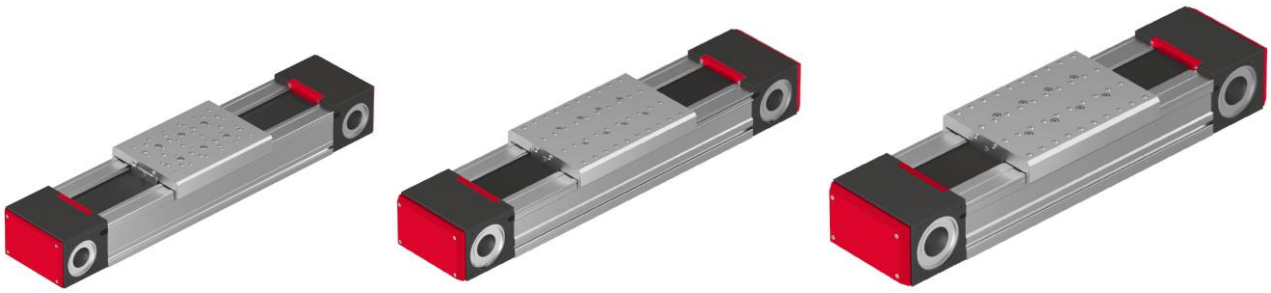
Assembly and operating instructions

Portal axes
PDZ-128 I PDZ-160
PDZ-200



Translation of the Original Assembly Instructions EN

- PDZ-128 ⇨ Order no.: 50394896
- PDZ-160 ⇨ Order no.: 50245033
- PDZ-200 ⇨ Order no.: 50228209

Dear Customer

Thank you for choosing our products and placing your trust and confidence in our company!

These assembly and operating instructions contain all essential information you need about your product. Our aim is to provide the required information as concisely and clearly as possible. If, however, you still have any questions on the contents or suggestions, please do not hesitate to contact us. We are always grateful for any feedback.

Our team will also be glad to answer any further question you may have regarding the portal axis or other options.

We wish you every success with our products!

With kind regards

Your Afag team

© Subject to modifications

The modules have been designed by Afag according to the state of the art. Due to the constant technical development and improvement of our products, we reserve the right to make technical changes at any time.

Updates of our documentations

Unlike the printed documents, our digital instructions manuals, product data sheets and catalogues are being continuously updated on our website.

Please keep in mind that the digital documents on our website are always the latest versions.

Afag Automation AG
Luzernstrasse 32
CH-6144 Zell (Switzerland)
Tel.: +41 62 959 86 86
e-mail: sales@afag.com
Internet: www.afag.com

Table of contents

1 General

1.1 Contents and purpose of these assembly instructions

These assembly instructions contain important information on assembly, commissioning, functioning and maintenance of the portal axes PDZ-128, PDZ-160 and PDZ-200 to ensure safe and efficient handling and operation.

Consistent compliance with these assembly instructions will ensure:

- permanent operational reliability of the PDZ,
- optimal functioning of the PDZ,
- timely detection and elimination of defects (thereby reducing maintenance and repair costs)
- prolongation of the PDZ service life.

The illustrations in this manual shall provide you with a basic understanding of the module and may vary from the actual design of your module.

1.2 Explanation of symbols

The safety notes are marked by a pictogram and a signal word. The safety notes describe the extent of the hazard.

DANGER

Danger!

This safety note indicates an imminently hazardous situation which, if not avoided, will result in death or severe injury.

WARNING

Warning!

This safety note points out a potentially hazardous situation which, if not avoided, could result in death or severe injury.

CAUTION

Caution!

This safety note points out a potentially dangerous situation which, if not avoided, can result in minor or slight injuries.

NOTICE

This safety note points out a potentially dangerous situation which, if not avoided, can cause substantial damage to property and the environment.

This note contains important additional information as well as useful tips for safe, efficient and trouble-free operation of the portal axis.

Further warning signs:

Where applicable, the following standardised symbols are used in this manual to point out the various potential health risks.

	Warning - Dangerous electrical voltage.
	Warning - Risk of injury from contact with hot surfaces.
	Warning - Risk of hand and finger injury due to uncontrolled movements of components.
	Warning - Magnetic field
	Warning - back injury due to heavy lifting.
	Warning - Risk of injury as a result of parts being flung out!
	Warning -high noise levels

1.3 Additional symbols

In these assembly instructions the following symbols are used to highlight instructions, results, references, etc..

Symbol	Description
1.	Instructions (steps ...)
⇨	Results of actions
➲	References to sections
■	Enumerations not ordered

1.4 Applicable documents

Each portal axis is accompanied by a safety information sheet. This information sheet must be read carefully by every person who carries out work on and with the portal axis.

1.5 Warranty

The warranty terms for Afag handling components and handling systems are the following:

- 24 months from initial operation and up to a maximum of 27 months from delivery.
- Wear parts are excluded from the warranty (The customer is entitled to a product free of defects. *This does also apply to defective accessories and wear parts. Normal wear and tear are excluded from the warranty.*

The warranty covers the replacement or repair of defective Afag parts. Further claims are excluded.

The warranty shall expire in the following cases:

- Improper use of the module
- Non-observance of the instructions regarding assembly, commissioning, operation and maintenance of the module.
- Improper assembly, commissioning, operation and maintenance
- Repairs and design changes carried out without prior technical instructions of Afag Automation AG
- Removing the serial number from the product
- Inadequate checking of wear parts
- Non-observance of the EC Machinery Directive, the Accident Prevention Regulations, the Standards of the German Electrotechnology Association (VDE) and these safety and assembly instructions.

1.6 Liability

No changes shall be made to the portal axis unless described in this instructions manual or approved in writing by Afag.

Afag accepts no liability for unauthorized changes or improper assembly, installation, commissioning, operation, maintenance or repair work.

2 Safety instructions

2.1 General

This chapter provides an overview of all important safety aspects to ensure safe and proper use of the portal axis and optimal protection of personnel.

Safe handling and trouble-free operation of the portal axis requires knowledge of the basic safety regulations.

Every person carrying out installation, commissioning, maintenance work or operating the module must have read and understood the complete user manual, especially the chapter on safety instructions.

Beyond this, there are rules and regulations regarding accident prevention that are applicable to the place of installation which must be observed.

Improper use may result in danger to life and limb of the user or third parties or in damage to the automation system or other material assets.

Failure to follow the directions and safety instructions given in this instructions manual may result in serious hazards.

2.2 Intended use

The portal axis is used for shock- linear movement of fixed loads in **non-hazardous** environments and in the ambient and operating conditions defined for this axis (➲Chap. 3 “Technical data” & data sheet in the catalogue).

The portal axes are specially designed for horizontal operation.

Typical areas of application are e.g.:

- Moving module assemblies over longer distances.
- Use as portal modules.
- In combination with OZ modules for fast and flexible pick & place applications.

Any use beyond the described purpose is considered to be not in accordance with the intended use.

The intended use of the module also includes:

- observance of all instructions given in this instructions manual.
- compliance with the inspection and maintenance work and the specifications in the data sheets,
- using only original spare parts.

2.3 Foreseeable misuse

Any use other than or beyond the intended use described is considered a misuse of the stroke PDZ.

Especially the following use is considered a misuse:

- The use for the transport of people and animals,
- the use as pressing or bending device for cold working of metals.
- Use in potentially explosive atmospheres without additional measures. Please consult AFAG in this regard!
- Use in the chemical and food industry without additional measures. Please consult AFAG in this regard!

WARNING

Risk of injury if the module is not used as intended!

The improper use of the portal axis poses a potential hazard to the personnel.

- The portal axes may only be used in a technically perfect condition in accordance with its intended use and the instructions in this manual as well as in compliance with the safety requirements!
- Any malfunctions, particularly those that could impair safety, must be eliminated immediately!

Risks can occur if the module is not used as intended. In the event of damages caused by improper use the following shall apply:

- the operating company shall be solely responsible for such damage, and
- Afag does not accept any liability for damage caused by improper use.

2.4 Obligations of the operator and the personnel

2.4.1 Observe the assembly instructions

A basic prerequisite for safe and proper handling of PDZ is a good knowledge of the basic safety instructions.

These assembly instructions, in particular the safety instructions contained therein, must be observed by all persons working with the portal axis.

2.4.2 Obligations of the operating company

In addition to the safety instructions given in this manual, the operating company must comply with the safety, accident prevention and environmental protection regulations valid for the field of application of the portal axis.

Only persons may work on the PDZ axes who:

- have the necessary professional qualifications and experience,
- are familiar with the basic rules regarding occupational safety and accident prevention,
- have been instructed in the correct handling of the portal axis,

- have read and understood these assembly instructions.

The operating company is also required to:

- monitor on an ongoing basis that the personnel work safely considering any potential hazard involved and the assembly instructions are observed,
- ensure that the assembly instructions are always kept at hand at the installation in which the modules are mounted,
- observe and communicate universally applicable laws and regulations regarding accident prevention and environmental protection,
- provide the necessary personal protective equipment (e.g. protective gloves) and instruct the personnel to wear it.

2.4.3 Obligations of the personnel

All personnel working with the modules are required to:

- read and observe these assembly instructions, especially the chapter on safety,
- observe the occupational safety and accident prevention regulations,
- observe all safety and warning signs on the PDZ,
- refrain from any activity that might compromise safety and health.

In addition, the personnel must wear the personal protective equipment required for carrying out their work. (➲Chapter 2.6).

2.5 Personnel requirements

2.5.1 Personnel qualification

The activities described in the assembly instructions require specific requisites at the level of professional qualifications of the personnel.

Personnel not having the required qualification will not be able to asses the risks that may arise from the use of the portal axis thus exposing himself and others to the risk of serious injury. Therefore, only qualified personnel may be permitted to carry out the described activities on the portal axes.

Persons whose ability to react is restricted due to the intake of medication or the like must not interact with the portal axis.

These installation instructions are intended for skilled personnel (installers, system integrators, maintenance personnel, technicians), electricians and operating personnel.

The following is a description of the professional skills (qualifications) required for carrying out the different activities:

Qualified personnel:
Qualified personnel with appropriate training who are qualified due to their special know-how and fully familiar with the machine and who have been given instructions on how to carry out the task entrusted to them safely.

Qualified electrician:
Persons who have obtained their electrical qualifications through appropriate professional training and complementary courses that enables them to identify risks and prevent possible hazards resulting from electricity.

Operator (trained personnel):
Authorized persons who due to their specialized professional training, expertise and experience are capable of identifying risks and preventing possible hazards arising from the use of the machine.

2.6 Personal protective equipment (PPE)

The personal protective equipment serves to protect the personnel from hazards affecting their safety and health at work.

When working on/with the portal axis, the personnel must wear the personal protective equipment assigned by the safety officer of the operating company or as required by safety regulations. In addition, the personnel is required to:

- wear the personal protective equipment provided by the operating company (employer),
- check the personal protective equipment for proper condition, and
- immediately notify the person responsible on site of any defects found on the personal protective equipment.

Personal protective equipment and the respective mandatory signs:

	*Protective clothing* is a close-fitting clothing specifically designed to protect personnel from hazards during work.
	*Protective gloves* are specifically designed to protect the personnel against hand injuries (such as cuts, abrasion, burns).
	*Safety shoes* are specifically designed to protect the personnel against foot injuries from crushing, falling objects or slipping on slippery surfaces.
	Hearing protectors are required to protect the personnel against excessive noise levels to prevent noise-induced hearing loss.

2.7 Changes and modifications

No changes may be made to the portal axes which have not been described in these assembly instructions or approved in writing by Afag Automation AG.

Afag Automation AG accepts no liability for unauthorised changes or improper assembly, installation, commissioning, maintenance or repair work.

The portal axes may not be changed or modified in any way, except with the prior written consent of AFAG.

2.8 General hazards / residual risks

Despite the safe design of the machine and the technical protective measures taken, there still remain residual risks that cannot be avoided, and which present a non-obvious residual risk when operating the modules.

Observe the safety instructions in this chapter and in the other sections of this manual to avoid damage to property and dangerous situations for the personnel.

2.8.1 General hazards at the workplace

The portal axis has been built according to the state-of-the-art and the applicable health and safety requirements. However, improper use of the portal axis may cause the following hazards to the personnel:

- danger to life and limb of the operator or third parties,
- on the portal axes themselves,
- property damage.

Always keep the assembly instructions ready at hand at the workplace! Please, also observe:

- the general and local regulations on accident prevention and environmental protection,
- the safety information sheet for the portal axis.

WARNING

Danger - Do not use in unsuitable environment !

The portal axes are designed for use in **non** explosive atmospheres.

- **Do not** use the portal axis in potentially hazardous atmospheres!

WARNING

Risk of injuries due to uncontrolled parts movements!

When connecting and operating the portal axes, unexpected movements can lead to serious injuries and/or damage to property.

- Only qualified personnel may work with or on the portal axis.

CAUTION

Risk of injury due to high noise exposure!

the portal axis generates 78 dB(A) during full-load operation. Depending on the add-ons, the environment and the resonance of the protective device theses values may be exceeded and expose the operator to a higher noise level.

- The operating company is responsible for ensuring that the permissible noise levels are observed.
- If the permissible noise levels are exceeded, the operating company shall ensure that the operator uses a suitable hearing protection.

CAUTION

Risk of injury when lifting the portal axis!

Depending on the type, the weight of the portal axis can be between 11.8 kg and 55 kg. Back injuries can occur when packing and unpacking as well as when handling the portal axes.

- To lift the modules, we recommend attaching the axes to straps and lifting the portal axis out of the transport box with a lifting device.

2.8.2 Danger due to electricity

DANGER

Danger! Risk of electric shock!

If work on electrical components is required, ensure that the work is carried out properly, failure to do so will cause serious or fatal injuries.

- Work on the machine's electrical equipment may only be performed by skilled electrician or trained personnel under the supervision of a skilled electrician in accordance with all relevant electrical regulations.

