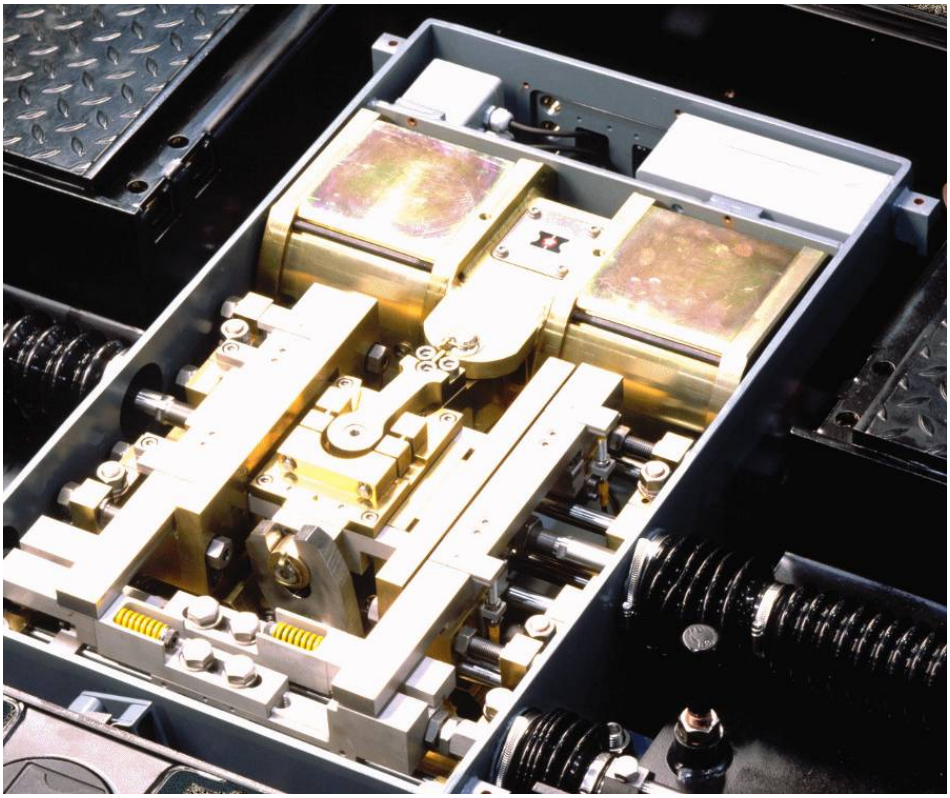
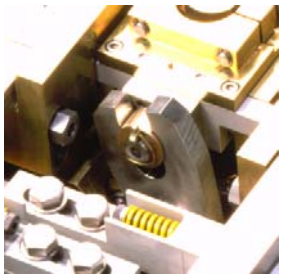
HANNING & KAHL

Operating Manual

Electromagnetic Point Machine

HW61 AVV-ZVV





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Contents

1 General

This chapter contains information on:

- Important comments on the operating instructions
- Symbols
- Further documentation
- Manufacturer's and Customer Service Address

1.1 Important information on the operating instructions

These operating instructions provide information to familiarize you with the point machine and the proper deployment possibilities. It is designed for skilled workers employed by transit authorities with corresponding professional training as point fitters or electricians.

It contains important instructions on proper and safe operation of the unit. Observing the instructions in the manual helps to avoid dangers, reduce repair costs and downtimes and increase the reliability and service life of the point machine.

National regulations on the prevention of accidents and the protection of the environment must also be observed.

The manual must be available when working on the point machine. It must be read and applied by everyone working on or with the point machine unit, i.e.

- Transport,
- Assembly,
- Commissioning,
- Trouble shooting,
- Service,
- Disposal.

All instructions in the operating manual, regulations on the prevention of accidents applicable in the country of deployment and at the installation location must be observed along with all regulations concerning safe and professional work.

HANNING & KAHL and the representative responsible for your area are at your disposal for any questions after studying the operating instructions. See chapter entitled "Manufacturer's and Customer Service Address" for contact address. Please quote the number and the date of the documentation indicated in the footer.

The documentation corresponds to the status of the point machine when supplied. In the interest of continuous improvement, modifications are made at certain intervals which cannot be taken into account when this manual is printed. New manuals are distributed when modifications are made.

1.2 Symbols

The following symbols are used in this document:

Instructions are introduced with the sentence: "Proceed as follows:" The following steps are numbered.

✓ A check indicates requirements which have to be fulfilled before you actually proceed as instructed.

⇨ An arrow indicates that the steps already performed have to be repeated.

➢ A triangle refers to several main steps which have to be performed in succession.

◈ A rhombus indicates different possibilities. Select the relevant chapter.

- A dot indicates a main list.

- A line indicates a sub list.

ⓘ An information symbol refers to a special feature.

 A book refers you to further information in other documents.

1.3 Further documentation

HANNING & KAHL endeavours to describe the assembly and setting procedure for the point machine as graphically as possible. The point machines are, however, frequently project-related special constructions.

Therefore please consult the following documents:

- project-related point installation drawing (WEB)
- drive rod drawing
- detector rod drawing
- circuit diagram for electric point machine
- circuit diagram for electric monitoring
- cable route plan
- commissioning protocol
- spare-part list

1.4 Manufacturer's and Customer Service Address

If you have any questions concerning these operating instructions, please contact:

HANNING & KAHL GmbH & Co KG
Rudolf-Diesel-Straße 6
33813 Oerlinghausen
Germany

Telephone: +49 5202 707-600
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www.hanning-kahl.com

The Service Division (After-Sales) at HANNING & KAHL can be reached at telephone number **+49 (0) 5202 70 76 04**.

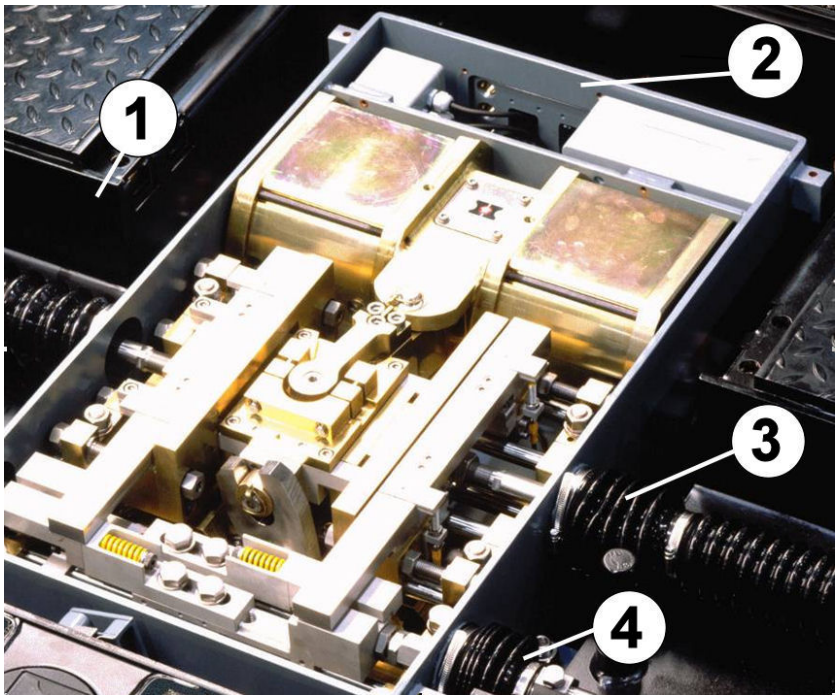
In emergencies, our **on-call service** can be reached at: **+49 171 3360360**.

2 Product description

This chapter contains important product information:

- Overview
- Type plate
- Technical data
- Stowage
- Housing with protection grade IP67

2.1 Overview



1 Earthcase
2 Housing with components of the point machine
3 Drive rods
4 Detector rods

Fig. 1: Overview of point machine HW61 AVV-ZVV

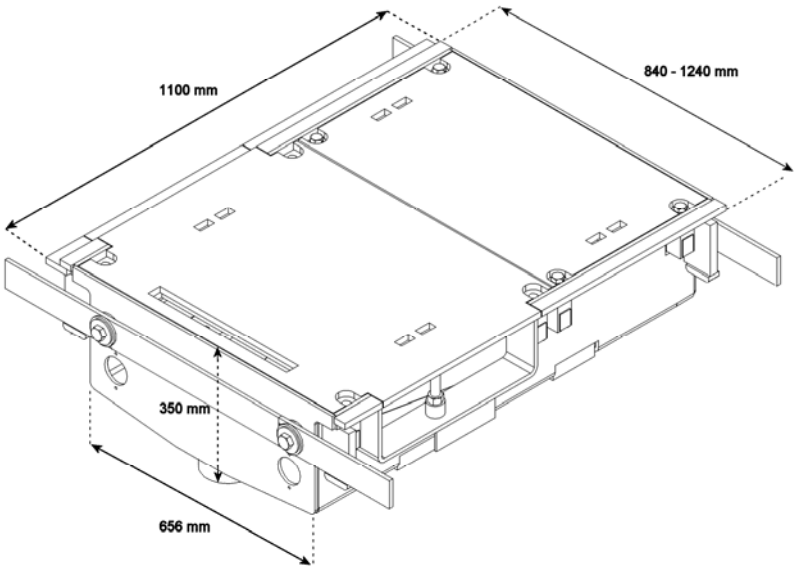


Fig. 2: Standard dimensions of the earthcase

2.2 Type plate

The type plate of the point machine is in the housing at the level of the lever box:

Fig. 3: Type plate

2.3 Technical data

Data	Values
Gauge	≥ 900 mm *)
Point opening	30 … 70 mm
Tongue connection	Hammerhead screw *)
Tongue detector connection	Tongue attachment*)
Trailing force of open point tongue	7000 N
Pressure exerted by the springs	Progressively adjustable to 3500 N
Moment required for manual setting	< 400 Nm
Shortest setting time	0.5 s **)
Lock and end position monitoring	 See documentation on "Electrical connection of point machine“ (Part of the scope of supply)
Electromagnetic drive	 See documentation on "Electrical connection of point machine“ (Part of the scope of supply)
Protection grade of housing when supplied	EU: IP 67 (EN 60529) USA: NEMA Type 6 (250-1997)
Operating force	5000 N
Hydraulic oil for hydraulic damping device	Hydraulic oil Pentopol J32 Quantity: approx. 0.3 litres
Desiccant bag	Active clay to adsorb condensation in the housing Quantity: approx. 560 g per bag
Total weight of point machine	ca. 500 kg (1000 mm gauge) ca. 700 kG (1435 mm gauge)
Weight of earthcase cover	50 … 90 kg *)
Operating temperature	-25 … +60 °C
Safety category	AK 6 per DIN V 19250 /DIN V 19251

*) Alternatives available on request
**)Depends on the setting of the hydraulic damping device and the point construction.

Table 1: Technical data HW61 AVV-ZVV

2.4 Stowage

Rods:

The rods for the point machine are underneath the plastic sheeting in which the point machine is packed.

Caution

Risk of component mix-up!

Switch machine accessories (rods etc.) are on top of the switch machine.

Be careful not to confuse the accessories of this particular switch machine with those of other setting devices in other versions.

Otherwise adjustment may not be possible.

Desiccant bag:

It is impossible to rule out condensation in a closed system. This means that it is not possible to completely rule out humidity in the interior of the point machines of the **61** series. Desiccant bags protect the components in the housing of the point machine from humidity. Since the middle of 2007, all point machines of the 61 series are supplied as standard with desiccant bags.

The desiccant bag is placed in the area of the junction boxes. A sticker with indicator (cobalt dichlorid) indicates the humidity content of the granulate. Before use, the indicator is dark blue, the colour changes to pink as humidity increases. If the humidity indicator is pink, replace the desiccant bag.

Fig. 4: Humidity indicator on the desiccant bag before use

The desiccant bag must be inspected every six months when the point machine is serviced. If the humidity indicator is pink, replace the desiccant bag.

Caution

Risk of corrosion in the housing!

Humidity in the housing of the point machine can lead to component corrosion.

Check the condition of the desiccant bag when commissioning, maintaining and servicing the equipment.

The humidity indicator must be blue.

If the humidity indicator is pink, the desiccant bag must be replaced.

2.5 Housing with protection grade IP67

Before the point machine is supplied to the customer, it is tested with a tightness tester for protection grade IP67.

The following must be ensured before testing the housing:

- The housing cover with profile packing is screwed tight.
- The rod openings are sealed with rubber caps:

Fig. 5: Rubber cap on rod opening

- The cable glands or connectors are plugged.

When the test has been successfully completed, the result is documented in the post-assembly examination protocol.

The housing of the point machine fulfils protection grade IP67 when supplied.

Caution

Danger of loss of protection grade IP67!

Protection grade IP67 is only guaranteed if no modifications are made to the housing of the point machine during storage.

Do not remove the rubber caps, plugs and the housing cover until immediately before assembly.

ⓘ A tightness test after assembly and maintenance guarantees protection grade IP67 of the point machine.

3 Fundamental safety instructions

Everyone assigned to work on the point machine must read and understand these operating instructions before starting work. All safety instructions must be obeyed in the interest of your own safety.

Non-observance of safety instructions can result in danger to persons, the environment and the device itself.

3.1 Designation of instructions and warnings in this manual

Special warnings and instructions in this manual are marked by the following symbols:

General dangers!

Danger - Electrical current!

Caution **Danger of damaging components!**

Please also pay attention to instructions which are mounted directly on the product and ensure that they are always legible.

3.2 Intended usage

The point machine described in this manual was developed for the setting of both point tongues in point constructions of the grooved, flat-bottomed and flat-bed types for point openings from 1.26 to 2.76 in [32 to 70 mm].

3.3 Unauthorized usage

The operational safety of the HN-EOW supplied is only guaranteed if the device is used for the purpose described in the chapter “Intended usage” above.

The limit values indicated in the chapter entitled “Technical Data“ must not be exceeded.

3.4 Personnel qualification and training

Personnel engaged to work on the point machine must have the necessary qualifications. It is the responsibility of the operator to determine areas of responsibility, competence and staff

supervision. HANNING & KAHL can provide training if requested to do so by the operator of the point machine.

The manufacturer/supplier assumes that general safety requirements (e.g. national directives for electrical installations, regulations for the prevention of accidents, in-house safety instructions) are known to the operator and his specialist staff and are observed.

The electric connection of the point machine must be made by an approved and accredited qualified electrician.

3.5 Personal protective equipment

To limit the risk of injury to life and limb, personal protective equipment must be used where required or dictated by regulations.

High-visibility flourescent vests, protective gloves, safety helmet and safety shoes are compulsory for all persons who work on or with the point machine.

3.6 Safety instructions for assembly, maintenance and inspection work

Consult the point installation drawing before installing and commissioning the point machine. It provides detailed information.

Never work on the point machine when the device is switched on. This does not apply to tests and measurements.

All safety and protective devices must be re-installed/put back into operation immediately after completion of work.

3.7 Unauthorized modification and spare part manufacture

The point machine may only be modified or altered after consultation with HANNING & KAHL.

Original spare parts and accessories authorized by the manufacturer contribute to safety. The use of any other parts annuls HANNING & KAHL’s liability for the consequences.

3.8 What the point controller must do

The tongue detectors of the point machine detect the end position of the point tongues. At the latest, three seconds after the end position is reached, the point controller should switch off the power from the point machine.

Caution

Damage to components!

If this time period is exceeded, increased wear / defects can result on the point and the drive unit (double-acting magnet).

3.9 Trailing the point machine

The point machine is designed in such a way that the point can be trailed in special cases (e.g. incorrect running, cleaning vehicles). After a trailing procedure, the tongue device and the point machine must be checked.

The lock of the point machine is, however, not designed for routine trailing (permanent trailing). Trailing procedures should be avoided to keep wear of the tongue and setting mechanism as low as possible.

For routine trailing of the point machine we recommend a setting command for trailing routes or securing of the point tongues by spring-actuated locking (e.g. HWE 61 O-Z for speeds under 9.3 mph [15 km/h]).

3.10 Further instructions

Caution

Corrosion caused by precipitation water!

Protect the point machine with covering (e. g. a tent), if assembly work must be carried out in rain.

Remove water which may have penetrated the point machine.

There is a risk of corrosion if the water is not removed.

4 Packaging, storage, transportation

This chapter contains information on:

- Packaging
- Storage
- Transportation
- Housing with protection grade IP67
- Returning the point machine to HANNING & KAHL

4.1 Packaging

The point machine is secured to the European pallet with metal tapes. It is protected against external influences e.g. rain, contamination by a plastic sheeting:

Fig. 6: originally packed point machine

Do not unpack the point machine until immediately before installation in the track. This guarantees that it is optimally protected against external influences.

4.2 Storage

Store the point machine in original packing until time of installation preferably in a warehouse. This way it is best protected against external influences.

Caution

Danger of loss of protection grade IP67!

Protection grade IP67 is only guaranteed if no modifications are made to the housing of the point machine during storage.

Do not remove the rubber caps, plugs and the housing cover until immediately before assembly.

4.3 Transport

Danger of injury!

Only use hoisting equipment which is suitable for the weight of the point machine.

Danger of injury for yourself and people in the vicinity.

Only use appropriate hoisting equipment !

When in its original packing, the point machine can be safely transported with the help of a forklift truck in the store or on a lorry to the installation location.

To lift the unpacked point machine, HANNING & KAHL recommends a 4-strand lifting gear with cobra hooks (strength 6 mm; length 2002 mm) and four M20 eye bolts with securing key.

The eye bolts are screwed into the threaded holes for the weld-on lugs on the earthcase. The cobra hooks of the 4-strand lifting gear are hooked into the eye bolts:

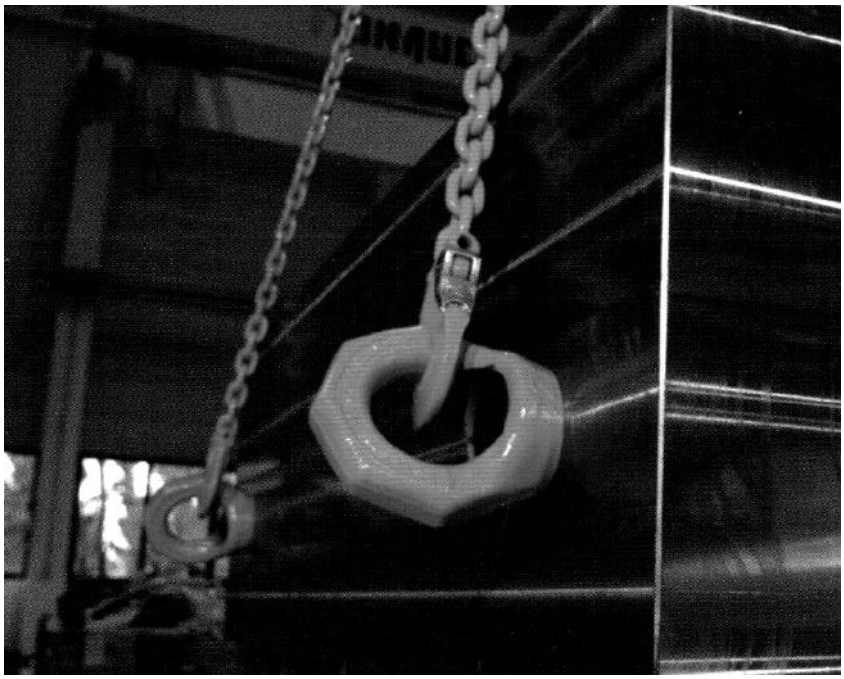


Fig. 7: Transporting the point machine

ⓘ The accessories which can be acquired from HANNING & KAHL can be used to raise all point machines. See Chapter "Accessories" for further information.

Suspended loads!

Hands and other body parts must be kept well away from the separate lifting accessories to avoid injuries when the separate lifting accessories tighten.

Before hoisting the point machine, everyone must leave the direct danger zone.

No-one should stand around underneath the suspended loads! Wear a helmet.

Danger of injury!

Ensure that the load is under control, not rotating and cannot hit objects and that no objects can fall from the load as there is otherwise a risk of injury.

Caution

Caution - Damage to components!

When the transportation pallet is removed, the drainage water outlet is the lowest point of the point machine.

Be careful not to damage it by placing the point machine roughly on the ground!

Caution

Risk of component mix-up!

Be careful not to confuse the accessories of this particular point machine with those of other setting devices in other versions. Otherwise adjustment may not be possible.

4.4 Housing with protection grade IP67

Before the point machine is supplied to the customer, it is tested with a tightness tester for protection grade IP67.

The following must be ensured before testing the housing:

- The housing cover with profile packing is screwed tight.
- The rod openings are sealed with rubber caps:

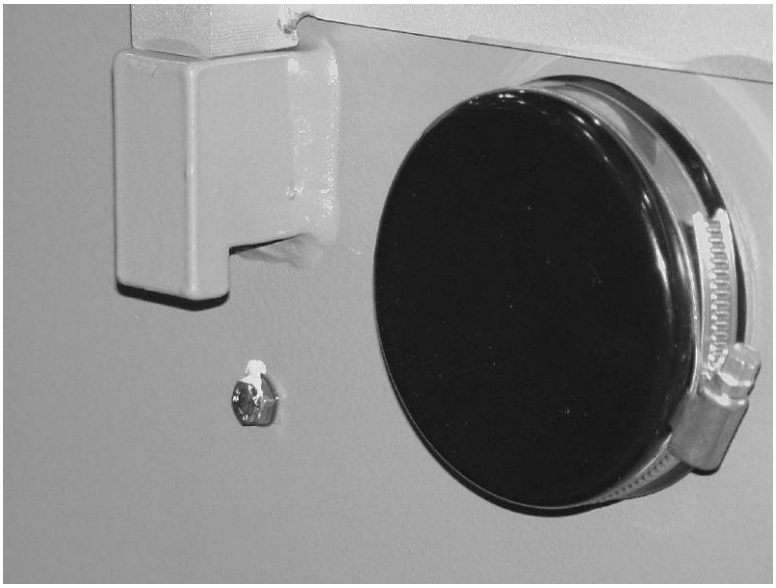


Fig. 8: Rubber cap on rod opening

- The cable glands or connectors are plugged.

When the test has been successfully completed, the result is documented in the post-assembly examination protocol.

The housing of the point machine fulfils protection grade IP67 when supplied.

Caution

Danger of loss of protection grade IP67!

Protection grade IP67 is only guaranteed if no modifications are made to the housing of the point machine during storage.

Do not remove the rubber caps, plugs and the housing cover until immediately before assembly.

A tightness test after assembly and maintenance guarantees protection grade IP67 of the point machine.

4.5 Returning the point machine to HANNING & KAHL

The point machine is returned to HANNING & KAHL for repair and general overhaul.

Ensure the following:

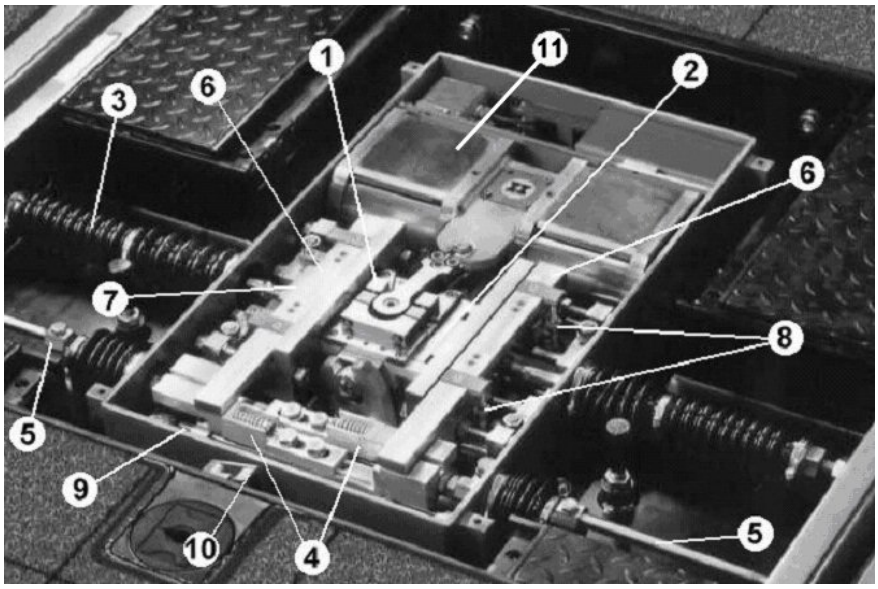
- ✓ Connection cables are disconnected at the connecting point (junction box, connector plug). Do not cut off connecting cables!
- ✓ Disconnect jacks from connectors.
  Protect the coupling from damage with the cover (protective cap).
- ✓ The housing is covered with the housing cover and the cover is screwed tight.
- ✓ Lever box and electro connections are protected against damage.
- ✓ The point machine is transported on a European pallet. Only one point machine is transported per European pallet.

ⓘ HANNING & KAHL cannot be held liable for any costs which result from non-observation of these instructions. Such costs are the responsibility of the customer.

5 Operating mode

The switch machine facilitates the setting of switch tongues from one end position to the other. When an end position is reached, the corresponding point tongue is positively locked via drive and detector rods. BOStrab (German regulations on construction and operation of trams) allow speeds > 9.3 mph [> 15 km/h] when the switch is crossed from the facing direction.

This chapter describes the operating mode of the point machine. The numbers which mark components below also refer to the same components when found in other chapters below:



1 Connecting plate
2 Setting unit
3 Drive rods
4 Tongue detector of tongue detector lock device
5 Detector rods
6 Lock guide
7 Positive locking
8 Inductive proximity switch or mechanical switch
9 Springs
10 Lever box

Fig. 9: Components of HW61 AVV-ZVV

Setting procedure:

With a control impulse from the corresponding switch controller, the switch machine facilitates the setting of the switch tongues in respective end position.

The setting force required of the drive mechanism takes impact on the setting unit and the drive rods which form the contact to the switch tongues via the connecting plate.

Tongue end position detection:

Tongue end position is detected by two tongue detectors which are allocated to the point tongues. They form part of the tongue detector - lock device (4) and are coupled via a detector rod (5) to the respective point tongue. The tongue detectors detect the respective position of both point tongues independently of each other.

Lock:

When the point tongue has reached its end position on the stock rail, the point machine locks both the setting unit (2) and also detector lock devlce (4) with positive locking via the lock guide.

Lock and end position monitoring:

The function of the lock is safely evaluated by signals by two independent inductive proximity switches, and reported to the point controller.

Holding force:

Apart from the positive locking of the closed point tongue, two redundantly working spring assemblies generate additional holding force which holds the point tongues to the stock rail. This allows crossing at v < 15 km/h [9.3 mph] even when there is no lock.

Trailing procedure:

The point machine is trailable. For a corresponding procedure, the wheel of a rail vehicle must overcome the spring-actuated locking of the open point tongue of approx. 7000 N. Immediately after trailing, the point can be crossed at sight at a speed of < 9.3 mph [v <15 km/h] . A subsequent electric or manual setting procedure then locks the setting mechanism with positive locking again so that speeds of over > 9.3 mph

[v >15 km/h] are possible. After a trailing procedure, the tongue device and the setting mechanism must be checked.

Manual setting:

Point tongues can be set by means of a hand lever directly with one stroke via a lever box. The lever box is equipped with an inductive proximity switch. In conjunction with the point controller, the inductive proximity switch prevents electrical setting as long as a setting lever is inserted in the lever box.

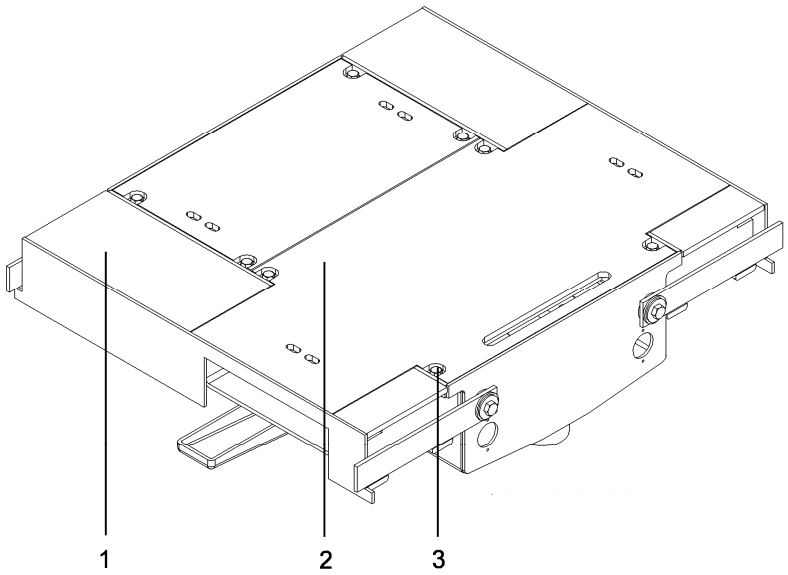
6 Components

This chapter contains information on the:

- Earthcase
- Adapter frame
- Housing
- Double-acting magnet
- Hydraulic damping device
- Drive shaft
- Linkage springs
- Setting mechanism
- Locking device
- Lock and end position monitoring
- Detector lock device
- Magnet terminal box
- Tongue detector terminal box
- Drive rods
- Tongue detector rods
- Lever box

6.1 Earthcase

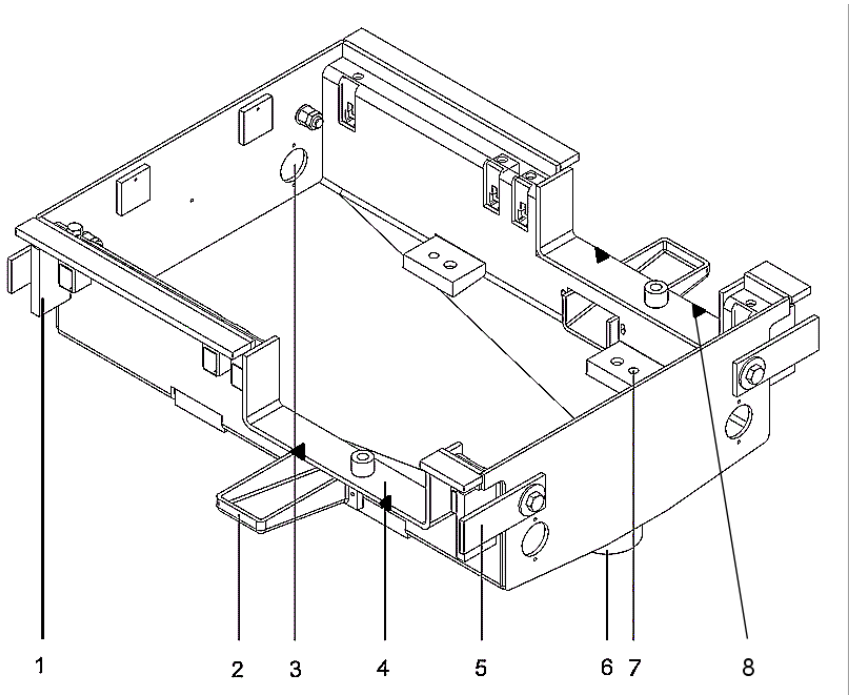
When the point machine is to be crossed by road traffic, the housing of the point machine is installed in an earthcase. The earthcase and its two-part cover are designed for an axle load of 13.23 tn [12 t]:



1 Cover
2 Earthcase cover
3 Hexagon screw

Fig. 10: Earthcase closed

Earthcase covers are attached to the earthcase with four hexagon screws (3).



