



Welding machine

Tetrix 351, 451, 551 AC/DC Classic FWD

099-000107-EW501

11.08.2011

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General instructions

CAUTION



Read the operating instructions!

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

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

NOTE



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

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

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

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

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

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2 Safety instructions

2.1 Notes on the use of these operating instructions



DANGER

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

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



WARNING

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

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



CAUTION

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

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

CAUTION

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

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

NOTE








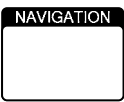





Special technical points which users must observe.

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

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

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

2.2 Explanation of icons

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

2.3 General

DANGER



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!



Electromagnetic fields!

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

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



Do not carry out any unauthorised repairs or modifications!

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

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

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

WARNING



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!



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!

 **WARNING****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!

**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!

 **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/EEG), as well as the associated individual directives.
- In particular, directive (89/655/EEG), 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!

CAUTION



Risk of tipping!

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

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



Damage due to supply lines not being disconnected!

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

- Disconnect supply lines!

CAUTION



Equipment damage when not operated in an upright position!

The units are designed for operation in an upright position!

Operation in non-permissible positions can cause equipment damage.

- Only transport and operate in an upright position!

2.4.1 Lifting by crane

 **DANGER****Risk of injury during lifting by crane!**

When lifting the equipment by crane, serious injuries can be inflicted by falling equipment or add-on units.

- Transport on all lifting lugs at the same time (see Fig. Lifting principle)!
- Ensure that there is an even load distribution! Only use ring chains or suspension ropes of the same length!
- Observe the lifting principle (see Fig.)!
- Remove all accessory components before lifting (e.g. shielding gas cylinders, tool boxes, wire feed units, etc.)!
- Avoid jerky movements when raising or lowering!
- Use shackles and load hooks of the appropriate size!

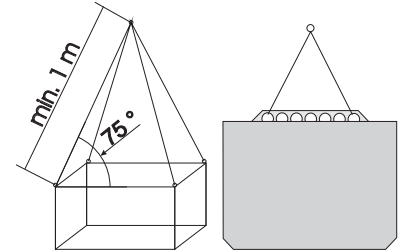


Fig. Lifting principle

**Risk of injury due to unsuitable ring screws!**

In case of improper use of ring screws or the use of unsuitable ring screws, persons can be seriously damaged by falling equipment or add-on components!

- The ring screw must be completely screwed in!
- The ring screw must be positioned flat onto and in full contact with the supporting surfaces!
- Check that the ring screws are securely fastened before use and check for any damage (corrosion, deformation)!
- Do not use or screw in damaged ring screws!
- Avoid lateral loading of the ring screws!

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

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 TIG welding

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

3.1.2 MMA welding

Manual arc welding or, for short, MMA welding. It is characterised by the fact that the arc burns between a melting electrode and the molten pool. There is no external protection; any protection against the atmosphere comes from the electrode.

3.2 Documents which also apply

3.2.1 Warranty

NOTE



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

3.2.2 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.

3.2.3 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.

3.2.4 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

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 Tetrix 351 AC/DC

4.1.1 Front view

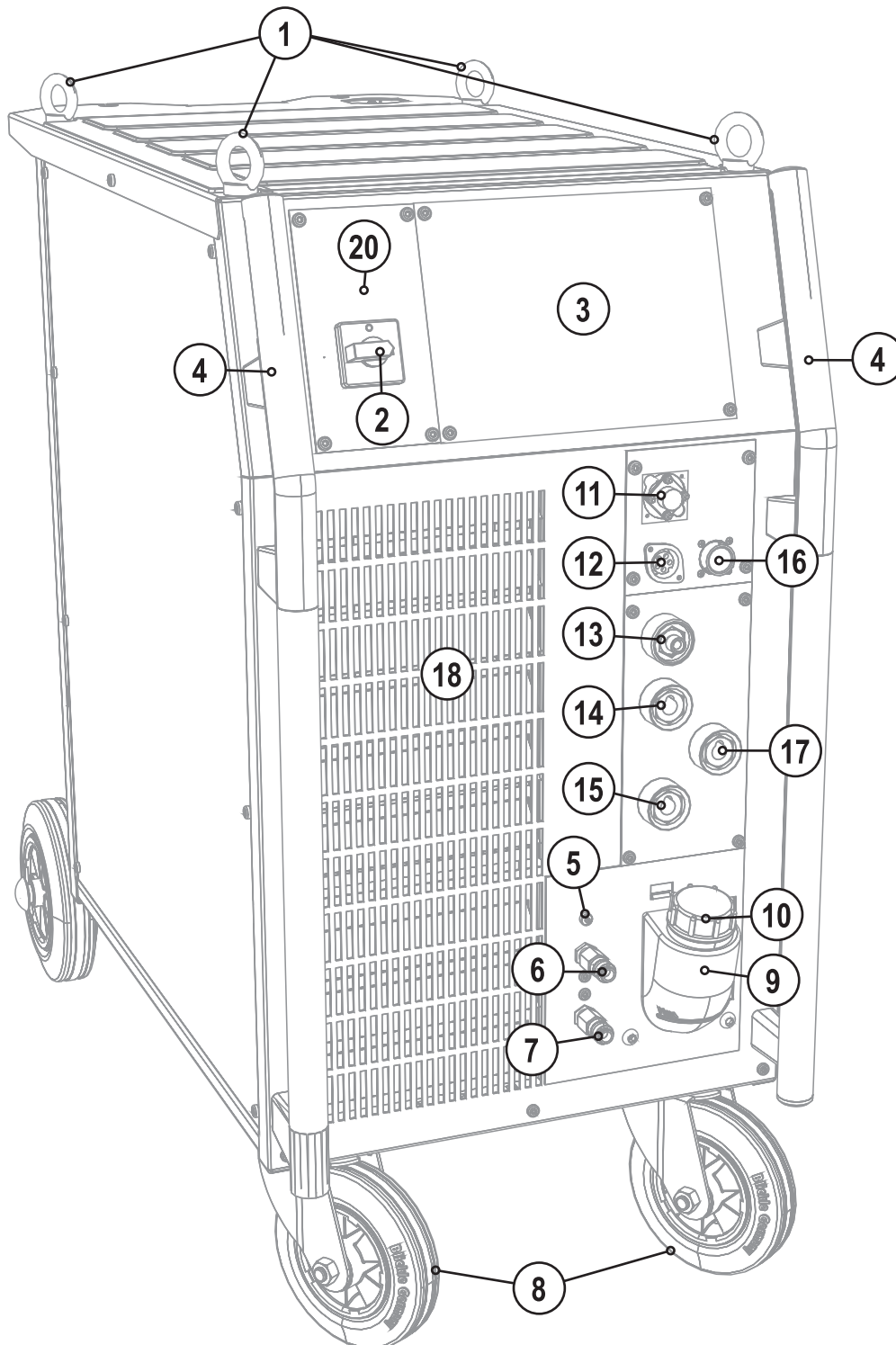


Figure 4-1

Item	Symbol	Description
1		Lifting lug
2		Main switch, machine on/off
3		Machine control See Machine control – operating elements chapter
4		Carrying handle
5		Automatic cut-out of coolant pump key button press to reset a triggered fuse
6		Quick connect coupling (red) coolant return
7		Quick connect coupling (blue) coolant supply
8		Wheels, guide castors
9		Coolant tank
10		Coolant tank cap
11		Connection socket, 8-pole TIG Up/Down or potentiometer torch control lead
12		Connection socket, 5-pole Standard TIG torch control lead
13		G1/4" connecting nipple, "-" welding current Shielding gas connection (with yellow insulating cap) for TIG welding torch
14		Connection socket, "-" welding current TIG welding torch connection
15		Connection socket, "+" welding current Connection for workpiece lead
16		Connection socket, 19-pole Remote control connection
17		Connection socket, "-" welding current Electrode holder connection
18		Cooling air inlet
19		Operating state signal lamp Lights up when the machine is ready for use.

4.1.2 Rear view

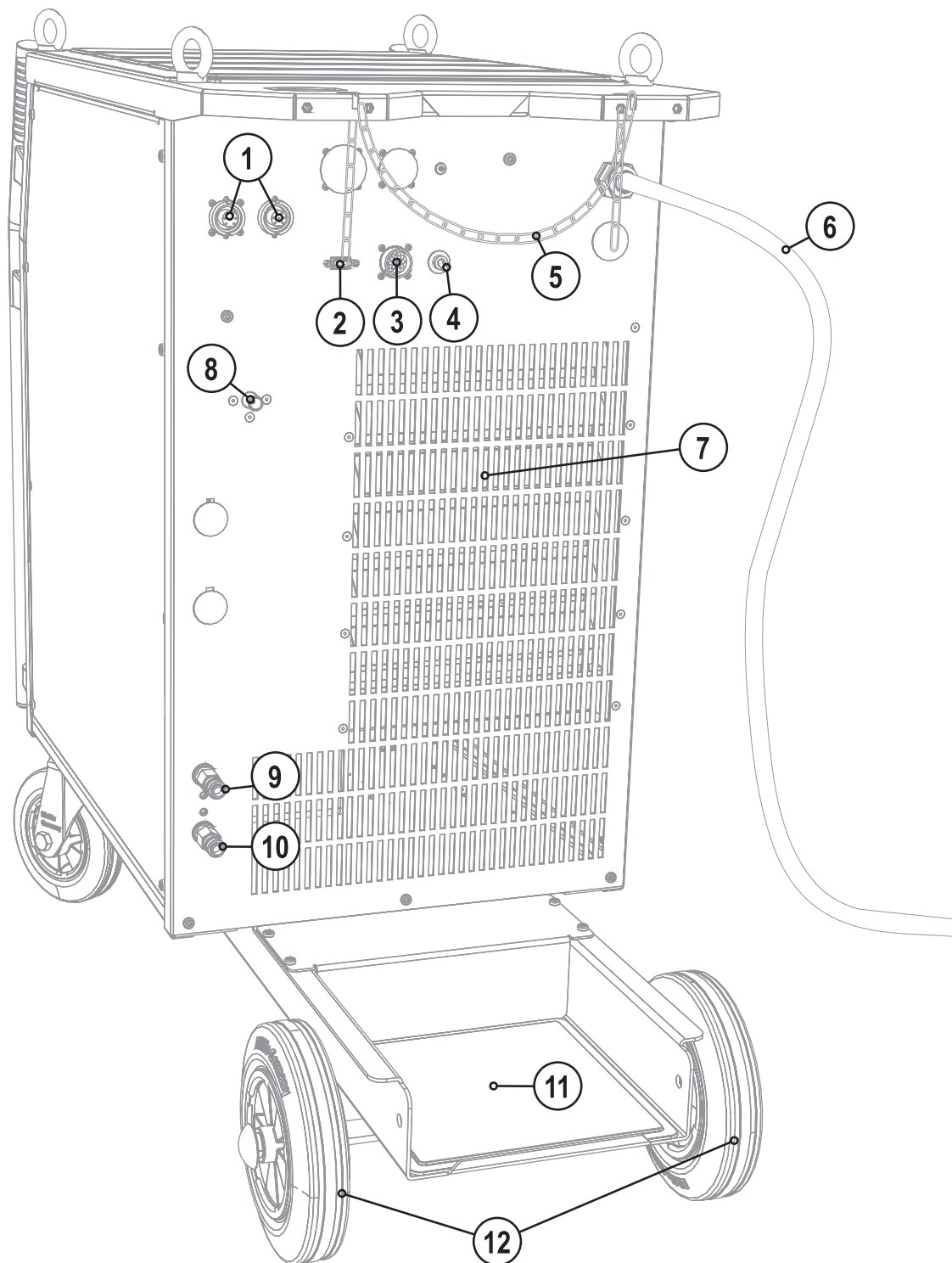









Figure 4-2

Item	Symbol	Description
1		7-pole connection socket (digital) For connecting digital accessory components
2		PC interface, serial (D-Sub connection socket, 9-pole)
3	 analog	19-pole mechanised welding interface (analogue) (See chapter entitled "Design and function > interfaces".)
4	 HF	Ignition type changeover switch HF = Liftarc (contact ignition) HF = HF ignition
5		Securing elements for shielding gas cylinder (strap/chain)
6		Mains connection cable
7		Cooling air outlet
8		G$\frac{1}{4}$" connecting nipple Shielding gas connection on the pressure regulator
9		Quick connect coupling (red) coolant return
10		Quick connect coupling (blue) coolant supply
11		Bracket for shielding gas cylinder
12		Wheels, fixed castors

4.2 Tetrix 451, 551 AC/DC

4.2.1 Front view

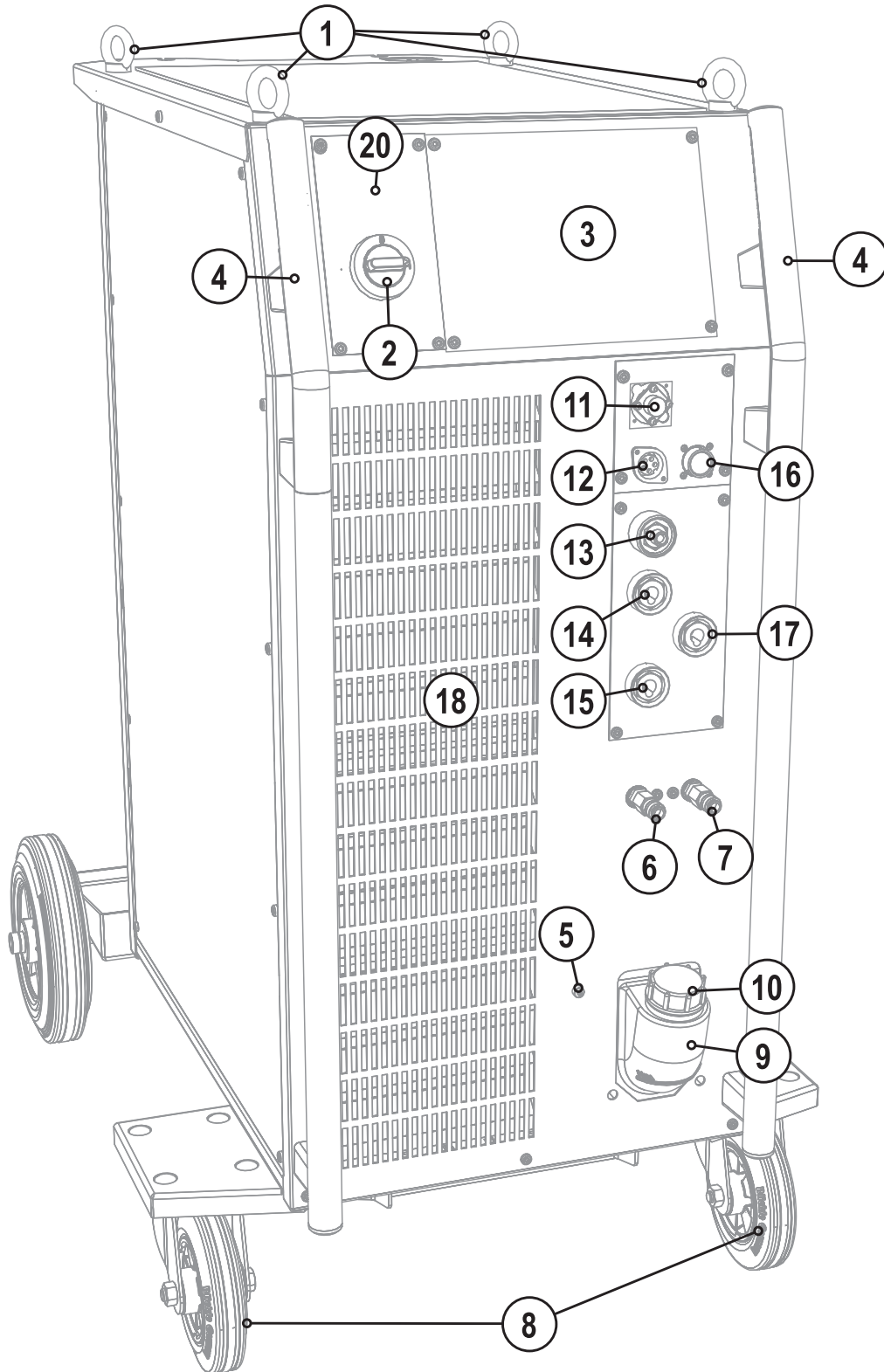


Figure 4-3

Item	Symbol	Description
1		Lifting lug
2		Main switch, machine on/off
3		Machine control See Machine control – operating elements chapter
4		Carrying handle
5		Automatic cut-out of coolant pump key button press to reset a triggered fuse
6		Quick connect coupling (red) coolant return
7		Quick connect coupling (blue) coolant supply
8		Wheels, guide castors
9		Coolant tank
10		Coolant tank cap
11		Connection socket, 8-pole TIG Up/Down or potentiometer torch control lead
12		Connection socket, 5-pole Standard TIG torch control lead
13		G1/4" connecting nipple, welding current "-" (with DC- polarity) Shielding gas connection (with yellow insulating cap) for TIG welding torch
14		Connection socket, welding current "-" (with DC- polarity) connection TIG welding torch
15		Connection socket, welding current "+" (with DC- polarity) Connection for workpiece lead
16		Connection socket, 19-pole Remote control connection
17		Connection socket, welding current "-" (with DC- polarity) connection for Electrode holder
18		Cooling air inlet
19		Operating state signal lamp Lights up when the machine is ready for use.

