

User's Manual

Z-Stages series 5103

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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 Diffraktionstechnik GmbH & Co. KG.

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The following symbols will be used:

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

This symbol indicates important information for proper operation. Ignoring this may result in malfunction on 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 Z-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 Z-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 Z-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 Z-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 Z-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 the 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
Parts of the Z-Stage are not corrosion-resistant. To operate or to store the Z-Stage in damp environment 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



Z-Stages series 5103 are precision linear translation systems for positioning mechanical, optical or electronic set-ups or samples.

All interaction on the Z-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 Packaging



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

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

- The function of Z-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 Z-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 Z-Stage always use proper screw lengths. Screws which exceed the length of the mounting holes might cause damage and malfunction of the stage.
- The hole pattern of the mounting surfaces of the Z-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 Z-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 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



4.1 Interval



Under normal operating conditions, the Huber Z-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:

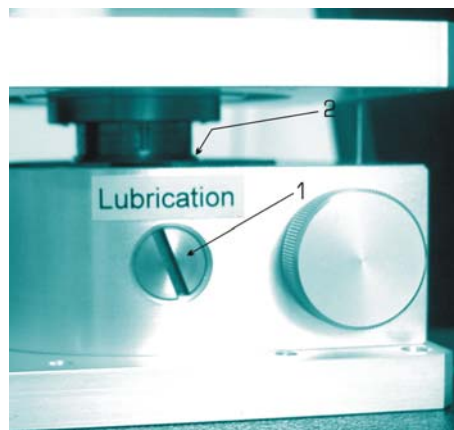
- extreme ambient conditions (humidity, temperature, dust)
- non horizontal mounting position
- uncompensated torque – unbalanced load
- very fast positioning over long distances - high speed operation
- oscillating over a small range

In this case please check the drive components (worm shaft, worm wheel) frequently for sufficient lubrication.

4.2 Lubrication

For visual inspection of the worm shaft (Pos. 2, see picture below) drive the top plate to its maximum position. Afterwards remove the lubrication cover (Pos. 1). Especially those areas on the tothing 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 Z-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.



4.3 Type of lubricant



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.

- 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
- gear reduction of the stage
- additional gear reduction with optional gear box

