■ Operating instructions

ewm®

Power sources for automated applications

Tetrix 152 Synergic Plasma
Tetrix 352 Synergic Plasma
Tetrix 552 Synergic Plasma

099-008722-EW501	Observe additional system documents!	01.02.2012

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General instructions

<table>
<tr><td colspan="2" align="center">**CAUTION**</td></tr>
<tr><td></td><td>**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.</td></tr>
</table>

<table>
<tr><td colspan="2" align="center">*NOTE*</td></tr>
<tr><td>☞</td><td>**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.</td></tr>
</table>

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.

1 Contents

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
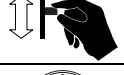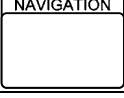
Special technical points which users must observe.
- Notes include the "NOTE" keyword in the heading without a general warning symbol.

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 (enter the menu)**
NAVIGATION	**NAVIGATION (Navigating in the menu)**
EXIT	**EXIT (Exit the menu)**
4 s	**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

<table>
<tr><td colspan="2" align="center">⚠ **DANGER**</td></tr>
<tr>
<td>⚠</td>
<td>

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).

</td>
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<tr>
<td>⚠</td>
<td>

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)!

</td>
</tr>
<tr>
<td>⚠</td>
<td>

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!

</td>
</tr>
</table>

<table>
<tr><td colspan="2" align="center">⚠ **WARNING**</td></tr>
<tr>
<td>⚠</td>
<td>

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!

</td>
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<td>⚠</td>
<td>

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!

</td>
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</table>

⚠ 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!

⚠ 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.

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 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!

2.5 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! |
└───┘

2.5.1 In operation

Temperature range of the ambient air:
• -20 °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!** |
└───┘

2.5.2 Transport and storage

Storage in an enclosed space, temperature range of the ambient air:
• -25 °C to +55 °C

Relative air humidity
• Up to 90% at 20 °C

3 Intended use

This machine has been manufactured according to the latest developments in technology and current regulations and standards. It must only be operated in line with the instructions on correct usage.

> ⚠️ **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

3.1.1 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.

3.1.2 TIG welding

TIG welding with direct current.

Non-contact HF ignition.

3.1.3 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 prevents the tungsten electrode sticking in the molten pool and the tungsten inclusions are reduced. This is particularly useful in tacking and in spot welding.

3.1.4 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.

3.2 Use and operation solely with the following machines

• BUSINT X11*
• RINT X12
• RK 1
• RK 2
• RK 3

(*) Please note the interface capabilities!

3.3 Documents which also apply

3.3.1 Warranty

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

3.3.2 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.

3.3.3 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.

3.3.4 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.

4 Machine description – quick overview

4.1 Tetrix 152, 352, 552 Synergic Plasma

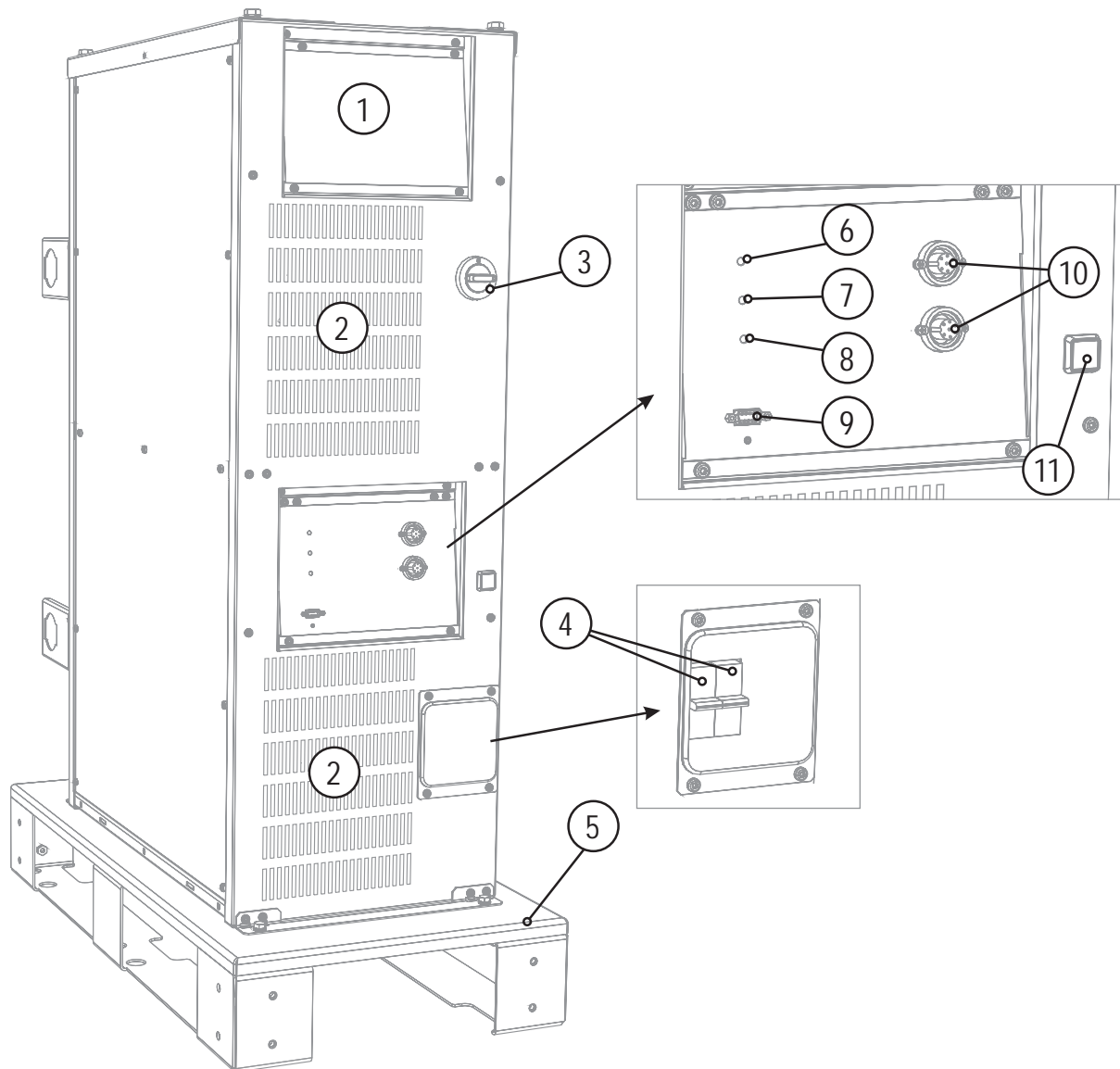| NOTE |
| --- |
| ☞ **The maximum possible machine configuration is given in the text description.**
If necessary, the optional connection may need to be retrofitted (see "Accessories"
chapter). |

4.1.1 Front view

Figure 4-1

Item	Symbol	Description
1		**Machine control**
		See Machine control – operating elements chapter
2		**Cooling air inlet**
3		**Main switch, machine on/off**
4		**Automatic cutouts**
		• Fuse protection for the pilot arc power source
		• Fuse protection for the reverse cooling unit's protective contact socket (back of machine)
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

4.1.2 Rear view
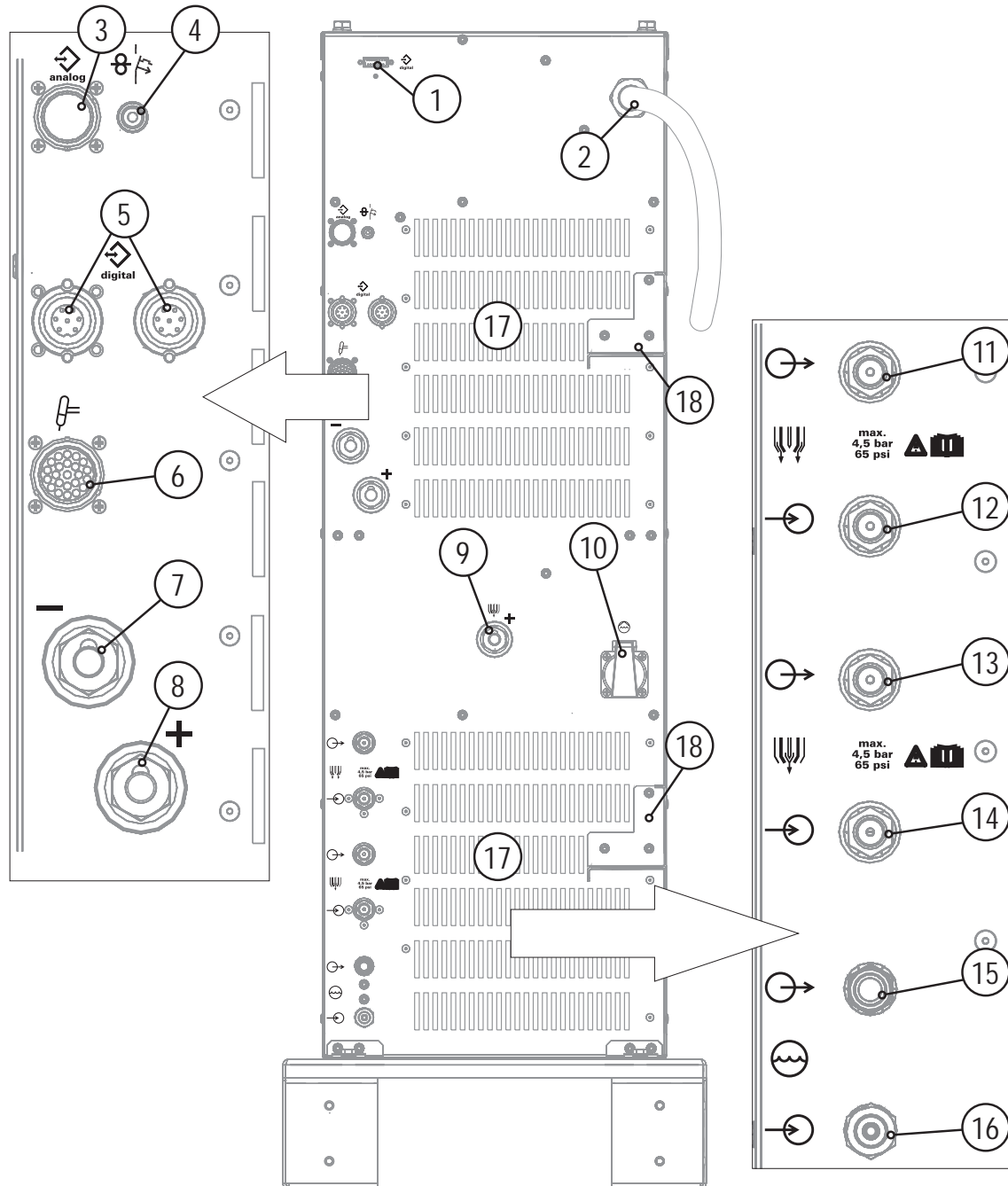
Figure 4-2

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

4.2   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.**
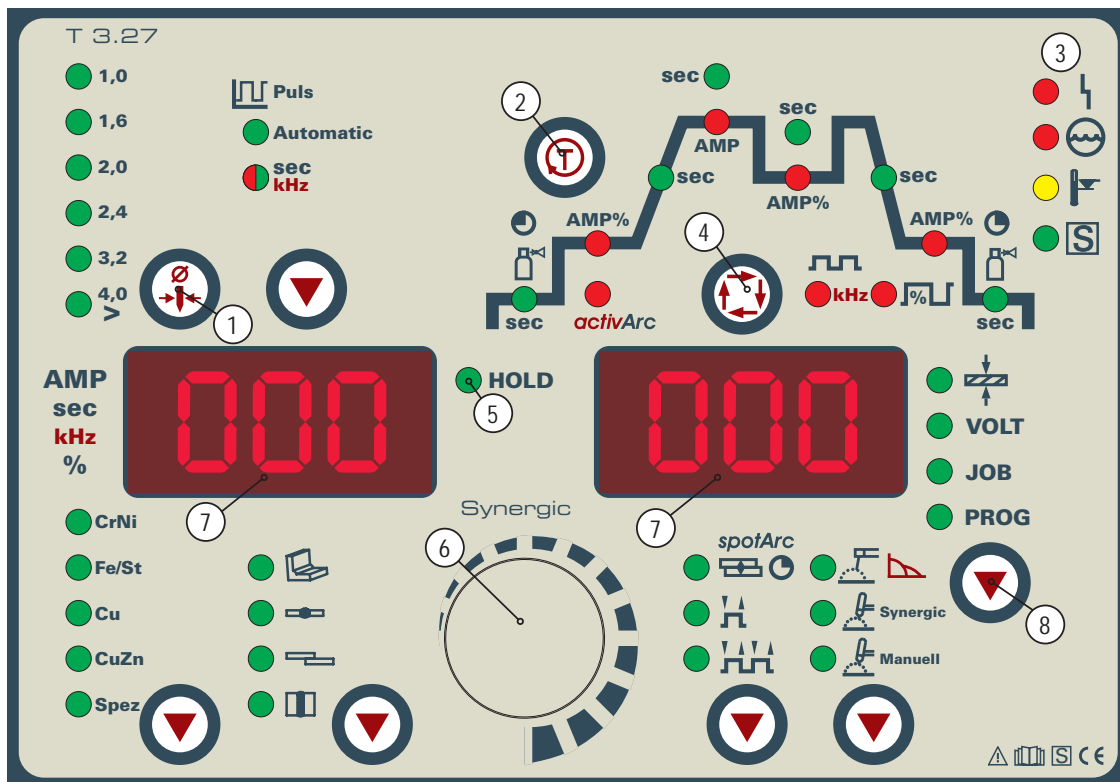
Figure 4-3

Item	Symbol	Description
1	⌀	**Ignition optimisation key button** Optimum ignition and stabilisation of the arc. 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
4		**Function sequence (see next chapter)**

Item	Symbol	Description
5	**HOLD**	**Status display** 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
6		**Welding parameter setting rotary transducer** Setting flows, times and parameters.
7	000	**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

4.2.1 Function sequence
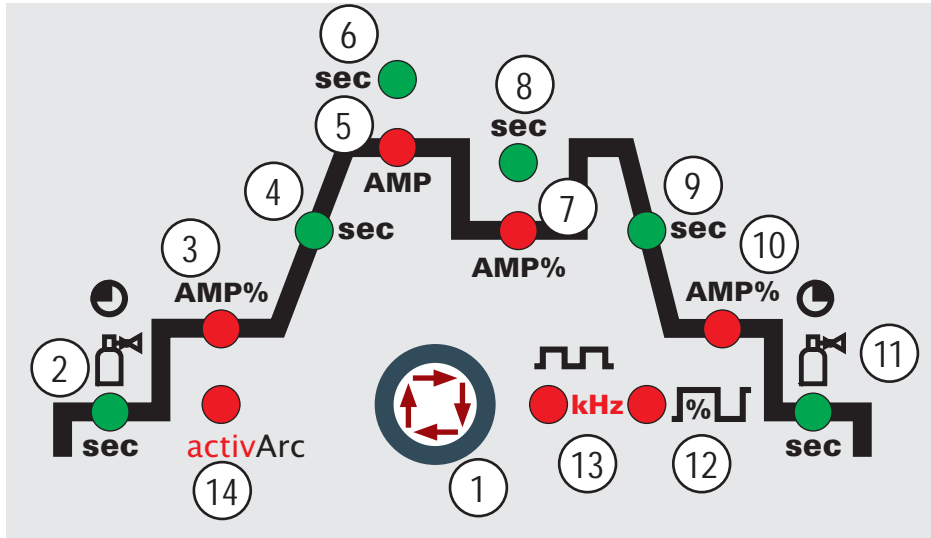
Figure 4-4

Item	Symbol	Description	
1	(icon)	**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 / Spot time** - 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) Die Pulszeit gilt für die Hauptstromphase (AMP) beim Pulsen. - Slope time (tS2) setting range: 0.0 s to 20.0 s (see chapter "Advanced settings")	
7	AMP%	**Secondary current (TIG)** Setting range 1 % to 200 % (1 % increments). Percentage of the main current.	
8	sec	**Pulse pause time / slope time from AMP to AMP%** - Pulse pause 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 "Advanced settings") The pulse time applies to the secondary current phase (AMP%)	
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.	

