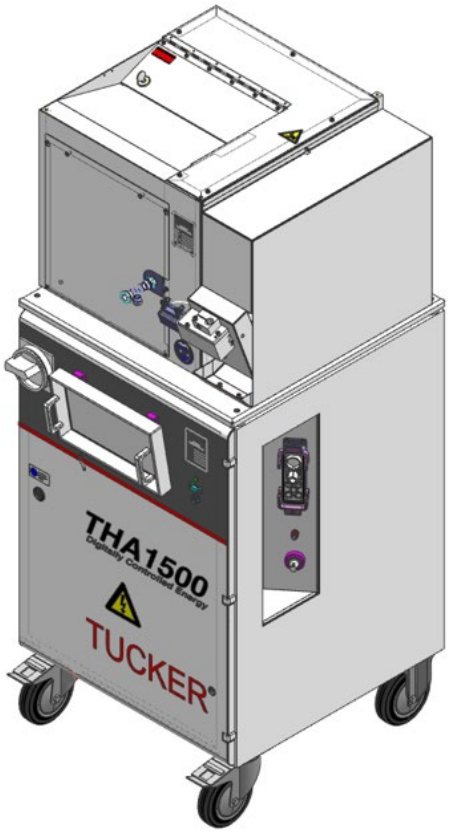
STANLEY
Engineered Fastening



Operating manual

Stud welding system

THA1500

Type / Device: Semi-automatic, Manual
Edition: May 2016
Revision: 00 EN

Read through carefully before using!

1.8.2016

TUCKER®

TUCKER®

Stud welding system

THA1500

Operating manual

Type / Device:	Stationary
Translation of the Operating manual	BTA_THA1500_00_en

Manufacturer

TUCKER GmbH

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Imprint

Responsibility for the content listed in this medium from
STANLEY Engineered Fastening in accordance with § 5
TMG is the manufacturer: Tucker GmbH;
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Table of contents

The Declaration of Conformity is added at the end of these instructions!

Notes:

1 Information about using this manual

1.1 Revision status

Rev.	Date	Section / Modification	Author / Editor	Examination	Release
00	May 2016	New edition	M. Appel	H. Ivo	R. Lyss

1.2 Identification of the entity

Brand	TUCKER
Product group	Stud welding system
Product types	THA1500
Serial-Nos.	jj/nnnnnn00100NN; Nom.: j = year/n = Order No. + consecutive no.
Name, Address, Manufacturer	Name plate and make; Page 2 of this manual
Edition, year of delivery	2016

1.3 Name and address of the manufacturer

Important information regarding Manufacturer, Imprint, confidentiality and Copyright can be found on the cover page2. Contact can be made via this address with regard to service, spare parts or maintenance requirements.

1.4 How to use these operating instructions

This operating manual provides you with important instructions regarding the understanding and use of this document, identifies and describes the system and its - important components, information about the special requirements regarding safety and health protection as well as instructions covering the preparation needed before using the system, usage and operation, maintenance, spare parts and consumable materials, tools and instruments and finally, decommissioning, dismantling and disposal.

One prerequisite for safe working is given when all specified safety instructions, safety regulations and instructions as well as the operator duties according to the national regulations in respect of work protection, operating safety, the works constitution, workplaces, use of work equipment, operational and inspection regulations are - observed.

This manual is aimed at the following users: Manufacturer specialists/skilled employees, operator specialists, logistics service providers, specialist installation engineers,

specialist maintenance engineers and instructed and specially tasked employees of the plant builder and operator. Individual qualification requirements are defined in passages from 4.1. The qualification requirements placed on the personnel are defined in the - national training standards.

1.5 Quick access

Every user of the operating manual must carefully read it through before taking any action and treat this carefully as a product component.

As the operator you must inform all authorised personnel[1] about the suitable storage location or permanent storage location of this manual and ensure continuous availability throughout the estimated operational and service life of the whole system.

1.6 Long-term backup

The manufacturer grants permission to make precautionary backup copies for archiving, registration and long-term storage. Copyright will not be affected. The retention period for the availability of this manual for use is at least 10 years, starting from the day after the last series unit has been produced and ending, at the earliest, with the disposal, however not before 30 years has expired. The operator or his representative is solely responsible for the availability of all of the remaining editions of this manual and the reusability of the back-up copies as well as their applicable documents.

1.7 Reordering

This instruction manual can be reordered using the following details from the - manufacturer and publisher during the next 10 years:

Designation	Edition	Rev.	File name
Stud welding system THA1500	May 2016	00	BTA_THA1500_00_en

1.8 Applicable documents

The attached documents for the interlinked components as well as directives from the EU, the operator and applied standards all apply in addition to this manual:

[1] Your and instructed and specially tasked employees.

1.8.1 Associated instructions

Type of document	Product	Edition	Rev.	File name or annex
Instructions from the manufacturer				
Operating - manual	DCE control and power unit	2008-03	00	dce_v0108_en
Fault messages	DCE system	2010-10-29	01	FSM_DCESYS_01_en

1.8.2 Instructions for customer-specific requirements through Directives:

Non-existent.

1.8.3 Applied standards and regulations

1.8.3.1 Type A standards

Standard	Issue	Title	Change standard
DIN EN ISO 12100: 2011-03	2011-03	Safety of machinery - General design principles - Risk assessment and risk reduction (ISO 12100:2010)	--
DIN EN ISO 12100: 2011-03	2011-03	Safety of machinery - General design principles - Risk assessment and risk reduction (ISO 12100:2010)	12100:2013-08 BER1 DIN EN ISO
DIN EN 82079-1: 2013-6	2013-06	Preparation of instructions for use - Structuring, content and presentation - Part 1: General principles and detailed requirements (IEC 82079-1:2012);	--

1.8.3.2 Other standards and technical regulations

Standard	Issue	Title	Change standard
DIN 4844-1: 2012-06	2012-06	Graphical symbols – Safety colours and safety signs – Part 1: Observation distances and colorimetric and - photometric requirements	--

Standard	Issue	Title	Change standard
DIN 4844-2: 2012-12	2012-12	Graphical symbols – Safety colours and safety signs – Part 2: Registered safety signs	A1:2015-09 “Changes to 4 safety signs“
ISO 3864 sp. 2	(all)	Graphic symbols – safety colours and safety signs	
DIN EN ISO 7010: 2012-10	2012-10	Graphical symbols – Safety colours and safety signs – registered safety signs (ISO 7010: 2011); German version EN ISO 7010: 2012 / 2016	--
DIN ISO 7000	2008-12	Graphic symbols for use on equipment	
ISO/IEC 17050-1: + :2	2004	Conformity assessment - Supplier's declaration of conformity - Part 1: General requirements; Part 2: Supporting documentation;	(corr. Version 2007-06-15)
DIN 61082-1:	2007-03	Documents for Electrical Engineering – Part 1	
DIN EN 62023	2012	Documentation structure; structuring - technical information and documentation	
DIN EN 13306, 2015-09	2015-09	Maintenance – maintenance terminology	--
DIN EN 31051: 2012-09	2012-09	Fundamentals of maintenance	--
DIN EN 62061: 2013-09	2013-09	Safety of machinery - functional safety of safety-related electrical, electronic and programmable electronic control systems (IEC 62061:2005 + A1:2012);	

1.8.3.3 Guidelines

Guideline	Issue	Title	Change
2006/42/EC	2006	Machine Directive	
2006/95/EC	2006	Low voltage directive	2014/35/EU
2004/108/EC	2004	EMC guideline	2014/30/EU

1.9 Printing conventions

This manual is to be printed on paper in upright DIN A4 format. The page margins must be sufficiently wide and alternated so that double-sided printing can be realised. The mirrored set on each page is 166 x 246 mm (w x h). The 22 mm gutter must be on the left of every odd-numbered page and on the right for every even-numbered page. The edge of the holes must comply with ISO 838 and be 12 ± 1 mm from the edge of the paper.

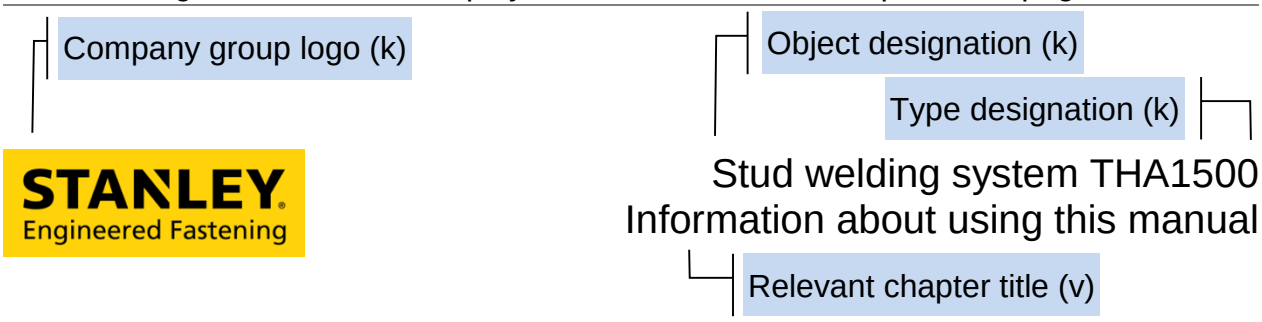
Printing onto US letter format – 8.5 x 11 inch – is also possible. The default setting printing to be taken into account is an upper margin of 10 mm – 4/10 inch – and a lower margin of 7.6 mm – 3/10 inch, to be removed respectively

1.10 Orientation in the manual

Use the table of contents listed before the first chapter to orientate and navigate through the document's structure. It lists the chapter numbers and their titles down to the third grouping level, e.g. 3.2.1. The option of searching through the indices or illustrations can be realised at the end of the document.

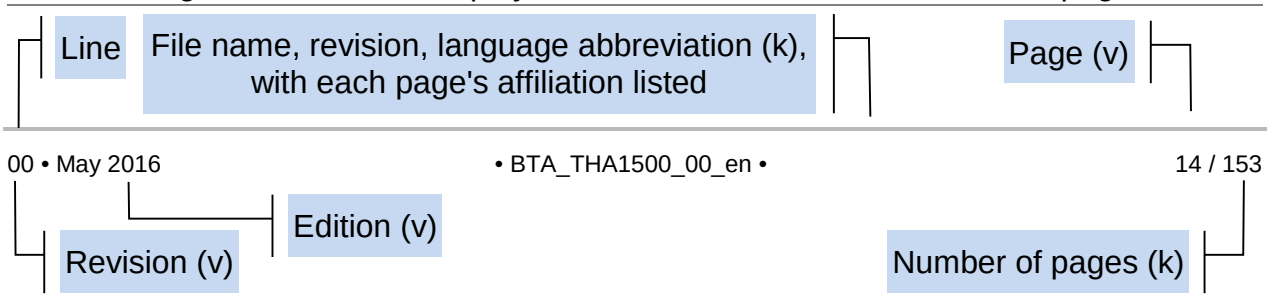
Apart from the title page and cover page 2, every other page contains an alternating header or footer, which contains constant (k) and variable (v) information structured as follows:

The following details must be displayed in the header at the top of each page:



The system name is clearly listed at the top of every page for identifying the whole system and for navigating the title of the relevant main chapter.

The following details must be displayed in the footer at the bottom of each page:



The file or document name, document revision and edition information and the page number of the actual page from the total number of pages contained in the document are included at the bottom of each page so that you can identify the source and navigate through the document.

It can be assumed that this operating manual will also be available in a digital file form and a bound paper form. The detail given of the total number of pages on each page could be dropped therefore. However, it may be meaningful also to use a loose sheet folder edition. The user can then add additions or revisions to this. Therefore providing details of the total number of pages, which is normal in plant construction and machine building, is recommended.

NOTE!

Images used in this manual support the general understanding. These can deviate from the actually delivered variant of the device.

2 Description

This section is aimed at the following users of the unit: The structure of the unit, its main functions and use of the unit are explained in this chapter. The explanations provide you with the knowledge required to use and to implement the unit within its defined usage and performanceareas.

You will be infirmed about the risks and danger areas associated with use in the following Chapter 4.

2.1 General functional and application areas

The THA1500 stud welding system is obtainable in the following two variants:

- The product THA1500/X is exclusively designed for manual operation of the stud-welding system. The plant is to be used in combination with the stud welding guns defined in Chapter 4.2 “Intended use“. The skilled employee manually places the welding stud in the stud welding gun, positions the gun on the workpiece and initiates the welding process.
- The product THA1500/X is exclusively designed for manual operation of the stud-welding system and also includes a step feeder for the control and energy unit. The plant is to be used in combination with the stud welding guns defined in Chapter 4.2 “Intended use“. The welding studs are separated out by the feeder and fed automatically to the stud welding gun. The skilled employee manually positions the gun on the workpiece and initiates the welding process.

The whole system has been designed for use in roofed and enclosed rooms or areas used for industrial production. It is usable for manual or semiautomatic operation.

2.2 Composition

2.2.1 Variants of THA1500/X

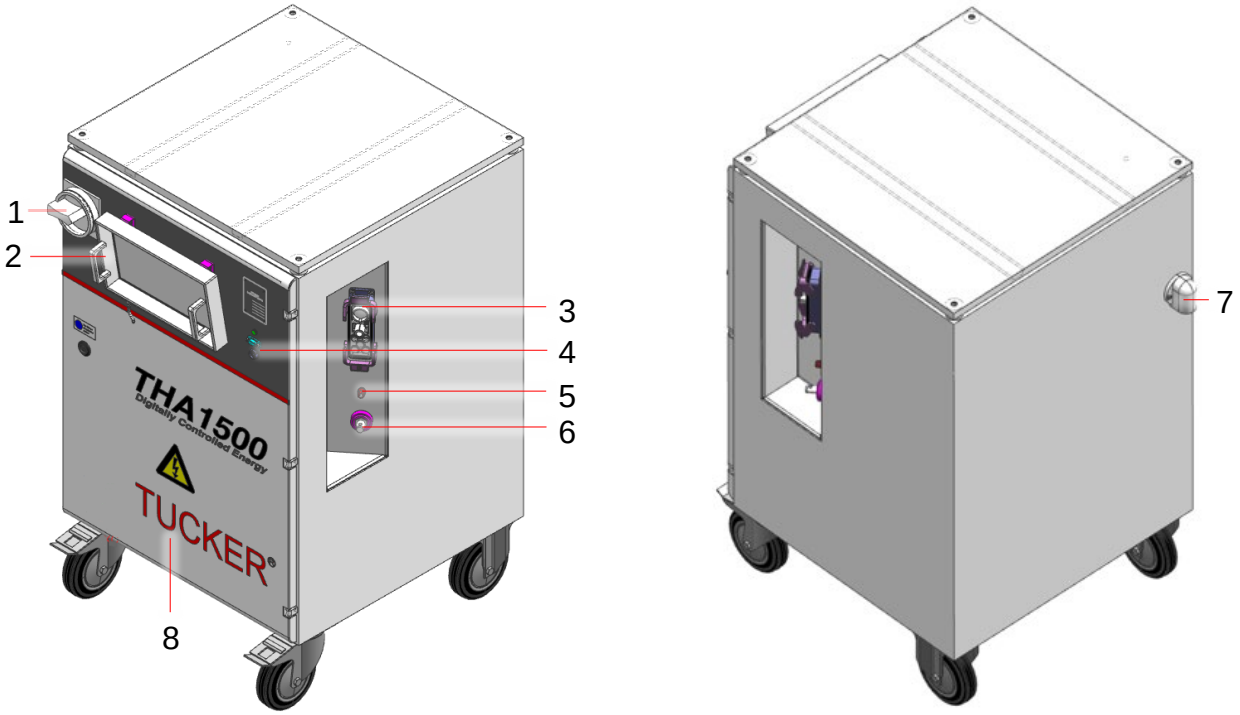


Figure 1: Stud welding system THA1500/X

Assignments to Figure 1

1 Main switch	For turning the control and energy unit On/Off
2 Control panel	For operating and programming the stud welding system (see operating instructions for the DCE software)
3 Multicoupling	To connect up the welding gun
4 Front panel	There are various control and display elements arranged on the front panel. (See section “Plug connector, control and display elements“)
5 Pole terminal	To connect up the ground cable
6 DSE flanged plug	To connect up the ground cable
7 Mains connection	To provide power to the stud welding system
8 Service door	Protection against accidental contact with components carrying an electrical current

2.2.2 Plug connector, control and display elements

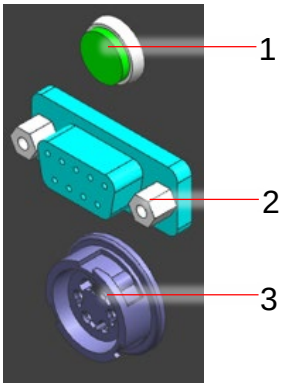


Figure 2: Plug connector, control and display elements

Assignments to Figure 2

1 Status LED	LED lights up when the supply voltage is established and the stud welding gun is connected.
2 RS232 interface	For installing and updating the device software
3 Round plug	For connecting the operating unit

2.2.3 Variants of THA1500/F

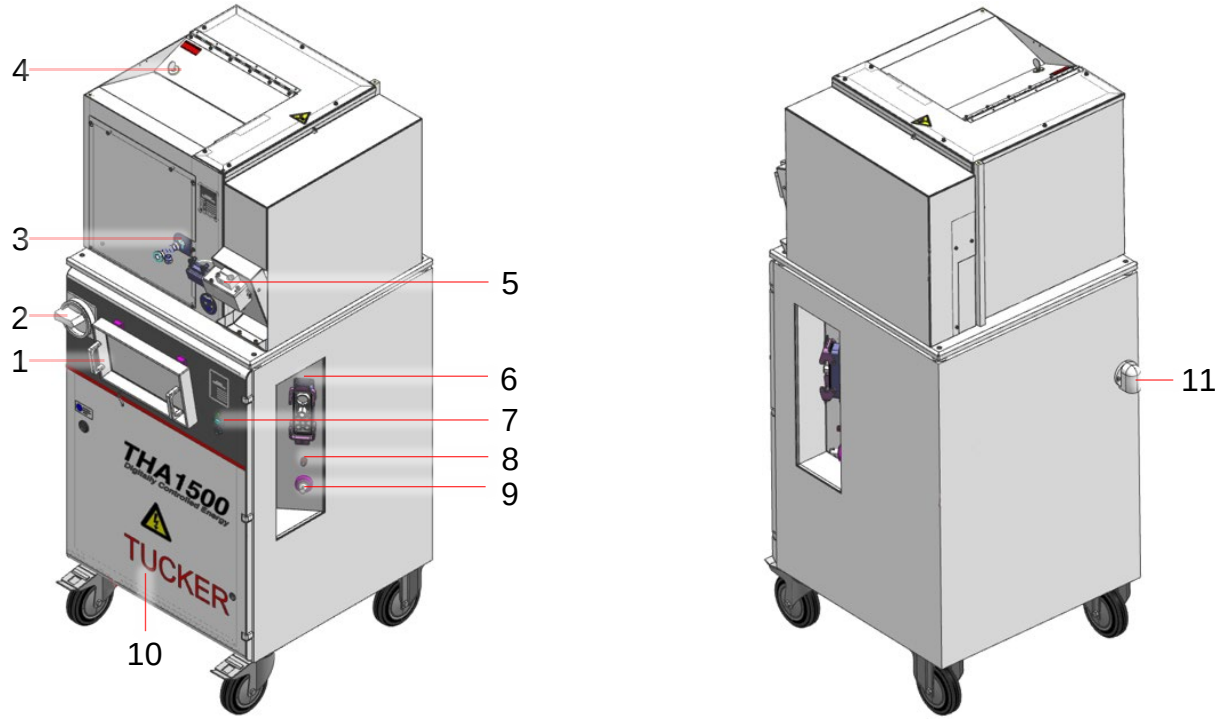


Figure 3: Stud welding system THA1500/F

Assignments to Figure 3

1	Control panel/operating unit	For operating and programming the stud welding system (see operating instructions for the DCE software)
2	Main switch	For turning the control and energy unit On/Off
3	Compressed air connection	For providing a compressed air supply to the stud welding system
4	Replenishing shaft	For replenishing with weld studs
5	Coupling	For connecting the feeding hose
6	Multicoupling	To connect up the welding gun
7	Front panel	There are various control and display elements arranged on the front panel.
8	Pole terminal	To connect up the ground cable
9	DSE flanged plug	To connect up the ground cable
10	Service door	Protection against accidental contact with components carrying an electrical current

11 Mains connection	To provide power to the stud welding system

2.2.4 Plug connector, control and display elements

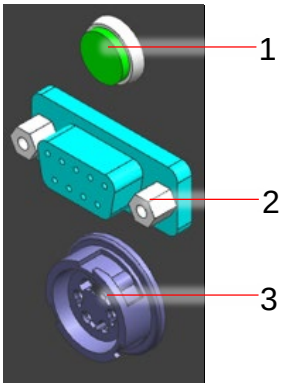


Figure 4: Connector for instrument displays on the front panel

Assignments to Figure 4

1 Status LED	LED lights up when the supply voltage is established and the stud welding gun is switched on.
2 RS232 interface	For installing and updating the device software
3 Round plug	For connecting the operating unit

3 Technical data

This section is aimed at the following users of the unit:

3.1 General information

Designation	Parameters / value	Unit
Space requirement incl. free space	Approx. 4	m²
Operating position	stands vertically on rollers	
Control panel size	10.6 / 270	Inches/mm
Operating mode	Manual	
Operating time without an interruption	Continuous operation, 24	h / d
Service life	15	Y
Welding time	6 – 100	ms

3.2 Dimensions and weight

THA1500/X		
Dimensions L x W x H	570 x 650 x 950	mm
Total weight	Approx. 150	kg
THA1500/F		
Dimensions L x W x H	570 x 650 x 1350	mm
Total weight	Approx. 210	kg

3.3 Total connected load rating, energy consumption

Designation / Parameter	Value	Unit
Rated voltage	3/PE 400	V AC
Max. effective open-circuit voltage	110	V
Nominal frequency	50/60	Hz
Effective output current	130	A
Output peak performance	230	W
Welding current	10-1500	A
Duty cycle	I=710	A
(for 20 weldings per minute)	t=100	ms
	I=1500	A
	t=20	ms
Fuses for	3 x 25	A
Control voltage	24	V DC
Control voltage BAW	15	V
Max. arc voltage	55	V

3.4 Compressed air supply

Designation / Parameter	Value	Unit
Operating pressure	500	kPa
System pressure (on the customer side)	300 – 800	kPa

3.5 Emissions from the entire system

Designation	Parameters	Value	Unit
Emissions, assessed as 'A'	Sound pressure level	<< 75	dB (A)

3.6 Protection type

Designation	Parameters	Value	Unit
Protection in accordance with IEC 60529	Protection type	IP 21	

3.7 Ambient and operating conditions

Transport and storage	Transport and storage temperature	– 25 to + 55	°C
Transportation	Permissible relative humidity (max. 20°C/h fluctuating, non-condensing)	< 80	%
Storage	Permissible relative humidity (max. 20°C/h fluctuating, non-condensing)	< 55	%
The equipment can be stored in its original packaging for a maximum period of six months in specially provided dry, ventilated, flood-proof areas with stable protective roofs.		180	d
If the storage period will be longer than 6 months then the equipment must be sealed with desiccants in commercial shrink-wrap so that it is air-tight.			
Operation	Operating temperatures, min - max	15 – 50	°C
	Permissible relative humidity (non-condensing):	15 – 70	%
	Installation heights above sea level up to	1 000	m
	Roofed and enclosed sites		

3.7.1 Type plate

Figure 5: Type plate on the front panel

The following details can be found on the type plate:

- Manufacturer
- Article number
- Network voltage and frequency
- Type
- Fabrication number

4 Safety instructions

NOTE!

This section contains important information regarding safety when operating and using the complete system and/or product.

Always mind the information in the "Safety instructions" chapter when using and operating the entity. Read the chapter carefully and verify that you have understood all safety instructions, whether you're always observing these and what documents you can refer to in case of need.

If you have any doubts as to your own understanding of the required care and, if applicable, the safety-relevant instructions, acting guidelines or directions, do not operate the unit!

4.1 Personal qualifications

4.1.1 Electrotechnically instructed personnel

An electrotechnically instructed person is a person who was instructed by an electrician regarding the task he or she is supposed to perform as well as all possible dangers caused by improper behaviour and, if necessary, an instructed person who has also received instruction regarding the required protective equipment and protective - measures.

4.1.2 Electricians

An electrician is a capable person with suitable specialist training, current knowledge and proven [2]experience so that he or she is capable of assessing the tasks he or she was entrusted with and is capable of recognizing and preventing dangers that might be caused by electricity.

He or she has been specially tasked by a "responsible electrician (VEFK)" or the operator to perform the entrusted operations as well as be provided with the authorisation for switch operation, usually formally and in writing.

4.1.3 Specialist for machines and plant

A specialist for machines and plant is a capable person with suitable specialist training, current knowledge and proven[2] experience[3] so that he or she is capable of assessing the tasks he or she was entrusted with and is capable of recognizing and preventing

[2] through training and certification [EN 50110-1:2008-09, Section 3.2.3 Electrician; see also IEC 60050 in [IEV 195-4-1]]
[3] [in conformance with DIN VDE 0105-100].

dangers that might be caused by plants and machines. ([2] through training & certification)

4.1.4 Instructed person of the operator

An instructed person of the operator is instructed regarding the tasks they are entrusted with and any possible danger in case of improper behaviour by a specialist for machines and facilities employed by the operator (or the manufacturer) and instructed, as required, regarding the required safety devices and protective measures[4].

