



PAH-1

Stud Welding Gun

94-20-025

(for stud welding with tip ignition (gap stud welding)
and short-cycle drawn-arc stud welding)



Operating Manual

After-sales service for Germany:

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Translation of the Original Operating Manual

Please keep the manual in a safe place for future reference.

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Dear Customer,

Many thanks for buying a stud welding machine from HBS Bolzenschweiss-Systeme.

We at HBS wish you success at all times when working with this stud welding machine.

The high level of quality of our products is guaranteed by ongoing further development in the design, equipment and accessories. This may result in differences between the present operating manual and your product. No claims can therefore be derived from the data, illustrations and descriptions.

We have compiled the data and information in this reference work with the greatest care, and have made every effort to ensure that the information contained in this manual was correct and up-to-date at the time of delivery. We can nevertheless give no guarantee for an absolutely error-free document.

Should you discover any errors or unclear points when reading this operating manual, please do not hesitate to contact us.

We would also be grateful for any feedback should you have any suggestions or complaints to make about our product.

HBS Bolzenschweiss-Systeme GmbH & Co. KG

Felix-Wankel-Strasse 18

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GERMANY



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1 Important Safety Precautions

The target group for this manual are qualified personnel who in view of their technical training, know-how and experience and knowledge of applicable regulations are able to assess the work assigned to them and recognise potential hazards.



Danger from incorrect use

- ◆ Use the stud welding machine only for the purpose described in this manual.

Otherwise you may endanger yourself or damage the stud welding machine.

You endanger yourself and others if you operate the stud welding machine incorrectly or fail to observe the safety precautions and warnings. This can lead to serious injury or extensive material damage.



Danger for unauthorised operating personnel

- ◆ Work with the stud welding machine only when
 - You are appropriately trained, instructed and authorised to do so, and
 - You have read and completely understood this operating manual.
- ◆ Never work with the stud welding machine when you are under the influence of
 - Alcohol,
 - Drugs or
 - Medication.



Danger from unauthorised modifications

- ◆ Never modify the stud welding machine or parts thereof without obtaining a clearance certificate from the manufacturer.

You will otherwise endanger yourself. This can lead to serious injury or extensive material damage.



Life-threatening danger for wearers of active implanted cardiac devices

Danger for workers at particular risk within the meaning of the EMF directive

Persons at particular risk within the meaning of the EMF directive are:

- Workers with active implanted medical devices
 - Workers with passive implanted medical devices that contain metal
 - Workers with medical devices worn on the body
 - Pregnant workers.
- ◆ Never operate the stud welding machine if you are among the group of workers at particular risk within the meaning of the EMF directive.
 - ◆ In this case, never remain in the vicinity of the stud welding machine during welding.
 - ◆ Never operate the stud welding machine if persons are located nearby who are among the group of workers at particular risk within the meaning of the EMF directive.

Strong electromagnetic fields are produced in the vicinity of the stud welding machine during welding. These fields can adversely affect the function of medical devices as well as the course of a pregnancy.



Danger from fumes and airborne particulates

- ◆ Switch on the welding fume extractor at the place of work.
- ◆ Ensure that the room is well ventilated.
- ◆ Never weld in rooms with a ceiling height of less than 3 m.
- ◆ Observe furthermore your working instructions and the accident prevention regulations.

This will help to avoid health damage due to fumes and airborne particulates.



Danger from glowing metal spatter (fire hazard)

Glowing hot weld spatter and liquid splashes, flashes of light and a loud bang > 90 dB (A) must be anticipated during stud welding.

- ◆ Inform colleagues working in the immediate vicinity accordingly before starting work.
- ◆ Ensure that an approved fire extinguisher is available at the work-place.
- ◆ Do not weld when wearing working clothes soiled with flammable substances such as oil, grease, petroleum, etc.
- ◆ Wear your proper protective equipment, such as:
 - Protective gloves in accordance with the relevant standard,
 - Non-flammable clothing,
 - A protective apron over your clothing,
 - Full-ear hearing protection in accordance with the relevant standard,
 - A safety helmet when welding above your head,
 - Safety shoes,
 - Safety goggles with sight glass of protection level 2 in compliance with the applicable standards and do not look directly into the electric arc.
- ◆ Remove all flammable materials and liquids from the vicinity of the work area before starting welding.
- ◆ Weld at a safe distance from flammable materials or liquids. Select a safety distance large enough to ensure that no danger can arise from weld spatter.



Protection of the stud welding unit

- ◆ Protect the stud welding machine against the ingress of foreign matter and liquids caused by cutting or grinding work in the vicinity of your work area.

This will help to prolong the service life of your stud welding machine.

Safety notices in accordance with EMF directive 2013/35/EU

Currents flowing through electrical conductors during stud welding cause electric and magnetic fields that can occur, in particular, near the hand-held welding guns, the welding arrangement (e.g., welding cables) and the welding power sources.

Due to the high currents, high EMF exposures may occur.



Danger for workers at particular risk within the meaning of the EMF directive

Persons at particular risk within the meaning of the EMF directive are:

- Workers with active implanted medical devices
- Workers with passive implanted medical devices that contain metal
- Workers with medical devices worn on the body
- Pregnant workers.

Strong electromagnetic fields are produced in the vicinity of the stud welding machine during welding.

To reduce the danger posed by electromagnetic fields, we recommend, among other things, the following rules of conduct:

- ◆ Lay all cables as close together as possible.

For proper bundling and safeguarding of the cables, HBS offers protective tubes in various sizes.

- ◆ Do not position yourself between the welding cables.
- ◆ Only lay the cables to one side and position them as far as possible from the operating personnel.
- ◆ Do not loop the cables over your body, especially not at head level.
- ◆ Completely unwind the welding cables.
- ◆ Use the shortest possible welding cables.
- ◆ Place portable welding power sources as far away as possible while welding.
- ◆ If possible, do not operate welding power sources in the immediate vicinity of other persons, do not sit directly next to the welding power source while working and do not lean against it.
- ◆ In addition to these safety notices, also observe your work instructions and accident prevention regulations.

2 Symbols and Terms Used

The symbols used in this operating manual have the following meanings:



Danger

Warns you of hazards that can lead to **injury of persons** or to **considerable material damage**.



Caution

Problems in operating **may occur** if this information **is not observed**.



No access for people with active implanted cardiac devices



No access for persons with implants made of metal



No access for pregnant women



Danger

Warns you of **electrical** hazards



Danger

Warns you of **electromagnetic fields** that can be generated during welding



These symbols prompt you to wear **personal protective equipment** when **working with the stud welding unit**.



This symbol prompts you to wear **ear protection**. **A loud bang > 90 dB (A)** can occur during the welding process.



Tip

Cross-reference to **useful information** on the use of the stud welding machine



Cross-references in this operating manual are marked with this symbol or *are printed in italics*



Fire hazard

Have a suitable fire extinguisher for the working area ready before starting work.



