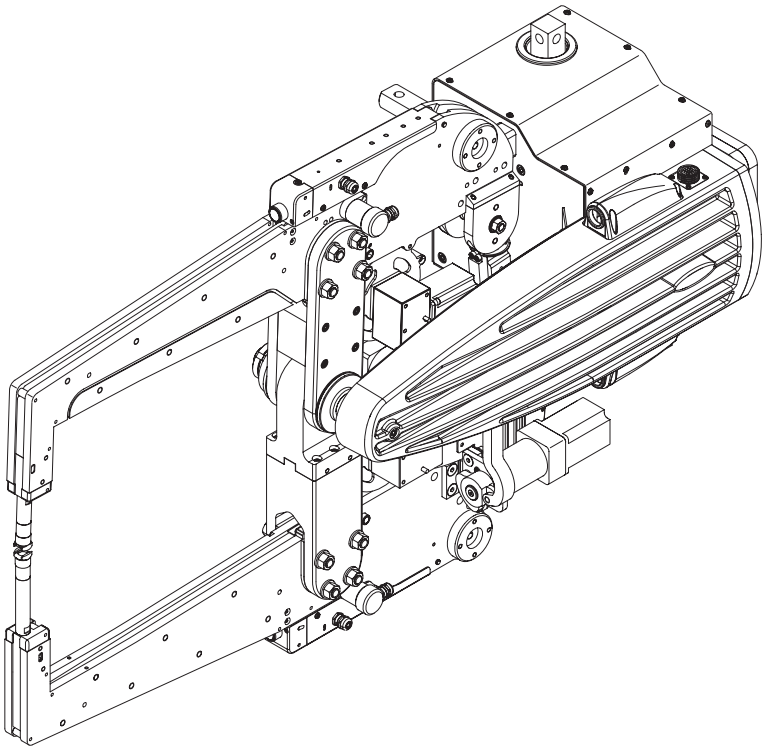
GB Operating Instructions
Spare Parts List

Resistance welding gun

DeltaSpot



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Dear Reader

Introduction

Thank you for choosing Fronius - and congratulations on your new, technically high-grade Fronius product! This instruction manual will help you get to know your new machine. Read the manual carefully and you will soon be familiar with all the many great features of your new Fronius product. This really is the best way to get the most out of all the advantages that your machine has to offer.

Please also take special note of the safety rules - and observe them! In this way, you will help to ensure more safety at your product location. And of course, if you treat your product carefully, this definitely helps to prolong its enduring quality and reliability - things which are both essential prerequisites for getting outstanding results.

Safety rules

DANGER!

„DANGER!“ indicates immediate and real danger. If it is not avoided, death or serious injury will result.

WARNING!

„WARNING!“ indicates a possibly dangerous situation. Death or serious injury may result if appropriate precautions are not taken.

CAUTION!

„CAUTION!“ indicates a situation where damage or injury could occur. If it is not avoided, minor injury and/or damage to property may result.

NOTE!

„NOTE!“ indicates a risk of flawed results and possible damage to the equipment.

Important!

„Important!“ indicates tips for correct operation and other particularly useful information. It does not indicate a potentially damaging or dangerous situation.

If you see any of the symbols depicted in the „Safety rules“, special care is required.

General remarks

The device is manufactured using state-of-the-art technology and according to recognised safety standards. If used incorrectly or misused, however, it can cause

- injury or death to the operator or a third party,
- damage to the device and other material assets belonging to the operator,
- inefficient operation of the device.

All persons involved in commissioning, operating, maintaining and servicing the device must

- be suitably qualified,
- have sufficient knowledge of resistance welding and
- read and carefully follow these operating instructions as well as the operating instructions for all system components.

The operating instructions must always be at hand wherever the device is being used. In addition to the operating instructions, generally applicable and local regulations regarding accident prevention and environmental protection must be made available and observed.

General remarks
(continued)

All safety and danger notices on the device
- must be kept in a legible state
- must not be damaged/marked
- must not be removed
- must not be covered, pasted or painted over.

For the location of the safety and danger notices on the device, refer to the section headed „General remarks“ in the operating instructions for the device.

Before switching on the device, remove any faults that could compromise safety.

Your personal safety is at stake!

Utilisation in accordance with „intended purpose“

The device is to be used exclusively for its intended purpose.

The device is intended exclusively for the welding process described in the rating plate.
Utilisation for any other purpose, or in any other manner, shall be deemed to be „not in accordance with the intended purpose“. The manufacturer shall not be liable for any damage resulting from such improper use.

Utilisation in accordance with the “intended purpose” also comprises
- reading all operating instructions carefully and following them thoroughly
- studying and obeying all safety and danger notices carefully
- performing all stipulated inspection and servicing work.

The device must not be used for the following applications:
- thawing out pipes
- charging batteries/accumulators
- starting engines

The device is designed for use in industry and the workshop. The manufacturer accepts no responsibility for any damage caused through use in living quarters.

The manufacturer likewise accepts no liability for inadequate or incorrect results.

Environmental conditions

Operation and/or storage of the device outside the stipulated area will be deemed as „not in accordance with the intended purpose.“ The manufacturer shall not be liable for any damage resulting from such improper use.

Surrounding temperature:
- during operation: -10 °C to + 40 °C (14 °F to 104 °F)
- for transport and storage: - 25 °C to + 55 °C (-13 °F to 131 °F)

Relative humidity:
- up to 50 % at 40 °C (104 °F)
- up to 90 % at 20 °C (68 °F)

Ambient air: free from dust, acids, corrosive gases and substances, etc.

For use at altitudes above sea level: up to 2000 m (6500 ft)

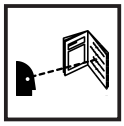
Obligations of the operator

The operator undertakes to allow only such people to work with the device who:

- are familiar with the fundamental instructions regarding safety and accident prevention, and have been instructed how to use the device
- have read and understood the „Safety rules“ section and warning notices in these operating instructions, and then signed them to confirm this
- are trained to produce the required results.

Checks must be carried out at regular intervals to ensure that operators are working in a safety-conscious manner.

Obligations of personnel



Before using the device, all persons instructed to do so undertake to:

- follow the basic instructions regarding safety at work and accident prevention
- read the „Safety rules“ section and warning notices in these operating instructions, and sign them to confirm that they have understood them and will follow them.

Before leaving the work area, ensure that no-one or nothing can come to any harm in your absence.

Protecting yourself and others

Anyone involved with welding exposes themself to numerous risks e.g.:

- flying sparks, hot pieces of metal flying around

- hazardous electromagnetic fields, which risk the lives of those using cardiac pacemakers

- risk of electrocution from mains current and welding current

- greater noise pollution

- harmful welding smoke and gases

Anyone working on the workpiece whilst welding is taking place must wear suitable protective clothing with the following properties:

- flame-resistant
- insulating and dry
- covers the whole body, is undamaged and in good condition
- Safety helmet
- trousers with no turn-ups

Protecting yourself and others
(continued)

Protective clothing refers to a variety of different items. Operators should

- protect eyes and face from UV rays, heat and sparks with regulation protective visor with filter.
- wear regulation protective goggles with side protection behind the safety visor.
- wear solid footwear that provides insulation even in wet conditions
- protect the hands with suitable gloves (electrically insulated and providing protection against heat).

Insulated ear protectors should be worn to reduce the harmful effects of noise and to prevent injury.

Keep all persons, especially children, out of the working area while any devices are in operation or welding is in progress. If, however, there are people in the vicinity,

- make them aware of all the dangers (risk of dazzling by arc, injury from sparks, inhaling welding smoke, noise, possible danger from mains or cutting current, etc),
- provide suitable protective equipment or
- erect suitable safety screens/curtains.

Danger from toxic gases and vapours

The smoke produced during welding contains harmful gases and vapours.

This smoke contains substances which may, under certain circumstances, cause birth defects or cancer.

Keep face away from welding smoke and gases.

Smoke and hazardous gases,

- must not be breathed in
- must be extracted from the working area using appropriate methods.

Make sure the area is well ventilated.

Otherwise, a protective mask with air supply must be worn.

If there is any doubt about whether the extraction system is powerful enough, then the measured toxic emission values should be compared with the permissible limit values.

The following components are responsible, amongst other things, for the welding smoke's degree of toxicity:

- Metals used for the workpiece
- Coating of the process tapes
- Coatings of the materials
- Cleaners, degreasers etc.

The relevant material safety data sheets and manufacturer's specifications for the listed components should therefore be studied carefully.

Flammable fumes (e.g. solvent fumes) should be kept away from the direct welding process.

Danger from flying sparks

Flying sparks may cause fires or explosions.

Never weld close to flammable materials.

Flammable materials must be at least 11 metres (35 ft) away from the welding process, or alternatively covered with a checked cover.

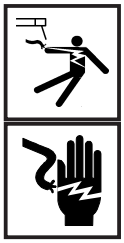
A suitable, tested fire extinguisher must be available and ready for use.

Sparks and pieces of hot metal may also get into adjacent areas through small gaps or openings. Take appropriate precautions to prevent any danger of injury or fire.

Welding must not be performed in areas that are subject to fire or explosion or near sealed tanks, vessels or pipes unless these have been prepared in accordance with the relevant national and international standards.

Do not carry out welding on containers which are being or have been used to store gases, propellants, mineral oils or similar products. Residues pose an explosive hazard.

Risks from mains current and welding current



An electric shock can be fatal. Every electric shock is potentially life threatening

Do not touch live parts either inside or outside the device.

Make sure that you and others are protected with an adequately insulated, dry temporary backing or cover for the earth or ground potential. This backing or cover must extend over the entire area between the body and the earth or ground potential.

All cables and leads must be complete, undamaged, insulated and adequately dimensioned. Loose connections, scorched, damaged or inadequately dimensioned cables and leads must be repaired/replaced immediately .

Have the mains and device supply checked regularly by a qualified electrician to ensure the PE conductors are functioning properly.

The device must only be operated on a mains supply with a PE conductor and a socket with an earth contact.

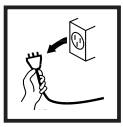
If the device is operated on a mains without a PE conductor and in a socket without an earth contact, this will be deemed to be gross negligence. The manufacturer shall not be liable for any damage resulting from such improper use.

If necessary, provide an adequate earth connection for the workpiece.

Switch off unused devices.

Wear a safety harness if working at great heights.

Risks from mains current and welding current (continued)



Before working on the device, switch it off and disconnect it from the mains supply.

Attach a clearly legible and easy-to-understand warning sign to the device to prevent anyone from reconnecting it to the mains and switching it on again.

After opening the device:
- discharge all components that are electrically charged
- ensure that all components in the device are de-energised.

If work on live parts cannot be avoided, appoint a second person to switch off the main switch at the right moment.

Meandering welding flows

If the following instructions are ignored, meandering welding flows can develop with the following consequences:
- Fire hazard
- Overheating of parts connected to the workpiece
- Irreparable damage to P.E. conductors
- Damage to device and other electrical equipment

EMC measures

Warning, electromagnetic field Electromagnetic fields may pose as yet unknown risks to health.

It is the operator's responsibility to ensure that no electromagnetic interference occurs in electrical and electronic devices.

If electromagnetic interference is detected, the operator is obliged to take action to rectify the situation.

Check for possible problems, and check and evaluate neighbouring devices' resistance to interference according to national and international requirements:
- safety components
- power, signal and data transfer lines

- computer and telecommunications devices
- measuring and calibrating devices
- the health of neighbouring persons

Precautions against EMC problems:

a) Mains supply
- if electromagnetic interference arises despite correct mains connection, additional measures are necessary (e.g. use a suitable line filter).

b) Welding leads
- should be as short as possible
- allow them to run closely together
- keep them far from other leads

c) Potential equalisation

EMC measures
(continued)

d) Earthing the workpiece
- If necessary, establish earth connection using suitable capacitors.

e) Screening, if necessary
- screen off other devices nearby
- screen off entire welding installation

f) Prohibited to persons with pacemakers:
The strong magnetic fields generated by resistance welding will interfere with the function of pacemakers. This can have serious health consequences for the affected person.
Persons with pacemakers must not remain in the immediate vicinity of welding operations.

g) Prohibited to persons with metal implants:
Persons with metal implants may not work with a resistance welding device and must not remain in the vicinity when welding is being carried out.

h) You should not be carrying magnetic or electronic data carriers:
Magnetic electronic data carriers can be damaged by the magnetic fields generated by resistance welding.

i) You should not be carrying watches or metal parts:
You should not be carrying watches or metal parts: Watches can be damaged when operating resistance welding devices.

Specific hazardous areas

Keep hands, hair, clothing and tools away from moving parts, for example:
- Cogs
- Rollers
- Shafts
- Arms

Do not reach into rotating drive parts

Danger of crushing
Do not place hands or other body parts between the welding electrodes

Danger of shearing
Wear safety gauntlets when handling sharp edged objects.

Covers and side panels may only be opened/removed while maintenance or repair work is being carried out.

During operation
- ensure that all covers are closed and all side panels are fitted properly.
- Keep all covers and side panels closed.

Specific hazardous areas
(continued)

Never touch the workpiece, electrodes or process tape during or after welding - risk of burns.

Welding residues can jump off cooling work pieces. The specified protective equipment must therefore also be worn when reworking workpieces, and steps must be taken to ensure that other people are also adequately protected.

Welding electrodes, process tape and other parts with a high operating temperature must be allowed to cool down before handling.

Special provisions apply in areas at risk of fire or explosion - observe relevant national and international regulations.

Danger of scalding from escaping steam. Switch off cooling unit before detaching water feed or return lines.

Use only suitable load-carrying equipment when transporting devices by crane.
- Hook chains and/or ropes onto the suspension points provided on the load-carrying equipment.
- Chains/ropes must be at the smallest angle possible to the vertical.

Safety measures at the installation location and during transport

A device that topples over can easily kill someone. Place the device on a solid, level surface.

Special regulations apply in rooms at risk of fire or explosion
- observe relevant national and international requirements.

Use internal directives and checks to ensure that the workplace environment is always clean and clearly laid out.

Only set up and operate the device in accordance with the degree of protection shown on the rating plate.

When setting up the device, ensure there is a gap of 0.5 m (1.6 ft.) all round so that cooling air can enter and exit unhindered.

When transporting the device, observe the relevant national and local guidelines and accident prevention regulations. This applies especially to guidelines regarding the risks arising during transportation.

Before transporting the device, allow coolant to drain completely and detach components.

After transporting the device, and before commissioning, you MUST carry out a visual inspection to check whether it has been damaged in any way. Any damage must be repaired by trained service personnel before commissioning takes place.

Safety measures in normal mode

Only operate the device when all protection devices are fully functional. If the protection devices are not fully functional, there is a risk of
- injury or death to the operator or a third party,
- damage to the device and other material assets belonging to the operator,
- inefficient operation of the device.

Any safety devices that are not functioning properly must be repaired before switching on the device.

Never bypass or disable protection devices.

Before switching on the device, ensure that no one is likely to be endangered.

- Check the device at least once a week for obvious damage and proper functioning of safety devices.
- Use only appropriate coolant. Note the information provided by the manufacturer of the cooling system
- If damage results from using a different coolant the manufacturer accepts no liability. In addition, all warranty claims are forfeited.
- Check the coolant level before you start to weld while the system is still cool.

Maintenance and repair

It is impossible to guarantee that bought-in parts are designed and manufactured to meet the demands made on them, or that they satisfy safety requirements. Use only original replacement and wearing parts (also applies to standard parts).

Do not carry out any modifications, alterations, etc. without the manufacturer's consent.

Components that are not in perfect condition must be changed immediately.

When ordering, please give the exact designation and part number as shown in the spare parts list, as well as the serial number of your device.

Carrying out a safety inspection

The operator is obliged to arrange a safety inspection of the device at least once every 12 months.

A safety inspection must be carried out by a qualified electrician
- after any changes are made
- after any additional parts are installed and after any conversions
- after repair, care and maintenance
- at least every twelve months.

For safety inspections, follow the appropriate national and international standards and directives.

Further details on safety inspections can be obtained from your service centre. They will provide you on request with any documents you may require.

Disposal

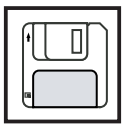
Do not dispose of this device with normal domestic waste!
To comply with the European Directive 2002/96/EC on Waste Electrical and Electronic Equipment and its implementation as national law, electrical equipment that has reached the end of its life must be collected separately and returned to an approved recycling facility Any device that you no longer require must be returned to our agent, or find out about the approved collection and recycling facilities in your area.
Ignoring this European Directive may have potentially adverse affects on the environment and your health!

Safety

Devices with the CE mark satisfy the fundamental requirements of the low-voltage and electromagnetic compatibility directive.

Devices with the CSA test mark satisfy the requirements of the relevant standards in Canada and the USA.

Data protection



The user is responsible for the safekeeping of any changes made to the factory settings. The manufacturer accepts no liability for any deleted personal settings.

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Contents

General remarks

Principle

The DeltaSpot resistance spot welding system is a revolutionary system in spot welding technology. The newly developed system with continuous process tapes allows you to welded steel, galvanised sheet and aluminium and to mix materials such as steel plate with aluminium. The process tapes protect the electrodes and the materials to be joined and prevent spattering.

The continuous advance of the process tape enables spot welds of equally high quality to be produced throughout several shifts.

The result is previously unmatched precision in the welding process, exact quality control and maximum service life for the electrodes.

Device concept

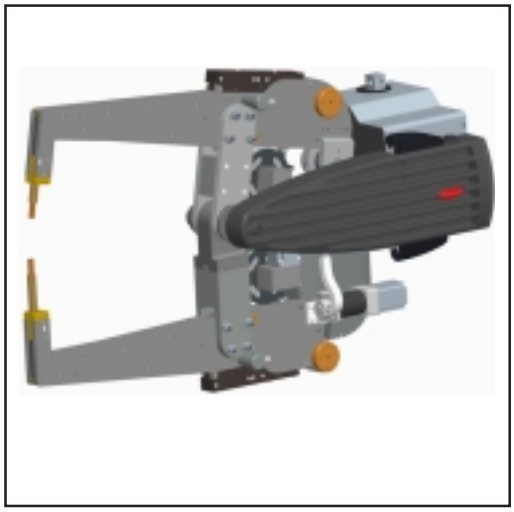


Fig.1 X-welding gun

This new resistance welding system features outstanding flexibility and is well able to cope with challenging jobs. This reason is thanks to the well thought out design of the welding guns, and the easily controlled operating procedures.

The system also enables every single spot weld within an ongoing production run to be detected and analysed.
The optional integration of the quality assurance system „QMaster“ allows continuous monitoring of the ongoing process. Welding faults can therefore be recognised quickly, thereby reducing costly subsequent quality checks.

Areas of utilisation

The DeltaSpot spot welding process is designed for joining two or more sheets of standard coated or uncoated steels and all standard aluminium alloys. It is also ideal for welding different combinations and thicknesses of materials (Usibor, CrNi, etc.).

Main application areas:
- Automobile and component supply industry
- Domestic appliances industry
- Aircraft construction
- Plant, machine and container construction, steel engineering

Scope of supply

System is supplied with:

- Holder main body x 500 + arms, sandwich design
- Medium frequency transformer (1000 Hz) water-cooled
- Holder drive
- Servo-electric holder adjustment
- Holder control
- Industrial PC for graphical display of control functions (Fronius Xplorer)
- DeltaRemote remote control
- DeltaRemote plus remote control (optional)
- Quality assurance system (optional)
- Process tape
- Electrodes, water-cooled
- Guide bushes
- Elastomer springs

Information for dimensioning the welding plant

CAUTION! Overloading the welding plant may result in damage to property. Check the inverter and the transformer are configured correctly for the respective application.

To prevent components from being overloaded, it is necessary to define the load capacity of the inverter and the transformer in relation to each job.

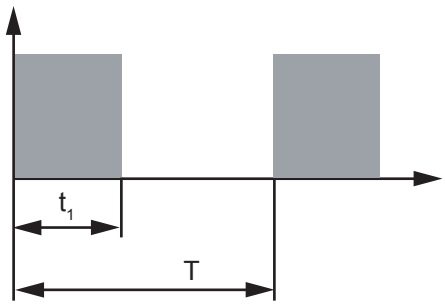
Load capacity diagrams define the maximum permitted welding current in relation to the duty cycle.

Operating points need to be defined both for the transformer and for the inverter. The lower of the two values should be used for the application.

