

# User's Manual

## XY-Stages series 5102

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Manual 5102\_en-A06

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The present product documentation was constructed and checked with biggest care. However, a guarantee with regard to accuracy can not be taken over. Specification changes reserve. These indications raise no claim to completeness. In doubtful case, please address to the Huber Diffraktions-technik GmbH & Co. KG.

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The following symbols will be used:

This symbol indicates a potential dangerous situation with consequential danger of personal injuries or damage to property.

This symbol indicates important information for proper operation. Ignoring this may result in malfunction of the equipment.

Liability does not apply to damages resulting from:

- Improper mounting, operation, service or storage
- Operation with damaged or inappropriately attached safety devices
- Unauthorized modifications of the XY-Stage and its accessories

Huber gives a two year warranty on mechanical and a one year warranty on electronic components from the date of shipment. In case of defect during warranty period, the XY-Stage will be either replaced or repaired at Huber.

Please be aware of the fact that warranty does not apply to damages resulting from improper use of the Stage:

- Improper handling
- Applying loads and torques exceeding the specified limits
- Mounting to a surface, which is not in accordance with the specified parameters
- Unauthorized modification of the XY-Stage or parts of it
- Removal of sealing-wax/sealing paint

**For warranty claims, write or call your local agent or get in touch with Huber directly.**

We hereby declare that the machinery is designed and built according to machinery directive 98/37/EC.

The XY-Stage is only a part of a machine. That the whole system corresponds to the valid EU directives, the required measures must be met by the manufacturer of the overall system

Products which were valued with an economic write-off are disposed after return in our works free of charge.

1.1 Symbols

1.2 Liability

1.3 Warranty

1.4 Conformity

1.5 Disposal

## 2.1 Environmental conditions



For optimum performance of your XY-Stage you should consider the following:

- **Temperature variation**  
Temperature variation (mainly caused by the stepper motor) during long term measurements affects the positioning accuracy due to thermal expansion of the driving shaft. To minimize the thermal power loss it is strongly recommended to keep the motor power supply as low as possible. Keep external temperature variations to a minimum.
- **Humidity**  
Some parts of the XY-Stage are not corrosion-resistant. To operate or to store the XY-Stage in damp environments would substantially impair the Stage in its operation, in the worst case make it unusable.
- **Handling**  
Handle the system only in clean environment (without dirt, dust, or metallic chips etc.).

## 2.2 Intended purpose



XY-Stages series 5102 are precision linear translation systems for positioning mechanical, optical or electronic set-ups or samples

All interaction on the XY-Stage as for example assembly, operation and maintenance should be exclusively performed by qualified personnel.

If modifications on the stage are required, please contact one of our representations or Huber directly.

## 2.3 Package



In case of return, the goods should be packed (if possible) in their original package to guarantee safe transportation. Keep the packaging carefully and store it in dry surroundings.

To support the protection of environment Huber takes care to use recyclable packing materials. Nevertheless the use of other package materials is partly inevitable in order to achieve best protection for the product during the transportation process. We ask for your understanding.

## 2.4 Loss of warranty claim



Damages during the return shipping caused by inappropriate package are upon shippers risk and void warranty claims.

**For motorized systems please, pay attention particularly to the following security indications:**

- The connection of the motor must be done by qualified personnel only
- Immediately switch off the motor power supply when:
  - the XY-Stage comes in contact with liquids
  - the motor emits smoke or smells
  - the motor emits unusual noise
  - the XY-Stage has been damaged

**In above mentioned cases, please, get in touch with one of our Huber representations or Huber directly.**

- The function of XY-Stages and corresponding assemblies may contain risks for the operators. You should consider the installation of a safety system to prevent persons from accessing the device during operation.
- Before working on the XY-Stage (making attachments etc.), please switch off the motor and disconnect the power supply.
- Injuries to health or material damages can occur from changes made to the device as for example removing safety covers.

## 2.5 Safety remarks





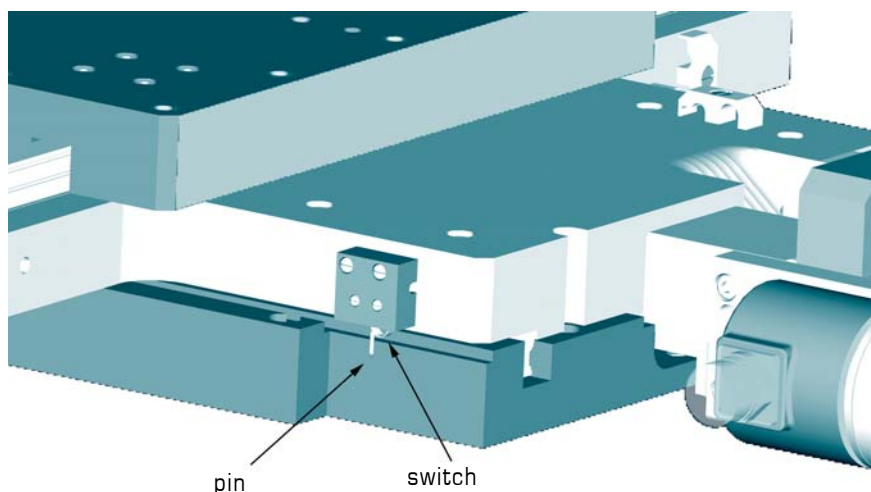


- The flatness of the mounting surface of parts to be adapted to the stage must not exceed 10 µm. Otherwise the system could warp, not keeping the guaranteed specifications
- When adapting parts on the XY-Stage always use proper screw lengths. Screws which exceed the length of the mounting holes might cause damage and malfunction of the XY-Stage.
- The hole pattern of the mounting surfaces of the XY-Stage and its support or setup needs to be identical. Otherwise the system could warp not keeping the guaranteed specifications.
- For motorized systems a circuit diagram is included in the shipment

All XY-Stages are equipped with mechanical limit switches at fixed positions to limit the travel range. A control unit should monitor the status of the connected switches permanently and stop the motor movement if the switch is triggered.

