



AM 12 A

Welding gun

93-20-242



Operating manual

After-sales service for Germany:

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

Phone	+49 8131 511-0
Fax	+49 8131 511-100
E-mail	international@hbs-info.com
Web	www.hbs-info.com

AM 12 A Operating Manual Issue 2021-01 Order No. E-BA 93-20-242

Translation of the Original Operating Manual

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

Transmission and duplication of this document, dissemination and notification of the contents are not permitted unless expressly approved.

All rights, errors and technical amendments reserved.

©HBS Bolzenschweiss-Systeme GmbH & Co. KG



Dear Customer,

Many thanks for buying a nut welding unit from HBS Bolzenschweiss-Systeme.

We at HBS wish you success at all times when working with this nut welding unit.

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	6
2	Symbols and Terms Used	10
3	Scope of Supply	13
4	Accessories	14
5	Technical Data	16
6	Intended Use	18
7	Warranty	19
8	Design and Function	20
9	Welding Process	23
10	Preparing the Welding Gun	24
10.1	Assembling the Welding System	24
10.2	Installing the Magnetic Field Guidance	25
10.3	Installing the Shielding Gas Tripod	26
10.4	Connecting the Welding Gun to the Stud Welding Unit	27
10.5	Inspection Tasks Prior to Commissioning	27
10.6	Adjusting Welding Parameters	28
	Adjusting Lift	30
	Setting the Insertion Depth (Protrusion)	32
	Adjusting Spring Force	33
11	Welding	34
12	Troubleshooting	35
12.1	Possible Faults/Repair Work	35
12.2	Checking the Torque	37

13	Maintenance and Care	44
13.1	Cleaning	44
13.2	Inspection and Tests	45
14	Storage	46
15	Disposal	46
	Declaration of Incorporation of Partly Completed Machinery	47
	Service & Support	48
	Index	49

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 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 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 with the operating procedures **can 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 your **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 unit



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

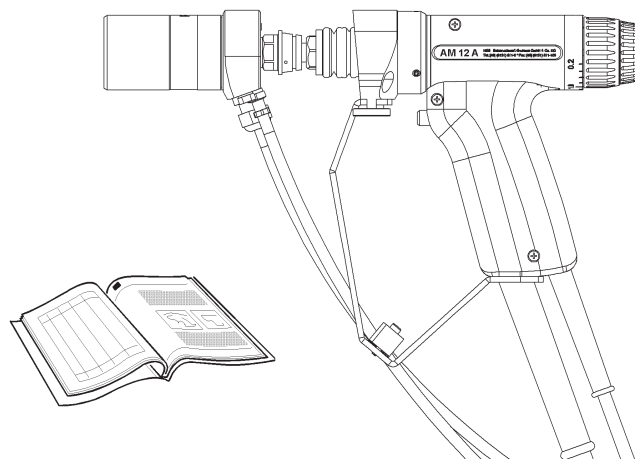
Glossary

Automatic welding head:	Device for welding of welding elements
Capacitor:	Component for storage of electrical energy.
Cooling unit:	Component for cooling the field former
Field former:	Component for generating the magnetic field
Electric arc:	Independent 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 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 AM 12 A welding gun (Order no. 93-20-242) contains the following parts:

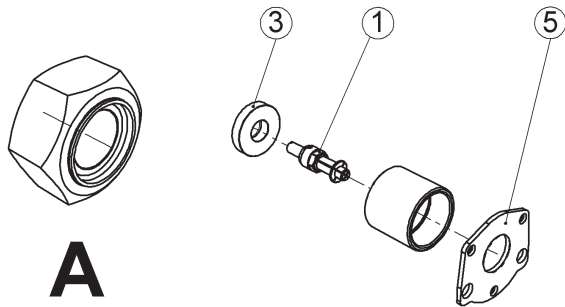
Quantity	Part	Type	Order No.
1	Welding gun Basic module Cable length 4.8 m	AM 12 A	88-23-040
1	Complete field former	FA2 MARC.1A	88-18-951
1	Field former bell	universal	88-16-929
1	Complete shielding gas tripod	MARC 1	88-23-039
1	Operating manual	AM 12 A	E-BA 93-20-242



- ◆ 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

The following components are available as **accessories**:



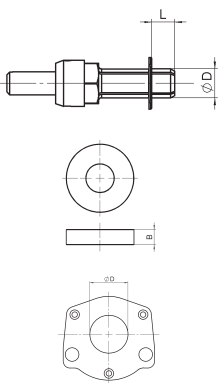
A - Welding nut type Hex^{Nut} M6, M8, M10, M12

Complete equipment for welding elements with adapted centring geometry and welding geometry

The definition of the equipment is defined depending on the welding element after performing test welds.

Complete equipment (items 1 + 3 + 5), order no.:

93-40-0030068	for Hex ^{Nut} M6
93-40-003008	for Hex ^{Nut} M8
93-40-003010	for Hex ^{Nut} M10
93-40-003012	for Hex ^{Nut} M12

MARC 1 equipment	Item	Qty.	Description		Order No.
	1	1	Complete sleeve fixture		M6: 88-22-532 M8: 88-21-107 M10: 88-21-108 M12: 88-21-109
	3	1	Distance washer	W = 7 mm W = 7 mm W = 8 mm W = 9 mm	M6: 88-18-966 M8: 88-18-966 M10: 88-21-116 M12: 88-18-967
	5	1	Magnetic field guidance	D = 21 mm D = 21 mm D = 26 mm D = 28 mm	M6: 88-17-266A M8: 88-17-266A M10: 88-17-267A M12: 88-17-268A

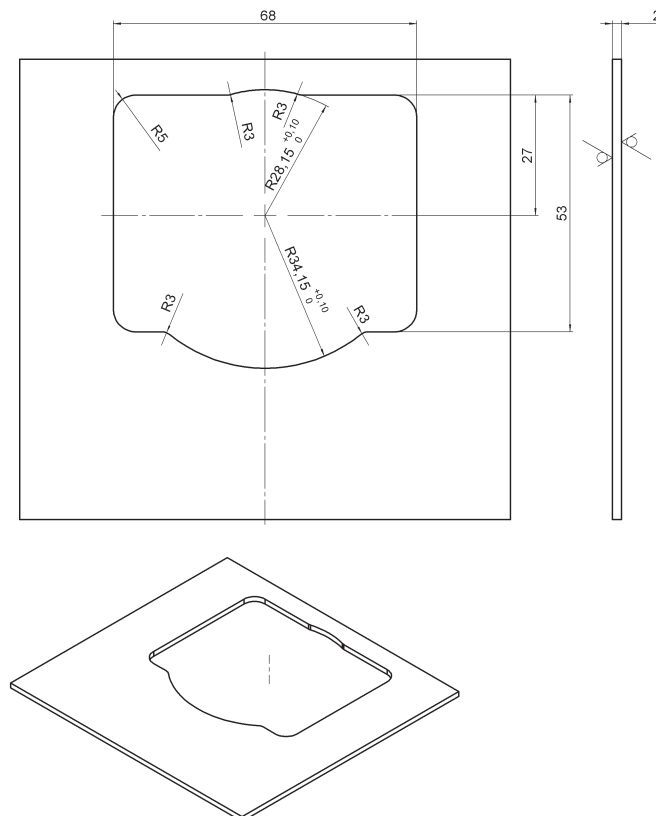
Custom-made welding elements are on request.