2.8.3 Danger due to high temperatures

CAUTION

Danger of injury from hot surfaces.

During continuous operation of the portal axes, the surface on the motor heats up to 100°C.

- Wear protective gloves!
- Before touching hot surfaces without protective gloves, make sure they have cooled down to ambient temperature.

2.8.4 Mechanical hazards

CAUTION

Danger of injury by moving components!

Limbs can be crushed by moving components!

- Work on and with the portal axis may only be carried out by qualified personnel.
- Never reach into the system during normal operation!

3 Technical data

3.1 Portal axis PDZ-128

3.1.1 Dimensional drawing PDZ - 128-D

Type	PDZ-128
A	Module length (stroke + 433) mm
B	Lubricator nipple
C	8x both sides M5
H	Module stroke xxxx mm

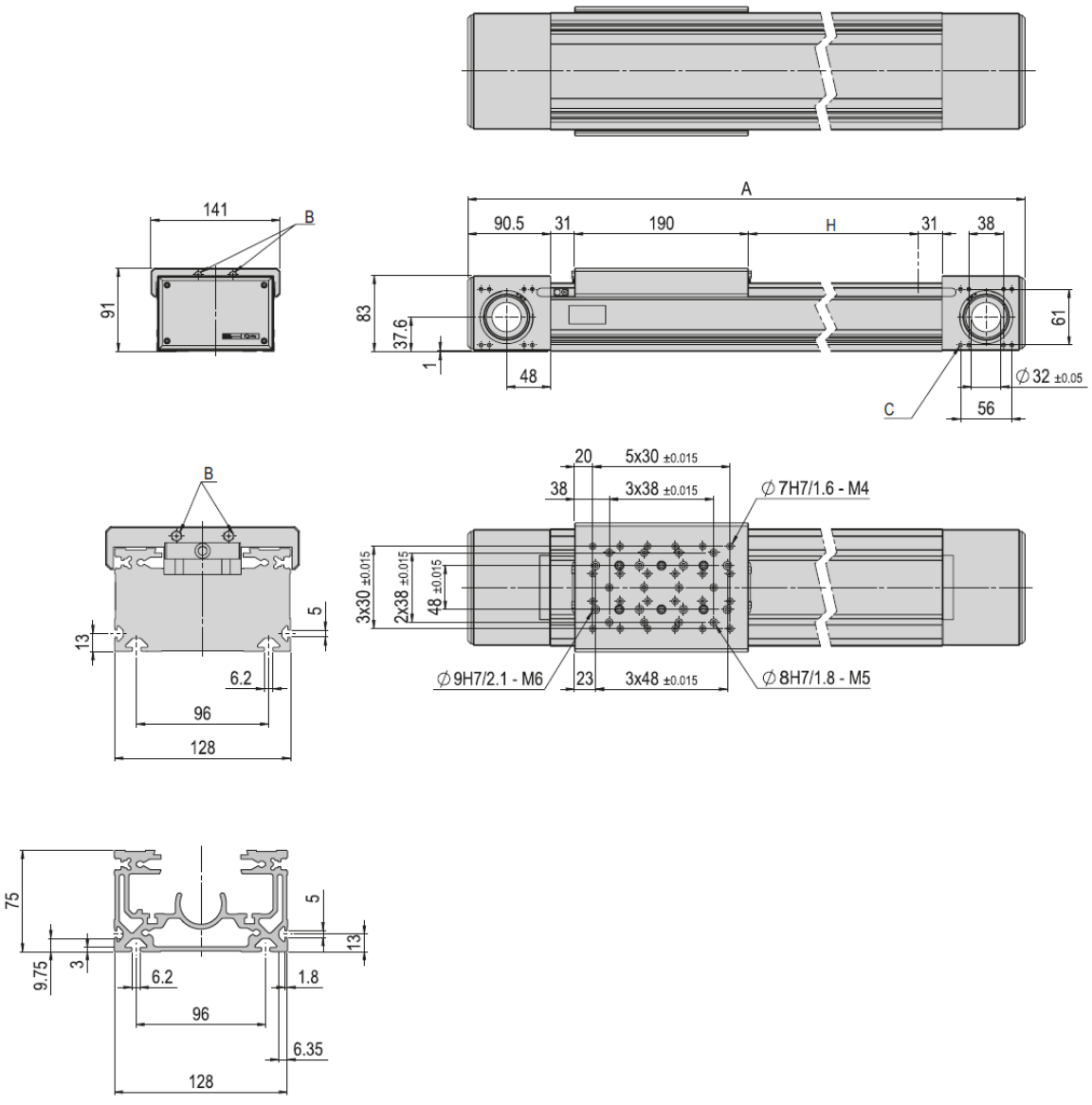


Fig. 1 Dimensional drawing portal axis PDZ -128

3.1.2 Technical data PDZ -128

PDZ-128	
Operating temperature	10 - 40 °C
Storage temperature	0 - 50 °C
Humidity	< 90 %

Type	PDZ-128
Order number	**50394896**
Max. stroke	1700 mm
Net weight	10.7 kg (at 0 mm stroke)
Moving weight	3.4 kg
Weight/100 mm stroke	0.95 kg
Cross-section profile W x H	128 x 75 mm
Module length	H + 433 mm
Toothed belt width	65 mm
Groove size (below/side)	6/5 mm
Groove distance (below)	96 mm
Hollow shaft Ø	32 mm
Number of linear guides	2 pcs
Torque	65.5 Nm
Protection type	IP 30
Feed constant	175 mm/U
Max. speed v	*3 m/s
Max. acceleration a	*30 m/s²
Max. circumferential force	2340 N
Repeat accuracy	+/- 0.05 mm
Mounting position	

The technical data pertains to Afag standard test conditions.
Note: The mounting sets, gears, motors, controllers and cables can be foand in the corresponding chapters.
Cleanroom class ISO 14644-1, class ISO 7

*The maximum values listed above depend on the application and must not be combined. In case of doubt, please contact your Afag partner.

Inlcuded in the delivery

- 1x Sensor set portal axes [p. 321]

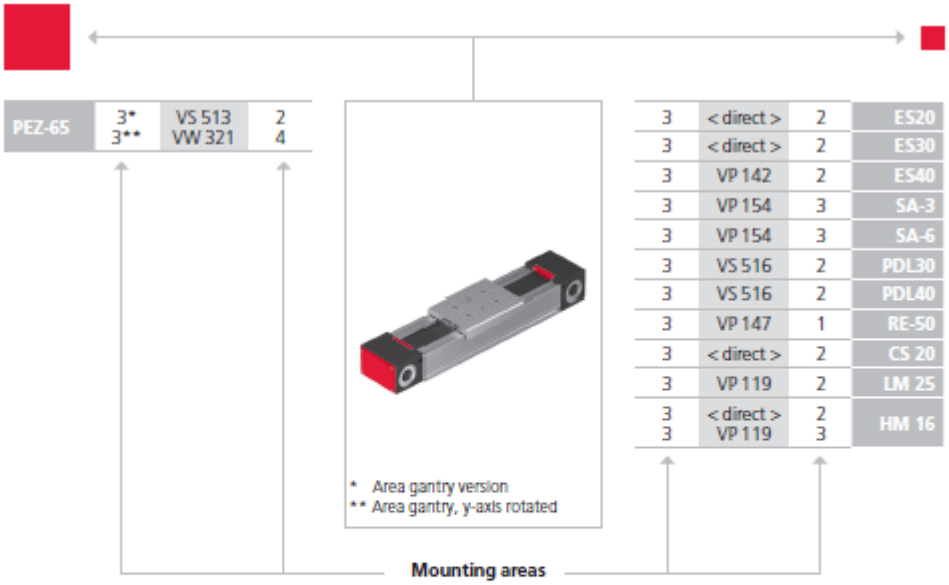
Accessories

- Stroke limitation PDZ-128 [p. 317]
- Load transmission unit PEZ-65/PDZ-128 [p. 320]

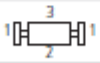
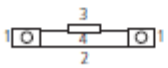
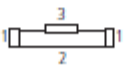
(Catalogue HT accessories)

- T-nut M5
- Connecting set VS 513
- Mounting set 060
- Mounting set 070
- Planetary gearbox PE050
- Planetary gearbox PE070
- Planetary gearbox AF060
- Angular gearbox AFR060
- Servomotor-21-72VDC-400W
- Servomotor-31-320VDC-950W
- Servomotor-31-560VDC-950W
- Servo controller SE-Power
- Servo controller E14xx

3.1.3 Preferred combinations PDZ -128-D



3	< direct >	2	ES20
3	< direct >	2	ES30
3	VP 142	2	ES40
3	VP 154	3	SA-3
3	VP 154	3	SA-6
3	VS 516	2	PDL30
3	VS 516	2	PDL40
3	VP 147	1	RE-50
3	< direct >	2	CS 20
3	VP 119	2	LM 25
3 3	< direct > VP 119	2 3	HM 16

CS, ES	LM	HM	SA	UG, GM, SG, DG, PG, GE, SGE
				
PMP, PMP-c	**PEZ, PDZ**	**PEL, PDL**	**RM, RE**	**CR, RM 32, RE, SREH, RA**
				

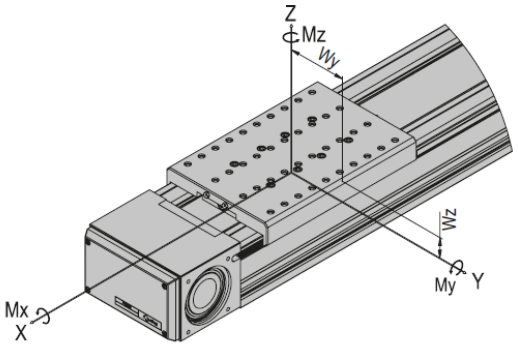
Note that there might be different mounting positions from one module to another one.
The required connection elements and the range of support columns are depicted in the catalogue HT accessories.

AFAG accepts no liability where third-party modules have been attached to portal axes.

Add-on modules must be able to absorb forces (accelerations) occurring when the portal axis is running at full capacity.

3.1.4 Slide loads PDZ-128

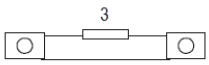
Type	PDZ-128
Max. torque Mx	110 Nm
Max. torque My	230 Nm
Max. torque Mz	230 Nm



$$\frac{Mx}{Mx\ max} + \frac{My}{My\ max} + \frac{Mz}{Mz\ max} < 1$$

Maximum payload/type	PDZ-128
Installation position (horizontal) for mounting side 3	100 kg
Installation position (vertical) for mounting side 3	100 kg

Assembly sides module mounting horizontal:



vertical:

Calculation of position versus time
The travel times of electrically driven gantry axis are dependent on the useful load, stroke + drive.

Our technicians will be pleased to make an optimum position/time calculation for you based on the gantry axis chosen. For being able to advise you correctly, we need the following data from you.

- Maximum planned stroke length
- Maximum moving mass
- Operation time desired

The values given are guide values that can be specified more precisely depending on the intended use!

3.2 Portal axis PDZ-160

3.2.1 Dimensional drawing PDZ -160-D

Type	PDZ-160
A	Module length (stroke + 574) mm
B	Lubricator nipple
C	4x both sides M6
H	Module stroke xxxx mm

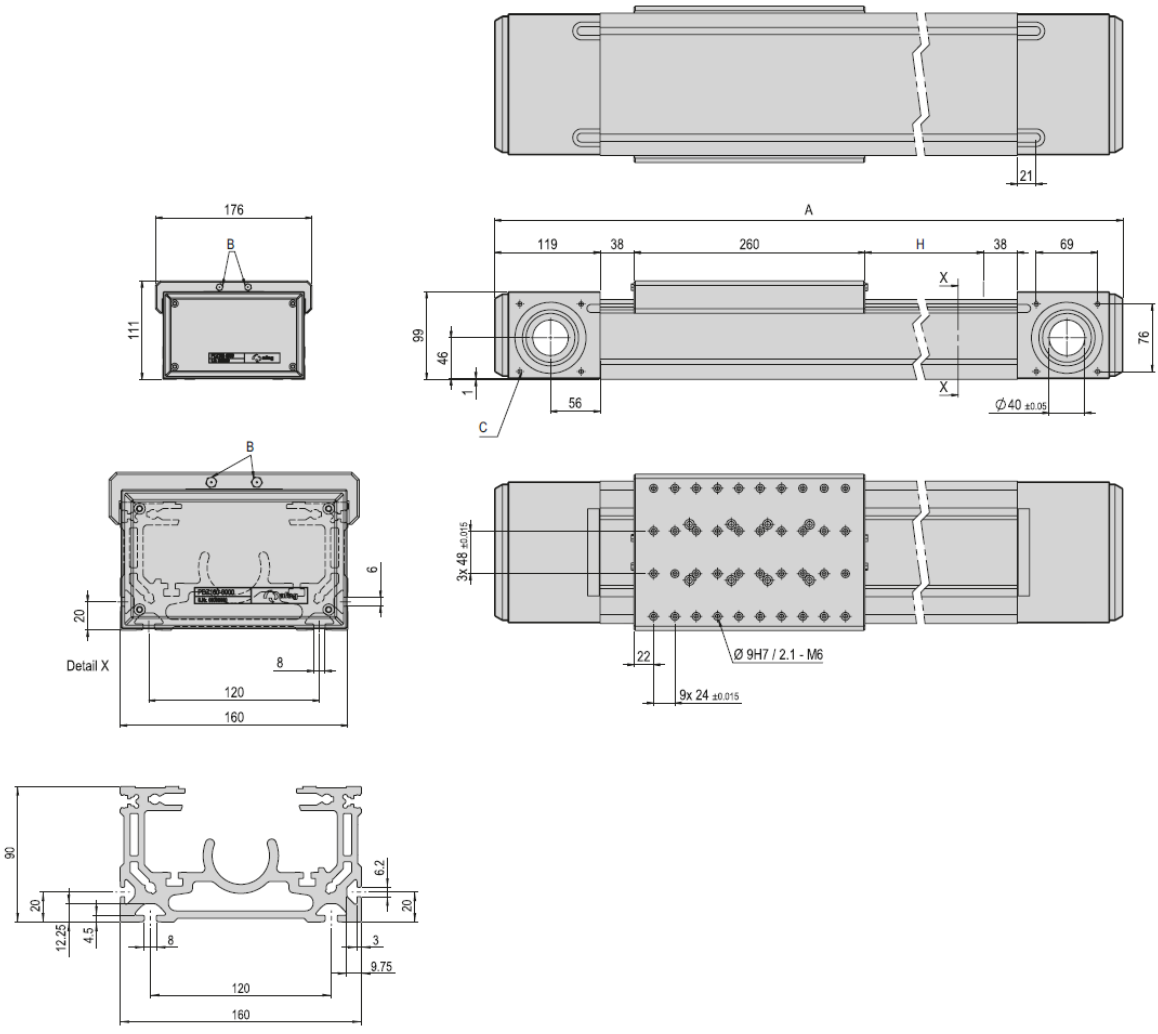


Fig. 2 Dimensional drawing portal axis PDZ -160

3.2.2 Technical data PDZ-160

PDZ-160	
Operating temperature	10 - 40 °C
Storage temperature	0 - 50 °C
Humidity	< 90 %