Work instruction



List

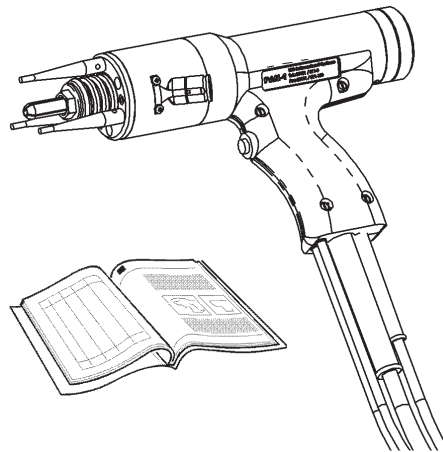
Glossary

Automatic welding head:	Device for welding of welding elements
Capacitor:	Component for storage of electrical energy.
Electric arc:	Autonomous gas discharge between two electrodes when the current is high enough. A whitish light is emitted in the process. The electric arc allows very high temperatures to be generated.
Rectifier:	Electrical component that converts alternating voltage into direct voltage
Stud feeder:	Device for automatic feeding of welding elements
Stud welding gun:	Device for welding of welding elements
Stud welding system:	Stud welding unit including stud welding gun or welding head
Stud welding unit:	Device for provision of the electrical energy for stud welding
Thyristor:	Electronic component for contact-free switching of high currents; switching takes place via the control input
Welding element:	Component such as stud or pin that is welded to the workpiece
Welding parameters:	Mechanical and electrical settings at the stud welding gun or welding head and at the stud welding unit (e.g. spring force, charging voltage)
Workpiece:	Components such as sheet metal or tubes to which the welding elements are to be fastened

3 Scope of Supply

The **basic configuration** of your stud welding gun contains the following parts:

No. of pieces	Part	Type	Order No.
1	Stud welding gun cable length 3 m	PAH-1	94-20-025
1	Operating manual	PAH-1	E-BA 94-20-025
1	Socket wrench	AF 17	80-40-085



- ◆ Inspect the shipment for visible damage and completeness immediately on receipt.
- ◆ Report any transport damage or missing components immediately to the delivering shipping agent or the dealer (address, see page 2).

4 Accessories

For example:

Assortment box equipped for dia. 3 to 8 mm

- for manual stud feeding (by hand) 84-40-013A
- for fully automatic stud feeding (by VBZ-3) 84-43-013A

Additional accessories can be found in our extensive accessories catalogue.



5 Technical Data

Stud welding gun Type PAH-1

for capacitor discharge stud welding with tip ignition (gap welding) and drawn arc stud welding (short-cycle drawn arc welding) as well as stud welding with automatic stud feeding according to current standards

Welding range	M3 to M8, dia. 3 to 8 mm (#4 to 5/16", dia. #4 to 5/16")
Stud length	8 to 30 mm (0.31" to 1.18")
Stud material	Mild steel, stainless steel, aluminium, brass
Lift	Adjustment range 5 mm
Welding cable	3 m (9.84')
IP Code	IP 20 (protect against humidity)
Workplace noise level	> 90 dB (A) may occur during welding
Ambient temperature limits	0 °C to 40 °C (32 °F to 104 °F)
Dimension L x B x H	295 x 60 x 170 mm (11.61" x 2.36" x 6.70") without cable
Weight	1.4 kg (3.09 lbs) without cable

6 Intended Use

The stud welding gun has been designed exclusively for use with standardised stud welding elements. The use of any other elements will result in the desired strength of the welded joint being diminished.

The stud welding gun must only be connected to HBS stud welding units.

- ◆ Always check with the operating manual of your stud welding unit whether this stud welding gun may be used.

Observation of the operating manual of the stud welding unit being used is also part of the intended use.



7 Warranty

Please refer to the latest "General Terms and Conditions" for the scope of the warranty.

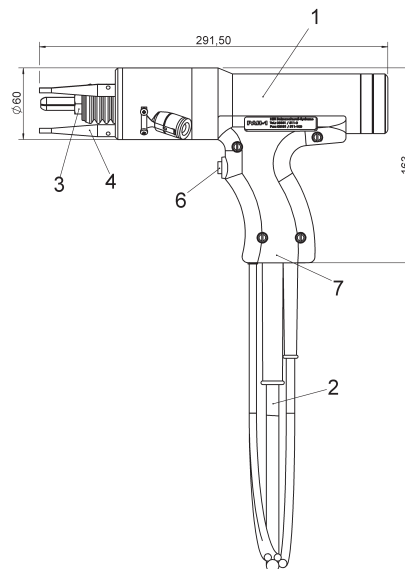
The warranty does not cover faults caused by e.g.

- Normal wear,
- Improper handling,
- Failure to observe the operating manual,
- Failure to observe the safety precautions,
- Use for other than the intended purpose, or
- Transport damage.

Warranty entitlement shall no longer be valid if modifications, changes or service and repair work is carried out by unauthorised persons or without the knowledge of the manufacturer. Invalidation of warranty entitlement shall also render the declaration of conformity invalid. The CE marking shall be declared invalid by the manufacturer.

We expressly point out that only spare parts and accessories or components approved by us may be used. The same applies likewise to installed units from our sub-suppliers.

8 Design and Function



The body of the stud welding gun consists of a sturdy two-part **plastic housing (1)**.

The **control cable (2)**, the **welding current cable (2)** and the compressed air are connected through the welding gun handle to the stud welding gun.

Positioned at the front of the welding gun are the welding piston and the **retaining nut (3)** used to fix the automatic chuck.

At the front of the stud welding gun, the foot ring is installed. **Three legs (4)** can be used to position the welding gun straight. The spring-loaded welding elements project over the feet of the welding gun. In this way, they can accurately adjusted via the ignition tip.

At the front of the welding gun handle, the **welding gun trigger (6)** is installed. It is used to trigger the welding process.

Below the cap at the welding gun backside, a milled knob nut is placed for adjusting the lift.

The **serial number (7)** is stamped on the welding gun handle.

Type plate

The type plate contains the following information:

- Manufacturer
- Type



9 Welding Process

This stud welding gun may only be used for capacitor discharge stud welding with tip ignition (gap welding) and drawn arc stud welding (short-cycle drawn arc welding) as well as stud welding with automatic stud feeding.

- ◆ Please refer to the original operating manual of the connected stud welding unit for the welding procedure.

10 Preparing the Stud Welding Gun

Prepare the stud welding gun by

- adjusting the working position,
- preparing the stud welding gun for a welding element and
- adjusting the lift.



◆ **Do not connect** the welding gun **to the stud welding unit until it has been prepared.**

In this way you can avoid any unintentional starting of the welding process.

10.1 Determining the Insertion Depth (Protrusion)

- ◆ Feed a welding element into the chuck by pressing the welding gun trigger.



For standard lengths (see following chapter 10.2 “*Equipping the Welding Gun, table: equipment parts*”), the insertion depth was already optimised by the equipment. For intermediate lengths, the insertion depth must be compensated for with the lift.

Determining the insertion depth (protrusion) - capacitor discharge

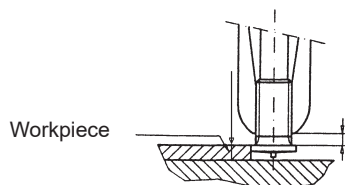
The protrusion for PT, UT, IT type studs should be about 1.5 mm.

Dependent on

- welding process used,
- stud diameter,
- shape of the spatter ring or the welding seam

the protrusion can vary between 0.7 mm and 2 mm.

Contact welding (gap) tip ignition



Protrusion of the welding element 1.5 mm

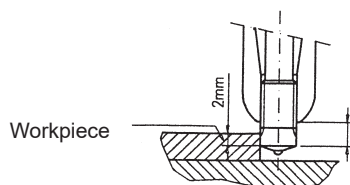


The upper edge of the flange must be flush with the upper edge of the workpiece.