Item	Symbol	Description
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	%⎍	**Balance TIG DC pulses (15 kHz)**
		Setting range: 1% to +99% (1% increments).
13	⎍⎍ kHz	**Frequency TIG DC pulses (15 kHz)**
		Setting range: 50 Hz to 15 kHz
14	*activArc*	**activArc TIG welding process**
		• Switch activArc on or off
		• Correct the activArc characteristic (setting range: 0 to 100)

4.3   Machine control (Mode RC - off)
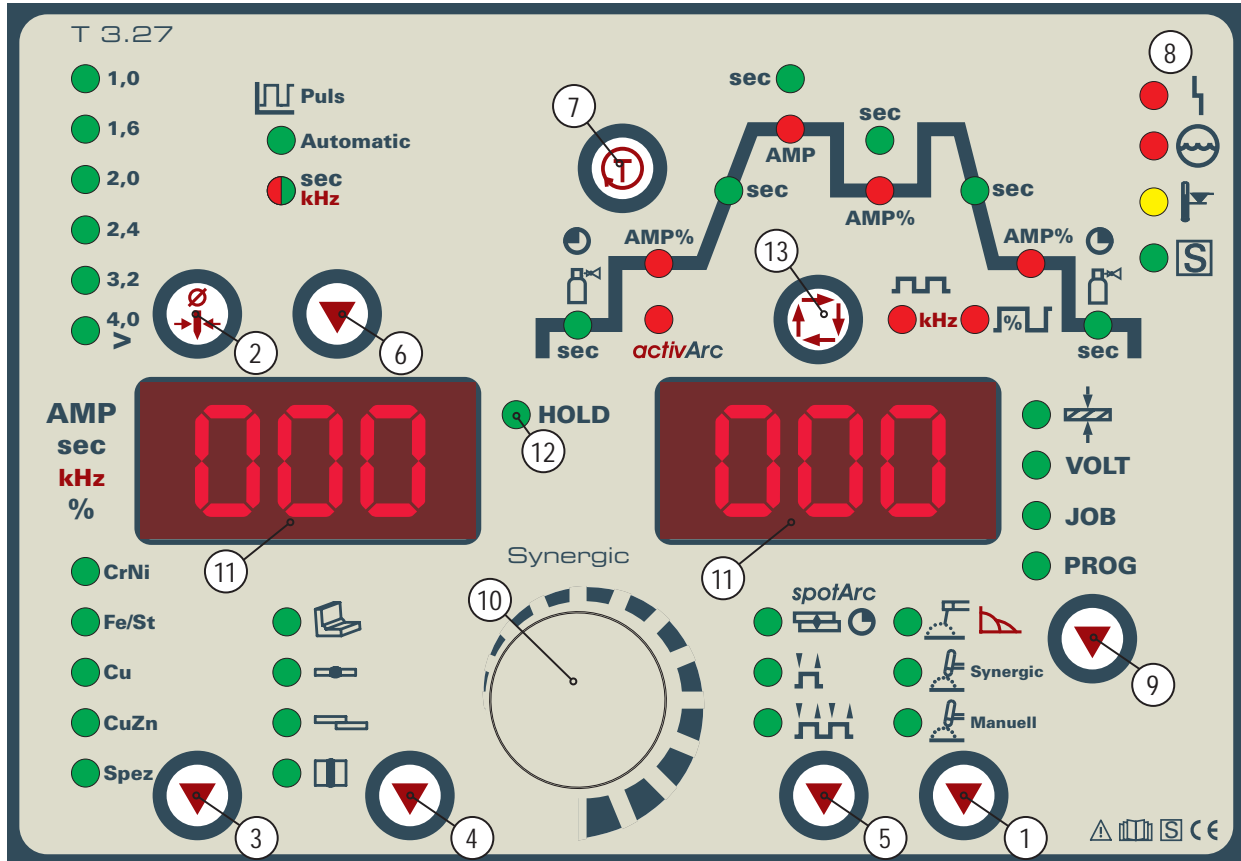
Figure 4-5

Item	Symbol	Description
1	▼	**"Welding process" button** MMA welding, lights up in green / arcforce setting, lights up in red Synergic — TIG synergic welding (synergic parameter setting) Manuell — TIG manual welding (manual parameter setting)
2	⌀	"Tungsten electrode diameter"/ "Ignition optimisation" key button ⌀ 1,0mm, ⌀ 1,6mm, ⌀ 2,0mm, ⌀ 2,4mm, ⌀ 3,2mm, ⌀ 4,0mm or greater Optimum ignition and stabilisation of the arc. The adjustable welding current is limited to the maximum permissible welding current of the tungsten electrode.
3	▼	**"Select material type" button** CrNi Chrome nickel alloys FeSt Iron and steel alloys Cu Copper or copper alloys (bronzes) CuZn Copper zinc alloys (brass) Spez Special (for special custom-built tasks)
4	▼	Select seam type button Fillet weld Butt joint Fillet weld - lap joint Vertical-down

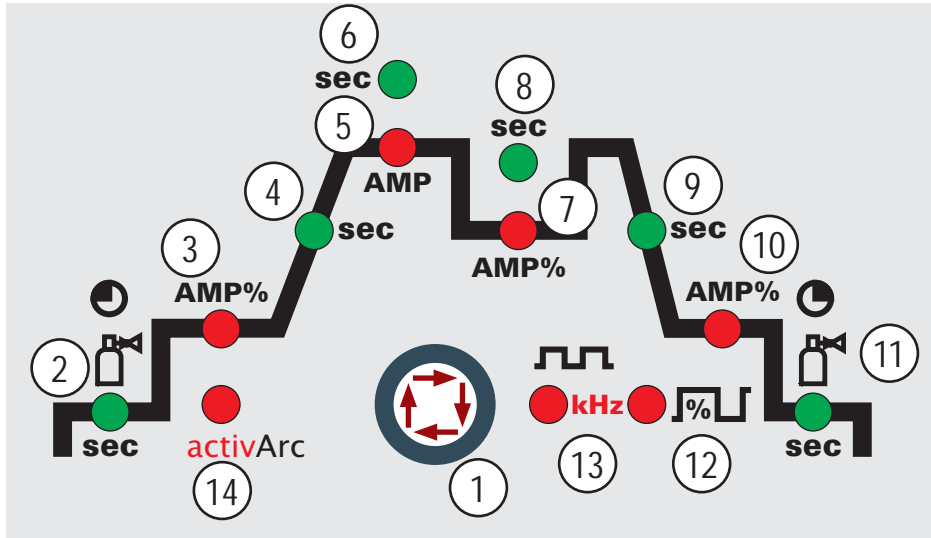| Item	Symbol	Description
5	▼	**Operating mode button**
		spotArc
		⊞ ☉ spotArc (spot time setting range 0.01 sec. to 20.0 sec.)
		⊓ Non-latched
		⊓⊔ Latched
6	▼	**TIG pulses key button**
		Automatic TIG automated pulses (frequency and balance)
		sec kHz TIG pulses with times, lights up in green / Fast TIG DC pulses with frequency and balance, lights up in red
7	ⓣ	**Gas test/rinse hose package button**
		see "Shielding gas setting" chapter
8	● ⌐ ● ⊖ ● ⊩ ● Ⓢ	**Error/status indicators**
		● ⌐ Collective interference signal light
		● ⊖ Water deficiency signal light (welding torch cooling)
		● ⊩ Excess temperature signal light
		● Ⓢ Ⓢ safety sign signal light
9	▼	**Display switching button**
		⇥ Material thickness display
		VOLT Welding voltage display
		JOB JOB number display
		PROG Program number display
10	☼	**Welding parameter setting rotary transducer**
		Setting flows, times and parameters.
11	000	**Three-figure LED display**
		Welding parameter display (see also chap. "Welding data display").
12	HOLD	**Status display**
		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
13		**Function sequence (see next chapter)**

4.3.1 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 / Spot time** • 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) Die Pulszeit gilt für die Hauptstromphase (AMP) beim Pulsen. • Slope time (tS2) setting range: 0.0 s to 20.0 s (see chapter "Advanced settings")	
7	AMP%	**Secondary current (TIG)** Setting range 1 % to 200 % (1 % increments). Percentage of the main current.	
8	sec	**Pulse pause time / slope time from AMP to AMP%** • Pulse pause 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 "Advanced settings") The pulse time applies to the secondary current phase (AMP%)	
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.	

Item	Symbol	Description
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	⌐%⌐	**Balance TIG DC pulses (15 kHz)** Setting range: 1% to +99% (1% increments).
13	⊓⊔⊓ kHz	**Frequency TIG DC pulses (15 kHz)** Setting range: 50 Hz to 15 kHz
14	*activArc*	**activArc TIG welding process** • Switch activArc on or off • Correct the activArc characteristic (setting range: 0 to 100)

5 Design and function

NOTE
☞ **Observe documentation of other system components when connecting!**

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**
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 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!

5.2 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**

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.

5.3 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.

5.4 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!

5.5 Welding torch cooling system

5.5.1 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.

5.5.2 List of coolants

Only the following coolant may be used:

Coolant	Temperature range
DKF 23E (for plasma machines)	0 °C to +40 °C

5.6 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 (any phase sequence for three-phase machines)!
> - 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.

5.6.1 Mains configuration

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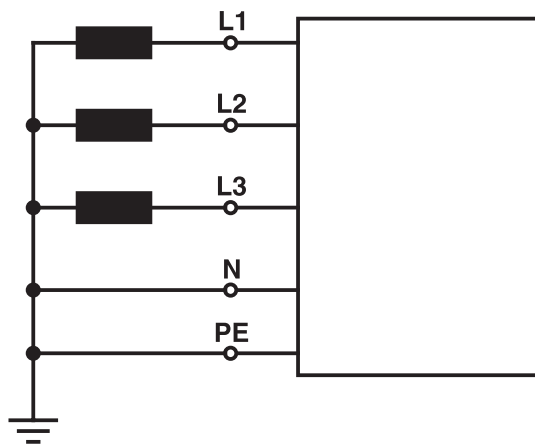> ☞ **The machine may only be connected to a three-phase system with four conductors and an earthed neutral conductor.**

Figure 5-1

Legend

Item	Designation	Colour code
L1	Outer conductor 1	black
L2	Outer conductor 2	brown
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.

5.7 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.**
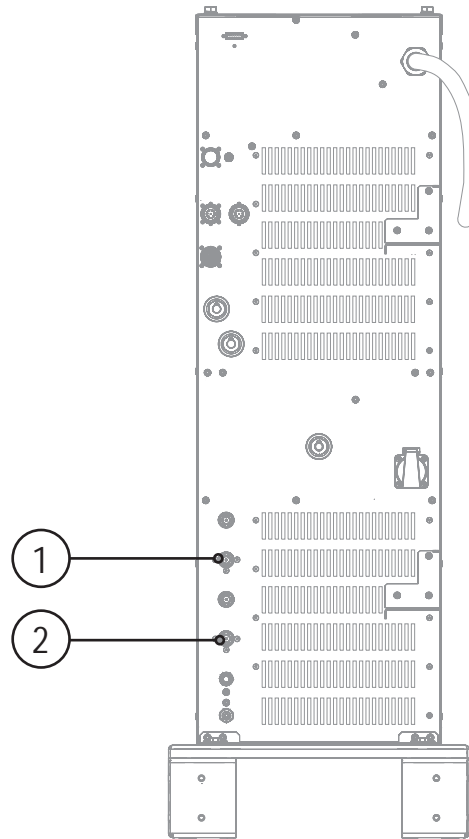

Figure 5-2

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).**

5.7.1 Connecting the shielding gas supply
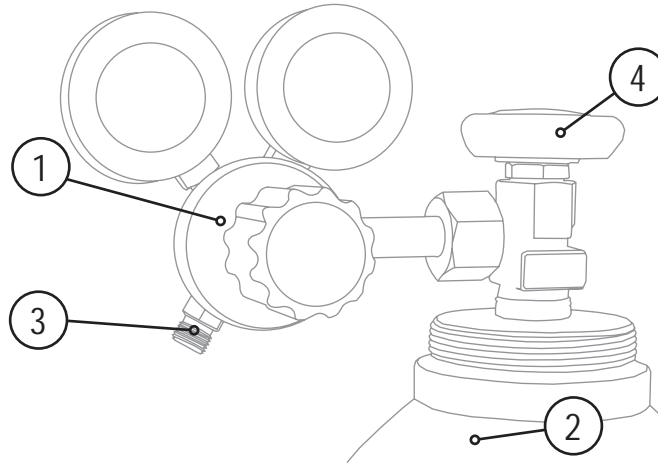
Figure 5-3

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).

5.7.1.1 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.

5.7.1.2 "Rinse 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!**

5.8 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 DKF 23E coolants (observe temperature range of 0°C bis + 40°C).