4.2.2 Rear view

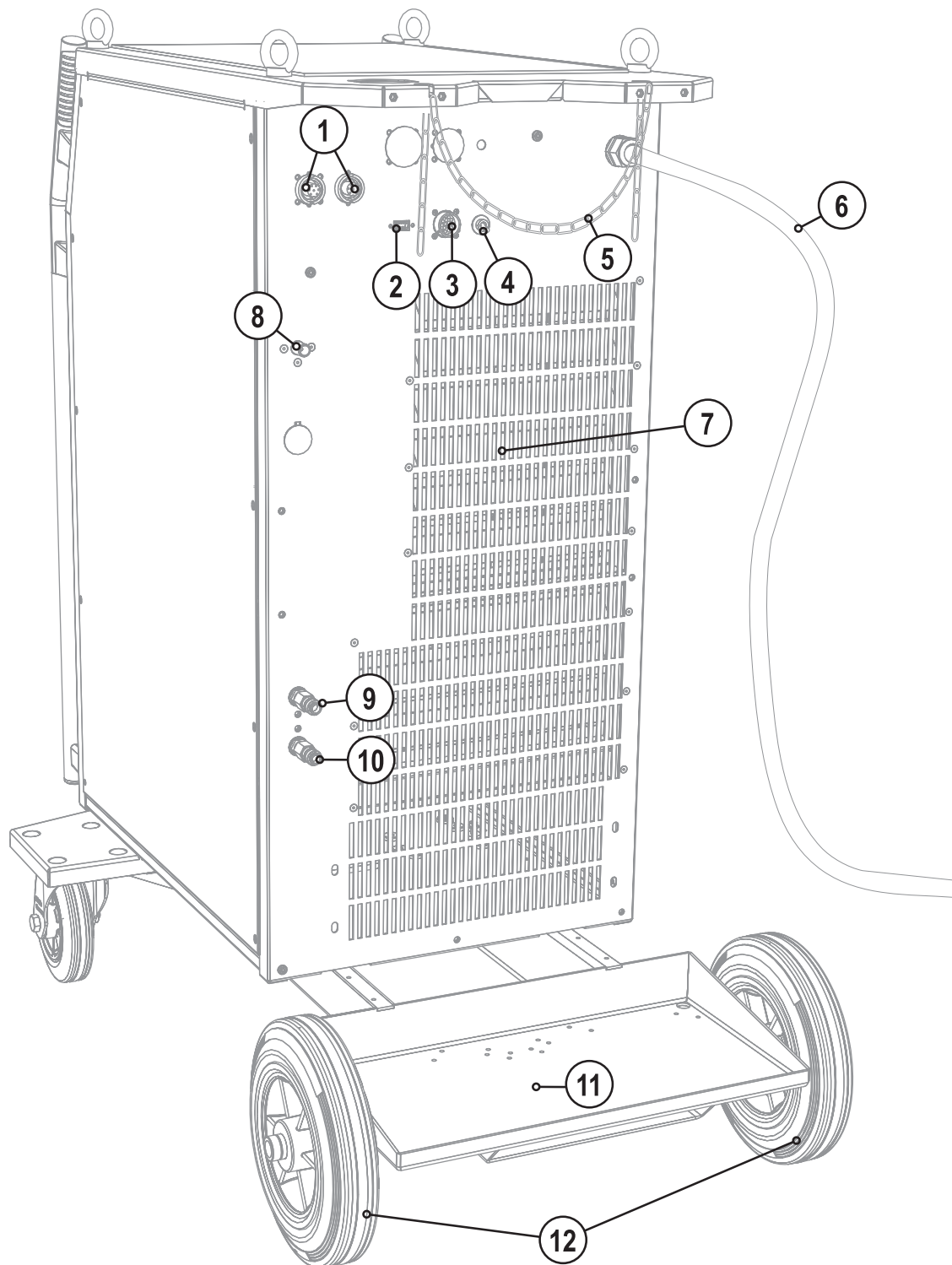









Figure 4-4

Item	Symbol	Description
1	 digital	7-pole connection socket (digital) For connecting digital accessory components (documentation interface, robot interface or remote control, etc.).
2	 COM	PC interface, serial (D-Sub connection socket, 9-pole)
3	 analog	19-pole mechanised welding interface (analogue) (See chapter entitled "Design and function > interfaces".)
4	 HF	Ignition type changeover switch HF = Liftarc (contact ignition) HF = HF ignition
5		Securing elements for shielding gas cylinder (strap/chain)
6		Mains connection cable
7		Cooling air outlet
8		G¹/₄" connecting nipple Shielding gas connection on the pressure regulator
9		Quick connect coupling (red) coolant return
10		Quick connect coupling (blue) coolant supply
11		Bracket for shielding gas cylinder
12		Wheels, fixed castors

4.3 Machine control – Operating elements

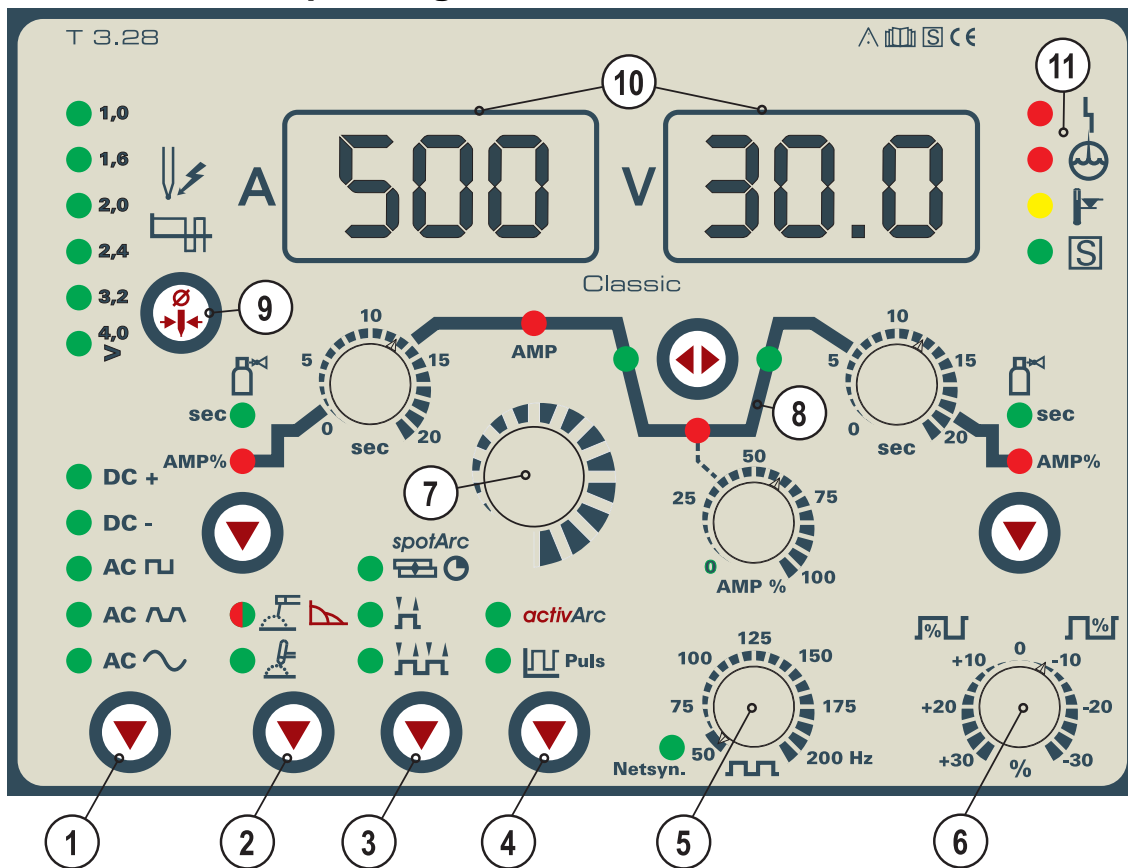
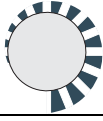









Figure 4-5

Item	Symbol	Description
1		Welding current polarity button DC + Direct current welding with positive polarity on the electrode holder in relation to the workpiece (pole reversal switch, MMA only). DC - DC welding with negative polarity on the torch (or stick electrode holder) in relation to the workpiece. AC \square Alternating current welding with rectangular current output wave form. Maximum power loading and safe welding. AC \wedge Alternating current welding with trapezoidal current output wave form. The all-rounder for most applications. AC \sim Alternating current welding with sinusoidal current output wave form. Low noise level.
2		Welding process button MMA welding, lights up in green / arcforce setting, lights up in red TIG welding
3		Operating mode button spotArc spotArc (spot time setting range 0.01 sec. to 20.0 sec.) Non-latched Latched
4		TIG pulses key button / Select activArc key button activArc TIG activArc welding TIG pulse welding
5		Alternating current frequency (TIG AC) rotary dial 50 Hz to 200 Hz

Item	Symbol	Description
6	%	Alternating current balance (TIG AC) rotary dial Max. setting range: - 30% to + 30%
7		Welding parameter setting rotary transducer Setting flows, times and parameters.
8		Function sequence (see next chapter)
9		Tungsten electrode diameter / Ignition optimisation / Spherical cap formation button Ø 1.0mm, Ø 1.6mm, Ø 2.0mm, Ø 2.4mm, Ø 3.2mm, Ø 4.0mm or greater Best ignition and stabilisation of the arc (DC, AC) and optimum spherical cup formation in the tungsten electrode according to the electrode diameter being used. The adjustable welding current is limited to the maximum permissible welding current of the tungsten electrode.
10		Three-figure LED display Welding parameter display (see also chap. "Welding data display").
11		Error/status indicators  Collective interference signal light  Water deficiency signal light (welding torch cooling)  Excess temperature signal light  <input type="checkbox"/> safety sign signal light

4.3.1 Function sequence

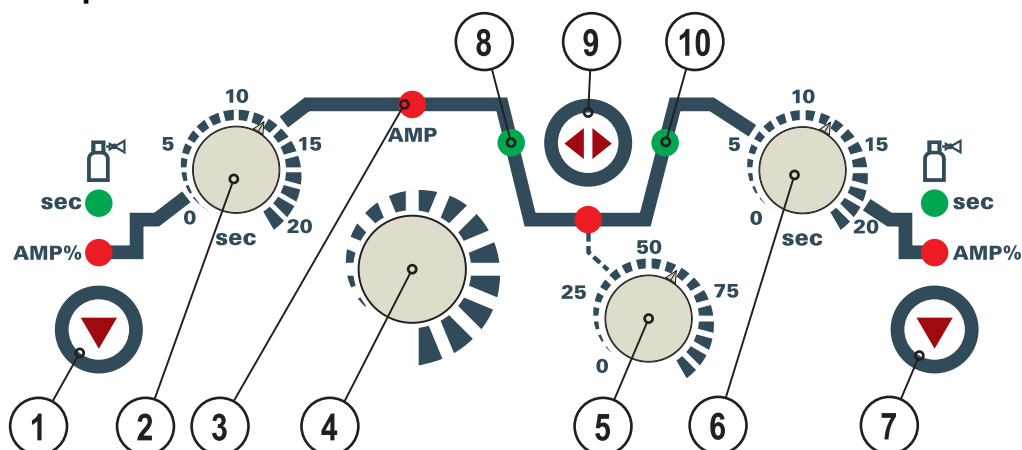



Figure 4-6

Item	Symbol	Description
1		<p>Gas and current parameters button</p> <p>sec Gas pre-flow time / gas test / gas rinsing (TIG) Gas pre-flows: Setting range 0.0 sec to 20.0 sec (0.1s increments). Gas test: Shielding gas flows up to 20 sec. Gas rinsing: Press button for longer than 5 sec. (LED flashing). Shielding gas flows until the button is pressed again</p> <p>AMP% Ignition current (TIG) / hotstart current (MMA) Percentage of the main current. Setting range 1% to 200% (1% increments).</p>
2		<p>Up-slope time / hotstart time rotary dial</p> <p>Up-slope time setting range: 0.00 sec to 20.0 sec (TIG) Hotstart time setting range: 0.00 sec to 5.0 sec (MMA)</p>
3	AMP	<p>Main current (TIG) / pulse current Main current (MMA)</p> <p>I min to I max (1 A increments) I min to I max (1 A increments)</p>
4		<p>Welding parameter setting rotary transducer</p> <p>Setting flows, times and parameters.</p>
5		<p>Secondary current (TIG) / pulse pause current rotary dial</p> <p>Setting range 1% to 200% (1% increments). Percentage of the main current.</p>
6		<p>Down-slope time rotary dial</p> <p>0.00 sec to 20.0 sec</p>
7		<p>Gas post-flow time/end current button</p> <p>sec Gas post-flow time (automatic) Automatic function switched on: The gas post-flow time (4.0 sec. to 40.0 sec.) is specified by the machine control. Automatic function switched off: Absolute gas post-flow time can be set from 0.0 sec. to 40.0 sec.</p> <p>AMP% End current Percentage of the main current. Setting range 1% to 200% (1% increments).</p>

Item	Symbol	Description
8		<p>Signal light for secondary current downslope time (tS1)/pulse time (t1)</p> <ul style="list-style-type: none"> Downslope time (tS1): Period from main current AMP to secondary current AMP%. Pulse time (t1): Main current phase (AMP) during pulses. See chapter "Advanced settings". <p>Setting range: 0.01 s to 20.0 s (0.01 s increments < 0.5 s; 0.1 s increments > 0.5 s).</p>
9		<p>Slope times button/select expert menu</p> <ul style="list-style-type: none"> TIG downslope time (main current to secondary current) TIG upslope time (secondary current to main current) Expert menu (pulse times, wire return for TIG cold wire)
10		<p>Signal light for secondary current upslope time (tS2)/pulse pause time (t2)</p> <ul style="list-style-type: none"> Upslope time (tS2): Period from secondary current AMP% to main current (AMP). Pulse pause time (t2): Secondary current phase (AMP%) during pulses. See chapter "Advanced settings". <p>Setting range: 0.01 s to 20.0 s (0.01 s increments < 0.5 s; 0.1 s increments > 0.5 s).</p>

5 Design and function

5.1 General

WARNING



Risk of injury from electric shock!

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

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

CAUTION



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



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 Installation

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.



Insufficient frost protection in the welding torch coolant!

Depending on the ambient conditions, different liquids are used for cooling the welding torch (see overview of coolants).

Coolants with frost protection (KF 37E or KF 23E) must be checked regularly to ensure that the frost protection is adequate to prevent damage to the machine or the accessory components.

- The coolant must be checked for adequate frost protection with the TYP 1 frost protection tester (see accessories).
- Replace coolant as necessary if frost protection is inadequate!

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

The following coolants may be used (for item nos., please see the Accessories chapter):

Coolant	Temperature range
KF 23E (Standard)	-10 °C to +40 °C
KF 37E	-20 °C to +10 °C
DKF 23E (for plasma machines)	0 °C to +40 °C

5.5.3 Adding coolant

The unit is supplied ex works with a minimum level of coolant.

NOTE

- After the initial filling, wait for at least one minute when the machine is switched on so that the tube package is filled with coolant completely and without bubbles.
- With frequent changes of torch and during the initial filling process, the cooling unit tank should be topped up as necessary.

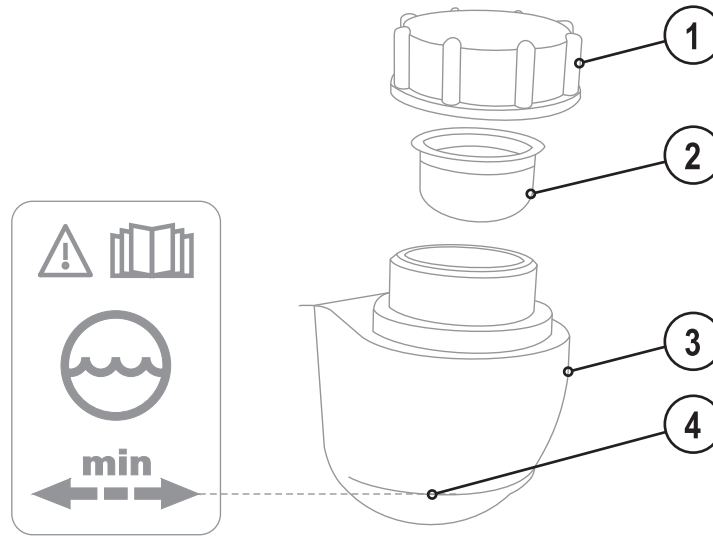


Figure 5-1

Item	Symbol	Description
1		Coolant tank cap
2		Coolant filter sieve
3		Coolant tank
4		"Min" mark Minimum coolant level

- Unscrew and remove the coolant tank sealing cover.
- Check filter sieve insert for dirt, clean if necessary and reinsert into position.
- Top up coolant to the filter sieve insert, close sealing cover again.