- Accuracy

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

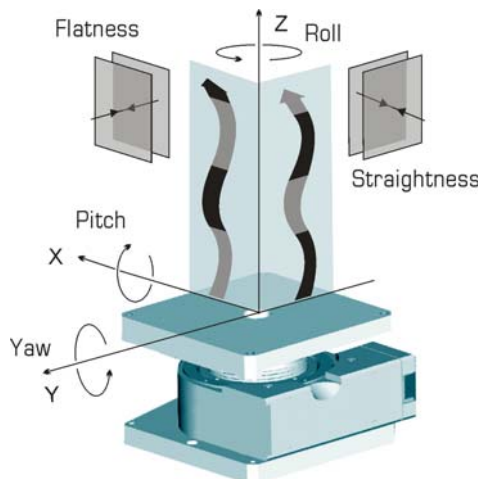
- Repeatability

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

- Reversal error

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

-



- Max. Load

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

5.1 Definition

5.2 Specification, load and dimension



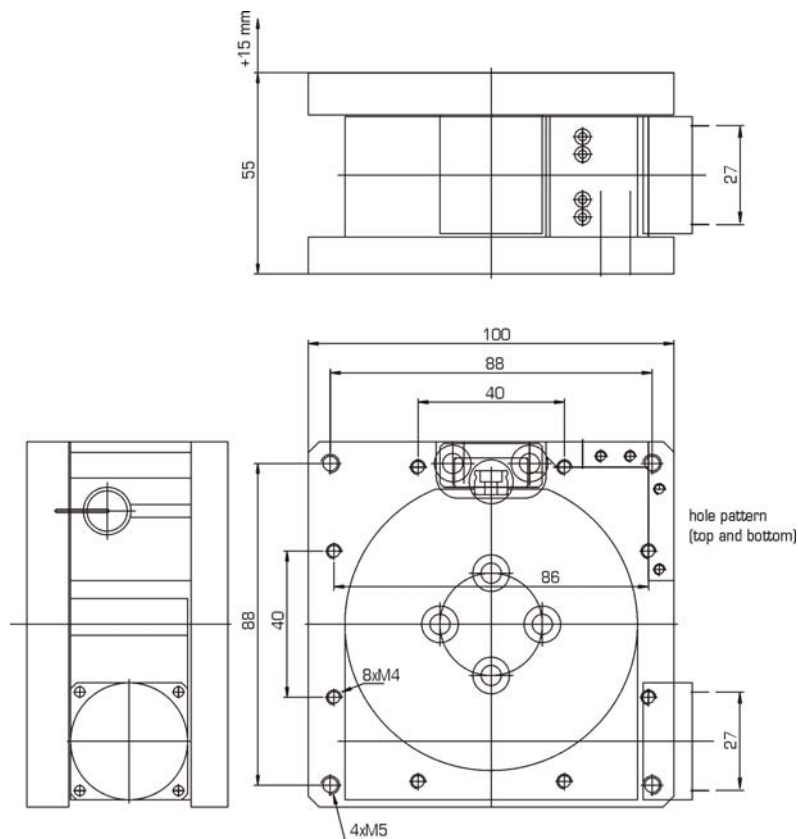
Spezifikation

| | |
|------------------------|-----------|
| Travel range [mm]: | 15 |
| Material (base/slide): | Aluminium |
| Slope [mm/rev.] | 0,02 |
| Mininput (min) [Nm]: | 0,3 |
| Weight [kg]: | 18"/Nm |
| Stiffness ["/Nm]: | 12 |
| F(max) [N]: | 300 |

■ 5103.10

| | |
|--|---------------|
| Accuracy [μm]: | $\leq \pm 7$ |
| Repeatability (unidir.) [μm]: | $\leq \pm 3$ |
| Reversal Error [μm]: | ≤ 10 |
| Faltness [μm]: | $\leq \pm 12$ |
| Straightness [μm]: | $\leq \pm 12$ |
| Yaw ["] | $\leq \pm 14$ |
| Pich ["] | $\leq \pm 14$ |
| Roll ["] | $\leq \pm 14$ |

Dimension

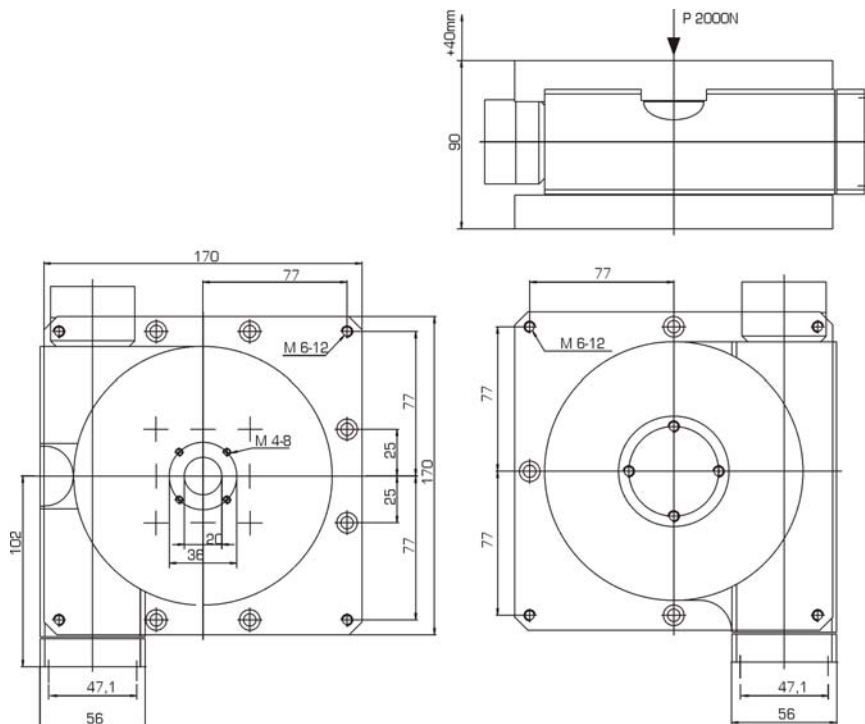


Specification

| | |
|------------------------|-----------|
| Travel range X [mm]: | 40 |
| Material (base slide): | Aluminium |
| Slope [mm/rev.] | 0,02 |
| Minput (min) [Nm]: | 0,3 |
| Weight [kg]: | 7,5 |
| Stiffness ["/Nm]: | 1,5 |
| F(max) [N]: | 1500 |

| | |
|--|--------------|
| Accuracy ["]: | $\leq \pm 5$ |
| Repeatability (unidir.) [μm]: | $\leq \pm 3$ |
| Reversal error [$\mu\text{m}'$]: | 7 |
| Flatness [μm]: | $\leq \pm 4$ |
| Straightness [μm]: | $\leq \pm 4$ |
| Yaw ["] | $\leq \pm 6$ |
| Pich ["] | $\leq \pm 6$ |
| Roll ["] | $\leq \pm 8$ |

