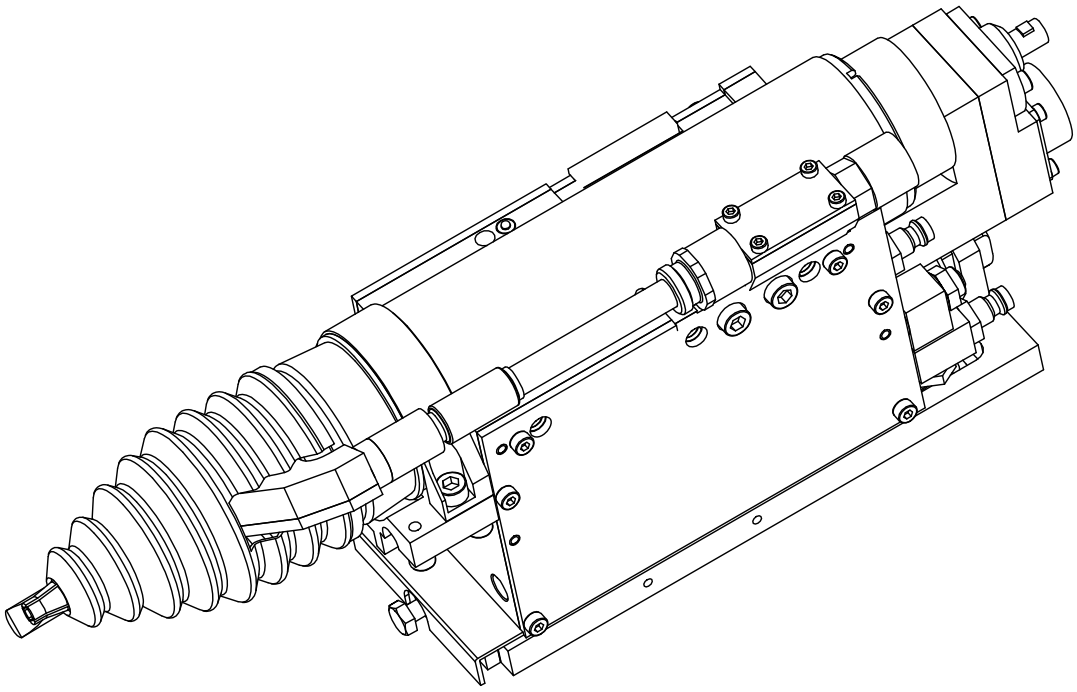
Emhart Teknologies
TUCKER™

Assembly Instructions

Stud Welding Head

LM 310



Please read the assembly instructions before any operation!

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Table of Contents:

1. General Information

1.1 Information Regarding the Assembly Instructions

These assembly instructions contain important information regarding the handling of this device. The compliance with all security advisories and operation instructions is a precondition for a safe operation.

Furthermore the local accident prevention regulations and the general safety regulations effective for the application area of the device have to be observed.

Please read the assembly instructions carefully before any operation! It is a part of the product and has to be stored in an accessible location in the direct vicinity of the device for use by the appropriate personnel.

1.2 Limitation of Liability

All instructions and information in these assembly instructions have been compiled in consideration of the valid standards and regulations, the state of the art as well as our experience of many years.

The manufacturer assumes no liability for damages due to:

- Non-observance of the assembly instructions.
- Not intended use.
- Employment of unskilled personnel.
- Arbitrary rebuilding.
- Technical modifications.
- Use of non-licensed replacement parts.

On special design, on demands of additional order options or due to latest technical modifications the actual shipment may differ from the explanations and expositions described here.

Effective are the obligations agreed in the supply contract, the general terms and conditions as well as the delivery conditions of the supplier and the legal regulations valid to the time of conclusion of the contract.

Technical modifications within the improvement of the usage properties and the further development are reserved.

1.3 Symbol Legend

Warning notices

The warning notices in this operation manual are indicated by symbols. The notes commence with a signal word which expresses the extent of the danger.

Observe the notes and act with caution to avoid accidents and damage to persons and property.

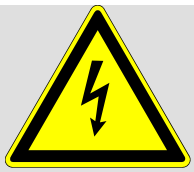
	**DANGER!** … points to a directly dangerous situation which can lead to death or severe injuries if it is not avoided.
	**WARNING!** … points to a possibly dangerous situation which can lead to death or severe injuries if it is not avoided.
	**CAUTION!** … points to a possibly dangerous situation which can lead to slight injuries if it is not avoided.
!	**CAUTION!** … points to a possibly dangerous situation which can lead to damage of property if it is not avoided.

Tips and recommendations

	**NOTE!** … highlights useful tips and recommendations as well as information for an efficient and failure-free operation.

Special security advisories

In order to make attentive on special dangers, the following symbols are used in connection with security advisories:



DANGER!
Danger to life by electric current!
… indicates perilous situations by electric current. Disregarding of the security advisories can lead to severe injuries or death.
The operations which need to be carried out may only be executed by electronic technicians.

1.4 Copyright Protection

This instruction is protected by copyright and only intended for internal purposes.

The provision of the instruction to a third party, duplications in all kinds and forms - also in extracts - as well as the utilisation and/or communication of the content are, aside from internal purposes, not permitted without a written authorization of the manufacturer.
Non-compliances obligate to damages. Further claims remain reserved.

1.5 Replacement Parts

WARNING!
Safety risk due to false replacement parts!
False or defective replacement parts can affect the safety as well as lead to damages, malfunctions or total breakdown.
Therefore:
- Use original TUCKER replacement parts.

Purchase replacement parts via licensed dealer or directly at manufacturer. Address see page 2.

1.6 Guarantee Instructions

For material and manufacturing faults, the guarantee period for this stud welding head amounts to 1 year from delivery date on. Excluded from this is damage that is caused by accident or by incorrect handling.

The guarantee covers free-of-charge replacement of the faulty component. In this connection, liability for consequential damage is excluded.

Guarantee void in case of attempts to repair by personnel that has not been trained by the manufacturer and/or when using spare parts that TUCKER has not approved of. In the event of a defect the non-conforming appliance must be sent to the next TUCKER agent or directly to the manufacturer.

The guarantee claim lapses when attempts at repair are carried out by unauthorised or unqualified persons. In the event of a defect the non-conforming appliance must be sent to the next TUCKER agent or directly to the manufacturer.

For further information concerning national representation, our customer service is at your disposal. The corresponding contact data can be found on page 2.

1.7 After Sales Service

Our service department is available for technical support.

Information about the responsible contact person is available via telephone, fax, E-Mail or anytime via the Internet, please see manufacturer address on page 2.

Furthermore, our employees are constantly interested in new information and experiences that result from the single applications and could be helpful for improving our products.

1.8 Remark to the Declaration of Incorporation

Note!
A declaration of incorporation for the inc of an incomplete machine with the corresponding details according to the EC machinery directive 2006/42/EG, appendix II, paragraph B is attached to the documents.

2. Safety

This paragraph gives a review about all important safety aspects for an optimal protect of the personnel as well as for the safe and failure-free operation.

Disregard of the operating instructions and security advices mentioned in this manual could lead to serious dangers.

2.1 Responsibility of the Operating Company

The control unit is used industrially. Therefore the operating company of the unit is liable to the legal obligations of operational safety.

In addition to the operational safety advisories in this assembly instructions the safety-, accident prevention- and environmental regulations in force for the area of application need to be observed.

Please consider particularly the following:

- The operating company has to inform himself about the valid industrial safety regulations and determine additional dangers in an assessment of hazards which occur by the special working conditions on the site of the device. He has to implement these for the operation of the control unit in the form of operating instructions.
- The operating company has to verify that the operating instructions are state of the art during the complete operating time of the unit. If necessary, the operating company is to adjust the operating instructions to the valid rules and regulations.
- The operating company has to manage and determine the responsibilities for installation, operation, maintenance and cleaning in an explicit manner.
- The operating company has to ensure that all employees dealing with the unit have read and understood this manual. Moreover, the operating company has to train the operating personnel in regular intervals and has to provide information on possible dangers.
- The operating company has to provide the personnel with the required protective equipment.

2.2 Personnel Requisition

2.2.1 Qualification

WARNING!
Risk of injury on insufficient qualification!
Improper handling can lead to serious damage to persons and property.
Therefore:
- All activities are to be carried out by skilled personnel only!

The following qualifications for different areas of operations are named in the assembly instructions:

- **Instructed person**

  Has been informed about the tasks assigned and possible dangers of improper execution of an instruction by the operating company.

- **Qualified personnel**

  Qualified personnel are able to carry out the assigned tasks due to their qualified training, knowledge and job experience. In addition, the personnel are able to recognize and avoid possible dangers on their own.

- **Electrician**

  The electrician is able to carry out activities on electric units due to his qualified training, knowledge and job experience. In addition, he is able to recognize and avoid possible dangers on his own.
  The electrician has been trained for the special site he is working on and knows about the relevant rules and regulations.

Only persons who can be expected to carry out their work in a reliable manner can be accepted as personnel. Persons whose reactivity is influenced, e.g. by drugs, alcohol or medicaments, are not admitted.

- Please consider the regulations at site specific to age and profession when choosing personnel!

2.2.2 Trespassers

WARNING!
Danger for trespassers!
Trespassers who do not fulfil the requirements mentioned in this document do not know about the dangers of this working area.
Therefore:

- Keep trespassers away from the working area.
- When in doubt, approach persons and banish them from the working area.
- Interrupt your work as long as there are trespassers within the working area.

2.2.3 Instruction

The personnel have to be instructed regularly by the operating company. For a better traceability the implementation of the instruction should be recorded.

Date	Name	Kind of instruction	Instruction carried out by	Signature

2.3 Intended Use

The stud welding head was designed exclusively for the intended use mentioned in this manual.

The LM 310 was designed for short term drawn arc stud welding from all standard, large-flange and T-studs and only for application in premises. The LM 310 can be installed on an industrial robot or also in stationary units.

Intended use also includes observing all the symbols and information in the assembly instructions.

Any excess of the intended use or different use of the device is considered as misuse and can lead to dangerous situations.