1 Supports
2 Drainage channels
3 Cable entry points
4 Rod channels
5 Weld-on lugs
6 Water outlets
7 Base for the housing
8 Notches for rod guidance

Fig. 11: Earthcase, open

The earthcase rests with its supports (1) on the foot of the rail or on the steel base plate of the switch construction. It is secured in the point via a screw connection through four weld-on lugs (5) which are welded to the side rail:

For drainage of the grooved rails in the switch area, two drainage channels (2) are mounted underneath the rod channel (4) to guide contamination and water into the inside of the earthcase. The inclined earthcase is equipped with a drainage connection (6) with a cleaning eye at its lowest spot forming the connection to the drainage system.

ⓘ The earthcase can also be supplied with a separate drain box on the front to facilitate flushing with the cleaning lance.

In the case of point machines which have to be installed on gradients, the water outlets can also be provided on the opposite side.

The housing of the point machine is attached to four supports (7) on the floor of the earthcase. Fast assembly and disassembly is possible with studs (stud bolts). The height of

the housing of the point machine can be adjusted to compensate production tolerances in point construction.

Notches (8) on the rod channels (4) mark the path of the rods. With the aid of this marking it is easier to align the earthcase in the track.

There are two cable entry points (3) respectively on the front side of the earthcase for electrical connection of the switch machine.

ⓘ As an option, the point machine can also be designed with an insulated earthcase. Plastic components interrupt the electric contact from side rail to side rail:

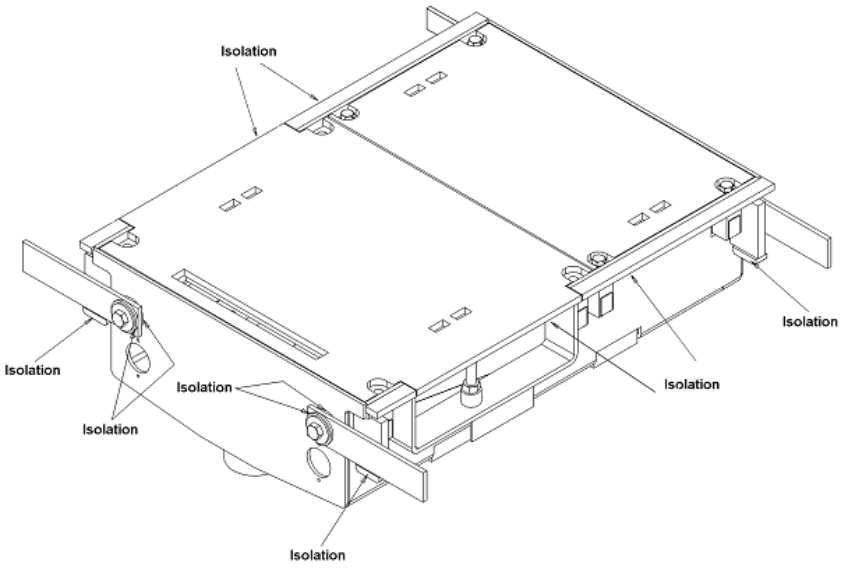


Fig. 12: Earthcase in insulated version

6.2 Adapter frame

Being of compact design, the point machine can be installed/ retrofitted in existing earthcases (2) with the help of an adapter frame:

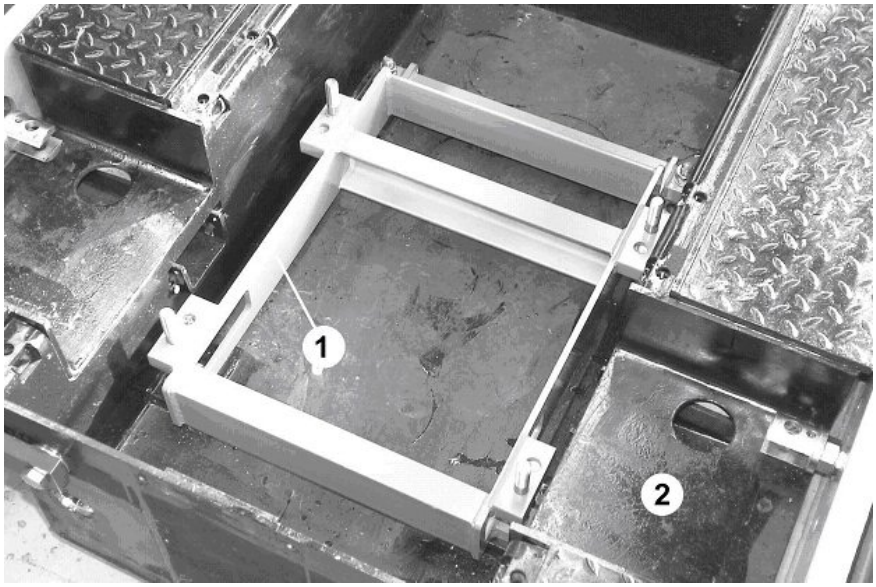


Fig. 13: Adapter frame for installation in the HWE60 earthcase

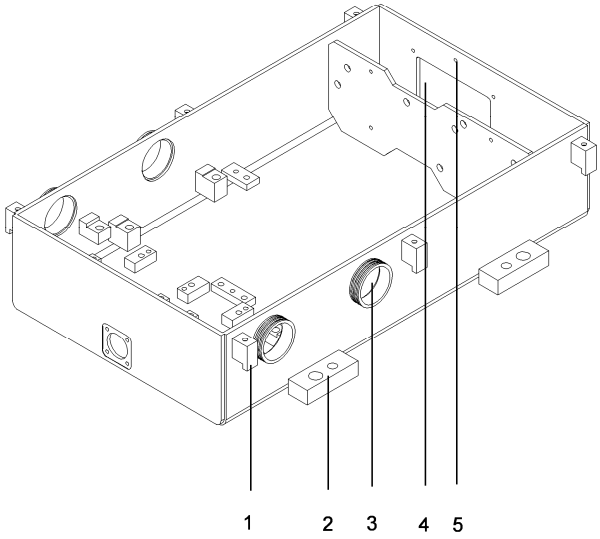
Adaption is possible in the following earthcases:

- Earthcase for HW40,
- Earthcase for HWE60,
- Earthcase for HW70,
- Earthcase for HWE100,
- Earthcases of other makes.

6.3 Housing

The housing of the point machine is a robust steel plate construction with the external dimensions 870 x 500 x 200 mm. In the housing all mechanical, hydraulic and electrical devices are arranged in modular design.

Four housing pedestals (2) facilitate safe attachment in the earthcase or on the adapter frame as well as progressive variation of the installation height:



1 Cover seat
2 Housing pedestal
3 Rod opening
4 Opening for cable entry
5 Electrical connecting bolt

Fig. 14: Housing

The upper part of the housing is equipped with 6 cover seats (1) for fastening the cover of the housing.

High-quality profile sealing between cover and housing protects all the sub-assemblies in the housing even in unfavourable weather conditions and rising surface water. Furthermore, environmental impact caused by hydraulic oil or grease is virtually ruled out due to the complete metal protection.

ⓘ The housing of the point machine is tested for tightness before the device is supplied. When supplied, it fulfils protection grade IP67. Fur further information, refer to the Chapter "Housing with protection grade IP67“.

An electrical connecting bolt (5) above the cable entry point (4) is provided for the connection to the return wire (rail potential).

The four side rod openings (3) facilitate assembly of the bellows to the corresponding drive/tongue detector rods and prevent dirt and humidity from entering the interior of the housing.

Caution

Damage to components in the housing!

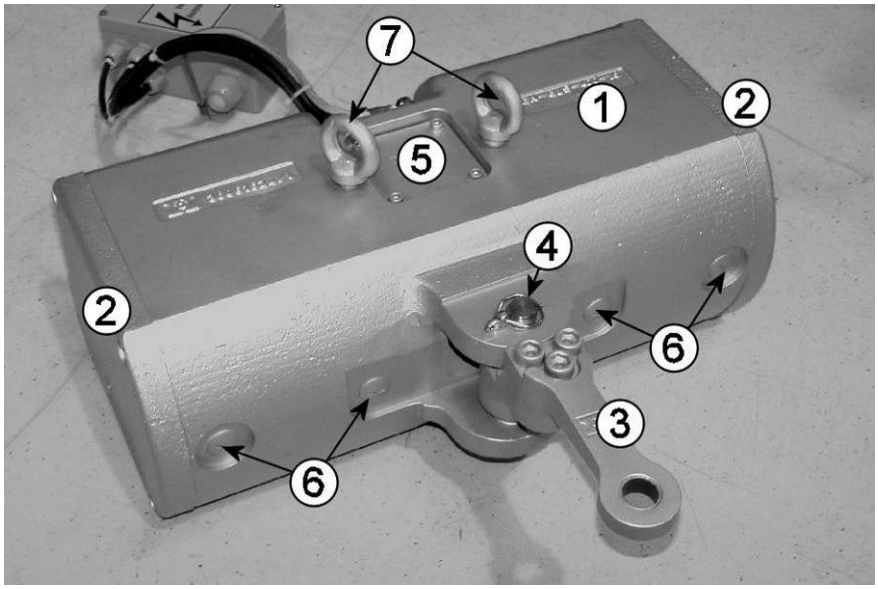
The housing cover bends when you stand on it.

A bent housing cover can lead to component corrosion in the housing.

Do not stand on the housing cover. Pay attention to the pictogramm on the housing cover.

6.4 Double-acting magnet

The double-acting magnet is the drive element of the HW61 point machine. It is used for force generation and transmission with direct use of contact wire voltage (600 - 750 V DC):



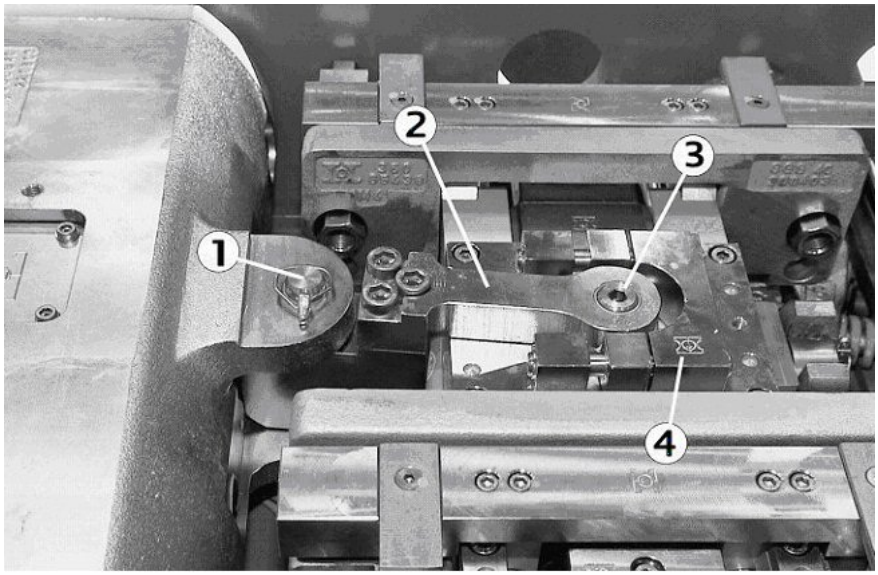
1 Housing magnet
2 Cover
3 Drive lever
4 Bearing bolt = fulcrum
5 Cover
6 Dummy plug
7 Eye bolts for assembly and disassembly

Fig. 15: Double-acting magnet

The main components of the drive mechanism are the basic body of the housing (1) which guides the armature located inside and two covers (2) respectively which accommodate the cast-in coils and protect them against external influences.

The core and the armature are magnetised by energising a magnet winding. On account of the mutual attractive forces of the two components, the armature is moved from one side of the housing to the other. When doing so, the drive lever (3) which is guided by the bolt (4) pivots around the fulcrum (4).

The double-acting magnet is arranged in the point machine as follows:



1 Bearing bolt
2 Two-part lever
3 Bolt of connecting plate
4 Connecting plate

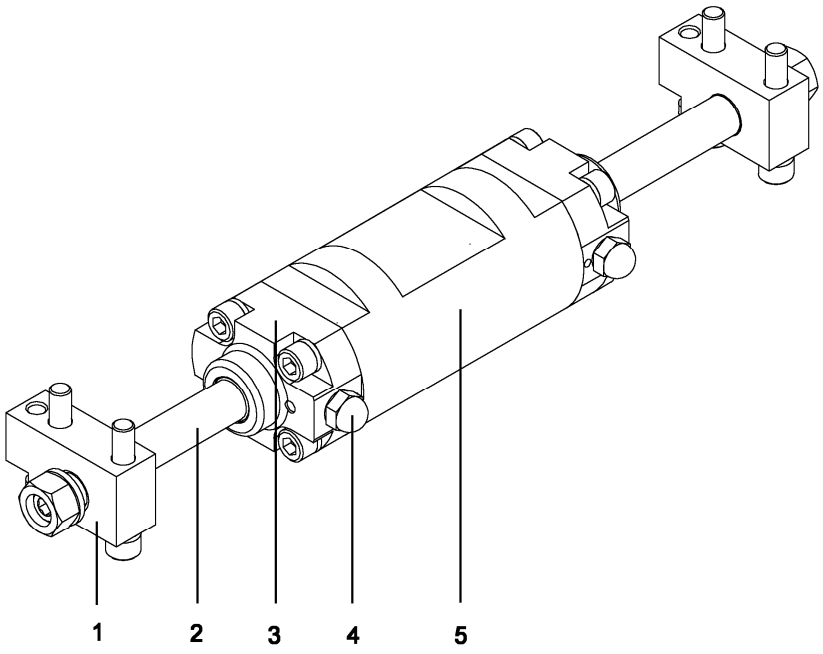
Fig. 16: Installed double-acting magnet

During a setting procedure, the two-part lever (2) transfers the electromagnetic power via a bolt (3) and the connecting plate (4) to the setting mechanism and the drive rods.

6.5 Hydraulic damping device

The point machine is equipped with a hydraulic damping device which facilitates gentle setting of point machine tongues and reduces wear of the tongue device to a minimum.

The figure below illustrates the hydraulic damping device, which consists of a fixed hard-chrome plated piston rod (2) with piston, an anodized cylinder (5) and two covers (3):



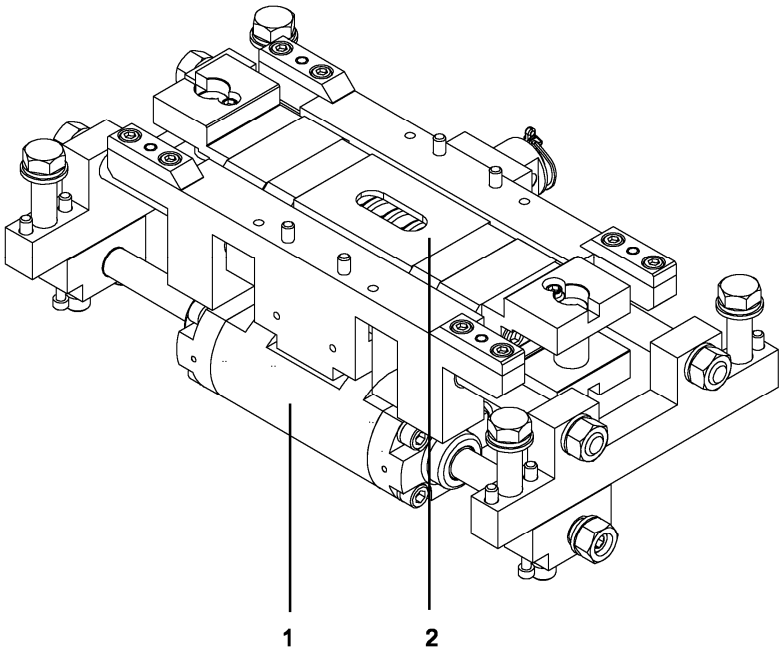
1 Rod retainer
2 Piston rod
3 Cover
4 Damping valve
5 Cylinder

Fig. 17: Hydraulic damping device

Oil channel cross-section can be altered via two damping valves (4) for each direction which work independently of each other, making it possible to change the oil flow-through speed and thus regulate setting speed and point-tongue noise development.

The hydraulic damping device is designed in such a way that the damping effect does not take impact until the middle position is passed, i.e. in the last part of the setting path.

The hydraulic damping device is arranged inside the setting mechanism as follows:



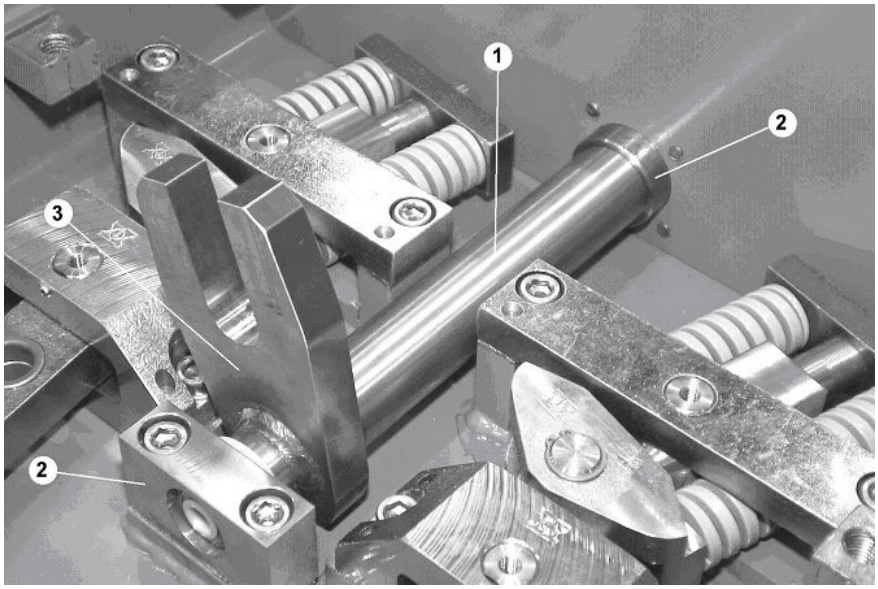
1 Hydraulic damping device
2 Setting mechanism

Fig. 18: Arrangement of the hydraulic damping in the setting mechanism

The hydraulic damping device contains approx. 0.06 gal [0,3 l] hydraulic oil J32 from ESSO or Pentopol J32.

6.6 Drive shaft

The drive shaft (1) of the point machine is protected by maintenance-free, Teflon-lined bushes in the interior of the point machine housing (2):



1 Drive shaft
2 Bearing locations
3 Setting lever

Fig. 19: Drive shaft with double bearing

The setting lever (3) of the drive shaft (1) connects the setting slide of the setting mechanism with the lever box which is located outside the housing (See Chapter "Lever box").

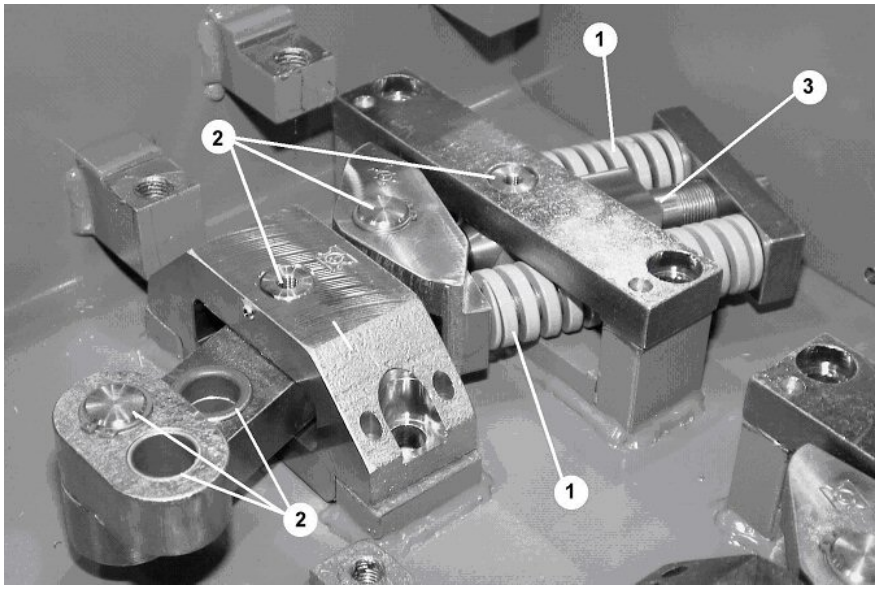
Point tongues can be moved manually from one end position to another by insertion of the setting lever in the lever box.

During this process the swinging movement of hand lever and drive shaft is transformed into a translatory motion of the setting slide.

Seals over shaft and housing make sure that no dirt or water can penetrate the setting mechanism.

6.7 Linkage springs

Two independent spring assemblies are located under the tongue detector on the bottom of the housing. The figure below shows a corresponding spring assembly:



1 Pressure springs
2 Bearing locations with Teflon bushing
3 Adjustment spindle

Fig. 20: Linkage springs

Each spring assembly consists of two redundant pressure springs (1), which generate a holding force for the end position of the point tongues independently of the lock function.

All force-transmitting connections as well as bearing locations are equipped with maintenance-free, Teflon-lined bushes (2).

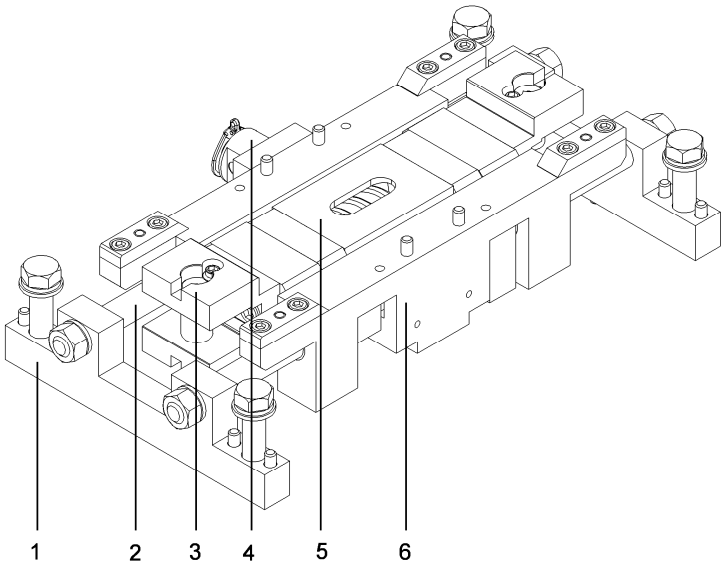
The resulting total force of the spring assemblies taking impact on the setting unit of the setting mechanism presses the point tongue to the respective stock rail.

The initial stress of the spring assemblies is pre-adjusted depending on the tongue devices and the point opening to be operated. The force of the spring assemblies can be adjusted and adapted to the respective application by turning the adjustment spindle (3) if required.

6.8 Setting mechanism

The setting mechanism of the point drive essentially consists of two functional parts:

- locking slide (6)
- setting unit with trailable springs (5)



1 Guide rod retainers
2 Guide rod
3 Locking driver
4 Connection to drive shaft
5 Setting unit
6 Locking slide

Fig. 21: Seting mechanism

The locking slide (6) and setting unit (5) are installed on a movable parallel guiding rod system. The hard-chrome plated guide rods (2) of the parallel guiding rod system are firmly anchored in two guiding rod retainers (1) and guarantee maintenance and wear-free operation on account of the Teflon-lined bearing locations of the locking slide and the setting unit.

The setting unit (5) is connected to the drive rods of both point tongues. The dimension of their movement corresponds exactly to the point opening, i.e. the path of the point tongues from one end position to the other.

At the outer ends of this functional group are the locking drivers (3), which together with the lock guide of the locking

mechanism generate positive locking in the respective point tongue end position.

The locking slide (6) was designed in such a way that it can run a path of 0.39 in [10 mm] more than the setting unit (5) on the parallel guiding rod system.

During a setting procedure, first the locking slide (6) is moved by 0.39 in [10 mm]. At the same time, it releases the existing positive locking between locking driver (3) of the setting mechanism and lock guide, i.e. the lock guide is lifted vertically to the movement of the setting unit via inclined planes:

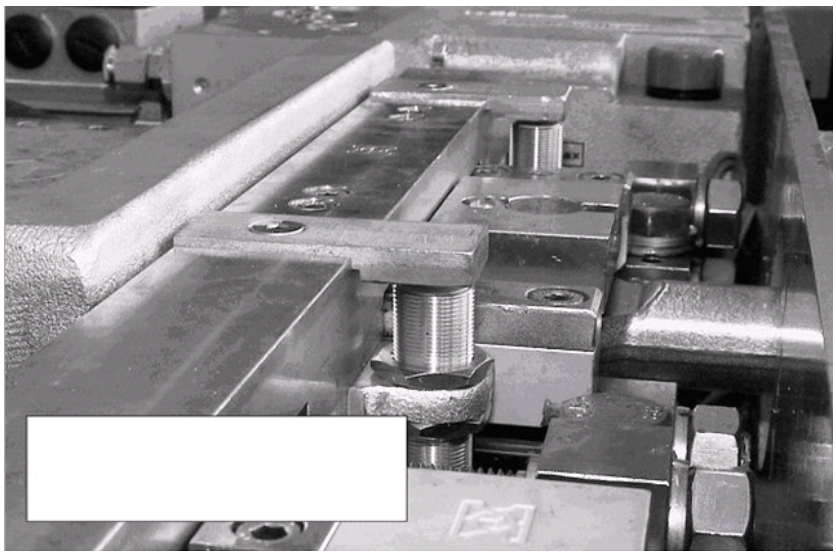


Fig. 22: Lock guide in place

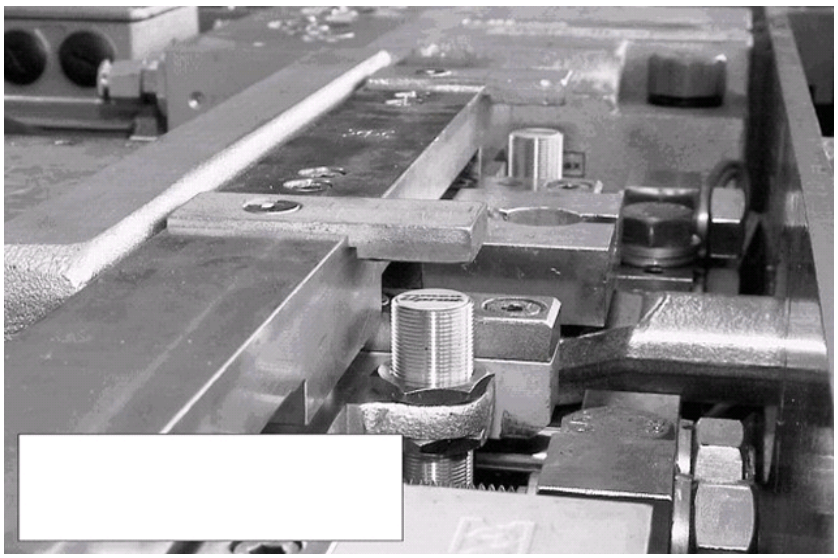


Fig. 23: Delocked lock guide

As soon as the lock guide has been raised, the locking slide (6) takes the setting unit (5) / the point tongues into the other end position. When this position is reached, the locking slide moves a further 0.39 in [10 mm]. The corresponding lock guide lowers and the closed point tongue is again positively locked.

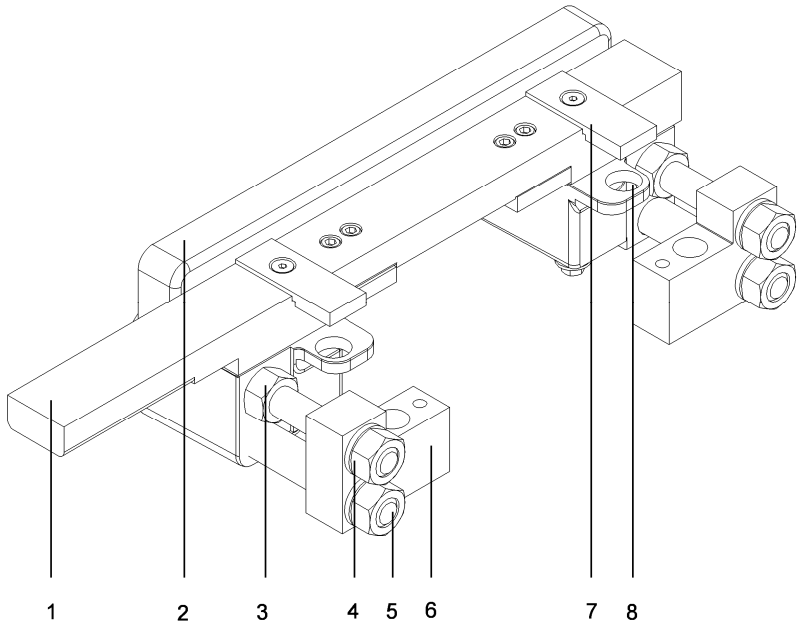
The same applies for a manual setting procedure with a setting lever.

In addition, the setting unit transfers to the point tongue the holding force generated by the linkage spring assembly which is independent of the lock (See Chapter entitled "Linkage springs").

In the trailable version AVV, there are trailable springs consisting of two parallel switched pressure springs in the setting unit which hold the open point tongue with spring-actuated locking.