NOTE

- The level of coolant must never fall below the "min" mark.
- If there is less coolant in the coolant tank than the minimum required you may need to vent the coolant circuit. In this case the welding machine will automatically shut down the coolant pump and signal an error, see chapter "Rectifying faults".

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 be connected to:

- a three-phase system with four conductors and an earthed neutral conductor
- a three-phase system with three conductors of which any one can be earthed, e.g. the outer conductor

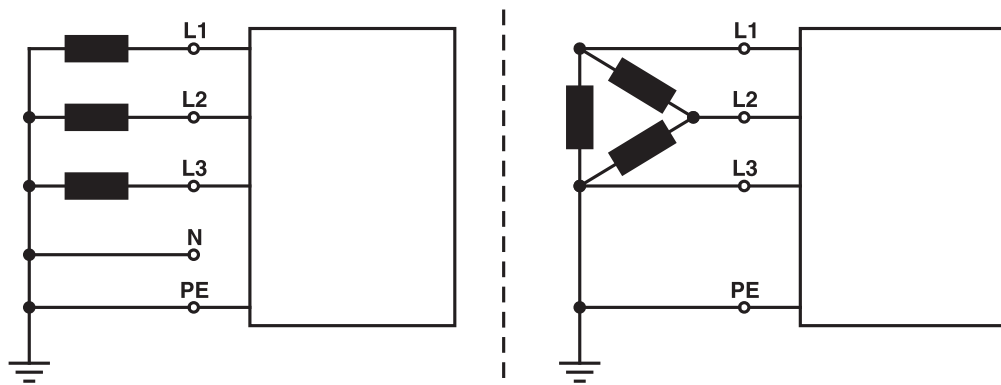


Figure 5-2

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 TIG welding

5.7.1 Welding torch and workpiece line connection

CAUTION



Equipment damage due to improperly connected coolant lines!

If the coolant lines are not connected or a gas-cooled welding torch is used, the coolant circuit is interrupted and equipment damage can occur.

- Connect all coolant lines correctly!
- When using a gas-cooled welding torch, add a tube bridge to the coolant circuit (see chapter "Accessories").

NOTE



Prepare welding torch according to the welding task in hand (see operating instructions for the torch).

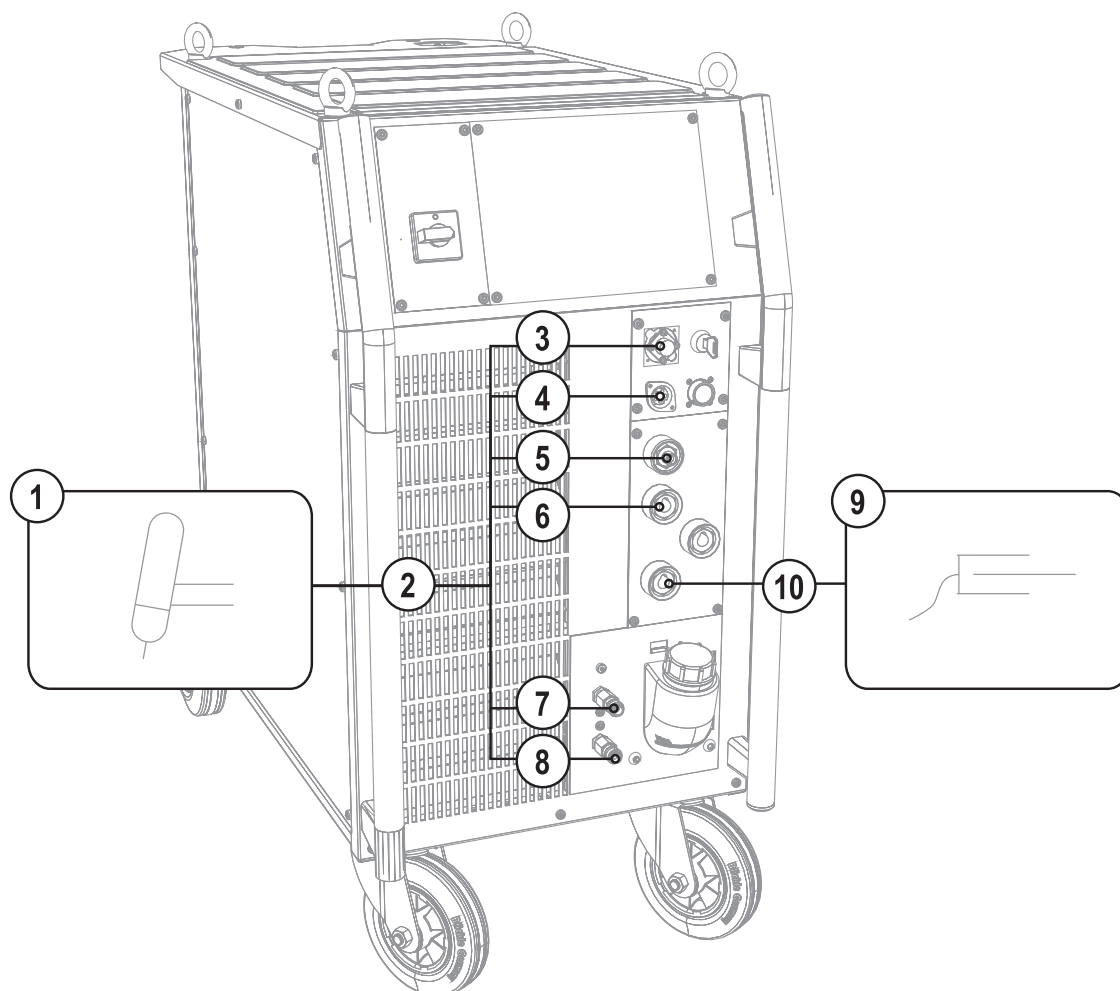


Figure 5-3

Item	Symbol	Description
1		Welding torch
2		Welding torch hose package
3		Connection socket, 8-pole TIG Up/Down or potentiometer torch control lead
4		Connection socket, 5-pole Standard TIG torch control lead
5		G$\frac{1}{4}$" connecting nipple, "-" welding current Shielding gas connection (with yellow insulating cap) for TIG welding torch
6		Connection socket, "-" welding current TIG welding torch connection
7		Quick connect coupling (red) coolant return
8		Quick connect coupling (blue) coolant supply
9		Workpiece
10		Connection socket, "+" welding current Connection for workpiece lead

- Insert the welding current plug on the welding torch into the welding current connection socket and lock by turning to the right.
- Screw welding torch shielding gas connection tightly onto the G $\frac{1}{4}$ " connection nipple, welding current "-".
- Insert control lead plus on the welding torch into the connection socket for the welding torch control lead (5-pole for a standard torch, 8-pole for up/down or potentiometer torches) and tighten.
- Lock connecting nipples of the cooling water tubes into the corresponding quick connect couplings: Return line red to quick connect coupling, red (coolant return) and supply line blue to quick connect coupling, blue (coolant supply).
- Insert the cable plug on the work piece lead into the "+" welding current connection socket and lock by turning to the right.

5.7.2 Torch connection options and pin assignments

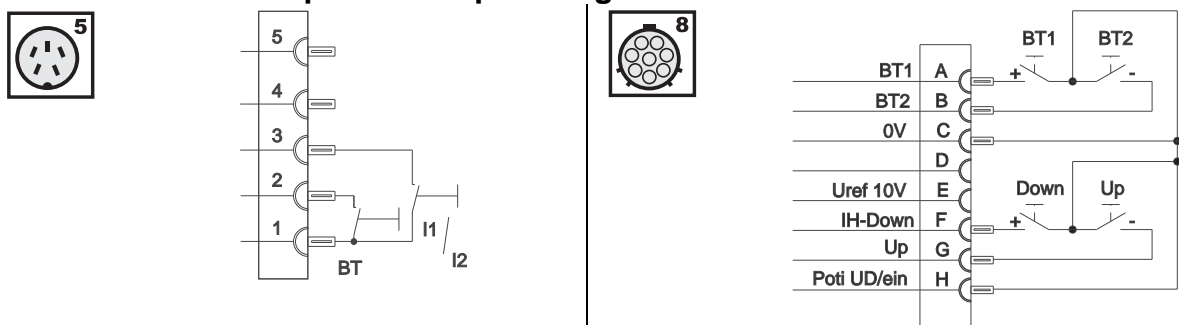


Figure 5-4

5.7.3 Shielding gas supply (shielding gas cylinder for welding machine)

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!

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

5.7.3.1 Connecting the shielding gas supply

- Place the shielding gas cylinder into the relevant cylinder bracket.
- Secure the shielding gas cylinder using a securing chain.

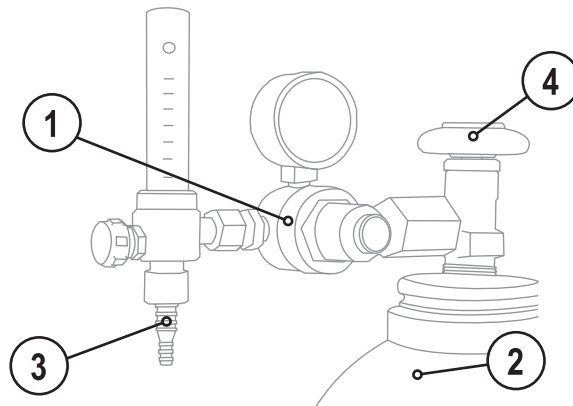


Figure 5-5

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

- 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.

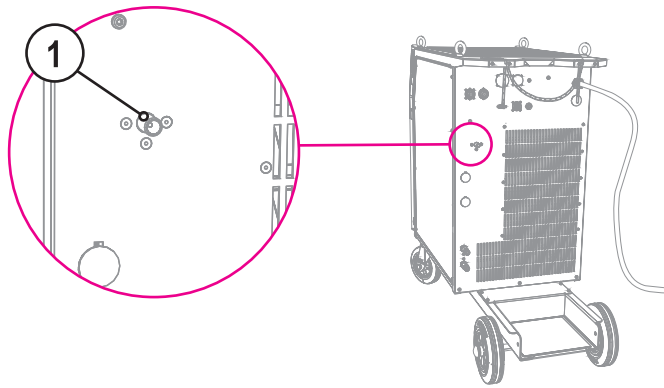



Figure 5-6

Item	Symbol	Description
1		Connecting nipple G $\frac{1}{4}$ ", shielding gas connection

- Connect crown nut of the shielding gas line to the G $\frac{1}{4}$ " connecting nipple.

5.7.3.2 Setting the shielding gas quantity

NOTE

- Rule of thumb for the gas flow rate:**
Diameter of gas nozzle in mm corresponds to gas flow in l/min.
Example: 7mm gas nozzle corresponds to 7l/min gas flow.
- Incorrect shielding gas setting!**
If the shielding gas setting is too low or too high, this can introduce air to the weld pool and may cause pores to form.
 - Adjust the shielding gas quantity to suit the welding task!

- Slowly open the gas cylinder valve. Conduct a gas test (see chapter "gas test")
- Set the required amount of shielding gas on the pressure reducer, about 4 - 15 l/min depending on the current strength and the material.

5.7.3.3 Gas test

Operating element	Action	Result	Displays
	1 x	Select gas test. Shielding gas flows for approx. 20 seconds. The gas test can be ended immediately by pressing it once more.	

5.7.3.4 "Rinse tube package" function

Operating element	Action	Result	Displays
	 5 sec.	Select rinse hose package. Shielding gas flows continuously until the gas test button is pressed again. "AMP%" LED flashes.	

5.7.3.5 Automatic gas post-flow

When the automatic gas post-flow function is activated, the gas post-flow time is defined by the machine control depending on the application (4.0 s to 40.0 s). The gas post-flow time can be adjusted if necessary on the machine control. This value is then saved for the current application.

When the automatic gas post-flow function is deactivated, the gas post-flow time can be set absolutely by the user to between 0.0 s and 40.0 s.
















NOTE

- To adjust or switch this machine function on or off, see chapter "Menus and submenus on the machine control"**

5.7.4 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.

Set the welding task in the following order:

Item	Symbol	Description
1		Welding process button  MMA welding, lights up in green / arcforce setting, lights up in red  TIG welding
2		Operating mode button <i>spotArc</i>  spotArc (spot time setting range 0.01 sec. to 20.0 sec.)  Non-latched  Latched
3		TIG pulses key button / Select activArc key button <i>activArc</i> TIG activArc welding  Puls TIG pulse welding
4		Welding current polarity button DC + Direct current welding with positive polarity on the electrode holder in relation to the workpiece (pole reversal switch, MMA only). DC - DC welding with negative polarity on the torch (or stick electrode holder) in relation to the workpiece. AC  Alternating current welding with rectangular current output wave form. Maximum power loading and safe welding. AC  Alternating current welding with trapezoidal current output wave form. The all-rounder for most applications. AC  Alternating current welding with sinusoidal current output wave form. Low noise level.
5		Tungsten electrode diameter / Ignition optimisation / Spherical cap formation button \varnothing 1.0mm, \varnothing 1.6mm, \varnothing 2.0mm, \varnothing 2.4mm, \varnothing 3.2mm, \varnothing 4.0mm or greater Best ignition and stabilisation of the arc (DC, AC) and optimum spherical cup formation in the tungsten electrode according to the electrode diameter being used. The adjustable welding current is limited to the maximum permissible welding current of the tungsten electrode.
6		Welding parameter setting rotary transducer Setting flows, times and parameters.

5.7.5 Welding data display

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

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

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.

5.7.5.1 Welding parameter setting

During the welding parameter setting process, the parameter being set is displayed on the right-hand display and the relevant value is shown on the left-hand display.

5.7.6 Arc ignition

5.7.6.1 HF ignition

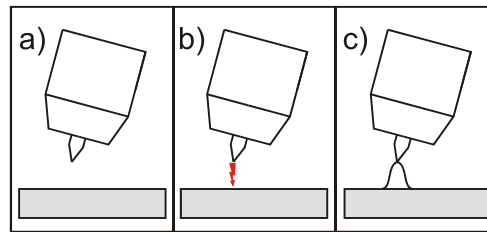


Figure 5-7

The arc is started without contact from high-voltage ignition pulses.

- Position the welding torch in welding position over the workpiece (distance between the electrode tip and workpiece should be approx. 2-3mm).
- Press the torch trigger (high voltage ignition pulses ignite the arc).
- Ignition current flows, and the welding process is continued depending on the operating mode selected.

End the welding process: Release or press the torch trigger depending on the operating mode selected.

5.7.6.2 Liftarc ignition

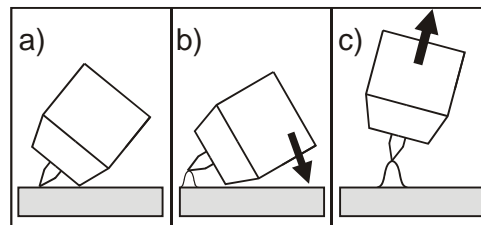


Figure 5-8

The arc is ignited on contact with the workpiece:

- Carefully place the torch gas nozzle and tungsten electrode tip onto the workpiece and press the torch trigger (liftarc current flowing, regardless of the main current set).
- Incline the torch over the torch gas nozzle to produce a gap of approx. 2-3 mm between the electrode tip and the workpiece. The arc ignites and the welding current is increased, depending on the operating mode set, to the ignition or main current set.
- Lift off the torch and swivel to the normal position.

Ending the welding process: Release or press the torch trigger depending on the operating mode selected.

5.7.7 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.

5.7.8 Optimising the ignition characteristics for pure tungsten electrodes

The best ignition and stabilisation of the arc (DC, AC) and optimum spherical cup formation in the tungsten electrode depend on the electrode diameter being used.

The set value should correspond to the diameter of the tungsten electrode. The value can of course be adjusted in line with different requirements.

This parameter can be used to improve the ignition characteristics of "pure tungsten electrodes", for example.

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

5.7.9 Optimal and fast spherical cup formation
NOTE

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





Operating element	Action	Result
<ul style="list-style-type: none"> DC + DC - AC AC AC 		Select AC/DC welding with the relevant alternating current type: AC Square current output wave form AC Trapezoidal current output wave form AC Sinusoidal current output wave form
		Select ignition optimisation/spherical cap formation Signal light for the relevant needle diameter selected starts to flash.
		Select spherical cap formation Signal light flashes quickly. The spherical cap is formed in the subsequent ignition process. The welder determines the end of this process. This function can be switched off without an ignition process by selecting the ignition optimisation and spherical cap formation key combination once again. The parameter must be selected within approx. 5 sec. after selecting the ignition optimisation.

