Operating Instructions
Stud Welding System
HesoMatic-9

GB: English version

Read these operating instructions before starting any work!

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Device numbers

We recommend entering the device numbers here so that they can be accessed quickly if servicing is required.

Device	Type	Serial number
Stud welding system	HesoMatic-9	
Stud welding gun	PS-3A	

Operating Instructions

Document no: P00155, 01-2021, translation of the original German manual (English: P00255)

Revision status

Document	created / modified	Editor	Date
Original	modified	MS/IS	January 25th, 2021

CONTENTS

1 General information

These operating instructions contain important information and rules for the operation of the devices. Keep the operating instructions in a readily accessible location close to the devices.

The term 'Devices' in the operating instructions refers to the stud welding system and the stud welding gun.

Carefully read the operating instructions and any other documents contained in the technical documentation. Pay particular attention to the safety instructions which are intended to help you recognise any possible residual risks and prevent hazards.

The drawings and diagrams in these operating instructions are for illustration purposes and may vary slightly from the actual equipment.

The manufacturer reserves the right to make technical changes.

1.1 Validity of the operating instructions

These operating instructions apply to the following devices:

Stud welding system	HesoMatic-9
Stud welding gun	PS-3A

1.2 Registered trademarks

The following terms in these instructions are used with registered trademarks:

SOYER®: Developments/technologies of Soyer GmbH.

1.3 Declarations of conformity

The devices are designed and constructed in accordance with the generally accepted codes of practice.

Please note that significant changes to the device will cause the declaration of conformity to become void.

Furthermore, the manufacturer's warranty may be rendered invalid.

Conformity declaration – Stud welding system

EC Declaration of Conformity

in accordance with the EC Machinery Directive 2006/42/EC of 17 May 2006, Annex II A

We herewith declare that the design and construction of the machine described below as well as in the version marketed by us meet the fundamental safety and health requirements of the EC Directive 2006/42/EC. Any modification of this machine without our confirmation shall automatically annul this declaration.

Manufacturer:
Heinz Soyer Bolzenschweißtechnik GmbH,
Inninger Straße 14
D-82237 Wörthsee, Germany
Phone: +49(0)8153-8850

Description of the machine:
• Function: Stud welding system (unit consisting of feeder and stud welding device)
• Type/Model: HesoMatic-9

• Serial number: _____

• Year of manufacture: _____

The product is conform with other directives/regulations applicable to the product:
• EC Low Voltage Directive 2006/95/EC
• EMC Directive (2004/108/EC) of 15 December 2004

Harmonised standards applied, in particular:
- DIN EN 12100-2011-03 Safety of machinery - General principles for design, risk assessment and risk reduction
- DIN EN 60204-1 Safety of machinery - Electrical equipment of machines, Part 1: General requirements
- DIN EN 60974-1 Arc welding equipment; Part 1: Welding power sources

Other technical standards and specifications applied:
- DIN EN ISO 4414 Fluid power - General rules and safety requirements for pneumatic systems and their components

Responsible person for the technical documentation:

Mr. Klein, Soyer Company

Place/date: Wörthsee, 24 August 2018

Undersigned person:
Heinz Soyer, Managing Director

Signature:
_____

1.4 Manufacturer

The manufacturer of the devices is:
Heinz Soyer Bolzenschweißtechnik GmbH
Inninger Straße 14
82237 Wörthsee
Phone: 0049-8153-885-0
Fax: 0049-8153-8030
Email: info@soyer.de
Web: www.soyer.de, www.soyer.com

1.5 Instruction, training

SOYER® offers optional and individual instruction in the operation of the devices.

Moreover, SOYER® offers training for customer-specific use of the devices.

Information on the scope and costs of instruction and training can be obtained from Soyer GmbH.

1.6 Standards and directives

The following standards, inter alia, must be observed for carrying out stud welding work and for the qualification of personnel:

- DIN EN ISO 14555 Welding — Arc stud welding of metallic materials
- DIN EN ISO 14732 Welding personnel - Qualification testing of welding operators and weld setters for mechanised and automatic welding of metallic materials
- DIN EN 60974-9 Arc welding equipment - Installation and use
- Technical Bulletin DVS 0904 Instruction for practice - Arc stud welding

2 Important safety instructions

Read the following chapters carefully and follow the safety instructions. If you are uncertain or an instruction cannot be followed, please contact the manufacturer.

The devices have been constructed according to the generally accepted codes of practice and in compliance with, and application of, the usual and established safety requirements. In order to reach maximum safety, it is essential that all of the safety instructions in these operating instructions are heeded and followed.

2.1 Safety alerts used

Warning signs are used in this document, depending on the potential danger of the situation.

Safety and information symbols used in this manual	
DANGER	This warning sign indicates imminent danger leading to severe injuries or death.
WARNING	This warning sign indicates a potentially dangerous situation that may lead to severe injuries or death.
CAUTION	This warning sign indicates a potentially dangerous situation that may lead to minor injuries. Without the warning triangle, this warning sign is also used in the event of danger of material damage.
	Additional information indicating danger from electric current. The additional sign is used in conjunction with a warning sign.
	Additional sign indicating the danger of burns. The additional sign is used in connection with a warning sign.
	Do not touch the surface or the housing: Shock hazard.
	Do not touch or open, danger to unauthorised persons.
	Danger to persons with medical implants such as pacemakers.
	The information sign is not a warning sign. It indicates important and useful information on the subject.

Safety instructions on the devices

As an additional warning of danger, warning labels can be found on the devices. Warning labels are affixed by the manufacturer and must not be removed. If a warning label is damaged and thus illegible, a new warning label must be affixed immediately.

Warning labels must be obtained from the manufacturer.

2.2 General safety instructions

Danger from electric current, general information

When working on live components, there is a danger to life from electric current.

- Work on electric or electronic components may only be performed by trained electrotechnical personnel in accordance with currently applicable electrotechnical regulations.
- Protection devices must not be manipulated or disabled. Protection devices include, for example, housing and housing cover, fuses or power switches.
- If protection devices have to be removed for maintenance work, the device may only be switched on again when all protection devices are installed and their functionality has been checked.
- Starting the device with faulty protection devices is not permitted. Faulty protective devices must be repaired or replaced immediately. Unintentional operation by third parties must be prevented.

DANGER 

Danger from electric current during maintenance and repair

When working on live components, there is a danger to life from electric current.

- Work on electric or electronic components must only be carried out by trained electrotechnical personnel of Soyer Bolzenschweißtechnik.
- Before performing any work on the stud welding device, the mains switch of the device must be switched off and the mains plug of the stud welding device must be disconnected.
- Before performing any work on the stud welding gun, the supply cables to the stud welding device must be disconnected.
- If protection devices have to be removed for maintenance work, the device must only be switched on again when all protection devices are installed and their functionality has been checked.

DANGER 

Danger from magnetic fields

In the area surrounding the device, strong magnetic fields occur during the welding process, which may influence medical auxiliary aids and therefore result in danger to life.

- Persons with electrical medical aids (such as pacemakers) must keep away from the devices.
- The operating personnel must ensure that persons with medical aids keep away from the devices.

DANGER

Danger of explosion from an inappropriate installation location in explosive atmospheres

The device is not designed for use in explosive zones.

- The device must not be installed and operated in explosive atmospheres.

CAUTION 

Danger of burns due to hot surfaces

During the welding process, the workpieces and some parts of the welding gun get so hot that touching them may cause burns.

- Always use personal protective equipment.
- Before working on hot parts of the device, check if they have cooled down.
- Do not hold the gun in the welding area.

WARNING 

Danger of burns from hot welding spatter

Dangerous welding spatter can occur during the welding process.

- Always use personal protective equipment.

WARNING 

Fire hazards from hot welding spatter

Welding spatter or hot workpieces occurring during the welding process can result in fire hazards.

- Do not store combustible or highly inflammable materials in the welding area.

2.3 Safety instructions for the working method

WARNING

Hazards due to incorrect working method

Hazards for operators and third parties can arise due to an incorrect working method.

- Ensure sufficient stability and a dry installation location for the device.
- Make sure you do not knock over the device or pull it down from its position with the gun cables.
- Make sure, especially with mobile use, of your own good stability during welding.
- Do not hold the workpiece in your hands during welding. The workpiece must be securely fixed during the welding process.
- Never wrap the gun lines around parts of your body (e.g. arm) as electric fields can occur.
- If the gun is not put on properly or the gun settings are incorrect, a flash can occur during welding. Do not look directly into the flash.
- The gun carries out lifting movements during the welding process. Do not hold the gun tight in the area of moving parts.

WARNING

Danger due to overloading the holding device

The holding device may only be used for the PS-3A stud welding gun. If the holding device is overloaded it may be damaged by the prying effect or tip over together with the stud welding system.

Check the holding device and balancer for visible signs of damage before starting work. Faulty parts have to be replaced immediately.

2.4 Personnel protective equipment

It is recommended to wear personal protective equipment when working with the stud welding device.

WARNING

Danger due to missing or incorrect personal protection kit

There is a danger of burns during stud welding, especially due to hot welding spatters. A danger of blinding can also arise due to the occurrence of strong arcs.

- Always wear suitable, closed protective clothing.
- Type and extent of the protective equipment depends on the respective occurrence and intensity of welding spatter, arcs and/or noise. This varies depending on the basic material, stud material, stud size and required welding performance.
- Please observe the following instructions for protective equipment.

Recommended personal protection equipment	
	Protective goggles During welding, welding spatters and a flash occur. Wear appropriate safety goggles with side protection and a filter protector, if necessary.
	Protective gloves During welding, the workpieces and parts of the welding gun get hot and welding spatters occur. Wear appropriate, non-combustible, heat-resistant protective gloves.
	Protective clothing Welding spatters occur during the welding process. Wear appropriate, non-combustible and, if necessary, heat-resistant, protective clothing.
	Safety shoes Welding spatters occur during the welding process. Wear appropriate, non-combustible, heat-resistant safety footwear.
	Hearing protection Depending on the welding device and the welding application, relatively loud welding noises may occur. Wear appropriate hearing protection.

2.5 Intended use of the stud welding system

The welding system described here consists of the following individual devices:

Stud welding system	HesoMatic-9
Stud welding gun	PS-3A

These operating instructions and the declaration of conformity only apply if the named devices are used together as described in these operating instructions.

With the SOYER® HesoMatic-9 capacitor discharge stud welding system, pins and threaded studs from M3 to M8 as well as many different weld fasteners made of steel, stainless steel, aluminium and brass can be welded in accordance with DIN EN ISO 13918 (capacitor discharge).

In connection with the PS-3A stud welding gun, the studs can be fed into the gun automatically using compressed air.

In automatic mode, the stud welding system may only be operated with the accessories described in these instructions.

The devices described here can also be operated separately in other combinations. If these are used outside of the automatic system, the operating instructions for the respective device must be observed.

Special studs or diameters upon request.

Operation of the stud welding system must be in accordance with the technical data.

2.5.1 Incorrect use

Any use of the devices deviating from the intended use is considered as not intended.

Not intended use, unauthorised modification, separate device operation or manipulation of the devices will void the declaration of conformity and warranty claims against the manufacturer.

Misuse of the welding gun as a tool, e.g. as a hammer for checking the weld quality, is not permitted.

2.6 Operating company prerequisites

The operating company of the devices must ensure that the preconditions described in this operating manual for a safe operation of the devices are fulfilled.
These include, for example, conditions at the installation location, regulatory requirements for a safe workplace, training of the operating personnel and qualified personnel in using the device, if applicable, compliance with required maintenance work as well as monitoring the intended use of the stud welding system.

These operating instructions must be stored in the vicinity of the stud welding system.

The operating company of the devices must ensure that all protection devices are present, active and intact before the stud welding system is used.

2.6.1 Prerequisites for personnel

Operating personnel

The persons authorised to operate the devices must be familiar with the stud welding system and trained accordingly. They must have read and understood these operating instructions. When working with the stud welding system, they must also be able to avert possible residual danger to themselves and third parties or minimise them as far as possible.

To retain the qualification, the safety training must be carried out at least once a year. In the event of failure or if maintenance becomes necessary, consult specially trained personnel or the manufacturer.

Operators of stud welding equipment must have technical expertise for operating and adjusting the devices properly as well as for properly carrying out weldings.

If welding personnel has to be qualified for certification of welding, the DIN EN ISO 14555 and DIN EN ISO 14732 standards are to be observed.

Trained electrotechnical personnel

In general: Work on live elements may only be performed by authorised electricians. This work must be performed in line with the applicable technical rules for electrotechnical devices.

All devices of Soyer Bolzenschweißtechnik GmbH must only be opened by SOYER® personnel or personnel authorised by SOYER®.

3 Transport

When transporting the devices, make sure they cannot be damaged. Appropriate packaging can protect the device against weathering effects, especially moisture.

4 Storage, shutdown

During storage or shutdown, make sure to protect the devices against dirt and humidity.

Protect the stud welding system against unauthorised access by third parties.

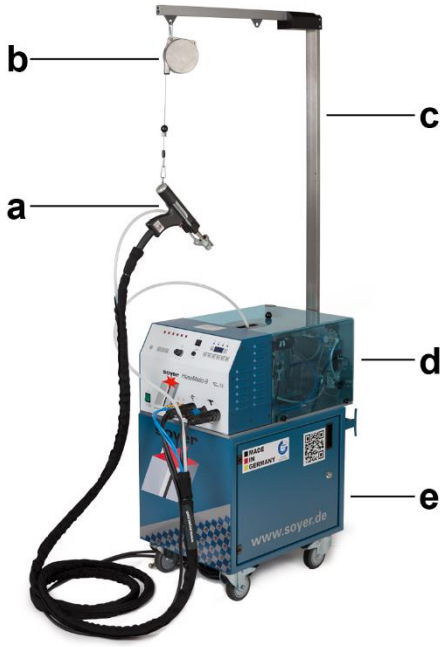
5 Disposal

Local environmental directives must be observed when disposing of the device.

Water-endangering as well as environmentally hazardous substances are to be disposed of in accordance with legal regulations.

If applicable, materials must be separated according to regulations.

6 Description of the HesoMatic-9 stud welding system



Item	Designation
a	PS-3A stud welding gun
b	Balancer (tensile force 2 - 3 kg, adjustable)
c	Holding device for welding gun (load capacity max. 10 kg)
d	Energy source with feeding unit (feeder)
e	Transport cart with storage space and drawer (lockable door)

WARNING

Danger due to overloading the holding device

The holding device may only be used for the PS-3A stud welding gun. If the holding device is overloaded it can be damaged by the prying effect or tip over together with the stud welding system.

Check the holding device and balancer for visible signs of damage before starting work. Faulty parts have to be replaced immediately.

The main elements of the stud welding system and its features are described in the following.

6.1 Type differentiation

Designation Order number	Feature
HesoMatic-9 **P01079**	Mains voltage 230 V, 50/60 Hz, 10A

6.2 Working method

Pins and threaded studs from M3 - M8 or Ø 3 - 8 mm and a wide range of different steel and stainless steel fasteners can be welded in accordance with DIN EN ISO 13918 (capacitor discharge) with the SOYER® HesoMatic-9 stud welding system.

The welding of aluminium and brass fasteners is also possible.

For the first time, users can automatically feed and weld pins and threaded studs in a combination device consisting of a stud welding device and a feeding unit (feeder). This simplifies the operator's job and also considerably increases the quality of the welding joints.

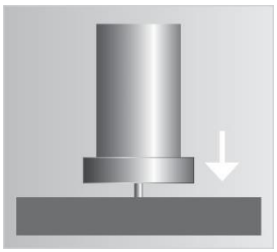
Product highlights

- Easy selection of welding parameters using the function keys
- Inverter switching power supply for maximum welding performance
- Automatic storage of the charging voltage
- Short charging cycles to increase productivity
- Precise digital display of the charging voltage
- High performance in a compact design
- Efficient and economical conversion to 6 different stud sizes
- Complete housing as a protection against welding spatter, dirt and noise
- Large feeder bowl diameter of 300 mm for long studs and large filling quantities
- Trouble-free transport thanks to stud feed via steps and low-noise operation
- Monitoring of all functions using a clear function display panel
- **Automatic feeding**. In connection with the PS-3A stud welding gun, the studs can be fed automatically using compressed air.

