Electronics

Mechanics

Software

Systems

Automation 2010/11

isel®

From Components to Systems

GENERAL

ELECTRONICS

MECHANICS

SOFTWARE

SYSTEMS

isel®

Business hours:

Dermbach plant
- Sales, order processing and registry
  Monday - Thursday 7:30 a.m. - 4:30 p.m.
  Friday 7:30 a.m. - 2 p.m.

Eichenzell plant
- Shipping and receiving
  Monday - Thursday 7 a.m. - 2 p.m.
  Friday 7 a.m. - 2 p.m.

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

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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 the company sites at Eichenzell (Hessen), Eiterfeld (Hessen) and Dermbach (Thüringen) with a total of 33,000 m² of production, warehousing and office space.

Company 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.

GENERAL

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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.

Sites

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

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

Sites

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

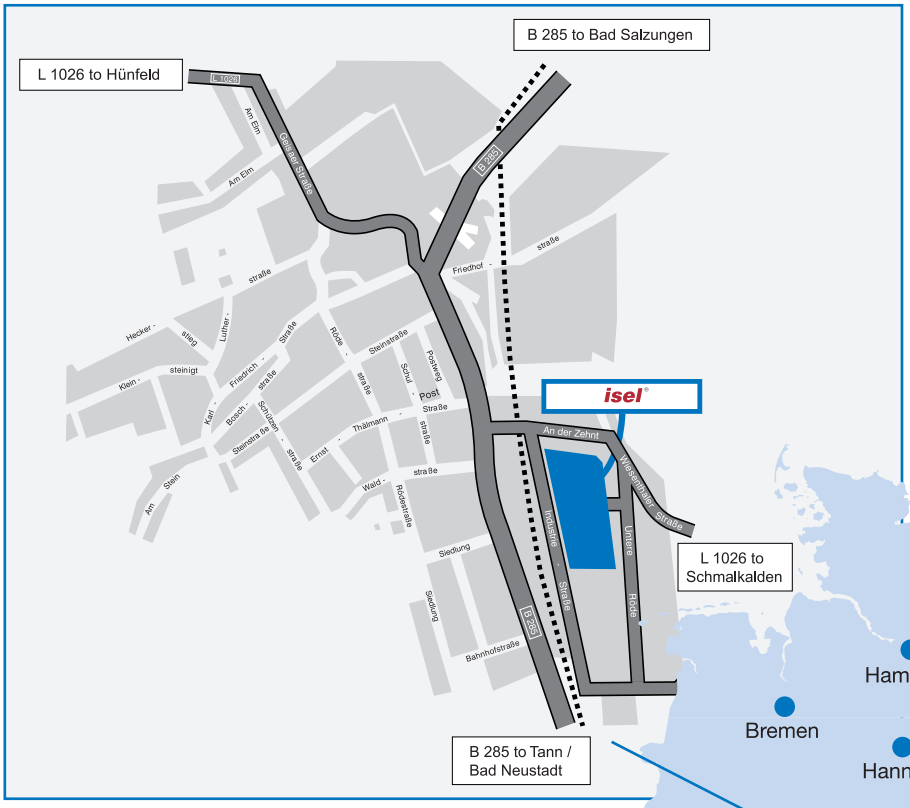
Exhibition

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 exhibition 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.

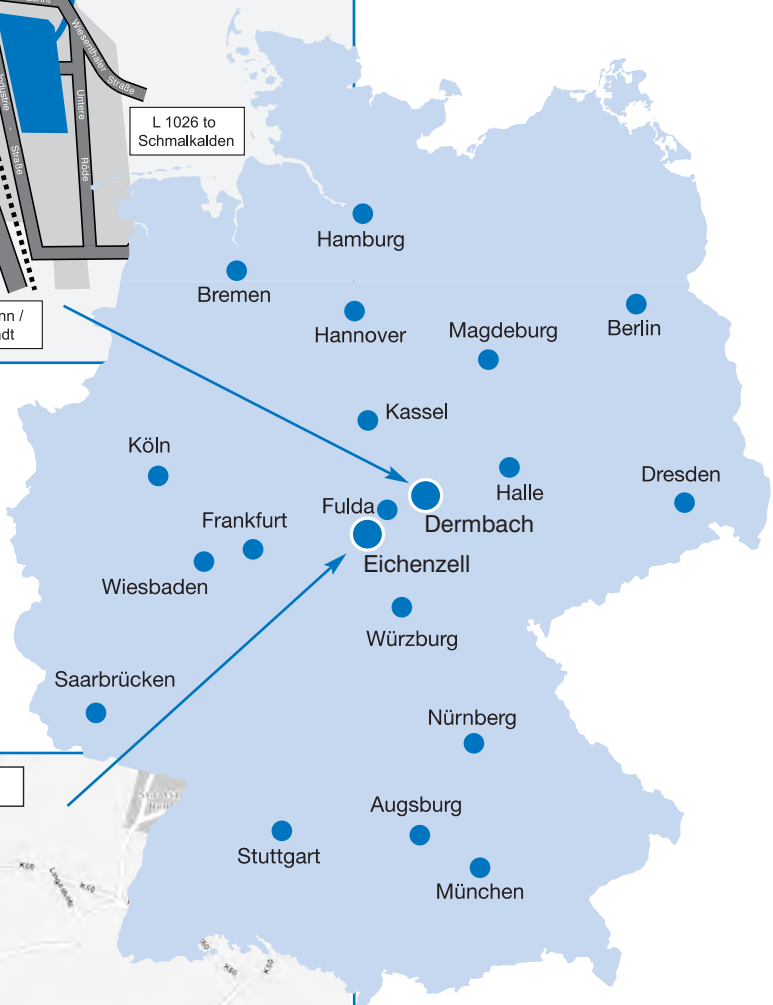
How to find us



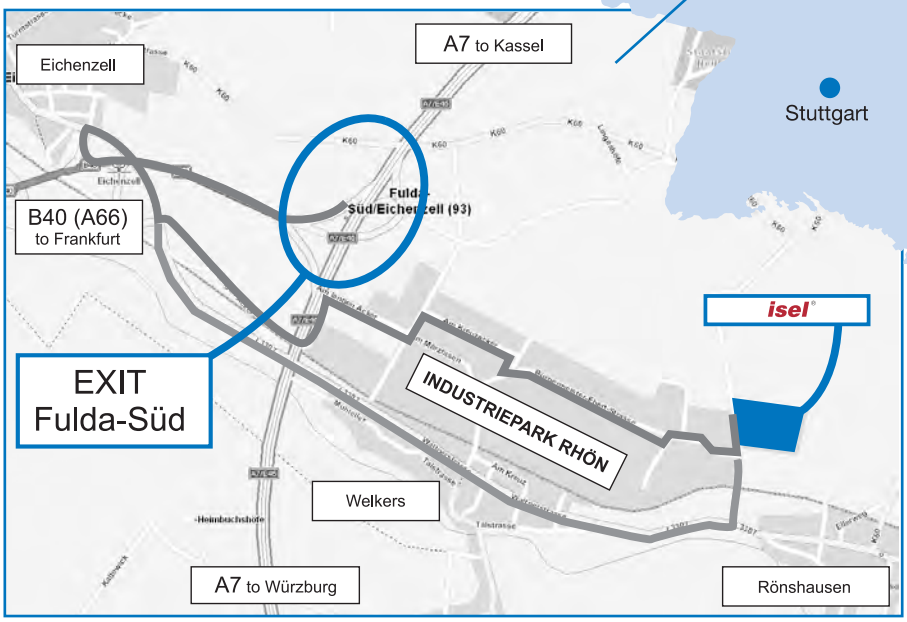
Dermbach

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

The following elements have been introduced and used, as set out in DIN ISO 9001:2000:

- Document and data control
- Procurement
- Testing (inspection on receipt, intermediate and final testing)
- Test equipment monitoring
- Test status
- Controlling defective goods
- Corrective and preventive measures
- Handling, storage, packaging, conservation and shipping

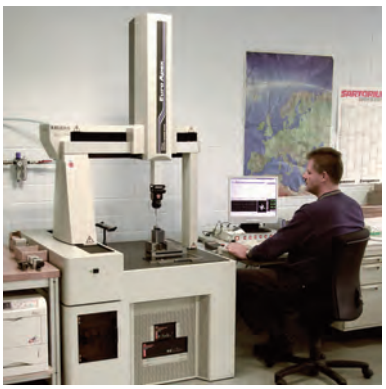
Coordinate measuring equipment

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

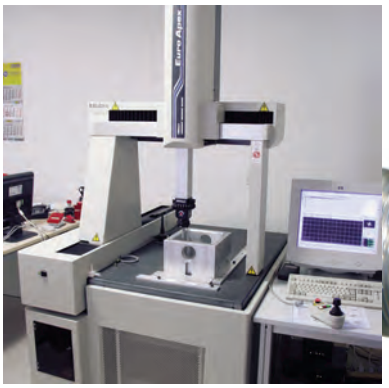
Mitutoyo Euro C 544 Apex

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 method: Ra, Ry, Rz, Rq, Rt

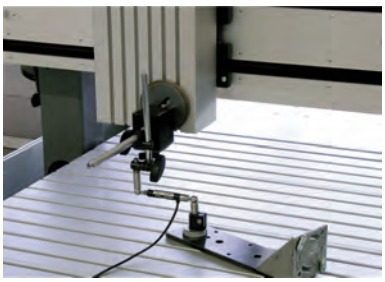
Hardness test equipment Wolpert

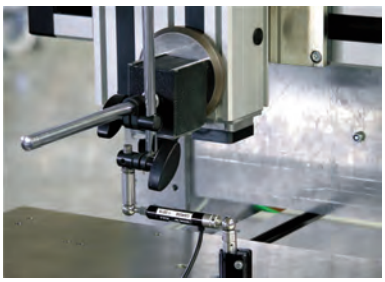
Type: Dia Testor 2 Rc
Test method: Vickers, Brinell and Rockwell

Layer thickness measuring equipment Elektro 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 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.

electron
NB_FAN
RTL8101L

ELECTRONICS

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MS 200HT-2

MS 300HT-2
MS 600HT-2
MS 900HT-2

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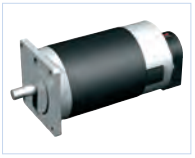
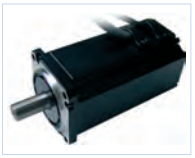
with brushes


DC 100

DC 300

EC servomotors B 8
brushless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Overview

electronics

Two-phase step motors

MS 135/200 HT-2

Twp-phase step 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)

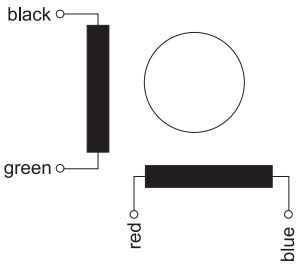
General

Two-phase step 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 step motors in the MS range are of the high torque type. A particularly high torque is achieved by the use of rare earth magnets.

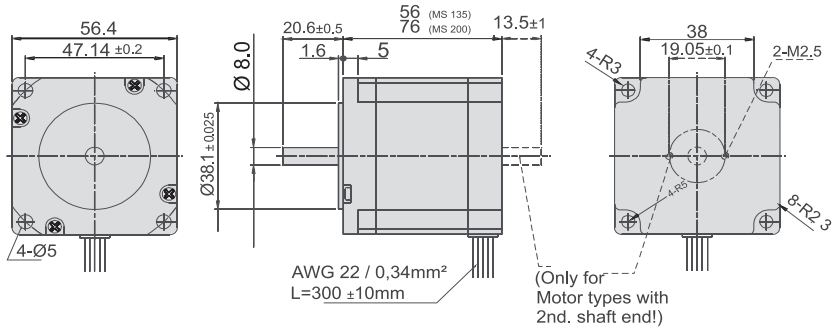
Technical specification

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

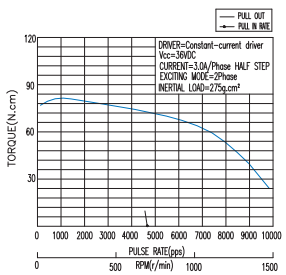


Dimensioned drawing

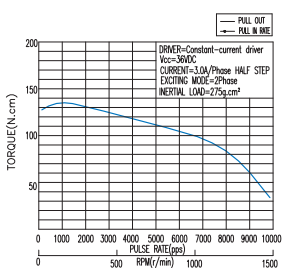


Torque curves

MS 135 HT



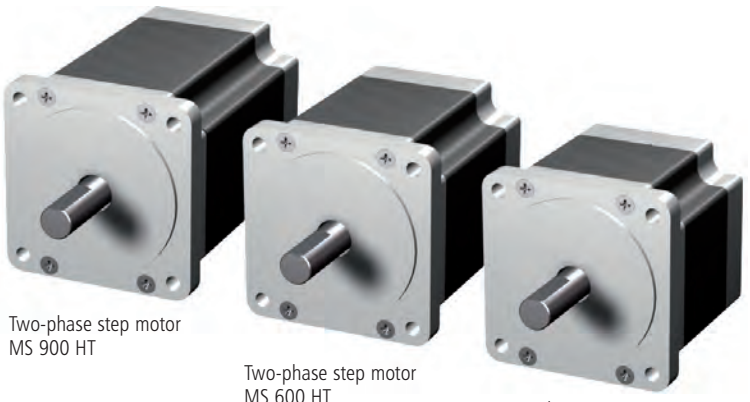
MS 200 HT



Subject to technical changes.

Two-phase step motors

MS 300/600/900 HT-2



Two-phase step motor
MS 900 HT

Two-phase step motor
MS 600 HT

Two-phase step 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
- 8-lead connection
- Smaller step angle errors, non-cumulative
- IP43 protection class
- Optional: MD 28 drive module

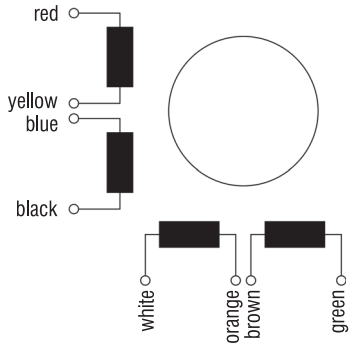
General

Two-phase step 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 step motors in the MS range are of the high torque type. A particularly high torque is achieved by the use of rare earth magnets.

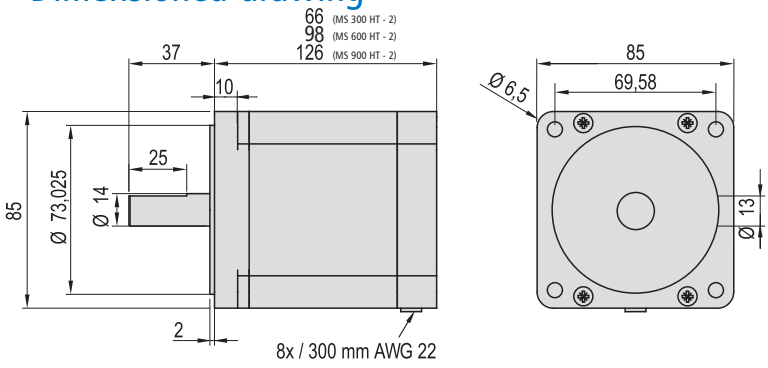
Technical specification

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 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

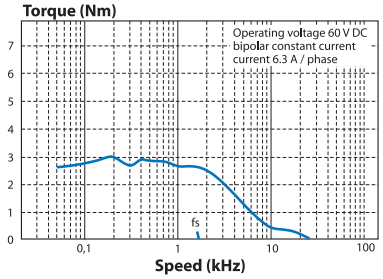


Dimensioned drawing

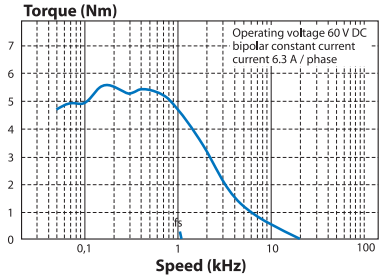


Torque curves

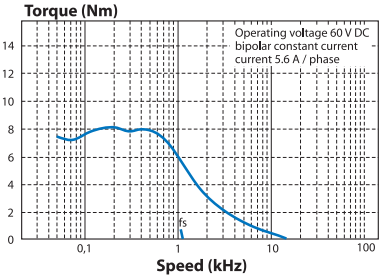
MS 300 HT



MS 600 HT



MS 900 HT

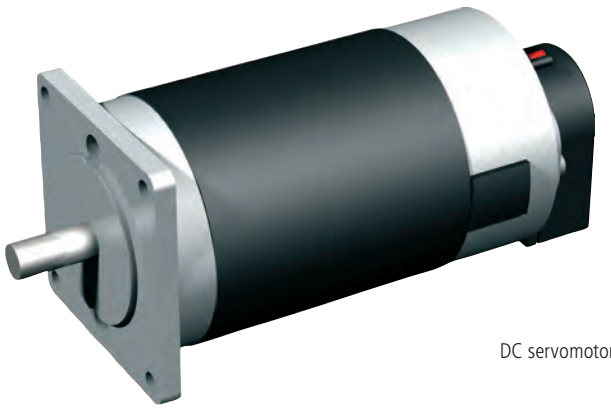


Subject to technical changes.

electronics

Servomotors
with brush drive

DC 100



DC servomotor DC 100

Features

- Servomotor with brushes
- Low-resistance winding construction
- Good dynamic response
- Two-finger brush (long working life)
- Incremental encoder with 512 pulses/turn (optional for DC 300: 1,000 pulses/turn)
- IP43 protection class/IP50 encoder

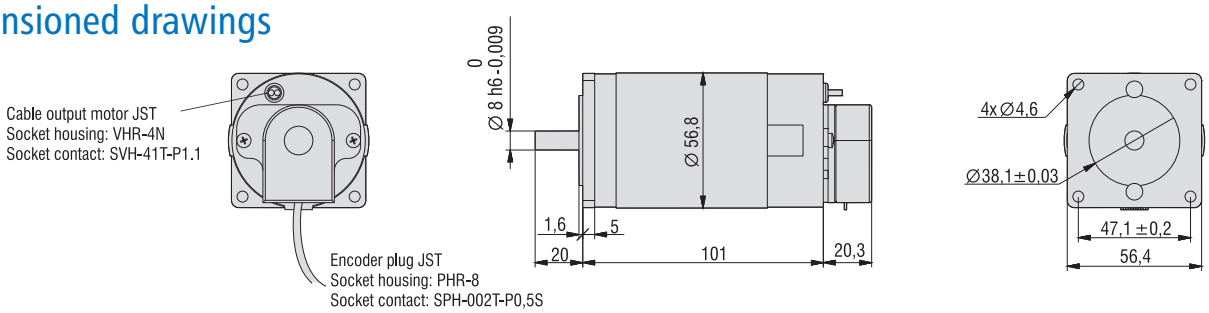
General

DC servomotors 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



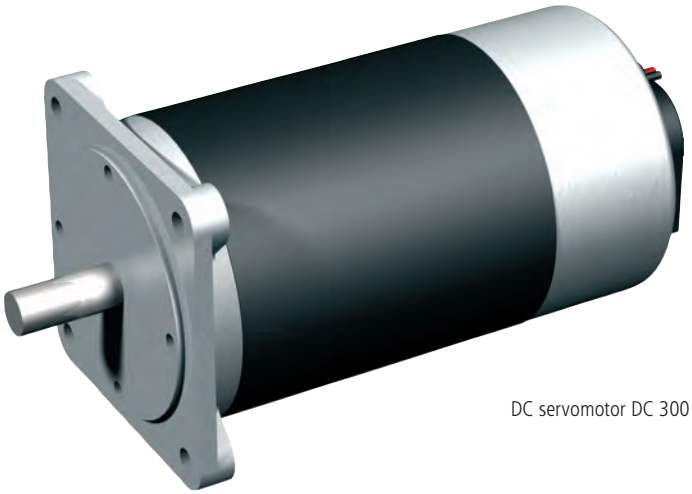
Pin assignments

Cable coding	1	2	3	4	5	6	7	8
Wire colour	Black	Red	Green	Brown	Grey	White	Yellow	Orange
Driver output	0V	Vcc	SIG A	SIG $\overline{A}$	SIG $\overline{B}$	SIG B	SIG Z	SIG $\overline{Z}$

Subject to technical changes.

Servomotors
with brush drive

DC 300



DC servomotor DC 300

Features

- Servomotor with brushes
- Low-resistance winding construction
- Good dynamic response
- Two-finger brush (long working life)
- Incremental encoder with 512 pulses/turn (optional for DC 300: 1,000 pulses/turn)
- IP43 protection class/IP50 encoder

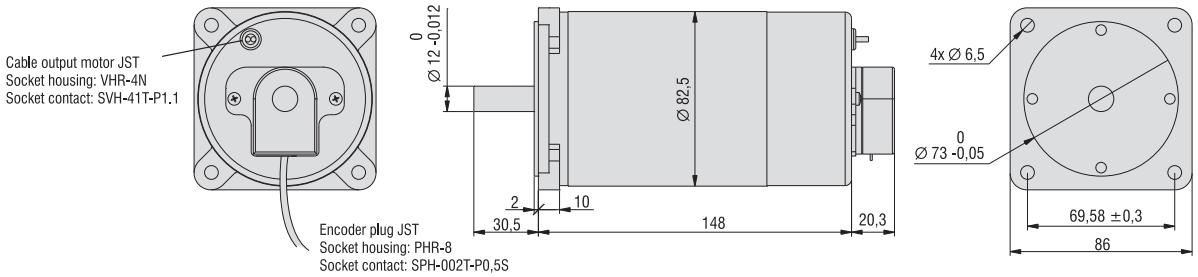
General

DC servomotors with brushes are the entry into the controlled drive technology class. They have a 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 300	48	3,200	1	3,000	100	9	315	20	471024

Dimensioned drawings



Pin assignments

Cable coding	1	2	3	4	5	6	7	8
Wire colour	Black	Red	Green	Browm	Grey	White	Yellow	Orange
Driver output	0V	Vcc	SIG A	SIG $\overline{A}$	SIG $\overline{B}$	SIG B	SIG Z	SIG $\overline{Z}$

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 measuring system
- Hall sensors
- IP44 protection class
- Uses: Positioning controllers, speed control
- Connection via circular plug
- Option: Brake

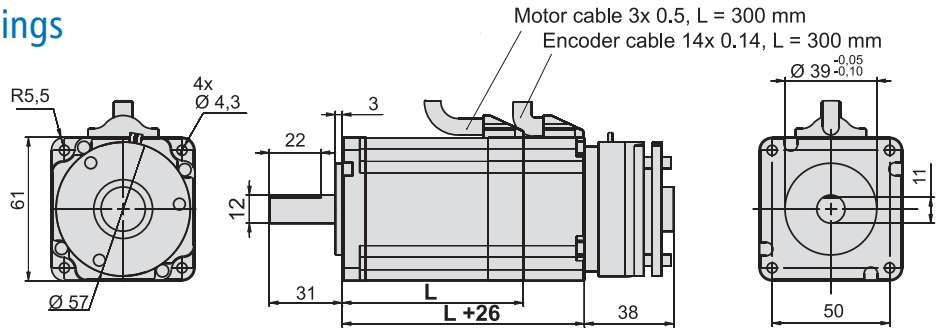
General

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



Pin assignments

Encoder cable

PIN	Colour	Signal	PIN	Colour	Signal
1	yellow	HALL_A_IN	9	white	HALL_B_IN
2	red	VCC_Encoder	10	black	GND_Encoder
3	orange/black	/ENC_Z	11	orange	ENC_Z
4	brown/black	/ENC_B	12	brown	ENC_B
5	grey/black	/ENC_A	13	grey	ENC_A
6	–		14	green	HALL_C_IN
7	–		15	--	
8	–				

Motor cable

Colour	Signal
yellow	Motor U
blue	Motor V
green	Motor W

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 measuring system
- Hall sensors
- IP44 protection class
- Uses: Positioning controllers, speed control
- Connection via circular plug
- Option: Brake

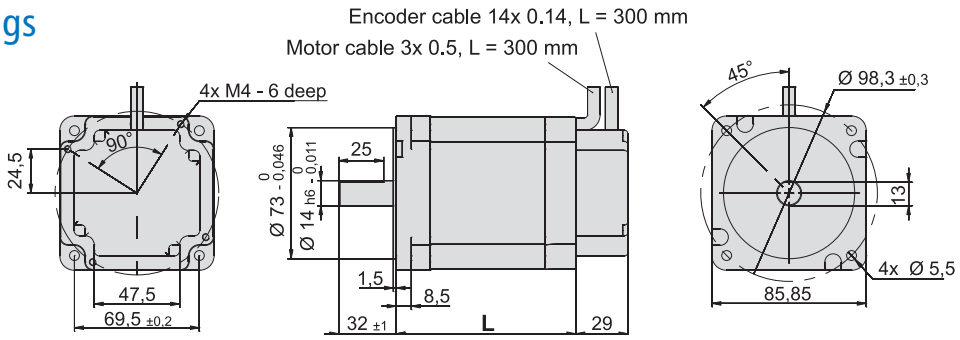
General

Brushless EC motors are constructed 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



Pin assignments

Encoder cable

PIN	Colour	Signal	PIN	Colour	Signal
1	yellow	HALL_A_IN	9	white	HALL_B_IN
2	red	VCC_Encoder	10	black	GND_Encoder
3	orange/black	/ENC_Z	11	orange	ENC_Z
4	brown/black	/ENC_B	12	brown	ENC_B
5	grey/black	/ENC_A	13	grey	ENC_A
6	–		14	green	HALL_C_IN
7	–		15	--	
8	–				

Motor cable

Colour	Signal
yellow	Motor U
blue	Motor V
green	Motor W

Subject to technical changes.

electronics

Linear motors
LS coil package with MS magnetic rail

iLM series

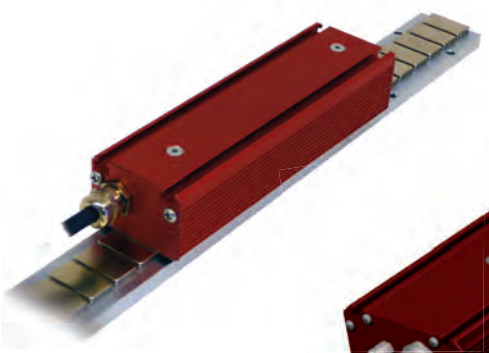


Diagram:
LS 25 winding package
with MS 25 magnetic rail

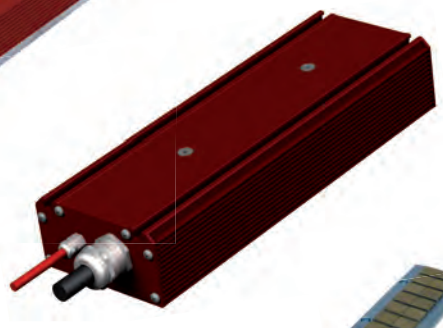


Diagram:
LS 50 winding package

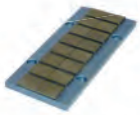


Diagram:
MS 25 magnetic rail
with 8 magnets

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**

Ordering example

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.

Linear motors
LS coil package with MS magnetic rail

iLM series

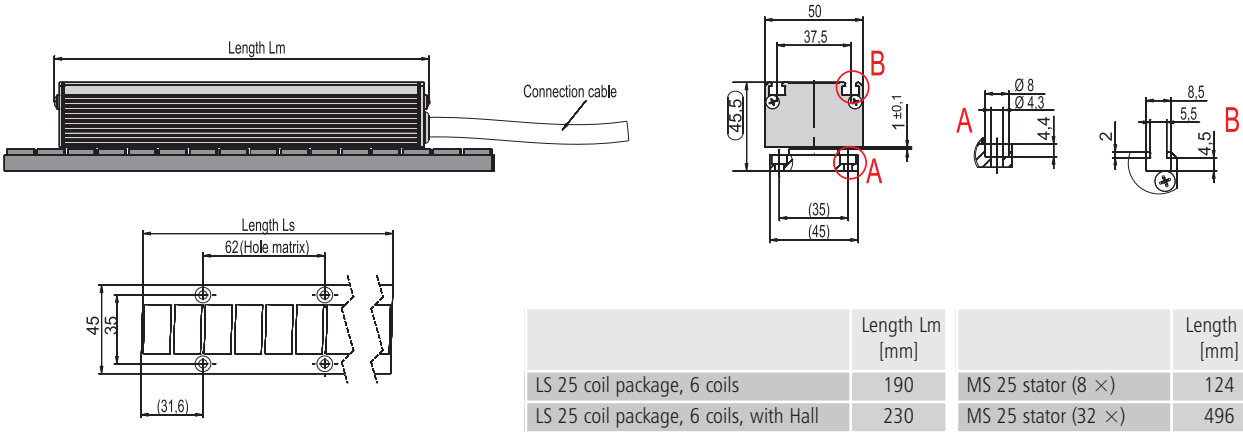
Technical specification

	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

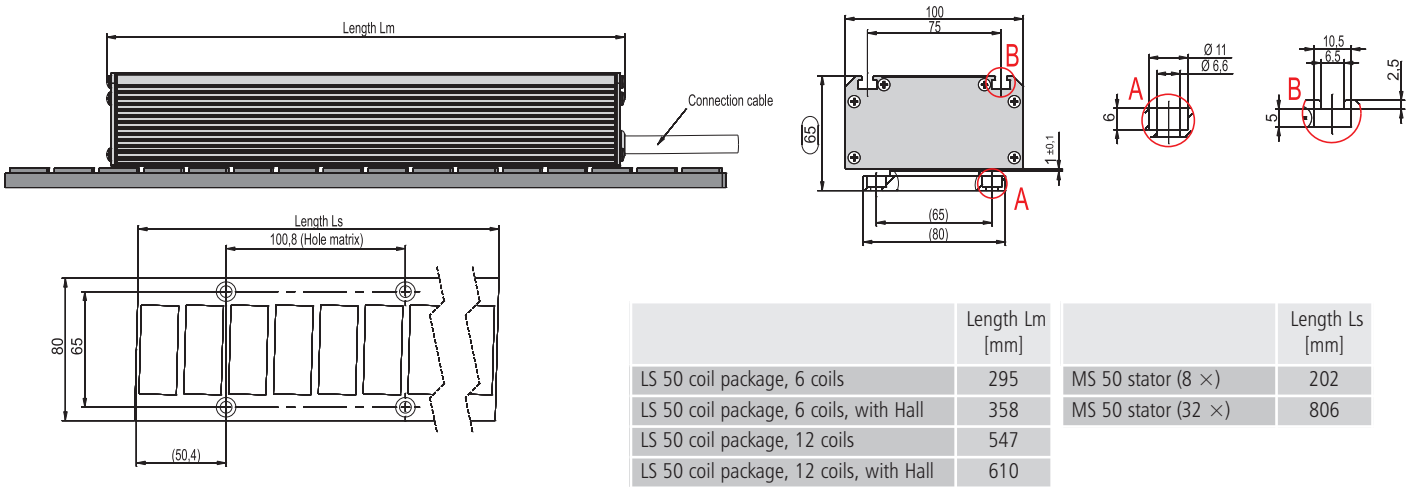
iLM 25 linear motor



	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.

iMS magnetic length measuring system

Detailed information under www.isel-germany.de

Figure:
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.

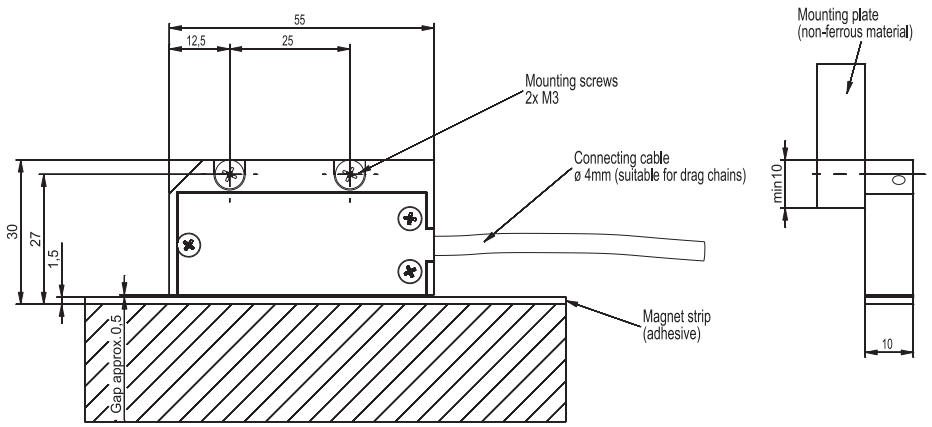
Available sensor interfaces for further processing in the peripherals are, optionally, a pulse sensor with incremental RS422 AB output (Z optional) and a SIN/COS/(Z optional) sensor with voltage amplitude 1Vss.

Ordering information

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	appr. 70 g
Sensor cable	PUR
Cable bending radius	>10 mm, first bend > 10 mm from sensor casing
Electronic data	
Supply voltage	4.9V - 5.1V (optional: 7V - 15V)
Current drain	< 100 mA on no load
Output signals	Standard RS422 A, /A, B, /B optional reference Z, /Z Option: SIN/ COS 1Vss +20%, -40%, Z and /Z right sign
Termination	Terminating resistor = 120 Ohm between corresponding output signals, 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
Repeatability	Incremental resolution ± 1 increment, plus errors due to angular tilting in the 3 sensor axes
Accuracy	Measurement error 20 µm, 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 strip

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, optional: 0.1 mm stainless steel tape + bonding view 0.2 mm
Width	10 mm
Length	up to 50 m on roll
Pole pitch/PITCH	2 mm, i.e. north pole = 2 mm, south pole = 2 mm magnetic period = 4 mm
Number of tracks	Single track, 10 mm wide Option: signal track 5 mm, reference track periodically 5 mm
Accuracy	± 0.04 mm/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; among others,it depends 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
serious effect on the measurement standard	Aromatic hydrocarbons, ketones, inorganic acids

Subject to technical changes.

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 0102**
19" CNC control panel iBP 19-1, English silicon keyboard	Part no.: **371076 0112**
19" CNC control panel iBP 19-2, German steel keyboard	Part no.: **371077 0102**
19" CNC control panel iBP 19-2, English steel keyboard	Part no.: **371077 0112**
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 0009**
Mounting arm for rack assembly iBP 19 on PS 100	Part no.: **371050 0010**
Mounting arm for rack assembly iBP 19 on PS 140	Part no.: **371050 0008**

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

Option:

- English keyboard

Subject to technical changes.

Drive modules
for 2-phase step motors

MD 24/28

Features

- High performance, low noise
- Power supply up to 50 V DC (80V DC)*
- Output current up to 4.2 A (7.8 A)*
- Automatic current reduction
- Suitable for 2-phase and 4-phase step motors
- Clocking/direction interface
- Input frequency for clocking 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

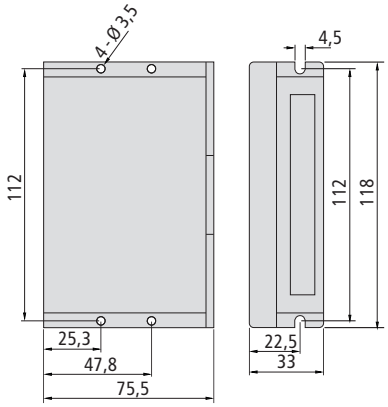
The step motor drive modules MD24/MD28 are powerful final stages for 2-phase and 4-phase step motors.
The modules are micro-step capable and thus allow very quiet running of the connected motors. Due to its particular chopper technology for the motor current, identical motors can deliver higher speeds and torques than conventional comparable drive modules. The clocking/direction interface also allows simple connection to various motion controllers or a PLC.

Technical specification

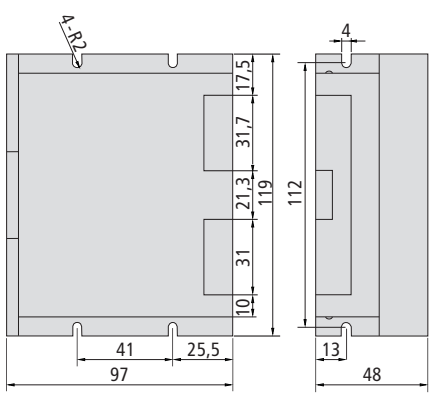
		MD 24			MD 28		
Parameter	unit	Min.	Typical	Max.	Min.	Typical	Max.
Output current	A	1.0	-	4.2 (3.0 A RMS)	2.8	-	7.8
Mains voltage	VDC	20	36	50	24	68	80
Current logic signals	mA	7	10	16	7	10	16
Clocking input frequency	kHz	0	-	300	0	-	300
Insulation resistance MΩ		500			500		
Part no.		316303			316304		

Dimensioned drawings

MD 24



MD 28



Subject to technical changes.

Subject to technical changes.

Drive controllers
for multi-phase and servomotors

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.

Subject to technical changes.

Drive controllers
for multi-phase and servomotors

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

Subject to technical changes.

Motion Kits

iMK

iMK 20 S/L

iMK 40 S/L

General

Motion kits comprise brushless servomotors including matching drive controller. Motion kits are suitable for use in the range of small to medium outputs up to 2 kW.

These servomotors are electronically switched 3-phase motors with incremental sensor and Hall sensors. They are available in 4 sizes (for details, see catalogue pages for EC 60S/L and EC 80S/L).

Both iMD20/40 controllers are designed for power supplies of 40-90V DC (iMD20) or 230V AC (iMD40).

As the interface for higher-level controllers, both the CANopen interface and an analogue ±10V interface can be used (for details, see catalogue pages for iMD20 and iMD40).

Technical specification

	iMK 20S	iMK 20L	iMK 40S	iMK 40L
Motor type	EC 60 S	EC 60 L	EC 86 S	EC 86 L
Motor output [W]	157	235	440	660
Rated torque [Nm]	0.5	0.75	1.4	2.1
Peak torque [Nm]	1.75	2.25	5.0	7.5
Rated speed [rpm]	3,000			
Encoder resolution [incr]	1,000			
Power supply	40-95 V DC		230 V AC	
CAN bus interface	CANopen DS301, DS402 of CiA (CAN in automation)			
Analogue input (±10V)	11 bit resolution			
PWM switching frequency	8.2 kHz or 16.4 kHz			
Current/speed/position controllers	Scanning times min 61 µs, 344µs, 488 µs			
Inputs for reference & limit switches	✓			
Brake controller	✓			
Gantry or synchronous operation	✓			
Motor current monitoring	✓			
Monitoring of encoder signals	✓			
Watchdog	✓			
Galvanic isolation	Processor Power section, I/Os			
Rest state monitoring	✓			
Drive controller dimensions	180 x 35 x 120 mm		180 x 50 x 150 mm	
Part no. Drive controller and motor	317000 0002	317000 0003	317000 0004	317000 0005
Part no. Motor cable	392760 xxxx *		392305 xxxx *	
Part no. Encoder cable	392740 xxxx *			

* Cable length in mm
available in different lengths.
e.g.: 0150 = 1.50 m 0200 = 2.00 m 0300 = 3.00 m 0500 = 5.00 m ... 1000 = 10.00 m

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. A multifunctional panel provides many potential variations in the connection area.

Inter alia, a CAN interface with optionally 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 (up to 2GB)
Hard disks (S-ATA)	2,5" ≥ 160 GB
Graphics	Intel GMA 950
Monitor	VGA/DVI-D
Audio	Realtek® ALC662 Audio Codec
LAN	10/100/1,000 Mbit LAN
Power supply	12 V DC
External connections (Basic version - with blind panel)	3 × USB 2.0, LAN VGA, DVI-D Audio multifunction connection 12V DC power supply
Internal interfaces	1 × PCI (without CAN interface) 1 × mini PCI Express, 1 x IDE 2 × SATA (1 x with HDD) 4 × USB 2.0 (3 × with SSD), 1 × parallel interface, 2 × serial interface, 1 × PS/2, 1 × SPDIF
Humidity	Max. 90% (not 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

iPC15 PC controller,
CAN-PCI-1-channel, PCI riser board,
serial, remote, including Windows,
power supply unit and lead
Part no.: **371064 0005**

iPC15 PC controller,
CAN-PCI-2-channel, PCI riser board,
serial, remote, including Windows,
power supply unit and lead
Part no.: **371064 0006**

Subject to technical changes.

electronics

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.

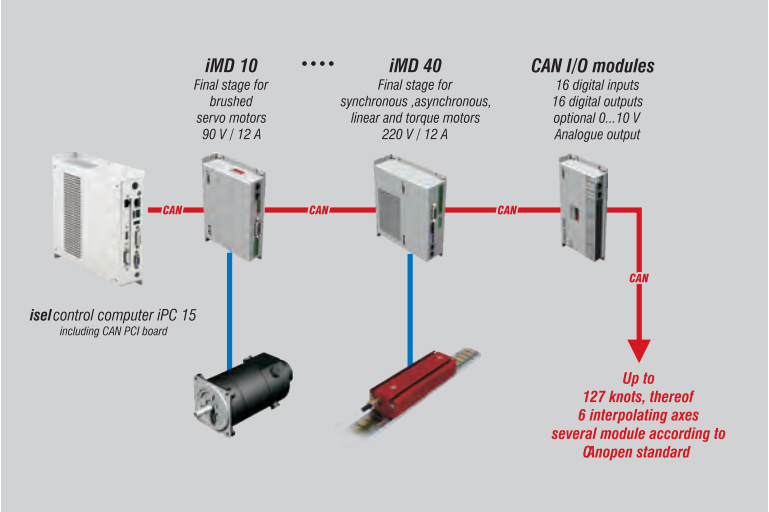
The board can also be used in conjunction with CoDeSys V2.3.

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	1/2
galvanic isolation	✓
Data transfer rate	up to 1 Mbits/s
Plug	RJ45

Block diagram 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 CAN channel RJ45 connector, screened
- CAN bus galvanically isolated
- Data transfer rate up to 1 Mbits/s
- Drivers for NT/2000/XP/Vista
- Driver 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 board 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 very 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 8 × electronically, Imax < 350 mA	12 4 × relays, Imax < 5A 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), 24V DC (process voltage),	
Power consumption	160 mA (logic and relays) 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 couplers (input current approx. 8 m A)
- 16 digital outputs, 8 × relays, Imax < 5A, 8 × electronically, Imax < 350 mA (thermal protection, short circuit protection)
- One analogue output, 0V - 10V 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 couplers (Input current approx. 8 m A)
- 12 digital outputs, 4 × relays, Imax < 5A, 8 × electronically, Imax < 350 mA (thermal protection, short circuit protection)
- One analogue output, 0V - 10V via 8-bit D/A converter
- 4 analogue outputs, 0V - 10V 10-bit resolution

Subject to technical changes.

CAN controller components

Universal CAN positioning module
CPC 12, with ± 10V output

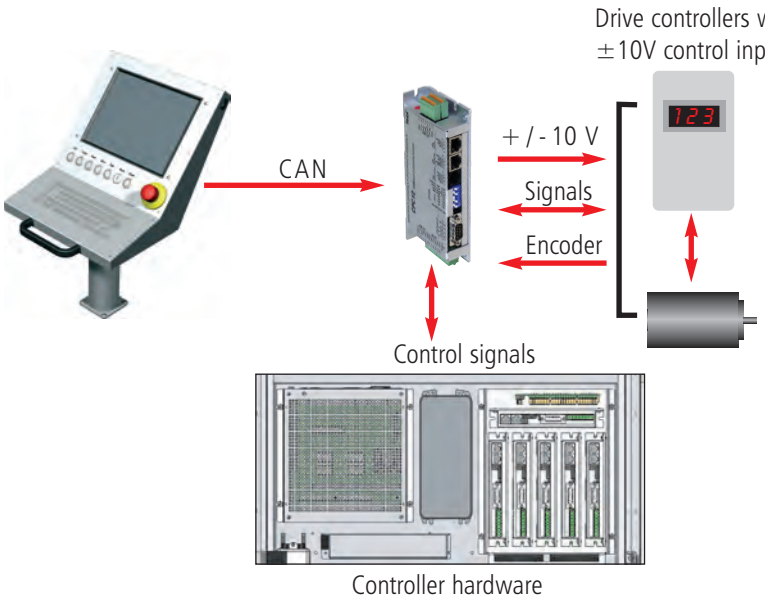
General

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 - operation of not 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 diagram



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**

Subject to technical changes.

Step controller
Single axis controller

IT116 Flash

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 step 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

- the DNC mode of the controller: PC/laptop connected permanently with the step controller via the serial interface

and

- the CNC mode of the controller: The step controller works independently, without PC coupling of the stored user program (stand alone).

Features

- Final output stage
  48V DC/4.2A peak
  for 2-phase step 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 (frontal) for
  coupling with PC/notebook
  (program download)
- optional: USB interface (frontal)
  for loading user programs from an
  USB memory stick (USB on the go)
- Control signals Program
  start/stop, reset to controller
  back side
- 4 optically isolated signal inputs
  (Signal voltage : 24V DC)
- 4 relay outputs (24V DC, 300 mA)
- Motor brake controller (24V DC)
- Remote plug on rear of controller
  for external EMERGENCY
  SHUTDOWN (2-channel),
  external 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

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 0200** (2m)
Part no.: **392755 0300** (3m)
Part no.: **392755 0500** (5m)

Motor lead
SubD 9-pin socket - plug 1:1
Part no.: **392780 0081** (0.8m)
Part no.: **392780 0151** (1.5m)
Part no.: **392780 0201** (2.0m)
Part no.: **392780 0301** (3.0m)

Scope of supply

- 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

Subject to technical changes.

electronics

Step controllers
Multiple axis controller

iMC-P

Figure:
Front and rear
iMC-P step controller

General

iMC-P step controllers **iMC-P** are freely programmable compact controllers with max. 4 final stages for 2-phase step motors.
The controllers integrate all necessary components (interfaces, motion controllers, power supply, final stages, safety circuit incl. door controller, control elements), which are needed to control a machine, in a compact bench housing. The iMC-P1 controller with core module with 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 through 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

Features

- 8 signal inputs (24V DC)
- 8 relay outputs (24V DC, 300 mA)
  max. 2A total current
- 1 relay output (230V AC/6A)
- 1 analogue output (0 - 10V)
- RS232 programming interface (rear)
- 32-bit RISC processor and memory for 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 (48V/4.2A) for 2-phase step 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

Deliverables

- 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.: **392780 0151** (1.50 m)
Part no.: **392780 0201** (2.00 m)
Part no.: **392780 0301** (3.00 m)

Motor lead SubD9 plug - M23 socket
Part no.: **392755 0200** (2.00 m)
Part no.: **392755 0300** (3.00 m)
Part no.: **392755 0400** (4.00 m)
Part no.: **392755 0500** (5.00 m)
Part no.: **392755 0600** (6.00 m)
Part no.: **392755 0800** (8.00 m)
…other lengths to order.

Subject to technical changes.

Step controllers
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 electrochnics, 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

Deliverables

Controller, mating plug (I/O, pulse, Remote), serial interface lead (null modem), 230V AC mains lead, PAL-PC software CD, operating instructions, programming instructions

Subject to technical changes.

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 deliverables)
  - 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)

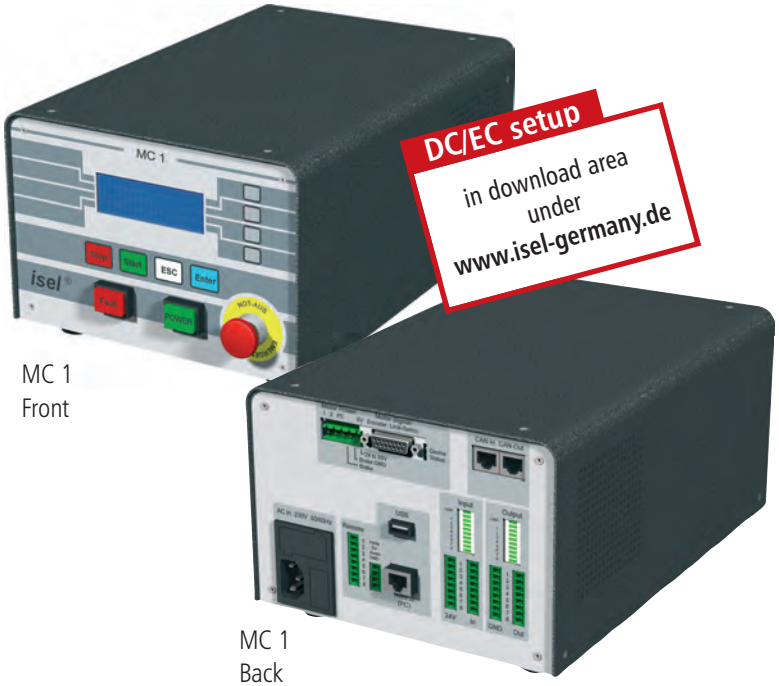
Controller software - Remote
Part no.: **Z12-334500**

Controller and programming software ProNC
Part no.: **Z11-333500**

electronics

Servo controller
Single axis controller

MC 1-10/1-20



MC 1
Front

MC 1
Back

General

Servo controllers in the MC1 series are freely programmable compact controllers for a linear or rotary unit with servomotor.

The single axis controllers integrate all necessary components (interfaces, motion controller, power supply, drive controller, safety circuit, control elements), which are needed to control a machine, in a compact bench housing.
The supplied PAL-PC software can be used for programming.

Two versions are available:

- MC-10: For controlling brush DC servomotors

- MC-20: For controlling brushless EC servomotors

Ordering information

MC1-10 (including PAL-PC)	Part no.: **381518 0010**
MC1-20 (including PAL-PC)	Part no.: **381518 0020**

Motor lead	Part no.: **392760 xxxx ***
Encoder lead	Part no.: **392740 xxxx ***

* Lead length [mm] available in different lengths.
e.g.: 0100 = 1.00 m/0150 = 1.50 m/0200 = 2.00 m ... 1000 = 10.00 m

Features

MC-10
- for controlling brush servomotors
- Commissioning program "DcSetup"
- For technical specification for the drive controller see "iMD10 drive controller"

MC-20
- for controlling brushless servomotors
- Analysis of Hall signals
- Commissioning program "AcSetup"
- For technical specification for the drive controller see "iMD20 drive controller"

Common features

- Max. output power 500 W
- 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 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 (24V DC)
- 8 relay outputs (24V DC/700 mA)
- Stop category 0 to EN60204
- Emergency shutdown circuit via plug in higher level safety circuit can be integrated
- Broadband mains supply: 110 - 250V AC, 50..60 Hz
- Bench casing W 204 × H 149 × D286

Deliverables

- 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

Subject to technical changes.

Servo controller
Multiple axis controller

iMC-DC/iMC-EC

Figure:
Front and rear
iMC-DC servo controller

General

CAN controllers in the iMC-DC and iMC-EC series are compact, powerful drive controllers for 2 to 6 DC servomotors at an ideal price/performance ratio.

The attractive bench housing integrates all control components which are needed to solve a wide variety of automation tasks. They range from the final stage via the I/O assembly to the safety controller. In addition, a 26 cm (10.2") touch screen TFT display and a keyboard are incorporated, which makes for convenient operation.

A CANopen PCI board is integrated in the control computer as an interface. This acts as the CAN master for the drive controller and the I/O module. In addition, external expansions up to 128 CAN nodes are possible with ease.

The NC controller core allows interpolation of up to 6 axes (linear, circular and helical) and online and lock ahead track processing. 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 0 X 0 X 0

Number of axes
2 = 2 axes
3 = 3 axes
4 = 4 axes
5 = 5 axes
6 = 6 axes

Versions
1 = iMC-DC* (brush DC servomotors)
2 = iMC-EC* (brushless EC servomotors)

* including PAL-PC

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)

Subject to technical changes.

Features

- Drive controller for up to 6 brush or brushless DC servomotors
- 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
- external EMERGENCY SHUTDOWN and POWER connection for integration in higher level safety circuits
- Connection for external control signals, such as START, STOP, RESET via signal inputs
- Connection for milling spindle (100 -230V AC)
- 0 .. 10V output for external frequency converter for speed-controlled main spindle
- Control elements in the front of the casing
- Industrial control computer running under Windows® with
  - CANopen PCI board
  - Driver software for CNC controller
- Programming/Operation
  - Remote (optional: ProNC)

Technical specification

- Broadband mains supply
  - 115V AC/230V AC, 50..60 Hz
- Switching power supply 1000W/48V
- iMD10/iMD20 final output stages
  - Power supply 24 - 80V DC
  - Peak current/rated current: 25A/12 A
- Inputs/outputs
  - 16 digital inputs
  - 8 digital outputs
  - 1 analogue output
- Safety controller
  - up to safety category 3
  - Door circuit controller
  - Spindle controller
- Bench casing
  W 630 × H 230 × D 400 mm

Option: without TFT display and keyboard

Scope of supply

- Controller
- mating plug (I/O, pulse, Remote)
- 230V AC mains lead
- PAL-PC software CD
- Operating and programming instructions

electronics

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 controllers
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** (3 m)
	Part no.: **392759 0500** (5 m)
Encoder lead SubD15 plug - SubD15 socket	Part no.: **392740 0300** (3 m)
	Part no.: **392740 0500** (5 m)
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**

Features

- Drive controller for up to four brush or brushless DC servomotors
- 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, such as 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 governed main spindle
- Control elements in the front of the casing (optionally, installed in the rear)
- two alternative casings
- Programming/Operation
  - Remote (optional: ProNC)

Technical specification

- Broadband mains supply
  - 115V AC/230V AC, 50..60 Hz
- Switching power supply unit 1000 W/48 V
- iMD10/iMD20 final output stages
  - Power supply 24 - 80V DC
  - Peak current/rated current: 25A/12 A
- Inputs/outputs
  - 4 digital inputs (24V DC/8mA)
  - 8 digital outputs (24V DC/350mA)
  - 1 relay output (230V AC, max. 6A)
  - 1 analogue output (0 - 10V)
- Safety controller
  - up to safety category 3
  - Door circuit controller
  - Spindle controller
- RJ 45 CANopen interface
- Versions:
- Bench housing
  W 475 × H 410 × D 187.5 mm
- 19" housing
  W 482.5 × H 410 × D 175.5 mm

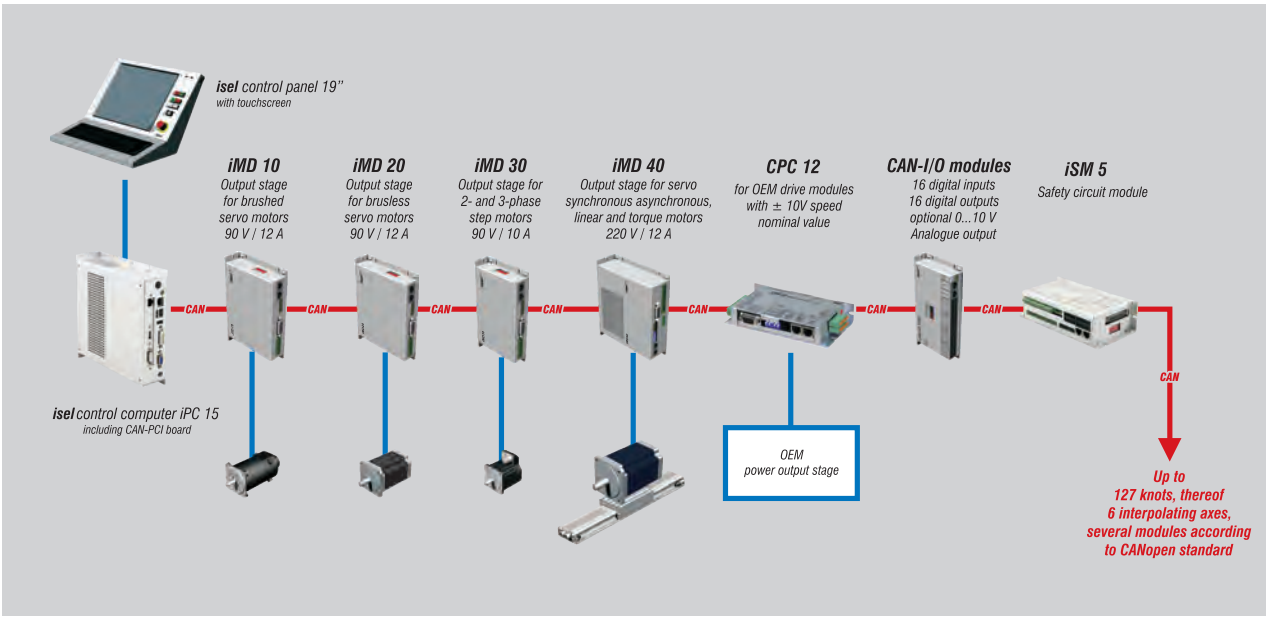
Scope of supply

- Controller
- mating plug (I/O, pulse, Remote)
- CAN bus lead (RJ45, patch lead)
- 230V AC mains lead
- Operating instructions

Subject to technical changes.

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.

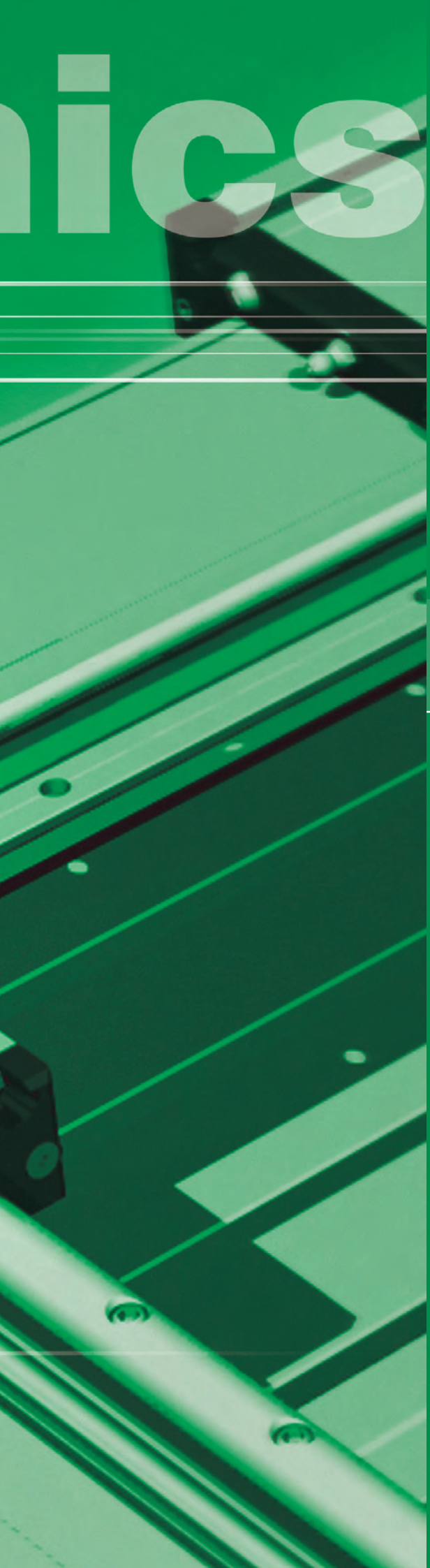
For this purpose, ProNC provides a universal programming environment.