The duty cycle is calculated as follows:

$$X = \frac{t_1 \times 100}{T}$$

t_1 Duty time, welding time
T Duration
X On-time



Information for dimensioning the welding plant
(continued)

Example:
The welding time is 180 ms and cycle time is 4 s

The on-time is accordingly ED = t_1 / T x 100 % = 0.18 s / 4 s x 100 % = 4.5 %

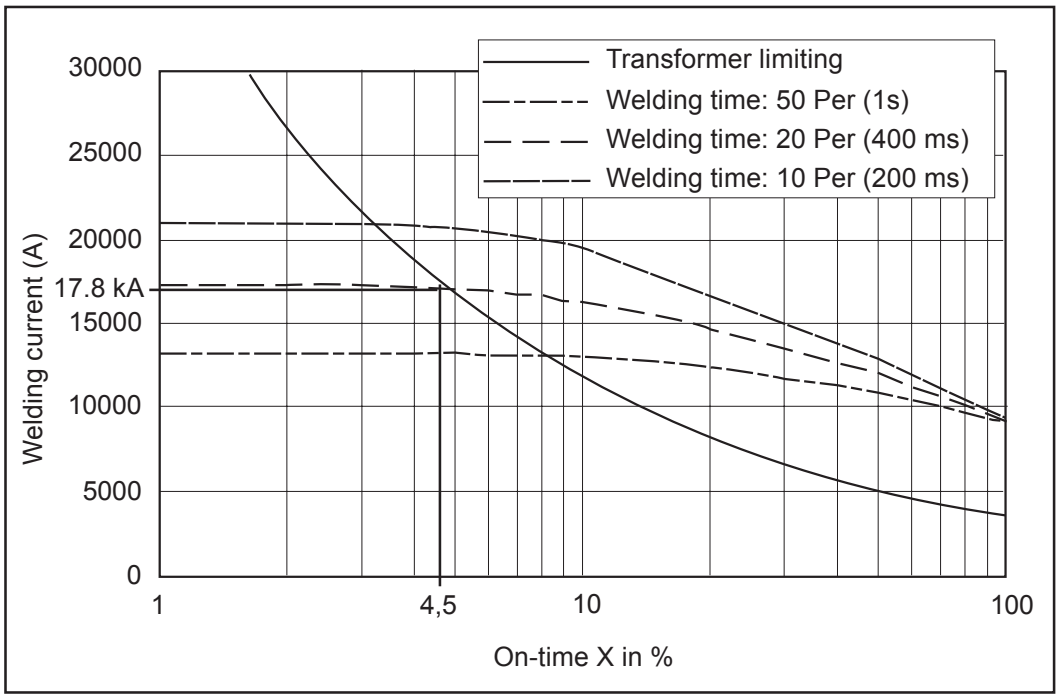


Fig.2 Diagram for dimensioning the welding gun

System components

General remarks

Using the medium frequency technique the weight of the welding transformer can be significantly reduced.

Reaching a greater operating frequency with medium frequency welding can result in a significant reduction of the weight and volume of the welding transformer.

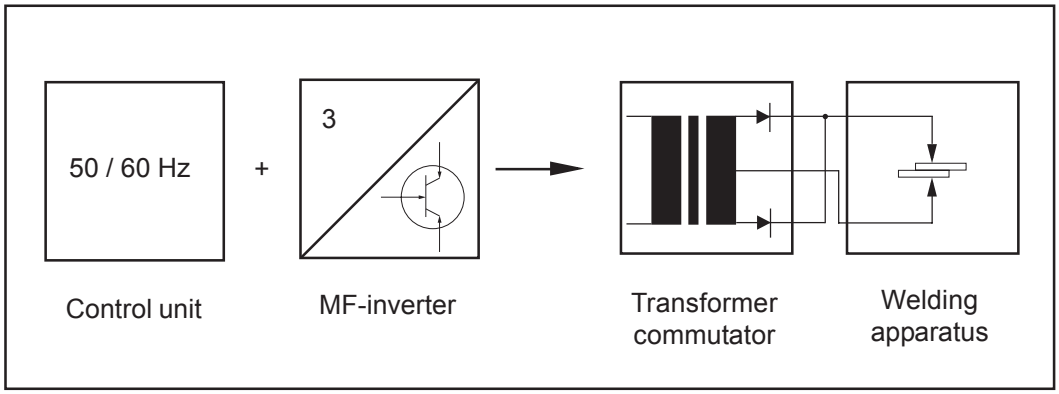


Fig. 3 Construction of 1 kHz medium frequency DC welding system

The 50/60 Hz AC mains voltage is converted to DC voltage via a bypass rectifier. The transistorised H-bridge circuit transfers the direct current to the welding transformer at a frequency of 1 kHz. The welding current is rectified in the welding transformer.

Overview of system components

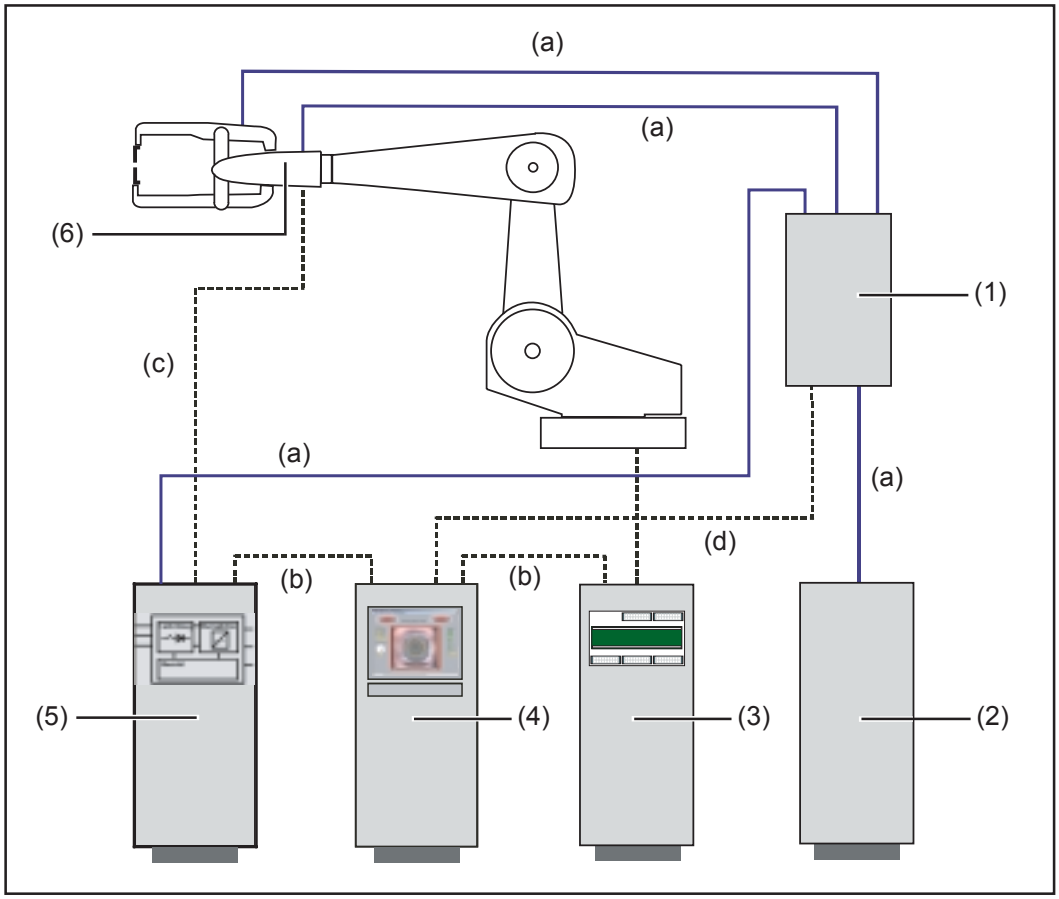


Fig. 4 Overview of system components

(1) Distributor cooling water supply
(2) Cooling unit/cooling network
(3) Robot control
(4) Holder control
(5) Power module
(6) Welding gun

(a) Cooling water supply
(b) Buses
(c) Transformer supply
(d) Flow monitor signals

Controls and connections

General remarks

NOTE! As a result of firmware updates, you may find that there are functions available on your unit that are not described in these operating instructions or vice versa. Also, certain illustrations may be very slightly different from the actual controls on your machine. However, these controls function in exactly the same way.

WARNING! Operating the equipment incorrectly can cause serious injury and damage. Do not use the functions described here until you have read and completely understood all of the following documents:
- these operating instructions
- all the operating instructions for the system components, especially the safety regulations

DeltaControl controls

Fig. 5 DeltaControl controls

No.	Function
(1)	**Main switch** to switch on the holder control
(2)	**Operating mode key switch** - Manual: manual operation with DeltaRemote (Plus) remote control - Bus: Robot welding

Delta Control connections

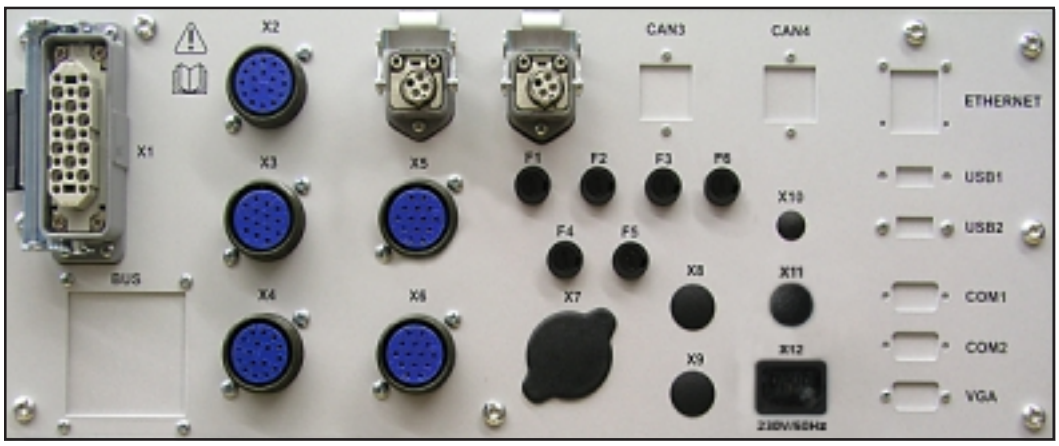


Fig. 6 DeltaControl connections

Delta Control connections
(continued)

X1 Connection of main plug of DeltaSpot welding arm
to connect the control lead

X2 EMERGENCY OFF external
for connection to the robot
Pin configuration:

A	+ 24 V output (via X5 Pin A, B)
B	Feedback signal + 24 V
C	NC 1 of relay K2
D	Root 1 of relay K2
E	NO 1 of relay K2
F	NC 2 of relay K1
G	Root 2 of relay K1
H	NO 2 of relay K1
J	NC 3 of relay K2
K	Root 3 of relay K2
K	NO 3 of relay K2

X3 Connection monitor of coolant flow monitor
for connecting the Hall installation panel
Pin configuration:

A	+ 24 V Output for flow monitor
B	Flow monitor feedback signal

X4 Connection of digital current source
for the collection of digital signals from the current source
Configuration, number of strands, connection cable:

1	GND DeltaControl
2	24 V Start welding
3	Welding current on/off
4	+ 15 V transformer temperature metre
5	Feedback signal from transformer temperature metre
6	Relay root Emergency Stop
7	Emergency Stop relay NO
8	Power source ready
9	Reset error
10	Power source OK
11-17	not assigned

X5 External welding start-up
For external start-up of the welding process without Hold to Run function
Pin configuration:

A	+ 24 V output for Emergency Stop
B	24 V Emergency Stop return signal
C	+ 24 V output for actuating welding startup
D	24 V return signal for welding startup actuation

WARNING! Operating the equipment incorrectly can cause serious injury and damage. The design of external operating equipment or Emergency Stop actuators must comply with valid national and international standards.

X6 Analogue power source connection
for the collection of digital signals from the current source
Configuration, strand colour, connection cable:

Yellow	(+) pin secondary voltage, welding transformer
Green	(-) pin secondary voltage, welding transformer
White	(+) pin secondary current meter (Rogowski coil)
Brown	(-) pin secondary current meter (Rogowski coil)
Green/yellow	Current meter shield
Pink	(+) pin welding current command value (0 -10V)
Grey	(-) pin welding current command value (0 -10V)

Delta Control connections (continued)

X7	**Reserve socket**
X8 - X 11	**reserve**
CAN1	**communication interface to the PC**
CAN2	**communication interface to the DeltaSpot welding gun**
F1	**DeltaControl 24V supply fuse**
F2	**DeltaSpot welding gun 24V supply fuse**
F3	**Bus coupler 24V supply fuse**
F4	**Welding voltage metre fuse**
F5	**Mains power adapter fuse**
F6	**Fuse 48V**

Welding transformer connections

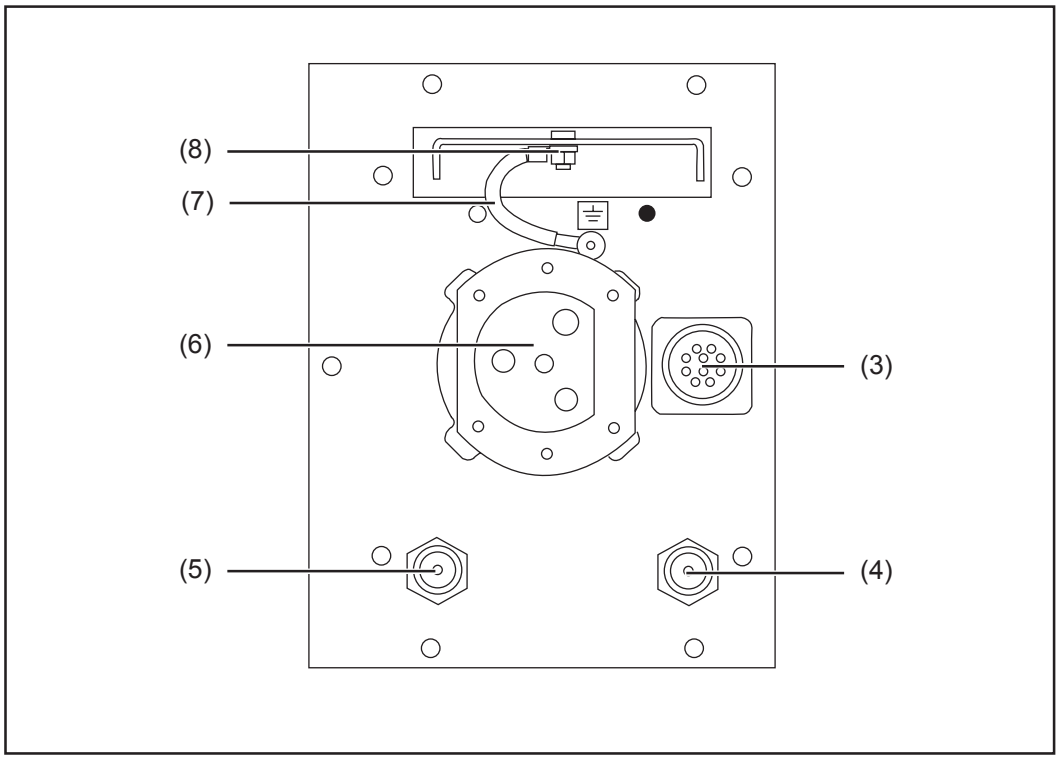


Fig. 7 Welding transformer connections

No.	Function
(3)	**Transformer metering signal connection** for connection of welding control
(4)	**Cooling water supply connection**
(5)	**Cooling water return connection**
(6)	**Transformer primary connection** for transformer power supply
(7)	**Ground strap**
(8)	**Connection (-) pin**

Welding gun connections

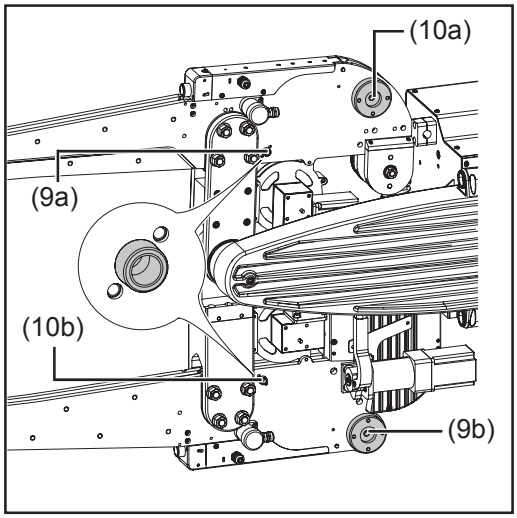


Fig. 8 Connections for cooling water

(9a) Cooling water supply connection to the upper holder arm

(10 a) Cooling water return connection to the upper holder arm

(9b) Cooling water supply connection to the lower holder arm

(10 b) Cooling water return connection to the lower holder arm

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Mechanical components

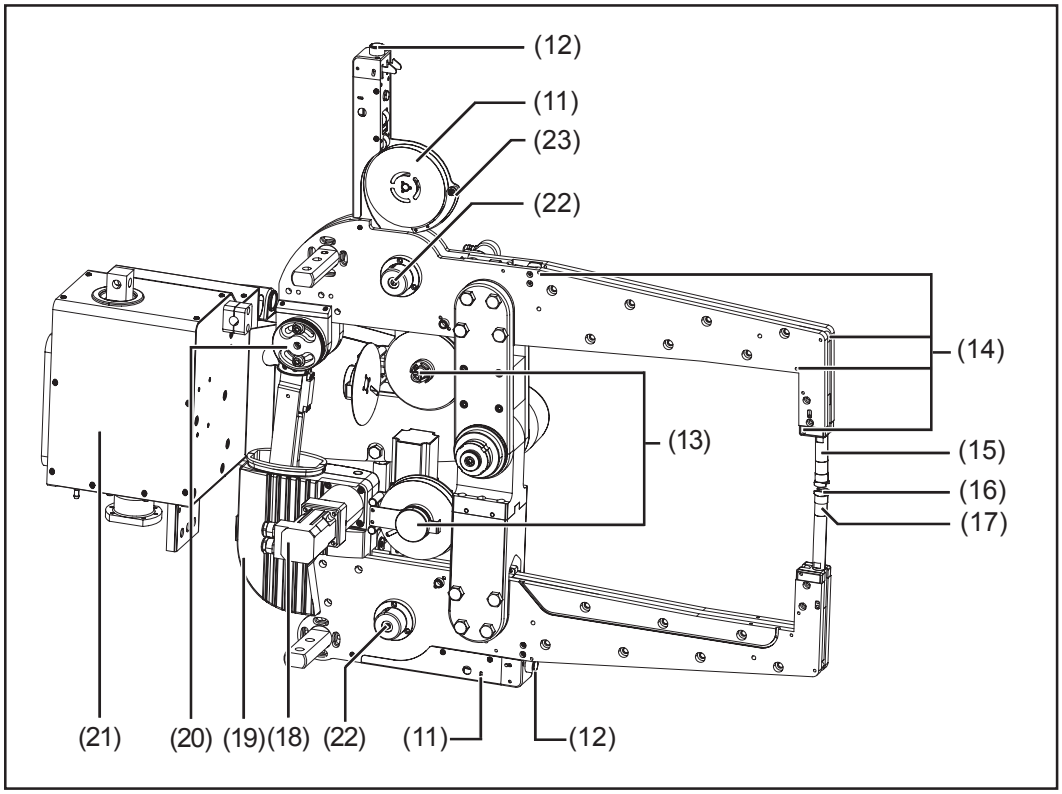

Fig. 9 Mechanical components

(11) Process tape holder
to hold unused process tapes

(12) Lock for process tape holder

(13) Process tape spooling device with drive
to hold used process tape

(14) Process tape guide roller

(15) Electrode shaft

(16) Process tape guide bush with electrode

(17) Elastomer spring

(18) Motor with planetary gear

(19) Holder drive

(20) Sheet thickness correction
for adjusting to different sheet thicknesses

(21) Console with transformer and control box

(22) Process tape brake

(23) Process tape securing device
pevents process tape from unrolling by itself

Mechanical components
(continued)

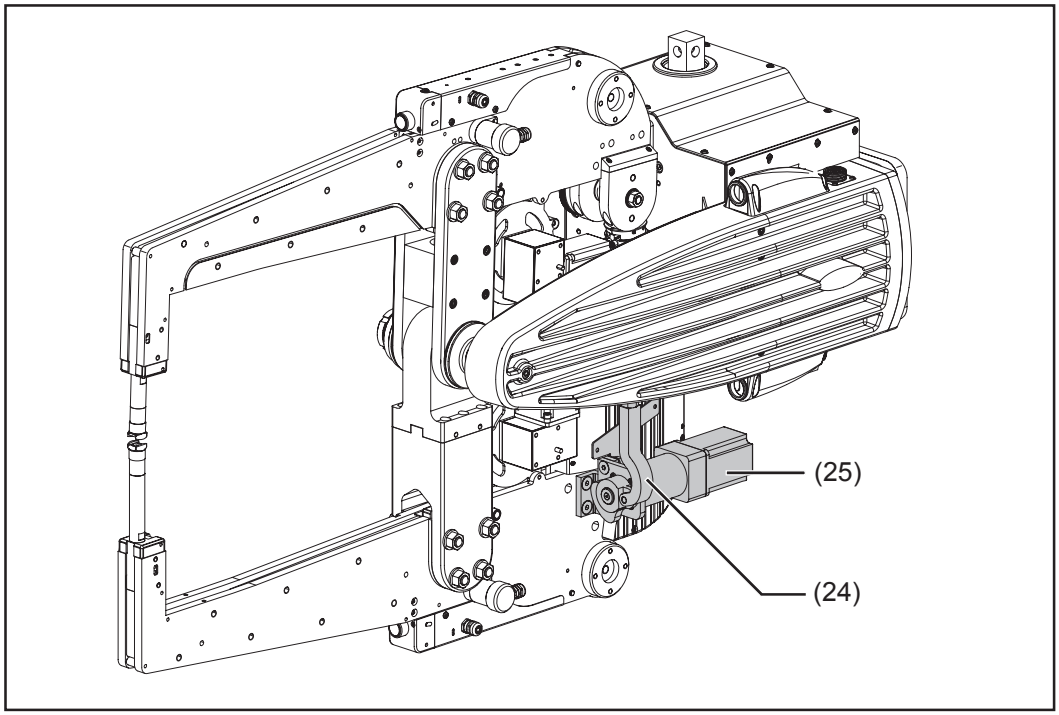

Fig. 10 Holder adjustment

(24) Holder adjustment
to equalise component tolerances or position differences

(25) Holder adjustment drive

Delta Remote control

WARNING! Automatically starting machines can cause serious injury and damage. In addition to these operating instructions, the robot and welding system manufacturer's safety rules must also be observed. For your personal safety, ensure that all protective measures have been taken and will remain in place for the duration of your stay within the working area of the robot.