Dimension



■ 5103.20

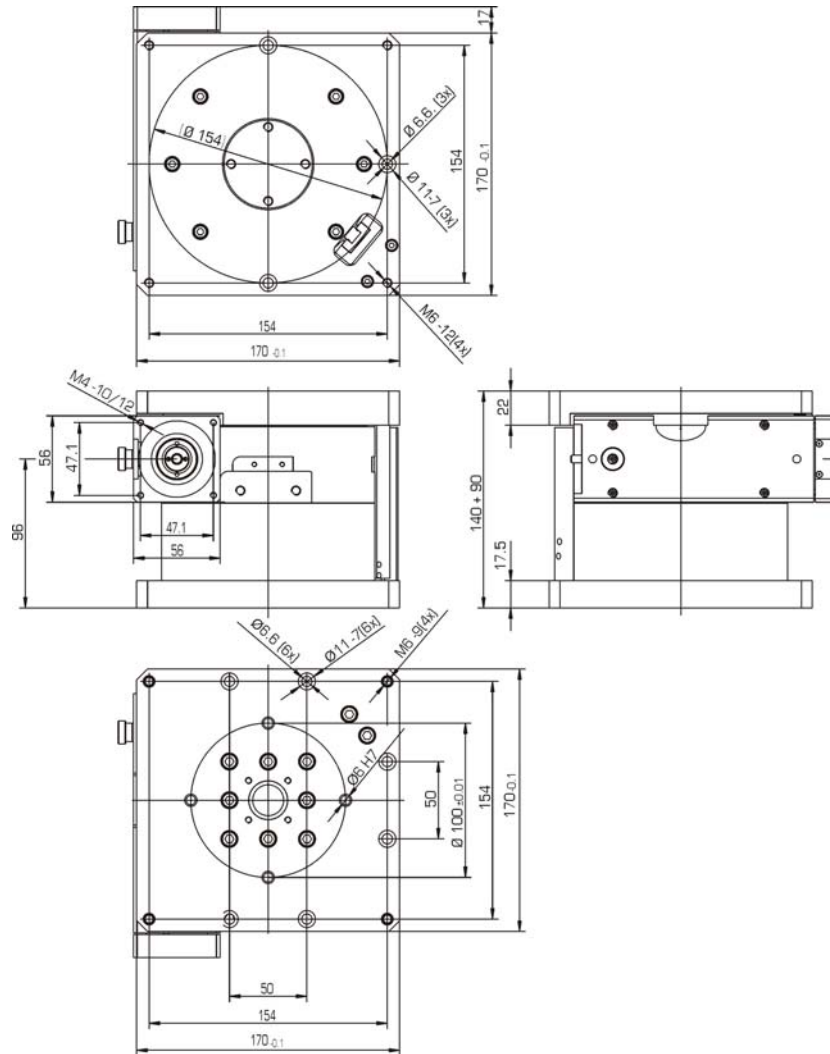
Specification

| | |
|------------------------|-----------|
| Travel range X [mm]: | 90 |
| Material (base slide): | Aluminium |
| Slope [mm/rev.]: | 0,02 |
| Minput (min) [Nm]: | 0,3 |
| Weight [kg]: | 11 |
| Stiffness ["/Nm]: | 2,5 |
| F(max) [N]: | 1500 |

| | |
|--|---------------|
| Accuracy [": | $\leq \pm 5$ |
| Repeatability (unidir.) [μm]: | $\leq \pm 3$ |
| Reversal error [μm]: | 9 |
| Flatness [μm]: | $\leq \pm 7$ |
| Straightness [μm]: | $\leq \pm 7$ |
| Yaw [": | $\leq \pm 8$ |
| Pich [": | $\leq \pm 8$ |
| Roll [": | $\leq \pm 10$ |

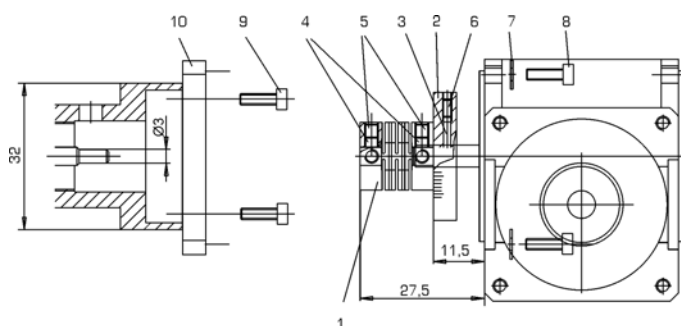
■ 5103.20-90

Dimension



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

- Please mount adapter plate (Pos. 10) on flange of Z-Stage 5103.10 with four screws (Pos. 9).
- Fix the dial (Pos.2) on output shaft of gear box by tightening the corresponding set screw (Pos. 6). Then push coupling (Pos. 1) on gear shaft and tighten the set screws (Pos. 5) (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 Z-Stage. Provide gear box with screws and washers (Pos. 8/7) and tighten the screws (Pos. 8) gently.
- Centre the gear box by slight rotating motions around the Z-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 Z-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 (3 x 4mm) |
| 2 | 1 | Dial | O-408.000-007 |
| 3 | 1 | Pressure piece | Ø1,5 x 6,5 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-M2 x 4 |
| 7 | 4 | Washer | DIN 988-3 x 6 x 1 |
| 8 | 4 | Screw | DIN 912-M2,5 x 8 |
| 9 | 4 | Screw | DIN 84-M2,5 x 6 |
| 10 | 1 | Adapter | M301.301-001 |