6.9 Locking device

The point machine has two identical locking devices which are independent of each other and each of which is allocated to a point tongue.
The figure below illustrates the construction of a locking device:



1 Lock guide
2 Locking support
3 Hexagon nuts M16
4 Adjusting pins
5 Guide shafts
6 Joining plates
7 Safety plate
8 Mounting position for inductive proximity switches

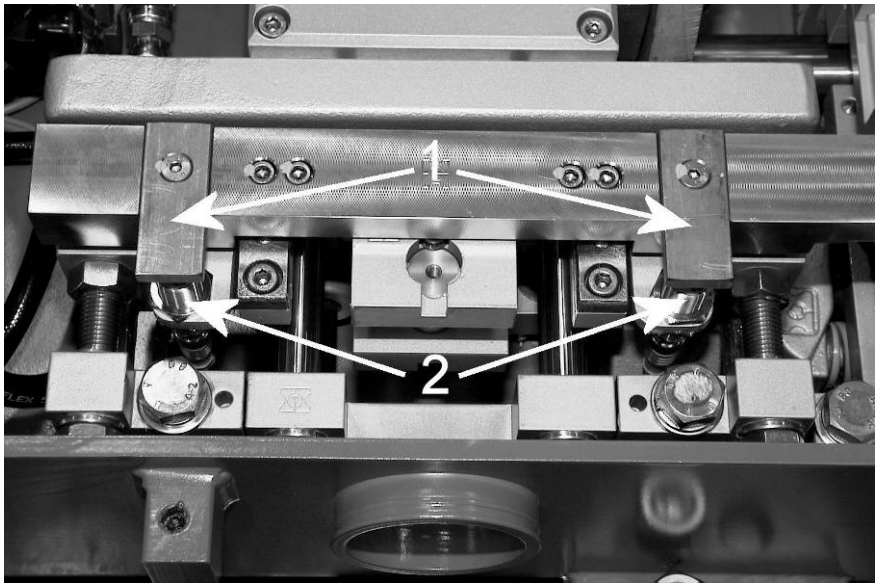
Fig. 24: Progressively adjustable locking device

The locking support (2) is mounted on two hard-chrome plated guide shafts (5) and can be moved progressively. It is secured via two adjusting pins (4) with four hexagon nuts M16 (3). The guide shafts and adjusting pins are anchored in joining plates (6). They are connected to the guide rod retainers of the setting mechanism via two spacer bolts in the housing.

The closed point tongue is locked positively by the vertical movement of the lock guide (1) (lock engagement) caused by gravity, in conjunction with the locking driver of the setting mechanism (See figures in the chapter "Setting mechanism"). Along with the weight of the lock guide, two pressure springs support this procedure.

6.10 Lock and end position monitoring

The lock and end position monitoring function of the point machine checks the locking function of the two independently operating inductive proximity switches (2):



1 Safety plates
2 Inductive proximity switches

Fig: Lock and end position monitoring

When the point machine is set properly, the respective locking guide only falls into place when the setting unit and the tongue detectors have reached their end position.

The safety plates (1) attached to the locking guides activate the inductive proximity switches (2) and report proper locking as well as the end position to the corresponding point controller.

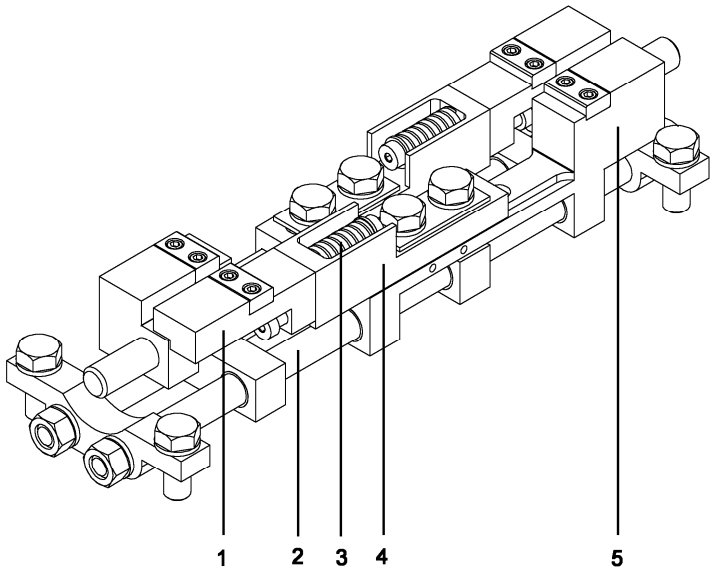
The inductive proximity switches (2) are connected in the detector terminal box. They are equipped with control LEDs which light up when the locking guides engage.

6.11 Detector lock device

The detector lock device checks the position of the tongues at the tip of the point and it also checks that the tongues are locked by the lock guide.

This component consists of two independent tongue detectors which are moved by the point tongues via the detector rods.

The two tongue detectors consist of sliding carriages (5), guide bracket (4) and locking support (1):



1 Locking support
2 Parallel guiding rod system
3 Pre-tensioned pressure spring
4 Guide bracket
5 Sliding carriages

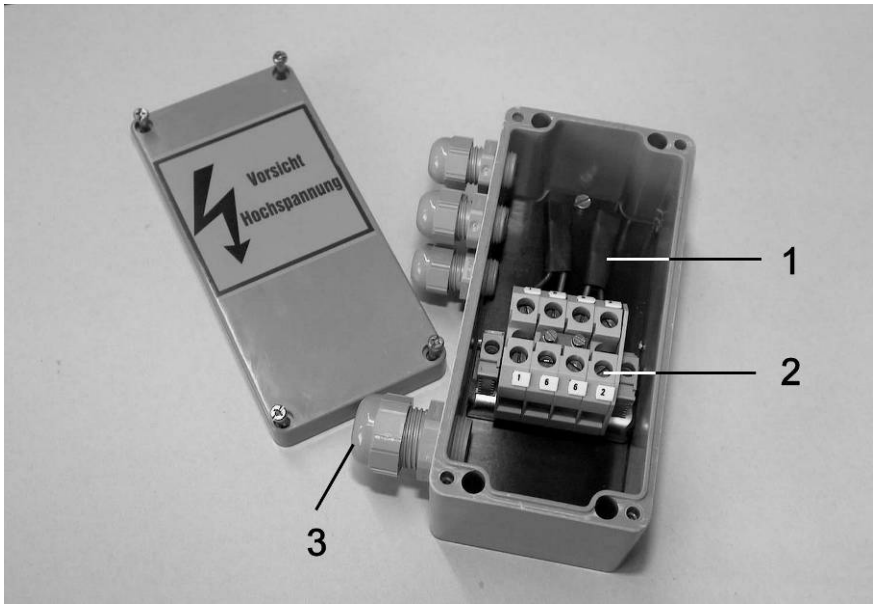
Fig. 25: Detector lock device

The sliding carriages of the detector lock device have Teflon-lined bushes and are installed on a hard-chrome plated parallel guiding rod system (2). They guarantee precise and maintenance-free operation.

Additional spring-actuated locking of the respective open point tongue is provided by a pre-tensioned pressure spring (3). The spring bearing allows relative movement between guide bracket (4) and locking support (1), which only takes place during a trailing procedure and allows "trailing“ of the point from the trailed side although locked.

6.12 Magnet terminal box

The double-acting magnet is connected to the point controller via an underground cable:



1 Free-wheeling diodes
2 Connecting terminals (1= left; 2= right; 6= earth)
3 Cable gland (for earth cable entry)

Fig. 26: Magnet terminal box

A cable with sufficient diameter must be used to electrically connect the magnet terminal box and the point controller. The cable must also be suitable for laying in the ground.

Free-wheeling diodes (1) are connected in the magnet terminal box to short-circuit the induction voltage of the coils of the double-acting magnet. They protect the switching elements in the point controller.

ⓘ As standard, HANNING & KAHL uses cable gland M25 x 1.5 (3), to be able to connect an underground cable with an external diameter of 0.35... 0.66 in [9... 17 mm] to the magnet terminal box.

In the tongue detector terminal box, the electrical connection is made between the inductive proximity switches of the lock and end position monitoring, the point controller and the lever box switch:

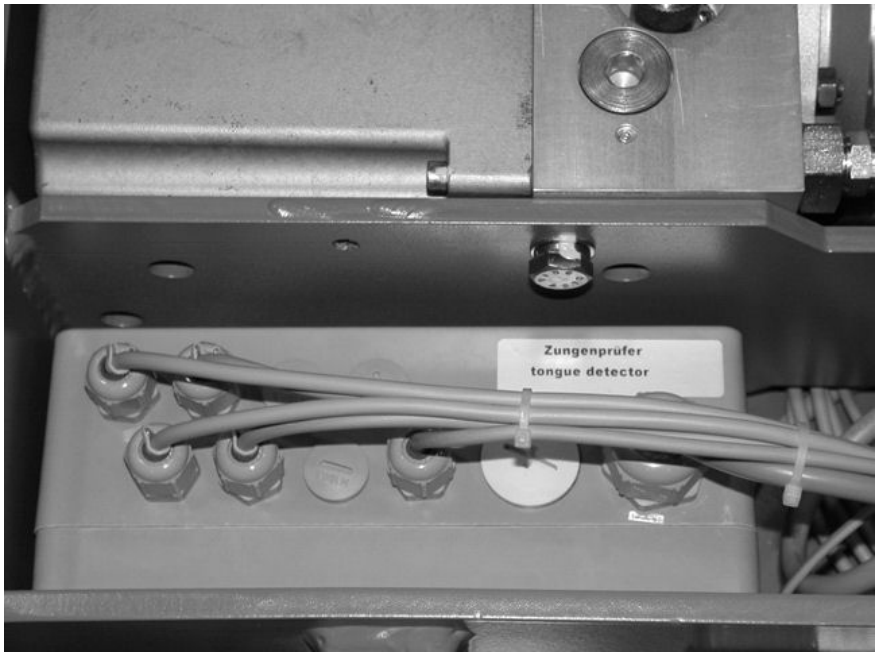


Fig. 27: Tongue detector - terminal box

Electrical connection to the point controller is via earth cable direct to the terminals inside the tongue detector terminal box or to a connector.

The electrical outputs of the inductive proximity switches are switched on a board in the tongue detector terminal box. Output switching on the board ensures that a safe end position is only reported to the point controller when both point tongues are in proper end position.

The board is programmed via a number of DIP switches on a coding rail. The DIP switches are set at the factory.

Danger of short circuit!

The setting of the switches is shown on a sticker in the cover of the tongue detector terminal box.

Ensure that the switch settings correspond to the specifications on the sticker at all times.

The switch settings may only be altered

after consultation with HANNING & KAHL.

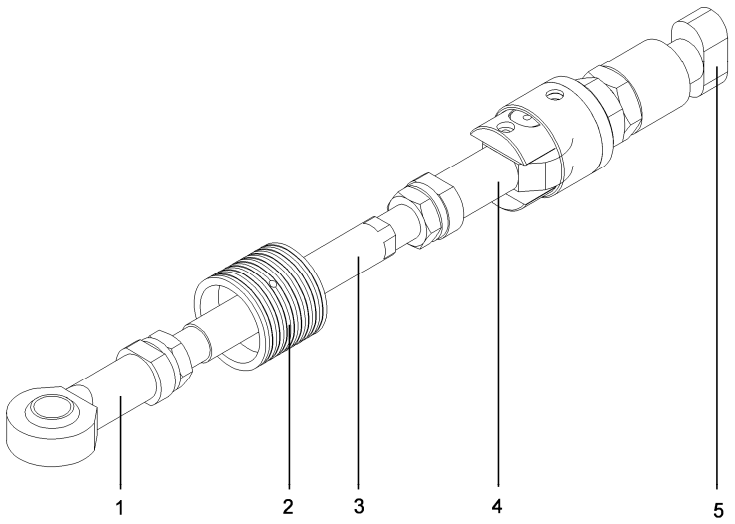
It is particularly important to pay attention to correct switch setting when replacing the board or the entire tongue detector terminal box when performing maintenance work.

The electrical monitoring wiring diagram provides detailed information.

6.13 Drive rods

The drive rods connect the setting unit of the setting mechanism to the two point tongues. They transfer the setting forces and hold the point tongues in their end position.

A drive rod is constructed as follows:



1 Joint head for connection to the locking driver of the setting mechanism
2 Ring for attachment of bellows
3 Setting bolt
4 Joint head
5 Hammerhead screw for connection to point tongue

Fig. 28: Drive rods

In conjunction with the joint heads (1) and (4), a setting bolt (3) with right and left-hand thread facilitates modification of the effective length of this component and allows exact adaptation of the rods to the tongue opening of the respective point construction.

With the joint heads (7) and (11) the drive rods have two bearings. This means that point tongue length changes caused by temperature fluctuations can be compensated. Discrepancies in installation height of the point machine and production tolerances in point construction can also be compensated.

For flat-bed points, the drive rods are connected to the point tongue via a hammerhead screw (5).

ⓘ Options:

- As an option, the connection can also be made via a connection bracket to the tongue profile (e. g. Zu 2 - 49) for deep-bed or flat-bottomed points.
- The connection can also be made via a round bolt or a connection bracket.
- Rods can also be supplied in insulated design at customer request.

Bellows seal the housing to the inside and protect the setting mechanism from contamination and water:

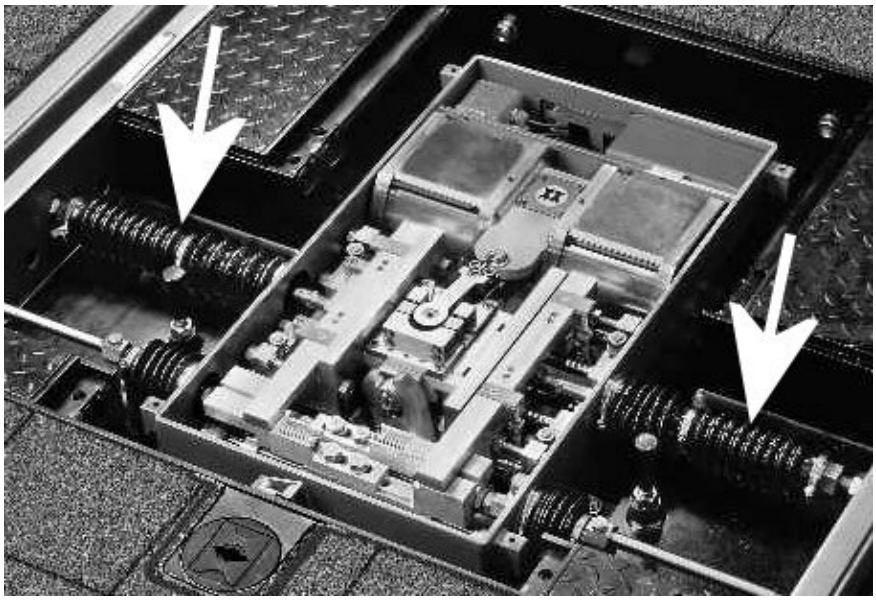
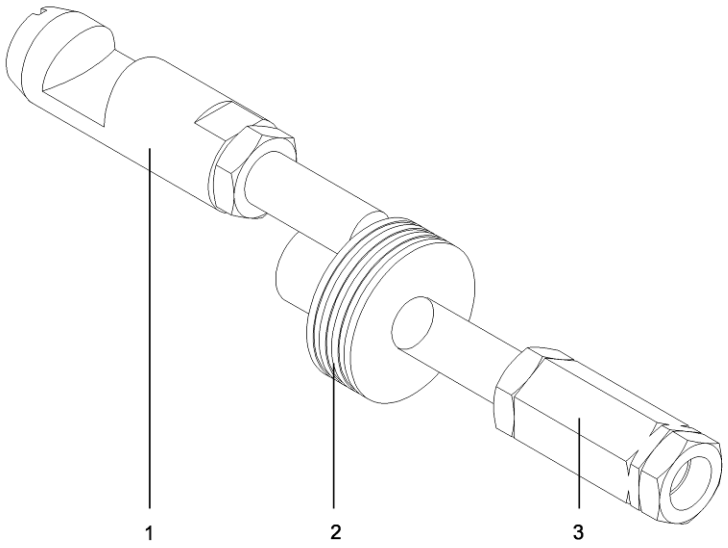


Fig. 29: Drive rod bellows

6.14 Tongue detector rods

The tongue detector rods connect each of the point tongues to the corresponding sliding carriage of the tongue detector.

The tongue detector rods are constructed as follows:



1 Tongue attachment for attachment to the point tongue
2 Threaded ring for attachment of bellows
3 Adjusting nut for connection to the sliding carriage

Fig. 30: Tongue detector rods

As in the case of the drive rods, the length of the tongue detector rods can also be modified and adapted to the points design/the point opening.

The tongue detector rods are connected to the point tongue via an adjustable tongue attachment (1).

ⓘ As an option, the connection can also be made via a connection bracket to the tongue profile (e. g. Zu 2 - 49) for flat-bed or flat-bottomed points.

Bellows seal the housing to the inside and protect the setting mechanism from contamination and water:

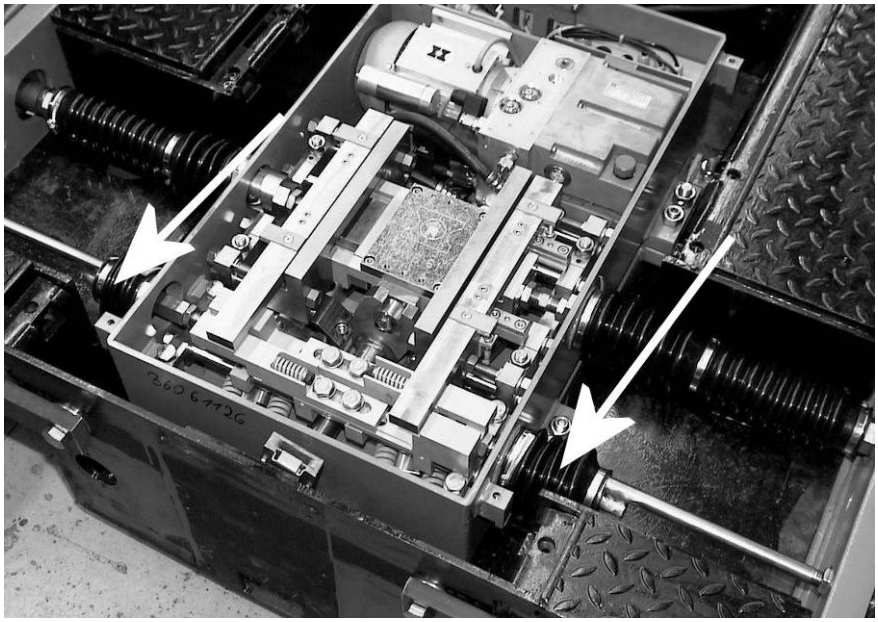
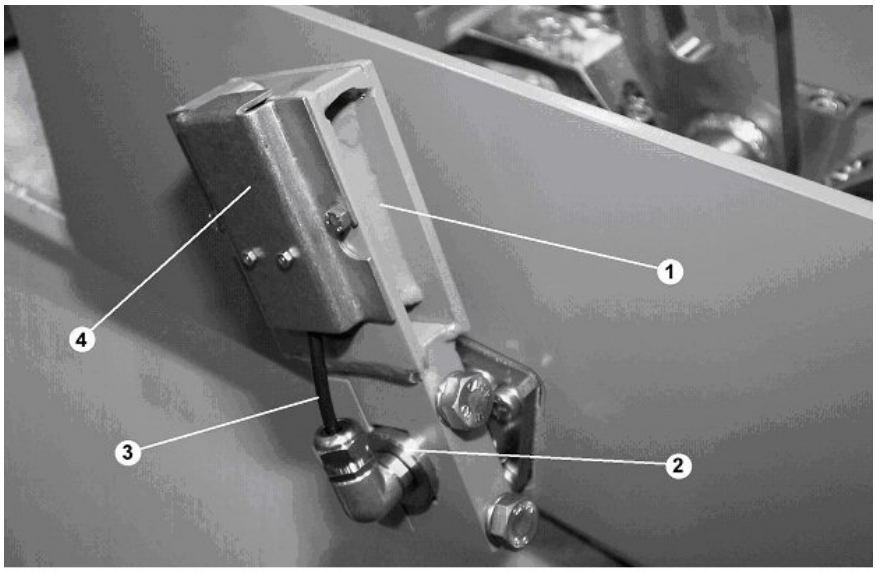


Fig. 31: Tongue detector bellows

6.15 Lever box

The lever box (1) is mounted on the outer-lying end of the drive shaft (2):



1 Lever box
2 Drive shaft
3 Lever box switch cable
4 Lever box switch cover

Fig. 32: Lever box with lever box switch

The point tongue can be moved manually from one end position to another when a setting lever is inserted.

ⓘ The dimensions of the lever box correspond to those of the setting lever used by the transport authority.

6.15.1 Lever box switch

To guarantee optimum safety when working on the point machine, the lever box is equipped with a lever box switch (See the Figure in the Chapter entitled "Lever box").

The lever box switch recognises when a setting lever is inserted in the lever box. A corresponding signal is sent to the point controller and follow-on setting commands are blocked / the controller is locked.

Logical evaluation and interruption of the load current circuit takes place in the point controller.

The lever box switch prevents an electrical setting command from the controller from setting the point and injuring people in the vicinity by the swing of the setting lever.

The lever box switch is connected in the tongue detector-terminal box.

Danger of injury by swinging setting lever!

Only use hand levers which are adapted to the lever box and which switch on the lever box switch safely.

Do not carry out any work on the point machine or the point construction unless you are sure that the inserted hand lever has been recognised and the point controller is locked.

If the lever box switch does not recognize a hand lever because it is too small and the point controller does not lock, a rail vehicle can generate a setting command which will be executed.

The points will be set with a risk of injury by the hand lever to you and other persons in the vicinity.

7 Assembly

This chapter contains information on:

- Preparing assembly
- Unpacking the point machine
- Installing the point machine in the tracks
- Electrically connecting the point machine
- Mounting the drive rods
- Setting the locking device
- Mounting the detector rods
- Checking the setting of the rods
- Attaching the bellows
- Setting the springs
- Setting the hydraulic damping device

ⓘ The point machine can also be installed professionally by HANNING & KAHL customer service (Service Division).

7.1 Preparing assembly

ⓘ The point machine can also be installed professionally by HANNING & KAHL customer service (Service Division).

Caution

Precipitation water can damage equipment!

Protect the point machine with a cover (e. g. tent) if work must be performed in the rain.

Wipe out any water which gets into the point machine to prevent condensation water forming in the closed point machine.

Condensation water can cause corrosive damage in the point machine.

Ensure the following:

✓ You have the accessories and tools at hand for assembly (Refer to chapters entitled "Accessories" and "Tools List").

✓ This switch machine is designated for this installation location. Compare the EDP number of the setting mechanism with the number cited in the lay-out plan. Consult the project manager if necessary. The EDP number is underneath the transparent packing film.

✓ The clearance between the drive and detector rods on the point machine is identical to the clearance of the rod connections of the point tongues.

✓ This particular type of point machine (electromagnetic) can be operated with the point controller provided.

✓ The line power voltage tallies with the operating voltage of the double acting magnet cited. Information on the operating voltage is on the type plate of the double acting magnet.

✓ You have the documents below which are enclosed with your point machine at hand:

- project-related point installation drawing (WEB)
- drawing of drive and detector rods
- circuit diagram for electric point machine
- circuit diagram for electric monitoring

7.2 Unpacking the point machine

Proceed as follows:

1. Remove the protective film.
2. Dispose of the protective film in an ecologically sound manner.
3. Remove the steel tapes which secure the point machine to the European pallet.

Danger of cutting hands!

The point machine is secured on the European pallet with steel tapes.

Wear work gloves when you separate the steel tapes.

4. Store the point machine accessories (rod components), which are on top of the point in a place where they are safe from damage and confusion with other parts.

Caution

Danger of confusing components!

Be careful not to confuse the accessories with accessories of other point machines in other possible versions.

This may render setting impossible.

The accessories may be stored in the earthcase.

5. Remove the cover with the help of two cover hooks (See Chapter "accessories").
6. Before assembling the point machines check the relevant dimensions of the housing and the tongue device.

Consult the point installation drawing which is enclosed with the point machine for more information.

7.3 Installing the point machine in the tracks

Ensure the following:

✓ For standard points in compliance with the German Association of Transit Authorities, VDV, the clearance between the cut-outs between drive and detector rods of the point machine is identical to the clearance of the cut-outs on the rails and point tongues:

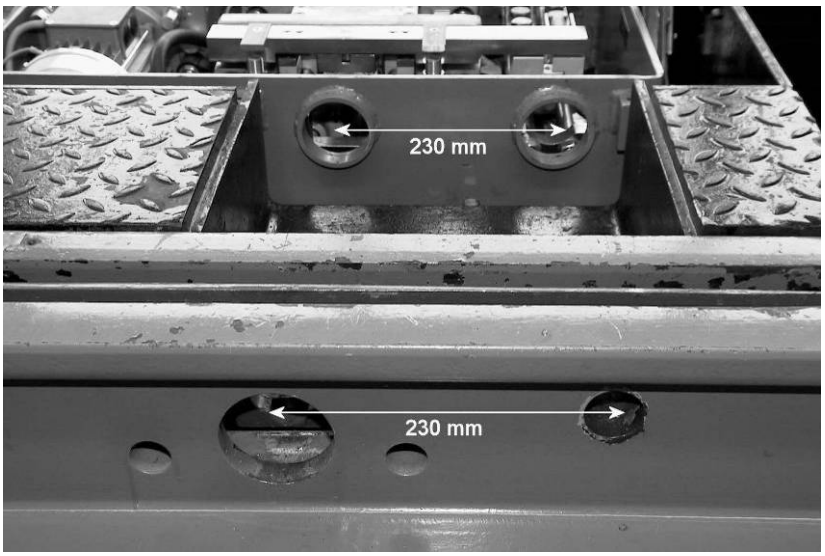


Fig. 33: Clearance between the cut-outs between drive and detector rods

✓ The standard clearance is 9,06 in [230 mm]. Deviations must be taken into account when ordering. They will be recorded in the point installation drawing.

The clearance between the connection point of the tongue detector and the tip of the tongue is not greater than 6.69 in [170 mm]:

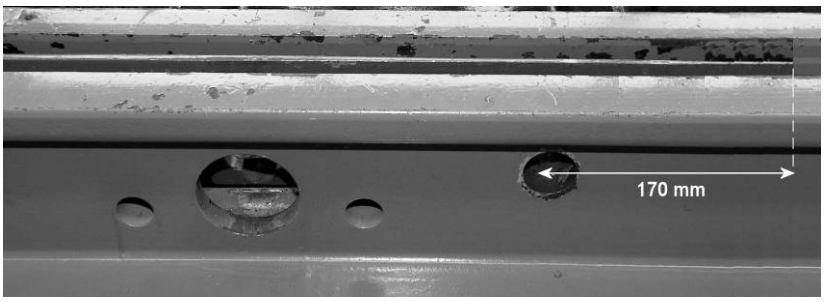


Fig. 34: Clearance between the gap for the detector rods and the tip of the switch tongue

Deviations are only possible subject to the tongue profile and are the responsibility of the point manufacturer. They are recorded on the point installation drawing.

Danger of derailment!

The clearance between the connection point of the tongue detector and the tip of the tongue must not be greater than 6.69 inch [170 mm].

If the clearance is greater than 6.69 in [170 mm], the function of the tongue detector may no longer be guaranteed. If the switch tongue is bent, the tongue detector may detect a safe tongue end position even though there are objects in the area of the tip of the tongue between the switch tongue and the stock rail which prevent the tongue from closing.

Proceed as follows:

1. Observe the specifications in the chapter entitled "Transport".

Danger of injury!

Do not transport the point machine with hoisting equipment which is not suitable for the purpose.

Only use hoisting equipment which is

suitable for the weight of the switch machine 1102-1543 lb [500-700 kg], depending on the type).

Danger of injury for yourself and people in the vicinity.

Only use appropriate hoisting equipment !

2. Screw the four M20 eye bolts into the four threaded holes for the weld-on lugs.
3. Hook the cobra hooks of the 4-strand lifting gear into the eye bolts.
4. Hook the 4-strand lifting gear into the load hook of the hoisting device.

Warning! Suspended loads!

Hands and other body parts must be kept well away from the separate lifting accessories to avoid injuries when the separate lifting accessories tighten.

Before hoisting the point machine, everyone must leave the direct danger zone.

No-one should stand around underneath suspended loads! Wear a helmet.

Warning! Danger of injury!

Ensure that the load is under control, not rotating and cannot hit objects and that no objects can fall from the load as there is otherwise a risk of injury, and that no objects can fall from the load as there is otherwise a risk of injury.

5. Insert the earthcase into the track bed.

Caution

Danger of damage to the water outlet!

When the transportation pallet is removed, the water outlet is the lowest point of the switch machine.

Placing the switch machine roughly on the ground could damage the drainage connection!

