Operating Instructions
Stud Welding Device
BMK-20i

SRM EcoWeld

GB: English version

Read these operating instructions before starting any work!

CE

Doc.ID: **P00265** Date of issue: 06.2021 www.soyer.com

Device numbers

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

Device	Type	Serial number
Stud welding device	BMK-20i	
Stud welding gun	PH-3N SRM	
Stud welding gun	PH-2L	
Stud welding gun	PH-4L	

Operating Instructions

Document no.: P00265, 06-2021, translation of the original German manual (German: P00165)

Revision status

Document	created / modified	Editor	Date
Original	Created	MS/IS	June 08th, 2021

CONTENTS

1 General information

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

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

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

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

The manufacturer reserves the right to make technical changes.

1.1 Validity of the operating instructions

These operating instructions apply to the following devices:

Stud welding device	BMK-20i
Stud welding gun	PH-3N SRM
	PH-2L
	PH-4L

1.2 Registered trademarks

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

SRM®: SRM Technology®	SRM stands for magnetic field stud welding and refers to welding or stud welding in a radially symmetrical magnetic field.
SOYER®:	Developments/technologies of Soyer GmbH.

1.3 Abbreviations and definitions

Essential abbreviations or designations in this manual:

HZ-1 threaded studs:	SOYER® universal weld studs with centring tip
MF threaded studs:	SOYER® threaded studs with a reduced flange diameter (MF stands for mini flange).
PT threaded stud	Capacitor discharge welding studs with thread
IT tapped studs	Capacitor discharge tapped studs
RD threaded studs	Drawn arc welding studs with thread

1.4 Declaration of conformity

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

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

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

Heinz Soyer Bolzenschweißtechnik GmbH
Inninger Straße 14
82237 Wörthsee

CE Declaration of Conformity

We herewith declare that the machine described in the following and the version available on the market correspond in design and construction to the safety and health requirements of the listed guidelines and standards. Any unauthorised modification to this machine automatically annuls this declaration.

Designation of machine	:	**Stud welding device**
Machine type	:	**BMK-20i**
Machine no.	:	_____
Applicable EU directives	:	RoHS Directive (2011/65/EU) Low Voltage Directive (2014/35/EU) EMC Directive (2014/30/EU)
Applied harmonised standards, in particular	:	EN 60 974-1:2018 + A1:2019 EN 60 974-10:2016
Applied national standards	:	DGUV Regulation 1
Date	:	01 February 2021
Producer's signature	:	_____
Signer's function	:	Managing Director

1.5 Manufacturer

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

1.6 Instruction, training

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

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

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

1.7 Standards and directives

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

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

2 Important safety instructions

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

The devices have been constructed according to the generally accepted codes of practice and in compliance with, and application of, the recognised safety requirements. To achieve the greatest possible safety, it is essential that all of the safety instructions in these operating instructions are heeded and followed.

2.1 Warning signs used

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

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

Safety instructions on the devices

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

Warning labels must be obtained from the manufacturer.

2.2 General safety instructions

DANGER

Danger from electric current, general information

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

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

DANGER 

Danger from electric current during maintenance and repair

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

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

DANGER 

Danger from magnetic fields

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

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

DANGER

Danger of explosion from an inappropriate installation site in explosive atmospheres

The device is not designed for use in potentially explosive zones.

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

⚠CAUTION 

Risk of burns due to hot surfaces

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

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

⚠WARNING 

Risk of burns from hot welding spatter

Dangerous welding spatter can occur during the welding process.

- Always use personal protective equipment.

⚠WARNING 

Fire hazard from hot welding spatter

Welding spatter or hot workpieces produced during the welding process can result in fire hazard.

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

2.3 Safety instructions for the working method

WARNING

Hazards due to incorrect working method

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

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

2.4 Personal protective equipment

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

WARNING

Danger due to a lack of or incorrect PPE

During stud welding, there is a risk of burns, especially due to hot welding spatter. The formation of strong electric arcs can also cause a glare hazard.

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

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

2.5 Intended use of the stud welding device

Pins and threaded studs from M3 - M16 made of steel and stainless steel can be welded using the SOYER® BMK-20i stud welding device (M16 preferred with SOYER® HZ-1 weld studs and SRM Technology®).

Special studs or diameters on request.

The stud welding device must only be operated with the welding guns described in chapter “6.5 Permitted welding guns” on page 27.

The stud welding device must be operated within the technical specifications.

Only welding studs according to DIN EN ISO 13918 and SOYER® standard may be welded.

The stud welding device supports the following welding processes:

- SRM® welding (stud welding in a radially symmetrical magnetic field)
- Drawn arc stud welding with inert gas
- Drawn arc stud welding with ceramic ferrules

2.5.1 Incorrect use

Any use of the device deviating from the intended use is considered improper use.

Improper use, unauthorised modification or manipulation of the device will void the declaration of conformity and all warranty claims against the manufacturer.

2.6 Intended use of the stud welding guns

With the SOYER® stud welding guns described in these operating instructions, pins and threaded studs from M3 to M16 as well as many different weld fasteners made of steel and stainless steel can be welded according to the DIN EN ISO 13918 and SOYER® standards.

The maximum diameter and type of weldable studs can be limited by the performance capacity of the stud welding device on which the gun is operated.

Special studs or diameters on request.

The operation of welding guns is only permitted with the stud welding devices described in the technical data of the gun.
The stud welding gun must be operated within the technical specifications.

2.6.1 Incorrect use

Any use of the welding gun deviating from the intended use is considered improper use.

Non-intended use, unauthorised modification or manipulation of the device will void the declaration of conformity as well as all warranty claims against the manufacturer.

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

2.7 Requirements on the part of the operator

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

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

The operator of the device must ensure that all protective devices are present, active and intact before the stud welding device is used.

Please observe the DIN EN IEC 60974-9 standard (arc welding equipment - part 9: Installation and operation) in the currently valid version.

2.7.1 Prerequisites for personnel

Operating personnel

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

To maintain the qualification, safety training must be carried out at least once a year. In the event of malfunction or for maintenance, specially trained personnel or the manufacturer must be consulted, if necessary.

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

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

Trained electrotechnical personnel

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

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

3 Transport

When transporting the device, make sure it cannot be damaged. Use appropriate packaging to protect the device against weathering effects, especially moisture.

WARNING

Danger during transport

The device is equipped with a handle and carrying strap on the top. The handle and carrying strap are intended exclusively for transport by hand. Never pull ropes through the handle or carrying strap to lift the stud welding device by means of a crane to the installation site. The welding device would become instable and might tilt from its original position. As a result the handle or carrying strap could rip and the unit could fall to the ground.

4 Storage, shutdown

During storage or shutdown, make sure to protect the device against dirt and humidity. Protect the stud welding device against unauthorised access by third parties.

5 Disposal

Local environmental directives must be observed when disposing of the device. Water-endangering as well as environmentally hazardous substances are to be disposed of in accordance with legal regulations.

If applicable, materials must be separated according to regulations.

6 Description of the BMK-20i stud welding device

The main elements of the stud welding device and their function are shown and described in the following.

6.1 Type designation

Designation Order number	Feature
BMK-20i **P01347**	Mains voltage 3 x 400 V, 50/60 Hz, 32 AT

6.2 Working method

With the SOYER® BMK-20i stud welding device, pins and threaded studs from M3 to M16 or Ø 2 - 16 mm (M16 preferred with SOYER® HZ-1 weld studs & SRM Technology®) made of steel and stainless steel can be welded.

Only welding studs from SOYER® (preferably HZ-1 and MF types) may be welded. Fasteners from other manufacturers must be approved by SOYER®.

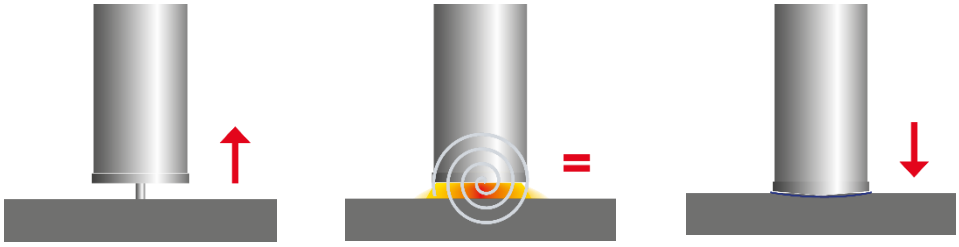
The BMK-20i stud welding device operating with SRM Technology® was specially developed for mobile use. Thanks to SRM®, it enables problem-free welding, even under difficult conditions.

The BMK-20i stud welding device operates on the basis of a compact inverter power source and provides a constant welding current from 100 A to 1200 A at welding times from 20 ms to 500 ms. The rectified mains voltage is converted into high frequency voltage with a frequency of 75 kHz by an Insulated Gate Bipolar Transistor-based (IGBT-based) inverter. The energy is transferred by a high frequency transformer and rectified on the output side. As a result of the high control speed in combination with the integrated SRM® welding process of the BMK-20i, the reproducibility of the welds is increased and the quality of the welds considerably improved.

6.2.1 Stud welding with SRM Technology®

The welding procedure recommended by SOYER® for operating the BMK-20i is the patented SRM® welding procedure (patent no.: 10 2004 051 389) in conjunction with the HZ-1 universal weld stud with a plane end face and centring tip (patent no.: 10 2006 016 553).
SRM® stands for stud welding in a radially symmetric magnetic field. This innovative welding technology allows for welding in a ratio of 1:10 of the sheet metal thickness to the stud diameter (previously 1:4) where the use of ceramic ferrules can be dispensed with.
The various advantages of the SRM® procedure open up completely new possible applications in the entire stud welding sector.

Functional principle



The stud tip touches the workpiece and is lifted. The arc is initiated.	The ignited arc is guided by a magnetic field and melts both joint parts fully.	The stud immerses in the very flat weld penetration zone and is solidly connected.

The advantages of the SRM® welding process are:

- No bothersome weld bead
- Welding from constrained positions now also without ceramic ferrule
- Reduced weld penetration in the plate
- Lower energy consumption and reduced welding time
- No welding spatter

For stud welding with SRM Technology®, a gas mixture is used as an aid.

Following inert gas mixtures are recommended:

- 82% argon and 18% CO_2 (standard inert gas)
- 90% argon and 10% CO_2 (preferably with Ø ≥ 12 mm)
- 85% argon and 15% CO_2

6.2.2 Drawn arc stud welding technology using inert gas

For drawn arc stud welding using inert gas, a gas mixture is used as an aid.

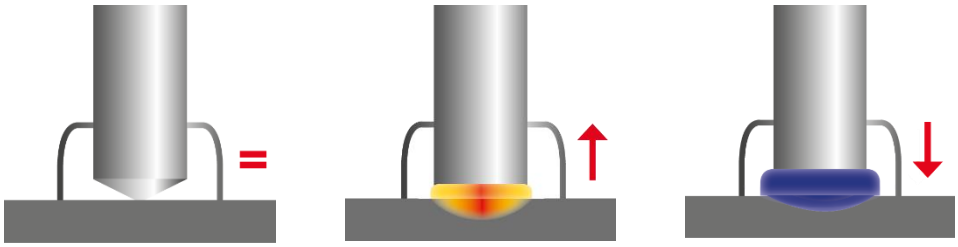
The following inert gas mixtures are recommended:

- 82% argon and 18% CO_2 (standard inert gas)

This inert gas shields the welding area from the atmosphere and also provides the weld pool backup. Furthermore, it produces a welding bead shaped as a concave fillet weld with a metallically bright surface, reducing the risk of corrosion and achieving a better dynamic behaviour of the welding joint.