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 to a forecast.
- 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

Subject to technical changes.

mechan



MECHANICS

Aluminium profiles C2

Linear guides C18

Drive elements.....C48

Linear units C56

Rotational units.....C102

Aluminium profiles Overview

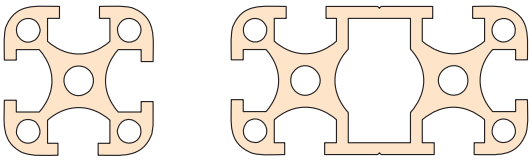
PP profiles Panel profiles C 4

PP 25 PP 50 PP 100 PP 150 PP 200

PP 250

PP 50L

PU profiles Universal profiles C 5

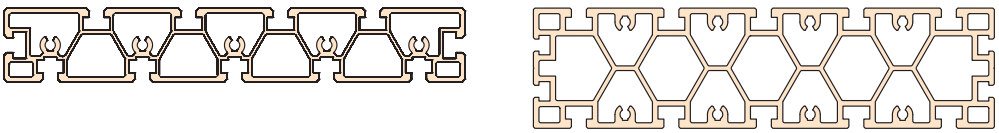


PU 25 PU 50

PT profiles T-groove panels C 6

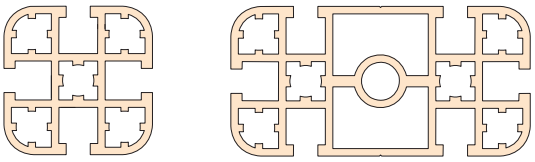
PT 25 PT 50

RE profiles Rectangular profiles C 8



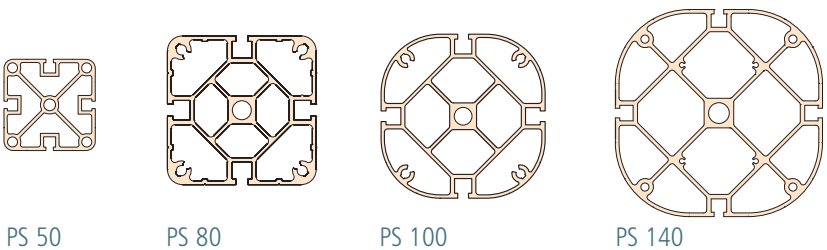
RE 40 RE 65

PL profiles Light frame profiles C 10



PL 40 PL 80

PS profiles Stand profiles C 11



PS 50 PS 80 PS 100 PS 140

Aluminium profiles Overview

AT Workbenches C 13

Accessories C 14

Profile connections C 16

Profile quick clamping extension C 17

CAD data on our website **www.isel.com**

Linear guides

Overview

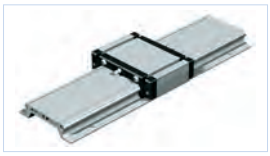
Slide functional overview
General notes

C 20

LFS-8-1 Linear guide rails
LFS-8-2

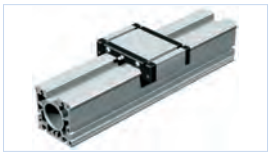
C 22
with LW 6 carriage
with WS 1 aluminium slide

LFS-8-3 Linear guide rail



C 24
with LW 7 carriage
with WS 3 aluminium slide

LFS-8-4 Linear guide rail



C 26
with LW 7 carriage
with WS 3 aluminium slide

LFS-12-1 Linear guide rail

C 28
with LW 3 carriage
with WS 4 aluminium slide
with LS 1 steel slide

LFS-12-11 Linear guide rail

C 30
with LW 5 carriage
with WS 6 aluminium slide

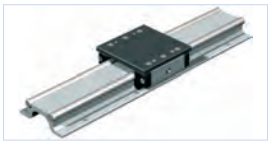
LFS-12-2 Linear guide rail

C 32
with LW 3 carriage
with WS 4 aluminium slide

CAD data on our website **www.isel.com**

Linear guides — Overview

LFS-12-3 Linear guide rail



C 34

with LW 2 carriage
with LW 8 carriage
with WS 7 aluminium slide

LFS-12-10 Linear guide rail

C 36

with LW 4 carriage
with WS 8 aluminium slide
With dual track set 1+2

LFS-16-2 Linear guide rail

C 38

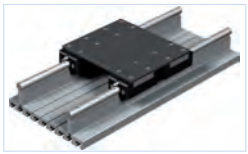
with ILW 3 carriage
with IWS 1 aluminium slide
with ILS 1 steel slide

LFS-16-120 Linear guide rail

C 40

with 2 or 4 IWS 1 aluminium slides
with 2 or 4 ILS 1 steel slides

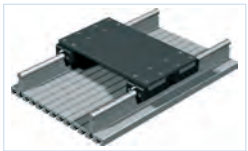
LFS-16-150 Linear guide rail



C 42

with ILS1 steel slide
with IWS1 aluminium slide

LFS-16-250 Linear guide rail



C 43

with ILS1 steel slide
with IWS1 aluminium slide

Accessories — C 44

Operating loads calculation — C 45

CAD data on our website **www.isel.com**

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
- Our profile linkages produce very rigid connections, resistant to tension, distortion and bending by means of drillings and Allen screws in conjunction with PS profiles.
- Profile cutting to order
- Extensive range of accessories (see page C14)

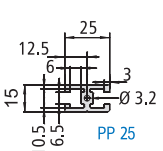
Technical specification

	PP 25	PP 50 L	PP 50	PP 100	PP 150	PP 200	PP 250
Dimensions (W × H)	25 x 15 mm	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 to order)						
Weight	appr. 0.5 kg/m	appr. 1.7 kg/m	appr. 1.1 kg/m	appr. 1.9 kg/m	appr. 2.6 kg/m	appr. 3.4 kg/m	appr. 4.1 kg/m
	1 cavity insert Ø 3.2 mm for M4 screw	2 cavity inserts Ø 5.5 mm for M6 screw	1 cavity insert Ø 5.5 mm for 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	0.88 cm⁴	13.25 cm⁴	8.13 cm⁴	67.27 cm⁴	213.92 cm⁴	482.77 cm⁴	908.52 cm⁴
Moment of inertia I_y	0.54 cm⁴	13.25 cm⁴	1.37 cm⁴	2.46 cm⁴	3.55 cm⁴	4.64 cm⁴	5.74 cm⁴
Moment of resistance W_x	0.70 cm³	4.39 cm³	3.25 cm³	13.45 cm³	28.52 cm³	48.27 cm³	72.68 cm³
Moment of resistance W_y	0.70 cm³	4.39 cm³	1.71 cm³	3.08 cm³	4.44 cm³	5.80 cm³	7.17 cm³

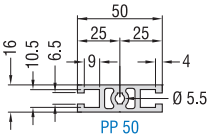
Ordering information

Part no. for L = **1000 mm**	**201 044 1000**	**201 045 1000**	**201 040 1000**	**201 041 1000**	**201 042 1000**	**201 043 1000**	**201 009 1000**
Part no. for L = **3000 mm**	**201 044 3000**	**201 045 3000**	**201 040 3000**	**201 041 3000**	**201 042 3000**	**201 043 3000**	**201 009 3000**

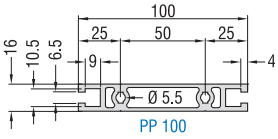
Dimensioned drawings



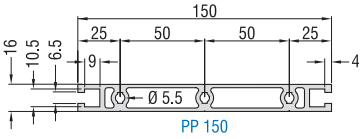
PP 25



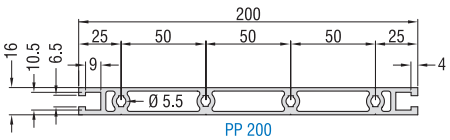
PP 50



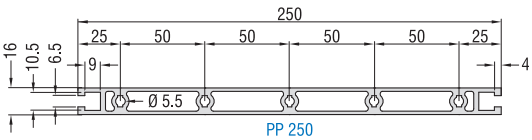
PP 100



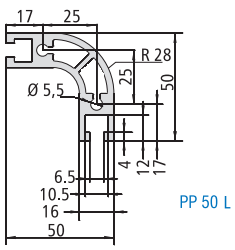
PP 150



PP 200



PP 250



PP 50 L

Universal profiles

PU 25 / PU 50

Merkmale

- For fast and simple erection of frames, benches and racks
- Aluminium, naturally anodised
- Produced to DIN EN 12020-2
- Light, compact & stable
- For universal use
- Suitable for very high loads
- Our clamped linkages produce very rigid connections, resistant to tension, distortion and bending, between profiles by means of profile drillings and clamping elements.
- Profile cutting to order
- Extensive range of accessories (see page C14)

Option: - powder coatings in anthracite and light grey

Technical specification

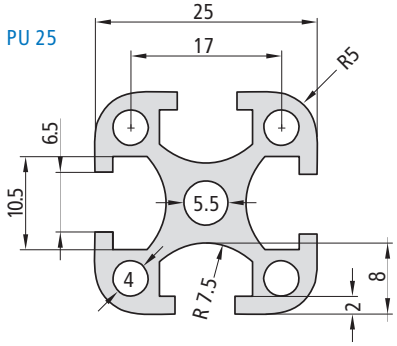
	PU 25	PU 50
Dimensions (W × H)	25 x 25 mm	50 x 25 mm
Length	up to 3 metres (special lengths to order)	
Weight	appr. 0.7 kg/m	appr. 1.3 kg/m
	4 T-key inserts for M6 sliding nuts Cavity insert, Ø 5.5 mm for M6	4 T-key inserts for M6 sliding nuts 2 cavity inserts, Ø 5.5 mm for M6
Moment of inertia I_x	1.43 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 information

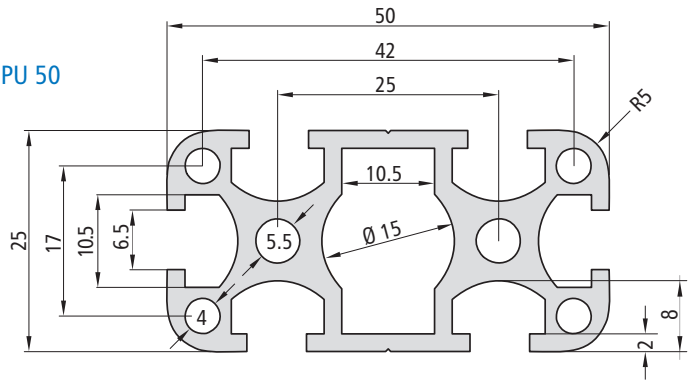
Profile description	Part no.: L = **1000 mm** Part no.: L = **3000 mm**
PU 25 W 25 × H 25 mm	200 001 **1000** 200 001 **3000**
PU 50 W 50 × H 25 mm	200 002 **1000** 200 002 **3000**

Dimensioned drawings

PU 25



PU 50



T-groove panels

PT 25

Figure:
T-key plate PT 25 (square) and T-key plate PT 25 (circular) with optional drainage channel

Features

- Universal precision, clamping and machining surface
- Aluminium, naturally anodised
- Produced to 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 C14)
- Option:
  - Drainage channel for small quantities of liquid

Technical specification

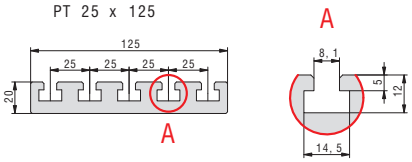
	PT 25		
Dimensions (W × H)	125 x 20 mm	250 x 20 mm	375 x 20 mm
Length	up to 3 metres (special lengths to order)		
Weight	appr. 4.8 kg/m	appr. 9.6 kg/m	appr. 13.7 kg/m
T-grooves	one-sided in 25 mm raster		
Moment of inertia I_x	243.36 cm^4	1848.57 cm^4	5996.01 cm^4
Moment of inertia I_y	6.46 cm^4	12.77 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 information

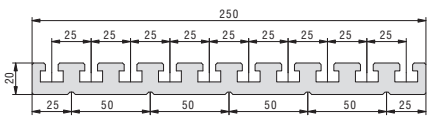
L [mm]	**PT 25** W 125 × H 20 mm	**PT 25** W 250 x H 20 mm	**PT 25** W 375 x H 20 mm
	Part no.	Part no.	Part no.
400	201 014 **0400**	201 018 **0400**	201 020 **0400**
500	201 014 **0500**	201 018 **0500**	201 020 **0500**
600	201 014 **0600**	201 018 **0600**	201 020 **0600**
700	201 014 **0700**	201 018 **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

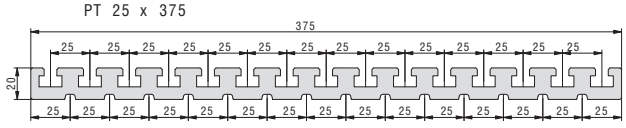
PT 25 x 125



PT 25 x 250



PT 25 x 375



T-slot blocks - see accessories, aluminium profiles

T-groove panels

PT 50

Features

- Universal precision, clamping and machining surface
- Aluminium, naturally anodised
- Produced to 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 C14)

Technical specification

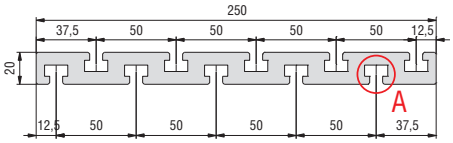
	PT 50	
Dimensions (W × H)	250 x 20 mm	375 x 20 mm
Length	up to 3 metres (special lengths to order)	
Weight	appr. 10.0 kg/m	appr. 14.8 kg/m
T-grooves	both-sided in 50 mm raster	
Moment of inertia I_x	2062.99 cm^4	6745.96 cm^4
Trägheitsmoment I_y	13.85 cm^4	20.63 cm^4
Moment of resistance W_x	165.04 cm^3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

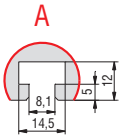
Ordering information

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**

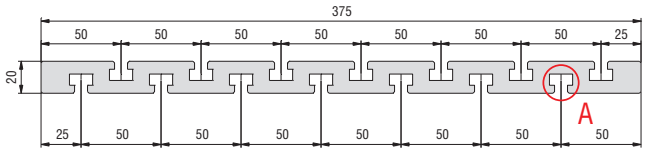
Dimensioned drawings

PT 50 x 250





PT 50 x 375



T-slot blocks - see accessories, aluminium profiles

mechanics

Rectangular profiles

RE 40

Features

- Universal precision, clamping and machining surface
- As a stabiliser for machine and sub-frame constructions
- Aluminium, naturally anodised
- Produced to DIN EN 12020-2
- Light & very stable
- Numerous applications with the accessories are possible
- Profile cutting to order
- Extensive range of accessories (see page C14)

Technical specification

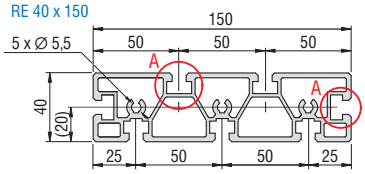
	RE 40		
Dimensions (W × H)	150 x 40 mm	250 x 40 mm	350 x 40 mm
Length	up to 3 metres (special lengths to order)		
Weight	appr. 4.8 kg/m	appr. 7.6 kg/m	appr. 10.4 kg/m
	various cavities and T-slot inserts for sliding nuts or M6 tapped strips for frontal inserts for M6 screws		
Moment of inertia I_x	393.7 cm^4	1654.53 cm^4	4306.69 cm^4
Moment of inertia I_y	33.42 cm^4	54.18 cm^4	75.00 cm^4
Moment of resistance W_x	52.49 cm^3	131.64 cm^3	246.1 cm^3
Moment of resistance W_y	16.71 cm^3	27.09 cm^3	37.5 cm^3

Ordering information

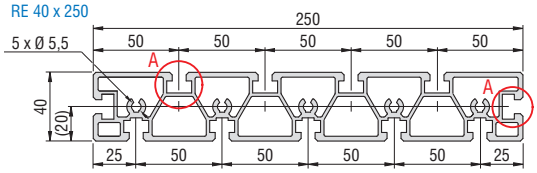
Profile description	Part no.: L = **1000 mm** Part no.: L = **3000 mm**
RE 40 W 150 x H 40 mm	201 035 **1000** 201 035 **3000**
RE 40 W 250 x H 40 mm	201 030 **1000** 201 030 **9000**
RE 40 W 350 x H 40 mm	201 031 **1000** 201 031 **8305**

Dimensioned drawings

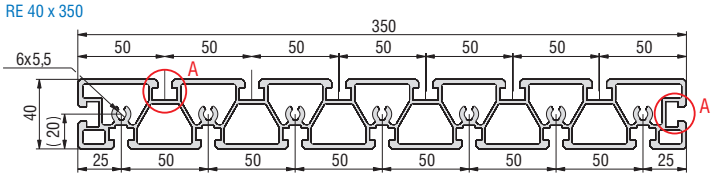
RE 40 x 150

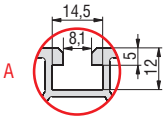


RE 40 x 250



RE 40 x 350





Rectangurlar profiles

RE 65

Features

- Universal precision, clamping and machining surface
- As a stabiliser for machine and sub-frame constructions
- Aluminium, naturally anodised
- Produced to DIN EN 12020-2
- Light & very stable
- Milled flat on both sides
- Numerous applications with the accessories are possible
- Profile cutting to order
- Extensive range of accessories (see page C14)

Technical specification

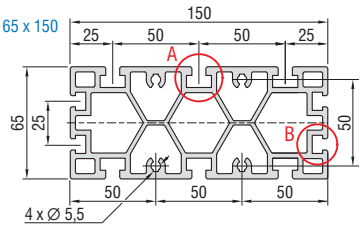
	RE 65		
Dimensions (W × H)	150 x 65 mm	250 x 65 mm	350 x 65 mm
Length	up to 3 metres (special lengths to order)		
Weight	appr. 7.7 kg/m	appr. 12.4 kg/m	appr. 17.0 kg/m
	various cavities and T-slot inserts for sliding nuts or M6 tapped strips for frontal inserts for M6 screws		
Moment of inertia I_x	633.47 cm⁴	2,658.48 cm⁴	6,953.91 cm⁴
Moment of inertia I_y	148.87 cm⁴	243.85 cm⁴	338.52 cm⁴
Moment of resistance W_x	84.46 cm³	212.68 cm³	397.37 cm³
Moment of resistance W_y	45.83 cm³	75.03 cm³	104.16 cm³

Ordering information

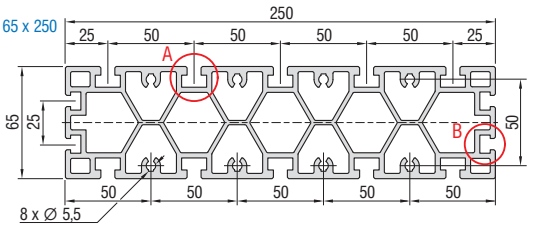
Profile description	Part no.: L = **1000 mm** Part no.: L = **3000 mm**
RE 65 W 150 x H 65 mm	201 034 **1000** 201 034 **3000**
RE 65 W 250 x H 65 mm	201 032 **1000** 201 032 **3000**
RE 65 W 350 x H 65 mm	201 033 **1000** 201 033 **3000**

Dimensioned drawings

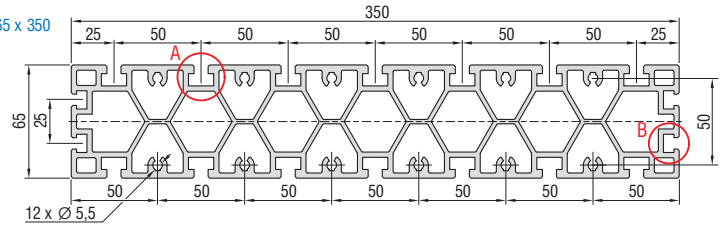
RE 65 x 150

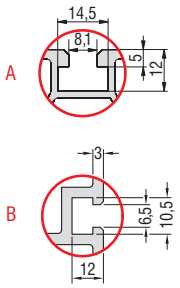


RE 65 x 250



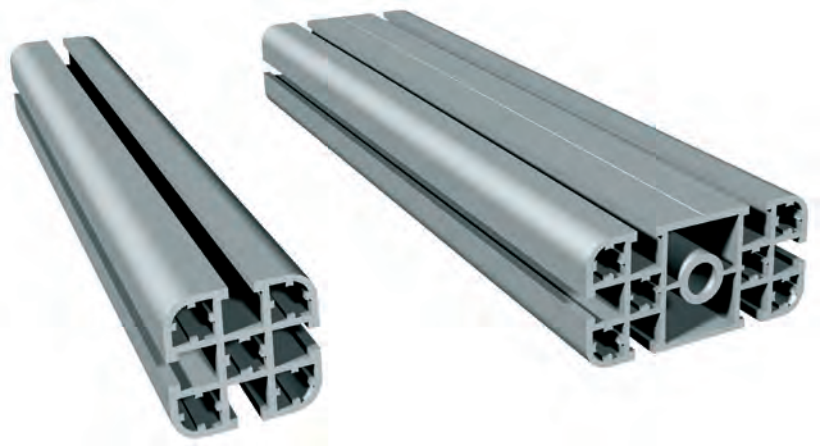
RE 65 x 350





Light frame profiles

PL 40/PL 80



Features

- For fast and simple erection of frames, benches and racks
- Aluminium, naturally anodised
- Produced to DIN EN 12020-2
- Light, compact & stable
- Suitable for very high loads
- Our clamped linkages produce very rigid connections between profiles, resistant to tension, distortion and bending, through profile drillings and clamping elements
- Profile cutting to order
- Extensive range of accessories (see page C14)

Option: - powder coatings in anthracite and light grey

Technical specification

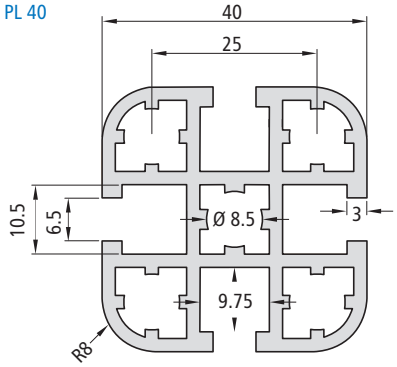
	PL 40	PL 80
Dimensions (W × H)	40 x 40 mm	80 x 40 mm
Length	up to 3 metres (special lengths to order)	
Weight	appr. 1.5 kg/m	appr. 2.9 kg/m
	4 T-slot inserts for M6 sliding nuts 5 cavity inserts, Ø 8.5 mm for M10	6 T-slot inserts for M6 sliding nuts 6 cavity inserts, Ø 8.5 mm for M10 Cavity insert, Ø 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 information

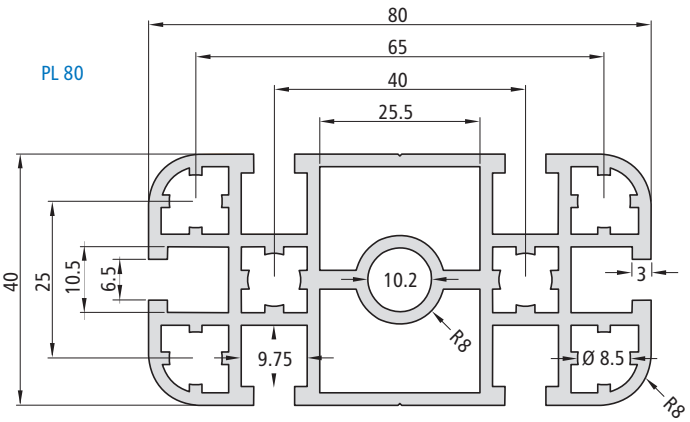
Profile description	Part no.: L = **1000 mm** Part no.: L = **3000 mm**
PL 40 W 40 x H 40 mm	200 008 **1000** 200 008 **3000**
PL 80 W 80 x H 40 mm	200 009 **1000** 200 009 **3000**

Dimensioned drawings

PL 40



PL 80



Stand profiles

PS 50 / PS 80

Features

- For fast and simple erection of frames, benches and racks
- Aluminium, naturally anodised
- Produced to 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 to order
- Extensive range of accessories (see page C14)

Option: - powder coatings in anthracite and light grey

Technical specification

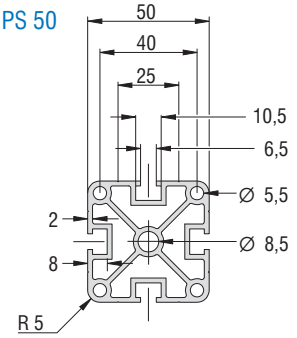
	PS 50	PS 80
Dimensions (W × H)	50 x 50 mm	80 x 80 mm
Length	up to 3 metres (special lengths to order)	
Weight	appr. 2.3 kg/m	appr. 4.5 kg/m
	4 T-slot inserts for M6 sliding nuts 4 cavity inserts, Ø 5.5 mm for M6 Cavity insert, Ø 8.5 mm for M10	4 T-slot inserts for M6 sliding nuts 4 cavity inserts, Ø 5.5 mm for M6 Cavity insert, Ø 8.5 mm for M10
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 information

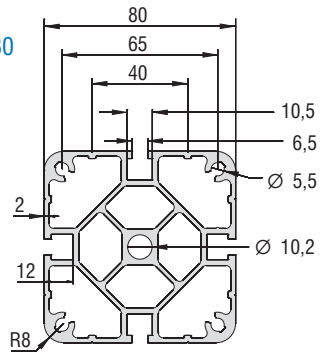
Profile description	Part no.: L = **1000 mm** Part no.: L = **3000 mm**
PS 50 W 50 x H 50 mm	200 003 **1000** 200 003 **3000**
PS 80 W 80 x H 80 mm	200 014 **1000** 200 014 **3000**

Dimensioned drawings

PS 50



PS 80



Stand profiles

PS100 / PS140

Features

- For fast and easy erection of frames, benches and racks
- Aluminium, naturally anodised
- Produced to DIN EN 12020-2
- Light, compact & stable
- Suitable for high loadings
- Our clamped linkages produce very rigid connections, resistant to tension, distortion and bending, between profiles
- Profile cutting to order
- Extensive range of accessories (see page C14)

Option: - powder coatings in anthracite and light grey

Technical specification

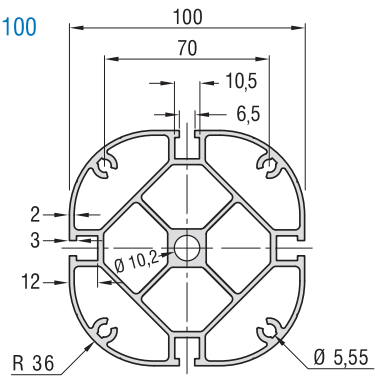
	PS 100	PS 140
Dimensions (W × H)	100 x 100 mm	140 x 140 mm
Length	up to 3 metres (special lengths to order)	
Weight	appr. 5.1 kg/m	appr. 9.2 kg/m
	4 T-slot inserts for M6 sliding nuts 4 cavity inserts, Ø 5.55 mm for M6 Cavity insert, Ø 10.2 mm for M12	4 T-slot inserts for M6 sliding nuts 4 cavity inserts, Ø 5.5 mm for M6 4 cavity inserts, Ø 3.4 mm for M4 Cavity insert, Ø 14 mm for M16
Moment of inertia I_x	163.00 cm⁴	601.80 cm⁴
Moment of inertia I_y	163.00 cm⁴	598.11 cm⁴
Moment of resistance W_x	32.60 cm³	85.97 cm³
Moment of resistance W_y	32.60 cm³	85.44 cm³

Ordering information

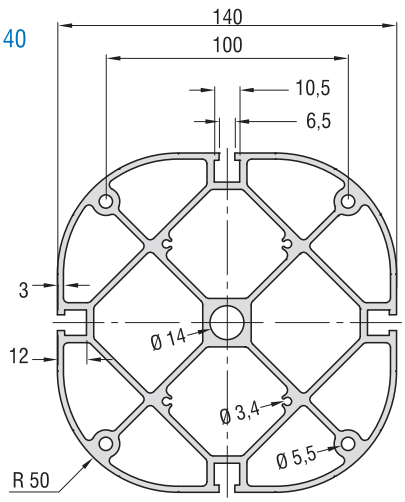
Profile description	Part no.: L = **1000 mm** Part no.: L = **3000 mm**
PS 100 W 100 x H 100 mm	200 015 **1000** 200 015 **3000**
PS 140 W 140 x H 140 mm	200 016 **1000** 200 016 **3000**

Dimensioned drawings

PS 100



PS 140



Workbenches AT

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 right angle profiles 40 × 250 mm with T-key inserts

Options

- length up to 2 m
- Various accessories

Bench 1

Bench 2

Accessories

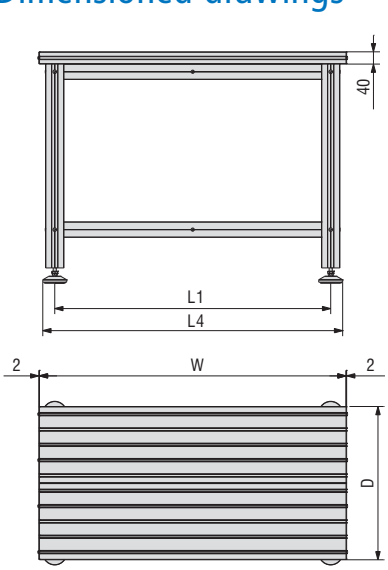
Insert base for AT 1
Part no.: **248551 0010**

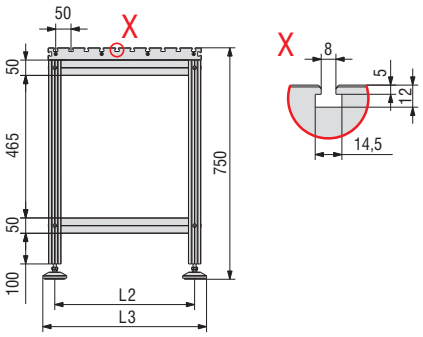
Insert base for AT 2
Part no.: **248551 0012**

Ordering information

Part no.	Description	Loading: surface load	Weight
248 550 0010	Bench 1, W 1000 × D 500 × H 750 mm	200 kg	appr. 30 kg
248 550 0012	Bench 2, W 1500 × D 750 × H 750 mm	400 kg	appr. 60 kg

Dimensioned drawings





Description	W	D	L 1	L 2	L 3	L 4
Bench 1	1,000	500	900	456	536	980
Bench 2	1,500	750	1,380	680	800	1,500

mechanics

Accessories

Tapped rails

M6 tapped rail
• 13 x 6 mm • galvanised
• M6 Ra 50 mm • VE 3 pcs. at 1m
• for PT/RE 40, 65
Part no.: **209010**

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

Sliding nuts

M6 sliding nut (Figure 1)
• L25 x W10 x H3.5 • galvanised
• VE 100 pcs.
• all except PT/RE 40, 65
Part no.: **209001 0005**

M6 sliding nut (Figure 1)
• L 25 x W 13 x H 5 mm
• galvanised
• VE 50 pcs.
• for PT/RE 40, 65
Part no.: **209004 0001**

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

2 × M6 sliding nuts (Figure 2)
• L 45 x W 13 x H 6 mm
• galvanised
• 2 × M6 Ra 25 mm • VE 25 pcs.
• for PT/RE 40, 65
Part no.: **209005 0001**

M5 sliding nut
• L25 × W10 × H3.5 • galvanised
• VE 20 pcs.
• for all except PT/RE 40, 65
Part no.: **209006 0001**

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

Special angle sliding nut 3 × M6 (Figure 4)
• galvanised • VE 25 pcs.
• for all except PT/RE 40, 65
Part no.: **209022 0003**

Sliding nuts

M5/M6 sliding nuts
• galvanised • VE 20 pcs.
• 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)
rhombus-shaped
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 pcs.
• 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 pcs. + fixing material
L 125 mm
Part no.: **290021 0125**
L 175 mm
Part no.: **290021 0175**
L 225 mm
Part no.: **290021 0225**

T-slot blocks

M6 T-slot block
• DIN 508 • hardened
• VE 20 pcs.
• for PT/RE 40, 65
Part no.: **209119 0003**

Edging strip/section

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)

Black edging profile 2-part
• Plate thicknesses 3 - 6 mm
• VE 3 pcs. at 3 m
• for all except PT
Part no.: **209212 3000**

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 pcs. + fixing
• Ra 43 × 20 mm
• for PL
Part no.: **209050 0012**

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

Subject to technical modifiactions.

Accessories

Profile connection cubes

Profile connection cubes black

- VE 10 pcs. + fixing material
- for PU 25

2×Part no.: **209104 0002**
3×Part no.: **209103 0002**

Profile connection cubes, black

- VE 10 pcs. + fixing material
- for PU 25

3×Part no.: **209106 0002**
4×Part no.: **209107 0002**

Profile connection cubes black

- VE 10 pcs. + fixing material
- for PU 25

4×Part no.: **209108 0002**
5×Part no.: **209109 0002**

T-groove cover

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

Aluminium corner connectors

Aluminium corner connectors

- L 25 × W 25 × H 15 mm
- VE 10 pcs. + 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 pcs. + fixing material
- for PP/PL/PS/PU

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

- L 50 × W 50 × H 15 mm
- VE 10 pcs. + fixing material
- for RE/PU/PS

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

- L 80 × W 80 × H 22 mm
- VE 10 pcs. + 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 pcs. + 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 pcs.
- 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**

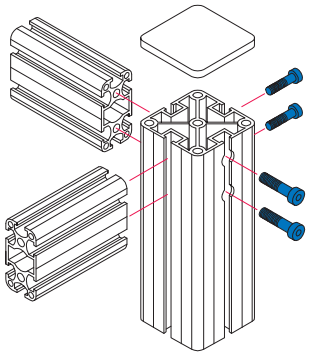
We reserve the right to make technical changes.

Current information under www.mechanik.isel.com

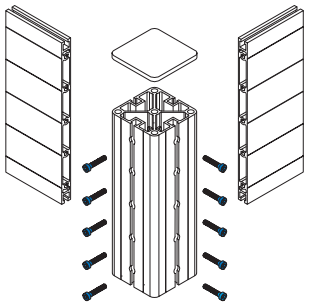
Profile connections

Examples:

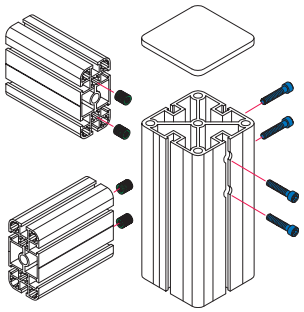
PS 50 with PU 50



PS 50 with PP 250



PS 80 with PL 80



Allen screws

Allen screws
M6 × 25 mm
- VE 10 pcs.
  Part no.: **209147 0009**
- VE 50 units
  Part no.: **209147 0010**

Allen screws
M6 × 50 mm
- VE 10 pcs.
  Part no.: **209147 0003**
- VE 50 units
  Part no.: **209147 0004**

Allen key
SW 5
- DIN 911
- VE 1 pcs.

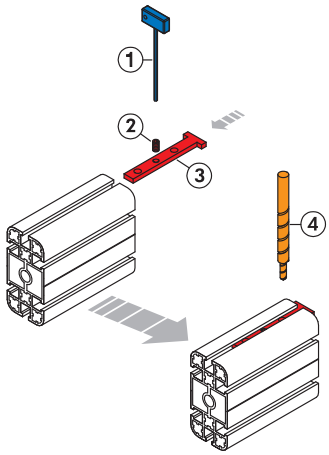
Part no.: **931152**

Tapped bushings

Tapped bushings
M9/M6
- VE 10 pcs.
  Part no.: **209147 0001**
- VE 50 units
  Part no.: **209147 0002**

Tapped bushings
M10/M6
- VE 10 pcs
  Part no.: **209147 0124**
- VE 50 pcs
  Part no.: **209147 0125**

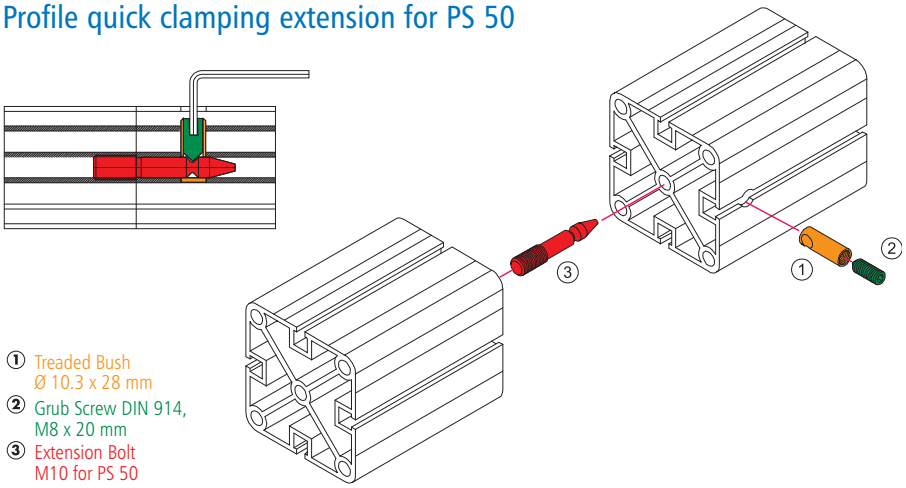
Example PL 80



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

Example:

Profile quick clamping 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**

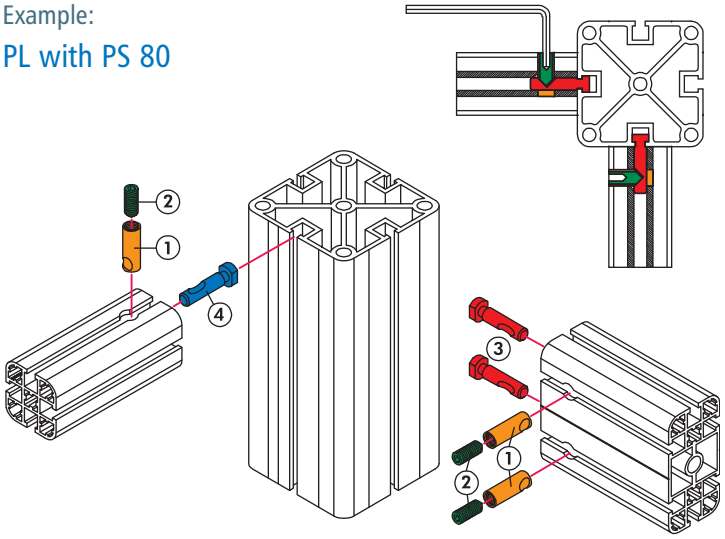
matching drill pattern 2
Part no.: **290015 0002**

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

Profile quick clamping connections

Example:

PL with PS 80

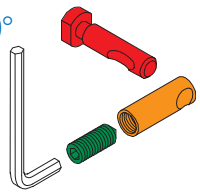


① Treaded Bush Ø 10.3 x 28 mm
② Grub Screw DIN 914, M6 x 20 mm
③ Connection Bolt 0° for PL 40 and PL 80
④ Connection Bolt 90° for PL 40 and PL 80

Quick Clamping Connection 0°

e.g. for

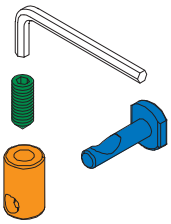
PL/PS 80



Quick Clamping Connection 90°

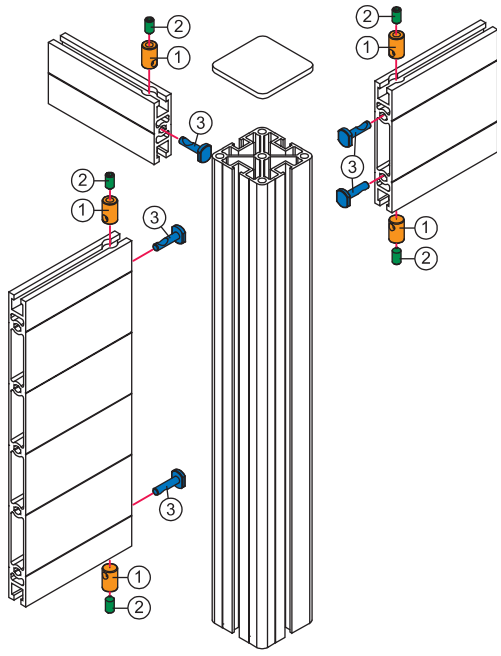
e.g. for

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°

Quick clamping 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

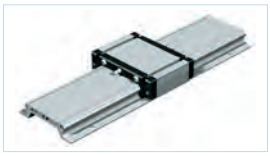
Slide functional overview
General notes

C 20

LFS-8-1 Linear guide rails
LFS-8-2

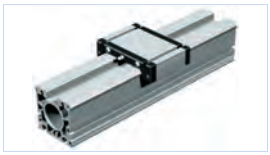
C 22
with LW 6 carriage
with WS 1 aluminium slide

LFS-8-3 Linear guide rail



C 24
with LW 7 carriage
with WS 3 aluminium slide

LFS-8-4 Linear guide rail



C 26
with LW 7 carriage
with WS 3 aluminium slide

LFS-12-1 Linear guide rail

C 28
with LW 3 carriage
with WS 4 aluminium slide
with LS 1 steel slide

LFS-12-11 Linear guide rail

C 30
with LW 5 carriage
with WS 6 aluminium slide

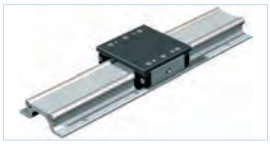
LFS-12-2 Linear guide rail

C 32
with LW 3 carriage
with WS 4 aluminium slide

CAD data on our website **www.isel.com**

Linear guides — Overview

LFS-12-3 Linear guide rail



C 34

with LW 2 carriage
with LW 8 carriage
with WS 7 aluminium slide

LFS-12-10 Linear guide rail

C 36

with LW 4 carriage
with WS 8 aluminium slide
With dual track set 1+2

LFS-16-2 Linear guide rail

C 38

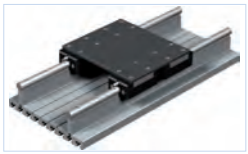
with ILW 3 carriage
with IWS 1 aluminium slide
with ILS 1 steel slide

LFS-16-120 Linear guide rail

C 40

with 2 or 4 IWS 1 aluminium slides
with 2 or 4 ILS 1 steel slides

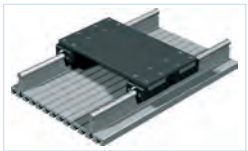
LFS-16-150 Linear guide rail



C 42

with ILS1 steel slide
with IWS1 aluminium slide

LFS-16-250 Linear guide rail



C 43

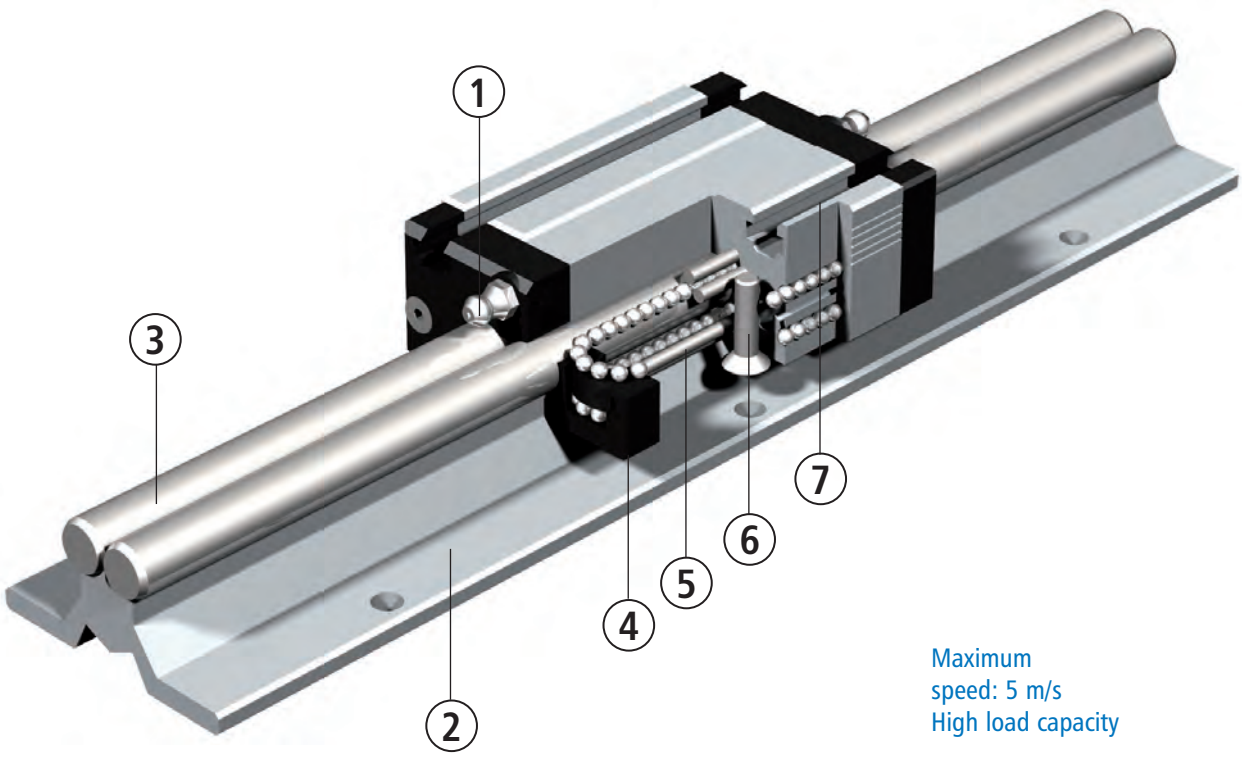
with ILS1 steel slide
with IWS1 aluminium slide

Accessories — C 44

Operating loads calculation — C 45

CAD data on our website **www.isel.com**

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.

A 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. Both sides greasing option for the recirculating balls.
2. The basic supports for all linear guides are extruded aluminium profiles to DIN EN 12020-2, which are provided with T-key inserts for fastening in the body of the profile or have fixing borings.
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 is reinforced with glass fibre.
5. There are patented recirculating balls in the linear slides. Ball bearings run in each case between two ground steel pins and the guidance shaft.
6. The slide is adjusted with self-locking setting screws. This is how the rows of balls and shafts or pins are used with each other and thus pre-stressed. The slides are preset in the factory to the correct stress. All shaft slides are optinally available stainless.
7. To secure transport loads, slide plates, etc., the shaft slides are provided with T-key inserts or fixing borings.

General notes

Load capacity and working life

Installation position

In principal, the installation position 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 from 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/1,000 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 C_0
- the static torques M_{0X}, M_{0Y} and M_{0Z}

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

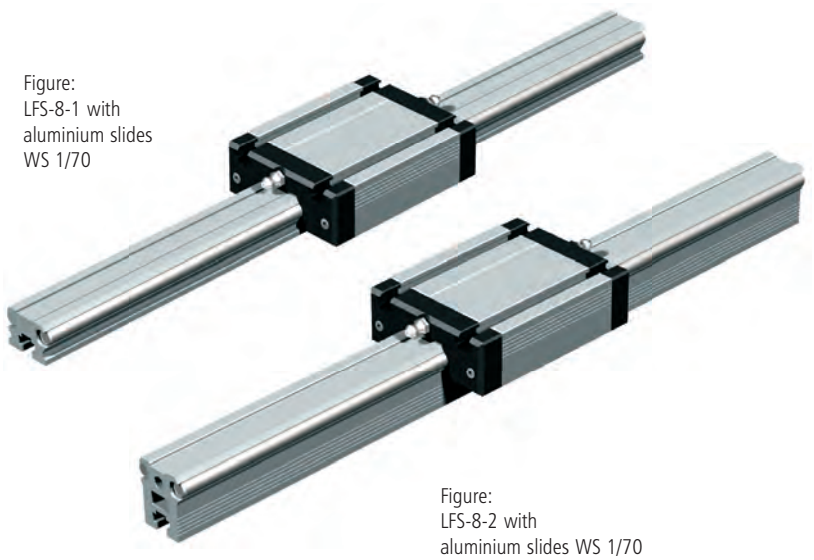


Figure:
LFS-8-1 with
aluminium slides
WS 1/70

Figure:
LFS-8-2 with
aluminium slides 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 T-key insert
- Conditionally self-supporting
- Special lengths to order
- Weights: appr.1.6 kg/m (LFS-8-1)
  appr. 2.0 kg/m (LFS-8-2)

Options:

- stainless design
- 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

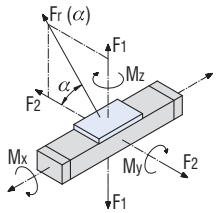
Profile up to 6,000 mm available without impact connection, steel shafts divided.

Load data

Shaft slide WS 1/70	
C_o	3114 N
C	1846 N
F_1 stat.	2659 N
F_1 dyn.	1576 N
F_2 stat.	3114 N
F_2 dyn.	1846 N
M_x stat.	37.3 Nm
M_y stat.	100.5 Nm
M_z stat.	117.6 Nm
M_x dyn.	22.1 Nm
M_y dyn.	59.5 Nm
M_z dyn.	69.7 Nm

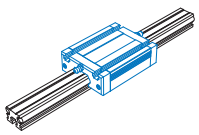
Shaft slide WS 1	
C_o	4590 N
C	2390 N
F_1 stat.	3920 N
F_1 dyn.	2041 N
F_2 stat.	4590 N
F_2 dyn.	2390 N
M_x stat.	55.0 Nm
M_y stat.	148.1 Nm
M_z stat.	173.4 Nm
M_x dyn.	28.6 Nm
M_y dyn.	77.1 Nm
M_z dyn.	90.2 Nm

Carriage LW 6	
C_o	2160 N
C	4000 N
F_1 stat.	4320 N
F_1 dyn.	3792 N
F_2 stat.	2160 N
F_2 dyn.	4000 N
M_x stat.	121.1 Nm
M_y stat.	194.4 Nm
M_z stat.	97.2 Nm
M_x dyn.	106.3 Nm
M_y dyn.	170,6 Nm
M_z dyn.	180.0 Nm



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

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

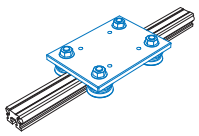


Aluminium slide

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

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

L 126 x W 72 x H 28.5 mm (WS 1)
(Weight: appr. 0.5 kg)
Part no.: **223100**
Stainless steel: **223101**



Carriage LW 6

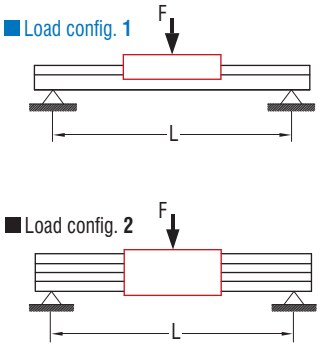
- L 125 × W 90 × H 7.7 mm
- ground steel plate
- 4 rollers Ø 31, sealed for life
- adjustable for no play
- Weight: appr. 1 kg

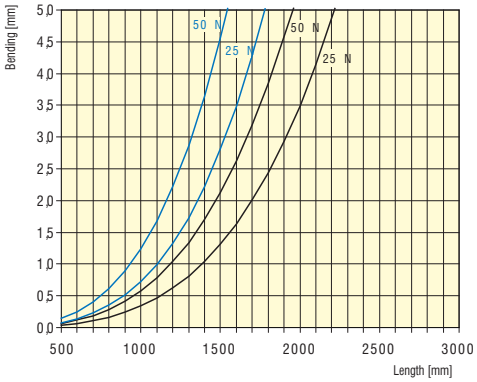
Part no.: **223011**

Linear guide rails

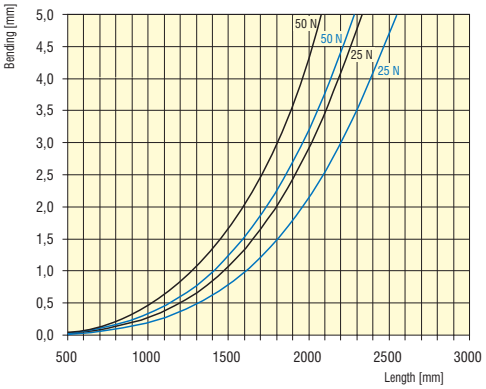
LFS-8-1
LFS-8-2

Bending



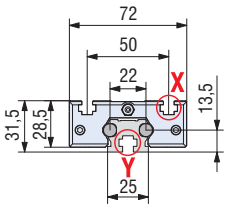


LFS-8-1

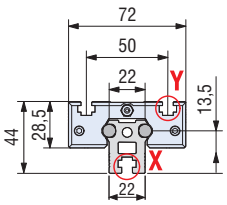


LFS-8-2

Dimensioned drawings

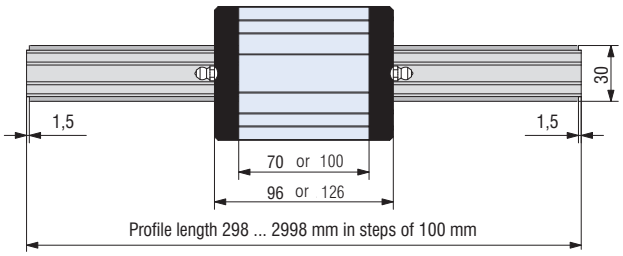


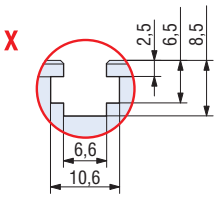
LFS-8-1

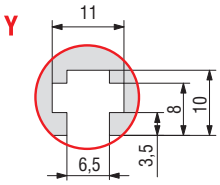


LFS-8-2

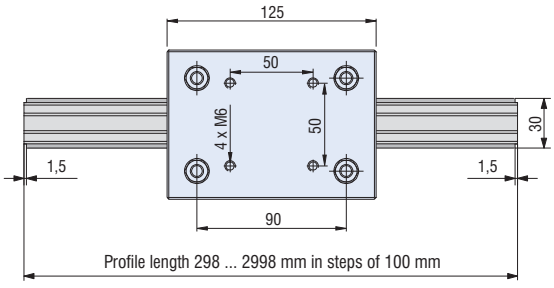
LFS-8-1 or **LFS-8-2** with aluminium slide **WS 1/70** or **WS 1**

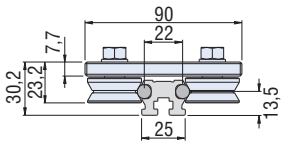




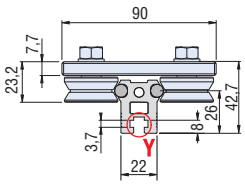


LFS-8-1 or **LFS-8-2** with carriage **LW 6**





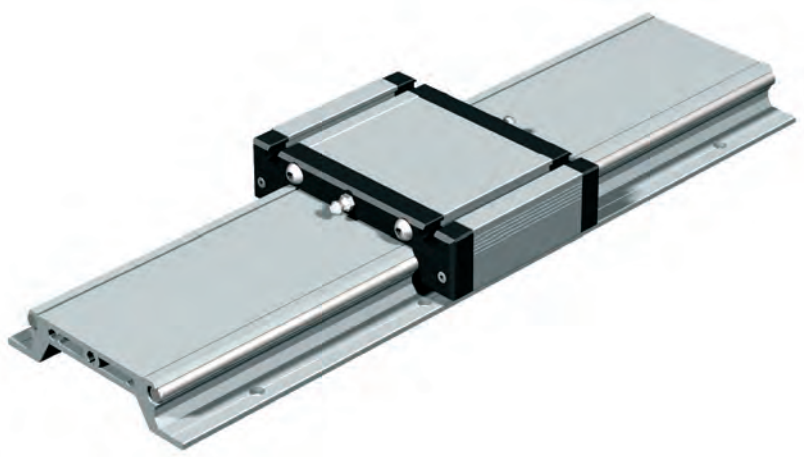
LFS-8-1



LFS-8-2

Linear guide rail

LFS-8-3



Features

- W 115 × 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: appr. 3.2 kg/m
- Option: stainless design

Ordering key

235 00X XXXX

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

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

Steel shaft length: Length overall L -1 mm

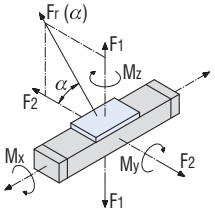
Profile up to 6000 mm available without impact link, steel shafts divided.

Load data

Shaft slide WS 3/70	
C_o	3141 N
C	1879 N
F_1 stat.	2682 N
F_1 dyn.	1604 N
F_2 stat.	3141 N
F_2 dyn.	1879 N
M_x stat.	115.7 Nm
M_y stat.	105.3 Nm
M_z stat.	123.3 Nm
M_x dyn.	69.2 Nm
M_y dyn.	62.9 Nm
M_z dyn.	73.7 Nm

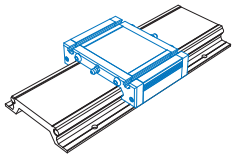
Shaft slide WS 3	
C_o	6945 N
C	3190 N
F_1 stat.	5931 N
F_1 dyn.	2724 N
F_2 stat.	6945 N
F_2 dyn.	3190 N
M_x stat.	255.9 Nm
M_y stat.	232.8 Nm
M_z stat.	272.5 Nm
M_x dyn.	117.5 Nm
M_y dyn.	106.9 Nm
M_z dyn.	125.1 Nm

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



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

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

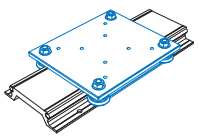


Aluminium slide

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

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

L 176 × W 130 × H 32 mm (WS 3)
(Weight: appr. 0.9 kg)
Part no.: **223103**
Stainless steel: **223103 1000**



Carriage LW 7

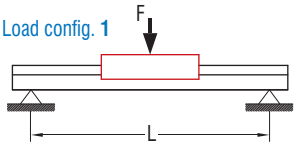
- L 175 × W 150 × H 7.5 mm
- ground steel plate
- 4 rollers Ø 31, sealed for life
- adjustable for no play
- Weight: appr. 2 kg

Part no.: **223012**

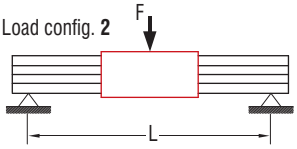
Linear guide rail LFS-8-3

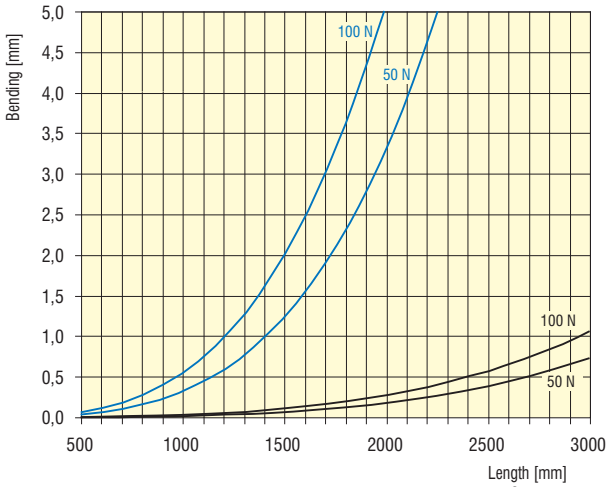
Bending

Load config. **1**

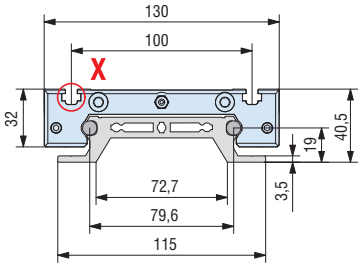


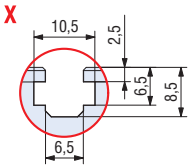
Load config. **2**



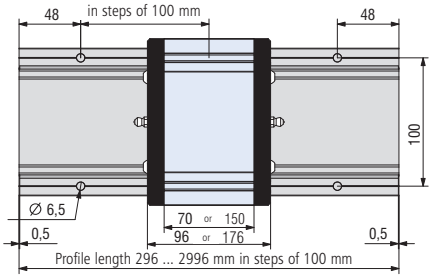


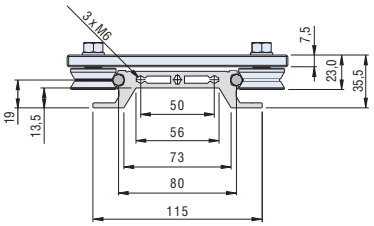
Dimensioned drawings



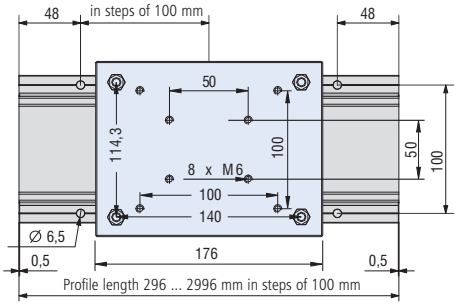


LFS-8-3 with aluminium slides **WS 3/70 or WS 3**





LFS-8-3 with carriage **LW 7**



Linear guide rail

LFS-8-4

Diagram:
LFS-8-4 with 2 steel shafts
and an aluminium slide

Diagram:
LFS-8-4 with 4 steel shafts
and two aluminium slides (optional)

Features

- W 80 × H 80 mm
- 2 precision steel shafts Ø 8
- anti-twist
- Aluminium shaft housing profiles, naturally anodised
- Fixing from below with M6 tapped rails in the T-key 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: appr.7.2 kg/m
- Options: stainless design
  2 extra steel shafts
  2. slides or carriage

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: Length overall L -3 mm

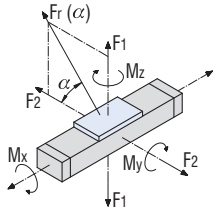
Profile up to 6000 mm available without impact link, steel shafts divided.

Load data

Shaft slide WS 3/70	
C_o	3141 N
C	1879 N
F_1 stat.	2682 N
F_1 dyn.	1604 N
F_2 stat.	3141 N
F_2 dyn.	1879 N
M_x stat.	115.7 Nm
M_y stat.	105.3 Nm
M_z stat.	123.3 Nm
M_x dyn.	69.2 Nm
M_y dyn.	62.9 Nm
M_z dyn.	73.7 Nm

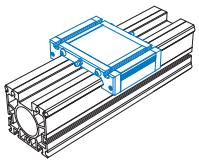
Shaft slide WS 3	
C_o	6945 N
C	3190 N
F_1 stat.	5931 N
F_1 dyn.	2724 N
F_2 stat.	6945 N
F_2 dyn.	3190 N
M_x stat.	255.9 Nm
M_y stat.	232.8 Nm
M_z stat.	272.5 Nm
M_x dyn.	117.5 Nm
M_y dyn.	106,9 Nm
M_z dyn.	125.1 Nm

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



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

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

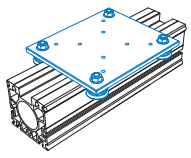


Aluminium slide

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

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

L 176 × W 130 × H 32 mm (WS 3)
(Weight: appr. 0.9 kg)
Part no.: **223103**
Stainless steel: **223103 1000**



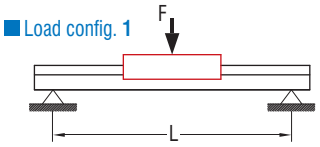
Carriage LW 7

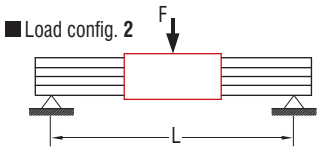
- L 175 × W 150 × H 7.5 mm
- ground steel plate
- 4 rollers Ø 31, sealed for life
- adjustable for no play
- Weight: appr. 2 kg

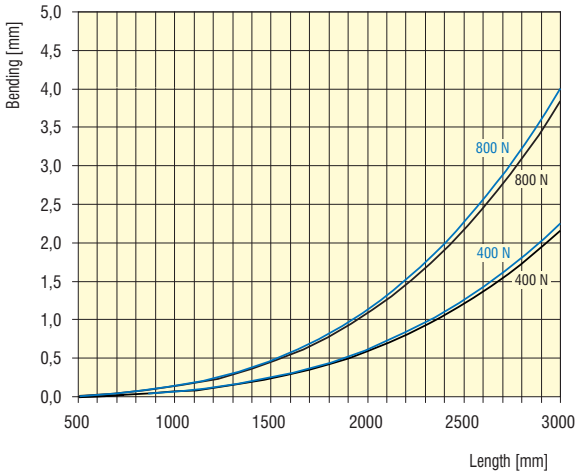
Part no.: **223012**

Linear guide rail LFS-8-4

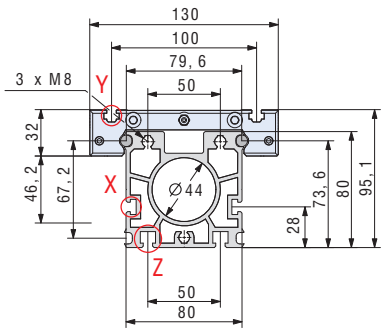
Bending



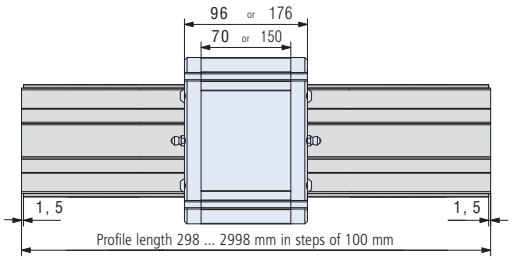




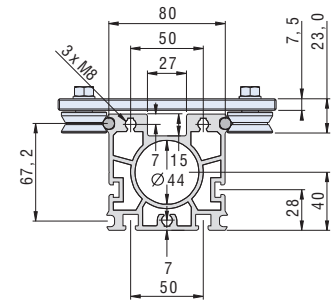
Dimensioned drawings

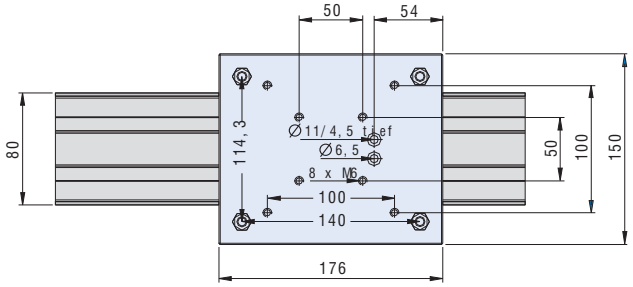


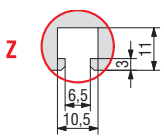
LFS-8-4 with aluminium slide WS 3/70 or WS 3



LFS-8-4 with carriage LW 7







Linear guide rail

LFS-12-1

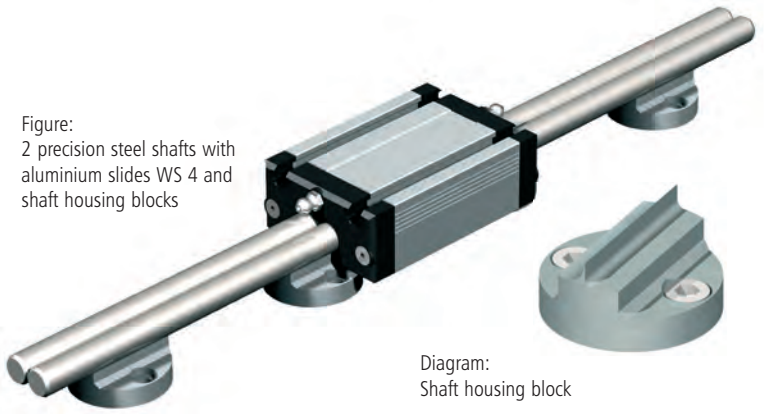


Figure:
2 precision steel shafts with aluminium slides WS 4 and shaft housing blocks

Diagram:
Shaft housing block

Features

- W 40 × 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: appr. 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

Load data

Shaft slide WS 4/70	
C_0	3003 N
C	1873 N
F_1 stat.	2821 N
F_1 dyn.	1599 N
F_2 stat.	3303 N
F_2 dyn.	1873 N
M_x stat.	29.8 Nm
M_y stat.	105.3 Nm
M_z stat.	123.3 Nm
M_x dyn.	16.8 Nm
M_y dyn.	59.7 Nm
M_z dyn.	69.9 Nm

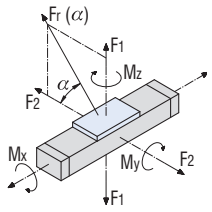
Shaft slide WS 4	
C_0	4868 N
C	2426 N
F_1 stat.	4157 N
F_1 dyn.	2071 N
F_2 stat.	4868 N
F_2 dyn.	2426 N
M_x stat.	43.9 Nm
M_y stat.	155.2 Nm
M_z stat.	181.7 Nm
M_x dyn.	21.8 Nm
M_y dyn.	77.3 Nm
M_z dyn.	90.5 Nm

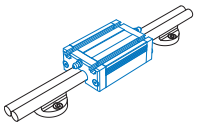
Steel slide LS 1	
C_0	3508 N
C	2105 N
F_1 stat.	3549 N
F_1 dyn.	2130 N
F_2 stat.	3508 N
F_2 dyn.	2105 N
M_x stat.	36.2 Nm
M_y stat.	129.0 Nm
M_z stat.	127.5 Nm
M_x dyn.	21.7 Nm
M_y dyn.	77.4 Nm
M_z dyn.	76.5 Nm

Carriage LW 8	
C_0	2160 N
C	4000 N
F_1 stat.	4320 N
F_1 dyn.	3846 N
F_2 stat.	2160 N
F_2 dyn.	4000 N
M_x stat.	109.5 Nm
M_y stat.	194.4 Nm
M_z stat.	97.2 Nm
M_x dyn.	97.4 Nm
M_y dyn.	173.0 Nm
M_z dyn.	180.0 Nm

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

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



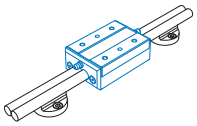


Aluminium slides

- Clamping surface plane milled
- Weight: appr. 0.3 kg
- Option: stainless design

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

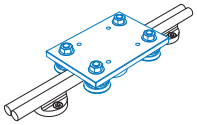
L 124 x W 62 x H 31.5 mm (WS 4)
Part no.: **223104**
Stainless: **223104 1000**



Steel slide LS 1

L 91 × W 60 × H 32 mm
- Clamping surface ground
- Weight: appr. 0.8 kg

Part no.: **223006**



Carriage LW 3

L 125 × W 85 × H 7.7 mm
- ground steel plate
- Weight: appr. 0.9 kg

Part no.: **223008**

Shaft housing blocks

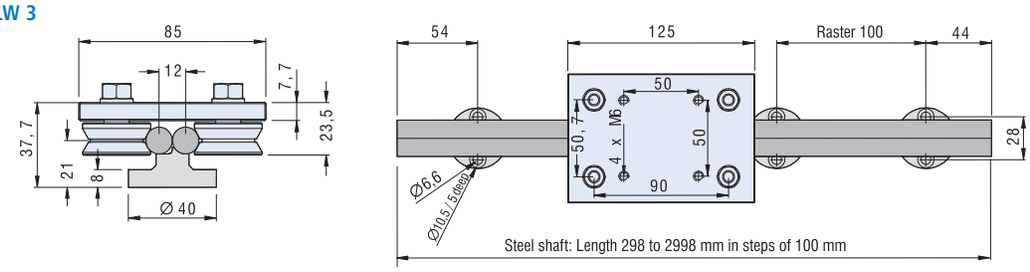
- Ø 40 mm, hole spacing 28 mm
- Cast zinc, VE 10 units

Part no.: **221501**

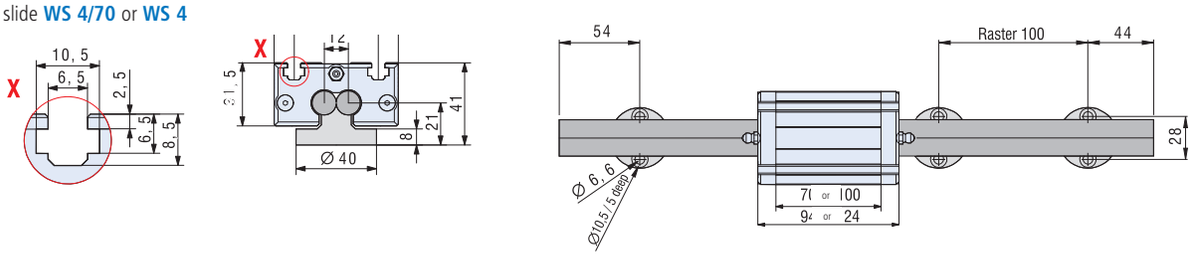
Linear guide rail LFS-12-1

Dimensioned drawings

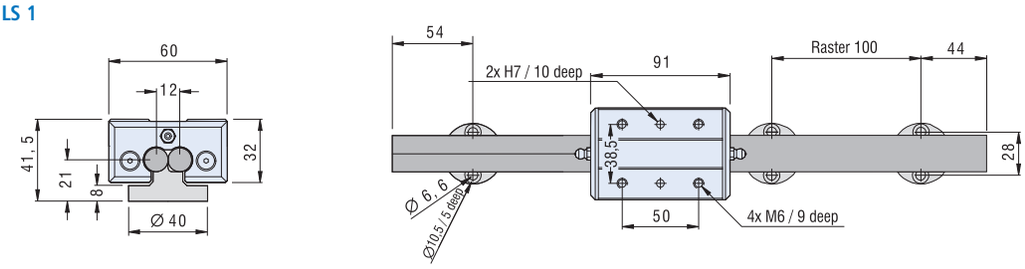
LFS-12-1 with Carriage **LW 3**



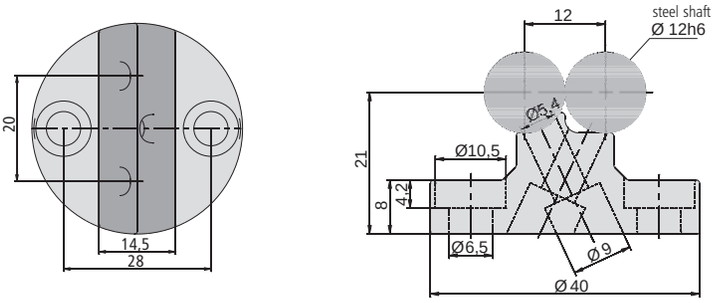
LFS-12-1 with
shaft slide **WS 4/70** or **WS 4**



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



Shaft housing block



mechanics

Linear guide rail

LFS-12-11

Features

- W 20 × H 31 mm
- Precision steel shaft Ø 12
- Aluminium shaft housing profile, naturally anodised
- Securing from below with M6 tapped rails in T-groove insert on flat surface
- Special lengths to order
- Weight: appr. 1.3 kg/m

Ordering key

220 002 XXXX

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

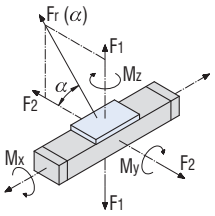
Profile length = Length overall L -2 mm

Loading data

Shaft slide WS 6/70	
C_o	3303 N
C	1873 N
F_1 stat.	2821 N
F_1 dyn.	1599 N
F_2 stat.	3303 N
F_2 dyn.	1873 N
M_x stat.	-
M_y stat.	105.3 Nm
M_z stat.	123.3 Nm
M_x dyn.	-
M_y dyn.	59.7 Nm
M_z dyn.	69.9 Nm

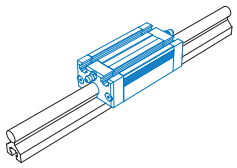
Shaft slide WS 6	
C_o	4868 N
C	2426 N
F_1 stat.	4157 N
F_1 dyn.	2071 N
F_2 stat.	4868 N
F_2 dyn.	2426 N
M_x stat.	-
M_y stat.	155.2 Nm
M_z stat.	181.7 Nm
M_x dyn.	-
M_y dyn.	77.3 Nm
M_z dyn.	90.5 Nm

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



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

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

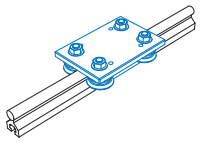


Aluminium slide

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

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

L 126 × W 50 × H 31.5 mm (WS 6)
(Weight: appr. 0.5 kg)
Part no.: **223106**
Stainless steel: **223106 1000**



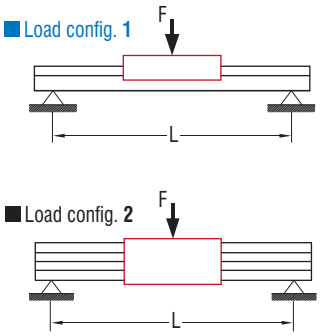
Carriage LW 5

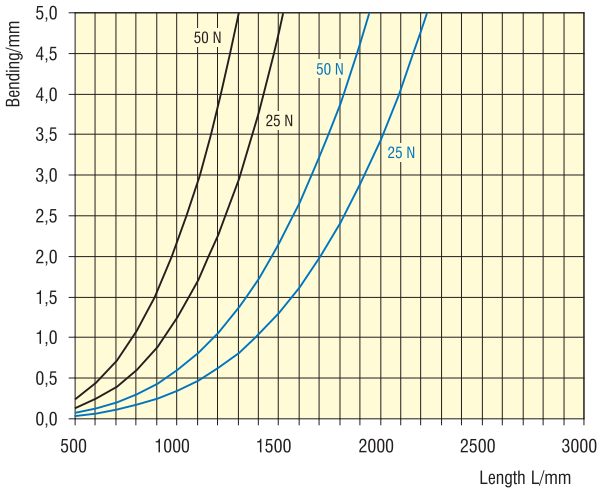
- L 110 × W 75 × H 7.7 mm
- ground steel plate
- 4 rollers Ø 31, sealed for life
- adjustable for no play
- Weight: 0.81 kg

Part no.: **223010**

Linear guide rail LFS-12-11

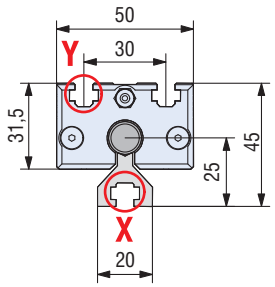
Bending

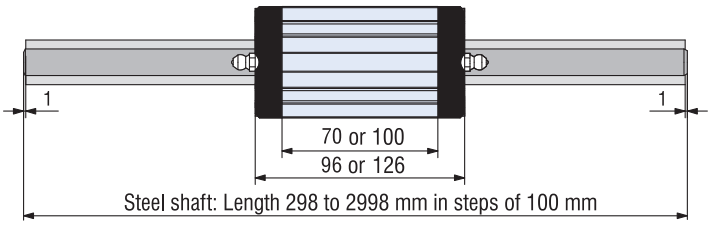


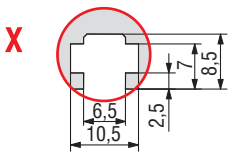


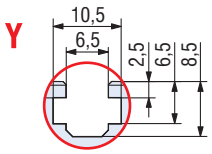
Dimensioned drawings

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

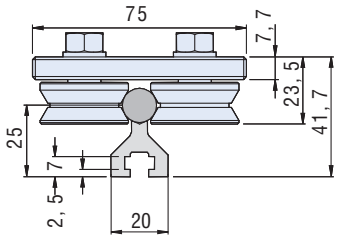


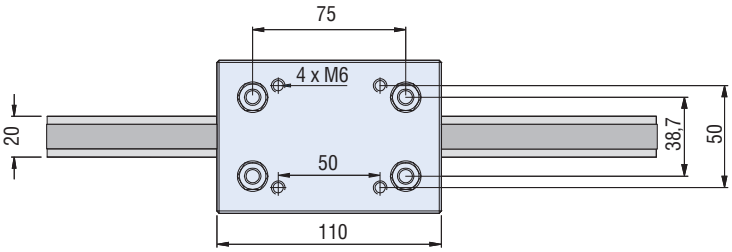






LFS-12-11 with Carriage **LW 5**





mechanics

Linear guide rail

LFS-12-2

Features

- W 62 × H 31 mm
- 2 precision steel shafts Ø 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 drillings Ø 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: appr. 3.3 kg/m

Ordering key

235 200 XXXX

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

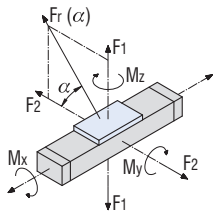
Profile length = Length overall L -2 mm

Loading data

Shaft slide WS 4/70	
C_0	3003 N
C	1873 N
F_1 stat.	2821 N
F_1 dyn.	1599 N
F_2 stat.	3303 N
F_2 dyn.	1873 N
M_x stat.	29.8 Nm
M_y stat.	105.3 Nm
M_z stat.	123.3 Nm
M_x dyn.	16.8 Nm
M_y dyn.	59.7 Nm
M_z dyn.	69.9 Nm

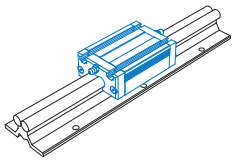
Shaft slide WS 4	
C_0	4868 N
C	2426 N
F_1 stat.	4157 N
F_1 dyn.	2071 N
F_2 stat.	4868 N
F_2 dyn.	2426 N
M_x stat.	43.9 Nm
M_y stat.	155.2 Nm
M_z stat.	181.7 Nm
M_x dyn.	21.8 Nm
M_y dyn.	77.3 Nm
M_z dyn.	90.5 Nm

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



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

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

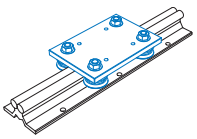


Aluminium slide

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

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

L 124 × W 62 × H 31.5 mm (WS 4)
(Weight: appr. 0.46 kg)
Part no.: **223104**
Stainless steel: **223104 1000**



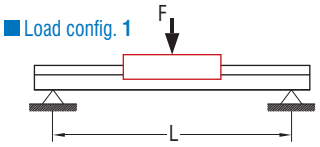
Carriage LW 3

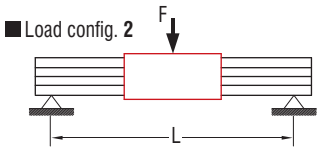
- L 125 × W 85 × H 7.7 mm
- ground steel plate
- Weight: 0.93 kg

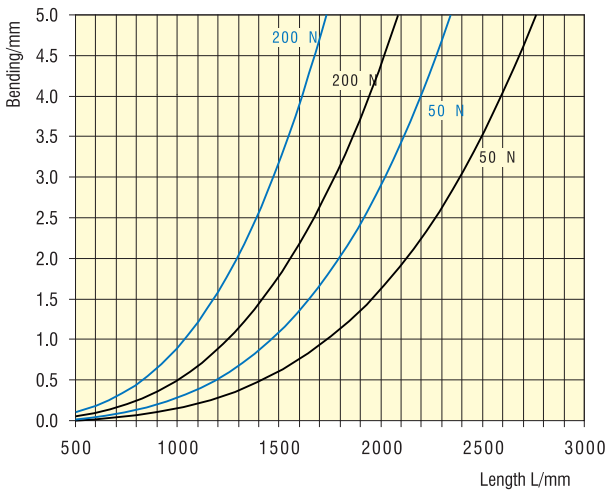
Part no.: **223008**

Linear guide rail LFS-12-2

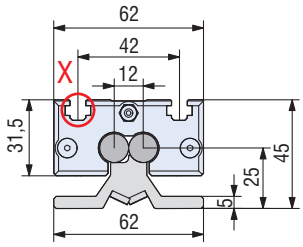
Bending

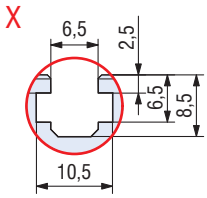




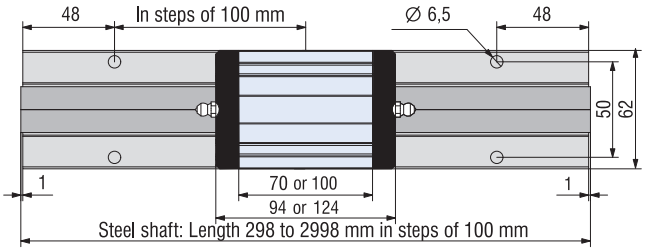


Dimensioned drawings

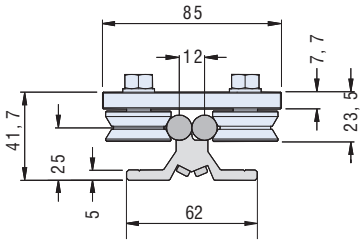


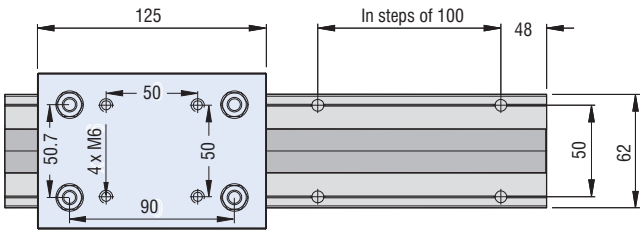


LFS-12-2 with aluminium slide **WS 4/70 or WS 4**



LFS-12-2 with Carriage **LW3**

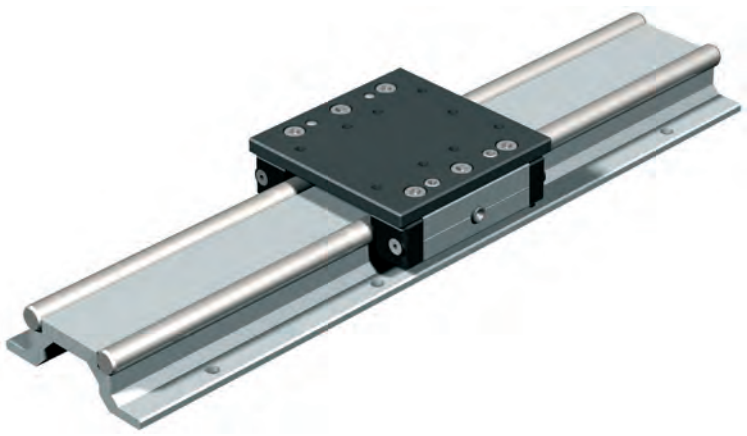




mechanics

Linear guide rail

LFS-12-3



Features

- W 90 × 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: appr. 3.9 kg/m

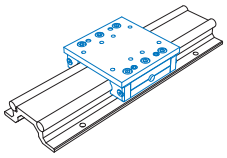
Ordering key

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.

