V-308.753030

Voice coil PIFOC high dynamics focus drive

PI

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Original instructions
First printing: 30.08.2021
Document number: V308UM0001EN, KSch

Subject to change. This manual is superseded by any new release. The latest respective release is available for download (p. 7) on our website.

Contents

About this Document

Objective and Target Audience of this User Manual

This document contains the information on using the V-308 as intended.

It assumes that the reader has a fundamental understanding of basic servo systems as well as motion control concepts and applicable safety procedures.

Symbols and Typographic Conventions

The following symbols and typographic conventions are used in this document:

DANGER
Imminently hazardous situation If not avoided, the hazardous situation will result in death or serious injury. ➢ Actions to take to avoid the situation

CAUTION
Dangerous situation If not avoided, the dangerous situation will result in minor injury. ➢ Actions to take to avoid the situation.

NOTICE
Dangerous situation If not avoided, the dangerous situation will result in damage to the equipment. ➢ Actions to take to avoid the situation.

INFORMATION
Information for easier handling, tricks, tips, etc.

Symbol/Label	Meaning
1. 2.	Action consisting of several steps whose sequential order must be observed
➢	Action consisting of one or several steps whose sequential order is irrelevant
•	List item
p. 5	Cross-reference to page 5
⚠ 🚫❤ ⚠ ⚠	Warning signs affixed to the product that refers to detailed information in this manual.

Figures

For better understandability, the colors, proportions and degree of detail in illustrations can deviate from the actual circumstances. Photographic illustrations may also differ and must not be seen as guaranteed properties.

Other Applicable Documents

The devices and software tools that are mentioned in this user manual note are described in their own manuals.

Product	Document
C-414 PIMag® motion controller	MS254E user manual
G-910.RC0242200 motion controller*	G910M0001EN user manual

* This G-910 controller includes components from ACS.

For the electronics from ACS:

Product number	Document
SP+EC motion controller	SPiiPlusEC Installation Guide ACSPL+ Commands & Variables Reference Guide ACSPL+ Programmer's Guide
NPMpm (NanoPWM incl.)	NPMpm Installation Guide

INFORMATION

- Each product from ACS is delivered with information for download.
- You always load the complete software package from the ACS page, which also contains all user information (product guides, data sheets, etc.):
  https://www.acsmotioncontrol.com/downloads
- Individual documents can also be downloaded from the respective product page at ACS.
- Note that only the product name is relevant but not the complete product number: For example, ECMsm instead of ECMsm-4B40N-NNNNN. Therefore, there is one product guide for all ECMsmXXXXXX models.
- Further information can be found in ACS's knowledge center after login:
  https://www.acsmotioncontrol.com/knowledge-center
- When you have installed the software on your host PC you can find basic trainings in the "<ACS installation directory>\Training\Training Presentations".

Downloading Manuals

INFORMATION

If a manual is missing or problems occur with downloading:

➢ Contact our customer service department (p. 40).

1. Open the website **www.pi.ws**.
2. Search the website for the product number (e.g., C-414).
3. Click the corresponding product to open the product detail page.
4. Click *Downloads*.

   The manuals are shown under Documentation.
5. Click the desired manual and fill out the inquiry form.

   The download link will then be sent to the email address entered.

Safety

Intended Use

The V-308.753030 is a laboratory device as defined by DIN EN 61010-1. It is intended for indoor use and use in an environment which is free of dirt, oil, and lubricants.

The V-308.753030 is intended for positioning, adjusting and shifting loads in one axis at various velocities. It is not intended for applications in areas in which a failure would present severe risks to human beings or the environment.

The vertical orientation of the V-308.753030's motion axis is the preferred orientation. Horizontal orientation of the motion axis is possible, as well.

The intended use of the V-308.753030 is only possible when installed and in conjunction with a suitable controller. The controller is not included in the scope of delivery of the V-308.753030.

The V-308.753030 may not be used for purposes other than those stated in this user manual. The V-308.753030 may only be used in compliance with the technical specifications and instructions in this user manual.

General Safety Instructions

The V-308.753030 contains permanent magnets that could impair the function of heart pacemakers and electronic implants.

➢ Make sure that people with heart pacemakers and / or electronic implants do not have access to the V-308.753030.

The magnets in the V-308.753030 can damage parts susceptible to magnetic influences, e.g., magnetic data carriers and electronic devices.

➢ Make sure that there are no objects sensitive to magnets within a radius of at least 10 cm around the V-308.753030.

The magnets in the V-308.753030 can attract magnetizable parts, e.g., loose screws. Objects attracted can damage the V-308.753030.

➢ Make sure that there are no movable, magnetizable objects within a radius of at least 10 cm around the V-308.753030.

Mechanical forces can destroy the V-308.753030.

➢ Avoid knocks that affect the V-308.753030.

➢ Do not drop the V-308.753030.

The V-308.753030 is built according to state-of-the-art technology and recognized safety standards. Improper use can result in personal injury and/or damage to the V-308.753030.

➢ Use the V-308.753030 for its intended purpose only, and only when it is in perfect technical condition.

➢ Read the user manual.

➢ Eliminate any malfunctions that may affect safety immediately.

The operator is responsible for the correct installation and operation of the V-308.753030.

Organizational Measures

User manual

➢ Always keep this user manual available with the V-308.753030.

➢ Add all information given by the manufacturer to the user manual, for example supplements or technical notes.

➢ If you give the V-308.753030 to other users, also include this user manual as well as other relevant information provided by the manufacturer.

➢ Always work according to the complete user manual. If your user manual is incomplete and is therefore missing important information, damage to equipment can result.

➢ Install and operate the V-308.753030 only after you have read and understood this user manual.

Personnel qualification

The V-308.753030 may only be installed, started up, operated, maintained, and cleaned by authorized and appropriately qualified personnel.

Product Description

Product Labeling
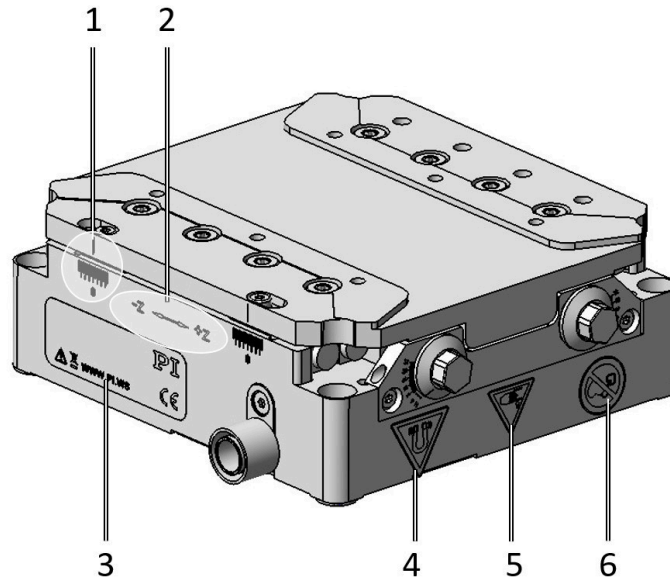
Figure 1:   Product labels on the V-308.753030

1   Scale for travel range
2   Direction of motion
3   Type plate
4   Warning symbol "Magnetic field"
5   Warning symbol "Risk of crushing"
6   Prohibition sign for heart pacemakers, defibrillators, and other active implants)

Type Plate
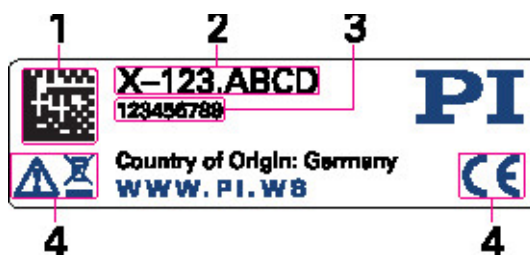
Figure 2:   Type plate of the V-308.753030

1   Data matrix code (example; contains the serial number)
2   Product number (example)
3   Serial number (example), individual for each V-308.753030
      Meaning of the position (counting from the left):
      1 = internal information,
      2 and 3 = year of manufacture,
      4 to 9 = consecutive numbers
4   Warning and conformity symbols (old equipment disposal (p. 49), CE mark (p. 52))

Scope of Delivery

Item number	Component
V-308.753030	Product according to order, including mounting materials: ▪ Hex key, AF 0.9, for adjusting the weight force compensation ▪ Wrench, see Figure 14 on p. 28, for adjusting the weight force compensation ▪ TX 6 screwdriver, for adjusting the travel range
V308UM0001EN	User manual (this document), in printed form
V308T0002	Installation guide

Overview
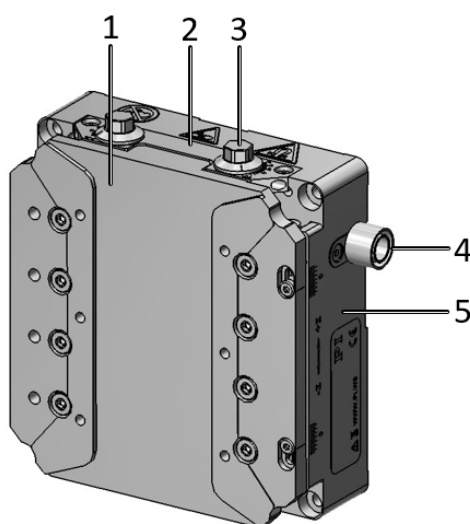
Figure 3:   Product view of the V-308.753030

1   Motion platform (movable part)
2   Weight force compensation
3   1 of 2 rotary knobs for adjustment of weight force compensation
4   Cable exit for drive and sensor connector (HD D-sub 26 (m))
5   Base body

Base Body

The base body is the basis of the positioner. The V-308.753030 is mounted onto a surface via the base body (p. 17). The base body comprises the following subassembly (subassemblies):

Drive

A single voice coil motor drives the V-308.753030. The voice coil motor transfers the drive force to the motion platform directly and free of friction.