6. Align the earthcase in such a way that the rod connection points of the switch tongues are flush with the connections of the detector rods of the switch machine:

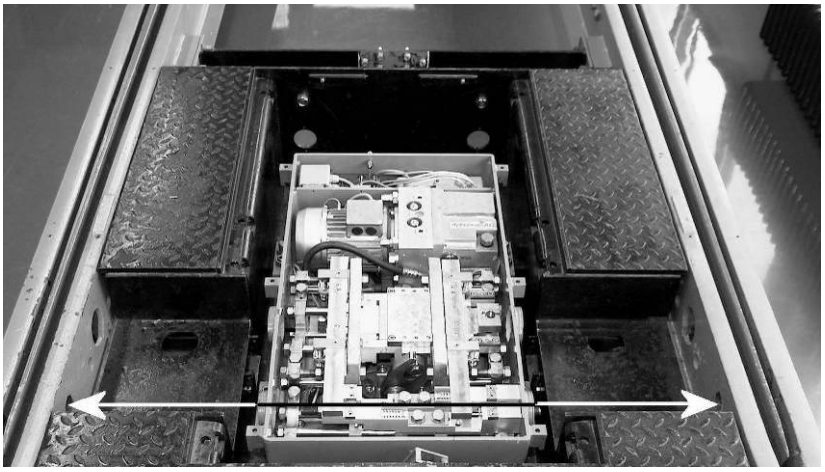


Fig. 35: Flush alignment of the earthcase and switch tongue

ⓘ Notches on the rod channels of the earthcase mark the course of the drive and tongue detector rods and simplify alignment of the earthcase in the track:

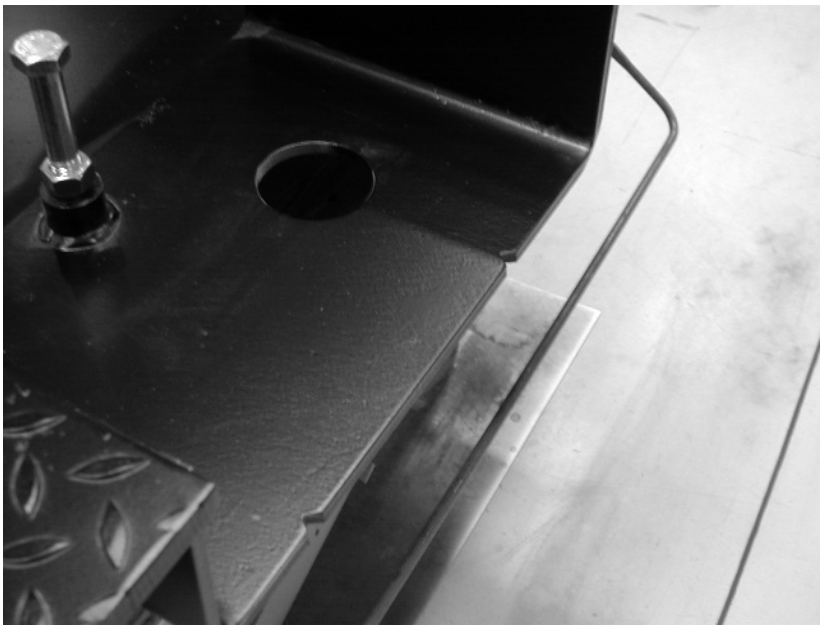


Fig. 36: Notches on the rod channels of the earthcase

7. Measure the clearance from ’inner edge of right stock rail’ to ’inner edge of left stock rail’:

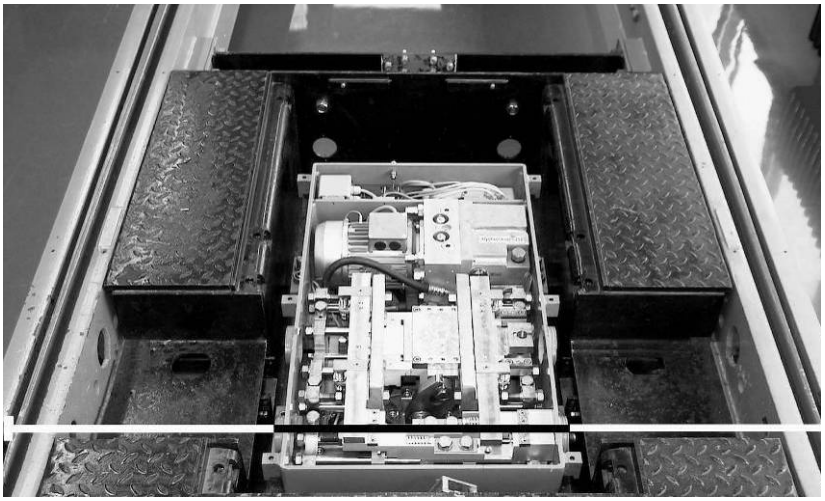


Fig. 37: Clearance from 'inner edge of right stock rail' to inner edge of left stock rail’

8. Halve the value measured.
9. Align the middle of the earthcase at this point:

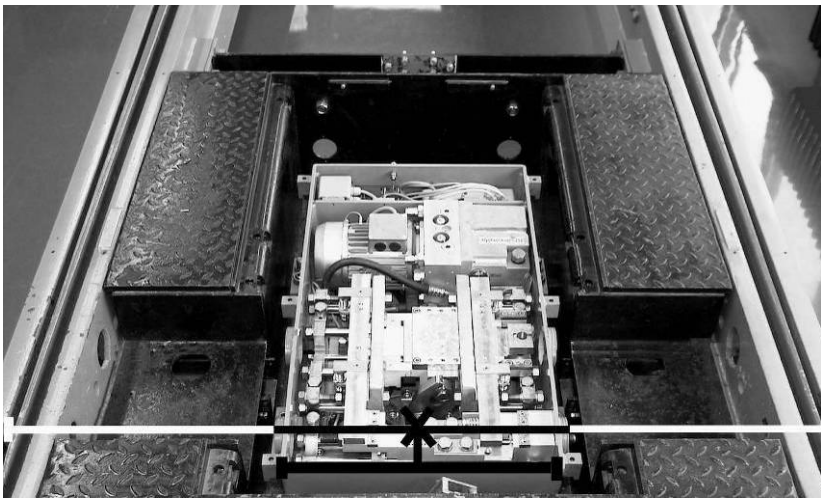


Fig. 38: Align the switch machine

ⓘ Over-dimensioned cases must be adapted to the point geometry on site. Mark out the exact dimension. Take the switch machine out of the track bed again. Cut the cover along the markings. Place the earthcase into the track bed again and align anew.

10. Ensure that the upper edge of the earthcase occludes with the upper surface of the rail.

    ⓘ The switch machine described in this operating manual rests on the rail foot (steel base plate) and is connected to the point construction via welding lugs.

11. Weld the mounting lugs of the earthcase to the side rails (1):

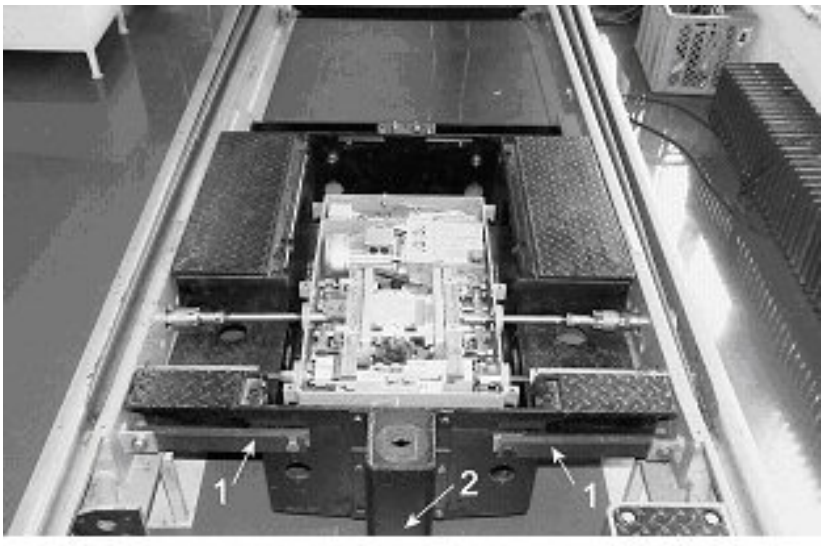


Fig. 39: Mounting lugs and drainage connection of the earthcase

12. Screw the earthcase to the mounting lugs.
13. Connect the earthcase drainage connection to the drainage system.

Caution

Danger of flooding of the point machine if there is no drainage connection!

The drainage connection of the earthcase must be connected to the drainage system.

If the drainage connection is not connected to the drainage system, there is a danger of flooding!

The precipitation water which penetrates the earthcase cannot flow away. There is also a risk of the precipitation water penetrating the housing (Protection grade IP67 and NEMA Type 6).

This could lead to function failure of the point machine.

14. Install the drain channels on both sides of the earthcase:

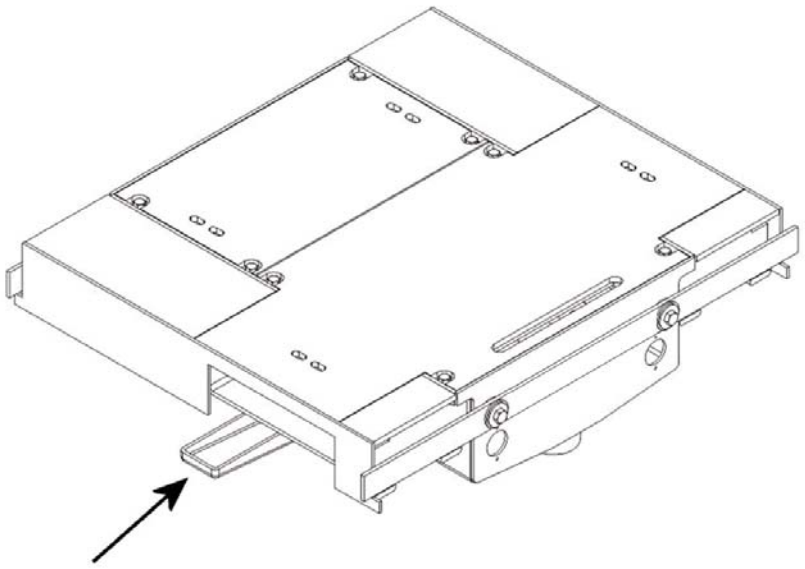


Fig. 40: Connect drainage channels

15. Check the clearance of the housing to the top of the rail. The upper surface of the housing must be 1,77 in [45 mm] below the upper surface of the rail:

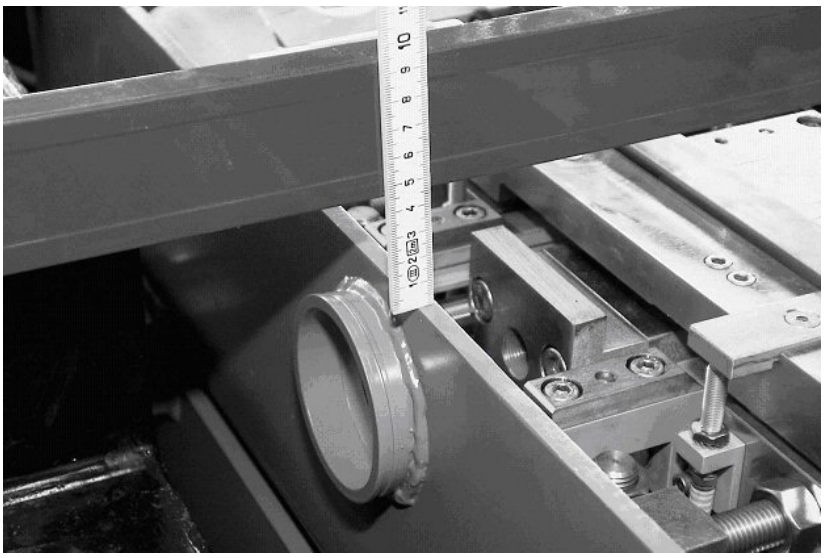


Fig. 41: Measure the clearance between the upper surface of the rail and the upper surface of the housing

If the dimension is not correct, loosen the nuts of the spacer bolts (3):

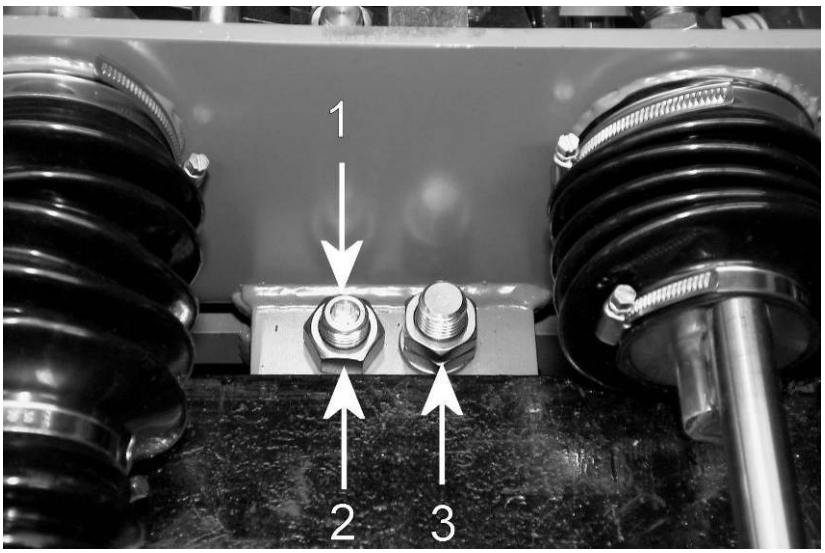


Fig. 42: Adjust the height of the housing

16. Adjust the height via the four threaded bolts (1) with a hexagon socket screw.
17. When adjusting the installation height, ensure that the housing rests securely on all four points.
18. Secure the threaded bolts (1) with locknuts (2) after height adjustment.
19. Tighten the nuts of the spacer bolts (3) after the adjustment measures have been completed.

7.4 Electrically connecting the point machine

Two cables have to be laid for the electrical connection of the point machine:

- **Power supply cable** for the double-acting magnet. This cable is connected in the magnet terminal box. During the setting procedure this cable carries mains voltage DC 600/750 V (recommended cable type NYY-O 4x2.5).
- **Control voltage cable** for connection of the inductive proximity switch. This cable is connected in the tongue detector terminal box. It constantly carries the control voltage potential of DC 24 V (recommended cable type NYY-O 5x1.5).

Caution

Danger of function failure of the point machine!

The cable type must be suitable for laying in the ground.

Unsuitable cable types could be decomposed by substances in the ground

Malfunctions of the switch machine could result.

When selecting cables, observe VDE directives and transport authority stipulations.

High voltages!

The connecting terminals for the power supply cable in the point controller can carry dangerously high voltage.

Ensure that the device is switched off when working on it.

Ensure that the point controller is also switched off when performing the work.

The following themes are described:

- Connecting operating voltage, protective earth (PE) and system earth
- Connecting the tongue detector terminal box
- Connection via connectors

7.4.1 Connecting operating voltage, protective earth (PE) and system earth

Caution

Danger of malfunction!

Ensure that the low and extra low voltage cables / cables which carry control and line power voltage are not laid in the same cable ducts or pipes.

Malfunctions could otherwise result !

Proceed as follows:

1. Lay the cable from the point controller to the point machine.
2. Connect the power supply cable to the terminals in the magnet terminal box.
3. Pay attention to the following terminal designations:
   Terminal 1 = Switch on ”Point left“
   Terminal 2 = Switch on ”Point right“
   Terminal 6 = System
4. Install the free-running diodes.
   Ensure that poling is correct:
   red = Anode > to terminal 1 and terminal 2
   blue = cathode > to terminal 6

On the double acting magnet there is a terminal screw for connection of the PE ground wire. At the factory, an electrical connection (10 mm² Cu) is installed from the terminal screw to the through bolt on the housing.

A further electrical connection is imperative from the screw connection on the inner housing to the return line (rail potential/ earth). This connection must be made during assembly.

On the housing there is a terminal screw for connection of the PE ground wire.

Hazardous!

If the housing is not connected to the feedback line (rail earth) correctly, the safety elements in the switch cabinet might not be able to switch off in the event of malfunctions.

In such a case, dangerous touch voltage could arise on the housing.

Proceed as follows:

1. Lay the PE ground wire from the point machine to the rail. The electrical conductor should have a cross-section of at least 10 mm² on account of the risk of corrosion. It should not be mounted under tension.
2. Make a reliable contact point on the rail potential.
3. Connect the PE ground wire to the contact points on the rail potential.
4. Connect the outer connection side of the through bolt on the housing to the PE ground wire.

7.4.2 Connecting the detector terminal box

Proceed as follows:

1. Lay the cable from the point controller to the point machine.
2. Connect the control voltage cable to the detector - terminal box or - where available - to the connector.

   There are different possibilities of connecting the point controller to the detector terminal box. Two examples are given below:

   Example 1:

   DC 24 V power supply für the inductive proximity switches, DC 24 V as control voltage for detection of the point end position.

   Observe the following terminal designations:

   A - Operating voltage (-)

   B - Operating voltage (+)

   E - Output tongue detector left

   F - Output tongue detector right

   Pay attention to the sticker in the cover of the detector-terminal box and the corresponding wiring diagram.

   The detector – terminal boxes and their boards are the same for different point machine versions. They differ in the setting of the coding switches. The sticker describes the switch position of these coding switches.

The figure below illustrates an example of such a sticker:

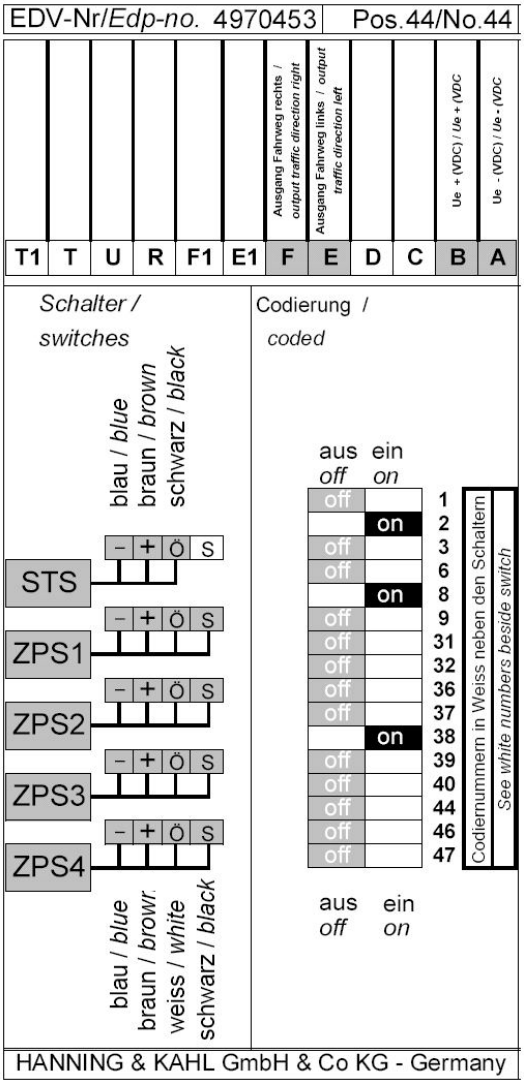


Fig. 43: Example sticker in the cover of the detector terminal box

Example 2

24 V DC power supply for the inductive proximity switches, deployment of volt-free contacts for display of the point end positions, etc.

Proceed as follows:

1. Connect the control voltage to :
   R = lever box switch
   L + J = drive-lock monitoring
2. Connect the outputs to: U + T = Lever box switch (change-over contact) K + M = Drive lock monitoring

3. Consult the corresponding wiring diagram and the sticker in the cover of the detector - terminal box with regard to electrical connection and the setting of the coding switches.

The "wiring diagram electrical monitoring" provides detailed information.
It is enclosed with your point machine.

7.4.3 Connection via connectors

Where applicable, the connector is on the outside on the front of the setting mechanism housing and it is hardwired to the tongue-detector terminal box. Re-programming of the tongue detector board using the switches, (as described in this example) is only possible to a limited extent as only a 10-pin connector is available. The wiring within the setting mechanism housing must also be changed.

Proceed as follows:

1. Push the connecting cable through the screwed cable gland of the connector shell.
2. Connect the stripped wires to the terminal screws of the insert:

Fig. 44: Bush insert with terminal designation

3. Use wire end ferrules !
4. Consult the corresponding wiring diagram.
5. When assembling the connector shell, ensure that the coded pins/coded bushings (black and white arrow) are screwed in completely:

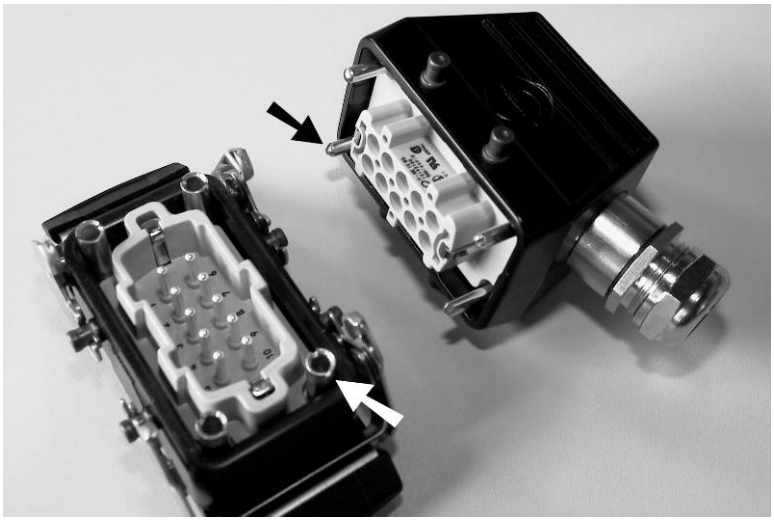


Fig. 45: Connector shell with bush insert

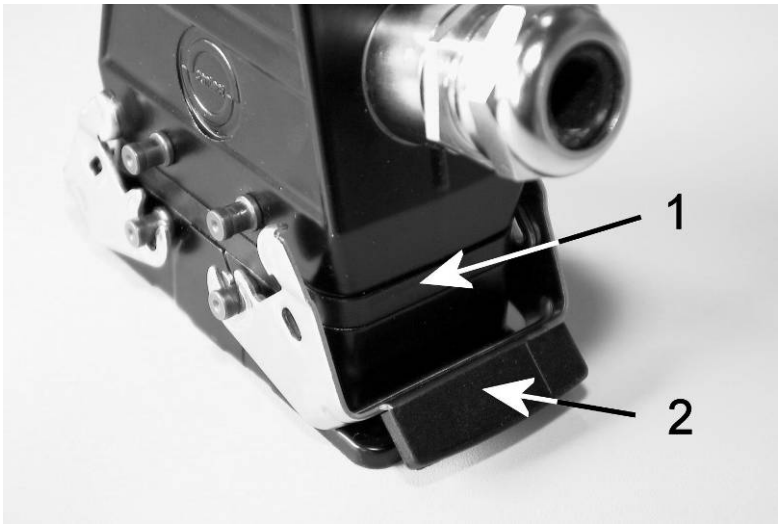
Caution

Danger of malfunction!

If the coded pins/coded bushings are not screwed in completely, the socket housing with rubber lip seal does not close tightly to the connector shell.

In this case, water and contamination can penetrate the interior of the connector shell.

6. Turn down the stirrup on the connector shell (2):



1 Seal
2 Stirrup

Fig. 46: Close the connector shell

⇨ Repeat the steps from point 5 on if the stirrup is difficult or impossible to shift.

7.5 Mounting the drive rods

This chapter describes:

- Connecting drive rods to point tongue
- Connecting drive rods to setting mechanism
- Setting drive rods
- Securing the setting of the drive rods

For the purposes of this documentation, assembly begins with the right drive rod in driving direction.

Also refer to the drawing "Drive rods". It is enclosed with your point machine.

Option "Insulated version“:
If the drive rods are insulated, there is no electrical connection between the setting mechanism and the point tongues after assembly.

Plastic bushes can tear out!

The insulation (optional) in the drive and tongue detector rods consists of screwed-in plastic bushes.

Ensure that the plastic bushes are screwed in maximum length in the designated bores at all times!

Drive rods have less tensile and compressive strength if the plastic bushes are not screwed in properly!

The plastic bushes can tear out.

7.5.1 Connecting drive rods to point tongue

Proceed as follows:

1. Screw the hammerhead screw out of the connection bracket of the drive rod.
2. Insert the·hammerhead·screw·through·the·cross-hole bore·into the point tongue
3. Position·the·hammerhead·screw·by·turning·it·90°:

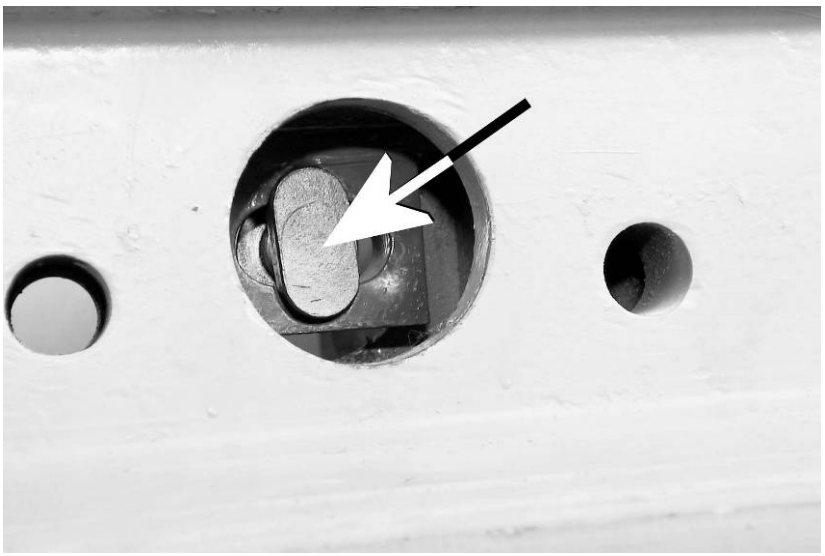


Fig. 47: Mount the hammerhead screw

4. Screw the hammerhead screw tightly to the washer and nuts on the point tongue. Observe the torque specifications in the chapter entitled "Tightening torque".
5. Check the length of the remaining thread after mounting the hammerhead screw.
   The remaining length must be 22 - 32 mm:

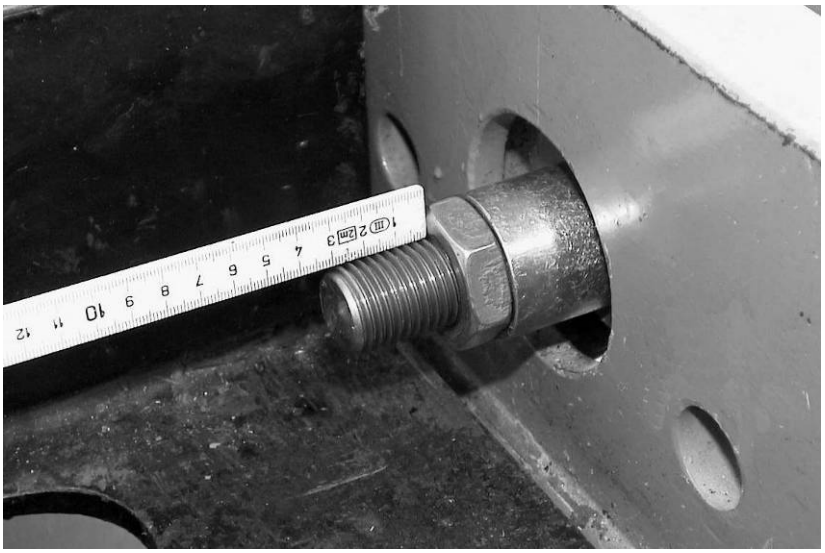


Fig. 48: Measure the remaining thread of the hammerhead screw

Caution

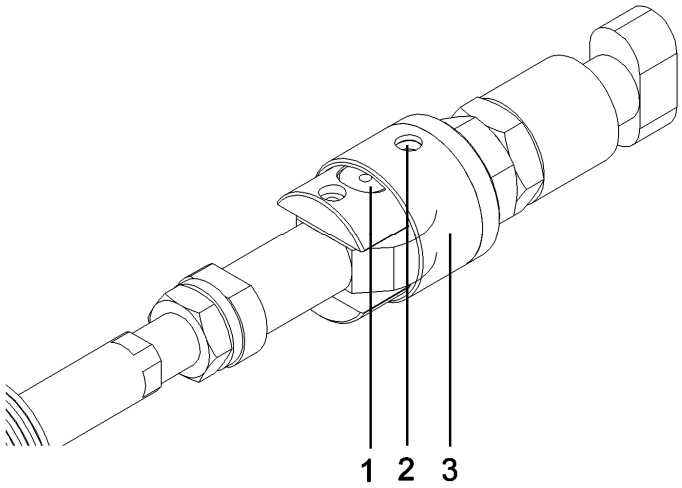
Thread can tear out!

The remaining thread of the hammerhead screws must be 22 - 32 mm.

If the length is not sufficient, the geometry of the cross-hole gap can cause the thread to tear.

In this case use longer hammerhead screws.

6. Remove the hexagon socket screw (2):



1 Bolt
2 Hexagon socket screw
3 Brass sleeve

Fig. 49: Mount the hammerhead screw

7. Push back brass bush (3).
8. Push out the bolt (1).
   The connection bracket is now disconnected from the rest of the drive rods.
9. Screw the connection bracket onto the hammerhead screw:

Fig. 50: Mount the connection bracket

10. Do not tighten the connection bracket. This facilitates easier mounting of the bolt in the connection bracket when assembling.
11. Screw the swivel heads of the drive rods as far as possible onto the adjusting bolt situated in between.
12. Lubricate the bolt and the connection bracket with AUTOL TOP 2000 (See Chapter "Accessories").
13. Insert the swivel head into the connection bracket.

Danger of shearing fingers!

Do not insert fingers into the connection of swivel head and connection bracket.

Danger of injury to fingers if they slip off the rod.

14. Push the bolt through the connection bracket:

Fig. 51: Mount drive rods

15. Push the brass sleeve over the connection bracket.
16. Secure the brass sleeve with the hexagon socket screw:

Fig. 52: Secure brass sleeve

17. Tighten the connection bracket on the hammerhead screw.
    One point tongue is now connected to the drive rods.
18. Pull back the bellows onto the drive rods.
    The bellows have a larger and a smaller opening.
19. Ensure that the large opening of the bellows points in the direction of the housing.

7.5.2 Connecting the drive rods to the setting mechanism

Proceed as follows:

1. Remove the hexagon socket screw (1) which secures the bolt (2) of the locking driver (3):

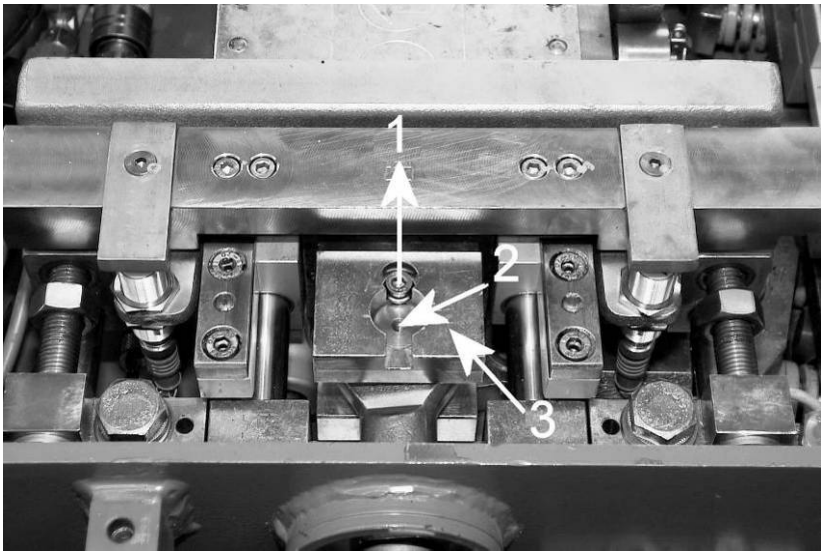


Fig. 53: Disconnecting the drive rods from the setting device

2. Screw the hexagon socket screw (1) into the bolt (2).
3. Pull out the bolt.
4. Insert the joint head of the drive rod into the locking driver (3).
5. Screw the hexagon socket screw out of the bolt.
6. Re-insert the bolt into the locking driver.
7. Secure the bolt again with the hexagon socket screw after insertion.

7.5.3 Setting the drive rods

When setting the point machine in manual operation, the following must be observed with regard to the springs:

Caution

Danger of limbs being squashed!

The linkage spring assemblies transfer forces to the inner components and the connected point tongues in each point position.

Limbs could be squashed in the area of the inner housing, e.g. in the windings of the spring assemblies and in the point tongue area.

Instruct surrounding persons to stop working and to remove tools from the housing and the point tongue area during the setting process.

