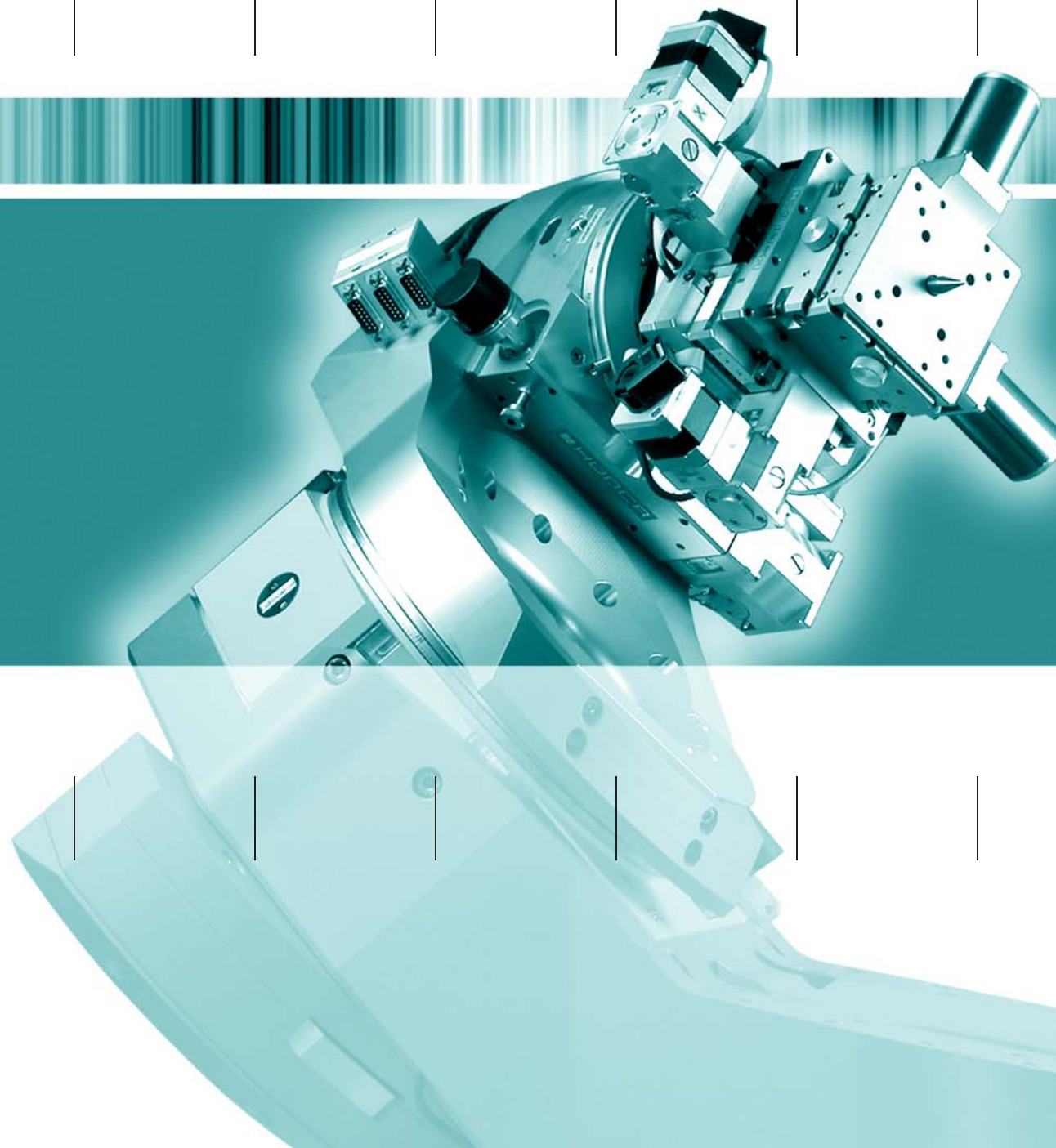




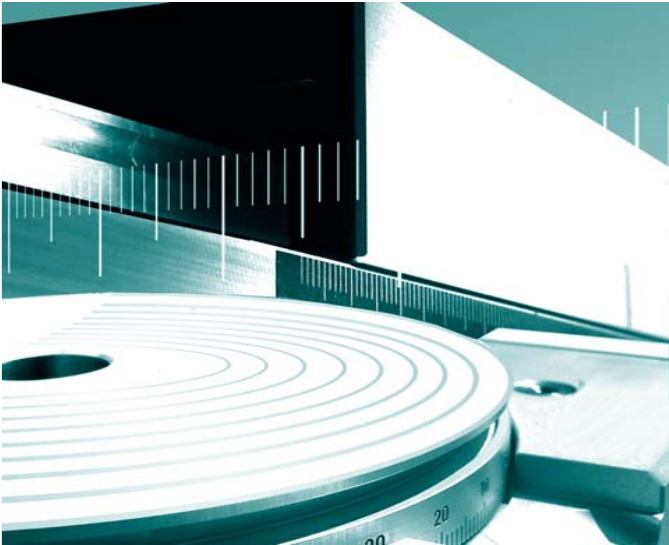
**HUBER**  
Diffraction and Positioning Equipment

Your Decision for Precision

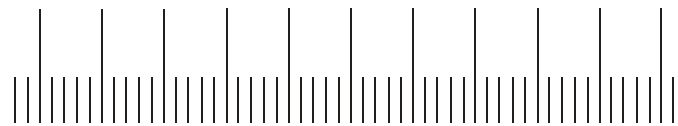
**Catalogue**  
Products and Service



**HUBER**  
Diffraction and Positioning Equipment



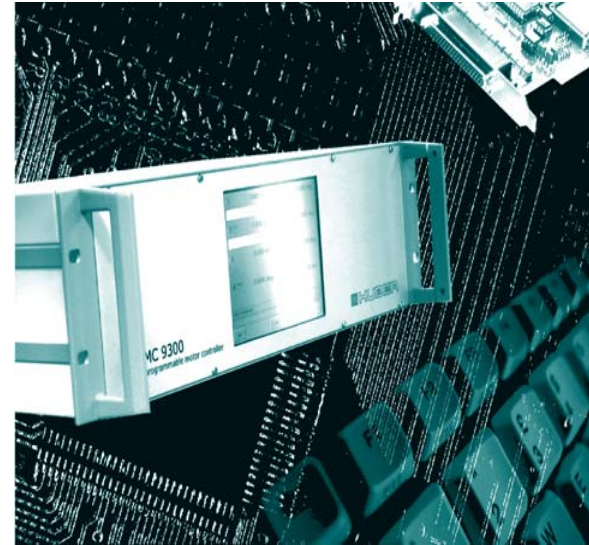
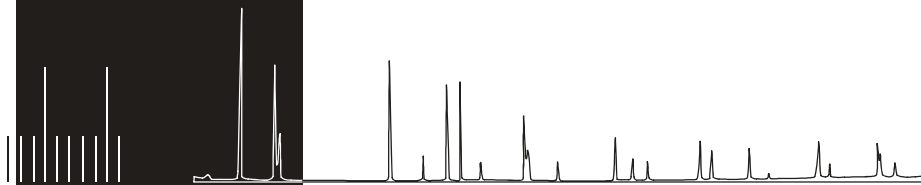
Positioning Systems



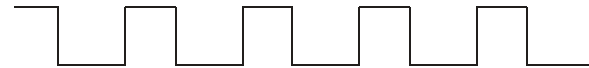
Your Decision for Precision



Applications



Control Systems



Company

History

**HUBER**  
Diffraction and Positioning Equipment

## History

**1950**

Foundation by Robert Huber sen. as a one-man business in Rimsting

On May 1, 1950, Robert Huber founded a specialist engineering company in Rimsting am Chiemsee under the name „Robert Huber, Instrumente und Maschinen“.

application fields were diffraction experiments with neutrons, laser technology, astronomy and precise measurement technology.

**1965**

Production of instruments for X-ray diffraction

With a small number of employees he began producing precision machines and tools for companies in the surrounding area.

In the nineties the production facilities were extended in order to provide the floor space required for modern production plants.

**1979**

Foundation of a GmbH

In the following years the company “Robert Huber” became renowned beyond the surrounding region for the exceptional precision of his instruments.

The acquisition of the company PP-Elektronik in Anzing in the year 1998 ensured the continuous development and production of control systems and software for the positioning systems and measurement instruments built by Huber.

**1980**

Expansion of production range to include measurement instruments for synchrotron and neutron radiation. Conversion to Huber Diffractionstechnik GmbH & Co. KG

In the seventies the company started to become involved in the design and production of X-ray cameras and accessories for X-ray fine structural analysis. The exceptional precision and reliability of the instruments produced by Huber ensured that the name became common in laboratories and research centers around the world.

In the year 2002 the legal transition was made, changing the company to Huber Diffractionstechnik GmbH & Co. KG. This was done to pave the way for the handover of the company to the next generation.

**2003**

Transfer of company to Norman Huber, son of founder Robert Huber

Success led to company growth, which resulted in the formation of a GmbH in 1979. After this, Huber began more and more to develop and produce high-precision positioning systems primarily used for X-ray diffraction in laboratories and at synchrotron beam sources. Other

Today, the companies Huber Diffractionstechnik GmbH & Co. KG and PP-Electronic GmbH present themselves as successful and independent second generation family businesses.

**2006**

Expansion of company premises

Company

Philosophy

**HUBER**  
Diffraction and Positioning Equipment

### Philosophy

The company "Huber Diffractionstechnik GmbH" was founded in 1979. Both then and today the foundations of our company's philosophy remain:

**Innovation, Quality, Flexibility, Service**



Norman Huber,  
Managing Director



Support



Development



Design



Manufacturing



Quality Control

We define **service** as the direct contact with our customers, the personal consultation during the offer phase, the support in the production stage and comprehensive service after product delivery. We have agencies and representatives all over the world who will gladly attend to the individual requirements of your application. Of course, all our customers are free to contact the Huber headquarters in Germany for advice and support.

In order to continue to meet your highest requirement standards in the future, we develop and produce almost

all mechanical and electronic components in our own production facilities. Here they are continually subject to the strictest quality management system. Additionally, this production philosophy enables us to react quickly and effectively to the individual requests from every single customer.

The realisation of visions from the individual idea up to the production stage requires a high level of innovation. Yet our intense internal development processes and our cooperations with international research centers enable our visions to become reality.



Company

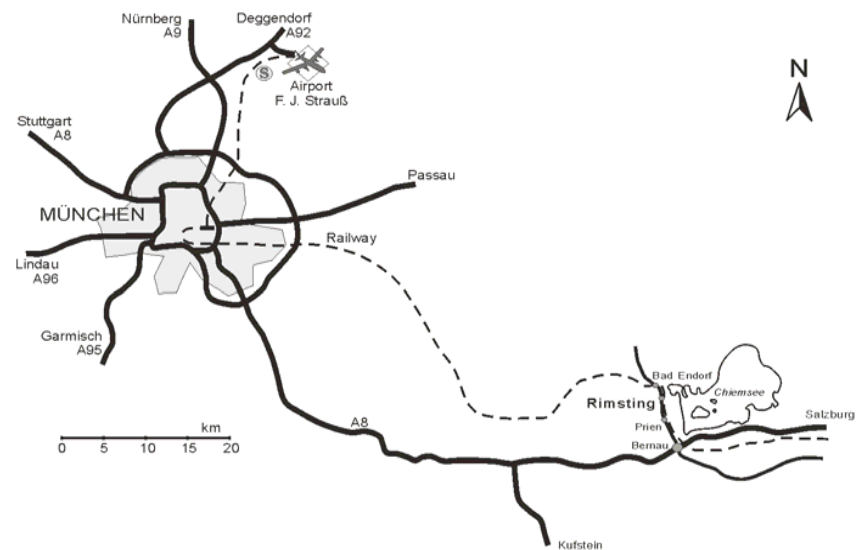
Location

**HUBER**  
Diffraction and Positioning Equipment

Huber Diffraction and Positioning Equipment is located in Rimsting in Upper Bavaria near to Lake Chiemsee on the edge of the Alps.

To visit us by car you travel along the Autobahn A8 Munich-Salzburg and take the exit 'Bernau' on the southern shore of Lake Chiemsee. From there you follow the signs to 'Prien'. At the main junction in the town centre of Prien you turn left towards 'Rimsting' or 'Seebruck'. After approximately 2 km you arrive in Rimsting. About one kilometre later, past the church, you turn right at the roundabout towards 'Seebruck'. After another 500 m, immediately before the petrol station, you turn left into Sommerstrasse. The entrance to the company is located approx. 50 m later on the right-hand side.

To visit us by train you take the service from Munich to Salzburg and exit in 'Prien'.



HUBER Diffractionstechnik GmbH & Co. KG  
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info@xhuber.com



Contact

**HUBER**  
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e-Mail: [contact@scitek.com.au](mailto:contact@scitek.com.au)



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NJ 07076-2099

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Fax: +1 908 233 1354  
e-Mail: [blake4xray@worldnet.att.net](mailto:blake4xray@worldnet.att.net)



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Fax: +81 3 3456 3423  
e-Mail: [asachan@nikiglass.com](mailto:asachan@nikiglass.com)



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Fax: +82 2 544 4456  
e-Mail: [thkim@kits-euro.co.kr](mailto:thkim@kits-euro.co.kr)



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Tel./Fax: +44 1189 40 36 57  
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Tel.: +886 2 928 9006  
Fax: +886 2 292 70451  
e-Mail: [paul.wen8@msa.hinet.net](mailto:paul.wen8@msa.hinet.net)

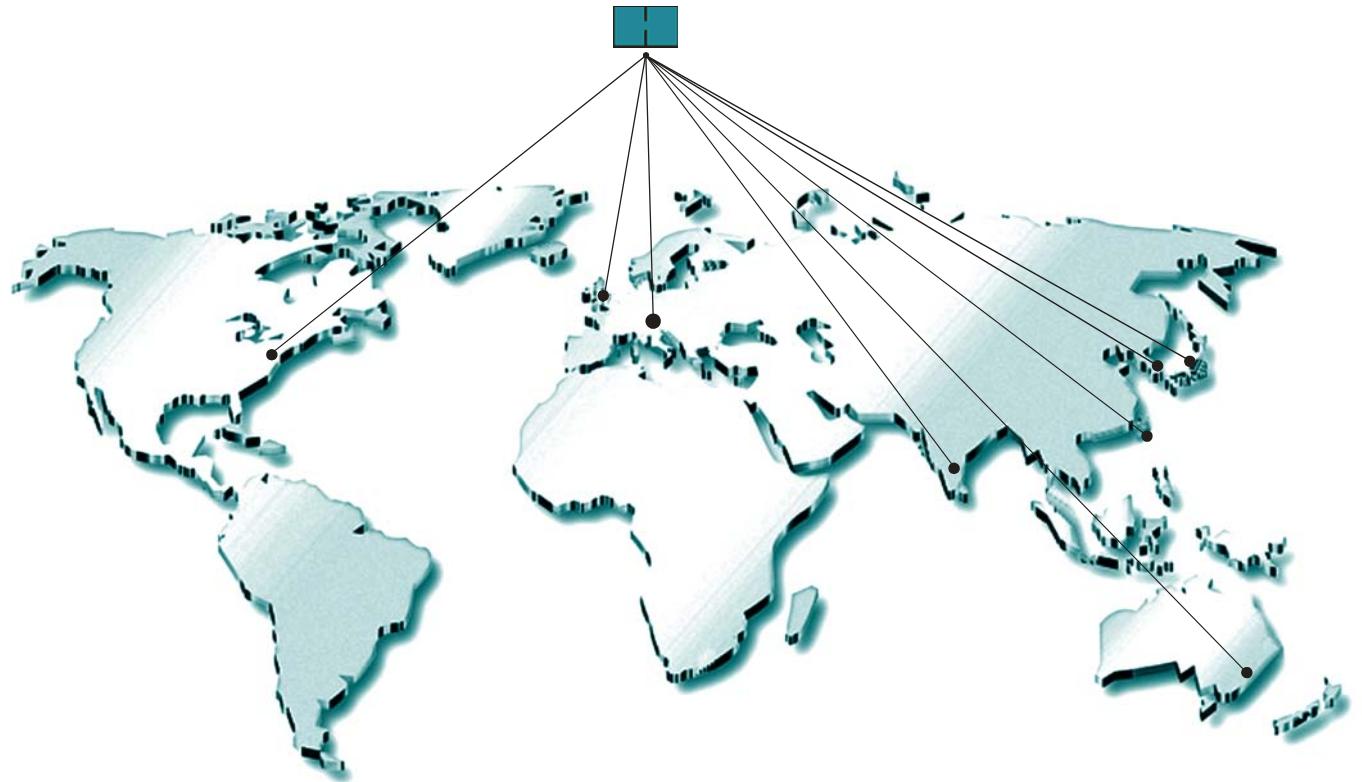
Contact

**HUBER**  
Diffraction and Positioning Equipment



In countries without direct representatives please contact Huber Diffractionstechnik GmbH & Co. KG directly.

Please contact us. We will gladly assist you in the realisation of the technical equipment required for your application.





## 1. Positioning Systems

### 1.1. Translation

- 1.1.1. Linear Stages
- 1.1.2. XY-Stages
- 1.1.3. Z-Stages
- 1.1.4. Integrated Z-Stages

- 1.1.1.1. Series 5101
- 1.1.2.1. Series 5102
- 1.1.3.1. Series 5103
- 1.1.4.1. Series 5104

### 1.2. Rotation

- 1.2.1. 1-Circle Goniometers
- 1.2.2. 2-Circle Goniometers
- 1.2.3. 1-Circle Segments
- 1.2.4. 2-Circle Segments
- 1.2.5. Eulerian Cradles
- 1.2.6. Kappa Goniometers

- 1.2.1.1. Series 401
- 1.2.1.2. Series P-401
- 1.2.2.1. Series 402
- 1.2.3.1. Series 5202
- 1.2.4.1. Series 5203
- 1.2.5.1. Series 500
- 1.2.6.1. Series 515

### 1.3. Translation & Rotation

- 1.3.1. 4-Axis Segments
- 1.3.2. Alignment Stages
- 1.3.3. Combinations

- 1.3.1.1. Series 5204
- 1.3.2.1. Series 6204





2. Applications

2.1. X-Rays

- 2.1.1. Classical Camera Systems
- 2.1.2. Powder Diffractometers
- 2.1.3. Single Crystal Diffractometers
- 2.1.4. Tension and Texture

2.2. Neutrons

2.3. Lasers und more

3. Control Systems

3.1. Motors

- 3.1.1. Controllers
- 3.1.2. Driver Boards
- 3.1.3. Control Examples

3.2. Temperature

4. Accessories

4.1. Mechanics

- 4.1.1. Gear Boxes
- 4.1.2. Hand Wheels
- 4.1.3. Goniometer Heads Series 1000
- 4.1.4. Goniometer Head Supports
- 4.1.5. Cryostat Carriers
- 4.1.6. Air Bearings
- 4.1.7. Reflection Goniometer

- 4.1.3.1. Manual Versions
- 4.1.3.2. Motorised Versions
- 4.1.3.3. Special Versions
- 4.1.5.1. Manual Versions
- 4.1.5.1. Motorised Versions

4. Accessories

4.2. Beam Applications

4.2.1. Slit Systems

4.2.2. X-Ray Optics

4.2.3. X-Ray Sources

4.2.4. Detector Systems

4.2.5. Polarisation Analyser

4.2.1.1. Manual Versions

4.2.1.2. Motorised Versions

4.2.2.1. Monochromators

4.2.3.1. X-Ray Generator

4.2.3.2. Radiation Protection Housing

4.2.3.3. Tube Shield

4.2.4.1. Series 9900

4.3. Electronics

4.3.1. Motors

4.3.2. Encoders

4.3.3. Limit Switches

4.3.4. Zero Point Controls

4.3.5. MiniVID

4.3.6. Impuls Counter

4.3.7. Signal Converter



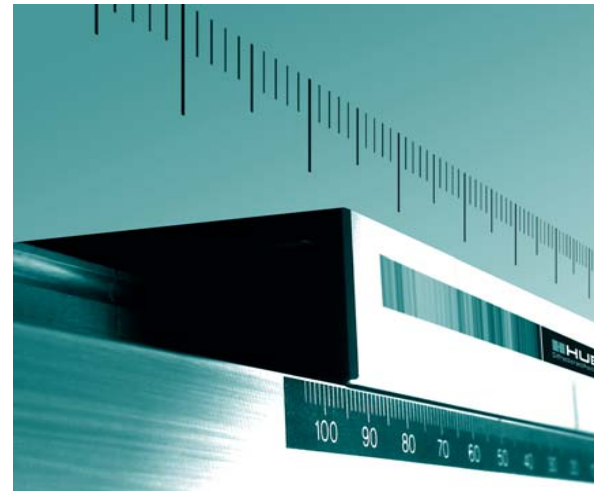
Product Groups

1. Positioning Systems

1.1. Translation  
1.2. Rotation  
1.3. Translation & Rotation

**HUBER**  
Diffraction and Positioning Equipment

1. Translation  
2. Rotation  
3. Translation &  
Rotation

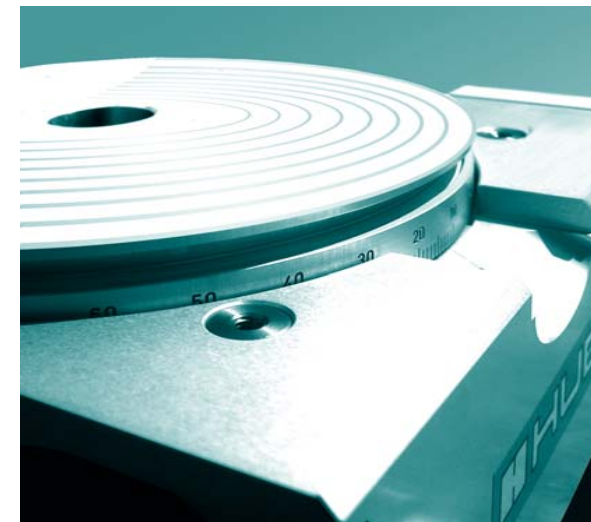


In addition to our standard range of products, we of course offer customer specific solutions tailored to your individual requirements.

Our main focus of our system development is in these three areas:

**Positioning, Beam Applications and Control**

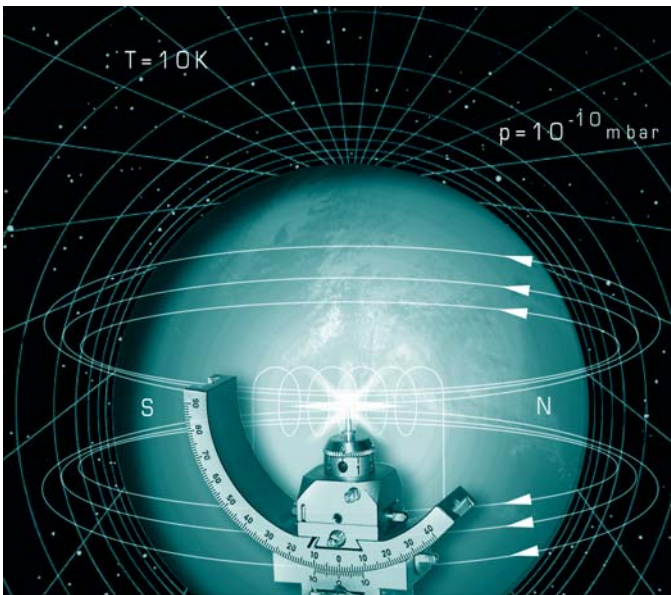
A wide range of accessories is available for all products.





Extreme conditions

**HUBER**  
Diffraction and Positioning Equipment



### General information

Many applications are subject to extreme conditions. These could encompass vacuum, low temperature or antimagnetic conditions as well as high-radiation environments.

We develop systems which are custom-designed to operate under these extreme conditions.

### Strategy

For many years Huber has been investing in the development and testing of positioning systems for applications under extreme conditions. These are becoming more and more important in industry and science. Thus, in order to conform to the increasing demands, new systems are constantly being developed in cooperation with international research institutes.

### Materials

Fundamentally, these systems are almost identical to the standard versions. However, many materials have to be replaced or specially treated. The anodisation of aluminium, for example, increases the porosity of the metal, which in turn enlarges its surface area, thus rendering it unsuitable for vacuum conditions.

### Construction/Production/Assembly

The individual components are required to be resistant to a multitude of conditions over long periods of time. At the same time the utilised materials are not allowed to influence applications or measurements. This can only be accomplished by using special materials and coatings as well as by additional modifications to the design of the instrument.

For example, it is important to ensure that vacuum products do not have gas inclusions and that none of the materials used contain impurities with high vapor pressures. If this is not taken into consideration, residual gases could not only lead to false measurements, but could also generate aggressive ionisation derivatives which could in turn cause damage the measurement and positioning system. Elaborate cleansing processes guarantee grease and oil free surfaces. These processes, as well as the assembly and packaging of the components, take place in specially prepared, highly clean rooms.

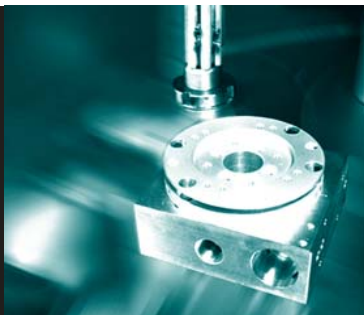
### Accessories

Of course we also offer an extensive range of accessories for our positioning systems such as step motors, rotary encoders, reducers and so on. If you have any questions regarding these products or accessories, our engineers will gladly be of assistance. We are confident that we will be able to find suitable solutions for your requirements.

Extreme Conditions

**HUBER**  
Diffraction and Positioning Equipment

Vacuum



Huber positioning components and systems are used in vacuum conditions for a variety of applications. Most of the standard Huber instruments fulfill the necessary requirements with certain preconditions.

In addition, the standard Huber instruments are prepared and modified by special cleaning procedures, use of special materials, drilling of degassing holes, and suitable surface treatments and lubrications. These procedures result in short outgassing times and insure that the desired vacuum can be attained in the shortest possible time.

Some areas of application are in accelerator technology, soft X-ray investigations or in astronomy.

Magnetism



Huber instruments are occasionally used for experiments and applications in large magnetic fields of 15 Tesla and above. These applications are often combined with high loads. Huber has developed a special product line for applications in these conditions. Specially selected non-magnetic (and non-magnetisable) and highly tensile materials are used which ensure reliability and high precision in the required environment.

An example of an application field is the investigation of magnetic structures by X-ray diffractometry.

Radiation



Huber systems used in high-radiation environments (electromagnetic / neutron / electron radiation) are equipped with specially modified components and assemblies. These utilise special lubrications and suitable materials (e.g. materials with low activity, radiation resistant materials).

Some application fields for these systems are monochromators in neutron reactors or experiments with synchrotron beam sources.

Product Groups

1. Positioning Systems

1.1. Translation

1.1.1. Linear Stages  
1.1.2. XY-Stages  
1.1.3. Z-Stages  
1.1.4. Integrated Z-Stages

**HUBER**  
Diffraction and Positioning Equipment

### General information

Huber translation systems are designed to meet the highest fine positioning requirements.

For our systems we only use materials of high quality which have been treated in modern processing facilities. Their statically optimised construction guarantees highest torsional stiffness at lowest possible weight.

In combination with our high precision guides we are thus able to build highly reliable positioning systems with long life and low maintenance.

Additionally, our translation systems of the series 5103 offer a very high resolution.

### Combinations

The series 5100 units can easily be combined with systems of the same and/or other series.

Depending on requirements it is possible to adapt and combine translational and rotational systems to create multi-axis positioning systems.

Please contact us and we will find the ideal system for your needs.

### Materials

Base/Slide: Aluminium anodised  
Guide system: Steel  
Drive system: Steel/Bronze

### Precision

Each product comes in up to three precision configurations:

X1 X2 XE

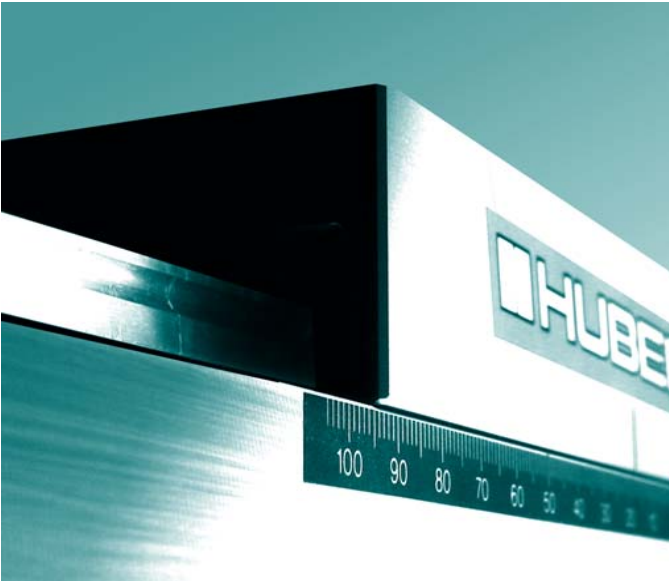
### Equipment

All systems are equipped with mechanical end switches. Also included are scales and couplings to adapt to your drive system.

### Accessories

We offer an extensive range of accessories for individual requirements. Detailed information is given on the respective catalogue product pages.

*Individual solutions  
for individual requirements*





## Application specific versions:

- vacuum compatible
- antimagnetic
- radiation resistant
- in black

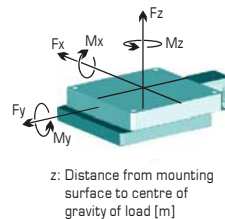
## Specifications

Travel range [mm]:	30*
Material (base/slide):	Aluminium
Slope [mm]:	1
$M_{input}$ [min] [Nm]:	0,02
Weight [kg]:	0,25

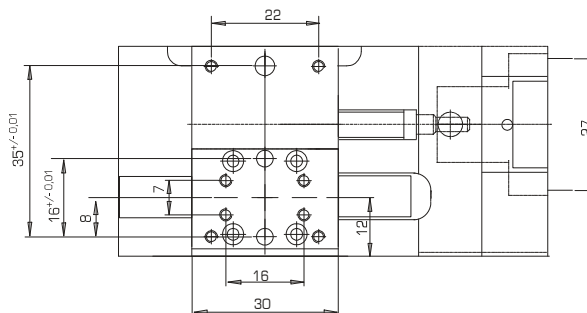
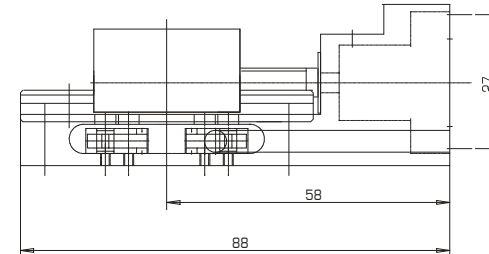
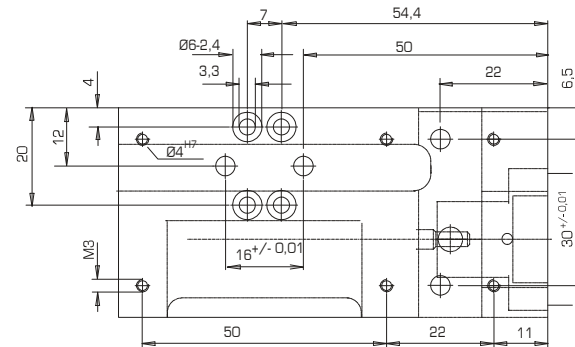
\*Optional: extended or shortened travel range

## Maximum load and torque

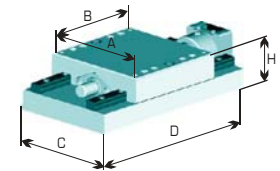
$F_x$ [N]:	50
$F_y$ [N]:	50
$F_z \uparrow$ [N]:	50
$F_z \downarrow$ [N]:	50
$\Sigma F$ [N]:	$\leq 50$
$M_x$ [Nm]:	5,5 [ $=F_y \times (z+0,010)$ ]
$M_y$ [Nm]:	4 [ $=F_x \times (z+0,010)$ ]
$M_z$ [Nm]:	4
$\Sigma M$ [Nm]:	$\leq 6$



- Compact linear stage for the positioning of light samples or mountings
- Especially suitable for the adjustment of slit screens of the series 3000
- Multi-axis positioning systems possible by simple combination of stages
- Ground and tempered thread spindle, self-locking
- Wear resistant delta bronze spindle nut
- Robust surfaces through galvanic natural-anodising treatment



## Dimensions [mm]



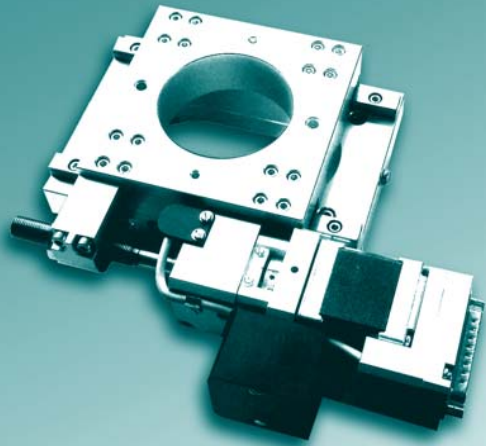
A:	B:	C:	D:	H:
43	30	43	88	29

## Accessories

Step motors:	2-/5-Ph. Servo/DC
Hand wheel:	0032
Gear boxes:	2042.10* 2042.20*
Limit switches:	included
Zero-point control:	9100
Encoder:	incremental
Control system:	9300

\* Adaptor M301.301-001 required





## Application specific versions:

- vacuum compatible
- antimagnetic
- radiation resistant
- in black

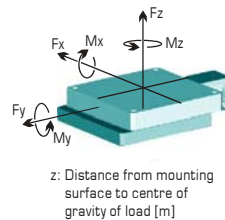
## Specifications

Travel range [mm]:	40*
Material (base/slide):	Aluminium
Slope [mm]:	1
$M_{input}$ (min) [Nm]:	0,02
Weight [kg]:	1,1

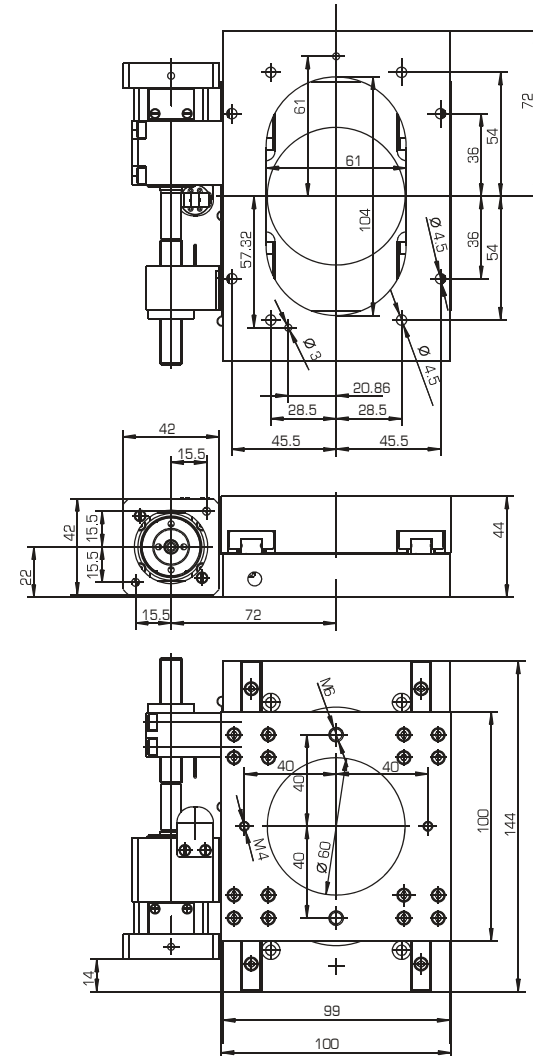
\*Optional: extended or shortened travel range

## Maximum load and torque

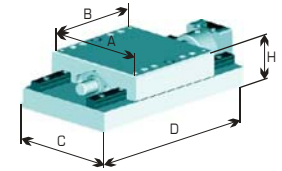
$F_x$ [N]:	200
$F_y$ [N]:	200
$F_z \uparrow$ [N]:	200
$F_z \downarrow$ [N]:	200
$\Sigma F$ [N]:	$\leq 200$
$M_x$ [Nm]:	13 [= $F_y \times (z+0,013)$ ]
$M_y$ [Nm]:	20 [= $F_x \times (z+0,013)$ ]
$M_z$ [Nm]:	16
$\Sigma M$ [Nm]:	$\leq 23$



- Aperture with 60mm over complete operational range (especially suitable for optical applications)
- Ground and tempered thread spindle, mounted on side
- Wear resistant delta bronze spindle nut
- Mounting of drive spindle free of play
- Use of low-fiction linear guides results in optimum fine adjustment due to high reproducibility of minimum system step distance
- Robust surfaces through galvanic black- or natural-anodizing treatment



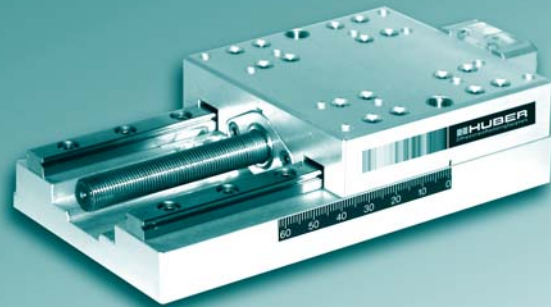
## Dimensions [mm]



A:	B:	C:	D:	H:
100	100	99	144	44

## Accessories

Step motors:	2-/5-Ph. Servo/DC
Hand wheel:	0042
Gear boxes:	2042.10 2042.20
Limit switches:	included var. limit switches
Zero-point control:	9100
Encoder:	incremental, absolute
Control system:	9300



Modularly individually configurable

- from basic model to high-end system
- to multi-axis systems
- with individual travel range
- with customer-specific hole pattern

Application specific versions:

- vacuum compatible
- antimagnetic
- radiation resistant
- in black

Three precision configurations:

**X1** **X2** **XE**

- Multi-axis positioning systems possible by simple combination of stages
- Optionally available with precision ball-roll, thread-roll or ground thread spindle
- Wear resistant delta bronze spindle nut
- Mounting of drive spindle free of play
- Use of low-friction linear guides results in optimum fine adjustment due to high reproducibility of minimum system step distance
- Use of stress relieved, highly resilient materials guarantees high system stability and long life
- Robust surfaces through galvanic natural-anodising treatment

Maximum load and torque

$F_x$  [N]: 250

$F_y$  [N]: 250

$F_z \uparrow$  [N]: 250

$F_z \downarrow$  [N]: 250

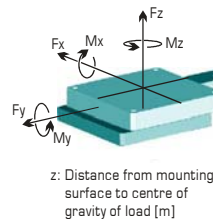
$\Sigma F$  [N]:  $\leq 250$

$M_x$  [Nm]: 18 [=  $F_y \times (z+0,013)$ ]

$M_y$  [Nm]: 26 [=  $F_x \times (z+0,013)$ ]

$M_z$  [Nm]: 21

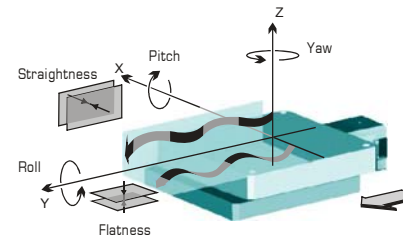
$\Sigma M$  [Nm]:  $\leq 30$



## Specifications

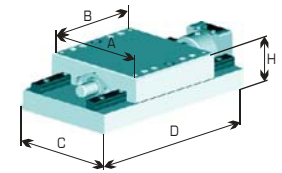
Travel range [mm]:	60*
Material (base/slide):	Aluminium
Slope [mm]:	1
$M_{input}$ (min) [Nm]:	0,1
Stiffness ["/Nm]:	4
Weight [kg]:	1,0

\*Optional: extended or shortened travel range



		<b>X1</b>	<b>X2</b>	<b>XE</b>
Accuracy [ $\mu$ m]:	$\leq \pm$	20	15	0,1...
Repeatability (unidir.) [ $\mu$ m]:	$\leq \pm$	3	2	0,1...
Reversal error [ $\mu$ m]:	$\leq$	8	4	0,1...
Flatness [ $\mu$ m]:	$\leq \pm$	3	2	2
Straightness [ $\mu$ m]:	$\leq \pm$	3	2	2
Yaw ["]:	$\leq \pm$	6	4	4
Pitch ["]:	$\leq \pm$	9	5	5
Roll ["]:	$\leq \pm$	9	5	5

## Dimensions [mm]



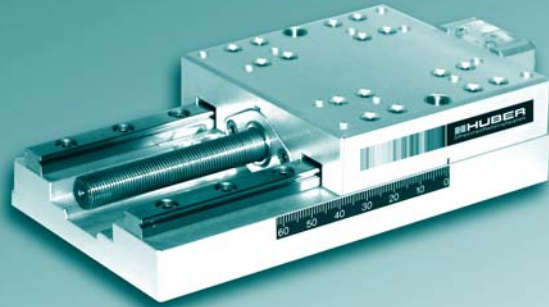
A:	B:	C:	D:	H:
80	80	80	144	35

## Accessories

Step motors:	2-/5-Ph. DC/Servo
Hand wheels:	0032
Gear boxes:	2042.10* 2042.20*
Limit switches:	included
var. limit switches	
Zero-point control:	9100
Encoder <b>XE</b> :	incremental, absolute
Control system:	9300

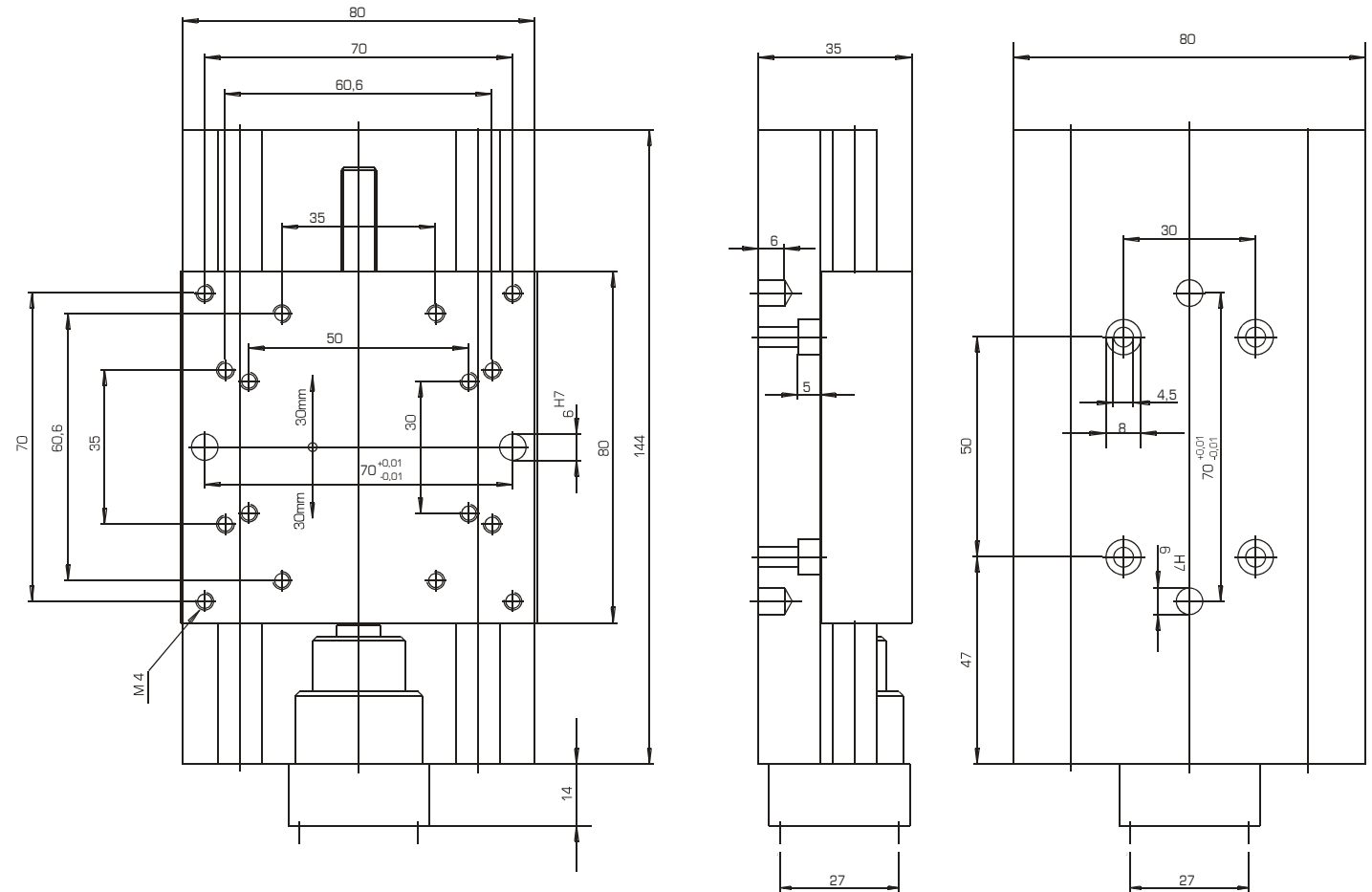
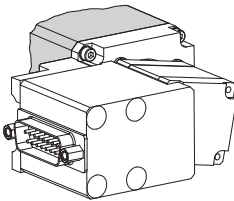
\* Adaptor M301.301-001 required

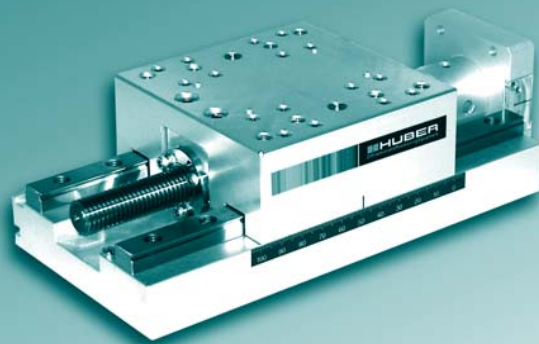
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Diffraction and Positioning Equipment



#### Power supply of motorised version:

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2-phase motors, and via a Sub D25 connector for 5-phase motors. In the standard version this connector is in a housing mounted on the side of the motor.





Modularly individually configurable

- from basic model to high-end system
- to multi-axis systems
- with individual travel range
- with customer-specific hole pattern

Application specific versions:

- vacuum compatible
- antimagnetic
- radiation resistant
- in black

Three precision configurations:

**X1** **X2** **XE**

- Multi-axis positioning systems possible by simple combination of stages
- Optionally available with precision ball-roll, thread-roll or ground thread spindle
- Wear resistant delta bronze spindle nut
- Mounting of drive spindle free of play
- Use of low-friction linear guides results in optimum fine adjustment due to high reproducibility of minimum system step distance
- Use of stress relieved, highly resilient materials guarantees high system stability and long life
- Robust surfaces through galvanic natural-anodising treatment

Maximum load and moments

$F_x$  [N]: 400

$F_y$  [N]: 250

$F_z \uparrow$  [N]: 500

$F_z \downarrow$  [N]: 1000

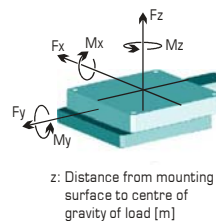
$\Sigma F$  [N]:  $\leq 1000$

$M_x$  [Nm]: 47 [=  $F_y \times (z+0,031)$ ]

$M_y$  [Nm]: 63 [=  $F_x \times (z+0,031)$ ]

$M_z$  [Nm]: 53

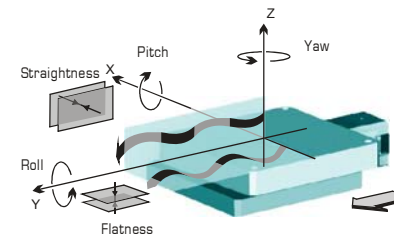
$\Sigma M$  [Nm]:  $\leq 70$



Specifications

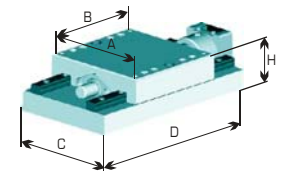
Travel range [mm]:	100*
Material (base/slide):	Aluminium
Slope [mm]:	2
$M_{input}$ (min) [Nm]:	0,6
Stiffness ["/Nm]:	1,8
Weight [kg]:	2,8

\*Optional: extended or shortened travel range



		<b>X1</b>	<b>X2</b>	<b>XE</b>
Accuracy [ $\mu$ m]:	$\leq \pm$	10	4	0,1...
Repeatability (unidir.) [ $\mu$ m]:	$\leq \pm$	3	2	0,1...
Reversal error [ $\mu$ m]:	$\leq$	6	4	0,1...
Flatness [ $\mu$ m]:	$\leq \pm$	3	2	2
Straightness [ $\mu$ m]:	$\leq \pm$	3	2	2
Yaw ["]:	$\leq \pm$	6	4	4
Pitch ["]:	$\leq \pm$	6	4	4
Roll ["]:	$\leq \pm$	6	4	4

Dimensions [mm]

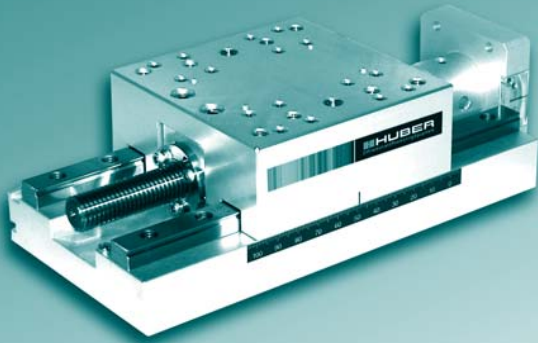


A:	B:	C:	D:	H:
102	100	100	216	62

Accessories

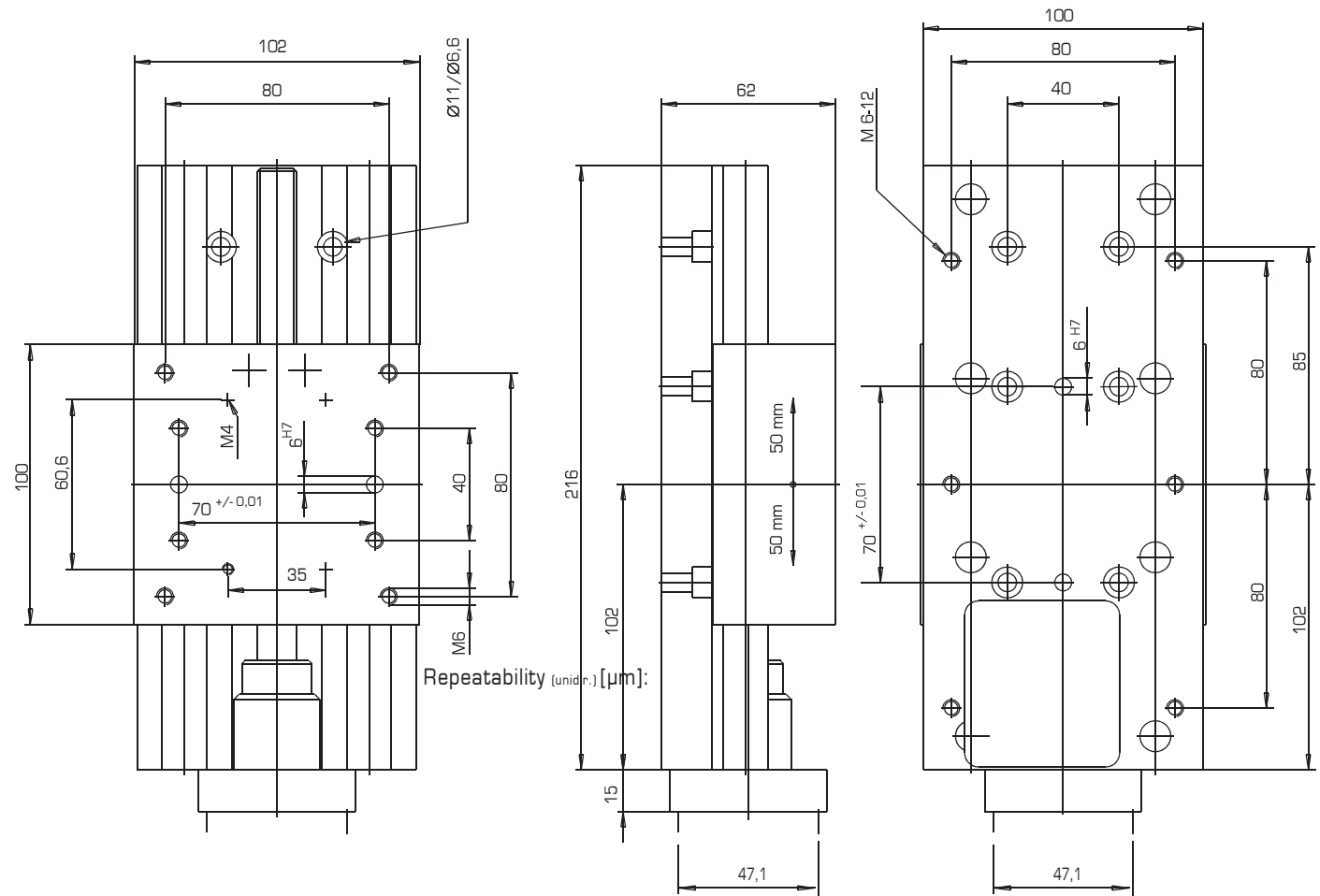
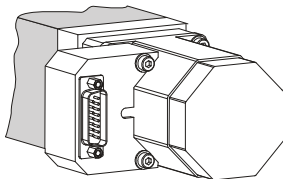
Step motors:	2-/3-/5-Ph. Servo/DC
Hand wheels:	0056
Gear boxes:	2056.05 2056.10 2056.20
Limit switches:	included var. limit switches
Zero-point control:	9100
Encoder <b>XE</b> :	incremental, absolute
Control system:	9300

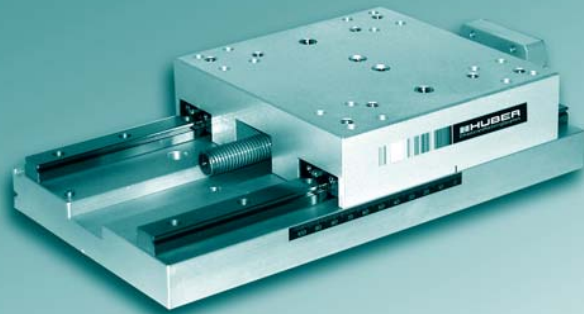
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#### Power supply of motorised version:

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2- and 3-phase motors, and via a Sub D25 connector for 5-phase motors. In the standard version this connector is in a housing mounted on the side of the motor.





- Multi-axis positioning systems possible by simple combination of stages
- Optionally available with precision ball-roll, thread-roll or ground thread spindle
- Wear resistant delta bronze spindle nut
- Mounting of drive spindle free of play
- Use of low-friction linear guides results in optimum fine adjustment due to high reproducibility of minimum system step distance
- Use of stress relieved, highly resilient materials guarantees high system stability and long life
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Modularly individually configurable

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Application specific versions:

- vacuum suitable
- antimagnetic
- radiation resistant
- in black

Three precision configurations:

**X1** **X2** **XE**

### Maximum load and moments

$F_x$  [N]: 250

$F_y$  [N]: 400

$F_z \uparrow$  [N]: 500

$F_z \downarrow$  [N]: 1500

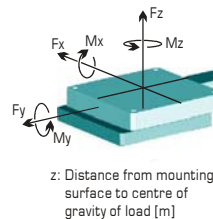
$\Sigma F$  [N]:  $\leq 1500$

$M_x$  [Nm]: 160 [ $=F_y \times (z+0,029)$ ]

$M_y$  [Nm]: 154 [ $=F_x \times (z+0,029)$ ]

$M_z$  [Nm]: 174

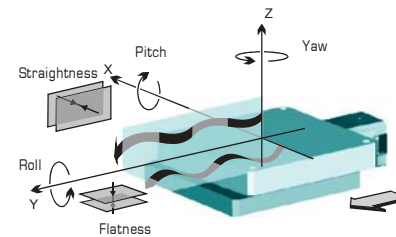
$\Sigma M$  [Nm]:  $\leq 190$



### Specifications

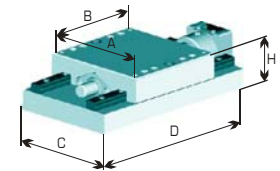
Travel range [mm]:	100*
Material (base/slide):	Aluminium
Slope [mm]:	2
$M_{input}$ (min) [Nm]:	0,6
Stiffness ["/Nm]:	0,7
Weight [kg]:	5,5

\*Optional: extended or shortened travel range



		<b>X1</b>	<b>X2</b>	<b>XE</b>
Accuracy [ $\mu$ m]:	$\leq \pm$	10	4	0,1...
Repeatability (unidir.) [ $\mu$ m]:	$\leq \pm$	3	2	0,1...
Reversal error [ $\mu$ m]:	$\leq$	6	4	0,1...
Flatness [ $\mu$ m]:	$\leq \pm$	3	2	2
Straightness [ $\mu$ m]:	$\leq \pm$	3	2	2
Yaw ["]:	$\leq \pm$	6	4	4
Pitch ["]:	$\leq \pm$	6	4	4
Roll ["]:	$\leq \pm$	6	4	4

### Dimensions [mm]



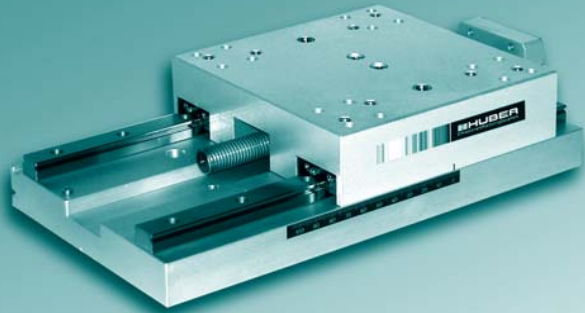
A:	B:	C:	D:	H:
151	150	150	274	62

### Accessories

Step motors:	2-/3-/5-Ph. Servo/DC
Hand wheels:	0056
Gear boxes:	2056.05 2056.10 2056.20
Limit switches:	included var. limit switches
Zero-point control:	9100
Encoder <b>XE</b> :	incremental, absolute
Control system:	9300

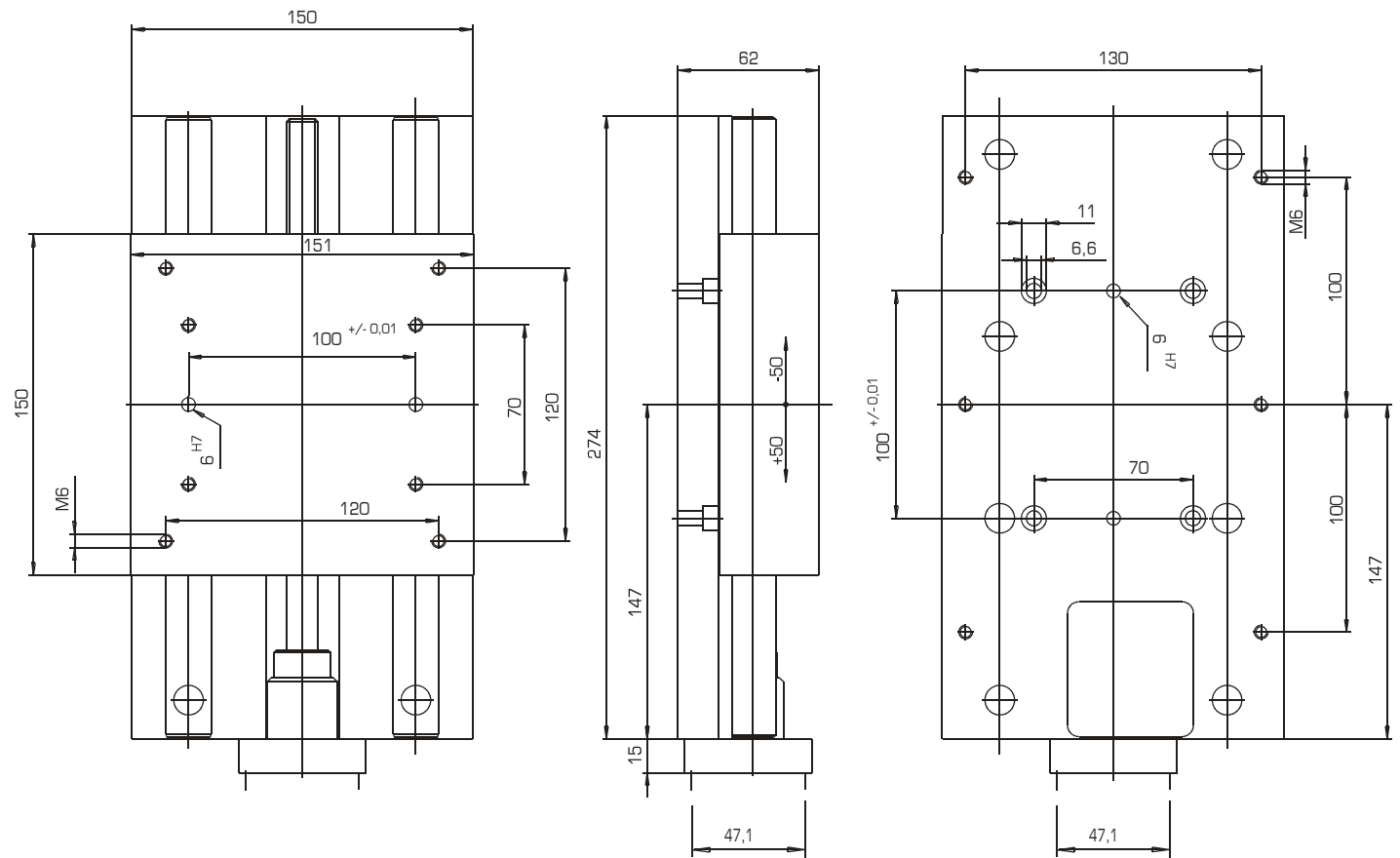
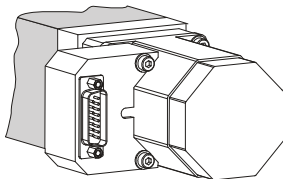


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#### Power supply of motorised version:

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2- and 3-phase motors, and via a Sub D25 connector for 5-phase motors. In the standard version this connector is in a housing mounted on the side of the motor.



Modularly individually configurable

- to multi-axis systems
- with individual travel range
- with customer-specific hole pattern

Application specific versions:

- vacuum compatible
- antimagnetic
- radiation resistant
- in black

### Maximum load and moments

$F_x$  [N]: 400

$F_y$  [N]: 250

$F_z \uparrow$  [N]: 500

$F_z \downarrow$  [N]: 1500

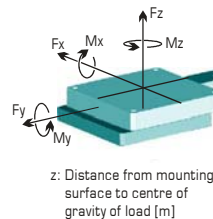
$\Sigma F$  [N]:  $\leq 1500$

$M_x$  [Nm]: 154 [ $=F_y \times (z+0,029)$ ]

$M_y$  [Nm]: 160 [ $=F_x \times (z+0,029)$ ]

$M_z$  [Nm]: 174

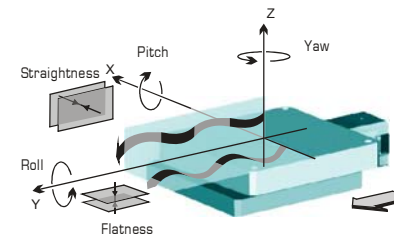
$\Sigma M$  [Nm]:  $\leq 190$



### Specifications

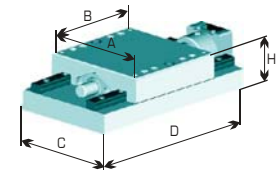
Travel range [mm]:	300*
Material (base/slide):	Aluminium
Slope [mm]:	2
$M_{input}$ (min) [Nm]:	0,6
Stiffness ["/Nm]:	0,7
Weight [kg]:	11

\*Optional: extended or shortened travel range



		X2	XE
Accuracy [ $\mu$ m]:	$\leq \pm$	10	0,1...
Repeatability (unidir.) [ $\mu$ m]:	$\leq \pm$	2	0,1...
Reversal error [ $\mu$ m]:	$\leq$	6	0,1...
Flatness [ $\mu$ m]:	$\leq \pm$	3,5	3,5
Straightness [ $\mu$ m]:	$\leq \pm$	3,5	3,5
Yaw ["]:	$\leq \pm$	2,5	2,5
Pitch ["]:	$\leq \pm$	3,5	3,5
Roll ["]:	$\leq \pm$	2,5	2,5

### Dimensions [mm]



A:	B:	C:	D:	H:
151	150	150	475	75

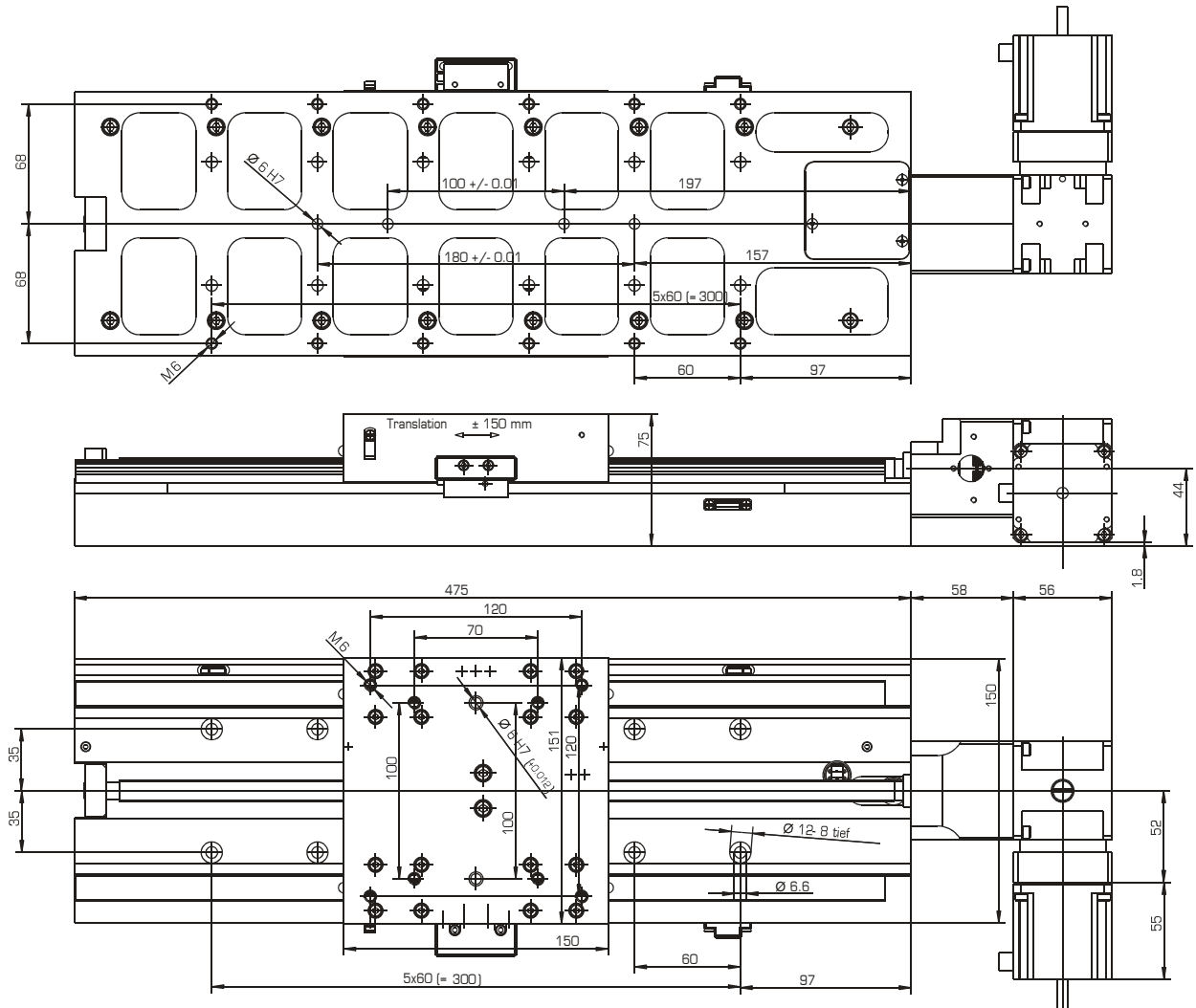
### Accessories

Step motors:	2-/3-/5-Ph. Servo/DC
Hand wheels:	0056
Gear boxes:	2056.05 2056.10 2056.20
Limit switches:	included var. limit switches
Zero-point control:	9100
Encoder XE:	incremental, absolute
Control system:	9300

The linear table type 5101.30 in precision configuration X2 with an operational range of 300mm is exemplary for the precision technology of the series 5101.

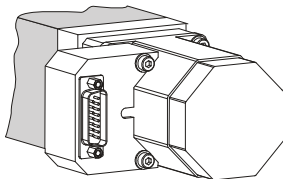
- Drive and guide components manually adjusted and controlled with up-to-date measurement technology
- High-precision recirculating ball spindle
- Mounting of drive spindle free of play
- Use of low-friction linear guides results in optimum fine adjustment due to high reproducibility of minimum system step distance
- Use of stress relieved, highly resilient materials guarantees high system stability and long life
- Robust surfaces through galvanic natural-anodising treatment

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Diffraction and Positioning Equipment



#### Power supply of motorised version:

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2- and 3-phase motors, and via a Sub D25 connector for 5-phase motors. In the standard version this connector is in a housing mounted on the side of the motor.





- Base and slide made of high-strength low-tension aluminium
- Ground and tempered, self-locking thread spindle drive
- Wear resistant delta bronze spindle nut
- Use of low-friction linear guides results in optimum fine adjustment due to high reproducibility of minimum system step distance
- Robust surfaces through galvanic natural-anodizing treatment
- Optional choice of step or DC-motor drive
- Adaptor for mounting of series 1000 goniometer heads included

#### Application specific versions:

- vacuum suitable
- antimagnetic
- radiation resistant
- in black

#### Maximum load and torque

A general statement of maximum load and torque capacities is not possible for eccentric forces due to the amount of different configurations.

However, our engineers will gladly calculate the maximum load capacity for your specific application.

#### Specifications

Travel range [mm]:	± 5 (both axes)
Maximum load [N]:	50
Material (base/slide):	Aluminium
Slope [mm/U]:	0,5
$M_{input}$ (min) [Nm]:	0,2
Stiffness ["/Nm]:	9
Weight [kg]:	3

#### Technical data motor:

Type:	AM 1524
Number of phases:	2
Socket configuration:	optional
Angle of full step [°]:	15
Rated current [A/phase]:	0,25
Resistance [ $\Omega$ /phase]:	12,5
Gear box reduction:	141:1
Gear box type:	15/8 free of play

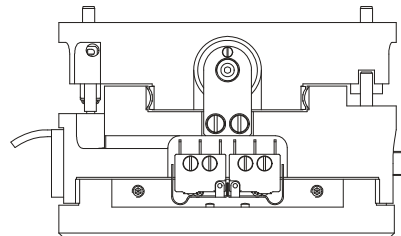
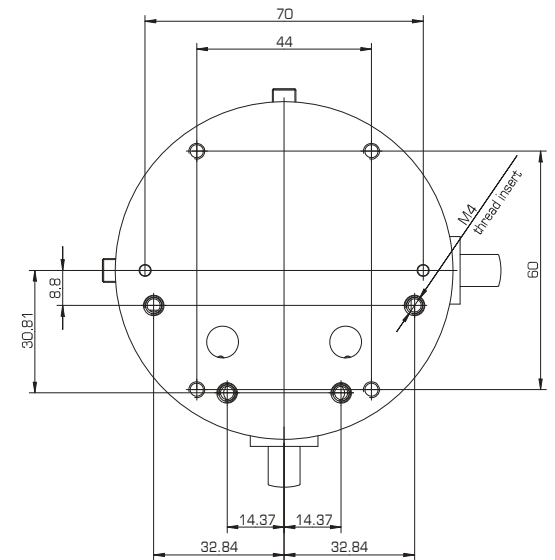
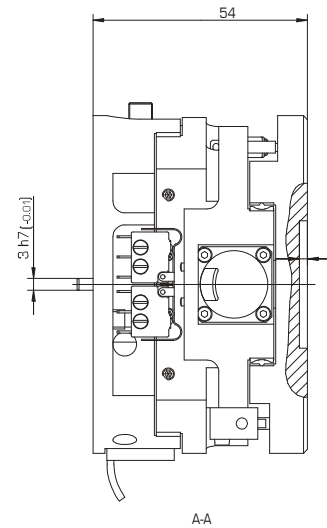
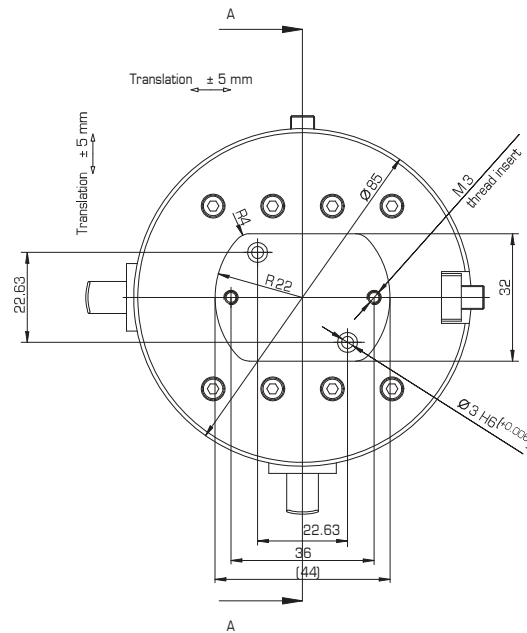
#### Dimensions [mm]

Mounting area [mm]:	Ø 85
Height [mm]:	54

#### Accessories

Step motors:	2-Ph. incl.
DC Motor	1616
Gear box:	141:1 included
Limit switches:	included
Zero-point control:	included
Encoder:	DC version incremental
Control system:	9300

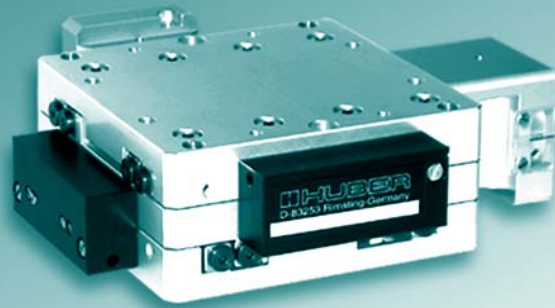
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Diffraction and Positioning Equipment



#### Power supply:

The power supply for the motor as well as the transmission of the end switch and reference point signals are via two Sub D15 connector. The connectors are mounted either on an additional base plate, or optionally on a 0,5m long cable.





- Multi-axis positioning systems possible by simple combination of stages (e.g with 5203.10, 5103.10)
- High-precision spindle drive with ground and tempered spindle, self-locking
- Wear resistant delta bronze spindle nut
- Mounting of drive spindle free of play
- Use of low-friction linear ball guides results in optimum fine adjustment due to high reproducibility of minimum system step distance
- Use of stress relieved, highly resilient materials guarantees high system stability and long life
- Robust surfaces through galvanic anodisation

Modularly individually configurable

- from basic model to high-end system
- to multi-axis systems
- with customer-specific hole pattern

Application specific versions:

- vacuum compatible
- antimagnetic
- radiation resistant
- in black

Three precision configurations:

**X1** **X2\*** **XE**

\* Please contact us for values

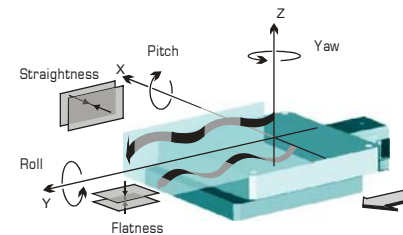
### Maximum load and torque

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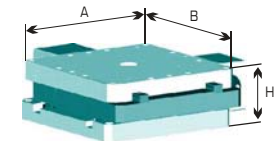
### Specifications

Travel range [mm]:	± 12
Max. load [N]:	500
Material (base/slide):	Aluminium
Slope [mm]:	1
$M_{input}$ (min) [Nm]:	0,2
Stiffness ["/Nm]:	7
Weight [kg]:	2,5



	<b>X1</b>	<b>XE</b>
Accuracy [μm]:	≤ ± 15	0,1
Repeatability (unidir.) [μm]:	≤ ± 3	0,1
Reversal error [μm]:	≤ 5	0,1
Flatness [μm]:	≤ ± 3	3
Straightness [μm]:	≤ ± 3	3
Yaw ["]:	≤ ± 5	5
Pitch ["]:	≤ ± 7	7
Roll ["]:	≤ ± 7	7

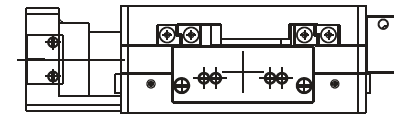
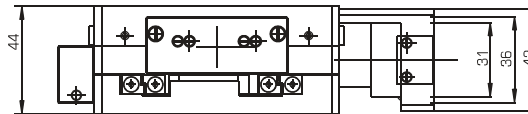
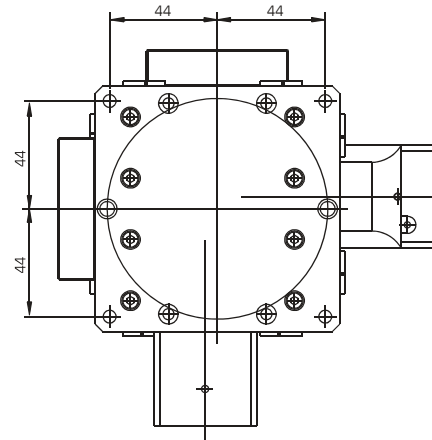
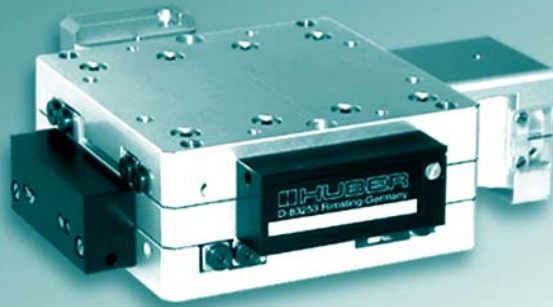
### Dimensions [mm]



A:	B:	H:
100	100	44

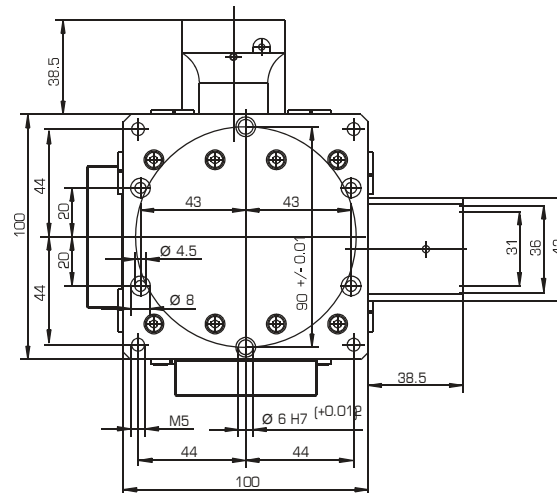
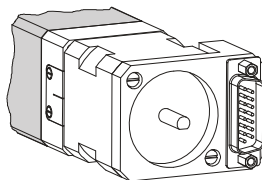
### Accessories

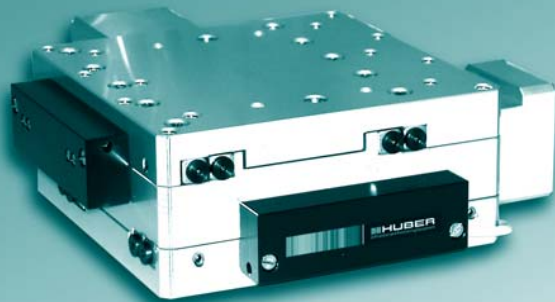
Motors:	2-/5-Ph. Servo/DC
Hand wheels:	0042
Gear boxes:	2042.10 2042.20
Limit switches:	included
Zero-point control:	9100
Encoder <b>XE</b> :	incremental, absolute
Control system:	9300



#### Power supply of motorised version:

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2-phase motors, and via a Sub D25 connector for 5-phase motors. In the standard version this connector is in a housing mounted on the back of the motor.





Modularly individually configurable

- from basic model to high-end system
- to multi-axis systems
- with customer-specific hole pattern

Application specific versions:

- vacuum compatible
- antimagnetic
- radiation resistant
- in black

Three precision configurations:

**X1** **X2\*** **XE**

\* Please contact us for values

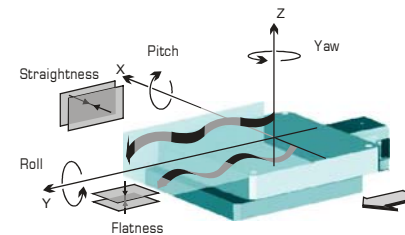
### Maximum load and torque

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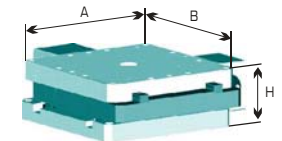
### Specifications

Travel range [mm]:	± 25
Max. load [N]:	500
Material (base/slide):	Aluminium
Slope [mm]:	1
$M_{input}$ (min) [Nm]:	0,3
Stiffness ["/Nm]:	3
Weight [kg]:	2,8



		<b>X1</b>	<b>XE</b>
Accuracy [μm]:	≤ ±	14	0,1
Repeatability (unidir.) [μm]:	≤ ±	5	0,1
Reversal error [μm]:	≤	4	0,1
Flatness [μm]:	≤ ±	3	3
Straightness [μm]:	≤ ±	3	3
Yaw ["]:	≤ ±	5	5
Pitch ["]:	≤ ±	6	6
Roll ["]:	≤ ±	6	6

### Dimensions [mm]

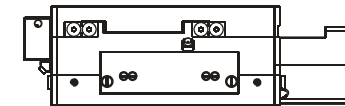
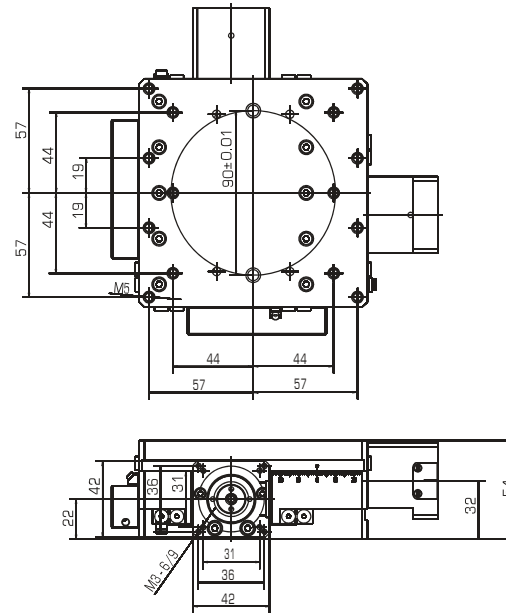
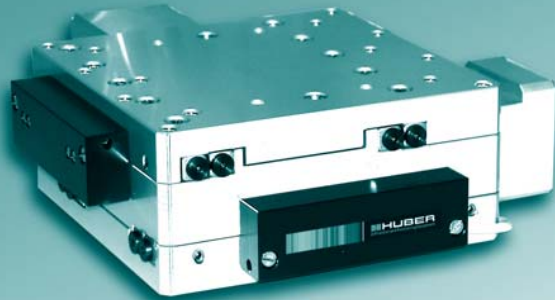


A:	B:	H:
125	125	54

### Accessories

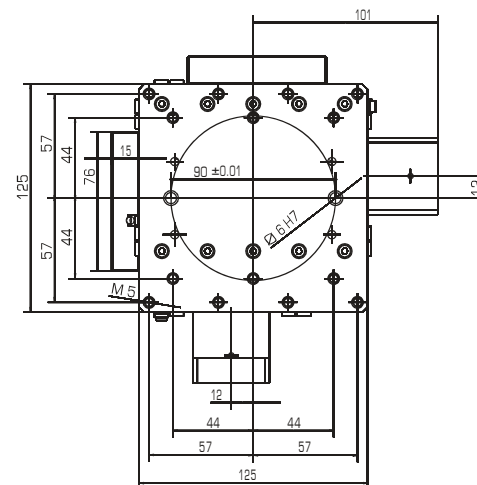
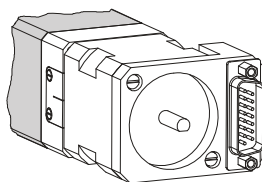
Motors:	2-/5-Ph. Servo/DC
Hand wheels:	0042
Gear boxes:	2042.10 2042.20
Limit switches:	included
Zero-point control:	9100
Encoder <b>XE</b> :	incremental, absolute
Control system:	9300

- Multi-axis positioning systems possible by simple combination of stages
- High-precision spindle drive with ground and tempered spindle, self-locking
- Wear resistant delta bronze spindle nut
- Mounting of drive spindle free of play
- Use of low-friction linear ball guides results in optimum fine adjustment due to high reproducibility of minimum system step distance
- Use of stress relieved, highly resilient materials guarantees high system stability and long life
- Robust surfaces through galvanic anodisation



#### Power supply of motorised version:

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2-phase motors, and via a Sub D25 connector for 5-phase motors. In the standard version this connector is in a housing mounted on the back of the motor.



## Application specific versions:

- radiation resistant
- in black

## Two precision configurations:

**X1** **X2**

## Technical data motor:

Type:	PK 244
Number of phases:	2
Socket configuration:	SUB D15
Steps/revolution:	200/400
Rated current [A/phase]:	1,2
Resistance [ $\Omega$ /phase]:	3,3
Holding torque [Nm]:	0,26

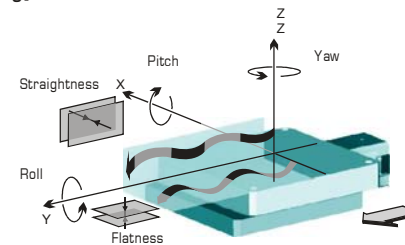
## Maximum load and torque

A general statement of maximum load and torque capacities is not possible for eccentric forces due to the amount of different configurations.

However, our engineers will gladly calculate the maximum load capacity for your specific application.