WARNING!

Risk by not intended use!

Every not intended use and/or different use can lead to dangerous situations.

Especially refrain the following use of the device:

- Use with control and power units of other manufacturers.
- Use with stud feeding units of other manufacturers.
- Use of improper weld studs.
- Use in explosive areas.
- Use in damp locations.

Claims of any kind because of damages due to not intended use are excluded.

An electro-magnetically interference-free operation of the LM 310 stud welding head can be guaranteed by complying with the specifications in chapter 6 "Connection and installation"!

2.4 Personal Protective Equipment

At work wearing personal protective equipment is essential to minimize the risks for the health.

- During working time always wear the required protective equipment for the respective work.
- Observe the signs regarding the personal protective equipment which exist in the working area.

Strictly to wear **Strictly to wear at working on the LM 310**:

Protective glasses
For the protection of the eyes from foreign bodies.

Wear on welding

Protective glasses for welding of protective level 3
For the protection of the eyes from UV-A/B/C radiation and weld splatters.

Protection clothes
Wear flame resistant clothes for the protection of weld splatters.

Hardhat
A hardhat is to be worn when welding overhead for the protection of falling weld splatters.

2.5 Special Risks

The residual risks which arise from the hazard analysis are described in the following chapter.

Please consider the below mentioned security advices and warnings in the following chapters of this manual to reduce health hazards and to avoid dangerous situations.

Electric current

DANGER!

Danger of life by electric current!

Contact with components under current is perilous. Damage of the electrical isolation or of several components can be perilous.

Therefore:

- On damages of the electrical isolation cut-off immediately the power supply and induce repairing.
- Work on the electric installation may only be executed by qualified electricians/electronic technicians.
- Do not connect or disconnect the live plug connector.
- The collet is electrified during welding and therefore may not be touched.
- For maintenance work and repair operations disconnect the LM 310 from the power supply.
- Keep away moisture from current conducting parts. This way leads to short circuit.

Moved components

WARNING!

Risk of injury by moved components!

Rotating and/or linearly moved components could cause severe injuries. Therefore:

- Do not grasp in or handle on moved components while operation.
- No not open the coverings while operation.
- Consider the follow-up time.
  Before opening the covers ensure that parts do not move anymore.

Pneumatic

WARNING!

Risk of injury by pneumatic energy!

Pneumatic energies could cause severe injuries.

Pneumatically driven parts could move unexpectedly.

On damages of several components air can discharge under high pressure and damage e.g. the eyes.

Therefore:

- Wear protective glasses when working on the LM 310.
- Use only clean and oil-free air.
- Prior to start of operation of the LM 310, firm fit of the feed tube at the feed pipe is to be verified.
- When repairing at location of operation the welding head must be cut off from compressed-air supply.
- Check all electrical and pneumatic lines for intactness before commissioning.
- In all cases any kind of maintenance and adjustments must be agreed on with the operating personnel.

DANGER!

Risk of injury by studs falling out unintentionally

Check the feed tube connection at the welding head and at the feeder before every start of operation. In case a divider is involved in the operation, check the feed tube connections at the divider, too.

Under no circumstances are persons using a cardiac pacemaker to operate or remain in the vicinity of stud welding machines.

2.6 Safety Installations

The LM 310 stud welding head is designed for the application within an installation. It has no autonomous emergency-stop-function.

3. Technical Data

3.1 General Specifications

	Specification	Value	Unit
	Weight	approx. 5,5	kg
	Length	370	mm
	Width	102	mm
	Height	140	mm
	System of protection: Protected against solid objects > 2,5 mm	IP 31 following IEC 529	Protected against water drops
	Operating temperature	15 - 40	°C
	Stocking temperature	-25 - 55	°C
	Relative humidity of air, not condensing	5 - 95	%
	Working position	Indefinite	
Noise emission	Sound pressure level	< 75	dB (A)

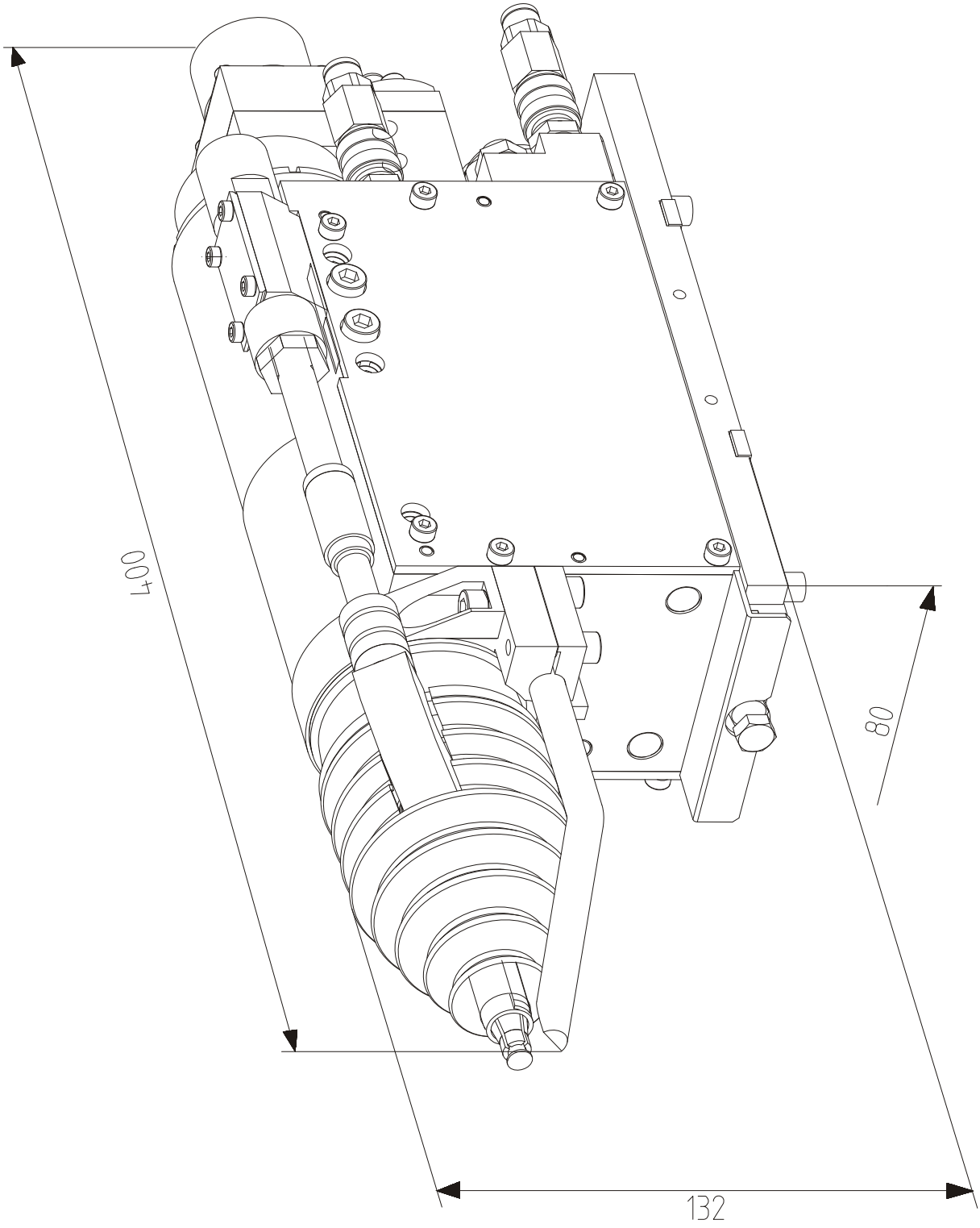
3.2 Connected loads

Electrical	Specification	Value	Unit
	Driving voltages	24 / 140	V DC
	Drawing of current max.	2,5	A
Pneumatic	Operating pressure	4 to 8	Bar
	Operating pressure max.	8	Bar

3.3 Accessories

Specification	Order number
Kit quick clamping system	M310 304
Setting gauge for lift	M111 012
Hook spanner for clamping ring	M110 103

3.4 Dimensioned Drawing



3.5 Type Plate

Type plate

The type plate is located on the housing of the stud welding head and contains the following information:

- Manufacturer
- Part number
- Power supply with frequency
- Type description
- Serial number

4. Preface: Stud Welding

In almost all technological disciplines where continuous metal work surface fastenings are required, light arc stud welding has become more and more important.

Decisive factors in the growing acceptance of light arc stud welding are the wide range of possible applications and the increasing demand for efficiency and rationalization in today's business environment.

TUCKER has chosen to perform light arc welding using a drawn arc welding ignition mechanism.

This technology offers highly repeatable piece-to-piece accuracy, works quietly and achieves a consistently high quality level.

Reliability and process safety are the hallmarks of the welding process, which essentially consists of stud movement combined with synchronous welding current.

The precise adjustment of these process elements guarantee the quality and reproduce ability of TUCKER unit welding results in automated, in semi-automated and also in manual operation.

5. General Description

The LM 310 weld head has been specifically developed for use in an industrial robot. It may, however, also be installed in stationary units.

In connection with a control and power unit and a stud feeding unit the LM 310 weld head is able to weld all standard and large-flange TUCKER stud types as well as T-studs.

There is the possibility to install the stud feed pipe parallel to the right or left side plate in order not to unnecessarily restrict the working range of the robot by the weld head clearance.

Also this user-specific positioning of the feed pipe facilitates robot programming since all supply cables can be fed from one side to the LM 310.

Furthermore the LM 310 is equipped with a linear motor, with which the plunge movement of the stud can be specified precisely. The weld results, particulary with aluminium, are improved as a result.

In combination with a second stud feeder and a stud divider, the use of a linear motor permits the welding of studs of various dimensions. Fluctuations in the stud length as a result of manufacturing as well as slight unevenness in the surface of the work piece are counterbalanced.

The mechanical sliding qualities of the weld head during stud movement could be improved dramatically through the use of a maintenance-free cylindrical ball bearing traveller.