Proceed as follows:

1. Test by manual setting with the setting lever whether the setting mechanism moves the same distance to the right and to the left from the middle position.
2. If necessary, turn the insulating bolt of the drive rod until the setting mechanism moves the same distance to the right and to the left from the middle position for each point end position.

   The drive rod is set correctly when the dimension X from the locking driver to the inner wall of the housing is the same in both point end positions. A tolerance of 0.08 in [2 mm] is permissible:

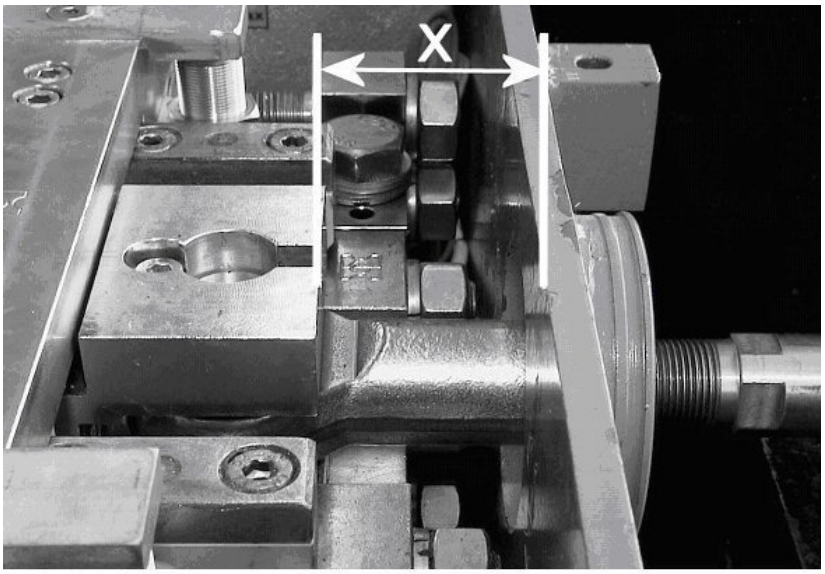


Fig. 54: Dimension X in point position - left (setting mechanism)

The setting of the opposite drive rod must ensure that both point tongues close in their end positions and that only minimum clearance to the side rail remains when the point tongue is in open position.

The clearance is checked by a feeler for compliance with transit authority specifications.

7.5.4 Securing the setting of the drive rods

Proceed as follows:

1. Secure the drive rods respectively to two swivel joints (left-hand thread and right-hand thread:

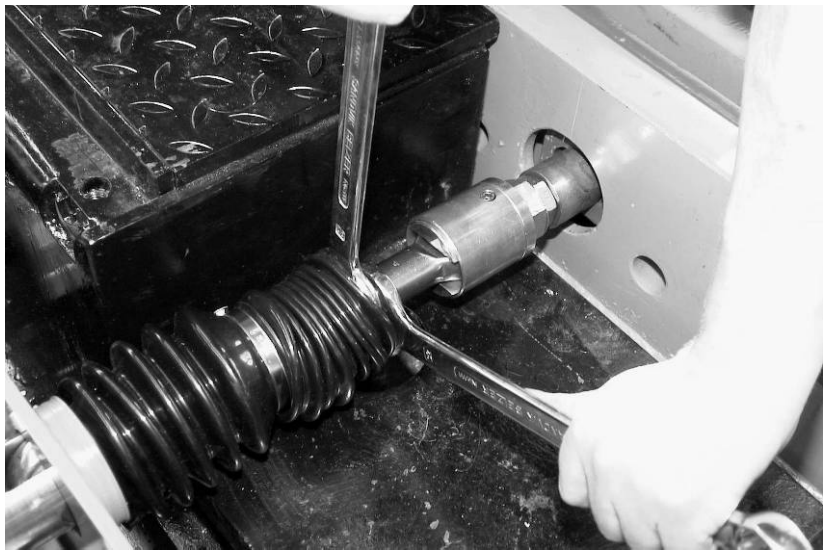


Fig. 55: Secure the nuts on the swivel joints

7.6 Setting the locking device

Taking the geometric relationship between the rail and the wheel into account (measure qm), a small gap is permissible between the stock rail and the closed point tongue. This gap is defined by the transport authority based on examination of the geometric relationship between the rail and the wheel.

The description below is based on an admissible gap between the tongue and the stock rail of 0.16 in [4 mm]. The setting is made with a gap of 0.08 in [2 mm] to keep sufficient distance to the limit value.

Proceed as follows:

1. Bring the point machine into one of the end positions.
2. Place a 0.08 in [2 mm] measuring plate at the height of the drive rods between the point tongue and the stock rail. The force of the springs should be sufficient to hold the measuring plate in position:

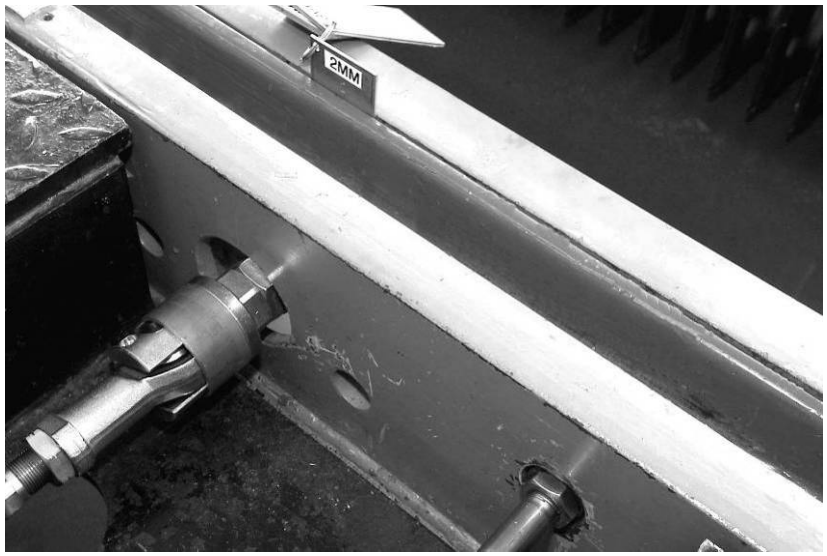


Fig. 56: Insert measuring plate between point tongue and stock rail

3. Unscrew the two securing nuts of the locking component:

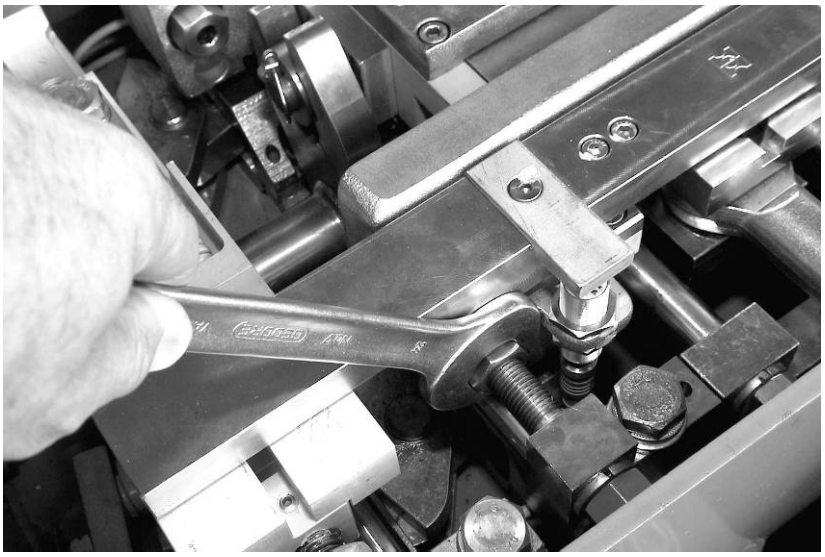


Fig. 57: Unscrew the securing nuts

4. Push the locking component on its guiders outwards until the locking guide rests without force and without a gap on the locking driver:

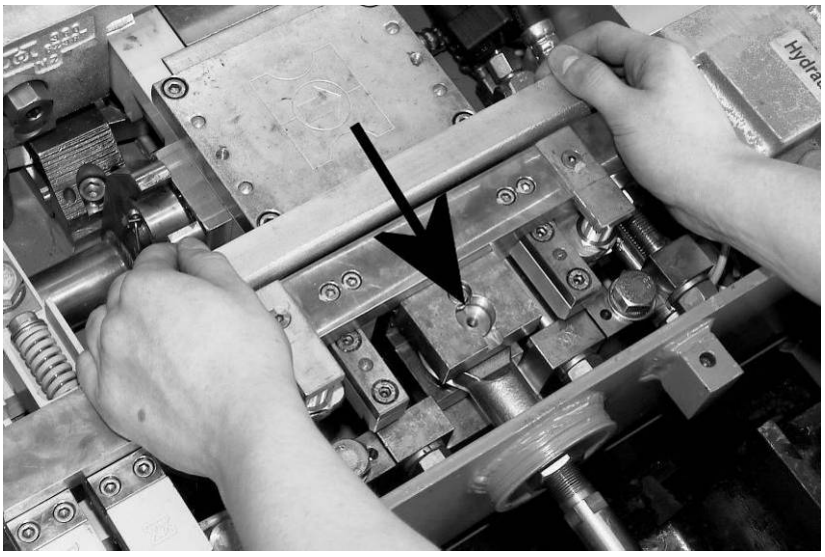


Fig. 58: Set the locking component

5. Tighten the hexagon long nuts on the opposite side by hand:

Fig. 59: Tighten the hexagon long nuts by hand

6. Tighten the attachment nuts of the locking component with a 0.94-inch [24-iger] open-jawed wrench.
   This secures the locking component in its set position on its guider.
7. Remove the 0.08 in [2 mm] measuring plate.
8. Ensure that the point tongues have reliably reached the end position.
   They must lie tight to the stock rail. When the measuring plate is removed, the play between the locking guide and the locking driver is set.

⇨ Repeat the steps described in this chapter to set the other point tongue.

7.7 Mounting the detector rods

This chapter describes:

- Adapting the gap for the tongue detector attachment to the point tongue
- Connecting drive rods to point tongue
- Connecting detector rods to the point machine
- Setting the lock on the closed point tongue
- Setting the lock on the opened point tongue

ⓘ For the purposes of this documentation, assembly begins with the left detector rod in driving direction.

Also refer to the "Detector rods" drawing enclosed with your point machine.

7.7.1 Adapting the tongue attachment to the point tongue

Before commencing assembly, the tongue attachment must be adapted to the point tongues.

Proceed as follows:

1. Remove contamination from the bore-hole in the tongue bed.
2. Lift the point tongue with a lever.
3. Push the tongue attachment into the designated bore:

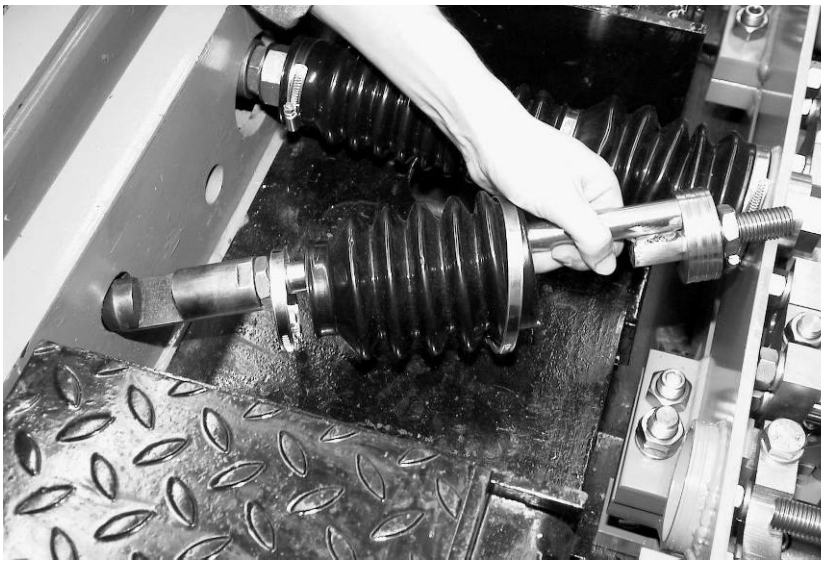


Fig. 60: Install detector rods

4. Lower the point tongue again slowly. The point tongue must fit exactly into the tongue detector attachment gap. It must not jam or clamp !

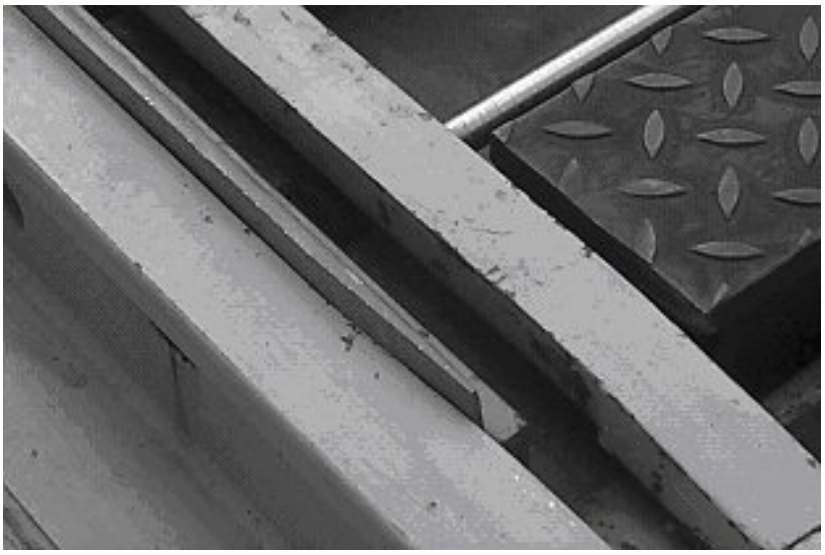


Fig. 61: Lift point tongue and adapt the tongue attachment

5. Check the dimension between the attachment gap and the tongue width with a feeler gauge. It must not be greater than 0.02 inch [0.5 mm]:

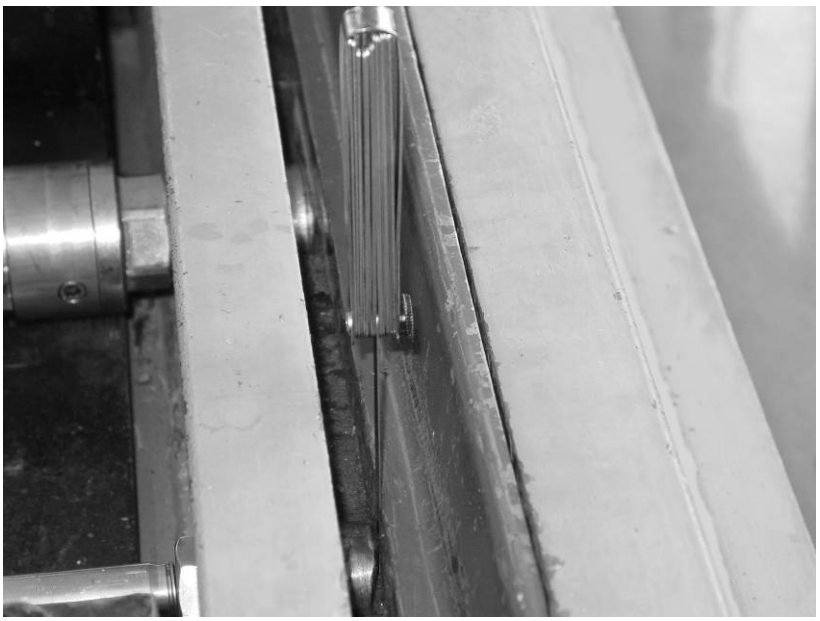


Fig. 62: Measure the dimension between the attachment gap and the point tongue

If the attachment gap does not fit, the tongue attachment must be screwed from the tongue rods and then:

If the gap dimension is too great, material has to be welded on and the tongue attachment has to be ground.

Only use Oerlikon Citodur D4V1000 welding electrodes when welding.

If the gap dimension is too small, the tongue attachments have to be ground. The inner sides of the gap must be ground in an angle of 5 – 10° and have a radius of r=2,56 in [r= 65 mm]:

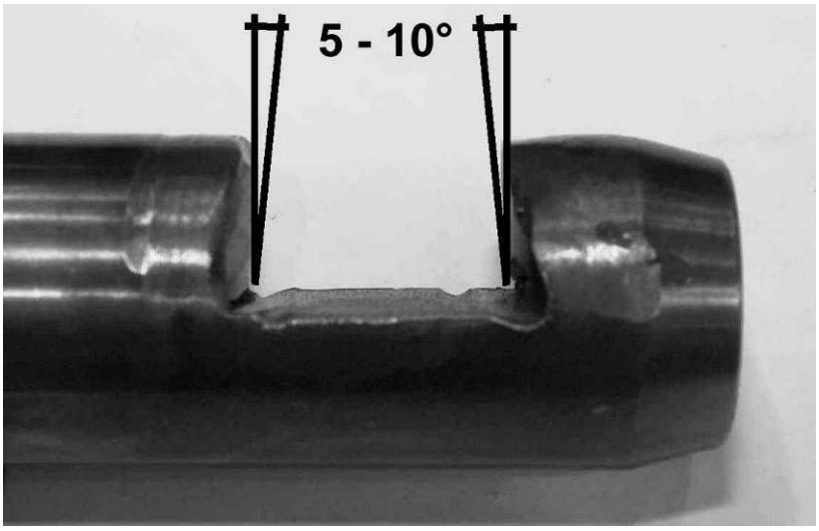


Fig. 63: Tongue detector attachment (side view)

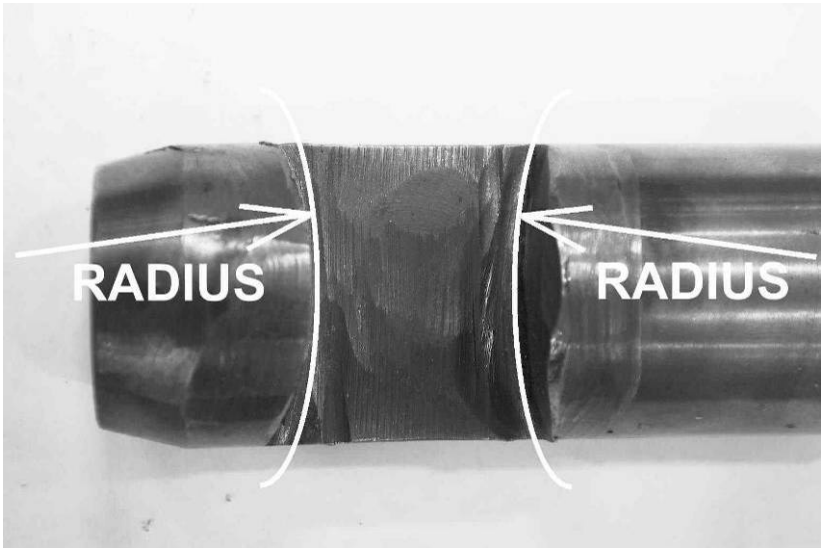


Fig. 64: Tongue attachment (top view)

6. Screw the adapted tongue attachment completely back onto the detector rods.

7.7.2 Connecting the detector rods to the point tongue

Proceed as follows:

1. Lift the point tongue with a lever.
2. Insert the detector rods with the gap attachment into the point tongue:

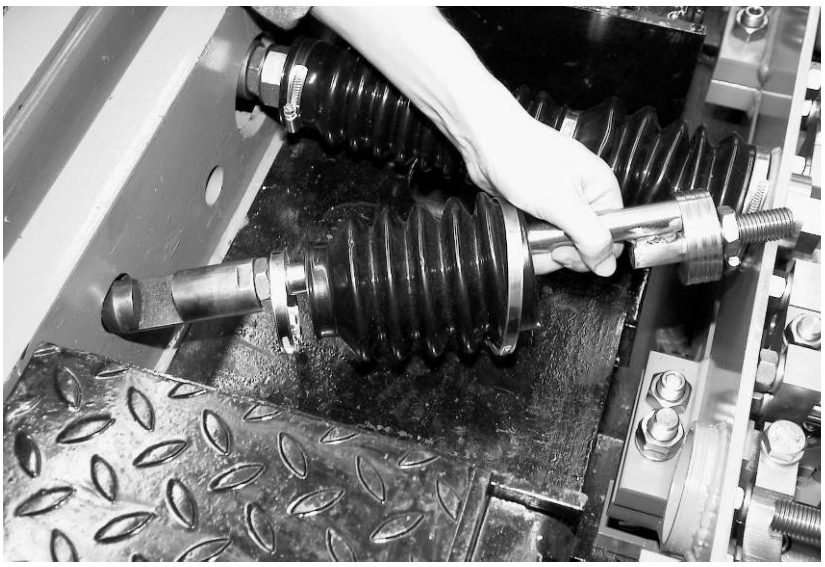


Fig. 65: Install detector rods

3. Lower the point tongue again.

7.7.3 Connecting the detector rod to the point machine

Proceed as follows:

1. Unscrew the adjusting nut from the detector rods.
   This makes installation easier. The adjusting nut has a left-hand thread and a right-hand thread and is used to alter the length (setting) of the detector rod.
2. Connect the detector rod to the sliding carriage of the point machine using the adjusting nut:

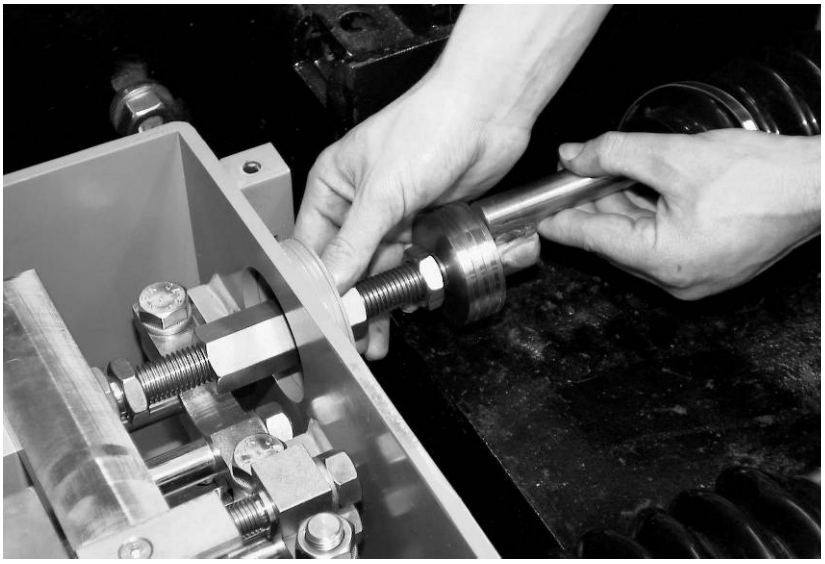


Fig. 66: Connect the detector rods to the tongue detector of the point machine

3. Loosen the hexagon socket screws of the sliding carriage:

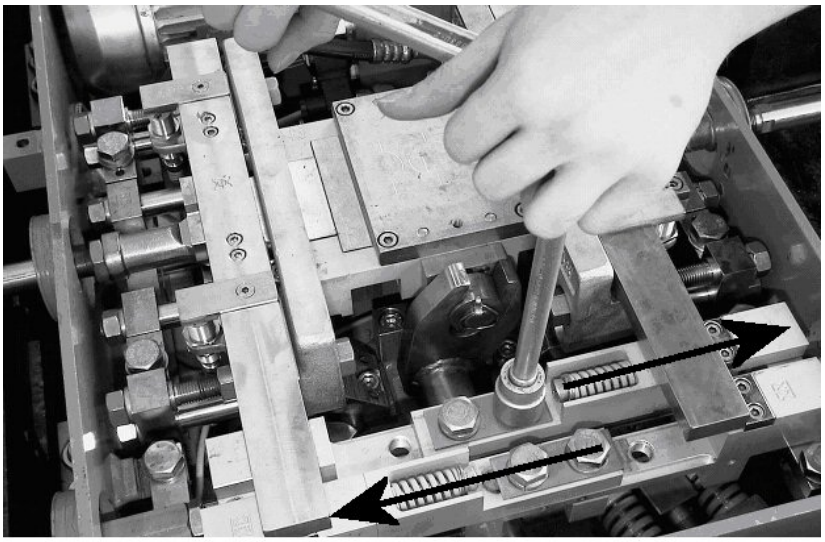


Fig. 67: Loosen the hexagon socket screws of the sliding carriage

4. Temporarily push the sliding carriage to the outside as far as the stop.
5. Tighten the hexagon socket screws of the sliding carriage again.

7.7.4 Setting the lock on the closed point tongue

Proceed as follows:

1. Place the 0.08 in [2 mm] measuring sheet at the height of the tongue detector rod between point tongue and stock rail:

Fig. 68: Insert measuring plate 0.08 in [2 mm] - in driving direction left

2. Adjust the tongue detector with the help of the adjusting nut of the closed side in such a way that the locking surface of the locking cam rests on the lock guide which has fallen into place without force and without a gap (1):

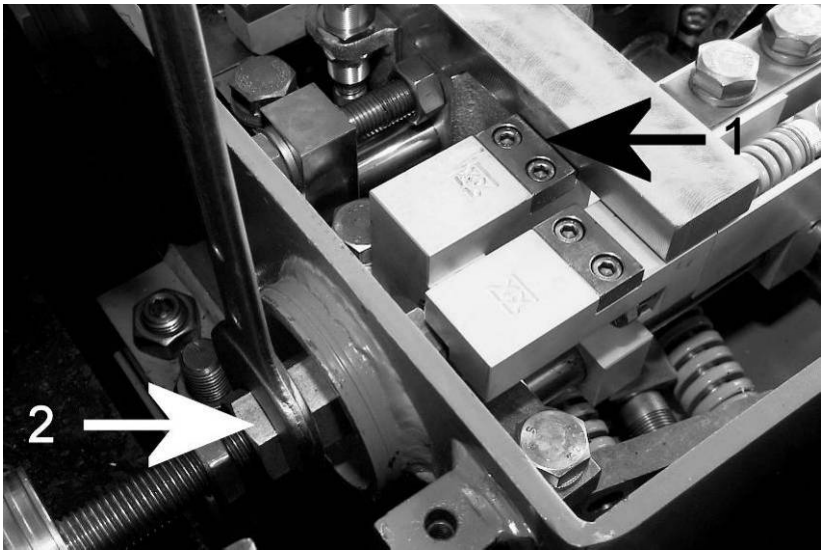


Fig. 69: Set the detector rod - left

3. Secure the adjusting nut (2) with the two locknuts. The closed side of a point tongue is set.

7.7.5 Setting the lock of the open point tongue

Proceed as follows:

1. Place the 0.08 in [2 mm] measuring sheet at the height of the tongue detector rod between point tongue and stock rail.
2. Loosen the two screws of the closed tongue detector which connect the sliding carriage and the locking support:

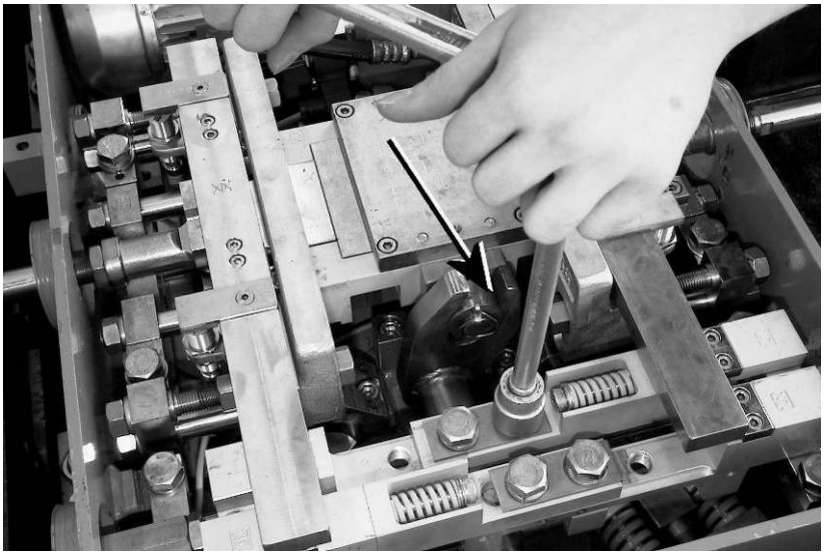


Fig. 70: Disconnect the sliding carriage/locking support connection

3. Push the locking support of the tongue detector to the lock guide until it rests without force and without a gap:

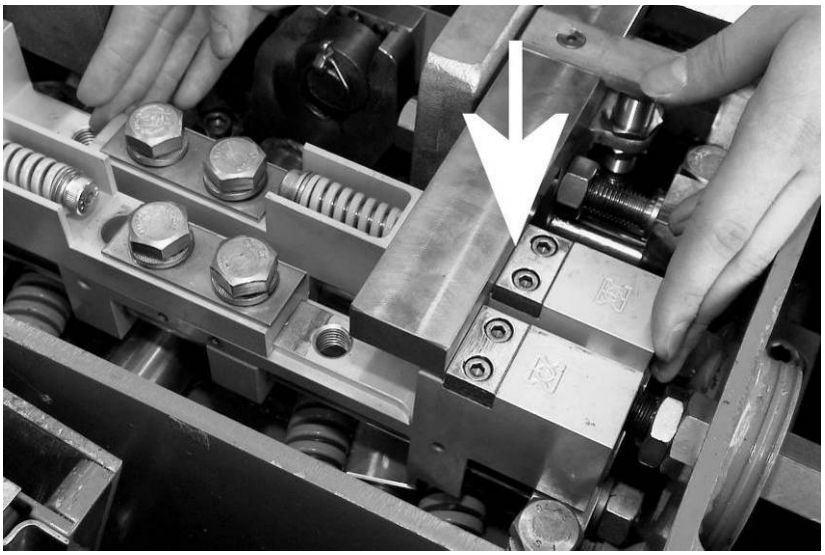


Fig. 71: Set the tongue detector lock on the open point

4. Screw the set locking support of the tongue detector via the two screws tightly in its position on the sliding carriage again.

⇨ Repeat the steps described in this chapter to set the second tongue detector lock.

7.8 Checking the setting of the rods

A final check of the clearance between point tongue and stock rail ensures that the drive and detector rods are set correctly.

Proceed as follows:

1. Place a 0.16 in [4 mm] plate between the point tongue and the stock rail at the level of the detector rods.

   If the lock guide does not fall into place, the setting was made correctly.

   If the lock guide can fall into place, the settings of the drive rods described in the chapter "Setting the lock on the closed point tongue" and in the chapter "Setting the lock on the open point tongue" must be repeated and re-checked.

7.9 Attaching the bellows

Caution

Precipitation water can damage equipment!