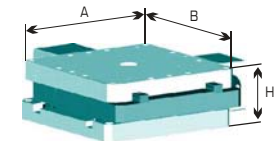
## Specifications

Travel range [mm]:	$\pm 75$
Max. load [N]:	300
Material (base/slide):	Aluminium
Spindle gauge [mm]:	2
$M_{input}$ (min) [Nm]:	0,25
Stiffness [ $^{\circ}$ /Nm]:	10
Weight [kg]:	4



		<b>X1</b>	<b>X2</b>
Accuracy [ $\mu\text{m}$ ]:	$\leq \pm$	50	15
Repeatability (unidir.) [ $\mu\text{m}$ ]:	$\leq \pm$	5	3
Reversal error [ $\mu\text{m}$ ]:	$\leq$	5	3
Flatness [ $\mu\text{m}$ ]:	$\leq \pm$	15	15
Straightness [ $\mu\text{m}$ ]:	$\leq \pm$	10	10
Yaw [ $^{\circ}$ ]:	$\leq \pm$	15	15
Pitch [ $^{\circ}$ ]:	$\leq \pm$	30	30
Roll [ $^{\circ}$ ]:	$\leq \pm$	20	20

## Dimensions [mm]



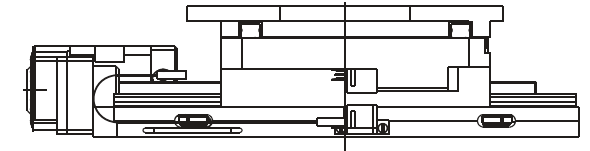
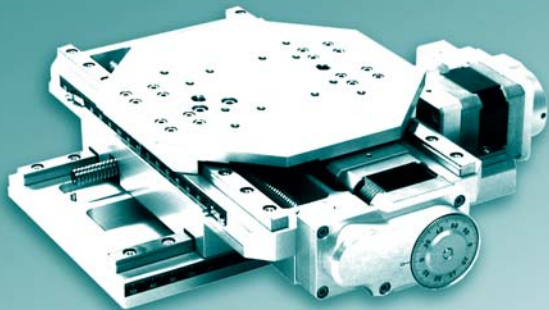
A:	B:	H:
150	150	62

## Accessories

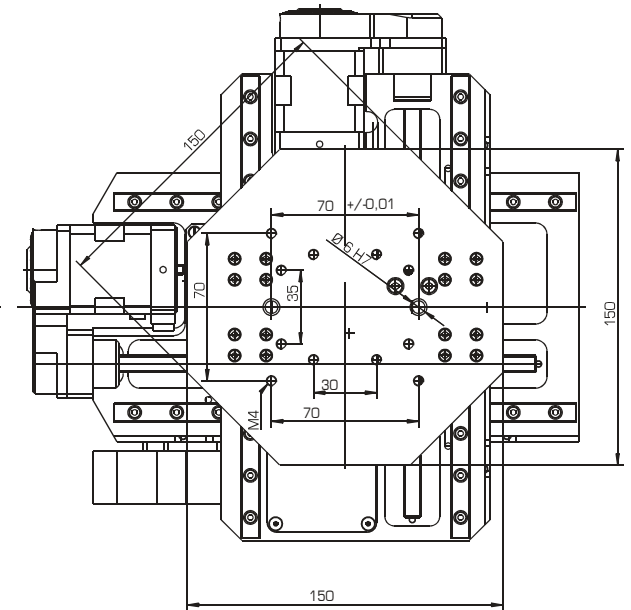
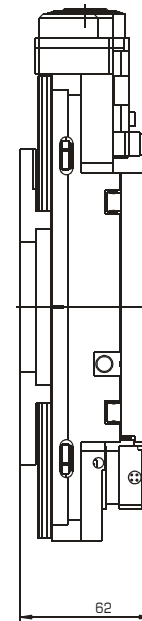
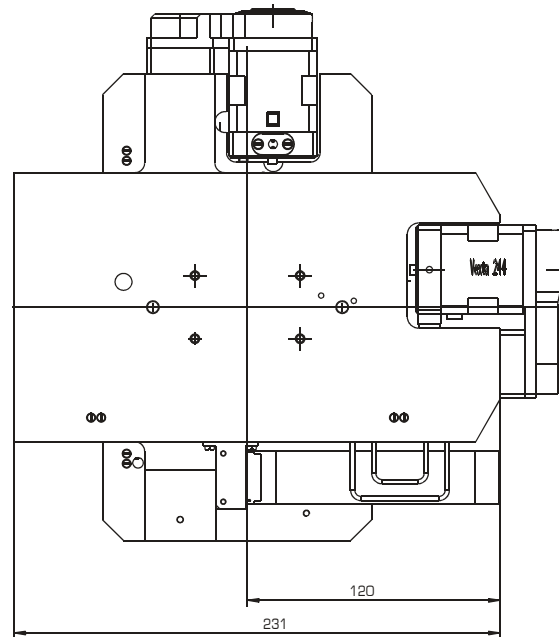
Motors:	2-Ph. included 5-Ph. optional
Limit switches:	included
Zero-point control:	included
Control system:	9300

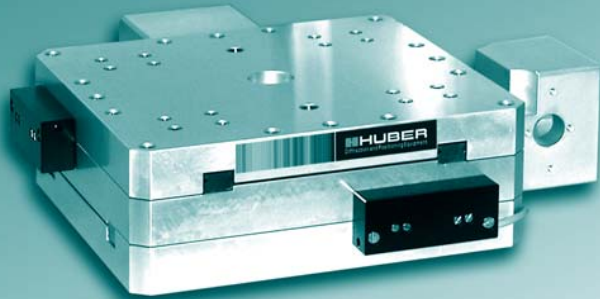
- Multi-axis positioning systems possible by simple combination of stages (e.g with 5104.B20)
- High-precision ball roll spindle drive (two precision configurations available) or optional ground and tempered thread spindle
- Reduced dimensions using a belt drive
- Use of low-friction linear ball guides results in optimum fine adjustment due to high reproducibility of minimum system step distance
- Robust surfaces through galvanic anodisation
- 2-phase step motors as standard motorisation (5-phase step motors optional)



**Power supply:**

The power supply for the motor as well as the transmission of the end switch and reference point signals are via two Sub D15 connectors. In the standard version these connectors are mounted on the side of the housing





- Multi-axis positioning systems possible by simple combination of stages (e.g with 5203.20, 5103.20)
- High-precision trapezoidal spindle drive with ground and tempered spindle, self-locking
- Wear resistant delta bronze spindle nut
- Mounting of drive spindle free of play
- Use of low-friction linear ball guides results in optimum fine adjustment due to high reproducibility of minimum system step distance
- Use of stress relieved, highly resilient materials guarantees high system stability and long life
- Robust surfaces through galvanic anodisation

Modularly individually configurable

- from basic model to high-end system
- to multi-axis systems
- with customer-specific hole pattern

Application specific versions:

- vacuum compatible
- antimagnetic
- radiation resistant
- in black

Three precision configurations:

**X1** **X2\*** **XE**

\* Please contact us for values

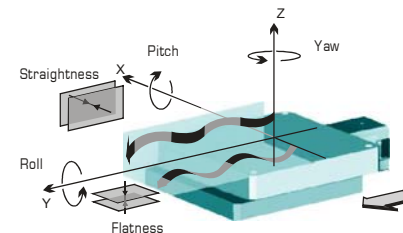
### Maximum load and torque

A general statement of maximum load and torque capacities is not possible for eccentric forces due to the amount of different configurations.

However, our engineers will gladly calculate the maximum load capacity for your specific application.

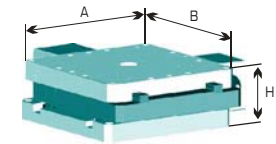
### Specifications

Travel range [mm]:	± 15
Max. load [N]:	2000
Material (base/slide):	Aluminium
Slope [mm]:	2
M <sub>input</sub> (min) [Nm]:	0,3
Stiffness ["/Nm]:	2
Weight [kg]:	7,5



		<b>X1</b>	<b>XE</b>
Accuracy [μm]:	≤ ±	5	0,1
Repeatability (unidir.) [μm]:	≤ ±	2	0,1
Reversal error [μm]:	≤	6	0,1
Flatness [μm]:	≤ ±	2	2
Straightness [μm]:	≤ ±	2	2
Yaw ["]:	≤ ±	6	6
Pitch ["]:	≤ ±	6	6
Roll ["]:	≤ ±	6	6

### Dimensions [mm]



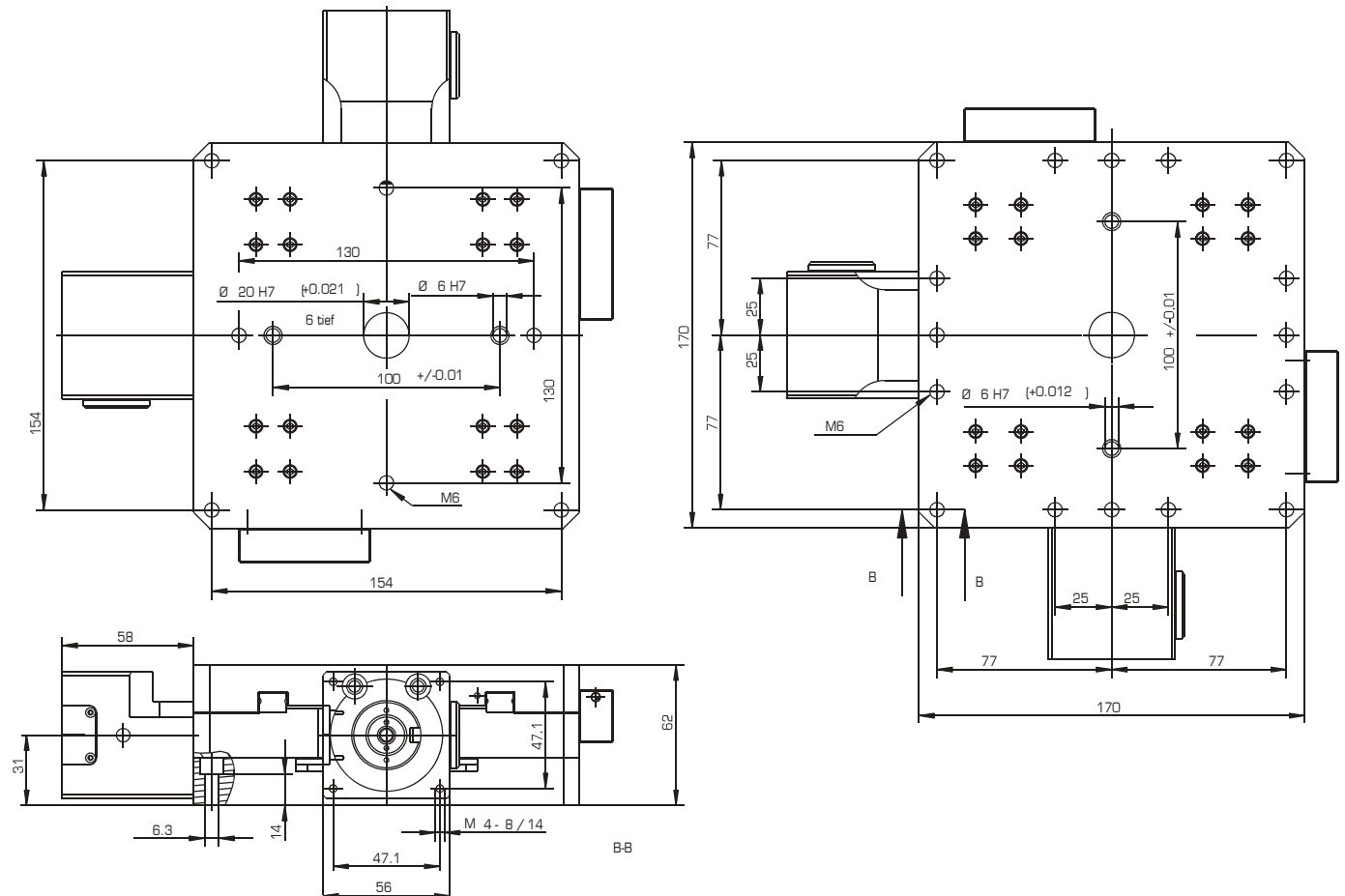
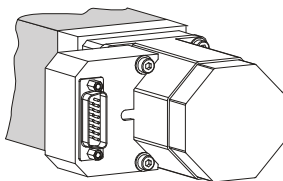
A:	B:	H:
170	170	62

### Accessories

Motors:	2-/3-/5-Ph. Servo/DC
Hand wheels:	0056
Gear boxes:	2056.05 2056.10 2056.20
Limit switches:	included
Zero-point control:	9100
Encoder <b>XE</b> :	incremental, absolut
Control system:	9300

**Power supply of motorised version:**

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2- and 3-phase motors, and via a Sub D25 connector for 5-phase motors. In the standard version this connector is in a housing mounted on the side of the motor.



Modularly individually configurable

- from basic model to high-end system
- to multi-axis systems
- with customer-specific hole pattern

Application specific versions:

- vacuum compatible
- antimagnetic
- radiation resistant
- in black

Three precision configurations:

**X1** **X2\*** **XE**

\* Please contact us for values

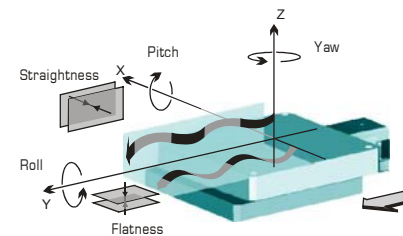
### Maximum load and torque

A general statement of maximum load and torque capacities is not possible for eccentric forces due to the amount of different configurations.

However, our engineers will gladly calculate the maximum load capacity for your specific application.

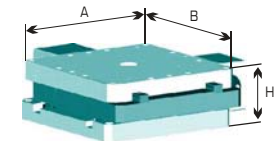
### Specifications

Travel range [mm]:	± 15
Max. load [N]:	2000
Material (base/slide):	Aluminium
Slope [mm]:	2
$M_{input}$ (min) [Nm]:	0,5
Stiffness ["/Nm]:	1
Weight [kg]:	11



		<b>X1</b>	<b>XE</b>
Accuracy [μm]:	≤ ±	5	0,1
Repeatability (unidir.) [μm]:	≤ ±	2	0,1
Reversal error [μm]:	≤	6	0,1
Flatness [μm]:	≤ ±	2	2
Straightness [μm]:	≤ ±	2	2
Yaw ["]:	≤ ±	5	5
Pitch ["]:	≤ ±	5	5
Roll ["]:	≤ ±	5	5

### Dimensions [mm]

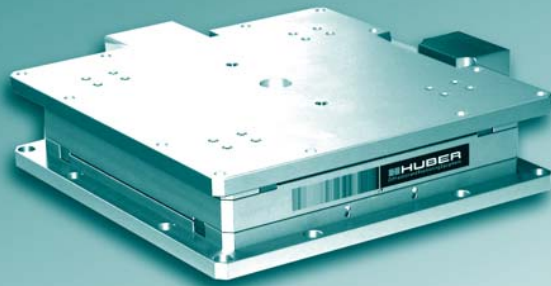


A:	B:	H:
250	250	62

### Accessories

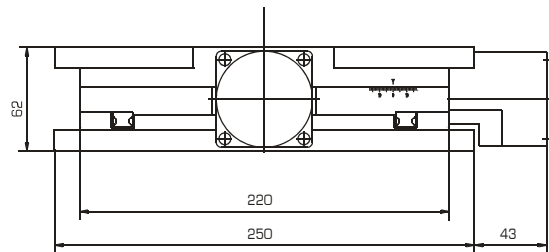
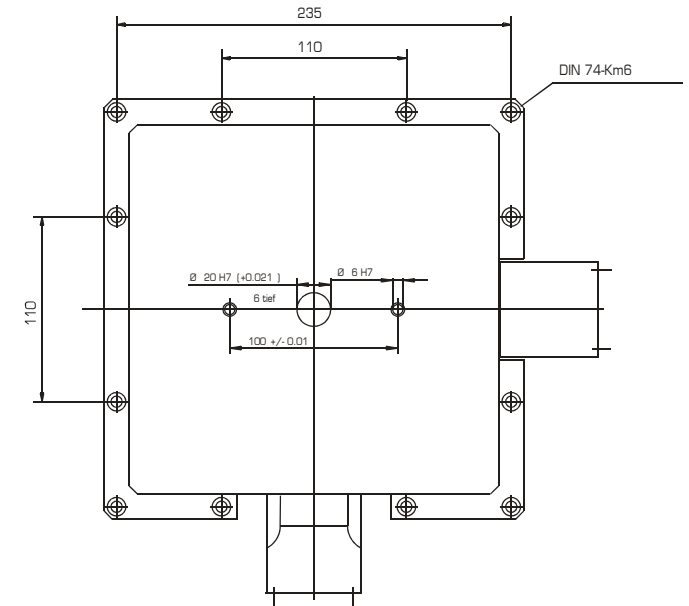
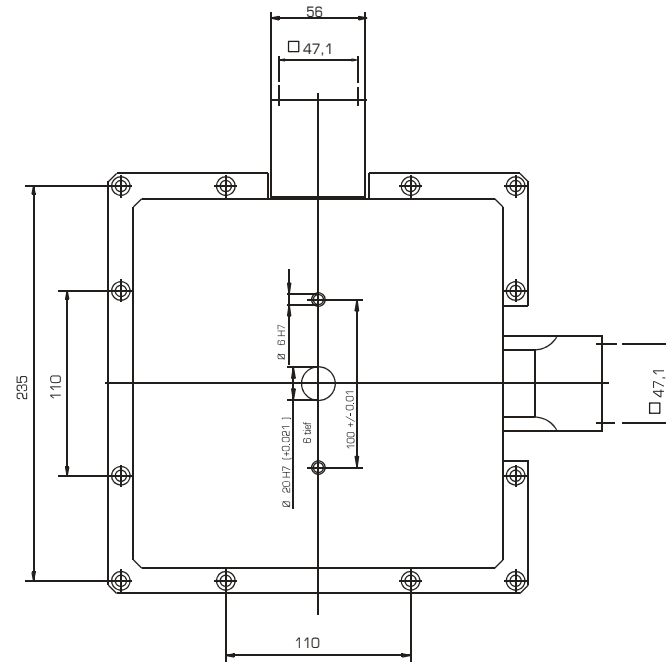
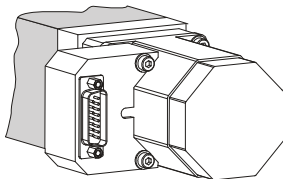
Motors:	2-/3-/5-Ph. Servo/DC
Hand wheels:	0056
Gear boxes:	2056.05 2056.10 2056.20
Limit switches:	included
Zero-point control:	9100
Encoder <b>XE</b> :	incremental, absolute
Control system:	9300

- Multi-axis positioning systems possible by simple combination of stages
- High-precision trapezoidal spindle drive with ground and tempered spindle, self-locking
- Wear resistant delta bronze spindle nut
- Mounting of drive spindle free of play
- Use of low-friction linear ball guides results in optimum fine adjustment due to high reproducibility of minimum system step distance
- Use of stress relieved, highly resilient materials guarantees high system stability and long life
- Robust surfaces through galvanic anodisation

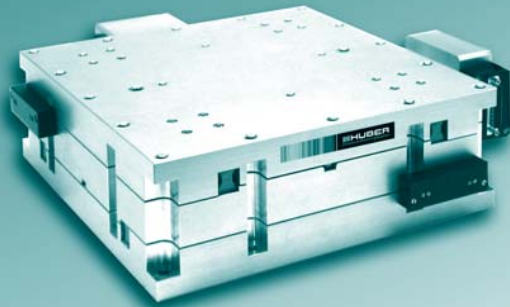


#### Power supply of motorised version:

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2- and 3-phase motors, and via a Sub D25 connector for 5-phase motors. In the standard version this connector is in a housing mounted on the side of the motor.







Modularly individually configurable

- from basic model to high-end system
- to multi-axis systems
- with individual travel range
- with customer-specific hole pattern

Application specific versions:

- vacuum compatible
- antimagnetic
- radiation resistant
- in black

Three precision configurations:

**X1** **X2\*** **XE**

\* Please contact us for values

### Maximum load and torque

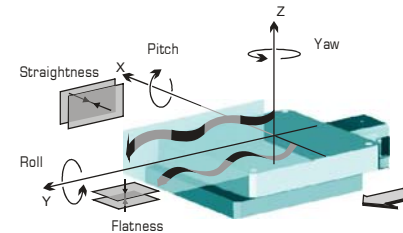
A general statement of maximum load and torque capacities is not possible for eccentric forces due to the amount of different configurations.

However, our engineers will gladly calculate the maximum load capacity for your specific application.

### Specifications

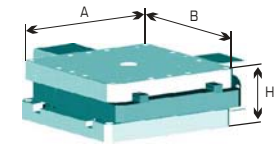
Travel range [mm]:	± 25*
Max. load [N]:	3000
Material (base/slide):	Aluminium
Slope [mm]:	2
M <sub>input</sub> (min) [Nm]:	0,5
Stiffness ["/Nm]:	0,8
Weight [kg]:	26

\*Optional: extended or shortened travel range



		<b>X1</b>	<b>XE</b>
Accuracy [μm]:	≤ ±	4	0,1
Repeatability (unidir.) [μm]:	≤ ±	2	0,1
Reversal error [μm]:	≤	5	0,1
Flatness [μm]:	≤ ±	7	7
Straightness [μm]:	≤ ±	3	3
Yaw ["]:	≤ ±	4	4
Pitch ["]:	≤ ±	4	4
Roll ["]:	≤ ±	4	4

### Dimensions [mm]

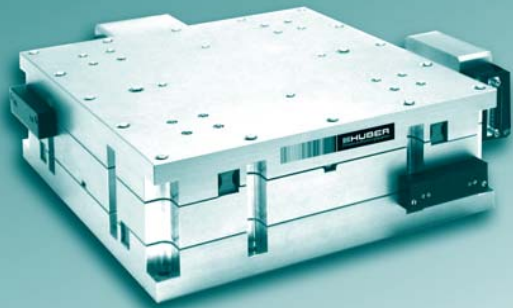


A:	B:	H:
300	300	100

### Accessories

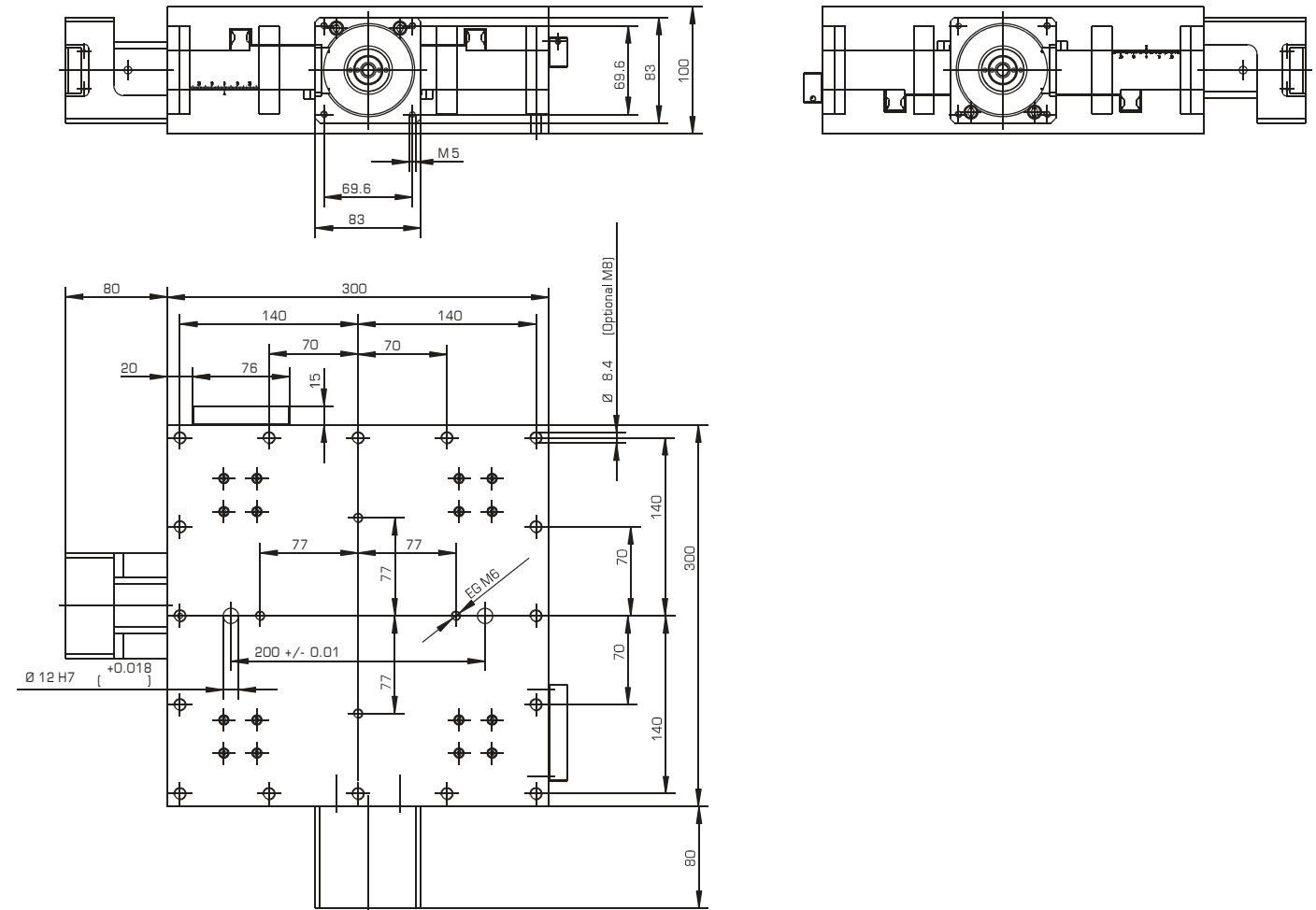
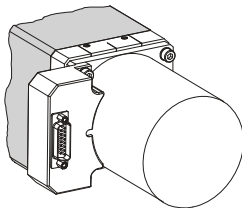
Motors:	2-/3-/5-Ph. Servo/DC
Hand wheels:	0083
Gear boxes:	2083.05 2083.10 2083.20
Limit switches:	included
Zero-point control:	9100
Encoder <b>XE</b> :	incremental, absolute
Control system:	9300

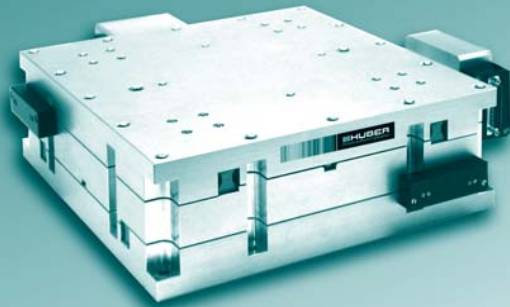
- Multi-axis positioning systems possible by simple combination of stages (e.g with 5203.80, 5104.D80)
- High-precision trapezoidal spindle drive with ground and tempered spindle, self-locking
- Wear resistant delta bronze spindle nut
- Mounting of drive spindle free of play
- Use of low-friction linear ball guides results in optimum fine adjustment due to high reproducibility of minimum system step distance
- Use of stress relieved, highly resilient materials guarantees high system stability and long life
- Robust surfaces through galvanic anodisation



#### Power supply of motorised version:

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2- and 3-phase motors, and via a Sub D25 connector for 5-phase motors. In the standard version this connector is in a housing mounted on the side of the motor.





Modularly individually configurable

- from basic model to high-end system
- to multi-axis systems
- with individual travel range
- with customer-specific hole pattern

Application specific versions:

- vacuum compatible
- antimagnetic
- radiation resistant
- in black

Three precision configurations:

**X1** **X2\*** **XE**

\* Please contact us for values

### Maximum load and torque

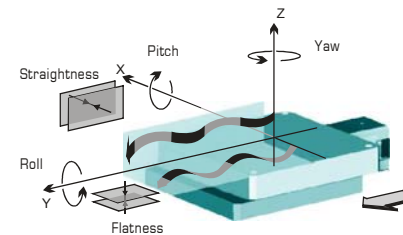
A general statement of maximum load and torque capacities is not possible for eccentric forces due to the amount of different configurations.

However, our engineers will gladly calculate the maximum load capacity for your specific application.

### Specifications

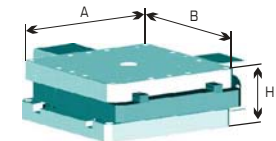
Travel range [mm]:	± 25*
Max. load [N]:	4000
Material (base/slide):	Aluminium
Slope [mm]:	2
$M_{input}$ (min) [Nm]:	0,5
Stiffness ["/Nm]:	0,7
Weight [kg]:	35

\*Optional: extended or shortened travel range



		<b>X1</b>	<b>XE</b>
Accuracy [μm]:	≤ ±	4	0,1
Repeatability (unidir.) [μm]:	≤ ±	2	0,1
Reversal error [μm]:	≤	6	0,1
Flatness [μm]:	≤ ±	2	2
Straightness [μm]:	≤ ±	2	2
Yaw ["]:	≤ ±	4	4
Pitch ["]:	≤ ±	4	4
Roll ["]:	≤ ±	4	4

### Dimensions [mm]

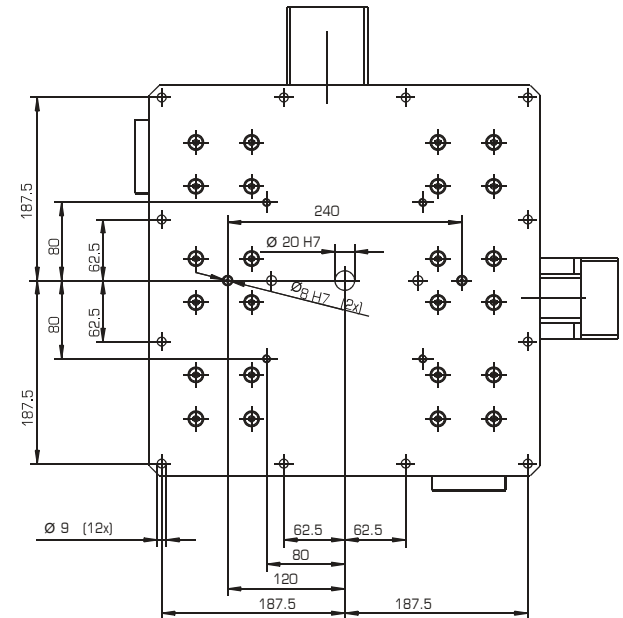
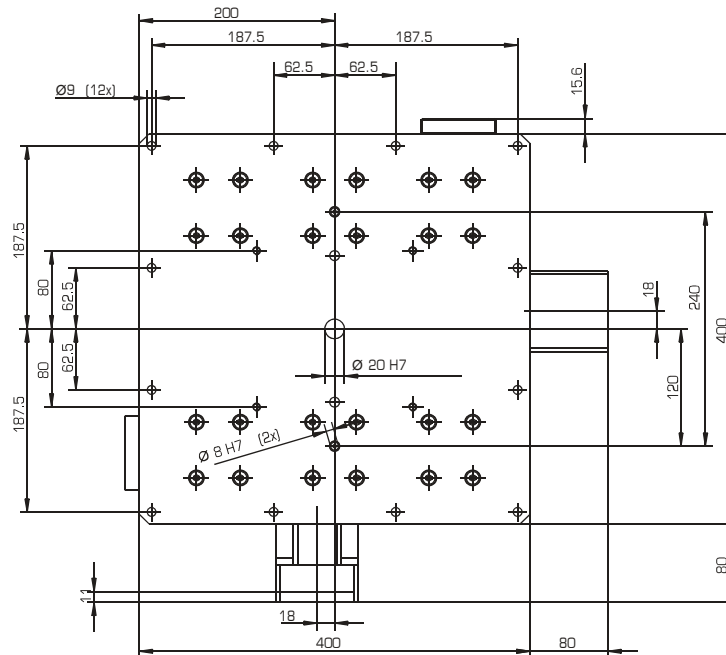
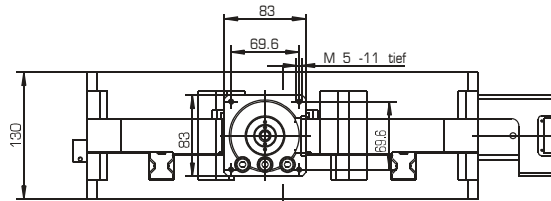
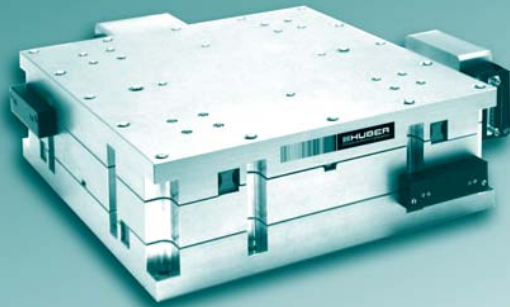


A:	B:	H:
400	400	130

### Accessories

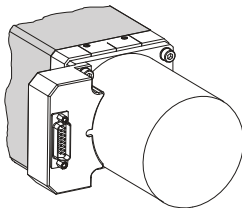
Motors:	2-/3-/5-Ph. Servo/DC
Hand wheels:	0083
Gear boxes:	2083.05 2083.10 2083.20
Limit switches:	included
Zero-point control:	9100
Encoder <b>XE</b> :	incremental, absolute
Control system:	9300

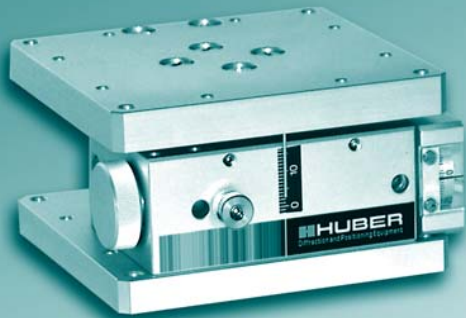
- Multi-axis positioning systems possible by simple combination of stages (e.g with 5203.80, 5104.D80)
- High-precision trapezoidal spindle drive with ground and tempered spindle, self-locking
- Wear resistant delta bronze spindle nut
- Mounting of drive spindle free of play
- Use of low-friction linear ball guides results in optimum fine adjustment due to high reproducibility of minimum system step distance
- Use of stress relieved, highly resilient materials guarantees high system stability and long life
- Robust surfaces through galvanic anodisation



#### Power supply of motorised version:

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2- and 3-phase motors, and via a Sub D25 connector for 5-phase motors. In the standard version this connector is in a housing mounted on the side of the motor.





- Multi-axis positioning systems possible by simple combination of stages (e.g. with 5102.10, 5203.10)
- High-precision worm gear drive
- Use of low-friction plastic slideway high-precision pillar guides results in optimum fine adjustment due to high reproducibility of minimum system step distance
- Use of stress relieved, highly resilient materials guarantees high system stability and long life
- Robust surfaces through galvanic anodisation

Modularly individually configurable

- from basic model to high-end system
- to multi-axis systems
- with option of three spindle slopes
- with customer-specific hole pattern

Application specific versions:

- vacuum compatible
- antimagnetic
- radiation resistant
- in black

Three precision configurations:

**X1** **X2** **XE**

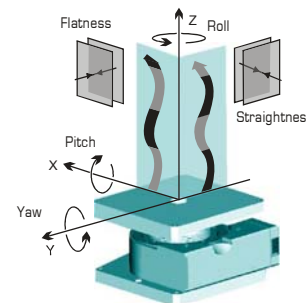
#### Maximum load and torque

A general statement of maximum load and torque capacities is not possible for eccentric forces due to the amount of different configurations.

However, our engineers will gladly calculate the maximum load capacity for your specific application.

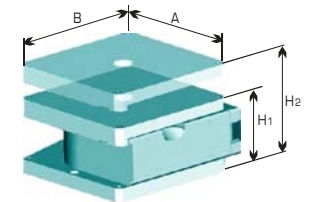
#### Specifications

Travel range [mm]:	15
Max. load [N]:	300
Material (housing/plates):	Aluminium
Slope [mm/U]:	0,02, 0,06, 0,12
Stiffness ["/Nm]:	12
$M_{input}$ [min] [Nm]:	0,3
Weight [kg]:	1,5



		<b>X1</b>	<b>X2</b>	<b>XE</b>
Accuracy [μm]:	≤ ±	7	3	0,1...
Repeatability (unidir.) [μm]:	≤ ±	3	2	0,1...
Reversal error [μm]:	≤	10	3	0,1...
Flatness [μm]:	≤ ±	12	5	5
Straightness [μm]:	≤ ±	12	5	5
Yaw ["]:	≤ ±	14	8	8
Pitch ["]:	≤ ±	14	8	8
Roll ["]:	≤ ±	14	8	8

#### Dimensions [mm]



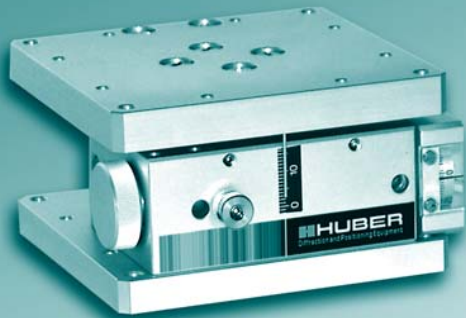
A:	B:	H1:	H2:
100	100	55	55+15

#### Accessories

Motors:	2-/5-Ph. Servo/DC
Hand wheels:	0032
Gear boxes:	2042.10* 2042.20*
Limit switches:	included
Zero-point control:	
Encoder <b>XE</b> :	incremental, absolute
Control system:	9300

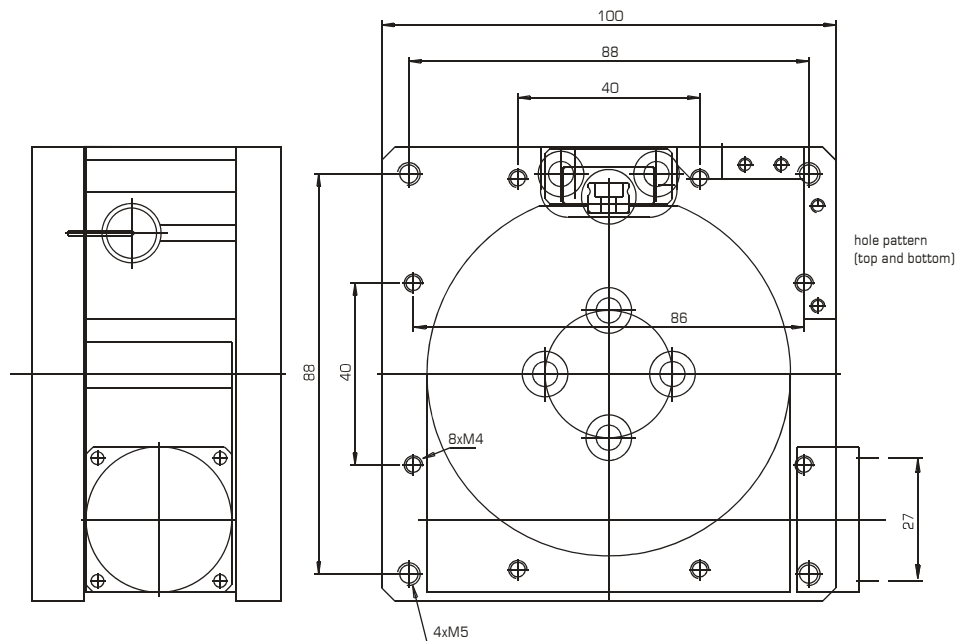
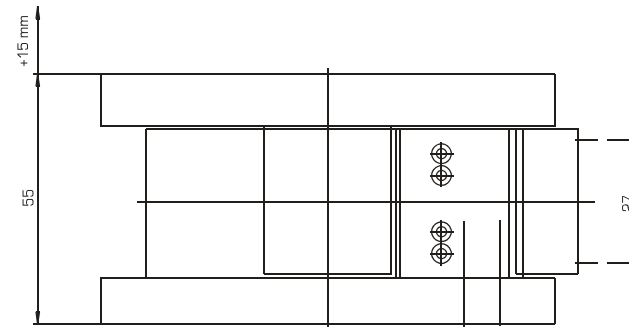
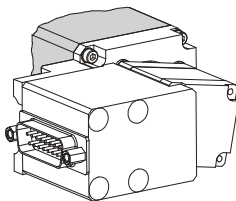
\* in combination with adaptor M301.301-001

**HUBER**  
Diffraction and Positioning Equipment

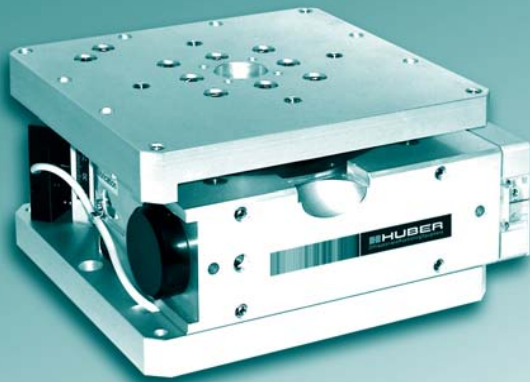


#### Power supply of motorised version:

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2-phase motors, and via a Sub D25 connector for 5-phase motors. In the standard version this connector is in a housing mounted on the side of the motor.







- Multi-axis positioning systems possible by simple combination of stages (e.g. with 5102.20, 5203.20)
- High-precision worm gear drive
- Use of low-friction plastic slideway high-precision pillar guides results in optimum fine adjustment due to high reproducibility of minimum system step distance
- Use of stress relieved, highly resilient materials guarantees high system stability and long life
- Robust surfaces through galvanic anodisation

Modularly individually configurable

- from basic model to high-end system
- to multi-axis systems
- with option of three spindle slopes
- with customer-specific hole pattern

Application specific versions:

- vacuum compatible
- antimagnetic
- radiation resistant
- in black

Three precision configurations:

**X1** **X2** **XE**

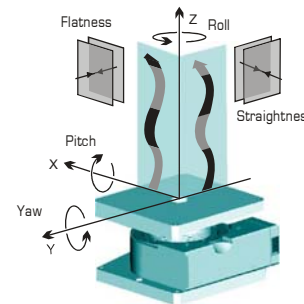
### Maximum load and torque

A general statement of maximum load and torque capacities is not possible for eccentric forces due to the amount of different configurations.

However, our engineers will gladly calculate the maximum load capacity for your specific application.

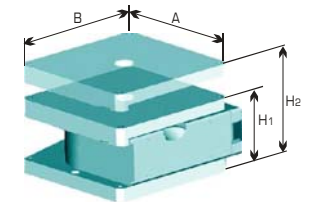
### Specifications

Travel range [mm]:	40
Max. load [N]:	1500
Material (housing/plates):	Aluminium
Slope [mm/U]:	0,02, 0,06
Stiffness ["/Nm]:	1,5
$M_{input}$ [min] [Nm]:	0,3
Weight [kg]:	7,5



		<b>X1</b>	<b>X2</b>	<b>XE</b>
Accuracy [ $\mu$ m]:	$\leq \pm$	5	2	0,1...
Repeatability (unidir.) [ $\mu$ m]:	$\leq \pm$	3	1	0,1...
Reversal error [ $\mu$ m]:	$\leq$	7	2	0,1...
Flatness [ $\mu$ m]:	$\leq \pm$	4	2	2
Straightness [ $\mu$ m]:	$\leq \pm$	4	2	2
Yaw ["]:	$\leq \pm$	6	2	2
Pitch ["]:	$\leq \pm$	6	2	2
Roll ["]:	$\leq \pm$	8	3	3

### Dimensions [mm]

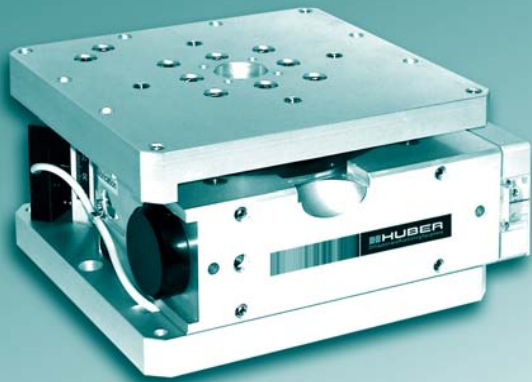


A:	B:	H1:	H2:
170	170	90	90+40

### Accessories

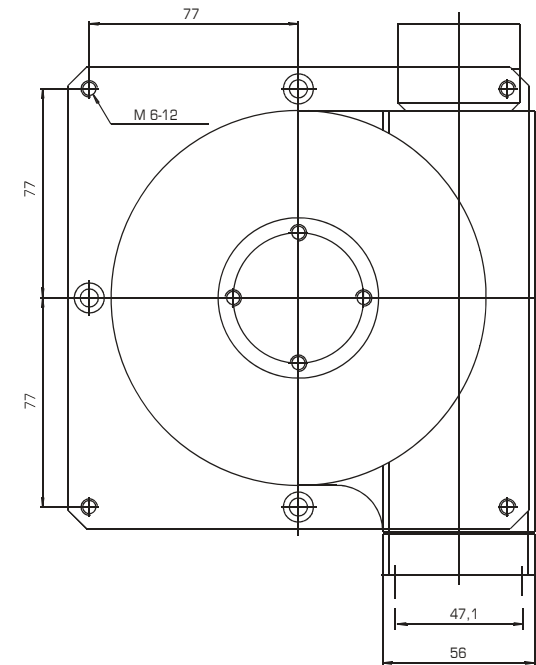
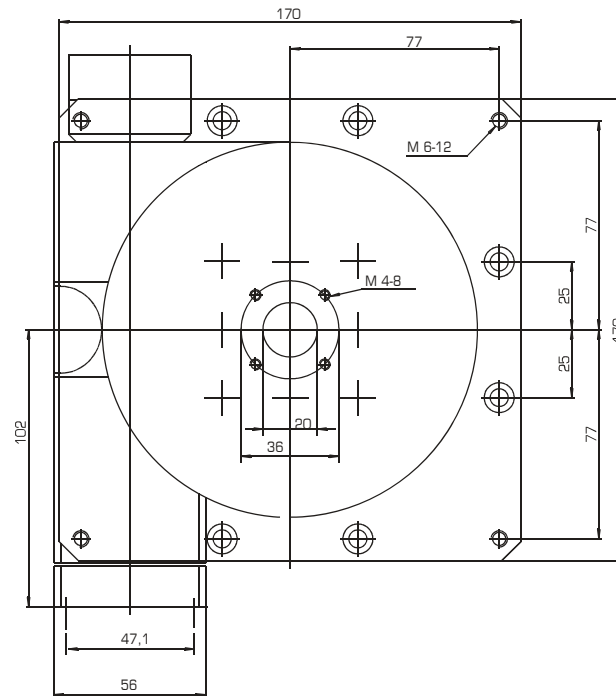
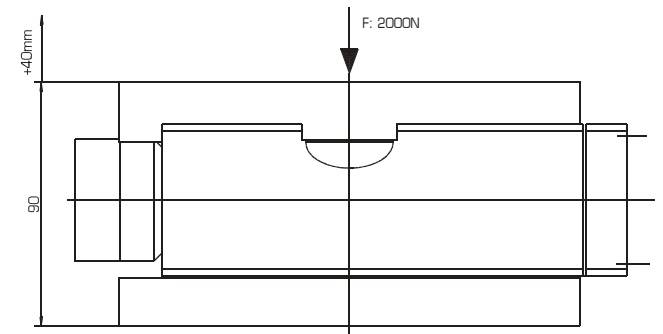
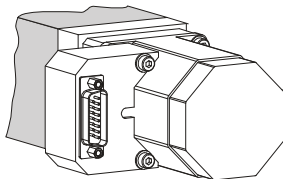
Motors:	2-/3-/5-Ph. Servo/DC
Hand wheels:	0056
Gear boxes:	2056.05 2056.10 2056.20
Limit switches:	included
Zero-point control:	9100
Encoder <b>XE</b> :	incremental, absolute
Control system:	9300

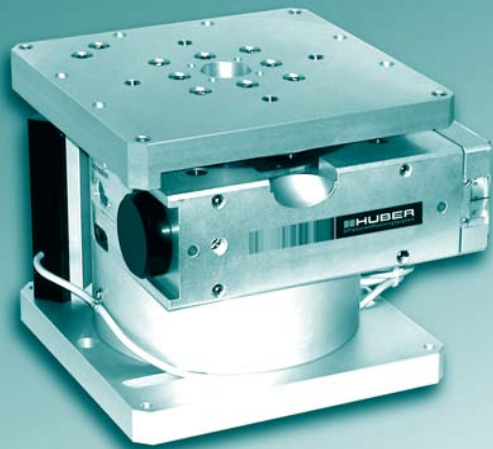
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#### Power supply of motorised version:

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2- and 3-phase motors, and via a Sub D25 connector for 5-phase motors. In the standard version this connector is in a housing mounted on the side of the motor.





- Multi-axis positioning systems possible by simple combination of stages (e.g. with 5102.20, 5203.20)
- High-precision worm gear drive
- Use of low-friction plastic slideway high-precision pillar guides results in optimum fine adjustment due to high reproducibility of minimum system step distance
- Use of stress relieved, highly resilient materials guarantees high system stability and long life
- Robust surfaces through galvanic anodisation

Modularly individually configurable

- from basic model to high-end system
- to multi-axis systems
- with option of three spindle slopes
- with customer-specific hole pattern

Application specific versions:

- vacuum compatible
- antimagnetic
- radiation resistant
- in black

Three precision configurations:

**X1** **X2** **XE**

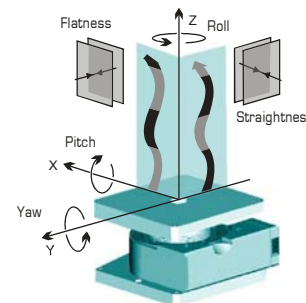
#### Maximum load and torque

A general statement of maximum load and torque capacities is not possible for eccentric forces due to the amount of different configurations.

However, our engineers will gladly calculate the maximum load capacity for your specific application.

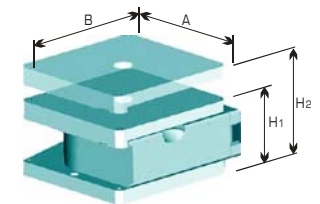
#### Specifications

Travel range [mm]:	90
Max. load [N]:	1500
Material (housing/plates):	Aluminium
Slope [mm/U]:	0,02, 0,06
Stiffness ["/Nm]:	2,5
$M_{input}$ [min] [Nm]:	0,3
Weight [kg]:	11



		<b>X1</b>	<b>X2</b>	<b>XE</b>
Accuracy [ $\mu$ m]:	$\leq \pm$	5	3	0,1...
Repeatability (unidir.) [ $\mu$ m]:	$\leq \pm$	3	1	0,1...
Reversal error [ $\mu$ m]:	$\leq$	9	4	0,1...
Flatness [ $\mu$ m]:	$\leq \pm$	7	4	4
Straightness [ $\mu$ m]:	$\leq \pm$	7	4	4
Yaw ["]:	$\leq \pm$	8	5	5
Pitch ["]:	$\leq \pm$	8	5	5
Roll ["]:	$\leq \pm$	10	6	6

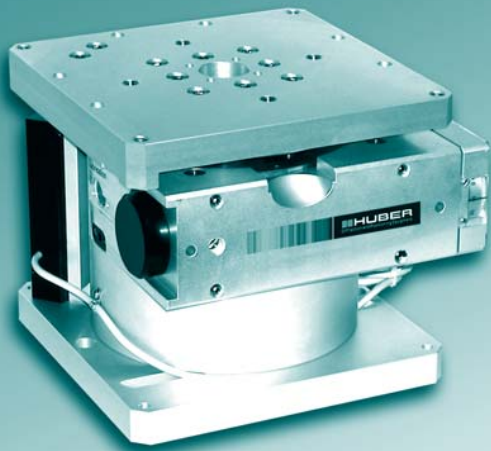
#### Dimensions [mm]



A:	B:	H1:	H2:
170	170	140	140+90

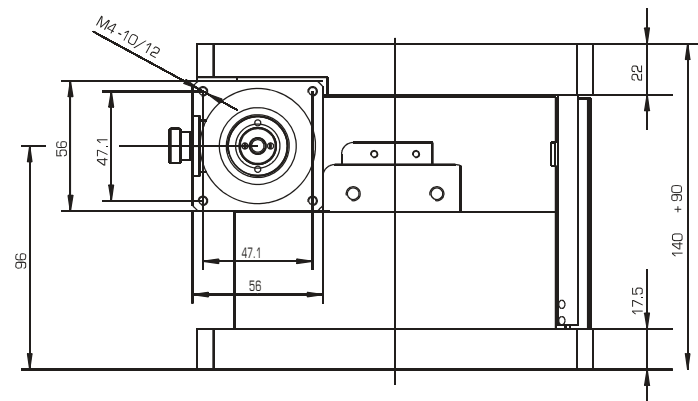
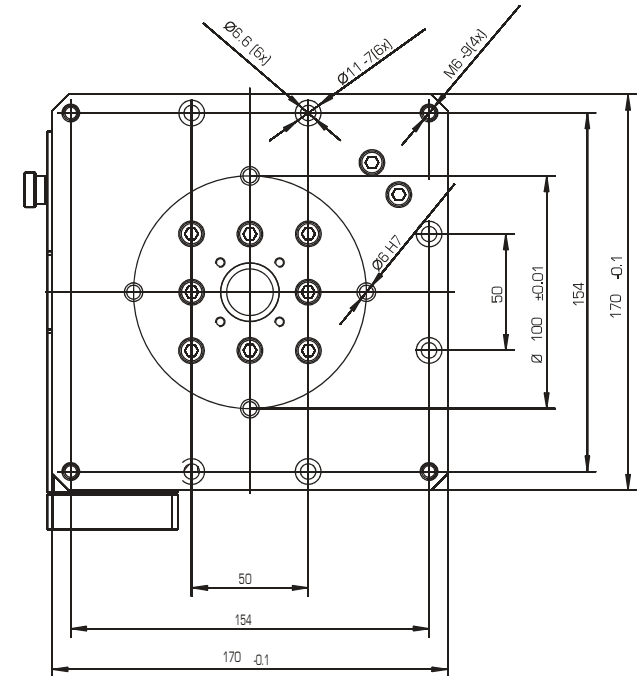
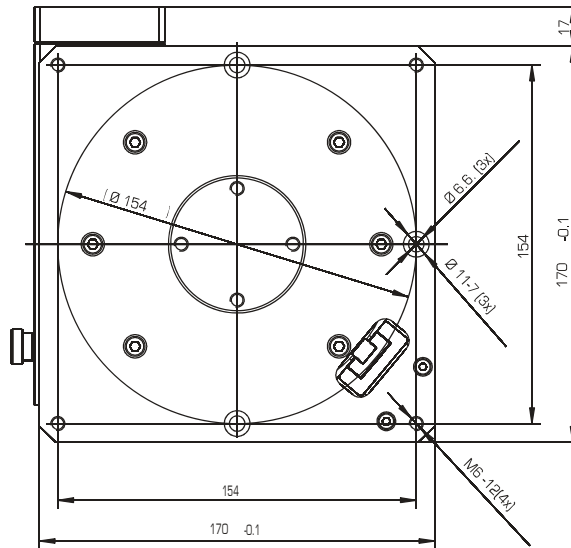
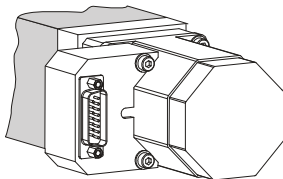
#### Accessories

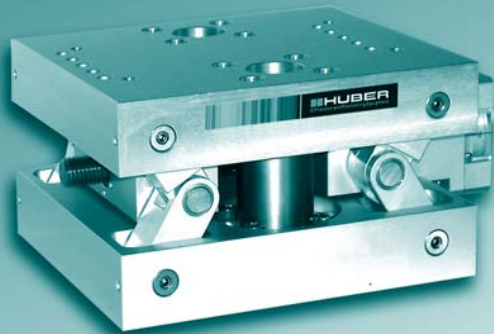
Motors:	2-/3-/5-Ph. Servo/DC
Hand wheels:	0056
Gear boxes:	2056.05 2056.10 2056.20
Limit switches:	included
Zero-point control:	9100
Encoder <b>XE</b> :	incremental, absolute
Control system:	9300



#### Power supply of motorised version:

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2- and 3-phase motors, and via a Sub D25 connector for 5-phase motors. In the standard version this connector is in a housing mounted on the side of the motor.





Modularly individually configurable

- from basic model to high-end system
- to multi-axis systems
- with customer-specific hole pattern

Application specific versions:

- vacuum compatible
- antimagnetic
- radiation resistant
- in black

Three precision configurations:

**X1** **X2\*** **XE**

\* Please contact us for values

### Maximum load and torque

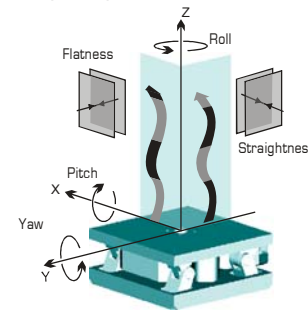
A general statement of maximum load and torque capacities is not possible for eccentric forces due to the amount of different configurations.

However, our engineers will gladly calculate the maximum load capacity for your specific application.

- Multi-axis positioning systems possible by simple combination of stages (e.g. with 5102.20, 5203.20)
- Stable knee lever system for high loads and shear forces
- Non-linear trapezoidal spindle drive with ground and hardened spindle
- Use of low-friction plastic slideway high-precision pillar guides results in optimum fine adjustment due to high reproducibility of minimum system step distance
- Use of stress relieved, highly resilient materials guarantees high system stability and long life
- Robust surfaces through galvanic anodisation

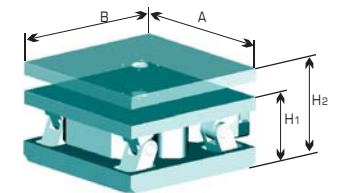
### Specifications

Travel range [mm]:	10
Max. load [N]:	2000
Material (housing/plates):	Aluminium
Resolution:	non-linear
Stiffness ["/Nm]:	12
$M_{input}$ [min] [Nm]:	0,4
Weight [kg]:	7,4



		<b>X1</b>	<b>XE</b>
Repeatability (unidir.) [μm]:	≤ ±	3	0,1...
Reversal error [μm]:	≤	5	0,1...
Flatness [μm]:	≤ ±	2	2
Straightness [μm]:	≤ ±	2	2
Yaw ["]:	≤ ±	4	4
Pitch ["]:	≤ ±	4	4
Roll ["]:	≤ ±	3	3

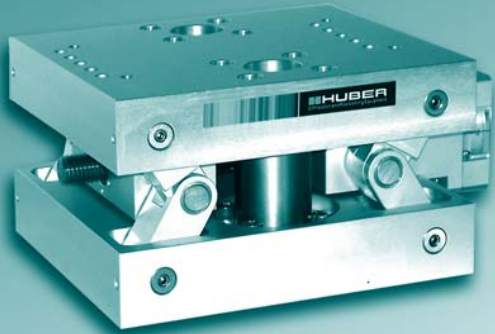
### Dimensions [mm]



A:	B:	H1:	H2:
170	170	100	100 + 10

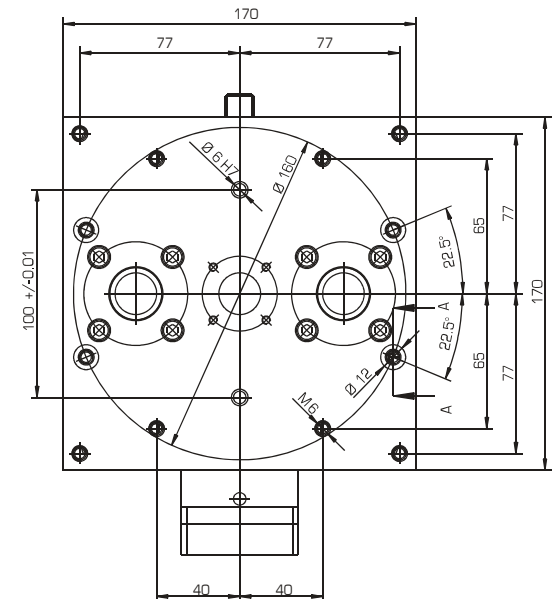
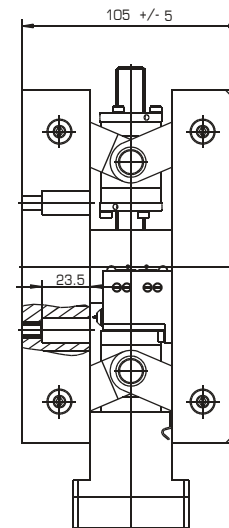
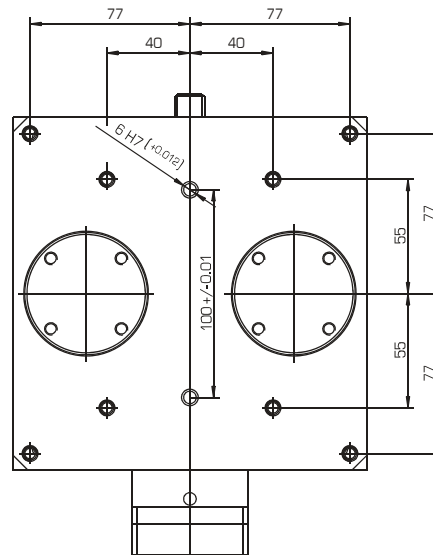
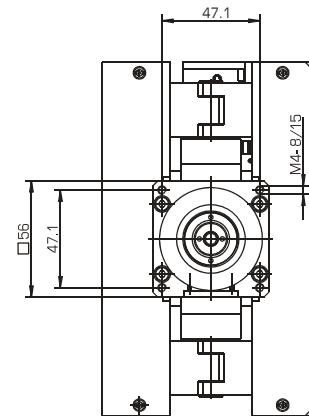
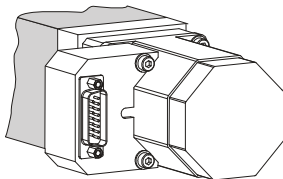
### Accessories

Motors:	2-/3-/5-Ph. Servo/DC
Hand wheels:	0056
Gear boxes:	2056.05 2056.10 2056.20
Limit switches:	included
Zero-point control:	9100
Encoder <b>XE</b> :	incremental, absolute
Control system:	9300



#### Power supply of motorised version:

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2- and 3-phase motors, and via a Sub D25 connector for 5-phase motors. In the standard version this connector is in a housing mounted on the side of the motor.







- Multi-axis positioning systems possible by simple combination of stages (e.g. with 5102.40, 5203.80)
- Conversion of horizontal to vertical movement by means of a precision wedge drive with eight linear ball guides
- High-precision trapezoidal spindle drive with ground and tempered spindle, self-locking
- Use of low-friction plastic slideway high-precision pillar guides results in optimum fine adjustment due to high reproducibility of minimum system step distance
- Use of stress relieved, highly resilient materials guarantees high system stability and long life
- Robust surfaces through galvanic anodisation

Modularly individually configurable

- from basic model to high-end system
- to multi-axis systems
- with customer-specific hole pattern

Application specific versions:

- vacuum compatible
- antimagnetic
- radiation resistant
- in black

Two precision configurations:

**X1** **XE**

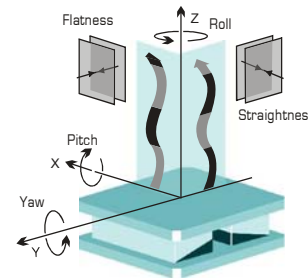
#### Maximum load and torque

A general statement of maximum load and torque capacities is not possible for eccentric forces due to the amount of different configurations.

However, our engineers will gladly calculate the maximum load capacity for your specific application.

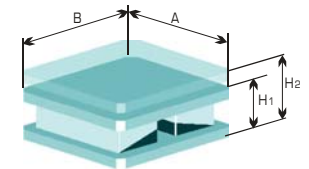
#### Specifications

Travel range [mm]:	20
Max. load [N]:	4000
Material (housing/plates):	Aluminium
Resolution [ $\mu\text{m}$ ]:	0,91 <small>(step motor, 400 steps/revolution)</small>
$M_{\text{input}}$ (min) [Nm]:	1,5
Weight [kg]:	50



		<b>X1</b>	<b>XE</b>
Accuracy [ $\mu\text{m}$ ]:	$\leq \pm$	2	0,1...
Repeatability <small>(unidir.)</small> [ $\mu\text{m}$ ]:	$\leq \pm$	1	0,1...
Reversal error [ $\mu\text{m}$ ]:	$\leq$	10	0,1...
Flatness [ $\mu\text{m}$ ]:	$\leq \pm$	2	2
Straightness [ $\mu\text{m}$ ]:	$\leq \pm$	2	2
Yaw ["]:	$\leq \pm$	2	2
Pitch ["]:	$\leq \pm$	2	2
Roll ["]:	$\leq \pm$	2	2

#### Dimensions [mm]



A:	B:	H1:	H2:
400	400	120	120 + 20

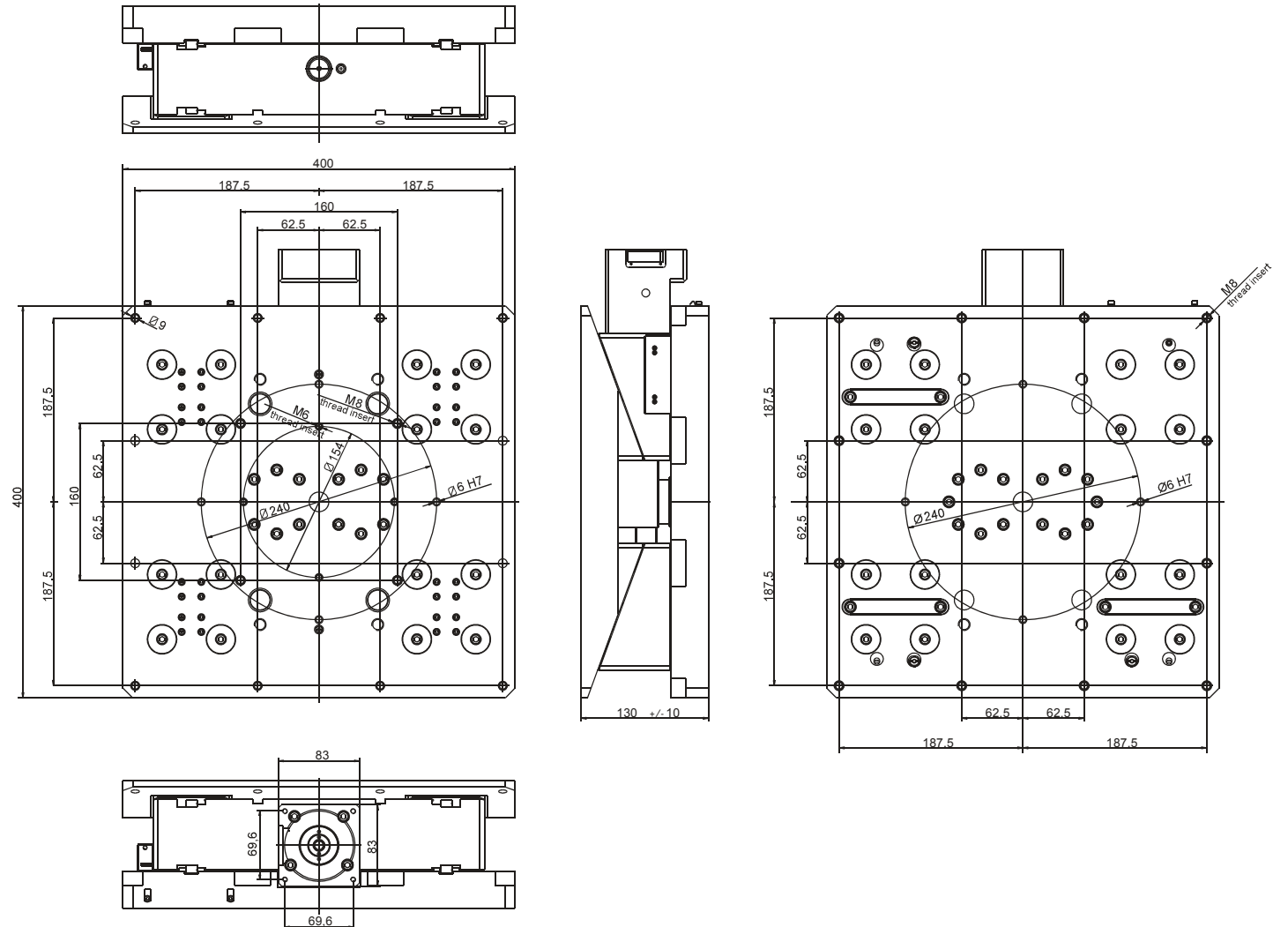
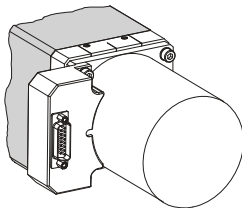
#### Accessories

Motors:	2-/3-/5-Ph. Servo/DC
Hand wheels:	0083
Gear boxes:	2083.05 2083.10 2083.20
Limit switches:	included
Zero-point control:	9100
Encoder <b>XE</b> :	incremental, absolute
Control system:	9300



#### Power supply of motorised version:

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2- and 3-phase motors, and via a Sub D25 connector for 5-phase motors. In the standard version this connector is in a housing mounted on the side of the motor.





- Multi-axis positioning systems possible by simple combination of stages (e.g. with 5102.40, 5203.80)
- Conversion of horizontal to vertical movement by means of a precision wedge drive with eight linear ball guides
- High-precision trapezoidal spindle drive with ground and tempered spindle, self-locking
- Use of low-friction plastic slideway high-precision pillar guides results in optimum fine adjustment due to high reproducibility of minimum system step distance
- Use of stress relieved, highly resilient materials guarantees high system stability and long life
- Robust surfaces through galvanic anodisation

Modularly individually configurable

- from basic model to high-end system
- to multi-axis systems
- with customer-specific hole pattern

Application specific versions:

- vacuum compatible
- antimagnetic
- radiation resistant
- in black

Two precision configurations:

**X1** **XE**

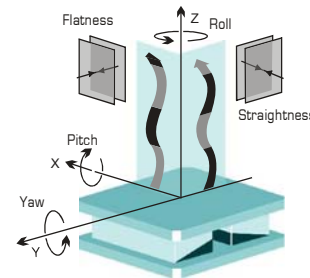
#### Maximum load and torque

A general statement of maximum load and torque capacities is not possible for eccentric forces due to the amount of different configurations.

However, our engineers will gladly calculate the maximum load capacity for your specific application.

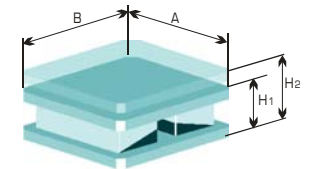
#### Specifications

Travel range [mm]:	20
Max. load [N]:	6000
Material (housing/plates):	Aluminium
Resolution [ $\mu\text{m}$ ]:	0,00067 (step motor, 400 steps/revolution)
$M_{\text{input}}$ (min) [Nm]:	2
Weight [kg]:	66



		<b>X1</b>	<b>XE</b>
Accuracy [ $\mu\text{m}$ ]:	$\leq \pm$	2	0,1...
Repeatability (unidir.) [ $\mu\text{m}$ ]:	$\leq \pm$	1	0,1...
Reversal error [ $\mu\text{m}$ ]:	$\leq$	10	0,1...
Flatness [ $\mu\text{m}$ ]:	$\leq \pm$	2	2
Straightness [ $\mu\text{m}$ ]:	$\leq \pm$	2	2
Yaw ["]:	$\leq \pm$	2	2
Pitch ["]:	$\leq \pm$	2	2
Roll ["]:	$\leq \pm$	2	2

#### Dimensions [mm]



A:	B:	H1:	H2:
460	460	120	120 + 20

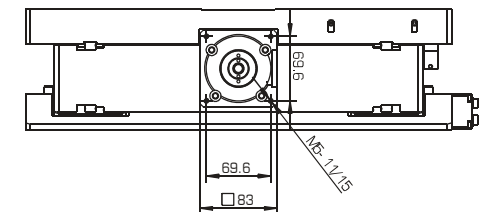
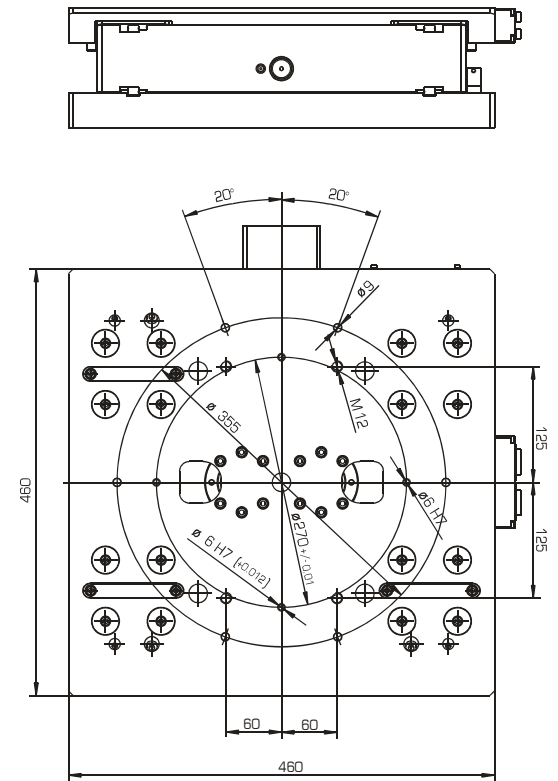
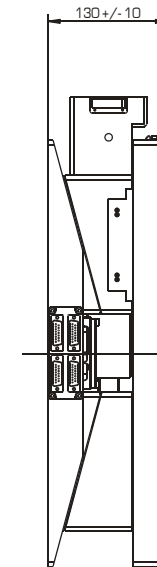
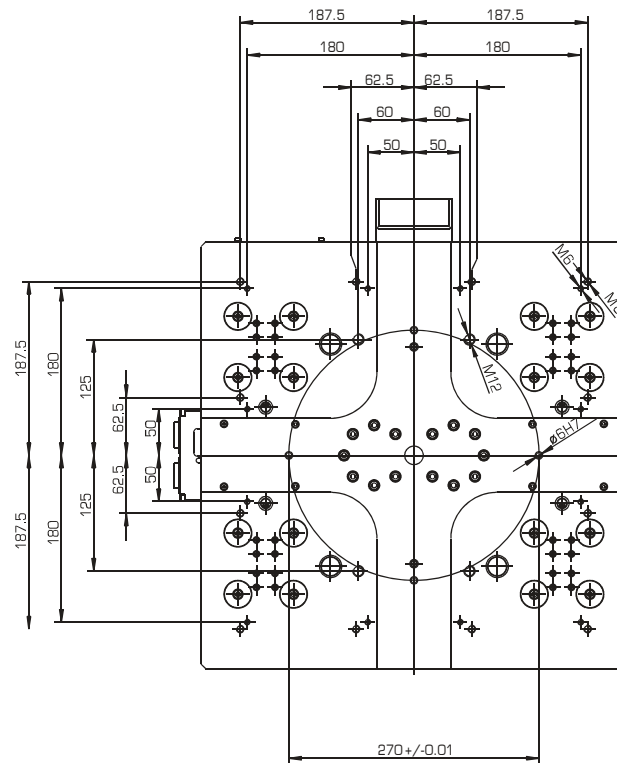
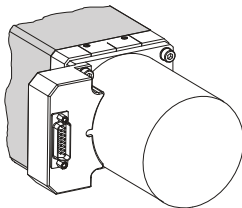
#### Accessories

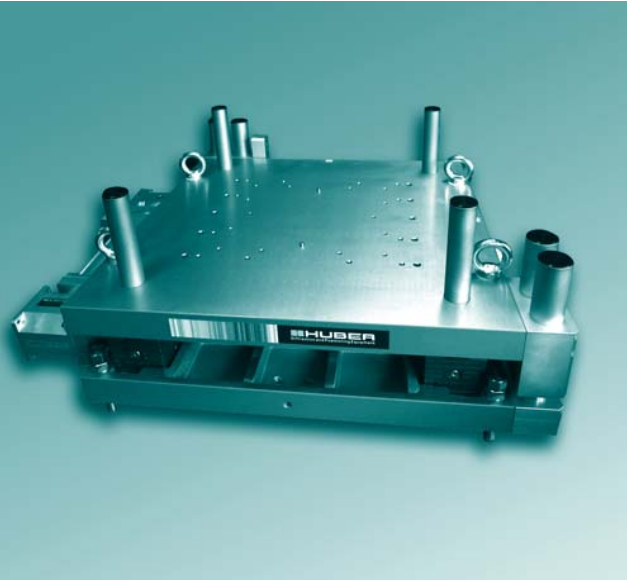
Motors:	2-/3-/5-Ph. Servo/DC
Hand wheels:	0083
Gear boxes:	2083.05 2083.10 2083.20
Limit switches:	included
Zero-point control:	9100
Encoder <b>XE</b> :	incremental, absolute
Control system:	9300



#### Power supply of motorised version:

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2- and 3-phase motors, and via a Sub D25 connector for 5-phase motors. In the standard version this connector is in a housing mounted on the side of the motor.





- Multi-axis positioning systems possible by simple combination of stages
- Four spindle lifting gear drives interconnected by a linking shaft
- High-precision trapezoidal spindle drive with ground and tempered spindle, self-locking
- Two high-precision pillar guides mounted on sides guarantee high guidance stability
- Four height-adjustable feet for table alignment
- Maximum system resolution increased by a reduction transmission
- Robust surfaces through galvanic anodisation

Modularly individually configurable

- Various dimensions available
- from basic model to high-end system
- to multi-axis systems
- with customer-specific travel range
- with customer-specific hole pattern

#### Maximum load and torque

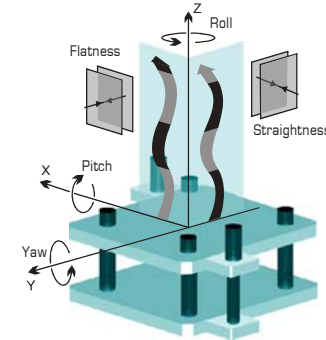
A general statement of maximum load and torque capacities is not possible for eccentric forces due to the amount of different configurations.

However, our engineers will gladly calculate the maximum load capacity for your specific application.

#### Specifications

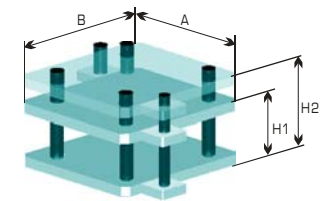
Travel range [mm]:	120*
Max. load [N]:	5000
Material (housing/plates):	Aluminium
$M_{input}$ (min) [Nm]:	1,5
Resolution [ $\mu$ m]:	0,125 (step motor, 400 steps/revolution)
Weight [kg]:	73

\*Optional: extension or shortening of travel range



Accuracy [ $\mu$ m]:	$\leq \pm$	15	<b>XE</b> 0,1...
Repeatability (unidir.) [ $\mu$ m]:	$\leq \pm$	3	0,1...
Reversal error [ $\mu$ m]:	$\leq$	3	0,1...
Flatness [ $\mu$ m]:	$\leq \pm$	20	20
Straightness [ $\mu$ m]:	$\leq \pm$	20	20
Yaw ["]:	$\leq \pm$	2	2
Pitch ["]:	$\leq \pm$	2	2
Roll ["]:	$\leq \pm$	4	4

#### Dimensions [mm]

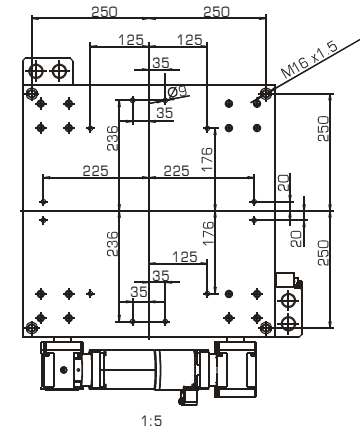
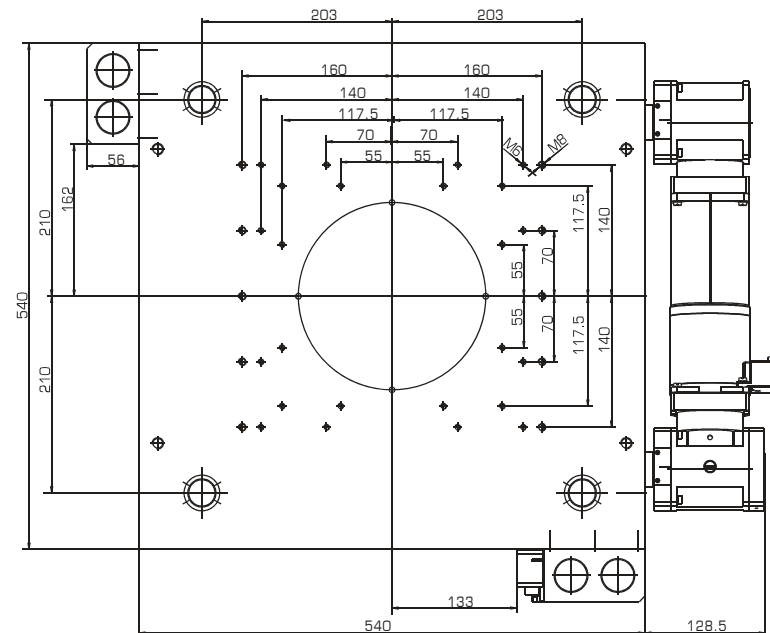
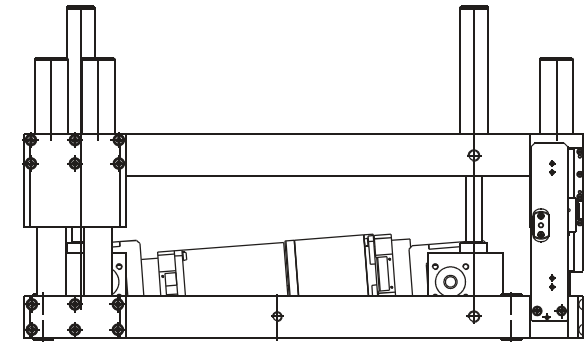
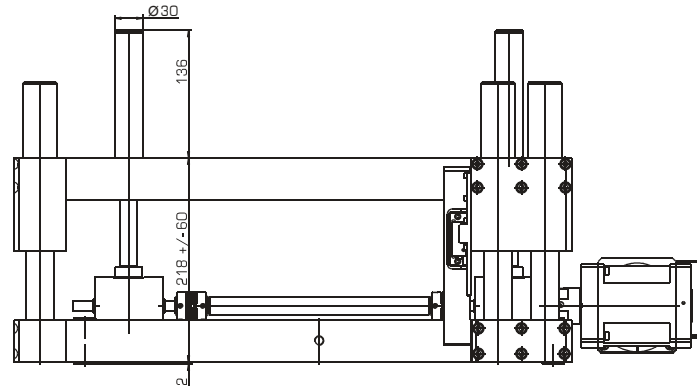
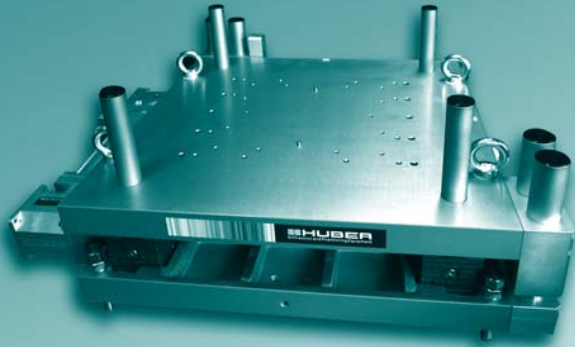


A:	B:	H1:	H2:
540	540	158	158+120

#### Accessories

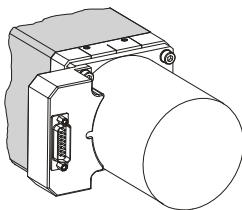
Motors:	2-/3-/5-Ph. Servo/DC
Limit switches:	included
Zero-point control:	9100
Encoder:	incremental, absolute
Control system:	9300

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Diffraction and Positioning Equipment



#### Power supply of motorised version:

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2- and 3-phase motors, and via a Sub D25 connector for 5-phase motors. In the standard version this connector is in a housing mounted on the side of the motor.







- Low-friction, high-precision plastic guide
- Ground and tempered threaded spindle drive
- Optional drive belt for reduced unit height
- Wear resistant delta bronze spindle nut
- Mounting of drive spindle free of play
- Standard support for series 1000 goniometer heads
- Individually configurable due to a large assortment of accessories such as step motors, slip rings, Zero-point controls and limit switches

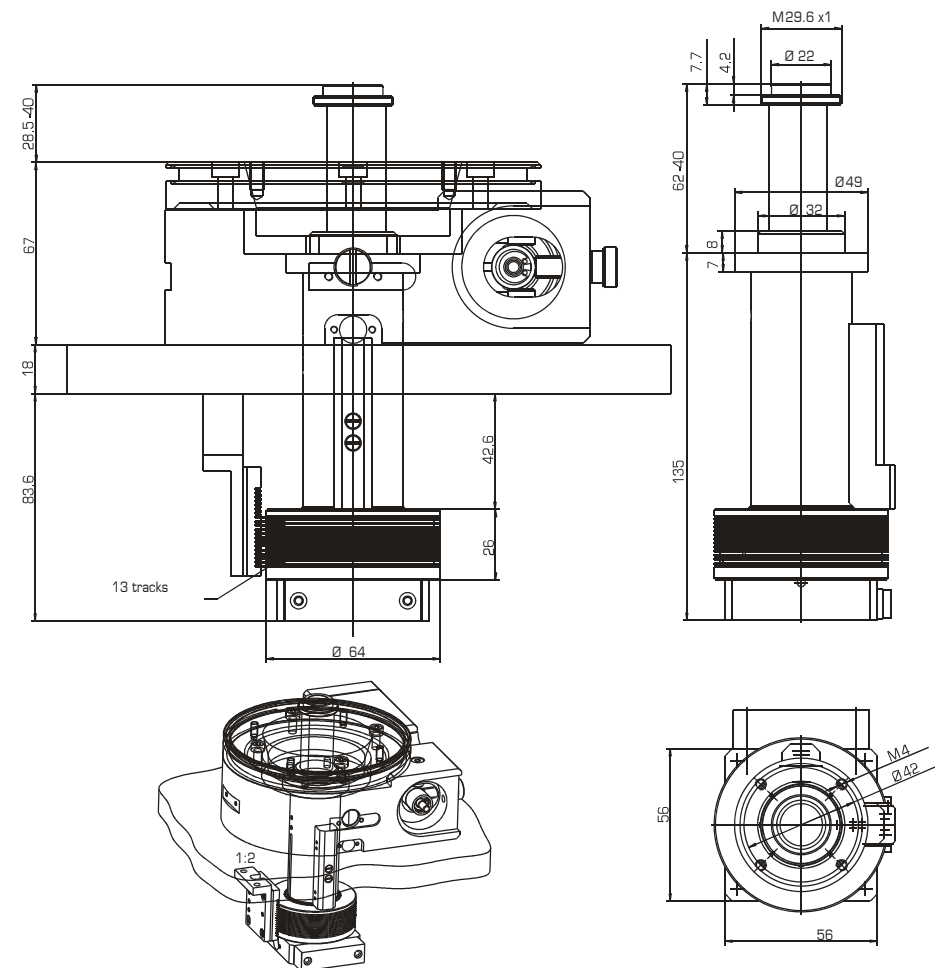
The series 5104.A Stages are predominantly used in type 500 Eulerian cradles and are used for mounting series 1000 goniometer heads.

