



Welding machine

Phoenix 351, 401, 451, 551 Concept puls FDW

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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!

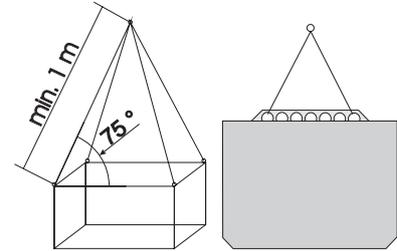


Fig. Lifting principle



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 MIG/MAG standard welding

Metal arc welding using a wire electrode whereby gas from an external source surrounds the arc and the molten pool to protect them from the atmosphere.

3.1.2 MIG/MAG pulse welding

Welding process for optimum welding results when joining stainless steel and aluminium thanks to controlled drop transfer and targeted, adapted heat input.

3.1.3 rootArc

Stable, soft, short arc even with long welding leads; ideal for simple, reliable root welding without pool support, easy gap bridging.

3.1.4 forceArc

Welding with a powerful forced arc, deep fusion penetration and virtually spatter-free weld seams of the highest quality.

3.1.5 TIG (Liftarc) welding

TIG welding process with arc ignition by means of workpiece contact.

3.1.6 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 Use and operation solely with the following machines

NOTE



A suitable wire feed unit (system component) is required in order to operate the welding machine!

Phoenix Concept	351, 401, 451, 551
drive 200C WE	<input checked="" type="checkbox"/>
drive 300C WE	<input checked="" type="checkbox"/>
drive 4L	<input checked="" type="checkbox"/>
drive 4	<input checked="" type="checkbox"/>

3.3 Documents which also apply

3.3.1 Warranty

NOTE



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

3.3.2 Declaration of Conformity



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

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

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

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

3.3.3 Welding in environments with increased electrical hazards



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

3.3.4 Service documents (spare parts and circuit diagrams)



DANGER



Do not carry out any unauthorised repairs or modifications!

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

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

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

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

Spare parts can be obtained from the relevant authorised dealer.