Determining the insertion depth (protrusion) - drawn arc

The protrusion for PD, UD, ID, PS, US and IS type studs should be about 2 mm.

Drawn arc stud welding



Protrusion of the welding element

Select pin stop one level shorter than standard

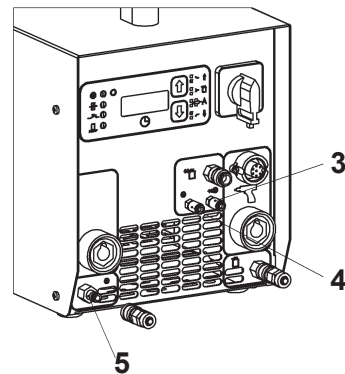
e. g. length of the welding element 12 >

pin stop 10

10.2 Equipping the Welding Gun



- ◆ Switch the stud welding unit off and unplug the air connection (blue) before equipping the stud welding gun!

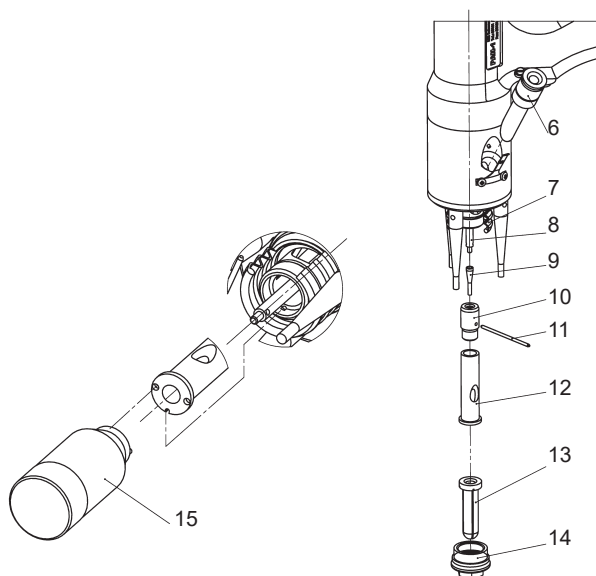


3 - Air outlet black

4 - Air outlet blue

5 - Compressed air supply

Included in the delivery contents of the automatic welding gun is a set of equipment of your choice, consisting of:



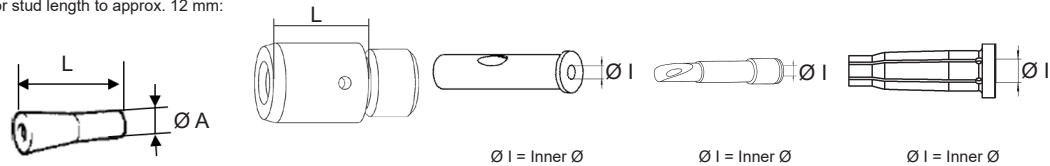
Pos:	Number	Description	Order No.
6	1	Feed tube	*)
7	1	Bellows	80-20-010
8	1	Piston	80-40-012
9	1	Plunger	*)
10	1	Pin stop	*)
11	1	Pin	80-10-208
12	1	Guide bushing	*)
13	1	Chuck	*)
14	1	Retaining nut	80-40-010
15	1	Special wrench	84-40-010

*) Selection according to model and dimensions of the welding element

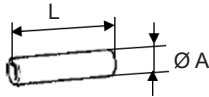
Manual and Automatic Equipment Parts

Manual Equipment Part

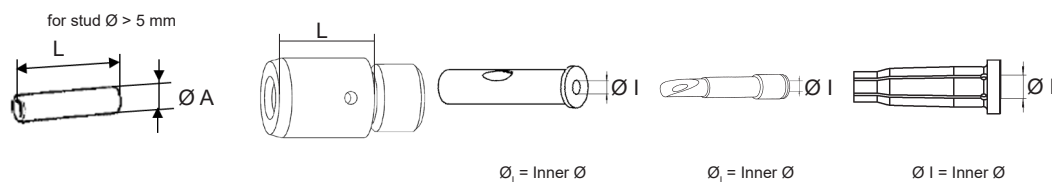
for stud length to approx. 12 mm:



for stud length from approx. 12 mm:



Stud dimension Ø x Length in mm	Pos. 9			Pos. 10		Pos. 12		Pos. 6		Pos. 13	
	Plunger	Length L in mm	Outside Ø Ø A in mm	Pin stop	Length L in mm	Führungs- hülse	Inner Ø Ø I in mm	Manual feed tube	Inner Ø Ø I in mm	Chuck	Inner Ø Ø I in mm
3 x 8	84-40-531	21.0	2.5	84-40-408	15	84-41-301	5.3	84-40-101	5.3	84-50-003	5.5
3 x 10	84-40-531	21.0	2.5	84-40-410	17	84-41-301	5.3	84-40-101	5.3	84-50-003	5.5
3 x 12	84-40-531	21.0	2.5	84-40-412	19	84-41-301	5.3	84-40-101	5.3	84-50-003	5.5
3 x 15	84-40-531	21.0	2.5	84-40-415	22	84-41-301	5.3	84-40-101	5.3	84-50-003	5.5
3 x 20	84-40-561	21.0	4.6	84-40-420	27	84-41-302	6.3	84-40-102	6.3	84-50-003	5.5
3 x 25	84-40-561	21.0	4.6	84-40-425	32	84-41-302	6.3	84-40-102	6.3	84-50-003	5.5
3 x 30	84-40-561	21.0	4.6	84-40-430	37	84-41-303	7.3	84-40-103	7.3	84-50-003	5.5
4 x 8	84-40-531	21.0	2.5	84-40-408	15	84-41-302	6.3	84-40-102	6.3	84-50-004	6.5
4 x 10	84-40-531	21.0	2.5	84-40-410	17	84-41-302	6.3	84-40-102	6.3	84-50-004	6.5
4 x 12	84-40-531	21.0	2.5	84-40-412	19	84-41-302	6.3	84-40-102	6.3	84-50-004	6.5
4 x 15	84-40-531	21.0	2.5	84-40-415	22	84-41-302	6.3	84-40-102	6.3	84-50-004	6.5
4 x 20	84-40-561	21.0	4.6	84-40-420	27	84-41-303	7.3	84-40-103	7.3	84-50-004	6.5
4 x 25	84-40-561	21.0	4.6	84-40-425	32	84-41-303	7.3	84-40-103	7.3	84-50-004	6.5
4 x 30	84-40-561	21.0	4.6	84-40-430	37	84-41-304	10.3	84-40-104	10.3	84-50-004	6.5
5 x 8	84-40-531	21.0	2.5	84-40-408	15	84-41-303	7.3	84-40-103	7.3	84-50-005	7.5
5 x 10	84-40-531	21.0	2.5	84-40-410	17	84-41-303	7.3	84-40-103	7.3	84-50-005	7.5
5 x 12	84-40-531	21.0	2.5	84-40-412	19	84-41-303	7.3	84-40-103	7.3	84-50-005	7.5
5 x 15	84-40-561	21.0	4.6	84-40-415	22	84-41-303	7.3	84-40-103	7.3	84-50-005	7.5
5 x 20	84-40-561	21.0	4.6	84-40-420	27	84-41-304	8.3	84-40-104	8.3	84-50-005	7.5
5 x 25	84-40-561	21.0	4.6	84-40-425	32	84-41-304	8.3	84-40-104	8.3	84-50-005	7.5
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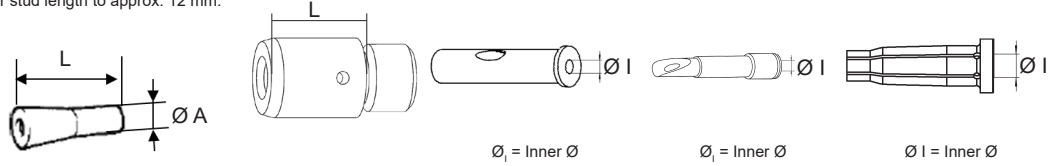
Stud dimension $\varnothing \times$ Length in mm	Pos. 9			Pos. 10		Pos. 12		Pos. 6		Pos. 13	
	Plunger	Length L in mm	Outside $\varnothing$ $\varnothing A$ in mm	Pin stop	Length L in mm	Guide bushing	Inner $\varnothing$ $\varnothing I$ in mm	Manual feed tube	Inner $\varnothing$ $\varnothing I$ in mm	Chuck	Inner $\varnothing$ $\varnothing I$ in mm
6 x 8	84-40-561	21.0	4.6	84-40-408	15	84-41-304	8.3	84-40-104	8.3	84-50-006	8.5
6 x 10	84-40-561	21.0	4.6	84-40-410	17	84-41-304	8.3	84-40-104	8.3	84-50-006	8.5
6 x 12	84-40-561	21.0	4.6	84-40-412	19	84-41-304	8.3	84-40-104	8.3	84-50-006	8.5
6 x 15	84-40-561	21.0	4.6	84-40-415	22	84-41-304	8.3	84-40-104	8.3	84-50-006	8.5
6 x 20	84-40-561	21.0	4.6	84-40-420	27	84-41-305	10.3	84-40-105	10.3	84-50-006	8.5
6 x 25	84-40-561	21.0	4.6	84-40-425	32	84-41-305	10.3	84-40-105	10.3	84-50-006	8.5
6 x 30	84-40-561	21.0	4.6	84-40-430	37	84-41-305	10.3	84-40-105	10.3	84-50-006	8.5
7.1 x 10	84-40-561	21.0	4.6	84-40-410	17	84-41-305	10.3	84-40-105	10.3	84-50-071	9.5
7.1 x 12	84-40-561	21.0	4.6	84-40-412	19	84-41-305	10.3	84-40-105	10.3	84-50-071	9.5
7.1 x 15	84-40-561	21.0	4.6	84-40-415	22	84-41-305	10.3	84-40-105	10.3	84-50-071	9.5
7.1 x 20	84-40-561	21.0	4.6	84-40-420	27	84-41-305	10.3	84-40-105	10.3	84-50-071	9.5
7.1 x 25	84-40-561	21.0	4.6	84-40-425	32	84-41-305	10.3	84-40-105	10.3	84-50-071	9.5
7.1 x 30	84-40-561	21.0	4.6	84-40-430	37	84-41-305	10.3	84-40-105	10.3	84-50-071	9.5
8 x 10	84-40-561	21.0	4.6	84-40-410	17	84-41-305	10.3	84-40-105	10.3	84-50-008	9.5
8 x 12	84-40-561	21.0	4.6	84-40-412	19	84-41-305	10.3	84-40-105	10.3	84-50-008	9.5
8 x 15	84-40-561	21.0	4.6	84-40-415	22	84-41-305	10.3	84-40-105	10.3	84-50-008	9.5
8 x 20	84-40-561	21.0	4.6	84-40-420	27	84-41-305	10.3	84-40-105	10.3	84-50-008	9.5
8 x 25	84-40-561	21.0	4.6	84-40-425	32	84-41-305	10.3	84-40-105	10.3	84-50-008	9.5
8 x 30	84-40-561	21.0	4.6	84-40-430	37	84-41-305	10.3	84-40-105	10.3	84-50-008	9.5



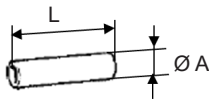
◆ When selecting the equipment, take the notices from chapter 10.1 *Adjusting the Working Position - Determining the protrusion* (see page 20) into account.

Automatic Equipment Part

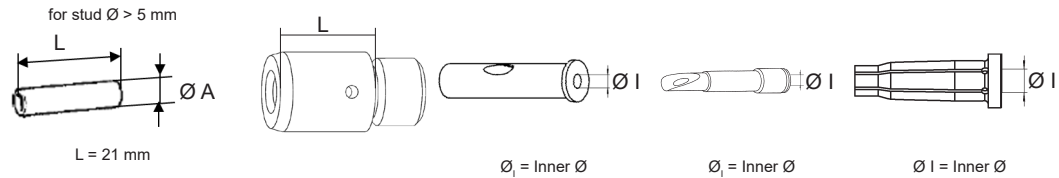
for stud length to approx. 12 mm:



for stud length from approx. 12 mm:



Stud dimension Ø x Length in mm	Pos. 9			Pos. 10		Pos. 12		Pos. 6		Pos. 13	
	Plunger	Length L in mm	Outside Ø Ø A in mm	Pin stop	Length L in mm	Guide bushing	Inner Ø Ø I in mm	Feed tube VBZ	Inner Ø Ø I in mm	Chuck	Inner Ø Ø I in mm
3 x 8	84-40-531	21.0	2.5	84-40-408	15	84-41-301	5.3	84-40-201	5.3	84-50-003	5.5
3 x 10	84-40-531	21.0	2.5	84-40-410	17	84-41-301	5.3	84-40-201	5.3	84-50-003	5.5
3 x 12	84-40-531	21.0	2.5	84-40-412	19	84-41-301	5.3	84-40-201	5.3	84-50-003	5.5
3 x 15	84-40-531	21.0	2.5	84-40-415	22	84-41-301	5.3	84-40-201	5.3	84-50-003	5.5
3 x 20	84-40-561	21.0	4.6	84-40-420	27	84-41-302	6.3	84-40-202	6.3	84-50-003	5.5
3 x 25	84-40-561	21.0	4.6	84-40-425	32	84-41-302	6.3	84-40-202	6.3	84-50-003	5.5
3 x 30	84-40-561	21.0	4.6	84-40-430	37	84-41-303	7.3	84-40-203	7.3	84-50-003	5.5
4 x 8	84-40-531	24.6	2.5	84-40-408	15	84-41-302	6.3	84-40-202	6.3	84-50-004	6.5
4 x 10	84-40-531	21.0	2.5	84-40-410	15	84-41-302	6.3	84-40-202	6.3	84-50-004	6.5
4 x 12	84-40-531	21.0	2.5	84-40-412	17	84-41-302	6.3	84-40-202	6.3	84-50-004	6.5
4 x 15	84-40-531	21.0	2.5	84-40-415	19	84-41-302	6.3	84-40-202	6.3	84-50-004	6.5
4 x 20	84-40-561	24.6	4.6	84-40-420	27	84-41-303	7.3	84-40-203	7.3	84-50-004	6.5
4 x 25	84-40-561	24.6	4.6	84-40-425	32	84-41-303	7.3	84-40-203	7.3	84-50-004	6.5
4 x 30	84-40-561	24.6	4.6	84-40-430	37	84-41-304	8.3	84-40-204	8.3	84-50-004	6.5
5 x 8	84-40-531	21.0	2.5	84-40-408	15	84-41-303	7.3	84-40-203	7.3	84-50-005	7.5
5 x 10	84-40-531	21.0	2.5	84-40-410	17	84-41-303	7.3	84-40-203	7.3	84-50-005	7.5
5 x 12	84-40-531	21.0	2.5	84-40-412	19	84-41-303	7.3	84-40-203	7.3	84-50-005	7.5
5 x 15	84-40-561	21.0	4.6	84-40-415	22	84-41-303	7.3	84-40-203	7.3	84-50-005	7.5
5 x 20	84-40-561	21.0	4.6	84-40-420	27	84-41-304	8.3	84-40-204	8.3	84-50-005	7.5
5 x 25	84-40-561	21.0	4.6	84-40-425	32	84-41-304	8.3	84-40-204	8.3	84-50-005	7.5
5 x 30	84-40-561	21.0	4.6	84-40-430	37	84-41-305	8.3	84-40-205	10.3	84-50-005	7.5