When welding using inert gas without other aids, it is not possible to produce an exact bead in a dimensionally stable calibrated and reproducible manner. Stud welding using inert gas can be carried out at much shorter intervals, as it is not necessary to insert and remove the ceramic ferrules for each welding operation.

Functional principle



The stud touches the workpiece.	The stud is lifted from the workpiece. The arc is ignited.	The stud immerses in the welding pool. The material solidifies and the stud is solidly welded.

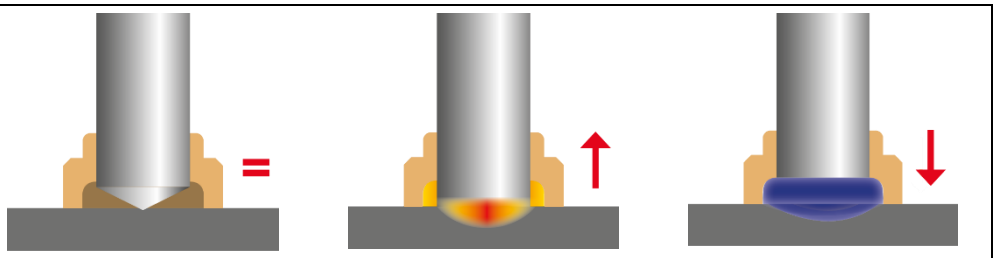
6.2.3 Drawn arc stud welding technology with ceramic ferrules

In drawn arc stud welding with ceramic ferrules, the ceramic ferrule serves as weld pool protection and fulfils the following functions:

- It centres the electric arc.
- It protects the welding point from the atmosphere.
- It ensures the formation of a welding bead.
- It prevents too rapid cooling of the welding pool.
- It partially protects against spraying sparks.

To ensure the formation of a welding bead, each stud requires a ceramic ferrule matching its diameter and shape. After each welding process, the ceramic ferrule must be knocked off and replaced by a new one. Generally this method allows you to weld in any position.

Functional principle



The stud touches the workpiece.	The stud is lifted from the workpiece. The arc is ignited.	The stud immerses in the welding pool. The material solidifies and the stud is solidly welded.

IMPORTANT

Protect ceramic ferrules from moisture and humidity.

6.3 Overview of the controls and connecting elements

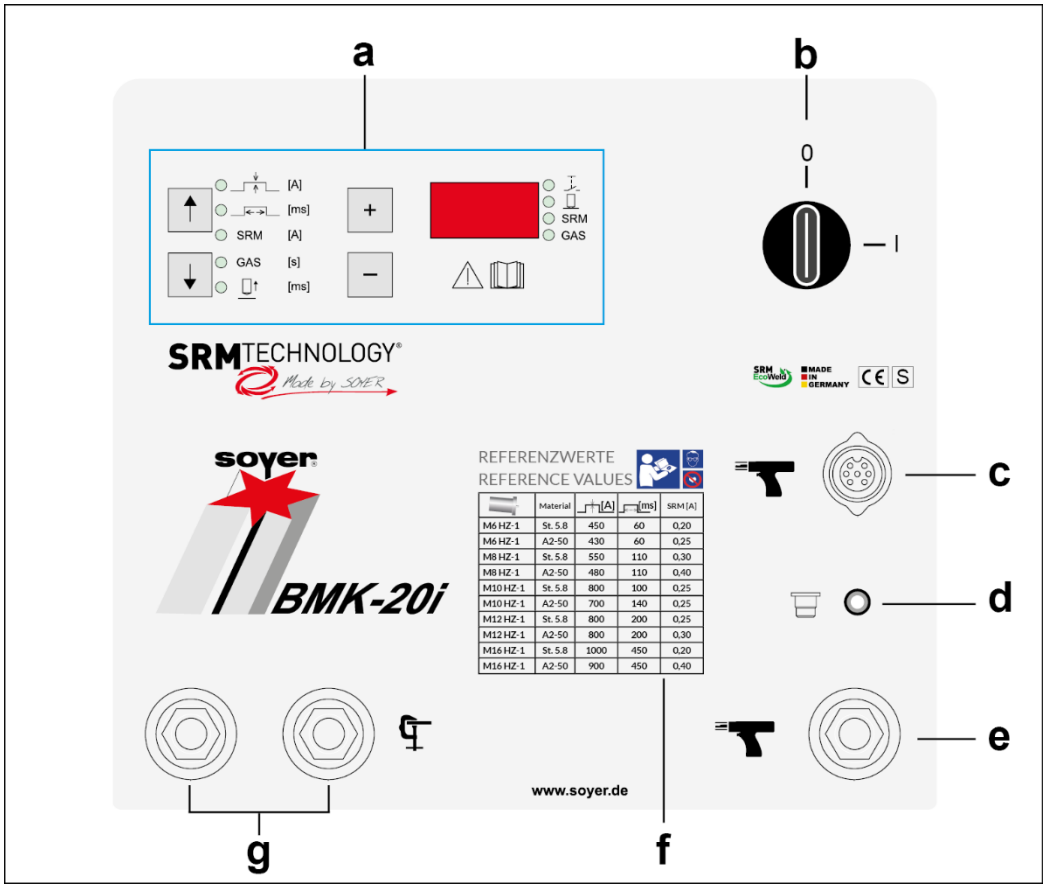


Figure 1: Overview of the device front

Item	Designation
a	Selection and display area with display and function keys (see chapter "6.3.1 Display and setting area" on page 25)
b	Mains switch for turning the device ON / OFF
c	Control cable connection of the gun
d	Inert gas connection of the gun, coupling socket KD ¼
e	Welding cable connection of the gun
f	Table for setting values
g	Connection of the earth cable

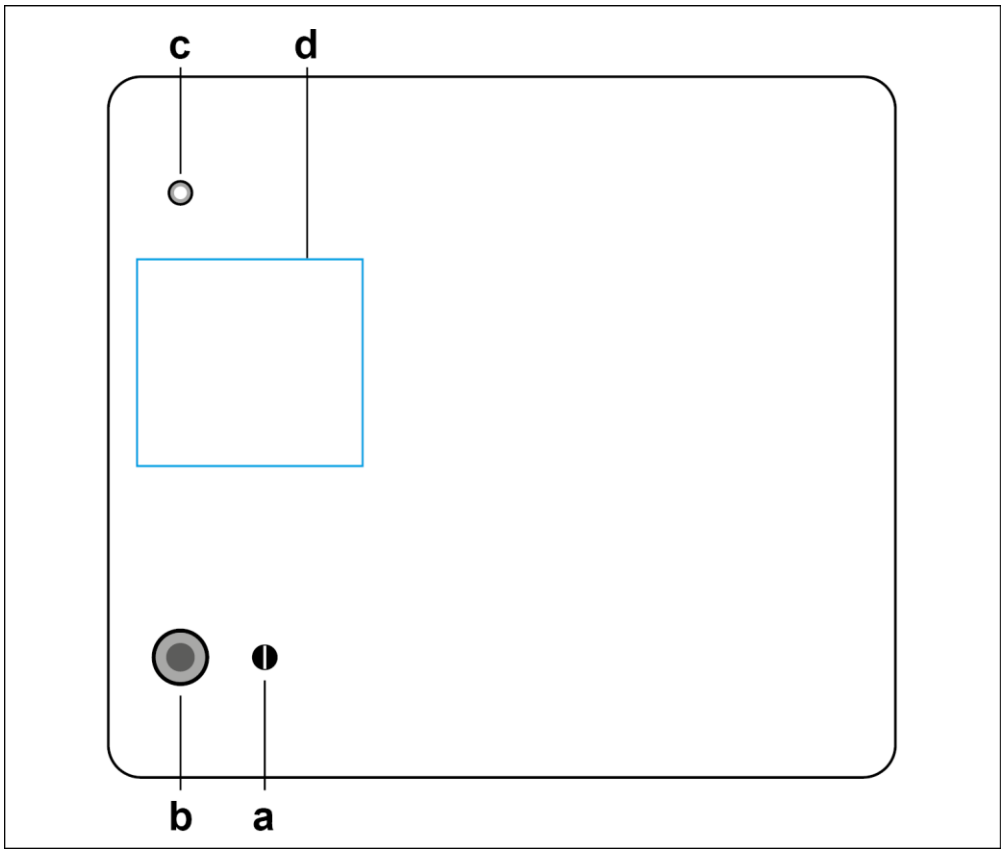


Figure 2: Overview of the back of the device

Item	Designation
a	Fuse element with fuse 1 AT
b	Mains supply cable
c	Gas connection KS-1/4 (maximum permissible amount of gas: 12 l/min)
d	Type plate

6.3.1 Display and setting area

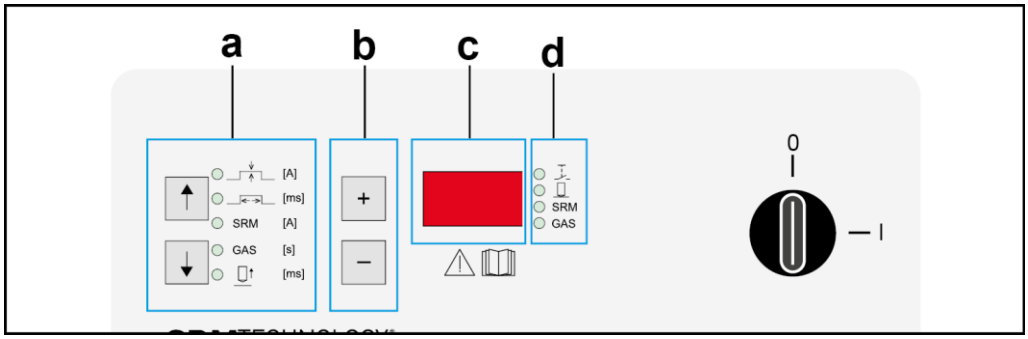


Figure 3: Display and setting area

Item	Designation
a	**Function selection** The following functions can be selected using the arrow keys: • Welding current • Welding time • SRM® current (deactivated at value 0 A, activated at value > 0 A) • Gas preflow time (deactivated at value 0 s, activated at value > 0 s) • Lift test (see chapter "11.1.5 Setting the lift height (drop time) in the "Setup" mode" on page 67) The LED next to the selected function lights up.
	+/- keys For setting the value of the selected function shown on the display.
c	**Display** The set values of the selected function are shown on the display.
d	**Display of the operating state** The following operating states are displayed during the welding operation: • Release button of the gun is pressed • Gun is placed on the workpiece and ready for welding • SRM® is active • Gas preflow is active The LED next to the active operating state lights up.

6.4 Technical data of the BMK-20i stud welding device

Designation	BMK-20i stud welding device
Welding process	Drawn arc stud welding (DA)
Standard gun	PH-3N SRM stud welding gun
Welding area	M3 - M16 or Ø 2 - 16 mm (M16 preferred with SOYER® HZ-1 welding stud & SRM Technology®)
Current source	Inverter technology
Welding current	100 - 1200 A stud welding
Welding time	20 up to 500 ms
Welding sequence	Ø 6 mm up to 12 studs/min | Ø 16 mm up to 3 studs/min
Mains connection	3 x 400 V (+10% -15%), 32 AT, 50/60 Hz
E-connection power	36 KVA
E- standby power	< 100 VA
E-maximum current	116 A / phase (short-time duty)
No-load voltage	< 30 V / DC (direct current)
Protection class	IP 23
Inert gas connection	max. 12 l/min
Dimensions	approx. 320 x 310 x 610 mm (w x h x d)
Weight approx.	approx. 25 kg (with cable)
Colour	Blue
Subject to technical changes	

6.5 Permitted welding guns

WARNING

Hazards due to wrong gun

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

- Only use welding guns permitted by Soyer GmbH.