The switches are normally closed. If the pin (see drawing below) actuates the switch, the contact opens. This ensures that damaged cables or switches cannot cause safety problems.

**We strongly recommend to check the function of the limit switches frequently!!! Actuate the switch manually. You should hear a click. Check the function of the switches again manually with your control unit.**



### 3.1 Mounting



### 3.2 Adjustment of limit switches



In some case the switches are hidden by a limit switch housing. In order to access the switch you have to remove the housing by removing the indicated screws (see picture below).



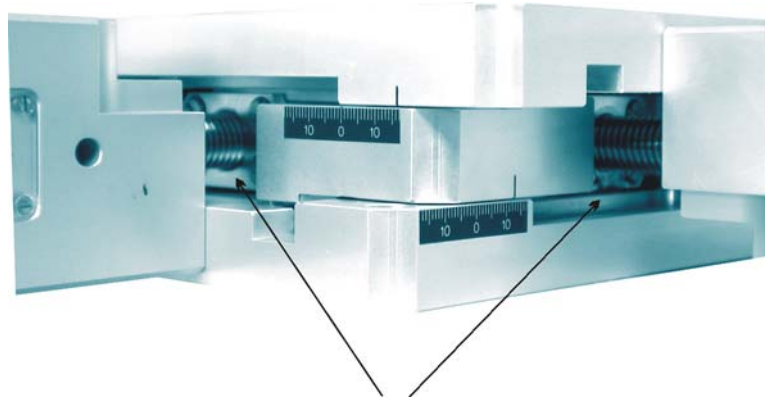
Under normal operating conditions, the Huber XY-Stages and their mechanical components do not require any service or maintenance. However, some operating conditions lead to increased strain on the driving mechanism of the stage as:

- extreme ambient conditions (humidity, temperature, dust)
- non horizontal mounting position
- uncompensated torque – unbalanced load
- very fast positioning over long distances - high speed operation
- oscillating over a small range

In this case please check the drive components (driving spindle, rail) frequently for sufficient lubrication.

Especially those areas on the spindle (see picture below) showing a blackening of the lubricant film should be lubricated. Remove old lubricant, if possible. Use a small brush and apply only a very small amount.

After lubrication move the stage several times over its full positioning range to spread the lubricant all over the worm gear. Even if you did not add any lubricant, we recommend this procedure from time to time.



**Before you start, please pay attention to the following indications:**

Always use lubricants of the same type. Mixing different types of lubricant may reduce or neutralize the lubricant effect. When required, please, contact Huber directly or one of our representations.

#### 4.1 Interval



#### 4.2 Lubrication

#### 4.3 Type of lubricant



## 5.1 Definition

### ■ Resolution

The minimum controllable motion interval that the system is capable of producing

The resolution depends on the following factors:

- motor-steps, encoder-signals per revolution
- spindle slope
- additional gear reduction with optional gear box

### ■ Accuracy

The maximum expected difference between the actual and the ideal (desired) position for a given input.

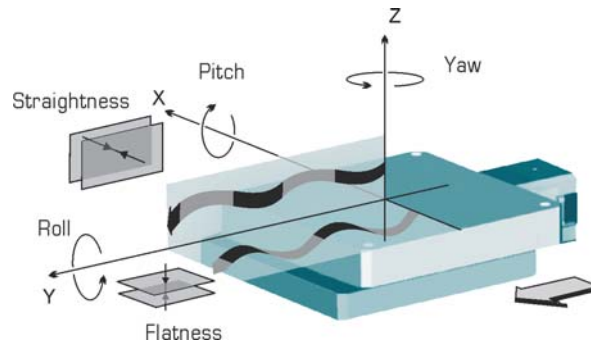
### ■ Repeatability

The ability of a device to return to a desired position from the same direction of movement

### ■ Reversal error

The difference in the absolute position of an object after travelling in one direction and then reversing to return by the opposite way.

■



## 5.2 Specification, load and dimension

### ■ Precision

Some of the XY-stages series 5102 have two precision classes as an option. The standard type corresponds to class X1. Class X2 is equipped with a higher precision spindle and guiding system.

### ■ Max. Load

A general statement concerning maximum loads during eccentric forces is only partially possible. However, we would calculate the maximum loads permitted for your specific application.