The DeltaRemote remote control is for manual control of the welding gun. It is used to
- reload process tape
- replace electrodes

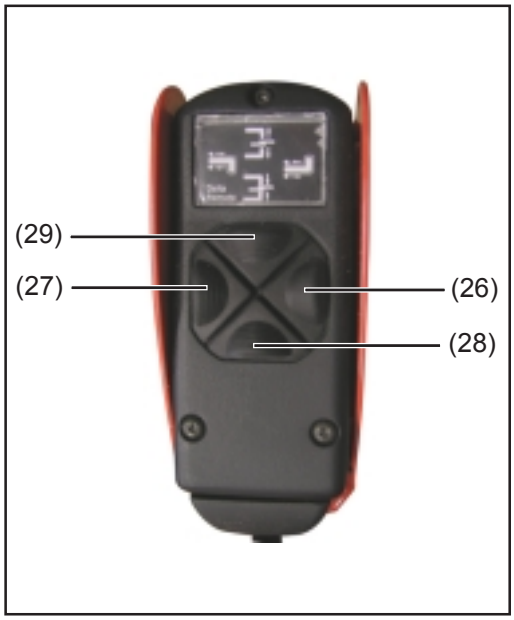

Fig. 11 DeltaRemote control

(26) Process tape forward switch (lower holder arm)
for manual feed of lower process tape

(27) Process tape forward switch (upper holder arm)
for manual feed of upper process tape

(28) Close welding gun button
to close welding gun manually

(29) Open welding gun button
to open welding gun manually

DeltaRemote Plus remote control

WARNING! Automatically starting machines can cause serious injury and damage. In addition to these operating instructions, the robot and welding system manufacturer's safety rules must also be observed. For your personal safety, ensure that all protective measures have been taken and will remain in place for the duration of your stay within the working area of the robot.

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The DeltaRemote control is for manual control of the welding gun. It is used to
- define a reference point after commissioning the system
- reload process tape
- manually spot weld within preset parameters
- reset faults that have arisen

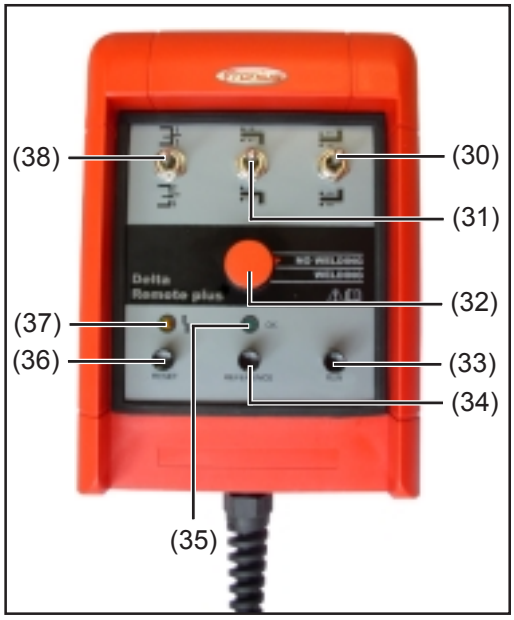


Fig. 12 DeltaRemote Plus remote control

(30) Process tape forward or backwards switch (lower holder arm)
for manual feed of process tape

(31) Process tape forward or backwards switch (upper holder arm)
for manual feed of process tape

(32) Welding current button
- No Welding: Press RUN (32) key to simulate a spot weld without power.
- Welding: Press RUN (32) key to carry out a spot weld within preset parameters

(33) RUN key
To test a spot weld within actual preset parameters

NOTE! Danger of premature termination of the welding process. The RUN key is equipped with the - HOLD TO RUN - safety feature. Hold button down until the end of the welding process. The RUN button can be released at any time during the welding process to terminate the welding operation immediately (Emergency Stop function).

(34) Move to reference point key
to define a reference point before starting the welding operation

(35) Reference point LED
Is lit as soon as the reference point is defined

DeltaRemote Plus remote control
(continued)

(36) Reset key
to reset faults that have arisen

(37) LED default
lit
- during commissioning if the reference point has not yet been defined
- should faults arise during an ongoing operation

(38) Open and close welding gun switch
to open and close welding gun manually

Before commissioning

General remarks

WARNING! Automatically starting machines can cause serious injury and damage. In addition to these operating instructions, the robot and welding system manufacturer's safety rules must also be observed. For your personal safety, ensure that all protective measures have been taken and will remain in place for the duration of your stay within the working area of the robot.

Utilisation in accordance with „intended purpose“

The welding gun is designed exclusively for automated resistance welding. Utilisation for any other purpose, or in any other manner, shall be deemed to be “not in accordance with the intended purpose”. The manufacturer shall not be liable for any damage resulting from such improper use.

Utilisation in accordance with the “intended purpose” also comprises
- Following all the instructions in this manual
- performing all stipulated inspection and servicing work.

Machine set-up regulations

WARNING! A machine that topples over or falls from its stand can easily kill someone. Make sure that all components are installed and secured correctly.

NOTE! The assembly of components of the resistance welding system is the responsibility of the system of fitter. Ensure that
- all connections are connected properly
- all screw fastenings are securely fixed

The manufacturer shall not be liable for any damage caused as a result of incorrect assembly of the welding gun.

Mains connection

The equipment is designed to run on the mains voltage specified on the respective rating plates. The required mains supply fuse protection can be found in the „Technical data“ section.
If there is no network cable or mains plug on your charger, fit a network cable or plug according to the national standards.

NOTE! Inadequately dimensioned electrical installations can lead to serious damage. The mains lead, and its fuse protection, must be dimensioned in accordance with the local power supply. The technical data shown on the rating plate shall apply.

Guidelines for system cooling

The cooling liquid intake, the purity of the coolant and the differential pressure in the cooling water system should be checked each time you start-up the welding system.

CAUTION! Danger of burns from hot coolant. Check coolant only when cool.

NOTE! Inadequate cooling can cause damage to property. Never operate welding equipment without adequate cooling. The manufacturer will not be held responsible for damage due to inadequate cooling.

Important! We recommend fitting water-cooled components with flow monitors. Flow monitor switch point: Approximately 4.0 l/min (1.0 gal./min)

Recommended cooling water quality:

pH-value	7 to 8.5
hardness rate D_{max}	10 German degrees 12.5 English degrees 10.5 US degrees 18 French degrees
Chloride	max. 20 mg / l
Nitrate	max. 10 mg / l
Sulphate	max. 100 mg / l
Insoluble substances	max. 250 mg / l

CAUTION! Risk of condensate causing short-circuit. Water-carrying parts should be isolated to prevent condensate from leaking out. Note the information provided by the manufacturer of the cooling system

Transformer PE conductor connection

Fronius medium frequency transformers comply with protection class 1.

NOTE! Additional safety precautions are required for medium frequency transformers in protection class 1 to guard against an isolation failure between the primary and secondary power circuits. National and international standards and guidelines must be complied with

The medium frequency transformer is equipped on delivery with the additional safety feature of a „direct PE conductor connection“ as follows:

- Detachable PE conductor bridge (MPE) between the secondary circuit of the medium frequency transformer and the transformer’s PE conductor connector.

If applying an alternative valid safety precaution:

1. Remove PE conductor bridge (MPE)
2. Indicate removal of PE conductor bridge (MPE) permanently on the transformer.

WARNING! Danger of serious injury from compensating currents. Compensating currents can interrupt the PE conductor connection via the PE conductor bridge (MPE). In the event of an isolation failure the „ direct PE conductor connection“ will become ineffective. If compensation currents cannot be prevented, additional safety precautions must be taken according to applicable regulations.

Commissioning

General remarks

WARNING! An electric shock can be fatal. If the machine is connected to the mains electricity supply during installation, there is a high risk of very serious injury and damage. Disconnect from the power supply, before carrying out any work on the equipment.

WARNING! Operating the equipment incorrectly can cause serious injury and damage. All connections must be carried out by trained and qualified personnel in compliance with the relevant safety regulations. Note the safety rules in the operating instructions.

Connecting DeltaControl

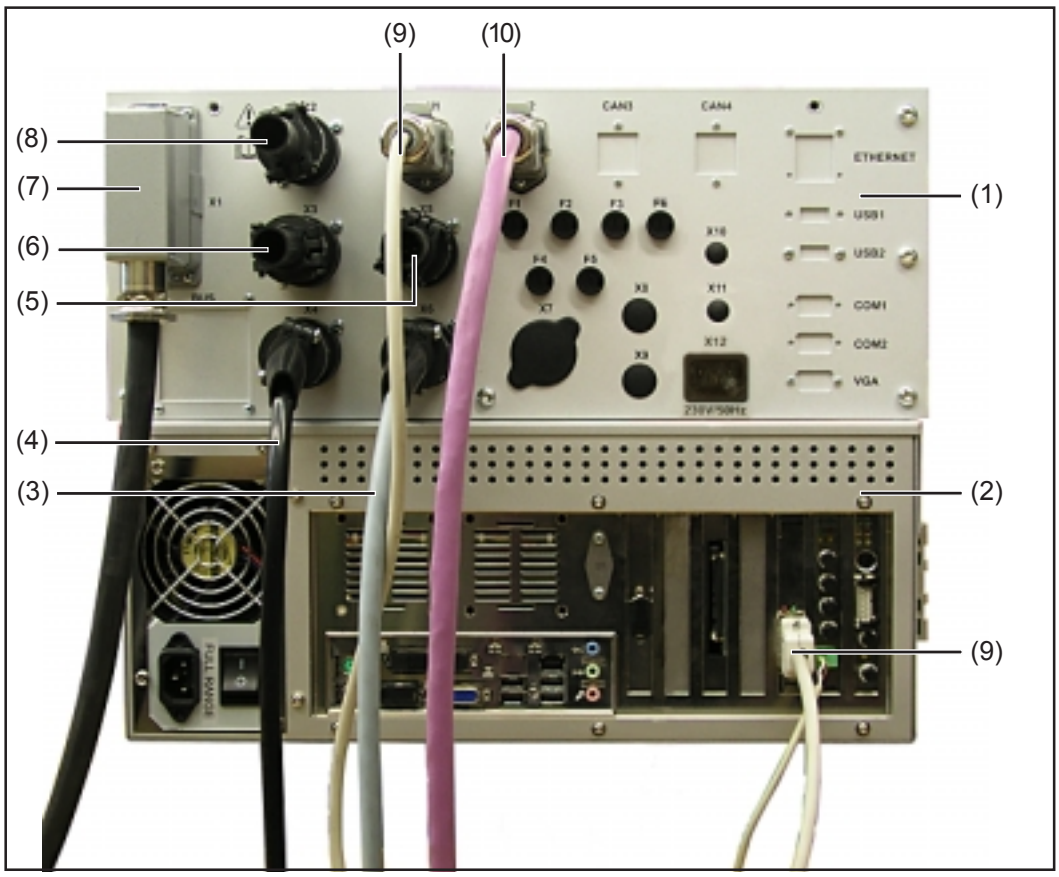


Fig. 13 Connecting DeltaControl

(1) DeltaControl
(2) Industrial PC

1. Connect the signal cable (7) to the main plug connector of the DeltaSpot (X1) welding gun
2. Connect the analogue signal cable from the power source (3) to the analogue power source connector (X6).
3. Connect the digital signal cable from the power source (4) to the digital power source connector (X6).
4. Connect the signal cable from the hall installation panel (6) to the coolant flow monitor connector (X3).
5. Connect the external Emergency Stop signal cable from the robot (8) to the external Emergency Stop connector (X2).

Connecting DeltaControl (continued)

6. If applicable, connect the external welding start-up connection cable (5) to the external welding start-up connector (X5)

WARNING! Operating the equipment incorrectly can cause serious injury and damage. The design of external operating equipment or Emergency Stop actuators must comply with valid national and international standards.

7. Connect to the industrial PC (9) via the CAN1 communication interface
8. Connect the welding gun motor controllers (10) via the CAN2 communication interface

Connecting the welding gun

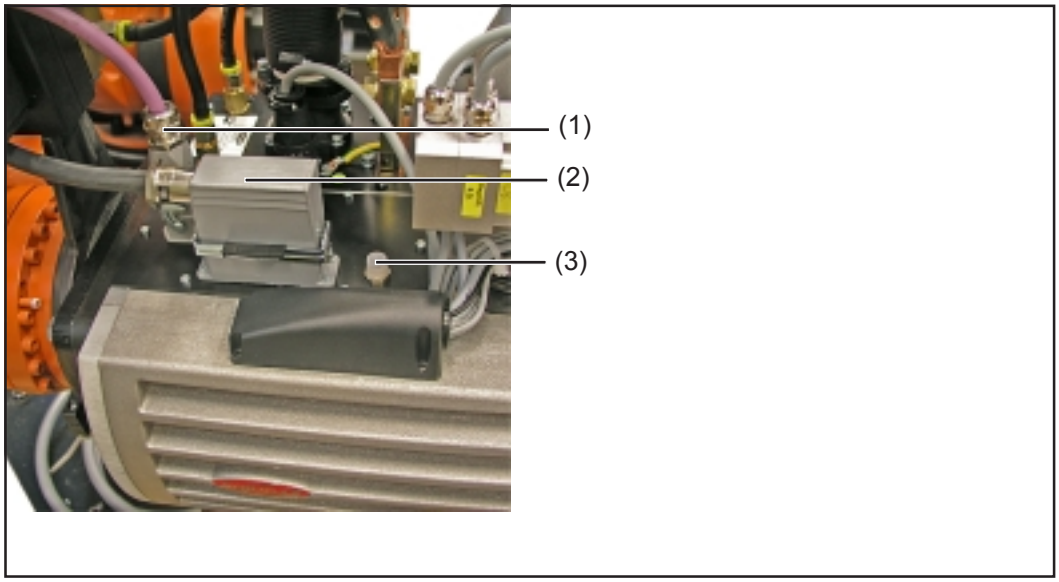


Fig. 14 Connecting the welding gun

1. Connect the CAN1 communication interface CAN 2.1 (1) to the PC
2. Insert Delta Spot (2) welding gun main connector into connection X1.1

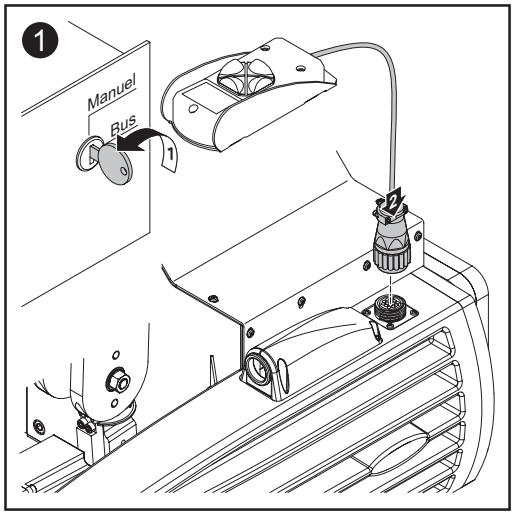
(3) Service connection socket X23.1

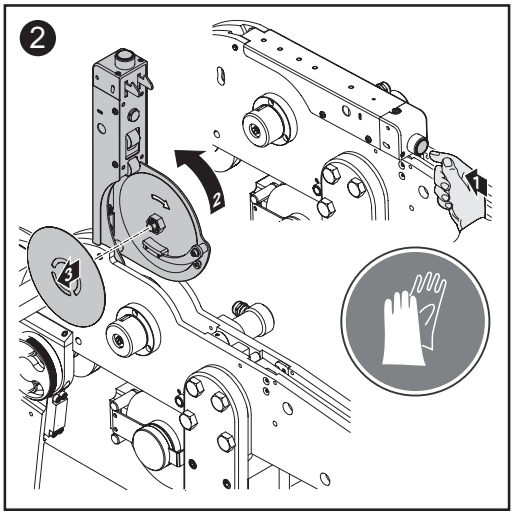
Connecting to cooling water supply

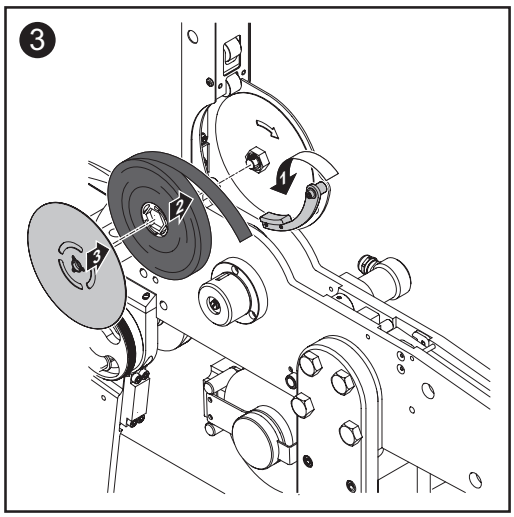
NOTE! Inadequate cooling can cause damage to property. Never operate welding equipment without adequate cooling. The manufacturer will not be held responsible for damage due to inadequate cooling.

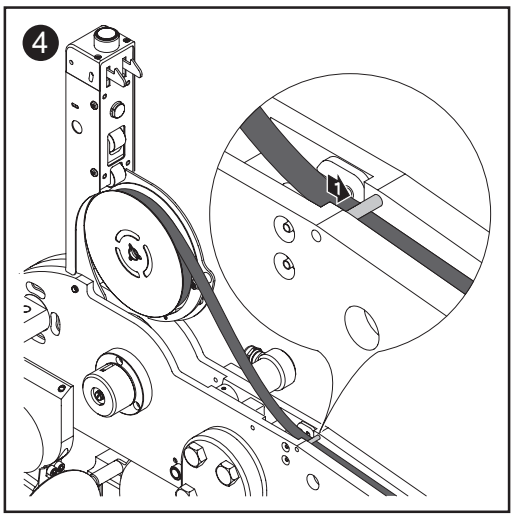
1. Connect cooling water intake and return to the distributor block on the welding gun
2. Connect cooling water supply

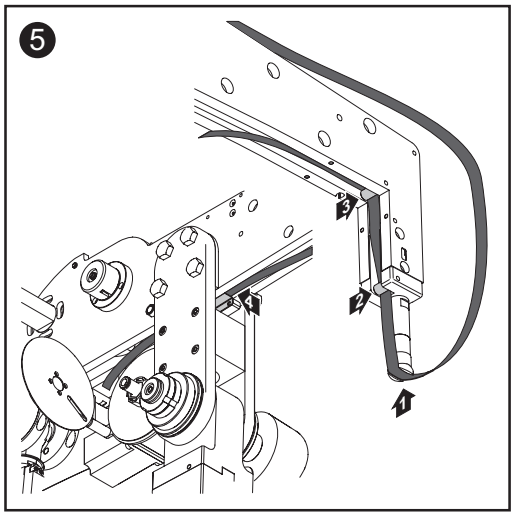
Threading up process tape

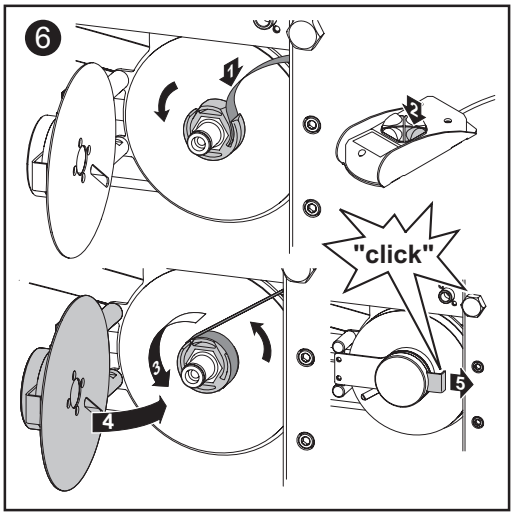












Move to reference point

WARNING! Automatically starting machines can cause serious injury and damage. In addition to these operating instructions, the robot and welding system manufacturer's safety rules must also be observed. For your personal safety, ensure that all protective measures have been taken and will remain in place for the duration of your stay within the working area of the robot.

