



Power sources for automated applications

**Tetrix 352 AC/DC SYNERGIC PL. AW GR
(SCO 3133)**

General instructions

CAUTION



Read the operating instructions!

The operating instructions provide an introduction to the safe use of the products.

- Read the operating instructions for all system components!
- Observe accident prevention regulations!
- Observe all local regulations!
- Confirm with a signature where appropriate.

NOTE



In the event of queries on installation, commissioning, operation or special conditions at the installation site, or on usage, please contact your sales partner or our customer service department on +49 2680 181-0.

A list of authorised sales partners can be found at www.ewm-group.com.

Liability relating to the operation of this equipment is restricted solely to the function of the equipment. No other form of liability, regardless of type, shall be accepted. This exclusion of liability shall be deemed accepted by the user on commissioning the equipment.

The manufacturer is unable to monitor whether or not these instructions or the conditions and methods are observed during installation, operation, usage and maintenance of the equipment.

An incorrectly performed installation can result in material damage and injure persons as a result. For this reason, we do not accept any responsibility or liability for losses, damages or costs arising from incorrect installation, improper operation or incorrect usage and maintenance or any actions connected to this in any way.

© EWM AG · Dr. Günter-Henle-Str. 8 · D-56271 Mündersbach, Germany

The copyright to this document remains the property of the manufacturer.

Reprinting, including extracts, only permitted with written approval.

Subject to technical amendments.

1 Contents

1	Contents	3
2	Safety instructions	6
2.1	Notes on the use of these operating instructions	6
2.2	Explanation of icons.....	7
2.3	General	8
2.4	Transport and installation	12
2.4.1	Ambient conditions	13
2.4.1.1	In operation	13
2.4.1.2	Transport and storage.....	13
3	Intended use	14
3.1	Applications.....	14
3.2	Plasma welding.....	14
3.3	TIG welding.....	14
3.3.1	TIG <i>activArc</i> welding.....	14
3.3.2	spotArc	14
3.3.3	TIG hot wire welding.....	14
3.3.4	TIG cold wire welding	14
3.4	Use and operation solely with the following machines	15
3.5	Documents which also apply	15
3.5.1	Warranty	15
3.5.2	Declaration of Conformity.....	15
3.5.3	Welding in environments with increased electrical hazards.....	15
3.5.4	Service documents (spare parts and circuit diagrams)	15
3.5.5	Calibration/Validation.....	15
4	Machine description – quick overview	16
4.1	Front view	16
4.2	Rear view	18
4.3	Machine control (Mode RC - on).....	20
4.3.1	Function sequence	22
4.4	Machine control (Mode RC - off).....	24
4.4.1	Function sequence	27
4.5	Plasmadrive	29
4.6	"Insufficient wire" sensor.....	30
5	Design and function	31
5.1	General	31
5.2	System integration	33
5.2.1	Plasma application with hot wire	33
5.2.1.1	Legend	34
5.3	Transport and installation	35
5.3.1	Power source for hot wire welding	36
5.4	Machine cooling.....	36
5.5	Workpiece lead, general	37
5.6	Notes on the installation of welding current leads	38
5.7	Welding torch cooling system	40
5.7.1	General.....	40
5.7.1.1	List of coolants	40
5.8	Mains connection	41
5.8.1	Mains configuration	41
5.9	System gas connection.....	42
5.9.1	Connecting the shielding gas supply.....	44
5.9.1.1	Gas test.....	44
5.9.1.2	"Purge hose package" function.....	44

5.10	Welding torch connection.....	45
5.11	"Insufficient wire" sensor connection	47
5.12	Connecting the wire feed unit.....	48
5.13	Hot wire power source connection	49
5.14	Cooling unit connection.....	50
5.15	Connection for workpiece lead.....	52
5.16	TIG Synergic operating principle.....	53
5.16.1	Synergic parameter setting in the functional sequence.....	54
5.16.2	Conventional parameter setting in the functional sequence.....	54
5.16.2.1	Set the operating principle (conventional/synergic)	55
5.16.3	Select welding task	56
5.16.4	Select welding current	56
5.16.5	Welding data display.....	57
5.16.5.1	Welding parameter setting	57
5.16.6	Arc ignition	58
5.16.7	Optimising the ignition characteristics for pure tungsten electrodes	58
5.16.8	TIG automatic cut-out	58
5.16.9	Optimal and fast spherical cup formation	59
5.17	Welding task definition	60
5.18	Protecting welding parameters from unauthorised access	61
5.19	Welding programs	61
5.19.1	Selection and adjustment	62
5.19.2	Specifying max. no. of accessible programs	62
5.19.3	Example "Program with synergetic setting"	63
5.19.4	Example "Program with conventional setting"	63
5.19.5	Accessories for switching over programs	63
5.20	Organising welding tasks (Mode "JOB Manager").....	64
5.20.1	Explanation of symbols on the display	64
5.20.2	Creating a new JOB in the memory or copying a JOB	65
5.20.3	Loading an existing JOB from the free memory	66
5.20.4	Resetting an existing JOB to the factory setting (Reset JOB).....	66
5.20.5	Resetting JOBS 1-128 to the factory setting (Reset All JOBS)	67
5.20.6	Exit JOB Manager without changes	67
5.21	Interfaces.....	68
5.21.1	Connecting the robot interface / industrial bus interface	68
5.21.1.1	RINT X12 robot interface.....	69
5.21.1.2	BUSINT X11 industrial bus interface.....	69
5.21.2	Connecting the PC 300.net welding parameterisation software.....	70
5.21.3	Connecting the Q-DOC 9000 V2.0 welding data documentation software	71
5.21.4	Connecting the WELDQAS welding data monitoring and documentation system	72
5.21.5	Automation interface.....	73
5.21.6	Connection socket automation torch	75
5.21.7	Sensor current	76
5.22	Advanced settings.....	77
5.22.1	Setting slope times for secondary current AMP% or pulse edges	77
5.22.2	Welding current display (ignition, secondary, end and hotstart currents)	78
5.23	Menus and sub-menus on the machine control	79
5.23.1	Direct menus (direct access to parameters).....	79
5.23.2	Expert menu (TIG)	79
5.23.3	Machine configuration menu.....	81

6	Maintenance, care and disposal	86
6.1	General	86
6.2	Maintenance work, intervals	86
6.2.1	Daily maintenance tasks	86
6.2.1.1	Visual inspection	86
6.2.1.2	Functional test	86
6.2.2	Monthly maintenance tasks	86
6.2.2.1	Visual inspection	86
6.2.2.2	Functional test	86
6.2.3	Annual test (inspection and testing during operation)	87
6.3	Maintenance work	87
6.4	Disposing of equipment	88
6.4.1	Manufacturer's declaration to the end user	88
6.5	Meeting the requirements of RoHS	88
7	Rectifying faults	89
7.1	Checklist for rectifying faults	89
7.2	Machine faults (error messages)	91
7.3	Resetting welding parameters to the factory settings	93
7.4	Display machine control software version	94
7.5	General operating problems	94
7.5.1	Interface for automated welding	94
7.6	Vent coolant circuit	95
8	Technical data	96
8.1	Tetrix 352 AC/DC SYNERGIC PL. AW GR	96
9	Accessories	97
9.1	Welding torch cooling system	97
9.2	Wire feed units	97
9.3	General accessories	97
9.4	Connection cables, connection sockets	97
9.5	Options	97
9.6	Computer communication	97
9.7	Interfaces	98
9.8	Connection and extension cables	98
10	Circuit diagrams	99
10.1	Tetrix 352 AC/DC SYNERGIC PL. AW GR	99
11	Appendix A	105
11.1	JOB-List	105
12	Appendix B	109
12.1	Overview of EWM branches	109

2 Safety instructions

2.1 Notes on the use of these operating instructions

DANGER

Working or operating procedures which must be closely observed to prevent imminent serious and even fatal injuries.

- Safety notes include the "DANGER" keyword in the heading with a general warning symbol.
- The hazard is also highlighted using a symbol on the edge of the page.

WARNING

Working or operating procedures which must be closely observed to prevent serious and even fatal injuries.

- Safety notes include the "WARNING" keyword in the heading with a general warning symbol.
- The hazard is also highlighted using a symbol in the page margin.

CAUTION

Working or operating procedures which must be closely observed to prevent possible minor personal injury.

- The safety information includes the "CAUTION" keyword in its heading with a general warning symbol.
- The risk is explained using a symbol on the edge of the page.

CAUTION

Working and operating procedures which must be followed precisely to avoid damaging or destroying the product.

- The safety information includes the "CAUTION" keyword in its heading without a general warning symbol.
- The hazard is explained using a symbol at the edge of the page.

NOTE

Special technical points which users must observe.

- Notes include the "NOTE" keyword in the heading without a general warning symbol.

Instructions and lists detailing step-by-step actions for given situations can be recognised via bullet points, e.g.:

- Insert the welding current lead socket into the relevant socket and lock.

2.2 Explanation of icons

Symbol	Description
	Press
	Do not press
	Turn
	Switch
	Switch off machine
	Switch on machine
	ENTER (enter the menu)
	NAVIGATION (Navigating in the menu)
	EXIT (Exit the menu)
	Time display (example: wait 4s/press)
	Interruption in the menu display (other setting options possible)
	Tool not required/do not use
	Tool required/use

2.3 General



DANGER



Electromagnetic fields!

The power source may cause electrical or electromagnetic fields to be produced which could affect the correct functioning of electronic equipment such as IT or CNC devices, telecommunication lines, power cables, signal lines and pacemakers.

- Observe the maintenance instructions! (see Maintenance and Testing chapter)
- Unwind welding leads completely!
- Shield devices or equipment sensitive to radiation accordingly!
- The correct functioning of pacemakers may be affected (obtain advice from a doctor if necessary).



Do not carry out any unauthorised repairs or modifications!

To avoid injury and equipment damage, the unit must only be repaired or modified by specialist, skilled persons!

The warranty becomes null and void in the event of unauthorised interference.

- Appoint only skilled persons for repair work (trained service personnel)!



Electric shock!

Welding machines use high voltages which can result in potentially fatal electric shocks and burns on contact. Even low voltages can cause you to get a shock and lead to accidents.

- Do not touch any live parts in or on the machine!
- Connection cables and leads must be free of faults!
- Switching off alone is not sufficient!
- Place welding torch and stick electrode holder on an insulated surface!
- The unit should only be opened by specialist staff after the mains plug has been unplugged!
- Only wear dry protective clothing!
- Wait for 4 minutes until the capacitors have discharged!



WARNING



Risk of injury due to radiation or heat!

Arc radiation results in injury to skin and eyes.

Contact with hot workpieces and sparks results in burns.

- Use welding shield or welding helmet with the appropriate safety level (depending on the application)!
- Wear dry protective clothing (e.g. welding shield, gloves, etc.) according to the relevant regulations in the country in question!
- Protect persons not involved in the work against arc beams and the risk of glare using safety curtains!



Explosion risk!

Apparently harmless substances in closed containers may generate excessive pressure when heated.

- Move containers with inflammable or explosive liquids away from the working area!
- Never heat explosive liquids, dusts or gases by welding or cutting!

 **WARNING****Smoke and gases!**

Smoke and gases can lead to breathing difficulties and poisoning. In addition, solvent vapour (chlorinated hydrocarbon) may be converted into poisonous phosgene due to the ultraviolet radiation of the arc!

- Ensure that there is sufficient fresh air!
- Keep solvent vapour away from the arc beam field!
- Wear suitable breathing apparatus if appropriate!

**Fire hazard!**

Flames may arise as a result of the high temperatures, stray sparks, glowing-hot parts and hot slag produced during the welding process.

Stray welding currents can also result in flames forming!

- Check for fire hazards in the working area!
- Do not carry any easily flammable objects such as matches or lighters.
- Keep appropriate fire extinguishing equipment to hand in the working area!
- Thoroughly remove any residue of flammable substances from the workpiece before starting welding.
- Only continue work on welded workpieces once they have cooled down.
Do not allow to come into contact with flammable material!
- Connect welding leads correctly!

**Risk of accidents if these safety instructions are not observed!**

Non-observance of these safety instructions is potentially fatal!

- Carefully read the safety information in this manual!
- Observe the accident prevention regulations in your country.
- Inform persons in the working area that they must observe the regulations!

**Danger when coupling multiple power sources!**

Coupling multiple power sources in parallel or in series has to be carried out by qualified personnel and in accordance with the manufacturer's guidelines. Before bringing the power sources into service for arc welding operations, a test has to verify that they cannot exceed the maximum allowed open circuit voltage.

- Connection of the machine may be carried out by qualified personnel only!
- When decommissioning individual power sources, all mains and welding current leads have to be safely disconnected from the welding system as a whole. (Danger due to inverse voltages!)
- Do not couple welding machines with pole reversing switch (PWS series) or machines for AC welding, as a minor error in operation can cause the welding voltages to be combined.

 **CAUTION****Noise exposure!**

Noise exceeding 70 dBA can cause permanent hearing damage!

- Wear suitable ear protection!
- Persons located within the working area must wear suitable ear protection!

CAUTION



Obligations of the operator!

The respective national directives and laws must be observed for operation of the machine!

- National implementation of the framework directive (89/391/EWG), as well as the associated individual directives.
- In particular, directive (89/655/EWG), on the minimum regulations for safety and health protection when staff members use equipment during work.
- The regulations regarding work safety and accident prevention for the respective country.
- Setting up and operating the machine according to IEC 60974-9.
- Check at regular intervals that users are working in a safety-conscious way.
- Regular checks of the machine according to IEC 60974-4.



Damage due to the use of non-genuine parts!

The manufacturer's warranty becomes void if non-genuine parts are used!

- Only use system components and options (power sources, welding torches, electrode holders, remote controls, spare parts and replacement parts, etc.) from our range of products!
- Only insert and lock accessory components into the relevant connection socket when the machine is switched off.



Damage to the machine due to stray welding currents!

Stray welding currents can destroy protective earth conductors, damage equipment and electronic devices and cause overheating of components leading to fire.

- Make sure all welding leads are securely connected and check regularly.
- Always ensure a proper and secure electrical connection to the workpiece!
- Set up, attach or suspend all conductive power source components like casing, transport vehicle and crane frames so they are insulated!
- Do not place any other electronic devices such as drillers or angle grinders, etc., on the power source, transport vehicle or crane frames unless they are insulated!
- Always put welding torches and electrode holders on an insulated surface when they are not in use!



Mains connection

Requirements for connection to the public mains network

High-performance machines can influence the mains quality by taking current from the mains network. For some types of machines, connection restrictions or requirements relating to the maximum possible line impedance or the necessary minimum supply capacity at the interface with the public network (Point of Common Coupling, PCC) can therefore apply. In this respect, attention is also drawn to the machines' technical data. In this case, it is the responsibility of the operator, where necessary in consultation with the mains network operator, to ensure that the machine can be connected.

CAUTION

**EMC Machine Classification**

In accordance with IEC 60974-10, welding machines are grouped in two electromagnetic compatibility classes (see technical data):

Class A machines are not intended for use in residential areas where the power supply comes from the low-voltage public mains network. When ensuring the electromagnetic compatibility of class A machines, difficulties can arise in these areas due to interference not only in the supply lines but also in the form of radiated interference.

Class B machines fulfil the EMC requirements in industrial as well as residential areas, including residential areas connected to the low-voltage public mains network.

Setting up and operating

When operating arc welding systems, in some cases, electro-magnetic interference can occur although all of the welding machines comply with the emission limits specified in the standard. The user is responsible for any interference caused by welding.

In order to **evaluate** any possible problems with electromagnetic compatibility in the surrounding area, the user must consider the following: (see also EN 60974-10 Appendix A)

- Mains, control, signal and telecommunication lines
- Radios and televisions
- Computers and other control systems
- Safety equipment
- The health of neighbouring persons, especially if they have a pacemaker or wear a hearing aid
- Calibration and measuring equipment
- The immunity to interference of other equipment in the surrounding area
- The time of day at which the welding work must be carried out

Recommendations for reducing interference emission

- Mains connection, e.g. additional mains filter or shielding with a metal tube
- Maintenance of the arc welding equipment
- Welding leads should be as short as possible and run closely together along the ground
- Potential equalization
- Earthing of the workpiece. In cases where it is not possible to earth the workpiece directly, it should be connected by means of suitable capacitors.
- Shielding from other equipment in the surrounding area or the entire welding system

2.4 Transport and installation

WARNING



Incorrect handling of shielding gas cylinders!

Incorrect handling of shielding gas cylinders can result in serious and even fatal injury.

- Observe the instructions from the gas manufacturer and in any relevant regulations concerning the use of compressed air!
- Place shielding gas cylinders in the holders provided for them and secure with fixing devices.
- Avoid heating the shielding gas cylinder!



Risk of accident due to improper transport of machines that may not be lifted!

Do not lift or suspend the machine! The machine can fall down and cause injuries! The handles and brackets are suitable for transport by hand only!

- The machine may not be lifted by crane or suspended!

CAUTION



Risk of tipping!

There is a risk of the machine tipping over and injuring persons or being damaged itself during movement and set up. Tilt resistance is guaranteed up to an angle of 10° (according to EN 60974-A2).

- Set up and transport the machine on level, solid ground!
- Secure add-on parts using suitable equipment!
- Replace damaged wheels and their fixing elements!
- Fix external wire feed units during transport (avoid uncontrolled rotation)!



Damage due to supply lines not being disconnected!

During transport, supply lines which have not been disconnected (mains supply leads, control leads, etc.) may cause hazards such as connected equipment tipping over and injuring persons!

- Disconnect supply lines!

CAUTION



Equipment damage when not operated in an upright position!

The units are designed for operation in an upright position!

Operation in non-permissible positions can cause equipment damage.

- Only transport and operate in an upright position!

2.4.1 Ambient conditions

CAUTION



Installation site!

The machine must not be operated in the open air and must only be set up and operated on a suitable, stable and level base!

- The operator must ensure that the ground is non-slip and level, and provide sufficient lighting for the place of work.
- Safe operation of the machine must be guaranteed at all times.

CAUTION



Equipment damage due to dirt accumulation!

Unusually high quantities of dust, acid, corrosive gases or substances may damage the equipment.

- Avoid high volumes of smoke, vapour, oil vapour and grinding dust!
- Avoid ambient air containing salt (sea air)!



Non-permissible ambient conditions!

Insufficient ventilation results in a reduction in performance and equipment damage.

- Observe the ambient conditions!
- Keep the cooling air inlet and outlet clear!
- Observe the minimum distance of 0.5 m from obstacles!

2.4.1.1 In operation

Temperature range of the ambient air:

- -10 °C to +40 °C*

Relative air humidity:

- Up to 50% at 40 °C
- Up to 90% at 20 °C

NOTE

- * Ambient temperature depends on coolant!
Observe the coolant temperature range for the welding torch cooling!

2.4.1.2 Transport and storage

Storage in an enclosed space, temperature range of the ambient air:

- -30 °C to +70 °C

Relative air humidity

- Up to 90% at 20 °C

3 Intended use

WARNING



Hazards due to improper usage!

Hazards may arise for persons, animals and material objects if the equipment is not used correctly. No liability is accepted for any damages arising from improper usage!

- The equipment must only be used in line with proper usage and by trained or expert staff!
- Do not modify or convert the equipment improperly!

3.1 Applications

3.2 Plasma welding

In plasma welding a plasma jet is used as heat source. Plasma is an electrically conducting gas that has been heated to a very high temperature by an arc. In the plasma torch the flowing plasma gas (argon) is ionised by high-frequency pulses and the pilot arc ignites. The pilot arc then burns between the negative tungsten electrode and the nozzle (anode), thus ionising the gas column between nozzle and positive workpiece. In this way a non-contact ignition of the arc is possible.

3.3 TIG welding

TIG welding with alternating or direct current. Arc ignition optionally by means of non-contact HF ignition or contact ignition with Liftarc.

3.3.1 TIG *activArc* welding

The EWM *activArc* process, thanks to the highly dynamic controller system, ensures that the power supplied is kept virtually constant in the event of changes in the distance between the welding torch and the weld pool, e.g. during manual welding. Voltage losses as a result of a shortening of the distance between the torch and molten pool are compensated by a current rise (ampere per volt - A/V), and vice versa. This helps prevent the tungsten electrode sticking in the molten pool and the tungsten inclusions are reduced. This is particularly useful in tacking and in spot welding.

3.3.2 *spotArc*

This process is suitable for tack welding or joint welding of metal sheets made from steel and CrNi alloys up to a thickness of approximately 2.5 mm. Metal sheets of different thicknesses can also be welded on top of one another. As this is a one-sided process, it is also possible to weld metal sheets onto tubular sections such as round or square pipes. In arc spot welding, the arc melts through the upper metal sheet and the lower metal sheet is melted onto it. This produces flat, fine-textured welding tacks which require little or no post weld work, even in visible areas.

3.3.3 TIG hot wire welding

The TIG hot wire welding system technology is based on the TIG cold wire welding system technology.

A wire feed system transports the wire-like welding consumable, which is heated at the stick-out between contact tip and weld pool contact point by means of resistance heating. A second power source is required for this resistance heating. Its secondary power circuit is closed by the wire's permanent contact with the weld pool. The process of pre-heating the wire can be controlled in a wide range by the selected hot wire power.

By pre-heating the wire, the energy taken from the weld pool for melting the wire can be reduced. This allows a significantly larger amount of welding consumables to be used at a higher welding speed, thus reducing the energy per unit length.

3.3.4 TIG cold wire welding

Cold wire welding is a variant of TIG welding featuring mechanically fed filler material. With this process, cold welding wire is melted, without power, in the arc of a tungsten electrode.

3.4 Use and operation solely with the following machines

- BUSINT X11
- RINT X12
- T drive 4 Rob 3 RE
- T drive 4 Rob 3 LI
- cool82 U44
- cool82 U45
- RK 1
- RK 2
- RK 3

3.5 Documents which also apply

3.5.1 Warranty

NOTE



For further information, please see the accompanying supplementary sheets "Machine and Company Data, Maintenance and Testing, Warranty"!

3.5.2 Declaration of Conformity



The designated machine conforms to EC Directives and standards in terms of its design and construction:

- EC Low Voltage Directive (2006/95/EC),
- EC EMC Directive (2004/108/EC),

This declaration shall become null and void in the event of unauthorised modifications, improperly conducted repairs, non-observance of the deadlines for the repetition test and / or non-permitted conversion work not specifically authorised by the manufacturer.

The original copy of the declaration of conformity is enclosed with the unit.

3.5.3 Welding in environments with increased electrical hazards



In compliance with IEC / DIN EN 60974, VDE 0544 the machines can be used in environments with an increased electrical hazard.

3.5.4 Service documents (spare parts and circuit diagrams)



DANGER



Do not carry out any unauthorised repairs or modifications!

To avoid injury and equipment damage, the unit must only be repaired or modified by specialist, skilled persons!

The warranty becomes null and void in the event of unauthorised interference.

- Appoint only skilled persons for repair work (trained service personnel)!

Original copies of the circuit diagrams are enclosed with the unit.

Spare parts can be obtained from the relevant authorised dealer.

3.5.5 Calibration/Validation

We hereby confirm that this machine has been tested using calibrated measuring equipment, as stipulated in IEC/EN 60974, ISO/EN 17662, EN 50504, and complies with the admissible tolerances. Recommended calibration interval: 12 months

4 Machine description – quick overview

4.1 Front view

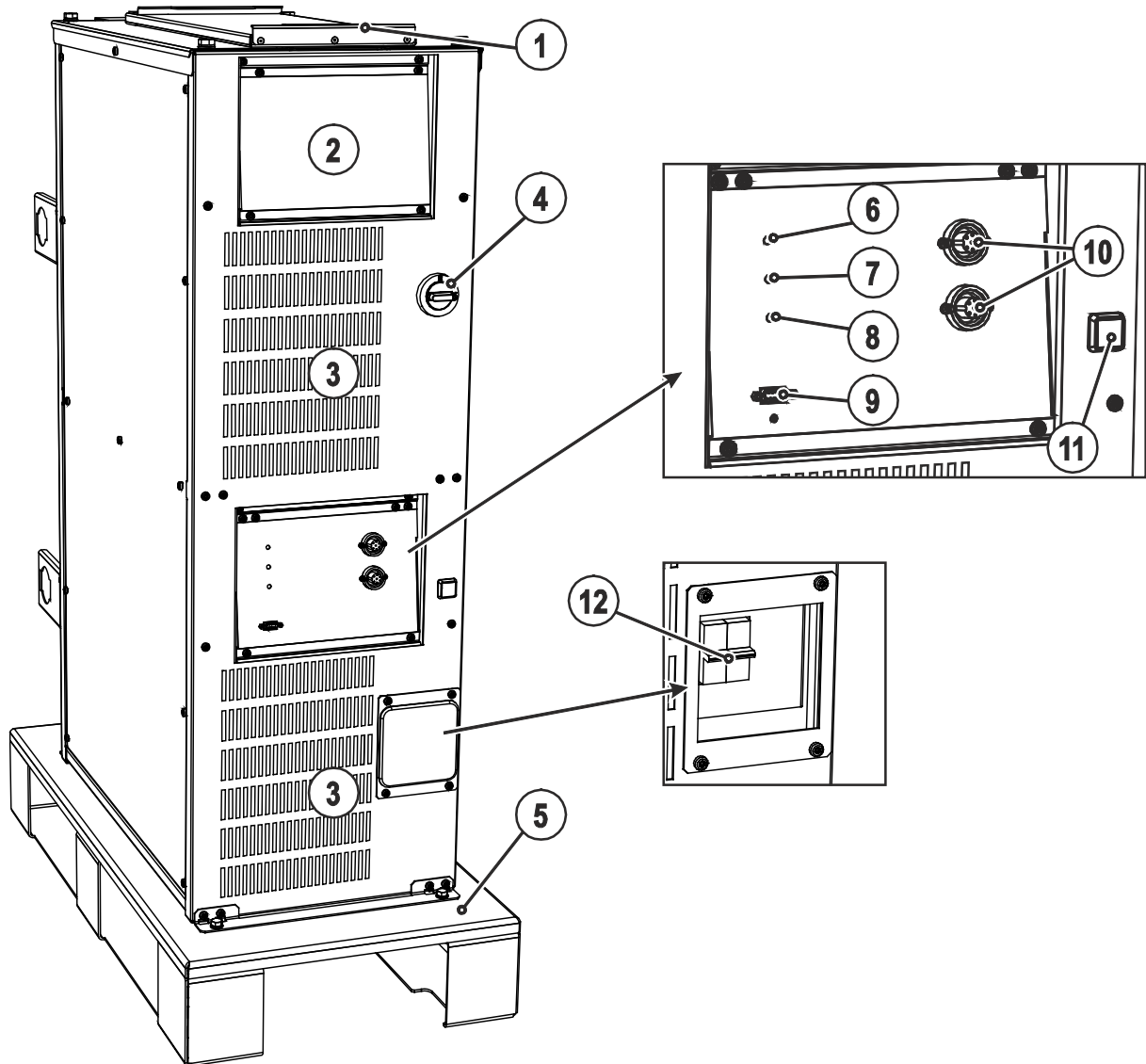










Figure 4-1

Item	Symbol	Description
1		Carrier plate for system components only hot wire version
2		Machine control See Machine control – operating elements chapter
3		Cooling air inlet
4		Main switch, machine on/off
5		ROB XX2 pallet Transport pallet
6		Operating state signal lamp Lights up when the machine is ready for use.
7		Operating problem signal light (see chapter "Rectifying faults")
8		Welding process signal lamp Lights up when the welding process runs.
9		PC interface, serial (D-Sub connection socket, 9-pole)
10		7-pole connection socket (digital) For connecting digital accessory components
11		Pilot arc button with signal light Signal light off: pilot arc off Signal light on: pilot arc lit
12		Automatic cutouts <ul style="list-style-type: none"> • Fuse protection for the pilot arc power source • Fuse protection for the reverse cooling unit's protective contact socket (back of machine)

4.2 Rear view

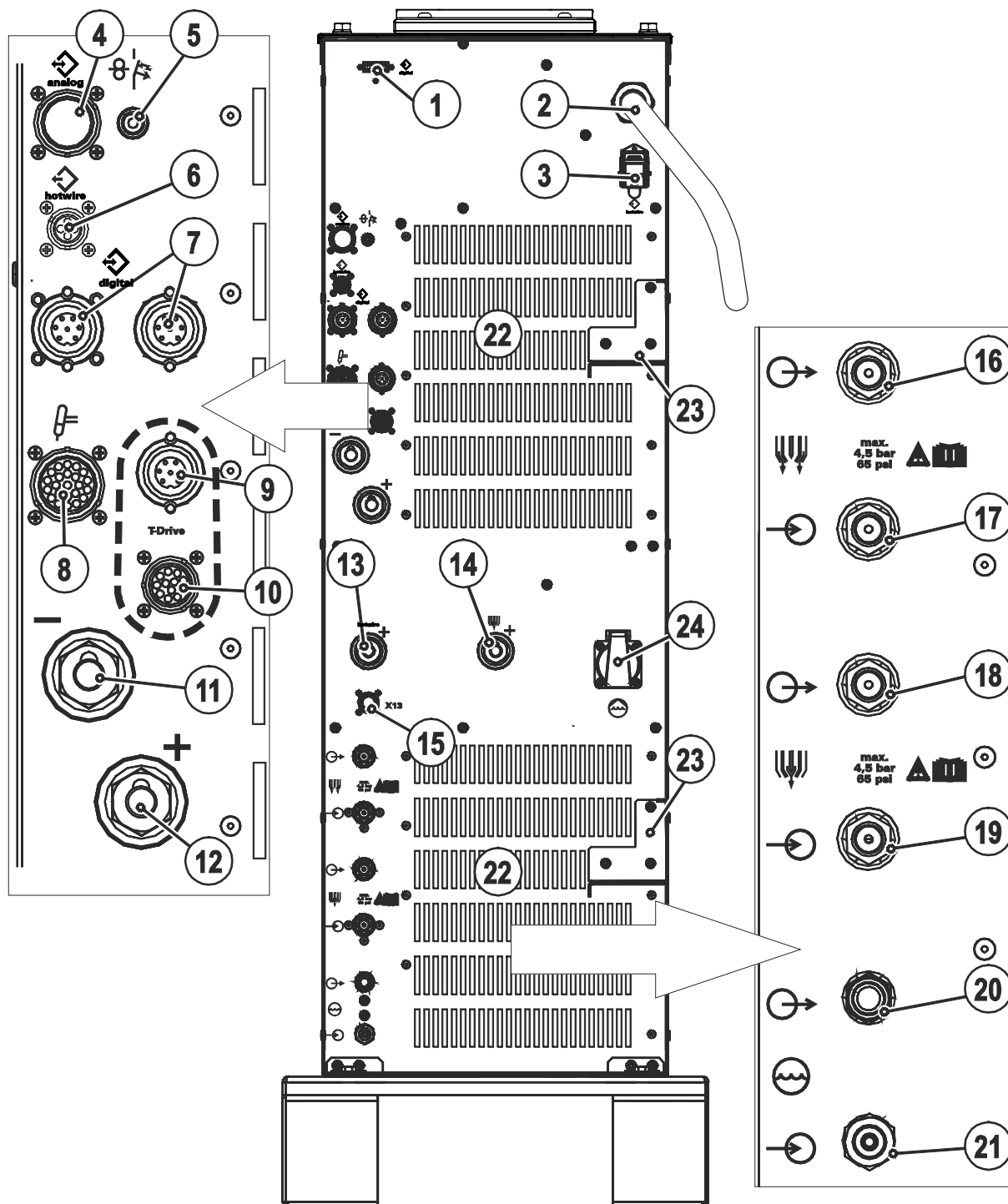

















Figure 4-2

Item	Symbol	Description
1	 digital	Interfaces connection socket (15-pole)
2		Mains connection cable
3		Mains connection, hot wire power source Power supply for hot wire power source
4	 analog	19-pole mechanised welding interface (analogue) (See chapter entitled "Design and function > interfaces".)
5		Key button, automatic cutout Wire feed motor supply voltage fuse press to reset a triggered fuse
6	hotWire	Control lead connection, hot wire power source 4-pole connection to the hot wire power source
7		7-pole connection socket (digital) For connecting digital accessory components
8		23-pole connection socket (analogue) Mechanised welding torch connection
9		7-pole connection socket (digital) Wire feed unit connection
10		12-pole connection socket (analogue) Wire feed unit connection
11		Connection socket, welding current - Welding torch connection
12		Connection socket, "+" welding current Connection for workpiece lead
13		Connection socket for "+" welding current Connection to TIG power source for hot wire application
14		Pilot current connection socket Plasma welding torch nozzle potential
15	X13	"Insufficient wire" sensor connection
16		G1/4" connecting nipple, shielding gas, outlet Connection to welding torch
17		Connecting nipple G1/4" shielding gas, inlet Connection to pressure regulator
18		G1/4" connecting nipple, plasma gas, outlet Connection to welding torch
19		Connecting nipple G1/4" plasma gas, inlet Connection to pressure regulator
20		Quick connect coupling (red) Coolant return to cooling unit
21		Rapid-action closure nipple Coolant return from welding torch
22		Cooling air outlet
23		Intermediate hose package strain relief
24		Cooling unit voltage supply Protective contact socket

4.3 Machine control (Mode RC - on)

NOTE

This welding machine is operated in the „RC – on, remote-controlled“ mode as a factory setting.

