# A 16

Stud Welding Gun

93-20-280C

# Operating Manual

2018

**After-sales service for Germany:**

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**A 16 Operating Manual Issue 2018-01 Order No. E-BA 93-20-280C**

Translation of the Original Operating Manual

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

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

85221 Dachau

GERMANY

# Table of Contents

# 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**

- Never operate the stud welding machine if you wear a heart pacemaker or implanted defibrillator.
- In this case, never remain in the vicinity of the stud welding machine during welding.
- Never operate the stud welding machine if persons with heart pacemakers or implanted defibrillators are in the vicinity.

Strong electromagnetic fields are produced in the vicinity of the stud welding machine during welding. These fields could impact the function of heart pacemakers or implanted defibrillators.

**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 workplace.

- Do not weld when wearing working clothes soiled with flammable substances such as oil, grease, petroleum, etc.
- Wear your proper protective clothing, 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 light 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.

# 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** with the operating procedures **can occur** if this information **is not observed.**

**No access for people with active implanted cardiac devices**

**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 clothing 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**

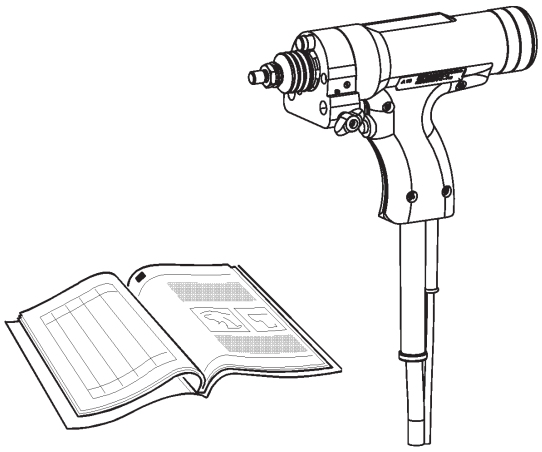
## Glossary

| | |
|---|---|
| Automatic welding head: | Device for welding of welding elements |
| Capacitor: | Component for storage of electrical energy. |
| Light arc: | Independent gas discharge between two electrodes when the current is high enough. A whitish light is emitted in the process. The light 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 machine: | Stud welding unit including stud welding gun |
| 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 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 welding gun contains the following parts:

| No. of pieces | Part | Type | Order No. |
|---|---|---|---|
| 1 | Welding gun<br>cable length 4.85 m | A 16 | 93-20-280C |
| 1 | Operating manual | A 16 | E-BA 93-20-280C |



- ◆ 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:

| | |
|---|---|
| Mounting tool set | 93-40-116 |
| Protective hose, complete with zipper | 80-11-430 |

Additional accessories can be found in our extensive accessories catalogue.

# 5 Technical Data

**Stud welding gun type A 16 (damped)**
for ARC stud welding according to current standards

| | |
|---|---|
| Welding range | Dia. 3 to 16 mm |
| Stud length | 10 to 300 mm (depending on leg assembly) |
| Stud material | Mild steel, stainless steel |
| Stud type | Any type or shape (special chucks if required) |
| Length compensation | 6 mm automatic |
| Lift | Adjustment range 4 mm,<br>(0.25 mm steps, arresting) |
| Damping | Adjustable oildamper |
| Welding cable | 4.85 m, 50 mm² |
| IP Code | IP 20 (protect against humidity) |
| Workplace noise level | Up to 90 dB (A) may occur during welding |
| Ambient temperature limits | 0 °C to 40 °C |
| Dimension L x B x H | 260 x 74 x 220 mm<br>(without cable, with tripod leg guidance) |
| Weight | 2 kg (without cable), 4.6 kg (with cable) |

**Ceramic leg assembly**
(not included in delivery)
for stud welding with ceramic ferrule according to current standards

**Ceramic leg assembly PSC-2** **Order no. 93-40-028**


| | |
|---|---|
| Welding range | Welding elements (RD, DD, PD, UD, ID)<br>dia. 4 to 12 mm<br>Shear connectors (SD) up to dia. 13 mm |
| Stud length | up to 170 mm |
| Dimension tripod legs | 10 x 240 mm |
| Dimension food piece | Inner diameter d = 22 mm |
| Weight | 0.397 kg |

**Ceramic leg assembly PSC-2** **Order no. 93-40-040**


| | |
|---|---|
| Welding range | Welding elements (RD, DD, PD, UD, ID)<br>dia. 16 to 20 mm<br>Shear connectors (SD) up to dia. 13 mm |
| Stud length | up to 150 mm |
| Dimension tripod legs | 10 x 240 mm |
| Dimension food piece | Inner diameter d = 28 mm |
| Weight | 0.388 kg |