NOTE

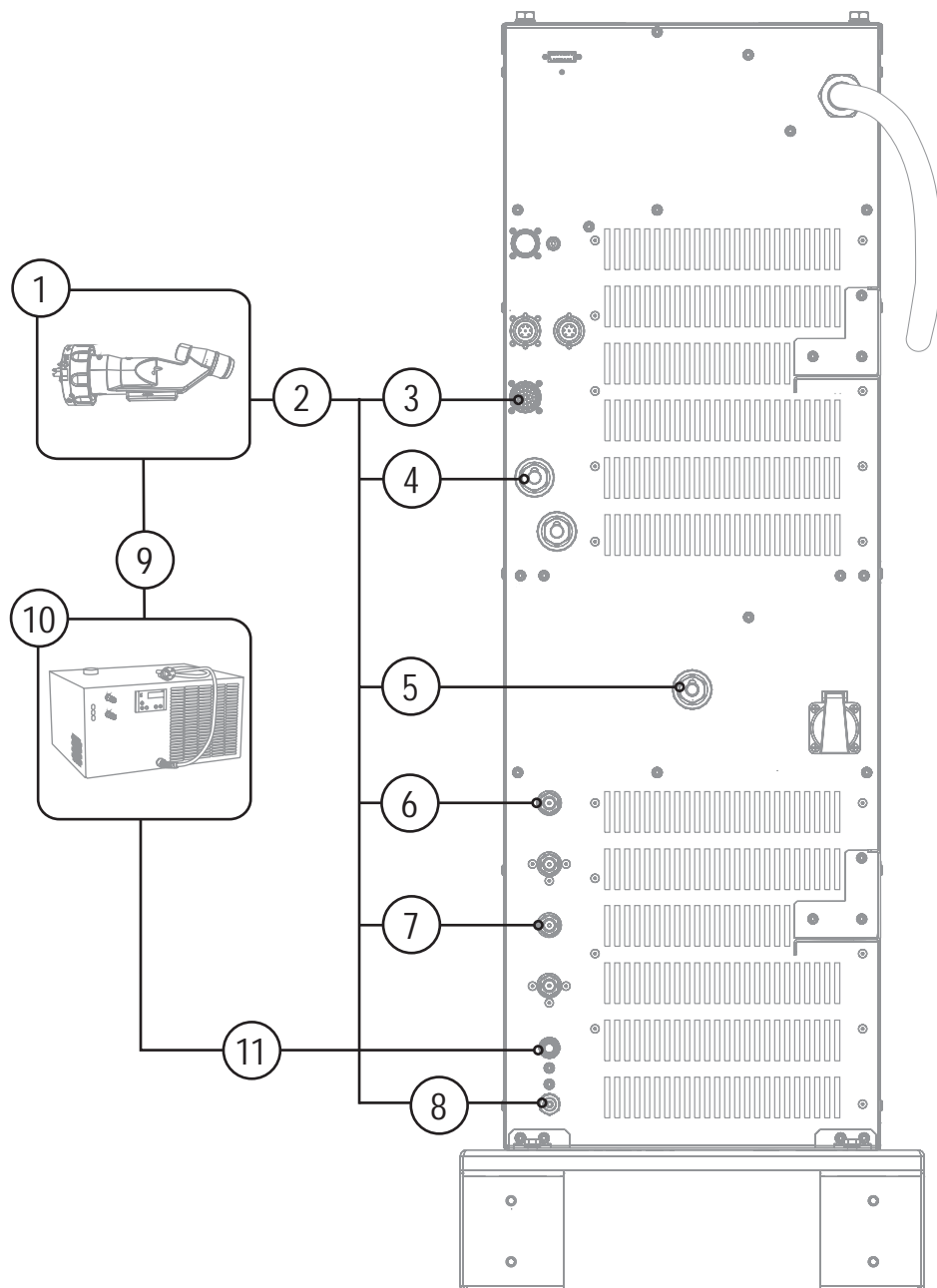📖 **Please note the relevant documentation of the accessory components.**

Figure 5-4

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 (G¼").
- Screw the crown nut of the plasma gas line tightly on to the connecting thread (G¼").
- 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.

5.9 Plasma welding

5.9.1 Welding torch connection (with gas metering unit GMU)

> **NOTE**
>
> ☞ **If the plasma and shielding gases are connected via a gas metering unit (GMU), the connection between the welding machine and the GMU is created using the supplied gas connection lines with G 1/4" crown nuts connected on both sides.**
> **The GMU can be used for plasma or TIG welding.**
> **Adapters for connecting the welding torch gas connections are screwed onto the GMU where appropriate.**
>
> ☞ **Before commissioning, the plasma welding torch must be equipped for the welding JOB and correspondingly set/adjusted!**

Figure 5-5

Item	Symbol	Description
1		**G1/4 gas connection line** Connection of the welding gases between the gas metering unit (GMU) and welding machine
2		**G1/4" shielding gas connecting nipple, welding machine output** Connection to the welding torch or gas metering unit (GMU)
3		**G1/4 shielding gas connecting nipple, gas metering unit input** Connection to the welding machine
4		**G1/4" plasma gas connecting nipple, welding machine output** Connection to the welding torch or gas metering unit (GDE)
5		**G1/4 plasma gas connecting nipple, gas metering unit input** Connection to the welding machine
6		**Adapter (G1/4 > G1/8)**
7		**G1/4 shielding gas connecting nipple, gas metering unit output** Connection to the welding torch
8		**Adapter (G1/8 > cap)**
9		**G1/4 plasma gas connecting nipple, gas metering unit output** Connection to the welding torch
10		**Adapter (G1/8 > plug-in nipple)**

- Create the connection between the G1/4 shielding gas connecting nipple, welding machine output and the G1/4 shielding gas connecting nipple, gas metering unit input to the G1/4 gas connection line.
- Create the connection between the G1/4 plasma gas connecting nipple, welding machine output and the G1/4 plasma gas connecting nipple, gas metering unit input to the G1/4 gas connection line.
- Screw adapter (G1/4 > G1/8) onto G1/4 shielding gas connecting nipple, gas metering unit output.
- Screw adapter (G1/8 > cap) onto adapter (G1/4 > G1/8).
- Screw adapter (G1/4 > G1/8) onto G1/4 plasma gas connecting nipple, gas metering unit output.
- Screw adapter (G1/8 > plug-in nipple) onto adapter (G1/4 > G1/8).

5.9.2 Welding torch connection (no gas metering unit GMU)

NOTE
☞	**Before commissioning, the plasma welding torch must be equipped for the welding JOB and correspondingly set/adjusted!**

Figure 5-6

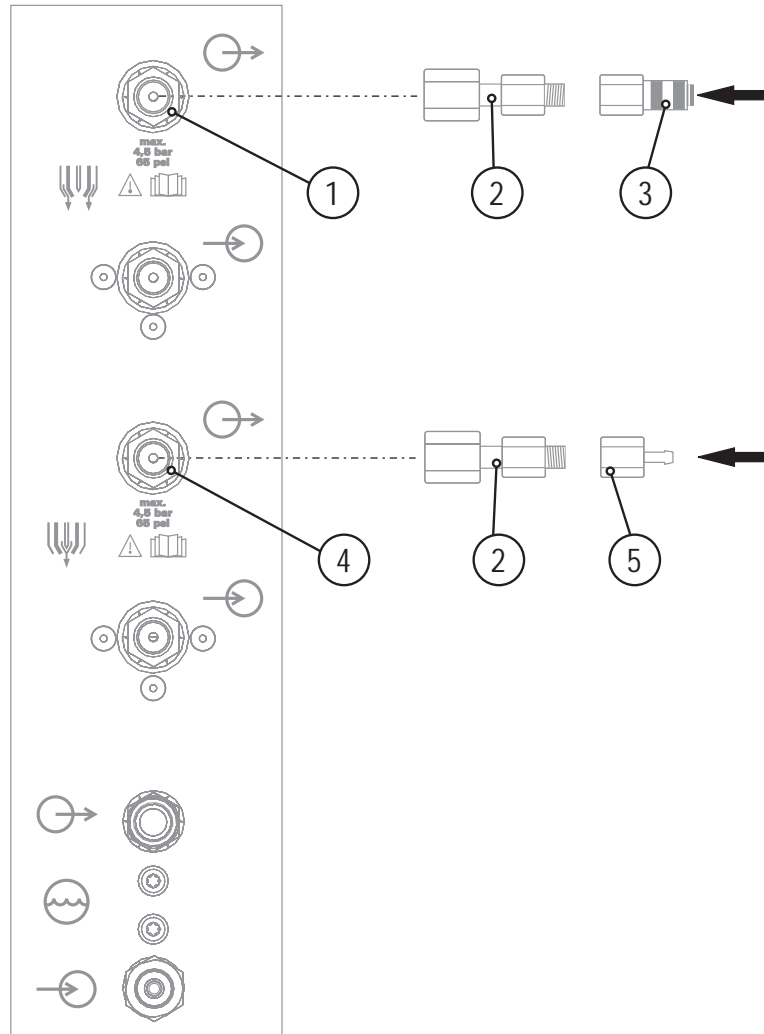| Item	Symbol	Description
1	⩔	**G1/4" shielding gas connecting nipple, welding machine output** Connection to the welding torch or gas metering unit (GMU)
2	▭▯	**Adapter (G1/4 > G1/8)**
3	▭▯	**Adapter (G1/8 > cap)**
4	⩔	**G1/4" plasma gas connecting nipple, welding machine output** Connection to the welding torch or gas metering unit (GDE)
5	⊏▭	**Adapter (G1/8 > plug-in nipple)**

- Screw adapter (G1/4 > G1/8) onto G1/4 shielding gas connecting nipple, welding machine output.
- Screw adapter (G1/8 > cap) onto adapter (G1/4 > G1/8).
- Insert connecting nipple on the torch shielding gas line into adapter (G1/8 > cap).
- Screw adapter (G1/4 > G1/8) onto connecting nipple (G1/4, plasma gas connection).
- Screw adapter (G1/8 > plug-in nipple) onto adapter (G1/4 > G1/8).
- Insert connection socket on the torch plasma gas line onto adapter (G1/8 > plug).

5.10   Cooling module connection

<table>
<tr><td colspan="2" style="text-align:center">CAUTION</td></tr>
<tr><td>⚠</td><td>Use of unsuitable coolants results in damage to the welding torch!
Unsuitable coolants can cause damage to the welding torch!
• Use only DKF 23E coolants (observe temperature range of 0°C bis + 40°C).</td></tr>
</table>

<table>
<tr><td colspan="2" style="text-align:center"><i>NOTE</i></td></tr>
<tr><td>☞</td><td>Observe the fitting and connection instructions given in the relevant operating instructions for the cooling unit.</td></tr>
</table>
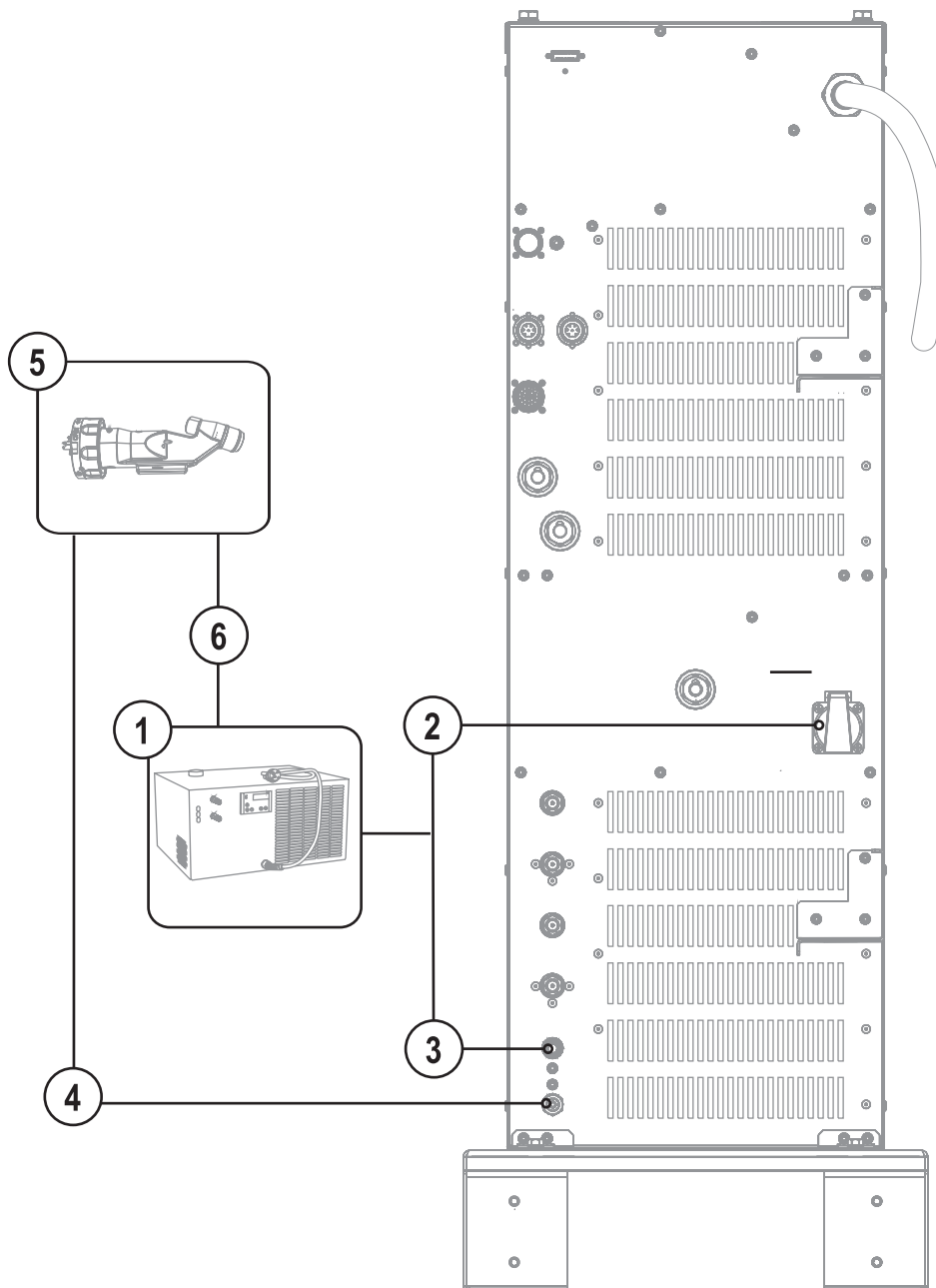
Figure 5-7

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 to the cooling unit voltage supply connection socket.
• Establish a coolant return from the 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 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. |