Type	PDZ-160
Order number	**50245033**
Max. stroke	3650 mm
Net weight	20.8 kg (at 0 mm stroke)
Moving weight	6.8 kg
Weight/100 mm stroke	1.62 kg
Cross-section profile W x H	160 x 90 mm
Module length	H + 574 mm
Toothed belt width	80 mm
Groove size (below/side)	8/6 mm
Groove distance (below)	120 mm
Hollow shaft Ø	40 mm
Number of linear guides	2 pcs
Torque	114.1 Nm
Protection type	IP 30
Feed constant	224 mm/U
Max. speed v	*5 m/s
Max. acceleration a	*50 m/s²
Max. circumferential force	3200 N
Repeat accuracy	+/- 0.05 mm
Mounting position	

The technical data pertains to Afag standard test conditions.
Note: The mounting sets, gears, motors, controllers and cables can be foand in the corresponding chapters.
Cleanroom class ISO 14644-1, class ISO 7

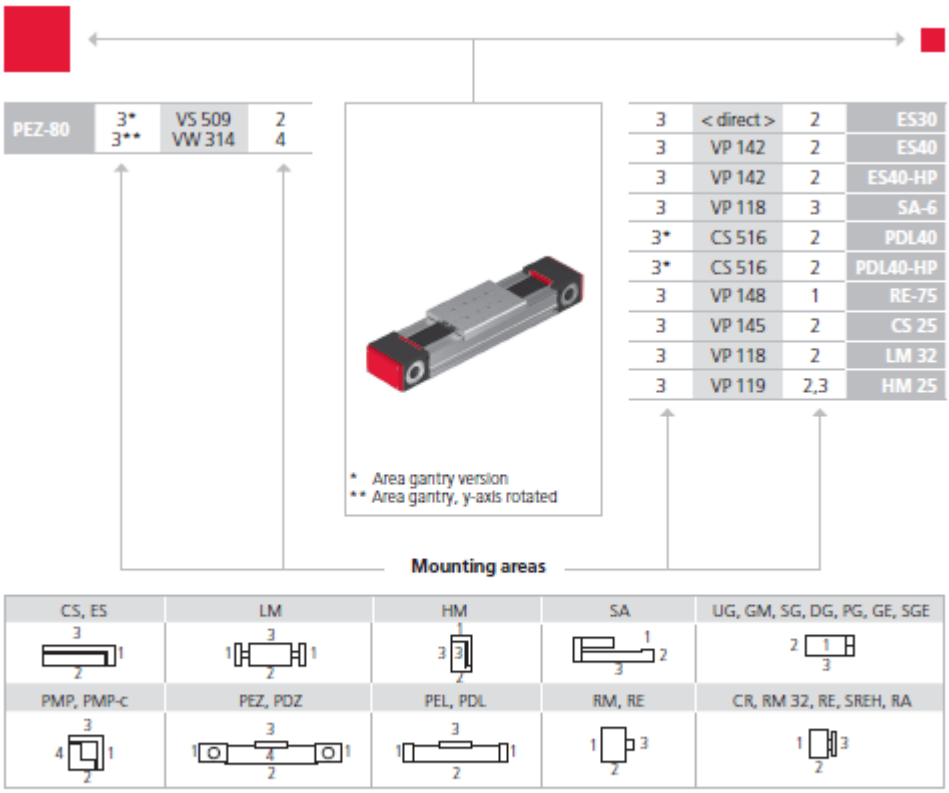
*The maximum values listed above depend on the application and must not be combined. In case of doubt, please contact your Afag partner.

Inlcuded in the delivery
- 1x Sensor set portal axes [p. 321]

Accessories
- Stroke limitation PDZ-160 [p. 321]
- Load transmission unit PEZ-80/PDZ-160 [p. 318]

(Catalogue HT accessories)
- T-nut M6
- INI 8x4.7x16-Sn2.0-PNP-NC-M8x1
- Connecting set VS 509
- Mounting set 060
- Mounting set 070
- Mounting set 075
- Mounting set 090
- Planetary gearbox PE070
- Planetary gearbox PE090
- Planetary gearbox AF060
- Planetary gearbox AF075
- Angular gearbox PER070
- Angular gearbox PER090
- Angular gearbox AFR060
- Angular gearbox AFR075
- Servomotor-31-320VDC-950W
- Servomotor-31-560VDC-950W
- Servomotor-41-560VDC-2.8kW
- Servo controller SE-Power
- Servo controller E14xx

3.2.3 Preferred combinations PDZ-160



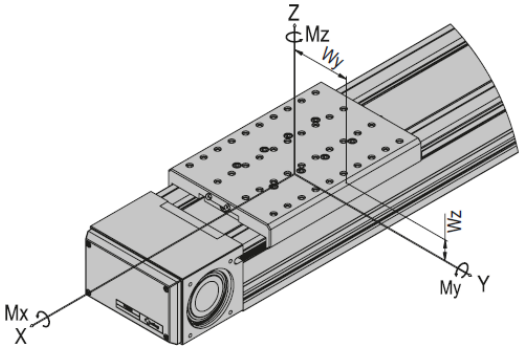
Note that there might be different mounting positions from one module to another one.
The required connection elements and the range of support columns are depicted in the catalogue HT accessories.

AFAG accepts no liability where third-party modules have been attached to portal axes.

Add-on modules must be able to absorb forces (accelerations) occurring when the portal axis is running at full capacity.

3.2.4 Slide loads PDZ-160

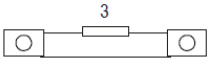
Type	PDZ-160
Max. torque Mx	260 Nm
Max. torque My	550 Nm
Max. torque Mz	550 Nm



$$\frac{Mx}{Mx\ max} + \frac{My}{My\ max} + \frac{Mz}{Mz\ max} < 1$$

Maximum payload/type	PDZ-160
Installation position (horizontal) for mounting side 3	200 kg
Installation position (vertical) for mounting side 3	200 kg

Assembly sides module mounting horizontal:



vertical:

Calculation of position versus time
The travel times of electrically driven gantry axis are dependent on the useful load, stroke + drive.

Our technicians will be pleased to make an optimum position/time calculation for you based on the gantry axis chosen. For being able to advise you correctly, we need the following data from you.

- Maximum planned stroke length
- Maximum moving mass
- Operation time desired

The values given are guide values that can be specified more precisely depending on the intended use!

3.3 Portal axis PDZ-200

3.3.1 Dimensional drawing PDZ -200-D

Type	PDZ-200
A	Module length (stroke + 662) mm
B	Lubricator nipple
C	8x both sides M8
H	Module stroke xxxx mm

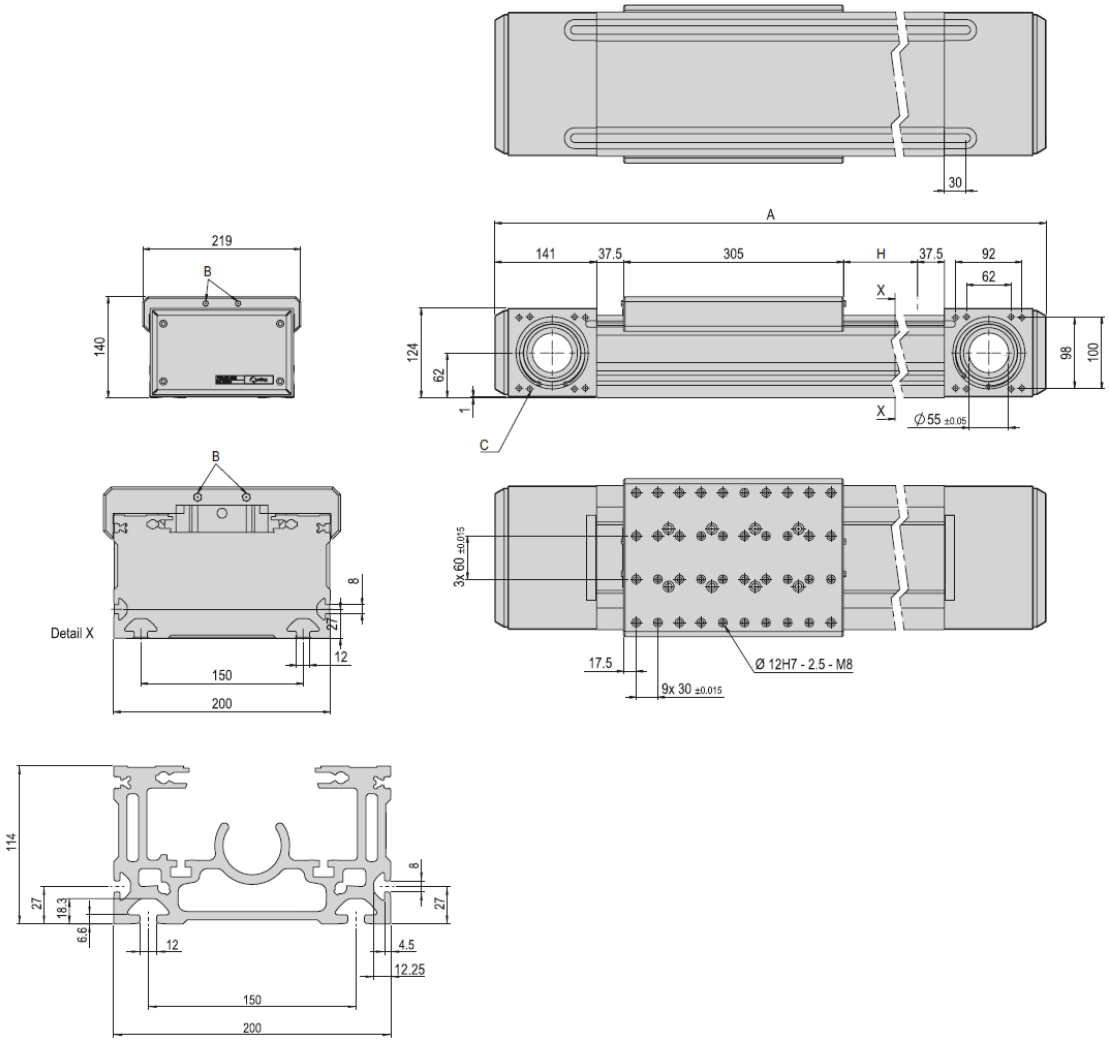


Fig. 3 Dimensional drawing portal axis PDZ -200

3.3.2 Technical data PDZ-200

PDZ-200	
Operating temperature	10 - 40 °C
Storage temperature	0 - 50 °C
Humidity	< 90 %

Type	PDZ-200
Order number	**50228209**
Max. stroke	5260 mm
Net weight	35.6 kg (at 0 mm stroke)
Moving weight	11.8 kg
Weight/100 mm stroke	2.5 kg
Cross-section profile W x H	200 x 114 mm
Module length	H + 662 mm
Toothed belt width	100 mm
Groove size (below/side)	12/8 mm
Groove distance (below)	150 mm
Hollow shaft Ø	55 mm
Number of linear guides	2 pcs
Torque	178.3 Nm
Protection type	IP 30
Feed constant	280 mm/U
Max. speed v	*5 m/s
Max. acceleration a	*50 m/s²
Max. circumferential force	4000 N
Repeat accuracy	+/- 0.05 mm
Mounting position	

The technical data pertains to Afag standard test conditions.
Note: The mounting sets, gears, motors, controllers and cables can be foand in the corresponding chapters.
Cleanroom class ISO 14644-1, class ISO 7

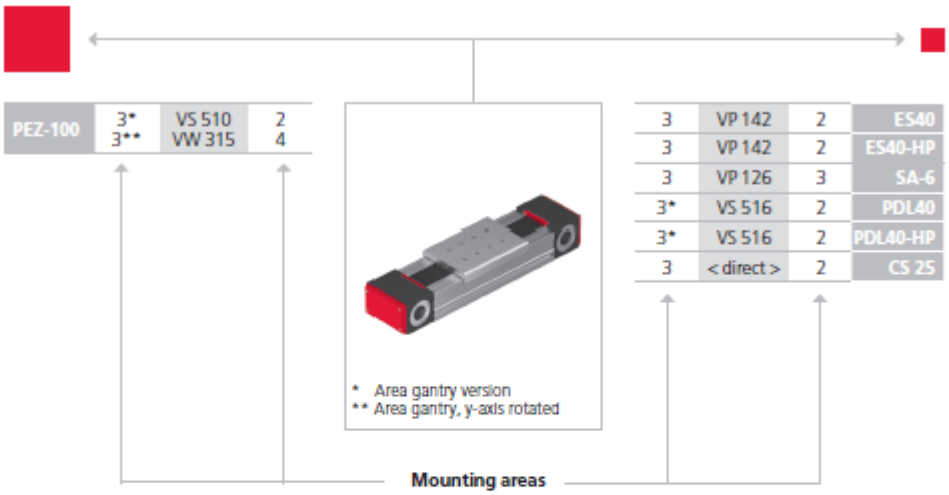
*The maximum values listed above depend on the application and must not be combined. In case of doubt, please contact your Afag partner.