NOTE

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

5.7.10 Function sequences/operating modes

5.7.10.1 Explanation of symbols

Symbol	Meaning
	Press torch trigger 1
	Release torch trigger 1
I	Current
t	Time
	Gas pre-flows
I_{start}	Ignition current
t_{Up}	Up-slope time
tP	Spot time
AMP	Main current (minimum to maximum current)
AMP%	Secondary current (0% to 100% of AMP)
t1	Pulse time
t2	Pulse pause time
ts1	TIG pulses: Slop time from main current (AMP) to secondary current (AMP%)
ts2	TIG pulses: Slop time from secondary current (AMP%) to main current (AMP)
t_{Down}	Down-slope time
I_{end}	End-crater current
	Gas post-flows

5.7.10.2 Non-latched mode

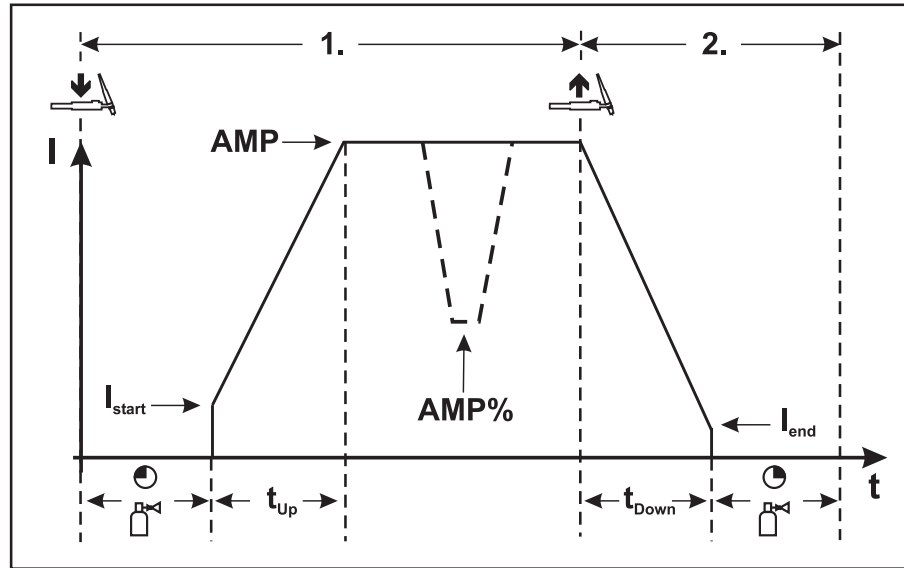


Figure 5-9

1st cycle:

- Press and hold torch trigger 1.
- The gas pre-flow time elapses.
- HF ignition pulses jump from the electrode to the workpiece, the arc ignites.
- The welding current flows and immediately assumes the value set for the ignition current I_{start} .
- HF is switched off.
- The welding current increases with the adjusted up-slope time to the main current AMP.

If torch trigger 2 is pressed in addition to torch trigger 1 during the main current phase, the welding current drops at the slope time set (t_{S1}) to the secondary current AMP%.

After torch trigger 2 is released, the welding current rises at the slope time set (t_{S2}) back to the main current AMP.

2nd cycle:

- Release torch trigger 1.
- The main current falls in the set down-slope time to the end-crater current I_{end} (minimum current).

If the 1st torch trigger is pressed during the down-slope time, the welding current returns to the main current AMP set.

- The main current reaches the end-crater current I_{end} , the arc extinguishes.
- The set gas post-flow time elapses.

NOTE

When the foot-operated remote control RTF is connected, the machine switches automatically to non-latched operation. The up- and down-slopes are switched off.

5.7.10.3 Latched mode

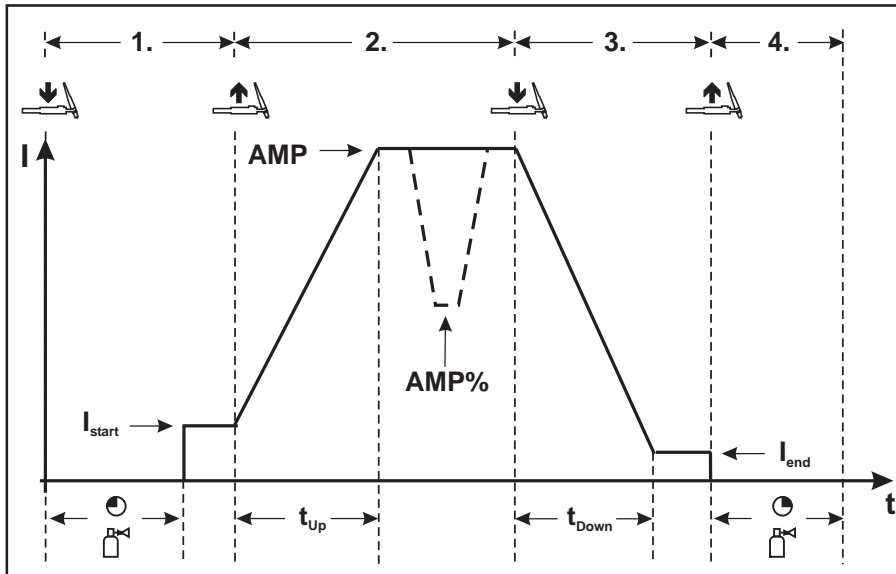


Figure 5-10

Step 1

- Press torch trigger 1, the gas pre-flow time elapses.
- HF ignition pulses jump from the electrode to the workpiece, the arc ignites.
- Welding current flows and immediately assumes the ignition current value set (search arc at minimum setting). HF is switched off.

Step 2

- Release torch trigger 1.
- The welding current increases with the set up-slope time to the main current AMP.

Switching from main current AMP to secondary current AMP%:

- Press torch trigger 2 or
- Tap torch trigger 1

The slope times can be set (see chapter "Advanced settings", section "Setting slope times for secondary current AMP% or pulse edges").

Step 3

- Press torch trigger 1.
- The main current drops with the set down-slope time to the end-crater current I_{end} (minimum current).

Step 4

- Release torch trigger 1, the arc extinguishes.
- The set gas post-flow time begins.

Immediate termination of the welding procedure without down-slope and end-crater current:

- Briefly press the 1st torch trigger (3rd and 4th step).
The current drops to zero and the gas post-flow time begins.

NOTE



When the foot-operated remote control RTF is connected, the machine switches automatically to non-latched operation.
The up- and down-slopes are switched off.



The user can initiate the welding operation also by lightly tipping the torch trigger. This function is available from torch mode 11 (see chapter "Torch mode setting)."

5.7.10.4 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.

Selecting and setting TIG spotArc

Operating element	Action	Result	Display
 	 x x	Signal light on The spot time can be set for approx. 4 sec. using the "Welding parameter setting" rotary transducer (signal light flashing)	
		Set spot time "tP" (signal light flashing)	

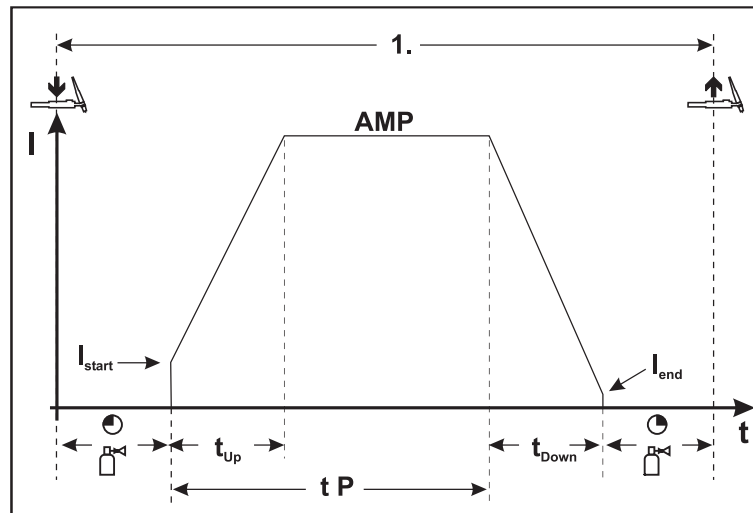


Figure 5-11

NOTE

The process ends when the set spotArc time elapses or if the torch trigger is released prematurely.

Sequence:

- Press and hold torch trigger 1.
- The gas pre-flow time elapses.
- HF ignition pulses jump from the electrode to the workpiece, the arc ignites.
- The welding current flows and immediately assumes the value set for the ignition current I_{start} .
- HF is switched off.
- The welding current increases in the adjusted up-slope time to the main current AMP.

NOTE

The up-slope and down-slope times should be set to "0" to achieve an effective result.

5.7.10.5 Spotmatic

The arc is ignited fully automatically without actuating the torch trigger by simply touching the tip of the electrode with the workpiece. Hundreds of reproducible tacks can be made without tungsten inclusions.

NOTE



Selection and adjustment are made in the same way as with spotArc operating mode (see chapter TIG spotArc).

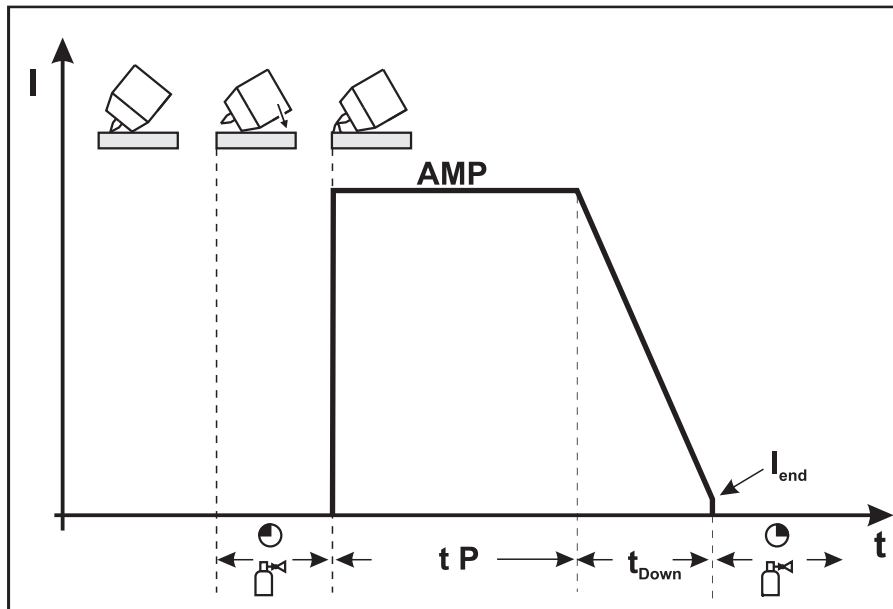


Figure 5-12

NOTE



In order to achieve an effective result, the upslope time should be set to "0 s".

Sequence

The procedure is shown with the example of the HF ignition type. Arc ignition with Liftarc is, however, also possible (see chapter entitled "Arc ignition").

- The torch trigger must first be pressed once to activate the function. The spotArc signal light starts to flash rapidly. The user must now start the welding process within 30 s.
- Position the torch gas nozzle and tungsten electrode tip carefully on the workpiece.
- Incline the torch over the torch gas nozzle until there is a gap of approx. 2-3 mm between the electrode tip and the workpiece.

Shielding gas flows in the set gas pre-flow time.

The arc ignites and the previously set welding current flows.

The main current phase ends when the set spotArc time expires.

The welding current drops in the set downslope time to the end current.

The gas post-flow time expires and the welding process ends.

If the welding torch with the electrode tip is placed again on the workpiece, the next welding process is started.

5.7.10.6 Non-latched operation, version C

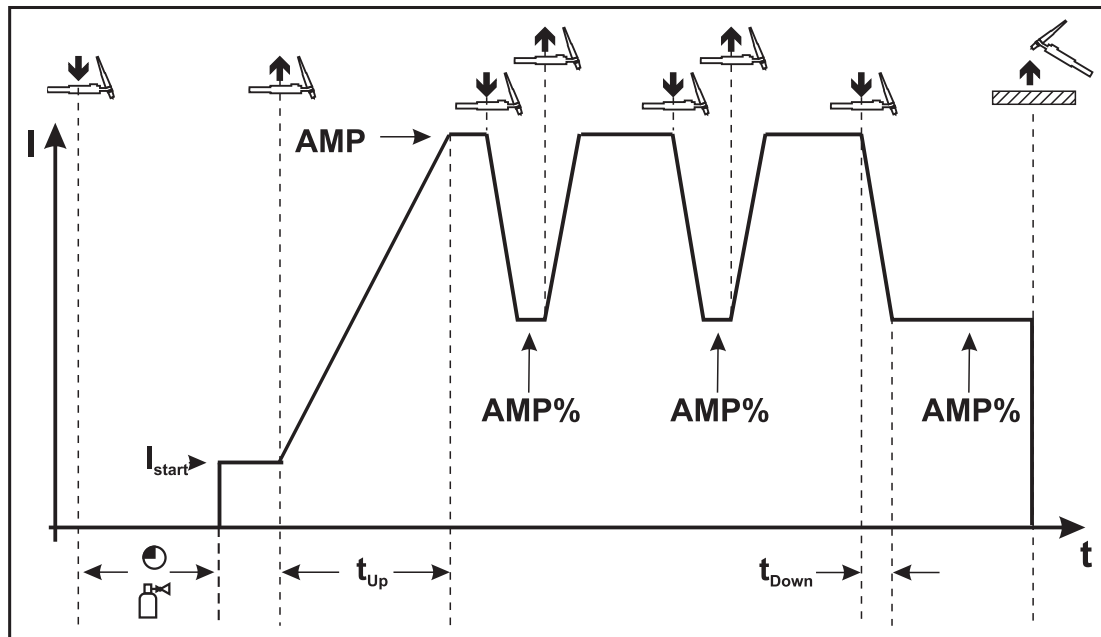


Figure 5-13

1st cycle

- Press torch trigger 1, the gas pre-flow time elapses.
- HF ignition pulses jump from the electrode to the workpiece, the arc ignites.
- Welding current flows and immediately adopts the ignition current value set (search arc at minimum setting). HF is switched off.

2nd cycle

- Release torch trigger 1.
- The welding current increases in the set up-slope time to the main current AMP.

NOTE

- Pressing torch trigger 1 starts the slope (t_{S1}) from main current AMP to secondary current AMP%. Releasing the torch trigger starts the slope (t_{S2}) from the secondary current AMP% back to the main current AMP. This process can be repeated as often as required.

The welding process is ended by the arc interruption in the secondary current (removing the torch from the workpiece until the arc is extinguished).

The slope times can be set (see chapter "Advanced settings", section "Setting slope times for secondary current AMP% or pulse edges").
- This operating mode needs to be activated (see chapter "Advanced settings" in the "TIG non-latched operating mode, C version") section.

5.7.11 Pulses, function sequences

NOTE

- The function sequences in pulses basically behave in the same way as in standard welding, but during the main current phase there is a continual switching back and forth between the pulse and pause currents at the relevant times.
- The pulse function can also be deactivated if necessary during the upslope and downslope phases (see chapter "Advanced settings").

5.7.11.1 TIG pulses – non-latched operation

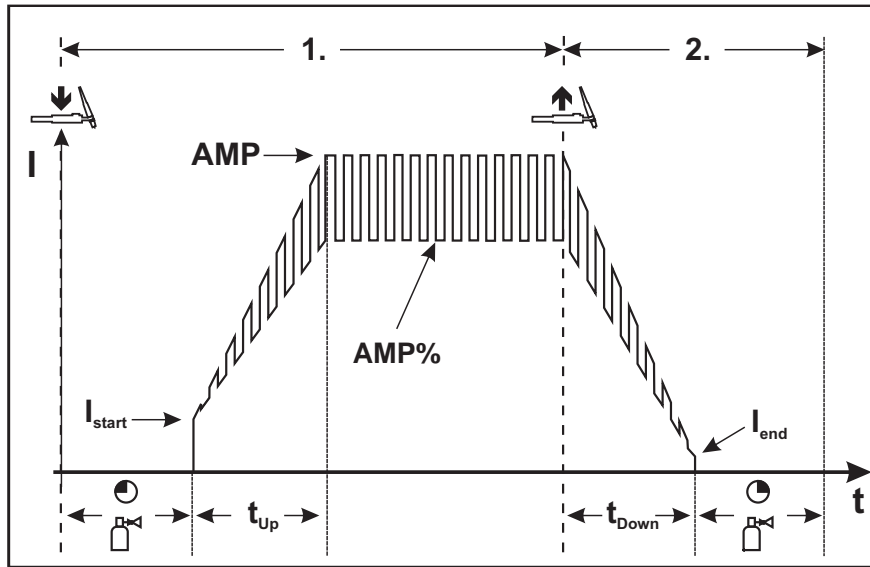


Figure 5-14

5.7.11.2 TIG pulses - latched operation

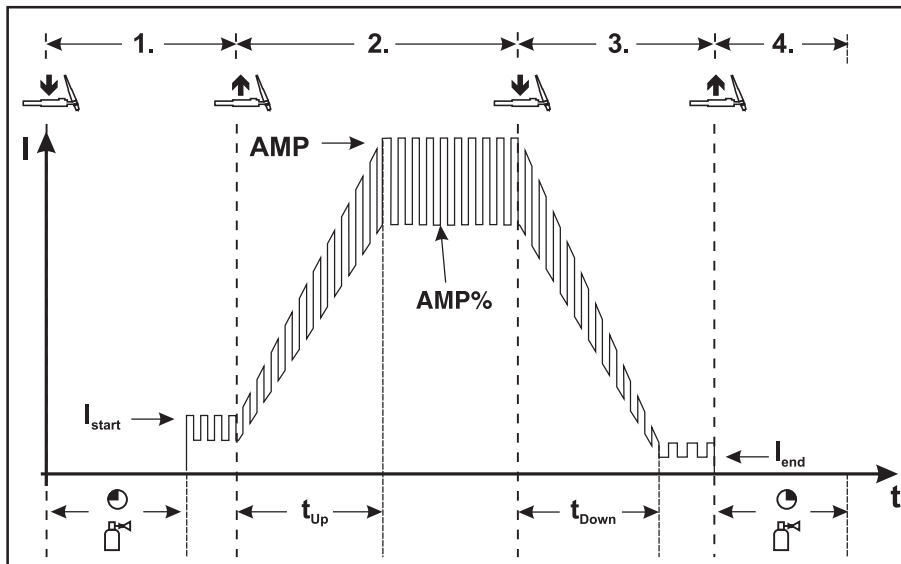


Figure 5-15

5.7.12 TIG *activArc* welding

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

Operating element	Action	Result
 		Select <i>activArc</i> Press until signal light <i>activArc</i> comes on

Parameter setting

The *activArc* parameter (control) can be adjusted specifically for the welding task (panel thickness). These parameters have been modified for the welding current level at the factory.