RC - on: The machine is operated via an external interface in this mode. The majority of the machine control's operating elements will be deactivated and are only used to monitor the welding data.

RC - off: The welding machine is operated via the machine control.

Refer to the „Machine configuration menu“ chapter to switch between the operating modes.

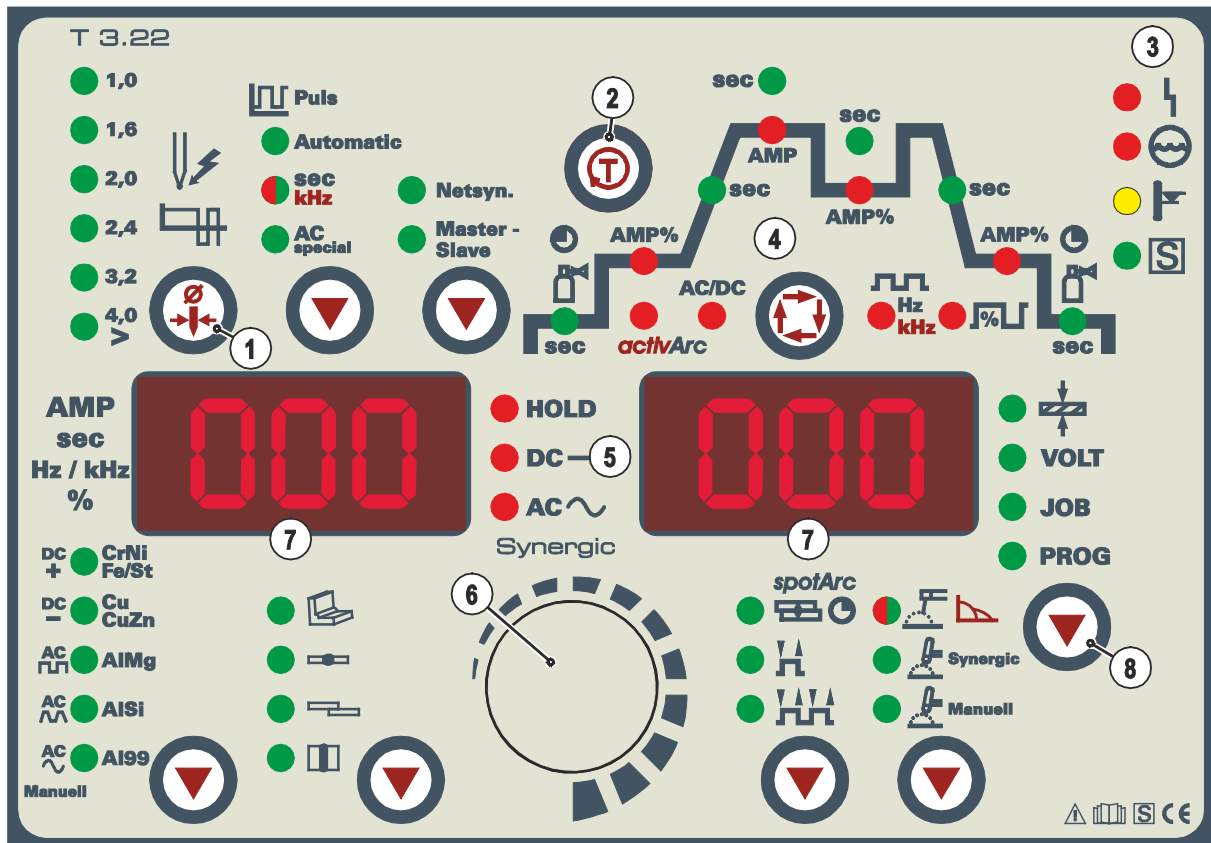






Figure 4-3

Item	Symbol	Description
1		Tungsten electrode diameter / Ignition optimisation / Spherical cap formation button Ø 1.0mm, Ø 1.6mm, Ø 2.0mm, Ø 2.4mm, Ø 3.2mm, Ø 4.0mm or greater Best ignition and stabilisation of the arc (DC, AC) and optimum spherical cup formation in the tungsten electrode according to the electrode diameter being used. The adjustable welding current is limited to the maximum permissible welding current of the tungsten electrode.
2		Gas test/rinse hose package button see "Shielding gas setting" chapter
3		Error/status indicators • Collective interference signal light • Water deficiency signal light (welding torch cooling) • Excess temperature signal light • safety sign signal light

Item	Symbol	Description
4		Function sequence (see next chapter)
5		Status displays HOLD After each completed welding task, the last values used in the welding process for the welding current and welding voltage are shown on the displays, and the signal light will be on DC — Direct current welding AC ~ Alternating current welding DC — and AC ~ simultaneously: Alternating current welding, AC special
6		Welding parameter setting rotary transducer Setting of all parameters such as welding current, sheet metal thickness, gas pre-flow time, etc.
7		Three-figure LED display Welding parameter display (see also chap. "Welding data display").
8		Display switching button  Material thickness display VOLT Welding voltage display JOB JOB number display PROG Program number display

4.3.1 Function sequence

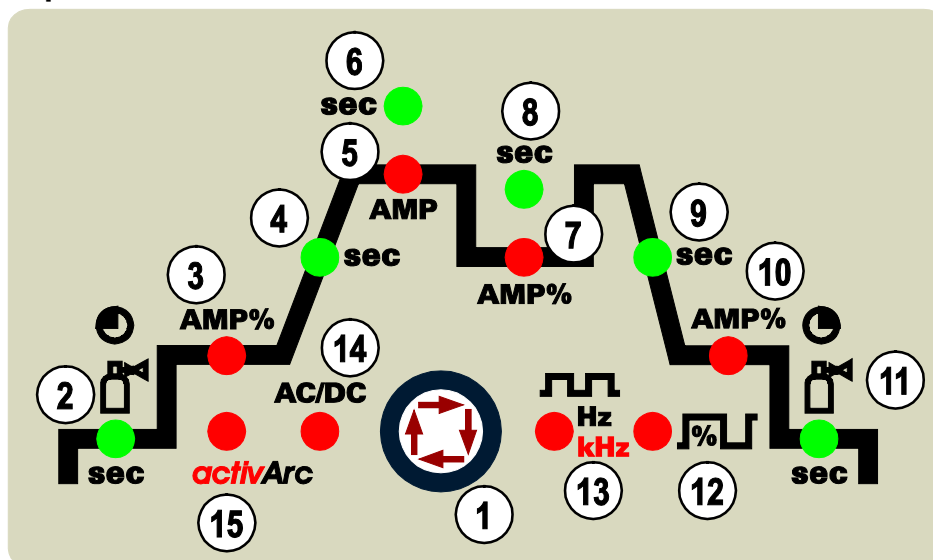




Figure 4-4

Item	Symbol	Description	
1		Select welding parameters button This button is used to select the welding parameters depending on the welding process and operating mode used.	
2	sec	Gas pre-flow time (TIG) absolute setting range 0.0 sec to 20.0 sec (0.1 s increments).	
3	AMP%	Ignition current (TIG) Percentage of the main current. Setting range 1 % to 200 % (1 % increments). There are no pulses during the ignition current phase.	Hotstart current (MMA) Percentage of the main current. Setting range 1 % to 200 % (1 % increments).
4	sec	Up-slope time (TIG) Setting ranges: 0.00 s to 20.0 s (0.1 s increments). The up-slope time can be set separately for non-latched and latched.	Hotstart time (MMA) Setting ranges: 0.00 s to 20.0 s (0.1 s increments).
5	AMP	Main current (TIG) / pulse current I min to I max (1 A increments)	Main current (MMA) I min to I max (1 A increments)
6	sec	Pulse time / slope time from AMP% to AMP <ul style="list-style-type: none"> Pulse time setting range: 0.01 s to 20.0 s (0.01 s increments < 0.5 s; 0.1 s increments > 0.5 s) Slope time (tS2) setting range: 0.0 s to 20.0 s (see chapter "Pulse variants") 	
		TIG pulses The pulse time applies to the main current phase (AMP) for pulses.	TIG AC Special The pulse time applies to the AC phase for AC special.
7	AMP%	Secondary current (TIG) / pulse pause current Setting range 1 % to 100 % (1 % increments). Percentage of the main current.	
8	sec	Pulse break time/slope time from AMP to AMP% <ul style="list-style-type: none"> Pulse break setting range: 0.01 sec to 20.0 sec (0.01 sec increments < 0.5 sec; 0.1 sec increments > 0.5 sec) Slope time (tS1) setting range: 0.0 sec to 20.0 sec (see chapter "Pulse variants"). TIG pulses: The pulse break time applies to the secondary current phase (AMP%) TIG AC Special: The pulse break time applies to the DC phase with AC special.	

Item	Symbol	Description
9	sec	Down-slope time (TIG) 0.00 s to 20.0 s (0.1 s increments). The down-slope time can be set separately for non-latched and latched.
10	AMP%	End-crater current (TIG) Setting range 1 % to 200 % (1 % increments). Percentage of the main current.
11	sec	Gas post-flow time (TIG) Setting ranges: 0.00 sec to 40.0 sec (0.1 sec increments).
12		Alternating current balance (TIG AC) Max. setting range: -30 % to +30 % (1 % increments). The setting range may also be lower depending on the factory setting. Optimisation of cleaning effect and fusion penetration characteristics.
		Balance fast TIG DC pulses Setting range: 1 % to +99 % (1 % increments)
13		Alternating current frequency (TIG AC) 50 Hz to 200 Hz (1 Hz increments). Constriction and stabilisation of the arc: The cleaning effect increases with a greater frequency. Particularly thin panels (welding with a low current), anodised sheet aluminium or highly contaminated articles for welding can be welded and cleaned perfectly at a higher frequency.
		Frequency fast TIG DC pulses Setting range: 50 Hz to 15 kHz
14	AC/DC	Welding current polarity, MMA (see chap. "Switching the welding current polarity")
15	activArc	activArc TIG welding process <ul style="list-style-type: none"> • Switch activArc on or off • Correct the activArc characteristic (setting range: 0 to 100)

4.4 Machine control (Mode RC - off)

NOTE

As the plasma welding process is based directly on the TIG welding process, the TIG descriptions are used for plasma welding, with just a few differences.

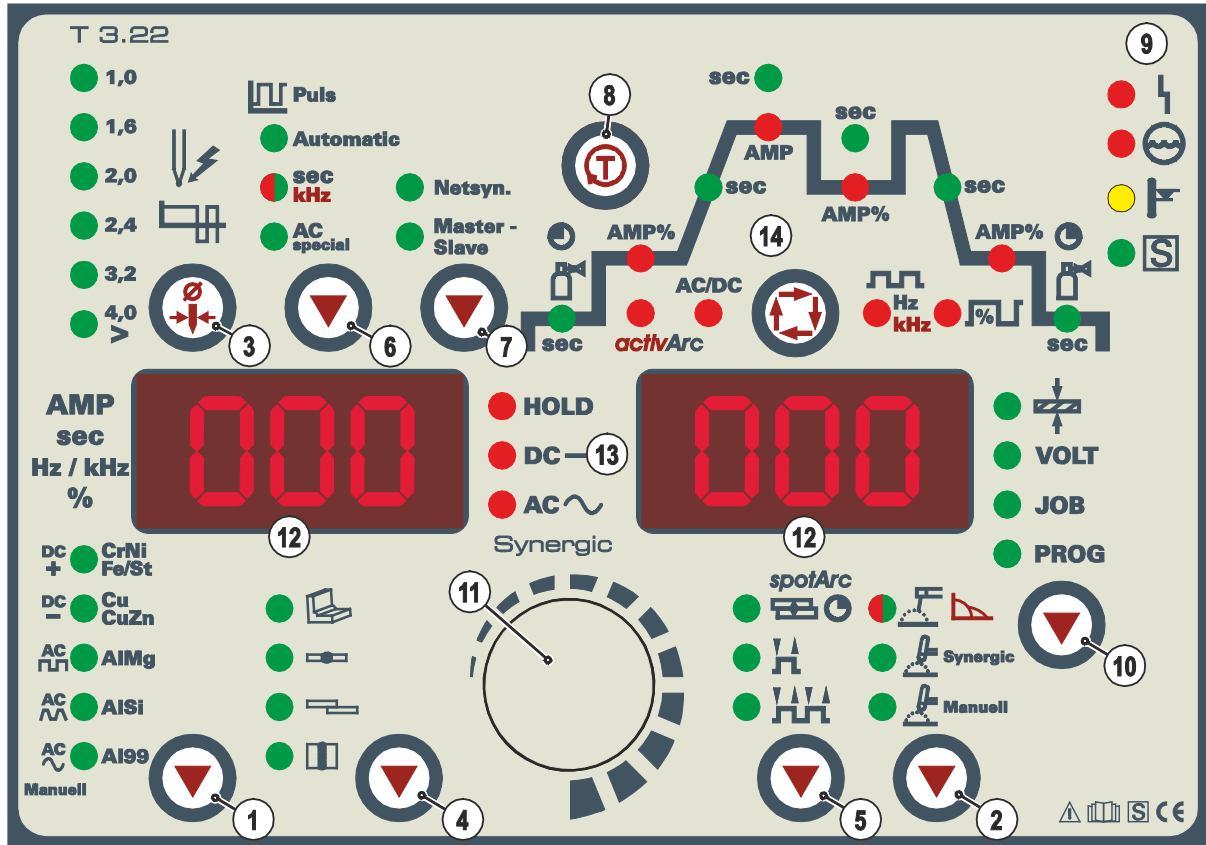


Figure 4-5

Item	Symbol	Description
1		Polarity changeover (TIG manual) button
		DC welding with positive polarity on the electrode holder in relation to the workpiece (pole reversing switch, MMA only).
		DC welding with negative polarity at the torch (or electrode holder) with respect to the workpiece.
		AC welding with rectangular current output wave form. Maximum power loading and safe welding.
		AC welding with trapezoidal current output wave form. An all-rounder, suitable for most applications.
2		Select material type (TIG Synergic) key button
		AC welding with sinusoidal current output wave form. Low noise level.
		"Welding process" button
		MMA welding, lights up in green / arcforce setting, lights up in red
		TIG synergic welding (synergic parameter setting)
TIG manual welding (manual parameter setting)		

Item	Symbol	Description
3		Tungsten electrode diameter / Ignition optimisation / Spherical cap formation button \varnothing 1.0mm, \varnothing 1.6mm, \varnothing 2.0mm, \varnothing 2.4mm, \varnothing 3.2mm, \varnothing 4.0mm or greater Best ignition and stabilisation of the arc (DC, AC) and optimum spherical cup formation in the tungsten electrode according to the electrode diameter being used. The adjustable welding current is limited to the maximum permissible welding current of the tungsten electrode.
4		Select seam type button Fillet weld Butt joint Fillet weld - lap joint Vertical-down
5		Operating mode button spotArc spotArc / Spotmatic (spot time setting range) Non-latched Latched
6		TIG pulse welding Automatic 80C kHz TIG automated pulses (frequency and balance) TIG pulses with times, green light / Fast TIG DC pulses with frequency and balance, red light AC special TIG AC special
7		Synchronisation types key button (two-sided, simultaneous welding) <ul style="list-style-type: none"> Synchronisation via mains voltage Synchronisation via cable
8		Gas test/rinse hose package button see "Shielding gas setting" chapter
9		Error/status indicators Collective interference signal light Water deficiency signal light (welding torch cooling) Excess temperature signal light Safety sign signal light
10		Display switching button Material thickness display VOLT Welding voltage display JOB JOB number display PROG Program number display
11		Welding parameter setting rotary transducer Setting of all parameters such as welding current, sheet metal thickness, gas pre-flow time, etc.
12		Three-figure LED display Welding parameter display (see also chap. "Welding data display").
13		Status displays HOLD After each completed welding task, the last values used in the welding process for the welding current and welding voltage are shown on the displays, and the signal light will be on DC — Direct current welding AC ~ Alternating current welding DC — and AC ~ simultaneously: Alternating current welding, AC special

Machine description – quick overview

Machine control (Mode RC - off)



Item	Symbol	Description
14		Function sequence (see next chapter)

4.4.1 Function sequence

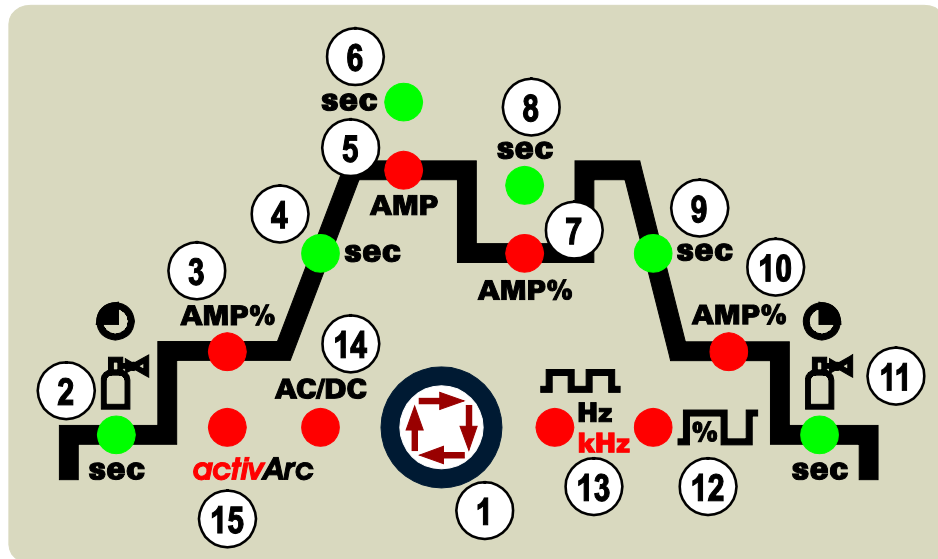





Figure 4-6

Item	Symbol	Description
1		Select welding parameters button This button is used to select the welding parameters depending on the welding process and operating mode used.
2	sec	Gas pre-flow time (TIG) absolute setting range 0.0 sec to 20.0 sec (0.1s increments).
3	AMP%	Ignition current (TIG) Percentage of the main current. Setting range 1 % to 200 % (1 % increments). There are no pulses during the ignition current phase.
		Hotstart current (MMA) Percentage of the main current. Setting range 1 % to 200 % (1 % increments).
4	sec	Up-slope time (TIG) Setting ranges: 0.00 s to 20.0 s (0.1 s increments). The up-slope time can be set separately for non-latched and latched.
		Hotstart time (MMA) Setting ranges: 0.00 s to 20.0 s (0.1 s increments).
5	AMP	Main current (TIG) / pulse current I min to I max (1 A increments)
		Main current (MMA) I min to I max (1 A increments)
6	sec	Pulse time / slope time from AMP% to AMP <ul style="list-style-type: none"> Pulse time setting range: 0.01 s to 20.0 s (0.01 s increments < 0.5 s; 0.1 s increments > 0.5 s) Slope time (tS2) setting range: 0.0 s to 20.0 s (see chapter "Pulse variants")
		TIG pulses The pulse time applies to the main current phase (AMP) for pulses.
		TIG AC Special The pulse time applies to the AC phase for AC special.
7	AMP%	Secondary current (TIG) / pulse pause current Setting range 1 % to 100 % (1 % increments). Percentage of the main current.
8	sec	Pulse break time/slope time from AMP to AMP% <ul style="list-style-type: none"> Pulse break setting range: 0.01 sec to 20.0 sec (0.01 sec increments < 0.5 sec; 0.1 sec increments > 0.5 sec) Slope time (tS1) setting range: 0.0 sec to 20.0 sec (see chapter "Pulse variants").
		TIG pulses: The pulse break time applies to the secondary current phase (AMP%)
		TIG AC Special: The pulse break time applies to the DC phase with AC special.

Machine description – quick overview

Machine control (Mode RC - off)



Item	Symbol	Description
9	sec	Down-slope time (TIG) 0.00 s to 20.0 s (0.1 s increments). The down-slope time can be set separately for non-latched and latched.
10	AMP%	End-crater current (TIG) Setting range 1 % to 200 % (1 % increments). Percentage of the main current.
11	sec	Gas post-flow time (TIG) Setting ranges: 0.00 sec to 40.0 sec (0.1 sec increments).
12		Alternating current balance (TIG AC) Max. setting range: -30 % to +30 % (1 % increments). The setting range may also be lower depending on the factory setting. Optimisation of cleaning effect and fusion penetration characteristics.
		Balance fast TIG DC pulses Setting range: 1 % to +99 % (1 % increments)
13		Alternating current frequency (TIG AC) 50 Hz to 200 Hz (1 Hz increments). Constriction and stabilisation of the arc: The cleaning effect increases with a greater frequency. Particularly thin panels (welding with a low current), anodised sheet aluminium or highly contaminated articles for welding can be welded and cleaned perfectly at a higher frequency.
		Frequency fast TIG DC pulses Setting range: 50 Hz to 15 kHz
14	AC/DC	Welding current polarity, MMA (see chap. "Switching the welding current polarity")
15		activArc TIG welding process <ul style="list-style-type: none"> • Switch activArc on or off • Correct the activArc characteristic (setting range: 0 to 100)

4.5 Plasmadrive

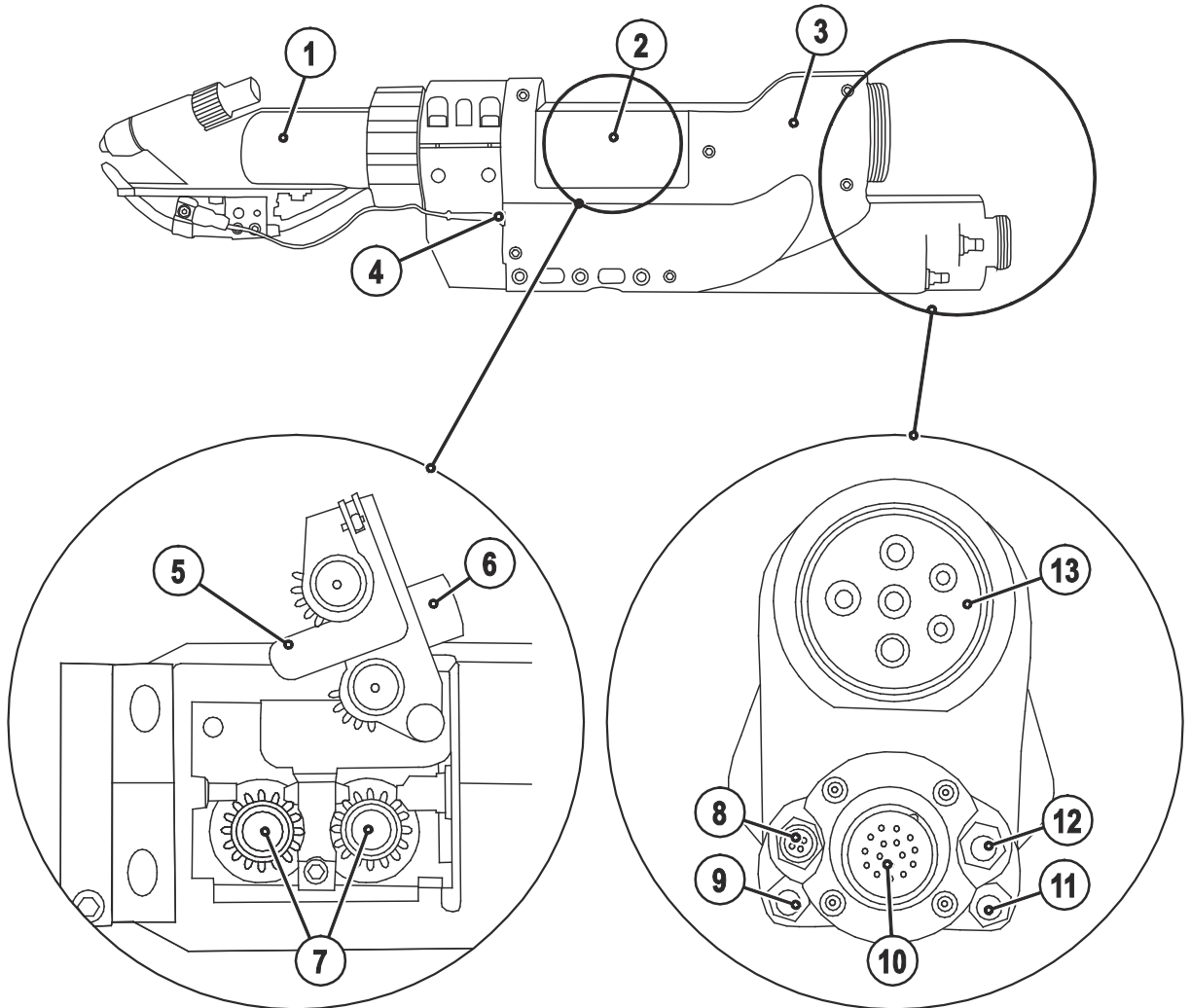


Figure 4-7

Item	Symbol	Description
1		Welding torch head
2		Protective cap Cover for the wire feed mechanism and other operating elements. Depending on the machine series, additional stickers with information on the replacement parts and JOB lists will be located on the inside.
3		Plasmadrive Filler wire drive
4		Sensor voltage connection for the filler wire fusing detection
5		Contact pressure roller lock
6		Contact pressure setting (hexagon socket)
7		Drive roller
8		Anticollision device connection
9		Reverse inching button
10		Connection socket control lead welding torch
11		Wire inching key button
12		Gas test button Shielding gas flows for 20 s, or press again to stop the gas flow.
13		Torch hose package connection

4.6 "Insufficient wire" sensor

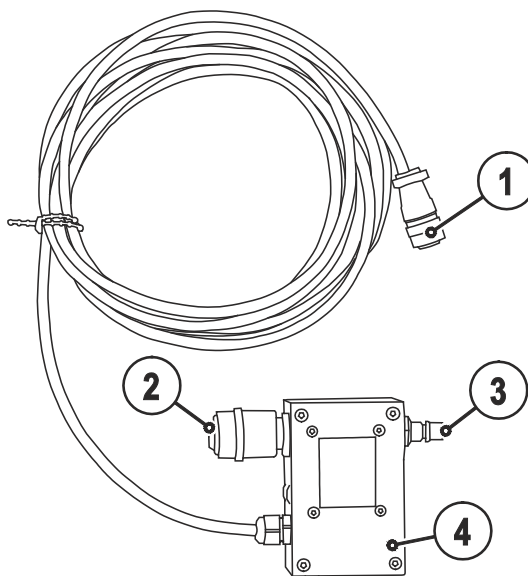


Figure 4-8

Item	Symbol	Description
1		"Insufficient wire" sensor control lead plug
2		Wire feed rapid-action closure Connection to wire source
3		Wire exit rapid-action closure Connection to wire feed connection hose
4		"Insufficient wire" sensor A warning is issued as soon as the end of the wire (insufficient wire) is reached. The process will not be shut down.

5 Design and function

5.1 General

WARNING



Risk of injury from electric shock!

Contact with live parts, e.g. welding current sockets, is potentially fatal!

- Follow safety instructions on the opening pages of the operating instructions.
- Commissioning may only be carried out by persons who have the relevant expertise of working with arc welding machines!
- Connection and welding leads (e.g. electrode holder, welding torch, workpiece lead, interfaces) may only be connected when the machine is switched off!

CAUTION



Insulate the arc welder from welding voltage!

Not all active parts of the welding current circuit can be shielded from direct contact. To avoid any associated risks it is vital for the welder to adhere to the relevant safety regulations. Even low voltages can cause a shock and lead to accidents.

- Wear dry and undamaged protective clothing (shoes with rubber soles/welder's gloves made from leather without any studs or braces)!
- Avoid direct contact with non-insulated connection sockets or connectors!
- Always place torches and electrode holders on an insulated surface!



Risk of burns on the welding current connection!

If the welding current connections are not locked, connections and leads heat up and can cause burns, if touched!

- Check the welding current connections every day and lock by turning in clockwise direction, if necessary.



Risk of injury due to moving parts!

The wire feeders are equipped with moving parts, which can trap hands, hair, clothing or tools and thus injure persons!

- Do not reach into rotating or moving parts or drive components!
- Keep casing covers or protective caps closed during operation!



Risk of injury due to welding wire escaping in an unpredictable manner!

Welding wire can be conveyed at very high speeds and, if conveyed incorrectly, may escape in an uncontrolled manner and injure persons!

- Before mains connection, set up the complete wire guide system from the wire spool to the welding torch!
- Remove the pressure rollers from the wire feeder if no welding torch is fitted!
- Check wire guide at regular intervals!
- Keep all casing covers or protective caps closed during operation!



Risk from electrical current!

If welding is carried out alternately using different methods and if a welding torch and an electrode holder remain connected to the machine, the open-circuit/welding voltage is applied simultaneously on all cables.

- The torch and the electrode holder should therefore always be placed on an insulated surface before starting work and during breaks.

CAUTION



Damage due to incorrect connection!

Accessory components and the power source itself can be damaged by incorrect connection!

- Only insert and lock accessory components into the relevant connection socket when the machine is switched off.
- Comprehensive descriptions can be found in the operating instructions for the relevant accessory components.
- Accessory components are detected automatically after the power source is switched on.



Using protective dust caps!

Protective dust caps protect the connection sockets and therefore the machine against dirt and damage.

- The protective dust cap must be fitted if there is no accessory component being operated on that connection.
- The cap must be replaced if faulty or if lost!

NOTE



Observe documentation of other system components when connecting!