5.11   Connection for workpiece lead
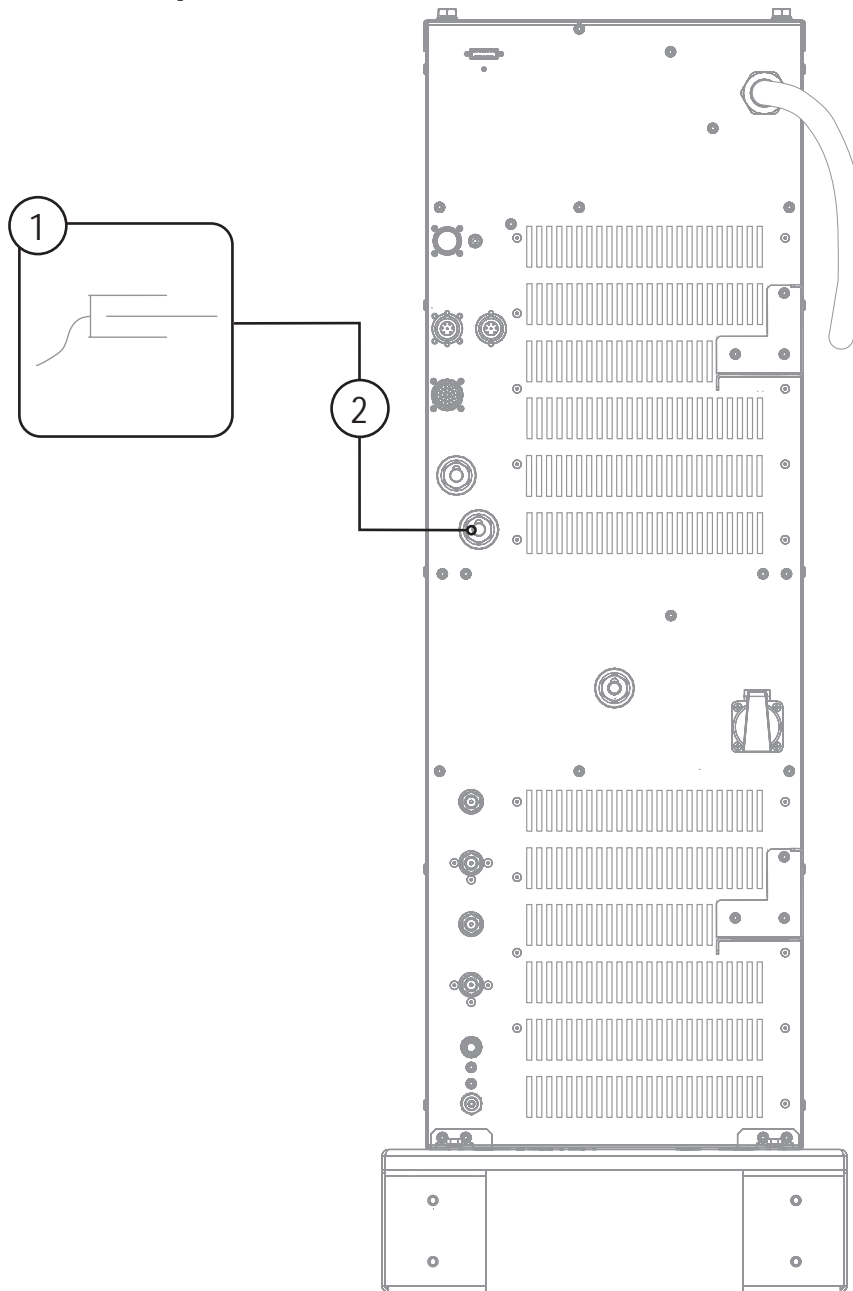
Figure 5-8

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.
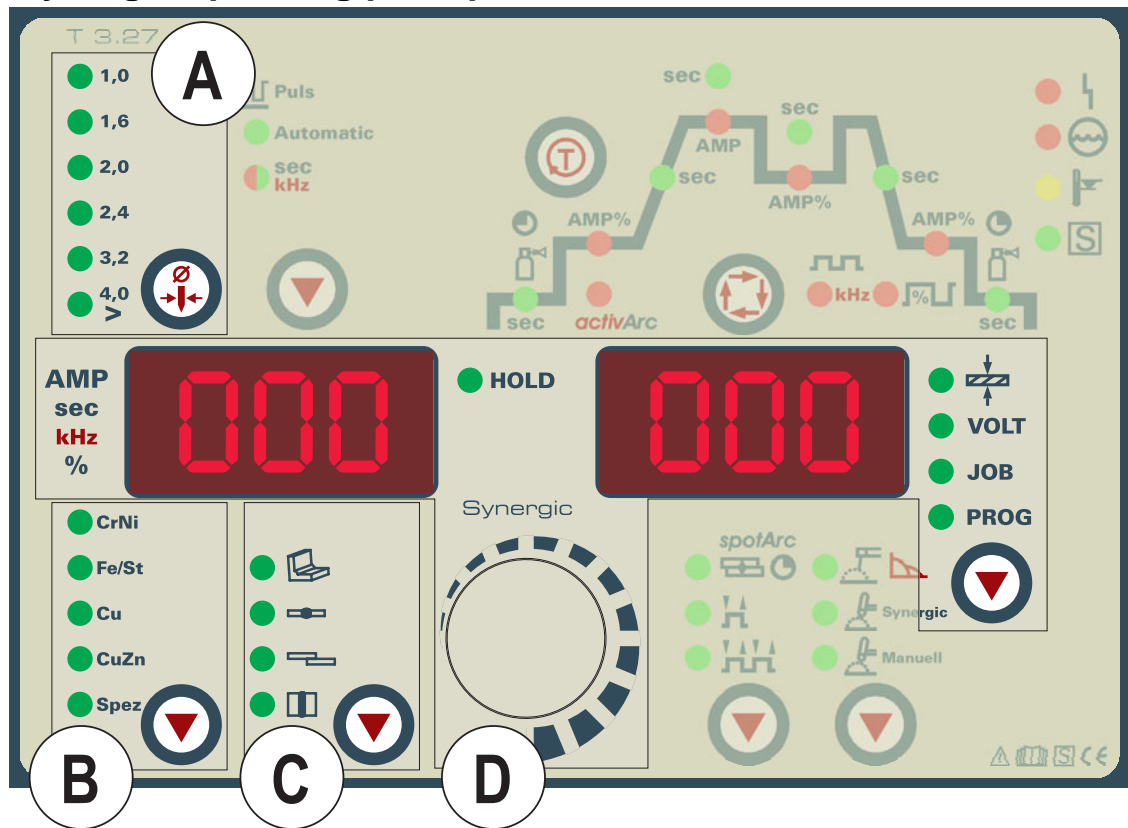
5.12   TIG Synergic operating principle

Figure 5-9

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 Tetrix PCT 300 welding parameter software.

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

5.12.1 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").
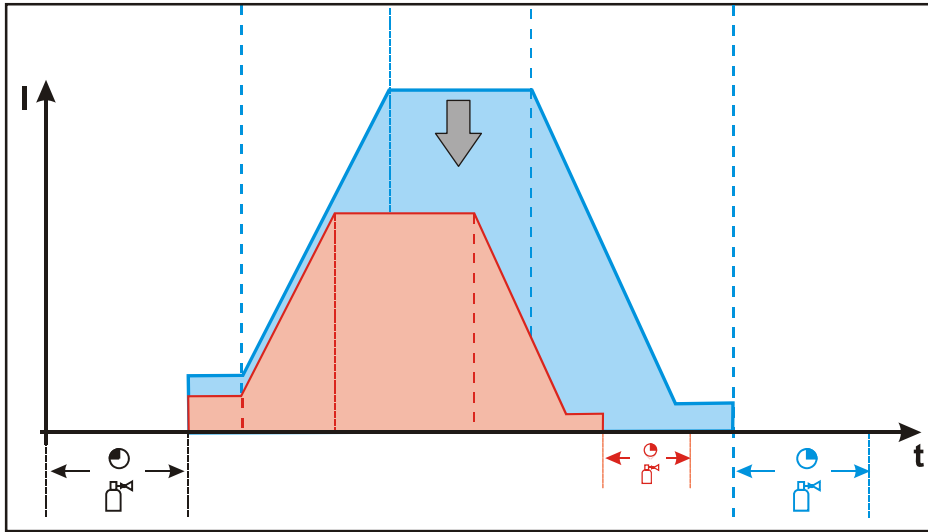
Figure 5-10

5.12.2 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.
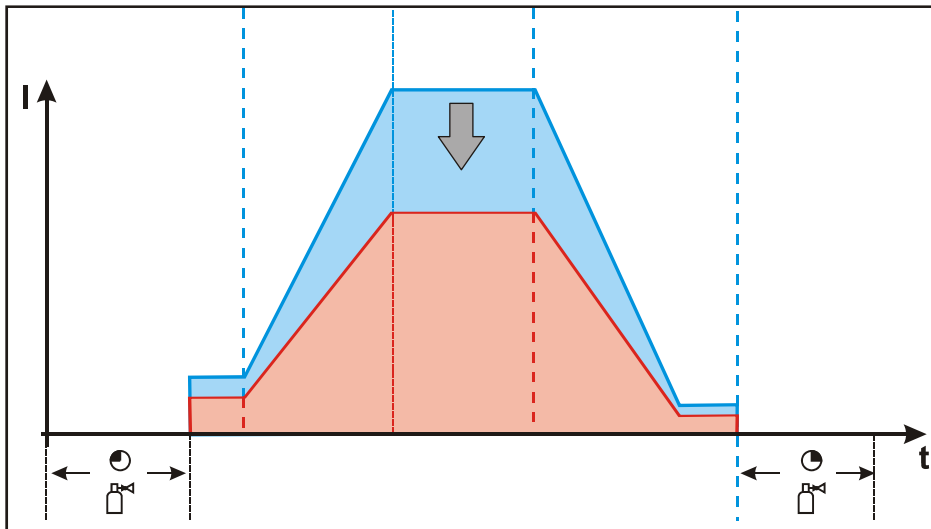
Figure 5-11

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").**

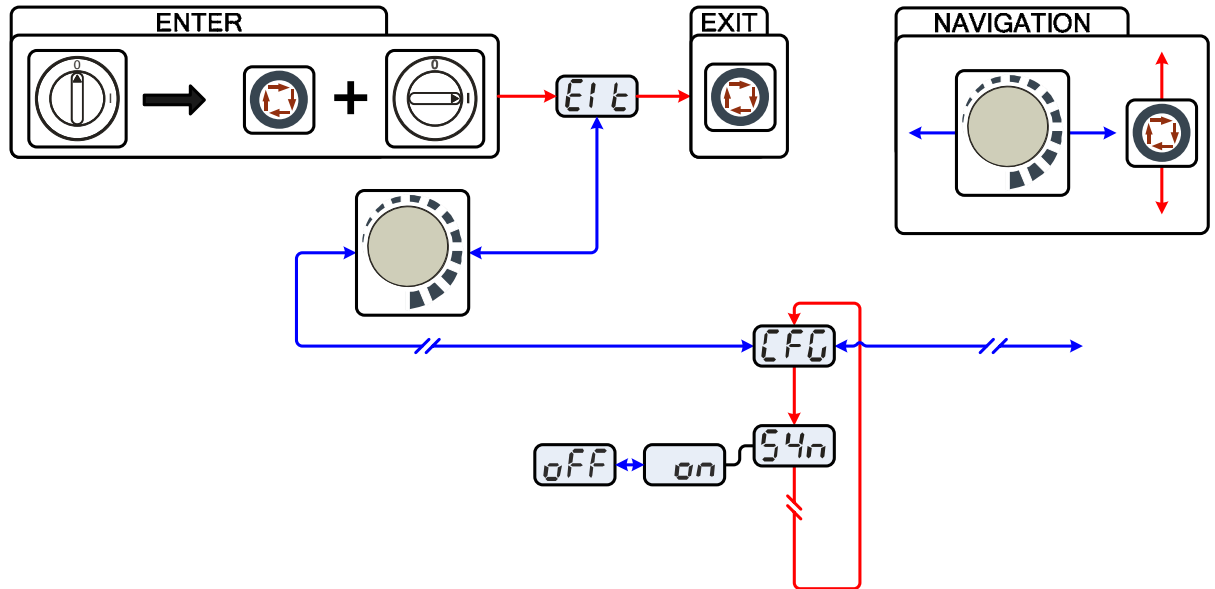### 5.12.2.1 Set the operating principle (conventional/synergic)

Figure 5-12

Display	Setting/selection
EIt	**Exit the menu** Exit
CFG	**Machine configuration** Settings for machine functions and parameter display
S4n	**Operating principle** • 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 "EIt" menu item.
- Press the "welding parameters" button (settings will be applied, machine changes to the ready-to-operate status).

5.12.3 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**
>
> ☞ **The following plasma JOBs are pre-defined and can be selected via the JOB manager:**
> - JOB 130 plasma 2.4 mm needle up to 150 A
> - JOB 140 plasma 4.0 mm needle up to 300 A
> - JOB 150 plasma 3.2 mm needle up to 250 A
>
> **Other JOBs can be created as explained in the "Organising welding tasks" chapter.**
>
> ☞ **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	Display
● VOLT ● JOB ● PROG ▼	x x ✍	Select JOB Manager mode	Press until the "VOLT" signal light is on
● VOLT ● JOB ● PROG ▼	2 sec. ✍	Select JOB Manager mode	`LoJ` `---`
(rotary transducer)	⟳	Select the required JOB number using the rotary transducer (e.g. 150)	`LoJ` `150`
● VOLT ● JOB ● PROG ▼	1 x ✍	JOB loaded, machine switches back to Display mode. The JOB can be customised as required.	Current value and JOB number displayed

5.12.4 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)
● ⟷ ● VOLT ● JOB ● PROG ▼	X x ☝	Press button until signal light ⟷ Material Thickness comes on.	Material thickness in mm is displayed.
(rotary knob)	↻☝	Set welding current or sheet metal thickness.	Welding current and sheet metal thickness are displayed

5.12.5 Welding data display

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

Parameter	Before welding (nominal values)	During welding (actual values)	After welding (hold values)
	left-hand display		
Welding current	☑	☑	☑
Parameter times	☑	☐	☐
Parameter currents	☑	☐	☐
	right-hand display		
Material thickness	☑	☑	☑
Welding voltage	☑	☑	☑
JOB number	☑	☐	☐
Program number	☑	☐	☐

When the settings are changed (e.g. welding current) after welding when the hold values are displayed, the display will be switched to the relevant nominal values.

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 (JOB 128 to 256, see chapter "Creating a new JOB in the free memory").

5.12.5.1 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	
10	*0ᒣ*	Increase parameter value	To restore the factory settings.
20	*-0-*	Factory setting	Parameter value is on the optimum setting
30	*Lᒣ0*	Reduce parameter value	To restore the factory settings.

5.13 Arc ignition

The pilot arc is switched on and off using the pilot arc button „On/Off".

After switching on the pilot arc, the gas pre-flow time set starts running, the pilot arc current ignites without workpiece contact between the electrode and nozzle, and the control lamp in the pressure switch comes on.

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).