In this context, professionally "instructed personnel" and specially tasked employees are required in the following categories:

- as technically instructed personnel for machines and facilities
- as technically instructed personnel for pneumatic control systems
- as electrotechnically instructed personnel
- as instructed personnel for logistics, if required with certification to operate floor-level conveyors

4.1.5 Warehouse logistics specialists

A warehouse logistics specialist is a capable person with suitable specialist training, current knowledge and proven[1] experience so that he or she is capable of assessing the tasks he or she was entrusted with and is capable of recognizing and preventing dangers that might be caused by the use of equipment as well as the acceptance, storage, commissioning and shipment of goods. ([1] through training & certification)

4.1.6 Recommendations regarding specialist training, knowledge and experience

The information shown in the following for defining the specialist personnel is only for orientation purposes and there is no binding claim to completeness and the definitions are reproduced from Directive 2013/55/EU covering the recognition of professional qualifications. They describe the minimum requirements needed for the personnel to gain the required knowledge of the different types of handling that has to be undertaken and these are listed in Chapter 1.4 for users of this manual and the accompanying documents.

Professional qualifications are specialist knowledge gained through appropriate professional vocational training (industrial, crafts, commercial) or gained from comparable training. One of the professional qualifications that is frequently required is approx. 5-years' experience in completing complex requirements. The professional designations provided for orientation purposes are not made in respect to a valuation of a specific sex, but are specified to clarify the expected qualifications in regard to the

[4] [adopted from DIN VDE 0105-100].

aforementioned requirements with special focus on the areas of

- Electrical technology, electronics and mechanical technology
- Mechanical engineering, precision mechanics and tool-making
- Logistics, transportation and storage.

As the employer, the operator is obligated to provide instruction and special tasking to his employees.

4.2 Intended use

4.2.1 Stud welding system without a step feeder THA1500/X

The THA1500/X stud welding system is the central unit for generating welding current and controlling the welding process. Feeding in of welding studs to the gun takes place manually by hand. The plant has been designed for use with the following the stud welding guns from the manufacturer:

- PK560 with adapter box
- PLM560
- PK600

4.2.2 Stud welding system with a step feeder THA1500/F

The THA1500/F stud welding system is the central unit for generating welding current and controlling the welding process. Feeding in of welding studs takes place over an integral step feeder which automatically sorts and separates out the welding studs ready for storage. Feeding takes place by pressing the button on the stud welding gun. When using the feeder only the welding studs which have been released for the device may be used. The welding studs which have been released for the feeder can be taken from the plate on the filling shaft.

The plant has been designed for use with the following the stud welding guns from the manufacturer:

- PLM200

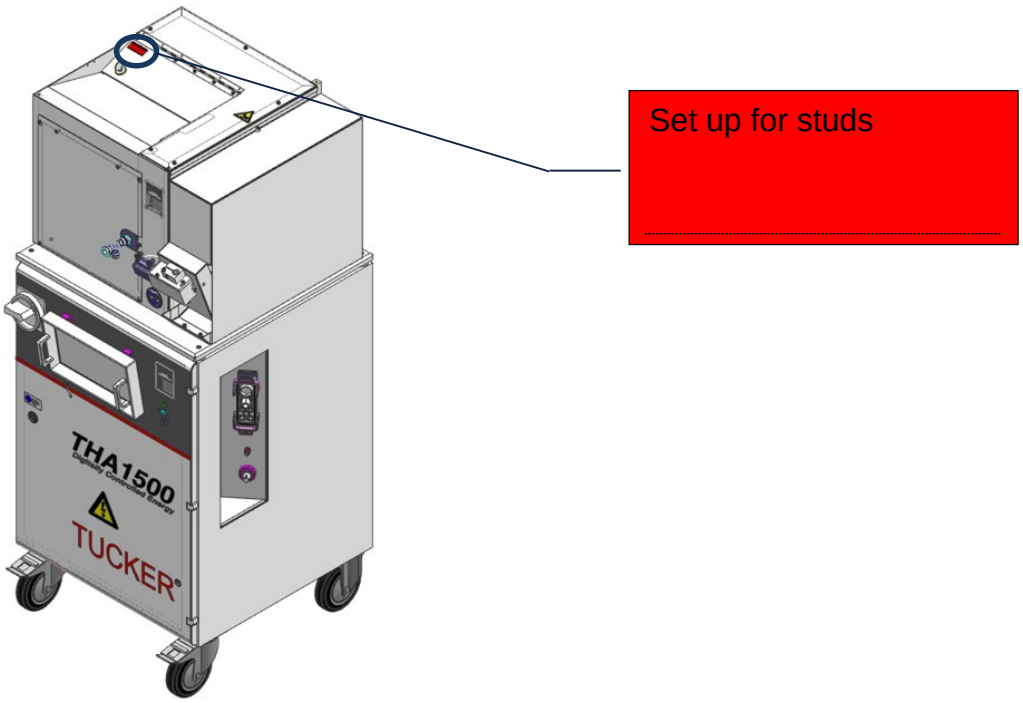


Figure 6: Set up for studs

4.3 Reasonably foreseeable misuse

Any use other than the intended use of the system or deviation from the intended use will be considered to be misuse of the systemand might result in dangerous situations occurring as well as unforeseen events!

WARNING

Danger from misuse!

Misusing the system might result in dangerous situations arising.

You must strictly abide by the following instructions!

- Never misuse the unit and never operate it outside the manufacturer's specifications! Do not combine operation with components from other manufacturers!
- Do not use welding tools outside of the manufacturer's specifications! Do not combine operation with welding tools from other manufacturers!
- Do not use welding studs outside of the manufacturer's specifications! Do not combine or vary the use of unsuitable joining elements!
- Always consider the maximum performance capabilities of the unit! Never exceed the maximum performance capabilities of the overall system as well as individual associated components!
  You must ensure that the supplies concur with the manufacturer's specifications!
- Always remain calm and level-headed in all operating conditions, particularly in case of a malfunction or failure. Do not attempt to keep the unit in operation during production under all circumstances.
- Proceed carefully and in a focused manner when using the unit. Move around with care and in an appropriate fashion. Put your skills, capabilities and experience to use when handling work equipment.
- Only perform actions that you are authorized to perform and only do so safely and determinedly.
- Never operate the unit in a potentially explosive environment!
  The unit is not approved for use in potentially explosive areas!
- Never operate the unit in flammable environments!
- Never operate the unit in damp environments!

	ATTENTION	
	**Warning of a danger to equipment and to the - environment!** Only use original Tucker studs from the manufacturer. Otherwise, proper functioning of the device cannot be guaranteed.	

Observe all the information in this manual regarding operation of the unit!

4.4 Explanation of symbols used in safety signs

Pertinent graphical symbols, signs, signal colours and safety instructions prompt users to exhibit heightened awareness and attention. They have to be understood as anticipatory instructions regarding existing risks due to safety and health protection requirements. You, the user, are instructed to not let hazards arise in the first place and are asked to perform certain actions, to refrain from performing different actions or to follow certain guidelines.

In this respect the safety sign symbols are mandatory in compliance with DIN EN ISO 7010.

In public areas and non-public restricted areas such as workshops, service and production facilities, the use of signs and devices is stipulated and these have been sub-divided into categories and they are explained in the following. They must concur with ISO 7010, IEC 60417 and ISO 7000.

In accordance with DIN EN 82079, safety signs must be used in user information, if the user has to be preventively informed regarding possible hazards, so that he or she can take the necessary safety precautions. The manufacturer has used this here.

As the user, you are required to observe all safety instructions in this manual and to realize the degree of risk, grasp the type of applicable risk and what the possible consequences may be, if the risks are not considered, as well as what you have to do to prevent a risk from being created in the first place.

4.4.1 Categories of safety colours and safety signs

Safety signs	Type and designation according to EN ISO 7010
 	**Rescue symbols** Rescue and emergency exit signs or emergency exit diagrams; emergency exit symbols as well as assembly points and first aid equipment provide orientation in emergencies and they are also visible in the dark. Characteristics: Bright green quadtratic shape/square, matt white symbol or combined sign Illustrated symbol: Emergency exit to the left; personnel must vacate in the event of danger or if told to do so, e.g. warning klaxon or announcement that this instruction must be followed!
	**Fire protection symbols** Fire-fighting signs and symbols giving safety information such as emergency fire doors, fire reporting phones, fire extinguishers, fire alarms and hydrants. Characteristics: Bright red quadratic shape, bright white symbols Illustrated symbol: Fire extinguisher; personnel and firemen can find important fire-fighting devices at the indicated positions!
	**Mandatory symbols** Mandatory signs and safety symbol for workplace procedure and for workplace safety. Characteristics: Bright blue round surface, bright white symbols Illustrated symbol: Wear protective gloves; mandatory instruction for personnel or information about the allowed handling procedure!
	**Warning symbols** Warning signs increase awareness and warn you about dangers and risks. Characteristics: Bright yellow triangle, bright black border and symbol Illustrated symbol: Warning about forklift trucks; personnel must be especially aware and take careful measures!
	**Prohibition symbols** Prohibition signs with a safety symbol; they make an important contribution to industrial safety in the workplace. Characteristic: a bright white round surface, bright red inside circle with sloping diagonals Illustrated symbol: Smoking forbidden; personnel are strictly forbidden to smoke!

4.5 Personal work safety equipment und mandatory signs

Wearing and carrying your personal safety equipment is mandatory whenever you're inside the production facility or working with the installation or operating materials/equipment, in order to minimize any safety and health hazards. The system operator must undertake regular checks and, if necessary, implement regular maintenance work to ensure that the safety and health protection devices are effective.

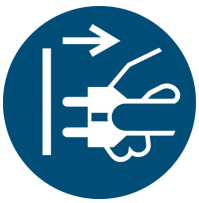
You must ensure that before anyone enters the site where the system is installed that they have their complete personal safety equipment with them and that they are abiding by the safety instructions and safety signs. You must be familiar with the emergency - exits plan and the emergency measures, fire-fighting equipment, industrial safety regulations, warnings about dangers and risks with regard to safety in the workplace!

Also observe the strict laws on working safety described in Section 4.8 and following in this instruction manual.

- Always wear the personal safety equipment needed for the respective work whilst carrying out the work.
- Always take note of the existing mandatory signs about your personal safety equipment in front of and in the work area.

4.5.1 Basic work safety equipment

Safety signs	Safety statement - type and designation according to EN ISO 7010
	**Wear protective goggles!** Your eyes will be endangered by flying splinters, particles or grit during many of the working situations. Always keep your suitable protective goggles ready and wear them whenever necessary!
	**Wear a protective helmet!** The wearing of helmets by employees and visitors is mandatory in many workplaces and especially at construction sites. Keep your protective helmet or industrial helmet close to hand and wear it whenever necessary!
	**Wear hearing protectors!** Prevent your hearing from being irreparably damaged. Ensure that you have - suitable hearing protectors and check the marking on the operating equipment. Keep your suitable hearing protectors close to hand and wear them whenever necessary!

Safety signs	Safety statement - type and designation according to EN ISO 7010
	**Foot protection must be worn!** Prevents foot injuries from falling objects or objects that you walk into or nudge against, chemicals, slipping over or being driven over. Provide yourself with suitable safety shoes and always wear them in places where the signs indicate that you must do so!
	**Wear protective gloves!** Suitable protective gloves must always be worn when working with chemicals, sharp objects or in extreme temperatures. Keep suitable protective gloves ready at all times and always wear them whenever you see the marked signs!
	**Wear protective clothing!** Protective clothing is used to shield you from potential hazards, such as heat or chemicals. Provide yourself with suitable protective clothing and wear it whenever you see signs that indicate that you must do so; put the protective clothing on before you pass this area!
	**Wear a safety vest!** A safety vest helps to avoid accidents occurring at the workplace. Wear the safety vest at the indicated locations, before you pass by this location!
	**Disconnect the mains plug! (before opening …)** Always disconnect electrical equipment from the mains before starting any cleaning, maintenance or repair work in order to prevent electrical shocks or short circuits! Always abide by these instructions for your own personal safety!
	**General mandatory symbols!** The general mandatory symbols increase your awareness and your trained behaviour will make you mindful of the accident prevention measures.
	**Switch off before performing repair work!** Ensure that you always abide by the safety regulations when working on electrical systems. Abide by the sign's instruction and before starting any work and switch off correctly in order to prevent short circuits and electrical shocks!

Abide by the instruction manual!

Ensure that the tools, machines and systems are all functioning correctly. Abide by the symbol relevant to the instruction manual which requires you to read the instruction manual at indicated positions, before commencing or continuing with your work!

4.5.2 Atypical work safety symbols

Work safety symbol – not a normative symbol	Type and designation – used in this manual
	**Use a protective shield!** Protective shields are used to protect you from physical dangers. Abide by this order and use protective equipment between you and the potential danger!
	**Use sufficient lighting in the working and use areas!** Ensure sufficient lighting/illumination of the workplace. Light enables safe use and operation of the installation and increases visibility. Replace defective lamps immediately. Always abide by these instructions for your own personal safety!

4.5.3 Warning signs

Safety signs	Safety statement - type and designation according to EN ISO 7010
	**Warning of suspended loads!** The warning sign shows an item that is suspended from a crane hook and thereby illustrates the danger of that item falling down.
	**Warning of materials handling (industrial traffic)!** Warning of areas where material handling vehicles (for example forklift trucks) are operating so that people do not collide with moving vehicles.
	**Warning of electrical voltage!** The danger sign with the black flash warns of dangers associated with electrical voltage.

Safety signs	Safety statement - type and designation according to EN ISO 7010
	**General warning sign!** The danger sign with the exclamation mark in combination with an additional sign or other sign is used to raise awareness.
	**Warning of automated start-up!** Signs with this danger sign warn of accident hazards due to automatically starting machinery.
	**Warning of hand injuries!** Signs with this danger sign warn of accident hazards resulting in injuries to the hands, such as pinching hazards or crushing hazards.
	**Warning of crushing hazards!** Signs with this danger sign warn of crushing hazards.
	**Warning of optical radiation!** This safety sign warns of optical radiation so that persons do not expose themselves to these influences unprotected.
	**Warning of obstacles in the head area** This safety sign clearly warns of hazards that might result in head injuries.
	**Warning of potentially explosive materials!**
	**Additional sign for text embossing**

4.5.4 Knowledge and capabilities

The operator's qualified specialists will acquire significant technological knowledge from seminars held by the manufacturer of the entity, which will qualify them as operators, maintenance engineers, process supervisors and network administrators and enable them to reliably carry out the following requirements:

- To learn and comprehend basic Tucker welding technology
- Troubleshoot/rectify faults
- Install/remove and replace components
- Repair components
- Data backup, software updating

By participating in the technology-specific training and safety-related instruction from the system constructor as well as the operator of the entire system, the responsible personnel will gain additional and necessary capabilities with regard to operating and maintaining as well as health and safety protection. Knowledge and capabilities will be confirmed by the award of qualification certificates.

4.6 Warning of potential dangers and risks

Whenever you have to be warned of potential dangers and risks – residual risks – that may lead to death or to personal injuries, this instruction manual uses the safety - combination symbols portrayed in the following analogous to ISO 3864-2 and/or ISO 7010 for product safety signs on the plant and/or machine, which instruct users to react accordingly.

Three signal words and the relevant signal colours define the degree of danger (colour requirements in accordance with ISO 3864-4):

- DANGER - bright red
- WARNING - deep orange
- CAUTION - bright yellow

The signal words have been standardised and defined for various languages. The - degree of danger is shown at the top edge of the sign.

The safety combination symbols portrayed herein contain at least one safety sign symbol, which is normally taken from the mandatory, warning or prohibition signs - category. A separate safety information text is specified beneath the signal word for the risk severity level.

The following safety instructions provide the required information where possible in this sequence:

S What signal word and/or which level of risk must you pay attention to?

A What type of danger is this and what could occur, that is the type of damages?

F What consequences does this hazard present for you?

E How might you be able to escape and what can you do to prevent this hazard?

Always make yourself aware of the fact that every hazard, i.e. every potential source of damage

- is there permanently either for appropriate use, for example mechanically movable structures, electricity, temperature, noise, vibration, etc.
- or can occur unexpectedly, for example cutting oneself on sharp edges, crushing due to sudden movement, breakage due to material fatigue, falling as a result of acceleration, fire due to an overload, etc.

4.6.1 Safety sign DANGER

DANGER

Warning about high risk of danger!

This signal word makes one aware of a potentially high risk or hazard.

For example dangers arising from a rotating open gearbox or wheels which can catch hold of you.

There is a high risk of accident. – Life-threatening injuries or death will be the consequence!

A certain action must be followed and it is shown how the hazard can be avoided! – for example: Only open protective covers at a standstill and with the machine safely turned off!

With a high probability of occurrence for a certain accidental event, the consequences of that

- will lead to death

or a personal – irreversible – disability of more than 15 % due to:

- Severe injuries to internal organs,
- loss of limbs, vision or hearing,
- severe burns (> 25%), of the 3rd and 4th degree
- becoming permanently disabled, or
- severe mental impairment or long-term coma.

4.6.2 Safety sign WARNING

WARNING

Warning about medium risk of danger!

This signal word points to a medium risk or hazard.

For example warning of hand injuries! People can get caught on opened assemblies.

There is a possible risk of accident. – Severe injuries or death can be the consequence!

A certain action must be followed and it is shown how the hazard can be avoided! – for example: Do not reach into the assembly!

For a medium probability of a possible accidentaccident the consequences lead to 2% up to less than 15% impairment – irreversibly – due to:

- Severe cuts,
- Severe fractures or loss of fingers or toes
- Impairment of hearing or vision
- Medium burns (< 15 %), 2nd degree or
- Moderate disability.

4.6.3 Safety sign CAUTION

CAUTION

Warning about a danger with minor risks!

This signal word points to a low/minor risk or hazard.

For example persons are subjected to increased UV radiation when welding without protection.

There is low to possible risk of accident. – Carelessness or negligence can lead to slight or light injuries!

A certain action must be followed and it is shown how the hazard can be avoided! – for example: Wear your personal safety equipment!

The slight probability of a possible accident leading to a less than 2% impairment – reversible – might result in:

- Minor cuts
- Minor fractures
- Minor burns, 1st degree
- Sprains

4.6.4 Safety sign ATTENTION

The lack of normative regulations has resulted in a combined safety symbol being - introduced in this manual, which will be used to warn about potential equipment or - environmental damage. In order to represent the degree of risk, the following signal word occurs in combination with the signal colour (without reference from a standard):

- ATTENTION - zinc yellow (RAL9003)

	ATTENTION	
	**Warning of a danger to equipment and to the environment!** This signal word makes you aware of the risk of potential danger to equipment or the environment. For example, structural stability can be compromised if supporting structure does not provide sufficient load bearing capability! There is a risk of loss of property or of environmental damage! – Your ignorance can lead to loss of the unit! (Personal injuries are not expected.) A certain action must be followed and it is shown how the hazard can be avoided! - Make sure that the load-bearing capacity of the supporting structure is sufficiently dimensioned!	

Low to high probability of of possible malfunctions or malpractice might result in damage to the equipment or the environment through:

- Complete failure, damage or equipment destruction
- Long-lasting environmental damage from emissions into the ground or water and emissions into the atmosphere.

4.7 Dangers and risks over the life cycle of the product

The safety instructions and information provided in the following sections call your attention to the potential hazards and risk for the duration of the product lifecycle that you have to pay attention to and show how the risk or hazard can be prevented.

4.7.1 Transport, positioning commissioning

The supplied package contains components that are normally preassembled by the manufacturer. Transporting will be undertaken using pallets with side screens.

4.7.1.1 Falling components

WARNING

Danger of injury from falling components!

Wrong procedures implemented during the transporting or when moving heavy components can cause objects or components to fall down with the risk of injury.

Transporting and positioning the complete package must always be undertaken by at least two people.

Transportation and installation may only be performed by specialists or instructed and specially tasked employees of the operator.

Always hold all components that are a part of the scope of supply securely in your hands during on site transportation

When transporting or moving components that are a part of the scope of supply using lifting devices, no persons may be located in the immediate danger zone.

Wear your personal safety equipment!

4.7.1.2 Transporting from the factory hall

WARNING

Factory traffic! Lorry and forklift traffic!

There is a risk of colliding with vehicles of any type in this area.

Severe injuries or death can be the consequence!

Always look around and avoid obstacles as well as vehicles carefully and at a proper distance. Avoid traffic lanes and always use the indicated footpaths.

As the driver of vehicles, only drive at walking speed (< 6 km/h) and only within marked traffic lanes.

Wear your personal safety equipment!

4.7.1.3 Transporting using a crane

WARNING

Never stand beneath a suspended load!

There is a risk of injury from falling components in this area.

Severe injuries or death can be the consequence!

Always transport the goods carefully, slowly, in a - safe and stable manner without impacting or swinging them and do not shift the centre of gravity!

Wear your personal safety equipment!

4.7.1.4 Transporting using a lifting cart or a forklift

WARNING

Forklift traffic!

There is a risk of colliding with forklift vehicles and -industrial trucks in this area.

Severe injuries or death can be the consequence!

Always look around and avoid obstacles as well as vehicles carefully and at a proper distance. Avoid traffic lanes and always use the indicated footpaths.

Wear your personal safety equipment!

4.7.2 Positioning and installation

Assembly will be carried out by the manufacturer's specialists in compliance with the manufacturer's assembly instructions. Alternatively, the assembly can be carried out by the operator's specialists.

At least 2 people are needed for the assembly or dismantling.

4.7.2.1 Correct assembly

WARNING

Danger from faulty, incorrect or unsafe assembly of the component parts!

Mortal danger will exist from faulty, incorrect or unsafe assembly of the component parts as this can result in components working loose or falling off.

Only allow the specialist personnel of the manufacturer or correspondingly instructed and specially tasked employees of the operator to install the supplied partial components.

Wear your personal safety equipment!

4.7.2.2 Corners and edges

WARNING

Danger of being injured by sharp edges or corners!

Sharp-edges or sharp-edged corners on the components and in the equipment utilisation areas can cause hand injuries (grazes, scratches) or cuts!

Take care when moving in areas with sharp edges or pointed objects.

Wear your personal safety equipment!

4.7.2.3 Lighting

WARNING

Danger of being injured due to inadequate lighting in the workplace and utilisation areas!

The danger of personnel being injured always exists if the lighting in the workplace and utilisation areas is inadequate or non-existent. This will also make it impossible to operate the system and might result in the equipment being damaged!

The operator must always ensure that adequate lighting is available in the workplace and utilisation areas.

Replace defective lamps immediately.

Never install the system if the lighting/illumination is missing or not operational

Lighting - strength more than 500 lux; luminous flux Φ_v 600 to 1,200 lumens; colour temperature 3,500 to 6,500 K

4.7.2.4 Ergonomic criteria, mechanical hazards

WARNING

Mechanical hazard!

The danger of colliding with moving components that might result in severe injuries or accidental death always exists in these areas!

Wear your personal safety equipment!

Make sure that the entire scope of delivery has been installed correctly in accordance with the plan/assembly instructions as well as ergonomic - criteria and is operated safely within the working - area of the operator.

4.7.3 Commissioning

CAUTION

You must have read and understood the assembly instructions before the whole system is commissioned!

Commissioning will be carried out by the manufacturer's specialists with the relevant knowledge and experience. Alternatively, the commissioning can also be carried out by correspondingly instructed and specially tasked employees of the operator. At least 2 people are needed for the commissioning.

They must be made aware of the safety instructions regarding potential dangers, which apply to "close cooperation with the individual components“. Additional risks can arise from several components working together.

Always abide by the details listed in Section 4.7.1.2 with regard to adequate lighting in the workplace and utilisation area.

4.7.3.1 Industrial robot

WARNING

Danger from industrial plant and movable work equipment!

Automated production process! The robots carry out several sequential work processes, such as swivelling and holding, which can involve dangerous situations!

In this area there is danger of colliding with rotating or linearly moving work equipment or with heavy equipment or getting caught up by it in this area. Severe injuries or death can be the consequence! Observe run-on times!

When entering the danger areas, or when in the - dangerous area, you should always move around carefully in front of or behind the fixed safety - partition!

Wear your personal safety equipment!

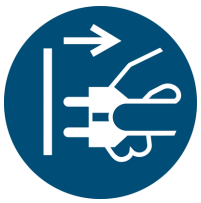
4.7.3.2 Electricity

DANGER

Danger from electric shock!

Life-threatening injuries or death will be the consequence!

Always unplug the power plug of a device before opening it!



4.7.3.3 Compressed air

WARNING

Danger from pneumatic power!

You can be severely injured by unexpected movements of pneumatically operated parts in the components and equipment utilisation areas!

Act with care in the vicinity of pneumatically moved parts.

Wear your personal safety equipment!

4.7.3.4 Noise

WARNING

Danger from shrill noises!

Acoustic harassment through noise is a health hazard. Some of the components in the package can generate loud noise in the environments where they are used. Hearing impairments may be the consequence.

Wear hearing protectors!

4.7.4 Working on electrical operating equipment

DANGER

You must abide by the following 5 safety - regulations before starting any work on electrical devices and the entity:

- Switch off (create a voltage-free state by disconnecting)
- Secure against switching back on
- Check the voltage-free state by measuring it
- Set up grounds and short circuits
- Cover or fence-off any adjoining equipment that is still live

4.7.5 Switching authorisation

Only an electrician who has been specially tasked by a "responsible electrician (VEFK)" or the operator to perform the entrusted operations as well as be provided with the authorisation for switch operation, usually formally and in writing, is authorised for switching operations.

4.7.6 Use and operation

4.7.6.1 Operation

ATTENTION

Warning of a danger to equipment and to the environment!