Ensure that the bellows are pulled over the rods before the rods are mounted.

Mount the bellows properly.
The precise attachment position of the bellows is specified in the rod drawings.

If the bellows are not properly mounted, precipitation water can penetrate the housing of the point machine. Damage and function failure of the point machine can result.

The bellows protect the drive and detector rods and the point machine from contamination. They are attached with hose clips to the guiding bearing of the housing and to the drive and detector rods.

Proceed as follows:

1. Pull the end of the bellows over the guiding bearings of the housing:

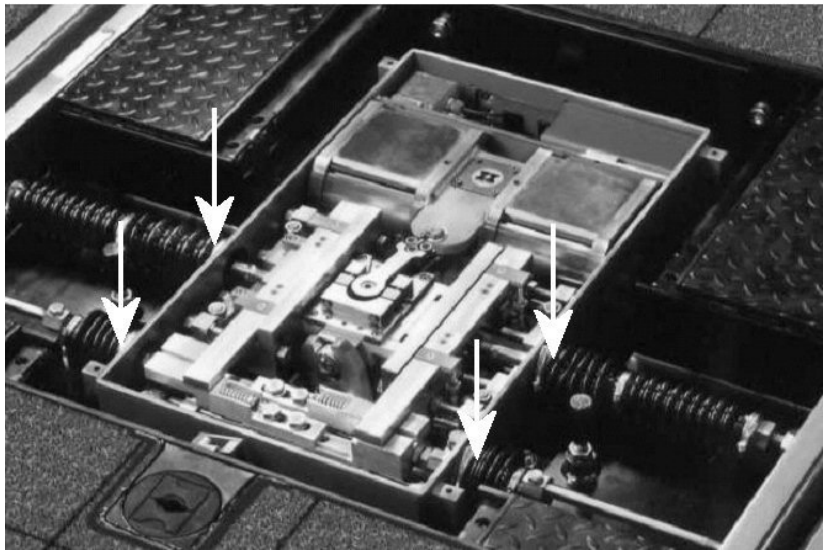


Fig. 72: Connect bellows

2. Attach the bellows to the housing with the hose clips.

3. Attach the bellows to the drive and detector rods with the hose clips.

Consult the detector rod drawing for the exact position.

7.10 Setting the springs

The springs are pre-set at the factory.

The following may make it necessary to readjust the rod linkage springs on site:

- tongue stiffness,
- friction of the tongue support structure,
- the pressing force of the tongues in end position is insufficient.

First the force of the springs set must be checked.

Danger of squeezing limbs!

When setting the point machine in manual operation, the spring assemblies transfer forces to the inner components and the connected point tongues in each points position.

Limbs could be squashed in the area of the inner housing, e.g. in the windings of the spring assemblies and in the point tongue area.

Before the setting procedure, remove the tools from the housing and the point tongue area.

Stop working during the setting procedure.

Proceed as follows:

1. Place a 0,16 in [4 mm] measuring plate between the tip of the tongue and the stock rail.
2. Pull the measuring plate out in upward direction.

   The point tongue must fall into end position with the spring force of the springs.

   The tip of the point tongue must lie firmly on the stock rail.

If, after this examination, the tip of the point tongue does not rest tightly on the stock rail, it may be necessary to align the point tongues or adjust the springs.

Proceed as follows:

1. Undo the locknut of the setting bolt (left-hand thread):

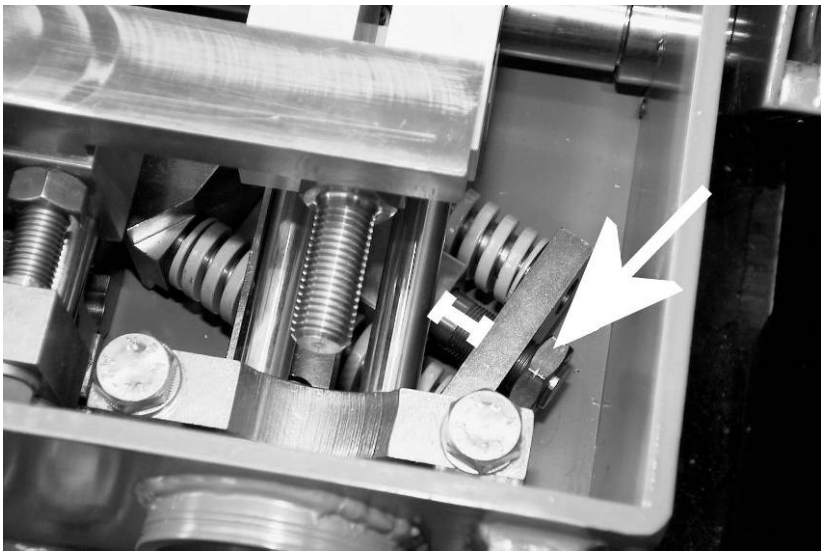


Fig. 73: Setting the springs

2. Turn the setting bolt with the square wrench to adjust the spring tension.

   To increase force = turn to the right

   To reduce force = turn to the left

   Both spring assemblies in the point machine must be set at the same spring tension.

3. Secure the setting by tigthening the locknuts when the spring force required has been set.
4. Check again that the tips of the point tongues close to the stock rails.

7.11 Setting the hydraulic damping device

The setting speed of the point tongues is regulated via the setting of the one-way restrictors on the hydraulic unit. The setting speed is set at 0.5 - 1 second at the factory.

The following may make it necessary to readjust the setting speed on site:

- tongue stiffness,
- friction of the tongue support structure,
- point opening,
- loud banging of point tongues in end position,
- a different setting speed is requested.

Caution

Increased noise and wear when setting time is shortened!

When setting the hydraulic damping, please note that the shorter the setting speed is, the greater the noise development and the wear.

Premature wear of the tongue device and the point machine can result if the hydraulic damping set is too weak.

ⓘ The hydraulic damping device is set with an angled Allen wrench with 0.16 in [4 mm] hexagon socket bit (See Chapter entitled "Accessories"):

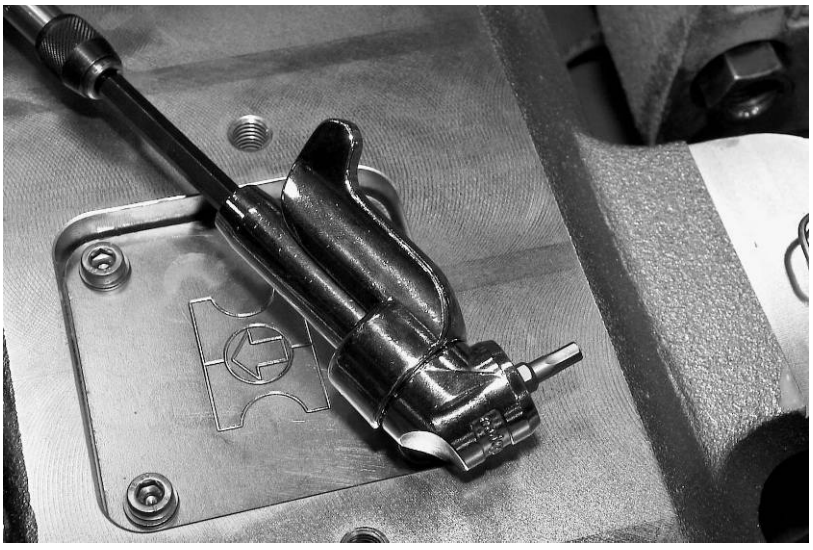
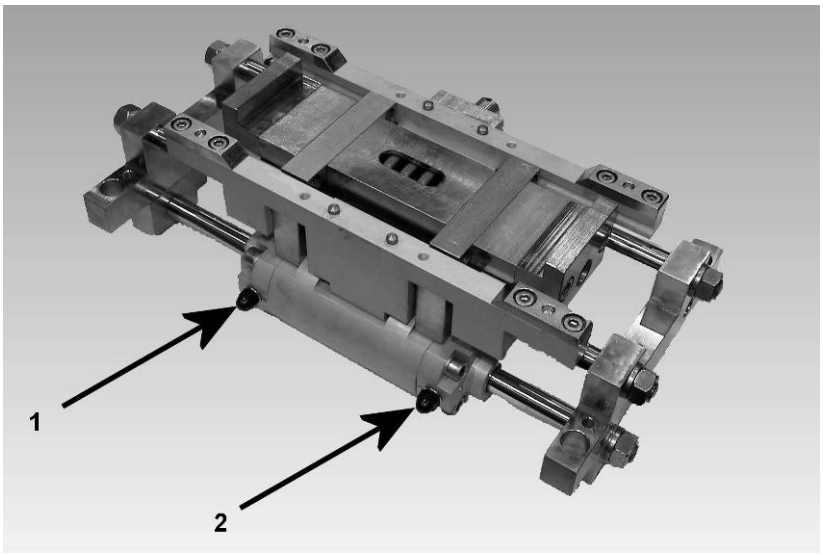


Fig. 74: Angled Allen wrench

Proceed as follows:

1. Remove the protective caps of the damping valves:



1 Damping valve for setting tongue movement from right to left (as seen from the tip of the tongue)
2 Damping valve for setting tongue movement from the left to the right (as seen from the tip of the tongue)

Fig. 75: Damping valves of the hydraulic damping device

2. Place the open-jawed wrench 0.51 in [13 mm] on the locknut of the setting screw.
3. Loosen the locknut slightly.

Caution

Oil may escape!

Do not loosen the locknuts too far.

The locknut has a rubber seal and also functions as a valve.

Oil loss results if the locknuts are turned too far!

4. Leave the open-jawed wrench on the locknut.
5. Turn the setting screw with the angled Allen wrench.

   Turn to the right = increased damping intensity

   Turn to the left = reduced damping intensity:

Fig. 76: Set the hydraulic damping device

6. Tighten the locknut again after each turn of the setting bolt.
7. After each adjustment, set the point electrically to check the modified damping effect.
   The damping device is set correctly when the point tongues go into end position without loud banging.
8. Replace the protective cap on the damping valve when the adjustment work is completed.

⇨ Repeat the steps described in this chapter to set the second damping valve of the hydraulic damping device.

8 Commissioning

The following themes are described:

- Filling in the commissioning protocol
- Closing the point machine

8.1 Filling in the commissioning protocol

Caution

Danger of damage to the device!

Commission the point machine using the commissioning protocol in order to avoid errors.

Fill in the commissioning protocol conscientiously.

The commissioning protocol is enclosed with the "Technical documentation" for your point machine.

Ensure the following:

✓ The protocol must be completely filled in.

✓ The protocol must be signed.

✓ The protocol must be filed for 10 years.

✓ Then check the function of the point machine by setting several times.

8.2 Closing the point machine

The following themes are described:

- Closing the housing
- Closing the earthcase

8.2.1 Closing the housing

Proceed as follows:

1. Close the housing with the housing cover.
2. Tighten the six screws. Observe the specifications in the chapter entitled "Tightening torque":

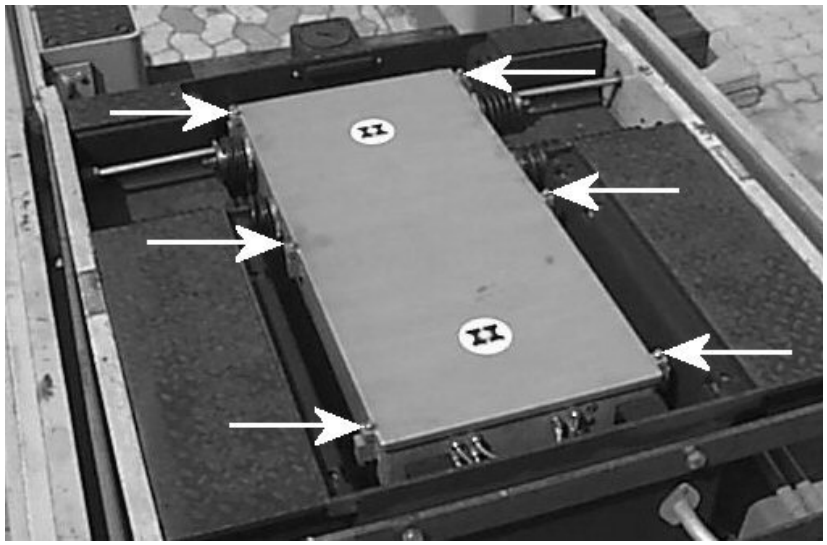


Fig. 77: Closing the housing

When the work is completed, a tightness test should be performed with a tightness tester.

See Chapter entitled "Accessories" for further information.

Refer to the operating instructions for the testing device for information on execution of the tightness test.

8.2.2 Closing the earthcase

Proceed as follows:

1. Close the earthcase with the two earthcase covers.

Danger of squeezing limbs!

Use the cover hooks to place the covers on the earthcase.

2. Tighten the eight screws.
   Observe the torque specifications in the chapter entitled "Tightening torque".

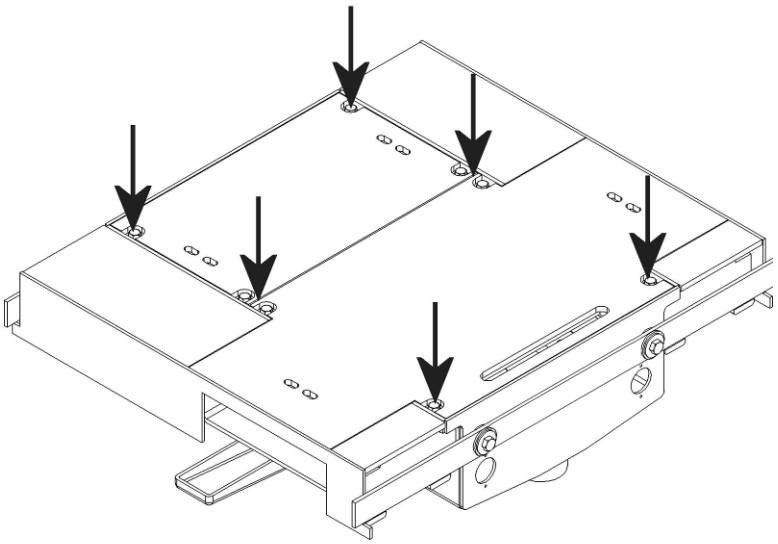


Fig. 78: Closing the earthcase

9 Trouble clearance

Malfunction	Possible causes	Symptom	Remedy
Point machine cannot be set electrically	Power supply is interrupted Fuse defective	Power supply cannot be measured	Check power supply; Check fuse element in point controller Check supply cable (See Chapter "Electrically connect point machine)
	Coil of the double-acting magnet is defective	Forward resistance of the coil cannot be measured, i.e. coil interrupted or earth leakage to housing measurable	Replace double-acting magnet and send to HANNING & KAHL for inspection (See maintenance card "Replace double-acting magnet“)
Tongue end position is not reached	Foreign body in point area	No driving signal	Remove foreign body
	Current application time is too short	Protective switch-off before tongue end position is reached	Check nominal time in the point controller
Point end position reached is not signalled	Foreign body in point area	Lock guide does not fall into place	Remove foreign body
	Defective inductive proximity switch	LED of inductive proximity switch does not light up	Check power supply (See Chapter "Electrical Connection“) Replace inductive proximity switch (See maintenance card "Check function of inductive proximity switch“)
Point tongue bangs loudly in end position	Damping setting on hydraulic unit not correct	Disturbing noise	Set hydraulic damping (See Chapter "Set hydraulic damping“)
Point tongues do not stay in end positions	Pressing force of rod linkage springs too low	Visible gap between stock rail and point tongue	Increase pressing force of rod linkage springs (See Chapter "Set springs“)

Table 2: Trouble clearance

When the work is completed, a tightness test should be performed with a tightness tester.

See Chapter entitled "Accessories" for further information.

Refer to the operating instructions for the testing device for information on execution of the tightness test.

10 Maintenance

This chapter contains information on:

- General maintenance instructions
- Maintenance intervals
- Preparing for maintenance
- Maintenance overview
- Closing the point machine

10.1 General maintenance instructions

This chapter contains information on maintenance work which is necessary for the safe and efficient operation of the switch machine.

We would like to point out explicitly that all checks, tests and preventative maintenance measures prescribed must be carried out conscientiously. If this is not the case, we refuse all liability and warranty.

If you require technical or advisory support, please contact our Service Division who are at your disposal 24 hours a day.

10.2 Maintenance intervals

The maintenance intervals for point machines are stipulated in BOStrab. They correspond to the regulations of VDV 346.

- Acc. to BOStrab (§57), point machines should be subjected to **general overhaul (GO)** every five years. General overhaul may only be performed by qualified and skilled staff or in a specialised workshop (e. g. HANNING & KAHL).
- **Intermediate inspections (Z) must be carried out annually.** Intervals may be extended depending on local factors (e.g. a predetermined number of point settings or on-site conditions). Inspection work must also be performed by qualified staff who have been given adequate instruction (See Chapter "Personnel qualification and training“).
- Newly commissioned switch machines should be inspected every month during the first three months of operation. Inspection must be carried out by qualified staff (See Chapter "Personnel qualification and training“).

ⓘ For equipment which fulfils safety category AK 6 in accordance with DIN 19250 the following must be performed: Maintenance and inspection work must be documented and the documentation must be stored (BOStrab §57 sub-paragraph 6 and 7).

10.3 Preparing for maintenance

Read the Chapter "Safety instructions" before you start work on the point machine.

Caution

Corrosion caused by precipitation water!

Protect the point machine with a cover (e. g. tent) if work must be performed in the rain.

Remove water which may have penetrated the point machine with a cloth.

Components may corrode if the water is not removed.

You require the following for maintenance (See Chapter "Operating means“):

✓ Tools,

✓ Operating materials,

✓ Accessories.

10.4 Maintenance overview

The table below provides a summary of the maintenance of your point machine. See the sub-chapters below the table for information on the individual steps:

Component/Sub-assembly	Maintenance work	Maintenance intervals			Measures / operating means / documentation
		6 months	1 year	5 years	
Earthcase	Check earthcase environment (subsidence, cavities)		X	X	Fill up if necessary
	Check attachment to rail		X	X	Tighten screw joints if necessary. (Observe torque)
	Visual check for cracks and corrosion		X	X	Remove rust if necessary and apply new coat of paint
	Check cover screws		X	X	Clean and lubricate with COPASLIP anti-corrosion paste if necessary
	Check drainage function (clean drainage channels and drainage connections)	X	X	X	See chapter entitled "Checking drainage function of earthcase“.
	Inspect rod ducts		X	X	Clean if necessary
Housing	Visual check for cracks and corrosion		X	X	Remove rust if necessary and apply new coat of paint
	Check cover screws		X	X	Clean if necessary
	Check sponge rubber seal of the housing cover for elasticity and damage.		X	X	Replace if necessary (See Chapter "Replacing the sponge rubber seal of the housing cover“) Adhesive: Patex
	Check desiccant bag	X	X	X	See Chapter "Check desiccant bag"
	Check tightness	X	X	X	See Chapter "Check tightness of housing“
Double-acting magnet	Double-acting magnet defective; forward resistance of the coil cannot be measured		X	X	See Chapter "Replacing double-acting magnet"
Setting mechanism	Check that all accessible screws and nuts are tight		X	X	Tighten if necessary (Observe torque)
	Check the end positions of the point tongues		X	X	See chapter entitled "Checking end position of the point tongues"

Component/Sub-assembly	Maintenance work	Maintenance intervals			Measures / operating means / documentation
		6 months	1 year	5 years	
	Check setting of hydraulic damping		X	X	Reset if necessary. See chapter entitled "Setting hydraulic damping"
	Check hydraulic damping unit for escaping oil (visual check)		X	X	The damping device must be replaced if oil escapes. See chapter entitled "Replacing hydraulic damping device“
	Check function of proximity switches		X	X	See chapter entitled "Checking the function of the inductive proximity switches“
	Lubricating components		X	X	See chapter entitled "Lubricating components"
Drive and tongue detector rods	Check screw and nut connections		X	X	See Chapter "Checking the screw connections of the drive and detector rods"
	Check bellows for porosity and holes	X	X	X	See chapter entitled "Checking bellows"
	Checking the dimension between the gap and the tongue width		X	X	See chapter entitled "Checking the dimension between the gap and the tongue width"
	Check clearance between locking driver and inner housing wall in both end positions.		X	X	See chapter entitled "Setting drive rods“
	Check that bellows hose clips are tight		X	X	Tighten if necessary
Terminal box	Check connectors		X	X	See Chapter "Checking the terminal boxes“
	Check cover seal for damage and rigidification		X	X	Replace if necessary
	Check connections for corrosion		X	X	Replace if necessary
	Check connections are tight		X	X	Tighten if necessary
Connecting cable	Check PE connections, drive mechanism to earthcase connections and earthcase to rail connections		X	X	Resistance measuring R < 0.5 Ohm

Table 3: Maintenance overview HW61…

10.4.1 Check the drainage function of the earthcase

Proceed as follows:

1. Remove the earthcase cover with the help of two cover hooks.

Danger of squeezing fingers!

Earthcase covers are very heavy. Depending on type, a cover weighs 110 - 198 lb [50 - 90 kg].

Use cover hooks.

2. Check that the bellows are tight.

Caution

Danger of corrosion!

Openings in the bellows can lead to water accumulating in the point machine during cleaning work. This can cause corrosion and function failure!

Replace porous bellows before beginning cleaning work.

See Chapter "Check bellows" for more information.

3. Remove dirt from the drainage channels.
4. Clean the earthcase from the inside with a high-pressure cleaner.
5. Also clean the drain channels of the earthcase.

ⓘ The drainage outflow is either in the earthcase or outside in the drainage box.

Caution

Danger of damage to point machine!

All the water must be able to drain out of the earthcase.

Water remaining in the earthcase can cause damage to the point machine.

10.4.2 Replacing the sponge rubber seal of the housing cover

Caution

Humidity in the housing!

Humidity can enter the housing if the sponge rubber seal of the housing cover is damaged.

Humidity in the housing leads to corrosion of the components.

Damaged sponge rubber seals must be replaced.

Proceed as follows:

1. Check if the sponge rubber seal of the housing cover is damaged or porous.
2. Remove the defective sponge rubber seal.
3. Remove any adhesive residue in the lining groove of the housing cover with a scraper.
4. Clean the lining groove with Loctite quick cleaner.
5. Cut the new sponge rubber seal to the right size.
   You need four pieces for the housing cover:

   2 x 34,45 in (2 x 87.5 cm) and **2 x 19,88 in** (2 x 50.5 cm),
   ⇨ total length = 108,66 in (276 cm).
6. Adhere the four cut-out pieces with Pattex into the lining groove of the housing cover:

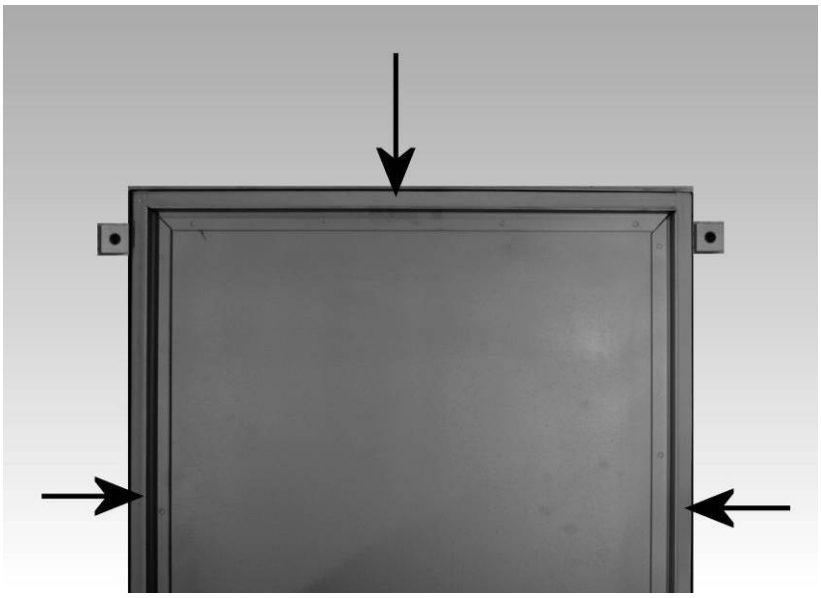


Fig. 79: Stick the sponge rubber seal into the housing cover

7. Also apply adhesive to the laminated joints so that they close tightly.
   There must not be any gap between the laminated joint connections through which humidity could get into the interior of the housing:

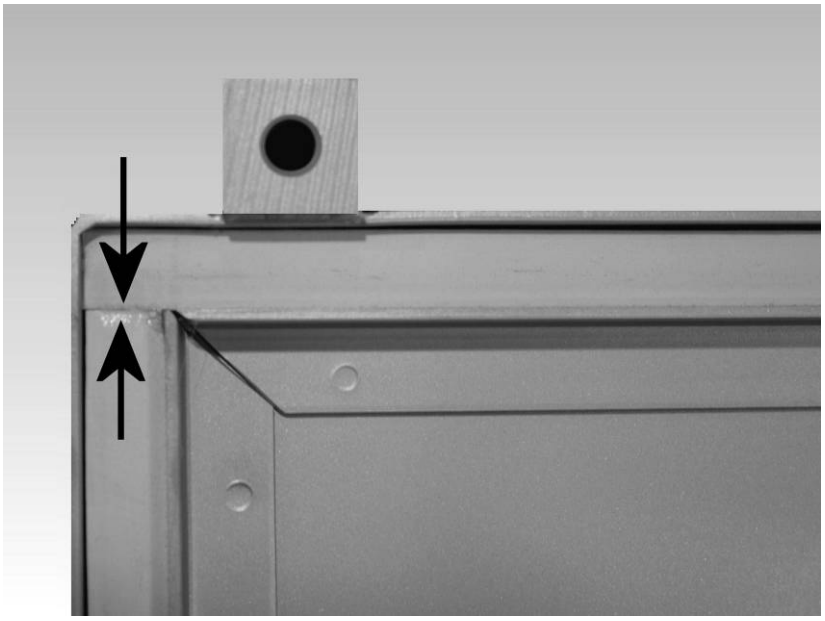


Fig. 80: The laminated joint connections of the sponge rubber seal must be adhered

10.4.3 Check the end position of the point tongues

Due to environmental influences (e.g. contamination, wear), the point tongues may no longer move properly into safe end position.

Proceed as follows:

1. Remove the contamination from the point tongues.
2. Open the cover of the point machine.
3. Proceed as described in the chapter "Setting linkage springs".

Caution

Burr may form on the point tongue and stock rail as a result of wear. Burr must be removed by qualified staff.

Bent point tongues must be straightened.

10.4.4 Replacing the double-acting magnet

ⓘ Maintenance work should not be carried out on the double-acting magnet when it is installed.

Proceed as follows:

1. Disconnect the operating voltage for the point machine in the point controller (switch, safety cut-out) and ensure that it cannot be switched on again by accident.
2. Loosen the attachment screw of the double-acting magnet:

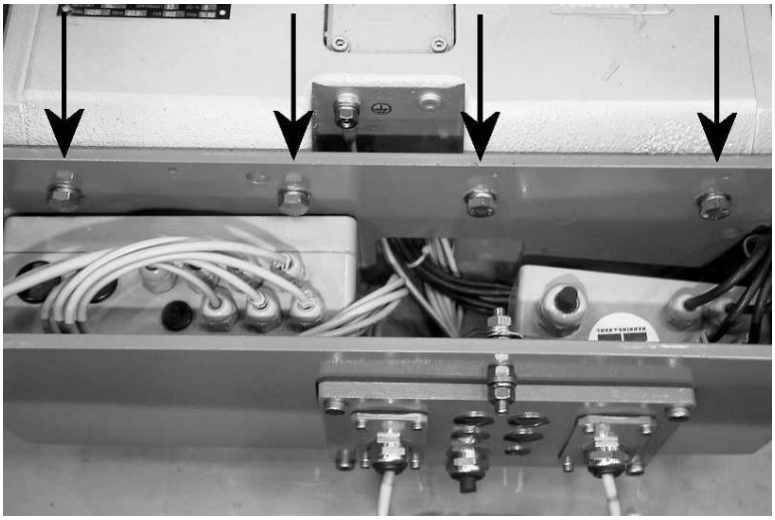


Fig. 81: Attachment screws

3. Screw the eye bolts into the M8 thread on the upper side of the double-acting magnet:

Fig. 82: Attach eye bolts to the double-acting magnet

4. Open the magnet terminal box and loosen the screw terminals for the electrical connection of the double-acting magnet.
5. Disconnect the PE ground wire connection on the housing of the double-acting magnet.
6. Connect the hoisting harness of a hoisting device to the eye bolts when the latter have been screwed in completely.

Double-acting magnets are very heavy!

Always use suitable hoisting equipment when lifting the double-acting magnet out of the housing and transporting it.

Do not use hoisting equipment which is not suitable for the weight of the double-acting magnet 242 lbs [110 kg].

Danger of injury for yourself and people in the vicinity.

Only use appropriate hoisting equipment!

7. Lift the double-acting magnet out of the housing.
   The lever on the double-acting magnet to the setting mechanism lifts from the bearing bolt of the connecting plate.
8. Screw the eye bolts into the double-acting magnet to be installed.
9. Lift the new double-acting magnet into the housing.
   Ensure that the bearing bolt of the connecting plate is led from the underside into the lever of the double-acting magnet.
10. Screw the attachment screws through the separating wall into the housing of the double-acting magnet and tighten them.
11. Connect the connecting cables to the corresponding terminals inside the magnet terminal box
12. Re-establish the electrical PE ground wire connection to the housing of the double-acting magnet.
    The new double-acting magnet is ready for operation.

10.4.5 Replacing the hydraulic damping device

Replacing the hydraulic damping device entails the following steps:

- Disconnecting the lever of the double-acting magnet
- Removing the drive rods
- Reducing the tension of the springs
- Disassembling the locking components
- Replacing the hydraulic damping device

The individual steps are described in the sub-chapters below.