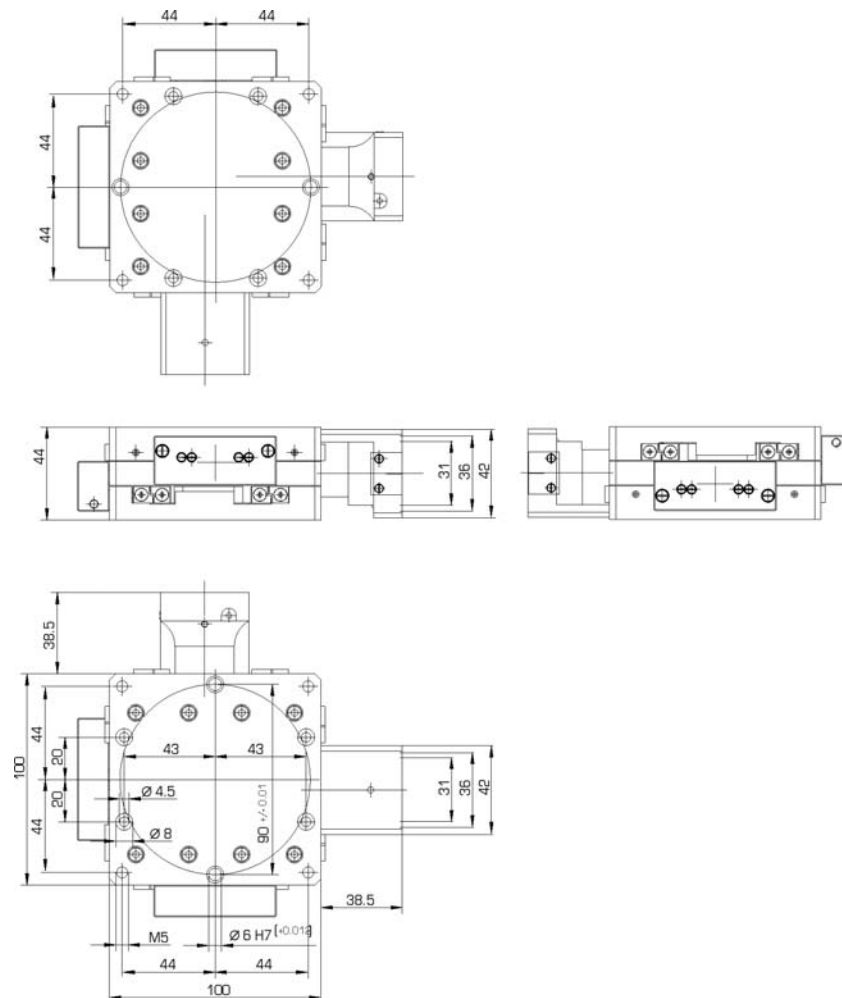
### Specification

Travel range X [mm]:	+/- 12
Travel range Y [mm]:	+/- 12
Material (base slide):	Aluminium
Slope [mm/rev.]	1
Minput (min) [Nm]:	0,2
Weight [kg]:	2,5
Stiffness ["/Nm]:	7
F(max) [N]:	500

Accuracy [":	<= +/- 15
Repeatability (unidir.) [ $\mu$ m]:	<= +/- 3
Reversal error [ $\mu$ m]:	5
Flatness [ $\mu$ m]:	<= +/-3
Straightness [ $\mu$ m]:	<= +/-3
Yaw [":	<= +/-5
Pich [":	<= +/-7
Roll [":	<= +/-7

■ 5102.10

### Dimension



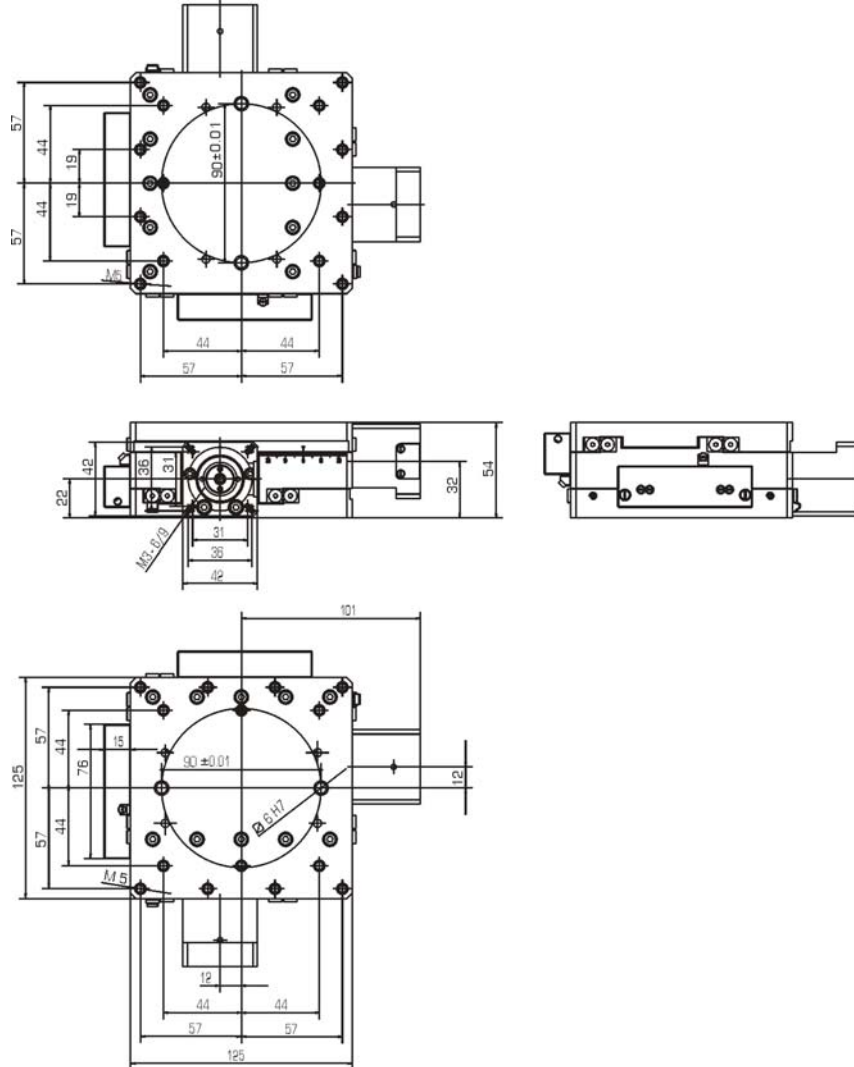
### Specification

Travel range X [mm]:	+/- 25
Travel range Y [mm]:	+/- 25
Material (base slide):	Aluminium
Slope [mm/rev.]	1
Minput (min) [Nm]:	0,3
Weight [kg]:	7,5
Stiffness ["/Nm]:	3
F(max) [N]:	500