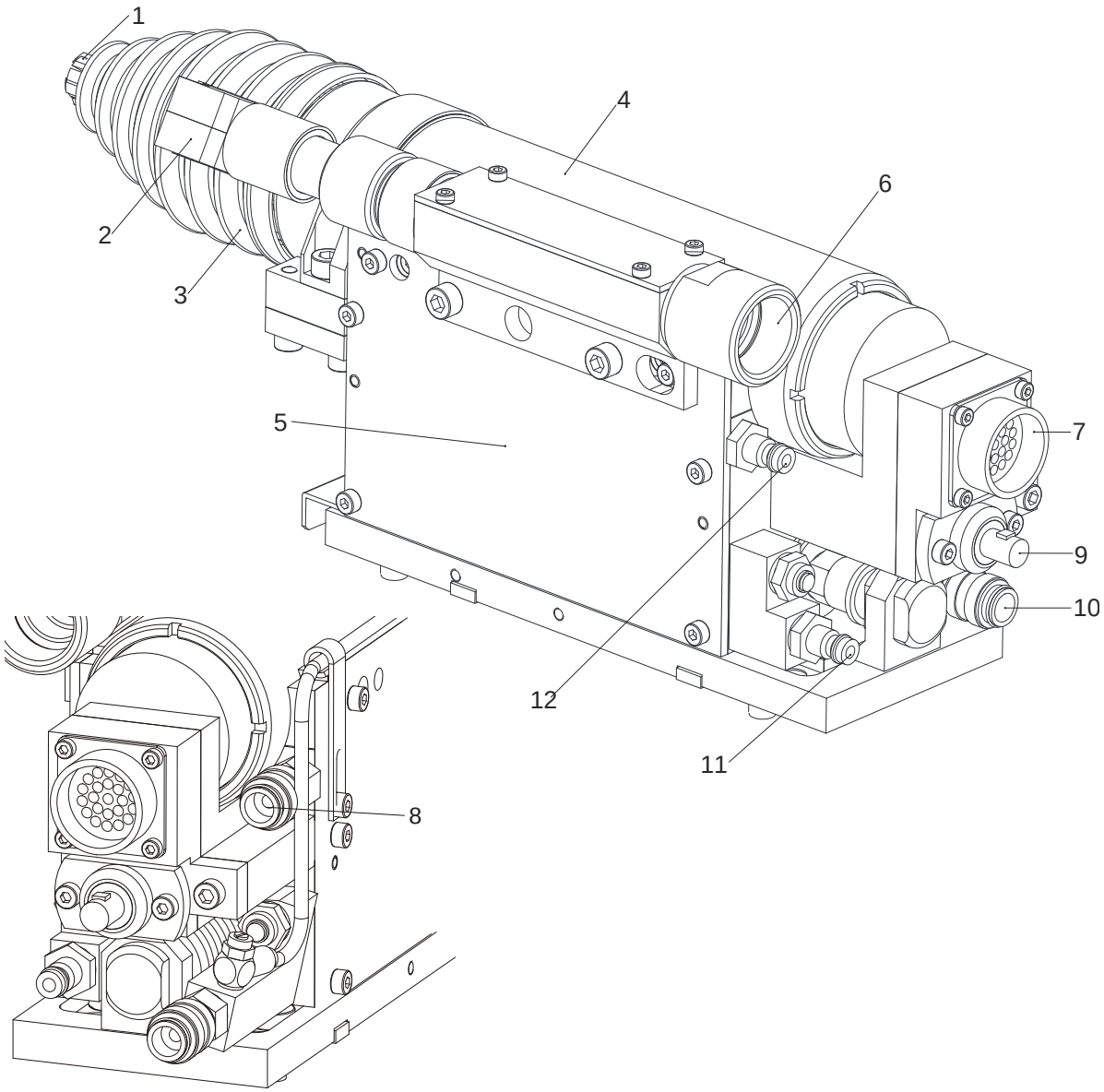
The stud movement of the LM 310 is monitored through a distance measuring system, which is able to measure exactly the stud lift as well as the plunge depth of the stud into the melt.

During external control of the weld head slide rail two proximity switches “ V “ and “ R “ inform the user about the current end position of the slide rail.

The quick-coupling system of the electrical and pneumatic supply cables along with the quick-clamping feature allow a fast and simple replacement of the weld head while refitting.

6. Connection and Installation

6.1 Overview LM 310



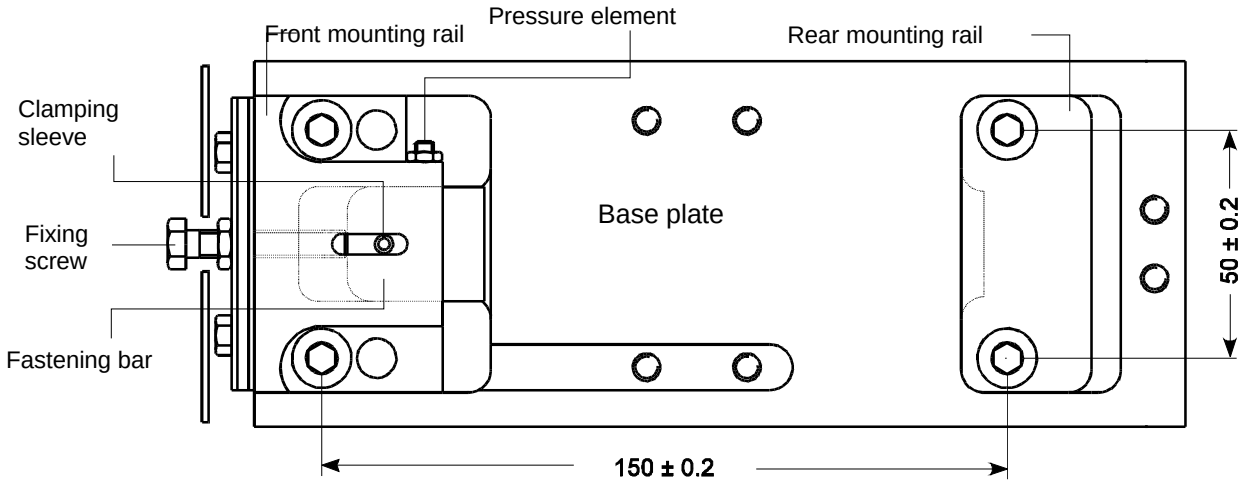
1.	Collet	2.	Firing channel
3.	Dirt protection cover	4.	Kit housing
5.	Kit slide	6.	Connection feeding tube
7.	Connection control cable	8.	Connection loading pin forward
9.	Connection weld cable	10.	Connection slide forward
11.	Connection slide back	12.	Connection loading pin back

6.2 Connection Adapter Plate

> **!** **CAUTION!**
> Prior to assembling the LM 310, an adapter plate must be installed on the customer-specific operating equipment.

In order to keep the time for replacing weld heads as short as possible, the LM 310 is equipped with a quick-clamping system which must be mounted on the operating equipment according to the following description.

1. Position the fastening bar correctly in the front mounting rail so that the tension sleeve is positioned correctly in the guide notch.
2. Now screw the front as well as the rear mounting rail with two M 8 hexagon socket screws onto the adapter plate (see reference drawing).
3. Then release the fixing screw so that the fastening bar can be completely imbedded in the front mounting rail.
4. Afterwards hang the weld head with the recess of the base plate into both mounting rails on the adapter plate.
5. Fix the weld head with the fixing screw so that a firm connection with the customer-specific operation equipment results.
6. Secure the fixing screw by tightening the counter nut.



Having completed the assembly, verify smooth running of the weld head slide rail by moving it manually from the front end to the rear end of travel.

6.3 Connection Cable Package

NOTE!

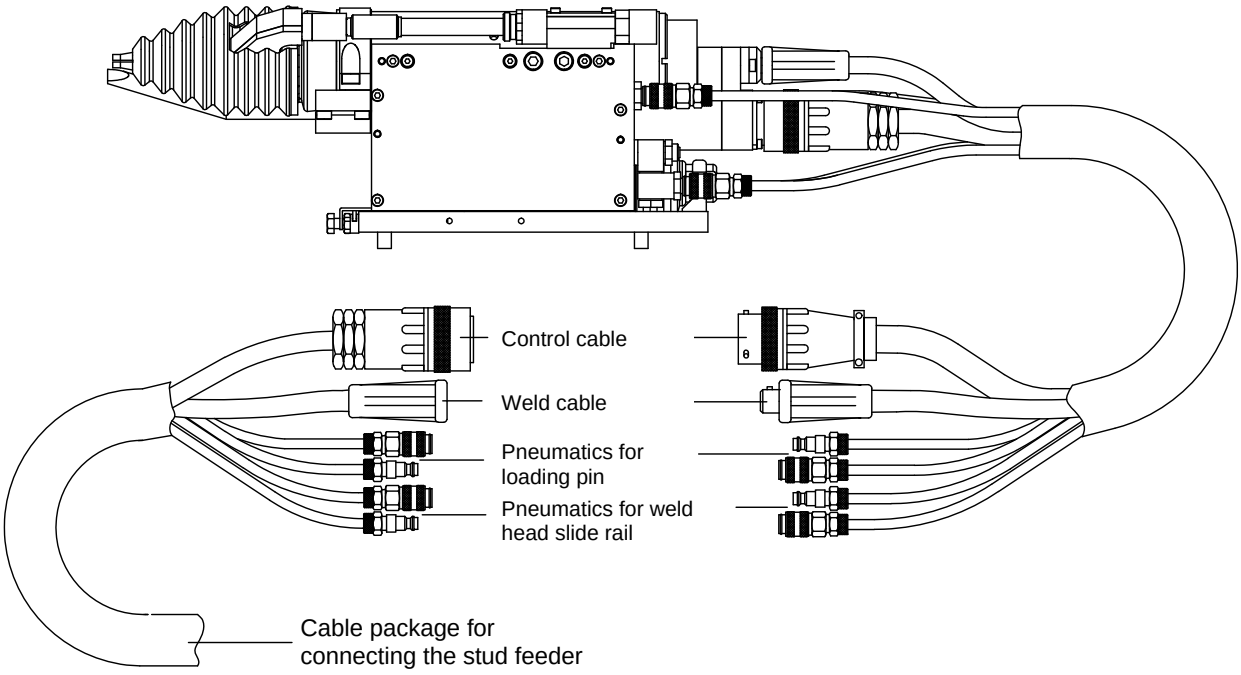
The cable package and the feeding tube do not form part of the LM 310 delivery contents and must be ordered separately.

