |
| Housing - cable shield | |

## Pin assignment for stepper motors with encoder

(for RDH)

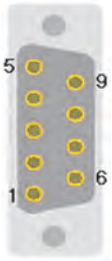
Motor connection




Plug side view of pin insert

| M23 12-pin Pin | |
|---|---|
| 1 | Motor phase 1A |
| 2 | Motor phase 1B |
| 3 | Motor phase 2A |
| 4 | Motor phase 2B |
| 5 | +24V switch |
| 6 | +24V brake |
| 7 | GND switch |
| 8 | GND brake |
| 9 | Limit switch 1 |
| 10 | Limit switch 2 |
| 11 | --- |
| 12 | --- |
| Housing - cable shield | |

Encoder connection

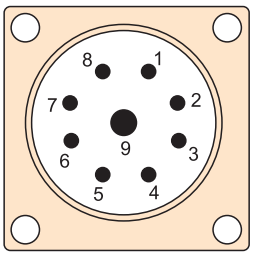



Plug side view of pin insert

| Sub-D 9-pin Pin | |
|---|---|
| 1 | +5V encoder |
| 2 | Encoder track A |
| 3 | Encoder track B |
| 4 | Encoder track Z |
| 5 | --- |
| 6 | GND encoder |
| 7 | Encoder track/A |
| 8 | Encoder track/B |
| 9 | Encoder track/Z |
| Housing - cable shield | |

## Pin assignment for DC servo motors with brushes (BDC)

Motor connection




Plug side view of pin insert

| M23 9-pol. (8+1) pin | |
|---|---|
| 1 | Motor phase 1 (V+) |
| 2 | Motor phase 1 (V-) |
| 3 | Motor phase 1 (V+)* |
| 4 | Motor phase 1 (V-)* |
| 5 | +24V brake |
| 6 | GND brake |
| 7 | --- |
| 8 | --- |
| 9 | Earthing lead |
| Housing - cable shield | |

* Part motor phase connection over 2 wires.

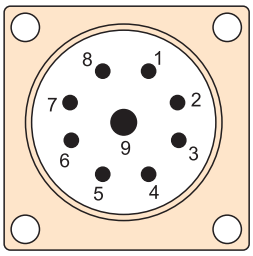
Encoder connection


Plug side view of pin insert

| Sub-D 15-pin Pin | |
|---|---|
| 1 | --- |
| 2 | +5V encoder |
| 3 | Encoder track/Z |
| 4 | Encoder track/B |
| 5 | Encoder track/A |
| 6 | +24V switch |
| 7 | Limit switch 1 |
| 8 | GND switch |
| 9 | --- |
| 10 | GND encoder |
| 11 | Encoder track Z |
| 12 | Encoder track B |
| 13 | Encoder track A |
| 14 | Reference switch |
| 15 | Limit switch 2 |
| Housing - cable shield | |

## Pin assignment for brushless EC servomotors (BLDC) 48V

Motor connection




Plug side view of pin insert

| M23 9-pol. (8+1) pin | |
|---|---|
| 1 | Motor phase U |
| 2 | Motor phase V |
| 3 | Motor phase W |
| 4 | --- |
| 5 | +24V brake |
| 6 | GND brake |
| 7 | --- |
| 8 | --- |
| 9 | Earthing lead |
| Housing - cable shield | |

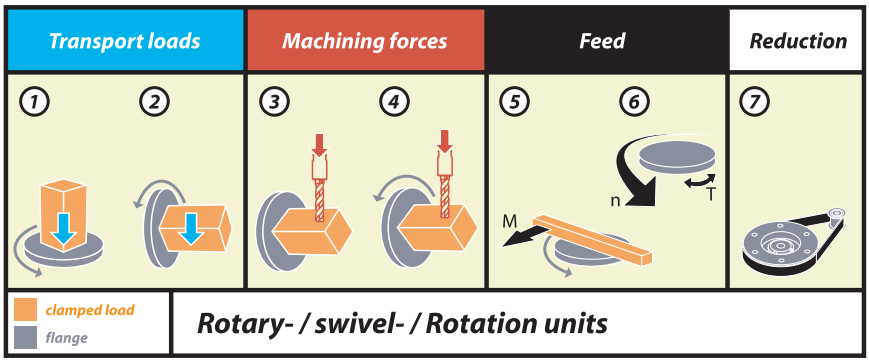
Encoder connection


Plug side view of pin insert

| Sub-D 15-pin Pin | |
|---|---|
| 1 | Hall signal A |
| 2 | +5V encoder/Hall |
| 3 | Encoder track/Z |
| 4 | Encoder track/B |
| 5 | Encoder track/A |
| 6 | +24V switch |
| 7 | Limit switch 1 |
| 8 | GND switch |
| 9 | Hall signal B |
| 10 | GND encoder |
| 11 | Encoder track Z |
| 12 | Encoder track B |
| 13 | Encoder track A |
| 14 | Hall signal C |
| 15 | Limit switch 2 |
| Housing - cable shield | |

## Turn/tilt/rotation units:

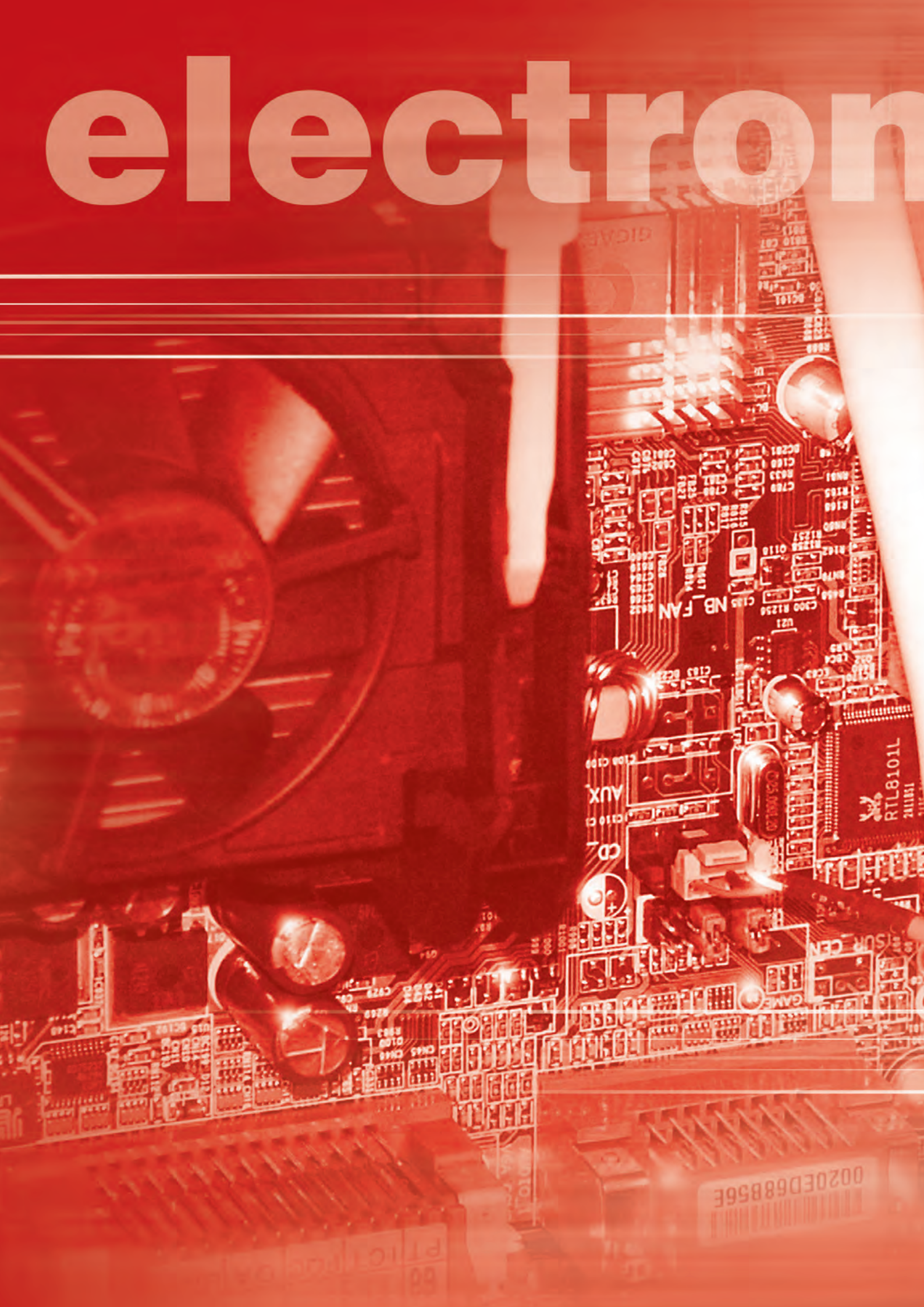
# Transport loads, machining forces, feed




| Rotary or tilting 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 (EC-servo, brushless) | 110 kg | 50 kg | 26 Nm | 9 Nm | 9 Nm | 22 rpm | 1:51 |
| RDH-M (EC-servo, brushless) | 180 kg | 80 kg | 51 Nm | 17 Nm | 17 Nm | 11 rpm | 1:101 |
| RDH-S (step) | 30 kg | 15 kg | 7 Nm | 7 Nm | 7 Nm | 4 rpm | 1:51 |
| RDH-S (step) | 48 kg | 24 kg | 11 Nm | 11 Nm | 11 Nm | 2 rpm | 1:101 |
| RDH-S (EC-servo, brushless) | 30 kg | 15 kg | 7 Nm | 4.6 Nm | 4.6 Nm | 22 rpm | 1:51 |
| RDH-S (EC-servo, brushless) | 48 kg | 24 kg | 11 Nm | 4.6 Nm | 9.2 Nm | 11 rpm | 1:101 |
| RDH-S (DC-servo) | 25 kg | 13 kg | 7 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 (EC-servo, brushless) | 30 kg | 10 kg | 5 Nm | 5 Nm | 5 Nm | 59 rpm | 1:50 |
| RDH-XS (EC-servo, brushless) | 30 kg | 10 kg | 7 Nm | 7 Nm | 7 Nm | 30 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/EC servo) | 70 kg | 35 kg | 7 / 12 Nm | 6 / 10 Nm | 6 / 10 Nm | 125 rpm | 1:24 |
| RF 1 (DC servo/EC servo) | 110 kg | 55 kg | 16 / 26 Nm | 13 / 22 Nm | 13 / 22 Nm | 58 rpm | 1:52 |
| RF 1 (DC servo/EC servo) | 160 kg | 80 kg | 30 / 50 Nm | 25 / 42 Nm | 25 / 42 Nm | 30 rpm | 1:100 |
| 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 | 3.9 Nm | 3 Nm | 3 Nm | 175 rpm | 1:20 |
| MD 1 (EC servo, brushless) | 6 kg | 3 kg | 4 Nm | 3.2 Nm | 3.2 Nm | 150 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 |

*) Guideline values will vary according to application !!

# electron



## ELECTRONICS

# Overview

# Overview

electronics

# Two-phase stepper motors

## MS 135/200 HT-2

Two-phase stepper motor MS 135 HT - 2

## Features

- Step angle 1.8°, higher resolution through microstep mode
- Very high torque through rare earth magnets
- Optimised for use with position controllers
- Optimum torque/size ratio
- Smaller step angle errors, non-cumulative
- IP43 protection class
- Optional:
  - MD 24 drive module
  - Brake (MS 200 HT)
  - Second shaft end (MS 200 HT)

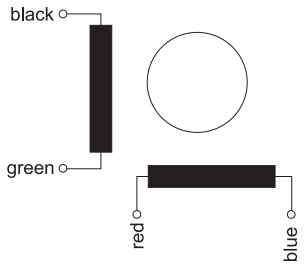
## General

Two-phase stepper motors behave similarly to synchronous motors. They are easy to control and are characterised by very long working life and reliability, at a favourable price. This results in a wide range of applications. Two-phase stepper motors in the MS range are of the high torque type. A particularly high torque is achieved by the use of rare earth magnets.

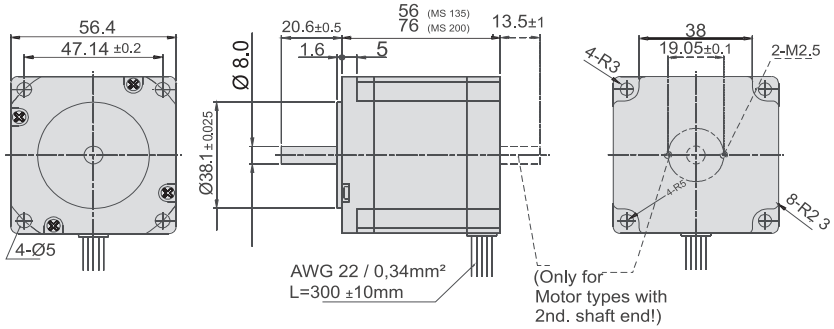
## Technical specification

| Description | Holding moment bipolar Nm | Winding current per phase A | Winding voltage per phase V | Winding inductance per phase mH | Weight kg | Length (without shaft) mm | Part no. |
|---|---|---|---|---|---|---|---|
| MS 135 HT-2 | 1.1 | 3.0 | 2.4 | 2.4 | 0.7 | 56 | 470551 |
| MS 200 HT-2 | 1.8 | 3.0 | 3.0 | 3.5 | 1.0 | 76 | 470581 |
| MS 200 HT-2 (2nd shaft end) | 1.8 | 3.0 | 3.0 | 3.5 | 1.1 | 76 | 470581 0100 |
| MS 200 HT-2 (brake) | 1.8 | 3.0 | 3.0 | 3.5 | 1.8 | 76 | 470581 0200 |

## Wiring diagram

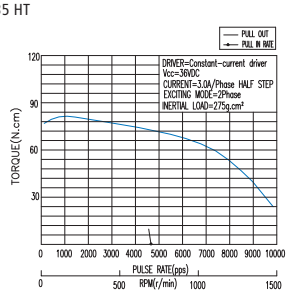



## Dimensioned drawing

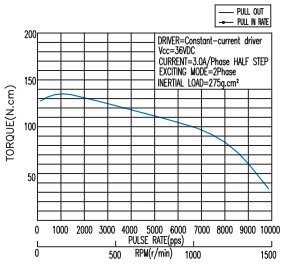



## Torque curves

MS 135 HT




MS 200 HT



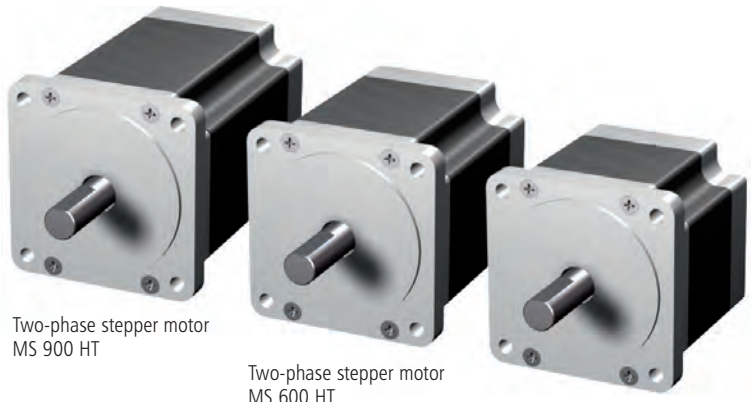

Subject to technical changes.



isel®

# Two-phase stepper motors

## MS 300/600/900 HT-2



Two-phase stepper motor MS 900 HT

Two-phase stepper motor MS 600 HT

Two-phase stepper motor MS 300 HT

## Features

- Step angle 1.8°, higher resolution through microstep mode
- Very high torque through rare earth magnets
- Optimised for use with position controllers
- Optimum torque/size ratio
- Smaller step angle errors, non-cumulative
- IP43 protection class
- Optional:
  - MD 28 drive module
  - Brake (MS 300 HT)

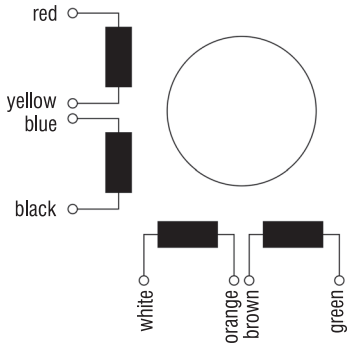
## General

Two-phase stepper motors behave similarly to synchronous motors. They are easy to control and are characterised by very long working life and reliability, at a favourable price. This results in a wide range of applications. Two-phase stepper motors in the MS range are of the high torque type. A particularly high torque is achieved by the use of rare earth magnets.

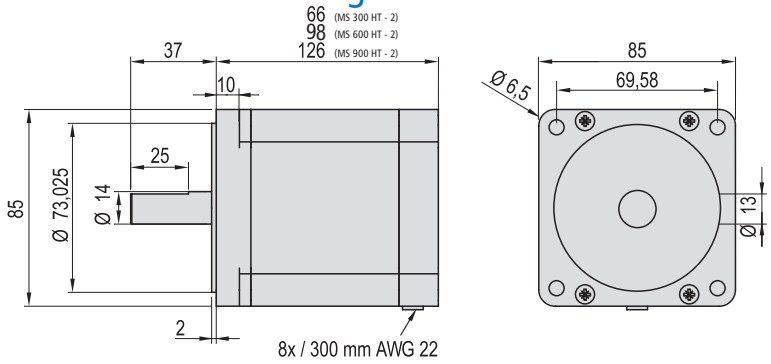
## Technical specification

| Description | Holding torque Bipolar Nm | Winding current per phase parallel/series A | Winding voltage per phase parallel/series V | Winding inductance per phase mH | Weight kg | Length (without shaft) mm | Part no. |
|---|---|---|---|---|---|---|---|
| MS 300 HT - 2 | 3.11 | 5.6 / 2.8 | 1.68 / 3.38 | 1.6 | 2.0 | 66 | 470821 |
| MS 300 HT - 2 (brake) | 3.11 | 5.6 / 2.8 | 1.68 / 3.38 | 1.6 | 2.75 | 104 | 470821 0200 |
| MS 600 HT - 2 | 6.80 | 7.0 / 3.5 | 2.28 / 4.55 | 2.4 | 3.0 | 98 | 470851 |
| MS 900 HT - 2 | 9.00 | 6.3 / 3.1 | 2.84 / 5.67 | 4.2 | 4.5 | 126 | 470881 |

## Wiring diagram

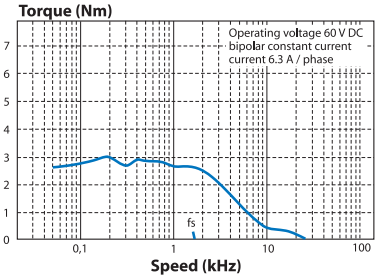



## Dimensioned drawing

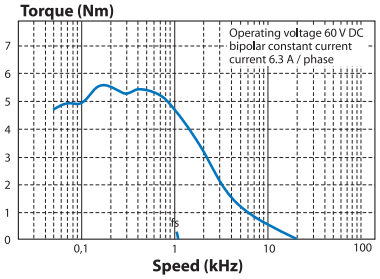



## Torque curves

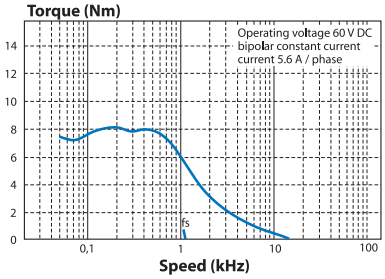
MS 300 HT




MS 600 HT




MS 900 HT

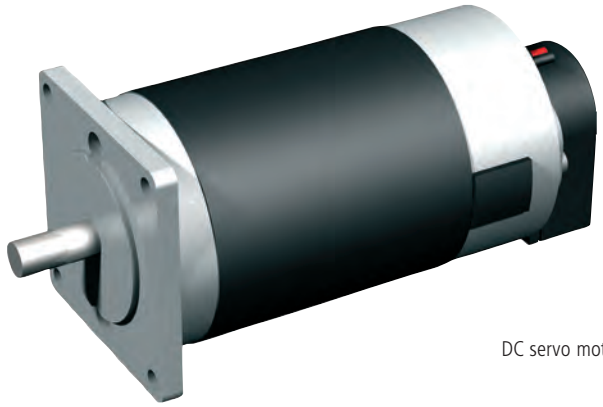



Subject to technical changes.

electronics

# Servo motors
with brush drive

# DC 100



DC servo motor DC 100

## Features

- Servo motor with brushes
- Low-resistance winding construction
- Good dynamic response
- Two-finger brush (long working life)
- Incremental encoder with 512 pulses/turn
- IP43 protection class/IP50 encoder

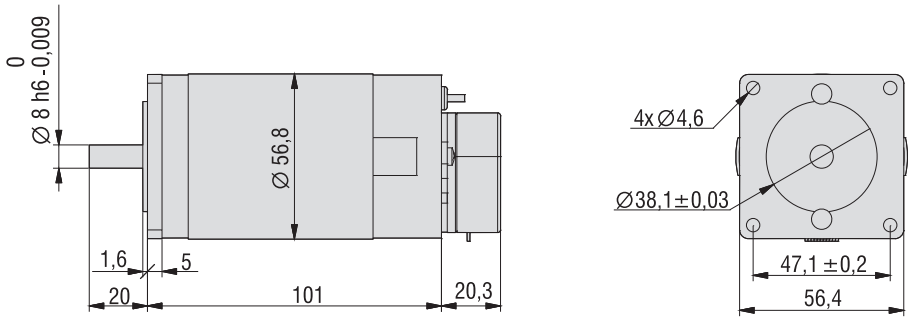
## General

DC servo motors with brushes are the entry into the controlled drive technology class. They have good dynamic response and have proved themselves in drive systems. The attached encoder enables precise positioning. This predestines their use in CNC machines and in automation systems.

## Technical specification

| Description | Voltage V | No-load speed rpm | No-load current A | Rated speed rpm | Rated torque Ncm | Rated current A | Rated output W | Peak current A | Part no. |
|---|---|---|---|---|---|---|---|---|---|
| DC 100 | 48 | 3,400 | 0.25 | 3,000 | 30 | 2.8 | 95 | 6.5 | 471022 0020 |

## Dimensioned drawings




## Wire colours/ Pin assignments

### Motor cable

| Signal | Colour |
|---|---|
| Motor + | red |
| Motor - | black |

### Encoder cable

| Pin | Signal | Colour |
|---|---|---|
| 1 | Gnd | black |
| 2 | Vcc +5 V | red |
| 3 | Encoder A | green |
| 4 | Encoder /A | brown |
| 5 | Encoder B | white |
| 6 | Encoder /B | grey |
| 7 | Encoder Z | yellow |
| 8 | Encoder /Z | orange |

Plug connector: 8-pole female connector strip, type JST PHR-8

Subject to technical changes.

# Servo motors
with brushless drive

# EC 42

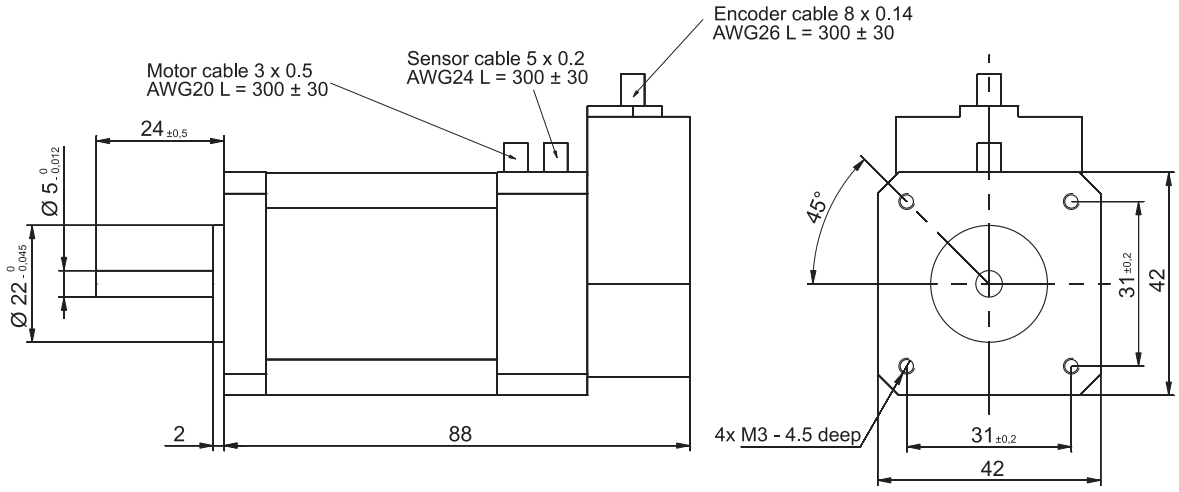


## Features

- Electronically commutated 3-phase-servo motor
- Brushless drive
- Compact configuration
- Incremental encoder with 512 pulses/turn, RS422
- Hall sensors
- Areas of application: positional control, speed control

## Technical specification

| Part no. | Description | Rated output W | Nominal voltage V DC | Current A | Number of poles | Rated speed rpm | torque at rated speed Nm | Peak torque Nm | Length L mm | Weight kg |
|---|---|---|---|---|---|---|---|---|---|---|
| 474062 0048 | EC 42 | 62 | 48 | 1.75 | 8 | 3000 | 0.2 | 0.6 | 88 | 0.55 |




## Wire colours

### Motor cable

| Signal | Colour |
|---|---|
| Motor U | yellow |
| Motor V | blue |
| Motor W | green |

### Hall cable

| Signal | Colour |
|---|---|
| Hall A | yellow |
| Hall B | green |
| Hall C | blue |
| Vcc +5 V | red |
| Gnd | black |

### Encoder cable

| Signal | Colour |
|---|---|
| Encoder A | blue |
| Encoder /A | blue/black |
| Encoder B | green |
| Encoder /B | green/black |
| Encoder Z | yellow |
| Encoder /Z | yellow/black |
| Vcc +5 V | red |
| Gnd | black |

Subject to technical changes.

electronics

# Servomotors
with brushless drive

# EC 60

## Features

- Electronically commutated 3-phase servomotor
- Brushless drive
- High output performance concurrently with compact build
- Incremental encoder with 512 pulses/turn, RS422
- Hall sensors
- IP44 protection class
- Uses: Positioning and speed control
- Connection via circular plug
- Option: Brake

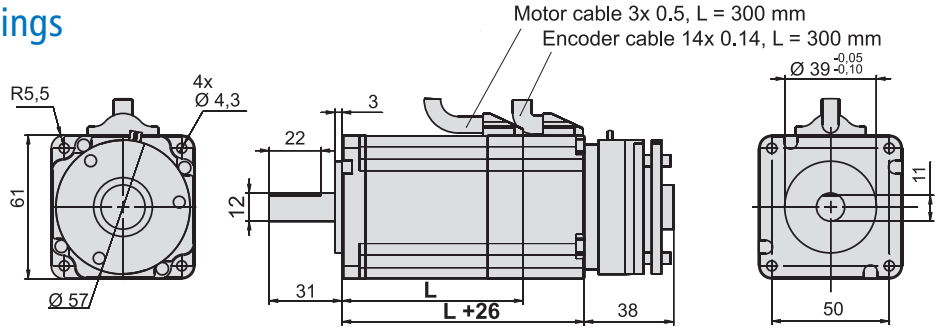
## General

Brushless EC motors are designed as electronically switched 3-phase synchronous motors. Compared with brush drives, these motors have an even longer working life, because they are subjected to less wear. Moreover, in this case, high power density and dynamic response relative to size must be emphasized. These motors are used in many automation technology areas and in CNC machines.

## Technical specification

| Part no. | Description | Rated output W | Rated voltage V DC | Current A | Number of poles | Rated speed rpm. | Torque at rated speed Nm | Peak torque Nm | Length L (mm) | Weight kg |
|---|---|---|---|---|---|---|---|---|---|---|
| 474156 0048 | EC 60S | 156 | 48 | 6.9 | 8 | 3,000 | 0.5 | 1.75 | 73 | 1.25 |
| 474156 1048 | EC 60S with brake | 156 | 48 | 6.9 | 8 | 3,000 | 0.5 | 1.75 | 73 | 2.0 |
| 474235 0048 | EC 60L | 235 | 48 | 10.5 | 8 | 3,000 | 0.75 | 2.25 | 94 | 1.6 |
| 474235 0310 | EC 60L | 235 | 310 | 1.6 | 8 | 3,000 | 0.75 | 2.25 | 94 | 1.6 |
| 474235 1310 | EC 60L with brake | 235 | 310 | 1.6 | 8 | 3,000 | 0.75 | 2.25 | 94 | 2.35 |

## Dimensioned drawings




## Wire colours/ Pin assignments

### Motor cable

| Signal | Colour |
|---|---|
| Motor U | yellow |
| Motor V | blue |
| Motor W | green |
| PE | green/yellow |

### Encoder cable

| Pin | Signal | Colour |
|---|---|---|
| 1 | Shield | Shield |
| 2 | Gnd | black |
| 3 | Vcc +5 V | red |
| 4 | Encoder B | grey |
| 5 | Encoder /B | grey/black |
| 6 | Encoder A | brown |
| 7 | Encoder /A | brown/black |
| 8 | Encoder Z | orange |
| 9 | Encoder /Z | orange/black |
| 10 | Hall A | yellow |
| 11 | Hall B | white |
| 12 | Hall C | green |

Encoder cable plug connector:
12-pole female connector strip, type JST PHR-12

Subject to technical changes.

# Servomotors
## with brushless drive

# EC 86

## Features

- Electronically commutated 3-phase servomotor
- Brushless drive
- High output performance concurrently with compact build
- Incremental encoder with 512 pulses/turn, RS422
- Hall sensors
- IP44 protection class
- Uses: Positioning and speed control
- Connection via circular plug
- Option: Brake

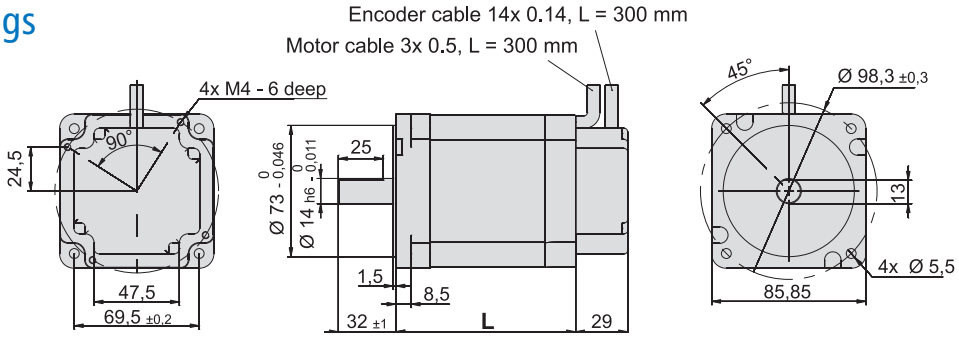
## General

Brushless EC motors are designed as electronically switched 3-phase synchronous motors. Compared with brush drives, these motors have an even longer working life, because they are subjected to less wear. Moreover, in this case, high power density and dynamic response relative to size must be emphasized. These motors are used in many automation technology areas and in CNC machines.

## Technical specification

| Part no. | Description | Rated output W | Rated voltage V DC | Current A | Number of poles | Rated speed rpm. | Torque at rated speed Nm | Peak torque Nm | Length L mm | Weight kg |
|---|---|---|---|---|---|---|---|---|---|---|
| 474440 0310 | EC 86S | 440 | 310 | 3.4 | 8 | 3,000 | 1.4 | 5.0 | 100 | 2.6 |
| 474660 0310 | EC 86L | 660 | 310 | 3.6 | 8 | 3,000 | 2.1 | 7.4 | 125 | 4 |

## Dimensioned drawings




## Wire colours/ Pin assignments

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| PE | green/yellow |

### Encoder cable

| Pin | Signal | Colour |
|---|---|---|
| 1 | Shield | Shield |
| 2 | Gnd | black |
| 3 | Vcc +5 V | red |
| 4 | Encoder B | grey |
| 5 | Encoder /B | grey/black |
| 6 | Encoder A | brown |
| 7 | Encoder /A | brown/black |
| 8 | Encoder Z | orange |
| 9 | Encoder /Z | orange/black |
| 10 | Hall A | yellow |
| 11 | Hall B | white |
| 12 | Hall C | green |

Encoder cable plug connector:
12-pole female connector strip, type JST PHR-12

Subject to technical changes.

electronics

# Linearmotoren
## LS winding package with MS magnetic rail

# iLM Serie

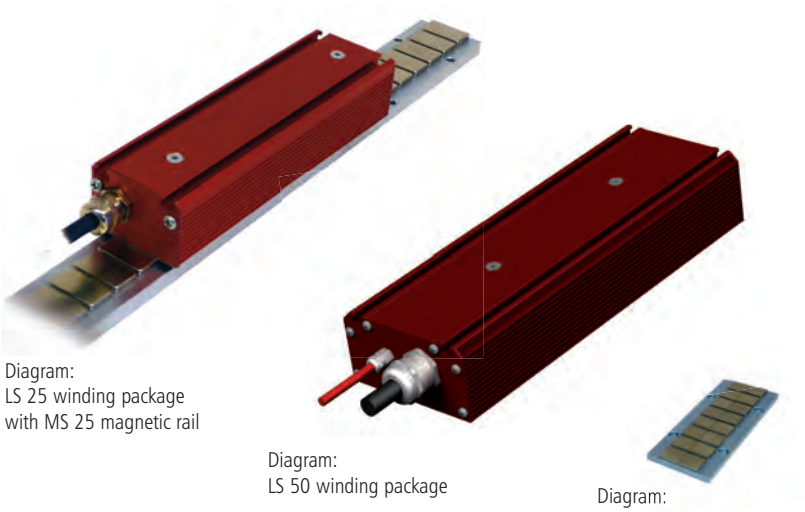


Diagram:
LS 25 winding package
with MS 25 magnetic rail

Diagram:
LS 50 winding package

Diagram:
MS 25 magnetic rail
with 8 magnets

## Features

- Ready-for-installation systems comprising primary part (LS winding package) and secondary part (MS magnetic rail)
- Compact build
- High acceleration
- High speed and dynamic response
- High efficiency
- Free from wear
- Custom motor length
- Secondary part (MS magnetic rail): Elements of any length, depending on their carrier system, can be arranged in rows
- Controllable with standard servo converters

Optional:
- iMD 40 drive controller (only in conjunction with Hall board)
- Magnetic length measurement system
- Linear guides

## General

Linear motors in the iLM series are linear 3-phase servomotors of various sizes and any length at a favourable price/performance ratio. The optionally integrated Hall sensors provide the positional information for switching the motor. There is a PTC temperature sensor in the primary component to protect the motor. The electrical connections (Hall, windings and temperature sensor) are made via permanently installed cable. Owing to the direct power transfer, there is no need for any mechanical transfer elements, such as spindles and toothed belts which completely eliminates friction and play. This means that higher speeds and dynamic responses can be achieved. The resultant lower clocking times reduce production costs and increase productivity. Because there are no mechanical elements in the drive itself, noise, wear and the resultant maintenance costs are minimised. In comparison with other linear drives, drives with linear motors are more accurate, faster, free from play (without return play) and more robust.

## Ordering information

Winding package

**486 0XX 000X**

Coil package
0 = LS 25
1 = LS 50

Hall boards
0 = without Hall board
1 = with Hall board

Number of coils
1 = 3 coils
2 = 6 coils
3 = 9 coils
4 = 12 coils

Note:
For the iMD 40 drive controller use coil packages with Hall boards only.
Any number of magnetic rails can be arranged with each other.