These stages are available in both manual and motorised configurations (2- or 5-phase motors). The power supply is via cables or optionally via slip rings.

Additionally the stages can be equipped with limit switches and/or Zero-point controls. A drive belt version with reduced height is also available.

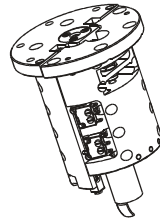
### Specifications

Travel range [mm]	
5104.A05-20:	20
5104.A05-40:	40
Max. load [N]:	50
Slope [mm/U]:	1
$M_{input}$ (min) [Nm]:	0,3
Weight [kg]:	0,7-1,5





5104.B10


**Specifications**

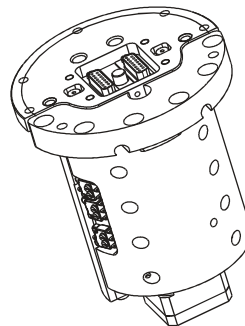
Travel range [mm]:	25
Max. load [N]:	50
Slope [mm/U]:	1
$M_{input}$ (min) [Nm]:	0,03
Weight [kg]:	0,7

5104.B20

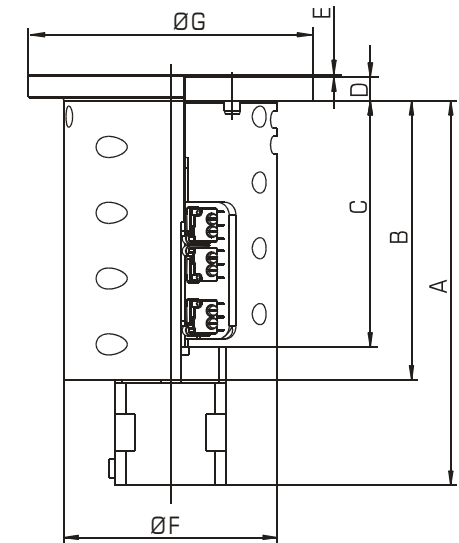


Travel range [mm]:	25
Max. load [N]:	100
Slope [mm/U]:	1
$M_{input}$ (min) [Nm]:	0,04
Weight [kg]:	1,8

5104.B30



Travel range [mm]:	25
Max. load [N]:	150
Slope [mm/U]:	1
$M_{input}$ (min) [Nm]:	0,05
Weight [kg]:	3,0



- Compact and rigid translation stages designed to be integrated in goniometer 409, 410 and 411
- Unit 5104.B10 has a ground threaded spindle drive, units 5104.B20 and 5104.B30 have a precision recirculating ball spindle, free of play
- Use of two low-friction linear rolling guides results in high reproducibility of minimum step distance
- Motor and signal currents transferred by cables or optionally by slip rings
- XYZ-positioning systems possible by simple combination with XY-stages of the series 5102 (the power supply of the XY-stages is via the SUB-D-15 sockets integrated in the Z-stage)

	5104.B10	5104.B20	5104.B30
A	98	146	139
B	48	106	100
C	69	94	111
D	8	9	17
E	1	1	1
ØF	59	81	94
ØG	79	108	129



The series 5104.C Stages are translational stages designed for high loads. These units are predominantly integrated in larger goniometers (e.g. 420, 430).

This series is equipped with either 2-, 3- or 5-phase motors. The power supply is via cables or optionally via slip rings.

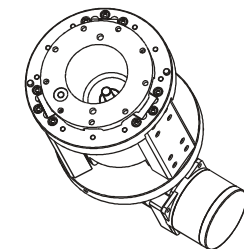
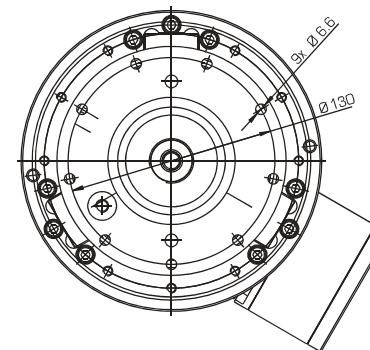
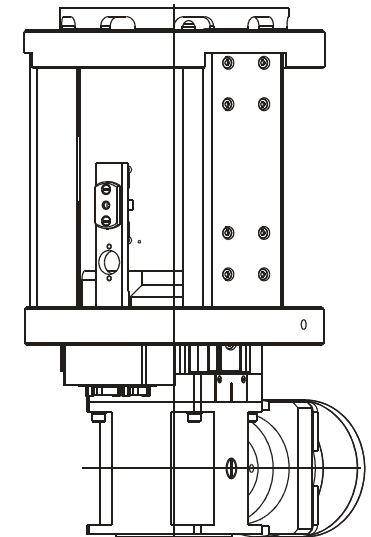
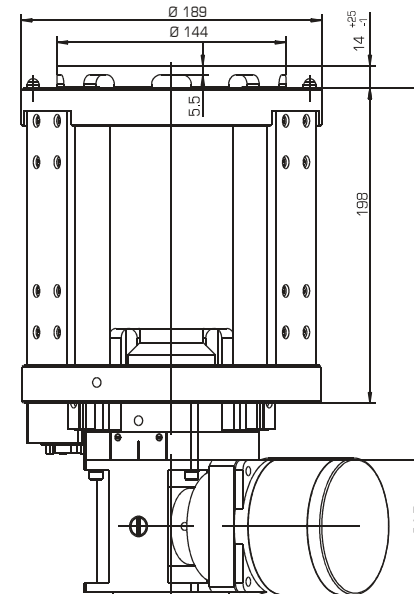
The positioners are equipped with limit switches and a Zero-point control. Gear boxes (series 2083) can be incorporated to increase resolution. A position/step control via encoders is available as an option.

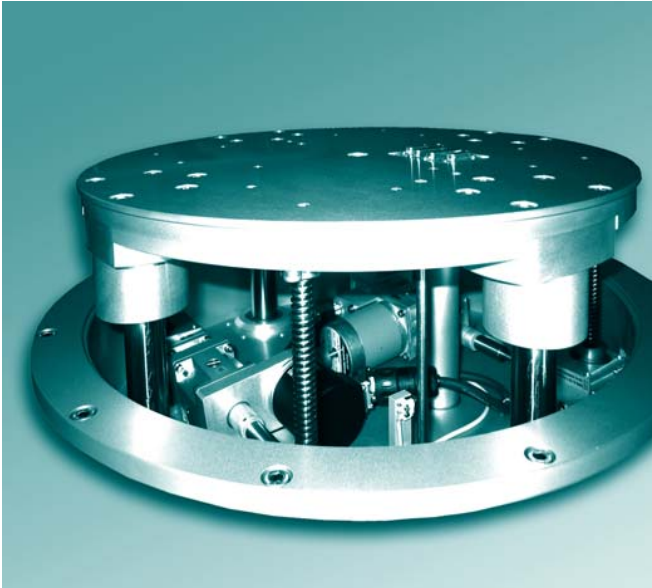
#### Specifications

Travel range [mm]	
5104.C30:	26*
Max. load [N]:	500
Slope [mm/U]:	1
$M_{input} (min)$ [Nm]:	1,5
Weight [kg]:	16,5

\*Optional: extension or shortening of travel range

- Multi-axis positioning systems possible by simple combination of stages
- Threaded spindle drive with ground and tempered spindle, self-locking
- Wear resistant delta bronze spindle nut
- Use of three low-friction linear ball guides results in high reproducibility of minimum step distance
- Robust surfaces through galvanic anodisation
- Use of stress relieved, highly resilient materials guarantees high system stability and long life





The series 5104.D Stages are translational stages designed for high loads. These units are predominantly integrated in large goniometers (e.g. 480).

This series is equipped with either 2-, 3- or 5-phase motors.

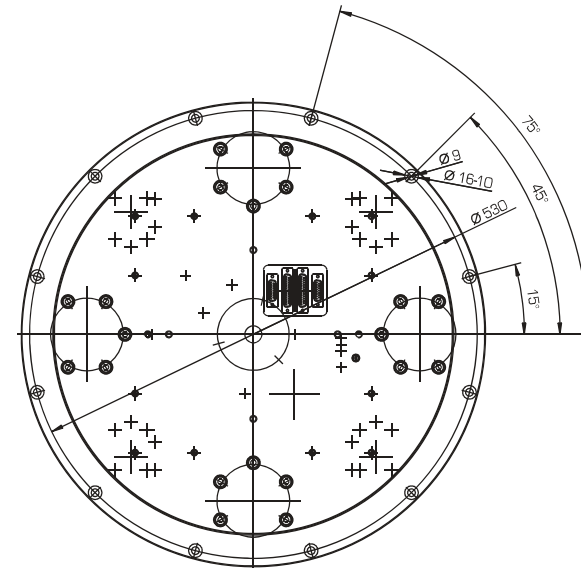
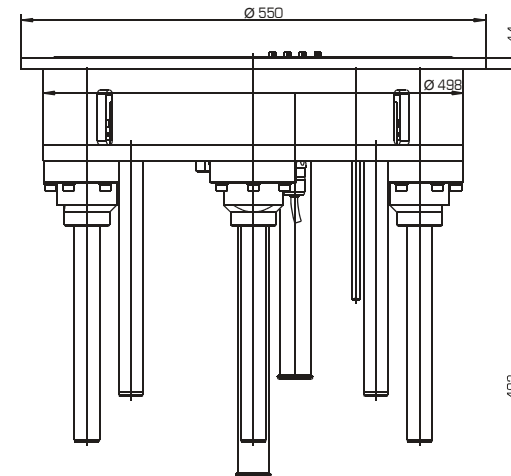
The stages are equipped with limit switches and a Zero-point control. Integrated gear boxes enable a resolution in the order of nm. A position/step control via encoders is available as an option.

It is possible to combine the integrated Z-stages with series 5102 XY-tables to XYZ positioning systems. The power supply of the XY-stages is via the SUB-D-15 sockets integrated in the Z-positioning stage.

### Specifications

Travel range [mm]	
5104.D90	250*
Max. load [N]:	2000
Slope [mm/U]:	4
M <sub>input</sub> (min) [Nm]:	1,5
Resolution [µm]:	0,0625
Weight [kg]:	60

\*Optional: extension or shortening of travel range



- Multi-axis positioning systems possible by simple combination of stages
- Four spindle lifting gear drives controlled by a connecting shaft
- Trapezoidal spindle drive with ground and tempered spindle, self-locking
- Four high-precision ball-type nipples guarantee high guidance stability
- Maximum system resolution increased by a reduction transmission
- Robust surfaces through galvanic anodisation

Product Groups

1. Positioning systems

1.2. Rotation

1.2.1. 1-Circle Goniometer  
1.2.2. 2-Circle Goniometer  
1.2.3. 1-Circle Segments  
1.2.4. 2-Circle Segments  
1.2.5. Euler Cradles  
1.2.6. Kappa Goniometers

**HUBER**  
Diffraction and Positioning Equipment

### General information

Huber rotational systems combine highest precision with greatest stability.

Our specially developed worm gear drive guarantees optimum specification properties, especially under high loads. Modern machining and coating processes combined with high-quality materials and strictest quality assurance controls ensure high reliability and long life with low maintenance requirements.

The surfaces of our systems are either anodised, hard coated, varnished, chromated or made of stainless steel.

### Combinations

Our rotational positioning products can be combined both with units of the same series as well as with units from other series.

Rotational and translational movements can be combined and adapted to form multi-axis positioning systems capable of meeting all requirements.

Please contact our engineers for advice on the combination to meet your requirements.

### Material

Housings: Aluminium/Bronze  
Guide system: Steel  
Drive system: Steel/Bronze

### Precision and loading

Each product comes in up to four precision and two different maximum loading configurations:

X1 X2 X3 XE W1 W2

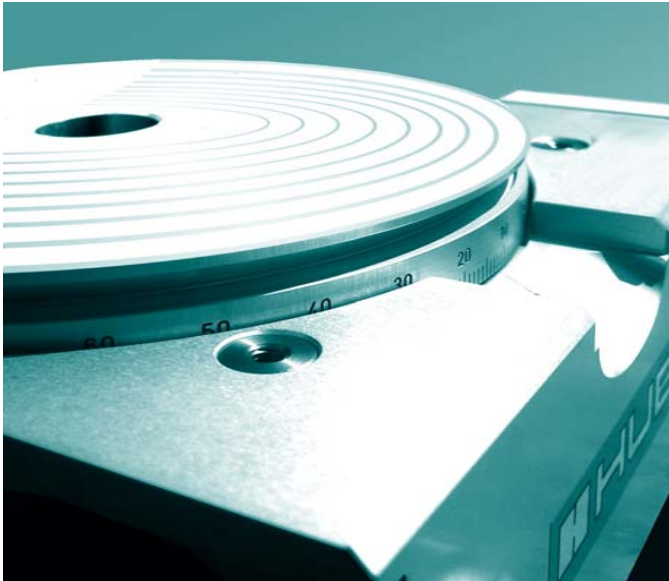
### Equipment

All systems are equipped with limit switches (optional for series 5202 and goniometer 408). Also included are scales and couplings to adapt to your drive system.

### Accessories

We offer an extensive range of accessories for individual requirements. Detailed information is given on the respective catalogue product pages.

*Individual solutions  
for individual requirements*





### Modularly individually configurable

- from basic model to high-end system
- to multi-axis systems
- with individual transmission aperture
- with customer-specific hole pattern

### Application specific versions:

- vacuum compatible
- antimagnetic
- radiation resistant
- in black

### Four precision configurations:

**X1** **X2** **X3** **XF**

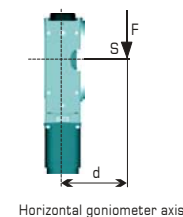
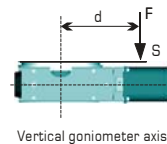
### Two load configurations:

**W1** **W2**

### Maximum load

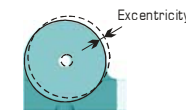
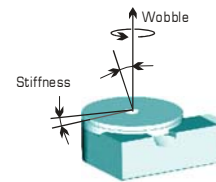
**W1** **W2**  
400 N 650 N

**W1** **W2**  
125 N 200 N



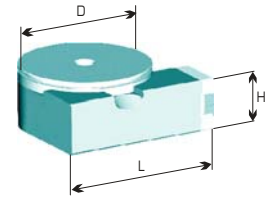
### Specifications

Travel range [°]:	360
Material (housing/worm gear):	Aluminium/Bronze
Gear ratio:	180:1
Resolution [°]:	0,002 (step motor, 1000 steps/revolution) 0,0001 minimum
$M_{input}$ (min) [Nm]:	0,05
$M_{output}$ (max) [Nm]:	1,2
Stiffness [ $\mu$ rad/Nm]:	22
Weight [kg]:	1,5
Flange size [mm]:	32
Transm. aperture [mm]:	20



	<b>X1</b>	<b>X2</b>	<b>X3</b>	<b>XF</b>
Accuracy [°]:	≤ 60	40	25	0,4...
Repeatability (unidir.) [°]:	≤ 4	2	2	0,4...
Reversal error [°]:	≤ 30	20	10	0,4...
Eccentricity [ $\mu$ m]:	≤ 8	5	2	2
Wobble [°]:	≤ 18	10	8	8

### Dimensions [mm]

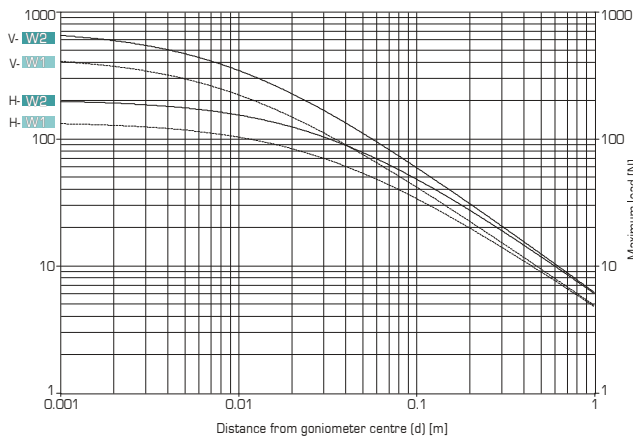


D: 80 L: 95 H: 40

### Accessories

Motors:	2-/5-Ph. Servo/DC
Hand wheels:	0032
Gear boxes:	2042.10* 2042.20*
Limit switches:	optional
Zero-point control:	9100
Encoder <b>XF</b> :	incremental, absolute
Control system:	9300

\* in combination with Adaptor M301.301-001



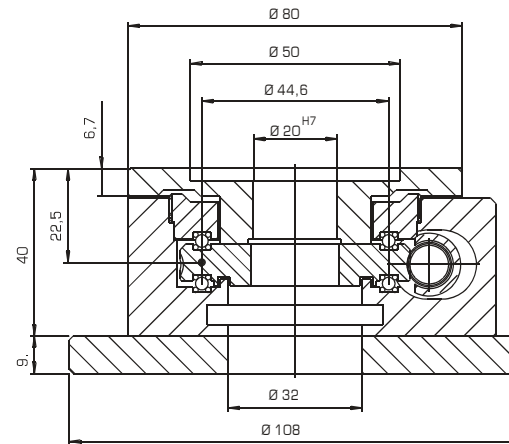
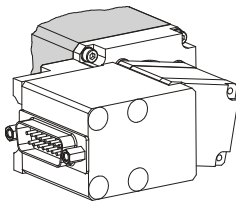
Vertical goniometer axis (V-W1, V-W2)  
Horizontal goniometer axis (H-W1, H-W2)



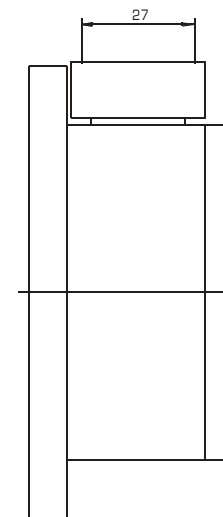
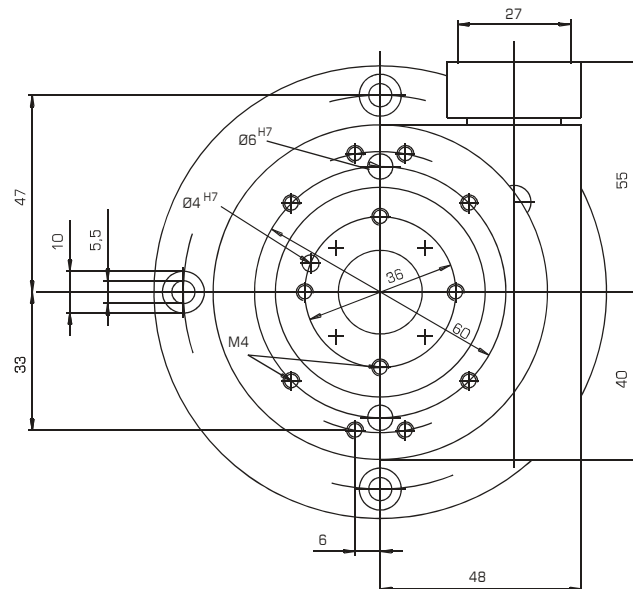
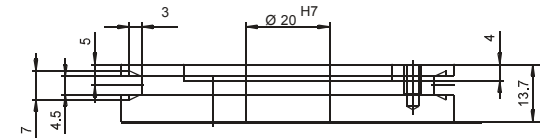


#### Power supply of motorised version:

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2-phase motors, and via a Sub D25 connector for 5-phase motors. In the standard version this connector is in a housing mounted on the side of the motor.



Scale of goniometer 408 with limit switches:





Modularly individually configurable

- from basic model to high-end system
- to multi-axis systems
- with individual transmission aperture
- with customer-specific hole pattern

Application specific versions:

- vacuum compatible
- antimagnetic
- radiation resistant
- in black

Four precision configurations:

**X1** **X2** **X3** **XF**

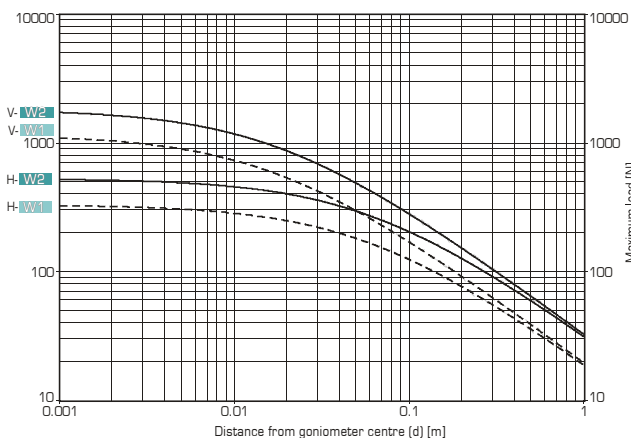
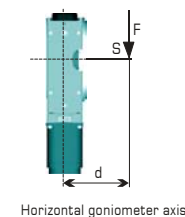
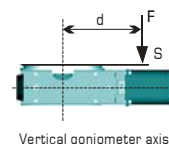
Two load configurations:

**W1** **W2**

### Maximum load

**W1** **W2**  
1100 N 1800 N

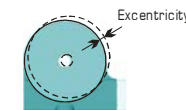
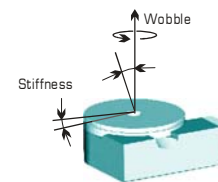
**W1** **W2**  
320 N 500 N



Vertical goniometer axis (V-W1, V-W2)  
Horizontal goniometer axis (H-W1, H-W2)

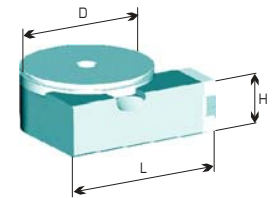
### Specifications

Travel range [°]:	360
Material (housing/worm gear):	Aluminium/Bronze
Gear ratio:	180:1
Resolution [°]:	0,002 (step motor, 1000 steps/revolution) 0,0001 minimum
$M_{input}$ (min) [Nm]:	0,12
$M_{output}$ (max) [Nm]:	4
Stiffness [ $\mu$ rad/Nm]:	6
Weight [kg]:	2,2
Flange size [mm]:	42
Transm. aperture [mm]:	20 (standard) - 61



	<b>X1</b>	<b>X2</b>	<b>X3</b>	<b>XF</b>
Accuracy [°]:	≤ 45	30	15	0,3...
Repeatability (unidir.) [°]:	≤ 4	2	2	0,3...
Reversal error [°]:	≤ 20	15	9	0,3...
Excentricity [ $\mu$ m]:	≤ 5	3	2	2
Wobble [°]:	≤ 8	5	3	3

### Dimensions [mm]

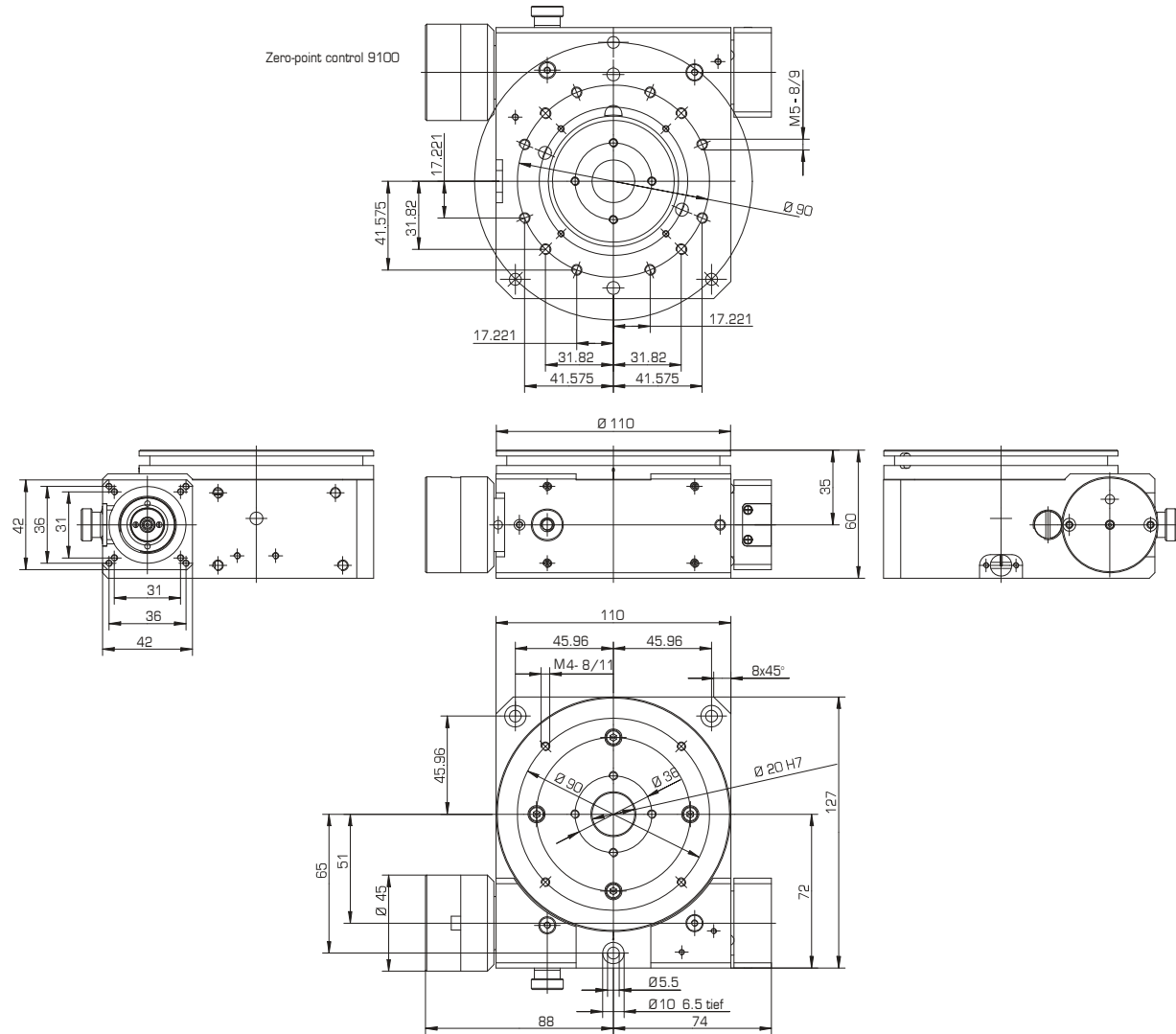


D: 110 L: 110 H: 60

### Accessories

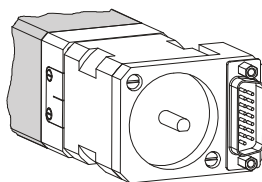
Motors:	2-/5-Ph.
Hand wheels:	0042
Gear boxes:	2042.10 2042.20
Limit switches:	included
Zero-point control:	9100
Encoder <b>XE</b> :	incremental, absolute
Control system:	9300

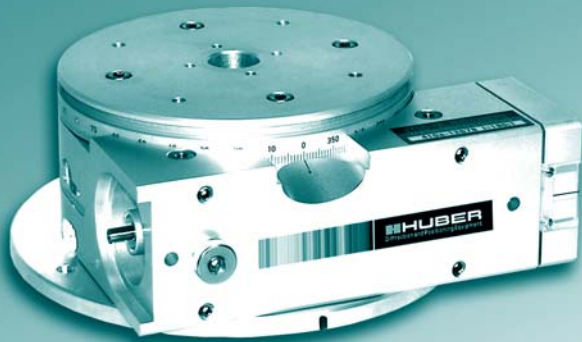
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Diffraction and Positioning Equipment



#### Power supply of motorised version:

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2-phase motors, and via a Sub D25 connector for 5-phase motors. In the standard version this connector is in a housing mounted on the back of the motor.





Modularly individually configurable

- from basic model to high-end system
- to multi-axis systems
- with individual transmission aperture
- with customer-specific hole pattern

Application specific versions:

- vacuum compatible
- antimagnetic
- radiation resistant
- in black

Four precision configurations:

**X1** **X2** **X3** **XE**

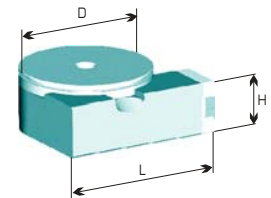
Two load configurations:

**W1** **W2**

**Specifications**

Travel range [°]:	360
Material (housing/worm gear):	Aluminium/Bronze
Gear ratio:	360:1/180:1*
Resolution [°]:	0,001/0,002* <small>(step motor 1000 steps/revolution)</small> 0,00005/0,0001* minimum <small>(step motor 1000 steps/rev. with gear box 20:1)</small>
M <sub>input</sub> (min) [Nm]:	0,10/0,13*
M <sub>output</sub> (max) [Nm]:	3/5*
Stiffness [μrad/Nm]:	3
Weight [kg]:	4
Flange size [mm]:	56
Transm. aperture [mm]:	20 (standard) - 82

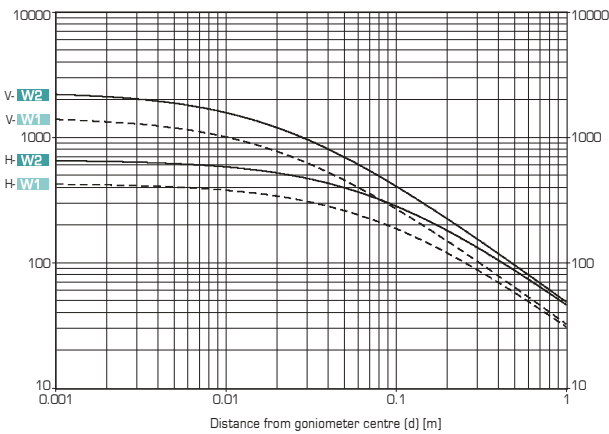
**Dimensions [mm]**



D:	L:	H:
138	171	67

**Accessories**

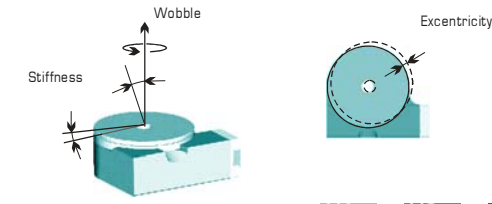
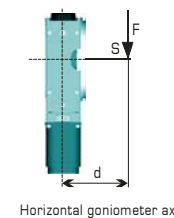
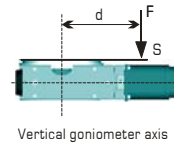
Motors:	2-/3-/5-Ph. Servo/DC
Hand wheels:	0056
Gear boxes:	2056.05 2056.10 2056.20
Limit switches:	included
Zero-point control:	9100
Encoder <b>XE</b> :	incremental, absolute
Control system:	9300



Vertical goniometer axis (V-W1, V-W2)  
Horizontal goniometer axis (H-W1, H-W2)

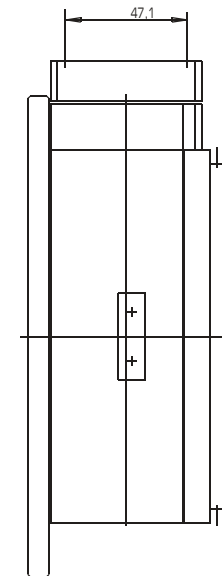
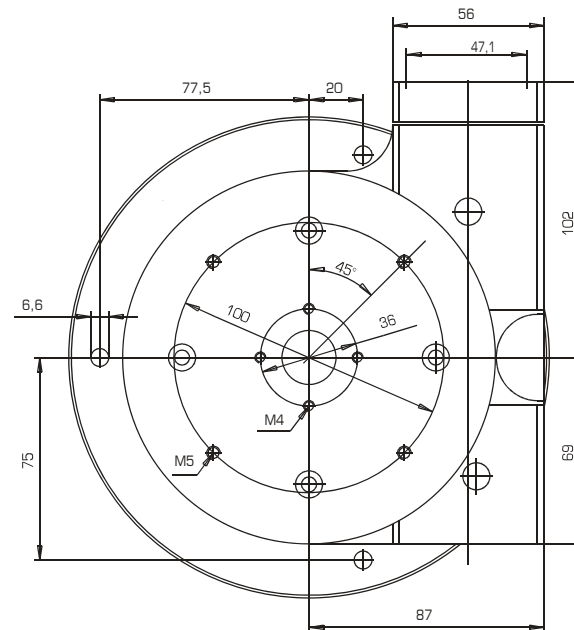
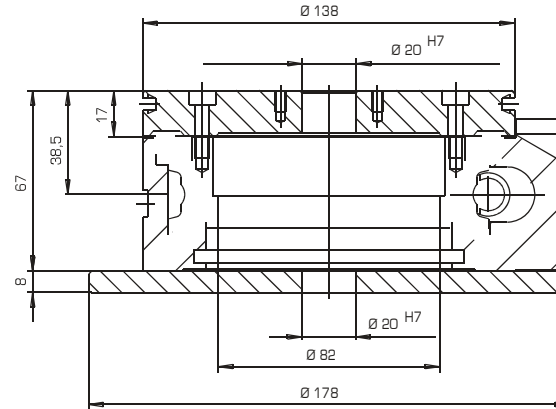
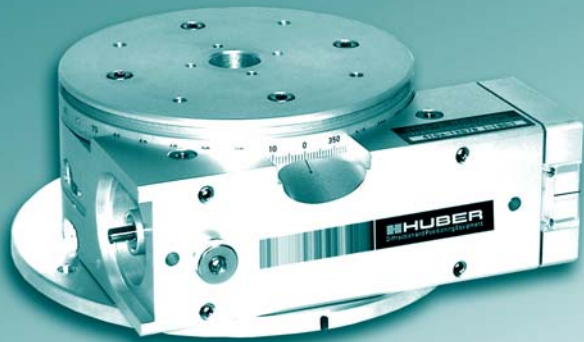
**Maximum load**

<b>W1</b>	<b>W2</b>
1450 N	2300 N
<b>W1</b>	<b>W2</b>
410 N	650 N



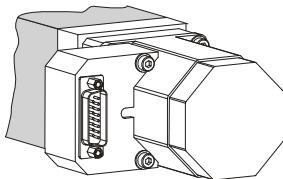
Accuracy ["]:	≤	40	30	15	0,2...
Repeatability (unidir.) ["]:	≤	4	2	2	0,2...
Reversal error ["]:	≤	20	10	7	0,2...
Eccentricity [μm]:	≤	5	3	2	2
Wobble ["]:	≤	8	4	3	3

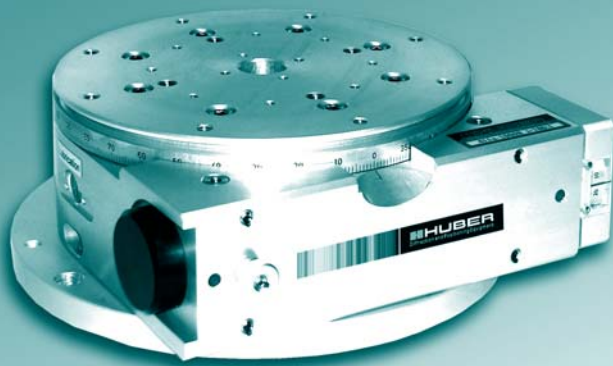
**HUBER**  
Diffraction and Positioning Equipment



#### Power supply of motorised version:

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2- and 3-phase motors, and via a Sub D25 connector for 5-phase motors. In the standard version this connector is in a housing mounted on the side of the motor.



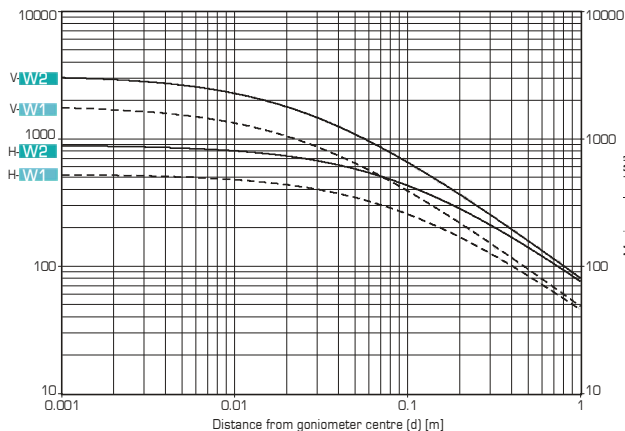
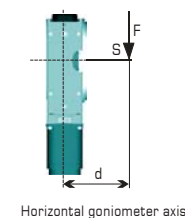
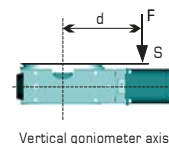

**Modularly individually configurable**

- from basic model to high-end system
- to multi-axis systems
- with individual transmission aperture
- with customer-specific hole pattern

**Application specific versions:**

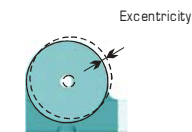
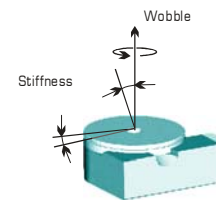
- vacuum compatible
- antimagnetic
- radiation resistant
- in black

**Four precision configurations:**
**X1 X2 X3 XF**
**Two load configurations:**
**W1 W2**
**Maximum load**
**W1 W2**  
 1800 N 3100 N

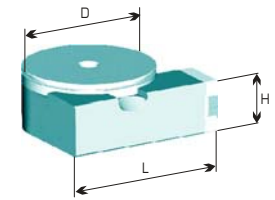
**W1 W2**  
 500 N 870 N

 Vertical goniometer axis (V-W1, V-W2)  
 Horizontal goniometer axis (H-W1, H-W2)

**Specifications**

Travel range [°]:	360
Material (housing/worm gear):	Aluminium/Bronze
Gear ratio:	360:1/180:1*
Resolution [°]:	0,001/0,002* (step motor 1000 steps/revolution) 0,00005/0,0001* minimum (step motor 1000 steps/rev. with gear box 20:1)
$M_{input}$ (min) [Nm]:	0,40/0,45*
$M_{output}$ (max) [Nm]:	15/18*
Stiffness [ $\mu$ rad/Nm]:	1
Weight [kg]:	6
Flange size [mm]:	56
Transm. aperture [mm]:	20 (standard) - 101



	X1	X2	X3	XF
Accuracy ["]:	≤ 40	30	15	0,2...
Repeatability (unidir.) ["]:	≤ 4	2	2	0,2...
Reversal error ["]:	≤ 20	8	7	0,2...
Excentricity [ $\mu$ m]:	≤ 5	3	2	2
Wobble ["]:	≤ 8	4	3	3

**Dimensions [mm]**

 D: 179  
 L: 195  
 H: 70

**Accessories**

Motors:	2-/3-/5-Ph. Servo/DC
Hand wheels:	0056
Gear boxes:	2056.05 2056.10 2056.20
Limit switches:	included
Zero-point control:	9100
Encoder <b>XF</b> :	incremental, absolute
Control system:	9300

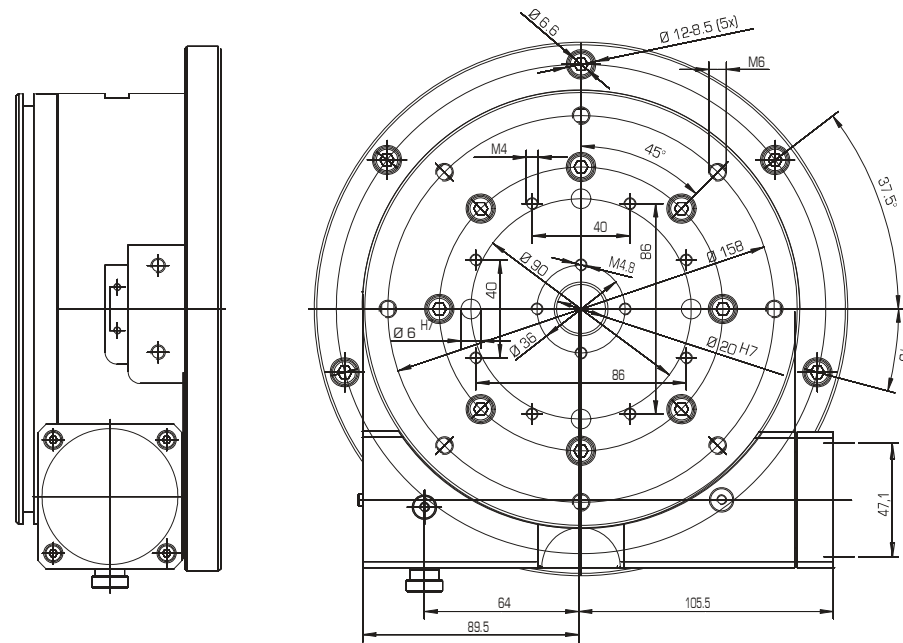
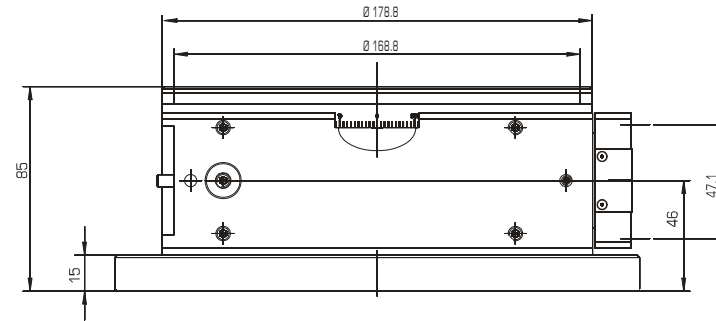
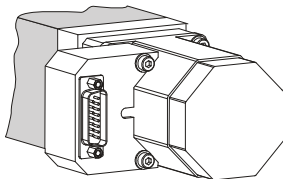


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#### Power supply of motorised version:

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2- and 3-phase motors, and via a Sub D25 connector for 5-phase motors. In the standard version this connector is in a housing mounted on the side of the motor.





Modularly individually configurable

- from basic model to high-end system
- to multi-axis systems
- with individual transmission aperture
- with customer-specific hole pattern

Application specific versions:

- vacuum compatible
- antimagnetic
- radiation resistant
- in black

Four precision configurations:

X1 X2 X3 XE

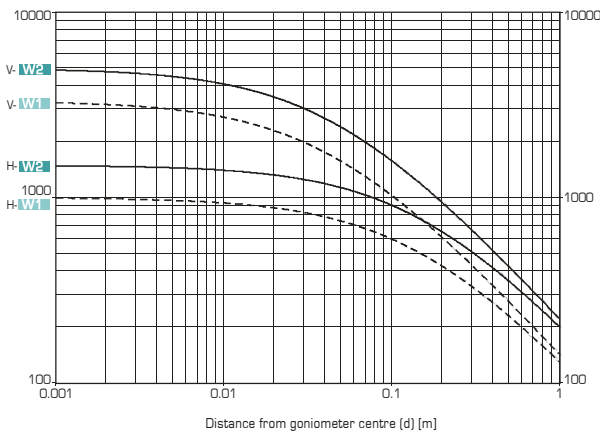
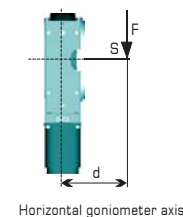
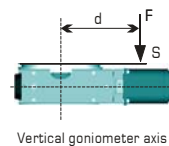
Two load configurations:

W1 W2

Maximum load

W1 W2  
3300 N 5000 N

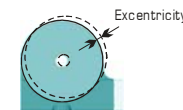
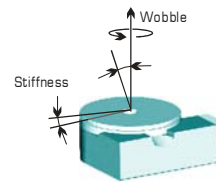
W1 W2  
1000 N 1500 N



Vertical goniometer axis (V-W1, V-W2)  
Horizontal goniometer axis (H-W1, H-W2)

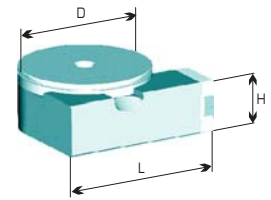
Specifications

Travel range [°]:	360
Material (housing/worm gear):	Aluminium/Bronze
Gear ratio:	360:1
Resolution [°]:	0,001 (step motor, 1000 steps/revolution) 0,00005 minimum
M <sub>input</sub> (min) [Nm]:	1,0
M <sub>output</sub> (max) [Nm]:	40
Stiffness [μrad/Nm]:	0,2
Weight [kg]:	33
Flange size [mm]:	82
Transm. aperture [mm]:	190 (standard)



	≤	X1	X2	X3	XE
Accuracy ["]:	40	25	12	0,1...	
Repeatability (unidir.) ["]:	4	2	2	0,1...	
Reversal error ["]:	8	4	3	0,1...	
Eccentricity [μm]:	5	3	2	2	
Wobble ["]:	8	3	3	3	

Dimensions [mm]

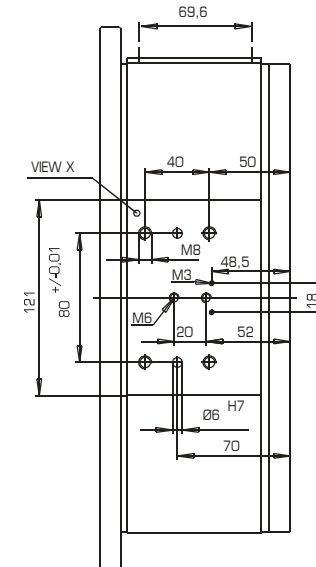
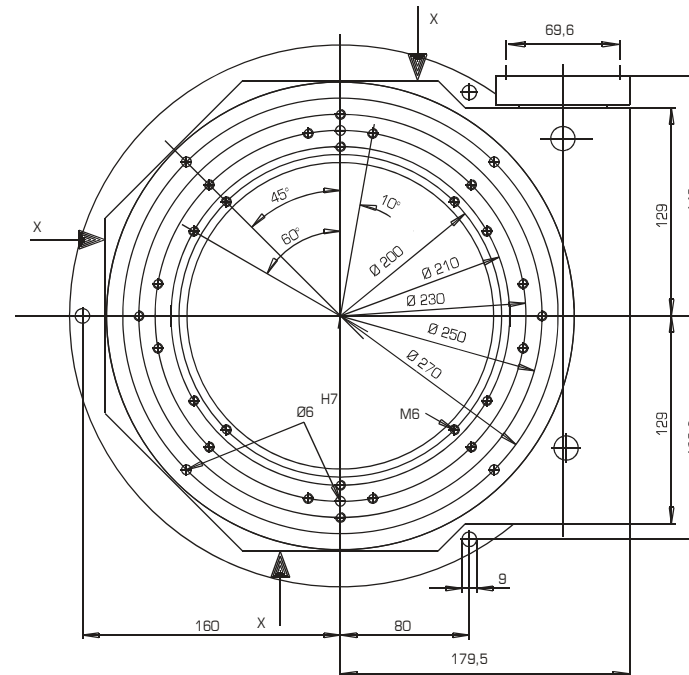
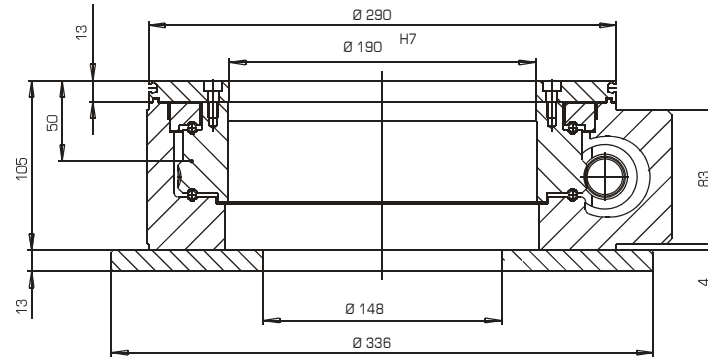


D: 290 L: 294 H: 105

Accessories

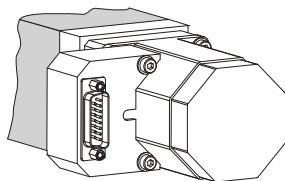
Motors:	2-/3-/5-Ph. Servo/DC
Hand wheels:	0083
Gear boxes:	2083.05 2083.10 2083.20
Limit switches:	included
Zero-point control:	9100
Encoder XE:	incremental, absolute
Control system:	9300

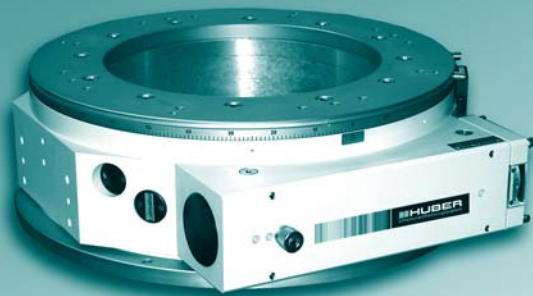
**HUBER**  
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#### Power supply of motorised version:

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2- and 3-phase motors, and via a Sub D25 connector for 5-phase motors. In the standard version this connector is in a housing mounted on the side of the motor.





Modularly individually configurable

- from basic model to high-end system
- to multi-axis systems
- with individual transmission aperture
- with customer-specific hole pattern

Application specific versions:

- vacuum compatible
- antimagnetic
- radiation resistant
- in black

Four precision configurations:

**X1** **X2** **X3** **XF**

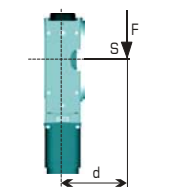
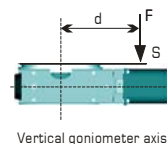
Two load configurations:

**W1** **W2**

**Maximum load**

**W1** **W2**  
6650 N 11300 N

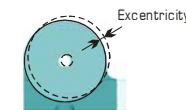
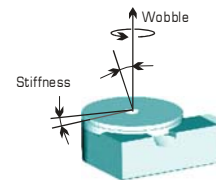
**W1** **W2**  
2000 N 3300 N



Horizontal goniometer axis

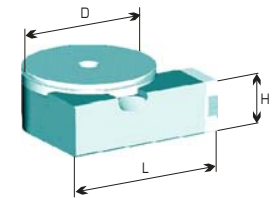
## Specifications

Travel range [°]:	360
Material (housing/worm gear):	Aluminium/Bronze
Gear ratio:	360:1
Resolution [°]:	0,001 (step motor, 1000 steps/revolution) 0,00005 minimum
$M_{input}$ (min) [Nm]:	1,5
$M_{output}$ (max) [Nm]:	100
Stiffness [ $\mu$ rad/Nm]:	0,1
Weight [kg]:	55
Flange size [mm]:	82
Transm. aperture [mm]:	260 (standard)



	<b>X1</b>	<b>X2</b>	<b>X3</b>	<b>XF</b>
Accuracy ["]:	≤ 35	20	10	0,1...
Repeatability (unidir.) ["]:	≤ 4	2	2	0,1...
Reversal error ["]:	≤ 8	4	3	0,1...
Excentricity [ $\mu$ m]:	≤ 5	3	2	2
Wobble ["]:	≤ 6	2	2	2

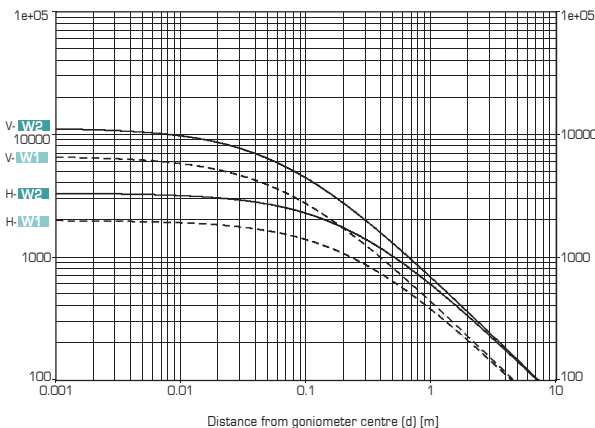
## Dimensions [mm]



D: 400 L: 359 H: 125

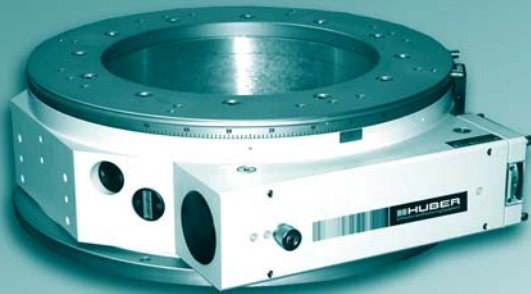
## Accessories

Motors:	2-/3-/5-Ph. Servo/DC
Hand wheels:	0083
Gear boxes:	2083.05 2083.10 2083.20
Limit switches:	included
Zero-point control:	9100
Encoder <b>XF</b> :	incremental, absolute
Control system:	9300



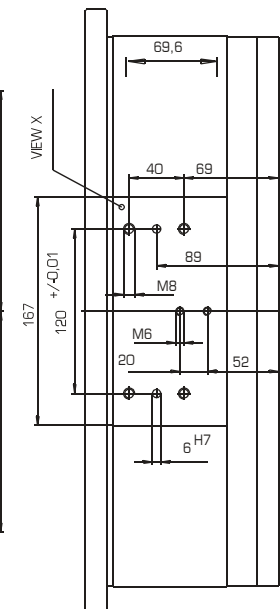
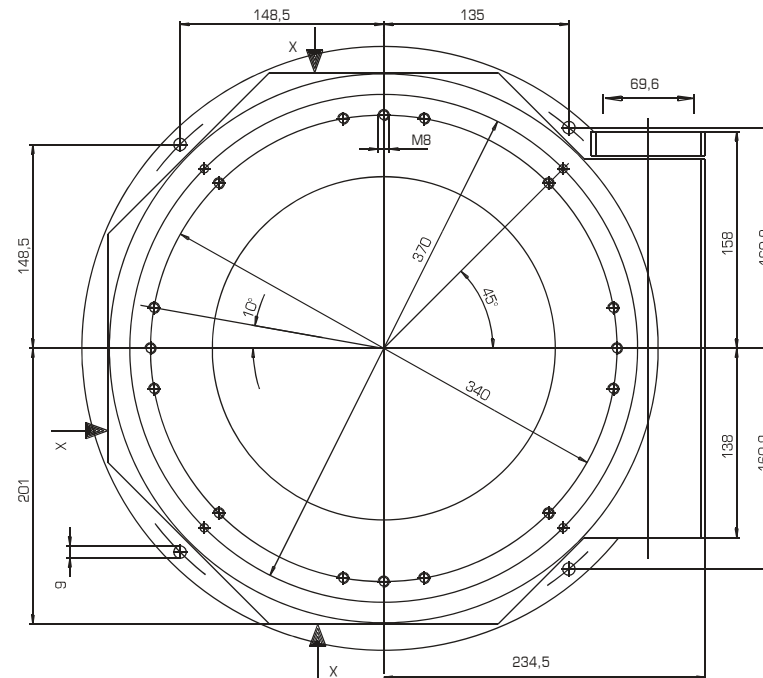
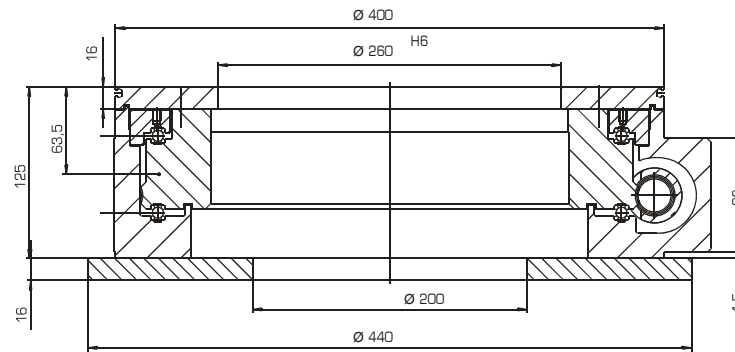
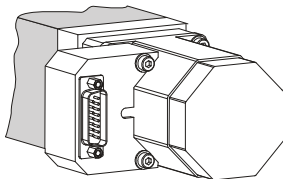
Vertical goniometer axis (V-W1, V-W2)  
Horizontal goniometer axis (H-W1, H-W2)

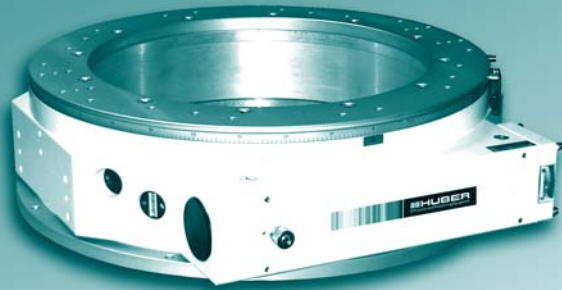
**HUBER**  
Diffraction and Positioning Equipment



#### Power supply of motorised version:

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Modularly individually configurable

- from basic model to high-end system
- to multi-axis systems
- with individual transmission aperture
- with customer-specific hole pattern

Application specific versions:

- vacuum compatible
- antimagnetic
- radiation resistant
- in black

Four precision configurations:

**X1** **X2** **X3** **XF**

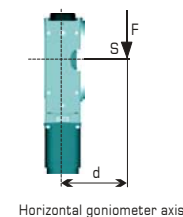
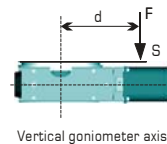
Two load configurations:

**W1** **W2**

Maximum load

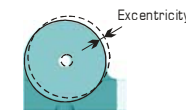
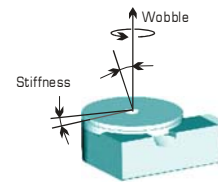
**W1** **W2**  
 8500 N 14500 N

**W1** **W2**  
 2300 N 4300 N



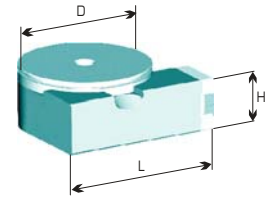
## Specifications

Travel range [°]:	360
Material (housing/worm gear):	Aluminium/Bronze
Gear ratio:	360:1
Resolution [°]:	0,001 (step motor, 1000 steps/revolution) 0,00005 minimum
$M_{input}$ (min) [Nm]:	2,0
$M_{output}$ (max) [Nm]:	125
Stiffness [ $\mu$ rad/Nm]:	0,07
Weight [kg]:	77
Flange size [mm]:	82
Transm. aperture [mm]:	370 (standard)



	<b>X1</b>	<b>X2</b>	<b>X3</b>	<b>XF</b>
Accuracy ["]:	≤ 35	20	10	0,1...
Repeatability (unidir.) ["]:	≤ 4	2	2	0,1...
Reversal error ["]:	≤ 8	4	3	0,1...
Excentricity [ $\mu$ m]:	≤ 5	3	2	2
Wobble ["]:	≤ 6	2	2	2

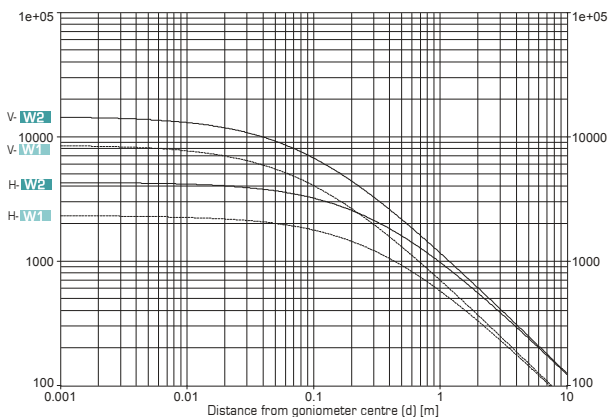
## Dimensions [mm]



D: 500 L: 447 H: 133

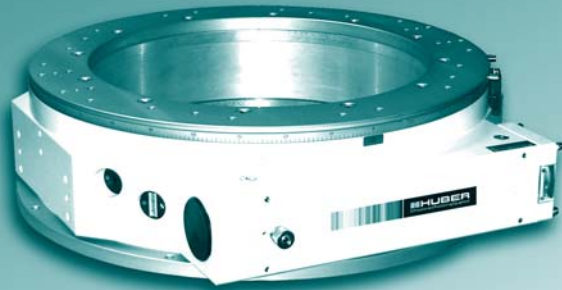
## Accessories

Motors:	2-/3-/5-Ph. Servo/DC
Hand wheels:	0083
Gear boxes:	2083.05 2083.10 2083.20
Limit switches:	included
Zero-point control:	9100
Encoder <b>XF</b> :	incremental, absolute
Control system:	9300



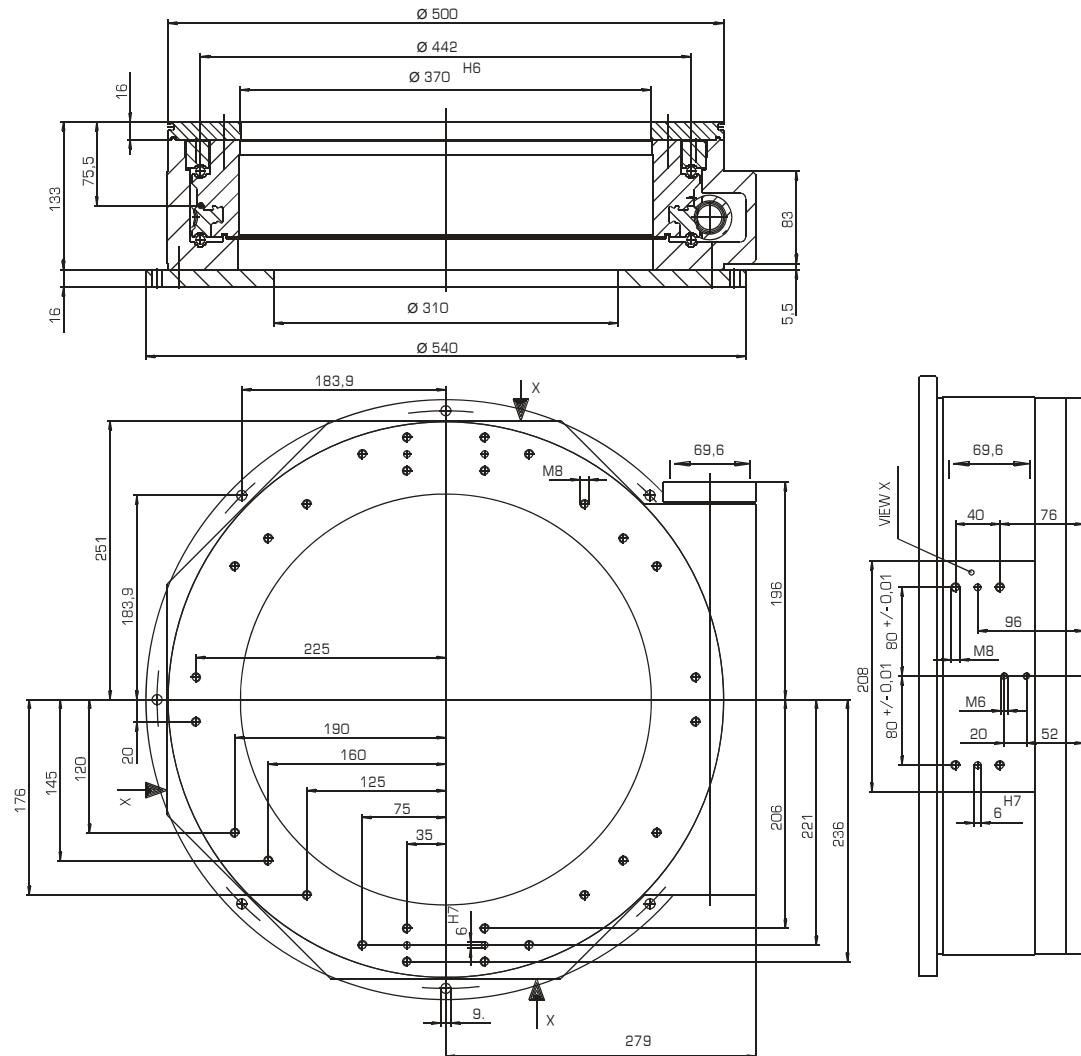
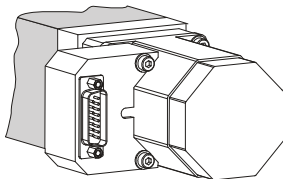
Vertical goniometer axis (V-W1, V-W2)  
 Horizontal goniometer axis (H-W1, H-W2)

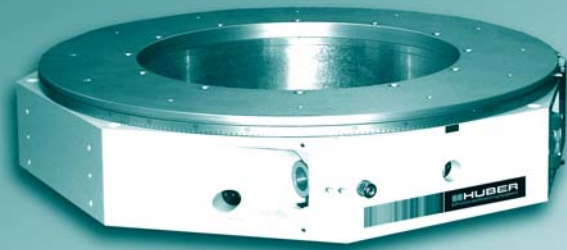




#### Power supply of motorised version:

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2- and 3-phase motors, and via a Sub D25 connector for 5-phase motors. In the standard version this connector is in a housing mounted on the side of the motor.





Modularly individually configurable

- from basic model to high-end system
- to multi-axis systems
- with individual transmission aperture
- with customer-specific hole pattern

Application specific versions:

- vacuum compatible
- antimagnetic
- radiation resistant
- in black

Four precision configurations:

**X1** **X2** **X3** **XF**

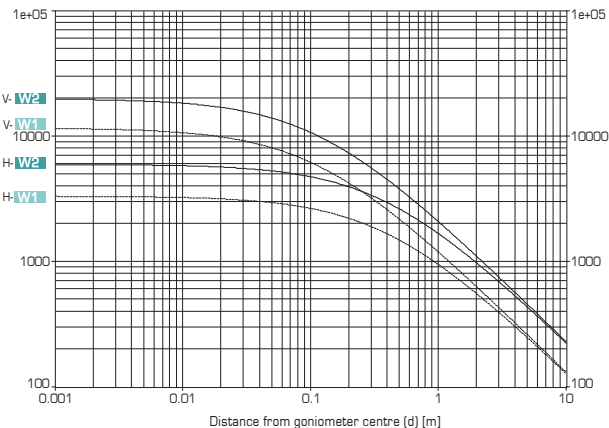
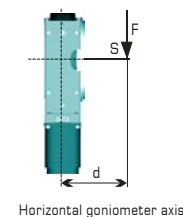
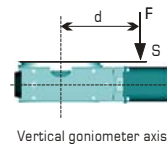
Two load configurations:

**W1** **W2**

### Maximum load

**W1** **W2**  
 11500 N 20000 N

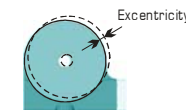
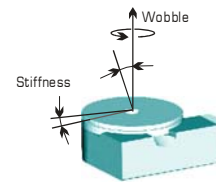
**W1** **W2**  
 3300 N 6000 N



Vertical goniometer axis (V-W1, V-W2)  
 Horizontal goniometer axis (H-W1, H-W2)

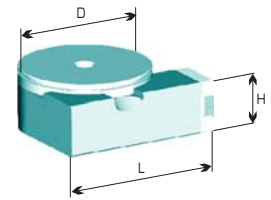
### Specifications

Travel range [°]:	360
Material (housing/worm gear):	Aluminium/Bronze
Gear ratio:	360:1
Resolution [°]:	0,001 (step motor, 1000 steps/revolution) 0,00005 minimum
$M_{input}$ (min) [Nm]:	3,8
$M_{output}$ (max) [Nm]:	250
Stiffness [ $\mu$ rad/Nm]:	0,02
Weight [kg]:	200
Flange size [mm]:	82
Transm. aperture [mm]:	500 (standard)



	<b>X1</b>	<b>X2</b>	<b>X3</b>	<b>XF</b>
Accuracy [°]:	≤ 35	20	10	0,1...
Repeatability (unidir.) [°]:	≤ 4	2	2	0,1...
Reversal error [°]:	≤ 8	4	3	0,1...
Eccentricity [ $\mu$ m]:	≤ 5	3	2	2
Wobble [°]:	≤ 7	4	2	2

### Dimensions [mm]

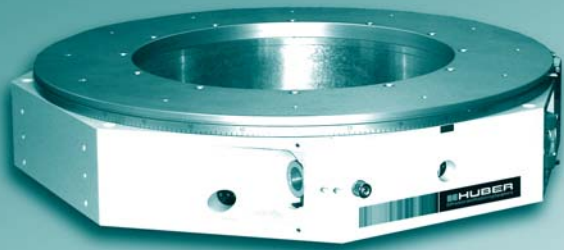


D: 800    L: 621    H: 165

### Accessories

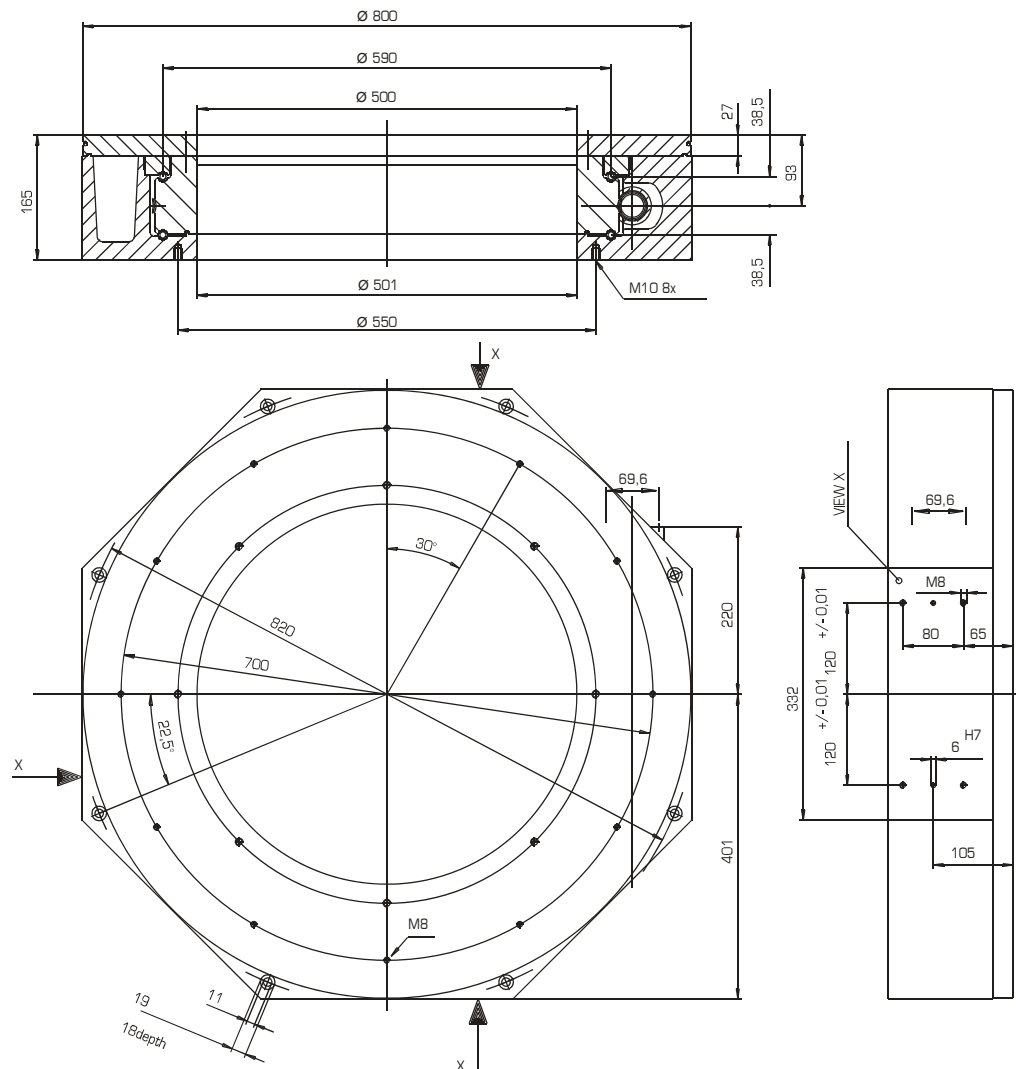
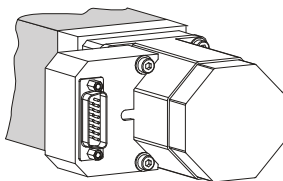
Motors:	2-/3-/5-Ph. Servo/DC
Hand wheels:	0083
Gear boxes:	2083.05 2083.10 2083.20
Limit switches:	included
Zero-point control:	9100
Encoder <b>XF</b> :	incremental, absolute
Control system:	9300

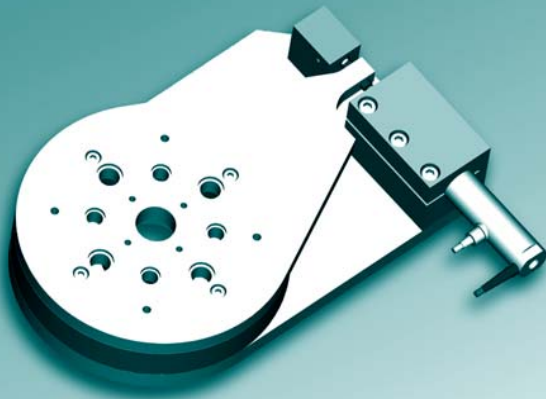
**HUBER**  
Diffraction and Positioning Equipment



#### Power supply of motorised version:

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2- and 3-phase motors, and via a Sub D25 connector for 5-phase motors. In the standard version this connector is in a housing mounted on the side of the motor.





### General information

The translational movement of the piezo actuator generates a minute rotational movement of the rotation plate.

An actuator with an operational range of  $90\mu\text{m}$  is capable of a maximum angle range of 134 arc seconds.

The resolution of the system is dependent both on the length of the leverage arm (standard 137.51mm) and the resolution of the actuator.

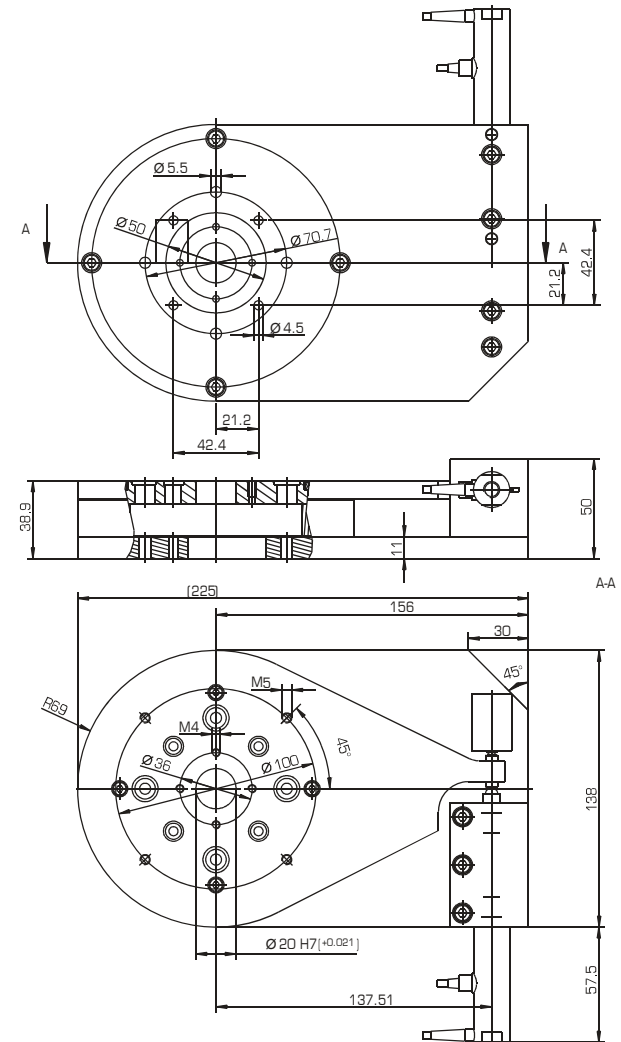
A goniometer 410 or 408 mounted underneath is used for pre-adjustment.

The system is available in a high-vacuum configuration.

### Also available:

- various actuators
- voltage amplifier
- connecting cables

### Dimensions [mm]



## Description

The 2-circle goniometer 414/414A basically consists of two goniometers 410 mounted one on top of the other. The rotational axis of the lower circle (theta) is fed through the upper circle (2-theta) by a drive shaft. This system, when mounted on a detector arm, is ideal for application as an analyser in 4- and 6-circle diffractometers.

Application specific versions:

- vacuum compatible
- antimagnetic
- radiation resistant
- in black

Four precision configurations:

**X1** **X2** **X3** **XE**

## Maximum load

This system is available in two different load configurations:

**W1** **W2**

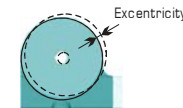
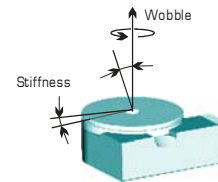
Maximum load - 2-theta-circle:  
see diagramme on left

Maximum load - theta-circle:

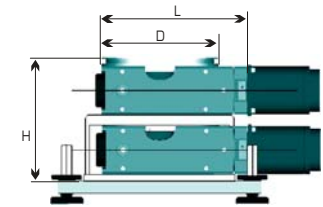
**W1**      **W2**  
50 N      100 N

## Specifications

Travel range [°]:	360
Material: (housing/worm gear)	Aluminium/Bronze
Gear ratio:	360:1/180:1 *
Resolution [°]:	0,001/0,002 * <small>(step motor 1000 steps/revolution)</small> 0,00005/0,0001 * minimum <small>(step motor 1000 steps/rev. with gear ratio 20:1)</small>
M <sub>input</sub> (min) [Nm]:	0,10/0,13 *
Weight [kg]:	13
Flange size [mm]:	56



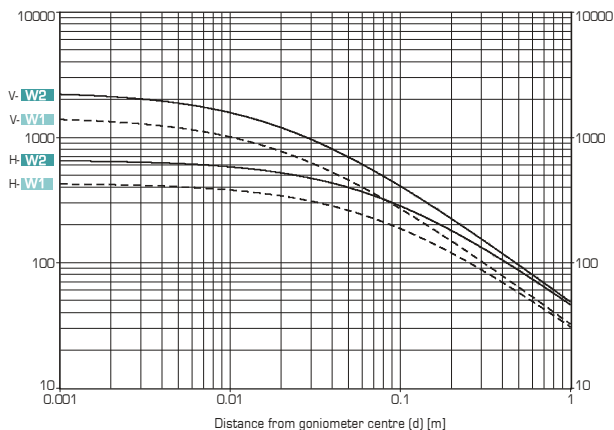
## Dimensions [mm]



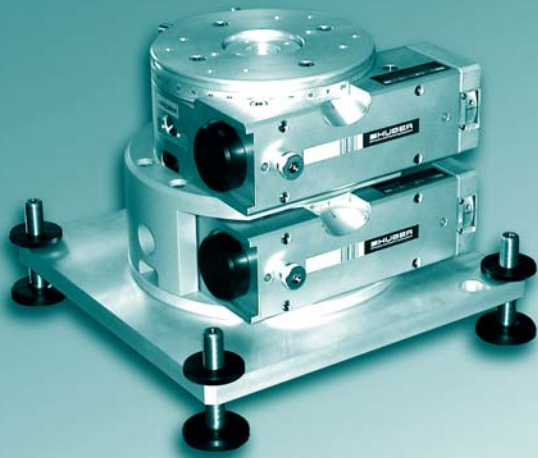
D:	L:	H:
138	171	145

## Accessories

Motors:	2-/3-/5-Ph. Servo/DC
Hand wheels:	0056
Gear boxes:	2056.05 2056.10 2056.20
Limit switch	
2-theta-circle:	included
Zero-point control:	9100
Encoder <b>XE</b> :	incremental, absolute
Control system:	9300
Goniometer head mounting:	1412, 1413
Arms:	Analyser Counter weight
Counter weight	
Base plate:	423.12 incl.

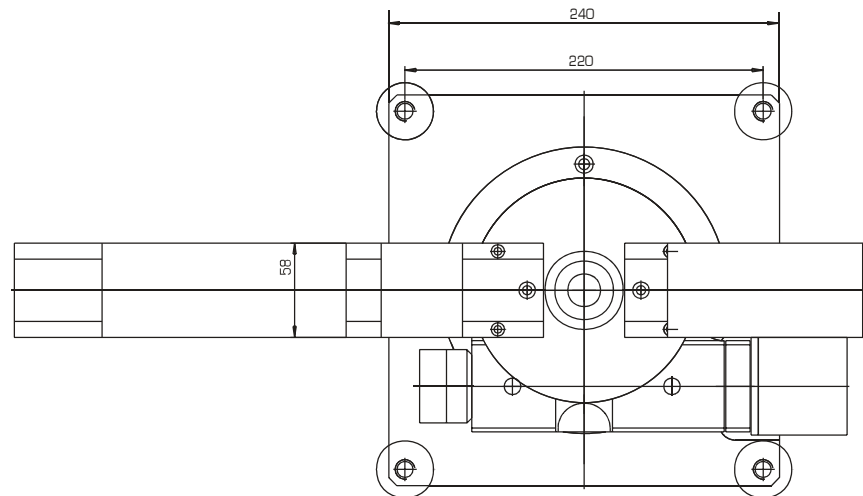
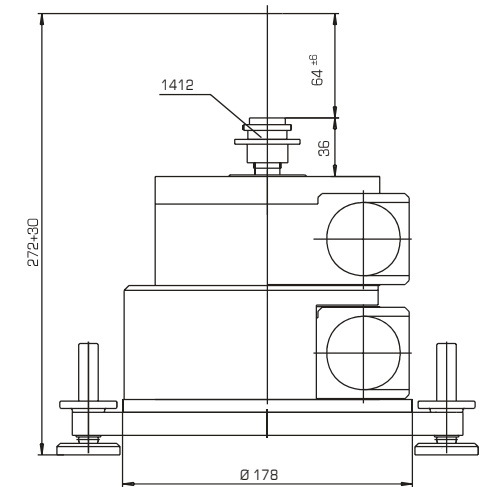
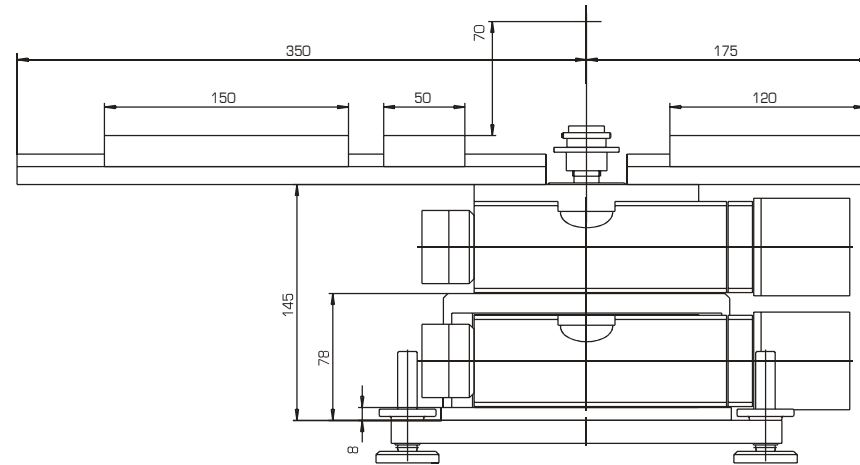
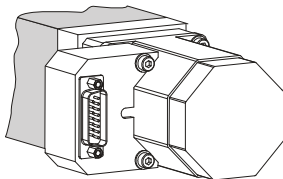


Vertical goniometer axis (V-W1, V-W2)  
Horizontal goniometer axis (H-W1, H-W2)

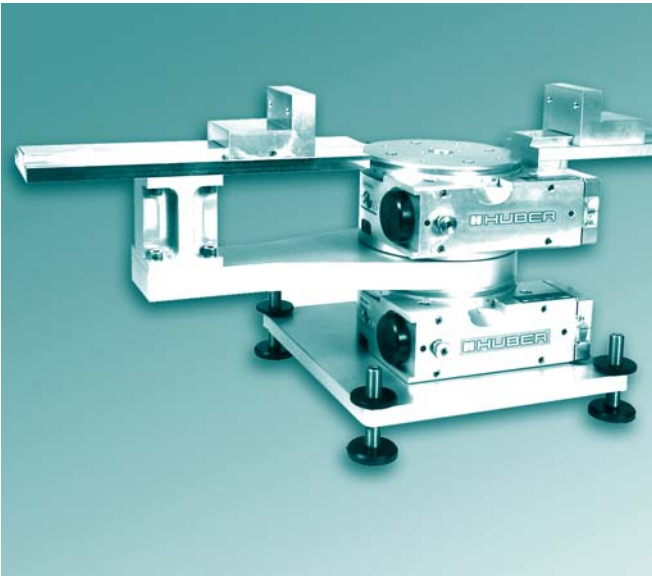


#### Power supply of motorised version:

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2- and 3-phase motors, and via a Sub D25 connector for 5-phase motors. In the standard version this connector is in a housing mounted on the side of the motor.







### Description

The system 415 is a combination of two 1-circle goniometers 410 or 410A\*. Both circular motions are independent of each other. The upper circle is equipped with a 2-theta arm with a prism guide and carriage. A further prism guide with carriage is mounted on the side of the housing of the upper circle.