4 Machine description – quick overview

4.1 Front view

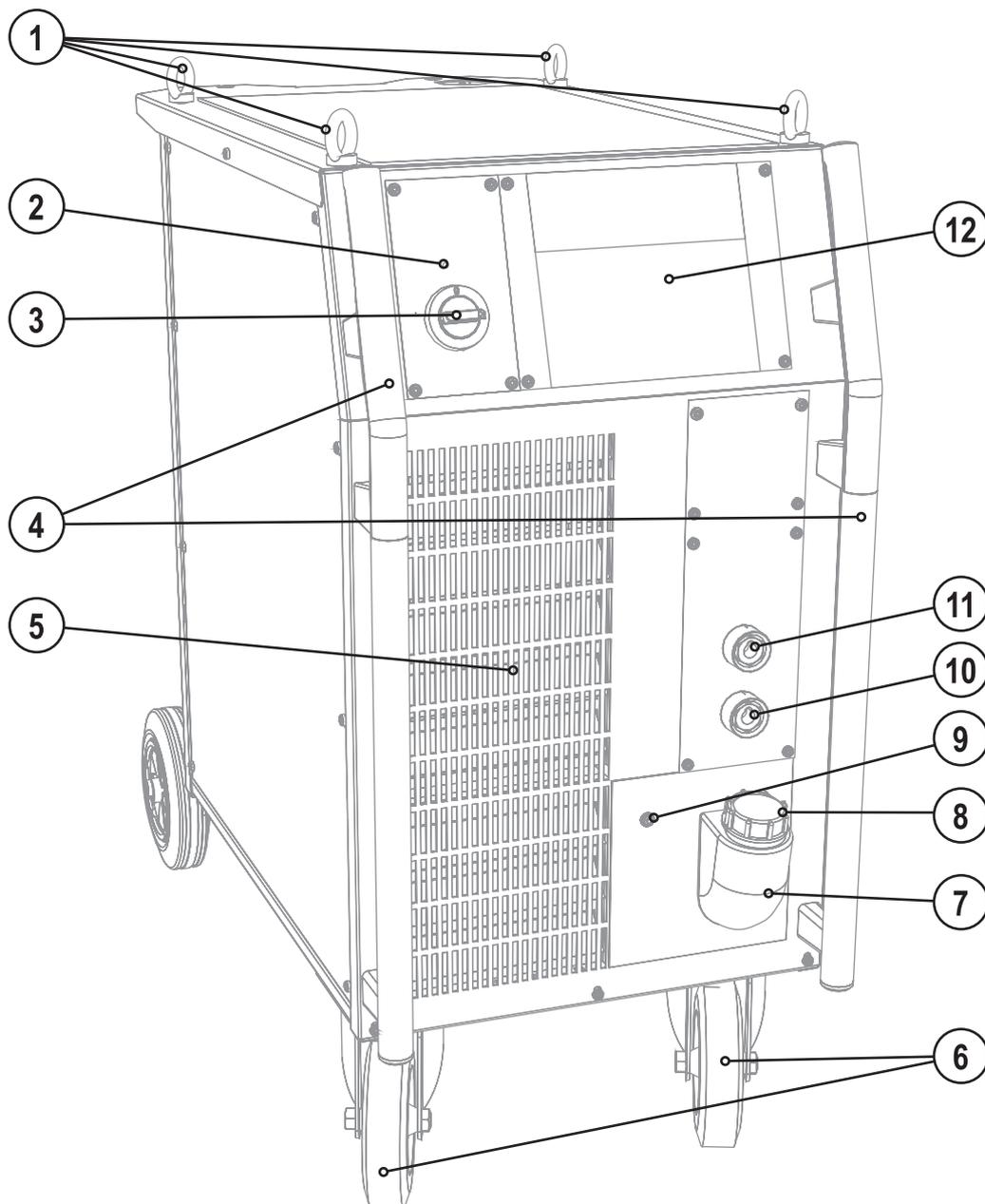


Figure 4-1

Item	Symbol	Description
1		Lifting lug
2		Ready for operation signal light Signal light on when the machine is switched on and ready for operation
3		Main switch, machine on/off
4		Carrying handle
5		Cooling air inlet
6		Wheels, guide castors
7		Coolant tank
8		Coolant tank cap
9		Automatic cut-out of coolant pump key button press to reset a triggered fuse
10		Connection socket, "+" welding current <ul style="list-style-type: none"> • MIG/MAG cored wire welding: Workpiece connection • TIG welding: Workpiece connection • MMA welding: Workpiece connection
11		"-" welding current connection socket <ul style="list-style-type: none"> • MIG/MAG welding: Workpiece connection • TIG welding: Welding current connection for welding torch • MMA welding: electrode holder connection
12		Machine control See Machine control – operating elements chapter