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

Overview of permitted stud welding guns

Gun	Note
PH-3N SRM (item no.: P02249)	Standard gun with SRM Technology®
PH-2L (*1)	SRM^{XL}, inert gas or ceramic ferrule
PH-4L (*1)	SRM^{XL}, inert gas or ceramic ferrule

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

Depending on the type of your stud welding gun, you will need the following adapters for connection to the device:

Designation		Figure
Adapter cable Control cable (1)	F06695/FA	
Adapter plug Gas connection (2) No adapter required with ceramic ferrules	F06694/FA	

6.6 Cleaning the stud welding system

DANGER

Hazards during cleaning

Improper cleaning of the stud welding device can endanger persons.

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

Do not use aggressive detergents for cleaning the device.

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

CAUTION

Damage to the device due to incorrect cleaning

Improper cleaning may cause damage to the device.

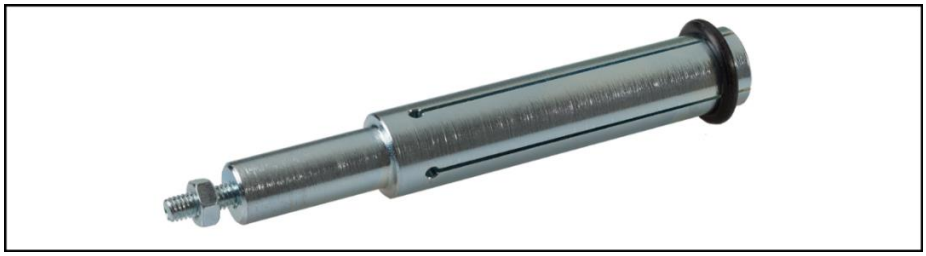
- Make sure that no detergents get into the device.
- Do not use aggressive detergents for cleaning the device.

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

7 Description of stud chuck

7.1 SRM® stud chuck

Each welding gun is provided with a stud chuck that matches the welding stud.
For the SRM® welding process, there are:



Adjustable stud chucks:

• SRM® stud chuck M6	Order number:	F05307
• SRM® stud chuck M8	Order number:	F05215
• SRM® stud chuck M10	Order number:	F05217
• SRM® stud chuck M12	Order number:	F05219
• SRM® stud chuck M14	Order number:	F05353
• SRM® stud chuck M16	Order number:	F05275

The stud chuck in the gun must be installed/changed in accordance with the stud diameter.

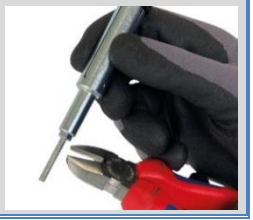
Different stud diameters require different stud chucks.

7.1.1 Setting the SRM® stud chuck

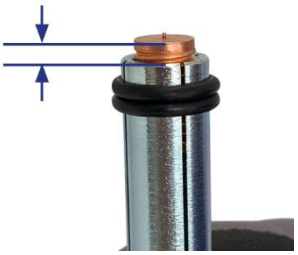
SRM® stud chucks must be set to the length of the welding stud and, if necessary, to the gun size.

The standard stud chuck is suitable for studs up to a length of 60 mm.

When using studs with a length > 45 mm, the stop screw must be shortened. If the setting screw is too long, the stud chuck cannot be fully inserted into the welding gun or the lift test during welding cannot be carried out properly.



Setting the SRM® *stud chuck*

Step 1:	**WARNING** **Switch the stud welding device off when the gun is connected to the stud welding device.**	
Step 2:	Select the stud chuck according to the required stud diameter.	
Step 3:	Insert the stud into the stud chuck.	
Step 4:	Set the stop screw so that the stud, when it is sitting on the screw, is about 5 mm above the stud chuck. If the stud protrusion is more than 10 mm, the required transverse magnetic field is deflected sideways which can lead to uncontrolled SRM® welding.	 
Step 5:	Fix the end screw with the locknut.	
The adjustment is complete.		

7.2 Drawn arc stud chucks

The PH-2L and PH-4L stud welding guns can be equipped with a stud chuck for drawn arc operation when welding studs with a diameter of 6 mm and more are welded. Adjustment of drawn arc stud chucks is not necessary.

The stud chuck is directly screwed on the retaining screw.

The stud chuck (a) must be tightly screwed on the retaining screw (b). When the screwed connection is not tight enough, there is a risk of scorching during the welding process.

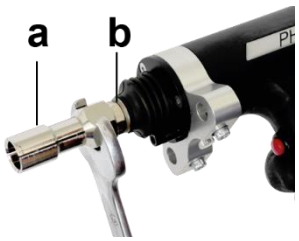


Figure shows PH-2L (PH-4L is similar)

Stud chucks for drawn arc operation:

- HZ stud chuck M6 Order number: F01190
- HZ stud chuck M8 Order number: F01191
- HZ stud chuck M10 Order number: F01192
- HZ stud chuck M12 Order number: F01193
- HZ stud chuck M14 Order number: F01194
- HZ stud chuck M16 Order number: F01195

The stud chuck in the welding gun must be installed or changed in accordance with the stud diameter.

Different stud diameters require different stud chucks.

Check after installation that the stud chuck is tightly screwed. There is a risk of scorching during the welding process when the stud chuck is screwed too loosely.

8 Description of the PH-3N SRM stud welding gun

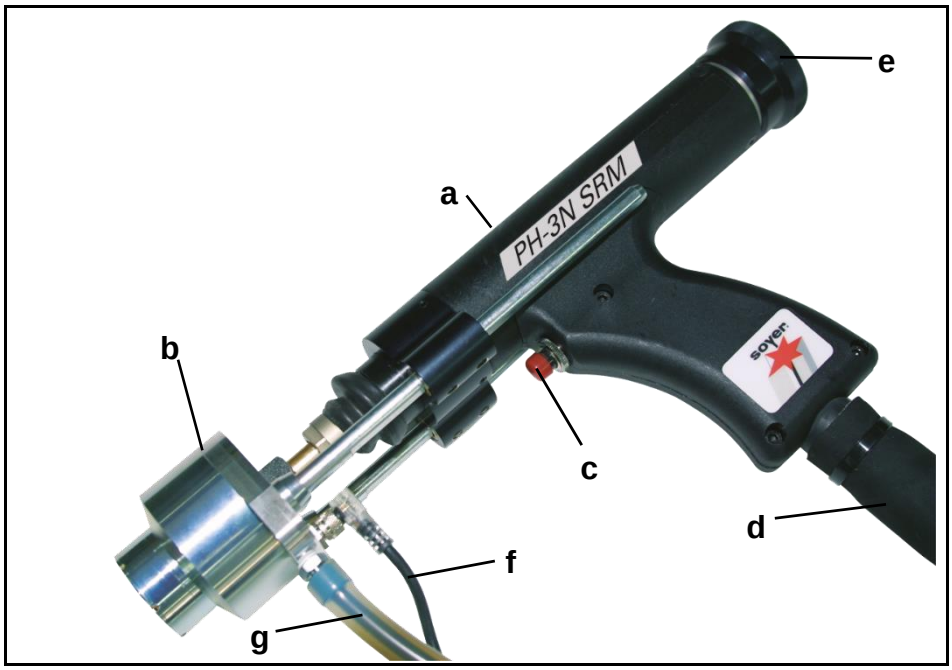


Figure 4: PH-3N SRM stud welding gun

Item	Description
a	PH-3N SRM welding gun, gap welding gun with lifting magnet
b	Inert gas shroud with SRM Technology®
c	Release button
d	Power and control cables for connection to the stud welding device
e	Adjustment wheel for setting the lift height/drop time
f	SRM® supply for connection to the stud welding device
g	Gas supply for connection to the stud welding device

The gun is equipped with a lifting magnet. Before welding, the stud is lifted by a magnet and automatically lowered again for welding.

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

The lift height can be determined using the drop time with the aid of the stud welding device. To do so, please refer to chapter "11.1.5 Setting the lift height (drop time) in the "Setup" mode" on page 67.

The lift height is set using the adjustment wheel (e) on the gun.

The PH-3N SRM stud welding gun may only be operated with the stud welding devices specified in the technical data.

8.1 Technical data of the PH-3N SRM stud welding gun

Designation	PH-3N SRM stud welding gun
Item number	P02249
Welding process	• SRM® welding process (preferred) • Drawn arc stud welding
Stud diameter	M3 - M12 (depending on the stud welding device) (preferably with SOYER® HZ-1 weld studs)
Stud chuck	SRM® stud chuck and SRM® nut holder
Stud length	Standard up to 60 mm, special length possible on request and with special accessories
Stud welding devices	The gun is approved for operation on the following SOYER® stud welding devices: • BMK-8i, BMK-8i ACCU • BMK-10i • BMK-12i • BMK-20i • BMK-16i (*)
Weight	1.3 kg without cable
Subject to technical changes	

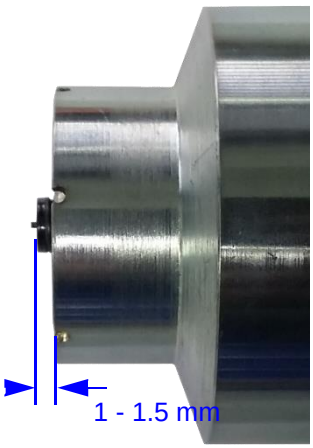
(*) with adapter plug, see chapter "6.5 Permitted welding guns" on page 27.

8.2 Installing the SRM® stud chuck in the PH-3N SRM welding gun

Installing the SRM® stud chuck

Step 1:	**WARNING** **Switch off the stud welding device when the gun is connected to it.**	
Step 2:	Set the stud chuck to the desired stud (see chapter "7.1.1 Setting the SRM® stud chuck" on page 29).	
Step 3:	Remove the support with the inert gas shroud. To this end, loosen the four Allen screws. **It is not essential to remove the support with the inert gas shroud, however, this makes use easier.**	
Step 4:	Undo the union nut.	
Step 5:	If there is still a stud chuck in the gun, remove it.	
Step 6:	Slide the stud chuck up to the stop into the spring piston of the gun.	
Step 7:	Hand-tighten the union nut.	

Installing the SRM® stud chuck

Step 8:	Insert a stud and check the stud protrusion. The stud / stud flange must protrude 1 - 1.5 mm from the inert gas shroud. If necessary, correct the settings of the stud chuck by shifting the support.	
Step 9:	Fasten the support with the inert gas shroud to the gun.	
The adjustment is complete.		

8.3 Cleaning the welding gun

Regularly free the gun and inert gas shroud of slag and welding spatter using a suitable tool.

The frequency of cleaning depends on conditions under which the stud welding gun is used.

⚠WARNING

Danger of injury when cleaning

Switch the stud welding device off when the gun is connected to the stud welding device.

⚠CAUTION

Danger of injury when cleaning

Welding spatter and slag can have sharp edges.

- Wear protective gloves when cleaning.

To prevent impurities from welding spatter and slag and to simplify cleaning, we recommend using SOYER® release spray (order number M01464).