Stud dimension Ø x Length in mm	Pos. 9			Pos. 10		Pos. 12		Pos. 6		Pos. 13	
	Plunger	Length L in mm	Outside Ø Ø A in mm	Pin stop	Length L in mm	Guide bushing	Inner Ø Ø I in mm	Feed tube VBZ	Inner Ø Ø I in mm	Chuck	Inner Ø Ø I in mm
6 x 8	84-40-561	21.0	4.6	84-40-408	15	84-41-304	8.3	84-40-204	8.3	84-50-006	8.5
6 x 10	84-40-561	21.0	4.6	84-40-410	17	84-41-304	8.3	84-40-204	8.3	84-50-006	8.5
6 x 12	84-40-561	21.0	4.6	84-40-412	19	84-41-304	8.3	84-40-204	8.3	84-50-006	8.5
6 x 15	84-40-561	21.0	4.6	84-40-415	22	84-41-304	8.3	84-40-204	8.3	84-50-006	8.5
6 x 20	84-40-561	21.0	4.6	84-40-420	27	84-41-305	10.3	84-40-205	10.3	84-50-006	8.5
6 x 25	84-40-561	21.0	4.6	84-40-425	32	84-41-305	10.3	84-40-205	10.3	84-50-006	8.5
6 x 30	84-40-561	21.0	4.6	84-40-430	37	84-41-305	10.3	84-40-205	10.3	84-50-006	8.5
7.1 x 10	84-40-561	21.0	4.6	84-40-410	17	84-41-305	10.3	84-40-205	10.3	84-50-071	9.5
7.1 x 12	84-40-561	21.0	4.6	84-40-412	19	84-41-305	10.3	84-40-205	10.3	84-50-071	9.5
7.1 x 15	84-40-561	21.0	4.6	84-40-415	22	84-41-305	10.3	84-40-205	10.3	84-50-071	9.5
7.1 x 20	84-40-561	21.0	4.6	84-40-420	27	84-41-305	10.3	84-40-205	10.3	84-50-071	9.5
7.1 x 25	84-40-561	21.0	4.6	84-40-425	32	84-41-305	10.3	84-40-205	10.3	84-50-071	9.5
7.1 x 30	84-40-561	21.0	4.6	84-40-430	37	84-41-305	10.3	84-40-205	10.3	84-50-071	9.5
8 x 10	84-40-561	21.0	4.6	84-40-410	17	84-41-305	10.3	84-40-205	10.3	84-50-008	9.5
8 x 12	84-40-561	21.0	4.6	84-40-412	19	84-41-305	10.3	84-40-205	10.3	84-50-008	9.5
8 x 15	84-40-561	21.0	4.6	84-40-415	22	84-41-305	10.3	84-40-205	10.3	84-50-008	9.5
8 x 20	84-40-561	21.0	4.6	84-40-420	27	84-41-305	10.3	84-40-205	10.3	84-50-008	9.5
8 x 25	84-40-561	21.0	4.6	84-40-425	32	84-41-305	10.3	84-40-205	10.3	84-50-008	9.5
8 x 30	84-40-561	21.06	4.6	84-40-430	37	84-41-305	10.3	84-40-205	10.3	84-50-008	9.5

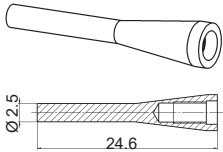
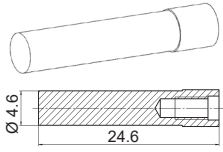
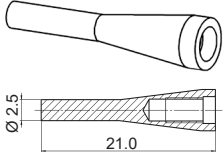
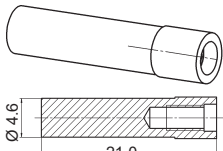


◆ When selecting the equipment, take the notices from chapter 10.1 *Adjusting the Working Position - Determining the protrusion* (see page 20) into account.

Compensating for the insertion depth for intermediate lengths

For welding elements with intermediate lengths that are not listed in the “equipment parts” tables, the insertion depth (protrusion) must be compensated for with the lift.

The following accessories are available for this purpose:

Description	Order No.
 Plunger for stud diameter up to Ø 5 mm, L - <u>only</u> 6 mm Plunger length = 24.6 mm	84-40-532
 Plunger for stud diameter from Ø 6 mm, L - <u>only</u> 6 mm Plunger length = 24.6 mm	84-40-562
 Plunger for stud diameter up to Ø 5 mm, L - to 12 mm	84-40-531
 Plunger for stud diameter from Ø 5 mm, L - from 15 mm	84-40-561

Length compensation	Plunger	Difference of stud length	Difference of plunger length	Insertion depth (Protrusion), recommended	Lift, recommended
Example: Welding element M3 x 6, tip ignition					
84-40-410 for M3 x 10	84-40-532	4 mm	3.6 mm	1.5 mm	4 mm + 4 mm - 3.6 mm ≈ 4 mm
Example: Welding element M3 x 7, tip ignition					
84-40-408 for M3 x 10	84-40-531	1 mm	---	1.5 mm	4 mm + 1 mm = 5 mm
Example: Welding element M3 x 18, tip ignition					
84-40-420 for M3 x 20	84-40-562	2 mm	3.6 mm	1.5 mm	4 mm

Length compensation	Plunger	Difference of stud length	Difference of plunger length	Insertion depth (protrusion), recommended	Lift, recommended
Example: Welding element M8 x 9 mm, tip ignition					
84-40-410 für M8 x 8	84-40-561	1 mm	---	1.5 mm	4 mm + 1 mm = 5 mm
Example: Welding element M8 x 28 mm, tip ignition					
84-40-425 für M8 x 25	84-40-562	3 mm	3.6 mm	1.5 mm	4 mm + 3 mm - 3.6 mm ≈ 5 mm
84-40-430 für M8 x 30	84-40-561	2 mm	---	1.5 mm	4 mm + 2 mm = 6 mm

- ◆ Select the change-over parts suitable for your welding element.
- ◆ Unscrew the retaining nut from the slot piston with the WAF 17 socket wrench.
- ◆ Use air connection B to apply a short pulse of air to the stud welding gun to move the piston rod to the front end position. (Any equipment in the stud welding gun is pressed out.)
- ◆ Insert the pin 2 mm into the cross hole of the piston rod and use pliers to carefully tighten the plunger.
- ◆ Screw the pin stop with the pin 2 mm onto the guide bushing.
- ◆ Push the unit (pin stop/guide bushing) into the slot piston. The correct position is ensured by the guide pin in the slot piston and the groove in the guide bushing.