Reference switch

The reference switch is a sensor whose fixed position serves as the reference point for incremental sensor signals.

The V-308.753030 is equipped with an optical reference switch (p. 51).

The commands that use the reference signal are described in the user manual for the controller and/or in the corresponding software manuals.

Incremental linear encoder

The linear encoder of the V-308.753030 is an optical, incremental sensor: It measures the position of the motion platform relative to a known reference point. Optical encoders measure the actual position directly (direct position measuring). Therefore, drive errors such as nonlinearity, backlash or elastic deformation cannot influence position measuring.

Weight Force Compensation

The V-308.753030 features a weight force compensation. With a vertically oriented motion axis the weight force compensation keeps a specified load in position, even without supply current (see "Mounting the V-308.753030" (p. 17) for possible orientations of the V-308.753030).

The weight force compensation can be adjusted. When delivered, it compensates the weight of the motion platform (see Figure 3 on p. 11).

Adjusting is required when a load is mounted to the positioner or whenever the load is changed with vertically aligned motion axis or when the positioner is to be used with horizontally aligned motion axis.

Adjusting is performed by iterations of mechanical adjustment (coarse adjustment) and checking the motor current using the controller (fine adjustment).

Instructions both for coarse and for fine adjustment are given in "Adjusting the Weight Force Compensation" starting on p. 27.

Vertical alignment of motion axis

With vertical alignment of the motion axis, a maximum payload of 1.0 kg can be compensated.

For coarse adjustment, the scales and both rotary knobs shown in Figure 12 and Figure 13 on p. 28 are intended. The scales show the possible force levels.

INFORMATION

For coarse adjustment, both rotary knobs of the weight force compensation must be set to roughly the same value of force level.

Please note that the actual force level to be set on the left and the right side of the weight force compensation may differ due to the mechanical tolerances. This may also apply when comparing multiple V-308 positioners.

Figure 4 on p. 13 gives approximated values for a coarse adjustment.

In addition, you must perform a fine adjustment based on the motor current to realize the optimum compensation effect for a specific load and to avoid unwanted lateral forces on the bearings.

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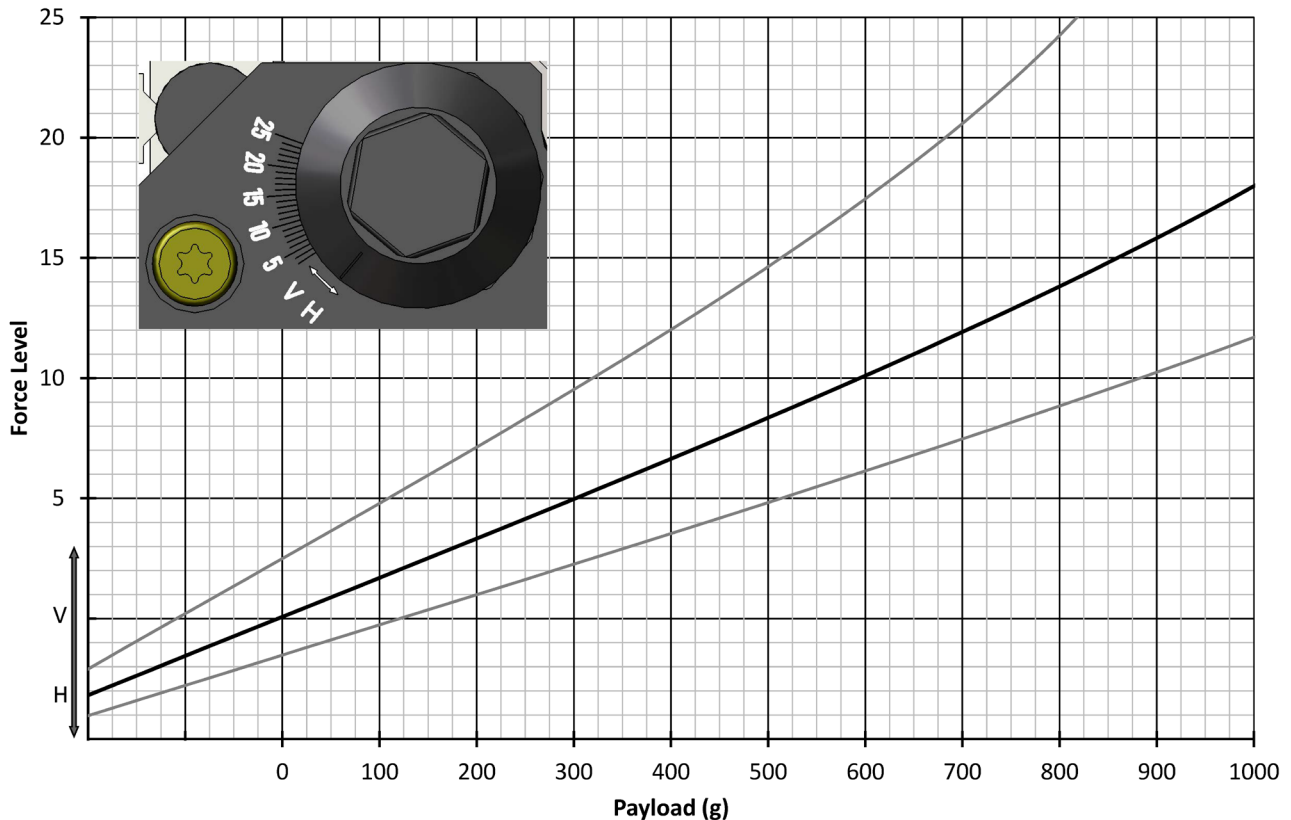
Figure 4: Force level versus payload for coarse adjustment of the weight force compensation;
Black line: Calculated force level dependency on payload. The actual dependency on payload can lie in between the two gray lines. This results from mechanical tolerances.

The double arrow marked with "H" and "V" on the scale represents the range in which the operating mode changes from horizontal to vertical. This range results from mechanical tolerances as well.

"H": Motion platform is not compensated or starting to compensate in the other direction
"V": Motion platform is compensated or starting to compensate payloads

Example:

If a payload of 350 g is to be compensated set both rotary knobs to a value between 3 and 10.5 (roughly equal value for both knobs) for coarse adjustment. **In addition, a fine adjustment is required (see p. 29).**

Horizontal alignment of motion axis

For horizontal alignment of the motion axis, the weight force compensation is to be deactivated by setting both knobs roughly to "H" for coarse adjustment.

In addition, a fine adjustment is required, too, to fully deactivate the weight force compensation. For more information see "Adjusting the Weight Force Compensation" starting on p. 27.

Drive and Sensor Connector

The electrical connection to the controller is established via the drive and sensor connector. The drive and sensor connector transmits the supply voltage for the drive, the signals of the reference switch, and the sensor signals of the V-308.753030.

Accessories

The following articles are not in the scope of delivery of the V-308.753030 and must be ordered separately, if required.

Item number	Description
V-308.OH1	Objective holder for V-308.753030, for horizontal mounting
V-308.OH2	Objective holder for V-308.753030, for vertical mounting
V-308.AP1	Adapter for the installation of V-308.753030 linear stages on optical tables (metric and imperial)
Thread adapters	
P-725.02L	Thread adapter for objective, M26 x 0.75
P-725.03L	Thread adapter for objective, M27 x 0.75
P-725.04L	Thread adapter for objective, M28 x 0.75
P-725.05L	Thread adapter for objective, M32 x 0.75
P-725.06L	Thread adapter for objective, M26 x 1/36"
P-725.08L	Thread adapter for objective, M19 x 0.75
P-725.11L	Thread adapter for objective, M25 x 0.75
P-725.12L	Thread adapter for objective, W0.8 x 1/36"
P-725.13L	Thread adapter for objective, SM1 (1,035"-40)
Adapter cables	
K020B0186	Adapter cable, HD D-sub 26 (m) to JST 6-pin and JST 10-pin, 1.5 m, with crimp flange
K020B0194	Adapter cable, HD D-sub 15 (m) to JST 6-pin and JST 10-pin, 1.5 m, with crimp flange

> ➢ To order, contact our customer service department (p.).

Unpacking

DANGER

Strong magnetic fields affect heart pacemakers!

The V-308.753030 contains permanent magnets that could impair the function of heart pacemakers and other active implants. **The magnetic fields are also effective when the V-308.753030 is not connected to the controller/electric power.**

➢ Make sure that people with heart pacemakers and / or other active implants do not have access to the positioner.

➢ Ensure that hazardous areas are marked correspondingly.

NOTICE

Mechanical overload from incorrect handling!

An impermissible mechanical load on the V-308.753030 due to transportation without a transport safeguard can damage the motion platform of the V-308.753030 as well as cause loss of accuracy.

➢ Only ship the V-308.753030 in the original packaging and with the transport safeguard installed.

The V-308.753030 is delivered with a transport safeguard installed.
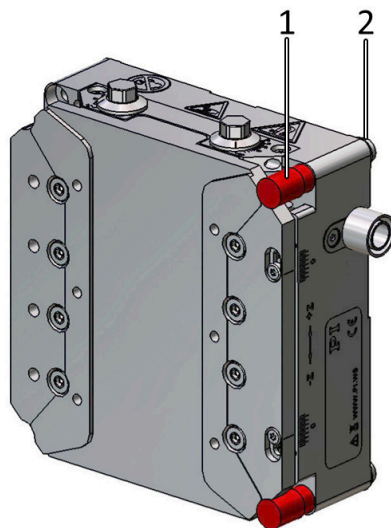
Figure 5:   Positioner with transport safeguard

    1   1 of 2 transport safeguards
    2   1 of 2 M3×25 screws, DIN EN ISO 14580

Tools and accessories

▪ TX10 screwdriver

Unpacking

1. Unpack the V-308.753030 with care.

2. If the V-308.753030 was supplied with ESD protective caps on the connectors: Do not remove the ESD protective caps.

3. Compare the contents with the scope of delivery according to the contract and the delivery note.

4. Inspect the contents for signs of damage. If any parts are damaged or missing, contact our customer service department (p. 40) immediately.