- The *activArc* process must be selected first (*activArc* signal light is on permanently).

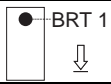
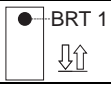
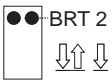
Operating element	Action	Result	Display
 		Select <i>activArc</i> parameter <ul style="list-style-type: none"> Press until <i>activArc</i> LED flashes 	
		Set parameter value <ul style="list-style-type: none"> Increase parameter value (A/V) Decrease parameter value (A/V) 	

5.7.13 Welding torch (operating variants)

Different torch versions can be used with this machine.

Functions on the operating elements, such as torch triggers (TT), rockers or potentiometers, can be modified individually via torch modes.

Explanation of symbols for operating elements:

Symbol	Description
	Press torch trigger
	Tap torch trigger *
	Tap * and press torch trigger

5.7.13.1 Tap torch trigger (tapping function)

NOTE



Pressing the torch trigger briefly to change a function, e.g. changing over from main to secondary current.

The function is used in torch modes 1-4 (factory setting). The function is deactivated in torch modes 11-14 (for more in-depth information, see Torch mode setting chapter).

5.7.14 Torch mode and up/down speed setting

The user has the modes 1 to 6 and modes 11 to 16 available. Modes 11 to 16 include the same function options as 1 to 6, but without tapping function for the secondary current.

The function options in the individual modes can be found in the tables for the corresponding torch types. The welding process can of course be switched on and off in all modes using torch trigger 1 (TT 1).

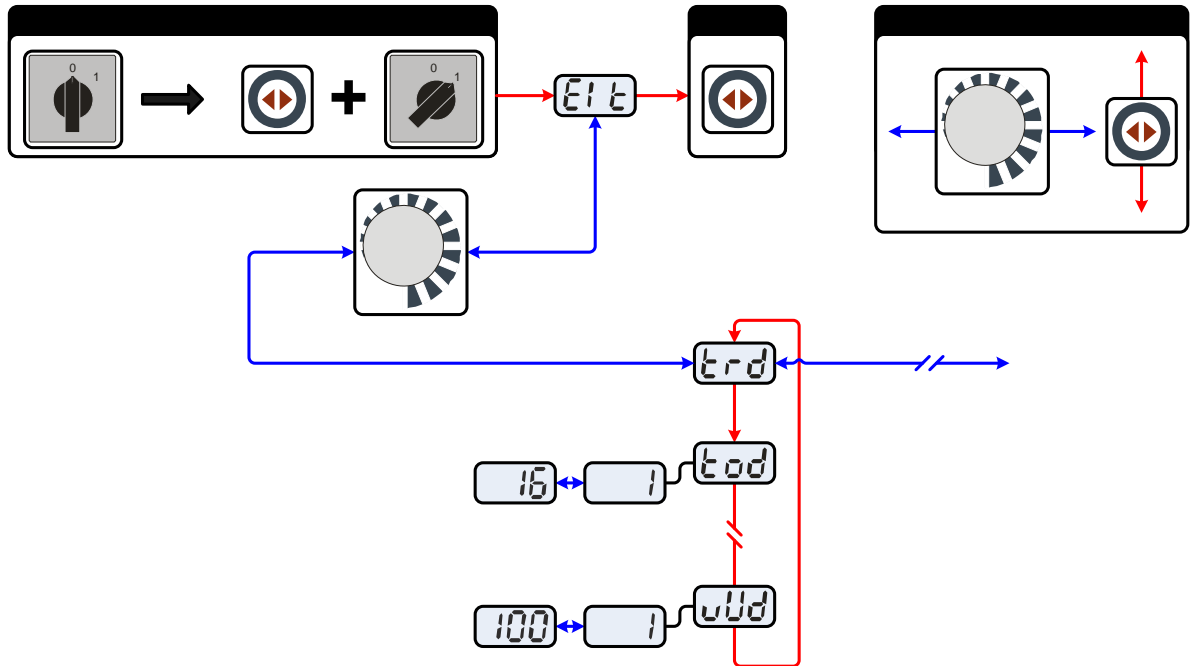


Figure 5-16



Display	Setting/selection
	Exit the menu Exit
	Torch configuration menu Set welding torch functions
	Torch mode <ul style="list-style-type: none"> Modes 1-6: with tapping function (factory setting 1) Modes 11-16: without tapping function
	Up-/Down speed (not available in modes 4 and 14) Increase value = rapid current change (factory setting 10) Reduce value = slow current change

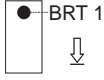
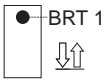
NOTE

Only the modes listed are suitable for the corresponding torch types.



5.7.14.1 Standard TIG torch (5-pole)

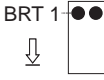
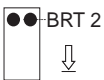
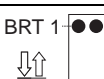
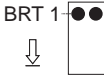
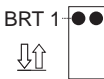
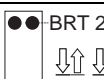
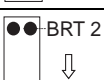
Standard torch with one torch trigger:

Diagram	Operating elements	Explanation of symbols
		BRT1 = Torch trigger 1 (welding current on/off; secondary current via tapping function)



Functions	mode	Operating elements
Welding current On/Off	1 (factory-set)	
Secondary current (Latched mode)		












Standard torch with two torch triggers:

Diagram	Operating elements	Explanation of symbols
		BRT1 = torch trigger 1 BRT2 = torch trigger 2

Functions	mode	Operating elements
Welding current On/Off	1 (factory-set)	
Secondary current		
Secondary current (tapping mode) / (Latched mode)		
Welding current On/Off	3	
Secondary current (tapping mode) / (Latched mode)		
Up function		
Down function		

Standard torch with one rocker (MG rocker, two torch triggers)

Diagram	Operating elements	Explanation of symbols
		BRT 1 = torch trigger 1 BRT 2 = torch trigger 2

Functions	mode	Operating elements
Welding current On/Off	1 (factory-set)	
Secondary current		
Secondary current (tapping mode) / (Latched mode)		
Welding current On/Off	2	
Secondary current (tapping mode)		
Up function		
Down function		
Welding current On/Off	3	
Secondary current (tapping mode) / (Latched mode)		
Up function		
Down function		


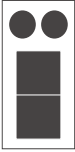
5.7.14.2 TIG up/down torch (8-pole)















Up/down torch with one torch trigger

Diagram	Operating elements	Explanation of symbols
		TT 1 = torch trigger 1

Functions	Mode	Operating elements
Welding current on/off	1 (factory-set)	
Secondary current (tapping mode) / (Latched mode)		
Increase welding current, infinite adjustment (up function)		
Reduce welding current, infinite adjustment (down function)		
Welding current on/off	2	
Secondary current (tapping mode)		
Welding current on/off	4	
Secondary current (tapping mode) / (Latched mode)		
Increase welding current by an increment (see chapter "Setting the first increment in modes 4 and 14")		
Reduce welding current by an increment (see chapter "Setting the first increment in modes 4 and 14")		

Up/down torch with two torch triggers

Diagram	Operating elements	Explanation of symbols
		TT 1 = torch trigger 1 (left) TT 2 = torch trigger 2 (right)

Functions	Mode	Operating elements
Welding current on/off	1 (factory-set)	BRT 1 
Secondary current		 BRT 2
Secondary current (tapping mode) / (Latched mode)		BRT 1 
Increase welding current, infinite adjustment (up function)		 Up
Reduce welding current, infinite adjustment (down function)		 Down
Welding current on/off	2	BRT 1 
Secondary current		 BRT 2
Secondary current (tapping mode)		BRT 1 
Welding current on/off	4	BRT 1 
Secondary current		 BRT 2
Secondary current (tapping mode)		BRT 1 
Increase welding current by an increment (see chapter "Setting the first increment in modes 4 and 14")		 Up
Reduce welding current by an increment (see chapter "Setting the first increment in modes 4 and 14")		 Down
Gas test	4	 BRT 2 ↓ > 3 s

5.7.14.3 Potentiometer torch (8-pole)

NOTE

The welding machine needs to be configured for operation with a potentiometer torch (see chap. "Configuring TIG potentiometer torch")

Potentiometer torch with one torch trigger:

Diagram	Operating elements	Explanation of symbols
		BRT 1 = torch trigger 1
Functions	Mode	Operating elements
Welding current On/Off	3	
Secondary current (tapping mode)		
Increase welding current, infinite adjustment		
Reduce welding current, infinite adjustment		

Potentiometer torch with two torch triggers:

Diagram	Operating elements	Explanation of symbols
		BRT 1 = torch trigger 1 BRT 2 = torch trigger 2
Functions	Mode	Operating elements
Welding current On/Off	3	
Secondary current		
Secondary current (tapping mode)		
Increase welding current, infinite adjustment		
Reduce welding current, infinite adjustment		

5.7.15 Setting the first increment

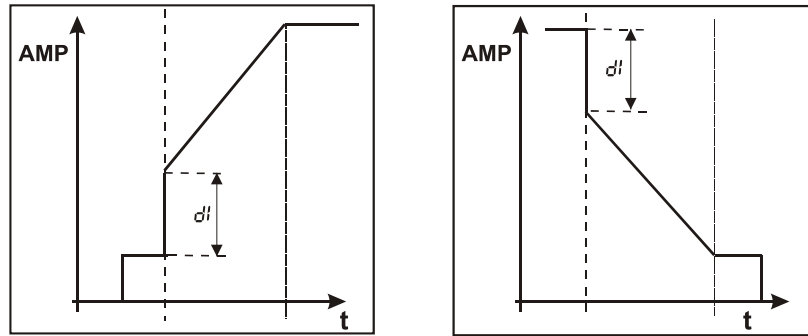


Figure 5-17

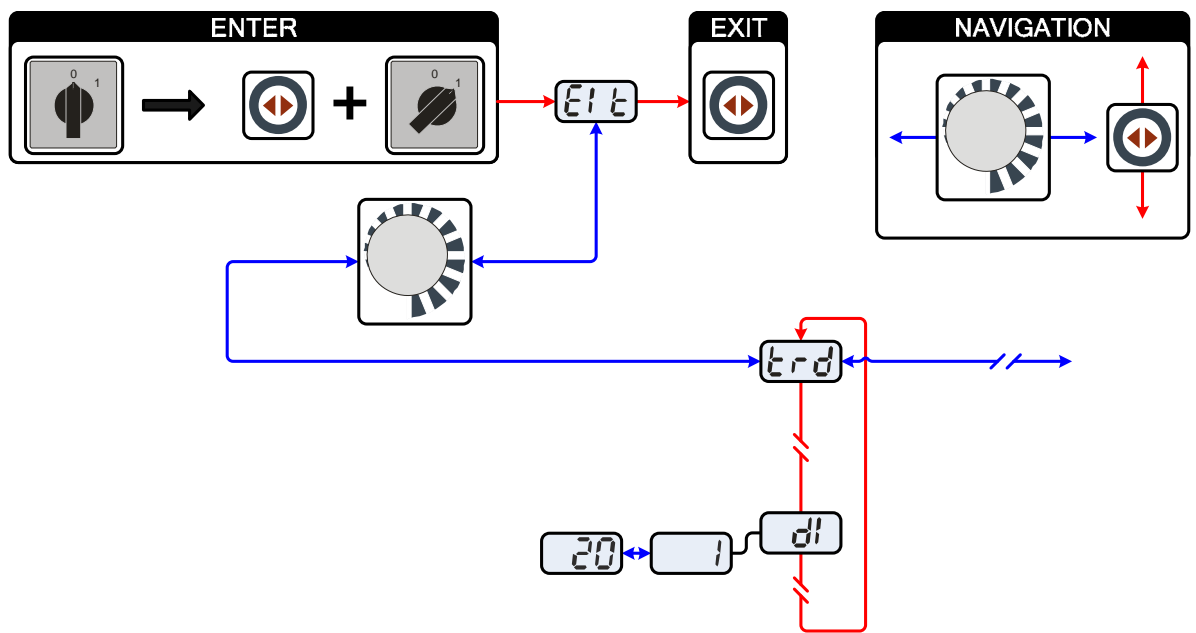


Figure 5-18

Display	Setting/selection
	Exit the menu Exit
	Torch configuration menu Set welding torch functions
	Setting the first increment Setting: 1 to 20 (factory setting 1)

NOTE

This function is only available when using up/down torches in modes 4 and 14!

5.8 MMA welding

⚠ CAUTION



Risk of being crushed or burnt.

When replacing spent or new stick electrodes

- Switch off machine at the main switch
- Wear appropriate safety gloves
- Use insulated tongs to remove spent stick electrodes or to move welded workpieces and
- Always put the electrode holder down on an insulated surface.



Shielding gas connection!

During MMA welding open circuit voltage is applied at the shielding gas connection (G $\frac{1}{4}$ " connecting nipple).

- Place yellow insulating cap on the G $\frac{1}{4}$ " connection nipple (protects against electrical voltage and dirt).

5.8.1 Connecting the electrode holder and workpiece lead

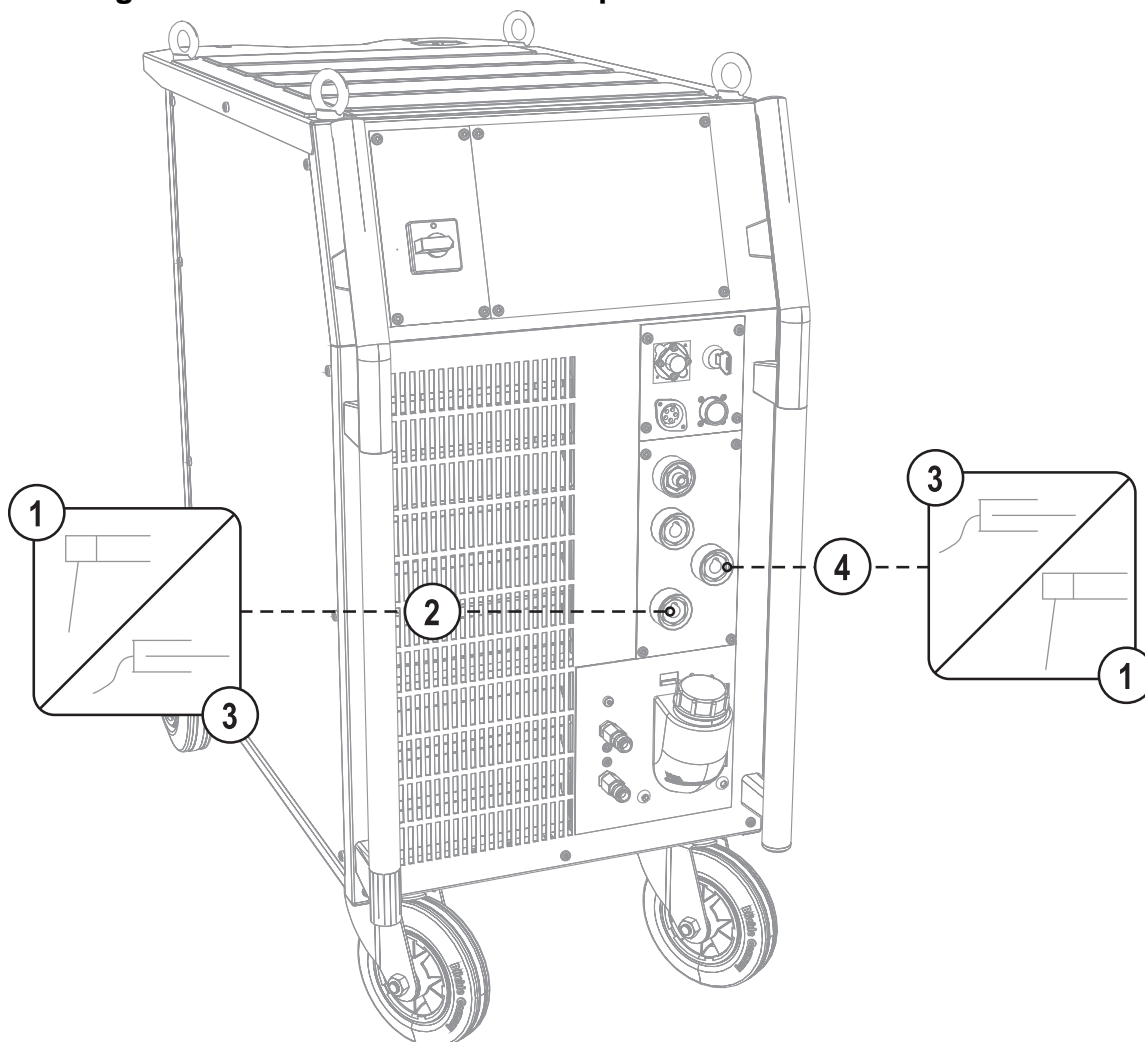


Figure 5-19

Item	Symbol	Description
1		Electrode holder
2		Connection socket, “-” welding current Electrode holder connection
3		Workpiece
4		Connection socket, “+” welding current Connection for workpiece lead

- Insert cable plug of the electrode holder into either the "+" or "-" welding current connection socket and lock by turning to the right.
- Insert cable plug of the workpiece lead into either the "+" or "-" welding current connection socket and lock by turning to the right.