10.4.5.1 Disconnecting the lever of the double-acting magnet

Proceed as follows:

1. Loosen the three hexagon socket screws:

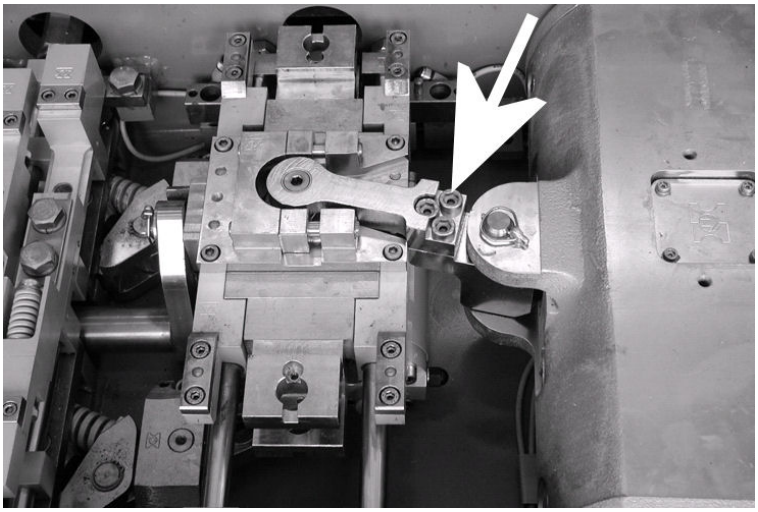


Fig. 83: Disconnect the lever of the double-acting magnet

2. Remove the lever of the double-acting magnet.

10.4.5.2 Removing the drive rods

Proceed as follows:

1. Loosen the hose clips of the bellows.
2. Loosen the hexagon socket screw which secures the brass bush:

Fig. 84: Loosen the hexagon socket screw

3. Push back the brass ring.
4. Remove the bolt:

Fig. 85: Remove the bolt

5. Swivel the rods to the side.

Proceed as follows to disconnect the drive rods from the setting mechanism:

1. Screw out the hexagon socket screw (1) which secures the bolt (2) of the locking driver (3):

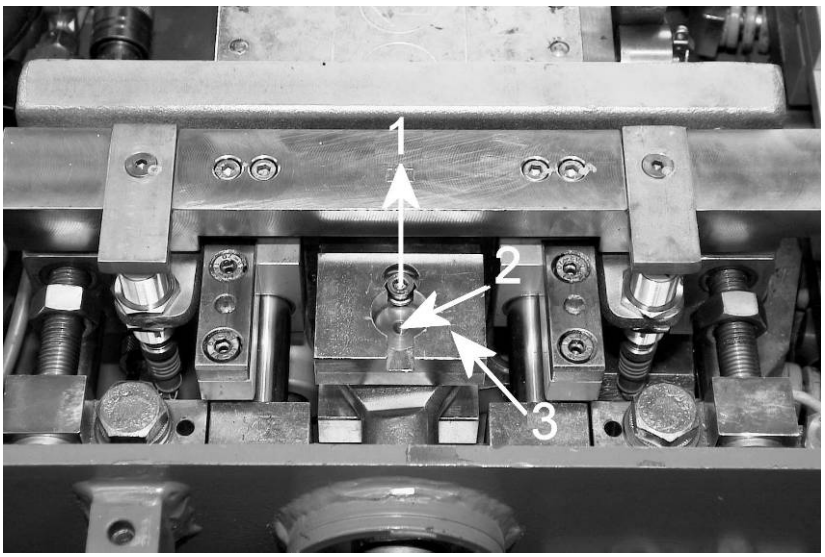


Fig. 86: Disconnect the drive rods from the setting mechanism

2. Turn the hexagon socket screw (1) into the bolt (2).
3. Pull out the bolt.

4. Pull the drive rods out of the locking driver (3) of the setting mechanism.
5. Set the point machine with the setting lever.

⇨ Repeat steps 1. to 5. to remove the second drive rod.

10.4.5.3 Reducing the tension of the springs

Proceed as follows:

1. Loosen the locknuts on the adjusting spindles of both springs.
2. Turn the two setting spindles anticlockwise until the pressure springs are completely tension free:

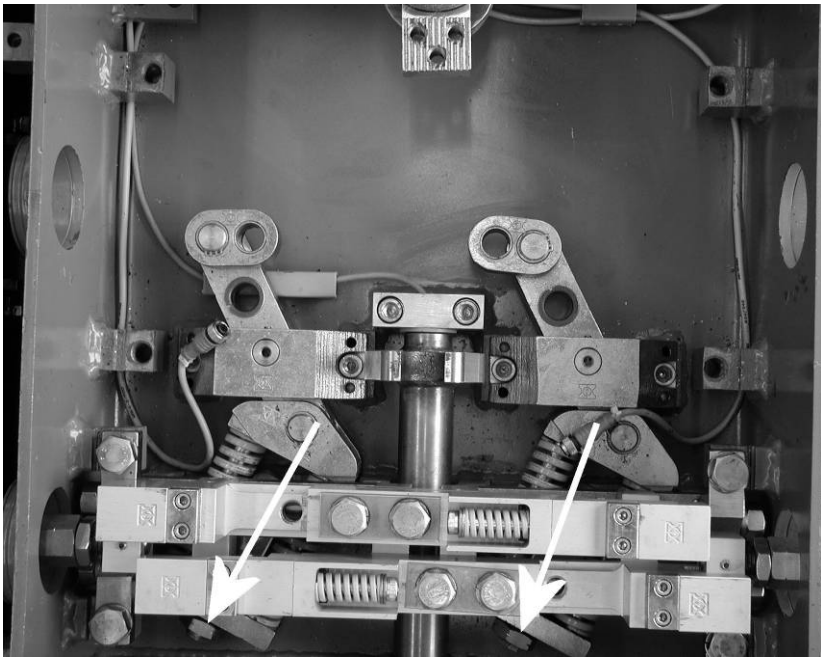


Fig. 87: Reducing the tension of the springs

10.4.5.4 Disassembling the locking components

Proceed as follows:

1. Loosen the screws (1):

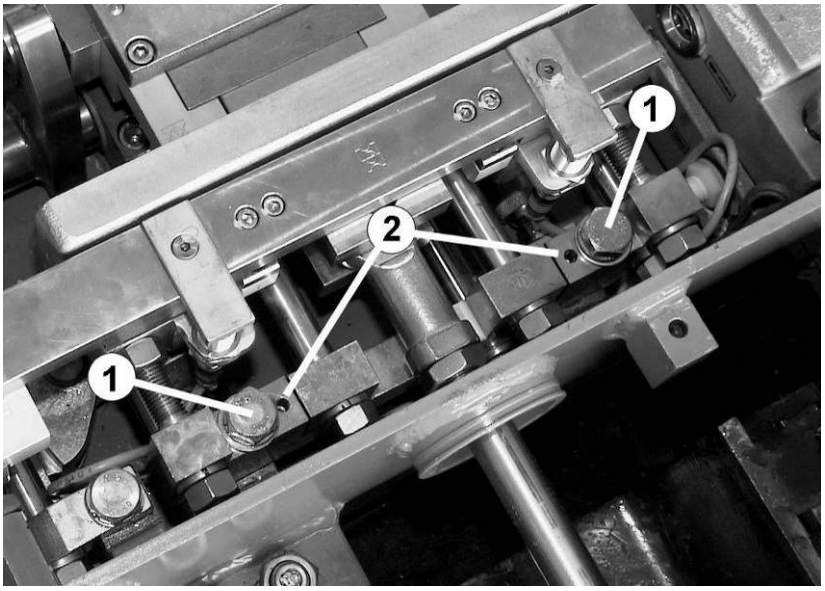


Fig. 88: Disassemble the locking component

2. Screw an M6x60 screw into the two designated thread bores (2).
   The locking component now lifts from the holding device.
3. Remove the locking component.
4. Disconnect the plug-in connections of the proximity switches.
   The locking component is disassembled.
5. Set the point machine with the setting lever.

⇨ Repeat steps 1. to 4. to remove the second locking device.

10.4.5.5 Replacing the hydraulic damping device

Proceed as follows:

1. Take the setting mechanism out of the housing.
2. Remove any oil which may have dropped on the floor of the housing.
3. Disassemble the hydraulic damping device by loosening the screw connections to the setting mechanism:

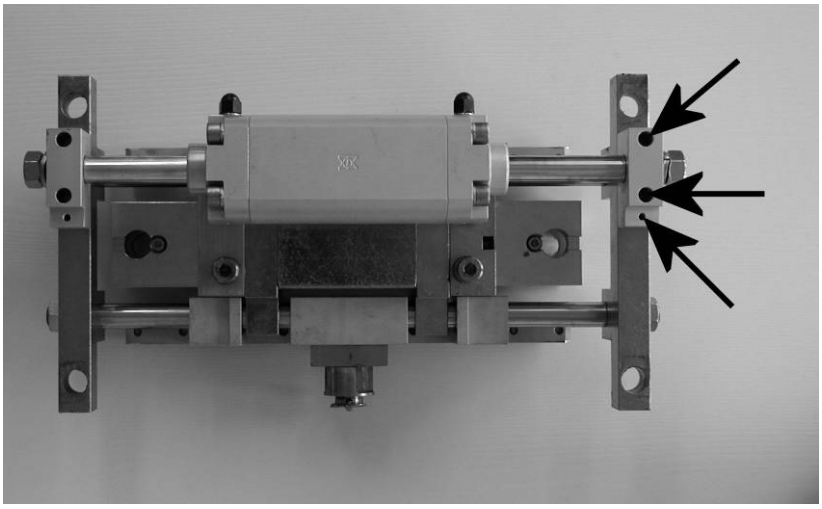


Fig. 89: Disconnect the hydraulic damping device from the setting mechanism

4. Attach the new damping device to the setting mechanism.
5. Tighten the locknuts on the side of the setting mechanism:

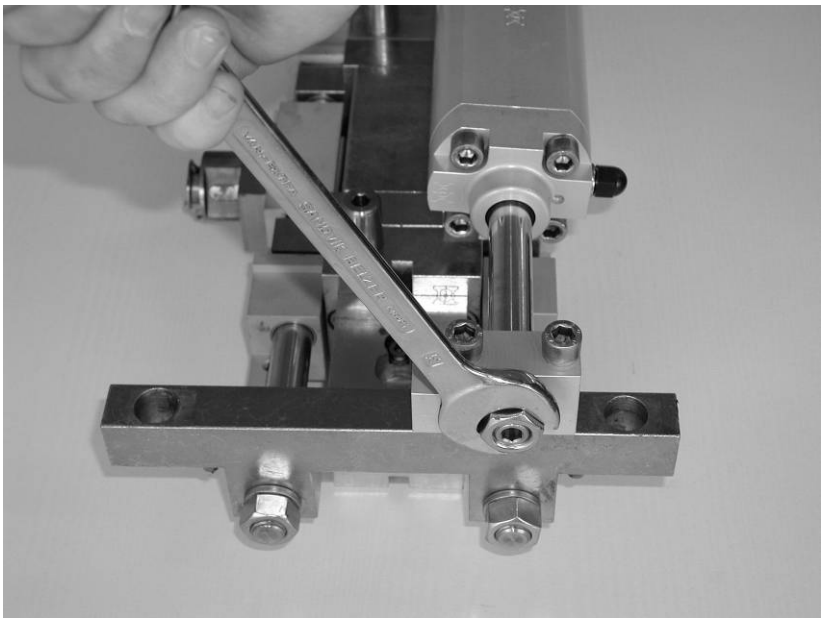


Fig. 90: Tighten the locknuts on the side of the setting mechanism

6. Position the springs and the drive lever for insertion of the setting mechanism:

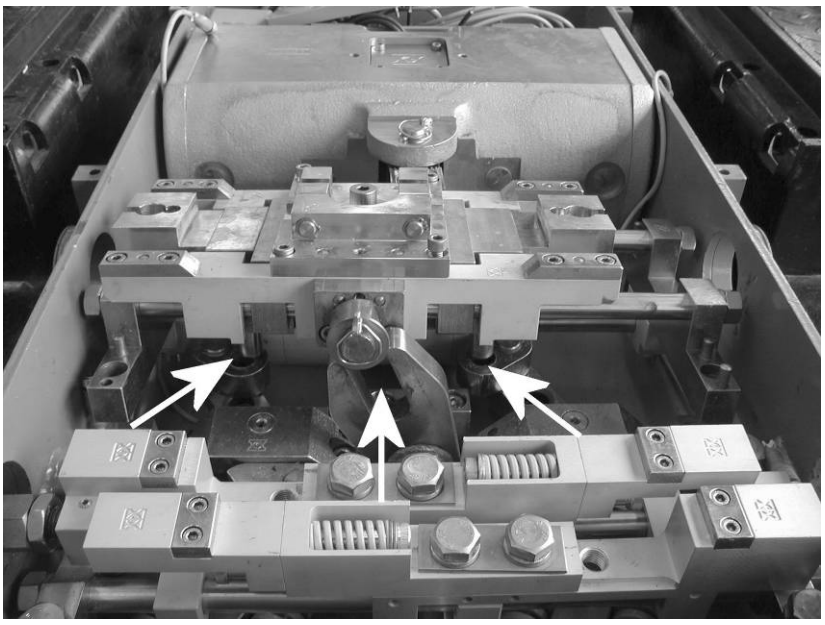


Fig. 91: Insert the setting mechanism

7. Place the setting mechanism in the housing.

Danger of fingers being squashed!

There is a danger of fingers being

squashed when inserting the setting mechanism in the housing.

8. Mount the lock components.
   Proceed in reverse chronological order to that described in the chapter "Disassemble lock components".
9. Mount the drive rods.
   Proceed in reverse chronological order to that described in the chapter "Remove Removing the drive rods".
10. Set the springs again.
    Proceed as described in the chapter "Rod linkage springs".
11. Check the setting of the newly installed hydraulic damping device.
    Proceed as described in the chapter "Hydraulic damping device".
12. Check that the point machine sets correctly.

10.4.6 Check the function of the inductive proximity switch

Proceed as follows:

1. Bring the point machine into one of the end positions with the setting lever.
2. Check whether the LEDs on the two inductive proximity switches light up when lock guide (yellow) has engaged:

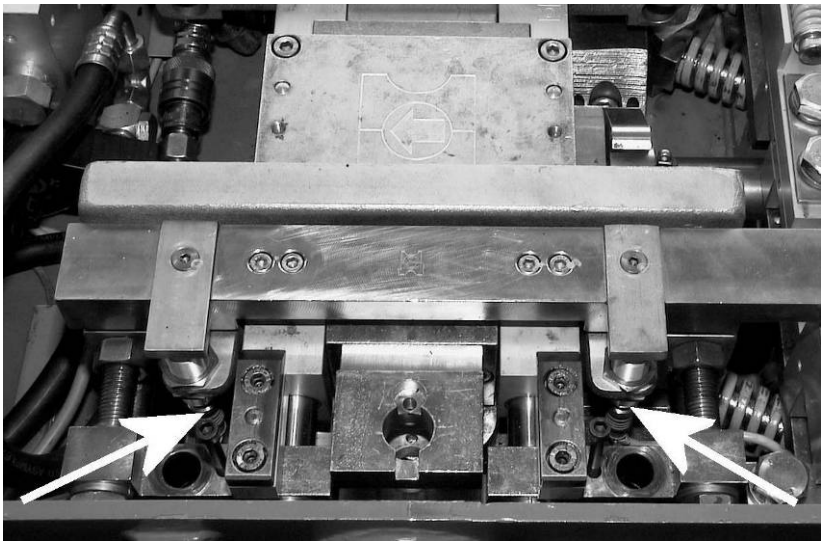


Fig. 92: LEDs of the inductive proximity switches

If one of the LEDs does not light up, the inductive proximity switch must be replaced.

3. Switch off the power supply for the point machine in the point controller.
4. Loosen and remove the screws (1):

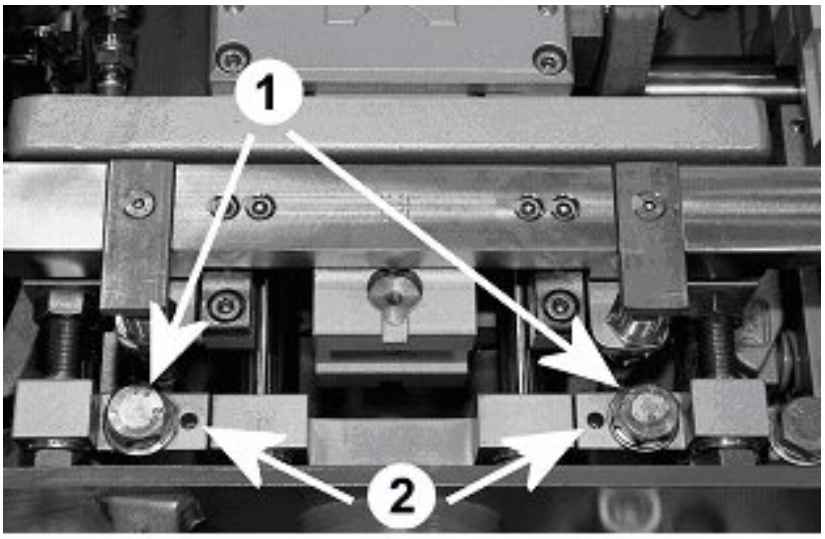


Fig. 93: Remove the locking component

5. Screw one M6 x 60 screw respectively into the two threaded bores (2).
   The locking component now lifts off from the setting mechanism.
6. Raise the locking device and fold it back.
   The inductive proximity switches can now be accessed.
7. Loosen the union nut of the cable connector:

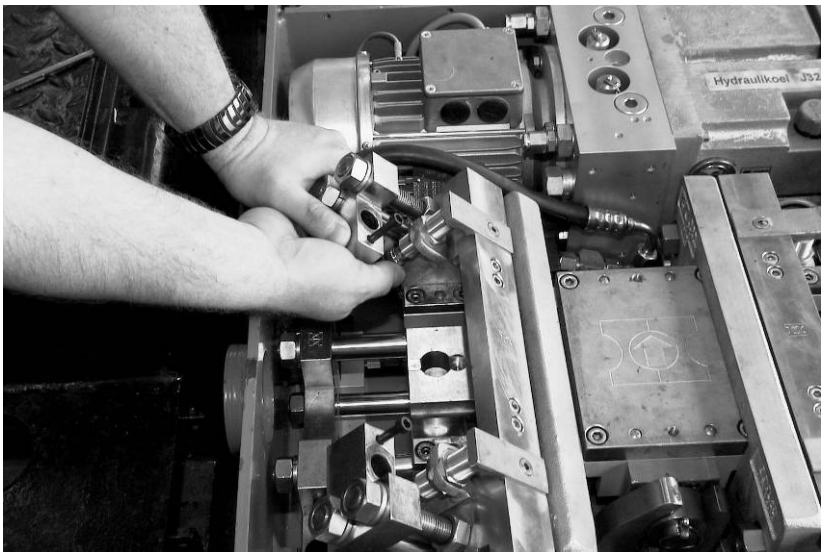


Fig. 94: Loosen the union nut of the cable connector

8. Disconnect the connector.

9. Loosen the locknut (1) of the defective inductive proximity switch:

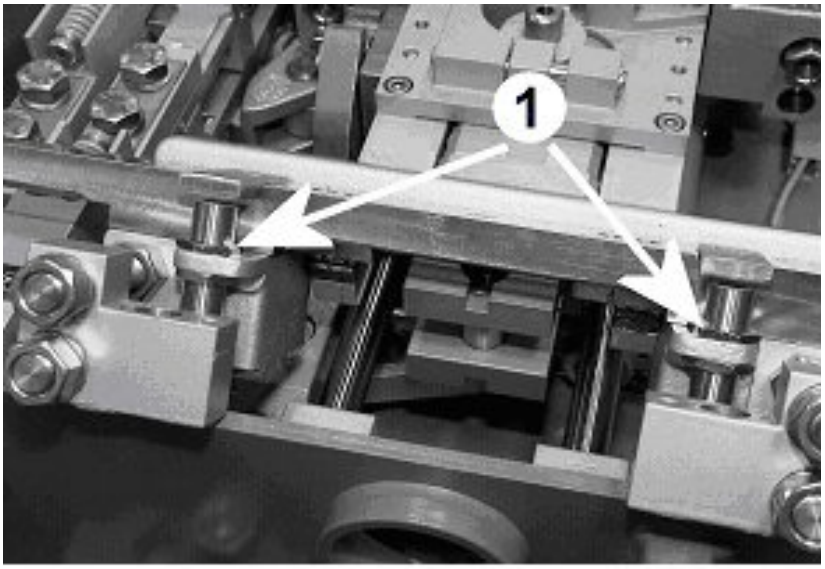


Fig. 95: Loosen the locknut of the defective inductive proximity switch

10. Replace the inductive proximity switch.
11. Tighten the locknuts of the inductive proximity switch.
12. Connect the connector.
13. Tighten the union nut of the cable connector.
14. Set the clearance between the inductive proximity switch and the lock washer at 1.12 in [3 mm] (measuring plate):

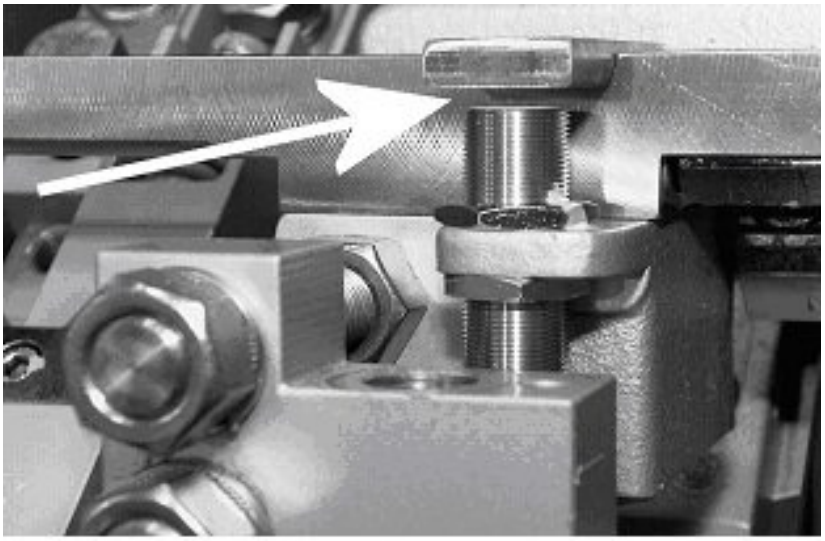


Fig. 96: Set the clearance between the inductive proximity switch and the lock washer

15. Switch on the power supply in the point controller.
16. Place the 0.08 in [2 mm] measuring plate between the lock guide and the locking support:

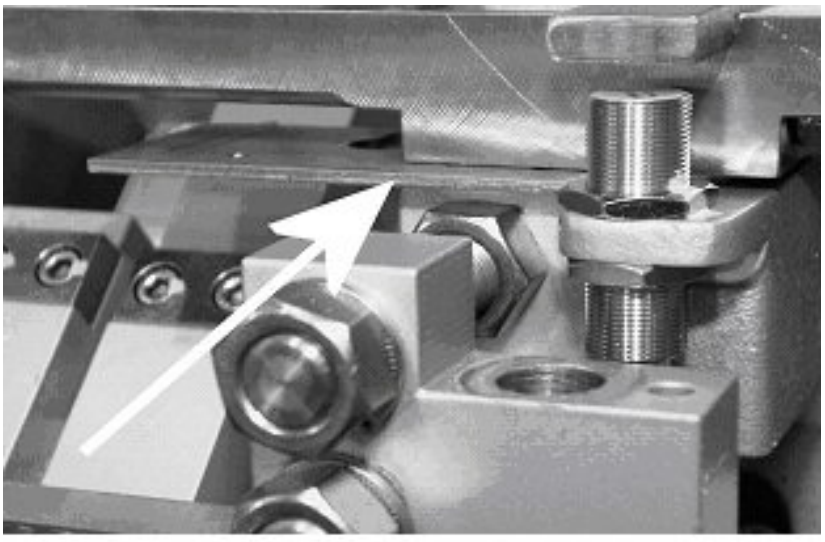


Fig. 97: Set the switching distance with the measuring plate

17. Bring the point machine into end position.
    The LED of the inductive proximity switch must light up when the lock guide is engaged (locked).
18. Replace the 0.08 in [2 mm] measuring plate with the 0.12 in [3 mm] measuring plate.

The LED of the inductive proximity switch must not light up when the lock guide has engaged (locked).

⇨ If points 17. and 18. do not materialise, check the clearance between the proximity switch and the lock washer. Proceed as described from point 14. to 18.

19. Fold back the locking device again.

20. Screw the M6 x M60 screws out of the threaded bores (2):

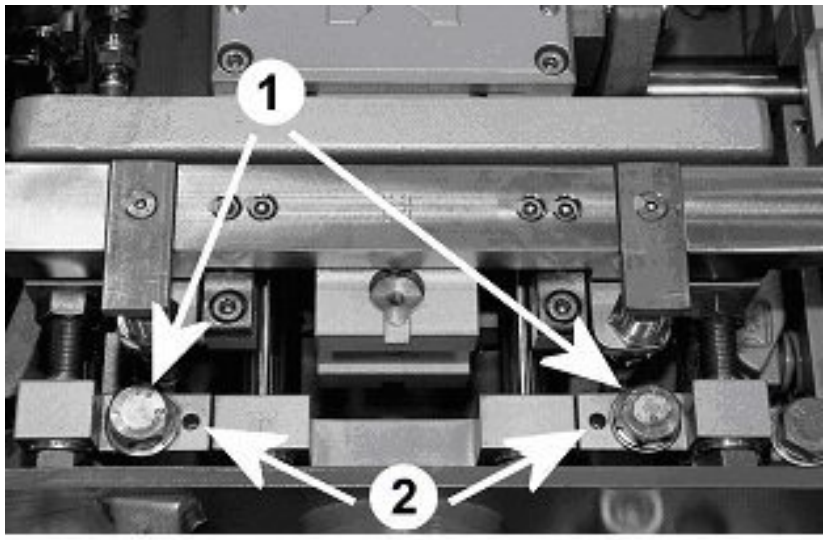


Fig. 98: Install the locking component

21. Tighten the locking component with the screws again (1). Consult the specifications in the chapter " Tightening torque".

22. Set the locking component as described in the chapter "Setting the locking device".

10.4.7 Lubricate components

The delocking guides and the drive shaft must be lubricated with AUTOL TOP 2000 (See Chapter "Accessories").

Proceed as follows:

1. Lubricate the components marked in the two figures below:

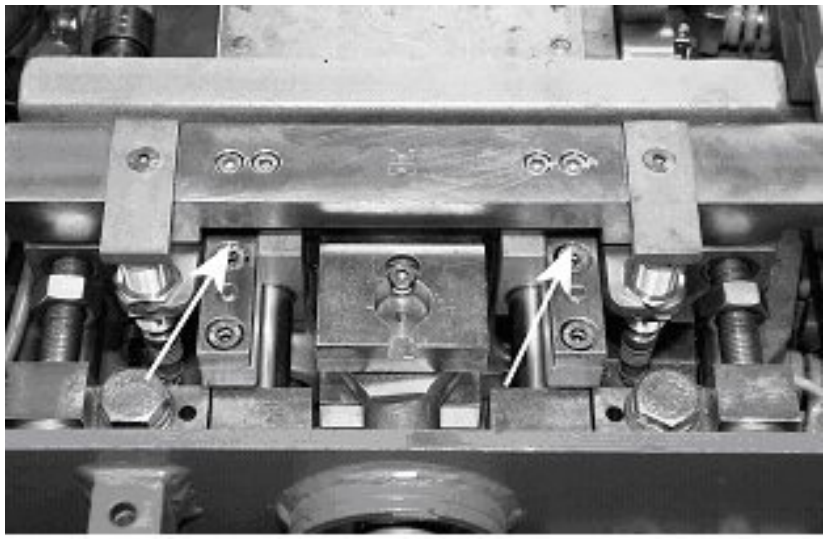


Fig. 99: Lubricate the delocking guides

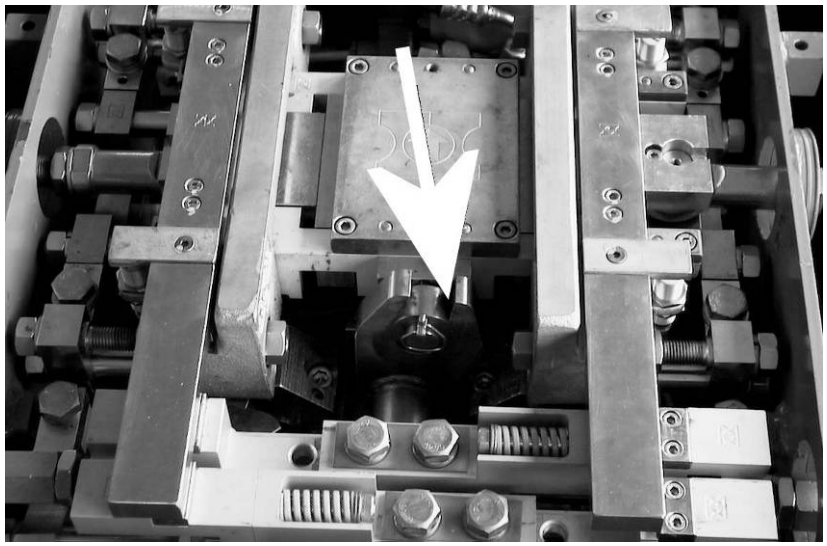


Fig. 100: Lubricate the setting lever of the drive shaft

10.4.8 Rod screw connections

Check the screw connections of the drive and detector rods.

Proceed as follows:

1. Loosen the hose clips of the bellows on the drive and detector rods.
2. Check that the following nuts and screw connections of the drive rods are tight:

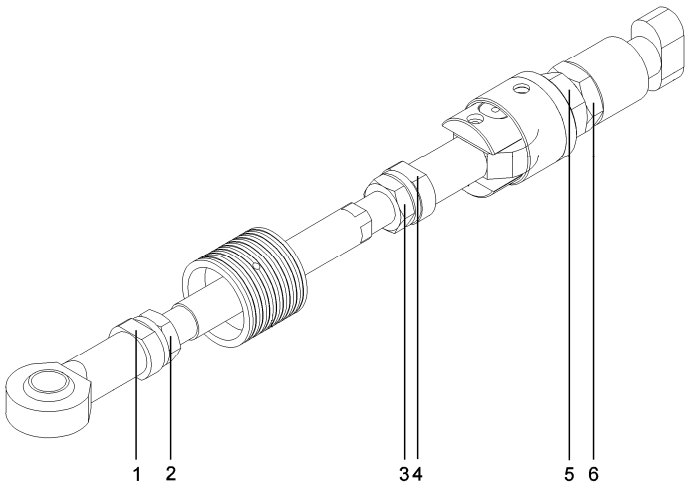


Fig. 101: Tighten nuts on drive rods

Nut (6) and connection bracket (5) must be screwed tight together.