Magnetic rails

MS 25 magnetic rail with 8 magnets (L×W×H approx.124/45/11mm)
Part no.: **486100 01241**

MS 25 magnetic rail with 32 magnets (L×W×H approx.496/45/11 mm)
Part no.: **486100 04961**

MS 50 magnetic rail with 8 magnets (L×W×H approx. 200/80/11 mm)
Part no.: **486110 0200**

MS 50 magnetic rail with 16 magnets (L×W×H approx. 400/80/11 mm)
Part no.: **486110 0400**

MS 50 magnetic rail with 32 magnets (L×W×H approx. 800/80/11 mm)
Part no.: **486110 0800**

| | |
|---|---|
| LS 25 coil package with 6 coils and Hall boards | Part no.: **486001 0002** |
| + 2× MS 25 magnetic rails with 32 magnets | Part no.: **486100 0496** |
| + iMD 40 drive controller | Part no.: **314040** |
| + iMS-I magnetic length measuring system (5 µm resolution) | Part no.: **390255 4412** |

Subject to technical changes.

# Linearmotoren
## LS winding package with MS magnetic rail

# iLM Serie

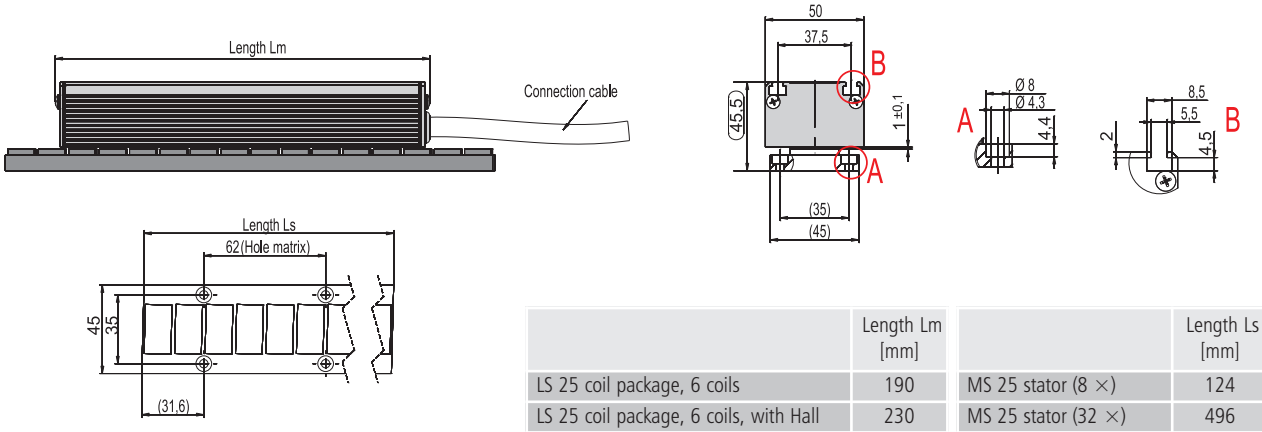
## Technical specification

| | Intermediate circuit voltage [V] ** | Number of coils | Rated current [A] | Peak current [A] | Feed force [N] | max. feed force [N] | max. tensile force [N]* | Rated speed [m/s] at rated current |
|---|---|---|---|---|---|---|---|---|
| LS 25/6 coils | 330 | 6 | 2.6 | 6.5 | 70 | 170 | 500 | 6.6 |
| LS 25/12 coils | 330 | 12 | 2.6 | 6.5 | 140 | 340 | 1,000 | 4.0 |
| LS 50/6 coils | 330 | 6 | 6.0 | 15.0 | 285 | 675 | 1,995 | 5.1 |
| LS 50/12 coils | 330 | 12 | 6.0 | 15.0 | 570 | 1,350 | 3,990 | 3.5 |

* Higher intermediate circuit voltage to order.
* * Applicable for a working air gap of 0.8 mm.

## Dimensioned drawings

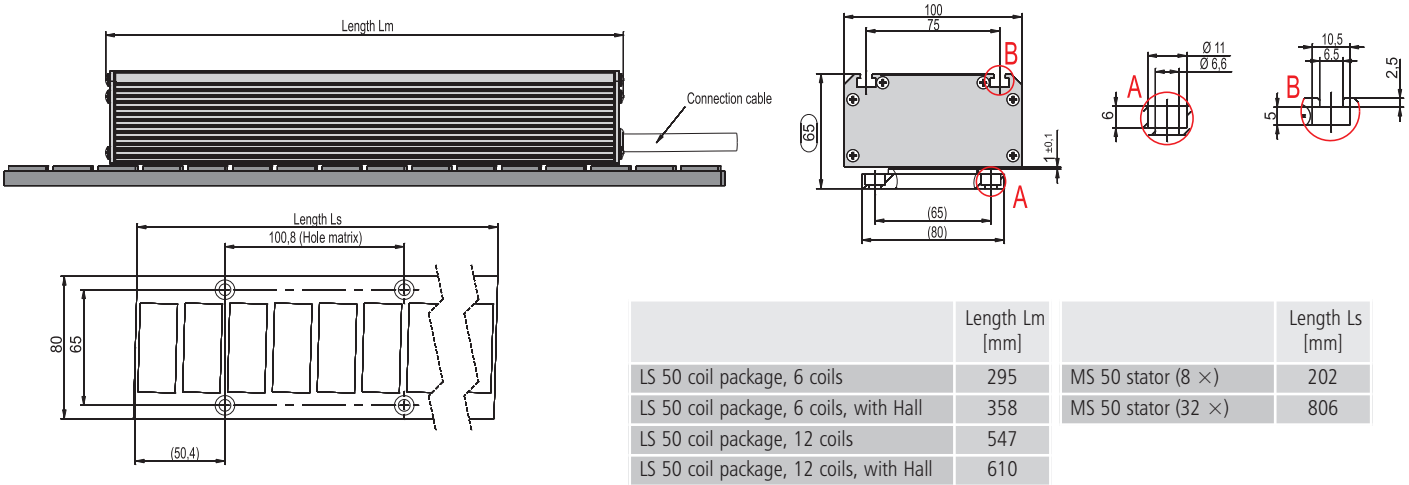
iLM 25 linear motor




| | Length Lm [mm] |
|---|---|
| LS 25 coil package, 6 coils | 190 |
| LS 25 coil package, 6 coils, with Hall | 230 |
| LS 25 coil package, 12 coils | 365 |
| LS 25 coil package, 12 coils, with Hall | 405 |

| | Length Ls [mm] |
|---|---|
| MS 25 stator (8 ×) | 124 |
| MS 25 stator (32 ×) | 496 |

iLM 50 linear motor




| | Length Lm [mm] |
|---|---|
| LS 50 coil package, 6 coils | 295 |
| LS 50 coil package, 6 coils, with Hall | 358 |
| LS 50 coil package, 12 coils | 547 |
| LS 50 coil package, 12 coils, with Hall | 610 |

| | Length Ls [mm] |
|---|---|
| MS 50 stator (8 ×) | 202 |
| MS 50 stator (32 ×) | 806 |

Subject to technical changes.

electronics

# iMS magnetic length measuring system

Detailed information under www.isel-germany.de

Diagram:
iMS magnetic length measuring system

## Features

- Measuring head with sensor in stable casing
- Reliable, robust, good value
- 2 channels, A and B,
  difference mode incremental RS 422 or
  difference mode analogue 1VSS
- Incremental/digital resolution (see table)
- Repeatability = ±1 increment
- Magnetic tape on self-adhesive,
  stainless steel bearer tape

optional:
- Reference pulse

## General

The iMS contactless magnetic measuring system relies on scanning a magnetically coded measuring tape by means of a magnetically sensitive sensor and is suitable for detection of both linear and radial positions. A decisive advantage compared with significantly more expensive optical systems is provided by its insensitivity to contamination caused by liquids, greases and dust. Our length measuring system is therefore a cost-effective alternative to other systems on the market.

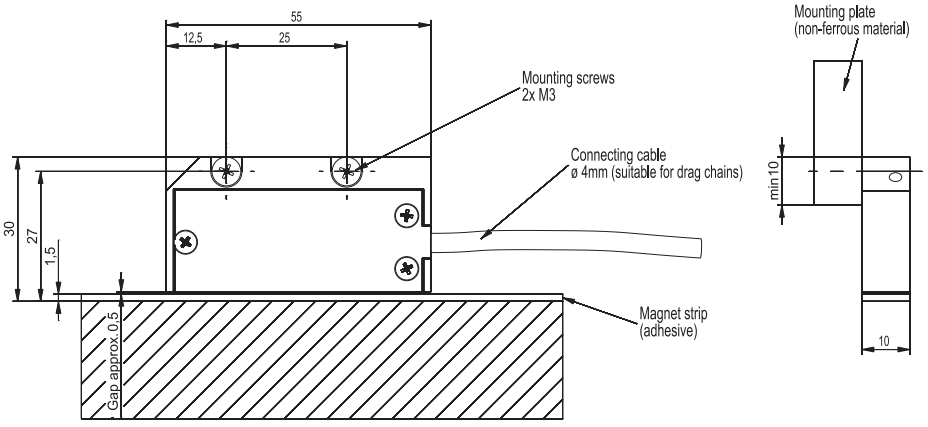
Available sensor interfaces for further processing in the peripherals are, optionally, a pulse sensor with incremental RS422 AB output (Z optional) and a SIN/COS/(Z optional) sensor with voltage amplitude 1Vss.

## Ordering data

iMS-I magnetic length measuring system in casing
Resolution 5µm, edge interval 0.55 µs,
Processing speed 5.25 m/s
Part no.: **390255 4412**

Magnetic tape on self-adhesive stainless steel bearer tape (2 mm pole pitch, 10 mm wide, 1.3 mm thick)
Part no.: **563150**

## dimensioned drawing




Subject to technical changes.

# iMS magnetic length measuring system

## Technical specification

### Sensor

| Mechanical specification | |
|---|---|
| Casing | Aluminium |
| Weight | approx. 70g |
| Sensor lead | PUR |
| Cable bending radius | >10 mm, first bend > 10 mm from sensor casing |
| **Electronic data** | |
| Supply voltage | 4.9V - 5.1V<br>(optional: 7V - 15V) |
| Current drain | < 100 mA on no load |
| Output signals | Standard RS422 A, /A, B, /B optional reference Z, /Z<br>Option: SIN/ COS 1Vss +20%, -40%, Z und /Z right sign |
| Termination | Terminating resistor = 120 Ohm between corresponding output signals,<br>e.g. A - /A, at receiver |
| Sensor distance - magnetic tape | 0.4 - 0.7 mm |
| Sensor resolution incremental | 1 µm, 2.5 µm, 5 µm, 10 µm, 20 µm |
| Pulse interval | 0.25 µs, 0.55 ns, 1 µs, 2 µs, 4 µs, 8 µs |
| Analogue sensor resolution | Sinusoidal period length = 2 mm |
| maximum speed | < 10 m/s, higher on request |
| Repeat accuracy | Incremental resolution ± 1 increment, plus errors due to<br>angular tilting in the 3 sensor axes |
| accuracy | Measurement error 20 µm,<br>plus errors due to angular tilting in the 3 sensor axes |
| Reference sequence | optional: NSN (special order) |
| **Ambient conditions** | |
| Operating temperature | -5°C to 80°C |
| Storage temperature | -20°C to 100°C |
| Air humidity (only sensor) | 100%, dewing allowed |

### Normal measurement - magnetic tape

| | |
|---|---|
| operating temperature | -5°C to 80°C |
| Material | High quality stainless steel, coding bearer elastomer, self-adhesive |
| Thickness | 1.3 mm ± 0.15 mm + bonding layer 0.13 mm,<br>optional: 0.1 mm stainless steel tape + 0.2 mm bonding layer |
| Width | 10 mm |
| Length | up to 50m on roll |
| Pole pitch/PITCH | 2 mm, i.e. north pole = 2 mm, south pole = 2 mm<br>magnetic period = 4 mm |
| Number of tracks | Single track, 10 mm wide<br>Option: signal track 5 mm, reference track periodically 5 mm |
| accuracy | ± 0.04mm/m up to 50 m length, at 20°C |
| Coefficient of expansion | 17E-6 m/Kelvin |
| **Ambient conditions** | |
| with no or minimum effect on the measurement norm | Chemical resistance to contamination with motor oil, gearbox oil, ATF, hydraulic oil, kerosene, antifreeze, Clorox disinfectant, turpentine, water, brine. The materials listed have no or little effect on the long term stability of the measurement standard; this depends, among other things, on the concentration, the temperature and the time of the contamination. Please check your own case. |
| little/average effect on the measurement standard | Jet petrol, carburettor fuels, heptanes, alcohols |
| strong effect on the measurement standard | Aromatic hydrocarbons, ketones, inorganic acids |

Subject to technical changes.

electronics

# CNC control panels

# iBP 19

Figure:
iBP 19-1 with wall bracket
and silicon keyboard

Figure:
iBP 19-1 with stand
and silicon keyboard

Figure:
iBP 19-2 with bench mounting and stainless steel keyboard

## General

CNC control panels are robust and powerful control units for an extensive range of applications in industrial automation and much more.
A conventional external PC can be connected and operated with the standard connections provided. All CNC control panels come with an integrated touch screen monitor, a keyboard and a control panel with stainless steel keys and 2-channel emergency shutdown switch for operating
CNC machines The extensive range of installation options cater to both wall and bench mounting. Three different versions are available.

## Ordering information

| | |
|---|---|
| 19" CNC control panel iBP 19-1, German silicon keyboard | Part no.: **371076 1102** |
| 19" CNC control panel iBP 19-1, English silicon keyboard | Part no.: **371076 1112** |
| 19" CNC control panel iBP 19-2, German steel keyboard | Part no.: **371077 1102** |
| 19" CNC control panel iBP 19-2, English steel keyboard | Part no.: **371077 1112** |
| Mounting arm for wall mounting iBP 19 | Part no.: **371050 0003** |
| Mounting arm for bench mounting | Part no.: **371050 0004** |
| Stand iBP 19 | Part no.: **371050 0005** |
| Mounting arm for rack assembly iBP 19 on PS 80 | Part no.: **371050 1009** |
| Mounting arm for rack assembly iBP 19 on PS 100 | Part no.: **371050 1010** |
| Mounting arm for rack assembly iBP 19 on PS 140 | Part no.: **371050 1008** |

## Features

iBP 19-1

- 19" TFT touch screen display
- 102 keys, silicon keyboard (IP65) with integrated 2-key mouse pointer or mouse carrier plate fixed to the side
- Dimensions: 475 x D 501 x H 354 mm
- Weight: appr. 17.4 kg

iBP 19-2

- 19" TFT touch screen display
- 102 keys, stainless steel keyboard (IP65) with integrated 2-key trackball
- Dimensions: W 475 x T 501 x H 354 mm
- Weight: appr. 18.4 kg

## Common features

- stable metal casing with aluminium front plate
- pivoted with wall and bench mounting
- simple connection of external PC systems
- Touch screen monitor
- robust and tamper-proof casing
- Control panel with stainless steel keys
- 2-channel emergency shutdown switch

# Drive modules MD 24/28

## for 2-phase step motors

## Features

- High performance, low noise
- Power supply up to 50 V DC (80 V DC)*
- Output current up to 4.2 A (7.8 A)*
- Automatic current reduction
- Suitable for 2-phase and 4-phase stepper motors
- Clock / direction interface
- Input frequency for clock input up to 300 KHz
- 15 (14)* selectable resolutions up to 25,600 steps/rev (51,200 steps/rev)*
- Opto-isolated, TTL-compatible inputs
- Protection against short-circuit, overvoltage and overcurrent

* MD 28

## General

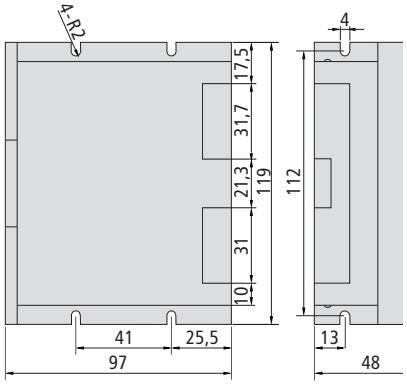
The step motor drive modules MD24/MD28 are powerful final stages for 2-phase and 4-phase step motors.
The modules are micro-step capable and thus allow very quiet running of the connected motors. Due to its particular chopper technology for the motor current, identical motors can deliver higher speeds and torques than conventional, comparable drive modules. The clocking/direction interface also allows simple connection to various motion controllers or a PLC.

## Technical specification

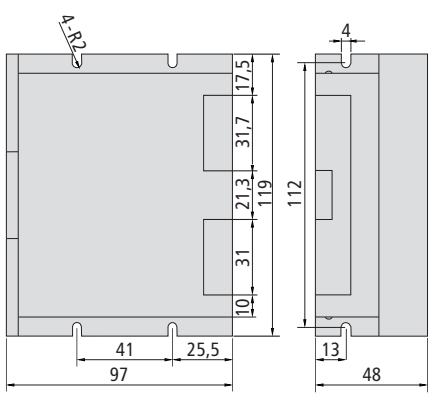
| | | MD 24 | | | MD 28 | | |
|---|---|---|---|---|---|---|---|
| Parameter | **Unit** | Min. | Typical | Max. | Min. | Typical | Max. |
| Output current | **A** | 1 | - | 4.2 (3.0 A rms) | 2.8 | - | 7.8 |
| Mains voltage | **VDC** | 20 | 36 | 50 | 24 | 68 | 80 |
| Current logic signals | **mA** | 7 | 10 | 16 | 7 | 10 | 16 |
| Clocking input frequency | **kHz** | 0 | - | 300 | 0 | - | 300 |
| Insulation resistance | **MΩ** | 500 | | | 500 | | |
| Part no. | | | **316303** | | | **316304** | |

## Dimensioned drawings

MD 24




MD 28

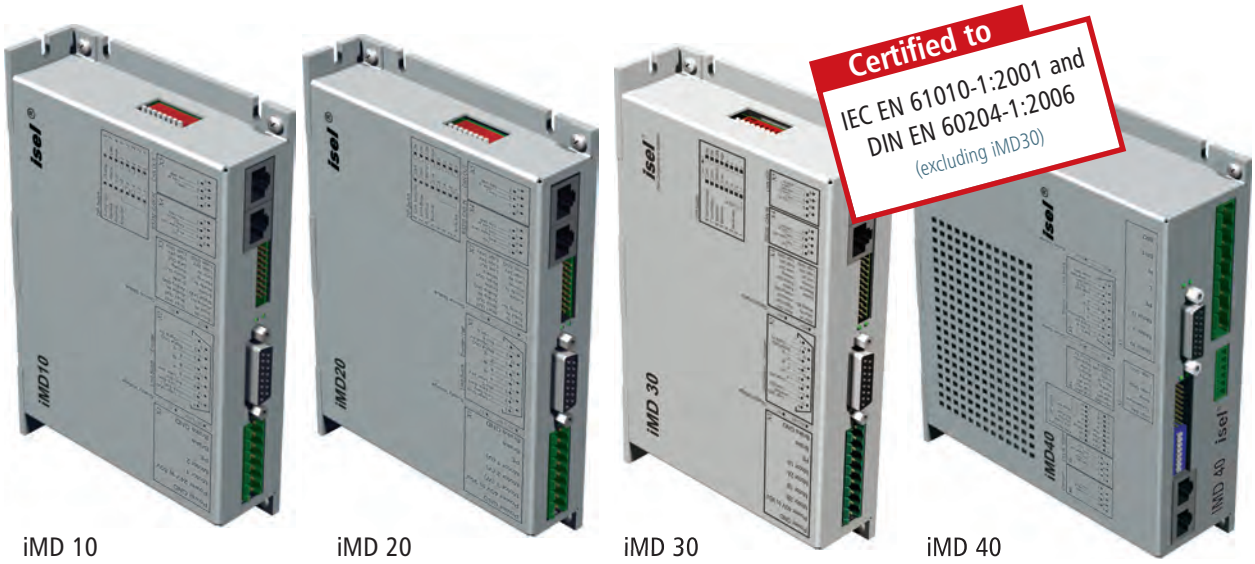



Subject to technical changes.

Subject to technical changes.

# Drive controller
## for stepper and servo motors

# iMD 10/20/30/40




iMD 10 iMD 20 iMD 30 iMD 40

## General

The **iMD10/20/30** series of drive controllers are economical final stages for DC motors (iMD10) and EC servomotors (iMD20) as well as for two-phase step motors (iMD30). The fully digital **iMD40** drive controller is an economical final stage, powered directly from the mains, for EC servomotors (synchronous motors, such as linear or torque motors) up to 2 kW.

Typical applications are CNC machines and automation systems. The final stage casings are optimised for cabinet installation. The extensive configuration options allow flexible adaptation to a wide range of applications and all required settings can be made with a user-friendly commissioning software package.

There are various user interfaces available for integration with proprietary applications. Here, the CAN open interface must be emphasized. In addition to synchronous point-to-point positioning (S-PTP) and speed control, track control (CP -Continuous Path) and synchronised multiple axis applications are feasible using the implemented CANopen protocol DS402. Additional interfaces include a ±10V interface (nominal speed) and a RS232 interface. The iMD30 also has a clocking/direction interface.

Short controller cycle times (current, speed, position controller) ensure optimum performance for highly dynamic drives. The drive controllers are suitable both for rotary drives and for the corresponding linear direct drives and torque motors (iMD20 and iMD40). A redundant rest monitoring system has been integrated in the drive controller. It reduces work by the controller in external assemblies to a minimum and allows for convenient operation or use of the machine.

# Drive controller
## for stepper and servo motors

# iMD 10/20/30/40



## Technical specification

| Features | iMD 10 | iMD 20 | iMD 30 | iMD 40 |
|---|---|---|---|---|
| Motor type | Brush servomotors (DC) | Brushless servomotors (EC, BLDC) | Two-phase step motors (ST) | Brushless servomotors (DC, BLDC) |
| Power supply | 40-95 V DC | | | 230V AC, mains, single phase |
| Motor current | Constant current 12 A, peak current 25 A | | Constant current 12 A | Constant current 6.5 A Peak current 8 A |
| CAN bus interface | CANopen DS301 V4.0 and DS402 V1.0 der CiA (CAN in automation) | | | CANopen DS301 V4.0 and DS402 V1.0 of CiA (CAN in automation) |
| RS-232 interface (asynchronous, 19.2 or 57.6 kbits/s). | For commissioning (DcSetup.exe) or e.g. PLC connection; effective data transfer protocol | For commissioning (AcSetup.exe) or e.g. PLC connection; effective data transfer protocol | For commissioning (StepSetup.exe) or e.g. PLC connection; effective data transfer protocol | For commissioning (AcSetup.exe) or, e.g. PLC connection; effective data transfer protocol |
| Measuring system | Incremental encoder (RS422); max. input frequency: 1.25 MHz | | -- | Incremental encoder (RS422); max. input frequency: 1.25 MHz |
| Commutation | -- | Hall sensor signals | -- | Hall sensor signals |
| Analogue input (±10V) | 11 bit resolution | | | 11 bit resolution |
| PWM switching frequency | max. 12.5 kHz | max. 16.4 kHz | max. 10.0 kHz | max. 16.4 kHz |
| Inputs for limit and reference switches | ✓ | ✓ | ✓ | ✓ |
| Digital current, speed and position control | Scanning times: min. 80 µs/244 µs/ 488 µs for current/speed/position controllers | Scanning times: min. 61 µs/244 µs/ 488 µs for current/speed/position controllers | Scanning times: min. 100 µs for current controllers | Scanning times: min. 61µs/ 244 µs/488 µs for current/ speed/position controllers |
| Brake controller | ✓ | ✓ | ✓ | ✓ |
| Gantry mode or synchronous control | of 2 modules, Master-Slave via CAN bus | | | |
| Monitoring of the motor current | Short circuit, $I^2t$ | Short circuit, $I^2t$, Pulse-by-pulse | Short circuit | Short circuit, $I^2t$, Pulse-by-pulse |
| Monitoring of the encoder signals | ✓ | ✓ | -- | ✓ |
| Monitoring of the software by internal Watchdog timer | ✓ | ✓ | ✓ | ✓ |
| Simple update of the firmware over RS-232 | Possible locally by customer or service engineer | | | |
| Rest state monitoring | Redundancy to ISO standard | | | |
| Dimensions | 180 x 35 x 110 mm | 180 x 35 x 120 mm | 180 x 35 x 110 mm | 180 x 50 x 150 mm |
| Part no. Drive controllers | 314 020 | 314 030 | 314 070 | 314 040 |

Motor and encoder connecting leads are NOT included in delivery.

Subject to technical changes.

# PC controller

# iPC 15

Figure:
iPC 15 PC controller with blind panel and with possible connection alternatives

## General

The iPC15 universal PC controller is a Windows- or Linux-compatible controller at a favourable price/performance ratio. Its versatile applications may be found throughout the entire industry sector and in various consumer sectors.

All connections are made on the front. The multifunctional panel offers a wide range of connection options.

Inter alia, a CAN interface with either 1 or 2 channels is available.

A remote interface is available for covered installation (e.g. in a cabinet or in the interior of a motor vehicle).

Installation is possible both in the "standing" and "lying" positions.

## Technical specification

| | iPC15 PC controller |
|---|---|
| CPU | Intel® Atom N270 |
| Form factor mainboard | Mini-ITX (half height) |
| RAM | DDR2 SO DIMM 1GB (bis zu 2GB) |
| Hard disks (S-ATA) | 2½ inches ≥ 160 GB |
| Graphics | Intel GMA 950 |
| Monitor | VGA/DVI-D |
| Audio | Realtek® ALC662 audio codec |
| LAN | 10/100/1000 Mbit LAN |
| Power supply | 12 V DC |
| External connections (Basic version - with blind panel) | USB 2.0, LAN<br>VGA, DVI-D<br>Audio multifunction connection<br>12 V DC power supply |
| Internal interfaces | 1 × PCI (without CAN interface)<br>1 × mini PCI Express, 1 x IDE<br>2 × SATA (1 x with HDD)<br>USB 2.0 (3 × with SSD),<br>1 × parallel interface,<br>2 × serial interface,<br>1 × PS/2, 1 × SPDIF |
| Humidity | Max. 90% (non-condensing) |
| Ambient temperature | 0°C to 35°C |
| Protection class | IP 20 |
| Weight | 1.1 kg |
| Dimensions (W×H×D) | 200 x 50 x 190 mm |

## Features

- Universal PC controller
- Robust, impact-proof aluminium casing
- Compact configuration
- Various installation options
- Energy-efficient and low noise
- Supply voltage 12V DC
- Front multifunctional panel for versatile connection options
- Design with hard disk or solid state disk (optional)
- Windows- and Linux-compatible

## Ordering information

Part no.: **371064 0011** - CAN
Part no.: **371064 0007** - serial

Subject to technical changes.

# CAN PCI board

# iCC 10/20



Figure:
Single channel

Figure:
2 channels

## General

CAN-PCI boards offer a simple solution for connecting a CAN bus to the PCI bus system of a PC (e.g. iPC 15).

A driver software package is supplied with the board, which controls the entire CANopen communication with the application interface (e.g. ProNC) and also provides a programming interface for your own software.

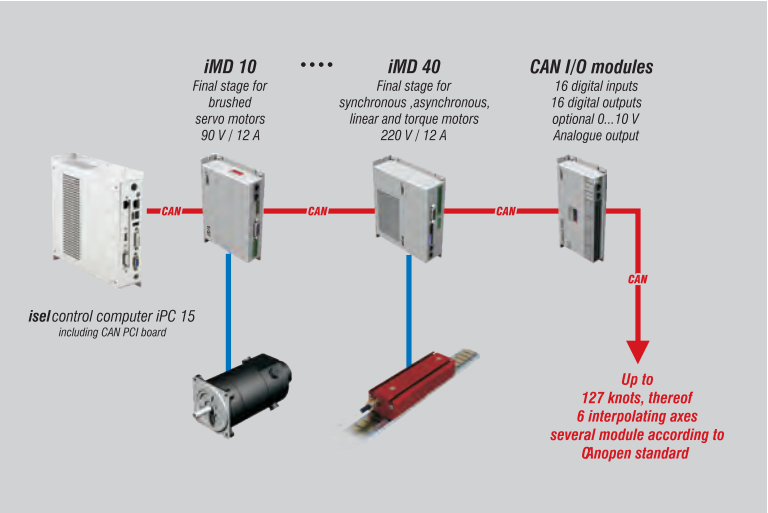
The board can also be used in conjunction with CoDeSys V2.3.

The software package also includes configuration software which can be used to install the default settings for the CAN parameters (CANset).

## Technical specification

| | iCC 10/20 |
|---|---|
| Interface | PCI V2.2/32 bit |
| CAN channels | 40910 |
| galvanic isolation | ✓ |
| Data transfer rate of | up to 1 Mbits/s |
| RJ45 | connector |

## Block figure CAN bus with iPC 15




## Features

- Mechanical dimensions: 119.5 × 47.3 mm
- PCI-V2.2-compliant
- 32-bit, 33 MHz target interface chip
- 1 or 2 RJ45 CAN channel connectors, screened
- CAN bus galvanically isolated
- Data transfer rate of up to 1 Mbit/s
- Drivers for NT/2000/XP/Vista
- Driver software for isel-CAN-CNC Controller
- Driver for CoDeSys available
- PDO and SDO communication via supplied DLL
- Can be used as CANopen master for a wide range of applications

## Ordering information

CAN PCI board iCC 10
Part no.: **320310** (Single channel)

CAN-PCI-Karte iCC 20
Part no.: **320311** (2 channels)

Subject to technical changes.

# CAN controller components


CAN I/0 module 16/16


CAN I/0 module 8/12 - 4/1

## General

Both isel CANopen I/O modules provide an entry level into the world of modern industrial automation. They enable installation on site or in a cabinet.

A 24V DC power supply, galvanic isolation of the inputs and outputs and the terminals available directly on the module provide a great range of operating possibilities.

Connection via plug-in terminals and the status display assigned directly to the connection make for particularly user-friendly installation and servicing.

## Technical specification

| | CAN I/0 module 16/16 | CAN I/0 module 8/12 -4/1 |
|---|---|---|
| Digital inputs | 16 via optical coupler (Input current approx. 8 mA) | 8 via optical coupler (Input current approx. 8 mA) |
| Digital outputs | 16 8 × relays, Imax < 5A<br>8 × electronically, Imax < 350 mA | 12 4 × relays, Imax < 5A<br>8 × electronically, Imax < 350 mA |
| Analogue output | 1 0V - 10V via 8-bit D/A converter (when using the analogue output , the electronic outputs are no longer available for use) | 1 0V - 10V via 8-bit D/A converter |
| Analogue input | -- | 4 0V - 10V, 10-bit resolution |
| Protection class | IP20 | |
| Supply voltage | 24V DC (logic voltage),<br>24V DC (process voltage), | |
| Power consumption | 160 mA (logic and relays)<br>$I_{Load}$ is dependent on the external wiring | |
| Ambient temperature | -5°C to +40 °C | |
| Storage temperature | -25°C to +70 °C | |
| Relative humidity | max 95 % | |
| Protection class | IP20 | |
| Weight | 260 g | |
| Casing size | 85 × 180 × 28 mm (W × H × D) | |
| **Part no.** | **321002** | **321004** |

## Features

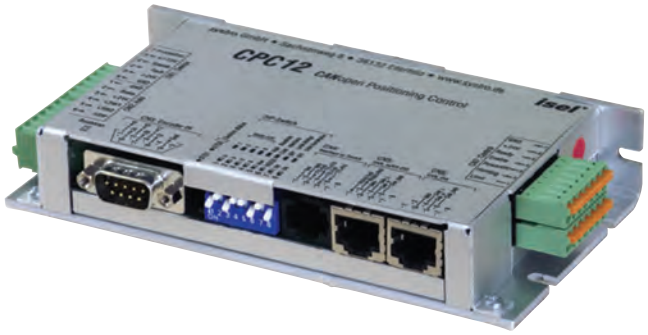
**CAN I/0 module 16/16**

- 16 digital inputs via optical coupler (input current approx. 8 mA)
- 16 digital outputs, 8 × relays, Imax < 5A, 8 × electronically, Imax < 350 mA (thermal protection, short circuit protection)
- One analogue output, 0 V - 10 V via 8-bit D/A converter (users of an analogue output can no longer use the electronic outputs)

**CAN I/0 module 8/12 - 4/1**

- 8 digital inputs via optical coupler (Input current approx. 8 mA)
- 12 digital outputs, 4 × relays, Imax < 5A, 8 × electronic, Imax < 350 mA (thermal protection, short circuit protection)
- One analogue output, 0 V - 10 V via 8-bit D/A converter
- 4 analogue outputs, 0 V - 10 V 10-bit resolution

# CAN controller components




Universal CAN positioning module
CPC 12, with ± 10V output

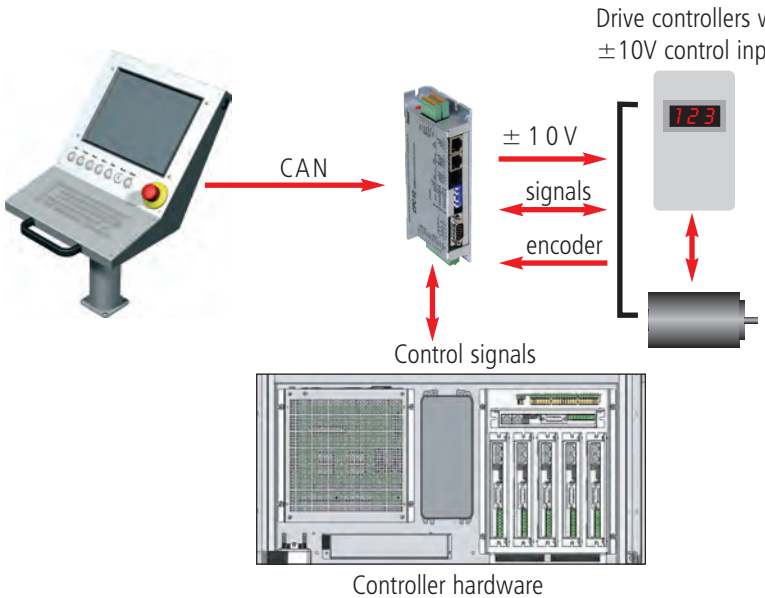
## General

The CAN CPC12 positioning module serves adaptation of drive controllers from various other manufacturers with ±10V interface to the CAN CNC controller.

This enables - in addition to CAN drive controllers offered by isel - the operation of non-CAN-enabled modules or modules that are not directly compatible with this controller.

The necessary control inputs and outputs for this purpose are provided by the CPC12 module.

## Application figure




## Features

**CAN CPC 12 positioning module**

- Controlling any number of drive controllers and frequency converters with ± 10V input
- Digital position control with cycle time 488 µs
- Power supply +24V DC
- CANopen DS 301, DS 402, data transfer rate up to 1 Mbd
- RS232 for commissioning or PLC coupling
- Outputs for releasing external servo controllers and brake controllers
- Inputs for reference & limit switches
- Incremental encoder (RS422)
- Monitoring of limit switches for the positioning axes with emergency shutdown message
- Optionally as multi-axis solution in control cabinet
- Gantry mode or synchronous control of 2 modules, Master-Slave via CAN bus

Part no.: **320 210**

# Step controller IT116 Flash

## Single axis controller

Figure:
IT 116 Flash front

Figure:
IT 116 Flash back side

## General

The **IT 116 Flash step controller** is a freely programmable compact controller for a linear or circular axis with 2-phase stepper motor. The step controller comprises an intelligent step motor stage, a processor core with Flash memory for downloading/storing the PAL-PC user program and the clocking/direction signal generation for the final stage of the motor, the necessary power supply units, a safety circuit (Stop category 0 to EN 60204) and a casing with mains input filter and control elements.