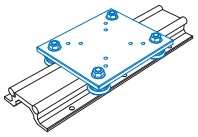


Slide

- ground steel plate
- central lubrication system option
- adjustable for no play

L 100 × W 100 × H 32 mm (WS 7/70)
(Weight: appr. 0.8 kg)
Part no.: **223107 0070**

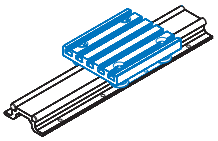
L 200 × W 100 × H 32 mm (WS 7)
(Weight: appr. 1.7 kg)
Part no.: **223107**



Carriage LW 8

- L 150 × W 125 × 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**



Carriage LW 2

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

Part no.: **223005**

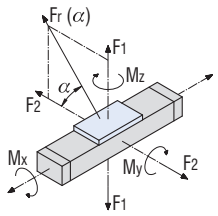
Loading data

Shaft slide WS 7/70	
C_o	3303 N
C	1873 N
F_1 stat.	2821 N
F_1 dyn.	1599 N
F_2 stat.	3303 N
F_2 dyn.	1873 N
M_x stat.	82.0 Nm
M_y stat.	105.3 Nm
M_z stat.	123.3 Nm
M_x dyn.	46.4 Nm
M_y dyn.	59.7 Nm
M_z dyn.	69.9 Nm

Shaft slide WS 7	
C_o	7303 N
C	3179 N
F_1 stat.	6237 N
F_1 dyn.	2715 N
F_2 stat.	7303 N
F_2 dyn.	3179 N
M_x stat.	181.2 Nm
M_y stat.	232.8 Nm
M_z stat.	272.5 Nm
M_x dyn.	78.8 Nm
M_y dyn.	101.3 Nm
M_z dyn.	118.6 Nm

Carriage LW 2	
C_o	3114 N
C	1846 N
F_1 stat.	2659 N
F_1 dyn.	1576 N
F_2 stat.	3114 N
F_2 dyn.	1846 N
M_x stat.	216.0 Nm
M_y stat.	100.5 Nm
M_z stat.	108.0 Nm
M_x dyn.	168.4 Nm
M_y dyn.	192.3 Nm
M_z dyn.	200.0 Nm

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



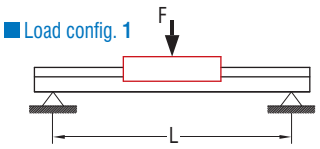
$$Fr(\alpha) = \frac{F2}{\cos \alpha}$$

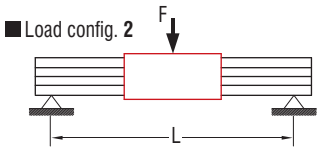
$$Fr(\alpha) = \frac{F1}{\sin \alpha}$$

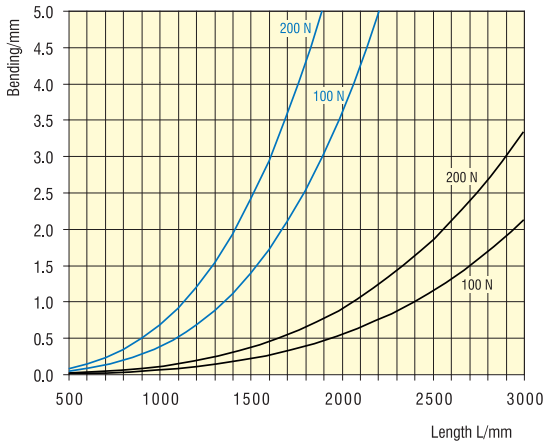
made by isel®

Linear guide rail LFS-12-3

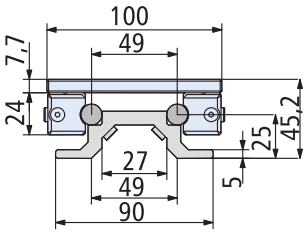
Bending



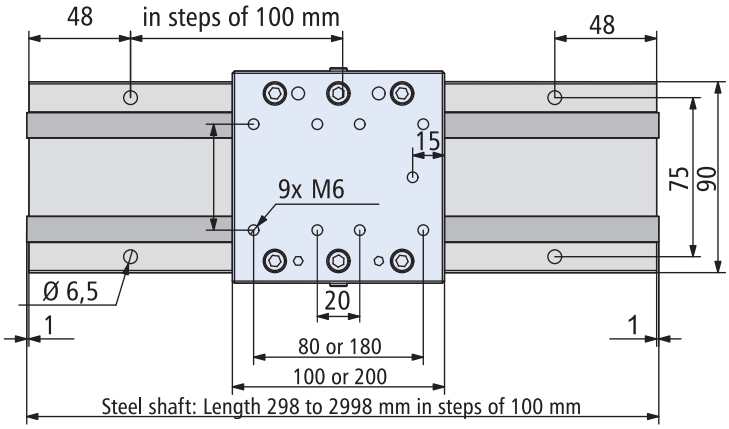


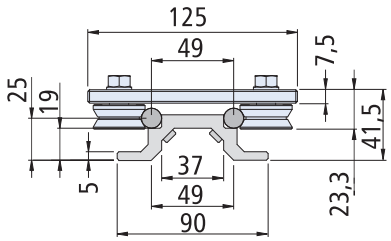


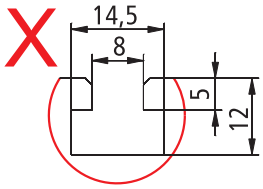
Dimensioned drawings

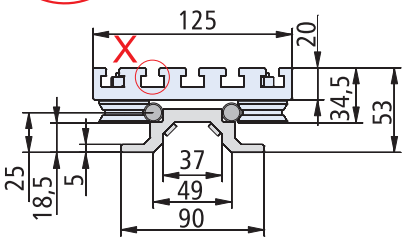


LFS-12-3 with aluminium slide **WS 7**

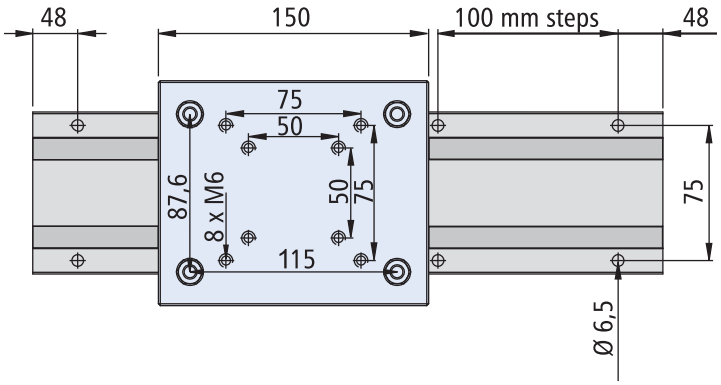




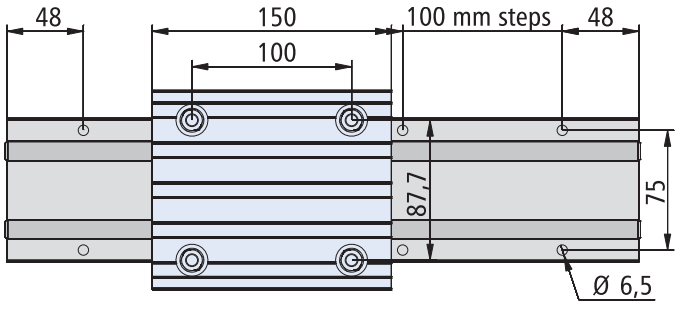




LFS-12-3 with Carriage **LW 8**

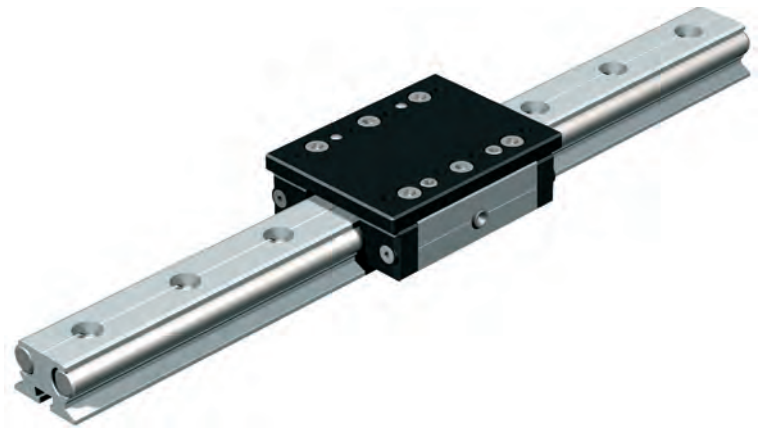


LFS-12-3 with Carriage **LW 2**



Linear guide rail

LFS-12-10



Features

- W 36 × H 24.5 mm
- 2 precision steel shafts Ø 12
- anti-twist
- Aluminium shaft housing profile, naturally anodised
- Fixing from below with M6 tapped rails in T-groove insert and from above M6 drillings in 50 mm raster
- conditionally freeloading
- Special lengths to order
- Weight: appr. 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 with rod linkage to order.

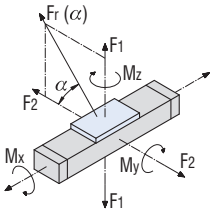
Loading data

Slide WS 8/70	
C_o	3303 N
C	1873 N
F_1 stat.	2821 N
F_1 dyn.	1599 N
F_2 stat.	3303 N
F_2 dyn.	1873 N
M_x stat.	46.7 Nm
M_y stat.	105.3 Nm
M_z stat.	123.3 Nm
M_x dyn.	26.4 Nm
M_y dyn.	59.7 Nm
M_z dyn.	69.9 Nm

Slide WS 8	
C_o	4868 N
C	2426 N
F_1 stat.	4157 N
F_1 dyn.	2071 N
F_2 stat.	4868 N
F_2 dyn.	2426 N
M_x stat.	68.8 Nm
M_y stat.	155.2 Nm
M_z stat.	181.7 Nm
M_x dyn.	34.2 Nm
M_y dyn.	77.3 Nm
M_z dyn.	90.5 Nm

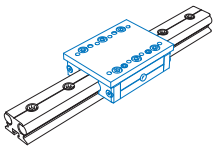
Carriage LW 4	
C_o	2160 N
C	4000 N
F_1 stat.	4320 N
F_1 dyn.	3846 N
F_2 stat.	2160 N
F_2 dyn.	4000 N
M_x stat.	135.4 Nm
M_y stat.	194.4 Nm
M_z stat.	97.2 Nm
M_x dyn.	120.5 Nm
M_y dyn.	173,0 Nm
M_z dyn.	180.0 Nm

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



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

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

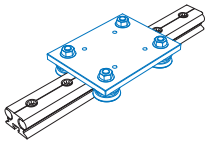


Slide

- ground steel plate
- lubrication system option
- adjustable for no play

L 100 × W 75 × H 31.5 mm (WS 8/70)
(Weight: appr. 0.7 kg)
Part no.: **223108 0070**

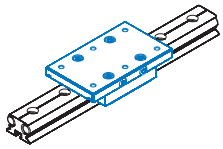
L 150 × W 75 × H 31.5 mm (WS 8)
(Weight: appr. 1.0 kg)
Part no.: **223108**



Carriage LW 4

- L 125 × W 97 × 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**

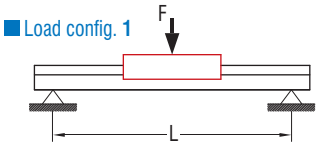
Dual track set 2

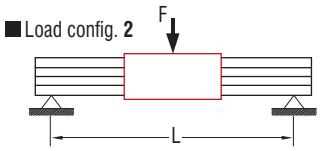
- L125 x W75 x H30.2 mm
- with 2 LARGE linear ball bearings

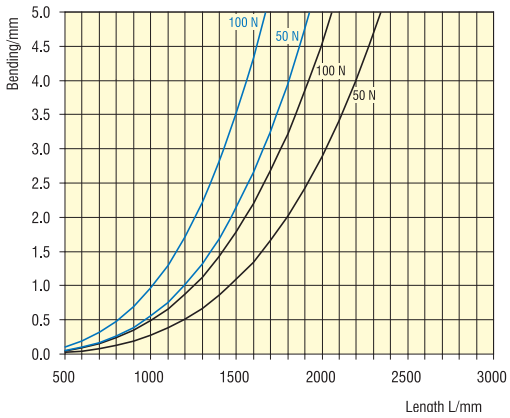
Part no.: **223002**

Linear guide rail LFS-12-10

Bending

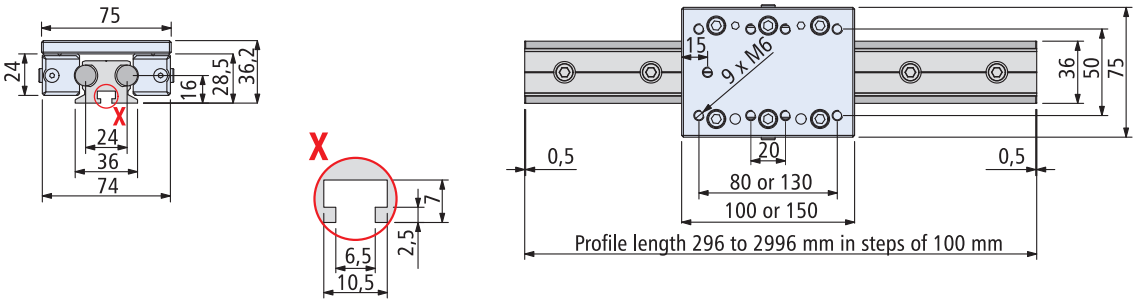




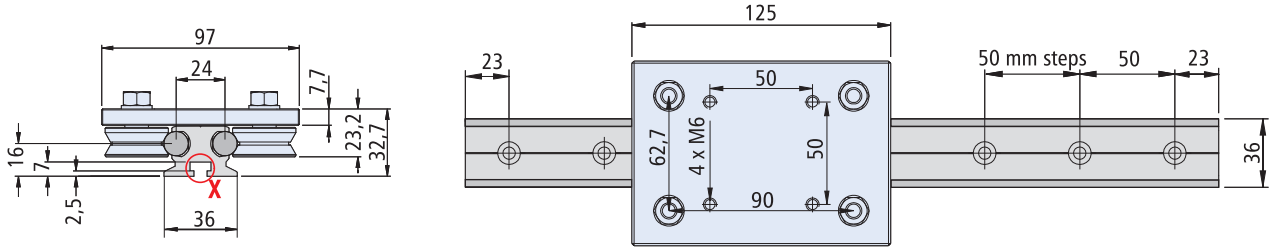


Dimensioned drawings

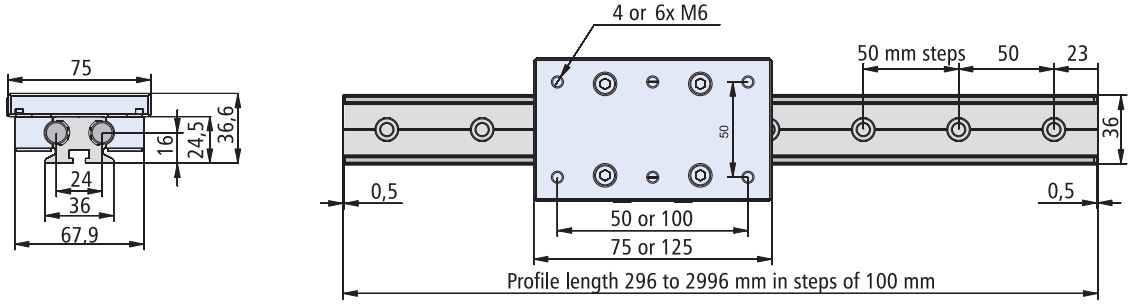
LFS-12-10 with slide **WS 8**



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



LFS-12-10 with dual track set



mechanics

Linear guide rail

LFS-16-2

Features

- W 25 × H 47.5 mm
- Precision steel shaft Ø 16
- Aluminium shaft housing profile, naturally anodised
- Securing from below on flat surface with M6 tapped rails in T-groove insert
- not self-supporting
- Lengths in 100 mm raster
- max. Length 2998 mm
- Special lengths to order
- Weight: appr. 2.7 kg/m

Ordering key

220 004 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 to order

Loading data

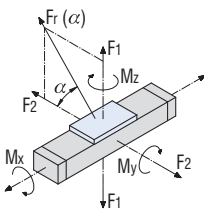
Carriage ILW 1	
C_0	2160 N
C	4000 N
F_1 stat.	4320 N
F_1 dyn.	3897 N
F_2 stat.	2160 N
F_2 dyn.	4000 N
M_x stat.	-
M_y stat.	194.4 Nm
M_z stat.	97.2 Nm
M_x dyn.	-
M_y dyn.	175.3 Nm
M_z dyn.	180.0 Nm

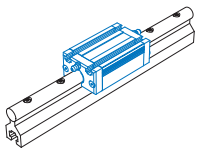
Slide IWS 1	
C_0	3286 N
C	1773 N
F_1 stat.	2806 N
F_1 dyn.	1514 N
F_2 stat.	3286 N
F_2 dyn.	1773 N
M_x stat.	--
M_y stat.	104.7 Nm
M_z stat.	122.6 Nm
M_x dyn.	--
M_y dyn.	56.4 Nm
M_z dyn.	66.1 Nm

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

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

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

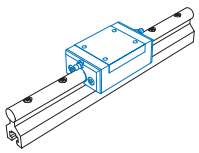




Aluminium slide IWS 1

- L 94 × W 55 × H 33.5 mm
- Clamping surface plane milled
- Weight: 0.32 kg
- Option: stainless steel design

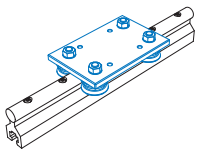
Part no.: **223220**
Stainless steel: **223220 0001**



Steel slide ILS 1

- L 94 × W 58 × H 33.7 mm
- Clamping surface ground
- Weight: 0.72 kg

Part no.: **223210**



Carriage ILW 1

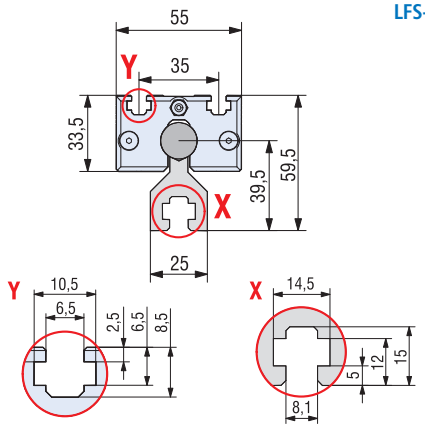
- L 125 × W 80 × H 7.7 mm
- ground steel plate
- Weight: 0.87 kg

Part no.: **223230**

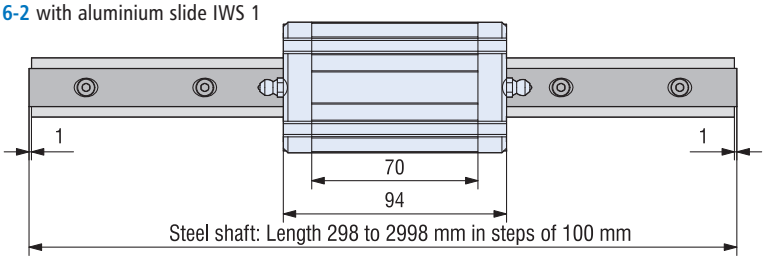
made by isel®

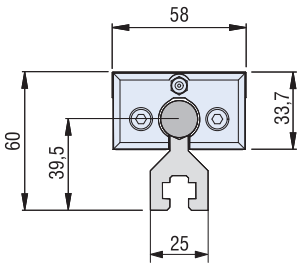
Linear guide rail LFS-16-2

Dimensioned drawings

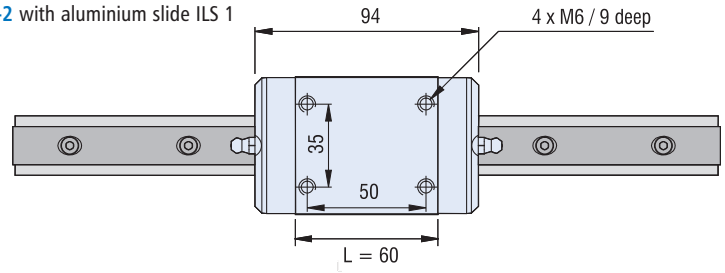


LFS-16-2 with aluminium slide IWS 1

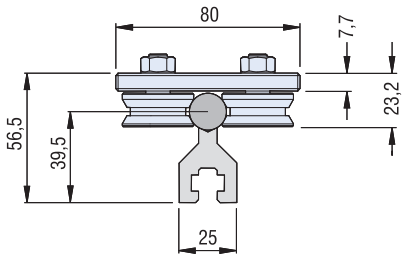


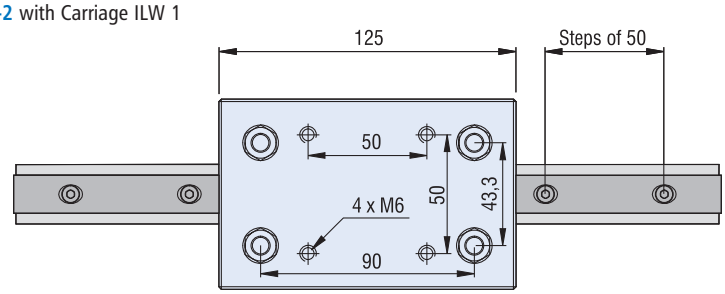


LFS-16-2 with aluminium slide ILS 1



LFS-16-2 with Carriage ILW 1

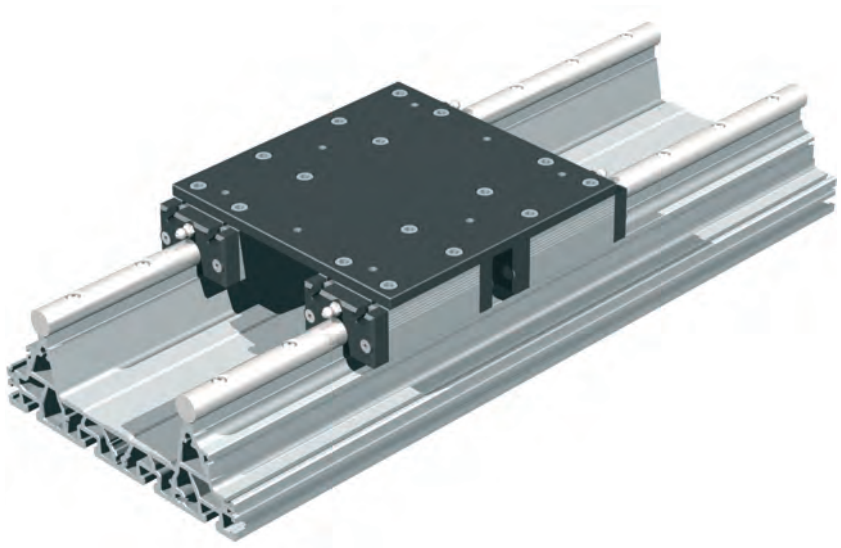




mechanics

Linear guide rail

LFS-16-120



Features

- W 190 × H 61 mm
- 2 precision steel shafts Ø 16
- anti-twist
- Aluminium shaft housing profile naturally anodised
- Securing from below with M6 tapped rails in T-groove profile
- conditionally not self-supporting
- Any guide length
- Weight: 10.2 kg/m

Ordering key

220 008 XXXX

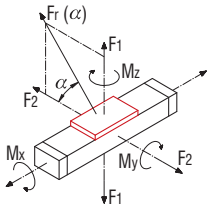
Length in mm (in 100 mm raster)
e.g. **0029** = Length 298
0299 = Length 2998

Profile length = Length overall L -2 mm
Special lengths to order

Loading data

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

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



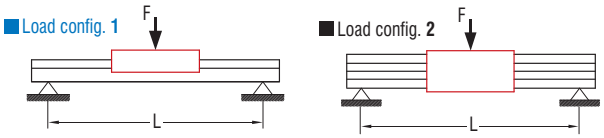
Unit with 2x IWS1	
C_0	4929 N
C	2660 N
F_1 stat.	4209 N
F_1 dyn.	2271 N
F_2 stat.	4929 N
F_2 dyn.	2660 N
M_x stat.	253 Nm
M_y stat.	147 Nm
M_z stat.	173 Nm
M_x dyn.	136 Nm
M_y dyn.	79 Nm
M_z dyn.	93 Nm

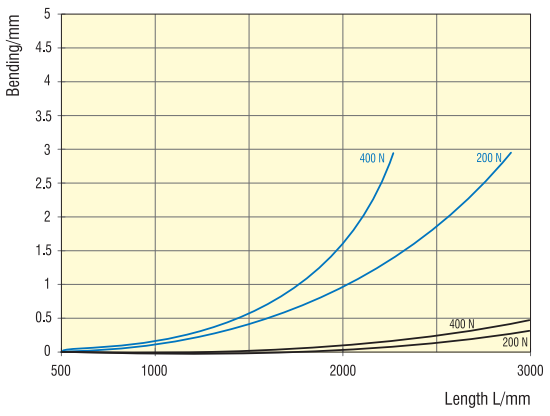
Unit with 2x ILS1	
C_0	7598 N
C	4857 N
F_1 stat.	6488 N
F_1 dyn.	4148 N
F_2 stat.	7598 N
F_2 dyn.	4857 N
M_x stat.	389 Nm
M_y stat.	195 Nm
M_z stat.	228 Nm
M_x dyn.	249 Nm
M_y dyn.	124 Nm
M_z dyn.	146 Nm

Unit with 4x IWS1	
C_0	6572 N
C	3546 N
F_1 stat.	5612 N
F_1 dyn.	3028 N
F_2 stat.	6572 N
F_2 dyn.	3546 N
M_x stat.	337 Nm
M_y stat.	309 Nm
M_z stat.	361 Nm
M_x dyn.	182 Nm
M_y dyn.	167 Nm
M_z dyn.	195 Nm

Unit with 4x ILS1	
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

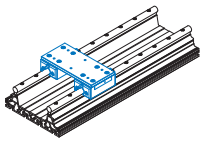




made by isel®

Linear guide rail LFS-16-120

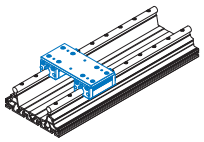
Slide unit
with 2 × steel slide
ILS 1 (kit)



- L 84 × W 178 × 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**

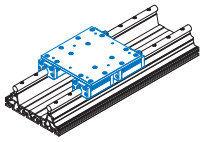
Slide unit
with 2 × aluminium slide
IWS 1 (kit)



- L 84 × W 178 × 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**

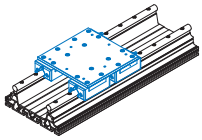
Slide unit
with 4 × aluminium slide
IWS 1 (kit)



- L 180 × W 178 × H 8 mm
- ground steel plate
- 4 × IWS 1,
  central lubrication option
- adjustable for no play

Part no.: **223240 0008**

Slide unit
with 4 × steel slide
ILS 1 (kit)

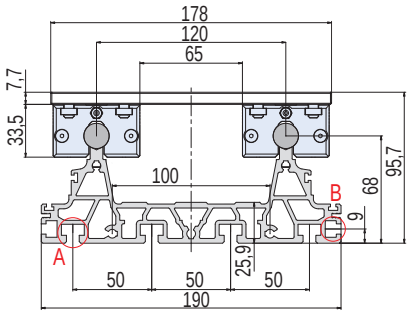


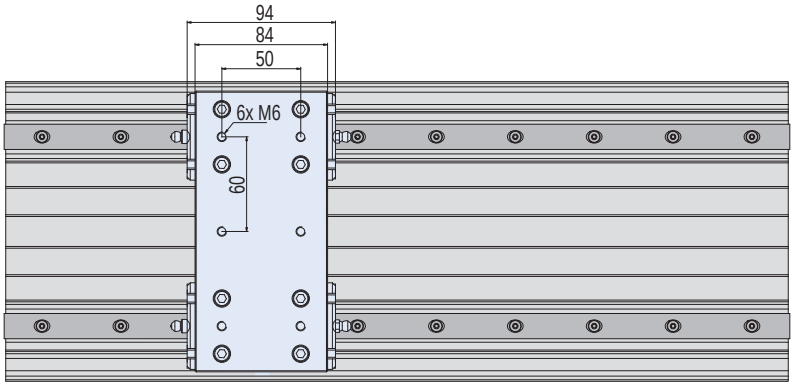
- L 180 × W 178 × H 8 mm
- ground steel plate
- 4 x ILS 1,
  central lubrication option
- adjustable for no play

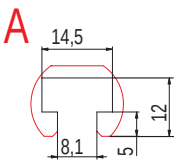
Part no.: **223240 0010**

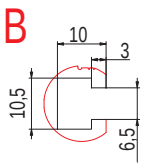
Dimensioned drawings

Aluminium slide IWS 1

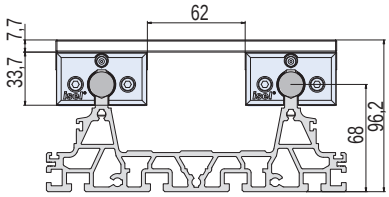


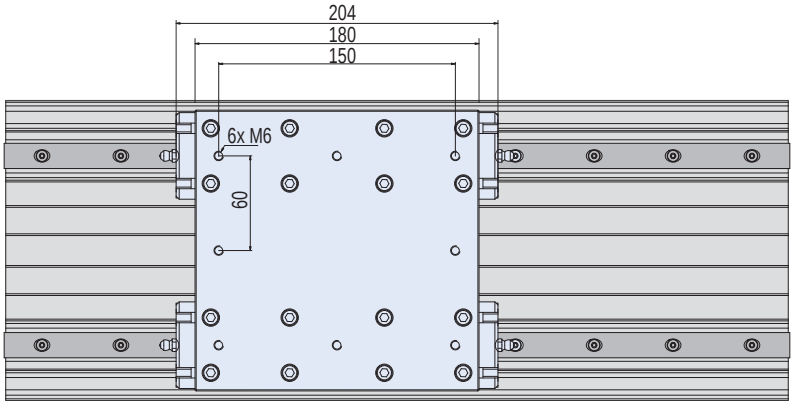






Steel slide ILS 1





mechanics

Linear guide

LFS-16-150

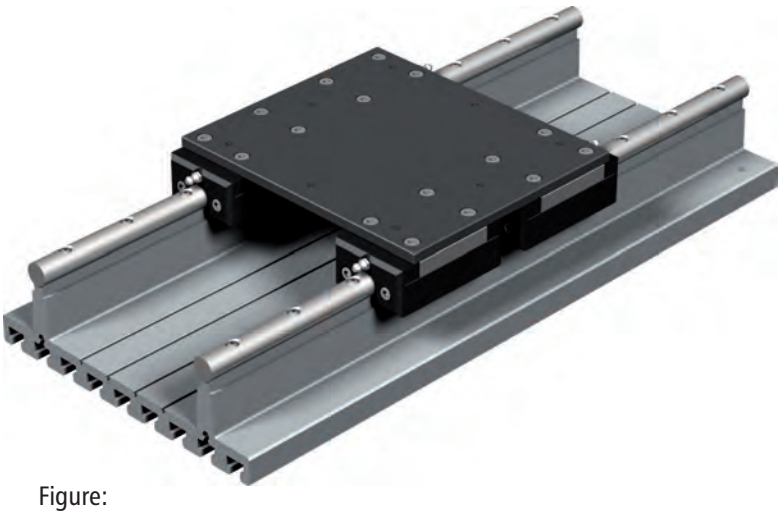


Figure:
Linear guide rail and 4 linear guide slide with slot plate

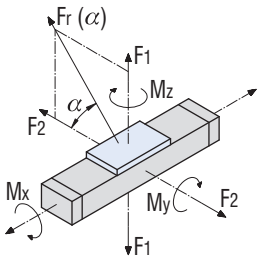
Loading data

Linear guide LFS-16-150 2 steel slide	
C_o	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.	486.6 Nm
M_y stat.	194.6 Nm
M_z stat.	227.9 Nm
M_x dyn.	311.1 Nm
M_y dyn.	124.4 Nm
M_z dyn.	145.7 Nm

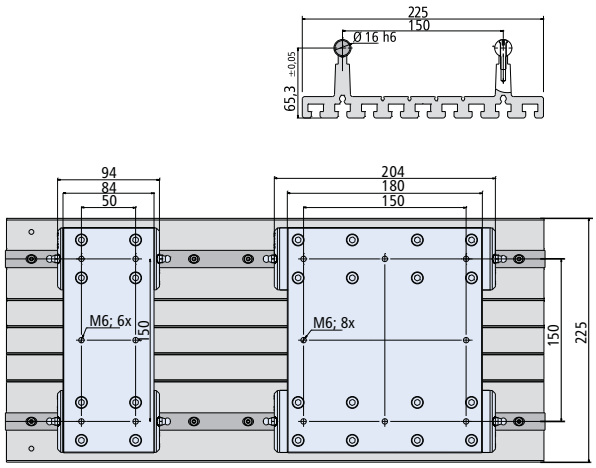
Linear guide LFS-16-150 4 steel slide	
C_o	10130 N
C	6476 N
F_1 stat.	8650 N
F_1 dyn.	5530 N
F_2 stat.	10130 N
F_2 dyn.	6476 N
M_x stat.	648.8 Nm
M_y stat.	475.8 Nm
M_z stat.	557.2 Nm
M_x dyn.	414.8 Nm
M_y dyn.	304.2 Nm
M_z dyn.	356.2 Nm

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

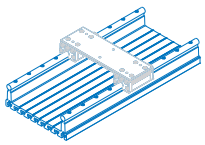
$$Fr(\alpha) = \frac{F1}{\sin \alpha}$$



Dimensioned drawing



Linear guide rail LS-16-150



- 2 precision steel shafts Ø 16 mm
- Aluminium profile rail with T-groove inserts, raster 25 mm, anodised
- exact, shaft housing outline milled in a clamping fixture
- Conditionally freeloading
- Standard length 3 m, any number of segments
- Weight: 13.9 kg/m

Part no.: **220030 0099** (Length 1 m)
220030 0199 (Length 2 m)
220030 0299 (Length 3 m)

Option:
- Other lengths (longer or shorter)

Steel slide ILS 1

- Steel slide L 94 × W 58 × 33.7 mm
- 4 recirculating balls, adjustable for no play
- Grease nipple on front
- Weight: 0.7 kg

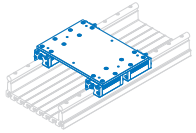
Part no.: **223210**

Aluminium slide IWS 1

- L 94 × W 55 × H 33.5 mm
- Clamping surface plane milled
- Weight: 0.32 kg
- Option: stainless steel design

Part no.: **223220**
Stainless steel: **223220 0001**

Aluminium slide IWS 1 with slot plate



- 2 or 4 linear guide slides
- Slot plate (ground steel)
- Adjustable for no play
- Weight: 2.5 kg or 5.1 kg

Part no.: **223240 0036** (2 slides)
223240 0037 (4 slides)

made by isel®

Linear guide

LFS-16-250

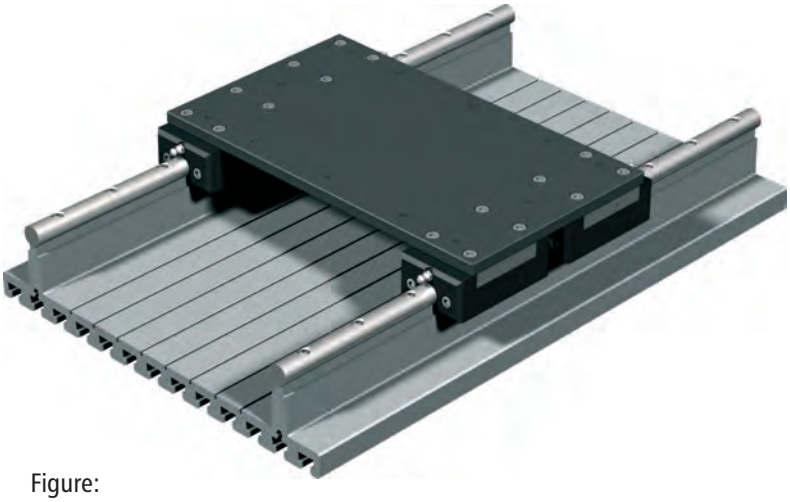


Figure:
Linear guide rail and 4 linear guide slide with slot plate

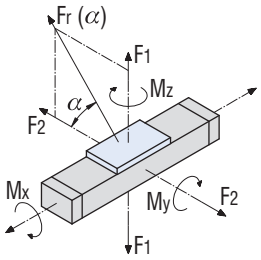
Loading data

Linear guide LFS-16-250 2 steel slide	
C_o	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.	810.9 Nm
M_y stat.	194.6 Nm
M_z stat.	227.9 Nm
M_x dyn.	518.4 Nm
M_y dyn.	124.4 Nm
M_z dyn.	145.7 Nm

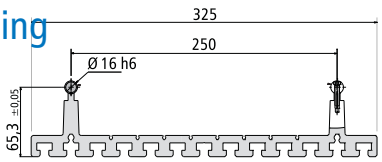
Linear guide LFS-16-250 4 steel slide	
C_o	10130 N
C	6476 N
F_1 stat.	8650 N
F_1 dyn.	5530 N
F_2 stat.	10130 N
F_2 dyn.	6476 N
M_x stat.	1081.3 Nm
M_y stat.	475.8 Nm
M_z stat.	557.2 Nm
M_x dyn.	691.3 Nm
M_y dyn.	304.2 Nm
M_z dyn.	356.2 Nm

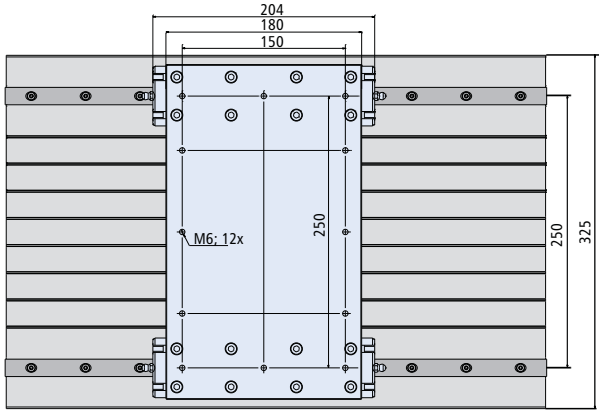
$$Fr(\alpha) = \frac{F2}{\cos \alpha}$$

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

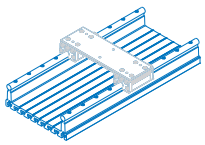


Dimensioned drawing





Linear guide rail LS-16-250



- 2 precision steel shafts Ø 16 mm
- Aluminium profile rail with T-groove inserts, raster 25 mm, anodised
- exact, shaft housing outline milled in a clamping fixture
- Conditionally not self-supporting
- Standard length 3 m, any number of segments
- Weight: 17.5 kg/m

Part no.: **220029 0099** (Length 1 m)
220029 0199 (Length 2 m)
220029 0299 (Length 3 m)

Option:
- Other lengths (longer or shorter)

Steel slide ILS 1

- Steel slide L 94 × W 58 × 33.7 mm
- 4 recirculating balls, adjustable for no play
- Grease nipple on front
- Weight: 0.7 kg

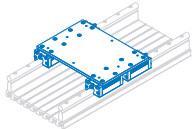
Part no.: **223210**

Aluminium slide IWS 1

- L 94 × W 55 × H 33.5 mm
- Clamping surface plane milled
- Weight: 0.32 kg
- Option: stainless steel design

Part no.: **223220**
Stainless steel: **223220 0001**

Aluminium slide IWS 1 with slot plate



- 2 or 4 linear guide slides
- Slot plate (ground steel)
- Adjustable for no play
- Weight: 3.5 kg or 7.0 kg

Part no.: **223240 0040** (2 slides)
223240 0041 (4 slides)

mechanics

Accessories

Tapped rails

M6 tapped rail
- 10 × 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 units
- all except PT/RE 40, 65

Part no.: **209 001 0005**

2 × M6 sliding nuts (Figure 2)
- L 45 × W 10 × H 3.5 mm
- galvanised
- VE 50 units
- 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 units
- 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 × M6 (Figure 4)
- galvanised, VE 25 units
- for all except PT/RE 40, 65

Part no.: **209 022 0003**

Sliding nuts

M5 sliding nuts
- galvanised
- VE 20 units
- 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 × W20 × 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 thread (SF12) or M6 (SF16) in 100 mm raster or with stepped bore for M4 (SF 12) or M5 (SF 16) in 100 mm raster

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

Rollers

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

Part no.: **222 010**

Roller Ø 30 mm for SF 16
- with M6 tapped drilling
- VE 2 units

Part no.: **222 010 0003**

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 slot configuration with 2 slide.

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

The load factor in this case is $C_0/2$.

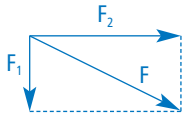
Combined load

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:

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



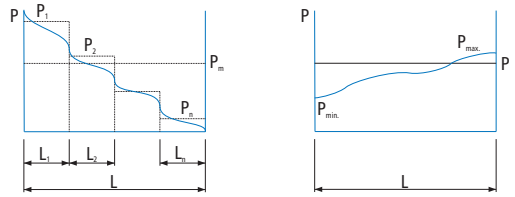
P [N]	dynamically equivalent load
F [N]	opposing force $= \sqrt{F_1^2 + F_2^2}$
F_1 [N]	vertical component see sketch (4)
F_2 [N]	horizontal component see sketch (4)
C_0 [N]	static load factor
M [Nm]	opposing torque
$M_{0(XYZ)}$ [Nm]	static torque in the direction of the opposing torque

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.

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

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

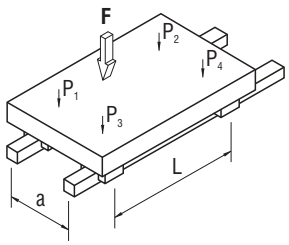
$$L_h = \frac{1666}{V} \cdot \left(\frac{C}{P}\right)^3$$

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

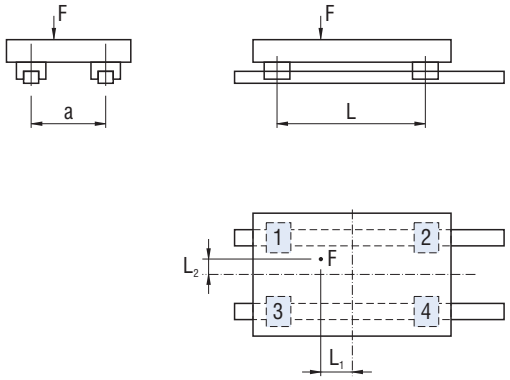
Operating loads calculation

Load vertically on the **bench surface**

Loading



Dimensioned figure



Load on a Carriage

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

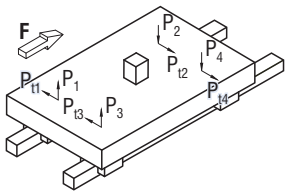
$$P_2 = \frac{F}{4} - \frac{F \cdot L_1}{2L} + \frac{F \cdot L_2}{2a}$$

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

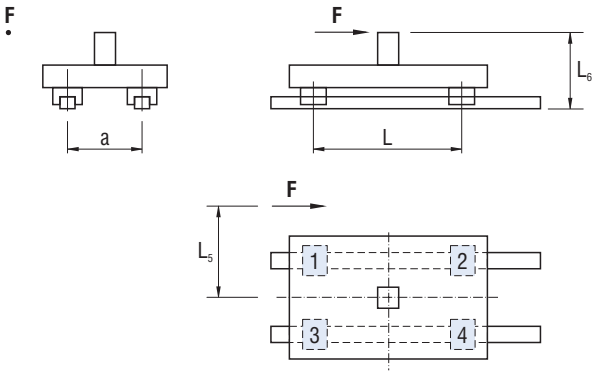
$$P_4 = \frac{F}{4} - \frac{F \cdot L_1}{2L} - \frac{F \cdot L_2}{2a}$$

Load in **direction of motion**

Loading



Dimensioned figure



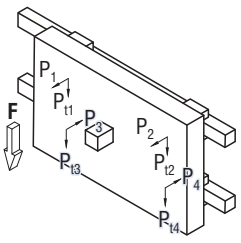
Load on a Carriage

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

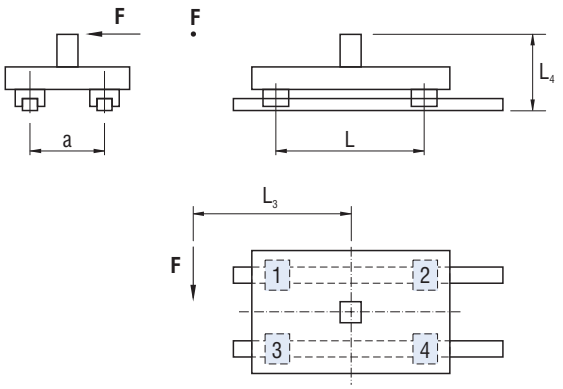
$$P_{t1} \ldots P_{t4} = \frac{F \cdot L_5}{2L}$$

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

Loading



Dimensioned figure



Load on a Carriage

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

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

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

Space for your notes

mechanics

Drive elements

Overview

Function overview C 49
Ball screw spindle ∅ 16 C 50
Ball screw spindle ∅ 25 C 50
Ball bearing nut 2 C 51
Ball bearing nut 3 C 51
Clamping blocks for nut version 3 C 52
Flange bearing for spindle ∅ 16 C 53
Flange bearing for spindle ∅ 25 C 53
Bearing supports C 54
Shaft couplings C 55

Information

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

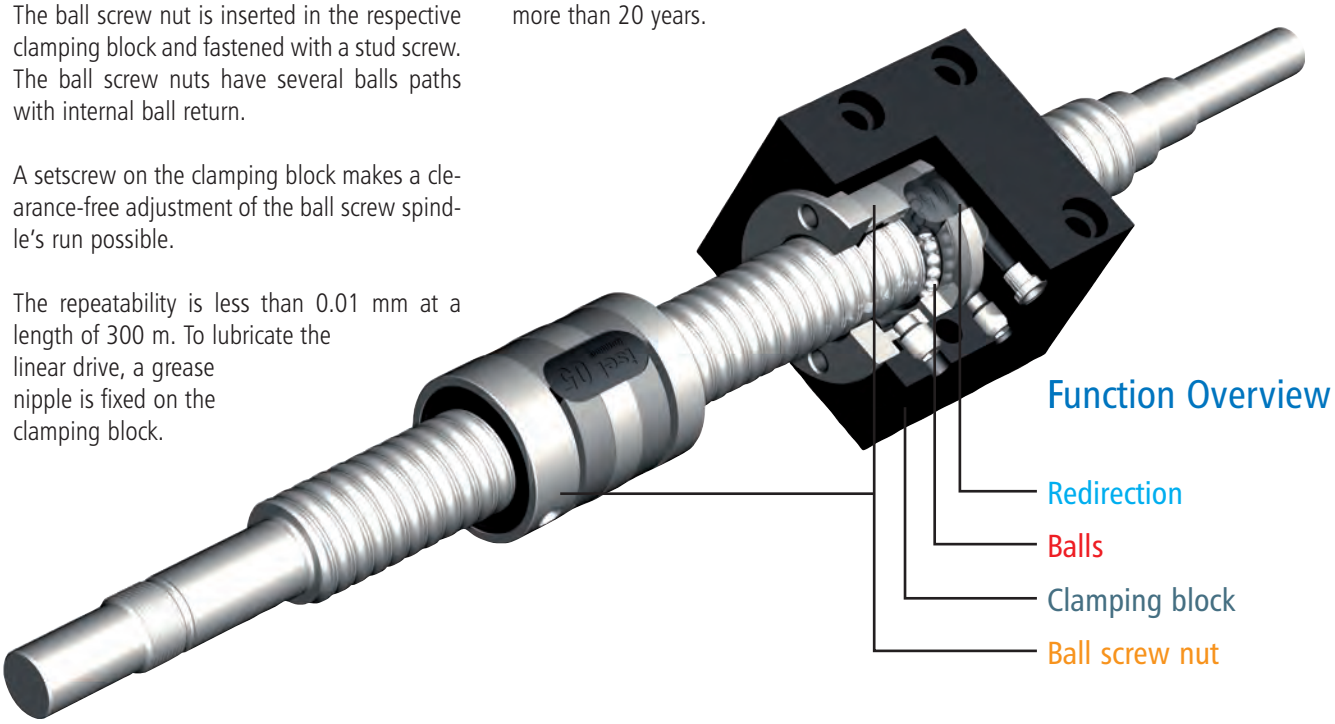
The ball screw nut is inserted in the respective clamping block and fastened with a stud screw. The ball screw nuts have several balls paths with internal ball return.

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

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

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

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

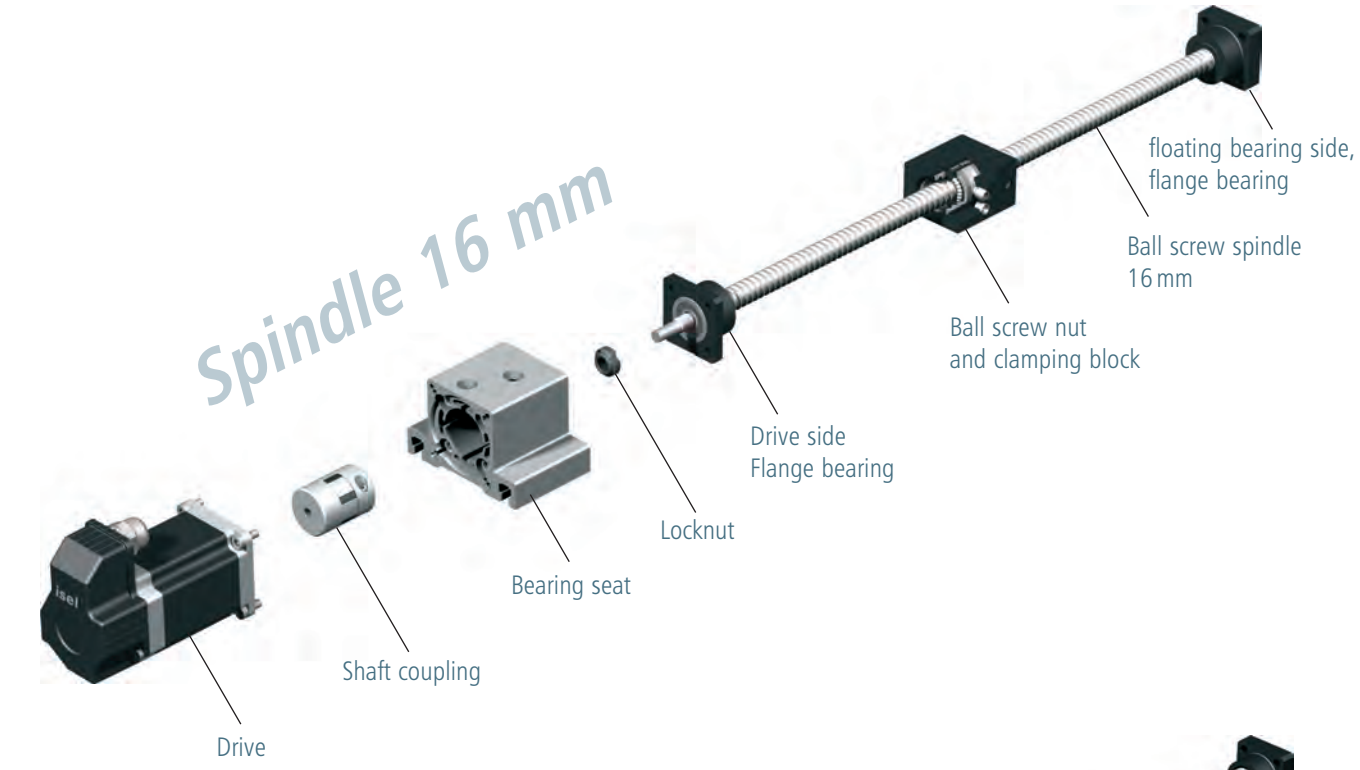


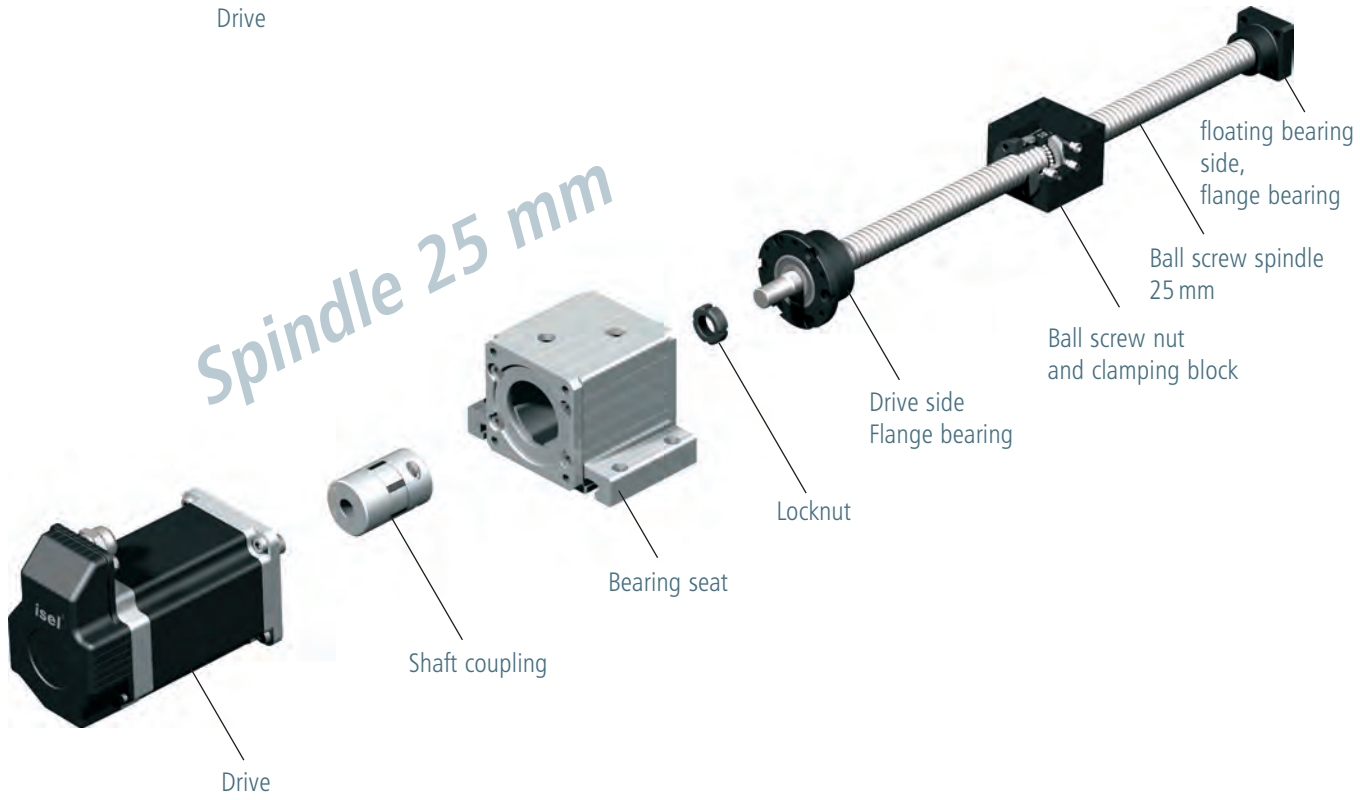
Drive elements

Overview

Linear Drives

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





mechanics

Ball screw 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 to order (see "Available lengths")
- Produced to DIN 69051, Part3, Tolerance class 7

Options
- End machining to order

Available lengths

Without end machining
in 100 mm raster
- 452 to 1052 mm
- 1252 mm • 1552 mm
- 1752 mm • 2052 mm
- 2252 mm • 2752 mm
- 3052 mm

Special length according to drawing: 211 13X 0998

Both-sided end machining
in 100 mm raster
- 368 mm to 3068 mm

Special length to drawing: 211 13X 5999

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)

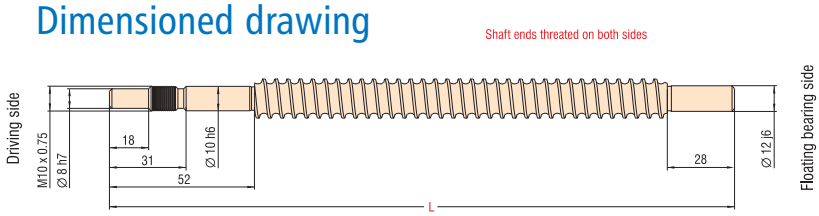
See "Available lengths" for permissible Combinations.

Ordering information

Slotted nut
- Self-locking
- M 10 x 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. 3052 mm available
- End machining to isel standard or to order (see "Available lengths")
- Produced to DIN 69051, Part 3, Tolerance class 7

Options
- End machining to order

Available lengths

Without end machining
in 100 mm raster
- 500 to 3,000 mm

Special length to drawing: 211 14X 0999

Shaft ends on both sides machined in steps of 100 mm
- 295 to 2,995 mm

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 final digit)

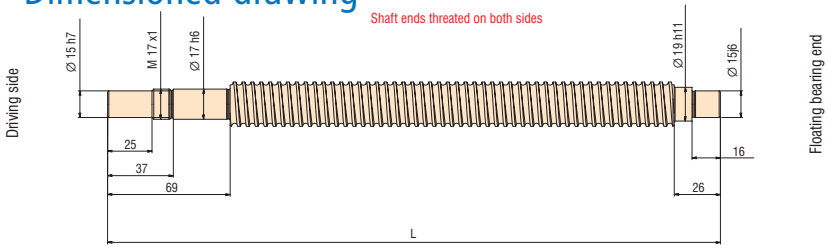
See "Available lengths" for permitted combinations.

Ordering information

Slotted nut
- Self-locking
- M 17 × 1.0 mm

Part no.: **890259 0011**

Dimensioned drawing



Ball bearing 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

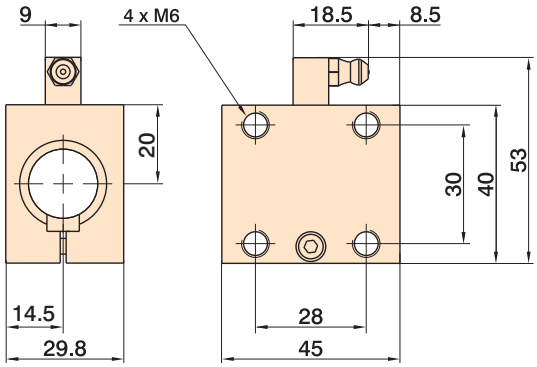
Ordering information

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

matching:
Dirt scraper
- VE 2 pcs. 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 and 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
20.0	25	3570	8800

Ordering information

only for spindles Ø 25

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

matching:
dirt scraper
- VE 2 pcs.

Part no.: 213700 9000

only for spindles Ø 16

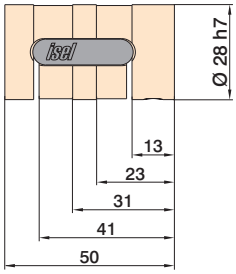
Pitch	Part no.
2.5 mm	213 503
4.0 mm	213 514
5.0 mm	213 505
10.0 mm	213 510
20.0 mm	213 520

matching:
dirt scraper
- VE 2 pcs.