5. Remove the transport safeguards:

   a) Loosen and remove both M3 screws.

   b) Remove both transport safeguards.

6. Keep all packaging materials and the transport safeguards in case the product needs to be returned.

Installation

Mounting the V-308.753030

The V-308.753030 can be mounted onto a base either from above or from below. In addition, the positioner can be mounted onto an optical table using the V-310.AP1 adapter (p. 21).

The positioner is intended primarily for mounting with a vertically aligned motion axis. Installation in horizontal alignment of the motion axis is also possible. However, the weight force compensation must be adjusted for horizontal mounting.

Mounting the V-308.753030 with Vertically Aligned Motion Axis
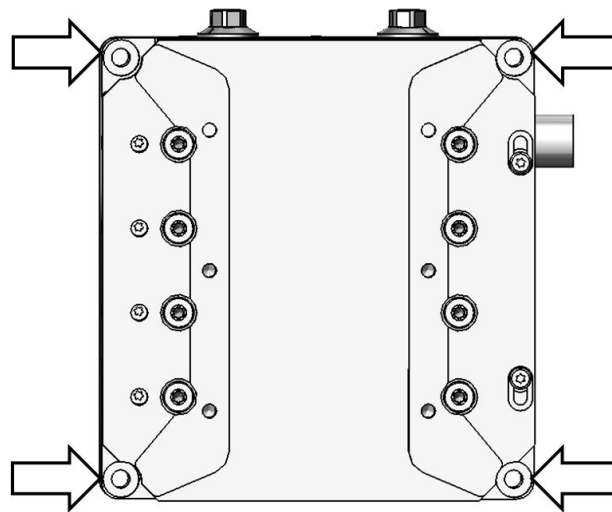
Figure 6:   View from above: V-308.753030 with vertically oriented motion axis.

The arrows mark the holes for fixing the positioner to a surface.

Requirements

✓ You have read and understood the general safety instructions (p. 8).

✓ You have performed the following steps:

   – You have connected the positioner to the controller.

   – You have established communication

✓ You have provided a suitable underlying surface with the holes necessary for the screws. For the position and depth required for the holes, see "Dimensions" (p. 45):

   – The evenness of the underlying surface is ≤20 µm.

   – For applications with large temperature changes: The underlying surface should have the same thermal expansion properties as the positioner (e.g., mechanical mounting made of aluminum).

   – You have accounted for the space required to route cables without bending and according to regulations.

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Tools and accessories

- For fixing the positioner **from above: 4 M3** screws of suitable length (p. 45)

- For fixing the positioner **from below: 4 M4** screws of suitable length (p. 45)

- Suitable screwdriver

DANGER

Strong magnetic fields affect heart pacemakers!

The V-308.753030 contains permanent magnets that could impair the function of heart pacemakers and other active implants. **The magnetic fields are also effective when the V-308.753030 is not connected to the controller/electric power.**

➢ Make sure that people with heart pacemakers and / or other active implants do not have access to the positioner.

➢ Ensure that hazardous areas are marked correspondingly.

NOTICE

Damage due to collisions!

Selecting "H" or a position between "H" and "V " on the scales of the weight force compensation eliminates the holding force of the V-308.753030. With non-horizontal orientation of the V-308.753030 collisions are possible. Collisions can damage the positioner, the load to be moved, and the surroundings.

➢ Make sure that collisions are not possible between the V-308.753030, the load to be moved, and the surroundings in the motion range of the V-308.753030.

➢ With vertical or tilted orientation of the motion axis: When you have mounted a payload to the positioner adjust the force level for the weight force compensation. See p. 27 for instructions.

➢ Do not place cables or any other objects in areas where they could be caught by moving parts.

Mounting the V-308.753030 with vertically aligned motion axis

1. If necessary: Give access to the mounting holes in the base body of the V-308.753030.

   Possible measures:

   − Temporary startup and operation of the positioner (p. 30) and commanding the motion platform to a suitable position

   − Moving the motion platform by hand

2. Align the V-308.753030 on the underlying surface so that the corresponding mounting holes in the V-308.753030 and underlying surface are in line.

3. Tighten the screws in all accessible mounting holes completely paying attention to the following maximum torque:

   For **M3 screws**, for mounting from above: **1.1 Nm**.

   For **M4 screws**, for mounting from below: **2.6 Nm**.

4. If necessary: Repeat steps 1 to 3 for all concealed mounting holes.

5. Check that the V-308.753030 is fixed firmly to the underlying surface.

Mounting the V-308.753030 with Horizontally Aligned Motion Axis
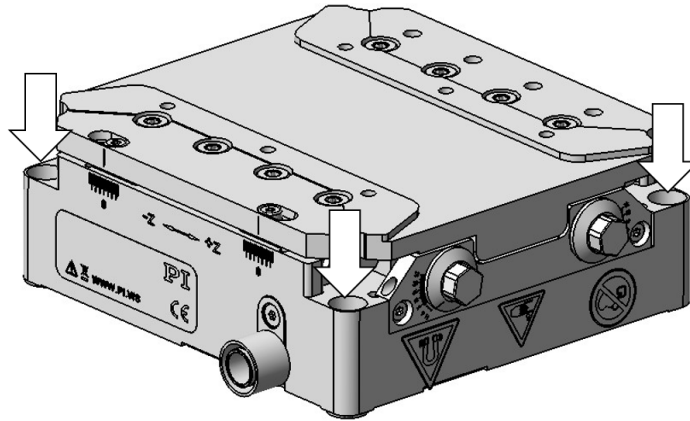

Figure 7:   V-308.753030 with horizontally oriented motion axis, 3 of 4 holes are visible here

The arrows mark the holes for fixing the positioner to a surface.

Requirements

✓ You have read and understood the general safety instructions (p. 8).

✓ You have performed the following steps:

– You have connected the positioner to the controller.

– You have established communication.

✓ You have provided a suitable underlying surface with the holes necessary for the screws. For the position and depth required for the holes, see "Dimensions" (p. 45):

– The evenness of the underlying surface is ≤20 µm.

– For applications with large temperature changes: The underlying surface should have the same thermal expansion properties as the positioner (e.g., mechanical mounting made of aluminum).

– You have accounted for the space required to route cables without bending and according to regulations.

Tools and accessories

▪ For fixing the positioner **from above: 4 M3** screws of suitable length (p. 45)

▪ For fixing the positioner **from below: 4 M4** screws of suitable length (p. 45)

▪ Suitable screwdriver

For adjusting the weight force compensation:

▪ Hex key, AF 0.9

▪ Wrench (see Figure 14 on p. 28)

DANGER

Strong magnetic fields affect heart pacemakers!

The V-308.753030 contains permanent magnets that could impair the function of heart pacemakers and other active implants. **The magnetic fields are also effective when the V-308.753030 is not connected to the controller/electric power.**

➢ Make sure that people with heart pacemakers and / or other active implants do not have access to the positioner.

➢ Ensure that hazardous areas are marked correspondingly.

NOTICE

Damage due to collisions!

Collisions can damage the positioner, the load to be moved, and the surroundings.

➢ Make sure that collisions are not possible between the V-308.753030, the load to be moved , and the surroundings in the motion range of the V-308.753030.

➢ Do not place cables or any other objects in areas where they could be caught by moving parts.

Mounting the V-308.753030 with horizontally aligned motion axis

1. Adjust the weight force compensation for horizontal orientation:

   a) Loosen both pressure pieces (see Figure 12 on p. 27) using the hex key.

   b) Position both rotary knobs using the wrench so that the marks of both knobs are set to "H".

   c) Tighten both pressure pieces with a **maximum torque of 0.3 Nm**.

2. If necessary: Give access to the mounting holes in the base body of the V-308.753030.

   To do so move the platform by hand.

3. Align the V-308.753030 on the underlying surface so that the corresponding mounting holes in the V-308.753030 and underlying surface are in line.

4. Tighten the screws in all accessible mounting holes completely paying attention to the following maximum torque:

   For **M3 screws**, for mounting from above: **1.1 Nm**.

   For **M4 screws**, for mounting from below: **2.6 Nm**.

5. If necessary: Repeat steps 2 to 4 for all concealed mounting holes.

6. Check that the V-308.753030 is fixed firmly to the underlying surface.

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Mounting the V-308.753030 with Adapter onto the Optical Table

Tools and accessories

- V-308.AP1 adapter, available as optional accessory (p. 14)
- Screws included in the scope of delivery of the adapter:
    - 4 screws ISO 14580, M3x20, A2
    - 4 screws ISO 14580, M6x10, A2
- TX 10 screwdriver
- TX 30 screwdriver

Requirements

- ✓ You have read and understood the general safety instructions (p. 8).
- ✓ The optical table's flatness is ≤ 20 µm to prevent the V-308.753030 from warping.
- ✓ You have accounted for the space required to route cables according to regulations and without bending them.

DANGER

Strong magnetic fields affect heart pacemakers!

The V-308.753030 contains permanent magnets that could impair the function of heart pacemakers and other active implants. **The magnetic fields are also effective when the V-308.753030 is not connected to the controller/electric power.**

➢ Make sure that people with heart pacemakers and / or other active implants do not have access to the positioner.

➢ Ensure that hazardous areas are marked correspondingly.

NOTICE

Damage due to collisions!

Collisions can damage the positioner, the load to be moved, and the surroundings.

➢ Make sure that collisions are not possible between the V-308.753030, the load to be moved , and the surroundings in the motion range of the V-308.753030.

➢ Do not place cables or any other objects in areas where they could be caught by moving parts.

Mounting the V-308.753030 with adapter onto the optical table

1. Mount the adapter to the V-308.753030:

    a) Align the V-308.753030 on the adapter so that the corresponding holes of the adapter and of the V-308.753030 are in line.

    b) Mount the V-308.753030 with four M3×20 screws and a **maximum torque of 1.1 Nm**.

    c) Check that the V-308.753030 is fixed firmly.