Inlcuded in the delivery
(Catalogue HT accessories)
- 1x Sensor set portal axes [p. 321]

Accessories
- Stroke limitation PDZ-200 [p. 321]
- Load transmission unit PEZ-100/PDZ-200 [p. 318]

(Catalogue HT accessories)
- INI 8x4.7x16-Sn2.0-PNP-NC-M8x1
- T-nut M10
- Connecting set VS 510
- Mounting set 075
- Mounting set 090
- Mounting set 100
- Mounting set 120
- Planetary gearbox PE090
- Planetary gearbox PE120
- Planetary gearbox AF075
- Planetary gearbox AF100
- Angular gearbox PER090
- Angular gearbox PER120
- Angular gearbox AFR075
- Angular gearbox AFR100
- Servomotor-41-560VDC-2.8kW
- Servomotor-51-560VDC-5.0kW
- Servo controller SE-Power
- Servo controller E14xx

3.3.3 Preferred combinations PDZ-200

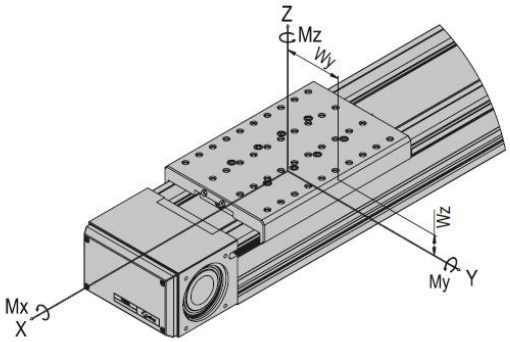


CS, ES	LM	HM	SA	UG, GM, SG, DG, PG, GE, SGE
PMP, PMP-c	PEZ, PDZ	PEL, PDL	RM, RE	CR, RM 32, RE, SREH, RA

Note that there might be different mounting positions from one module to another one.
The required connection elements and the range of support columns are depicted in the catalogue HT accessories.

3.3.4 Slide loads PDZ-200

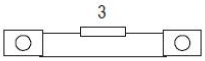
Type	PDZ-200
Max. torque Mx	500 Nm
Max. torque My	930 Nm
Max. torque Mz	930 Nm



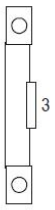
$$\frac{Mx}{Mx\ max} + \frac{My}{My\ max} + \frac{Mz}{Mz\ max} < 1$$

Maximum payload/type	PDZ-200
Installation position (horizontal) for mounting side 3	300 kg
Installation position (vertical) for mounting side 3	300 kg

Assembly sides module mounting horizontal:



vertical:



Calculation of position versus time
The travel times of electrically driven gantry axis are dependent on the useful load, stroke + drive.

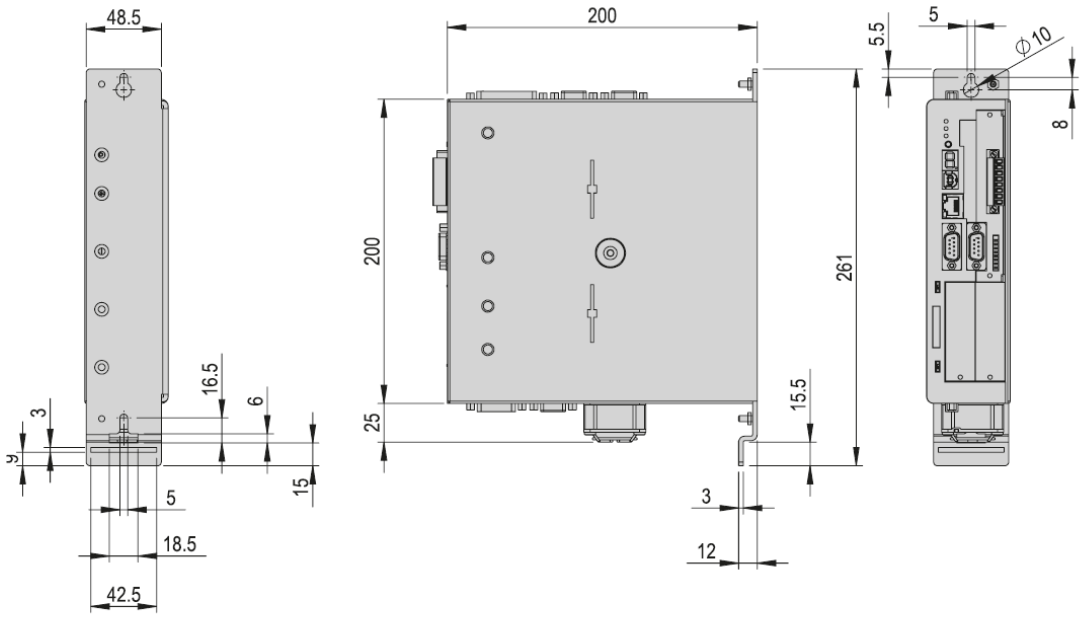
Our technicians will be pleased to make an optimum position/time calculation for you based on the gantry axis chosen. For being able to advise you correctly, we need the following data from you.

- Maximum planned stroke length
- Maximum moving mass
- Operation time desired

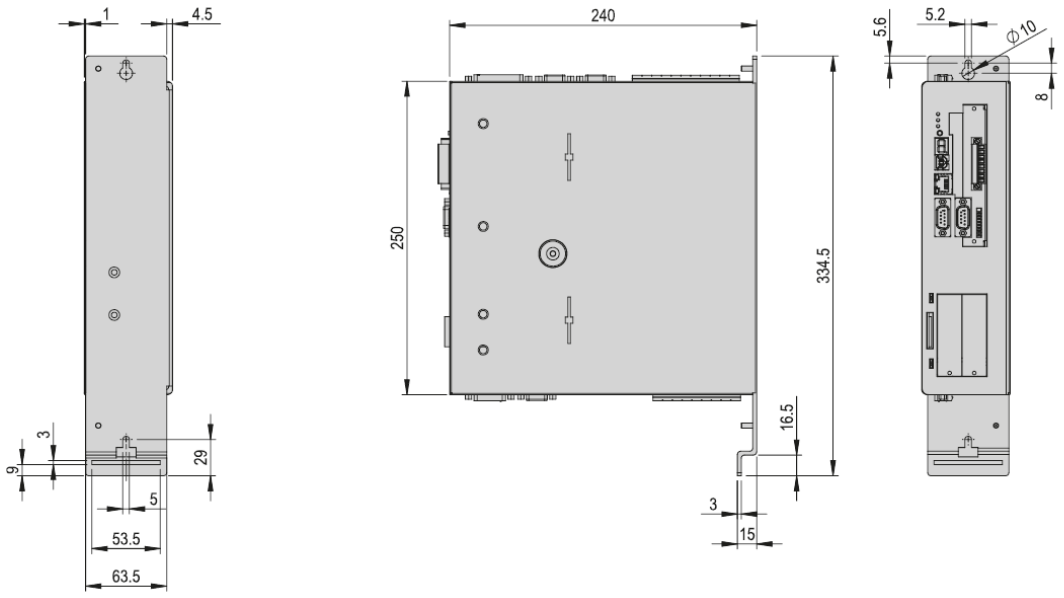
3.4 SE Power Control

3.4.1 Dimension drawing SE-Power

SE-Power 1kVA



SE-Power 3kVA / 6kVA



3.4.2 Technical data SE-Power

SE-Power	
Operating temperature	0 - 40 °C
Bearing temperature	-25 - 70 °C
Humidity	< 90 %
Encoder evaluation	Resolver, incr., SinCos, Hiperface, en Dat

Type	SE-Power 1kVA	SE-Power 3kVA	SE-Power 6kVA
Order number	**50036337**	**50162993**	**50183996**
Net weight	2.1 kg	3.7 kg	3.7 kg
Dimensions W x H x D	54x201x200 mm	69x250x240 mm	69x250x240 mm
Nominal output current	5 A	5 A	10 A
Supply voltage	48 - 230 VAC	3 x 400 VAC	3 x 400 VAC
Voltage supply, alternative	60 - 380 VDC		
Control voltage	24 VDC	24 VDC	24 VDC
Protection type	IP 20	IP 20	IP 20
Intermediate circuit voltage	320 VDC	560 VDC	560 VDC
Output power	1 kVA	3 kVA	6 kVA
Programming interface	USB/RS 232	USB/RS 232	USB/RS 232
Standard interfaces for higher-level control	CANopen DSP 402	CANopen DSP 402	CANopen DSP 402
Number of position data records via Onboard I/Os	16	16	16
Number of position data records with option I/O interface	250	250	250
Analog	+/- 10 V	+/- 10 V	+/- 10 V

Accessories

- Programming cable USB SE power FS
- Programming cable RS232 SE power
- I/O Interface
- Profibus Interface
- Profinet Interface
- EtherCAT Interface
- FS Safety Module FSM 2.0

4 Transport, packaging and storage

4.1 Safety instructions for transport

CAUTION

Risk of injury when unpacking the portal axes!

The portal spindle axis can be moved back and forth when it is not fastened, causing crushing injuries to the fingers.

- Carefully pack or unpack the portal axis.

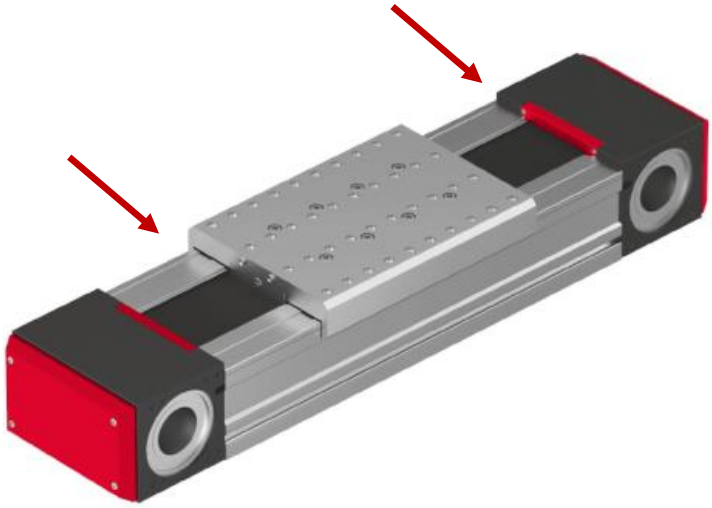


Fig. 4 Carefully unpack the portal axis

CAUTION

Risk of injury when lifting the portal axis!

Depending on the type, the weight of the portal axis can be between 11.8 kg and 55 kg. Back injuries can occur when packing and unpacking as well as when handling the portal axes.

- To lift the modules, we recommend attaching the axes to straps and lifting the portal axis out of the transport box with a lifting device.

Also observe the safety instructions in ➲ chapter 2 „Safety instructions“ in this manual.

4.2 Scope of supply

In addition to the assembly and operating instructions, a safety information sheet is enclosed with each portal axis.

This information sheet must be read by every person who carries out work with and on the PDZ!

[Unt]	Description
1 x	Portal axis without drive system
1 x	Installation instructions

The reference sensor is already mounted on the module on delivery.

For the control of the portal axis, it makes sense to approach a reference sensor. For the delivery test, the reference sensor is delivered already mounted (Fig. 5).

The reference sensor can be mounted differently at any time. Other reference sensors (➲ Chapter 5.3 Accessories - Sensor set portal axes) can also be mounted on the axis.

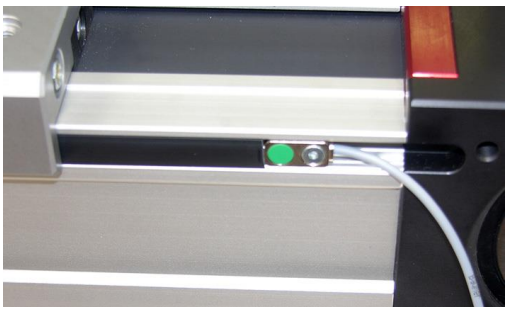


Fig. 5 Portal axis with mounted reference sensor

The sensor set of the portal axis contains the following parts:

[Unt]	Description
1 x	Sensor
1 x	Spacer plate
1 x	Countersunk bolt with nut

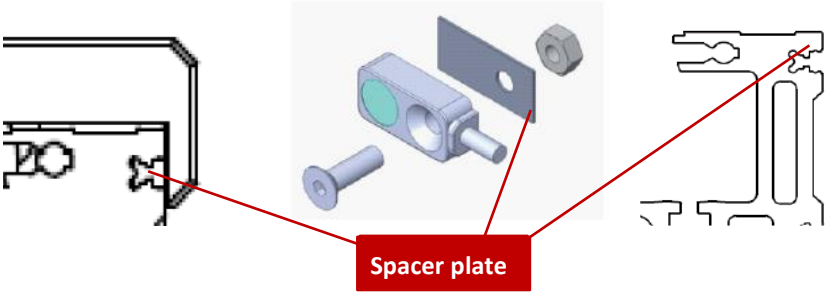


Fig. 6 Scope of delivery of sensor set for portal axes

Due to the profile and slide tolerances, individual faulty switching of the sensor used may occur. In this case, the spacer plate can be mounted or removed.

4.3 Transport

No liability can be assumed for damages caused by improper installation on the part of the operating company.

The following conditions must be complied with for transport and storage:

- Storage temperature: 0-50 °C
- Relative air humidity: < 90%, non condensing

4.4 Packaging

the portal axis is transported in the Afag Automation AG transport packaging. If no Afag packaging is used, the portal axis must be packed in such a way that it is protected against shocks and dust.