The LM 310 has been preset by TUCKER according to the required stud type. Following the assembly the weld head can be connected as described below.

6.3.1 Connection with Quick-Coupling System

As shown in connection diagrams 1, the LM 310 will be connected to the stud feeder via the quick-coupling system with cable package for power and air supply.

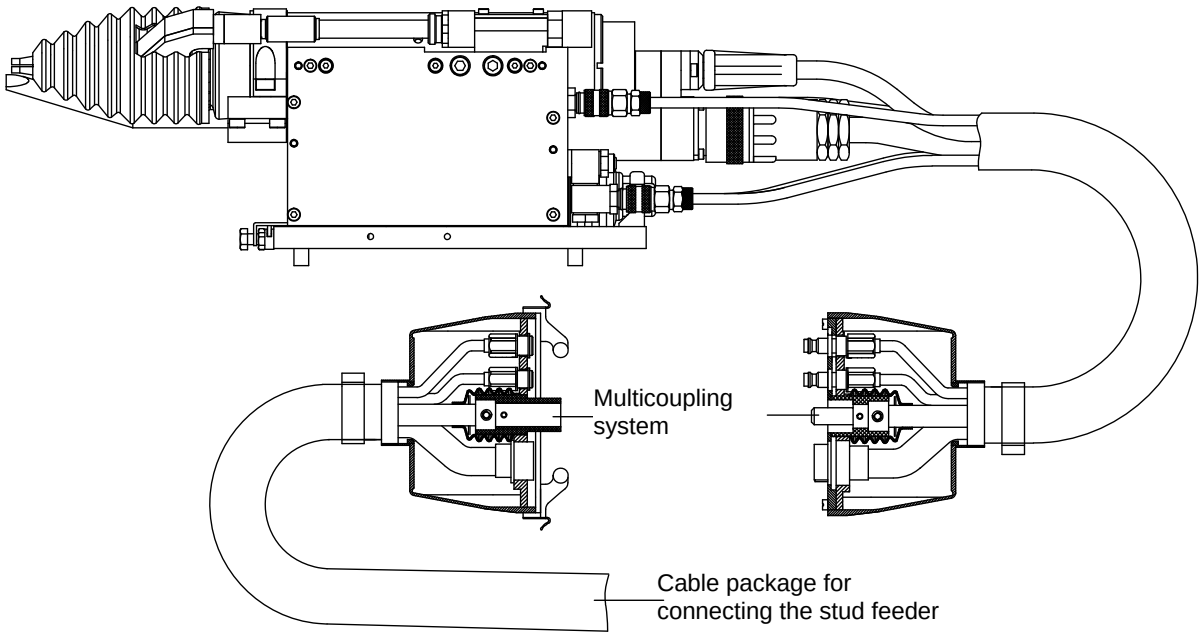
Coloured markings on the pneumatic tubes and connections make it possible to connect the tubing set to the weld head without any difficulty.



Connection diagram 1

6.3.2 Connection with Multicoupling

As shown in connection diagrams 2, the LM 310 will be connected to the stud feeder via the multicoupling system with cable package.



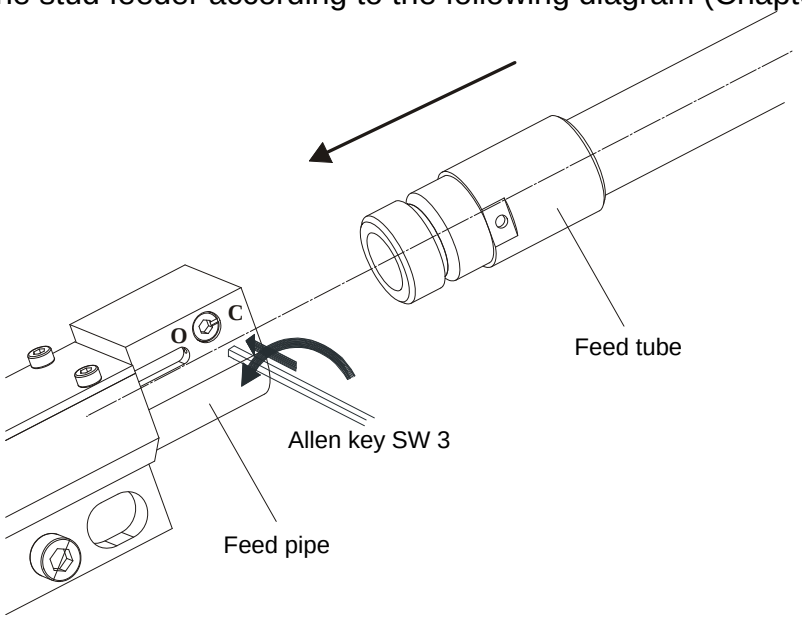
Connection diagram 2

6.4 Connection Feed Tube

The feeding tube can be connected in two different ways:

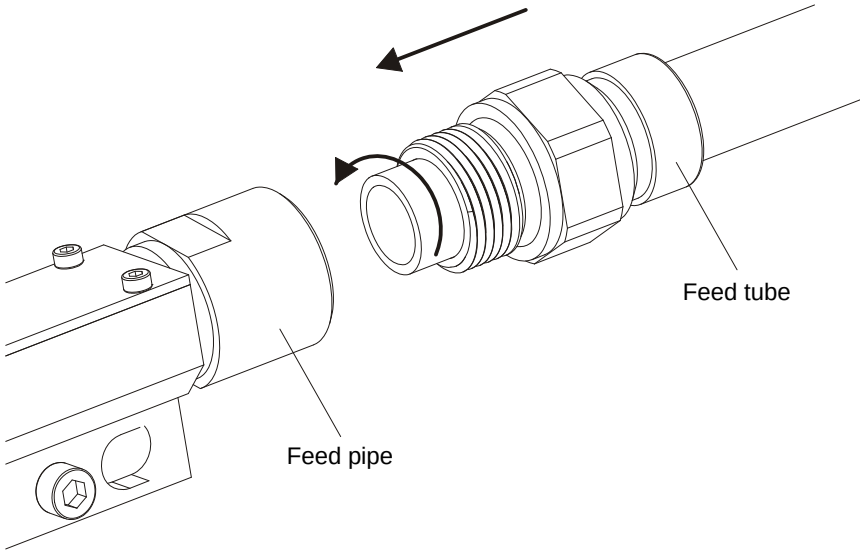
6.4.1 Connection with Quick-Coupling System

The stud feed tube is fixed at the feed pipe via the quick-coupling system and then connected to the stud feeder according to the following diagram (Chapter 6.5).

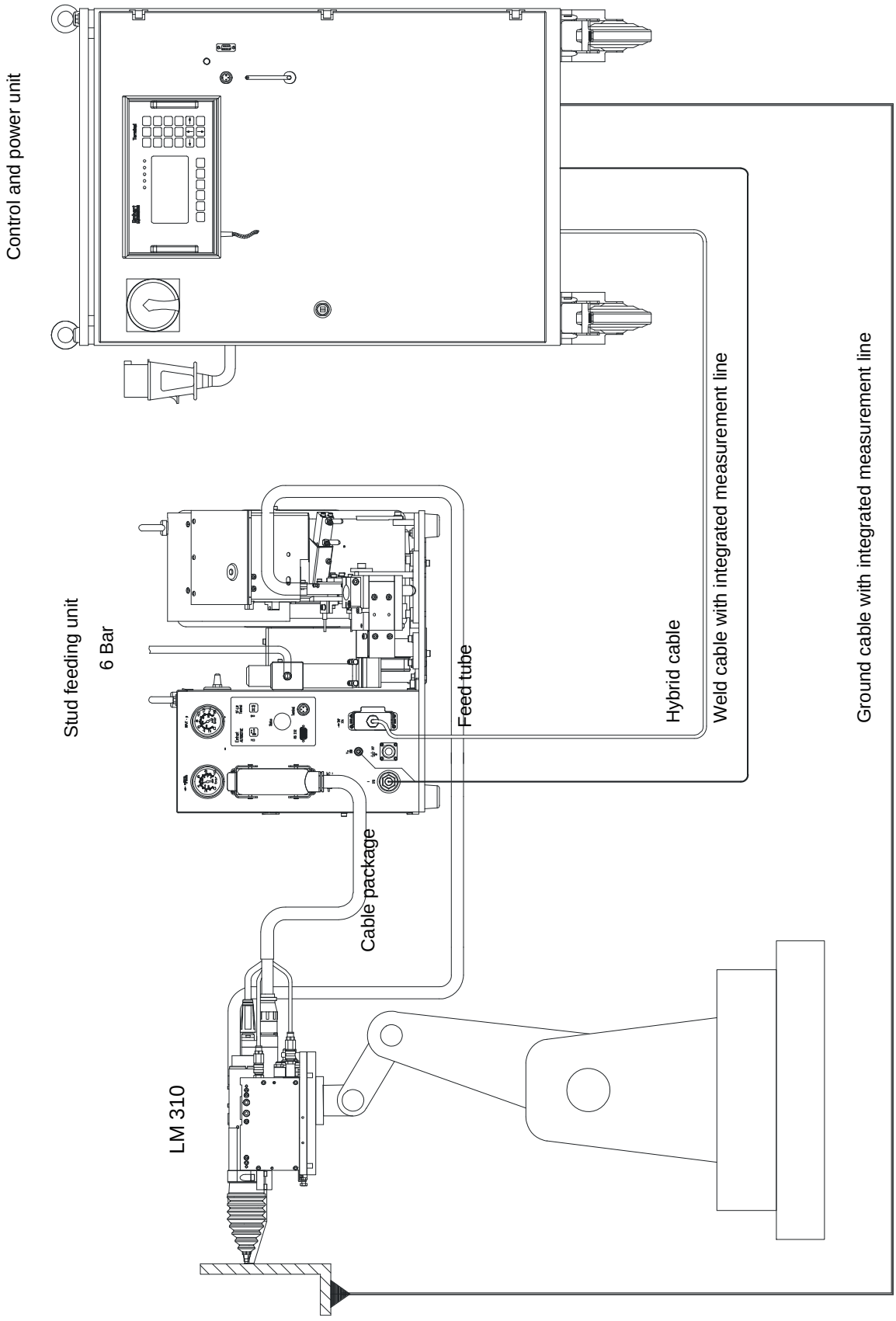


6.4.2 Connection with threaded joint

The feeding tube is fastened on the feed pipe with a standard open-end wrench and connected with the stud feeding unit according to the following diagram (Chapter 6.5).