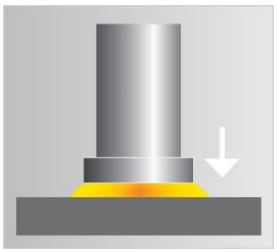
6.2.1 Capacitor discharge stud welding

The SOYER® stud welding system operates according to the principle of capacitor discharge with tip ignition according to DVS bulletin 0903 (DVS = German Welding Society). This system uses the sudden discharge of a capacitor bank to generate arc energy.

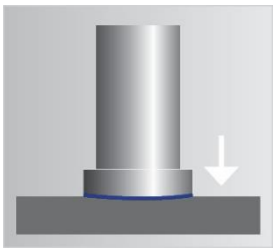
Function principle



The stud tip is placed into contact with the work-piece



The ignited arc creates a melt zone on the stud and the metal sheet.



The stud is immersed in the weld pool. The material solidifies and the stud is permanently welded.

For more information on this subject, please visit: www.soyer.com.

6.3 Overview of the controls

6.3.1 Overview of the front panel

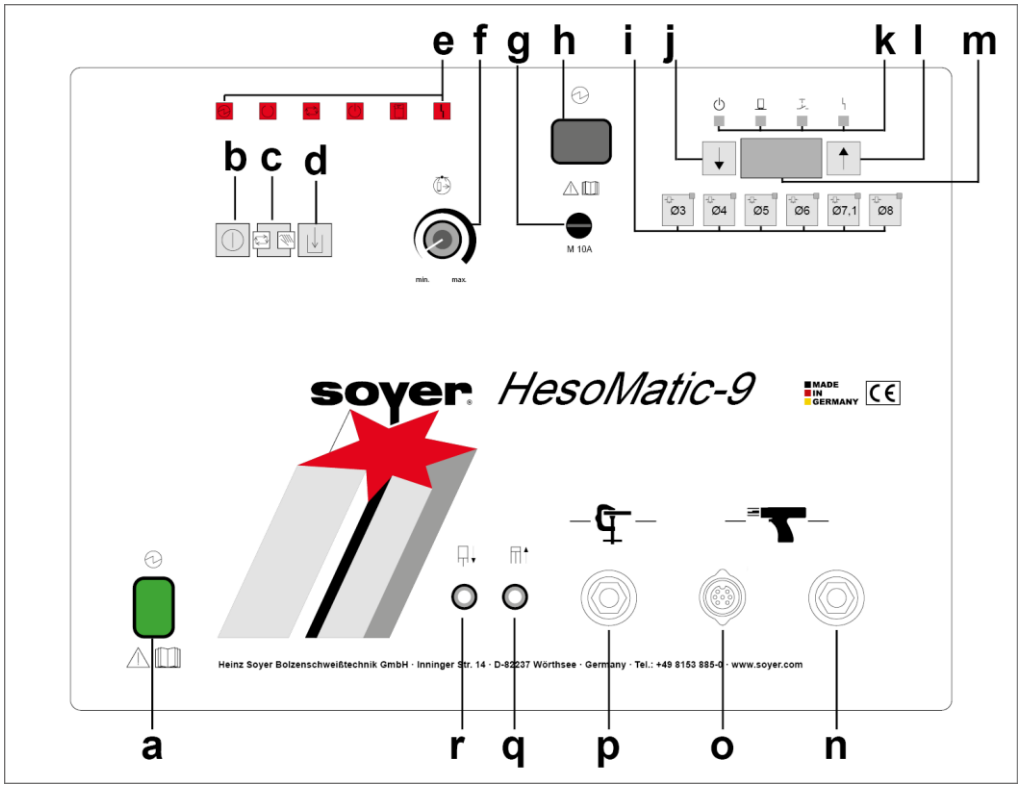


Figure 1: Overview – Front panel

Item	Designation (feeding unit)
a	Mains switch for turning the feeding unit on/off.
b	Function key: ON/OFF, to switch the feeding unit on/off.
c	Function key: Operating mode to switch to • Manual mode (continuous operation) • Automatic mode
d	Function key: Reload to convey a stud to the welding gun. You can also reload by triggering the welding gun.
e	LED operating mode (see “6.4.2 Operating states (feeding unit)” on page 24)
f	Rotary knob for adjusting the feed speed in the feeder bowl • Min.: Minimum feed speed • Max.: Maximum feed speed

Item	Designation (stud welding system)
g	Fuse element 10 A (for stud welding system)
h	Mains switch for turning the stud welding system on/off
i	Selection keys to quickly and directly preselect the stud diameter and the charging voltage (see chapter “11.3.1 Tables for adjusting the device" on page 70)
j	Function key to reduce displayed charging voltage
k	Display of operating states, see chapter “6.4.1 Operating states (stud welding system)” on page 24
l	Function key to increase displayed charging voltage
m	Display
n	Connection of gun hose package: Connection of welding cable
o	Connection of gun hose package: Connection socket for control cable
p	Connection of the earth cable
q	Connection of gun hose package: Plunger back
r	Connection of gun hose package: Plunger forward

Observe the labelling on the hoses and cables of the gun hose package, do not mix up.

WARNING

Hazards due to wrong fuse

Only replace fuses when mains plug is disconnected!

Should it become necessary to replace fuses, only use fuses with the specified electrical values. Oversized fuses could either cause defects on the electrical system or a fire.

6.3.2 Rear panel/Connections

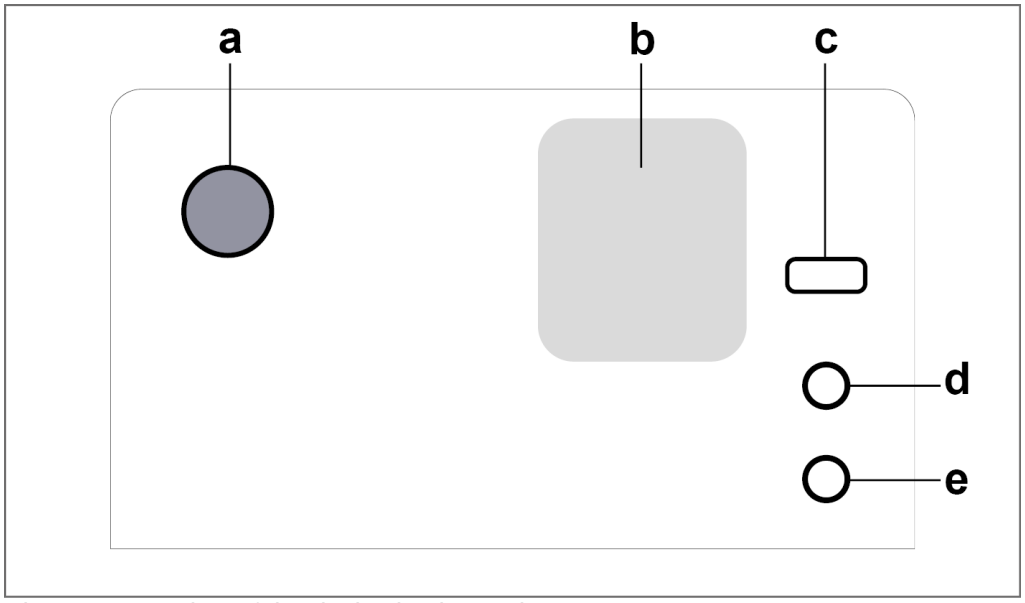


Figure 2: Overview of the device back panel

Item	Designation
a	Blow air regulator
b	Type plate
c	CNC interface
d	Main air connection
e	Mains connection / Mains cable

6.4 Display of the operating states

6.4.1 Operating states (stud welding system)

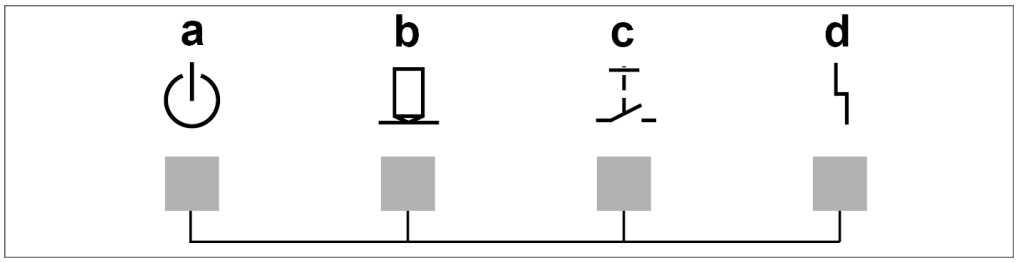


Figure 3: Operating states (stud welding system)

Item	Designation
a	**Device ready** In normal operation, the LED lights up when the stud welding system is ready for operation in normal mode.
b	**Stud on workpiece** The LED lights up when the earth terminal is connected and the stud touches the workpiece.
c	**Release** The LED lights up when the trigger button on the welding gun is pressed.
d	**Malfunction** The LED lights up when a malfunction of the stud welding system occurs. Then, observe chapter “12.5 Malfunctions with an error message on the stud welding device” on page 80.

6.4.2 Operating states (feeding unit)

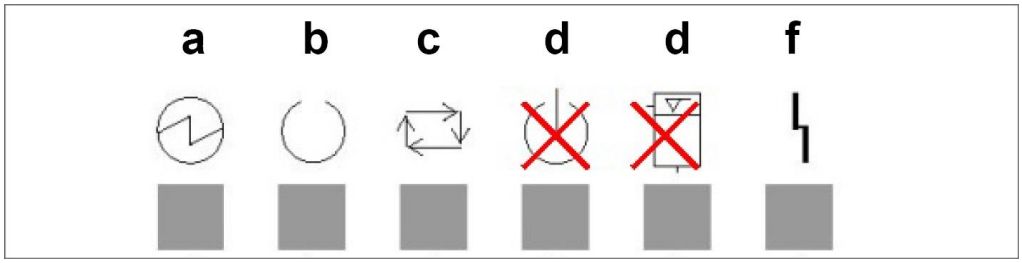


*Figure 4: Operating states (*feeding unit*)*

Item	Designation
a	**Feeding unit ready** LED lights up when line voltage is supplied.
b	**Operation** LED lights up when vibration drive is in operation.
c	**Automatic** LED lights up with automatic operation being switched on.
d	**No function** LEDs unassigned with HesoMatic-9**.**
f	**Malfunction** LED lights up in case of malfunction.

6.5 Special functions (feeder control)

Under the cover cap on the front panel of the device, there are adjustment elements for special functions.

The jumper and potentiometer have been preset by the factory and do not normally have to be adjusted.

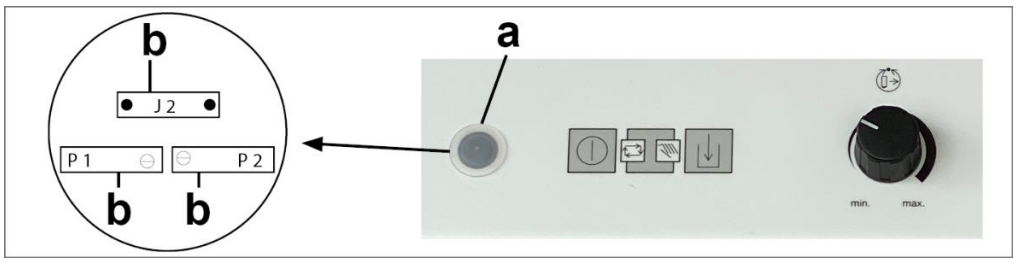


Figure 5: Potentiometer and jumper for special functions (feeder control)

a	Cover cap
b	J 2 jumper to switch between BMK and BMS mode • BMK mode (preset for feeder operation): J 2 is open. In the light test after switching on, all 6 operating displays light up and then go out again one by one. • BMS mode: J 2 is plugged. In the light test after switching on, all 6 operating displays light up and then go out again at the same time.
c	P 1: Feeder reload time (only in BMS mode) After each loading process, the vibration drive reloads briefly to guarantee the outlet is sufficiently full. The reload time can be regulated based on the stud diameter. Turning to the left increases the time; turning to the right shortens the time.
d	P 2: Frequency adjustment for the feeder vibration drive.

6.6 Technical data for HesoMatic-9 stud welding system

Designation	HesoMatic-9
Welding procedure	Capacitor discharge stud welding
Standard gun	PS-3A
Welding area	M3 - M8 or Ø 3 - 8 mm with steel, stainless steel, aluminium and brass (M8 or Ø 8 in aluminium and brass limited, depending on the respective requirements)
Power source	Capacitor bank 99,000 µF
Charging voltage	50 - 200 V infinitely variable up/down
Welding sequence	Ø 3 up to 24 studs/min, Ø 8 up to 7 studs/min
Mains connection	230 V, 50/60 Hz, 10 A
Compressed-air supply	5 - 7 bar
Fuse Energy source	M 10 A (fuse 5 x 20 mm semi time-lag)
Fuse Feeder control	2 x T 1 A (time-lag fuse 5 x 20 mm)
Cooling method	F
Protection class	IP 21
Dimensions	430 x 310 x 690 mm (w x h x d) >> Height with holding device 1960 mm
Weight	90 kg (without welding gun)
Filling weight (feeder bowl)	max 6 kg
Colour	RAL 5009 azure blue
Subject to technical changes	

WARNING

Hazards due to wrong fuse

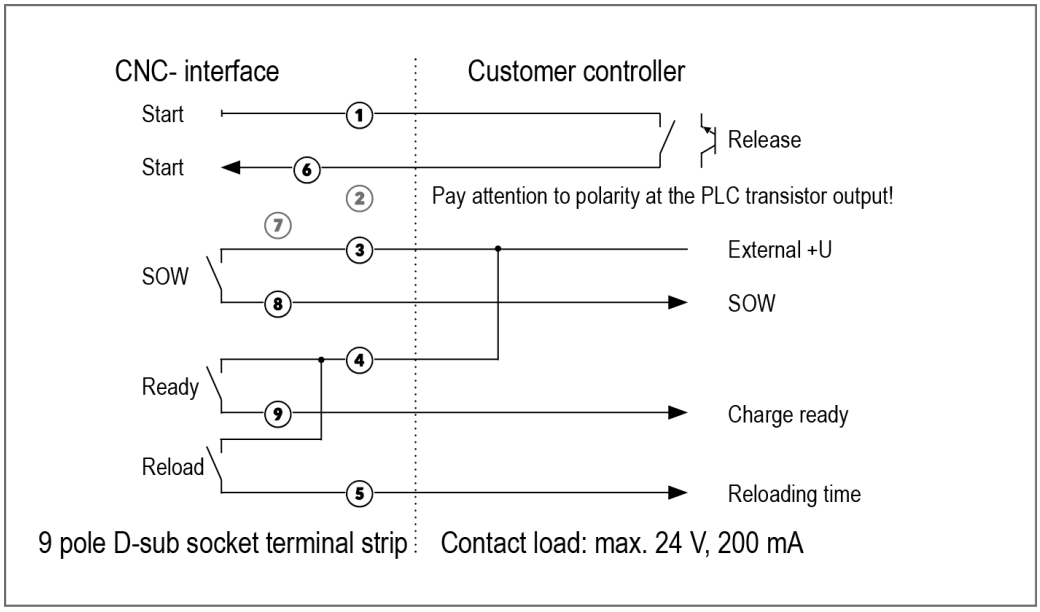
Only replace fuses when mains plug is disconnected!

Should it become necessary to replace fuses, only use fuses with the specified electrical values. Oversized fuses could either cause defects on the electrical system or a fire.

6.7 Interface HesoMatic-9

CNC interface

The CNC interface is intended for control and communication, e.g. with a coordinate table CNC stud welding system.