Careless operation might result in potentially dangerous situations arising with regard to the equipment or the environment and they might also cause system malfunctions or environmental damage.

Always act in a cautious and forward-thinking manner!

4.7.6.2 Compressed air

WARNING

Danger from pneumatic power!

You can be severely injured by unexpected movements of pneumatically operated parts in the components and equipment utilisation areas!

Act with care in the vicinity of pneumatically moved parts.

Wear your personal safety equipment!

4.7.6.3 Lighting

Always abide by the details listed in Section 4.7.2 with regard to adequate lighting in the workplace and utilisation area.

4.7.6.4 Noise

WARNING

Danger from shrill noises!

Acoustic harassment through noise is a health hazard. Some of the components in the package can generate loud noise in the environments where they are used. Hearing impairments may be the consequence.

Wear hearing protectors!

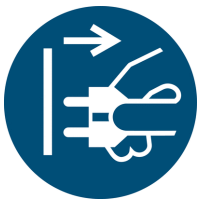
4.7.6.5 Electricity

DANGER

Danger from electric shock!

Life-threatening injuries or death will be the consequence!

Always unplug the power plug of a device before opening it!



4.7.7 Maintenance

Commissioning will be carried out by the manufacturer's specialists with the relevant knowledge and experience. Alternatively, maintenance and, in many cases, also inspections and cleaning operations, can be performed by appropriately instructed and specially tasked employees of the operator.

At least 2 people are needed for the maintenance and cleaning.

4.7.7.1 Electricity

	**DANGER** **Danger from electric shock!** Life-threatening injuries or death will be the consequence! Always unplug the power plug of a device before opening it!	

4.7.7.2 Lighting

	**WARNING** **Danger of being injured due to inadequate lighting in the workplace and utilisation areas!** The danger of personnel being injured always exists if the lighting in the workplace and utilisation areas is inadequate or non-existent. This will also make it impossible to maintain the system and might result in the equipment being damaged! The operator must always ensure that adequate lighting is available in the workplace and utilisation areas. Replace defective lamps immediately. Never install the system if the lighting/illumination is not intact or missing.	 Lighting - strength more than 500 lux; luminous flux Φ_v 600 to 1,200 lumens; colour temperature 3,500 to 6,500 K

4.7.7.3 Corners and edges

	**WARNING** **Danger of being injured by sharp edges or corners!** Sharp-edges or sharp-edged corners on the components and in the equipment utilisation areas can cause hand injuries (grazes, scratches) or cuts! Take care when moving in areas with sharp edges or pointed objects. Wear your personal safety equipment!	

4.7.8 Decommissioning, dismantling, disposal

The decommissioning is performed by instructed and specially tasked employees of the operator and/or by appropriately trained specialists of a disassembly and disposal company or specialist disposal company.

At least 2 people are needed for the decommissioning and continuing up to the disposal.

4.7.8.1 Electricity

	**DANGER** **Danger from electric shock!** Life-threatening injuries or death will be the consequence! Always unplug the power plug of a device before opening it!	

4.7.8.2 Working on electrical operating equipment

DANGER

You must abide by the following 5 safety - regulations before starting any work on electrical devices and the whole system:

- Switch off (create a voltage-free state by disconnecting)
- Secure against switching back on
- Check the voltage-free state by measuring it
- Set up grounds and short circuits
- Cover or fence-off any adjoining equipment that is still live

4.7.8.3 Compressed air

WARNING

Danger from pneumatic power!

You can be severely injured by unexpected movements of pneumatically operated parts in the components and equipment utilisation areas!

Act with care in the vicinity of pneumatically moved parts.

Wear your personal safety equipment!

4.8 Duty of care of the operator

The operator is subject to the legal regulations on occupational safety as an employer.

The guidelines specified in the following:

- The occupational safety guidelines of Article 153 TFEU
- The occupational framework guidelines of 89/391/EEC
- The work equipment directive 89/655/EEC, supplemented by the directives 95/63 EC, 2001/45/EC
- Operating and testing specifications in the respective national policies
- The industrial safety regulations, specifically Appendix 1 and Appendix 2

For operators inside the EU and the nationally applicable occupational safety, accident prevention, environmental protection and disposal guidelines in the state of the operator, must be complied with.

Always keep the product in a technically flawless condition. The operator must

- ensure the material supply;
- abide by the maintenance intervals defined in the accompanying manuals – cf. chapter 1.8.1;

4.9 Duty of care of the specialist personnel

- As executive staff, responsible specialists and instructed and specially tasked - employees, you are responsible for the safety considerations you are entrusted with as well as the aversion of any dangers.
- You must refrain from using any procedures that might affect the safety of the personnel or cause the entity to malfunction. The whole system must only be operated in a checked and tested and correctly functioning state. Never dismantle any of the safety devices unless authorised to do so. Only perform work that you are authorized to perform.
- All efforts to prevent accidents must be given priority. You must ensure that only sound or suitable personnel are allowed to work on the entity and that they can reliably complete the work delegated to them.
- Observe the safety instructions!

4.10 Deadlines for recurring inspections

NOTE!

According to the industrial safety regulations § 3 Risk assessment (BetrSichV):

… (3) Type, scope and deadlines must be defined for necessary - inspections of the work equipment. Furthermore, the employer must define and determine the necessary conditions that the personnel must fulfil so that he can authorise them to undertake the inspections or carry out the testing of the work equipment.

4.10.1 Electrical systems and work equipment

System / work equipment	Inspection deadline	Type of inspection	Inspector
Electrical systems and stationary work equipment	4 years	For correct working state	Electricians
Electrical systems and stationary electrical work equipment in "work locations, areas and systems of a special type" (DIN VDE 0100 Group 700)	1 year	For correct working state	Electricians
Protective measures with leakage current protection devices in non-stationary systems	1 month	For effectiveness	Electricians or [5]
Leakage current, residual current and error voltage protection switch - in stationary systems - in non-stationary systems	6 month daily working	Correct functioning by confirming using test equipment	User

[5] electrically trained personnel using suitable measuring and test equipment

4.10.2 Pneumatic systems and work equipment (§ 15; pressurised equipment)

System / work equipment	Inspection deadline	Type of inspection	Inspector
Systems and stationary work equipment: external / internal stability	2 / 5 / 10 years	For correct working state	Inspection agency, industrial mechanic, authorised person
Systems and mobile work equipment: external / internal stability	1 / 3 / 9 years	For correct working state	Authorised person

5 Preparing for use

5.1 Goal and target groups for this chapter

To guide the specialist person to put the plant step by step into operation for production, to undertake the production with all prepared measures, to undertake appropriate measures for the case of error messages or for failure of media or system, as well as to decommission the plant again.

This section is directed at the following users/persons for installation and commissioning:

- responsible specialists,
- specialists for installation,
- specialists for commissioning and
- instructed and specially tasked employees

of the user, plant constructor and operator.

Also, regarding transportation and storage, it is directed at

- specialists for transportation and storage
- warehouse clerks and
- instructed and specially tasked employees

of the logistics service provider and user.

5.2 Transport and storage

The following requirements apply to:

- The storage of packaged goods for transportation after leaving the Tucker shipping department,
- the transport of goods to the recipient during temporary storage at the shipping company,
- The storage of packaged goods at the recipient until these leave the warehouse.

Continue to keep all goods in their original packaging and housing and store these for a maximum of 24 months. The storage location must be provided with a thick protective roof to protect against direct sunlight, rain and lightning as well as against flooding hazards.

	Designation	Parameters	Unit
Transport and storage	Transport and storage temperature	– 25 to + 55	°C
Transportation	Permissible relative humidity (max. 20°C/h fluctuating, non-condensing)	< 80	%

	Designation	Parameters	Unit
Storage	Permissible relative humidity (max. 20°C/h fluctuating, non-condensing)	< 55	%
The equipment can be stored in its original packaging for a maximum period of 24 months in specially provided dry, ventilated, flood-proof areas with stable protective roofs.		730	d
If the storage period will be longer than 24 months then the equipment must be sealed with desiccants inside PE foil so that it is air-tight. The storage duration then amounts to another 24 months.			
Required storage area	Euro-pallet, EN 13698-1, < 24 kg	0.96 to 1.44	m²
Weight per unit	Net/gross	80 / 90	kg
	Storage heights above sea level up to	2 000	m
	Roofed and enclosed sites		

5.2.1 Storage – packagingcheck for damage

The goods are conserved, packaged and mounted on pallets using lateral mounts and tightening straps for transportation at the Tucker shipping warehouse.

If the packaging is ruptured or the transport goods are damaged as determined during acceptance of the goods and the visual inspection,

- which points to a damaging of the goods inside – visible without opening the packaging itself – this constitutes significant transport damage,
- which excludes damage to the goods inside, the goods must be repackaged.

In the first case, specify the damage on the form intended for the reporting of transport damages and contact those responsible for returning the transported goods.

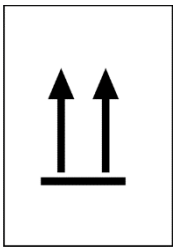
5.2.2 Transportation

ATTENTION

Store and transport the goods in an upright position.

Secure the transported goods against tipping over, falling, shifting, slipping and all types of unintentional movements.

If the goods are to be transported by pallet truck or forklift, all routes must be flat without steps, sills or holes. Slopes of transport paths may not exceed 4%.



5.2.3 Use of lifting devices and lifting tackles

WARNING

Mortal danger due to material failure or upon breaking of lifting devices or lifting tackles due to falling items or loads

Only use lifting devices that are designed for loads of at least 500 kg or more!

Prior to using any lifting device or tackle, make sure that these are dimensioned for the intended load-bearing capacity!Check and observe the load-bearing capacity designations and the CE-mark! Any lifting equipment must be in flawless condition!

5.2.3.1 General requirements for lifting:

- Use suitable, designated textile slings, fibre ropes, lifting belts or straps from natural or chemical fibres, such as hemp, polyamides, polyester, polypropylene or equivalent materials as specified in DIN EN 1492-1 to -3 for lifting purposes.
- Never use lifting straps, chains or belts made of metal that could come into direct contact with the product!
- When transporting goods on lifting points, for example as shown in Figure 7 on the right, make sure that all transport rings [6] are provided with a CE-marking in accordance with EU directives or an ACTEK® marking for US transportation and only make use of these standardized lifting tackles.
- Follow the instructions of the respective supervisors for storage, transportation and the construction sites regarding the safe approach to the lifting and transportation of goods!

WARNING

Danger of injury from falling components!

Wrong procedures implemented during the transporting or when moving heavy components can cause objects or components to fall down with the risk of injury.

Transporting and positioning the complete package must always be undertaken by at least two people.

Transportation and installation are only permitted to the group of personnel defined in the beginning of this chapter.

Always hold all components that are a part of the scope of supply securely in your hands during on site transportation

When transporting or moving components that are a part of the scope of supply using lifting devices, no persons may be located in the immediate danger zone.

Wear your personal safety equipment!

[6] Lifting points GK8 and GK10, as well as lifting eyes, eye bolts, ring trestles, etc.

5.2.3.2 Transportation by crane

- Proceed as follows for transportation using a crane:
- Fit a sufficient number of lifting tackles or lifting straps to the transport goods.
- The type of tackle for lifting straps is shown in Figure 7 on the left for pallets and crates. Always sling lifting straps at the marked spots.
- If transport rings with CE markings are used on the upper edges of the transport goods, the lifting tackles must be mounted using quadruple ropes, incl. hooks as shown in Figure 7 on the right.
- Lift the transport goods carefully and move them with caution to the intended storage location or place of use.
- At the target location, the goods must be lowered to the ground without impacting of the ground or jerking.
- Remove all lifting tackle and the lifting equipment fully from the vicinity of potentially endangered personnel.

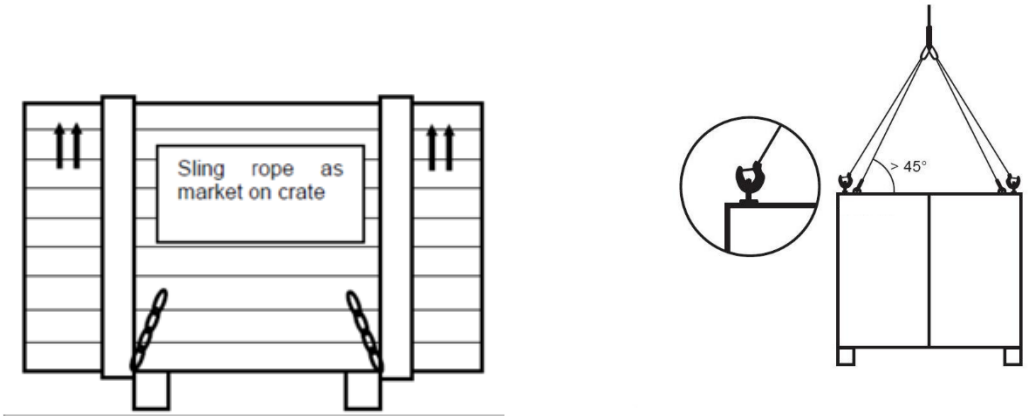


Figure 7: Transport goods by crane – on the left for pallets or crates, on the right for transport lugs

WARNING

Mortal danger due to falling items or loads!

Do not step beneath suspended loads!

There is a risk of injury from falling components in this area.

Severe injuries or death can be the consequence!

Always transport the goods carefully, slowly, in a - safe and stable manner without impacting or swinging them and do not shift the centre of gravity!

Wear your personal safety equipment!

5.2.3.3 Transportation by lifting cart or forklift

Proceed as follows for transportation using a lifting cart or forklift:

- Move the transport forks under the pallet or crate of the transport goods in a forward motion at the marked points.
- Lift the transport goods carefully and move them with caution to the intended storage location or place of use.
- At the target location, the goods must be lowered to the ground without impacting of the ground or jerking .
- Move the transport forks out of the pallet or crate of the goods in a rearward motion and ensure the way is unobstructed.

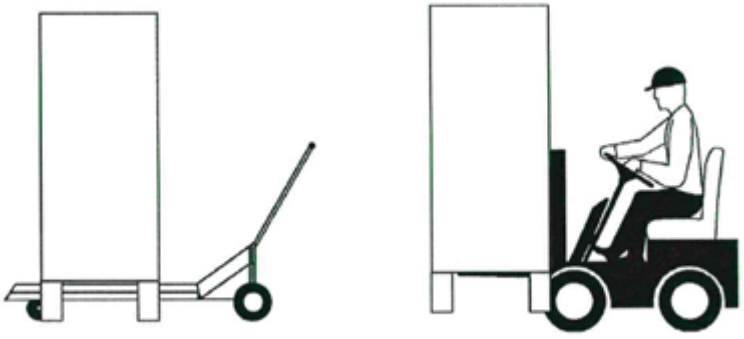


Figure 8: Transportation by lifting cart – left – or forklift – right

  	**WARNING** **Mortal danger or risk of injury due to tipping items or loads!** **Forklift traffic!** There is a risk of colliding with forklift vehicles and industrial trucks in this area. Severe injuries or death can be the consequence! Always look around and avoid obstacles as well as vehicles carefully and at a proper distance. When transporting goods using forklift trucks use the marked traffic lanes. Otherwise, avoid traffic lanes and use the designated footpaths. Always transport the goods carefully, slowly, in a safe and stable manner without impacting or swinging them and do not shift the centre of gravity! Wear your personal safety equipment!	

5.3 Safety measures prior to use

5.3.1.1 General consideration of potential risks and hazards

	**ATTENTION** **Warning of a danger to equipment!** Only remove the packaging immediately prior to the installation. This prevents damage or contamination. Temporarily store the packaging at a safe location so that the product can be safely packaged once again, if it is not to be installed!	

5.4 Unpacking and checking the package

5.4.1 Checking the delivery

The components contained as part of the scope of delivery are delivered as premounted by the manufacturer. Transportation is handled using pallets with laterally mounted tackles.

Observe the following instructions:

- Remove the accompanying transport documents from the delivery pouch and check the transport goods for completeness using the delivery list.
- Open the packaging and remove the documents contained in the packaging.
- Store all documents in a pre-planned location so that they are reusable and available at any time - these will be needed again in the future.
- Always remove and/or lift and unpack a single component intended for installation from the transport platform at a time.
- Check the type plate, CE-sign and warning sign on the product for their presence and legibility as well as any possible damage.
- Dispose of and separate the packing material, when the product is being installed.

5.5 Preparation work before the installation

ATTENTION

The chosen installation site must be of sufficient size. The underground and foundations at the chosen installation site must be suitable for the entity and able to bear four times the overall weight at the minimum. The underground and the foundations must also be guarantee safe horizontal standing and they must never sink down when under load.

The manufacturer has fitted the product with rollers. You can move the product using these. There are parking brakes attached to two rollers, which should be locked so that the product does not roll away on its own at the installation location.

You must take all required and reasonable measures, to prevent or limit damages caused by use.

5.5.1 Suitable ground, suitable base

The strength of the supporting surface must at least withstand the static and dynamic loads which act on the supporting surface during the service life of the product due to it's mass and usage. The strength requirements should be designed equivalent to at least strength class C25/30 for concrete and must be demonstrated via calculations.

5.5.2 Space requirements, conditions, occupational safety

The following conditions must be satisfied at the installation location of the product:

- Sufficient space and freedom of movement for the installation specialists. The necessary distance from adjoining devices must be at least 1 m in accordance with economic requirements around the components that have to be installed.
- There must not be any ignitable, explosive, flammable or hazardous materials at the installation site. The formation of poisonous and acidic aerosols by substances - reacting with airborne water vapour or gases must be prevented.
- Avoid noise hazards. Take the necessary safety precautions and prevent noise and/or take measures to maintain speech intelligibility.
- Provide intact and protected electrical facilities and supply voltages of 230 / 400 VAC and/or the customary power supplies in the respective country.
- The lighting must never be less than 500 lux and it should lay between 600 to 1,200 lumens at a colour temperature of 3,500 to 6,500 K.
- Extraction of the dust and smoke caused by the installation, assembly and commissioning.

- The installation site must be dry and clean.
- Ambient temperature for pleasant working conditions: 15°C < ϑ < 25°C;
- Use lifting gear including slings for a more than 500 kg load bearing capacity;
- Attach the required construction site signage, labels and symbols.
- Identify the working area and prevent access to unauthorized persons.
- Perform a risk assessment of the installation and working location and create the usage and working instructions from this assessment and hand these to the responsible site manager.
- Designate a responsible person for the coordination of all working operations and safe assembly. Unambiguously define responsibilities and demonstrate responsibilities accordingly.
- If protective equipment is removed or put out of operation in order to install the - product, this protective equipment must be mounted again, activated and checked for proper functioning after installation, but before commissioning the product.

5.5.3 Tools and consumables

The tools and consumables listed in the following are required to perform dismantling, assembly and setting operations on the stud welding head:

5.5.3.1 Tools

Tool image	Designation
	**Allen wrench** One set of Allen wrenches
Figure 9: Allen wrench	
	**Flat head screwdriver** A set of screwdrivers in different sizes for the assembly and disassembly of parts
Figure 10: Screwdriver	
	**Spanner** A set of spanners in different sizes for the assembly and disassembly of parts
Figure 11: Spanner	
	**Torque wrench** One set of torque wrenches (0-60Nm) with one set of hexagon bits
Figure 12: Torque wrench	
	**Side cutter** For cutting electric cables to length
Figure 13: Side cutter	
	**Needle-nosed pliers** Needle-nosed pliers for working in narrow and difficult to access areas.
Figure 14: Needle-nosed pliers	

5.5.3.2 Consumables

The following consumables must be provided when performing maintenance on the stud welding system:

- non-etching, grease removing cleaning agent (e.g. Rivolta A.C.S or Weicon S)
- lint-free cleaning cloths

5.6 Installation in the device

The scope of delivery of the manufacturer (the product) including the accessories should be installed by the user while taking account of ergonomic criteria, so that risk-free assembly and commissioning, problem-free operation, problem-free disassembly of the product and appropriate use are possible at all times.

5.6.1 Lifting, transporting and lowering of the product

Proceed as follows for lifting and transportation using a lifting device:

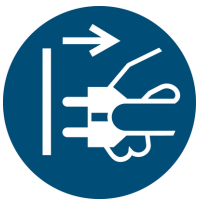
- Unpack the product if this has not occurred already; lay the packaging material to the side.
- Check the transported goods for damage. In case if damage separate items to be sent back from the transported goods
- Use two endless ropes or belts with an adequate load-bearing capacity and form a fixed sling through the transport rings above.
- Lead the opposing loops in the load hook of the lifting device so that the lock closes.
- Lift the product slowly off the pallet and hold it in two hands, if you are not using a crane. Ensure that there is a solid sling of the belt around the transport rings and the load hooks.
- With the aid of the liftingdevice, lead the products over the foreseen assemblylocation and lower it slowly and vertically in the direction of the foreseen place of utilisation.
- Only lower the load hooks of the lifting device until the product is standing but the belt is not loose, in order to avoid it possibly tipping over. Actuate both parking brakes on the rollers of the product.
- Check again the direction of intended use and correct this is if necessary.
- Only lower the load hooks of the lifting device until the product is standing securely and the belt is loose so one can take them off and remove them.

5.7 Assembly and sequence

The product is now prepared to receive the accessories delivered. It is to be built together with the foreseen components according to the plan in the plant.

5.7.1 Warning signs on the unit

5.7.1.1 Electricity

	**DANGER** **Danger from electric shock!** Life-threatening injuries or death will be the consequence! Always unplug the power plug of a device before opening it!	

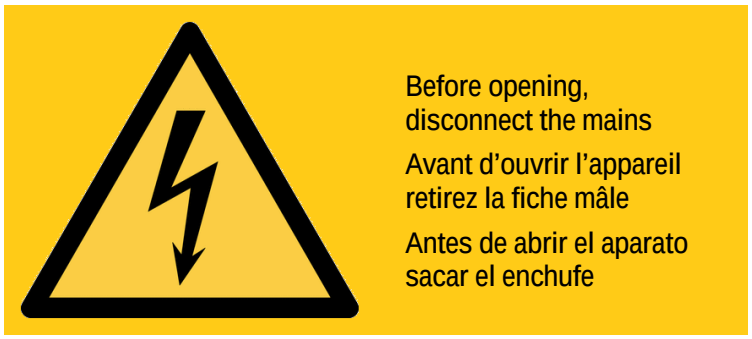
5.7.1.2 Preset supply voltage

Location: under the rear mains connection

	Ensure that the supplyvoltage is correctly attached to the device by means of a mains connection, and is placed correctly at the exit of the operator's network!

5.7.1.3 Pull out the mains plug before opening the device

Location: under the main switch

	Pull out the mains plug which is plugged in at the output of the lowvoltagedistribution systemof the operator's network! Alternatively switch OFF the load-break switch or fuse switch disconnector for the output in the distributor switch cabinet!

5.7.2 Safety signs in the unit

5.7.2.1 Temperature

Location: Inside the device

	WARNING	
	**Warning of hot surfaces!** One can suffer burns due to the high temperatures of operating equipment! Avoid being in the area of hot surfaces! Only touch hot operating equipment when wearing - suitable gloves! Before handling operating equipment, allow it to cool down below 40°C (hand warm)!	