4.2 Rear view

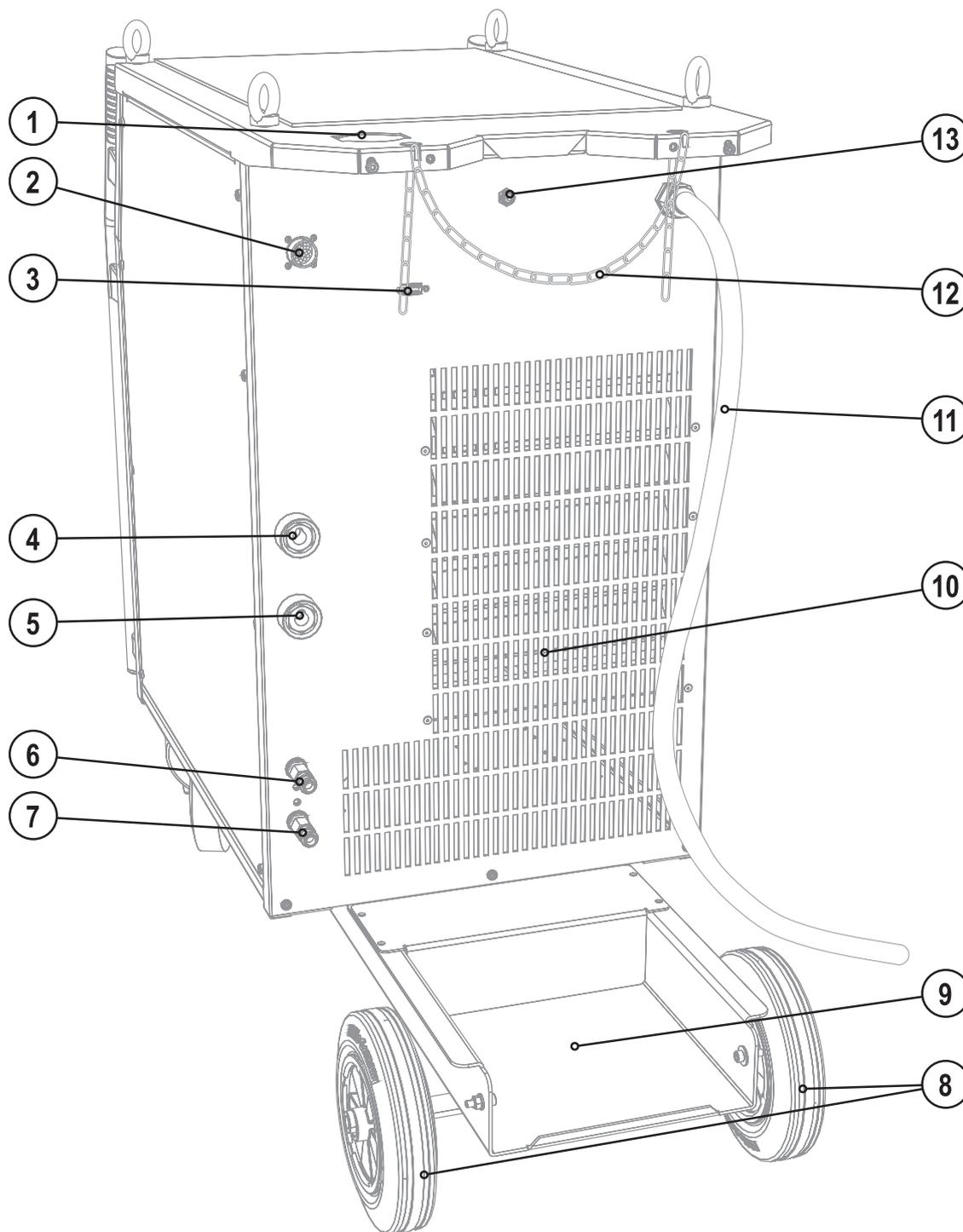


Figure 4-2

Item	Symbol	Description
1		Intermediate hose package strain relief
2		19-pole connection socket (analogue) Wire feed unit control lead connection
3		PC interface, serial (D-Sub connection socket, 9-pole)
4		Connection socket, "+" welding current • MIG/MAG welding: Welding current to central connection/torch
5		"-" welding current connection socket • MIG/MAG cored wire welding: Welding current to central connection/torch
6		Quick connect coupling (red) coolant return
7		Quick connect coupling (blue) coolant supply
8		Wheels, fixed castors
9		Bracket for shielding gas cylinder
10		Cooling air outlet
11		Mains connection cable
12		Securing elements for shielding gas cylinder (strap/chain)
13		Key button, Automatic cutout Wire feed motor supply voltage fuse (press to reset a triggered fuse)