◆ Carry and store the sleeve fixtures with welding element inserted.
This will avoid damage to the plates.



We recommend a positioning template as positioning aid for welding on flat, unperforated components:





5 Technical Data

Welding gun model AM 12 A

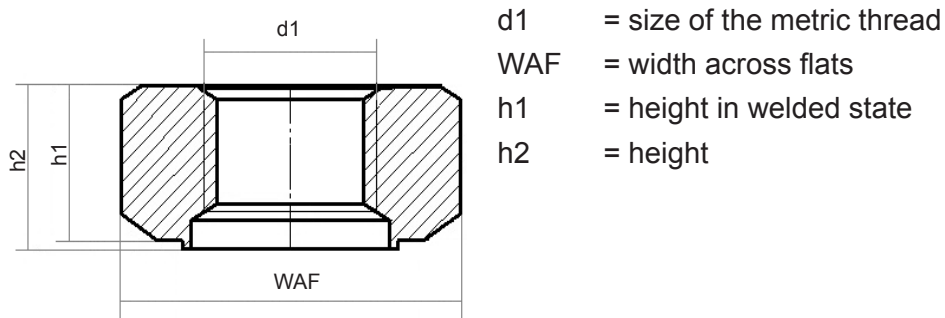
For welding Hex^{Nut} nuts with magnetic rotating arc
(manual nut welding)

Welding range	Welding nut type Hex ^{Nut} M6 - M12
Dimensions of welding element	Hex ^{Nut} M6, M8, M10, M12
Welding element material	Steel A2-50
Welding element type	MARC welding nut type Hex ^{Nut}
Welding sequence ¹⁾	Up to 4 welding nuts/min
Length compensation	3 mm automatic
Lift	Adjustment range 3 mm, lockable
Spring force	Variable, locking
Welding cable	5 m (16.40')
IP Code	IP 20 (protect against moisture)
Workplace noise level	Up to 90 dB (A) possible briefly during the welding process
Ambient temperature limit	0 °C to 40 °C (32 °F to 104 °F)
Dimension L x W x H	Approx. 320 x 70 x 200 mm (12.60" x 2.76" x 7.87") without cable, with face plate
Weight	Approx. 0.9 kg (1.98 lbs) without cable

¹⁾ The maximum welding sequence is limited by a number of parameters.

Field former FA2 MARC1.A

Cooling	Uncooled
Field former coil	Coil resistance 20 Ω
Ambient temperature limit	0 °C to 40 °C (32 °F to 104 °F)
Dimension L x W x H	Approx. 170 x Ø 45 mm (6.69" x Ø 1.77")
Weight	550 g (1.21 lbs)

Welding nut type Hex^{Nut}


WAF	d1	Suitable for d _{Hole} in mm	h1 in mm	h2 in mm
14	M6	10.7 to 11.0	7.5	8
14	M8	10.7 to 11.0	7.5	8
17	M10	12.7 to 13.0	8.5	9
19	M12	15.0 to 15.3	10.5	11



6 Intended Use

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

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

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

Observation of the operating manual of the used stud welding unit 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.

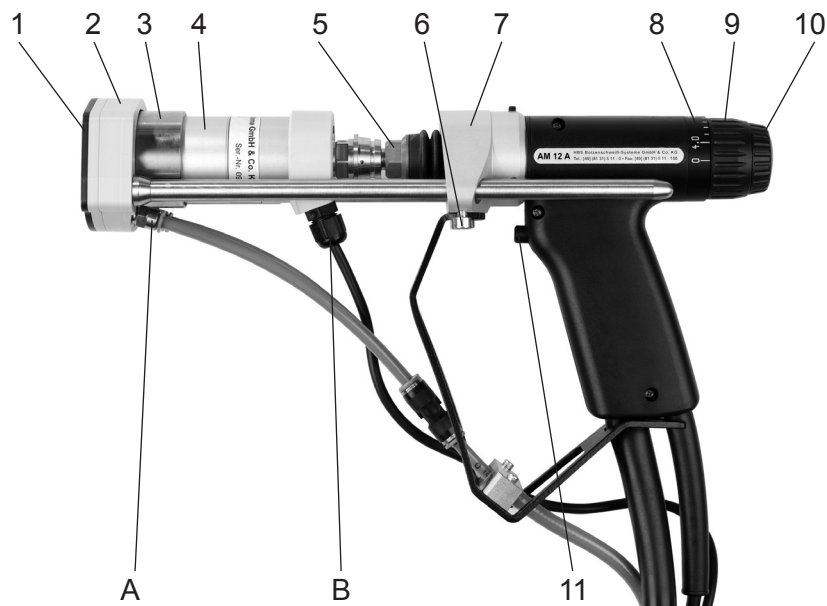
- Normal wear,
- Improper handling,
- Failure to observe the operating manual,
- Failure to observe the safety precautions,
- Use for other than the intended purpose, or
- Transport damage.

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

Welding gun AM 12 A



A - Shielding gas connection (blue)

B - Temperature sensor connection

On the front side of the welding gun are the welding piston and the **retaining nut (5)** which serve to hold and secure the **F2 MARC1.A field former (4)**. On the front of the field former is a thread for screwing on the **field former bell (3)**.

Attached to the front side of the welding gun is the **leg assembly (7)**. The **shielding gas tripod (2)** is clamped with the **allen screw (6)**. The **magnetic field guidance (1)** is secured to the shielding gas tripod with three M3 x 12 screws.

On the rear side is the adjustment possibility for the **lift adjustment (9)**, the rotating **scale ring (8)** and the adjuster for the **spring force (10)**.

On the front of the welding gun handle is the **gun button (11)** for initiating the welding process.

The temperature sensor in the welding current coil is evaluated via **connection cable (B)**. This sensor prevents triggering of the welding process via the gun button in the event of overheating of the welding current coil.