6.5 Layout Welding System



7. LM 310 Adjustments

The LM 310 has already been preset according to customer requirements. However, specific changes on location require an appropriate adjustment of the weld head which can be achieved by the following adjustments.

7.1 Adjusting the Stabilizer

The position of the stabilizer can be altered in terms of contact point. The different possibilities are listed below:

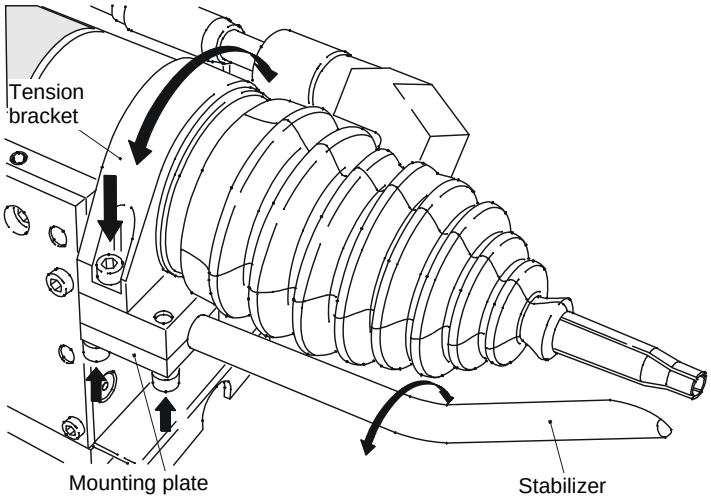
1. Decide upon right or left side mounting at the LM 310.

Remark: The stabilizer must be mounted on the opposite side of the feed pipe.

2. For refitting release the two fillister head screws on the fastening plate.
3. Mount the fastening plate and the stabilizer on the corresponding side.
4. Bring the stabilizer exactly into line with the requested contact point.

Remark:

If the welding location requires a stabilizer position that can not be achieved by this adjustment, there is the possibility to increase the action radius of the stabilizer by twisting the tension bracket.



5. To achieve this, release one of the two M6 fillister head screws of the tension bracket and rotate the tension bracket together with the stabilizer around the longitudinal axis of the weld head.
6. Move and twist the stabilizer into correct position and retighten the fillister head screws of the tension bracket and fastening plate.

NOTE!

While adjusting the tension bracket, it must in any case be observed that the lift movements of the weld head are not restricted by blocking of the stud feed pipe!

7.2 Adjusting the Safety Distance to the Collet

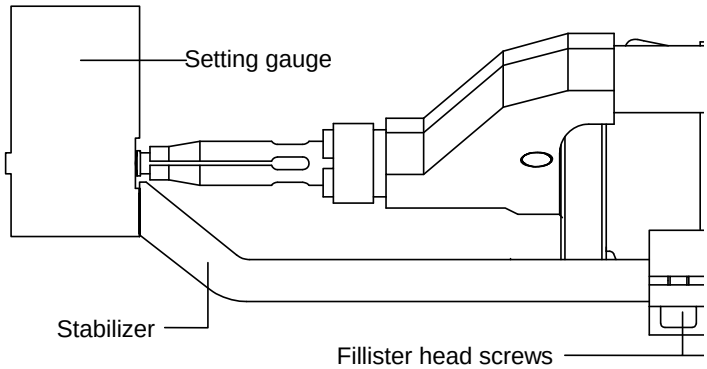
NOTE!
Condition for correct adjustment of the safety clearance to the collet is the fact that the weld stud is held in its front end position by means of the loading pin under compressed-air supply.

During the downwards movement of the stud by the linear motor the molten front face of the stud is plunged into the melt of the work piece.

Since the stud plunge depth depends on the positioning of the collet, the distance between stud entering edge and stabilizer front edge must be verified.

The stud must rise above the front edge of the stabilizer by 1,5 mm. Verification is to be performed with the setting gauge (Accessory chapter 3).

1. Make sure that a stud was fed into the collet.
2. Release the two fillister head screws on the mounting device of the stabilizer.
3. Move the stabilizer until it contacts the setting gauge.
4. Then the two fillister head screws are to be retightened.

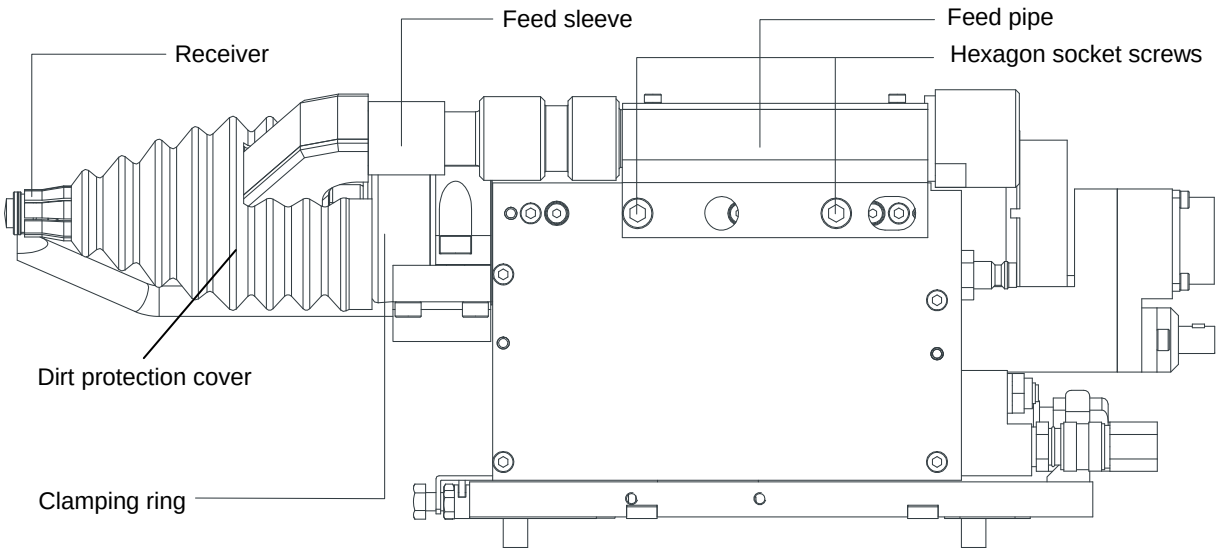


If stabilizer and stud are not on one level (when welding edges), the plunge depth can not be adjusted via the gauge. In this case the plunge depth is to be established empirically.

CAUTION!
Keep a safety distance of 1,0 mm. Otherwise the collet instead of the stud will be welded to the work surface, if no studs have been supplied.

7.3 Adjusting the Stud Feed Pipe

In order to optimally adapt the LM 310 to the welding location environment, there is the possibility to individually mount the stud feed pipe either on the left or on the right side plate.



1. Make sure that compressed-air supply has been shut off at the feeder and remove the front protection cover over the collet.
2. Release the clamping ring with a hook spanner (standard accessory) and remove the receiver completely from the weld head.
3. Release the M 5 hexagon socket screws on both side plates and replace the stud feed pipe on the opposite side.
4. Now orient the receiver in its correct position at the straight pin of the clamp flange and adapt the feed sleeve including feed pipe.
5. Position the receiver correctly and retighten the two hexagon socket screw as well as the clamping ring.
6. The protection cover must be put back in place over the collet after the stud feed pipe has been repositioned.

7.4 Adjusting the Weld Head Slide Rail Speed

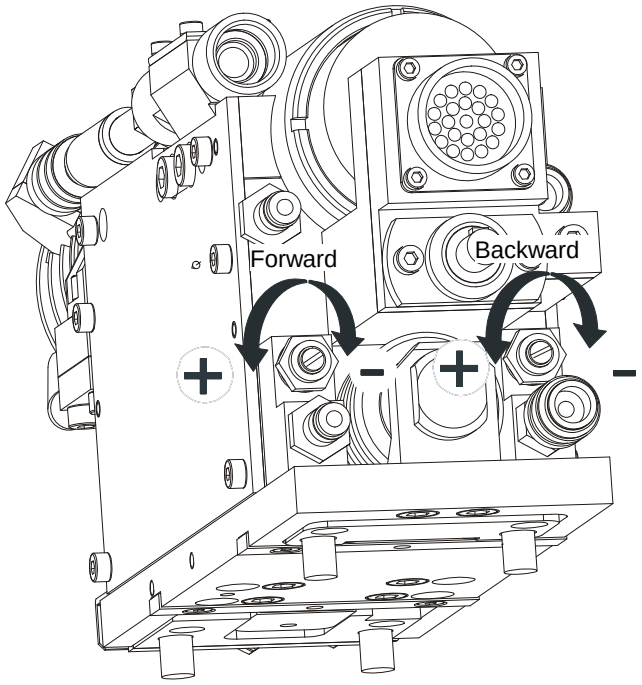
The speed for the ”forward“ and ”backward“ movement of the slide rail can be individually set with the two one-way restrictors of the LM 310.

When adjusting the slide rail speed there always has to be made a compromise between increased welding cycles and increased material wear.

The basic rule is: ”Advance slide rail slowly and return it fast“.

- If the weld head slide rail is advanced too fast, the work surface might be deformed by the contacting stabilizer.
- If the weld head slide rail is returned too fast, increased wear and tear might occur at the customer-specific operation equipment and at the weld head.