5.2 System integration

5.2.1 Plasma application with hot wire

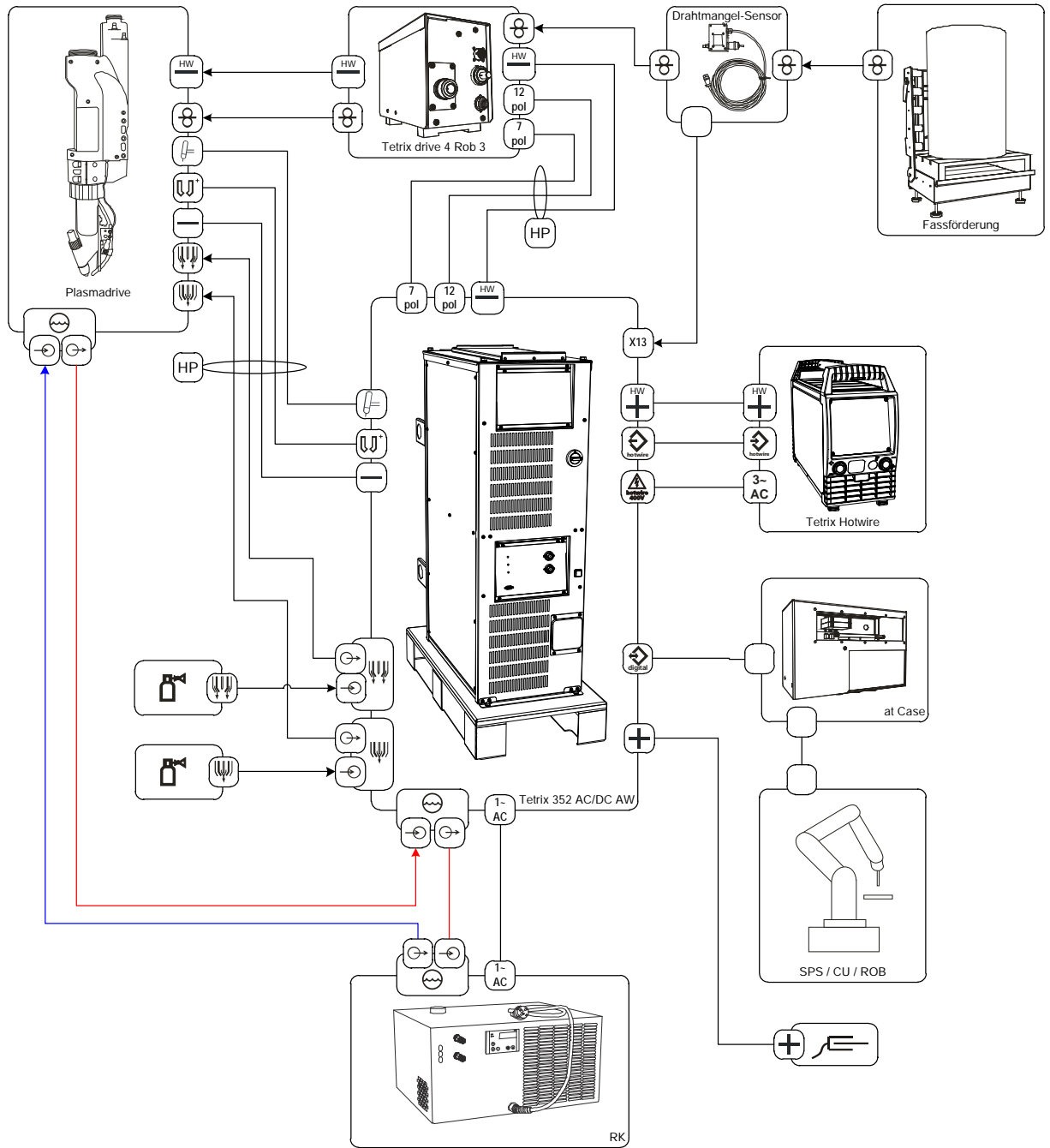






















Figure 5-1

5.2.1.1 Legend

	Wire feed (cold wire)
	Welding torch control lead (19-pole) connection socket
	Pilot arc current
	Welding current (minus potential)
	Shielding gas
	Plasma gas
	Welding torch coolant
	Input
	Output
	Reverse cooling unit supply voltage (230 V/AC, one-phase)
	Welding current (plus potential, workpiece)
	Wire feed unit control lead (12-pole) connection socket
	Wire feed unit control lead (7-pole) connection socket
	"Insufficient wire" sensor control lead connection socket
	Interface connection socket (15-pole)
	Hose package (HP = hose package)
	Welding current (plus potential, hotwire) connection socket
	Welding current (minus potential, hotwire) connection socket
	Control lead, hot wire (signal output, 4-pole) connection socket
	Supply voltage, hot wire power source connection socket

5.3 Transport and installation

WARNING



Risk of accident due to improper transport of machines that may not be lifted!

Do not lift or suspend the machine! The machine can fall down and cause injuries! The handles and brackets are suitable for transport by hand only!

- The machine may not be lifted by crane or suspended!

CAUTION



Hazards due to improper mounting!

In this system, the hot wire power source is positioned on the carrier platform of the mobile power source (filler wire).

- The machine may only be mounted and operated on the carrier platform for the hot wire power source!
- Safe operation of the machine must be guaranteed at all times!

5.3.1 Power source for hot wire welding

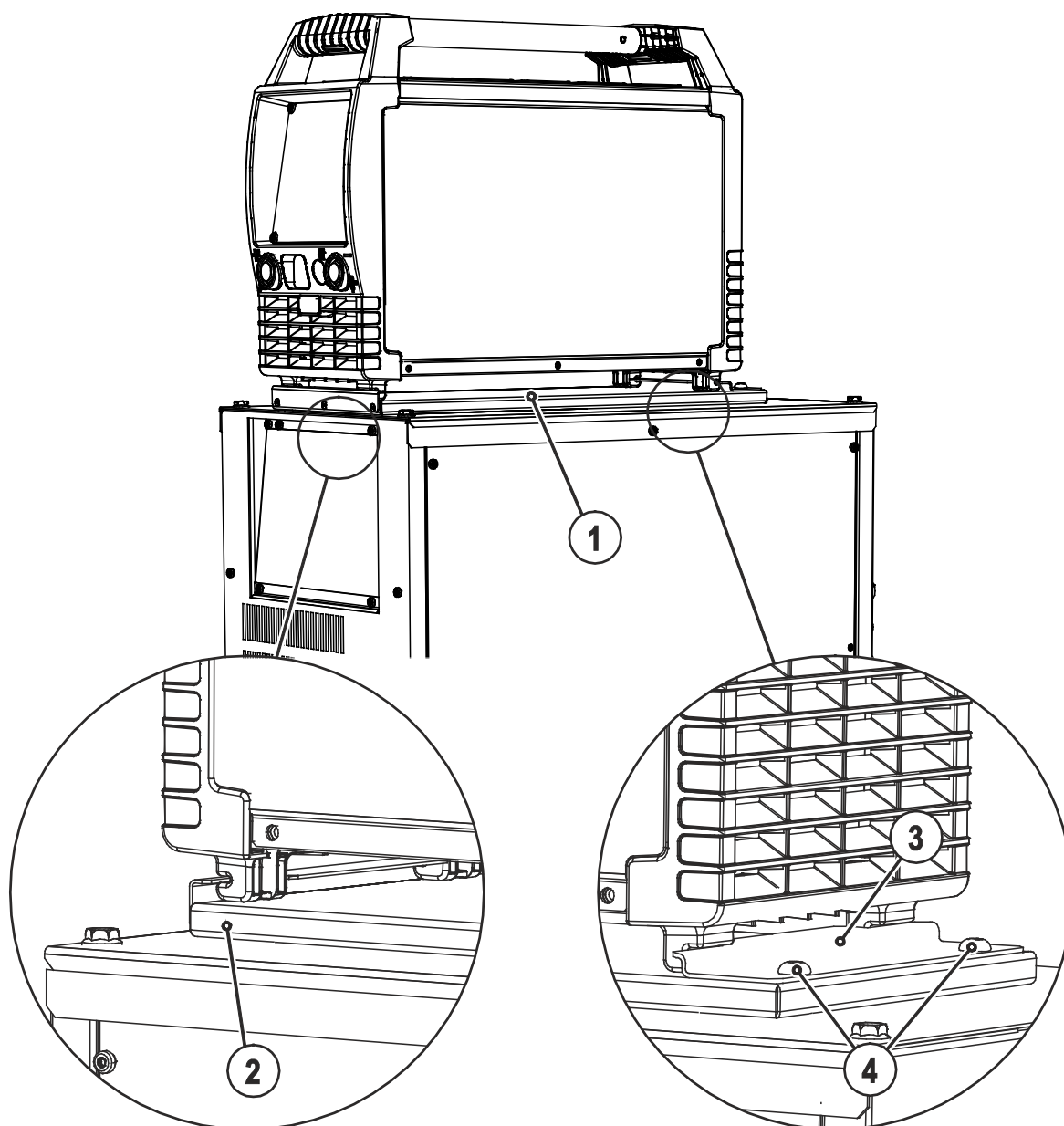


Figure 5-2

Item	Symbol	Description
1		Carrier platform for hot wire power source
2		Front holder Push the hot wire power source with the machine feet into the holder
3		Rear holder To fix, push the holder into the machine feet and secure with fixing screws.
4		Fixing screws (x 4)

5.4 Machine cooling

To obtain an optimal duty cycle from the power components, the following precautions should be observed:

- Ensure that the working area is adequately ventilated.
- Do not obstruct the air inlets and outlets of the machine.
- Do not allow metal parts, dust or other objects to get into the machine.

5.5 Workpiece lead, general

CAUTION



Risk of burns due to incorrect connection of the workpiece lead!

Paint, rust and dirt on the connection restrict the power flow and may lead to stray welding currents.

Stray welding currents may cause fires and injuries!

- Clean the connections!
- Fix the workpiece lead securely!
- Do not use structural parts of the workpiece as a return lead for the welding current!
- Take care to ensure faultless power connections!

5.6 Notes on the installation of welding current leads

NOTE



Incorrectly installed welding current leads can cause faults in the arc (flickering).

Lay the workpiece lead and hose package of power sources without HF igniter (MIG/MAG) for as long and as close as possible in parallel.

Lay the workpiece lead and hose package of power sources with HF igniter (TIG) for as long as possible in parallel with a distance of 20 cm to avoid HF sparkover.

Always keep a distance of at least 20 cm to leads of other power sources to avoid interferences.

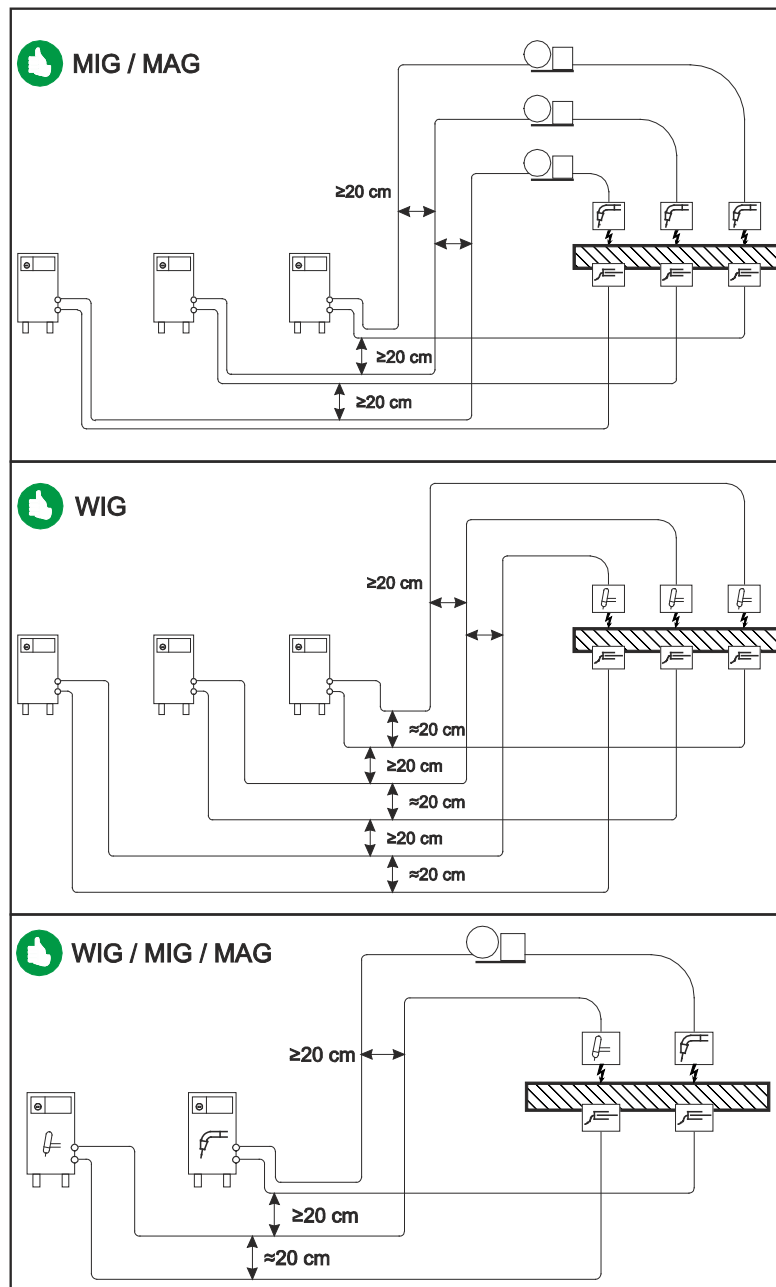


Figure 5-3

NOTE

Use an individual welding lead to the workpiece for each welding machine!

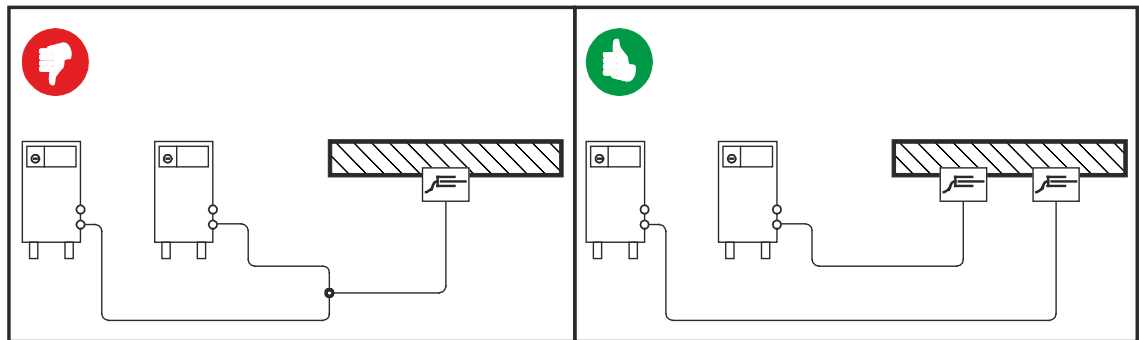


Figure 5-4

NOTE

- ☞ Fully unroll welding current leads, torch hose packages and intermediate hose packages. Avoid loops!
- Always keep leads as short as possible!
- Lay any excess cable lengths in meanders.

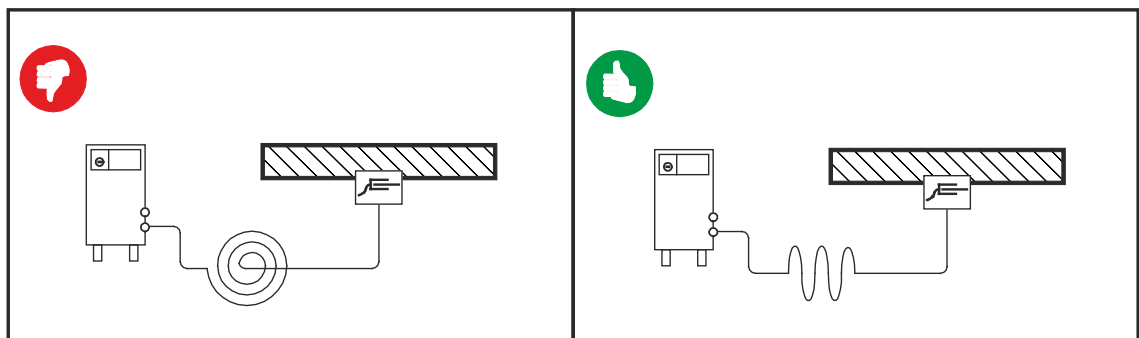


Figure 5-5

5.7 Welding torch cooling system

5.7.1 General

CAUTION



Coolant mixtures!

Mixtures with other liquids or the use of unsuitable coolants result in material damage and renders the manufacturer's warranty void!

- Only use the coolant described in this manual (overview of coolants).
- Do not mix different coolants.
- When changing the coolant, the entire volume of liquid must be changed.

NOTE



The disposal of coolant must be carried out according to official regulations and observing the relevant safety data sheets (German waste code number: 70104)!

- Coolant must not be disposed of together with household waste.
- Coolant must not be discharged into the sewerage system.
- Recommended cleaning agent: water, if necessary with cleaning agent added.

5.7.1.1 List of coolants

Only the following coolant may be used:

Coolant	Temperature range
KF 23E	- 10 °C to +40 °C

5.8 Mains connection

DANGER



Hazard caused by improper mains connection!

An improper mains connection can cause injuries or damage property!

- Only use machine with a plug socket that has a correctly fitted protective conductor.
- If a mains plug must be fitted, this may only be carried out by an electrician in accordance with the relevant national provisions or regulations!
- Mains plug, socket and lead must be checked regularly by an electrician!
- When operating the generator always ensure it is earthed as stated in the operating instructions. The resulting network has to be suitable for operating devices according to protection class 1.

5.8.1 Mains configuration

NOTE



The machine may only be connected to a three-phase system with four conductors and an earthed neutral conductor.

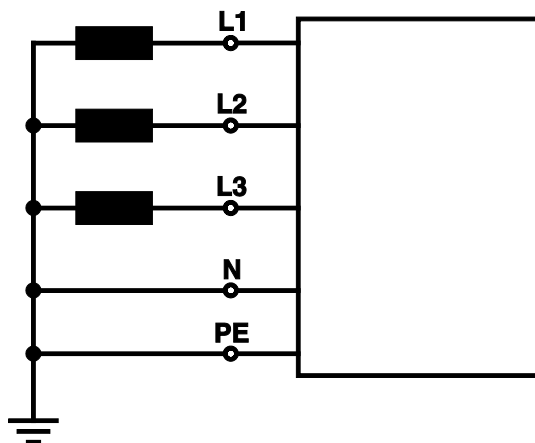


Figure 5-6

Legend

Item	Designation	Colour code
L1	Outer conductor 1	brown
L2	Outer conductor 2	black
L3	Outer conductor 3	grey
N	Neutral conductor	blue
PE	Protective conductor	green-yellow

CAUTION



Operating voltage - mains voltage!

The operating voltage shown on the rating plate must be consistent with the mains voltage, in order to avoid damage to the machine!

- For mains fuse protection, please refer to the "Technical data" chapter!

- Insert mains plug of the switched-off machine into the appropriate socket.

5.9 System gas connection

WARNING



Incorrect handling of shielding gas cylinders!

Incorrect handling of shielding gas cylinders can result in serious and even fatal injury.

- Observe the instructions from the gas manufacturer and in any relevant regulations concerning the use of compressed air!
- Place shielding gas cylinders in the holders provided for them and secure with fixing devices.
- Avoid heating the shielding gas cylinder!



Danger due to escaping system gasses!

The machine is equipped with pressure relief valves to control the connected system gasses. In case of excess pressure (>4.5 bar) the gas is released into the ambient air.

- Never exceed the maximum input pressure of 4.5 bar!
- Follow the safety data sheets of the gasses used!
- Make sure the working area is adequately ventilated!

CAUTION



Faults in the shielding gas supply.

An unhindered shielding gas supply from the shielding gas cylinder to the welding torch is a fundamental requirement for optimum welding results. In addition, a blocked shielding gas supply may result in the welding torch being destroyed.

- Always re-fit the yellow protective cap when not using the shielding gas connection.
- All shielding gas connections must be gas tight.

NOTE



Before the process starts, the system gas primary pressure values are checked. If the pressure is insufficient a process warning is issued on the system interface (gas error). In case of warnings the pilot arc cannot be started. If the gas flow stops during a process the process/pilot arc is shut down to protect the welder and machine component.

NOTE



Before connecting the pressure regulator to the gas cylinder, open the cylinder valve briefly to expel any dirt.

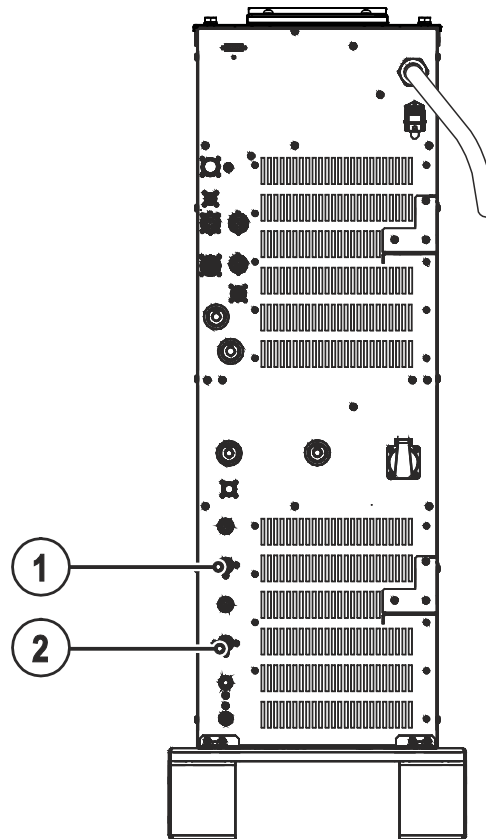


Figure 5-7

Item	Symbol	Description
1		G1/4" connecting nipple, shielding gas connection Connection to the pressure reducer
2		G1/4" connecting nipple, plasma gas connection Connection to the pressure reducer

- Screw the connection coupling of the plasma gas line onto the G1/4" connecting nipple, plasma gas connection.
- Screw the connection coupling of the shielding gas line onto the G1/4" connecting nipple, shielding gas connection.

NOTE

The connected gas lines should each show a pre-pressure level of 4.5 bar (tolerance limits: Plasma gas 4 bar to 5 bar, shielding gas 4 bar to 5 bar).

5.9.1 Connecting the shielding gas supply

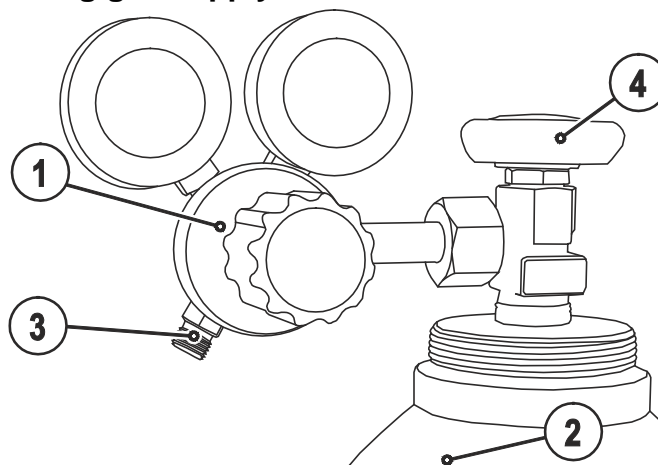


Figure 5-8

Item	Symbol	Description
1		Pressure regulator
2		Shielding gas cylinder
3		Output side of the pressure regulator
4		Cylinder valve

- Place the shielding gas cylinder into the relevant cylinder bracket.
- Secure the shielding gas cylinder using a securing chain.
- Tighten the pressure regulator screw connection on the gas bottle valve to be gas-tight.
- Screw gas hose connection crown nut onto the output side of the pressure regulator.
- Fit the gas hose and G1/4" crown nut onto the relevant connection on the welding machine, and fit the wire feed unit (if present on this version).

5.9.1.1 Gas test

Operating element	Action	Result
	1 x	Select gas test "Gas pre-flow time (TIG)" signal light is on. Shielding gas flows for approx. 20 seconds. The gas test can be ended immediately by pressing it once more.

5.9.1.2 "Purge hose package" function

Operating element	Action	Result
	5 s	Select hose package rinsing "Gas pre-flow time (TIG)" signal light flashes. The function is ended by pressing the button again.

NOTE

If the "Rinse hose package" function is not ended by pressing the "Gas and current parameters" button again, shielding gas will flow until the gas cylinder is empty!

5.10 Welding torch connection

CAUTION



Use of unsuitable coolants results in damage to the welding torch!

Unsuitable coolants can cause damage to the welding torch!

- Use only KF 23E coolants (observe temperature range of - 10 °C bis + 40°C).

NOTE



Please note the relevant documentation of the accessory components.

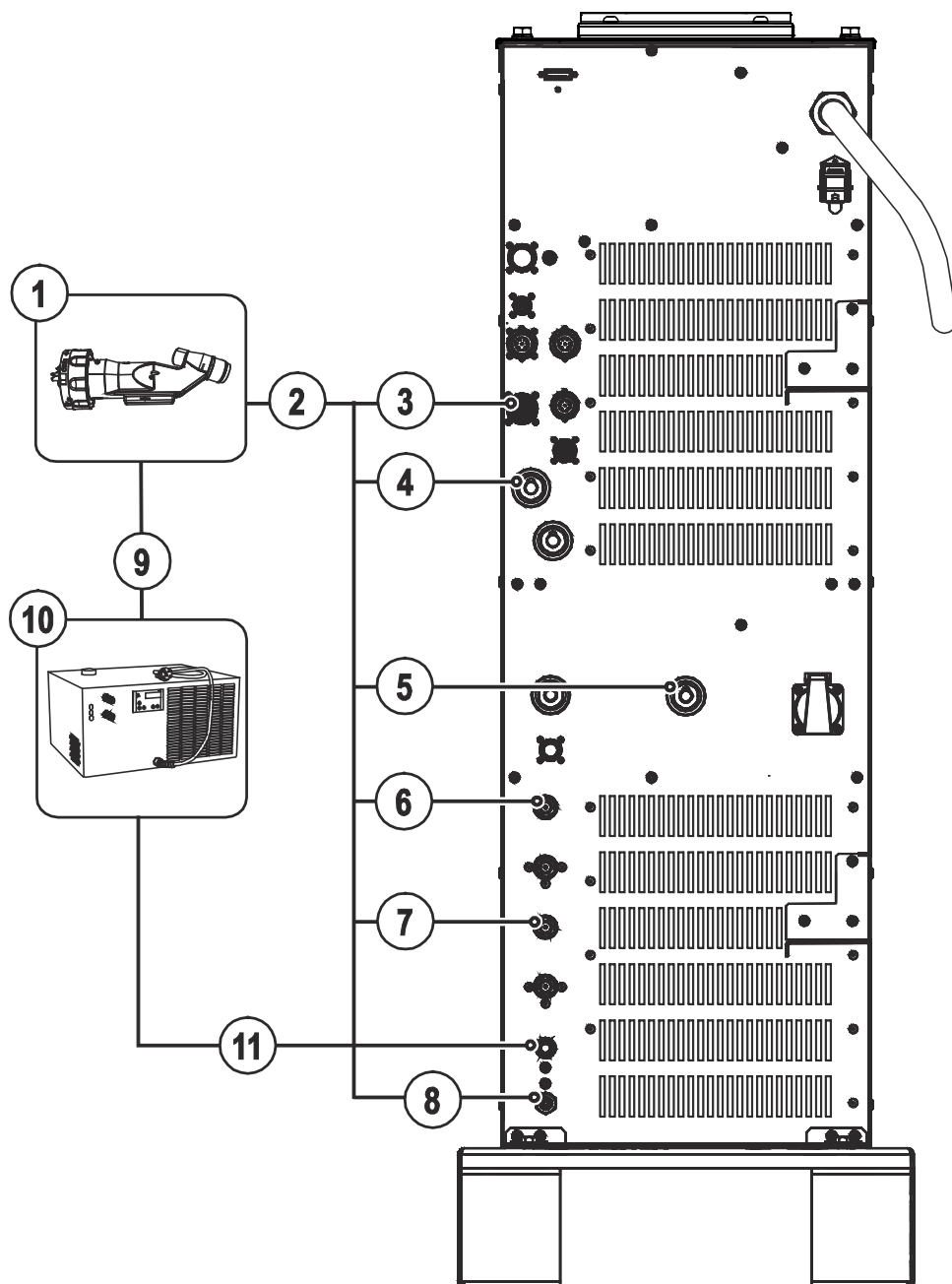










Figure 5-9

Item	Symbol	Description
1		Plasma torch
2		Welding torch hose package
3		23-pole connection socket (analogue) Mechanised welding torch connection
4		Connection socket, welding current - Welding torch connection
5		Pilot current connection socket Plasma welding torch nozzle potential
6		G1/4" connecting nipple, shielding gas, outlet Connection to welding torch
7		G1/4" connecting nipple, plasma gas, outlet Connection to welding torch
8		Rapid-action closure nipple Coolant return from welding torch
9		Quick connect coupling, blue Coolant supply to the welding torch
10		Cooling unit
11		Quick connect coupling (red) Coolant return to cooling unit

- Insert the 23-pole control lead plug into the 23-pole connection socket (analogue) and lock.
- Insert the welding current plug on the welding torch into the welding current connection socket and lock by turning to the right.
- Insert the plug of the pilot power line into the "+" pilot current connection socket.
- Screw the crown nut on the shielding gas lead gastight to the connecting thread (G $\frac{1}{4}$ ").
- Screw the crown nut of the plasma gas line tightly on to the connecting thread (G $\frac{1}{4}$ ").
- Fit and firmly engage the torch's reverse coolant flow to the quick connect coupling of the welding machine.
- Fit and firmly engage the reverse coolant flow of the reverse cooling unit to the welding machine's quick connect coupling.
- Fit and firmly engage the torch's coolant supply to the quick connect coupling of the reverse cooling unit.

5.11 "Insufficient wire" sensor connection

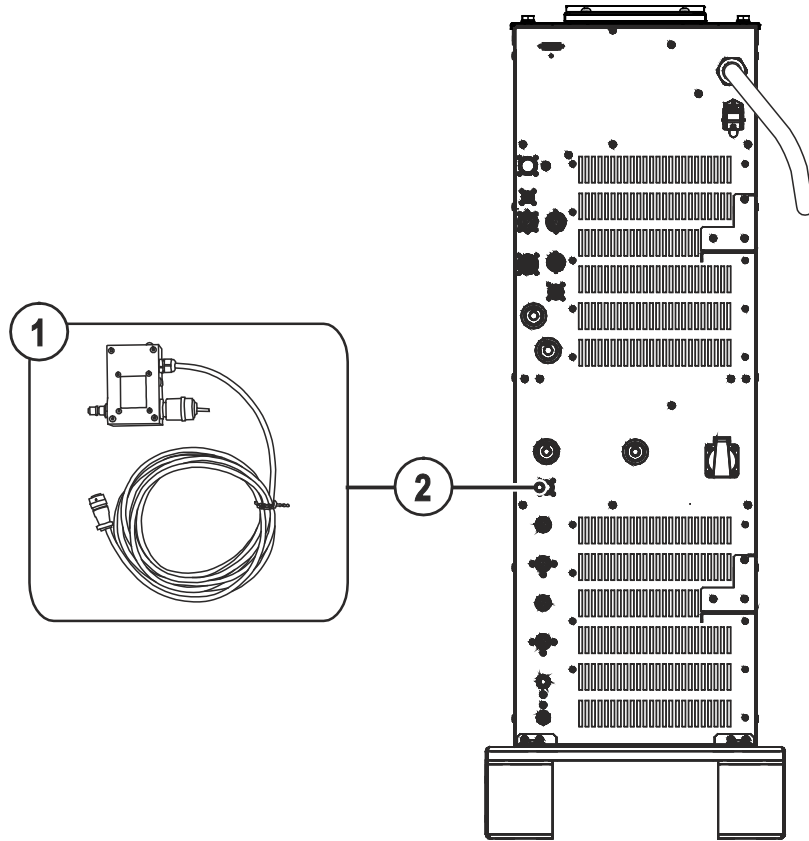


Figure 5-10

Item	Symbol	Description
1		"Insufficient wire" sensor A warning is issued as soon as the end of the wire (insufficient wire) is reached. The process will not be shut down.
2	X13	"Insufficient wire" sensor connection

NOTE

The cold wire supply is monitored by the "Insufficient wire" sensor, which is fastened to the wire drum and signals low wire supply in good time. If the wire supply is insufficient a process warning is issued on the system interface (wire error). However, this is just a warning; the process will not be shut down.