NOTE! Please note that the integrated Emergency Stop function in the robot control directly influences the DeltaRemote Plus remote control.

In order to be able to determine the position of the holder arm after switching on the system, it is necessary to open the holder arm fully. A sensor detects the reference point and releases the holder for the welding process.

Important! If the position of the holder is not determined after switching on the system, an attempt to start the welding process will result in a fault message (yellow LED lights up). Manual opening and closing of the welding gun will also take place at a reduced speed.

Fig. 15 Functions on the DeltaRemote Plus remote control.

After switching on the system

1. Press the reference point key (3)
2. Reference point LED (4) lights up and indicates that the welding gun is ready

Sheet thickness correction

Rotate the sheet thickness corrector to adjust the position of the robot holder, so that when closed the position of the drive is within the operating range (1). The closed position depends on the thickness of the sheets being welded.

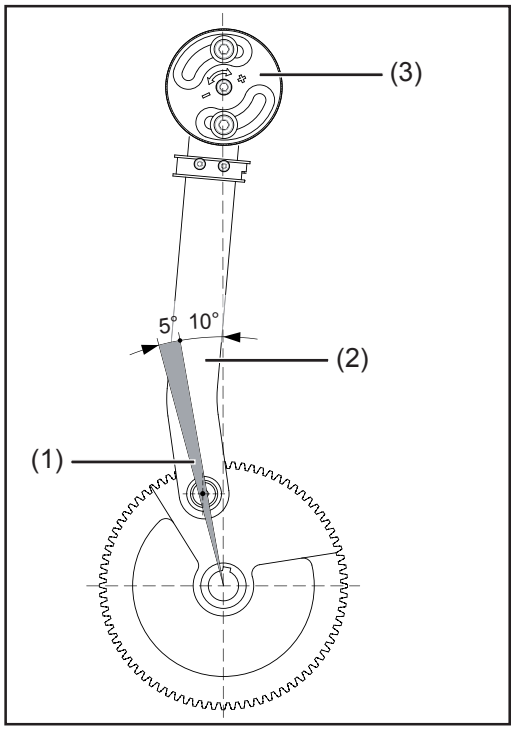


Fig. 16 Detail, holder drive in the operating range

(1) Operating range: 10 - 15° away from top dead centre
(2) 0 - 10 °: 0° = top dead centre
(3) Sheet thickness correction

Important! If the operating point in the closed position is outside the defined operating range the specified holder force cannot be applied.

Sheet thickness correction

1. Weld the point with the necessary sheet thickness
2. If the actual operating point (1) is outside the defined operating range, Fronius Xplorer (2) will give a warning signal. The warning is listed in the status options sheet

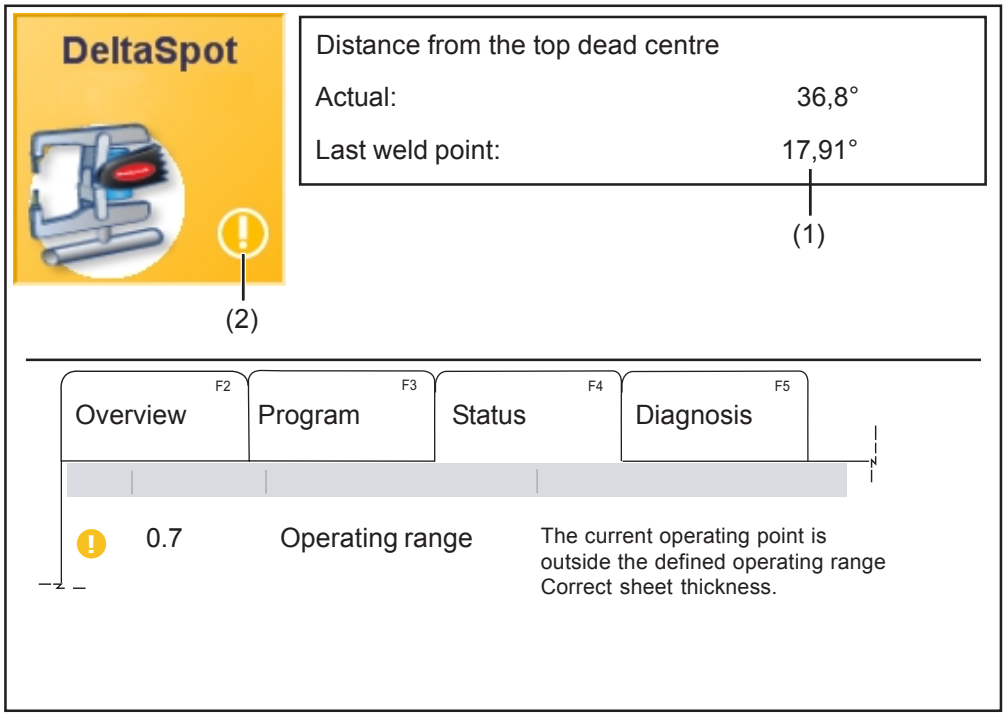
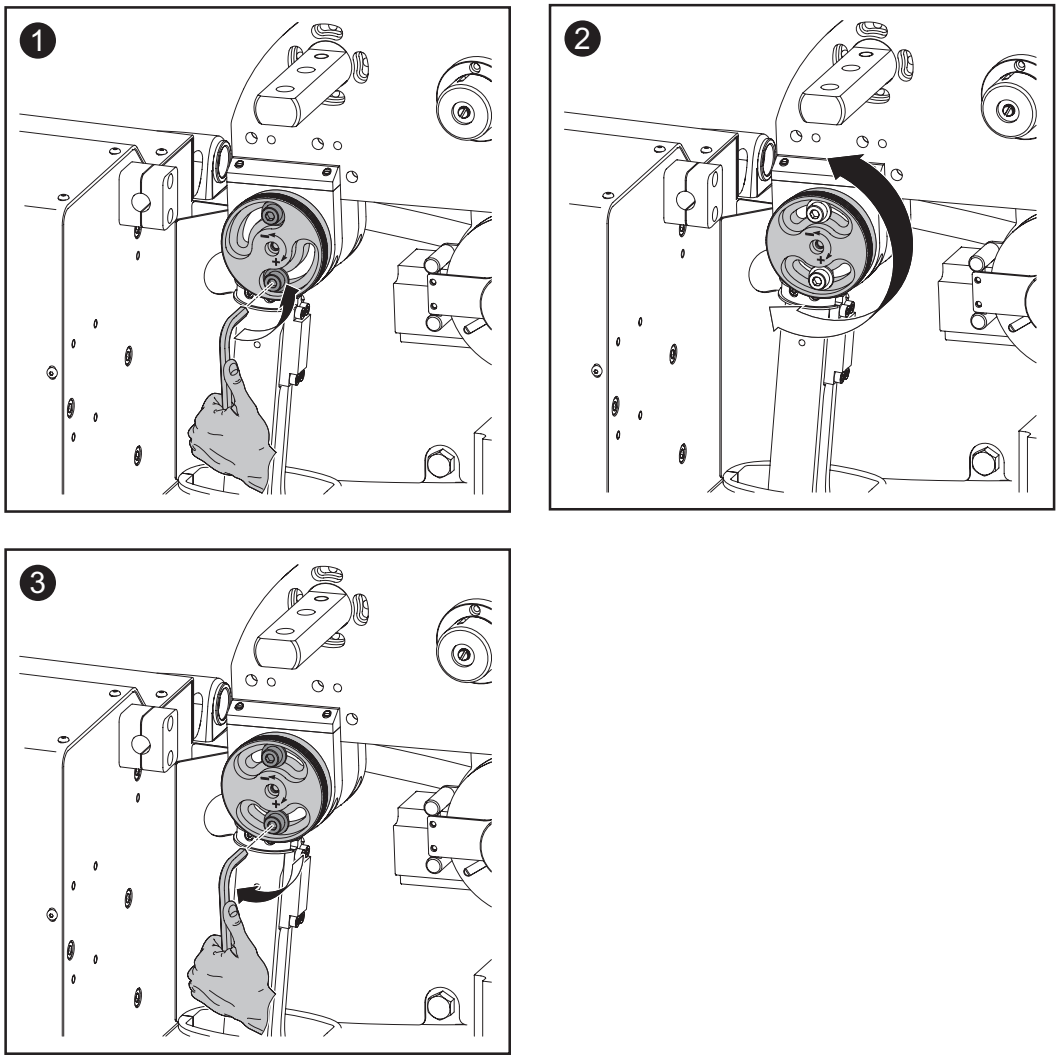


Fig. 17 Operating point is outside the defined operating range

Sheet thickness correction
(continued)

3. Set the operating point by correcting the sheet thickness to within the defined operating range:



4. Re-weld the point with the required sheet thickness
5. Repeat operating steps 2- 5 until the actual operating range is within the defined operating range.

Distance from the top dead centre	
Actual:	36,8°
Last weld point:	12,22

Fig. 18 Operating point lies within the defined operating range

DeltaSpot resistance spot welding

General remarks

The most significant feature in the case of DeltaSpot resistance spot welding is the process tape. As well as protecting the electrodes, it offers additional advantages such as the control of the heat application, improvement of efficiency and the ability to bond very different materials.

WARNING! Operating the equipment incorrectly can cause serious injury and damage. Do not use the functions described here until you have read and completely understood all of the following documents:
- these operating instructions
- all the operating instructions for the system components, especially the safety regulations

WARNING! Automatically starting machines can cause serious injury and damage. In addition to these operating instructions, the robot and welding system manufacturer's safety rules must also be observed. For your personal safety, ensure that all protective measures have been taken and will remain in place for the duration of your stay within the working area of the robot.

Process tape consumption

Depending on the contamination caused by the material being welded, a section of the process tape can be used several times. For example, a series of 15,000 spot welds can be produced with a 50 m long process tape if each tape section is basically used three times (short tape feed).

If the process tape is advanced by 10 mm after each spot weld, a tape of 50 m long can produce a sequence of approximately 5000 spot welds.

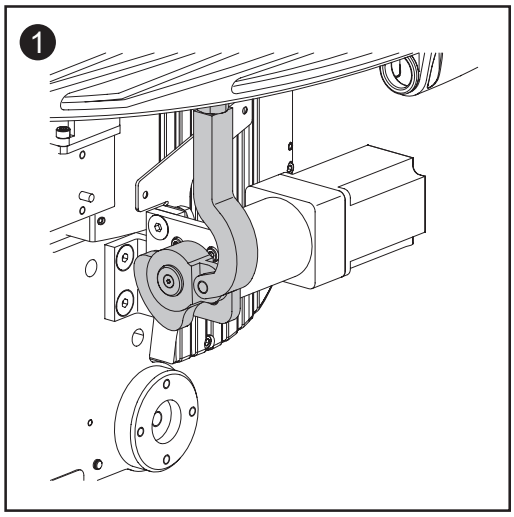
Important! Fronius quality management system „QMaster" tape sections can be used for a single spot weld only.

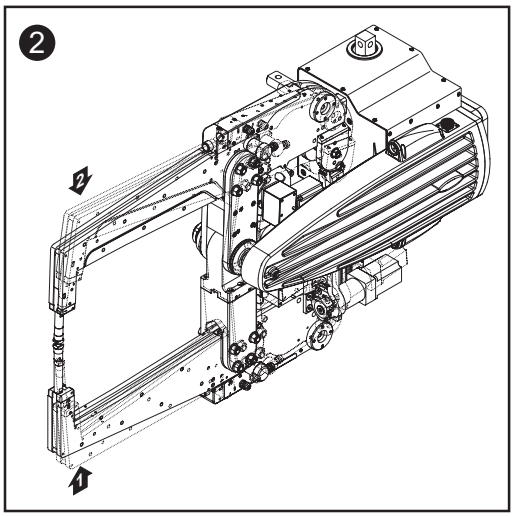
Holder adjustment

The holder adjuster enables the welding gun to be adjusted to fit the workpiece and to compensate for part tolerances.

Holder adjustment activated

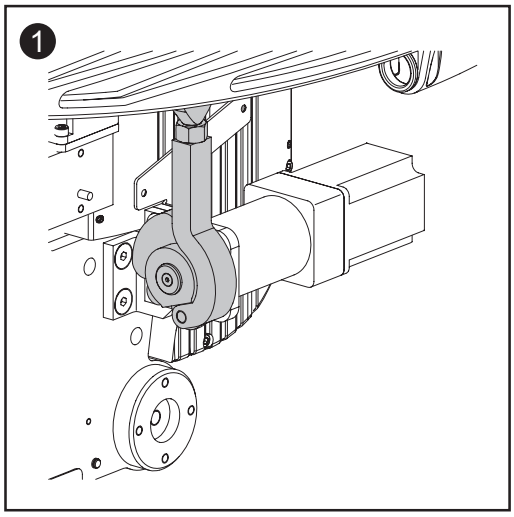
If holder adjustment is activated, both holder arms are able to move freely around the axis (1). During welding, both holder arms close simultaneously. In this case, usually one holder arm makes contact with the component first and stops the closing process. The second holder arm continues to close until it also makes contact with the part. After building up the preset force, the welding process begins.

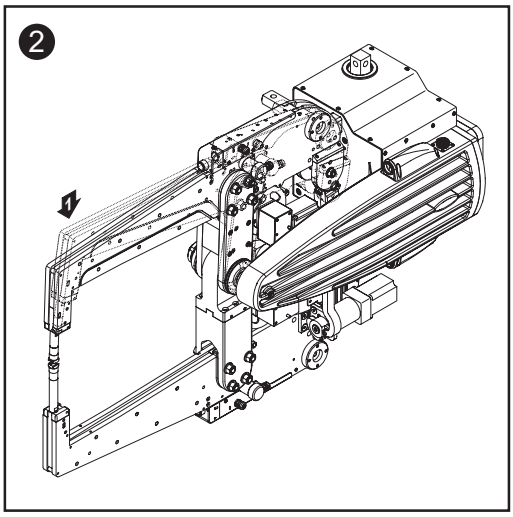




Holder adjustment activated

If the holder adjuster is disabled, the low holder arm is fixed when you switch on the system. During the welding process the electrode force is applied via the upper holder arm, while the lower holder arm functions solely as a support.





Influence of the process tape on the welding process

The use of the process tape results in additional resistances being generated between electrode and tape. The required welding current is far less than with conventional spot welding thanks to the improved efficiency.

The reduced welding current and the type of alloy of the process tape, enable a controlled application of heat and control over the position and form of the weld point.

Resistances with DeltaSpot resistance welding:

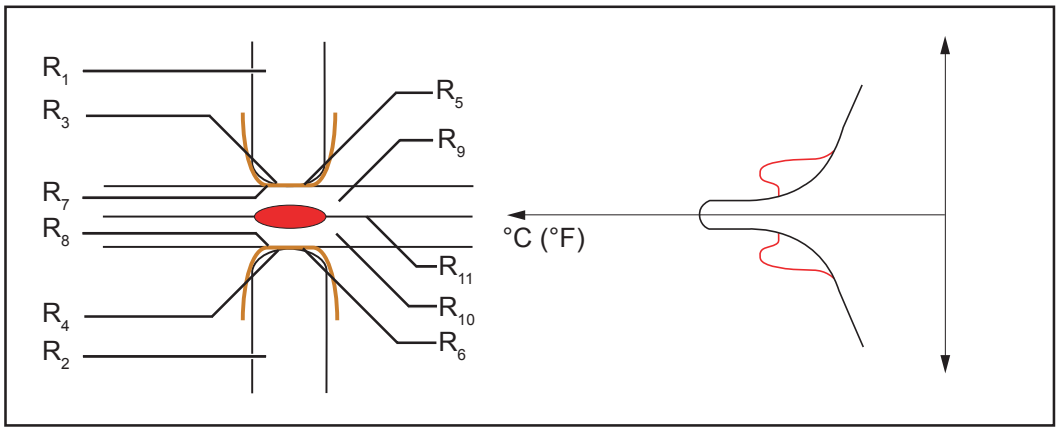


Fig.19 Resistances with DeltaSpot spot welding:

R_1, R_2	Material resistances of the electrode
R_3, R_4	Contact resistances of the electrode - process tape
R_5, R_6	Material resistances of the process tape
R_7, R_8	Contact resistances of the process tape - workpiece
R_9, R_{10}	Material resistances of the workpieces
R_{11}	Contact resistances, workpiece - workpiece

Weld forms with multi-sheet joins:

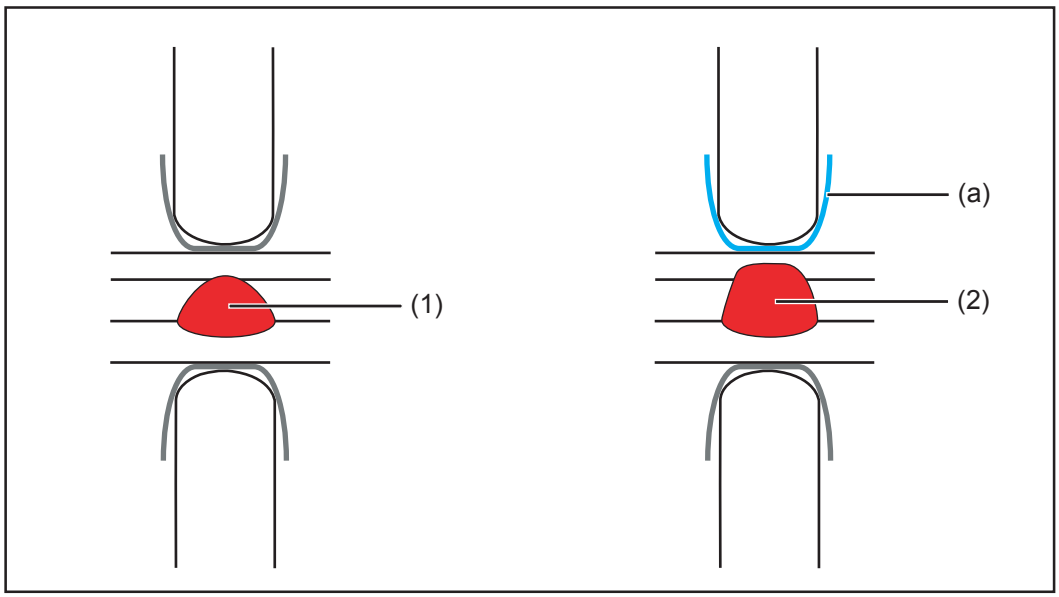


Fig. 20 Weld forms with multi-sheet joins

(1) Weld form when using different materials, material thicknesses and the same process tape alloys
(2) Weld form when using different materials, material thicknesses and different process tape alloys, for example (a): Process tape with higher resistance.

Holder control / Fronius Xplorer

General remarks

Access to the robot holder controller can be via an existing company network. This enables remote maintenance and central monitoring and documentation of all connected equipment.

Welding parameters can be set using the programme editor in Fronius Xplorer. You can find further details in the Fronius Xplorer operating instructions.

NOTE: As a result of firmware updates, you may find that there are functions available on your device that are not described in these operating instructions or vice versa. Also, certain illustrations may be very slightly different from the actual controls on your machine. However, these controls function in exactly the same way.

System overview

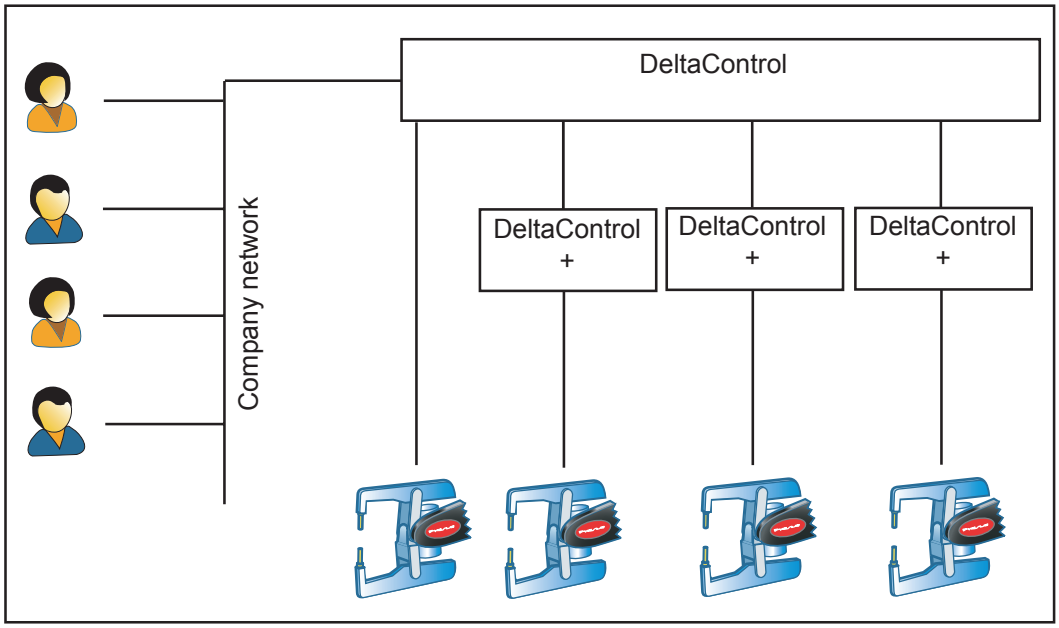


Fig.21 DeltaSpot system overview

Configuring DeltaSpot

WARNING! Incorrect details can have serious consequences for equipment. The welding gun must be configured by trained specialist personnel. The manufacturer will not be held responsible for damage due to incorrect settings.