4.3 Machine control – Operating elements

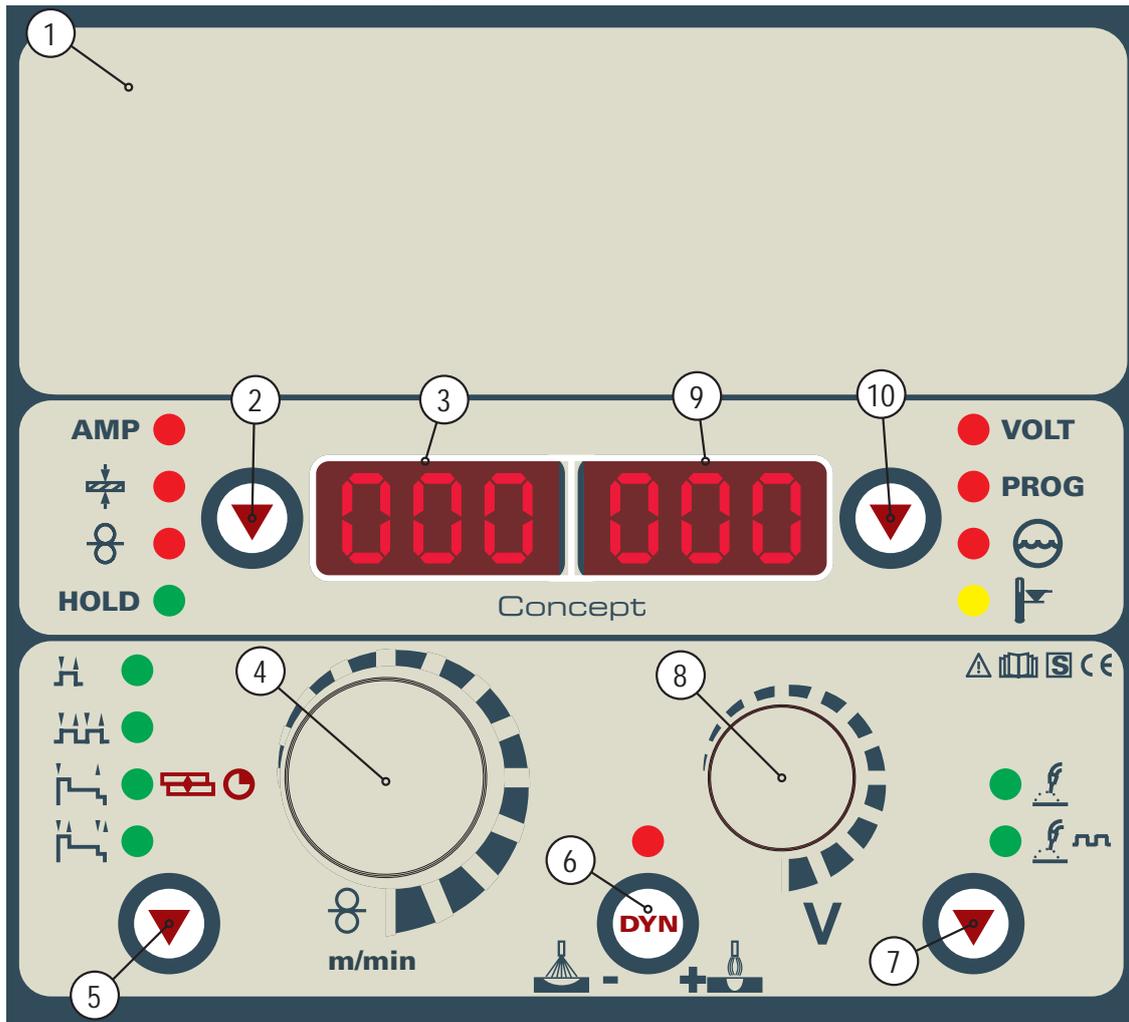


Figure 4-3

Item	Symbol	Description
1		Lid (see chap. "Machine control – concealed operating elements")
2		Button, Parameter selection left AMP Welding current Material thickness Wire speed HOLD After each completed welding process, the last parameter values used for the welding process are shown on the display in the main program; the signal light is on
3		Display, left Welding current, material thickness, wire speed, hold values
4		Rotary dial, welding parameters <ul style="list-style-type: none"> • Selecting the JOB (welding task) • Setting other welding parameters
5		Operating mode selection button Non-latched Latched Signal light lights up in green: special non-latched Signal light lights up in red: MIG spots Special latched You can preselect or change the operating mode at the wire feed unit (cf. "Advanced settings > P18").
6		Dynamics/choke effect button Arc harder and narrower Arc softer and wider
7		Welding type button MIG/MAG standard welding MIG/MAG pulse arc welding You can preselect or change the welding type at the wire feed unit (cf. "Advanced settings > P18").
8		Selection of welding program, rotary dial <ul style="list-style-type: none"> • Selection of welding programs 0 to 15 (not possible if accessory components, such as program torches, are connected).
9		Display, right Welding voltage, program number
10		Button, Parameter selection (right) VOLT Welding voltage PROG Program number Coolant error Temperature error