NOTICE

Risk to the environment due to incorrect disposal of the packaging material

Environmental damage can be caused by incorrect disposal of the packaging material.

- Dispose of the packaging material in an environmentally sensitive way in accordance with the local environmental regulations.

4.5 Storage

If the portal axis is stored for an extended period of time, observe the following:

- Store the portal axis in the transport packaging in a dry place.
- Do not store the rotational axis outdoors or expose it to weather conditions.
- The storage space must be dry and dust free.
- Room temperature of the storage space: 0-50 °C.
- Relative air humidity: < 90% non condensing
- Clean the portal axis and protect the blank metal parts against corrosion using the appropriate means.
- Protect the portal axis from dirt and dust.

5 Design and description

5.1 Structure of portal axis

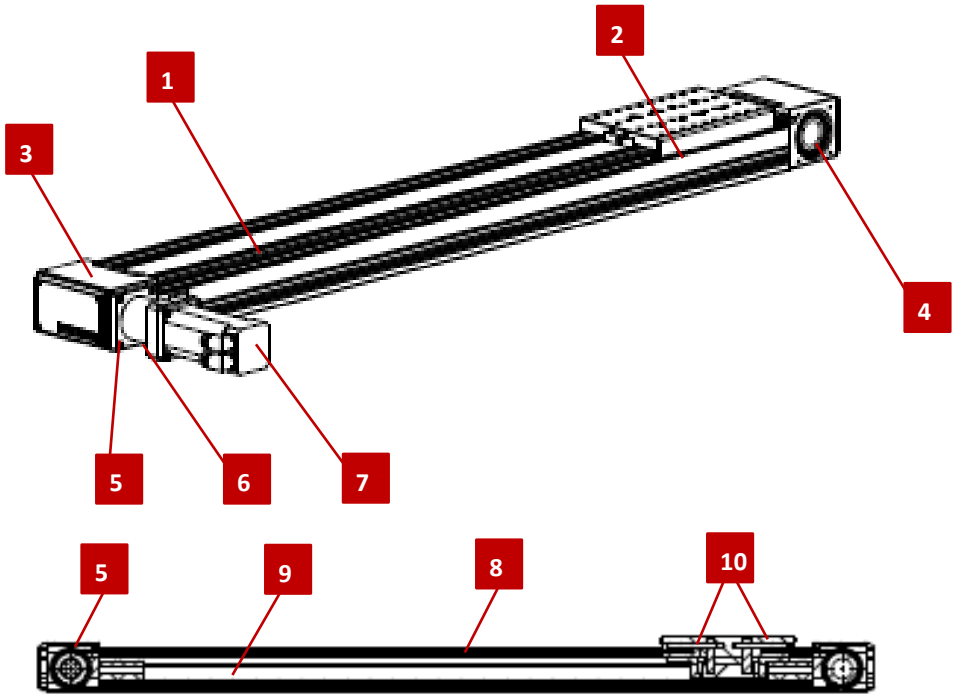


Fig. 7 Structure of portal axis

1. Portal axis
2. Slide
3. End pieces
4. Idler pulley
5. Mounting flanges/clamping set
6. Gearbox
7. Servo motor
8. Toothed belt
9. Linear guides
10. Clamping device

5.2 Product description

The portal axis function according to the slide principle, i.e., the slide moves linearly to a fixed drive unit (axis).

The drive unit including the mounting flange (Figs. 7, 5), the gear unit (Figs. 7, 6) and the motor (Figs. 7, 7) is permanently mounted and is therefore not considered part of the moving mass of the system. The system consists of an axis (Fig. 7, 1), the slide (Fig. 7, 2), the gearbox (Fig. 7, 6) and motor (Fig. 7, 7).

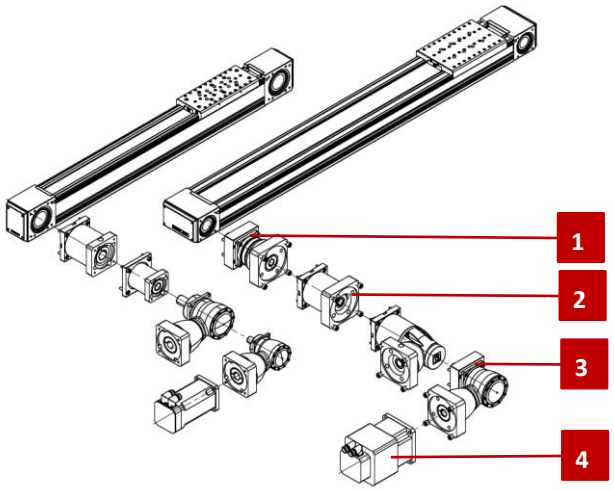
The Slide (Fig. 7, 2) is equipped with a linear guide (Fig. 7, 9). The toothed belt is mounted (Fig. 7, 8) inside the axis (Fig. 7, 1). The toothed belt idler pulleys are located on the axes end units (Fig. 7, 4). The toothed belt is clamped at the bottom of the slide. The clamping devices are also located at both ends of the unit (Fig. 7, 10).

Planetary gear units or angular gear units in various accuracy classes can be attached as required. The backlash-free connection between the drive shaft and the idler pulley is ensured by a clamping set (Fig. 7, 5). The reference switch is an inductive sensor which recognizes the home position of the slide during the reference run.

The motor/gearbox unit is mounted on the fixed slide component and is therefore not added to the moving load of the system. This results in high dynamics , and a favourable mass distribution for the substructure.

5.3 Accessories

The accessories for the portal axes can be found in the Afag Automation Ag technical product catalogue and on the Internet at www.afag.com.



Item	Description
1	Mounting flange
2	Gear unit (straight)
3	Gear unit (angle)
4	Servo motor

Fig. 8 Accessories and scope of delivery for the portal axis

Cr.	Designation	Order Number
1	Servo controller SE-Power 1kVA	50036337 (PDZ)
2	Servo controller SE-Power 3 kVA	50162993 (PDZ)
3	Servo controller SE-Power 6 kVA	50162996 (PDZ)
4	Encoder cable G5-5m-0-0	50075695
5	Encoder cable G5-10m-0-0	50224183
6	Encoder cable G9-3m-0-0	50341491
7	Encoder cable G9-5m-0-0	50341493
8	Motor cable M5-5m-0-open	50075693
9	Motor cable M9-3m-0-0	50341506
10	Motor cable M9-5m-0-0	50341507
11	Proximity switch cable M5-5m-0-open	11006446
12	Proximity switch cable M5-10m-0-open	50072072
13	Proximity switch cable M5-5m-90-open	11007826
14	Proximity switch cable M5-10m-90-open	50310513
15	Proximity switch cable R2-3m-0-0	50340271
16	Proximity switch cable R2-5m-0-0	11017754
17	Proximity switch cable R2-5m-90-0	50340272
18	Proximity switch cable R2-10m-90-0	50340903
19	Proximity switch INI 8x4.7x16-Sn2-PNP-NC-M8x1	50230625
20	Sensor set portal axis	50318206
21	Mounting flanges / gearbox / motor	see catalogue
22	Connecting angle VW 310	50254008
23	Connecting angle VW 311	50254009
24	Connecting angle VW 312	50254010
25	Connecting angle VW 313	50254011
26	Connecting angle VW 314	50254012
27	Connecting angle VW 315	50254013
28	Connecting angle VW 316	50279234
29	Connecting plate VP 144	50280005
30	Stroke limiter PDZ-128	50403196
31	Stroke limiter PDZ-160	50281047
32	Stroke limiter PDZ-200	50281048
33	Connection set for PDZ-200 (VS 510)	50254007

The mounting brackets and the connection set for the portal axis assembly are listed in the handling catalogue or can be found at www.afag.com.

6 Installation, assembly & setting

The portal axis is an incomplete machine. For safe operation, the system must be integrated into the safety concept of the system in which it is installed.

During normal operation, it must be ensured that the user cannot interfere with the working area of the portal axis. This can be achieved through suitable protective measures (e.g. enclosure, light grid).

When the system is running in special operating modes, it must be ensured that there is no danger to the operator.

The system operator is responsible for the installation of the portal axis in a system!

6.1 Safety Instructions for Installation & Assembly

CAUTION

Risk of injury when lifting the portal axis!

Depending on the type, the weight of the portal axis can be up to 55 kg. Back injuries can result when lifting them without aids.

- For installation in a mounting system, securely fasten the portal axis to straps and lift with a lifting device.

CAUTION

Risk of injury due to high noise exposure!

The PDZ achieves acceleration values of 3G in full load operation. This poses a risk of injury, e.g., from ejected parts, if care is not taken.

- When installing the PDZ in a machine or an assembly system, a guard must be provided.

No warranty will be granted for damage caused by improper installation on the part of the operating company.

Also observe the safety instructions in ➲ chap. 2 „Safety instructions“ in this manual.

6.2 Assembly & attachment

The installation position of the PDZ is horizontal.

6.2.1 Overview of individual parts of the PDZ

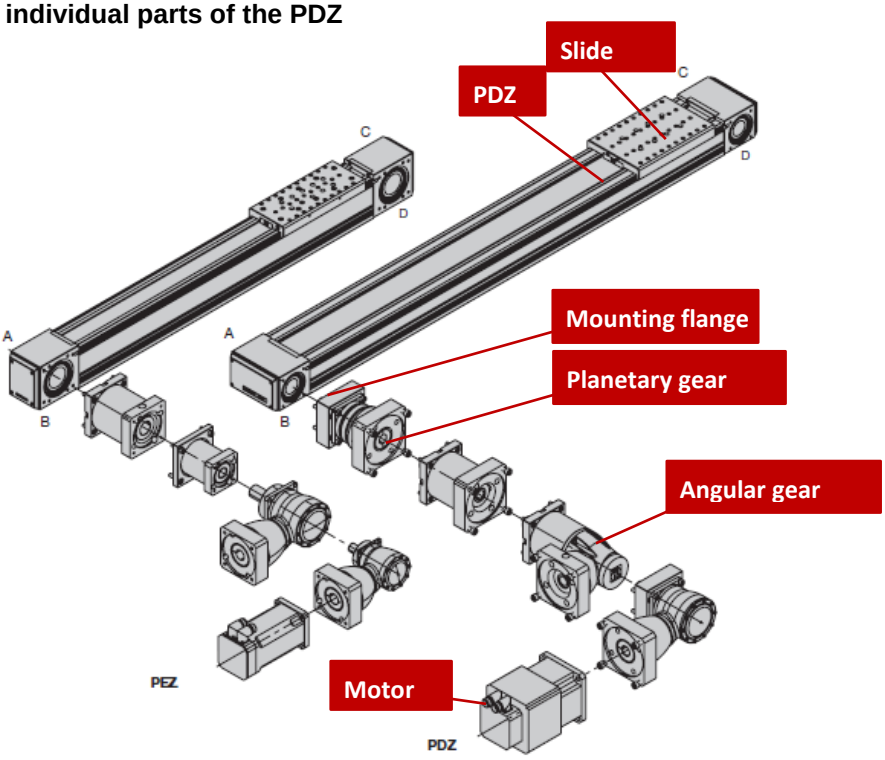
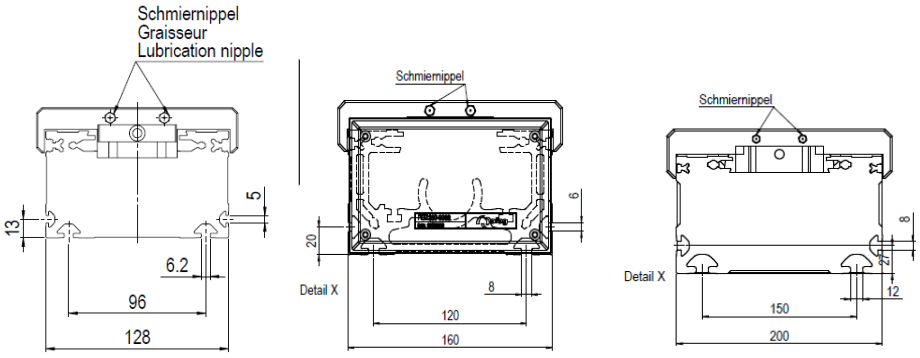


Fig. 9 Individual parts portal axis (exemplary Symbol)

Motor and gearbox attachment is possible at positions A, B, C and D.

6.2.2 Mounting surfaces

The mounting surfaces for the portal axes are located on the underside as standard. Attachment brackets can mainly be mounted on the side grooves.



PDZ-128 PDZ-160 PDZ-200

Fig. 10 Mounting surfaces portal axis PDZ

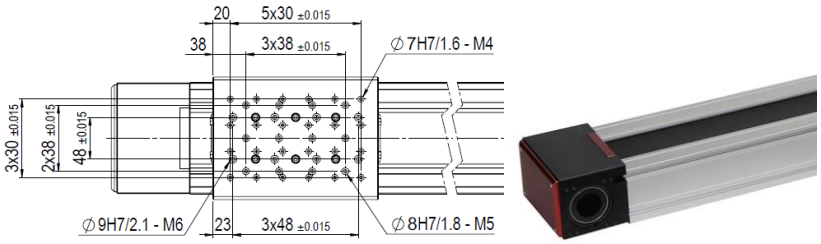
Main mounting surface:

The main mounting surface of the portal axes is at the bottom of the two grooves! To avoid distortion, make sure that the screw-on surface has a flatness of at least 0.15 mm.

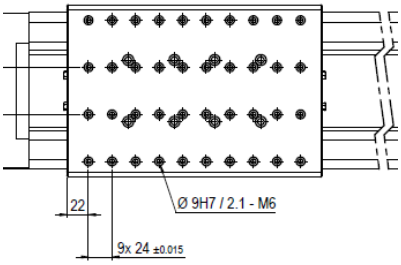
The lateral grooves may only be used in connection with the connection set (clamping jaws) for fastening the axes (➲ chap. 5.3 Accessories or Afag catalogue)!