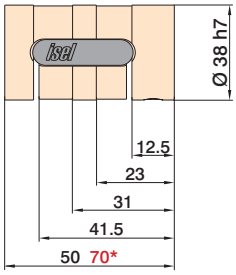
Part no.: 213500 0001

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 information

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

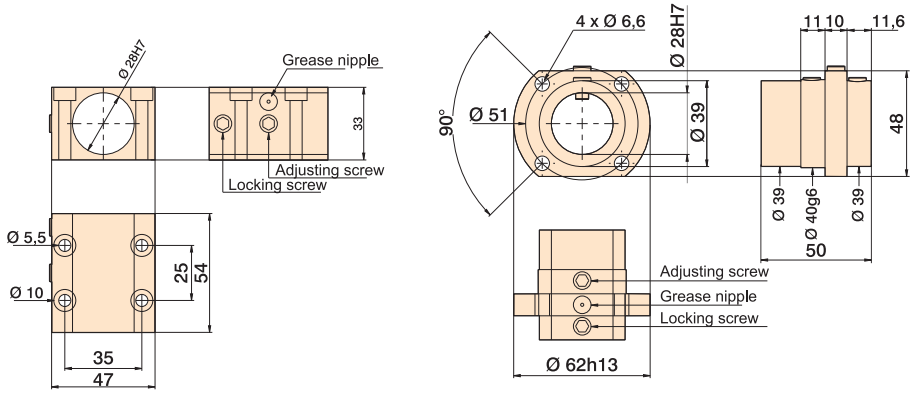
Pitch	Part no.
5 / 10	213 700 9003
20	213 700 9004

Clamping block 1 Ø25

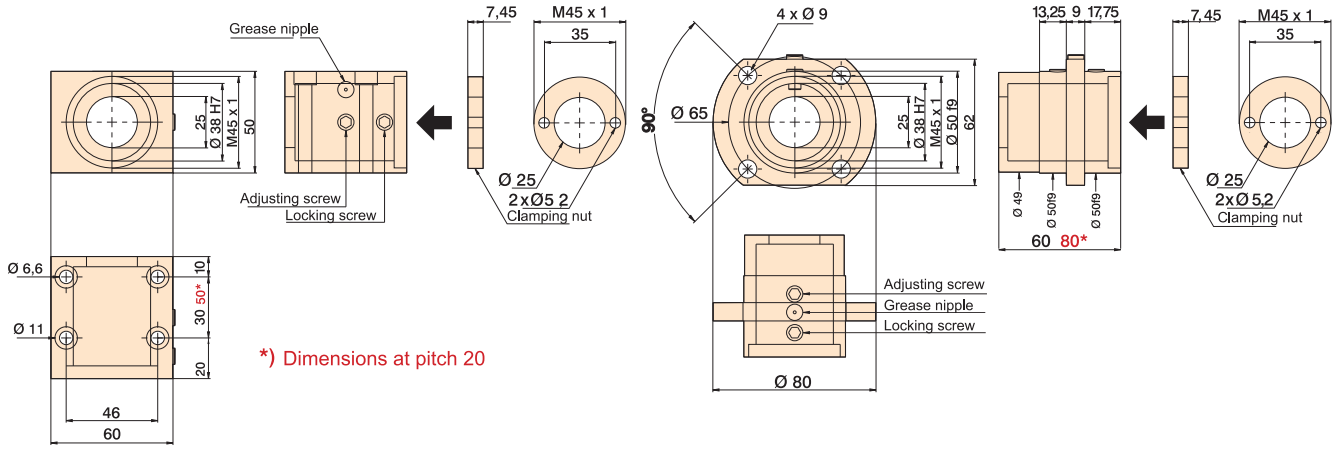
Base securing

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 information

Flange bearing, drive side

Part no.: 216 504 0001

Flange bearing, floating bearing side

Part no.: 216 504 0002

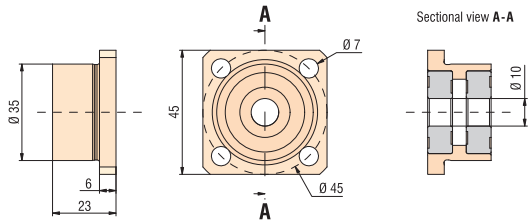
Features

- 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 (counterbearing): bushing with a pressed needle bearing

Dimensioned drawings

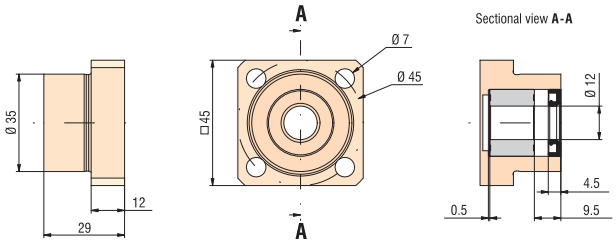
Flange bearing

drive side



Flange bearing

Floating bearing side



for spindle ∅ 25 mm

Flange bearing

drive side

Flange bearing

floating bearing side

Ordering information

Flange bearing, drive side

Part no.: 216 504 0006

Flange bearing, floating bearing side

Part no.: 216 504 0005

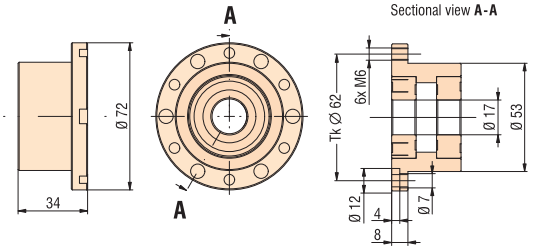
Features

- 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 (counterbearing): bushing with a pressed needle bearing

Dimensioned drawings

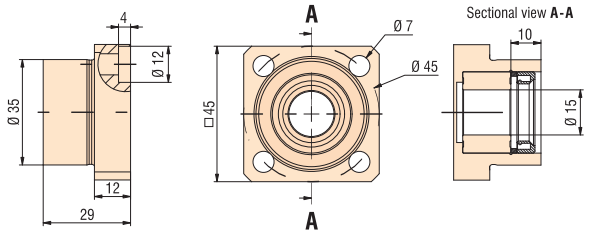
Flange bearing

drive side



Flange bearing

floating bearing side



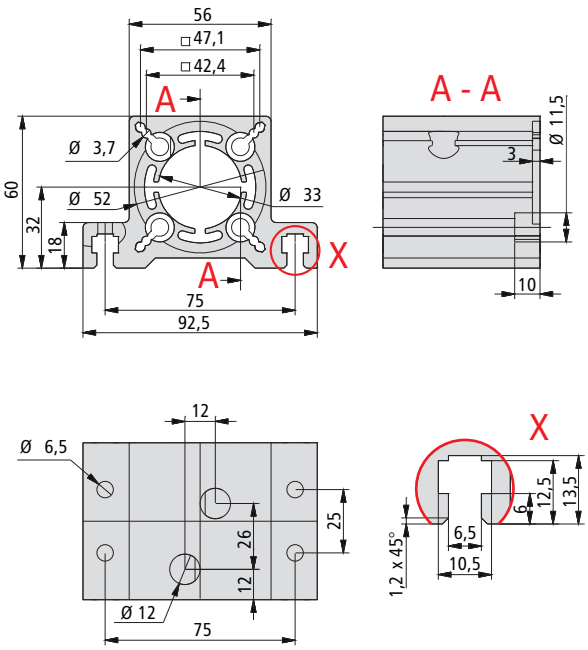
Bearing supports

Bearing support 1

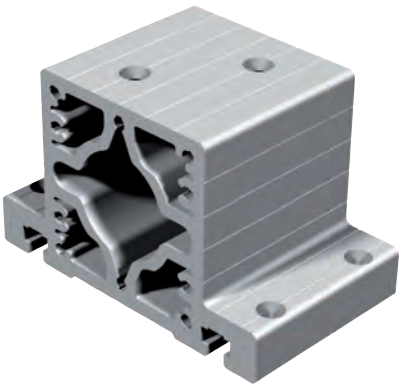
- Aluminium profile to DIN EN 12020-2
- As a parallel connection of flange bearing and motor flange
- Flat milled securing surfaces
- Version for recirculating ball spindle Ø 16 mm
- Universal securing options

.

Part no.: **216504 0007**



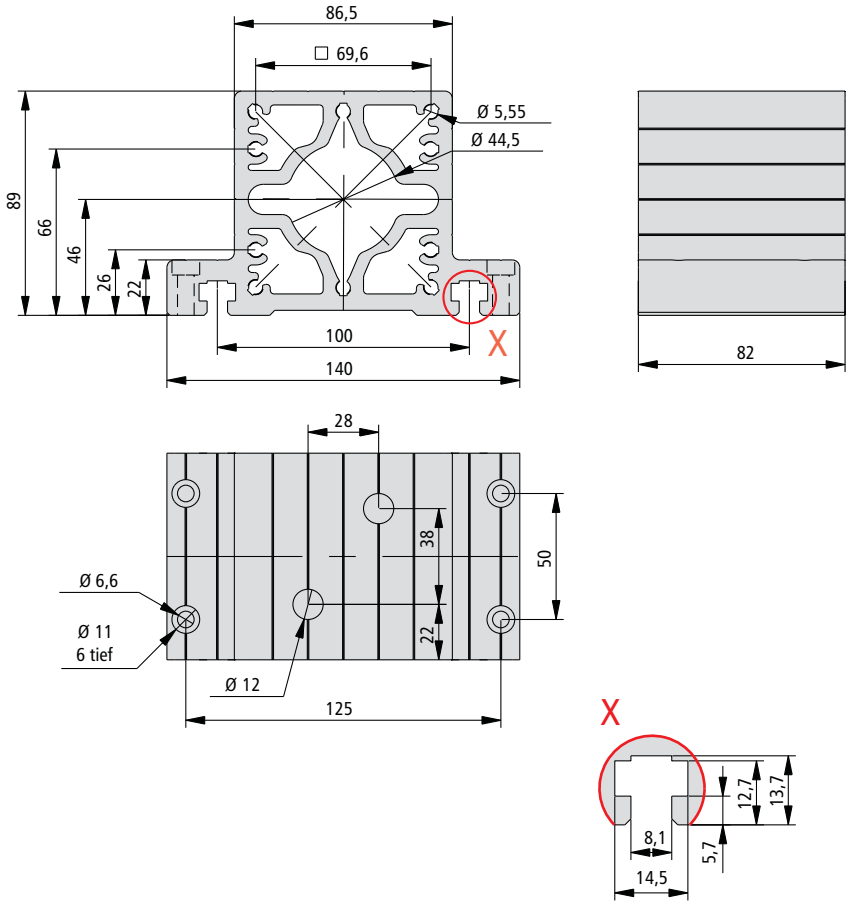
Bearing support 2



- Aluminium profile to DIN EN 12020-2
- As a parallel linkage of flange bearing and motor flange
- Version for recirculating ball spindle Ø 25 mm
- Universal securing options

.

Part no.: **216504 0008**



Shaft couplings

Connection options Direct drive	LES 4	LES 6	LES 5	Angular transmission Securing 0°	Angular transmission Securing 90°
MS 135 HT - 2 MS 200 HT - 2 DC 100 EC 60	Connection via clutch housing 1 short bushing with corresponding shaft coupling				Clutch housing 1 long bushing
MS 600 HT MS 900 HT DC 300 EC 86	Connection via clutch housing 2 short bushing with corresponding shaft coupling				Clutch housing 2 long bushing
Angular transmission Securing 0°	split clutch housing short bushing with corresponding shaft coupling			Connection via Transmission shaft set	
Angular transmission Securing 90°	split clutch housing long bushing with corresponding shaft coupling				

Shaft couplings

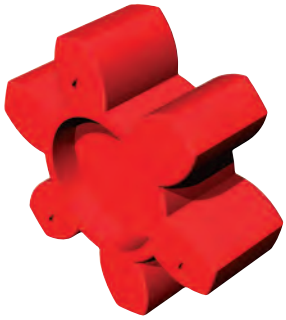
Deliverables: 2 aluminium blocks,
3 PUR sprockets (86°, 92° and 98° Shore) and matching adjusting screws

For part no. see table

Clutch	Part no.	d 1	d 2
20/30	218001 5060	5.0	6.0
	218001 9999	from 4 to 7 mm	
30/40	218002 6380	6.35	8.0
	218002 8080	8.0	8.0
	218002 9999	from 4 to 13 mm	
40/60	218003 9580	9.52	8.0
	218003 9999	from 4 to 18 mm	

Other clutches to order.

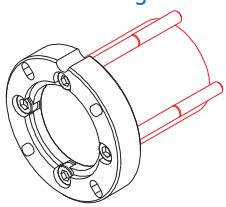
PUR sprockets



for WK 20/30 Part no.: 217 011 00**
for WK 30/40 Part no.: 217 012 00**
for WK 40/60 Part no.: 217 013 00**

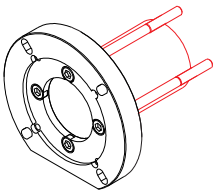
for ** use the Shore hardness

Clutch housing 1 + 2



short bushing
Part no.: 218 100 0001

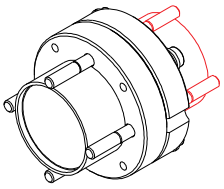
long bushing
Part no.: 218 100 0002



short bushing
Part no.: 218 100 1001

long bushing
Part no.: 218 100 1002

split clutch housing



short bushing
Part-no.: 218 100 2001

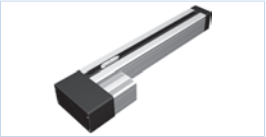
long bushing
Part-no.: 218 100 2002

mechanics

Linear units Overview

LES functional overview C 58

LES 4 C 60
with spindle drive



LES 6 C 62
with spindle drive

LES 5 C 64
with spindle drive

LES 16-150 C 66
with spindle drive

LES 16-250 C 67
with spindle drive

Calculations C 68

Combination examples C 70

Motor modules C 72

Installation kit with angular transmission C 76

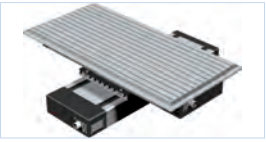
Slot/crossbench plates C 78

T-key slot plates C 81

Angle bracket C 82

Accessories C 85

Cross bench 10/20 C 86



Linear units

Overview

LEZ functional overview C 88

LEZ 1 C 90
with toothed belt drive

LEZ 2 C 92
with toothed belt drive

LEZ 3 C 94
with toothed belt drive

LEZ 9 C 96
with toothed belt drive

Accessories C 98

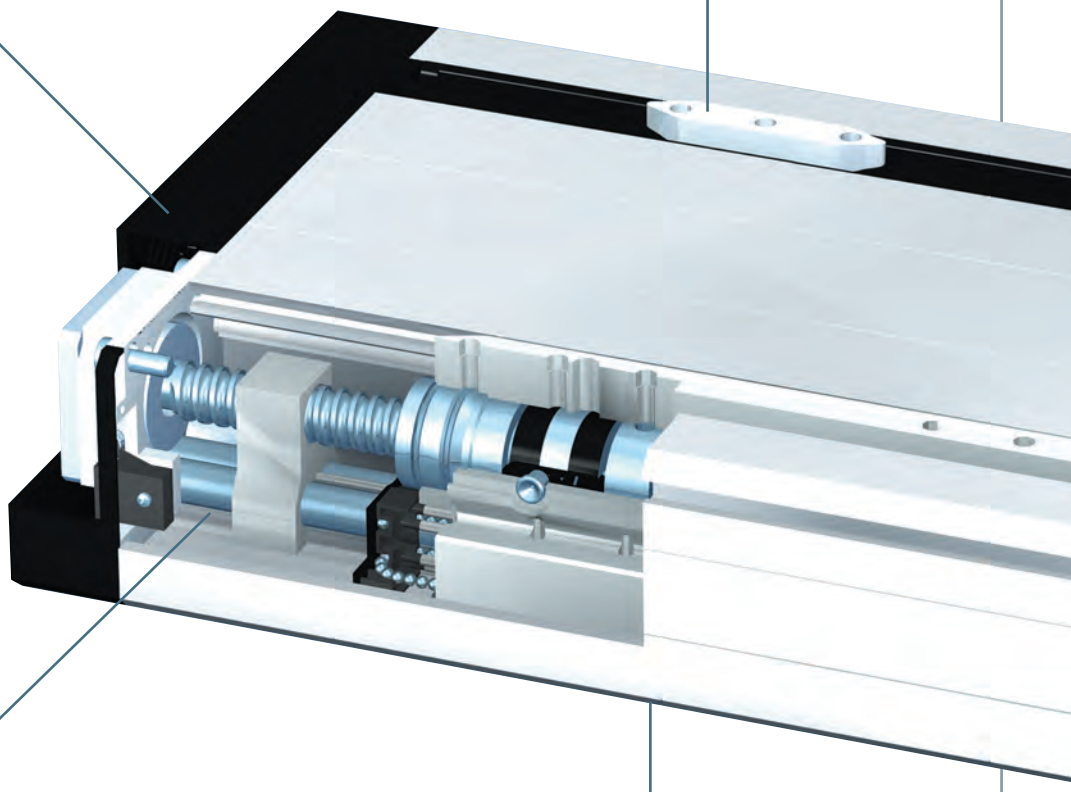
Examples in use C 99

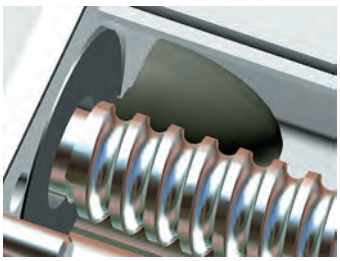
iLD C 100
with direct drive

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

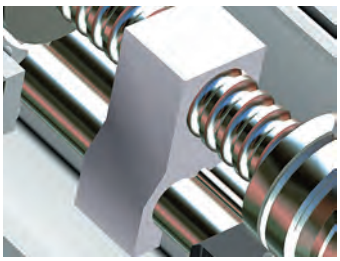
Functional overview

at example LES 5

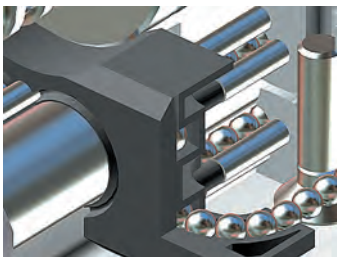




- End position buffering both sides with soft PVC parabolic springs
- Counter-bearing with 2 needle bushings



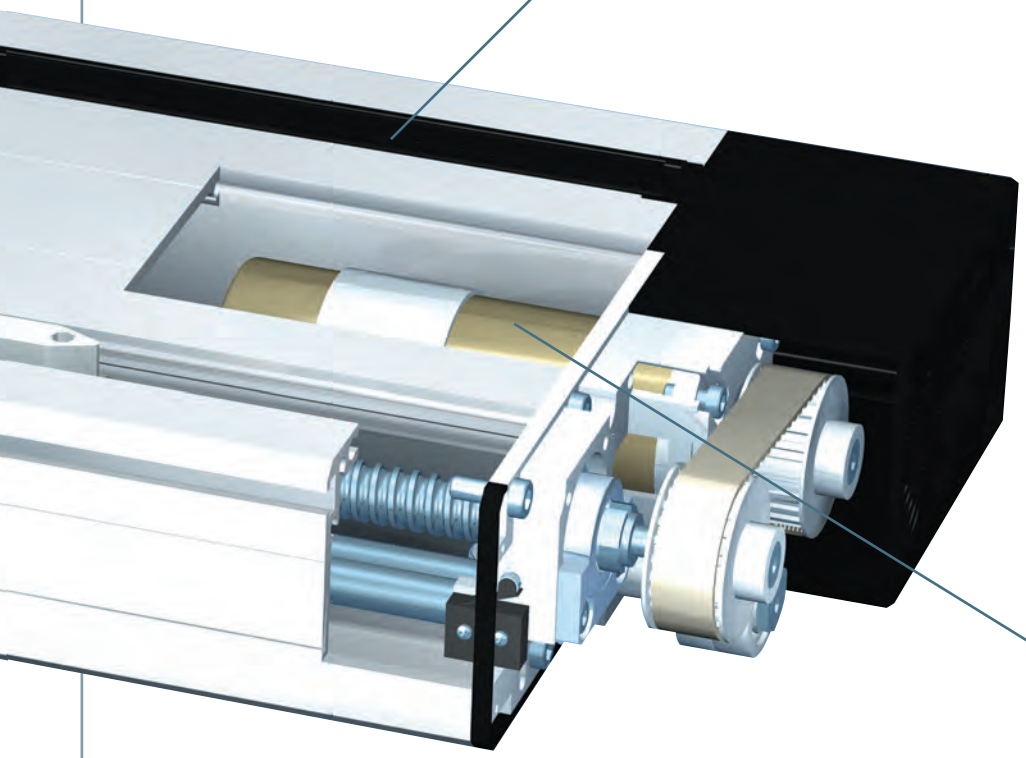
- Spindle support from a profile length of 1500 mm without limiting the travel

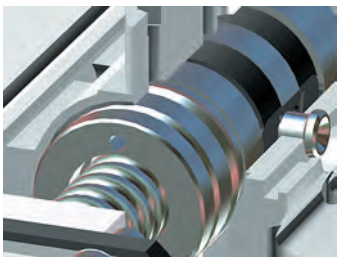


- Recirculating ball in patented aluminium linear slots
- Glass fibre reinforced loop components with scrapers

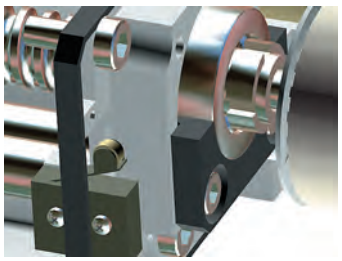
Functional overview

at example LES 5

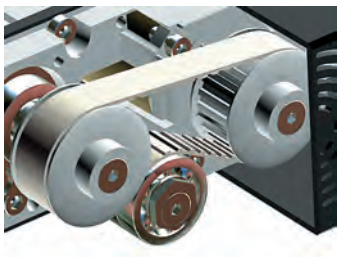




- Preset play-free recirculating ball nut with scrapers
- Central lubrication system for recirculating ball nut and circulations



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

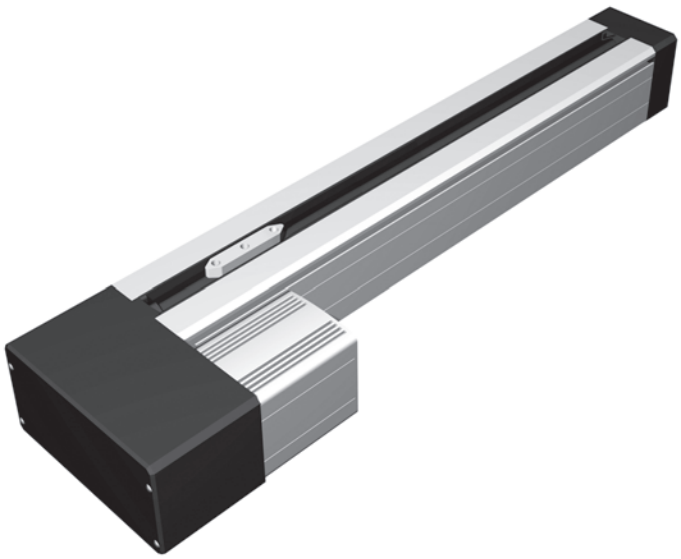


- Belt return and connecting electronics covered completely by protective cap

mechanics

Linear units
with spindle drive

LES 4



LES 4 with side belt drive module

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 slots WS 5/70, 2 x WS 5/70 (70 mm long), adjustable for no play, central lubrication system
- Recirculating ball transmission with 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, Repeatability ± 0.02 mm
- sealed angular contact bearings in drive - steel flange

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

Ordering key

234 XXX 0XXX

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

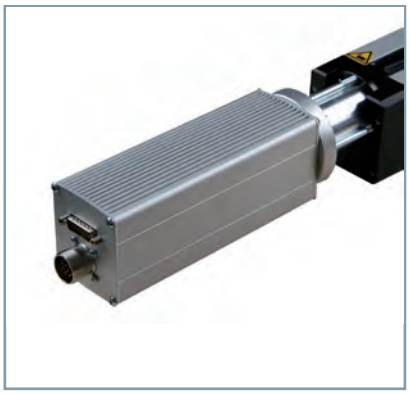
Shaft slots
0 = 1 Shaft slots 70 mm
2 = 2 shaft slots 70 mm

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

Recirculating ball drive
0 = none
1 = Pitch 2.5 mm
2 = Pitch 4.0 mm
3 = Pitch 5.0 mm
4 = Pitch 10 mm
5 = Pitch 20 mm

Drive modules

see page 72 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

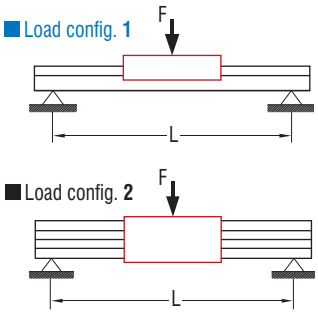
No load running torques

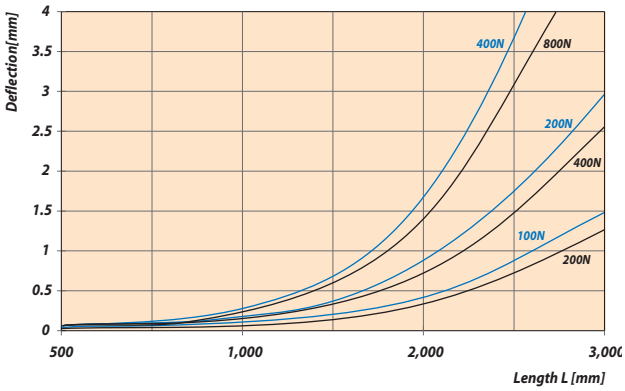
No load running torques					
Speed (rpm)	Spindle pitch				
	2.5	4	5	10	20
500	15	15	16	17	18
1500	19	19	19	20	21
3000	23	24	24	25	26

Linear units
with spindle drive

LES 4

Bending

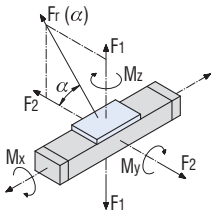




Load factors

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

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



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

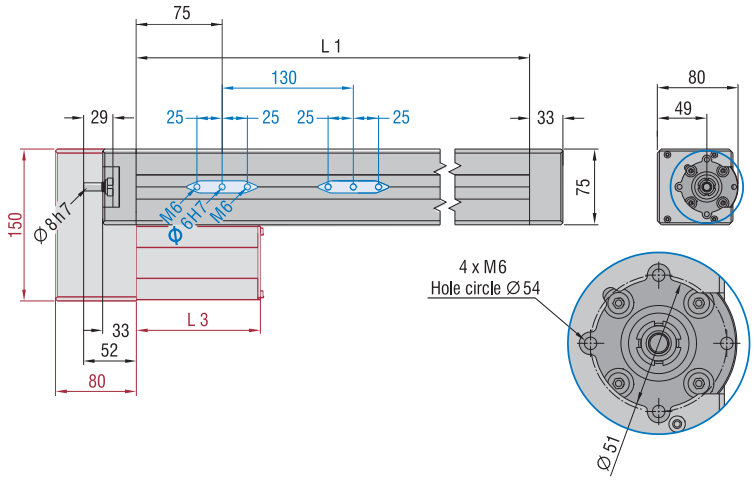
* with spindle support

Dimensioned drawing

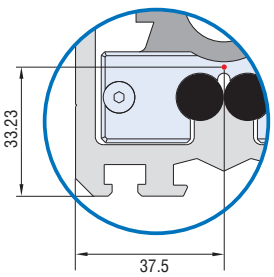
process travel

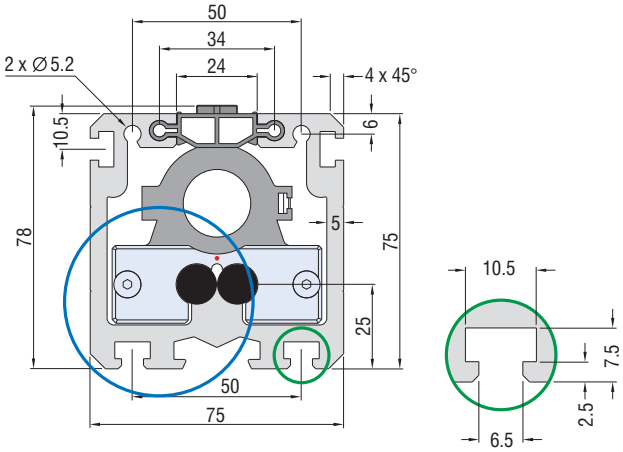
at 1xWS 5/70 = L1 -150 mm
at 2xWS 5/70 = L1 -280 mm

external limit switches see page **C85**



Dimensioned drawing
Aluminium profile





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 slots WS 5/70, 2 x WS 5/70 (70 mm long), adjustable for no play, central lubrication system
- Recirculating ball transmission with 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, Repeatability ± 0.02 mm
- sealed angular contact bearings in drive - steel flange

Ordering key

234 XXX 0XXX

Profil length (L1)
e.g. 029 = 290 mm (min.)
299 = 2990 mm (max.)
(rounded to the last digit)
Standard profile length in 100 mm raster – to order

Recirculating ball drive
0 = none
1 = Pitch 2.5 mm
2 = Pitch 4.0 mm
3 = Pitch 5.0 mm
4 = Pitch 10 mm
5 = Pitch 20 mm

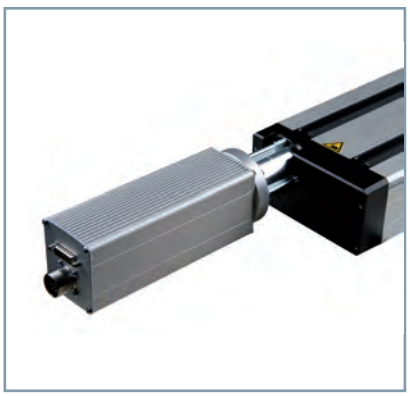
Drive
6 = Preparation Direct drive modules
7 = Preparation Belt drive module

Shaft slots
0 = 2 shaft slots 70 mm
2 = 4 shaft slots 70 mm

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

Drive modules

see page 72 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

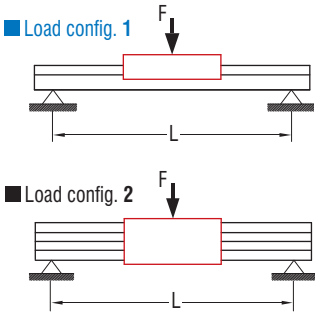
No load running torques

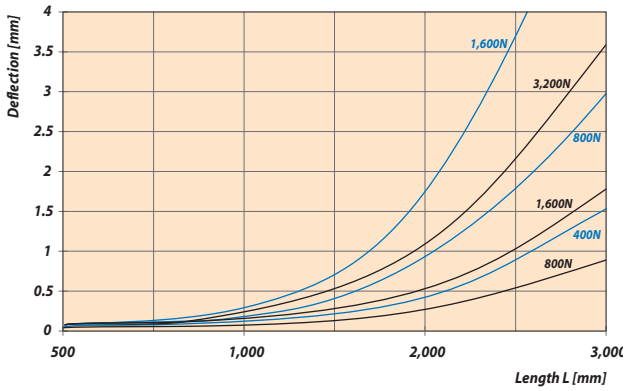
No load running torques (Ncm)					
Speed (rpm)	Spindle pitch				
	2.5	4	5	10	20
500	17	17	18	20	21
1500	20	20	22	24	25
3000	24	25	26	29	30

Linear units
with spindle drive

LES 6

Bending

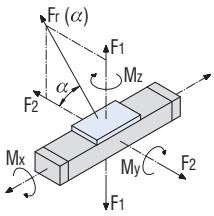




Load factors

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

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



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

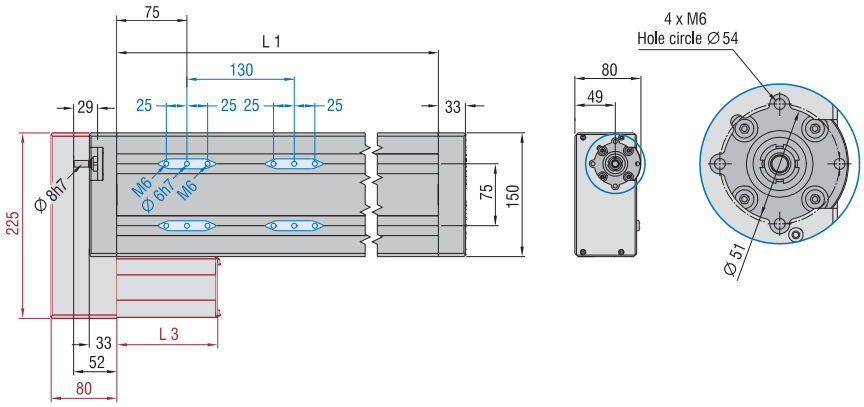
* with spindle support

Dimensioned drawing

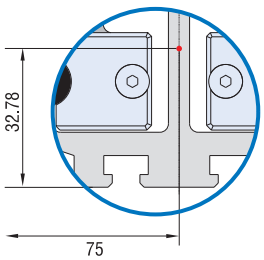
process travel

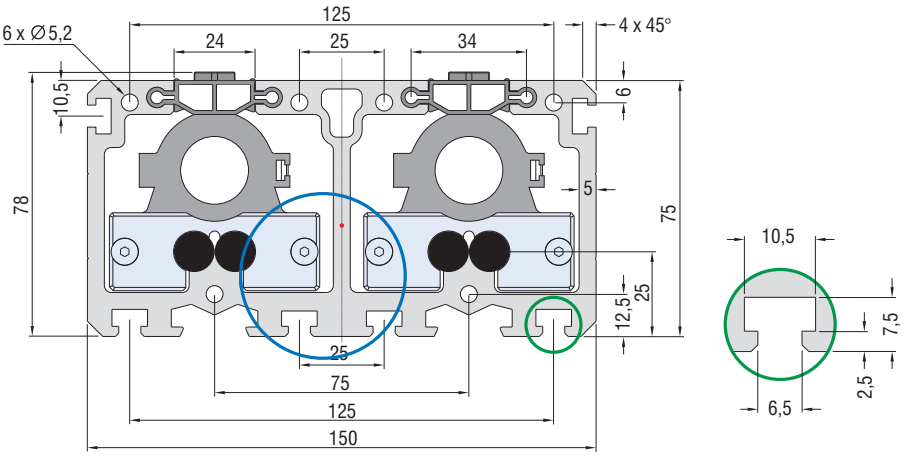
at 2 × WS 5/70 = L1 -150 mm
at 4 × WS 5/70 = L1 -280 mm

external limit switches see page **C85**



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 slots WS 5/70, 2 x WS 5/70 (70 mm long), adjustable for no play, central lubrication system
- Recirculating ball transmission with 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, Repeatability ± 0.02 mm
- sealed angular contact bearings in drive - steel flange

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

Ordering key

234 XXX 0XXX

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

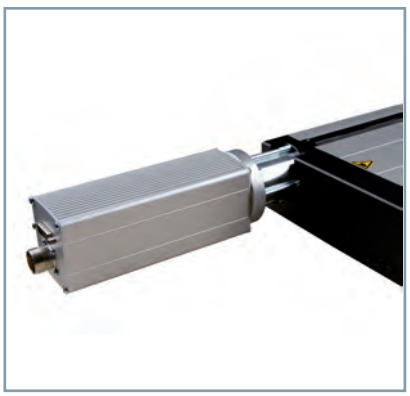
Shaft slots
0 = 2 shaft slots 70 mm
2 = 4 shaft slots 70 mm

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

Recirculating ball drive
0 = none
1 = Pitch 2.5 mm
2 = Pitch 4.0 mm
3 = Pitch 5.0 mm
4 = Pitch 10 mm
5 = Pitch 20 mm

Drive modules

See page 72 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

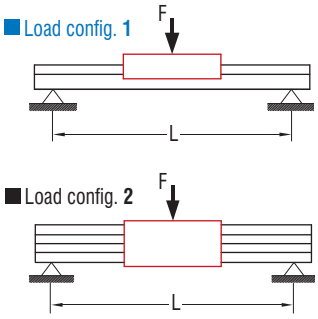
No load running torques

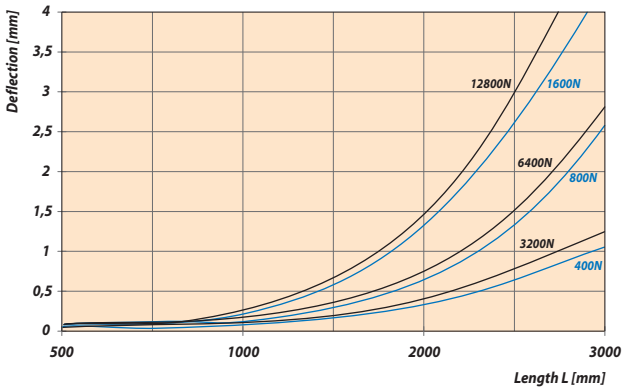
No load running torques (Ncm)					
Speed (rpm)	Spindle pitch				
	2.5	4	5	10	20
500	15	15	16	17	18
1500	19	19	19	20	21
3000	23	24	24	25	26

Linear units
with spindle drive

LES 5

Bending

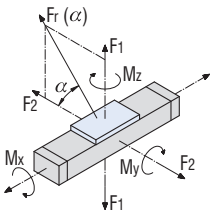




Load factors

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

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



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

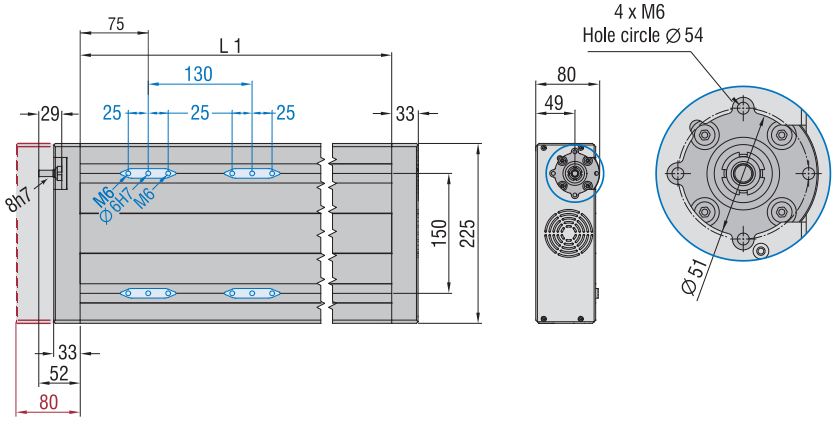
* with spindle support

Dimensioned drawing

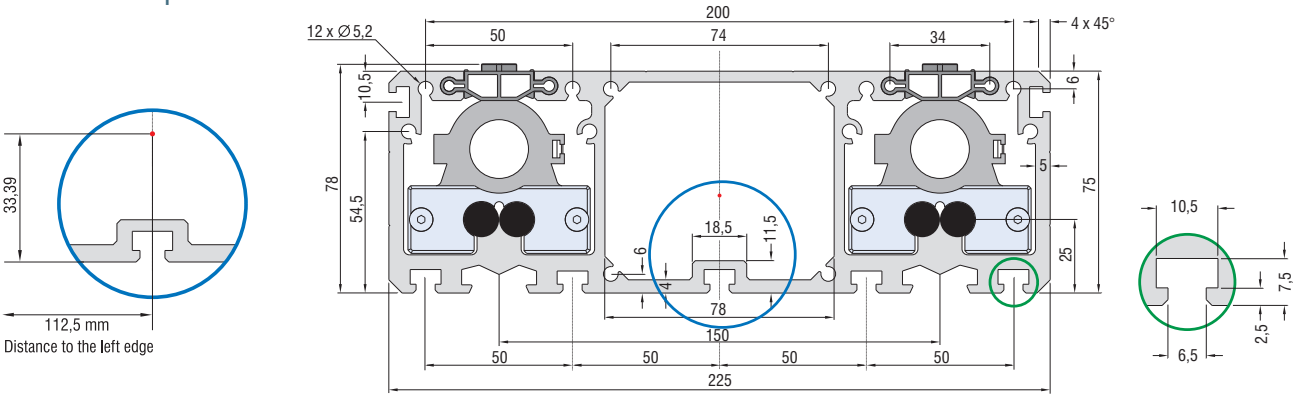
process travel

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

external limit switches see page **C85**



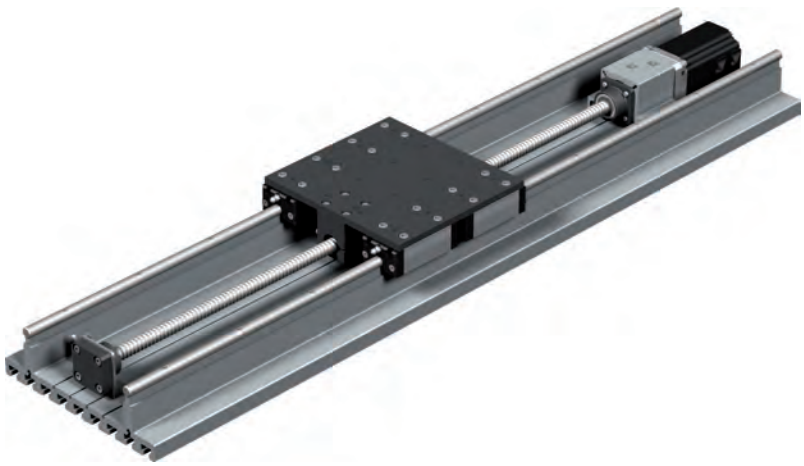
Dimensioned drawing
Aluminium profile



mechanics

Linear units
with spindle drive

LES 16-150



Features

- Aluminium shaft housing profile W 225 × H 65.3 mm
- Length: 0.5/1.0/1.5 m Intermediate sizes to order
- 2 precision steel shafts Ø 16 mm with exactly milled shaft housings
- 4 aluminium slides IWS 1
- Central lubrication option
- 2 limit or reference switches
- Repeatability ± 0.01 mm
- Recirculating ball drive Ø 16 × 5 mm
- various drive options

Options:
- Other lengths (longer or shorter)
- Profile cover
- Ball screw drive Ø16×2.5mm /10mm

General

Linear units in the LES series with spindle drive are of modular construction and can be used for a wide variety of applications. They are based on rigid aluminium profiles with precision steel shafts. Recirculating ball drives produce the feed movement, multiphase motors or servomotors are used as motor drives. Linear units in the LES series can be used either horizontally or vertically. Patented shaft slots with recirculating balls are used as guide slots. The load-bearing balls also run between 2 ground steel pins and the guide shaft respectively. The desired dimensions can be delivered up to a length of 3 metres according to customer requirements.

Technical specification

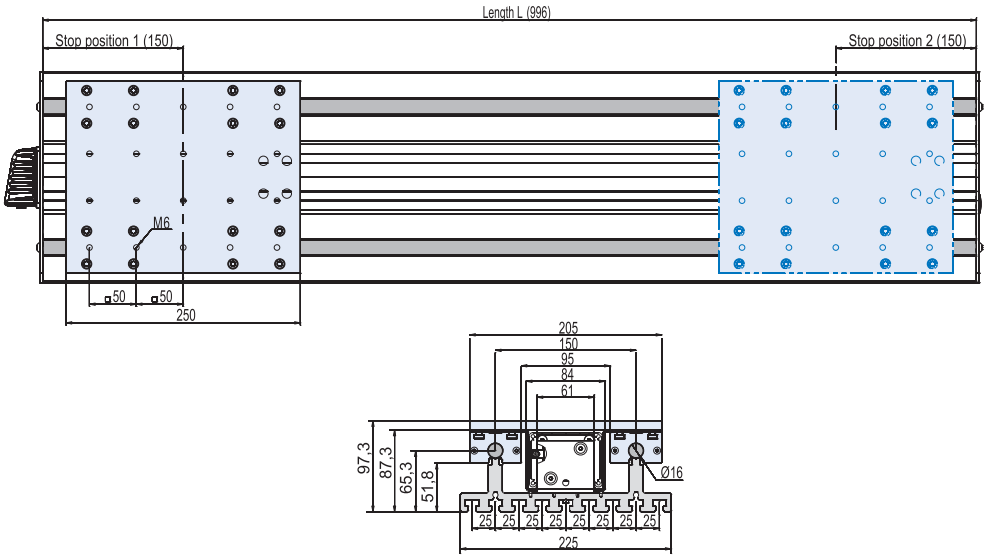
Moment of inertia I_x	1899.61 cm^4
Moment of inertia I_y	104.94 cm^4
Cross-sectional area	39.63 cm^2
Material	AlMgSiO, 5F 22
Anodising	E6/EV 1
Weight with steel shafts	12.43 kg/m

Ordering data

Part-no.: **238053 004907*** (Length 0,5 m)
Part-no.: **238053 009907*** (Length 1 m)
Part-no.: **238053 014907*** (Length 1.5 m)

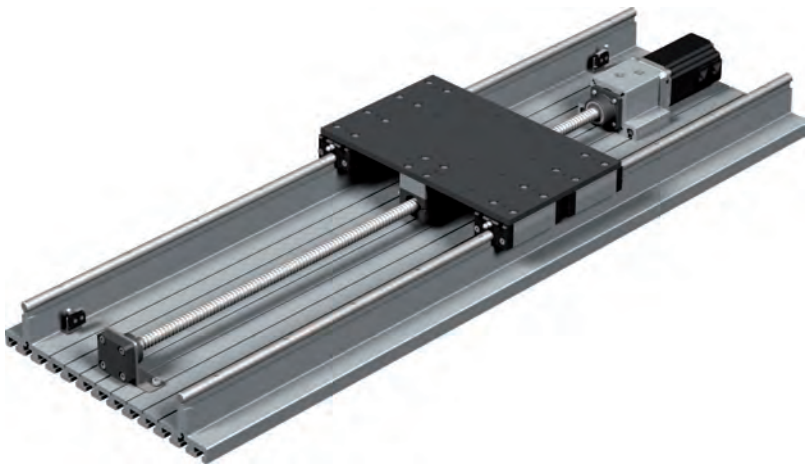
* inkluding Motor

Dimensioned drawing



Linear units
with spindle drive

LES 16-250



Features

- Aluminium shaft housing profile W 325 × H 65.3 mm
- Length: 0.5/1.0/1.5 m Intermediate sizes to order
- 2 precision steel shafts Ø 16 mm with exactly milled shaft housings
- 4 aluminium slides IWS 1
- Central lubrication option
- 2 limit or reference switches
- Repeatability ± 0.01 mm
- Recirculating ball drive Ø 16 × 5 mm
- various drive options

Options:
- Other lengths (longer or shorter)
- Profile cover
- Ball screw drive Ø 16 × 2.5 mm/10 mm

General

Linear units in the LES series with spindle drive are of modular construction and can be used for a wide variety of applications. They are based on rigid aluminium profiles with precision steel shafts. Recirculating ball drives produce the feed movement, multi-phase motors or servomotors are used as motor drives. Linear units in the LES series can be used either horizontally or vertically. Patented shaft slots with recirculating balls are used as guide slots. The load-bearing balls also run between 2 ground steel pins and the guide shaft respectively. The desired dimensions can be delivered up to a length of 3 metres according to customer requirements.

Technical specifications

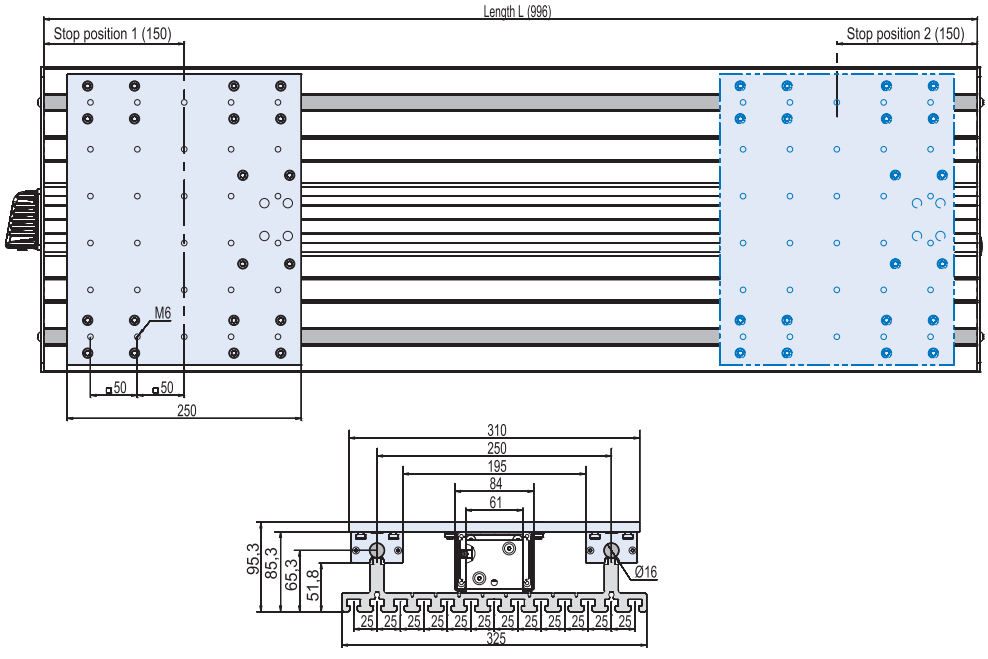
Moment of inertia I_x	5637.55 cm^4
Moment of inertia I_y	121,37 cm^4
Cross-sectional area	53.63 cm^2
Material	AlMgSiO, 5F22
Anodising	E6/EV1
Weight with steel shafts	14.41 kg/m

Ordering data

Part no.: **238063 004907*** (Length 0.5m)
Part no.: **238063 009907*** (Length 1m)
Part no.: **238063 014907*** (Length 1.5 m)

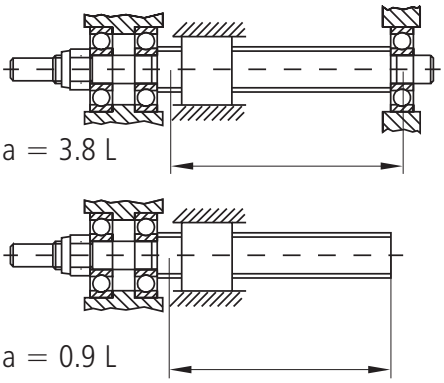
* including motor

Dimensioned drawing



mechanics

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

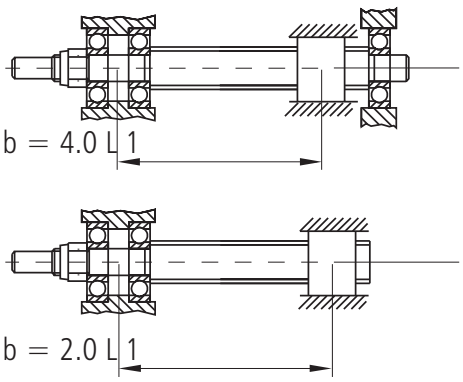
In most applications, you need to check tapped spindles at their critical speed.

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

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

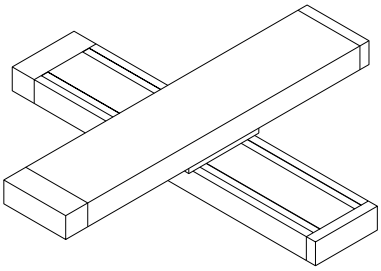
Drive power

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

Definitions

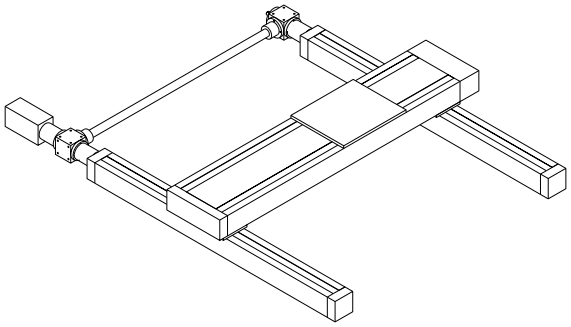
M_A	[Nm]	required drive torque
M_{leer}	[Nm]	Torque, resulting from the various loads
M_{leer}	[Nm]	No load torque
M_{rot}	[Nm]	Rotational acceleration torque
M_{trans}	[Nm]	translational acceleration torque
Fx	[N]	Feed force
g	[m/s^2]	Acceleration due to gravity
v_{max}	[m/s]	maximum process speed
m	[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
μ		coefficient of friction
J_{sp}	[kgm^2/m]	Inertial torque of inertia of the spindle per meter
F_a	[N]	Accelerating force

Combination examples



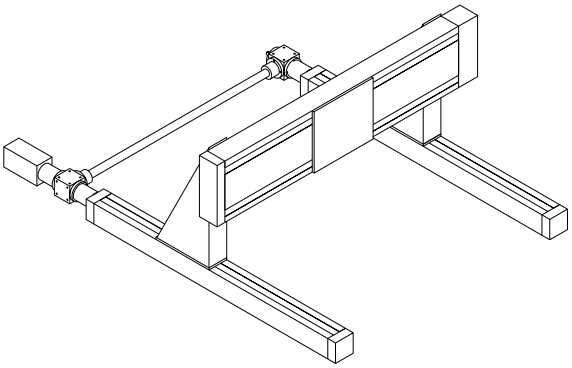
Crossbench

2 x LES 5
PS 4 with VP 2



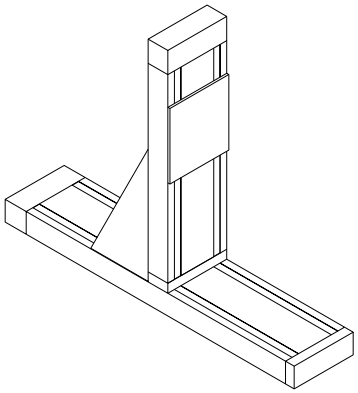
2-axis H-design

2 × LES 4, LES 5, angular transmission kit,
2 x PS 6, PS 4



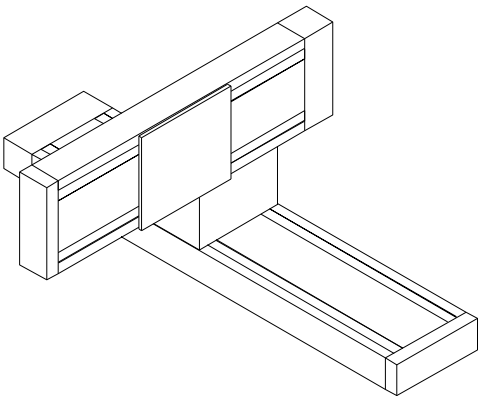
2-axis flatbed configuration

2 × LES 4, LES 5, angular transmission kit,
2 x PS 2, 2 × WV 2, PS 4



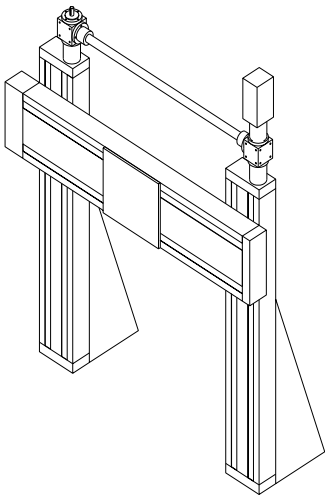
2-axis lifting configuration

2 × LES 5, 2 × PS 4
WV 6



2-axis boom configuration

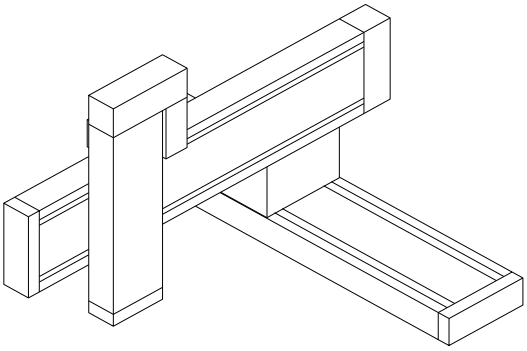
2 × LES 5
2 × PS 4
WV 3



2-axis H-design

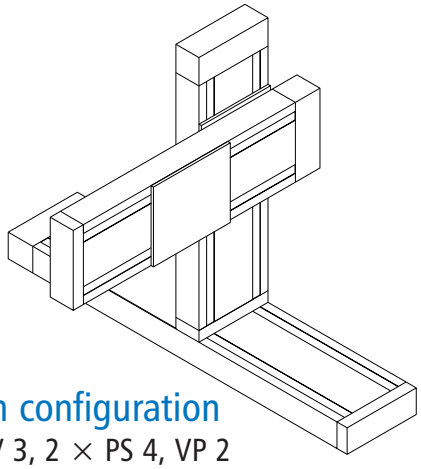
LES 5, 2 × LES 6, 2 × WV 7
Angular transmission kit, 2 × PS 12
PS 4

Combination examples



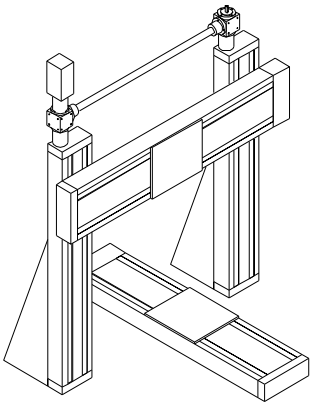
3-axis boom configuration

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



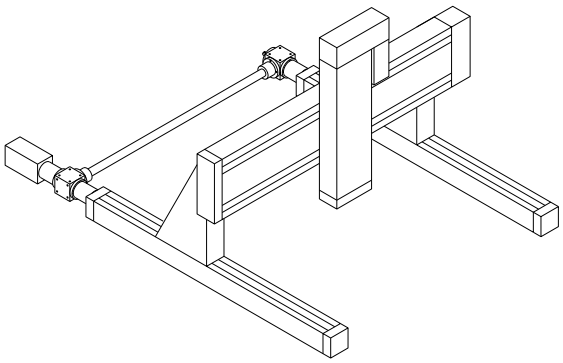
3-axis raised boom configuration

3 × LES 5, WV 3, 2 × PS 4, VP 2



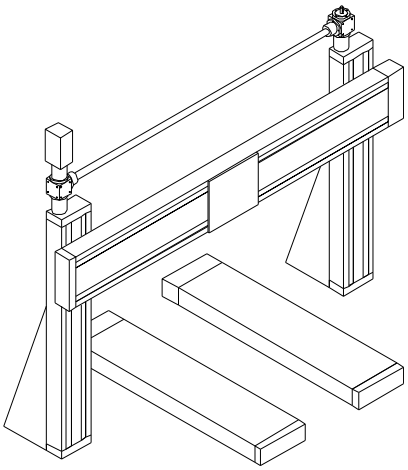
3-axis portal configuration

2 × LES 5, 2 × LES 6, 2 × WV 7
Angular transmission kit, 2 × PS4, PS 12



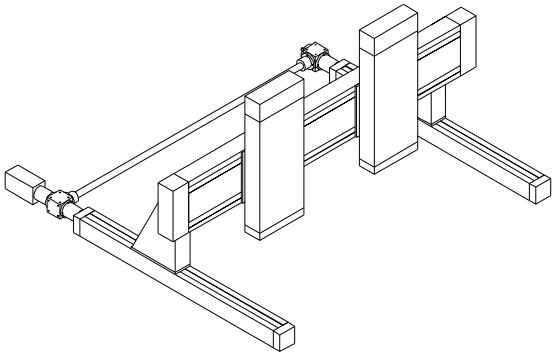
3-axis flatbed configuration

2 × LES 4, LES 5, LES 6, 2 × PS 2, 2 × WV 2
Angular transmission kit, PS 4, PS 7



4-axis portal configuration

3 × LES 5, 2 × LES 6, 2 × WV 7
Angular transmission kit
3 × PS 4
2 × PS 12



5-axis flatbed configuration

2 × LES 5 (Z-axes)
LES 5 (2 spindle drives)
2 × LES 4, 2 × PS 2, 2 × WV 2
Angular transmission kit, 2 × PS4 with VP 2

Motor modules

Ordering overview

LES 4/5/6 Direct drives	System / circular plug	Z-axis / circular plug with brake
DC servo motor DC 100	396 112 0060	-
Step motor MS 135 HT - 2	396 055 0060	396 055 0360
Step motor MS 200 HT - 2	396 058 0060	396 058 0360
EC servo motor EC 60S	396 415 0060	396 415 0260
EC servo motor EC 60L 48V	396 423 0060	-
EC servo motor EC 60L 310V	396 423 0070	-
DC servo motor DC 300	396 114 0060	-
EC servo motor EC 86L	396 466 0070	-
EC servo motor EC 86S	396 444 0070	-
Step motor MS 600 HT	396 085 0060	-
Step motor MS 900 HT	396 088 0060	-

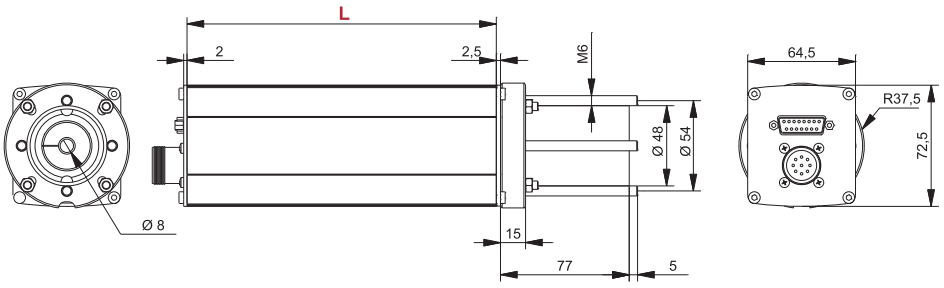
LES 5 integrated	System / circular plug	Z-axis / circular plug with brake
Step motor MS 135 HT - 2	396 055 1060	396 055 1360
Step motor MS 200 HT - 2	396 058 1060	396 058 1360
DC servo motor DC 100	396 112 1060	-
EC servo motor EC 60S	396 415 1060	396 415 1260
EC servo motor EC 60L 48V	396 423 1060	-
EC servo motor EC 60L 310V	396 423 1070	-

LES 4 / LES 6 side mounting	System / circular plug	Z-axis / circular plug with brake
Step motor MS 135 HT - 2	396 055 2060	396 055 2360
Step motor MS 200 HT - 2	396 058 2060	396 058 2360
DC servo motor DC 100	396 112 2060	-
EC servo motor EC 60S	396 415 2060	396 415 2260
EC servo motor EC 60L 48V	396 423 2060	-
EC servo motor EC 60L 310V	396 423 2070	-

Motor modules

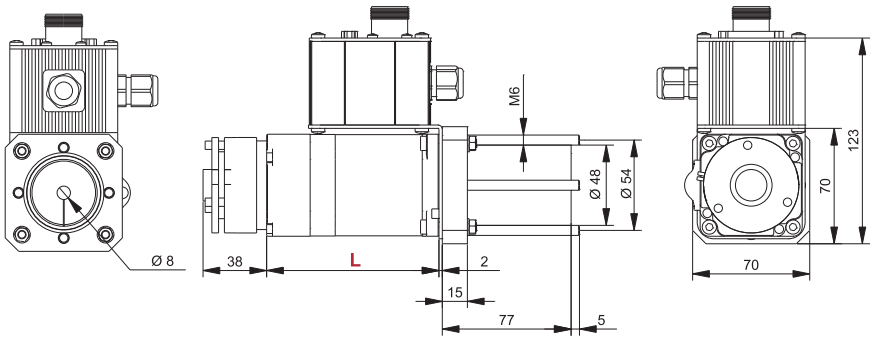
Dimensioned drawing
Motor module 1

Part no.	Motor module	Length L
396112 0060	DC 100	185 mm
396055 0360	MS 135 HT-2 with brake	165 mm
396055 0060	MS 135 HT-2 w/o brake	105 mm
396058 0360	MS 200 HT-2 with brake	165 mm
396058 0060	MS 200 HT-2 w/o brake	105 mm



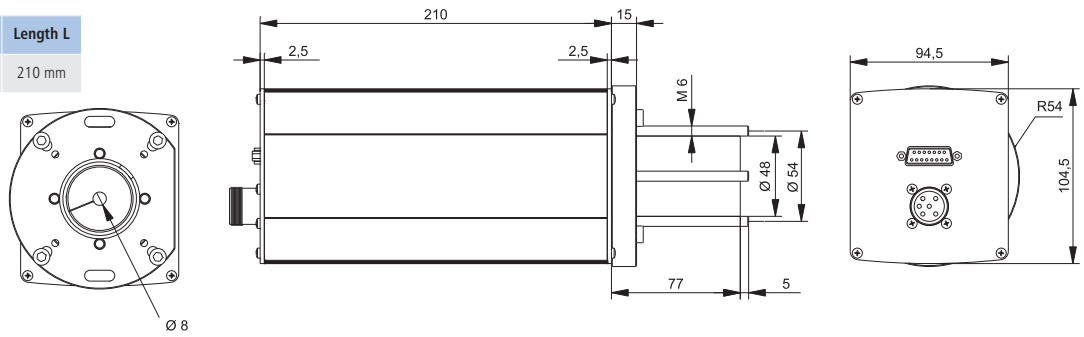
Dimensioned drawing
EC 60

Part no.	Motor module	Length L
396415 0260	EC 60S with brake	99 mm
396415 0060	EC 60S w/o brake	99 mm
396423 0060	EC 60L 48V	120 mm
396423 0070	EC 60L 310V	120 mm



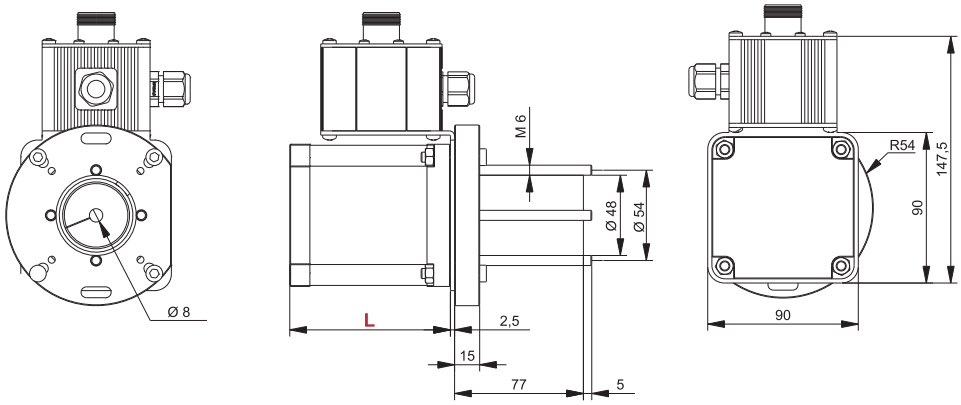
Dimensioned drawing
DC 300

Part no.	Motor module	Length L
396114 0060	DC 300	210 mm



Dimensioned drawing
Motor module 2

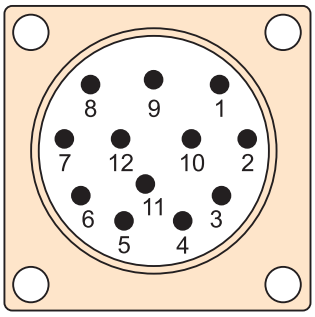
Part no.	Motor module	Length L
396466 0070	EC 86L	151 mm
396444 0070	EC 86S	126 mm
396085 0060	MS 600HT	96 mm
396088 0060	MS 900 HT	126 mm



Motor pin assignments

Pin assignment for step motors

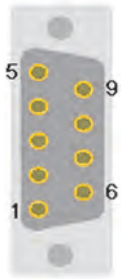
Motor connection



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

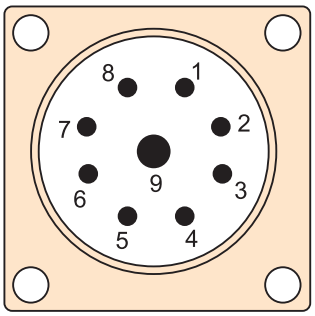


View of pin insert
at the insertion side

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 (BCD)

Motor connection

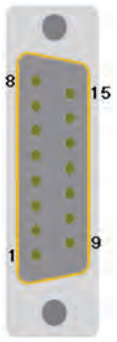


View of pin insert at the insertion side

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

* Motor phases are connected partially with two wires.

Encoder connection

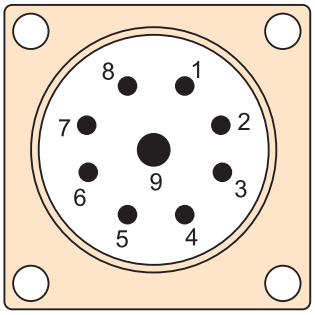


View of pin insert
at the insertion side

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

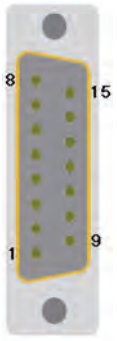
Motor connection



View of pin insert at the insertion side

M23 9-pin (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



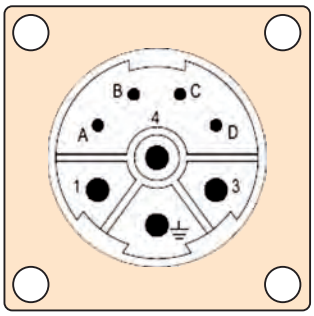
View of pin insert
at the insertion side

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 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 servo motors (BLDC) 310V

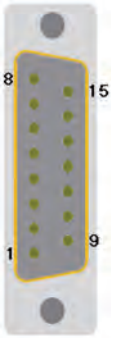
Motor connection



View of pin insert at the insertion side

M23 9-pin (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 step-, DC servo and EC motors

Part number	Description
392305 0300	3-metre EC/AC servomotor lead M23 310V (4+3+PE) socket - wire end sockets
392305 0500	5-metre EC/AC servomotor lead M23 310V (4+3+PE) socket - wire end sockets
392325 0300	3-metre encoder lead M23 17-pin socket – D-sub 15-pin plug
392325 0500	5-metre encoder lead M23 17-pin socket – D-sub 15-pin plug
392740 0300	3-metre encoder lead D-sub 15-pin plug – socket 1:1
392740 0500	5-metre encoder lead D-sub 15-pin plug – socket 1:1
392750 0300	3-metre step motor lead M23 12-pin plug – socket 1:1
392750 0500	5-metre step motor lead M23 12-pin plug – socket 1:1
392755 0300	3-metre step motor lead D-sub 9-pin plug – M23 12-pin socket
392755 0500	5-metre step motor lead D-sub 9-pin plug – M23 12-pin socket
392759 0300	3-metre DC/EC servomotor lead M23 9-pin (8+PE) plug - socket 1:1
392759 0500	5-metre DC/EC servomotor lead M23 9-pin (8+PE) plug - socket 1:1
392760 0300	3-metre DC/EC servomotor lead M23 9-pin (8+PE) plug – wire end bushings
392760 0500	5-metre DC/EC servomotor lead M23 9-pin 8+PE) plug – wire end bushings
392781 0300	3-metre step motor lead D-sub 9-pin plug – socket 1:1
392781 0500	5-metre step motor lead D-sub 9-pin plug – socket 1:1

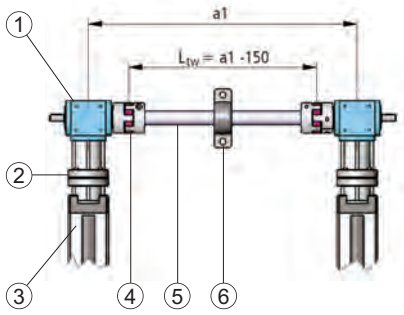
All listed motor and encoder leads are fit for use with tow chains.