The integrated operating system in the Flash memory of the processor core supports both

- DNC controller mode: PC/laptop connected permanently with the step controller via the serial interface

and the

- CNC controller mode: the step controller works independently, without PC coupling of the stored user program (standalone).

## Ordering information

IT 116 Flash step controller (115V AC, 60 Hz) Part no.: **381016 0115 ***
IT 116 Flash step controller (230V AC, 50 Hz) Part no.: **381016 ***

*** including PAL-PC**

### Accessories

Motor lead
M23 12-pin socket - SubD 9-pin Pin
Part no.: **392755 0500** (5m)

Motor lead
SubD 9-pin socket - plug 1:1
Part no.: **392781 0500**

Other lengths on request.

## Features

- Final output stage
  48 V DC / 4.2 A peak
  for 2-phase stepper motors
- max. 25,600 microsteps/turn
- Mains voltage:
  115V AC/230V AC, 50…60 Hz
- Automatic current sink at
  50% phase current at
  motor speed < 1 rpm
- Motor current/microstep resolution
  variable with DIP switch
- Integrated 32-bit RISC processor
  (Embedded controller) with Flash
  memory for firmware and
  PAL PC user program
- RS-232 interface (front) for
  coupling with PC/notebook
  (program download)
- Control signals:
  Program start/stop, reset on
  controller back side
- 4 optically isolated signal inputs
  (Signal voltage: 24 V DC)
- 4 relay outputs (24 V DC, 300 mA)
- Motor brake controller (24 V DC)
- Remote plug on rear of controller
  for external EMERGENCY SHUT-
  DOWN (2-channel), ext. power on
- Euro cooling rib casing
- Programming with PAL-PC 2.1
  for Win2000, XP, Vista, 7
- Dimensions
  W 105 × H 111 × D 320 mm

## Scope of delivery

- Controller in cassette casing
- Mating plug (I/O, pulse, remote)
- Serial interface lead (SubD9 - RJ 45)
- 230V AC mains lead
- PAL-PC software CD
- Operating instructions
- Programming instructions

# Step controller
## Multiple axis controller

# iMC-P

Figure:
Front and rear
iMC-P step controller

## General

The step controllers **iMC-P** are freely programmable compact controllers with max. 4 final stages for 2-phase step motors The controllers integrate all components (interfaces, motor controllers, voltage supplies, output stages, safety circuits, incl. door controller, control elements) needed to control a machine, in a compact bench housing. The iMC-P1 controller with core module and at least one integrated final stage enables the control of up to 3 additional final stages with clocking / direction module. The signals needed for this are provided by the appropriate external interfaces.

- **iMC-P1n**: with intelligent core module for control via RS232
  The controller also works either in DNC mode (permanently connected with the computer) or in CNC mode (after transfer of the user program as a standalone controller), e. g. via the accompanying PAL-PC software

n ... Number of axes

## Features

- 8 signal inputs (24 V DC)
- 8 relay outputs (24 V DC, 300 mA) max. 2A total current
- 1 relay output (230 V AC/6 A)
- 1 analogue output (0 - 10 V)
- RS232 programming interface (rear)
- 32-bit RISC processor and memory for the user program
- Programming with PAL-PC (DNC and CNC modes), @-format (DNC and CNC modes), ProNC, Remote, Galaad, Labview (DNC mode), various high level languages
- Max. 4 final stages (48 V/4.2 A) for 2-phase stepper motors (power supply unit 500 W)
- From a step angle of 1.8° up to 25,600 microsteps/turn (1/128 microstep)
- Automatic current sink
- Motor current adjustable via DIP switch
- Additional control signals (start, stop, reset) adaptable
- Safety circuits (emergency shutdown, door circuit controller) via external plugs in higher level safety circuits integrable
- Broadband mains supply: 110 - 250V AC, 50..60 Hz
- Clocking/direction module to order
- Bench casing W 379 × H 137 × D260

## Scope of delivery

- Controller
- Mating plug (I/O, pulse, remote)
- Serial interface lead (null modem)
- 230V AC mains lead
- PAL-PC software CD
- Operating and programming instructions

## Ordering information

| | |
|---|---|
| 2-axis controller iMC-P1-2 | Part no.: **381403 0002*** |
| 3 axis controller iMC-P1-3 | Part no.: **381403 0003*** |
| 4 axis controller iMC-P1-4 | Part no.: **381403 0004*** |
| USB - RS232 converter | Part no.: **372000 0001** |

* including PAL-PC

## Accessories

Motor lead SubD9 plug - SubD9 socket
Part no.: **392781 0500**

Motor lead SubD9 plug - M23 socket
Part no.: **392755 0500** (5.00 m)

...other lengths available to order.

electronics

# Step controller
## Multiple axis controller

# iMC-S8

Figure:
iMC-S8 step controller as
bench version and with 19" housing

## General

The **iMC-S8** step controller is a freely programmable compact controller for linear or circular axes with 2-phase step motors.
The controller integrates all the necessary components (power supply, safety circuit, power electronics, core processor, interfaces, operating elements) that are needed to control individual spindles all the way to entire machines. It has an intelligent core module that is controlled and programmed via a RS232 interface. The core module also converts the commands programmed in the user program into clocking/direction signals for the connected final stages. Depending on the purpose, the **iMC-S8** controller can be used either in CNC or in DNC mode.

In CNC mode, the processor processes the CNC program which was previously produced with PAL-PC and stored in the controller's Flash memory.

In DNC mode, the **iMC-S8** controller is connected permanently with a control computer (PC, laptop) via a serial interface (RS232). Processing is carried out via the isel control software Remote.

## Ordering information

| | |
|---|---|
| 2-axis iMC-S8 step controller, bench housing | Part no.: **383320 2002 *** |
| 2-axis iMC-S8 step controller, 19" housing | Part no.: **383320 1002 *** |
| 3-axis iMC-S8 step controller, bench housing | Part no.: **383320 2003 *** |
| 3-axis iMC-S8 step controller, 19" housing | Part no.: **383320 1003 *** |
| 4-axis iMC-S8 step controller, bench housing | Part no.: **383320 2004 *** |
| 4-axis iMC-S8 step controller, 19" housing | Part no.: **383320 1004 *** |

* including PAL-PC

## Scope of delivery

Controller, mating plug (I/O, pulse, Remote), serial interface lead (null modem), 230V AC mains lead, PAL-PC software CD, operating instructions, programming instructions

## Features

- 32-bit RISC processor with Flash memory for user program
- Final output stages
  - Step resolution and motor current adjustable via variable DIP switch
  - automatic current sink
- Acceleration, start-stop frequency and step output frequency variable
- both hardware limit switches configurable
- Door controller/hood controller
- Control elements in the front of the casing
- external EMERGENCY SHUTDOWN and POWER connection for integration in higher level safety circuits
- Connection for external control signals, such as START, STOP, RESET (only CNC mode)
- 230V connection for milling spindle (100-230V AC)
- 0 .. 10V analogue output for external frequency converter for speed-controlled main spindle
- Programming/Operation
  - PAL-PC in CNC mode (in the scope of delivery)
  - Remote (optional: ProNC) in DNC mode
  - isel @ - format in CNC/DNC modes

## Technical specification

- Broadband mains supply
  100 - 250V AC, 50..60Hz
- Processor
  - Flash memory 128 kB,
    Capacity to store 350 commands
  - max. step output frequency 40 kHz
- Final stages
  - Power supply 48V DC
  - Peak current: 2.8 - 7.8A
  - Step resolution: 400-51200 steps
- Inputs/outputs
  - 8 inputs (24V DC)
  - 8 outputs (24V DC/300mA, Itot 2A)
  - 1 relay output (230V AC, max. 6A)
  - 1 analogue output (0 - 10V)
- RS232 operating/programming interface
- Stop category 1, safety category 2
- Versions:
  - Bench casing
    W 475 × H 410 × D 187.5 mm
  - 19" housing
    W 482.5 × H 410 × D 175.5 mm

## Accessories

Motor lead M23 plug - M23 socket
Part no.: **392750 0300** (3m)
Part no.: **392750 0500** (5m)

Motor lead M23 plug - SubD9 socket
Part no.: **392752 0300** (3m)
Part no.: **392752 0500** (5m)

Controller software - Remote
Part no.: **Z12-334500**

Controller and programming software ProNC
Part no.: **Z11-333500**

Subject to technical changes.

# Single axis controller MC1-10/20/40

## iMD single axis controller for isel linear units


MC 1-40
Front view

MC 1-10/20
Rear view

MC 1-40
Rear view

## General

MC 1 series servo-controllers are freely-programmable compact controllers for linear or rotating units with servomotors. The single axis controllers integrate all the components (interfaces, motion controller, power supply, drive controller, safety circuit, control elements) needed for axis control in compact bench housings. The supplied PAL-PC software can be used for programming
.

**There are three MC1 variants available:**

- MC1-10: for controlling brush-type DC servomotors (48 V)
- MC1-20: for controlling brushless EC servomotors (48 V)
- MC1-40: for controlling brushless EC servomotors (310 V)

## Ordering information

| | |
|---|---|
| MC 1-10 (including PAL-PC) | Part no.: **38d1518 0010** |
| MC 1-20 (including PAL-PC) | Part no.: **381518 0020** |
| MC 1-40 (including PAL-PC) | Part no.: **381518 0040** |
| Motor leads MC 1-10/20 | Part no.: **392760 xxxx*** |
| Motor leads MC 1-40 | Part no.: **392307 xxxx*** |
| Encoder lead | Part no.: **392740 xxxx*** |

* Leads available in different lengths,
e.g.: 0100 = 1 m / 0150 = 1.5 m / 0200 = 2 m ... / 1000 = 10 m

Subject to technical changes.

## Features

**MC1-10**
- For controlling brush-type servomotors with an intermediate circuit voltage of 48 V DC
- Setup program "DcSetup"

**MC1-20**
- For controlling brushless servomotors with an intermediate circuit voltage of 48 V DC
- Analysis of Hall signals
- Setup program "AcSetup"

**MC1-40**
- For controlling brushless servomotors with an intermediate circuit voltage of 310V DC
- Analysis of Hall signals
- Setup program "AcSetup"

## Common features

- Max. output power 500 W (MC1-10, MC1-20)
- 32-bit high performance RISC processor with 256 kB Flash memory
- User program in CNC mode for up to 650 commands
- Processing of the program in CNC or DNC mode
- Programming with PAL-PC (CNC and CNC mode), @-format (CNC mode), ProNC, Remote (DNC mode)
- LC display with 4 lines, each with 20 characters (freely programmable)
- Additional control signals (Start, Stop) adaptable
- Connection for incremental encoder
- 6(8) signal inputs (24 V DC)
- 8 relay outputs (24 V DC/700 mA)
- Stop category 0 in accordance with EN60204
- Emergency shutdown circuit via plug in higher level safety circuit integrable
- Broadband mains supply:
  110...250 V AC, 50..60 Hz (MC1-10 / MC1-20)
- 250 V AC, 50Hz (MC1-40)
- Bench casing
  W 204 × H 149 × D286

## Scope of delivery

- Controller
- Mating plug (I/O, pulse, remote)
- Serial interface lead (SubD9 - RJ 45)
- 230V AC mains lead
- PAL-PC software CD
- Operating instructions
- Programming instructions

electronics

# Multiple axis controller

## iMD multiple axis controller for isel linear units

# iCU-DC / iCU-EC

ICU-DC
Front view

ICU-DC
Rear view

## General

The **CAN controllers** of the **iCU-DC** and **iCU-EC** series are compact, high-performance drive controllers for 2 - 6 DC servomotors and are offered at an optimal price / performance ratio.

The bench housing integrates all control components needed to solve a wide variety of automation tasks, ranging from the final stage via the I/O assembly to the safety controller.

The control computer has an integrated CANopen PCI card interface serving as CAN Master for the drive controller and I/O components. External upgrades are also possible, up to 128 CAN nodes. The connecting points at the rear of the control computer facilitate easy connection to (for example) a monitor. Peripherals such as a mouse and keyboard can be connected at the USB interfaces provided. LAN connection allows integration into an existing network and can be used for remote servicing.

The NC control core facilitates the interpolation of up to 6 axes (linear, circular, helical) as well as Online and Look Ahead machining. When using the ProNC software, individual axes can be controlled as handling axes (in addition to the interpolating axes).

All final stages have automatic jerk limitation and rest state monitoring (up to safety category 3).

## Ordering information

**3 5 4 0 0 2 X 0 X 0**

**Number of axes**
**2** = 2 axes
**3** = 3 axes
**4** = 4 axes
**5** = 5 axes
**6** = 6 axes

**Versions**
**1** = iCU DC* (brush-type DC servomotors)
**2** = iCU EC* (brushless EC servomotors)

## Accessories

Motor lead M23 pin - M23 socket
Part no.: **392759 0300** (3m)
Part no.: **392759 0500** (5m)

Encoder lead SubD 15 plug - SubD15 socket
Part no.: **392740 0300** (3m)
Part no.: **392740 0500** (5m)

## Features

- Drive controller for up to 6 brush or brushless DC servo motors
- NC control via CANopen field bus
- iMD10/iMD20 final output stages
  - 4-quadrant drive controller
  - Analysis for incremental encoder
  - Rest state monitoring
  - Over- and undervoltage protection,
  - Overtemperature protection, short-circuit proof
- Door control / hood control
- External emergency cut-out for integration into higher level safety circuits
- Connection for external control signals (START, STOP, RESET) via signal inputs
- Control computer connections: VGA, 4 x USB (2 x front, 2 x rear), RJ45 Ethernet (100 Mbit/s)
- Connection for milling spindle (100 -230V AC)
- 0 ...10 V output for external frequency converter for speed-controlled main spindle
- Front-sided control elements
- Industrial control computer based on Windows® with
  - CANopen PCI board
  - driver software for CNC control
- Programming/Operation
  - Remote (optional: ProNC)

## Technical specification

- Broadband mains supply
  - 115 V AC / 230 V AC, 50...60 Hz
- Switching power supply 1000 W / 48 V
- iMD10/iMD20 final output stages
  - Power supply: 24...80 V DC
  - Peak / nominal current: 25 A / 12 A
- Input/output of CAN E/A module
  - 4 digital inputs, 8 digital outputs
  - 1 relay output (230V AC, max. 6 A)
  - 1 analog output (not required with frequency convertor option)
- CAN safety circuit module
  - up to safety category 3
  - door circuit control
  - spindle control
- Bench casing
  W 630 x H 230 x T 400 mm
- Options:
  - frequency converter for iSA500 - iSA2200
  - additional CAN I/O module (16 x inputs, 16 x outputs)

## Scope of delivery

- Controller
- Mating plug (I/O, pulse, remote)
- 230V AC mains lead
- Operating and programming instructions

Subject to technical changes.

# Power unit
## Multiple axis controller

# iPU-DC/iPU-EC

Figure:
Power unit iPU as
bench version and with 19" housing

## General

The **iPU power units** are powerful drive controllers for up to four linear or circular axes with brush or brushless motors. The compact controller integrates all necessary controller components, which are needed to solve a wide range of automation tasks. These range from iMD10 or iMD20 final output stages through the I/O module to safety control and power electronics.

As its interface for NC control, the **iPU power unit** has a CANopen interface at the back of the housing, which works according to the DS301 bus protocol and DS402. By using the optional CAN PCI board iCC 10 or a iPC series control computer, the controller can control interpolation (linear, circular, helical) of all four axes as well as track processing.

The final output stages (iMD10 or iMD20) also have automatic jerk limitations and rest state monitoring. The control elements integrated in the front of the housing, such as EMERGENCY SHUTDOWN, START or STOP enable convenient operation.

## Ordering information

**3 5 3 0 0 0 X 0 X X**

**Number of axes**
2 = 2 axes
3 = 3 axes
4 = 4 axes

**Versions**
1 = 19" housing
2 = Bench housing

**Drive controller**
1 = iMD 10 (brush DC servomotors)
2 = iMD 20 (brushless EC servomotors)

* in preparation, available to order

## Accessories

| | |
|---|---|
| Motor lead M23 plug - M23 socket | Part no.: **392759 0300** (3m) |
| | Part no.: **392759 0500** (5m) |
| Encoder lead SubD15 plug - SubD15 socket | Part no.: **392740 0300** (3m) |
| | Part no.: **392740 0500** (5m) |
| CAN PCI board iCC 10 (single channel) | Part no.: **320310** |
| CAN PCI board iCC 20 (2 channels) | Part no.: **320311** |
| Controller software - Remote | Part no.: **Z12-334500** |
| ProNC control software | Part no.: **Z11-333500** |

Subject to technical changes.

## Features

- Drive controller for up to four brush or brushless DC servo motors
- NC control via CANopen field bus
- iMD10/iMD20 final output stages
  - 4-quadrant drive controller
  - Analysis for incremental encoder
  - Rest state monitoring
  - Over- and undervoltage protection, Overtemperature protection, short-circuit proof
- Door controller / hood controller
- Connection for external control signals, (EMERGENCY SHUTDOWN, START, STOP) for integration in higher level safety circuits
- Connection for milling spindle (100 -230V AC)
- 0 .. 10V output for external frequency converter for speed-controlled main spindle
- Front-sided control elements (optionally, installed in the rear)
- Two alternative casings
- Programming/Operation
  - Remote (optional: ProNC)

## Technical specification

- Broadband mains supply
  - 115 V AC / 230 V AC, 50..60 Hz
- Switching power supply 1000 W / 48 V
- Final output stages iMD10 / iMD20
  - Power supply: 24 - 80 V DC
  - Peak / nominal current: 25 A / 12 A
- Inputs/outputs
  - 4 digital inputs (24 V DC / 8 mA)
  - 8 digital outputs (24 V DC / 350 mA)
  - 1 relay output (230 V AC, max. 6 A)
  - 1 analog output (0 - 10 V)
- Safety controller
  - up to safety category 3
  - door circuit and spindle control
- RJ 45 CANopen interface
- Versions:

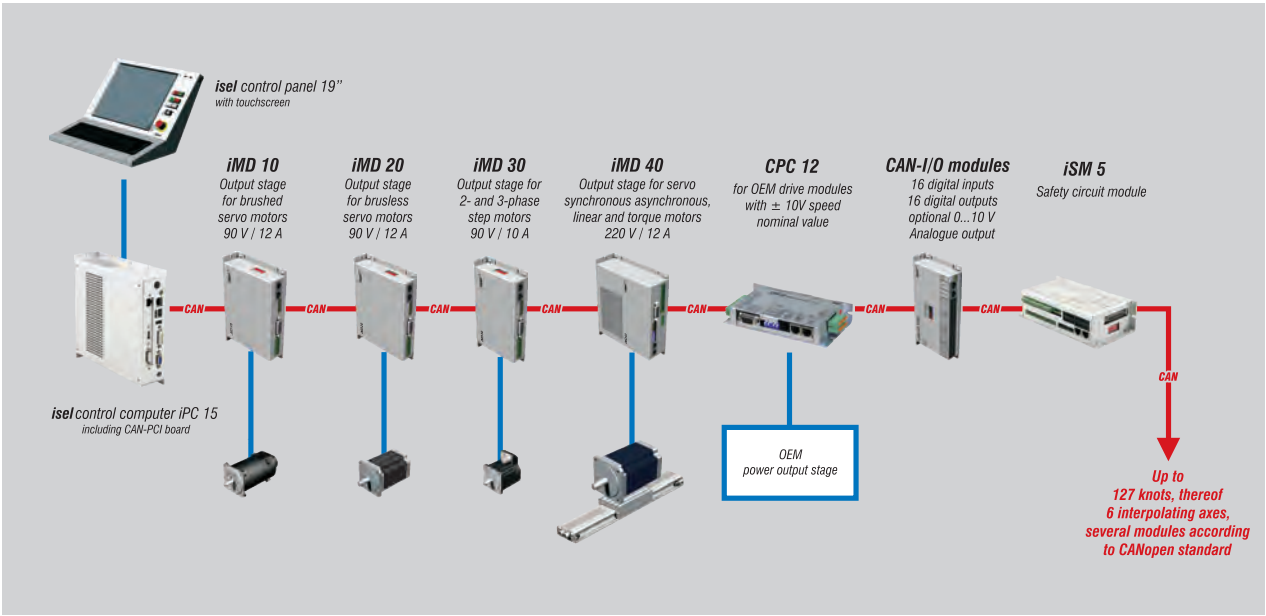
- Bench housing
  W 475 x H 410 x D 187.5 mm
- 19" housing
  W 482.5 x H 410 x T 175.5 mm

## Scope of delivery

- Controller
- Mating plug (I/O, pulse, remote)
- CAN bus lead (RJ45, patch lead)
- 230 V AC mains lead
- Operating instructions

# CAN-CNC controller

## Example of a topology with the isel-CAN-CNC controller




With consequent use of the CiA's (CAN in automation) CANopen standards, isel Germany delivers a high quality PC-based CAN-CNC controller for intelligent positioning/drive units and I/O modules.

The CAN-CNC controller supports interpolation operation (linear, circular and helical) of up to six positioning drives per machine and up to 127 handling axes and CAN modules.

The high time demands of a CNC controller are guaranteed by a WDM driver developed by isel. An additional real time operating system for Windows will be unnecessary. This guarantees compatibility with future Windows versions (Win7 in preparation)

The CAN controller is a pure software solution for PCs with Windows 2000/XP/VISTA. The CANopen PCI boards iCC 10/20 also act as an interface.

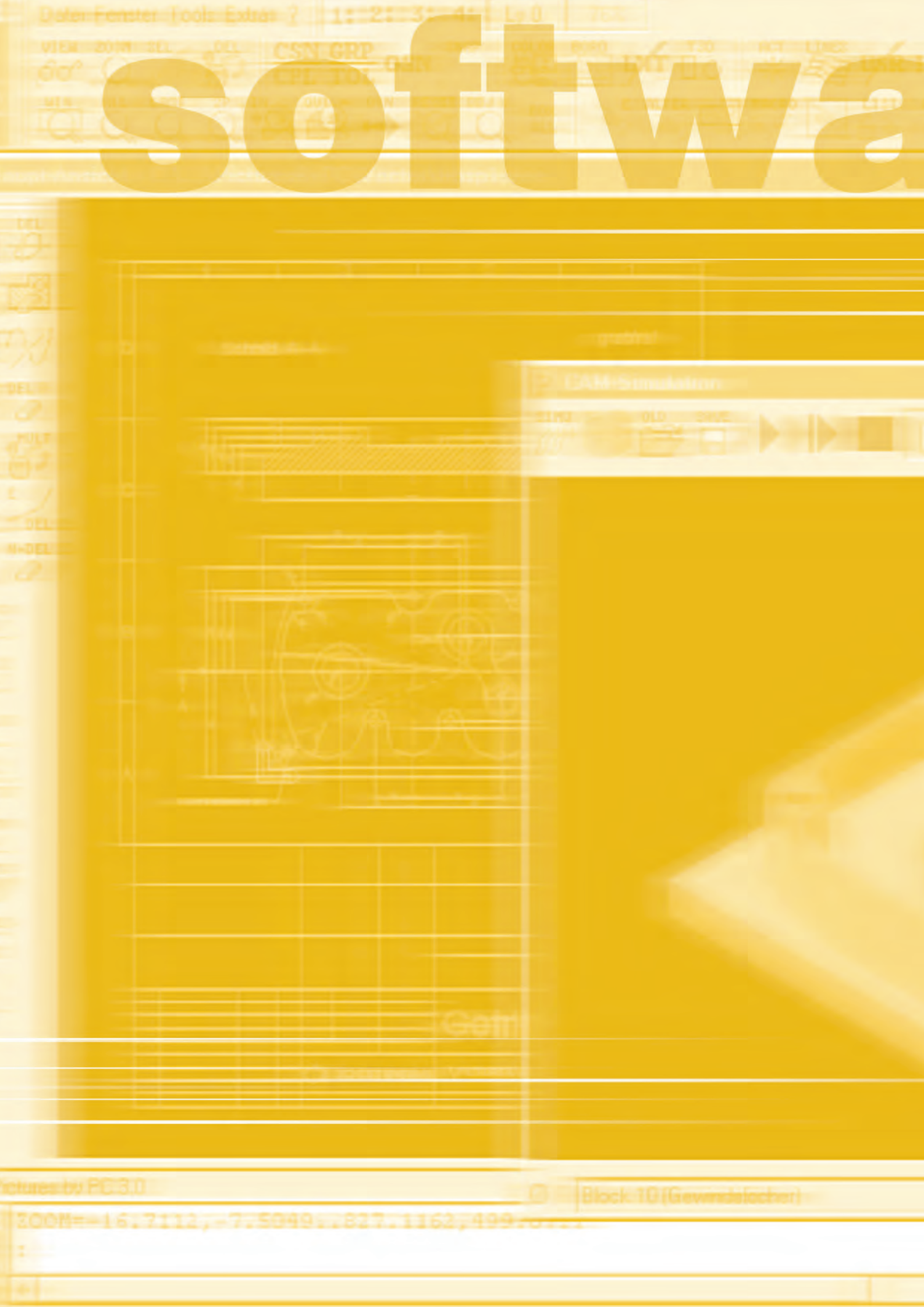
Owing to the features provided, the CAN-CNC controller is equally suited for all machining tasks, such as milling, engraving, drilling, turning, water jet and laser cutting, as well as for applications in automation systems.

For this purpose, ProNC provides a universal programming environment.

## Features

- Machine control to the CANopen standard as a pure software solution for PCs with Windows 2000/XP/VISTA
- CiA-Standard, DS 301, DSP 401, DSP 402
- Supports up to six positioning axes and 127 handling axes and CAN modules.
- Look ahead track processing with a freely definable number of movement elements, which the controller processes while looking ahead.
- Jerk limitation for elimination of mechanical vibrations
- Upstream speed control for highly dynamic and lag error-free machining
- Software tools for setting and optimising motor final stages/positioning modules
- Interfaces for PC:
  - CANopen PCI board iCC 10 (single channel)
  - CAN bus 1
  - CANopen PCI board iCC 20 (two channels)
  - CAN buses 1 and 2

Space for your notes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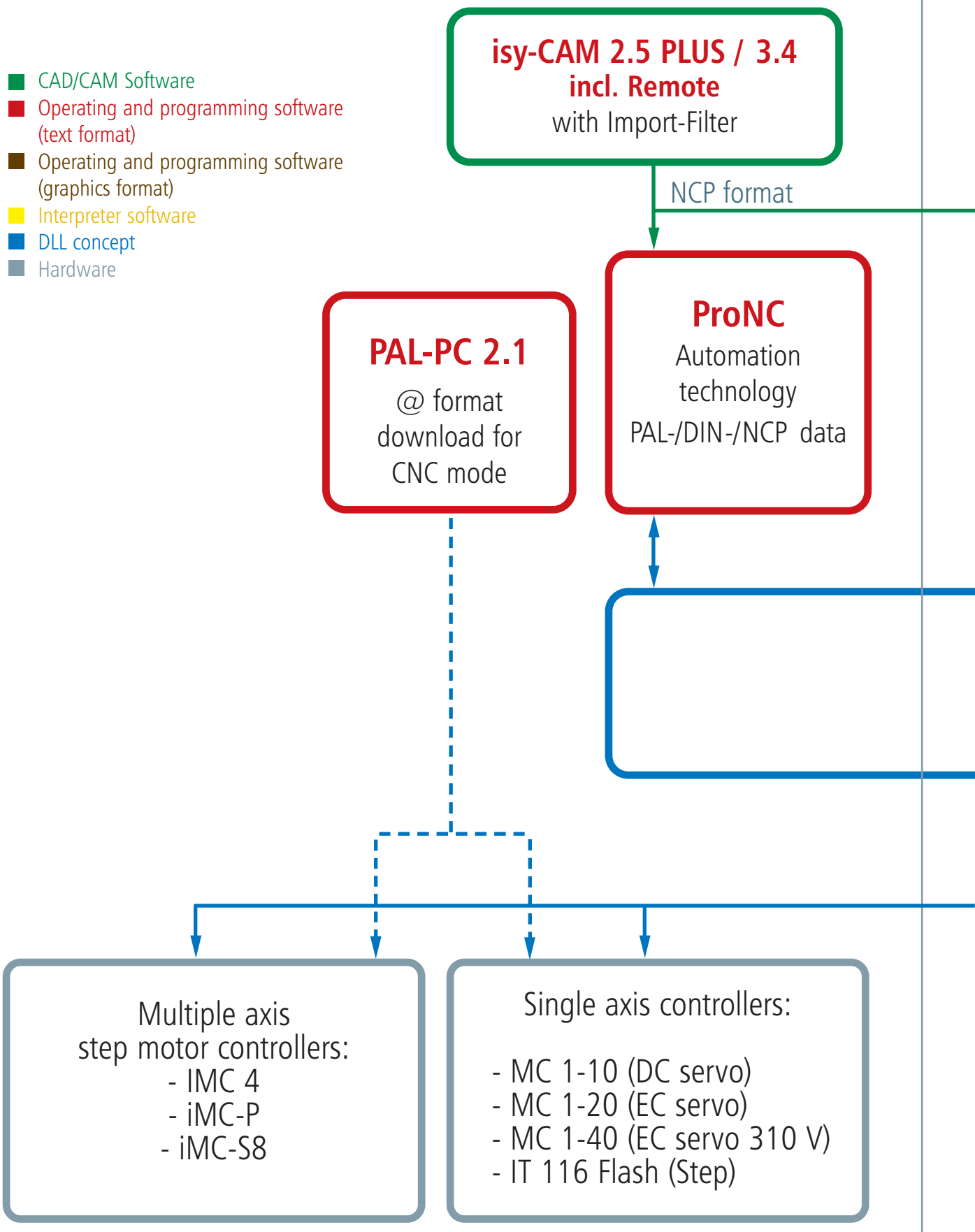
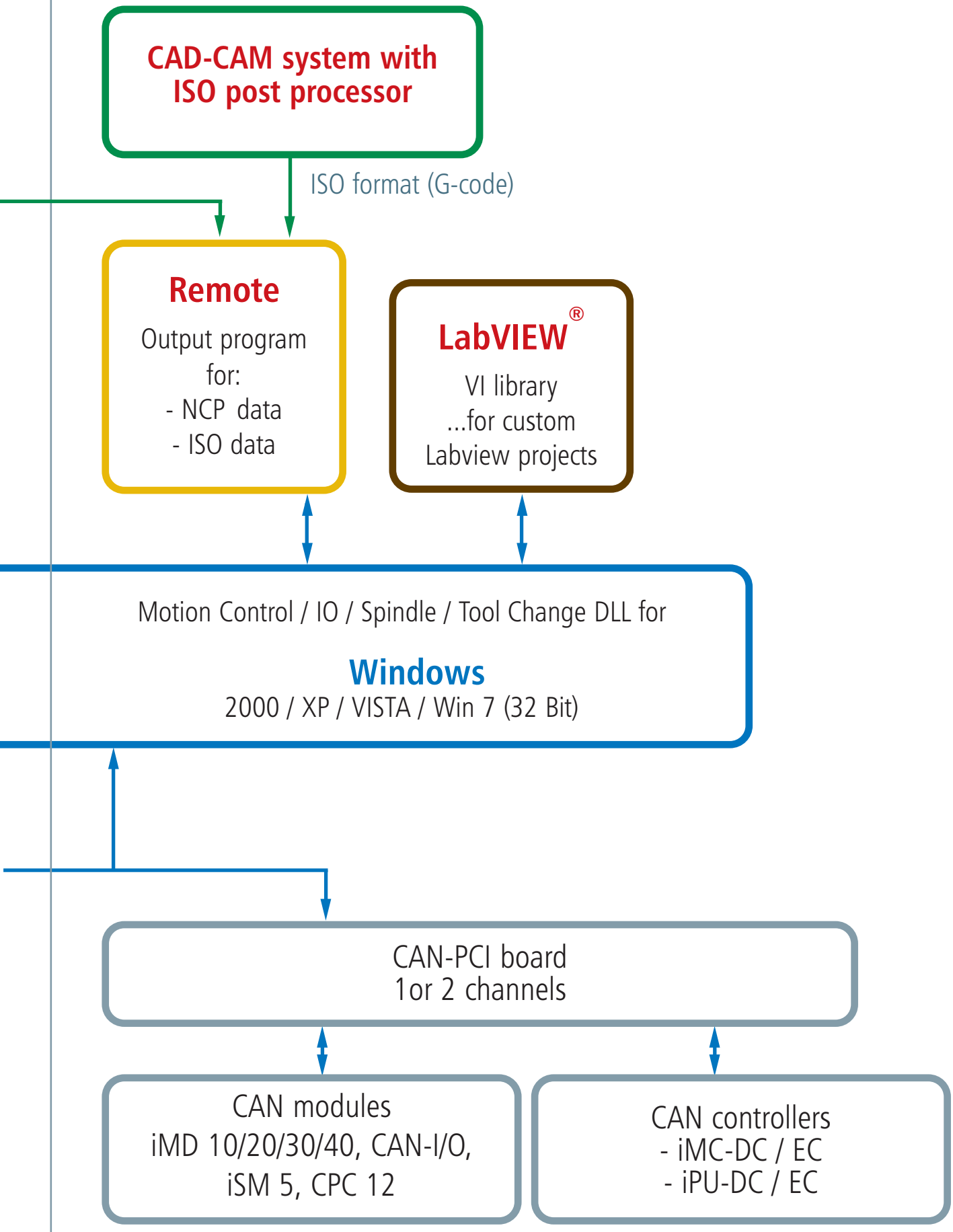
# SOFTWARE

# Software and controller organisation

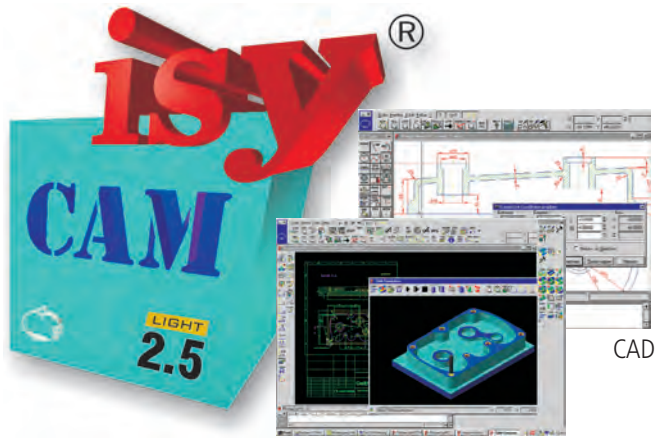


# Software and controller organisation





# isy-CAM 2.5 PLUS




CAD

CAM

## a complete package with:

- 2D-CAD/Design
- 2.5D-CAM up to 3+1 axes
- Integrated machine controller
- Service

## General

With isy-CAM 2.5 PLUS the customer is provided with a Windows®-based CAD/CAM package. It provides a comprehensive solution from design to production with CNC machines.

The software package provided is ideal for entry into the CAD/CAM world. Operation is "windows-like", via graphic menus and dialogue boxes.

The **CAD component** includes all necessary features for design in the 2D area. With the **CAM component**, processing data for the machine controller can be generated simply and quickly - directly from the design data. This processing data can then be output directly with the integrated operating and output software Remote to the CNC machine or controller.