5.12 Connecting the wire feed unit

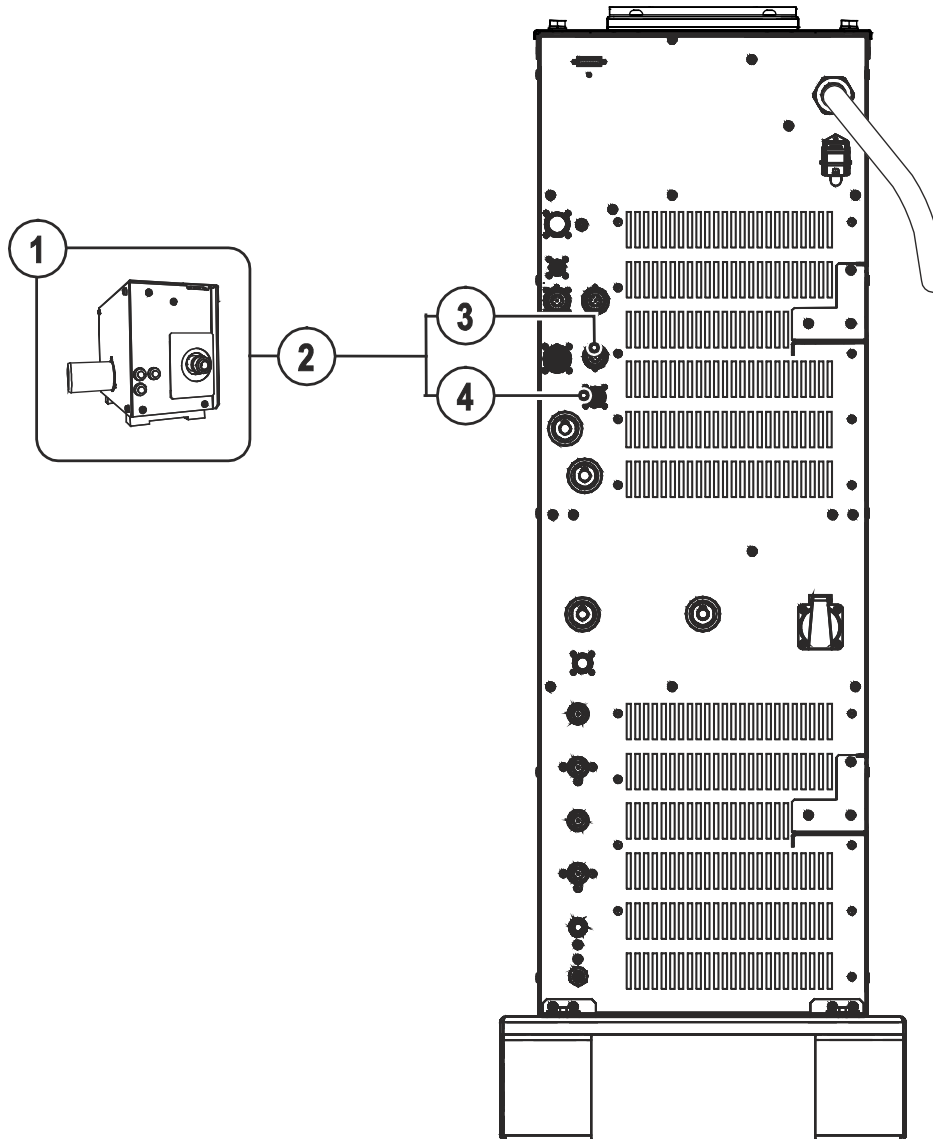


Figure 5-11

Item	Symbol	Description
1		Wire feed unit
2		Control lead assembly
3		7-pole connection socket (digital) Wire feed unit connection
4		12-pole connection socket (analogue) Wire feed unit connection

- Insert 7-pole plug on the intermediate tube package lead into the 7-pole connection socket and secure with crown nut (the plug can only be inserted into the connection socket in one position).
- Plug the 12-pole cable socket on the intermediate tube package into the 12-pole connector plug and secure using crown nut.

5.13 Hot wire power source connection

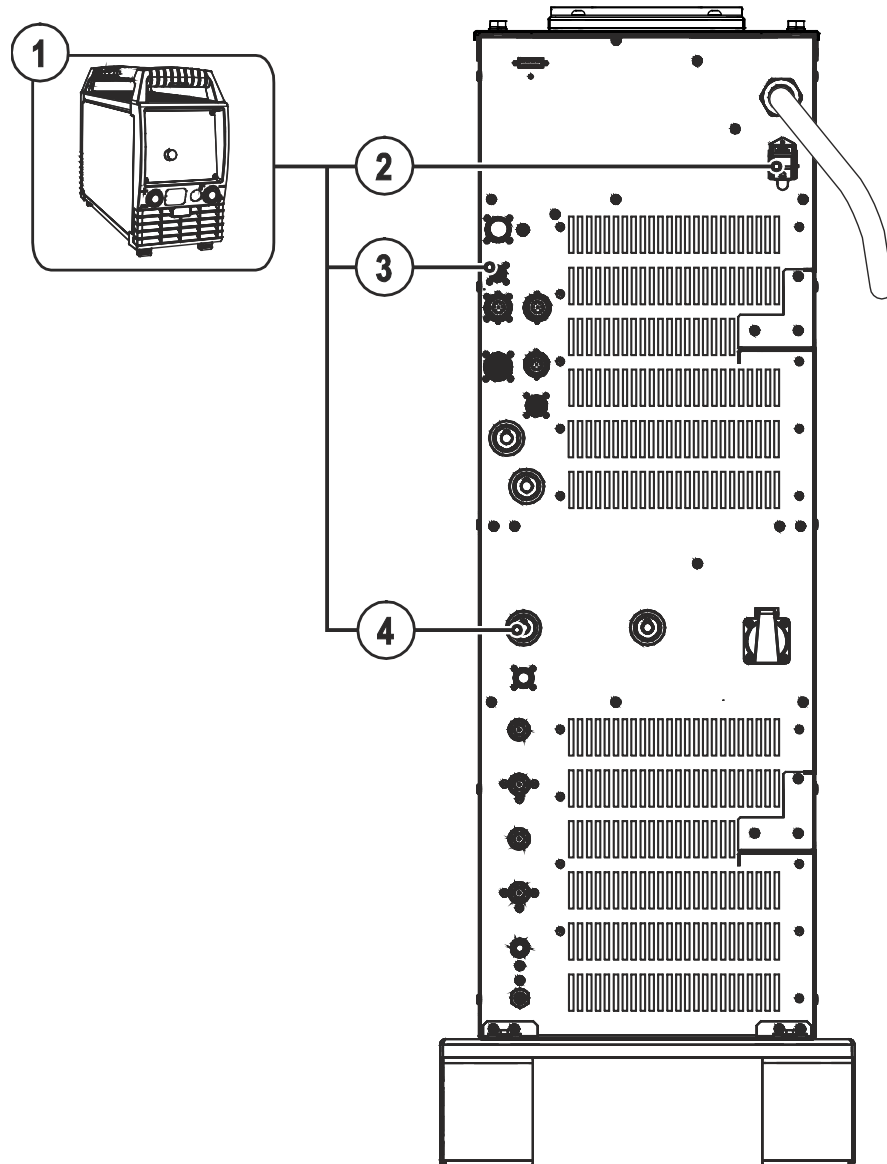


Figure 5-12

Item	Symbol	Description
1		Hot wire power source
2		Mains connection, hot wire power source Power supply for hot wire power source
3	hotWire	Control lead connection, hot wire power source 4-pole connection to the hot wire power source
4	+	Connection socket for “+” welding current Connection to TIG power source for hot wire application

- Insert the 4-pole cable plug of the hot wire power source control lead into the 4-pole connection socket and secure with a crown nut (the plug can only be inserted into the connection socket in one position).
- Push the cable socket for the welding current (TIG hot wire) onto the connector plug (TIG hot wire) and lock by turning to the right.
- Insert mains plug of the switched-off machine into the appropriate socket on the TIG power source.

5.14 Cooling unit connection

CAUTION



Use of unsuitable coolants results in damage to the welding torch!

Unsuitable coolants can cause damage to the welding torch!

- Use only KF 23E coolants (observe temperature range of - 10 °C bis + 40°C).

NOTE



Observe the fitting and connection instructions given in the relevant operating instructions for the cooling unit.

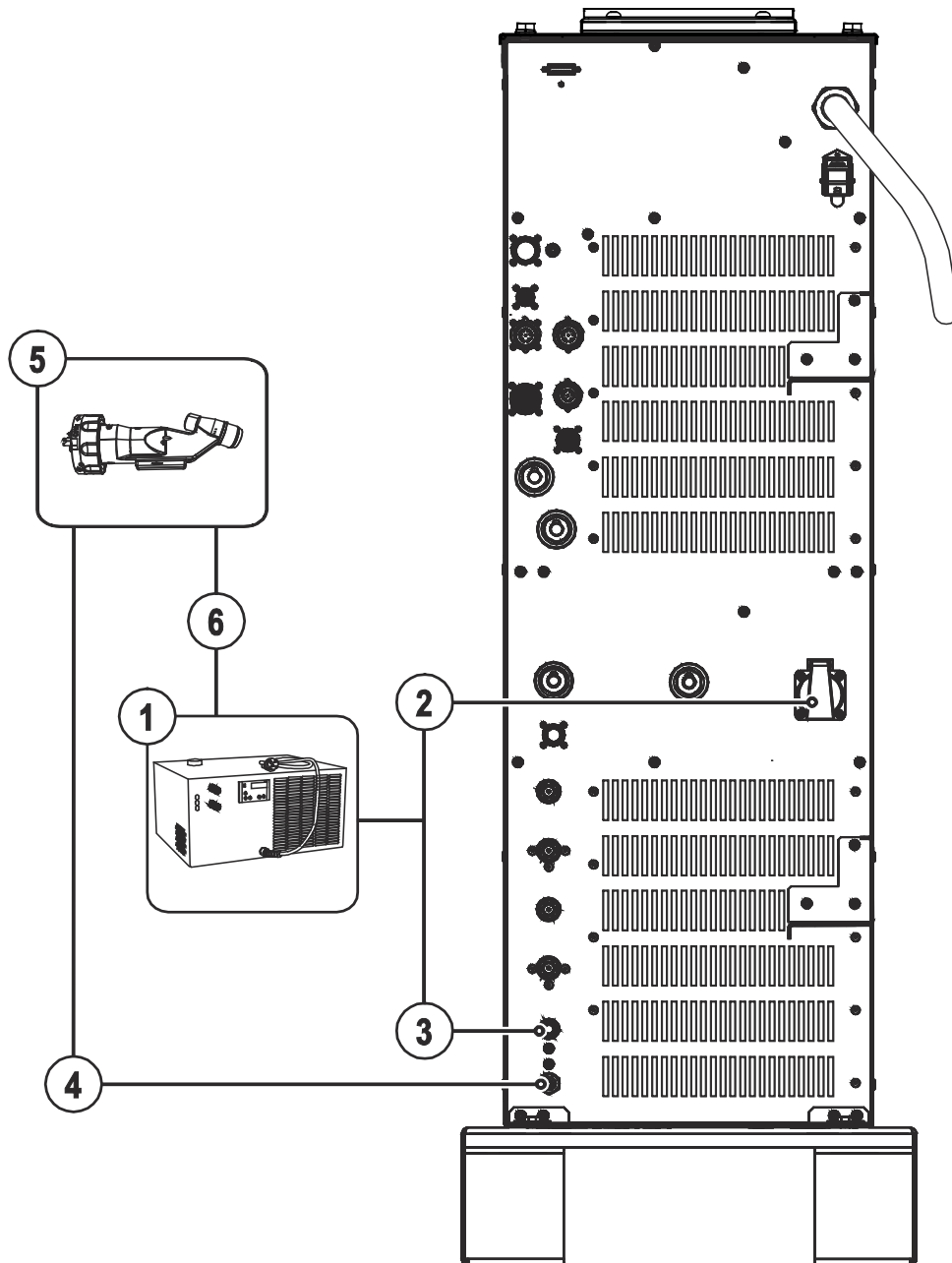






Figure 5-13

Item	Symbol	Description
1		Cooling unit
2		Cooling unit voltage supply Protective contact socket
3		Quick connect coupling (red) Coolant return to cooling unit
4		Rapid-action closure nipple Coolant return from welding torch
5		Plasma torch
6		Quick connect coupling, blue Coolant supply to the welding torch

- Connect the cooling unit mains connection cable with an external voltage supply.
- Establish a coolant return from the welding torch to the power source.
- Establish a coolant return from the power source to the cooling unit.
- Establish a coolant forward flow from the cooling unit to the welding torch.

NOTE



Coolant flow monitoring

After switching on the system, monitoring sets in with a time delay of 30 s to allow for the system pressure to build up. The flow rate depends on the torch used. At the moment monitoring is adjusted for use with a torch of type 150A PMC. If the flow rate is less than 1,2 l/min a process warning is issued on the system interface (coolant error). If the flow rate drops below 1,0 l/min an error is generated in the system causing the main and pilot arc to be switched off.

Coolant temperature monitoring

After switching on the system, monitoring sets in with a time delay of 30 s to allow for the system temperature to build up. If the system temperature rises to above 35 °C a process warning is issued on the system interface (coolant error). If the temperature rises to above 42 °C an error is generated in the system causing the main and pilot arc to be switched off.

5.15 Connection for workpiece lead

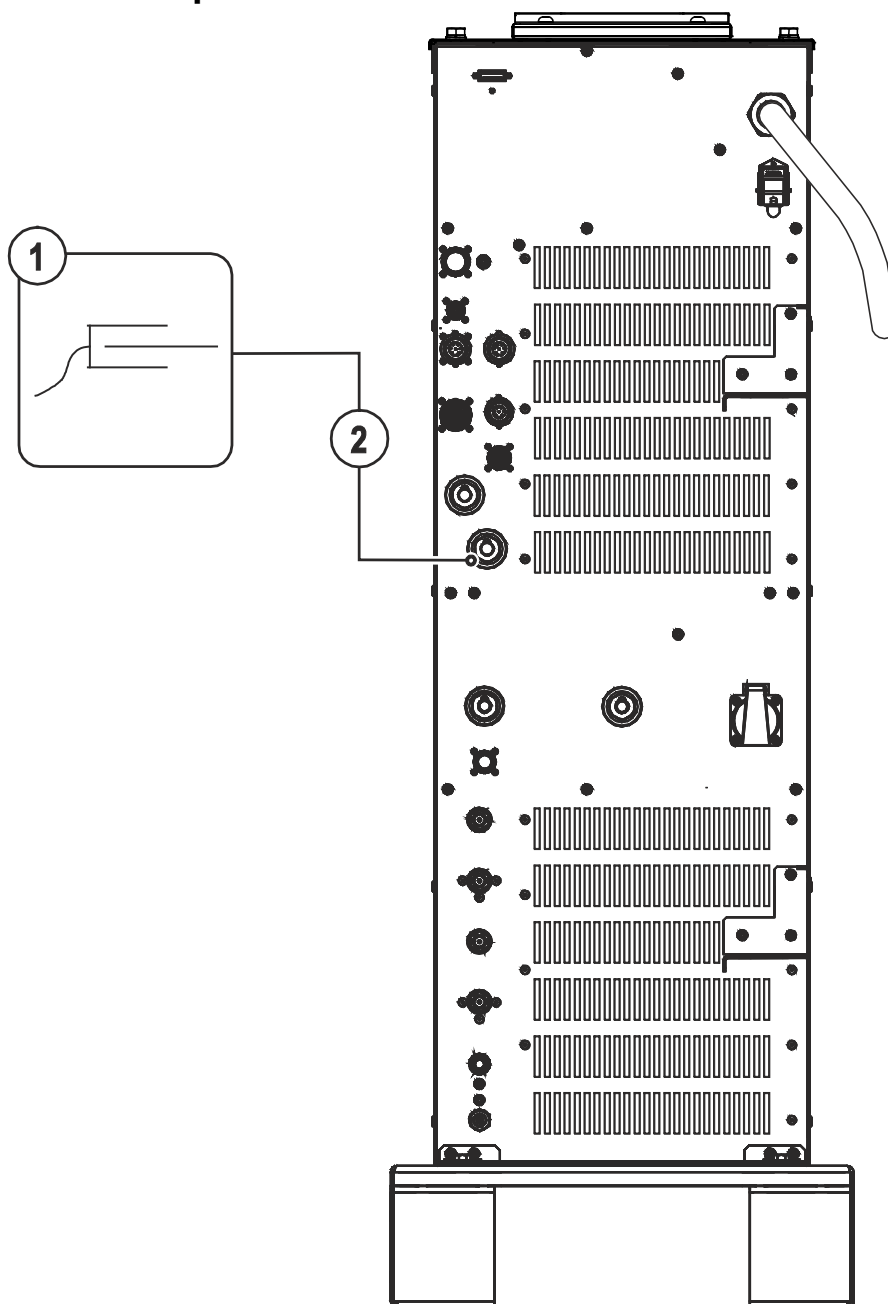


Figure 5-14

Item	Symbol	Description
1		Workpiece
2		Connection socket, "+" welding current Connection for workpiece lead

- Insert the cable plug on the work piece lead into the "+" welding current connection socket and lock by turning to the right.

5.16 TIG Synergic operating principle

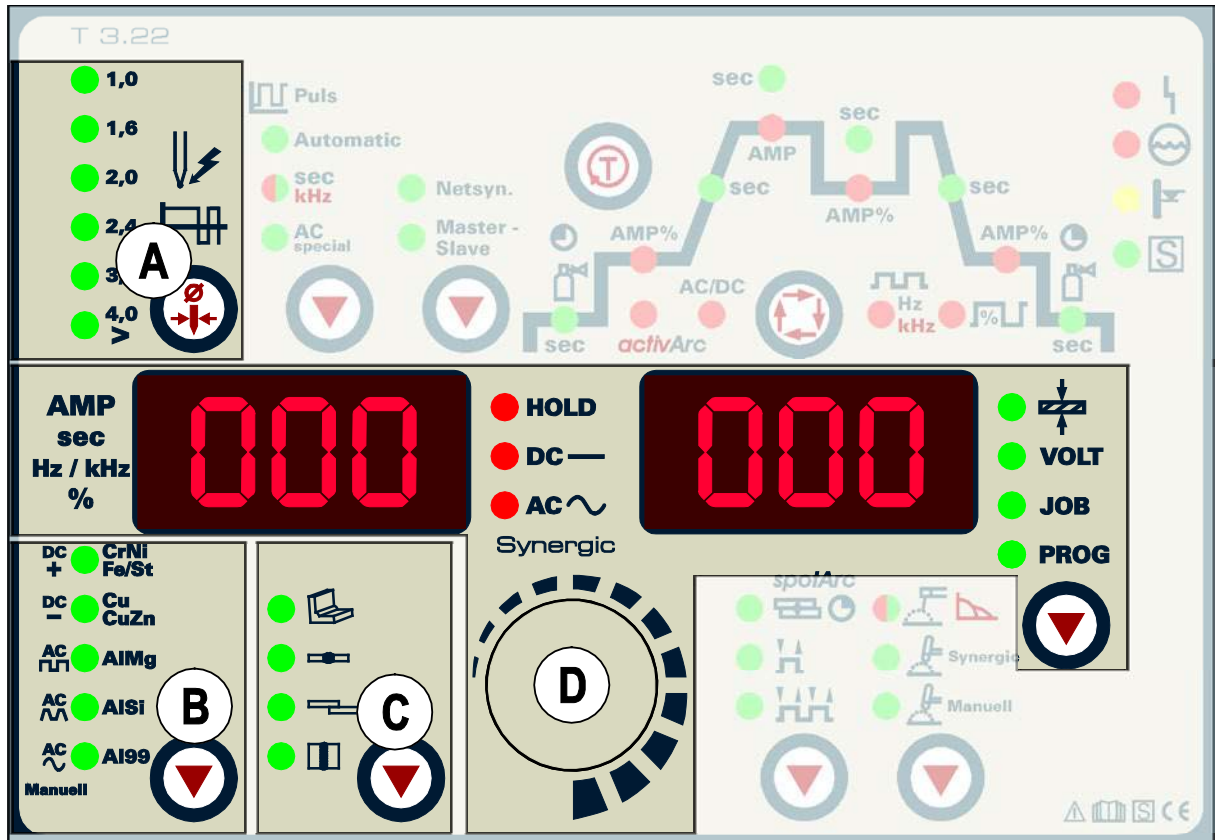


Figure 5-15

The machine is operated according to the TIG Synergic operating principle:

The three basic parameters

- tungsten electrode diameter (A),
- material type (B) and
- seam type (C)

are used to select the welding task (JOB).

All welding parameters specified here are the optimum settings for a variety of applications, but they can also be modified individually.

The required welding current can be set as the sheet metal thickness or conventionally as the welding current (D).

The parameters and functions described here can also be programmed by PC using the Tetric PCT 300 welding parameter software.

The Tetric machine range has been designed to be very easy and quick to operate, whilst still providing all the functions one could ever need.

5.16.1 Synergic parameter setting in the functional sequence

When setting the welding current, all the necessary welding parameters are adjusted automatically during the functional sequence (see chap. "TIG functional sequences") with the exception of the gas pre-flow time. These welding parameters can also be set in the conventional way if required (regardless of the welding current) (see chap. "Conventional parameter setting in the functional sequence").

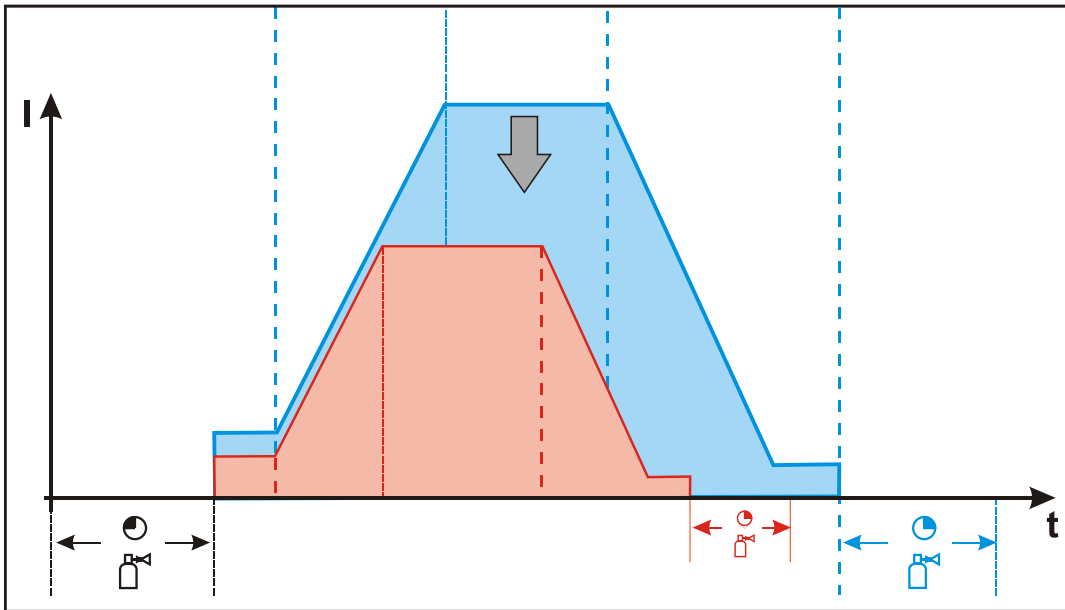


Figure 5-16

5.16.2 Conventional parameter setting in the functional sequence

All welding parameters in the functional sequence can also be adjusted, regardless of the welding current set. This means that if the welding current is changed, the values for the down slope time or gas post-flow time remain unchanged, for example. The welding task still needs to be selected as before using the three basic parameters of tungsten electrode diameter, material type and seam type.

NOTE

The parameters for the ignition, secondary and end currents can be set and displayed as percentage values or absolute values (see chapter "Welding current display").

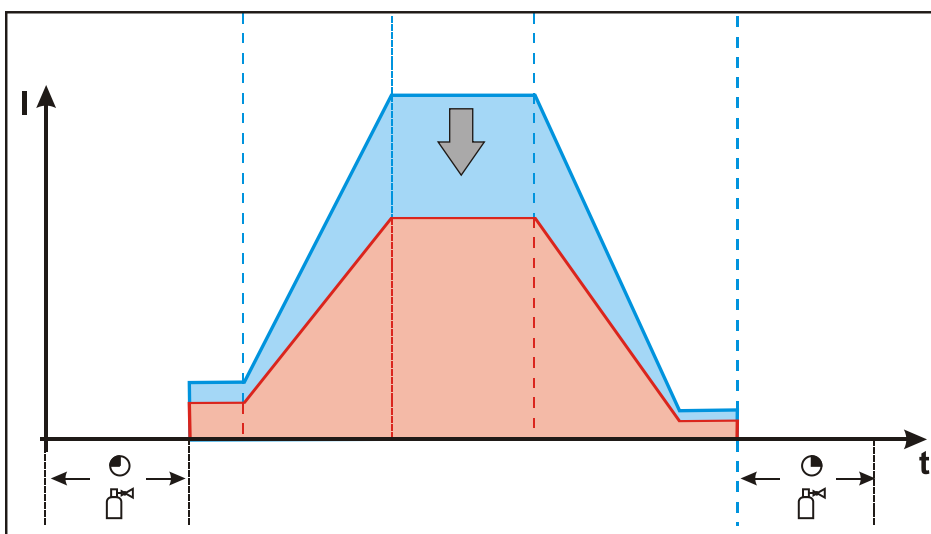


Figure 5-17

5.16.2.1 Set the operating principle (conventional/synergic)

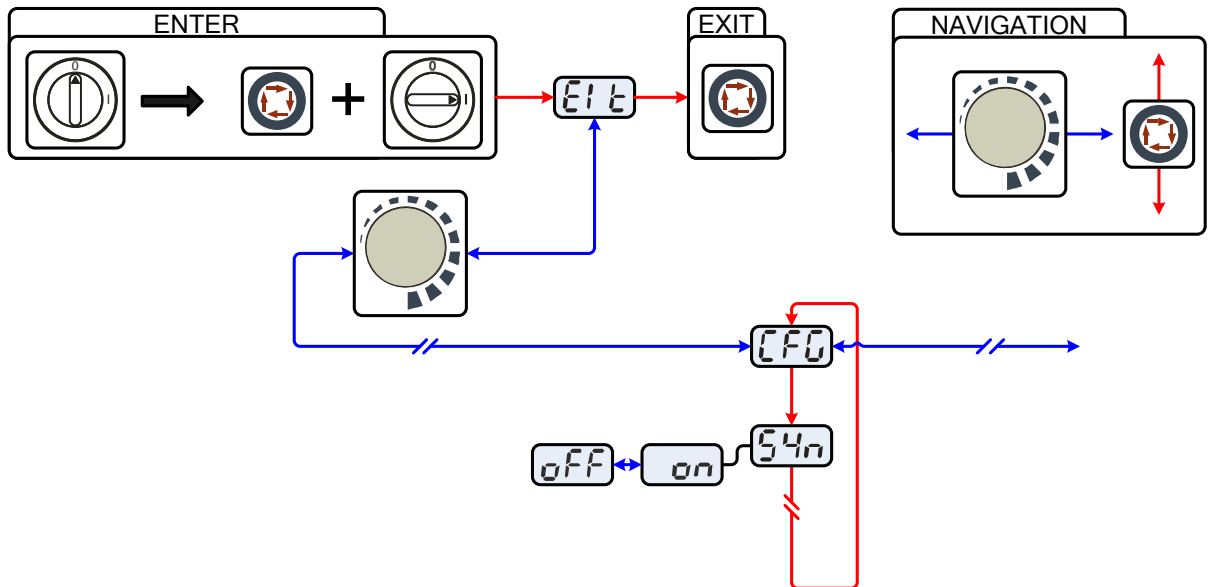


Figure 5-18

Display	Setting/selection
	Exit the menu Exit
	Machine configuration Settings for machine functions and parameter display
	Operating principle <ul style="list-style-type: none"> • on = synergic parameter setting (factory setting) • off = conventional parameter setting

NOTE

- ENTER (enter the menu)**
 - Switch off machine at the main switch
 - Press and hold the "welding parameters" button and switch the machine on again at the same time.
- NAVIGATION (navigating in the menu)**
 - Parameters are selected by pressing the "welding parameters" button.
 - Set or change the parameters by turning the "welding parameter setting" rotary dial.
- EXIT (leave the menu)**
 - Select the "Elt" menu item.
 - Press the "welding parameters" button (settings will be applied, machine changes to the ready-to-operate status).

5.16.3 Select welding task

The welding task is selected using the buttons on the machine control on the welding machine. Signal lights (LED) display the welding parameter selection.

NOTE

It is only possible to change the basic welding parameters if:

- No welding current is flowing and
- The key switch (option) is set to position “1”.

Operating element	Action	Result
		Select and display welding process.
		Select and display electrode diameter / ignition optimisation. <ul style="list-style-type: none"> • TIG - Synergic: Select electrode diameter (ignition optimisation is determined automatically). • TIG - Manual: Select ignition optimisation.
		Select and display material type or welding current polarity. <ul style="list-style-type: none"> • TIG - Synergic: Select material type (welding current polarity is determined automatically). • TIG - Manual: Select welding current polarity.
		Select and display seam type.
		Select and display operating mode.

5.16.4 Select welding current

The user has two options for setting the required welding current:

- Using the sheet metal thickness
- Directly as welding current

The welding current is displayed in the left-hand display. The “Material thickness” parameter can be selected in the right-hand display.

Control element	Action	Result	Display (right)
	X x	Press button until signal light Material Thickness comes on.	Material thickness in mm is displayed.
		Set welding current or sheet metal thickness.	Welding current and sheet metal thickness are displayed

5.16.5 Welding data display

The following welding parameters can be displayed before (nominal values), during (actual values) or after welding (hold values):

"Left-hand display"			
Parameter	Before welding (nominal values)	During welding (actual values)	After welding (hold values)
Welding current	●	●	●
Parameter times	●	-	-
Frequency, balance	●	-	-
Parameter currents	●	-	-
"Right-hand display"			
Material thickness	●	-	-
Welding voltage	●	●	●
JOB number	●	-	-
Program number	●	-	-

After welding the hold values are displayed. When changes are made to the settings (e.g. welding current) after welding, the display switches to the relevant nominal values.