5.7.3 Assembly and commissioning

1. Set up the product
   - Prepare the product at the desired installation site
   - Actuate brakes on the steering rollers

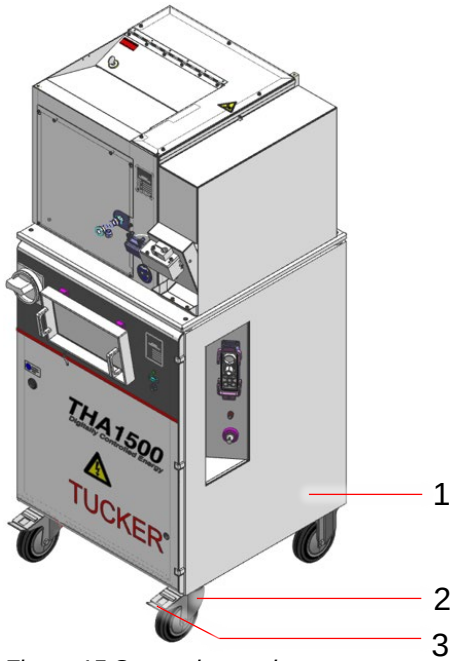


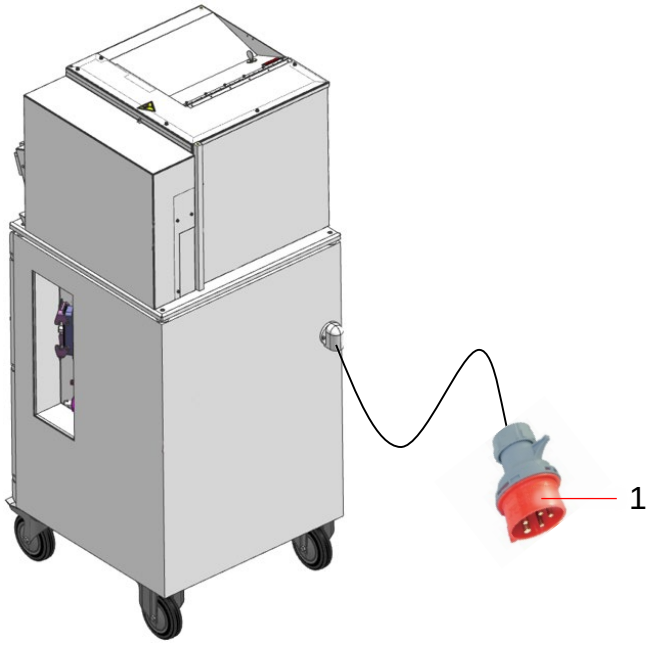
Figure 15:Set up the product

1 Product THA1500

2 Steering roller

3 Brake steering roller

2. Establish the supply voltage
   - Insert the CEE plug in the CEE socket

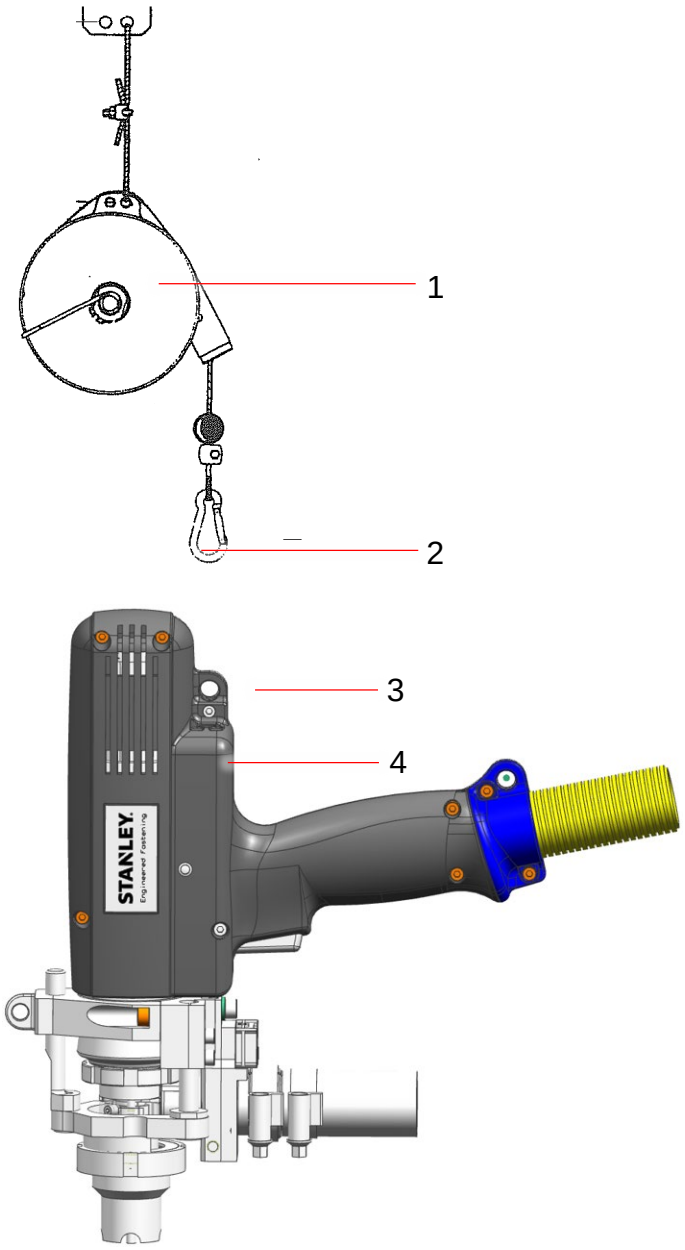


1 CEE plug

Figure 16: Establish the supply voltage

	**WARNING** **Danger of crushing** Severe injuries can be suffered if the stud weld gun falls down. The spring balancer on which the stud weld gun is mounted must be approved for a load capacity range of 4 to 6 kg.	

3. Fasten the stud weld gun to the spring balancer
   - Hook the spring hook onto the fastening point



1 Spring balancer

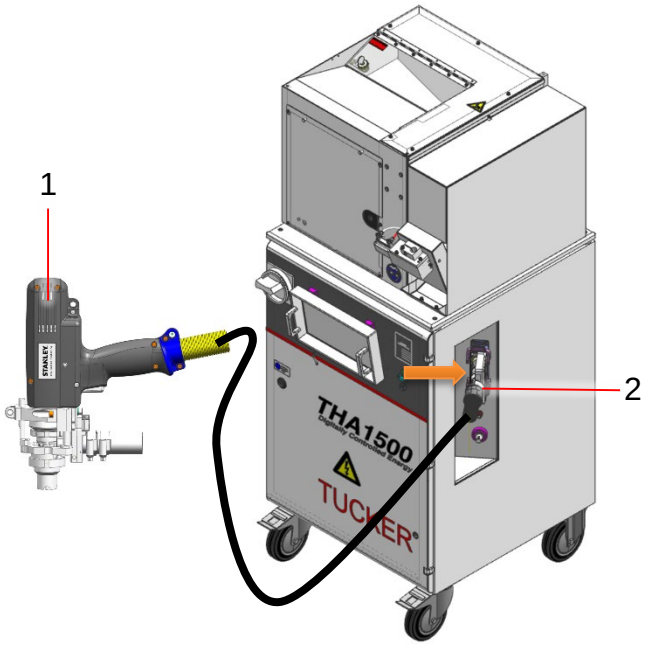
2 Spring hook

3 Fastening point

4 Stud welding gun

Figure 17: Fasten the stud weld gun to the spring balancer

4. Connect the stud welding gun
   - Insert the multicoupling of the stud welding gun and lock it place

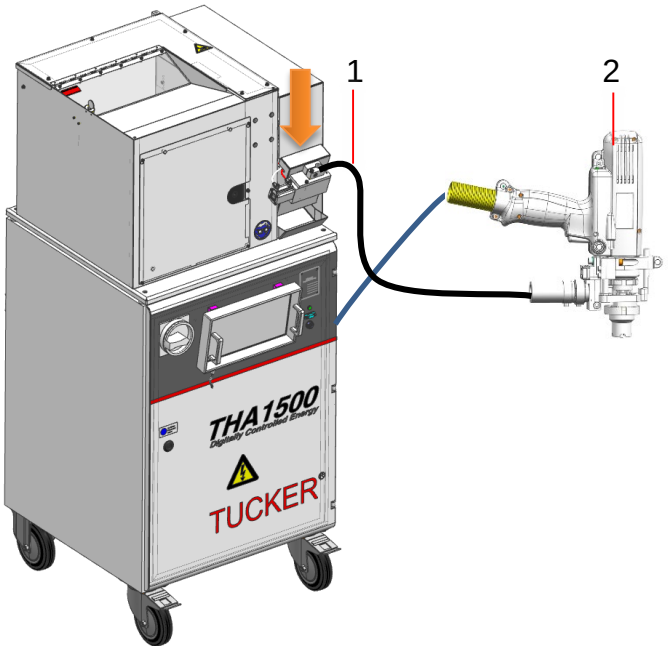


1 Stud welding gun

2 Multicoupling

Figure 18: Connect the stud welding gun

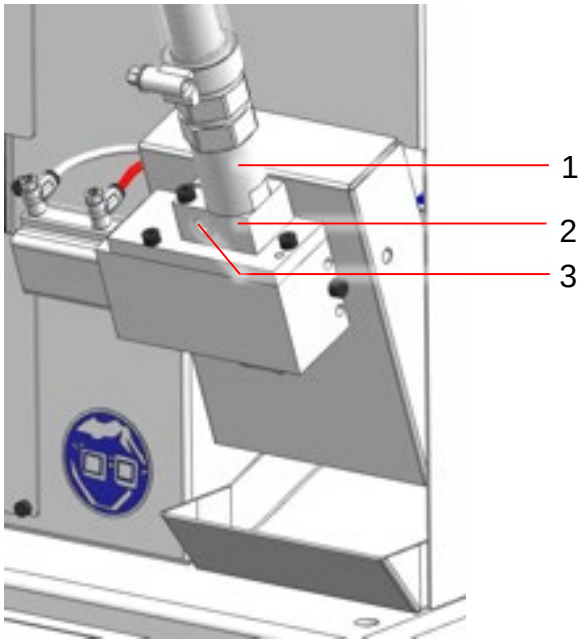
5. Install the feed tube
   - Loosen the clamping screw, do not remove it
   - Insert feeding hose into the coupling piece until it meets the stop
   - Tighten the clamping screw
   - (see adjusting the chapter on the coupling piece)



1 Feeding hose

2 Stud welding gun

Figure 19: Connect the feeding hose



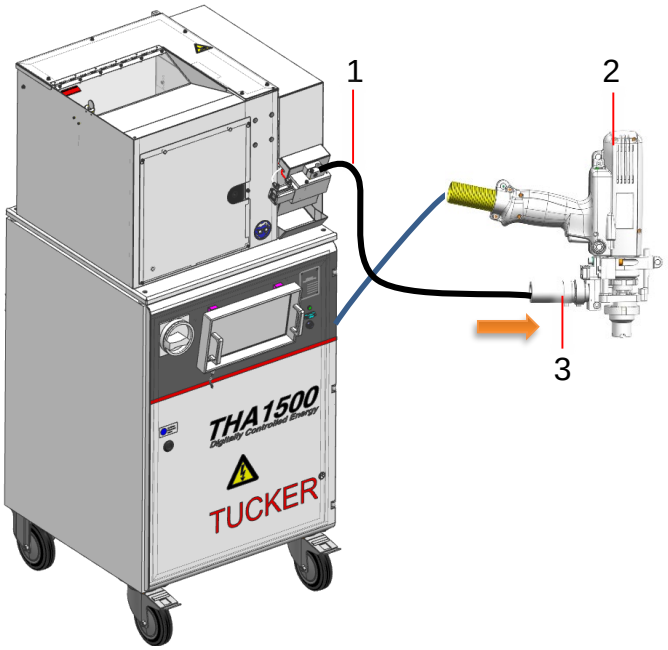
1 Feeding hose

2 Coupling piece

3 Clamping screw

Figure 20: Install the feed tube

6. Mount the feeding hose on the stud welding gun
   - Loosen the hose clamp
   - Insert feeding hose into the coupling piece until it meets the stop
   - Tighten down the hose clamp



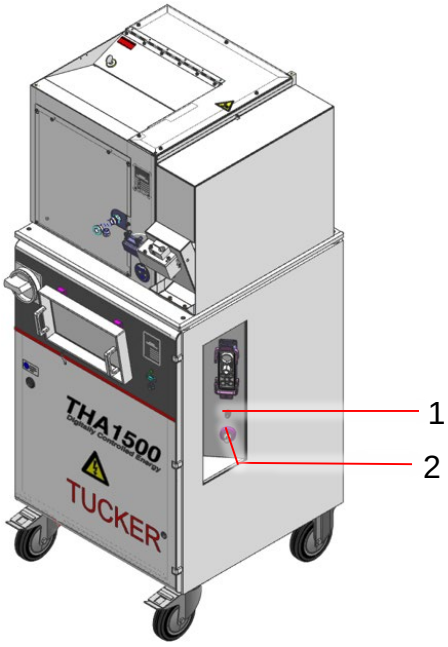
1 Feeding hose

2 Stud welding gun

3 Hose clamp

Figure 21: Connect the feeding hose

7. Connect up the ground cable and ground measuring cable
   - Ground measurement cable
   - Insert the ground cable and turn it to the right
   - Fasten to the grip or earthing cable clamp on the workpiece



1 Ground measurement cable bush

2 Ground connection plug

Figure 22: Connect up the ground cable

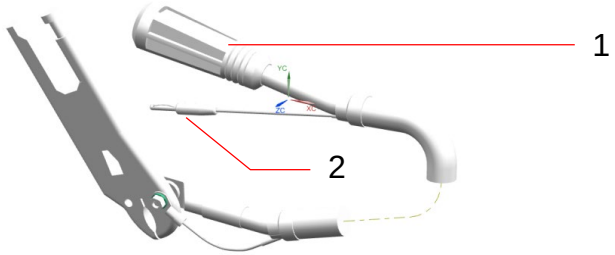
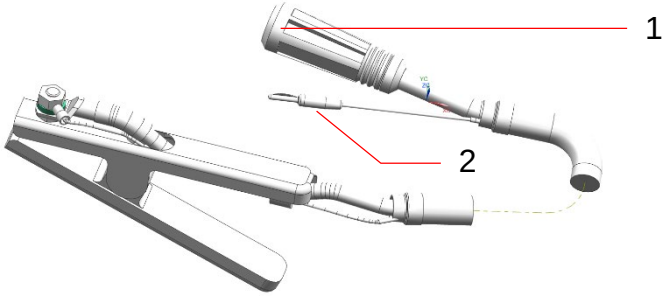


Figure 23: Grip universal clamp

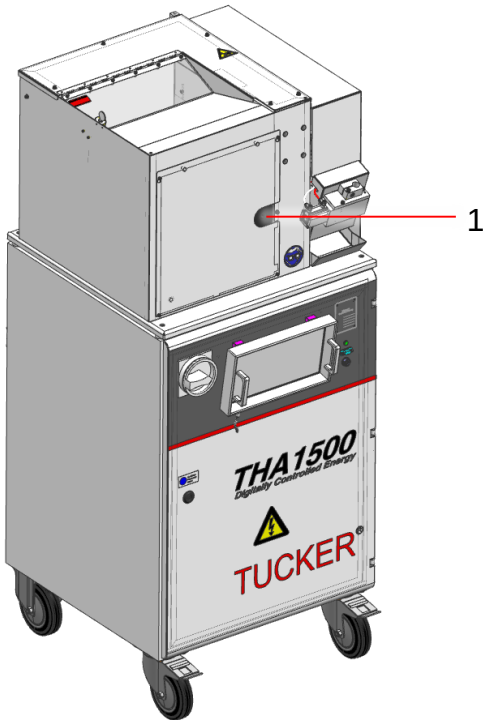


1 Ground cable

2 Ground measurement cable

Figure 24: Earthing cable clamp

8. Connect the compressed air supply
   - Screw in the compressed air screw connection
   - Slide compressed air line onto compressed air connection until it engages



1 Compressed air connection

Figure 25: Establishing compressed air supply

5.8 Commissioning, setting up, adjusting, test runs

Commissioning will be carried out by the manufacturer's specialists with the relevant knowledge and experience. Alternatively, the commissioning can also be carried out by instructed and specially tasked employees of the operator.

At least 2 people are needed for the commissioning.

Note that additional risks can occur through the interaction of a number of components.

5.8.1 Check

5.8.1.1 Check the whole system for damage

- If there is slight damage present (signs of wear, scratches, scrapes), the operator should use measures to remove them.
- If there is heavy damage present, the whole system should not be put into operation. Exchange or replace the damaged components before the commissioning can be - continued!

5.8.1.2 Check the whole system for stability

- The supporting feet and rollers must be in a perfect condition and new; there should be no damage on those parts. There must be no deformation, fatigue, corrosion, breakage or cracks on the unit.
- The control unit must stand perpendicular (max. ± 4°).

5.8.1.3 Check the attached signs and pictograms

- Type plate, CE and safety signs on the housing walls of the unit
- Supply voltage plate
- Danger from an electric shock on the service door

5.8.1.4 Check the freedom of movement

- The freedom of movement of specialists must be designed according to ergonomic criteria in such a way that risk-free commissioning and perfect operation of the unit and deviation is possible at any time for appropriate use.
- Escape routes must be directly accessible so that one can leave a location if it becomes dangerous.

5.8.2 Prerequisites for commissioning

5.8.2.1 Plug connectors and connections

Check whether all connections from the control unit to the other involved operating equipment are made according to plan:

- Control cables
- River-feed-hose lines
- Supplies

5.8.3 Activation

Switch ON the stud welding system at the main switch.

- The illuminated LED “Control On“ indicates by lighting up green that the unit is ready to operate.
- The device type and the plant configuration is shown in the display on the operating unit touchpad.
  Check the details for device configuration with all attached operating equipment and products.
- In an orderly fashion the control unit recognizes the given configuration itself while starting.
  When you establish the fact, on the basis of an error message in the touchpad display, that the details for device configuration do not match, you must adjust the configuration and check the plug connectors and connections. Also use the “- Operating instructions for the ERC control unit touchpad“ and continue over the menu navigation.
- In the submenu “Configuration of the tool“, enter the system and outputrelevant parameters and the welding parameters in the submenu “Programming the process“.
- Check the programming over the submenu “Test process“, in that you request a number of welding attempts over the “Single cycle“ menu point and perform these.

5.8.4 Settings

The device is delivered in a preconfigured condition. Should adjustments still be required, make the settings as described in the following.

5.8.4.1 Dip-switch setting

The dip switches S1-S8 are used to set up the respective device configuration on the CPU PCB of the feeder.

1. Switch off the control and energy unit on the main switch

2. Disconnect the compressed air supply

3. Open the service door
   - Turn the locking to the right
   - Open the service door

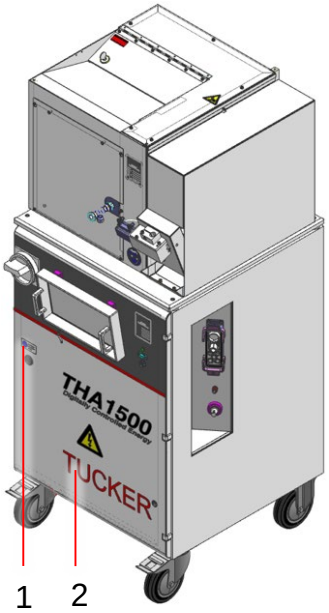


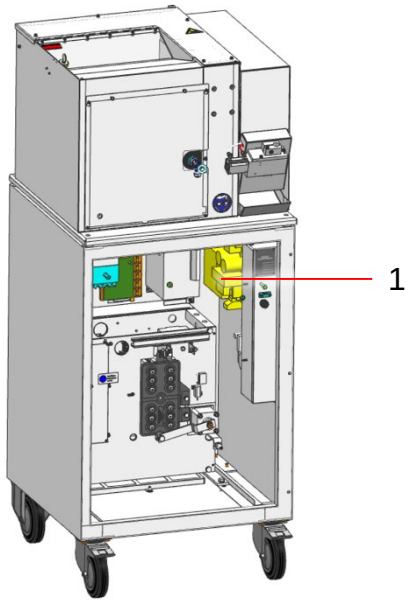
Figure 26: Open the service door

1 Locking mechanism

2 Service door

4. Check the dip switch on the feeder

   - The variants of the feeders can be set on the dip switches on the CPU PCB of the feeder.



1 CPU PCB for the feeder

S1 ON

S2 OFF

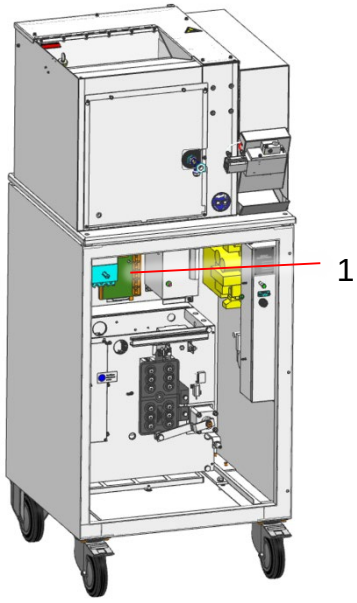
S3 ON

S4 OFF

S5 ON

Figure 27: Check the dip switch on the feeder

5. Check the dip switch on the control and energy unit



1 CPU PCB for control and energy unit

S1 For turning the programming function On/Off

S2 Delete the RAM module to activate and deactivate the function

S3 Not assigned (standard setting OFF)

S4 Not assigned (standard setting OFF)

S5 Not assigned (standard setting OFF)

S6 Not assigned (standard setting OFF)

S7 Test function development (standard setting OFF)

S8 Test function development (standard setting OFF)

Figure 28: Check the dip switch on the control and energy unit

6. Close the service door
   - Close the service door
   - Turn the locking to the left

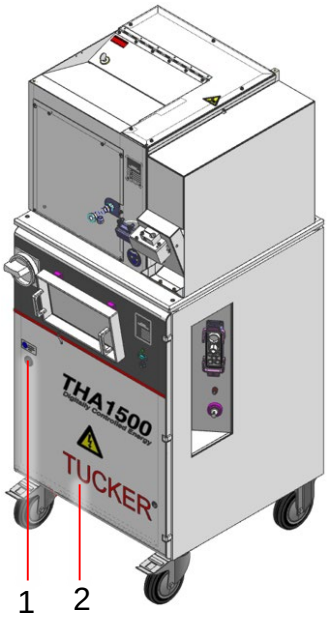


Figure 29: Close the service door

1 Service door

2 Locking mechanism

5.8.4.2 Adjust the air pressure

WARNING

Danger from pneumatic power!

You can be severely injured by unexpected movements of pneumatically operated parts in the components and equipment utilisation area!

Act with care in the vicinity of pneumatically moved parts.

Wear your personal safety equipment!

1. Open the "Controls" insert
   - Loosen the Allen screws (4 pcs.) but do not remove it
   - Raise the plate and remove to the front

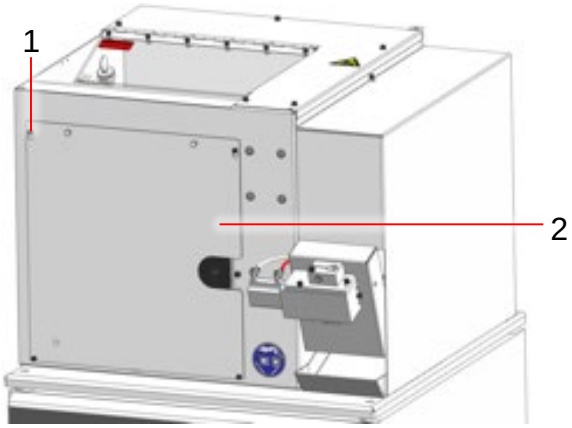
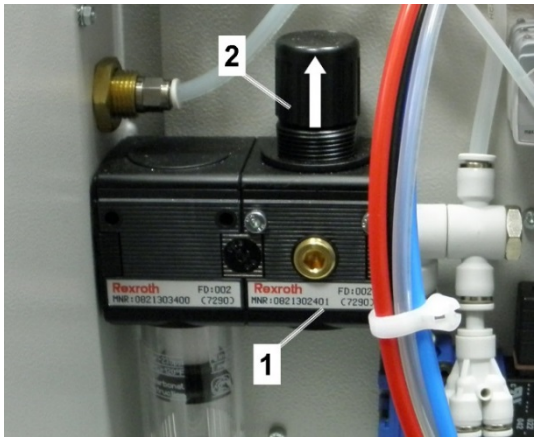


Figure 30: Opening the "Controls" insert

1 Allen screws

2 "Controls" insert

2. Setting the operating pressure
   - Pull the adjustment knob up to unlock
   - Set the desired operating pressure by rotating the adjustment knob
   - Push the adjustment knob down to lock

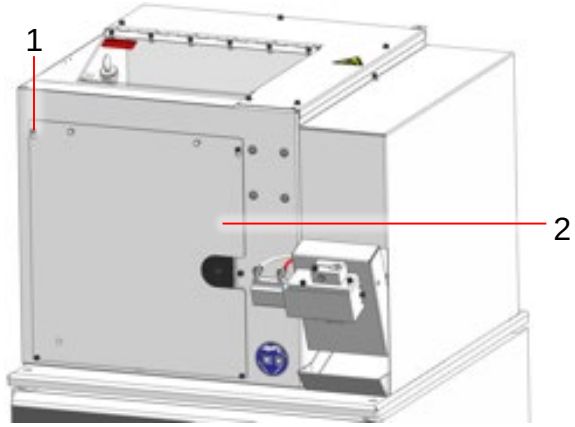


1 Adjustment knob

2 Pressure reducer

Figure 31: Setting the operating pressure

3. Close the control rack
   - Push insert in to the stop
   - Screw the Allen screws (4 pcs.) into place and tighten them



1 Allen screws

2 "Controls" insert

Figure 32: Opening the "Controls" insert

5.8.4.3 Set feeding speed

WARNING

Danger from pneumatic power!

You can be severely injured by unexpected movements of pneumatically operated parts in the components and equipment utilisation area!

Act with care in the vicinity of pneumatically moved parts.

Wear your personal safety equipment!