- ◆ **Note that, when correctly assembled, the unit (pin stop/guide bushing) is inserted completely into the slot piston.**

- ◆ Place the chuck in the slot piston and secure it with the retaining nut.



- A loose retaining nut will damage the chuck, the slot piston and the retaining nut.**

- ◆ Before you start welding, check the bellows at the front of the welding gun for possible damage and proper installation.



- ◆ **Never work with damaged or improperly positioned bellows.**
This may affect the life expectancy of your stud welding gun.

- ◆ Push the feed tube into the welding gun sleeve.
- ◆ Take care that the stop spring engages, then the feed tube is properly inserted and locked.
- ◆ Now you may plug-in the air connector blue again.

10.3 Setting the Welding Parameters

Insertion depth and lift are, among others, dependent on the workpiece and welding elements used and their diameters.

The specifications in the following table are guidelines.

- ◆ Select the parameters that are relevant to lift for your workpiece.

The insertion depth (protrusion) is set by means of the selected equipment.

Capacitor discharge with gap

Material of welding elements	Diameter of welding elements		CDMi 2402 *) / CDMi 3202, CDi 1502 Autom. Welding gun parameters PAH-1 ¹⁾ Lift in mm
	metric ⁵⁾		
	PT, UT	IT	
Material of workpiece: Mild steel (suitable for welding)			
4.8 (suitable for welding)	M3, 3 mm	--	4
4.8 (suitable for welding)	M4, 4 mm	--	4
4.8 (suitable for welding)	M5, 5 mm	5 mm, M3	4
4.8 (suitable for welding)	M6, 6 mm	6 mm, M4	4
4.8 (suitable for welding)	M8, 7.1 mm	7.1 mm, M5	4
Material of workpiece: Galvanised steel (suitable for welding)			
4.8 (suitable for welding)	M3, 3 mm	--	3-4
4.8 (suitable for welding)	M4, 4 mm	--	3-4
4.8 (suitable for welding)	M5, 5 mm	5 mm, M3	3-4
4.8 (suitable for welding)	M6, 6 mm	6 mm, M4	3-4
4.8 (suitable for welding)	M8, 7.1 mm	7.1 mm, M5	3-4
Material of workpiece: Alloyed steel (suitable for welding)			
A2-50	M3, 3 mm	--	4
A2-50	M4, 4 mm	--	4
A2-50	M5, 5 mm	5 mm, M3	4
A2-50	M6, 6 mm	6 mm, M4	4
A2-50	M8, 7.1 mm	7.1 mm, M5	4
Material of workpiece: Alloyed steel (suitable for welding)			
CuZn37	M3, 3 mm	--	2
CuZn37	M4, 4 mm	--	2
CuZn37	M5, 5 mm	5 mm, M3	2
CuZn37	M6, 6 mm	6 mm, M4	2
CuZn37	M8, 7.1 mm	7.1 mm, M5	2
Werkstoff Werkstück: Aluminium			
AlMg3	M3, 3 mm	--	3-4
AlMg3	M4, 4 mm	--	3-4
AlMg3	M5, 5 mm	5 mm, M3	3-4
AlMg3	M6, 6 mm	6 mm, M4	3-4
AlMg3	M8, 7.1 mm	7.1 mm, M5	3-4

¹⁾ to be checked by test weldings

⁵⁾ according to **EN ISO 13918**

Stud welding with drawn arc

Material of welding elements 4.8 (suitable for welding) / A2-50 ⁴⁾		Diameter of welding elements metric ⁵⁾		ARC 800 Autom., IT 90, IT 1002 Autom. Welding gun parameters PAH-1 ¹⁾ Lift in mm
		Stud diameter in mm	eff. diameter in mm	
Material of workpiece: Mild steel (suitable for welding) / stainless steel (suitable for welding) ⁴⁾				
		Ø d ₁	Ø d ₂	
4.8 (suitable for welding) / A2-50 ⁴⁾	RD (MR) ²⁾	M6	4.7	1.0
4.8 (suitable for welding) / A2-50 ⁴⁾	RD (MR) ²⁾	M8	6.2	1.0
		Ø d ₁	Ø d ₂	
4.8 (suitable for welding) / A2-50 ⁴⁾	PD/DD (MD) ²⁾	M6	5.35	1.0
4.8 (suitable for welding) / A2-50 ⁴⁾	PD/DD (MD) ²⁾	M8	7.19	1.2
		Ø d ₁		
4.8 (suitable for welding) / A2-50 ⁴⁾	UD / Pins ²⁾	3 (ISO)		1.0
4.8 (suitable for welding) / A2-50 ⁴⁾	UD / Pins ²⁾	4 (ISO)		1.0
4.8 (suitable for welding) / A2-50 ⁴⁾	UD / Pins ²⁾	5 (ISO)		1.0
4.8 (suitable for welding) / A2-50 ⁴⁾	UD / Pins ²⁾	6		1.0
4.8 (suitable for welding) / A2-50 ⁴⁾	UD / Pins ²⁾	8		1.2
		Ø d ₁	Ø d ₂	
4.8 (suitable for welding) / A2-50 ⁴⁾	PS (US, IS) ³⁾	M3	4	1.2
4.8 (suitable for welding) / A2-50 ⁴⁾	PS (US, IS) ³⁾	M4	5	1.4
4.8 (suitable for welding) / A2-50 ⁴⁾	PS (US, IS) ³⁾	M5	6	1.4
4.8 (suitable for welding) / A2-50 ⁴⁾	PS (US, IS) ³⁾	M6	7	1.6
4.8 (suitable for welding) / A2-50 ⁴⁾	PS (US, IS) ³⁾	M8	9	2.0

¹⁾ to be checked by test weldings

²⁾ Information and recommendations on this can be found in **DIN EN ISO 14555**.

³⁾ Information and recommendations on this can be found in **DVS 0902** and **DVS 0904**.

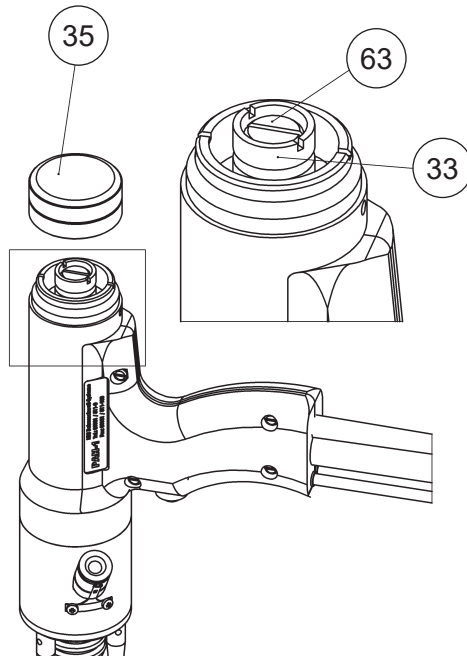
⁴⁾ When welding on galvanized workpieces we recommend increasing the lift.

⁵⁾ according to **EN ISO 13918**



The specified values apply for welding in welding position PA.