#### Application specific versions:

- vacuum compatible
- antimagnetic
- radiation resistant
- in black

#### Four precision configurations:

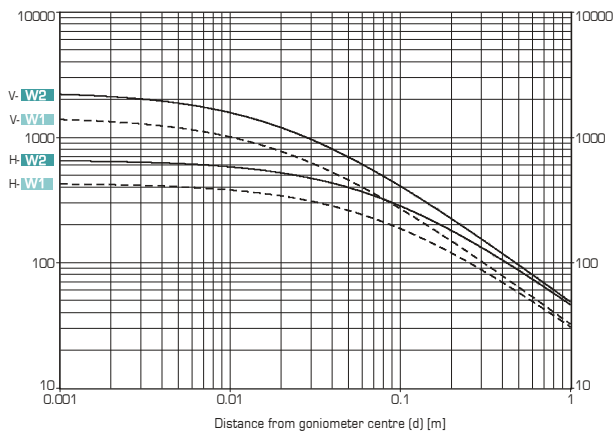
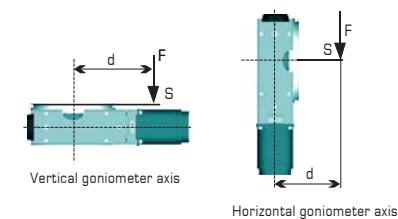
**X1** **X2** **X3** **XE**

### Maximum load

Theta-Kreis (axial): 1500 N

The 2-theta circle is available in two different load configurations:

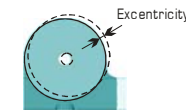
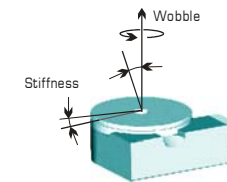
**W1** **W2** (see diagramme)



Vertical goniometer axis (V-W1, V-W2)  
Horizontal goniometer axis (H-W1, H-W2)

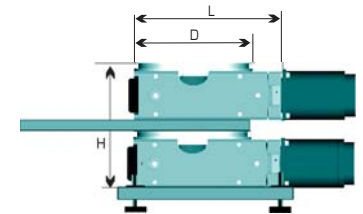
### Specifications

Travel range [°]:	360
Material: (housing/worm gear)	Aluminium/Bronze
Gear ratio:	360:1/180:1*
Resolution [°]:	0,001/0,002* <small>(step motor 1000 steps/revolution)</small> 0,00005/0,0001* minimum <small>(step motor 1000 steps/rev. with gear ratio 20:1)</small>
$M_{input}$ (min) [Nm]:	0,10/0,13*
Weight [kg]:	13
Flange size [mm]:	56



	<b>X1</b>	<b>X2</b>	<b>X3</b>	<b>XE</b>
Accuracy ["]:	≤ 40	30	15	0,2...
Repeatability (unidir.) ["]:	≤ 4	2	2	0,2...
Reversal error ["]:	≤ 20	10	7	0,2...
Eccentricity [µm]:	≤ 5	3	2	2
Wobble ["]:	≤ 8	4	3	3

### Dimensions [mm]

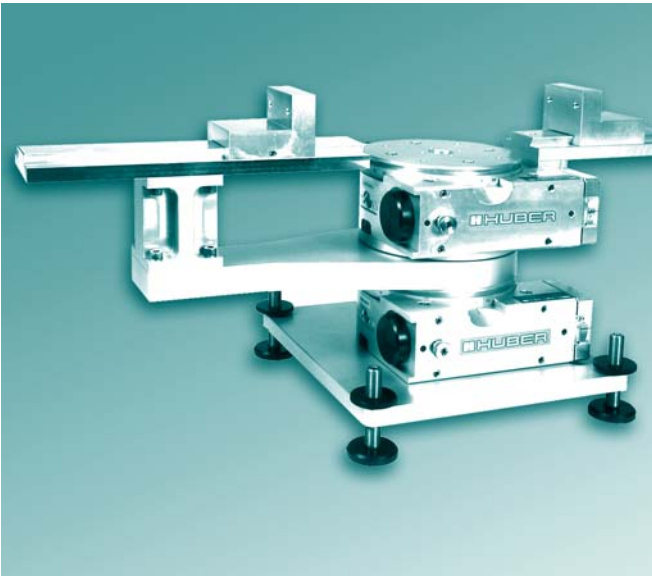


D:	L:	H:
138	171	168

### Accessories

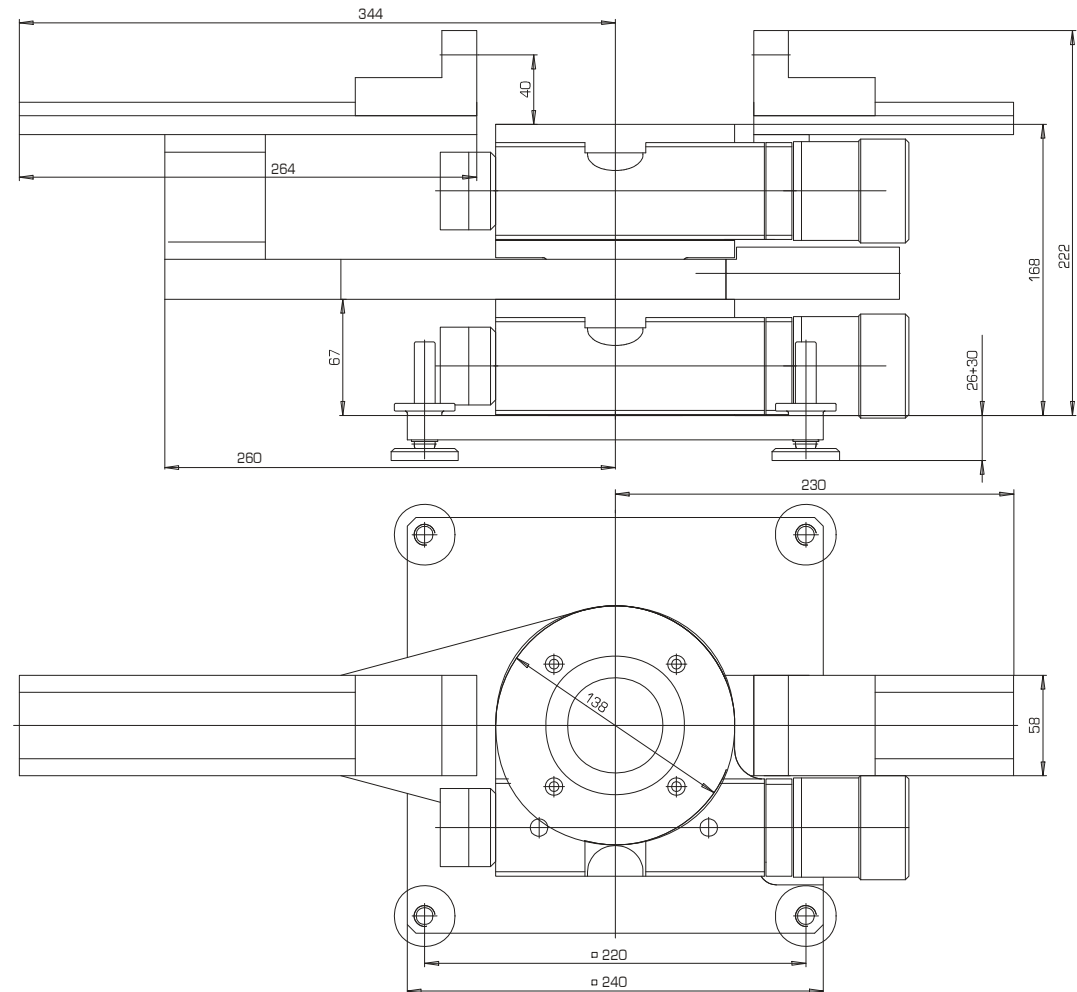
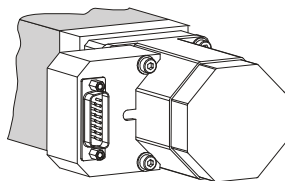
Motors:	2-/3-/5-Ph. Servo/DC
Hand wheels:	0056
Gear boxes:	2056.05 2056.10 2056.20
Limit switches:	included
Zero-point control:	9100
Encoder <b>XE</b> :	incremental, absolute
Control system:	9300
Goniometer head mounting:	1412, 1413
Arms:	Analyser Counter weight
Counter weight	
Base plate:	423.12 incl.

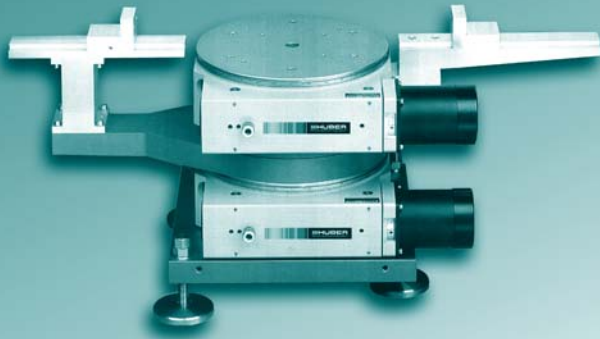
**HUBER**  
Diffraction and Positioning Equipment



#### Power supply of motorised version:

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2- and 3-phase motors, and via a Sub D25 connector for 5-phase motors. In the standard version this connector is in a housing mounted on the side of the motor.





### Description

This 2-circle goniometer 422 is a combination of two 1-circle goniometers 420. Both circular motions are independent of each other. The lower circle is equipped with a 2-theta arm with a prism guide and carriage. A further prism guide with carriage is mounted on the side of the housing of the upper circle.

Application specific versions:

- vacuum compatible
- antimagnetic
- radiation resistant
- in black

Four precision configurations:

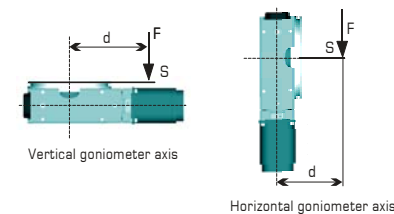
**X1** **X2** **X3** **XE**

### Maximum load

Theta-circle (axial): 3600

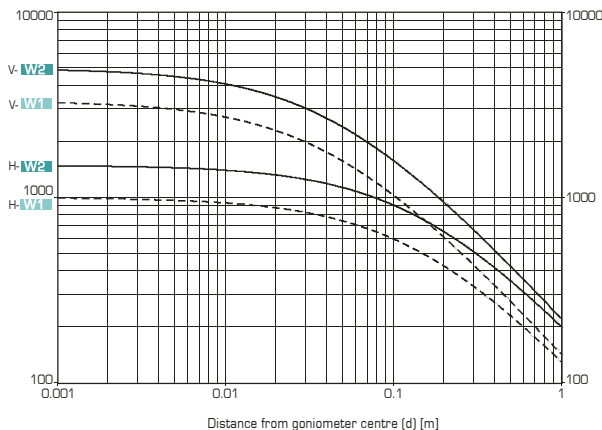
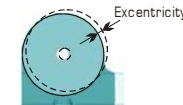
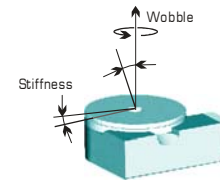
The 2-theta circle is available in two different load configurations:

**W1** **W2** (see diagram)



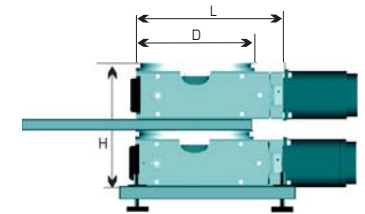
### Specifications

Travel range [°]:	360
Material: (housing/worm gear)	Aluminium/Bronze
Gear ratio:	360:1
Resolution [°]:	0,001 (step motor with 1000 steps/revolution) 0,00005 minimum
Stiffness [ $\mu$ rad/Nm]:	0,2
$M_{input}$ (min) [Nm]:	1,0
Weight [kg]:	85
Flange size [mm]:	82



Vertical goniometer axis (V-W1, V-W2)  
Horizontal goniometer axis (H-W1, H-W2)

### Dimensions [mm]

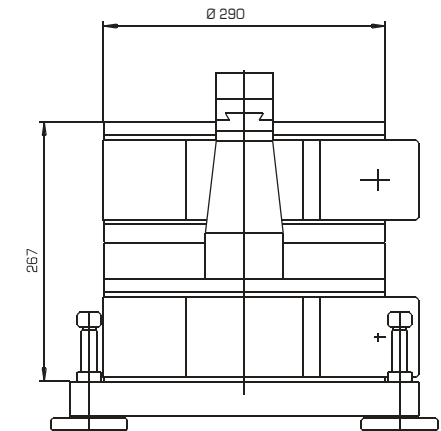
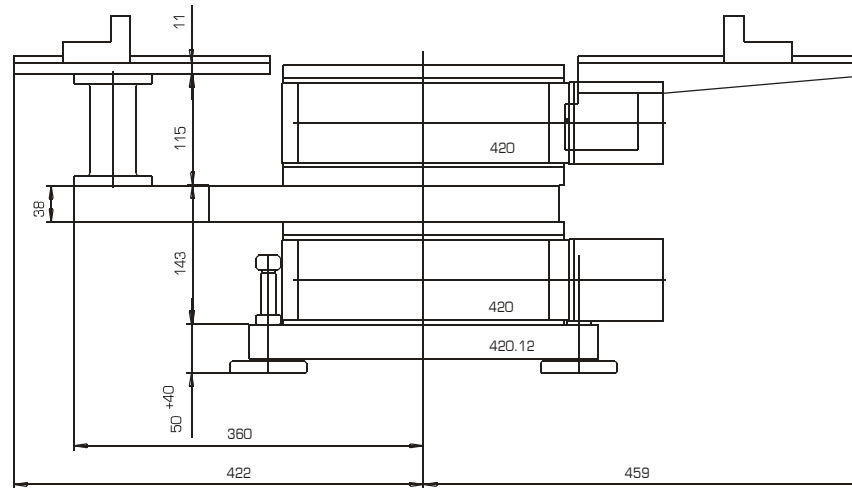


D:	L:	H:
290	278	267

### Accessories

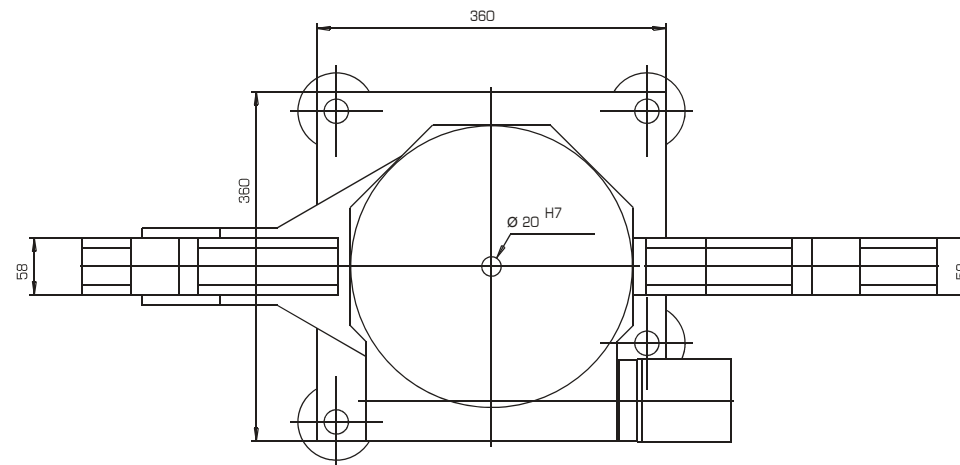
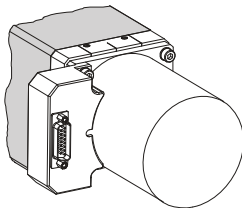
Motors:	2-/3-/5-Ph. Servo/DC
Hand wheels:	0083
Gear boxes:	2083.05 2083.10 2083.20
Limit switches:	included
Zero-point control:	9100
Encoder <b>XE</b> :	incremental, absolute
Control system:	9300
Various adaptor plates	
Arms:	Analyser Counter weight
Counter weight	
Base plate:	420.12 incl.

		<b>X1</b>	<b>X2</b>	<b>X3</b>	<b>XE</b>
Accuracy ["]:	≤	40	25	12	0,1...
Repeatability (unidir.) ["]:	≤	4	2	2	0,1...
Reversal error ["]:	≤	8	4	3	0,1...
Eccentricity [ $\mu$ m]:	≤	5	3	2	2
Wobble ["]:	≤	8	3	3	3



#### Power supply of motorised version:

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2- and 3-phase motors, and via a Sub D25 connector for 5-phase motors. In the standard version this connector is in a housing mounted on the side of the motor. .





### Description

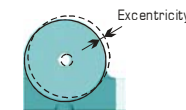
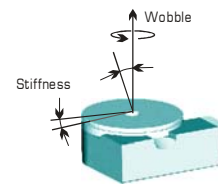
Due to its compact construction, this 2-circle goniometer 423 is ideal for applications where space is limited. Both circular motions are independent of each other. The lower circle is equipped with a 2-theta arm with a prism guide and carriage. A further prism guide with carriage is mounted on the side of the housing of the upper circle.

#### Application specific versions:

- vacuum compatible
- antimagnetic
- radiation resistant
- in black

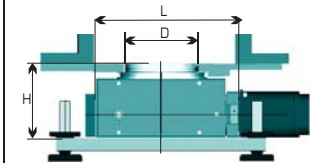
### Specifications

Travel range [°]:	360
Material: (housing/worm gear)	Aluminium/Bronze
Gear ratio:	360:1
Resolution [°]:	0,001 (step motor with 1000 steps/rev.) 0,00005 minimum
$M_{input}$ (min) [Nm]:	0,2
Stiffness [ $\mu$ rad/Nm]:	6
Maximum load (theta) [N]:	1500
Maximum load (2-theta) [N]:	50
Weight [kg]:	12
Flange size [mm]:	56



Accuracy ["]:	$\leq 30$
Repeatability (unidir.) ["]:	$\leq 2$
Reversal error ["]:	$\leq 10$
Eccentricity [ $\mu$ m]:	$\leq 3$
Wobble ["]:	$\leq 5$

### Dimensions [mm]

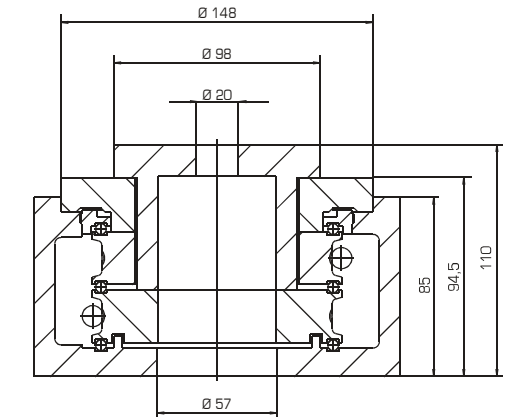
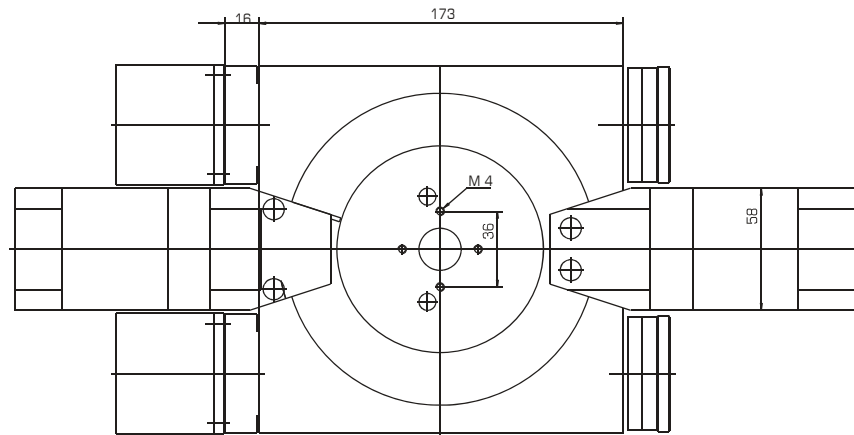
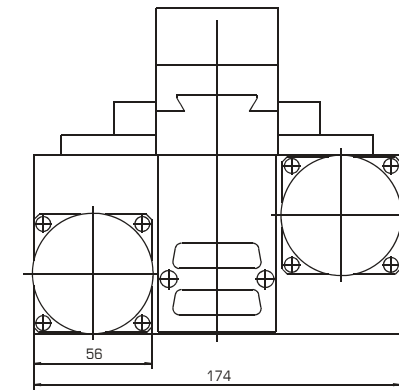
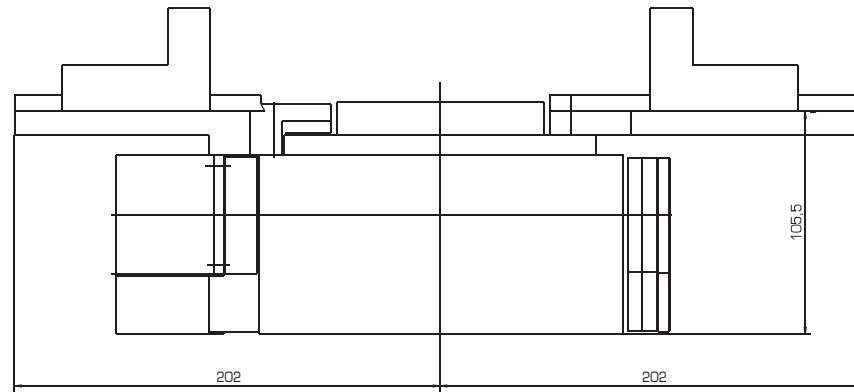


D:	L:	H:
98	189	110

### Accessories

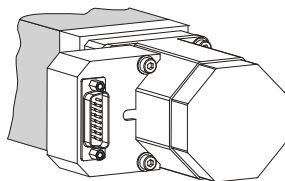
Step motors:	included
Gear boxes:	2056.05 2056.10 2056.20
Limit switches:	included
Zero-point control:	included
Encoder:	incremental, absolute
Control system:	9300
Goniometer head support:	1412, 1413
Various arms:	Analyser Counter weight
Counter weight	
Base plate:	423.12 incl.
Soller slit system	

**HUBER**  
Diffraction and Positioning Equipment

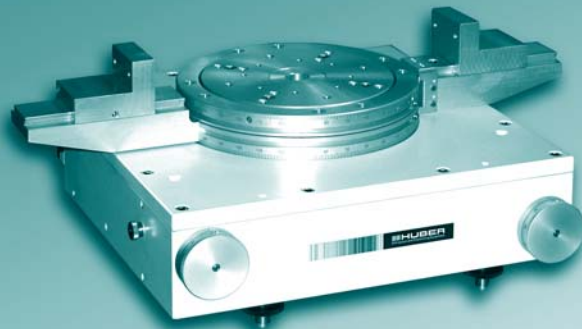


#### Power supply of motorised version:

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2- and 3-phase motors, and via a Sub D25 connector for 5-phase motors. In the standard version this connector is in a housing mounted on the side of the motor.







### Description

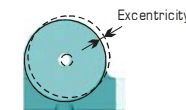
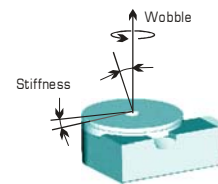
This system offers low height, high precision and high load capacity. As in all other systems in this series, both circular motions are independent of each other. The 2-theta circle is equipped with an arm with a prism guide and carriage. A further prism guide with carriage is mounted to the side of both circles

#### Application specific versions:

- vacuum compatible
- antimagnetic
- radiation resistant
- in black

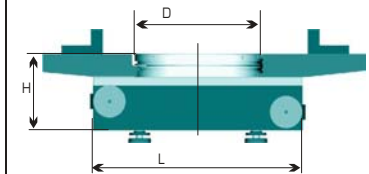
### Specifications

Travel range [°]:	360
Material: (housing/worm gear)	Aluminium/Bronze
Gear ratio:	360:1
Resolution [°]:	0,001 (step motor with 1000 steps/rev.) 0,00005 minimum
$M_{input}$ (min) [Nm]:	0,5
Stiffness [ $\mu$ rad/Nm]:	2
Maximum load (theta) [N]:	3600
Maximum load (2-theta) [N]:	100
Weight [kg]:	36
Flange size [mm]:	56



Accuracy ["]:	$\leq 30$
Repeatability (unidir.) ["]:	$\leq 2$
Reversal error ["]:	$\leq 7$
Eccentricity [ $\mu$ m]:	$\leq 3$
Wobble ["]:	$\leq 4$

### Dimensions [mm]



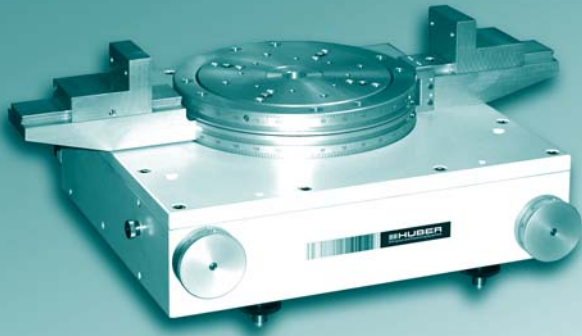
D:	L:	H:
215	356	130

### Accessories

Step motors:	included
Gear boxes:	2056.05 2056.10 2056.20

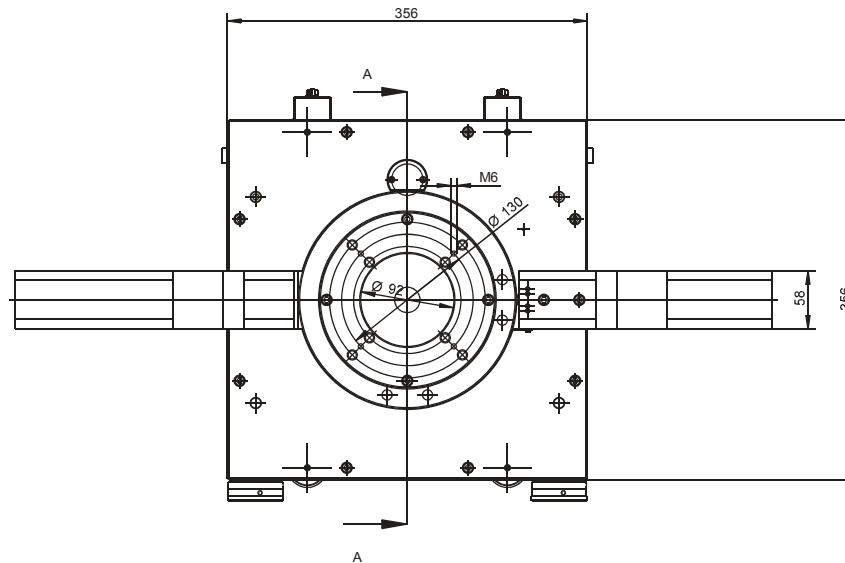
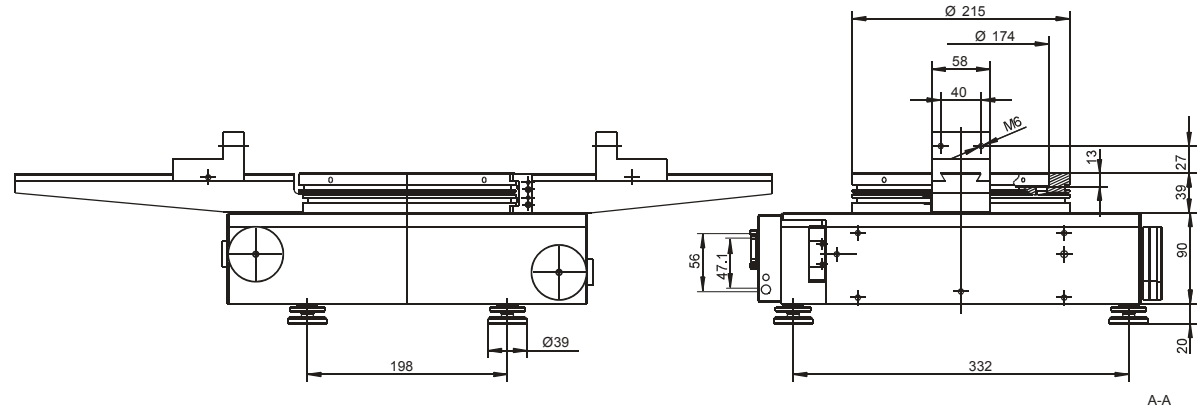
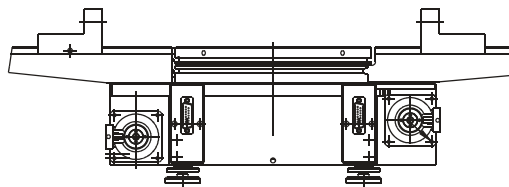
Limit switches:	included
Zero-point control:	included
Encoder:	incremental, absolute
Control system:	9300

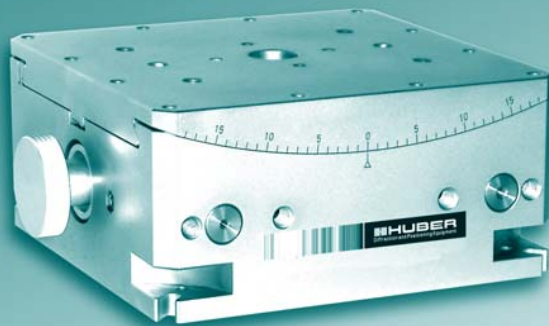
Various arms  
Counter weight  
Soller aperture system



#### Power supply of motorised version:

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2- and 3-phase motors, and via a Sub D25 connector for 5-phase motors. These connectors are in the housing of the 2-circle goniometer on the side of the motor.





- Multi-axis positioning systems possible by simple combination of stages (e.g. with 5102.20, 5103.20)
- High-precision worm gear drive with ground and tempered worm gear, self-locking
- Dovetail guides with fitted bronze slideways
- Use of stress relieved, highly resilient materials guarantees high system stability and long life
- Robust surfaces through nickel-/chrome-treatment

Modularly individually configurable

- from basic model to high-end system
- to multi-axis systems
- with customer-specific hole pattern

Application specific versions:

- vacuum compatible
- antimagnetic
- radiation resistant
- in black

Two precision configurations:

**X1** **XE**

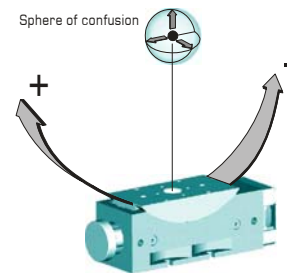
### Maximum load and torque

A general statement of maximum load and torque capacities is not possible for eccentric forces due to the amount of different configurations.

However, our engineers will gladly calculate the maximum load capacity for your specific application.

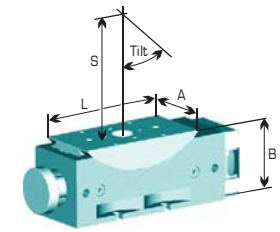
### Specifications

Travel range [°]:	± 17
Material (housing/worm gear):	Bronze
Ratio:	360:1
Resolution [°]:	0,001 (step motor with 1000 steps/revolution) 0,00005 minimum
M <sub>input</sub> (min) [Nm]:	0,6
Load (max) [Nm]:	1000
Weight [kg]:	13
Flange size [mm]:	56



		<b>X1</b>	<b>XE</b>
Sphere of conf. [µm]:	≤ ±	10	10
Accuracy ["]:	≤ ±	6	0,1...
Repeatability (unidir.) ["]:	≤ ±	3	0,1...
Reversal error ["]:	≤	6	0,1...

### Dimensions [mm]

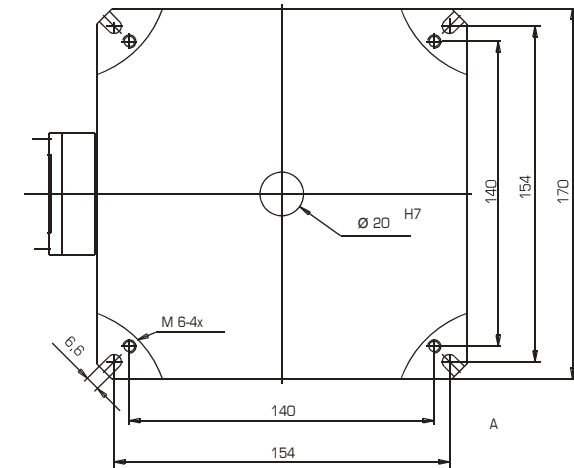
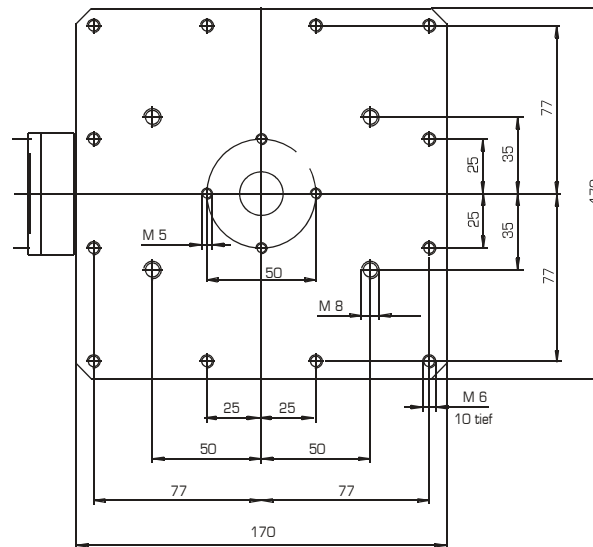
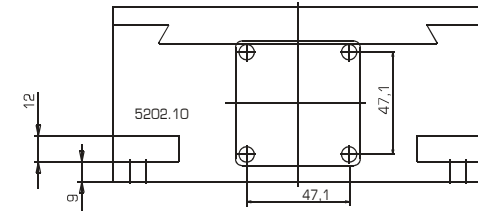
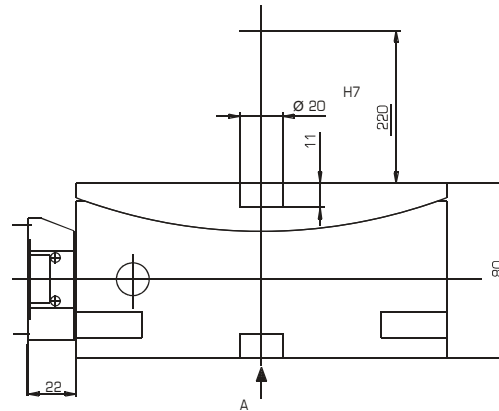
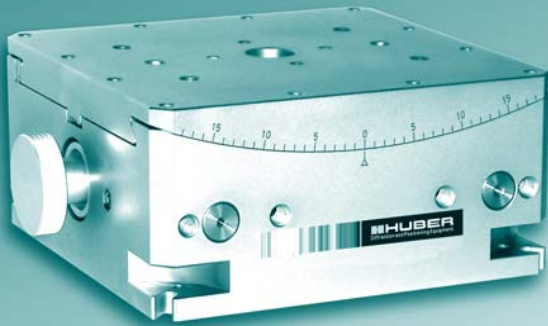


S:	Tilt:	L:	A:	B:
220	±17°	170	170	80

### Accessories

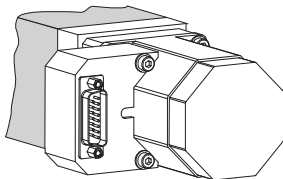
Motors:	2-/3-/5-Ph. Servo/DC
Hand wheels:	0056
Gear boxes:	2056.05 2056.10 2056.20
Limit switches	
Zero-point control	
Encoder <b>XE</b> :	incremental, absolute
Control system:	9300

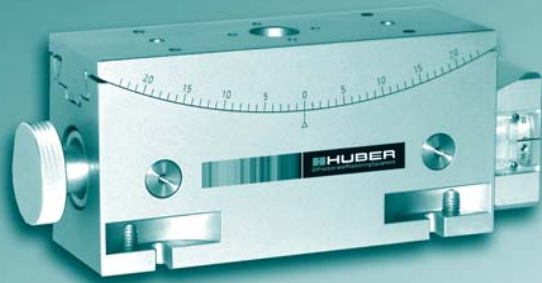
**HUBER**  
Diffraction and Positioning Equipment



#### Power supply of motorised version:

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2- and 3-phase motors, and via a Sub D25 connector for 5-phase motors. In the standard version this connector is in a housing mounted on the side of the motor.





- Multi-axis positioning systems possible by simple combination of stages
- High-precision worm gear drive with ground and tempered worm gear, self-locking
- Dovetail guides with fitted bronze slideways
- Use of stress relieved, highly resilient materials guarantees high system stability and long life
- Robust surfaces through nickel-/chrome-treatment

Modularly individually configurable

- from basic model to high-end system
- to multi-axis systems
- with customer-specific hole pattern

Application specific versions:

- vacuum compatible
- antimagnetic
- radiation resistant
- in black

Two precision configurations:

**X1** **XE**

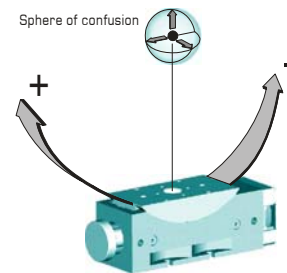
### Maximum load and torque

A general statement of maximum load and torque capacities is not possible for eccentric forces due to the amount of different configurations.

However, our engineers will gladly calculate the maximum load capacity for your specific application.

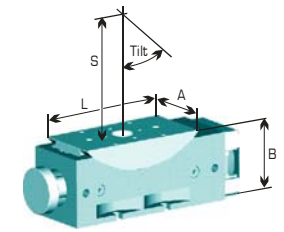
### Specifications

Travel range [°]:	± 20
Material (housing/worm gear):	Bronze
Ratio:	360:1
Resolution [°]:	0,001 (step motor with 1000 steps/revolution) 0,00005 minimum
M <sub>input</sub> (min) [Nm]:	0,5
Load (max) [Nm]:	1000
Weight [kg]:	4
Flange size [mm]:	56



		<b>X1</b>	<b>XE</b>
Sphere of conf. [µm]:	≤ ±	12	12
Accuracy ["]:	≤ ±	20	0,1...
Repeatability (unidir.) ["]:	≤ ±	3	0,1...
Reversal error ["]:	≤	6	0,1...

### Dimensions [mm]



S:	Tilt:	L:	A:	B:
170	±20°	170	60	84

### Accessories

Motors: 2-/3-/5-Ph.  
Servo/DC

Hand wheels: 0056

Gear boxes: 2056.05  
2056.10  
2056.20

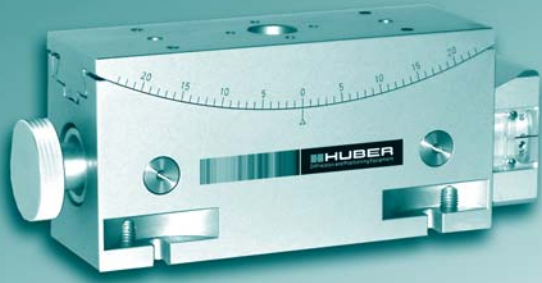
Limit switches

Zero-point control

Encoder **XE**: incremental,  
absolute

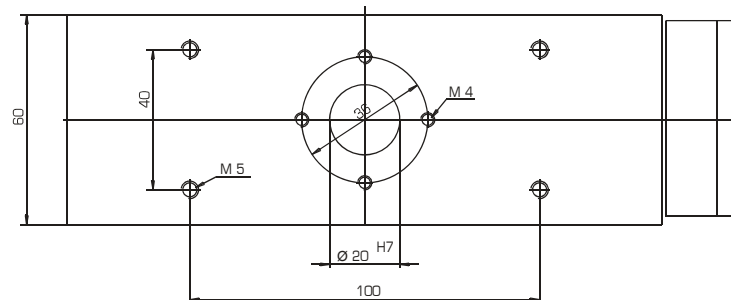
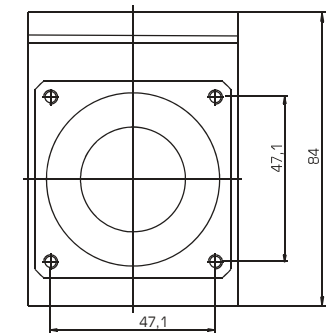
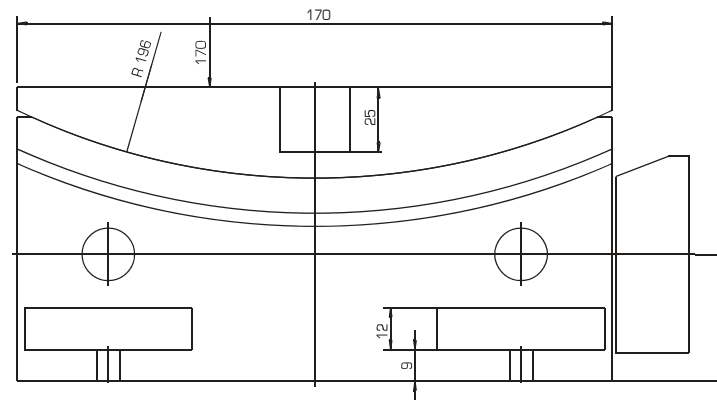
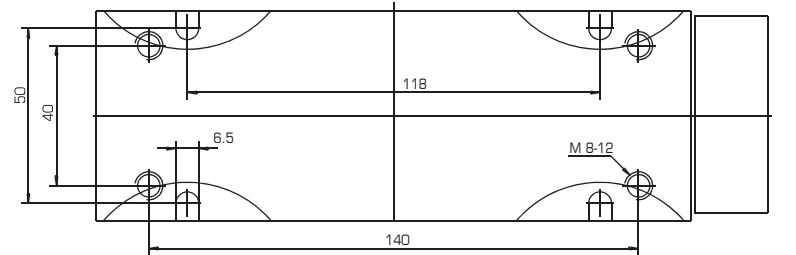
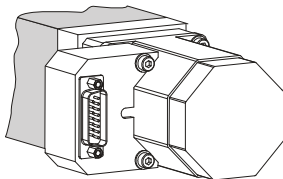
Control system: 9300

**HUBER**  
Diffraction and Positioning Equipment



#### Power supply of motorised version:

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2- and 3-phase motors, and via a Sub D25 connector for 5-phase motors. In the standard version this connector is in a housing mounted on the side of the motor.





Modularly individually configurable

- from basic model to high-end system
- to multi-axis systems
- with customer-specific hole pattern

Application specific versions:

- vacuum compatible
- antimagnetic
- radiation resistant
- in black

Two precision configurations:

**X1** **XE**

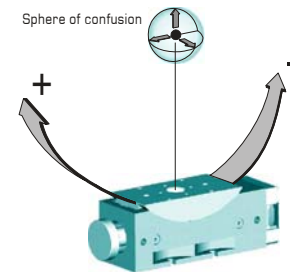
### Maximum load and torque

A general statement of maximum load and torque capacities is not possible for eccentric forces due to the amount of different configurations.

However, our engineers will gladly calculate the maximum load capacity for your specific application.

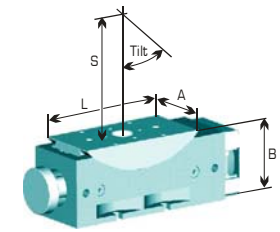
### Specifications

Travel range [°]:	± 17
Material (housing/worm gear):	Bronze
Ratio:	360:1
Resolution [°]:	0,001 (step motor with 1000 steps/revolution) 0,00005 minimum
M <sub>input</sub> (min) [Nm]:	0,45
Load (max) [Nm]:	1000
Weight [kg]:	4
Flange size [mm]:	56



		<b>X1</b>	<b>XE</b>
Sphere of conf. [µm]:	≤ ±	12	12
Accuracy ["]:	≤ ±	25	0,1...
Repeatability (unidir.) ["]:	≤ ±	3	0,1...
Reversal error ["]:	≤	6	0,1...

### Dimensions [mm]



S:	Tilt:	L:	A:	B:
220	±17°	170	60	80

### Accessories

Motors: 2-/3-/5-Ph.  
Servo/DC

Hand wheels: 0056

Gear boxes: 2056.05  
2056.10  
2056.20

Limit switches

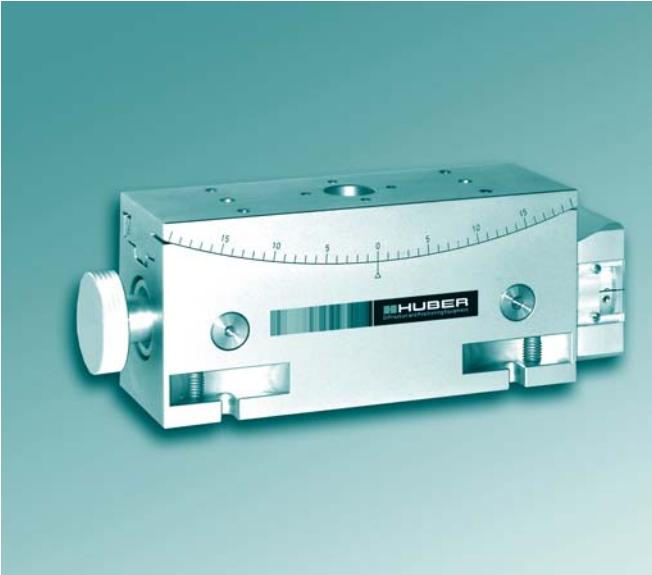
Zero-point control

Encoder **XE**: incremental,  
absolute

Control system: 9300

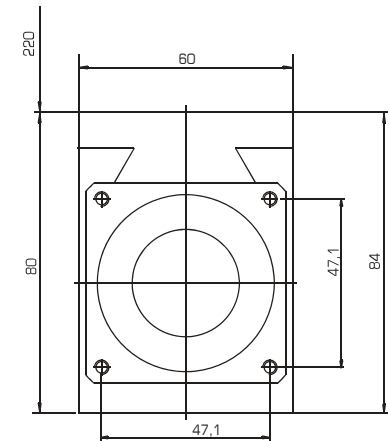
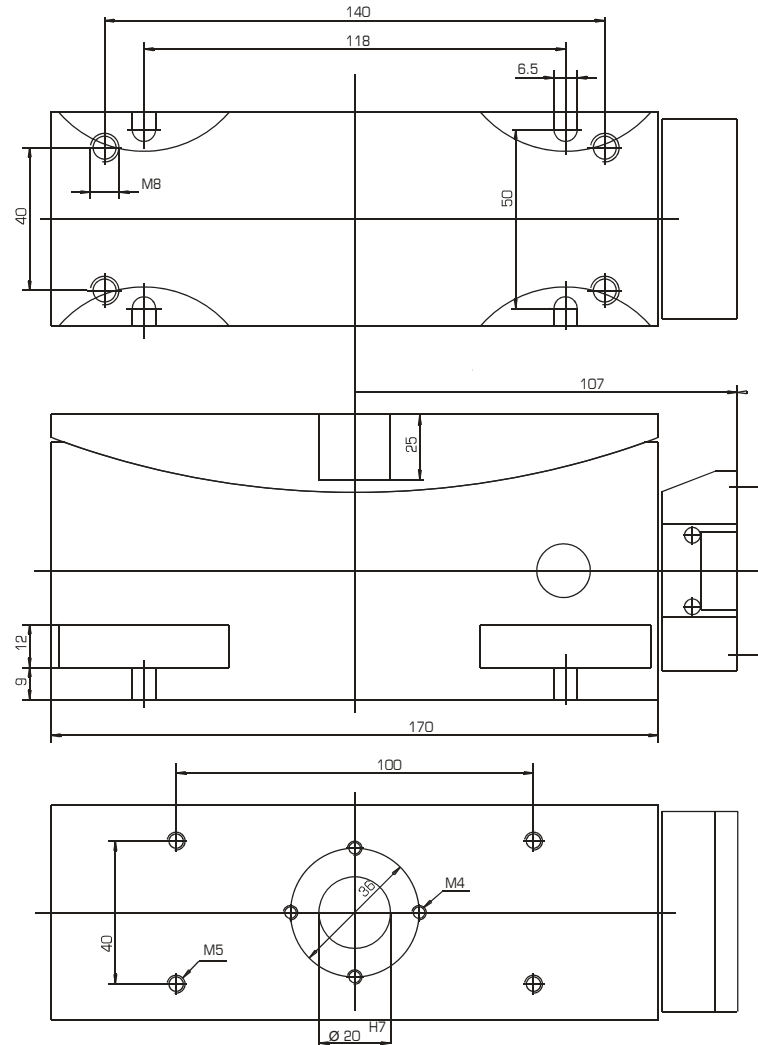
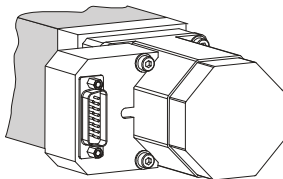
- Multi-axis positioning systems possible by simple combination of stages (e.g. with 5102.20, 5103.20)
- High-precision worm gear drive with ground and tempered worm gear, self-locking
- Dovetail guides with fitted bronze slideways
- Use of stress relieved, highly resilient materials guarantees high system stability and long life
- Robust surfaces through nickel-/chrome-treatment

**HUBER**  
Diffraction and Positioning Equipment



#### Power supply of motorised version:

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2- and 3-phase motors, and via a Sub D25 connector for 5-phase motors. In the standard version this connector is in a housing mounted on the side of the motor.





- Multi-axis positioning systems possible by simple combination of stages (e.g. with 5102.20, 5103.20)
- High-precision worm gear drive with ground and tempered worm gear, self-locking
- Dovetail guides with fitted bronze slideways
- Use of stress relieved, highly resilient materials guarantees high system stability and long life
- Robust surfaces through nickel-/chrome-treatment

Modularly individually configurable

- from basic model to high-end system
- to multi-axis systems
- with customer-specific hole pattern

Application specific versions:

- vacuum compatible
- antimagnetic
- radiation resistant
- in black

Two precision configurations:

**X1** **XE**

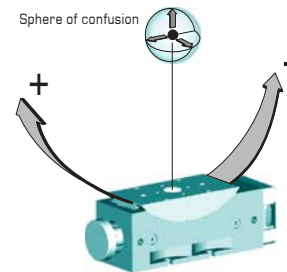
#### Maximum load and torque

A general statement of maximum load and torque capacities is not possible for eccentric forces due to the amount of different configurations.

However, our engineers will gladly calculate the maximum load capacity for your specific application.

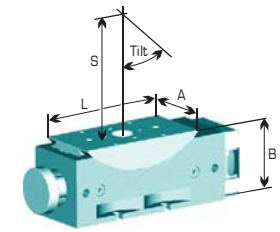
#### Specifications

Travel range [°]:	± 30
Material (housing/worm gear):	Bronze
Ratio:	360:1
Resolution [°]:	0,001 (step motor with 1000 steps/revolution) 0,00005 minimum
M <sub>input</sub> (min) [Nm]:	0,45
Load (max) [Nm]:	1000
Weight [kg]:	4
Flange size [mm]:	56



		<b>X1</b>	<b>XE</b>
Sphere of conf. [µm]:	≤ ±	12	12
Accuracy ["]:	≤ ±	25	0,2...
Repeatability (unidir.) ["]:	≤ ±	3	0,2...
Reversal error ["]:	≤	6	0,2...

#### Dimensions [mm]



S:	Tilt:	L:	A:	B:
60	±30°	115	60	66

#### Accessories

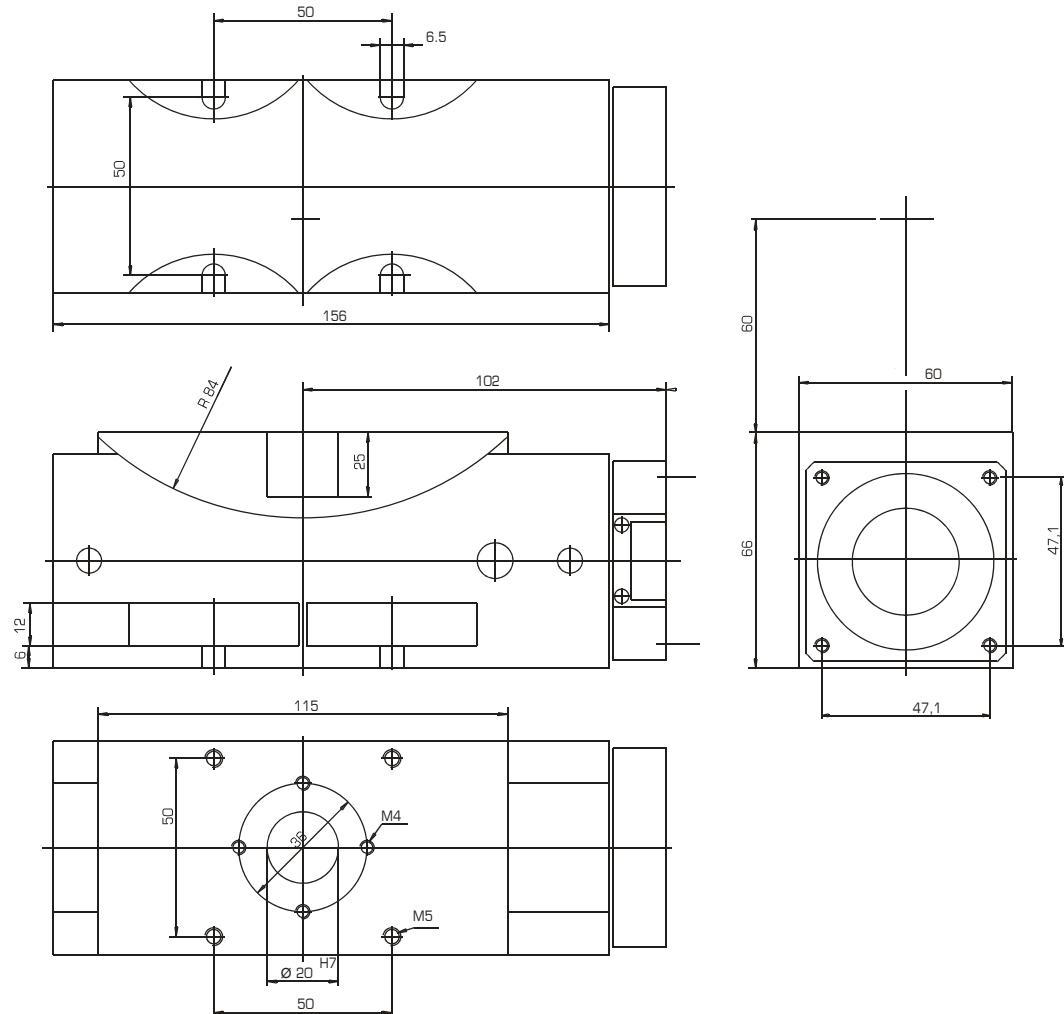
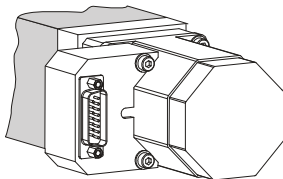
Motors:	2-/3-/5-Ph. Servo/DC
Hand wheels:	0056
Gear boxes:	2056.05 2056.10 2056.20
Limit switches	
Zero-point control	
Encoder <b>XE</b> :	incremental, absolute
Control system:	9300

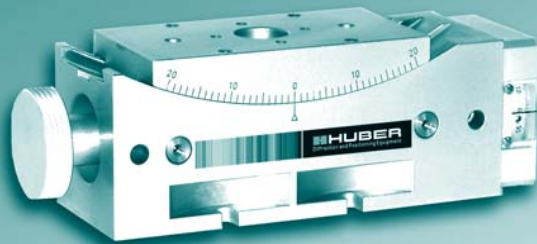
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Diffraction and Positioning Equipment



#### Power supply of motorised version:

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2- and 3-phase motors, and via a Sub D25 connector for 5-phase motors. In the standard version this connector is in a housing mounted on the side of the motor.





- Multi-axis positioning systems possible by simple combination of stages (e.g. with 5102.20, 5103.20)
- High-precision worm gear drive with ground and tempered worm gear, self-locking
- Dovetail guides with fitted bronze slideways
- Use of stress relieved, highly resilient materials guarantees high system stability and long life
- Robust surfaces through nickel-/chrome-treatment

Modularly individually configurable

- from basic model to high-end system
- to multi-axis systems
- with customer-specific hole pattern

Application specific versions:

- vacuum compatible
- antimagnetic
- radiation resistant
- in black

Two precision configurations:

**X1** **XE**

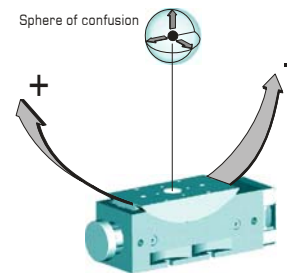
### Maximum load and torque

A general statement of maximum load and torque capacities is not possible for eccentric forces due to the amount of different configurations.

However, our engineers will gladly calculate the maximum load capacity for your specific application.

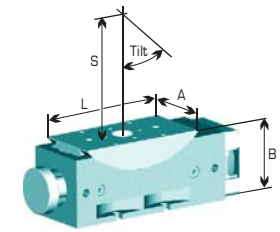
### Specifications

Travel range [°]:	± 20
Material (housing/worm gear):	Bronze
Ratio:	360:1
Resolution [°]:	0,001 (step motor with 1000 steps/revolution) 0,00005 minimum
M <sub>input</sub> (min) [Nm]:	0,45
Load (max) [Nm]:	1000
Weight [kg]:	4
Flange size [mm]:	56



		<b>X1</b>	<b>XE</b>
Sphere of conf. [µm]:	≤ ±	12	12
Accuracy [°]:	≤ ±	25	0,1...
Repeatability (unidir.) [°]:	≤ ±	3	0,1...
Reversal error [°]:	≤	6	0,1...

### Dimensions [mm]

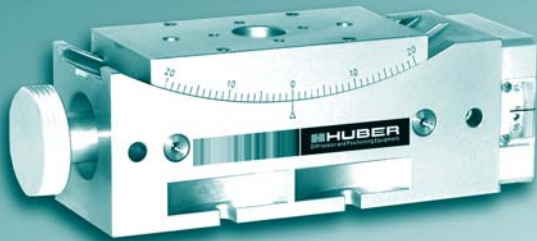


S:	Tilt:	L:	A:	B:
126	±20°	110	60	64

### Accessories

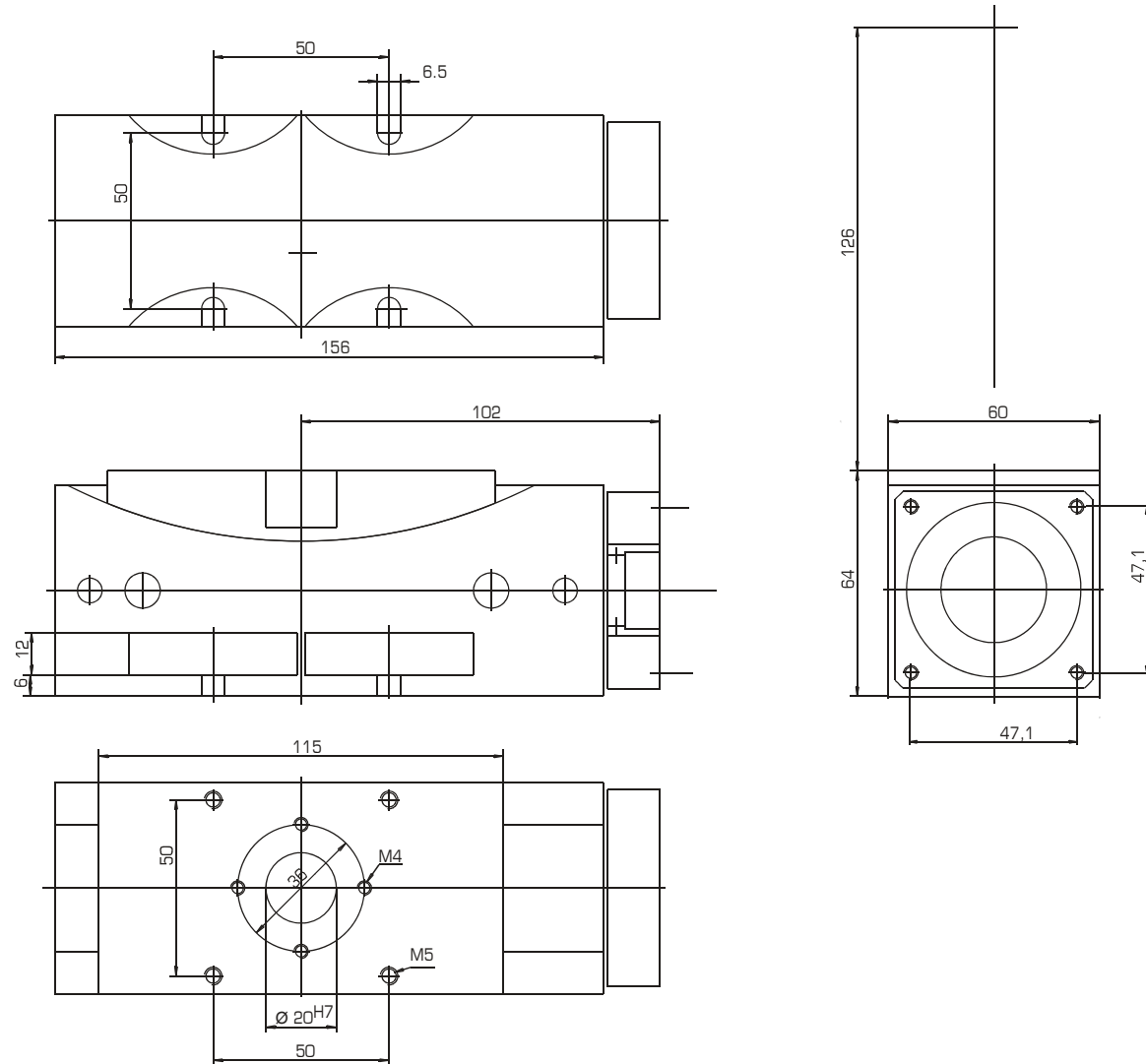
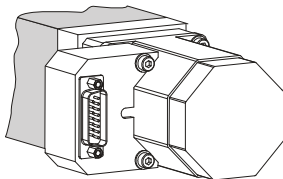
Motors:	2-/3-/5-Ph. Servo/DC
Hand wheels:	0056
Gear boxes:	2056.05 2056.10 2056.20
Limit switches	
Zero-point control	
Encoder <b>XE</b> :	incremental, absolute
Control system:	9300

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Diffraction and Positioning Equipment

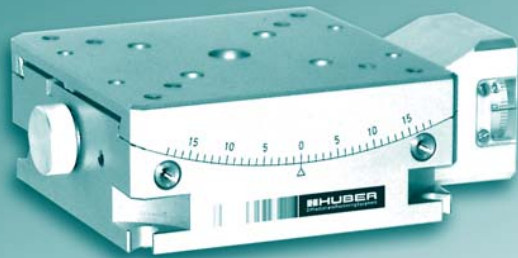


#### Power supply of motorised version:

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2- and 3-phase motors, and via a Sub D25 connector for 5-phase motors. In the standard version this connector is in a housing mounted on the side of the motor.







- Multi-axis positioning systems possible by simple combination of stages (e.g. with 5102.20, 5103.20)
- High-precision worm gear drive with ground and tempered worm gear, self-locking
- Dovetail guides with fitted bronze slideways
- Use of stress relieved, highly resilient materials guarantees high system stability and long life
- Robust surfaces through nickel-/chrome-treatment

Modularly individually configurable

- from basic model to high-end system
- to multi-axis systems
- with customer-specific hole pattern

Application specific versions:

- vacuum compatible
- antimagnetic
- radiation resistant
- in black

Two precision configurations:

**X1** **XE**

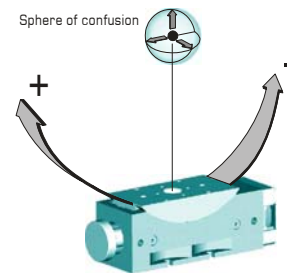
#### Maximum load and torque

A general statement of maximum load and torque capacities is not possible for eccentric forces due to the amount of different configurations.

However, our engineers will gladly calculate the maximum load capacity for your specific application.

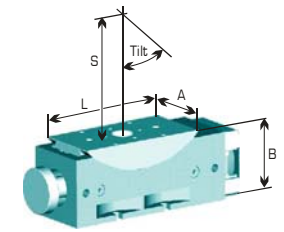
#### Specifications

Travel range [°]:	± 17
Material (housing/worm gear):	Bronze
Gear ratio:	360:1
Resolution [°]:	0,001 (step motor with 1000 steps/revolution) 0,00005 minimum
M <sub>input</sub> (min) [Nm]:	0,45
Load (max) [Nm]:	1000
Weight [kg]:	4
Flange size [mm]:	42



		<b>X1</b>	<b>XE</b>
Sphere of conf. [µm]:	≤ ±	20	20
Accuracy ["]:	≤ ±	25	0,2...
Repeatability (unidir.) ["]:	≤ ±	3	0,2...
Reversal error ["]:	≤	6	0,2...

#### Dimensions [mm]

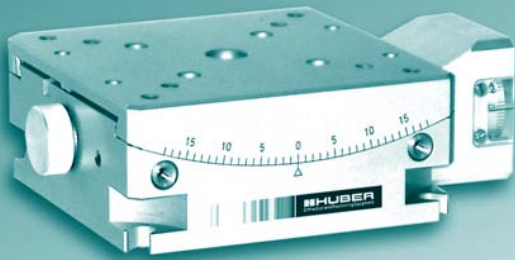


S:	Tilt:	L:	A:	B:
110	±17°	100	100	42

#### Accessories

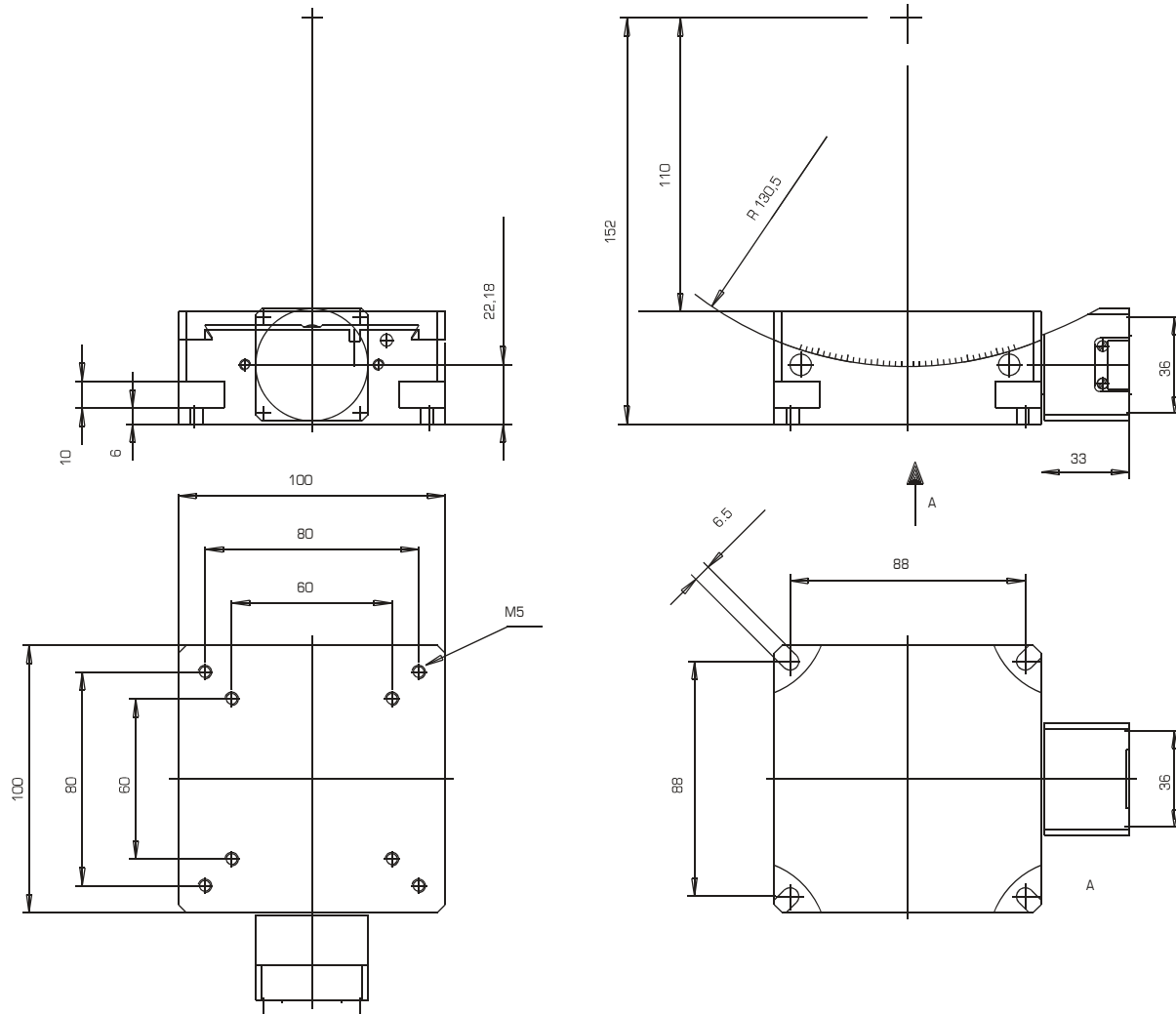
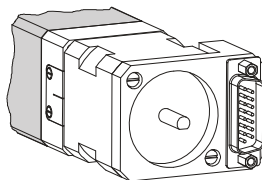
Motors:	2-/5-Ph. Servo/DC
Hand wheels:	0042
Gear boxes:	2042.10 2042.20
Limit switches	
Zero-point control	
Encoder <b>XE</b> :	incremental, absolute
Control system:	9300

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Diffraction and Positioning Equipment



#### Power supply of motorised version:

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2-phase motors, and via a Sub D25 connector for 5-phase motors. In the standard version this connector is in a housing mounted on the back of the motor.





Modularly individually configurable

- with customer-specific radius
- from basic model to high-end system
- to multi-axis systems
- with customer-specific hole pattern

Application specific versions:

- vacuum compatible
- antimagnetic
- radiation resistant
- in black

- Multi-axis positioning systems possible by simple combination of stages (e.g. with series 400, 5102, 5103)
- Non-linear drive by ground and tempered trapezoidal spindle or optional recirculating ball spindle
- Roller guide surfaces made of hard-coated, highly tensile aluminium, sliding guide surfaces made of low-friction compression-proof plastic
- Use of stress relieved, highly resilient materials guarantees high system stability and long life
- Robust surfaces through galvanic natural-anodizing treatment

### General information

The segments of this series are individually developed and produced to customer specifications.

The type of guide system used (rolling or sliding guide) is dependent on requirements (load, mounting position, etc.). Highly tensile aluminium is mainly used for the bodies of the segments. High stiffness and low weight are further characteristics of these units.

### Dimensions

The individual dimensions are determined by load, radius and mounting position requirements:  
The size of the mounting surface is from 250mm x 250mm for the smaller segments to 400mm x 400mm for the larger segments.

### Specifications

The importance of various specifications can also be determined by the customer. Some applications require high repetition stability, others a smaller sphere of error.


Please contact us. We will find the solution for you.

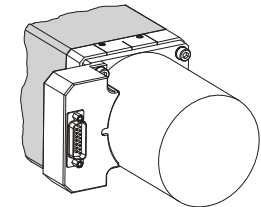
### Power supply of motorised version:

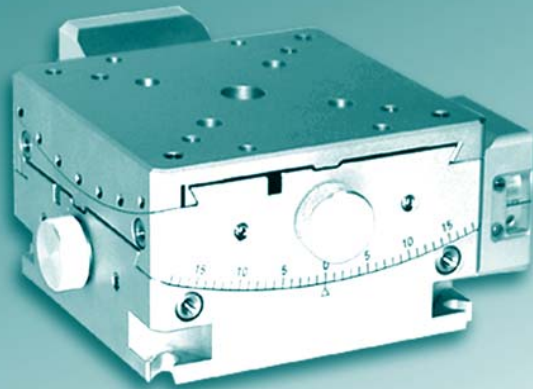
The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2- and 3-phase motors, and via a Sub D25 connector for 5-phase motors.

In the standard version this connector is in a housing mounted on the side of the motor.

### Accessories

Step motors:	2-/3-/5-Ph. Servo/DC
Hand wheels:	0083
Gear boxes:	2083.05 2083.10 2083.20
Limit switches:	included
Zero-point control:	9100
Encoder  :	incremental, absolute
Control system:	9300





Modularly individually configurable

- from basic model to high-end system
- to multi-axis systems
- with customer-specific hole pattern

Application specific versions:

- vacuum compatible
- antimagnetic
- radiation resistant
- in black

Two precision configurations:

**X1** **XE**

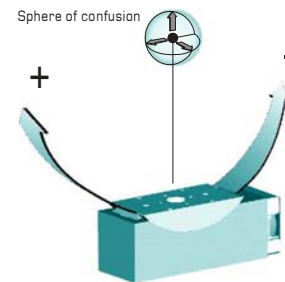
### Maximum load and torque

A general statement of maximum load and torque capacities is not possible for eccentric forces due to the amount of different configurations.

However, our engineers will gladly calculate the maximum load capacity for your specific application.

### Specifications

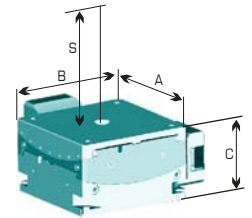
Travel range [°]:	± 12 (upper axis) ± 10 (lower axis)
Material: (base/carriage)	Bronze
Gear ratio:	360:1
Resolution [°]:	0,001 <small>(step motor with 1000 steps/revolution)</small> 0,00005 minimum
Sphere of conf. <small>total</small> [µm]	± 15
Load (max) [N]:	500
M <sub>input</sub> (min) [Nm]:	0,50
Weight [kg]:	3,5
Flange size [mm]:	42



### Rx-/Ry-Axis

		<b>X1</b>	<b>XE</b>
Accuracy ["]:	≤ ±	30	0,2...
Repeatability <small>(unidir.)</small> ["]:	≤ ±	6	0,2...
Reversal error ["]:	≤	12	0,2...

### Dimensions [mm]



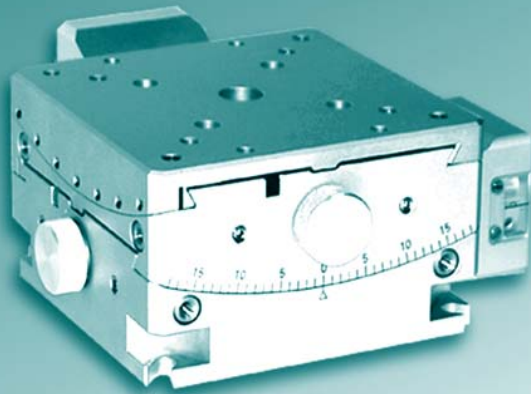
S:	A:	B:	C:
110	100	100	60

### Accessories

Motors:	2-/5-Ph. Servo/DC
Hand wheels:	0042
Gear boxes:	2042.10 2042.20
Limit switches:	included
Zero-point control:	9100
Encoder <b>XE</b> :	incremental, absolute
Control system:	9300

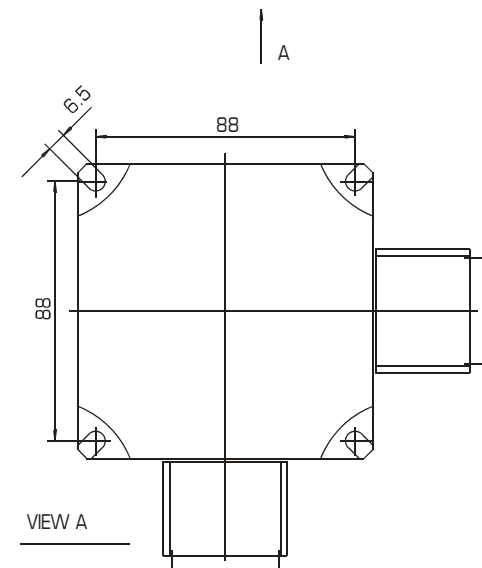
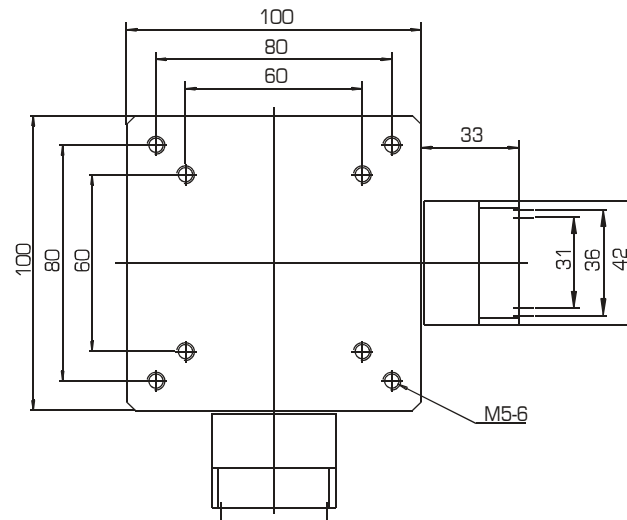
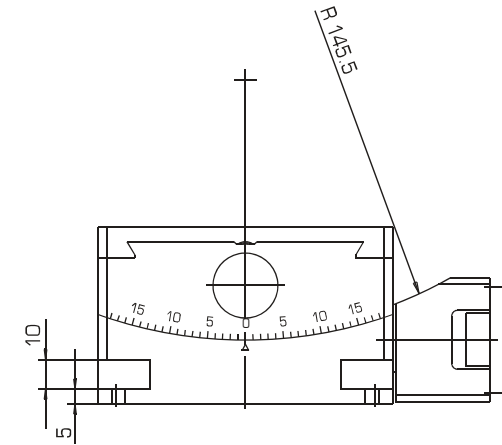
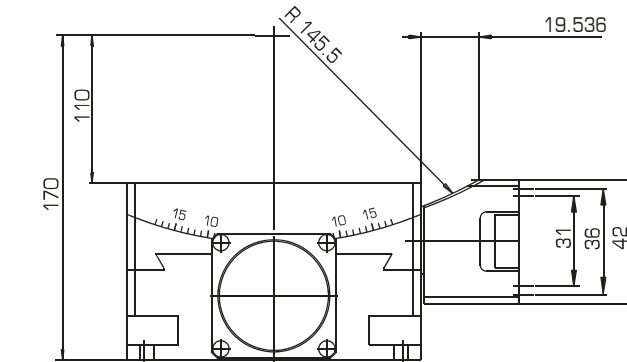
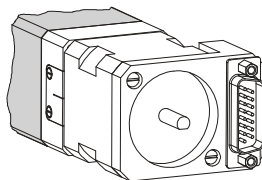
- Multi-axis positioning systems possible by simple combination of stages (e.g. with 5102.10, 5103.10)
- High-precision worm gear drive with ground and tempered worm gear, self-locking
- Dovetail guides with fitted bronze slideways
- Use of stress relieved, highly resilient materials guarantees high system stability and long life
- Robust surfaces through nickel-/chrome-treatment

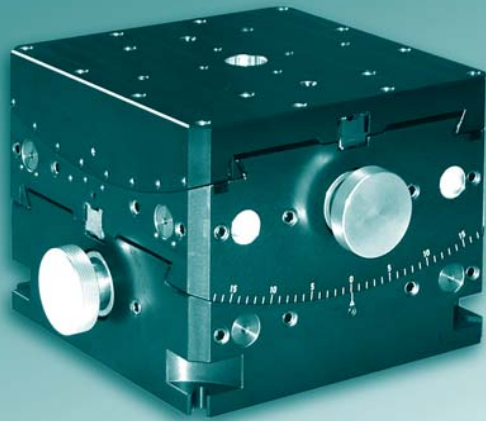
**HUBER**  
Diffraction and Positioning Equipment



#### Power supply of motorised version:

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2-phase motors, and via a Sub D25 connector for 5-phase motors. In the standard version this connector is in a housing mounted on the back of the motor.





- Multi-axis positioning systems possible by simple combination of stages (e.g. with 5102.20, 5103.20)
- High-precision worm gear drive with ground and tempered worm gear, self-locking
- Slideways of the dovetail guides made of low-friction compression-proof plastic sliding surface and hard coated aluminium
- Minimal "Sphere of Confusion" through specially fitted guide tracks optimised to each other
- Use of stress relieved, highly resilient materials guarantees high system stability and long life
- Robust surfaces through highly tensile hard-coated aluminium

Modularly individually configurable

- from basic model to high-end system
- to multi-axis systems
- with customer-specific hole pattern

Application specific versions:

- vacuum compatible
 

Material:	Bronze
(base/slide)	
Weight [kg]:	22,5
- anti magnetic
- radiation resistant

Two precision configurations:

**X1** **XE**

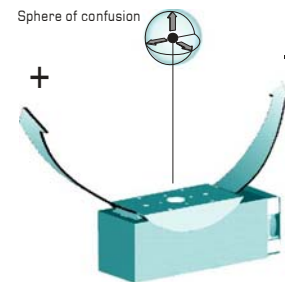
#### Maximum load and torque

A general statement of maximum load and torque capacities is not possible for eccentric forces due to the amount of different configurations.

However, our engineers will gladly calculate the maximum load capacity for your specific application.

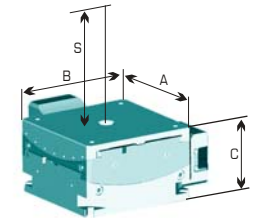
#### Specifications

Travel range [°]:	± 18 (upper axis) ± 15 (lower axis)
Material: (base/slide)	Aluminium coated
Gear ratio:	360:1
Resolution [°]:	0,001 <small>(step motor with 1000 steps/revolution)</small> 0,00005 minimum
Sphere of conf. total [µm]	+/- 5
Load (max) [N]:	2000
M <sub>input</sub> (min) [Nm]:	0,45
Weight [kg]:	9,5
Flange size [mm]:	56



Rx-/Ry-Axis	<b>X1</b>	<b>XE</b>
Accuracy ["]:	≤ ± 15	0,1...
Repeatability <small>(unidir.)</small> ["]:	≤ ± 2	0,1...
Reversal error ["]:	≤ 10	0,1...

#### Dimensions [mm]



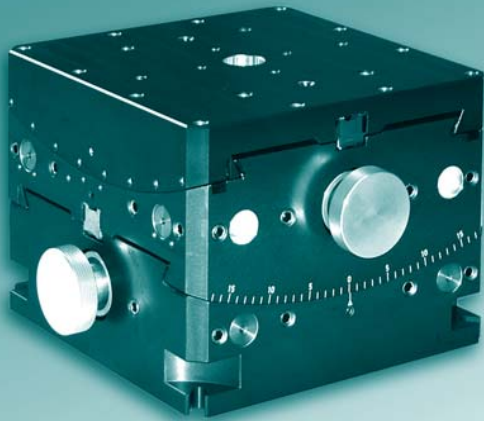
S:	A:	B:	C:
170	170	170	130

#### Accessories

Motors:	2-/3-/5-Ph. Servo/DC
Hand wheels:	0056
Gear boxes:	2056.05 2056.10 2056.20
Limit switches:	
Zero-point control:	
Encoder <b>XE</b> :	incremental, absolute
Control system:	9300

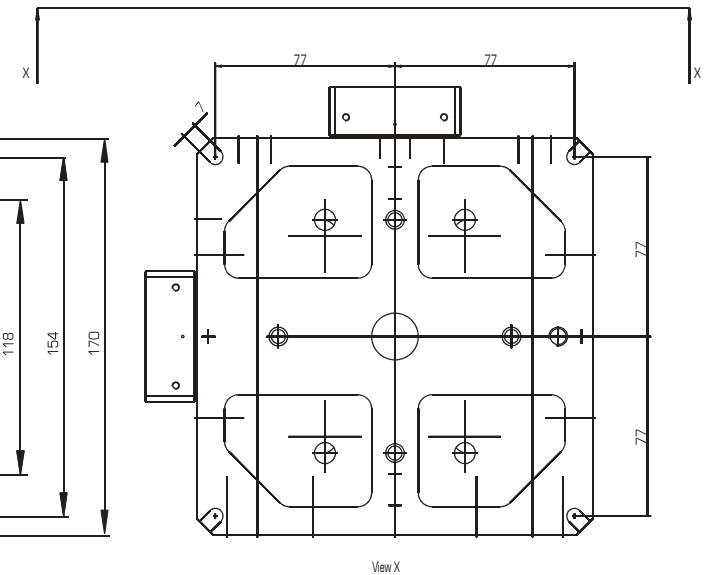
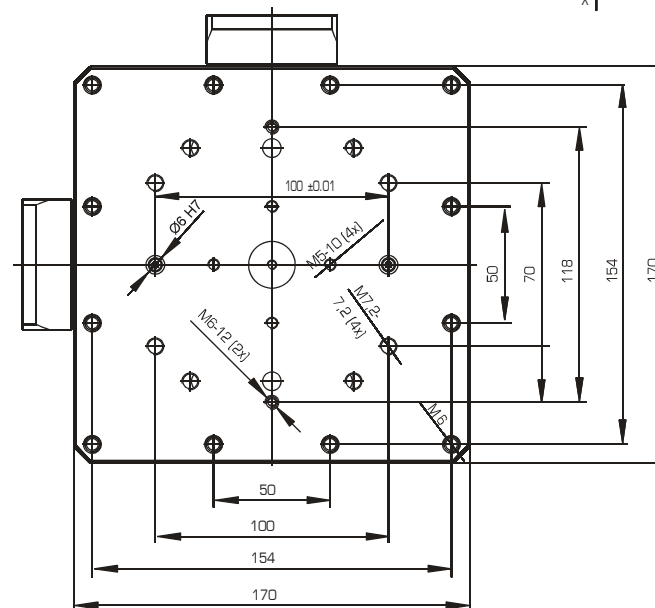
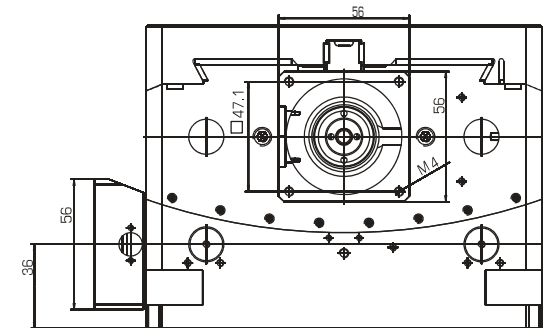
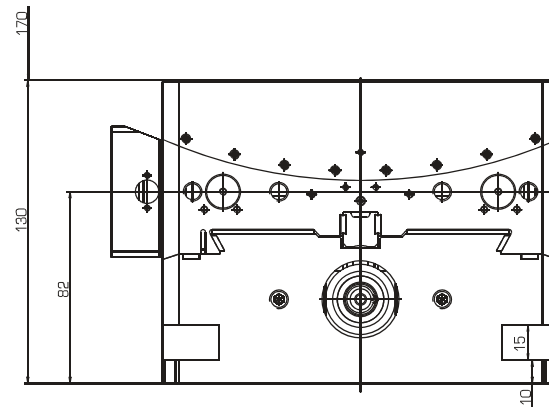
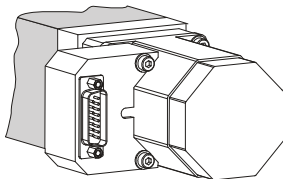


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Diffraction and Positioning Equipment



#### Power supply of motorised version:

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2- and 3-phase motors, and via a Sub D25 connector for 5-phase motors. In the standard version this connector is in a housing mounted on the side of the motor.



Modularly individually configurable

- with customer-specific radius
- from basic model to high-end system
- to multi-axis systems
- with customer-specific hole pattern

Application specific versions:

- vacuum compatible
- antimagnetic
- radiation resistant
- in black

### General information

The segments of this series are individually developed and produced to customer specifications.

The type of guide system used (rolling or sliding guide) is dependent on requirements (load, mounting position, etc.). Highly tensile aluminium is mainly used for the bodies of the segments. High stiffness and low weight are further characteristics of these units.

### Dimensions

The individual dimensions are determined by load, radius and mounting position requirements:  
 The size of the mounting surface is from 250mm x 250mm for the smaller segments to 400mm x 400mm for the larger segments.

### Specifications

The importance of various specifications can also be determined by the customer. Some applications require high repetition stability, others a smaller sphere of confusion.


Please contact us. We will find the solution for you.

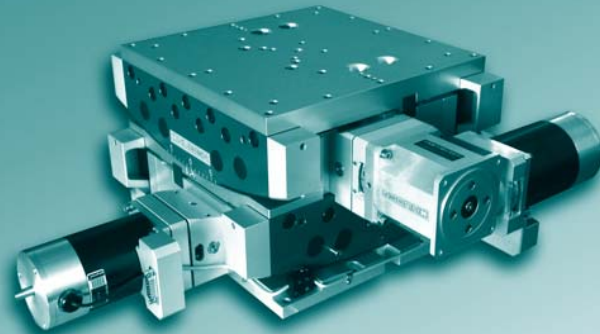
### Power supply of motorised version:

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2- and 3-phase motors, and via a Sub D25 connector for 5-phase motors.

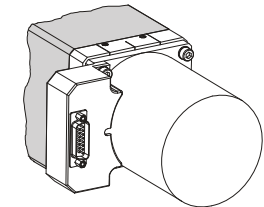
In the standard version this connector is in a housing mounted on the side of the motor.