■ Mounting of a
Huber gearbox
on

5103.10

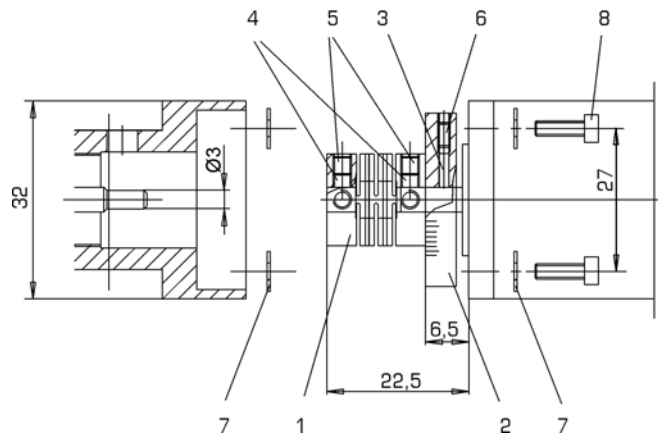


- Mounting of motor on

5103.10



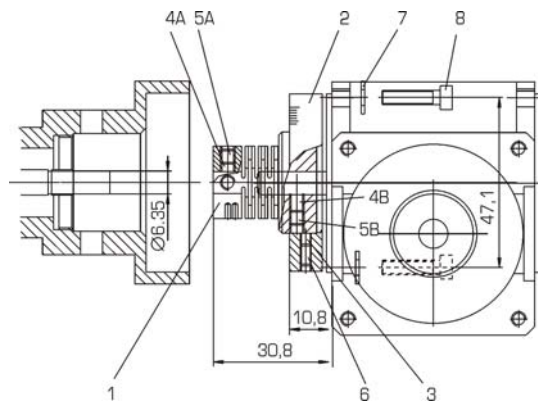
- Fix the dial (Pos. 2) on motor shaft by tightening the corresponding set screws (Pos. 6). Then push coupling (Pos. 1) on motor shaft and tighten the set screws (Pos. 5 (2x)).
Pay attention to pressure pieces (Pos. 3/4)! The absence of this part leads to damage of the shaft or the mechanics.
- Push coupling with motor on Z-Stage shaft. Provide motor with screws and washers (Pos. 8/7) and tighten the screws (Pos. 8) gently.
- Centre 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 Z-Satge. Look through the mounting hole of the Z-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 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-60L (3 x 4mm) |
| 2 | 1 | Dial | O-408.000-007 |
| 3 | 1 | Pressure piece | Ø1,5 x 6,5 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-M2 x 4 |
| 7 | 8 | Washer | DIN 988-3 x 6 x 1 |
| 8 | 4 | Screw | DIN 912-M2,5 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 Z-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 Z-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 Z-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-63L (6,35 x 6,35mm) |
| 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 gearbox on

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5103.20-90

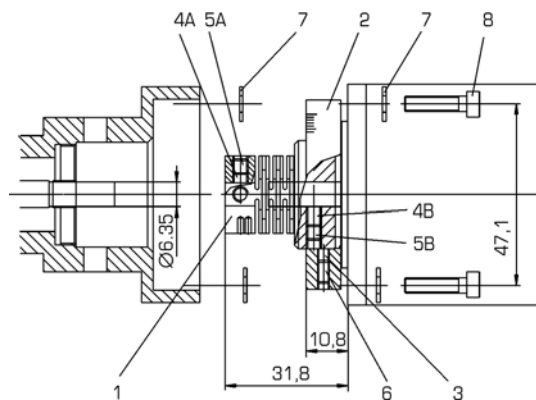


■ Mounting of motor on

5103.20-40
5103.20-90

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- Fix the coupling (Pos. 1) on motor shaft by tightening the corresponding set screws (Pos. 5B (2x)). Then push dial (Pos. 2) on motor shaft and tighten the set screw (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 the Z-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 Stage. Look through the mounting hole of the Z-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 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-63L (6,35 x 6,35mm) |
| 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 |