5.13.1 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.	20 -0-
		Set parameter value Increase parameter value: more ignition power Reduce parameter value: less ignition power	30 ⌐0

5.13.2 TIG automatic cut-out

NOTE
☞ **The automatic cut-out function will be triggered by two conditions during the welding process:** **During the ignition phase (ignition fault)** • If there is no welding current within 3s after starting the welding. **During the welding phase (arc interruption)** • If the arc is interrupted for longer than 3s. **In both cases, the welding machine ends the ignition or welding process immediately.**

5.14 TIG 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).

5.15 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

5.16 Welding programs

NOTE
☞ **Changes made to the other welding parameters during the course of the program have the equivalent effect on all programs.**
The change to the welding parameters is saved immediately in the JOB.

The welding machine has 16 programs, which you can change during welding.

In each selected welding task (JOB), see chapter "Selecting the welding task", 16 programs can be set, saved and called up. In program "0" (default setting) the welding current can be infinitely adjusted across the entire range. In programs 1-15, 15 different welding currents (incl. operating mode and pulse function) are defined.

Example:

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

5.16.1 Selection and adjustment

Setting welding programs using the welding machine control

| Operating element	Action	Result	Display
● ⊽ / VOLT / JOB / PROG ▼	👆	Press button until signal light PROG comes on.	$\boxed{50}$ $\boxed{0}$ Welding current (left) and program no. (right)
(rotary knob)	🔄👆	Select or retrieve program no., e.g. no. 1	$\boxed{50}$ $\boxed{1}$
spotArc ● ⊞⊙ / ● ⊓ / ● ⊓⊓ ▼	👆	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 equivalent way.	$\boxed{50}$ $\boxed{P\ 1}$
(rotary knob)	🔄👆	Set welding current for the corresponding program (e.g.: 75 A in program 1).	$\boxed{75}$ $\boxed{P\ 1}$
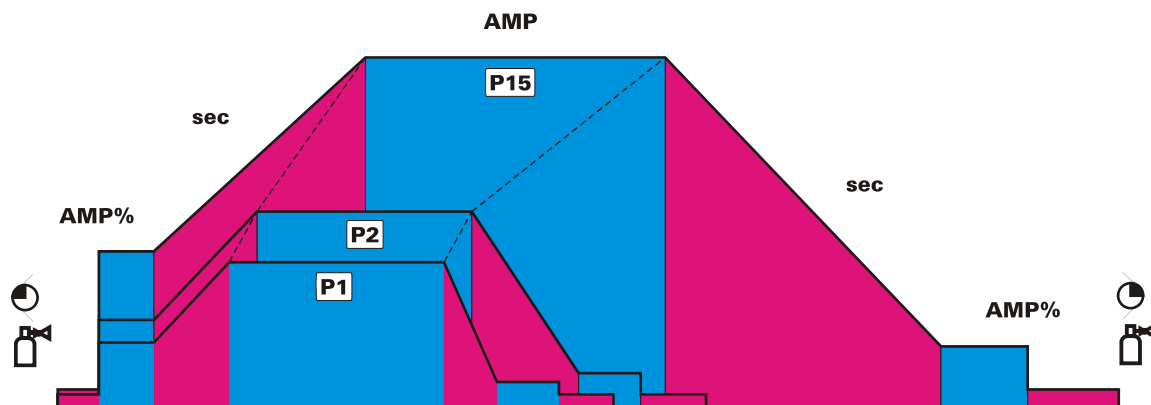
Figure 5-13
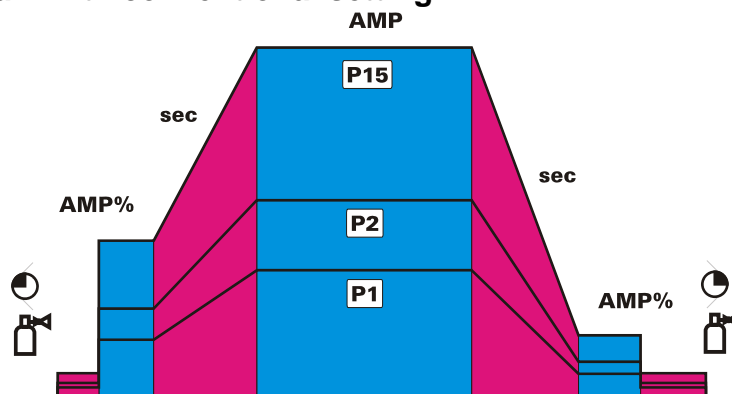
5.16.2 Example "Program with conventional setting"

Figure 5-14

5.16.3 Accessories for switching over programs

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

	Programs	
Component	**Create and change**	**Retrieve**
Welding machine control	16	16
Up/down welding torch	-	16
RETOX TIG torch	-	16
RINT X11 / X12 robot interface	-	16
BUSINT X11 industrial bus interface	-	16

5.17 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.

5.17.1 Explanation of symbols on the display

Display		Meaning
`L o.J`	`- - -`	Load JOB
`c o.J`	`- - -`	Copy JOB
`r E.J`	`- - -`	Reset JOB
`r E.A`	`- - -`	Reset all JOBs

5.17.2 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
● ⚡ ● VOLT ● JOB ● PROG ▼	x x 👆	Select JOB Manager mode	Press until the "VOLT" signal light is on
● ⚡ ● VOLT ● JOB ● PROG ▼	2 sec. 👆	Select JOB Manager mode	$Lo.J$ $---$
● ⚡ ● VOLT ● JOB ● PROG ▼	1 x 👆	Switch from "Load JOB" to "Copy JOB"	$Co.J$ $---$
🔄 👆		Select the required JOB number using the rotary transducer (e.g. 150)	$Co.J$ 150
● ⚡ ● VOLT ● JOB ● PROG ▼	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

5.17.3 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	L o.J ---
		Select the required JOB number using the rotary transducer (e.g. 150)	L o.J 150
	1 x	JOB loaded, machine switches back to Display mode. The JOB can be customised as required.	Current value and JOB number displayed

5.17.4 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	L o.J ---
	2 x	Switch from "Load JOB" to "Reset JOB"	r E.J ---
		Select the required JOB number using the rotary transducer (e.g. 150)	r E.J 150
	1 x	JOB reset to factory settings, machine switches back to Display mode.	Current value and JOB number displayed

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

Operating element	Action	Result	Display
VOLT JOB PROG ▼	x x ☞	Select JOB Manager mode	Press until the "VOLT" signal light is on
VOLT JOB PROG ▼	2 sec. ☞	Select JOB Manager mode	`LoJ` `- - -`
VOLT JOB PROG ▼	3 x ☞	Switch from "Load JOB" to "Reset All JOBs"	`rE.A` `- - -`
⟳	⟳	• ON = Reset all JOBs to factory settings • OFF = Do not reset JOBs	`rE.A` `on`
VOLT JOB PROG ▼	1 x ☞	All JOBs reset to factory settings, machine switches back to Display mode.	Current value and JOB number displayed

5.17.6 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
VOLT JOB PROG ▼	2 sec. ☞	Machine switches back to Display mode The JOB can be adjusted individually.	Current value and JOB number displayed

5.18 Interfaces

5.18.1 Connecting the robot interface / industrial bus interface

<table>
<tr><td colspan="2" align="center">CAUTION</td></tr>
<tr>
<td>⚠️</td>
<td>

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.

</td>
</tr>
<tr>
<td>⚠️</td>
<td>

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.

</td>
</tr>
</table>

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.
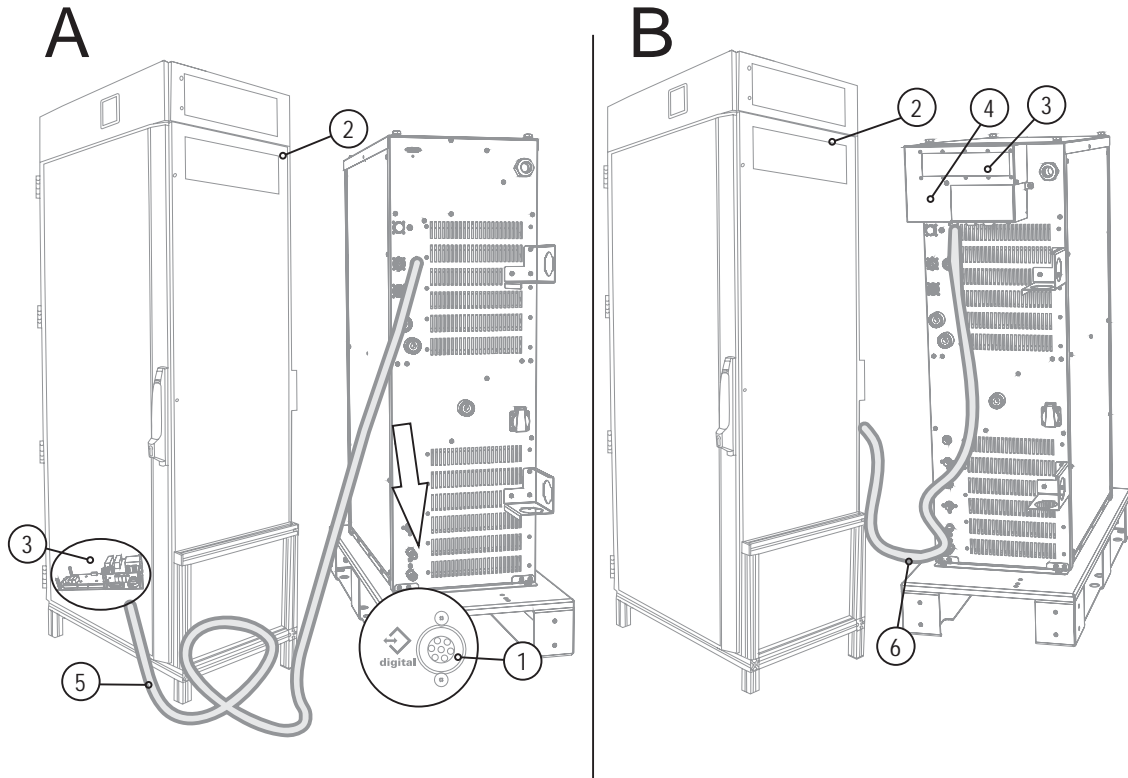
Figure 5-15

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 cables, 12-, 19- and 23-pole** Connection between interface casing and switching cabinet

5.18.1.1 RINT X11 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.

5.18.1.2 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.**

5.18.2 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)
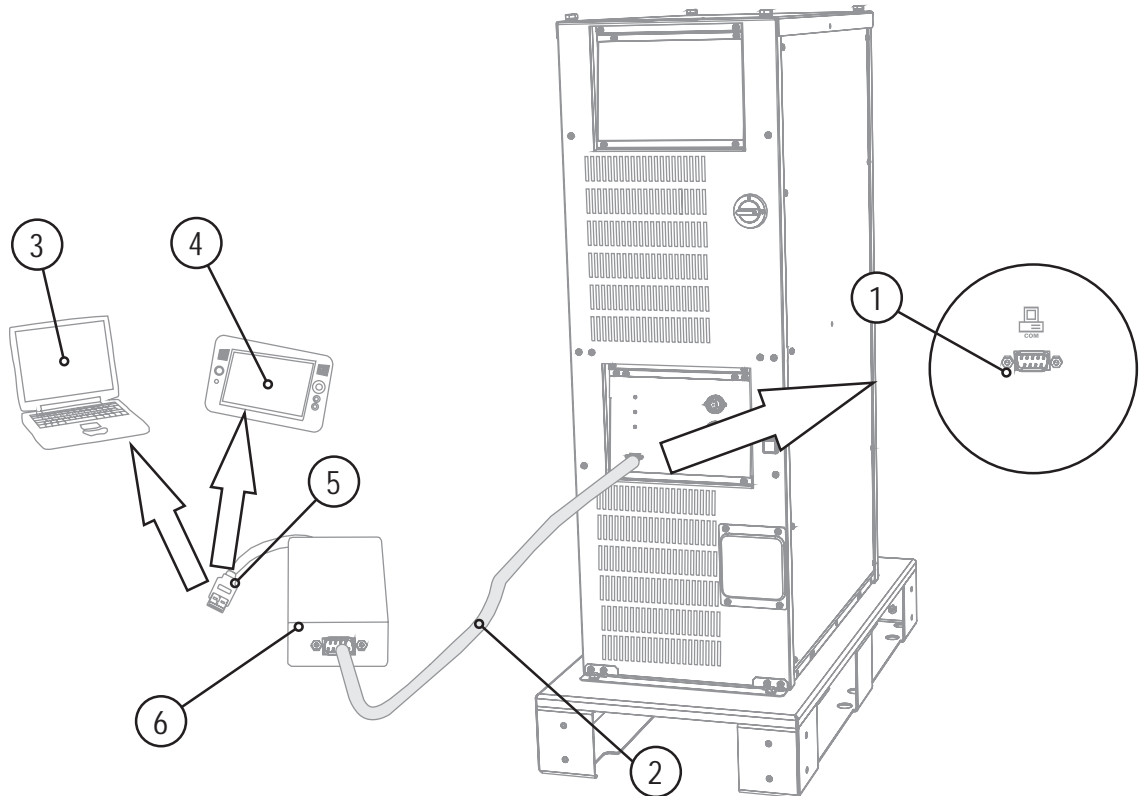
Figure 5-16

Item	Symbol	Description
1	🖳 COM	**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)!