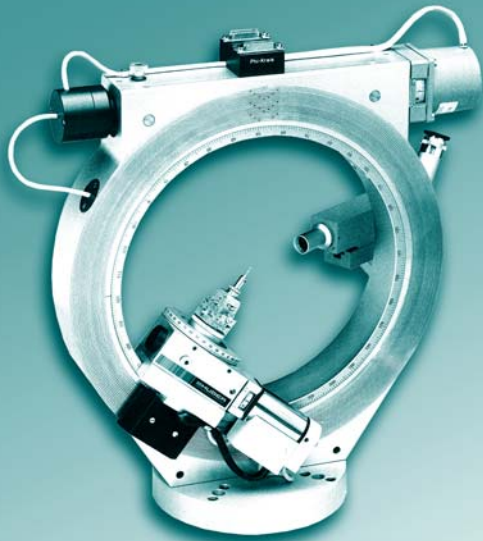
### Accessories

Step motors:	2-/3-/5-Ph. Servo/DC
Hand wheels:	0083
Gear boxes:	2083.05 2083.10 2083.20
Limit switches:	included
Zero-point control:	9100
Encoder  :	incremental, absolute
Control system:	9300



- Multi-axis positioning systems possible by simple combination of stages (e.g. with series 400, 5102, 5103)
- Non-linear drive by ground and tempered trapezoidal spindle or optional recirculating ball spindle
- Roller guide surfaces made of hard-coated, highly tensile aluminium, sliding guide surfaces made of low-friction compression-proof plastic
- Use of stress relieved, highly resilient materials guarantees high system stability and long life
- Robust surfaces through galvanic natural-anodizing treatment





### General information

The Euler cradles of the series 500 can be combined with the goniometers of the series 400 to create multi-circle diffractometers. These can be used for analytical investigations in the fields of X-ray and neutron diffraction.

### Description

The Euler cradle is a full-circle cradle with an asymmetrical design. The phi- and chi-circle planes are at right angles to one another.

The motor and signal currents are transmitted via slip rings. This enables an unrestricted rotation around both axes.

In order to reduce the absolute angular deviation, it is possible to replace the standard goniometer 408 with the version 410. Due to its larger dimensions, however, the area in shadow is increased.

For sample adjustment an optical microscope or an optional CCD-camera is integrated (see accessory MiniVID).

Both circles are equipped with zero-point controls and step motors. A range of different motor types and specifications is available according to customer requirements.

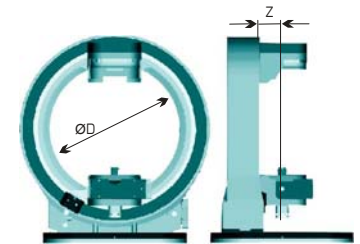
### Specifications

	Phi-circle	Chi-circle
Travel range [°]:	360	360
Resolution [°] <sup>1</sup> :	0,002	0,001
Accuracy ["]:	30	30
Repeatability (unidir.) ["]:	≤ 2	2
Reversal error ["]:	≤ 20	15
Gear ratio:	180:1	360:1
M <sub>input</sub> (min) [Nm]:	0,05	0,8
Flange size [mm]:	32	56
Sphere of confusion [mm] <sup>2</sup> :	0,02	
Parallelity ["] <sup>2</sup> : <small>(chi-plane to phi-axis)</small>	≤ ± 5	
Weight [kg]:	17	

<sup>1</sup> in combination with step motor (1000 Steps/revolution)

<sup>2</sup> with a load of 3 kg

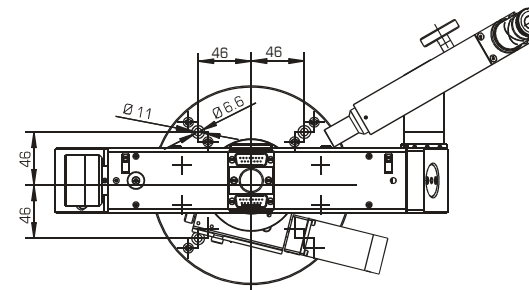
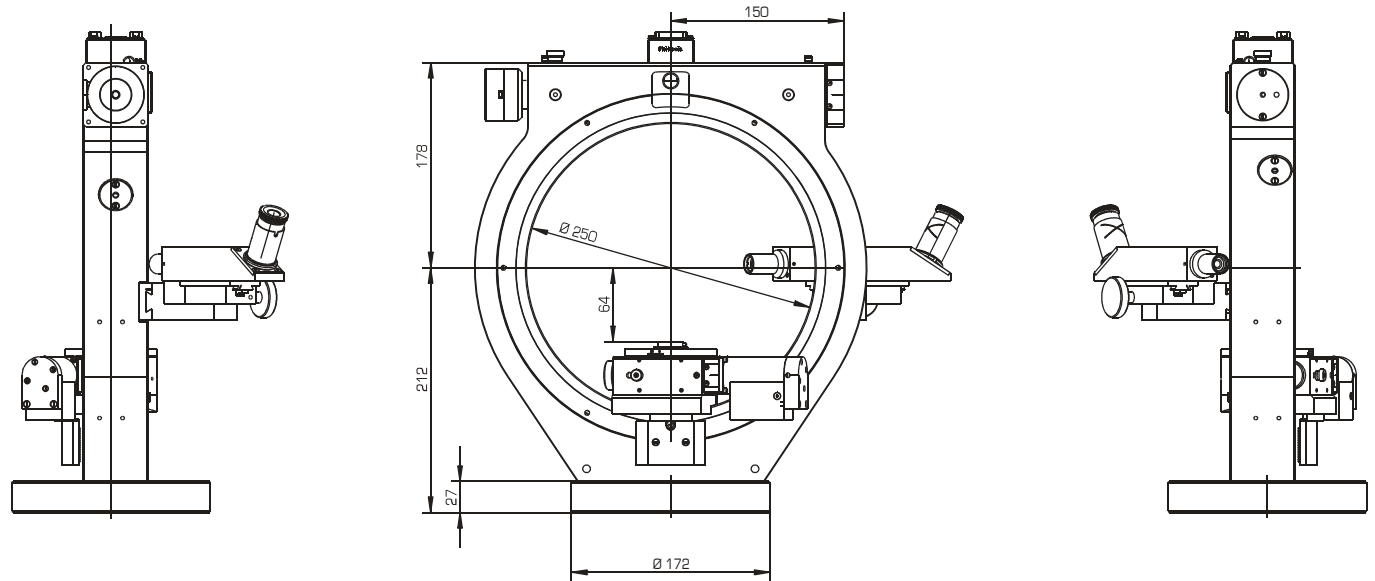
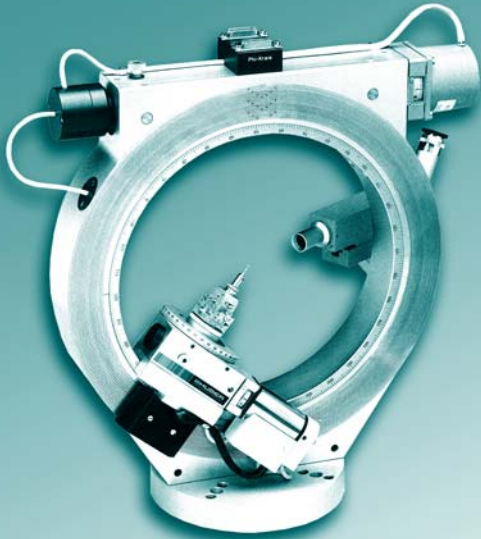
### Dimensions [mm]



D [mm]: Z [mm]:  
250      -

### Accessories

Step motors:	included
Limit switches (chi):	included
Zero-point control:	included
Gear boxes (chi):	2056.05 2056.10 2056.20
Encoder (chi):	incremental, absolute
Control system:	9300
CCD-camera:	MiniVID
Goniometer heads:	1001 1002 1004 1007

**Power supply:**

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2- and 3-phase motors, and via a Sub D25 connector for 5-phase motors.



### General information

The Euler cradles of the series 500 can be combined with the goniometers of the series 400 to create multi-circle diffractometers. These can be used for analytical investigations in the fields of X-ray and neutron diffraction.

### Description

The Euler cradle is a full-circle cradle with an asymmetrical design. The phi- and chi-circle planes are at right angles to one another.

The motor and signal currents are transmitted via slip rings. This enables an unrestricted rotation around both axes.

A manual Z-adjustment 5104.20-22 is integrated in the phi-circle, enabling the mounting of goniometer heads of the series 1000.

For sample adjustment an optical microscope or an optional CCD-camera is integrated (see accessory MiniVID).

Both circles are equipped with zero-point controls and step motors. A range of different motor types and specifications is available according to customer requirements.

It is possible to equip the Euler cradle with a cryostat mount and/or counter bearings for mounting individually required equipment.

### Specifications

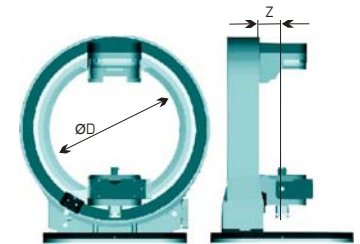
	Phi-circle	Chi-circle
Travel range [°]:	360	360
Resolution [°] <sup>1</sup> :	0,001/0,002 <sup>2</sup>	0,001
Accuracy ["]:	30	30
Repeatability (unidir.) ["]:	≤ 2	2
Reversal error ["]:	≤ 10	15
Gear ratio:	360:1/180:1 <sup>2</sup>	360:1
M <sub>input</sub> (min) [Nm]:	0,10/0,13 <sup>2</sup>	0,8
Flange size [mm]:	56	56
Sphere of confusion [mm] <sup>3</sup> :	0,02	
Parallelity ["] <sup>3</sup> : <small>(chi-plane to phi-axis)</small>	≤ ± 20	
Weight [kg]:	18	

<sup>1</sup> in combination with step motor (1000 Steps/revolution)

<sup>2</sup> using goniometer 410A

<sup>3</sup> with a load of 10 kg

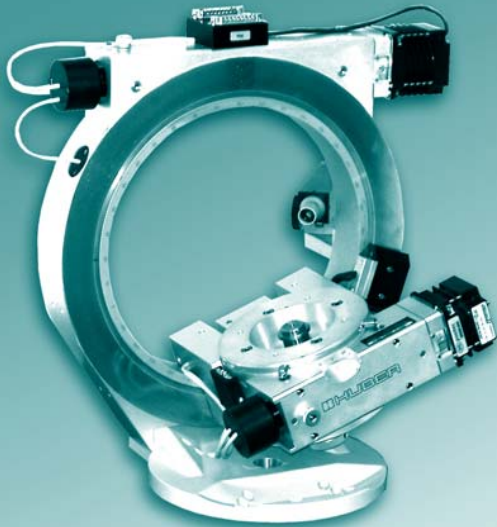
### Dimensions [mm]



D [mm]: Z [mm]:  
250 70

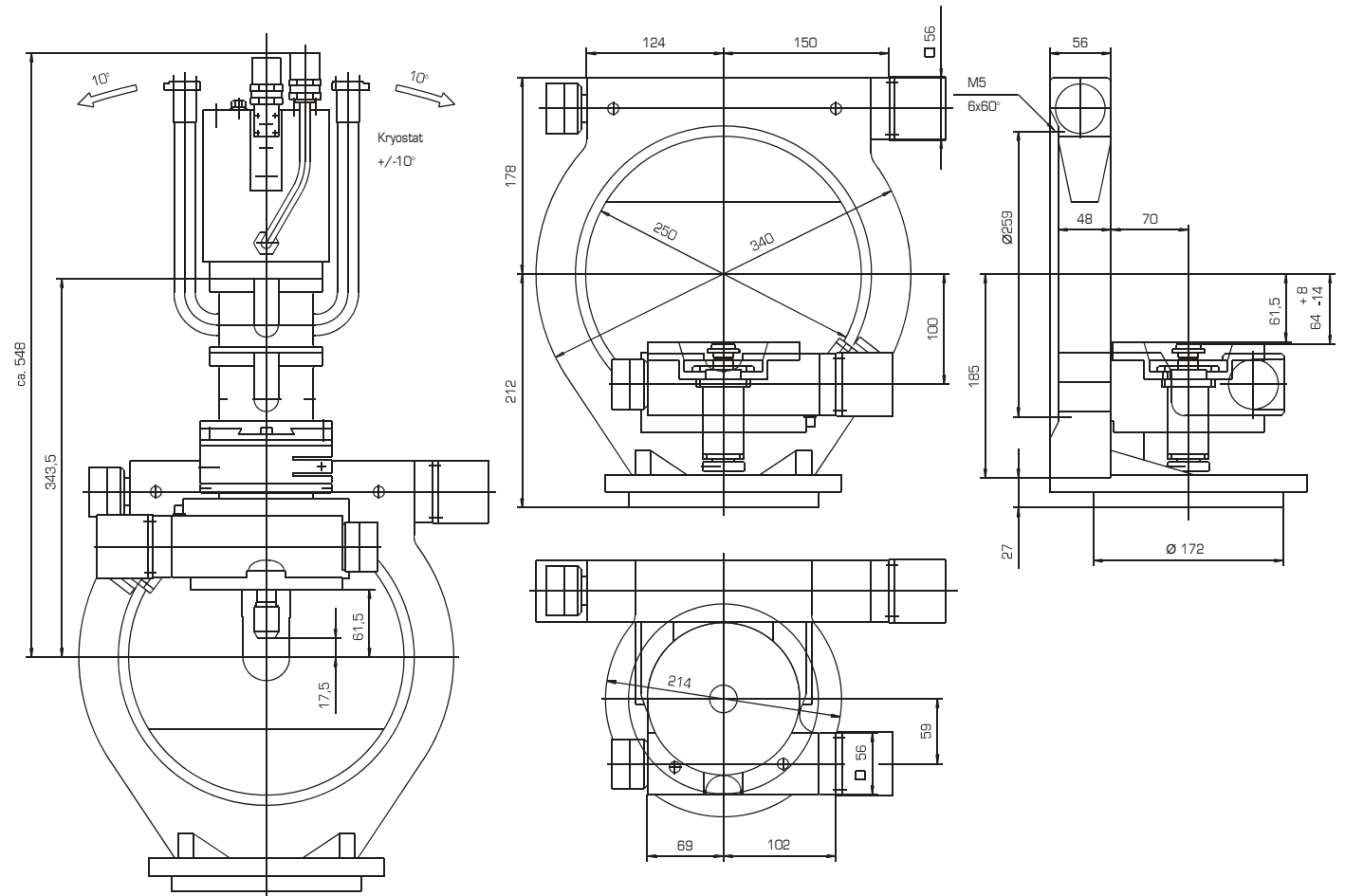
### Accessories

Step motors:	included
Limit switches:	included
Zero-point control:	included
Gear boxes:	2056.05 2056.10 2056.20
Encoder:	incremental, absolute
Control system:	9300
CCD-camera:	MiniVID
Goniometer heads:	1001, 1002 1004, 1007
Cryostat mount:	511.12
Counter bearing:	511.11
Z-adjustment motorised:	5104.A05M <small>(special base necessary, cradle raised by 40mm)</small>



#### Power supply:

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2- and 3-phase motors, and via a Sub D25 connector for 5-phase motors.







### General information

The Euler cradles of the series 500 can be combined with the goniometers of the series 400 to create multi-circle diffractometers. These can be used for analytical investigations in the fields of X-ray and neutron diffraction.

### Description

The Euler cradle is a full-circle cradle with an asymmetrical design. The phi- and chi-circle planes are at right angles to one another.

The motor and signal currents are transmitted via slip rings. This enables an unrestricted rotation around both axes.

This model is predominantly used for texture analyses. It comes equipped with a texture module 511.301 (rot-trans) for both reflection and transmission beam geometries (oscillation range: 12mm).  
Optional: texture module 511.302 (trans-rot).

For sample adjustment an optical microscope or an optional CCD-camera is integrated (see accessory MiniVID).

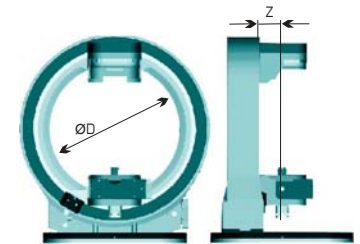
Both circles are equipped with zero-point controls and step motors. A range of different motor types and specifications is available according to customer requirements.

### Specifications

	Phi-circle	Chi-circle
Travel range [°]:	360	360
Resolution [°] <sup>1</sup> :	0,001	0,001
Accuracy ["]:	50	30
Repeatability (unidir.) ["]:	≤ 5	2
Reversal error ["]:	≤ 30	15
Gear ratio:	360:1	360:1
M <sub>input</sub> (min) [Nm]:	0,5	0,8
Flange size [mm]:	56	56
Sphere of confusion [mm]:	0,02	
Parallelity ["]:	≤ ± 5	
<small>(chi-plane to phi-axis)</small>		
Weight [kg]:	18	

<sup>1</sup> in combination with step motor (1000 Steps/revolution)

### Dimensions [mm]



D [mm]: Z [mm]:  
250 0

### Accessories

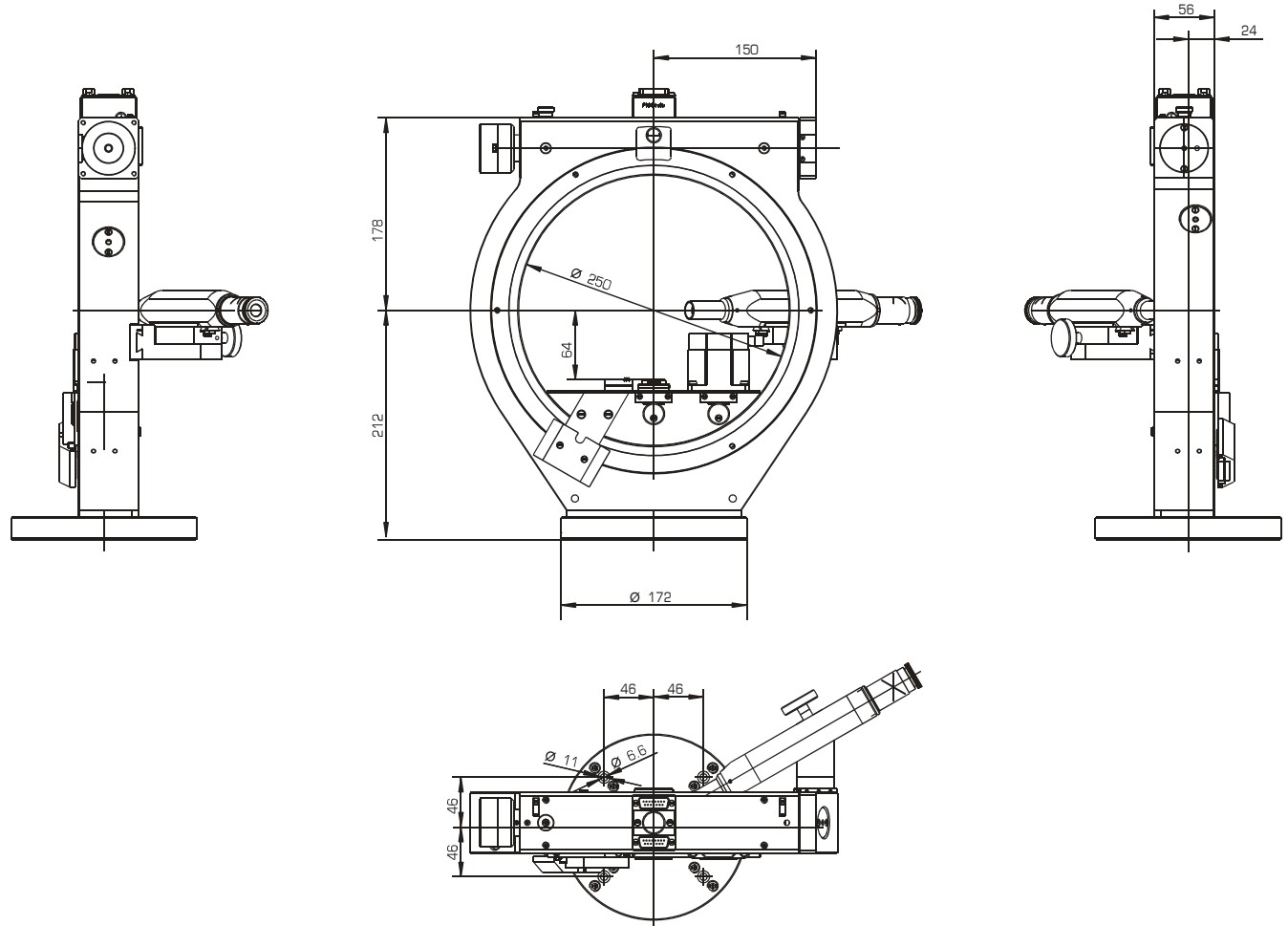
Step motors:	included
Limit switches (chi):	included
Zero-point c. (chi):	included
Gear boxes (chi):	2056.05 2056.10 2056.20
Encoder (chi):	incremental, absolute
Control system:	9300
CCD-camera:	MiniVID
Texture attachm.:	511.301 511.302

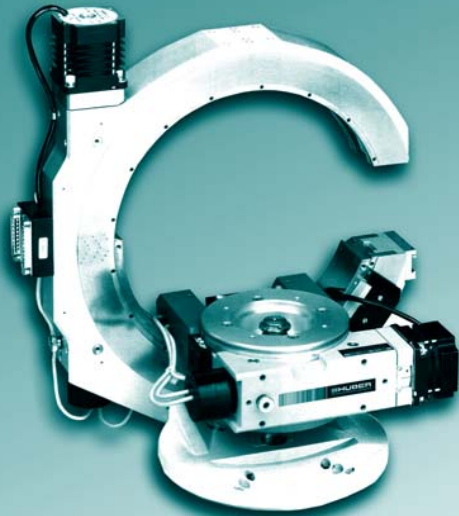
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Diffraction and Positioning Equipment



**Power supply:**

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2- and 3-phase motors, and via a Sub D25 connector for 5-phase motors.





### General information

The Euler cradles of the series 500 can be combined with the goniometers of the series 400 to create multi-circle diffractometers. These can be used for analytical investigations in the fields of X-ray and neutron diffraction.

### Description

The Euler cradle is a full-circle cradle with an asymmetrical design. The phi- and chi-circle planes are at right angles to one another.

The motor and signal currents are transmitted via slip rings. This enables an unrestricted rotation around the phi-axis.

A manual Z-adjustment is integrated in the phi-circle, enabling the mounting of goniometer heads (operational range +/-20mm).

Incorporated in the chi-circle is an aperture of 90 mm. This limits the operational range to 157°.

For sample adjustment an optical microscope or an optional CCD-camera is integrated (see accessory MiniVID).

Both circles are equipped with zero-point controls and step motors. A range of different motor types and specifications is available according to customer requirements.

In combination with the 2-circle goniometer 424 this system forms a compact X-ray diffractometer.

### Specifications

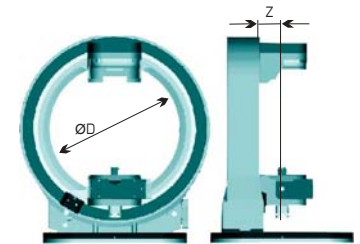
	Phi-circle	Chi-circle
Travel range [°]:	360	157
Resolution [°] <sup>1</sup> :	0,001/0,002 <sup>2</sup>	0,001
Accuracy ["]:	30	30
Repeatability (unidir.) ["]:	≤ 2	2
Reversal error ["]:	≤ 10	15
Gear ratio:	360:1/180:1 <sup>2</sup>	360:1
M <sub>input</sub> (min) [Nm]:	0,10/0,13 <sup>2</sup>	0,7
Flange size [mm]:	56	56
Sphere of confusion [mm] <sup>3</sup> :	0,02	
Parallelity ["] <sup>3</sup> : <small>(chi-plane to phi-axis)</small>	≤ ± 20	
Weight [kg]:	22	

<sup>1</sup> in combination with step motor (1000 Steps/revolution)

<sup>2</sup> using goniometer 410A

<sup>3</sup> with a load of 5 kg

### Dimensions [mm]



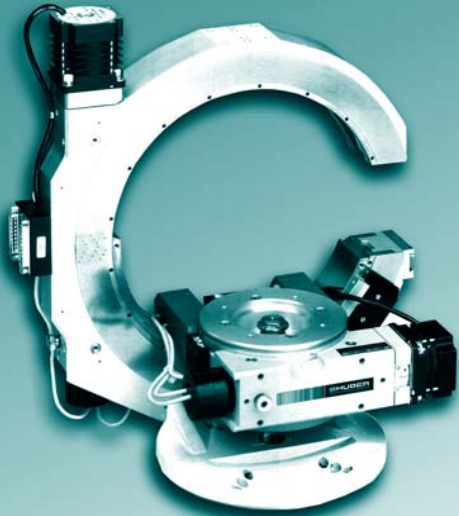
D [mm]: Z [mm]:  
250 70

### Accessories

Step motors:	included
Limit switches:	included
Zero-point control:	included
Gear boxes:	2056.05 2056.10 2056.20
Encoder (Chi):	incremental, absolute
Control system:	9300
CCD-camera:	MiniVID
Goniometer heads:	1001, 1002 1004, 1007
Z-adjustment motorised:	5104.A05M

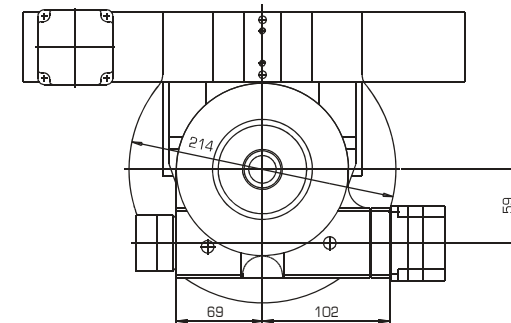
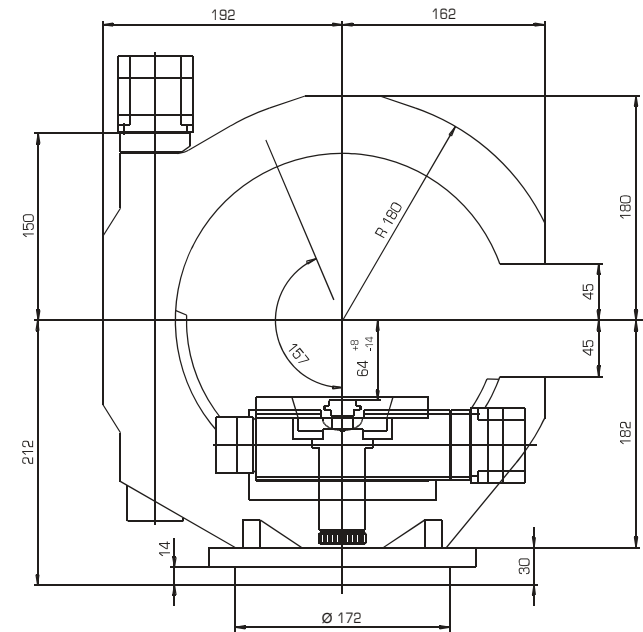
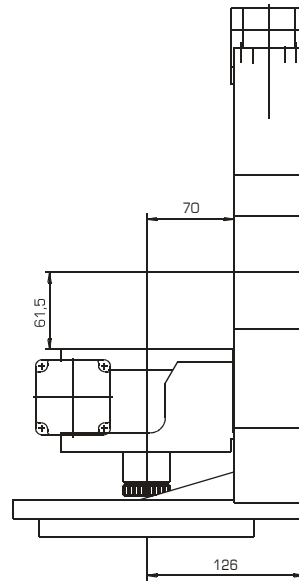
(special base necessary, cradle raised by 40mm)

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Diffraction and Positioning Equipment



#### Power supply:

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2- and 3-phase motors, and via a Sub D25 connector for 5-phase motors.





### Description

The Euler cradle is a full-circle cradle with an asymmetrical design. The phi- and chi-circle planes are at right angles to one another.

The motor and signal currents are transmitted via slip rings. This enables an unrestricted rotation around both axes.

Incorporated in the phi-circle is a motorised XY-stage with an operational range of 60 x 60 mm. The Z-adjustment (15 mm) is manual.

For sample adjustment an optical microscope or an optional CCD-camera is integrated (see accessory MiniVID).

All movements (except Z-adjustment) are equipped with zero-point controls, limit switches and step motors.

### General information

The Euler cradles of the series 500 can be combined with the goniometers of the series 400 to create multi-circle diffractometers. These can be used for analytical investigations in the fields of X-ray and neutron diffraction.

### Specifications

	Phi-circle	Chi-circle
Travel range [°]:	360	157
Resolution [°] <sup>1</sup> :	0,001/0,002 <sup>2</sup>	0,001
Accuracy ["]:	30	30
Repeatability (unidir.) ["]:	≤ 2	2
Reversal error ["]:	≤ 10	15
Gear ratio:	360:1/180:1 <sup>2</sup>	360:1
M <sub>input</sub> (min) [Nm]:	0,10/0,13 <sup>2</sup>	0,7
Flange size [mm]:	56	56
Sphere of confusion [mm] <sup>3</sup> :	0,05	
Parallelity ["] <sup>3</sup> : <small>(chi-plane to phi-axis)</small>	≤ ± 20	
Weight [kg]:	24	

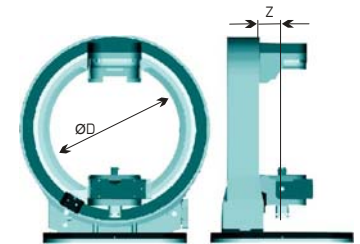
<sup>1</sup> in combination with step motor (1000 Steps/revolution)

<sup>2</sup> using goniometer 410A

<sup>3</sup> with a load of 3 kg

Specifications	X	Y	Z
Travel range [mm]:	60	60	15
Resolution [µm]:	0,005	0,005	0,05
WDH (unidir.) [µm]: ≤ +/-	3	3	20
Reversal error [µm]:	4	5	-

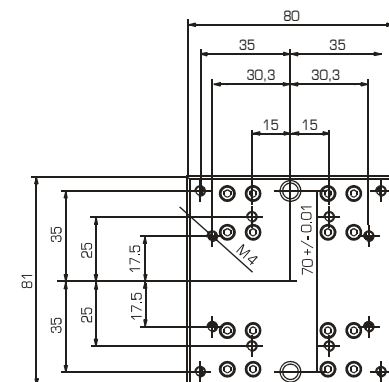
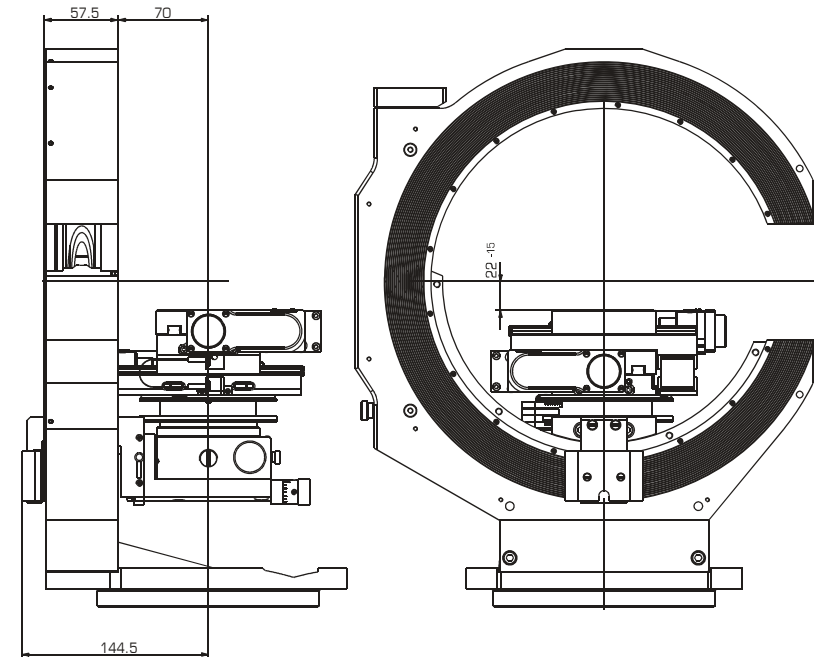
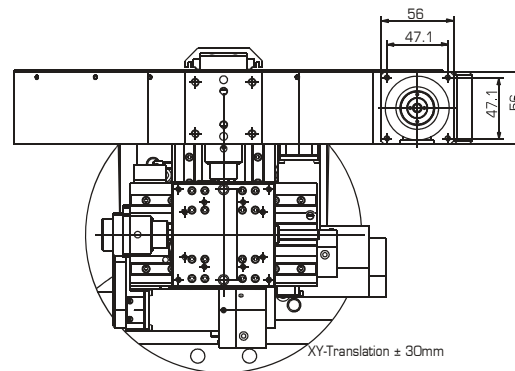
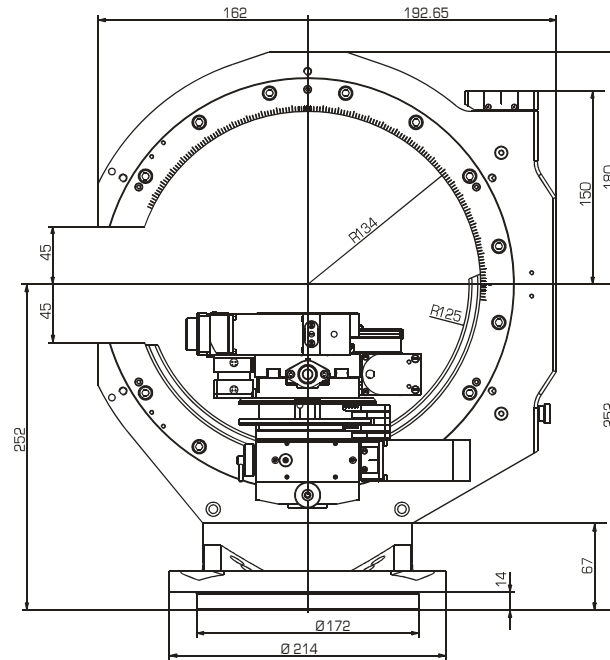
### Dimensions [mm]



D [mm]: Z [mm]:  
250 70

### Accessories

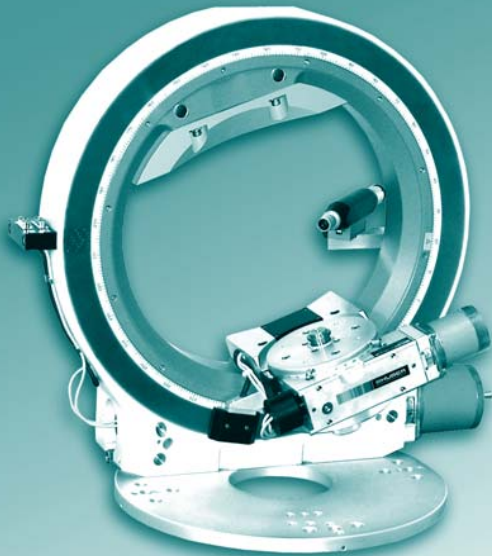
Step motors:	included
Limit switches:	included
Zero-point control:	included
Gear boxes (chi):	2056.05 2056.10 2056.20
Encoder:	incremental, absolute
Control system:	9300
CCD-camera:	MiniVID



#### Power supply:

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2- and 3-phase motors, and via a Sub D25 connector for 5-phase motors.





### General information

The Euler cradles of the series 500 can be combined with the goniometers of the series 400 to create multi-circle diffractometers. These can be used for analytical investigations in the fields of X-ray and neutron diffraction.

### Description

The Euler cradle is a full-circle cradle with an asymmetrical design. The phi- and chi-circle planes are at right angles to one another.

The motor and signal currents are transmitted via slip rings. This enables an unrestricted rotation around both axes.

A manual Z-adjustment 5102.40-40 (operational range +/-20 mm) is incorporated in the phi-circle, enabling goniometer heads of the series 1000 to be mounted. Also available is a motorised Z-adjustment.

For sample adjustment an optical microscope or an optional CCD-camera is integrated (see accessory MiniVID).

Both circles are equipped with zero-point controls and step motors. A range of different motor types and specifications is available according to customer requirements.

It is possible to equip the Euler cradle with a cryostat mount and/or counter bearings for mounting individually required equipment.

### Specifications

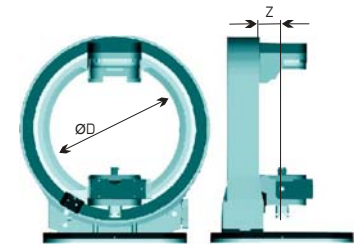
	Phi-circle	Chi-circle
Travel range [°]:	360	360
Resolution [°] <sup>1</sup> :	0,001/0,002 <sup>2</sup>	0,001
Accuracy ["]:	30	30
Repeatability (unidir.) ["]:	≤ 2	3
Reversal error ["]:	≤ 10	15
Gear ratio:	360:1/180:1 <sup>2</sup>	360:1
M <sub>input</sub> (min) [Nm]:	0,10/0,13 <sup>2</sup>	1,5
Flange size [mm]:	56	83
Sphere of confusion [mm] <sup>3</sup> :	0,02	
Parallelity ["] <sup>3</sup> : <small>(chi-plane to phi-axis)</small>	≤ ± 10	
Weight [kg]:	64	

<sup>1</sup> in combination with step motor (1000 Steps/revolution)

<sup>2</sup> using goniometer 410A

<sup>3</sup> with a load of 10 kg

### Dimensions [mm]



D [mm]:    Z [mm]:  
362        63,5

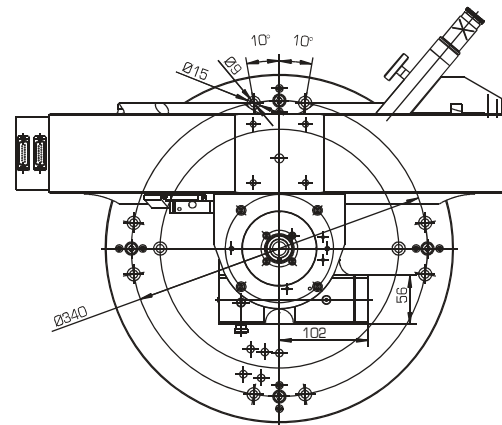
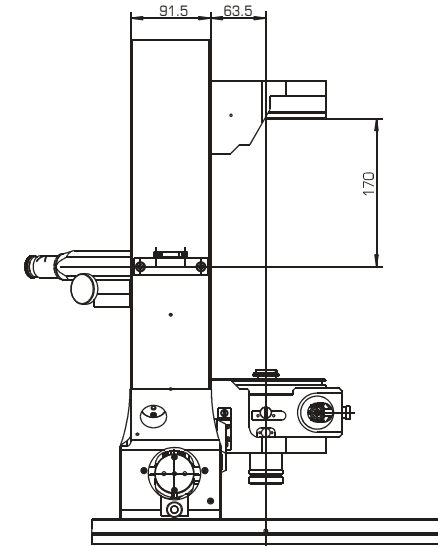
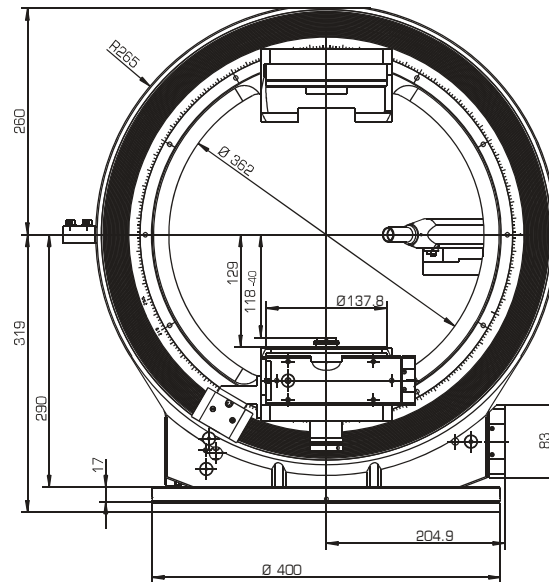
### Accessories

Gear boxes (phi):	2056.05 2056.10 2056.20
Gear boxes (chi):	2083.05 2083.10 2083.20
Encoder:	incremental, absolute
Control system:	9300
CCD-camera:	MiniVID
Goniometer heads:	Series 1000
Cryostat mount:	512.12 512.12M
Counter bearing:	512.11
Z-adjustment motorised:	5104.A05M



#### Power supply:

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2- and 3-phase motors, and via a Sub D25 connector for 5-phase motors.





### General information

The Euler cradles of the series 500 can be combined with the goniometers of the series 400 to create multi-circle diffractometers. These can be used for analytical investigations in the fields of X-ray and neutron diffraction.

### Description

The Euler cradle is a full-circle cradle with an asymmetrical design. The phi- and chi-circle planes are at right angles to one another.

The motor and signal currents are transmitted via slip rings. This enables an unrestricted rotation around the phi-axis.

A manual Z-adjustment 5102.40-40 (operational range +/-20 mm) is incorporated in the phi-circle, enabling goniometer heads of the series 1000 to be mounted. Also available is a motorised Z-adjustment.

For sample adjustment an optical microscope or an optional CCD-camera is integrated (see accessory MiniVID).

Both circles are equipped with Zero-point controls and step motors. A range of different motor types and specifications is available according to customer requirements.

### Specifications

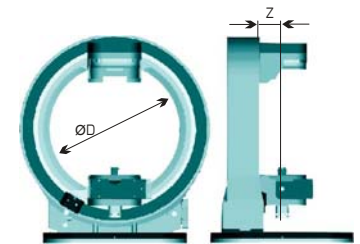
	Phi-circle	Chi-circle
Travel range [°]:	360	160
Resolution [°] <sup>1</sup> :	0,001/0,002 <sup>2</sup>	0,001
Accuracy ["]:	30	30
Repeatability (unidir.) ["]:	≤ 2	3
Reversal error ["]:	≤ 10	15
Gear ratio:	360:1/180:1 <sup>2</sup>	360:1
M <sub>input</sub> (min) [Nm]:	0,10/0,13 <sup>2</sup>	1,5
Flange size [mm]:	56	83
Sphere of confusion [mm] <sup>3</sup> :	0,04	
Parallelity ["] <sup>3</sup> : <small>(chi-plane to phi-axis)</small>	≤ ± 20	
Weight [kg]:	60	

<sup>1</sup> in combination with step motor (1000 Steps/revolution)

<sup>2</sup> using goniometer 410A

<sup>3</sup> with a load of 10 kg

### Dimensions [mm]

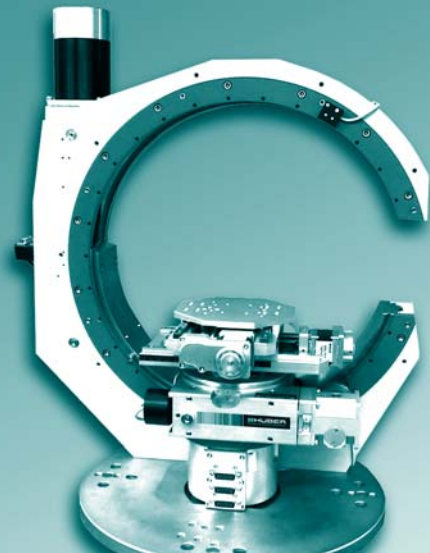


D [mm]: Z [mm]:  
400 63,5

### Accessories

Step motors:	included
Limit switches:	included
Zero-point control:	included
Gear boxes (phi):	2056.05 2056.10 2056.20
Gear boxes (chi):	2083.05 2083.10 2083.20
Encoder:	incremental, absolute
Control system:	9300
CCD-camera:	MiniVID
Goniometer heads:	Series 1000
Z-adjustment motorised:	5104.A05M





### General information

The Euler cradles of the series 500 can be combined with the goniometers of the series 400 to create multi-circle diffractometers. These can be used for analytical investigations in the fields of X-ray and neutron diffraction.

### Description

The Euler cradle is a full-circle cradle with an asymmetrical design. The phi- and chi-circle planes are at right angles to one another.

The motor and signal currents are transmitted via slip rings. This enables an unrestricted rotation around both axes.

A motorised XYZ-stage with an operational range of 150 x 150 x 25 mm is integrated in the phi-circle.

For sample adjustment an optical microscope or an optional CCD-camera is integrated (see accessory MiniVID).

All movements are equipped with zero-point controls, limit switches and step motors.

### Specifications

	Phi-circle	Chi-circle
Travel range [°]:	360	160
Resolution [°] <sup>1</sup> :	0,001/0,002 <sup>2</sup>	0,001
Accuracy ["]:	30	30
Repeatability (unidir.) ["]:	≤ 2	3
Reversal error ["]:	≤ 10	15
Gear ratio:	360:1/180:1 <sup>2</sup>	360:1
M <sub>input</sub> (min) [Nm]:	0,10/0,13 <sup>2</sup>	1,5
Flange size [mm]:	56	83
Sphere of confusion [mm] <sup>3</sup> :	0,05	
Parallelity ["] <sup>3</sup> :	≤ ± 20	
<small>(chi-plane to phi-axis)</small>		
Weight [kg]:	69	

<sup>1</sup> in combination with step motor (1000 Steps/revolution)

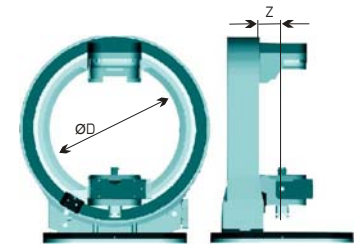
<sup>2</sup> using goniometer 410A

<sup>3</sup> with a load of 10 kg

### Specifications

	X	Y	Z
Travel range [mm]:	150	150	25
Resolution [µm]:	0,005	0,005	0,0025
Repeatability (unidir.) [µm]:	≤ +/- 5	5	2
Reversal error [µm]:	5	5	3

### Dimensions [mm]

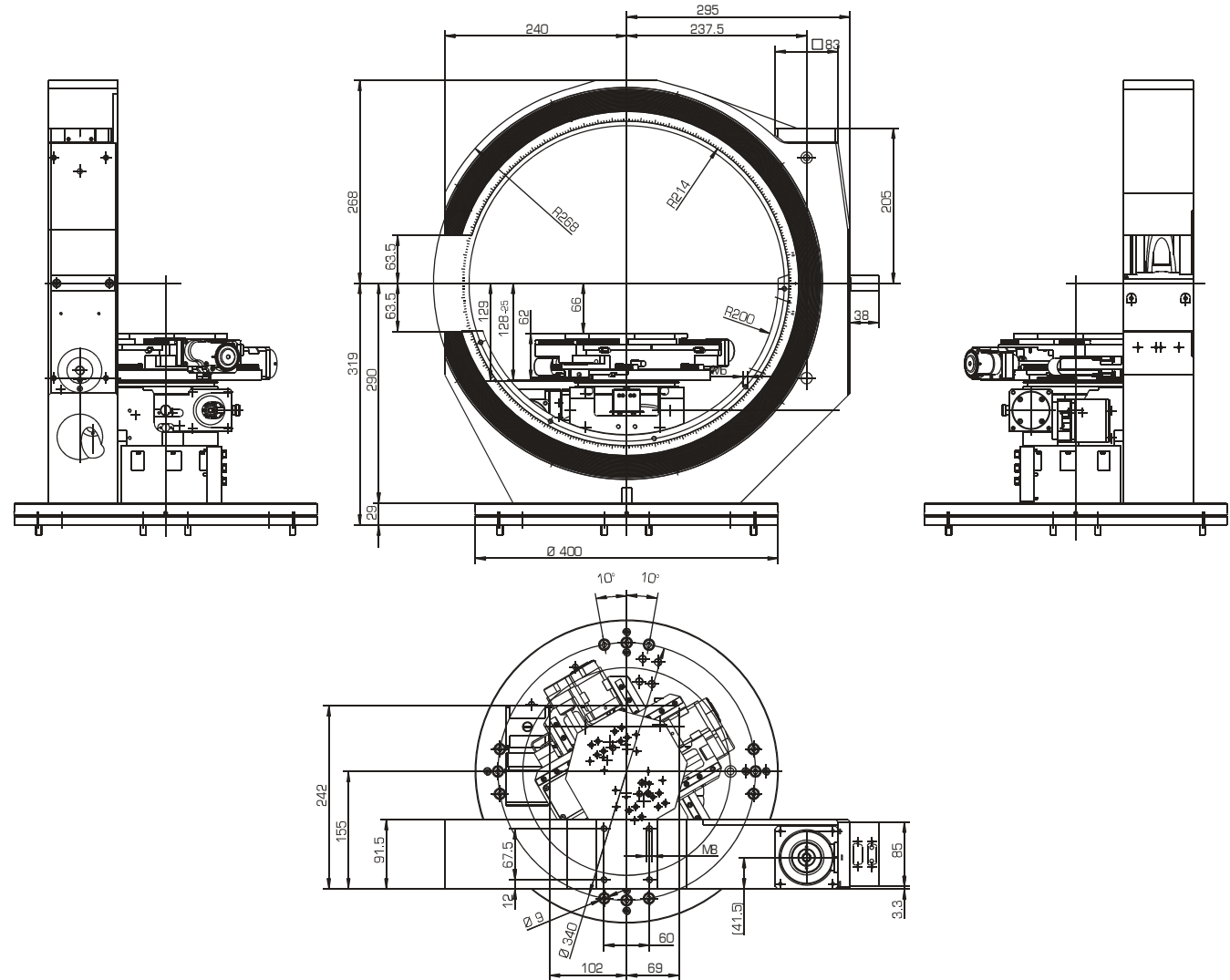
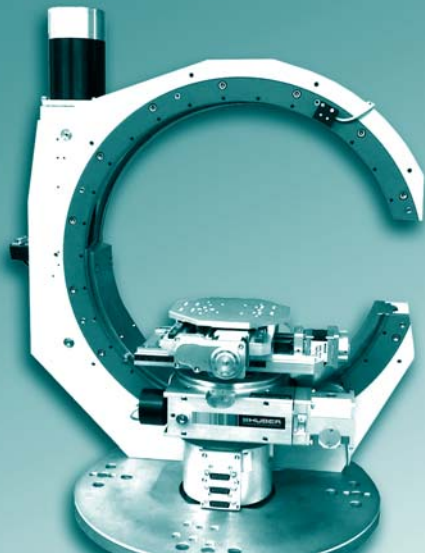


D [mm]: Z [mm]:  
400 63,5

### Accessories

Step motors:	included
Limit switches:	included
Zero-point control:	included
Gear boxes (phi):	2056.05 2056.10 2056.20
Gear boxes (chi):	2083.05 2083.10 2083.20
Encoder:	incremental, absolute
Control system:	9300
CCD-camera:	MiniVID
Goniometer heads:	Series 1000

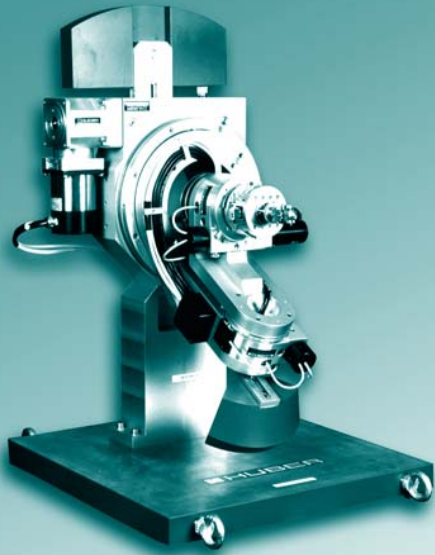




#### Power supply:

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2- and 3-phase motors, and via a Sub D25 connector for 5-phase motors.





### General Information

The kappa goniometers of the series 515 basically consist of two rotational stages assembled together in a  $60^\circ$  kappa geometry.

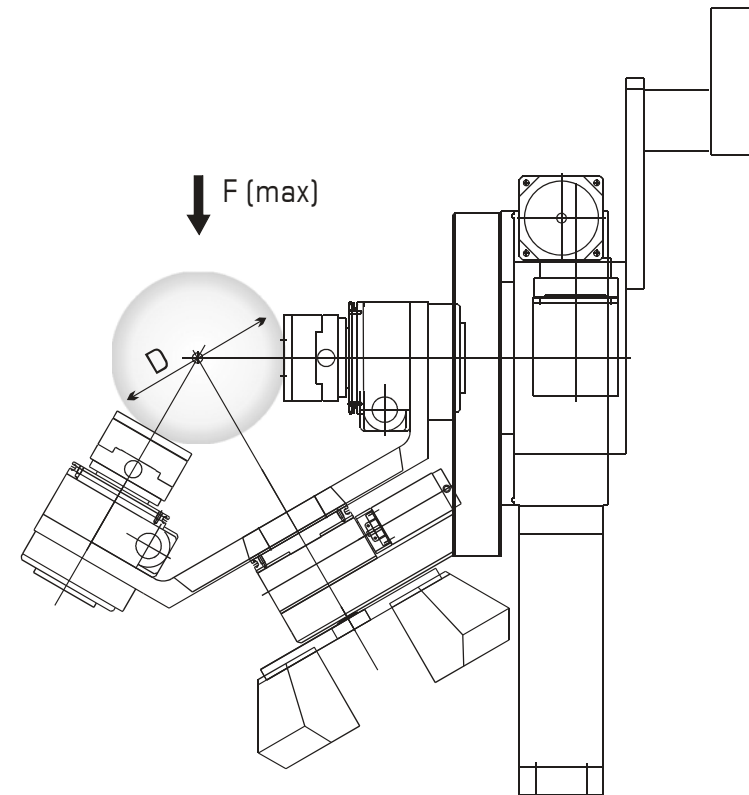
A further circle rotates the Kappa unit around a horizontal axis. An XYZ-stage driven by micromotors is incorporated for the fine adjustment of the sample.

Similar to the Euler cradle 512, motor and signal currents are transmitted via slip rings. This enables unrestricted kappa and phi rotation.

Depending on load ( $F_{max}$ ) and size requirements ( $D$ ), various system sizes are available.

Please contact us. Our engineers will gladly find the ideal system for your requirements.

### Dimensions



Product Groups

1. Positioning Systems

1.3. Translation & Rotation

1.3.1. 4-Axis Segments  
1.3.2. Alignment bases  
1.3.3. Combinations

**HUBER**  
Diffraction and Positioning Equipment

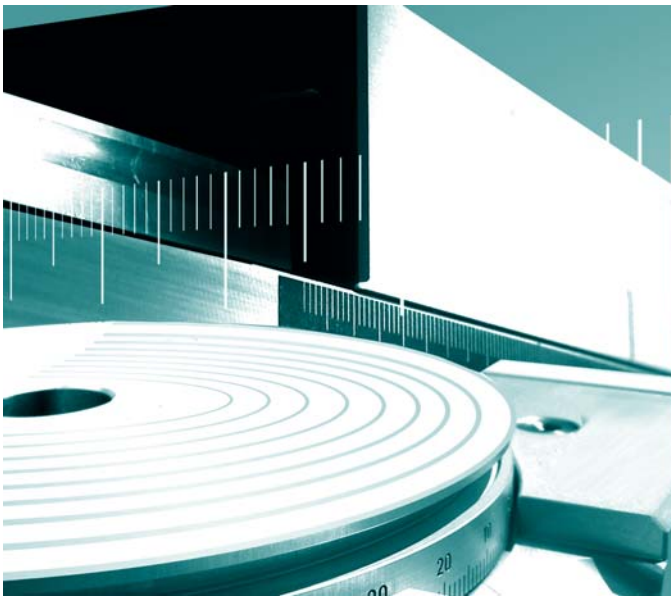
### General information

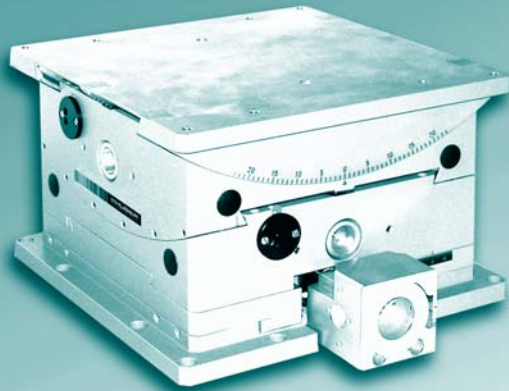
A variety of positioning tasks requires a multitude of possibilities to combine translational and rotational movements.

Some of these movements have been combined to form standard systems. The goniometer head 5204.20 for example is an inseparable combination of a 2-circle segment and an XY-table. Of course it is also possible to generate an identical movement by combining individual systems such as the goniometer head 5203.10 with the XY-table 5102.10.

Huber also offers the possibility of combining existing systems or developing special systems for rotational/translational positioning to meet customer requirements. Such systems consist of individual rotational and translational elements which are combined either directly or via adaptors.

This means that our customers obtain individually customised systems without having to compromise. Some examples are shown in the combinations chapter.





Modularly individually configurable

- from basic model to high-end system
- to multi-axis systems
- with customer-specific hole pattern

Application specific versions:

- vacuum compatible
- antimagnetic
- radiation resistant
- in black

#### Maximum load and torque

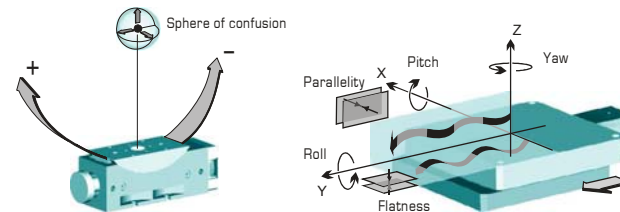
A general statement of maximum load and torque capacities is not possible for eccentric forces due to the amount of different configurations.

However, our engineers will gladly calculate the maximum load capacity for your specific application.

- Multi-axis positioning systems possible by simple combination of individual stages
- High-precision worm gear drive with ground and tempered worm gear, self-locking (Rx, Ry)
- Ground and tempered trapezoidal spindle (X, Y)
- Dovetail guides with fitted bronze slideways
- Use of low-tension, highly resilient materials guarantees high system stability and long life
- Galvanically anodised robust mounting surfaces

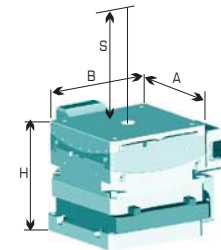
#### Specifications

Travel range:	$\pm 15\text{mm (X,Y), } \pm 12^\circ(\text{Rx,RY})$
Maximum load [N]:	2000
Material (base/carriage):	Aluminium
Slope:	2mm/U (X,Y), $2^\circ/\text{U (Rx, Ry)}$
$M_{\text{input}}$ (min) [Nm]:	0,5
Stiffness ["/Nm]:	2
Weight [kg]:	26



Sphere of con. [ $\mu\text{m}$ ]:	$\pm 10$	Accuracy [ $\mu\text{m}$ ]:	$\pm 5$
Accuracy ["]:	$\pm 6$	Repeatability (unidir.) [ $\mu\text{m}$ ]:	$\pm 2$
Repeatability (unidir.) ["]:	$\pm 3$	Reversal error [ $\mu\text{m}$ ]:	8
Reversal error ["]:	6	Flatness [ $\mu\text{m}$ ]:	$\pm 2$
		Parallellity [ $\mu\text{m}$ ]:	$\pm 2$
		Yaw ["]:	$\pm 5$
		Pitch ["]:	$\pm 5$
		Roll ["]:	$\pm 5$

#### Dimensions [mm]

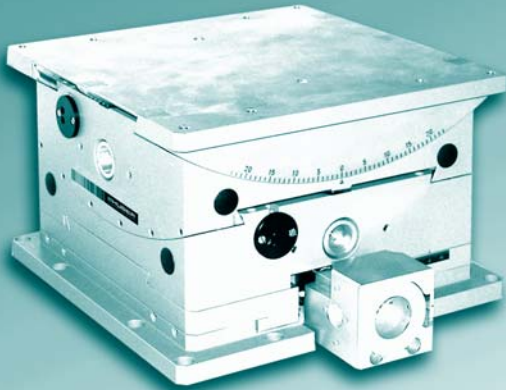


A:	B:	H:	S:
250	250	161	152

#### Accessories

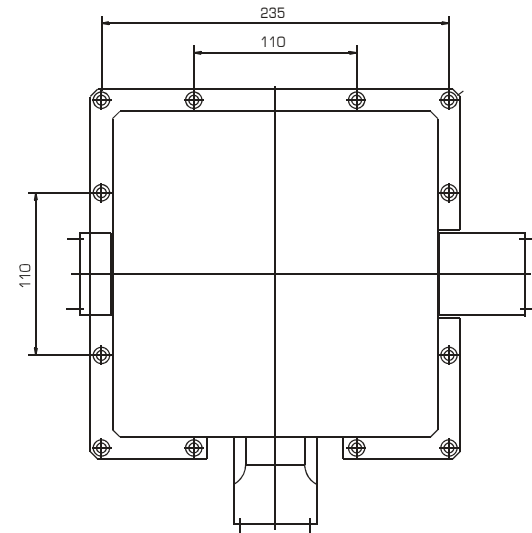
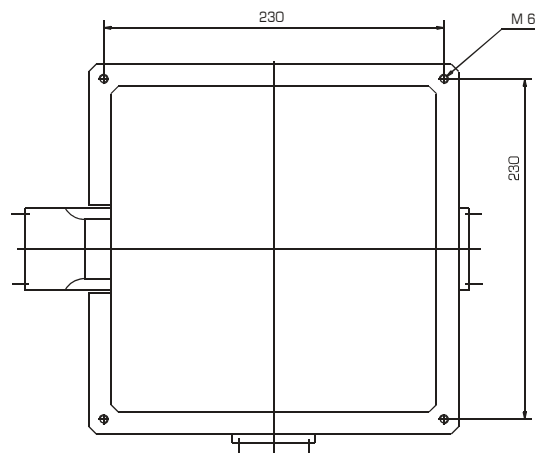
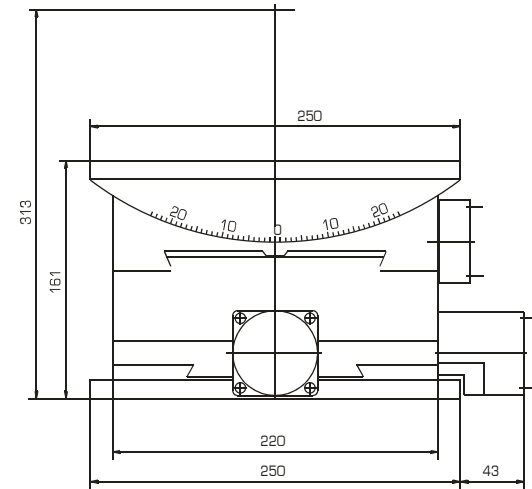
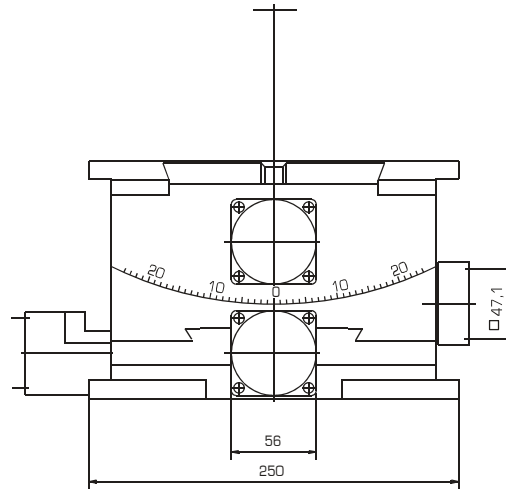
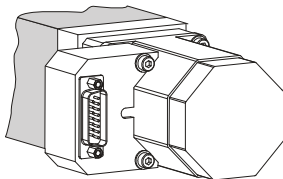
Step motors:	2-/3-/5-Ph.
Hand wheels:	0056
Gear boxes:	2056.05 2056.10 2056.20
Limit switches:	included
Zero-point control:	9100
Encoder:	incremental, absolute
Control system:	9300

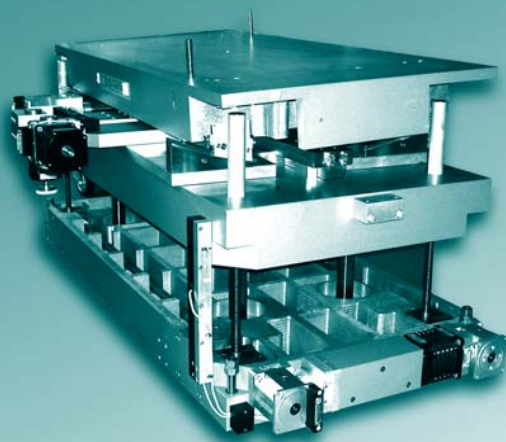
**HUBER**  
Diffraction and Positioning Equipment



#### Power supply of motorised version:

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2-phase motors, and via a Sub D25 connector for 5-phase motors. In the standard version this connector is in a housing mounted on the side of the motor.





### General Information

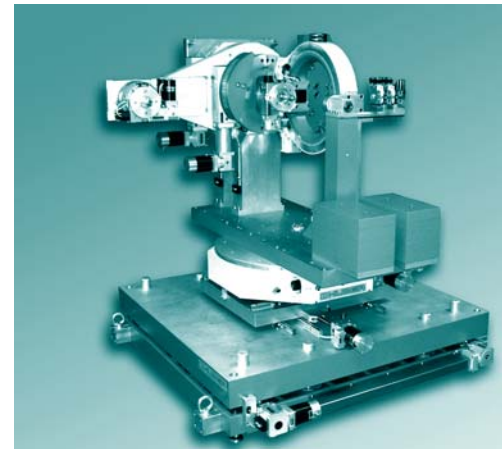
These platform systems are generally used for the alignment of multi-circle diffractometers within the synchrotron beam.

Depending on individual requirements, alignments can be performed in up to three rotational (Rx, Ry, Rz) and three linear (X, Y, Z) dimensions.

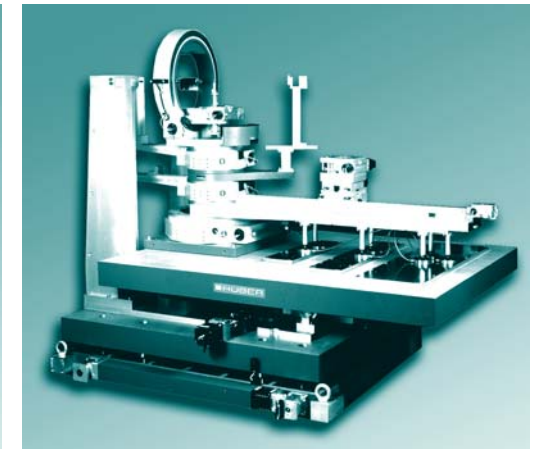
These extremely rigid systems with high load capacity are characterised by the high resolution and manipulation precision of their drive components.

For detailed information, please contact Huber directly or one of our representatives.

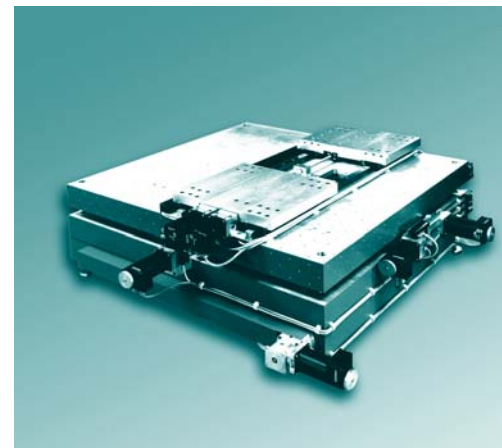
### Examples



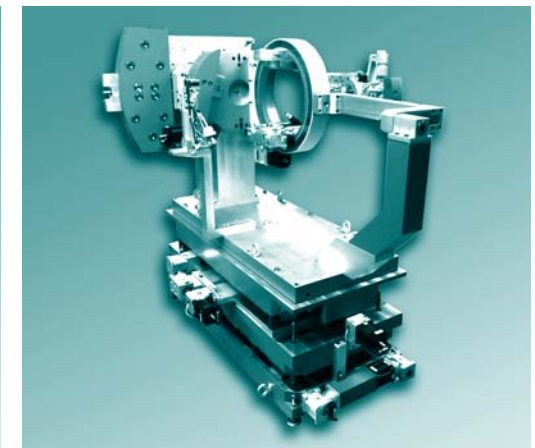
Z-, X-Platform



Z-, Y-, Rz-, Ry-Platform

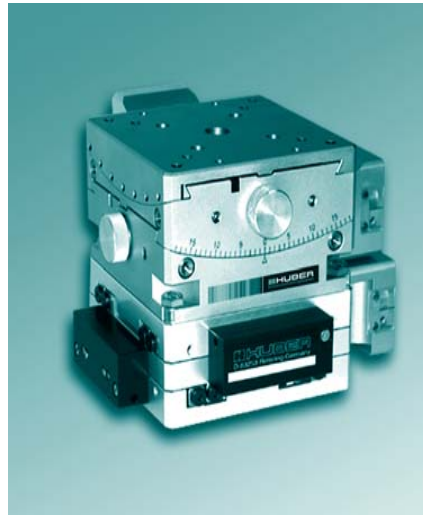
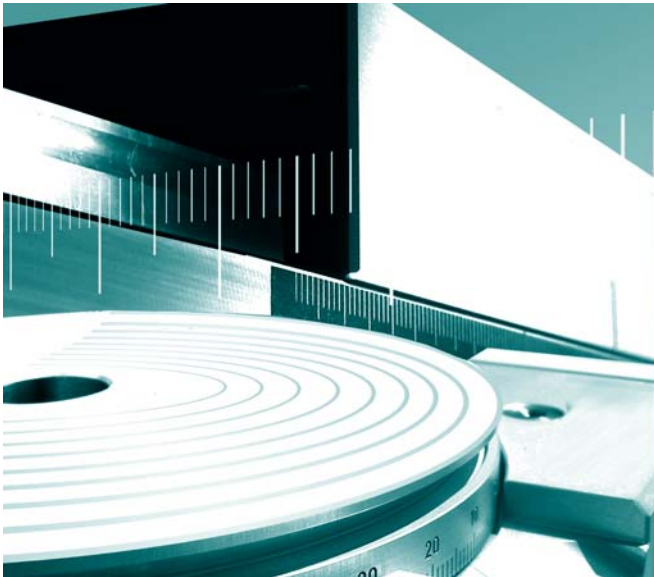


Z-, X-, Rx-, Rz-Platform

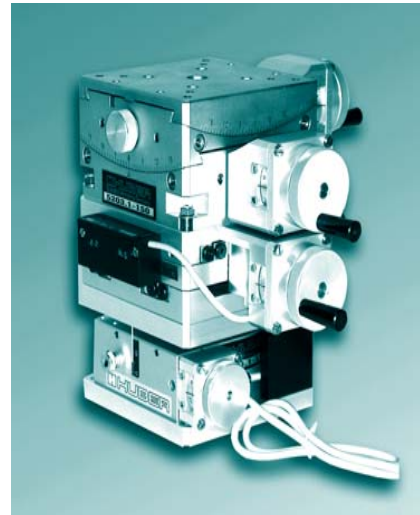


Z-, X-, Rx-, Rz-Platform

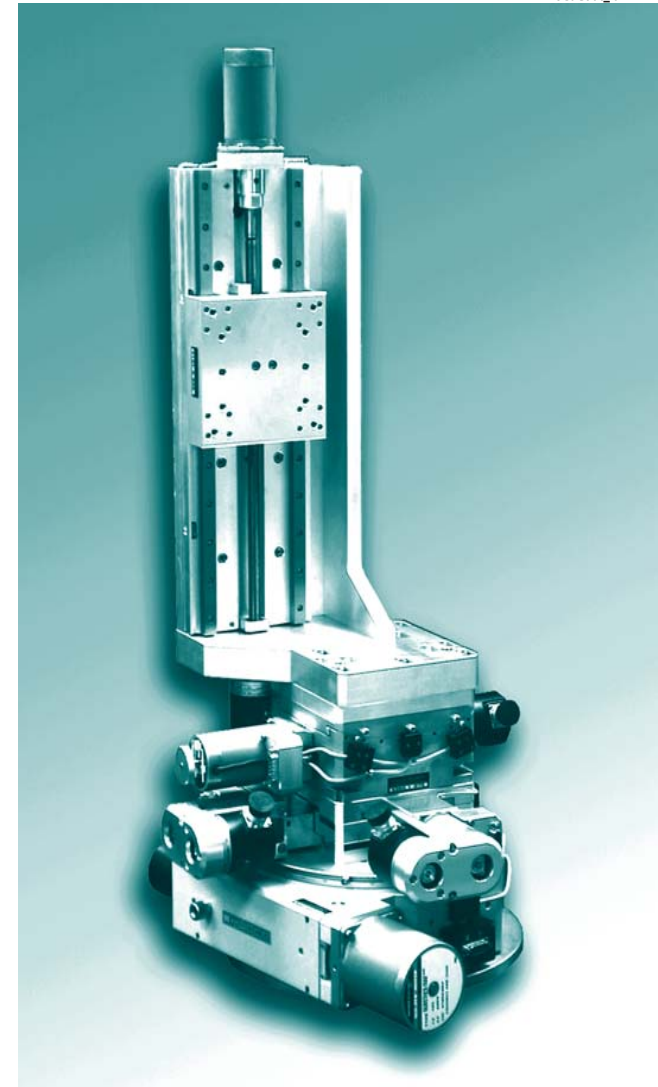




4-axis system: Rx/Ry, X/Y



5-axis system: Rx/Ry, X/Y, Z

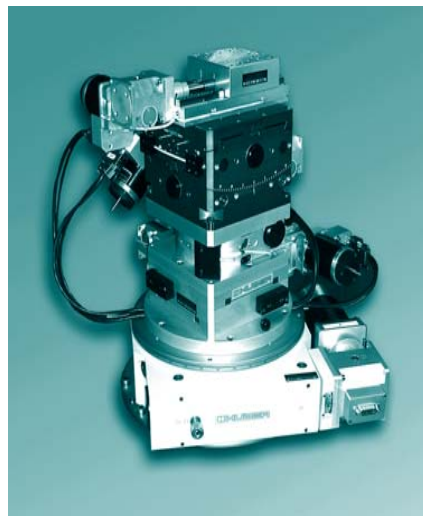


6-axis system: Z, Rx/Ry, X/Y, Rz

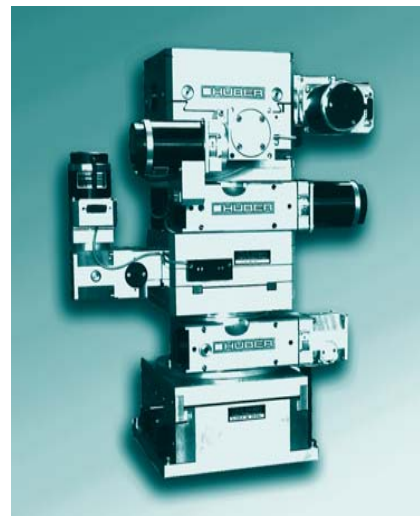
**Note**

The combinations depicted here are just a few examples of possible combinations.

Please contact our engineers for advice on the combination to meet your requirements.



7-axis system: X, Rx/Ry, Z, X/Y, Rz



7-axis system: Rx/Ry, Z, X/Y, Rz, Ry

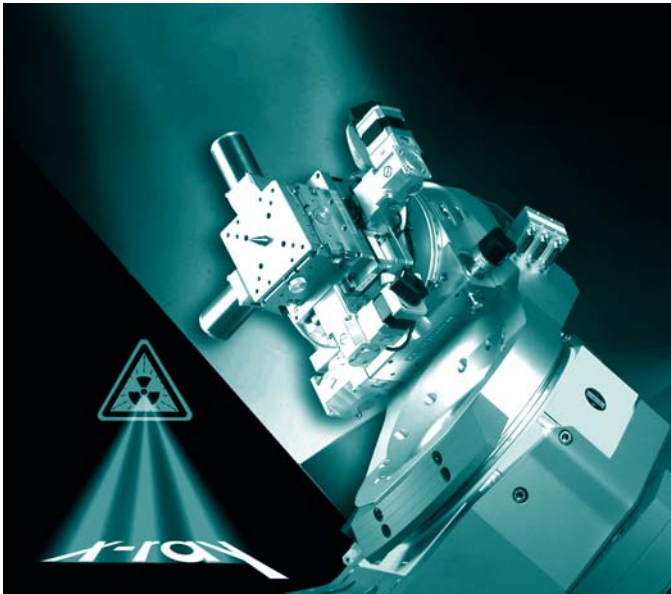


Product Groups

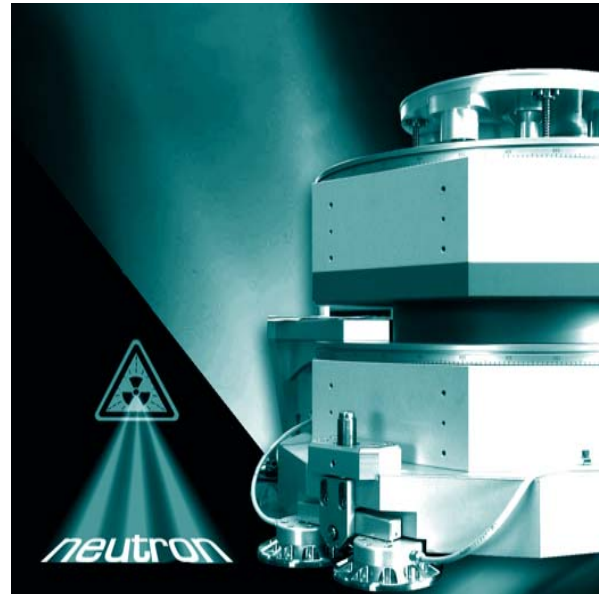
2. Applications

- 2.1. X-Rays
- 2.2. Neutrons
- 2.3. Lasers and more

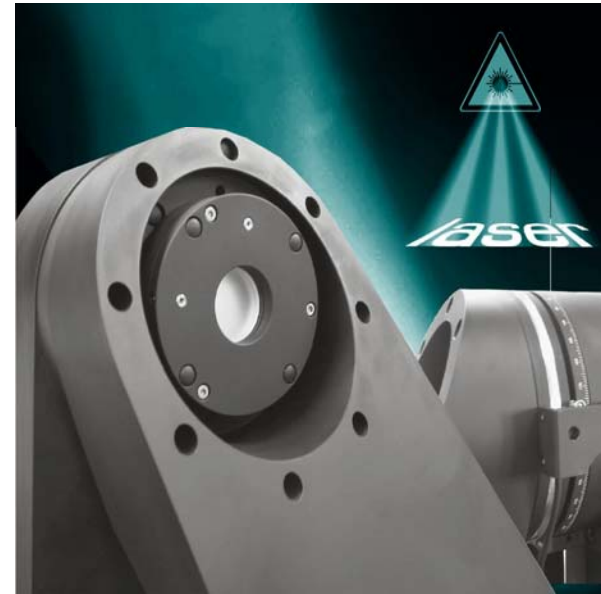
**HUBER**  
Diffraction and Positioning Equipment



From classical camera systems  
to synchrotron diffractometers



Individual multi-circle goniometers  
with high load capacity and precision



Customer specific systems  
e.g. in black design for optical  
applications

Precise  
Individual  
Reliable

### Description

The Laue procedure is the classical method for the X-ray analysis of single crystals. With a relatively simple process it is possible to obtain detailed information on the symmetry and orientation of crystals.

The Laue camera built by HUBER operates both in transmission and return beam modes. Two film cassettes can be positioned along a dovetail guide, with a central mount for standard goniometer heads for the fine positioning of the sample crystals.

Model 801 can be mounted directly to the tube shield window by means of the adaptor 800, enabling both horizontal and vertical tube positions.

Model 802 has a stable base for independent mounting on a laboratory bench.

### Technical Data

Dovetail guide [mm]:	200
Rotation range of goniometer head mount [°]:	360
Max. axial adjustment [mm]:	14
Suitable gon. head dimensions [mm]:	56-70
Collimator inside diameter [mm]:	0,5/0,8
Film/bore diameter [mm]:	115/8
Beam height 802 [mm]:	275 +/-10
Weight 801/802 [kg]:	3/5

### Accessories

800 Camera mount

801.011 Film cutter

801.013 Adjustment microscope

801.012 Polaroid Land Cassette adaptor

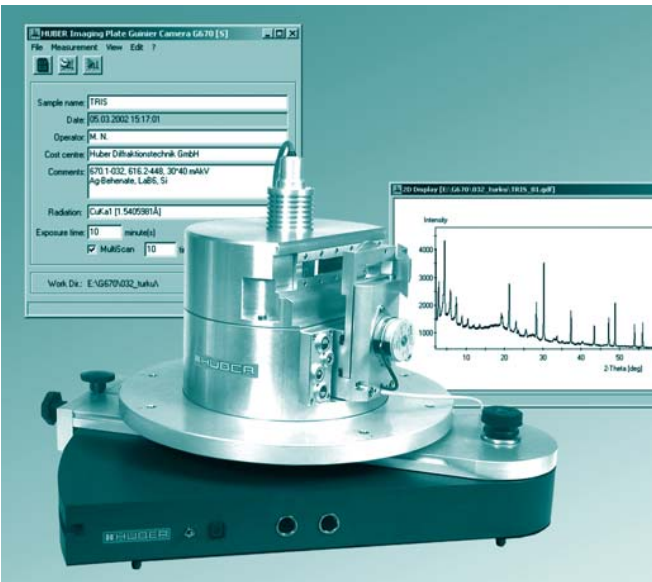
801.014 Attachment

801.015 Stretching device

801.016 Specimen rotating drive

806.011 Drive motor





### Description

For the first time the Huber G670 offers a modern image plate detection method in the Guinier geometry. In many Guinier cameras the over 100 years old wet film technique has been replaced by step-by-step counting scintillation and proportional detectors. Although this enables digital data acquisition, measurement times can not be significantly reduced and remain in the range of hours to days. In contrast to this, the desired data is available within a few minutes with Huber's image plate detection method. The only similarities with classical Guinier cameras are the geometry and the high resolution - instead, the Huber G670 can be seen as a fully-fledged diffractometer.

In addition to the image memory foil, the housing of the 670 camera contains the laser recording unit with photomultiplier and pre-amplifier as well as the halogen deleting lamp. This compact Guinier powder diffractometer unites the high resolution of the old analog wet film method with the high sensitivity of image plate detection technology. Thus it is capable of providing digital powder diffractograms within the shortest possible time which can then be processed further by Rietveld analysis or similar methods.

The provided measurement software runs under MS-Windows and generates diffractogram files with up to 20001 points in all standard file formats.

### Sample supports and environments

The 670 camera housing with the measurement electronics is shielded from ambient light and self-contained. The X-rays diffracted in the sample enter the camera by means of a side-mounted incidence window.

Various different sample supports are available which can be reproducibly attached to the outside of the camera housing by means of two screws.

### Technical data

Number of measurement points (max.):	20001
Step size (2-Theta):	0,005°
Bragg angle area (asymm. transmission):	0°...100°
Bragg angle area (17° Reflexion):	50°...150°
Focal circle radius [mm]:	90
A/D converter resolution [bit]:	16
Signal dynamics (counts):	200000
Simple read time [Sek]:	< 5
Deletion time [Sek]:	10

### Hardware requirements

X-ray source (fine line focus) [mm]:	0,4*8
Beam height above table [mm]:	ca. 275
Required working area next to the tube [mm]:	ca. 600*500
Up-to-date MS-Windows PC with 3 free PCI slots	

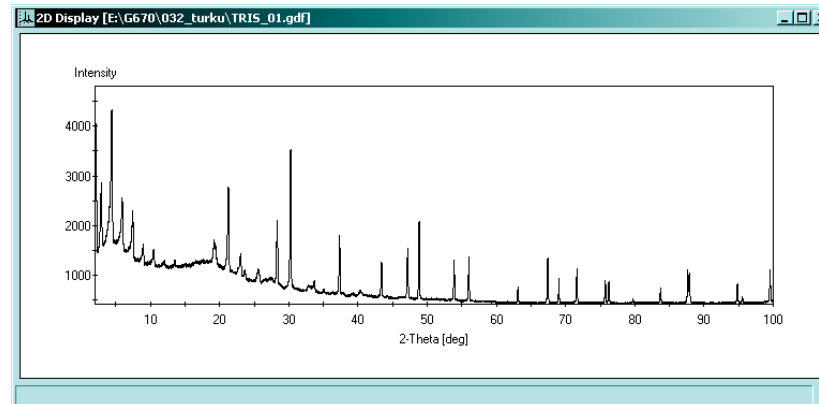
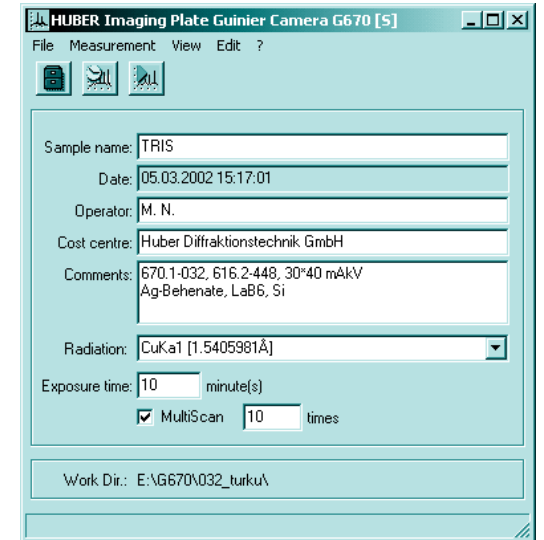
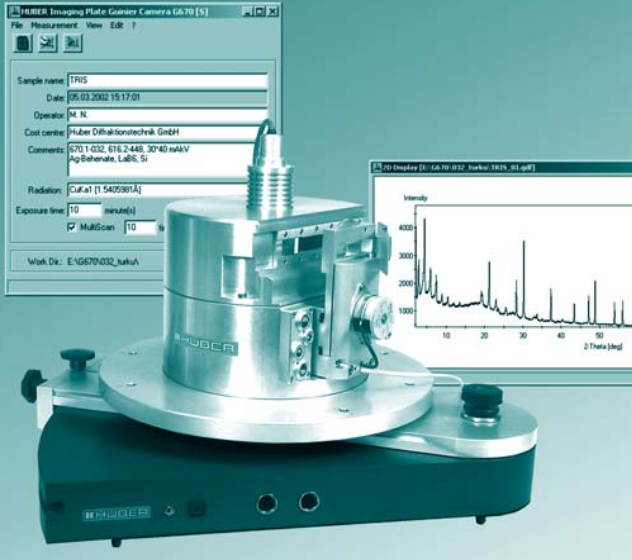
### What is an image plate?

A flexible mounting foil made of polyester is coated with a homogenous powder consisting of crystallites (particle size approx. 0.005 mm) of a luminescent storage material, namely photo-stimulatable phosphor consisting of bariumfluorobromide with trace amounts of Europium with a valence of 2 which acts as a luminescence centre (BaFBr:Eu<sup>2+</sup>).

The image storage foil is positioned in the Guinier camera 670 with the sensitive side facing inward precisely on the focal circle with a radius of 90 mm. It is exposed in the same way as the previously used wet film. After this, the image plate is scanned by a vertical linear red diode laser beam within approx. 5 seconds.