Accuracy ["]:	<= +/- 14
Repeatability (unidir.) [µm]:	<= +/- 5
Reversal error [µm]:	4
Flatness [µm]:	<= +/-3
Straightness [µm]:	<= +/-3
Yaw ["]	<= +/-5
Pich ["]	<= +/-6
Roll ["]	<= +/-6

■ 5102.15

### Dimension





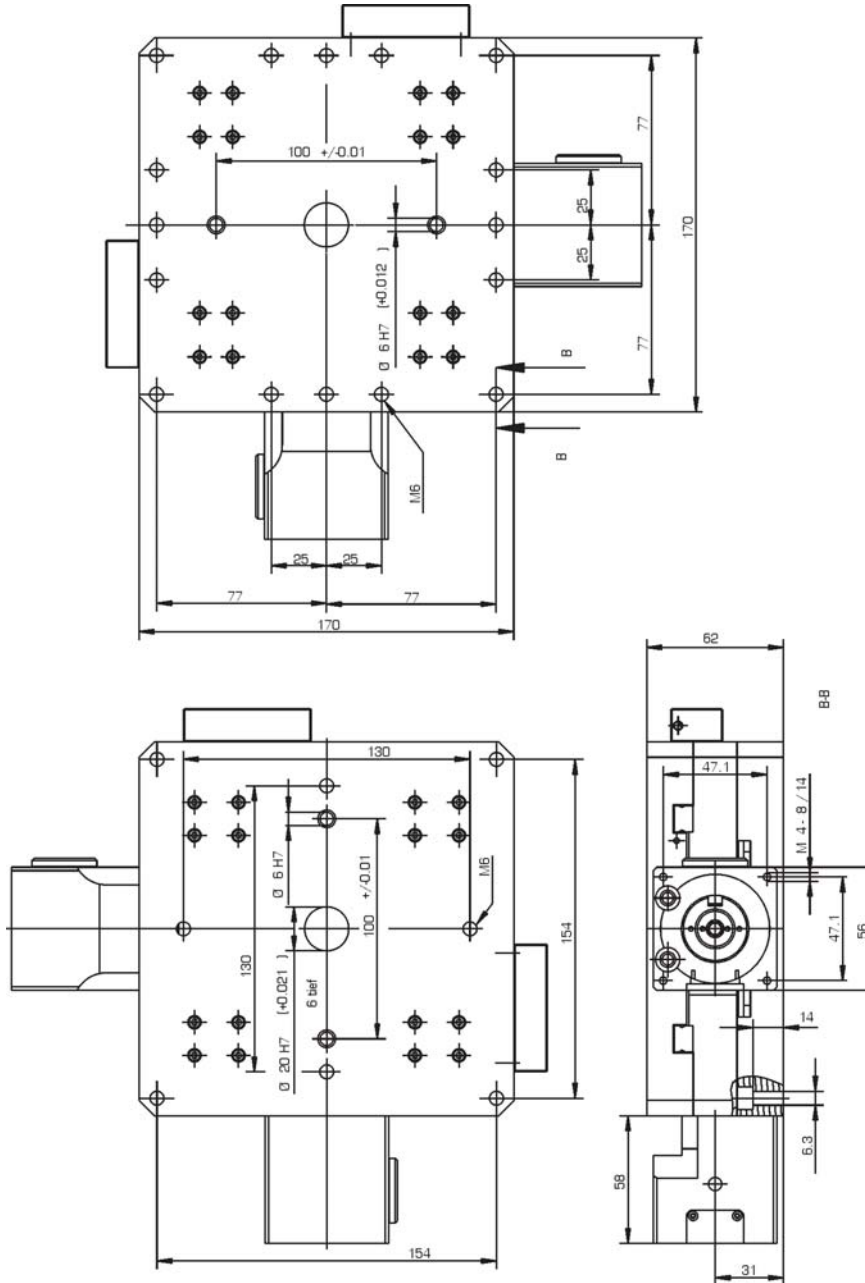
### Specification

Travel range X [mm]:	+/- 15
Travel range Y [mm]:	+/- 15
Material (base slide):	Aluminium
Slope [mm/rev.]	2
Minput (min) [Nm]:	0,3
Weight [kg]:	7,5
Stiffness ["/Nm]:	2
F(max) [N]:	2000

Accuracy ["]:	<= +/- 5
Repeatability (unidir.) [µm]:	<= +/- 2
Reversal error [µm]:	6
Flatness [µm]:	<= +/-2
Straightness [µm]:	<= +/-2
Yaw ["]	<= +/-6
Pich ["]	<= +/-6
Roll ["]	<= +/-6