5.18.3 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.
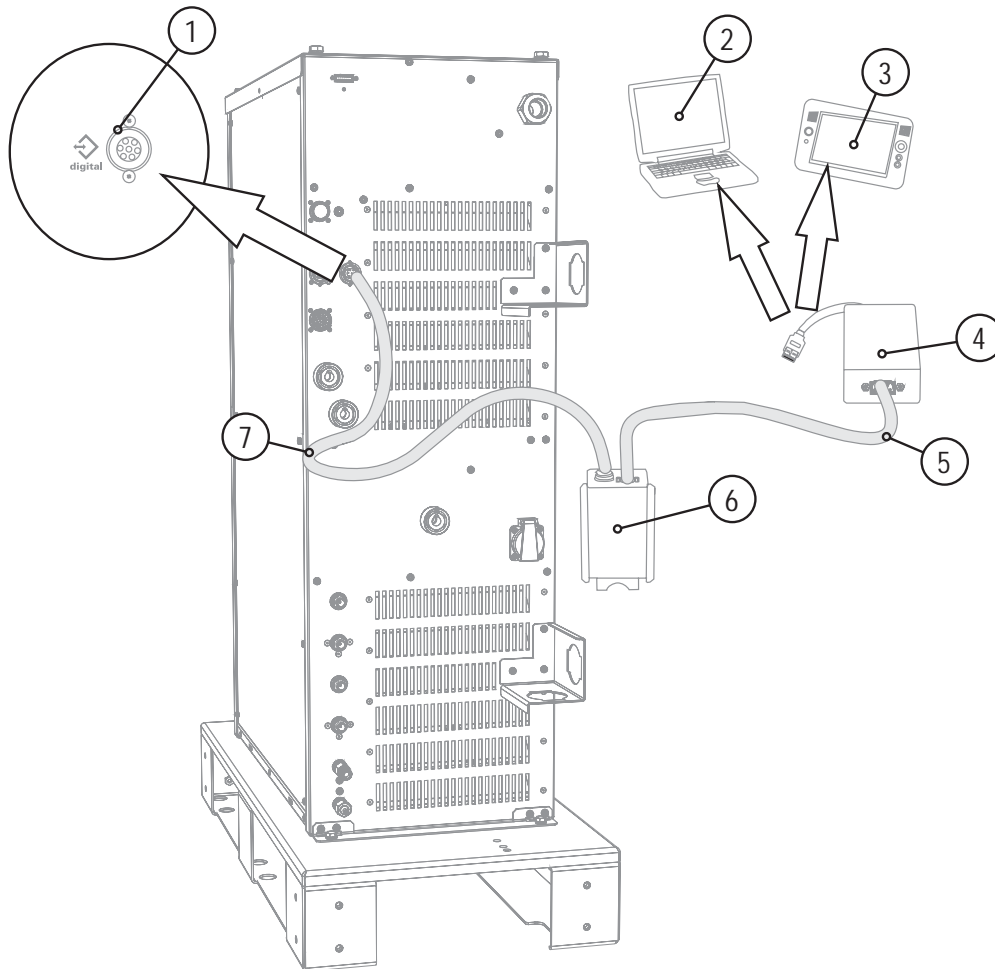
Figure 5-17

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)!

5.18.4 Connecting the WELDQAS welding data monitoring and documentation system

Network-compatible welding data monitoring and documentation system for digital power sources.
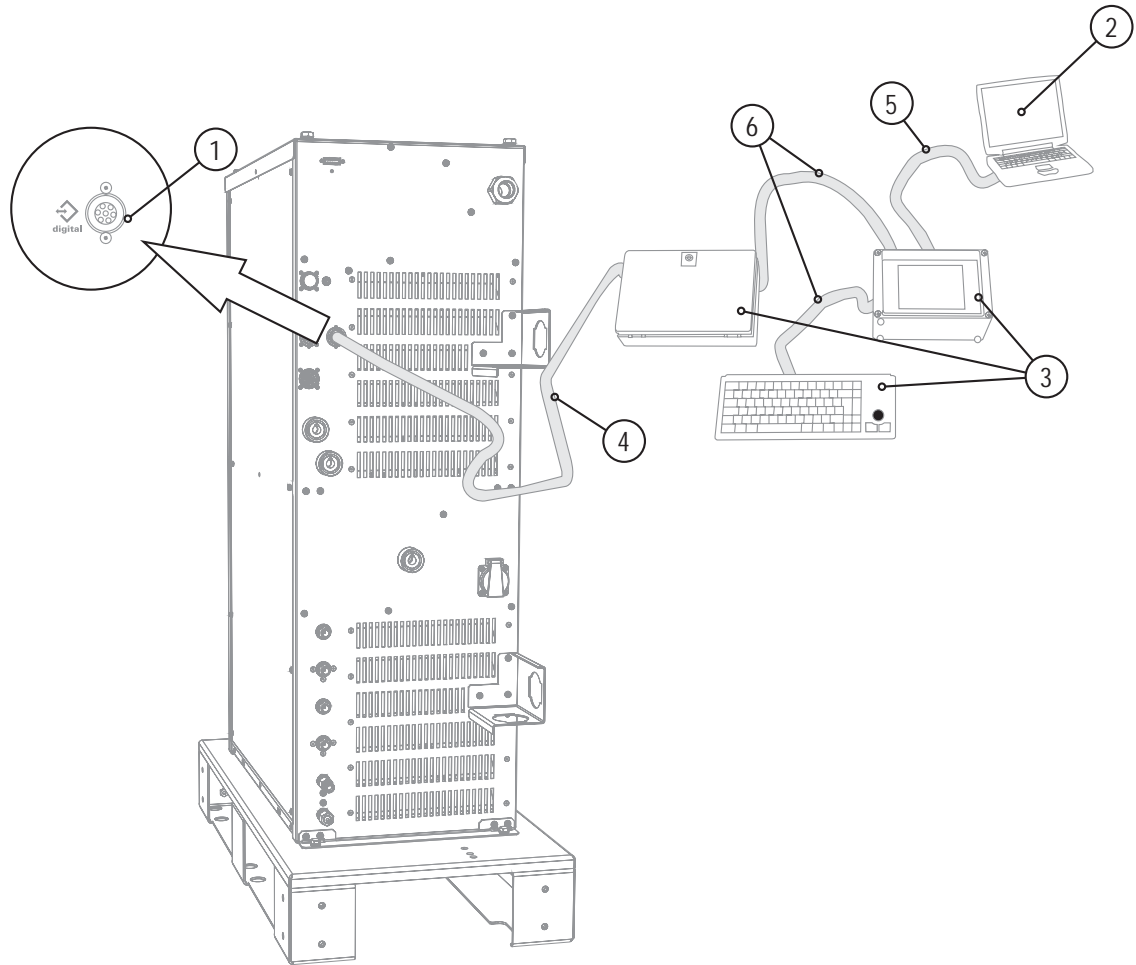
Figure 5-18

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**

5.18.5 Automation interface

> ### ⚠ WARNING
>
> **No function of the external shut-down devices (emergency stop switch)!**
> **If the emergency stop circuit has been realised using an external shut-down device via the interface for mechanised welding, the device must be set for this setup. If this is not observed, the power source will ignore the external shut-down devices 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.

PE	A
Pulsen ein	B
Festbrand	C
IGR0 Relais	D
Not/Aus	E
Sollwert Absenkstrom	F
IGRO Relais	G
Prozeßspannung Uist	H
+24V1	J
Phase o.k.	K
Str./Stp.	L
NC	M
Sollwert Grundstrom	N
NC	P
Not/Aus	R
0V	S
Prozeßstrom Iist	T
BR KOLL 1	U
BR KOLL 2	V
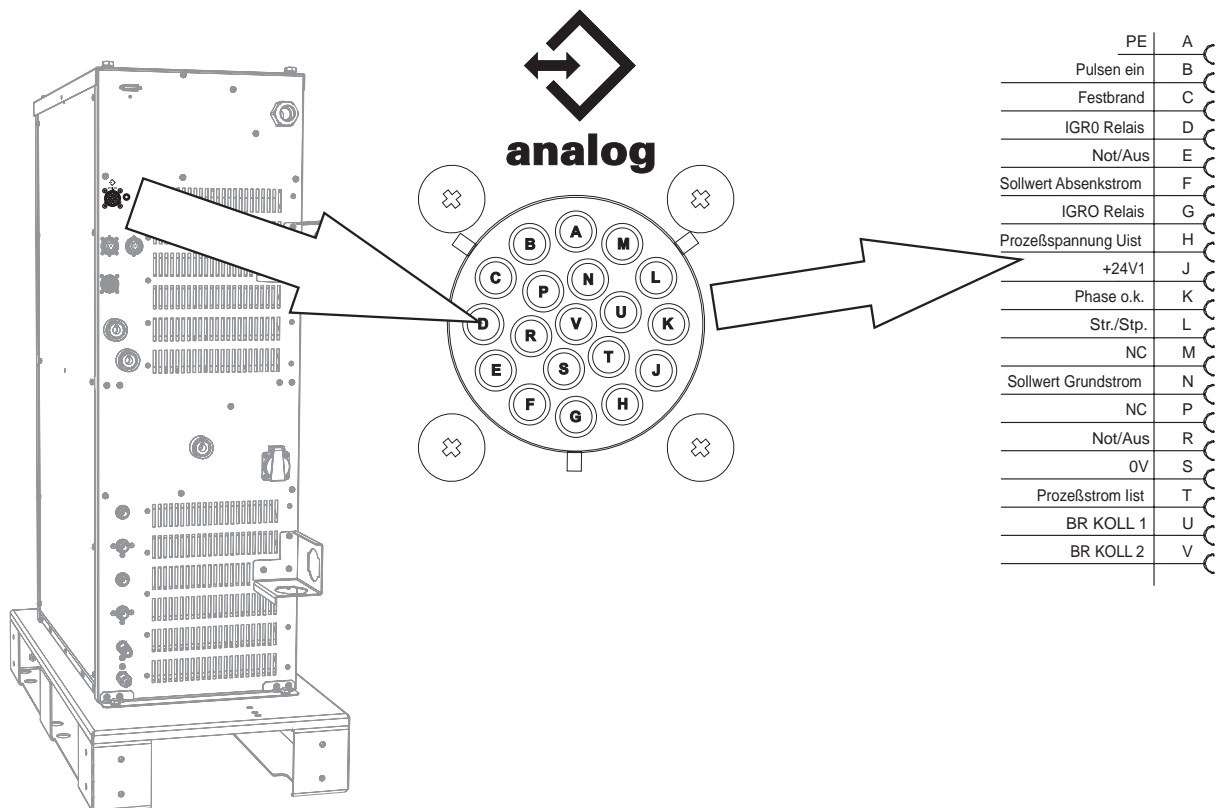
Figure 5-19

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 V = I^{min}/10 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 V = 0 V, 10 V = 100 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 V = 0 A, 10 V = 1000 A)
U	Input	BR. KOLL: 1	Emergency shutdown for anticollision device +24 V
V	Output	BR. KOLL. 2	Emergency shutdown for anticollision device

5.18.6 Connection socket automation torch
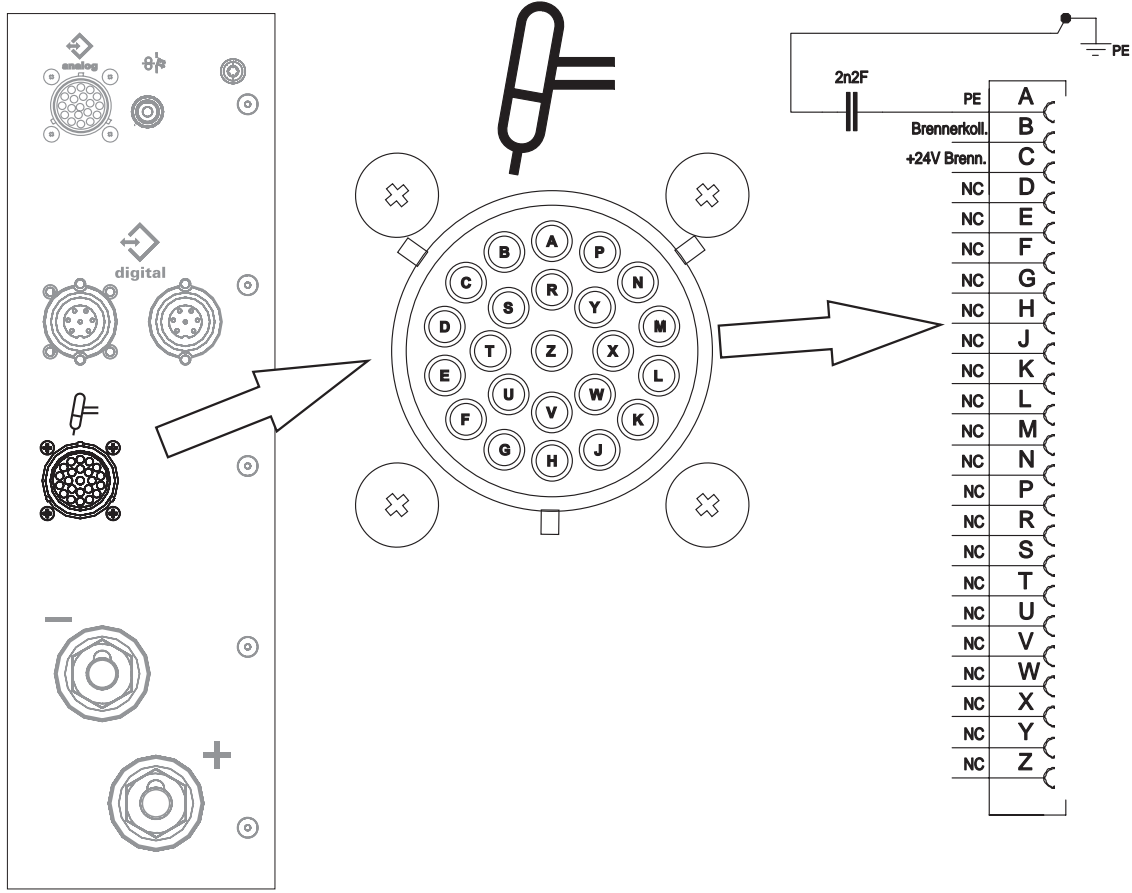
Figure 5-20

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 collision protection
C	Output	+24V Brenn.	Emergency shut-down collision protection + 24 V
D-Z		NC	not used

5.19 Advanced settings

5.19.1 Setting slope times for secondary current AMP% or pulse edges
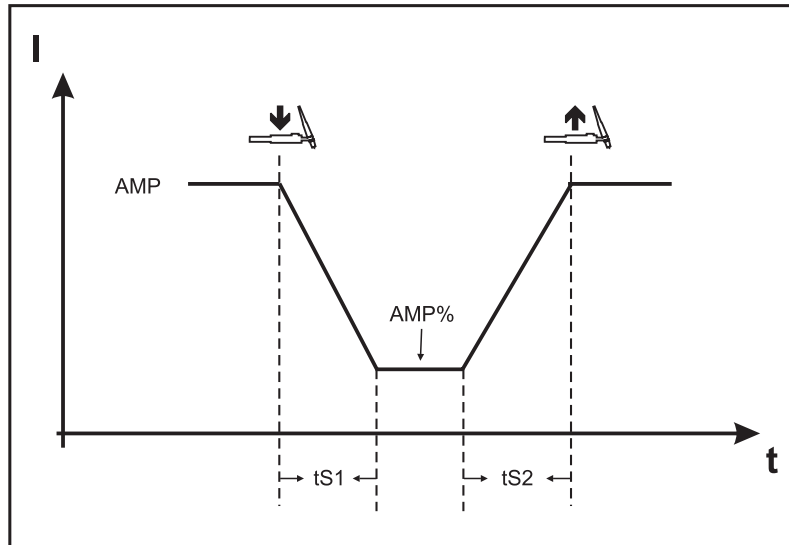
Figure 5-21
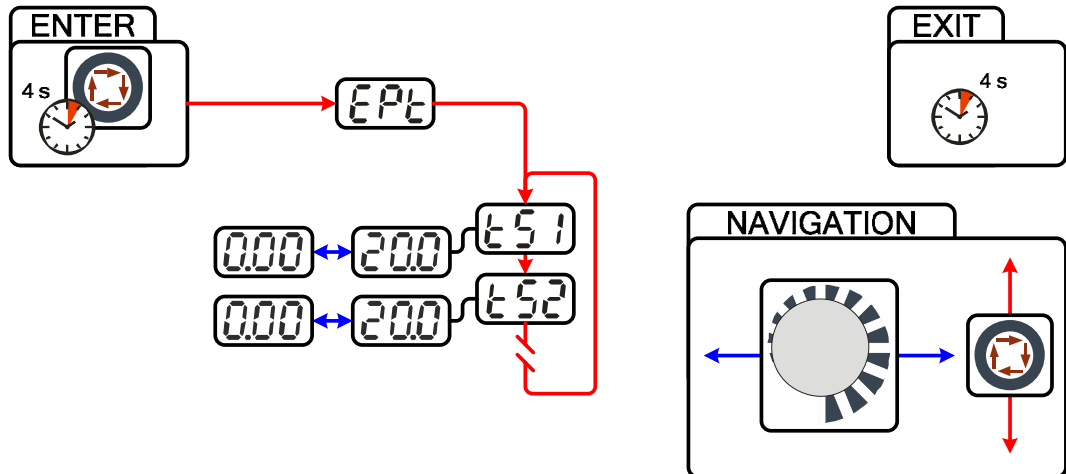
Figure 5-22