## Post-processor features

- Tool list with selection and instructions for the tool geometry
- Immersion versions/start-up strategy
- Automatic residual material treatment
- Clockwise/reverse running
- Measurement/undersize machining
- Calculation tolerances
- Tool track separation
- Any setting of the processing sequence for technology blocks
- Post-processor run to generate NCP data for 3 axes (X/Y/Z) or cylindrical jacket area with a 4th axis (spindle)

## Ordering information

Part no.: **Z13-337030**
isy-CAM 2.5 PLUS

Part no.: **Z13-337030-0001**
Update isy-CAM 2.5 light to isy-CAM 2.5 PLUS

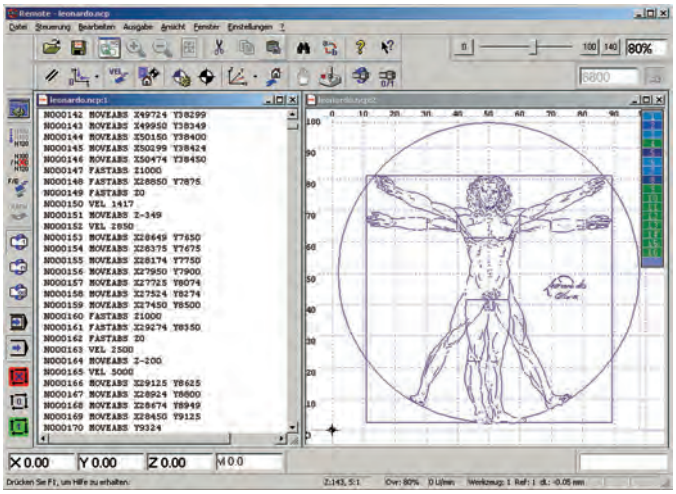
Part no.: **Z13-337030-1000**
Second licence on isy-CAM 2.5 PLUS

## Features

- freely definable line types and colours
- integrated online help, configurable interface
- parallel and independent working on several drawings
- Geometric element such as points, lines, ellipses, circles, curves (polygons, splines, Bezier curves, NURBS), polygons and many more.
- direct use of Windows scripts
- professional counting and text preparation features
- Hatching, freely definable hatching types
- automatic arrangement and alignment features
- Sketching outlines and changing them interactively
- numeric input options for absolute, relative and polar coordinates
- Import: DXF, HPGL, AI, EPS, TIFF, BMP, NC, NCP
- Export: DXF, HPGL, AI, WMF, EMF, TIFF, JPG, BMP
- extensive DIN/ISO-compliant measuring and dimensioning features
- Trim, separate and drag curves, Conversions of various geometry types
- Geometry manipulation by moving and copying as translation, rotation, scaling, mirror imaging
- intelligent object snapping
- optimum checking of the computed NCP data through integrated online simulation of the tool tracks
- Generation of processing data for all typical 2D and 2.5D production tasks
- Option: 3D version to order

# Remote

## Control software for Windows



## General

Remote is a universal control program for outputting files for machining methods milling, drilling, adhesive bonding, engraving, applying and water jet cutting or laser cutting/welding.

Supported file formats are the isel-specific NCP format (ASCII file with machining data generated by a CAM post-processor, the isel-specific CNC format (ASCII files in an expanded format for universal use in the process automation area, generated by ProNC) and the G-code format to DIN 66025.

Remote is used first and foremost for controlling CNC machines operating different tasks and processes, which is why flexibility is a key feature of the program. A large choice of options allows easy adaptation to current requirements in each case.

## Features

- Support for digital joysticks
- "Fast file selection" control panel for serial production
- Milling/multiple output with movements
- Graphic depiction of the processing file with zero point and dimensions

### isel-NCP, DIN66025/G-code file formats

- Linear and circular interpolation, helical interpolation, drilling cycles
- Access to digital and analogue inputs and outputs
- When using a CAN controller: "On-the-fly" input/output (without stopping the movement) for metering applications
- Message window, messages in the status line, time delay, input of variable values
- Definition and use of machine positions (tool zero point, park position, home position, etc.)

### Additional features for the isel-CNC file format (ProNC output format)

- Repeating loops, counting loops, unconditional and conditional branches
- Arithmetic and trigonometric functions
- Sub-program systems
- Real and symbol chain variables
- Loading and storing process variables
- Access to user-specific expansions, option to call up user software

## Ordering information

Part no.: **Z12-334500**
Remote - software for CAN-CNC controllers (Windows)

## Features

- runs with Windows operating systems (Windows 2000, XP, Vista)
- compatible with previous software versions
- Processing of DIN66025 (G-code) file formats, NCP or CNC
- immediate processing without conversion, File translation or conversion
- integrated text editor with numerous features for rapid corrections to the present NC program
- Use of up to 6 interpolating axes (Cartesian coordinates system and 3 auxiliary axes)
- Look-ahead track processing with CAN controller
- Managing a milling spindle
- 2 I/O units can be used (max. 64 inputs, 64 outputs)
- Signalling inputs and outputs for process synchronisation
- manual axis movement with joystick, keyboard and mouse
- incremental processing and system monitoring for commissioning
- Configurable interface for user-friendly operation, serial production, handshake with master PLC, etc.
- Control panel for movement control, input/output, spindle and tool change with buttons
- Control panel for max. 6 handling axes independently of the interpolating axes
- available in various languages (German, English, French, Magyar)

# PAL-PC

## Process automation software for Windows


## General

PAL-PC enables rapid, easy and low-cost implementation of automation projects such as handling systems, drilling machines, clocking devices, test and measurement systems, machines for individual and serial processing and much more....

PAL-PC is a modern program development environment for CNC step motor controllers and CNC machines

PAL-PC uses memory operation (CNC mode) for the target controller. PAL-PC produces automation solutions in which the controller works in standalone mode, i.e. independent of a control computer.

PAL-PC runs with Windows 2000, XP and Vista operating systems.

## Features

- Path commands for relative and absolute positioning
- Carry out movement until event occurs at an input
- Teach-in-programming (linear)
- Linear 2D interpolation, switchable to 3D interpolation
- Circular interpolation
- Input signal analysis for process control
- Loops for repeating of instruction blocks
- Unconditional and conditional branches
- Analysis of the program selection unit
- Output of messages to a display
- Sending and receiving synchronisation marks
- Additional aids for automated processing of typical tasks

## Ordering information

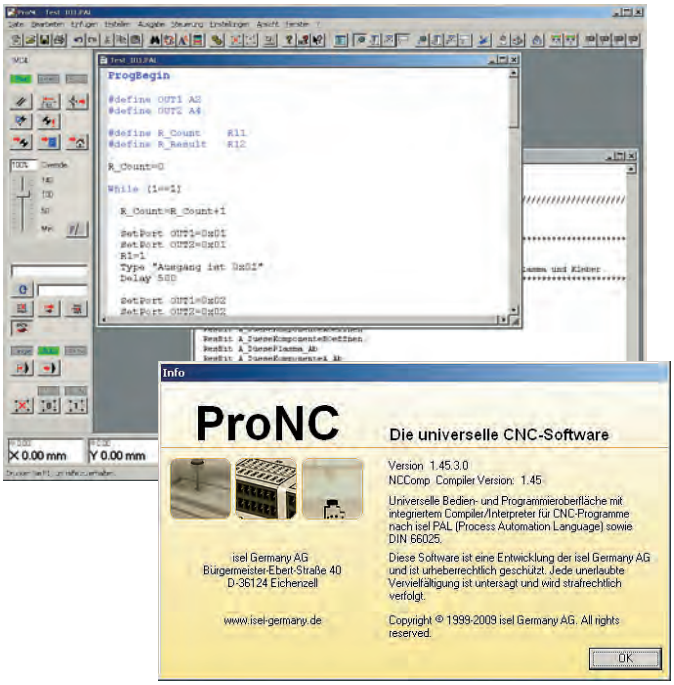
Part no.: **Z11-331810**
PAL-PC - software for CAN-CNC controllers (Windows)

## Features

- compatible with previous versions (PAL-PC programs, which were produced with an earlier release of PAL-PC, can be used without adaptation)
- Programming to isel-PAL or DIN66025:
  In addition to the PAL format, users who know programming to DIN66025, can also produce their PAL-PC applications with corresponding G-code commands.
- Integrated editor:
  fast and convenient editing of source texts, editor features such as "Search", "Replace", "Copy" and "Insert " automated code generation, multiple Undo/Redo for efficient programming
- PAL-PC can (depending of the type of controller used) control controllers with up to 4 axes
- Terminal for direct communication with the controller
- Downloading of externally generated CNC programs
- Automatic calculation of type and data transfer rate of the connected controller
- Display of compiler errors and navigating to an error in the source code
- Command rapid overview with optional insertion into the program
- Teach-in-programming with keyboard or mouse
- Acceptance in the editor of target positions as formatted source code
- Live status display at the inputs
- Setting outputs during program generation
- available in German and English

# ProNC

## Process automation software for Windows




## General

The basis of any automation solution is a powerful software that enables implementation of practical solutions for existing tasks quickly and conveniently. In these cases, the operating and programming interface ProNC provides an ideal solution.

ProNC runs with the Windows 2000, XP and Vista operating systems.
ProNC is available for a variety of control systems and controllers from isel
ProNC applications can be produced to isel-PAL or DIN66025

ProNC is outstandingly suited to automation solutions in the milling, drilling, metering, installation, handling, loading and quality control fields, in which application programs are produced mainly in text format, using teach-in-features and the integration of contour data sets (e. g. NCP format).

## Features

- Path commands for relative and absolute positioning of the interpolating axes
- Programming of additional axes in handling mode
- Circular interpolation, helical interpolation, drilling cycles
- Repeating loops, counting loops, unconditional and conditional branches
- various mathematical and trigonometric functions
- Sub-program systems, symbolic variables
- Real and symbol chain variables
- Message window, messages in the status line
- Loading and storing process variables
- Access to digital and analogue inputs and outputs
- "On-the-fly" input/output (without stopping the movement) for metering applications
- Access to user-specific extension DLLs
- convenient support for debugging (interruption points, monitoring of status and variable)

## Ordering information

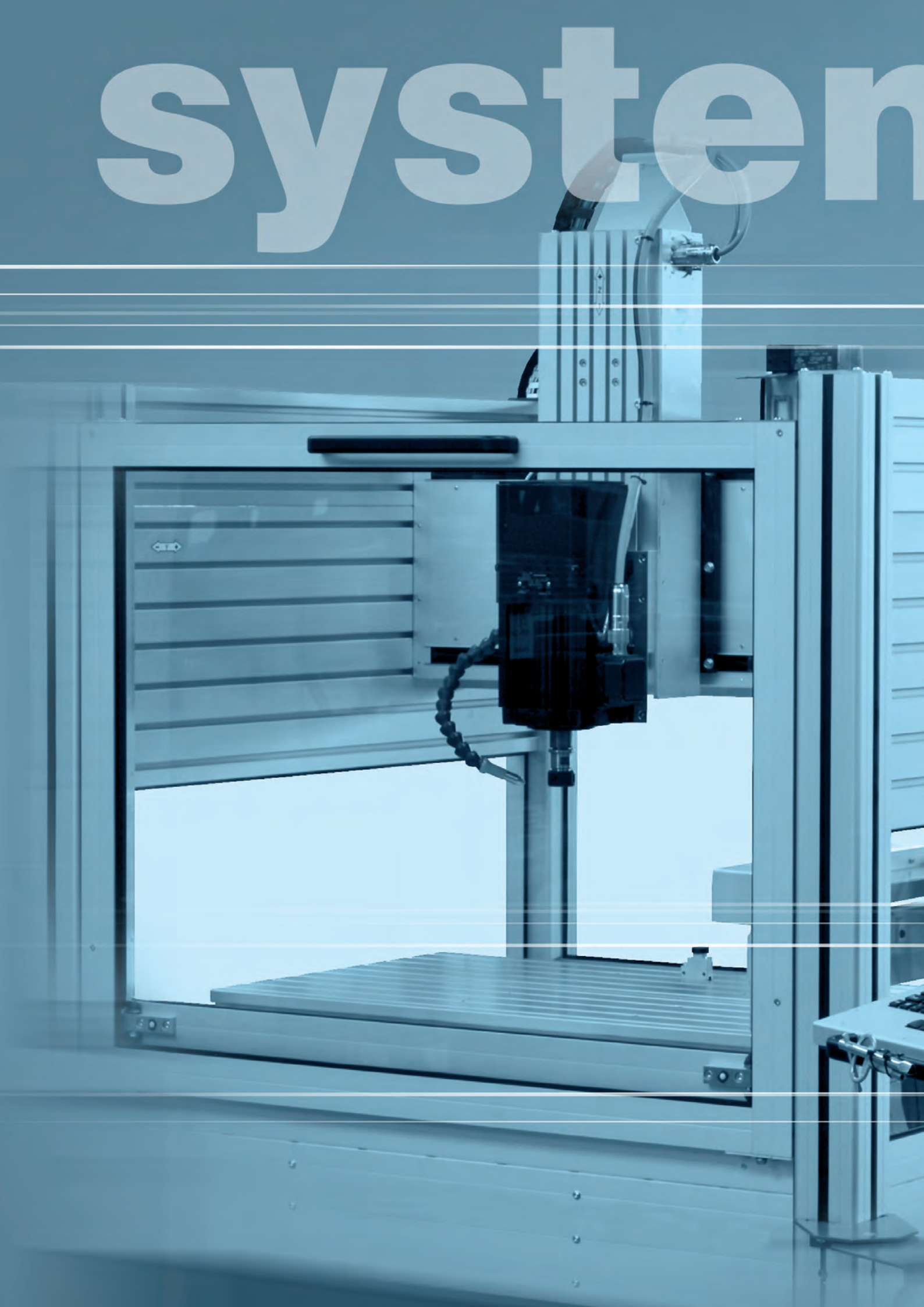
Part no.: **Z11-333500**
ProNC - software for CAN-CNC controllers (Windows)

Training courses and application solutions to order.

## Features

- Programming to DIN66025 (G-codes) or isel-PAL
- compatible with previous software versions (ProDIN, ProPAL)
- integrated text editor with numerous features for rapid and efficient source code processing
- Import of geometric data (NCP, e.g. from isy-CAD/CAM)
- Use of up to 6 interpolating and up to 6 handling axes (with CAN controller)
- Look-ahead track processing with CAN controller
- up to 4 spindle motors can be used
- up to 4 I/O units can be used (max. 64 inputs, 64 outputs)
- Signalling inputs and outputs for process synchronisation
- Teach-in-with joystick, keyboard and mouse
- Offline programming with simulation modules
- incremental processing, hold points and system monitoring for commissioning
- individually expandable with software libraries
- Control panels for movement control, input/output, spindle and tool change with buttons
- Control panel for max. 6 handling axes independent of the interpolating axes
- available in German and English

# syste



ns

## SYSTEMS

systems

# CNC machines Overview

# CNC machines Overview



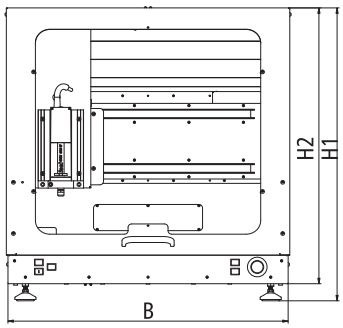
# CNC machine
## with step motor drive

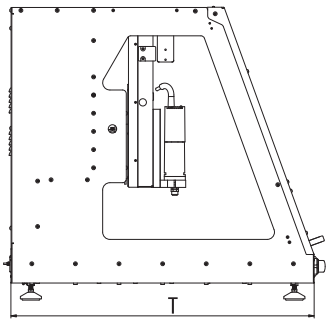
# ICP

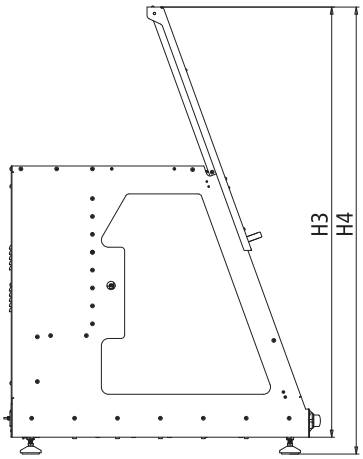

**ICP 4030** with hood open

## Dimensioned drawings

| | | ICP 3020 | ICP 4030 |
|---|---|---|---|
| **Width W** | [mm] | 610 | 780 |
| **Depth D** | [mm] | 650 | 850 |
| **Height H1** | [mm] | 715 | 810 |
| **Height H2** | [mm] | 670 | 770 |
| **Height H3** | [mm] | 1030 | 1203 |
| **Height H4** | [mm] | 1080 | 1250 |



# CNC machine
## with step motor drive

# ICP

## General

CNC machines in the ICP series have been developed from the proven CPM series. By introducing a sliding door, the machines can now be operated in a sitting position which, inter alia, leads to shorter cycle times when opening the hood. The chassis is completely bolted instead of being welded like its predecessors. This produces higher precision when building the machine and makes servicing easier. In addition, it was possible to optimise the resonance and vibration behaviour and therefore lower noise build-up has been achieved.

## Technical specification

| | ICP 3020 | ICP 4030 |
|---|---|---|
| **Traverse path X/Y/Z** [mm] | 300 × 200 × 90 | 400 x 300 x 140 |
| **Clamping table surface W × D** [mm] | 500 x 250 | 600 x 375 |
| **Throughput** [mm] | 115 | 170 |
| **Dimensions W × D × H** [mm] | 610 × 650 × 715 | 780 × 850 × 810 |
| **Guides** | Linear units with precision steel shafts and recirculating ball slots, clearance free adjustable | |
| **Process speed X/Y/Z** [mm/s] | 100 | |
| **Repeatability** [mm] | ± 0.02 | |
| **Drive motors** | Stepper motors | |
| **Drive elements X/Y/Z** | Ball screw drives 16 × 10/16 × 10/16 × 4 mm<br>Clearance free adjustable (optional: 16 × 4 mm in X/Y/Z) | |
| **Controller** | iMC-P step controller with 4 final stages 48V/4.2A and 500W power supply unit with processor board | |
| **Operation** | Function keys and emergency shutdown | |
| **Software** | WinRemote (optional: ProNC, isy 2.5 PLUS) | |
| **Weight** [kg] | appr. 102 | appr. 120 |
| **Part no.:** | **280210 7406 *** | **280220 7405 *** |

* The deliverables include an accompanying pack with mechanical accessories (inter alia Hand lever clamping device, stop rails Triangle wrench, open jaw wrench, hook wrench, Allen key, one 6-socket bench extension, connection lead, power lead)

## Accessories

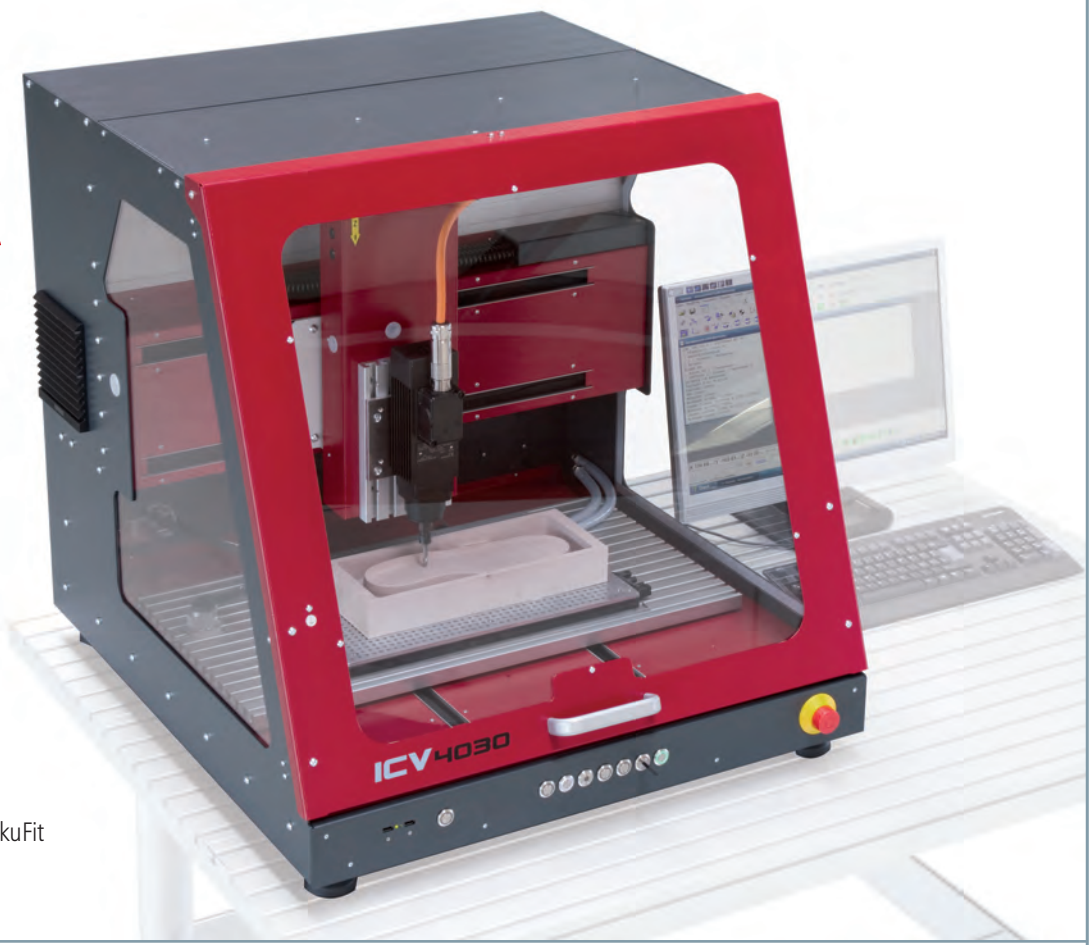
| | |
|---|---|
| **280220 9012** | Cooling/spray device for ICP 3020/4030 |
| **280120 9010** | Length measuring button for ICP 3020/4030 |
| **280120 9004** | Workspace lighting for ICP 3020/4030 |
| **420003 0500** | Milling motor UFM 500, 500 W, 11,000...25,000 r.p.m. |
| **280110 9001** | Suction device for UFM 500 |
| **Z13-337030** | isy-CAM 2.5 PLUS |
| **Z11-333500** | ProNC software |
| **310704 1631** | iSA 500 spindle motor up to 30,000 rpm, 500 W, with frequency converter, CoolMin tool cooling system, ER 11 clamping ring and motor lead (only ICP 4030) |
| **310707 1631** | iSA 750 spindle motor up to 24,000 rpm, 750 W, with frequency converter, CoolMin tool cooling system, ER 16 clamping ring and motor lead (only ICP 4030) |
| **280210 9001** | Suction device for iSA 500 / 750 |
| **280000 0046** | Fixing plate for main spindle drive iSA 500 / 750 |
| **290055** | Vice 1 (W 130 × H 45 × L 152 mm) |
| **290056** | Vice 2 (W 180 x H 75 x L 215 mm) |

systems

# CNC machine
with servo motor drive

# ICV 4030

**Control unit**
... with integrated control computer.



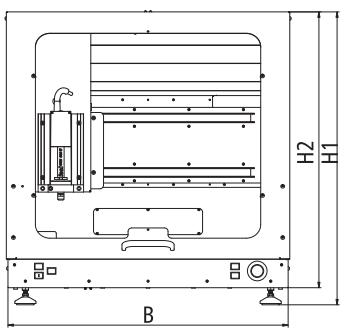

**ICV 4030-F**
with optional
Vacuum clamping system VakuFit

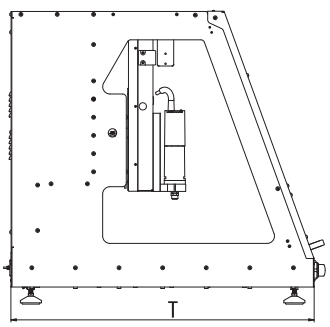
## Dimensioned drawings

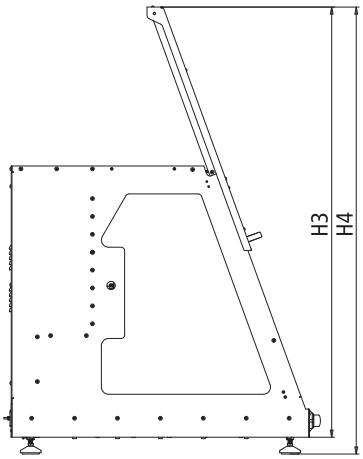
| | ICV 4030 |
|---|---|
| **Width W** [mm] | 780 |
| **Depth D** [mm] | 835 |
| **Height H1** [mm] | 806 |
| **Height H2** [mm] | 765 |
| **Height H3** [mm] | 1203 |
| **Height H4** [mm] | 1250 |

**machine bench**
W 1500 D1000 H 750

Part no. 248550 0013



# CNC machine
## with servo motor drive

# ICV 4030

## General note

The ICV 4030 has been developed from the proven, 3D-enabled CNC machine CPV 4030, which is delivered ready for connection to the mains.
The sliding hood, opening upwards, can be operated conveniently from a sitting position. The completely bolted chassis produces higher precision when building the machine and is easier to service. In addition, it was possible to optimise the resonance and vibration behaviour and therefore lower noise build-up has been achieved. Prerequisites for working with the ICV 4030 are simply basic knowledge of CNC systems, general IT literacy and basic knowledge of graphics programs!

## Technical specification

| | ICV 4030 |
|---|---|
| **Processing areas X/Y/Z** [mm] | 395 x 300 x 95 |
| **Bench clamping area W × D** [mm] | 600 x 375 |
| **Gap** [mm] | 150 |
| **Dimensions WxTxH** [mm] | 780 x 835 x 806 |
| **Guides** | Linear units with precision steel shafts<br>and recirculating ball slots, adjustable for no play |
| **Processing speed X/Y/Z** [mm/s] | max. 200 |
| **Repeat accuracy** [mm] | ± 0.02 |
| **Drive motors** | Servo motors |
| **Drive elements X/Y/Z** | Recirculating ball transmission 16 × 10/16 × 10/16 × 4 mm<br>adjustable for no play |
| **Controller** | iMC CAN controller with 3 drive controllers, integrated<br>control computer, I/O module, safety circuit and rest state monitoring<br>Power supply unit 48V/1000 W |
| **Operation** | Function keys and emergency shutdown |
| **Software** | WinRemote (optional: ProNC, isy 2.5 PLUS) |
| **Weight [kg]** | approx. 120 |
| **Part no.** | **280230 4400** |

**isel CNC milling machine ICV 4030-F**
**with spindle motor iSA 500, IMD10 controller including PC**

- Servo motor driven
- Spindle motor 500 W, 30,000 rpm
- Collets 3 and 6 mm for iSA 500
- Length measuring probe for measuring tool lengths
- Four-axis controller incl. PC with Windows operating system
- Drive elements: X/Y axes 16x10 mm, Z axis 16x4 mm
- Set of mechanical clamping elements
- LED workspace illumination
- WinRemote output programme
- Electrical supply data: 230 V / 16 A
- Chassis colours: RAL 7016 and RAL 3003

**Part no.**
280230 4440

**isel CNC Basis machine ICV 4030-B**
**with IMD10 controller including PC**

- Servo motor driven
- Four-axis controller incl. PC with Windows operating system
- Drive elements: X/Y axes 16x10 mm, Z axis 16x4 mm
- LED workspace illumination
- WinRemote output programme
- Electrical supply data: 230 V / 16 A
- Chassis colours: RAL 7016 and RAL 3003

**Part no.**
280230 4400

Note:
Vacuum clamping plates can be clamped in sizes A5 - A3. (see Page 5-34)

# CNC machine
## with servo motor drive

EuroMod®


**EuroMod MP 45**
with closed sliding door

## Technical specification

| | EuroMod® MP 30 | EuroMod® MP 45 | EuroMod® MP 65 |
|---|---|---|---|
| **Processing areas X/Y/Z** [mm] * | 650/300/250 | 650/450/250 | 1000/650/250 |
| **Bench clamping area W × D** [mm] | 900x350 | 900x500 | 1200x700 |
| **Gap** [mm] * | 350 | | |
| **Dimensions WxDxH** [mm] | 1160x800x1960 | 1160x1110x1960 | 1480x1510x1960 |
| **Processing speed X/Y/Z** | max. 250 mm/s | | |
| **Repeat accuracy** [mm] | ± 0.02 | | |
| Drive motors | Servo motors | | |
| **Drive elements X/Y/Z** | Recirculating ball drive, adjustable for no play | | |
| **Controller** | iMD CAN controller with 3 drive controllers, expandable to 12 axes (max. 6 interpolated & 6 handling axes), PC, I/O module, safety circuit with rest state monitoring, power supply unit 48V/1000 W | | |
| **Operation** | 19" CNC control panel with touch screen, keyboard and mouse | | |
| **Weight** (kg) | approx. 275 | approx. 300 | approx. 400 |
| **Software** | Windows, WinRemote (optional: ProNC, isy 2.5 PLUS) | | |
| **Connection values** | 230 V, 16 A | | |
| **Part no.** | 275133 53655 | 275143 53655 | 275153 53655 |

*** without mounted components on the axes.**

# CNC machine
## with servo motor drive

EuroMod®



## General note

The choice of the ideal CNC machine for you should focus both on the clamping area for the workpiece, materials or plates to be machined and on the strategy or difficulties of the machining. In principal, all machines are perfectly suited for machining **light metals, non-ferrous metals, plastics** and **wood** . Extensive range of accessories for all our CNC machines to order (see Page 5-18 et seq.).

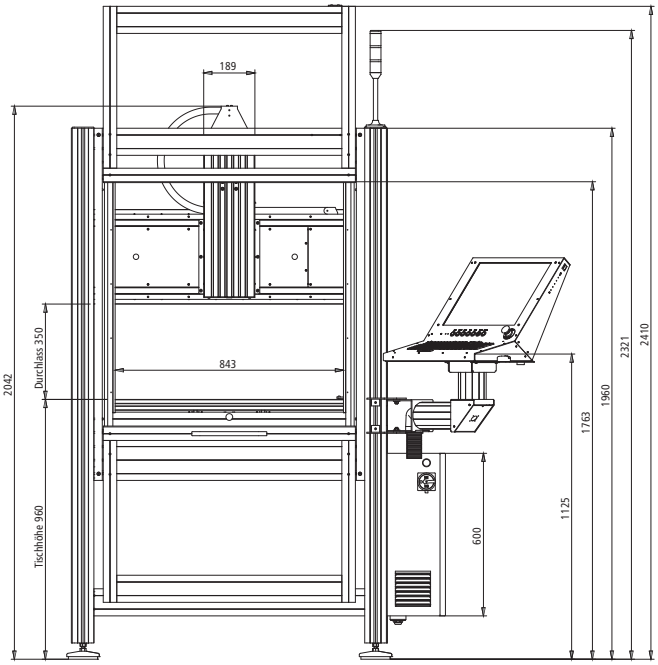
## Options

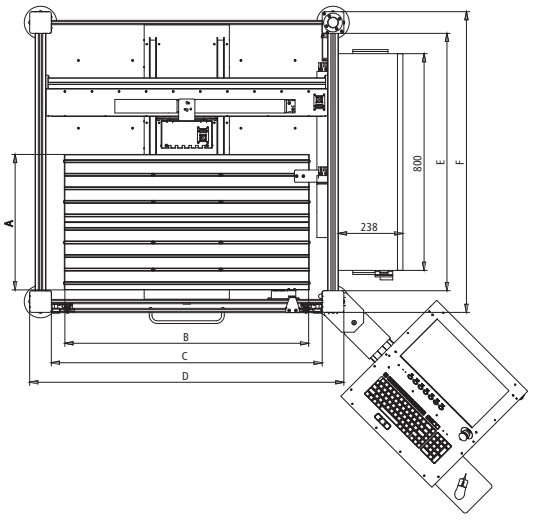
- PC control console with free PCI plug-ins (for use by external PCI hardware)
- Stainless steel keyboard
- Safety light curtain
- Milling and engraving spindles
- SK11/SK20 automatic tool change stations
- Minimum quantity lubrication or CoolMin cooling system
- Vacuum clamping benches
- Suction device
- 4th axis e. g. RDH series installation
- pneumatic sliding door
- closed hood attachment

## Setup

- Portal: fixed, bench: moveable

## Dimensioned drawings/dimensions




| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| **EuroMod MP30** | 350 | 900 | 1000 | 1160 | 640 | 800 |
| **EuroMod MP45** | 500 | 900 | 1000 | 1160 | 950 | 1110 |
| **EuroMod MP65** | 700 | 1200 | 1200 | 1480 | 1350 | 1510 |

We reserve the right to make technical changes.

systems

# CNC machine
## with servo motor drive

FLATCOM® M series

**FlatCom M 30**
with open hood and options:
spindle motor, tool changer, VakuFit vacuum clamping plate, length measuring key, CoolMin tool cooling, CNC joystick

## Technical specification

| | FLATCOM® M 20 | FLATCOM® M30 | FLATCOM® M40 | FLATCOM® M50 |
|---|---|---|---|---|
| **Processing areas X/Y** [mm] * | 700/600 | 700/900 | 1200/900 | 1200/1400 |
| **Z lift** [mm] | 150 (optional 250, in each case without processing unit) | | | |
| **Bench clamping area W × D** [mm] | 750x750 | 750x1000 | 1250x1000 | 1250x1500 |
| **Z gap** [mm] * | 200 (optional 300, in each case without processing unit) | | | |
| **Dimensions WxDxH** [mm]** | 1420x1150x1870 | 1420x1450x1870 | 1920x1450x1870 | 1920x1950x1870 |
| **Processing speed X/Y/Z** | max. 250 mm/s | | | |
| **Repeat accuracy** [mm] | ± 0.02 | | | |
| **Drive motors** | Servo motors | | | |
| **Drive elements X/Y/Z** | Recirculating ball drive, adjustable for no play | | | |
| **Controller** | iMD CAN controller with 3 drive controllers, expandable to 12 axes (max. 6 interpolated & 6 handling axes), PC, I/O module, safety circuit with rest state monitoring, power supply unit 48 V / 1000 W | | | |
| **Operation** | 19" CNC control panel with touch screen, keyboard and mouse | | | |
| Weight (kg) | approx. 300 | approx. 340 | approx. 450 | approx. 525 |
| **Software** | Windows, WinRemote (optional: ProNC, isy 2.5 PLUS) | | | |
| **Connection values** | 230 V, 16 A | 400 V, 16 A | | |
| **Part no.** | **275023 52455 **** | **275033 52455 **** | **275043 52455 **** | **275053 52455 **** |

* without mounted components on the axes.
** with switchgear cabinet and hood

# CNC machine
## with servo motor drive

FLATCOM® M series



## General note

The choice of the ideal CNC machine for you should focus both on the clamping area for the workpiece, materials or plates to be machined and on the strategy or difficulties of the machining. In principal, all machines are perfectly suited for machining **light metals, non-ferrous metals, plastics** and **wood** . Extensive range of accessories for all our CNC machines to order (see Page 5-18 et seq.).