1. Open the "Controls" insert
   - Loosen the Allen screws (4 pcs.) but do not remove it
   - Raise the plate and remove to the front

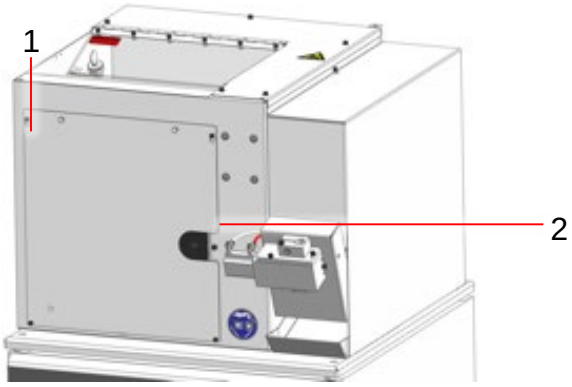


Figure 33: Opening the "Controls" insert

1 Allen screws

2 "Controls" insert

2. Set feeding speed
   - Turning the valve to the left causes the valve to open and the feeding speed to be increased
   - Turning the valve to the right causes the valve to close and the feeding speed to be reduced

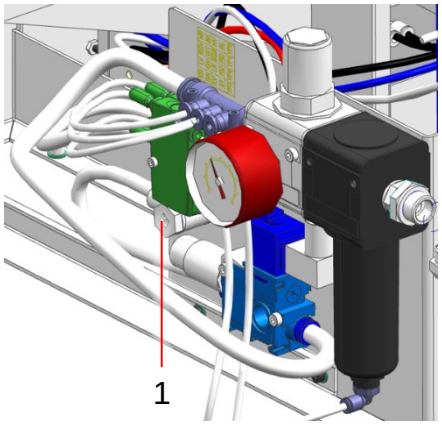


Figure 34: Set feeding speed

1 One-way restrictor

3. Close the control rack
   - Push insert in to the stop
   - Screw the Allen screws (4 pcs.) into place and tighten them

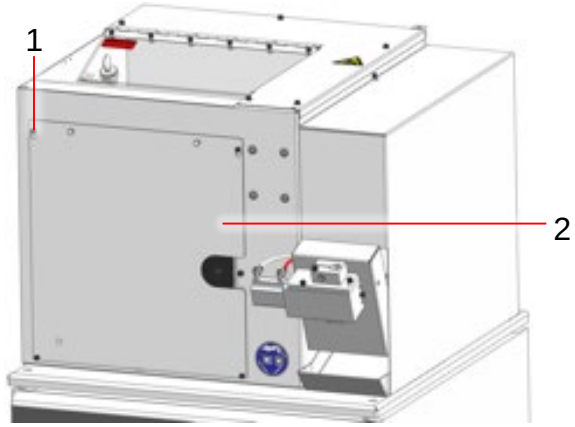


Figure 35: Opening the "Controls" insert

1 Allen screws

2 "Controls" insert

5.8.4.4 Adjust coupling fitting

1. Coupling piece
   - Loosen the Allen screws (2 pcs.) but do not remove them
   - Insert feeding hose into the coupling piece until it meets the stop
   - Tighten the Allen screw, item 4
   - Tighten the Allen screw, item 3

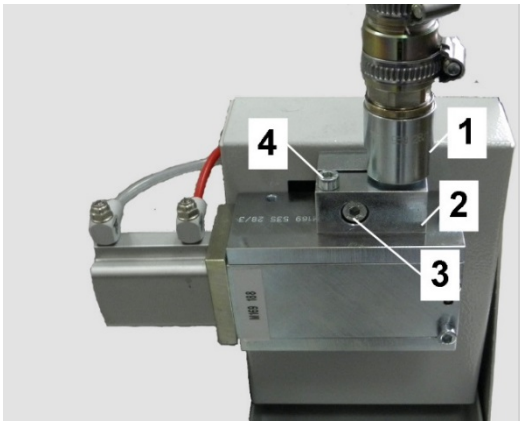


Figure 36: Adjust coupling fitting

1 Feeding hose

2 Coupling piece

3 M4x8 hexagon socket screws

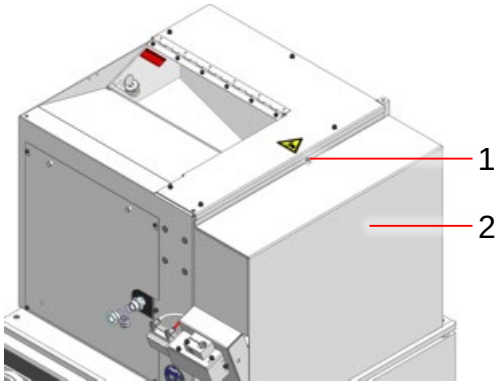
4 M4x8 hexagon socket screws

5.8.4.5 Set proximity switch

1. Switch off the control and energy unit on the main switch

2. Disconnect the compressed air supply

3. Remove the cover
   - Do not remove the Allen screw
   - Remove the cover

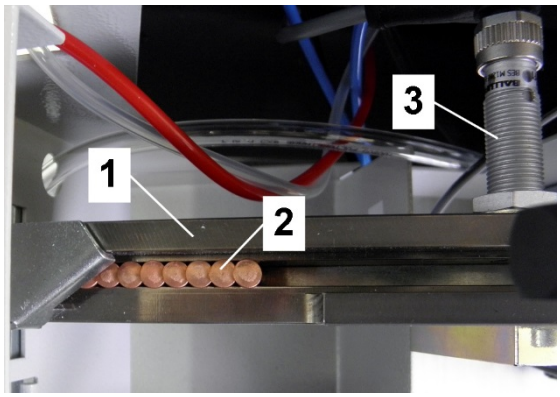


1 M4x8 hexagon socket screws

2 Covering

Figure 37: Disassemble the cover

4. Empty the feed guide
   - Remove all studs in the area of the proximity switch



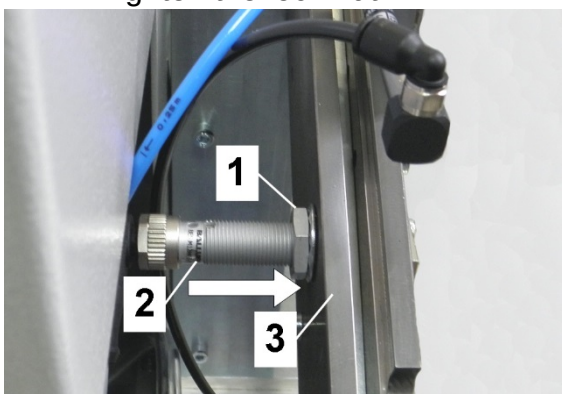
1 Feed guide

2 Weld stud

3 Proximity switch

Figure 38:empty the feed guide

5. Adjusting the proximity switch
   - Loosen the lock nut
   - Screw the proximity switch into place until the front surface of the sensor is coplanar to the inner surface of the feed guide
   - Tighten the lock nut



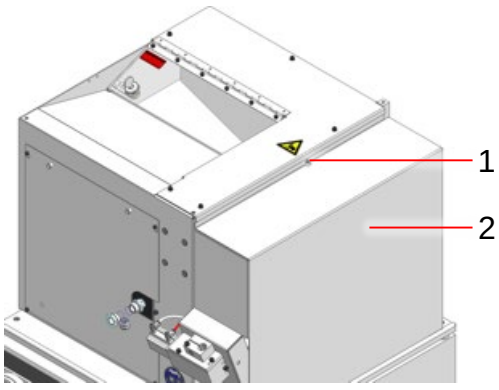
1 Counter nut

2 Proximity switch

3 Feed guide

Figure 39:set proximity switch

6. Mount the cover
   - Position covering
   - Tighten the Allen screw



1 M4x8 hexagon socket screws

2 Covering

Figure 40: Disassemble the cover

5.8.4.6 Set stud slider speed

When setting the stud slider speed, always observe a compromise between an adequate traversing speed and the risk of damaging the component.

- An excessive stud slider speed can cause the workpiece to be deformed.
- A stud slider speed which is too low can cause the parameterized clock cycle not to be reached.

WARNING

Danger from pneumatic power!

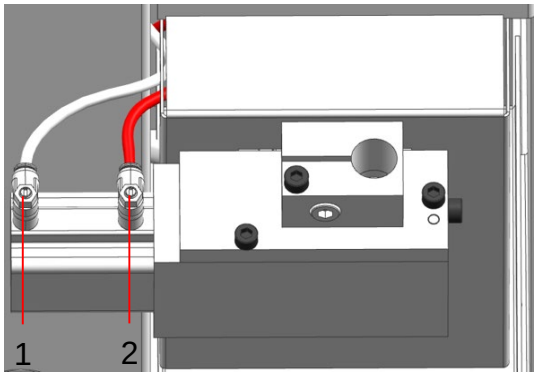
You can be severely injured by unexpected movements of pneumatically operated parts in the components and equipment utilisation area!

Act with care in the vicinity of pneumatically moved parts.

Wear your personal safety equipment!

1. Adjusting the throttle check valve on the left
   - Turning the valve to the left causes the valve to open and the cylinder reverse speed to be increased
   - Turning the valve to the right causes the valve to close and the cylinder reverse speed to be reduced

2. Adjusting the throttle check valve on the right
   - Turning the valve to the left causes the valve to open and the cylinder reverse speed to be increased
   - Turning the valve to the right causes the valve to close and the cylinder reverse speed to be reduced



1 Throttle check valve left

2 Throttle check valve right

Figure 41: Adjusting the stud slider speed

5.8.5 Application and test runs

Test for appropriate use during commissioning together with the foreseen hooked on tool and accessories and perform this a number of times.

Check:

- the freedom of movement of all components and accessories (tool, cable, hoses)
- welding processes with welding studs according to the specified joining specification
- the feed processes with welding studs
- removal of provoked faults and malfunctions

Have the responsible tester from the user conform in an acceptance testing and -commissioning report that all required functions were fulfilled.

5.9 Storage and protection between periods of use

Short time: Keep all parts free of dust and dry within the specifications for transportation and storage in accordance with chapter 5.2.

Long time: Keep all parts free of dust and dry within the specifications for transportation and storage in accordance with chapter 5.2.

If increased emissions of dust, aerosols or air humidity are expected, spray all external parts with a common, industrially used conservation agent for corrosion protection, for example ARDROX 396/1M by CHEMETALL, add a desiccant and wrap everything air-tight with polyethylene films.

5.10 Storage location for the manual

Store a copy of this manual and all associated manuals in the vicinity of the product, so that these are always available to the personnel on site and can be used to loop up information.

6 Use and operation

6.1 Goal and target groups for this chapter

To guide the specialist person to put the plant step by step into operation for production, to undertake the production with all prepared measures, to undertake appropriate measures for the case of error messages or for failure of media or system, as well as to decommission the plant again.

This section is aimed at the following users:

- responsible specialists,
- specialists for usage and operation of the entity and
- instructed and specially tasked employees

of the user, plant constructor and operator.

For your function to be executed and safe operation, it only requires issue of a signal for a welding process to take place, for manual or a semiautomatic operating mode from the manual control.

6.2 Safety at the work location

Always observe the safety instructions and the fire protection signs!

Responsible specialists – VFK, or people from the operator for their awarded work as well as for particular employees with authorisation for switch operation, teach and -instruct as necessary other persons about the tasks awarded to them and possible dangers arising from inappropriate behaviour and also teach about the required protective safety devices and protective measures before beginning their work!

The safety officer supports
employees and superiors concerning all questions about work safety.

6.3 Safe operation, safe functioning

Maintain a maximum duty cycle of 60% as part of the specifications which are permissible for safe operation. All movements and operations of associated components to be performed are fully triggered, coordinated, monitored, reported and recorded if necessary, by the control unit, after each issue of a signal for a welding operation. In normal operating mode no intervention by persons is necessary in as far as no error messages arise.

6.4 Work processes

The functions of the unit run automatically after starting every welding process. Issue of a command for each welding process to be executed from outside, by the operator person.

6.5 Secondary functions, e.g. material handling

To operate the unit, THA1500F welding studs are needed. These must be replenished at regular intervals dependent on the production.

6.6 Signals to be monitored

The LED lamp on the front panel shows that the control of the unit is ready to operate and the stud welding gun is connected.

–H1	Display	Status
	ON	Ready for operation.
	OFF	Switched off or the fault was recognised

The following messages are visible on the operating unit during regular operation:

- The current error and warning messages appear in the “Status line“
- The status indicator for the outputs or the system by means of signal buttons according to the operating manual for the control unit DCE perating unit

Furthermore, the error description on the operating device shows detailed information about individual faults which can be clearly and uniquely interpreted based upon document “Fault message of the DCE system“ and should allow one to remove faults.

6.7 Extraordinary functions, situations

6.7.1 Handling

The document “Fault message of the DCE system“ offers detailed descriptions about foreseeable possible errors and their removal using the touchpad.

6.7.2 Protective measure (mechanical)

Mechanical protective measures should be used to counter dangers which cannot be avoided by taking design measures which arise from the product in connection with other mechanical components, electrical operating equipment or other machines in a production plant. This can, for example, mean mounting of mobile or permanent separating safety partition devices. entry into which is monitored by suitable operating equipment.

6.7.3 Action sequences in an emergency situation

6.7.3.1 Alarm

- break off every started work operation immediately!
- leave the work area quickly and carefully!
- follow the direction shown at the nearest escape route sign!
- get out of/clear the danger area – section, plant, building – immediately!
- find the nearest factory gathering point!

 	**DANGER** **Incorrect use of the EMERGENCY-STOP function might result in life-threatening injuries or even death!** Has the EMERGENCY-STOP chain been connected up to the units and activated by the system controller? Check to see whether the EMERGENCY-STOP - protective function is active! For separating protective devices do not block off or impair the operating equipment. Check for and ensure free accessibility to all EMERGENCY-STOP elements.	 

6.7.3.2 Accidents resulting in personal injuries

Action sequences and general first measures to be taken when an accident resulting in personal injuries[7] has occurred: obtain more details by read Chapter 6.11.3 and 6.12 ff.

Recommendation: Factories should have their occupational safety and health management system certified by accredited companies, which are listed by an accreditation office, according to OHSAS 18001[8].

6.7.3.3 Accidents resulting in damage to assets or breakdowns

In the case of an accident resulting in damage to assets[9] or breakdowns, follow the following instructions:

	**WARNING** **Danger due to destruction and breakage of a unit!** Injuries can result from falling in or bursting components!	

- Stop every form of work on this unit immediately!
- Report any equipment damage or breakdown to your immediate superior or the factory and work safety team!
- Do not try to remove the fault yourself if you do not have any authorisation to do so, even when the damage is very small!
- Report or remove deficits in the safety systems or dangerous situations immediately
- Establish what damages exist on the unit; do not run it any further!

6.7.3.4 Interruptions to operations

In the case of an unexpected interruption to the power supply, feed and exhaust air or illumination of the workshop, the required compressed air or protective gas or in case of an alarm occurring, the planned work sequence should not be continued. When these kind of faults occur, follow the instructions provided by the pertinent working instructions, operating instructions, the superior, the safety officer or the factory management.

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[7] the most common causes of accident resulting in personal injuries are falls, factory internal traffic routes accidents, burns, puncturing and cutting injuries, electrocutions

[8] Occupational Health- and Safety Assessment Series - oriented closely on the standards ISO 9001 and ISO 14001. Many companies today see themselves truly under pressure from their customers to be certified according to OHSAS 18001. In this way these customers can formally verify that their suppliers are socially responsible companies.

[9] An accident resulting in damage to assets has occurred when a sudden collision occurs with an external part which does not belong to the machine. A breakdown has occurred when there is sudden failure due to a cause – not from outside however – but solely due to an inner faulty process or due to operating errors or overloading without any external influence occurring and a component of a machine or the plant caused consequential damages on the machine or plant. Damages due to general wear are not accidents or breakdowns.

6.8 Identifying malfunctions and their correction

The document “Fault message of the TE system“ offers detailed descriptions about foreseeable possible errors and their removal using the touchpad.

6.9 Brief instructions

Not present.

6.10 Disposing of waste material

Dispose of waste material according to national – if necessary regional – regulations for disposal and commission a certified specialist disposal company. Further information can be found in Chapter 11.6.

6.11 Protection for personnel

6.11.1 For a new start after intervention, see Maintenance

Before every new putting into operation and resumption of production satisfy yourself about the (good) condition of the overall system in terms of appropriate uses according to Section 4.2 ff. In cases of doubt about whether safe operation can be achieved, report your concerns to your immediate superior or the safety officer.

Check

- all safety devices for completeness and proper functioning,
- and use your personal work safety equipment – PSA – when entering the workshop,
- whether the whole system is in a safe condition before use “parked“ – “parking brake“,
- all components of the whole system for intactness and functionality.

6.11.2 WARNING of possible escape of the substances & precautionary measures

The components of the whole system – usable products – do not contain any dangerous substances which are subject to such a declaration. In the case of obligatory use within the specification data one does not expect any leaking substances (coatings, lubricants, materials and connecting elements) or leakages. In the case of an exposure which has occurred under inappropriate use conditions the whole system must be inspected visually and, if necessary, subjected to special checks according to the damage pattern in order to obtain recertification – conformity.

RoHS – the guideline 2011/65/EU for limitation of the dangerous substances mentioned in electrical and electronic devices is applied.

6.11.3 First-Aid for acute injuries (foreseeable conditions)

The measures which are arranged for in the company and the workshops used by the user to care for injured persons, for First-Aid and the care from the company medical officer must always – like safety instructions – be given priority.

Foreseeable acute injuries are taken as reversible and non-reversible personal injuries, which can occur due to

- reasonably foreseeable or unforeseeable misuse
- disregard of safety instructions and signs, for example due to recklessness,
- non-use of personal safety equipment, as well as negligence,
- not careful, preventative behaviour to avoid dangers,
- lack of knowledge about possible danger areas and sources of danger,
- Collision, destruction, material fatigue, wear and tear,

can occur and require rapid First-Aid measures.

As “FIRST-AID” one understands every measure taken by every person to save lives, to avoid or mitigate the effects of dangers or health problems up to use of professional help.

The first person to arrive on the scene where a person has been injured should proceed according to the following handling procedure, in particular where there are medium and severe injuries involved:

6.11.3.1 Behaviour in the case of accidents

Action to be taken in the case of an accident

	**1 Report the accident** • Select the emergency call [10]! – 112 – This is only possible by telephone! Raise the alarm with the rescue services and make sure the rescue routes are free! - Where did it occur? - What occurred? - How many are injured? - What are the injuries! - Wait for questions!
	**2 First-Aid** • Secure the accident location! - use other employees as helpers at the accident location - One's own security takes priority over offering aid! • Care for the injured; provide First Aid, at best led by the next first aider! - until a rescue service arrives - • Take note of the instructions which apply to the accident location!
	**3 Further measures** • Inform the rescue services! – Instruct a helper to lead the arriving rescue services to the person who has had the accident! – The first aider instructs the rescue services about previous observations: Where? – What? – How? – What are the injuries? – If required, how? • Get rid of curious onlookers! – Tell the curious very firmly to leave the accident location!

[10] in every member state of the EU the Fire Brigade can be reached under **112**

6.12 Emergency measures

6.12.1 Immediate measures for acute injuries (accidents)

If despite training of the specialists and the instructed and specially tasked employees of the plant builder, user and plant operator as well as the safety instructions concerning residual risks in this manual, a person is injured while using and during the expected service life of the unit and the accessories in the scope of delivery, differentiate – as a first helper or a trained in-house paramedics person – according to the following criteria concerning the measures which need to be initiated.

DIN EN 62061 differentiates in the definition of “the severity of the injury" between four grades:

- 4 Irreversible: Death, loss of an eye or arm, emergency doctor
- 3 Irreversible: broken bones, loss of fingers, emergency doctor
- 2 Reversible: medical treatment necessary doctor
- 1 Reversible: first aid necessary first aider

They should make a simple decision immediately after an “accident“ about the measures to be initiated – which they have been trained in in advance – and which are taken here as a decision-taking aid. The manufacturer has in the following overview subdivided the degree of the injuries into three levels – slight, medium and severe .
– Note: this overview does not make any claim to completeness! –
It provides one with first and second instruction manuals on what one must do:

6.12.1.1 slight injuries

In the case of slight injuries, for example for	First measure	Second measure
• minor cuts • minor fractures • minor burns, 1st degree • Sprains	First Aid … do this whoever reaches the accident location first! 	Med. Clarification by a doctor, specialist doctor

6.12.1.2 medium level injuries

In the case of medium level, for example for	First measure	Second measure
• severe cuts, • severe fractures or • loss of fingers or toes • Impairment of vision • Impairment of hearing • Orientation disorders • medium burns (< 15%), 2nd degree • medium freezing	First Aid … provide this together with an as quickly contacted trained-ed first aider! 	Care from an emergency doctor 
• Disability for example due to • dizziness, • nausea, vomiting, • Allergic reaction • short-term unconsciousness	Initiate an emergency call 	Instructions given by the emergency doctor concerning - in-patient or out-patient treatment

6.12.1.3 severe injuries

In the case of severe injuries, for example	First measure	Second measure
• Severe injuries to internal organs, • Eye injuries • Loss of limbs • Loss of vision • Loss of hearing • severe burns (> 25%), of the 3rd and 4th degree • severe freezing	First Aid … provide this together with as quickly contacted trained first aider! 	Care from an emergency doctor 
• severe disability for example after receiving an electric shock • severe mental impairment - traumatic brain injury - or • longer-term unconsciousness	Initiate an emergency call 	Instructions given by the emergency doctor concerning in-patient treatment

6.12.2 Preventive fire protection - firefighting

6.12.2.1 Firefighting devices

If a fire breaks out in or on a unit, use the extinguishing 'small extinguishing device or the portable fire extinguisher with a total mass of a maximum of 20 kg, which only have a limited fire extinguishing capability, such as hand-heldin-patient fire extinguisher.

In order to fight a fire proceed quickly and in a coordinated fashion – with many practiced persons fitted with hand-held fire extinguisher – in parallel and from many sides. A suitable formation is the semicircle position with a roughly equal distance from the seat of fire. The fire extinguishing devices which must be used acutely must have the same identification. Absolutely take note!

For fire fighting on electrical operating equipment such as the unit, use of ABC powder is appropriate as an extinguisher. The identification on the fire extinguisher is PG.

Watch out for installations and devices which refer to fire fighting, for example.

Safety signs	Type and designation
	**Fire protection signs for a fire extinguishing device** Personnel and firemen can find important fire-fighting devices at the - indicated positions! Ensure rapid action and prevent fires from spreading. Small and burgeoning fires can be fought in a timely manner using extinguishing measures! The identification on the fire extinguisher provides information about the extinguishing agent used and suitability for fire fighting! Use the identification PG For fire fighting on electrical operating equipment!

6.12.2.2 Behaviour in the case of a fire

Action to be taken in the case of small and burgeoning fires

1 Report the fire

- Press the nearest fire alarm! -
  Raise the alarm with the Fire Brigade and make sure the rescue routes are free!
- Select the emergency call [11]! – 112 – This is only possible by telephone!
  - Where is it burning?
  - What is burning?
  - How much is burning?
  - What are the dangers involved?
  - Wait for questions!

2 Bring to safety

- Take endangered people with you
- Close doors
- Follow the marked escape routes
- Do not use the lift
- Follow instructions

3 Perform the extinguishing attempt

- Use fire extinguishers
- If required, Use the extinguishing hose
  - do not use extinguishing water on electrical plant! -

[11] in every member state of the EU the Fire Brigade can be reached under **112**

Go to a safe place until the Fire Brigade arrives

	• After fire fighting secure the fire location - use other employees as helpers at the fire location-. One's own safety takes precedence over fire fighting! • Quickly leave the area around the seat of fire, close the door and go to the nearest assembly point and wait there – until the Fire Brigade arrives! • Also, instruct a helper to lead the arriving Fire Brigade to the seat of fire! • The trained helper involved in the firefighting instructs the Fire Brigade about previous observations; Where? – What? - How much? - Dangers? – How?

The Fire Brigade takes over assessment of the damage and associated damage[12] which is bound to occur alongside the main damage.

The Fire Brigade issues instructions about further use of the workshops and the work equipment which was subjected to the fire.

[12] Associated damages are usually in connection with every case of damage there are damages which were first caused by the rescue attempts but which were unavoidable to reach the goal; for example water damage occurring when extinguishing a fire, ground damage at the entrance to the operation site, breaking in which was necessary under the circumstances caused by a brutal rescue operation ("*immediate rescue*", crash rescue).

7 Optional module and extras

7.1 Maintenance flap

Instead of the standard cover, a cover can optionally installed with a maintenance flap. The viewing windows allow you to monitor the separation during operation. A removal of faults as well as the cleaning work can be performed quicker by opening the maintenance flap.

The maintenance flap monitors by means of a stop switch. In this way one can prevent that you reach into the running machine and are injured.

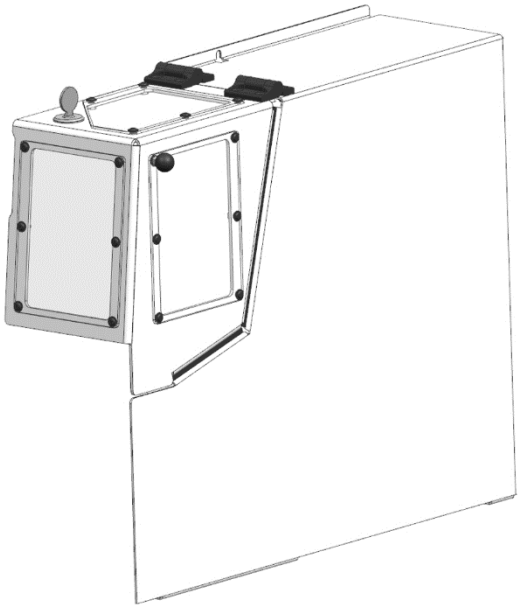


Figure 42: Maintenance flap

8 Maintenance

This section is aimed at the following users from the user, plant builder and operating company:

- responsible specialists,
- specialists for maintenance and
- instructed and specially tasked employees for maintenance

8.1 Standards, guidelines and safety

8.1.1 Standards

Standard	Issue	Title	Change standard
DIN EN 13306:2015-09	2015-09	Maintenance – maintenance terminology [13]	-- [14]
DIN 31051:2012-09	2012-09	Fundamentals of maintenance	--

8.1.2 Goals

The user's goals of maintenance can be the following:

- Prevention of system failures
- Increase of service life and optimisation of usage
- Maintaining a high degree of availability
- Optimizing processes
- Reducing malfunctions
- Planning costs in an anticipatory manner

[13] The purpose of this standard is to define basic terms for all types of maintenance and maintenance management, regardless of the type of considered unit. The exclusive maintenance of software is not covered by this standard draft. However, the maintenance of units and systems that include software are taken into account by this standard draft. It is the responsibility of every maintenance management, to define its maintenance strategy in accordance with the following main goals:
- securing the availability of the unit in its desired state/function at lowest possible costs;
- considering the safety and all other obligatory requirements regarding the unit;
- considering all environmental impacts;
- maintaining the durability of the unit and/or the quality of the supplied products or the received services, if required, under consideration of costs;

Maintenance contributes significantly to the functional safety of a unit. Correct and exact definitions are required that provide the users of additional maintenance standards with a comprehensive understanding of the used maintenance terms. These terms can be of special importance regarding the composition of maintenance contracts. The terms included in this standard draft show that maintenance is not limited to technical measures alone, but also other activities, such as planning, handling of documentation and so forth.