The two one-way restrictors for the forward and backward movement of the weld head slide rail are located on the weld head rear.



- <u>Increasing the slide rail speed:</u>

  Turn the valve screw in ” **+** “ direction, to increase the air escape from the pneumatic cylinder.

- <u>Reducing the slide rail speed:</u>

  Turn the valve screw in ” **-** “ direction, to reduce the air escape from the pneumatic cylinder.

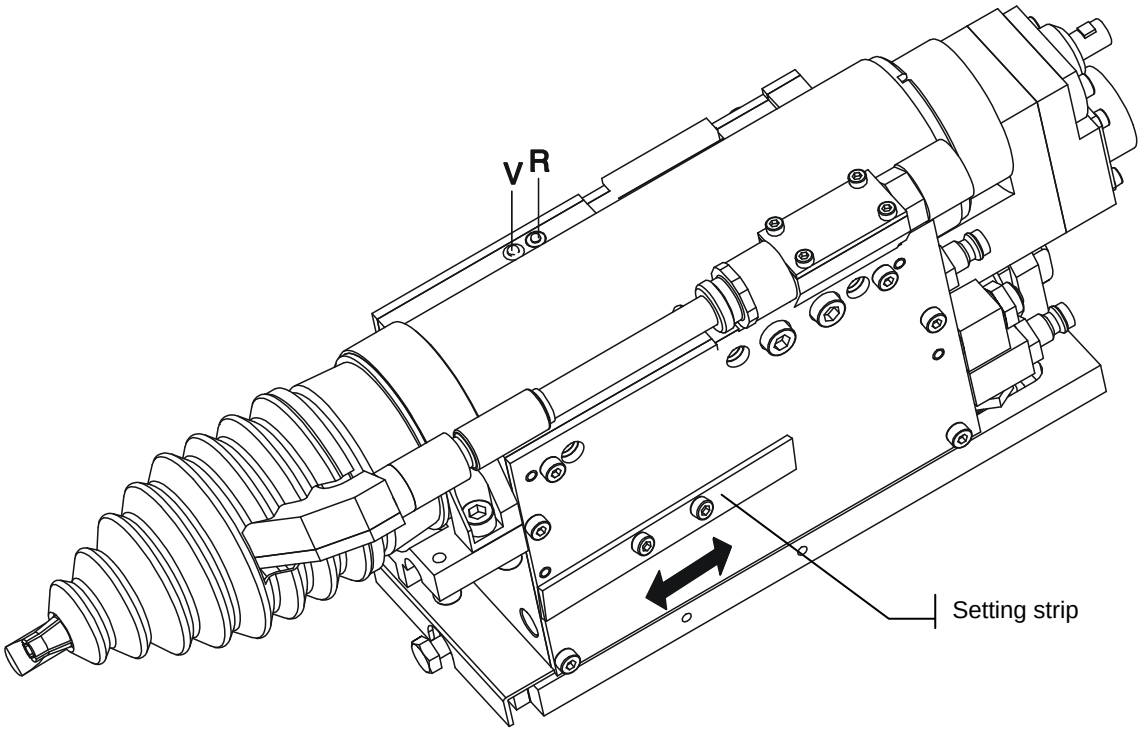
NOTE!
The adjustment criteria’s for increasing or reducing the weld head slide rail speed are to be applied to both one-way restrictors.

7.5 Adjusting the Proximity switch “ V ” (option)

The front and rear end of travel of the LM 310 weld head slide rail is inductively monitored by the proximity switches ” V “ and ” R “.

Since the proximity switch ” R “ for the rear slide rail position has already been installed fixedly, only the proximity switch ” V “ can be adjusted.

The below described adjustment procedure can be retraced on the customer control, at the feeder or directly via the ” V “-LED of the LM 310.



- Make sure that the compressed-air supply at the stud feeder has been shut-off and press the weld head manually into welding position.
- Release the two hexagon socket screw on the setting strip and move it until the red LED ” V “ at the weld head responds.
- Retighten the hexagon socket screw on the setting strip.

NOTE!
If the LM 310 is exclusively controlled via the control and power unit (internal slide rail control) an adjustment of ”**V**“ is not required.

7.6 Adjusting the Loading Pin Speed

NOTE!
The required condition for verifying the loading pin speed is the installation of the LM 310 in the operation equipment as well as connection to a stud feeder and to a control and power unit.

A slower than standard forward motion speed of the loading pin is required when welding large-flange studs with flange nut. To regulate the loading pin speed, the weld head is equipped with a regulating valve.

Remark: If the existing weld head does not have such a regulating valve, it may be retrofitted.

To adjust the loading pin speed, please proceed as follows:

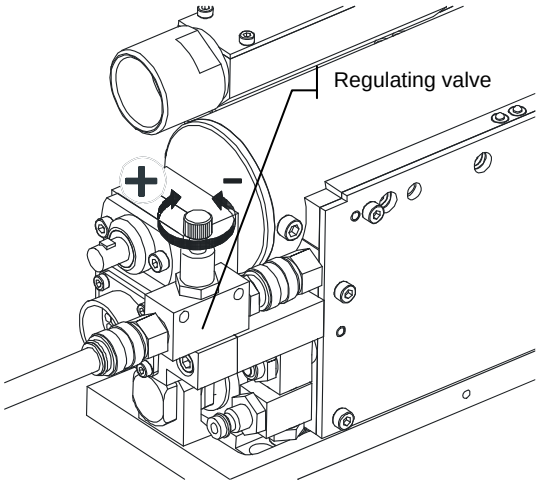
1. The setting screw of the regulating valve is located in the pneumatic cable for the loading pin backward motion (see drawing.)
2. Release the counter nut of the setting screw.
3. For adjusting, turn the setting screw.
4. Test the loading pin speed setting by repeatedly feeding large-flange studs. If the weld stud sits firmly in the collet, the adjustment is correct.
5. Secure the setting by retightening of the counter nut.

- **Increasing the loading pin speed:**

  Turn the valve screw in ” **+** “ direction, to increase the air escape through the regulating valve.

- **Reducing the loading pin speed:**

  Turn the valve screw in ” **-** “ direction, to reduce the air escape through the regulating valve.



NOTE!
Adjustment of the loading pin speed is only required for the welding of large-flange studs with flange nut. For all other weld studs the regulating valve must be fully opened.

7.7 Verification of the Auto Refeed Function

NOTE!
The required condition for verifying auto refeed is the installation of the LM 310 in the operation equipment as well as connection to a stud feeder and to a control and power unit.

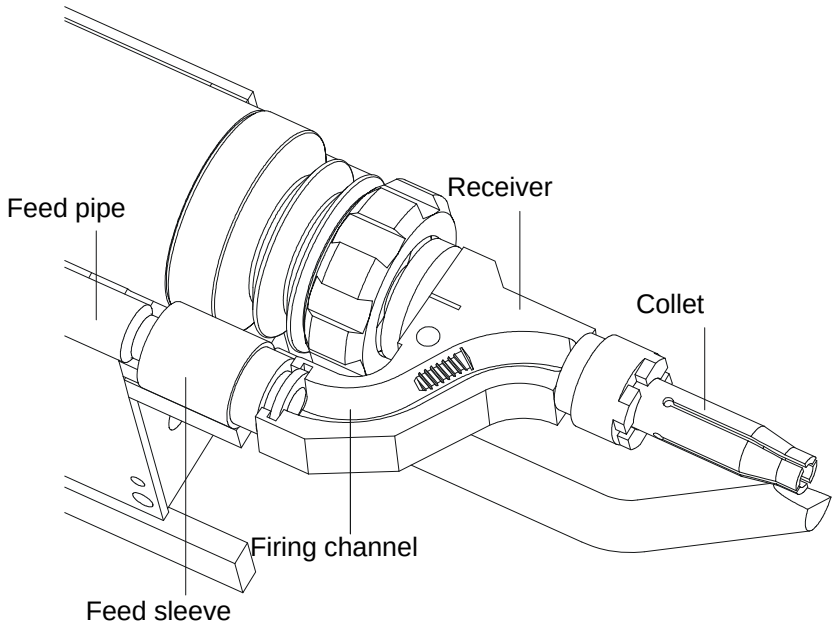
The verification procedure is to be performed following the below listed sequence:

1. Check connection of feed tube to feed pipe and check connection of feed pipe and feed sleeve for clearance.
2. Program the loading time t_L and the feeding time t_Z . For information please consult the programming manual of the control and power unit.
3. Give the command for auto refeed via either the corresponding signal of the customer control, of the welding unit or of the stud feeder.

With this command the loading pin moves into the rear end of travel. Now the stud can be fed into the receiver through the feed pipe.

The stud is pressed into the collet through the forward movement of the loading pin. The stud is now located in the final welding position.

Should there already be a weld stud in the collet during auto-refeed, it will be ejected from the collet.



Remark: If no stud arrives in the collet, the loading and feeding times must be corrected. Afterwards repeat verification procedure.