4.3.1 Covered operating elements

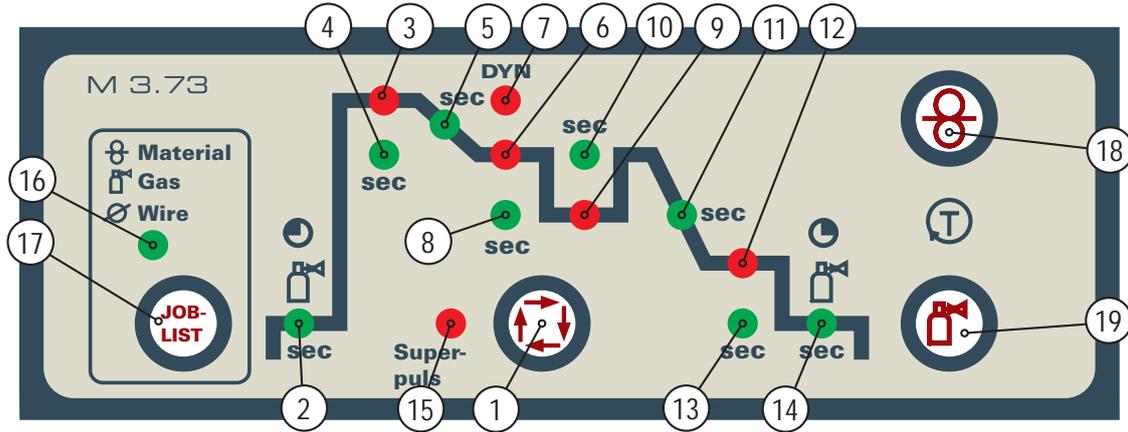


Figure 4-4

Item	Symbol	Description
1		Select welding parameters button This button is used to select the welding parameters depending on the welding process and operating mode used.
2		Signal light, gas pre-flow time Setting range 0.0 s to 20.0 s
3		Signal light, start program (P_{START}) <ul style="list-style-type: none"> Wire speed: 1% to 200% of the main program P_A Correction of the arc length -9.9 V to +9.9 V
4	sec	Signal light, start time Setting range, absolute 0.0 s to 20.0 s (0.1 s increments)
5	sec	Signal light, slope time program P_{START} to main program P_A Setting range 0.0 s to 20.0 s (0.1 s increments)
6		Signal light, main program (P_A) <ul style="list-style-type: none"> Wire speed WF-min. to WF-max. Correction of the arc length -9.9 V to +9.9 V
7	DYN	Signal light, dynamics Setting range -40 to +40
8	sec	Signal light, duration of main program P_A Setting range 0.0 s to 20.0 s (0.1 s increments). Used e.g. in connection with the super pulse function
9		Signal light, reduced main program (P_B) <ul style="list-style-type: none"> Wire speed: 1% to 200% of the main program P_A Correction of the arc length -9.9 V to +9.9 V
10	sec	Signal light, duration reduced main program P_B Setting range 0.0 s to 20.0 s (0.1 s increments). Used e.g. in connection with the super pulse function.
11	sec	Signal light, slope time program P_A (or P_B) to end program P_{END} Setting range 0.0 s to 20.0 s (0.1 s increments)
12		Signal light, end program (P_{END}) <ul style="list-style-type: none"> Wire speed: 1% to 200% of the main program P_A Correction of the arc length -9.9 V to +9.9 V
13	sec	Signal light, duration of end program P_{END} Setting range 0.0 s to 20.0 s (0.1 s increments)
14		Signal light, gas post-flow time Setting range 0.0 s to 20.0 s

Item	Symbol	Description
15	Super-puls	Signal lamp, super pulse function Lights up when the super pulse function is active.
16		Signal light, JOB-List Illuminates upon display or selection of the JOB number
17		Key button, JOB-List Selection of the welding task (JOB) from the JOB list
18		Wire inching button See also "Inching the Wire Electrode" chapter
19		Gas test / rinse button <ul style="list-style-type: none"> Gas test: For setting the shielding gas quantity Rinse: For rinsing longer tube packages See also "Shielding Gas Supply" chapter

5 Design and function

NOTE



Observe documentation of other system components when connecting!