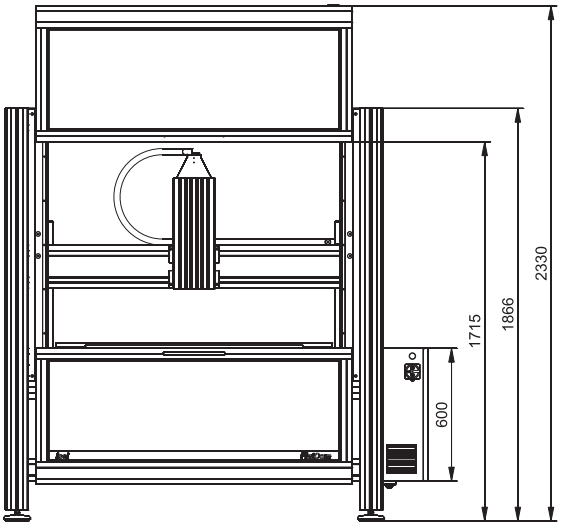
## Options

- PC control console with free PCI plug-ins (for use by external PCI hardware)
- Safety light curtain
- Milling and engraving spindles
- SK11/SK20 automatic tool change stations
- Minimum quantity lubrication or CoolMin cooling system
- Vacuum clamping benches
- Suction device
- 4th axis e. g. RDH series installation
- Version without hood
- Maximum 6 interpolated axes + 6 handling axes
- Portal gap 300 mm
- Pneumatic sliding door
- Closed hood attachment

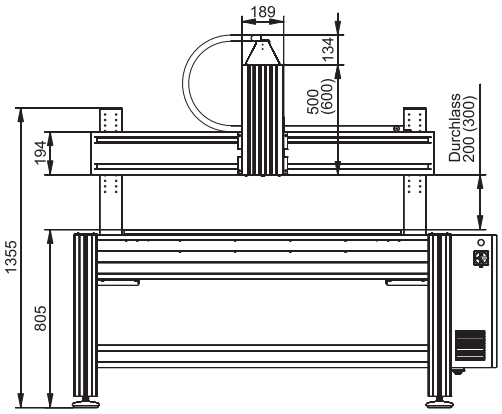
## Setup

- Portal: moveable, bench: fixed

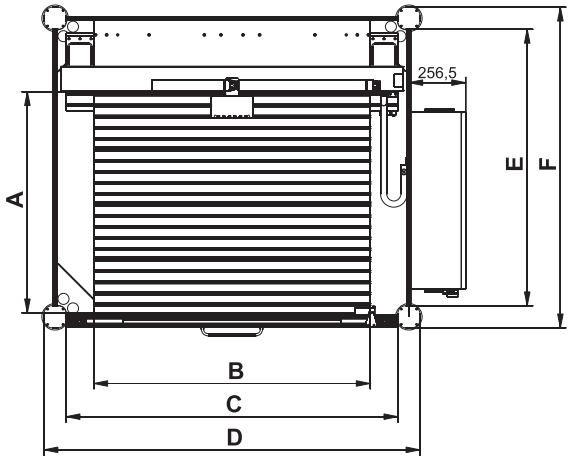
## Dimensioned drawings/dimensions




**FlatCom** with sub-frame and hood




**FlatCom** with sub-frame, without hood




| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| **FlatCom M20** | 750 | 750 | 1000 | 1200 | 950 | 1150 |
| **FlatCom M30** | 1000 | 750 | 1000 | 1200 | 1250 | 1450 |
| **FlatCom M40** | 1000 | 1250 | 1500 | 1700 | 1250 | 1450 |
| **FlatCom M50** | 1500 | 1250 | 1500 | 1700 | 1750 | 1950 |

# CNC machine
## with servo motor drive

FlatCom® L series

FlatCom **L** with hood

## Technical specification

| | FlatCom® L150 | FlatCom® L250 |
|---|---|---|
| **Processing areas X/Y** [mm] * | 1500/1700 | 2500/1700 |
| **Z lift** [mm] | 200 (optional 300, in each case without processing unit) | |
| **Bench clamping area W × D** [mm] | 1600x2250 | 2600x2250 |
| **Z gap** [mm] * | 300 (optional 500, in each case without processing unit) | |
| **Dimensions WxDxH** [mm] | 2216x2430x1995 | 3216x2430x1995 |
| **Processing speed X/Y/Z** | max. 250 mm/s | |
| **Repeat accuracy** [mm] | ± 0.02 | |
| **Drive motors** | Servo motors | |
| **Drive elements X/Y/Z** | Recirculating ball drive, adjustable for no play | |
| **Controller** | iMD CAN controller with 3 drive controllers, expandable to 12 axes (max. 6 interpolated & 6 handling axes), PC, I/O module, safety circuit with rest state monitoring, power supply unit 48 V / 1000 W | |
| **Operation** | 19" CNC control panel with touch screen, keyboard and mouse | |
| **Weight** [kg] | approx. 435 | approx. 510 |
| **Software** | Windows, WinRemote (optional: ProNC, isy 2.5 PLUS) | |
| **Connection values** | 400 V, 16 A | |
| **Part no.** | 275062 34565 | 275072 34565 |

* without mounted components on the axes.

# CNC machine
## with servo motor drive

FLATCOM® L series



## General note

The choice of the ideal CNC machine for you should focus both on the clamping area for the workpiece, materials or plates to be machined and on the strategy or difficulties of the machining. In principal, all machines are perfectly suited for machining **light metals, non-ferrous metals, plastics** and **wood** . Extensive range of accessories for all our CNC machines to order (see Page 5-18 et seq.).

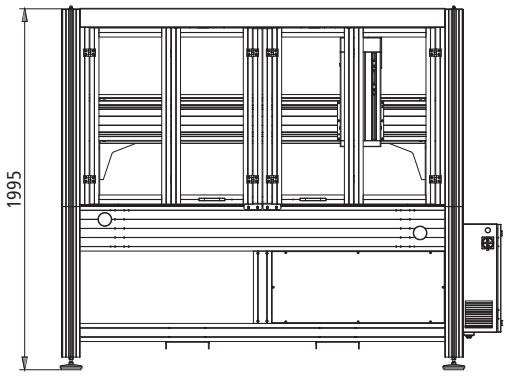
## Options

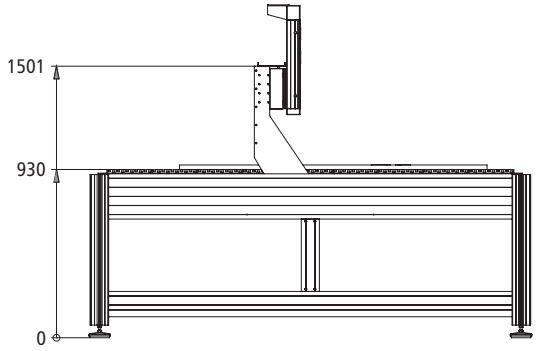
- PC control console with free PCI plug-ins (for use by external PCI hardware)
- Safety light curtain
- Milling and engraving spindles
- SK11/SK20 automatic tool change stations
- Minimum quantity lubrication or CoolMin cooling system
- Vacuum clamping benches
- Suction device
- 4th axis e. g. RDH series installation
- Version without hood
- Maximum 6 interpolated axes + 6 handling axes
- Portal gap 300 mm
- Protective hood

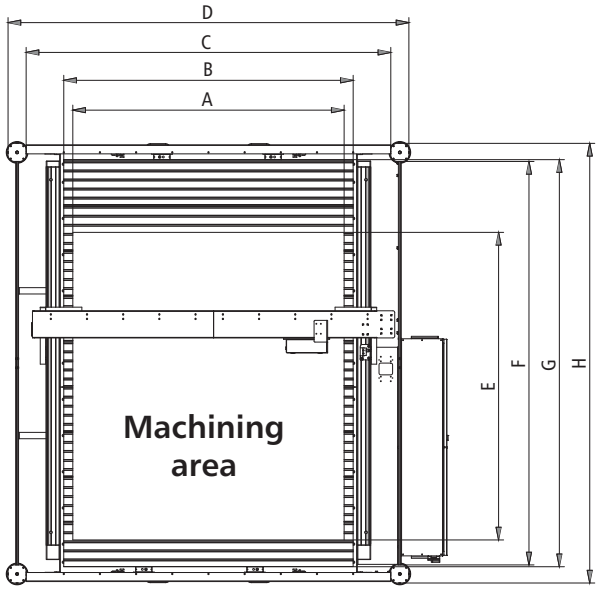
## Setup

- Portal: moveable, bench: fixed

## Dimensioned drawings/dimensions




| | A | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|
| **FlatCom L 150** | 1500 | 1600 | 2016 | 2216 | 1700 | 2230 | 2250 | 2430 |
| **FlatCom L 250** | 2500 | 2600 | 3016 | 3216 | 1700 | 2230 | 2250 | 2430 |

# CNC machine
## with servo motor drive

FLATCOM® XL series


FlatCom XL with control panel

## Technical specification

| | FLATCOM® 102/72 | FLATCOM® 102/112 | FLATCOM® 142/112 | FLATCOM® 142/162 | FLATCOM® 142/252 |
|---|---|---|---|---|---|
| **Processing areas X/Y/Z** [mm] * | 1020/720/220 | 1020/1120/220 | 1420/1120/220 | 1420/1620/220 | 1420/2520/220 |
| **Bench clamping area W × D** [mm] | 1125 x 1300 | 1125 x 1700 | 1500 x 1700 | 1500 x 2200 | 1500 x 3050 |
| **Z gap** [mm] * | 235 (optional 435, in each case without processing unit) | | | | |
| **Dimensions WxDxH** [mm] | 2084/1584/1990 | 2084/1984/1990 | 2459/1984/1990 | 2459/2484/1990 | 2459/3384/1990 |
| **Processing speed X/Y/Z** | max. 250 | | | | |
| **Repeat accuracy** [mm] | ± 0.02 | | | | |
| **Drive motors** | Servo motors | | | | |
| **Drive elements X/Y/Z** | Recirculating ball drive, adjustable for no play | | | | |
| **Controller** | iMD CAN controller with 3 drive controllers, expandable to 12 axes (max. 6 interpolated & 6 handling axes), PC, I/O module, safety circuit with rest state monitoring, power supply unit 48V/1000 W | | | | |
| **Operation** | 19" CNC control panel with touch screen, keyboard and mouse | | | | |
| **Weight** [kg] | approx. 550 | approx. 600 | approx. 700 | approx. 800 | approx. 1000 |
| **Software** | Windows, WinRemote (optional: ProNC, isy CAD-CAM) | | | | |
| **Connection values** | 400 V, 16 A | | | | |
| **Part no.** | 274552 0013 | 274553 0013 | 274554 0013 | 274555 0013 | 274556 0013 |

* without mounted components on the axes.

# CNC machine
## with servo motor drive

FLATCOM® XL series



## General note

The choice of the ideal CNC machine for you should focus both on the clamping area for the workpiece, materials or plates to be machined and on the strategy or difficulties of the machining. In principal, all machines are perfectly suited for machining **light metals, non-ferrous metals, plastics** and **wood** . Extensive range of accessories for all our CNC machines to order.
(see page 5-18 et seq.)

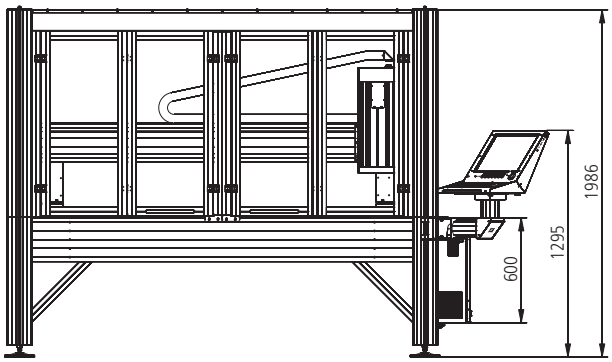
## Options

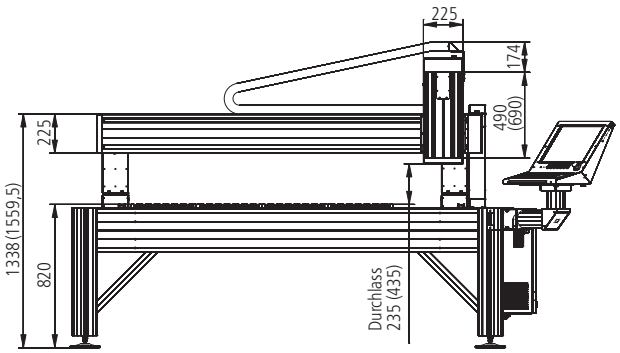
- PC control console with free PCI plug-ins (for use by external PCI hardware)
- Safety light curtain
- Milling and engraving spindles
- SK11/SK20 automatic tool change stations
- Minimum quantity lubrication or CoolMin cooling system
- Vacuum clamping benches
- Suction device
- 4th axis e. g. RDH series installation
- Version without hood
- Maximum 6 interpolated axes + 6 handling axes
- Portal gap 300 mm
- closed hood attachment

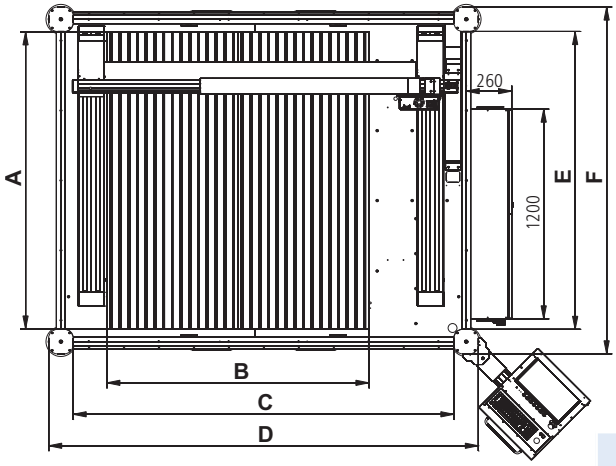
## Setup

- Portal: moveable, bench: fixed

## Dimensioned drawings/dimensions




| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| FlatCom XL 102/72 | 1300 | 1125 | 1804 | 2084 | 1304 | 1584 |
| FlatCom XL 102/112 | 1700 | 1125 | 1804 | 2084 | 1704 | 1984 |
| FlatCom XL 142/112 | 1700 | 1500 | 2179 | 2459 | 1704 | 1984 |
| FlatCom XL 142/162 | 2200 | 1500 | 2179 | 2459 | 2204 | 2484 |
| FlatCom XL 142/252 | 3050 | 1500 | 2179 | 2459 | 3100 | 3380 |

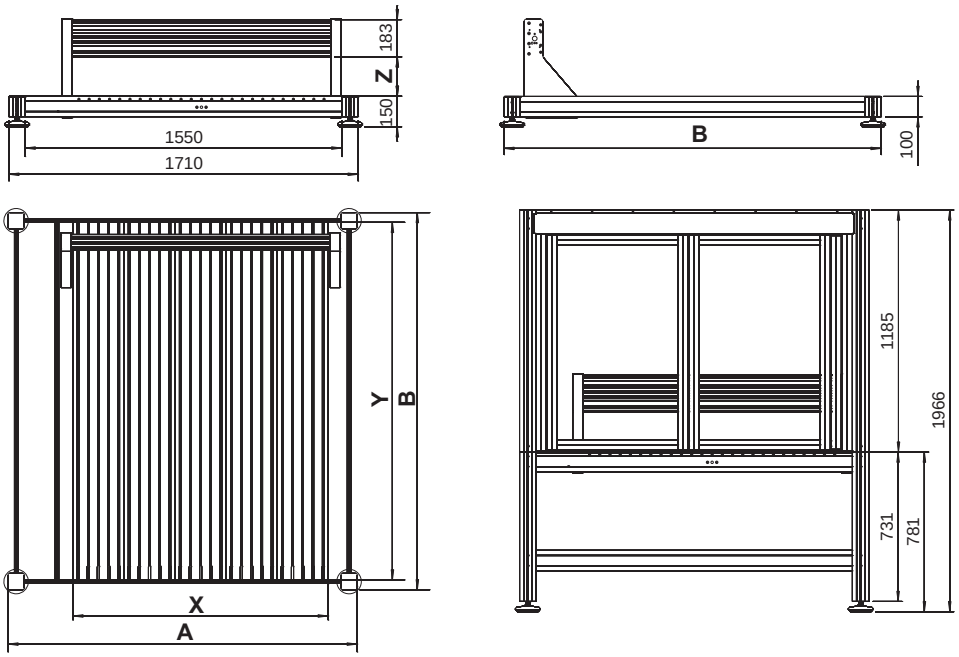
# Flat bed units


**Flat bed unit** with Z axis

## General note

Flatbed units as defined in the machine guidelines as incomplete machines according to the modular system with processing paths of 250 to 1250 mm. Step motors (MS200HT), set for no-play, are used as spindle drives Recirculating ball drives with a repeatability of ± 0.02 mm (positioning reproducibility) are used. The linear guides used are the isel double track feeds, proven over many years, with no-play pre-stressed linear ball bearings and recirculating ball spindles with a repeatability of ± 0.02 mm. All units are equipped with two limit switches per spindle. The machining and positioning units are available in a number of versions and are characterised by smooth running and high process speeds. The use of high quality aluminium components with flat-milled surfaces achieves low weight and high accuracy. isel X/Y/Z units are the ideal basis for setting up machines and systems for fitting and assembling, pressing and engraving, drilling and milling, milling and screwing, shaping and modelling, bonding and casting, soldering and welding, measuring and checking, sawing and cutting, etc..

## Dimensioned drawings



# Flat bed units

## X/Y flatbed units FB2

| Part no. | Chassis A × B (mm) | Clamping surface X × Y (mm) | process travel X × Y (mm) | Z gap (mm) |
|---|---|---|---|---|
| **246203M** | 1210 x 946 | 750 x 850 | 530 x 500 | 190 |
| **246203 2040M** | 1210 x 1196 | 750 x 1100 | 530 x 750 | |
| **246203 2054M** | 1210 x 1446 | 750 x 1350 | 530 x 1000 | |
| **246203 2067M** | 1460 x 1446 | 1000 x 1350 | 780 x 850 | |
| **246203 2130M** | 1710 x 1846 | 1250 x 1750 | 1030 x 1250 | |

All flatbed units are fitted with **16 x 4 mm recirculating ball** drives as standard


## Z axes for flatbed units

| Part no. | Lift (mm) | |
|---|---|---|
| **230514M** | 75 | with magnet brake 24 V |
| **230514 0400M** | 160 | with magnet brake 24 V |

## Underframes

| Part no. | suitable for flatbed unit With clamping surface: |
|---|---|
| **248500 0027** | 750 x 850 |
| **248500 0040** | 750 x 1100 |
| **248500 0054** | 750 x 1350 |
| **248500 0067** | 1000 x 1350 |
| **248500 0130** | 1250 x 1750 |

## Accessories

| Part no. | |
|---|---|
| **219200 0001** | Energy guidance chain |

## Software

| Part no. | |
|---|---|
| **Z11 - 333 500**<br>**Z13 - 337 030** | ProNC software<br>isy-CAM 2.5 Plus |

## Options

- Appropriate Controller (e.g.: iMC-S8)
- Software modules for operating in CAM, CNC and SPS applications
- Frame
- Housing
- Spindle motors (see pages 5-18 et seq.)
- Gap: 300 and 500 mm respectively

## Housings

| Part no. | suitable for flatbed units with clamping surface: |
|---|---|
| **248200 0000** | 750 x 850 |
| **248200 2040** | 750 x 1100 |
| **248200 2054** | 750 x 1350 |
| **248200 2067** | 1000 x 1350 |
| **248200 2130** | 1250 x 1750 |

systems

# Introduction

When developing our spindle motors, our main emphasis was on functionality, quality, and the optimum price structure. Our spindle motors are also particularly easy to maintain. The particularly slim lines and square housing cross-section allow installation in rows with minimum separation.
Our approach to electrical construction is to use an AC short circuit rotor with 2-pole windings in our motors, designed to DIN EN 60034. The insulation of the windings is produced according to heat class F. The motors are dynamically balanced to very fine tolerances, so that good running properties are achieved even at high speeds. In all, they cover a range of speeds from 3,000 to 30,000 rpm. All spindle motors are produced entirely in Germany, meet at least the criteria for IP54 protection class and are therefore approved even for areas where wood dust is present. In our product portfolio, in addition to spindle motors, you'll find all the leads you will need in various lengths and preset, reliable frequency converters for connecting to the controller. By integrating development, production, sales and service under one roof, we have very short procedures and have our own repair service which operates year-round, unlike many of our competitors. An extensive range of accessories, such as vacuum cleaning systems, minimum amount greasing systems, collets, SK housings, tool changers and our unique, patented Coolmin system for optimum and economical tool cooling, without residues, round off our product portfolio.



Subject to technical changes.

# Spindle motor
## with manual tool changer

# iSA 500

iSA 500 with manual tool change

iSA 500 with manual tool change and **CoolMin** tool cooling system

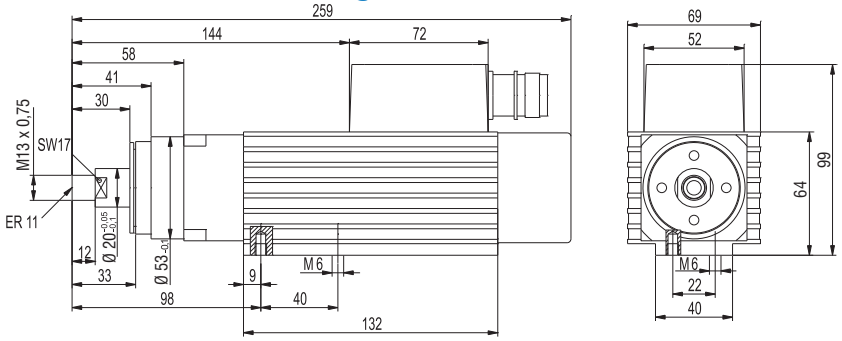
## Features

- Robust 2-pole AC motor (asynchronous motor)
- Square shape, protection class IP54, isolation class F
- Cast bearing apron A-side, aluminium extrusion B-side
- Motor shaft to take ER 11 collets
- Rated output 0.5 kW (S6-40% operation)
- Speed range 5,000 rpm. - 30,000 rpm.
- Manual tool change
- M23 plug connection
- incl. ER 11 collet, Ø 6 mm
- Clamping range Ø 1 mm – Ø 7 mm
- Intrinsic ventilation B-side
- Controlled by Frequency converter
- Spindle bearing: 2 bearings A-side, 1 bearing B-side
- Optional:
  - CoolMin® (internal and external)
  - Frequency converter
  - Various collets, mounting plates, lead lengths
  - Suction device

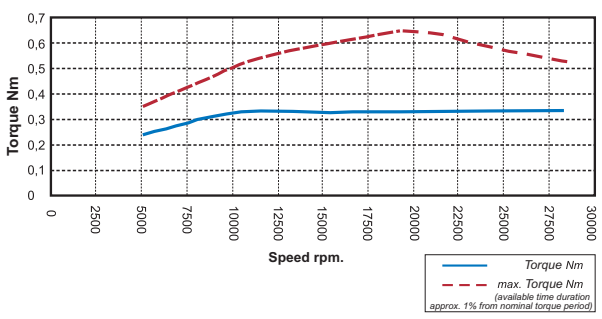
## Technical specification

| Description | | iSA 500 |
|---|---|---|
| Torque at rated speed 18,000 rpm | [Nm] | 0.28 |
| Speed | [rpm] | 5,000 to 30,000 |
| Cut-off frequency | [Hz] | 300 |
| Number of poles | | 2 |
| Rated voltage | [V] | 230 |
| Rated current | [A] | 2.6 |
| cos ϕ | | 0.75 |
| S 6 = 40% rated output | [kW] | 0.5 |
| Concentricity | [mm] | 0.01 |
| Weight | [kg] | 2.8 |

## Dimensioned drawings




## Torque curves




## Ordering information

iSA 500 spindle motor
Part no.: **477004 3130**

iSA 500 spindle motor with converter and lead (8m)
Part no.: **310704 1611**

iSA 500 spindle motor with CoolMin®
Part no.: **477004 5130**

iSA 500 spindle motor with converter, lead (8 m) and CoolMin®
Part no.: **310704 1631**

LES 5 mounting plate
Part no.: **277014**

LES 6 / FB 2 mounting plate
Part no.: **277028 0008 / 277013**

ICP/ICV mounting plate
Part no.: **280000 0046**

EuroMod/FlatCom mounting plate
Part no.: **277028**

- SKC 750 frequency converter see page **5-31**
- M23 motor side leads see page **5-31**
- Suction device for 38 mm hose see page **5-31**
- collet set, ER11 type see page **5-32**

Subject to technical changes.

systems

# spindle motor
## with manual tool changer

# iSA 750

iSA 750 with manual tool change

iSA 750 with manual tool change and **CoolMin**tool cooling system

## Features

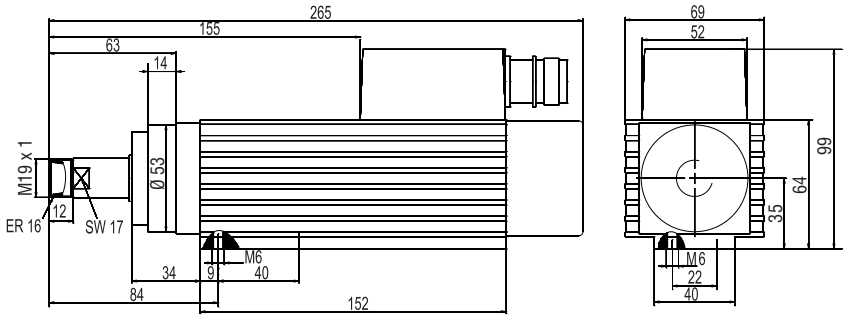
- Robust 2-pole AC motor (asynchronous motor)
- Square shape, Protection class IP54, insulation class F
- Aluminium extrusion A and B sides
- Motor shaft to take ER 16 collets
- Rated output 0.75 kW (S6-40% operation)
- Speed range 3,000 rpm. - 24,000 rpm.
- Manual tool change
- M23 plug connection
- Incl. ER16 collet, Ø 6 mm
- Clamping range Ø 1 mm – Ø 10 mm
- Intrinsic ventilation B-side
- Two precision bearings
- Controlled by frequency converter

- optional:
  - CoolMin® (internal and external)
  - Frequency converter
  - Various collets, mounting plates, lead lengths
  - Suction device

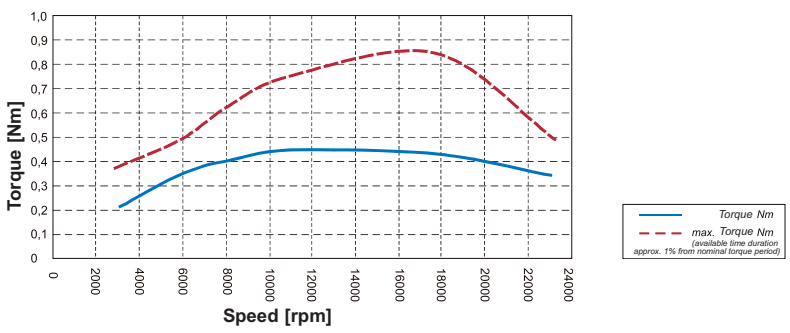
## Technical specification

| Description | | iSA 750 |
|---|---|---|
| Torque at rated speed 22,000 rpm | [Nm] | 0.34 |
| Speed | [rpm] | 3,000 to 24,000 |
| Cut-off frequency | [Hz] | 300 |
| Number of poles | | 2 |
| Rated voltage | [V] | 230 |
| Rated current | [A] | 3.4 |
| cos ϕ | | 0.79 |
| S 6 = 40% rated output | [kW] | 0.75 |
| Concentricity | [mm] | 0.01 |
| Weight | [kg] | 2.6 |

## Dimensioned drawings




## Torque curves




## Ordering information

iSA 750 spindle motor
Part no.: **477008 3124**

iSA 750 spindle motor with converter and lead (8 m)
Part no.: **310708 1611**

iSA 750 spindle motor with CoolMin®
Part no.: **477008 5124**

iSA 750 spindle motor with converter, lead (8 m) and CoolMin®
Part no.: **310707 1631**

LES 5 / FB 2 mounting plate
Part no.: **277014 / 277013**

LES 6 mounting plate
Part no.: **277028 0008**

ICP/ICV mounting plate
Part no.: **280000 0046**

EuroMod/FlatCom mounting plate
Part no.: **277028**

- SKC 750 frequency converter see page **5-31**
- M23 motor side leads see page **5-31**
- Suction device for 38 mm hose see page **5-31**
- collet set, ER16 type see page **5-32**

Subject to technical changes.

# Spindle motor
## with manual tool changer

# iSA 1500

iSA 1500 with manual tool change

iSA 1500 with manual tool change and CoolMin tool **cooling system**

## Features

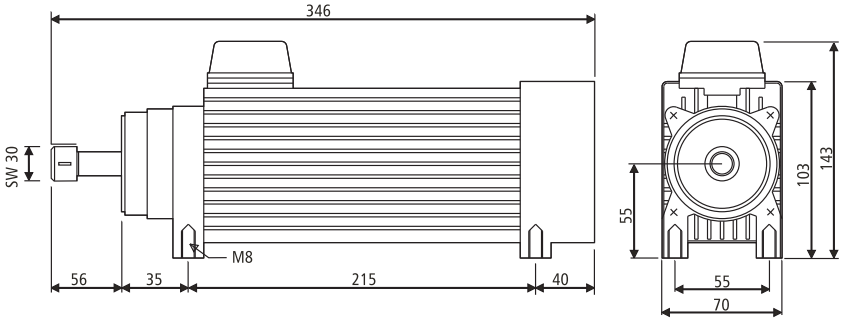
- Robust 2-pole AC motor (asynchronous motor)
- Square shape, protection class IP54, insulation class F
- Cast bearing apron A and B sides
- Motor shaft to take ER 20 collets
- Rated output 1.5 kW (S6-40% operation)
- Speed range 5,000 rpm. - 20,000 rpm.
- Manual tool change
- M23 plug connection
- Incl. ER20 collet, Ø 6 mm
- Clamping range Ø 2 mm – Ø 13 mm
- Intrinsic ventilation B-side
- Controlled by frequency converter
- Spindle bearing: 2 bearings A-side 1 bearing B-side

optional:
- CoolMin® (internal and external)
- Frequency converter
- Various collets, mounting plates, lead lengths
- Suction device
- 4-pole motor version to order

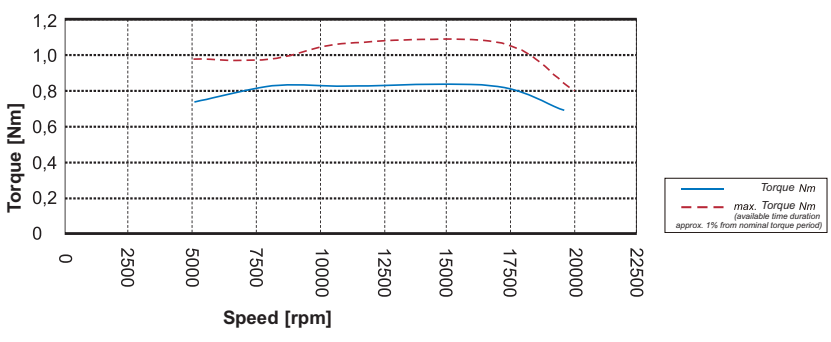
## Technical specification

| Description | | iSA 1500 |
|---|---|---|
| Torque at rated speed 20,000 rpm | [Nm] | 0.72 |
| Speed | [rpm] | 5,000 to 20,000 |
| Cut-off frequency | [Hz] | 300 |
| Number of poles | | 2 |
| Rated voltage | [V] | 230 |
| Rated current | [A] | 7 |
| cos ϕ | | 0.85 |
| S 6 = 40% rated output | [kW] | 1.5 |
| Concentricity | [mm] | 0.01 |
| Weight | [kg] | 6.4 |

## Dimensioned drawings




## Torque curves




Subject to technical changes.

## Ordering information

iSA 1500 spindle motor
Part no.: **477510 3120**

iSA 1500 spindle motor with converter and connecting lead (8 m)
Part no.: **310610 3614**

iSA 1500 spindle motor with CoolMin®
Part no.: **477510 5120**

iSA 1500 spindle motor with converter and CoolMin®
Part no.: **310610 3634**

LES 5 mounting plate
Part no.: **277028 0003**

EuroMod/FlatCom mounting plate
Part no.: **277028 0002**


- CoolMin® external with hose see page **5-29**
- SKC 1500 frequency converter see page **5-31**
- M23 motor side connecting leads see page **5-31**
- Suction device for 80 mm hose see page **5-31**
- collet set, ER20 type see page **5-32**

systems

# Spindle motor
## with manual tool changer

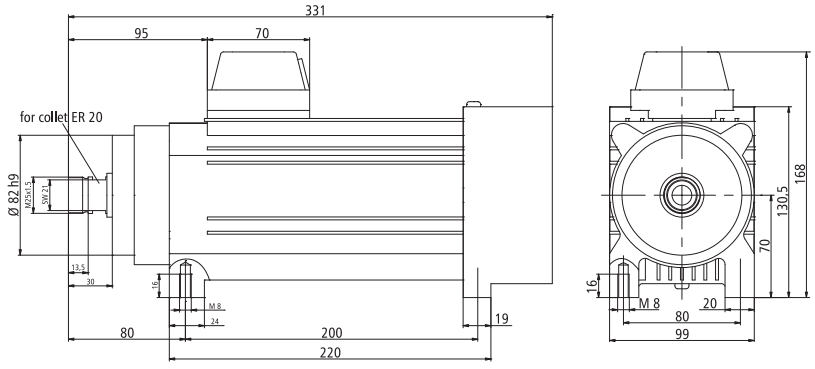
# iSA 1500 L

iSA 1500 L with manual tool change

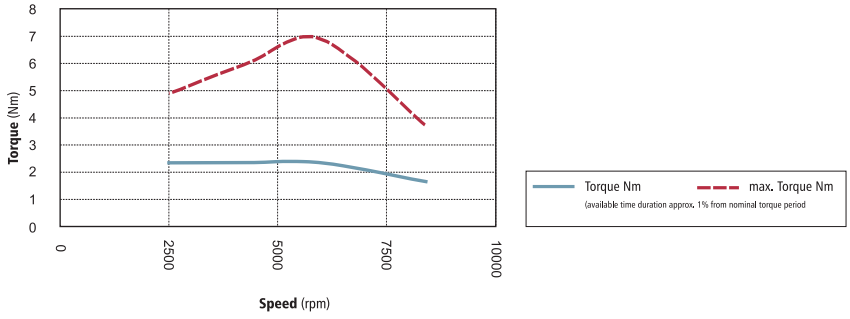
## Technical specification

| Description | | iSA 1500 L |
|---|---|---|
| Torque at rated speed 6,000 rpm | [Nm] | 2.37 |
| Speed range | [rpm] | 2,500 to 6,000 |
| Cut-off frequency | [Hz] | 107 |
| Number of poles | | 2 |
| Rated voltage | [V] | 200 |
| Rated current | [A] | 6.5 |
| cos ϕ | | 0.84 |
| Rated power (S 6 = 40% operation) | [W] | 1500 |
| Concentricity | [mm] | 0.01 |
| Weight | [kg] | 10.5 |

## Dimensioned drawings




## Torque curves




## Features

- Robust 2-pole AC motor
- Protection class IP54, insulation class F
- Motor shaft to take ER 20 collets
- Cast bearing apron A and B sides
- Rated output 1.5 kW (S6-40% operation)
- Rotational speed range 2,500 rpm – 6,000 rpm
- Torque 2.37 Nm (at 6,000 rpm)
- Rated voltage 200 V
- Manual tool change
- Clamping range Ø 2 mm – Ø 13 mm
- Intrinsic ventilation B-side
- Controlled by frequency converter
- Spindle bearing:
  A-side (milling side) double,
  B-side (ventilation side) single
- Concentricity: 0.01 mm
- Weight: 10.5 kg

- Optional:
  - CoolMin® Tool and material cooling, external
  - Frequency converter
  - collets

## Ordering information

iSA 1500 L spindle motor
with collet ER 20 (6 mm), clamping key ER 20, jaw key SW 22, Interconnectron connection
Part no.: **477510 3106**

iSA 1500 L spindle motor with converter
with collet ER 20 (6 mm), clamping key ER 20, jaw key SW 22, Interconnectron connection
Connecting leads 8 m
Part no.: **310610 3615**

CoolMin® external
Part no.: **239011 0119**

Suction device for EuroMod / FlatCom
prepared for 38 mm diameter hose
Part no.: **239012 0001**

Clamping set ER 20
2.0 / 3.0 / 4.0 / 5.0 / 6.0 / 7.0 / 8.0 / 9.0 / 10.0 / 11.0 / 12.0 / 13.0 mm
Part no.: **239172 0001**

Mounting plate isel System (Z axis)
EuroMod / FlatCom (LES 21)
Part no.: **277028 0011**

Mounting plate isel System (Z axis)
Linear unit LES 5
Part no.: **277028 0005**

Subject to technical changes.