The thus resulting blue photostimulated luminescence (PSL) emanating from the areas subject to X-ray exposure is amplified during the scanning process by a photomultiplier and then registered. This initially analog signal is then converted into digital number counts by a 16-bit A/D converter.

By means of a white halogen lamp it is possible to delete the registered image structure within 10 seconds. After this process the Guinier camera is ready for the next image.





### Flat specimen holder 670.1

The flat specimen holder 670.1 is the standard choice for measuring powder samples under normal laboratory conditions. It is ideal for the generation of very fine peaks at high intensities.

The powder is applied to a 6 µm thick mylar mounting foil 10 x 20 mm in size. The X-ray asymmetrically penetrates the sample surface at an angle of 45°, whilst the sample oscillates in its plane at approximately 1 Hz with an amplitude of 10 mm. This compensates for intensity variations caused by the variously orientated powder particles.

### Capillary powder sample holder 670.2

Capillaries are predominantly used either for very small sample amounts, when the sample has to be air-tightly sealed, or when the sample requires accessory heating or tempering.

As capillaries only cover approximately 10% of the X-ray cross section, the intensity of the refraction lines is one order of magnitude smaller than that of flat samples. In addition, the refraction lines increase in width due to the greater sample thickness of the capillaries from 0.2 to 0.5 mm. Despite this it is still possible to record spectra of high quality due to the optimised geometry of the G670 and its high-resolution detection method.

At first the capillaries are mounted in a brass tube which is in turn mounted on a small adjustable goniometer head.

After this, a microscope is used to gyrationally centre the sample and then mounted on the sample holder. This contains a small direct current motor which rotates the capillaries at approx. 60 revs/min.



670.3

670.2



670.3

### Heater device 670.3

This u-shaped ceramic heating fork enables the heating of sample capillaries to temperatures of up to 900° C. Both oven and capillaries can be shielded from infiltrating air by a cylindrical capon foil shield.

The heat transfer is purely by radiation between "black" or "gray" bodies, with absolutely no heat transfer through direct contact or gaseous convection. In this process the temperature is measured by a Pt-10Rh-Pt thermal element positioned immediately above the rotating capillaries.





### Diode laser furnace 670.31

This heater is powered by a continuous high-performance diode laser (30 W). Its narrow band emissions in near infrared are focussed on the rotating sample capillaries by specially developed cylinder lens optics.

Its line focus is 0.3 x 10 mm in cross-section, thus ideally illuminating the centre of the capillaries. The sample powder is mixed with fine-grained Pt powder at a ratio of approx. 1:1 and then inserted into the capillaries.

The Pt powder is required for two reasons:

1. It absorbs the infrared laser radiation, thus heating up and in turn passing the heat energy on to the surrounding sample crystallites.
2. The cubic crystal lattice of the Pt particles expands isotropically, causing a temperature-dependent deflection of its X-ray diffraction lines towards smaller Bragg angles.

### Low-temperature device 670.4

Flat powder samples can be investigated at temperatures between approx. 12 to 350 K. Similar to the standard sample holder 670.1, the powder is held between two mylar foils.

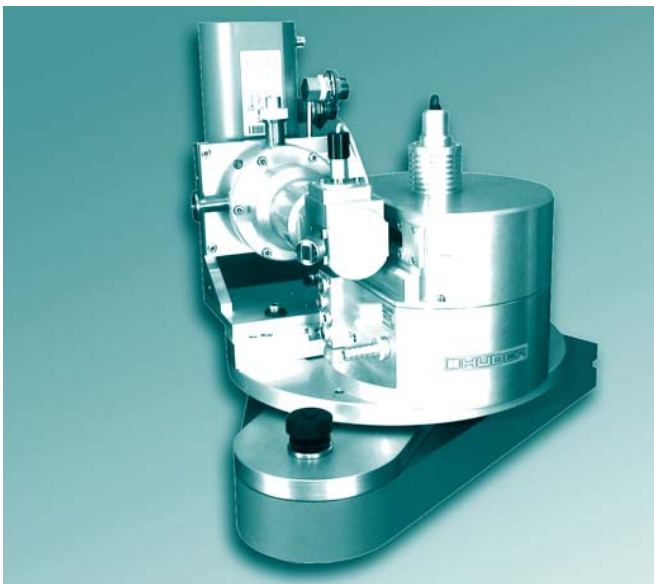
The complete geometry of the cooling head is designed for a transmission angle of 45°. The sample is enclosed in a cooled Cu block, which is in turn surrounded by two cooling shields. The sample is oscillated by a rotating bar magnet located outside the cryostat housing.

An air-cooled compressor supplies the closed cycle He cooling system. The temperature is controlled by Si-diodes and a heating element in the cooling head.

As the corresponding function is known, it is possible to determine the sample temperature from the positions of the Pt-peaks with an accuracy of +/- 30 K. As the Quarz capillaries start to lose rigidity at approx. 1500° C, they can only be used for short periods of time at such high temperatures. It is possible to attain higher temperatures with ceramic capillaries, the limiting factor being the melting point of the Pt particles at 1772°C.

The diode laser furnace 670.31 is supplied with an adjustable power supply with a RS232 interface and a closed-loop water cooling system. The optical laser output and thus the temperature is controlled by the power supply to the laser diodes. The water cooling system is equipped with a cooling compressor as well as several safety features. A quotiential pyrometer is optionally available for temperature measurements.

The regulating system is controlled by a PC and RS232/IEEE488. It is supplied with a complete vacuum pump system and all necessary equipment.





**HUBER**

### Diamond anvil cell holder 670.5

With a diamond high pressure cell (DAC) Diacell Bragg-(S) supplied by easyLab Technologies Ltd., it is possible to investigate powder samples at high pressures of up to 70 GPa.

For the precise positioning of the cell on the 670 housing, a special mount was developed. Using the IUCr-ACA normed thread, the high pressure cell can be easily mounted after precise adjustment with the supplied microscope.

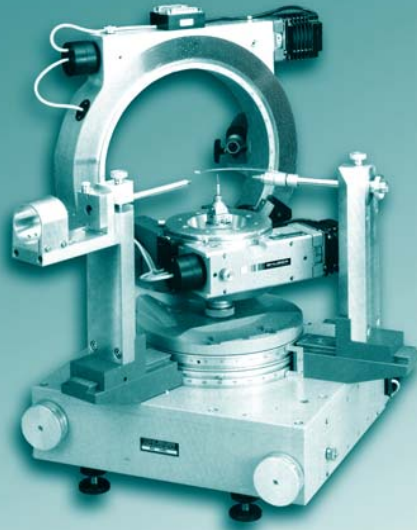
### Vertical base for liquids/thin films 670.6

The base 670.6 enables the G670 camera to be mounted with the incidence window facing down.

The X-ray tube is mounted with the monochromator so that they can be rotated whilst the sample surface remains horizontal. The incidence angle of the X-ray beam can be varied between 0° and 20° by means of a precise adjustment system.

Thus, this set-up is ideal for the diffraction of liquids or thin films.





### Description

This 4-circle diffractometer, consisting of the components 424 and 511.1, is an effective system for the investigation of single crystal samples.

The instrument features:

- Step motors
- Limit switches and zero-point control
- Collimator and detector arms
- Detector mount
- Cross slit screen 3011
- Collimators  
(Inside diameter 0,3/0,5/0,8mm)
- Primary beam collector
- Secondary beam collector  
(Inside diameter 3,2 mm)

We would be happy to incorporate customer specific alterations, if technically possible.

### Specifications

	Phi-Circle	Chi-Circle
Travel range [°]:	360	360
Resolution [°] <sup>1</sup> :	0,001/0,002 <sup>2</sup>	0,001
Accuracy ["]:	30	30
Repeatability (unidir.) ["]:	≤ 2	≤ 3
Reversal error ["]:	≤ 10	≤ 15
Gear ratio:	360:1/180:1 <sup>2</sup>	360:1

### Specifications

	2-Theta	Omega
Resolution [°] <sup>1</sup> :	0,001	0,001
Accuracy ["]:	≤ 30	≤ 30
Repeatability (unidir.) ["]:	≤ 2	≤ 2
Reversal error ["]:	≤ 7	≤ 7
Gear ratio:	360:1	360:1
Excentricity [µm]:	≤ 3	≤ 3
Wobble ["]:	≤ 4	≤ 4

### System specifications

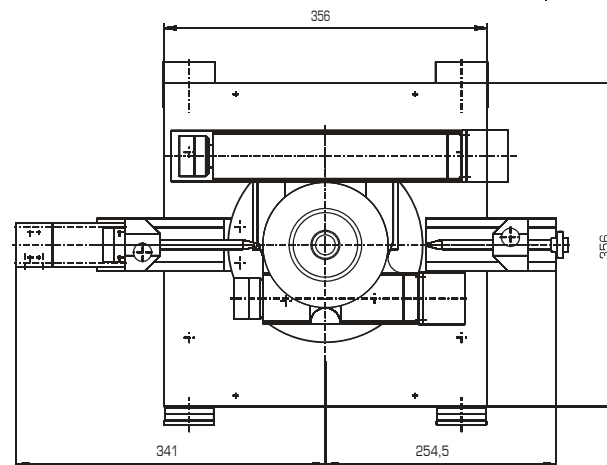
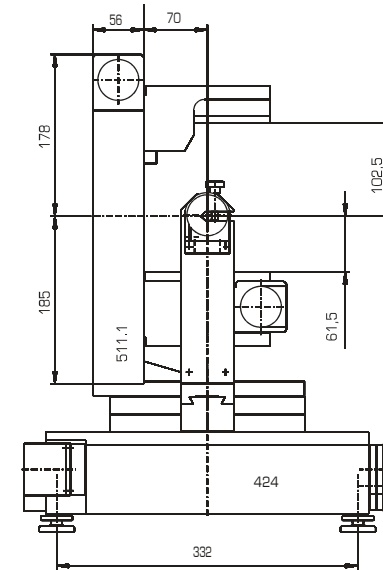
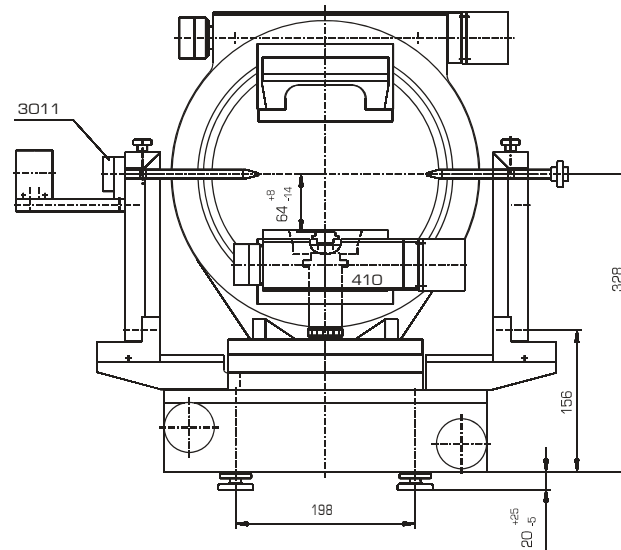
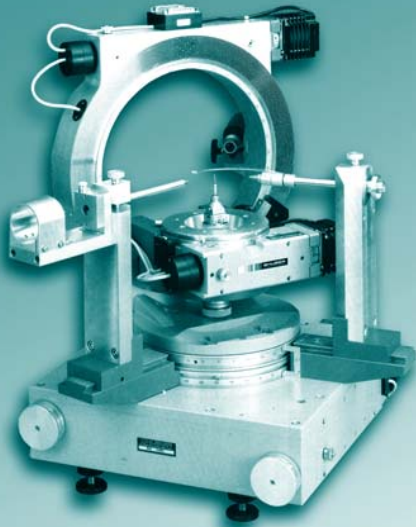
Sphere of confusion [mm]:	≤ 0,02
Weight [kg]:	60

<sup>1</sup> in combination with step motor (1000 steps/revolution)

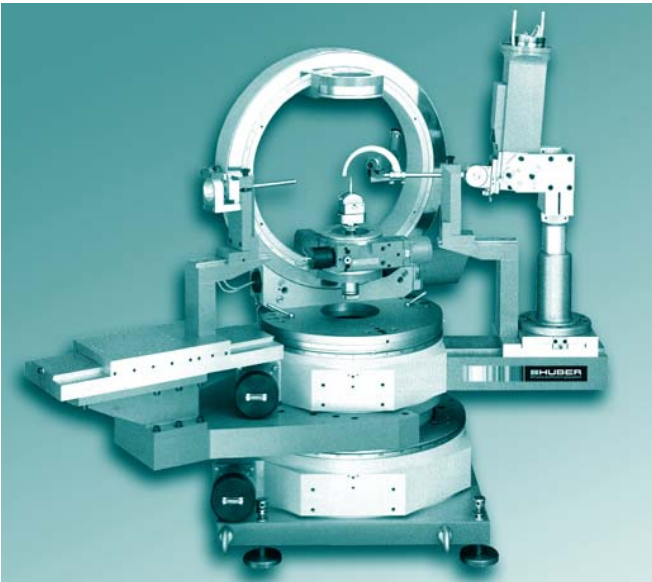
<sup>2</sup> using Goniometer 410A

### Accessories

Collimator arm	
Cryostat carrier:	511.120
Counter bearing:	511.110
Slit screens:	Series 3000
Control system:	9300
CCD-Camera:	MiniVID
Motors:	2-, 3-, 5-Ph.
Limit switches:	included
Zero-point con.:	9100
Gonio heads:	Series 1000
Encoder:	incred./absol.
Integr. Z-stage motorised:	5104.20-22M (specific mount with cradle raised by 40mm necessary)
Gear box:	2056.05 2056.10 2056.20
Half-screen device	
Absorption filter device	

**HUBER**  
Diffraction and Positioning Equipment**Power supply:**

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2-phase motors, and via a Sub D25 connector for 5-phase motors.



### Description

The Huber diffractometer type 5042 is a stable 4-circle diffractometer that can be used both for x-ray as well as for neutron applications.

Depending on its use, the system is equipped with different components:

Tube hood and monochromator 151 for x-ray applications, and plane detector for neutron applications.

The instrument features:

- Step motors
- Limit switches and zero-point control
- Collimator and detector arms
- Detector mount
- Cross slit screen 3011
- Collimators  
(Inside diameter 0,3/0,5/0,8mm)
- Primary beam collector
- Secondary beam collector  
(Inside diameter 3,2 mm)

We would be happy to incorporate customer specific alterations, if technically possible.

### Specifications

	Phi-Circle	Chi-Circle
Travel range [°]:	360	360
Resolution [°] <sup>1</sup> :	0,001/0,002 <sup>2</sup>	0,001
Accuracy ["]:	30	30
Repeatability (unidir.) ["]:	≤ 2	≤ 3
Reversal error ["]:	≤ 10	≤ 15
Gear ratio:	360:1/180:1 <sup>2</sup>	360:1

### Specifications

	2-Theta	Omega
Resolution [°] <sup>1</sup> :	0,001	0,001
Accuracy ["]:	≤ 20	≤ 20
Repeatability (unidir.) ["]:	≤ 2	≤ 2
Reversal error ["]:	≤ 4	≤ 4
Gear ratio:	360:1	360:1
Excentricity [µm]:	≤ 3	≤ 3
Wobble ["]:	≤ 2	≤ 2

### System specifications

Sphere of confusion [mm]:	≤ 0,02
Weight [kg]:	320

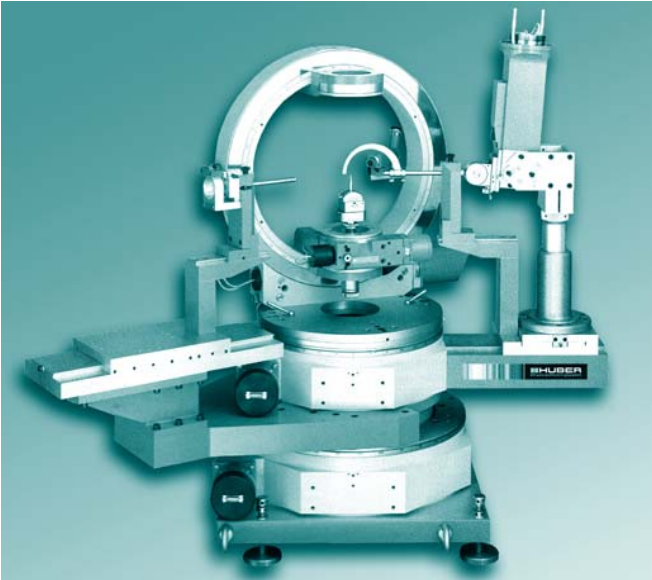
<sup>1</sup> in combination with step motor (1000 steps/revolution)

<sup>2</sup> using Goniometer 410A

### Accessories

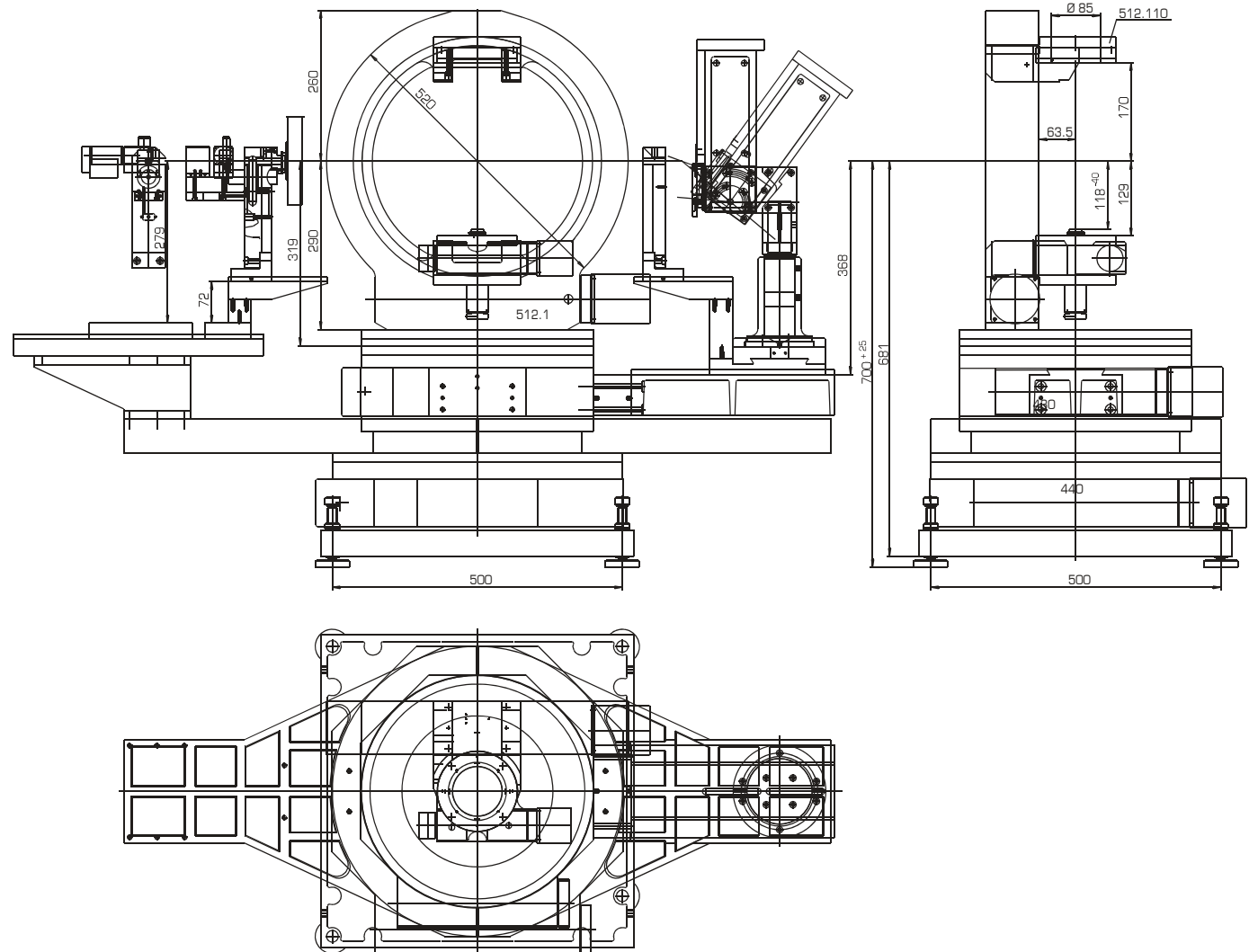
Collimator arm	
Cryostat carrier:	512.120 512.120M
Counter bearing:	512.110
Slit screens:	Series 3000
XY-stages	
Control system:	9300
CCD-camera:	MiniVID
Motors:	2-, 3-, 5-Ph.
Limit switches:	included
Zero-point con.	9100
Gonio heads	Series 1000
Encoder:	incrim./absol.
Integr. Z-stages motorised:	5104.20-22M
Gear box:	2056.05 (Phi) 2056.10 2056.20
Gear box:	2083.05 (Chi, Omega, 2-Theta) 2083.10 2083.20
Mounting for Tube shield	adjustable in X-/Y-/Z-/Rz-/Ry
Alignment bases	

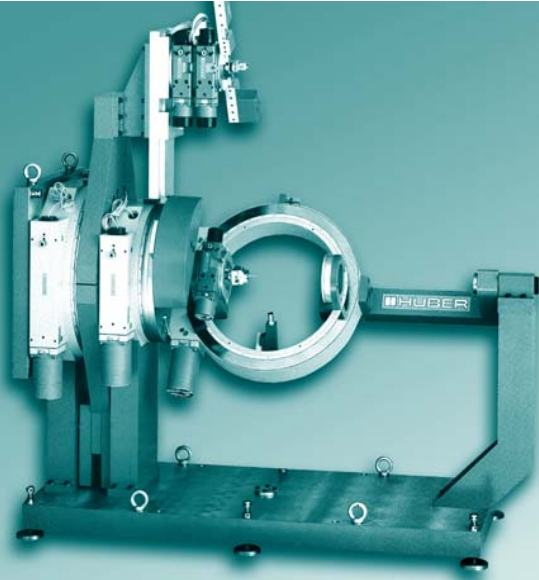
**HUBER**  
Diffraction and Positioning Equipment



**Power supply:**

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2-phase motors, and via a Sub D25 connector for 5-phase motors.





### Description

The Huber diffractometer type 5020 is a 4-circle diffractometer that can be used both vertically and horizontally.

The system mainly consists of the components 440, 430 and 512.

A 2-circle goniometer 414, mounted on the 2-theta Arm, serves as an analyser.

Occuring forces are compensated by corresponding counter weights.

### Specifications

	Phi-Circle	Chi-Circle
Travel range [°]:	360	360
Resolution [°] <sup>1</sup> :	0,001/0,002 <sup>2</sup>	0,001
Accuracy ["]:	30	30
Repeatability (unidir.) ["]:	≤ 2	≤ 3
Reversal error ["]:	≤ 10	≤ 15
Gear ratio:	360:1/180:1 <sup>2</sup>	360:1

### Specifications

	2-Theta	Omega
Resolution [°] <sup>1</sup> :	0,001	0,001
Accuracy ["]:	≤ 20	≤ 20
Repeatability (unidir.) ["]:	≤ 2	≤ 2
Reversal error ["]:	≤ 4	≤ 4
Gear ratio:	360:1	360:1
Excentricity [µm]:	≤ 3	≤ 3
Wobble ["]:	≤ 2	≤ 2

### System specifications

Sphere of confusion [mm]:	≤ 0,02
Weight [kg]:	480

<sup>1</sup> in combination with step motor (1000 steps/revolution)

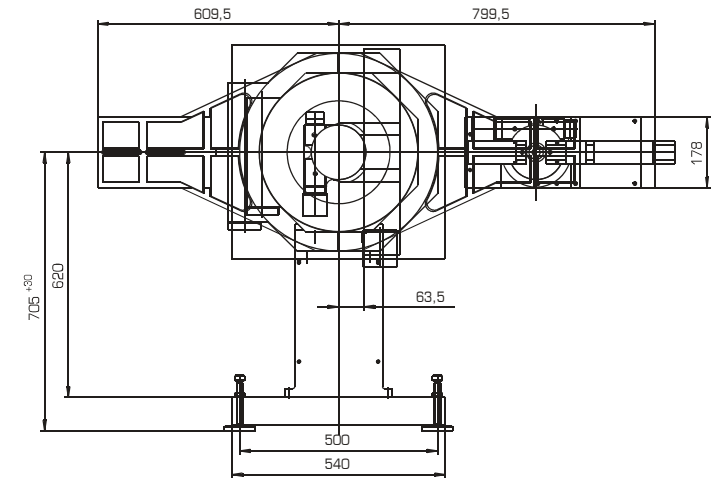
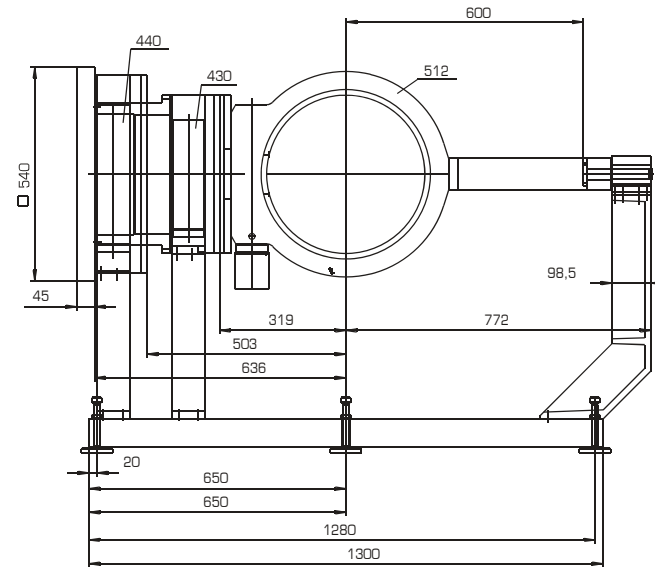
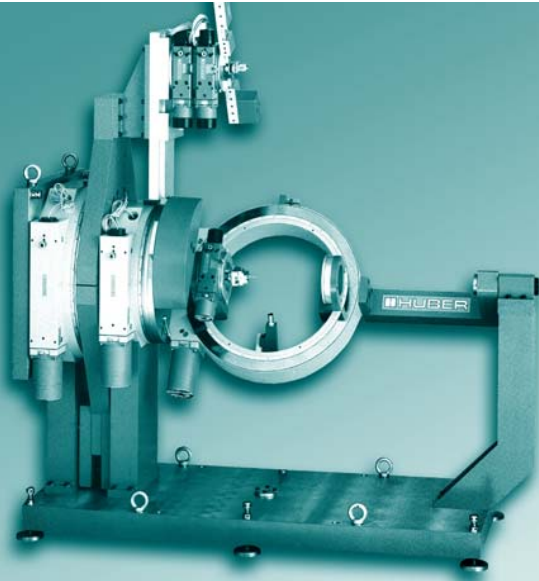
<sup>2</sup> using Goniometer 410A

### Accessories

Collimator arm	
Cryostat carrier:	512.120 512.120M
Counter bearing:	512.110
Slit screens	Series 3000
XY-stages	
Control system:	9300
CCD-camera:	MiniVID
Motors:	2-, 3-, 5-Ph.
Limit switches:	included
Zero-point con.	9100
Gonio heads	Series 1000
Encoder:	incred./absol.
Integr. Z-stages motorised:	5104.20-22M
Gear box:	2056.05 (Phi) 2056.10 2056.20
Gear box:	2083.05 (Chi, Omega, 2-Theta) 2083.10 2083.20
Alignment bases	
Analyser	

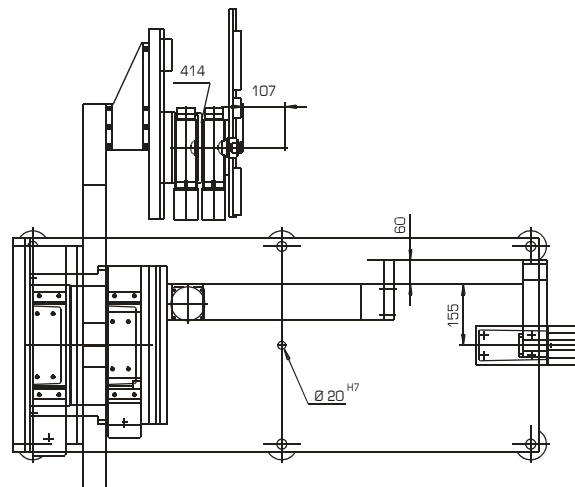


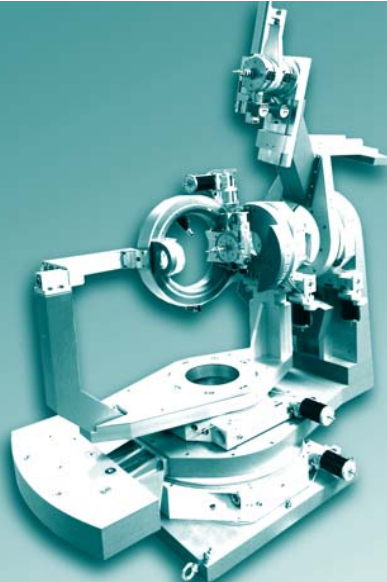
**HUBER**  
Diffraction and Positioning Equipment



#### Power supply:

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2-phase motors, and via a Sub D25 connector for 5-phase motors.





### Description

The Huber diffractometer type 5021 is a 6+2-circle diffractometer for synchrotron radiation.

The system mainly consists of the components 480, 2x 440, 430 and 512.1.

A 2-circle goniometer 415, mounted on the 2-theta Arm, serves as an analyser.

Occuring forces are compensated by corresponding counter weights.

### Specifications

	Phi-Circle	Chi-Circle
Accuracy ["]:	30	30
Resolution [°] <sup>1</sup> :	0,001/0,002 <sup>2</sup>	0,001
Travel range [°]:	360	360
Repeatability (unidir.) ["]:	≤ 2	≤ 3
Reversal error ["]:	≤ 10	≤ 15
Gear ratio:	360:1/180:1 <sup>2</sup>	360:1

Specifications	2-Theta (vert.)	2-Theta (horiz.)	Omega (vert.)	Omega (horiz.)
Accuracy ["]:	≤ 20	≤ 20	≤ 20	≤ 20
Resolution [°] <sup>1</sup> :	0,001	0,001	0,001	0,001
Repeatability (unidir.) ["]:	≤ 2	≤ 2	≤ 2	≤ 2
Reversal error ["]:	≤ 4	≤ 4	≤ 4	≤ 4
Excentricity [µm]:	≤ 3	≤ 3	≤ 3	≤ 3
Wobble ["]:	≤ 4	≤ 2	≤ 2	≤ 2
Gear ratio:	360:1	360:1	360:1	360:1

### System specifications

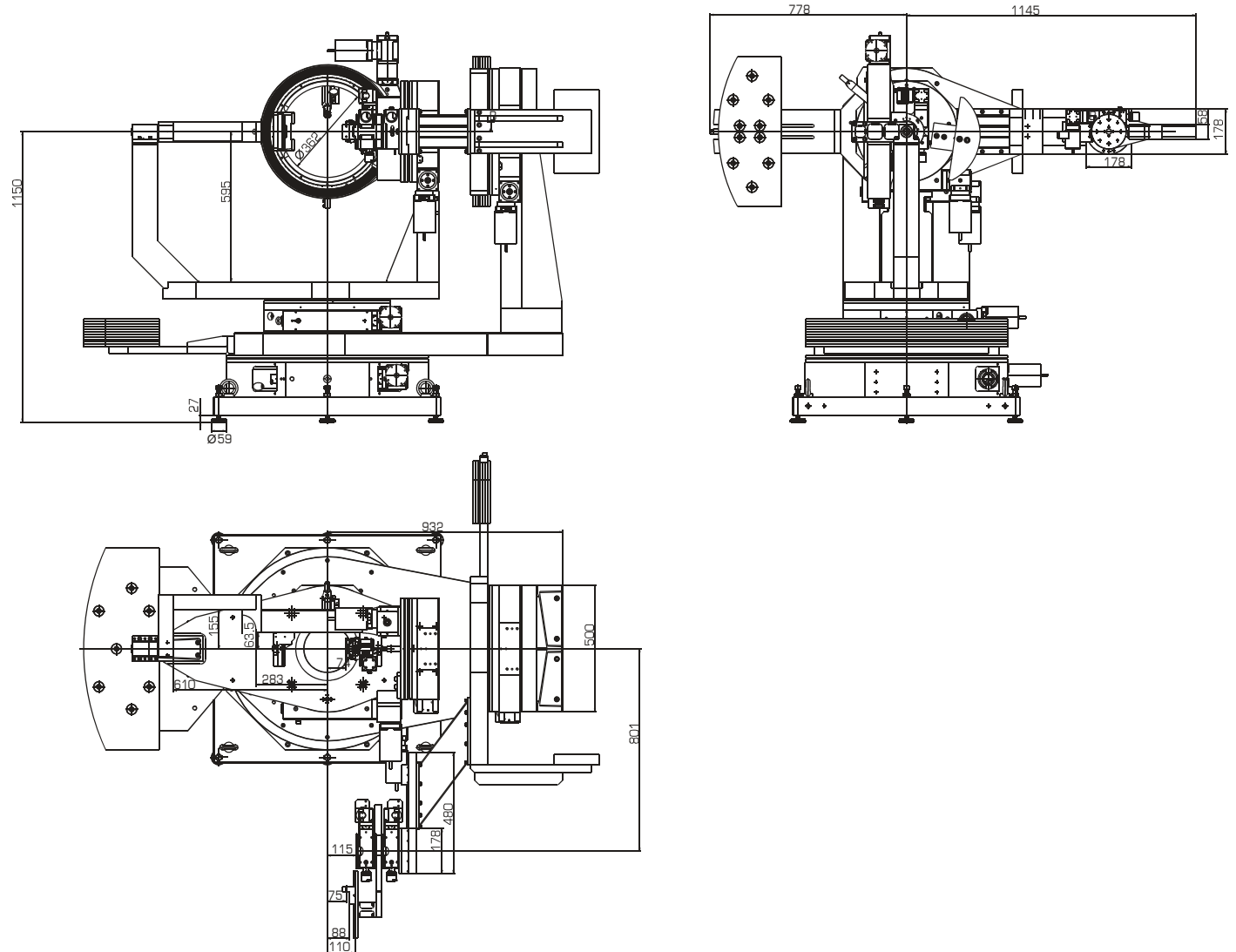
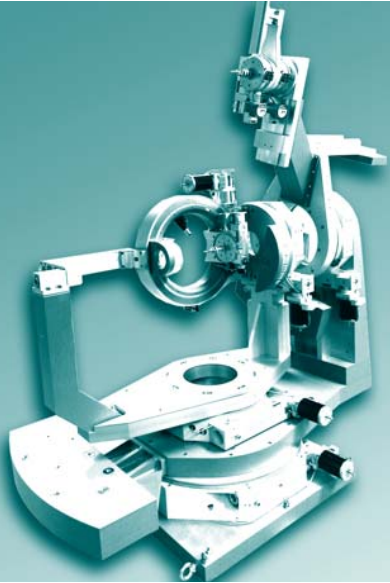
Sphere of confusion [mm]:	≤ 0,04 (sample circles)
Sphere of confusion [mm]:	≤ 0,05 (detector circles)
Weight [kg]:	1100

<sup>1</sup> in combination with step motor (1000 steps/revolution)

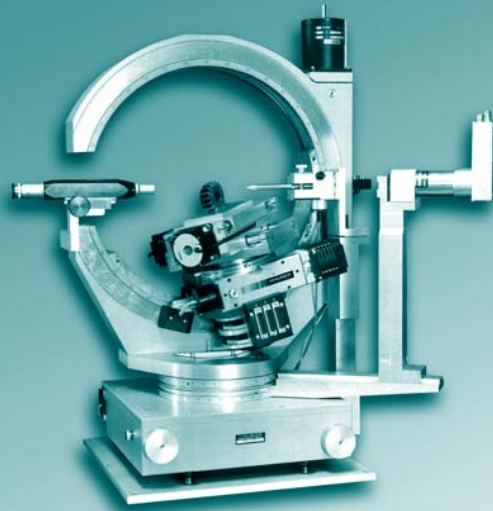
<sup>2</sup> using Goniometer 410A

### Accessories

Collimator arm	
Cryostat carrier:	512.120 512.120M
Counter bearing:	512.110
Slit screens:	Series 3000
XY-stages	
Control system:	9300
CCD-camera:	MiniVID
Motors:	2-, 3-, 5-Ph.
Limit switches:	included
Zero-point con.:	9100
Gonio heads:	Series 1000
Encoder:	incrim./absol.
Integr. Z-stages motorised:	5104.20-22M
Gear box:	2056.05 (Phi) 2056.10 2056.20
Gear box:	2083.05 (Chi, Omega, 2-Theta) 2083.10 2083.20
Alignment bases	
Analyser	

**HUBER**  
Diffraction and Positioning Equipment**Power supply:**

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2-phase motors, and via a Sub D25 connector for 5-phase motors.



### Description

This 4-circle diffractometer, consisting of the components 424 and 512.51, offers a wide variety of possible applications ranging from residual stress and textural measurements to thin film analysis and wafer investigations.

Integrated in the Phi-circle is an XYZ adjustment (150mm x 150mm x 25mm). The power supply is via jumper rings.

### System specifications

Sphere of confusion [mm]:  $\leq 0,03$   
Weight [kg]: 120

### Specifications

	Phi-Circle	Chi-Circle
Travel range [°]:	360	360
Resolution [°] <sup>1</sup> :	0,001/0,002 <sup>2</sup>	0,001
Accuracy ["]:	30	30
Repeatability (unidir.) ["]:	$\leq 2$	$\leq 3$
Reversal error ["]:	$\leq 10$	$\leq 15$
Gear ratio:	360:1/180:1 <sup>2</sup>	360:1

### Specifications

	2-Theta	Omega
Resolution [°] <sup>1</sup> :	0,001	0,001
Accuracy ["]:	$\leq 30$	$\leq 30$
Repeatability (unidir.) ["]:	$\leq 2$	$\leq 2$
Reversal error ["]:	$\leq 7$	$\leq 7$
Gear ratio:	360:1	360:1
Excentricity [µm]:	$\leq 3$	$\leq 3$
Wobble ["]:	$\leq 4$	$\leq 4$

### Specifications

	X	Y
Resolution [mm] <sup>1</sup> :	0,002	0,002
Accuracy [µm]:	+/- 50	+/- 50
Repeatability (unidir.) [µm]:	+/- 5	+/- 5
Reversal error [µm]:	5	5
Slope [mm/U]:	2	2

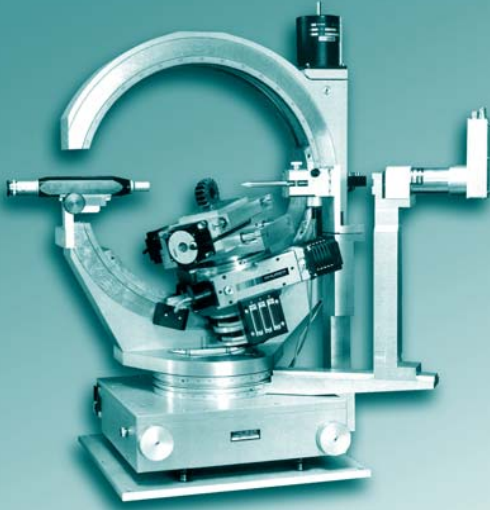
<sup>1</sup> in combination with step motor (1000 steps/revolution)

<sup>2</sup> using Goniometer 410A

### Accessories

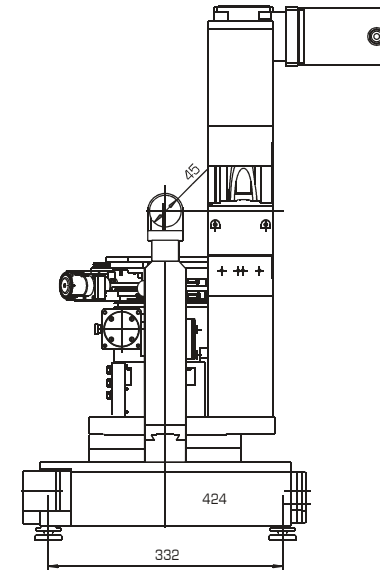
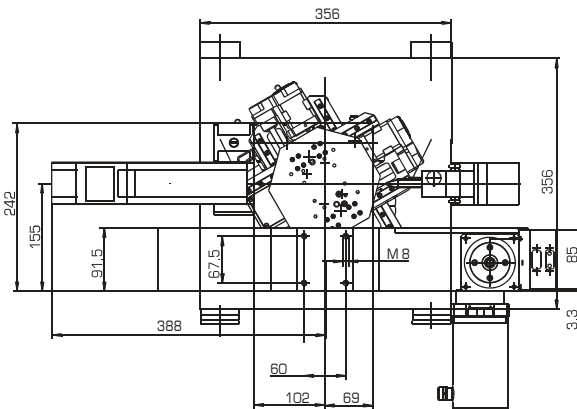
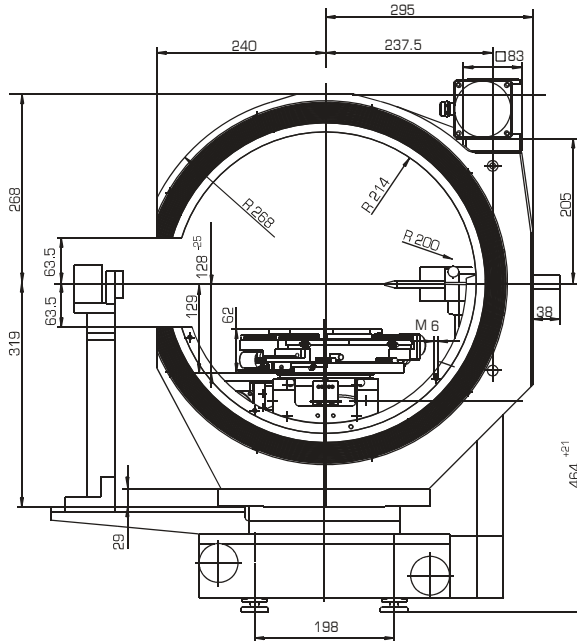
Collimator arm	
Collimator carrier: 8692	
Detector	
Slit screens:	Series 3000
Control system:	9300
CCD-camera:	MiniVID
Motors:	2-, 3-, 5-Ph.
Limit switches:	included
Zero-point con...:	9100 incl.
Encoder:	incred./absol.
Gear box:	2056.05
(Phi, Omega, 2-Theta)	2056.10
	2056.20
Gear box:	2083.05
(Chi)	2083.10
	2083.20

**HUBER**  
Diffraction and Positioning Equipment



#### Power supply:

The power supply for the motor as well as the transmission of the end switch and reference point signals are via a Sub D15 connector for 2-phase motors, and via a Sub D25 connector for 5-phase motors.



### General information

Positioning systems for Neutron experiments

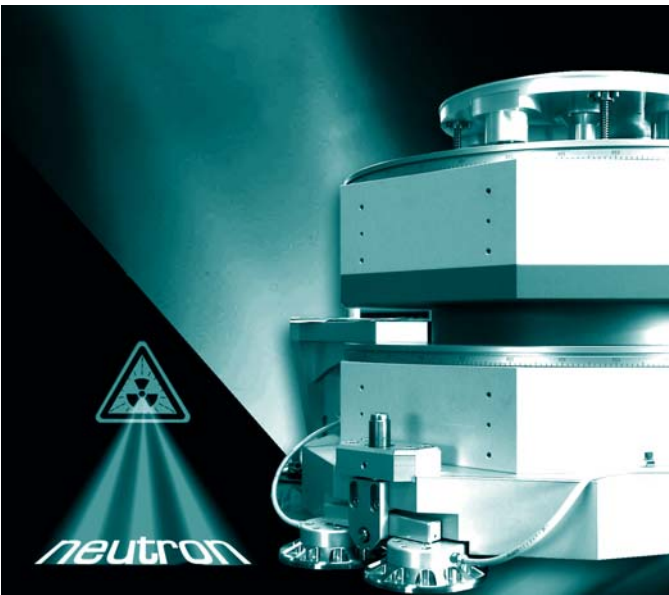
HUBER has a long experience in developing positioning system for Neutron applications.

Flexibility, reliability, ability to carry high loads in combination with highest precision

- Custom designed solutions
- Flexible systems
- High loads

Please find examples for HUBER Systems in category **Positioning Systems**.

As an example for complex systems please see the **Single Crystal Diffractometers**.





Product Groups

2. Applications

2.3. Lasers and More

**HUBER**  
Diffraction and Positioning Equipment

### General information

Positioning systems for optic experiments

For laser and optical applications HUBER provides a wide range of positioning systems.

Nearly the whole range from 1-Circle Goniometer to multi-axis positioning systems are available in black design.

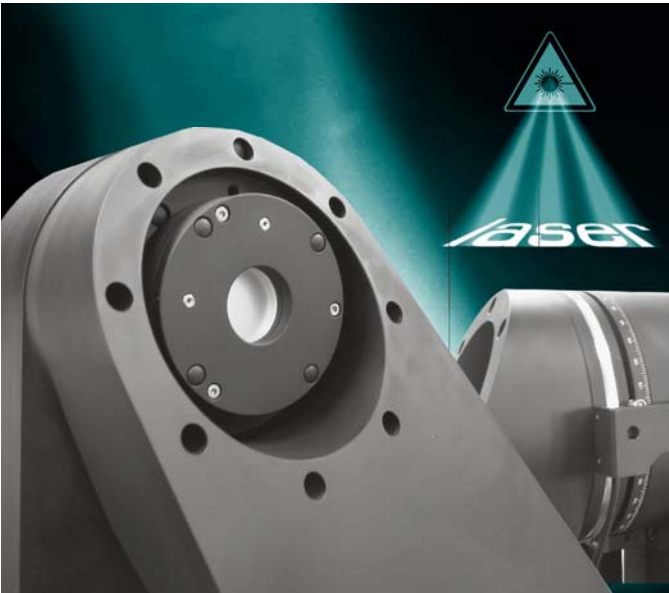
Each product comes in up to four precision and two different maximum loading configurations.

X1 X2 X3 XE W1 W2

- from 1-Circle Goniometer to multi-axis positioning systems
- in black
- from basic model to high-end system

Please find examples for HUBER Systems in category **Positioning Systems**.

:



Product Groups

3. Control Systems

3.1 Motors  
3.2 Temperature

**HUBER**  
Diffraction and Positioning Equipment

The tasks required of control systems are as distinct as their individual uses.

We are certain that you will benefit from our systems which are specially designed for your requirements and can also be perfectly integrated into existing systems.

This is the flexible concept made by Huber.  
For precision, reliability and efficiency.

Our toolbox system enables the development of the ideal control solution for your requirements, both quickly and efficiently. This saves you time and costs, and ensures that you receive the perfect system for your needs.

The quick, individual and cost-effective path to the control system for your specific requirements.

### 3.1 Motors

#### 3.1.1 Controllers

SMC 9300

Step motor control for 1 to 16 axes

SMC 9300 PP

PowerPack for driving 1 to 8 axes

SMC\_PC.PCI

Plug-in PC board for controlling 1 to 4 axes

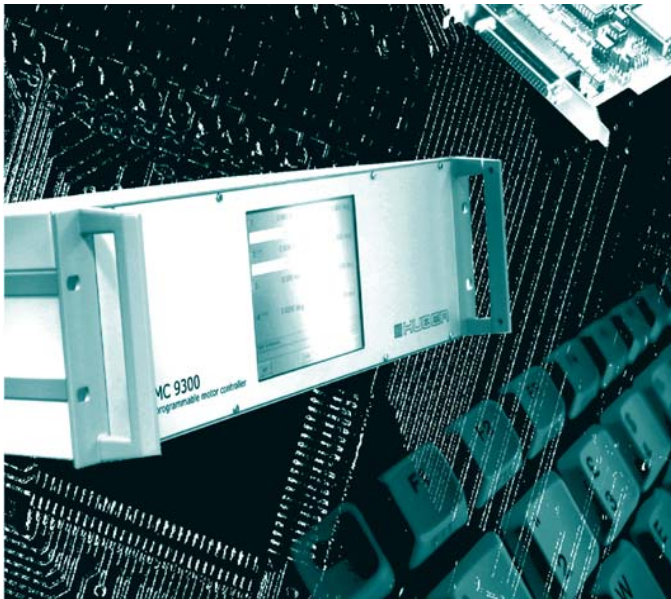
#### 3.1.2 Motor driver boards

#### 3.1.3 Control examples

### 3.2 Temperature

HTC-9634

High temperature control  
Max. temperature range 900°C



Manual operation and configuration of the unit is via a touchscreen display. Alternatively, both operation and updating of software can take place simply and quickly via the standard network interface.

Control systems operating more than two motor axes generally consist of a number of 19" rack modules with individual power supplies, depending on type and quantity of required power units.

We are always able to accommodate special configurations and versions, customer-specific adaptations as well as individual control software requirements.

#### Alternative system: SMC.IPC

- Industrial PC for up to 40 axes
- Integration of additional measuring boards possible (e.g.: lk220)

#### Technical data

Number of axes	1 to 16 (40)
CPU	Embedded Intel
Operating system	Windows XP Embedded
Display	6" colour TFT display
Mass memory	integrated hard drive
Operator interface	touchscreen
Communication interfaces	serial (RS232), network (TCP/IP)
Signal inputs	limit switches, braking point, reference point 8 digital inputs (TTL), optional
Outputs	8 digital outputs (TTL), optional
Encoder input	3-channel incremental enc. (A/B/I, RS 422)
Dimensions	19"/3HU rack housing 450 x 300 x 132 mm
Power supply	115/230 VAC, 50/60Hz 600VA max.
Weight	approx. 12 kg
Environmental conditions	storage: -10°C...+60°C operation: +10°C...+40°C rel. humidity: 15%...85%
<b>Options:</b>	
Control software	SPEC/C-Plot



#### General information

The motor controller SMC 9300 is an intelligent control system with which up to 16 step motor axes can be independently operated at the same time.

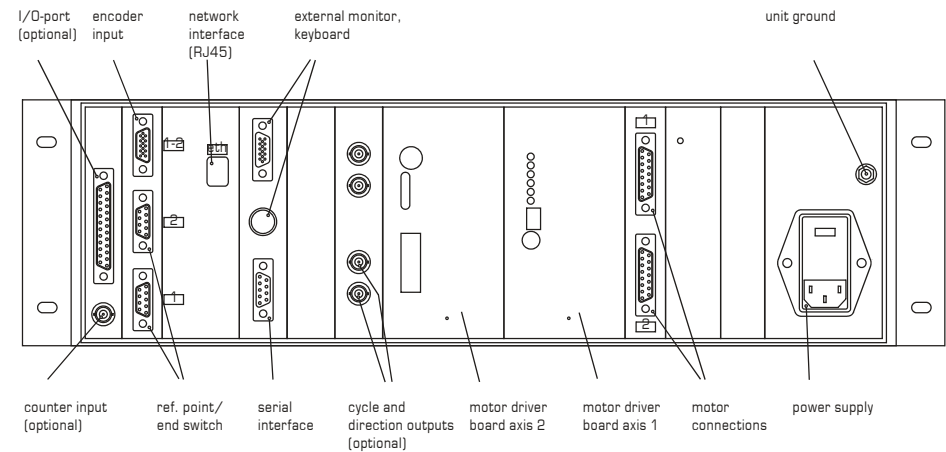
Its flexible, modular design enables the SMC 9300 to be easily adapted to individual requirements. Of course a customer-specific configuration utilising components of various different producers is possible, as is also a task oriented adaption of the controlling software.

The following options are also available:

- Digital I/O-port (8 in, 8 out)
- Connections for filter and half-aperture for cristallography applications
- Impulse counter (TTL)
- Cycle and direction outputs for external position monitor

Shown below is the rear of the SMC 9302 control system for two step motor axes.

In this case the motor driver boards are integrated in the control unit. The system comes equipped with both serial and network interfaces as standard.



The PowerPack SMC 9300 PP is capable of supplying power to up to eight step motor driver boards. In addition to the standard version, Huber also offers individually built units incorporating motor driver boards of various producers for different step motors.

Depending on requirements, the PowerPack can be equipped with modules and units for signal processing and distribution. We are also happy to fulfil customer-specific requests concerning the types of connectors used as well as changes to the pin assignments.

### Connections

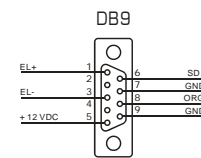
The image on the right shows an example of the connections on the back of a PowerPack equipped with four two-phase step motor driver board, an input module for the step motor control board SMC\_PC.PCI, as well as signal inputs for end switches and reference points for each motor axis.

### Specifications

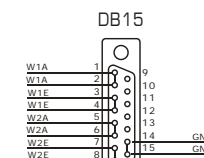
Power supply	115VAC/230VAC, $\pm 10\%$
Output power	max. 1200VA
Motor driver boards	2-, 3-, or 5-phase step motor driver boards, mixed configurations possible
Housing	19" rack housing, 3HE, h x w x d: (133 x 440 x 450) mm
Operating temperature	5°C...40°C
Storage temperature	-10°C...85°C, condensation formation prohibited
Weight	max. 22 kg, depending on configuration



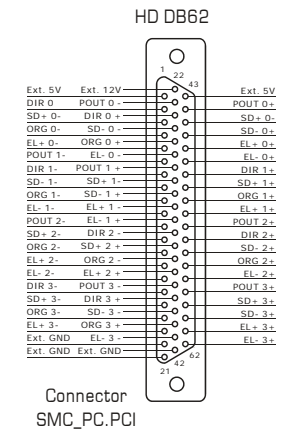
rear view



Connector  
reference point  
and limit switches



Connector  
2-phase step motor



Connector  
SMC\_PC.PCI

By combining the step motor control board SMC\_PC.PCI with the PowerPack power supply, it is possible to create a flexible and cost-effective step motor control based on a PC.

These two components incorporate all features necessary for an individual control system that fulfils all requirements.

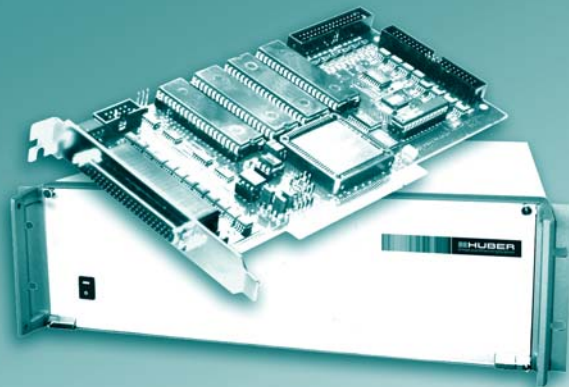
#### Technical data PowerPack

Power supply	115VAC/230VAC, $\pm 10\%$
Output power	max. 1200VA
Motor driver boards	up to eight 2-, 3-, or 5-phase step motor driver boards
Housing	19" rack housing, 3HE h x w x d: (133 x 440 x 450) mm

#### Technical data SMC\_PC.PCI

Board type	PC board, PCI-bus compatible
Dimensions (w x h)	190 x 100 mm
Positioning range	$2^{24}-1$ steps
Frequency range	1 Hz ... 240 kHz
Acceleration ramp	2 Hz/ms ... 65 kHz/ms
Inputs	encoder, limit switches, brake point, reference point, 8 digital inputs (opto-decoupled)
Outputs	motor cycle, direction, 8 digital outputs (opto-decoupled)



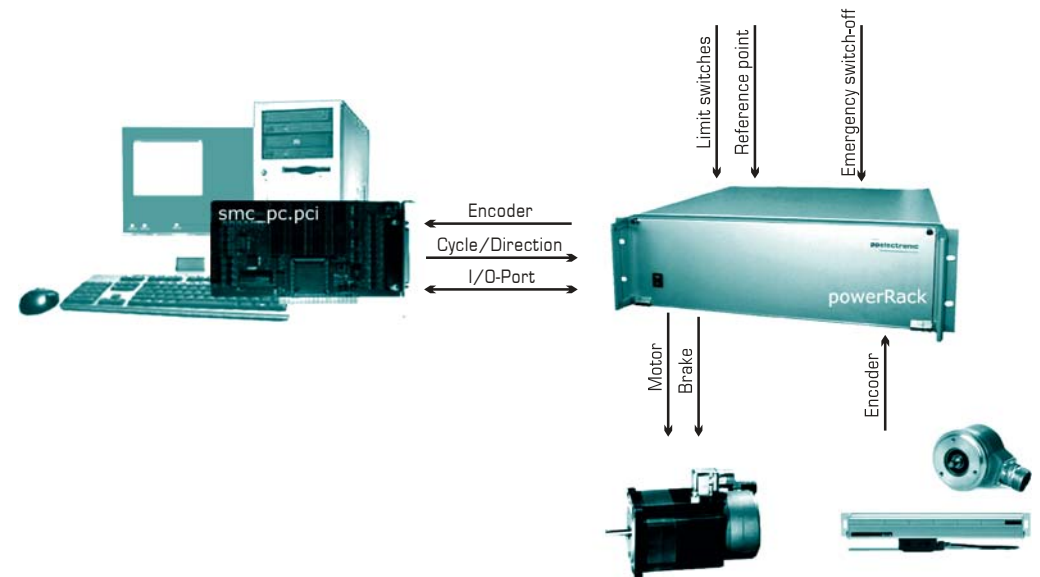


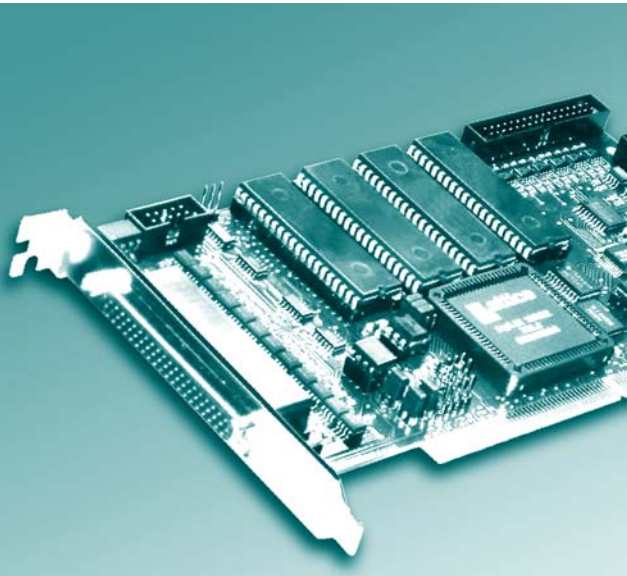
The diagramme on the right shows possible step motor control configurations when using the SMC\_PC.PCI step motor control board with a PowerPack.

Also shown are additional functions that can be integrated in the PowerPack such as control of a motor brake, transmission of encoder signals, emergency switch-off as well as connection of an I/O-port.

The actual control software can be programmed individually on the PC according to requirements. The function libraries of the SMC\_PC.PCI enable quick user programming, for example with Microsoft VisualBasic, C/C++ or all other computer languages which command DLL function calls. We would be glad to assist you in the compilation of your programme, or, alternatively, to compile it for you.

### Configuration example





The SMC\_PC.PCI board is a compact PC board for the PCI bus, capable of operating up to four step motors at the same time.

Inputs for end switches, reference and brake point signals and angle encoders are incorporated, as is a digital 8-bit I/O-port for the controlling and monitoring of connected peripheral equipment.

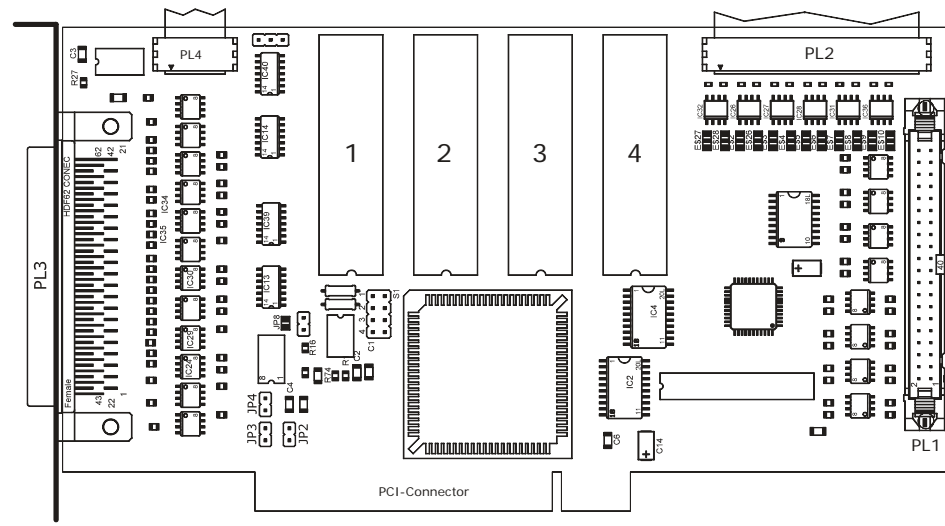
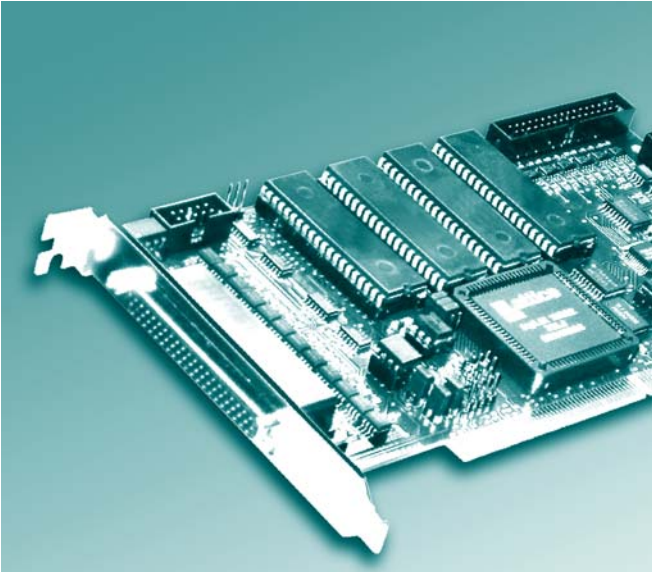
It is possible to use more than one board in a PC.

It comes with a library of functions for programming user software in Microsoft Windows® as well as with some software examples.

### Specifications

Board type:	PC board, PCI-bus compatible
Dimensions (w x h):	190 x 100 mm
Positioning range:	2 <sup>24</sup> -1 steps
Frequency range:	1 Hz ... 240 kHz
Acceleration ramp:	2 Hz/ms ... 65 kHz/ms
Inputs:	encoder, limit switches, brake point, reference point, 8 digital inputs (opto-decoupled)
Outputs:	motor cycle, direction, 8 digital outputs (opto-decoupled)
Operating temperature	+5°C ... +45°C
Storage temperature	-10°C ... +70°C
Rel. humidity	15% ... 85%

Lay-out and pin assignment



PL2: Encoder Signal Input

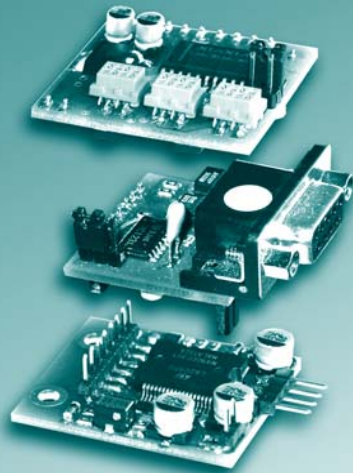
Vcc	1	2	Gnd
A0	3	4	A0
B0	5	6	B0
I0	7	8	I0
Vcc	9	10	Gnd
A1	11	12	A1
I1	13	14	I1
Vcc	15	16	Gnd
A2	17	18	A2
B2	19	20	B2
I2	21	22	I2
Vcc	23	24	Gnd
A3	25	26	A3
B3	27	28	B3
I3	29	30	I3
n.c.	31	32	I3
	33	34	n.c.

PL1: I/O-Port

IN 0 -	1	2	IN 0 +
IN 1 -	3	4	IN 1 +
IN 2 -	5	6	IN 2 +
IN 3 -	7	8	IN 3 +
IN 4 -	9	10	IN 4 +
IN 5 -	11	12	IN 5 +
IN 6 -	13	14	IN 6 +
IN 7 -	15	16	IN 7 +
Vcc	17	18	Gnd
OUT 0 -	19	20	OUT 0 +
OUT 1 -	21	22	OUT 1 +
OUT 2 -	23	24	OUT 2 +
OUT 3 -	25	26	OUT 3 +
OUT 4 -	27	28	OUT 4 +
OUT 5 -	29	30	OUT 5 +
OUT 6 -	31	32	OUT 6 +
OUT 7 -	33	34	OUT 7 +
Vcc	35	36	Gnd
n.c.	37	38	n.c.
n.c.	39	40	n.c.

PL3: Motor- and Control Signals

1	Ext. 5V	22	Ext. 12V	43	Ext. 5V
2	DIR 0 -	23	POUT 0 -	44	POUT 0 +
3	SD+ 0 -	24	DIR 0 +	45	SD+ 0 +
4	ORG 0 -	25	SD- 0 -	46	SD- 0 +
5	EL+ 0 -	26	ORG 0 +	47	EL+ 0 +
6	POUT 1 -	27	EL- 0 -	48	EL- 0 +
7	DIR 1 -	28	POUT 1 +	49	DIR 1 +
8	SD- 1 -	29	SD+ 1 -	50	SD+ 1 +
9	ORG 1 -	30	SD- 1 +	51	ORG 1 +
10	EL- 1 -	31	EL+ 1 -	52	EL+ 1 +
11	POUT 2 -	32	EL- 1 +	53	POUT 2 +
12	SD+ 2 -	33	DIR 2 -	54	DIR 2 +
13	SD- 2 -	34	SD+ 2 +	55	SD- 2 +
14	EL+ 2 -	35	ORG 2 -	56	ORG 2 +
15	EL- 2 -	36	EL+ 2 +	57	EL- 2 +
16	DIR 3 -	37	POUT 3 -	58	POUT 3 +
17	SD+ 3 -	38	DIR 3 +	59	SD+ 3 +
18	ORG 3 -	39	SD- 3 -	60	SD- 3 +
19	EL+ 3 -	40	ORG 3 +	61	EL+ 3 +
20	Ext. GND	41	EL- 3 -	62	EL- 3 +
21	Ext. GND	42	Ext. GND		



## General information

The SMM110i unit is a compact motor driver board designed for the operation of a bipolar 2-phase step motor. The operation current is variably adjustable.

An integrated overheating protection safeguards the driver board from damage caused by thermal overloading. The stage can be equipped with either an opto-couple input module or a PIC controller module with a serial interface. Up to four PIC modules can be operated from one serial interface.

## Operating details

A sufficiently dimensioned filter electrolytic capacitor (at least 4700µF/50V) is required for the motor supply voltage. Additionally, it is necessary for the voltage supply to be equipped with a suitably dimensioned fuse.

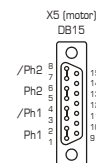
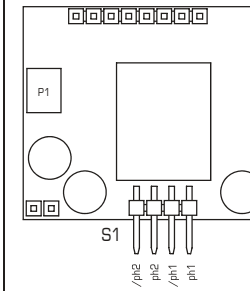
## Specifications

Motor type:	2-phase step motor
Control:	bipolar
Dimensions:	l x w x h: (37 x 32 x 10)mm
Weight:	10 g
Ambient temperature:	5 °C...40 °C
Storage temperature:	-10 °C...70 °C
Installation/Assembly:	DIN rail housing, Small housing
Connections:	multi-pin connector, AMP miniature connector
Motor voltage:	12V DC...36V DC, typ. 24V DC
Phase current:	0.15A...1A, variably adjustable above 0,8A a cooling fan is required
Holding current red.:	reduction to approx. 50% of set phase current, activation approx. 500 ms after motor stop
Input signals:	cycle, direction, enable (opto-mod.) limit switches, power-off, start (PIC-mod.)
Signal levels:	24V DC or 12V DC (optional)
Step angle:	adjustable: 1/1- 1/2-steps
Max. step frequency:	50 kHz (full step)
Positioning range:	2 <sup>31</sup> -1 steps

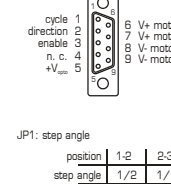
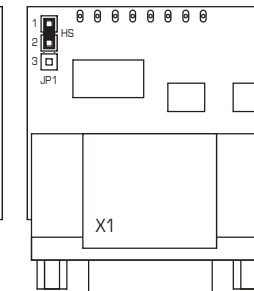
## Special features

Opto-coupler module, control module with PIC controller and serial interface, up to four modules operated from one interface.

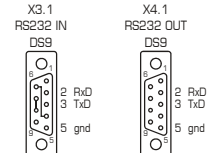
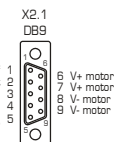
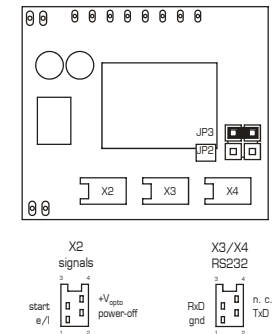
### Driver board module



### Opto-module



### PIC module

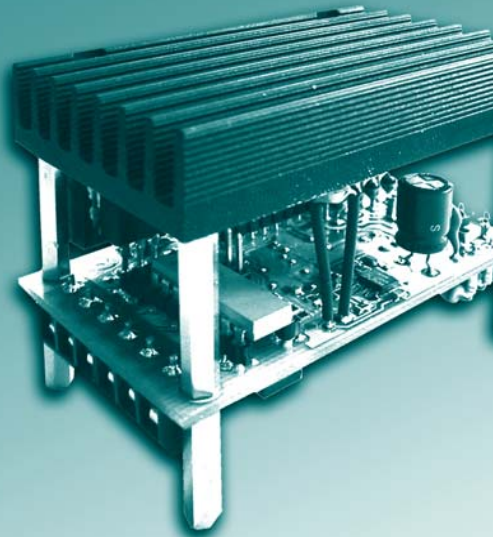


Com-parameters:  
9600-n-8-1

JP2+JP3: module address

	1	2	3	4
JP2	-	x	-	x
JP3	-	-	x	x

x: JP connected  
-: JP not connected



### General information

The SMM 120 unit is a small compact motor driver board designed for the operation of a bipolar 2-phase step motor.

The operation current is variably adjustable. The signal inputs for cycle, direction and enable are opto-decoupled.

### Operating details

The signal inputs are low-active. For motor operation the enable input of the driver board has to be connected against ground. Otherwise the motor will not receive current.

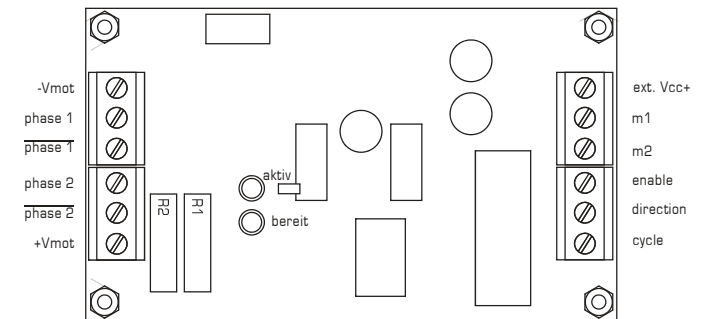
The motor direction is reversed by the switching of the direction input against ground.

A sufficiently dimensioned filter electrolytic capacitor (at least 4700 $\mu$ F/50V) is required for the motor supply voltage. Additionally, it is necessary for the voltage supply to be equipped with a suitably dimensioned fuse.

### Specifications

Motor type:	2-phase step motor
Control:	bipolar
Dimensions:	110 x 15 x 75 mm (h x w x d)
Weight:	220 g
Ambient temperature:	0 °C...40 °C
Installation/Assembly:	hexagonal bolts
Connections:	terminal strip
Motor voltage:	18 VDC...36 VDC, typ. 24 VDC
Phase current:	0,19 A...2 A, above 0,8 A a cooling fan is required
Input signals:	cycle, direction and power-off, opto-decoupled
Step angle:	adjustable: 1/1-, 1/2-, 1/4- and 1/8-steps motor direction reversible
Max. step frequency:	50 kHz (full step)

Connector view




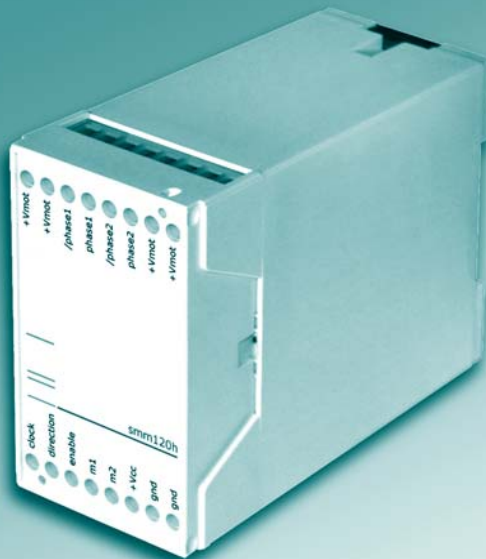
step angle	m2	m2
full step	gnd	gnd
1/2-step	open	gnd
1/4-step	gnd	open
1/8-step	open	open

open = do not connect  
gnd = connect pin with gnd

#### Motor operational current settings (R1/R2)

4.7 Ohm = 0.19 A	
3.3 Ohm = 0.33 A	
2.2 Ohm = 0.42 A	
1.5 Ohm = 0.5 A	
1.0 Ohm = 0.8 A	
<hr/>	
0.82 Ohm = 0.95 A	
0.75 Ohm = 1.10 A	only with large
0.68 Ohm = 1.30 A	cooling element
0.56 Ohm = 1.50 A	
<hr/>	
0.47 Ohm = 1.65 A	only with large cooling
0.39 Ohm = 2.00 A	element and cooling fan

 The resistors may only be exchanged in pairs by qualified technical personell.



### General information

The SMM 120H unit is a small compact motor driver board designed for the operation of a bipolar 2-phase step motor.

The operation current is variably adjustable. The signal inputs for cycle, direction and enable are opto-decoupled.

### Operating details

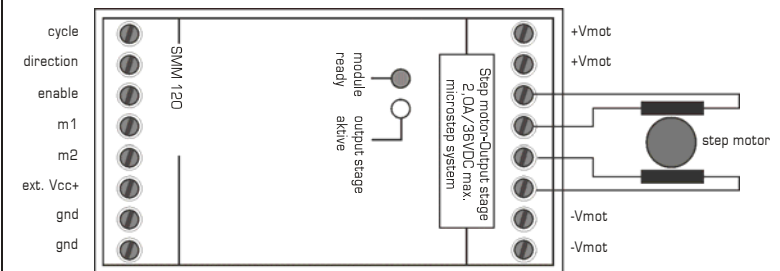
The signal inputs are low-active. For motor operation the enable input of the driver board has to be connected against ground. Otherwise the motor will not receive current.

The motor direction is reversed by the switching of the direction input against ground.

A sufficiently dimensioned filter electrolytic capacitor (at least 4700 $\mu$ F/50V) is required for the motor supply voltage. Additionally, it is necessary for the voltage supply to be equipped with a suitably dimensioned fuse.

### Specifications

Motor type:	2-phase step motor
Control:	bipolar
Dimensions:	45 x 75 x 110 mm (w x h x d)
Weight:	150 g
Ambient temperature:	0 °C...40 °C
Installation/Assembly:	DIN rail
Connections:	terminal strip
Motor voltage:	18 VDC...36 VDC, typ. 24 VDC
Phase current:	0,5 A...2 A, above 0,8 A a cooling fan is required
Input signals:	cycle, direction and power-off, opto-decoupled
Step angle:	adjustable: 1/1-, 1/2-, 1/4- and 1/8-steps motor direction reversible
Max. step frequency:	50 kHz (full step)




step angle	m2	m2
full step	gnd	gnd
1/2-step	open	gnd
1/4-step	gnd	open
1/8-step	open	open

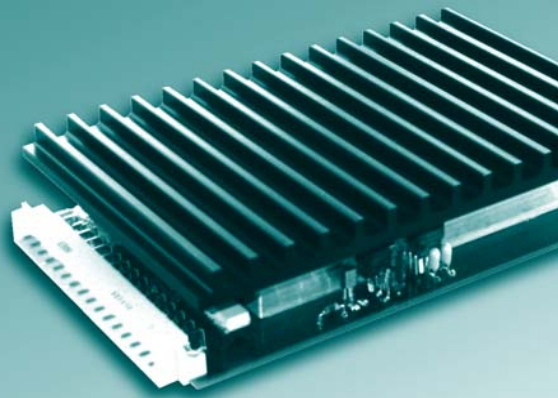
open = do not connect  
gnd = connect pin with gnd

#### Motor operational current settings

1.5 Ohm = 0.5 A	
1.0 Ohm = 0.8 A	
0.82 Ohm = 0.95 A	
0.75 Ohm = 1.10 A	only with internal cooling fan
0.68 Ohm = 1.30 A	cooling fan
0.56 Ohm = 1.50 A	
0.47 Ohm = 1.65 A	only with internal high-performance cooling fan
0.39 Ohm = 2.00 A	

 The resistors may only be exchanged in pairs by qualified technical personell.





### General information

The programmable SME130i unit is a compact, short-circuit-proof motor driver board designed for the operation of a bipolar 2-phase step motor.

Operating and standby currents can each be set to one of 16 levels. The signal inputs for cycle, direction and power-off are opto-decoupled.

The driver board has integrated intelligence, enabling an automatic execution of predefined positioning processes.

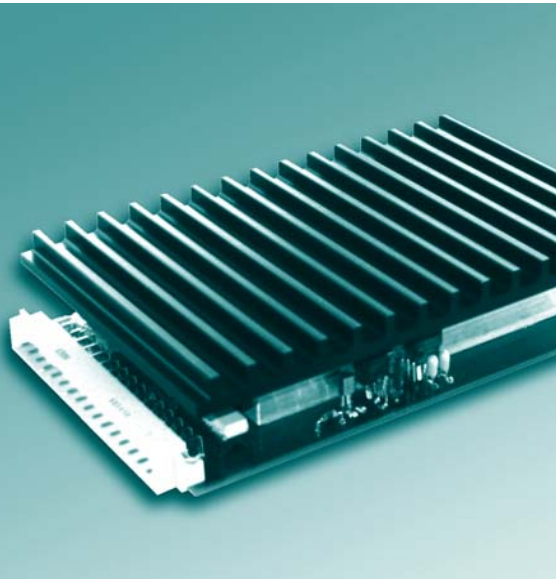
Also included are inputs for reference point and limit switch signals, as well as for an external start signal. The stage is programmed via an integrated serial RS232 interface.

### Operating details

A sufficiently dimensioned filter electrolytic capacitor (at least 4700 $\mu$ F/50V) is required for the motor supply voltage. Additionally, it is necessary for the voltage supply to be equipped with a suitably dimensioned fuse.

### Specifications

Motor type:	2-phase step motor
Control:	bipolar
Format:	Euroboard (160 x 100)
Weight:	450 g
Ambient temperature:	0 °C...40 °C
Installation/Assembly:	19" rack, 3HE
Connections:	32-pin VG connector panel
Motor voltage:	12 VDC...48 VDC, typ. 36 VDC
Phase current:	0.3 A...3 A, adjustable to 16 levels
Holding current red.:	automatically to approx. 60% of rated current, activation approx. 500 ms after motor stop
Input signals:	cycle, direction and power-off, opto-decoupled
Step angle:	adjustable: Full-, 1/2-, 1/4- and 1/8-steps,
Max. step frequency:	50 kHz (full step)
Special features:	onboard PIC controller with serial interface



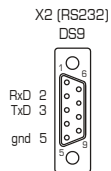
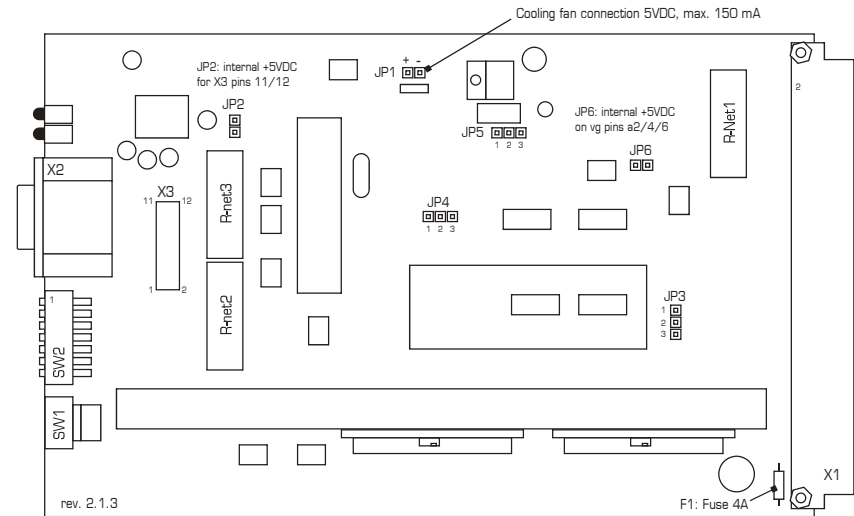
### Programming

Positioning tasks received via the serial interface are permanently stored on an e<sup>2</sup>prom.

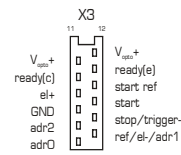
Listed below is an excerpt of the orders available for the programming of positioning tasks.

After connecting to the mains power supply, the programme which was last saved is automatically loaded into the RAM memory. The execution of a task is either commenced by a start order via the interface or by an external signal at the start input of the output stage).

Order	Function
Direct orders	
I	Initialisation
C	Clear Ram
Q	Quit program
G	Go
Z	Zero
M	Modus
Programming orders	
S	Start speed
V	Run speed
R	Acceleration ramp
Query orders	
?P	Positional query
?T	Task query
?S	Status query



parameters:  
9600-n-8-1



V <sub>5V+</sub>	5V	12V	24V
R-Net	150R	470R	1k

SW1	Phase current [A]	SW1	Phase current [A]
0	0.3	B	1.8
1	0.5	S	2.0
2	0.7	A	2.1
3	0.9	B	2.3
4	1.1	C	2.5
5	1.3	D	2.7
6	1.5	E	3.0
7	1.8	F	3.3

SW2, switches 1+2

Step angle	1	2
full step	ON	ON
1/2-step	OFF	ON
1/4-step	ON	OFF
1/8-step	OFF	OFF

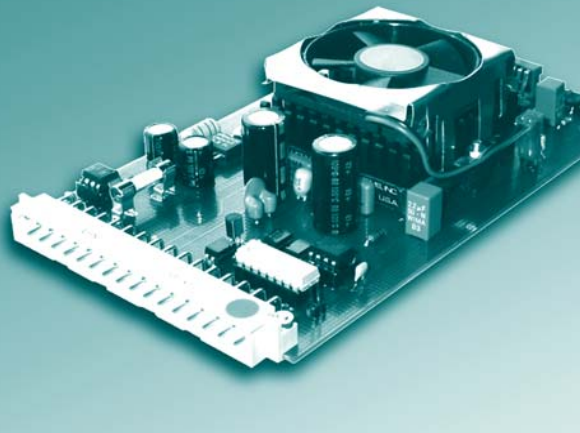
SW2, switches 3+4

Address	3	4
1	OFF	OFF
2	ON	OFF
3	ON	ON
4	ON	ON

SW2, switches 5+6

Mode	5	6
Positioning	ON	ON
Frequency	OFF	ON
Trigger	ON	ON
(not valid)	OFF	OFF

	c	a
Cycle-	<input type="checkbox"/> 2	<input type="checkbox"/> Cycle+
dir-	<input type="checkbox"/> 4	<input type="checkbox"/> dir+
enable-	<input type="checkbox"/> 6	<input type="checkbox"/> enable+
n.c.	<input type="checkbox"/> 8	<input type="checkbox"/> n.c.
n.c.	<input type="checkbox"/> 10	<input type="checkbox"/> n.c.
n.c.	<input type="checkbox"/> 12	<input type="checkbox"/> n.c.
n.c.	<input type="checkbox"/> 14	<input type="checkbox"/> n.c.
vmot-	<input type="checkbox"/> 16	<input type="checkbox"/> vmot-
vmot-	<input type="checkbox"/> 18	<input type="checkbox"/> vmot-
/Phase 1	<input type="checkbox"/> 20	<input type="checkbox"/> Phase 1
/Phase 2	<input type="checkbox"/> 22	<input type="checkbox"/> Phase 2
Phase 1	<input type="checkbox"/> 24	<input type="checkbox"/> n.c.
Phase 2	<input type="checkbox"/> 26	<input type="checkbox"/> /Phase 1
n.c.	<input type="checkbox"/> 28	<input type="checkbox"/> /Phase 2
vmot+	<input type="checkbox"/> 30	<input type="checkbox"/> vmot+
n.c.	<input type="checkbox"/> 32	<input type="checkbox"/> n.c.



### General information

The SMM130m/150m units are compact motor driver boards designed for the operation of a bipolar 2-phase step motor.

In microstep mode a resolution of up to 51200 steps per motor revolution is possible. Signal inputs and outputs are opto-decoupled.

Special features of the moduls:

- overheating protection
- short-circuit-proof phase-phase
- LED status display (ready and error)
- connection compatible with SME 145

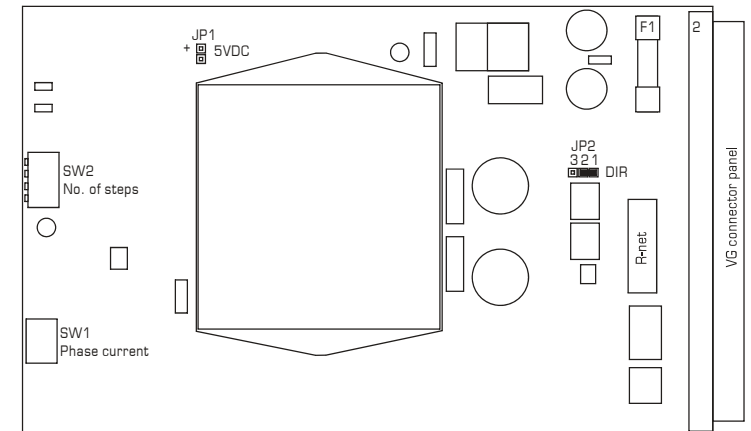
### Operating details

A sufficiently dimensioned filter electrolytic capacitor (at least 4700µF/50V) is required for the motor supply voltage. Additionally, it is necessary for the voltage supply to be equipped with a suitably dimensioned fuse.

The signal input 'enable' can be used to switch the driver board to power-off. A short activation of the 'reset' input moves the motor to the next full step. Additionally, this resets the error output. A fully performed full step generates an impulse at the 'full step' output.