**Ceramic leg assembly PSC-2** **Order no. 93-40-041**


| | |
|---|---|
| Welding range | Shear connectors (SD) dia. 16 mm |
| Stud length | up to 150 mm |
| Dimension tripod legs | 10 x 240 mm |
| Dimension food piece | Inner diameter d = 29 mm |
| Weight | 0.380 kg |

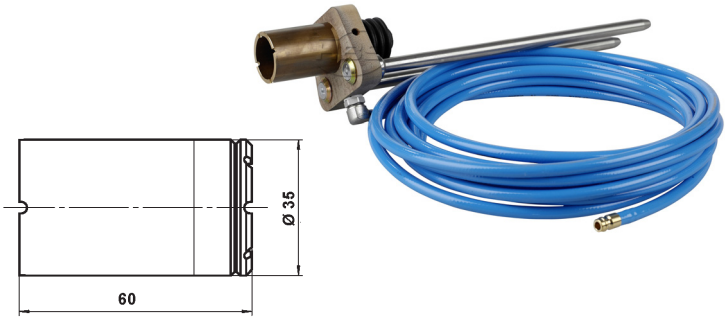
**Ceramic leg assembly PSC-2** **Order no. 93-40-074**


| | |
|---|---|
| Welding range | Shear connectors (SD) dia. 16 mm |
| Stud length | up to 300 mm |
| Dimension tripod legs | 10 x 390 mm |
| Dimension food piece | Inner diameter d = 29 mm |
| Weight | 0.551 kg |

**Shielding gas leg assembly**
(not included in delivery)

for stud welding with shielding gas according to current standards

| **Shielding gas leg assembly PSS-3** | **Order no. 93-40-017** |
|---|---|




| | |
|---|---|
| Welding range | Welding elements (RD, DD, PD, UD, ID, PS, US, IS) dia. 6 to 16 mm |
| Stud length | up to 150 mm |
| Dimension tripod legs | 10 x 240 mm |
| Dimension | D = 35 mm, l = 60 mm |
| Weight | 0.960 kg |

# 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.

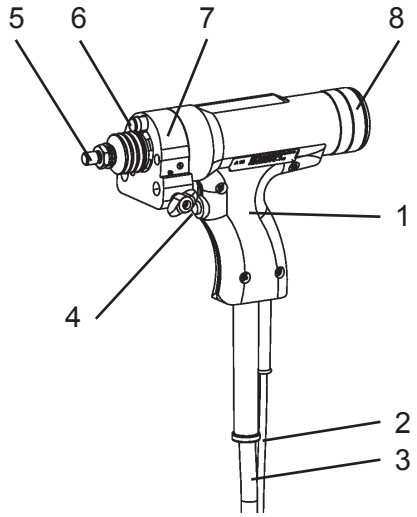
The warranty does not cover faults caused by e.g.

– 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 welding gun consists of a sturdy two-part **plastic housing (1)**.

The **control cable (2)** and the **welding cable (3)** are connected through the welding gun handle to the welding gun.

Positioned at the front of the stud welding gun is a **double nipple (5)** used to fix the manual chuck.

At the front of the stud welding gun, the **tripod leg guidance (7)** is installed. Here the leg assembly is mounted.

The **protection cap (6)** is used to cover the damper.

At the rear (under the **cap (8)**), there is the mechanism for lift adjustment.

At the front of the welding gun handle, the **welding gun trigger (4)** is installed. It is used to trigger the welding process.

The serial number 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 drawn arc stud welding.

◆ 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

– mounting the leg assembly
– mounting the chuck
– adjusting the lift
– adjusting the insertion depth (protrusion).

◆ Do not connect the stud 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 Drawn Arc Stud Welding (Ceramic Application)

◆ Select a leg assembly suitable for your welding element:


**Ceramic leg assembly PSC-2**
Order no.: 93-40-028
(d = 22 mm)

for welding elements (RD, DD, PD, UD, ID)
dia. 4 to 12 mm
for shear connectors (SD) up to dia. 13 mm

up to length 170 mm

**Ceramic leg assembly PSC-2**
Order no.: 93-40-040
(d = 28 mm)

for welding elements (RD, DD, PD, UD, ID)
dia. 16 to 20 mm
for shear connectors (SD) up to dia. 13 mm

up to length 150 mm


**Ceramic leg assembly PSC-2**
Order no.: 93-40-041
(d = 29 mm)

for shear connectors (SD)
dia. 16 mm up to length 150 mm

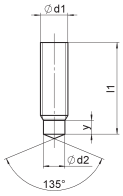
**Ceramic leg assembly PSC-2**
Order no.: 93-40-074
(d = 29 mm)

for shear connectors (SD)
dia. 16 mm up to length 300 mm

◆ Select a chuck suitable for your welding element:

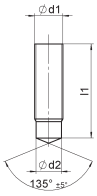
## Welding elements for drawn arc stud welding (ceramic application):