* Different lengths to order.

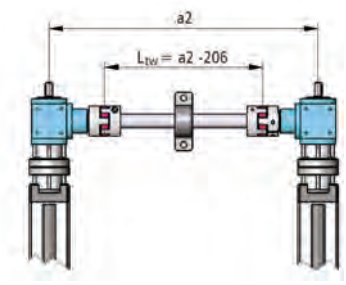
Installation kit with angular transmission Drive element accessories

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)

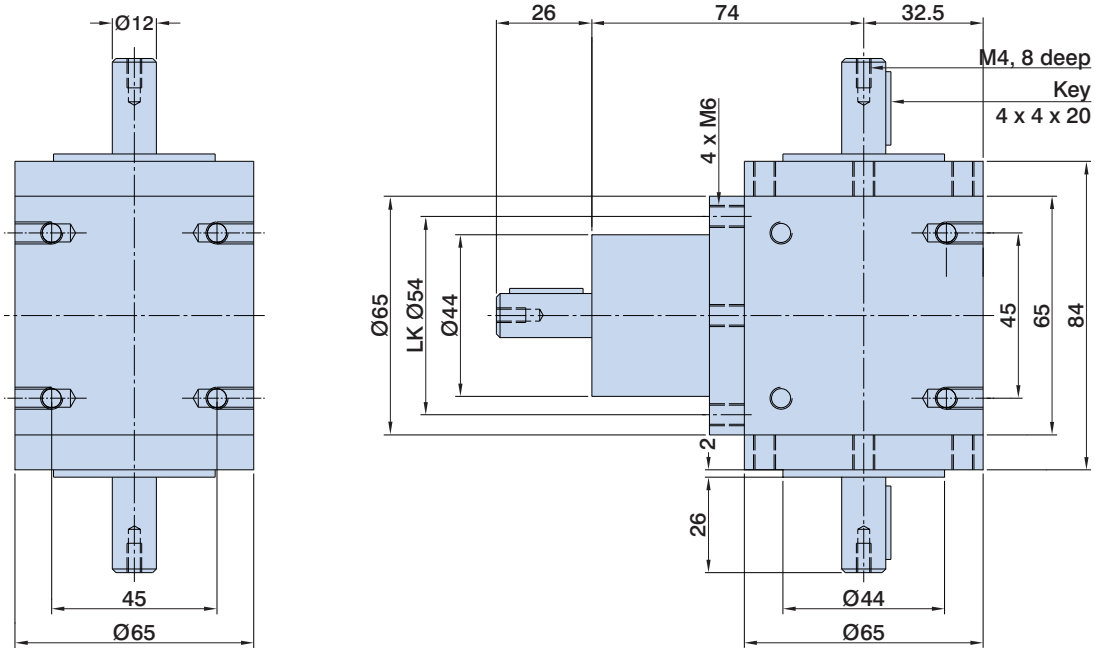
④ Coupling for transmission shaft Ø 25

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, securing 90°
Deliverables: 2 ×①, 2 ×②, 2 ×④
Part no.: 216150 0002

for H-design on LES 4/LES 6/LES 5, securing 0°
Deliverables: 2 x①, 2 x②, 2 x④
Part no.: 216150 0001

Transmission shaft

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

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

Coupling / stationary bearing

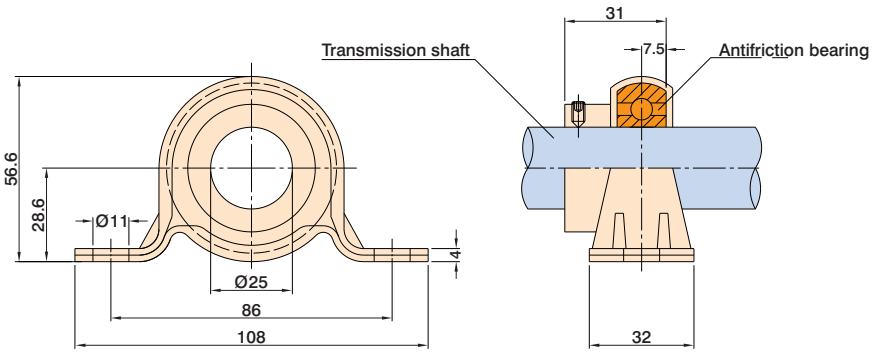
Coupling for transmission shaft 12 to 25 mm adaptor, VE 2 pcs.
Part no.: 218050 0002

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

For matching direct drive modules LES 4/5/6 see table on page "C72".

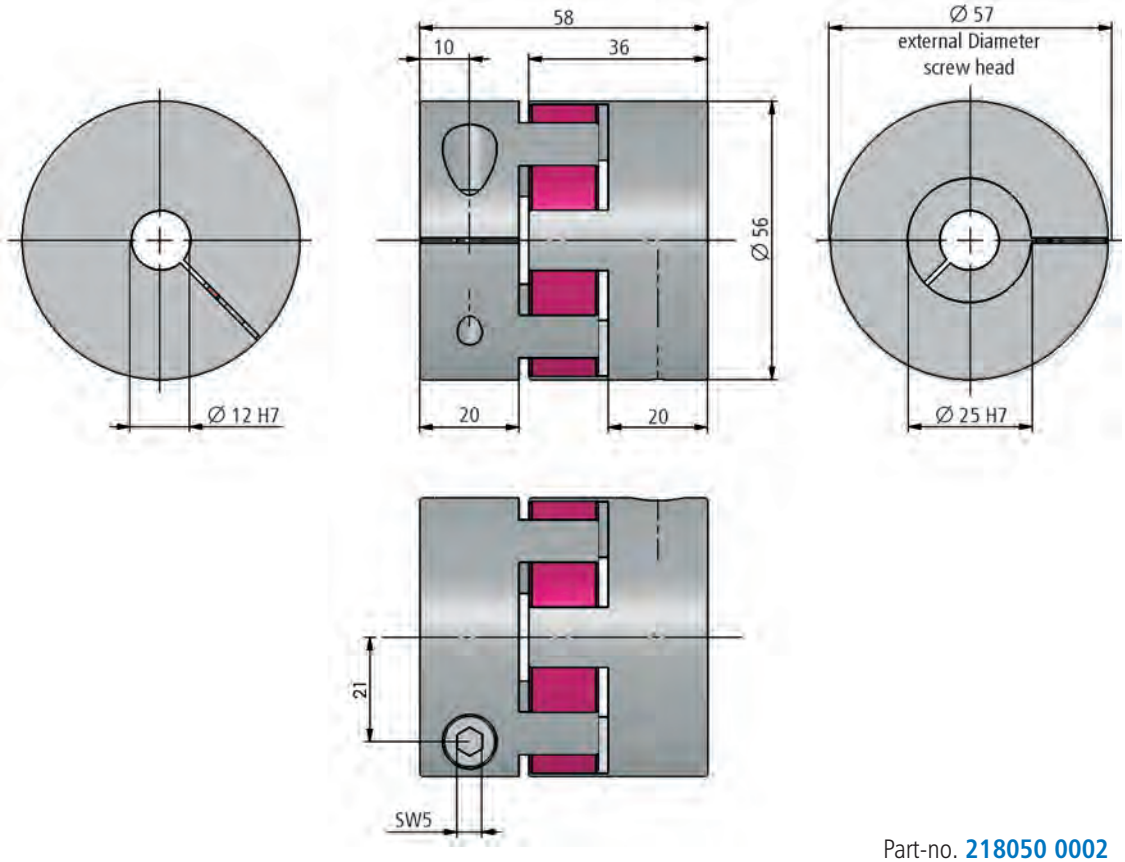
Installation kit with angular transmission Drive element accessories

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} kgm^2
Moment of inertia of shaft	8.171 " 10^{-6} kgm^2/100 mm

Dimensioned drawing - coupling



Part-no. **218050 0002**

mechanics

Slide/crossbench plates

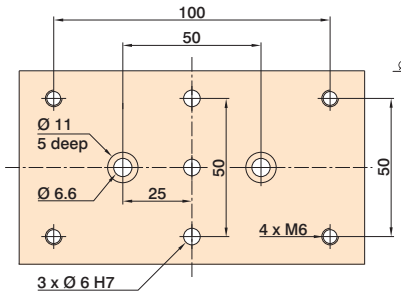
Connectors

Hole diagram, slide plate PS 1

L 125 x W 70 x H 7.7 mm

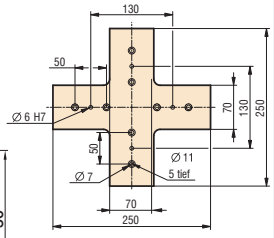
Mounting on:
LES 4 with 1 x WS 5/70

Part no.: **277001**



Connecting cross 2 x LES 4

Part no.: **277007**



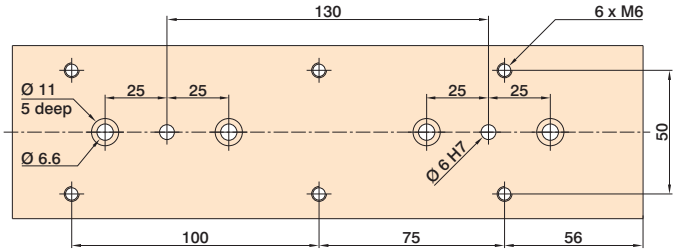
Hole diagram, slide plate PS 2

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**

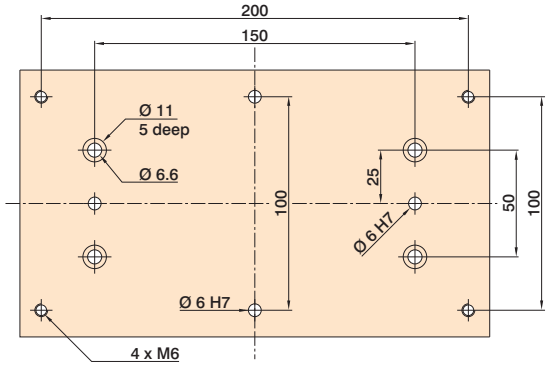


Hole diagram, slide plate PS 3

L 220 x W 125 x H 7.5 mm

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

Part no.: **277003**

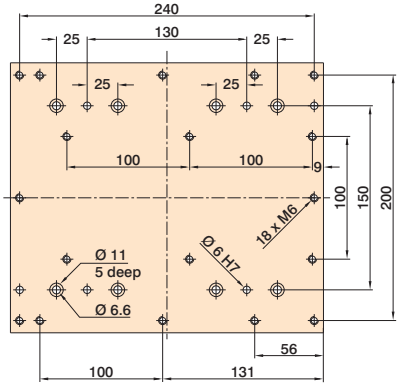


Hole diagram, slide plate PS 4

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**

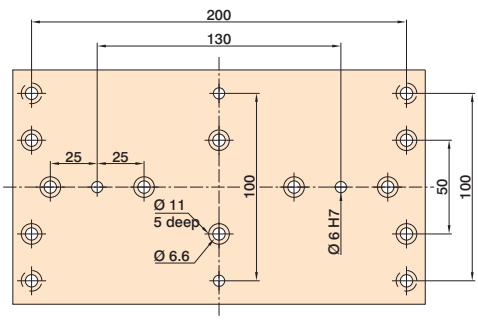


Hole diagram, slide plate PS 6

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**

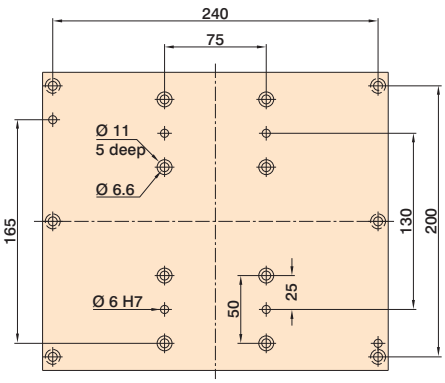


Hole diagram, slide plate PS 7

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**



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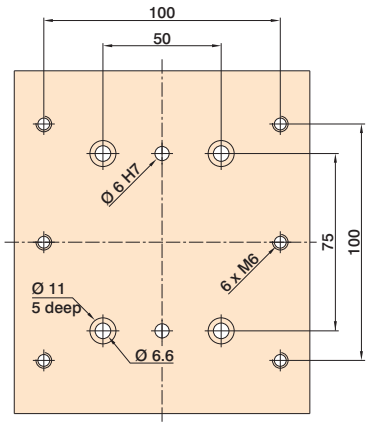
Slide/crossbench plates

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**

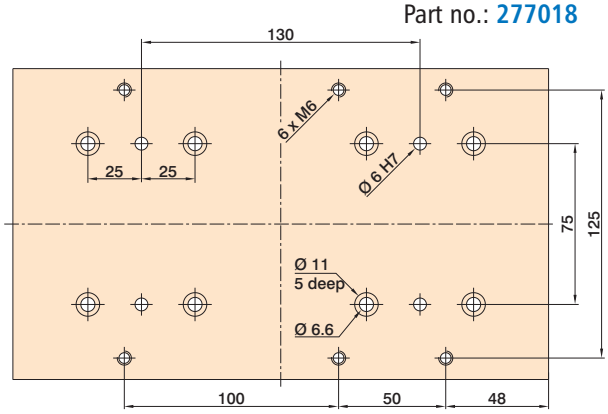


Hole diagram, slide plate PS 9

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**

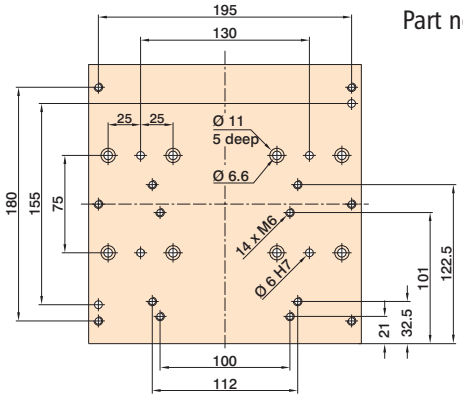


Hole diagram, slide plate PS 10

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**

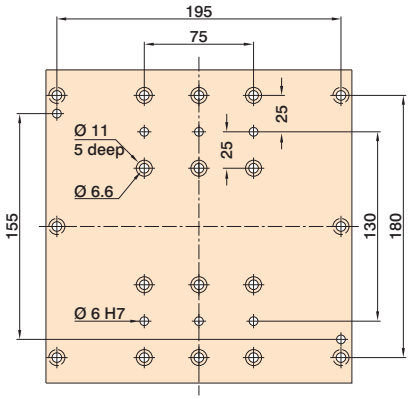


Hole diagram, slide plate PS 11

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

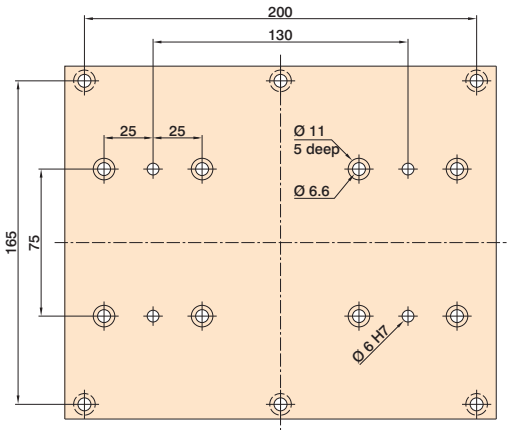
Part no.: **277020**



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**

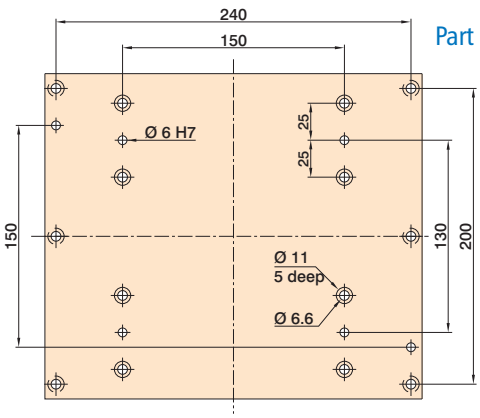


Hole diagram, connection plate VP 2

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

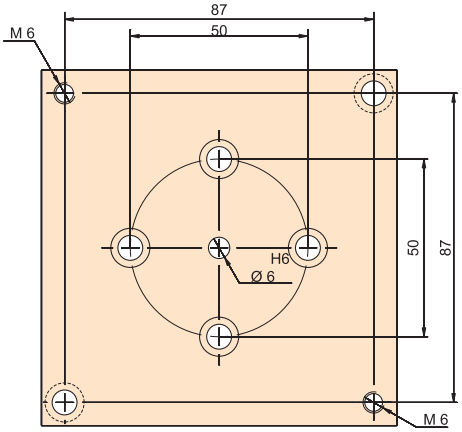
Connectors

Hole diagram, slot plate set for crossbench LES 4

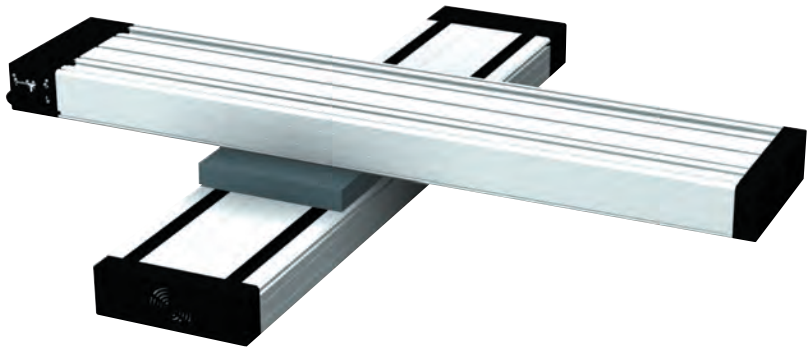
L 100 × W 100 × H 8 mm

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

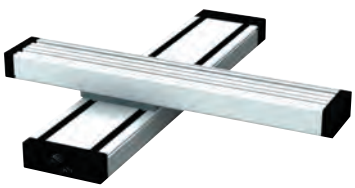
Crossbench connection plates 2

2 × L 220 × 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 x LES 6
PS 10 and PS 11

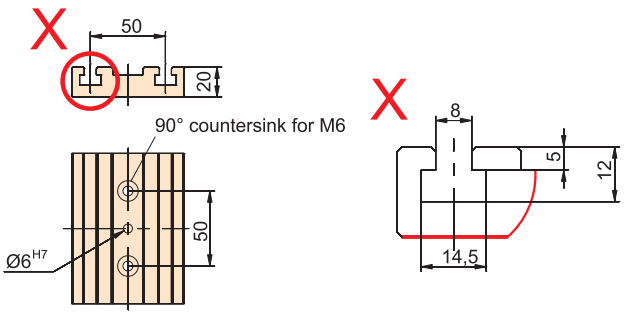
Crossbench LES 4 and LES 6
PS 11 and PS 10

T-slot slide plates

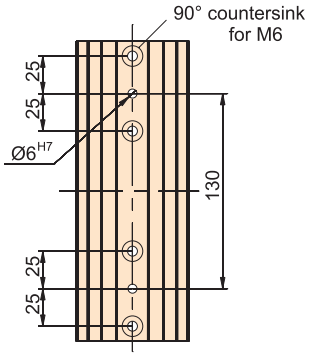
Connectors

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

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

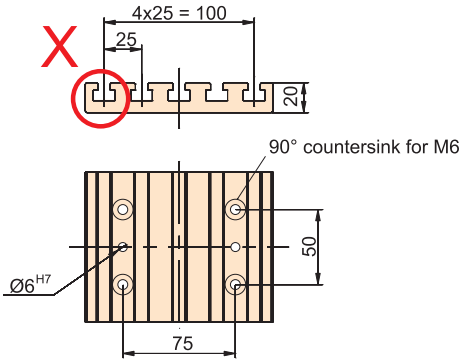


L 200 × W 75 × H 20 mm
Mounting on: LES 4 with 2 × WS 5/70
Part no.: **277030 0002**

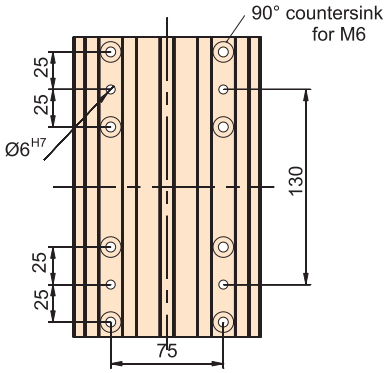


Hole pattern T-slot plate PT 25 × 250 for LES 6

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

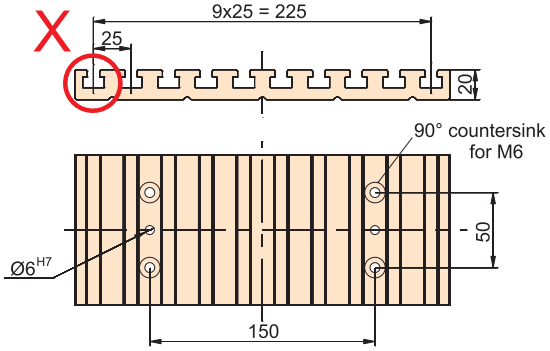


L 200 × W 125 × H 20 mm
Mounting on: LES 6 with 4 × WS 5/70
Part no.: **277030 0004**

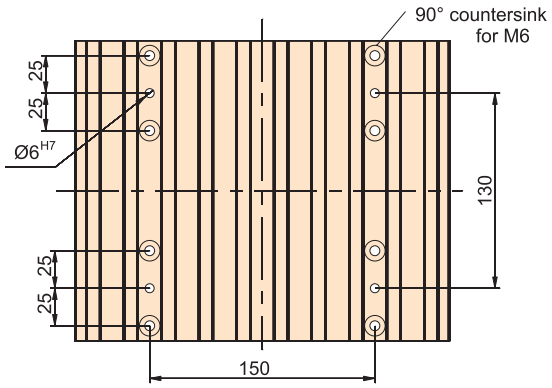


Hole pattern T-slot plate PT 25 × 250 for LES 5

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



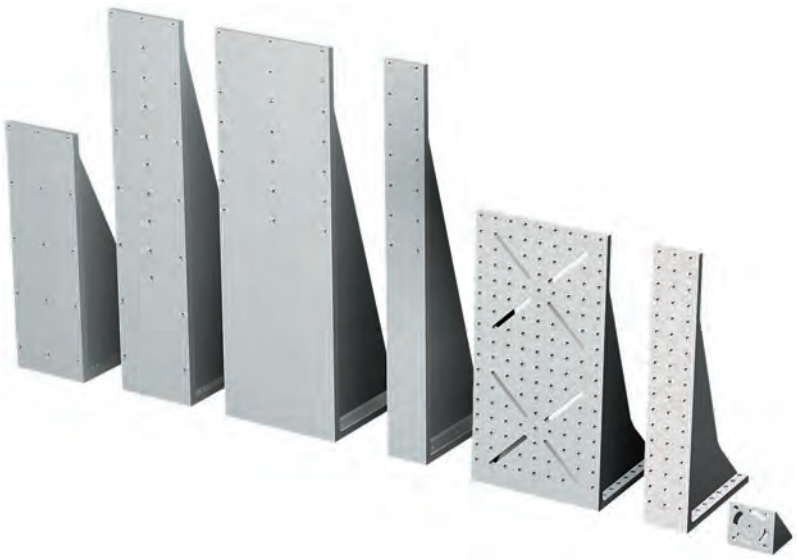
L 200 × W 250 × H 20 mm
Mounting on: LES 5 with 4 × WS 5/70
Part no.: **277030 0006**



Angle brackets

Connectors

Angle bracket with clamping surface milled flat



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

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 (1.1 kg)
- L221 × W221× H446

Part no.: **209110 0032**

Angle bracket **WV 5**
- blank
- Aluminium, welded (5.3 kg)
- L220 × W75 × H670

Part no.: **209110 0050**

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 × W220 × H670

Part no.: **209110 0070**

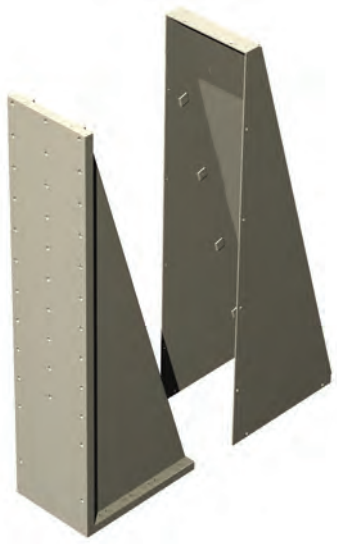
Angle bracket **WV 8**
- blank
- Aluminium, welded (7.4 kg)
- L222 × W145 × H446

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 5**
- naturally anodised
- Aluminium sheet, weight 1.2 kg

Part no.: **209110 0051**

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**

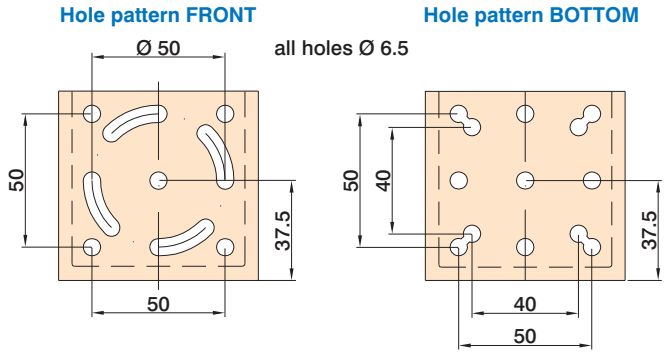
Angle brackets

Connectors

Hole diagram

Angle bracket WV 1

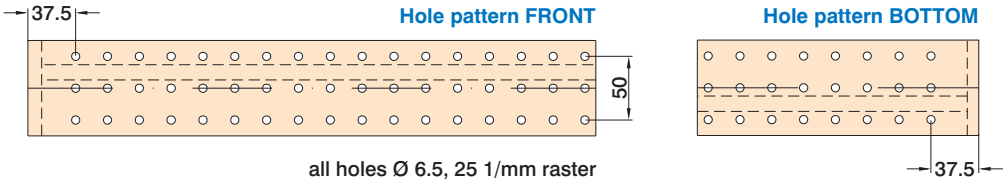
L 71 × W 75 × H 71 mm



Hole diagram

Angle bracket WV 2

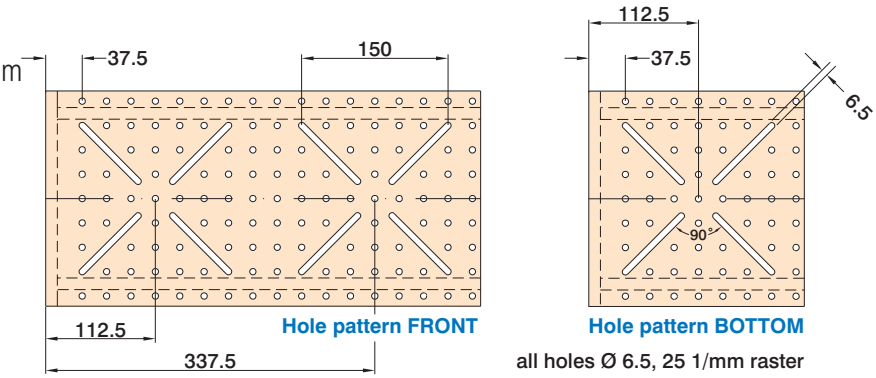
L 221 × W 75 × H 446 mm



Hole diagram

Angle bracket WV 3

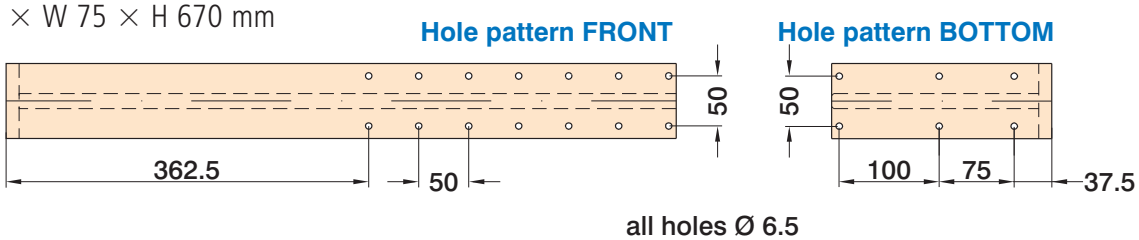
L 221 × W 221 × H 446 mm



Hole diagram

Angle bracket WV 5

L 220 × W 75 × H 670 mm

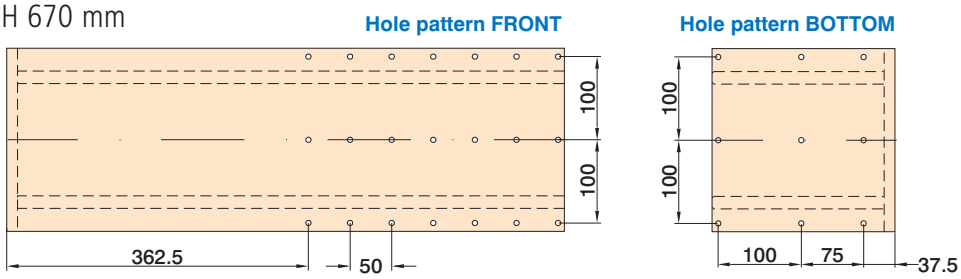


Angle bracket

Connectors

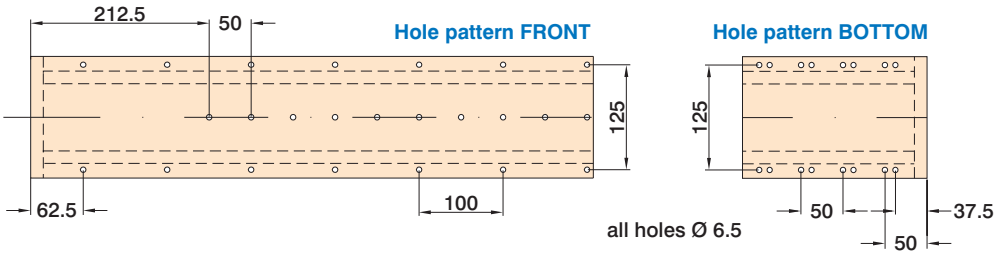
Hole diagram

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



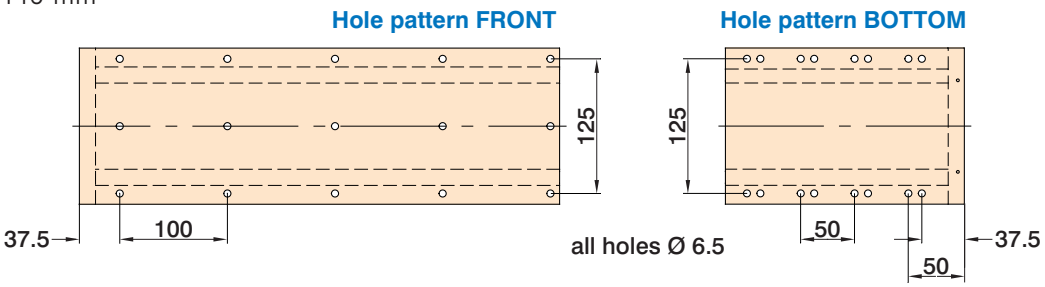
Hole diagram

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



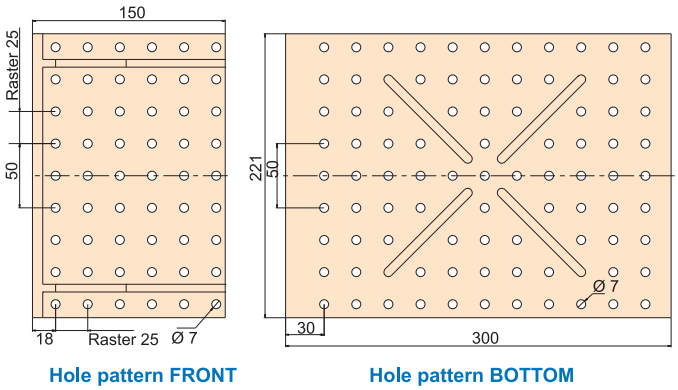
Hole diagram

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



Hole diagram

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



Accessories

Energy guidance chain

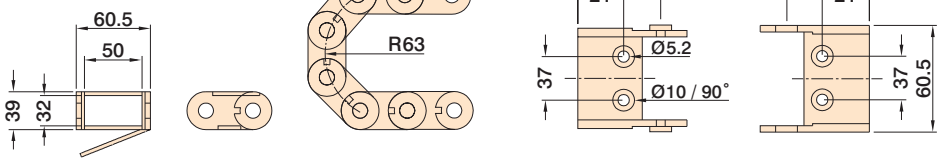
Energy guide chain 3
- VE 1 pc. at 1 m

Part no.: **219204 1000**

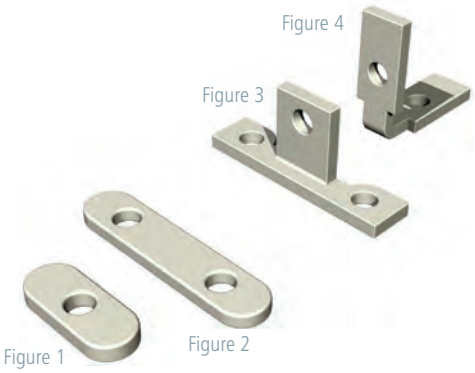
Connectors
for energy chain 3
- with strain relief
- VE 1 kit

Part no.: **219205 0002**

Dimensioned drawing
Energy guide chain



Tapped strips / sliding nuts



Tapped strips
M6 (no figure)
- galvanised
- Ra 50 mm
- VE 3 pcs. at 1 m

Part no.: **209011**

Sliding nut
2 × M6 (Figure 2)
- galvanised
- VE 50 units

Part no.: **209002 0004**

Special
angle sliding nut
3 × M6 (Figure 3)
- galvanised
- VE 25 pcs.

Part no.: **209022 0003**

Sliding nut
M6 (Figure 1)
- galvanised
- VE 100 pcs.

Part no.: **209001 0005**

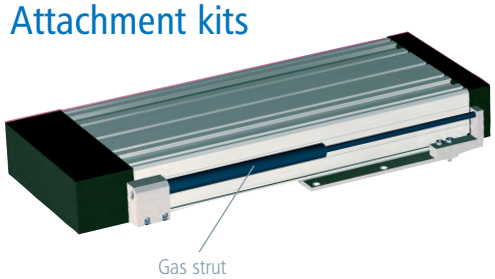
Angle sliding nut
2 × M6 (Figure 4)
- galvanised
- VE 25 pcs.

Part no.: **209021 0003**

Sliding nut
M5 (no figure)
- galvanised
- VE 20 pcs.

Part no.: **209006 0001**

Attachment kits

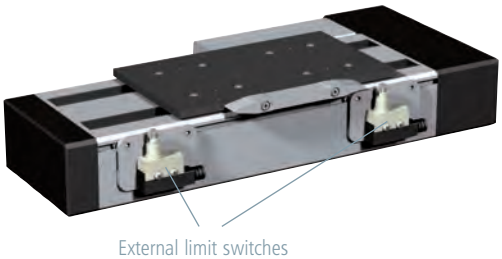


Gas strut attachment kit
- Stroke 220 mm
- Nominal length 490 mm

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 appr. 40 mm

Part no.: **216460 0001**

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

Part no.: **216460 0003**

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

Part no.: **216460 0002**

Mounting set for sealing air
- for LF4 - LF6

Part no.: **216460 0006**

Cross bench 10/20

Crossbench 20
With milled T-key plate and drainage channel (option)

Features

- Two isel linear units LES 5 adjustable for no play with integrated servomotor
- Recirculating ball drive, pitch 10 mm
- Travel:
  X-axis: 210/310 mm
  Y-axis: 210/310 mm

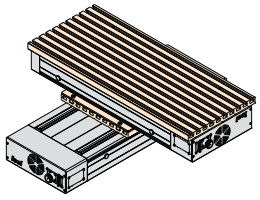
- Options:
  - 5 mm spindle pitch
  - Milled T-slot plate
  - step motor
  - Servo controller
  - Other travel

The crossbenches 10/20 consist of two linear units LES 5, which are interconnected at right angles. The individual axes are driven by servo motor with a recirculating ball drive of 10 mm pitch.

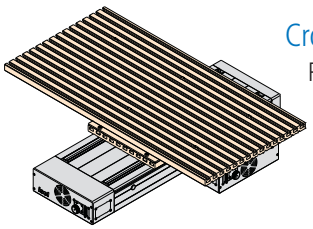
To achieve very high load-bearing capabilities, each axis is fitted with four linear slots.

In addition to this standard design, it is possible to combine all LES 5 linear units with each other by means of the crossbench connection plates.

Ordering data

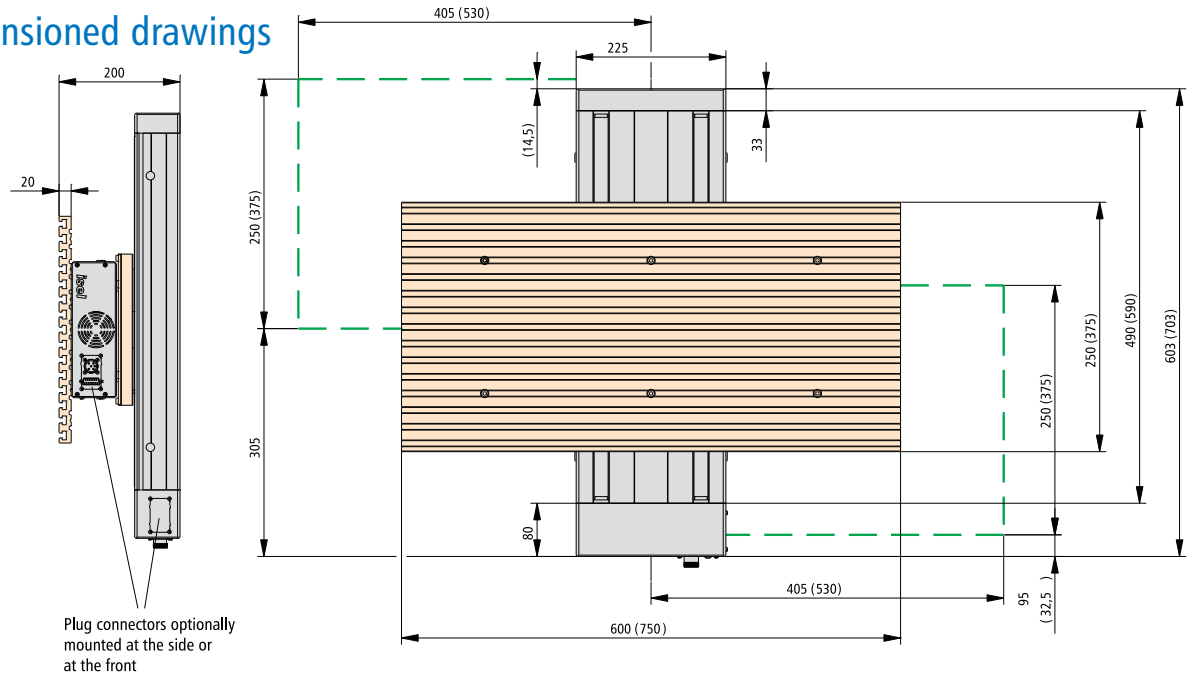


Crossbench 10-V
Part no.:
272200 0001



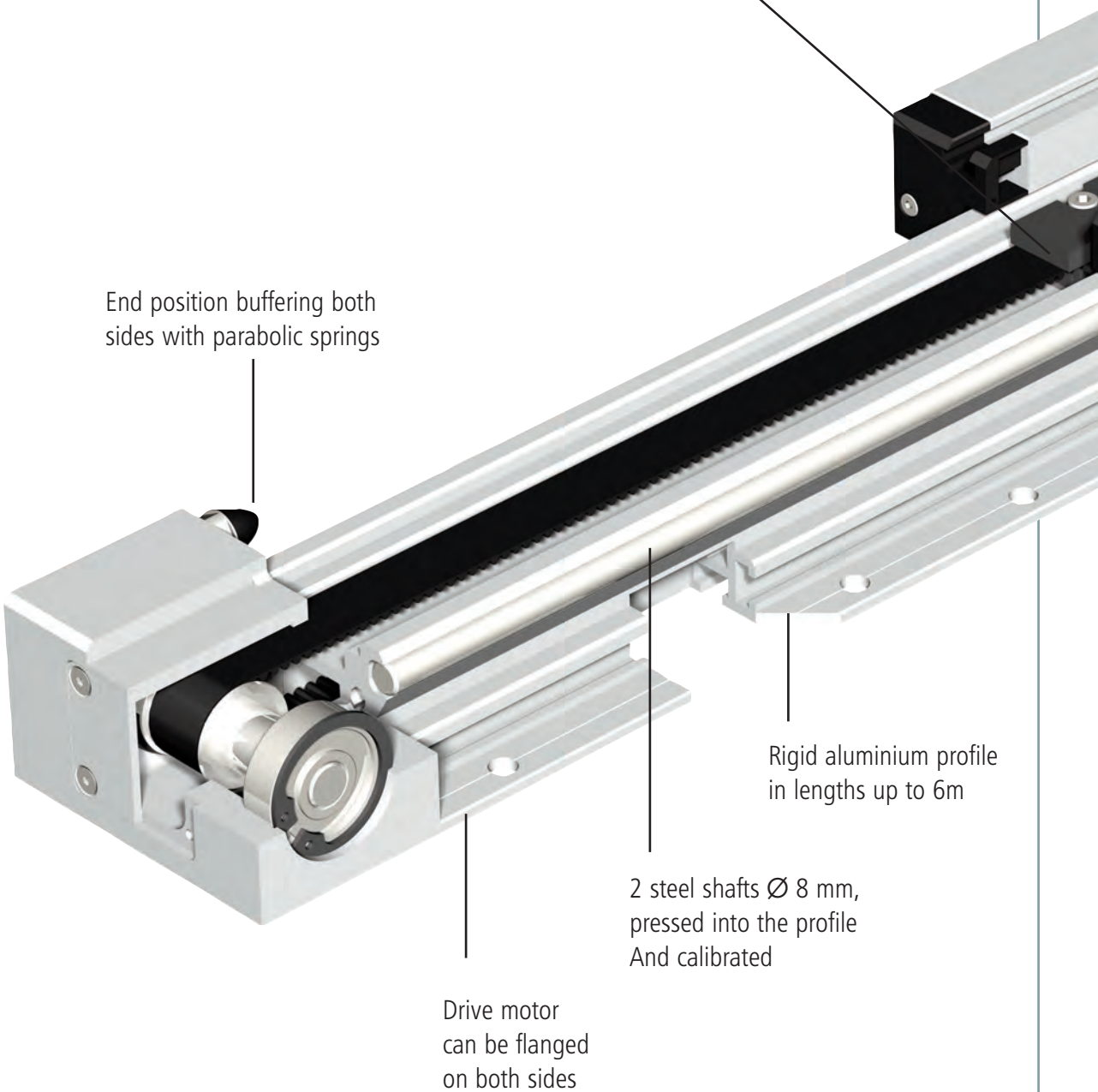
Crossbench 20-V
Part no.:
272200 0002

Dimensioned drawings

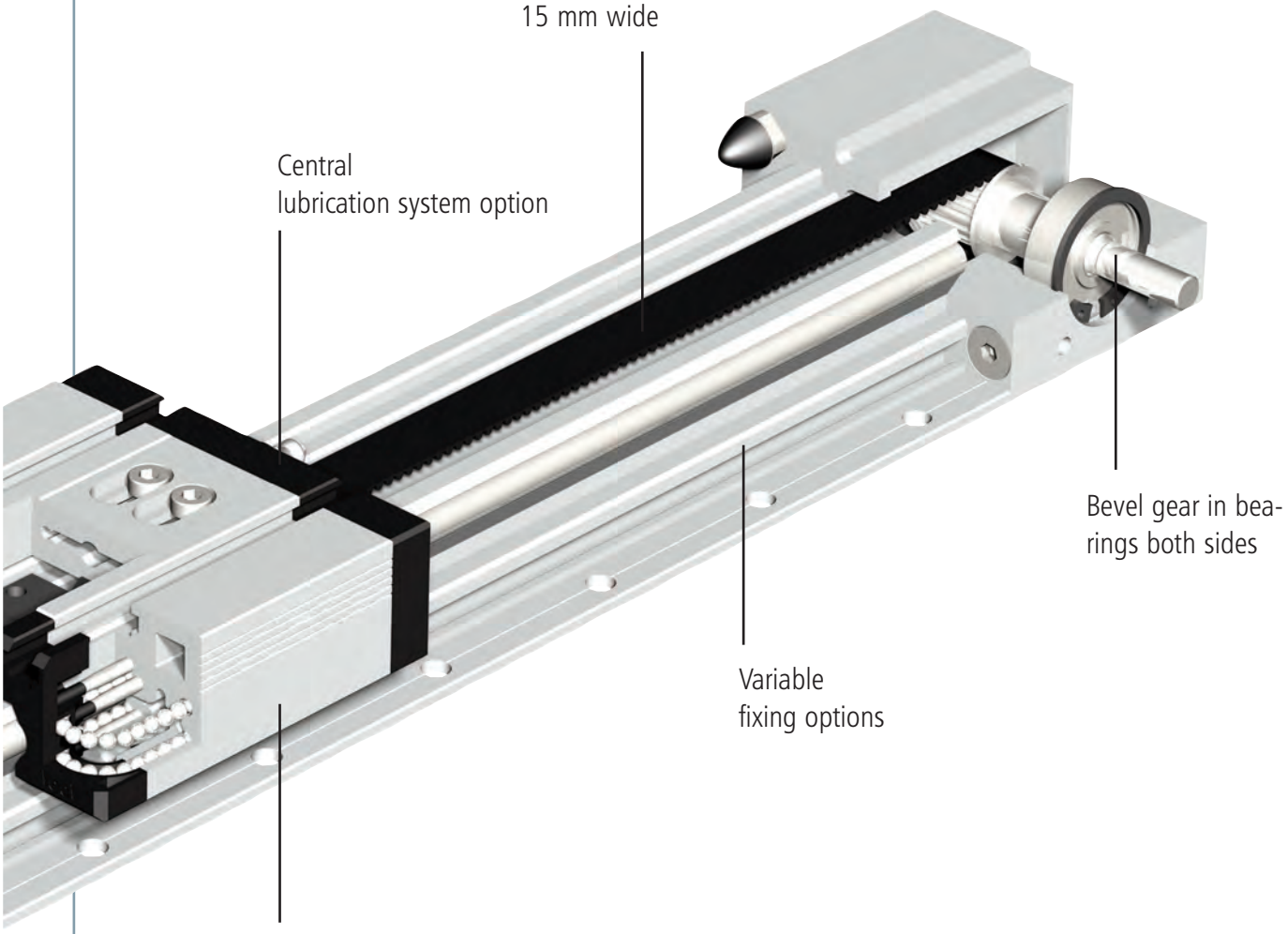


Space for your notes

Functional overview Linear unit LEZ 9



Functional overview Linear unit LEZ 9



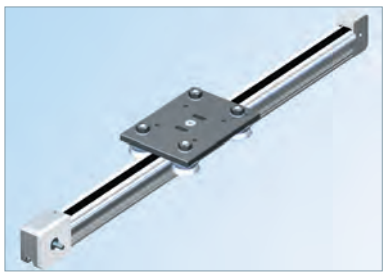
mechanics

Linear units
with toothed belt drive

LEZ 1

Guides and shaft slides also available stainless.

with shaft slides



with roller carriages

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
- Limit or reference switch accuracy < 0,1 mm (with drive modules)

Accessories are on page **C98**.

Options:
- special lengths in 100 mm raster to order, max. 6000 mm
- Also available as direct drive with
  - step motor
  - DC servo motor
- Overrun limit switches with connecting cable (only in combination with integrated drive module)

Ordering key

232 005 XXXX

Drives/Slides
Roller carriages
8 = without motor, with shaft slides
9 = without motor, with roller carriages

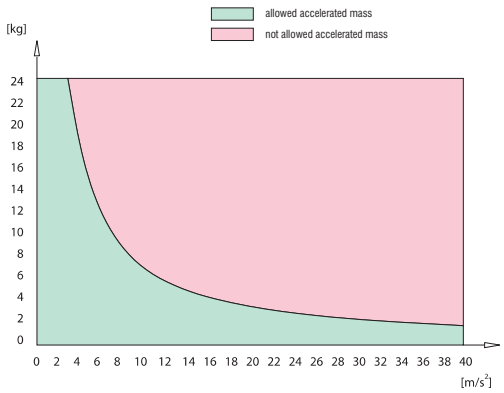
Profile lengths LFS-8-2 (mm)
298, 398, 498, 598, 675, 698, 798, 998, 1498, 1798, 1998, 2498, 2998
(e. g. 398 mm = 040
675 mm = 068)
Option: up to 6000 mm

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
Roller carriage weight	1.03 kg
specific guide weight	0.200 kg/100 mm
Effective diameter of the synchronous disks	Ø 19.10 mm
Moment of inertia of the synchronous disks	5.585·10-7 kgm^2
Feed per turn	60 mm

Load diagram

Permitted accelerated weights relative to the belt strength.*



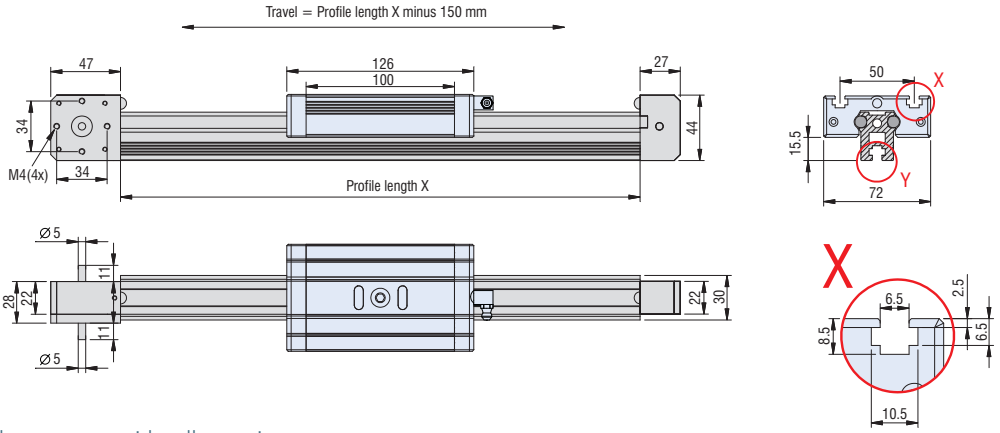
* with vertical construction, the acceleration due to gravity (g = 9.81 m/s^2) must be taken into account

Bending data is on page **C 23**.

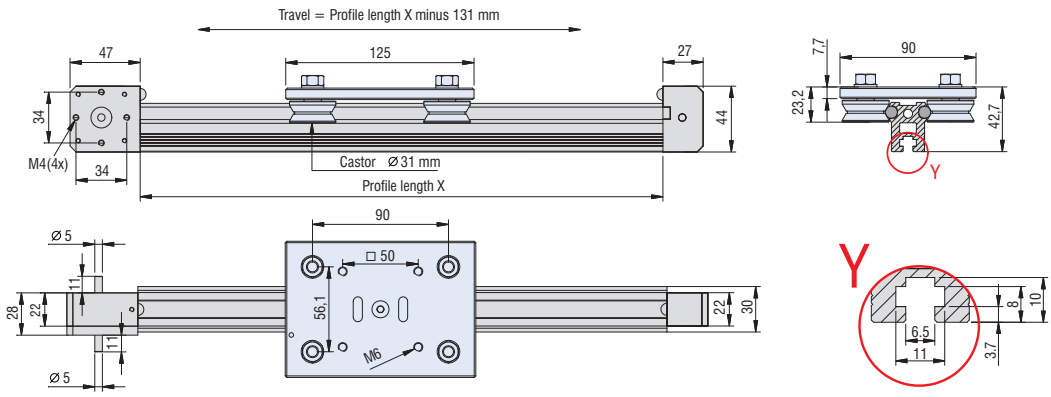
Linear units
with toothed belt drive

LEZ 1

Dimensioned drawings
without motor, with shaft slides



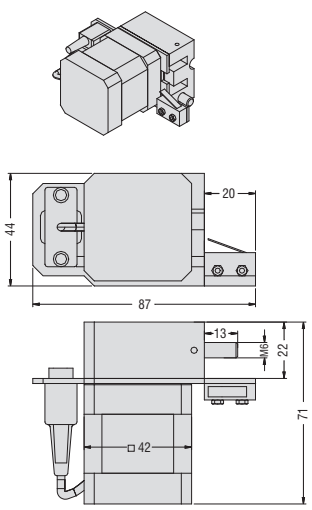
without motor, with roller carriages



Motor modules (Motor pin assignments are on page C74.)

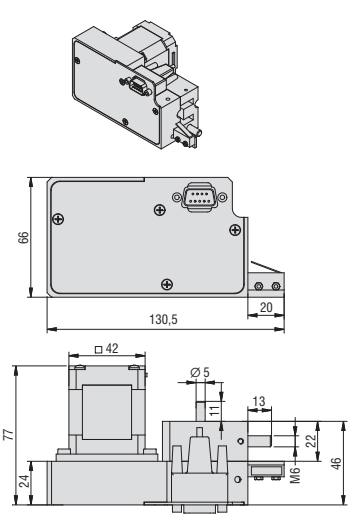
Drive module with step motor
MS-045 HT (direct drive)
Feed: 60 mm/turn

Part no.: **396048 3015**



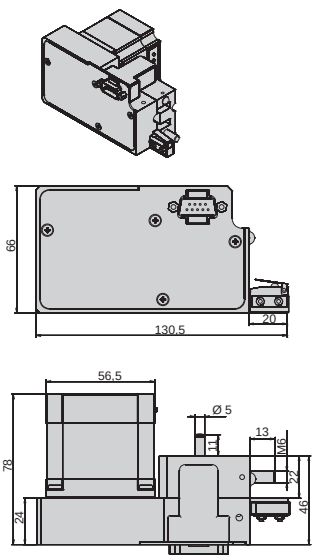
Drive module with step motor
MS-045 HT (reduction 2:1)
Feed: 30 mm/turn

Part no.: **396049 3015**



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

Part no.: **396056 3015**



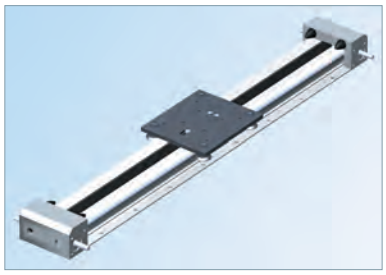
mechanics

Linear units
with toothed belt drive

LEZ 2

Guides and shaft slides also available stainless.

with shaft slides



with roller carriages

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
- Repeatability less than or equal to ± 0.2 mm
- Limit or reference switch accuracy < 0.1 mm
- available in lengths up to 6,000 mm

Accessories are on page C98.

Options:
- Special lengths in 100 mm raster to order, max. 6,000 mm
- also as direct drive with
  - Multi-phase motor
  - DC servomotor
- Overrun limit switches with connecting cable (only in combination with integrated drive module)

Ordering key

232 002 XXXX

Drive/Slides, Roller carriages
8 = without motor, with shaft slides
9 = without motor, with roller carriages

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

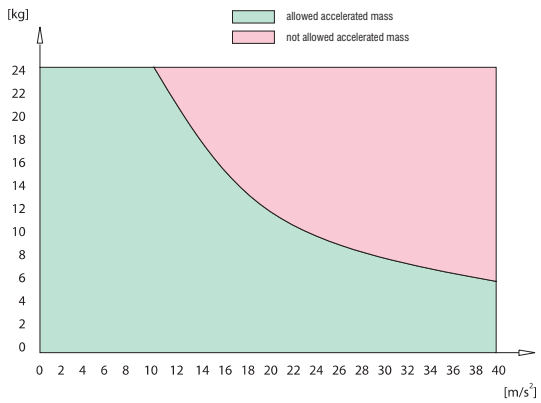
Feed per turn..... 70 mm

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/s^2) must be taken into account

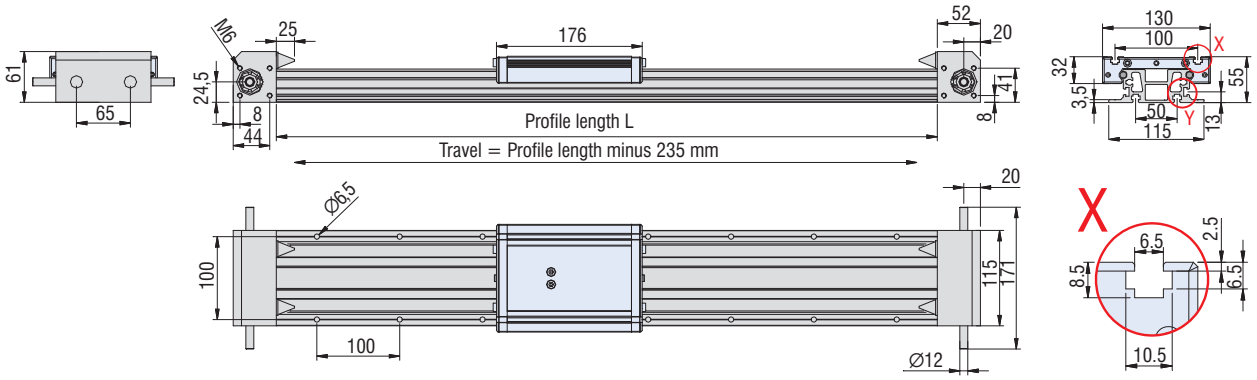
made by isel®

Linear units
with toothed belt drive

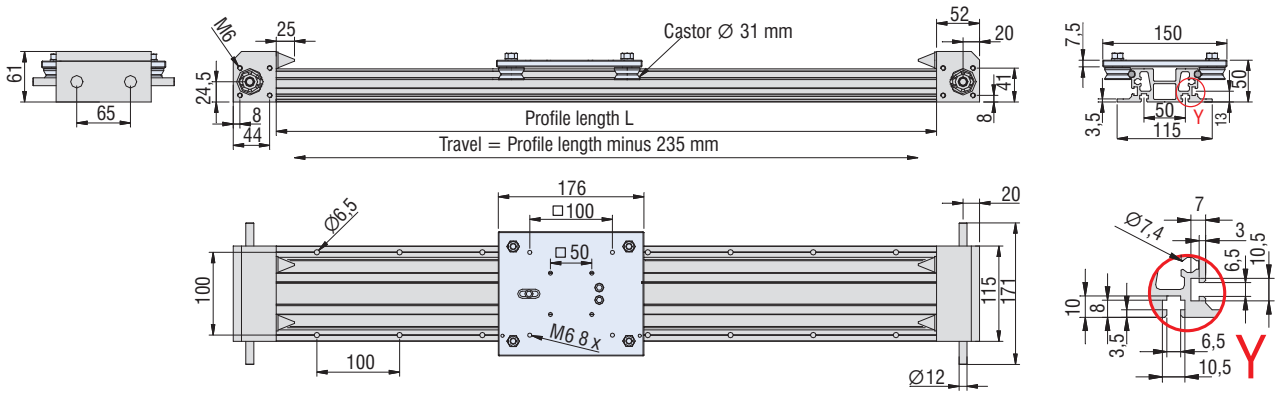
LEZ 2

Dimensioned drawings

without motor, with shaft slides



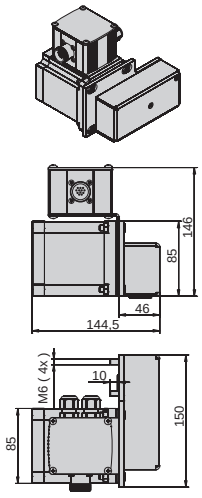
without motor, with roller carriages



Motor modules (Motor pin assignments are on page C74.)

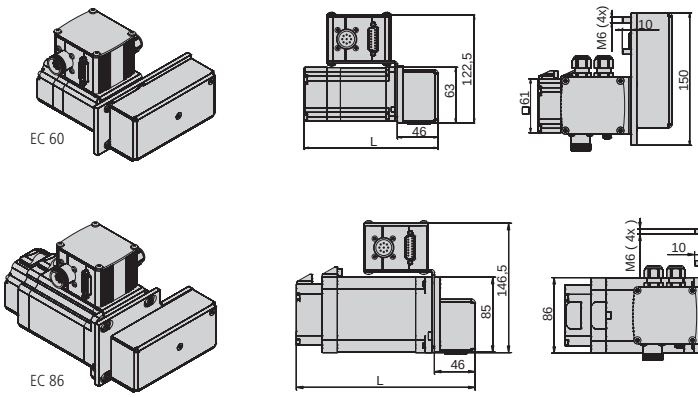
Drive module with step motor
MS-600 HT (reduction 2:1)
Feed: 35 mm/turn

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 slides

with roller carriage

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
- Repeatability 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 right and left can be flanged

Accessories are on page C98.

Options:
- Special lengths in 100 mm raster to order, max. 6,000 mm
- Overrun limit switches with connecting cable (only in combination with integrated drive module)

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

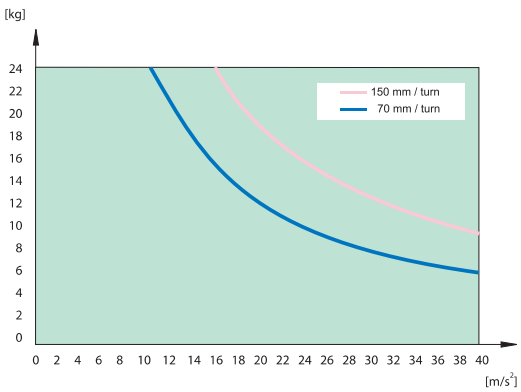
Slides, roller carriages
0 = with shaft slides
1 = with roller carriages

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/s^2) must be considered

Bending data is on page C 27.

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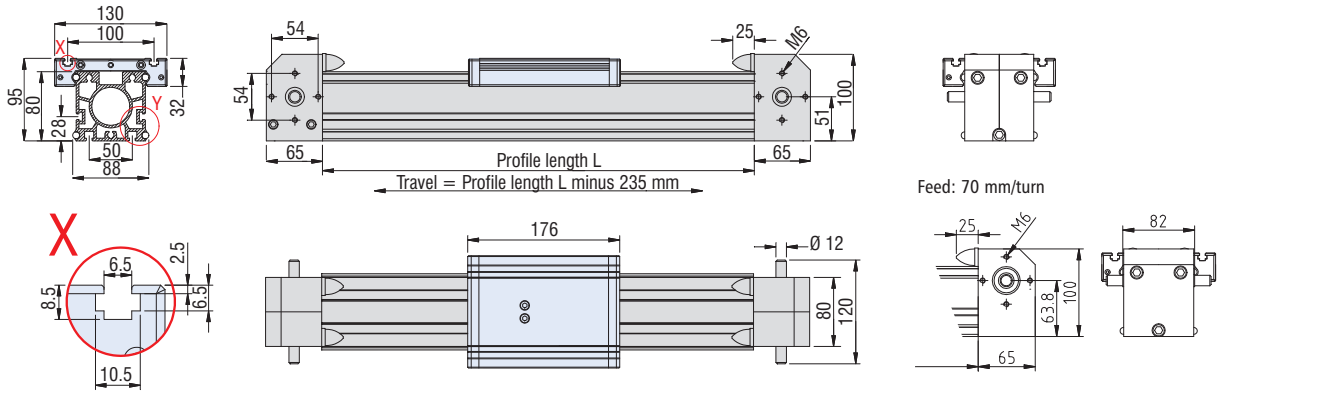
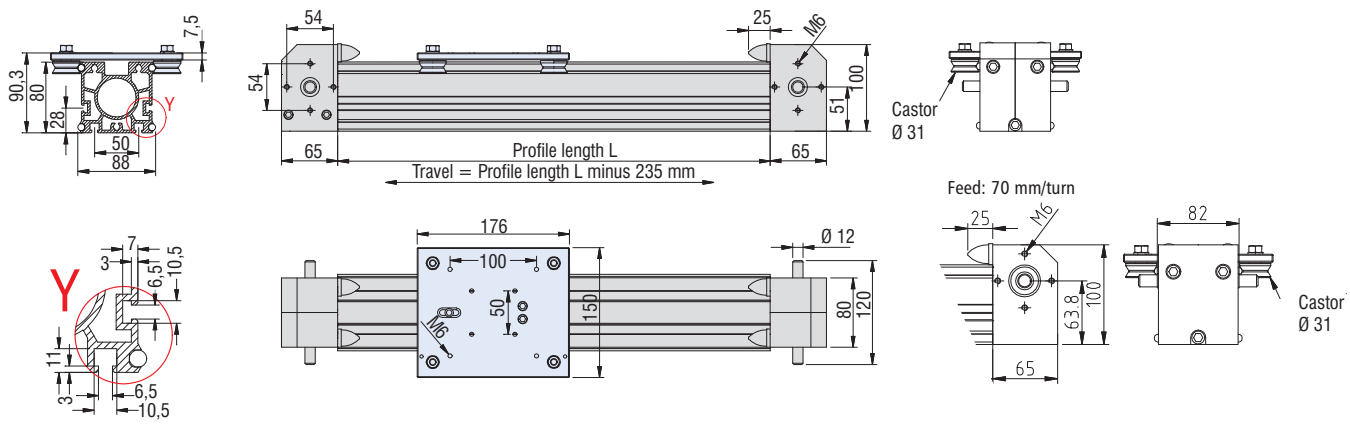
Linear units
with toothed belt drive

LEZ 3

Dimensioned drawings
with shaft slides

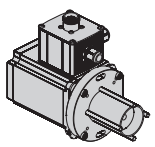


with roller carraiges



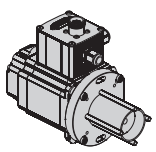
Motor modules (Motor pin assignments are on page C74.)

Drive module with stepper motor (direct drive)



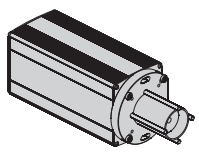
Part number	Motormodul	
396 085 0060	MS 600 HT	right
396 085 0061	MS 600 HT	left
396 088 0060	MS 900 HT	right
396 088 0061	MS 900 HT	left

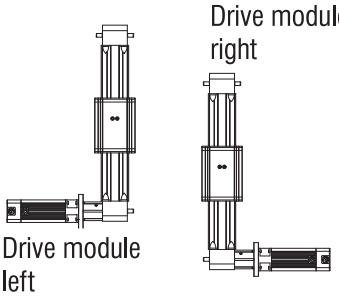
Drive module with EC servomotor EC 86 (direct drive)



Part number	Motor module	Length L
396 444 0070	EC 86S	177.5 mm
396 466 0070	EC 86L	202.5 mm

Drive module with DC servomotor DC 300 (direct drive)
Part no.: **396114 0060**





mechanics

Linear units
with toothed belt drive

LEZ 9

with roller carriages

with shaft slides

Features

- Aluminium profile
  Linear guide LFS-8-7
- no-play feed with
  toothed belt drive
- toothed belt with 3 mm interval
  Width 15 mm
- Max. feed. 2 m/s
- Shaft slides WS 11
  L 96 × W 95 mm
- Feed per turn: 60 mm
- Repeatability less than or
  equal to ± 0,2 mm
- Limit or reference switch
  accuracy < 0.1 mm
- Servomotor

Accessories are on page C98.

Options:
- Special lengths in 100 mm raster
  to order
- Stepper motor

Ordering key

2 3 2 0 1 0 XXXX*

Profile lengths (mm)
496, 996, 1496, 1996, 2496, 2996
(e. g. 496 mm = 0050
1496 mm = 0150)

Note:
Please order drive modules separately on the listed part numbers and specify here, whether the delivery should take place with or without attachment.