6.2.3 Mounting options on the axle slide

PDZ-128



PDZ-160



PDZ-200

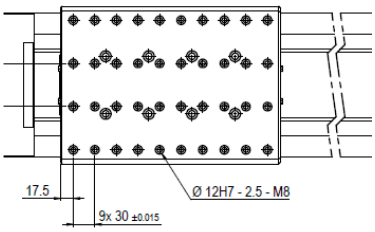


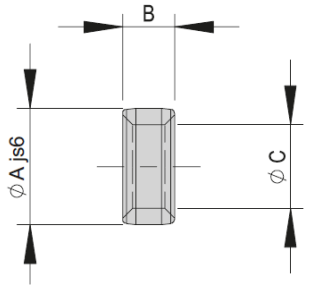
Fig. 11 Mounting surfaces portal axis PDZ

6.2.4 Attachment grid and centering bushings

Use the centring bushings included in the scope of delivery for positioning. Insert the centering bushings into two diagonally opposite holes of the attachment grid.

Element	PDZ-128	PDZ-160	PDZ-200
Hole grid	30x30	24x48	30x60
Thread/Hole	M4	M6	M8
Centering bushing (H7)	Ø7mm	Ø9mm	Ø12mm

Centering bushings	Ø4x2	Ø5x2.5	Ø7x3	Ø8x3.5	Ø9x4	Ø12x4.8	Ø19x5.8
Order number	50332257	50035831	11016850	50263565	11004942	50187424	50189497
Net weight	0.001 kg	0.001 kg	0.001 kg	0.001 kg	0.001 kg	0.002 kg	0.006 kg
A	4 mm	5 mm	7 mm	8 mm	9 mm	12 mm	19 mm
B	2 mm	2.5 mm	3 mm	3.5 mm	4 mm	4.8 mm	5.8 mm
C	2.6 mm	3.2 mm	4.3 mm	5.4 mm	6.5 mm	8.5 mm	13 mm



Attachment grid	16x16 mm	20x20 mm	30x30 mm	38x38 mm	48x48 mm	60x60 mm	75x75 mm	96x96 mm
A	16 mm	20 mm	30 mm	38 mm	48 mm	60 mm	75 mm	96 mm
B	8 mm	10 mm	15 mm	19 mm	24 mm	30 mm	75 mm	48 mm
C	4x1.1 mm	5x1.3 mm	7x1.6 mm	8x1.8 mm	9x2.1 mm	12x2.5 mm	15x2.7 mm	19x3 mm
D	M2.5	M3	M4	M5	M6	M8	M10	M12

Module-centering, centering bushings
In order to guarantee a high and repetitive fit accuracy during installation, operation or replacement of a module, all components of the entire program are consequently provided with a precise module centering. Centering bushings or pins are supplied as standard with each module.

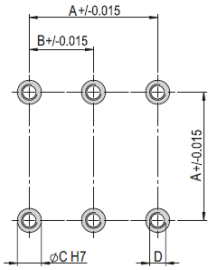


Fig. 12 Centring sleeves portal axes PDZ

6.2.5 Tightening torques

For assembling use screws with the following minimum specifications:

Standard	VDI 2230
Screw strength	Category 8.8
Surface:	Galvanized blue, oiled or greased

Thread	Tightening torque
M3	1.1 … 1.4 Nm
M4	2.6 … 3.3 Nm
M5	5.2 … 6.5 Nm
M6	9.0 … 11.3 Nm
M8	21.6 … 27.3 Nm

6.3 Installation in an assembly system

A stable substructure is necessary for the installation of the portal axis in an assembly system. All screws must be fastened in accordance with the specified tightening torques.

The portal axes must be earthed when installed in a system! An insulation test must be carried out before the portal axis is put into operation!

CAUTION

Risk of injury when installing the portal axis in a system!

Risk of injury when installing the portal axis in a system!

- Installation may only be carried out by a qualified specialist!
- The portal axis may only be installed with the control unit switched off and secured!
- Connect or disconnect the cables only when the control is switched off.

CAUTION

Danger of crushing!

Risk of injury (crushing of fingers) when installing the portal axis in a system!

- Take care when handling the portal axes
- Install portal axes with the aid of a lifting device!

6.4 Motor gearbox combination

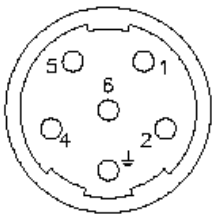
The motor/gearbox unit is mounted on the fixed slide component and is therefore not added to the moving load of the system. This results in high dynamics and a favourable mass distribution for the substructure.

Any use under conditions with increased dirt content should be avoided, as no additional protective measures or covers are available.

6.4.1 Electrical interfaces of the portal axis

The operating company is responsible for the safety of the control system, as lifting the portal axis is controlled by the control unit of the operating company.

For the connection of the PDZ portal axis the use of AFAG standard cables (➲ chap. 5.3 accessories) is recommended.

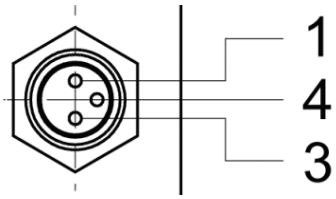


Item	Signal
1	U
5	V
2	W
3	GND Motor
6	Brake +
4	Brake -

Pin assignment motor connection (view motor side)

Item	Signal
1	S1
2	S3
3	S4
4	S2
5	R1
6	R2
7	Thermo switches
8	Thermo switches

Pin assignment encoder (view motor side)



Item	Signal
1	5 … 24 V DC
3	GND
4	Signal, PNP

Pin assignment reference switch

6.4.2 Changing the gearbox mounting side

If required, the gearbox or motor can be attached to positions A, B, C and D with relatively little effort.

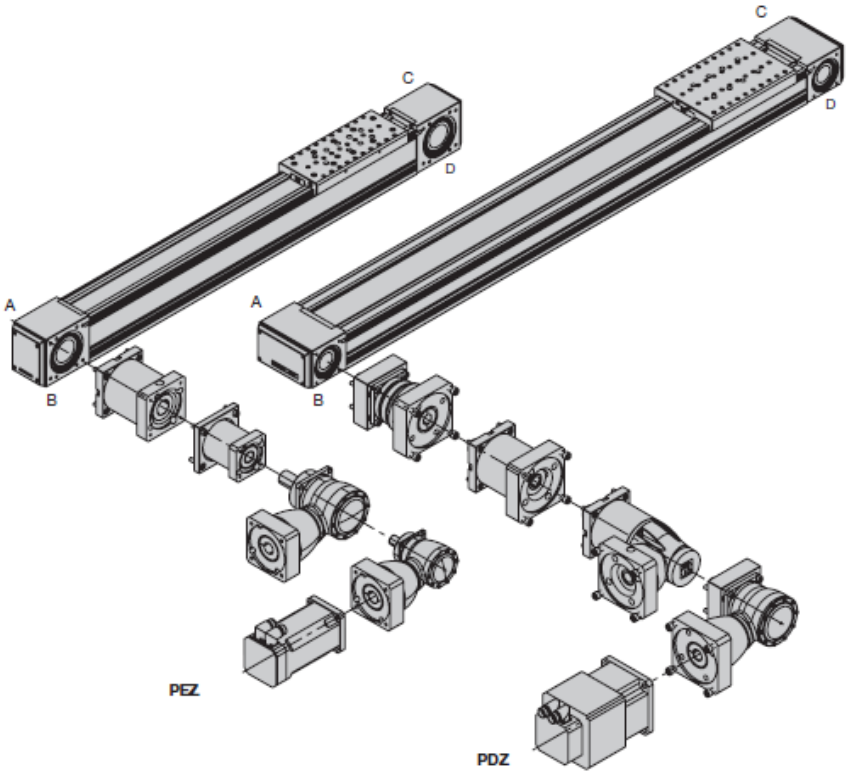


Fig. 13 Attachment of the PDZ (exemplary illustration)

CAUTION

Danger arising from work carried out improperly!

The gearbox mounting side may only be changed with the portal axis removed!

- Disconnect the portal axis from the power supply before removing it!

CAUTION

Risk injury/property damage due to electric voltage!

Applied electric voltage and current can cause injuries and damage to the equipment!

- Avoid over-voltage and over-currents!

After changing the gearbox/motor mounting side carry out the following activities:

- Reverse/adjust the direction of rotation of the motor!
- Reference the portal axis (➲ controller manual)!

Procedure change the gearbox/motor mounting side:

Torques for screws (Class 12.9)

PDZ-128	4 x M4: 5.6 Nm
PDZ-160	4 x M6: 19.3 Nm
PDZ-200	4 x M8: 46.9 Nm

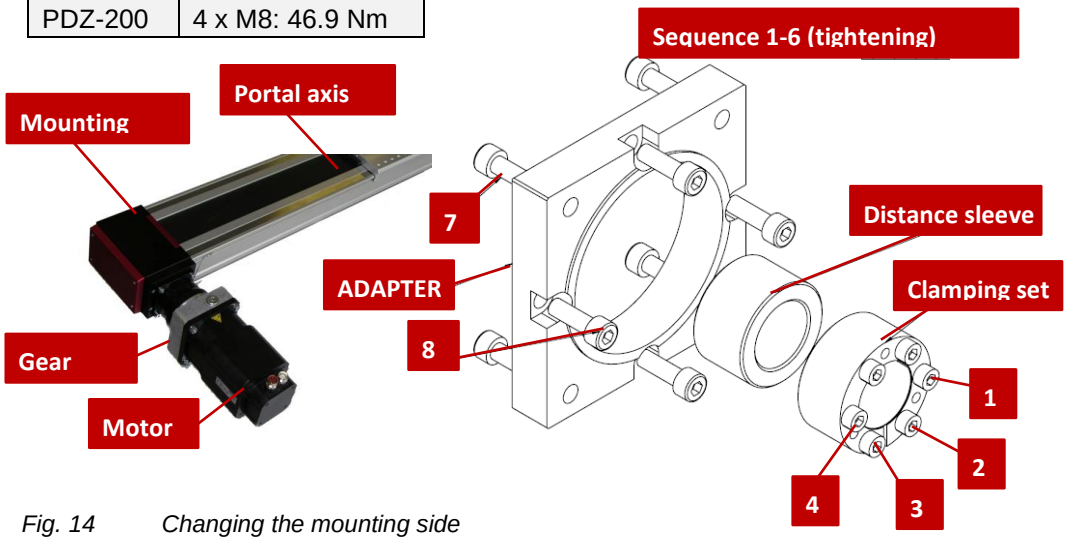


Fig. 14 Changing the mounting side

Procedure:

1. Ensure that the portal axis is de-energised.
2. Remove the connection cable from the portal axis.
3. Remove the motor connector and encoder connector.
4. Remove the adapter, gearbox and motor together:
   - Loosen the 4 screws (Fig. 14, 7) on the clamping set.
   - Turn 2 x screws into the forcing threads until the clamping set is released.
   - Turn the screws back into the clamping threads.
5. Remove the 4 screws (Fig. 14, 8).
6. Remove the gearbox adapter (Fig. 14) together with the gearbox and motor.
7. First, push the adapter sleeve (Fig. 14) and then the clamping set (Fig. 14) onto the gear shaft as far as it will go.
8. First, push the gear shaft with the clamping set on the opposite side into the hollow shaft.
9. Tighten the gear adapter with the 4 screws.
   - Do not tighten the screws yet! Tighten only so as far that the adapter rests snugly on the mounting surface.
10. Tighten the clamping set.
    - Pre-tension the clamping screws in the sequence (Fig. 14, 1-6).
    - Then tighten evenly to the specified torque Ms using a torque spanner.
11. Tighten the gear adapter with the 4 screws.
12. Connect motor and encoder plugs (note voltages and currents present!)

⇨ The change of the gearbox/motor mounting side is completed.

6.4.3 Attachment of other gearboxes

Gear units from other manufacturers can also be mounted on the portal axis. The procedure for changing the gearbox and fitting the motor is described in chapter 6.

Only use gearboxes suitable for the operation of the portal axis (observe the requirements of the portal axis for this).

Note the prerequisites:

- The diameter of the gearbox output shaft must be 16/22/32 mm (PDZ-128, PDZ-160, PDZ-200) . This is based on the size of the appropriate attachment set.
- A matching adapter to the mounting surface (Fig. 15) incl. centring collar must be manufactured. The supporting surfaces are the same on the left and right.

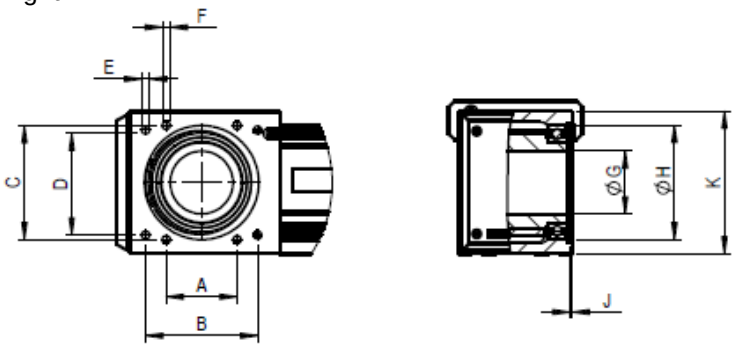


Fig. 15 Mounting of third-party gearboxes

Types	A	B	C	D	E	F	G	H	J	K
PDZ-128	38	56	61		M5		32			82
PDZ-160		69		76	M6		40	80	4	98
PDZ-200	62	92	100	98	M8	M8	55	100	4	123

The retainer ring (Fig. 16, 1) must be removed before mounting the gearbox! If the gearbox is installed in a different position, the corresponding retainer ring must also be repositioned!