The serial number can be found on the welding gun handle.

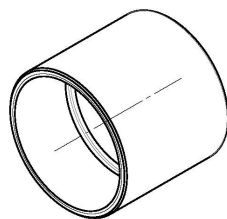
Type plate

The type plate contains the following information:

- Manufacturer
- Type

The serial number is stamped.

Field former



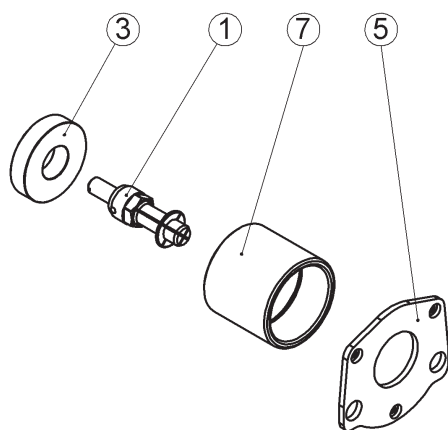
Field former bell



Complete field former

The field former generates the magnetic field. The field former bell guides the magnetic field generated in the field former to the welding plane.

Accessories



- 1 - Sleeve fixture
- 3 - Distance washer
- 5 - Magnetic field guidance
- 7 - Field former bell

Tasks of the sleeve fixture:

- Receive and hold the welding element
- Transfer the welding current to the welding element
- Transfer the magnetic field to the welding element

Tasks of the distance washer

- Adjustment aid for correct, recommended insertion depth (protrusion) of approx. 2 mm for the used welding element
- Protection of the field former against internal soiling (spatter)

Tasks of the magnetic field guidance

- Induction and feedback of the magnetic field at the welding point
- Improvement of the shielding gas flow at the welding point.

9 Welding Process

This welding gun may only be used for the MARC welding process (welding with magnetic rotating arc).

- ◆ The process flow of the welding process can be found in the original operating manual of the used stud welding unit.

10 Preparing the Welding Gun

Prepare the welding gun by

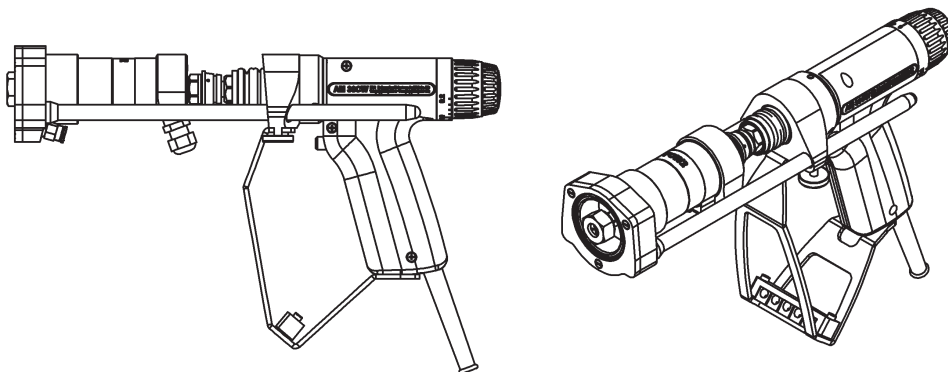
- assembling the welding system
- installing the magnetic field guidance
- connecting the connecting lines between welding gun and stud welding unit
- adjusting lift, protrusion (insertion depth) and spring force as well as welding current and welding time.



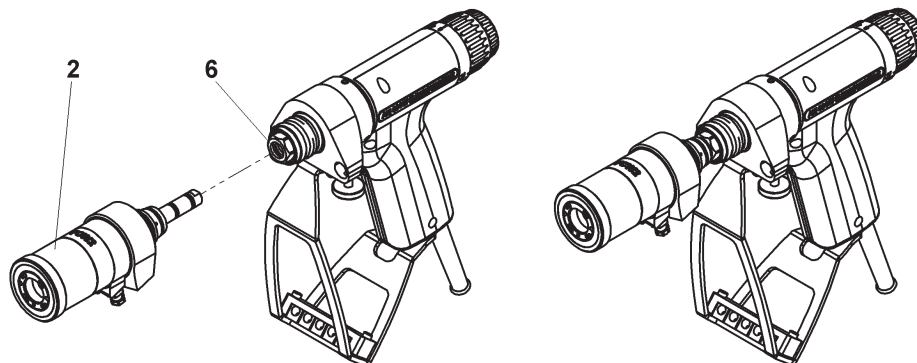
◆ **Do not connect the gun to the stud welding unit until it has been prepared.**

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

10.1 Assembling the Welding System

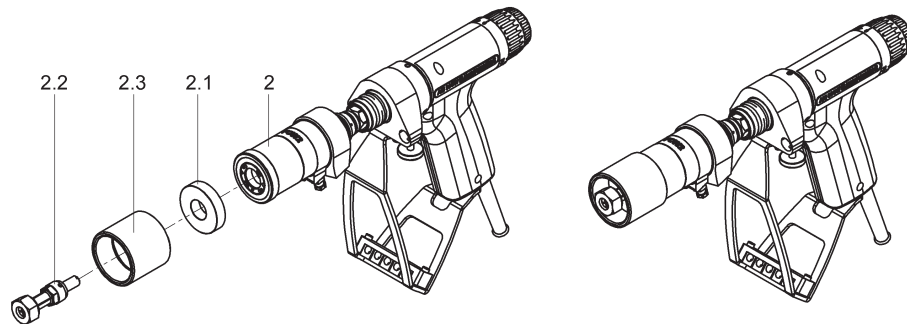


◆ Push the **field former (2)** with the mounting mandrel completely in to the bore of the **welding piston (6)** of the welding gun as illustrated.