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 0.01 s)
tS2	**Slope time tS2 (secondary current to main current)** Setting: 0.00 s to 20.0 s (factory setting 0.01 s)

5.19.2 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.
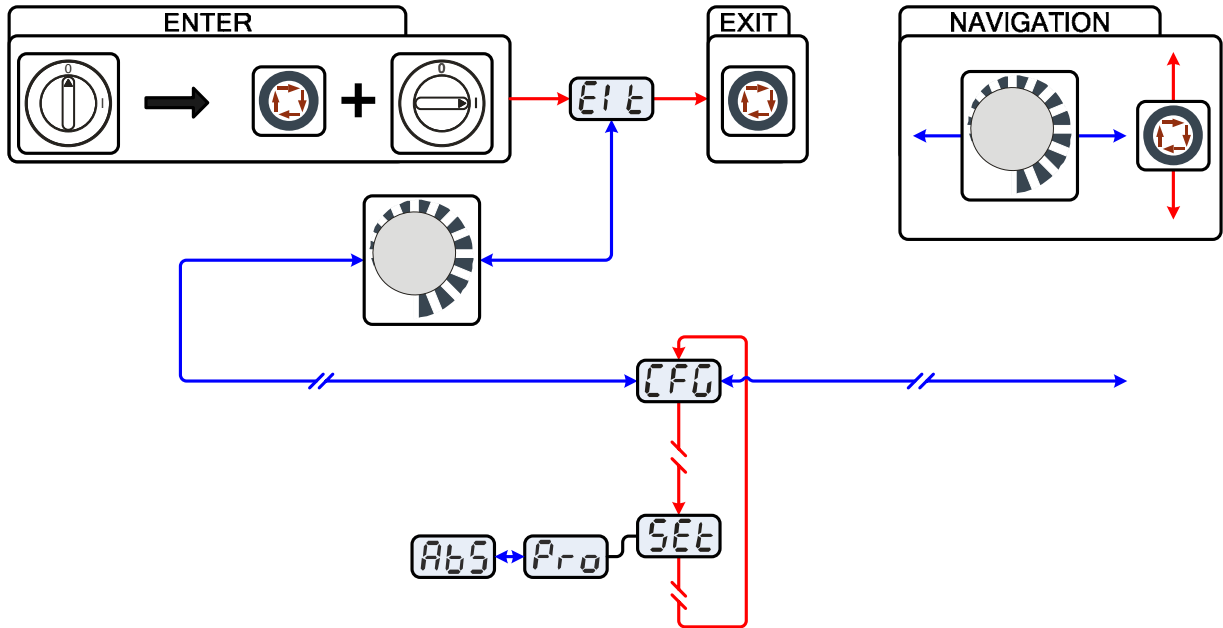
Figure 5-23

Display	Setting/selection
EIt	**Exit the menu** Exit
CFG	**Machine configuration** Settings for machine functions and parameter display
SEt	**Welding current display (ignition, secondary, end and hotstart currents)** • Pro = welding current display as a percentage of the main current • Abs = absolute welding current display (factory setting)

5.20 Menus and sub-menus on the machine control

5.20.1 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.

5.20.2 Expert menu (TIG)

The expert menu includes functions and parameters which are either not set on the machine control, or which do not require regular setting.
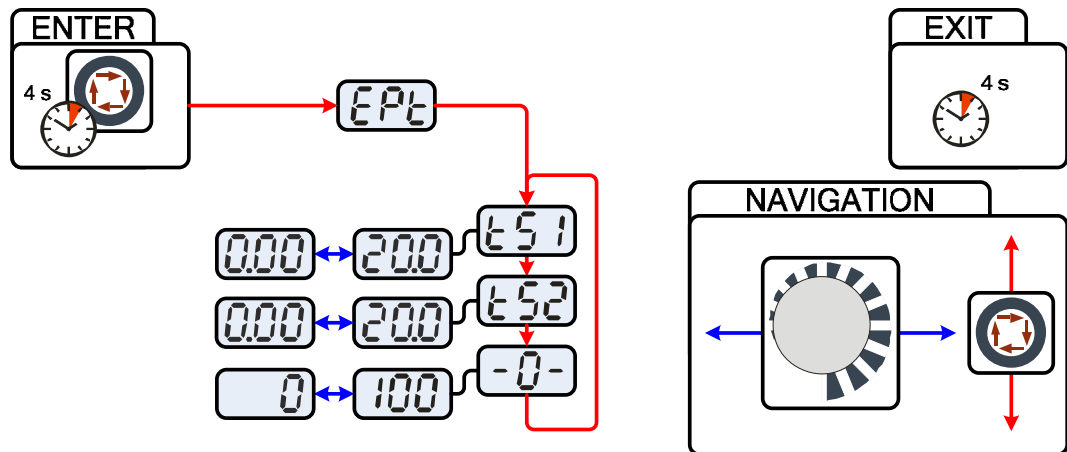
Figure 5-24

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 0.01 s)
tS2	**Slope time tS2 (secondary current to main current)** Setting: 0.00 s to 20.0 s (factory setting 0.01 s)
dur	**Wire return** • 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).
-0-	**activArc parameter** Parameter can also be set after activating TIG activArc welding. Display shown = factory setting.

NOTE
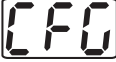
☞ **ENTER (enter the menu)**
   • Keep the "welding parameters" button pressed for 4 s.
   Navigating in the menu
   • Parameters are selected by pressing the "welding parameters" button.
   • Set or change the parameters by turning the "welding parameter setting" rotary dial.
   EXIT (leave the menu)
   • After 4 s, the machine will return automatically to the ready-to-operate status.

5.20.3 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 5-25

Display	Setting/selection
EIt	**Exit the menu** Exit
trd	**Torch configuration menu** Set welding torch functions
tod	**Torch mode (factory setting 1)**
dI	**Setting the first increment** Setting: 1 to 20 (factory setting 1)
uUd	**Up-/Down speed** Increase value = rapid current change (factory setting 10) Reduce value = slow current change
nrJ	**Get JOB number** Set maximum selectable jobs (setting: 1 to 128, factory setting 10). Additional parameter after activating the BLOCK JOB function.
StJ	**Start JOB** Set first JOB to get (setting: 129 to 256, factory setting 129).
CFG	**Machine configuration** Settings for machine functions and parameter display
$54n$	**Operating principle** • on = synergic parameter setting (factory setting) • off = conventional parameter setting
SEt	**Welding current display (ignition, secondary, end and hotstart currents)** • Pro = welding current display as a percentage of the main current (factory setting) • Abs = absolute welding current display
$2tc$	**Non-latched operation (C version)** • on = on • off = off (factory setting)
$dI\ S$	**Setting for the primary setpoint value display** Defines the priority display for setpoint values: • bld = panel thickness • vol = welding voltage (factory setting)
bJ	**RINT X12, JOB control for automation solutions** • on = on • off = off (factory setting)
rCd	**Power display switching (MMA)** • on = actual value display • off = setpoint value display (factory setting)
Snn	**spotMatic** Variation of operation mode spotArc, ignition with workpiece contact • on = on • off = off (factory setting)
FFr	**Ramp function Remote control RTF 1** The ramp function can be switched on and off
PUL	**Pulses in the upslope and downslope phases** The function can be switched on or off
CU	**Torch cooling mode** • AUt = automatic operation (ex works) • on = permanently switched on • off = permanently switched off
EPt	**Expert menu**

Display	Setting/selection
AAA	**activArc voltage measuring** • on = function on (factory setting) • off = function off
SAo	**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
AUt	**Automation menu**
FAu	**Fast take-over of control voltage (automation)** • on = function on • off = function off (factory setting)
orb	**Orbital welding** • off = off (ex works) • on = on
oCC	**Orbital welding** Correction value for orbital current
Sru	**Service menu** Modifications to the service menu may only be carried out by authorised maintenance staff!
rES	**Reset (reset to factory settings)** • 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).
rC	**Automated/Manual (rC on/off) operating mode** Select machine/function control on: with external control voltages/signals off: with machine control
07.0 **2c0**	**Software version query (example)** 07= System bus ID 02c0= Version number System bus ID and version number are separated by a dot.

6 Maintenance, care and disposal

> ⚠ **DANGER**
>
> **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

• Mains supply lead and its strain relief
• Welding current cables (check that they are fitted correctly and secured)
• Gas tubes and their switching equipment (solenoid valve)
• Gas cylinder securing elements
• Operating, message, safety and adjustment devices (Functional test)
• Other, general condition

6.2.2 Monthly maintenance tasks

• Casing damage (front, rear and side walls)
• Selector switches, command devices, emergency stop devices, voltage reducing devices, message and control lamps
• Check coolant tubes and their connections for impurities

6.2.3 Annual test (inspection and testing during operation)

> *NOTE*
>
> ☞ **The welding machine may only be tested by competent, capable personsl.**
> **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 tube 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 tube 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 HIGHTEC Welding GmbH 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

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

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 diffuser 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

⚒ Rinse 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.**

- 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/tube package
	Wire feed unit not connected	• Switch off cold wire mode in the device configuration menu (off status) • Connect wire feed unit
Err 4	Temperature error	Allow machine to cool down.
	Error in emergency stop circuit (interface for mechanised welding)	• Check the external shut-down equipment • Check plug-in jumper JP 1 on PCB T320/1
Err 5	Overvoltage	Switch off the machine and check mains voltages
Err 6	Undervoltage	
Err 7	Coolant error (only if cooling module connected)	Check coolant level and refill if necessary
Err 8	Gas error	Check gas supply
Err 9	Secondary overvoltage	Switch the machine off and on again.
Err 10	PE error	If the error persists, inform the service dept.
Err 11	FastStop position	Edge "Acknowledge error" signal (0 to 1) via robot interface (if available)
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): • 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?	• 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
Err 19	Shielding gas Nominal value significantly different from actual value -> No shielding gas?	• Check that the gas supply lead of the plasma torch is not blocked Reset error via robot interface (reset error)

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 • 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	• 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	• Allow equipment to cool down • Adjust processing cycle times if necessary Reset error via robot interface (reset error)
Err 51	Error in emergency stop circuit (interface for mechanised welding)	• Check the external shut-down equipment • Check plug-in 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.**
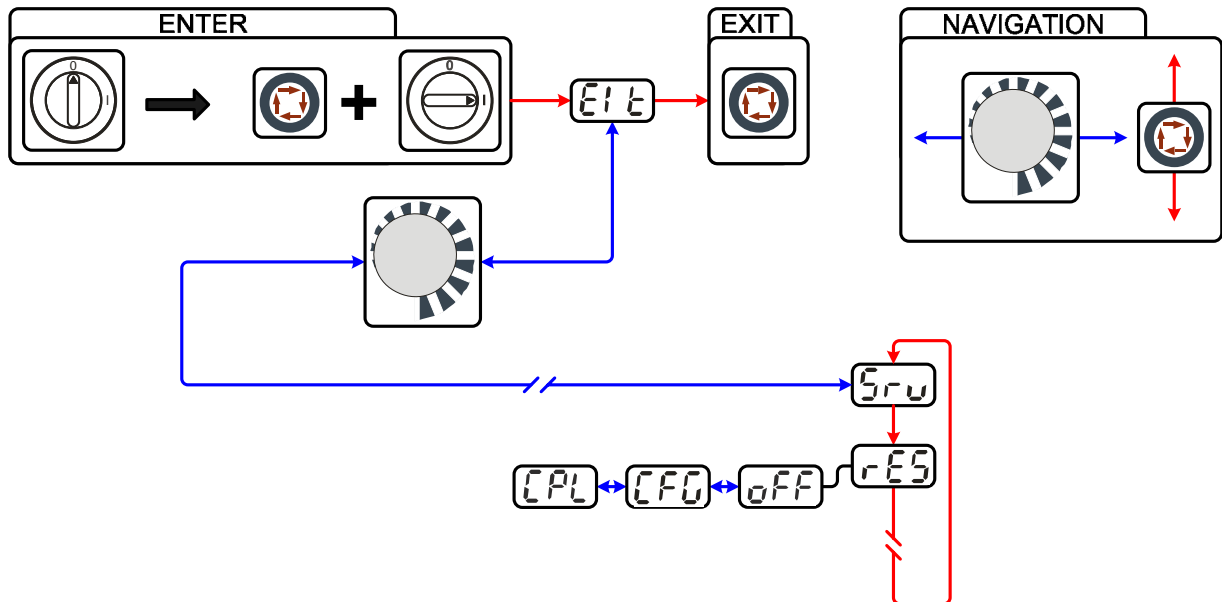
Figure 7-1

Display	Setting/selection
`EIt`	**Exit the menu** Exit
`Srv`	**Service menu** Modifications to the service menu may only be carried out by authorised maintenance staff!
`rES`	**Reset (reset to factory settings)** • 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).
`oFF`	**Switch off** Switching off machine function
`CFG`	**Reset machine configuration** Resetting the values in the machine configuration menu
`CPL`	**Complete reset** Complete reset of all values and settings by the factory settings