9 Description of the PH-2L and PH-4L stud welding guns

Depending on the type of gun, the illustrations may differ in some details from your product. However, this has no influence on the operation.

9.1 Description of the PH-2L stud welding gun

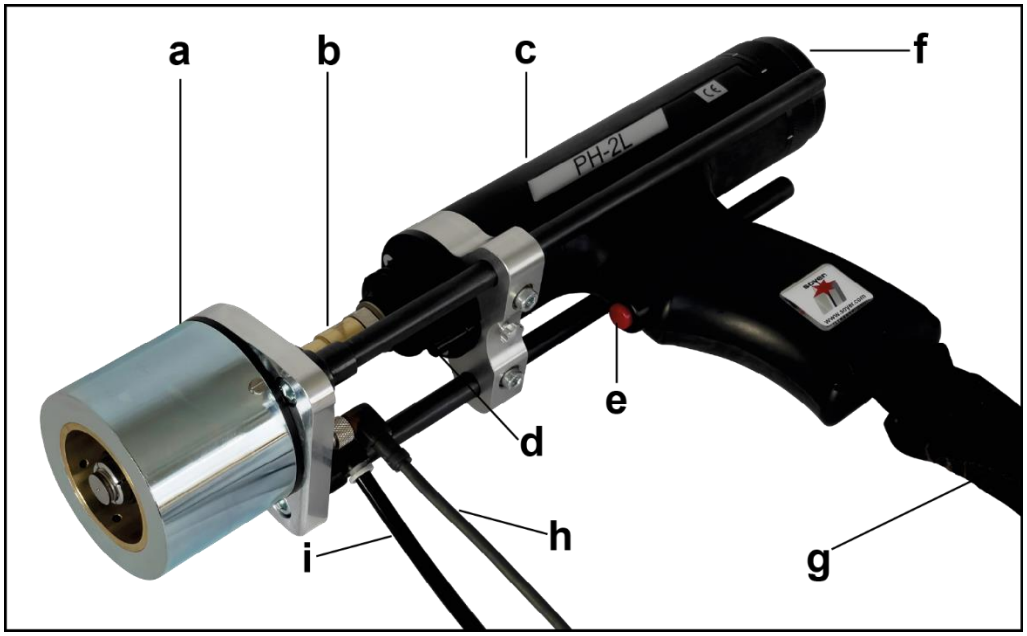


Figure 5: PH-2L stud welding gun with SRM® support SRM^{XL}

Item	Designation
a	Inert gas shroud with SRM Technology®
b	Adapter for SRM® stud chuck
c	PH-2L SRM^{XL} stud welding gun, gap welding gun with lifting magnet
d	Adjustment wheel for setting the speed of immersion (damping)
e	Release button
f	Adjustment wheel for setting the lift height / drop time
g	Power and control cable for connection to the stud welding device
h	SRM® supply for connection to the stud welding device
i	Gas supply for connection to the stud welding device

The gun is equipped with a lifting magnet. Before welding, the stud is lifted by the lifting magnet and automatically lowered again for welding. The lift height is also a decisive factor for the welding result.
The lift height can be determined via the drop time using the stud welding device. See chapter “11.1.5 Setting the lift height (drop time) in the "Setup" mode” on page 67.

The lift height is set using the adjustment wheel (f) on the gun.

The PH-2L stud welding gun may only be operated with the stud welding devices specified in the technical data.

The PH-2L stud welding gun can be specially equipped depending on the respective welding task.

- Support with SOYER® SRM Technology®
- Support with inert gas equipment
- Support with ceramic ferrule equipment

9.1.1 Technical data of the PH-2L stud welding gun

Designation	PH-2L stud welding gun
Item no.	P02225
Welding process	• SRM® welding process (preferred) • Drawn arc stud welding
Stud diameter	M6 - M16 (M8 - M12 preferred) (depending on accessory and stud welding device)
Stud chuck	SRM® stud chuck, SRM® nut holder and drawn arc stud chuck
Stud length	Standard up to 60 mm, special lengths possible on request and with special accessories
Stud welding devices	The gun is approved for operation on the following SOYER® stud welding devices: • BMK-16i • BMH-22i • BMH-30i • BMK-20i (*)
Weight	7.2 kg with cable
Subject to technical changes	

(*) Depending on the type of equipment, adapter plugs may be required.

See also chapter “6.5 Permitted welding guns“ on page 27.

9.1.2 Adjusting the speed of immersion (damping) for PH-2L

The PH-2L stud welding gun can be set to "Damping ON" or "Damping OFF".

The immersion speed and/or its damping depends on the stud diameter and the welding process.

Studs with a diameter of up to 12 mm do not require any damping.
You do not need damping when stud welding with SOYER® SRM Technology®.

A damped immersion speed helps to avoid excessive spatter formation when welding studs of more than 10 mm in diameter. The stud should be rapidly immersed in the weld pool, this – however – in a decelerated and non-hammer-type method.

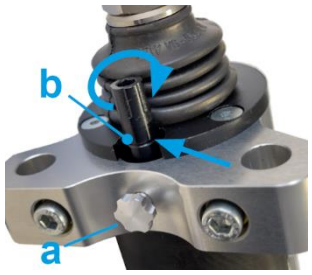
Adjusting the damping of the PH-2L stud welding gun

WARNING

Switch off the stud welding device when the gun is connected to it.

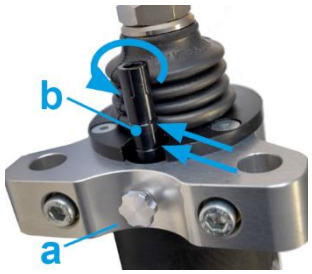
Adjusting the damping to "ON"

1. Loosen the lock screw (a) by turning it to the left.
2. Manually turn the adjustment screw (b) to the right until stop. A marking is now visible on the adjustment screw.
3. Secure your setting by turning the lock screw (a) to the right.



Adjusting the damping to "OFF"

1. Loosen the lock screw (a) by turning it to the left.
2. Manually turn the adjustment screw (b) approx. four turns to the left till two marks are visible on the adjustment screw.
3. Secure your setting by turning the lock screw (a) to the right.



If the lock screw is too tight and difficult to turn, you can also use a 4 mm hexagon wrench key.

Do not turn the adjustment screw out too far. To ensure proper functioning, make sure not to lose the adjustment screw.

9.2 Description of the PH-4L stud welding gun

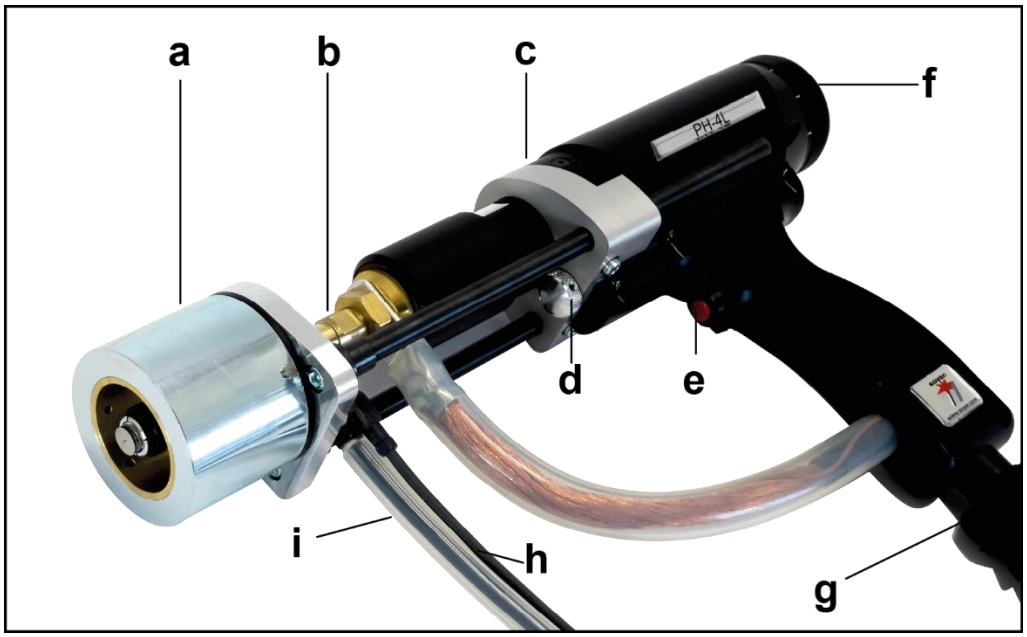


Figure 6: PH-4L stud welding gun with SRM® support SRM^{XL}

Item	Designation
a	Inert gas shroud with SRM Technology®
b	Adapter for SRM® stud chuck
c	PH-4L SRM^{XL} stud welding gun, gap welding gun with lifting magnet
d	Adjustment wheel for setting the speed of immersion (damping)
e	Release button
f	Adjustment wheel for setting the lift height / drop time
g	Power and control cable for connection to the stud welding device
h	SRM® supply for connection to the stud welding device
i	Gas supply for connection to the stud welding device

The gun is equipped with a lifting magnet. Before welding, the stud is lifted by the lifting magnet and automatically lowered again for welding. The height of the lift is also a decisive factor for the welding result.
The lift height can be determined via the drop time using the stud welding device. See chapter “11.1.5 Setting the lift height (drop time) in the "Setup" mode” on page 67.

The lift height is set using the adjustment wheel (f) on the gun.

The PH-4L SMR^{XL} stud welding gun may only be operated with the stud welding devices specified in the technical data.

The PH-4L stud welding gun can be specially equipped depending on the respective welding task.

- Support with SOYER® SRM Technology®
- Support with inert gas equipment
- Support with ceramic ferrule equipment

9.2.1 Technical data of the PH-4L stud welding gun

Designation	PH-4L stud welding gun
Item no.	P02250
Welding process	• SRM® welding process (preferred) • Drawn arc stud welding
Stud diameter	M6 - M16 (M10 - M16 preferred) (depending on accessory and stud welding device)
Stud chuck	SRM® stud chuck, SRM® nut holder and drawn arc stud chuck
Stud length	Standard up to 60 mm, special lengths possible on request and with special accessories
Stud welding devices	The gun is approved for operation on the following SOYER® stud welding devices: • BMK-16i • BMH-22i • BMH-30i • BMK-20i (*)
Weight	7.2 kg with cable
Subject to technical changes	

(*) Depending on the type of equipment, adapter plugs may be required.

See also chapter “6.5 Permitted welding guns“ on page 27.

9.2.2 Adjusting the speed of immersion (damping) for PH-4L

The PH-4L stud welding gun has an infinitely variable damping adjustment.

The immersion speed and/or its damping depends on the stud diameter and the welding process.

Studs with a diameter of up to 12 mm do not require any damping.
You do not need damping when stud welding with SOYER® SRM Technology®.

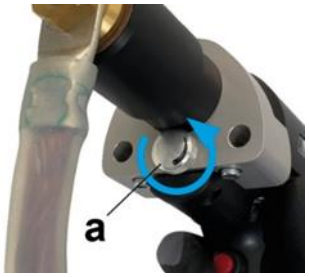
Adjusting the damping of the PH-4L stud welding gun

WARNING

Switch off the stud welding device when the gun is connected to it.

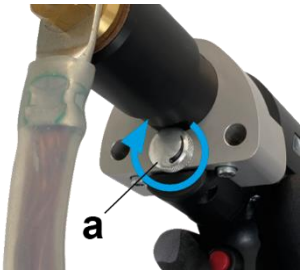
Adjusting the damping to "OFF"

Loosen the lock screw (a) by manually turning it to the left until stop.