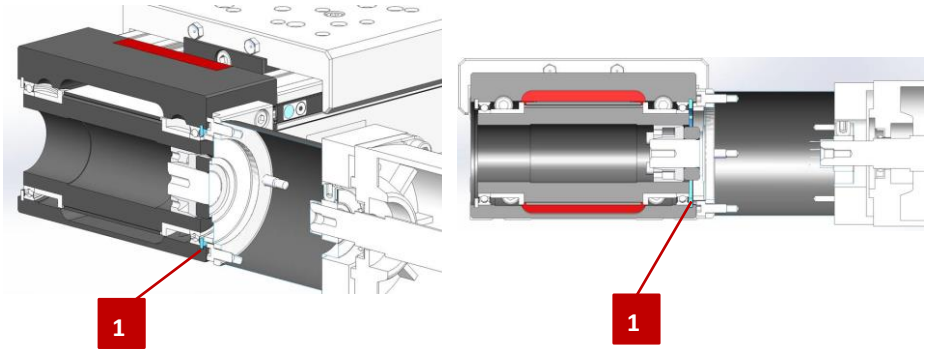


Fig. 16 Mounting of third-party gearboxes

6.5 Programming the portal axis

WARNING

Risk of injuries due to uncontrolled parts movements!

Incorrect programming can cause the portal axis to make rapid or uncontrolled movements or to drive into the stop without braking and cause serious injuries or damage to property.

- Ensure that the enclosure is closed and that there are no persons or loose parts/objects in the working area.
- Have programming carried out by qualified personnel only.

CAUTION

Risk of injuries due to uncontrolled parts movements!

A failure of the position sensor or a defective limit switch cable can cause unexpected movements of the portal axis.

- Immediately replace the defective position sensor and/or the defective switch cable.

Programming is done differently depending on the controller used. Observe the respective manuals of the controller manufacturers!

When using the Afag SE-Power control unit, please observe the enclosed operating instructions. These instructions are available on the Afag website.

6.6 Add-on modules

The portal axis is designed for the attachment of Afag modules. When using add-on modules, make sure that the add-on modules can withstand the forces (accelerations) that occur.

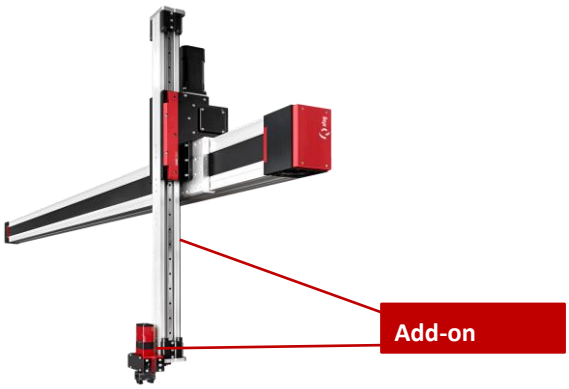


Fig. 17 Add-on modules (example illustration)

The gripper fingers are attached by the customer. The gripper fingers must must be appropriately designed for the application in order to avoid injuries caused by ejected parts during operation.

6.6.1 Servo motor

Servo motor connection data

Unit	PDZ-128	PDZ-160	PDZ-200
DC link voltage	560V	560V	560V
Nominal torque	2 Nm	2 Nm	3 Nm
Peak torque	10 Nm	10 Nm	21 Nm
Standstill torque	2.5 Nm	2.5 Nm	5.3 Nm
Rated current	2.2 A	2.2 A	4.3 A
Standstill current	2.6 A	2.6 A	6.8 A
Nominal speed	4500 min^{-1}	4500 min^{-1}	6000 min^{-1}
Brake holding torque 24 V	9 Nm	9 Nm	9 Nm
Brake	-	yes	yes
Moment of inertia with brake	1.58 $kgcm^2$	1.58 $kgcm^2$	3.19 $kgcm^2$
Weight motor with brake	3.75 kg	3.75 kg	6.1 kg
Weight without brake	3.2 kg	3.2 kg	5.6 kg

Turning the motor connector

The motor connectors can be turned if necessary.

Procedure:

1. Loosen the screws on the connector.
2. Turn the connectors.
3. Tighten the screws again.

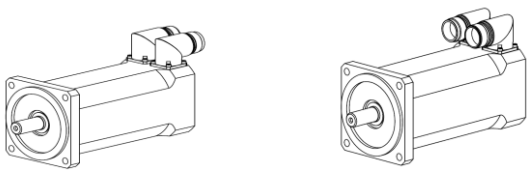


Fig. 18 Turn the motor connector

The peak torque of the motor can be higher (approx. 10%) than the max. permissible shaft torque due to losses in the mechanics.

If the values listed above cannot be complied with when using a motor from another manufacturer, AFAG must be consulted!

6.6.2 Mounting the transmission unit

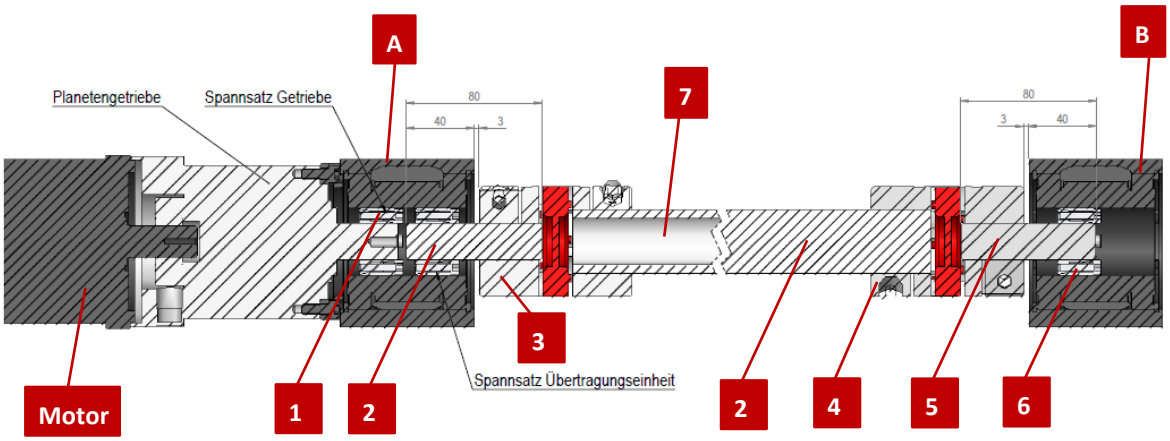


Fig. 19 Transmission unit (example illustration)

1. Clamping set	5. Spigot
2. Spigot	6. Clamping set
3. Coupling	7. Transmission shaft
4. Coupling	A+B: Axle bearings

Procedure for mounting the transmission unit:

1. Insert the clamping set (Fig. 19, 1) (screws pointing towards the shaft) and the pin (Fig. 19, 2) into the axle bearing **(A)** (motor side) and tighten.
2. Prepare transmission shaft (Fig. 19, 7) with couplings (Fig. 19, 3+4).
   - Loosen the coupling (Fig. 19, 3) and align it flush with the transmission shaft (Fig. 19, 7).
3. Insert transmission shaft (Fig. 19, 7) with coupling (Fig. 19, 3) on the journal (Fig. 19, 2) between axle bearing (**A**) and **(B**).
4. Push the pin (Fig. 19, 5) and the clamping set (Fig. 19, 6) into the axle bearing **(B**).
5. Align the transmission shaft (Fig. 19, 7) with the couplings (Fig. 19, 3+4).
6. Tighten the coupling (Fig. 19, 3+4) and tighten the clamping set (Fig. 19, 6) in the axle bearing **(B**).

   ⇨ The transmission unit is mounted.

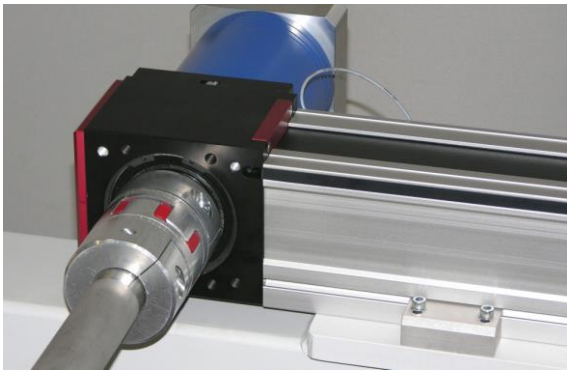


Fig. 20 Transmission unit (coupling on motor side)

6.6.3 Superstructures for portal axes

The portal axes can also be set up as portal units. You can find more information on this in our catalogue or at www.afag.com.

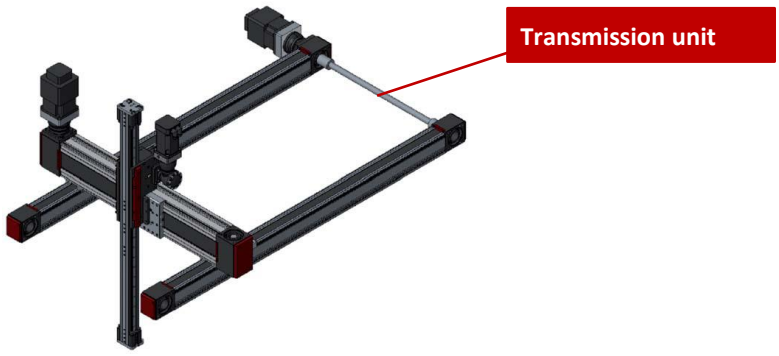


Fig. 21 Portal axes (transmission unit)

CAUTION

Danger from moving loads at high speed!

In this application, the portal axis performs fast movements with large loads that can cause injuries/property damage.

- Ensure that a suitable enclosure (guard) is in place and that the work area is adequately secured.

Accessories for synchronous drives

Synchronous drive	Order Number
PDZ-128	50267101
PDZ-160	50267102
PDZ-200	50267103

6.6.1 Stroke limiter

The stroke limitation serves as an Emergency-Stop so that damage to the axle or the attached parts (gripper, etc.) is avoided.

The stroke limitation is used in cases where the mechanical stroke of the portal axis may not be approached completely. This can be the case, for example, with cross and vertical superstructures (Fig. 22).

Two rubber buffers on each side act as end-position dampers. The movement is always stopped electrically by the servo controller.

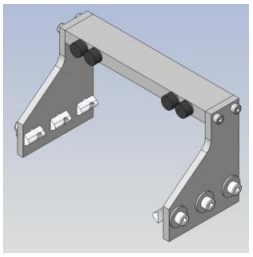


Fig. 22 Stroke limitation (example illustration)

Assembly process

Procedure for mounting the stroke limitation:

1. Insert the sliding blocks in the desired position in the profile grooves of the axes.
2. Insert the stroke limitation bracket onto the axis profile.
3. Insert screws with washers and spring washers.
4. Position and tighten the stroke limitation.

   ⇨ The stroke limitation is mounted.

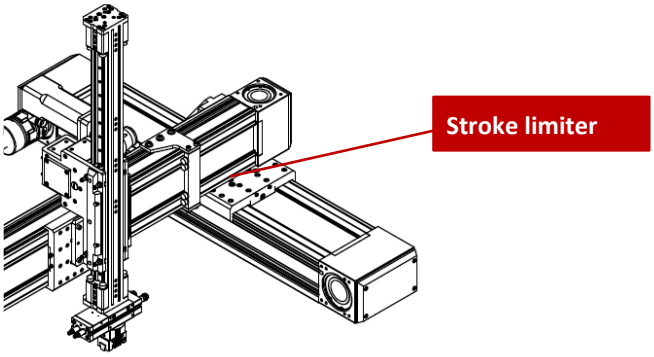


Fig. 23 Stroke limitation mounted

Set stroke limitation

The stroke limitation is supplied in individual parts which are assembled as shown.

Fig. 24 Individual parts of the stroke limitation

Stroke limiter	Order Number	Units
PDZ-128	50403196	1 x
PDZ-160	50281047	1 x
PDZ-200	50281048	1 x

After the axis slide has driven onto the stroke limiter, the stroke limiter must be checked for damage and replaced if damaged. This ensures that the stroke limitation continues to function properly.

6.6.2 Portal axis with double slide (special version)

These portal axes are specially designed for various special applications.
For further information, please contact AFAG's service department.

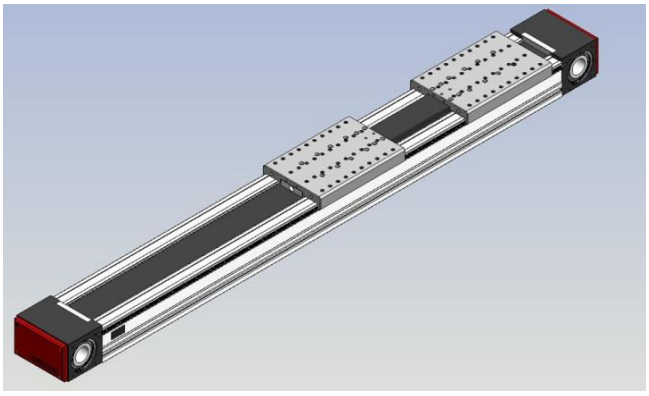


Fig. 25 Special version portal axis with two slides (on request)

If a connecting plate is used on a portal axis with double slides, centring sleeves may only be used on one slide!

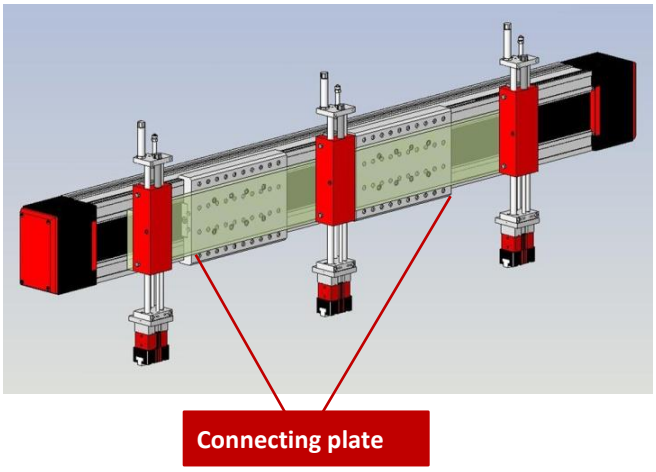


Fig. 26 Example of connecting plate for superstructures

7 Commissioning

After connection, the portal axes are put into operation for the first time via the system controller.