■ 5102.20

Dimension



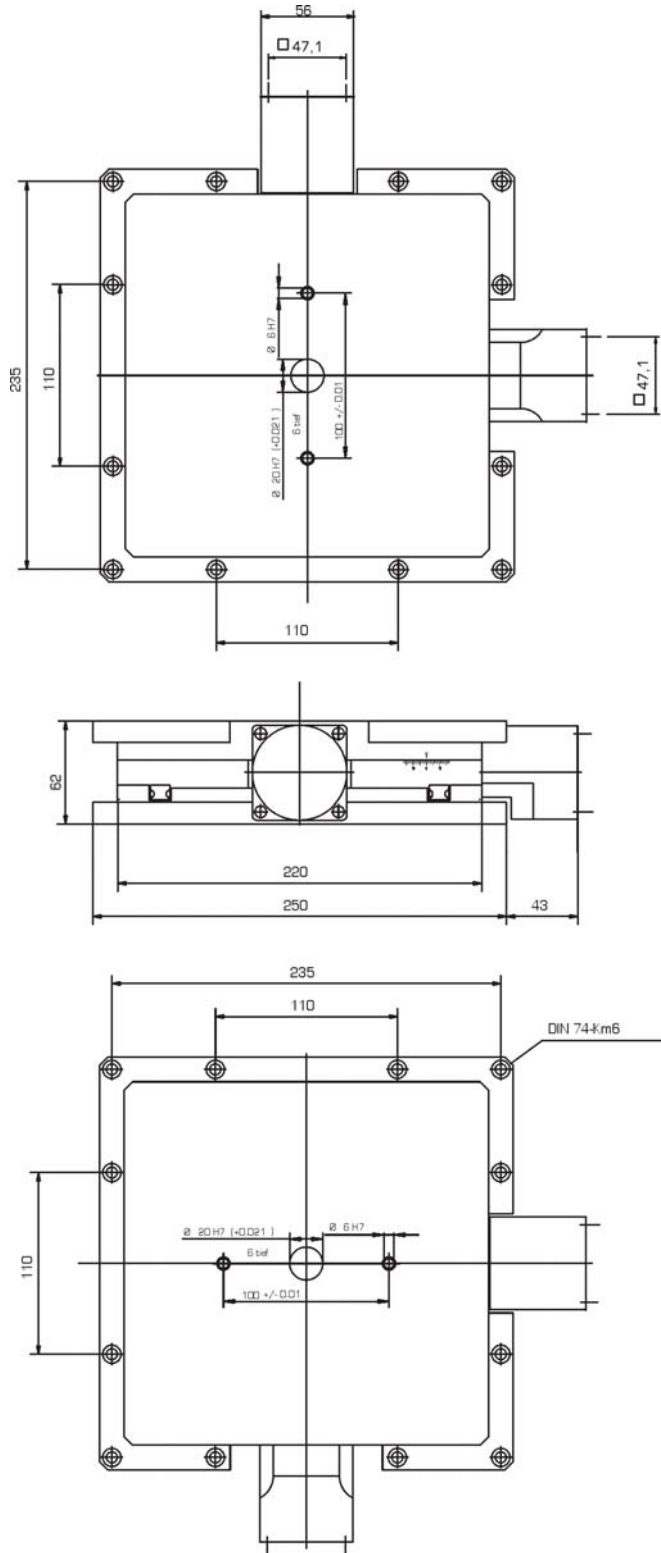
### Specification

Travel range X [mm]:	+/- 15
Travel range Y [mm]:	+/- 15
Material (base slide):	Aluminium
Slope [mm/rev.]	2
Minput (min) [Nm]:	0,5
Weight [kg]:	11
Stiffness ["/Nm]:	1
F(max) [N]:	2000

Accuracy [":	<= +/- 5
Repeatability (unidir.) [μm]:	<= +/- 2
Reversal error [μm]:	6
Flatness [μm]:	<= +/-2
Straightness [μm]:	<= +/-2
Yaw [":	<= +/-5
Pich [":	<= +/-5
Roll [":	<= +/-5


■ 5102.30

Dimension



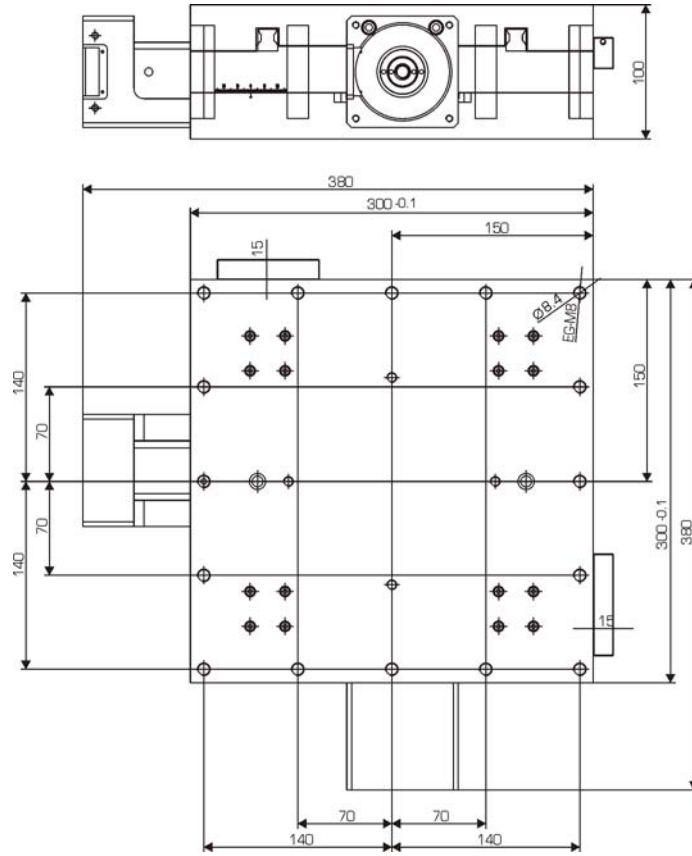
### Specification

Travel range X [mm]:	+/- 25
Travel range Y [mm]:	+/- 25
Material (base slide):	Aluminium
Slope [mm/rev.]	2
Minput (min) [Nm]:	1
Weight [kg]:	32
Stiffness ["/Nm]:	0,8
F(max) [N]:	3000