2. Mount the adapter on the optical table:

   a) Align the adapter on the optical table so that the corresponding mounting holes in the adapter and the optical table are in line.

   b) Fix the adapter with four M6×10 screws and a **maximum torque of 8.8 Nm**; refer to "Adapter V-308.AP1 Dimensions" (p. 46) for the position of the holes.

   c) Check that the adapter is fixed firmly.

Option: Modifying the Travel Range

The travel range of the V-308.753030 can be changed by displacing the integrated hard stops.
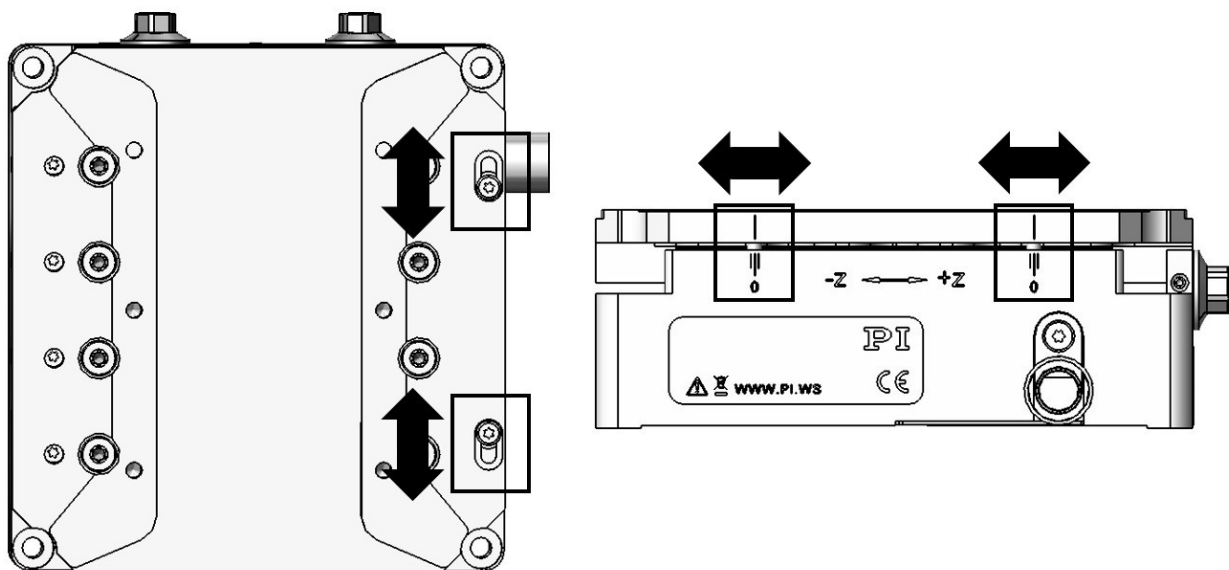
Figure 8:   View from above and lateral view of V-308.753030, for modifying the travel range.

Left: The screws in the longitudinal holes are used to displace the hard stops.

Right: Marks in motion platform and scales on the base body indicate the possible travel range.

> **INFORMATION**
>
> When delivered, displacement of the motion platform is possible from -3.5 mm to +3.5 mm.
> You can adjust the travel range **continuously on both sides as well as on one side only**.

> **INFORMATION**
>
> Both hardstops feature a mechanical tolerance. Therefore, an open-loop travel range of 0.5 mm in one motion direction is still possible, even if the position of the screw sets the travel range in that motion direction to 0 mm as shown in case D in Figure 9 on p. 24.
> As a result, you can set the hard stops for a minimum travel range of 1 mm. To obtain a travel range of less than 1 mm you have to use software limits.

Tools and accessories

- TX6 screwdriver

Requirements

✓ You have read and understood the general safety instructions (p. 8).

✓ You know the travel range required for a collision-free application.

✓ You have performed the following steps:

  – You have connected the positioner to the controller.

  – You have established communication.

✓ You have properly mounted the positioner onto a surface (p. 17).

DANGER

Strong magnetic fields affect heart pacemakers!

The V-308.753030 contains permanent magnets that could impair the function of heart pacemakers and other active implants. **The magnetic fields are also effective when the V-308.753030 is not connected to the controller/electric power.**

➢ Make sure that people with heart pacemakers and / or other active implants do not have access to the positioner.

➢ Ensure that hazardous areas are marked correspondingly.

Option: Modifying the travel range

1. Command the motion platform to the required position.
Refer to the manual for the controller for information on the required commands (p. 6).

2. Loosen the screws marked in the longitudinal holes, see view from above inFigure 8 (p. 22).

3. To obtain the required travel range displace the screws correspondingly. See the figure below for examples.

   For example, if you want to obtain a limited travel range of 0 mm to 3.5 mm in + Z then set the screws corresponding to case C in the figure below:

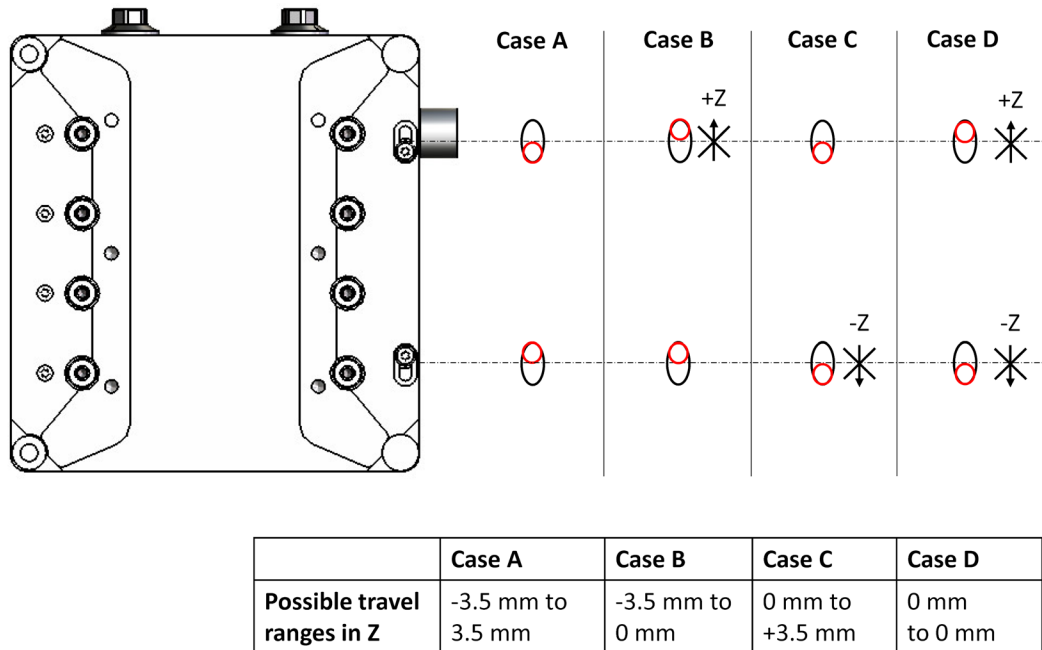|	Case A	Case B	Case C	Case D
Possible travel ranges in Z	-3.5 mm to 3.5 mm	-3.5 mm to 0 mm	0 mm to +3.5 mm	0 mm to 0 mm

Figure 9: Examples for how the position of the screws determines the possible travel range.
The upper screw determines the positive travel range: In its uppermost position (cases B and D), the screw limits the positive travel range to 0 mm. In its lowest position, it allows a maximum positive travel of 3.5 mm.
Note that with case D the minimum travel range that can be obtained mechanically is 1 mm, see the information above.
The lower screw influences the negative travel range in an analog way.
Here, the positioner is shown with vertically aligned motion axis. With horizontally aligned motion axis, the assignment of screw position and travel range is equal.

4. Tighten the screws with a **maximum torque of 0.3 Nm**.

5. Get the current position by sending the corresponding command, see the manual of the controller (p. 6).

6. To provide a safety distance between the adjusted ends of travel range and the software limits subtract an offset between 50 to 100 µm from the position obtained.
For example, if the maximum position was adjusted to 2.0 mm, then the recommended soft limit for the maximum position is 1.9 mm.

7. Adjust the parameters for the soft limits of the axis to the changed travel range on the controller; for more information on the required parameters refer to the manual of the controller (p. 6).

Mounting the Objective Holder to the V-308.753030

The V-308.OH1 objective holder can be mounted in horizontal orientation or the V-308.OH2 objective holder can be mounted in vertical orientation to the V-308.753030.

You have to adjust the weight force compensation whenever you have changed the load, i.e., its weight. For instructions refer to "Adjusting the Weight Force Compensation" (p. 27).