8. Stud Welding Instructions

8.1 Before Weld Process Start

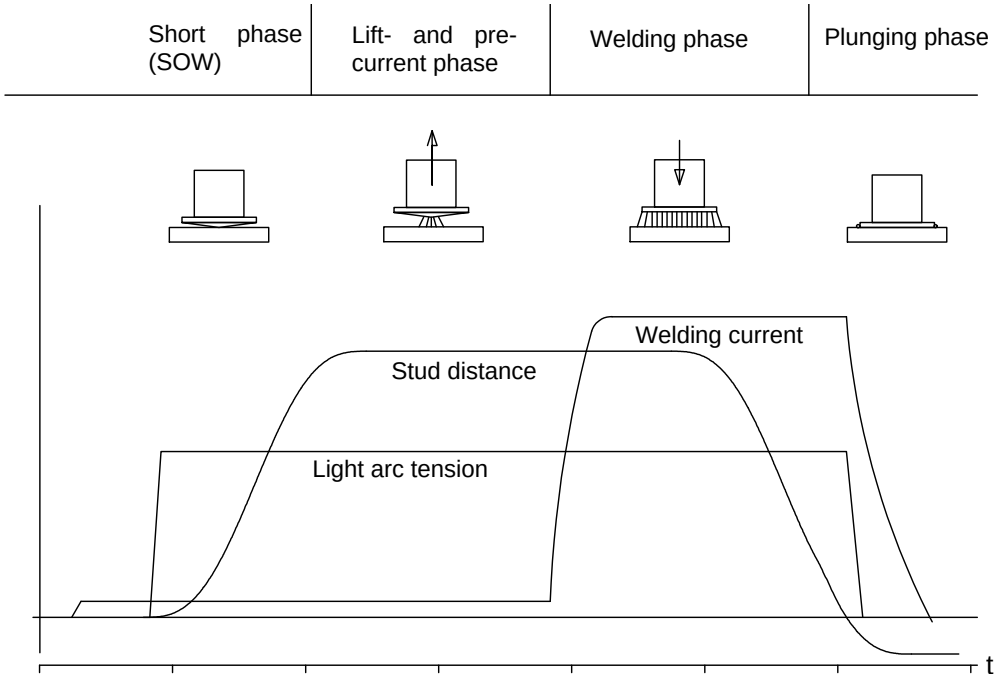
NOTE!
The following stud welding instructions must be observed before the welding process is started through the start command of the external customer control or of the control and power unit!

- Check the feed tube connection at the welding head and at the feeder.
- The welding location has to possess a level surface with a diameter of approx. 35 mm for fitting the stabilizer.
- The work surface, particularly in the direct welding zone, should be mostly free of any kind of impurities in order to guarantee for a high welding quality.
- The installation of the LM 310 in the operation equipment should be completed such that the weld head always contacts the work surface at an angle of 90°.
- It must be guaranteed during the welding process that the weld head position as well as the position of the work surface remain unchanged.
- The bending radii of the feed tube should not be less than 300 mm, even if they depend on the stud type to be fed.
- If different welding procedures must be performed on one work piece it must be ensured that those will take place at different times.
- Radiofrequency weldings must be performed in a separate location and must be supplied from a separate power circuit.
- The ground cable should be installed symmetrically on the work piece and not directly besides the welding site, in order to have an optimum weld quality.
- Elimination of unwanted light arcs on pressure spring retention elements will be achieved by a ground hold-down device from TUCKER (Order number M108 972).
- Vibrations of thin wall work pieces can be avoided by using a weld location thrust bearing made from copper, brass or aluminium.

NOTE!
The basic stud welding unit requirements can be read from the TUCKER installation guideline!

8.2 The Stud Welding Process

The mechanical process of stud movement along with the respective electrical processes are described in the reference drawing below.



1. The required condition for the welding process is contact of the weld stud with the work surface (SOW), so that when the start command has been given the weld circuit will be electrically shorted via stud and work piece.
2. After stabilization of the pilot current the linear motor of the weld head removes the stud from the work piece in accordance with a specified, programmed curve and the pilot current light arc is ignited. The pilot current light arc is needed for igniting the main light arc.
3. If the weld stud has achieved its lift height, the main welding current is switched on, which will intensify the light arc such that the stud front edge and the work surface are melted.
4. While the light arc creates a liquid melt on the work piece and on the front face of the stud, the linear motor is reversed. By means of a controlled, mechanical movement the stud is pressed into the melt. The linear motor stays in this position in keeping with the programmed holding line.
5. With the plunging of the stud into the melt, the light arc extinguishes so that the melt coagulates and the weld head can be removed from the stud when the welding current is switched off again.

The welding cycle is terminated with the removal of the weld head from the stud and can be repeated after a new stud has been refeed.

9. Transport, Packaging and Storage

9.1 Security Advice for the Transport

Improper transport

CAUTION!
Damages caused by improper transportation.
Improper transport could cause serious damage of property.
Therefore:
- Necessary transport actions are to be executed in that way that damage of the welding head is excluded.
- Avoid shocks and heavy vibrations

9.2 Transport check

Upon delivery, the equipment, including accessories, should be checked for completeness and damage.

On externally visible transport damage, proceed as follows:

- Do not accept the delivery or only accept with reservation.
- Note the extent of damage on the transport documents or on the delivery note of the deliverer.
- Induce complaint.

NOTE!
Complain each defect as soon as recognized. Claims for damages can only be asserted within the effective time for complaints.

9.3 Packaging

The respective packaging pieces are packed according to the transport conditions to expect. Exclusively non-polluting materials were used for packaging. The packaging shall protect the respective components against transport damages, corrosion and other damages until assembly. Therefore do not destroy the packaging and remove just shortly before assembly.

Packaging materials handling

Dispose packaging material according to the respectively valid legal regulations and local directives.

CAUTION!
Damage caused to the environment due to wrong disposal!
Packaging materials are valuable raw materials and can be further used in a lot of cases or can be prepared reasonably and recycled.
Therefore:
- Dispose packaging materials environmentally friendly.
- Regard the locally effective regulations for waste disposal. Charge a specialist with the disposal if applicable.

9.4 Storing

Storing of the packaging pieces

Store the packaging pieces under the following conditions:
- Do not store out of doors.
- Store dry and dust-free.
- Protect against insolation.
- Avoid mechanical vibrations.
- Stocking temperature: -25 to +55 °C.
- Relative humidity of air (not condensing): 5 to 95 %.
- On storage longer than 3 months the general condition of all parts and the packaging has to be checked regularly. Refresh or exchange the conservation if necessary.

NOTE!
Notes regarding storage which exceed the requirements mentioned here are possibly on the packaging pieces. These are to be observed respectively.

10. Maintenance and Cleaning

10.1 Safety

Personnel	• The maintenance work described can be executed by the operator, unless it is marked differently. • Some maintenance work may only be executed by specially trained experts. • Maintenance work on the electric installation basically may only be executed by specialists for electronics.

Improper execution of maintenance work

WARNING!

Risk of injury due to improper executed maintenance work!

Improper maintenance can lead to heavy damage to persons and property.

Therefore:

- Before start of work arrange for a sufficient space for assembly.
- If components have been removed pay attention to a correct assembly, install all fastening elements again and observe screw tightening torques.

10.2 Maintenance and cleaning schedule

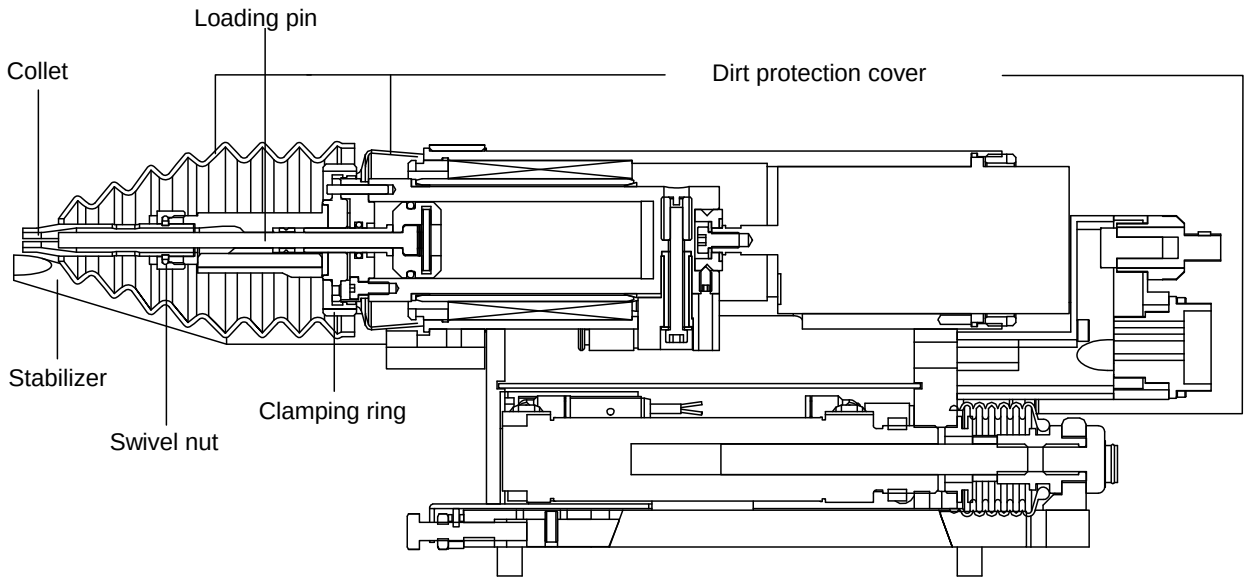
The maintenance work essential for an optimal and failure-free operation is described in the following chapters.

In case of detection of an increased abrasion during regular checks, shorten the required maintenance intervals accordingly to the actual signs of abrasion.

If you have questions concerning maintenance work and intervals contact the manufacturer, see service address on page 2.

Interval	Maintenance works	To be carried out by
daily	Stabilizer Remove weld slag Clean the collet and check for damages as broken or deformed segments	Qualified personnel
weekly	Check feed pipe for plastic wear Clean the loading pin, check for abrasion and grease again	Qualified personnel
monthly	Check feed tube for wear. Clean and check for firm fit dirt: protection covers, swivel nut and clamping ring Grease the O-Ring on the loading pin piston	Qualified personnel
depending on dirt	Clean complete welding head	Qualified personnel
annually	Complete overhaul and check for wear	Manufacturer

Wearing parts



NOTE!

It is recommended to stock the above mentioned wearing parts.

10.3 Maintenance Works

If the installation of replacement parts becomes necessary, maintenance has to be performed consulting the attached explosion drawing.

NOTE!
Assembly of the mentioned parts must be performed in reverse order of the disassembly.

- **Implementation by specially trained experts.**
- **Tools required:**
  - Allen key SW3, SW4, SW5
  - Hook spanner (Accessories)
  - Socket wrench (Accessories)

10.3.1 Stabilizer Replacement

1. Release the two M 5 fillister head screws on the clamping plate with an Allen key.
2. Replace the stabilizer.

10.3.2 Collet Replacement

1. Carefully remove the front protection cover over the collet.
2. Using a socket spanner (accessories) unscrew the swivel nut from the receiver and then replace the collet.