NOTE

Polarity depends on the instructions from the electrode manufacturer given on the electrode packaging.

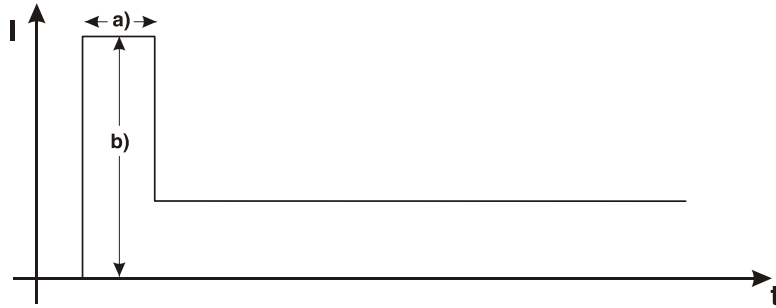
5.8.2 Select welding task

Operating element	Action	Result
		Select MMA welding process The signal light lights up in green
		Set welding current

5.8.3 Hotstart

The hotstart device improves the ignition of the stick electrodes using an increased ignition current.

- a) = Hotstart time
- b) = Hotstart current
- I = Welding current
- t = Time



5.8.3.1 Hotstart current

Operating element	Action	Result	Displays
		Select hotstart current welding parameter Press the "Gas and current parameter" button until signal light AMP% (hotstart current) comes on.	
		Set hotstart current The factory setting is a value as a percentage of the selected main current. To set the absolute hotstart current, see the "Switching between percentage and absolute welding currents" chapter.	

5.8.3.2 Hotstart time

Operating element	Action	Result
		Hotstart time setting on the "Up-slope time/Hotstart time" rotary dial Hotstart time = rotary dial setting divided by factor 4 (example: setting 10 sec. means $10/4 = 2.5$ sec. hotstart time)

5.8.4 Switching the welding current polarity

This function can be used to reverse the welding current polarity electronically.

For example, when welding with different electrode types for which different polarities are stipulated by the manufacturer, the welding current polarity can be switched easily on the control.

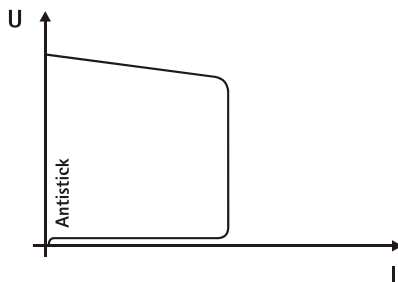
Operating element	Action	Result
<ul style="list-style-type: none"> ● DC + ● DC - ● AC ● AC ● AC 	 n x	Select welding current polarity welding parameter: Position DC - : "-" polarity on connection socket, welding current "-" "+" polarity on connection socket, welding current "+" Position DC + : "+" polarity on connection socket, welding current "-" "-" polarity on connection socket, welding current "+"

5.8.5 Arcforce

Shortly before the electrode threatens to stick, the arcforcing device sets an increased current designed to prevent the electrode sticking.

Operating element	Action	Result	Displays
<ul style="list-style-type: none"> ● ● ● 	 1 x	Select arcforcing welding parameter The signal light lights up in red	
		Set arcforcing -40 = low current increase > soft arc 0 = default setting +40 = high current increase > aggressive arc	

5.8.6 Antistick



Anti-stick prevents the electrode from annealing.
 If the electrode sticks in spite of the Arcforce device, the machine automatically switches over to the minimum current within about 1 second to prevent the electrode from overheating. Check the welding current setting and correct according to the welding task!

Figure 5-20

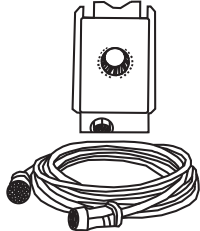
5.9 Remote control

NOTE



The remote control is operated on the 19-pole remote control connection socket.

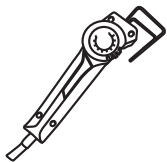
5.9.1 Manual remote control RT 1



Functions

- Infinitely adjustable welding current (0% to 100%) depending on the preselected main current on the welding machine.

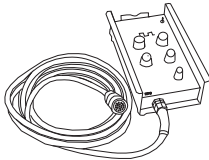
5.9.2 RTG1 19POL manual remote control



Functions

- Infinite setting of the welding current (0% to 100%) depending on the main current preselected at the welding machine

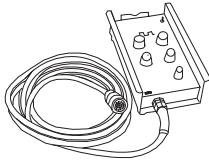
5.9.3 Manual remote control RTP 1



Functions

- TIG/MMA
- Infinitely adjustable welding current (0% to 100%) depending on the preselected main current on the welding machine.
- Pulse/spot/normal
- Pulse, spot and break times are infinitely adjustable.

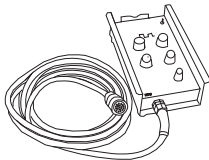
5.9.4 Manual remote control RTP 2



Functions

- TIG/MMA.
- Infinitely adjustable welding current (0% to 100%) depending on the preselected main current on the welding machine.
- Pulse/spot/normal
- Frequency and spot times infinitely adjustable.
- Coarse adjustment of the cycle frequency.
- Pulse/pause ratio (balance) adjustable from 10% to 90%.

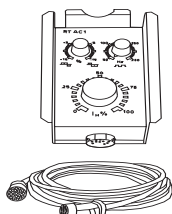
5.9.5 RTP 3 manual remote control



Functions

- TIG / MMA.
- Infinitely adjustable welding current (0% to 100%) depending on the preselected main current on the welding machine.
- Pulse / SpotArc spots / normal
- Frequency and spot time infinitely adjustable.
- Coarse adjustment of the pulse frequency.
- Pulse/pause ratio (balance) adjustable from 10% to 90%.

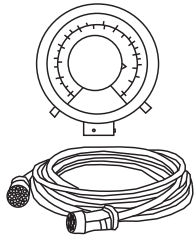
5.9.6 Manual remote control RT AC 1



Functions

- Infinitely adjustable welding current (0% to 100%) depending on the preselected main current on the welding machine.
- AC frequency of welding current infinitely adjustable.
- AC balance (positive/negative half-wave ratio) can be set from +15% to -15%.

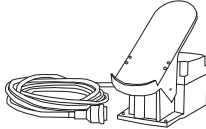
5.9.7 Manual remote control RT PWS 1



Functions

- Infinitely adjustable welding current (0% to 100%) depending on the preselected main current at the welding machine
- Pole reversing switch, suitable for machines with PWS function

5.9.8 Foot-operated remote control RTF 1



Functions

- Infinitely adjustable welding current (0% to 100%) depending on the preselected main current on the welding machine.
- Start/stop welding operation (TIG)

ActivArc welding is not possible in combination with the RTF 1 foot-operated remote control.

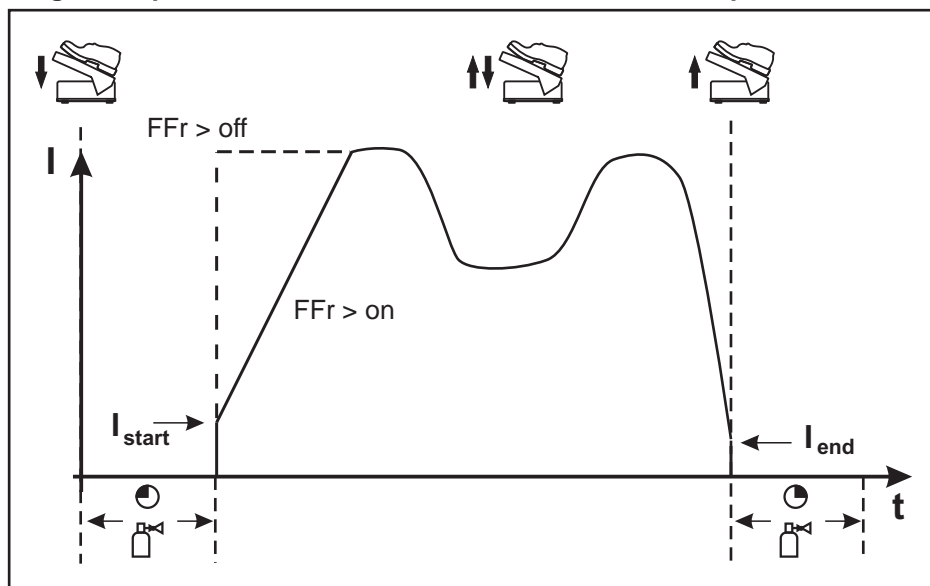


Figure 5-21

Symbol	Meaning
	Actuate foot-operated remote control (start welding process)
	Operate foot-operated remote control (set welding current according to application)
	Release foot-operated remote control (end welding process)
FFr	RTF ramp function
on	Welding current runs in a ramp function at the specified main current
off	Welding current goes immediately to the specified main current

NOTE

The RTF ramp function can be switched on and off in the machine control sub-menu (see "Advanced settings > ramp function RTF" chapter).

5.10 PC interface

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)!

NOTE



Please note the relevant documentation of the accessory components.

5.11 Interfaces for automation

CAUTION



Damage to the machine due to improper connection!

Unsuitable control leads or incorrect connection of input and output signals can cause damage to the machine.

- Only use shielded control leads!
- If the machine is to be operated with control voltages connection via suitable isolation amplifiers is required!
- To control the main or secondary current via control voltages, the relevant inputs must be enabled (see specification for activation of control voltage).

5.11.1 Remote control connection socket, 19-pole

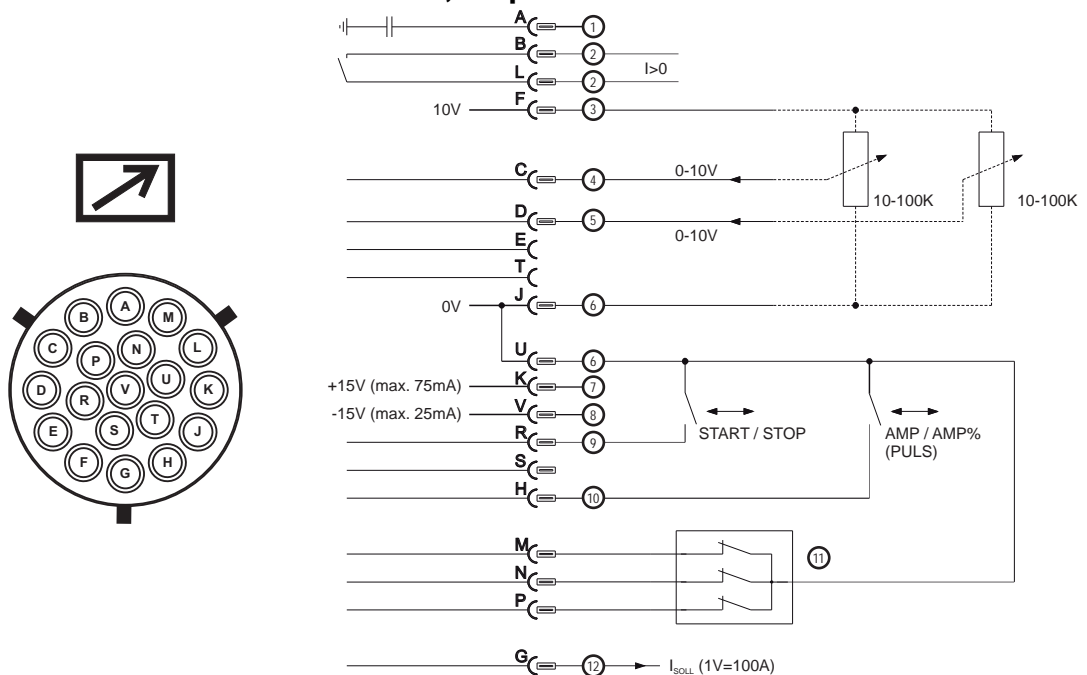


Figure 5-22

Pos.	Pin	Signal shape	Designation
1	A	Output	Connection for cable screen (PE)
2	B/L	Output	Current flows signal $I > 0$, galvanically isolated (max. $\pm 15V/100mA$)
3	F	Output	Reference voltage for potentiometer 10V (max. 10mA)
4	C	Input	Control value specification for main current, 0-10V ($0V = I_{min}$, $10V = I_{max}$)
5	D	Input	Control value specification for secondary current, 0-10V ($0V = I_{min}$, $10V = I_{max}$)
6	J/U	Output	Reference 0V
7	K	Output	Power supply +15V, max. 75mA
8	V	Output	Power supply -15V, max. 25mA
9	R	Input	Start/Stop welding current
10	H	Input	Switching between main and secondary welding currents (pulses)
11	M/N/P	Input	Activation of control voltage specification Set all 3 signals to reference potential 0V to activate external control voltage specification for main and secondary currents
12	G	Output	Measured value $I_{SETPOINT}$ (1V = 100A)

5.11.2 TIG interface for mechanised welding

NOTE



These accessory components can be retrofitted as an option, see Accessories chapter.

Pin	Signal shape	Designation	Diagram
A	Output	PE Connection for cable screen	
B	Output	REGaus For servicing purposes only	
C	Input	SYN_E Synchronisation for master/slave operation	
D	Input (no c.)	IGRO Current flows signal I>0 (maximum load 20mA / 15V) 0V = welding current flowing	
E	Input	Not/Aus Emergency stop for higher level shut-down of the power source.	
F	Output	0V Reference potential	
G	-	NC Not assigned	
H	Output	Uist Actual welding voltage, measured on pin F, 0-10V (0V = 0V, 10V = 100V)	
J		Vschweiss Reserved for special purposes	
K	Input	SYN_A Synchronisation for master/slave operation	
L	Input	Str/Stp Start / stop welding current, same as torch trigger. Only available in non-latched operating mode. +15V = start, 0V = stop	
M	Output	+15V Voltage supply +15V, max. 75mA	
N	Output	-15V Voltage supply -15V, max. 25mA	
P	-	NC Not assigned	
S	Output	0V Reference potential	
T	Output	list Actual welding current, measured on pin F; 0-10V (0V = 0A, 10V = 1000A)	
U		NC	
V	Output	SYN_A 0V Synchronisation for master/slave operation	

5.12 Simultaneous welding on both sides, synchronisation types

This function is important, if two power sources are used to simultaneously weld on both sides, as is sometimes required for welding thick aluminium materials in the PF position. This ensures that, with alternating currents, the positive and negative pole phases are present on both power sources simultaneously, thus avoiding the arcs negatively influencing each other.

5.12.1 Synchronisation via mains voltage (50Hz / 60Hz)

NOTE



This application relates to two types of synchronisation:

- Synchronisation between a Tetric series machine and a competitor machine.
- Synchronisation between two Tetric series machines.

Phase sequences and rotating fields of the supply voltages must be identical for both welding machines.

If this is not the case, the energy input into the weld pool will be negatively affected.

Use the "Phase sequence changeover" rotary switch to correct the phase difference in steps of 60° (0°, 60°, 120°, 180°, 240° and 300°).

An optimum phase correction will directly achieve better welding results.