Overview
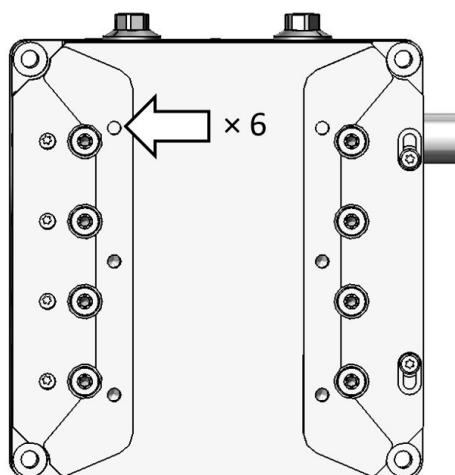
Figure 10:   M3 mounting holes with a depth of 6 mm for fixing the objective holder

Figure 11:   V-308.753030 with objective holder: Left: With V-308.OH1; Right: With V-308.OH2

The arrows mark the following screws in the objective holder's scope of delivery:

White arrows (mounting the V-308.OH1)	2 screws M3x8, ISO 14580
Hatched arrows (mounting the V-308.OH2)	3 screws M3x6, ISO 14580
Black arrows (clamping the objective)	1 screw M2x6, ISO 14580

Tools and Accessories

- V-308.OH1 objective holder, available as optional accessory (p. 14), for mounting the objective horizontally
- Screws in the objective holder's scope of delivery:
    - 1 screw M2x6, ISO 14580, A2
    - 2 screws M3x8, ISO 14580, A2
- Screwdriver TX 6
- Screwdriver TX 10

Alternative:

- V-308.OH2 objective holder, available as optional accessory (p. 14), for mounting the objective vertically
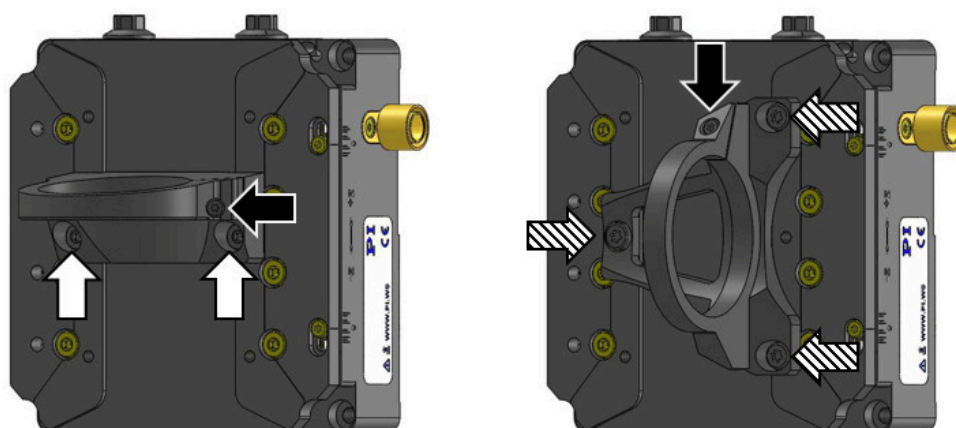- Screws in the objective holder's scope of delivery:
    - 1 screw M2x6, ISO 14580, A2
    - 3 screws M3x8 ISO 14580, A2
- Screwdriver TX 6
- Screwdriver TX 10

Requirements

- ✓ You have read and understood the general safety instructions (p. 8).
- ✓ You have mounted the V-308.753030 on the surface properly (p. 17).
- ✓ Fixing the objective to be used does not exceed the **maximum permissible force of 10 N** on the motion platform.
- ✓ The V-308.753030 is **not** connected to the controller.

DANGER

Strong magnetic fields affect heart pacemakers!

The V-308.753030 contains permanent magnets that could impair the function of heart pacemakers and other active implants. **The magnetic fields are also effective when the V-308.753030 is not connected to the controller/electric power.**

- ➢ Make sure that people with heart pacemakers and / or other active implants do not have access to the positioner.
- ➢ Ensure that hazardous areas are marked correspondingly.

NOTICE

Impermissibly high load on the V-308.753030!

An impermissible high load impairs the motion of the motion platform and can damage the V-308.753030.

- ➢ Pay attention to the maximum permissible forces (p. 41) that may act on the motion platform.

Mounting the objective holder

1. Align the objective holder to be used on the motion platform so that the required holes of the motion platform can be used for mounting the objective holder.

2. Tighten the screws in the mounting holes with a **maximum torque of 1.1 Nm**.

3. When you insert the objective: Fix the objective in the holder by tightening the M2 screw with a **maximum torque of 0.3 Nm**.

4. Check that the objective holder is fixed firmly to the motion platform.

Adjusting the Weight Force Compensation

You have to adjust the weight force compensation in the following cases:

- The load to be positioned has changed for a vertically aligned motion axis
- The positioner is to be mounted with horizontally aligned motion axis

When delivered, the positioner is adjusted to compensate the motion platform, but not yet for an objective holder and an objective.

Adjusting the weight force compensation is required.

INFORMATION

For coarse adjustment, both rotary knobs of the weight force compensation must be set to roughly the same value of force level.

Please note that the actual force level to be set on the left and the right side of the weight force compensation may differ due to the mechanical tolerances. This may also apply when comparing multiple V-308 positioners.

Figure 12: Items for adjustment of the weight force compensation

1   1 of 2 accomodations of a spring-loaded pressure piece

2   1 of 2 marks for the selected force level of the weight force compensation

3   1 of 2 rotary knobs for adjustment of the weight force compensation, with scale, width across flats 6.0 mm

Figure 13: The scales give the force levels for adjustment of weight force compensation;
The double arrow marked with "H" and "V" represents the range in which the operating mode changes from horizontal (H) to vertical (V).
See "Weight Force Compensation" on p. 12 for assignment of force level to compensated payload.
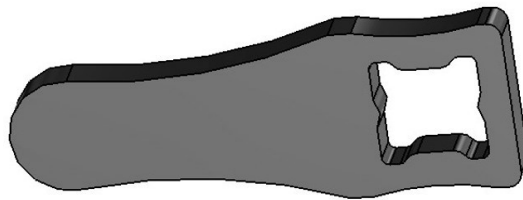
Figure 14: Wrench for adjustment of rotary knobs

Requirements

✓ You have read and understood the general safety instructions (p. 8).

✓ You have mounted a load to the V-308.753030 for the first time or the mounted load's weight was changed.

✓ The positioner is connected to the controller and communication with the controller is established.

✓ You have read and understood the manual for the controller (p. 6).

Tools and accessories

▪ Hex key, AF 0.9

▪ Wrench (see figure above)

DANGER

Strong magnetic fields affect heart pacemakers!

The V-308.753030 contains permanent magnets that could impair the function of heart pacemakers and other active implants. **The magnetic fields are also effective when the V-308.753030 is not connected to the controller/electric power.**

➢ Make sure that people with heart pacemakers and / or other active implants do not have access to the positioner.

➢ Ensure that hazardous areas are marked correspondingly.

> **INFORMATION**
>
> For coarse adjustment, both rotary knobs of the weight force compensation must be set to roughly the same value of force level.
>
> Please note that the actual force level to be set on the left and the right side of the weight force compensation may differ due to the mechanical tolerances. This may also apply when comparing multiple V-308 positioners.
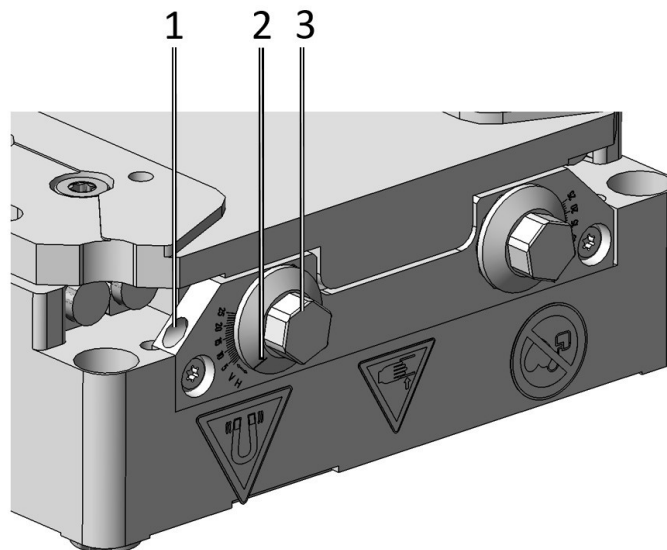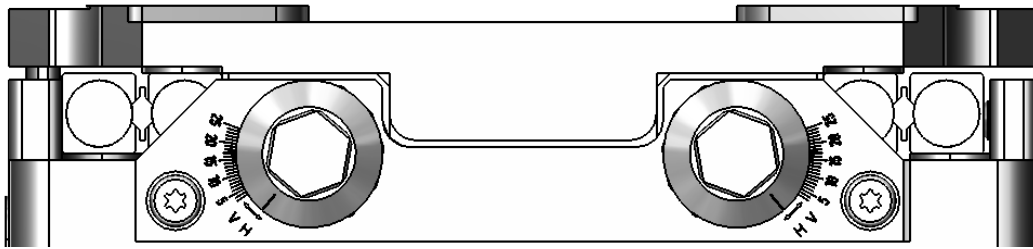

Adjusting the weight force compensation when the load has changed, for vertical orientation of the motion axis

For **coarse adjustment** of the weight force compensation steps 1 to 4 are required:

1. Position the V-308.753030 such that the motion axis is oriented vertically.

2. Select the recommended force level for the payload from Figure 4 on p. 13.

    Example: 89 g for V-308.OH2 + 261 g for an objective is 350 g.

    The diagram gives a range of force levels between 3 and 10.5 for 350 g.

3. Loosen both pressure pieces (see Figure 12 on p. 27) using the hex key.

4. Position **both rotary knobs** using the wrench so that the marks of both knobs are set to roughly the same value in the force level range.

    With the example of a common payload of 350 g you would set the rotary knobs to a value between 3 and 10.5 (roughly the same value for both knobs).

For **fine adjustment** of the weight force compensation steps 5 to 11 are required:

5. Activate the positioner's motor.

    Refer to the user manual for the controller for the required command line.

6. Make sure that the positioner's motion platform is not in contact with a mechanical hardstop, i.e. that it is not at the end of its travel range.

    – When the motion platform is at its negative end of the travel range send a command that moves the motion platform, for example, 1 mm in positive motion direction.

    – When the motion platform is at its positive end of travel range send a command that moves the motion platform, for example, 1 mm in negative motion direction.

    Refer to the user manual for the controller for the required command line.

7. Check the motor current, see the user manual for the controller.

    If the motor current is 0 mA, you have obtained the optimum setting of the force level.

8. Position both rotary knobs again in one way or the other trying to reduce the motor current to 0 mA.

9. Repeat steps 7 and 8 until you obtain a motor current of 0 mA.

10. Tighten both pressure pieces with a **maximum torque of 0.3 Nm**.

11. Deactivate the motor, see the user manual for the controller.

Adjusting the weight force compensation for horizontal orientation of the motion axis

1. Position the V-308.753030 such that the motion axis is oriented horizontally.

2. Loosen both pressure pieces (see Figure 12 on p. 27) using the hex key.

3. Position both rotary knobs using the wrench so that the marks of both knobs are set to roughly "H".

4. Perform steps 5-11 of fine adjustment on p. 29.

Connecting the V-308.753030

Tools and accessories

▪ If necessary: Suitable screwdriver for the locking screws of the connectors.