# Spindle motor
## with automatic tool changer

# iSA 900

iSA 900 with automatic tool change

## Features

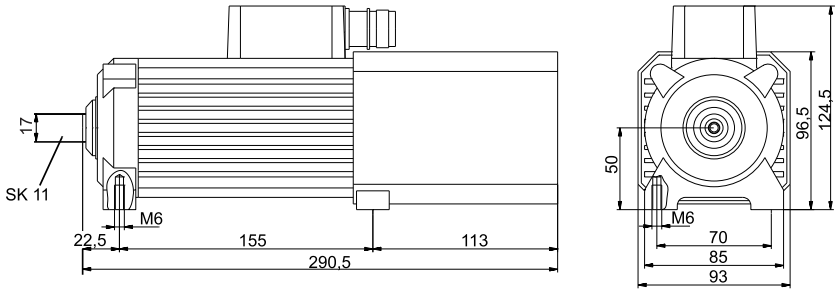
- Robust 2-pole AC motor (asynchronous motor)
- Square shape, Protection class IP55, insulation class F
- Cast bearing apron A and B sides
- Rated output 0.9 kW (S6-40% operation)
- Speed range 6,000 rpm. - 24,000 rpm.
- Automatic tool change with SK 11 tool holder and ER 11 collet, Ø 6 mm
- M23 plug connection
- Clamping range Ø 1 mm – Ø 7 mm
- Separately driven fan B-side
- Controlled by frequency converter
- Two precision bearings
- SK 11 tool changer, pneumatic (7.5 bars)

- Optional:
  - CoolMin® (external)
  - Frequency converter
  - Tool changing station
  - Various collets, mounting plates, lead lengths

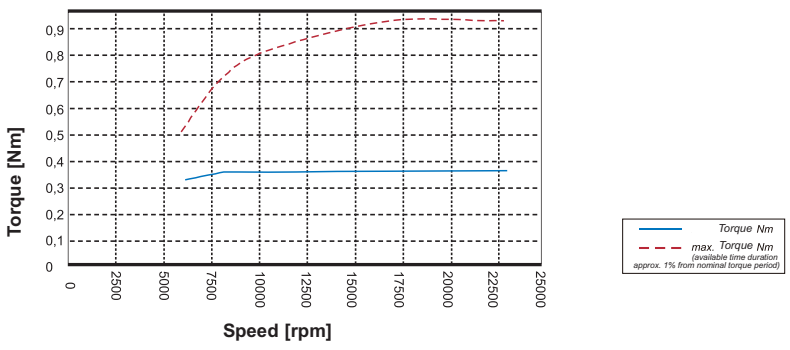
## Technical specification

| Description | | iSA 900 |
|---|---|---|
| Torque at rated speed 18,000 rpm | [Nm] | 0.37 |
| Speed | [rpm] | 6,000 to 24,000 |
| Cut-off frequency | [Hz] | 400 |
| Number of poles | | 2 |
| Rated voltage | [V] | 230 |
| Rated current | [A] | 3.25 |
| cos ϕ | | 0.84 |
| S 6 = 40% rated output | [kW] | 0.9 |
| Concentricity | [mm] | 0.01 |
| Weight | [kg] | 5.8 |

## Dimensioned drawings




## Torque curves




Subject to technical changes.

## Ordering information

iSA 900 spindle motor
Part no.: **477009 3324**

iSA 900 spindle motor
with converter and lead (8m)
Part no.: **310709 3612**

LES 5/EuroMod/FlatCom mounting plate
Part no.: **277028 0003**

- Cooling system® external with hose
  see pages **5-29**
- 5× SK 11 tool change stations
  see pages **5-30**
- 8× SK 11 tool change stations
  see pages **5-30**
- SK 11 tool holder
  see pages **5-30**
- SKC 750 frequency converter
  see pages **5-31**
- M23 motor side connecting leads
  see pages **5-31**
- collet set, ER11 type
  see pages **5-32**

systems

# Spindle motor
## with automatic tool changer

# iSA 2200


iSA 2200 with automatic tool change

iSA 2200 with CoolMin® for internal tool cooling

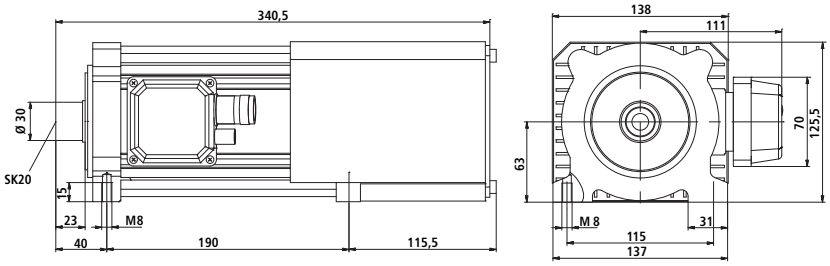
## Features

- Robust 2-pole AC motor
- Protection class IP55, insulation class F
- Cast bearing apron A and B sides
- Rated output 2.2 kW (S6-40% operation)
- Rotational speed range 5,000 rpm – 20,000 rpm
- Torque 1.26 Nm (at 18,000 rpm)
- Rated voltage 3 x 230 V
- Automatic tool change
- Clamping range Ø 2 – Ø 13 mm
- Separately driven fan B-side
- Controlled by frequency converter
- Two precision bearings
- SK 20 tool changer, pneumatic (7.5 bars)
- Concentricity: 0.01 mm
- Weight: 14.6 kg
- Optional:
  - CoolMin® Tool and material cooling, external
  - CoolMin® internal with **internal tool cooling**
  - Frequency converter
  - Tool changer, collets

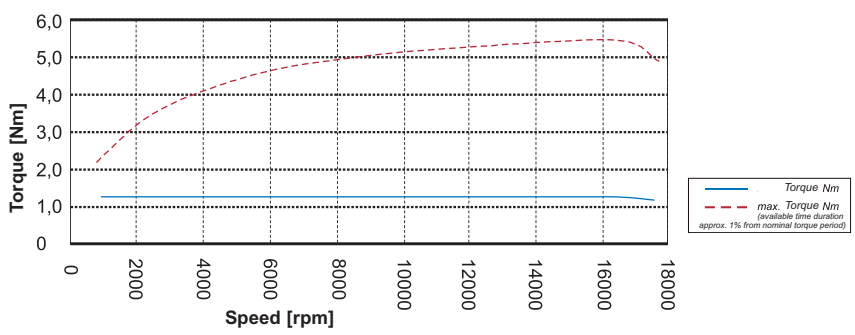
## Technical specification

| Description | | iSA 2200 |
|---|---|---|
| Torque at rated speed 18,000 rpm. | [Nm] | 1.26 |
| Speed range | [rpm] | 5,000 to 20,000 |
| Cut-off frequency | [Hz] | 280 |
| Number of poles | | 2 |
| Rated voltage | [V] | 3 x 230 |
| Rated current | [A] | 7.6 |
| cos ϕ | | 0.84 |
| Rated power (S 6 = 40% operation) | [W] | 2.2 |
| Concentricity | [mm] | 0.01 |
| Weight | [kg] | 14.6 |

## Dimensioned drawings




## Torque curves




## Ordering information

iSA 2200 spindle motor
with collets ER 20 (6 mm), nut ERM 20, clamping key ER 20 M, jaw key SW 22, Interconnectron connection
Part no.: **477022 3320**

iSA 2200 spindle motor as above, plus frequency converter SKC 1500, motor connecting cable 8 m
Part no.: **310722 3621**

iSA 2200 spindle motor+CoolMin® (internal)
with collets ER 20 (6 mm), nut ERM 20, clamping key ER 20 M, jaw key SW 22, Interconnectron connection
Part no.: **477022 5320**

iSA 2200 with converter+CoolMin® (internal)
as above, plus frequency convertor SKC 1500, motor connecting cable 8 m Part no.: **310722 3631**

SK 20 tool change station 4-fold with hood
Part no.: **239011 0041**

SK 20 tool holder
Part no.: **239172 0020**

Suction device for EuroMod/FlatCom, prepared for hose Ø 80 mm, pneumatic opening
Part no.: **239012 0002**

Suction device with CoolMin® (external)
for EuroMod/FlatCom, prepared for hose Ø 80 mm, pneumatic opening
Part no.: **239012 0003**

CoolMin® (external)
Part no.: **239011 0119**

Clamping set ER 20 2.0/3.0/4.0/5.0/6.0/7.0/8.0/9.0/10.0/11.0/12.0/13.0 mm Part no.:**239172 0001**

Mounting plate isel System (Z axis)
FlatCom / EuroMod Part no.: **277028 0004**
LES 5 Part no.: **277028 0005**

Subject to technical changes.

# Spindle motor
## with automatic tool changer

# iSA 3600



iSA 3600 with automatic tool change

## Features

- Robust 2-pole AC motor
- Square shape, protection class IP54, insulation class F
- Cast bearing apron A-side, aluminium extrusion B-side
- Motor shaft to take ER 32 collets
- Rated output 3.6 kW (S6-40% operation)
- Speed range 6,000 rpm. - 18,000 rpm.
- Automatic tool changer with SK 30 tool holder and ER 32 collet, Ø 6 mm
- Clamping range Ø 3 mm – Ø 20 mm
- Intrinsic ventilation B-side
- Two precision bearings
- Controlled by frequency converter
- Optional:
  - CoolMin® (external)
  - Frequency converter
  - Tool changing station
  - Various collets, mounting plates and lead lengths

## Technical specification

| Description | | iSA 3600 |
|---|---|---|
| Torque at rated speed 18,000 rpm | [Nm] | 4.5 |
| Speed | [rpm] | 6,000 to 18,000 |
| Cut-off frequency | [Hz] | 300 |
| Number of poles | | 2 |
| Rated voltage | [V] | 3 x 400 |
| Rated current | [A] | 5.4 |
| cos ϕ | | 0.87 |
| S 6 = 40% rated output | [kW] | 3.6 |
| Concentricity | [mm] | 0.01 |
| Weight | [kg] | 23.0 |

## Ordering information

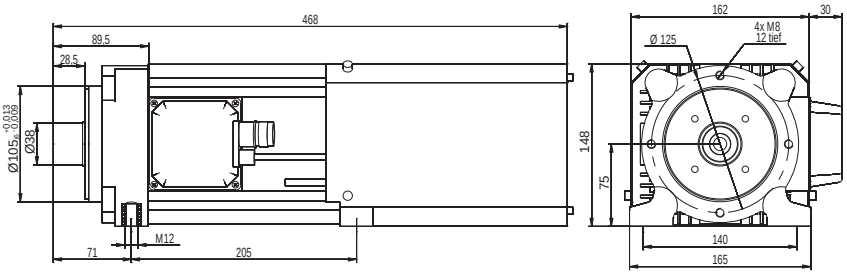
iSA 3600 spindle motor
Part no.: **477822 3600**

iSA 3600 spindle motor with converter and connecting lead (8 m)
Part no.: **310736 3615**

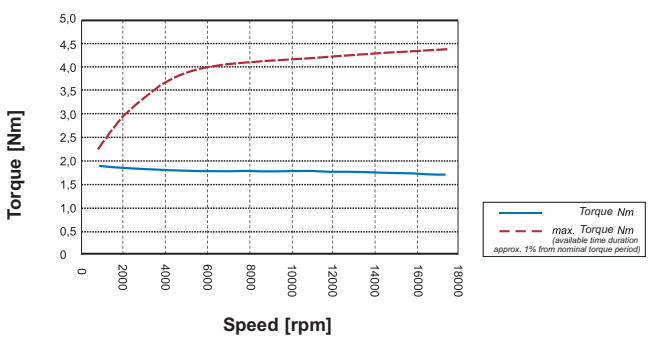
LES 5 mounting plates
Part no.: **277028 0009**

- CoolMin® external with hose see page **5-29**
- 4× SK 30 tool change stations see page **5-30**
- 5× SK 30 tool change stations see page **5-30**
- SK 30 tool holder see page **5-30**
- SKC 4000 frequency converter see page **5-31**
- M23 motor side leads see page **5-31**
- collet set, type ER 32 see page **5-32**

## Dimensioned drawings




## Torque curves




Subject to technical changes.

systems

# Spindle motor
## for high rotational speeds, with **automatic tool changer**

# iSA 1500 W

## Features

- Precision angular ball bearings
- Automatic tool change with SK 20 tool holder and ER 20 collets, Ø 6 mm
- Clamping range Ø 2 mm - 13 mm
- Pneumatic tool change (7.5 bar)
- Controlled by frequency converter
- Balancing to EN/ISO standards
- IP54 protection class

- Optional
  - Tool changing station
  - Various collets

## Technical specification

| Description | | |
|---|---|---|
| Max. torque | [Nm] | 0.47 |
| Max. Speed | [rpm] | 40,000 (666 Hz) |
| Cut-off frequency | [Hz] | 500 (30,000 rpm) |
| Number of poles | | 2 |
| Rated voltage | [V] | 3 x 230 |
| tool holder | [ISO] | 20 |
| cos ϕ | | 0.8 |
| Max. Output power (S 1) | [kW] | 1.75 |
| Concentricity | [mm] | under 0.01<br>or under 0.005 on request |
| Weight | [kg] | 10 |

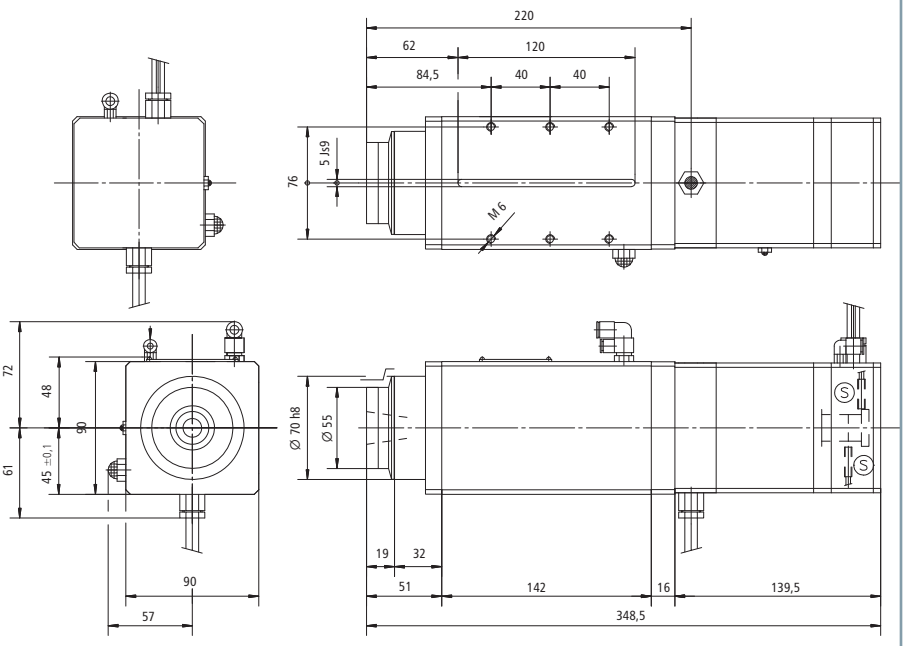
## Ordering information

iSA 1500 W spindle motor
Part no. **477015 3340**

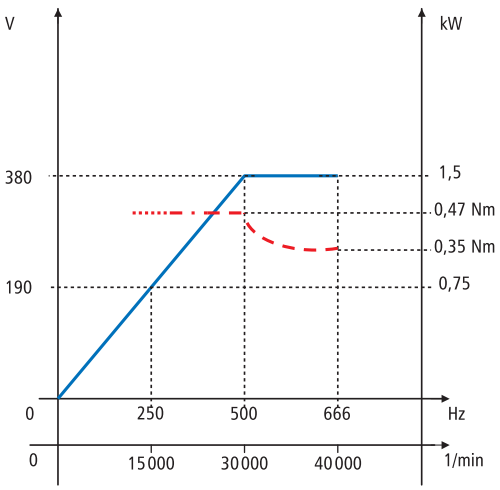
iSA 1500 W spindle motor with converter
Part no. **310715 3612**

- SKC 1500 frequency converter
  see pages **5-31**
- collet set, ER20 type
  see pages **5-32**

## Dimensioned drawings




## Torque curves




Subject to technical changes.

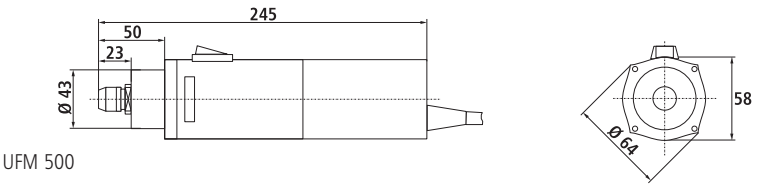
# Universal milling and engraving spindles UFM 500/1050

UFM 1050 UFM 500

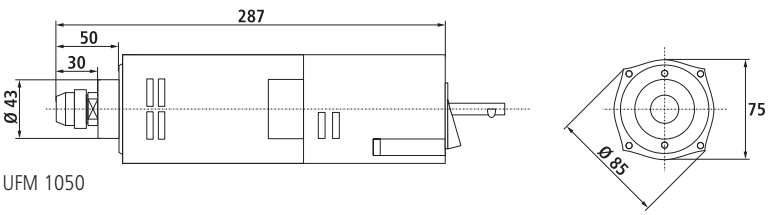
## Technical specification

| | Part no. | Load speed rpm | Voltage V | Efficiency % | Power consumption W | Power output W | Torque Nm |
|---|---|---|---|---|---|---|---|
| UFM 500 | **420003 0500** | 22.600 | 230 | 68 | 500 | 345 | 0.14 |
| UFM 500-11 | **420003 0501** | 22.600 | 115 | 68 | 500 | 345 | 0.14 |
| UFM 1050 | **420003 1050** | 21000 | 230 | 71 | 1050 | 720 | 0.32 |
| UFM 1050-11 | **420003 1051** | 21.000 | 115 | 71 | 1050 | 720 | 0.32 |

## Dimensioned drawings




UFM 500




UFM 1050

## Features

- Load-independent working speed with Tacho control electronics
- Smooth start for no-backlash acceleration to rated speed
- Blocking protection
- Protective isolation
- PTC thermal monitoring
- Rated output 345 W/720 W
- Speed range 11,000 to 25,000 rpm
- Torque 0.14 Nm (at 22,600/21,000 rpm)
- Rated voltage 230 V
- Collar
- Clamping range Ø 1 – Ø 6.35 / 8 mm
- Speed control
- Rigid double ball bearing
- Weight: 1.9 / 2.1 kg

**UFM 500**
- Input power **500 W**
- Output power **345 W**
- Torque **0.14 Nm**

**UFM 1050**
- Power consumption **1050 W**
- Output power **720 W**
- Torque **0.32 Nm**

## Clamping blocks

| Clamping blocks Ø 43mm | Part no. |
|---|---|
| Ra 100 and Ra 150 mm fixings | **290 902** |
| Ra 100 mm fixing | **290 903** |
| Ra 125 mm fixing | **290 904** |

## Collets

| collet sets | Part no. |
|---|---|
| for UFM 500 (Ø 1.0 - 6.35 mm) | **239110** |
| for UFM 1050 (Ø 1.0 - 8.0 mm) | **239112 0000** |

## Clamping nut

| Clamping nut | Part no. |
|---|---|
| for UFM 500 | **239 111** |
| for UFM 1050 | **239 112** |

## Carbon brushes

| Carbon brushes, VE = 2 units. | Part no. |
|---|---|
| for UFM 500 | **420 003 9000** |
| for UFM 1050 | **420 003 9001** |

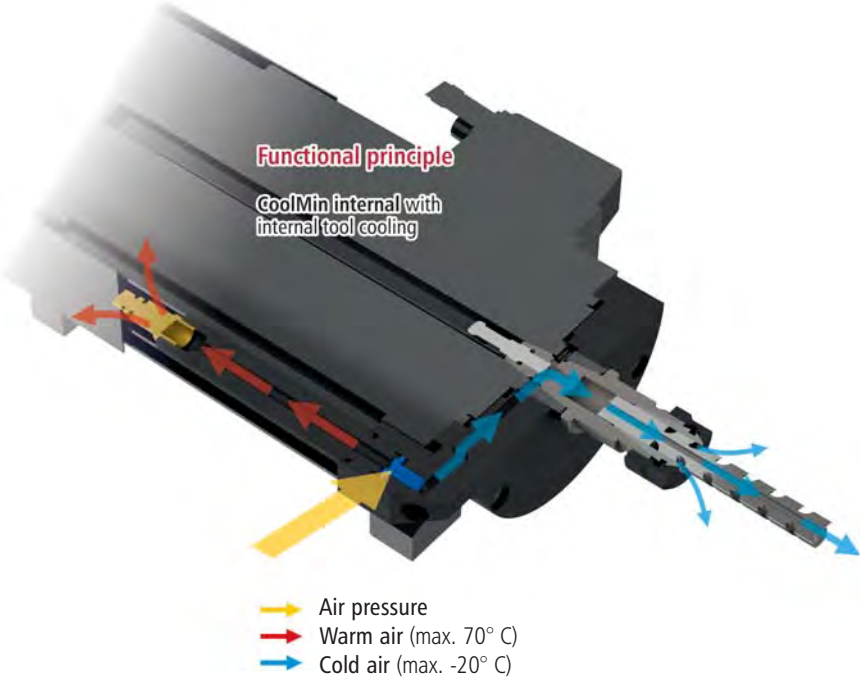
Subject to technical changes.

systems

# Tool cooling system

CoolMin

## Functional principle




Air pressure
Warm air (max. 70° C)
Cold air (max. -20° C)


1. Spindle motor
2. Temperature controller
3. Hot air exhaust
4. Vortex nozzle with cold air exhaust
5. Compressed air feed
6. Cold air blower in synthetic material
7. Tool holder for internal cooling
8. Milling cutter for internal cooling

## Tool and material cooling

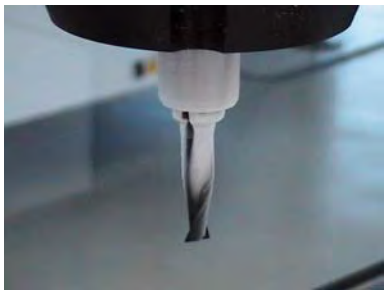
Dry cutting is today the first choice for many machining tasks.

Hitherto, materials, tool wear and surface finish have often necessitated cooling with appropriate coolants / greases. This always means moisture. Even minimal moisture spray cooling causes unwanted effects such as the build-up of dirt and the adhesion of swarf to the cutting tool or to the working surface and can lead to the deterioration of the material surface structure, depending on the material being machined.

Our patented cooling method ensures adequate tool and surface cooling and reduces such effects to negligible levels. This keeps the swarf dry and, depending on the material, easy to remove by either blowing or vacuuming. Surfaces are therefore protected and, as a result of direct tool cooling, tool life is significantly increased (also suitable for tools with integrated cooling).

The main component of our cooling method is a cold air nozzle, which operates on the eddy current principle and separates warm air from cold.

The system is powered by air pressure alone (6 to 10 bar).



Tool, cooled by CoolMin internal

Subject to technical changes.

# Tool cooling system

CoolMin



## Functional principle

**CoolMin external**

**CoolMin internal** without tool cooling system

1. Compressed air feed
2. Flexible mating hose
3. Spindle motor
4. Temperature controller
5. Hot air exhaust
6. Vortex nozzle with Cold air exhaust
7. Cold air supply in synthetic material
8. Collet


**Diagram**: CoolMin external with mating hose


**Diagram**: CoolMin internal

## Technical specification

| | |
|---|---|
| Compressed air feed | 6 – 10 bar |
| Cold air exhaust | up to max. -25° C |
| Hot air exhaust | up to max. 70° C |
| Air consumption | approx. 150 l/min. |

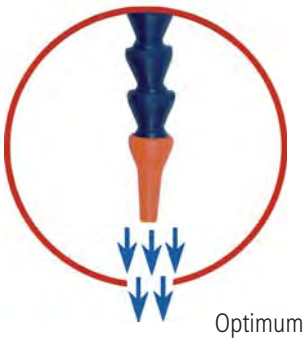


**Diagram:**
Optimum cold air flow (up to -25°C) for tool cooling and chip evacuation

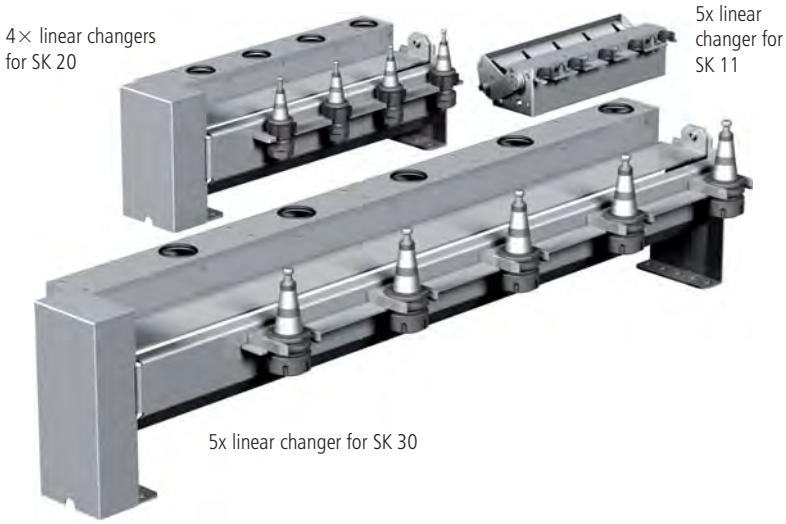
## Ordering information

| Description | | Part number |
|---|---|---|
| CoolMin external | with mating hose, incl. servicing kit and shut-off tap (manual) | 239011 0119 |
| CoolMin external | incl. servicing kit and electrically-powered valve | 239011 0117 |
| CoolMin internal | | see individual motors |

Subject to technical changes.

# Tool change stations

# SK 11 / 20 / 30

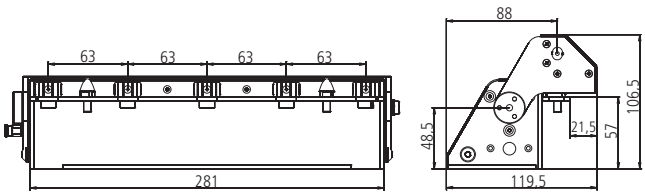



## Features

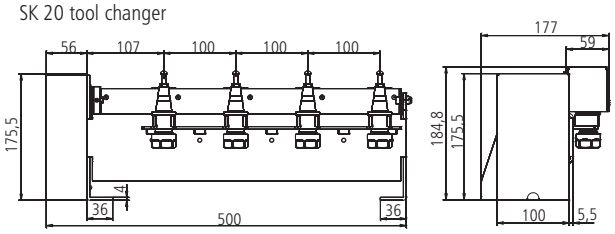
- Simple, functional tool changer for SK11, SK20 and SK30
- Pneumatic rotary cylinder and end position monitoring for safe changing
- Control via 5/2-way valve with integration in the safety circuit
- Low-maintenance, stainless steel design (powder-coated aluminium)
- Variable positioning on the machine bench

## Dimensioned drawings

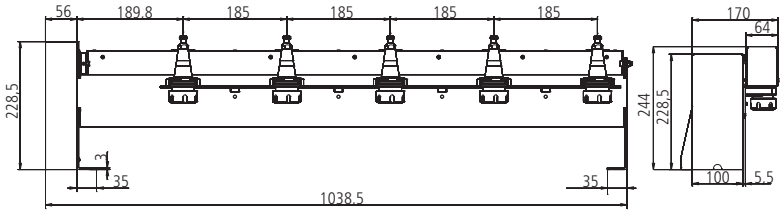
SK 11 tool changer




SK 20 tool changer




SK 30 tool changer




## Ordering information

### SK 11 tool change station
... for iSA 900

5×, without hood + pneumatics
Part no.: **239011 0053**

8×, with hood + pneumatics
Part no.: **239011 0083**

### Tool holders

SK 11 for collets, type ER 11
Part no.: **239111 0001**

### SK 20 tool change station
...for iSA 2200

4×, with hood + pneumatics
Part no.: **239011 0041**

5×, without hood + pneumatics
Part no.: **239011 0050**

10×, with hood + pneumatics
Part no.: **239011 0100** (to order)

### Tool holders

SK 20 for collets, type ER 20
Part no.: **239172 0020**

### SK 30 tool change station
...for iSA 3600

4×, with hood + pneumatics
Part no.: **239011 0045**

5×, without hood + pneumatics
Part no.: **239011 0055**

### Tool holders

SK 30 for collets, type ER 32
Part no.: **239130**

collets ER 11, ER 20, ER 30
see page **5-32**

Subject to technical changes.

# Frequency converter, motor leads and Vacuum cleaning

## Frequency converters

- Compact, pulse width modulated equipment in three output classes
- Input voltage, 230 V AC, single phase (SKC 750/1500) or 400 V AC, three phase (SKC 4000)
- Three phase, vector controlled control voltage frequency 0...1500 Hz
- Fast spindle braking with highly stressed, integrated brake resistance in the sub-frame
- Turn-off EMC filter
- Programmable inputs and outputs, relay output
- User-friendly control unit for configuring spindles
- 95 operating and display parameters for both simple and demanding applications (e. g. spindle energy sink in no load)
- Protection class: IP 20
- Control types: SPS; 0...10 V; 0...20 mA; with operating unit; CAN Bus (additional module required)
- Approved: CE; C-Tick; UL

SKC 750 frequency converter, suitable for iSA 500, iSA 750 + iSA 900
Part no.: **311707 6000**

SKC 1500 frequency converter, suitable for iSA 1500 + iSA 2200
Part no.: **311715 6000**

SKC 4000 frequency converter, suitable for iSA 3600
Part no.: **311740 6500**

## Length measurement button and motor leads

- 8-wire (3x 0.75 mm² +1x PE + 2x(2 × 0.34 mm²))
- Drag chain compatible
- External braiding and separately shielded pairs
- Pre-fabricated

Length measuring sensor for measuring tool lengths
Part no.: **239099 0001**

Motor side - M23 plug
Converter side - wire end bushings
Part no.: **392306 0300** (3 m)
Part no.: **392306 0500** (5 m)
Part no.: **392306 0800** (8 m)

Motor side - direct connection
Converter side - wire end bushings
Part no.: **392301 0300** (3 m)
Part no.: **392301 0500** (5 m)
Part no.: **392301 0800** (8 m)

## Vacuum cleaning

**... for iSA 500 + iSA 750 spindles** — Part no.: **239012 0000**
- prepared for hose 38 mm
- manual opening

**... for iSA 900 spindle** — Part no.: **239012 0004**
- prepared for hose 50 mm
- automatic opening

**... for iSA 1500 spindle** — Part no.: **239012 0001**
- prepared for hose 80 mm
- manual opening

**... for iSA 2200 spindle** — Part no.: **239012 0002**
- prepared for hose 80 mm
- automatic opening

**... for iSA 2200 spindle** with external CoolMin — Part no.: **239012 0002**
- prepared for hose 80 mm
- automatic opening

Dust cover closed

Air hose inside diameter 80 mm

Dust cover open

Subject to technical changes.

# Overview of collets and tool holders

## tool holders

SK 11 SK 20 SK 30

SK 11 for collets, type ER 11
Part no.: **239111 0001**

SK 20 for collets, type ER 20
Part no.: **239172 0020**

SK 30 for collets, type ER 32
Part no.: **239130**

**The following collets are also able to clamp shafts reduced in diameter by 1.0 mm:**

## Collets type ER 11

for iSA 500 and iSA 900

| Ø (mm) | Part no. |
|---|---|
| 1.0 | **239170 1000** |
| 1.5 | **239170 1500** |
| 2.0 | **239170 2000** |
| 2.5 | **239170 2500** |
| 3.0 | **239170 3000** |
| 3.5 | **239170 3500** |
| 4.0 | **239170 4000** |
| 4.5 | **239170 4500** |
| 5.0 | **239170 5000** |
| 5.5 | **239170 5500** |
| 6.0 | **239170 6000** |
| 6.5 | **239170 6500** |
| 7.0 | **239170 7000** |

## Collet set

| for spindle motor | Type | Ø (mm) | Part no. |
|---|---|---|---|
| iSA 500/iSA 900 | ER 11 | 1.0 - 7.0 | **239170 0001** |

## Clamping nuts

| Type | Part no. |
|---|---|
| ERM 11 | **239170** |
| ERM 16 | **239171** |
| ERM 20 | **239172** |

ER 11

ER 16

ER 20

**The following collets are also able to clamp shafts reduced in diameter by 0.5 mm:**

## Collets type ER 16

for iSA 750

| Ø (mm) | Part no. |
|---|---|
| 1.0 | **239171 1000** |
| 2.0 | **239171 2000** |
| 3.0 | **239171 3000** |
| 4.0 | **239171 4000** |
| 5.0 | **239171 5000** |
| 6.0 | **239171 6000** |
| 7.0 | **239171 7000** |
| 8.0 | **239171 8000** |
| 9.0 | **239171 9000** |
| 10.0 | **239171 0100** |

## Collets type ER 20

for iSA 1500 and iSA 2200

| Ø (mm) | Part no. |
|---|---|
| 2.0 | **239172 2000** |
| 3.0 | **239172 3000** |
| 4.0 | **239172 4000** |
| 5.0 | **239172 5000** |
| 6.0 | **239172 6000** |
| 7.0 | **239172 7000** |
| 8.0 | **239172 8000** |
| 10.0 | **239172 0100** |
| 11.0 | **239172 0110** |
| 12.0 | **239172 0120** |
| 13.0 | **239172 0130** |

## Collets type ER 32

for iSA 3600

| Ø (mm) | Part no. |
|---|---|
| 3.0 | **239130 3000** |
| 4.0 | **239130 4000** |
| 5.0 | **239130 5000** |
| 6.0 | **239130 6000** |
| 7.0 | **239130 7000** |
| 8.0 | **239130 8000** |
| 9.0 | **239130 9000** |
| 10.0 | **239130 0100** |
| 11.0 | **239130 0110** |
| 12.0 | **239130 0120** |
| 13.0 | **239130 0130** |
| 14.0 | **239130 0140** |
| 15.0 | **239130 0150** |
| 16.0 | **239130 0160** |
| 17.0 | **239130 0170** |
| 18.0 | **239130 0180** |
| 19.0 | **239130 0190** |
| 20.0 | **239130 0200** |

## Collet sets

| for spindle motor | Type | Ø (mm) | Part no. |
|---|---|---|---|
| iSA 750 | ER 16 | 1.0 - 10 | **239171 0001** |
| iSA 1500 / iSA 2200 | ER 20 | 2.0 - 13 | **239172 0001** |
| iSA 3600 | ER 32 | 3.0 - 20 | **239130 0000** |

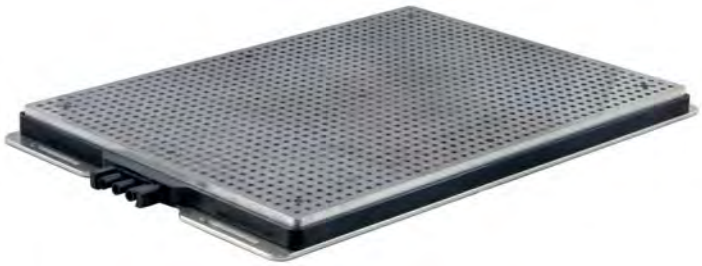
# Vacuum clamping plates

VakuFit®



## Sample diagram

Multiple connections for high volume flow and optimal vacuum distribution.