### Threaded studs with reduced shaft (RD)



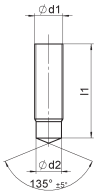

| Stud dimension Ø $d_1$ | Chuck | Depth for studs in mm | Ceramic ferrule grip | Suitable leg assembly |
|---|---|---|---|---|
| M6 | 83-50-006 | 7 | 80-31-095 | 93-40-028 |
| M8 | 83-50-008 | 9 | 80-31-120 | 93-40-028 |
| M10 | 83-50-010 | 11 | 80-31-150 | 93-40-028 |
| M12 | 83-50-012 | 13 | 80-31-170 | 93-40-028 |
| M16 | 83-50-016 | 15 | 80-30-116 | 93-40-040 |

### Virtually threaded studs (DD)



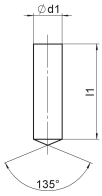

| Stud dimension Ø $d_1$ | Chuck | Depth for studs in mm | Ceramic ferrule grip | Suitable leg assembly |
|---|---|---|---|---|
| M6 | 83-50-006 | 7 | 80-31-095 | 93-40-028 |
| M8 | 83-50-008 | 9 | 80-31-150 | 93-40-028 |
| M10 | 83-50-010 | 11 | 80-31-150 | 93-40-028 |
| M12 | 83-50-012 | 13 | 80-31-205 | 93-40-028 |
| M16 | 83-50-016 | 15 | 80-31-262 | 93-40-040 |

### Partially threaded studs (PD)



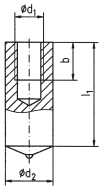

| Stud dimension Ø $d_1$ | Chuck | Depth for studs in mm | Ceramic ferrule grip | Suitable leg assembly |
|---|---|---|---|---|
| M6 | 83-50-006 | 7 | 80-31-095 | 93-40-028 |
| M8 | 83-50-008 | 9 | 80-31-120 | 93-40-028 |
| M10 | 83-50-010 | 11 | 80-31-150 | 93-40-028 |
| M12 | 83-50-012 | 13 | 80-31-170 | 93-40-028 |
| M16 | 83-50-016 | 15 | 80-30-116 | 93-40-040 |

**Unthreaded studs (pins) (UD)**



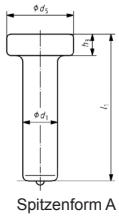

| Stud dimension Ø $d_1$ | Chuck | Depth for studs in mm | Ceramic ferrule grip | Suitable leg assembly |
|---|---|---|---|---|
| 6 | 83-50-006 | 7 | 80-31-095 | 93-40-028 |
| 8 | 83-50-008 | 9 | 80-31-150 | 93-40-028 |
| 10 | 83-50-010 | 11 | 80-31-150 | 93-40-028 |
| 12 | 83-50-012 | 13 | 80-31-205 | 93-40-028 |
| 16 | 83-50-016 | 15 | 80-31-262 | 93-40-040 |

**Studs with internal thread (ID)**




| Stud dimension Ø $d_2$ | Ø $d_1$ | Chuck | Depth for studs in mm | Ceramic ferrule grip | Suitable leg assembly |
|---|---|---|---|---|---|
| 10 | M5 | 83-50-010 | 11 | 80-31-150 | 93-40-028 |
| 10 | M6 | 83-50-010 | 11 | 80-31-150 | 93-40-028 |
| 12 | M8 | 83-50-012 | 13 | 80-31-205 | 93-40-028 |
| 16 | M10 | 83-50-016 | 15 | 80-31-262 | 93-40-040 |

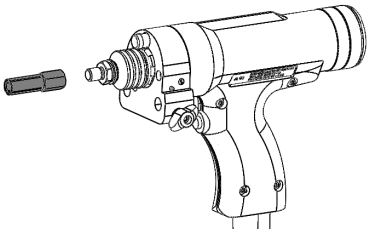
**Shear connectors (SD)**



Spitzenform A

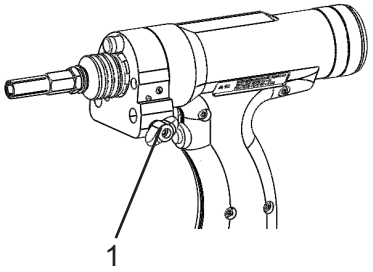
| Stud dimension Ø $d_2$ | Ø $d_1$ | Chuck | Depth for studs in mm | Ceramic ferrule grip | Suitable leg assembly |
|---|---|---|---|---|---|
| 6 | 12,5 | 83-53-006 | 6 | 80-30-206 | 93-40-028 |
| 9,5 | 19 | 83-53-010 | 9 | 80-30-210 | 93-40-028 |
| 10 | 19 | 83-53-010 | 9 | 80-30-210 | 93-40-028 |
| 12,7 | 25 | 83-53-012 | 8 | 80-30-213 | 93-40-028 |
| 13 | 25 | 83-53-012 | 8 | 80-30-213 | 93-40-040 |
| 13 | 25 | 83-53-012 | 8 | 80-31-213 | 93-40-028 |
| 16 | 32 | 83-53-019 | 12 | 80-30-219 | 93-40-041 / 93-40-074 |