5.1 General



WARNING



Risk of injury from electric shock!

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

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



CAUTION



Insulate the arc welder from welding voltage!

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

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



Risk of burns on the welding current connection!

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

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



Risk from electrical current!

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

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

CAUTION**Damage due to incorrect connection!**

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

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

**Using protective dust caps!**

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

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

5.2 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.

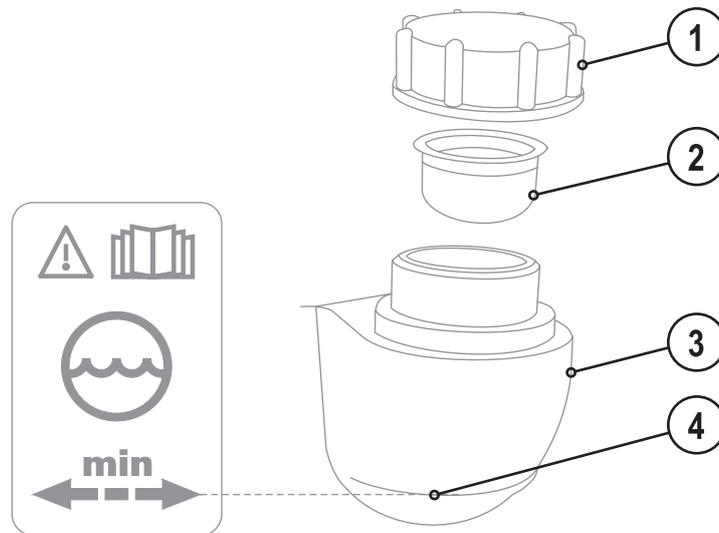


Figure 5-1

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

- ☞ 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.
- ☞ 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

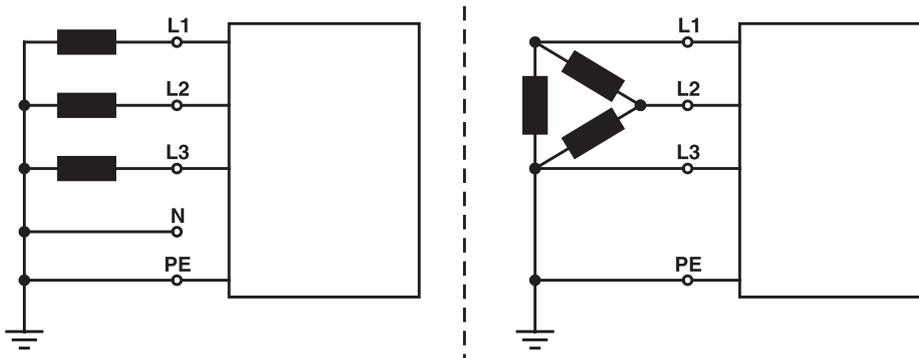


Figure 5-2

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 Connecting the intermediate hose package to the power source

5.7.1 Intermediate hose package strain relief

CAUTION



Missing or incorrectly fitted strain relief!

Connection sockets or connection plugs on the machine, or the intermediate tube package, may be damaged if the strain relief is missing or incorrectly fitted. The strain relief takes the strain from cables, plugs and sockets.

- Check the strain relief function by pulling in all directions. Cables and hoses must have sufficient play when the relief cord is fully stretched!

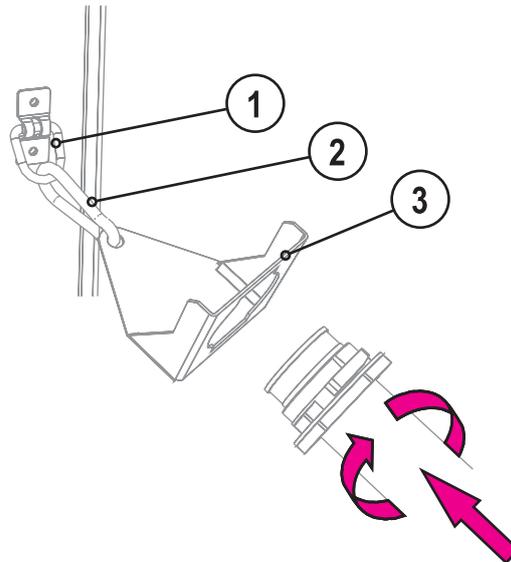


Figure 5-3

Item	Symbol	Description
1		Intermediate hose package strain relief
2		Snap hooks
3		Stirrup Intermediate hose package strain relief

- Insert the end of the hose package through the strain relief of the hose package and lock by turning to the right.