Caution **If nuts and connection bracket are not screwed together properly and secured, the hammerhead screw can tear out.**

3. After screwing the connection bracket (5) tight, check the setting and flexibility of the drive rods (See Chapter " Setting drive rods").
4. Check that the following nuts and screw connections on the detector rods are tight:

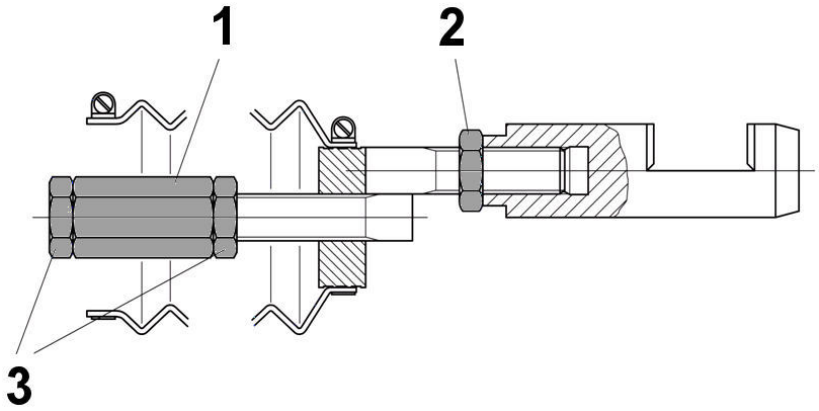


Fig 102: Tighten nuts on detector rods

10.4.9 Check the bellows

The bellows must be checked regularly for cracks and holes. HANNING & KAHL recommends the bellows be replaced every two years.

Proceed as follows:

1. Check the bellows for porosity and holes.
   The bellows must be replaced if porosity is established.

   To replace the bellows on the drive rods, read the chapter entitled “Replacing the bellows on the drive rods“.

   To replace the bellows on the tongue detector rods, read the chapter entitled “Replacing the bellows on the tongue detector rods“.

10.4.9.1 Replacing the bellows on the drive rods

Ensure the following:

✓ The operating voltage for the point machine is disconnected in the point controller (switch, safety cut-out).

✓ The point controller (switch, safety cut-out) cannot be switched on again by accident.

Proceed as follows:

1. Loosen the hose clips of the bellows (See Chapter "Drive rods").
2. Remove the hexagon socket screw:

Fig. 103: Loosen the hexagon socket screw on the drive rods

3. Push back the locking bush.
4. Remove the bolt from the connection bracket with the bolt drawer:

Fig.104: Remove bolt

5. Swivel the rod to the side:

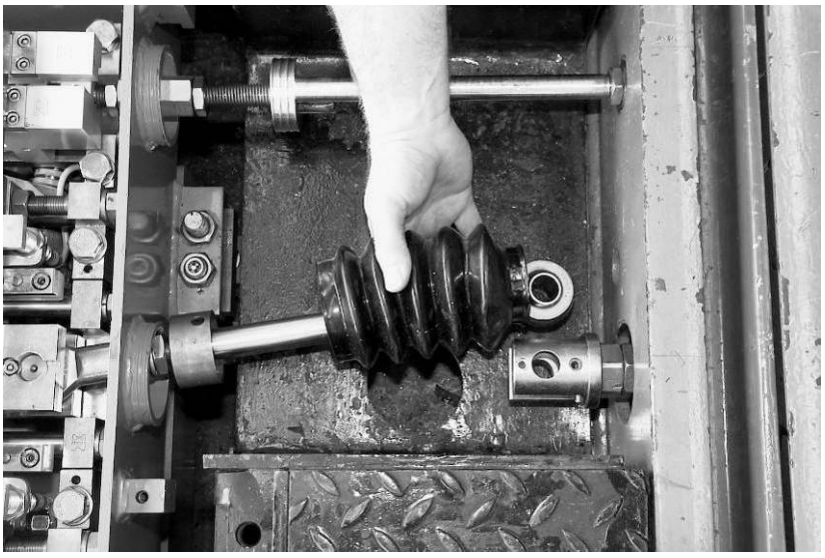


Fig. 105: Swivel the drive rods to the side

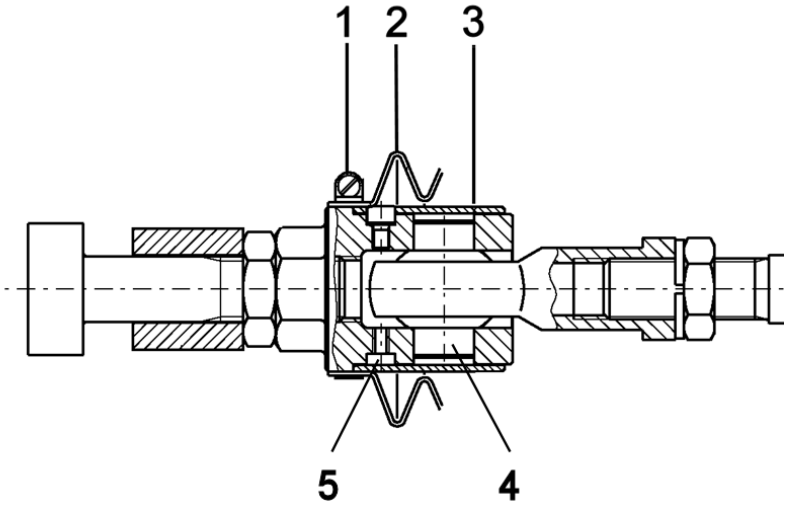
6. Replace the defective bellows.
7. Ensure that the large opening of the bellows points in the direction of the housing.
8. Lubricate the bolt (3) and the connection bracket (2) with AUTOL TOP 2000.
9. Insert swivel head back into the connection bracket.

Danger of shearing fingers!

Do not insert fingers into the connection of swivel head and connection bracket.

Danger of injury to fingers if they slip off the rod.

10. Push the bolt through the connection bracket.
11. Push the brass bush over connection bracket.
12. Secure the brass bush with the hexagon socket screw.
13. Secure the bellows (2) with the hose clips (1) on the housing and on the other side of the rods. Bellows (2) and brass bush (3) must be flush so that the hexagon socket screw (5) and the bolt (4) are covered:



1 Hose clip
2 Bellows
3 Brass bush
4 Bolt
5 Hexagon socket screw

Fig. 106: Secure the bellows over the brass bush

Caution

Precipitation water can damage equipment!

The bellows must be properly mounted. If the bellows are not properly mounted, precipitation water can penetrate the housing of the point machine. Damage and function failure of the point machine can result.

The precise attachment position of the bellows is specified in the rod drawings.

10.4.9.2 Replacing the bellows on the drive rods

Ensure the following:

- ✓ Disconnect the operating voltage for the point machine in the point controller (switch, safety cut-out).
- ✓ The point controller (switch, safety cutout) cannot be switched on again by accident.

Proceed as follows:

1. Loosen the locknuts on both sides of the adjusting nut.
2. Loosen the adjusting nut of the detector rod:

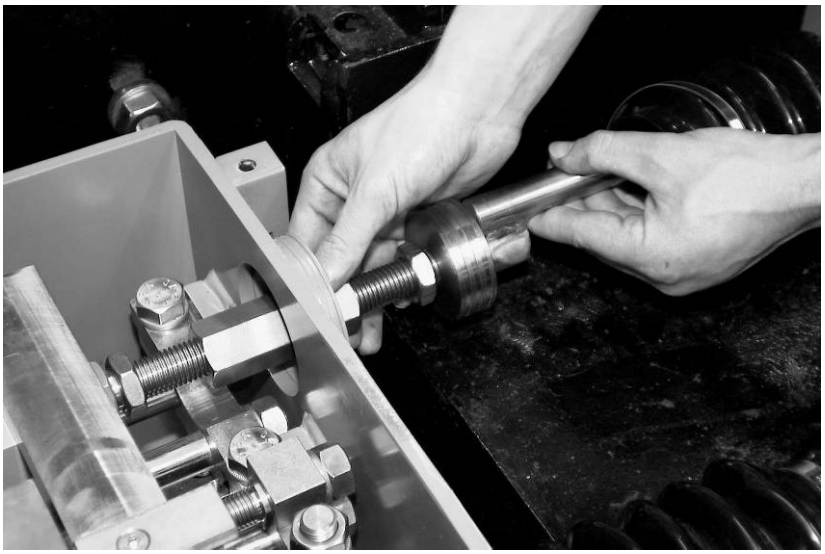


Fig. 107: Loosen the adjusting nut of the detector rod

3. Loosen the four hexagon socket screws which connect the guide brackets to the locking support:

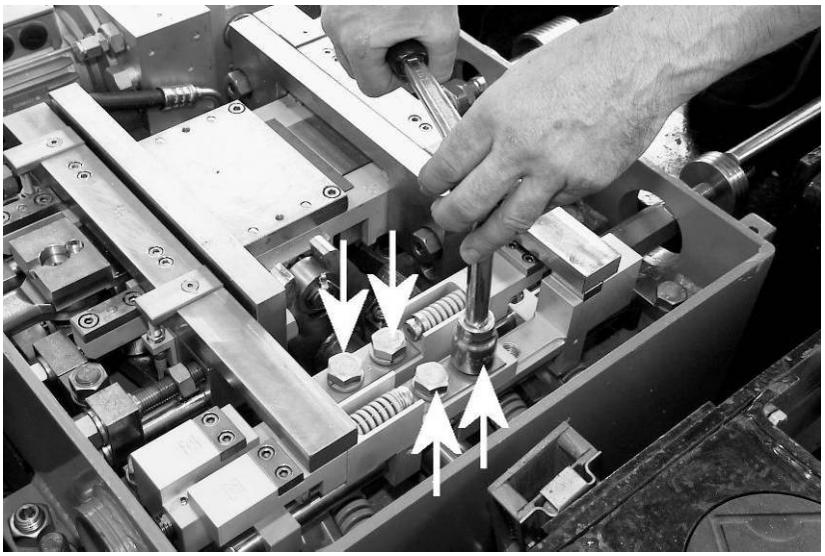


Fig. 108: Loosen the hexagon socket screws of the guide brackets

4. Remove the guide brackets:

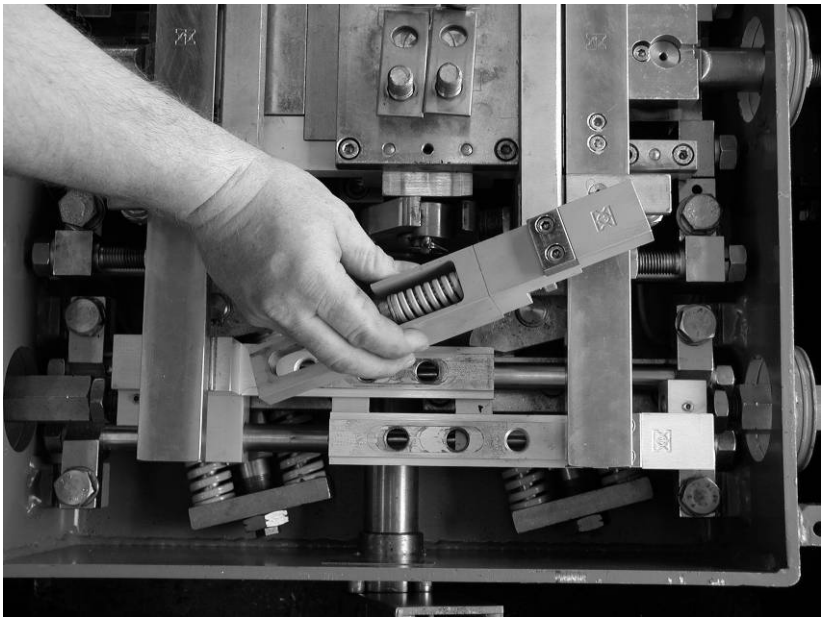


Fig. 109: Remove the guide bracket

5. Screw the adjusting nut so far until the rod is free.
6. Replace the bellows:

Fig. 110: Replace the bellows on the drive rods

7. Tighten the adjusting nut again.
8. Re-insert the guide brackets.
9. Tighten the hexagon socket screws again. Observe the torque specifications in the chapter entitled "Tightening torque".
10. Secure the adjusting nut with the two locknuts.
11. Secure the bellows to the housing and the detector rods with the hose clips.

    Consult the detector rod drawing for the exact position.

12. Set the drive-lock device. Consult chapter entitled "Setting drive-lock device".

10.4.10 Check clearance between gap and tongue width

Proceed as follows:

1. Measure the clearance between the gap of the detector rods and the point tongue with a feeler gauge:

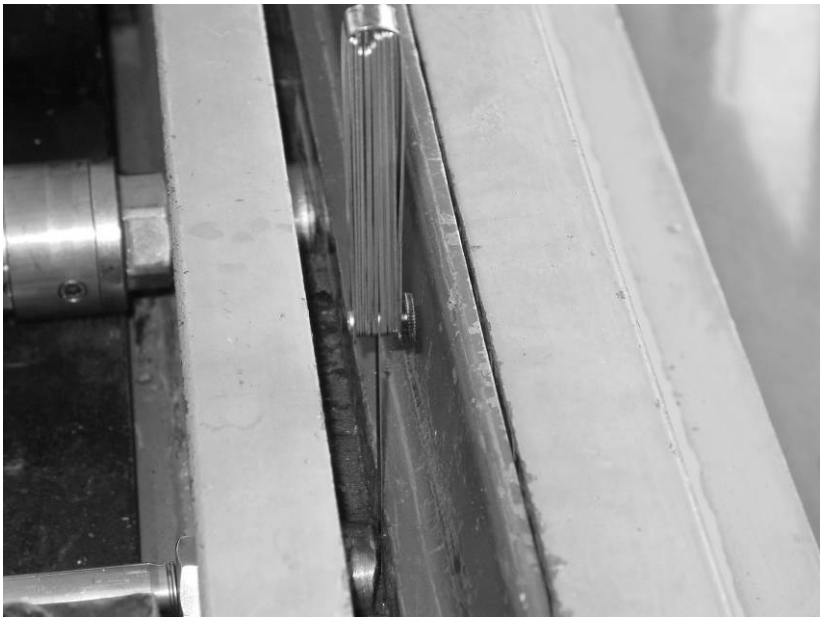


Fig. 111: Measure gap between tongue detector block and point tongue

Caution

Danger of derailment!

The clearance between the gap of the detector rod and the point tongue must not be greater than 0.02 in [0,5 mm]!

If the clearance is greater than 0.02 in [0,5 mm], the tongue detector can detect a safe end position of the tongue although between the point tongue and stock rail in the area of the tip of the tongue objects prevent the closing of the tongue.

If the gap is greater than 0.02 in [0,5 mm], the tongue attachment must be removed and reworked!

10.4.10.1 Reworking the tongue attachment

Proceed as follows:

1. Loosen the hexagon socket screws of the sliding carriage.
2. Temporarily push the sliding carriage to the outside as far as the stop.
3. Tighten the hexagon socket screws of the sliding carriage again.
4. Loosen the locknuts of the adjusting nut.
5. Turn the adjusting nut until the detector rod can be turned out of the setting mechanism:

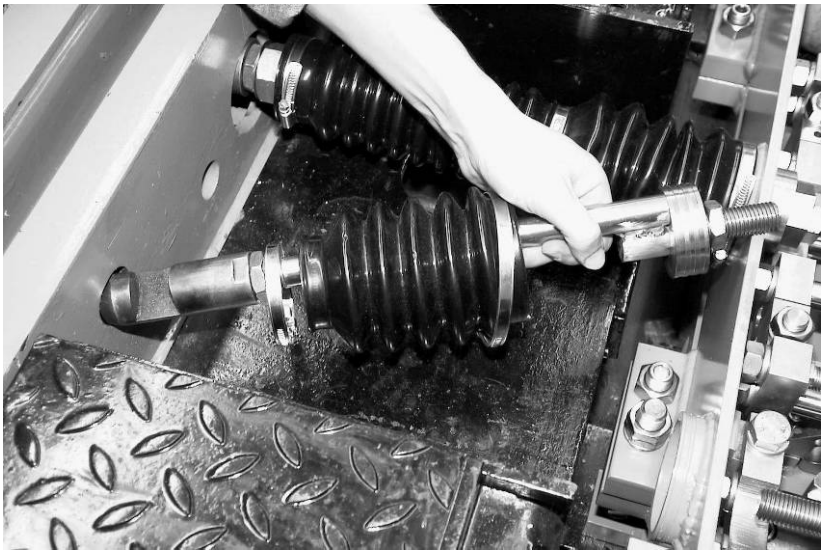


Fig. 112: Remove the detector rods

6. Lift the point tongue with a lever.
7. Take the detector rods out of the bore.
8. Unscrew the tongue attachment from the detector rods.
9. Weld material onto the tongue detector block.

Caution

Only use welding electrodes type Oerlikon Citodur D4V1000 for welding work.

Ensure that the inner sides of the gap must be ground in an angle of 5 - 10° and have a radius of r= 2.56 in [r= 65 mm].

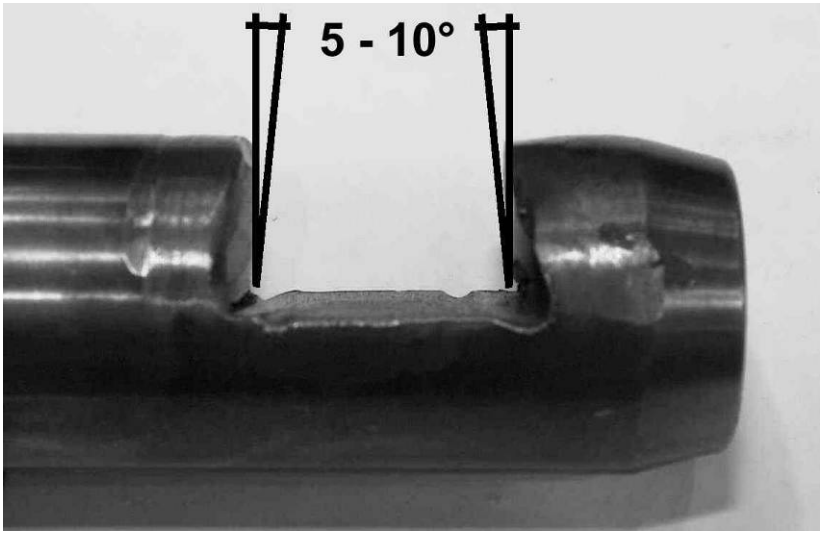


Fig. 113: Tongue detector block (Side view)

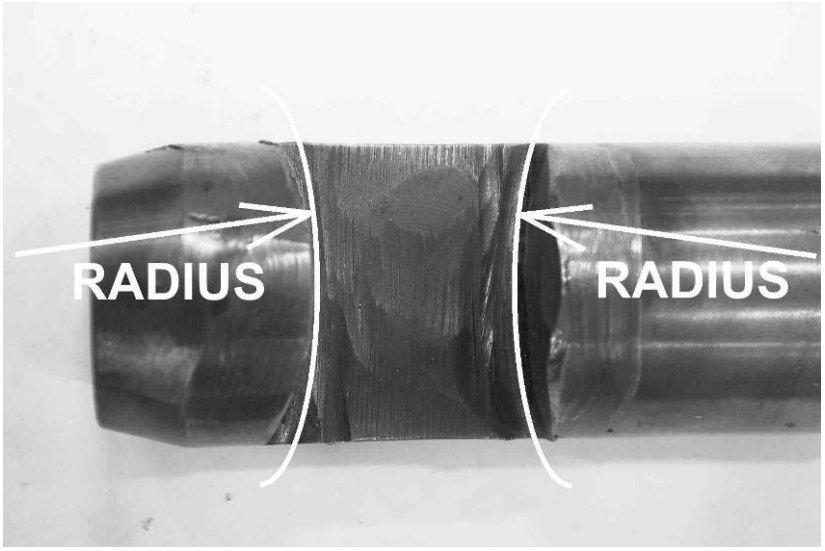


Fig. 114: Tongue detector block (Top view)

10. Put the tongue detector block back into the rail.
11. Check the gap dimension.
    It must not be greater than 0.02 in [0.5 mm]. Correct again if necessary.
12. Screw the adapted tongue detector block completely back onto the detector rods.
13. Mount the detector rods as described in the chapters from “Connecting tongue detector rods to point tongue“ to Chapter ”Setting the lock on the open point tongue“.

10.4.11 Check junction box

Check the following:

- there is no humidity in the junction box
- there is no humidity in the connector/bush insert
- the stirrup is locked properly
- check cover seal for rigidification, damage and porosity (change if necessary)
- ensure that screwed cable gland is tight
- ensure that terminal screws are tight

10.4.12 Check desiccant bag

Caution

Risk of corrosion in the housing!

Humidity in the housing of the point machine can lead to component corrosion.

Check the condition of the desiccant bag when commissioning, maintaining and servicing the equipment.

The humidity indicator must be blue.

If the humidity indicator is pink, the desiccant bag must be replaced.

Caution

Desicccant bags are sensitive to humidity!

Before use, the humidity indicator on the desiccant bag must be blue.

The plastic bag which contains the desiccant bags must not be opened until immediately before use.

Close the plastic bag tightly immediately if you only remove some of the desiccant bags.

Allergic reactions on the skin!

Working with desiccant bags can cause allergic reactions.

Wear protective gloves.

Wash skin with soap and water if in contact with desiccant bags.

Ensure the following:

✓ You have spare desiccant bags.

✓ You are wearing protective gloves.

✓ Before use, the humidity indicator on the desiccant bag must be blue:

Fig. 115: Humidity indicator on the desiccant bag before use

Proceed as follows:

1. Check the humidity indicator of the desiccant bag.
2. Replace the desiccant bag if the humidity indicator is pink.
3. Dispose of the desiccant bag in environmentally-friendly manner.

   The cover of the bag can be disposed off together with plastic waste. The content of the bag is active clay. This can be disposed off along with domestic waste.

Pay attention to the laws prevailing in your country with regard to disposal.

10.5 Closing the point machine

The following themes are described:

- Closing the housing
- Closing the earthcase

10.5.1 Closing the housing

Proceed as follows:

1. Close the housing with the housing cover.
2. Tighten the six screws. Observe the specifications in the chapter entitled "Tightening torque":

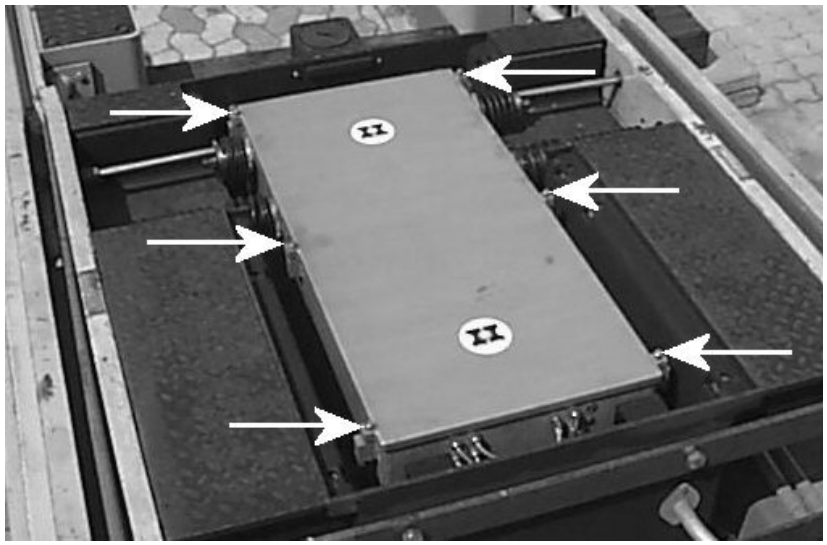


Fig. 116: Closing the housing

When the work is completed, a tightness test should be performed with a tightness tester.

See Chapter entitled "Accessories" for further information.

Refer to the operating instructions for the testing device for information on execution of the tightness test.

10.5.2 Closing the earthcase

Proceed as follows:

1. Close the earthcase with the two earthcase covers.

Danger of squeezing limbs!

Use the cover hooks to place the covers on the earthcase.

2. Tighten the eight screws.

   Observe the torque specifications in the chapter entitled "Tightening torque".

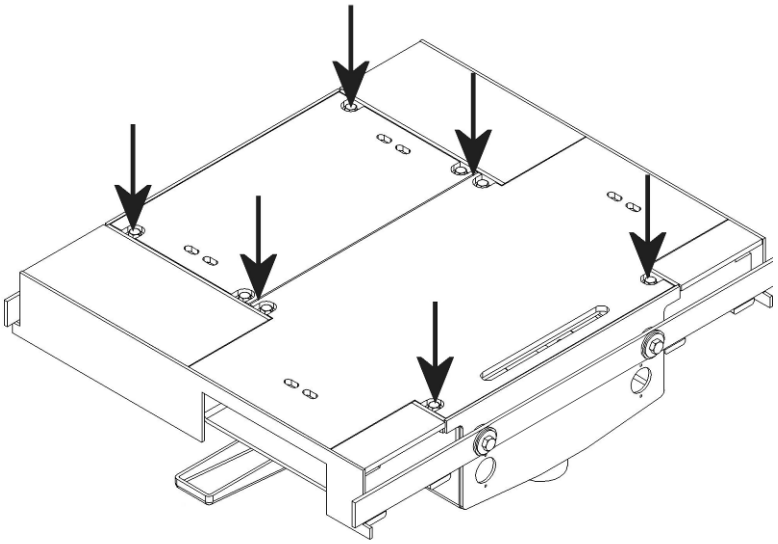


Fig. 117: Closing the earthcase

11 Decommissioning and disposal

The point machine must be decommissioned and disposed of by authorized skilled staff.

The point machine should be disposed of by specialist companies, observing national legislation and local regulations.

12 Appendix

- Operating materials
- Tightening torque
- Your opinion
- Notes

12.1 Operating materials

The following themes are described:

- Tool list
- Lubricants
- Accessories

12.1.1 Tool list

Tool	Quantity	Unit
Set of socket spanners	1	
Fitter's hammer	1	500 g
Nylon hammer	1	
Small crowbar	1	400 mm
Flat chisel	1	Size 200
Open-jawed wrench	1 of each	36, 41, 46 mm 1 ½'
Combination spanner	1	30/32 mm
Combination spanner	1	32 mm
Combination spanner	1	30 mm
Combination spanner	1	27 mm
Combination spanner	1	24 mm
Combination spanner	1	22 mm
Combination spanner	1	19 mm
Combination spanner	2	17 mm
Combination spanner	2	13 mm
Combination spanner	1	10 mm
Tubular hexagon box spanner	1	17/19 mm
Screwdriver	1	7 mm
Screwdriver	1	3.5 mm
Cross-hole screwdriver	1	
Hex head wrench with handle	1	
Hex head wrench 90° offset	1	
Torque wrench		
Measuring sheet	2	ⓘ varies from transport authority to transport authority; HANNING & KAHL recommends 2 mm and 4 mm
Screws (not of high-quality steel!)	2	M6x60
Eye bolts	4	M16 x 120
Cover hooks	2	380 mm length
Angled Allen wrench	1	incl. 4 mm hexagon socket bit

Table 4: Tool list

The HW tool kit contains a large range of tools including special tools which are necessary for installation, setting and maintenance of the point machines. Product information 37100321 contains more details of the HW tool kit.

12.1.2 Lubricants

The following lubricants are necessary for maintenance and repair work on the point machines:

Lubricants	Application	Container	EDP number
AUTOL TOP 2000	Lubricating screws	Kiloware	104505
COPASLIP Anti-corrosion paste	Lubricating cover screws	Kiloware	104514
LOCTITE quick cleaner	Preparing adhesive surfaces	Spray can	102180
Pattex	Adhesing of sponge rubber seal into the housing cover	125 g can	104703
Desiccant bag	Adsorption of condensation in the housing  Consult product information 37150301 for more details on desiccant bags.	5 pcs per bag	99119
Sponge rubber seal	Sealing the housing	Meterware	61122

Table 5: Lubricants

The lubricants can be ordered from HANNING & KAHL by phone, quoting the EDP number: **+49 5202 707-642**

12.1.3 Accessories

HANNING & KAHL offers the accessories listed in the table below for assembly, maintenance and repair work on point machines:

Accessories	Application	EDP number
HW tool kit	Contains the tools necessary for maintenance and repair work.  Product information no. 37100321 contains more information on the HW tool kit.	390000099
Lifting accessories for point machines	Transporting the point machine.  Consult product information 37140321 for more details on the lifting accessories.	610000135
Tongue-force measuring device	Measuring the forces which occur in the point machine.  Consult product information 37060321 for more details on the tongue-force measuring device.	399000138
Angled Allen wrench with 4 mm hexagon socket bit	Setting the hydraulic damping device.	The HANNING & KAHL tool kit contains: Angled Allen wrench: 152092 4 mm hexagon socket bit 152093
Cover hooks	1000 mm long to remove earthcase cover of switch machines in earthcase.	36067060
	380 mm long to remove earthcase cover of switch machines in earthcase. Short enough to fit into tool kit or tool box.	36067060
	 Consult product information 37110321 for more details on cover hooks.	
Wedging set	Secure against accidental electrical or manual setting of the switch machine  Consult product information 37130321 for more details on the wedging set.	610000104
Tightness tester	Check if the housing of the point machine is tight.  Refer to product information 37160321 for more details on the tightness tester.	610000171

Table 6: Accessories

Accessories can be ordered from HANNING & KAHL by phone, quoting the EDP number: **+49 5202 707 642**

12.2 Tightening torque

Proceed as follows:

1. Read the screw property class on the head of the screw which you wish to tighten.
2. Consult the table below for the corresponding torque.

   ⓘ The tightening torques refer to a coefficient of friction μ_{tot} = 0.125. Lubrication state – greased.

   HANNING & KAHL mainly uses 8.8 and A2:

Set screws with metric coarse-pitch thread in accordance with DIN 13, page 33:					
Dimension	**M_A (Nm)**				
	6.9*	8.8*	10.9*	12.9*	A2* (stainless steal)
M4	2.5	3	4	5	2
M5	5	6	8	10	4
M6	9	10	14	17	7
M8	20	24	34	40	18
M10	40	48	67	80	33
M12	70	83	117	140	57
M14	110	132	185	220	90
M16	170	200	285	340	114
M18	235	275	390	470	190
M20	330	390	550	660	280
M22	445	530	745	890	360
M24	570	675	950	1140	460
M27	840	995	1400	1680	680
M30	1140	1350	1900	2280	880

*) Screw property class.

Table 7: Tightening torque

Tightening torque of hammerhead screws:

M27 - max. 500 Nm

M24 - max. 350 Nm

12.3 Your opinion

Your opinion is important to us. Please use the form below for your suggestions and criticism of this documentation. We always welcome constructive feedback.

Please fill in and send the form to:

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Geschäftsbereich - Nahverkehr
Rudolf-Diesel-Str. 6

33813 Oerlinghausen

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My comment:

Name: …….

Transport authority: …….

Date: …….

12.4 Notes

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