* Only for model with shaft slide
(model with carriage on request)

Technical specification

Belt type..... HTD 3M, width 15 mm
Slide weight.....0.4 kg
Weight without drive module.....1000 mm = 4.4 kg
specific weight of the toothed belt.....0.04 kg/m
specific guide weight.....0.29 kg/100 mm

Effective diameter
of the synchronous disks..... Ø 19.1 mm

Moment of inertia
of the synchronous disks..... 5.58E-6 kgm^2

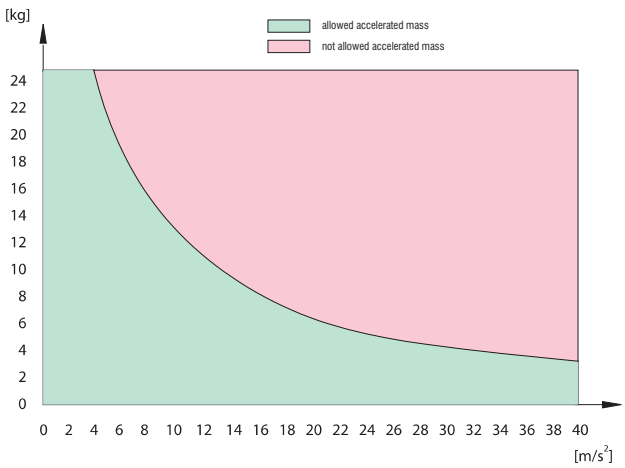
Feed per turn.....60 mm

Linear guide rail LFS-8-7

Moment of inertia I_x ..... 29.34 cm$_4$
Moment of inertia I_y..... 10.86 cm$_4$
Resistance torque W_x ..... 7.52 cm$_3$
Resistance torque W_y..... 5.68 cm$_3$

Load diagram

Permitted accelerated weights relative to the belt strength.*



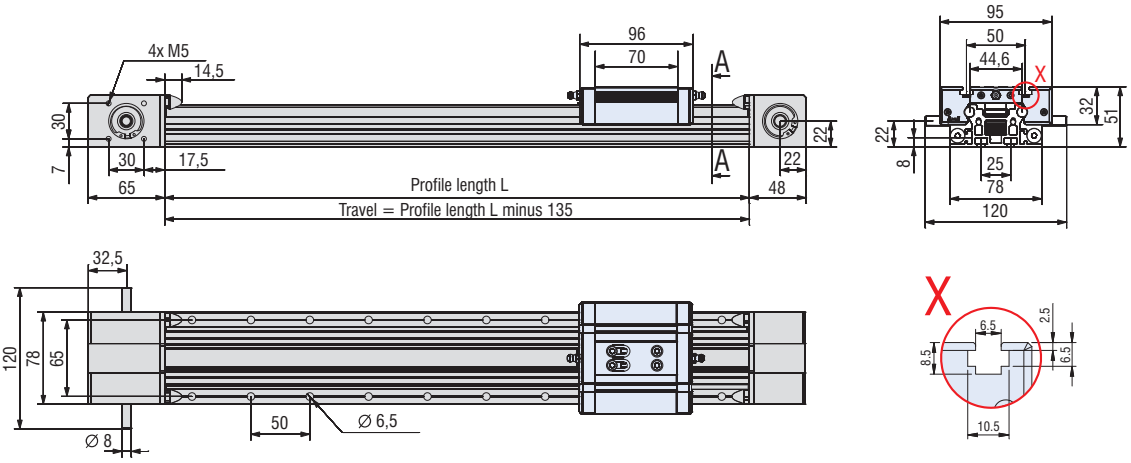
* with vertical construction, the acceleration due to gravity ($g=9.81$ m/s^2) must be considered

made by isel®

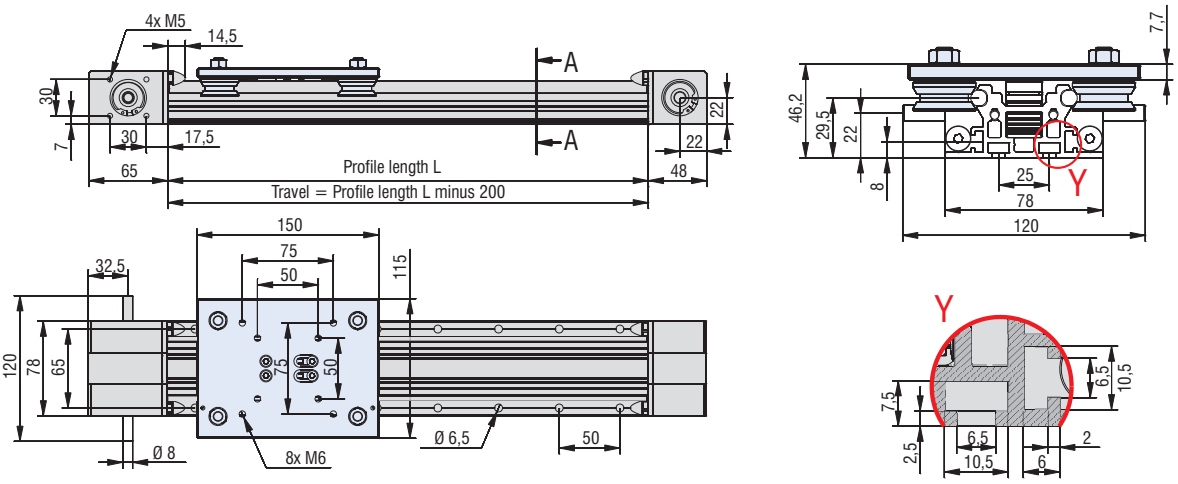
Linear units
with toothed belt drive

LEZ 9

Dimensioned drawings
with shaft slides



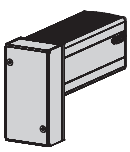
with roller carriages

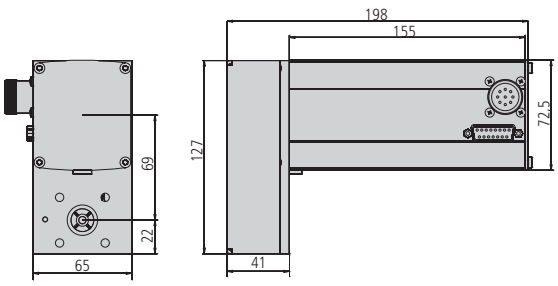


Motor modules (Motor pin assignments are on page C74.)

Drive module with stepper motor MS 200 HT
(Reduction 2:1)
Feed: 30mm / turn

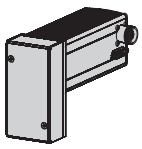
Part number	Motor module	
396 058 3017	MS 200 HT	right
396 058 3018	MS 200 HT	left





Drive module with DC servomotor DC 100
(Reduction 2:1)
Feed: 30mm / turn

Part no.: 396112 3063



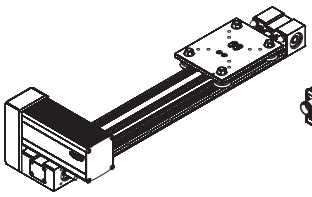


Figure:
LEZ 9 with roller carriage and
MS 200 HAT stepper motor
Mounted on left

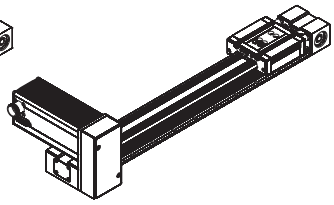
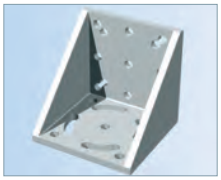


Figure:
LEZ 9 with shaft slide and
DC 100 servomotor
mounted on right

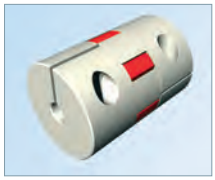
Accessories

LEZ 1



Angle bracket
- for LEZ 1

Part no.: 209110 0010



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

Part no.: 218001 5080

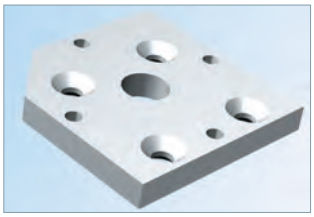
Shaft slide 1/70
- L 96 × W 72 × H 28.5 mm
- Clamping surface plane milled, T-slot insert, M6
- central lubrication system option, adjustable for no play
- Weight: 0.35 kg
- Option: stainless steel version

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

Limit switch set
- Option: 2. Limit switches
- for LEZ 1

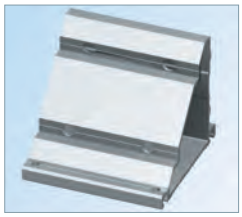
Part no.: 632 125 0002

LEZ 2



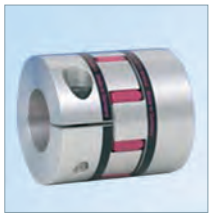
Motor fixing plate
- for LEZ 2
- incl. fixing material
- for direct drive see page C78 *et seq.*

Part no.: 232199 0004



Angle bracket
- for LEZ 2
- incl. fixing material

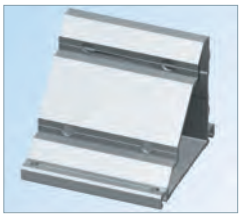
Part no.: 232199 0005



Coupling for Transmission shaft
- for LEZ 2
- 1 VE = 1 coupling

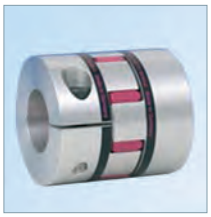
Part no.: 218003 0120

LEZ 3



Angle bracket
- for LEZ 3
- incl. fixing material

Part no.: 232199 0005



Coupling for transmissions shaft
- for LEZ 3
- 1 VE = 2 couplings

Part no.: 218050 0002

Transmission shaft ø 25 mm

Length 1m
Part no.: 219001 0125

Length 2m
Part no.: 219001 0225

Limit switch set

Motor side
Part no.: 397201 0000
Deviation
Part no.: 397201 XXXX

LEZ 9

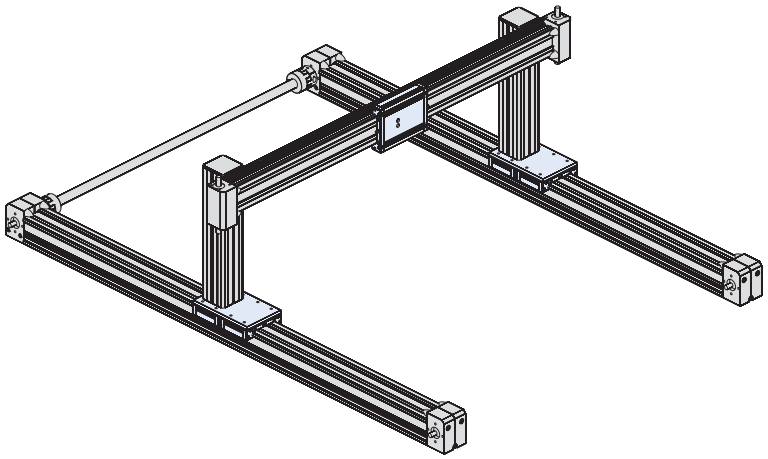
30/40 coupling
- for LEZ 9
- 1 VE = 1 coupling

Part no.: 218002 8080

Shaft slide WS 11/70
- L 96 × W 96 × H 32 mm
- Clamping surface plane milled, T-slot insert, M6
- central lubrication system option, adjustable for no play
- Weight: 0.4 kg
- Option: stainless steel version

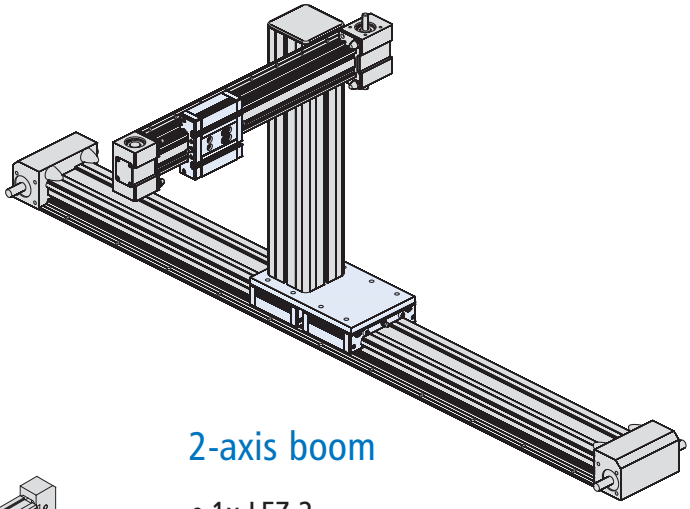
Part no.: 223111 0070
stainless: 223111 1070

Examples in use



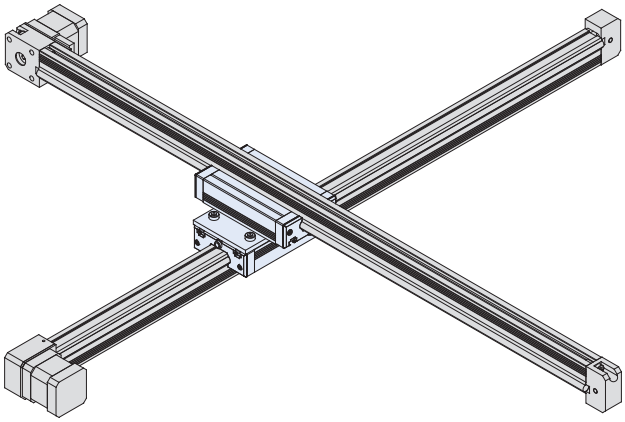
2-axis H-design

- 2 × LEZ 3
- 1 × LEZ 2
- Transmission shaft



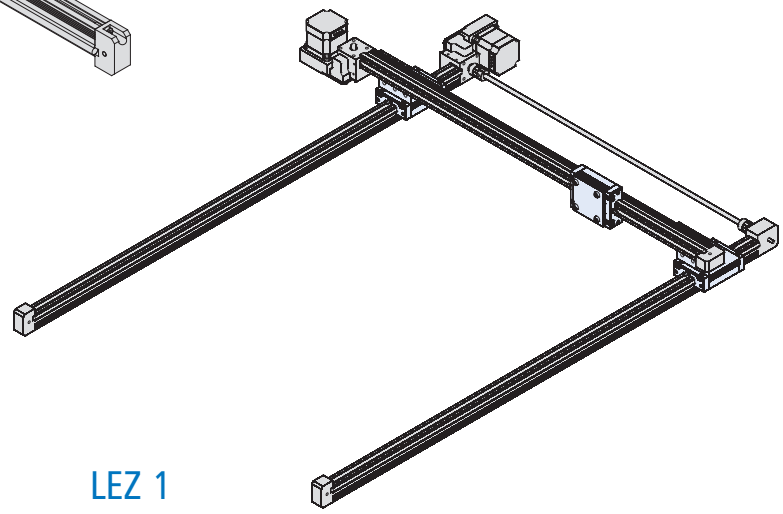
2-axis boom

- 1x LEZ 2
- 1x LEZ 9



Crossbench LEZ 1

- 2 x LEZ 1



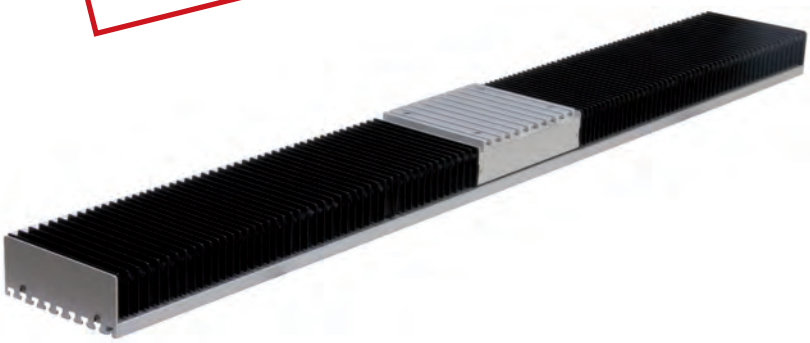
LEZ 1

- 2-axis flatbed configuration

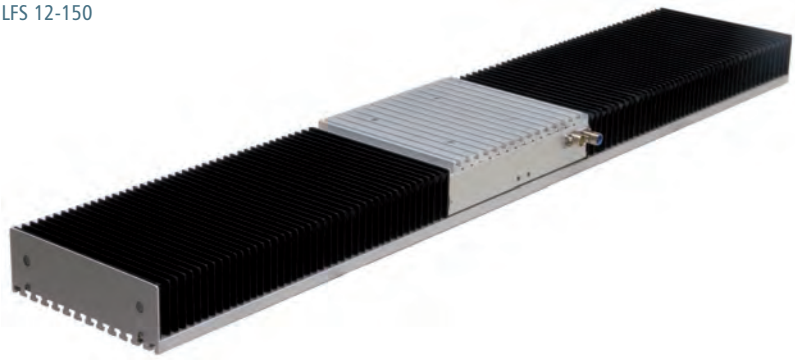
Linear units
with direct drive

iLD

Further information on request !



LFS 12-150



LFS 16-250

Features

- Aluminium linear guide with magnet rail
- internal magnetic tape
- Drive slots with spool package and magnetic length measurement system
- low noise running
- adjustable for no play
- high accelerations and speeds
- no backlash
- No need for mechanical transfer devices
- no servicing and greasing tasks
- with 2 limit or reference switches
- Repeatability ± 0.01mm
- Standard lengths to 3m (in 100 mm raster)

Options:
- Drive controller
- Folding cover
- Parking brake
- Various winding packages
- Segementable guide

General

Where the earlier conventional linear units with spindle drives were reaching their development limits, linear units with linear motors are coming to the fore: They are achieving enormous accelerations, move into positions with pinpoint accuracy and work with virtually no wear because of the absence of mechanical connectors.

Linear motors are being used increasingly in machine tools, as well as for positioning systems and handling systems in linear technology. Linear units with steel shaft guides are particularly suited for the machine tools field and positioning systems.

isel iLD series linear units are constructed from rigid aluminium profiles. The guides comprise isel precision steel shafts and isel aluminium shaft slots, proven in use for more than 20 years. The magnetic isel length measurement system is also incorporated.

In this field, Isel linear motor units have the advantage of higher accelerations (up to 30 m/s^2) and processing speeds of up to 4 m/s. Linear motors with iron core produce very high permanent forces, which reach more than 1000 N.

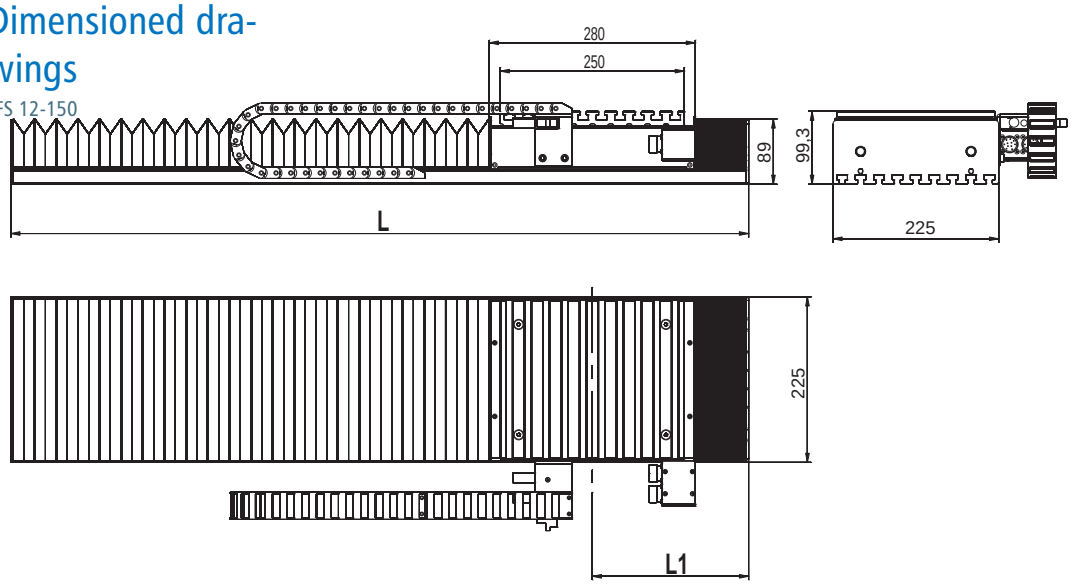
A matching integrated brake is also available as an option. Matching folding bellows covers are also available to protect from dirt. The "made by isel" concept means that an optimum price/performance-ratio is offered, which in its turn means very short amortisation periods for customers.

Linear units
with direct drive

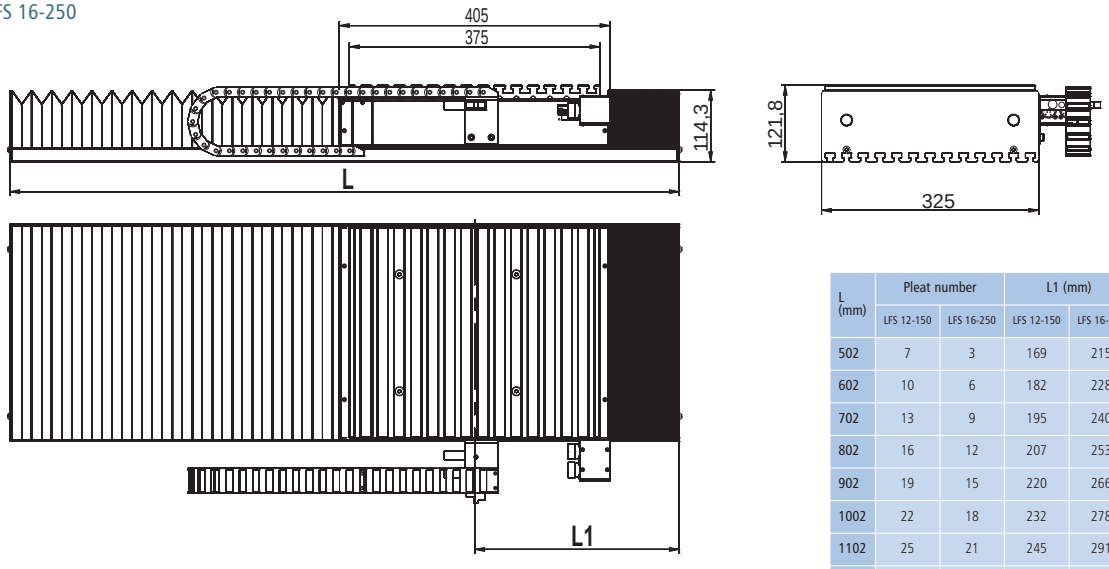
iLD

Dimensioned drawings

LFS 12-150



LFS 16-250



L (mm)	Pleat number		L1 (mm)		Travel (mm)	
	LFS 12-150	LFS 16-250	LFS 12-150	LFS 16-250	LFS 12-150	LFS 16-250
502	7	3	169	215	163	72
602	10	6	182	228	238	147
702	13	9	195	240	313	221
802	16	12	207	253	388	296
902	19	15	220	266	462	371
1002	22	18	232	278	537	446
1102	25	21	245	291	612	521
1202	27	24	253	303	695	595
1302	30	27	266	316	770	670
1402	33	30	279	329	845	745
1502	36	33	291	341	920	820
1602	39	35	304	350	994	903
1702	42	38	316	362	1069	978
1802	45	41	329	375	1144	1053
1902	48	44	342	387	1219	1127
2002	51	47	354	400	1294	1202
2102	54	50	367	413	1368	1277
2202	57	53	379	425	1443	1352
2302	60	56	392	438	1518	1427
2402	63	59	405	450	1593	1501
2502	65	62	413	463	1676	1576
2602	68	65	426	476	1751	1651
2702	71	68	438	488	1826	1726
2802	74	71	451	501	1900	1801
2902	77	74	463	513	1975	1875
3002	80	76	476	522	2050	1959

Rotation units Overview

RDH-M Indexing table / Rotary unit C 104

RDH-S Indexing table / Rotary unit C 106

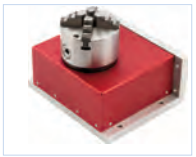
RDH-XS Indexing table / Rotary unit C 108

DSH-S Rotary / swivel unit C 110

RF 1 Indexing table C 112

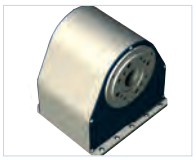
Rotation units Overview

iZD 54 Rotary unit C 114



MD 1 Miniature rotary unit C 116

ZD 30 Rotary unit C 118



ZR 20 Indexing table C 120

ZDS 2030 C 121

Pin assignments C 122

Transported loads
Maching forces
Feed C 123

CAD data on our website **www.isel.com**

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 C122
For transport loads see page C123

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.: 269062 0125

4-jaw chuck Ø 125
Part no.: 269061 0125*

*including flange

Aluminium T-key plate

Ø 240 mm/PT 25
Part no.: 269050 0240

Ø 365 mm/PT 25
Part no.: 269050 0365

Aluminium rotary plate

Ø 490 mm, customised fixing borings available at extra cost

Part no.: 269051 0500

Tailstock unit RE M

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

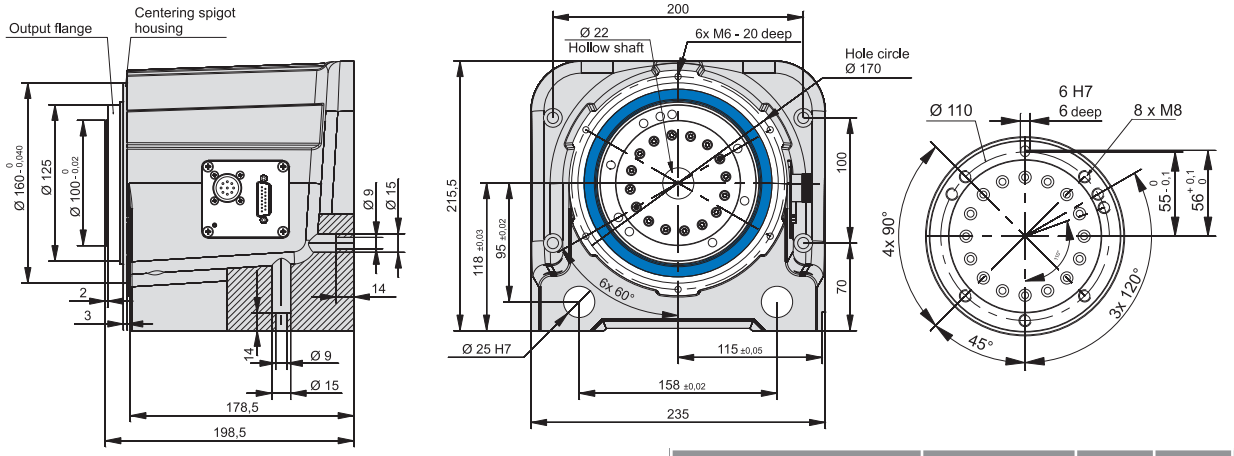
Indexing table / Rotary unit RDH-M

Technical specification

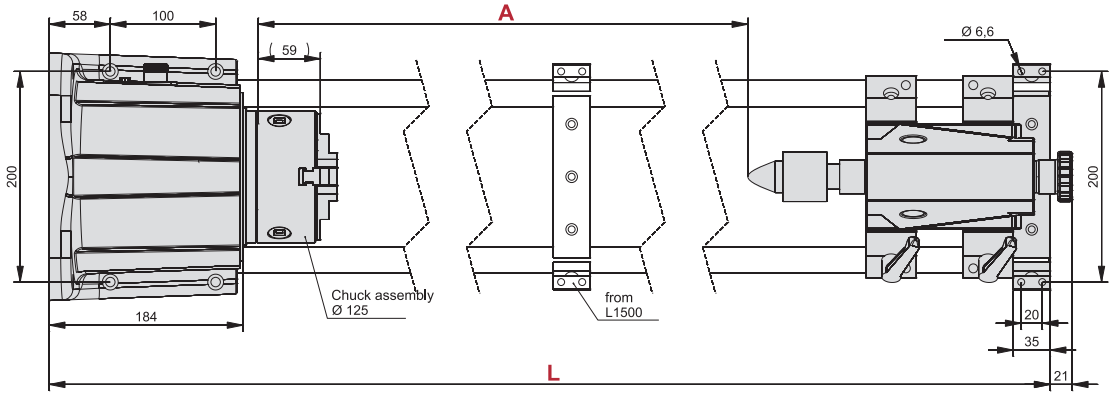
	Stepper motor MS 200 HT *		EC servomotor EC 60S (brushless)		DC servomotor DC 100 (brushed)	
Reduction ratio	1:51	1:101	1:51	1:101	1:51	1:101
Nominal speed [1/min]	4	2	22	11	22	11
	at 1500 Hz (225 1/min)		at 1100 1/min			
Max. speed [1/min]	24	12	59	30	59	30
	at 8000 Hz		--			
Nominal torque [Nm]	24	46	9	17	7	14
	bei 1500 Hz		--			
Max. torque (short term) [Nm]	--	--	42	80	39	73
Nominal 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 C_0 [N]	35800					

* Values for half-step operation

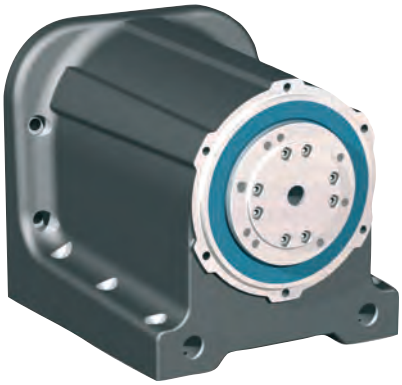
Dimensioned drawings



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 C122
For transport loads, see page C123

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

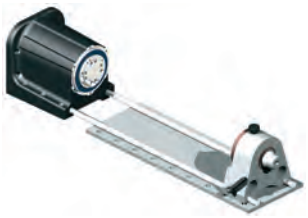
Chuck assembly
3-jaw chuck Ø 65
Part no.: **269060 3065***

3-jaw chuck Ø 80
Part no.: **269060 2080***

3-jaw chuck Ø 100
Part no.: **269060 2100***

Chuck jaws
4-jaw chuck Ø 100
Part no.: **269061 2100***

* including flange



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)

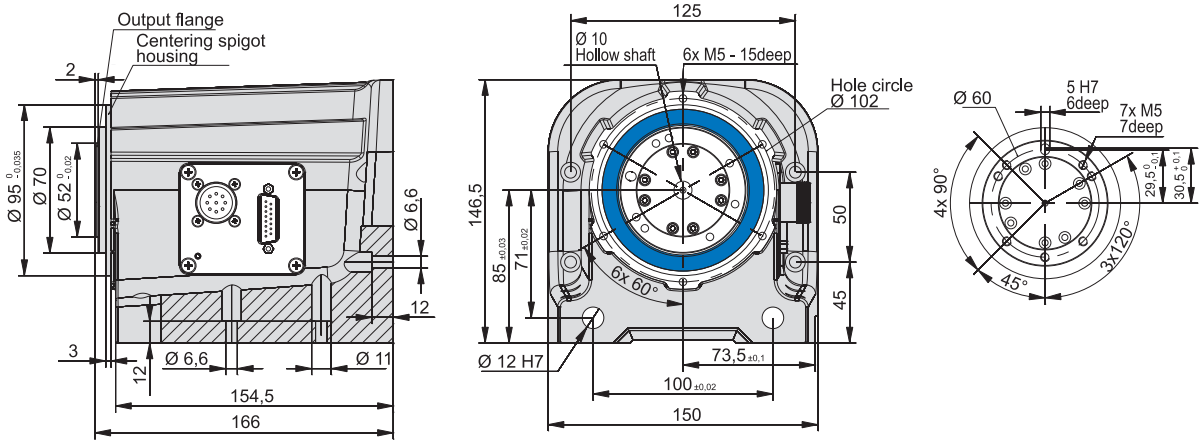
Indexing table / Rotary unit RDH-S

Technical specification

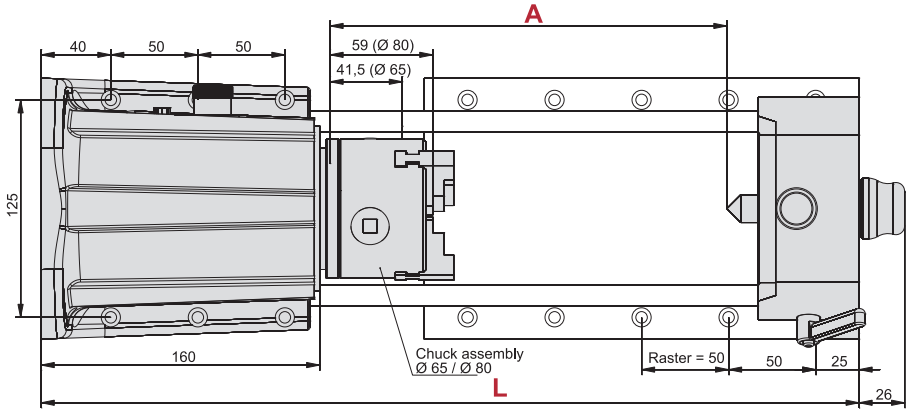
		Stepper motor MS 045 HT *		EC servomotor EC 42 (brushless)		DC servomotor RE 40 (brushed)	
Reduction ratio		1:51	1:101	1:51	1:101	1:51	1:101
Nominal speed [1/min]		4	2	22	11	22	11
		at 1500 Hz (225 1/min)		at 1100 1/min		at 1100 1/min	
Max. speed	[1/min]	24	12	59	30	69	35
		at 8000 Hz		--			
Nominal torque [Nm]		7	11	4.8	9.2	4.6	9
		at 1500 Hz		--			
Max. torque (short term)	[Nm]	--	--	7	11	7	11
Nominal 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					

* Values at 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



mechanics

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 C122
For transport loads, see page C123

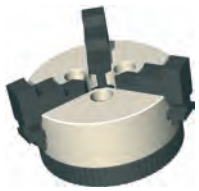
Ordering key

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)

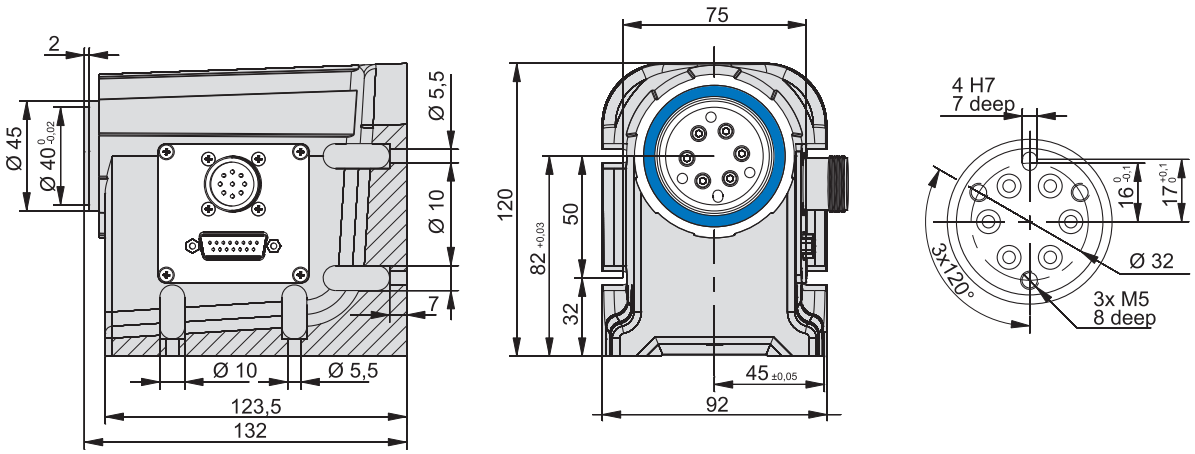
Indexing table / Rotary unit RDH-XS

Technical specification

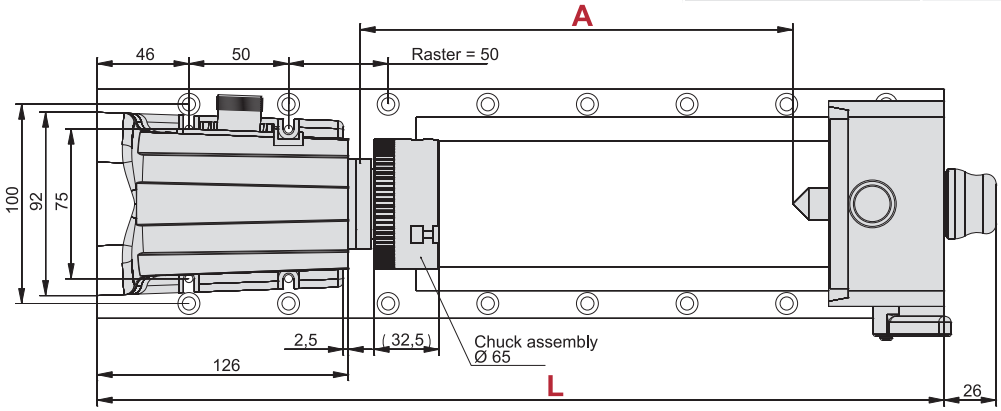
		Stepper motor MS 045 HT *		EC servomotor EC 42		DC servomotor RE 40	
Reduction ratio		1:50	1:100	1:50	1:100	1:50	1:100
Nominal speed	[1/min]	5	2	22	11	22	11
		at 1500 Hz (225 1/min)		at 1100 1/min		at 1100 1/min	
Max. speed	[1/min]	24	12	59	30	70	35
		at 8000 Hz (1200 1/min)		--			
Nominal torque	[Nm]	5	7	5	7	5	7
		at 1500 Hz (225 1/min)		--			
Max. torque (short term)	[Nm]	--	--	5	7	5	7
Nominal 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 C	[N]	392					
Static load C_0	[N]	392					

* 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 mm	269100 0030	425	217
Tailstock unit RE-XS 400 mm	269100 0040	525	317
Tailstock unit RE-XS 500 mm	269100 0050	625	417



mechanics

Rotary / swivel 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 C122
For transport loads, see page C123

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.: **269060 2080***

3-jaw chuck Ø 100
Part no.: **269060 2100***

Chuck assembly
4-jaw chuck Ø 100
Part no.: **269061 2100***

*** including flange**

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

made by isel®

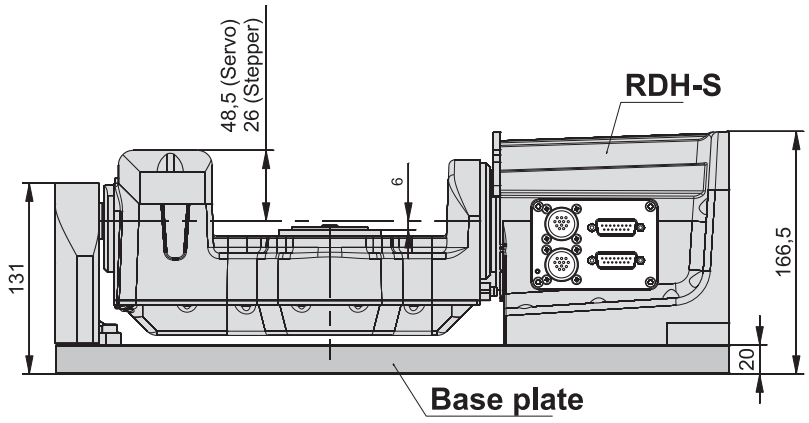
Rotary / swivel unit DSH-S

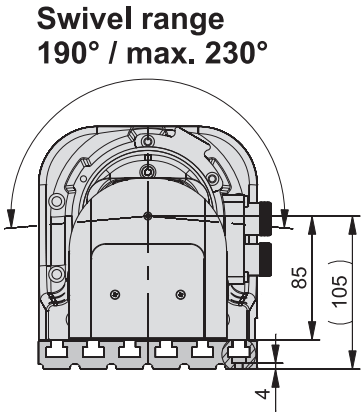
Technical specification

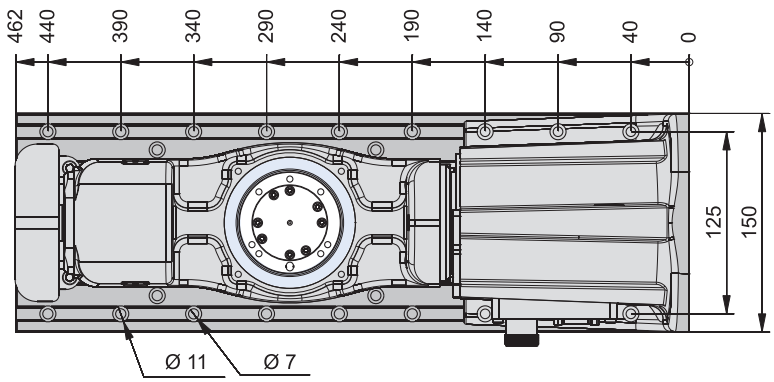
		Stepper motor MS 045 HT *		EC servomotor EC 42		DC servomotor RE 40	
Reduction ratio		1:51	1:101	1:51	1:101	1:51	1:101
Nominal speed	[1/min]	4	2	22	11	22	11
		at 1500 Hz (225 1/min)		at 1100 1/min		at 1100 1/min	
Max. speed	[1/min]	24	12	59	30	69	35
		at 8000 Hz		--			
Nominal torque	[Nm]	7	11	4.8	9.2	4.6	9
		at 1500 Hz		--			
Max. torque (short term)	[Nm]	--	--	7	11	7	11
Nominal 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					

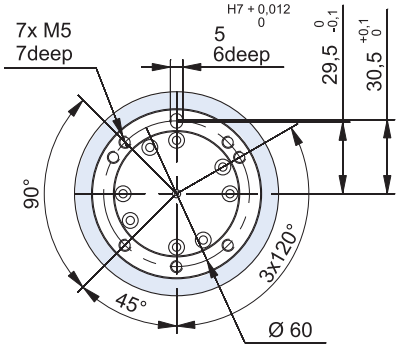
* Values for half-step operation

Dimensioned drawings

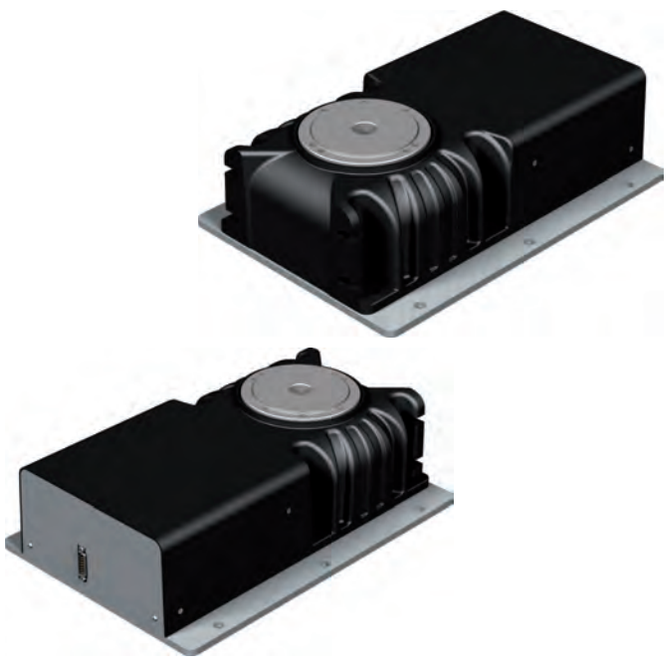








Indexing table RF 1



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 C122
For transport loads, see page C123

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**
f for reduction 1:100
Part no.: **269077 0002**

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

Aluminium rotary plate
Ø 490 mm, customised fixing borings available at extra cost
Part no.: **269051 0500**

Chuck assembly
3-jaw chuck Ø 125
Part no.: **269062 0125**
4-jaw chuck Ø 125
Part no.: **269061 0125**

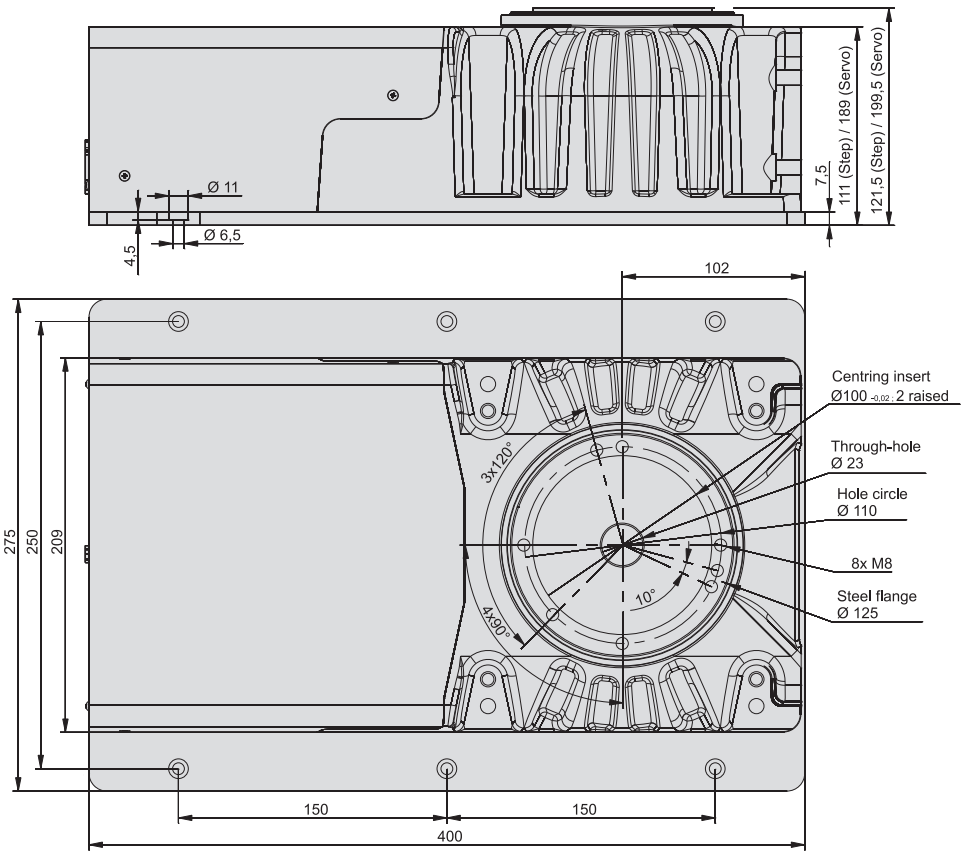
Indexing table RF 1

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
speed	[1/min]	0-50	0-23	0-12	0-125	0-58	0-30
Operation torque (0 - 500 Hz)	[Nm]	20	42	75	--		
Operation torque (500 - 1000 Hz)	[Nm]	18	38	75	--		
Nominal torque	[Nm]	--			6 / 10	13 / 22	25 / 42
Nominal holding torque (static load)	[Nm]	37	75	75	7 / 12	16 / 26	30 / 50
Min. Step (positional accuracy)	[arcmin]	2.5	2	2	2	2	2

* Values for half-step operation

Dimensioned drawings



Rotary unit

iZD 54

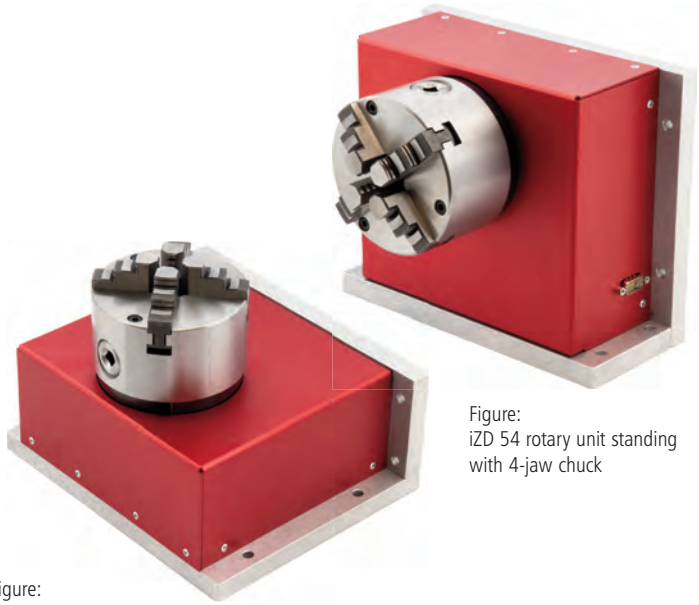


Figure:
iZD 54 rotary unit standing with 4-jaw chuck

Figure:
iZD 54 rotary unit lying with 4-jaw chuck

Features

- low play toothed belt drive with stepper motor
- horizontal and vertical
- Reduction 1:54
- good price/performance ratio
- high torque
- Dimensions (L×W×H): 220 × 185 × 95 mm
- Weight approx. 6.5 kg

For pin assignment see page C122
For transport loads, see page C123

Technical specification

Rotary unit iZD 54

Reduction ratio		1:54
Speed	[1/min]	0-22
Operating torque	[Nm]	30
Nominal holding torque (static load)	[Nm]	48
Min. step	[arcmin]	2

based max. 8 kHz, half-step operation

Ordering data

Basic iZD 54 rotary unit
Part no.: **260400 0000**

Accessories

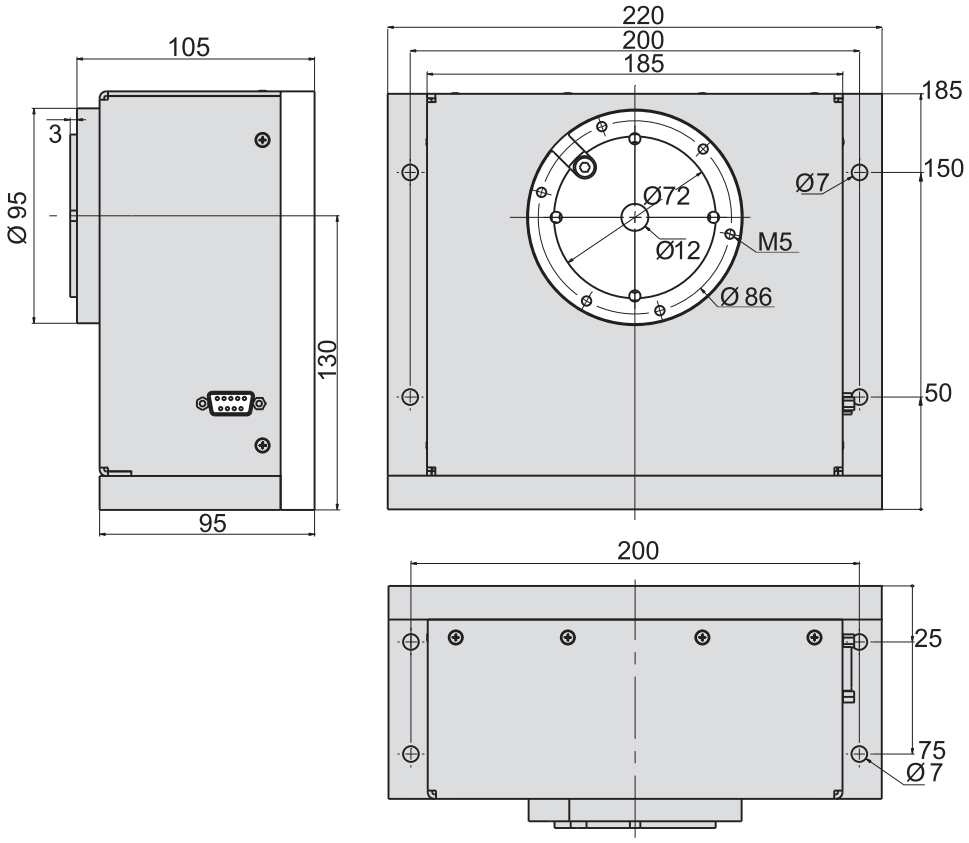
Chuck assembly
3-jaw chuck Ø 100
Part no.: **269060 0100**

4-jaw chuck Ø 100
Part no.: **269061 0100**

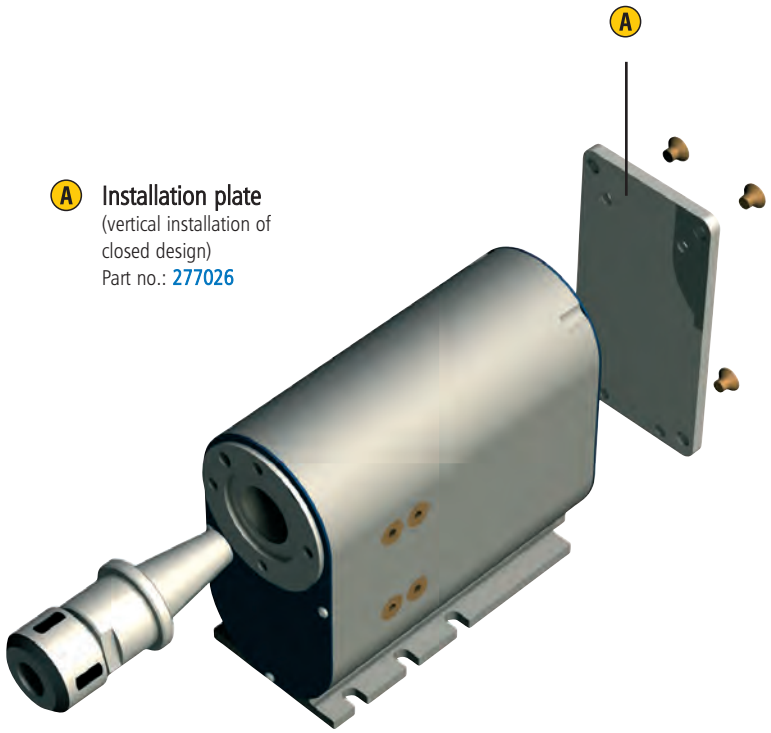
Aluminium T-key plate Ø 250 mm, PT 24
Part no.: **269050 0250**

Rotary unit iZD 54

Dimensioned drawing



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 with Ø 9 mm boring
- Housing flange with inner cone SK 20
- Weight:
  according to design, from 1.35 kg

For pin assignment see page C122
For transport loads, see page C123

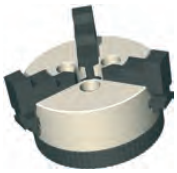
Optionen:
- additional installation plate (vertical installation possible)
- CNC controller

Ordering key

261010 0X10

Motors
0 = Stepper motor MS 045 HT
2 = brushed DC servomotor RE 40
3 = brushless EC servomotor EC 42

Accessories



Chuck assembly

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

*** including flange**

Collet holder

Collet holder SK 20
for tools Ø 3 - 10 mm, with installation ring
Part no.: **239172 0001**

Collets are on page E 29.

Mini rotary unit MD 1

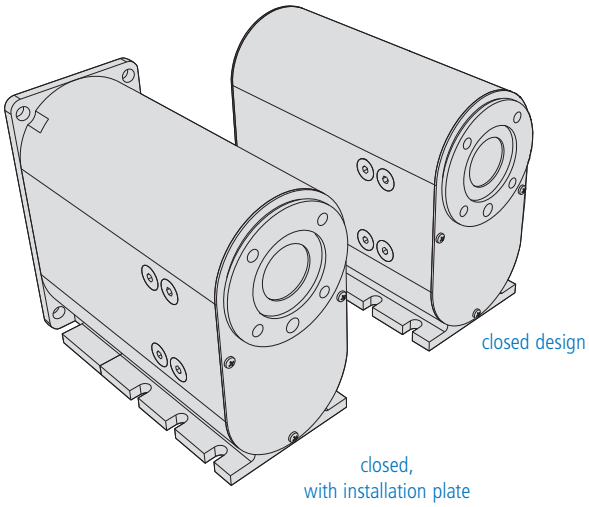
Technical specification

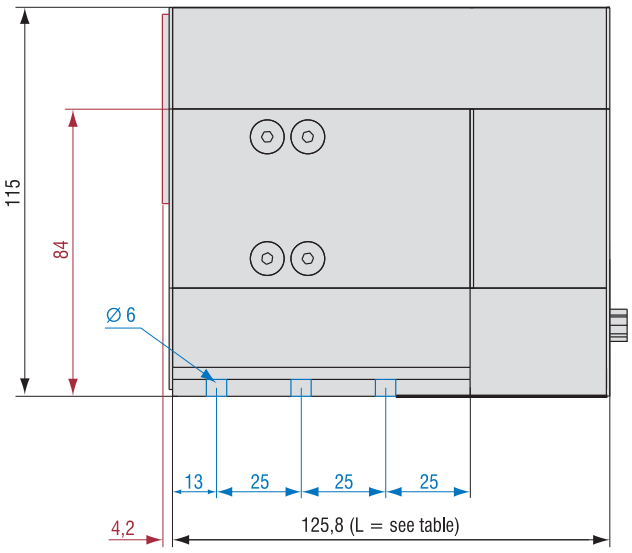
		Stepper motor MS 045 HT *	DC servomotor RE 40	EC servomotor EC 42
Reduction ratio		1:20	1:20	1:20
Speed	[1/min]	0 - 60	0 - 175	0 - 150
Operating torque (0 - 1600 Hz)	[Nm]	8	--	--
Nominal torque	[Nm]	--	3	3.2
Nominal holding torque (static load)	[Nm]	14	3.9	4
Min. step (positional accuracy)	[arcmin]	3.5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

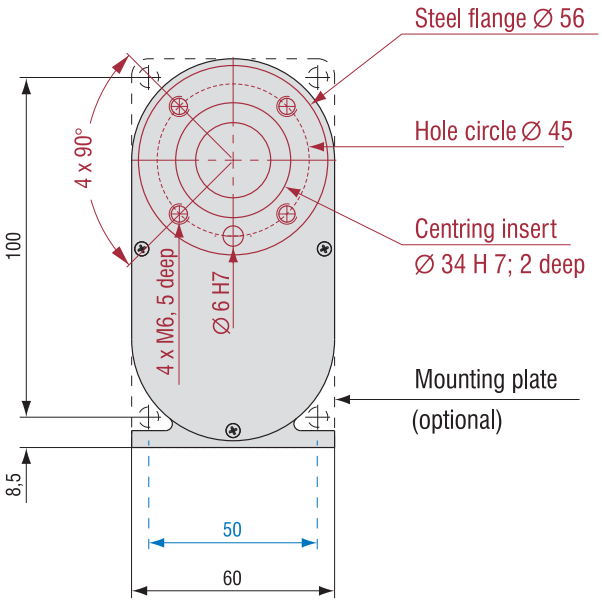
* Values for half-step operation

Dimensioned drawings

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

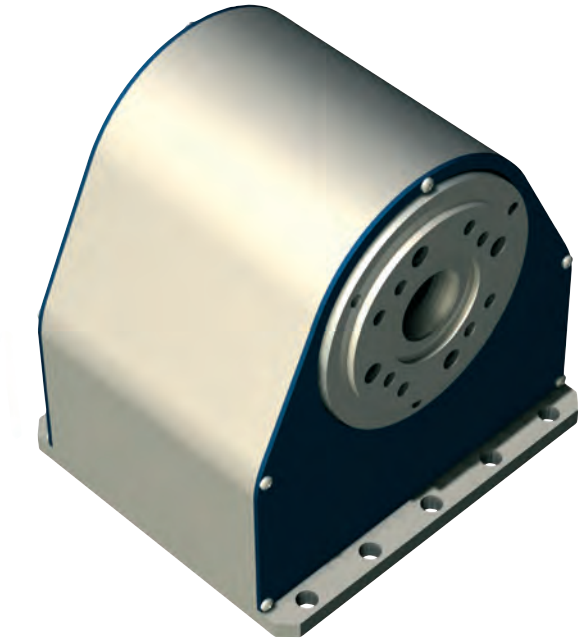






Rotary unit

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 C122
For transport loads, see page C123

Options:
- CNC controller via Sub D

Technical specification

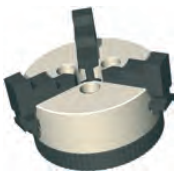
		Stepper motor MS 045 HT *
Reduction ratio		1:30
Speed	[1/min]	0 - 40
Operating torque (0 - 1600 Hz)	[Nm]	12
Nominal holding torque (static load)	[Nm]	20
Min. step (positional accuracy)	[arcmin]	2.5

* Values for half-step operation

Ordering information

ZD 30 rotary unit
Art.-Nr.: **261100 0000**

Accessories



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

Chuck assembly
3-jaw chuck Ø 80
Part no.: **269060 3080***

Collet holder
Collet holder SK 20
for tools Ø 3 - 13 mm, with installation ring
Part no.: **239172 0001**

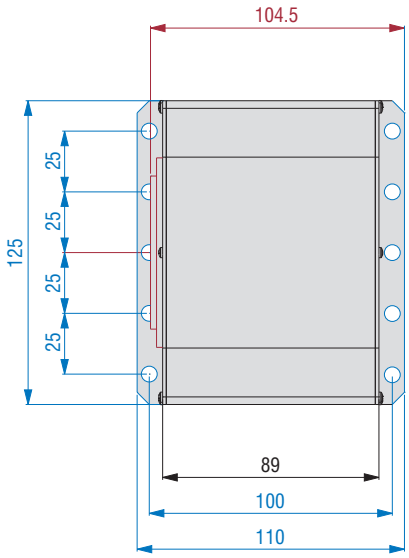
Collets are on page E 29.

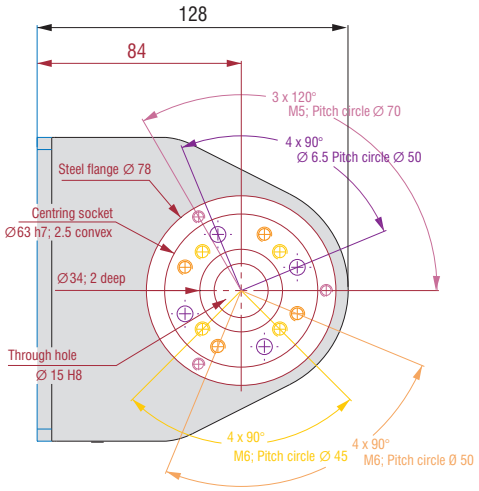
Tailstock unit RE-ZD30
200 mm Part no.: **269 100 1060** L 331
300 mm Part no.: **269 100 1070** L 431
400 mm Part no.: **269 100 1080** L 531
500 mm Part no.: **269 100 1090** L 631

* including flange

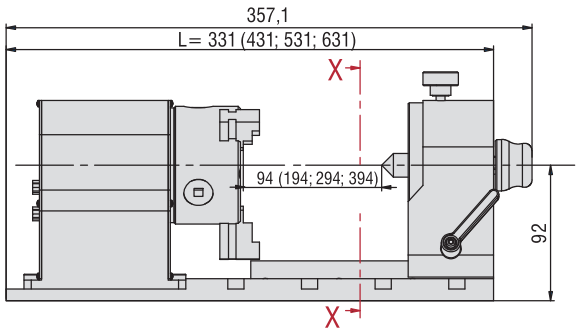
Rotary unit ZD 30

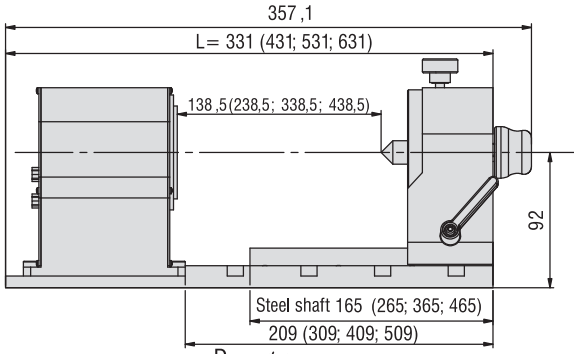
Dimensioned drawing

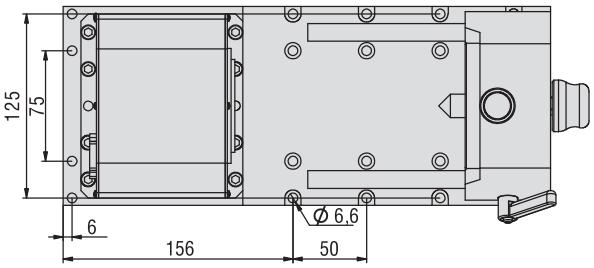


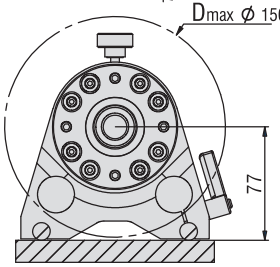


Tailstock unit RE-ZD30

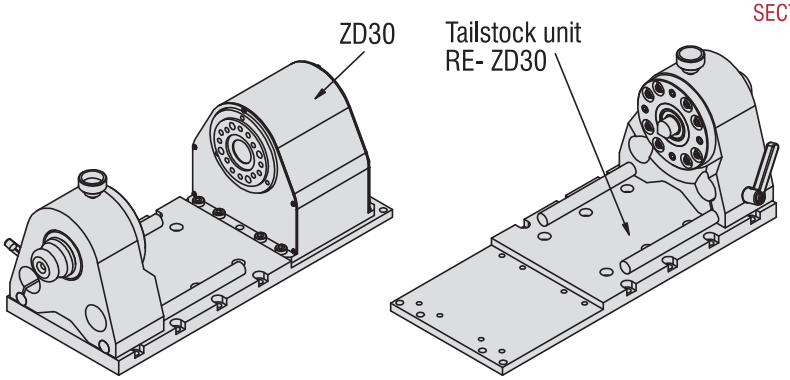






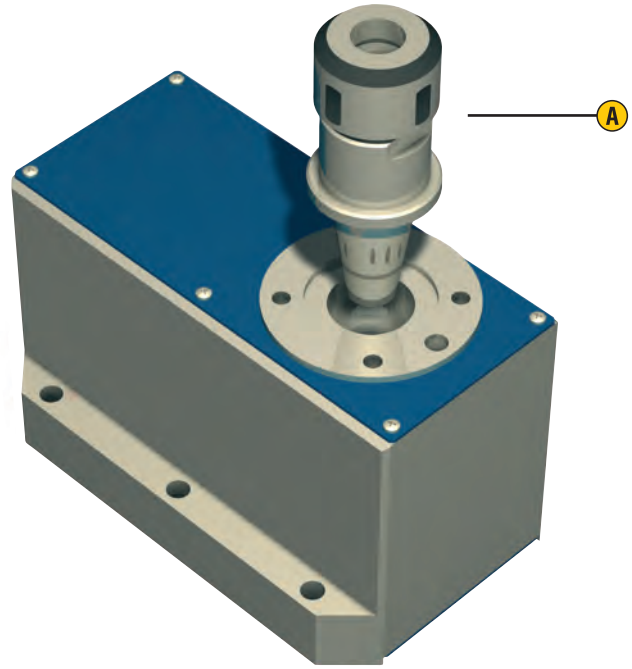


SECTIONAL DRAWING X-X



mechanics

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 C122
For transport loads, see page C123

Options:
- CNC controller via Sub D

Ⓐ Collet holder SK 20
(Accessories)

Ordering data

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

Technical specifications

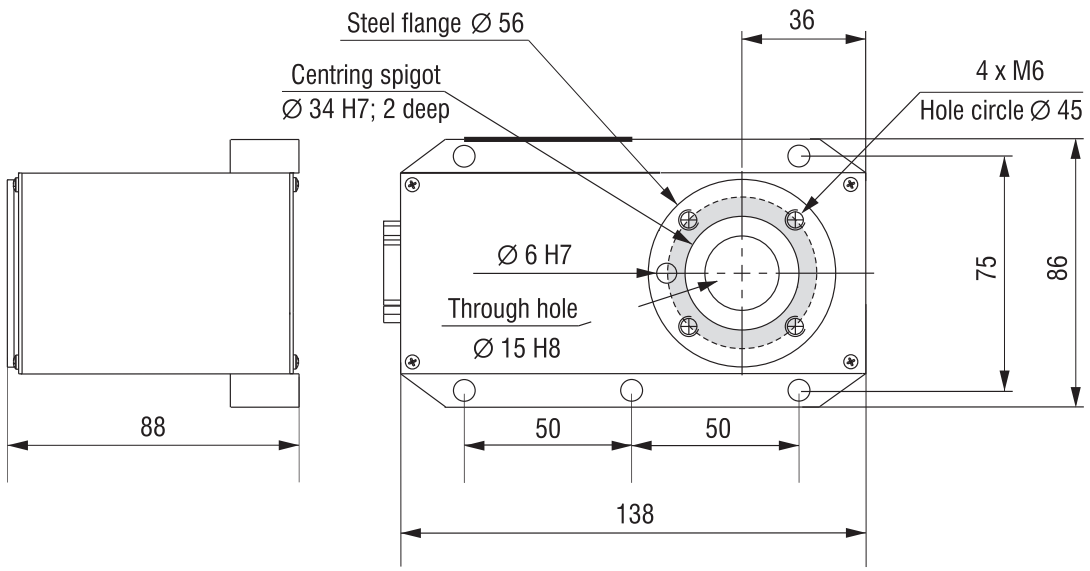
		Stepper motor MS 045 HT *
Reduction ratio		1:20
Speed	[1/min]	0 - 60
Operating torque (0 - 1600 Hz)	[Nm]	8
Nominal holding torque (static load)	[Nm]	14
Min. step (positional accuracy)	[arcmin]	3.5

* Values for half-step operation

Accessories

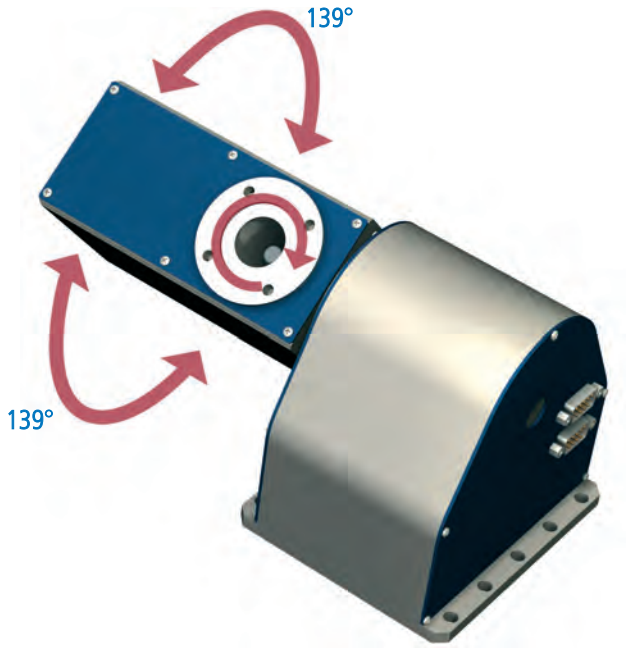
see rotary / swivel unit

Dimensioned drawing



made by isel®

Rotary / swivel 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.