NOTE



Note the polarity of the welding current!

Some wire electrodes (e.g. self-shielding cored wire) are welded using negative polarity. In this case, the welding current lead should be connected to the "-" welding current socket, and the workpiece lead should be connected to the "+" welding current socket.

- Observe the information from the electrode manufacturer!

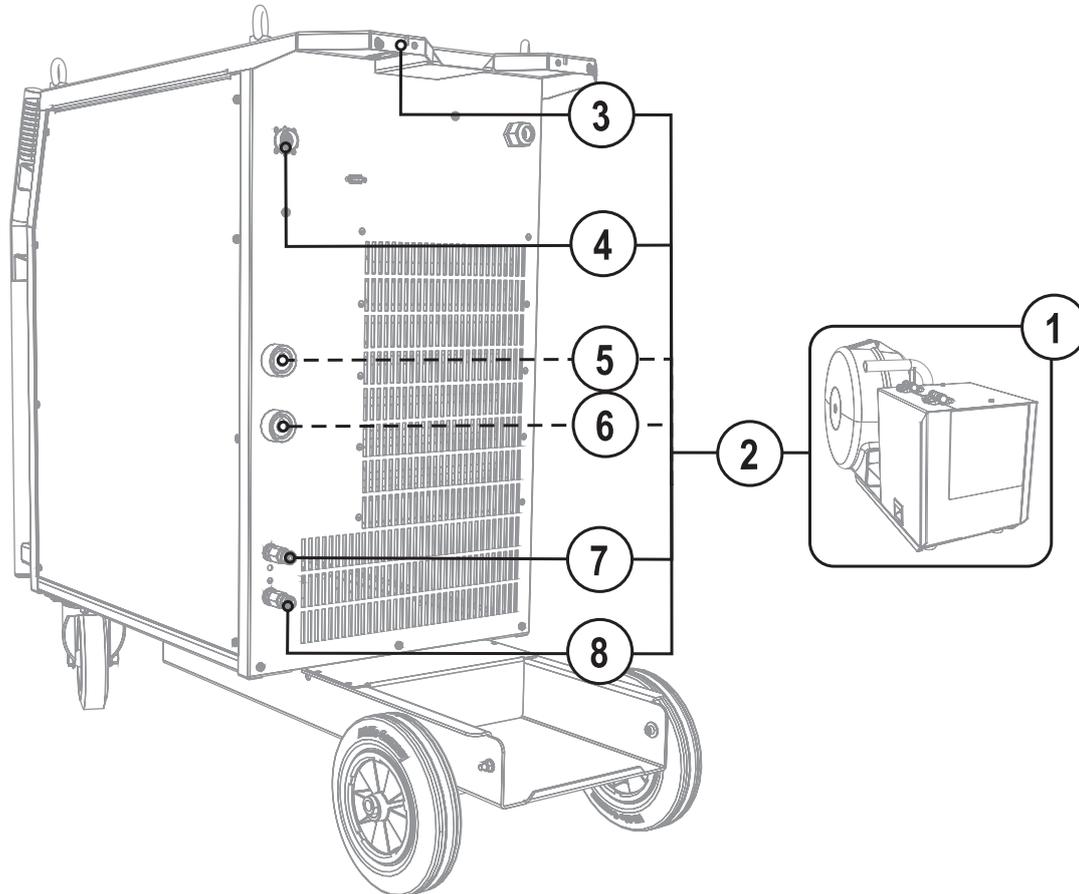


Figure 5-4

Item	Symbol	Description
1		Wire feed unit
2		Intermediate hose package
3		Intermediate hose package strain relief
4		19-pole connection socket (analogue) Wire feed unit control lead connection
5		Connection socket, "+" welding current • MIG/MAG welding: Welding current to central connection/torch
6		"-" welding current connection socket • MIG/MAG cored wire welding: Welding current to central connection/torch
7		Quick connect coupling (red) coolant return
8		Quick connect coupling (blue) coolant supply

- Insert the end of the hose package through the strain relief of the hose package and lock by turning to the right.
- Insert the plug on the welding current lead into the welding current connection socket "+" and lock.
- Insert cable plug on the control lead into the 19-pole connection socket and secure with crown nut (the plug can only be inserted into the connection socket in one position).