Only commission the portal axes with attachments and superstructures in setup or jog mode!

7.1 Safety instructions for commissioning

WARNING

Risk of injuries due to uncontrolled parts movements!

Incorrect programming can trigger uncontrolled movements of the portal axis and cause serious or fatal injuries and material damage.

- Make sure that there are no persons or tools in the working area of the portal axis.

CAUTION

Risk of injury due to mounted components!

Attachments can be a risk in conjunction with moving parts.

- Take appropriate measures to ensure safe operation!

Also observe the safety instructions in ➲ chap. 2 „Safety instructions“ in this manual.

Please also observe the installation instructions for the control unit used!

7.2 Preparatory activities for commissioning

An insulation test must be carried out before of the portal axis is put into operation!

7.3 Commissioning of the modules

Proceed carefully and follow the instructions step by step when commissioning the modules for the first time:

1. Switch off the control and use a lockout device to make sure that the control cannot be started up again.
2. Connect the encoder cable.
3. Connect the motor cable.
4. Connect the reference switch cable.
5. Switch on the controller unit and check the correct function of the encoder and the reference switch.

6. Perform test run:
   - Start with slow movements.
   - Subsequently under normal operating conditions.
   ⇨ Commissioning is completed.

7.4 Setting up & retrofitting

DANGER

Danger! Risk of electric shock!

If work on electrical components is the controller unit required, ensure that the work is carried out properly, failure to do so will cause serious or fatal injuries.

- Work on the machine's electrical equipment may only be performed by skilled electrician or trained personnel under the supervision of a skilled electrician in accordance with all relevant electrical regulations.

CAUTION

Danger of injury due to improper adjustment!

Improperly carried out activities can result in considerable material damage and serious injury.

- Only use trained specialist personnel to carry out the activities.

CAUTION

Risk of injury due to incorrect operation of the system!

During set-up work on the system, the portal axis can start up in an uncontrolled manner due to incorrect operation and injure persons working on the system.

- The operating company is responsible for ensuring that persons do not carry out any incorrect operation when setting up of the portal axis in an open system!
- Only use trained specialist personnel to carry out the activities.

When carrying out set-up work on of the portal axis, the controller must be deactivated and only switched on again after the work has been completed!

8 Fault elimination

8.1 Safety instructions for troubleshooting

WARNING

Danger of injury due to faulty troubleshooting!

Poorly performed troubleshooting work can lead to serious injuries and damage to property.

- Only use trained specialist personnel for troubleshooting.
- All work on of the portal axis must be carried out with the power supply cut off!

WARNING

Risk of injuries due to uncontrolled parts movements!

Signals from the control system can trigger unintentional movements of the portal axis, which can cause injury.

- Before starting any work on the portal axis, switch off the controller and secure to prevent it from being switched on.
- Observe the operating instructions of the controller used!

Also observe the safety instructions in chap. 2 „Safety instructions“ in this manual.

NOTICE

Risk of material damage due to strong oscillations!

Very strong vibrations at the moving part of the portal axis after switching on the control unit (vibrations at the drive) can damage the axis as well as the attached components.

- In case of strong oscillations, switch off the portal axis immediately!

8.2 Fault causes and remedy

8.2.1 A) Malfunctions during reference travel

Fault	Possible cause	Remedy:
Slide oscillates (strong vibrations at the drive)	▪ Control parameters poorly adjusted	▪ Readjust the parameters on the controller
Slide moves to end position and stops	▪ Reference sensor connection incorrect ▪ Interruption in the reference sensor connection ▪ Reference sensor defective	▪ Check connection; correct if necessary ▪ Check sensor cable ▪ Replace reference sensor (➲ repair instructions)
Module does not move	Drive incorrectly connected ▪ Motor disconnection ▪ Drive defective	▪ Check connection, correct if necessary ▪ Carry out function check according to commissioning ▪ Check motor cable ▪ Have spindle drive replaced by AFAG

8.2.2 Malfunction during operation

Fault	Possible cause	Remedy:
Slide oscillates (strong vibrations at the drive)	▪ Controller parameters incorrectly adjusted	▪ Readjust the parameters on the controller
Slide stops after short stroke	▪ Significant contouring error ▪ Interruption in the encoder connection	▪ Reduce values for acceleration and speed ▪ Check if portal axis is mechanically blocked ▪ Check encoder cable ▪ Check encoder for correct operation (➲ commissioning)
Increased toothed belt noise	▪ Toothed belt tension not correct ▪ Normal operating noise due to material combination polyurethane-steel ▪ Toothed belt defective	▪ Check toothed belt tension, correct if necessary ▪ Apply lubricant or silicone spray on toothed belts ▪ Replace damaged toothed belt (➲**Fehler! Verweisquelle konnte nicht gefunden werden.**)
Further increased running noise at the axis	▪ Linear guide insufficiently lubricated ▪ Perceptible play in linear guides ▪ Ball bearing of drive shaft or idler pulley defective ▪ Gearbox is defective	▪ Re-grease guides (➲0) ▪ Have guides exchanged by Afag ▪ Have bearing replaced by Afag ▪ Replace gearbox

9 Maintenance and repair

9.1 General notes

The portal axis is almost maintenance-free. Nevertheless, some maintenance work must be carried out to ensure an optimum operating condition of the portal axis.

9.2 Safety instructions for Maintenance and Repair

WARNING

Danger of injury due to improper maintenance!

Improperly carried out maintenance activities can cause considerable damage to property and serious injury.

- Only use trained specialist personnel to carry out the activities.
- Always wear personal protective equipment when carrying out maintenance and repair work!

WARNING

Risk of injuries due to uncontrolled parts movements!

Incorrect programming can trigger uncontrolled movements of the portal axis. Fast or unintentional movements of the portal axis may cause injury or material damage.

- Before starting any activities, switch off the media supply and lock to prevent it from being switched on again!
- Disconnect the control cable from the axle before starting work!

Also observe the safety instructions in ➲ chap. 2 „Safety instructions“ in this manual.

9.3 Maintenance activities and maintenance intervals

The maintenance intervals must be strictly observed. The intervals apply to normal operating conditions and are to be shortened accordingly for other conditions.

9.3.1 Overview of the maintenance points

Fig. 27 Maintenance portal axis PDZ

No.	Maintenance point	Maintenance work	Interval	System [On/Off]	Remarks
1	Axis	Cleaning and checking 	As required	[Off]	-
		▪ Clean the rotational axis with a dry, lint-free cloth. - Do not spray the rotational axis with water, do not use aggressive cleaning agents. - Perform a visual inspection of the axis.			
2	Toothed belt	visual check 	1 x Month	[Off]	-
		- Check for damage			
3	Linear guides	visual check 	1 x Month	[Off]	
		- Check for damage			
4	Gear	visual check 	1 x Month	[Off]	
		- Check for oil leakage			
5	Safety mark (sticker)	visual check 	1 x Month	[Off]	-
		- Check for damage, legibility and cleanliness			
6	Entire portal axis	check 	1 x Month	[On]	
		- Acoustic control for unusual noise generation			
7	Linear guide	Lubricating 	Every 2.000 km / after 6 months	[Off]	➲ Chap 9.3.2
		▪ Lubrication of the linear guide. Recommended lubricant: **Blasolube 301** (2-3 strokes at each grease nipple)			

9.3.2 Lubrication of the linear guide

NOTICE

Risk of damage due to improper lubricants!

Do not use lubricants with additives such as MoS2, graphite or PTFE. These lubricants can damage the linear guides!

- Only use the lubricants recommended by AFAG in the maintenance table ➲ chap. 9.3.1 or equivalent lubricants!

The guides must be lubricated at the four slide grease nipples after 2000 km or every 6 months.

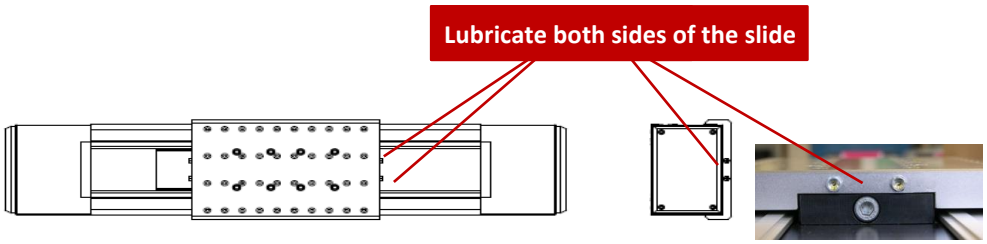


Fig. 28 Grease nipples on the slide

To lubricate the linear guides proceed as follows:

1. Make sure that the control unit is switched off and locked to prevent it from being switched on again!
2. Move the axis to the central position so that there is sufficient space for the grease gun between the slide and the end stops.
3. Remove old grease residues and dirt from the guide rails or the ends of the slide with a lint-free cloth.
4. Lubricate the slide at the four grease nipples (Fig. 28) with a grease gun (2-3 strokes).
   - Recommended lubricant: **Blasolube 301**
   ⇨ The lubrication of the linear guide is completed.

To ensure optimum distribution of the lubricant, first carry out 2-3 strokes at low speed after lubrication.

9.3.3 Further maintenance

Further maintenance is not required, if the ambient conditions listed below are complied with:

- Clean working area
- No use of splash water
- No abrasion or process dusts
- Environmental conditions as specified in the technical data

9.4 Spare parts and repair work

NOTICE

Repairs must be carried out on site by the Afag AG repair service . Contact Afag AG for this.

➲ www.afag.com

10 Decommissioning, disassembly, disposal

The portal axis must be properly dismounted after use and disposed of in an environmentally friendly manner.

10.1 Safety instructions for decommissioning and disposal

WARNING

Risk of injury due to improper decommissioning and disposal!

Improperly carried out activities can result in considerable material damage and serious injury.

- Only use trained specialist personnel to carry out the activities.
- Disconnect the media supply before dismounting the module!
- Only dismount the portal axis when the control unit is switched off and secured!

10.2 Decommissioning

If the portal axes are not used for a longer period of time, they must be properly commissioned and stored as described in ➲ chapter 4.5.

10.3 Disposal

The portal axis must be disposed of properly at the end of their service life and the raw materials used must be recycled. Observe the legal regulations and company requirements.

The portal axis must not be disposed of as a complete unit. Dismantle the portal axis and separate the various components according to type of material and dispose of them properly:

- Scrap the metallic materials.
- Hand over plastic parts for recycling.
- Sort the rest of the components by their material properties and dispose of them accordingly.

NOTICE

Risk to the environment due to incorrect disposal of the packaging material of the module!

Environmental damage can be caused by improper disposal of the portal axis.

- Electronic parts, electrical scrap, auxiliary and operating materials must be disposed of by approved specialist companies.
- Information on proper disposal can be obtained from the responsible local authorities.

11 Declaration of incorporation

Declaration of incorporation

for partly completed machinery according to the Machinery Directive 2006/42/EC, Annex II, 1.B

The manufacturer hereby declares:

Afag Automation AG, Luzernstrasse 32, CH-6144 Zell

that the partly completed machine:

Product description	Portal axes PDZ
Type:	PDZ-128, PDZ-160, PDZ-200

complies with the following essential health and safety requirements of the Machinery Directive 2006/42/EC at the time of declaration: 1.1; 1.1.1; 1.1.2; 1.2; 1.2.1; 1.2.3; 1.2.4.4; 1.2.5; 1.3; 1.3.3; 1.3.5; 1.3.6; 1.3.7; 1.3.8.1; 1.3.8.2; 1.3.9; 1.4; 1.4.1; 1.5; 1.5.1; 1.6; 1.6.1; 1.6.3; 1.6.4; 1.7; 1.7.1; 1.7.4.; 1.7.4.1; 1.7.4.2; 1.7.4.3; 3.3.5; 3.4.1.

Harmonised standards applied, in particular:	
2014/30/EU	Electromagnetic Compatibility Directive (EMC)
2014/35/EU	Low Voltage Directive (LVD)
EN ISO 12100:2010	Safety of machinery - General design principles - Risk assessment and risk reduction.
DIN EN 60204-1:2018	Safety of machinery - Electrical equipment of machines - Part 1: General requirements

Note: The partly completed machinery must not be put into service until the machinery into which it is to be incorporated has been declared in conformity with the provisions of Machinery Directive 2006/42/EC.

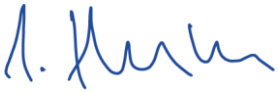
The manufacturer undertakes to transmit, in response to a reasoned request by the national authorities, relevant technical documentation for the partly completed machinery. The relevant technical documentation was created according to Annex VII, Part B of the above-mentioned Directive.

Authorised representative for compiling the technical documentation:

Niklaus Röthlisberger, Product Manager, Afag Automation AG, CH-6144 Zell

Zell, 31.05.2023

Adrian Fuchser



CEO Afag Gruppe

Klaus Bott

CTO Afag Gruppe

Afag Automation AG
Luzernstrasse 32
6144 Zell
Switzerland
T +41 62 959 86 86
sales@afag.com

Afag GmbH
Wernher-von-Braun-Straße 1
92224 Amberg
Germany
T +49 9621 650 27-0
sales@afag.com

Afag Engineering GmbH
Gewerbestraße 11
78739 Hardt
Germany
T +49 7422 560 03-0
sales@afag.com

Afag Automation Americas
Schaeff Machinery & Services LLC.
883 Seven Oaks Blvd, Suite 800
Smyrna, TN 37167
USA
T +1 615 730 7515
nashville@afag.com

Afag Automation APAC
Afag Automation Technology (Shanghai) Co., Ltd.
Room 102, 1/F, Bldg. 56, City Of Elite
No.1000, Jinhai Road, Pudong New District
Shanghai, 201206
China
T +86 021 5895 8065
shanghai@afag.com