## Mounting the chuck



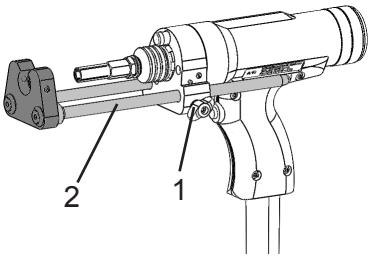
- Screw the chuck on the thread socket of the welding gun.
- Tighten the chuck firmly with a double open ended-wrench AF 14/17 or 19/22 (accessory).

### Mounting the leg assembly




1 - Wing screw

◆ Loosen the wing screw (1).

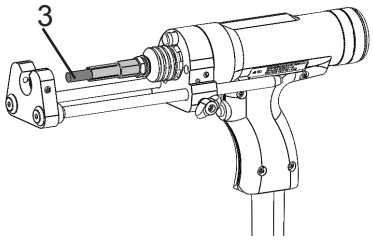



1 - Wing screw

2 - Tripod leg

◆ Now attach the leg assembly to the stud welding gun.

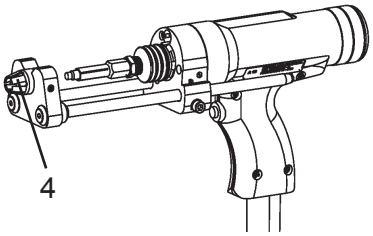
◆ Clamp the tripod legs (2) with the wing screw (1).




3 - Welding element

◆ Put the welding element up to the stop into the chuck.

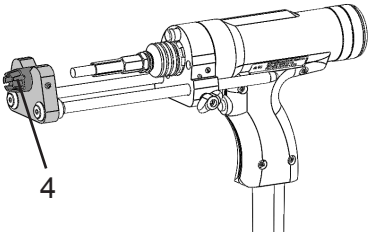
**Attention:**
**The welding element must firmly sit in the chuck, otherwise welding element and chuck would burn.**




4 - Ceramic ferrule grip

◆ Place the ceramic ferrule grip into the foot piece.

◆ Clamp the ceramic ferrule grip with an allen key 3 mm (included in accessories).




◆ Put on the ceramic ferrule (5).

◆ Adjust the foot piece until the stud can be moved in the ceramic ferrule without friction (centered).

◆ Tighten the foot piece with an allen key 4 mm (accessory).

◆ Clamp the tripod legs with the wing screw.

## 10.2 Drawn Arc Stud Welding (Shielding Gas Application)

◆ Select a leg assembly suitable for your welding element:

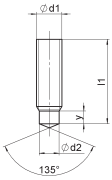
**Shielding gas leg assembly PSS-3**
Order no.: 93-40-017
(D = 35 mm)

for welding elements (RD, DD, PD, UD, ID, PS, US, IS) dia. 6 to 16 mm

◆ Select a chuck suitable for your welding element:

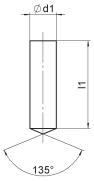
**Welding elements for drawn arc stud welding (shielding gas application):**

**Threaded studs with reduced shaft (RD and DD)**
**Partially threaded studs (PD)**



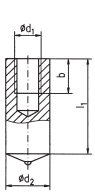

| Stud dimension Ø $d_1$ | Chuck | Depth for stud in mm |
|---|---|---|
| M6 | 83-51-006 | 7 |
| M8 | 83-51-008 | 9 |
| M10 | 83-51-010 | 11 |
| M12 | 83-51-012 | 13 |
| M16 | 83-51-016 | 16 |

**Unthreaded studs (pins) (UD)**



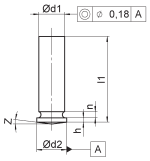

| Stud dimension Ø $d_1$ | Chuck | Depth for stud in mm |
|---|---|---|
| 6 | 83-51-006 | 7 |
| 8 | 83-51-008 | 9 |
| 10 | 83-51-010 | 11 |
| 12 | 83-51-012 | 13 |
| 16 | 83-51-016 | 16 |

**Studs with internal thread (ID)**



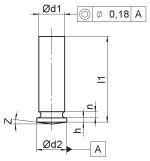

| Stud dimension Ø $d_2$ | Ø $d_1$ | Chuck | Depth for stud in mm |
|---|---|---|---|
| 10 | M5 | 83-51-010 | 11 |
| 10 | M6 | 83-51-010 | 11 |
| 12 | M8 | 83-51-012 | 13 |
| 16 | M10 | 83-51-016 | 16 |