Infinite adjustment of the damping

Manually turn the adjustment screw (a) to the right until the desired damping is reached. The larger the stud diameter, the more the immersion speed has to be damped.



Damping can only be adjusted when the welding gun is not positioned on the workpiece (spring housing is in rest position).

The optimal damping has to be determined by carrying out test welds.

The stud should be rapidly immersed in the weld pool, this – however – in a decelerated and non-hammer-type method to prevent excessive spatter formation.

Immersion speeds which are too low may cause pores and an uneven welding bead. The surface of the molten pool would solidify before the stud touches the workpiece.

9.3 PH-2L and PH-4L stud welding guns with SRM Technology®

The PH-2L and PH-4L stud welding guns can be equipped with innovative SRM Technology® when studs with a diameter of 6 mm and more (preferably from 8 mm on) are welded.

For this you also need the following:

- SRM^{XL} support with SOYER® SRM Technology® Item no.: F06576/FA
- SRM® stud chuck (see chapter 7.1 “SRM® stud chuck“ on page 29)
- Adapter for SRM® stud chuck Item no.: F01375 and F01619
- Inert gas supply

SRM^{XL} support with SOYER® SRM Technology®

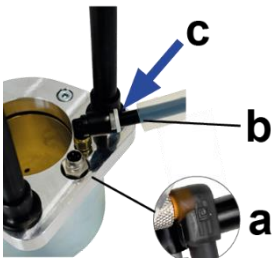
Depending on the scope of delivery, your welding gun is already equipped with a SRM^{XL} support.

SRM^{XL} support # F06576/FA

If you are unsure about optional equipment/accessories, please contact your responsible field service or contact us directly at export@soyer.de.

SRM^{XL} support / Notes on assembly and disassembly

The plug-in connection (a) for the SRM® coil is secured by a union nut.
The inert gas hose (b) is only inserted into the plug nipple. To detach the hose connection, press the locking mechanism (c) slightly inwards and pull out the hose.



Adapter for the SRM® stud chuck

- Union nut (a) # F01375
- Adapter sleeve (b) # F01619

The adapter is directly screwed on the retaining screw.

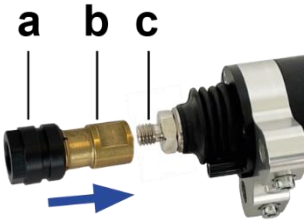


Figure shows PH-2L (PH-4L is similar)

The adapter sleeve (b) must be tightly screwed on the retaining screw (c). When the screwed connection is not tight enough, there is a risk of scorching during the welding process.

When using the PH-2L or PH-4L stud welding gun, the stop screw must be shortened to a maximum projection of 5 mm. If the setting screw is too long, the stud chuck cannot be fully inserted into the adapter.

Note on the immersion speed

A rapid immersion speed is required for the SRM® welding procedure. Set the immersion speed to no damping.

To this end, turn the setting screw (a) to the left until stop.

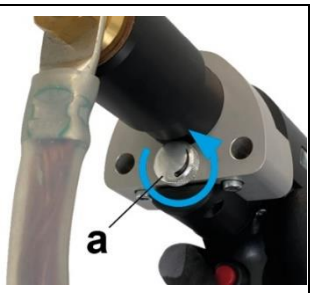


Figure shows PH-4L (PH-2L is similar)

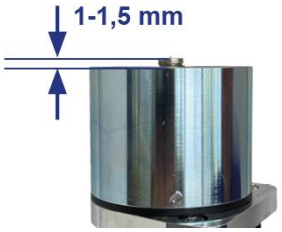
Damping can only be adjusted when the welding gun is not positioned on the workpiece (spring housing is in rest position).

9.3.1 How to retrofit the PH-2L and PH-4L stud welding guns to SRM Technology®

How to retrofit the PH-2L and PH-4L stud welding guns to a support with SRM Technology®

Step 1:	**WARNING** **Switch off the stud welding device when the gun is connected to it.**	
Step 2:	Set the stud chuck to the desired stud (see chapter “7.1.1 Setting the SRM® stud chuck“ on page 29).	
Step 3:	If the gun is equipped with a support, remove it if need be. To this end, loosen the two Allen screws. **It is not essential to remove the support, however, this makes use easier.**	
Step 4:	Undo the union nut.	
Step 5:	If there is still a stud chuck in the gun, remove it.	
Step 6:	Select a suitable stud chuck according to the stud dimension. Slide the stud chuck up to the stop into the adapter sleeve.	
Step 7:	Hand-tighten the union nut.	

How to retrofit the PH-2L and PH-4L stud welding guns to a support with SRM Technology®

Step 8:	Insert a stud and check the stud protrusion. The stud / stud flange must protrude 1 - 1.5 mm from the inert gas shroud. If necessary, correct the setting of the stud chuck by shifting the support.	 
Step 9:	Fasten the support with the inert gas shroud to the gun.	
The adjustment is complete.		

9.4 PH-2L and PH-4L stud welding guns with drawn arc & inert gas

The PH-2L and PH-4L stud welding guns can be equipped for drawn arc operation with inert gas when studs with a diameter of 6 mm and more are welded.

Usually this process is suitable for welding fasteners with a diameter of 6 - 12 mm.
See also chapter “6.2.2 Drawn arc stud welding technology using inert gas“ on page 21.

For this you also need the following:
- Support for inert gas Item no.: F04681/FA
- Drawn arc stud chuck (see chapter 7.2 “Drawn arc stud chucks“ on page 31
- Inert gas supply

Support for drawn arc welding with inert gas

Depending on the scope of delivery, your stud welding gun is already equipped with a support for inert gas.

Support # F04681/FA

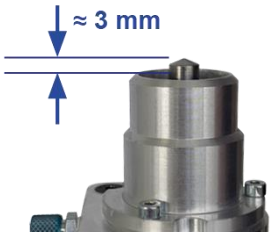
If you are unsure about optional equipment/accessories, please contact your responsible field service or contact us directly at export@soyer.de.

9.4.1 How to retrofit the PH-2L and PH-4L stud welding guns to drawn arc welding with inert gas

How to retrofit the PH-2L and PH-4L stud welding guns to drawn arc welding with inert gas

Step 1:	**WARNING** **Switch off the stud welding device when the gun is connected to it.**	
Step 2:	If the gun is equipped with a support, remove it if need be. To this end, loosen the two Allen screws. **It is not essential to remove the support, however, this makes use easier.**	
Step 3:	It may be necessary to remove a screwed-on adapter or stud chuck.	
Step 4:	Select a suitable stud chuck according to the stud dimension. Screw on the stud chuck.	
Step 5:	**The stud chuck must be tightly screwed. When the screwed connection is not tight enough, there is a risk of scorching during the welding process.**	

How to retrofit the PH-2L and PH-4L stud welding guns to drawn arc welding with inert gas

Step 6:	1. Insert a weld stud. 2. Insert the support and check the stud protrusion. The stud / stud flange must protrude approx. 3 mm from the inert gas shroud. If necessary, correct the setting of the stud chuck by shifting the support.	 
Step 7:	Fasten the support by means of the Allen screws of the gun.	
The adjustment is complete.		

9.5 PH-2L and PH-4L stud welding guns with drawn arc & ceramic ferrule

The PH-2L and PH-4L stud welding guns can be equipped for drawn arc welding with ceramic ferrule when studs with a diameter of 6 mm and more (preferably from 8 mm on) are welded.

As a rule, welding studs without flange of 6 - 16 mm in diameter are welded on with this welding process.

To ensure the formation of a weld bead, each stud needs a ceramic ferrule matching its diameter and shape. The ceramic ferrule must be knocked off and replaced by a new one after each welding process. See also chapter “6.2.3 Drawn arc stud welding technology with ceramic ferrules“ on page 22.

For this you also need:

- Support for ceramic ferrule (see chapter “15.1 Spare and conversion parts for drawn arc welding with ceramic ferrules“ on page 78.
- Drawn arc stud chuck (see chapter “7.2 Drawn arc stud chucks“ on page 31.

Support for drawn arc stud welding with ceramic ferrule

Depending on the scope of delivery, your stud welding gun is already equipped with a support for ceramic ferrules.

PH-2L and PH-4L support for ceramic ferrules

If you are unsure about optional equipment/accessories, please contact your responsible field service or contact us directly at export@soyer.de.

Ensure a minimum stud length when welding with ceramic ferrules. Minimum stud length = Height of ceramic ferrule + 15 mm, e.g. ceramic ferrule for MR10 weld stud = 10 mm high + 15 mm = minimum stud length of 25 mm.

9.5.1 How to retrofit the PH-2L and PH-4L stud welding guns to drawn arc welding with ceramic ferrule

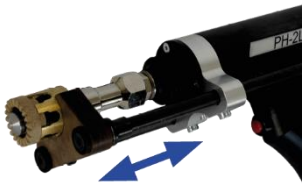
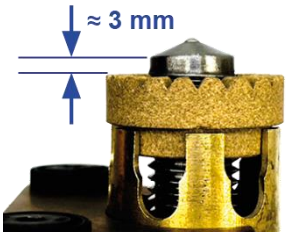
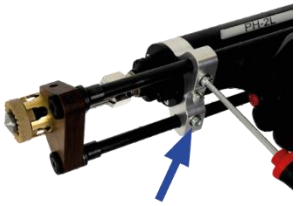
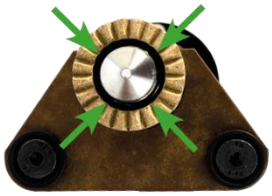
Preparation – Support for drawn arc stud welding with ceramic ferrule

Step 1:	Different stud diameters require different ferrule grips. Select the ferrule grip according to the desired stud diameter. See also chapter “15.1 Spare and conversion parts for drawn arc welding with ceramic ferrules“ on page 78.	
Step 2:	Depending on the ceramic ferrule, it may be necessary to readjust the ferrule grip. The ceramic ferrule should be firmly clamped in the ferrule grip. If the ceramic ferrule is too loose, it is advisable to carefully bend the prongs of the ferrule grip e.g. by means of a pincer.	
Step 3:	Insert the ferrule grip into a suitable foot plate. Fasten the ferrule grip by means of the Allen screws of the foot plate.	
Step 4:	Mount both support rods.	
The preparation is complete.		

How to retrofit the PH-2L and PH-4L stud welding guns to drawn arc stud welding with ceramic ferrule

Step 1:	**WARNING** **Switch off the stud welding device when the gun is connected to it.**	
Step 2:	If the gun is equipped with a support, remove it if need be. To this end, loosen the two Allen screws. **It is not essential to remove the support, however, this makes use easier.**	
Step 3:	It may be necessary to remove a screwed-on adapter or stud chuck.	
Step 4:	Select a suitable stud chuck according to the stud dimension. Screw on the stud chuck.	
Step 5:	**The stud chuck must be tightly screwed. When the screwed connection is not tight enough, there is a risk of scorching during the welding process.**	

How to retrofit the PH-2L and PH-4L stud welding guns to drawn arc stud welding with ceramic ferrule

Step 6:	3. Insert a weld stud. 4. Insert the ceramic ferrule support and check the stud protrusion. The stud / stud flange must protrude approx. 3 mm from the ceramic ferrule. If necessary, correct the setting of the stud chuck by shifting the ceramic ferrule support.	 
Step 7:	Fasten the ceramic ferrule support by means of the Allen screws of the gun.	
Step 8:	Check whether the stud is centrically aligned in the ceramic ferrule grip. The stud must not tilt during the "lifting movement". **The stud must not touch the ceramic ferrule.**	
Step 9:	If necessary, correct the position of the ceramic ferrule grip by shifting the foot plate. 1. Loosen both fastening screws of the foot plate. 2. Align the foot plate so that the stud is centred in the ceramic ferrule and does not touch the ceramic ferrule. 3. Then tighten both fastening screws of the foot plate.	
The adjustment is complete.		