	
Accuracy ["]:	<= +/- 4
Repeatability (unidir.) [µm]:	<= +/- 2
Reversal error [µm']:	6
Flatness [µm]:	<= +/-2
Straightness [µm]:	<= +/-2
Yaw ["]	<= +/-4
Pich ["]	<= +/-4
Roll ["]	<= +/-4

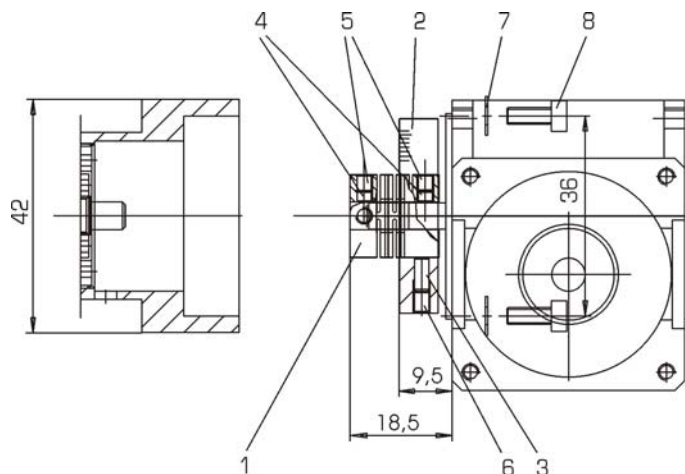
■ 5102.40

Dimension



Please note: Before you mount the gear box on the motor you should adapt the gear box to the positioning system.

- Fix the coupling (Pos. 1) on output shaft of gear box by tightening the corresponding set screw (Pos. 5 (2x)). Then push dial (Pos. 2) on coupling and tighten the set screws (Pos. 6). Pay attention to pressure pieces (Pos. 3/4)! The absence of this part leads to damage of the shaft or the mechanics.
- Push coupling with gear box on input shaft of the XY-Stage. Provide gear box with screws and washers (Pos. 8/7) and tighten the screws (Pos. 8) gently.
- Center the gear box by slight rotating motions around the XY-Stage axis. The threads of the screws (Pos. 8) should not touch the through holes of the gear box but should be well centered. Tighten the screws.
- Fix coupling on input shaft of gear box temporarily. Look through the mounting hole of the XY-Stage flange. Turn the coupling of the input shaft by hand until a set screw (Pos. 5) of the coupling (sitting on the output shaft) is visible. Tighten the set screw. Afterwards turn the coupling 90°. The second set screw is now visible. Tighten the set screw.
- Disassemble in reverse order.



Pos.	Amount	Type	Description
1	1	Coupling	O-60L (5 x 5 mm)
2	1	Dial	O-409.000-010
3	1	Pressure piece	Ø2,4 x 11 Ms58
4	4	Pressure piece	Ø2,4 x 2 Ms58
5	4	Set screw	DIN 913-M3 x 3
6	1	Set Screw	DIN 913-M3 x 4
7	4	Washer	DIN 988-3 x 6 x 1
8	4	Screw	DIN 912-M3 x 10

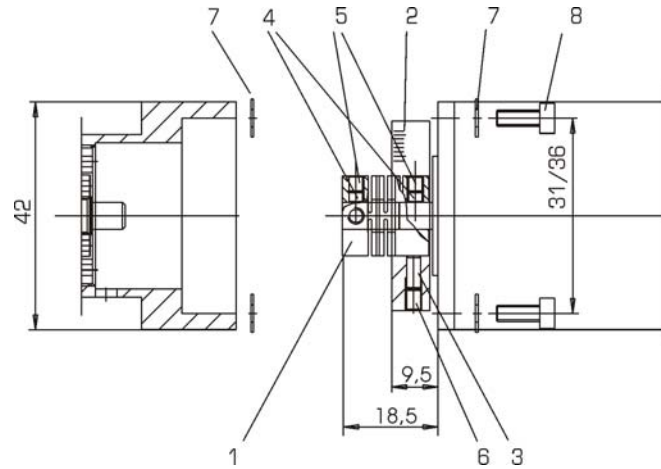
- Mounting of a Huber gearbox on

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■ Mounting of  
motor on

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5102.15

- Fix the coupling (Pos.1) on motor shaft by tightening the corresponding set screw (Pos. 5 (2x)). Then push dial (Pos. 2) on coupling and tighten the set screws (Pos. 6).  
Pay attention to pressure pieces (Pos. 3/4)! The absence of this part leads to damage of the shaft or the mechanics.
- Push coupling with motor on input shaft of the XY-Stage. Provide motor with screws and washers (Pos. 8/7) and tighten the screws (Pos. 8) gently.
- Center the motor by slight rotating motions around the XY-Stage axis. The threads of the screws (Pos. 8) should not touch the through holes of the motor but should be well centered. Tighten the screws.
- Unscrew the dial window of the stage. Look through the mounting hole of the XY-Stage flange. Turn the dial by hand until a set screw (Pos. 5) of the coupling is visible. Tighten the set screw. Afterwards turn the coupling 90°. The second set screw is now visible. Tighten the set screw and screw on the dial window.
- Disassemble in reverse order.