◆ Assemble the necessary welding equipment in the sequence:

- Distance washer (2.1)
- Sleeve fixture (2.2)
- Field former bell (2.3)

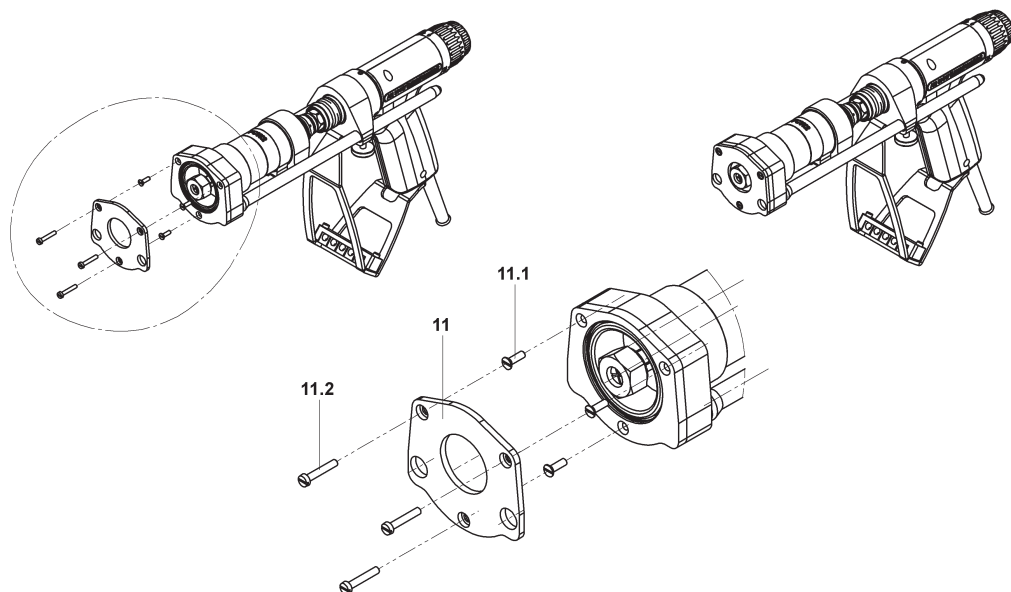


◆ Ensure that the sleeve fixture is firmly screwed to the field former!

A loose connection can lead to the destruction of the field former and/or the sleeve fixture!

10.2 Installing the Magnetic Field Guidance

◆ Remove the screws (11.1) and install the magnetic field guidance (11) using the three screws (11.2) M3 x 18 DIN 84-ISO 1207.



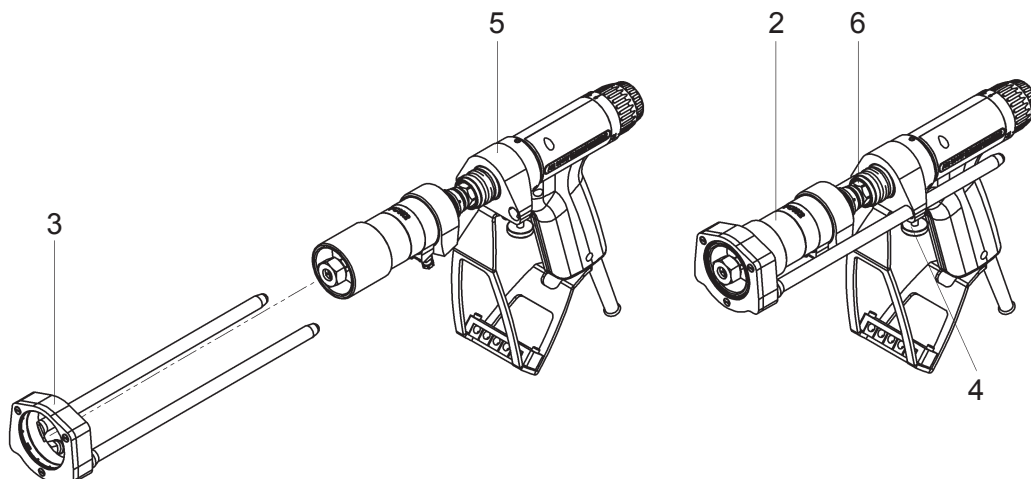
10.3 Installing the Shielding Gas Tripod

- ◆ Install the **shielding gas tripod (3)** - as illustrated - with the two guide columns against the leg assembly (5) of the welding gun.
- ◆ Push the shielding gas tripod towards the field former bell until contact is made there without pushing the welding piston backward.
- ◆ Clamp the guide columns using the two **allen screws (4)**.



Overtightening the allen screws (4) will damage the thread on the leg assembly!

- ◆ Align the **field former (2)** in the middle of the two guide columns.



- ◆ Clamp the field former in this position with the **retaining nut (6)** (open-jaw spanner WAF 17).



- ◆ **Check for free movement** by moving the field former in welding direction!



A loose connection will lead to destruction of the field former (2) and/or the welding piston.

- ◆ Therefore always check that the field former (2) is firmly connected to the welding gun by means of the retaining nut (6)!

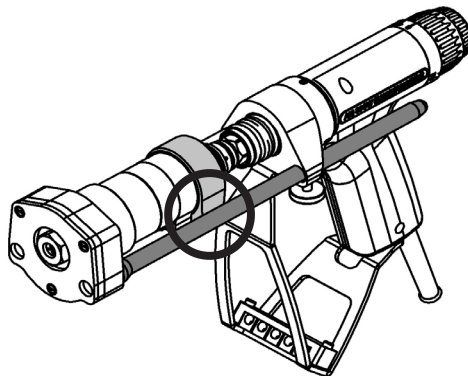
10.4 Connecting the Welding Gun to the Stud Welding Unit



◆ Refer here to the operating manual of your welding unit.

10.5 Inspection Tasks Prior to Commissioning

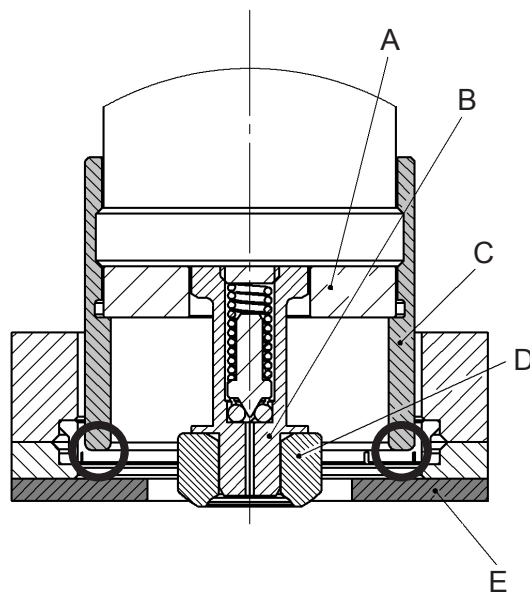
- ◆ Before commissioning, always check the field former and tripod legs for friction points.



A small gap must be visible between field former and tripod legs. This ensures freedom of movement of the field former.

- ◆ Check the magnetic field guidance for possible soiling.

The magnetic field guidance must be free of soiling. Soiling may prevent the field former bell from being properly positioned on the magnetic field guidance. This can lead to poor welding results.