9.6 Cleaning the welding gun

Regularly free the gun and inert gas shroud of slag and welding spatter using a suitable tool.

The frequency of cleaning depends on conditions under which the stud welding gun is used.

⚠WARNING

Danger of injury when cleaning

Switch off the stud welding device when the gun is connected to it.

⚠CAUTION

Danger of injury when cleaning

Welding spatter and slag can have sharp edges.

- Wear protective gloves when cleaning.

To prevent impurities from welding spatter and slag and to simplify cleaning, we recommend using SOYER® release spray (order number M01464).

10 Setup and connection

10.1 Requirements for the installation site

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

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

The installation site and workplace must comply with legal requirements.

Ensure that the installation site is readily accessible for maintenance work.

Make sure that the stud welding device cannot be soiled by dust (especially metal dust or chips) caused by work in the immediate surroundings (e.g. grinding work).

DANGER

Danger from humid operation site

There is a danger of electrocution when operating the stud welding device in a humid environment.

- The stud welding device may only be operated in dry rooms.

CAUTION

Danger from welding vapours

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

- If necessary, ensure that the welding fumes are suitably extracted.

10.2 Connection of the stud welding device and the stud welding guns

10.2.1 Mains connection

After installation, connect the stud welding device to the power supply using the mains plug. See chapter “6.4 Technical data of the BMK-20i stud welding device” on page 26.

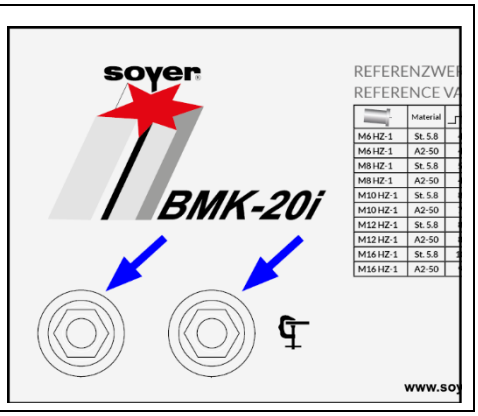
When switching on the device, all LEDs on the front panel light up briefly.

10.2.2 Connecting the earth cable

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

Insert both earth cables into the sockets and turn the plug to the right up to the stop.

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

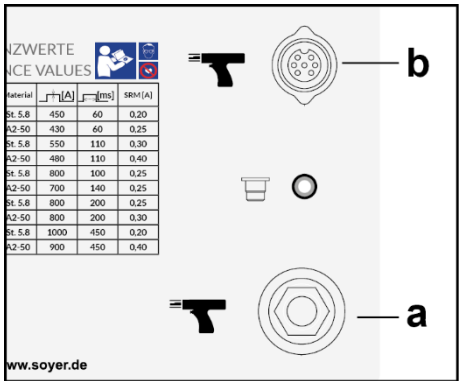


10.2.3 Connecting the stud welding gun

Only use the welding guns approved by the manufacturer. See chapter “6.5 Permitted welding guns” on page 27.

Plug the welding cable into the socket (a) and turn the plug to the right up to the end stop.

Plug the control cable into the control cable socket (b) and tighten the union nut.



Make sure to check if special adapters are required to connect the gun (see chapter “6.5 Permitted welding guns” on page 27).

10.2.4 Connecting the inert gas supply

Prior to welding with inert gas, a suitable gas supply connection must be established.

The gas connection on the back of the device is used for supplying gas to the stud welding device via a pressure reducer (pressure reduction valve not included in the scope of delivery).

The maximum permissible operating value for the inert gas amount is

12 l/min.

Example of an inert gas cylinder with connection fittings (not included in the scope of delivery).

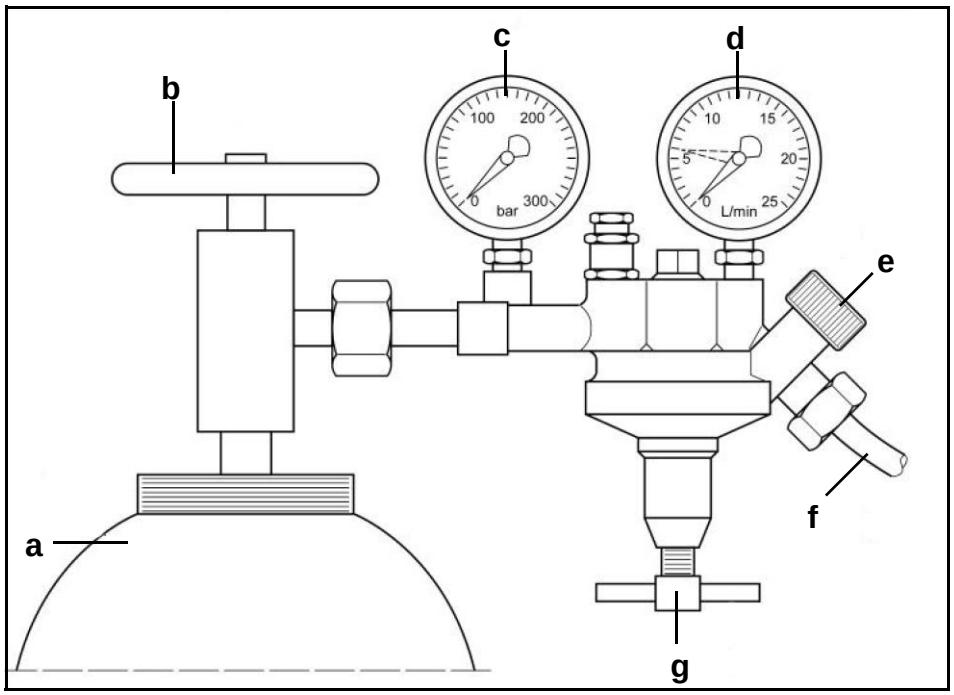


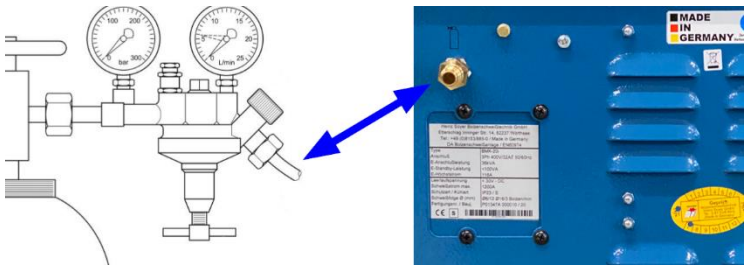
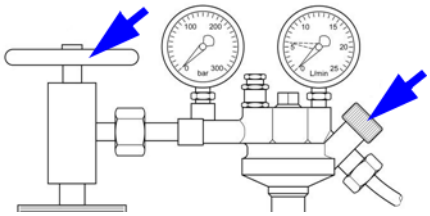
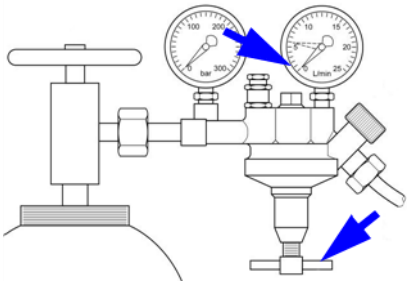
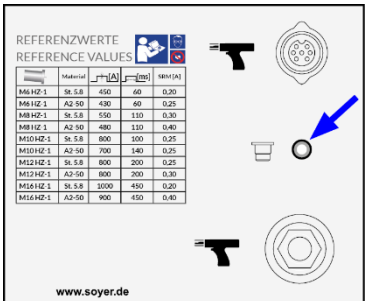
Figure 7: Example of a gas supply

Item	Designation
a	Gas cylinder with inert gas (for recommended mixtures, see below)
b	Main shut-off valve
c	Manometer for displaying the gas pressure in the gas cylinder [bar]
d	Gas flow meter [l/min] (pressure reducing valve)
e	Shut-off valve for the gas connection hose of the stud welding device
f	Gas connection hose of the stud welding device
g	Valve for regulating the gas flow rate (maximum permissible gas quantity: 12 l/min)

The following inert gas mixtures are recommended:

- 82% argon and 18% CO_2 (preferred)
- 90% argon and 10% CO_2
- 85% argon and 15% CO_2

Establishing the gas supply

Step 1:	Check the gas cylinder, the connection fitting and the gas hose with the connection plugs for integrity and functionality.
Step 2:	Connect the gas hose connection with the pressure reducing valve of the gas cylinder and the stud welding device (reverse side). 
Step 3:	Open the main valve of the gas cylinder and the shut-off valve of the gas connection hose. 
Step 4:	Use the regulating valve to set an inert gas flow rate of approx. 4 - 5 l/min.  Depending on the connection fitting used, the gas flow rate is only displayed in the gas test mode. See chapter “11.1.4 Setting the gas preflow time (gas test)“ on page 66.
Step 5:	Connect the inert gas hose of the gun to the stud welding device. 
The gas supply is established.	

WARNING

Danger from escaping gas

Numerous dangers can occur due to escaping gas, such as oxygen deprivation or line/gas cylinder whipping around.

- Make sure the gas cylinder is adequately secured against falling over and damage.
- Make sure the gas cylinder, fittings and lines are always in a good condition.
- Make sure there is an adequate supply of fresh air when using, storing or transporting the gas cylinder.
- Comply with the instructions of the gas/gas cylinder manufacturer.
- Carry out all necessary, prescribed checks of the gas cylinder, fittings and lines.
- Safeguard the gas supply against unauthorised access.

The following inert gas mixtures are recommended:

- 82% argon and 18% CO_2 (preferred)
- 90% argon and 10% CO_2
- 85% argon and 15% CO_2

11 Settings

The stud welding device and welding gun must be matched and adjusted for the respective work.

11.1 Setting welding parameters

The following describes how the welding parameters

- Welding current
- Welding time
- SRM® current
- Gas preflow time and
- Drop time/ lift height

are adjusted.

To achieve an optimum stud welding result, it is necessary to carry out some test welds with different settings.

The parameters to be set on the stud welding device also depend, among other things, on the following factors:

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

11.1.1 Support tables for device settings

The values stated in the following table may be useful reference values for a first test weld.

How to adjust the respective settings is explained in the following chapters.

Welding parameter adjustment aid for BMK-20i
SOYER® HZ-1 universal weld stud

Welding element	Material	MC [A]	MCT [ms]	SRM® [A]	Feature
M6 HZ-1	St.5.8	450	60	0.20	
M6 HZ-1	A2-50	430	60	0.25	
M8 HZ-1	St.5.8	550	110	0.30	
M8 HZ-1	St.8.8	550	110	0.30	
M8 HZ-1	A2-50	480	110	0.40	
M10 HZ-1	St.5.8	800	100	0.25	
M10 HZ-1	St.8.8	650	180	0.25	
M10 HZ-1	A2-50	700	140	0.25	
M12 HZ-1	St.5.8	800	180	0.25	
M12 HZ-1	St.8.8	750	300	0.15	
M12 HZ-1	A2-50	800	200	0.30	
M16 HZ-1	St. 5.8	1000	450	0.20	PH-4L SRM^{XL} Gas: 90%AR 10%CO_2 Lift 2-3 mm
M16 HZ-1	A2-50	900	450	0.40	

Fixed welding parameters (standard values)

Preweld current (PC) = 50 A	Preweld current time (PCT) = 50 ms
Gas preflow time = 1 s	Drop time ~ 10-12 ms

The values were determined on a sheet with a thickness of 5 mm.
Applied gas: 82%AR 18%CO_2. Gas flow rate: 7-10 l/min

Abbreviations and definitions

HZ-1: SOYER® universal studs with centring tip
.