The right-hand display automatically switches over to the material thickness after approx. 4 seconds.

If the "Program number" signal light is on in addition to the "Material thickness" signal light, the user is in program mode (programs 1-15, see chap. "Welding programs").

If the "JOB number" signal light is on in addition to the "Material thickness" light, the user is in a JOB in the free memory (JOBS 128 to 256, see chap. "Creating a new JOB in the free memory").

5.16.5.1 Welding parameter setting

During the welding parameter setting process, the parameter value being set is displayed on the left-hand display. The right-hand display shows the "Factory setting" or a variation of it upwards or downwards. Displays, e.g. when setting the ignition current, and their meanings:

Display	Meaning of the symbols shown in the right-hand display
	Increase parameter value To restore the factory settings.
	Factory setting Parameter value is on the optimum setting
	Reduce parameter value To restore the factory settings.

5.16.6 Arc ignition

The pilot arc is activated/deactivated by pressing the "Pilot arc on/off" push-button.

After activating the pilot arc, the pre-set gas pre-flow time runs, the pilot arc current ignites without workpiece contact between the electrode and nozzle, and the control lamp in the push-button illuminates.

CAUTION



Oxidation of the tungsten electrode!

To protect the tungsten electrode against oxidation carry out the following actions before switching off the power source:

- Switch off the pilot arc and wait for the gas post flow time to elapse!
- Do not switch off the machine while the arc is still burning!

NOTE



On delivery, the Hilibo current on the machine is preset to 10A.

The majority of applications are covered by this current setting.

If required, the Hilibo current can be adjusted individually using the PC300.NET software (5A to 80A).



Please note the relevant documentation of the accessory components.

5.16.7 Optimising the ignition characteristics for pure tungsten electrodes

This parameter can be used to improve the ignition characteristics of "pure tungsten electrodes", for example. The parameter is a %-value (factory-set to 20) and is changed across all JOBS.

Control element	Action	Result	Display
	1 x	Select Ignition Characteristics parameter The signal lights for the selected electrode diameter and ignition current AMP% flash for approx. 5 seconds. The parameter value can be optimised on the rotary transducer during this time.	
		Set parameter value Increase parameter value: more ignition power Reduce parameter value: less ignition power	

5.16.8 TIG automatic cut-out

NOTE



If the arc does not ignite after starting or if the arc is interrupted when the torch is moved away, an automatic cut-out occurs after 5 sec.

- The HF, gas and open circuit voltage (power unit) are switched off.
- If RINTX1x or BUSINTX1x are in use the automatic cut-out is regulated by the settings made with the software PC300.net.

5.16.9 Optimal and fast spherical cup formation

NOTE

A conically ground tungsten electrode (approx. 35°) is generally required to form an ideal spherical cup.

Operating element	Action	Result
DC+ CrNi Fe/St DC- Cu CuZn AC ΠΠ AIMg AC ΛΛ AISI AC ~ AI99 Manuell		Select AC/DC welding with appropriate material: AIMg aluminium and magnesium alloys. AISi aluminium and silicon alloys or AI99 aluminium 99%
		Ignition optimisation selection The signal light of the selected needle diameter starts flashing.
		Tungsten balling selection The main current signal light flashes rapidly. The current for tungsten balling is displayed and can be adjusted during the process. This function is switched off by pressing the ignition optimisation push-button again or automatically after the set gas post-flow time has elapsed.

NOTE

-
- Use a sample workpiece.
 - Ignite arc with HF ignition (non-contact) and form required spherical cup for the application in question.

5.17 Welding task definition

The user defines the welding tasks using JOB numbers.

Each JOB number stores all the parameters relating to the welding task.

The user can either load an existing JOB, load an existing JOB and change it, or define a completely new JOB via the various interfaces.

The welding task or JOB is defined using the following parameters:

Basic parameters

The JOB number is defined using the four basic welding parameters:

welding process, material type, wire diameter and seam type.

Program sequence

Other welding parameters, such as parameters for the start program, secondary program or end program and the gas pre-flow time, slope times and many more are preset for a variety of applications, but can be modified where required. On the various interfaces, the most important welding parameters are displayed directly and can be modified where required.

Operating point

The operating point can be set via up to 15 (PROG 1 to PROG 15) freely definable programs using a robot interface (RINT X12/BUSINT X11), for example.

- The welding current, operating mode and pulse function are stored in each program. These program parameters can be set on a PC or the tablet PC RC 300 using the PC 300 welding parameter software. The program number is selected by the robot control.

The digital system calculates the process parameters required, such as the welding current, welding voltage and pulse current according to the operating point specified.

Operating mode

Non-latched or special non-latched (start, main and end program).

These parameters are predefined by the robot control via robot interface RINT X12 or BUSINT X11 (see the relevant interface documentation).

Welding type

Pulse or standard welding.

This parameter setting is specified by the robot control via the RINT X12 or BUSINT X11 robot interface (see documentation in the relevant interface description).

5.18 Protecting welding parameters from unauthorised access

To protect against unauthorised or unintentional adjustment of the welding parameters on the machine, the control input can be locked with the aid of a key switch.

Key position 1 = All parameters can be set

Key position 0 = Only the following operating elements are functional:

- "Operating mode" button
- "Welding parameter setting" rotary transducer
- "Display switching" button
- "TIG pulse welding"/"Select activArc" button
- "Select welding parameters" button
- "Gas test" button

5.19 Welding programs

The welding machine has 16 programs, which can be accessed during the welding process, e.g. using an up/down torch.

In each selected welding task (JOB), see the "Selecting the welding task" chapter, 16 programs can be set, saved and accessed. In program "0" (default setting), the welding current can be set infinitely across the whole range. In programs 1–15, 15 different welding currents can be defined.

Operating mode and pulse function can also be defined for programs 1–15, if the connected RINT X12 or BUSINT X11 interface is in JOB mode. If the interfaces are not in JOB mode, operating mode and pulse function are predefined by the interfaces.

Example:

Program number	Welding current	Operating mode	Pulse function
1	80 A	Non-latched	Pulses on
2	70 A	Latched	Pulses off

The operating mode cannot be changed during the welding process. If the process is started with program 1 (non-latched operating mode), program 2, despite being set to latched operating mode, will apply the setting of start program 1 until the end of the welding process.

Pulse function (pulses off, pulses on) and welding currents will be applied from the relevant programs.

NOTE



Changes made to the other welding parameters during the course of the program have the equivalent effect on all programs.

Any change to the welding parameters is saved immediately in the JOB!

5.19.1 Selection and adjustment

Setting welding programs using the welding machine control

Operating element	Action	Result	Display
		Press button until signal light PROG comes on.	 Welding current (left) and program no. (right)
		Select or retrieve program no., e.g. no. 1	
		Set operating mode (can be specified separately for each program).	No change
		Press until a "P" for program no. is displayed in the left-hand section of the right-hand display. Any parameter can be selected and changed in the function sequence. The changes are transferred to all other programs in the same way.	
		Set welding current for the corresponding program (e.g.: 75 A in program 1).	

NOTE



When connecting a potentiometer torch or up/down torch or operating a standard torch in up/down mode, the program changeover to the welding machine control is blocked!

5.19.2 Specifying max. no. of accessible programs

NOTE



This function can be used to specify the maximum number of programs which can be called up (only applies to the welding torch). According to the factory setting, all 16 programs can be called up. If necessary these can be limited to a specific number. To limit the number of programs, the welding current needs to be set to 0A for the next, unused program. For example, if only programs 0 to 3 are being used, the welding current is set to 0A in program 4. A maximum of programs 0 to 3 can then be called up on the welding torch.

5.19.3 Example "Program with synergetic setting"
AMP

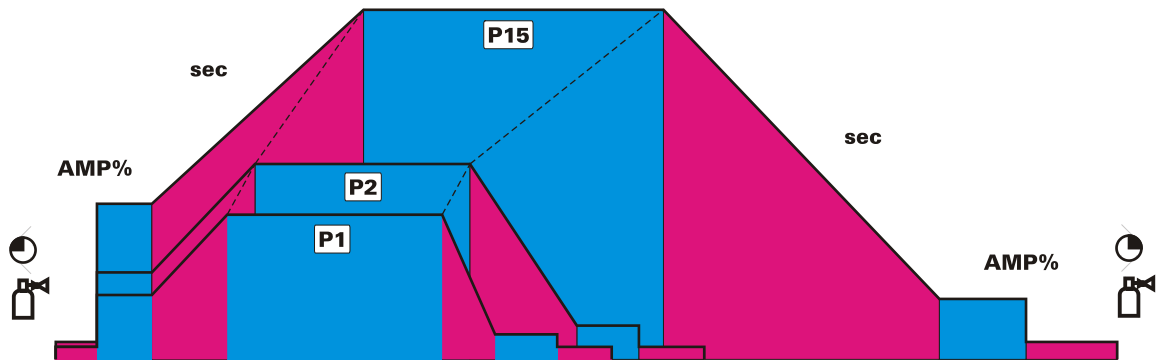


Figure 5-19

5.19.4 Example "Program with conventional setting"
AMP

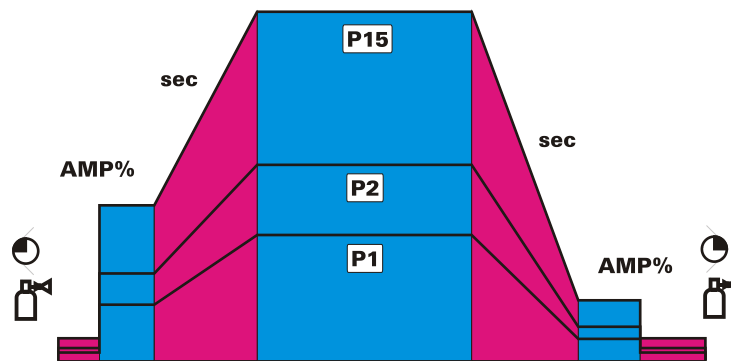


Figure 5-20


5.19.5 Accessories for switching over programs


The user can change, retrieve and save programs using the following components.

Component	Programs	
	create and change	call up
Welding machine control	16	16
PC with PC 300 welding parameter software	16	16
Tablet PC RC 300 with PC 300 welding parameters	16	16
Tetrix RINT robot interface	-	16
BUSINT X10 industrial bus interface	-	16

5.20 Organising welding tasks (Mode "JOB Manager")

NOTE

 **Welding jobs (JOBS) / programs are organised (configured, managed, created) using the parameterisation software PC300.Net. JOBS are switched with an interface (e.g., RINT X12).**

 **Please note the relevant documentation of the accessory components.**

The JOB Manager can be used to load, copy or save JOBS.

A JOB is a welding task defined using the 4 main welding parameters

- welding process,
- material type,
- electrode diameter and
- seam type.

One program sequence can be defined in each JOB.


Up to 16 programs (P0 to P15) can be set in each program sequence.

The user has a total of 249 JOBS available. 121 of these JOBS are pre-programmed. A further 128 JOBS can be freely defined.

A distinction is made between two memory sectors:





- 121 factory-set, pre-programmed, permanent JOBS. Permanent JOBS are not loaded but are defined by the welding task (each welding task is permanently assigned a JOB number).
- 128 freely definable JOBS (JOBS 129 to 256)

NOTE

 **After carrying out any of the actions described, the machine switches back to the default parameters such as current and voltage.**

To ensure that all the changes are active, the welding machine should only be switched off after 5 seconds have elapsed.

5.20.1 Explanation of symbols on the display

Display	Meaning
	Load JOB
	Copy JOB
	Reset JOB
	Reset all JOBS

5.20.2 Creating a new JOB in the memory or copying a JOB

NOTE

It is normally possible to adjust all 256 JOBS individually. However, it is a good idea to assign specific JOB numbers in the free memory (JOB 128 to 256) for specific welding tasks.

Copying a pre-defined welding task from the fixed memory (JOBS 1 to 128) to the free memory (JOBS 129-256):

NOTE

Define welding task which most closely matches the required application.

Operating element	Action	Result	Display
	x x	Select JOB Manager mode	Press until the "VOLT" signal light is on
	2 sec.	Select JOB Manager mode	
	1 x	Switch from "Load JOB" to "Copy JOB"	
		Select the required JOB number using the rotary transducer (e.g. 150)	
	1 x	JOB has been copied to the free memory, machine switches back to Display mode. The JOB can be modified individually.	Current value and JOB number displayed

5.20.3 Loading an existing JOB from the free memory

Operating element	Action	Result	Display
	x x	Select JOB Manager mode	Press until the "VOLT" signal light is on
	2 sec.	Select JOB Manager mode	
		Select the required JOB number using the rotary transducer (e.g. 150)	
	1 x	JOB loaded, machine switches back to Display mode. The JOB can be customised as required.	Current value and JOB number displayed

5.20.4 Resetting an existing JOB to the factory setting (Reset JOB)

Operating element	Action	Result	Display
	x x	Select JOB Manager mode	Press until the "VOLT" signal light is on
	2 sec.	Select JOB Manager mode	
	2 x	Switch from "Load JOB" to "Reset JOB"	
		Select the required JOB number using the rotary transducer (e.g. 150)	
	1 x	JOB reset to factory settings, machine switches back to Display mode.	Current value and JOB number displayed

5.20.5 Resetting JOBS 1-128 to the factory setting (Reset All JOBs)

Operating element	Action	Result	Display
	x x	Select JOB Manager mode	Press until the "VOLT" signal light is on
	2 sec.	Select JOB Manager mode	
	3 x	Switch from "Load JOB" to "Reset All JOBs"	
		<ul style="list-style-type: none"> • ON = Reset all JOBs to factory settings • OFF = Do not reset JOBs 	
	1 x	All JOBs reset to factory settings, machine switches back to Display mode.	Current value and JOB number displayed

5.20.6 Exit JOB Manager without changes

The user is in the JOB manager menu and wants to exit without making any changes:

Operating element	Action	Result	Display
	2 sec.	Machine switches back to Display mode The JOB can be adjusted individually.	Current value and JOB number displayed

5.21 Interfaces

5.21.1 Connecting the robot interface / industrial bus interface

CAUTION



Damage due to the use of non-genuine parts!

The manufacturer's warranty becomes void if non-genuine parts are used!

- Only use system components and options (power sources, welding torches, electrode holders, remote controls, spare parts and replacement parts, etc.) from our range of products!
- Only insert and lock accessory components into the relevant connection socket when the machine is switched off.



Damage due to incorrect connection!

Accessory components and the power source itself can be damaged by incorrect connection!

- Only insert and lock accessory components into the relevant connection socket when the machine is switched off.
- Comprehensive descriptions can be found in the operating instructions for the relevant accessory components.
- Accessory components are detected automatically after the power source is switched on.

The interfaces can be operated directly on the power source in a separate interface casing or externally, e.g. in a robot control cabinet or via a data cable.

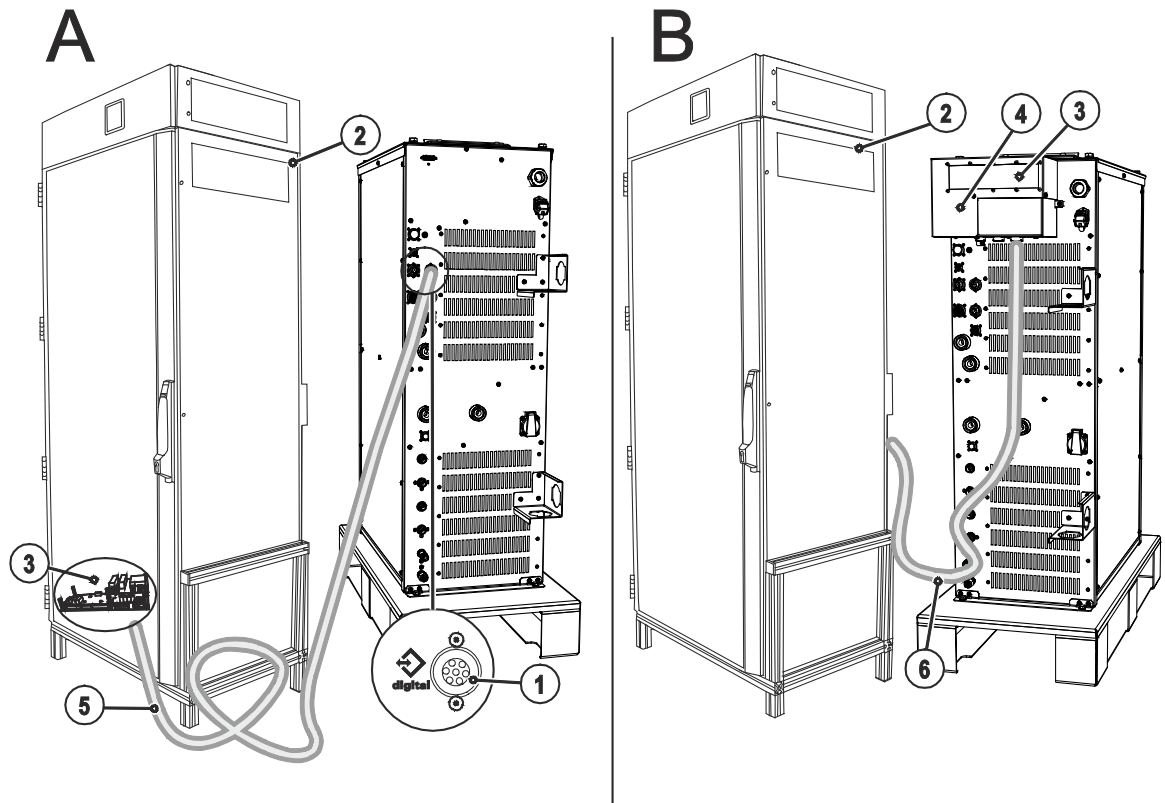


Figure 5-21

Item	Symbol	Description
1		7-pole connection socket (digital) For connecting digital accessory components
2		Switching cabinet
3		Robot interface / Industrial bus interface
4		Interface casing ATCASE
5		Connection cable, 7-pole Connection between switching cabinet and power source
6		Connection lead Connection between interface casing and switching cabinet

5.21.1.1 RINT X12 robot interface

The standard digital interface for mechanised applications (optional, retrofitting on the machine or external fitting by the customer)

Functions and signals:

- Digital inputs: start/stop, operating modes, JOB and program selection, inching, gas test
- Analogue inputs: control voltages, e.g. for welding performance, welding current, etc.
- Relay outputs: process signal, ready for welding, system composite fault, etc.

5.21.1.2 BUSINT X11 industrial bus interface

The solution for integration into mechanised production lines, with for example

- PROFIBUS
- CAN-OPEN, CAN DEVICENET
- ETHERNET IP
- PROFINET
- Interbus systems with copper and optical fibre connection (FSMA/Rugged Line)

NOTE

Only one variant can ever be operated at any one time.

5.21.2 Connecting the PC 300.net welding parameterisation software

Create all welding parameters quickly on the PC and easily transfer them to one or more welding machines (accessories, set consisting of software, interface, connection leads)

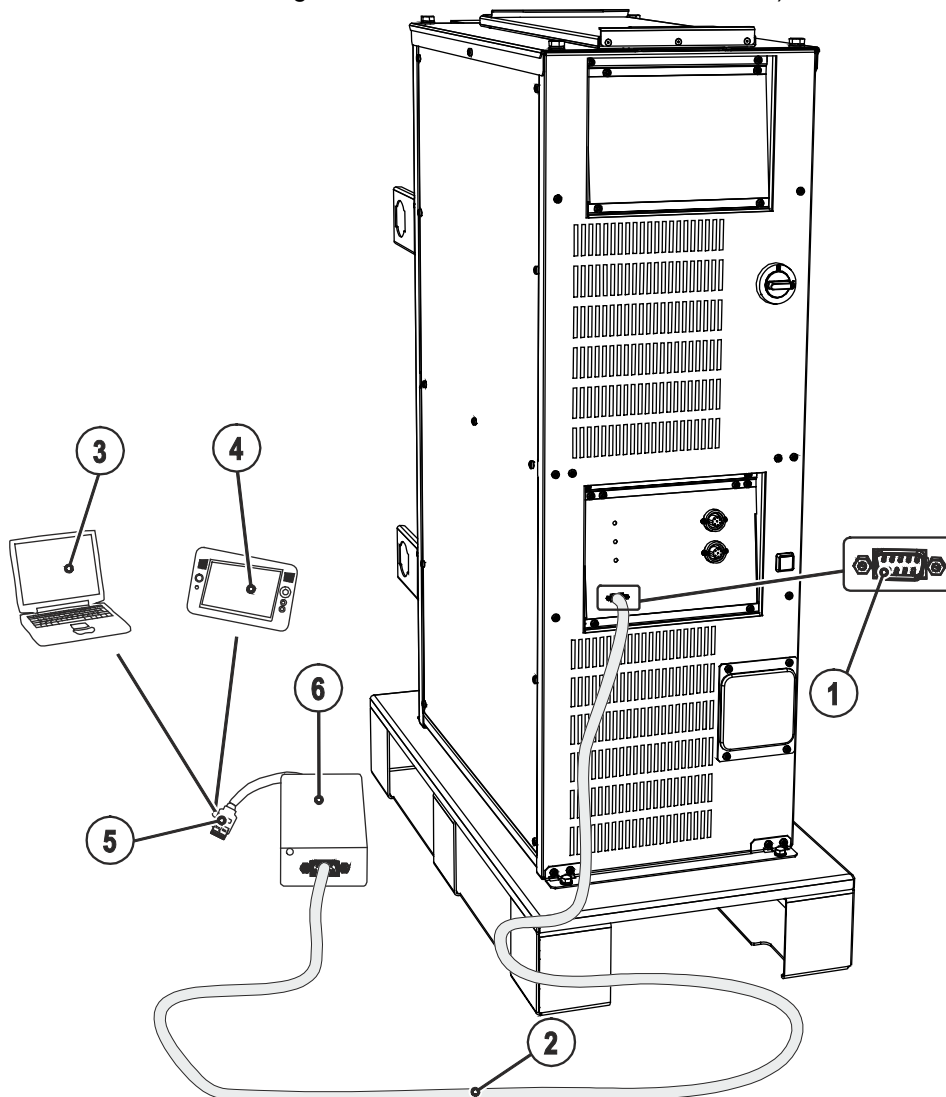



Figure 5-22

Item	Symbol	Description
1		PC interface, serial (D-Sub connection socket, 9-pole)
2		Connection cable, 9-pole, serial
3		Windows PC
4		RC300 tablet PC
5		USB connection
6		SECINT X10 USB

CAUTION



Equipment damage or faults may occur if the PC is connected incorrectly!
 Not using the SECINT X10USB interface results in equipment damage or faults in signal transmission. The PC may be destroyed due to high frequency ignition pulses.

- Interface SECINT X10USB must be connected between the PC and the welding machine!
- The connection must only be made using the cables supplied (do not use any additional extension cables)!

5.21.3 Connecting the Q-DOC 9000 V2.0 welding data documentation software

(Accessories: Set consisting of software, interface, connection leads)

The ideal tool for welding data documentation of, for example: welding voltage and current, wire speed and motor current.

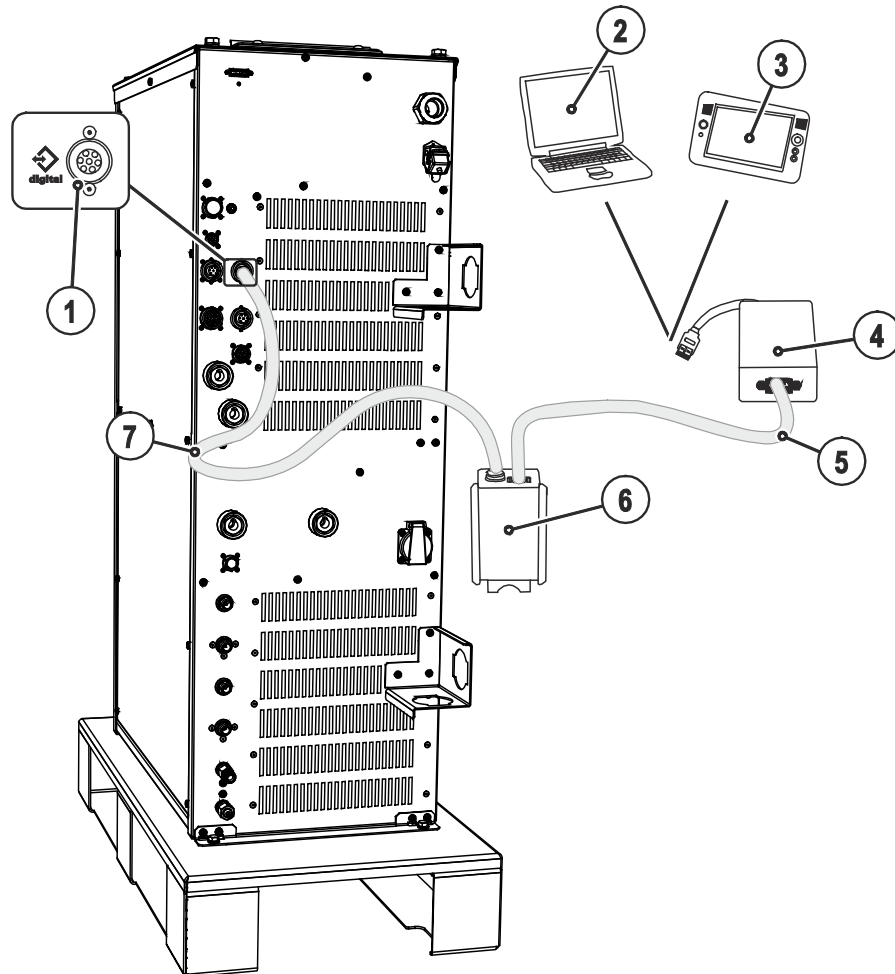


Figure 5-23

Item	Symbol	Description
1		7-pole connection socket (digital) For connecting digital accessory components
2		Windows PC
3		RC300 tablet PC
4		SECINT X10 USB
5		Connection cable, 9-pole, serial
6		PCINT X10
7		Connection cable, 7-pole Connection between switching cabinet and power source

CAUTION



Equipment damage or faults may occur if the PC is connected incorrectly!

Not using the SECINT X10USB interface results in equipment damage or faults in signal transmission. The PC may be destroyed due to high frequency ignition pulses.

- Interface SECINT X10USB must be connected between the PC and the welding machine!
- The connection must only be made using the cables supplied (do not use any additional extension cables)!

5.21.4 Connecting the WELDQAS welding data monitoring and documentation system

Network-compatible welding data monitoring and documentation system for digital power sources.

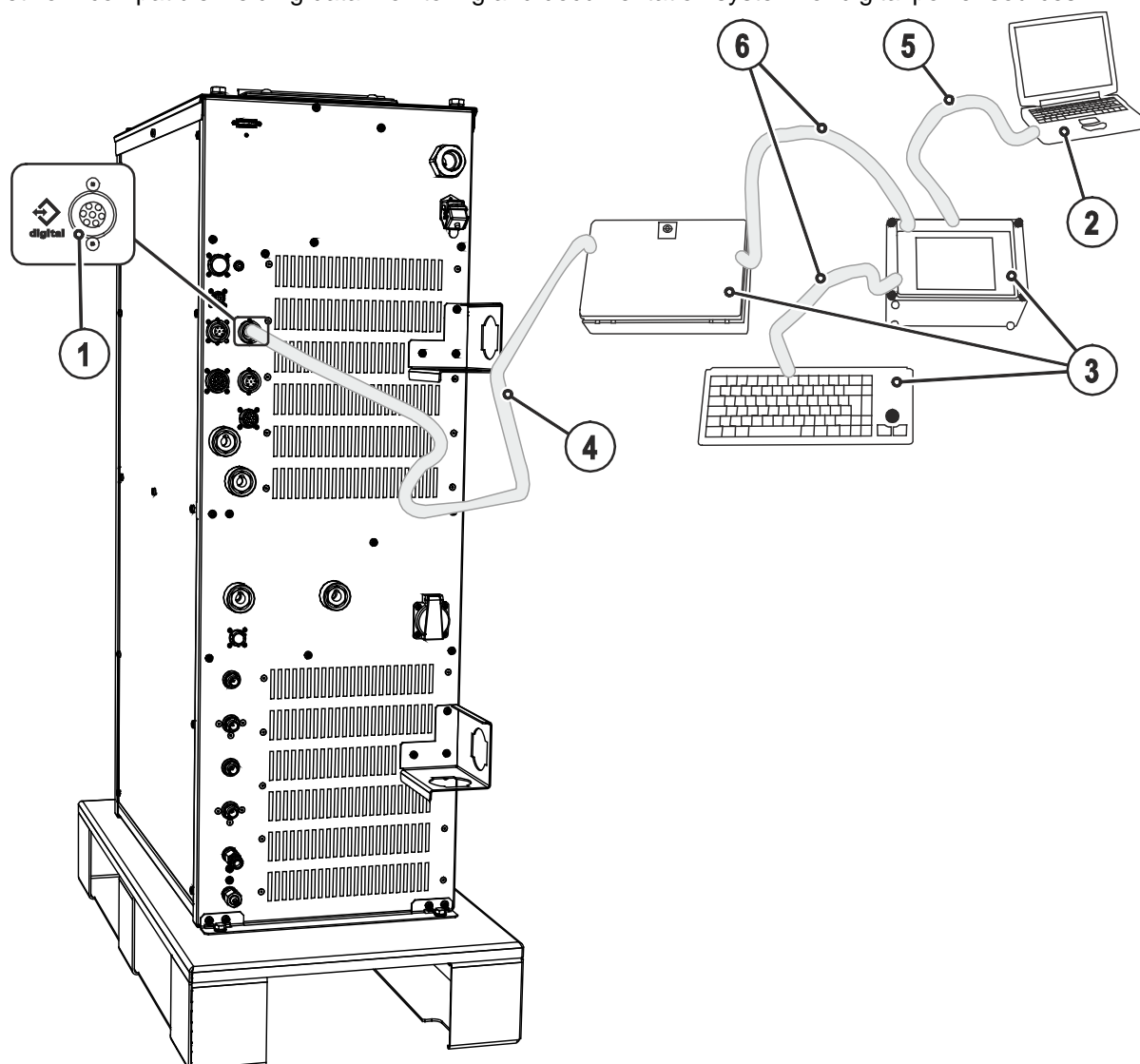


Figure 5-24

Item	Symbol	Description
1		7-pole connection socket (digital) For connecting digital accessory components
2		Windows PC
3		WELDQAS welding data monitoring and documentation system
4		Connection cable, 7-pole Connection between switching cabinet and power source
5		Integration option of WELDQAS into existing network systems via network cables
6		Connection cable included as standard with WELDQAS

5.21.5 Automation interface

⚠ WARNING



No function of the external interrupt equipment (emergency stop switch)!
 If the emergency stop circuit has been realised using an external interrupt equipment via the interface for automated welding, the machine must be configured for this setup. If this is not observed, the power source will ignore the external interrupt equipment and will not shut down!

- Disconnect jumper 1 on PCB T320/1 (Tetrix) or M320/1 (Phoenix / alpha Q)!

⚠ CAUTION



Equipment damage due to unshielded control leads!
 Unshielded control leads can cause damage to the power source and accessory components.

- Use shielded control leads only.

The welding power sources feature a very high safety standard. This safety standard is also maintained when peripheral equipment is connected for mechanised welding, if this peripheral equipment meets the same criteria, particularly with regard to isolation from the mains supply.

This is guaranteed by the use of transformers conforming to VDE 0551.