### Specifications

Motor type:	2-phase step motor
Control:	bipolar
Format:	Euroboard (160 x 100)
Weight:	270 g
Ambient temperature:	0 °C...40 °C
Installation/Assembly:	19" rack, 3HE
Connections:	32-pin VG connector panel
Motor voltage:	18 VDC...48 VDC, typ. 36 VDC
Phase current (130m):	0.4 A...3 A, adjustable to 16 levels
Phase current (150m):	0.8 A...5 A, adjustable to 16 levels
Holding current red.	autom. to 50% of rated current
Input signals:	cycle, direction, enable
Output signals:	ready (relais contact)
Step angle:	adjustable: half step to 1/256 microstep
Max. step frequency:	500 kHz
Direction:	reversable



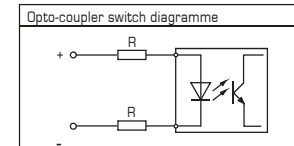
	c	a	
vmot+	0 2 0		vmot+
vmot+	0 4 0		vmot+
n.c.	0 6 0		n.c.
/Phase 1	0 8 0		/Phase 1
Phase 1	0 10 0		Phase 1
/Phase 2	0 12 0		/Phase 2
Phase 2	0 14 0		Phase 2
-dir	0 16 0		-enable
+dir	0 18 0		+enable
-clock	0 20 0		+clock
n.c.	0 22 0		ready s
ready r	0 24 0		ready a
n.c.	0 26 0		n.c.
n.c.	0 28 0		n.c.
gnd	0 30 0		gnd
gnd	0 32 0		gnd

Relais contact: ready



JP2, direction	1-2	2-3
direction	normal	inverted

Voltage	5V	12V	24V
Resistance of R-Network	330	680	1k5

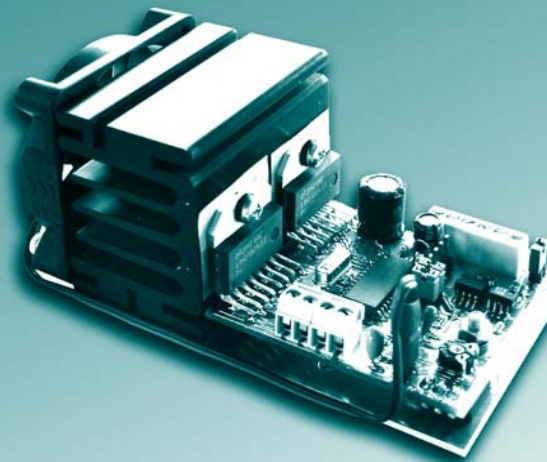


HEX	Phase current[A]
0	0.4
1	0.6
2	0.8
3	0.9
4	1.0
5	1.2
6	1.4
7	1.6
8	1.7
9	1.9
A	2.1
B	2.2
C	2.4
D	2.6
E	2.8
F	3.0

1/Umdr.	SW1	SW2	SW3	SW4
400	ON	ON	ON	ON
800	OFF	ON	ON	ON
1600	ON	OFF	ON	ON
3200	OFF	OFF	ON	ON
6400	ON	ON	OFF	ON
12800	OFF	ON	OFF	ON
25600	ON	OFF	OFF	ON
51200	OFF	OFF	OFF	ON
1000	ON	ON	ON	OFF
2000	OFF	ON	ON	OFF
5000	ON	OFF	ON	OFF
1000	OFF	OFF	ON	OFF
25000	ON	ON	OFF	OFF
50000	OFF	ON	OFF	OFF
x x x	ON	OFF	OFF	OFF
x x x	OFF	OFF	OFF	OFF

**Note:**  
The signal levels of the opto-coupler inputs are 5VDC (TTL).

By exchanging the resistance network R-net the levels can be changed to 12VDC or 24VDC (see table 1).



### General information

The SMM130h unit is a small, compact, short-circuit-proof motor driver board designed for the operation of a bipolar 2-phase step motor.

The operating current can be variably adjusted. The signal inputs for cycle, direction and enable are opto-decoupled.

### Operating details

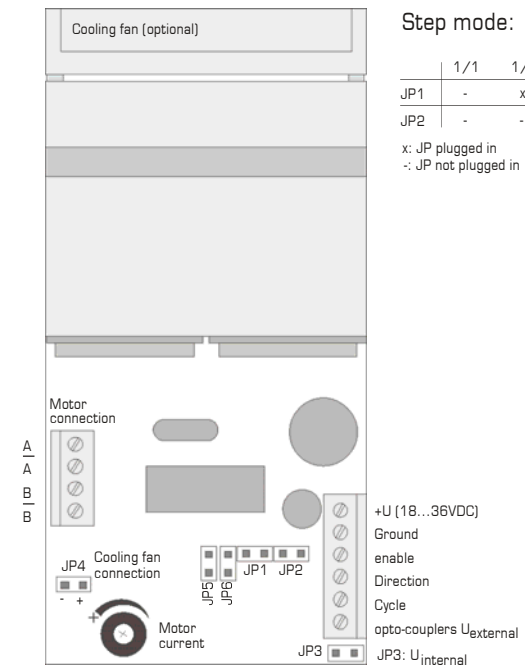
The signal inputs are low-active. For motor operation the enable input of the driver board has to be connected against ground. Otherwise the motor will not receive current.

The motor direction is reversed by the switching of the direction input against ground.

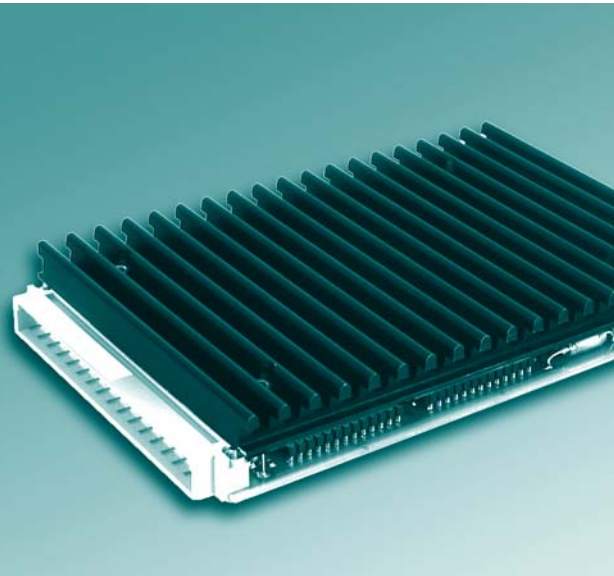
A sufficiently dimensioned filter electrolytic capacitor (at least 4700 $\mu$ F/50V) is required for the motor supply voltage. Additionally, it is necessary for the voltage supply to be equipped with a suitably dimensioned fuse.

### Specifications

Motor type:	2-phase step motor
Control:	bipolar
Dimensions:	80 x 50 x 51 mm with cooling fan: 98 x 50 mm
Weight:	200 g
Ambient temperature:	0 °C...40 °C
Installation/Assembly:	DIN rail
Connections:	terminal strip
Motor voltage:	18 VDC...45 VDC, typ. 36 VDC
Phase current:	0.3 A...3 A, variably adjustable above 2 A a cooling fan is required
Input signals:	cycle, direction and power-off, opto-decoupled
Step angle:	1/1-, 1/2-, 1/4- and 1/8-step, motor direction reversible
Max. step frequency:	80 kHz (full step)



The input signal opto-couplers have an internal power supply. An external supply with 5VDC to 12VDC is also possible. This requires the removal of the connector bridge JP3.



### General information

The SME 145 unit is a compact, short-circuit-proof motor driver board designed for the operation of a bipolar 2-phase step motor.

Operating and holding currents can each be individually set to one of 16 levels. The signal inputs for cycle, direction and power-off are opto-decoupled. Undervoltage, overvoltage, short-circuiting and overheating are displayed optically. Signal inputs and outputs are opto-decoupled.

### Operating details

A sufficiently dimensioned filter electrolytic capacitor (at least 4700µF/50V) is required for the motor supply voltage. Additionally, it is necessary for the voltage supply to be equipped with a suitably dimensioned fuse.

### Specifications

Motor type:	2-phase step motor
Control:	bipolar
Format:	Euroboard (160 x 100)
Weight:	550 g
Ambient temperature:	0 °C...40 °C
Installation/Assembly:	19"-Rack, 3HE
Connection:	32-pin VG connector panel
Motor voltage:	18 VDC...45 VDC, typ. 32 VDC
Phase current:	0.22 A...4,5 A, adjustable to 16 levels
Holding current red.:	0.22 A...4,5 A, adjustable to 16 levels activation approx. 250 ms after motor stop
Input signals:	cycle, direction, boost and power-off, all opto-decoupled
Step angle:	adjustable: full or half step
Max. step frequency:	50 kHz
Special features:	standby relais contact as ready or error signal

### Component view (cooling element not depicted)

Table 1			
Voltage	5V	12V	24V
Resistance of the R-Network	150R	470R	910R

Switching of the opto-couplers

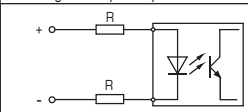


Table 2		
hex	Phase current [mA]	... with boost
0	0	0
1	220	550
2	600	850
3	900	1200
4	1200	1500
5	1500	1750
6	1800	2000
7	2100	2300
8	2400	2600
9	2700	3000
A	3000	3300
B	3300	3600
C	3600	3900
D	3900	4200*
E	4200	4500*
F	4500	4900*

\*) from level D upwards, boost is only permitted for a short-term torque increase at motor start.


Note: The standard input voltages of the opto-couplers opto1 and opto2 are 5VDC (TTL). By exchanging the resistance networks R-net1 and R-net2 the levels can be changed to 12VDC or 24VDC (see table 1).

It is always necessary to exchange both resistance networks.

VG connector panel

### Connection view

	c	a	
vmot+	0 2 0	n.c.	
vmot+	0 4 0	vmot+	
n.c.	0 6 0	n.c.	
/Phase 1	0 8 0	/Phase 1	
Phase 1	0 10 0	Phase 1	
/Phase 2	0 12 0	/Phase 2	
Phase 2	0 14 0	Phase 2	
- direction	0 16 0	-enable	
+ direction	0 18 0	+enable	
-cycle	0 20 0	+cycle	
n.c.	0 22 0	Relais s	
Relais r	0 24 0	Relais a	
+Boost	0 26 0	-Boost	
+step angle	0 28 0	-step angle	
gnd	0 30 0	gnd	
gnd	0 32 0	gnd	

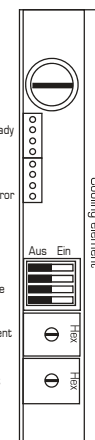


### Control elements

fuse 6.3A MT

status  
status

voltages ready  
driver board ready  
reset aktive  
power-off  
overvoltage  
undervoltage  
short-circuit  
temperature error





### Operating details

A sufficiently dimensioned filter electrolytic capacitor (at least 4700 $\mu$ F/50V) is required for the motor supply voltage. Additionally, it is necessary for the voltage supply to be equipped with a suitably dimensioned fuse.

### Specifications

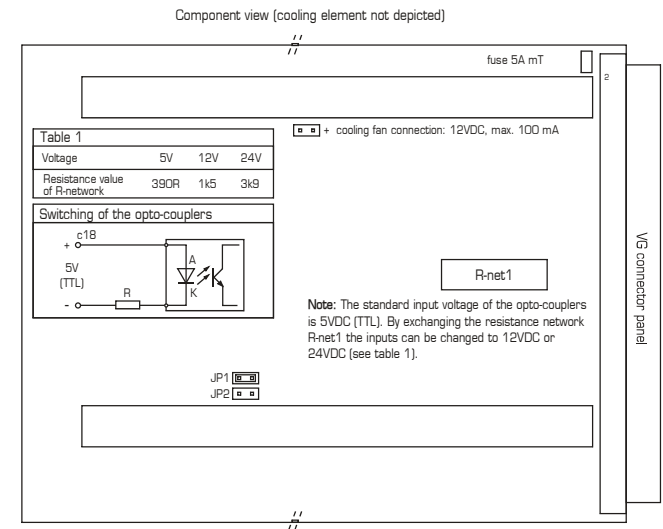
Motor type:	4 x 2-phase step motor
Control:	bipolar
Format:	Euroboard (160 x 100)
Weight:	560 g
Ambient temperature:	0 °C...40 °C
Installation/Assembly:	19" rack, 3HE
Connection:	32-pin VG connector panel
Motor voltage:	22 VDC...36 VDC, typ. 24 VDC
Phase current:	0.6 A...2 A, variably adjustable, Cooling fan is required for simultaneous operation of all axes
Holding current red.:	0,6 A...2 A, variably adjustable, activation approx. 250ms after motor stop
Input signals:	cycle, direction, one common enable, all opto-decoupled
Step angle:	adjustable: full, 1/2-, 1/4- and 1/8-steps
Max. step frequency:	50 kHz

### General information

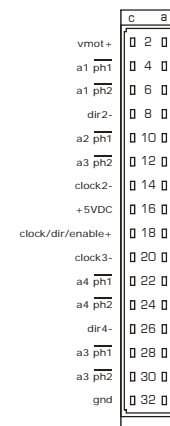
The SME420 unit is a compact 4-output motor driver board designed for the operation of four bipolar 2-phase step motors.

Operating and standby currents are each independently variably adjustable.

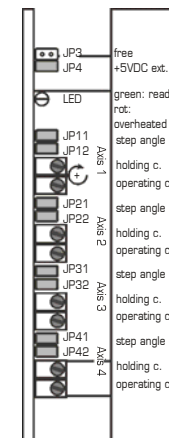
The signal inputs for cycle, direction and enable are opto-decoupled. Overheating (>75°C) is displayed optically.



### Connector view



### Control elements



### Function of the bridge connectors

JP1 connected: The driver board is deactivated when pin 18 is grounded. If pin 18 is open, i.e. not connected, the driver board is activated.

JP2 connected: The driver board is activated when pin 18 is grounded. If pin 18 is open, i.e. not connected, the driver board is deactivated.

JP4 connected: 5VDC produced on the board (Imax 40mA) are applied to a/c16 of the VG connector panel

JP4 open: External 5VDC need to be applied to a/c16 of the VG connector panel

step angle	JPx1	JPx2
full step	connected	connected
1/2-step	open	connected
1/4-step	connected	open
1/8-step	open	open



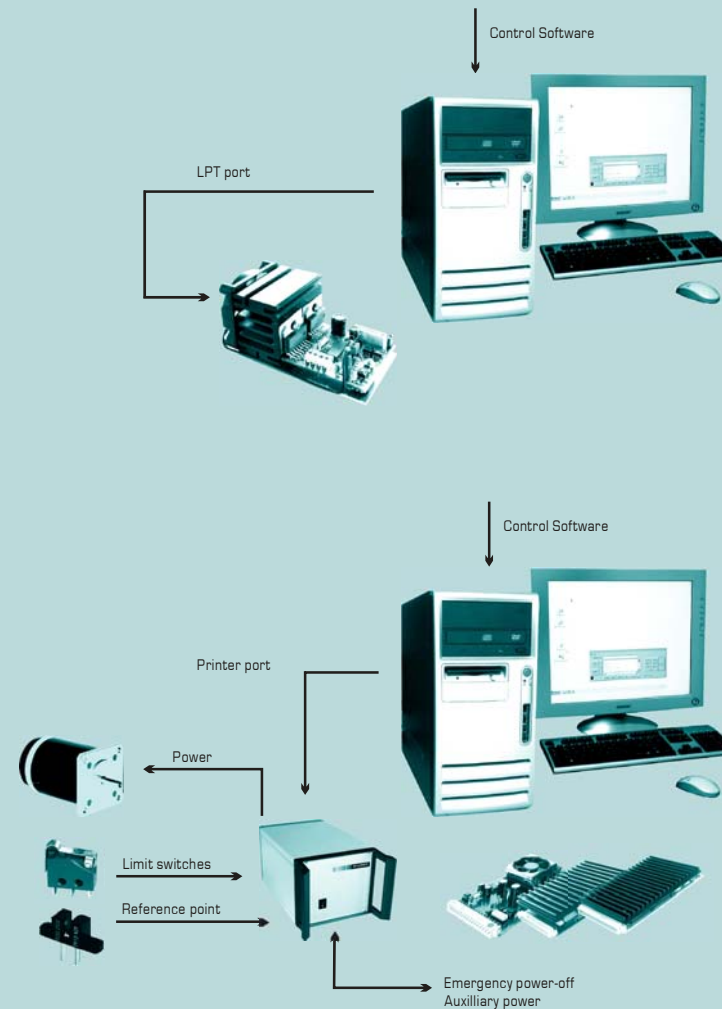
### Example 1

- 1-3 step motor axes via PC
- 12V power supply via PC power supply (complete motor current approx. 1.5 A depending on power supply unit, external power supply if necessary)
- Controllable via the LPT port (DOS-based)

### Example 2

- Up to three step motor axes
- Controllable via the PC printer port (DOS-based)
- Various output stage configurations possible

The depicted alternatives are examples and can be adapted and modified to your requirements.



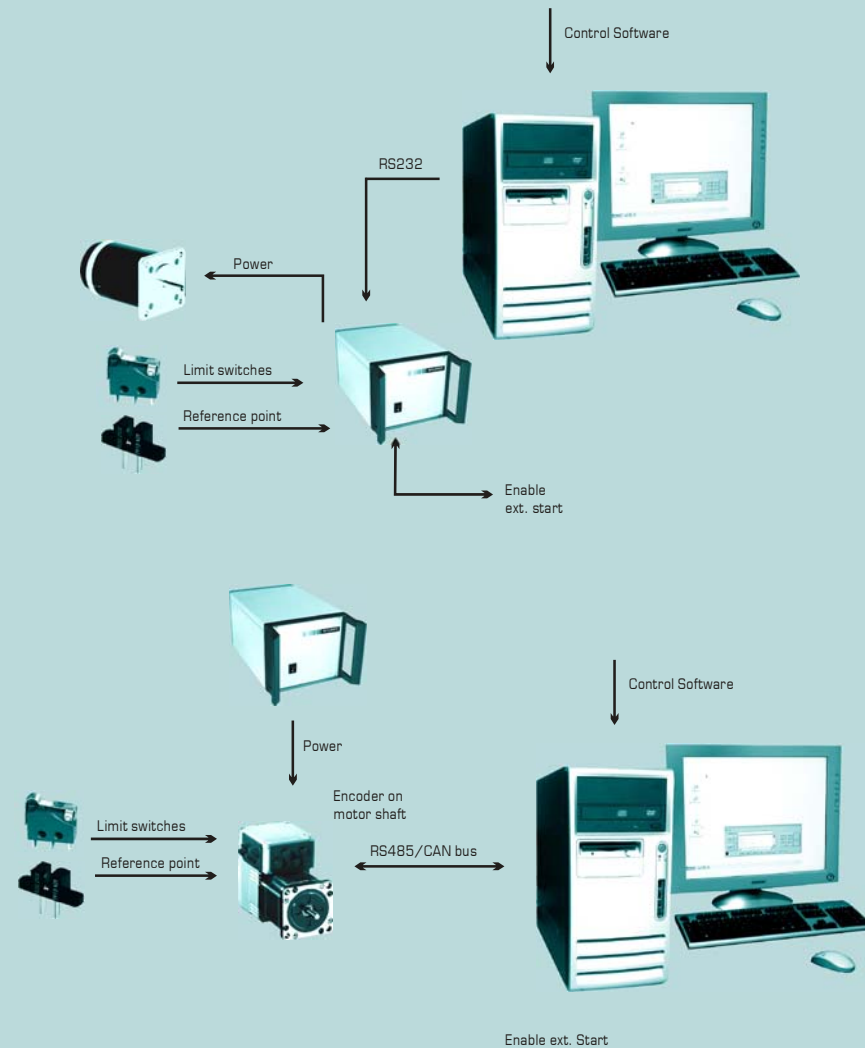
### Example 3

- Up to four step motor axes
- Controllable via a Rs232 interface
- Programmable motor driver board SME130i
- Programme can be permanently saved
- Programme commencement via interface or an external start impulse

### Example 4

- Motor with integrated control (Encoder, limit switches, reference points)
- External power supply
- Controllable via RS485/CAN bus

The depicted alternatives are examples and can be adapted and modified to your requirements.



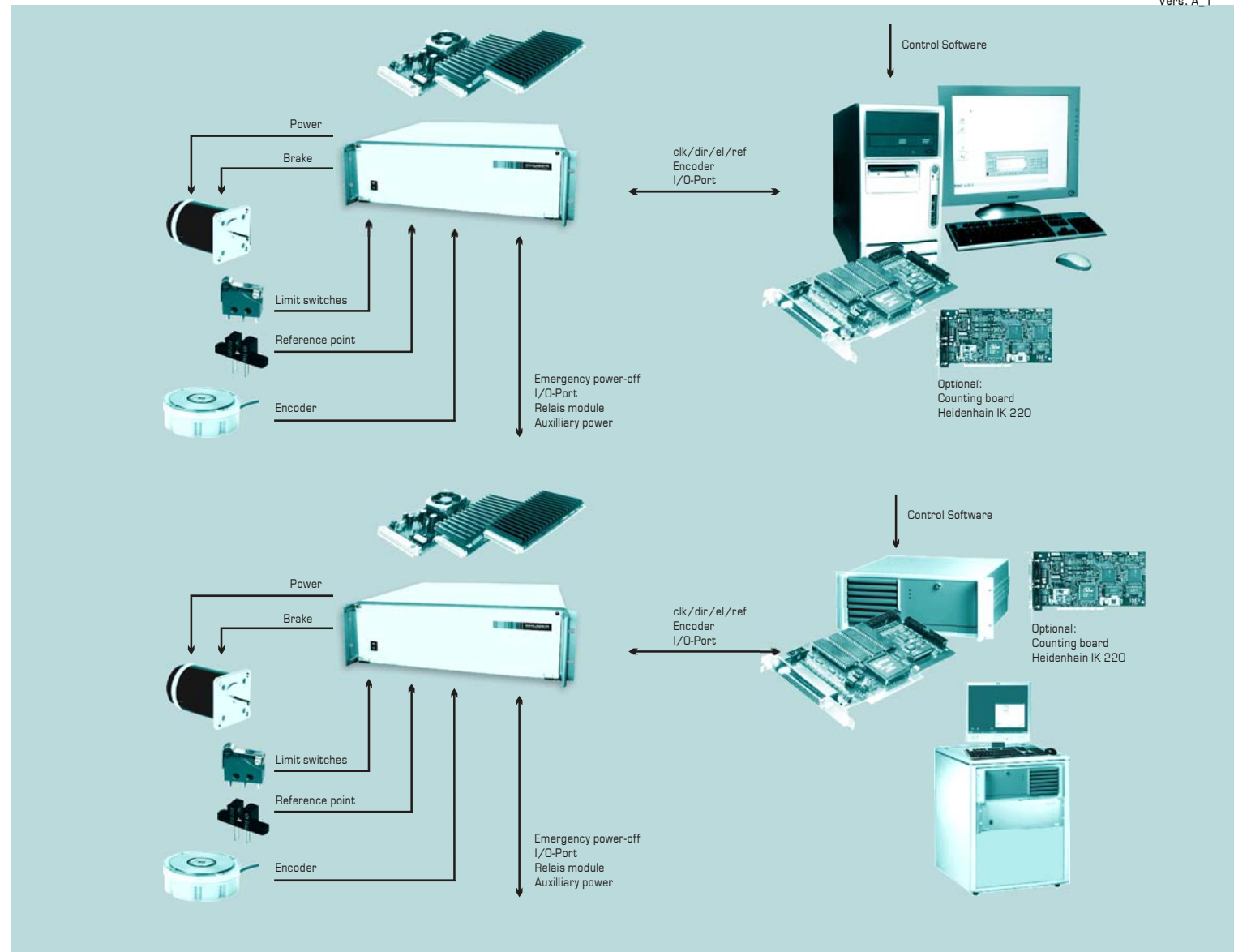
### Example 5

- PC with SMC\_PC.PCI or alternative PC motor control board
- 19" PowerPack with variable driver board configuration (max. 8 axes per 3-HE rack)
- Control via SMC Software (only in combination with SMC\_PC.PCI) or via customer programmed software

### Example 6

- Industrial PC with SMC\_PC.PCI or alternative PC motor control board
- 19" PowerPack with variable driver board configuration (max. 8 axes per 3-HE rack)
- Control via SMC Software (only in combination with SMC\_PC.PCI) or via customer programmed software

The depicted alternatives are examples and can be adapted and modified to your requirements.



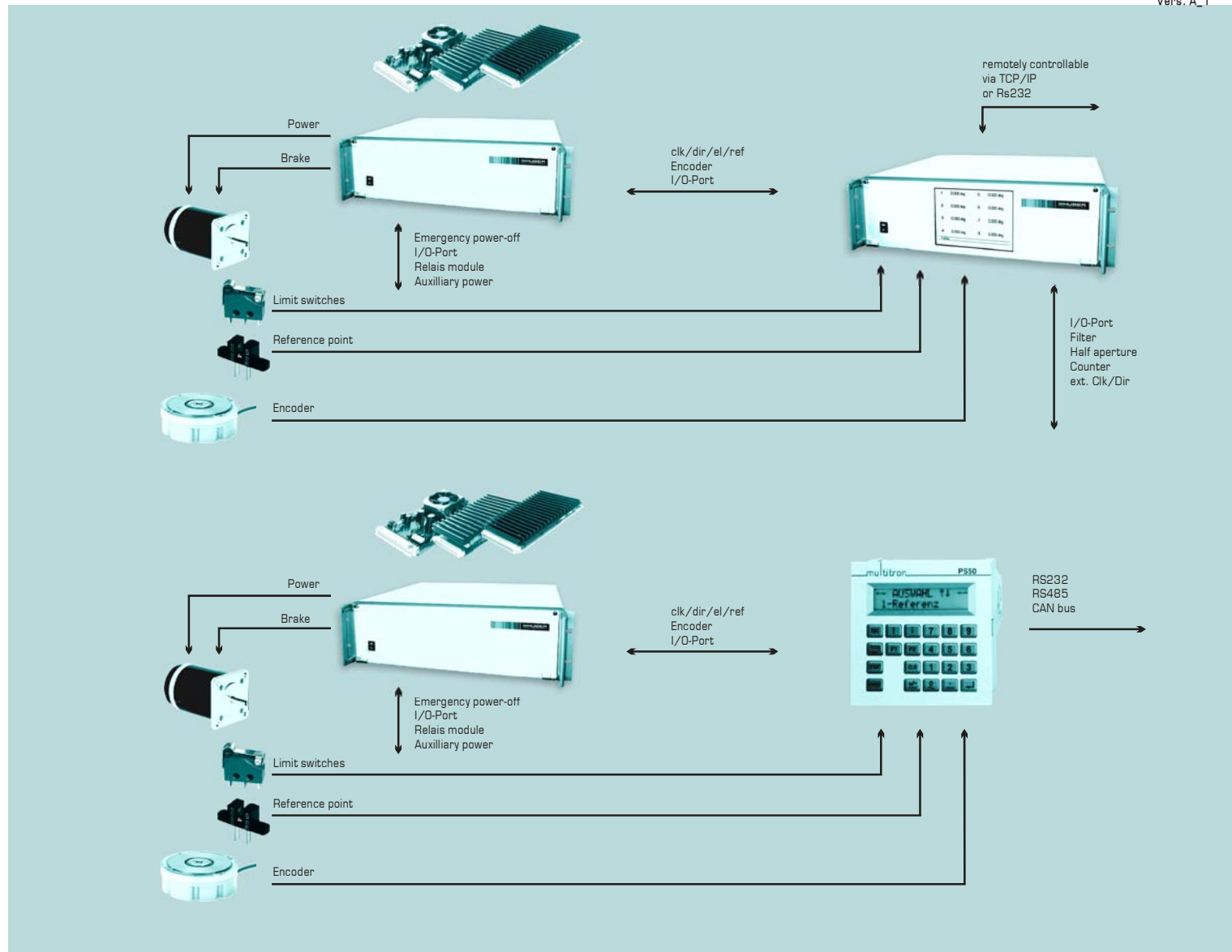
### Example 7

- SMC 9300 Controller with SMC control software
- 19" PowerPack with variable driver board configuration (max. 8 axes per 3-HE rack)
- With up to two axes no PowerRack is required

### Example 8

- Multitron Servo-Controller with SPS-functionality
- Max. four axes
- Control of servos and step motors
- Also possible in variable configurations

The depicted alternatives are examples and can be adapted and modified to your requirements.



The HTC 9634 unit was specially designed to operate smaller heating elements such as the Huber heater device 670.3 as well as customer-provided resistance heating systems.

The manual control is via a foil keyboard on the front of the unit. A Pt100 thermo-element is used as standard temperature sensor.

The temperature range is limited to 900°C. The unit controls the heating element via a pulsed direct current which is regulated by PID parameters which can be set individually. An automatic configuration of the PID parameters is also possible.

Stepped heating and cooling cycles are programmable via a TTY/RS232 interface.



Product Groups

4. Accessories

4.1. Mechanics  
4.2. Beam Applications  
4.3. Electronics

**HUBER**  
Diffraction and Positioning Equipment



Mechanical accessories for positioning systems

**Gear boxes  
Goniometer heads  
Cryostat carriers  
Air bearings  
etc.**

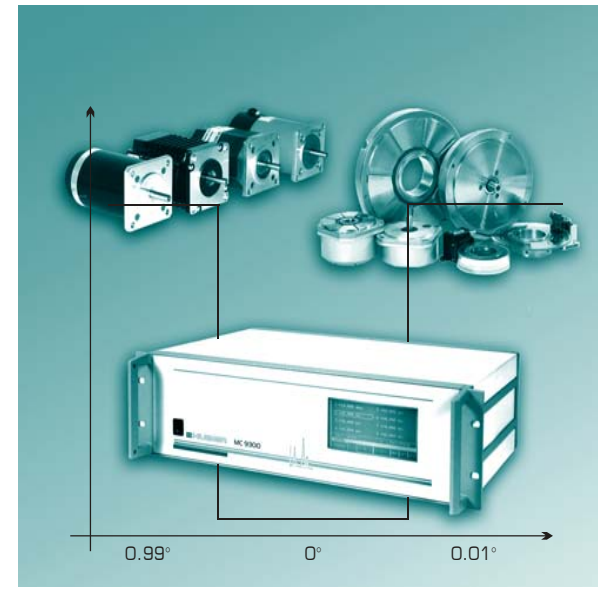


Extensive range of accessories especially for beam applications

**Slit systems  
X-ray optics  
Detectors  
X-ray sources  
etc.**

Mechanics  
Beam Applications  
Electronics

precise  
individual  
reliable



Provision of electronic components and systems

**Motors  
Encoders  
Zero-point controls  
CCD-cameras  
etc.**





4.1.1.  
Gear boxes



4.1.2.  
Hand wheels



4.1.3.  
Goniometer heads



4.1.4.  
Head supports



4.1.5.  
Cryostat carriers



4.1.6.  
Air bearings



4.1.7.  
Reflection  
Goniometer 302





### General information

The series 2000 gear boxes were developed in order to increase the resolution of our positioning systems.

The gear boxes are available for three flange sizes (42/56/83mm).

For worm gear drive systems the drive shaft is at right angles to the motor shaft. The output drive shaft position is either on the left or the right hand side of the gear box (versions L and R respectively).

For the version "L" gear boxes the input rotation direction remains the same, for version "R" gear boxes it is reversed.

Suitable for high revolutions and torque

High-quality materials

Basically maintenance-free

Low freedom of play

### Further versions

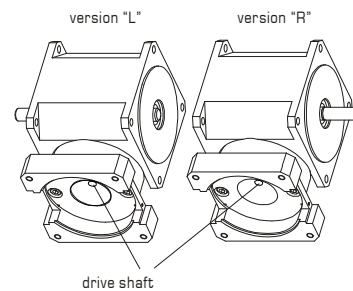
vacuum suitable

antimagnetic

radiation resistant

in black

### Versions



### Specifications

Gear box - flange size 42 mm:

	2042.10	2042.20
Ratio:	10:1	20:1
Reversal error [min]:	1,5	1,0
Efficiency:	0,60	0,35
M <sub>Drive</sub> (min) [Nm]:	0,06	0,06
M <sub>Output</sub> (max) [Nm]:	0,75	0,75
Revolutions (max) [rev/s]*:	35	35
Weight [kg]:	0,3	0,3

Gear box - flange size 56 mm:

	2056.05	2056.10	2056.20
Ratio:	5:1	10:1	20:1
Reversal error [min]:	2,0	1,5	1,0
Efficiency:	0,40	0,30	0,20
M <sub>Drive</sub> (min) [Nm]:	0,06	0,06	0,06
M <sub>Output</sub> (max) [Nm]:	3,2	3,2	3,2
Revolutions (max) [rev/s]*:	35	35	35
Weight [kg]:	0,6	0,6	0,6

Gear box - flange size 83 mm:

	2083.05	2083.10	2083.20
Ratio:	5:1	10:1	20:1
Reversal error [min]:	2,0	1,5	1,0
Efficiency:	0,40	0,30	0,20
M <sub>Drive</sub> (min) [Nm]:	0,06	0,06	0,06
M <sub>Output</sub> (max) [Nm]:	3,2	3,2	3,2
Revolutions (max) [rev/s]*:	35	35	35
Weight [kg]:	1,8	1,8	1,8

\* at input

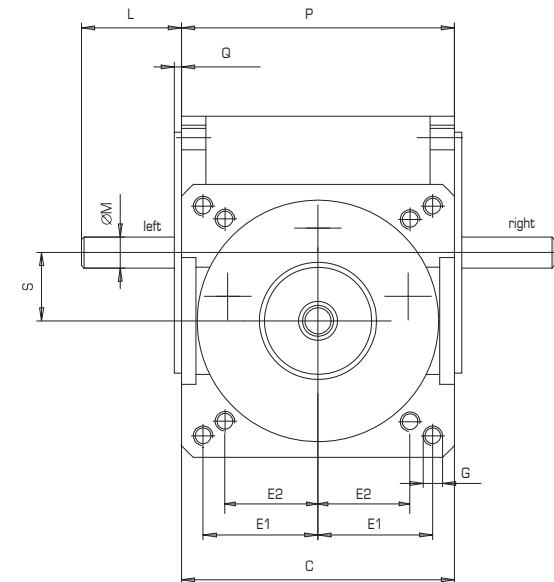
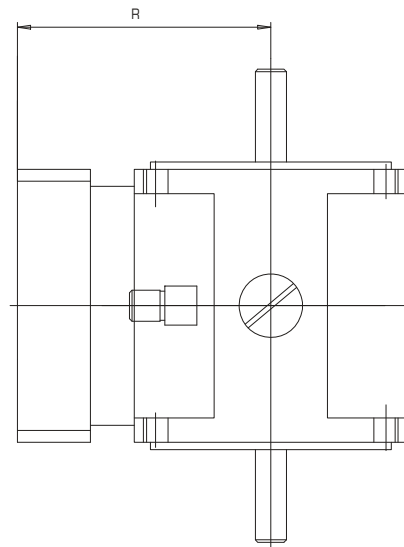
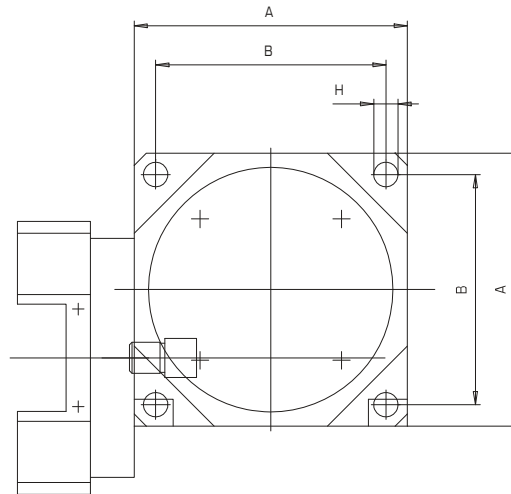
### Accessories

Flange extensions  
Heat-decoupled coupling

### Included:

Scale  
Coupling

**HUBER**  
Diffraction and Positioning Equipment



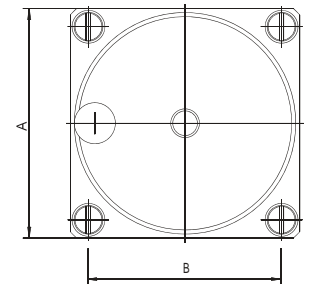
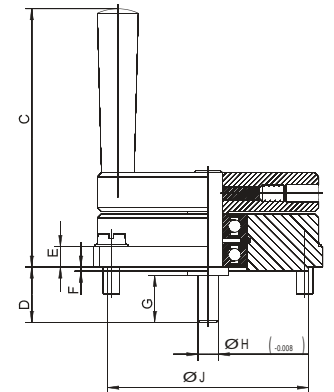
	A	B	C	E1	E2	G
2042.xx	42	36	42	18	15,5	M3
2056.xx	56	47,2	56	23,55	-	M4
2083.xx	83	69,6	83	34,8	-	M5
	H	L	M	P	Q	R
2042.xx	3,5	16,5	5h7	42	1,5	39
2056.xx	5	20,5	6,35h7	56	1,5	52
2083.xx	5,6	30,5	9,52h7	83	1,5	77,5

Shaft guided by ball bearings

Housing and drive wheel made  
of anodised aluminium

For manual operation of our  
positioning systems, hand wheels  
are available for various flange sizes.

	0032	0042	0056	0082
A [mm]	32	42	56	83
B [mm]	27	36	47,1	69,6
C [mm]	--	45	63	70
D [mm]	11	8	13,5	32
E [mm]	2,5	5	5	6
F [mm]	1	1	1	1,5
G [mm]	10	7	11,5	30
H [mm]	Ø4 h6	Ø5 h6	Ø5 h6	Ø9,52 h6
J [mm]	Ø29 -0,1	Ø35,5 -0,1	Ø49 -0,1	Ø73,1 -0,1



- Stable prism guides
- Automatic locking of sample position
- Compact dimensions
- Identical rotational centre of circle movements
- Corrosion resistant chrome coating
- Standard mount according to ACA/IUC

#### 4.1.3.1 Manual versions

	Axes	Height [mm]
1001	X, Y, Ry, Rx	64
1002	Rx, Ry, Y, X	64
1003	X, Y, Ry, Rx	107
1004	X, Y, Z	49...64
1005	Ry, Rx, Y, X	49
1006	X, Y, Rx, Ry	70
1007	X, Y, Tilt	64
1007-S	X, Y	26

#### 4.1.3.2 Motorised versions

	Motor
1003-MS/-MG	step/DC motor
1006-MS/-MG	step/DC motor

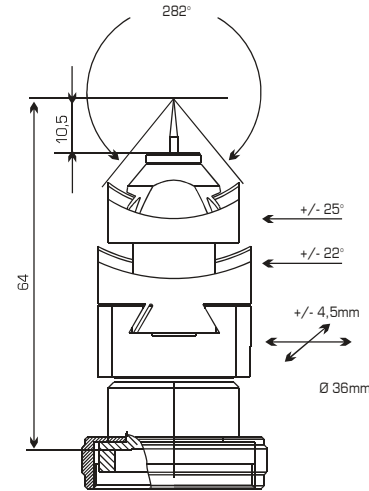
#### 4.1.3.3 Special versions with greater angle range

	Axes	Height [mm]
1002.01	Rx, Ry, Y, X	64
1002.02	Rx, Ry, Y, X	64
1005.01	Ry, Rx, Y, X	49
1005.02	Ry, Rx, Y, X	49



### Goniometer head 1001

Adjustable axes:	X, Y Ry, Rx
Range X, Y [mm]:	±4,5
Range Ry [°]:	±22
Range Rx [°]:	±25
Height [mm]:	64
Read-out accuracy [°]:	0,1
Weight [kg]:	0,2

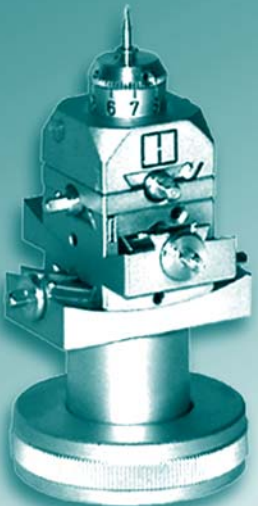


### Accessories

Supports:	1055 1412 1413
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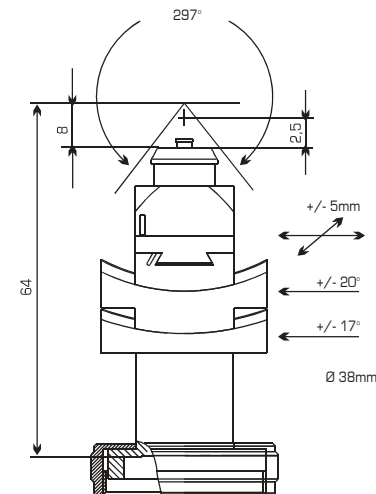
### Included:

- storage container
- adjustment pin
- spanner
- adhesive wax



### Goniometer head 1002

Adjustable axes:	Rx, Ry Y, X, Z
Range X, Y [mm]:	±5
Range Z [mm]:	±1,25
Range Ry [°]:	±20
Range Rx [°]:	±17
Height [mm]:	64
Read-out accuracy [°]:	0,1
Weight [kg]:	0,16



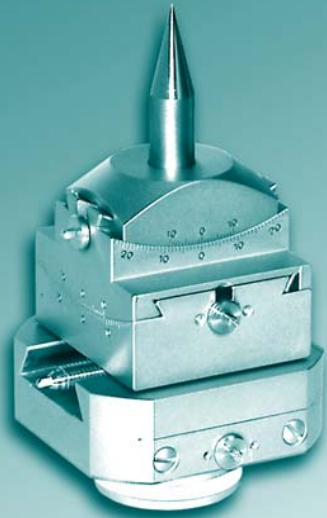
### Accessories

Supports:	1055 1412 1413
-----------	----------------------

### Included:

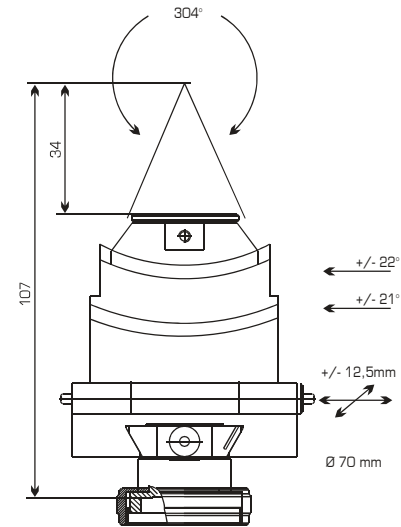
- storage container
- adjustment pin
- spanner
- adhesive wax





### Goniometer head 1003

Adjustable axes:	X, Y Ry, Rx
Range X, Y [mm]:	$\pm 12,5$
Range Ry [°]:	$\pm 21$
Range Rx [°]:	$\pm 22$
Height [mm]:	107
Read-out accuracy [°]:	0,1
Weight [kg]:	1,0



### Accessories

Supports:	1055 1412 1413
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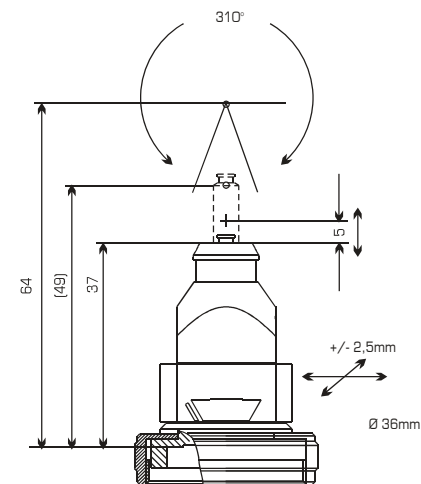
### Included:

- storage container
- adjustment pin
- spanner
- adhesive wax



### Goniometer head 1004

Adjustable axes:	Y, X, Z
Range X, Y [mm]:	$\pm 2,5$
Range Z [mm]:	$\pm 2,5$
Height [mm]:	49/64
Weight [kg]:	0,12



### Accessories

Supports:	1055 1412 1413
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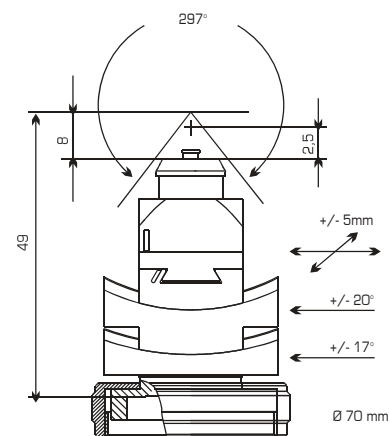
### Included:

- storage container
- adjustment pin
- spanner
- adhesive wax
- extension 49/64



### Goniometer head 1005

Adjustable axes:	X, Y, Z Rx, Ry
Range X, Y [mm]:	±5
Range Z [mm]:	2,5
Range Ry [°]:	±20
Range Rx [°]:	±17
Height [mm]:	49
Read-out accuracy [°]:	0,1
Weight [kg]:	0,14



### Accessories

Supports:	1055 1412 1413
-----------	----------------------

### Included:

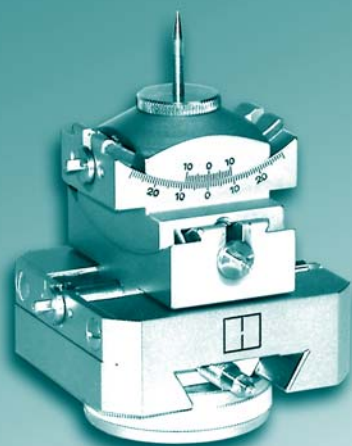
- storage container
- adjustment pin
- spanner
- adhesive wax

### Accessories

Supports:	1055 1412 1413
-----------	----------------------

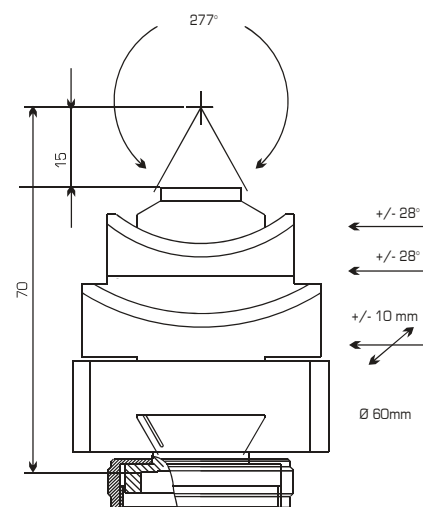
### Included:

- storage container
- adjustment pin
- spanner
- adhesive wax



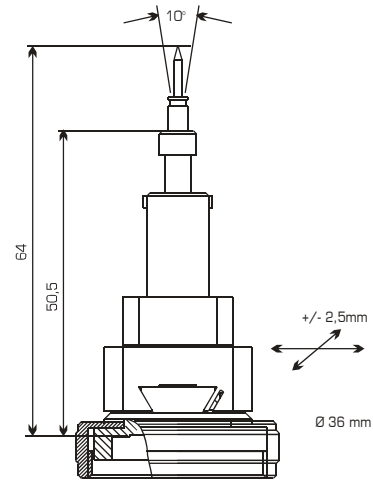
### Goniometer head 1006

Adjustable axes:	Ry, Rx X, Y
Range X, Y [mm]:	±10
Range Rx, Ry [°]:	±28
Height [mm]:	70
Read-out accuracy [°]:	0,1
Weight [kg]:	0,5




**Goniometer head 1007**

Adjustable axes:	X, Y Tilt
Range X, Y [mm]:	$\pm 2,5$
Tilt [°]:	$\pm 10$
Height [mm]:	64
Weight [kg]:	0,11


**Accessories**

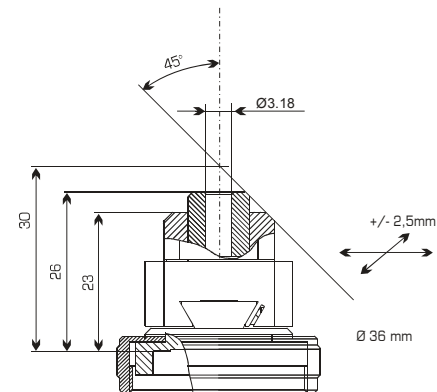
Supports:	1055 1412 1413
-----------	----------------------

**Included:**

- storage container
- adjustment pin
- spanner
- adhesive wax


**Goniometerkopf 1007-S**

Adjustable axes:	X, Y
Range X, Y [mm]:	$\pm 2,5$
Height [mm]:	26
Weight [kg]:	0,10


**Accessories**

Supports:	1055 1412 1413
-----------	----------------------

**Included:**

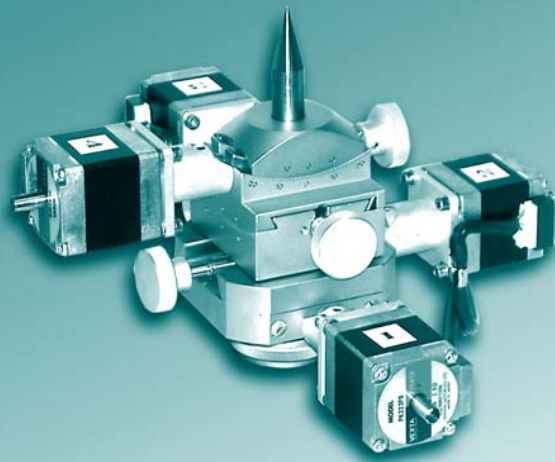
- storage container
- adjustment pin
- spanner
- adhesive wax

### Goniometer head 1003-MS

Adjustable axes:	X, Y, Ry, Rx
Range X [mm]:	±12,5
Range Y [mm]:	±12,5
Range Ry [°]:	±18
Range Rx [°]:	±18
Height [mm]:	107
Read-out accuracy [°]:	0,1
Max. load [N]:	50
Weight [kg]:	2,5
Resolution [µm]	2,5
Resolution Rx ["]:	9
Resolution Ry ["]:	9

### Technical data motor:

Type:	PK 223
Number of phases:	2
Cable length [m]:	0,5
Connectors:	SUB D15
Number of steps/rev.:	200/400
Rated current [A/phase]:	0,95
Holding torque [Nm]:	0,05
Insulation class:	B

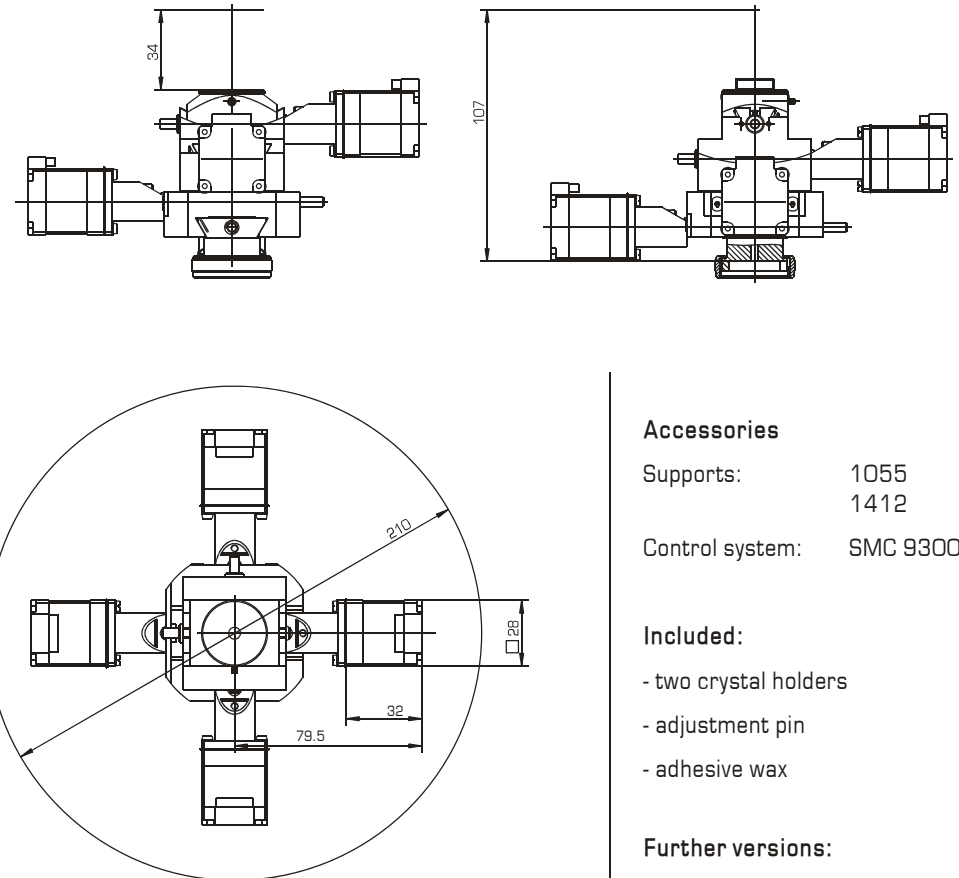


### General information

The goniometer head 1003-MS is driven by four step motors.

Limit switches can be optionally equipped to limit the operational range.

This unit is also available with other types of motor. There is also a wide range of different versions. We would be happy to incorporate customer-specific alterations, if technically possible.



### Accessories

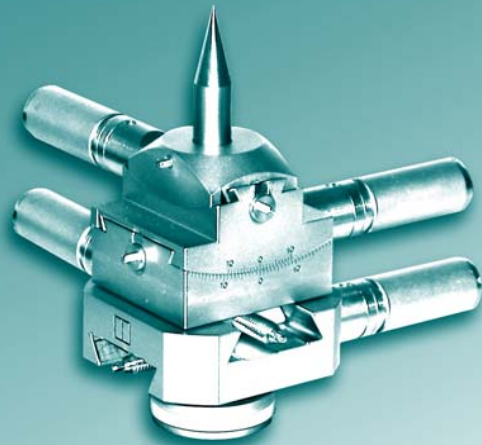
Supports:	1055 1412
Control system:	SMC 9300

### Included:

- two crystal holders
- adjustment pin
- adhesive wax

### Further versions:

- vacuum suitable
- radiation resistant
- antimagnetic



### General information

The goniometer head 1003-MG is driven by four DC motors.

Limit switches can be optionally equipped to limit the operational range.

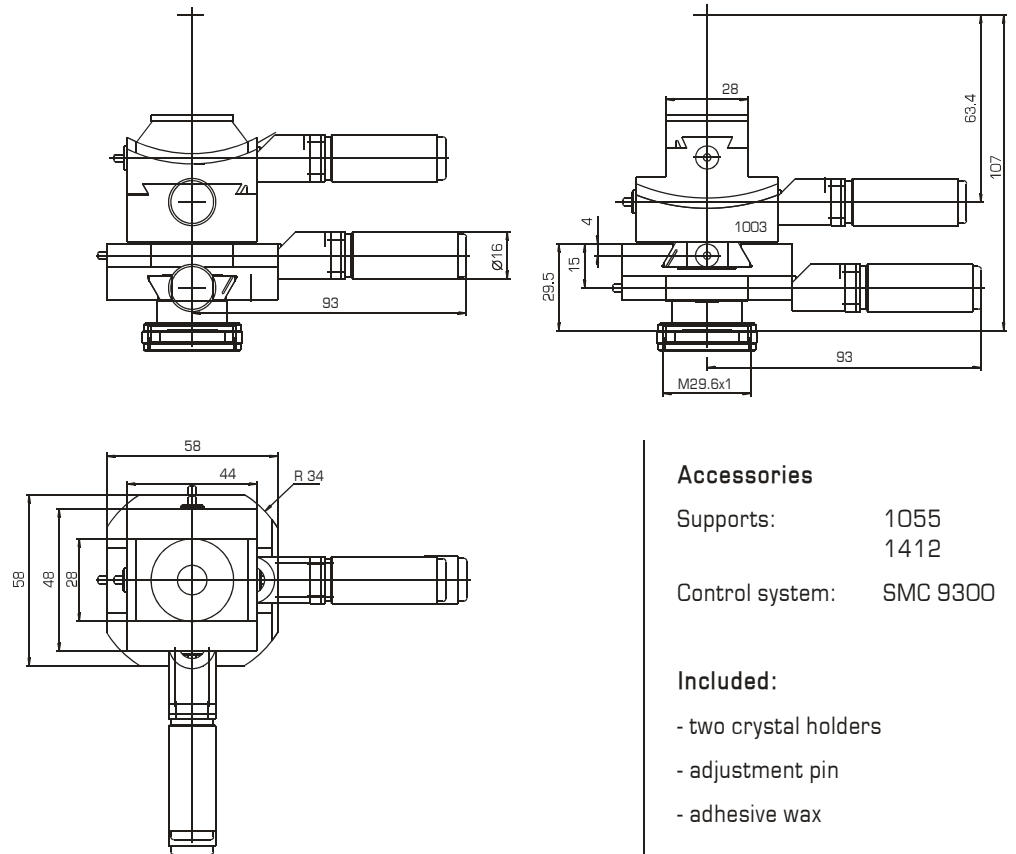
It is possible to equip the goniometer head with encoders enabling a defined positional movement.

### Goniometer head 1003-MG

Adjustable axes:	X, Y, Ry, Rx
Range X [mm]:	±12,5
Range Y [mm]:	±12,5
Range Ry [°]:	±18
Range Rx [°]:	±18
Height [mm]:	107
Read-out accuracy [°]:	0,1
Max. load [N]:	50
Weight [kg]:	2,0

### Technical data motor:

Type:	1516-012S
Voltage [V]:	12
Power [W]:	0,31
Resistance [Ohm]:	115
Gear box type:	15/5
Gear box ratio:	1670:1



### Accessories

Supports:	1055 1412
Control system:	SMC 9300

### Included:

- two crystal holders
- adjustment pin
- adhesive wax

### Further versions:

- vacuum suitable
- radiation resistant
- antimagnetic

### Goniometer head 1006-MS

Adjustable axes:	X, Y, Rx, Ry
Range X [mm]:	±10
Range Y [mm]:	±10
Range Ry [°]:	±28
Range Rx [°]:	±28
Height [mm]:	70
Read-out accuracy [°]:	0,1
Max. sample weight [N]:	5
Weight [kg]:	2
Resolution [µm]	2,5
Resolution Rx ["]:	9,54
Resolution Ry ["]:	14,58

### Technical data motor:

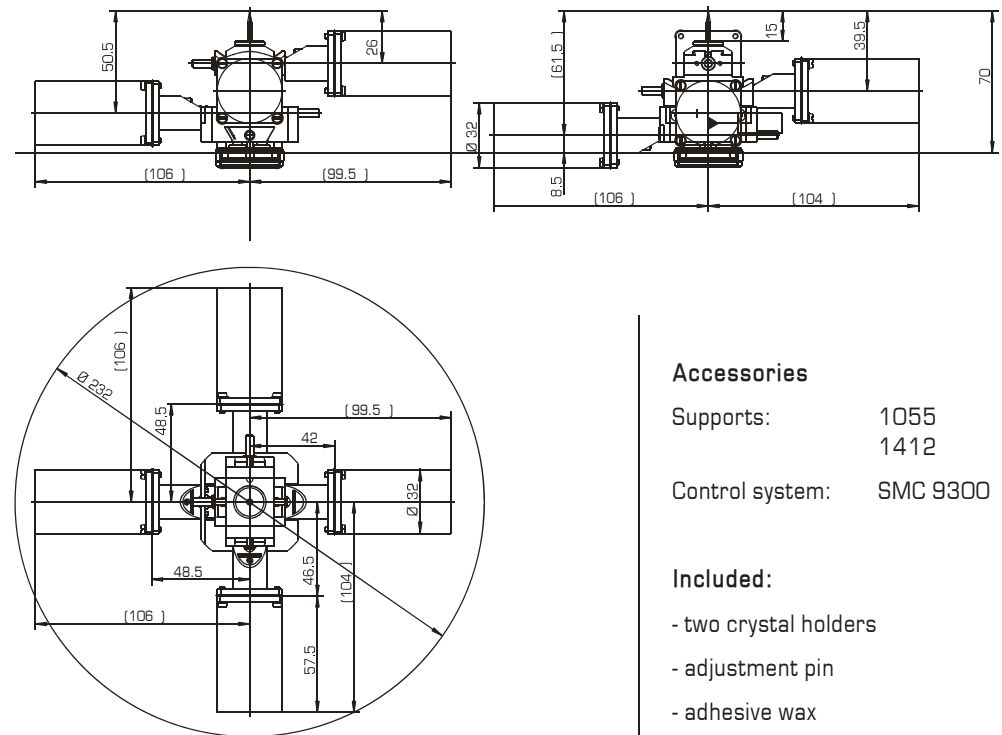
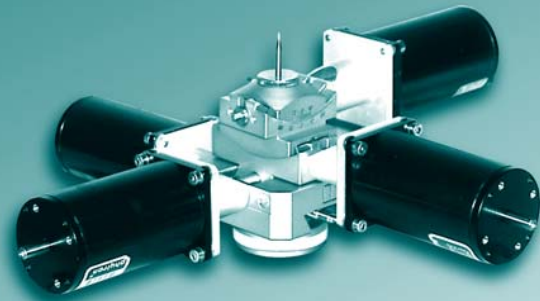
Type:	ZSS 33
Number of phases:	2
Cable length [m]:	0,5
Connectors:	SUB D15
Number of steps/rev.:	200/400
Rated current [A/phase]:	1,8
Holding torque [Nm]:	0,04
Insulation class:	F

### General information

The goniometer head 1006-MS is driven by four step motors.

Limit switches can be optionally equipped to limit the operational range.

This unit is also available with other types of motor. There is also a wide range of different versions. We would be happy to incorporate customer-specific alterations, if technically possible.



### Accessories

Supports:	1055 1412
Control system:	SMC 9300

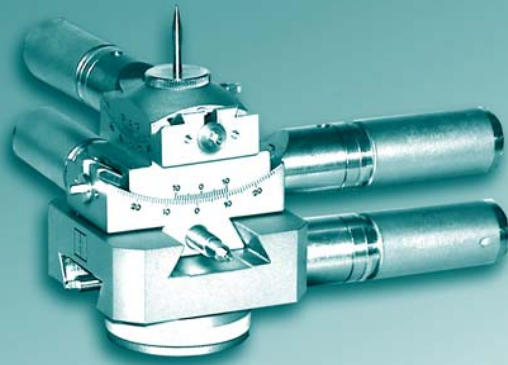
### Included:

- two crystal holders
- adjustment pin
- adhesive wax

### Further versions:

- vacuum suitable
- radiation resistant
- antimagnetic





### General information

The goniometer head 1006-MG is driven by four DC motors.

Limit switches can be optionally equipped to limit the operational range.

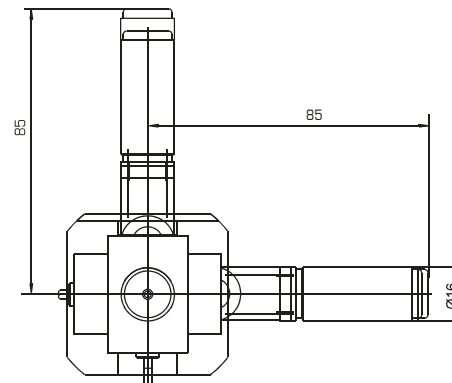
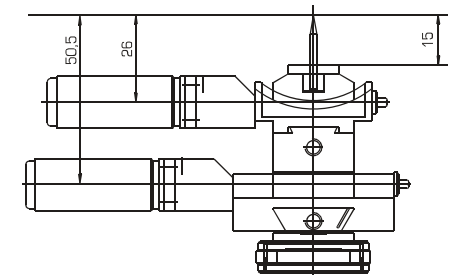
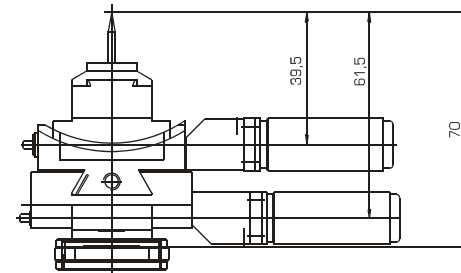
It is possible to equip the goniometer head with encoders enabling a defined positional movement.

### Goniometer head 1006-MG

Adjustable axes:	X, Y, Rx, Ry
Range X [mm]:	±10
Range Y [mm]:	±10
Range Ry [°]:	±28
Range Rx [°]:	±28
Height [mm]:	70
Read-out accuracy [°]:	0,1
Max. sample weight [N]:	5
Weight [kg]:	1,7

### Technical data motor:

Type:	1516-012S
Voltage [V]:	12
Power [W]:	0,31
Resistance [Ohm]:	115
Gear box type:	15/5
Gear box ratio:	1670:1



### Accessories

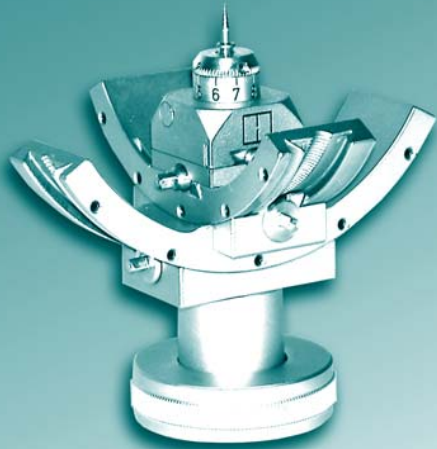
Supports:	1055 1412
Control system:	SMC 9300

### Included:

- two crystal holders
- adjustment pin
- adhesive wax

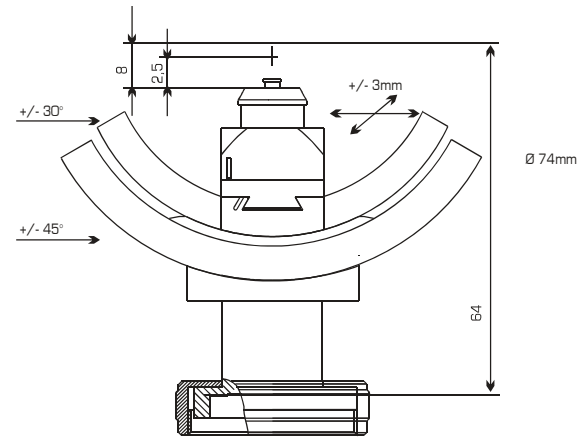
### Further versions:

- vacuum suitable
- radiation resistant
- antimagnetic



### Goniometer head 1002.01

Adjustable axes:	Y, X, Z Rx, Ry
Range X, Y [mm]:	±3
Range Z [mm]:	2,5
Range Ry [°]:	±30
Range Rx [°]:	±45
Height [mm]:	64
Read-out accuracy [°]:	0,1
Weight [kg]:	0,22



### Accessories

Supports:	1055 1412 1413
-----------	----------------------

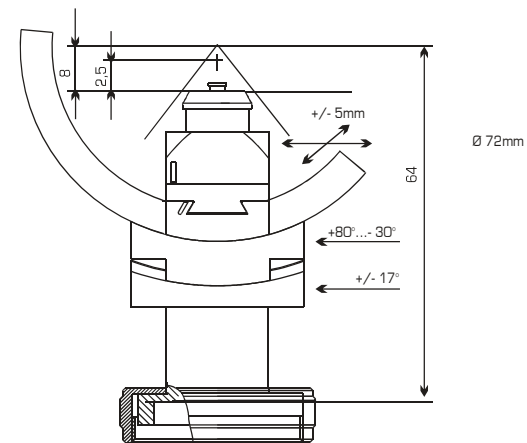
### Included:

- adjustment pin
- spanner
- adhesive wax



### Goniometer head 1002.02

Adjustable axes:	Rx, Ry Y, X, Z
Range X, Y [mm]:	±5
Range Z [mm]:	2,5
Range Ry [°]:	+80...-30
Range Rx [°]:	±17
Height [mm]:	64
Read-out accuracy [°]:	0,1
Weight [kg]:	0,23

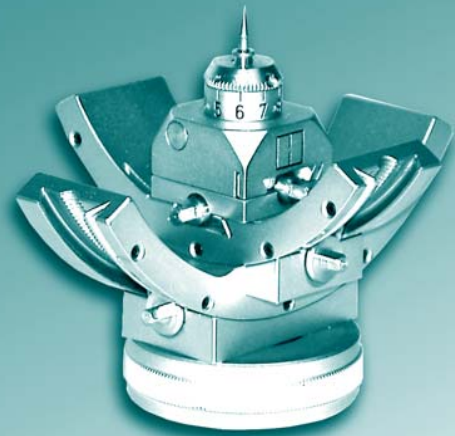


### Accessories

Supports:	1055 1412 1413
-----------	----------------------

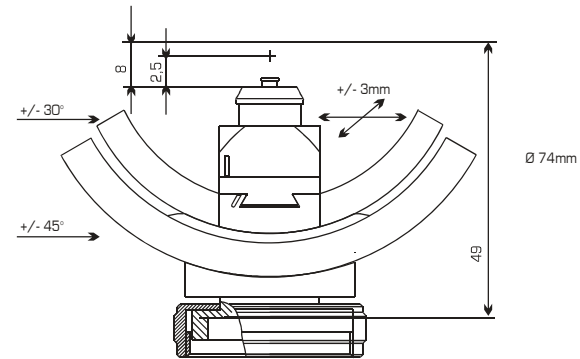
### Included:

- adjustment pin
- spanner
- adhesive wax



### Goniometer head 1005.01

Adjustable axes:	Y, X, Z Rx, Ry
Range X, Y [mm]:	±3
Range Z [mm]:	2,5
Range Ry [°]:	±30
Range Rx [°]:	±45
Height [mm]:	49
Read-out accuracy [°]:	0,1
Weight [kg]:	0,23

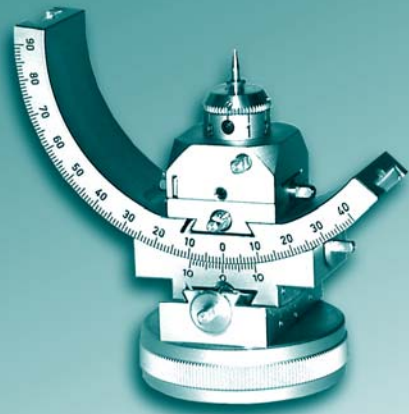


### Accessories

Supports:	1055 1412 1413
-----------	----------------------

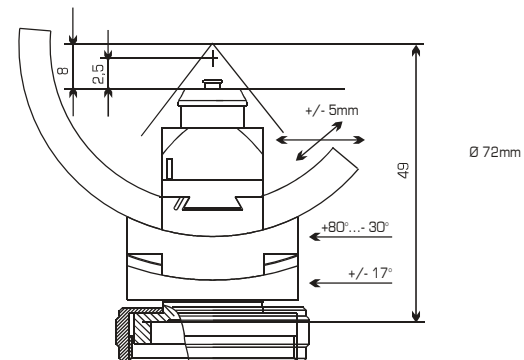
### Included:

- adjustment pin
- spanner
- adhesive wax



### Goniometer head 1005.02

Adjustable axes:	Y, X, Z Rx, Ry
Range X, Y [mm]:	±5
Range Z [mm]:	2,5
Range Ry [°]:	+80...-30
Range Rx [°]:	±17
Height [mm]:	49
Read-out accuracy [°]:	0,1
Weight [kg]:	0,23



### Accessories

Supports:	1055 1412 1413
-----------	----------------------

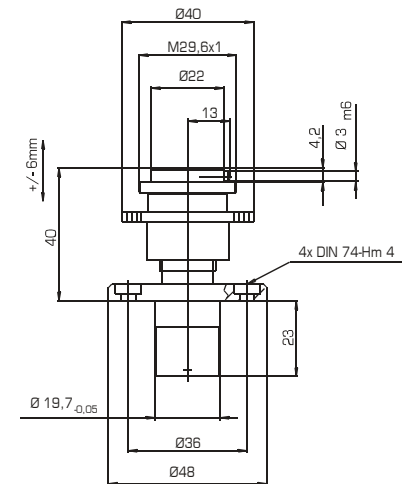
### Included:

- adjustment pin
- spanner
- adhesive wax



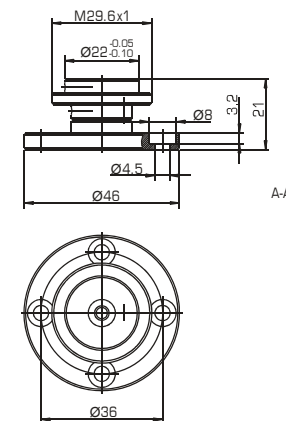
### Goniometer head support 1412

For mounting:	series 1000
Fits goniometers:	408, 409 410, 411 414, 415 423
Adjustment range [mm]:	±6
Weight [kg]:	0,2



### Goniometer head support 1413

For mounting:	series 1000
Fits goniometers:	408, 409 410, 411 414, 415 423
Adjustment range [mm]:	0
Weight [kg]:	0,1



Product Groups

4.  
Accessories

4.1.  
Mechanical

4.1.4.  
Head Supports

1055

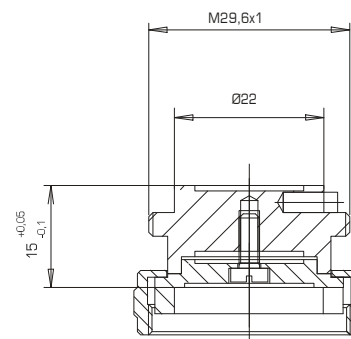
**HUBER**  
Diffraction and Positioning Equipment

Vers. A\_1



### Spacer 1055

For mounting: series 1000  
Extension [mm]: 15  
Weight [kg]: 0,1



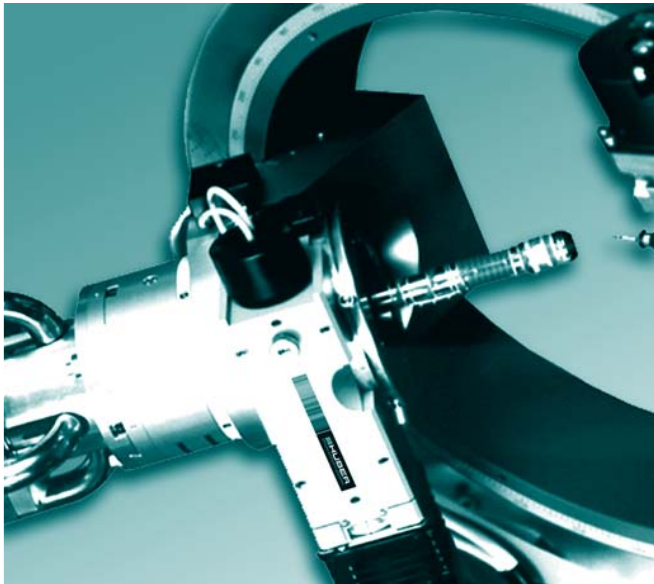
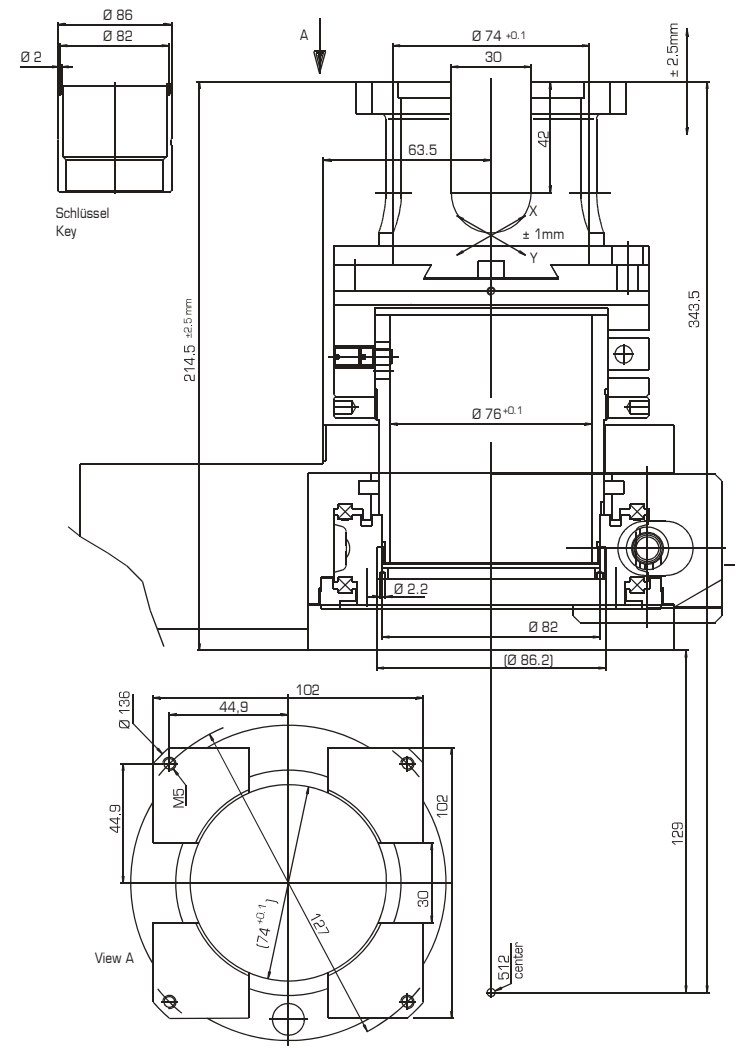
### Description

The manual XYZ cryostat mount is a simple but effective method of adjusting an ARS (APD) cryostat in the Euler cradle 512.1.

The stable prism-guided mechanics guarantee high stiffness. The adjustment ranges of x, y and z are +/- 2,5 mm.

### Included

- counter weight
- key
- scale





### General information

The motorised XYZ cryostat carrier enables the highly precise positioning of a cryostat or a goniometer head support within the Eulerian cradle system 512.1.

Integrated in the phi-circle of the Eulerian cradle, its compact design enables a rotational range of 180°.

### Technical details

The use of high-quality stainless steel in combination with high-precision linear guides and high-resolution transmissions ensure optimal specification values.

The independent XY translations are sinusoidally moved by eccentric drives. The XY adjustment range is +/-2.2mm, the Z adjustment range is +/-3mm. The resolution of all three translational directions is in the sub- $\mu$  range.

### Specifications

Material (housing):	st. steel
Adjustment range X [mm]:	+/- 2.2
Adjustment range Y [mm]:	+/- 2.2
Adjustment range Z [mm]:	+/- 3
Weight [kg]:	5
Resolution [ $\mu$ m]:	< 1

### Technical data motor:

Number of phases:	2
Connector type:	SUB D15
No. of steps [steps/rev]:	200/400
Rated current [A]:	1,2
Gear box ratio:	50:1
Insulations class:	B
Cable length [m]:	0,5

### Included

- counter weight
- key
- scale





### Description

Air bearings are used to move heavy loads with little effort.

For this a highly smooth, hard surface is required such as a smoothed granite slab.

Air is pumped into the inflow diffusors and the compensation chambers at a constant pressure of up to 6 bars. This generates an air cushion between the contact surfaces.

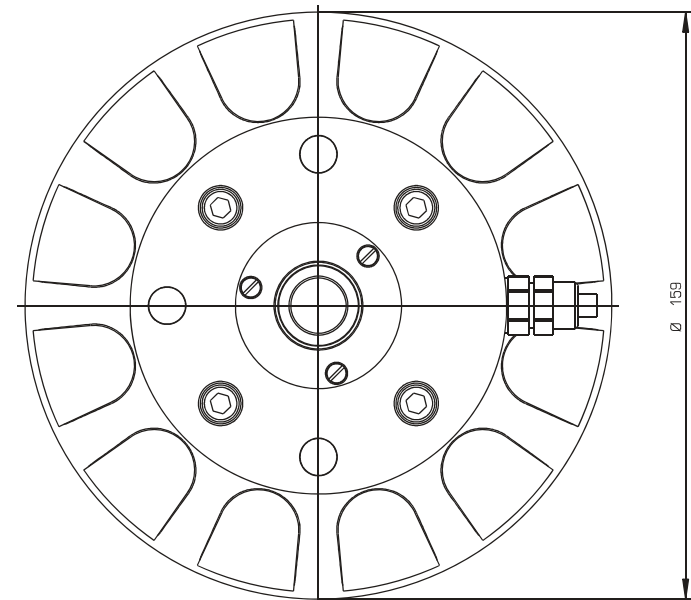
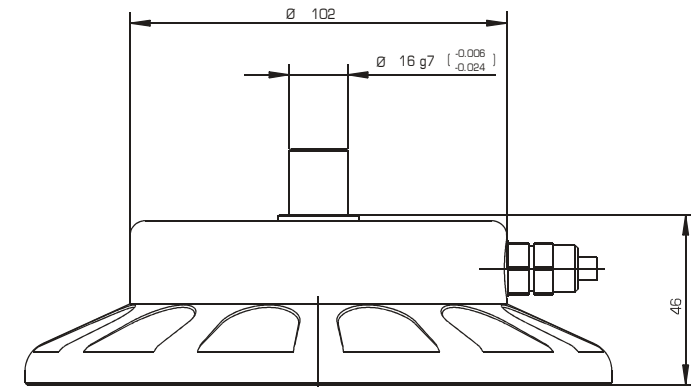
The air bearings are available in both single and twin versions.

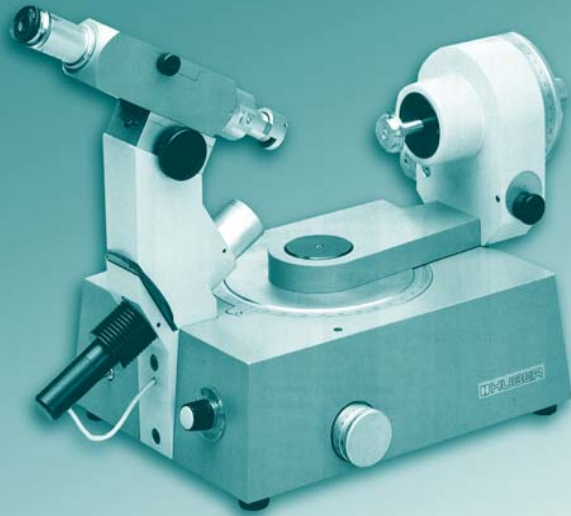
The mounting pin of the air bearings can be rotated. The twin version consists of two single bearings gimble-mounted on a frame.

The bearing body is made of stainless steel with inserted brass nozzles.

### Specifications

Max. load [N]:	3500
Supply pressure [bar]:	6
Air flow rate [m <sup>3</sup> /h]:	0,02





### Description

Perfectly grown single crystals have surfaces and sharp edges which are oriented to one another according to their main crystallographic planes. Light-optical goniometers are used for determining the plane angles. In this process the angles of the plane normals are measured.

The goniometer 302 is designed for crystal dimensions of between 0,01 and approx. 5 mm. The positioning and read-out accuracies are 0,01° or mm respectively. This precision is required for the preliminary adjustment on a goniometer head if the crystal is to be investigated by structural diffraction.

### Technical data

Horizontal circle [°]:	+/- 140
Vertical circle <small>unlimited</small> [°]:	360
Read-out accuracy [°]:	0,01
Sample adj. range <small>axial</small> [mm]:	+/- 10 mm
Read-out accuracy [mm]:	0,01

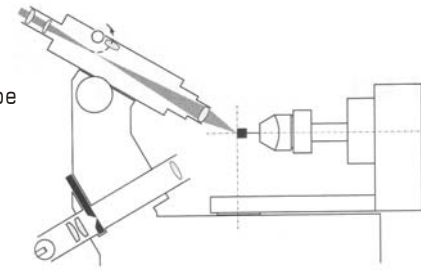
### Microscope

Magnification 40-fold, 20-fold with additional lens  
 Ocular 10-fold, adjustable focus, with cross-hairs and fine scale.  
 A scale unit corresponds to 0,025 mm on the sample (at 40-fold magnification)

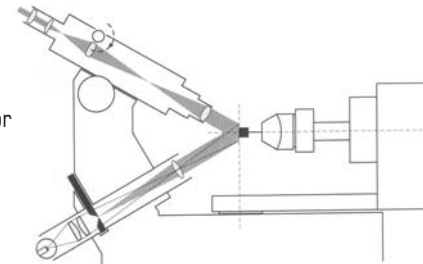
### Collimator

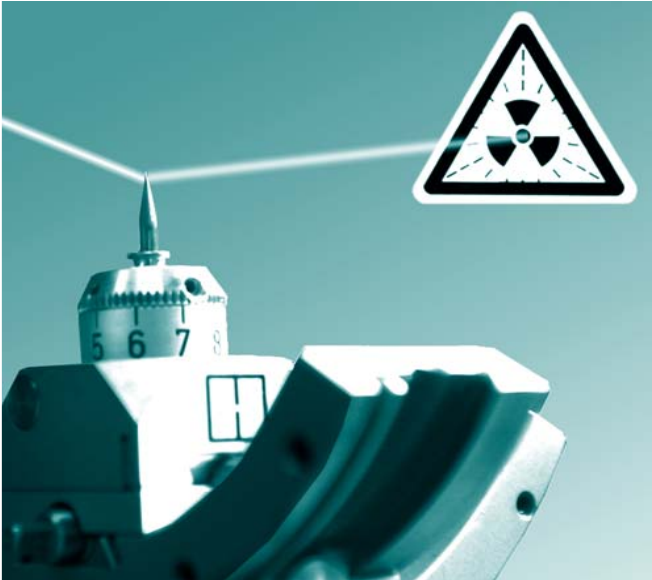
Websky cross-hairs  
 Double condensor optics  
 Projection lamp 6 V / 15 W  
 Adjustable illumination  
 Aperture disc with various apertures for limiting Websky cross-hairs

Microscope



Collimator





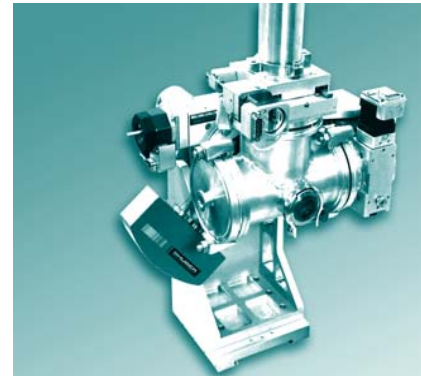
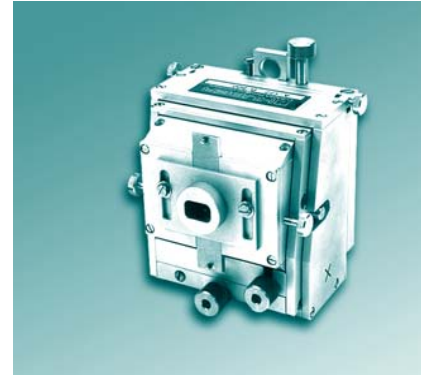
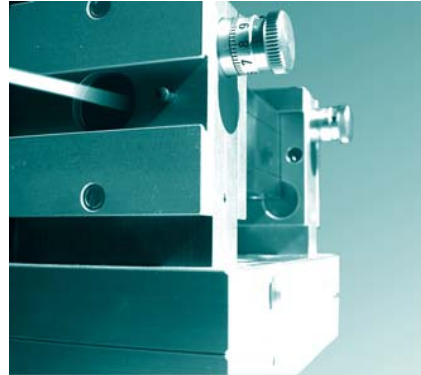
4.2.1.  
Slit systems

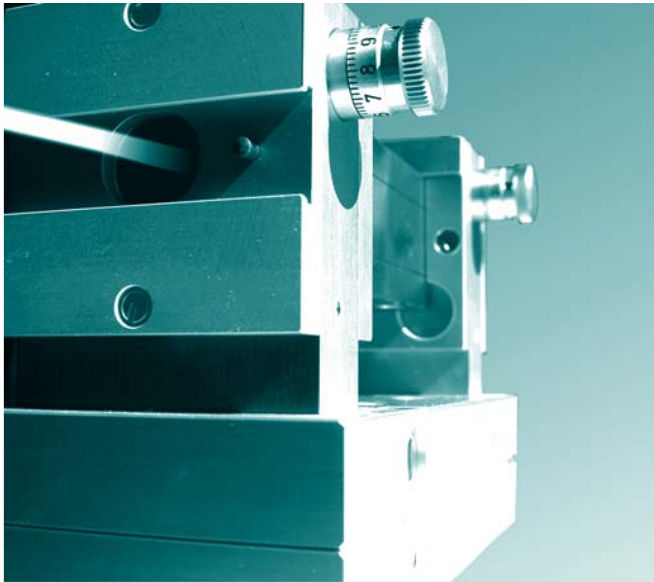
4.2.2.  
X-ray optics

4.2.3.  
X-ray sources

4.2.4.  
Detector systems

4.2.5.  
Polarisation  
analyser





### General information

Slit systems with finely adjustable blades enable a sharp limitation of x-ray cross-sections with various geometries.