A - Distance washer
B - Sleeve fixture
C - Field former bell
D - Welding element
E - Magnetic field guidance

10.6 Adjusting Welding Parameters

Determining the welding time and welding current

The determination of the welding time and welding current at the stud welding unit using the arrow keys depends i.a. on:

- the welding gun used,
 - the material of the welding element,
 - the diameter of the welding element,
 - the material of the workpiece.
- ◆ Determine the values for the welding time and welding current to be set at the stud welding unit using the following tables.



The figures in this table are indicative values and must be checked by means of test welding on the original material with the same properties as the original workpiece.

Determining the welding current, welding time and shielding gas quantity

Material - HBS Hex ^{Nut}	Size of the metric thread in mm	Stud welding unit IT 1002 ^{1) 2)}			
		Welding current ¹⁾ in A	Welding time ¹⁾ in ms	Gas pre-flow time ¹⁾ in ms	Shielding gas volume ^{1) 3)} in l/min
Workpiece material: alloyed steel (suitable for welding)					
A2-50	M6	400 ±5	130 ±20	1 200	12 - 15
A2-50	M8	400 ±5	130 ±20	1 200	12 - 15
A2-50	M10	450 ±5	200 ±20	1 200	12 - 15
A2-50	M12	560 ±5	200 ±20	1 200	12 - 15
Workpiece material: mild steel (suitable for welding)					
A2-50	M6	400 ±5	120 ±20	1 200	12 - 15
A2-50	M8	400 ±5	120 ±20	1 200	12 - 15
A2-50	M10	490 ±5	130 ±20	1 200	12 - 15
A2-50	M12	590 ±5	80 ±20	1 200	12 - 15

¹⁾ to be checked by test weldings

²⁾ Material thickness s = 2 mm

³⁾ Shielding gas according to HBS recommendation: shielding gas mixture 92 % Ar / 8 % CO₂

Determining the insertion depth, lift and spring force

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



The figures in this table are indicative values and must be checked by means of test welding on the original material with the same properties as the original workpiece.

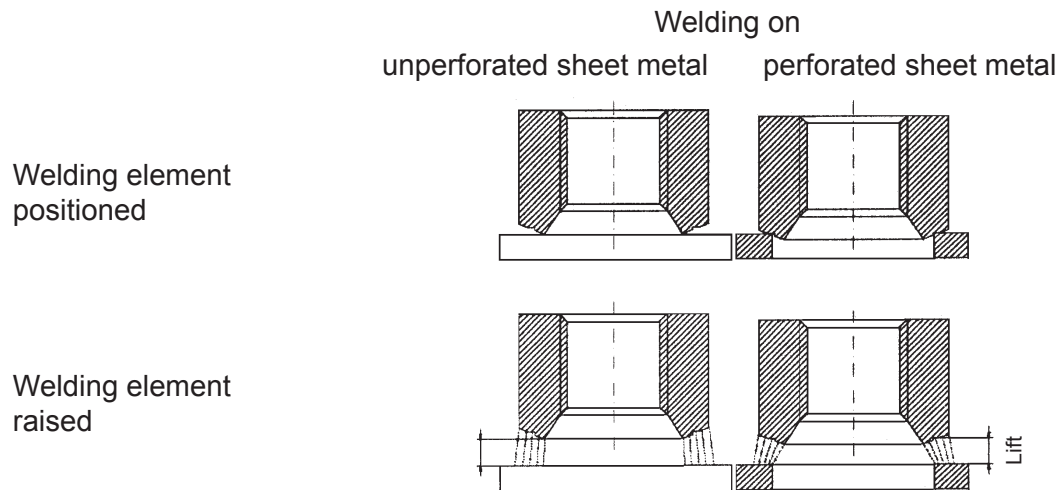
- ◆ Select the applicable parameters for lift, insertion depth and spring force for your workpiece.

Material - HBS Hex ^{Nut}	Size of the metric thread in mm	Stud welding unit IT 1002 Welding gun parameters AM 12 A ^{1) 2)}		
		Lift in mm	Insertion depth in mm	Spring force
Workpiece material: alloyed steel (suitable for welding)				
A2-50	M6	2.6 ±0.2	2.5	8 ±2
A2-50	M8	2.6 ±0.2	2.5	8 ±2
A2-50	M10	2.6 ±0.2	2.5	8 ±2
A2-50	M12	3.0 ±0.2	2.5	10 ±2
Workpiece material: mild steel (suitable for welding)				
A2-50	M6	2.6 ±0.2	2.5	8 ±2
A2-50	M8	2.6 ±0.2	2.5	8 ±2
A2-50	M10	2.6 ±0.2	2.5	8 ±2
A2-50	M12	2.6 ±0.2	2.5	10 ±2

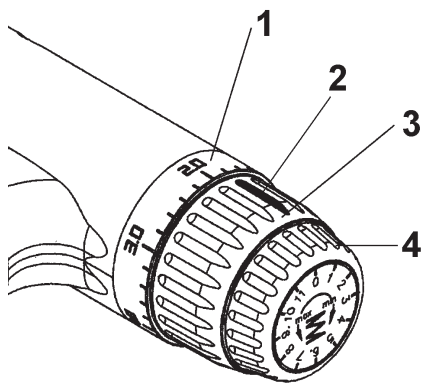
¹⁾ to be checked by test weldings

²⁾ Material thickness s = 2 mm

Adjusting Lift



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



- 1 - End ring
- 2 - Marking
- 3 - Adjustment piece lift
- 4 - Adjustment piece spring force

- ◆ Place the welding gun perpendicularly onto the workpiece.
- ◆ Pull the adjustment piece for lift (3) to the rear out of the locking position.
- ◆ With the welding gun in contact with the workpiece, turn the adjustment piece for lift in clockwise direction until the welding piston allows no further movement in axial direction.
- ◆ Now turn the end ring (1) of the welding gun until the "0" position is aligned with the marking (2) on the adjustment piece for lift.
- ◆ Now turn the adjustment piece for lift in counter-clockwise direction to the selected lift (*see table in chapter 10 section "Adjusting Welding Parameters"*).

The lift can be adjusted in steps of 0.2 mm.

- ◆ Now push the adjustment piece for lift forward again into the locking position.