The welding machines are equipped for mechanised operation as standard.

For the simplest possible mechanised applications, control inputs and galvanically isolated relay contacts are available on the interface for mechanised welding.

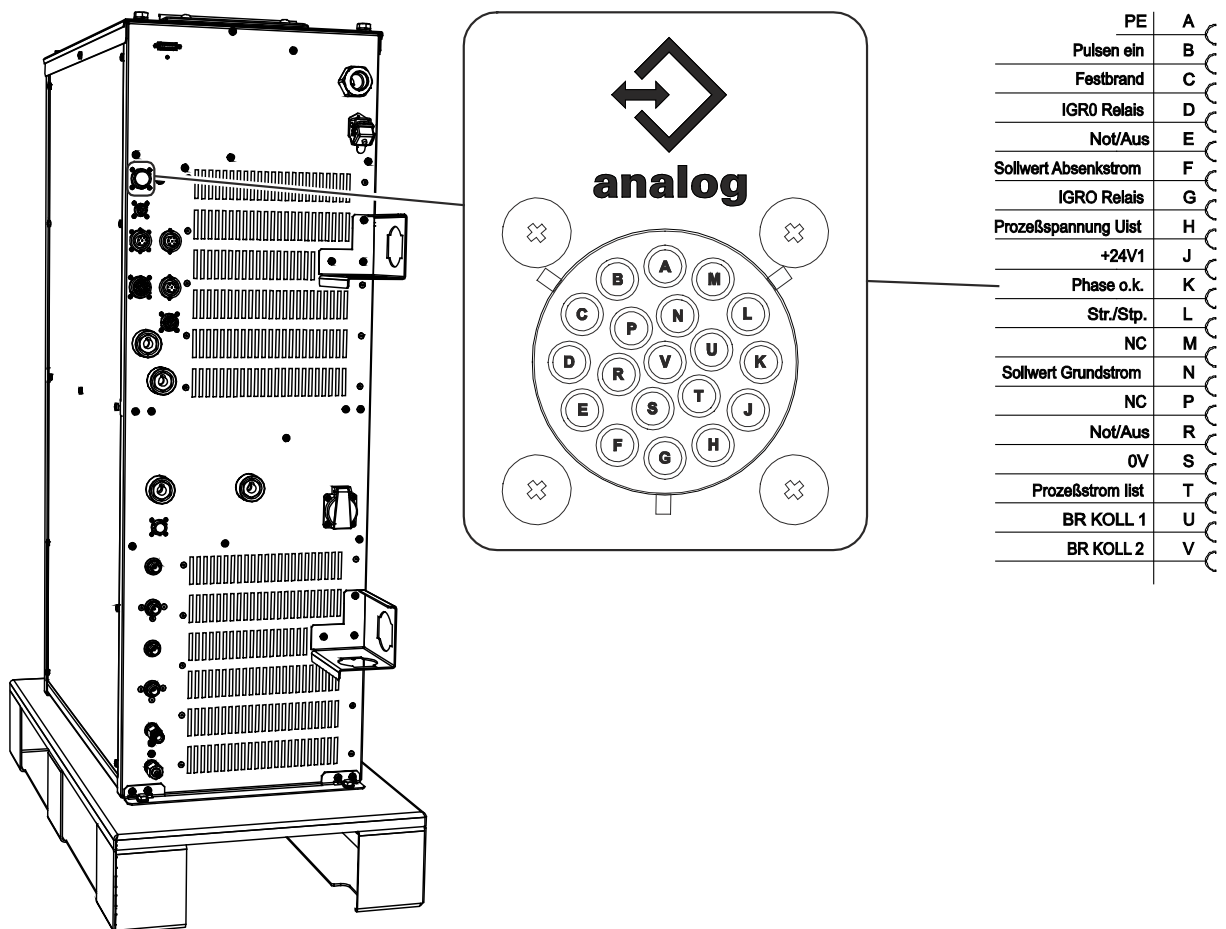


Figure 5-25

19-pole pin assignment for interface for automated welding (X6):

Pin	Signal form	Signal name circuit diagram	Function
A	Output	PE	Connection for cable screen
B	Input	PULSING ON	Thermal pulse mode up to max. 50 Hz, fixed balance of 50%
C	Output	Sticking	Analysis signal to detect sticking of the filler wire to the workpiece 24 V = sticking
D	Output	IGRO RELAY	Current flows signal $I > 0$ Contact closed = welding current flowing (forms contact with signal G)
E	Input	EMERGENCY STOP	Emergency stop for higher level shutdown of the power source. To use this function, jumper 1 must be unplugged on PCB T320/1 in the welding machine. Contact open = welding current switched off
F	Input	INOMINAL LOW	Pilot voltage default for secondary current, 0–10 V ($0\text{ V} = I^{\min}/10\text{ V} = I_{\max}$)
G	Output	IGRO RELAY	Current flows signal $I > 0$ Contact closed = current flows (forms contact with signal D)
H	Output	UACTUAL	Welding voltage, measured on pin S, 0–10 V ($0\text{ V} = 0\text{ V}$, $10\text{ V} = 100\text{ V}$)
J	Input	+24 V1	24 V voltage reference. Supplied by BUSINT X11.
K	Output	Phase OK	Signal to detect a failed network phase. Analysed by BUSINT X11.
L	Input	START/STOP	Start/stop of welding current, corresponds to torch trigger. Only available for non-latched operating mode. +15 V = start, 0 V = stop
M		NC	
N		Basic current nominal value	
P		NC	
R	Input	EMERGENCY STOP	Emergency stop for higher level shutdown of the power source. To use this function, jumper 1 must be unplugged on PCB T320/1 in the welding machine. Contact open = welding current switched off
S	Output	0 V	Reference potential
T	Output	I_{actual}	Welding current, measured on pin S; 0–10 V ($0\text{ V} = 0\text{ A}$, $10\text{ V} = 1000\text{ A}$)
U	Input	BR. KOLL: 1	Emergency shutdown for anticollision device +24 V
V	Output	BR. KOLL. 2	Emergency shutdown for anticollision device

5.21.6 Connection socket automation torch

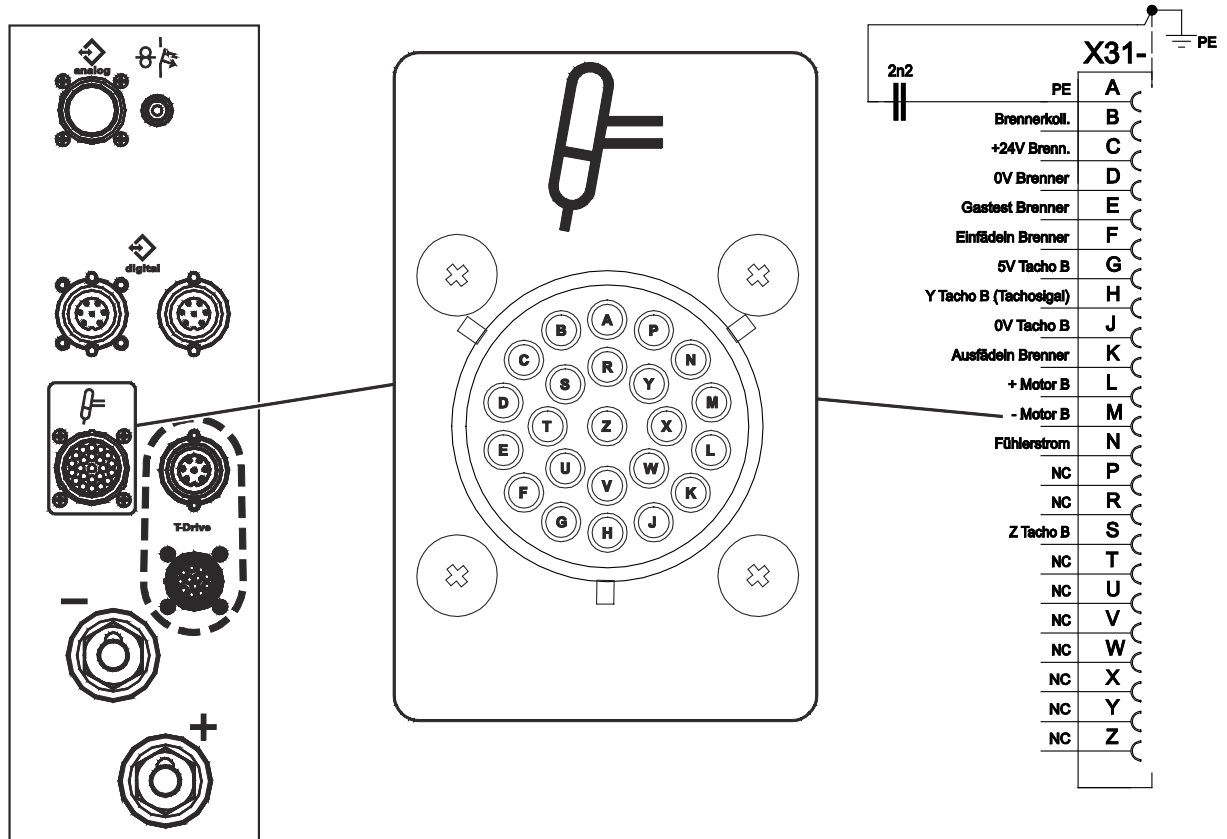


Figure 5-26

Connection socket 23-pole Automation torch:

Pin	Signal shape	Signal name	designation
A	Output	PE	Connection for cable screen
B	Input	Brennerkoll.	Emergency shut-down for anticollision device
C	Output	+24V Brenn.	Emergency shut-down for anticollision device +24 V
D	Output	0V Brenner*	GND for torch speedometer
E	Input	Gastest Brenner*	Gas test push-button from torch
F	Input	Einfädeln Brenner*	Inching push-button from torch
G	Output	5V Tacho B	Torch Vcc speedometer
H	Input	Y Tacho B (Tachosignal)	Speedometer signal input from torch
J	Output	0V Tacho B	GND for torch speedometer
K		Ausfädeln Brenner*	Reverse inching push-button from torch
L	Output	+ Motor B	Motor output +
M	Output	- Motor B	Motor output -
N	Output	Fühlerstrom	Sensor current output for cold wire
P-R		NC	not used
S	Input	Z Tacho B	Speedometer signal duct Z
T-Z		NC	not used

*Feature only available for the cold wire versions.

5.21.7 Sensor current

The sensor current is transferred via the connection socket of the automated welding torch.

At the torch, the signal has to be connected to the conducting part of the cold wire feeder. This means outside the welding process an electric potential is active which detects sticking when the feeder or wire has contact with the workpiece at the end of the process.

If the power source is used in combination with a TIG torch please note that the torch electrode having contact with the workpiece cannot be detected.

NOTE



At present, sticking detection is only possible with a dedicated interface which analyses the corresponding "sticking" signal at the 19-pole interface for automated welding. The usual sticking detection of standard interfaces (RINT X12 and BUSINT X11) does not work with this system type.

5.22 Advanced settings

5.22.1 Setting slope times for secondary current AMP% or pulse edges

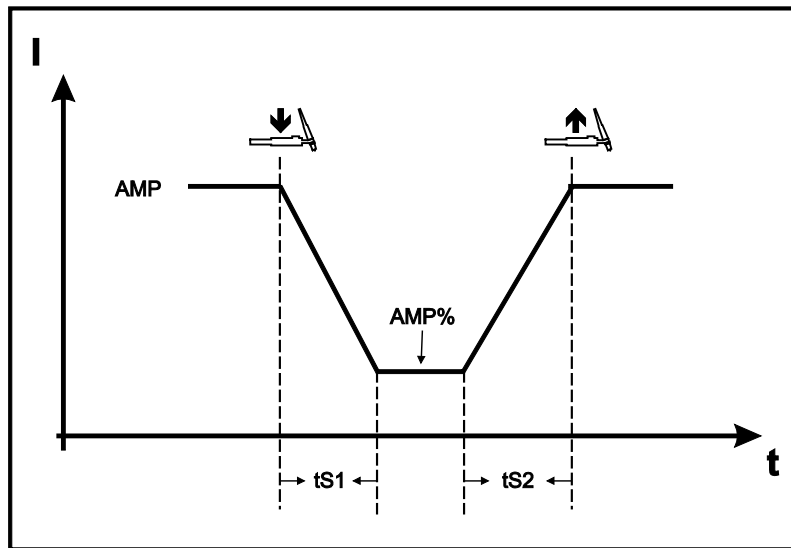


Figure 5-27

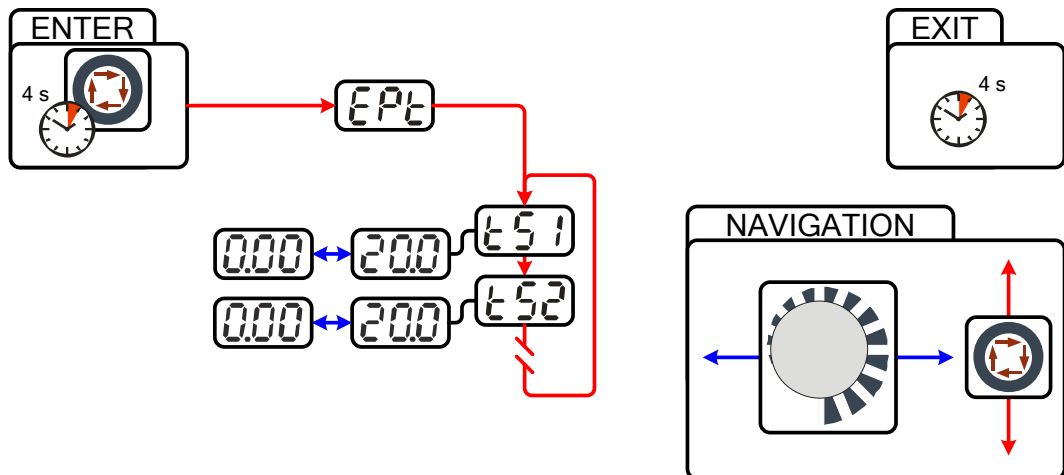


Figure 5-28

Display	Setting/selection
EPt	Expert menu
tS1	Slope time tS1 (main current to secondary current) Setting: 0.00 s to 20.0 s (factory setting 0.00 s)
tS2	Slope time tS2 (secondary current to main current) Setting: 0.00 s to 20.0 s (factory setting 0.00 s)

5.22.2 Welding current display (ignition, secondary, end and hotstart currents)

The welding currents for secondary current, ignition current and end current (expert menu) can be displayed as percentages or absolute values on the machine display.

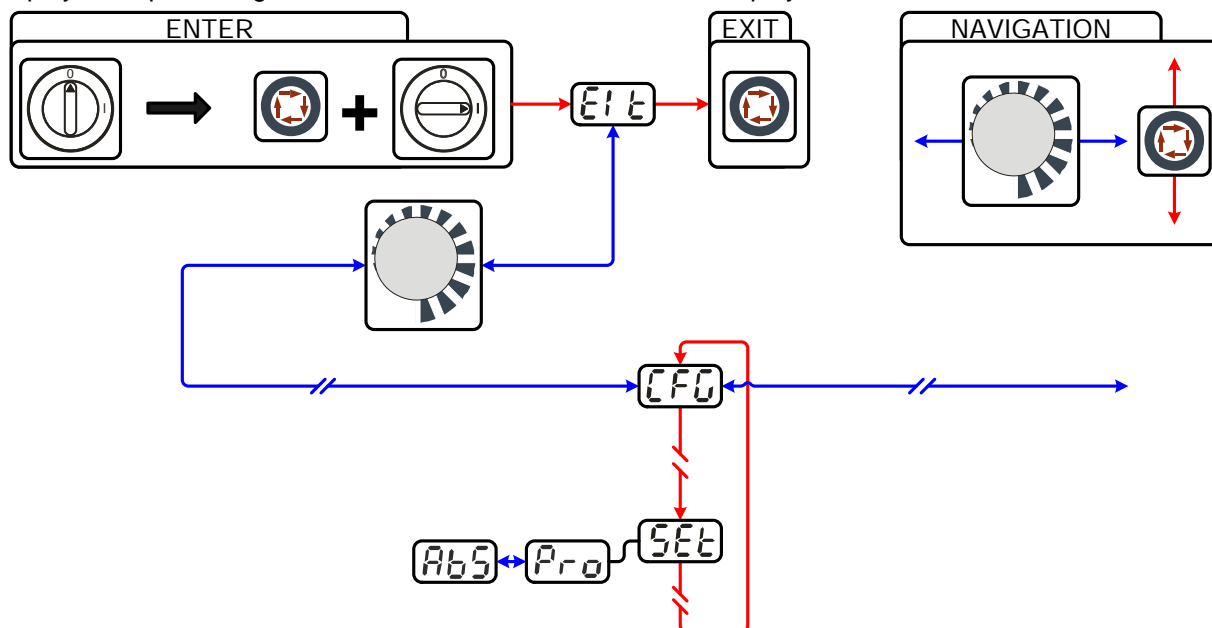


Figure 5-29

Display	Setting/selection
EIt	Exit the menu Exit
CFD	Machine configuration Settings for machine functions and parameter display
SEt	Welding current display (ignition, secondary, end and hotstart currents) <ul style="list-style-type: none"> • Pro = welding current display as a percentage of the main current • Abs = absolute welding current display (factory setting)

5.23 Menus and sub-menus on the machine control

5.23.1 Direct menus (direct access to parameters)

Functions, parameters and their values can be accessed directly, e.g. can be selected by pressing a button once.

5.23.2 Expert menu (TIG)

NOTE



ENTER (enter the menu)

- Keep the "welding parameters" button pressed for 4 s.

Navigating in the menu

- Parameters are selected by pressing the "welding parameters" button.
- Set or change the parameters by turning the "welding parameter setting" rotary dial.

EXIT (leave the menu)

- After 4 s, the machine will return automatically to the ready-to-operate status.

The expert menu includes functions and parameters which are either not set on the machine control, or which do not require regular setting.

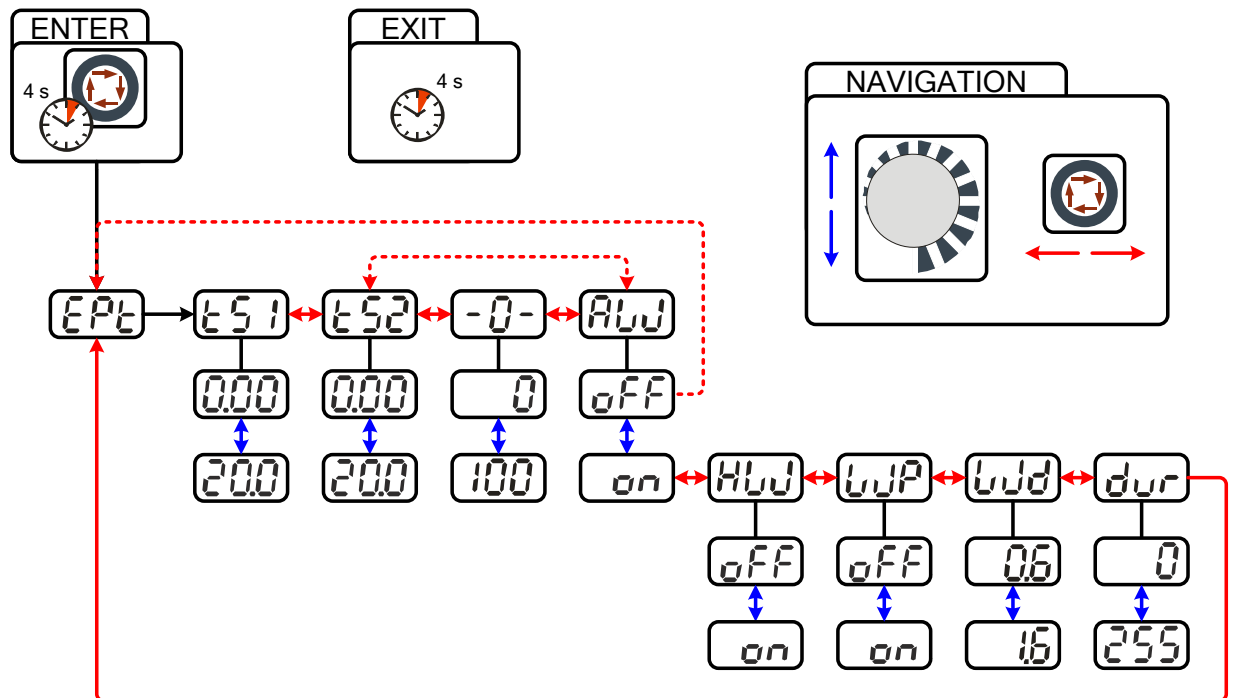

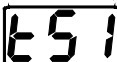




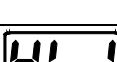




Figure 5-30

Display	Setting/selection
	Expert menu
	Slope time tS1 (main current to secondary current) Setting: 0.00 s to 20.0 s (factory setting 0.00 s)
	Slope time tS2 (secondary current to main current) Setting: 0.00 s to 20.0 s (factory setting 0.00 s)
	activArc parameter Parameter can also be set after activating TIG activArc welding. Display shown = factory setting.
	Filler wire process (cold/hot wire) <ul style="list-style-type: none"> • on = filler wire activated • off = filler wire deactivated (factory setting)
	Hot wire process (start signal for hot wire power source) <ul style="list-style-type: none"> • on = hot wire activated • off = hot wire deactivated (factory setting)
	Wire/pulse function (wire feed characteristics when using TIG pulses) The wire feeding can be disabled during pulse pauses (not in case of pulse automatic or kHz pulses). <ul style="list-style-type: none"> • on = wire feeding switched off during pulse pause • off = wire feeding switched on during pulse pause (ex works)
	Filler wire diameter (manual setting) Setting of the wire diameter from 0.6 mm to 1.6 mm. The character "d" preceding the wire diameter on the display (d0.8) indicates a pre-programmed characteristics (operating mode KORREKTUR). If there is no characteristics for the selected wire diameter, the parameters have to be set manually (operating mode MANUELL). For information on how to select the operating mode, refer to the chapter "Selecting the wire feed speed (KORREKTUR / MANUELL)".
	Wire return <ul style="list-style-type: none"> • Increase value = more wire return • Reduce value = less wire return Parameter can also be set after connecting a TIG cold wire feed unit. Setting: 0 to 255 (factory setting 50).

5.23.3 Machine configuration menu

NOTE

**ENTER (enter the menu)**

- Switch off machine at the main switch
- Press and hold the "welding parameters" button and switch the machine on again at the same time.

NAVIGATION (navigating in the menu)

- Parameters are selected by pressing the "welding parameters" button.
- Set or change the parameters by turning the "welding parameter setting" rotary dial.

EXIT (leave the menu)

- Select the "Elt" menu item.
- Press the "welding parameters" button (settings will be applied, machine changes to the ready-to-operate status).

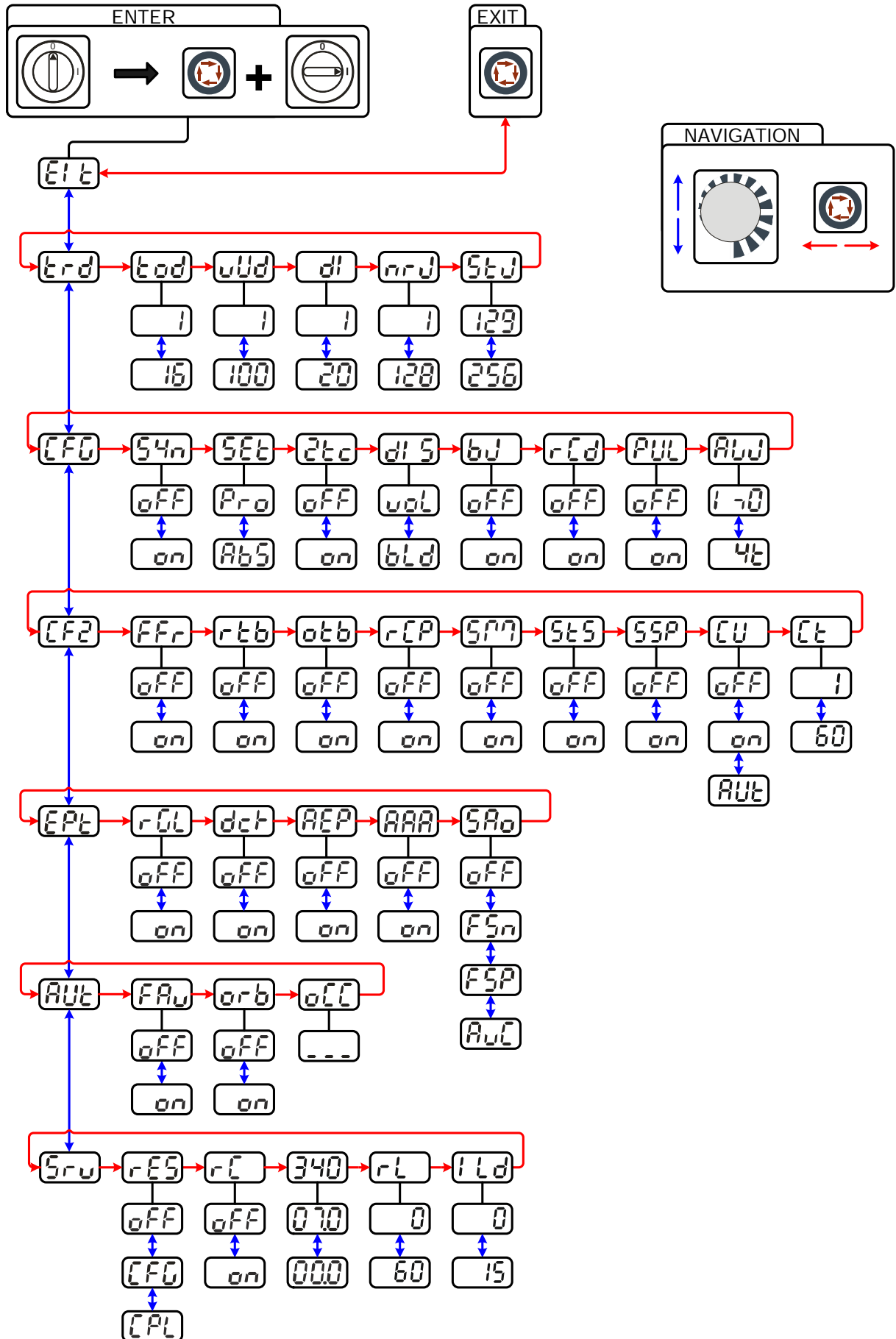






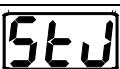

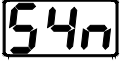

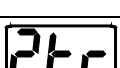
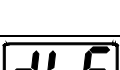







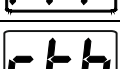
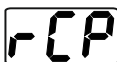

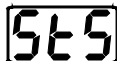


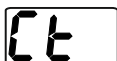



















Figure 5-31

Display	Setting/selection
	Exit the menu Exit
	Torch configuration menu Set welding torch functions
	Torch mode (factory setting 1)
	Up-/Down speed Increase value = rapid current change (factory setting 10) Reduce value = slow current change
	Setting the first increment Setting: 1 to 20 (factory setting 1)
	Get JOB number Set maximum selectable jobs (setting: 1 to 128, factory setting 10). Additional parameter after activating the BLOCK JOB function.
	Start JOB Set first JOB to get (setting: 129 to 256, factory setting 129).
	Machine configuration Settings for machine functions and parameter display
	Operating principle <ul style="list-style-type: none"> • on = synergic parameter setting (factory setting) • off = conventional parameter setting
	Welding current display (ignition, secondary, end and hotstart currents) <ul style="list-style-type: none"> • Pro = welding current display as a percentage of the main current (factory setting) • Abs = absolute welding current display
	Non-latched operation (C version) <ul style="list-style-type: none"> • on = on • off = off (factory setting)
	Setting for the primary setpoint value display Defines the priority display for setpoint values: <ul style="list-style-type: none"> • bld = panel thickness • vol = welding voltage (factory setting)
	RINT X12, JOB control for automation solutions <ul style="list-style-type: none"> • on = on • off = off (factory setting)
	Power display switching (MMA) <ul style="list-style-type: none"> • on = actual value display • off = setpoint value display (factory setting)
	Pulses in the upslope and downslope phases The function can be switched on or off
	additional wire welding, operating mode <ul style="list-style-type: none"> • l>0 = filler wire mode for automated applications, wire is conveyed when current flows • 2t (factory setting) to 4t = operating mode non-latched to latched
	Machine configuration (part two) Settings for machine functions and parameter display
	Ramp function Remote control RTF 1 The ramp function can be switched on and off
	Kalottenbildung mit Remote control <ul style="list-style-type: none"> • on = on (ex works) • off = off
	Tungsten balling (old variant) <ul style="list-style-type: none"> • on = on • off = off (ex works)

Display	Setting/selection
	Welding current polarity switching <ul style="list-style-type: none"> • on = polarity switching at the RT PWS 1 19POL remote control (ex works) • off = polarity switching at the welding machine control
	spotMatic Variation of operation mode spotArc, ignition with workpiece contact <ul style="list-style-type: none"> • on = on • off = off (factory setting)
	Short spot time Setting of 5--999 ms (1-ms steps)
	Setting process activation <ul style="list-style-type: none"> • on = Separate process activation: The welding process has to be reactivated for every arc ignition by pressing the torch trigger. • off = Permanent process activation: The welding process is activated by pressing the torch trigger once. The following arc ignitions are initiated by shortly touching the tungsten electrode against the workpiece.
	Torch cooling mode <ul style="list-style-type: none"> • AUt = automatic operation (ex works) • on = permanently switched on • off = permanently switched off
	Water block pre-flow time Setting 1--60 min. (ex works 5)
	Expert menu
	AC mean value controller <ul style="list-style-type: none"> • on = on (factory setting) • off = off
	Switching option for welding current potential (dc+) with TIG DC <ul style="list-style-type: none"> • off = Select option for TIG DC+ is blocked (factory setting). Serves to protect the tungsten electrode from being destroyed. • on = Polarity can be selected freely
	Reconditioning pulse (spherical cap stability) <ul style="list-style-type: none"> • on = function on (factory setting) • off = function off
	activArc voltage measuring <ul style="list-style-type: none"> • on = function on (factory setting) • off = function off
	Error output to automated welding interface, contact SYN_A off AC synchronisation or hot wire (factory setting) FSn Error signal, negative logic FSP Error signal, positive logic AvC AVC (Arc voltage control) connection
	Automation menu
	Fast take-over of control voltage (automation) <ul style="list-style-type: none"> • on = function on • off = function off (factory setting)
	Orbital welding <ul style="list-style-type: none"> • off = off (ex works) • on = on
	Orbital welding Correction value for orbital current

Display	Setting/selection
	Service menu Modifications to the service menu may only be carried out by authorised maintenance staff!
	Reset (reset to factory settings) <ul style="list-style-type: none"> • off = aus (factory setting) • CFG = Reset the values in the machine configuration menu • CPL = Complete reset of all values and settings The reset is performed when leaving the menu (EXIT).
	Automated/Manual (rC on/off) operating mode Select machine/function control on: with external control voltages/signals off: with machine control
	Software version query (example) 07= System bus ID
	0340= Version number System bus ID and version number are separated by a dot.
	Only qualified service personnel may change the parameters!
	Ignition pulse limit Setting 0 ms–15 ms (increments of 1 ms)

6 Maintenance, care and disposal



Risk of injury from electric shock!