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Configuring DeltaSpot welding gun:
Access system configuration via the options menu

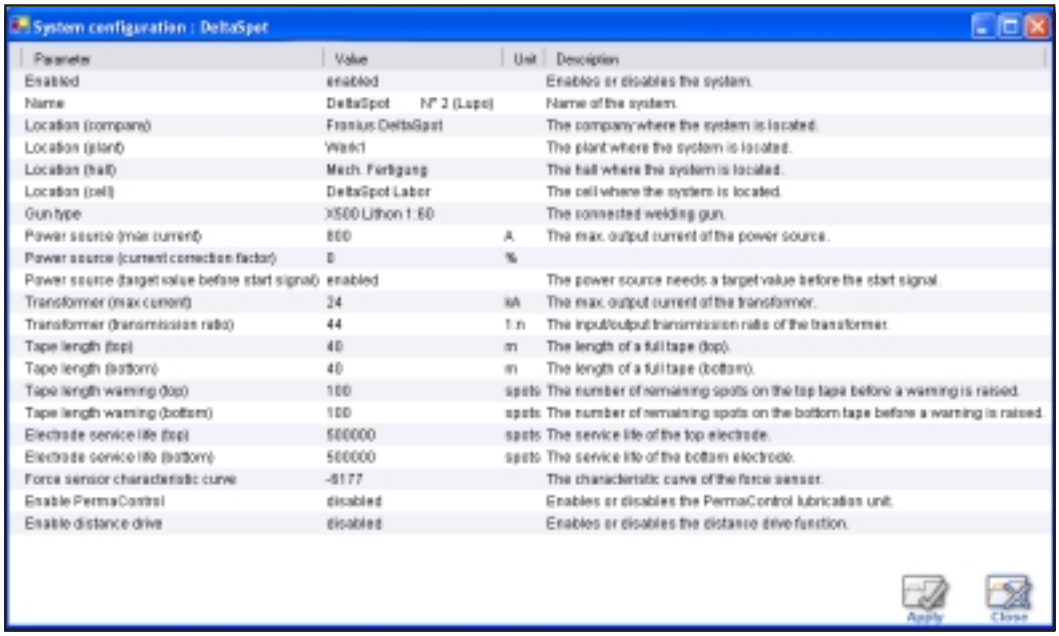
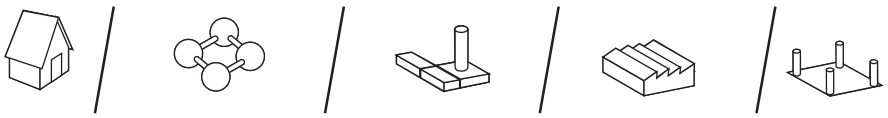


Fig. 22 System configuration

Enabled
Activate and deactivate system

Name
Identify DeltaSpot welding gun (identification in Fronius Xplorer)

Location (company), (plant), (hall), (cell)
Define company name and location of welding gun. The names that are entered are stored in Fronius Xplorer as a path (company / plant / hall / cell) and illustrated as a file structure.



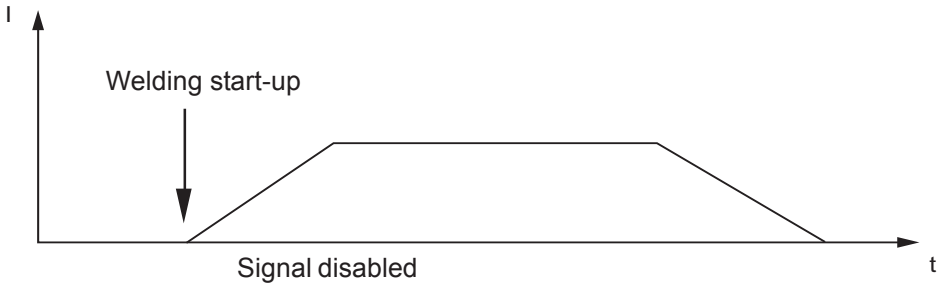
Home/ company/ plant/ hall/ cell

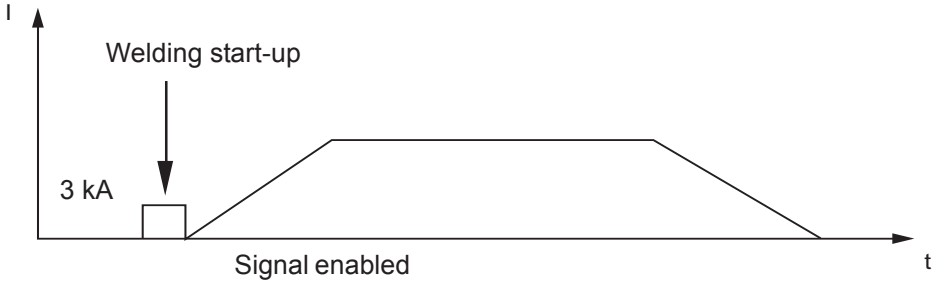
Gun type
Define arm geometry, fitted motors, gear ratio etc

Power source (max current)
Define maximum available current of the power source

Power source (current correction factor)
The reference current correction factor can be defined more accurately

Power source (target value before start signal)
This signal will send a short current pulse to activate the power source required to start the welding process.





Transformer (max current)
Define the maximum available current of the installed welding transformer

Transformer (transmission ratio)
Define the transmission ratio of the welding transformer

Tape length (top), (bottom)
Define the length of the process tape used

Tape length warning (top), (bottom)
Define a number of points before the end of the process tape at which a warning should be given

Electrode service life (top), (bottom)
Define the service life of the electrode. At a specified number of spot welds a service message is given (change electrode)

Force sensor characteristic curve
Define the characteristic curve for the force sensor

Enable distance drive
Define unit for external position specification (internal or millimetres)

Calculate maximum welding current:
The maximum available welding current is calculated from the product of the maximum current of the power source „power source (max current)“ and a transmission ratio of the welding transformer „transformer (transmission ratio)“. If the maximum calculated welding current is greater than the maximum admissible current of the welding transformer, the welding current is automatically limited to the maximum admissible current of the welding transformer.

Example:
maximum power source current: 800 A
Transformer ratio: 1:44
maximum welding transformer current: 24 kA

Maximum welding current: 0.8 kA * 44 = 35.2 kA

Because the maximum admissible current of the welding transformer is less than the calculated maximum welding current, the maximum welding current is limited to 24 kA.

Calibrating welding guns

Important! The welding gun is fully calibrated on delivery. Calibration is necessary only after a corresponding warning or fault message.

WARNING! Incorrect details can have serious consequences for equipment. The welding gun must be configured by trained specialist personnel. The manufacturer will not be held responsible for damage due to incorrect settings.

Configuring DeltaSpot welding gun:
Access system configuration via the options menu

After selecting the required calibration option, follow the instructions on the screen.

Overview of options

The overview of options provides information about the current settings of the
- interface
- program and spot numbers
- sheet thickness correction in the form of a display of the „distance from the top dead centre“

The overview also gives information about the current consumption values and can be used to reset the counters of the
- process tapes
- electrode service life
- lubrication cycle

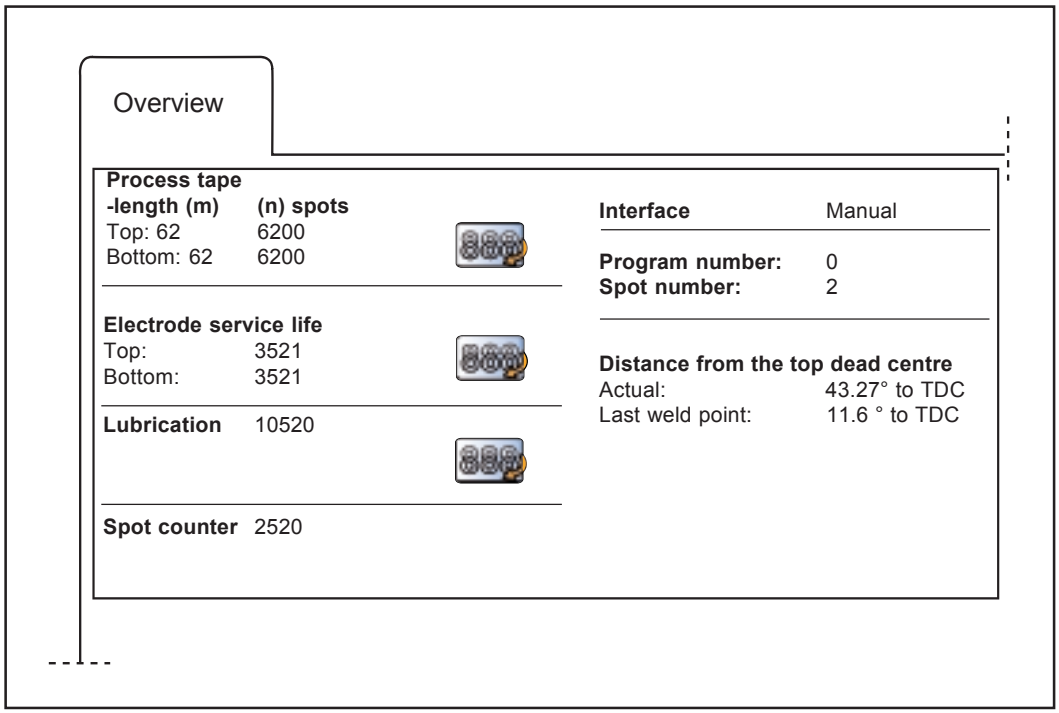


Fig. 23 Overview worksheet

Reset counter button
Reset by clicking on the counter button

Program options

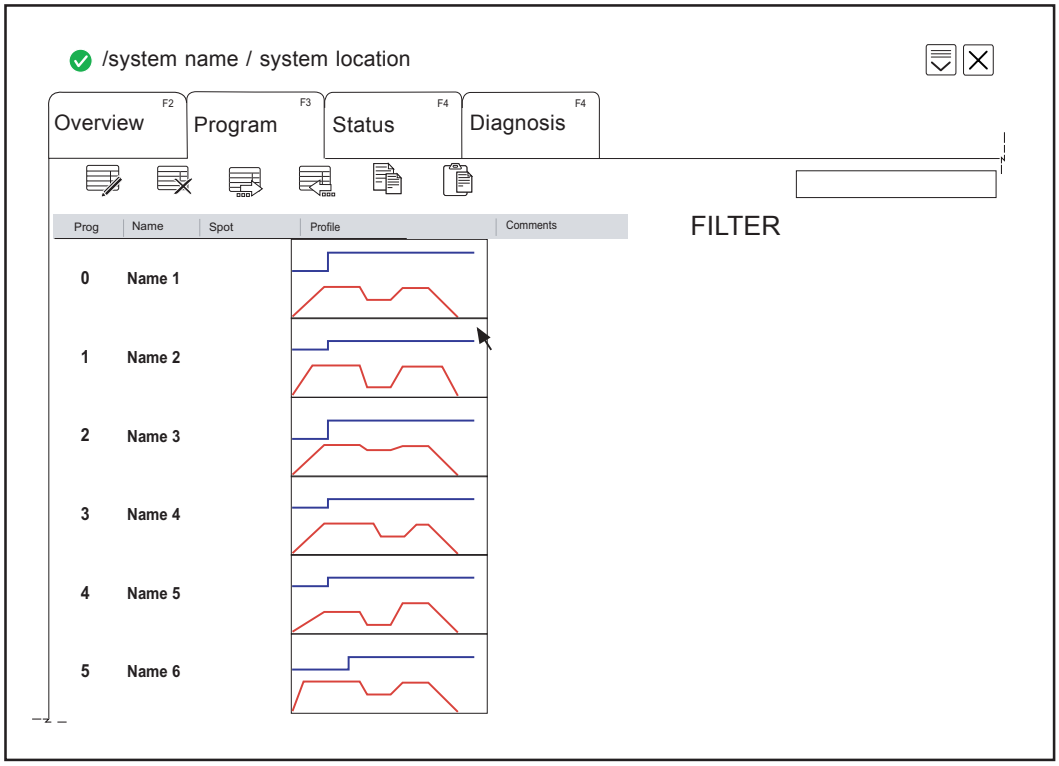


Fig. 24 Program option view

Create/edit program button
Click on profile preview (1) in options sheet to select and click on program editor button to open.
Shortcut: Enter key

Delete profile button
Click on profile to select and delete by clicking on the button.
Shortcut: Delete key

Save profile button to memory
Select required profile and click on button to save to a file

Import profile button
Opens a profile saved to a file

Copy profile button
Select required profile and click on button to save to a temporary file
Shortcut: Ctrl + C

Insert profile button
Click on required position to select and click on button to add previously copied profile.
Shortcut: Ctrl + V

FILTER
Option to limit program display according to:
- program number
- spot number
- program name
- comment
- material

Status options

In the status view you will find all current warnings and faults related to the welding gun.

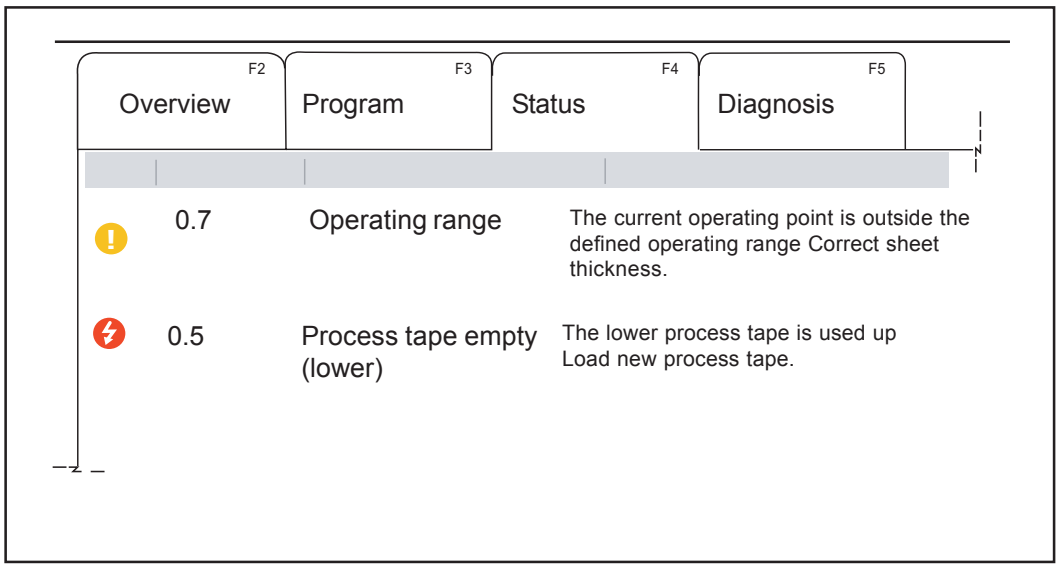


Fig. 25 Status view

System Stop symbol
The operation cannot be continued until the problem has been rectified

Warning symbol
Ignoring a warning can result in the system stopping

Diagnosis view

The diagnosis view gives information about:

- Current statuses of the input and output interfaces
- The connection statuses of the Can devices
- The device status

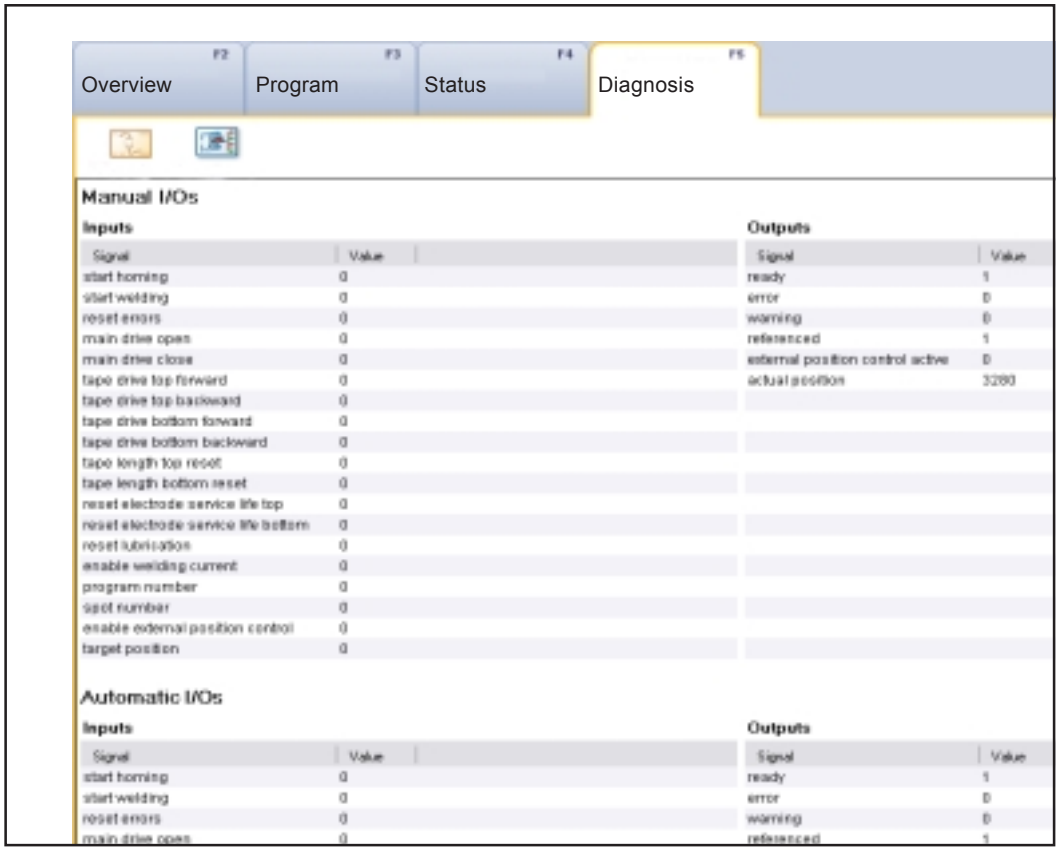


Fig. 26 Diagnosis view - interface

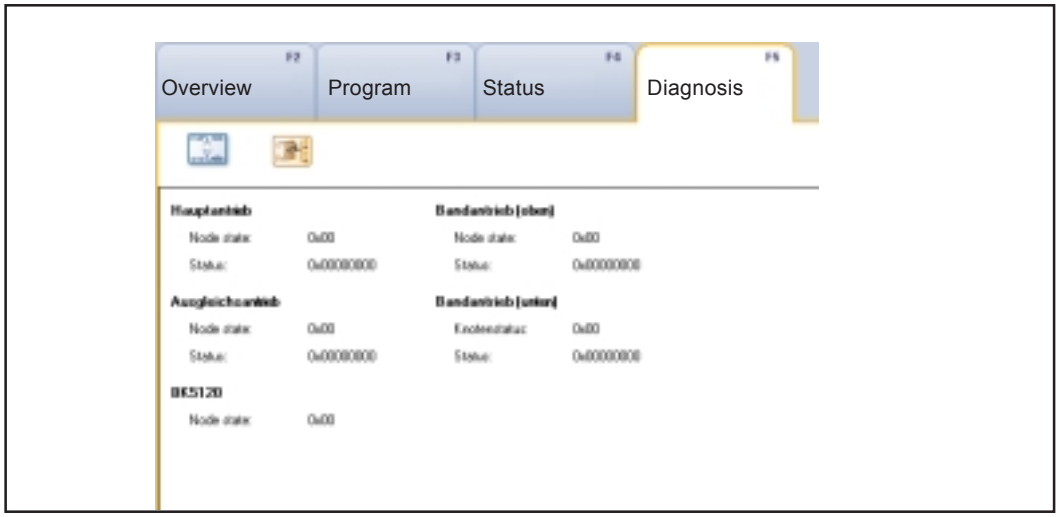


Fig. 27 Diagnosis view - components

Interface button

Activate to display the current statuses of the input and output interfaces.

Components button

Activate to display the current statuses of the Can devices and respective components.

If the figure displayed is not 0 there is a fault. The figure displayed relates to the fault and can assist a customer services to rectify the fault in as short a time as possible.