**Threaded studs with flange (PS)**



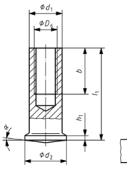

| Stud dimension | |  | |
|---|---|---|---|
| Ø $d_1$ | Ø $d_2$ | Chuck | Depth for stud in mm |
| M6 | 7 | 83-51-006 | 7 |
| M8 | 9 | 83-51-008 | 9 |
| M10 | 11 | 83-51-010 | 11 |

**Unthreaded studs (pins) with flange (US)**



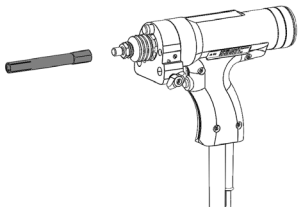

| Stud dimension | |  | |
|---|---|---|---|
| Ø $d_1$ | Ø $d_2$ | Chuck | Depth for stud in mm |
| 6 | 7 | 83-51-006 | 7 |
| 7.1 | 9 | 83-51-008 | 9 |
| 8 | 9 | 83-51-010 | 11 |

**Studs with internal thread and flange (IS)**

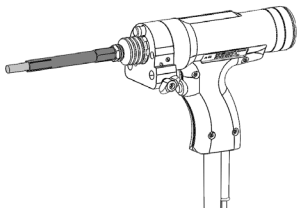



| Stud dimension | |  | |
|---|---|---|---|
| Ø $d_1$ | Ø $D_6$ | Chuck | Depth for stud in mm |
| 6 | M4 | 83-51-006 | 7 |
| 7.1 | M5 | 83-51-071 | 9 |
| 8 | M5 | 83-51-008 | 9 |
| 8 | M6 | 83-51-008 | 9 |

## Mounting the chuck



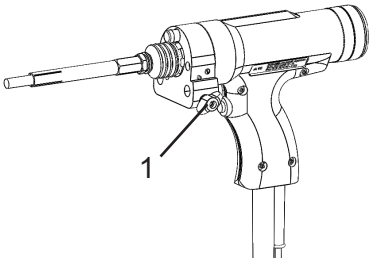
- Screw the chuck on the thread socket of the welding gun.
- Tighten the chuck firmly with a double open ended-wrench AF 14/17 or 19/22 (accessories).



- Put the welding element up to the stop into the chuck.

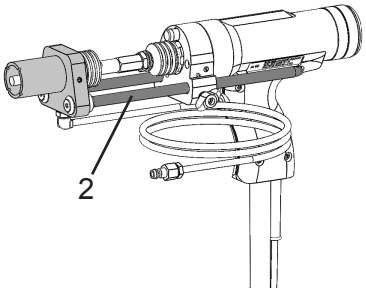
**Attention:**
**The welding element must firmly sit in the chuck, otherwise welding element and chuck would burn.**

### Mounting the leg assembly



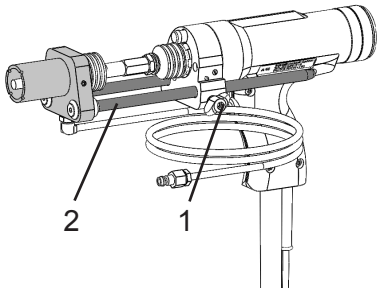

1 - Wing screw

◆ Loosen the wing screw (1).




2 - Tripod leg

◆ Now attach the leg assembly to the stud welding gun.



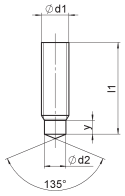
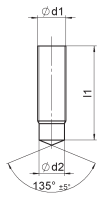
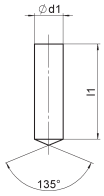
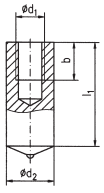

◆ Clamp the tripod legs (2) with the wing screw (1).

## 10.3 Setting the Welding Parameters

The insertion depth, lift and hydraulic damping are, among others, dependent on the workpiece and welding elements used and their diameters.

The specifications in the following table are guidelines.

◆ Select the applicable parameters for insertion depth, lift and hydraulic damping for your workpiece.