Requirements

✓ You have read and understood the general safety instructions (p. 8).

✓ You have read and understood the user manual for the controller used.

✓ You have installed the controller properly.

✓ The controller is switched off.

NOTICE

Damage due to mechanical stress on the cable!

The cable will break from excessive or repeated bending. A broken cable will lead to failure of the V-308.753030 or damage to the V-308.753030 or the controller.

➢ Install the V-308.753030 so that the cable is not bended to strongly or that it is not squeezed.

NOTICE

Damage due to incorrect connection of the V-308.753030!

Connecting unsuitable controller or the wrong cable can lead to damage to the V-308.753030 or the controller.

➢ Make sure that the controller support the drive type of the V-308.753030 and have been configured accordingly.

➢ Use cables from PI only to connect the V-308.753030 to the controller.

➢ Pay attention to correct pin assignment (p. 50).

Connecting the V-308.753030

1. When the V-308.753030 was delivered with ESD protective caps on the connections: Remove the ESD protective caps.

2. Connect the V-308.753030's drive and sensor plug to the corresponding socket on the controller.

3. Secure the connectors against unintentional removal.

Startup and Operation

Temperature Dependency of the Nominal Current: Calculating the Nominal Current

The nominal current in the data table (p. 41) only applies when operating at room temperature. The nominal current needed for operating the actuator must be adjusted when the ambient temperature rises.

Calculating the nominal current

➢ Calculate the nominal current according to the ambient temperature as follows:

$$I(T) = I(T_{ref}) \cdot \sqrt{\frac{T_{max} - T}{T_{max} - T_{ref}}}$$

With:

$I(T)$ = Nominal current, depending on ambient temperature T

T = Ambient temperature

$I(T_{ref})$ = Nominal current, determined at reference temperature T_{ref}, see specifications

T_{ref} = Reference temperature (22 °C)

T_{max} = Maximum temperature of positioner components, see specifications

Starting and Operating the V-308.753030

Requirements

✓ You have read and understood the general safety instructions (p. 8).

✓ You have installed the V-308.753030 correctly (p. 17).

✓ You have read and understood the user manual for the controller used.

✓ You have read and understood the manual for the PC software used.

✓ The controller and if required, the PC software, have been installed (refer to the user manual for the controller).

DANGER

Strong magnetic fields affect heart pacemakers!

The V-308.753030 contains permanent magnets that could impair the function of heart pacemakers and other active implants. **The magnetic fields are also effective when the V-308.753030 is not connected to the controller/electric power.**

➢ Make sure that people with heart pacemakers and / or other active implants do not have access to the positioner.

➢ Ensure that hazardous areas are marked correspondingly.

CAUTION

Risk of crushing by moving parts!

Risk of minor injuries from crushing between the moving parts of the V-308.753030 or the load and a fixed part or obstacle or due to unexpected motion. Unexpected motion is possible with the following cases:

▪ The weight force compensation is set to a force level which is too low for the fixed payload (p. 12).

▪ The weight force compensation is set to "H" for horizontal alignment of the motion axis.

➢ When you change the payload adjust the weight force compensation accordingly (p. 27).

➢ Set the weight force compensation to "H" only, when the positioner's motion axis is aligned horizontally.

➢ Use safeguards to protect limbs in areas where they could be caught by moving parts.

NOTICE

Operating voltage excessively high or incorrectly connected!

If not avoided, the dangerous situation will result in damage to the equipment.

Operating voltages that are too high or incorrectly connected can cause damage to the V-308.753030.

➢ Pay attention to the operating voltage range (p. 43), which is specified for the V-308.753030.

➢ Pay attention to correct pin assignment (p. 50).

NOTICE

Heating up of the V-308.753030 during operation!

The heat produced during operation of the V-308.753030 can affect your application.

➢ Ensure sufficient ventilation at the place of installation.

➢ Calculate the nominal current according to the ambient temperature (p. 31).

➢ Adapt your application (acceleration, speed, load) so that the calculated nominal current is not exceeded. If you have any questions, contact our customer service department (p. 40).

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NOTICE

Damage due to unsuitable servo control parameters!

The drive of the V-308.753030 can be damaged by excessive heating or oscillations when unsuitable servo control parameter are used. Oscillation is indicated by a humming noise. In addition, unsuitable servo control parameters reduce the positioning accuracy.

➢ Check whether the servo control parameters are suitable for the specified load, i.e., whether excessive heating occurs.

➢ If you notice oscillation, stop the V-308.753030 immediately.

➢ If necessary, adjust the servo control parameters. To find out how to change parameters in general, refer to the manual for the controller.

➢ If you have questions on adapting the servo control parameters, contact our customer service department (p. 40).

Starting and operating the V-308.753030

1. Start the controller (refer to the user manual for the controller).

2. Configure the controller for the V-308.753030 during startup:

    – If you are using a controller from PI: In the PC software, select the entry in the positioner database that matches the V-308.753030 exactly.

    – If you are using a controller from another manufacturer: Configure the controller according to the parameters of the V-308.753030 (see "Specifications" (p. 41)).

3. If the V-308.753030 has an incremental sensor (p. 41): Do a reference move (refer to the user manual for the controller).

4. Start a few motion cycles for testing purposes (refer to the user manual for the controller).

Maintenance

	NOTICE
⚠	**Damage due to improper maintenance!** Improper maintenance can lead to misalignment and failure of the V-308.753030. ➢ Loosen screws only according to the instructions in this manual or the instructions of our customer service department (p. 40).

Maintenance Run

Frequent motion along a limited travel range can cause uneven distribution of the lubricant. The maintenance run serves the purpose of distributing the existing lubricant.

➢ Perform a maintenance run at regular intervals, at the latest after a period of six months. The more often motion is performed over a limited travel range, the shorter the interval has to be between the maintenance runs.

Performing a Maintenance Run

1. Make sure that collisions between the V-308.753030, the load to be moved, and the surroundings are not possible over the entire travel range of the V-308.753030. If necessary, remove the load from the V-308.753030's motion platform for the maintenance run.

2. Perform a maintenance run over the entire travel range:

   a) Command the V-308.753030 to the end of a travel range and from there to the opposite end of the travel range (see manual for the controller).

   b) If necessary: Command the V-308.753030 to a position where the load can be mounted onto the motion platform again and mount the load back onto the V-308.753030 (p. 25).

Cleaning

Requirements

✓ You have disconnected the V-308.753030 from the controller.

Auxiliary Materials Required

▪ Soft, lint-free cloth

▪ Mild cleaning agent or disinfectant

If you have any questions on the auxiliary materials recommended for the V-308.753030, contact our customer service department (p. 24).

	NOTICE
ⓘ	**Damage due to unsuitable cleaning agents!** Some cleaning agents can cause rusting on the V-308.753030 or dissolve plastics, paints or adhesives. ➢ Do not clean with water or acetone.

Cleaning the V-308.753030

1. Dampen the cloth with the cleaning agent or disinfectant.
2. Carefully wipe the surfaces of the V-308.753030.

Troubleshooting

V-308.753030 does not move	
Cable not connected correctly	➢ Check the cable connections.
The controller or mechanics were replaced	➢ Run the startup (p. 31) once again.
Controller not connected correctly	➢ Check all connecting cables (p. 30).
Defective controller	➢ Check the controller.
The positioner was connected to the switched-on controller	➢ Switch the controller off and on again or restart it with the corresponding PC software function.
Incorrect configuration	➢ Check the V-308.753030's parameter settings in the controller connected and make the appropriate corrections.
Incorrect command or incorrect syntax	➢ Check the error code.
The wrong axis or channel were commanded	➢ Make sure that the right axis or channel identifier is used and that the V-308.753030 was connected correctly.
Commanded axis is not referenced	➢ Do a reference move for the axis as described in the user manual for the controller.
Reduced positioning accuracy	
Warped base body	➢ Mount the V-308.753030 onto a flat surface.
Increased wear due to small motion over a long period of time	➢ Perform a maintenance run.
Target position is approached too slowly or with overshoot	➢ Check whether the servo control parameter settings correspond to the selected closed-loop control mode; see user manual for the controller. ➢ If necessary, correct the settings of the servo control parameters.
The target position is not kept stable due to inappropriately set speed / acceleration	➢ Correct the corresponding servo control parameter settings (see the user manual for the controller).

Uncontrolled oscillation	
Large changes to the load or the alignment of the V-308.753030	➢ Switch off the servo control system or the controller immediately. ➢ Check whether the servo control parameter settings correspond to the selected closed-loop control mode; see user manual for the controller. ➢ If necessary, correct the settings of the servo control parameters.

Transportation

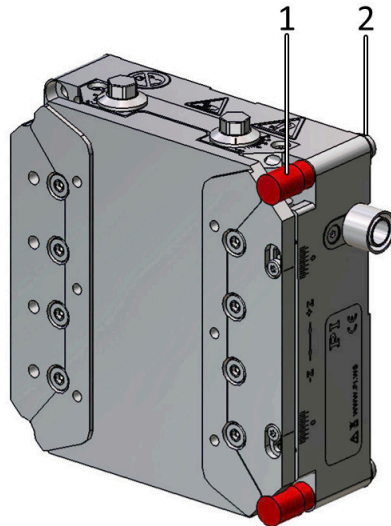## Preparing the V-308 for Transportation

Figure 15:   Positioner with transport safeguards

1	1 of 2 transport safeguards
2	1 of 2 M3×25 screws, DIN EN ISO 14580

Tools and accessories

- Transport safeguards, including 2 M3×25 screws
- TX10 screw driver
- Original packaging materials

NOTICE

Mechanical overload from transport without transport safeguards!