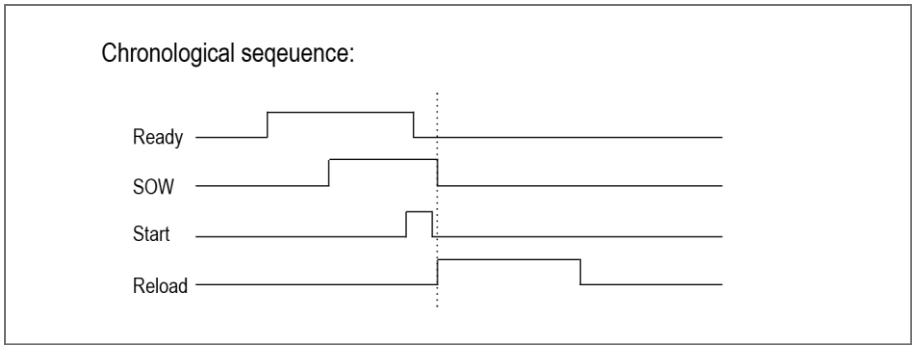
Definitions of terms:

Start: Contact triggers the welding process.

SOW: Stud on workpiece
Only queried if the device is operated with a higher-level control system. Contact is set when workpiece contact is made (e.g. head in ahead position).

Ready: Contact is set once the specified charge voltage is reached.

Reload: Contact is set during the reloading time.
(After the head is removed from the welded stud).



Reloading is initiated when the head is removed from the welded stud. We recommend setting a holding time of approx. 500 ms after a stud is positioned on the workpiece (SOW) as well as after welding. This ensures that the welded area can settle down before and after welding.

6.8 Permitted welding guns

WARNING

Hazards due to wrong gun

Hazards for the operator may occur when a wrong welding gun is used.

- Only use welding guns hereinafter permitted by Soyer GmbH.

The use of other guns or guns from another manufacturer will invalidate the declarations of conformity and warranties of Soyer GmbH.

Permitted stud welding gun for automatic operation

Gun	Note
PS-3A	Standard gun (M3 – M8)

The welding heads SK-5AP and SK-5AKS are also approved for use in automated systems.

Overview of permitted welding guns WITHOUT automatic operation

Gun	Note
PS-0K	M3 – M8 (1)
PS-1K	M3 – M8 (1)
PS-3K	M3 – M8 (1)
PS-3K Stativ	M3 – M8 (1)
PS-9	M3 – M8
PS-9K	M3 – M8
PS-2KS	M3 – M8
PS-3	M3 – M8 (1)

(1): Possible with optional adapter plug and adapter cable.

Adapter plug for the welding cable: BMK25/SK50 #E04027
Adapter cable for control cable: 7-pin plug/15-pole socket #F06009/FA

6.9 Cleaning the stud welding system

DANGER

Hazards during cleaning

Improper cleaning of the devices can endanger personnel.

- The device may only be cleaned by trained specialists.
- Prior to starting work, the stud welding system must be disconnected from the mains power supply and secured against accidental switch-on.
- Work on electrical devices and modules may only be carried out by skilled electricians in accordance with the electrotechnical regulations.
- Disconnect the main air feed at the back panel of the device.
- Make sure that no detergents get into the device.

Do not use aggressive detergents for cleaning the device.

Make sure that any cleaning waste is disposed of in an environmentally safe manner. Comply with the instructions of the detergent manufacturer.

CAUTION

Damage to the device due to incorrect cleaning

Improper cleaning may cause damage to the device.

- Make sure that no detergents get into the device.
- Do not use aggressive detergents for cleaning the device.

The frequency of cleaning depends on the operating conditions of the devices.

7 Description of the feeding unit (feeder)

The feeding unit is intended to transport the stud into the welding gun or welding head automatically.

A vibration drive transmits vibrations to the feeder bowl. The studs move clockwise from the base of the feeder bowl to the stud escapement via spiral-shaped steps travelling upwards.

The feeder bowl is fitted with a step width adjustment to strip off studs lying on top of one another, or to separate studs sitting next to one another. After the studs have run through the separating device, the individual studs move into the outlet rail through the vibration and hang in a vertical position.

When transporting tapped studs, it cannot be ruled out that the ignition tip in the internal thread may become entangled in a preceding or subsequent tapped stud. The air flow of an air nozzle separates the entangled tapped studs before they are fed into an inclined plane where they are transported to the slide.

A compressed air cylinder moves the stud retainer, which serves to hold the studs, under a hose retainer. Compressed air is fed through a blow air nozzle which blows the studs and moves them into the stud welding gun or the welding head via the stud feed hose.

The feeder intensity can be adjusted via a potentiometer. This is controlled via a control panel with membrane keypad. LED display and signal transmitters on the stud escapement enable a regulated function in both continuous or automatic mode.

7.1 Safety information with automatic operation

⚠WARNING

Risk due to accelerated welding studs

The welding studs are transported using compressed air and are therefore greatly accelerated.

- Always ensure that the stud feed hose is intact.
- Each time, before you start the system, check that the stud feed hose is correctly inserted on both sides, into the feeding unit (feeder) and the gun.
- Only use stud feed hoses from Soyer GmbH.
- Never bridge the safety pressure switch at the cover hood (do not trigger the switch if the protective hood has been removed).
- Do not carry out a functional check when the cover hood is opened and the compressed air is connected.
- Regularly check that the safety interlock at the stud feed hose connection piece moves smoothly.
- Only ever use system parts which are coordinated with the stud diameter being transported (see chapter 7.3 “Converting the feeding unit” on page 34).

⚠CAUTION

Stud feed malfunctions due to misalignment

In the feeder, a few screws are marked red (see the example on the right). If these screws become loose, the feeder must be realigned by factory.

- Do not loosen these screws.

7.2 Overview of feeding unit

Complete overview

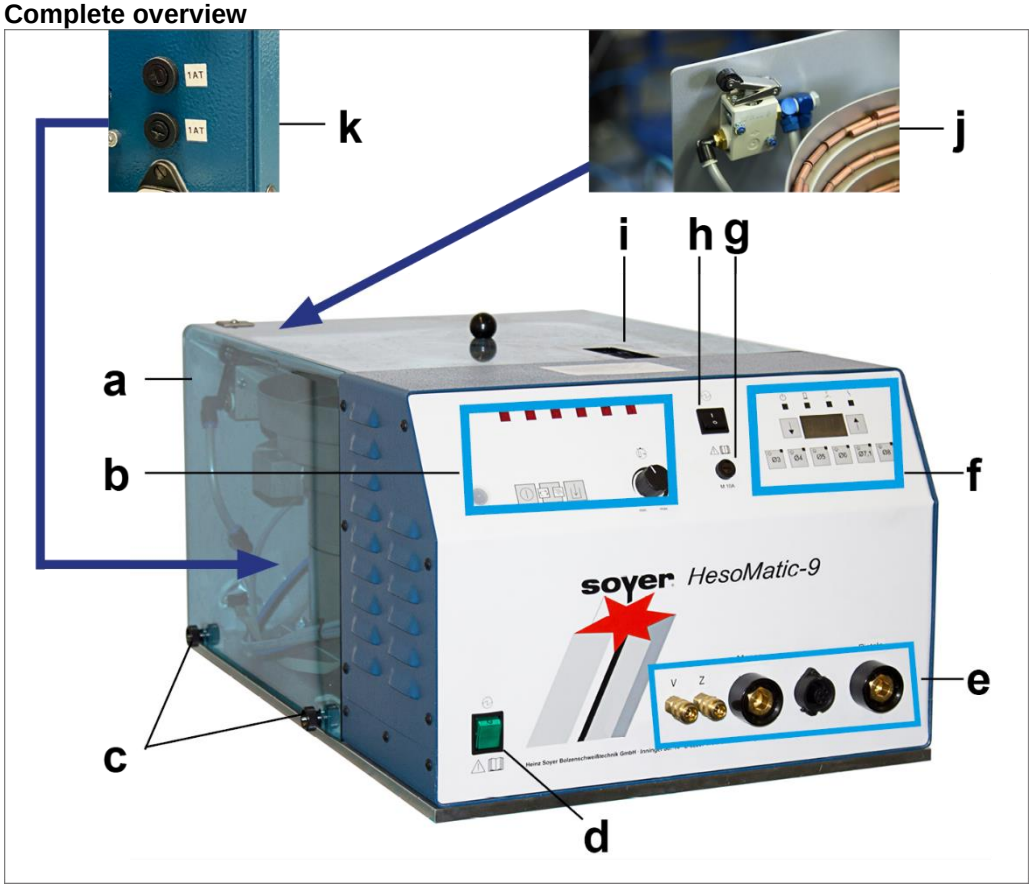


Figure 6: Complete overview of feeding unit

Item	Designation
a	Protective hood
b	Function keys – Feeding unit (see “6.3.1 ” on 21 ff.)
c	Both sides, locking screws for the protective hood
d	Main on/off switch (feeding unit)
e	Connections of stud welding gun (see “6.3.1 ” on page 21 ff.)
f	Function keys (welding device) (see “6.3.1 ” on page 21 ff.)
g	Fuse element 10 A (fuse 5 x 20 mm semi time-lag) - welding device
h	Main switch (welding device) for turning the device on/off
i	Feed opening for the stud feed hose
j	Safety switch to disconnect the compressed air when the protective hood is not attached. **⚠WARNING** **The safety switch must not be bridged!**
k	Fuse element 2 x 1 A (time-lag fuse 5 x 20 mm) - feeding unit

Transport area

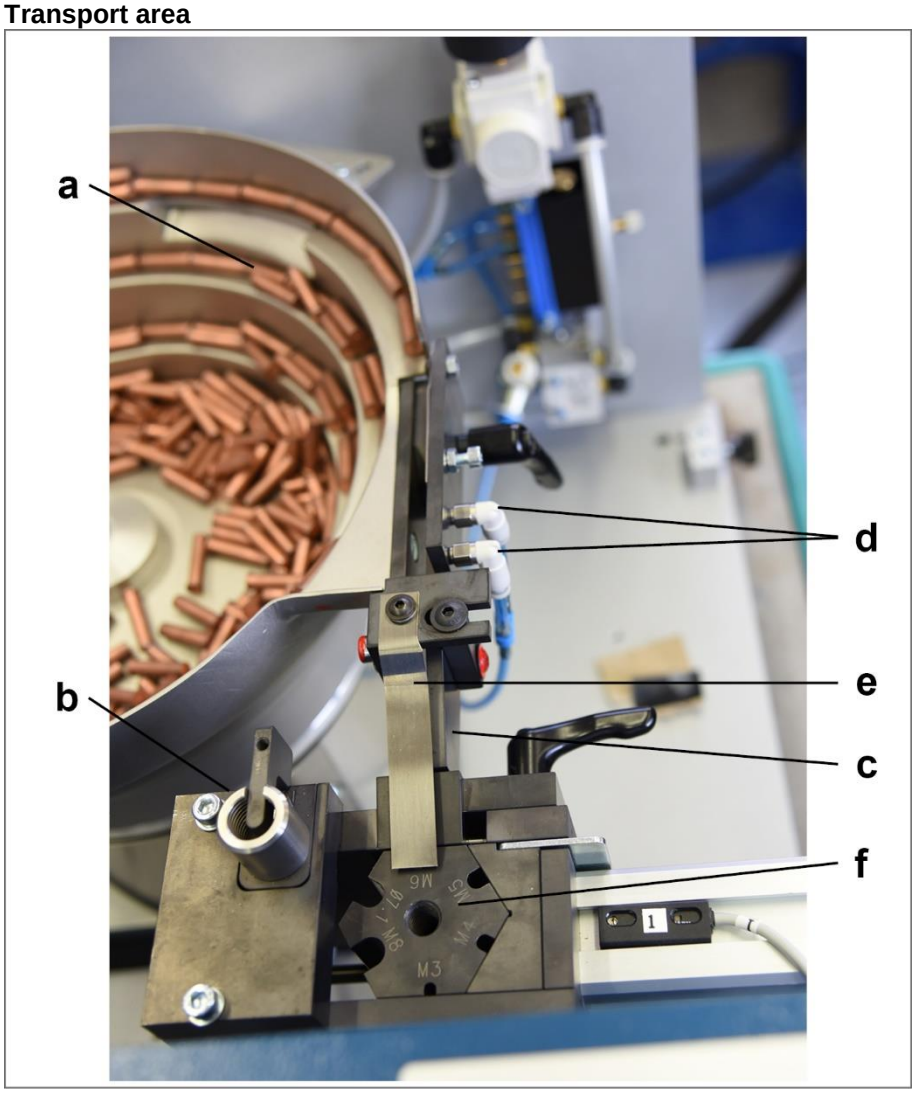


Figure 7: Overview of the transport area

Item	Designation
a	Feeder bowl with welding studs
b	Connection piece for the stud feed hose (replaceable part)
c	Outlet rail (replaceable part)
d	Blow-off nozzle to separate studs from on top of one another
e	Hold-down plate
f	Stud retainer

7.3 Converting the feeding unit

The feeding unit must be converted and/or readjusted when the stud type is changed, according to the studs being used.

Always convert all the required parts, as malfunctions otherwise may occur.

To convert the feeding unit for another stud size, there is a conversion set available with the parts which need to be changed.

The parts being converted are labelled according to the stud diameter they must be installed for.

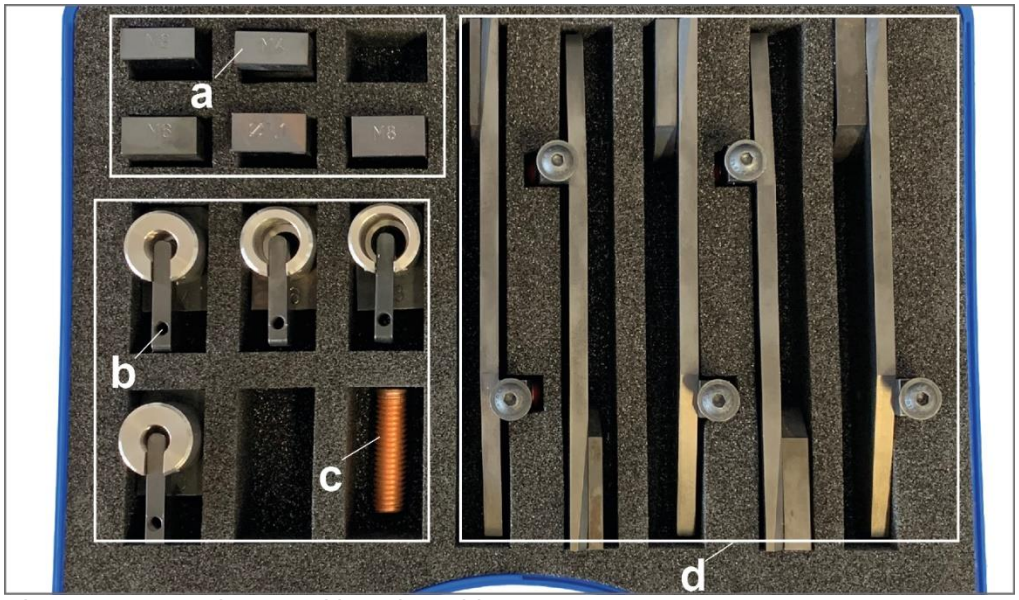


Figure 8: Conversion set with replaceable parts

Item	Designation
a	Limit stop distance plates
b	Connection pieces for the stud feed hose
c	Threaded studs M10, aid to remove the stud retainer
d	Outlet rails with distance piece

All conversion set parts can be ordered separately. For this, please observe chapter “16.1 Feeder conversion set” on page 83.