5.12.1.1 Selection and adjustment

Operating element	Action	Result
DC + DC - AC □ AC ▤ AC ~ 		Select AC welding with corresponding current output wave AC □ Square current output wave form AC ▤ Trapezoidal current output wave form AC ~ Sinusoidal current output wave form
		Turn the "Alternating current frequency (TIG AC)" rotary dial to the left as far as it will go Signal light Netsyn. comes on

5.13 Advanced settings

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

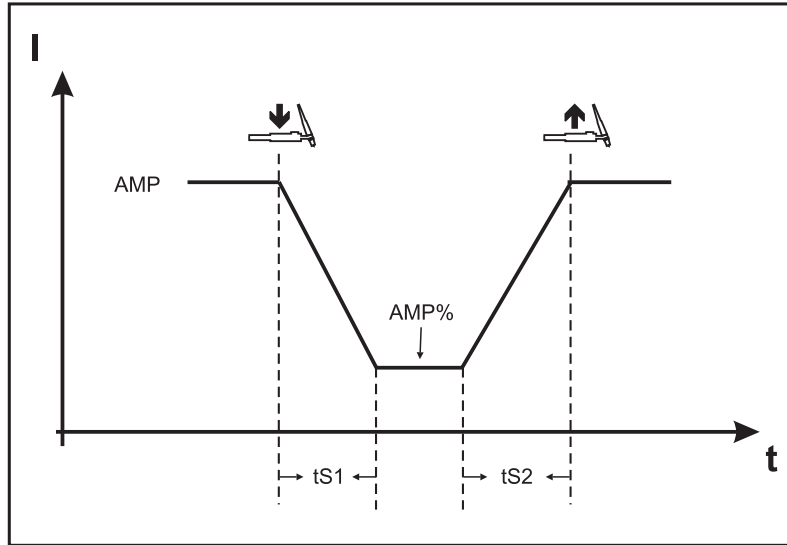


Figure 5-23

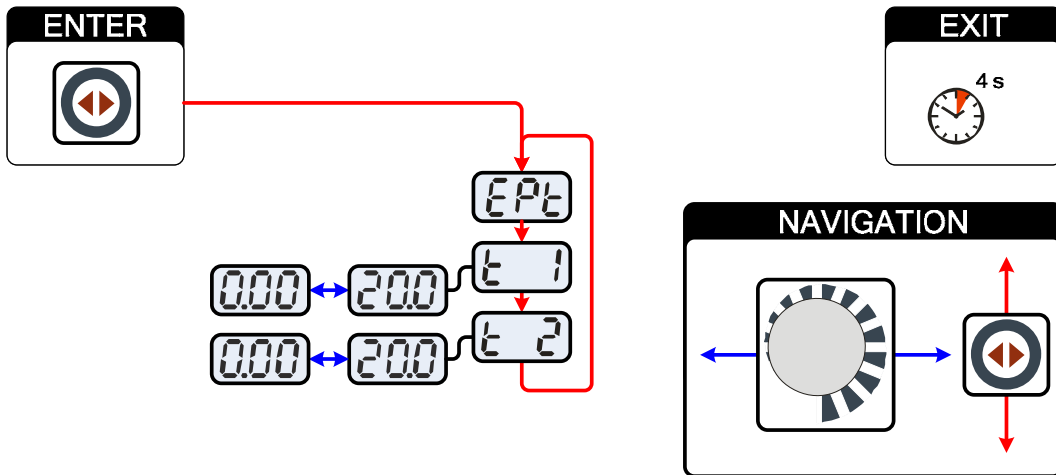


Figure 5-24

Display	Setting/selection
	Slope time tS1 (main current to secondary current) Setting: 0.00 s to 20.0 s (factory setting 0.01 s)
	Slope time tS2 (secondary current to main current) Setting: 0.00 s to 20.0 s (factory setting 0.01 s)

5.13.2 TIG non-latched operating mode, C version

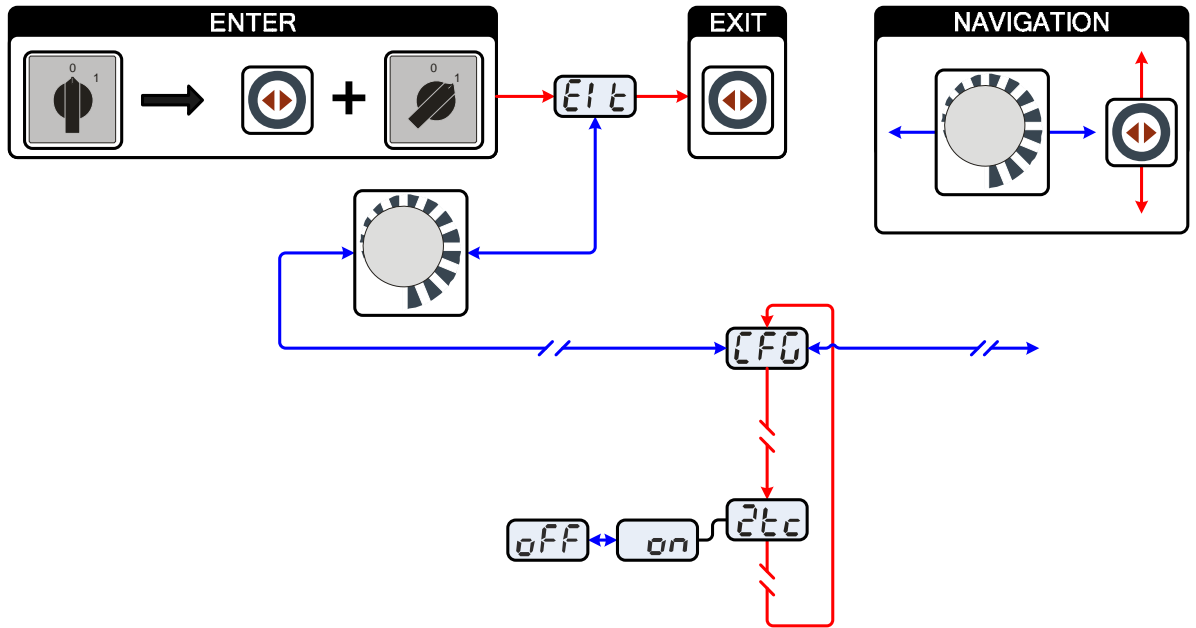


Figure 5-25

Display	Setting/selection
	Exit the menu Exit
	Machine configuration Settings for machine functions and parameter display
	Non-latched operation (C version) <ul style="list-style-type: none"> • on = on • off = off (factory setting)

5.13.3 Configuring the TIG potentiometer torch connection

⚠ DANGER



Risk of injury due to electrical voltage after switching off!
Working on an open machine can lead to fatal injuries!
Capacitors are loaded with electrical voltage during operation. Voltage remains present for up to four minutes after the mains plug is removed.

1. Switch off machine.
2. Remove the mains plug.
3. Wait for at last 4 minutes until the capacitors have discharged!

⚠ WARNING



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



Test!
Before re-commissioning, it is essential that an "inspection and test during operation" is carried out conforming to IEC / DIN EN 60974-4 "Arc welding devices - inspection and testing during operation"!

- For detailed instructions, please see the standard operating instructions for the welding machine.

When connecting a potentiometer torch, jumper JP27 on PCB T320/1 inside the welding machine should be unplugged.

Welding torch configuration	Setting
Prepared for TIG standard or up/down torch (factory setting)	<input checked="" type="checkbox"/> JP27
Prepared for potentiometer torches	<input type="checkbox"/> JP27

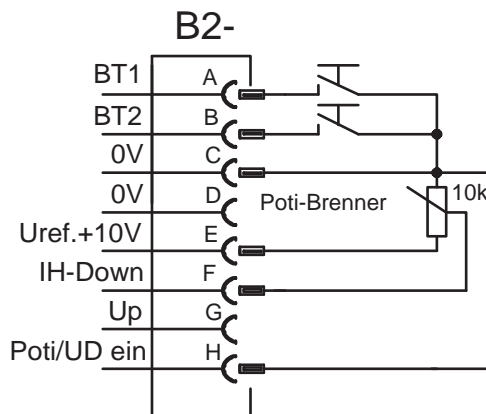


Figure 5-26

NOTE



For this torch type the welding machine has to be set to torch mode 3, see chapter "Setting torch mode and Up/Down speed".

5.13.4 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 (factory setting) or absolute values on the machine display.

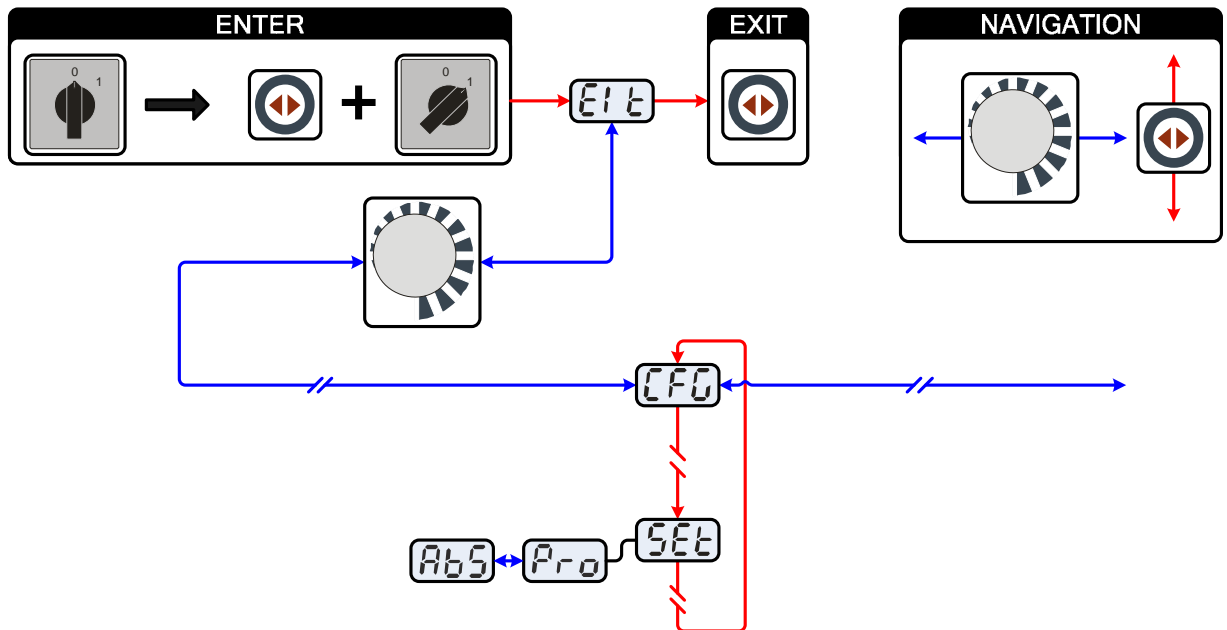


Figure 5-27

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

5.13.5 Ramp function foot-operated remote control RTF 1

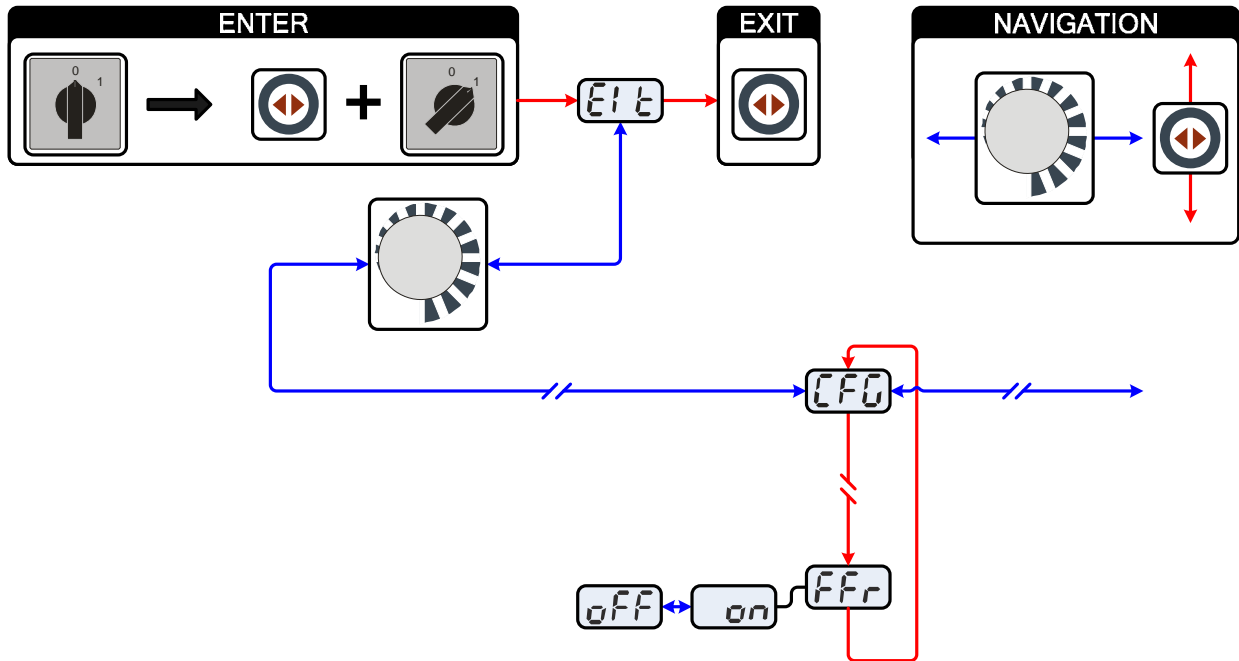


Figure 5-28

Display	Setting/selection
	Exit the menu Exit
	Machine configuration Settings for machine functions and parameter display
	Ramp function Remote control RTF 1 The ramp function can be switched on and off
	Switch on Switching on machine function
	Switch off Switching off machine function

5.14 Menus and sub-menus on the machine control

5.14.1 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.

5.14.2 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.

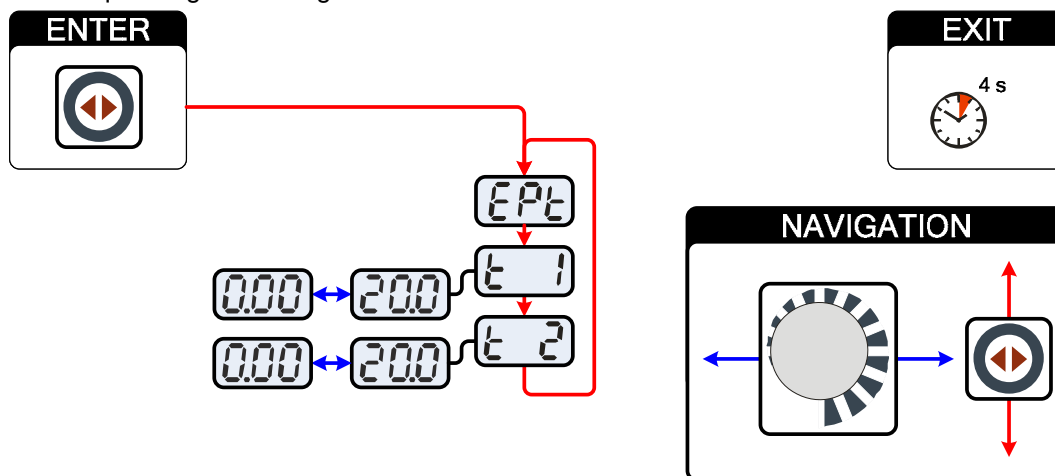


Figure 5-29

Display	Setting/selection
	Expert menu
	Pulse time t1 Setting: 0.00 s to 20.0 s (factory setting 0.01 s)
	Pulse pause t2 Setting: 0.00 s to 20.0 s (factory setting 0.01 s)

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.

5.14.3 Machine configuration menu

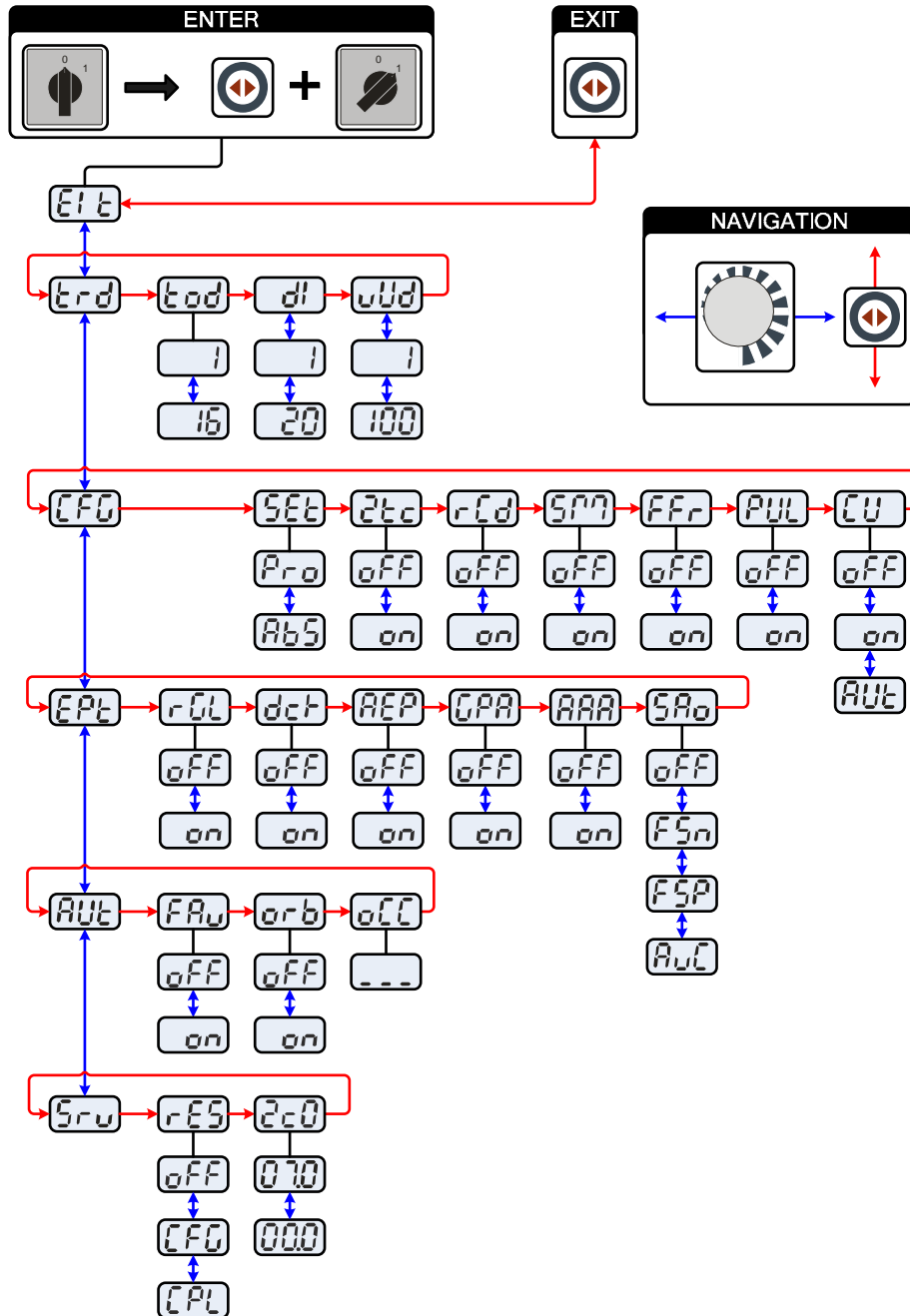


Figure 5-30

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).