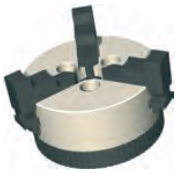
ZDS 2030 enables 5-side machining or free-form surface machining on a conventional 3-axis system of easily machinable materials (e.g. plastic).

The titling angle is 139° in both directions.

Ordering data

Rotary / swivel unit ZDS 2030
Part no.: **265000 0000**

Accessories

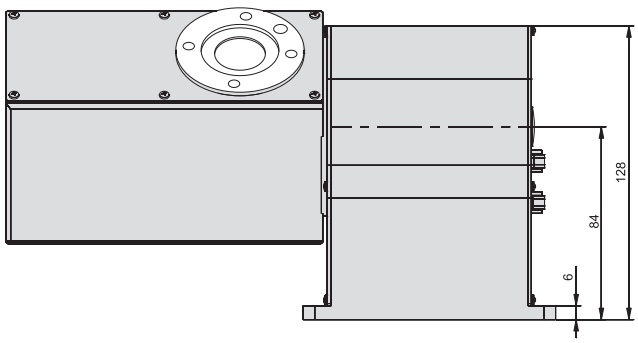


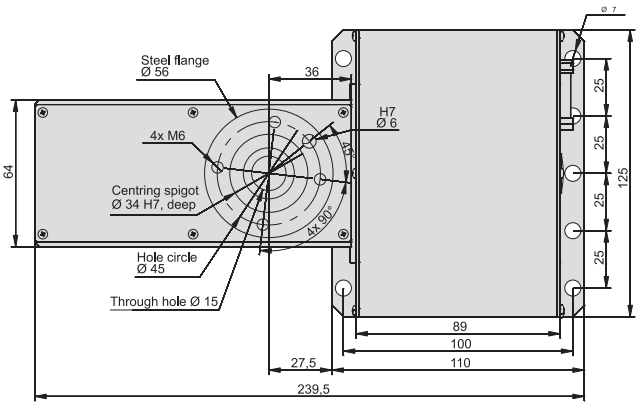
Chuck assembly
3-jaw chuck Ø 65
Part no.: **269060 2065***

* including flange

Collet holder
SK 20 collet holder for tools Ø 3 - 13 mm, with installation ring
Part no.: **239172 0001**
Collets are on page E 29.

Dimensioned drawing



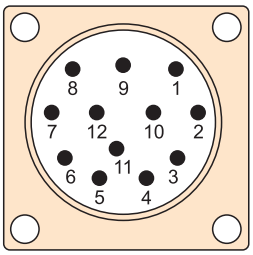


Motor pin assignments

Pin assignment for 12-pin stepper motors

(for RDH, DSH-S)

Motor connection



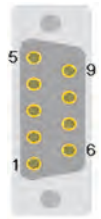
View of pin insert at the insertion side

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	

Pin assignment for 9-pin stepper motors

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

Motor connection



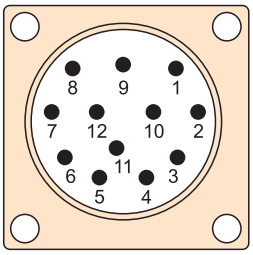
View of pin insert at the insertion side

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 stepper motors with encoder

(for RDH)

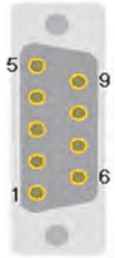
Motor connection



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	

Encoder connection

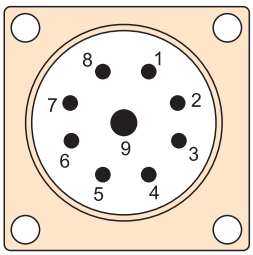


View of pin insert at the insertion side

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 brushed DC servo motors (BDC)

Motor connection



View of pin insert at the insertion side

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

* Motor phases are connected partially over 2 wires.

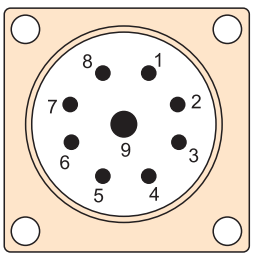
Encoder connection

View of pin insert at the insertion 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)

Motor connection



View of pin insert at the insertion side

M23 9-pin (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	

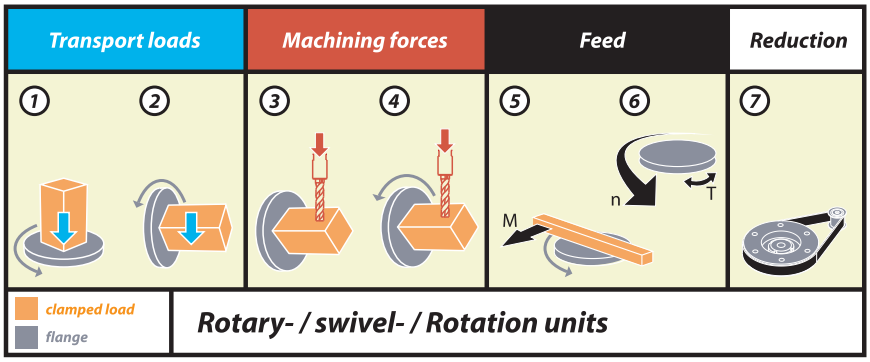
Encoder connection

View of pin insert 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 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	

Rotary- / swivel- / Rotation units

Transport loads, machining forces, feed



Rotary or Swivel units	1*	2*	3	4	5	6	7
RDH-M (step)	100 kg	45 kg	55 Nm	24 Nm	24 Nm	4 1/min.	1:51
RDH-M (step)	160 kg	70 kg	108 Nm	45 Nm	45 Nm	2 1/min.	1:101
RDH-M (brushless EC-servo)	110 kg	50 kg	26 Nm	9 Nm	9 Nm	22 1/min.	1:51
RDH-M (brushless EC-servo)	180 kg	80 kg	51 Nm	17 Nm	17 Nm	11 1/min.	1:101
RDH-S (Step)	30 kg	15 kg	7 Nm	7 Nm	7 Nm	4 1/min.	1:51
RDH-S (Step)	48 kg	24 kg	11 Nm	11 Nm	11 Nm	2 1/min.	1:101
RDH-S (brushless EC-servo)	30 kg	15 kg	7 Nm	4.6 Nm	4.6 Nm	22 1/min.	1:51
RDH-S (brushless EC-servo)	48 kg	24 kg	11 Nm	4.6 Nm	9.2 Nm	11 1/min.	1:101
RDH-S (DC-Servo)	25 kg	13 kg	7 Nm	4.6 Nm	4.6 Nm	22 1/min.	1:51
RDH-S (DC-Servo)	40 kg	20 kg	11 Nm	8.7 Nm	8.7 Nm	11 1/min.	1:101
RDH-XS (Step)	30 kg	10 kg	5 Nm	5 Nm	5 Nm	24 1/min.	1:50
RDH-XS (Step)	30 kg	10 kg	7 Nm	7 Nm	7 Nm	12 1/min.	1:100
RDH-XS (brushless EC-Servo)	30 kg	10 kg	5 Nm	5 Nm	5 Nm	59 1/min.	1:50
RDH-XS (brushless EC-Servo)	30 kg	10 kg	7 Nm	7 Nm	7 Nm	30 1/min.	1:100
RDH-XS (DC-Servo)	30 kg	10 kg	5 Nm	5 Nm	5 Nm	70 1/min.	1:50
RDH-XS (DC-Servo)	30 kg	10 kg	7 Nm	7 Nm	7 Nm	35 1/min.	1:100
RF 1 (Step)	60 kg	30 kg	37 Nm	17.5 Nm	17.5 Nm	50 1/min.	1:24
RF 1 (Step)	100 kg	50 kg	75 Nm	38 Nm	38 Nm	23 1/min.	1:52
RF 1 (Step)	150 kg	75 kg	75 Nm	75 Nm	75 Nm	12 1/min.	1:100
RF 1 (DC-Servo / EC Servo)	70 kg	35 kg	7 / 12 Nm	6 / 10 Nm	6 / 10 Nm	125 U/min.	1:24
RF 1 (DC servo / EC servo)	110 kg	55 kg	16 / 26 Nm	13 / 22 Nm	13 / 22 Nm	58 U/min.	1:52
RF 1 (DC servo / EC servo)	160 kg	80 kg	30 / 50 Nm	25 / 42 Nm	25 / 42 Nm	30 U/min.	1:100
MD 1 (Step)	5 kg	2,5 kg	14 Nm	8 Nm	8 Nm	60 U/min.	1:20
MD 1 (DC servo)	6 kg	3 kg	3,9 Nm	3 Nm	3 Nm	175 U/min.	1:20
MD 1 (brushless EC-servo)	6 kg	3 kg	4 Nm	3,2 Nm	3,2 Nm	150 U/min.	1:20
ZR 20 (step)	10 kg	5 kg	14 Nm	8 Nm	8 Nm	60 U/min.	1:20
ZD 30 (Step)	14 kg	8 kg	20 Nm	12 Nm	12 Nm	40 U/min.	1:30
iZD 54	30 kg	15 kg	48 Nm	30 Nm	30 Nm	22 U/min.	1:54

*) Guideline values, which will vary according to the use.

softwa

SOFTWARE

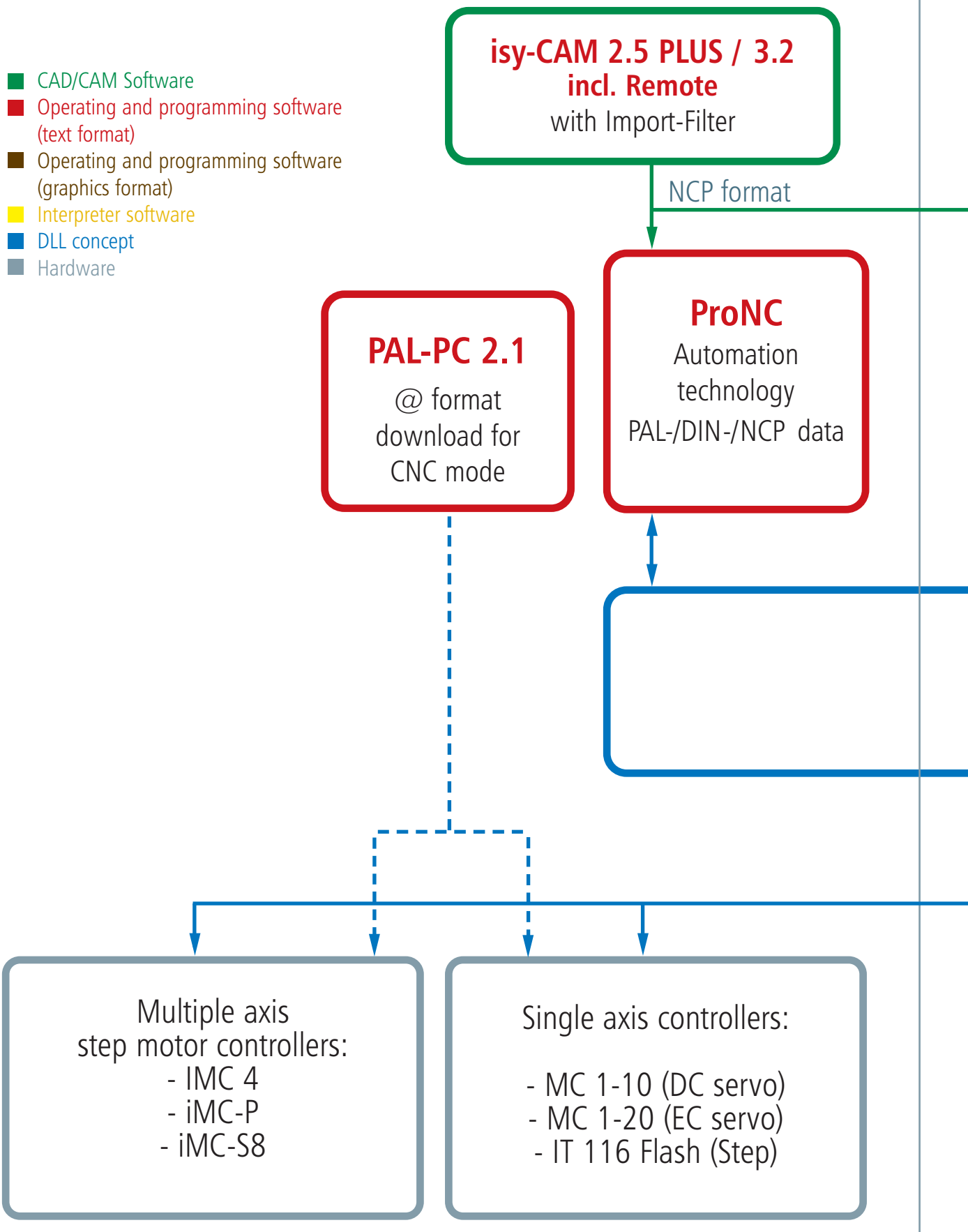
Software and
control organization D2

CAD/CAM software
isy-CAM 2.5 PLUS D4

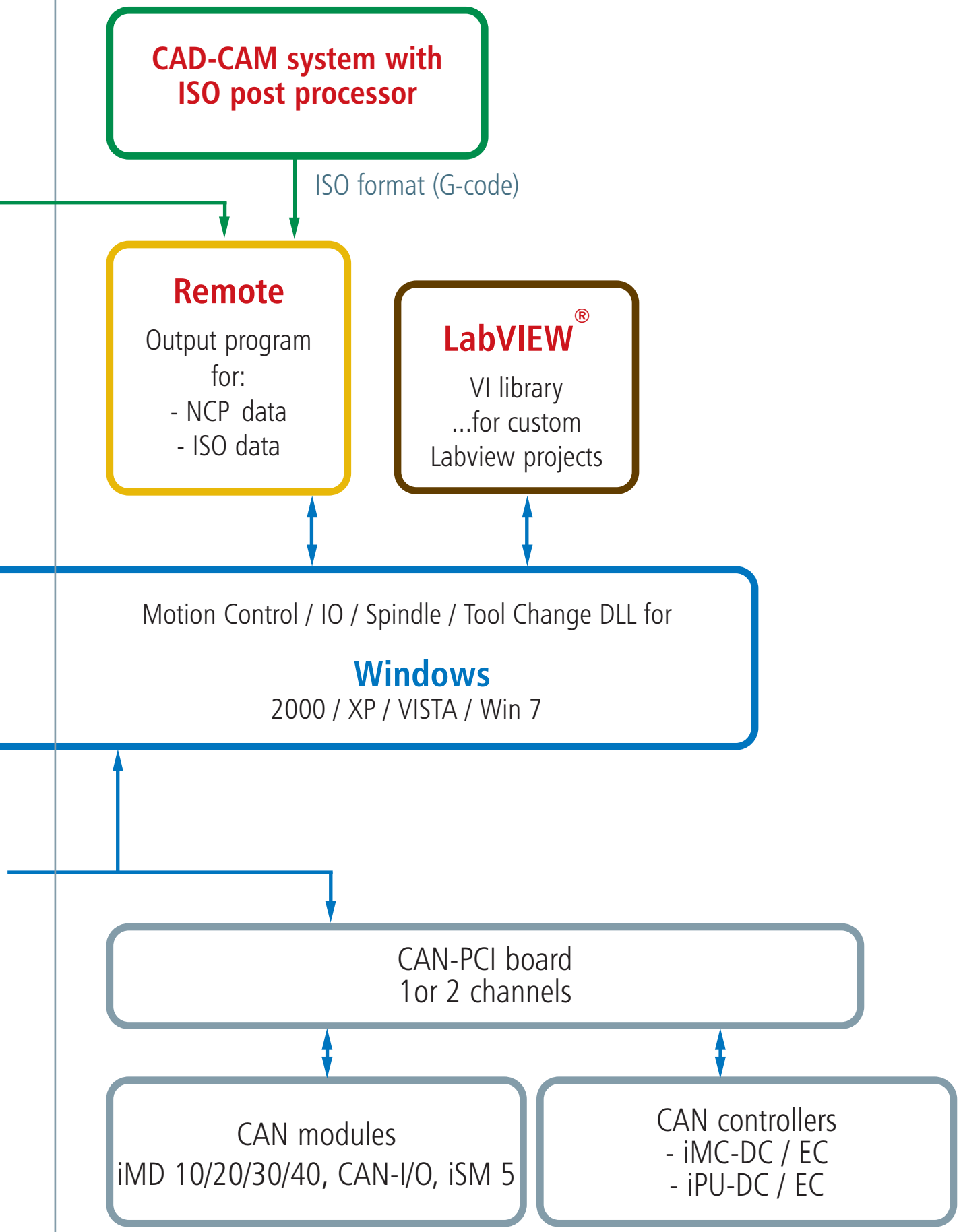
Interpreter software
Remote D5

Programming software
ProNC D6
PAL-PC 2.1 ..... D7

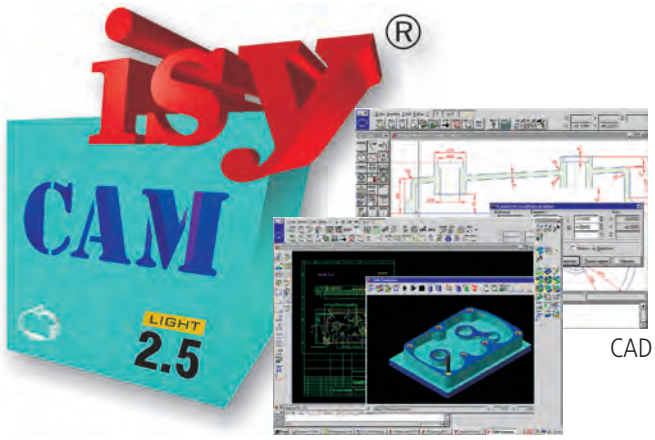
Software and controller organisation



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

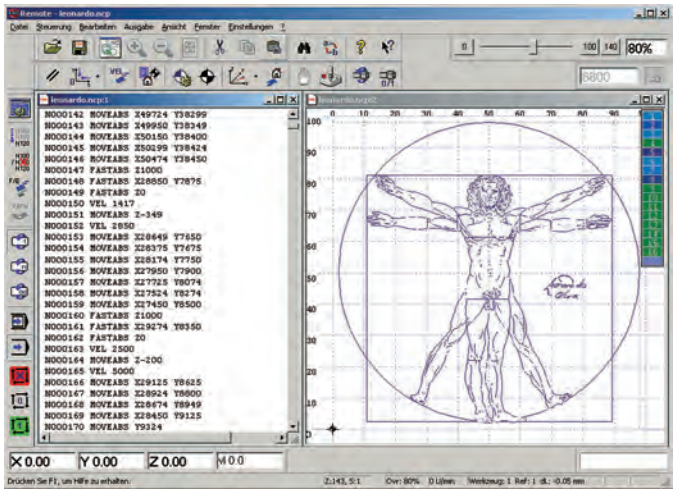
Part no.: **Z13-337030-1000**
Second licence on isy-CAM 2.5 PLUS

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)

software

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

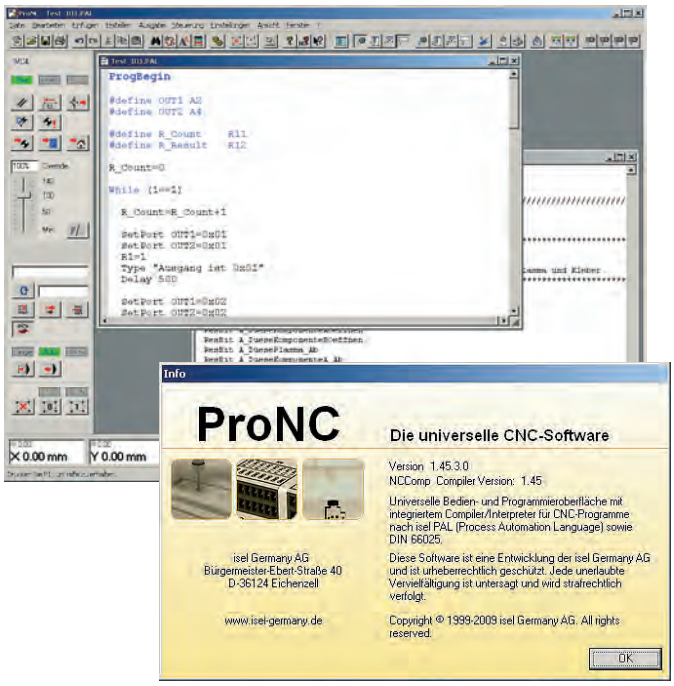
Part no.: **Z11-331810**
PAL-PC - software for CAN-CNC controllers (Windows)

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

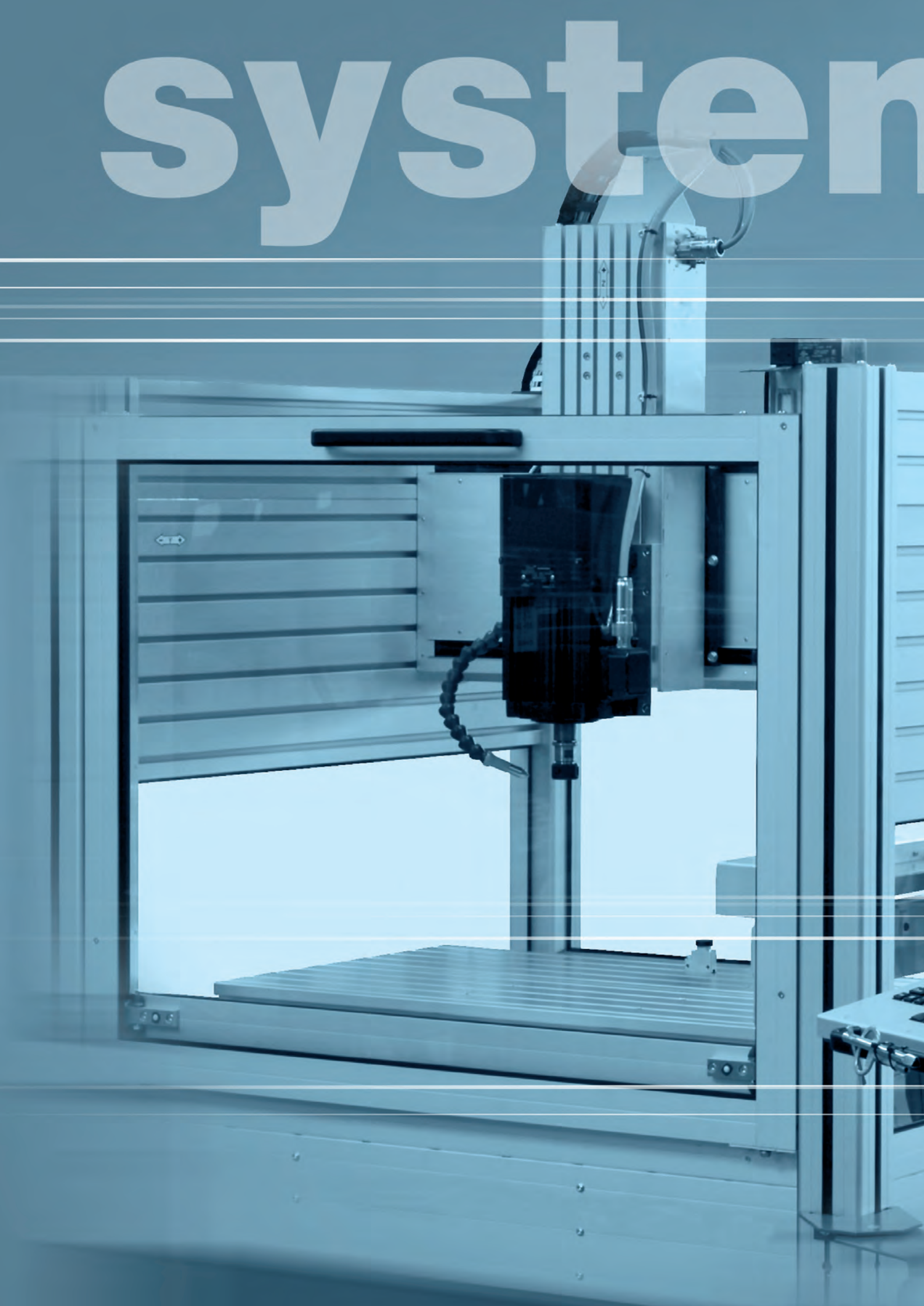
Part no.: **Z11-333500**
ProNC - software for CAN-CNC controllers (Windows)

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

CNC machines..... E2
with step motor or servomotor drive

Accessories..... E18

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systems

CNC machines Overview

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CNC machines Overview

Accessories E 18

Spindle motors E 19

iSA 500 with manual tool change
iSA 750 with manual tool change
iSA 1500 with manual tool change
iSA 900 with automatic tool change
iSA 2200 with automatic tool change
iSA 3600 with automatic tool change

UFM 500 / UFM 1050

CoolMin tool cooling system E 26

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Length measuring key
Motor leads
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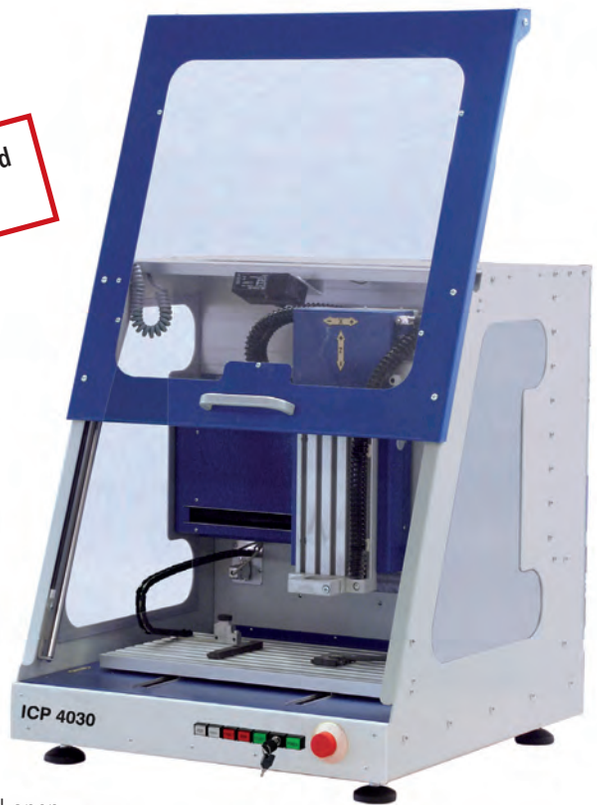
IWH F-2 wafer handling robots
IWH F-3 wafer handling robots
IWH F-5 vacuum robots
Vacuum elevator
Linear track
End effectors
Pre-aligners
Controller and accessories

systems

CNC machine
with step motor drive

ICP

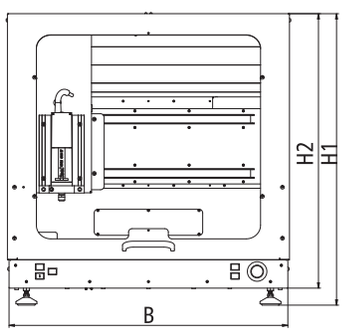
NEW
... with optimised controller.

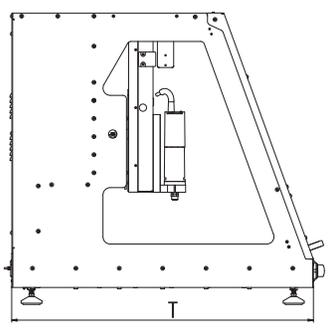


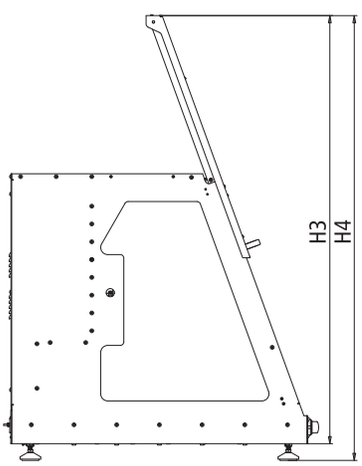
ICP 4030 with hood open

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 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 probe 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
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 750
280000 0046	Fixing plate for main spindle drive
290055	Vice 1 (W 130 × H 45 × L 152 mm)
290056	Vice 2 (W 180 × H 75 × L 215 mm)

CNC machine
with servomotor drive

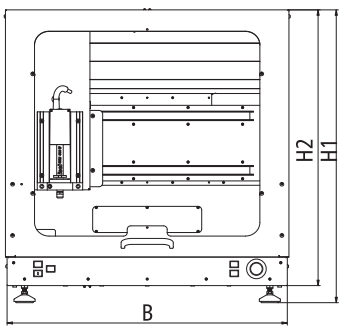
ICV 4030

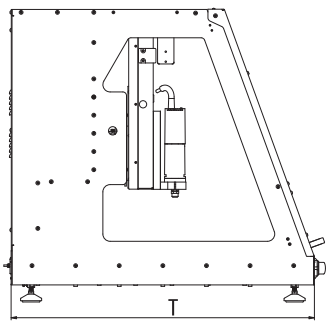
Control unit
... with integrated control computer.

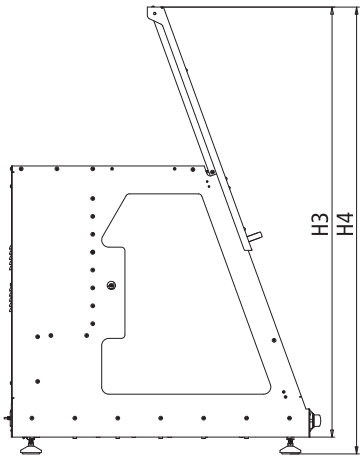
ICV **4030** with hood open

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







CNC machine
with servomotor 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
Traverse path X/Y/Z [mm]	395 x 300 x 100
Clamping table surface W × D [mm]	600 x 375
Throughput [mm]	150
Dimensions W × D × H [mm]	780 x 835 x 806
Guides	Linear units with precision steel shafts and recirculating ball slots, adjustable for no play
Processing speed X/Y/Z [mm/s]	200
Repeatability [mm]	± 0,02
Drive motors	Servomotors
Drive elements X/Y/Z	Recirculating ball transmission 16 × 10/16 × 10/16 × 10 mm clearance free adjustable (optional: 16 × 4 mm in X/Y/Z)
Controller	iMC CAN controller with 3 drive controllers, integrated control computer, I/O module, safety circuit and rest state monitoring Power supply unit 48V/1000 W
Operation	Function keys and emergency shutdown
Software	WinRemote (optional: ProNC, isy 2.5 PLUS)
Weight [kg]	appr. 120
Part no.	**280230 4405 ***

* 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 ICV 4030
280120 9010	Length measurement probe for ICV 4030
280120 9004	Workspace lighting for ICV 4030
420003 0500	Milling motor 500 W, 11,000...25,000 r.p.m.
420003 1050	Milling motor 1050 W, 11,000...25,000 r.p.m.
280110 9001	Suction device for UFM 500/1050
280120 9003	Engraving mat, incl. adapter plate
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
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
280210 9001	Suction device for iSA 500/iSA 750
280000 0046	Fixing plate for main spindle drive

Note:
Vacuum clamping plates can be clamped in sizes A5 - A3. (see page E31)

CNC machine
with servomotor drive

EuroMod®

EuroMod MP 30 with closed sliding door

Technical specification

	EuroMod® MP 30	EuroMod® MP 45	EuroMod® MP 65
Traverse path X/Y/Z [mm]	650/300/250	650/450/250	1000/650/250
Clamping table surface W×D [mm]	900x350	900x500	1200x700
Throughput [mm]	350		
Dimensions W × D × H [mm]	1160x800x1700	1160x1110x1700	1480x1510x1700
Processing speed X/Y/Z	appr. 250 mm/s		
Repeatability [mm]	± 0,02		
Drive motors	48V servomotors		
Drive elements X/Y/Z	Recirculating ball drive, clearance free adjustable		
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]	appr. 250	appr. 280	appr. 375
Software	Windows, WinRemote (optional: ProNC, isy 2.5 PLUS)		
Connection values	230V, 16A		
Part no.	**275133 33665**	**275143 33665**	**275153 33665**

* without mounted components on the axes.

CNC machine
with servomotor drive

EuroMod®

systems

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 E18 et seq.).

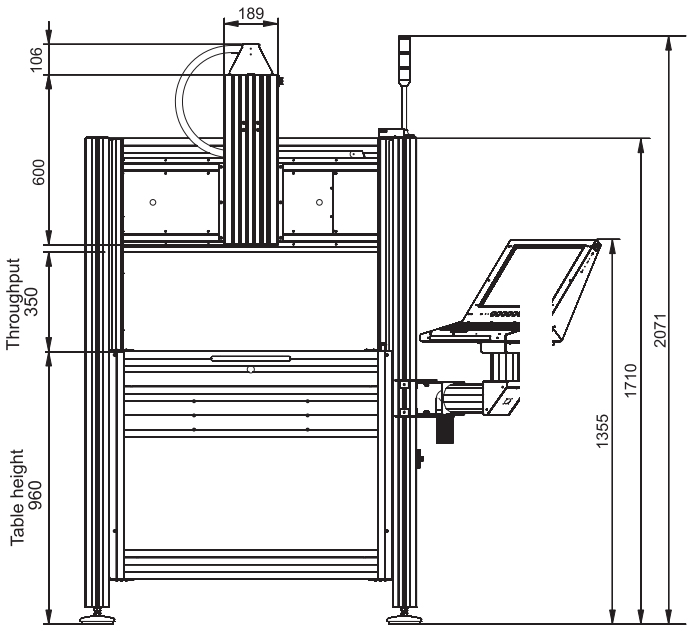
Options

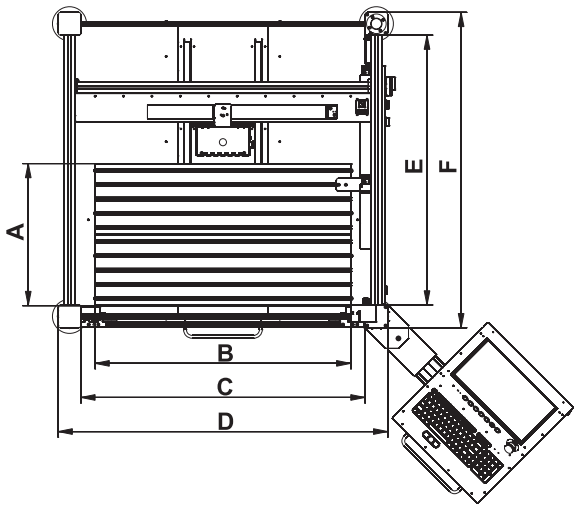
- PC control console with 2 free PCI plug-ins (for use by external PCI hardware)
- Stainless steel keyboard
- Safety light curtain
- Milling and engraving spindles
- SK11/SK20 automatic tool change stations
- Minimum quantity lubrication or CoolMin cooling system
- Vacuum clamping benches
- Suction device
- 4. Axis e. g. RDH series installation
- pneumatic sliding door
- closed hood attachment

Setup

- Portal: fixed, bench: mobile

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

Technical specifications subject to change.

CNC machine
with servomotor drive

FlatCom® M series

FlatCom M 30 without hood

FlatCom M 30 with hood open

Technical specification

	FlatCom® M 20	FlatCom® M30	FlatCom® M40	FlatCom® M50
Traverse path X/Y/Z [mm]	700/600	700/900	1200/900	1200/1400
Z lift [mm]	150 (optional 250, in each case without processing unit)			
Clamping table surface W×D [mm]	750x750	750x1000	1250x1000	1250x1500
Z-Throughput [mm]	200 (optional 300, in each case without processing unit)			
Dimensions W × D × H [mm]	1420x1150x1870	1420x1450x1870	1920x1450x1870	1920x1950x1870
Processing speed X/Y/Z	appr. 250 mm/s			
Repeatable accuracy [mm]	± 0,02			
Drive motors	48V servomotors			
Drive elements X/Y/Z	Recirculating ball drive, clearance free adjustable			
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]	appr. 300	appr. 340	appr. 450	appr. 525
Software	Windows, WinRemote (optional: ProNC, isy 2.5 PLUS)			
Connection values	400V, 16A			
Part no.	275023 32355 **	275033 32355 **	275043 32355 **	275053 32355 **

* without mounted components on the axes.
** with switchgear cabinet and table

CNC machine
with servomotor 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 to machining **light metals, non-ferrous metals, plastics** and **wood** . Extensive range of accessories for all our CNC machines to order (see page E18 *et seq.*).

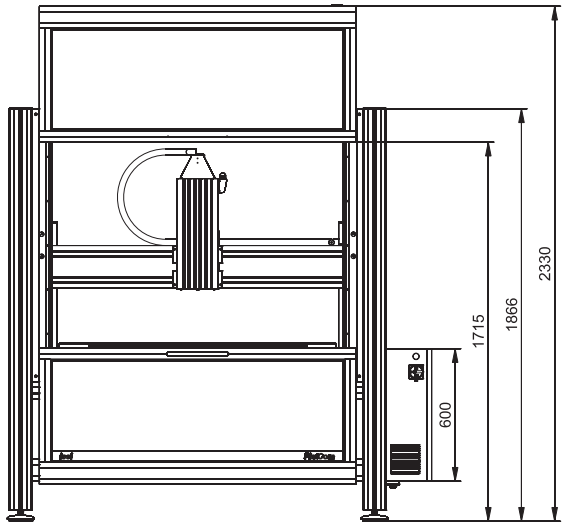
Options

- PC control console with 2 free PCI plug-ins (for use by external PCI hardware)
- Safety light curtain
- toothed belt drive
- Milling and engraving spindles
- SK11/SK20 automatic tool change stations
- Minimum amount lubrication or CoolMin cooling system
- Vacuum clamping benches
- Suction device
- 4. 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

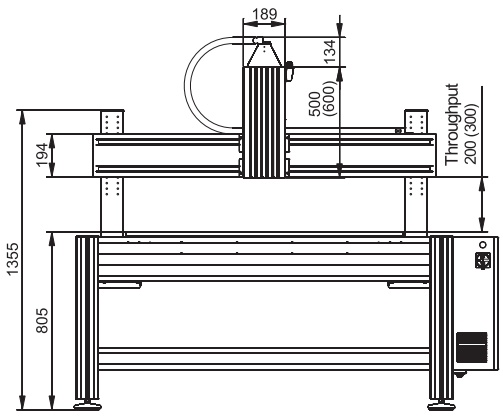
Setup

- Portal: mobile, bench: fixed

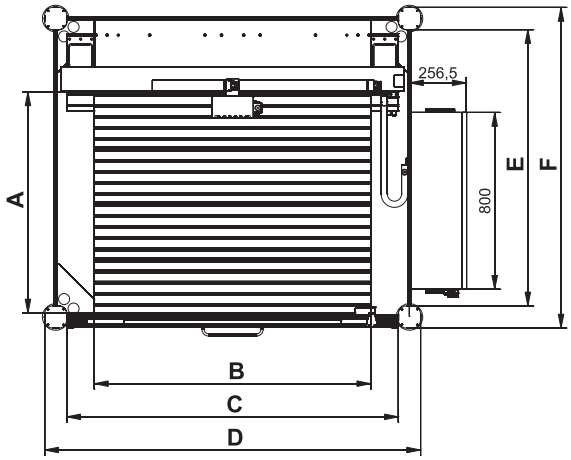
Dimensioned drawings/dimensions



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 servomotor drive

FlatCom® L series

FlatCom L without hood

Technical specification

	FlatCom® L150	FlatCom® L250	FlatCom® L300
Processing areas X/Y/Z [mm] *	1500/1700	2500/1700	1700/3000
Z lift [mm]	200 (optional 300, in each case without processing unit)		
Clamping table surface W × D [mm]	1750 × 2250	2750 × 2250	2250 × 3250
Z-Throughput [mm]	250 (optional 500, in each case without processing unit)		
Dimensions W × D × H [mm]	2216 × 2430 × 1600	3216 × 2430 × 1600	2430 × 3716× 1600
Processing speed X/Y/Z	appr. 250 mm/s		
Repeatable accuracy [mm]	± 0,02		
Drive motors	48 V servomotors		
Drive elements X/Y/Z	Recirculating ball drive, clearance free adjustable		
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 touchscreen, keyboard and mouse		
Weight [kg]	appr. 435	appr. 510	appr. 580
Software	Windows, WinRemote (optional: ProNC, isy 2.5 PLUS)		
Connection values	400 V, 16 A		
Part no.	**275062 34565** **	**275072 34565** **	**275082 34565** **

* without mounted components on the axes.
** without protective hood

CNC machine
with servomotor 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 to machining **light metals, non-ferrous metals, plastics** and **wood** . Extensive range of accessories for all our CNC machines to order (see page E18 *et seq.*).

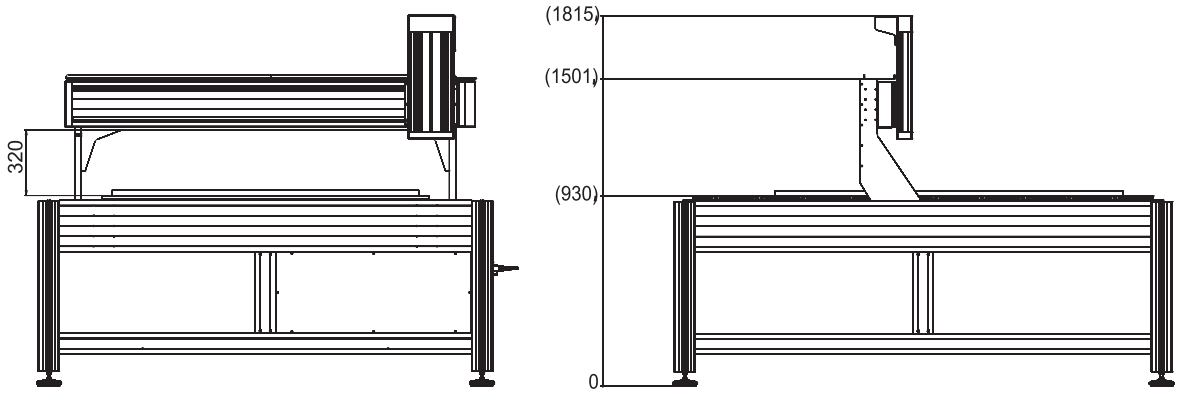
Options

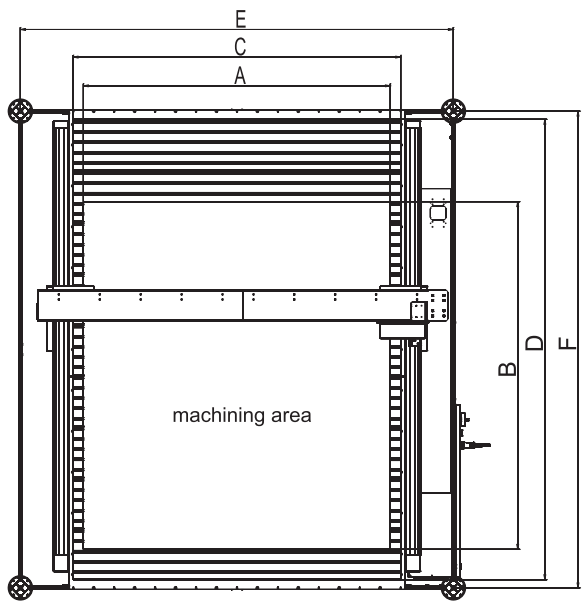
- PC control console with 2 free PCI plug-ins (for use by external PCI hardware)
- Safety light curtain
- toothed belt drive
- Milling and engraving spindles
- SK11/SK20 automatic tool change stations
- Minimum quantity lubrication or CoolMin cooling system
- Vacuum clamping benches
- Suction device
- 4. Axis e. g. RDH series installation
- Version without hood
- Maximum 6 interpolated axes + 6 handling axes
- Portal gap 300 mm
- Protective hood

Setup

- Portal: mobile, bench: fixed

Dimensioned drawings/dimensions





	A	B	C	D	E	F
FlatCom L 150	1500	1700	1750	2000	2116	2330
FlatCom L 250	2000	1700	1750	2000	2616	2330
FlatCom L 300	2000	3000	2050	3250	2616	2616

systems

CNC machine
with servomotor 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
Clamping table surface W×D [mm]	1125 x 1300	1125 x 1700	1500 x 1700	1500 x 2200	1500 x 3050
Z-Throughput [mm]	235 (optional 435, in each case without processing unit)				
Dimensions W × D × H [mm]	2084/1584/1890	2084/1984/1890	2459/1984/1890	2459/2484/1890	2459/3384/1890
Processing speed X/Y/Z	appr. 250				
Repeatable accuracy [mm]	± 0,02				
Drive motors	48V servomotors				
Drive elements X/Y/Z	Recirculating ball drive, clearance free adjustable				
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 touchscreen, keyboard and mouse				
Weight [kg]	appr. 550	appr. 600	appr. 700	appr. 800	appr. 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 servomotor 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 to machining **light metals, non-ferrous metals, plastics** and **wood** . Extensive range of accessories for all our CNC machines to order. (see page E18 *et seq.*)

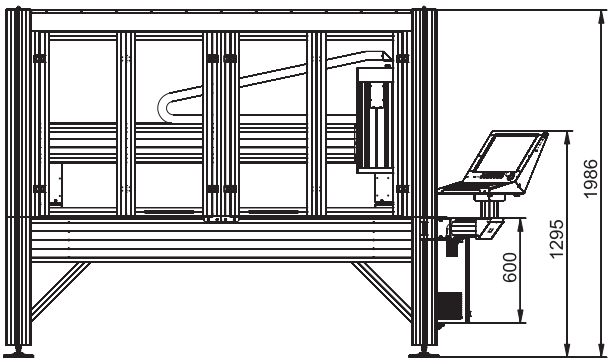
Options

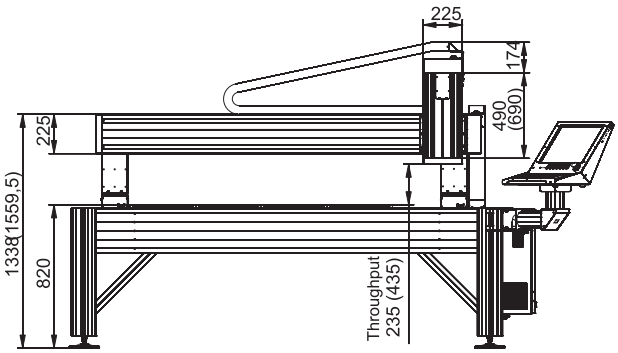
- PC control console with 2 free PCI plug-ins (for use by external PCI hardware)
- Safety light curtain
- toothed belt drive
- Milling and engraving spindles
- SK11/SK20 automatic tool change stations
- Minimum quantity lubrication or CoolMin cooling system
- Vacuum clamping benches
- Suction device
- 4. Axis e. g. RDH series installation
- Version without hood
- Maximum 6 interpolated axes + 6 handling axes
- Portal gap 300 mm
- closed hood attachment

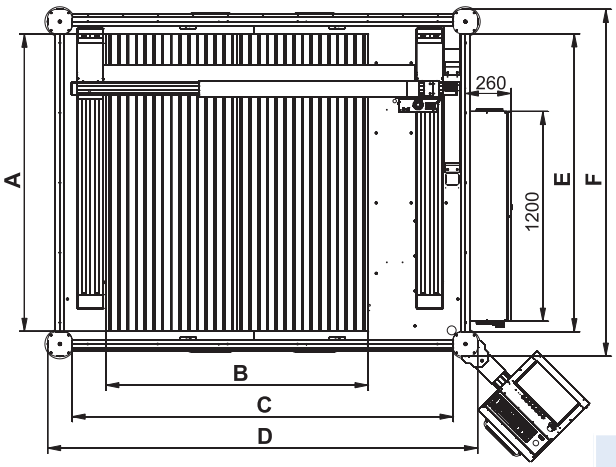
Setup

- Portal: mobile, 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

Flatbed and portal units

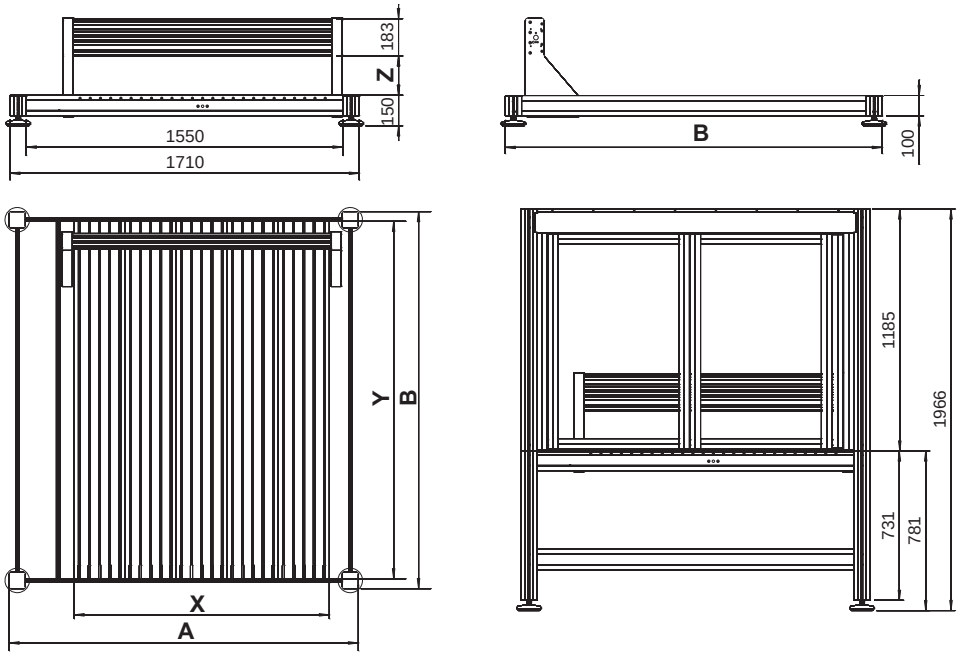
Flat bed unit with Z axis

Portal unit with Z axis

General note

Flatbed units as defined in the machine guideline are 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



Flatbed and portal units

X/Y flatbed units FB2

Part no.	Chassis A × B (mm)	Clamping surface X × Y (mm)	Process path (mm)	Z-Through-put (mm)
246203	1210 x 946	750 x 850	500 x 530	190
246203 2040	1210 x 1196	750 x 1100	750 x 530	
246203 2054	1210 x 1446	750 x 1350	1000 x 530	
246203 2067	1460 x 1446	1000 x 1350	850 x 780	
246203 2130	1710 x 1846	1250 x 1750	1250 x 1030	

All flatbed units are fitted with **16 × 4 mm recirculating ball drives** as standard

Z axes for flatbed units

Part no.	Lift (mm)	
230514	75	with 24V magnetic brake
230514 0400	160	with 24V magnetic brake

Sub-frames

Part no.	suitable for flatbed unit with clamping area:
248500 0027	850 x 750
248500 0040	1100 x 750
248500 0054	1350 x 750
248500 0067	1350 x 1000
248500 0130	1750 x 1250

Portal units PA2

Part no.	Part no. (without motor)	Process path (mm)	Ball screw drive (mm)	Lift (mm)
242 402	**242 409**	280 x 490	16 x 4	75
243 402	**243 409**	280 x 490	16 x 4	without Z axis

Software

Part no.	
Z11 - 333 500 Z13 - 337 030	ProNC software for CAN-CNC controllers isy-CAM 2.5 Plus (only available in combination with a unit)

Options

- matched controller (e.g.: iMC-S8)
- Software modules for operation in CAM, CNC, and PLC applications
- Sub-frame
- Enclosure
- Spindle motors (see E18 *et seq.*)

Enclosures

Part no.	suitable for flatbed unit with clamping area:
248200 0000	850 x 750
248200 2040	1100 x 750
248200 2054	1350 x 750
248200 2067	1350 x 1000
248200 2130	1750 x 1250

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, clamping rings, SK housings, tool changers and our unique, patented Coolmin system for optimum and economical tool cooling, without residues, round off our product portfolio.

iSA 500 with manual tool changer E 19

iSA 750 with manual tool changer E 20

iSA 1500 with manual tool changer E 21

iSA 900 with automatic tool changer E 22

iSA 2200 with automatic tool changer E 23

iSA 3600 with automatic tool changer E 24

Universal milling spindles UFM 500 /1050
Engraving spindles E 25

CoolMin tool cooling system E 26

SK 11/20/30 tool change station E 27

Frequency converter, length measuring button, vacuum cleaning, motor leads E 28

Overview of clamping rings and tool housings E 29

Technical specifications subject to change.

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

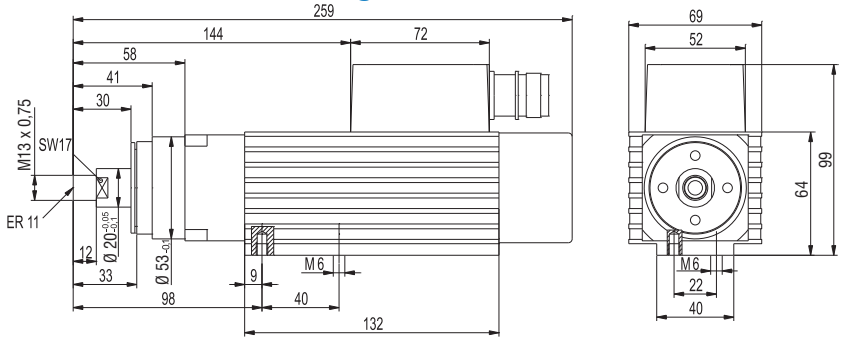
Features

- Robust 2-pole AC motor (asynchronous motor)
- Square shape, Protection class IP54, isolation class F
- Cast sign A side, aluminium cast B side
- Motor shaft to take ER 11 clamping rings
- 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 clamping ring, Ø 6 mm
- Clamping range Ø 1 mm – Ø 7 mm
- Intrinsic ventilation B-side
- Governed by frequency converter
- Spindle bearing: 2 bearings A-side
  1 bearing B-side
- optional:
  - CoolMin® (internal and external)
  - Frequency converter
  - various clamping rings, mounting plates, lead lengths
  - Suction device

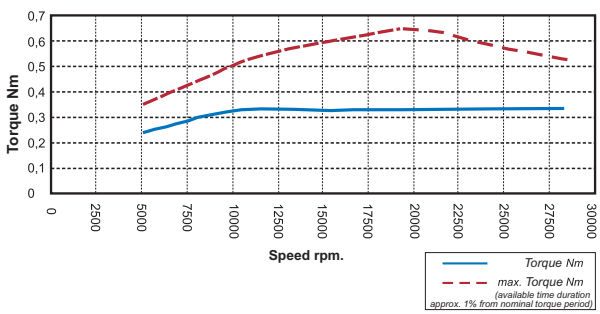
Technical specification

Description		iSA 500
Torque at nominal 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 (8m) and CoolMin®
Part no.: **310704 1631**

LES 5 mounting plate
Part no.: **277014**

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 **E28**
- M23 motor side leads see page **E28**
- Suction device for 38 mm hose see page **E28**
- Clamping ring set, ER11 type see page **E29**

Technical specifications subject to change.

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

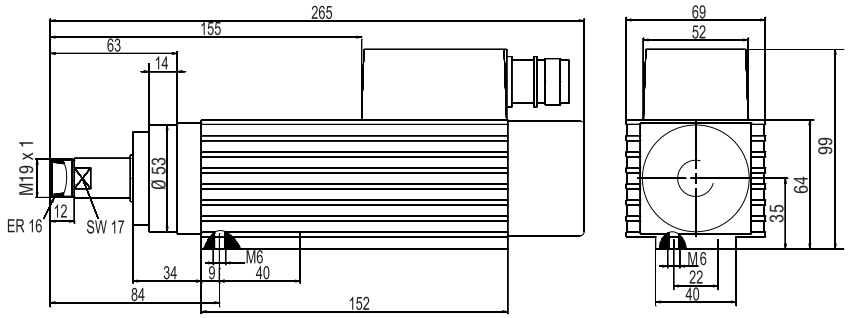
- Robust 2-pole AC motor (asynchronous motor)
- Square shape, Protection class IP54, isolation class F
- Steel sign A-side, Aluminium cast B-side
- Motor shaft to take ER 16 clamping rings
- Rated output 0.75 kW (S6-40% operation)
- Speed range 3,000 rpm. - 24,000 rpm.
- manual tool change
- M23 plug connection
- incl. ER16 clamping ring, Ø 6 mm
- Clamping range Ø 1mm – Ø 10 mm
- Intrinsic ventilation B-side
- Two precision bearings
- Speed control by frequency converter

- optional:
  - CoolMin® (internal and external)
  - Frequency converter
  - various clamping rings, mounting plates, lead lengths
  - Suction device

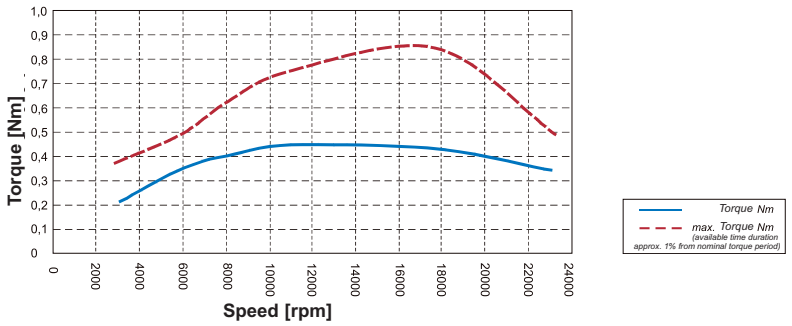
Technical specification

Description		iSA 750
Torque at rated speed 22.000 U/min.	[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 (8m)
Part no.: **310708 1611**

iSA 750 spindle motor with CoolMin®
Part no.: **477008 5124**

iSA 750 spindle motor with converter, lead (8m) and CoolMin®
Part no.: **310707 1631**

LES 5 mounting plate
Part no.: **277014**

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 **E28**
- M23 motor side leads see page **E28**
- Suction device for 38 mm hose see page **E28**
- Clamping ring set, ER16 type see page **E29**

Technical specifications subject to change.

Spindle motor
with manual tool changer

iSA 1500

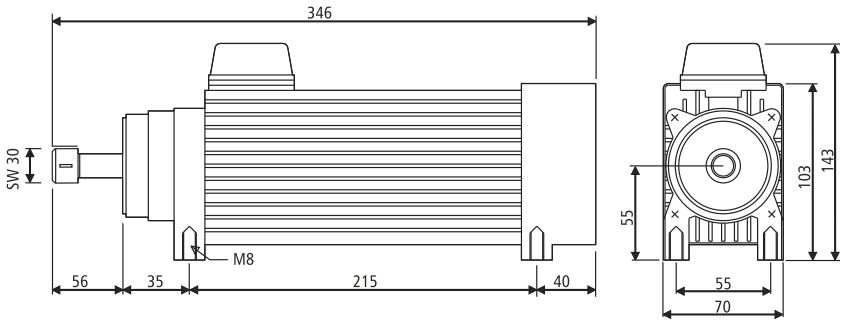
iSA 1500 with manual tool change

iSA 1500 with manual tool change and CoolMin tool cooling system

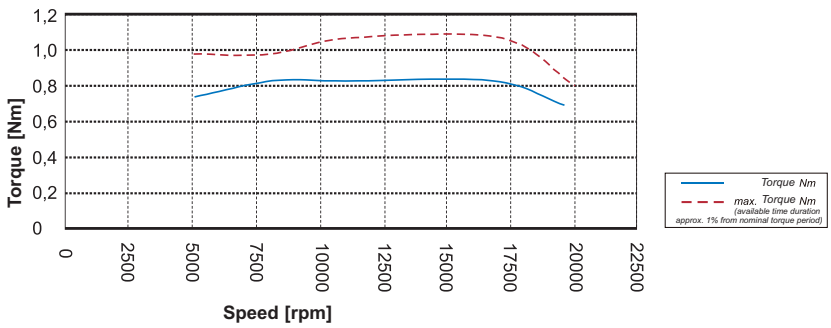
Technical specification

Description		iSA 1500
Torque at rated speed 20.000 U/min.	[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]	7.0
cos ϕ		0.85
S 6 = 40% rated output	[kW]	1,5
Concentricity	[mm]	0.01
Weight	[kg]	6.4

Dimensioned drawings



Torque curves



Technical specifications subject to change.

Features

- Robust 2-pole AC motor (asynchronous motor)
- Square shape, Protection class IP54, isolation class F
- Cast sign A and B side
- Motor shaft to take ER 20 clamping rings
- Rated output 1.5 kW (S6-40% operation)
- Speed range 5,000 rpm. - 20,000 rpm.
- manual tool change
- M23 plug connection
- incl. ER20 clamping ring, Ø 6 mm
- Clamping range Ø 2 mm – Ø 13 mm
- Intrinsic ventilation B-side
- Governed by frequency converter
- Spindle bearing: 2 bearings A-side
  1 bearing B-side

optional:
- CoolMin® (internal and external)
- Frequency converter
- various clamping rings,mounting plates, lead lengths
- Suction device
- 4-pole motor version to order

Ordering information

iSA 1500 spindle motor
Part no.: **477510 3120**

iSA 1500 spindle motor with converter
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 **E26**
- SKC 1500 frequency converter see page **E28**
- M23 motor side leads see page **E28**
- Suction device for 80mm hose see page **E28**
- Clamping ring set, ER20 type see page **E29**

systems

Spindle motor
with automatic tool changer

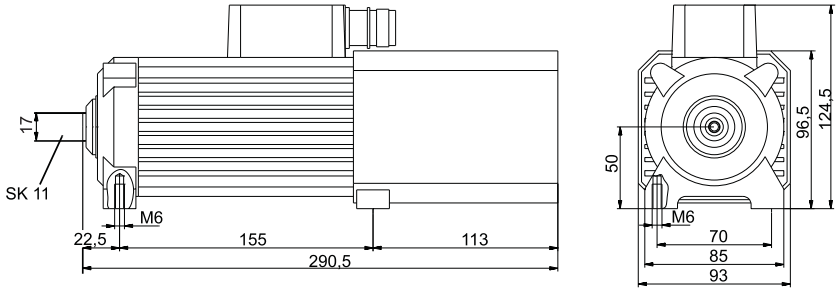
iSA 900

iSA 900 with automatic tool change

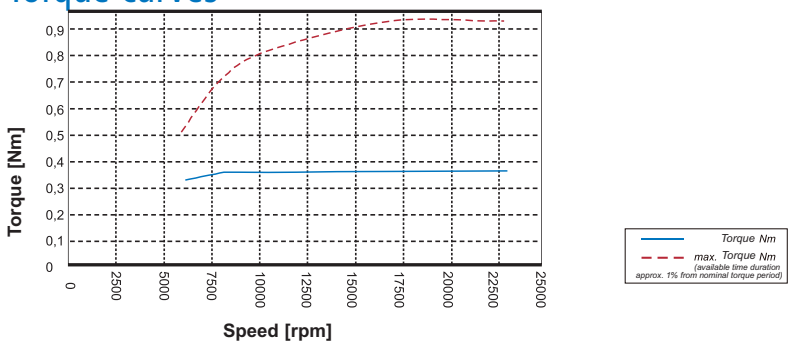
Technical specification

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



Features

- Robust 2-pole AC motor (asynchronous motor)
- Square shape, Protection class IP55, isolation class F
- Cast sign A and B side
- Rated output 0.9 kW (S6-40% operation)
- Speed range 6,000 rpm. - 24,000 rpm.
- Automatic tool change with SK 11 tool housing and ER 11 clamping ring, Ø 6 mm
- M23 plug connection
- Clamping range Ø 1 mm – Ø 7 mm
- separately driven fan B-side
- Governed by frequency converter
- Two precision bearings
- SK 11 tool changer pneumatic (7.5 bars)

- optional:
  - CoolMin® (external)
  - Frequency converter
  - Tool changing station
  - various clamping rings, mounting plates, lead lengths

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 mounting plate
Part no.: **277028 0003**

- CoolMin® external with hose see page **E26**
- 5× SK 11 tool change stations see page **E27**
- 8× SK 11 tool change stations see page **E27**
- SK 11 tool housing see page **E27**
- SKC 750 frequency converter see page **E28**
- M23 motor side leads see page **E28**
- Clamping ring set, ER11 type see page **E29**

Subject to technical changes.

Spindle motor
with automatic tool changer

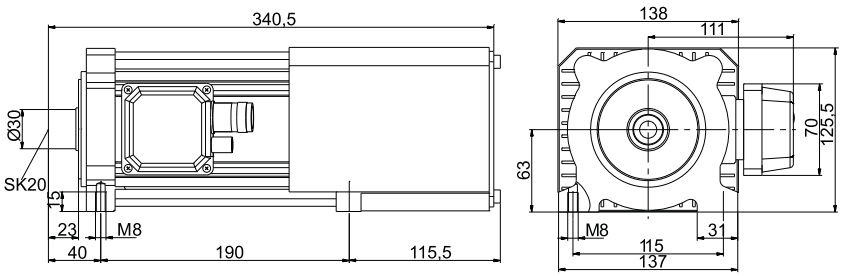
iSA 2200

iSA 2200 with automatic tool change

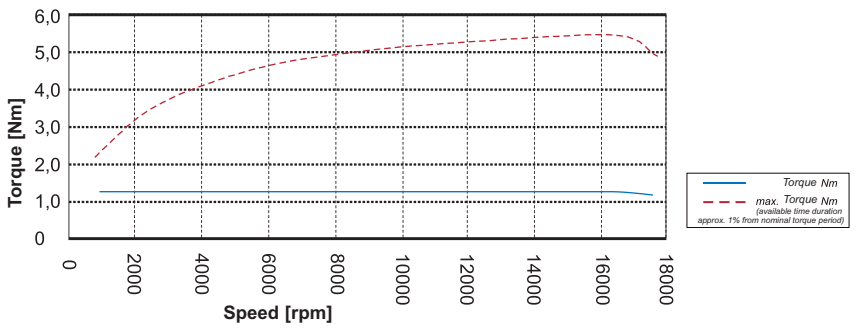
Technical specification

Description		iSA 2200
Torque at rated speed 18,000 rpm.	[Nm]	1.26
Speed	[rpm.]	5,000 to 20,000
Cut-off frequency	[Hz]	280
Number of poles		2
Rated voltage	[V]	230
Rated current	[A]	7.6
cos ϕ		0.84
S 6 = 40% rated output	[kW]	2.2
Concentricity	[mm]	0.01
Weight	[kg]	14.6

Dimensioned drawings



Torque curves



Technical specifications subject to change.