An impermissible mechanical load on the V-308.753030 due to transportation without a transport safeguard can damage the V-308.753030 as well as cause loss of accuracy.

➢ Only ship the V-308.753030 in the original packaging and with the transport safeguard installed.

Preparing the V-308.753030 for transportation

1. If the V-308.753030 was supplied with ESD protective caps on the connectors: Put the ESD protective caps on the connectors.

2. Insert both screws M3×25 in the 2 through holes in the underneath of the V-308.753030.

3. To fix the motion platform screw both transportation safeguards on the M3 screws. To do so lock the M3 screws on the positioner's underneath with the screwdriver.

4. Pay attention to the ambient conditions and classifications (p. 44).

5. Pack the V-308.753030 in the original packaging.

6. If the V-308.753030 is to be sent, use a stable outer box.

Customer Service

For inquiries and orders, contact your PI sales engineer or send us an email (service@pi.de).

➢ If you have any questions concerning your system, provide the following information:

− Product and serial numbers of all products in the system

− Firmware version of the controller (if applicable)

− Version of the driver or the software (if applicable)

− Operating system on the PC (if applicable)

➢ If possible: Take photographs or make videos of your system that can be sent to our customer service department if requested.

Technical Data

Subject to change without notice. You can get the latest product specifications on the positioner's website via www.pi.ws.

Specifications

	Unit	Tolerance	V-308.753030
Motion			
Active axes			Z
Travel range in Z	mm		7
Acceleration in Z, unloaded	m/s²	max.	8
Maximum velocity in Z, unloaded	mm/s		200
Flatness (Linear crosstalk in X with motion in Z)	µm	max.	± 0.75
Straightness (Linear crosstalk in Y with motion in Z)	µm	max.	± 0.75
Yaw (Rotational crosstalk in θX with motion in Z)	µrad	max.	± 125
Pitch (Rotational crosstalk in θY with motion in Z)	µrad	max.	± 125
Roll (Rotational crosstalk in θZ with motion in Z)	µrad	max.	± 125

	Unit	Tolerance	V-308.753030
Positioning			
System resolution in Z	nm		1
Bidirectional repeatability in Z	µm	typ.	± 0.75
Bidirectional repeatability in Z, 100 nm step	nm		± 25
Positioning accuracy in Z, uncalibrated	µm	typ.	± 4
Min. incremental motion in Z	µm	typ.	0.01
Settling time in Z (100 nm step, ±15 nm error band)	ms		15
Settling time in Z (250 nm step, ±15 nm error band)	ms		15
Position noise in Z	nm	max.	3
Integrated sensor			PIOne: Incremental linear encoder

	Unit	Tolerance	V-308.753030
Sensor signal			Sin/cos, 1 V peak-peak
Sensor resolution	nm		1
Sensor signal period	µm		2
Reference switch			Optical, direction sensing (reference edge track), 5 V, TTL
Reference switch repeatability	µm		0.5

	Unit	Tolerance	V-308.753030
Drive properties			
Drive type			Electric motor / Magnetic direct drive / Voice coil drive
Nominal voltage	V		48
Nominal current, RMS	A	typ.	1.15
Peak current, RMS	A	typ.	3.5
Drive force in negative direction of motion in Z	N	typ.	4.2
Drive force in positive direction of motion in Z	N	typ.	4.2
Peak force in negative direction of motion in Z	N		9.45
Peak force in positive direction of motion in Z	N		9.45
Force constant	N/A		2.7
Motor constant	N/√W	typ.	1.37
Resistance phase-phase	Ω	typ.	3.9
Inductance phase-phase	mH	typ.	0.85
Back EMF	Vs/m	max.	2.7
Permissible maximum temperature for positioner components	°C		50

	Unit	Tolerance	V-308.753030
Mechanical properties			
Guide			Rolling element guide / Crossed roller guide
Moved mass in Z, unloaded	g		200
Permissible push force in X	N	max.	10

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	Unit	Tolerance	V-308.753030
Permissible push force in Y	N	max.	10
Permissible push force in Z	N	max.	10
Overall mass	g		600
Mass without cable	g		450
Material			Aluminum, anodized

	Unit	Tolerance	V-308.753030
Miscellaneous			
Connector			HD D-sub 26 (m)
Recommended controllers / drivers			C-414, G-910, ACS SPiiPlus + NPMpm (NanoPWM incl.)
Cable length	m		1.5
Operating temperature range	°C		10 to 50

Note on sensor resolution and minimum incremental motion: With C-414 motion controller at an interpolation of 2^{11}

Note on settling time: With gain scheduling (only with NanoPWM)

Note on positioning accuracy and repeatability: Following ISO 230-2

Note on nominal current, peak current: Max. 10 s at 70 °C coil temperature

Note on nominal current, RMS: Value without cooling; with cooling: 1.55 A; with horizontally aligned positioner, with perforated plate made of steel, 200 mm × 250 mm × 12 mm

The specifications apply to room temperature (22 °C ±3 °C). The specifications can deviate outside of this range.

Maximum Ratings

The drive of the V-308.753030 is designed for the following operating data:

Maximum operating voltage	Maximum operating frequency	Maximum power consumption*
⚠	⚠	⚠
48 V DC	⎓	60 W

* With a peak current of 3.5 A, permissible for max. 10 s at 70 °C coil temperature

Ambient Conditions and Classifications

The following ambient conditions and classifications for the V-308.753030 must be observed:

Area of application	For indoor use only
Maximum altitude	2000 m above msl
Storage temperature	-20 °C to 60 °C
Transport temperature	-20 °C to 60 °C
Overvoltage category	II
Protection class	I
Degree of pollution	1
Degree of protection according to IEC 60529	IP20

Dimensions

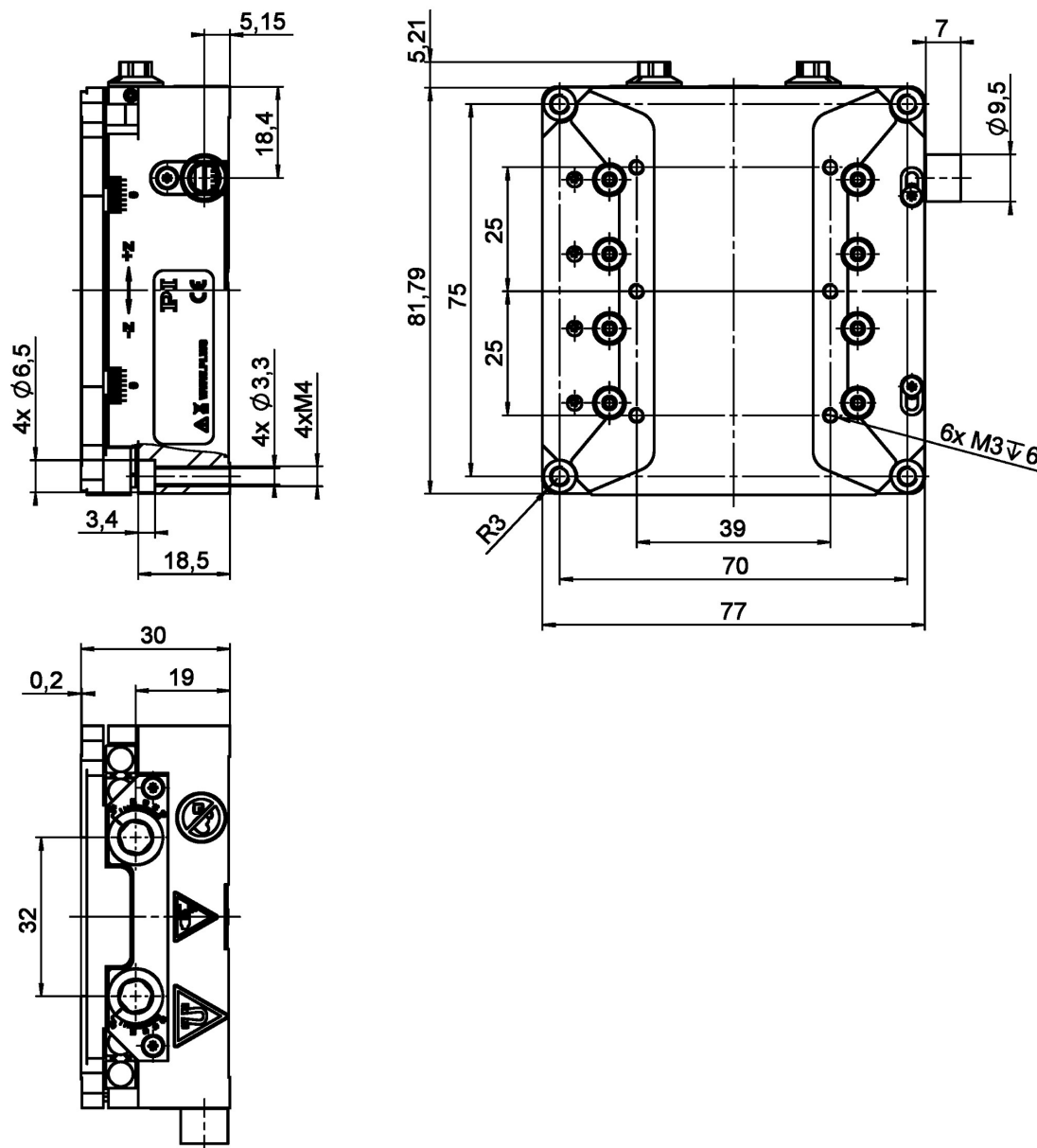Dimensions in mm. Note that the decimal places are separated by a comma in the drawings.
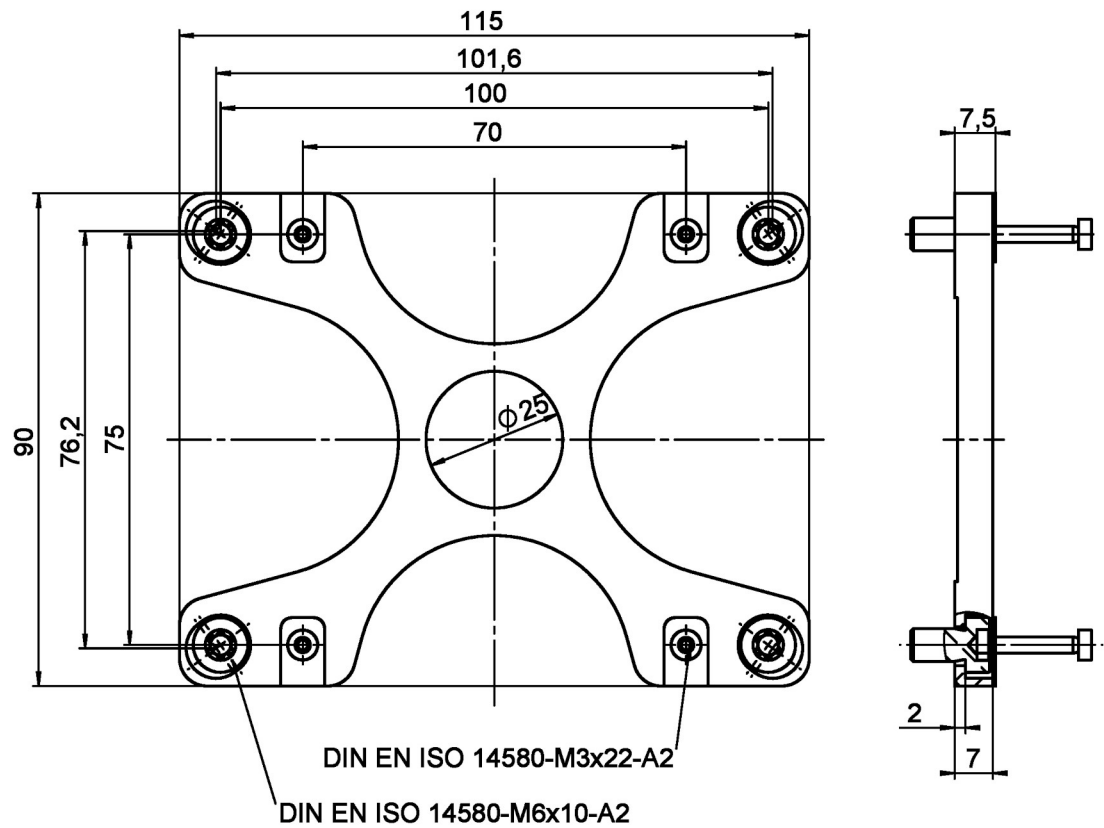
V-308.753030