Display	Setting/selection
	Exit the menu Exit
	Torch configuration menu Set welding torch functions
	Torch mode <ul style="list-style-type: none"> • Modes 1-6: with tapping function (factory setting 1) • Modes 11-16: without tapping function
	Setting the first increment Setting: 1 to 20 (factory setting 1)
	Up-/Down speed (not available in modes 4 and 14) Increase value = rapid current change (factory setting 10) Reduce value = slow current change
	Machine configuration Settings for machine functions and parameter display
	Welding current display (ignition, secondary, end and hotstart currents) <ul style="list-style-type: none"> • Pro = welding current display as a percentage of the main current (factory setting) • Abs = absolute welding current display
	Non-latched operation (C version) <ul style="list-style-type: none"> • on = on • off = off (factory setting)
	Power display switching (MMA) <ul style="list-style-type: none"> • on = actual value display • off = setpoint value display (factory setting)
	spotMatic Variation of operation mode spotArc, ignition with workpiece contact <ul style="list-style-type: none"> • on = on • off = off (factory setting)
	Ramp function Remote control RTF 1 The ramp function can be switched on and off
	Pulses in the upslope and downslope phases The function can be switched on or off
	Torch cooling mode <ul style="list-style-type: none"> • AUt = automatic operation (ex works) • on = permanently switched on • off = permanently switched off
	Expert menu
	AC mean value controller <ul style="list-style-type: none"> • on = on (factory setting) • off = off
	Switching option for welding current potential (dc+) with TIG DC <ul style="list-style-type: none"> • off = Select option for TIG DC+ is blocked (factory setting). Serves to protect the tungsten electrode from being destroyed. • on = Polarity can be selected freely
	Reconditioning pulse (spherical cap stability) <ul style="list-style-type: none"> • on = function on (factory setting) • off = function off
	Automatic gas post-flow <ul style="list-style-type: none"> • on = function on (factory setting) • off = function off
	Reconditioning pulse (spherical cap stability) <ul style="list-style-type: none"> • on = function on (factory setting) • off = function off

Display	Setting/selection
	activArc voltage measuring <ul style="list-style-type: none"> • on = function on (factory setting) • off = function off
	Error output to automated welding interface, contact SYN_A off AC synchronisation or hot wire (factory setting) FSn Error signal, negative logic FSP Error signal, positive logic AvC AVC (Arc voltage control) connection
	Automation menu
	Fast take-over of control voltage (automation) <ul style="list-style-type: none"> • on = function on • off = function off (factory setting)
	Orbital welding <ul style="list-style-type: none"> • off = off (ex works) • on = on
	Orbital welding Correction value for orbital current
	Service menu Modifications to the service menu may only be carried out by authorised maintenance staff!
	Reset (reset to factory settings) <ul style="list-style-type: none"> • off = aus (factory setting) • CFG = Reset the values in the machine configuration menu • CPL = Complete reset of all values and settings The reset is performed when leaving the menu (EXIT).
	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)
- Wheels and their securing elements
- Transport elements (strap, lifting lugs, handle)
- Selector switches, command devices, emergency stop devices, voltage reducing devices, message and control lamps

6.2.3 Annual test (inspection and testing during operation)

NOTE



The welding machine may only be tested by competent, capable persons!

A capable person is one who, because of his training, knowledge and experience, is able to recognise the dangers that can occur while testing welding power sources as well as possible subsequent damage and who is able to implement the required safety procedures.



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

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

6.3 Maintenance work

 **DANGER**


 **Do not carry out any unauthorised repairs or modifications!**
To avoid injury and equipment damage, the unit must only be repaired or modified by specialist, skilled persons!
The warranty becomes null and void in the event of unauthorised interference.

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


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 Customer checklist

Legend

↘: Fault/Cause

✘: Remedy

NOTE



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

Coolant error/no coolant flowing

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

Functional errors

- ↘ 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/collet 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	<ul style="list-style-type: none"> • 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)	<ul style="list-style-type: none"> • 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 32	Electronics error (I>0 error)	Switch the machine off and on again. If the error persists, inform the service dept.
Err 33	Electronics error (Uactual error)	
Err 34	Electronics error (A/D channel error)	
Err 35	Electronics error (edge error)	
Err 36	Electronics error (S sign)	
Err 37	Electronics error (temperature error)	Allow machine to cool down.
Err 38	---	Switch the machine off and on again. If the error persists, inform the service dept.
Err 39	Electronics error (secondary overvoltage)	
Err 51	Error in emergency stop circuit (interface for mechanised welding)	<ul style="list-style-type: none"> • Check the external shut-down equipment • Check plug-in jumper JP 1 on PCB T320/1

7.3 Resetting welding parameters to the factory settings

NOTE

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

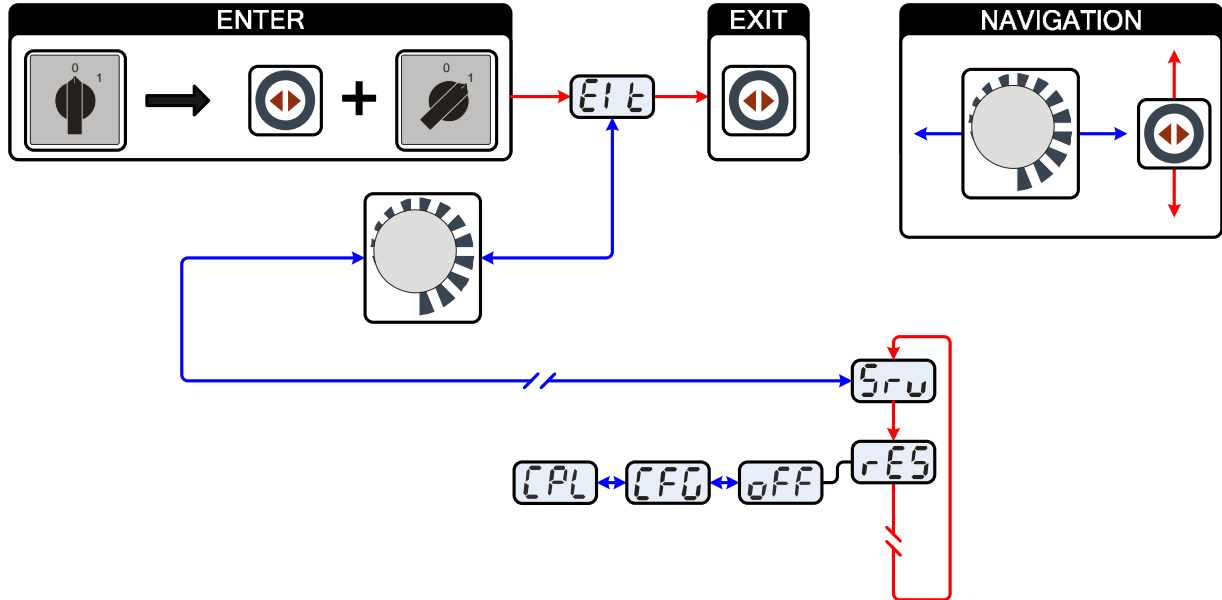


Figure 7-1

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

7.4 Display machine control software version

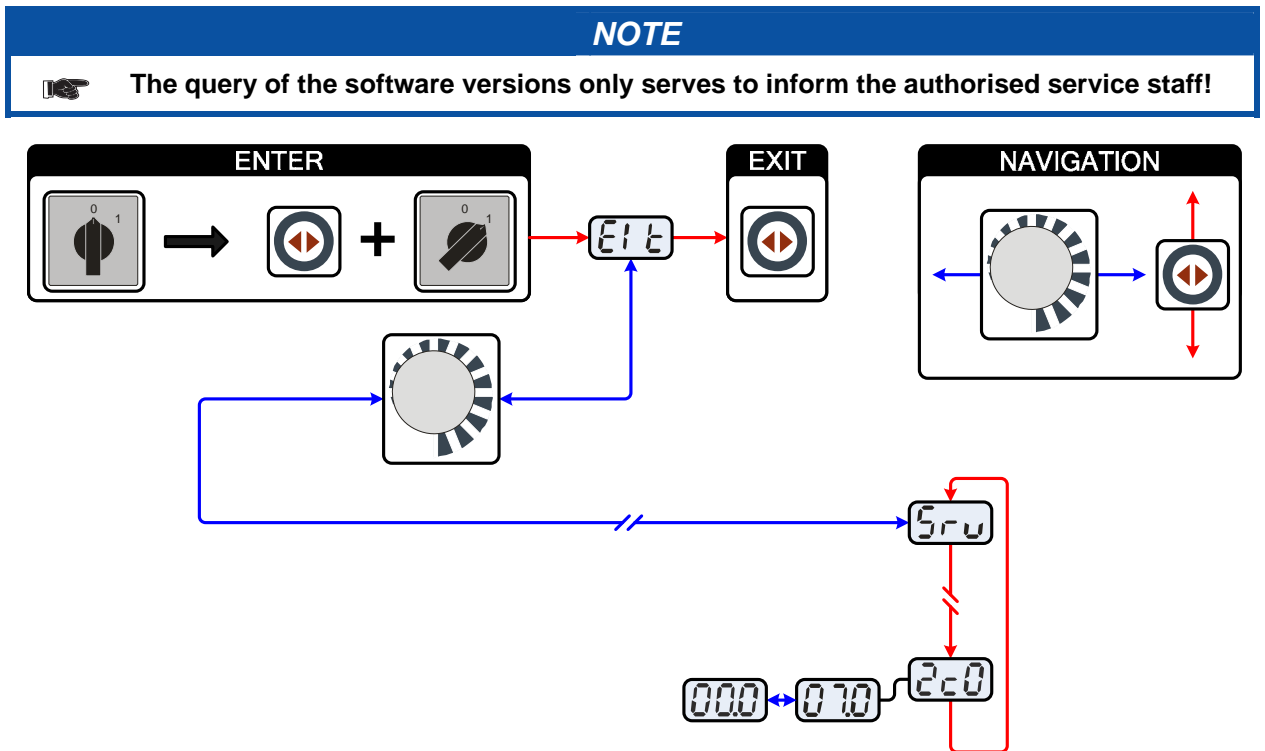


Figure 7-2

Display	Setting/selection
	Exit the menu Exit
	Service menu Modifications to the service menu may only be carried out by authorised maintenance staff!
	Software version query (example) 07= System bus ID
	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)!

8 Technical data

NOTE

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

8.1 Tetrix 351, 451, 551 AC/DC

Tetrix	351		451		551	
Setting ranges						
Welding current	5 A - 350 A		5 A - 450 A		5 A - 550 A	
Welding voltage (TIG)	10,2 V - 24 V		10,2 V - 28,0 V		10,2 V - 32,0 V	
Welding voltage (MMA)	20,2 V - 34 V		20,2 V - 38,0 V		20,2 V - 42,0 V	
Duty cycle	25 °C	40 °C	25 °C	40 °C	25 °C	40 °C
60% DC	-	350 A	-	-	550 A	550 A
80% DC	350 A	-	-	450 A	520 A	-
100% DC	320 A	300 A	450 A	420 A	450 A	420 A
Load alternation	10 min. (60% DC Δ 6 min. welding, 4 min. break)					
Open circuit voltage (DC)	100 V		79 V			
Mains voltage (tolerances)	3 x 400 V (-25% to +20%)					
Frequency	50/60Hz					
Mains fuse (slow-blow safety fuse)	3 x 25 A		3 x 35 A			
Mains connection lead	H07RN-F4G4		H07RN-F4G6			
Max. connected power (TIG)	10.6 kVA		15,9 kVA		22,2 kVA	
Max. connected power (MMA)	15.0 kVA		21,6 kVA		29,2 kVA	
Recommended generator rating	20.5 kVA		29,1 kVA		39,4 kVA	
Cos ϕ	0.99					
Insulation class/protection classification	H/IP 23					
Ambient temperature	-20 °C to +40 °C					
Machine/torch cooling	Fan/gas or water					
Cooling capacity at 1l/min	1500 W					
Max. flow rate	5 l/min					
Max. coolant outlet pressure	3.5 bar					
Max. tank capacity	12 l					
Coolant	Ex works: KF 23 E (-10 °C to +40 °C) or KF 37 E (-20 °C to +10 °C)					
Workpiece lead	70mm ²				95 mm ²	
Dimensions L/W/H [mm]	1100 x 455 x 1000		1080 x 690 x 1195			
Weight	132 kg		181,5 kg			
EMC class	A					
Constructed to standards	IEC 60974-1, -2, -3, -10; S; C ϵ					

9 Accessories

NOTE



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

9.1 Remote controls and accessories

Type	Designation	Item no.
RTF1 19POLE 5M	Foot-operated remote control current with connection cable	094-006680-00000
RT1	Remote control current	090-008097-00000
RTG1 19POL	Remote control, current	090-008106-00000
RTAC1	Remote control current/balance/frequency	090-008197-00000
RT PWS1	Remote control vertical-down current, pole reversal	090-008199-00000
RTP1	Remote control spots/pulses	090-008098-00000
RTP2	Remote control spots/pulses	090-008099-00000
RTP3	spotArc remote control for spots/pulses	090-008211-00000
RA5 19POL 5M	Remote control e.g. connection cable	092-001470-00005
RA10 19POL 10M	Remote control e.g. connection cable	092-001470-00010
RA20 19POL 20M	Remote control e.g. connection cable	092-001470-00020
RV5M19 19POLE 5M	Extension cable	092-000857-00000

9.2 Options

9.2.1 Tetrrix 351 AC/DC

Type	Designation	Item no.
ON FILTER T/P	Retrofit option contamination filter for air inlet	092-002092-00000
ON HOLDER GAS BOTTLE <50L	Retrofit option holding plate for gas bottle <50 L	092-002151-00000
ON SHOCK PROTECT	Ram protection retrofit option	092-002154-00000

9.2.2 Tetrrix 451, 551 AC/DC

Type	Designation	Item no.
ON FILTER TETRIX XL	Retrofit option, dirt filter for air inlet	092-004999-00000
ON HOLDER GAS BOTTLE <50L TETRIX XL	Optional retrofit holding plate for gas cylinder <50l	092-002345-00000

9.2.3 Tetrrix 351, 451, 551 AC/DC

Type	Designation	Item no.
ON 19POL 351/451/551	Optional 19-pole retrofit connection socket Accessory components and analogue A interface	092-001951-00000
ON 7POL	Optional 7-pole retrofit connection socket Accessory components and digital interfaces	092-001826-00000
ON HOSE/FR MOUNT	Optional holder for tubes and remote control for machines without star handle	092-002116-00000
OW REINFORCED PUMP T/P	Reinforced pump retrofit option ex works	092-002118-00001
ON FSB WHEELS W/T/P	Retrofit option for locking brake for machine wheels	092-002110-00000
ON TOOL BOX	Retrofit option tool box	092-002138-00000

9.3 General accessories

Type	Designation	Item no.
HOSE BRIDGE	Tube bridge	092-007843-00000
DM1 32L/MIN	Manometer pressure regulator	094-000009-00000
GH 2X1/4" 2M	Gas hose	094-000010-00001
5POLE/CEE/32A/M	Machine plug	094-000207-00000
TYP 1	Frost protection tester	094-014499-00000
KF 23E-10	Coolant (-10 °C), 9.3 l	094-000530-00000
KF 23E-200	Coolant (-10°C), 200 litres	094-000530-00001
KF 37E-10	Coolant (-20 °C), 9.3 l	094-006256-00000
KF 37E-200	Coolant (-20 °C), 200 l	094-006256-00001

9.4 Simultaneous welding on both sides, synchronisation types

9.4.1 Synchronisation via mains voltage (50Hz / 60Hz)

Type	Designation	Item no.
ON NETSYNCHRON	Optional retrofit set for phase sequence changeover for synchronous welding	090-008212-00000

9.5 Computer communication

Type	Designation	Item no.
PC300.NET	PC300.Net welding parameter software set incl. cable and SECINT X10 USB interface	090-008265-00000
CD-ROM PC300.NET	PC300.Net Update on CD-ROM	092-008172-00001

10 Appendix A

10.1 Overview of EWM branches

Headquarters

EWM HIGHTEC WELDING GmbH
Dr. Günter-Henle-Straße 8
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