Adjusting the Lift – Tip Ignition



Pos. 33 = Milled knob nut

Pos. 35 = Rear cap

Pos. 63 = Solenoid core

- ◆ Unscrew the rear cap (*pos. 35*).
- ◆ Loosen the milled knob nut (*pos. 33*), quarter turn is sufficient.
- ◆ Hold the milled knob nut firmly for the following adjustments. (It could rotate with it.)
- ◆ Turn the solenoid core (*pos. 63*) **anticlockwise** (upwards) until you feel resistance.

The solenoid core (*pos. 63*) is now against the stop block (upper end stop of the solenoid core).

- ◆ Then adjust the lift according to your welding task. For this purpose, rotate the solenoid core (*pos. 63*) **clockwise** (1 rotation = 1 mm lift):

for aluminium 2 rotations clockwise

For steel 4 rotations clockwise (guide value)

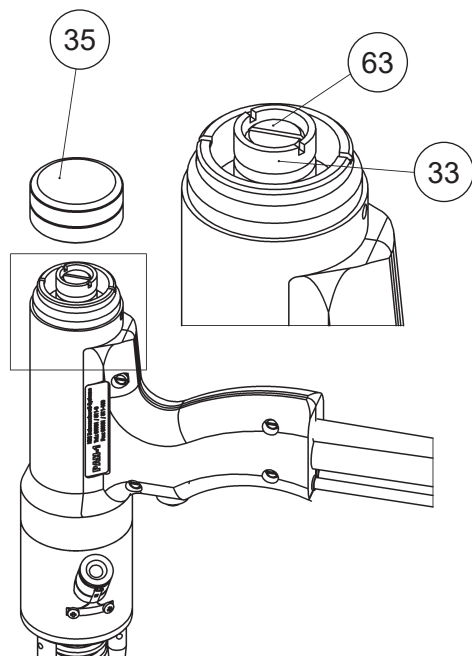
- ◆ Hold the solenoid core (*pos. 63*) firmly and tighten the milled knob nut (*pos. 33*) again.



Notice:

large lift	= short welding time
small lift	= long welding time

Adjusting the Lift – Drawn Arc



Pos. 33 = Milled knob nut

Pos. 35 = Rear cap

Pos. 63 = Solenoid core

- ◆ Unscrew the rear cap (*pos. 35*).
- ◆ Loosen the milled knob nut (*pos. 33*), quarter turn is sufficient.
- ◆ Hold the milled knob nut firmly for the following adjustments. (It could rotate with it.)
- ◆ Move a welding element into the chuck.
- ◆ Erect the welding gun on an insulated working surface so that the feet are supported.
- ◆ Turn the solenoid core (*pos. 63*) **clockwise** (downwards) until you feel resistance.

Now the solenoid core (*pos. 63*) is against the stop block (lower end stop of the solenoid core).

- ◆ Then adjust the lift according to your welding task. For this purpose, rotate the solenoid core **anticlockwise** (1 rotation = 1 mm lift).
- ◆ Hold the solenoid core (*pos. 63*) firmly and tighten the milled knob nut (*pos. 33*) again.

The welding parameters are dependent solely on the material and must always be determined new.



The lift must be checked for each workpiece or stud change.

- ◆ Before starting work, always check the welding gun for ease of movement of the function unit by manually deflecting the chuck in the axial direction.
- ◆ Remove the weld spatter from the chuck, the feet and the retaining nut.
- ◆ After completing the adjustments, re-attach the rear cap (*pos. 35*).



11 Welding



- ◆ Work according to the *original operating manual of the HBS power unit*.



Danger if used other than for the intended purpose

- ◆ Use the welding gun only for CD stud welding or short cycle drawn arc welding and only in combination with power units from manufacturer:



HBS Bolzenschweiss-Systeme GmbH & Co. KG

Felix-Wankel-Strasse 18
85221 Dachau
GERMANY



- ◆ Always check with the operating manual of your power unit whether this welding gun may be used.

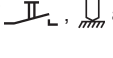
12 Troubleshooting



Danger from insufficiently qualified operating personnel

- ◆ Carry out only the work described here on your stud welding unit or stud welding gun.
- ◆ Repairs may only be carried out by appropriately qualified personnel.
- ◆ Inform your dealer or your maintenance department.

Fault	Possible cause	Fault localisation	Fault remedy	Performance
Welding elements not firmly attached	Wrong welding parameters on the stud welding unit selected	Check adjusted parameters on stud welding unit Check spring force of welding gun Check lift of welding gun	Change adjusted parameters Change adjusted parameters Change adjusted parameters	Trained personnel Trained personnel Trained personnel
	Insertion speed of welding element too low	Check welding piston and linear bearing for ease of movement *)	Clean or replace*)	Qualified specialists
Burning marks at the welding element	Chuck defective	Check chuck for possible defects	Replace chuck	Trained personnel
Stud welding gun does not weld	Control cable defective (no trigger signal available on stud welding unit)	Check control cable for electrical flow at control cable sleeve (Pin 3 and 4) with pressed welding gun trigger*)	In case of no signal: Replace control cable*)	Qualified specialists
	Push button defective (with present contact signal on stud welding unit)	Check push button for electrical flow*)	In case of no flow: Replace push button*)	Qualified specialists
	Welding current cable defective (no contact signal on stud welding unit)	Check, whether welding current cable is connected to stud welding unit in a technically correct way Check welding current cable for electrical flow*)	Connect welding current cable In case of no flow: Replace welding current cable and/or connecting cable*)	Trained personnel Qualified specialists

Fault	Possible cause	Fault localisation	Fault remedy	Performance
Stud welding gun does not weld	Ground connection defective (no contact signal on stud welding unit) Stud welding unit defective	Check, whether ground-cable is connected to workpiece in a technically correct way Check ground cable for electrical flow *) Follow the instructions of the connected stud welding unit	Connect ground cable In case of no flow: Replace ground cable*) Repair required	Trained personnel Qualified specialists HBS-factory service or authorized agencies
Gun does not lift, in spite of  and 	Short circuit of solenoid circuit of the welding gun Solenoid defective	Check resistance value at control cable connector (18 Ω to 22 Ω) between Pin 1 and Pin 2*) Check solenoid (18 Ω to 22 Ω*)	Replace control cable connector, control cable and solenoid*) Replace solenoid*)	Qualified specialists Qualified specialists
No  display	Magnetic circuit interrupted	Measure resistance value at control cable connector (18 Ω to 22 Ω) between Pin 1 and Pin 2*)	Replace solenoid or control cable*)	Qualified specialists



Work marked with *) may only be carried out by qualified electricians!

- ◆ Please contact our Service department if none of the measures described remedies the situation.
- ◆ Please use the form „Service & Support“ in the annex to send in the stud welding gun.

13 Maintenance and Care



Electric shock hazard

- ◆ Never perform maintenance and service work on your stud welding gun while it is connected to the stud welding unit
- ◆ Prior to this disconnect the stud welding gun from the stud welding unit.



Danger from insufficiently qualified operating personnel

- ◆ Carry out only the work described here on your stud welding gun.
- ◆ Repairs may only be carried out by appropriately qualified personnel.
- ◆ Inform your dealer or your maintenance department.

13.1 Cleaning

- ◆ Clean the casing of your stud welding gun with a slightly damp washcloth, when necessary.



- ◆ **Do not use solvents for cleaning.**

These may damage plastic components.