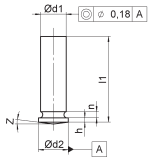
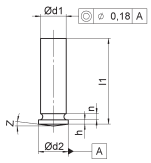
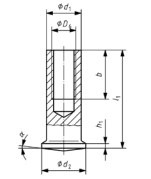
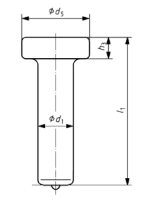
| Welding elements<br>Material:<br>4.8 (suitable for welding) / A2-50 [4] | Diameter of welding elements | | | | ARC 500, ARC 800, ARC 1550, IT 50, IT 90, IT 130, IT 1002, IT 2002, IT 3002<br>Welding gun parameters A 16 [1] | |
|---|---|---|---|---|---|---|
| | metric [5] | | imperial (US) | | | |
| | Stud-diameter in mm | eff. diameter in mm | Stud-diameter in inches (ca.) | eff. diameter in inches (ca.) | Insertion depth P in mm | Lift L in mm |
| Material of workpiece: Mild steel (suitable for welding) / stainless steel (suitable for welding) [4] | | | | | | |
|  | Ø $d_1$ | Ø $d_2$ | Ø $d_1$ | Ø $d_2$ | | |
| RD [2] | M6 | 4.7 | 1/4 | 0.187 | 2.0 | 1.0 |
| RD [2] | M8 | 6.2 | 5/16 | 0.275 | 2.0 | 1.0 |
| RD [2] | M10 | 7.9 | 3/8 | 0.312 | 2.5 | 1.25 |
| RD [2] | M12 | 9.5 | 1/2 | 0.435 | 3.0 | 1.5 |
| RD [2] | M16 | 13.2 | 5/8 | 0.500 | 3.0 | 2.0 |
|  | Ø $d_1$ | Ø $d_2$ | Ø $d_1$ | Ø $d_2$ | | |
| PD/DD (MD) [2] | M6 | 5.35 | 1/4 | 0.21 | 2.0 | 1.0 |
| PD/DD (MD) [2] | M8 | 7.19 | 5/16 | 0.28 | 2.5 | 1.25 |
| PD/DD (MD) [2] | M10 | 9.03 | 3/8 | 0.36 | 3.0 | 1.5 |
| PD/DD (MD) [2] | M12 | 10.86 | 1/2 | 0.43 | 3.0 | 1.5 |
| PD/DD (MD) [2] | M16 | 14.60 | | | 3.0 | 2.0 |
|  | Ø $d_1$ | | Ø $d_1$ | | | |
| UD [2] | 6 | | 1/4 | | 2.0 | 1.0 |
| UD [2] | 8 | | 5/16 | | 2.5 | 1.25 |
| UD [2] | 10 | | 7/16 | | 3.0 | 1.5 |
| UD [2] | 12 | | 1/2 | | 3.0 | 1.75 |
| UD [2] | 16 | | 5/8 | | 3.5 | 2.2 |
|  | Ø $d_1$ | Ø $d_2$ | Ø $d_1$ | Ø $d_2$ | | |
| ID [2] | M5 | 10 | 3/16 | 1/4“ | 3.0 | 1.5 |
| ID [2] | M6 | 10 | 1/4 | 0.393 | 3.0 | 1.5 |
| ID [2] | M8 | 12 | 5/16 | 0.472 | 3.0 | 1.75 |
| ID [2] | M10 | 16 | 3/8 | 0.638 | 3.5 | 2.2 |

[1] to be checked by test weldings

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

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

[5] according to **EN ISO 13918**

| Welding elements<br>Material:<br>4.8 (suitable for welding) / A2-50 [4] | Diameter of welding elements | | | | ARC 500, ARC 800, ARC 1550, IT 50, IT 90, IT 130, IT 1002, IT 2002, IT 3002 | |
|---|---|---|---|---|---|---|
| | metric [5] | | imperial (US) | | Welding gun parameters A 16 [1] | |
| | Stud-diameter in mm | eff. diameter in mm | Stud-diameter (ca.) | eff. diameter in inches (ca.) | Insertion depth P in mm | Lift L in mm |
| Material of workpiece: Mild steel (suitable for welding) / stainless steel (suitable for welding) [4] | | | | | | |
|  | Ø $d_1$ | Ø $d_2$ | Ø $d_1$ | Ø $d_2$ | | |
| PS [3] | M6 | 7 | 1/4 | 0.21 | 2.5 | 1.25 |
| PS [3] | M8 | 9 | 5/16 | 0.28 | 3.0 | 1.5 |
| PS [3] | M10 | 11 | 3/8 | 0.35 | 3.0 | 1.75 |
|  | Ø $d_1$ | Ø $d_2$ | Ø $d_1$ | Ø $d_2$ | | |
| US [3] | 6 | 7 | 1/4 | 9/32 | 2.5 | 1.25 |
| US [3] | 7.1 | 9 | 9/32 | 3/8 | 3.0 | 1.5 |
| US [3] | 8 | 9 | 5/16 | 3/8 | 3.0 | 1.7 |
|  | Ø $d_1$ | Ø $d_2$ | Ø $d_1$ | Ø $d_2$ | | |
| IS [3] | 6 | M4 | 1/4 | 5/32 | 2.5 | 1.25 |
| IS [3] | 7.1 | M5 | 9/32 | #10 / 3/16 | 3.0 | 1.5 |
| IS [3] | 8 | M5 | 5/16 | #10 / 3/16 | 3.0 | 1.5 |
| IS [3] | 8 | M6 | 5/16 | 1/4 | 3.0 | 1.5 |
|  | $d_1$ | | $d_1$ | | | |
| SD [2] | 9.5 / 10 | | 3/8“ | | 3.0 | 2.0 |
| SD [2] | 12.7 / 13 | | 1/2“ | | 3.0 | 2.5 |
| SD [2] | 16 | | 5/8“ | | 3.5 | 3.0 |

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.