[14] This standard fully structures maintenance into basic measures and defines terms that are required to understand the connections together with the terms of DIN EN 13306. CEN/TC 319 "Maintenance" revised European Standard EN 13306 "Maintenance terminology", which is published as DIN EN 13306. The terms defined in DIN EN 13306 only cover a part of the terms of DIN 31051. DIN EN 13306 also lacks a structuring of maintenance. These gaps are supposed to be closed with this standard DIN 31051, which uses the terms defined in DIN EN 13306 as a basis. Furthermore, terms are stated for definitive and explanatory purposes, which are close in nature to the topic of maintenance.

Maintenance of technical systems, facilities, construction elements, devices and -equipment is supposed to ensure that the functional state is maintained or that the functional state is restored in case of a failure.

This basic goal - to maintain safe and undisturbed operation - can be achieved using various strategies. In this regard, both economic as well as safety-related criteria are of importance.

DIN EN 13306 describes the following strategies:

Corrective maintenance	...is performed after fault recognition in order to return a unit into a state where it can perform its desired function
Preventive maintenance	...is performed at predetermined intervals or in accordance with prescribed criteria and serves the purposes of reducing the -likelihood of a failure or the likelihood of restricted functioning of a unit
Condition-based maintenance	...is a combination of condition monitoring and/or conformity testing and/or testing procedures as well as analyses and also includes the resulting maintenance measures

The favoured maintenance strategy results in a user-specific maintenance plan for technical systems and plants.

The manufacturer recommends a mixture of the aforementioned strategies in accordance with actual needs and provides basic notes and information in section .

8.1.3 Terms and Definitions

The DIN 31051 standard structures maintenance into four basic measures and makes use of four DIN terms to describe these common aspects of maintenance:

ISH [15]	Inspection	Maintenance	Repair	Overhaul
MRO	Maintenance		Repair	Overhaul

[15] Abbreviation used for "Maintenance" in this manual

8.1.4 Safety

	WARNING	
	**Danger from faulty, incorrect or insecure maintenance of the unit!** Unexpected events may arise from faulty, incorrect or unsafe maintenance of the unit. Mortal danger will exist. Only allow the specialist personnel of the manufacturer or correspondingly instructed and specially tasked employees of the operator to inspect, maintain, repair, replace or overhaul/improve the parts to be maintained. Wear your personal safety equipment!	

Also observe the safety instructions in chapter 4.7.6.1.

8.1.4.1 Corners and edges

	WARNING	
	**Danger of being injured by sharp edges or corners!** Sharp-edges or sharp-edged corners on the components and in the equipment utilisation areas can cause hand injuries (grazes, scratches) or cuts! Take care when moving in areas with sharp edges or pointed objects. Wear your personal safety equipment!	

8.2 Maintenance by specialists or customer service

Generally speaking, general maintenance of the unit can be performed by specialist personnel or correspondingly instructed and specially tasked employees of the operator/user for the entire life cycle of the unit.

In exceptional cases, if the knowledge, experience and qualifications of the employees of the user/operator do not suffice, service specialists of the manufacturer may be - requested who support the specialists of the user/operator and train them.

8.3 Maintenance cycles for safe operation

The "Maintenance cycles" section describes all maintenance, inspection and repair operations on the unit.

The following symbol references a maintenance instruction or manufacturer's operating instruction for individual components in the maintenance plan:

 Manufacturer operating manual

8.3.1 Manufacturer's recommendation regarding composition of a maintenance plan

Components to be maintained	Maintenance measure	Maintenance interval	
Components / Designation	**Activity to be performed**	**Cycle**	**Info**
Collet	Check collet for damage • Replace, if necessary	**t**	

Performance of maintenance intervals	
T	= daily
W	= weekly
M	= monthly
3M	= quarterly
6M	= half yearly
*	*= wear dependent

Cross-reference to manufacturer's operating instructions

8.3.2 Maintenance plan control and energy unit

Components / Designation	Activity to be performed	Cycle	Info
Filter mat	Check for contamination • Replace if necessary	W	

8.3.3 Maintenance plan for feeder

Components / Designation	Activity to be performed	Cycle	Info
Plug connection	Check for damage • Replace, if necessary	T	
	Check for firm seating • lock plug connection, if required	T	
Maintenance unit	Check the filling level of condensate container • empty if necessary	W	
	Check for functioning • replace if necessary	W	
Channel slider	Check for damage • replace if necessary	W	
Kicker	Check for damage • replace if necessary	W	
Separation	Check for contamination • clean if necessary	W	
Storage vessel	Check for contamination • clean if necessary	W	
Lifting system	Check for contamination • clean if necessary	W	

8.4 Repair and exchange of parts, extending the service lives

8.4.1 Fuses for equipment inside control cabinet

8.4.1.1 Supply voltage

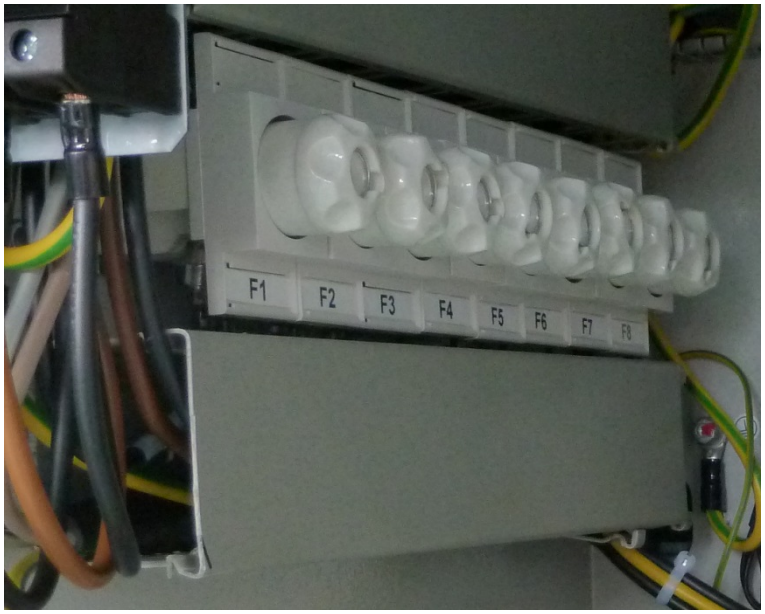


Figure 43: Circuit breaker of the NS distribution in the control unit

Location: Inside the unit, accessible after opening the front door

Equipment fuse	Type	Rated voltage (V)	Rated current (A)	Fuse characteristics
–F1 … –F3	1-pin	500	25	Slow
–F4 … –F6	1-pin		2	Slow
–F7 … –F8	1-pin		10	Slow

8.4.1.2 Fuse terminals

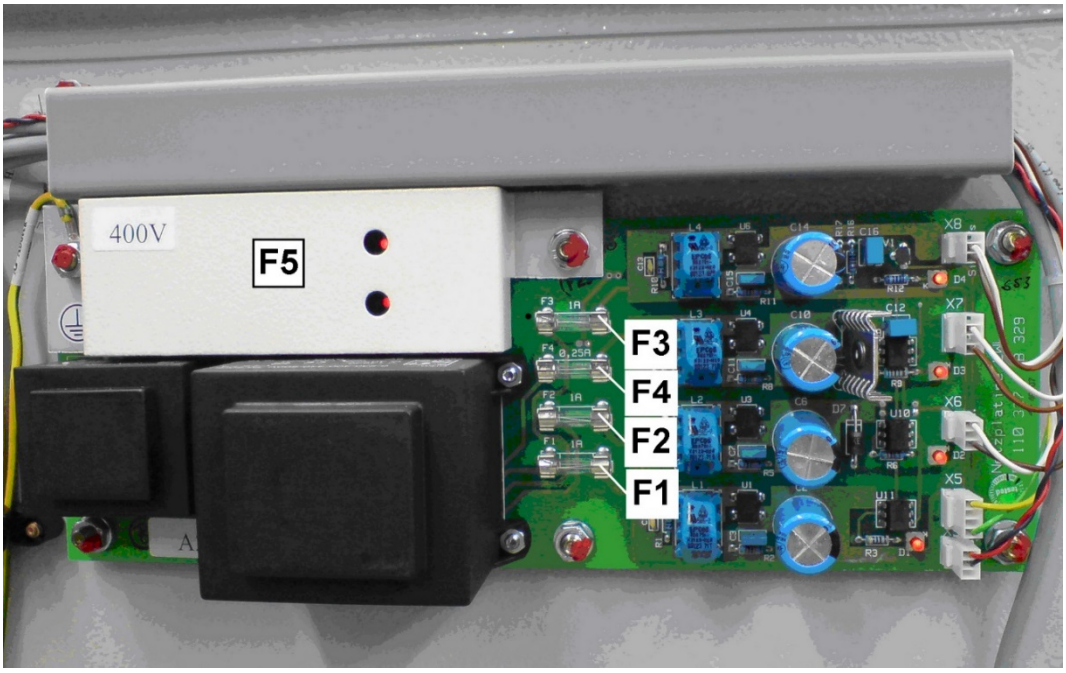


Figure 44: Operating equipment fuses for the control voltage

The voltage of the fused power circuit is a maximum of 24V.

The voltage on the F5 fuse is 400 VAC.

Equipment fuse	Type	Rated voltage (V)	Rated current (A)	Fuse characteristics
–F1	1-pin	250	1	medium time-lag
–F2	1-pin		1	medium time-lag
–F3	1-pin		1	Slow
–F4	1-pin		0.25	medium time-lag
–F5	1-pin	400	1	medium time-lag

8.4.1.3 Fine fuses on the PCB for the feeder

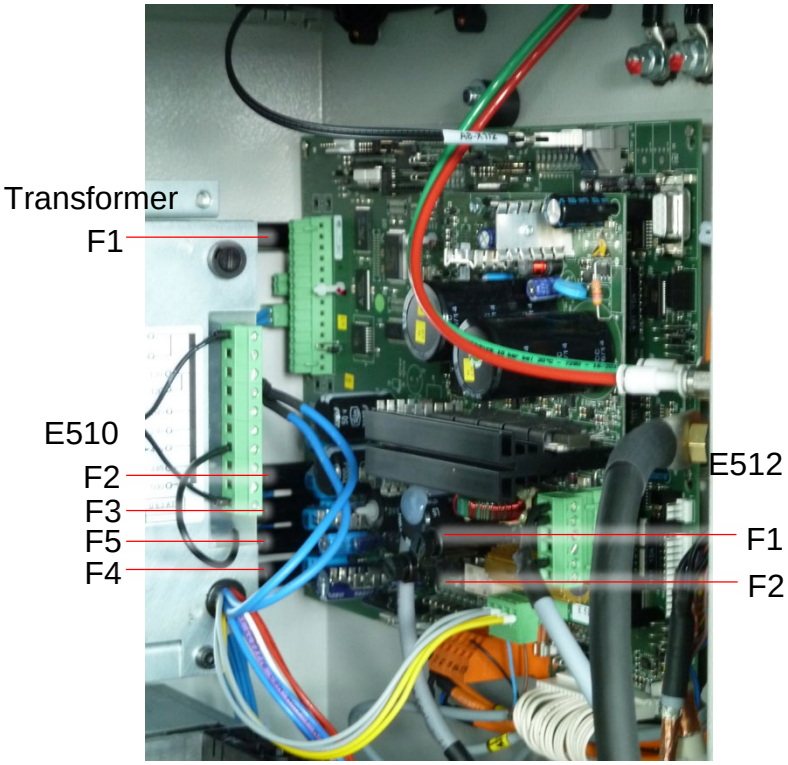


Figure 45: Fine fuses on the PCB for the feeder

Locations: Inside the unit, accessible after opening the front door

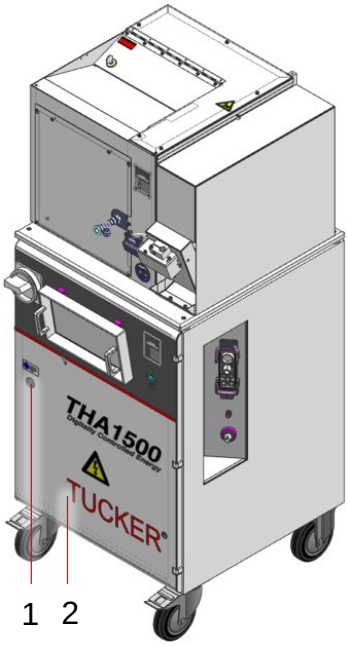
Equipment fuse	Assignment	Rated voltage (V)	Rated current (A)	Fuse characteristics
–F1	Transformer	500	6.3	Slow
–F2	CPU PCB E510		1.0	medium time-lag
–F3	CPU PCB E510g		1.0	medium time-lag
–F4	CPU PCB E510		1.25	medium time-lag
–F5	CPU PCB E510	250	1.25	medium time-lag
–F1	PCB E512 amplifier		1.0	medium time-lag
–F2	PCB E512 amplifier		2.0	slow type
–F1	Filter PCB E567		0.315	Slow

8.5 Maintenance work on the control and energy unit

8.5.1 Replace filter mat

1. Switch off the control and energy unit on the main switch

2. Open the service door
   - Turn the locking to the right
   - Open the service door

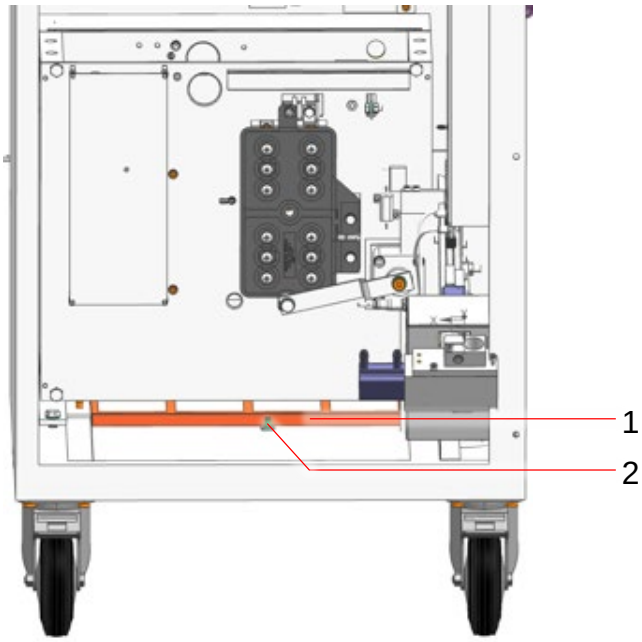


1 Locking mechanism

2 Service door

Figure 46: Open the service door

3. Disassemble the filter mat
   - Press the press-button downwards and lift the filter mat
   - Pull out the filter mat and replace



1 Filter mat

2 Press-button

Figure 47: Disassemble the filter mat

4. Insert filter mat

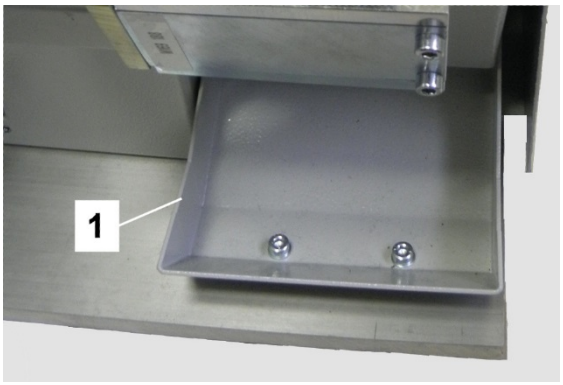
5. Close the service door and lock it

6. Switch on main switch on the control and energy unit

8.6 Maintenance work on the feeder

8.6.1 Empty collecting vessel

1. Empty stud collecting vessel

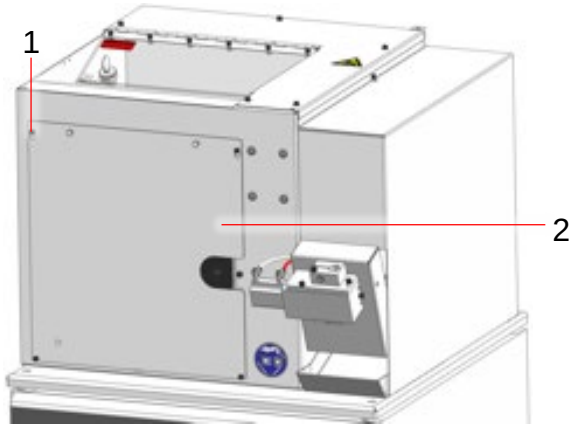


1 Stud collecting vessel

Figure 48: Empty stud collecting vessel

8.6.2 Emptying the maintenance unit

1. Open the "Controls" insert
   - Loosen the Allen screws (4 pcs.) but do not remove it
   - Raise the plate and remove to the front

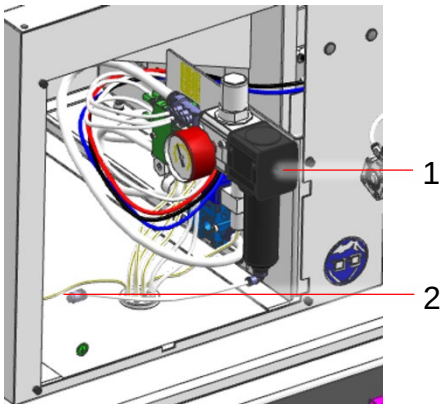


1 Allen screws

2 "Controls" insert

Figure 49: Opening the "Controls" insert

3. Emptying the maintenance unit
   - Place the collecting vessel under the drain plugs
   - Open drain plug
     - Condensate will be drained
   - Close drain plug



1 Maintenance unit

2 Drain plug

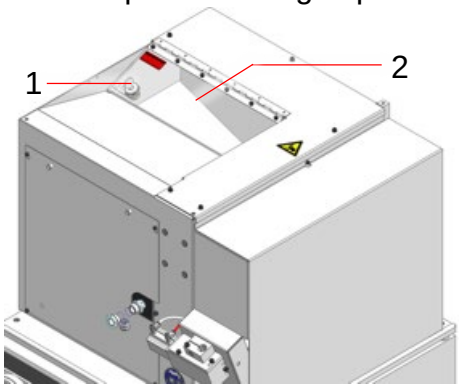
Figure 50: Emptying the maintenance unit

8.6.3 Clean the storage vessel

1. Switch off the control and energy unit on the main switch

2. Turn off compressed air supply

3. Open the filling flap
   - Open the lock on the filling flap
   - Open the filling flap

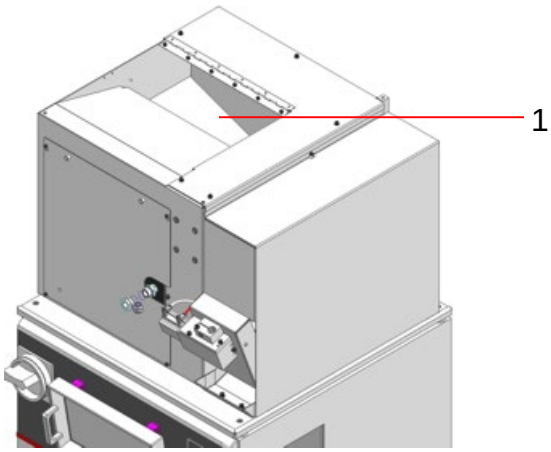


1 Locking mechanism

2 Fill flap

Figure 51: Open the filling flap

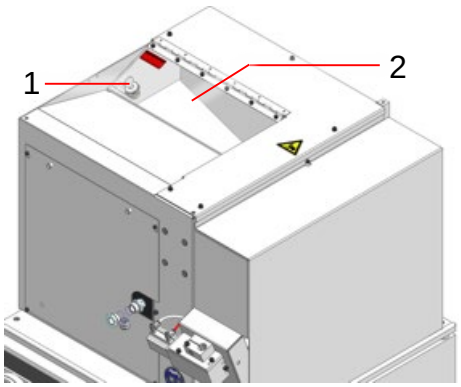
4. Clean the storage vessel
   - Empty storage vessel
   - Clean the storage vessel with a lint-free cloth and Rivolta ACS3



1 Storage vessel

Figure 52: Clean the storage vessel

5. Close filling flap
   - Close filling flap
   - Close the lock on the filling flap



1 Locking mechanism

2 Fill flap

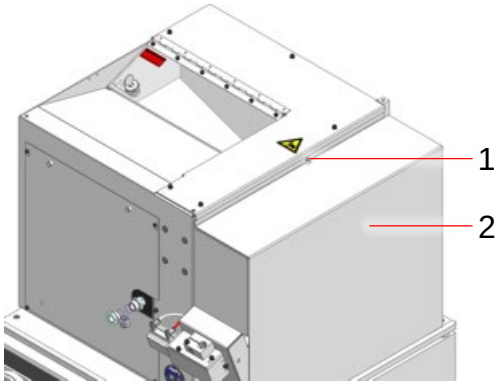
Figure 53: Close filling flap

8.6.4 Clean the separating unit

1. Switch off the control and energy unit on the main switch

2. Disconnect the compressed air supply

3. Disassemble the cover
   - Do not remove the Allen screw
   - Remove the cover

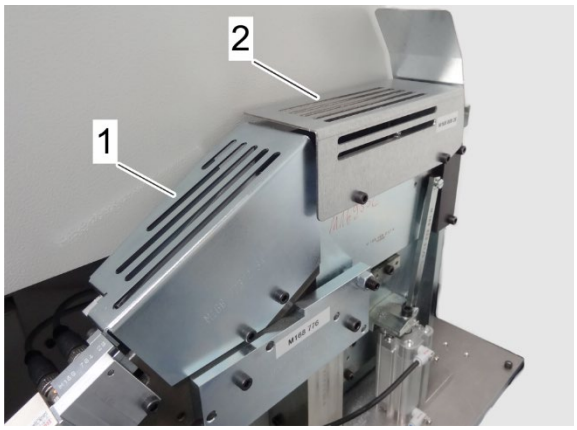


1 M4x8 hexagon socket screws

2 Covering

Figure 54: Disassemble the cover

4. Remove protective cover (if required)
   - Loosen the Allen screw (4 pcs) and remove
   - Remove the covering sheet

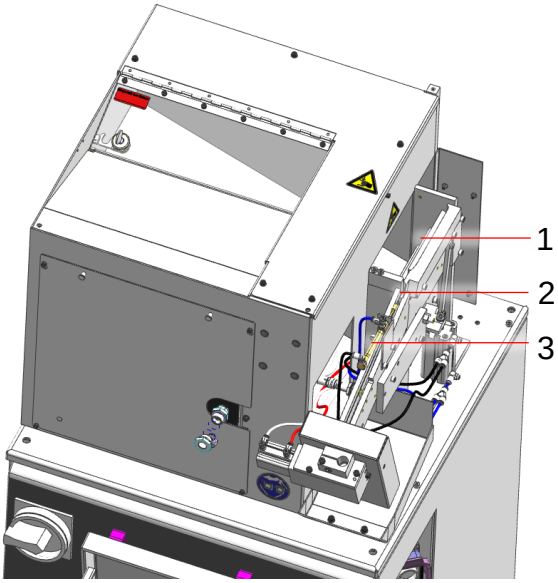


1 M4x8 hexagon socket screws

2 Covering

Figure 55: Remove protective cover

5. Clean the lifting system
   - Remove studs
   - Clean the lifting system with a lint-free cloth and Rivolta ACS3



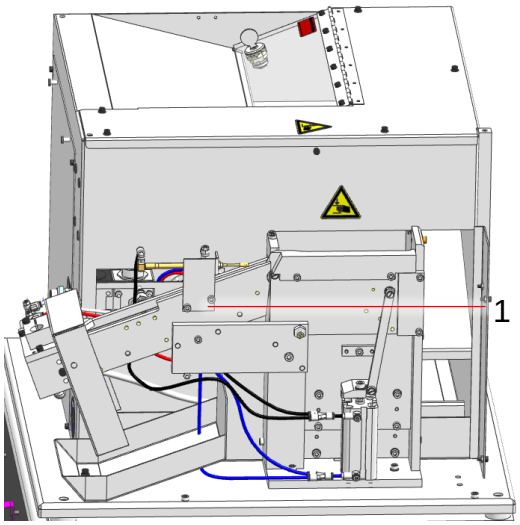
1 Lifting system

2 Channel

3 Channel slider

Figure 56: Clean the lifting system

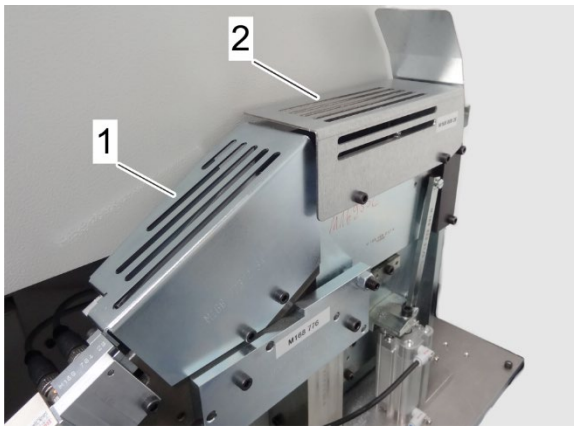
6. Clean separation guide
   - Remove studs
   - Clean the separation guide with a small brush and Rivolta ACS3



1 Separation guide

Figure 57: Cleaning the feed guide

7. Mount protective cover (if required)
   - Remove the covering sheet
   - Screw the Allen screws (4 pcs.) into place and tighten them