Welding parameter adjustment aid for BMK-20i

Welding studs (PT), tapped studs (IT), welding nuts and welding studs (RD)

Welding element	Material	MC [A]	MCT [ms]	SRM® [A]	
M3 PT	St. 4.8	200	70	0.20	
M3 PT	A2-50	150	80	0.30	
M4 PT	St. 4.8	340	60	0.25	
M4 PT	A2-50	250	80	0.40	
M5 PT	St. 4.8	320	110	0.25	
M5 PT	A2-50	270	130	0.40	
M6 (IT) Ø8 mm	St.4.8	630	100	0.25	
M6 (IT) Ø8 mm	A2-50	530	150	0.30	
M8 (IT) Ø10.8 mm	St.4.8	900	170	0.25	
M8 (IT) Ø10.8 mm	A2-50	790	230	0.25	
M5 weld nut	A2-50	230	180	0.60	
M6 weld nut	A2-50	270	250	0.70	
M8 weld nut	A2-50	370	350	0.75	
M10 weld nut	A2-50	500	450	1.15	
M12 weld nut	A2-50	600	500	1.25	
RD M6	St.4.8	420	90	0.30	
RD M6	A2-50	360	100	0.40	
RD M8	St.4.8	500	110	0.30	
RD M8	A2-50	450	130	0.30	
RD M10	St.4.8	600	160	0.30	
RD M10	A2-50	520	200	0.40	
RD M12	St.4.8	800	200	0.30	
RD M12	A2-50	700	200	0.40	
RD M16	St.4.8	950	350	0.80	
RD M16	A2-50	860	360	1.10	
RD M20	St.4.8	1150	450	0.70	
RD M20	A2-50	1050	500	0.90	

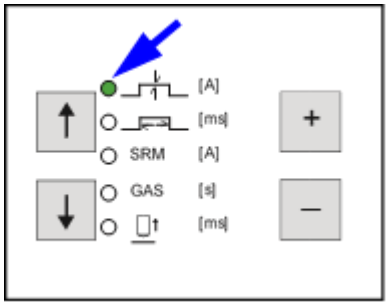
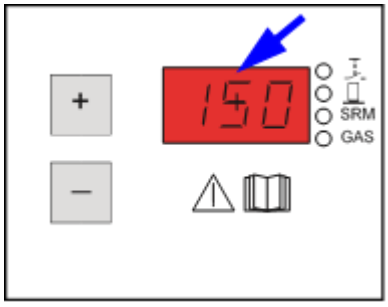
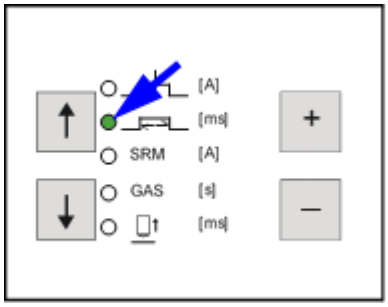
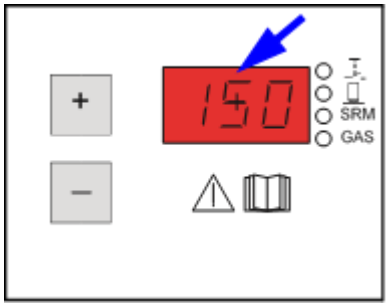
Fixed welding parameters (standard values)

Preweld current (PC) = 50 A	Preweld current time (PCT) = 50 ms
Gas preflow time = 1 s	Drop time ~ 10-12 ms
The values were determined on a sheet with a thickness of 5 mm. Applied gas: 82%AR 18%CO_2. Gas flow rate: 7-10 l/min	

11.1.2 Setting the welding current and the welding time

If you do not have specified values, the tables in chapter “11.1.1 Support tables for device settings” from page 62 can be used as an aid for a basic setting.

Setting the welding current and the welding time

Step 1:	Connect the device as described in chapter “10.2 Connection of the stud welding device and the stud welding guns” on page 56.	
Step 2:	Use the ↑↓ arrow keys to select the position for the welding current setting. The LED lights up if the selection is correct.	
Step 3:	Use the +/- keys to set the required value for the welding current on the display.	
The welding current has been set.		
Step 4:	Use the ↑↓ arrow keys to select the position for the welding time setting. The LED lights up if the selection is correct.	
Step 5:	Use the +/- keys to set the required value for the welding time on the display.	
The welding time has been set.		

11.1.3 Setting/deactivating the SRM® current

For the recommended welding procedure with SRM Technology® you must set an SRM® current value.

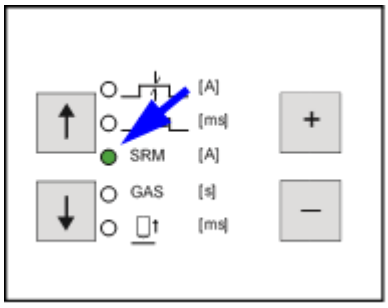
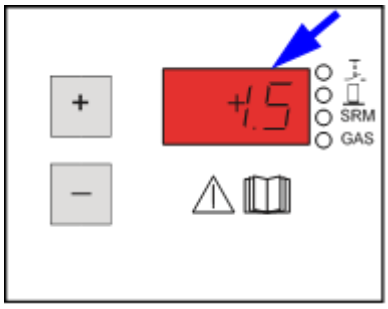
If you do not have specified values, please refer to the tables in chapter “11.1.1 Support tables for device settings” from page 62. These may be used as an aid for a basic setting.

As soon as you set an SRM® current value > 0 A, SRM® is automatically activated when welding with the set current value. When set to 0 A, SRM® is deactivated.

You can deactivate the SRM® current for the following welding procedures:

- Drawn arc stud welding with inert gas
- Drawn arc stud welding with ceramic ferrule

Setting/deactivating the SRM® current

Step 1:	Connect the device as described in chapter “10.2 Connection of the stud welding device and the stud welding guns” on page 56.	
Step 2:	Use the ↑↓ arrow keys to select the position for the SRM® current setting. The LED lights up if the selection is correct.	
Step 3:	Use the +/- keys to set the required value for the SRM® current on the display. The SRM® current is adjustable from 0 - 1.5 A (displayed in A) in 50 mA-steps (0.05 A). **If the setting is "0", SRM® is deactivated.**	
The SRM® current has been set.		

11.1.4 Setting the gas preflow time (gas test)

An often overlooked source of error is that there is ambient air and moisture in the inert gas line and inert gas shroud. It is therefore crucial to maintain a sufficiently long gas preflow time to expel the ambient air and moisture before each welding process.

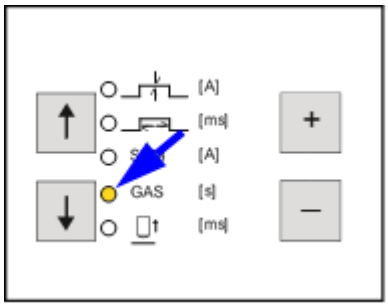
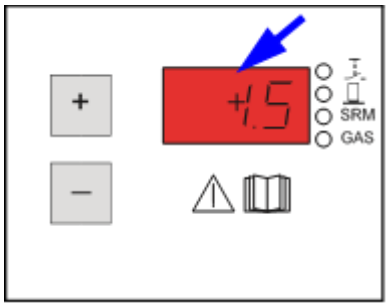
If you do not have specified values for the gas preflow time, please refer to the tables in chapter “11.1.1 Support tables for device settings from page 62. These may be used as an aid for a basic setting.

The "Gas test" mode can be used to check that the inert gas flows through the inert gas shroud of the gun. As soon as the release button on the gun is pressed, inert gas flows out of the inert gas shroud of the gun for the time set in seconds. This means the gas lines can also be flushed with inert gas before starting work.

During initial start-up or longer periods of non-use, the supply lines of the inert gas supply must be flushed.

This ensures that the weld pool is reliably covered with inert gas.

Setting the gas preflow time

Step 1:	Connect the device as described in chapter “10.2 Connection of the stud welding device and the stud welding guns” on page 56.	
Step 2:	Use the ↑↓ arrow keys to select the position for the gas preflow time setting. The LED lights up if the selection is correct.	
Step 3:	Use the +/- keys to set the required value (1-5 s) for the gas preflow time on the display.	
The gas preflow time has been set.		

11.1.5 Setting the lift height (drop time) in the "Setup" mode

For drawn arc welding guns, the stud is lifted for a defined height/time just before the welding process and automatically lowered again during the welding process.

As the lift height of the stud is difficult to measure, the equivalent drop time is specified on the stud welding device.

In the following setting of the drop time, the welding process is simulated in the "Setup" mode. The lifting and lowering of the stud is the same as during welding, only the welding current is not activated.

Operating modes

- Setup mode: No welding is carried out when simulating a welding process.
- Operating mode (normal mode): Welding is carried out.

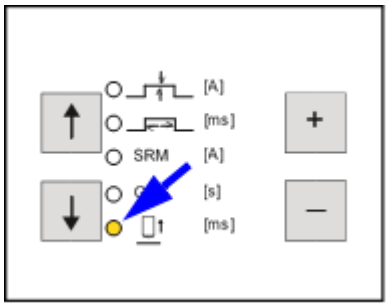
WARNING

Danger from incorrect operating mode

If the following setting operations are not carried out in the setup mode but in the operating mode, pressing the release button on the gun causes a weld to be carried out.

- Make sure that the "Setup" mode is activated for the lift test.

Setting the lift height with the stud welding device

Step 1:	Connect the device as described in chapter “10.2 Connection of the stud welding device and the stud welding guns” on page 56. **Switch on the device.**	
Step 2:	Fit the gun with a welding stud.	
Step 3:	Use the ↑↓ arrow keys to select the position for the lift test. The LED lights up if the selection is correct.	

Setting the lift height with the stud welding device

Step 4:	Place the gun on the workpiece and press the release button on the gun for the weld. The currently set value for the drop time in [ms] appears on the display. The longer the drop time, the higher the lift height. Determining the correct lift height/drop time requires experience and some trials. Guide values for the correct drop time can be found in chapter “11.1.1 Support tables for device settings on page 62.
The lift height/drop time is changed using the adjustment ring on the welding gun for the lift height of the stud. Pull out the adjustment ring and turn it to change the setting. After you have changed the setting, push the adjustment ring back in.	
Step 5:	Make sure the device is in the operating mode by selecting one of the three functions above (green LEDs).

Notes on "Setup" mode

The setup process can be repeated as often as required. However, to avoid the magnetic coil overheating, maintain a waiting time of approx. one second between two test strokes.

12 Welding operation

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

12.1 Carrying out welding

The following describes how weldings are carried out with a stud welding gun.

DANGER

Danger from incorrect operation

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

- Before using the stud welding device, refer to chapter “2 Important safety instructions” from page 10.
- If you have any problems understanding the operating instructions, contact the manufacturer, Soyer.
- Before each use, check that the devices and the cables/lines with the plugs are undamaged.