13.2 Maintenance Recommendations

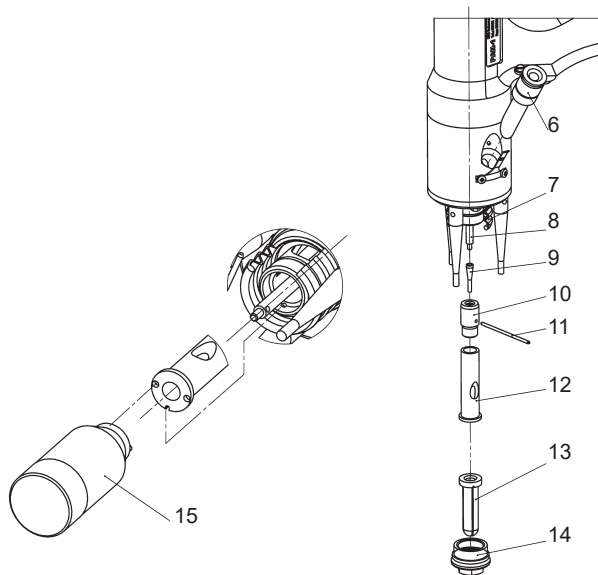


The maintenance recommendation below is regardless of the particular situation in your company. Therefore it is necessary to write down a suitable servicing schedule.

Maintenance Recommendations:	Shift S	Day T	Week W	Every two months 2M	Every six months 6M	Work to be performed
Power supply and control cable connection	x					Check for secure seating
Chuck		x				check, replace if necessary
Guide bushing			x			check, replace if necessary
Plunger			x			check, replace if necessary
Feed tube			x			check, replace if necessary
Pin stop			x			check, replace if necessary
Feed hose		x				check for kinks, check feed hose for secure seating in the hose coupling, check for wear
Clean the automatic welding gun			x			Cleaning with a vacuum cleaner or a cloth; never use compressed air
Adjustment of the automatic welding gun			x			check, readjust if necessary
Clean and grease the piston rod			x			with Amblygon TA 15/2

- ◆ Prior to every use, check whether the type designations and adjustment aids on the welding gun are still legible.
- ◆ Clean the type plates in the event of soiling.
- ◆ Replace any type plates that are damaged or no longer legible.

Replace equipment



Pos.	Number	Description	Order No.
6	1	Feed tube	*)
7	1	Bellows	80-20-010
8	1	Piston	80-40-012
9	1	Plunger	*)
10	1	Pin stop	*)
11	1	Pin	80-10-208
12	1	Guide bushing	*)
13	1	Chuck	*)
14	1	Retaining nut	80-40-010
15	1	Special wrench	84-40-010

*) Selection according to model and dimensions of the welding element

- ◆ Pull off the blue air hose from the stud welding unit.
- ◆ Screw off the retaining nut with the socket wrench AF 17.
- ◆ Remove the chuck.
- ◆ Charge the blue air hose with a short air pulse to expel the guide bushing and stop pin.
- ◆ Unlock the stop spring and pull out the feed tube.
- ◆ **Replace defective and worn equipment components.**
- ◆ Now re-assemble the stud welding gun.

14 Storage

- ◆ Store the stud welding gun in a safe and dust-free location when not in use.
- ◆ Protect the stud welding gun from moisture and metallic contamination.



- ◆ Store the stud welding gun only under the following ambient conditions.

Storage temperature:

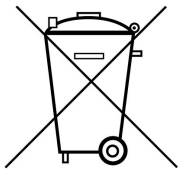
-5 °C to +50 °C (23 °F to 122 °F)

Relative humidity:

0 % - 50 % at +40 °C (104 °F)

0 % - 90 % at +20 °C (68 °F)

15 Disposal



- ◆ Dispose of the stud welding gun only via the manufacturer or a specialist disposal company.
- ◆ Never dispose of the stud welding gun in the domestic refuse.

Declaration of Incorporation of partly completed Machinery

to Directive 2006/42/EC, Annex II 1 B

(Original Declaration of Incorporation)

Herewith the manufacturer

HBS Bolzenschweiss-Systeme GmbH & Co. KG
Felix-Wankel-Strasse 18
P.O. Box 13 46
85221 Dachau
GERMANY
Phone +49 8131 511-0
Fax +49 8131 511-100

declares for the following product

Machine information: Stud welding gun
Type: PAH-1
Order No: 94-20-025
Serial No: 94-20-025/242XXXX
Year of manufacture: 2024

that the following essential requirements of the above mentioned Directive – including changes to the Directive to be applied at the moment of this declaration – were applied and fulfilled:

Annex I, Article 1, 1.1.2, 1.1.3, 1.1.5, 1.1.6, 1.1.7, 1.2.1, 1.2.2, 1.2.3, 1.2.4.1, 1.2.6, 1.3.1, 1.3.2, 1.3.3, 1.3.4, 1.3.7, 1.3.8, 1.3.9, 1.4.1, 1.4.2.1, 1.5.1, 1.5.2, 1.5.4, 1.5.5, 1.5.6, 1.5.8, 1.5.10, 1.5.11, 1.5.15, 1.5.16, 1.6.1, 1.6.2, 1.6.3, 1.6.4, 1.7.1.1, 1.7.2, 1.7.3, 1.7.4,

that special technical documentation was compiled in accordance with Part B of Annex VII of the above mentioned regulation and will be transmitted, in response to a reasoned request by the national authorities as follows:

The above mentioned documents will be transmitted by e-mail as a data file in German language.

that this partly completed machinery must not be put into service until the final machinery into which it is to be incorporated has been declared in conformity with the provisions of the Directive, where appropriate.

that this incomplete machine complies with corresponding regulations of the following additional EU Directives, including any changes to be applied at the moment of this declaration:

„Electromagnetic compatibility“ 2014/30/EU

Protection targets of the low voltage regulation were kept to appendix I, no. 1.5.1 of the machine regulation.

Persons who are based in the European community and who are authorised to compile the technical documentation:

Name: Address: see manufacturer

Dachau, 02.01.2024
Place of issue, Date


Anja Bloch (CEO HBS)



Service & Support

With the return please attach a copy of the filled out form together with the repair number given by HBS! Repairs without repair number will not be processed.

Repair number

(given by HBS)

Company:

Name / Surname:

Street:

City, State and ZIP/Postcode:

Country:

Phone & Fax:

E-mail address:

Stud welding unit / stud welding gun
type of model:

Serial number:

Date of purchase:

Purchased at distributor:

Detailed descriptions of errors:

Service & Support may be done up to the value of EUR _____
without quotation:

☐ Yes

☐ No

Could you find any damage / burn marks

on the cables:

☐ Yes

☐ No

on chucks:

☐ Yes

☐ No

Are all plug and screw connections tightly fastened *:

☐ Yes

☐ No

Are there any burn marks on plug or screw connections:

☐ Yes

☐ No

Is there any other visual damage (e.g. cracks, dents):

☐ Yes

☐ No

Have you checked the fuses:

☐ Yes

☐ No

Default on the display of the stud welding unit:

ARC / IT					CD / CDM / SC					

Which LED's are illuminated (please mark with a cross)?

Please e-mail or fax this form to service@hbs-info.de or fax: +49 8131 511-100.

In case a repair is necessary a repair number will be given!

* See also operating manual chapter „Connection“

** Doesn't light when using a contact welding gun

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