Cleaning machines that are not disconnected from the mains can lead to serious injuries!

- Disconnect the machine completely from the mains.
- Remove the mains plug!
- Wait for 4 minutes until the capacitors have discharged!

6.1 General

When used in the specified environmental conditions and under normal operating conditions, this machine is largely maintenance-free and requires a minimum of care.

There are some points, which should be observed, to guarantee fault-free operation of your welding machine. Among these are regular cleaning and checking as described below, depending on the pollution level of the environment and the length of time the unit is in use.

6.2 Maintenance work, intervals

6.2.1 Daily maintenance tasks

6.2.1.1 Visual inspection

- Mains supply lead and its strain relief
- Check the wearing parts in the torch.
- Check torch, hose package and power connections for exterior damage and replace or have repaired by specialist staff as necessary!
- Other, general condition

6.2.1.2 Functional test

- Operating, message, safety and adjustment devices (Functional test)
- Check correct mounting of the wire spool.
- Blow compressed air free from oil and condensates through the wire feed from the direction of the euro torch connector.
- Welding current cables (check that they are fitted correctly and secured)
- Gas tubes and their switching equipment (solenoid valve)
- Gas cylinder securing elements

6.2.2 Monthly maintenance tasks

6.2.2.1 Visual inspection



- Casing damage (front, rear and side walls)
- Wheels and their securing elements
- Transport elements (strap, lifting lugs, handle)

6.2.2.2 Functional test

- Selector switches, command devices, emergency stop devices, voltage reducing devices, message and control lamps
- Check coolant tubes and their connections for impurities
- Check that the wire guide elements (inlet nipple, wire guide tube) are fitted securely.
- Check that all connections and wearing parts are hand-tight and tighten if necessary.
- Check the wire guide.
- Check and clean the welding torch. Deposits in the torch can cause short circuits and have a negative impact on the welding result, ultimately causing damage to the torch.
- Check that all screw and plug connections and replaceable parts are secured correctly, tighten if necessary.

6.2.3 Annual test (inspection and testing during operation)

NOTE

-  The welding machine may only be tested by competent, capable persons.
A capable person is one who, because of his training, knowledge and experience, is able to recognise the dangers that can occur while testing welding power sources as well as possible subsequent damage and who is able to implement the required safety procedures.
-  For further information, please see the accompanying supplementary sheets "Machine and Company Data, Maintenance and Testing, Warranty"!

A periodic test according to IEC 60974-4 "Periodic inspection and test" has to be carried out. In addition to the regulations on testing given here, the relevant local laws and regulations must also be observed.

6.3 Maintenance work

DANGER



- Do not carry out any unauthorised repairs or modifications!**
To avoid injury and equipment damage, the unit must only be repaired or modified by specialist, skilled persons!
The warranty becomes null and void in the event of unauthorised interference.
- Appoint only skilled persons for repair work (trained service personnel)!

CAUTION



- Electric current!**
Repairs may only be carried out by authorised specialist staff!
- Do not remove the torch from the hose package!
 - Never clamp the torch body in a vice or similar, as this can cause the torch to be irreparably destroyed!
 - If damage occurs to the torch or to the hose package which cannot be corrected as part of the maintenance work, the entire torch must be returned to the manufacturer

Repair and maintenance work may only be performed by qualified authorised personnel; otherwise the right to claim under warranty is void. In all service matters, always consult the dealer who supplied the machine. Return deliveries of defective equipment subject to warranty may only be made through your dealer. When replacing parts, use only original spare parts. When ordering spare parts, please quote the machine type, serial number and item number of the machine, as well as the type designation and item number of the spare part.

6.4 Disposing of equipment

NOTE



Proper disposal!

The machine contains valuable raw materials, which should be recycled, and electronic components, which must be disposed of.

- Do not dispose of in household waste!
- Observe the local regulations regarding disposal!



6.4.1 Manufacturer's declaration to the end user

- According to European provisions (guideline 2002/96/EG of the European Parliament and the Council of January, 27th 2003), used electric and electronic equipment may no longer be placed in unsorted municipal waste. It must be collected separately. The symbol depicting a waste container on wheels indicates that the equipment must be collected separately. This machine is to be placed for disposal or recycling in the waste separation systems provided for this purpose.
- According to German law (law governing the distribution, taking back and environmentally correct disposal of electric and electronic equipment (ElektroG) from 16.03.2005), used machines are to be placed in a collection system separate from unsorted municipal waste. The public waste management utilities (communities) have created collection points at which used equipment from private households can be disposed of free of charge.
- Information about giving back used equipment or about collections can be obtained from the respective municipal administration office.
- EWM participates in an approved waste disposal and recycling system and is registered in the Used Electrical Equipment Register (EAR) under number WEEE DE 57686922.
- In addition to this, returns are also possible throughout Europe via EWM sales partners.

6.5 Meeting the requirements of RoHS

We, EWM AG Mündersbach, hereby confirm that all products supplied by us which are affected by the RoHS Directive, meet the requirements of the RoHS (Directive 2002/95/EC).

7 Rectifying faults

All products are subject to rigorous production checks and final checks. If, despite this, something fails to work at any time, please check the product using the following flowchart. If none of the fault rectification procedures described leads to the correct functioning of the product, please inform your authorised dealer.

7.1 Checklist for rectifying faults

NOTE

 The correct machine equipment for the material and process gas in use is a fundamental requirement for perfect operation!

Legend	Symbol	Description
	↘	Fault/Cause
	✘	Remedy

Coolant error/no coolant flowing

- ↘ Insufficient coolant flow
 - ✘ Check coolant level and refill if necessary
 - ✘ Eliminate kinks in conduit system (hose packages)
 - ✘ Reset automatic cutout of the coolant pump by activating
- ↘ Air in the coolant circuit
 - ✘ see chapter "Vent coolant circuit"

Functional errors

- ↘ Insufficient coolant flow
 - ✘ Check coolant level and refill if necessary
 - ✘ Eliminate kinks in conduit system (hose packages)
 - ✘ Reset automatic cutout of the coolant pump by activating
- ↘ Air in the coolant circuit
 - ✘ see chapter "Vent coolant circuit"
- ↘ Machine control without displaying the signal lights after switching on
 - ✘ Phase failure > check mains connection (fuses)
- ↘ No welding performance
 - ✘ Phase failure > check mains connection (fuses)
- ↘ Various parameters cannot be set
 - ✘ Entry level is blocked, disable access lock (see chapter entitled "Lock welding parameters against unauthorised access")
- ↘ Connection problems
 - ✘ Make control lead connections and check that they are fitted correctly.

Welding torch overheated

- ↘ Loose welding current connections
 - ✘ Tighten power connections on the torch and/or on the workpiece
 - ✘ Tighten contact tip correctly
- ↘ Overload
 - ✘ Check and correct welding current setting
 - ✘ Use a more powerful welding torch

Wire feed problems

- ✓ Unsuitable or worn welding torch equipment
 - ✗ Adjust contact tip (cold wire/hot wire) to wire diameter, blow through and replace if necessary
 - ✗ Adjust wire guide to material in use, blow through and replace if necessary
- ✓ Contact tip blocked
 - ✗ Clean, spray with anti-spatter spray and replace if necessary
- ✓ Setting the spool brake (see "Setting the spool brake" chapter)
 - ✗ Check settings and correct if necessary
- ✓ Setting pressure units (see "Inching wire electrodes" chapter)
 - ✗ Check settings and correct if necessary
- ✓ Worn wire rolls
 - ✗ Check and replace if necessary
- ✓ Wire feed motor without supply voltage (automatic cutout triggered by overloading)
 - ✗ Reset triggered fuse (rear of the power source) by pressing the key button
- ✓ Kinked hose packages
 - ✗ Extend and lay out the torch hose package
- ✓ Incompatible parameter settings
 - ✗ Check settings and correct if necessary
- ✓ Arc between gas nozzle and workpiece (metal vapour on the gas nozzle)
 - ✗ Replace gas nozzle

No arc ignition

- ✓ Incorrect ignition type setting.
 - ✗ Set ignition type changeover switch to the HF ignition setting.

Bad arc ignition

- ✓ Material inclusions in the tungsten electrode due to contact with filler material or workpiece
 - ✗ Regrind or replace the tungsten electrode
- ✓ Bad current transfer on ignition
 - ✗ Check the setting on the "Tungsten electrode diameter/ignition optimisation" rotary dial and increase if necessary (higher ignition energy).

Unstable arc



- ✓ Material inclusions in the tungsten electrode due to contact with filler material or workpiece
 - ✗ Regrind or replace the tungsten electrode
- ✓ Incompatible parameter settings
 - ✗ Check settings and correct if necessary

Pore formation

- ✓ Inadequate or missing gas shielding
 - ✗ Check shielding gas setting and replace shielding gas cylinder if necessary
 - ✗ Shield welding site with protective screens (draughts affect the welding result)
 - ✗ Use gas lens for aluminium applications and high-alloy steels
- ✓ Unsuitable or worn welding torch equipment
 - ✗ Check size of gas nozzle and replace if necessary
- ✓ Condensation (hydrogen) in the gas tube
 - ✗ Purge hose package with gas or replace

7.2 Machine faults (error messages)

NOTE

-  **A welding machine error is indicated by the collective fault signal lamp (A1) lighting up and an error code (see table) being displayed in the machine control display. In the event of a machine error, the power unit shuts down.**
-  **The display of possible error numbers depends on the machine version (interfaces/functions).**

- If multiple errors occur, these are displayed in succession.
- Document machine errors and inform service staff as necessary.

Error message	Possible cause	Remedy
Err 3	Speedometer error	Check wire guide/hose package
	Wire feeder is not connected	<ul style="list-style-type: none"> • Switch off cold wire mode in the device configuration menu (off status) • Connect the wire feeder
Err 4	Temperature error	Allow the machine to cool down
	Error in emergency stop circuit (interface for automated welding)	<ul style="list-style-type: none"> • Check the external interrupt equipment • Check jumper JP 1 on PCB T320/1
Err 5	Overvoltage	Switch off machine and check the mains voltage
Err 6	Low voltage	
Err 7	Coolant error (with connected cooling unit only)	Check coolant level and refill if necessary
Err 8	Gas error	Check gas supply
Err 9	Secondary overvoltage	Switch machine off and on again, inform the service department if the error continues
Err 10	PE error	
Err 11	FastStop position	Edge 'Acknowledge error' signal (0 to 1) via robot interface (if available)
Err 12	VRD error	Switch the machine off and on again. If the error persists, inform the service dept.
Err 16	Pilot arc current	Check welding torch
Err 17	Cold wire error Excess current limit of a motor control card has been triggered Cold wire error – a permanent deviation between wire nominal value and actual value or a blocked drive has been detected in the process	Inspect the wire feed system (drives, tube packages, torch): <ul style="list-style-type: none"> • Check cold wire on the torch / work piece (moved against work piece?) • Check relation of process wire feed speed to robot travel speed, and correct if necessary • Check wire feed for stiffness with wire inching function (resolve by checking wire guides section by section) Reset error via robot interface (reset error)
Err 18	Plasma gas error Nominal value significantly different from actual value -> No plasma gas?	<ul style="list-style-type: none"> • Check plasma gas supply; use the plasma gas test function on "cold wire feed unit" if necessary • Check guiding / connections of the gas supply hose for leaks / kinks • Check that the gas supply lead of the plasma torch is not blocked Reset error via robot interface (reset error)
Err 19	Shielding gas Nominal value significantly different from actual value -> No shielding gas?	

Error message	Possible cause	Remedy
Err 20	Coolant The flow quantity of the torch coolant has fallen below the permissible minimum -> the coolant flow is dirty or cut off because the tube package has been unsuitably installed The flow quantity of the torch coolant has fallen below the permissible level	Check coolant level and refill if necessary <ul style="list-style-type: none"> • Check coolant level in the reverse cooler • Check coolant lines for leaks and kinks • Check that the coolant inlet and outlet on the plasma torch is not blocked Reset error via robot interface (reset error)
Err 22	Excess temperature in coolant circuit Coolant temperature exceeded The temperature of the coolant is too high	<ul style="list-style-type: none"> • Check coolant level in the reverse cooler • Check temperature nominal value on the cooling unit Reset error via robot interface (reset error)
Err 23	HF choke excess temperature High frequency blocking inductor excess temperature The excess temperature of the high frequency blocking inductor has triggered	<ul style="list-style-type: none"> • Allow equipment to cool down • Adjust processing cycle times if necessary Reset error via robot interface (reset error)
Err 32	Electronics error (I>0 error)	Switch the machine off and on again. If the error persists, inform the service dept.
Err 33	Electronics error (Uactual error)	
Err 34	Electronics error (A/D channel error)	
Err 35	Electronics error (edge error)	
Err 36	Electronics error (S sign)	
Err 37	Electronics error (temperature error)	Allow machine to cool down.
Err 38	---	Switch the machine off and on again. If the error persists, inform the service dept.
Err 39	Electronics error (secondary overvoltage)	
Err 48	Ignition error	Check welding process
Err 49	Arc interruption	Inform the Service department
Err 51	Error in emergency stop circuit (interface for automated welding)	<ul style="list-style-type: none"> • Check the external interrupt equipment • Check jumper JP 1 on PCB T320/1

NOTE



If the industrial bus interface is connected error messages are output via the respective interface. It may occur that error messages output from the power source and the interface differ.



Please note the relevant documentation of the accessory components.

7.3 Resetting welding parameters to the factory settings

NOTE

All customised welding parameters that are stored will be replaced by the factory settings.

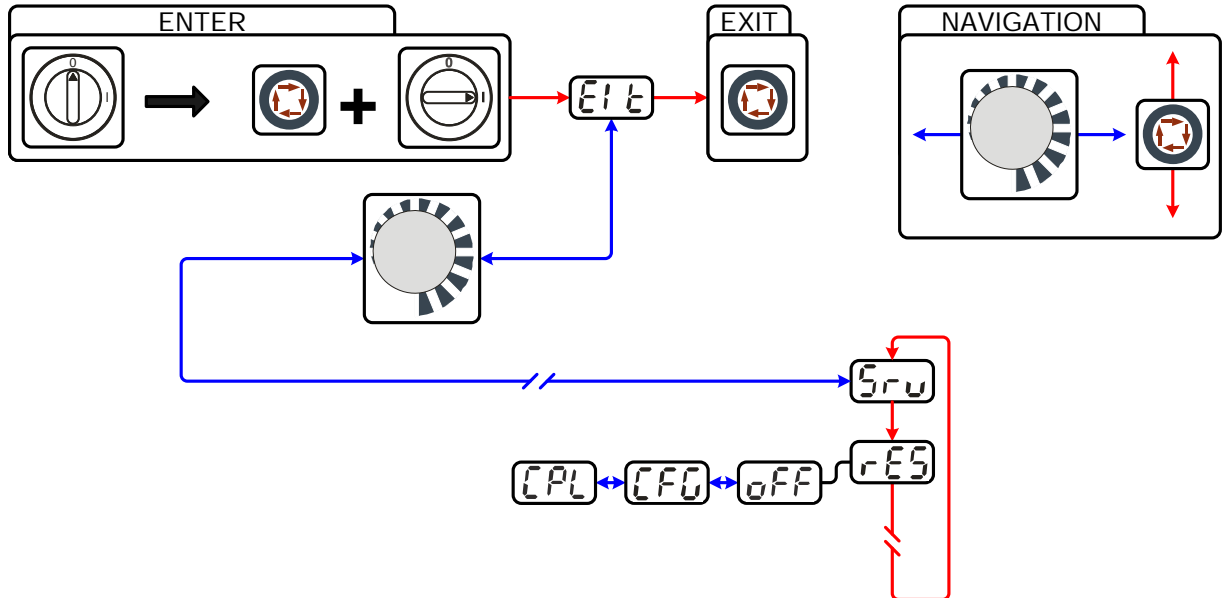


Figure 7-1

Display	Setting/selection
	Exit the menu Exit
	Service menu Modifications to the service menu may only be carried out by authorised maintenance staff!
	Reset (reset to factory settings) <ul style="list-style-type: none"> • off = aus (factory setting) • CFG = Reset the values in the machine configuration menu • CPL = Complete reset of all values and settings The reset is performed when leaving the menu (EXIT).
	Switch off Switching off machine function
	Reset machine configuration Resetting the values in the machine configuration menu
	Complete reset Complete reset of all values and settings by the factory settings

7.4 Display machine control software version

NOTE

The query of the software versions only serves to inform the authorised service staff!

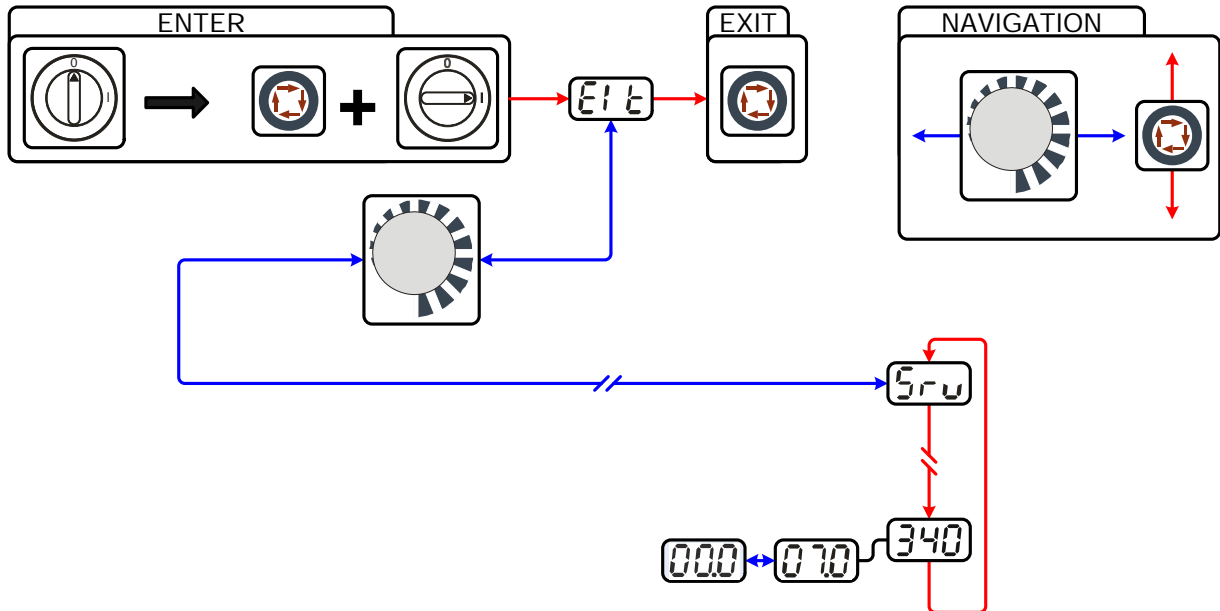


Figure 7-2

Display	Setting/selection
	Exit the menu Exit
	Service menu Modifications to the service menu may only be carried out by authorised maintenance staff!
	Software version query (example) 07= System bus ID
	0340= Version number System bus ID and version number are separated by a dot.

7.5 General operating problems

7.5.1 Interface for automated welding

WARNING



No function of the external interrupt equipment (emergency stop switch)!
If the emergency stop circuit has been realised using an external interrupt equipment via the interface for automated welding, the machine must be configured for this setup. If this is not observed, the power source will ignore the external interrupt equipment and will not shut down!

- Disconnect jumper 1 on PCB T320/1 (Tetrix) or M320/1 (Phoenix / alpha Q)!

7.6 Vent coolant circuit

NOTE

- Coolant tank and quick connect coupling of coolant supply and return are only fitted in machines with water cooling.
- To vent the cooling system always use the blue coolant connection, which is located as deep as possible inside the system (close to the coolant tank)!

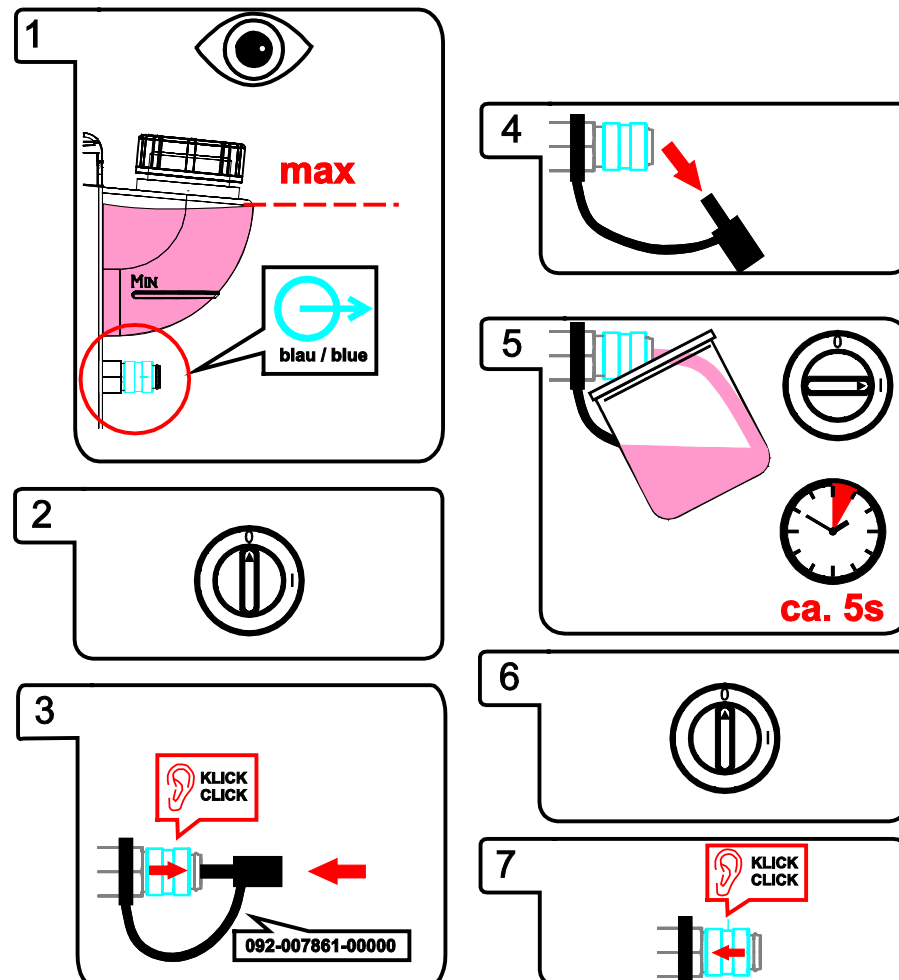


Figure 7-3

8 Technical data

NOTE

Performance specifications and guarantee only in connection with original spare and replacement parts!

8.1 Tetrix 352 AC/DC SYNERGIC PL. AW GR

	352
Welding current	5 A to 350
Welding voltage	25.2 V to 39.0 V
Plasma current (Pilot arc)	5 A to 80 A (factory setting 10 A, can be adjusted using PCT 300 software)
Duty cycle at 40 °C ambient temperature	
100% DC	350 A
60% DC	300 A
Load alternation	10 min. (60% DC \pm 6 min. welding, 4 min. pause)
Floating voltage	100 V
Mains voltage (tolerances)	3 x 400 V (-25% to +20%)
Frequency	50/60 Hz
Mains fuse (safety fuse, slow-blow)	3 x 25 A
Mains connection lead	H07RN-F5G6
Max. connected load	18.6 kVA
Recommended generator rating	25.1 kVA
Cos ϕ	0.99
Insulation class/protection classification	F/IP 23
Ambient temperature*	-10 °C to +40 °C*
Machine cooling/torch cooling	Fan/gas or water
Workpiece lead	70 mm ²
Dimensions L x W x H in mm	
Weight	160 kg
EMC class	A
Constructed to standards	IEC 60974-1, -3, -10;

NOTE

* Ambient temperature depends on coolant!
Observe the coolant temperature range for the welding torch cooling!

9 Accessories

NOTE

 Performance-dependent accessories like torches, workpiece leads, electrode holders or intermediate hose packages are available from your authorised dealer.

9.1 Welding torch cooling system

Type	Designation	Item no.
cool82 U44	Cooling module for robot welding machines	090-008268-00502
cool82 U45	Cooling module for robot welding machines	090-008280-00502
RK1	Reverse cooling unit	094-002283-00000
RK2	Reverse cooling unit	094-002284-00000
RK3	Reverse cooling unit	094-002285-00000
UKV4SET 4M	Hose connection set	092-000587-00000
KF 23E-10	Coolant (-10 °C), 9.3 l	094-000530-00000
KF 23E-200	Coolant (-10 °C), 200 litres	094-000530-00001

9.2 Wire feed units

Type	Designation	Item no.
T drive 4 Rob 3 RE Hotwire	Wire feeder for automated applications, hot wire, gas-cooled, opens on right with integrated IG3 speedometer solution	090-008702-00502
T drive 4 Rob 3 LI Hotwire	Wire feeder for automated applications, hot wire, gas-cooled, opens on left with integrated IG3 speedometer solution	090-008703-00502

9.3 General accessories

Type	Designation	Item no.
DM/ARGON	"Constant" pressure regulator	096-000000-00000
DM/H2	"Constant" pressure regulator	096-000001-00000
GH 2X1/4" 2M	Gas hose	094-000010-00001
2M-G1/4"+G3/8"/DIN EN 559	Gas tube, 2 m	092-000525-00001

9.4 Connection cables, connection sockets

Type	Designation	Item no.
5POLE/CEE/32A/M	Machine plug	094-000207-00000

9.5 Options

Type	Designation	Item no.
ON Key Switch	Optional retrofit kit for key switch	092-001828-00000
ON SENSOR UNIT WIRE END	Wire end sensor	092-001190-00000

9.6 Computer communication

Type	Designation	Item no.
RC 300	EWM tablet PC incl. software, adapter and interface	090-008238-00002
PC300.Net	PC300.Net welding parameter software kit incl. cable and SECINT X10 USB interface	090-008777-00000
QDOC9000 V2.0	Set consisting of interface, documentation software, connection lead	090-008713-00000
CD PC300.Net update	PC300.Net Update on CD-ROM	092-008172-00001

9.7 Interfaces

Type	Designation	Item no.
Tetrix BUSINT X11 PLASMA RUGGED LINE	RUGGED LINE industrial bus interface in casing	090-008623-00000
Tetrix BUSINT X11 PLASMA PROFIBUS ATCASE	PROFIBUS industrial bus interface in casing	090-008624-00000
Tetrix BUSINT X11 PLASMA PROFINET LWL ATCASE	PROFINET LWL industrial bus interface in casing	090-008625-00000
Tetrix BUSINT X11 PLASMA CAN-OPEN ATCASE	CAN-OPEN industrial bus interface in casing	090-008689-00000
Tetrix BUSINT X11 PLASMA DEVICE NET ATCASE	DEVICE NET industrial bus interface in casing	090-008690-00000

9.8 Connection and extension cables

Type	Designation	Item no.
FRV 7POL 5 m	Extension/connecting cable	092-000201-00003
FRV 7POL 10 m	Extension/connecting cable	092-000201-00000
FRV 7POL 20 m	Extension/connecting cable	092-000201-00001
RA5 19POL 5M	Remote control e.g. connection cable	092-001470-00005
RA10 19POL 10M	Remote control e.g. connection cable	092-001470-00010

10 Circuit diagrams

NOTE
Original format circuit diagrams are located inside the machine.