7.3.1 Carrying out the conversion

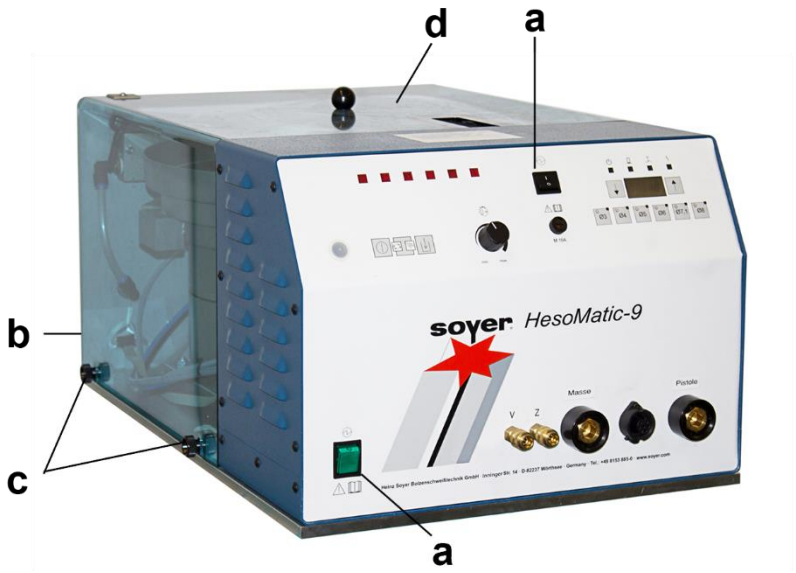
The following describes which tasks are required to convert the feeding unit to a different stud diameter.

CAUTION

Risks when the device is switched on

Before carrying out any conversion work, the following applies:

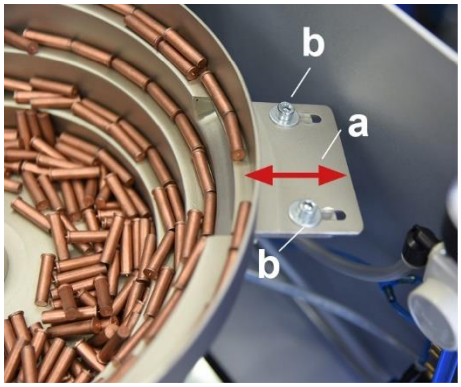
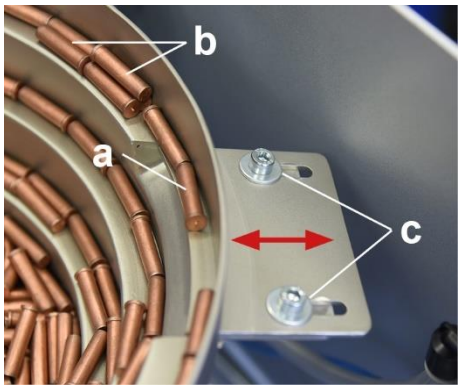
- Turn off both device switches (a).
- Disconnect the main air feed (b) at the back panel of the device.
- Remove the cover hood (d) via the fastening screws (c) on both sides.



Adjusting the step width

The step width is the width of the spiral-shaped upward steps in the feeder bowl. The continuous adjustment of the step width guarantees the separation of studs sitting next to one another, which would cause a malfunction if they reached the outlet rails.

Adjusting the step width

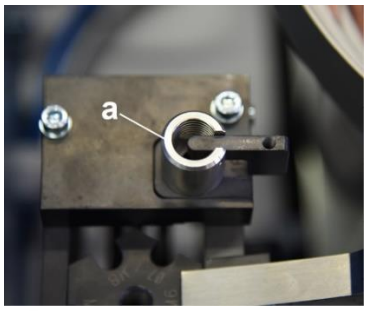
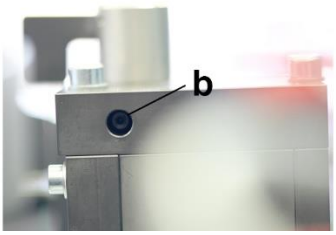
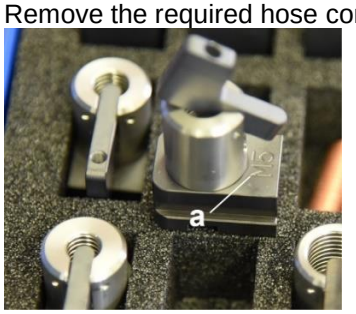
Step 1:	Turn off the device switch, disconnect the main air feed and remove the cover hood.
Step 2:	To adjust the step width, there is an adjustable plate (a) on the feeder bowl. To adjust the plate, loosen both clamp screws (b). 
Step 3:	Adjust the plate so that only one stud can lie across the whole retainer surface (a). Studs which are parallel to one another or on top of one another (b) then fall off the plate. After the adjustment, tighten the clamp screws (b) again. 
The step width is adjusted.	

Converting the feeding unit (feeder)

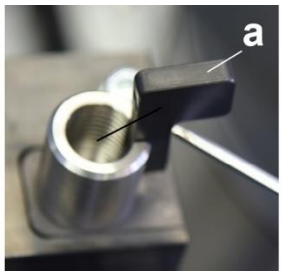
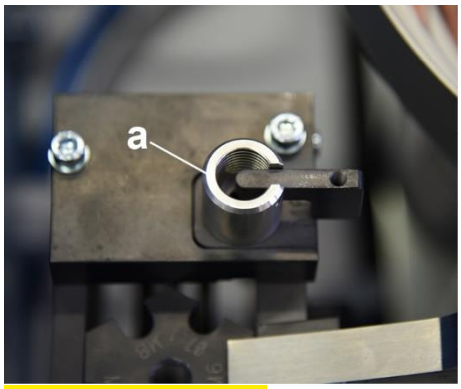
To convert the feeder to another stud diameter, the following actions must be taken:

- Replace the connection piece for the stud feed hose
- Replace the stud feed hose
- Replace the outlet rail
- Replace the limit stop distance plate
- Convert the stud retainer

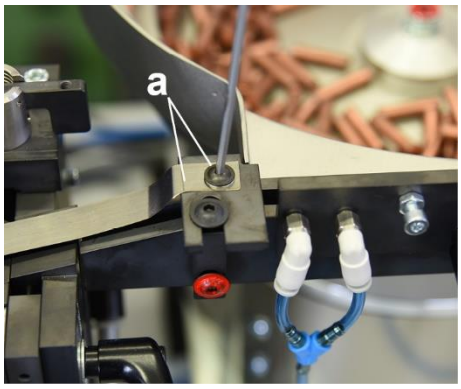
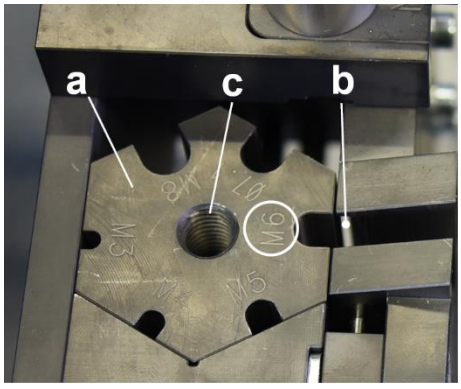
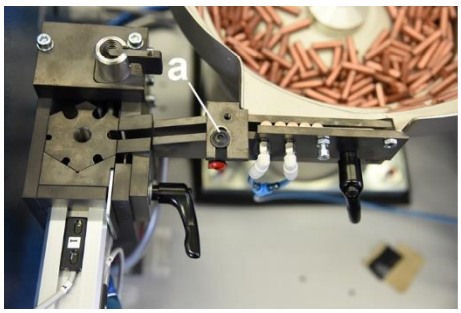
Replacing the connection piece for the stud feed hose

Step 1:	Turn off the device switch, disconnect the main air feed and remove the cover hood.
Step 2:	Remove the hose connection (a) from the feeder.  **The hose connection is fastened with a spring-loaded pin. Through the bore hole of the top panel (b), you can loosen or re-attach the threaded pin with an Allen key if required.** 
Step 3:	Remove the required hose connection from the conversion set.  **Each hose connection is labelled with the stud diameter it must be used for (a).**

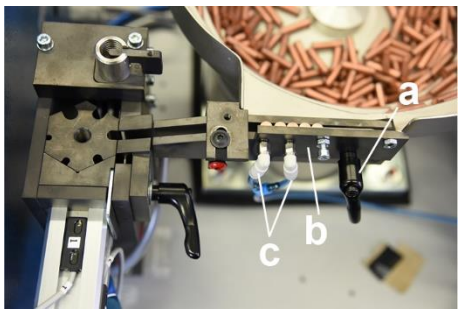
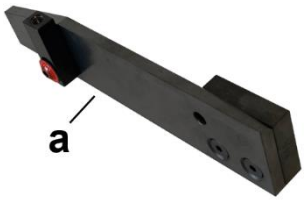
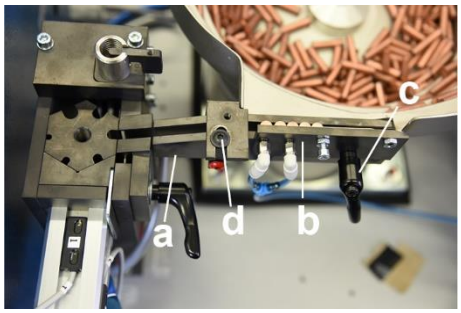
Replacing the connection piece for the stud feed hose

Step 4:	Ensure that the safety interlock (a) is unobstructed and can be moved easily. 
Step 5:	Insert the correct hose connection (a).  **⚠CAUTION** **Ensure that the spring-loaded pin clicks into place (see step 1).**
Step 6:	Insert the correct stud feed hose. Ensure that the hose end is clean, straight and free of burrs. Lightly chamfer the internal diameter of the hose, to avoid studs becoming stuck (e.g. with the 60° countersink F04922 from Soyer). Insert the hose into the connection piece until the stop.
The hose connection has been replaced. To replace the stud feed hose on the gun, please observe chapter “8.1 Inserting the stud feed hose on page 50.	

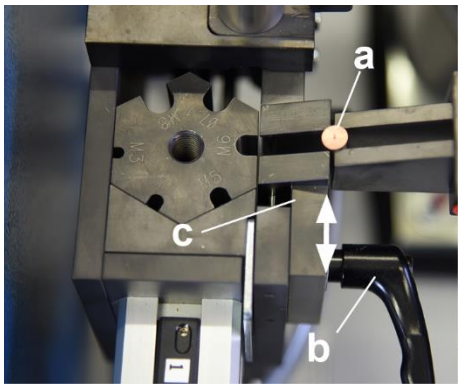
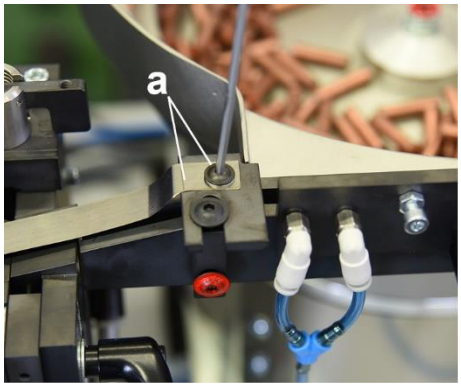
Replacing the outlet rail and rotating the stud retainer

Step 1:	Turn off both device switches, disconnect the main air feed and remove the cover hood.
Step 2:	Remove the hold-down plate with the fastening screw (a) above the outlet rail. 
Step 3:	Remove the stud retainer (a) and rotate the desired diameter to the outlet rail (b).  **To remove and insert the stud retainer, use a screw or a stud with diameter M 10 which you screw into the centre (c).** **⚠CAUTION** **Remove the screw/stud again after inserting the barrel.**
Step 4:	Loosen the fastening screws (a). 

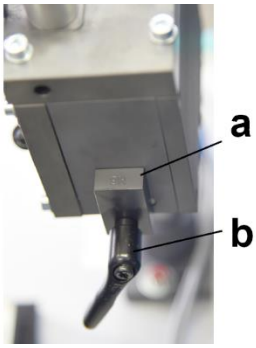
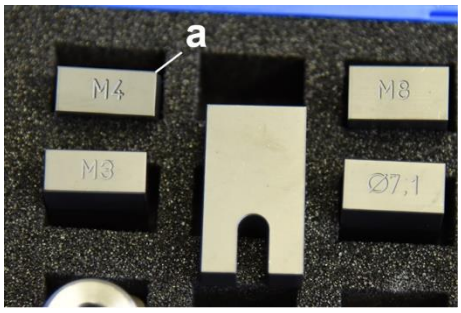
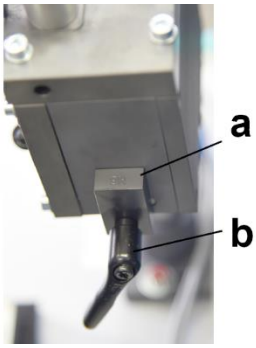
Replacing the outlet rail and rotating the stud retainer

Step 5:	Open the tommy screw (a) and remove the panel (b) with the compressed air connection (c).  **⚠CAUTION** **Ensure that the compressed air line and the compressed air nozzle are not damaged by this.**
Step 6:	Replace the outlet rail (a). Remove the required outlet rail (a) from the conversion set.  **Each outlet rail is labelled with the stud diameter it must be used for.**
Step 7:	Insert the outlet rail (a) and the panel with the compressed air connection (b). Fasten both with the tommy screw (c) and the fastening screw (d).  **⚠CAUTION** **Ensure that the compressed air line and the compressed air nozzle are not damaged by this.**

Replacing the outlet rail and rotating the stud retainer

Step 8:	Take a stud and check that it slides through the outlet rail transition (a) without getting caught. If not, open the tommy screw (b) and push the block on the transition (c) until there is a clean, aligning transition. 
Step 9:	Attach the hold-down plate with the fastening screw (a) above the outlet rail. 
The outlet rail has been changed.	

Replacing the limit stop distance plate

Step 1:	Turn off both device switches, disconnect the main air feed and remove the cover hood.
Step 2:	Remove the limit stop distance plate (a) by opening the tommy screw (b). 
Step 3:	Remove the required limit stop distance plate from the conversion set.  **Each limit stop distance plate is labelled with the stud diameter it must be used for (a).**
Step 4:	Attach the limit stop distance plate (a) and clamp it with the tommy screw (b). 
The limit stop distance plate has been changed.	

7.4 Adjusting the feeding unit

Various adjustments can be made to the feeding unit to optimise operation and to remove operational process malfunctions. For this, see also chapter “7.5 Correcting malfunctions of the feeding unit ” on page 47 and chapter “11 Converting/adjusting the automatic system” on page 64.

7.4.1 Adjusting the blow air regulator

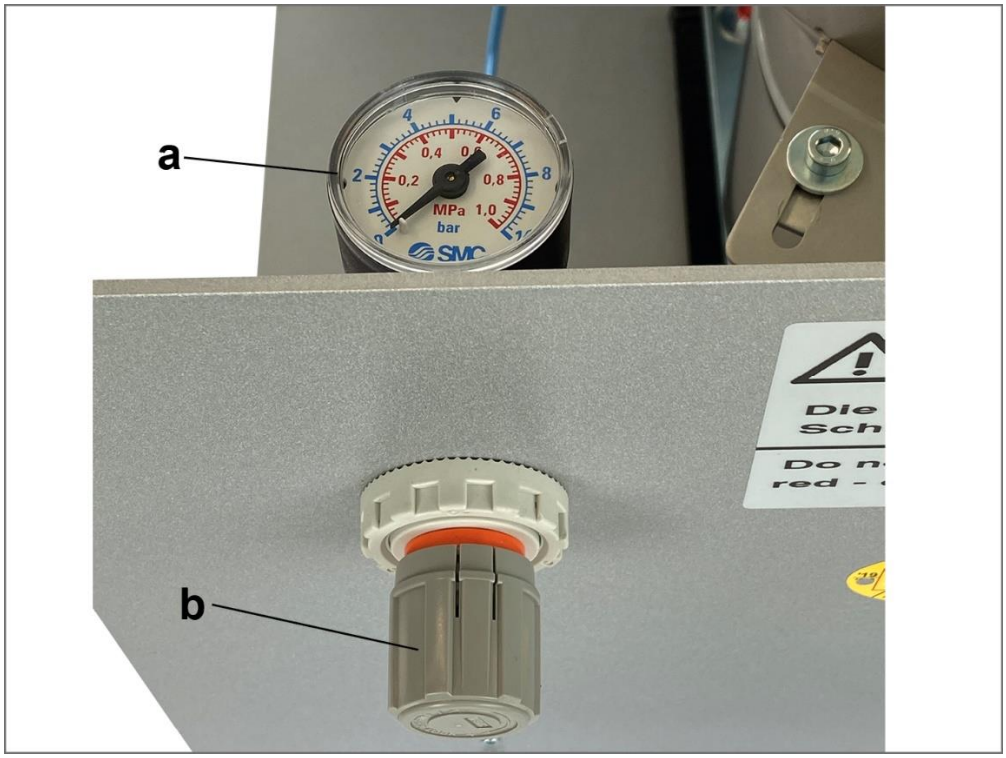


Figure 9: Blow air regulator

Item	Designation
a	Manometer
b	Pressure regulator Pull out to make the adjustment, push back in after adjusting the pressure.