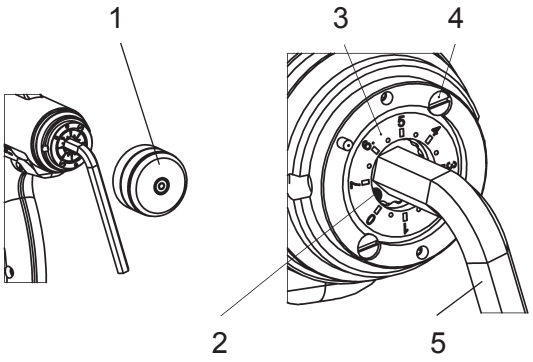
5) according to **EN ISO 13918**

**The maximum adjustment values which can be set for the insertion depth (3.5 mm) as well as the lift (3 mm) should not be exceeded.**

The specified values apply for welding in welding position PA.

## Adjusting Lift

**The adjustment piece for lift must not be turned by more than 360°.**




1 - Cap
2 - Marking
3 - Scale wheel
4 - Slotted screw
5 - Allen key size 8

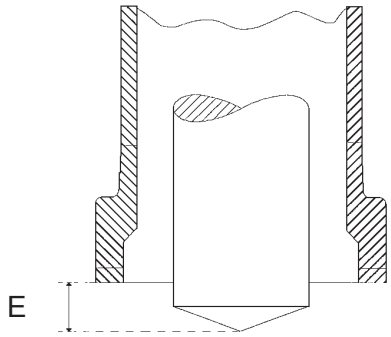
- Screw off the cap (1) at the rear.
- Use the allen key to turn the adjustment piece for lift counter-clockwise to the selected lift (*see table under point 10.3*).

The lift can be adjusted in steps of 0.25 mm. (The empty space between 0 and 0.25 mm serves to mechanically balance out the lifting ring construction).

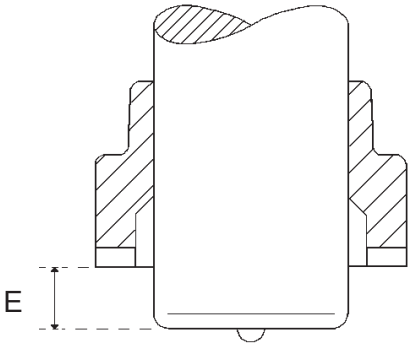
- Screw on the cap again.
- You can **reduce** the lift by turning the adjustment piece for lift **clockwise**.
- You can **increase** the lift by turning the adjustment piece for lift **counter-clockwise**.

## Setting the Insertion Depth (Protrusion)

The insertion depth characterizes the overlap size which would be achieved by welding element and base material with seated welding gun before welding. This overlap provides the melt for forming the weld collar.




E = Insertion depth for welding elements with conical face

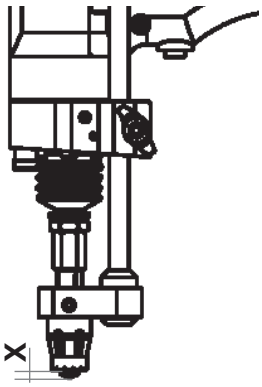



E = Insertion depth for welding elements with plane face

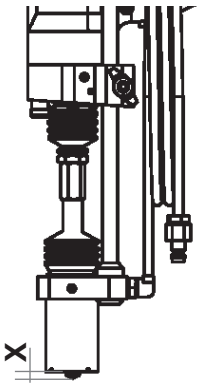
◆ Loosen the wing screw at the welding gun and adjust the insertion depth (*see table under point 10.3*).

**Insertion depth X**

Ceramic application




Shielding gas application




◆ Clamp the triopd legs with the wing screw.

**There must be no friction between welding element and ceramic ferrule.**

◆ If so, **center the foot piece of the welding gun.**

**When triggering the welding gun key, the welding gun lifts the welding element always by the same lift value, independant from the position of the welding element.**

**Assignment stud diameter – electrical current – welding time with lift and protrusion:**

Example:

| Diameter of the welding element | Welding current | Welding time | |
|---|---|---|---|
| dia. 16 mm | 1300 A | 0.65 s | with ceramic ferrule |
| dia. 12 mm | 1000 A (+ 10 %) | 0.45 s | with shielding gas |

Optimum parameters for an application may differ from indicated data due to plate thickness, welding position, coatings, type of ceramics ferrules etc.