Features

- Robust 2-pole AC motor (asynchronous motor)
- Square shape, Protection class IP54, isolation class F
- Cast sign A and B side
- Motor shaft to take ER 20 clamping rings
- Rated output 2.2 kW (S6-40% operation)
- Speed range 5,000 rpm. - 20,000 rpm.
- Automatic tool change with SK 20 tool housing and ER16 clamping ring, Ø 6 mm
- M23 plug connection
- Clamping range Ø2 mm – Ø 13 mm
- SK 20 tool changer pneumatic (7.5 bars)
- separately driven fan B-side
- Governed by frequency converter
- Two precision bearings
- optional:
  - CoolMin® (external)
  - Frequency converter
  - Tool changing stations
  - various clamping rings
  - Suction device
  - 4-pole motor version to order

Ordering information

iSA 2200 spindle motor
Part no.: **477022 3320**

iSA 2200 spindle motor with converter and lead (8m)
Part no.: **310722 3621**

LES 5 mounting plate
Part no.: **277028 0005**

EuroMod/FlatCom mounting plate
Part no.: **277028 0004**

- CoolMin® external with hose see page **E26**
- 4× SK 20 tool change stations see page **E27**
- 5× SK 20 tool change stations see page **E27**
- SK 20 tool housing see page **E27**
- SKC 4000 frequency converter see page **E28**
- M23 motor side leads see page **E28**
- Clamping ring set, ER20 type see page **E29**

systems

Spindle motor
with automatic tool changer

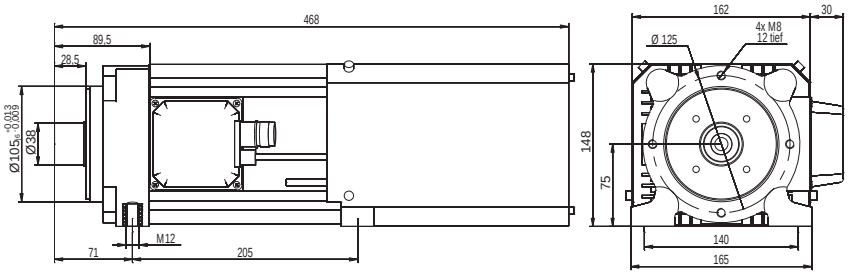
iSA 3600

iSA 3600 with automatic tool change

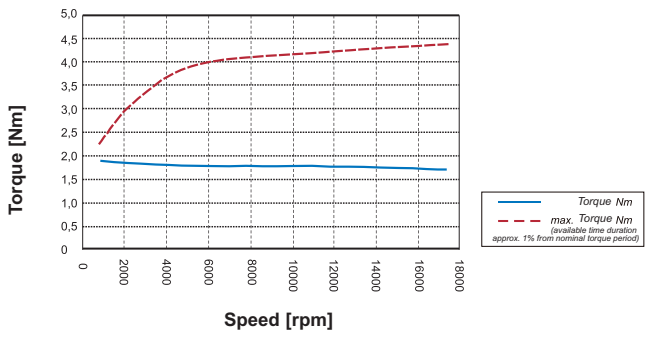
Technical specification

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 × 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

Dimensioned drawings



Torque curves



Features

- Robust 2-pole AC motor (asynchronous motor)
- Square shape. Protection class IP54 Isolation class F
- Steel sign A side, Cast sign B side
- Motor shaft to take ER 32 clamping rings
- Rated output 3.6 kW (S6-40% operation)
- Speed range 6,000 rpm. - 18,000 rpm.
- Automatic tool change with SK 30 tool housing and ER 32 clamping ring, Ø 6 mm
- Clamping range Ø3 mm – Ø 20 mm
- Intrinsic ventilation B-side
- Two precision bearings
- Speed control by frequency converter
- optional:
  - CoolMin® (external)
  - Frequency converter
  - Tool changing station
  - various clamping rings mounting plates and lead lengths

Ordering information

iSA 3600 spindle motor
Part no.: **477822 3600**

iSA 3600 spindle motor with converter and lead (8m)
Part no.: **310736 3615**

LES 5 mounting plates
Part no.: **277028 0009**

- CoolMin® external with hose see page **E26**
- 4× SK 30 tool change stations see page **E27**
- 5× SK 30 tool change stations see page **E27**
- SK 30 tool housing see page **E27**
- SKC 4000 frequency converter see page **E28**
- M23 motor side leads see page **E28**
- Clamping ring set, type ER 32 see page **E29**

Technical specifications subject to change.

Universal milling spindles UFM 500 /1050.

Engraving spindle

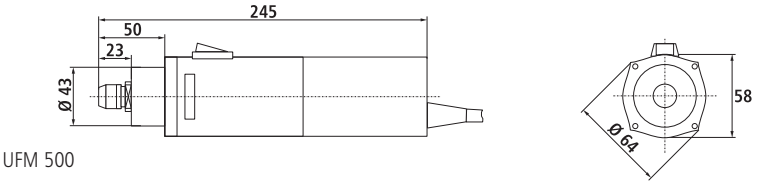
Uni milling motors

UFM 1050 UFM 500

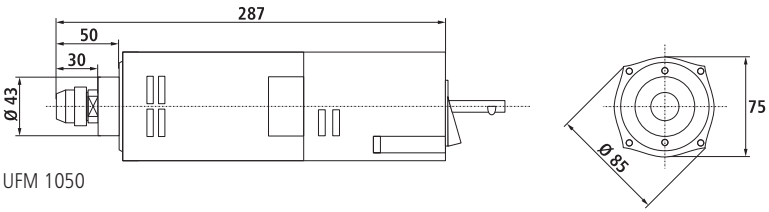
Technical specification

	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**	21.000	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

Engraving spindle with mech. height compensation

Engraving spindle
42V, 150 W, 60,000 rpm.
sealing air cooling
Suction preparation

including holder, corresponding frequency converter, mechanical height compensation and clamping ring Ø 3mm

Part no. **310802 1300**

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 rpm to 25,000 rpm
- Torque 0.14 Nm (at 22,600/21,000 rpm)
- Rated voltage 230V
- collar
- Clamping range Ø 1 mm – Ø 6.35/8 mm
- Speed control
- Stable double ball bearing
- Weight: 1.9/2.1 kg

UFM 500
- Rated input **500 W**
- Power output **345 W**
- Torque **0,14 Nm**

UFM 1050
- Rated input **1050 W**
- Power output **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**

Clamping rings

Clamping ring 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**

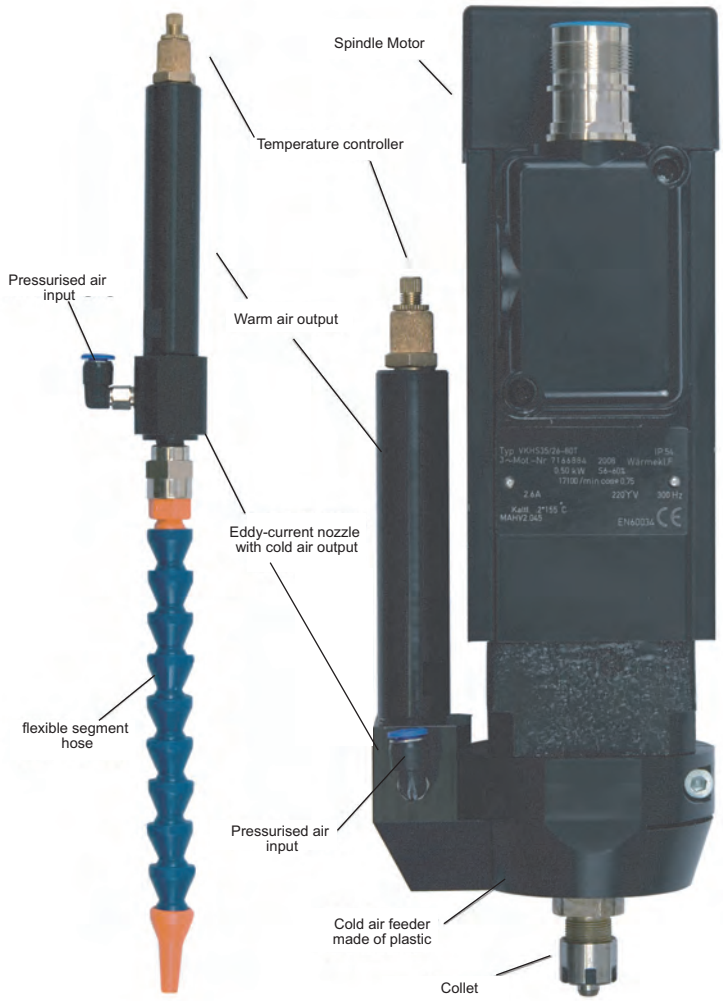
Technical specifications subject to change.

systems

Tool cooling system

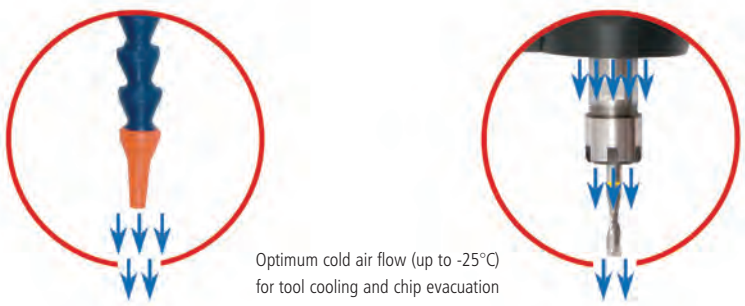
CoolMin

Functional principle



CoolMin external
with hose
Part no.: **239011 0119**

CoolMin internal



Optimum cold air flow (up to -25°C)
for tool cooling and chip evacuation

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 spray cooling with minimal amounts leads to unwanted side effects such as dirt building up, sticking of chips to the tool or to the surface and, depending on the material also an attack on its structure.
With the aforementioned patented cooling methods providing very good tool and surface cooling, the side effects are negligible.
The chips are dry and, according to the material, can be vacuumed or blown off easily.
The surface is protected and the direct tool cooling (also suitable for tools with internal cooling) achieves very long working lives for the tools.
The cooling method is based on a jet of cold air, which works on the eddy current principle and divides the flow into warm and cold air.
To operate the system, all that is required is compressed air (6 to 10 bars).

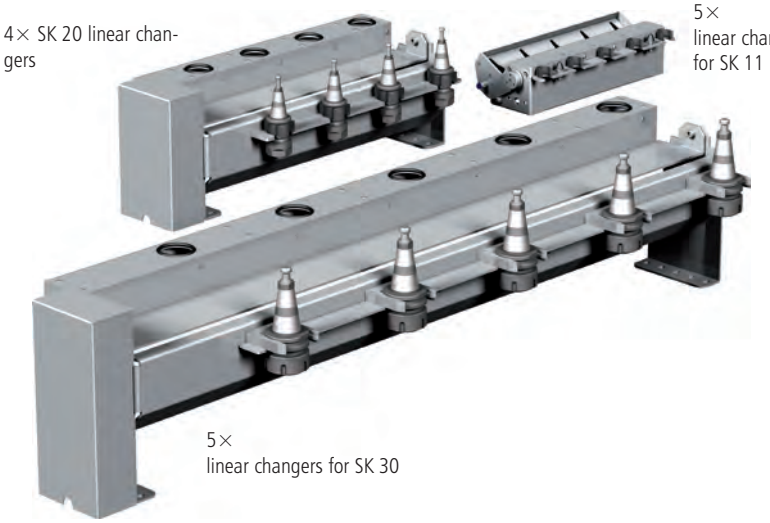
Technical specification:

- Compressed air feed: 6-10 bars
- Cooling air output up to a max. -25°C
- Hot air exhaust: up to a max. 70°C
- Air consumption approx. 150 l/min
- special servicing unit with 1μm filter
- No maintenance cold air jet

Technical specifications subject to change.

Change stations

SK 11/20/30

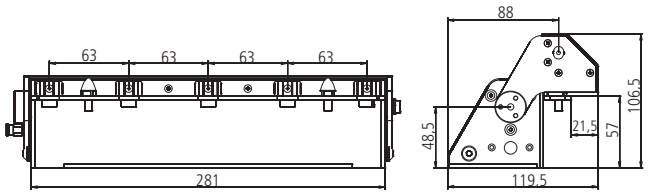


Features

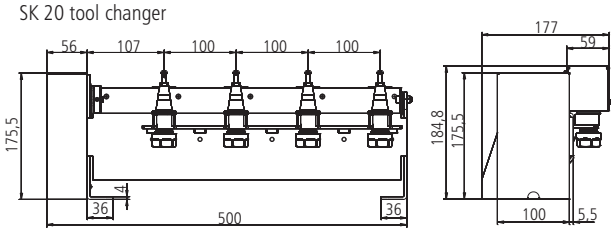
- Simple, functional tool changer for SK11, SK20 and SK30
- Pneumatic rotary cylinder and end position monitoring for safe changing
- Control via 5/2-way valve with integration in the safety circuit
- Low-maintenance stainless steel design (powder-coated aluminium)
- Variable positioning on the machine bench

Dimensioned drawings

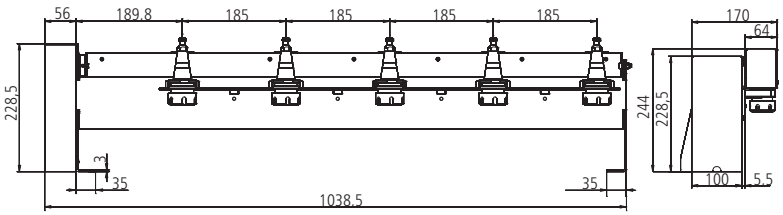
SK 11 tool changer



SK 20 tool changer



SK 30 tool changer



Ordering information

SK 11 tool change station
for iSA 900

5×, without hood
Part no.: **239011 0054**

8×, without hood
Part no.: **239011 0084**

5×, without hood + pneumatics
Part no.: **239011 0053**

8×, with hood + pneumatics
Part no.: **239011 0083**

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)

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 11 for clamping rings, type ER 11
Part no.: **239111 0001**

SK 20 for clamping rings, type ER 20
Part no.: **239172 0020**

SK 30 for clamping rings, type ER 32
Part no.: **239130**

Technical specifications subject to change.

Frequency converter, motor leads and vacuum cleaning system

Frequency converter

SKC 750 frequency converter, suitable for iSA 500, iSA 750 + iSA 900
Part no.: **311707 6000**

SKC 1500 frequency converter, suitable for iSA 1500
Part no.: **311715 6000**

SKC 4000 frequency converter, suitable for iSA 2200 + iSA 3600
Part no.: **311740 6500**

- Compact, pulse width modulated equipment in three output classes
- Input voltage, 230V AC, single phase (SKC 750/1500) or 400V AC, three phase (SKC 4000)
- Three phase, vector controlled control voltage. Frequency.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: PLC; 0...10 V; 0...20 mA; with control unit; CAN bus (extra mocule required)
- Approvals: CE; C-Tick; UL

Length measurement button and motor leads

Length measuring button for measuring tool lengths
Part no.: **239099 0001**

- 8-wire
  3 × 0.75 mm² + 1 × PE + 2 × (2 × 0.34 mm²)
- drag chain compatible
- Outer screening and separately screened in pairs
- pre-fabricated

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 system

... for iSA 500 + iSA 750 spindles
- prepared for hose 38 mm
- manual opening

Part no.: **239012 0000**

... for iSA 1500 spindle
- prepared for hose 80 mm
- manual opening

Part no.: **239012 0001**

... for iSA 2200 spindle
- prepared for hose 80 mm
- Öffnung automatisch

Art.-Nr.: **239012 0002**

Technical specifications subject to change.

Overview of clamping rings and tool housings

Tool housings

SK 11 SK 20 SK 30

SK 11 for clamping rings, type ER 11
Part no.: **239111 0001**

SK 20 for clamping rings, type ER 20
Part no.: **239172 0020**

SK 30 for clamping rings, type ER 32
Part no.: **239130**

The following clamping rings are also able to clamp shafts exactly that are reduced in diameter by 1.0 mm:

Clamping rings 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**

Clamping ring set

for spindle motor	Type	Ø (mm)	Part no.
iSA 500 / iSA 900	ER 11	1.0 - 7.0	**239170 0001**

ER 11

ER 16

ER 20

The following clamping rings are also able to clamp shafts exactly that are reduced in diameter by 0.5 mm:

Clamping rings 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**

Clamping rings 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**

Clamping rings 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**

Clamping 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**

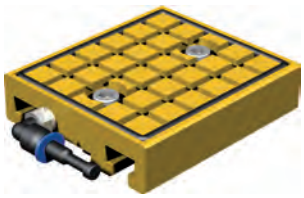
Technical specifications subject to change.

systems

Vacuum clamping plates

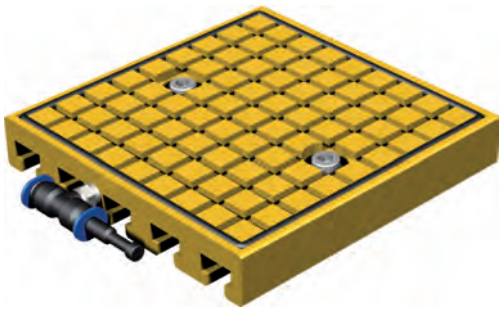
VakuFit®

VakuFit - S
L 75 × W 41.5 × H 20 mm
Part no.: 216601 0015



VakuFit - S
L 75 × W 85 × H 20 mm
Part no.: 216601 0016

VakuFit - S
L 125 × W 75 × H 20 mm
Part no.: 216601 0011



VakuFit - S
L 125 × W 125 × H 20 mm
Part no.: 216601 0012

VakuFit - S

Vacuum clamping plates made from naturally anodised aluminium allow a flexible clamping system on any T-key plate. Sealing is provided by a foamed 4 mm sealing cord, which can be laid freely according to the keyway raster. The hose connections to the suction line are designed for 6 mm hoses.

Depending on the material properties of the workpiece for clamping, up to 6 suction lines (e.g. 125 × 75) are connected to a pneumatic vacuum pump. This achieves up to an 80% vacuum with compressed air at 5.5 bar.
The system is suited for small clamping tasks up to clamping large size plates or components.

Option:
- Clamping plates gold anodised

Pneumatic vacuum pump including vacuum meter.

Pressure reducer, servicing unit with filter, hose, vacuum filter

Part no.: 216600 0009

Pneumatic vacuum pump with energy saving system including vacuum meter.

Pressure reducer, servicing unit with filter, hose, vacuum filter

Part no.: 216600 0008

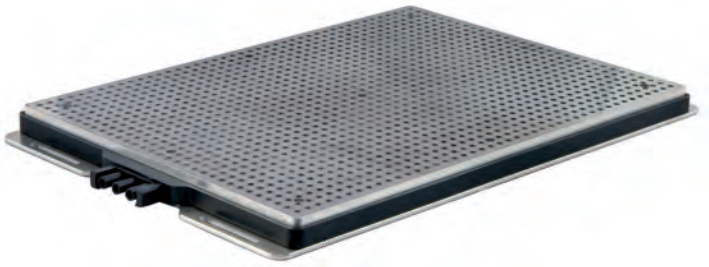
Technical specifications subject to change.

Vacuum clamping plates

VakuFit®

Sample diagram

Multiple connection for high volume flow and optimum vacuum distribution



All vacuum plates can be arranged next to each other over a large area.

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 slide valve pump (6.0 m³/h) for DIN A4 and A5
216601 0030	Rotary slide valve pump (10.0 m³/h) for DIN A2 and A3

216600 0027	Servicing kit for rotary slide valve pump 6.0 m³/h
216600 0028	Servicing kit for rotary slide valve pump 10.0 m³/h

VakuFit - L

The hole raster plates for vacuum clamping have little need for a vacuum pump. The plates are almost free from distortion and therefore well suited for engraving work and clamping plate material.

Unlike other vacuum clamping alternatives, materialmilling tasks up to a certain proportion of the total surface area are no problem and components remain securely clamped. Material end stops can be produced simply with 5 mm alignment pins in the hole raster borings. The hole raster rubber mats act as padding and can be used several times.
As well as our standard plates, we also meet individual orders for special tasks, up to complete packages.

Note

The holding force is proportional to the covered area, the coefficient of friction and the pressure difference.
To increase the coefficient of friction, a hole rubber mat is included in the deliverables.

Deliverables

- 1 × connection adapter
- 1 × 68 mm open jaw wrench
- 1 × hole rubber mat
- 1 × rubber mat to cover exposed holes
- 3 × connection hoses
- Operating instructions

Technical specifications subject to change.

Introduction

A division within isel Germany AG, **isel Robotik** presents a cross-section of its product portfolio of automation components from **robots, prealigners, linear units, end effectors** and accessories for the **semi-conductor industry**, made in Germany.

The company's Robotics Division has been operating for more than 8 years in the semiconductor sector. Sales began in 2005 with only a few types of robots and prealigners. Current components for the semiconductor industry cover all OEM customer needs in the semi-conductor sector. Since 2005, **over 500 robot systems have entered field service successfully**. In this connection, our customers mention the **long working life** of individual products as a plus. Our all-in-one designs allow handling of wafers and masks in a class 1 clean room environment.

For these processes, in addition to clean room capability, **high precision** and reliability are paramount. Because these requirements affect the entire production process in the chip industry, stringent specifications also apply for the handling components. The handling components are a shining example of why isel Germany AG has a reputation in the market place: for very high quality, short lead times, best service and a very good price/performance ratio.

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Overview

Wafer handling robots **IWH F-1**
with 2-link arm — E 34

Wafer handling robots **IWH F-1**
with 2-link arm in heavy duty design — E 35

Wafer handling robots **IWH F-1**
Heavy duty design with 3-link arm — E 36

Wafer handling robots **IWH F-2**
with 2-link arm and heavy duty housing — E 37

Wafer handling robots **IWH F-2**
with 2-link arm and housing in heavy duty design — E 38

Wafer handling robots **IWH F-2**
with 3-link arm and housing in heavy duty design — E 39

Wafer handling robots **IWH F-3**
with dual arm — E 40

Vacuum robots **IWH F-5**
with dual arm — E 41

Vacuum elevator
Linear Track — E 42

End effectors — E 43

Prealigners — E 44

Controller & accessories — E 45

systems

Wafer handling robots
with 2-link arm

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

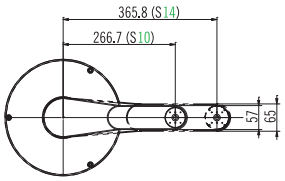
Technical specification

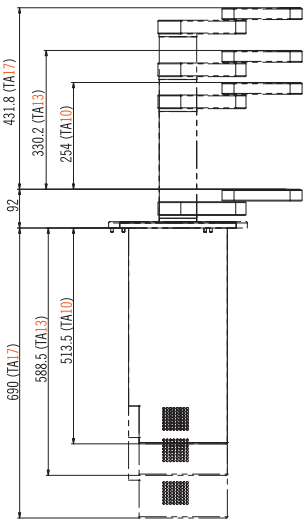
Description		IWH F-1
Repeatability	T	±0.02°
	R	±0.03 mm
	Z	±0.03 mm
Work area	Z	10", 13", 17"
	radial	10", 14"
	theta	450°
Payload on a joint		0.75 kg
Max. speed	T	360°/s
	R	1,000 mm/s
	Z	450 mm/s
Mains voltage		110 / 230 V AC
Control interface		RS-232 [DB9], option: Ethernet [RJ-45]
Interface for peripherals		RS-485 [RJ-45], RJ-11

Dimensioned drawings

IWH TA__S__F-1

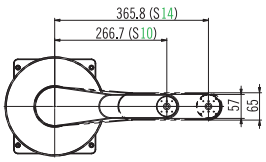
Possible configurations	
IWH TA10S10 F-1	IWH TA10S14 F-1
IWH TA13S10 F-1	IWH TA13S14 F-1
IWH TA17S10 F-1	IWH TA17S14 F-1

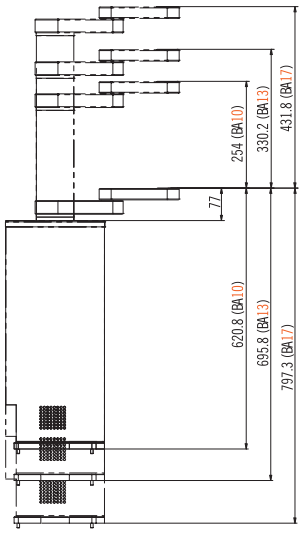




IWH BA__S__F-1

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 robots
with 2-link arm in heavy duty design

IWH F-1

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

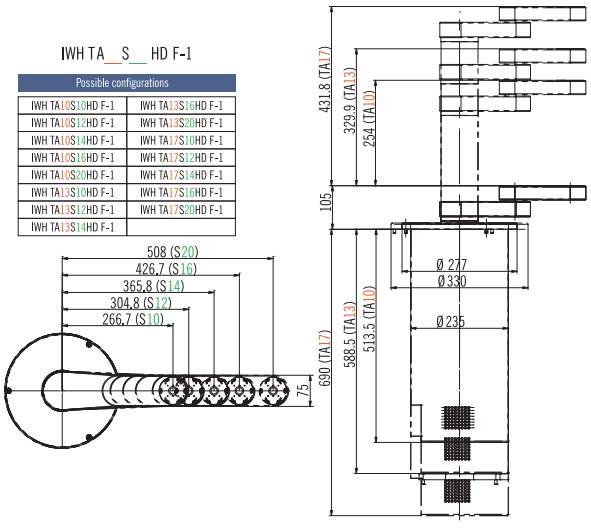
Technical specification

Description		IWH F-1
Repeatability	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°
Payload on a joint		2.75 kg
Max. speed	T	360°/s
	R	1,000 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

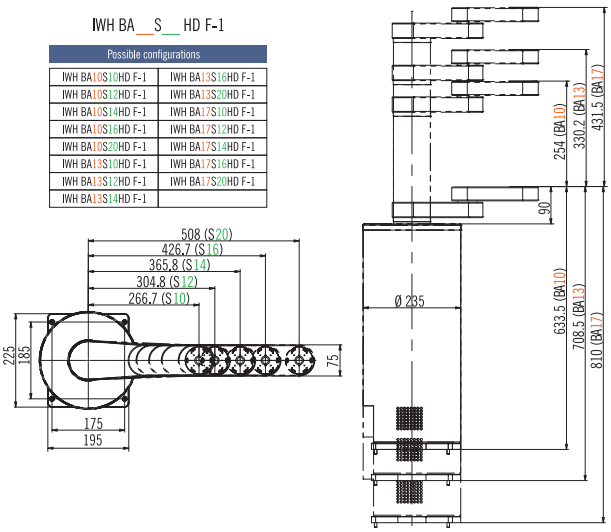
IWH TA__S__ HD F-1

Possible configurations	
IWH TA10S10HD F-1	IWH TA13S16HD F-1
IWH TA10S12HD F-1	IWH TA13S20HD F-1
IWH TA10S14HD F-1	IWH TA17S10HD F-1
IWH TA10S16HD F-1	IWH TA17S12HD F-1
IWH TA10S20HD F-1	IWH TA17S14HD F-1
IWH TA13S10HD F-1	IWH TA17S16HD F-1
IWH TA13S12HD F-1	IWH TA17S20HD F-1
IWH TA13S14HD F-1	



IWH BA__S__ HD F-1

Possible configurations	
IWH BA10S10HD F-1	IWH BA13S16HD F-1
IWH BA10S12HD F-1	IWH BA13S20HD F-1
IWH BA10S14HD F-1	IWH BA17S10HD F-1
IWH BA10S16HD F-1	IWH BA17S12HD F-1
IWH BA10S20HD F-1	IWH BA17S14HD F-1
IWH BA13S10HD F-1	IWH BA17S16HD F-1
IWH BA13S12HD F-1	IWH BA17S20HD F-1
IWH BA13S14HD F-1	



Wafer handling robots
Heavy duty design with 3-link arm

IWH F-1

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

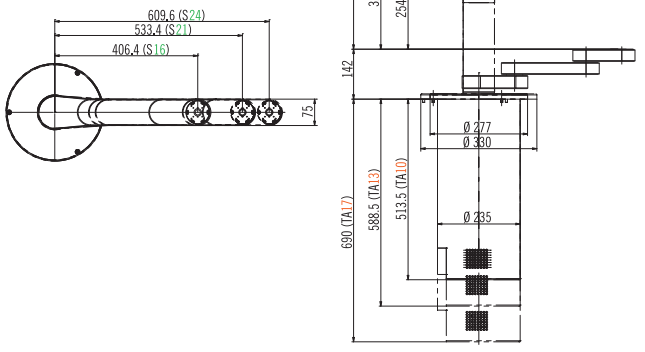
Technical specification

Description		IWH F-1
Repeatability	T	±0.02°
	R	±0.03 mm
	Z	±0.03 mm
Work area	Z	10", 13", 17"
	radial	16", 21", 24"
	theta	450°
Payload on a joint		2.75 kg
Max. speed	T	360°/s
	R	1,000 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

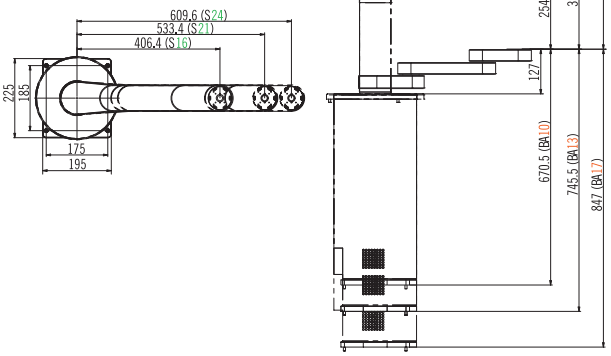
IWH TA__S__F-1

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 robots
with 2-link arm and heavy duty housing

IWH F-2

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

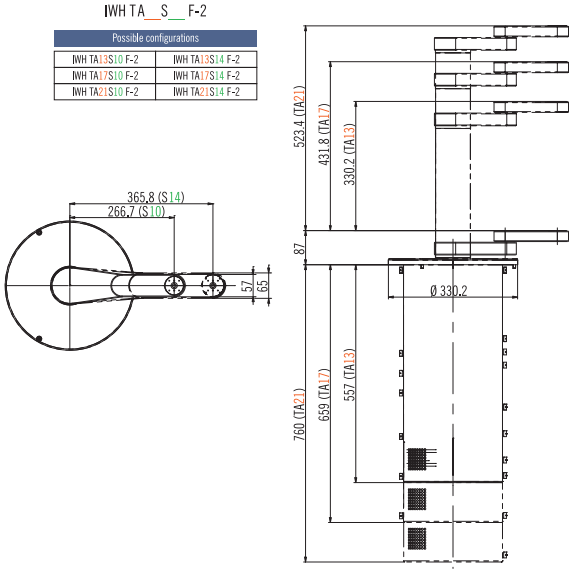
Technical specification

Description		IWH F-2
Repeatability	T	±0.02°
	R	±0.03 mm
	Z	±0.03 mm
Work area	Z	13", 17", 21"
	radial	10", 14"
	theta	450°
Payload on a joint		0.75 kg
Max. speed	T	360°/s
	R	1,000 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

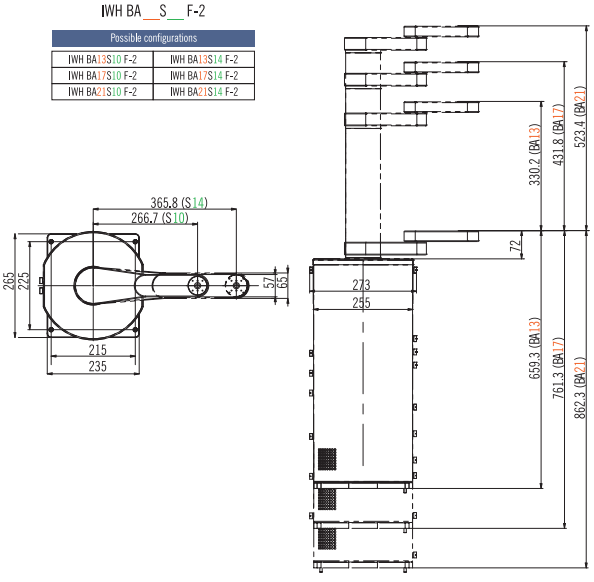
IWH TA__S__F-2

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 robots
with 2-link arm and housing in heavy duty design

IWH F-2

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

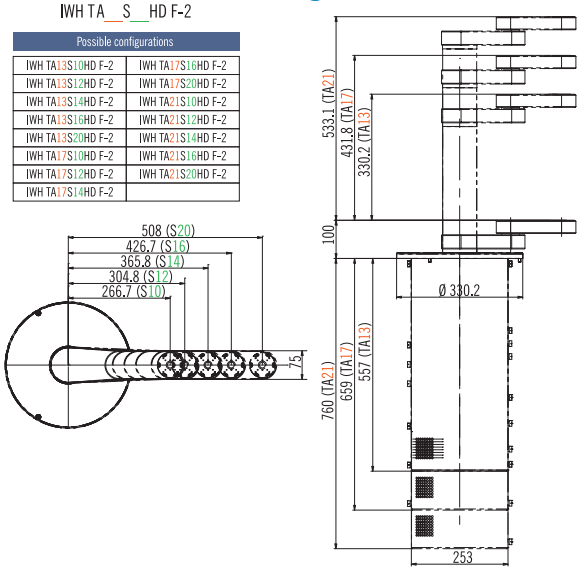
Technical specification

Description		IWH F-2
Repeatability	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	1,000 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

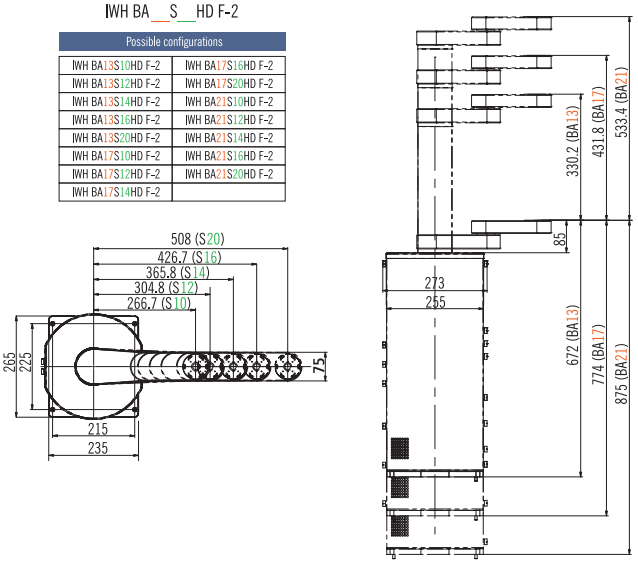
IWH TA__S__HD F-2

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 robots
with 3-link arm and housing in heavy duty design

IWH F-2

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

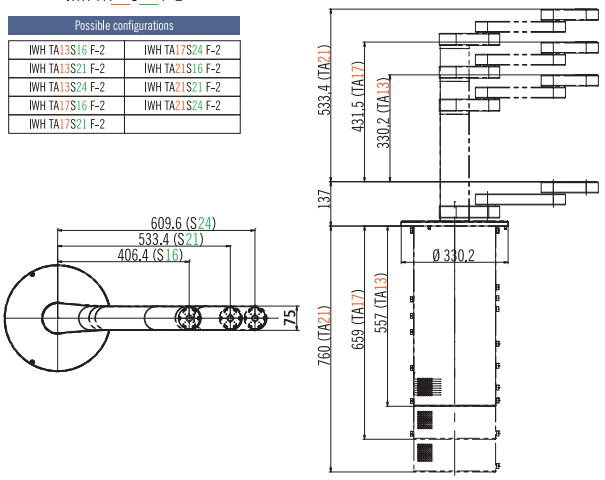
Technical specification

Description		IWH F-2
Repeatability	T	±0.02°
	R	±0.03 mm
	Z	±0.03 mm
Work area	Z	13", 17", 21"
	radial	16", 21", 24"
	theta	450°
Payload on a joint		2.75 kg
Max. speed	T	360°/s
	R	1,000 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

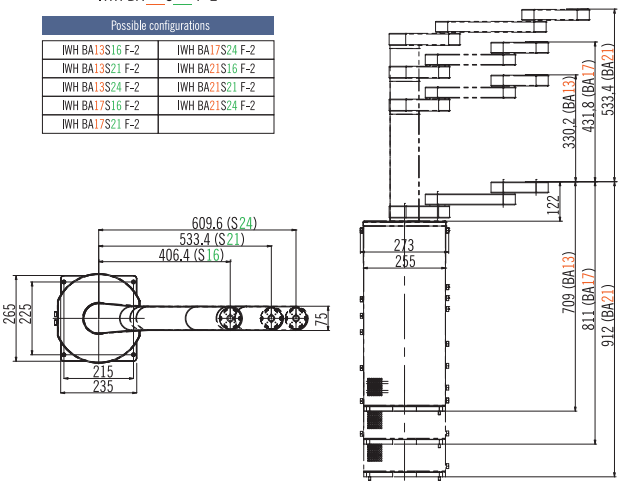
IWH TA__S__F-2

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	



systems

Wafer handling robots
with dual arm

IWH F-3

Figure:
IWH F-3

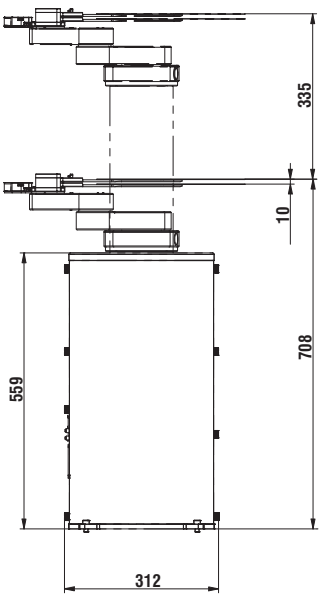
Features

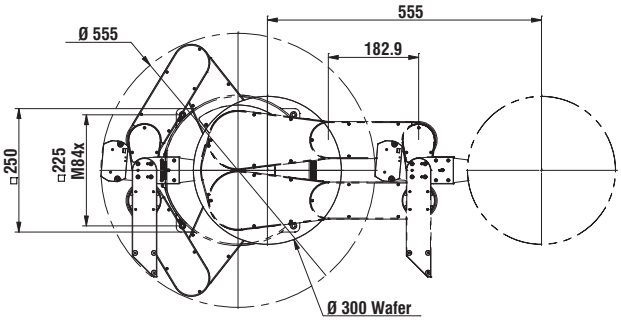
- excellent structural rigidity
- Handling wafers up to 300 mm
- extremely high reliability and accuracy
- simple connection of a linear track to the robot controller
- Real time motion control
- very quiet in operation
- brushless, no maintenance servo motors with low moment of inertia
- no-play harmonic 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
Repeatability	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°
Payload on a joint		max. 1.25 kg/arm
Max. speed	T	360°/s
	R	1,100 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 vacuum robots IWH F-5

with dual arm

Diagram:
IWH F-5

Features

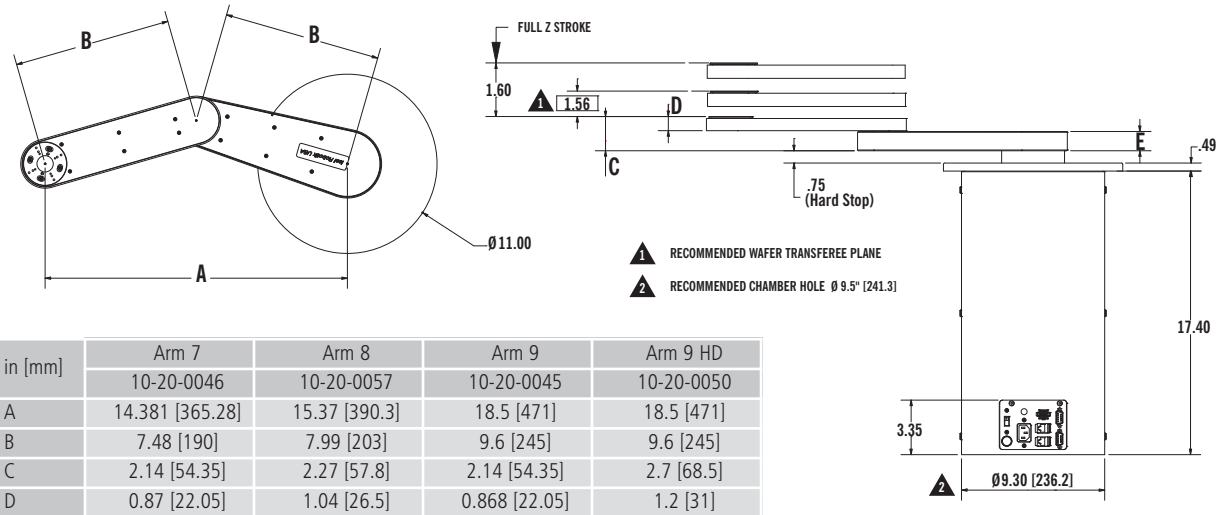
- Control area & installation configuration to industry standard
- Handling wafers up to 300 mm
- high precision, user-configurable 14", 16" and 18" arms
- extremely high reliability and precision
- Ferrofluid vacuum seal
- Vacuum < 5×10 Torr
- Real time motion control
- very quiet in operation
- brushless, 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
Repeatability	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°
Payload on a joint		1.0 to 2.2 kg
Leakage		<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

Diagram:
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

Diagram:
Linear track with
isel IWH-BA series wafer handling robot installed above

Technical specification

Description		
Repeatability	K	±0.02 mm
Standard spindles work area	K	21", 42", 62"
Payload		for all isel robots
Max. speed	K	1.200 mm/s
Max. acceleration	K	1.500 mm/s²
Power supply		110 / 230 V AC
Control interface		RS-232 [DB9], Option: Ethernet [RJ-45]

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.

Features

- High speed and dynamic response
- Lengths freely definable according to use
- Installation at the side or from below
- Very good structural rigidity
- Extremely high reliability and precision
- Simple connection to the robot controller
- Drive by linear or spindle motor
- Made in Germany

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

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 endeffectors 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

Wafer Mapping

0 = No wafer mapping sensor
4 = Thru beam sensor horseshoe
7 = Holder for wafer mapping sensor
10 = Exclusion zone vacuum

Option

0000 = Standard
0002 = Flip module
0003 = Vakuum-Auswertereinheit
9xxx = kundenspezifisch

Prealigners

LPA series

isel triple axis prealigner
IPA series with
side connection field
and PEEK pin/chuck

isel single axis prealigner
IPA series with
back connection field

General

The LPA series of prealigners 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 prealigner

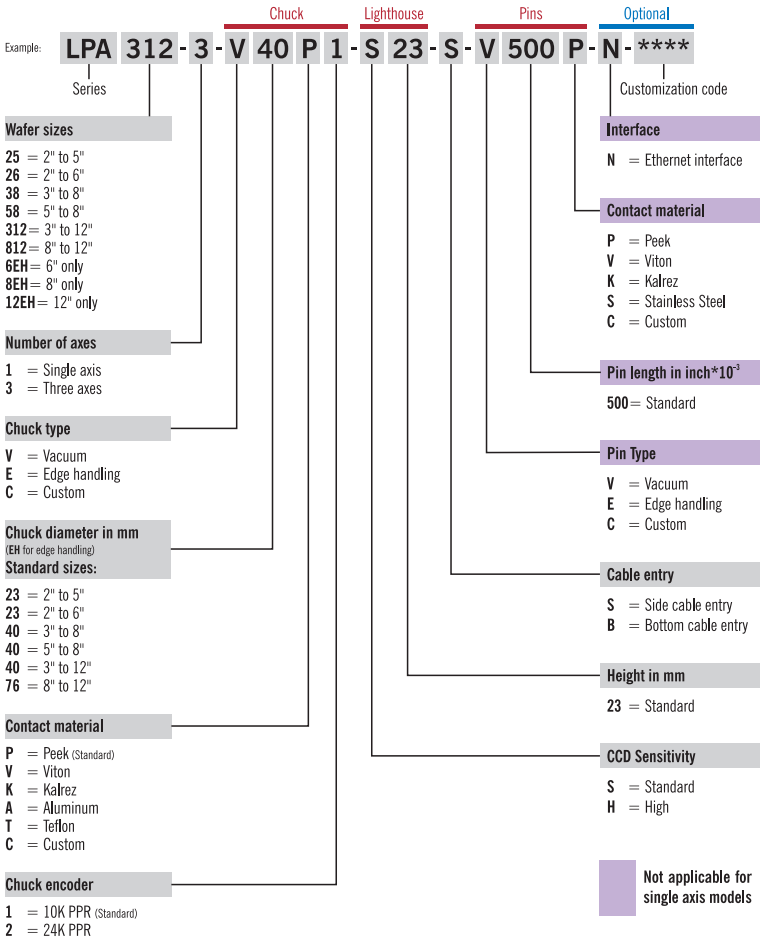
- innovative all-in-one design
- Alignment times < 3.5 seconds
- repeatability:
  linear ± 0.025 mm,
  circular ± 0.05°
- contactless measurement using LED and CCD sensor
- integrated scanning electronics
- standalone capability
- Chuck or pin load and change to another wafer size without rebuild
- transparent, 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



Controller and accessories

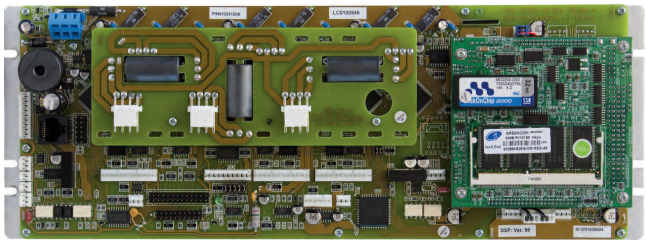


Figure: internal controller

Features
IRC 331 internal controller

- 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:
external controller

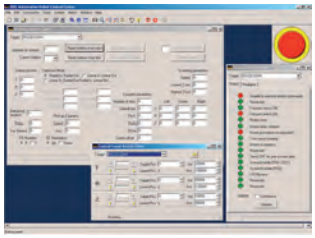


Figure: RCC software

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

Diagram: Flip module

Diagram: IHT hand terminal

Diagram: IMS-EX43(73)QS

Diagram: IMS-MDW1

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

IMS wafer mapping sensors

- Light source laser or LED
- Measurement distance 38/56 mm (1,5"/2,2")
- Sensor flexibly configurable

Space for your notes

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Transmission shaft C76
Transport loads (rotation units) C123
Two-phase step motors B4, B5

U

Uni-drill mill motors UFM 500/UFM 1050 E30
Universal profiles C10

V

Vacuum clamping plates E30-E31
Vacuum cleaning E28
Vacuum elevator E42
Vacuum robots E41

W

Wafer handling robots E34-E40
Workspace lighting E5
Worktables AT C13

Z

ZD 30 C118-C119
ZDS 2030 C121
ZR 20 C120

General Terms and conditions of Payment and Delivery and Software Terms of Use

Date: November 1st 2010

I. Scope of applicability

1. The following terms and conditions of sale are applicable to all contracts for the delivery of goods concluded between the customer and us. By placing an order and receiving the goods supplied by us, the customer confirms his acceptance of our terms and conditions. These terms and conditions shall also be applicable to all future business transactions, even if they are not expressly agreed again. Deviating terms and conditions of the customer are not binding for us unless expressly recognised, even if we have not expressly rejected such terms and conditions. The deviating terms and conditions are already herewith expressly rejected. The following terms and conditions of sale shall also be applicable where we unconditionally perform an order from the customer despite our knowledge of opposing or deviating terms and conditions of the customer.
2. Other agreements, amendments and understandings require written confirmation.
3. All agreements reached between the customer and us with regard to performance of the purchase contracts are drawn up in writing in those contracts.

II. Offers and conclusion of contracts

1. An order from the customer is deemed an offer to conclude a purchase contract. We may accept this offer by communicating a confirmation of offer within a period of two weeks or else by delivering the ordered goods within the same period.
2. Our offers are non-binding and subject to change, except where they are expressly described as binding. The scope of our obligation to perform is determined solely by our written confirmation of order.
3. The documents forming the basis for an offer or confirmation of order on our part, such as illustrations, drawings and specifications of dimensions and weights, are to be understood as approximate values only, insofar as they have not been described expressly as binding.
4. We reserve all property rights, copyrights and other protected privileges in respect of all illustrations, calculations, drawings and other documents, materials, models, specimens and specifications. The customer may only pass these on to third parties with our written consent, irrespective of whether they are marked as being confidential.
5. Evident errors or printing, arithmetic, spelling or calculation mistakes are not binding for us and do not found an entitlement for the customer to claim damages.
6. We reserve the right to implement design changes or other modifications to technical data and performance parameters where this is deemed to serve technical progress.

III. Pricing and terms of payment

1. Our prices are applicable ex works excluding packaging, unless specified otherwise in the confirmation of order. Our prices do not include value-added tax. Where applicable, this will be specified separately on the invoice at the statutory rate applicable on the date of invoicing. The costs for packaging will be charged at our discretion.
2. Deliveries are performed exclusively on the basis of cash on delivery or advance payment in the currency "EURO".
3. All orders are performed on the basis of the prices and discount rates applicable at the time of delivery. A discount for cash payment may only be deducted in case of a specific written agreement between us and the customer. This written agreement may also be deemed concluded, for example, by way of our confirmation of order.
4. Deliveries on account must be expressly agreed. The purchase price is then due for payment net (without deductions) immediately upon receipt of the invoice by the customer, insofar as no other period for payment is stipulated in the confirmation of order. A payment is only deemed effected once we are able to dispose of the amount. In case of payments by cheque, the payment is only deemed effected after the cheque has been submitted and credited to our account. We are not obliged to accept bills or drafts.
5. If the customer falls into arrears with payment, then the statutory rules shall apply.
6. All claims against the customer on our part become due for payment immediately, if a deadline for payment is not observed or the customer violates other contractual agreements or we gain knowledge of circumstances which may be expected to reduce the creditworthiness of the customer. In such a case, we are furthermore entitled to perform any outstanding deliveries only against advance payment or the furnishing of security, even if other agreements were reached previously. Following expiry of a reasonable period of grace, we are in this case also entitled to withdraw from the contract or to demand compensation for non-performance. We may furthermore prohibit the resale of goods supplied subject to a reservation of ownership, demand their return or transfer of immediate possession at the expense of the customer, and cancel an authorisation to collect.
7. The customer is only entitled to offset payments if the counterclaims are non-appealable, recognised by us or undisputed, even if notifications of defects or counterclaims are pending. The customer is only entitled to exercise a right of retention if his counterclaim is based on the same contractual relationship.

IV. Period for delivery or performance

1. Delivery dates and deadlines are exclusively non-binding indications, unless expressly agreed as binding. The delivery period specified by us begins only after clarification of all technical questions and details of performance.
2. The customer must fulfil the obligations resting upon him properly and in good time. The agreed delivery deadline is extended – notwithstanding our rights arising from the customer's default – by the period by which the customer is in default with his obligations from the present or any other contract. This applies also where a fixed delivery date was agreed.
3. If the underlying transaction of the purchase contract is a fixed-date transaction in the sense of § 286 para. 2 no. 4 BGB (German Civil Code) or § 376 HGB (German Commercial Code), then we are liable in accordance with the statutory regulations. The same applies also where the customer is entitled to assert the frustration of his interest in further performance of the contract due to a delay in delivery attributable to us. In this case, our liability is limited to the amount of the foreseeable, typically arising damage. The limitation of liability is not applicable where the delay in delivery is due to a deliberate violation of the contract attributable to us, for which purposes such fault on the part of our representatives or agents is deemed attributable to us.
We are similarly liable towards the customer in accordance with the statutory regulations in case of a delay in delivery arising from a deliberate or grossly negligent violation of the contract attributable to us, for which purposes such fault on the part of our representatives or agents is deemed attributable to us. Our liability is limited to the amount of the foreseeable, typically arising damage if the delay in delivery is not due to deliberate violation of the contract attributable to us.
4. In a case in which a delay in delivery attributable to us arises from culpable violation of an essential contractual duty, for which purposes such fault on the part of our representatives or agents is deemed attributable to us, we are liable in accordance with the statutory regulations with the proviso that the liability for compensatory damages is in this case limited to the amount of the foreseeable, typically arising damage.
5. The customer is in case of a delay in delivery attributable to us otherwise entitled to demand flat-rate compensation amounting to 0.5% of the delivery value for each full week of the delay, but in total no more than 5% of the delivery value.
6. All further liability for a delay in delivery attributable to us is excluded. Further statutory claims and rights on the part of the customer which may be available to him alongside the claim for compensatory damages due to a delay in delivery attributable to us remain unaffected.
7. We are entitled to effect partial delivery or partial performance at any time, insofar as this is reasonable for the customer.
8. Delivery deadlines are deemed to have been observed if the goods leave our premises in good time.
9. Cases of force majeure entitle us to delay the delivery for the period of the hindrance and a reasonable response time or else to withdraw from the portion of the contract which has not yet been performed. Strikes, lock-outs and other circumstances which significantly impair or otherwise render our delivery impossible are deemed equivalent to force majeure, irrespective of whether they affect us directly or a supplier. The customer is entitled to demand a statement from us as to whether we intend to withdraw or deliver within a reasonable period. If we make no such statement, then the customer is entitled to withdraw.
10. If the customer falls into default with his acceptance of our delivery, then we are entitled to demand reimbursement of the damage incurred and any additional expense. The same applies also where the customer culpably violates duties to cooperate. The risks of deterioration and accidental loss pass to the customer with his default in accepting or debtor's delay.

V. Transfer of risk – Dispatch and packaging – Delivery

1. Goods are dispatched and delivered insured at the customer's risk and expense, unless we have been prohibited accordingly by the customer. We will make every effort to take into account the wishes and interests of the customer when choosing the form of dispatch and forwarding route; any ensuing additional costs are to be paid by the customer, even if carriage-paid delivery was otherwise agreed. All liability is excluded in respect of the choice of transport means and forwarding route.
2. All risk passes to the customer upon handing-over to the forwarder, carrier or the customer himself as collector, but at the latest upon the goods leaving the works or warehouse.
3. In case of deliveries with erection or assembly at the customer's site, risk passes upon taking-over for own operations or, if agreed, after successful test operation. If the dispatch, delivery, start or performance of erection or assembly, taking-over for own operations or test operation is delayed for reasons attributable to the customer, or of the customer falls into default of acceptance for any other reasons, then risk already passes to the customer with the corresponding readiness.
4. We do not take back transport packaging or any other packaging in accordance with the directive on packaging, with the exception of pallets. The customer must provide for disposal of the packaging at his own expense.
5. If dispatch is delayed at the wishes or through the fault of the customer, then we take the goods into storage at the customer's risk and expense. In this case, the notification of readiness for dispatch is deemed equivalent to actual dispatch.
6. The minimum order amount for deliveries to be dispatched is 100 EURO (excluding VAT) for inland sales or 250 EURO for foreign sales. Inland orders below the minimum order value will be delivered subject to invoicing of an extra handling charge of 50 EURO (excluding VAT), in addition to the usual costs for packaging and dispatch. Foreign orders below the minimum order value will not be accepted for delivery.
7. Orders for custom products or for quantities and dimensions which are not specified in our catalogue must be submitted in written form by the customer. Where appropriate, an agreed advance payment must be made. If we accept orders for custom products in large quantities, then our delivery may exceed or fall short of the specified quantity by a reasonable amount (generally ±10%). Dispatch packaging is always charged at cost price.

VI. Warranty/liability

1. In contractual relations with registered traders and between companies we give a warranty of freedom from defects for our products for a period of one year.
2. For milling spindles and other wearing parts we give a warranty of freedom from defects for a period of 6 months. This warranty period of 6 months applies also to milling spindles which are integrated into a machine system.
3. Advice on applications is provided according to the best of our knowledge. All specifications and information with regard to the suitability and applicability of our goods, however, remain non-binding and do not release the customer from the requirement to perform his own calculations, tests and trials. The customer is himself responsible for compliance with statutory and authority regulations concerning use of the goods. We are liable for the suitability of the goods for a particular purpose only if this suitability has been expressly warranted in writing.
4. We provide a warranty for material defects as follows, to the exclusion of all further claims and subject to the following stipulations and the stipulations of Sections VIII and IX:
5. If the customer is a registered trader, he can assert claims for defects only if he has complied properly with his duties of inspection and notification of complaint in accordance with § 377 HGB. Other customers must submit their notice of complaint to us in writing within 10 days after receiving the goods. In the case of transactions with non-traders this applies only insofar as the defect is an evident defect. Notices of complaint can only be considered if the goods are still in the state in which they were delivered.
6. In case of justified notifications of defect we are entitled, to the exclusion of rights on the part of the customer, to withdraw from the contract or to reduce the purchase price or else obliged to rectify our performance, unless we are entitled to refuse rectifying performance on the basis of statutory regulations. The customer must grant us a reasonable period for rectifying performance. The rectifying performance may be effected by way of remedying of the defect (reworking) or replacement delivery at our own discretion. We bear the necessary expenses in case of remedying of the defect, insofar as the expenses are not increased due to the goods concerned being at a place other than the place of performance. If the rectifying performance is not successful, the customer may at his own discretion demand a reduction of the purchase price or declare his withdrawal from the contract. Remedying is deemed unsuccessful after the second unsuccessful attempt, insofar as further attempts at remedy are not justifiable and reasonable for the customer on account of the nature of the goods. The customer may only assert claims for damages due to defect under the following terms after an unsuccessful attempt at rectifying performance. The customer's rights to claim further damages under the following terms remain unaffected.
7. Returns of goods subject of a complaint are permissible only with our consent. Goods must be returned in the original or an equivalent packaging. Carriage costs are to be paid by the customer. Costs will be reimbursed only in case of a justified notification of defect. If the customer demands an inspection of the delivered goods and specifies a defect for which we would be liable, then we charge a handling fee for each inspected item which is shown not to be defective.
8. Warranty claims on the part of the customer expire one year after delivery to the customer, unless we have fraudulently concealed the defect; in this case the statutory regulations shall apply. Our duties arising from Section VI no. 9 and Section VI no. 10 remain unaffected.
9. We are obliged in accordance with the statutory regulations to take back the new goods or else to reduce the purchase price also without the otherwise necessary specification of a deadline if the customer's customer as end user of the new movable sold (consumer goods sales) is able to demand return of the goods or reduction of the purchase price from the customer due to the defect in the goods or if such a resulting claim under a right of recourse has been expressed against the customer. We are in this case furthermore obliged to reimburse the expenses, in particular transport, travel, labour and material costs, incurred by the customer in conjunction with his rectifying performance for the end user due to a defect in the goods present at the passing of risk from us to the customer. This claim is excluded if the customer failed to comply properly with his duties of inspection and notification of complaint in accordance with § 377 HGB.
10. The obligation under Section VI no. 9 is excluded insofar as the notice of defect is based on marketing statements or other contractual agreements which did not originate from us, or if the customer has given special guarantees to the end user. The obligation is similarly excluded if the customer himself was not obliged to perform the warranty duties towards the end user under statutory regulations or failed to assert such opposition to the claim made against him. This applies also where the customer has performed warranty duties towards the end user which go beyond the statutory scope.
11. We are liable according to the statutory regulations and irrespective of the following limitations of liability for injury to life, body or health which is attributable to a negligent or deliberate violation of duties by us, our legal representatives or our agents, as well as for damage which is covered by a liability under the Product Liability Act (Produkthaftungsgesetz). In case of damage which is not covered by sentence 1 above and which is attributable to deliberate or grossly negligent violations of contract or fraudulent actions by us, our legal representatives or our agents, we are liable in accordance with the statutory regulations. In this case, however, the liability for damages is limited to the amount of the foreseeable and typically arising damage, insofar as we, our legal representatives or our agents have not acted deliberately. To the extent to which we have given a warranty of quality or durability in respect of the goods or parts thereof, we are liable also within the framework of this warranty. In case of damage arising from the absence of the warranted quality or durability but not directly in the goods themselves, however, we are liable only where the risk of such damage is evidently covered by the warranty of quality and durability.
12. All further liability is excluded, irrespective of the legal nature of the asserted claim. This applies in particular also to tortious claims or claims for the reimbursement of futile expenses in lieu of performance; our liability in accordance with Section IV no. 6 to Section IV no. 10 of these terms and conditions remains unaffected. Where our liability is excluded or limited, this applies also to the personal liability of our staff, employees, representatives and agents.
13. Claims on the part of the customer for compensatory damages due to a defect expire one year after delivery of the goods. This does not apply in cases of injury to life, body or health for which we, our legal representatives or our agents are to blame, or where we or our legal representatives have acted deliberately or with gross negligence, or where our simple agents have acted with gross negligence.
14. We furthermore accept no liability for damage arising from the following circumstances: Unsuitable or improper use or storage, incorrect assembly by the customer or any third party, own modifications and attempts at repair, natural wear, incorrect or negligent handling, chemical influences, electrical influences, etc. over which we have no control, as well as in case of use for purposes other than those intended or failure to observe our operating instructions and catalogue specifications. Our warranty is also waived if the customer or any third party performs modifications without our prior written authorisation and without any other justification (delayed rectification of a fault on our part), in particular modifications to controllers/software, even if the fault occurs in a part which was not modified.
15. In case of legal defects, where use of the delivered goods violates industrial property rights or copyright in Germany, we will at our expense obtain a principle right for the customer or else modify the delivered goods in a manner reasonable for the customer and such that the rights are no longer violated. If this is not possible at economically reasonable expense or within a reasonable period, then the customer is entitled to withdraw from the contract. We will furthermore indemnify the customer against any undisputed or non-appealable claims.
16. Our above obligation is attendant subject to the above liability stipulations for cases of violation of property rights and copyright. The obligation under clause 15 is thus only effective if the customer informs us without delay of any claims of violation of property rights and copyright, the customer supports us to a reasonable extent in contesting the asserted claims and/or permits us to make corresponding modifications, we retain the right to take all defensive measures, including out-of-court settlements, the violation is not attributable to an instruction of the customer, and the violation is not due to the customer himself modifying the delivered goods or using the goods in a manner not compliant with the contract.

VII. Repairs and returns

1. If the customer wishes a cost estimate to be provided before performance of repairs, then this must be expressly specified. The costs of carriage and packaging are to be paid by the customer. The invoice amount for repairs is payable immediately without deductions of any kind. All repairs, including those performed as warranty repairs, are performed at our works, insofar as no other written agreement exists.
2. Returns of delivered goods are possible only after prior consultation and agreement, and are subject to appropriate mark-downs. All returns of custom products and software are excluded! All shipments and returns are to enclose a copy of the delivery note or invoice. The costs of the return shipment are to be paid by the customer. Returns must be delivered free of charge to our address.

VIII. Assembly

1. Assembly work is to be paid for separately, unless agreed otherwise in writing. The costs of assembly comprise in particular travel costs, daily allowances, the usual daily rates for working time and supplements for overtime, for work at nights or on Sundays and public holidays, for work under aggravated circumstances and for planning and supervision.
2. The costs for preparation, travelling, waiting and site-to-quarters times will be invoiced separately. If the assembly or commissioning is delayed for reasons not attributable to us, then the customer is to bear all costs for the waiting time and for any further travel which becomes necessary.
3. The customer is at his own expense to provide the necessary helpers in appropriate numbers with their required tools. The customer is furthermore to provide sufficiently large, suitable, dry and lockable rooms for the keeping of machine parts, equipment, materials, tools, etc. He is to take the same measures to protect our property and the assembly personnel as he would take to protect his own property. If the nature of the customer's operations requires special protective clothing or protective equipment for the assembly personnel, then he is also to provide this clothing and equipment.
4. Our assembly personnel and their subcontractors are not authorised to perform work which is not performed to fulfil our obligation to deliver and erect or assemble the goods nor to have such work performed by the customer or a third party without prior consultation with us. We are not liable for such work which is not attributable to our sphere of responsibility. If the assembly is performed by the customer or a third party commissioned to do so by him, then our correspondingly valid operating and assembly instructions are to be observed.

IX. Software, use of software and supplementary warranty and defect claims

1. For all software of whatever kind from us, including the corresponding documentation, the customer is in exchange for payment granted a non-exclusive, non-transferable and in terms of time unlimited right of use on a particular or individually specified hardware product. We remain the holders of the copyright and all other industrial property rights. The right of duplication is granted only for the purpose of data backups. Copyright notices must not be removed.
2. We supply installation and start-up instructions with appropriate safety notes for the software in printed form. All other documentation is provided only in the form of software data. When a new software release is sent to the customer, the correspondingly necessary software data will also be sent. We are also entitled to supply the documentation by way of an online help function or online documentation.
3. All communication to third parties requires our prior written consent. Where software is supplied for the purpose of resale, acceptance of this condition by the third party must be ensured. Modifications are not permitted.
4. In case of a violation of these stipulations, the customer is to pay a contractual penalty amounting to 10 times the order value for each violation. Further claims for compensatory damages remain unaffected. The contractual penalty is to be offset from any claims for compensatory damages. The customer is entitled to furnish proof that less or no damage has been incurred. The software and the corresponding documentation are in this case to be returned without delay.
5. The above stipulations are not applicable to exclusively customer-specific software developed on the basis of specifications provided by the customer. Such software developed within the framework of a contractually agreed complete control solution is composed specifically for the customer through the combination of modular software components created for a diversity of application cases (standard software modules) and is matched to the contractual performance specifications (customer-specific application software).
6. Upon full payment of the purchase price for the customer-specific application software, we grant the customer an exclusive and in terms of territory and time unlimited right of use, but without the customer acquiring any rights of any kind in respect of the individual standard software modules on which the customer-specific adaptation is based.
7. Irrespective of these stipulations, we remain entitled to create and offer further customer-specific software solutions on the basis of this development to accommodate the task specifications of other customers. We in any case retain a simple right of use in respect of the customer-specific solutions for our own internal purposes.
8. Subject to the stipulations of Section VI, we provide a warranty for the proper duplication of our software. Software from us will run on hardware products specified by us. Warranty duties are fulfilled by way of replacement delivery. Beyond this, we give no warranty regarding the flawless quality of the software and its data structure, unless agreed otherwise in writing. In the case of customer-specific software, we give a warranty in respect of the function and performance properties defined in the specifications, the confirmation of order, the documentation or the jointly determined work/process descriptions. We give no warranty regarding the flawless quality of the programs as used in all applications intended by the customer, in particular not in those applications which were not known to us or tested at the time of creation/acceptance.

X. Reservation of ownership

1. The supplied goods remain our property until all claims have been settled, including all open account balance claims which we hold now or in the future against the customer (reserved goods). In case of behaviour contrary to the contract on the part of the customer, e.g. payment arrears, we are entitled to take back the reserved goods after having previously specified a reasonable period of grace. If we take the reserved goods back, then this is deemed to represent withdrawal from the contract. If we seize the reserved goods, then this is deemed to represent withdrawal from the contract. We are entitled to dispose of reserved goods which are taken back. After deduction of a reasonable amount to cover the costs of disposal, the proceeds of disposal are to be offset against the amounts owed to us by the customer.
2. The customer is to handle the reserved goods with due care and is at his own expense to insure them adequately for their original value against fire, water damage and theft. Maintenance and inspection work which becomes necessary is to be performed by the customer in good time and at his own expense.
3. The customer is entitled to resell and/or make use of the reserved goods in the course of proper business, provided he is not in arrears with payments. He is not permitted to pledge the reserved goods nor to assign them as security. Claims arising from reselling or on any other legal basis (insurance, unlawful action) in respect of the reserved goods (including all open account balance claims) are already herewith assigned to us in full by the customer as security; we herewith accept this assignment. We authorise the customer revocably to collect the claims assigned to us in his own name for his account. The authorisation to collect can be revoked at any time, should the customer fail to properly fulfil his payment obligations. The customer is also not authorised to assign claims for the purpose of collection by way of factoring, unless an obligation is founded at the same time whereby the factor is to effect considerations up to the amount of the claims directly to us as long as we still hold claims against the customer.
4. Any processing or refashioning of the reserved goods by the customer is in all cases deemed to be performed on our behalf. Insofar as the reserved goods are processed with other items not belonging to us, we acquire co-ownership of the new goods according to the ratio between the value of the reserved goods (final invoice amount including VAT) and that of the other processed items at the time of processing. The same stipulations apply to the new goods arising through such processing as to the reserved goods. Where the reserved goods are combined inseparably with other items not belonging to us, we acquire co-ownership of the new goods according to the ratio between the value of the reserved goods (final invoice amount including VAT) and that of the other combined items at the time of combining. If the customer's product is to be considered the principal good as a result of the combining, then we and the customer are agreed that the customer is to assign proportional co-ownership of this good to us; we herewith accept this assignment. Our resulting sole or co-ownership of a good is to be kept for us by the customer.
5. In case of access to the reserved goods by a third party, in particular in case of seizure, the customer is to draw attention to our ownership and is to inform us without delay so that we are able to assert our ownership rights. If the third party is not in a position to reimburse the judicial and extrajudicial costs incurred by us in this connection, then the customer is to be liable accordingly.
6. We are obliged to release securities assigned to us insofar as the realisable value of our securities exceeds the secured claims by more than 10%; the decision as to which securities are to be released is left to our discretion.

XI. Place of performance, place of jurisdiction and applicable law

1. The place of performance and jurisdiction in respect of deliveries and payments (including actions pertaining to cheques and bills) as well as for all disputes arising between us and the customer from purchase contracts concluded between us and the customer, if the customer is a registered trader, a legal person under public law or a special trust under public law, or if he has his residence or business offices outside the Federal Republic of Germany, is the court at the place of our business offices in 36124 Eichenzell, Germany. We are entitled, however, to file action against the customer at the place of his residence or business offices.
2. The relationships between the contract parties are governed solely by the law applicable in the Federal Republic of Germany to the exclusion of all bilateral and multilateral treaties relevant to the transaction; the applicability of UN Law on International Sales, in particular, is excluded.

XII. Miscellaneous

1. If the customer exports our goods to territories outside the Federal Republic of Germany, then we accept no liability for an ensuing violation of property rights held by third parties. The customer is obliged to provide compensation for all damage arising from the exporting of goods which we did not supply expressly for export.
2. If any of the stipulations of these general terms and conditions of business are shown to be invalid, then this shall not affect the validity of the remaining stipulations. We and the customer are to replace the invalid stipulations with new stipulations which are legally permissible and correspond as closely as possible to the original legal and economic intention and purpose.
3. All changes and amendments to these general terms and conditions of business become effective only if executed in writing. This applies also to an agreement to waive this requirement of the written form.

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