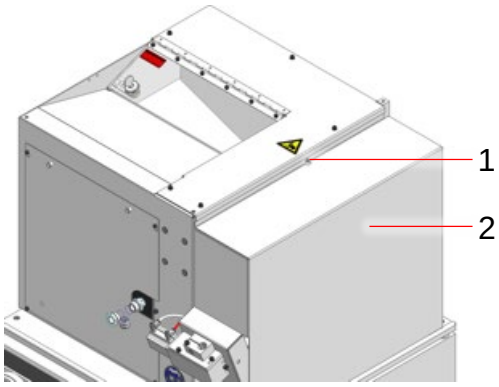


1 Hexagon socket screws

2 Covering

Figure 58: Remove protective cover

8. Mount the cover
   - Position covering
   - Screw the Allen screws into place and tighten them



1 Hexagon socket screws

2 Covering

Figure 59: Disassemble the cover

9. Turn on the compressed air supply

10. Switch on main switch on the control and energy unit

8.6.5 Change channel slider (if necessary)

1. Switch off main switch on the control and energy unit

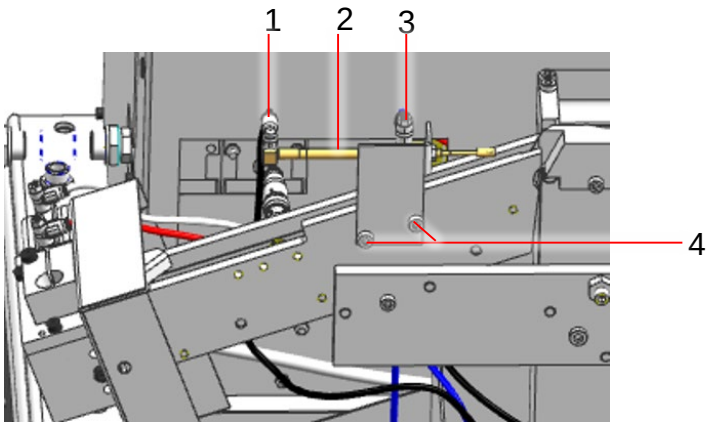
2. Disconnect the compressed air supply

3. Disassemble covering lifting system (see Clean the separating unit)

4. Disassemble covering plate (see Clean the separating unit)

5. Disconnect pneumatic hoses (2 pcs) from the pneumatic connectors

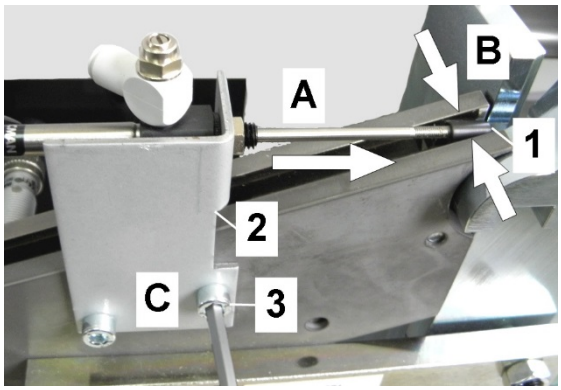
6. Exchange channel slider
   - Loosen the Allen screws (2 pcs.) and remove them
   - Position new channel slider
   - Screw the Allen screws (2 pcs.) into place and tighten them



1 Pneumatic coupling
2 Pneumatic cylinder
3 Pneumatic coupling
4 Allen screws

Figure 60: Exchange channel slider

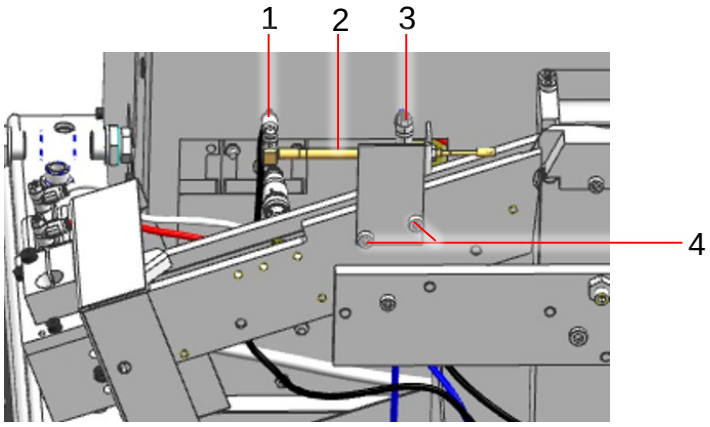
7. Setting the channel slider
   - Move the piston rod manually into the front position
   - Do not remove the Allen screw
   - Align the holder in such a way that the piston rod does not touch the channel
   - Tighten the Allen screw



1 Piston rod
2 Holder
3 Allen screws

Figure 61: Setting the channel slider

8. Connect compressed air hoses



1 Pneumatic coupling
2 Pneumatic cylinder
3 Pneumatic coupling
4 Allen screws

Figure 62: Exchange channel slider

9. Mount covering plate (see Clean the separating unit)

10. Mount covering lifting system (see Clean the separating unit)

11. Establish the compressed air supply

12. Switch on main switch on the control and energy unit

8.6.6 Change kicker (if necessary)

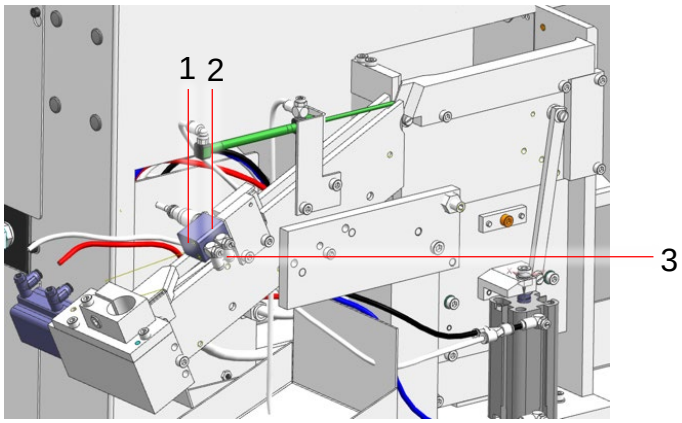
1. Switch off main switch on the control and energy unit

2. Disconnect the compressed air supply

3. Disassemble covering lifting system (see Clean the separating unit)

4. Disassemble covering plate (see Clean the separating unit)

5. Disassemble pneumatic cylinder
   - Disconnect pneumatic hoses from pneumatic connector
   - Loosen and remove the Allen screws
   - Remove pneumatic cylinder



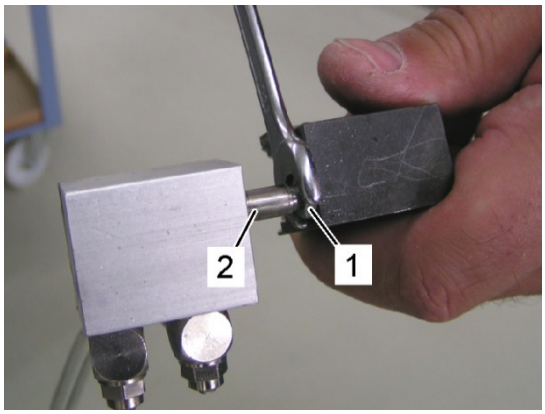
1 Allen screws

2 Pneumatic cylinder

3 Pneumatic connector

Figure 63: Disassemble kicker

6. Disassemble kicker
   - Loosen the lock nut
   - Unscrew kicker
   - Screw on new kicker
   - Tighten the lock nut

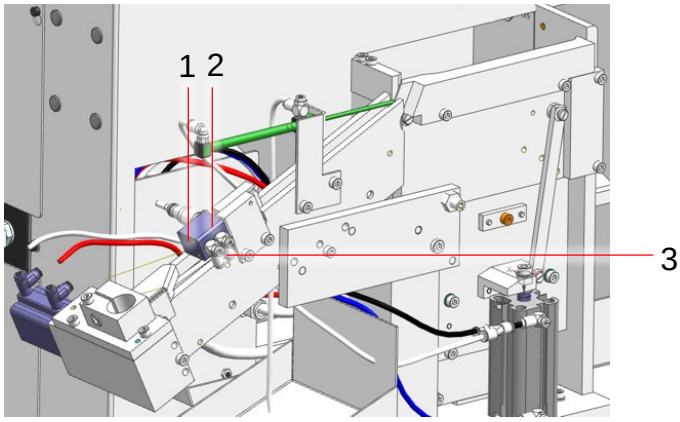


1 Counter nut

2 Piston rod

Figure 64: Remove kicker

7. Mount pneumatic cylinder
   - Position pneumatic cylinder
   - Screw the Allen screws into place and tighten them
   - Connect pneumatic hoses with the pneumatic connectors



1 Allen screws

2 Pneumatic cylinder

3 Pneumatic connector

Figure 65: Mount kicker

8. Mount covering plate (see Clean the separating unit)
9. Mount covering lifting system (see Clean the separating unit)
10. Switch on main switch on the control and energy unit
11. Establish the compressed air supply

8.7 Troubleshooting, error state diagnostics and repairs

The explanation for all error messages for the unit is presented in the file “Fault/error - messages for the DCE system“ (Trouble Shooting) in tabular form. The fault detection, fault status diagnosis and repair or intervention for putting into operation again can take place by experienced qualified specialists from the manufacturer or instructed and specially tasked employees from the user.

8.8 Addresses of customer service branch offices

Service addresses

For a global search for locations, visit the internet1 page:

http://www.stanleyengineeredfastening.com/contact/global-locations

The addresses for the German location are provided in the "Germany" section:

STANLEY Engineered Fastening

Tucker GmbH

Max-Eyth-Str. 1

35394 Giessen

Germany

Tel: +49 (0)641 4050

Fax: +49 (0)641 405300

Customer Service, Technical Service, Office, Manufacturing, R&D, Sales

STANLEY Engineered Fastening

Tucker GmbH

Nikolaus-Otto-Str. 11

35440 Linden

Germany

Tel: +49 (0)641 4050

Fax: +49 (0)641 405300

Customer Service, Office, Manufacturing, R&D, Warehouse, Distribution, Sales

9 Malfunctions during operation

9.1 Mechanical malfunctions on the feeding unit

While operating, mechanical blockages as well as jams may occur during the separation process. If a malfunction does occur on the device, it is indicated by the error message on the DCE operating unit.

9.2 Warning and error messages

All warning and error messages are described in the document “DCE error messages”. The fault codes on the alarm list of the DCE systems include

- Error message
- Cause of error
- Troubleshooting

.

9.3 Safety instructions

<table>
<tr><td rowspan="2"> 
  </td><td>WARNING</td><td rowspan="2">  </td></tr>
<tr><td>Mechanical hazard!
There is a risk of colliding with moving parts in this area. Serious injuries can result.
Use industrial safety equipment!
Make sure that the entire scope of delivery has been installed correctly in accordance with the plan/assembly instructions as well as ergonomic criteria and is operated safely within the working area of the operator.</td></tr>
</table>

	DANGER	
	**You must abide by the following 5 safety - regulations before starting any work on electrical devices and the whole system:** • Switch off (create a voltage-free state by disconnecting) • Secure against switching back on • Check the voltage-free state by measuring it • Set up grounds and short circuits • Cover or fence-off any adjoining equipment that is still live	

9.4 Remove the bunker blockade

Due to jamming of welding studs in front of the outlet sheet, no further welding stud will reach the step separator. A warning appears on the operating unit as soon as the fill level of the feed guide is not reached.

1. Power off the control and power unit

2. Disconnect the compressed air supply

3. Open the filling flap
   - Open the lock on the filling flap
   - Open the filling flap

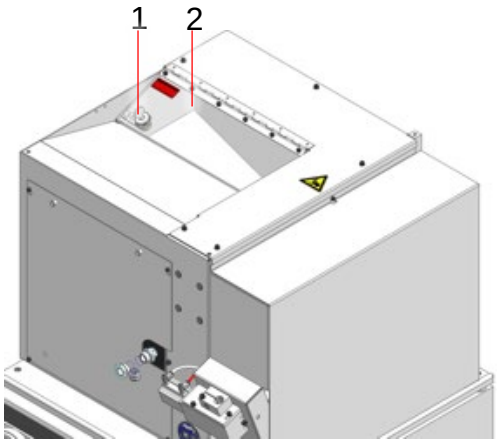


Figure 66: Open the filling flap

1 Locking mechanism

2 Fill flap

4. Loosen blockade

   - Loosen the blockade in front of the outlet sheet using a blunt object

5. Close the filling flap and lock it

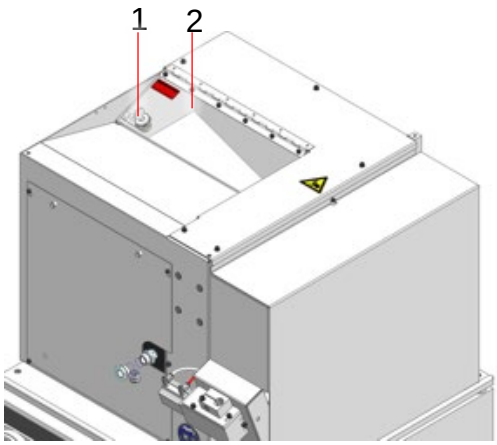


Figure 67: Close filling flap

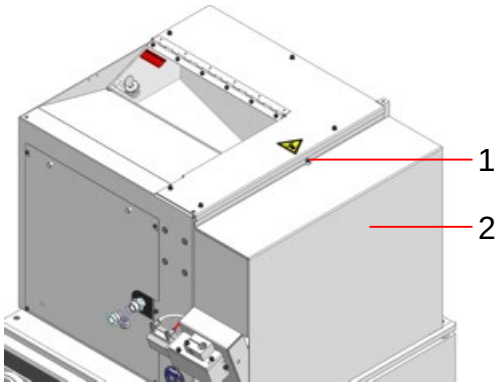
1 Locking mechanism

2 Fill flap

9.5 Remove the stud jam on the separating unit

9.5.1 Remove the jam on the step separator

1. Switch off main switch on the control and energy unit
2. Disconnect the compressed air supply
3. Disassemble the cover
   - Do not remove the Allen screw
   - Remove the cover

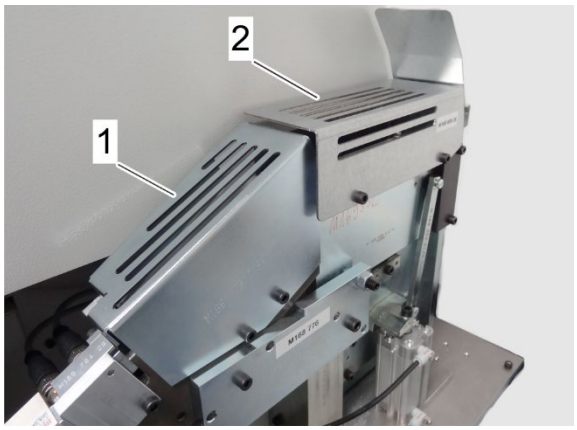


1 Hexagon socket screws

2 Covering

Figure 68: Disassemble the cover

4. Remove protective cover (if required)
   - Loosen the Allen screw (4 pcs) and remove
   - Remove the covering sheet

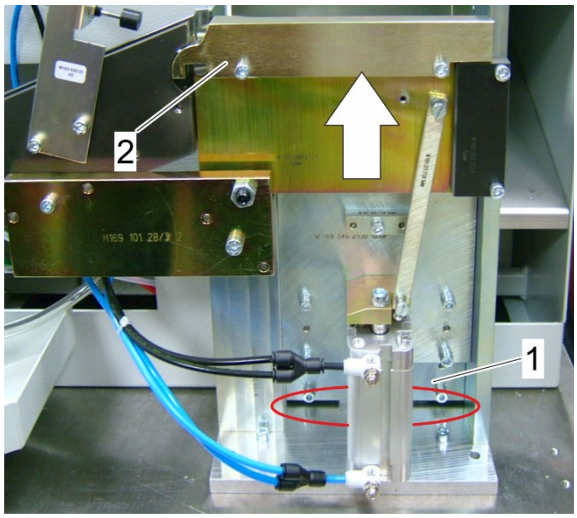


1 Hexagon socket screws

2 Covering

Figure 69: Remove protective cover

5. Remove the stud jam on the lifting system
   - Lift the swivelling plate manually
   - Remove the stud jam on the lifting plate

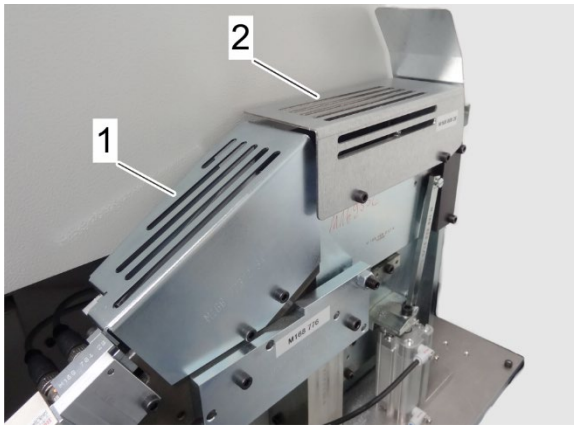


1 Lifting plate

2 Swivelling plate

Figure 70: Remove the stud jam on the lifting system

6. Mount protective cover plate (if required)
   - Position protective cover plate
   - Screw the Allen screws (4 pcs.) into place and tighten them

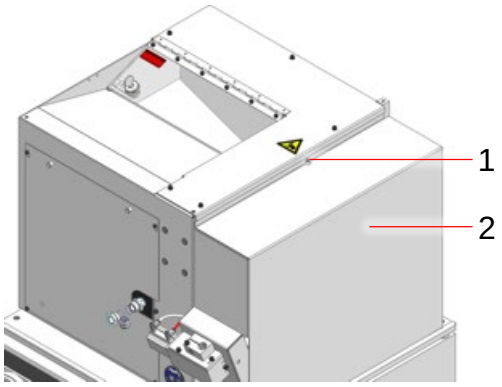


1 Hexagon socket screws

2 Covering

Figure 71: Remove protective cover plate

7. Mount the cover
   - Position covering
   - Screw the Allen screws into place and tighten them



1 Hexagon socket screws

2 Covering

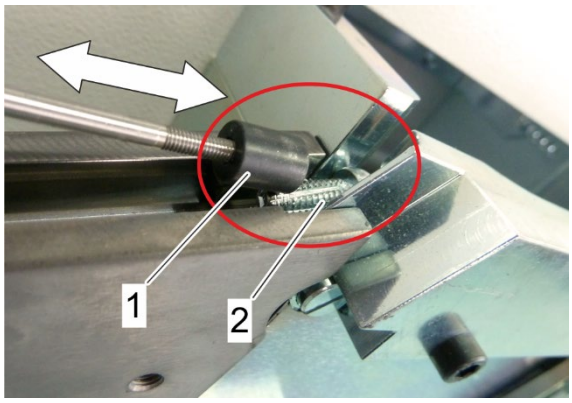
Figure 72: Disassemble the cover

8. Turn on the compressed air supply
9. Switch on main switch on the control and energy unit

9.5.2 Remove jam on the channel slider

1. Switch off main switch on the control and energy unit
2. Disconnect the compressed air supply
3. Disassemble cover (see Remove the jam on the step separator)
4. Remove protective cover plate (if required)

   (see Remove the jam on the step separator)
5. Remove jamming of the channel slider
   - Push back the channel slider manually
   - Remove studs



1 Channel slider

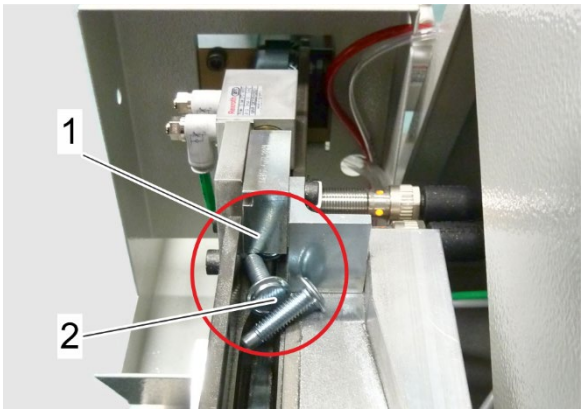
2 Stud

Figure 73: Remove jam on the channel slider

6. Disassemble cover plate (see Remove the jam on the step separator)
7. Disassemble lifting system (see Remove the jam on the step separator)
8. Switch on main switch on the control and energy unit
9. Establish the compressed air supply

9.5.3 Remove jam on the kicker

1. Switch off main switch on the control and energy unit
2. Disconnect the compressed air supply
3. Disassemble cover (see Remove the jam on the step separator)
4. Disassemble cover plate (if present)
   (see Remove the jam on the step separator)
5. Remove jamming of the kicker
   - Remove jammed studs on the kicker



1 Kicker

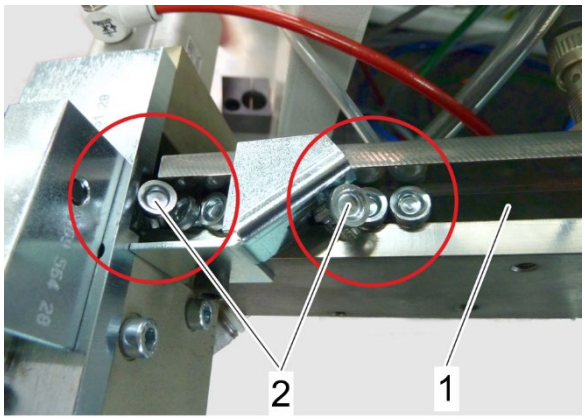
2 Stud

Figure 74: Remove jam on the kicker

6. Disassemble cover plate (see Remove the jam on the step separator)
7. Disassemble lifting system (see Remove the jam on the step separator)
8. Switch on main switch on the control and energy unit
9. Establish the compressed air supply

9.5.4 Remove the jam in the separating unit

1. Switch off main switch on the control and energy unit
2. Disconnect the compressed air supply
3. Disassemble cover (see Remove the jam on the step separator)
4. Disassemble cover plate (if present)
   (see Remove the jam on the step separator)
5. Remove the jam in the separation guide
   - Remove jammed stud from the separation guide



1 Separation guide

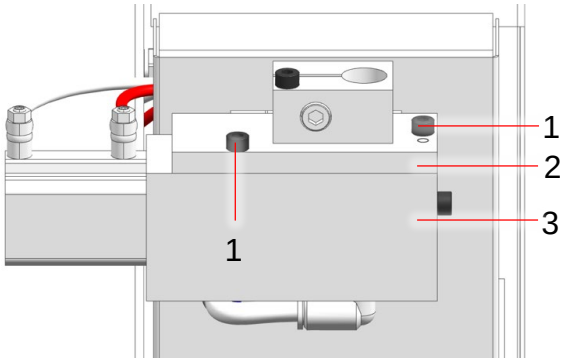
2 Stud

Figure 75: Remove jammed stud on the separation guide

6. Disassemble cover plate (see Remove the jam on the step separator)
7. Disassemble lifting system (see Remove the jam on the step separator)
8. Switch on main switch on the control and energy unit
9. Establish the compressed air supply

9.5.5 Fixing a jam of the separating block

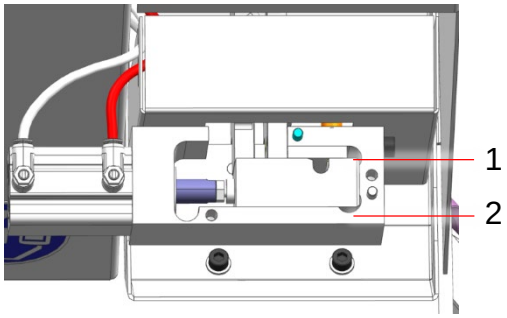
1. Switch off main switch on the control and energy unit
2. Disconnect the compressed air supply
3. Removing the cover plate
   - Loosen the Allen screws (2 pcs.) and unscrew them
   - Remove cover plate with feeding hose from separation block



1 Hexagon socket screws
2 Cover plate
3 Separation block

Figure 76: Remove cover plate

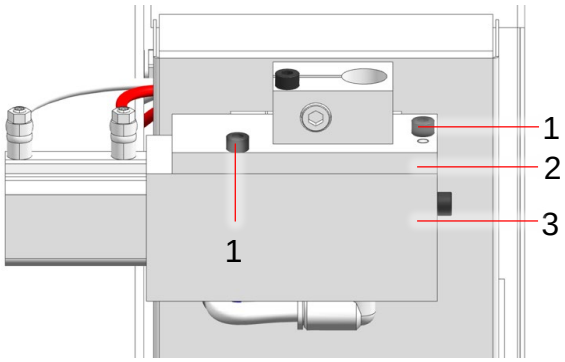
4. Remove stud slider
   - Clean the stud slider and the inner surfaces of the separating block
5. Insert stud slider
   - Place the stud slider on the pneumatic cylinder with the groove facing downward



1 Stud slider
2 Separation block

Figure 77: Remove stud slider

6. Mounting the cover plate
   - Position the cover plate with feeding hose on the separation block
   - Screw the Allen screws (2 pcs.) into place and tighten them



1 Hexagon socket screws
2 Cover plate
3 Separation block

Figure 78: Mounting the cover plate

7. Switch on main switch on the control and energy unit
8. Establish the compressed air supply

10 Lists

10.1 List of spare parts and consumables

A list of the main operating equipment is given in the service manual – SA. This can be delivered separately and contains the files:

Type of support base		Designation
Dimension Drawings	of the	control and energy unit
		SMPS THA1500
Position drawings / arrangement plans	for	control and energy unit
		Sub-assembly: complete housing
		Sub-assembly: assembly plate
		Sub-assembly: door
		Sub-assembly: SMPS THA1500
		Sub-assembly: SMPS Primary THA1500
		Sub-assembly: SMPS Secondary THA1500
		Sub-assembly: Multicoupling
Wiring plans	for	THA1500
		Control terminal
		SMPS
Connection plan	for	Control terminal/control cable
Arrangement and circuit diagrams	for	Circuit board E488A
		Circuit board B225
		Circuit board E476A
		Circuit board E650
		Circuit board BB329
		Circuit board E577A
		Circuit board E486A/B-E
		Circuit board E710A-Z
		Circuit board E567A

Type of support base	Designation
	Circuit board EE484A
	Circuit board E512B
Tables of the	DCE fault messages

10.2 Spare parts list

Step	Type	Parts No.	Designation	Designation	On / weight	Unit	Spare
.4	0008	M070 423	SPONGE RUBBER STRIPS 15X15	15X15 MM 1000 MM LONG	0.360	Pc.	E
.4	0009	M070 423	SPONGE RUBBER STRIPS 15X15	15X15 MM 1000 MM LONG	0.360	Pc.	E
.4		M017 705	HOLDING FRAME FOR THE FILTER MAT		1	Pc.	E
.4	0151	M040 013	DISC ISO7090 B 8.4		8	Pc.	E
.4	152	M030 012	NUT ISO4032 M8		8	Pc.	E
.3	0006	M017 612	FASTENING PLATE	THA 1500	1	Pc.	E
.3	0007	M016 328	FIXING BRACKET	FOR TRANSFORMER	2	Pc.	E
.3	0157	M040 011	DISC ISO7090 B 6.4		4	Pc.	E
.3	301	E001 119	DSE 500 M2 FLANGED PLUG		1	Pc.	E
.3	302	E101 153	POLE TERMINAL PKI 10A BLAU		1	Pc.	E
.3	303	E001 360	ATTACHMENT HOUSING HAN24E		1	Pc.	E
.3		E110 692	LWLLTG DUPLEX-DUPLEX 0.90 M	A4-X9/10;A10-X5/6	1	Pc.	E
.3	0608	E003 097	FUSE DIAZED 25A		3	Pc.	E
.3	0623	E003 096	FUSE DIAZED 2A		3	Pc.	E
.2		Z021 171	SMPS THA1500/1 400V		1	Pc.	
.3	0001	Z021 173	BS SMPS PRIMARY THA1500	400V	1	Pc.	E
.4	0503	E488A	CIRCUIT BOARD AUX8 400-500V		1	Pc.	E
.5		E009 265	RESISTOR KH 2.2 KOHM 7 W		1	Pc.	E
.5		E003 215	FUSE G 0.5A T 6.3X32	US-VERSION UL-LISTED	1	Pc.	E
.4	0504	E100 638	CIRCUIT BOARD B225 IGBTRCD/VB		1	Pc.	E
.4	0505	E476A	CIRCUIT BOARD IGBT-DRIVER		1	Pc.	E
.3	0002	Z021 174	BS SMPS SECONDARY THA1500	NORMAL POLARITY	1	Pc.	E
.4	0004	M069 191	INSULATION FILM		1	Pc.	E
.4	0010	M017 718	SPACER BUSHING	SMPS	1	Pc.	E
.4	0519	E009 203	TEMPERATURE SENSOR NTC 10K		1	Pc.	E
.4	0535	E007 166	DIODE SKND205F06	SEMIKRON	4	Pc.	E
.3	0003	E003 027	FUSE G 1.00A MT 5X20		1	Pc.	E
.3	0004	E003 027	FUSE G 1.00A MT 5X20		1	Pc.	E
.3	0005	E003 118	FUSE G 1.00A T 5X20		1	Pc.	E
.3	0006	E003 003	FUSE G 0.25A MT 5X20		1	Pc.	E
.3	0007	E003 027	FUSE G 1.00A MT 5X20		1	Pc.	E
.3		E486B	CIRCUIT BOARD DCE RAM MODULE	2 MBYTE BATTERY BUFFERED	1	Pc.	E
.3		E003 241	FUSE HOLDER 5X20 STE.	WITH CAP	1	Pc.	E
.3	0501	E003 027	FUSE G 1.00A MT 5X20		1	Pc.	

Step	Type	Parts No.	Designation	Designation	On / weight	Unit	Spare
.3	0502	E003 173	FUSE G 2.0A TT 5X20		1	Pc.	E
.3	0501	E003 158	FUSE G 0.315A MT 5X20		1	Pc.	E
.4		M012 537	PLASTIC GRIP, LIGHT GREY	OPERATING DEVICE OLD	1	Pc.	E
.3		E484A	OPERATING DEVICE CIRCUIT BOARD		1	Pc.	E
.4		E004 113	DISPLAY 16X40 CHARACTERS		1	Pc.	E

10.3 Consumables list

A list of the consumables is not necessary!

11 Decommissioning

11.1 Safety instructions

REFERENCE

First, observe the safety instructions in chapter 4.7.8 and then proceed here.

11.2 Decommissioning sequence

11.2.1 Power down

Switch OFF the control unit at the main switch. The indicator LED is OFF.

Remove all cables and lines as described from Chapter 11.5 Disassembly and removal.

Check that no voltage is present using a suitable tool.

11.3 Conservation when stopped (storage and protection)

Short time: Keep all parts free of dust and dry within the specifications for transportation and storage in accordance with chapter 5.2.

Long time: Keep all parts free of dust and dry within the specifications for transportation and storage in accordance with chapter 5.2.

Remove all cables and lines as described from Chapter “Disassembly and removal”.

If increased emissions of dust, aerosols or air humidity are expected, spray all external parts with a common, industrially used conservation agent for corrosion protection, for example ARDROX 396/1M by CHEMETALL, add a desiccant and wrap everything air-tight with polyethylene films.

11.4 Repacking for re-transporting

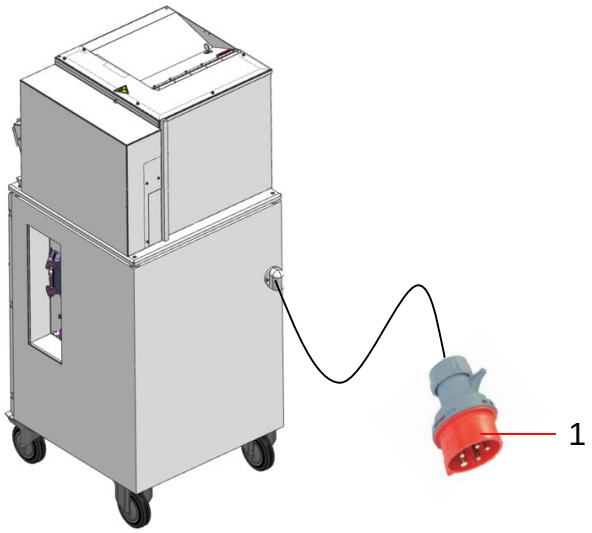
Add a desiccant and wrap everything with polyethylene film. Lift the unit and place it into a cardboard box and onto a pallet with lateral crates. Close the cardboard box and provide it with a transport sticker or the delivery papers, respectively. Tie the packaged unit down against sliding around on the pallet.

If transportation across multiple intermediate stations is required – road, rail, water, air – place the unit wrapped in polyethylene film in an airtight manner into a transport crate, tie it to the ground, add a desiccant and close the lid as intended. Close the transport box with the transport sticker or the delivery papers, respectively.

11.5 Dismantling and removal

1. Disconnect the power supply

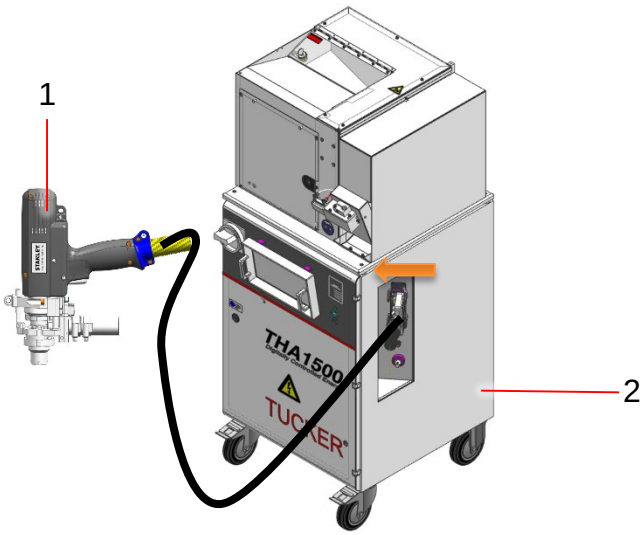
- Set the main switch to the position OFF
- Pull the CEE plug out of the CEE socket



1 CEE plug

Figure 79: Disconnect the power supply

2. Disassemble the stud welding gun
   - Open the locking mechanism of the multicoupling open and pull out the plug

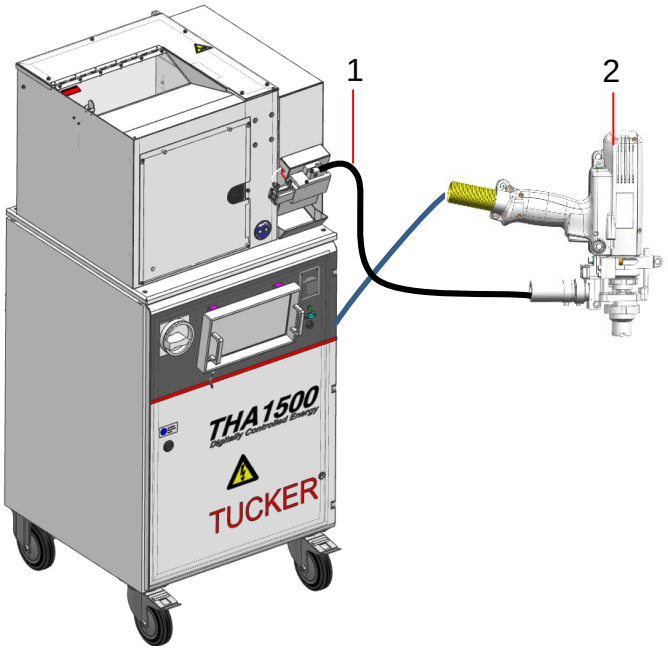


1 Stud welding gun

2 Multicoupling

Figure 80: Disassemble the stud welding gun

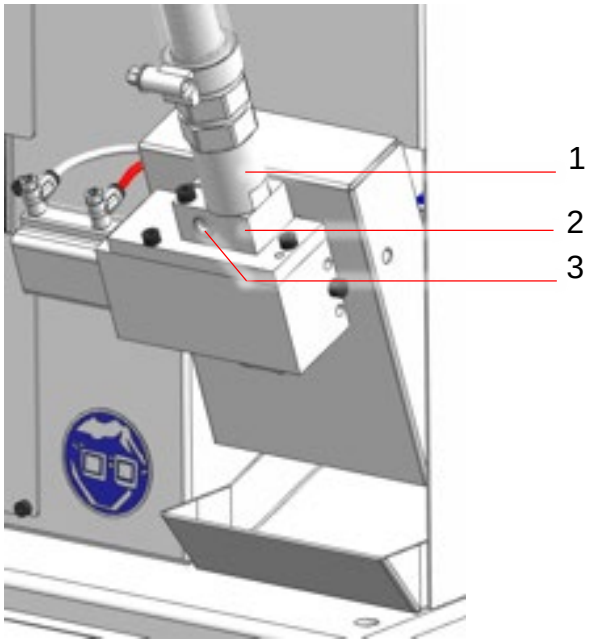
3. Dismantling of feeding hose
   - Loosen the clamping screw, do not remove it
   - Pull off the feeding hose
   - Tighten the clamping screw



1 Feeding hose

2 Stud welding gun

Figure 81: Dismantling of feeding hose



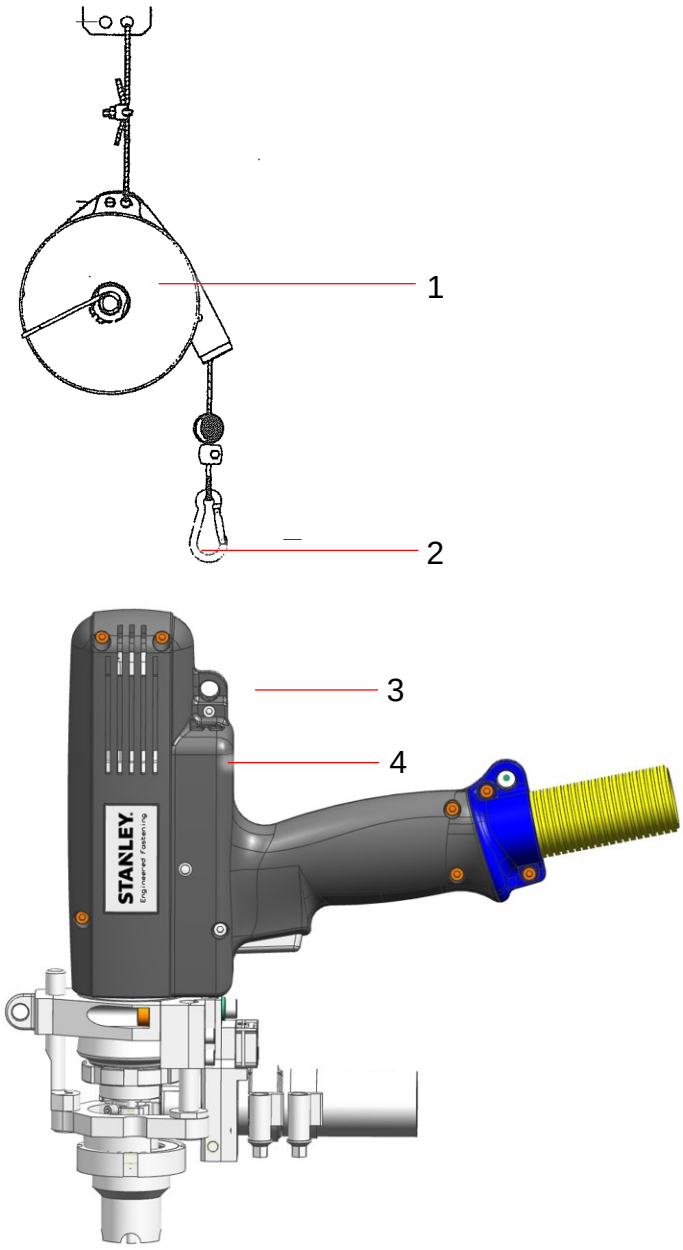
1 Feeding hose

2 Coupling piece

3 Clamping screw

Figure 82: Dismantling of feeding hose

4. Hook the stud weld gun onto the spring balancer
   - Hook the spring hook onto the fastening point



1 Spring balancer
2 Spring hook
3 Fastening point
4 Stud welding gun

Figure 83: Hook the stud weld gun onto the spring balancer

5. Connect up the ground cable and ground measuring cable
   - Disconnect the grip or earthing cable clamp from the workpiece
   - Pull out ground measurement cable
   - Turn the ground cable to the left and remove it

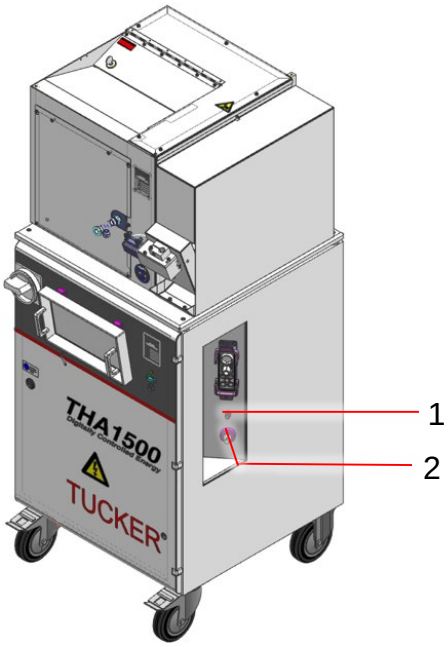


Figure 84: Disassemble the ground cable

1 Ground measurement cable bush

2 Ground connection plug

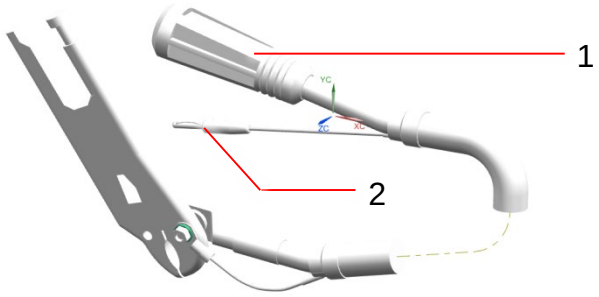


Figure 85: Grip universal clamp

1 Ground cable

2 Ground measurement cable

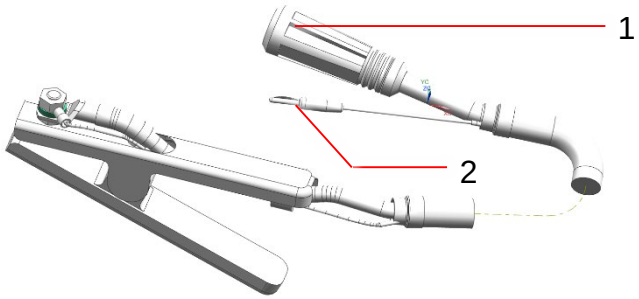
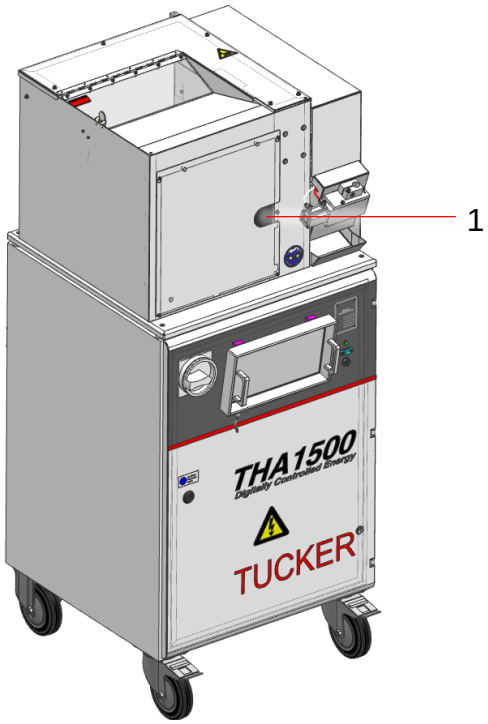


Figure 86: Earthing cable clamp

6. Disconnect the compressed air supply
   - Loosen the locking mechanism for the compressed air coupling and detach the compressed air line



1 Compressed air connection

Figure 87: Disconnect the compressed air feed line

11.6 Disposal

All procedures and activities for removing or recycling waste are summarized under the collective term "disposal".

11.6.1 Guidelines and regulations

The national waste disposal directive or a comparable, binding regulation serves as the basic framework for waste disposal in the user's or operator's country.

The disposal of waste in the industrial/commercial sector is governed by regulations regarding the removal or recycling of waste products. Every holder of waste must dispose of his waste in an autonomous fashion, which means that he must take measures to collect, separate, recycle waste to the possible extent or to deposit the waste after pretreatment (reduction of volumes and removal of pollutants, particularly using waste incineration plants).

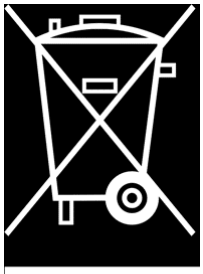
Alternatively: The disposal can be carried out by specialist disposal companies in accordance with applicable national and regional guidelines. Special requirements are placed on the disposal of special waste.

The European Commission has issued WEEE-Directive 2002/96/EC on the reduction of increasing amounts of electronic waste from unused electronic and electric devices. The goal is to avoid and reduce the creation of electronic waste as well as promote the environmentally friendly disposal of the increasing amounts of electronic waste by instating an expanded manufacturer's responsibility.

VDI-Guideline 2343 provides information and recommendations for action on handling old electric and electronic devices and includes aspects regarding basics, logistics, dismantling, processing, recycling, marketing and reuse.

Guideline	Issue	Title
VDI 2343 Sheet 1:2001-05	2001-05	Recycling of electrical and electronic products - Principles and terminology
VDI 2343 Sheet 2:2010-02	2010-02	Recycling of electrical and electronical equipment - Logistics
VDI 2343 Sheet 3:2009-04	2009-04	Recycling of electrical and electronical equipment - Disassembly
VDI 2343 Sheet 4:2012-01	2012-01	Recycling of electrical and electronic equipment - Preparation techniques
VDI 2343 Sheet 5:2014-11	2014-11	Recycling of electrical and electronic equipment - Material and thermal recycling and removal

VDI 2343 Sheet 7:2014-12	2014-12	Recycling of electrical and electronical equipment - Re-use



WEEE Guideline 2002/96/EC

The symbol for the separate collection of electric and electronic devices is a crossed garbage can on wheels.

This means that special waste should not be treated during the usual disposal but as special waste through environmentally friendly disposal.

Figure 88: Symbol for the separate collection of electric and electronic devices

11.6.2 Measures at the user/operator

The packaging used by the manufacturer is environmentally friendly and materials are named and designated. Disposal is governed by the packaging regulations.

You, as the user/operator, have to properly dispose of the packaging in accordance with the regulations in your country.

If no retrieval or disposal agreement has been made with the manufacturer, dismantle the components of the product and sort them in accordance with material types and condition.

Dispose of the waste separated by type in accordance with your national and regional guidelines.

11.6.3 Transferred retrieval obligation

The buyer assumes the obligation to properly dispose of the purchased product (electric devices) after he ceases using the device on his own responsibility and costs in accordance with the legal provisions of the Electronic Equipment Act.

12 Annex

Index

12.1 List of Figures

12.2 Specialised terms, acronyms and abbreviations

Acronym	Technical terms	Explanation
A	Physical SI unit Amps	Unit of measurement for electrical current
Bar	Physical SI unit bar	Unit of measurement for gas pressure, atmospheric pressure
BTA	Operating manual	
D	Physical SI unit day	
dB	Physical SI unit decibel	Unit of measurement for sound pressure
dB (A)	Physical SI unit decibel rating	Weighted according to Filter class A
EBE	Declaration of incorporation	
GA	Instruction manual	
h	Physical SI unit hours	Measuring unit for 1 hour
Hz	Physical SI unit periodicity	Measuring unit for oscillations per second
ISH	Maintenance	The short form used in the manual; en MRO
Y	Unit used for a year	Time measurement unit
K	Physical SI unit (Kelvin)	Temperature measuring unit
KFE	Declaration of Conformity	
kg	Physical SI unit for mass m (weight)	Ground measuring unit
KVA	Physical SI unit (KVA)	Measuring unit for electrical power 1,000 VA
lm	Physical SI unit Lumens	Lighting current measuring unit
Lux	Physical SI unit	Measuring unit for lighting strength
m²	Physical SI unit area	Measuring unit for square-metre
MRL	Machine Directive	
ms	Physical SI unit milliseconds	Measuring unit for time
MRO	Maintenance, repair, overhaul	An equivalent to ISH
MTA	Assembly Instructions	
NSR	Low voltage directive	
SA	Service manual	
Pa; kPa	Physical SI unit Pascal	Unit of measurement for gas pressure, 1 Pa = 1 $N \cdot m^{-2}$; 100 kPa = 1 bar
V AC	Physical SI unit V AC	Measuring unit for electrical voltage(s): V AC
SPR	Self-Pierce Riveting	Trademark
ϑ	Physical SI size temperature	Greek Small Theta symbol

EC declaration of conformity pursuant to machinery directive 2006/42/EC Appendix II 1A

Document name: KFE_THA1500_00_en

Manufacturer and authorised representative for assembling manufacturer technical documentation:

Technical Documentation

STANLEY Engineered Fastening
TUCKER GmbH
Max-Eyth-Straße 1
35394 Gießen
Germany

Product designation:	Electric arc stud welding system for use in stationary manual workstations with handheld electrically or electro-pneumatically operated welding guns.
Product model:	THA1500/X – Insert stud manually in the welding gun THA1500/F – Feed studs automatically to the welding gun
Serial number:	
Production year from:	2016

The manufacturer declares that the product indicated above fulfils all relevant provisions and the requirements of the following applicable directives:

2006/42/EC – Machine directive

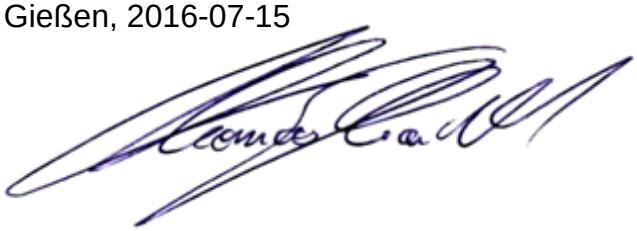
The conformity assessment was conducted for machines not subject to Appendix IV with internal production control for production of machines according to Appendix VIII. References to the directives, as published in the Official Journal of the European Community.

The following harmonized standards were used:

DIN EN ISO 12100: 2011-03	General principles for design - Risk assessment and risk reduction
DIN EN ISO 12100 +A1: 2013-08	General principles for design - Risk assessment and risk reduction; amendment to DIN EN ISO 12100:2011-03
DIN EN 60204-1: 2011-01	Safety of machinery - Electrical equipment of machines - Part 1: General requirements + 2014 draft

Represented by the chief executive officer: Thomas Ehrhardt

Location, date: Gießen, 2016-07-15



Observe the safety instructions in the included product user information!

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