Figure 16:   V-308.753030

V-308.AP1
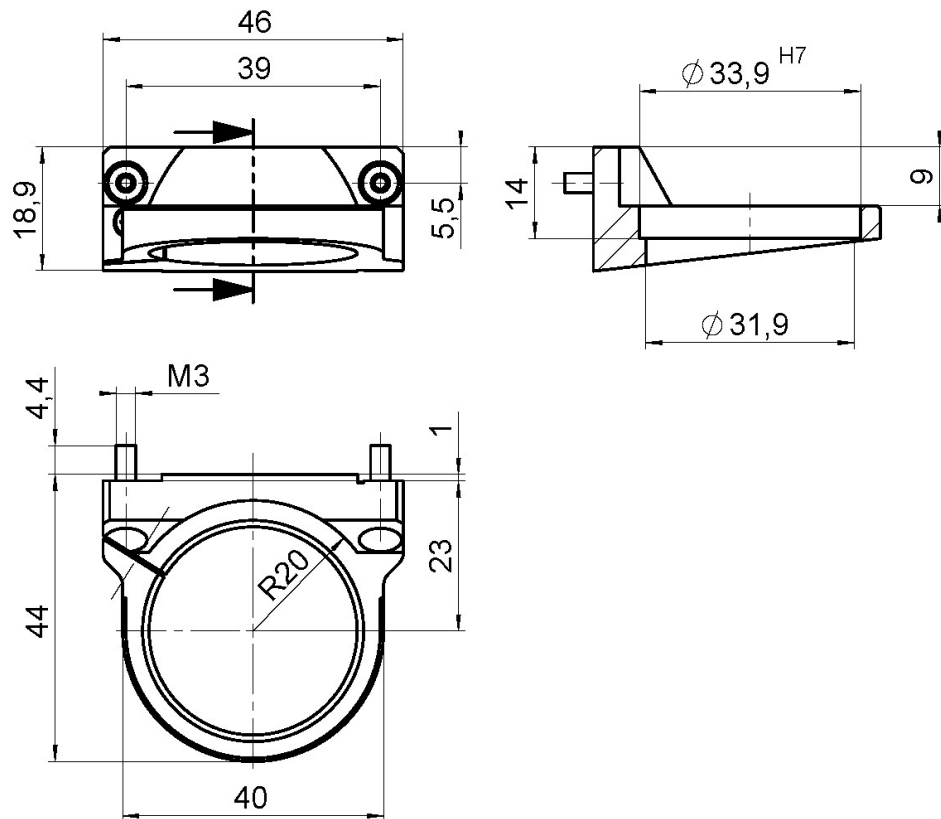

Figure 17:   V-308.AP1

V-308.OH1
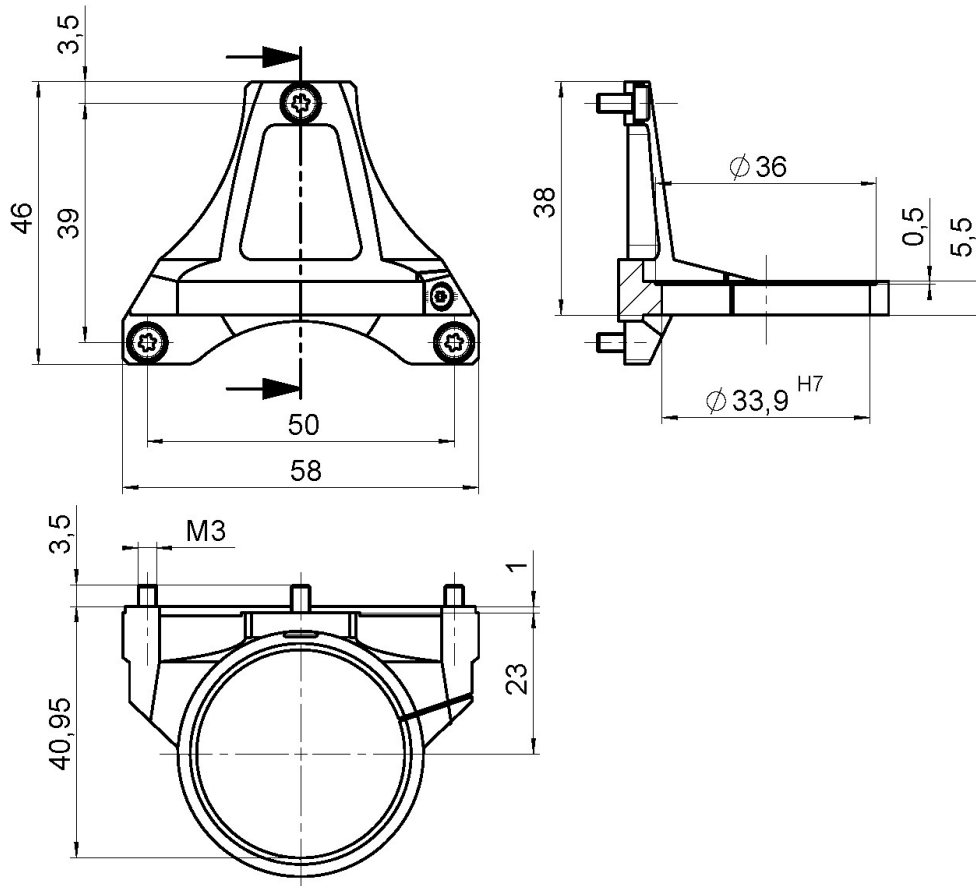

Figure 18:   V-308.OH1

V-308.OH2

Figure 19:   V-308.OH2

Old Equipment Disposal

In accordance with EU law, electrical and electronic equipment may not be disposed of in EU member states via the municipal residual waste.

Dispose of your old equipment according to international, national, and local rules and regulations.

In order to fulfil its responsibility as the product manufacturer, Physik Instrumente (PI) GmbH & Co. KG undertakes environmentally correct disposal of all old PI equipment made available on the market after 13 August 2005 without charge.

Any old PI equipment can be sent free of charge to the following address:

Physik Instrumente (PI) GmbH & Co. KG

Auf der Roemerstr. 1

D-76228 Karlsruhe, Germany

Appendix

Pin Assignment
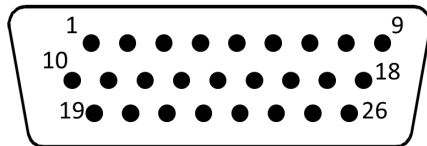
Drive and Sensor Connector

Figure 20:   HD Sub-D 26 (m) connector

Pin	Signal*
1	Motor +
2	Motor +
3	Motor -
4	Motor -
5 to 16	-
17	ID chip
18	+5 V
19	MA+ (A+)
20	MA- (A-)
21	SLO+ (B+)
22	SLO- (B-)
23	Reference +
24	Reference -
25	GND
26	+5 V
Shell	Shield

* The "-" sign indicates that the corresponding pin has not been assigned.

Reference Switch Specifications

Type	Optical sensor
Supply voltage	+5 V
Signal output	0 V / +5 V (TTL level)
Signal logic	Direction sensing via different signal levels on the left and right of the reference switch

EU Declaration of Conformity

An EU Declaration of Conformity was issued for the V-308.753030 in accordance with the following European directives:

- EMC Directive
- RoHS Directive

The applied standards certifying the conformity are listed below.

- EMC: EN 61326-1
- Safety: EN 61010-1
- RoHS: EN 50581 or EN IEC 63000