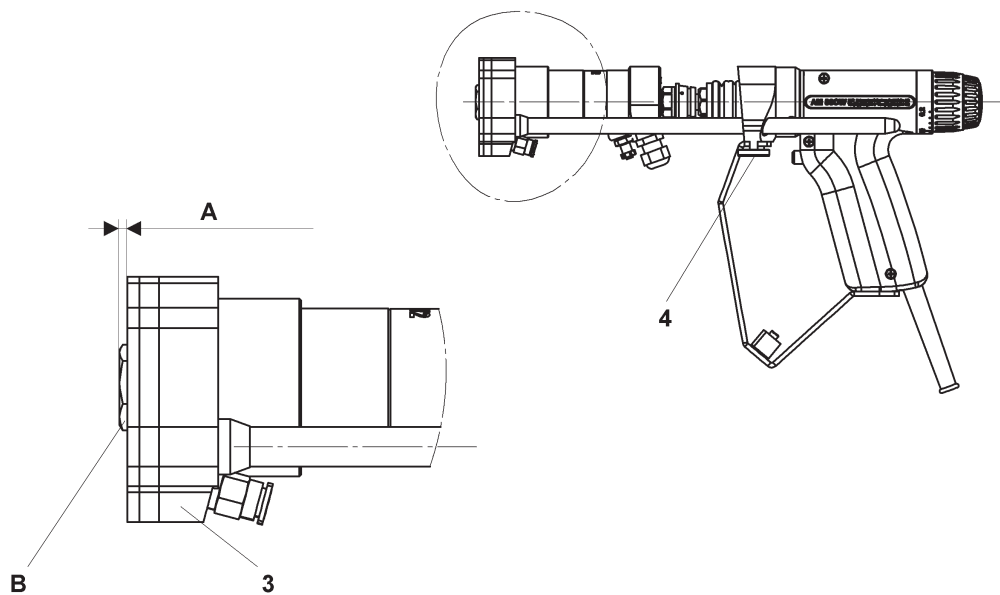


The scaling on the adjustment piece for lift is given in millimetres.

Setting the Insertion Depth (Protrusion)

The insertion depth (protrusion) is adjusted via the distance washer.

- ◆ Check whether the correct distance washer was inserted according to your welding task.
- ◆ Proceed as described in section *10.1 Assembling the Welding System*.



A - Protrusion

B - Welding element

3 - Tripod

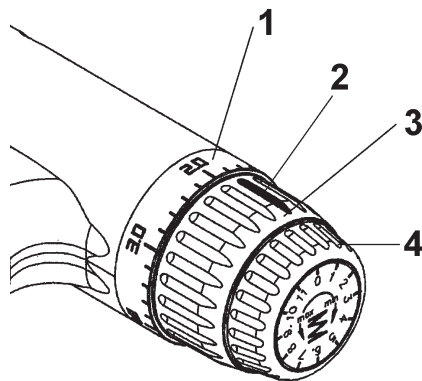
4 - Allen screw

Adjusting Spring Force



The adjustment piece for spring force must not be turned by more than 360°.

- ◆ Turn the adjustment piece for spring force only until you feel a noticeable resistance.
- ◆ Never turn the adjustment piece further with force, as otherwise mechanical parts of the welding gun may be damaged.



- 1 - End ring
- 2 - Marking
- 3 - Adjustment piece lift
- 4 - Adjustment piece spring force

- ◆ Turn the adjustment piece for spring force (4) up to the stop in "min" direction. The position "0" should be aligned with the marking (2) on the adjustment piece for lift (3).
- ◆ Now turn the adjustment piece for spring force to the selected value (*see table in chapter 10 section "Adjusting Welding Parameters"*).

You thus determine the insertion rate.



The scale on the adjustment piece for spring force does not correspond to any particular dimensions.

- ◆ You can **reduce** the insertion rate of the welding piston by turning the adjustment piece for spring force **clockwise**.
- ◆ You can **increase** the insertion rate of the welding piston by turning the adjustment piece for spring force **counter-clockwise**.



11 Welding



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



Danger if used other than for the intended purpose

- ◆ Only use the welding gun for pad welding with magnetic rotating arc in combination with stud welding units from manufacturer:



HBS Bolzenschweiss-Systeme GmbH & Co. KG

Felix-Wankel-Strasse 18
85221 Dachau
GERMANY

- ◆ Only use the following welding elements:

MARC welding nut	Order No.
M6 type Hex ^{Nut} , A2-50	60-06-0082
M8 type Hex ^{Nut} , A2-50	60-08-0082A
M10 type Hex ^{Nut} , A2-50	60-10-0092
M12 type Hex ^{Nut} , A2-50	60-12-0112



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



The hole diameter must be free of burrs and the welding surface must be "hollow" so that the electric arc can cleanly reach the welding range.

Otherwise, it is possible

- that the workpiece will be welded to the underlying surface or
- that the welding result will be negatively impacted, since the shielding gas cannot flow correctly.

12 Troubleshooting

If the strength of the welded joint is not sufficient, then:

- ◆ Check whether the surface of the welding element and the base material are clean and electrically conductive. The surface must be free from oil and paint.
- ◆ Check whether the used shielding gas was properly directed to the welding point.
- ◆ Check whether the welding gun can move freely.

If the welding gun cannot move freely, the welding element is pressed into the melt only when this has already cooled.

- ◆ Clean a welding gun that has limited movement.

12.1 Possible Faults/Repair Work



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.

Fault	Possible cause	Fault localisation	Fault remedy	Performance
Welding elements not firmly attached	Wrong welding parameters selected	Check welding time or welding current set at the stud welding unit	Change adjusted parameters	Trained personnel
		Check spring force of welding gun	Change adjusted parameters	Trained personnel
		Check lift at the welding gun	Change adjusted parameters	Trained personnel
	Insertion speed of the 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	Sleeve fixture is worn	Check sleeve fixture for possible wear	Replace sleeve fixture	Trained personnel

Fault	Possible cause	Fault localisation	Fault remedy	Performance
Welding gun does not weld	Control cable is defective (no button signal received on stud welding unit)	Check control cable at control cable connector (pin 3 and 4) for electrical continuity with pressed gun button*)	No signal: Replace the control cable*)	Qualified specialists
	Trigger switch is defective (no button signal received at the stud welding unit)	Check control cable at control cable connector (pin 3 and 4) for electrical continuity with pressed gun button*)	No signal: Replace micro-switch*)	Qualified specialists
	Welding current cable defective (no contact signal on stud welding unit)	Check, whether welding current cables connected to the stud welding unit in a technical correct way Check welding current cable for electrical flow*)	Connect welding current cable	Trained personnel
			In case of no flow: Replace welding current cable and/or connecting cable*)	Qualified specialists
	Ground connection defective (no contact signal received at the stud welding unit)	Check for proper connection of the ground cable to the workpiece Check ground cable for electrical flow*)	Connect the ground cable	Trained personnel
			In case of no flow: Replace ground cable*)	Qualified specialists
	Stud welding unit defective	Follow the instructions for the connected stud welding unit	Repair required	Factory service or authorised agencies
	Overheating of the welding current coil	Press the gun start button without ground contact --> gun will not trigger if held in air	Allow welding gun to cool; check welding parameters	Trained personnel