7.4   Display machine control software version
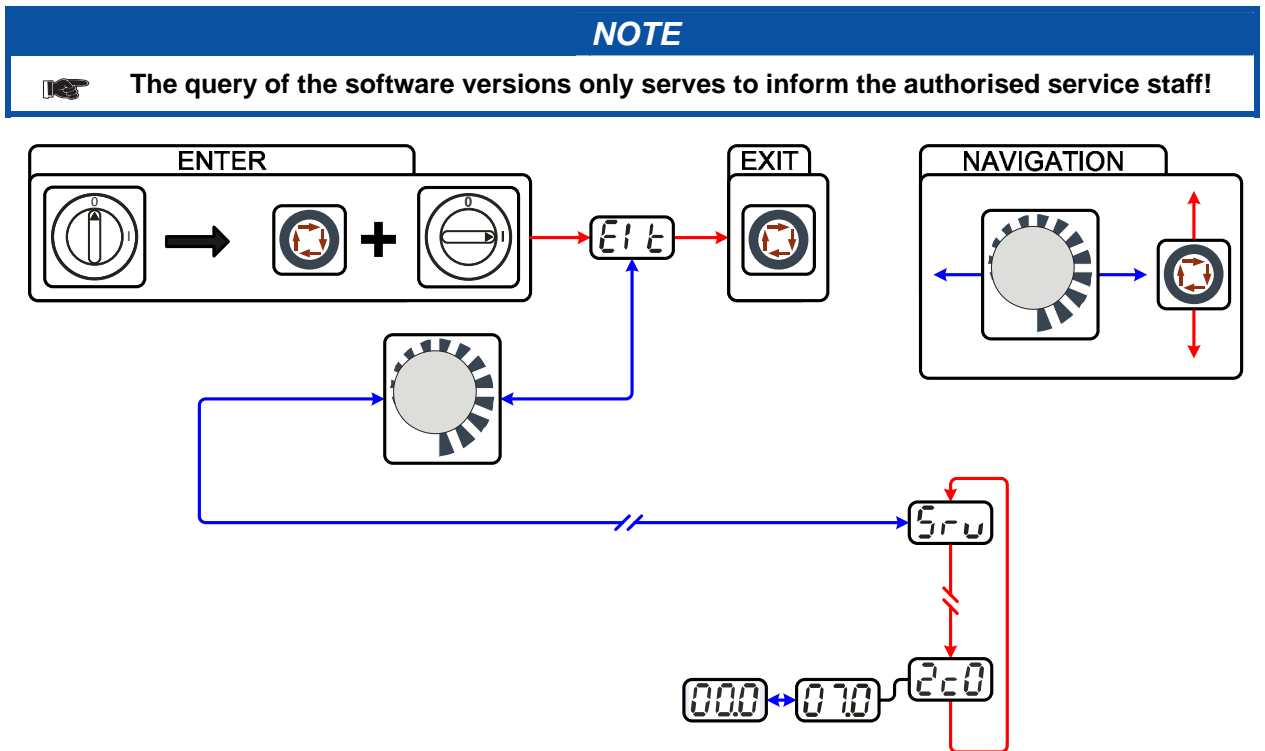
Figure 7-2

Display	Setting/selection
`EIt`	**Exit the menu** Exit
`Sru`	**Service menu** Modifications to the service menu may only be carried out by authorised maintenance staff!
`07.0` `2c0`	**Software version query (example)** 07= System bus ID 02c0= Version number System bus ID and version number are separated by a dot.

7.5   General operating problems

7.5.1   Interface for mechanised welding

⚠ **WARNING**
No function of the external shut-down devices (emergency stop switch)!   **If the emergency stop circuit has been realised using an external shut-down device via the interface for mechanised welding, the device must be set for this setup. If this is not observed, the power source will ignore the external shut-down devices 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)!**
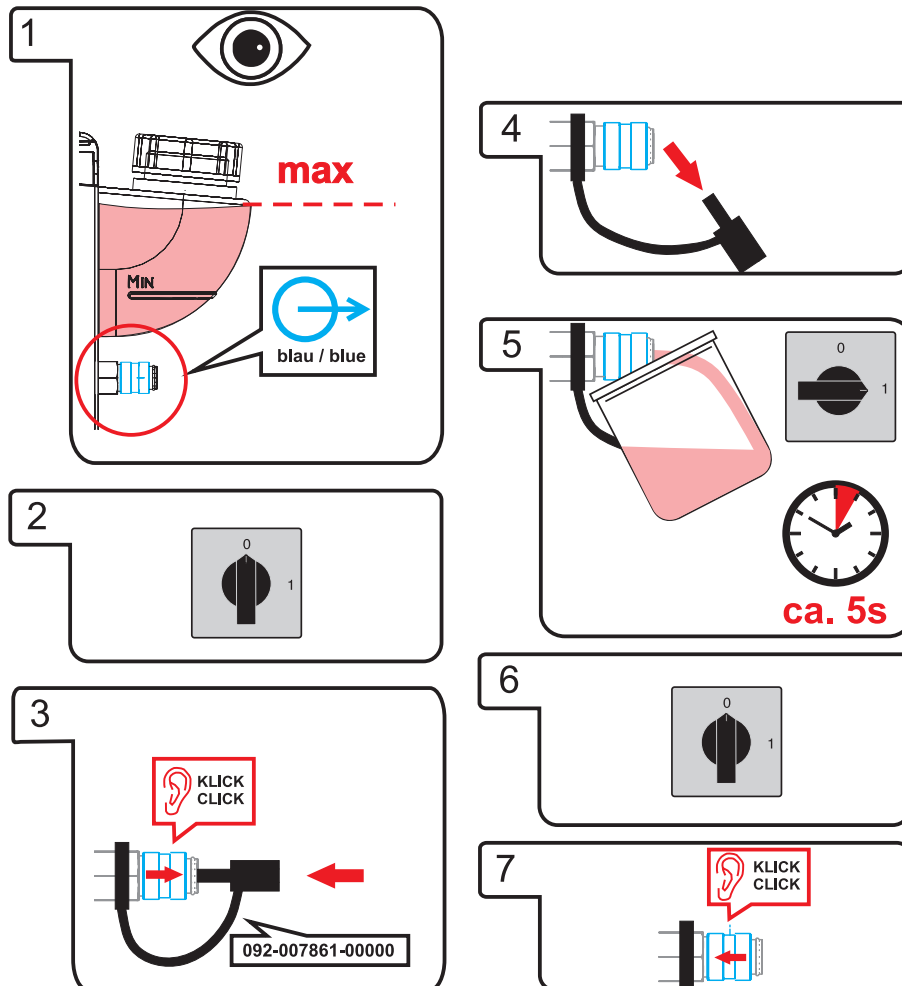
Figure 7-3

8 Technical data

> **NOTE**
>
> ☞ **Performance specifications and guarantee only in connection with original spare and replacement parts!**

8.1 Tetrix 152, 352, 552 Synergic Plasma

	152	352	552
Welding current	5 A to 150 A	5 A to 350	5 A to 550 A
Welding voltage	25.2 V bis 31.0 V	25.2 V to 39.0 V	25.2 V to 47.0 V
Plasma current (Hilibo)	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	150 A	350 A	420 A
60% DC	-	-	550 A
Load alternation	10 min. (60% DC ≙ 6 min. welding, 4 min. pause)		
Floating voltage	79 V		
Mains voltage (tolerances)	3 x 400 V (-25% to +20%)		
Frequency	50/60 Hz		
Mains fuse (safety fuse, slow-blow)	3 x 16 A	3 x 35 A	3 x 35 A
Mains connection lead	H07RN-F5G6	H07RN-F5G6	H07RN-F5G6
Max. connected load	7.2 kVA	18.6 kVA	34 kVA
Recommended generator rating	9.7 kVA	25.1 kVA	45.9 kVA
Cosφ	0.99		
Insulation class/protection classification	F/IP 23		
Ambient temperature*	-20 °C to +40 °C*		
Machine cooling/torch cooling	Fan/gas or water		
Workpiece lead	70 mm^2	95 mm^2	95 mm^2
Dimensions L x W x H in mm	1125 / 460 / 930		
Weight	132 kg		
EMC class	A		
Constructed to standards	IEC 60974-1, -3, -10; Ⓢ; CE		

> **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.
RK1	Reverse cooling unit	094-002283-00000
RK2	Reverse cooling unit	094-002284-00000
RK3	Reverse cooling unit	094-002285-00000
HOSE BRIDGE	Tube bridge	092-007857-00000
DKF10	Deionised coolant, no frost protection	094-001504-00000

9.2 General accessories

Type	Designation	Item no.
GDE2	Gas metering unit with 2 gas quantity meters	090-008077-00000
GDE2.1	Gas metering unit	090-S08077-01033
GDE3	Gas metering unit with 3 gas quantity meters	090-008081-00000
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

9.3 Connection cables, connection sockets

Type	Designation	Item no.
5POLE/CEE/32A/M	Machine plug	094-000207-00000
5POLE/CEE/63A/M	Machine plug	094-003410-00000

9.4 Options

Type	Designation	Item no.
ON Key Switch	Optional retrofit kit for key switch	092-001828-00000

9.5 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 set incl. cable and SECINT X10 USB interface	090-008265-00000
WELDQAS2 Station	Stationary welding data monitoring and docu set for two welding machines	090-008218-00000
QDOC9000 V2.0	Set consisting of interface, documentation software, connection lead	090-008713-00000

9.6 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

9.7 Connection and extension cables

Type	Designation	Item no.
FRV5-L 7POL	Extension/connecting cable	092-000201-00003
FRV10-L 7POL	Extension/connecting cable	092-000201-00000
FRV20-L 7POL	Extension/connecting cable	092-000201-00001

9.8 Connection cables

Type	Designation	Item no.
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 152, 352, 552 Synergic Plasma

Figure 10-1

Figure 10-2

Figure 10-3

Figure 10-4

11 Appendix A

11.1 JOB-List

JOB	TIG	TIG hot wire	TIG cold wire	MMA	Material	0,6	0,8	1,0	1,2	1,6	Fillet weld	Butt joint	Fillet weld lap joint	Vertical-down weld	Tungsten electrode Ø
	Process				Material	Wire Ø					Seam position				
1	Reserved														
2	☑				CrNi						☑				1
3	☑				CrNi						☑				1.6
4	☑				CrNi						☑				2
5	☑		☑		CrNi		☑	☑	☑		☑				2.4
6	☑		☑		CrNi		☑	☑	☑		☑				3.2
7	☑		☑		CrNi		☑	☑	☑		☑				>3.2
8	☑				CrNi							☑			1
9	☑				CrNi							☑			1.6
10	☑				CrNi							☑			2
11	☑		☑		CrNi		☑	☑	☑			☑			2.4
12	☑		☑		CrNi		☑	☑	☑			☑			3.2
13	☑		☑		CrNi		☑	☑	☑			☑			>3.2
14	☑				CrNi								☑		1
15	☑				CrNi								☑		1.6
16	☑				CrNi								☑		2
17	☑		☑		CrNi		☑	☑	☑				☑		2.4
18	☑		☑		CrNi		☑	☑	☑				☑		3.2
19	☑		☑		CrNi		☑	☑	☑				☑		>3.2
20	☑				CrNi									☑	1
21	☑				CrNi									☑	1.6
22	☑				CrNi									☑	2
23	☑		☑		CrNi		☑	☑	☑					☑	2.4
24	☑		☑		CrNi		☑	☑	☑					☑	3.2
25	☑		☑		CrNi		☑	☑	☑					☑	>3.2
26	☑				Fe/St						☑				1
27	☑				Fe/St						☑				1.6
28	☑				Fe/St						☑				2
29	☑		☑		Fe/St		☑	☑	☑		☑				2.4
30	☑		☑		Fe/St		☑	☑	☑		☑				3.2
31	☑		☑		Fe/St		☑	☑	☑		☑				>3.2
32	☑				Fe/St							☑			1
33	☑				Fe/St							☑			1.6
34	☑				Fe/St							☑			2
35	☑		☑		Fe/St		☑	☑	☑			☑			2.4

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

JOB	TIG	TIG hot wire	TIG cold wire	MMA	Material	0,6	0,8	1,0	1,2	1,6	Fillet weld	Butt joint	Fillet weld lap joint	Vertical-down weld	Tungsten electrode Ø
74	☑				CuZn						☑				1
75	☑				CuZn						☑				1.6
76	☑				CuZn						☑				2
77	☑		☑		CuZn			☑			☑				2.4
78	☑		☑		CuZn			☑			☑				3.2
79	☑				CuZn						☑				>3.2
80	☑				CuZn							☑			1
81	☑				CuZn							☑			1.6
82	☑				CuZn							☑			2
83	☑		☑		CuZn			☑				☑			2.4
84	☑		☑		CuZn			☑				☑			3.2
85	☑				CuZn							☑			>3.2
86	☑				CuZn								☑		1
87	☑				CuZn								☑		1.6
88	☑				CuZn								☑		2
89	☑		☑		CuZn			☑					☑		2.4
90	☑		☑		CuZn			☑					☑		3.2
91	☑				CuZn								☑		>3.2
92	☑				CuZn									☑	1
93	☑				CuZn									☑	1.6
94	☑				CuZn									☑	2
95	☑		☑		CuZn			☑						☑	2.4
96	☑		☑		CuZn			☑						☑	3.2
97	☑				CuZn									☑	>3.2
98	☑				Special						☑				1
99	☑				Special						☑				1.6
100	☑				Special						☑				2
101	☑				Special						☑				2.4
102	☑				Special						☑				3.2
103	☑				Special						☑				>3.2
104	☑				Special							☑			1
105	☑				Special							☑			1.6
106	☑				Special							☑			2
107	☑				Special							☑			2.4
108	☑				Special							☑			3.2
109	☑				Special							☑			>3.2
110	☑				Special								☑		1
111	☑				Special								☑		1.6

JOB	TIG	TIG hot wire	TIG cold wire	MMA	Material	0,6	0,8	1,0	1,2	1,6	Fillet weld	Butt joint	Fillet weld lap joint	Vertical-down weld	Tungsten electrode Ø
112	☑				Special								☑		2
113	☑				Special								☑		2.4
114	☑				Special								☑		3.2
115	☑				Special								☑		>3.2
116	☑				Special									☑	1
117	☑				Special									☑	1.6
118	☑				Special									☑	2
119	☑				Special									☑	2.4
120	☑				Special									☑	3.2
121	☑				Special									☑	>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	☑	☑			CrNi		☑	☑	☑		☑				2.4
181	☑	☑			CrNi		☑	☑	☑		☑				3.2
182	☑	☑			CrNi		☑	☑	☑		☑				>3.2
183	☑	☑			FeSt		☑	☑	☑		☑				2.4
184	☑	☑			FeSt		☑	☑	☑		☑				3.2
185	☑	☑			FeSt		☑	☑	☑		☑				>3.2
186	☑	☑			CuSi			☑			☑				2.4
187	☑	☑			CuSi			☑			☑				3.2
188-207	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 Imax														

☐ not possible
☑ possible

12 Appendix B
12.1 Overview of EWM branches

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