Creating welding parameters in program editor

Opening program editor

Select program editor by selecting the required profile and clicking on the create/edit profile button. Shortcut: double click on profile

Symbols used in program editor

Save settings
Backup parameter settings.
Shortcut: Enter key

Reset settings
Resets all changes carried out since the last save

Current profile button
to create waveform during welding process

Force profile button
to create force profile during welding process

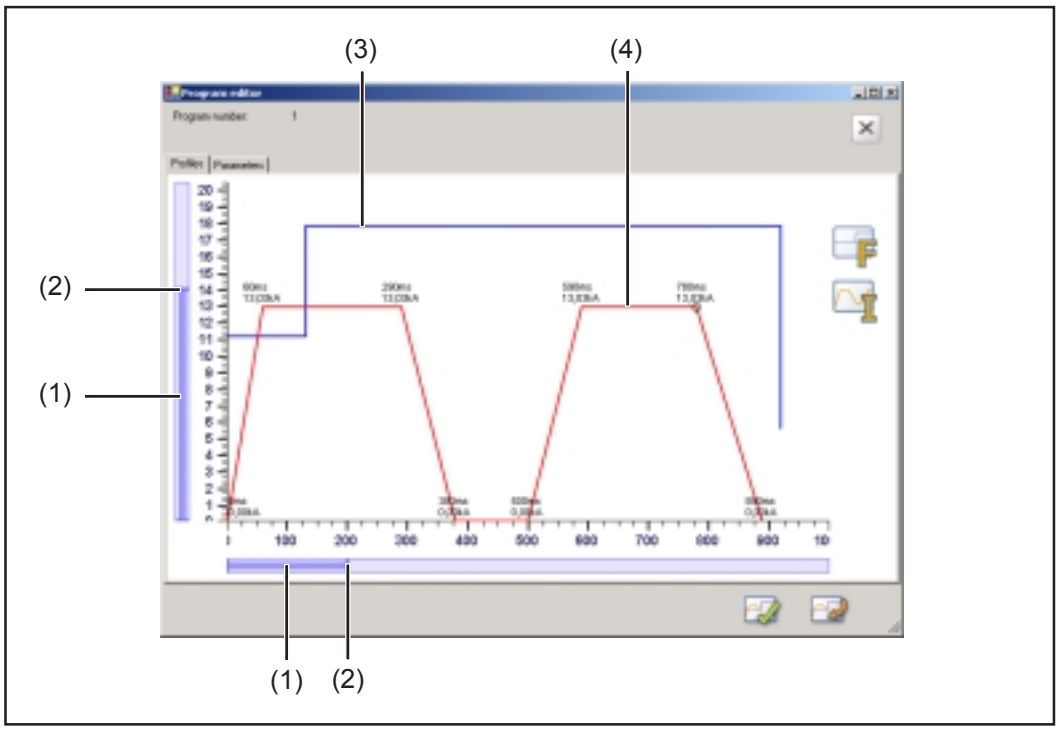


Fig.28 Program editor

(1) Scrollbar
to move the visible area

(2) Zoom
to enlarge and reduce the screen view

(3) Force profile (blue)
to control the force profile during the welding process

(4) Current profile (red)
to control the waveform during the welding process

Creating current/ force profile

Create force profile or current profile:

1. Opening program editor
2. Select button I for current profile or button F for force profile

3. Click on the first spot within the surface diagram and drag to the required position
4. Release the mouse button to fix the point of the first spot
5. Click again to create a new spot and drag to the required position

Important! The diagram incorporates an object grid (values 0.1 kN or 0.1 kA) which positions newly created spots level with the previously selected spot.
This function makes it easier to create an evenly shaped diagram.

6. Add more spots as described above
7. Confirm settings

Editing current/ force profiles

Edit force profile or current profile:

1. Open program editor
2. Select button A for current profile/button F for force profile
3. Click on the spots you want to select

Important! To select several spots at the same time, click on escape and drag a box around the required spots. Make sure that the starting point is not located within the selection.

4. Move selected spots or delete from the profile by clicking on the delete button.

Important! After moving the spots is it is possible to restore the original values at any time by clicking on the reset button.

5. Save settings

Exiting program editor

To exit program editor, click on the close button. Settings are not saved. To save changes, click on save settings button before closing.
Shortcut exit: Esc-button

Program presettings

The programme presetting view is for defining mechanical parameters during the welding operation. It is also possible to enter a program name and additional comments.

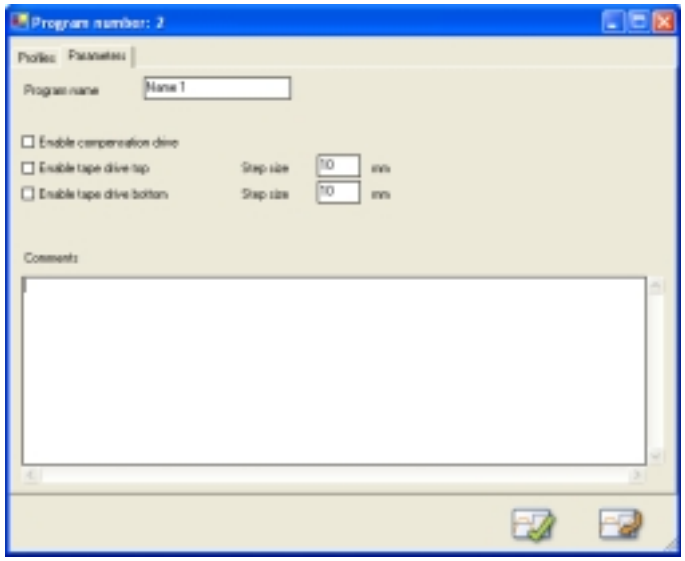


Fig.29 Program presettings

Program name
to define a program name

Enable compensation drive
to switch the power source on and off.

Enable tape drive top / bottom
to switch the process tape advance power source on and off.

Step size
To define the process tape advance in millimetres

Comments
to enter additional information about welding parameters, etc.

Signal description

General remarks

Signals can be transferred via field bus.

Description of signal inputs

start_homing *
Move to reference point

start_welding *
Start welding process

enable_welding_current *
Welding current active (high) / welding current off (low) - trial run

prog_nummer *
Program number from 0 - 255 (spots with different parameter settings)

reset_errors
Reset errors

md_open
Manual opening of welding gun

md_close
Manual closing of welding gun

td_t_forward (tapedrive_top_forward)
Top tape drive forward

td_t_backward (tapedrive_top_backward)
Top tape drive backward

td_b_forward (tapedrive_bottom_forward)
Bottom tape drive forward

td_b_backward (tapedrive_bottom_backward)
Bottom tape drive backward

tl_t_reset (tapelength_top_reset)
Reset tape length counter for upper process tape

tl_b_reset (tapelength_bottom_reset)
Reset tape length counter for lower process tape

electrode top reset
Reset top electrode service life

electrode bottom reset
Reset bottom electrode service life

lubrication_reset
Reset lubrication cycle counter

external_position_control (external position specification)
high - signal target position active , low - manual control

spot_number
Spot number (different weld positions with the same parameter settings in the program)
If the spot number = 0 the programme selection is via the programme number
If the spot number is not equal to 0 the programme selection is via the spot number

* Signals required for single welding process

Description of signal outputs

ready *
HIGH Commands can be revoked
LOW Command is carried out

target_position
The target position is specified via a higher-level control (robot)

warning
Warning e.g. process tape running out

error
Fault

referenced
Reference point confirmed

remote control connected
A remote control is connected to the welding gun

external_position_control_active (external position specification)
Feedback from input signal, external_position_control

* Signals required for single welding process

Data in process image, inputs

Input

Welding gun	Remarks	Field	Activity
E00	start_homing	-	High
E01	start_welding	-	High
E02	reset_errors	-	High
E03	md_open	-	High
E04	md_close	-	High
E05	td_t_forward	-	High
E06	td_t_backward	-	High
E07	td_b_forward	-	High
E08	td_b_backward	-	High
E09	tl_t_reset	-	High
E10	tl_b_reset	-	High
E11	electrode top reset	-	High
E12	electrode bottom reset	-	High
E13	lubrication_reset	-	High
E14	enable_welding_current	-	High
E15	external_position_control	-	High
	Program number	0 - 255	
E16 - E23	Reserve		
E24 - E31	- Low byte		
	Spot number	0 - XX	
E32 - E39	- High byte		
E40 - E47	- Low byte		
	Target position	0 - XX	
E48 - E55	- High byte		
E56 - E63	- Low byte		

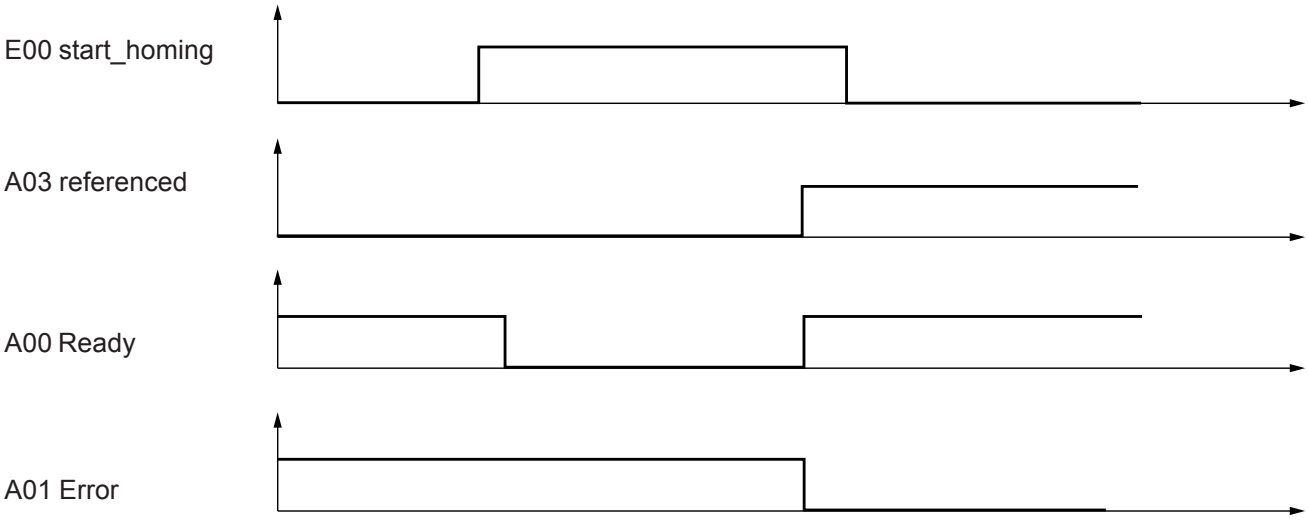
Data in process image, outputs

Input Welding gun	Remarks	Field	Activity
A00	ready	-	High
A01	Errors	-	High
A02	Warning	-	High
A03	referenced	-	High
A04	remote_control_connected	-	High
A05	external_position_control_active	-	High

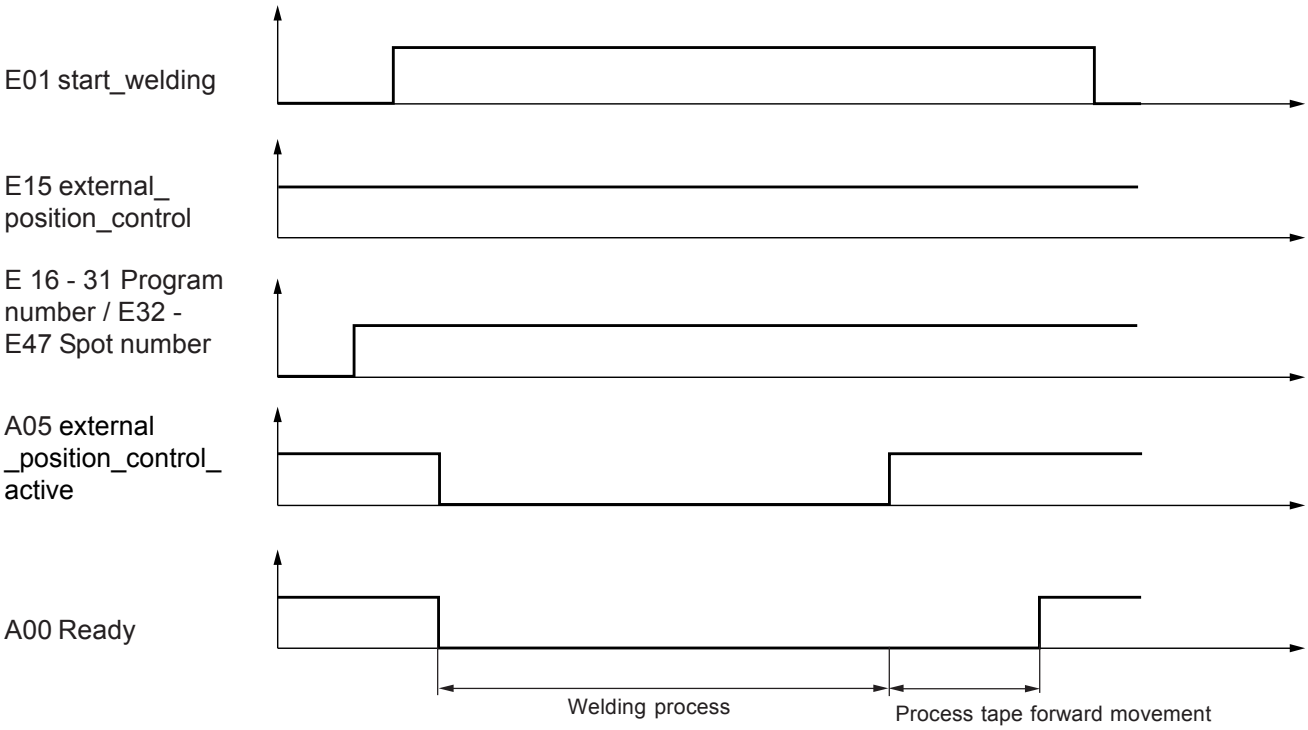
	Current position	0 - XX	
A16 - A23	- High byte		
A24 - A31	- Low byte		

Signal waveform

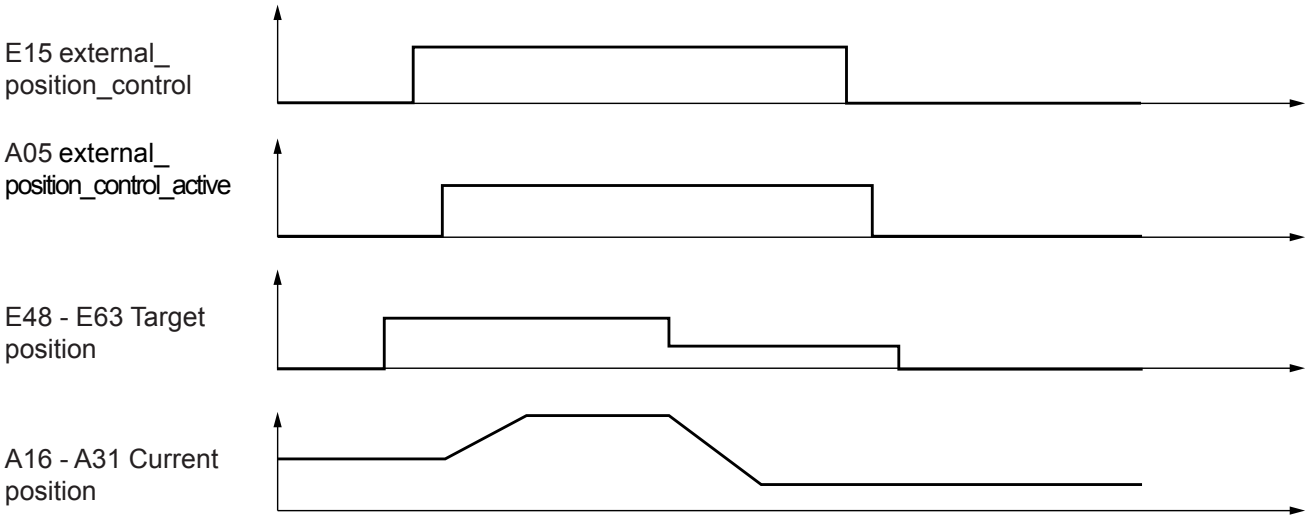
Move to reference point



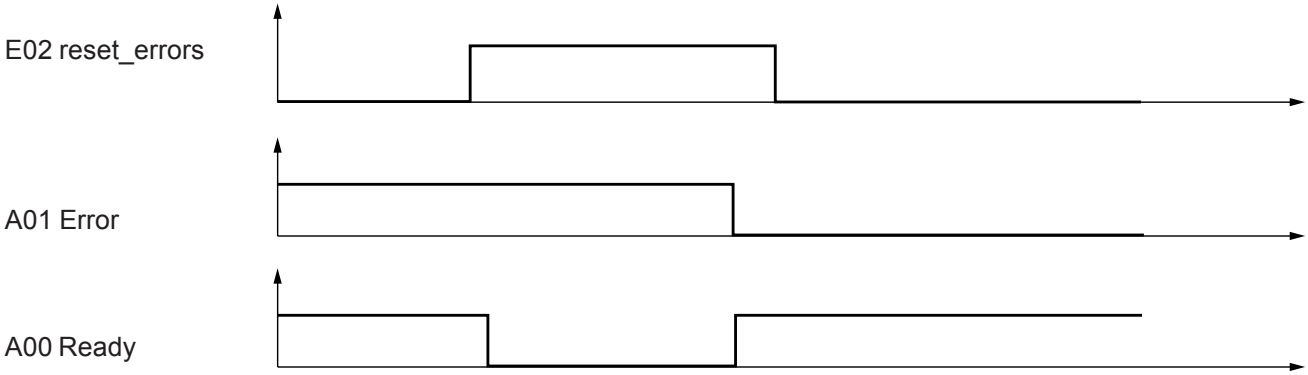
Start welding with external position specification



External position check



Reset error



Replace wearing parts

GB

General remarks

WARNING! Operating the equipment incorrectly can cause serious injury and damage. All connections must be carried out by trained and qualified personnel in compliance with the relevant safety regulations. Note the safety rules in the operating instructions.

Important!Check electrodes for wear and replace if necessary every time a new process tape is fitted

New process tape is loaded through the holder arm and over the electrodes and attached to the spooling device with the adhesive fastener.

Instructions for storing and assembling process tapes

To guarantee that the process tapes remain in top quality condition, please note the following recommended environmental conditions for storage:
- Store process tapes only in the original packaging (vacuum packed)
- The temperature at the storage place should not exceed 35° C (95°F)

When assembling a new process tape note the following:
- Do not remove process tapes from the packaging until immediately before use
- Wear oil and grease free gloves
- Dust and dirt free environment
- Do not touch adhesion points

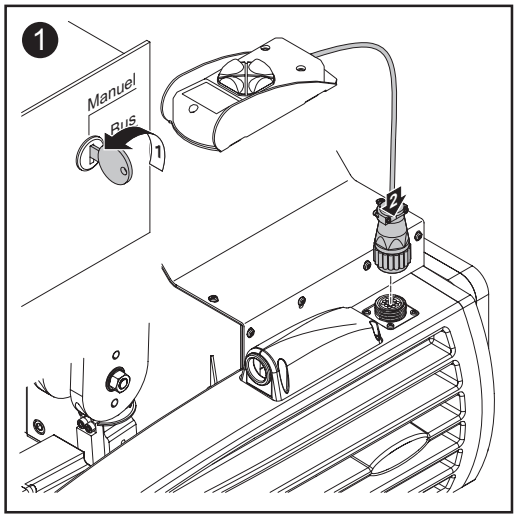
Material	**Process tape**	**Tape material**	**Heat input** (external)	**Tape length**
Deep drawn steel, ungalvanised Deep drawn steel, galvanised CrNi				
	PT 2000	copper	low	52 m (174 ft.)
High-strength and ultra-strong steel, boron steel				
	PT 1205	steel	medium	70 m (230 ft.)
	PT 2000	copper	low	52 m (174 ft.)
	PT 2110	steel	low	52 m (174 ft.)
Al 99 AlMg3 AlMg5	PT 1407	steel	medium	70 m (230 ft.)
AlMgSi	PT 1200	steel	medium	70 m (230 ft.)
Steel / aluminium	PT 3000*	CrNi	high	52 m (174 ft.)