10.3.3 Feed Pipe Replacement

1. Release the fillister head screws on the side part plate.
2. Replace the feed pipe completely.

10.3.4 Feed Tube Replacement

1. Unscrew the feeding tube from the feed pipe with a standard open-end wrench or remove the feeding tube by opening the quick-coupling and replace the feeding tube.

10.3.5 Loading Pin Replacement

1. Disconnect the welding head from the compressed-air supply!
2. Carefully remove the front protection cover over the collet and release the clamping ring with a hook spanner.
3. Remove the receiver from the clamping flange.
4. Unscrew the clamping flange from the air cylinder.
5. Also replace the O-ring along with the loading pin or replace the loading pin completely.

10.3.6 Replacing the Swivel Nut

1. Carefully remove the front protection cover over the collet.
2. Release the swivel nut with the socket spanner and replace it.

10.3.7 Replacing the Clamping Ring

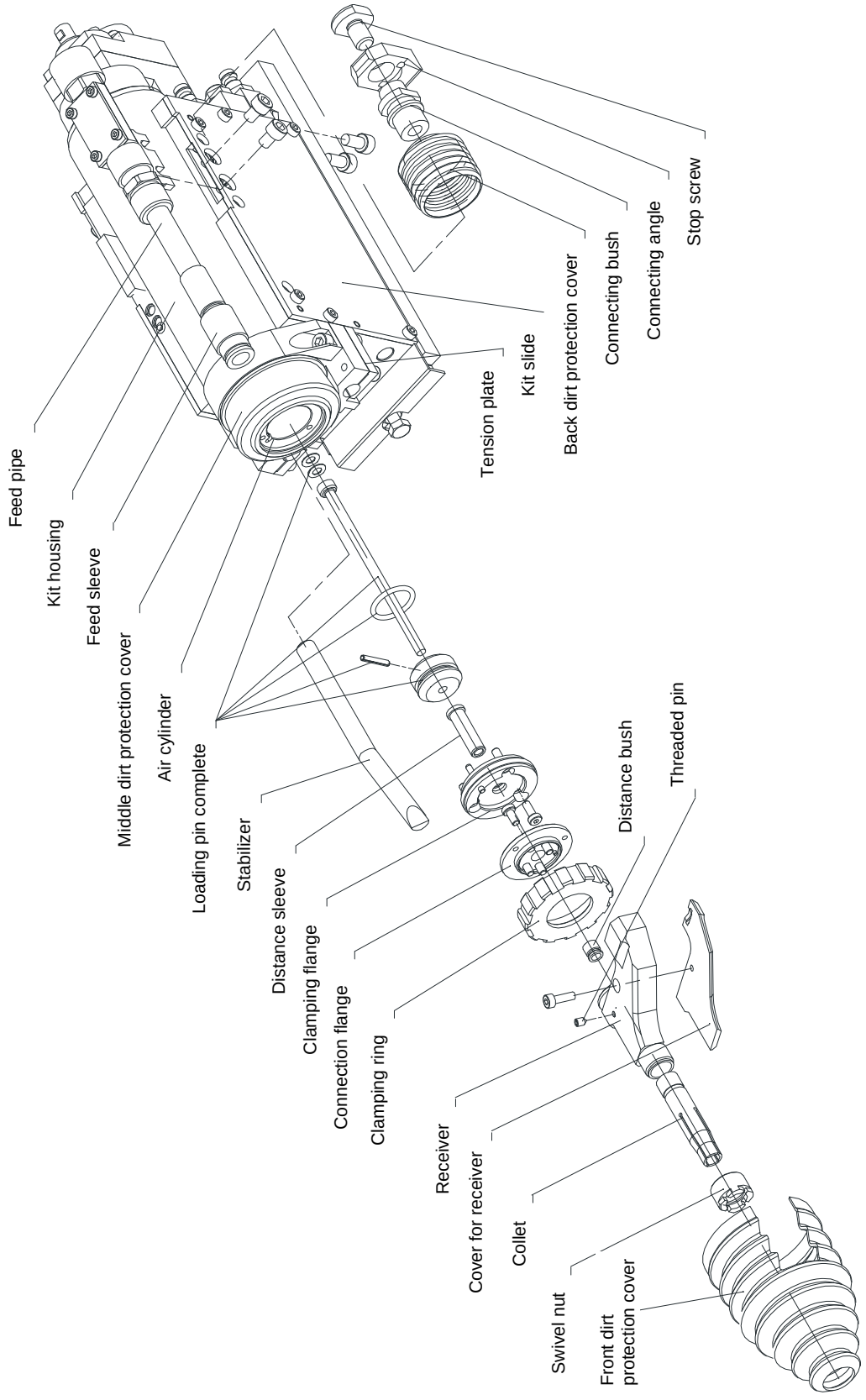
1. Carefully remove the front protection cover over the collet.
2. Release the clamping ring with the hook spanner and remove the completely assembled receiver.
3. Release the two M 4 hexagon socket screw and then remove the connection flange.
4. Replace the clamping ring.

10.3.8 Dirt Protection Cover Replacement

- **Front protection cover:** Remove the front protection cover over the collet and replace it.
- **Centre protection cover:** Unscrew the receiver and then replace the centre protection cover.
- **Rear protection cover:** Remove the two screws of the connection angle and the stop screw. Remove the rear protection cover over the connection bushing and replace the rear protection cover.

NOTE!
Having completed the maintenance work, the weld head must be readjusted and tested. For instructions please see the corresponding sections of this manual.

11. Exploded View



12. Refitting the LM 310 Weld Head

The LM 310 has already been adjusted by TUCKER to the requested stud. If the weld head is to operate with studs of different dimensions a refitting of the weld head LM 310 is required.

When refitting the weld head the LM 310 explosion drawing is to be consulted and the following sequence is to be observed:

NOTE!
On all refitting works the wearing parts are to be mounted in reverse order of the disassembling.
After refitting the type plate on the LM 310 has to be updated.
The adjustments on the LM 310 have to be checked after all refitting works.

CAUTION!
Refitting of LM 310 should be performed in the workshop.

Information for order:

- Read the actual stud dimensions from the label located on the weld head housing: (Ø [mm] / l [mm]).
- The refitting parts needed for a stud exchange are to be discussed with and, if necessary, can also be ordered by the TUCKER customer service.
- Information about the responsible contact person is available via telephone, fax, E-Mail or anytime via the Internet, please see manufacturer address on page 2.

12.1 Refitting the Collet

1. Remove the front dirt protection cover from the collet.
2. Using a socket spanner (accessories) unscrew the swivel nut, so that the collet can be removed from the receiver and then be refitted.

12.2 Refitting the Distance Bush

1. Remove the front dirt protection cover from the collet.
2. Unscrew the clamping ring with the hook spanner, so that the receiver can be completely removed from the clamping flange.
3. Release the threaded pin of the receiver. Then replace the distance bush according to the refitting table.

13 Disposal

Unless no recovery- or disposal arrangement was made disassembled parts have to be recycled:

- Scrap metals.
- Recycle plastic elements.
- Dispose sorted all the rest of the components according material properties.

ATTENTION!

Damage caused to the environment due to wrong disposal!

Electronic waste, electronic components, lubricants and other additives are subject to treatment of hazardous waste and may be disposed only by licensed certified specialists!

The local authority or special disposal specialists provide information regarding an environmentally friendly disposal.

Notizen/Notes:

Declaration of Incorporation acc. to the EC Machinery Directive 2006/42/EC,

Document number: EBE LM310 02

Manufacturer:

TUCKER GmbH
Max-Eyth-Straße 1
35387 Gießen
Deutschland

Authorized person to compile the relevant documentations:

Technische Dokumentation
TUCKER GmbH
Max-Eyth-Straße 1
35387 Gießen
Deutschland

Product name: LM 310
Stud weld head for short term drawn arc stud welding

Serial number:

Year of manufacture:

The manufacturer declares that the above-mentioned product is a partly completed machinery according to the EC Machinery Directive 2006/42/EC. The product is to be solely used for installation in a machine or partly completed machine and therefore does not comply with all existing requirements of the EC Machinery Directive.
A list of the applied and complied with basic requirements of the EC Machinery Directive is attached to this declaration.
The special technical documents according to appendix VII, paragraph B have been generated. The above-mentioned authorized person commits to submit the specific product documents in response to a reasoned request by the national authorities. The submission is carried out by post in hardcopy form or via electronic data carriers. The putting into service of the product is prohibited till it has been made sure that the machine that is to be installed into the above-mentioned product complies with all basic requirements of the EC Machinery Directive.

The above product follows the provision of the following EC Directives:

Number:	2006/42/ EC	Machinery Directive
	2004/108/ EC	Electromagnetic Compatibility

References of directives according to publication in Official Journal of the European Union.

Issued by: Manfred Müller, General Manager

Location, date: Giessen,

Legally binding signature:

This declaration certifies compliance with the named Directives.
The appendix is an integral part of this declaration.
The safety instructions on the supplied product information sheet are to be followed.

1.1 Appendix to the Declaration of Incorporation

List of applied and adhered to basic safety and health requirements for construction and assembly of machines with respect to the product mentioned on page 1.

Number-Appendix	Description	Adhered to
1.	Essential health and safety Requirements	
1.1.	General remarks	
1.1.5.	Design of machinery to facilitate its handling	x
1.1.6.	Ergonomics	x
1.2.	Control system	
1.2.2.	Control devices	x
1.2.4.	Stopping	
1.2.4.4.	Assembly of machinery	x
1.3.	Protection against mechanical hazard	
1.3.4.	Risks due to surface, edges or angels	x
1.3.9.	Risks uncontrolled movements	x
1.5.	Risks due other hazards	
1.5.1.	Electricity supply	x
1.5.4.	Errors of fitting	x
1.5.5.	Extreme temperature	x
1.5.7.	Explosion	x
1.5.8.	Noise	x
1.5.9.	Vibration	x
1.5.10.	Radiation	x
1.5.11.	External radiation	x
1.7.	Information	
1.7.3.	Marking of machinery	x