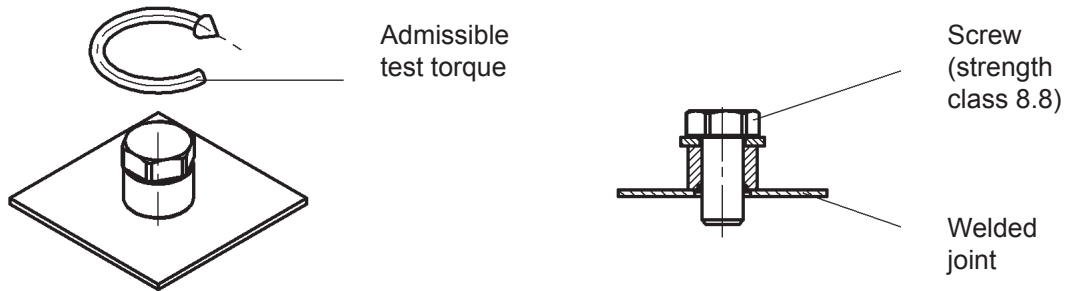


Work marked with *) may only be carried out by qualified electricians!

- ◆ 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 welding gun.

12.2 Checking the Torque

The torque test can be performed as follows:



During the torque test, pay attention that no transverse or shearing forces are exerted on the test piece.

This can falsify the determined strength.

Achievable strengths for HBS Hex^{Nut}, ascertained with the guide values for adjustments on welding gun and stud welding unit (IT 1002):



◆ **For further information, see *chapter 10*.**

Material - HBS Hex ^{Nut}		Permissible test torque in Nm
Workpiece material: alloyed steel (suitable for welding)		
A2-50	M6	3.8
A2-50	M8	9.5
A2-50	M10	19.0
A2-50	M12	33.0
Workpiece material: mild steel (suitable for welding)		
A2-50	M6	3.8
A2-50	M8	9.5
A2-50	M10	19.0
A2-50	M12	33.0

Weld spatter

Cause	Explanation	Remedy	Information	Performance
Short circuit during welding (due to technical reasons)	Dramatic increase in the current --> formation of liquid, melt bridges between the weld pools from welding element and base material --> explosion of the melt bridge	Increase lift slightly	There may be a loss in strength due to reduction in melted material quantity! Lift and insertion depth must be ensured	Trained personnel
		Reduce welding time		Trained personnel
		Clean welding gun		Trained personnel
Due to physical reasons	Due to undamped collision of two fluid cushions	Reduce spring force	There may be a loss in strength due to premature cooling of the melt	Trained personnel
Due to metallurgical reasons	Due to the use of materials that are not or that are only conditionally suitable for welding	Use materials that are suitable for welding	HBS recommendation, ISO 14555	Trained personnel
	Due to welding on coated materials	Remove coating, clean workpiece surface		Trained personnel
	Due to welding without, with little or with wrong shielding gas	Check connections, shielding gas type and flow rate		Trained personnel

Weld seam inhomogeneous or not closed

Cause	Explanation	Remedy	Information	Performance
Insufficient magnetic flux through the weld gap	Short circuit in cable routing	Check cable routing*)	$R_{\text{Coil}} \approx 18 \text{ to } 22 \, \Omega$	Qualified specialists
	Short circuit in coil of field former	Check field former, replace if necessary*)		Qualified specialists
	Circuit interruption due to cable breakage	Check all cable connections*)		Qualified specialists
	The internal clamping element on the sleeve fixture is too short relative to the length of the sleeve	Replace sleeve fixture	Due to wear, burn-off	Trained personnel
Weld spatter	Insufficient melt present for the formation of a closed weld seam	See section <i>Weld spatter</i>		
Welding time too short	Insufficient melted material present	Increase welding time, reduce lift, preheat thick workpieces		Trained personnel
Insertion depth of welding element insufficient	Due to incorrect equipment, resulting in small insertion depth	Check equipment	Lift and insertion depth must be ensured, piston must move freely	Trained personnel
	Due to insufficient spring force	Increase spring force		Trained personnel
	Due to insufficient energy input	Increase welding energy		Trained personnel
	Due to malfunctions at lift mechanism	Clean welding gun, magnetic field guidance and field former bell		Trained personnel
Faulty positioning of the welding element	No central positioning of the welding element when welding on perforated metal sheet	Position welding element in centre	Use positioning aid	Trained personnel
	Diameter of the through hole does not match centring diameter of the welding element	Adapt hole diameter / welding element	Hole $\varnothing \approx$ tube $\varnothing$ of sleeve exterior + 0.1...0.4 mm	Trained personnel
	Unsuitable, custom-made welding element	Use HBS welding element		Trained personnel
Blowing effect	See chapter <i>13.4 Blowing Effect</i>			

Weld seam porous

Cause	Explanation	Remedy	Information	Performance
Due to metallurgical reasons	Due to the use of materials that are not or that are only conditionally suitable for welding	Use materials that are suitable for welding	HBS recommendation, ISO 14555	Trained personnel
	Due to moisture	Dry/preheat workpiece		Trained personnel
	Due to corrosion of the workpiece surface	Clean workpiece surface		Trained personnel
	Due to welding on coated materials	Remove coating, clean workpiece surface		Trained personnel
	Due to welding without, with little or with wrong shielding gas	Check connections, shielding gas type and flow rate		Trained personnel
	Due to insufficient energy input	Increase welding time and/or welding current		Trained personnel

Strength too low

Cause	Explanation	Remedy	Information	Performance
Connection cross-section too small due to insufficient insertion of the welding element	Insufficient insertion depth due to incorrect equipment	Check equipment		Trained personnel
	Due to insufficient spring force	Increase spring force		Trained personnel
	Due to malfunctions at lift mechanism	Clean welding gun, magnetic field guidance and field former bell	Lift and insertion depth must be ensured, piston must move freely	Trained personnel
		Check magnetic field guidance for soiling, clean if necessary	See section 10.4 <i>Inspection Tasks Prior to Commissioning</i>	Trained personnel
		Check distances between tripod and field former, correct if necessary	See section 10.4 <i>Inspection Tasks Prior to Commissioning</i>	Trained personnel
Insufficient melt	Due to insufficient energy input	Increase welding time and/or welding current		Trained personnel
	Energy losses through heat	Preheat thick workpieces		Trained personnel
	Due to weld spatter	See section <i>Weld spatter</i>		
Inclusions in the weld seam	Due to the use of materials that are not or that are only conditionally suitable for welding	Use materials that are suitable for welding	HBS recommendation, ISO 14555	Trained personnel
	Due to welding on coated materials	Remove coating, clean workpiece surface		Trained personnel
Porosity	See section <i>Weld seam porous</i>			
Blowing effect	See chapter 13.4 <i>Blowing Effect</i>			
Insufficient melting of the workpiece		Preheat thick workpieces		Trained personnel
		Reduce lift	Note weld spatter	Trained personnel
		Increase welding current and/or reduce welding time		Trained personnel