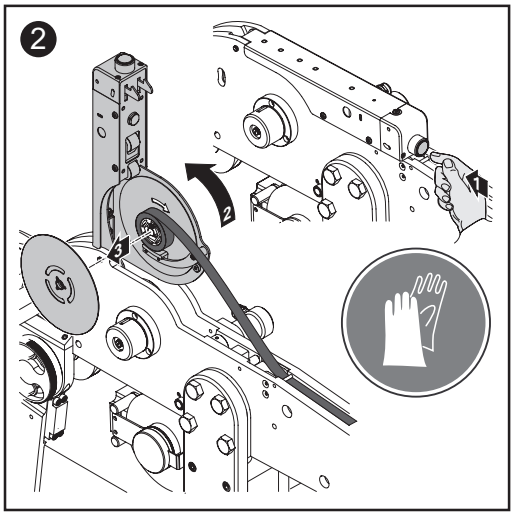
* aluminium side

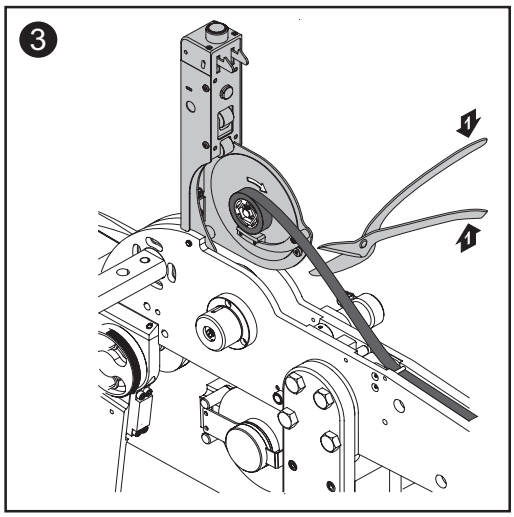
Loading new process tape

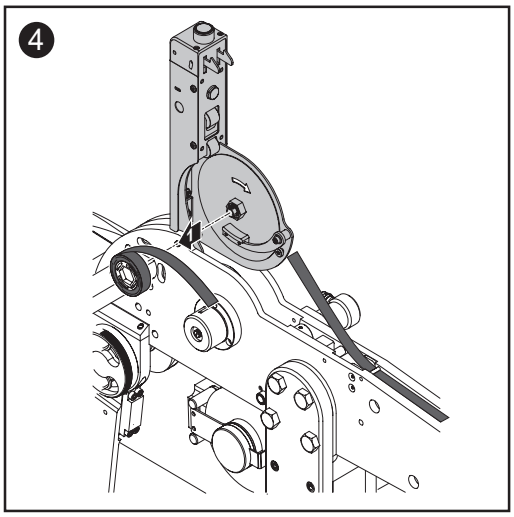
CAUTION! Risk of injury from springiness of spooled process tape. To avoid injuries caused by the welding wire springing back, hold the end of the wire firmly when feeding it.

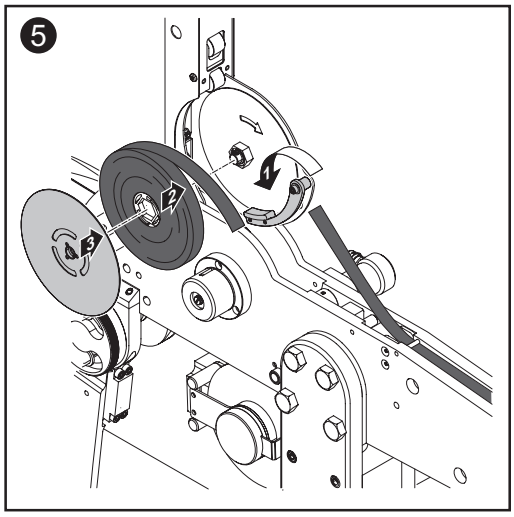
CAUTION! Danger of injury from sharp edged process tape . Wear safety gauntlets when working with process tape

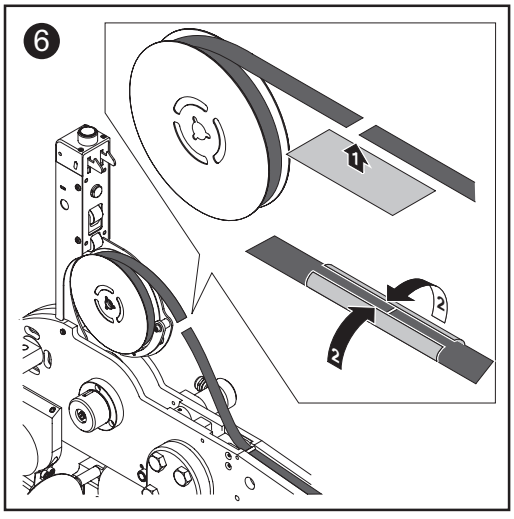






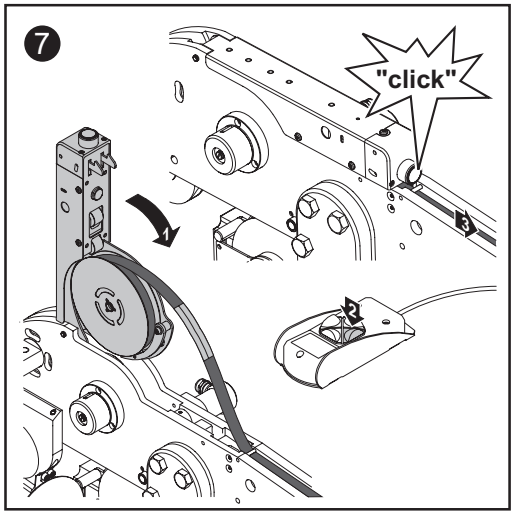


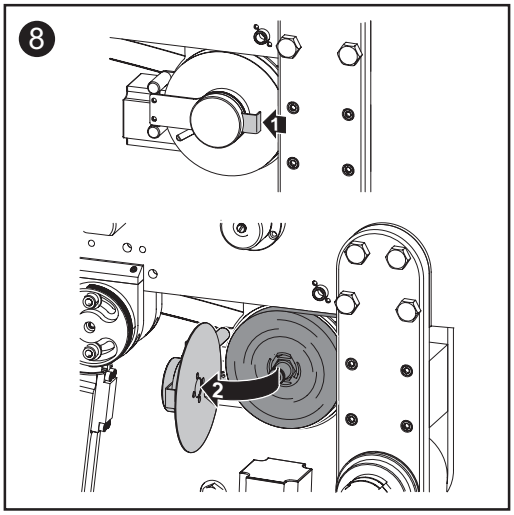


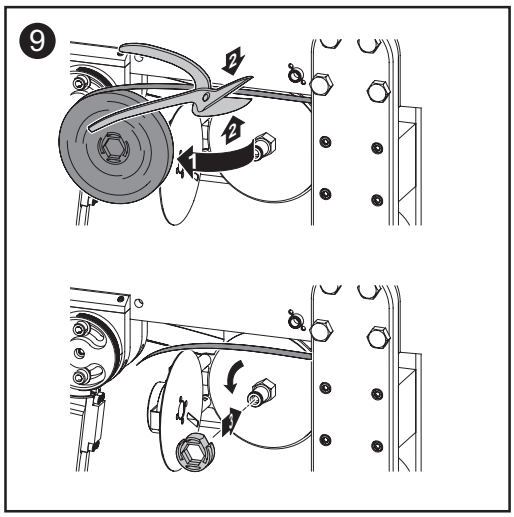


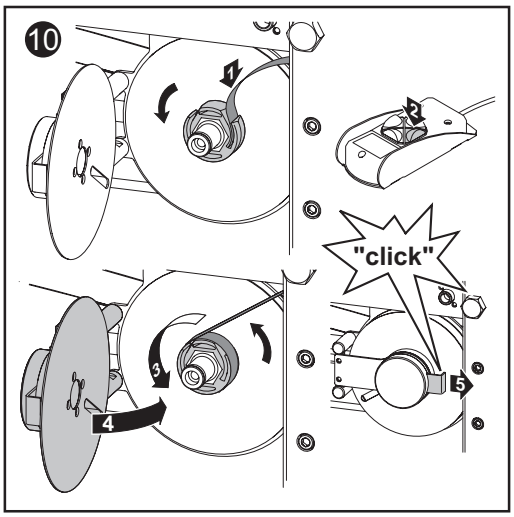
Loading new process tape
(continued)

CAUTION! Danger of serious damage to property caused by process tape slipping out due to holders and process tape spooling equipment being incorrectly closed. Before commissioning, make sure that all parts are correctly closed and intact. Never use welding gun with defective closures.

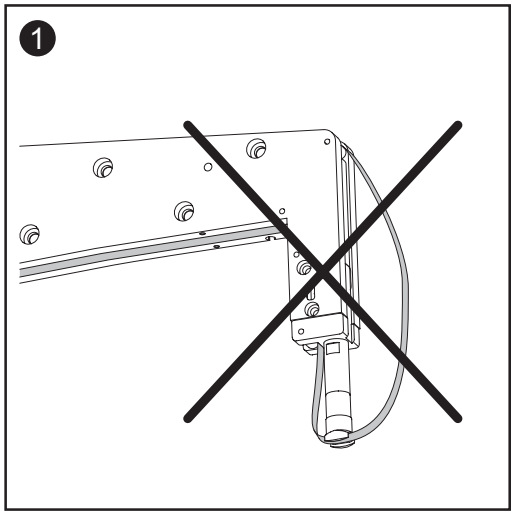


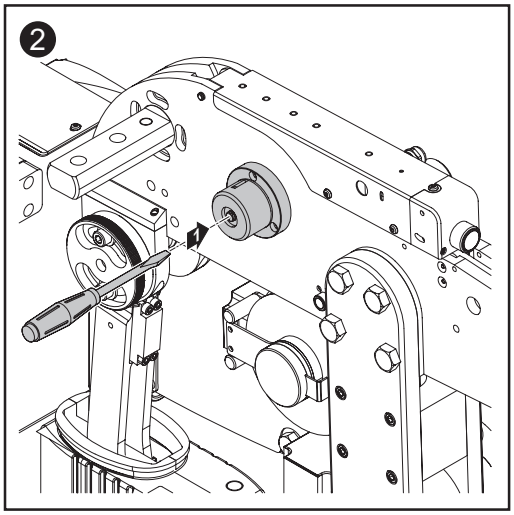


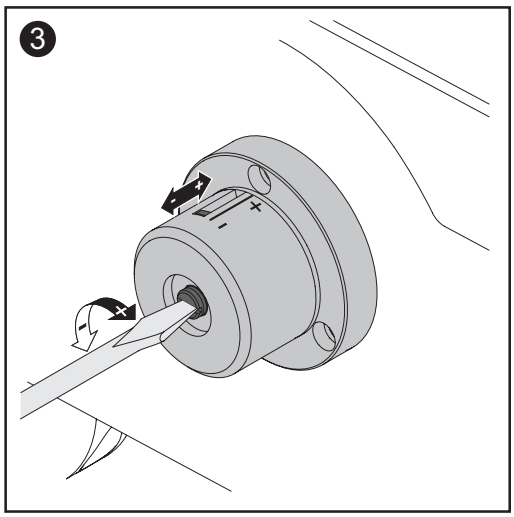


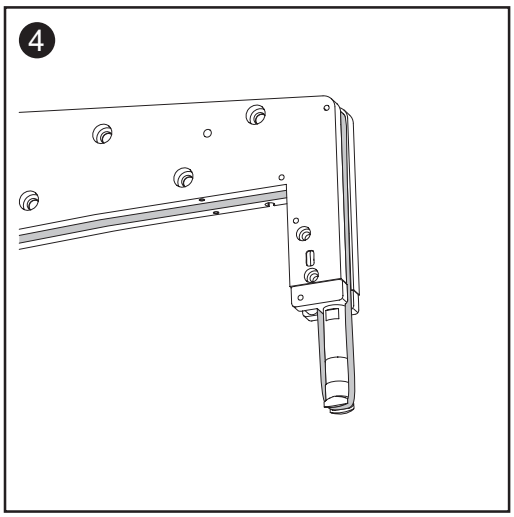


Adjusting process tape brake





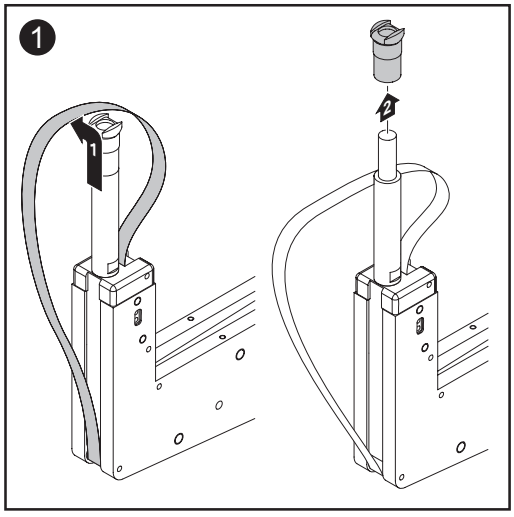


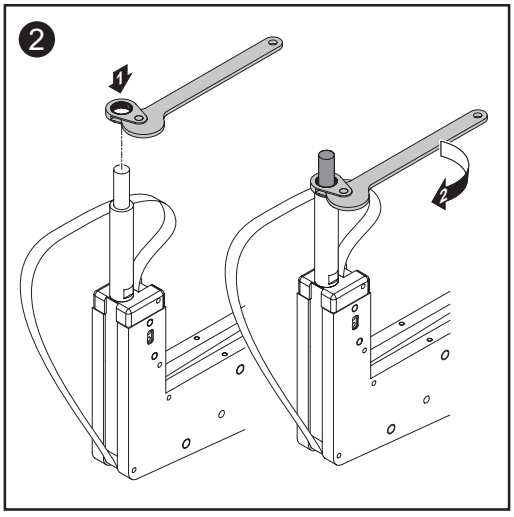


Replacing electrodes

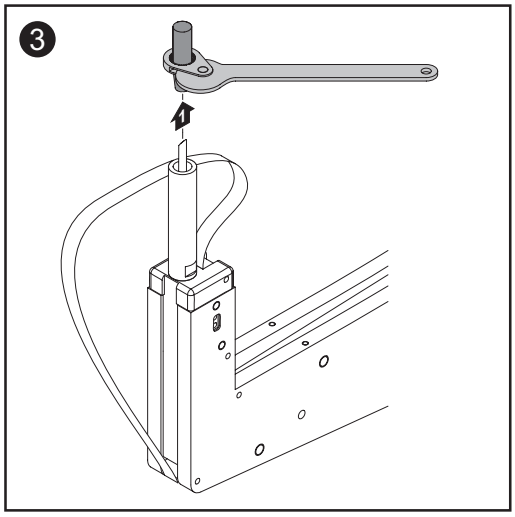
1. Move robot into the replace position
2. Turn off cooling water supply

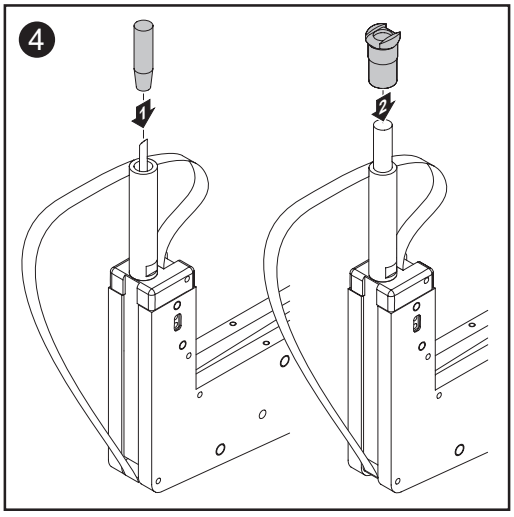
CAUTION! Danger of burns from hot coolant. Before changing the electrodes, turn off the coolant supply.

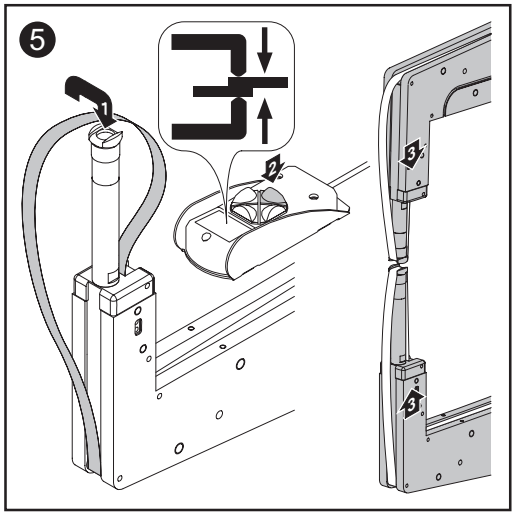


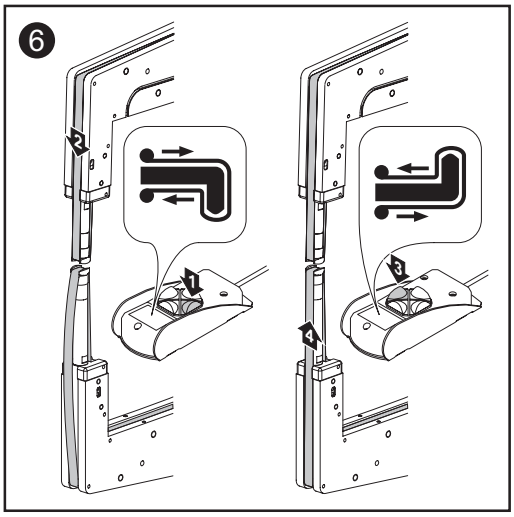


Replacing electrodes
(continued)





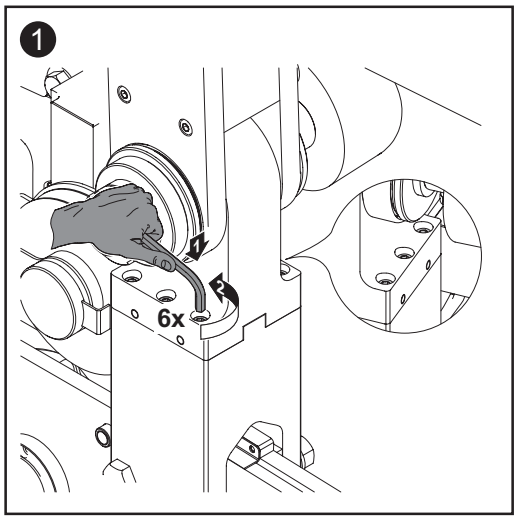


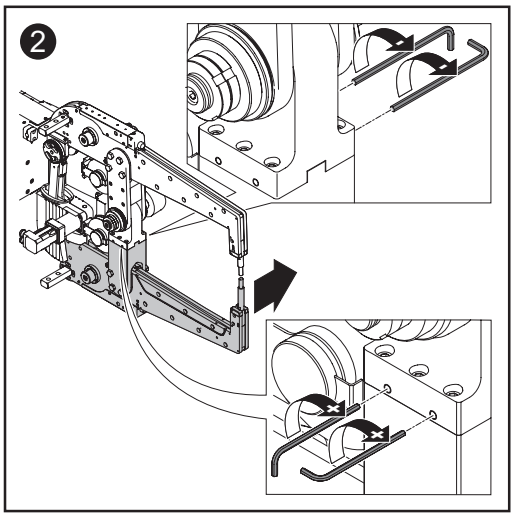


Important! If a large sheet thickness has been set, insert sheet when pushing in the new electrode in order to guarantee that the electrode is held securely.

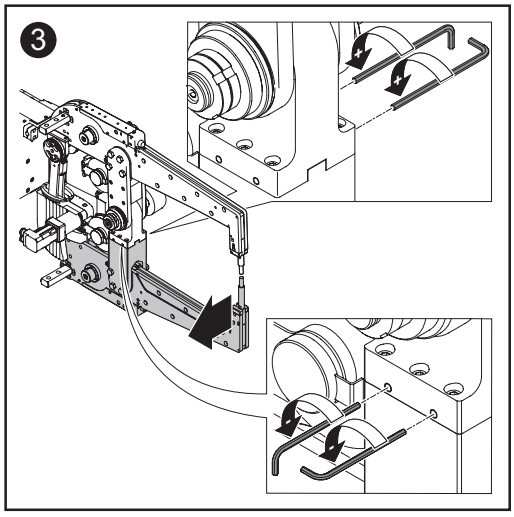
Adjusting holder arms

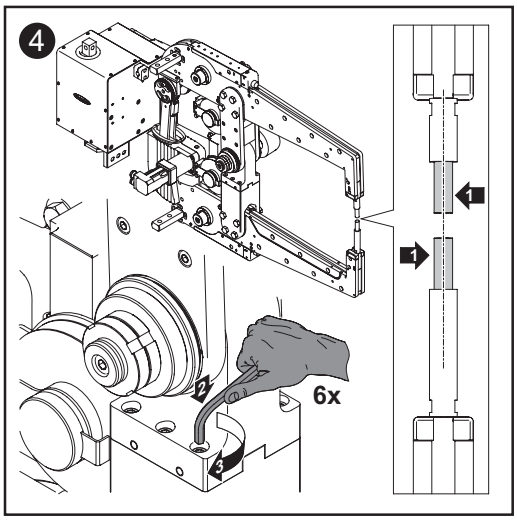
Important! After changing an electrode, check that the electrodes are flush with one another. If necessary, adjust the holder arm.





Important! Loosen hex socket head screws (figure 1). Do not remove otherwise you will not be able to carry out the adjustment.





Troubleshooting

General remarks

WARNING! An electric shock can be fatal. Before opening the machine
- Switch the mains switch to „O“
- Disconnect the machine from the mains
- Put up an easy-to-understand warning sign to stop anybody inadvertently switching it back on again
- Using a suitable measuring instrument, check to make sure that electrically charged components (e.g. capacitors) have been discharged

CAUTION! Failure to connect an appropriate earth lead may result in serious injury or damage. The housing screws provide a suitable PE conductor connection for earthing (grounding) the housing and must NOT be replaced by any other screws which do not provide a reliable PE conductor connection.