Carrying out welding

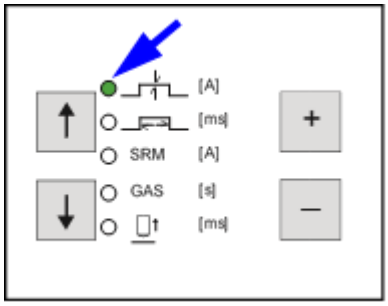
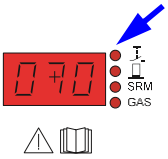
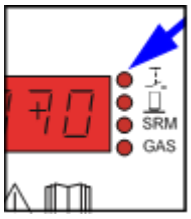
WARNING

When working with the stud welding device, we recommend wearing personal protective equipment.

See chapter “2.4 Personal protective equipment“ on page 15.

Step 1:	Before welding, please refer to chapter “2 Important safety instructions” on page 10.
Step 2:	Connect the gun to the stud welding device (see chapter “10.2 Connection of the stud welding device and the stud welding guns” on page 56). Check if a connection adapter may be required.
Step 3:	Insert the appropriate stud chuck and a welding stud (see chapter “7 Description of stud chuck” on page 29). Only use SOYER® welding studs.
Step 4:	Check the welding parameters (see chapter “11 Settings” on page 61).

Carrying out welding

Step 5:	Check the lift height / drop time of the stud welding gun (see chapter “11.1.5 Setting the lift height (drop time) in the "Setup" mode “ on page 67.	
Step 6:	Check the inert gas supply and purge the gas line (see chapter “11.1.4 Setting the gas preflow time (gas test)“ on page 66.	
Step 7:	Make sure the device is in the operating mode by selecting one of the upper three functions.	
Step 8:	Check that the welding points on the stud and workpiece are metallically bright.	
Step 9:	Press the gun onto the workpiece at an angle of 90 degrees.   The LEDs light up red when the contact to the workpiece and earth connection are correct.	
Step 10:	Press the release button of the gun. Welding is carried out. The LEDs also briefly light up red during the welding process.  **During the welding process, hold the gun still and only remove it vertically from the welded stud after completing the welding process. By doing so, widening or damaging the stud chuck is avoided.**	
The welding process is finished.		

12.2 Notes on checking the quality of the weld

When the SOYER® stud welding system is used properly and the correct materials are chosen, the strength of the welding joint (welding zone) is always higher than the strength of the stud or the basic material.

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

- Visual inspection
- Bend test

For further information, see standard:
DIN EN ISO 14555 - Arc welding of metallic materials or Technical Bulletin DVS 0904 Instructions for practice - Arc stud welding.

12.2.1 Visual inspection

The visual inspection serves as a rough check for major defects. The uniformity of the weld is assessed. The following table serves as an aid for the assessment of the welding result.

Visual inspection

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

12.3 Switching off the device

Switch off the stud welding device at the mains switch.

This also automatically switches off the connected welding gun.

Make sure that the stud welding device cannot be switched on and used by unauthorized persons.

Close the shut-off valves at the gas supply.

If the stud welding device is not used for a longer period of time, we recommend disconnecting it completely from the grid.

Carefully unplug the mains connecting cable to disconnect the stud welding device from the power supply.

12.4 Welding defects and their causes

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

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

Faults	Possible cause and troubleshooting
Device cannot be switched on.	• Check the mains supply fuses.
Device does not weld, there is no (or very little) spark formation.	Device is not connected to the mains or not switched on. • Connect the device to the mains supply and switch it on. The LED displays light up briefly when switching on.
	Welding cable, control cable or gas hose are not correctly connected or damaged. • Connect the cables or gas hose correctly or examine for damage, replace if necessary.
	Connection plugs or sockets of the device are damaged. • Have the plugs or sockets replaced by SOYER® customer service.
	Both earth cables are not (or not correctly) connected, or earth clamps are not fastened to the workpiece. • Connect the earth cable, fasten the earth clamps to the workpiece.
	Weld points or earth connection points on the workpiece are not bare metal. • Prepare the workpiece or studs.
	Lift height or immersion depth is not set correctly. • Set the lift height or the immersion depth correctly in accordance with the operating manual for the stud welding gun.
	Gas flow rate is set too high, i.e. greater than 12 l/min (the arc is blown out). • Set the gas flow rate to a lower value.
	Stud sits too loose in the stud chuck. • Press the stud chuck together or reclamp.
	Defect on the controller or on the welding gun. • Contact SOYER® customer service.

Faults	Possible cause and troubleshooting
Inert gas does not flow during the welding process.	Gas cylinder is not (or is not correctly) connected to the device or valve, or shut-off valve is not open. • Connect the gas cylinder or open the valve or the shut-off valve.
	Time for gas preflow time is set to "0". • Set the gas preflow time to the required preflow time.
	Gas flow rate is set too low. • Set the gas flow rate to 4 - 5 l/min with the regulating ball valve.
	Solenoid valve in the device is soiled or defective. • Contact customer service and have it replaced.
Stud does not lift, there is no main current arc although "Stud on workpiece" LED lights up.	Lift height is not set correctly. • Set the lift height in accordance with the operating manual for the stud welding gun.
	The control unit of the device or welding gun is defective. (Stud does not lift despite correctly set lift height). • Contact SOYER® customer service.
Stud lifts but main current is not ignited.	Lift is too large. • Set the lift in accordance with the operating manual for your welding gun.
	Gas pressure is too high. • Set the gas pressure to the specified value.

Faults	Possible cause and troubleshooting
Different weld results	SRM® current not set correctly. • Increase the SRM® current parameter in steps and check if there is any improvement.
	Welding energy not set correctly. • Adjust the welding energy.
	Cable connections are too loose, contact resistances are created. • Check all cable connections and ground clamps for tightness.
	Stud is too loose or not up to the end stop in the stud chuck. • Press the stud up to the end stop, replace the stud chuck if necessary.
	There is a magnetic arc blow effect. The arc is pushed in a specific direction. • Change the fastening of the earth clamps, place pieces of iron on the edges or turn the welding gun.
	Lift height and/or immersion depth are/is not set correctly. • Set the lift height and/or the immersion depth in accordance with the operating manual for your welding gun.
	You have used low quality studs with imprecise dimensions or poor surface quality. • Only use SOYER® welding studs.
	Welding time and/or gas flow rate are/is not set correctly. • Set the welding time and/or the gas flow rate again.
	Basic material is not suitable for welding. • Use suitable material combinations.
One-sided beads are formed at the same points.	The formation of a bead is caused by magnetic arc blow effect. The arc is pushed in a specific direction. • Change the fastening of the earth clamps, place pieces of iron on the edges or turn the welding gun.
	SRM® current is set to 0 or is set too low. • Increase the SRM® current parameter in steps and check if there is any improvement.
Very heavy spark formation, stud flange almost melted away.	Main current duration set too long. • Re-adjust the time for the main current duration according to the table.
	Welding current set too high. • Re-adjust the welding current.

Faults	Possible cause and troubleshooting
Stud is not welded to the whole flange surface, strength of the welding is insufficient.	Main current duration set too short. • Re-adjust the time for the main current duration according to the table.
	Earth connection is poor. • Check earth cable and earth clamps for tight fit, tighten if necessary.
	The contamination on the surface of the workpiece is too great. • Clean the surface of the workpiece.
	Front surface of the welding stud deformed. • Use a new welding stud.
	Stud protrusion for the stud chuck not set correctly. • Set the stud protrusion to 3 - 5 mm (distance between the stud chuck and the front surface of the stud).
	The welding gun was placed in tilted position. • Press the gun onto the workpiece at an angle of 90°.
	Lift not correctly set. • Adjust the lift.
The device switches itself off.	Stud lift not set correctly. • Set the stud lift in accordance with the operating manual for the welding gun and switch on the device.
	Welding gun has been pulled off the workpiece during the main current. • Switch the device on again.
	Arc breaks off because the gas pressure is too high. • Set the gas pressure to the specified value.
	The surface of the workpiece is electrically poorly conductive – arc breaks off. • Grind off the surface.
	Faulty mains supply. • Check the mains supply fuses.
	Fuse in the device is defective. • Contact customer service.
Scorched stud thread	Stud chuck is worn out. • Replace the stud chuck.

13 Maintenance and repair

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

14 Service

If servicing is required, please contact:

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

Please have the serial number ready during service requests.

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

15 Spare and conversion parts

15.1 Spare and conversion parts for drawn arc welding with ceramic ferrules

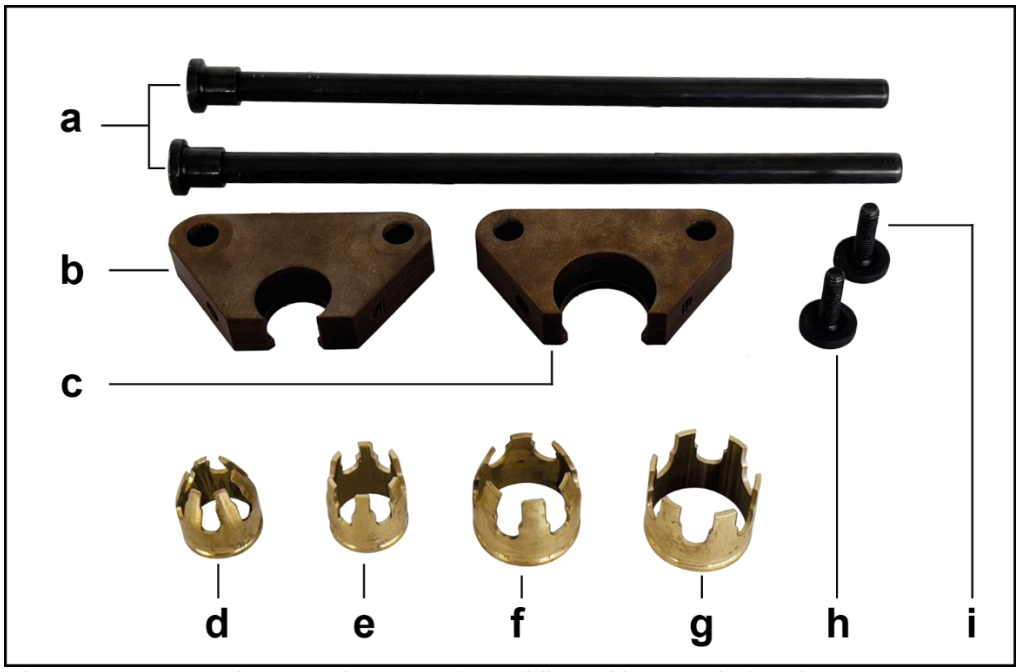


Figure 8: Spare and conversion parts for welding with ceramic ferrules

Individual parts in the conversion kit

Item	Designation	Dimension	Item no.
a	Support rod (n)	Length 230 mm	F02879
b	Foot plate FP1	KR 6 – KR 10	F01642
c	Foot plate FP2	KR 12 – KR 22	F01643
d	Ferrule grip	KR 6	F03768
e	Ferrule grip	KR 8 – KR 10	F03769
f	Ferrule grip	KR 12	F03770
g	Ferrule grip	KR 16 – KR 22	F03771
h	Conical socket (n)	M8	M01440
i	Countersunk head screw (n)	M6 x 25 mm	M01439

16 Warranty conditions

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

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

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

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