Through-screwing not assured

Cause	Explanation	Remedy	Information	Performance
Weld spatter adhering to the threads	See section <i>Weld spatter</i>			
Too much melt	Due to excessive energy input	Reduce welding time		Trained personnel
Non-uniform distribution of the melt	See section <i>Weld seam inhomogeneous or not closed</i>			
Faulty positioning of the welding element	Unsuitable, custom-made welding element	Use HBS welding element		Trained personnel
	Incorrect positioning by operator	Pay attention to correct positioning	Use positioning aid	Trained personnel
	Diameter of the through hole does not match centring diameter of the welding element	Adapt hole diameter / welding element	Hole $\varnothing \approx$ tube $\varnothing$ of sleeve exterior + 0.1...0.4 mm	Trained personnel

Tempering colours

Cause	Explanation	Remedy	Information	Performance
Due to metallurgical reasons	Absorption of gases (O_2 , N_2) on the workpiece surface near the seam	Leave gun on the welding element for a few seconds after welding, allow shielding gas to continue to flow		Trained personnel
		Remove tempering colours		Trained personnel

Decreasing weld pool / deformations on rear side of workpiece

Cause	Explanation	Remedy	Information	Performance
Due to metallurgical reasons	Due to temperature-related shrinkage and tension during the welding process; especially for thin workpieces	Decrease welding time and/or welding current Cool thin workpieces, e.g., with shielding gas from below	Hole Ø ≈ tube Ø of sleeve exterior + 0.1...0.4 mm	Trained personnel
	Diameter of the through hole does not match centring diameter of the welding element	Adapt hole diameter / welding element		Trained personnel
				Trained personnel

Welding the welding element to the sleeve fixture

Cause	Explanation	Remedy	Information	Performance
Electric arc between sleeve fixture and welding element	Due to improper seating of the welding element on the sleeve fixture	Check sleeve fixture, carefully increase air gap if necessary	Use screwdriver and carefully press in crosswise	Trained personnel
Fault in welding process	Electric arc does not rotate, but rather burns fixed in place	Check for proper seating of the control cable on the front side of the stud welding unit		Trained personnel
	The internal clamping element on the sleeve fixture is too short relative to the length of the sleeve	Replace sleeve fixture		Trained personnel

No ignition of arc between welding element and workpiece

Cause	Explanation	Remedy	Information	Performance
Welding element is not lifted from workpiece	Welding element sticks in too small bore hole while chuck is lifted	Adapt hole diameter	Hole Ø ≈ tube Ø of sleeve exterior + 0.1...0.4 mm	Trained personnel



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 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 welding gun:

- ◆ Inspect the sleeve fixture before every use.
- ◆ Replace the sleeve fixture if you discover burning marks on the welding element and/or on the sleeve fixture.
- ◆ Work here in accordance with section 10.1 "Assembling the Welding System" in this manual.
- ◆ Before every use, inspect the bellows on the front part of the welding gun for proper seating and/or damage.
- ◆ Prior to every use, check the field former bell, the magnetic field guidance and the shielding gas tripod for adhering weld spatter.



Never work with damaged or incorrectly seated bellows.

This will contribute to a long service life of your 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 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.

Inspect the field former:

- ◆ Inspect the field former before every use.
- ◆ Replace the field former if you identify burning marks on the field former thread.
- ◆ Work here in accordance with section 10.1 "Assembling the Welding System" in this manual.
- ◆ Check whether the distance washer is mounted on the sleeve fixture.

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:

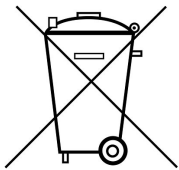
-5 °C to +50 °C (23 °F to 122 °F)

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

in accordance with 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: Welding gun
Type: AM 12 A
Order No: 93-20-242
Serial No: 93-20-242/212XXXX
Year of manufacture: 2021

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, 04.01.2021
Place of issue, Date


Gregor Gröger (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

Index

A

accessories 14
adjusting welding parameters 28
adjustment piece lift. 20, 31
adjustment piece spring force 20, 33
airborne particulates 7
automatic welding head. 12

B

bang. 8
basic configuration. 13

C

capacitor 12
cleaning 44
clothing, non-flammable 8
cooling unit 12

D

danger from incorrect use 6
Declaration of Incorporation 47
design and function 20
determining the shielding gas quantity 28
determining the welding current 28
determining the welding time. 28
disposal 46

E

ear protection. 10
electrical hazards. 10
electric arc 12
electromagnetic fields 10
EMF directive, safety notices. 9

F

field former. 12, 26
fire extinguisher 8
fire hazard 8
form „Service & Support“ 36, 43, 48
full-ear hearing protection 8
fumes, harmful to health 7

G

glossary 12
goggles with visor 8
gun button 20

H

hazards for the machine 10
hazards for the operator 10
heart pacemaker 7, 10
helmet 8

I

insertion depth. 29
inspecting the field former 45
inspecting the welding gun 45
intended use 18, 34

L

leg assembly 20
lift 29
lift adjustment 30

M

magnetic field guidance, installing. 25
maintenance and care. 44

O

operating manual. 13

P

protective apron. 8
protective equipment. 8
protective equipment, personal 10
protective gloves 8

R

rectifier. 12

S

safety goggles 10
safety goggles with sight glass 8
safety precautions 6
scope of supply 13
setting the insertion depth 32
spring force 29
spring force adjustment. 33
storage. 46
storage temperature 46
stud feeder. 12
stud welding gun 12
stud welding machine 12
stud welding unit 12
symbols used. 10



T

temperature sensor	20
torque test	37
troubleshooting	35
type plate	21

W

warranty entitlement	19
welding element	12
welding parameters	12
Welding system	24
workpiece	12

HBS Bolzenschweiss-Systeme GmbH & Co. KG
Felix-Wankel-Strasse 18 • 85221 DACHAU • GERMANY
Phone +49 8131 511-0 • Fax +49 8131 511-100 • E-mail international@hbs-info.com

www.hbs-info.com