Troubleshooting

No welding current
Inverter OK, control OK

Cause:	Welding lead break
Remedy:	Check leads and contacts

Insufficient welding power

Cause:	Faulty contacts
Remedy:	Check contacts
Cause:	Diode defective
Remedy:	Replace diode or commutator if necessary
Cause:	Transformer feed too weak
Remedy:	Transformer feed must comply with the technical data

Temperature relay triggered

Cause:	Dimensioning error
Remedy:	Dimension transformer correctly for the application
Cause:	Limited coolant flow
Remedy:	Ensure minimum flow according to technical data

Process tape torn or stuck to electrode

Cause:	Incorrect parameter settings (current too high) or incorrect tape type
Remedy:	Correct parameter settings, clean electrodes and rethread process tape, check tape type and replace if necessary
Cause:	No coolant flow
Remedy:	Ensure coolant flow, clean electrodes and rethread process tape

Description of error signals

error 0.XX

0.00 = internal communication

Cause: Internal communication error
Remedy: Check interface connections

0.01 = main drive

Cause: Main motor is not ready
Remedy: Reset error, contact service team if necessary

0.02 = spot number

Cause: The specified spot number is not included in any programme
Remedy: Select program with available spot numbers

0.03 = power source

Cause: There is a power supply error (e.g., no ready signal)
Remedy: Check power source

0.04 = homing error

Cause: The reference point could not be found
Remedy: Check the reference point sensor

0.05 = poslimit out of range

Cause: The operating range is outside the permitted range.
Remedy: Check whether the correct holder type has been selected in the system configuration.

0.06 = tape drive top

Cause: Upper tape motor is not ready
Remedy: Reset error, contact service team if necessary

0.07 = tape drive bottom

Cause: Lower tape motor is not ready
Remedy: Reset error, contact service team if necessary

0.08 = tape empty (top)

Cause: Upper process tape is empty
Remedy: Loading new process tape

0.09 = tape empty (bottom)

Cause: Lower process tape is empty
Remedy: Loading new process tape

0.10 = program number

Cause: The program number entered is invalid or the program is defective
Remedy: Check the program number or correct the program.

0.11 = not referenced

Cause: The drives are not referenced
Remedy: Reference drives

0.12 = compensation drive

Cause: Fault on compensating drive
Remedy: Reset error, contact service team if necessary

0.13 = main drive position limit reached

Cause: The main drive has exceeded the position limit
Remedy: Correct sheet thickness

0.14 = flow controller

Cause: No or limited coolant flow
Remedy: Check flow monitor

Description of error signals
(continued)

0.15 = emergency stop

Cause:	Emergency Stop has been actuated
Remedy:	Disengage Emergency Stop after rectifying the fault

0.16 = main drive position target not reached

Cause:	The welding gun cannot move the specified electrode distance
Remedy:	Contact service team

0.17 = invalid dms value

Cause:	The force sensor is not (yet) calibrated or a fault has occurred during calibration
Remedy:	Calibrate force sensor or call the service team

0.18 = poslimit not calibrated

Cause:	The position limit (opening angle) of the welding gun is not yet calibrated or a fault has occurred during the calibration.
Remedy:	Calibrate position limit

0.19 = max force limit reached

Cause:	The maximum electrode force has been exceeded
Remedy:	Reduce electrode force

0.22 = current exceeds max current limit

Cause:	Current profile is greater than the maximum available welding current
Remedy:	Correct current profile

0.23 = force exceeds max force limit

Cause:	Current profile is greater than the maximum available electrode force
Remedy:	Correct force profile

0.24 = invalid operation

Cause:	The welding gun cannot perform the action because another operation is still active
Remedy:	Wait until the operation has finished. Reset command if necessary

0.25 = lost start welding signal

Cause:	The welding start signal has been lost during the welding process
Remedy:	Set the start signal back to high (reset)

0.26 = invalid tape length (top)

Cause:	The length of the process tape is less than 0. Process tape length not reset after reloading.
Remedy:	Reset process tape length

0.27 = invalid tape length (bottom)

Cause:	The length of the process tape is less than 0. Process tape length not reset after reloading.
Remedy:	Reset process tape length

0.28 =main drive velocity target not reached

Cause:	Specified speed not reached when holder opening or closing.
Remedy:	Contact service team

Description of error signals (continued)

0.29 = main drive force target not reached

Cause: Specified holder force not achieved
Remedy: Contact service team

0.30 = force sensor not calibrated

Cause: The force sensor has not yet been calibrated
Remedy: Calibrate force sensor

0.31 = diode protection

Cause: Invalid welding parameters
Remedy: Reduce welding current or welding time

Description of warning signals

warning 0.XX

0.00 = tape length top

Cause: Top process tape running out
Remedy: Reload process tape immediately

0.01 = tape length bottom warning

Cause: Top process tape running out
Remedy: Reload process tape immediately

0.02 = lubrication

Cause: Lubrication no longer adequate
Remedy: Lubricate holder

0.03 = electrode service life top

Cause: The electrode is reaching the end of its service life
Remedy: Replace electrode immediately

0.04 = electrode service life bottom

Cause: The electrode is reaching the end of its service life
Remedy: Replace electrode immediately

0.05 = flow controller

Cause: Insufficient flow of coolant to the electrode Optional test run without power
Remedy: Ensure coolant flow

0.07 = working range

Cause: The operating range is outside the optimum range
Remedy: Correct sheet thickness

0.08 = power source

Cause: The power source is not ready Optional test run without power
Remedy: Ensure power source is ready

0.09 - 0.27 unused

Care, maintenance and disposal

General remarks

Under normal operating conditions the welding gun requires only a minimum of care and maintenance. However, it is vital to observe some important points to ensure the welding system remains in a usable condition for many years.

WARNING! Automatically starting machines can cause serious injury and damage. In addition to these operating instructions, the robot and welding system manufacturer's safety rules must also be observed. For your personal safety, ensure that all protective measures have been taken and will remain in place for the duration of your stay within the working area of the robot.

Every start-up

- Check welding gun mains plug and mains cable as well as electrodes and process tape for damage
- Check coolant
- Check that all holders and spooling devices for the process tape have been closed correctly and are intact
- Check the electrodes for wear and replace if necessary
- Check how much process tape remains and reload if necessary

Every time you change an electrode

Check that the electrodes are positioned flush to one another. Adjust holder arm if necessary

Disposal

Carry out disposal in accordance with the valid national and local regulations.

Technical Data

Special voltages

For machines designed for special voltages, the technical data on the rating plate applies.

TR-Unit

Mains voltage	500 V
Frequency	1000 Hz
Transformation ratio	44
Idling DC voltage U_{d0}	11.8 V
Continuous direct current I_d	3780 A
Primary current I_{1P}	86 A
Continuous direct current P_d	44.6 kW
Central module at	
100 % ED S_{100}, S_{1P}	55.0 kVA
50 % ED S_{50}	77.7 kVA
20 % ED S_{20}	122.8 kVA
I_2 max	26.75 A
I_1 cc	502 A
max. short circuit power Scc U_1N x I_1cc	214. kVA
max. welding power Smax. 0.8 x Scc	171. kVA
Cooling water quantity	< 4.0 l/min < 1.06 gal/min
Cooling water temperature	max 30° C max.86° F
Differential pressure at 4.0 l/min (1.06 gal/min)	< 0.6 bar
Current measuring coil	150mV / kA +/- 3%
Temperature monitor NC (transformer)	1 x 125° C 1 x 257° F
Temperature monitor NC (commutator)	1 x 80 ° C 1 x 176° F
Protection	IP 00
Insulation class	F
Electrical connection	
primary	MC adapter for TSB 150
secondary	d = 13 mm (0.51 in.)
Weight	16.5 kg 36.40 lbs.

DeltaSpot welding gun

Nominal output at 50% dc (medium ferquency)	77. kVA
Welding gun supply voltage	230 V (16 A)
Holder force	5 kN
Cooling water quantity / holder arm	< 4.0 l/min < 1.06 gal/min
Cooling water temperature	max 30° C max.86° F
Throat depth	500 mm 50.04 cm.
Holder weight	approx. 100 kg approx. 100.02 kg

(D) Ersatzteilliste

(GB) Spare Parts List

(F) Liste de pièces de rechange

(I) Lista parti di ricambio

(E) Lista de repuestos

(P) Lista de peças sobresselentes

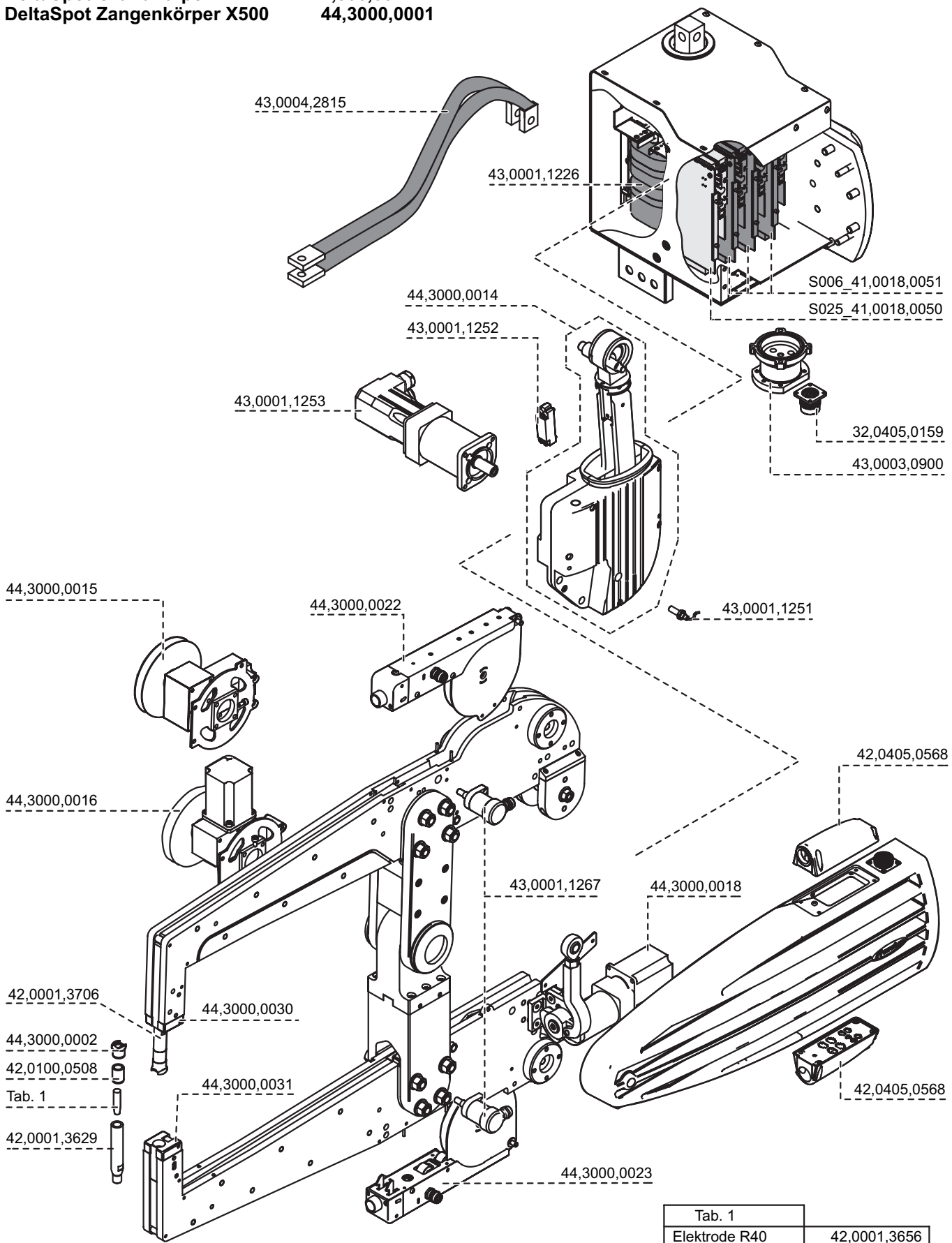
(NL) Onderdelenlijst

(N) Reservdelsliste

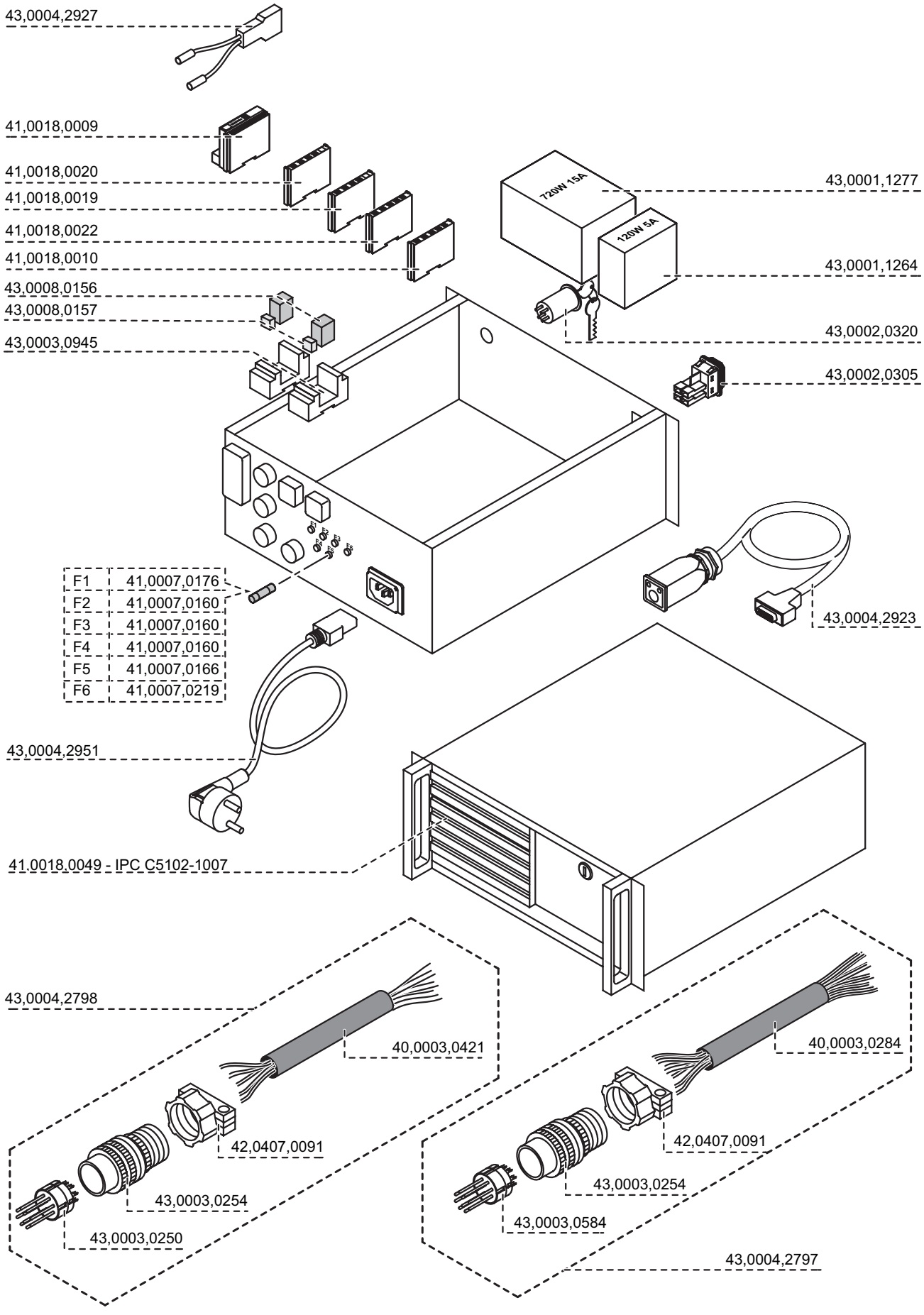
(CZ) Seznam náhradních dílů

(RUS) Список запасных частей

DeltaSpot Grundkörper **4,300,001**
DeltaSpot Zangenkörper X500 **44,3000,0001**



Tab. 1	
Elektrode R40	42,0001,3656
Elektrode R70	42,0001,3598
Elektrode R100	42,0001,3655
Elektrode R150	42,0001,3716


43,0004,2927
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41,0018,0019
41,0018,0022
41,0018,0010
43,0008,0156
43,0008,0157
43,0003,0945
720W 15A
120W 5A
43,0001,1277
43,0001,1264
43,0002,0320
43,0002,0305
F1 41,0007,0176
F2 41,0007,0160
F3 41,0007,0160
F4 41,0007,0160
F5 41,0007,0166
F6 41,0007,0219
43,0004,2923
43,0004,2951
41,0018,0049 - IPC C5102-1007
43,0004,2798
40,0003,0421
42,0407,0091
43,0003,0254
43,0003,0250
40,0003,0284
42,0407,0091
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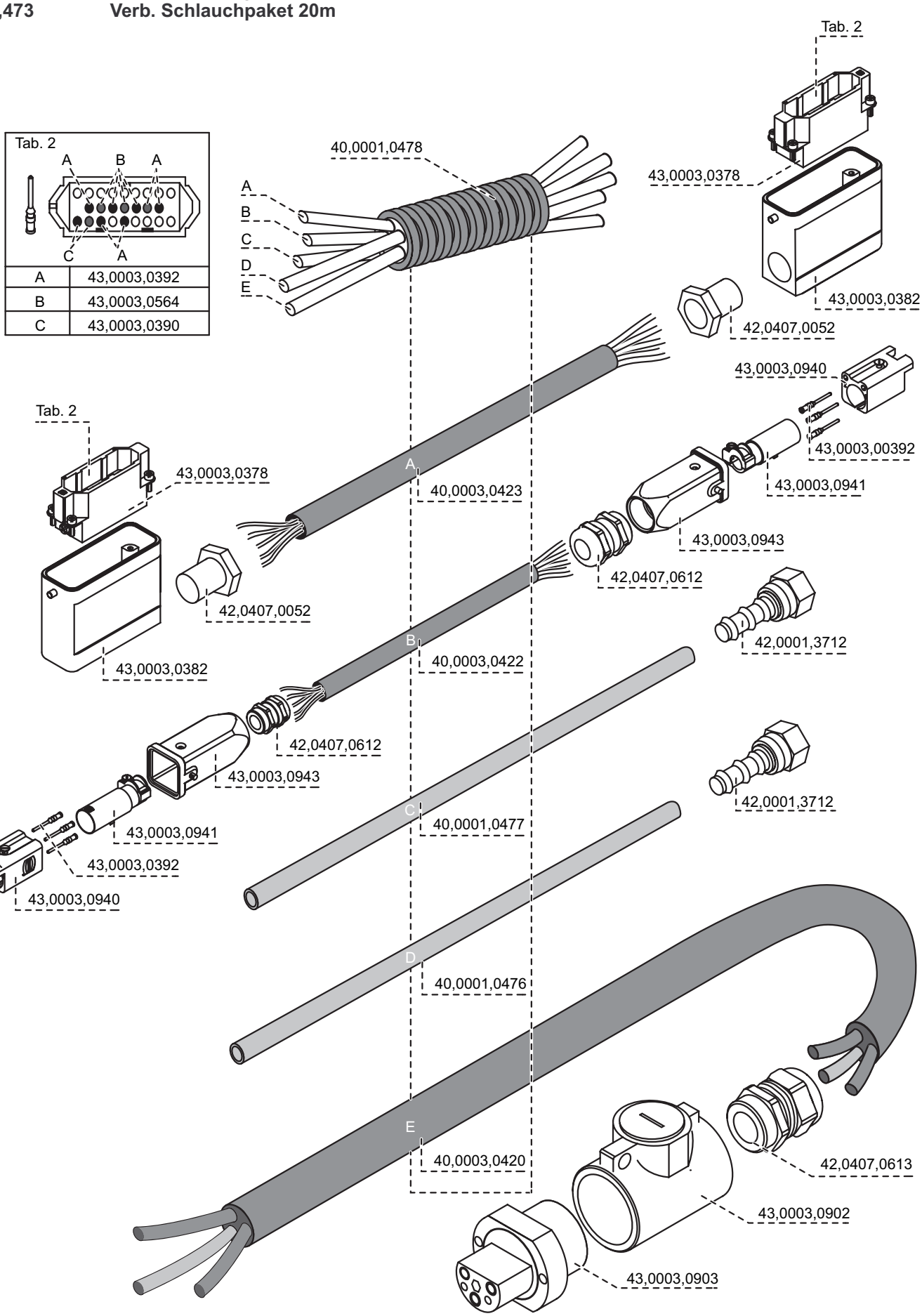
43,0004,2797

4,047,481 Verb. Schlauchpaket 10m
4,047,473 Verb. Schlauchpaket 20m



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