With the blow air regulator, you can adjust the pressure for transporting the studs through the stud feed hose to the gun.

For example, the pressure required depends on the stud diameter and weight, as well as on the length of the stud feed hose.

Here, observe the maximum permitted pressure (see chapter “6.6 Technical data for HesoMatic-9 stud welding system” on page 26).

7.4.2 Adjusting the blow-off nozzles

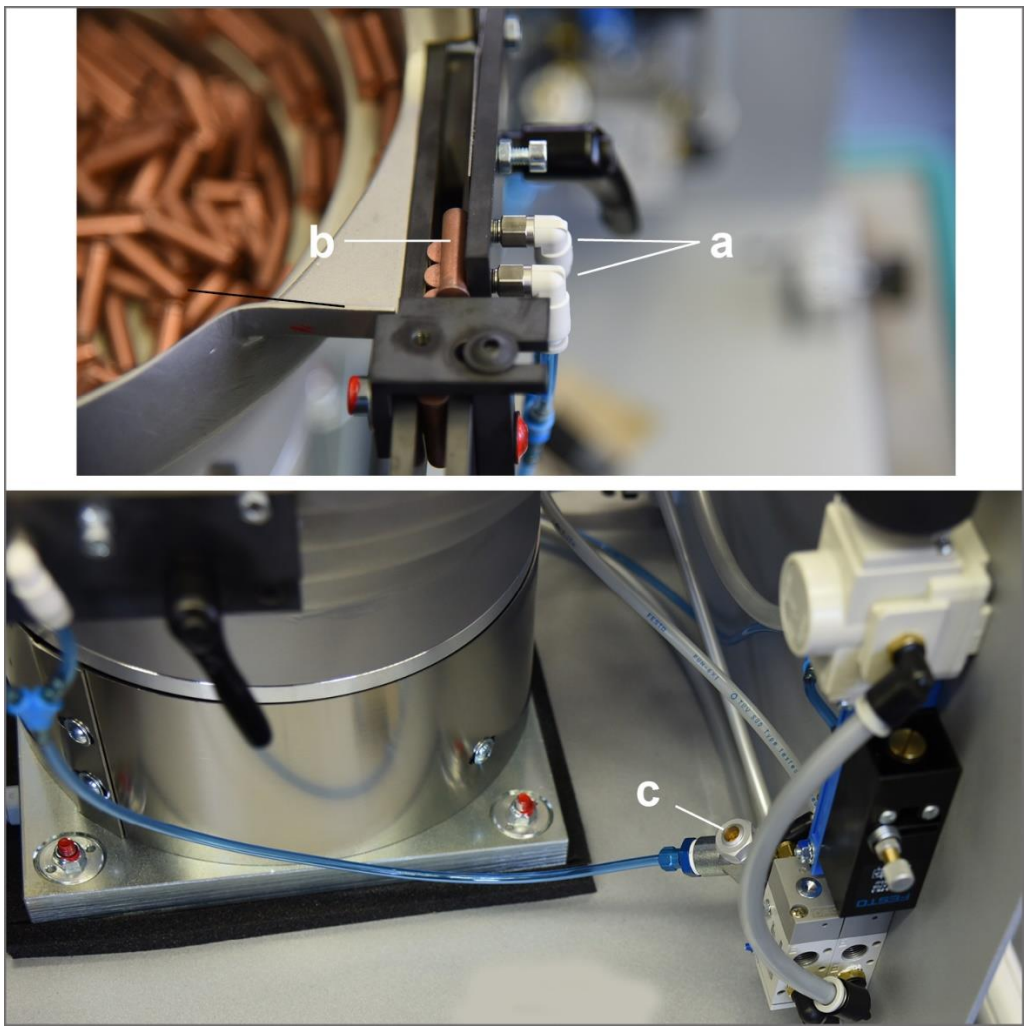


Figure 10: Blow-off nozzles

Item	Designation
a	Blow-off nozzles
b	Part being blown off (example)
c	Valve for regulating the blow-off air

The blow-off nozzles prevent an incorrectly positioned stud from being transported further. The blow-off air is adjusted via a central valve.

7.4.3 Adjusting the transport speed of the weld studs

The knob for adjusting the transport speed of the studs in the feeder bowl is located on the front panel of the device.

• Min.: Minimum transport speed
• Max.: Maximum transport speed

The transport speed to be adjusted depends on the type and size of the welding studs.

The welding studs must be transported upwards evenly, without gaps and without being pushed on top of one another.

7.4.4 Readjusting the limit switch

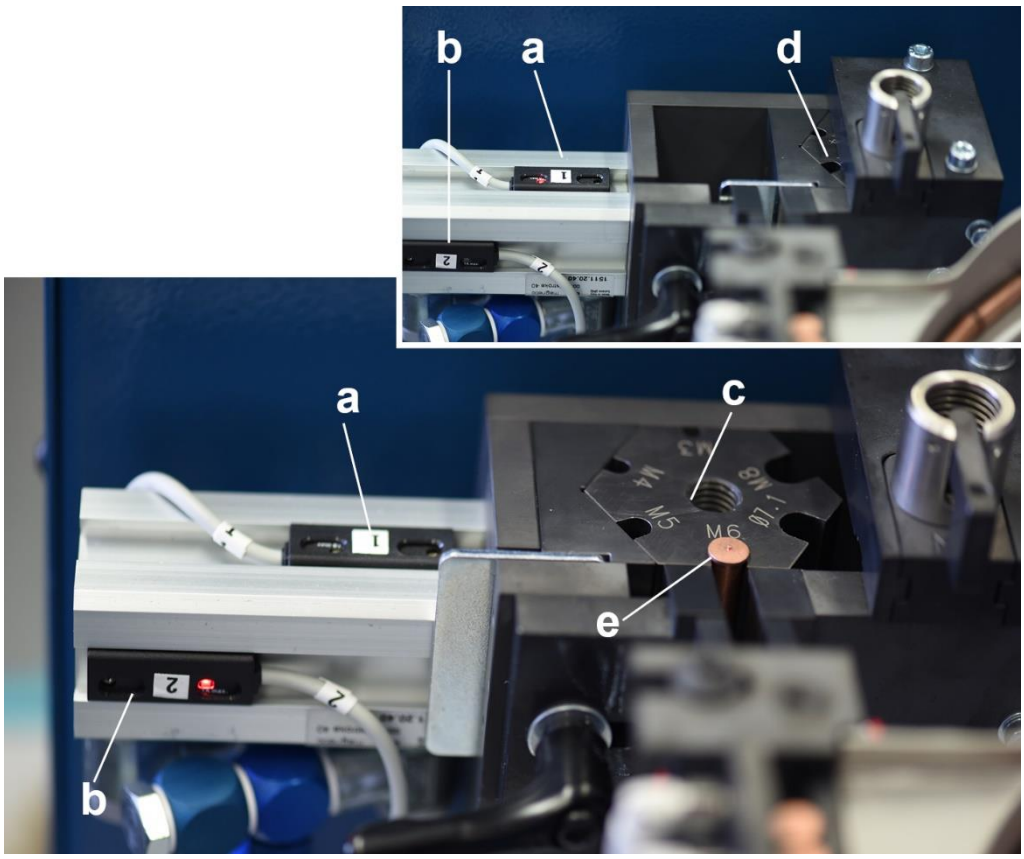


Figure 11: Limit switch for the feed slide with stud retainer

Item	Designation
a	Feed position limit switch The limit switch (lit up) is active when the stud retainer is in the feed position under the stud feed hose (item d).
b	Limit switch transfer position The limit switch (lit up) is active when the stud retainer is in the transfer position to hold the stud (item c).
c	Stud retainer in the transfer position to hold the stud.
d	Stud retainer in the feed position under the stud feed hose.
e	Stud

The limit switches must be readjusted when they are not active in the respective position of the slide (not lit up). If the limit switches are not active, no notification about the end position of the slide is issued to the controls, and the system stops.
To adjust this, the compressed air remains switched off and the device main switch is connected to power.
Push the feed slide into the end position of the limit switch being adjusted. Then, move the limit switch until its LED lights up.

7.5 Correcting malfunctions of the feeding unit

WARNING

Risk due to accelerated welding studs

The welding studs are transported using compressed air and are therefore greatly accelerated.

- Before correcting the malfunction, switch off the device at the main switch.
- Before correcting the malfunction, switch off the compressed-air supply. Be aware of any compressed air that may still be present.

The following table describes the most frequently occurring malfunctions and how to correct them.

Feeder malfunctions and how to correct them

Malfunction	Possible cause/remedy
The feeder is not conveying any studs.	The system is not switched on. • Turn on both device switches. The pilot lamps “Network” and “Automatic” must light up (the feeding unit is only able to function when the energy source is switched on).
	The control cable and/or mains cable are not connected properly or they are damaged. • Connect the cable properly or inspect it for damage and replace if required.
A stud has become stuck in the air gap between the outlet rail and stud escapement	Insufficient studs in the outlet rail. • Press the “Operating mode” button to switch the vibration drive briefly to continuous operation.
	Incorrect, too-small replacement set installed. • Check the conversion parts and install them according to the stud diameter.
	Insufficient quality of the welding studs. • Only use SOYER® welding studs which are suitable for automated systems.
A stud falls through the outlet rails or into the stud escapement.	Insufficient quality of the welding studs. • Only use SOYER® welding studs which are suitable for automated systems.
	Outlet rail or stud escapement is set for too great a diameter. • Use the correct distance piece according to the stud diameter.

Feeder malfunctions and how to correct them

The transport speed of the studs in the feeder bowl is too slow.	Potentiometer for transport speed is too close to “min”. • Turn the potentiometer for transport speed towards “max”.
	The permitted stud fill quantity has been exceeded. • Observe the maximum stud fill quantity of 6 kg, remove studs again if necessary.
The feeder drive is running constantly.	The feeder controls are set to “manual”. The “Automatic” control LED has gone out. • Set the feeder controls to “Automatic”. The “Automatic” control LED lights up.
	A stud is stuck in the outlet rail. The stud cannot reach the front position of the replaceable slide part. • Remove the stuck stud and reposition the outlet rail or stud escapement.
A stud is not blown out of the stud retainer.	The proximity switch is set incorrectly or defective (blow not activated). • Readjust the proximity switch or check its function (turnkey). Replace if necessary.
	The hose connection does not align with the stud retainer or the limit stop is misaligned. • Realign the hose connection with the stud retainer, or readjust the limit stop.
	The stud retainer cannot be moved into the blow-out position (stop) as a foreign object or stud has fallen into the main body of the escapement. • Switch off the compressed air. Switch off the device. Disassemble the stud retainer and remove any foreign objects or studs.
	The stud remains at the transition between the hose connection and the stud feed hose. • Cleanly cut the stud feed hose and chamfer the inside to get rid of burrs.
	The pressure regulator is set too low. • Turn the pressure regulator back up in a clockwise direction. Observe the maximum permitted pressure!
	No compressed-air supply. • Check the compressed-air supply, check the compressed air connection and switch on the compressed air source.
The stud does not reach the welding gun.	The compressed-air supply is not sufficient. • Regulate the pressure (observe maximum pressure).
	Problems with the stud feed hose. • Check the internal diameter. • Check for damage or kinks (and radii which are too small). • Check the hose ends, chamfer the inside of the hose end if necessary.

8 Description of the PS-3A stud welding gun

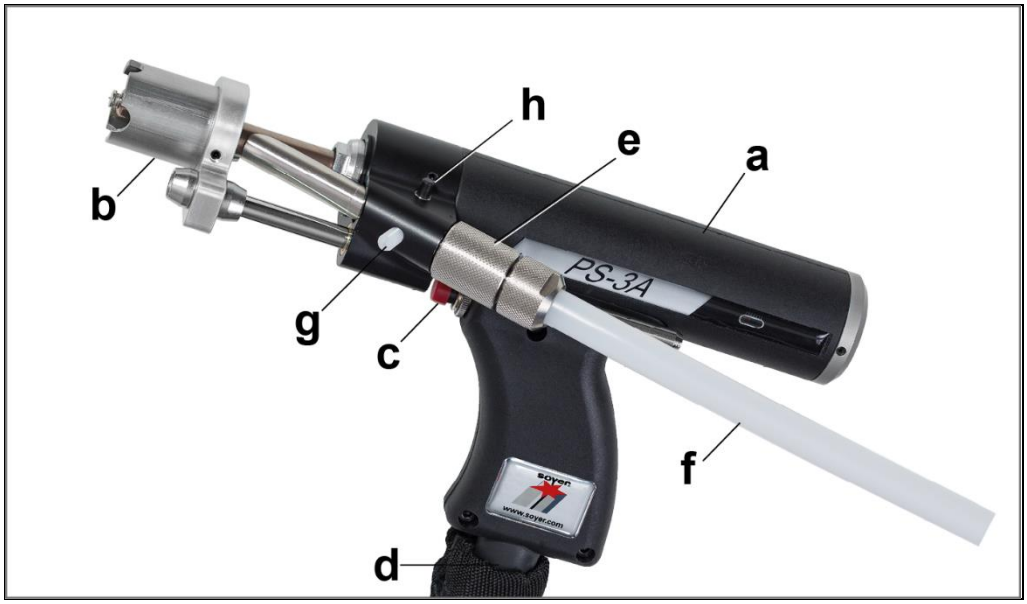


Figure 12: PS-3A stud welding gun

Item	Designation
a	PS-3A stud welding gun, gap welding gun with lifting magnet
b	Support tube
c	Release button
d	Welding and control cable for connection with the stud welding system
e	Stud feed pipe
f	Stud feed hose
g	Plastic clamping screw for the stud feed pipe
h	Locking pin to click the stud feed pipe into place

The gun is equipped with a lifting magnet. The stud is lifted by a magnet before the welding process and lowered automatically for welding (gap welding gun).

The height of the lift is also decisive for the welding result.

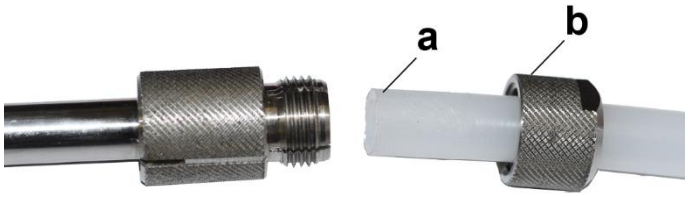
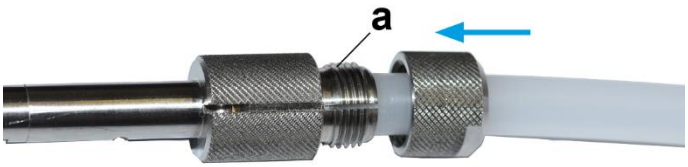
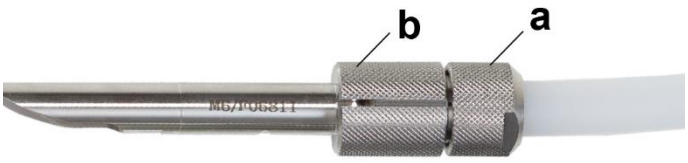
The height of lift can be determined via the lift time using the HesoMatic-9 stud welding system. See chapter “11.3.3 Adjusting the lift time (height of lift) in the setting mode” on page 72.

The PS-3A stud welding gun may only be operated with the stud welding devices specified in the technical data.

8.1 Inserting the stud feed hose

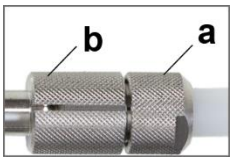
The stud feed hose is inserted into the stud feed pipe. Ensure that the stud feed pipe and hose are suitable for the desired stud diameter. Please observe chapter “16.2 Spare and wear parts for the gun and stud chuck” on page 85.