All our vacuum plates can be arranged to fit together to cover large areas.

| Part number | Description | DIN | Clamping surface |
|---|---|---|---|
| 216601 0017 | VT 2115 | A5 | 210 x 150 mm |
| 216601 0018 | VT 3021 | A4 | 300 x 210 mm |
| 216601 0019 | VT 4230 | A3 | 420 x 300 mm |
| 216601 0020 | VT 6042 | A2 | 600 x 420 mm |

| | |
|---|---|
| 216601 0028 | Rotary vane pump (6.0 m³/h) for DIN A4 und A5 |
| 216601 0030 | Rotary vane pump (10.0 m³/h) for DIN A4 und A5 |

| | |
|---|---|
| 216600 0027 | Servicing kit for rotary vane pump 6.0 m³/h |
| 216600 0028 | Servicing kit for rotary vane pump 10.0 m³/h |

| | |
|---|---|
| 216601 0010 | Connection set vacuum plate to rotary vane pump |
| 616601 | Rubber matting for vacuum plates |

Subject to technical changes.

## VakuFit - L

The raster plates for the vacuum clamping makes little demand on the vacuum pump. The plates are almost totally warp free and the material is therefore suitable for engraving operations when clamped.

In contrast to other vacuum clamping methods, surfaces can be milled over large areas without problem, with parts remaining securely clamped.

Material stops can be easily effected by inserting 5 mm dowelling pins into the raster plate holes. The board rubber matting is a consumable with a variety of uses. In addition to our standard plates, we offer customised variants and complete plate packages for special applications.

## Note

Retaining force is proportional to the area covered, the coefficient of friction and the differential pressure.

In order to increase the coefficient of friction, rubber matting is included within the scope of delivery.

## Scope of delivery

- 1x connection adapter
- 1x screw key 68 mm
- 1x rubber matting for holes
- 1x rubber matting for covering unused holes
- Operating instructions

systems

# 6-axis robot
## complete with controller and operating software

# UR-6-85-5-A

## Features

- Easy programming
- Graphic user interface
- Option of non-shielded (protection fence) operation
- Low weight
- Low space requirement
- Short payback period

Part no.: 250200 0001

## Robot arm specification

| |
|---|
| 6-axis robot arm with 85 cm working radius |
| Weight: 18 kg |
| Load capacity: 5 kg |
| Joint rotation: +/- 360 degrees |
| Speed: up to 180°/85 cm/s |
| Repeat accuracy +/-0.1 mm |
| Footprint: Ø149 mm |
| Degree of freedom: 6 rotating joints |
| Control box dimensions (WxHxD): 380 mm x 300 mm x 220 mm |
| Control box I/O ports: 8 digital inputs, 8 digital outputs, 2 analogue inputs, 2 analogue outputs |
| Tool I/O ports: 2 digital inputs, 2 digital outputs, 2 analogue inputs |
| I/O power requirements: 24 V 800 mA in control box and 12 V / 24 V 600 mA at the tool |
| Programming: Graphic user interface, 12" touchscreen plus frame |
| Sealing class (protection class): IP54 |
| Power consumption: approx. 200 Watt at average input power |
| The robot is fitted with Ethernet/TCP/IP for external communication |
| Collaborative applications: tested to EN ISO 10218-1:2006, 5,10 and Item 5.10.5. |

Space for your notes

# Introduction


As a division within isel Germany AG **isel Robotik** presents a cross-section of its product portfolio of automation components for **robots, prealigners, linear units, end effectors** and accessories for the **semiconductor industry**, made in Germany.

The company's Robotics Division has been operating for more than 10 years within the semiconductor sector. Sales began in 2004 with just a few types of robot and prealigner. Today the range of components for the semiconductor industry covers the needs of all OEM customer within the semiconductor sector. Since 2004, **over 500 robot systems have been successfully put into service.** Here, **long product service life** is one of the positive factors noted by our customers. Our all-in-one designs make it possible for wafers and masks to be handled in ISO 1 clean room environments.

For these processes, in addition to clean room compatibility, **high precision** and reliability are paramount. Since these requirements affect the entire production process in the chip industry, stringent specifications also apply with regard to component handling. Handling components exemplify isel Germany's market reputation: very high quality, short delivery times, the best possible service and a very good price-performance ratio.

Talk to our technical support staff:

Visit our website at **www.iselrobotik.com**

# Overview

systems

# Wafer handling robot
## with 2 link standard arm and standard base body

# IWH F-1

Figure:
IWH TA10S10 F-1

## Features

- excellent structural rigidity
- extremely high failure safety and precision
- optionally installed above (TA) or installed below (BA)
- customised adaptations possible
- absolute (digital) or incremental encoder
- simple connection of prealigners, linear track and other peripherals to the robot controller
- optional high end controller for controlling complex systems
- including Robot Control Centre (RCC)
- Class 1 clean room-compatible
- made in Germany

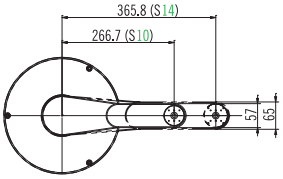
## Technical specification

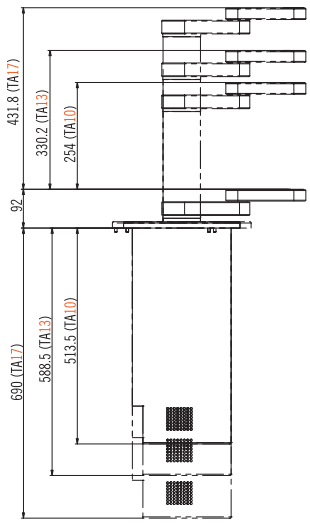
| Description | | IWH F-1 |
|---|---|---|
| Repeat accuracy | T | ±0.02° |
| | R | ±0.03 mm |
| | Z | ±0.03 mm |
| Work area | Z | 10", 13", 17" |
| | radial | 10", 14" |
| | theta | 450° |
| Joint payload | | 0.75 kg |
| Max. speed | T | 360°/s |
| | R | 1000 mm/s |
| | Z | 450 mm/s |
| Mains voltage | | 110/230 V AC |
| Control interface | | RS-232 [DB9], option: Ethernet [RJ-45] |
| Interface for peripherals | | RS-485 [RJ-45], RJ-11 |

## Dimensioned drawings

IWH TA__S__F-1

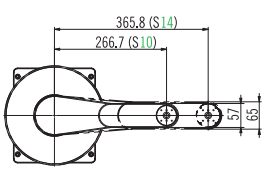
| Possible configurations | |
|---|---|
| IWH TA10S10 F-1 | IWH TA10S14 F-1 |
| IWH TA13S10 F-1 | IWH TA13S14 F-1 |
| IWH TA17S10 F-1 | IWH TA17S14 F-1 |

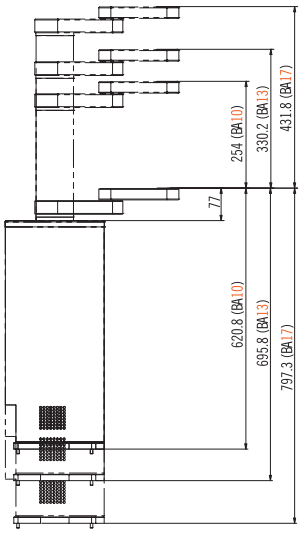



IWH BA__S__F-1

| Possible configurations | |
|---|---|
| IWH BA10S10 F-1 | IWH BA10S14 F-1 |
| IWH BA13S10 F-1 | IWH BA13S14 F-1 |
| IWH BA17S10 F-1 | IWH BA17S14 F-1 |



# Wafer handling robot IWH F-1

## with 2 link HD arm and standard base body

Figure:
IWH TA10S10HD F-1

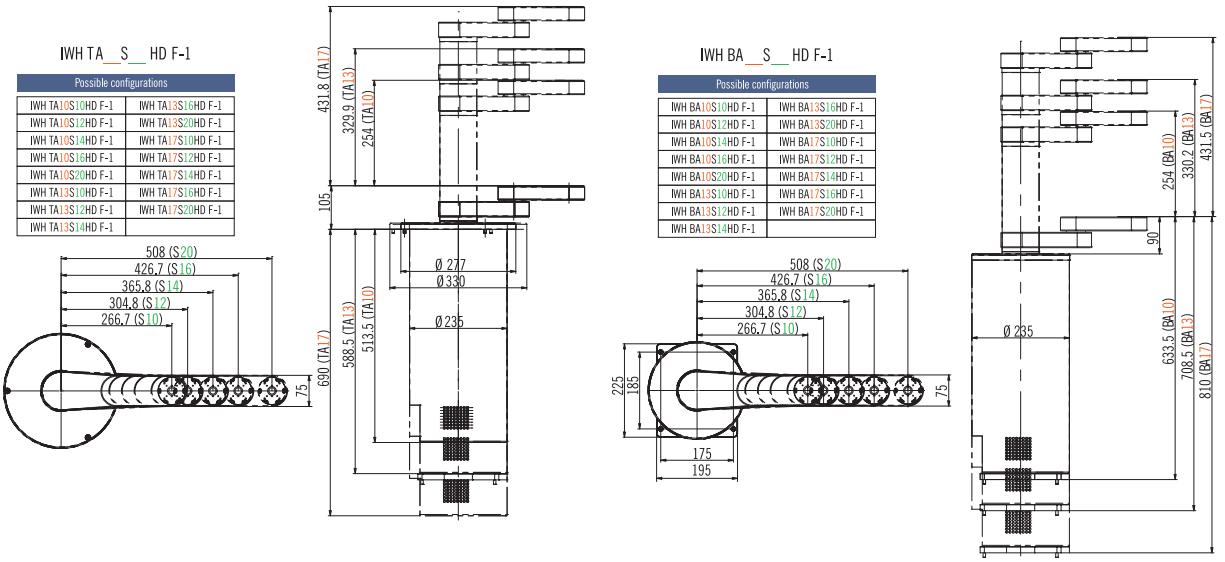
## Features

- excellent structural rigidity
- extremely high failure safety and precision
- optionally installed above (TA) or installed below (BA)
- customised adaptations possible
- absolute (digital) or incremental encoder
- simple connection of prealigners, linear track and other peripherals to the robot controller
- optional high end controller for controlling complex systems
- including Robot Control Centre (RCC)
- Class 1 clean room-compatible
- made in Germany

## Technical specification

| Description | | IWH F-1 |
|---|---|---|
| Repeat accuracy | T | ±0.02° |
| | R | ±0.03 mm |
| | Z | ±0.03 mm |
| Work area | Z | 10", 13", 17" |
| | radial | 10", 12", 14", 16", 20" |
| | theta | 450° |
| Joint payload | | 2.75 kg |
| Max. speed | T | 360°/s |
| | R | 1000 mm/s |
| | Z | 450 mm/s |
| Mains voltage | | 110/230 V AC |
| Control interface | | RS-232 [DB9], Option: Ethernet [RJ-45] |
| Interface for peripherals | | RS-485 [RJ-45], RJ-11 |

## Dimensioned drawings



# Wafer handling robot IWH F-1

## with 3 link HD arm and standard base body

Figure:
IWH TA10S16 F-1

## Features

- excellent structural rigidity
- extremely high failure safety and precision
- optionally installed above (TA) or installed below (BA)
- customised adaptations possible
- absolute (digital) or incremental encoder
- simple connection of prealigners, linear track and other peripherals to the robot controller
- optional high end controller for controlling complex systems
- including Robot Control Centre (RCC)
- Class 1 clean room-compatible
- made in Germany

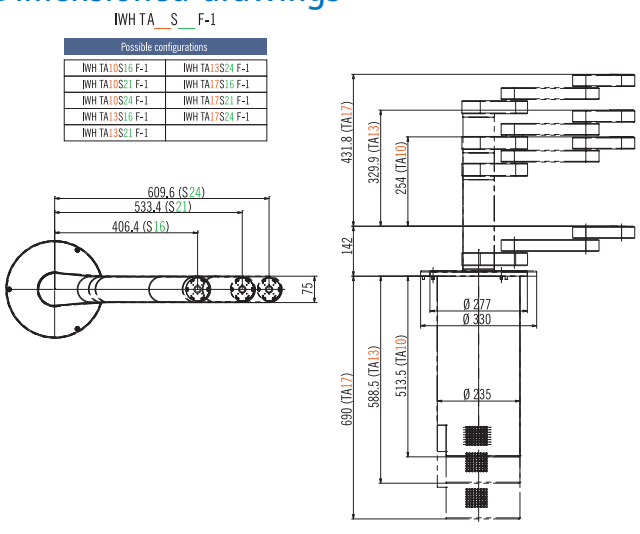
## Technical specification

| Description | | IWH F-1 |
|---|---|---|
| Repeat accuracy | T | ±0.02° |
| | R | ±0.03 mm |
| | Z | ±0.03 mm |
| Work area | Z | 10", 13", 17" |
| | radial | 16", 21", 24" |
| | theta | 450° |
| Joint payload | | 1.25 kg |
| Max. speed | T | 360°/s |
| | R | 1000 mm/s |
| | Z | 450 mm/s |
| Mains voltage | | 110/230 V AC |
| Control interface | | RS-232 [DB9], Option: Ethernet [RJ-45] |
| Interface for peripherals | | RS-485 [RJ-45], RJ-11 |

## Dimensioned drawings

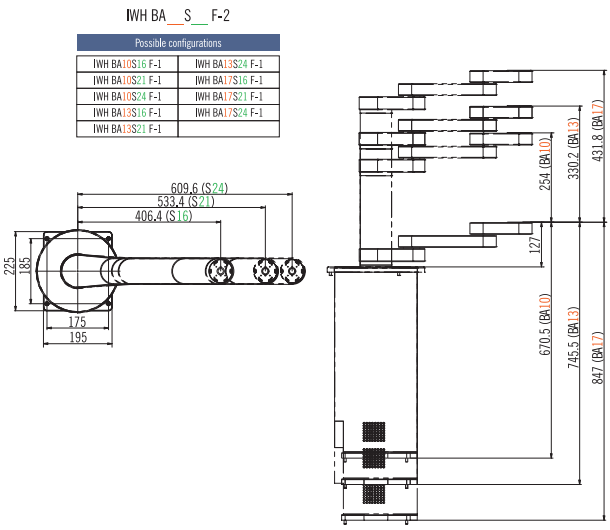
IWH TA__S__F-1

| Possible configurations | |
|---|---|
| IWH TA10S16 F-1 | IWH TA13S24 F-1 |
| IWH TA10S21 F-1 | IWH TA17S16 F-1 |
| IWH TA10S24 F-1 | IWH TA17S21 F-1 |
| IWH TA13S16 F-1 | IWH TA17S24 F-1 |
| IWH TA13S21 F-1 | |




IWH BA__S__F-2

| Possible configurations | |
|---|---|
| IWH BA10S16 F-1 | IWH BA13S24 F-1 |
| IWH BA10S21 F-1 | IWH BA17S16 F-1 |
| IWH BA10S24 F-1 | IWH BA17S21 F-1 |
| IWH BA13S16 F-1 | IWH BA17S24 F-1 |
| IWH BA13S21 F-1 | |



# Wafer handling robot IWH F-2

## with 2 link standard arm and HD base body

Figure:
IWH TA13S10 F-2

## Features

- excellent structural rigidity
- extremely high failure safety and precision
- optionally installed above (TA) or installed below (BA)
- customised adaptations possible
- absolute (digital) or incremental encoder
- simple connection of prealigners, linear track and other peripherals to the robot controller
- optional high end controller for controlling complex systems
- including Robot Control Centre (RCC)
- Class 1 clean room-compatible
- made in Germany

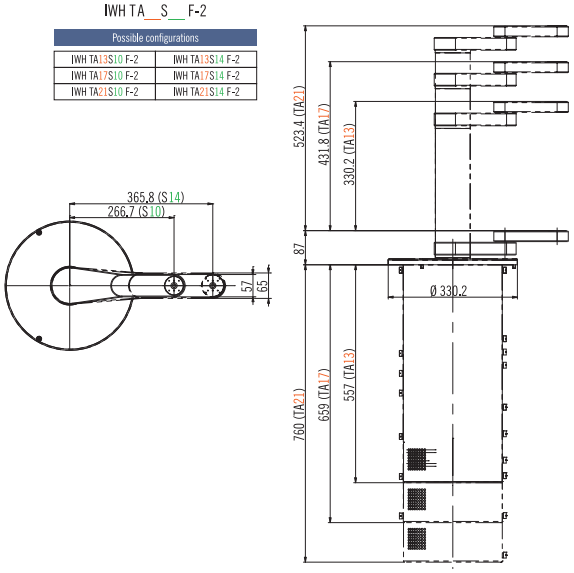
## Technical specification

| Description | | IWH F-2 |
|---|---|---|
| Repeat accuracy | T | ±0.02° |
| | R | ±0.03 mm |
| | Z | ±0.03 mm |
| Work area | Z | 13", 17", 21" |
| | radial | 10", 14" |
| | theta | 450° |
| Joint payload | | 0.75 kg |
| Max. speed | T | 360°/s |
| | R | 1000 mm/s |
| | Z | 450 mm/s |
| Mains voltage | | 110/230 V AC |
| Control interface | | RS-232 [DB9], Option: Ethernet [RJ-45] |
| Interface for peripherals | | RS-485 [RJ-45], RJ-11 |

## Dimensioned drawings

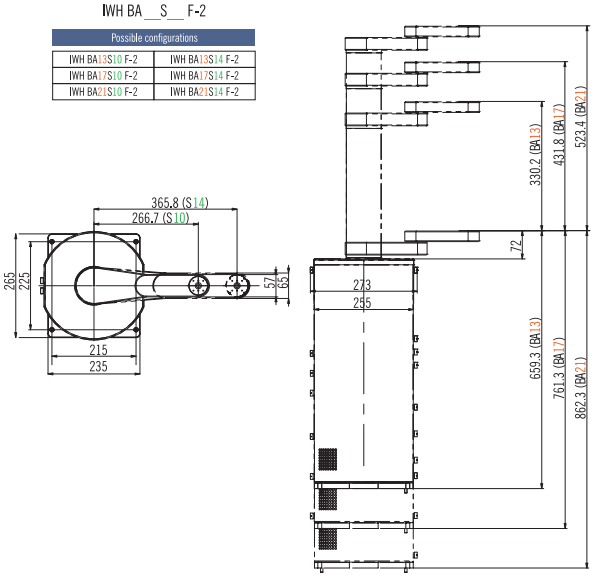
IWH TA__S__F-2

| Possible configurations | |
|---|---|
| IWH TA13S10 F-2 | IWH TA13S14 F-2 |
| IWH TA17S10 F-2 | IWH TA17S14 F-2 |
| IWH TA21S10 F-2 | IWH TA21S14 F-2 |




IWH BA__S__F-2

| Possible configurations | |
|---|---|
| IWH BA13S10 F-2 | IWH BA13S14 F-2 |
| IWH BA17S10 F-2 | IWH BA17S14 F-2 |
| IWH BA21S10 F-2 | IWH BA21S14 F-2 |



# Wafer handling robot IWH F-2

## with 2 link HD arm and HD base body

Figure:
IWH TA13S10HD F-2

## Features

- excellent structural rigidity
- extremely high failure safety and precision
- optionally installed above (TA) or installed below (BA)
- customised adaptations possible
- absolute (digital) or incremental encoder
- simple connection of prealigners, linear track and other peripherals to the robot controller
- optional high end controller for controlling complex systems
- including Robot Control Center (RCC)
- Class 1 clean room-compatible
- made in Germany

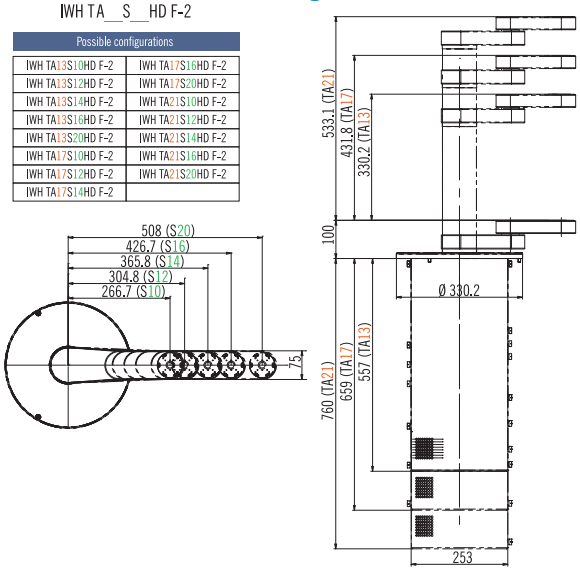
## Technical specification

| Description | | IWH F-2 |
|---|---|---|
| Repeat accuracy | T | ±0.02° |
| | R | ±0.03 mm |
| | Z | ±0.03 mm |
| Work area | Z | 13", 17", 21" |
| | radial | 10", 12", 14", 16", 20" |
| | theta | 450° |
| Payload on a joint | | 2.75 kg |
| Max. speed | T | 360°/s |
| | R | 1000 mm/s |
| | Z | 450 mm/s |
| Mains voltage | | 110/230 V AC |
| Control interface | | RS-232 [DB9], Option: Ethernet [RJ-45] |
| Interface for peripherals | | RS-485 [RJ-45], RJ-11 |

## Dimensioned drawings

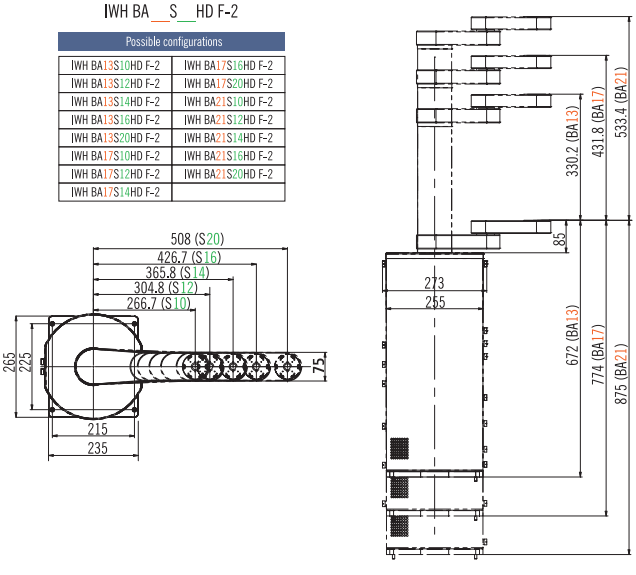
IWH TA__S__HD F-2

| Possible configurations | |
|---|---|
| IWH TA13S10HD F-2 | IWH TA17S16HD F-2 |
| IWH TA13S12HD F-2 | IWH TA17S20HD F-2 |
| IWH TA13S14HD F-2 | IWH TA21S10HD F-2 |
| IWH TA13S16HD F-2 | IWH TA21S12HD F-2 |
| IWH TA13S20HD F-2 | IWH TA21S14HD F-2 |
| IWH TA17S10HD F-2 | IWH TA21S16HD F-2 |
| IWH TA17S12HD F-2 | IWH TA21S20HD F-2 |
| IWH TA17S14HD F-2 | |




IWH BA__S__HD F-2

| Possible configurations | |
|---|---|
| IWH BA13S10HD F-2 | IWH BA17S16HD F-2 |
| IWH BA13S12HD F-2 | IWH BA17S20HD F-2 |
| IWH BA13S14HD F-2 | IWH BA21S10HD F-2 |
| IWH BA13S16HD F-2 | IWH BA21S12HD F-2 |
| IWH BA13S20HD F-2 | IWH BA21S14HD F-2 |
| IWH BA17S10HD F-2 | IWH BA21S16HD F-2 |
| IWH BA17S12HD F-2 | IWH BA21S20HD F-2 |
| IWH BA17S14HD F-2 | |



# Wafer handling robot IWH F-2

## with 3 link HD arm and HD base body


Figure:
IWH TA13S16 F-2

## Features

- excellent structural rigidity
- extremely high failure safety and precision
- optionally installed above (TA) or installed below (BA)
- customised adaptations possible
- absolute (digital) or incremental encoder
- simple connection of prealigners, linear track and other peripherals to the robot controller
- optional high end controller for controlling complex systems
- including Robot Control Center (RCC)
- Class 1 clean room-compatible
- made in Germany

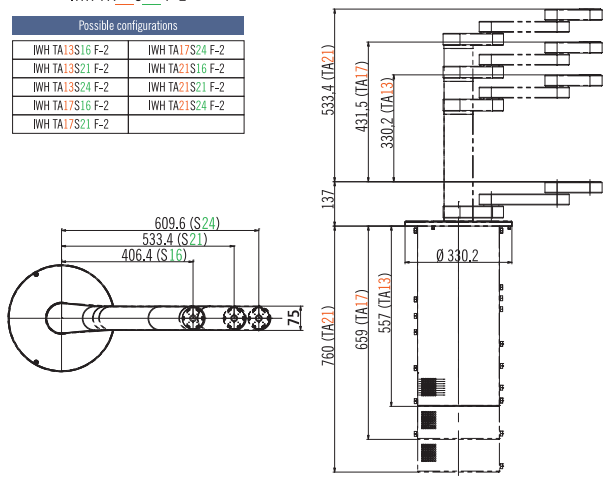
## Technical specification

| Description | | IWH F-2 |
|---|---|---|
| Repeat accuracy | T | ±0.02° |
| | R | ±0.03 mm |
| | Z | ±0.03 mm |
| Work area | Z | 13", 17", 21" |
| | radial | 16", 21", 24" |
| | theta | 450° |
| Joint payload | | 1.25 kg |
| Max. speed | T | 360°/s |
| | R | 1000 mm/s |
| | Z | 450 mm/s |
| Mains voltage | | 110/230 V AC |
| Control interface | | RS-232 [DB9], Option: Ethernet [RJ-45] |
| Interface for peripherals | | RS-485 [RJ-45], RJ-11 |

## Dimensioned drawings

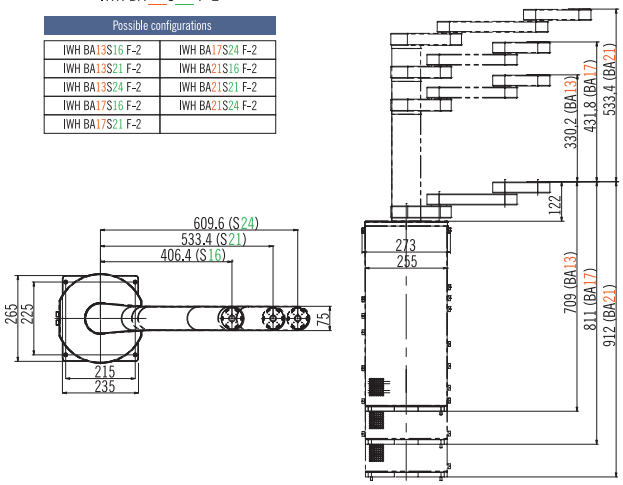
IWH TA__S__F-2

| Possible configurations | |
|---|---|
| IWH TA13S16 F-2 | IWH TA17S24 F-2 |
| IWH TA13S21 F-2 | IWH TA21S16 F-2 |
| IWH TA13S24 F-2 | IWH TA21S21 F-2 |
| IWH TA17S16 F-2 | IWH TA21S24 F-2 |
| IWH TA17S21 F-2 | |




IWH BA__S__F-2

| Possible configurations | |
|---|---|
| IWH BA13S16 F-2 | IWH BA17S24 F-2 |
| IWH BA13S21 F-2 | IWH BA21S16 F-2 |
| IWH BA13S24 F-2 | IWH BA21S21 F-2 |
| IWH BA17S16 F-2 | IWH BA21S24 F-2 |
| IWH BA17S21 F-2 | |



# Wafer handling robot IWH F-3

## with dual arm

Figure:
IWH F-3

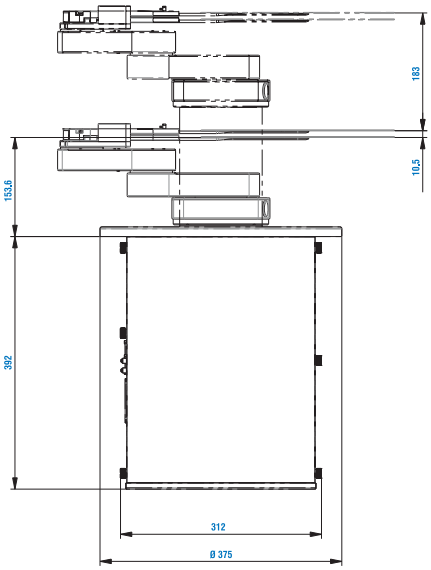
## Features

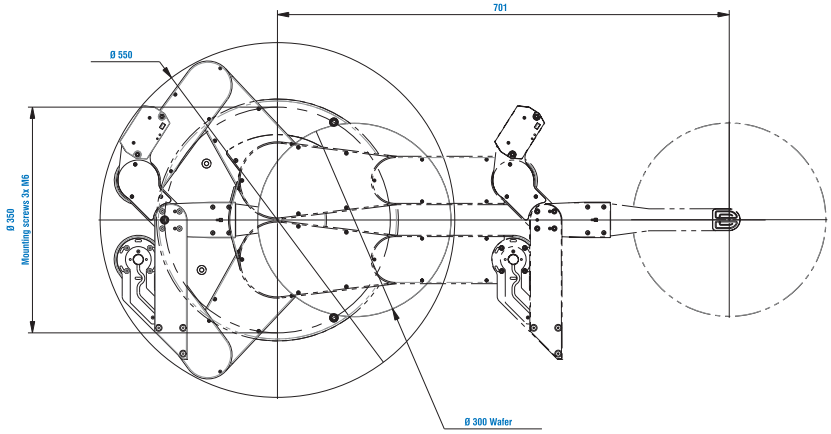
- excellent structural rigidity
- Handling wafers up to 300 mm
- extremely high reliability and accuracy
- simple connection of a linear track to the robot controller
- Real time motion control
- very quiet in operation
- brushless, no maintenance servo motors with low moment of inertia
- no-play harmonic drive® transmission
- Absolute encoder
- Versatile communication interfaces
- Class 1 clean room-compatible
- MTBF: > 50,000 operating hours
- including Robot Control Centre (RCC)

## Technical specification

| Description | | IWH F-3 |
|---|---|---|
| Repeat accuracy | T | ±0.02° |
| | R | ±0.03 mm |
| | Z | ±0.03 mm |
| Work area | Z | 13" (330.2 mm) |
| | radial | 14.4" (365.8 mm) |
| | theta | 450° |
| Joint payload | | max. 1.25 kg/arm |
| Max. speed | T | 360°/s |
| | R | 1100 mm/s |
| | Z | 425 mm/s |
| Mains voltage | | 110/230 V AC |
| Control interface | | RS-232 [DB9], Option: Ethernet [RJ-45] |
| Interface for peripherals | | RS-485 [RJ-45], RJ-11 |

## Dimensioned drawings



# Wafer Handling Vakuumroboter IWH F-5

Figure:
IWH F-5

## Features

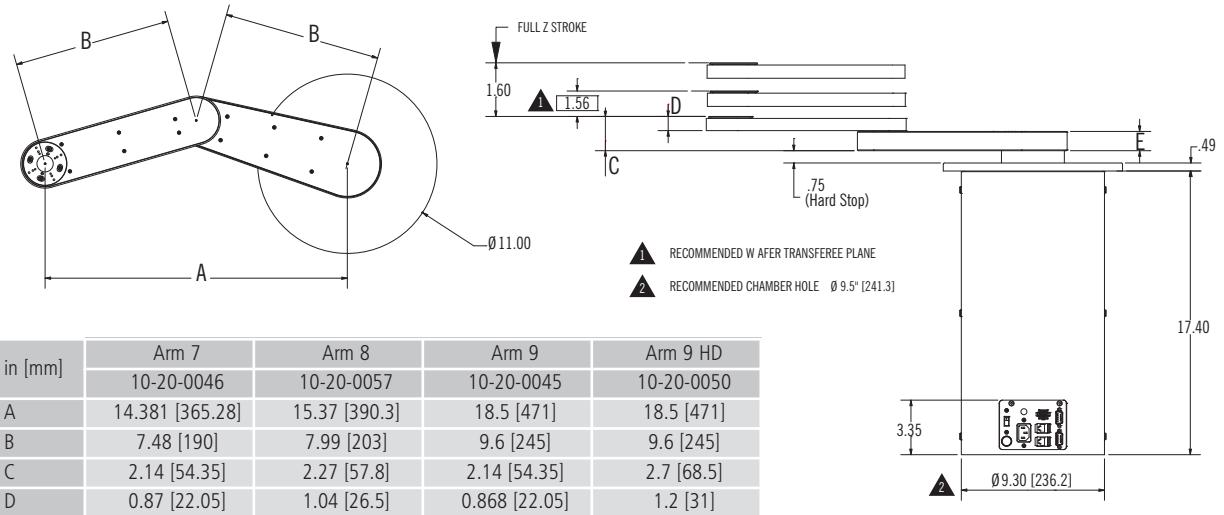
- Control area & installation configuration to industry standard
- Handling wafers up to 300 mm
- high precision, user-configurable 14“, 16“ and 18“ arms
- extremely high reliability and precision
- Ferrofluid vacuum seal
- Vacuum < 5×10 Torr
- Real time motion control
- very quiet in operation
- brushless, no maintenance servo motors with low moment of inertia
- Absolute encoder
- Wide range of communication interfaces
- Class 1 clean room-compatible
- MTBF: > 50,000 operating hours

## Technical specification

| Description | | IWH F-5 |
|---|---|---|
| Repeat accuracy | T | ±0.02° |
| | R | ±0.05 mm |
| | Z | ±0.05 mm |
| Work area | Z | 1.5“ (38.4 mm) |
| | radial | 14" (355.6 mm) |
| | theta | 380° |
| Joint payload | | 1.0 to 2.2 kg |
| Leakage rate | | <5E-9 Torr |
| Weight | | 21.8 kg |

| Description | | IWH F-5 |
|---|---|---|
| Max. speed | T | 360°/s |
| | R | 500 mm/s |
| | Z | 100 mm/s |
| Mains voltage | | 110 VAC |
| Control interface | | RS-232 [DB9], Option: Ethernet [RJ-45] |
| Max. temperature | | 150° C (302° F) |
| Max. operating temperature | | 80° C (176° F) |
| Visible materials | | Al 6061, stainless steel, Ferrofluid, Viton |
| Type of installation | | above/below the vacuum chamber |
| Configuration | | Modular, exchangeable arms |

## Dimensioned drawings




| in [mm] | Arm 7 | Arm 8 | Arm 9 | Arm 9 HD |
|---|---|---|---|---|
| | 10-20-0046 | 10-20-0057 | 10-20-0045 | 10-20-0050 |
| A | 14.381 [365.28] | 15.37 [390.3] | 18.5 [471] | 18.5 [471] |
| B | 7.48 [190] | 7.99 [203] | 9.6 [245] | 9.6 [245] |
| C | 2.14 [54.35] | 2.27 [57.8] | 2.14 [54.35] | 2.7 [68.5] |
| D | 0.87 [22.05] | 1.04 [26.5] | 0.868 [22.05] | 1.2 [31] |
| E | 1.181 [30] | 1.14 [29] | 1.18 [30] | 1.3 [32.5] |

# Vacuum elevator / Linear track

## Vacuum elevator

Figure:
Vacuum elevator

## Features

- Class 1 cleanroom compatible
- Absolute encoder
- Repeatability: 0.001“
- Maximum vertical lift: 406 mm (16“)
- Maximum vacuum: 1.0×10 Torr
- AC servo motors
- Weight: 18.2 kg
- Payload: 5.5 kg
- Surface: Aluminium, stainless steel
- Cassette detection sensor
- Z-lift: 304.8 mm (12“)

## Linear Track

Figure:
iLD 50-6 as Linear Track
for wafer handling robots

## General

The ILT linear track series can be integrated seamlessly into your system's handling area owing to its flexibility. Tracks are controlled in conjunction with our IWH series robots. This combination of linear tracks with isel robots makes for a very effective system and thus provides high throughputs.