10.1 Tetrix 352 AC/DC SYNERGIC PL. AW GR

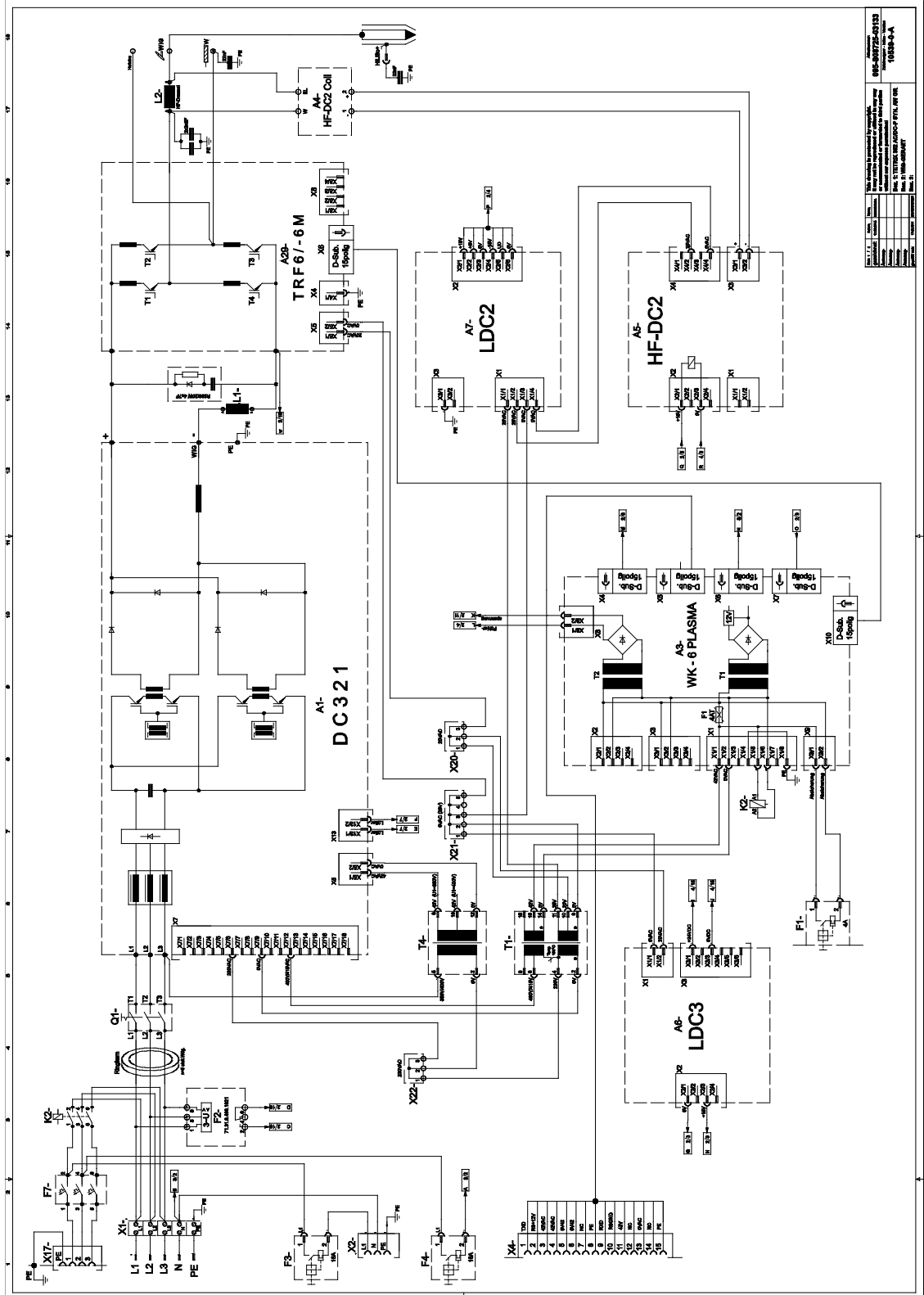


Figure 10-1

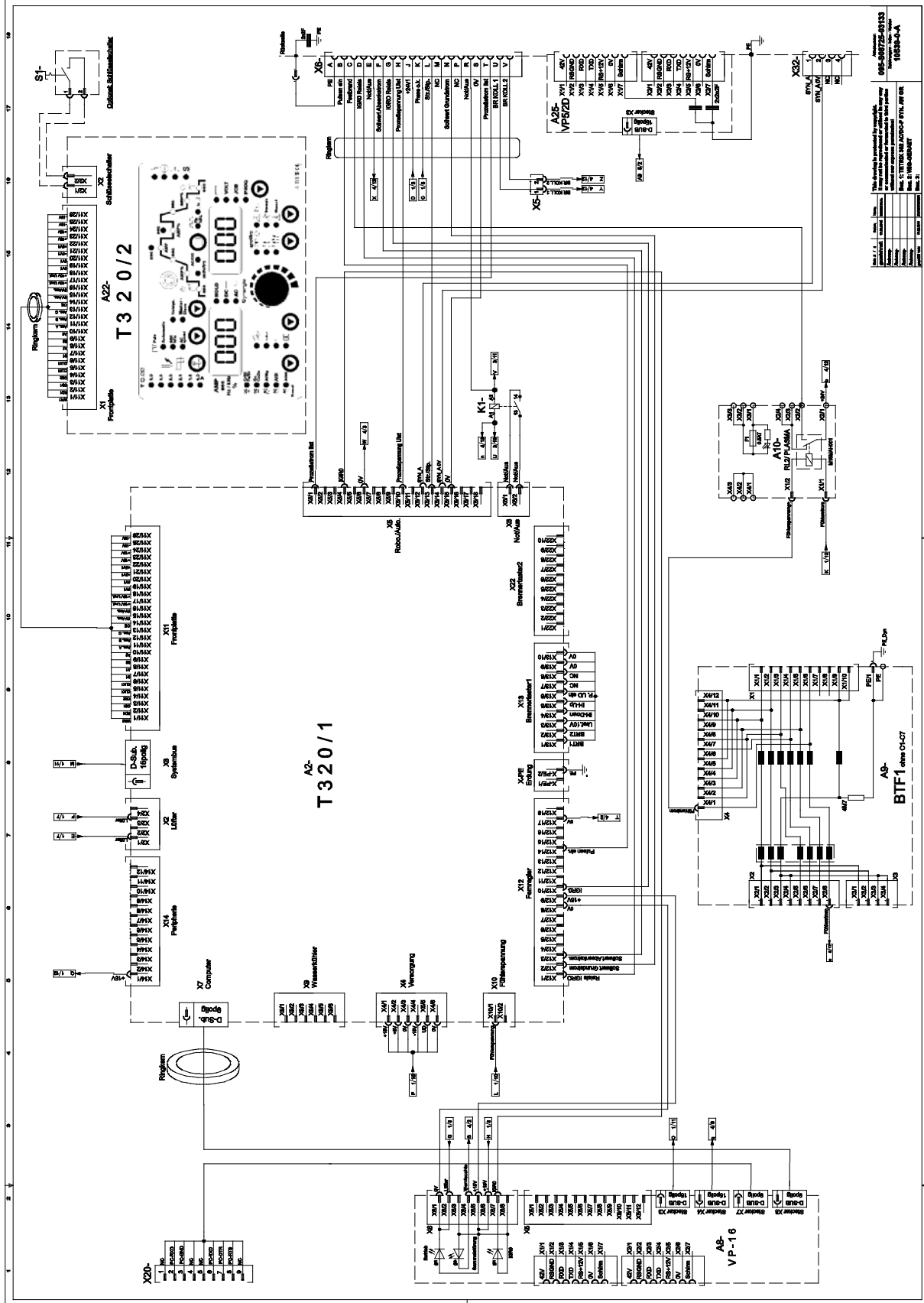


Figure 10-2

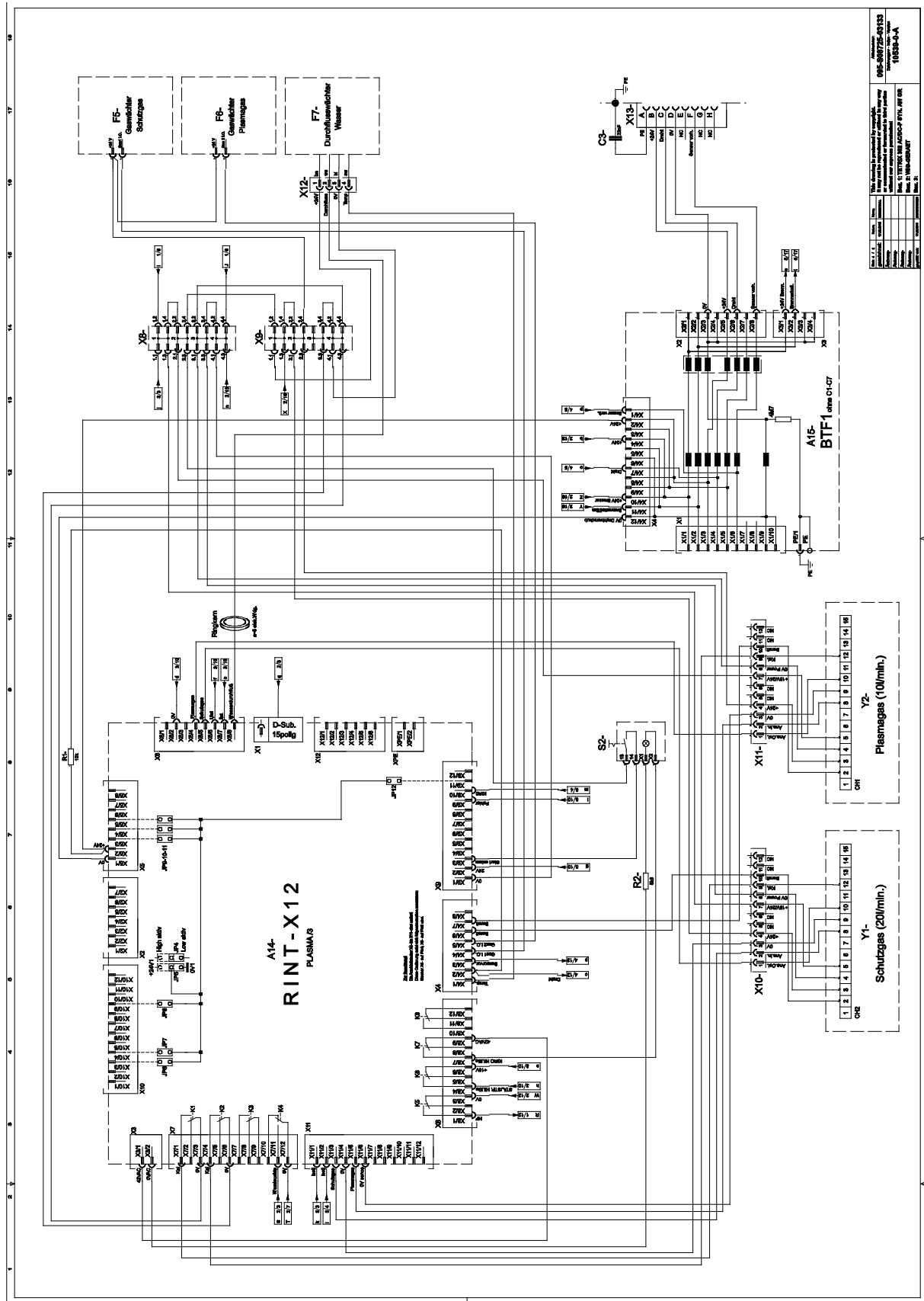


Figure 10-4

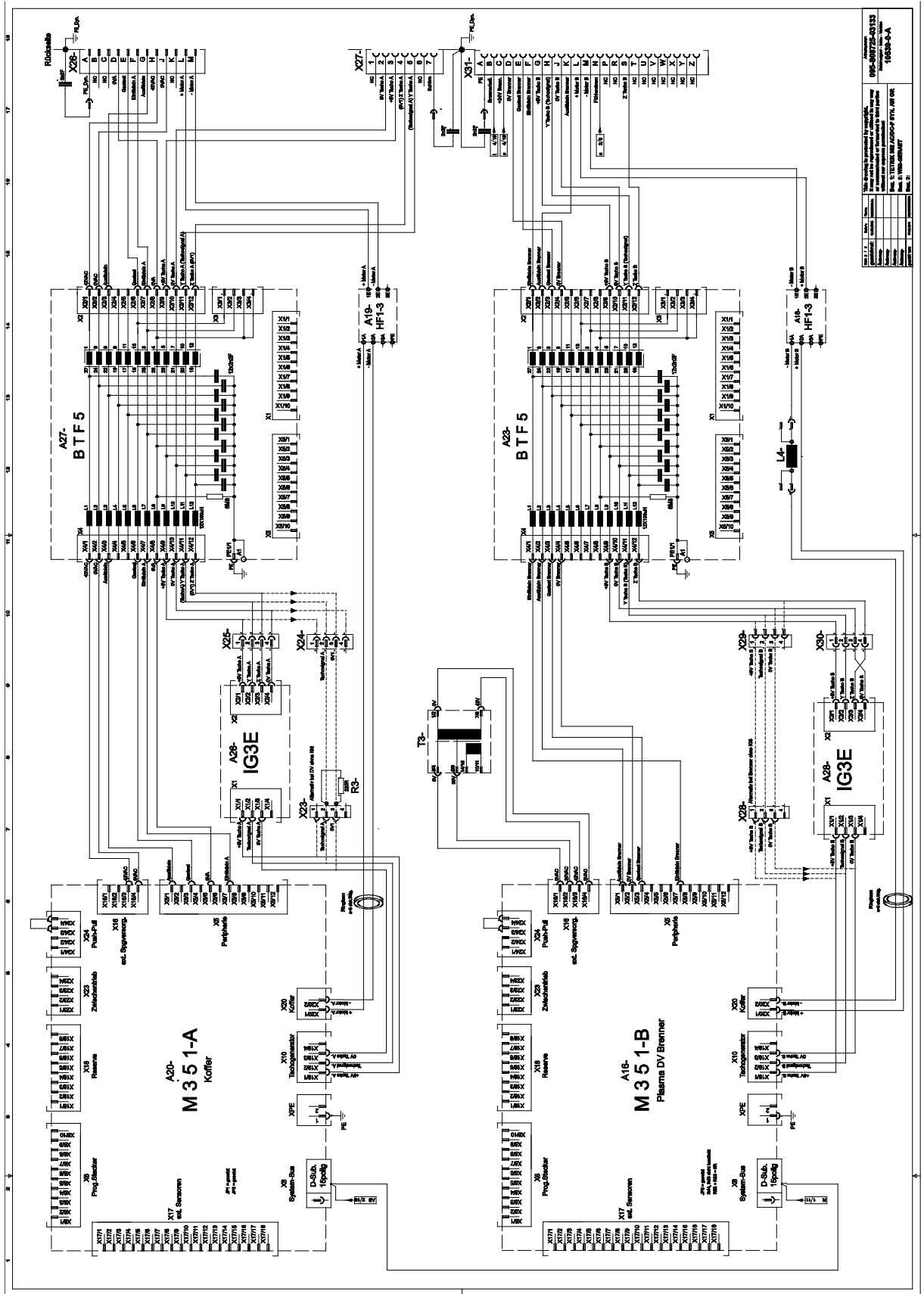


Figure 10-5

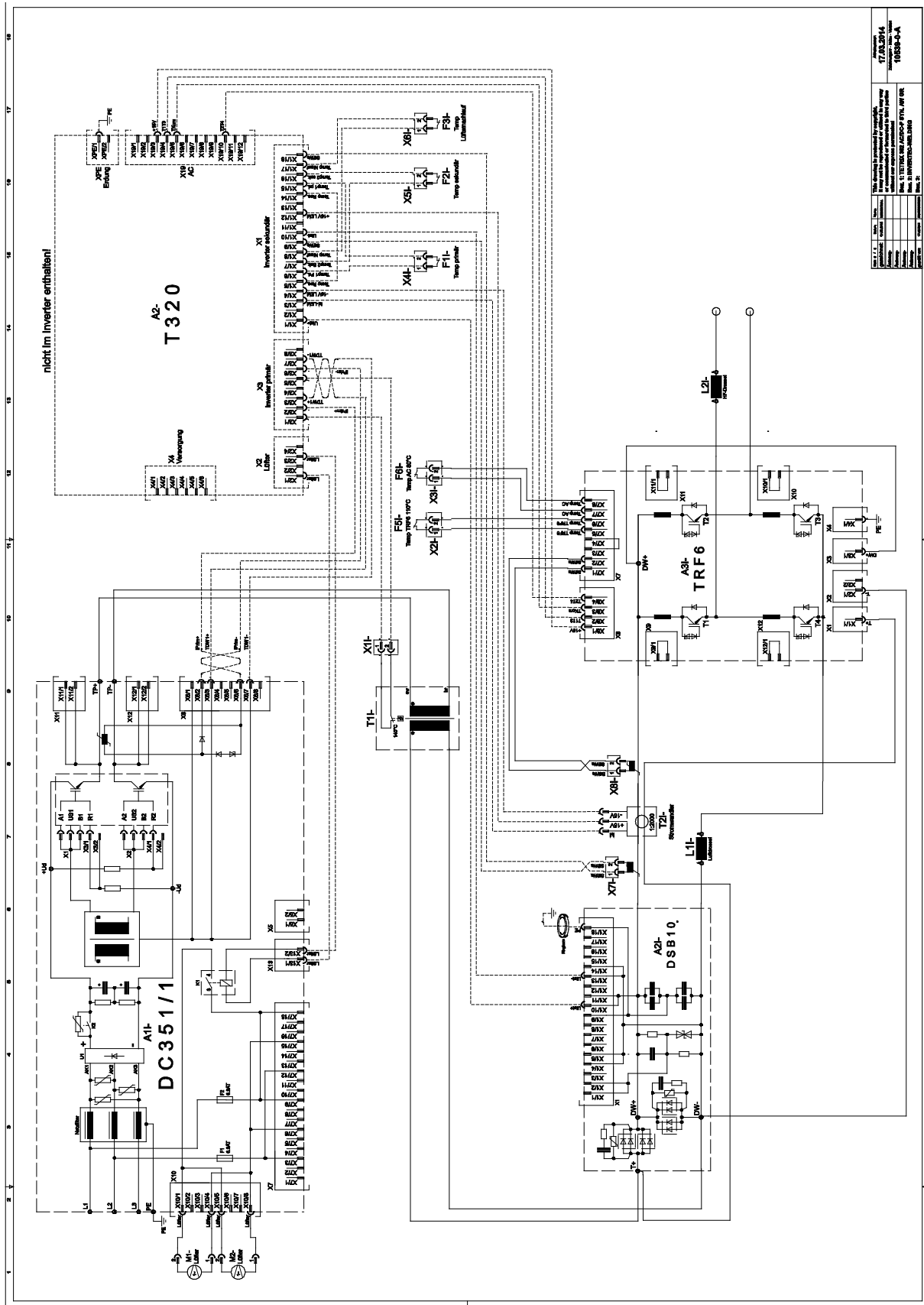


Figure 10-6

11 Appendix A
11.1 JOB-List

JOB	Process				Material	Wire					Seam position				Tungsten electrode Ø
	TIG	TIG hot wire	TIG cold wire	MMA		0,6	0,8	1,0	1,2	1,6					
1	Reserved														
2	<input checked="" type="checkbox"/>				CrNi/ Fe/ St						<input checked="" type="checkbox"/>				1
3	<input checked="" type="checkbox"/>				CrNi/ Fe/ St						<input checked="" type="checkbox"/>				1.6
4	<input checked="" type="checkbox"/>				CrNi/ Fe/ St						<input checked="" type="checkbox"/>				2
5	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		CrNi/ Fe/ St	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>				2.4
6	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		CrNi/ Fe/ St	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>				3.2
7	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		CrNi/ Fe/ St	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>				>3.2
8	<input checked="" type="checkbox"/>				CrNi/ Fe/ St						<input checked="" type="checkbox"/>				1
9	<input checked="" type="checkbox"/>				CrNi/ Fe/ St						<input checked="" type="checkbox"/>				1.6
10	<input checked="" type="checkbox"/>				CrNi/ Fe/ St						<input checked="" type="checkbox"/>				2
11	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		CrNi/ Fe/ St	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>				2.4
12	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		CrNi/ Fe/ St	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>				3.2
13	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		CrNi/ Fe/ St	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>				>3.2
14	<input checked="" type="checkbox"/>				CrNi/ Fe/ St							<input checked="" type="checkbox"/>			1
15	<input checked="" type="checkbox"/>				CrNi/ Fe/ St							<input checked="" type="checkbox"/>			1.6
16	<input checked="" type="checkbox"/>				CrNi/ Fe/ St							<input checked="" type="checkbox"/>			2
17	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		CrNi/ Fe/ St	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>			2.4
18	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		CrNi/ Fe/ St	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>			3.2
19	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		CrNi/ Fe/ St	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>			>3.2
20	<input checked="" type="checkbox"/>				CrNi/ Fe/ St								<input checked="" type="checkbox"/>		1
21	<input checked="" type="checkbox"/>				CrNi/ Fe/ St								<input checked="" type="checkbox"/>		1.6
22	<input checked="" type="checkbox"/>				CrNi/ Fe/ St								<input checked="" type="checkbox"/>		2
23	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		CrNi/ Fe/ St	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>					<input checked="" type="checkbox"/>		2.4
24	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		CrNi/ Fe/ St	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>					<input checked="" type="checkbox"/>		3.2
25	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		CrNi/ Fe/ St	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>					<input checked="" type="checkbox"/>		>3.2
26	<input checked="" type="checkbox"/>				Cu/CuZn						<input checked="" type="checkbox"/>				1
27	<input checked="" type="checkbox"/>				Cu/CuZn						<input checked="" type="checkbox"/>				1.6
28	<input checked="" type="checkbox"/>				Cu/CuZn						<input checked="" type="checkbox"/>				2
29	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		Cu/CuZn		<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>				2.4
30	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		Cu/CuZn		<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>				3.2
31	<input checked="" type="checkbox"/>				Cu/CuZn						<input checked="" type="checkbox"/>				>3.2
32	<input checked="" type="checkbox"/>				Cu/CuZn						<input checked="" type="checkbox"/>				1
33	<input checked="" type="checkbox"/>				Cu/CuZn						<input checked="" type="checkbox"/>				1.6
34	<input checked="" type="checkbox"/>				Cu/CuZn						<input checked="" type="checkbox"/>				2
35	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		Cu/CuZn		<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>				2.4

JOB	Process				Material	Wire					Seam position				Tungsten electrode Ø
	TIG	TIG hot wire	TIG cold wire	MMA		0,6	0,8	Ø			Fillet weld	Butt joint	Fillet weld lap joint	Vertical-down weld	
								1,0	1,2	1,6					
														±	
36	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		Cu/CuZn			<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>			3.2
37	<input checked="" type="checkbox"/>				Cu/CuZn							<input checked="" type="checkbox"/>			>3.2
38	<input checked="" type="checkbox"/>				Cu/CuZn								<input checked="" type="checkbox"/>		1
39	<input checked="" type="checkbox"/>				Cu/CuZn								<input checked="" type="checkbox"/>		1.6
40	<input checked="" type="checkbox"/>				Cu/CuZn								<input checked="" type="checkbox"/>		2
41	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		Cu/CuZn			<input checked="" type="checkbox"/>					<input checked="" type="checkbox"/>		2.4
42	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		Cu/CuZn			<input checked="" type="checkbox"/>					<input checked="" type="checkbox"/>		3.2
43	<input checked="" type="checkbox"/>				Cu/CuZn								<input checked="" type="checkbox"/>		>3.2
44	<input checked="" type="checkbox"/>				Cu/CuZn									<input checked="" type="checkbox"/>	1
45	<input checked="" type="checkbox"/>				Cu/CuZn									<input checked="" type="checkbox"/>	1.6
46	<input checked="" type="checkbox"/>				Cu/CuZn									<input checked="" type="checkbox"/>	2
47	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		Cu/CuZn			<input checked="" type="checkbox"/>						<input checked="" type="checkbox"/>	2.4
48	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		Cu/CuZn			<input checked="" type="checkbox"/>						<input checked="" type="checkbox"/>	3.2
49	<input checked="" type="checkbox"/>				Cu/CuZn									<input checked="" type="checkbox"/>	>3.2
50	<input checked="" type="checkbox"/>				AlMg						<input checked="" type="checkbox"/>				1
51	<input checked="" type="checkbox"/>				AlMg						<input checked="" type="checkbox"/>				1.6
52	<input checked="" type="checkbox"/>				AlMg						<input checked="" type="checkbox"/>				2
53	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		AlMg				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				2.4
54	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		AlMg				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				3.2
55	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		AlMg				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				>3.2
56	<input checked="" type="checkbox"/>				AlMg							<input checked="" type="checkbox"/>			1
57	<input checked="" type="checkbox"/>				AlMg							<input checked="" type="checkbox"/>			1.6
58	<input checked="" type="checkbox"/>				AlMg							<input checked="" type="checkbox"/>			2
59	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		AlMg				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>			2.4
60	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		AlMg				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>			3.2
61	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		AlMg				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>			>3.2
62	<input checked="" type="checkbox"/>				AlMg								<input checked="" type="checkbox"/>		1
63	<input checked="" type="checkbox"/>				AlMg								<input checked="" type="checkbox"/>		1.6
64	<input checked="" type="checkbox"/>				AlMg								<input checked="" type="checkbox"/>		2
65	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		AlMg				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>		2.4
66	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		AlMg				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>		3.2
67	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		AlMg				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>		>3.2
68	<input checked="" type="checkbox"/>				AlMg									<input checked="" type="checkbox"/>	1
69	<input checked="" type="checkbox"/>				AlMg									<input checked="" type="checkbox"/>	1.6
70	<input checked="" type="checkbox"/>				AlMg									<input checked="" type="checkbox"/>	2
71	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		AlMg				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>	2.4
72	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		AlMg				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>	3.2
73	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		AlMg				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>	>3.2

JOB	Process				Material	Wire					Seam position				Tungsten electrode Ø
	TIG	TIG hot wire	TIG cold wire	MMA		Ø					Fillet weld	Butt joint	Fillet weld lap joint	Vertical-down weld	
						0,6	0,8	1,0	1,2	1,6					
74	<input checked="" type="checkbox"/>				AlSi						<input checked="" type="checkbox"/>				1
75	<input checked="" type="checkbox"/>				AlSi						<input checked="" type="checkbox"/>				1.6
76	<input checked="" type="checkbox"/>				AlSi						<input checked="" type="checkbox"/>				2
77	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		AlSi				<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>				2.4
78	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		AlSi				<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>				3.2
79	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		AlSi				<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>				>3.2
80	<input checked="" type="checkbox"/>				AlSi						<input checked="" type="checkbox"/>				1
81	<input checked="" type="checkbox"/>				AlSi						<input checked="" type="checkbox"/>				1.6
82	<input checked="" type="checkbox"/>				AlSi						<input checked="" type="checkbox"/>				2
83	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		AlSi				<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>				2.4
84	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		AlSi				<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>				3.2
85	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		AlSi				<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>				>3.2
86	<input checked="" type="checkbox"/>				AlSi							<input checked="" type="checkbox"/>			1
87	<input checked="" type="checkbox"/>				AlSi							<input checked="" type="checkbox"/>			1.6
88	<input checked="" type="checkbox"/>				AlSi							<input checked="" type="checkbox"/>			2
89	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		AlSi				<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>			2.4
90	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		AlSi				<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>			3.2
91	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		AlSi				<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>			>3.2
92	<input checked="" type="checkbox"/>				AlSi								<input checked="" type="checkbox"/>		1
93	<input checked="" type="checkbox"/>				AlSi								<input checked="" type="checkbox"/>		1.6
94	<input checked="" type="checkbox"/>				AlSi								<input checked="" type="checkbox"/>		2
95	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		AlSi				<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>		2.4
96	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		AlSi				<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>		3.2
97	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		AlSi				<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>		>3.2
98	<input checked="" type="checkbox"/>				Al99						<input checked="" type="checkbox"/>				1
99	<input checked="" type="checkbox"/>				Al99						<input checked="" type="checkbox"/>				1.6
100	<input checked="" type="checkbox"/>				Al99						<input checked="" type="checkbox"/>				2
101	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		Al99				<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>				2.4
102	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		Al99				<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>				3.2
103	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		Al99				<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>				>3.2
104	<input checked="" type="checkbox"/>				Al99						<input checked="" type="checkbox"/>				1
105	<input checked="" type="checkbox"/>				Al99						<input checked="" type="checkbox"/>				1.6
106	<input checked="" type="checkbox"/>				Al99						<input checked="" type="checkbox"/>				2
107	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		Al99				<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>				2.4
108	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		Al99				<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>				3.2
109	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		Al99				<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>				>3.2
110	<input checked="" type="checkbox"/>				Al99							<input checked="" type="checkbox"/>			1
111	<input checked="" type="checkbox"/>				Al99							<input checked="" type="checkbox"/>			1.6

JOB	Process				Material	Wire					Seam position				Tungsten electrode Ø
	TIG	TIG hot wire	TIG cold wire	MMA		0,6	0,8	Ø			Fillet weld	Butt joint	Fillet weld lap joint	Vertical-down weld	
								1,0	1,2	1,6					
112	<input checked="" type="checkbox"/>				Al99								<input checked="" type="checkbox"/>		2
113	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		Al99				<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>		2.4
114	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		Al99				<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>		3.2
115	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		Al99				<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>		>3.2
116	<input checked="" type="checkbox"/>				Al99								<input checked="" type="checkbox"/>		1
117	<input checked="" type="checkbox"/>				Al99								<input checked="" type="checkbox"/>		1.6
118	<input checked="" type="checkbox"/>				Al99								<input checked="" type="checkbox"/>		2
119	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		Al99				<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>		2.4
120	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		Al99				<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>		3.2
121	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		Al99				<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>		>3.2
122	TIG manual/TIG classic														
123	Classic electrode														
124	Reserved														
125	Reserved														
126	Reserved														
127	Electrode JOB														
128	Reserved														
129-179	Free JOBs or SCO (e.g. plasma)														
180	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			CrNi/FeSt	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>					2.4
181	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			CrNi/FeSt	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>					3.2
182	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			CrNi/FeSt	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>					>3.2
183	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			CuSi			<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>					2.4
184	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			CuSi			<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>					3.2
185-207	Free JOBs or special customer order (SCO)/TIG Comfort (with Smart 200 only)														
208-215	Free JOBs or special customer order (SCO)/electrode Comfort (with Smart 208 only)														
216-254	Free JOBs or special customer order (SCO)														
255	DC- with DC+ ignition														
256	Test job: 5 A to I _{max}														

not possible

possible

12 Appendix B

12.1 Overview of EWM branches

Headquarters

EWM AG
Dr. Günter-Henle-Straße 8
56271 Mündersbach · Germany
Tel: +49 2680 181-0 · Fax: -244
www.ewm-group.com · info@ewm-group.com

Technology centre

EWM AG
Forststraße 7-13
56271 Mündersbach · Germany
Tel: +49 2680 181-0 · Fax: -144
www.ewm-group.com · info@ewm-group.com



Production, Sales and Service

EWM AG
Dr. Günter-Henle-Straße 8
56271 Mündersbach · Germany
Tel: +49 2680 181-0 · Fax: -244
www.ewm-group.com · info@ewm-group.com

EWM HIGHTEC WELDING (Kunshan) Ltd.
10 Yuanshan Road, Kunshan · New & High-tech Industry Development Zone
Kunshan · Jiangsu · 215300 · People's Republic of China
Tel: +86 512 57867-188 · Fax: -182
www.ewm-kunshan.cn · info@ewm-kunshan.cn

EWM HIGHTEC WELDING AUTOMATION GmbH
Boxbachweg 4
08606 Oelsnitz/V. · Germany
Tel: +49 37421 20-300 · Fax: -318
www.ewm-automation.de · info@ewm-automation.de

TEAMWELDER s.r.o.
Tř. 9. května 718 / 31
407 53 Jířkov · Czech Republic
Tel.: +420 412 358-551 · Fax: -504
www.teamwelder.cz · info@teamwelder.cz

Sales and Service Germany

EWM AG
Sales and Technology Centre
Grünauer Fenn 4
14712 Rathenow · Tel: +49 3385 49402-0 · Fax: -20
www.ewm-rathenow.de · info@ewm-rathenow.de

EWM HIGHTEC WELDING GmbH
Rudolf-Winkel-Str. 7-9
37079 Göttingen · Tel: +49 2623 9276-0 · Fax: -244
www.ewm-goettingen.de · info@ewm-goettingen.de

EWM HIGHTEC WELDING GmbH
Sachsstraße 28
50259 Pulheim · Tel: +49 2234 697-047 · Fax: -048
www.ewm-pulheim.de · info@ewm-pulheim.de

EWM HIGHTEC WELDING GmbH
Sales and Logistics Centre
Sälzerstraße 20a
56235 Ransbach-Baumbach · Tel: +49 2623 9276-0 · Fax: -244
www.ewm-ransbach-baumbach.de · info@ewm-ransbach-baumbach.de

EWM HIGHTEC WELDING GmbH
Eiserfelder Straße 300
57080 Siegen · Tel: +49 271 3878103-0 · Fax: -9
www.ewm-siegen.de · info@ewm-siegen.de

EWM HIGHTEC WELDING GmbH
Sales and Technology Centre
Draisstraße 2a
69469 Weinheim · Tel: +49 6201 84557-0 · Fax: -20
www.ewm-weinheim.de · info@ewm-weinheim.de

EWM Schweißtechnik Handels GmbH
Bildstock 9/3-4
88085 Langenargen · Tel: +49 7543 9344-30 · Fax: -50
www.ewm-langenargen.de · info@ewm-langenargen.de

EWM Schweißtechnik Handels GmbH
Pfaffensteig 17
89143 Blaubeuren · Tel: +49 7344 9191-75 · Fax: -77
www.ewm-blaubeuren.de · info@ewm-blaubeuren.de

EWM Schweißtechnik Handels GmbH
Heinkelstraße 8
89231 Neu-Ulm · Tel: +49 731 7047939-0 · Fax: -15
www.ewm-neu-ulm.de · info@ewm-neu-ulm.de

EWM HIGHTEC WELDING AUTOMATION GmbH
Steinfeldstraße 15
90425 Nürnberg · Tel: +49 911 3841-727 · Fax: -728
www.ewm-automation.de · info@ewm-automation.de

Sales and Service International

EWM HIGHTEC WELDING GmbH
Fichtenweg 1
4810 Gmunden · Austria · Tel: +43 7612 778 02-0 · Fax: -20
www.ewm-gmunden.at · info@ewm-gmunden.at

EWM HIGHTEC WELDING (Kunshan) Ltd.
10 Yuanshan Road, Kunshan · New & High-tech Industry Development Zone
Kunshan · Jiangsu · 215300 · People's Republic of China
Tel: +86 512 57867-188 · Fax: -182
www.ewm-kunshan.cn · info@ewm-kunshan.cn

EWM HIGHTEC WELDING UK Ltd.
Unit 2B Coopies Way · Coopies Lane Industrial Estate
Morpeth · Northumberland · NE61 6JN · Great Britain
Tel: +44 1670 505875 · Fax: -514305
www.ewm-morpeth.co.uk · info@ewm-morpeth.co.uk

EWM HIGHTEC WELDING Sales s.r.o. / Prodejní a poradenské centrum
Tyršova 2106
256 01 Benešov u Prahy · Czech Republic
Tel: +420 317 729-517 · Fax: -712
www.ewm-benesov.cz · info@ewm-benesov.cz