Inserting the stud feed hose

Step 1:	With the stud feed hose, ensure that the hose end (a) is straight, clean and free of burrs. Place the stud feed pipe union nut (b) onto the hose. 
Step 2:	Insert the hose into the stud feed pipe (a) until the stop. 
Step 3:	Manually rotate the union nut (a) onto the stud feed pipe (b) until the stop. 
The assembly is complete. Insert the stud feed pipe into the gun as described in chapter “9.2 Inserting the stud chuck and stud feed pipe” on page 55.	

To avoid damage to the gun, please observe the following information:

The spanner surface (a) on the union nut serves merely as an aid for opening the union nut, and not for tightening the union nut with an open-end spanner.



When opening and closing the union nut, always hold onto the stud feed pipe (b).

This applies in particular if the hose is to be changed and if the stud feed pipe is still installed in the gun.

For this reason: To avoid damage to the clamp of the stud feed pipe in the gun, it is recommended to always remove the stud feed pipe from the gun when changing the hose.

8.2 Technical data for the PS-3A stud welding gun

Technical data for the PS-3A stud welding gun

Designation	PS-3A stud welding gun
Item no.	P02147
Welding procedure	Capacitor discharge stud welding
Stud diameter	M3 - M8 (depending on the stud welding device used)
Stud chuck	Adjustable
Stud length	Adjustable stud chuck up to a maximum of 35 mm Longer stud lengths with optional accessory possible
Stud welding devices	The gun is approved for operation on the following SOYER® stud welding devices: • BMS-9 Automatic • BMS-9V Automatic • HesoMatic-9
Weight	4.1 kg with cable (without stud chuck and feed pipe)
Subject to technical changes	

8.3 Cleaning the stud welding gun

On a regular basis, remove slag and welding spatters from the gun and the support tube using a suitable tool.

The frequency of cleaning depends on the operating conditions of the stud welding gun.

⚠CAUTION

Risk of injury during cleaning

Welding spatters and slag can have sharp edges.

- Wear protective gloves when cleaning.

We recommend the use of SOYER® separating spray to prevent impurities from welding spatters and slag and to simplify the cleaning process (order number: M01464).

9 Description of the stud chuck for the PS-3A

In principle, the welding gun is provided with a stud chuck that matches the welding stud.

Corresponding to the stud diameter, stud chucks must be installed/changed in the gun.

The following describes the adjustable stud chuck for the automatic gun PS-3A.

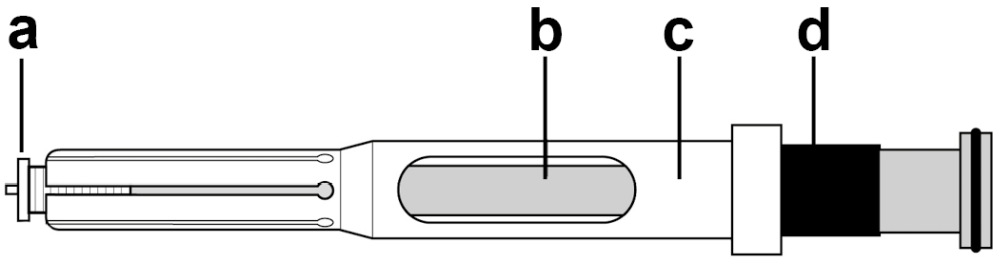


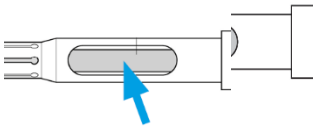
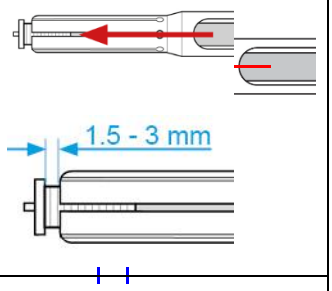
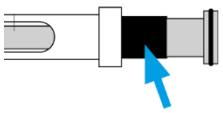
Figure 13: Stud chuck for PS-3A stud welding gun

Item	Designation
a	Stud
b	Plunger
c	Stud chuck
d	Distance sleeve

9.1 Adjusting the stud chuck

You require several conversion parts to convert and adjust the stud chuck. For this, please observe chapter “16.2 Spare and wear parts for the gun and stud chuck” on page 85.

Adjusting the stud chuck

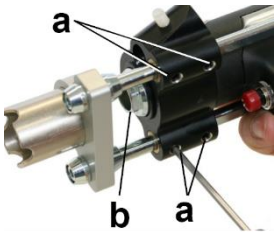
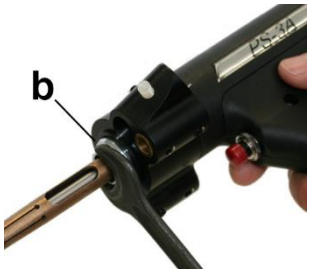
Step 1:	Select the appropriate conversion set for the stud diameter.	
Step 2:	Place the stud in the lateral opening of the stud chuck. The ignition tip of the stud must point in the direction of the stud chuck collet (here to the left).	
Step 3:	Insert the plunger into the stud chuck and using the flange, push the stud through the collet in such a way that the stud protrudes between 1.5 mm and 3 mm above the stud chuck with its flange upper edge.	
Step 4:	Place a distance sleeve or filling distance part combination between the plunger and the stud chuck.	
The adjustment is complete.		

9.2 Inserting the stud chuck and stud feed pipe

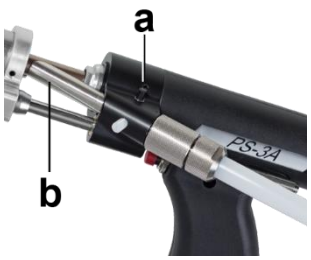
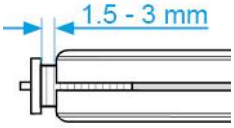
For this, see also chapter “8.1 Inserting the stud feed hose on 50, which describes how the stud feed hose is inserted into the stud feed pipe.

To avoid damaging the gun bracket, the hose should first be inserted into the stud feed pipe before the stud feed pipe is mounted into the gun.

Inserting the stud chuck and stud feed pipe

Step 1:	**WARNING** **Turn off both device switches when the gun is connected to it and remove the main compressed-air supply.**	
Step 2:	Set the stud chuck to the desired stud (see chapter “9.1 Adjusting the stud chuck” on page 54). **In the following steps, the stud chuck containing a stud is inserted.**	
Step 3:	Replacing the stud chuck is made easier by disassembling or moving the support. To do this, loosen the four Allen screws (a). Remove the union nut (b).	
Step 4:	Use the plunger to push the stud chuck into the air cylinder (a) until the stop. **Pay attention to the installation position (guide pin) of the stud chuck!** Then, fix the stud chuck in place with the union nut (b).	 

Inserting the stud chuck and stud feed pipe

Step 5:	Press the locking pin on the top of the gun (a) and slide the stud feed pipe (b) through the support retainer until the stop. **Pay attention to the installation position of the stud feed pipe (position pin)!** The stud feed pipe clicks into place.	
Step 6:	Secure the stud feed pipe with the plastic screw (a) at the side.	
Step 7:	Before installing the support, check that the stud still protrudes 1.5 to 3 mm (see chapter “9.1 Adjusting the stud chuck” on page 54 above the stud chuck. If not, the stud must either be moved into this position manually or the gun must be hit with compressed air for the plunger to push the stud and position it.	
Step 8:	Assemble the support. Adjust the position of the support in such a way that the stud protrudes 1.5 - 3 mm above the support. Fix the support into place after adjusting with the four Allen screws.	 
The assembly is complete.		

10 Setup and connection of the automatic system

The following describes how the devices

- HesoMatic-9 stud welding system
- PS-3A stud welding gun

are connected to power and connect together to the automatic system.

10.1 Requirements for the installation location

The installation location for the devices must be clean and dry. Ensure that ventilation for the device is sufficient. Do not install the automatic system in an unventilated room. There is a danger of overheating.

Ensure that the installation surface is flat, clean and stable.

The installation location and workplace must comply with legal requirements. Ensure that the installation location has a good accessibility for maintenance work.

Make sure that the devices cannot be soiled by dust (especially metal dust or swarf) caused by work in the immediate vicinity (e.g. grinding work).

Danger from humid installation location

There is a danger of electrocution when operating the automatic system in a humid environment.

- The automatic system must only be operated in a dry environment.

Danger from welding vapours

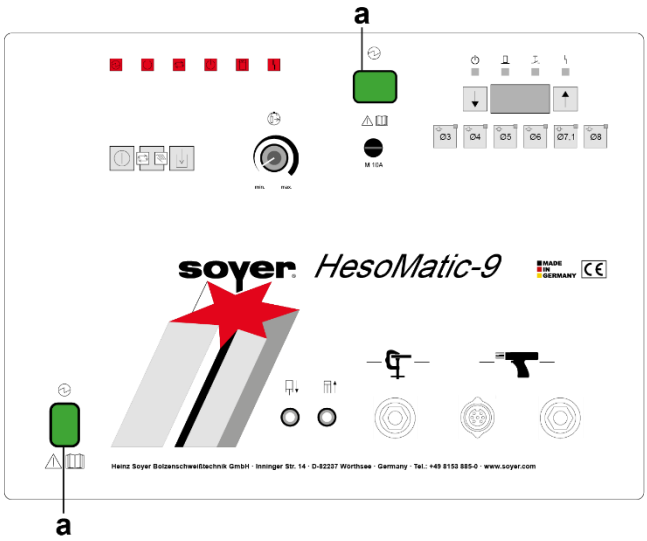
Vapours that are dangerous to health may occur, depending on the material of the workpiece and/or the welding stud.

- Where necessary, ensure suitable extraction of the welding vapours.

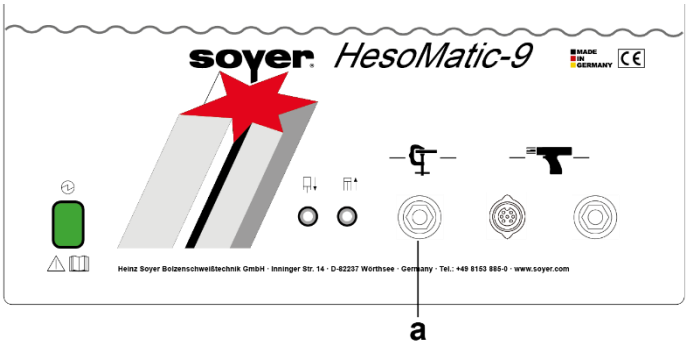
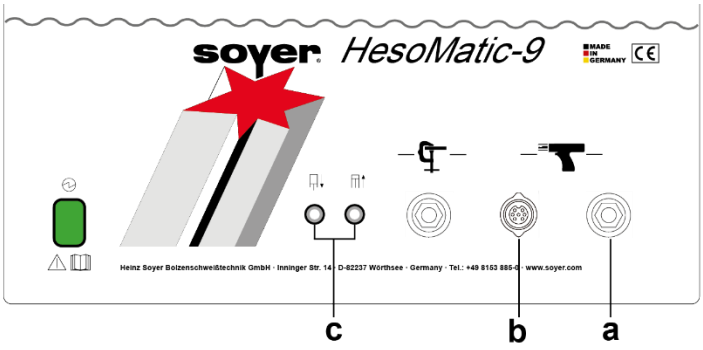
10.2 Connections of the HesoMatic-9 stud welding system

The following describes how to connect the device.

Connecting the front panel of the device

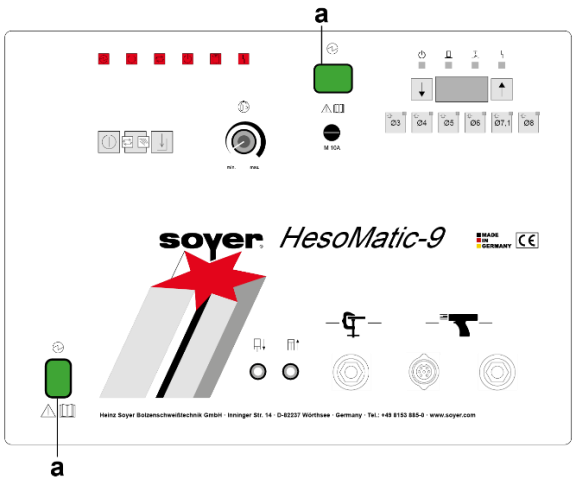
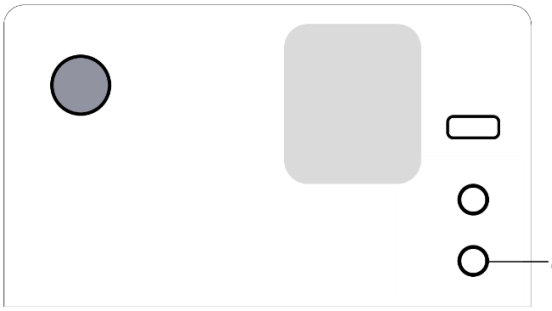
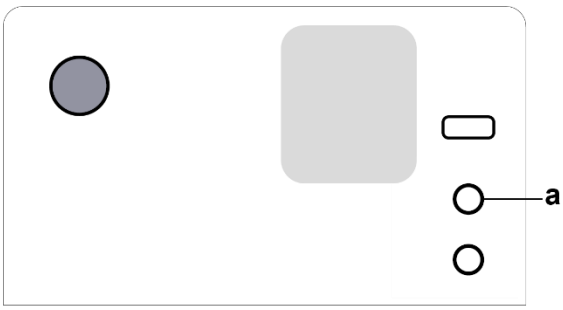
Step 1:	**Device switches OFF?**  Check that both device switches (a) are off.

Connecting the front panel of the device

Step 2:	**Earth connection**  Plug the earth cable connected to the workpiece into the socket (a) and turn the plug to the right up to the stop. See chapter „10.3 Information about connecting the earth cable“ on page 61.
Step 3:	**Gun connection**  Plug the welding cable into the socket (a) and turn the plug to the right up to the stop. Plug the control cable into the control cable socket (b) and tighten the union nut. Connect both compressed air hoses for the plunger (c) from the hose package. **Observe the labelling on the connection and hose, do not mix up!**
The front panel of the device is connected.	

Observe the coloured marking of the cables when connecting them.

Connecting the back panel of the device

Step 1:	**Device switch OFF?**  Check that both device switches (a) are off.
Step 2:	**Earth connection**  Use the mains plug (a) to connect the device to the power supply. See chapter “6.6 Technical data for HesoMatic-9 stud welding system” on page 26.
Step 3:	**Supply air**  Connect the main line to the compressed air supply (a). **Observe the maximum permitted pressure**
The back panel of the device is connected.	

10.3 Information about connecting the earth cable

A secure earth connection must be established between the workpiece onto which the studs are welded and the stud welding system.

Insert the earth cable into the socket and turn the plug to the right up to the stop.

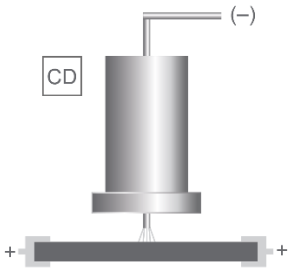
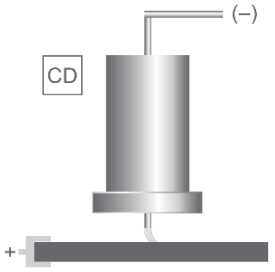
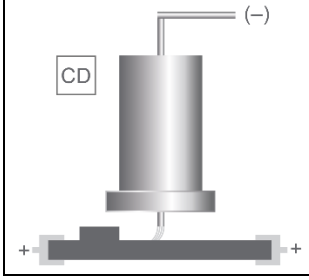
Then connect the earth cable to the workpiece (ensure a conductive connection).

Then attach the earth clamps to the workpiece so that the welding gun is positioned in the centre of the connecting line of the two earth clamps. This guarantees a symmetrical current distribution around the stud as well as good welding results.

Difficult areas are weldings on the edge of the workpiece or great inhomogeneities in material thickness, i.e. the sheet thickness varies by a few millimetres or additional material is welded or riveted to the material. This also includes stud welding on vertical sections.