Depending on the application, installation can be below or to the side of the robot. The use of brushless servo motors makes linear tracks very responsive dynamically, low maintenance and quiet in operation.

## Technical specification

| Description | |
|---|---|
| Repeatability | ±0.02 mm |
| Drive | Spindle or linear motor |
| Max. speed | 2 m/s |
| Max. length | 15 m |
| Max. acceleration | 10 m/s² |
| Power supply | 110 / 230 V AC |
| Control interface | RS-232 / Ethernet |

## Features

- Maximum speed up to 2 m/s
- Maximum acceleration up to 8 m/s²
- Repeat accuracy +/-0.01mm
- MTBF of 50,000 hrs
- Travel range from 181mm to 15 m segment construction available
- Installation at the side or floor-mounted
- Full integration into the robot controller
- Multi motor operation posssible (2 robots on one axis)

# End effectors

Paddle EE
with scanner

Horseshoe EE
without scanner

Dual EE with
thru beam scanner

Exclusion zone vacuum
with scanner

Edge grip
with scanner

Vacuum analyser unit at EE

## Features

- for wafer sizes up to 12" (300 mm)
- modular design
- low intrinsic weight
- high rigidity
- favourable price/performance ratio
- PTFE-coated

## Options

- various wafer mapping sensors
- various surface finishes
- Special designs
  - Pocket EE
  - Friction wafer
  - Edge grip EE
  - Exclusion zone grip EE
  - Exclusion zone vacuum EE
  - Multiple EE

## Accessories

### Vacuum analyser unit

- high response pattern
- freely programmable
- Resolution 0.001 bar
- Integrated end effectors
- two-colour display
- can be used with all vacuum end effectors

## Ordering key

| 2 | 5 | 0 | 0 | 4 | x | x | x | x | x | x | x | x |
|---|---|---|---|---|---|---|---|---|---|---|---|---|

**Automation components for the semiconductor industry,** product group end effectors IEE Series 1

**Wafer size**

5= 2 - 5"
6= 6 - 8"
7= 4 - 8"
8= 12"
9= 8 - 12"

**Endeffector type**

01= Paddle
02= Horse shoe
03= Edge grip
04= 2x paddle
05= Paddle/horse shoe
07= 2x horse shoe
08= Pocket end effector
09= Exclusion zone grip
10= Exclusion zone vacuum

**Wafer mapping**

0 = No wafer mapping sensor
4 = Thru beam sensor horseshoe
7 = Holder for wafer mapping sensor

**Option**

0000 = Standard
0002 = Flip module
0003 = Vacuum evaluation unit
9xxx = customized

systems

# Prealigners

# LPA Serie

isel triple axis prealigner
IPA series with
lateral connection field
and PEEK pin/chuck

isel single axis prealigner
IPA series with
rear connection field

## General

The LPA series of pre-aligners are an innovative, highly precise, Class 1 clean-room compatible prealigner solution with integrated scanning electronics.
The prealigners are developed and produced by Logosol Inc. USA and isel Germany AG is the exclusively authorised distributor for Europe.

## Features

### Three-axis prealigners

- innovative all-in-one design
- Alignment times < 3.5 seconds
- repeatability:
  linear ± 0.025 mm,
  circular ± 0.05°
- contactless measurement using LED and CCD sensor
- integrated scanning electronics
- standalone capability
- Chuck or pin load and change to another wafer size without rebuild
- transparent, semi-transparent, holed and opaque wafers can be aligned
- SEMI, flat and notch wafer specifications
- For wafer sizes from 2" to 12"
- Connection fields available from the side and from below

## Features

### Single axis prealigner

- Alignment times < 2.5 seconds
- contactless measurement using LED and CCD sensor
- integrated scanning electronics
- Chuck load
- Change to another wafer size without rebuild
- transparent, semi-transparent, holed and opaque wafers can be aligned
- SEMI, flat and notch wafer specifications
- For wafer sizes from 3" to 12"
- Connection fields available at the side and from below

## Configuration options

Example: **LPA 312 - 3 - V 40 P 1 - S 23 - S - V 500 P - N - ****

Chuck | Lighthouse | Pins | Optional

Series

**Wafer sizes**
**25** = 2" to 5"
**26** = 2" to 6"
**38** = 3" to 8"
**58** = 5" to 8"
**312** = 3" to 12"
**812** = 8" to 12"
**6EH** = 6" only
**8EH** = 8" only
**12EH** = 12" only

**Number of axes**
**1** = Single axis
**3** = Three axes

**Chuck type**
**V** = Vacuum
**E** = Edge handling
**C** = Custom

**Chuck diameter in mm**
(EH for edge handling)
**Standard sizes:**
**23** = 2" to 5"
**23** = 2" to 6"
**40** = 3" to 8"
**40** = 5" to 8"
**40** = 3" to 12"
**76** = 8" to 12"

**Contact material**
**P** = Peek (Standard)
**V** = Viton
**K** = Kalrez
**A** = Aluminum
**T** = Teflon
**PE** = TekaPeek ELS
**C** = Custom

**Chuck encoder**
**1** = 10K PPR (Standard)
**2** = 24K PPR

Customization code

**Interface**
**NE** = Ethernet interface and AC/DC Power
**N** = Ethernet interface

**Contact material**
**P** = Peek (Standard)
**V** = Viton
**K** = Kalrez
**S** = Stainless Steel
**C** = Custom

**Pin length in inch*10$^{-3}$**
**500** = Standard

**Pin Type**
**V** = Vacuum
**E** = Edge handling
**C** = Custom

**Cable entry**
**S** = Side cable entry
**B** = Bottom cable entry

**Height in mm**
**23** = Standard

**CCD Sensitivity**
**S** = Standard
**H** = High

**Not applicable for single axis models**

# Controller and accessories

## Features
### YAW Achse

- 4th axis upgrade for a three-axis system (yaw angle in the Z axis)
- In-Line handling of rectangular substrates
- In-Line handling without a linear track
- Upgrade for existing isel HD wafer handling robots

Figure:
external controller

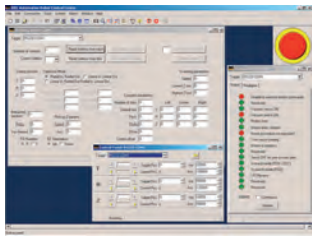


Figure: RCC Software

## Features
### IRC 331 external controller ex

- IWH series 1, IWH-HD series 2, IVR series, prealigners
- Incremental sensor control
- 3+1 axes, can be retrofitted
- 4 inputs, 3 outputs
- RS232 and Ethernet data transfer
- RCC software
- optional:
  - I/O expansion
  - Hand terminal

Figure: Flip Module


Figure: Hand terminal IHT

## Accessories

### IFM-300-3 flip module

- precise turning of wafers with highly accurate positioning through mechanical endstops
- universal end effector adapter
- Mapping sensor
- DC motor with transmission unit
- electrical damping at the end of rotary path
- continuously variable speeds

### Hand terminal

- optimum support for teaching an isel wafer handler
- isel wafer handler-optimised keyboard layout
- Terminal function
- Teach function
- Diagnostic function
- RS-485

Figure: IMS-EX43(73)QS

Figure: IMS-MDW1

### IMS wafer mapping sensors

- Light source laser or LED
- Measurement distance 38/56 mm (1,5"/2,2")
- Sensor flexibly configurable

# Index

## A



## B



## C



## D



## E

# Index



## F



## G



## H



## I



## L

# Index



## M



## O



## P



## R



## S

# Index

# Ordering

isel Germany AG

isel Germany AG
Order processing
Untere Röde 2

D-36466 Dermbach

Telephone +49(0)6659 / 9810
Fax +49(0)6659 / 981776

## Sender

Customer no.

Company

Department/Name

Street

Post code/Town

Your order number

Your phone number

Your fax number

Your email address

| Quantity | Part no. | Part description | Unit price |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
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| | | | |
| | | | |

I am ordering the aforementioned parts in accordance with your sale, delivery and payment terms.

# General delivery, payment and software use conditions

As at: 01.07.2012

## I. Area of application

1 The following conditions of sale shall apply to all goods delivery contracts concluded between the purchaser and ourselves. The ordering and acceptance of goods delivered by us shall constitute knowledge and/or confirmation of the customer's agreement with our conditions. These conditions shall apply to all future business relations, even where no further agreement has been expressly concluded. Any conflicting conditions on the part of the purchaser that have not been expressly acknowledged by us shall not be binding, even where we have made no express objection to them. Any such conflicting conditions are hereby expressly repudiated in advance. The following sales conditions shall also apply where we implement customer orders in the knowledge that conflicting or diverging conditions stipulated by the purchaser exist.
2 Any agreement, alteration or arrangement shall be made in writing.
3 Any agreements made between ourselves and the customer and relating to the purchasing contracts shall be confirmed in writing.

## II. Quotation and conclusion of contract

1 Purchasing contracts shall be concluded on the basis of a customer purchase order. The acceptance of a purchase order shall be confirmed either by the forwarding of an order confirmation document to the customer or by the delivery of the goods ordered, within a period of two weeks in both cases.
2 Our offers are subject to change and are non-binding, unless expressly stated otherwise. The scope of our responsibilities is established exclusively in our written order confirmation document.
3 Any drawings or illustrations included in our quotation or order confirmation documentation and any information issued with respect to weights or dimensions shall be understood as approximate, unless stated to the contrary.
4 All drawings, illustrations, calculations and other documents, materials, models, patterns and specifications are subject to property, copyright and other trade mark rights. These must be treated as confidential and may not be transferred to any third party without our written permission, irrespective of whether they are accompanied by any comment to that effect.
5 We accept no liability for any printing or calculation errors appearing in our literature or documentation and we shall entertain no claims for damages linked thereto.
6 We reserve the right to make any necessary changes in product construction, technical specifications and performance features, provided they constitute a technical improvement.

## III. Prices and payment condition

1 Our prices are based on CIP clause of the Inconterms 2010 of the ICC (carriage and insurance paid to the agreed place of destination in accordance with Point V.1. of these Terms and Conditions) including standard packaging and excluding VAT. Our calculations are made on the day on which the invoice is issued and are shown on the invoice.
2 Delivery shall be made following advance payment of invoice in "Euros".
3 All orders are based on the prices and price reductions valid at the time of delivery. Discounts shall only apply whereby an agreement to that effect has been made between ourselves and the purchaser. This is a written agreement, which shall also be shown in our order confirmation document.
4 Payment on delivery terms must be expressly agreed in advance. The purchase price is shown as net (with no deduction) with immediate payment by the purchaser following receipt of invoice, provided no other payment arrangements are shown in the order confirmation document. Payment is deemed to be fulfilled when we have access to the funds transferred. Payment by cheque is deemed to be fulfilled once the cheque is cleared and the funds have been transferred to us as credit. We are not bound to accept bills of exchange.
5 Legal provisions shall apply if a purchaser falls into payment arrears.
6 All claims against the purchaser shall immediately become due if the purchaser fails to make a payment on time, breaches any other agreement made with us, or where we have reason to doubt his creditworthiness. We shall also be entitled in such cases to withhold any outstanding deliveries until such time as payment or satisfactory payment assurance has been received, even where agreement has been previously made to the contrary. Following the setting of an appropriate period, we shall also be entitled in such cases to withdraw from the contract and/or to seek damages due to non-fulfilment of contract. We shall also be entitled to waive the purchaser's right to dispose of any goods delivered and, subject to retention of title, to demand their return or transfer at the purchaser's expense and direct debit authorization shall be revoked.
7 The purchaser shall only be entitled to compensation, even where notification of defect or counter claim has been made, where such claims are legally binding, are acknowledged by us or are undisputed. The purchaser shall only be entitled to withhold payment if his counter claims relate to the same contractual relationship.

## IV. Delivery and delivery times

1 Delivery dates or periods shall be understood as non-binding provided no express agreement to the contrary has been made. The delivery times specified by us shall only commence once all relevant technical and implementation issues have been resolved.
2 The purchaser shall be obliged to implement all necessary requirements correctly and promptly. The agreed delivery period shall be extended - provided our rights have not been infringed by any purchaser payment arrears - by a period equal to the payment backlog that the purchaser has on the given (or any other) account. This shall also apply when a fixed delivery date has been agreed.
3 In the case of purchase contracts based on fixed date delivery as stipulated in Art. 286 Para. 2 No. 4 of the German Civil Code or Art. 376 of the German Commercial Code, we accept liability in accordance with current statutory provisions. The same shall apply where the purchaser, following delayed delivery for which we are responsible, is entitled to discontinue his interest in the further fulfillment of the contract. In this case, our liability shall be limited to foreseeable, typically-occurring damage. No liability limitations shall apply where delayed delivery is related to any breach of contractual conditions caused by our representatives or associates.
We also accept liability in accordance with current statutory provisions for any negligence in respect of contractual conditions caused by our representatives or agents. Where delayed delivery is not related to any breach of contractual conditions, our liability shall be limited to foreseeable, typically-occurring damage.
4 Where delayed delivery relates to a breach of contractual conditions caused by our representatives or agents, we accept liability in accordance with current statutory provisions, provided that compensation liability is restricted to foreseeable, typically-occurring damage.
5 In the event of delayed delivery for which we are responsible, the purchaser shall be entitled, for each full week of non-delivery, to a one-off compensation payment of 0.5% of the value of the delivery (valid to a maximum of 5 %).
6 We shall accept no additional liability for delay in delivery. Any further legal claims or purchaser rights above and beyond those relating to damage compensation and made in respect of delays in delivery for which we are responsible shall remain unaffected.
7 We shall be entitled to make partial delivery at any time, provided this is acceptable to the customer.
8 Delivery times are considered as fulfilled if the goods have been dispatched from our factory on time.
9 Under the onset of any conditions beyond our control, we shall be entitled to reschedule delivery or retire from any delivery contract, non-fulfilment notwithstanding. Conditions beyond our control shall be taken to mean strikes, lock-outs or any other conditions that hinder delivery or make delivery impossible, irrespective of whether the said conditions affect us directly or affect our suppliers. The purchaser shall be entitled to receive a declaration from us, as to whether we continue to deliver within a set period or retire from the delivery contract. In the absence of any such declaration, the purchaser himself shall be entitled to withdraw from the contract.
10 In the event of delays in acceptance on the part of the purchaser, we shall be entitled to claim compensation for any damage incurred and any additional expenditure. The same shall apply where the purchaser culpably infringes any obligation to cooperate. In the event of delays in acceptance and debtor default, the risk of accidental deterioration or loss of the goods shall transfer to the purchaser.

## V. Transfer of risk - shipment/packaging - delivery

1 Delivery shall be implemented by CIP clause in accordance with Incoterms 2010 of the ICC for:
-- standard domestic deliveries or deliveries to EU countries to agreed delivery address (place of destination)
-- standard deliveries to third party countries to the customs departments of ports and airports as agreed places of destination
We reserve the right to make a surcharge for express shipment and shipment by air.
2 The risk is transferred to the customer with the delivery of the goods to the first forwarding agent or carrier, at the latest however on leaving the factory or warehouse.
3 With regard to deliveries involving goods to be installed or assembled at the purchaser's premises, risk shall transfer on the day on which the goods are commissioned into use, or at the end of a given trial period where the said period has been agreed beforehand. In the event of any delay occurring during shipment or delivery to the purchaser, any delay in the commencement or implementation of installation or assembly, any delay in commissioning or testing at the purchaser's premises or, where any delay occurs for whatever reason in the acceptance of the goods by the purchaser, risk shall be considered to have already transferred to the purchaser at the moment the goods were made available to him.
4 In accordance with packaging regulations and with the exception of palettes, we will not accept the return of any packaging used for transportation or any other purpose. The purchaser shall be responsible for the proper disposal of any packaging delivered.
5 Where shipment is delayed at the request of the purchaser, or occurs due to his negligence, any subsequent warehousing costs and risks shall be the responsibility of the purchaser. The same shall apply in the case of notification of readiness for shipment.
6 With regard to the delivery of customer orders, the minimum order values shall be 100 EUROS (domestic) and 250 EUROS (abroad). These costs do not include VAT. The preparation costs for small deliveries below the minimum value for delivery within Germany shall be 50 EUROS (excluding VAT). These costs do not include postage and packing. We are unable to ship orders below the above-stated minimum value to addresses outside Germany.
7 Special orders, including goods ordered in quantities or with dimensions not stated in our catalogue, must be made in writing by the purchaser. Such orders may be subject to an agreed advance payment. Where one-off production orders in very large quantities are accepted by us, we reserve the right to deliver the goods with an appropriate quantity margin (normally ±10%). Packaging charges are, as a general rule, calculated in accordance with manufacturing costs.

## VI. Guarantee / liability

1 In contractual relationships with registered traders, we guarantee our products defect free for a period of one year from arriving at the place of destination in accordance with V.1 of these Terms.
2 Milling spindles and other consumables are guaranteed defect free for a period of 6 months. This 6-month guarantee period also applies to milling spindles already integrated into machine systems.
3 The technical advice we give is based on the best of our knowledge. However, we accept no liability for any information relating to the suitability and application of our goods and the purchaser is not exempt from the responsibility of conducting his own calculations, tests and trials. The purchaser shall be solely responsible for complying with any statutory provisions and regulations applying to the use of the goods. Liability with regard to the suitability of our goods for any given application shall only be accepted where previously expressed in writing.
4 We accept liability for material defects, excluding any further claims - subject to the following provisions and those given under VIII. and IX - as follows:
5 Any claims relating to defects submitted by the purchaser as registered trader shall only be upheld if the purchaser has properly carried out the necessary inspection and has fulfilled notification obligations in accordance with Article 377 of the German Commercial Code. Other purchasers shall forward their complaints to us in writing within 10 days of receipt of the goods. With regard to business with non-trade personnel, this shall only apply where the defects are apparent. Complaints shall only be considered where the goods are still in "as delivered" condition.
6 With regard to justified complaints relating to defects we shall be entitled, in excluding purchaser rights, to withdraw from the contract, to reduce the sales price or to honour our supplementary performance obligations unless, in accordance with statutory provisions, we are justified in refusing to honour our supplementary performance obligations. The purchaser shall allow us a reasonable period in which to provide supplementary performance. With regard to supplementary performance, we shall be entitled to choose whether to correct the defect (rectification) or deliver replacement goods. If we we choose to correct the defect, we shall bear any costs (provided these do not increase) incurred due to the object of agreement being located at a location other than the delivery address. In the event of our failure to provide this supplementary performance, the purchaser shall be entitled to choose either a reduction in the purchase price or withdrawal from the contract. Supplementary performance is deemed to have failed following a second unsuccessful attempt, unless further supplementary performance attempts are appropriate and acceptable to the purchaser on the basis of the object of agreement. Claims for damage compensation under the following conditions and with regard to defects may only be issued by the purchaser after supplementary performance is deemed to have failed. The purchaser's right to claim damage compensation shall remain unaffected under the following conditions.
7 Goods may only be returned to us with our consent. Goods shall be returned in their original packaging or in packaging of similar value. The purchaser shall bear the full costs of shipment. Compensation shall only be made where the defect complaint is deemed justified. Where the customer allows us to test the goods and a defect is discovered, we accept liability; where no defect is found, we shall be entitled to issue a charge for each component tested.
8 Warranty claims may be lodged by the purchaser up to one year after the goods are delivered, except in the case where we have knowingly hidden the fault, whereby statutory provisions shall apply. Our responsibilities, as stipulated in Section VI, 9 and Section VI, 10 shall in this case remain unaffected.
9 We are required in accordance with current legal provisions to accept the return of new goods delivered or to reduce the purchase price without the setting of any requisite period if the purchaser's customer, as the end user of the new goods (sale of consumer goods), demands the return of the goods or a price reduction from the purchaser due to a defect or asserts a claim for recourse against the purchaser. In this case, we shall also be liable for compensating the purchaser's expenses, including transportation, travel, labour and material, incurred with respect to the end user due to the replacement of the defective goods on the basis of transfer of risk from us to the purchaser. No claim made by the purchaser with regard to defect shall be supported, where the purchaser has failed to carry out the inspection and to fullfil notification obligations in accordance with Article 377 of the German Commercial Code.
10 No liability under Section VI, 9 shall be accepted where the defect relates to any advertising slogan or any contractual agreements not originating with us, or where the purchaser himself affords the end user any special guarantees. Liability shall also be denied where, based on statutory provisions, the purchaser himself has no warranty obligations in respect of the end user or where the complaints have not been made in respect of any claim made by him. The above shall also apply, where the purchaser has afforded the end user guarantees above and beyond the legal limit.
11 We shall be liable, independent of the following liability limitations and in accordance with the statutory provisions covering loss of life, bodily injury and damage to health caused by the deliberate or negligent actions of ourselves, our legal representatives or our agents, as well as for any damage covered by the German Product Liability Act. We shall be liable in accordance with statutory provisions for any damage not included in Clause 1 caused by the deliberate act, gross negligence or due to any breach of contract committed by us, our legal representatives or our agents. In this case, compensation liability shall be limited to foreseeable, typically-occurring damage, in so far as we, our legal representatives and our agents are not deemed to have acted wilfully. We shall also be liable in the context of this warranty and in respect of the goods or their components for the properties and/or life span guarantees we have given. We shall only be liable for damage relating to defects affecting the guaranteed quality or life span, but not directly relating to the goods themselves, where the risk of such damage is apparent from the quality and life span warranty.
12 No further liability will be accepted without examination of the claims made; this shall apply in particular to tort claims or claims for the compensation of wasted expenses in lieu of performance; our liability as stipulated in Section IV, 6 - Section 6, 10 of this contract shall remain unaffected. Where our liability is limited or excluded, the same shall also apply to that of our employees, sub-contractors, representatives and agents.
13 Purchaser claims for defect damage compensation shall lapse one year after initial delivery of the goods. This shall not apply where we, our legal representatives or our agents are responsible for loss of life, bodily injury or damage to health or where we or our legal representatives have acted wilfully or negligently, or where our vicarious agents have acted wilfully.
14 In general, we accept no liability for any damage resulting from the following: incorrect or inappropriate use or storage, faulty installation by the customer or by any third party, damage resulting from the customer's own attempts at servicing or modification, natural instances of wear, faulty or negligent handling, chemical attack, electrical faults, etc. over which we have no control, or damage resulting from improper use or the failure to comply with operating instructions or information sheets. Furthermore, our warranty conditions shall not apply where the customer or a third party makes any modification without prior written approval from us and without justification (any delay on our part in the removal of defects), especially where such modifications relate to controls / software and even where the fault appears in an unmodified component.
15 In the event that use of the delivered goods infringes German Copyright or Trade Mark Law, we will bear the costs of either providing the customer with the respective rights or of modifying the goods in a way acceptable to the customer, such that no further breach of copyright law exists. Where it is not possible to restore appropriate commercial conditions within an acceptable period, the customer shall be entitled to withdraw from the contract. Under these conditions, we also reserve the right to withdraw from the said contractual obligations. In addition thereto, we will exempt the customer from any incontestable or legally established claims.
16 Our acceptance of liability shall be subject to current statutory provisions governing liability for infringements of copyright and trade mark law. Any liability under Article 15 shall only be accepted by us provided the customer immediately notifies us of the infringement of any copyright or trade mark law, provided he supports us to a reasonable extent in the defence of any claims made or allows us to make any relevant modification, provided all defensive measures, including extra-judicial provisions, are available to us, provided not based on the customer's instruction and where there has been no breach of the law and provided the customer has made no modification to the delivered goods or used them in any way contrary to the provisions of the contract.

## VII. Repairs and the return of goods

1 When requested, the purchaser shall be provided with cost estimates prior to any repair being undertaken. All costs relating to shipment and packaging shall be borne by the purchaser. Invoices for repair work shall be paid in full, with no deductions and immediately upon receipt. All repairs, including those made under warranty shall, under normal circumstances, be carried out in our repair facility, unless agreed to the contrary in writing.
2 Delivered goods will only be taken back with our consent and once any relevant fees have been agreed. Under normal circumstances, we will not accept the return of any specially-prepared goods or software!
Goods dispatched or returned must always be accompanied by delivery documents or copies of invoice. The costs of returning goods shall be borne by the purchaser under "free to door" conditions.

## VIII. Assembly

1 Installation work will be charged separately unless agreed to the contrary in writing. Installation costs shall include travel costs and accommodation allowances, as well as the normal rates of payment for the work including supplements for overtime, night work, work carried out on Sundays and holidays and work carried out under difficult conditions, as well as for planning and commissioning.
2 We shall invoice for all costs incurred in respect of preparatory work, travel, waiting times and commuting time. The customer shall compensate us for any further waiting time, travelling time and travelling costs incurred due to any delay in the starting or final commissioning of the said works, where the causes of such delays are beyond our control.
3 The customer shall bear all costs relating to the provision of any necessary auxiliary personnel and shall ensure that any tools needed are available in the required quantities. The customer shall also ensure the provision of suitably-sized, dry premises for the storage of machinery parts, apparatus, materials, tools, etc. The customer shall take appropriate measures to protect our property and that of our service personnel, equal to those he would take for the protection of his own property. Where the customer's operating conditions require the use of special clothing or protective equipment, he shall ensure that these are made available to our service personnel.
4 Our service personnel and auxiliary staff shall not be required to undertake any tasks not directly related to the implementation of our delivery and installation duties, unless prior agreement has been reached with us. Where such tasks are agreed, we accept no liability for any works implemented by our personnel beyond the scope of our contractual responsibilities.
Any installation works carried out by the customer, or by any third party commissioned by him, must meet our current operating and installation requirements.

## IX. Software, software use and additional guarantee and defect claims

1 With regard to any software supplied by us and all documentation belonging thereto, the customer shall be provided, in return for payment, with a non-expiring, non-exclusive, non-transferable user rights on an established or, in certain cases, yet to be specified hardware product. We shall remain the owner of the copyright and all associated trade marks. Any entitlement to produce copies shall be granted solely for the purposes of securing data. Copyright information must not be removed.
2 Instructions for installation and commissioning shall be supplied by us in a printed format together with safety advice relating to your software. All other documentation shall be supplied exclusively by us, in a software data format. Following the release of new software, all necessary software data relevant to the release will be sent together with the new software. Furthermore, we reserve the right to deliver such documentation in the form of online help or online documentation.
3 Transfer to any third party may only be effected subject to our prior written consent. Acknowledgement of this condition must be obtained prior to the the transfer of software to a third party. No modifications shall be permitted.
4 Each and every infringement of these provisions shall be subject to a penalty amounting to 10 times the total value of the customer order. Any entitlement to further claims for compensation shall remain unaffected. Contractual penalties shall be levied separately and in addition to any potential further claims for damage compensation. The customer shall be entitled to provide evidence in support of any claim of reduced or negligible damage. The software and all documentation belonging thereto shall, in this case, be returned to us.
5 These conditions shall not apply to exclusive, customer-specific software developed and provided to meet individual customer requirements. Under the contract-related provision of control software, developed by us using modular multi-application software components (standard software modules), these are to be fitted and adapted in accordance with customer-specific and contractual performance requirements (customer-specific applications program).
6 On payment of the full purchase price for the customer-specific application program, we shall provide the customer with exclusive, spatially- and temporally-unrestricted user rights. The customer will not be afforded any rights with regard to the standard software module on which the customer-specific adaptations are based, irrespective of the type of module.
7 We shall be entitled, irrespective of these provisions and on the basis of other customer orders, to prepare and offer for sale the resulting customer-specific software solutions developed. We shall in each and every case retain non-exclusive user rights to customer-specific solutions for internal operational purposes.
8 Subject to the provisions in VI, we undertake the guarantee for the correct duplication of our software. Our software is designed to run on hardware products specified by us. Our warranty obligations shall be fulfilled through the delivery of replacement parts. We undertake no guarantee for the fault-free operation of the software or its data structure, unless we have agreed to the contrary in writing. Regarding customer-specific software, we guarantee compliance with the specific function and performance features outlined in the operational specifications, the order confirmation document and the established function / operating sequence documentation. We accept no liability for the fault-free functioning of programs in all the customer's planned applications and, in particular, with regard to any applications not mentioned or tested at the time of program creation / acceptance.

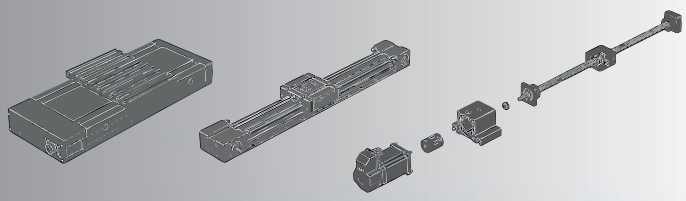
## X. Retention of title

1 The goods delivered (goods subject to the retention of title) shall remain our property until such time as all debts, including all current account balance claims, accrued by the purchaser both now and in the future, have been paid in full. In the event of any infringement of contractual conditions on the part of the purchaser, e.g. payment arrears, we shall be entitled, after setting and upon culmination of a reasonable period, to repossess goods subject to the retention of title. The repossession of goods subject to the retention of title shall constitute our withdrawal from the contract. The seizure of goods subject to the retention of title by us shall constitute our withdrawal from the contract. Following repossession, we shall be entitled to dispose of goods subject to the retention of title. Following the deduction of an appropriate amount for the costs of the disposal, the proceeds from the disposal shall be deducted from the outstanding amounts owed to us by the purchaser.
2 The purchaser shall be responsible for the proper handling of goods subject to the retention of title and shall insure these at his own expense to their full value against damage by fire, water and theft. The costs of inspecting and servicing the goods at their appropriate intervals shall be borne by the purchaser.
3 The purchaser shall be entitled to use and/or dispose of goods subject to the retention of title in the course of his normal business activities, provided he is not in payment arrears. Pawning or chattel mortgaging shall not be permitted. Any existing claims (including all current account balance claims) with respect to goods subject to the retention of title arising due to resale or for other legal reasons (insurance, tort) shall be assigned by the purchaser by way of security and in their entirety to us; we hereby accept assignation. The purchaser has our (revocable) authorisation to collect the claims assigned to us for his invoices in his own name. We reserve the right to revoke authorisation at any time, should the purchaser not be able to meet his payment obligations. The purchaser shall not be entitled to assign the claim even for the purposes of collecting the debts by way of factoring, unless an obligation is simultaneously imposed on the factor to transfer the collected amounts directly to us, provided we still have outstanding claims against the purchaser.
4 Any processing or modification of goods subject to the retention of title shall be carried out on our behalf. Where goods subject to the retention of title are modified using items not belonging to us, we shall become co-owners of the new commodity in the ratio of the value of the goods subject to the retention of title (total amount of invoice including VAT) to the other items used, at the time of modification. The same shall apply to the processing of new products created as applies to goods subject to the retention of title. In the case of an inseparable mix of goods subject to retention of title and items not belonging to us, we shall become co-owners of the new commodity in the ratio of the value of the goods subject to retention of title (total amount of invoice including VAT) to the other items used, at the time of creation of the mix. Where the purchaser's item is the major component of the mix, the purchaser shall agree to assign co-ownership to us on a proportional basis; we hereby accept the assignation. The purchaser shall ensure that a record of sole- and co-ownership on a single item is kept on our behalf.
5 Where a third party gains access to goods subject to retention of title and in particular to pledged goods, the purchaser shall provide notification of our ownership and shall notify us immediately, so that we can assert our rights of ownership. Where the third party is unable to compensate us for the in-court and out-of-court costs incurred in respect thereof, liability shall fall to the purchaser.
6 We undertake to release the securities due to us in so far as their value exceeds the claims to be secured by more than 10%, the choice being ours as to which securities to release.

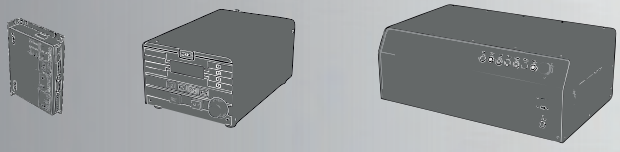
## XI. Applicable law, court of jurisdiction and location

1 All legal relationships between the parties are exclusively subject to German law, to the exclusion of the United Nations Convention on Contracts for the International Sales of Goods, even if the buyer has its usual place of residence or abode abroad or delivery is being made abroad. The same applies if the buyer transfers their usual residence to another country at a later time or is unavailable.
2 If you do not have a place of residency in Germany at the time of ordering or you move your place of residency to another country following the conclusion of the contract or your place of residency is not known at the time that a claim is made, legal jurisdiction for all disputes arising from and in relation to the contractual relationship is Fulda.
3 If the customer is a merchant under the provisions of paragraph 1 section 1 of the Commercial Code (Handelsgesetzbuch, HGB), a legal person under public law or a special fund under public law, the courts in Fulda will be exclusively responsible for all disputes arising from or in connection with the relevant contractual relationship. In all other cases the customer or we are permitted to bring claims before any court that is legally cognisant.
4 Should individual provisions of this contract be wholly or partly invalid or void then the validity of the rest of the contract will not be affected. The parties undertake to replace the invalid or void provision with a valid provision that is closest to the intended commercial purpose. The same applies in cases of gaps. Changes and amendments to these General Conditions must be agreed in writing. The suspension of this requirement of the written form must also be made in writing.

## Mechanics

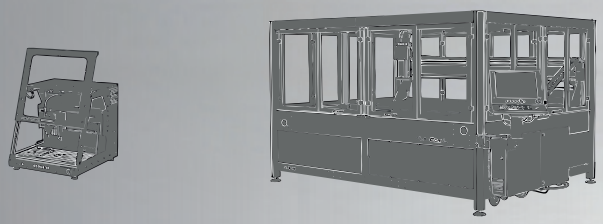


## Electronics



## Software

## Systems

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