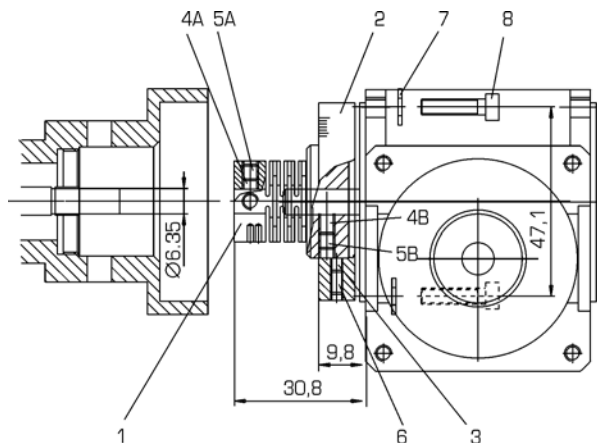


Pos.	Amount	Type	Description
1	1	Coupling	O-60L (5 x 5 mm)
2	1	Dial	O-409.000-010
3	1	Pressure piece	Ø2,4 x 11 Ms58
4	4	Pressure piece	Ø2,4 x 2 Ms58
5	4	Set screw	DIN 913-M3 x 3
6	1	Set Screw	DIN 913-M3 x 4
7	8	Washer	DIN 988-3 x 6 x 1
8	4	Screw	DIN 912-M3 x 10



Please note: Before you mount the gear box on the motor you should adapt the gear box to the positioning system.

- Fix the coupling (Pos. 1) on output shaft of gear box by tightening the corresponding set screw (Pos. 5B (2x)). Then push dial (Pos. 2) on coupling and tighten the set screws (Pos. 6). Pay attention to pressure pieces (Pos. 3/4A/4B)! The absence of this part leads to damage of the shaft or the mechanics.
- Push coupling with gear box on input shaft of the XY-Stage. Provide gear box with screws and washers (Pos. 8/7) and tighten the screws (Pos. 8) gently.
- Center the gear box by slight rotating motions around the XY-Stage axis. The threads of the screws (Pos. 8) should not touch the through holes of the gear box but should be well centered. Tighten the screws.
- Fix coupling on input shaft of gear box temporarily. Look through the mounting hole of the XY-Stage flange. Turn the coupling of the input shaft by hand until a set screw (Pos. 5A) of the coupling (sitting on the output shaft) is visible. Tighten the set screw. Afterwards turn the coupling 90°. The second set screw is now visible. Tighten the set screw.
- Disassemble in reverse order.



Pos.	Amount	Type	Description
1	1	Coupling	O-63L (6,35 x 6,35 n
2	1	Dial	O-54
3	1	Pressure piece	Ø2,4 x 2 Ms58
4A	2	Pressure piece	Ø3 x 2 Ms58
4B	2	Pressure piece	Ø3 x 4 Ms58
5A	2	Set screw	DIN 913-M4 x 4
5B	2	Set screw	DIN 913-M4 x 6
6	1	Set screw	DIN 913-M3 x 6
7	4	Washer	DIN 988-4 x 8 x 1
8	4	Screw	DIN 912-M4 x 14

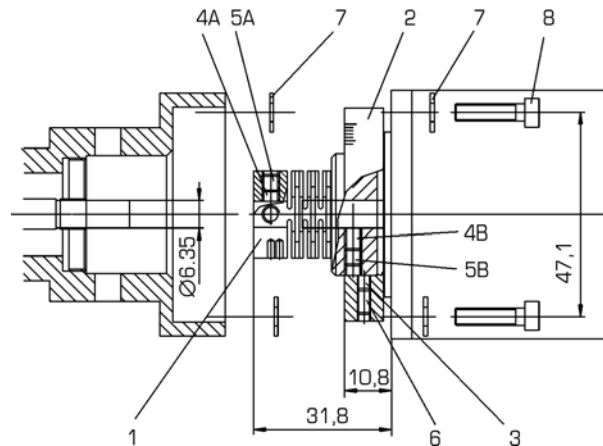
- Mounting of a Huber gearbox on

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■ Mounting of  
motor on

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- Fix the coupling (Pos.1) on motor shaft by tightening the corresponding set screw (Pos. 5B (2x)). Then push dial (Pos. 2) on coupling and tighten the set screws (Pos. 6).  
Pay attention to pressure pieces (Pos. 3/4A/4B)! The absence of this part leads to damage of the shaft or the mechanics.
- Push coupling with motor on input shaft of the XY-Stage. Provide motor with screws and washers (Pos. 8/7) and tighten the screws (Pos. 8) gently.
- Center the motor by slight rotating motions around the XY-Stage axis. The threads of the screws (Pos. 8) should not touch the through holes of the motor but should be well centered. Tighten the screws.
- Unscrew the dial window of the stage. Look through the mounting hole of the XY-Stage flange. Turn the dial by hand until a set screw (Pos. 5A) of the coupling is visible. Tighten the set screw. Afterwards turn the coupling 90°. The second set screw is now visible. Tighten the set screw and screw on the dial window.
- Disassemble in reverse order.