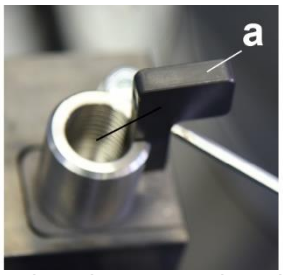
In order to achieve good welding results, carry out several test weldings under different conditions. Simply change the position of the earth clamps or turn the welding gun, for example.

Blow effect due to earth connection or workpiece geometry

Blow effect	Explanation
	Symmetrical earth connection Ideal condition, stud is located in the centre of the two earth connections.
	Asymmetrical earth connection The arc is deflected to the side where there is a lower current density.
	Workpiece geometry Additional workpiece masses disturb the arc symmetry.

10.4 Connecting the stud feed hose

Connecting the stud feed hose

Step 1:	**Stud feed hose**  Insert the stud feed hose into the connection piece (a) until the stop. **The stud feed hose and connection piece must match the stud diameter being processed.**
The stud feed hose is connected.	

CAUTION

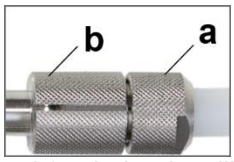
Risk of injury due to ejected welding studs

If the stud feed hose is used incorrectly, or an unsuitable hose is used, there is a risk of injury due to ejected welding studs.

- Only use original stud feed hoses from Soyer GmbH.
- Only ever use stud feed hoses which match the stud diameter.
- Pay attention to the correct and firm position of the stud feed hose in the plug connection of the gun and the feeder.
- Ensure that the stud feed hose is intact. Do not use stud feed hoses that are damaged or worn.
- Do not bend the stud feed hose.

10.5 Connections on the welding guns

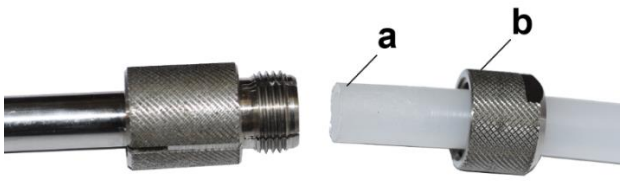
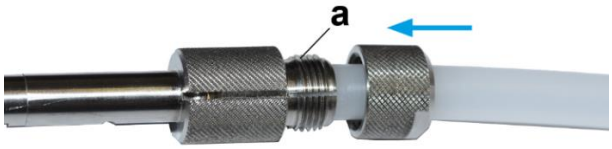
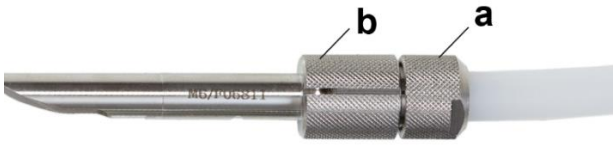
To avoid damage to the gun, please observe the following information:



The spanner surface (a) on the union nut serves merely as an aid for opening the union nut, and not for tightening the union nut with an open-end spanner.
When opening and closing the union nut, always hold onto the stud feed pipe (b).
This applies in particular if the hose is to be changed and if the stud feed pipe is still installed in the gun.

For this reason: To avoid damage to the clamp of the stud feed pipe in the gun, it is recommended to always remove the stud feed pipe from the gun when changing the hose.

Inserting the stud feed hose

Step 1:	With the stud feed hose, ensure that the hose end (a) is straight, clean and free of burrs. Place the stud feed pipe union nut (b) onto the hose. 
Step 2:	Insert the hose into the stud feed pipe (a) until the stop. 
Step 3	Manually rotate the union nut (a) onto the stud feed pipe (b) until the stop. 
The assembly is complete. Insert the stud feed pipe into the gun as described in chapter “9.2 Inserting the stud chuck and stud feed pipe” on page 55.	

11 Converting/adjusting the automatic system

The stud welding system and feeding unit must be matched and adjusted for the respective work.

This requires mechanical adjustment/conversions to the respective stud diameter and programme settings for the respective welding situation.

11.1 Converting the automatic system for the stud diameter

Before the automatic system devices are switched on, you must check that all elements related to the conveying of studs are set to the required stud diameter.
If not, or if the stud diameter is changed, these elements must be converted accordingly.

For this, observe
chapter “9 Description of the stud chuck for the PS-3A” on page 53
chapter “7.3 Converting the feeding unit” on page 34.

11.1.1 Conversion sets

To fit the gun with the correct stud chuck and to convert the feeder, you require a conversion set with the required parts.

The feeder is supplied with the corresponding conversion parts. You can find the conversion parts required for the gun in chapter “16.2 Spare and wear parts for the gun and stud chuck” on page 85.

11.2 Adjusting the device parameters

The following describes how the fundamental device parameters (main parameters and ancillary parameters) of the device can be set/changed.

11.2.1 Explanation of the parameters

Main parameters:

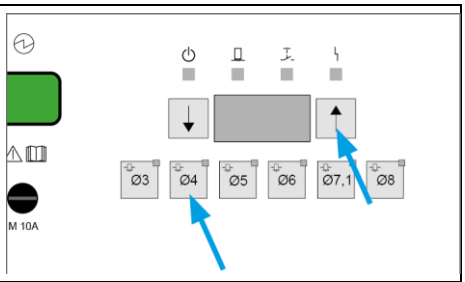
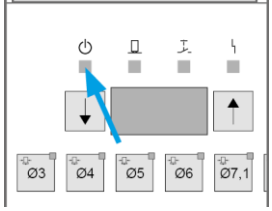
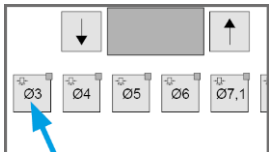
BMK-Modus:	A fast mode for feeding studs. This mode can only be used if the feeding unit also has BMK mode. The stud welding device and feeder must always be in the same mode. **(BMK mode is the factory setting for HesoMatic 9)**
BMS-Modus:	Standard mode for feeding studs if the welding device does not have BMK mode.
Blow time:	Time for the compressed air pulse to convey a welding stud from the feeding unit to the gun.
After-blow time:	Delayed switch-off of the blow pulse to prevent the stud from falling back out of the gun when the gun has to be held upwards for welding.
Preload time:	(preload time of loading plunger). The parameter is only available in BMK mode. When short hoses are used, this can prevent the stud from hitting the loading plunger of the gun.
Reload time:	(Feeder reload time). Here, in BMK mode, you can adjust the reload time of the feeder. In BMS mode, the adjustments are made directly on the feeder (see chapter “6.5 Special functions (feeder control)” on page 25).

Ancillary parameters:

Loosening attempts:	If a stud is not completely pushed into the escapement slide of the feeding unit, this becomes blocked. By moving the slide several times (loosening attempts), by applying compressed air to either side, the stud usually falls into the correct transport position. If not, the system goes into fault mode.
Finish time:	Time the escapement slide spends in the feed position at the hose.
Lift time:	(Lift time; gap welding). See chapter “11.3.3 Adjusting the lift time (height of lift) in the setting mode” on page 72.
Reload: :	(automatic reloading) "ON" with automatic stud feed "OFF" with manual stud feed
Trigger delay:	Do not change. Leave on the factory setting. The trigger delay is only used for CNC or robot operation.

11.2.2 Adjusting the main parameters

Activate the main parameter menu:

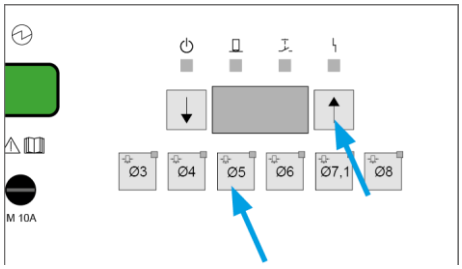
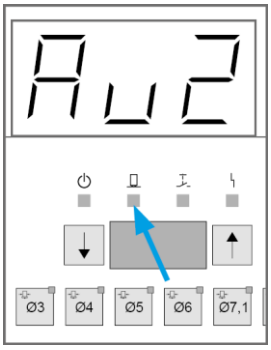
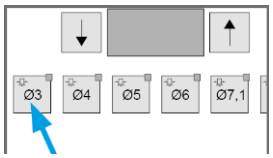
Step 1:	Before switching on the device, press and hold the arrow button ↑ and Ø 4 at the same time. 
Step 2:	Switch on the device while holding down the buttons. On the display, the following message appears:  The LED “Ready” shows that you are in the configuration menu for adjusting the main parameters. 
Step 3:	After approx. 3 seconds, the button Ø 3 is activated and the feeder operating mode is displayed on the screen. 
To adjust the parameters, see the following table.	

Adjusting the main parameters (see also chapter “11.2.1 Explanation of the parameters” on page 65)

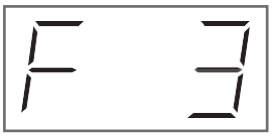
Button	Parameter	Display (example)	Adjustment range
Ø 3	Feeder mode		0: Only hand guns 1: Only automatic hand gun (PS-3A) with manual insertion of the stud. 2: BMK mode 3: BMS mode [Factory setting: 2] (Please note: In modes 1, 2 and 3, no illuminated ring is activated on the gun)
Ø 4	Blow time		0.0 to 9.9 s, in 0.1 s stages [Factory setting: 2.0]
Ø 5	After-blow time		0.0 to 1.0 s, in 0.1 s stages [Factory setting: 0.0]
Ø 6	Loading plunger pre-load time		0.0 to 1.0 s, in 0.1 s stages [Factory setting: 0.5]
Ø 7.1	Feeder reload time		0 to 20 s, in 1 s stages [Factory setting: 1]
Ø 8	End the adjustment menu.		

11.2.3 Adjusting the ancillary parameters

Activate the ancillary parameter menu:

Step 1:	Before switching on the device, press and hold the arrow button ↑ and Ø 5 at the same time.	
Step 2:	Switch on the device while holding down the buttons. On the display, the following message appears: The LED “Stud on workpiece” shows that you are in the configuration menu for adjusting the ancillary parameters.	
Step 3:	After approx. 3 seconds, the button Ø 3 is activated and the number of repair attempts is displayed on the screen.	
To adjust the parameters, see the following table.		

Adjusting the ancillary parameters (see also chapter “11.2.1 Explanation of the parameters” on page 65)

Button	Parameter	Display (Example)	Adjustment range
Ø 3	Loosening attempts		0: No loosening attempts 1 - 2 - 3: Number of loosening attempts *[Factory setting: 3]*
Ø 4	Finish time		0.0 to 2.0 s, in 0.1 s stages *[Factory setting: 0.7]*
Ø 5	Gap welding lift time		Display value x 10 = time in ms, in 10 ms stages, adjustment range 120 - 300 ms *[Factory setting: 25]*
Ø 6	Automatic reload		0: OFF 1: ON *[Factory setting: 1]*
Ø 7.1	Trigger delay		0.0 to 1.0 s, in 0.1 s stages *[Factory setting: 0]*
Ø 8	End the adjustment menu.		

11.3 Adjusting the charging voltage and lift time on the stud welding system

The following describes how the charging voltage and the lift time / height of lift is adjusted.

In order to achieve an optimal stud welding result, carrying out some test welds with different settings is necessary.

Setting the lift time only affects specific gap welding guns with lifting magnets (not the contact guns with the type designation “-K”).

The charging voltage to be set on the stud welding system depends, among others, on the following influencing factors:

- Material of the workpiece
- Thickness of the workpiece
- Material of the welding stud
- Diameter of the welding stud

11.3.1 Tables for adjusting the device

Charging voltage

The values stated in the following tables may be useful reference values for a first test weld.
On the stud welding system, you will find the information for the stud diameter (Ø) to quickly preselect the charging voltage. The corresponding threaded studs are stated in the following tables.
After pressing the preselect button, the values displayed in the table for the charging voltage are displayed on the device. The values can be changed with the arrow buttons ↑↓.

The preselect buttons are intended to determine a suggested value for a charging voltage which is approximately required to weld a stud with the selected diameter, according to experience. This value serves as a guideline and normally has to be adjusted based on test welds using the arrow keys.

The value which is set using the arrow keys is saved and remains unchanged until a new value is entered even if the device is switched off.

Lift time

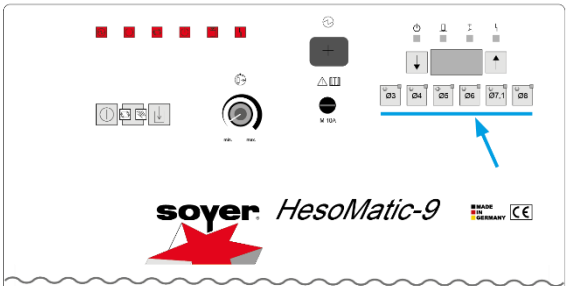
In the tables, you will also find experience values for adjusting the lift time (see chapter “11.3.3 Adjusting the lift time (height of lift) in the setting mode” on page 72).

Welding parameter adjustment aid for HesoMatic-9 stud welding system

Device button Ø [mm]	Ø3	Ø4	Ø5	Ø6	Ø7.1	Ø8
Corresponds to threaded stud	M3	M4	M5	M6	-/-	M8
Charging voltage preset [V]	70	100	115	140	175	195
Guideline value for lift time [ms]	With PS-3 und PS-3A welding guns: 9 - 10 ms					
Guideline value for lift time [ms]	With PS-9 welding gun: 6 - 7 ms					

11.3.2 Adjusting the charging voltage

The charging voltage is already preset (see chapter “11.3.1 Tables for adjusting the device on page 70). A value for the charging voltage is suggested, corresponding to the selected diameter and the gun type of the device.

Step 1:	Connect the device as described in chapter “10 Setup and connection of the automatic system” on page 57.
Step 2:	Preselect the desired stud diameter. 
Step 3:	On the display, a charging voltage value will be displayed in [V]. Use the arrow keys ↑↓ to increase or decrease the value, if required. 
The charging voltage is adjusted. **The adjusted value is saved and remains unchanged even after switching the device off and back on again.**	

11.3.3 Adjusting the lift time (height of lift) in the setting mode

Adjusting the height of lift / lift time only affects specific gap welding guns with lifting magnets (e.g. PS-3, PS-9, PS-3A, not the -K types). For these guns, the stud is lifted a defined height/for a defined time directly before the welding process, and lowered automatically during the welding process.
As it is difficult to measure the height to which the stud is lifted, the equivalent “lift time” is displayed on the stud welding device.
When adjusting the lift time in the following, the welding process is simulated in the setting mode. The stud is lifted and lowered as in the welding process, however, only the welding current is not activated.

Operating modes

- Setting mode: When simulating a welding process, no welding is carried out.
- Operating mode (normal operation): Welding is carried out.

WARNING

Danger of wrong operating mode

If the following adjustments are not made in the adjustment mode, but in the operating mode, welding is carried out when pressing the release button on the gun.

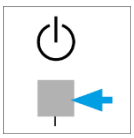
- If a contact gun (K type) is connected when adjustment mode is started, the screen shows “Con” for approx. 3 seconds, and automatically starts normal mode. There are no lifting magnets for contact guns.
- If the control plug of the gun is disconnected during the lifting test, the device displays “Con” for approx. 3 seconds and starts operating mode automatically.
- If no gun type is displayed on the screen after switching to adjustment mode, you are in operating mode.

Adjusting the lift time / height of lift

Step 1:	Connect the device as described in chapter “10 Setup and connection of the automatic system” on page 57.
Step 2:	Check that the stud welding device is switched off.
Step 3:	Equip the gun with a welding stud.
Step 4:	**Activating the adjustment mode** To activate the adjustment mode, press the buttons ↑↓ at the same time to switch on the stud welding device. Hold down the arrow buttons until the display “L- -“ appears.  **If the button combination pressed is not valid, “66” or “99” appears on the screen. Then, turn the device off and on again via the main switch to reset the error.**

After approx. 1 second, the gun type detected by the device appears on the screen.

WARNING



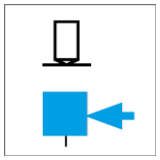
Adjustment mode is only activated if

- the gun type is displayed on the screen and
- the ready indicator is not lit and
- no stud preselection is lit.