The materials used for the blades are heavy metals such as W or Ta. The adjustment of the blades is either via a manual or motorised spindle drive (step or DC motor). The movement of opposite blades is either symmetrical or asymmetrical depending on the type of aperture.

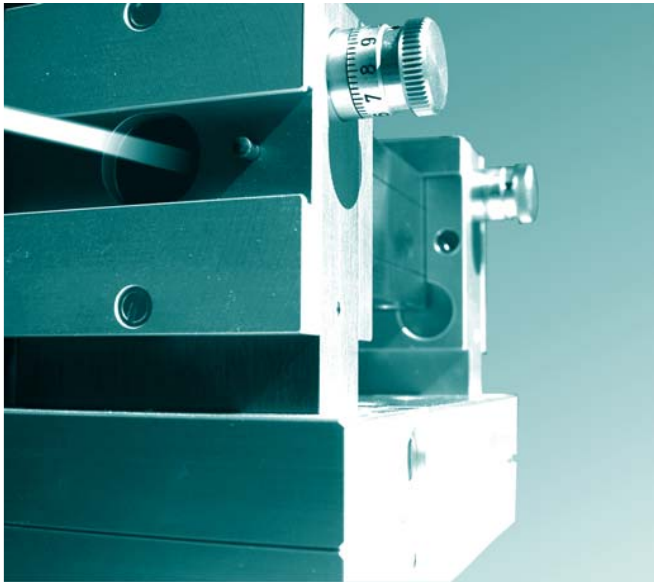
The length of slit apertures can be limited by large cross aperture gates.

Soller slits (segment slits, Venetian blinds) reduce the divergence of the beam in slit direction behind slit apertures.

Collimators are pinhole slits used for generating point-shaped beam cross-sections with lowest possible divergence.

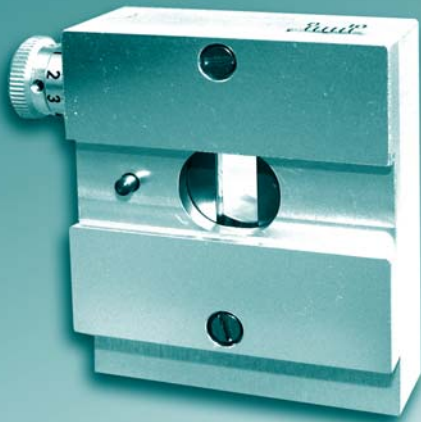
### 4.2.1.1. Manual versions

	type	aperture [mm]		
3001.10	slit screen	0...10		
3001.30	slit screen	0...25		
3002.10	cross-slit screen	0...10		
3002.20	cross-slit screen	0...15		
3002.30	cross-slit screen	0...25		
3002.40	cross-slit screen	0...40		
	type	divergence [°]		
3030.10	Soller slit	2		
3030.20	Soller slit	0,4		
3030.30	Soller slit	0,2		
3021	Soller slit system	0,4/2°		
3022	Soller slit system	0,4/2°		
	type	length [mm]	inner diameter [mm]	
3051	collimator	up to 187	0,05 to 3,3	
3052	collimator	up to 217	0,05 to 3,3	
3053	collimator	over 217	0,05 to 3,3	
3050	collimator carrier			

**4.2.1.2. Motorised versions**

	type	aperture [mm]
3001.10M	slit screen	0...10
3002.10M	cross-slit screen	0...10
3002.30M	cross-slit screen	0...25
3002.40M	cross-slit screen	0...40
3002.60M	cross-slit screen	0...4
3002.70M	cross-slit screen	0...4





### Slit Screen 3001.10

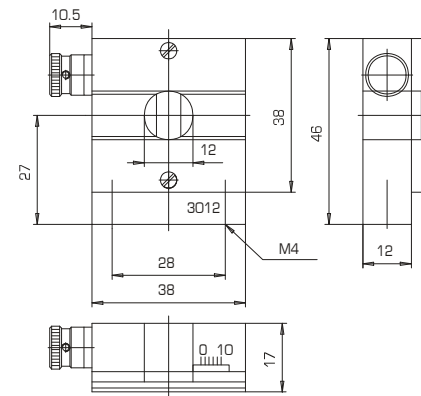
**Material:**

Housing: aluminium\*  
Blades: tungsten\*

\* other materials available on request

**Specifications:**

Aperture [mm]: 0-10  
Adjustment: symmetr.  
Adjust precision [mm]: 0,02  
Parallelity [mm]: 0,02  
Weight [kg]: 0,1


**Description:**

The slit consists of paired blades. Their motion is symmetrical to the centre of the aperture.

**Accessories:**

Slit apertures ranging from 0,01 to 8mm in size.

**Blade geometries:**

The following blade geometries are available:

- A) (standard)  
B)   
C)

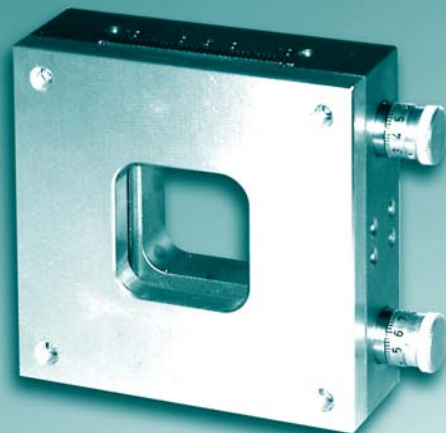
**Description:**

The slit consists of paired blades. Their motion is asymmetrical to the centre of the aperture.

**Blade geometries:**

The following blade geometries are available:

- A) (standard)  
B)   
C)



### Slit Screen 3001.30

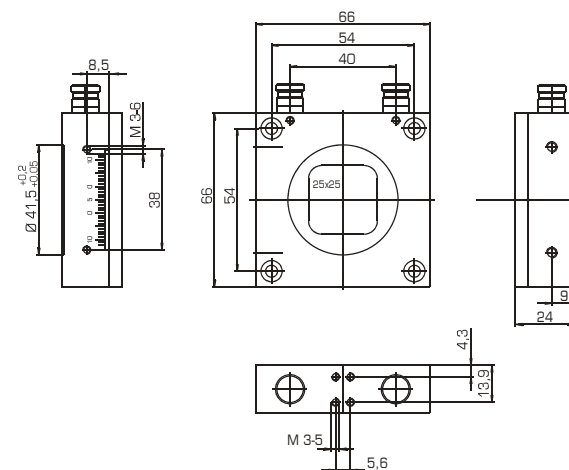
**Material:**

Housing: aluminium\*  
Blades: tungsten\*

\* other materials available on request

**Specifications:**

Aperture [mm]: 0-25  
Adjustment: asymmetr.  
Adjust precision [mm]: 0,02  
Parallelity [mm]: 0,02  
Weight [kg]: 0,15





### Cross Slit Screen 3002.10

**Material:**

Housing: aluminium\*

Blades: tungsten\*

\* other materials available on request

**Specifications:**

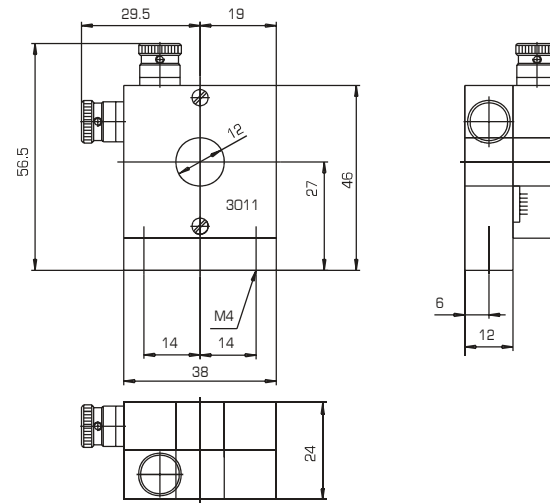
Aperture [mm]: 0-10

Adjustment: symmetr.

Adjust precision [mm]: 0,02

Parallelity [mm]: 0,02

Weight [kg]: 0,2



### Cross Slit Screen 3002.20

**Material:**

Housing: brass\*

Blades: tungsten\*

\* other materials available on request

**Specifications:**

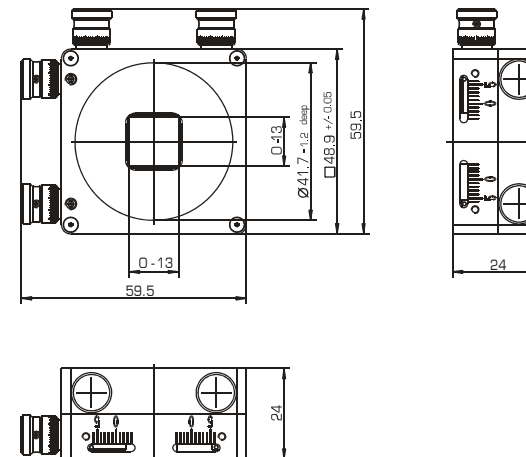
Aperture [mm]: 0-13

Adjustment: asymmetr.

Adjust precision [mm]: 0,02

Parallelity [mm]: 0,02


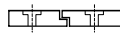

Weight [kg]: 0,3


**Description:**

The beam can be limited both horizontally and vertically by two blade pairs mounted at right angles to each other. Their motion is symmetrical to the centre of the aperture.

**Blade geometries:**

The following aperture geometries are available:

- A)  (standard)  
 B)   
 C) 


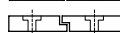

**Description:**

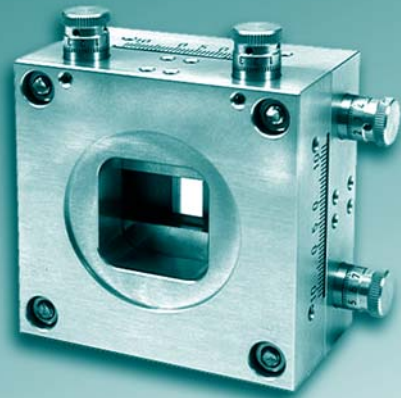
The beam can be limited both horizontally and vertically by two blade pairs mounted at right angles to each other. Their motion is asymmetrical to the centre of the aperture.

Symmetrical versions are also available.

**Blade geometries:**

The following aperture geometries are available:

- A)  (standard)  
 B)   
 C) 



### Cross Slit Screen 3002.30

#### Material:

Housing: aluminium\*

Blades: tungsten\*

\* other materials available on request

#### Specifications:

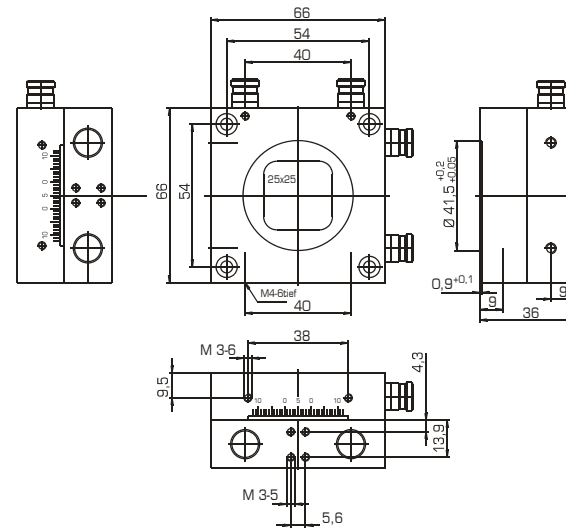
Aperture [mm]: 0-25

Adjustment: asymmetr.

Adjust precision [mm]: 0,02

Parallelity [mm]: 0,02

Weight [kg]: 0,4



### Cross Slit Screen 3002.40

#### Material:

Housing: aluminium\*

Blades: tungsten\*

\* other materials available on request

#### Specifications:

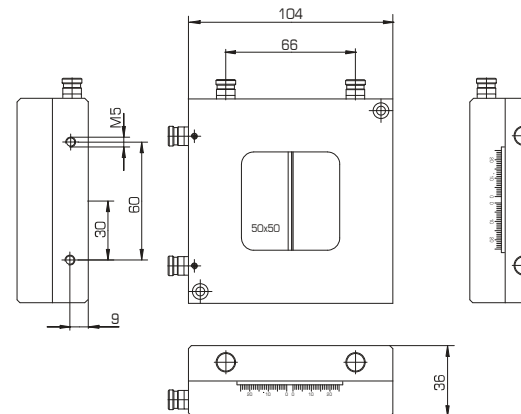
Aperture [mm]: 0-50

Adjustment: asymmetr.

Adjust precision [mm]: 0,02

Parallelity [mm]: 0,02

Weight [kg]: 0,9




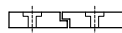

#### Description:

The beam can be limited both horizontally and vertically by two blade pairs mounted at right angles to each other. Their motion is asymmetrical to the centre of the aperture.

Symmetrical versions are also available.

#### Blade geometries:

The following blade geometries are available:

- A)  (standard)  
 B)   
 C) 


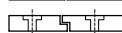

#### Description:

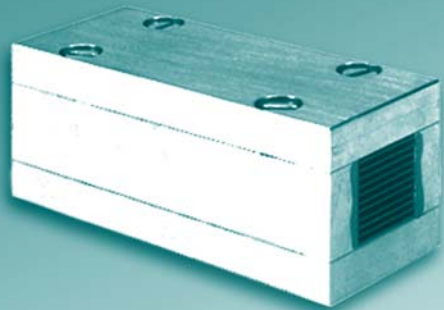
The beam can be limited both horizontally and vertically by two blade pairs mounted at right angles to each other. Their motion is asymmetrical to the centre of the aperture.

Symmetrical versions are also available.

#### Blade geometries:

The following blade geometries are available:

- A)  (standard)  
 B)   
 C) 

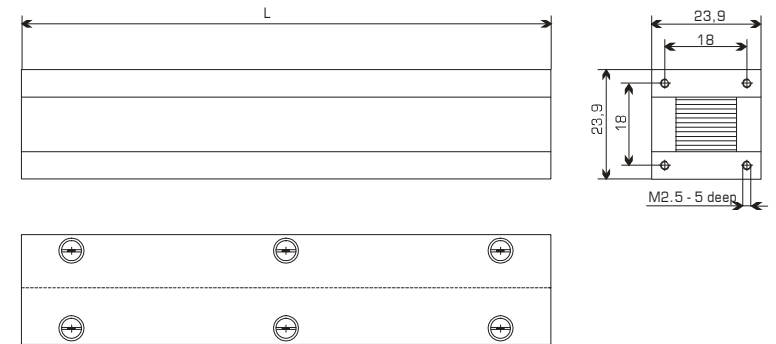


### Soller Slit Screens series 3030

Housing: brass  
Segments: stainless steel

The Soller Slit Screens 3030.10 and 3030.20 can be combined to the slit systems 3021 and 3022.

	3030.10	3030.20	3030.30
Length (L) [mm]:	58	58	116
Segment thickness [mm]:	0,1	0,1	0,1
Segment distance [mm]:	1	0,2	0,2
Divergence [deg]:	2	0,4	0,2
Weight [kg]:	0,2	0,2	0,4



3030.10

3030.20

### Soller Slit Screens series 3020

The slit system is a combination of two Slit Screens 3001.10 and a Soller Slit Screen (3030.10 or 3030.20). The base is adjustable.

The system 3021 is positioned at the beam entry, the system 3022 at the beam exit.

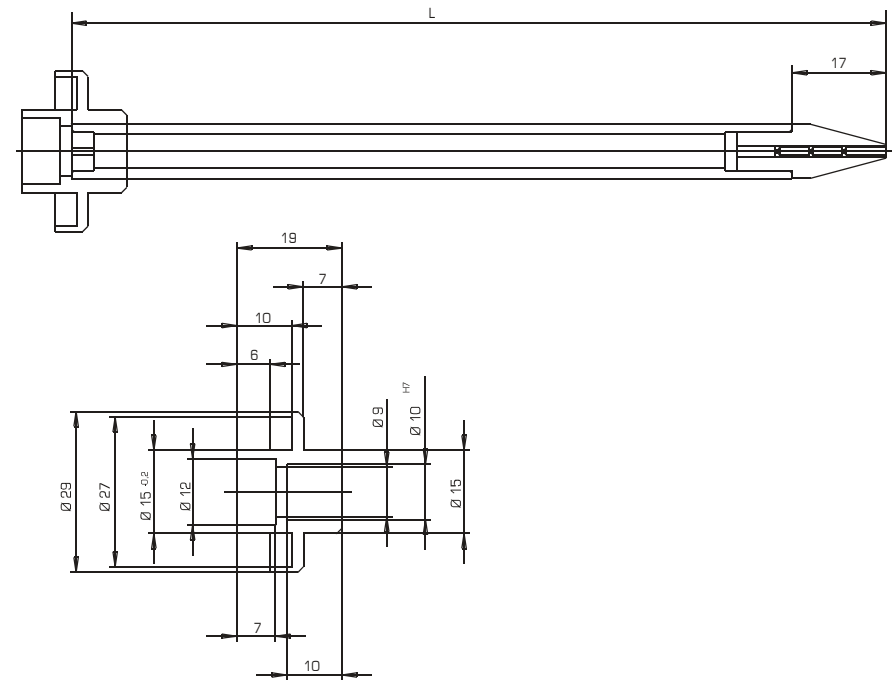
### Collimators

X-ray collimators are pinholes which enables the generation of point-shaped beam cross-sections with lowest possible divergence.

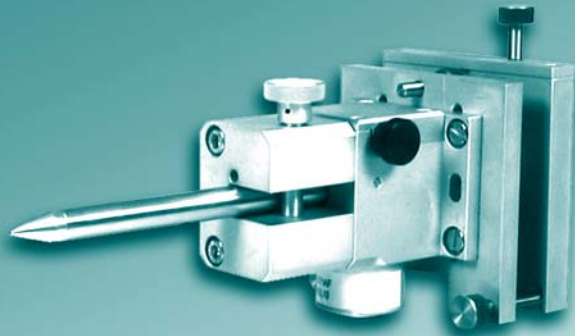
The collimators are available with inner diameters from 0.05 to 3.3 mm.

Special versions with rectangular holes are also available.

The collimator length is arbitrary.



	type	length [mm]	inner diameter [mm]
3051	collimator	up to 187	0,05 bis 3,3
3052	collimator	up to 217	0,05 bis 3,3
3053	collimator	over 217	0,05 bis 3,3



### Laser adjusted collimator mount

The adjustment of samples in single crystal diffractometers is both an intricate and, due to possible radiation, hazardous procedure.

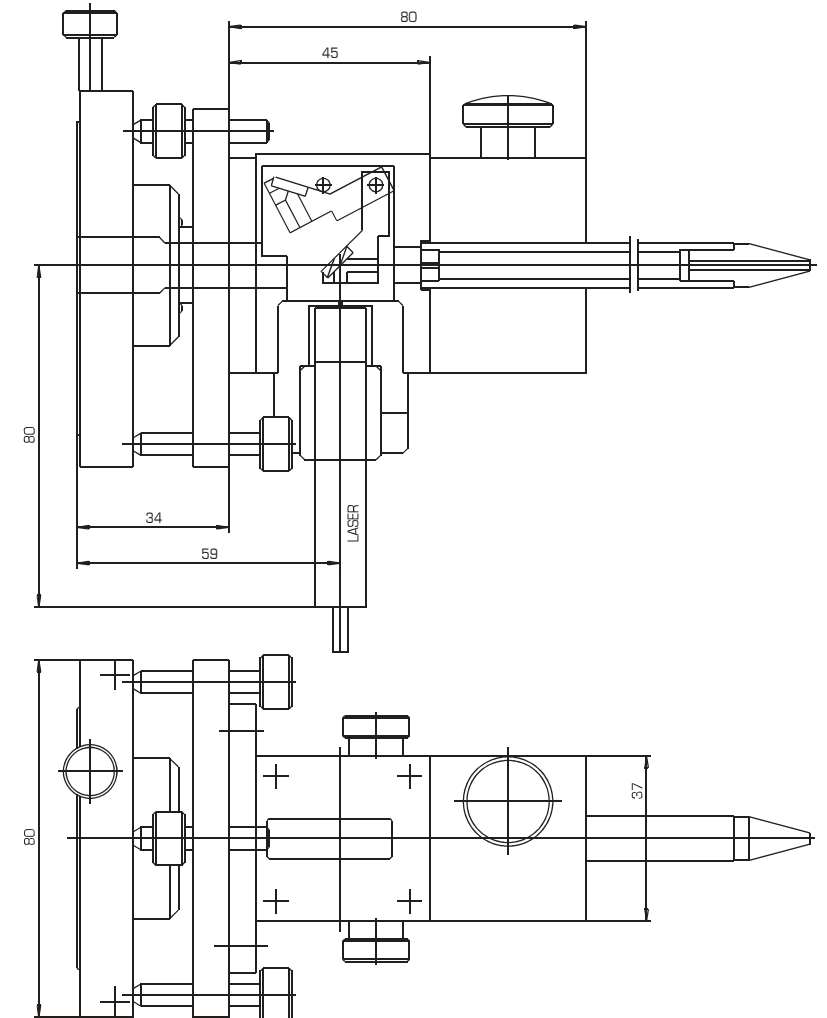
This collimator mount was developed in order to minimize this problem.

A laser beam which is colinear to the x-ray beam is focused on the sample through the collimator (inner diameter up to  $\varnothing,3\text{mm}$ ) by means of a mirror which can be tilted at an angle of  $45^\circ$ .

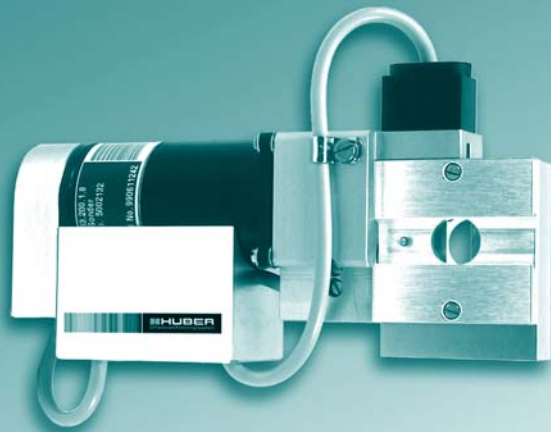
### Technical details

Wave length of laser [nm]:	670
Min. power (output) [mW]:	0,5
Beam divergence [mrad]:	<1
Focusing lens [mm]:	200
ID Collimator [mm] (incl.):	0,3

The power supply is included.







### General information

The Slit Screen is equipped with limit switches to prevent collision when opening or closing.

We would be happy to incorporate customer-specific alterations, if technically possible.

### Material:

Housing: aluminium\*

Blades: tungsten\*

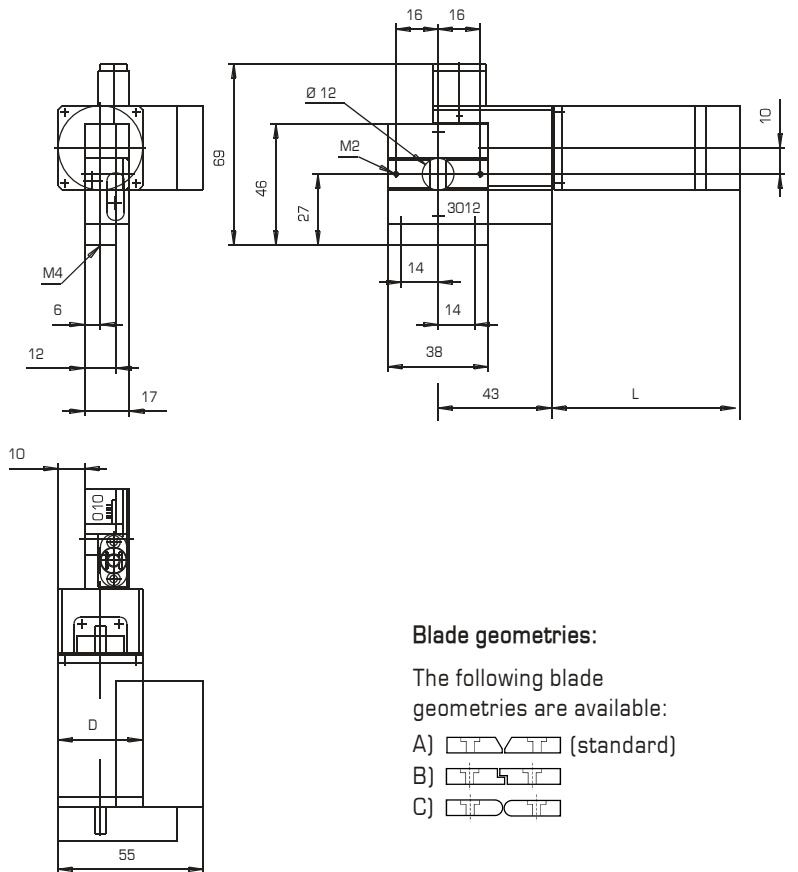
\* other materials available on request

### Specifications:

Aperture [mm]: 0-10  
 Adjustment: symmetrical  
 Adjust precision [mm]: 0,02  
 Parallelity [mm]: 0,02  
 Weight [kg]: 0,5  
 Resolution [ $\mu\text{m}$ ]: 2,5




### Technical data motor: Standard Vacuum (HV)

Number of phases:	2	2
Cable length [m]:	0,5	0,5
Connectors:	SUB D15	--
Steps/revolution:	200/400	200/400
Rated current [A/phase]:	0,95	1,8
Length [mm] (L):	38,5	62,5
Flange size [mm] (D):	28	32
Wiring:	bipol./ser.	bipol./par.
Number of conductors:	6	4



### Blade geometries:

The following blade geometries are available:

- A)  (standard)  
 B)   
 C) 

### Accessories

Control system: SMC 9300

**Material:**

Housing: aluminium\*

Blades: tungsten\*

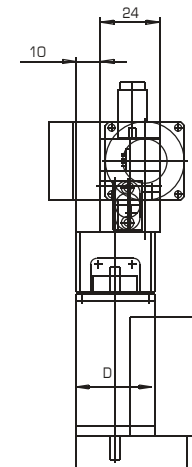
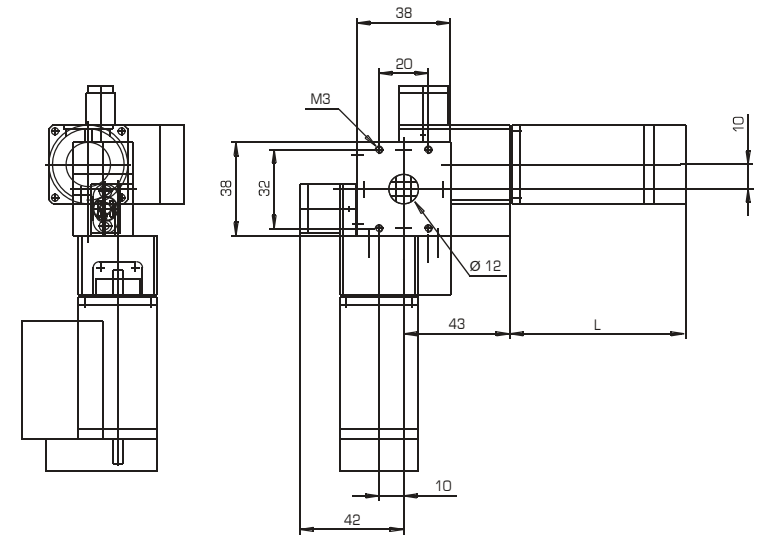
\* other materials available on request

**Specifications:**


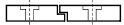

Aperture [mm]: 0-10  
 Adjustment: symmetrical  
 Adjust precision [mm]: 0,02  
 Parallelity [mm]: 0,02  
 Weight [kg]: 1,8  
 Resolution [ $\mu\text{m}$ ]: 2,5

**Technical data motor:**

	Standard	Vacuum (HV)
Number of phases:	2	2
Cable length [m]:	0,5	0,5
Connectors:	SUB D15	--
Steps/revolution:	200/400	200/400
Rated current [A/phase]:	0,95	1,8
Length [mm] (L):	38,5	62,5
Flange size [mm] (D):	28	32
Wiring:	bipol./ser.	bipol./par.
Number of conductors:	6	4

**Blade geometries:**

The following blade geometries are available:

- A)  (standard)  
 B)   
 C) 

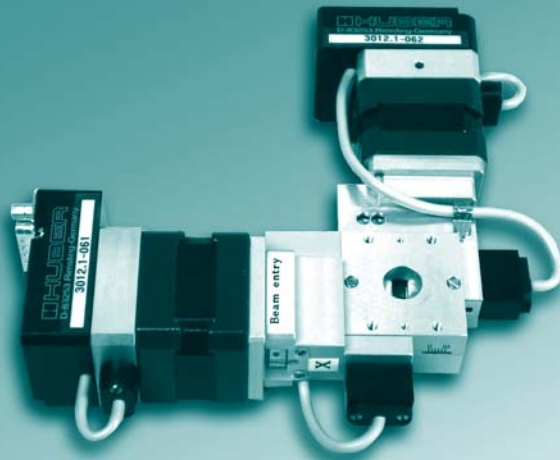
**Accessories**

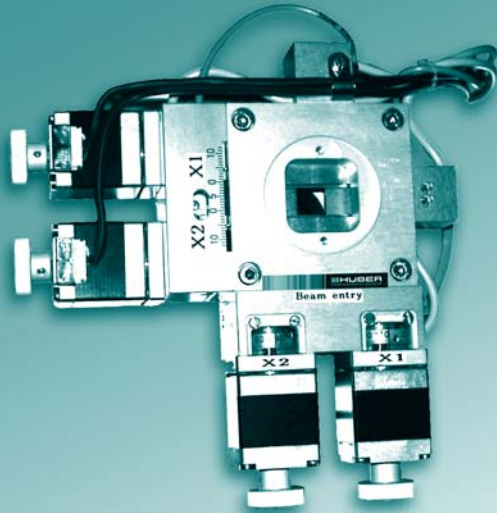
Control system: SMC 9300

**General information**

The Cross Slit Screen is equipped with limit switches to prevent collision when opening or closing.

A wide range of different versions is available. We would be happy to incorporate customer-specific alterations, if technically possible.





### General information

Each of the four Slit Screens is driven by a separate step motor.

The Cross Slit Screen is equipped with limit switches and  $\mu$ -com precision switches to prevent collision when opening or closing.

A wide range of different versions is available. We would be happy to incorporate customer-specific alterations, if technically possible.

### Material:

Housing: aluminium\*

Blades: tungsten\*

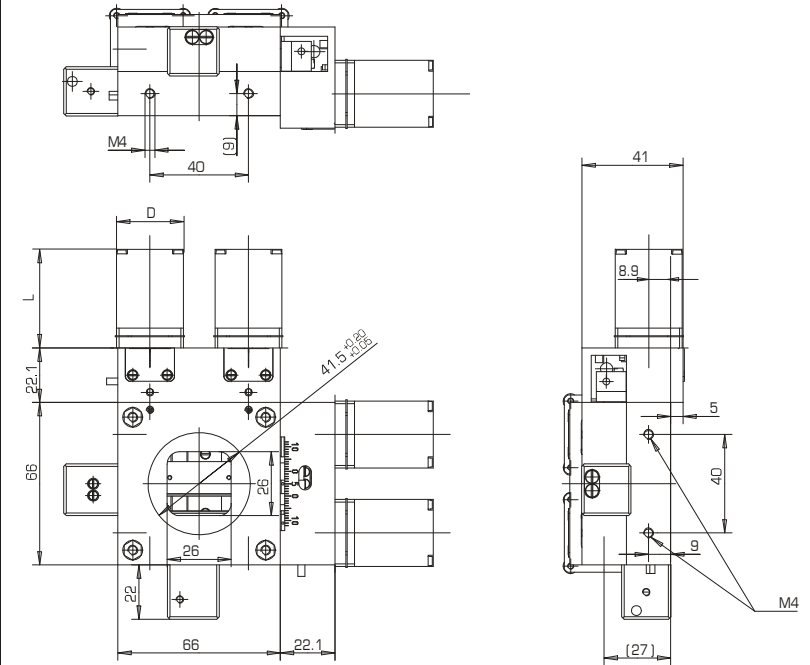
\* other materials available on request

### Specifications:

Aperture [mm]: 0-25  
 Adjustment: asymmetrical  
 Adjust precision [mm]: 0,02  
 Parallelity [mm]: 0,02  
 Weight [kg]: 2  
 Resolution [ $\mu$ m]: 1,25




### Technical data motor: Standard Vacuum (HV)

Number of phases:	2	2
Cable length [m]:	0,5	0,5
Connectors:	SUB D15	--
Steps/revolution:	200/400	200/400
Rated current [A/phase]:	0,95	1,8
Length [mm] (L):	38,5	62,5
Flange size [mm] (D):	28	32
Wiring:	bipol./ser.	bipol./par.
Number of conductors:	6	4



### Blade geometries:

The following blade geometries are available:

- A)  (standard)  
 B)   
 C) 

Product Groups

4.  
Accessories

4.2.  
Beam Applications

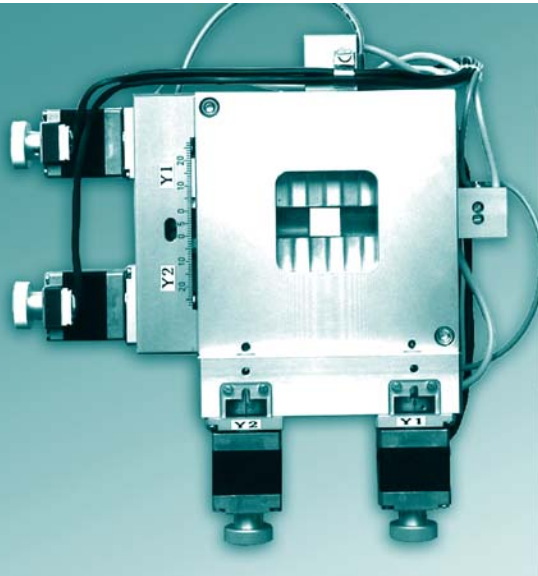
4.2.1.  
Slit Systems

4.2.1.2.  
Motor. Versions

3002.40M  
3002.40M-HV

**HUBER**  
Diffraction and Positioning Equipment

Vers. A\_1



**Material:**

Housing: aluminium\*

Blades: tungsten\*

\* other materials available on request

**Specifications:**

Aperture [mm]: 0-40  
 Adjustment: asymmetrical  
 Adjust precision [mm]: 0,02  
 Parallelity [mm]: 0,02  
 Weight [kg]: 4  
 Resolution [ $\mu$ m]: 1,25

**General information**

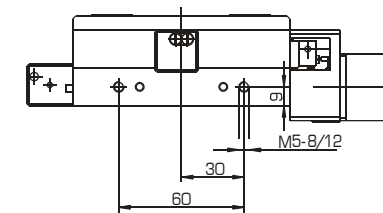
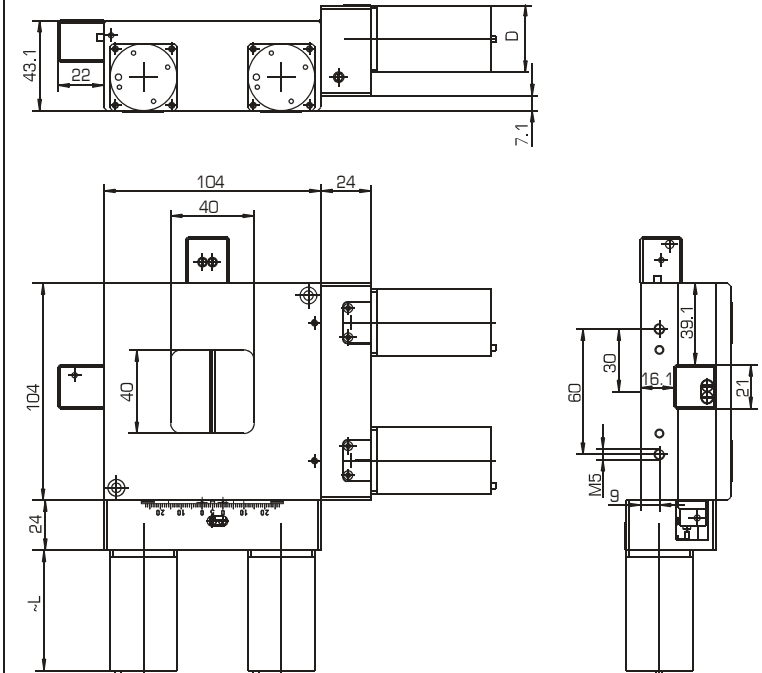
Each of the four Slit Screens is driven by a separate step motor.

The Cross Slit Screen is equipped with limit switches and  $\mu$ -com precision switches to prevent collision when opening or closing.

A wide range of different versions is available. We would be happy to incorporate customer-specific alterations, if technically possible.

**Technical data motor:**

	Standard	Vacuum (HV)
Number of phases:	2	2
Cable length [m]:	0,5	0,5
Connectors:	SUB D15	--
Steps/revolution:	200/400	200/400
Rated current [A/phase]:	0,95	1,8
Length [mm] (L):	38,5	62,5
Flange size [mm] (D):	28	32
Wiring:	bipol./ser.	bipol./par.
Number of conductors:	6	4



**Blade geometries:**

The following blade geometries are available:

- A) (standard)
- B)
- C)



### General

The in-vacuum tube slit was designed to allow a very close position of a cross slit to the sample due to its minimum physical design and to be operated in vacuum in order to reduce air scattering for low energy experiments.

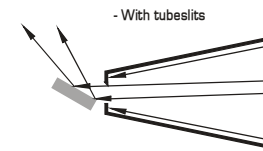
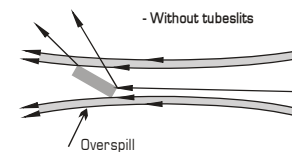
### Applications

Applications are for i.e. grazing incidence diffraction experiments performed with samples of limited size, which can lead to the incident beam spilling over the surface of the sample under investigation. This condition is undesirable as it generally leads to an increase of background scattering. Typical incident angles of  $<0.3^\circ$  and sample sizes in the order of 10mm x 10mm require that the vertical or horizontal extent of the beam be of the order of 50 $\mu$ m to avoid beam overspill.

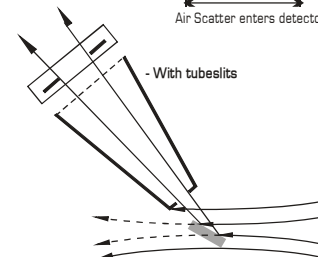
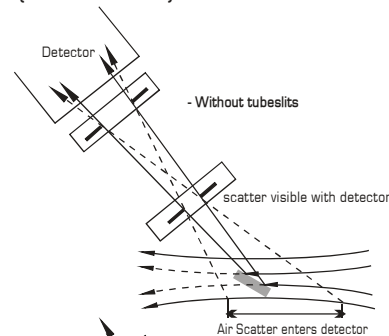
As the physical size of the spot is largely aberration limited, the only way of defining such an incident beam is by placing slits very close to the sample.

Also by placing the slits at the exit beam very close to the sample, a well defined sample footprint is obtained plus a further reduction in background scatter.

### Slit mounted on incident beam side



### Slit mounted on 2-Theta Arm (exit beam side)



### Specification

#### Material:

Body: Aluminium\*  
 Slit edges: Tungsten\*

\* other materials on request

#### Specification

Opening [mm]: 0-4  
 asymmetr.  
 Weight [kg]: 4,5  
 Resolution [ $\mu$ m]: 1,25

#### Technical Data Motor:

Number of phases: 2  
 Type of plug: SUB D15  
 Number of steps/rev.: 200/400  
 Voltage [V]: 5  
 Current per phase [A]: 0,7



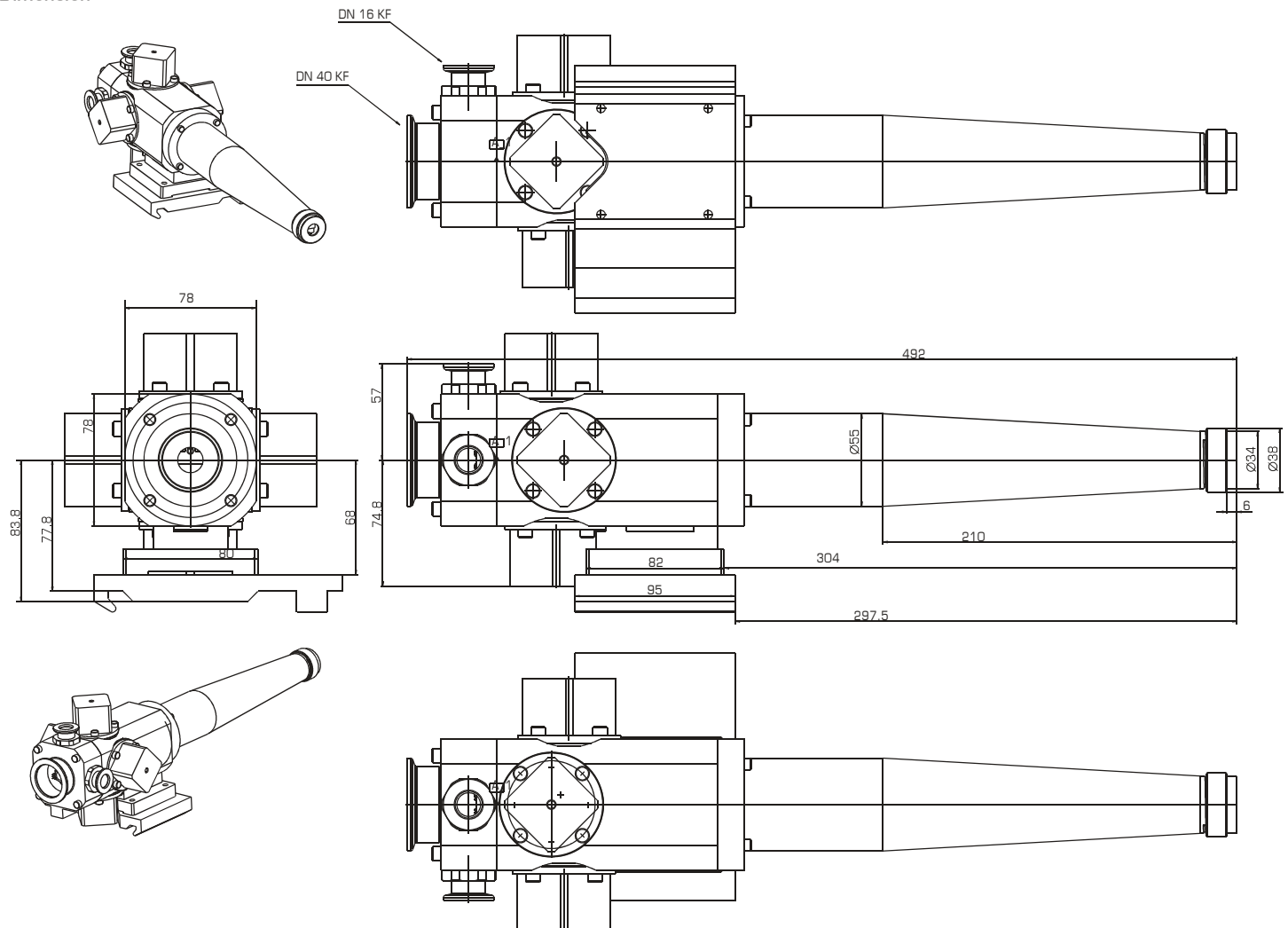
### Technical details

The actuation mechanics are spatially separated from the sample position, with the four independent (tungsten) slit jaws positioned by a system of levers.

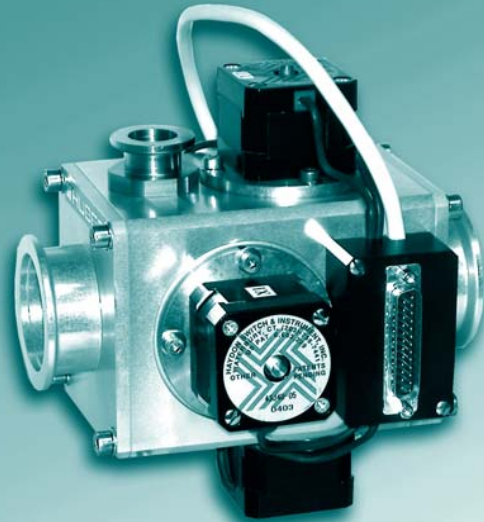
The actuation is achieved through use of 4 miniature linear vacuum feedthroughs which allow the motors to be mounted externally. The max. overall opening aperture for the slit assembly is 4mm x 4mm and each jaw can be independently positioned with a resolution of microns.

The slit jaw motions have limit switches to avoid collision and mechanical damage. The front end of the tube slit has a Kapton window which easily can be exchanged and has a standard vacuum KF flange for attachment of further optical elements.

### Dimension







### General

The in-vacuum cross slit highlights a very compact, modular design.

### Technical details

The actuation of the blades is achieved through use of four miniature linear vacuum feedthroughs which allow the motors to be mounted externally.

The maximum overall opening aperture for the slit assembly is 12mm x 12mm and each jaw can be independently positioned with a resolution of microns.

The slit jaw motions have limit switches to avoid collision and mechanical damage. The entry and exit of the slit has standard vacuum KF flanges for attachment of further optical elements like the HUBER in vacuum-tube slits and HUBER in-vacuum polarisation analyzer, all components kept operating windowless in vacuum.

The slit system may be mounted on a X95 compatible rail or comes optionally with a HUBER compatible dovetail slide and can therefore be exchanged and combined with any other beamline modular components.

### Specification

#### Material:

Body:	Aluminium*
Slit edges	Tungsten*

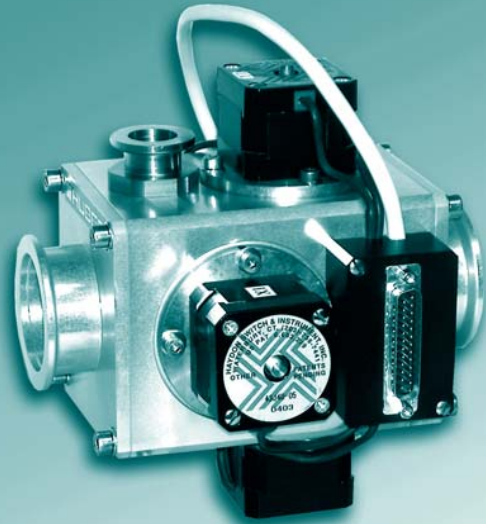
\* other materials on request

#### Specification

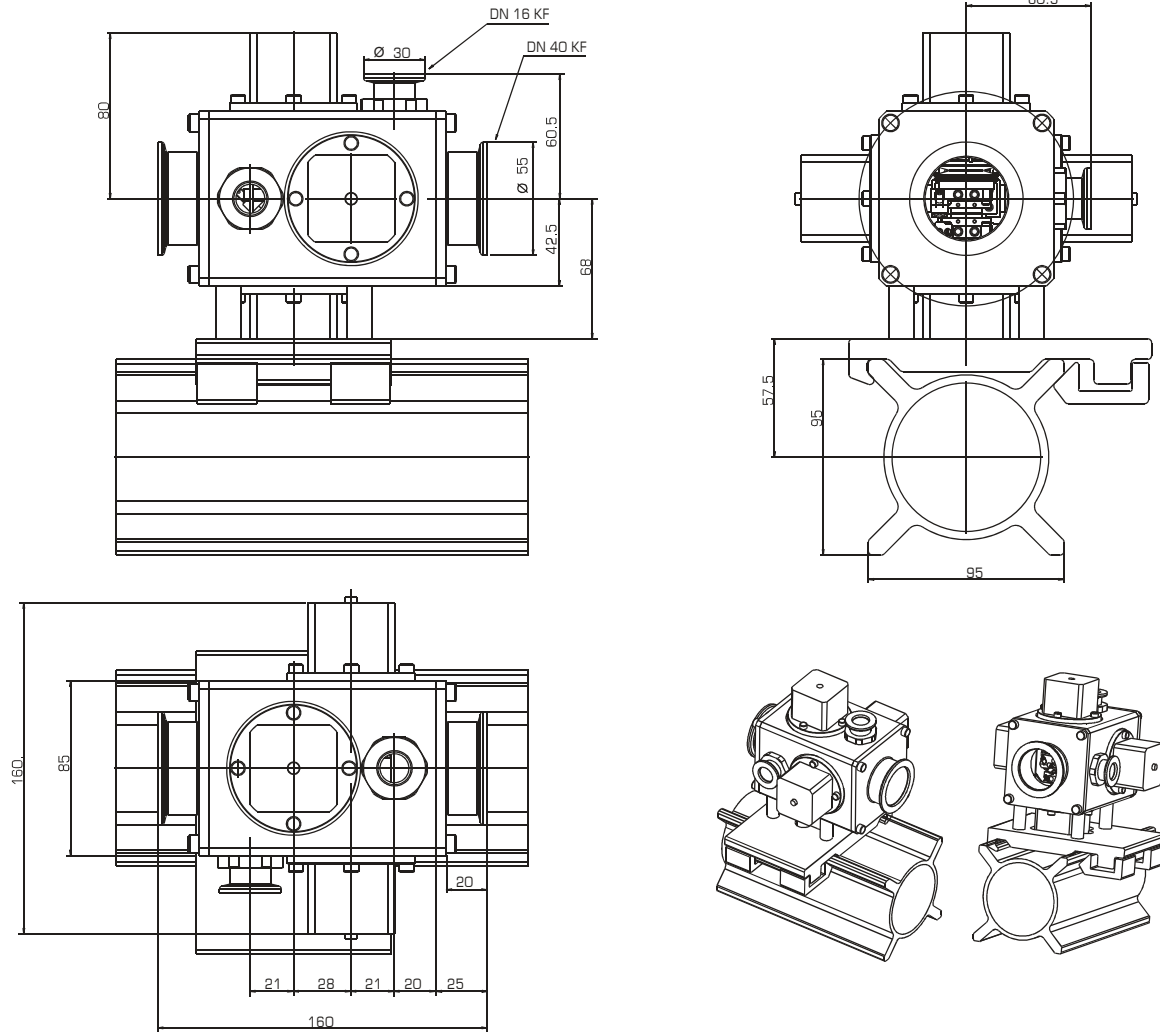
Opening [mm]:	0-12 asymmetr.
Weight [kg]:	4
Resolution [ $\mu\text{m}$ ]:	1,25

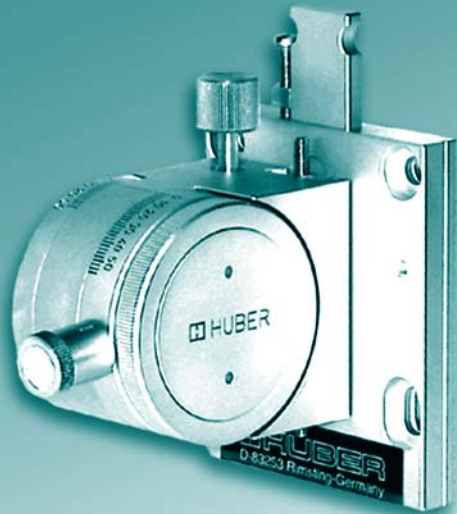
#### Technical Data Motor:

Number of phases:	2
Type of plug:	SUB D15
Number of steps/rev.:	200/400
Voltage [V]:	5
Current per phase [A]:	0,7



Dimension



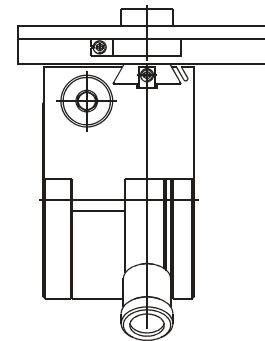
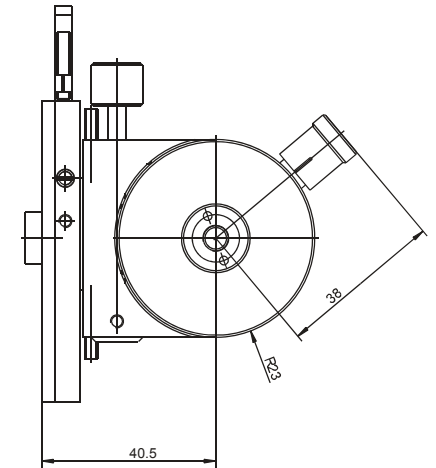
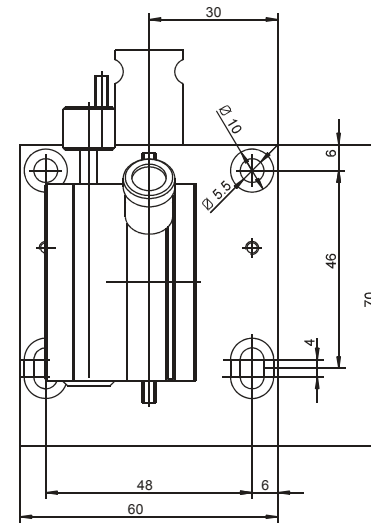


### Description

The graphite monochromator 151 contains a highly oriented pyrolytic graphite crystal (HOPG) mounted in a compact metal housing.

Inside the radiation-proof housing the crystal can be manually adjusted to the ideal Bragg angle for the used X-ray wave length. The diffracted beam is made directly visible by a fluorescent layer of paint on a small lead glass window.

Adjustable entry and exit apertures ensure a precise limitation of the X-ray beam path. A wide variety of adaptor plates is available for the mounting of the monochromator on the tube hoods of all standard manufacturers.



	$K\alpha_2$ [Å]	Theta	2-Theta
Ag	0,5608	4,804	9,608
Mo	0,7107	6,1	12,2
Cu	1,5418	13,3	26,6
Co	1,7902	15,5	31,0
Fe	1,9373	16,8	33,6
Cr	2,2909	20,0	40,0

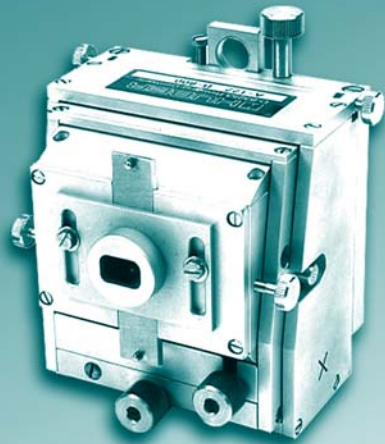
### Crystal data

Dimensions 12x12x1 mm

Surface oriented to (002) plane

$2d=6,714 \text{ \AA}$

Mosaic diffraction angle width  $0,4^\circ \pm 0,1^\circ$



### Crystals:

A wide variety of different crystals for various wave lengths and diverse focal lengths is available or can be produced to customer specifications. First, the crystal plates with the dimensions 20x40x1 mm are smoothed at a predetermined angle  $\tau$  to the lattice planes, and then machined and bent to a precisely calculated concave radius. The smoothing angle ensures that the primary side focus distance A, as measured from the centre of the tube to the centre of the crystal, is smaller than the secondary side focus distance B. The series 615/616 units only differ in the B distances. Series 616 crystals are predominantly used when greater distances are required.

### Description

The Guinier monochromator 611 has a mount for focussing monochromator crystals of the Johansson-Guinier type. The crystals are mounted in a U-shaped metal frame and can thus be easily inserted and exchanged.

The functional housing enables all positioning degrees of freedom that are necessary for the fine adjustment of the crystal in the beam path of the X-ray tube.

Various apertures are included for the precise limitation of the X-ray beam cross-section.

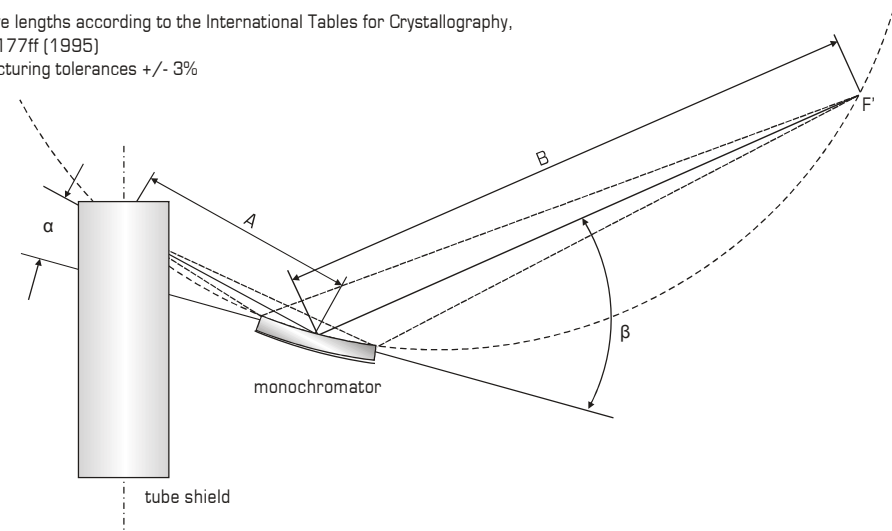
The monochromator is primarily used on the line side of fine focus X-ray tubes (0,4 x 8 mm). The  $K\alpha_2$  line of the primary radiation is suppressed completely with the exception of the extremely short wavelength Mo and Ag radiation. Approximately 10%, in respect to the  $K\alpha_1$  intensity, of this radiation is not suppressed.

Included are the housing, the crystal mount and a monochromator crystal.

### HUBER Guinier monochromator crystal 615/616 parameters

Huber#	Anode	$K\alpha_1$ [Å]	Cryst.	hkl	$2\theta$ [°]	A [mm]	B [mm]	$\alpha$ [°]	$\beta$ [°]
615001	Cu	1.54060	SiO <sub>2</sub>	101	13.320	120	220	9.337	17.304
615002	Cu	1.54060	Ge	111	13.640	120	220	9.558	17.723
615003	Cr	2.28962	SiO <sub>2</sub>	101	20.024	120	220	13.906	13.906
615004	Cr	1.54060	Ge	111	20.517	120	220	14.236	26.798
615005	Fe	1.93597	SiO <sub>2</sub>	101	16.829	120	220	11.745	21.913
615007	Co	1.78892	SiO <sub>2</sub>	101	15.517	120	220	10.849	20.186
615008	Co	1.78892	Ge	111	15.893	120	220	11.106	20.680
615009	Mo	0.70926	SiO <sub>2</sub>	101	6.089	120	220	4.292	7.886
615010	Mo	0.70926	Si	111	6.494	120	220	4.577	8.412
615011	Ag	0.55936	SiO <sub>2</sub>	101	4.798	120	220	3.384	6.213
616002	Cu	1.54060	Ge	111	13.640	120	360	6.722	20.559
616004	Cr	2.28962	Ge	111	20.517	120	360	9.919	31.115
616005	Fe	1.93597	SiO <sub>2</sub>	101	16.829	120	360	8.229	25.429
616007	Co	1.78892	SiO <sub>2</sub>	101	15.517	120	360	7.614	23.421
616009	Mo	0.70926	SiO <sub>2</sub>	101	6.089	120	360	3.036	9.142

$K\alpha_1$  wave lengths according to the International Tables for Crystallography, Vol. C, 177ff (1995)  
manufacturing tolerances +/- 3%





### Radiation protection housing

We equip complete diffraction systems with all standard radiation sources for fine structural analysis.

For example the 60kV X-ray generator (GE-IT ID 3003) depicted here can be equipped with up to four beam exit windows, both vertical and horizontal. The radiation protection housing contains both the X-ray diffractometer and the tube shield as a full protection system according to the Röntgenverordnung (RöV).

The experimental table is equipped with 19" rack rails. In addition to the generator, this enables the installation of all control system units.

The base (869801) and the upper housing (869802) are also separately available.

### X-ray generator

As standard, the X-ray generator comes equipped with:

- base unit ID 3003 as a 19" module with integrated high voltage generator
- cooling water control
- 1 water pipe (ID3003-tube hood), standard length 2m
- 2 water pipe (inflow and outflow), standard length 5m each (max. 20m\*)
- computer interface RS 232 C
- 20 mA current loop (with optional adaptor)
- RS 422 / 485 (with optional adaptor)

\* pipes above 5 m in length require a special diameter in order to minimise pressure loss

### Dimensions 869801 (experimental table)

Width [mm]:	1180
Height [mm]	800
Depth [mm]	900

### Dimensions 869802 (radiation protection housing)

Width [mm]:	1300
Height [mm]	1000
Depth [mm]	1000

### High voltage generator:

Max. output voltage:	60 kV direct current
Max. output current:	80 mA
Max. output power:	3,5 kW



### Description

The unit is designed to count X-rays in laboratory or production equipment and in synchrotron radiation experiments.

The 9910 is a wide dynamic range, X-ray counting system. X-rays up to 100 keV are detected using a scintillator coupled to a photomultiplier and signal processing electronics to provide a TTL output

The detector uses a window discriminator to detect X-rays within a selected energy band. The width and threshold (lower limit) of the window and the HV of the photomultiplier can be set by the user with the 9910-CONTROL.

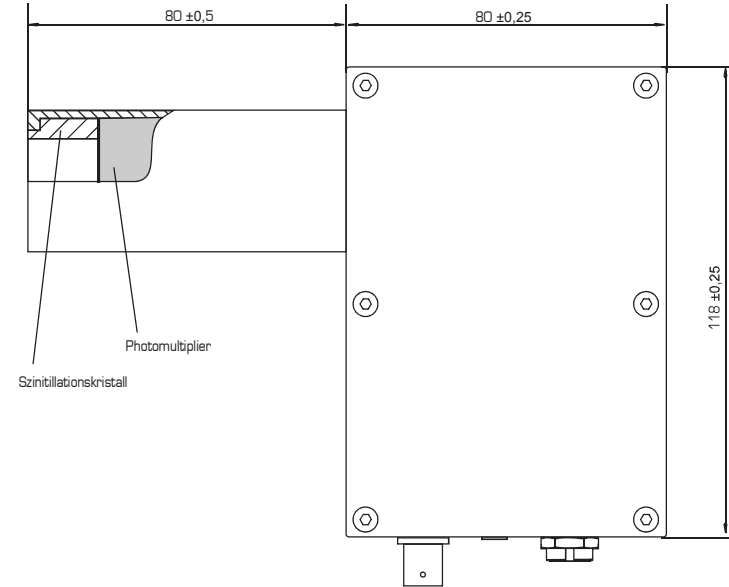
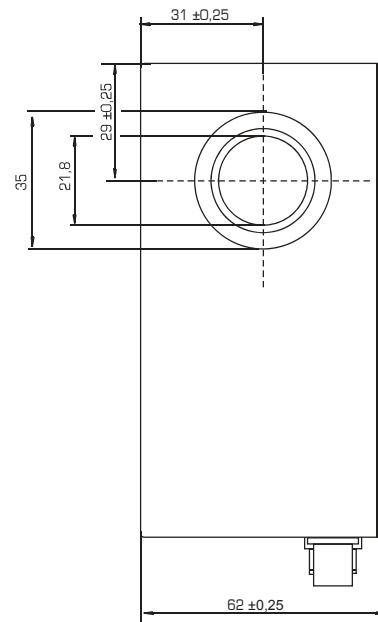
Fast count rates are achieved by using a YAP(Ce) scintillator, selected for its very fast (30 ns) decay time, and high speed electronics, designed to minimise dead-time.

As well as counting X-rays in a set energy band, the unit can be used to generate an energy spectrum by using a narrow (energy) window and progressively increasing the lower threshold. This feature is also used to calibrate the detector, using gamma and X-ray sources of known energy.

### Technical data

Scintillator:		Yttrium Aluminium Perovskit 21,8mm dia
Detection range:		5 keV to 100 keV
Window discriminator	lower (min): upper (max):	0,10 V 3,00 V
Window width:		variable, 3 V max
Count rate	actual counts: indicated counts:	10 MHz max 5 MHz max
Background counts		0,15 Hz
Supply voltage		4,75 to 5,25 V ripple < 100 mV pk-pk
Supply current		60 mA at 1 MHz count rate

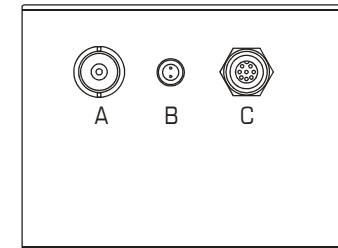


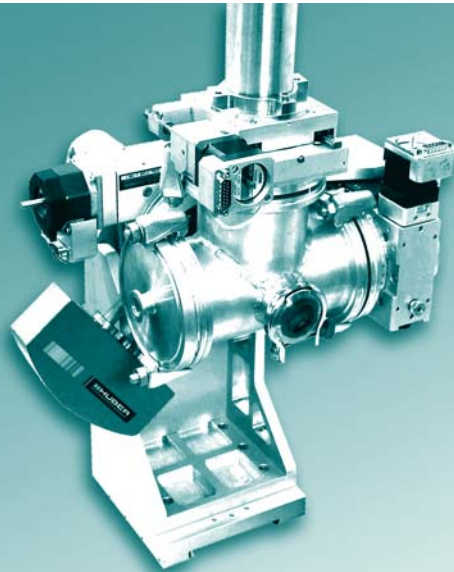


A: TTL signal out  
BNC

B: Power input  
PIN 1 +5V  
PIN 2 0V

C: Control unit interface





### General

The three axis HUBER in-vacuum polarisation analyser has been designed to facilitate the study of changes in the polarisation of the x-ray beam after diffraction from the sample.

The in-vacuum design allows the device to be used at low energies (ca. 3keV).

### Technical data

The polarisation analyzer comes with a T-shaped vacuum chamber, clamped on a CF vacuum flange with a support for the crystal holder. The top flange with a pumping connection can be removed in order to get access to the analyser crystal.

On the  $2\theta$  linear translation, which seals the chamber with a Kapton window, a detector with a max. diameter of 48mm with shielding can be mounted. The linear range is  $\pm 20$ mm which corresponds to  $2\theta = \pm 7^\circ$ .

Optionally a further detector can be mounted in direction of the scattered beam on the back side of the support of the  $\sigma/\pi$ -axis (Huber model 410a) and can be used windowless or with Kapton window in vacuum for measurements without analyzer crystal.

The whole assembly is mounted on a prism slide (or optional other slides) to be fitted on the  $2\theta$  arm of a diffractometer.

### Specification

Ranges [°]:

$\theta$  (model 409) [°]:  $\pm 5$

$2\theta$  (linear translation at  $90^\circ$  fixed angle [°]:  $\pm 7$

$\pi/\sigma$  (model 410a) [°]:  $\pm 180$

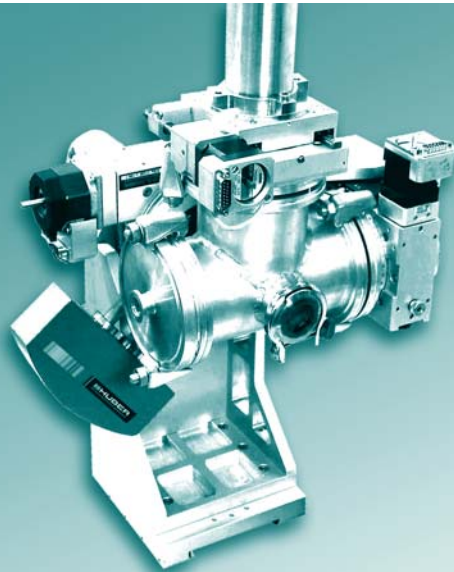
ca.  $\pm 110$   
(with detector mounted)

Resolution [°]: 0,005 to 0,0001  
(depending on application and motorisation)

Vacuum chamber with 2 ports for the direct beam with DN40KF flanges

One port for vacuum pumping

Mounting flange for analyzer Crystal



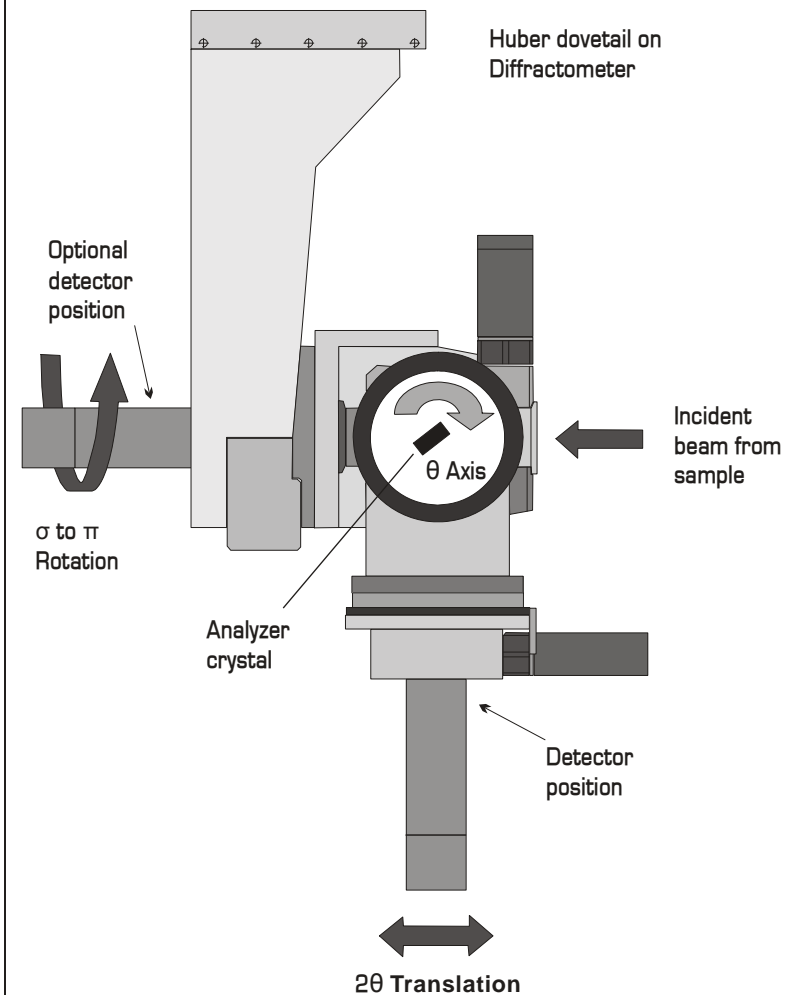
### Applications

The  $\Theta$ -axis (Huber model 409) allows alignment of the analyser crystal to a diffracting condition, with  $\Theta$  Bragg at, or close to,  $45^\circ$ . The second rotation axis (Huber model 410a) allows rotation of the diffracting plane of the analyser crystal about the beam.

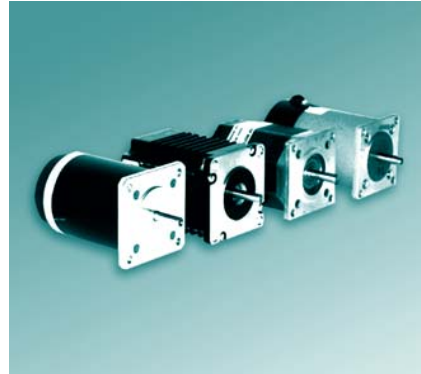
Any component of the incident polarisation lying in the diffracting plane will go to zero on charge scattering for  $\Theta$  Bragg =  $45^\circ$ . The third linear axis allows translation of the detector in a  $2\theta$  geometry in order to track the diffracted beam.

Conventionally, for vertical scattering experiments, the incident polarisation is referred to as  $\sigma$  polarised and any component orthogonal to it (i.e. vertically polarised) as  $\pi$  polarised. Thus, by positioning the rotation about the beam such that the diffracting plane of the analysing crystal is vertical, one is sensitive only to the  $\sigma$  polarised component and conversely a horizontal analyser crystal diffraction plane measures the  $\pi$  component.

Any additional components of polarisation introduced on diffraction from the sample, due to its magnetism, may therefore be quantified.



4.3.1.  
Motors



4.3.2.  
Encoders



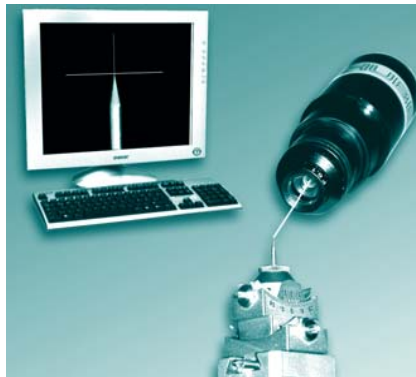
4.3.3.  
Limit switches



4.3.4.  
Zero-point control



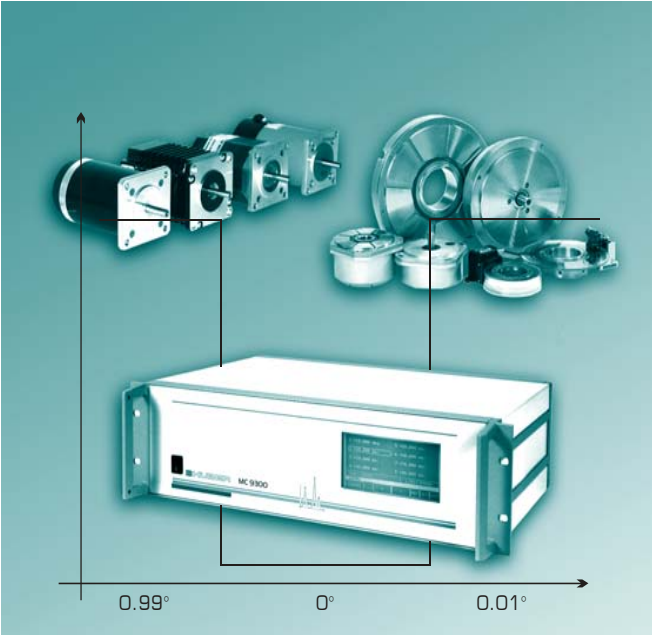
4.3.5.  
MiniVID

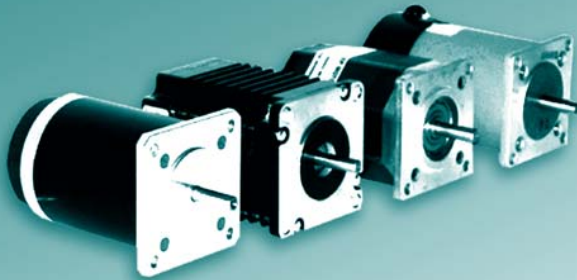


4.3.6.  
Impulse counter



4.3.7.  
Signal converter



**Motors:**

It is possible to drive the positioning systems with step motors or with direct current motors depending on the application requirements.

Step motors are generally used for absolute or incremental positioning processes, whilst for highly dynamic requirements servo or direct current motors are used.

An extensive range of manufacturers and available versions enables the Huber systems to be ideally adapted to your requirements.

**Manufacturer:**

Bautz  
 Berger Lahr  
 Faulhaber  
 Pytron  
 SloSyn  
 Vexta

**Version:**

2-phase  
 3-, 5-phase  
 DC, 2-phase  
 2-phase  
 2-phase  
 2-, 5-phase

**Technical notes:**

In standard versions, bipolar parallel wiring is used for step motors.

Sub-D sockets are used for connecting the motors. The number of pins depends on the type of motor as well as on additional inputs and outputs such as limit switches or zero-point controls.

**Encoders:**

A number of encoder systems of various manufacturers and versions can be integrated into the Huber positioning systems:

- distance measurement systems
- angular measurement systems
- rotary encoder for step monitoring

The available versions range from simple rotary encoders to complex closed-loop positioners.

Please contact our engineers for further information and advice.

**Manufacturer:**

Heidenhain  
 Renishaw  
 IVO

**Version:**

distance and angular systems  
 distance and angular systems  
 angular measurement systems





### Limit switches:

In order to control and limit the range of positioning stages, many systems come equipped with limit switches. In some systems the position of these can be set to individually limit the maximum range depending on requirements.

The switches are mounted in a T-groove and can thus be fixed at the requisite positions, ensuring the desired range of the unit.

In some systems it is possible to replace the fixed limit switches with variable ones and/or to mount additional ones.

### Zero-point control 9100

If positioning applications require a reference point, the positioning system can be equipped with a zero-point control.

The zero-point and/or reference point of an axis is adjusted by the interaction of two light beams.

As an alternative to the zero-point control 9100, a  $\mu$ -com precision switch is also available.

### Technical notes:

The status of the connected switch should be continually monitored by the control system which then stops the motor when the switch is activated.

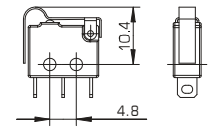
The internal logics of the miniature switch is implemented so that the power circuit is closed in idle mode. At contact with the switch, the switch cam breaks the circuit. This ensures that a faulty cable connection or a defective switch does not cause damage.

In smaller positioning systems the limit switch type Ls01 is predominantly installed, whilst in larger systems the type Ls02 is generally used.

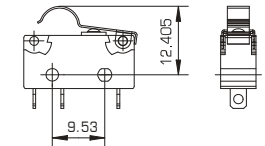
### Technical note

The first light beam is used to indicate the immediate vicinity of the reference point. Then the positioning speed is reduced to a low frequency. The second light beam then enables the precise and reproducible fine adjustment of the reference point.

### Type Ls01:



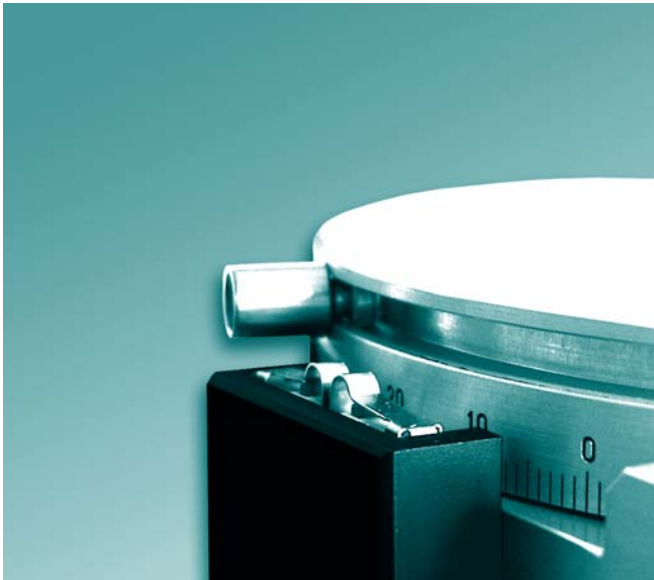
### Type Ls02:



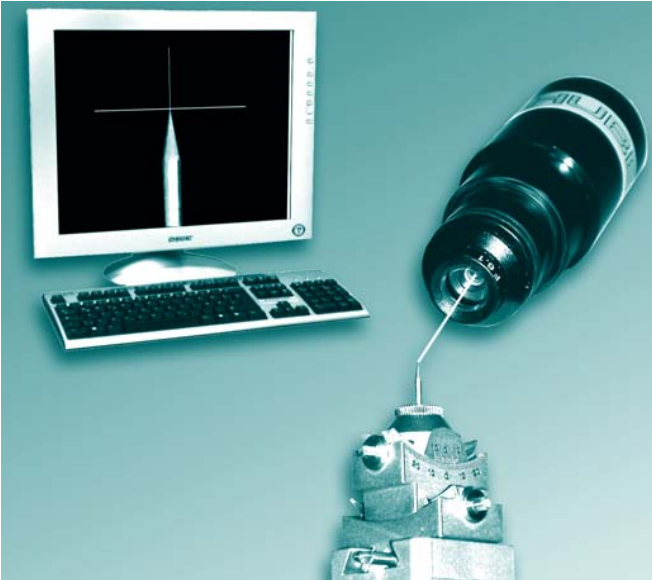
### Further versions:

Vacuum suitable

Radiation resistant







#### General information:

The Huber MiniVID microscope ocular camera enables smallest samples to be greatly magnified and displayed on a PC monitor or a video beamer.

This enables the simultaneous observation of a sample by a number of people, and is thus especially suitable e.g. for presentations.

On the other hand the use of the MiniVID in the adjustment microscope of the series 500 Euler cradles simplifies the adjustment of the sample significantly.

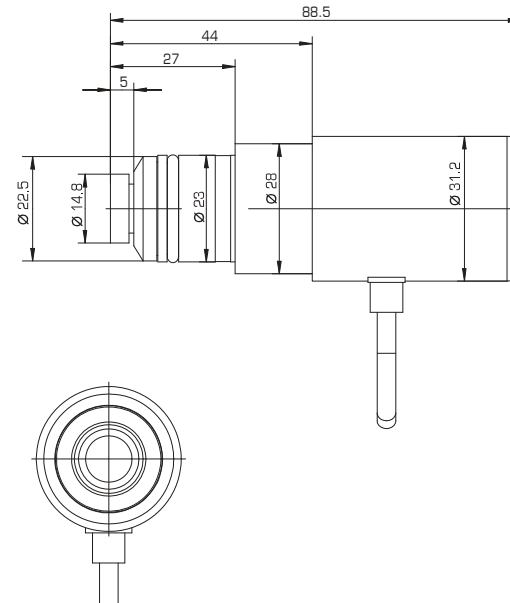
The MiniVID utilises up-to-date CCD camera technology and offers ideal performance at a reasonable price.

The MiniVID can be fit into the ocular mounting of all standard microscopes (23mm ocular) A 30mm adaptor is included.

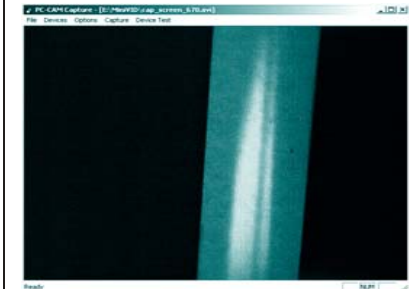
Of course the MiniVID can also be separately used as a stand-alone camera.

#### Technical data:

Connection:	USB Port
Operating system:	Windows 98, 2000, XP
Power supply:	USB-Port, 12V
Photosensitivity:	$\geq 5$ lux (!)
Resolution:	620 x 580 pixels
Chip:	1/3" color CMOS
Cable length:	1,8m
Accessories:	display and interface software (included) cross-hair generator



Huber microscope using MiniVID as an ocular camera  
Sample capillaries 0.3 mm (outer diameter)



MiniVID as a stand-alone camera. X-ray beam on a fluorescent foil showing sample capillary shadow



MiniVID as a stand-alone camera. Capillaries at 1500 K, heated by a diode laser.



### General information

The impulse counter CTR is a small module for registering and processing the output signals of an incremental encoder. The module comes equipped with a serial interface for programming and sampling of positional information as well as an interface for controlling the unit via the I/O signals of an SPS.

### Programming

The counter module can be controlled and programmed by ASCII-commands transmitted via the serial interface (see table below).

An SPS interface enables the module to be controlled via external I/O signals.

### Order      Function

#### Zählerkontrolle

S	start
Q	stop
C	clear
M	mode

#### Queries

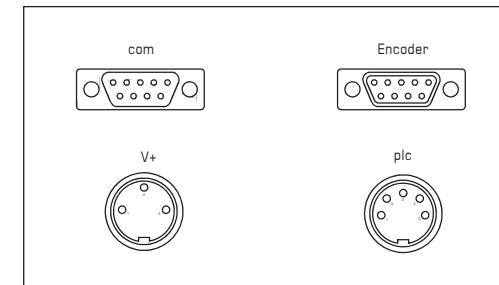
?P	position (counts)
?S	status
?M	mode
?V	firmware version

### Specifications

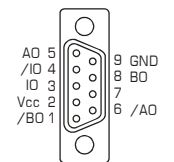
Dimensions [mm]:	170 x 105 x 60 (l x w x h)
Supply voltage:	5V DC, 250 mA
Display:	LCD display with 2 lines
Encoder input signals:	A, B, (RS422)
Interpolation:	1-, 2- or 4-fold
Max. input frequency:	1 MHz
Control signals (SPS):	start, stop, clear, mode
Communication interface:	serial (RS232)
Weight:	400 g
Ambient temperature:	0 °C...40 °C

### Pin assignments

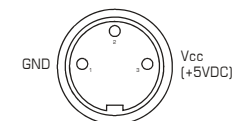
#### Connector view



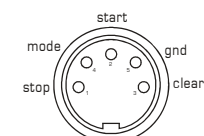
#### Encoder (RS422) 9-pin D-Sub plug



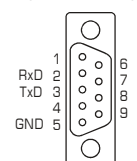
#### power supply



#### ext. control (PLC)



#### COM (RS232) 9-pin D-Sub plug



Parameters:  
9600-n-8-1



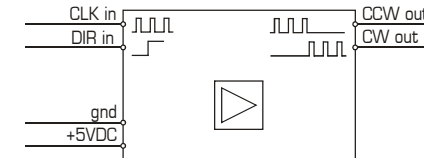
**General information**

The SC.1 is a compact module for the conversion of a TTL cycle/direction signal into a cw/ccw signal.

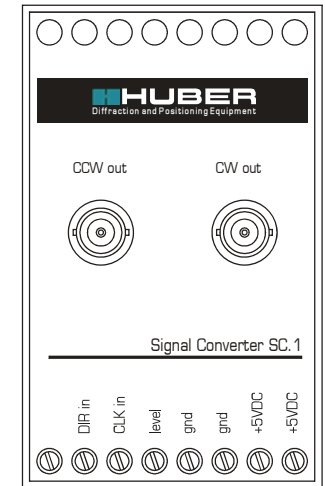
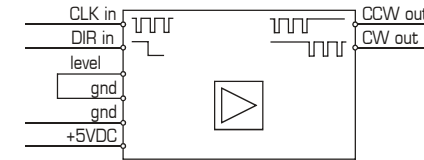
**Specifications**

Dimensions:	46 x 76 x 122 (w x h x d)
Weight:	100 g
Installation/Assembly:	DIN rail
Connection:	terminal strip
Input signal:	5V DC (TTL)
Max. input frequency:	500 kHz
Ambient temperature:	0 °C...40 °C

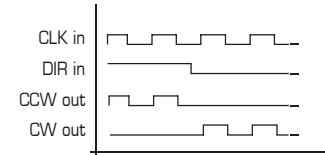
**Positive logic**



**Negative logic**



**Signal timing**





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