◆ Based on stud diameter at the welding place, determine welding current and welding time, then lift and insertion depth depending on type of stud tips (to ceramic ferrule or face area). Note the insertion speed!

Example 1:

Diameter of welding element = 16 mm:
Welding current = 1300 A, Welding time = 0.65 s,

flat stud tip (with alu ball):
lift = 3 mm, insertion depth = 3.5 mm, insertion speed = 100 mm/s.

# 11 Welding

◆ **Work according to the *original operating manual of the HBS stud welding unit*.**

**Danger if used other than for the intended purpose**

◆ Use the stud welding gun only for ARC stud welding and only in combination with stud welding units from manufacturer:

**HBS Bolzenschweiss-Systeme GmbH & Co. KG**
Felix-Wankel-Strasse 18
85221 Dachau
GERMANY

◆ Always check with the operating manual of your stud welding unit whether this stud 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 selected | Check adjusted parameters on stud welding unit | Change adjusted parameters | Trained personnel |
| | | Check lift of welding gun | Change adjusted parameters | Trained personnel |
| | | Check lift of welding gun | Change adjusted parameters | 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 |
| | Lamellas of chuck are not pretensioned | Check lamellas of chuck | Try to bend lamellas if possible, otherwise replace chuck | Trained personnel |
| Welding gun does not weld | Wrong welding parameters selected | Check lift on the stud welding gun | Change adjusted parameters | Trained personnel |
| | | Check protrusion (insertion depth) on the stud welding gun | Change adjusted parameters | Trained personnel |
| | 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 |
| | Micro switch defective (no trigger signal available at 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 micro switch *) | 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 | Connect welding current cable | Trained personnel |
| | | Check welding current cable for electrical flow *) | In case of no flow : Replace welding current cable and/or connecting cable *) | Qualified specialists |

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

- ◆ Inspect the chuck before every use.
- ◆ Replace the chuck if you discover burning marks on the welding element and/or on the chuck.
- ◆ Work here in accordance with *point 10 „Preparing the Stud Welding Gun“* in this manual.
- ◆ Before every use, inspect the bellows on the front part of the stud welding gun for proper seating and/or damage.


- ◆ **Never work with damaged or incorrectly seated bellows**.

This will contribute to a long service life of your stud welding gun.

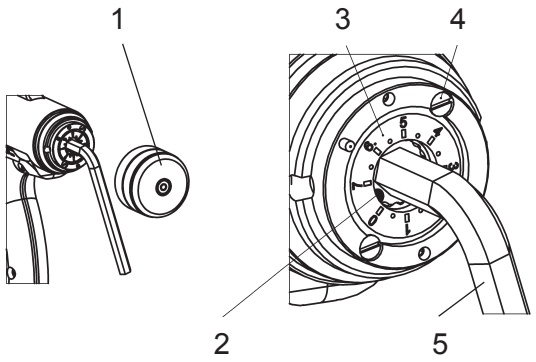
- ◆ Inform your dealer or maintenance department if you discover any damage.

- ◆ Before every use, check that the type designations and adjustment aids on the stud 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.

## 13.3 Adjusting the Lift Scale

The lift scale can only be adjusted with connected and switched on stud welding unit.

- ◆ Observe the safety instructions in the operating manual of the connected stud welding unit.
- ◆ Refer here to the operating manual of your stud welding unit.




1 - Cap
2 - Marking
3 - Scale wheel
4 - Slotted screw
5 - Allen key size 8

- ◆ Screw off the cap at the rear.
- ◆ Now screw in the lift up to the stop by turning clockwise.
- ◆ Now screw out the lift step by step by turning counter-clockwise.
- ◆ Push the welding gun trigger and check if lift is triggered.
- ◆ Repeat this procedure until a lifting motion at the chuck is visible.
- ◆ Lock this position with an allen key (size 8).
- ◆ Loosen both slotted screws.
- ◆ Adjust the scale wheel by turning and setting the zero position onto the marking.
- ◆ Then tighten the slotted screws.
- ◆ Screw on the cap again.

Now the scaling ‘Lift’ is adjusted.

# 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.

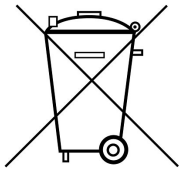
**Storage temperature:**

-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: A 16
Order No: 93-20-280C
Serial No: 93-20-280C/182XXXX
Year of manufacture: 2018

**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: Heike Otto Address: see manufacturer

Dachau, 02.01.2018
Place of issue, Date

Gregor Gröger (General Manager 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

# Index

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