A gap welding gun with lifting magnets not recognised as a PS-9 is automatically displayed as a PS-3 gun.

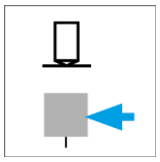
If all three criteria are not fulfilled, you are in operating mode and the welding is carried out when you then push the release button.

Adjusting the lift time/height of lift

Step 5:	Position the gun on the workpiece and press the release button on the gun for the welding.  Ensure that the “Stud on workpiece” control lamp is lit in blue before pushing the release button. The currently set value for the lift time is shown in [ms] on the display. The longer the lift time, the higher the height of the lift. Experience and a few attempts are needed to determine the correct lift time. For reference values for the correct lift time, see chapter “11.3.1 Tables for adjusting the device” on page 70. You can change the lift time using the adjusting ring on the welding gun for the height of lift of the stud.
If the desired lift time is set, switch off the stud welding device and switch it back on again. Afterwards, the device will be back in operating mode.	

Notes on the setting mode

- The adjustment can be repeated as often as needed. To prevent the magnetic coil from overheating, however, it is necessary to wait for approx. one second between two test lifts.
- If the lifting cycle takes place without the notification that the studs are on the workpiece, instead of the lift time, [- - -] is displayed, as no earth connection was present.



12 Welding operation with the automatic system

The following describes the tasks required for the welding process.

The basic requirements for the welding process are described in these instructions:

- The proper connection of the stud welding system,
- The conversion of the stud welding system and the welding gun to match the stud diameter being processed,
- The adjustment of the stud welding system to match the stud diameter.

12.1 Starting the automatic system and carrying out welding

The following describes how weldings are carried out and how possible welding errors can be avoided.

⚠ DANGER

Danger from incorrect operation

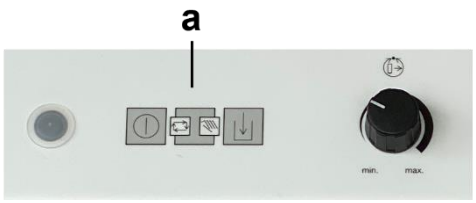
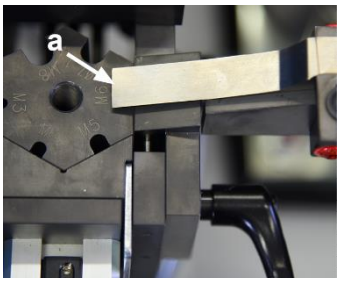
During stud welding, incorrect operation of the devices may cause many dangers.

Before using the stud welding system, see chapter “2. Important safety instructions” on page 9.

If you have any problems understanding the operating instructions, contact the manufacturer, Soyer.

Carrying out welding

Step 1:	Before welding, see chapter “2. Important safety instructions” on page 9.
Step 2:	Connect the devices as described in chapter “10 Setup and connection of the automatic system” on page 57.
Step 3:	Check or convert the automatic system according to chapter “11 Converting/adjusting the automatic system” on page 64.
Step 4:	Fill the feeder bowl (a) with welding studs. Only use SOYER® welding studs. Observe the permitted filling weight. 

Step 5:	Push the continuous load button (a) on the feeder.  The studs are transported to the stud retainer.
Step 6:	Once a stud makes it to the stud retainer (a), press the continuous flow button on the feeder again to switch back to automatic mode. 
Step 7:	Either press the reload button on the feeder (a) or the release button on the welding gun (b) until a welding stud is conveyed to the gun. **⚠CAUTION** **When reloading, a welding stud can be pushed out of the gun. Hold guns with stud ejectors facing downwards and do not point them at persons or animals.** 
Step 8:	Ensure that the welding points on the stud and workpiece are metallically bright.
Step 9:	Press the gun onto the workpiece at an angle of 90 degrees. When using a contact gun, press it firmly against the spring force. 

Step 10:	Push the release button of the gun. Welding is carried out. **During the welding process, hold the gun steadily and only remove it vertically from the welded stud after the welding process is finished. By doing so, widening or damaging the stud chuck is avoided.**
The welding process is finished. After removing the welding gun from the welded stud, the capacitor bank is recharged. At the same time, a welding stud is reloaded into the gun. After a few seconds, the system is ready to weld again (LED “Ready” lights up).	

12.1.1 Refilling the feeder during operation

To refill the feeder, open the cover hood (this switches off the compressed-air supply) and pour the welding studs directly into the feeder bowl. Observe the permitted filling weight and that the stud type is the same.
Afterwards, assemble the protective hood. The compressed-air supply is re-established and the work can be continued.

12.2 Notes on checking the quality of the weld

If the SOYER® stud welding system is handled correctly and the correct materials are selected, the strength of the welding joint (welding zone) is always greater than the strength of the stud or the base material.

In practice, the following production control tests have proved successful:

- Visual inspection
- Bend test

For further information, see standard:

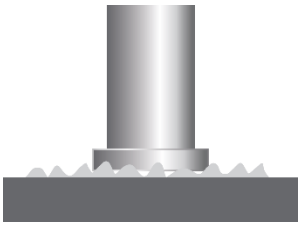
DIN EN ISO 14555 Arc stud welding of metallic materials or Technical Bulletin DVS 0904 Instruction for practice - Arc stud welding.

12.2.1 Visual inspection

The visual inspection serves as a rough check for major defects. The uniformity of the weld is assessed.

The following table serves as an aid for the assessment of the welding result:

Visual inspection

Welding image	Note
	Good welding joint. Optimum setting. Even, bright and closed welding bead.
	Poor welding joint, e.g. because the welding energy is too high or the immersion distance / lift is too small. The stud is constricted to the welding joint. The stud is only partially welded.
	Poor welding joint, e.g. because the welding energy is too low or the lift is too short. The welding bead is weak and unevenly formed.
	Poor welding joint, e.g. due to a blow effect or a welding gun that was shaken or applied at a slant. The stud flange is not welded completely and has visible imperfections. Undercuts are visible.

12.3 Switching off the devices

Switch off the stud welding system at both mains switches.

The connected welding gun becomes inactive automatically.

Switch off the main compressed air or disconnect the device from the compressed-air supply.

Ensure that the devices cannot be switched on and used by unauthorised persons.

12.4 Welding defects and their causes

The most common weld defects, their possible causes and how to troubleshoot them are described in the following.

If a problem cannot be solved, please contact Heinz Soyer Bolzenschweißtechnik GmbH.

Faults	Possible cause and troubleshooting
Device does not weld, there is no or only very little sparking.	Stud welding device is not switched on. • When switching on the device, blue indicator light “Ready” must light up.
	The welding points or earth connection points on the workpiece are not metallically bright. The LED display “Stud on workpiece” does not light up (see chapter “6.4 Display of the operating states” on page 24. • Prepare the workpiece or stud. Grind connection points to a bright metal finish.
Scorched stud thread	The stud is too loose in the stud chuck. • Replace the stud chuck.
	Stud chuck is worn. • Exchange stud chuck.
Varying welding results with unchanged settings	Stud is too loose or not fully inserted into the stud chuck. • Push in the stud until stop. • If necessary, exchange the stud chuck.
	Welding studs manufactured inaccurately. • Only use SOYER® welding studs.
Stud is not welded to the whole flange surface, strength of the welding is insufficient	The contamination on the surface of the workpiece is too great. • Clean or grind the surface of the workpiece to a bright metal finish.
	The front surface of the welding stud is deformed. • Use new welding studs. • Only use SOYER® welding studs.
	The welding gun was placed in tilted position. • Position the welding gun evenly.

12.5 Malfunctions with an error message on the stud welding device

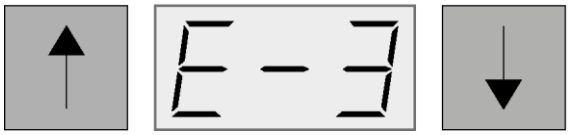
DANGER

Dangers during troubleshooting

During troubleshooting, various dangers may occur.

- Soyer Bolzenschweißtechnik GmbH devices must only be opened by Soyer personnel or personnel authorised by Soyer.
- For troubleshooting, the device must be disconnected from the main power supply and secured against accidental switch-on.

When there is a stud welding device malfunction, an error message (code) appears on the display.



Code	Description	Possible cause
E01	Safety shutdown as a voltage of more than 25 V was measured for more than approx. 40 ms on the welding power sockets.	• Stud inserted too deep into the stud chuck • Mechanical problems with the gap welding gun • External voltage of other welding devices • Error in the device (thyristor short circuit)
E02	Error when charging the capacitors	• Welding capacitors faulty (leakage current) • Charging current source faulty
E03	Safety circuit malfunction	• Defective quick-discharging resistor • Safety relay is clamping or sticking • Switching times of the safety relay too long
E04	Incorrect mains voltage	The mains voltage must be between 90...130 V or 180...275 V at 50...60 Hz. The device detects both ranges automatically.
E05	Excess temperature of the electronic equipment	During high welding sequences, the device may be exposed to an increased ambient temperature (>45°C) or direct sunlight.
E06	Error in the welding gun	• Non-permissible welding gun • Wrong adapter on the gun cable

Code	Description	Possible cause
E07	Short circuit in the magnetic circuit.	Gun cable or magnetic coil defective.
66	No valid key combination pressed	Incorrect keys pressed, or keys not pressed correctly. • Switch off the device and switch it back on again to reset the error.
99	No valid key combination pressed	Incorrect keys pressed, or keys not pressed correctly. • Switch off the device and switch it back on again to reset the error.

Notes on error messages

- In case of errors E01 to E04, E06 and E07, the device switches to malfunction. Welding is no longer possible. The device can only be recommissioned when it is switched off and then switched on again.

- In the event of error code E05, excess temperature, the welding device cannot be used until the displayed error message disappears.

- If the devices works with a reduced charging current due to a high internal temperature, the LED “Malfunction” flashes.

13 Maintenance and repair

Maintenance and repair of the stud welding system and the stud welding guns should only be performed by Heinz Soyer Bolzenschweißtechnik GmbH or authorised specialists.

14 Service

If servicing is required, please contact:

Heinz Soyer Bolzenschweißtechnik GmbH
Inninger Straße 14
82237 Wörthsee
Phone: 0049-8153-885-0
Fax: 0049-8153-8030
Email: info@soyer.de

Please have the serial number ready during service requests.

Alternatively, you can also contact your respective SOYER® agent. The contact data is available on our website at
www.soyer.de or
www.soyer.com (English)

15 Warranty conditions

The warranty period for commercial or equal use is 12 months. If repair is required, we guarantee the correction of the defects at the Etterschlag plant. Wearing parts are excluded.

The warranty claim shall expire if damage is caused through improper operation, repairs or interventions are undertaken by unauthorised persons and accessories and spare parts are used that are not intended for our system.

When using welding studs from external manufacturers, we do not assume any warranty for proper function of the stud welding system and the quality of the welding joint.

16 Spare and wear parts

The following lists contain the required conversion parts for changing the stud diameter being processed.

16.1 Feeder conversion set

To convert the feeding unit for another stud size, there is a conversion set available with the parts which need to be changed.
The parts being converted are labelled according to the stud diameter they must be installed for.

Figure 14: Conversion set – exchange parts (1)

Individual parts in the feeder conversion set (1)

Item	Description	Dimension	Item no.
a	Adjustment plate (limit stop distance plate)	M3	F05343
		M4	F05344
		M5	F05345
		M6	F05346
		Ø 7.1 mm	F05347
		M8	F05348
b	Hose connection	M3	F04554
		M4	F04555
		M5	F04556
		M6	F04557
		Ø 7.1 mm / M8	F04558
c	Threaded stud	M10 x 35 mm	B04673

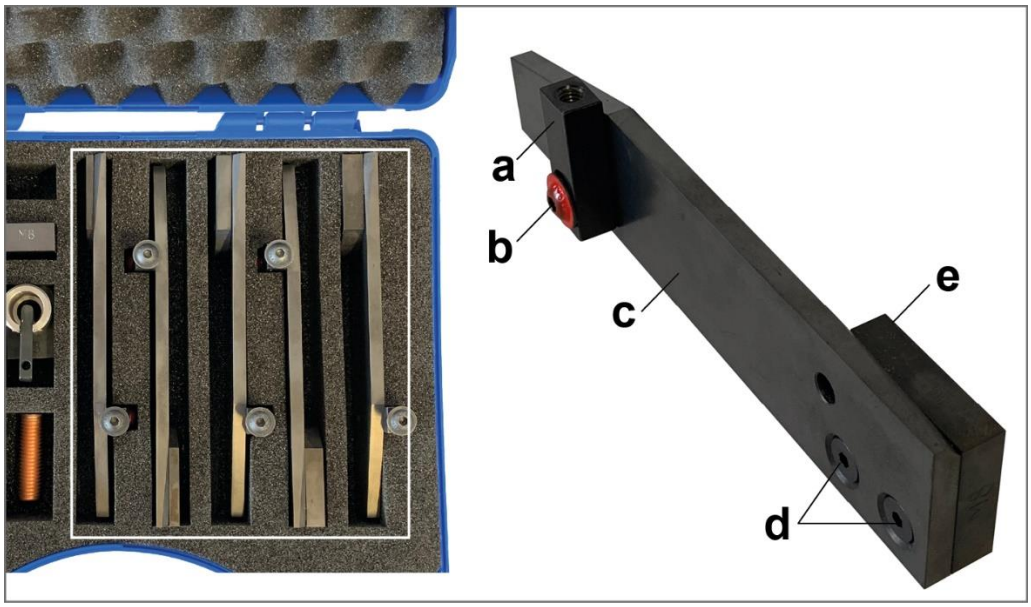


Figure 15: Conversion set – exchange parts (2)

Individual parts in the feeder conversion set

Item	Description	Dimension	Item no.
a	Limit stop for fixing bracket	-/-	F05335
b	Lens head screw	M5 x12 mm	M03870
c	Guide rail	-/-	F05329
d	Hexagonal Allen screw	M4 x 8 mm	M01563
e	Distance piece	M3	F05349
		M4	F05350
		M5	F05351
		M6	F05352
		Ø 7.1 mm	F06115
		M8	F05290

16.2 Spare and wear parts for the gun and stud chuck

Conversion and spare parts for the gun and stud chuck (standard)

Conversion/spare part	Description	Dimension	Item no.
	Automatic stud chuck Standard (stud length 10-35 mm)	M3	F02055
		M4	F02056
		M5	F02057
		M6	F02058
		Ø 7.1 mm	F02059
		M8	F02060
	Feed pipe with hose fastening (stud length 10-35 mm)	M3	F06389
		M4	F06390
		M5	F06391
		M6	F06392
		M8 / Ø 7.1 mm	F06393
	Pushing piston standard (stud length 8-35 mm)	M3	F02048
		M4	F02049
		M5	F02050
		M6	F02051
		M8 / Ø 7.1 mm	F02053
	Set of distance rings	M3	F02031
		M4 / M5	F02032
		M6, M8, Ø 7.1 mm	F02570
	Stud feed hose (always cut by metre. Please state desired length in metres). Item quantity 1 means 1 m.	M3	F01081
		M4	F01082
		M5	F01083
		M6	F01084
		M8 / Ø 7.1 mm	F01085

Conversion and spare parts for the gun and stud chuck (special lengths)

Conversion/spare part	Description	Dimension	Item no.
	Automatic stud chuck for short studs	M3 x 6 mm	F06080
		M4 x 8 mm	F06081
		M5 x 8 mm	F06082
		M6 x 8 mm	F06021
		Ø 7.1 x 10 mm	F06083*
		M8 x 10 mm	F06084*
	Feed pipe with hose fastening for short studs	M3 x 6 mm	F06399*
		M4 x 8 mm	F06400
		M5 x 8 mm	F06401
		M6 x 8 mm	F06402*
		M8 x 10 mm	F06403*
	Pushing piston for short studs	M5 x 6 mm	F04865
		M6 x 8 mm	F04866
		Ø 7.1 x 10 mm M8 x 10 mm	F04867

* Availability on request

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