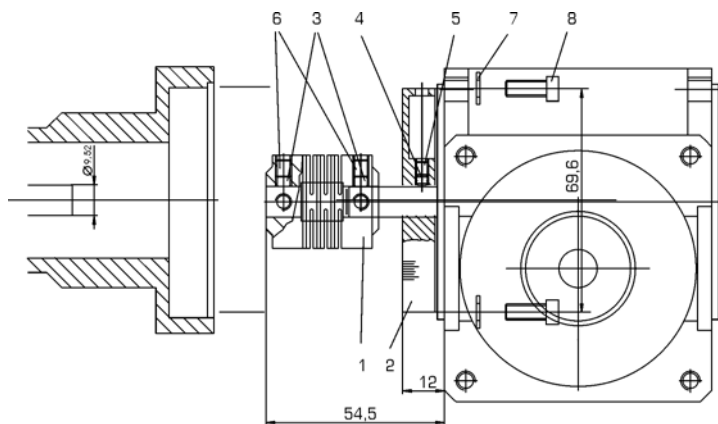


Pos.	Amount	Type	Description
1	1	Coupling	O-63L (6,35 x 6,35 mm)
2	1	Dial	O-54
3	1	Pressure piece	Ø2,4 x 2 Ms58
4A	2	Pressure piece	Ø3 x 2 Ms58
4B	2	Pressure piece	Ø3 x 4 Ms58
5A	2	Set screw	DIN 913-M4 x 4
5B	2	Set screw	DIN 913-M4 x 6
6	1	Set screw	DIN 913-M3 x 6
7	8	Washer	DIN 988-4 x 8 x 1
8	4	Screw	DIN 912-M4 x 14

B  
e  
i

**Please note:** Before you mount the gear box on the motor you should adapt the gear box to the positioning system.

- Fix the dial (Pos.2) on output shaft of gearbox by tightening the corresponding set screw (Pos. 5). Then push coupling (Pos. 1) on gear shaft and tighten the set screws (Pos. 6) (2x).  
**Pay attention to pressure pieces (Pos. 3/4)! The absence of this part leads to damage of the shaft or the mechanics.**
- Push coupling with gear box on input shaft of the XY-Stage. Provide gear box with screws and washers (Pos. 8/7) and tighten the screws (Pos. 8) gently.
- Center the gear box by slight rotating motions around the XY-Stage axis. The threads of the screws (Pos. 8) should not touch the through holes of the gear box but should be well centered. Tighten the screws.
- Fix coupling on input shaft of gear box temporarily. Look through the mounting hole of the XY-Stage flange. Turn the coupling of the input shaft by hand until a set screw (Pos. 6) of the coupling (sitting on the output shaft) is visible. Tighten the set screw. Afterwards turn the coupling 90°. The second set screw is now visible. Tighten the set screw.
- Disassemble in reverse order.



Pos.	Amount	Type	Description
1	1	Coupling	O-61L (9,52 x 9,52 mm)
2	1	Dial	O-87
3	4	Pressure piece	Ø4 x 2 Ms58
4	1	Pressure piece	Ø3 x 2 Ms58
5	1	Set screw	DIN 913-M4 x 8
6	4	Set screw	DIN 913-M5 x 6
7	4	Washer	DIN 988-5 x 10 x 1
8	4	Screw	DIN 912-M5 x 16

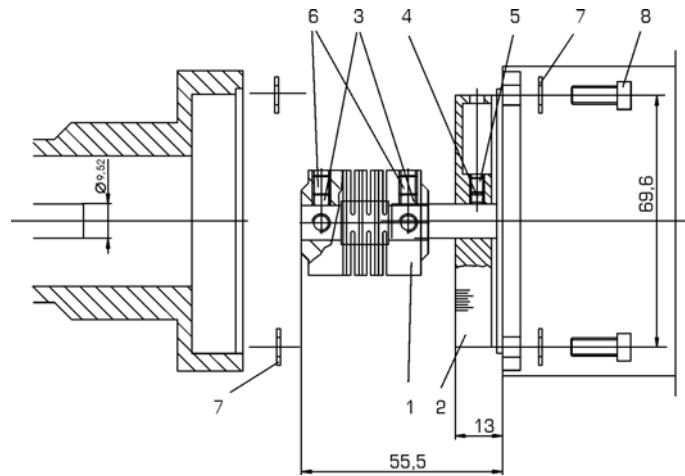
- Mounting of a Huber gearbox on

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■ Mounting of  
motor on

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- Fix the dial (Pos. 2) on motor shaft by tightening the corresponding set screws (Pos. 5)). Then push coupling (Pos. 1) on motor shaft and tighten the set screws (Pos. 6 (2x)).  
**Pay attention to pressure pieces (Pos. 3/4)! The absence of this part leads to damage of the shaft or the mechanics.**
- Push coupling with motor on XY-Stage shaft. Provide motor with screws and washers (Pos. 8/7) and tighten the screws (Pos. 8) gently.
- Center the motor by slight rotating motions around the motor axis. The threads of the screws (Pos. 8) should not touch the through holes of the motor but should be well centered. Tighten the screws.
- Unscrew the dial window of the XY-Stage. Look through the mounting hole of the XY-Stage flange. Turn the dial by hand until a set screw (Pos. 6) of the coupling is visible. Tighten the set screw. Afterwards turn the dial 90°. The second set screw is now visible. Tighten the set screw and screw on the dial window.
- Disassemble in reverse order.



Pos.	Amount	Type	Description
1	1	Coupling	O-61L (9,52 x 9,52 mm)
2	1	Dial	O-87
3	4	Pressure piece	Ø4 x 2 Ms58
4	1	Pressure piece	Ø3 x 2 Ms58
5	1	Set screw	DIN 913-M4 x 8
6	4	Set screw	DIN 913-M5 x 6
7	8	Washer	DIN 988-5 x 10 x 1
8	4	Screw	DIN 912-M5 x 16