Where applicable:

- 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).

5.8 Shielding gas supply

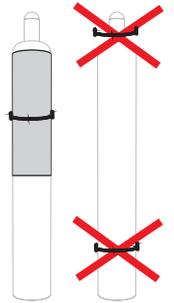
5.8.1 Connecting the shielding gas supply

WARNING



**Risk of injury due to improper handling of shielding gas cylinders!
Improper handling and insufficient securing of shielding gas cylinders can cause serious injuries!**

- Secure shielding gas cylinders using the standard fastening elements on the unit (chain/belt)!
- The fastening elements must tightly enclose the shielding gas cylinder!
- Attach the fastening elements within the upper half of the shielding gas cylinder!
- Do not attach any element to the shielding gas cylinder valve!
- Observe the instructions from the gas manufacturer and any relevant regulations concerning the use of compressed air!
- Avoid heating the shielding gas cylinder!
- When using shielding gas cylinders smaller than 50 litres, the ON HOLDER GAS BOTTLE option must be retrofitted



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.

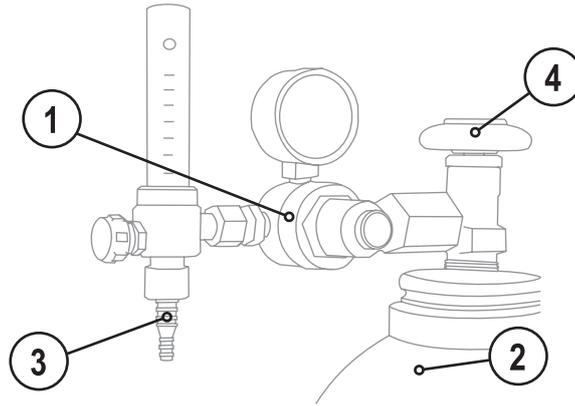


Figure 5-5

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

- Place the shielding gas cylinder into the relevant cylinder bracket.
- Secure the shielding gas cylinder using a securing chain.
- Tighten the pressure regulator screw connection on the gas bottle valve to be gas-tight.
- Tighten gas hose on pressure regulator to be gas tight.

5.8.2 Gas test

- Slowly open the gas cylinder valve.
- Open the pressure regulator.
- Switch on the power source at the main switch.
- Initiate gas test function on the machine control.
- Set the relevant gas quantity for the application on the pressure regulator.
- The gas test is triggered on the machine control by pressing the  button briefly.

Shielding gas flows for around 25 seconds or until the button is pressed again.

5.8.3 “Rinse hose package” function

Operating Element	Action	Result
	 5 s	Select rinse hose package. Shielding gas flows continuously until the Gas Test button is pressed again.

5.8.4 Setting the shielding gas quantity

Welding process	Recommended shielding gas quantity
MAG welding	Wire diameter x 11.5 = l/min
MIG brazing	Wire diameter x 11.5 = l/min
MIG welding (aluminium)	Wire diameter x 13.5 = l/min (100 % argon)

Helium-rich gas mixtures require a higher gas volume!

The table below can be used to correct the gas volume calculated where necessary:

Shielding gas	Factor
75% Ar/25% He	1.14
50% Ar/50% He	1.35
25% Ar/75% He	1.75
100% He	3.16

NOTE



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!

5.9 MIG/MAG welding

5.9.1 Connection for workpiece lead

NOTE



Note the polarity of the welding current!

Some wire electrodes (e.g. self-shielding cored wire) are welded using negative polarity. In this case, the welding current lead should be connected to the "-" welding current socket, and the workpiece lead should be connected to the "+" welding current socket.

- Observe the information from the electrode manufacturer!

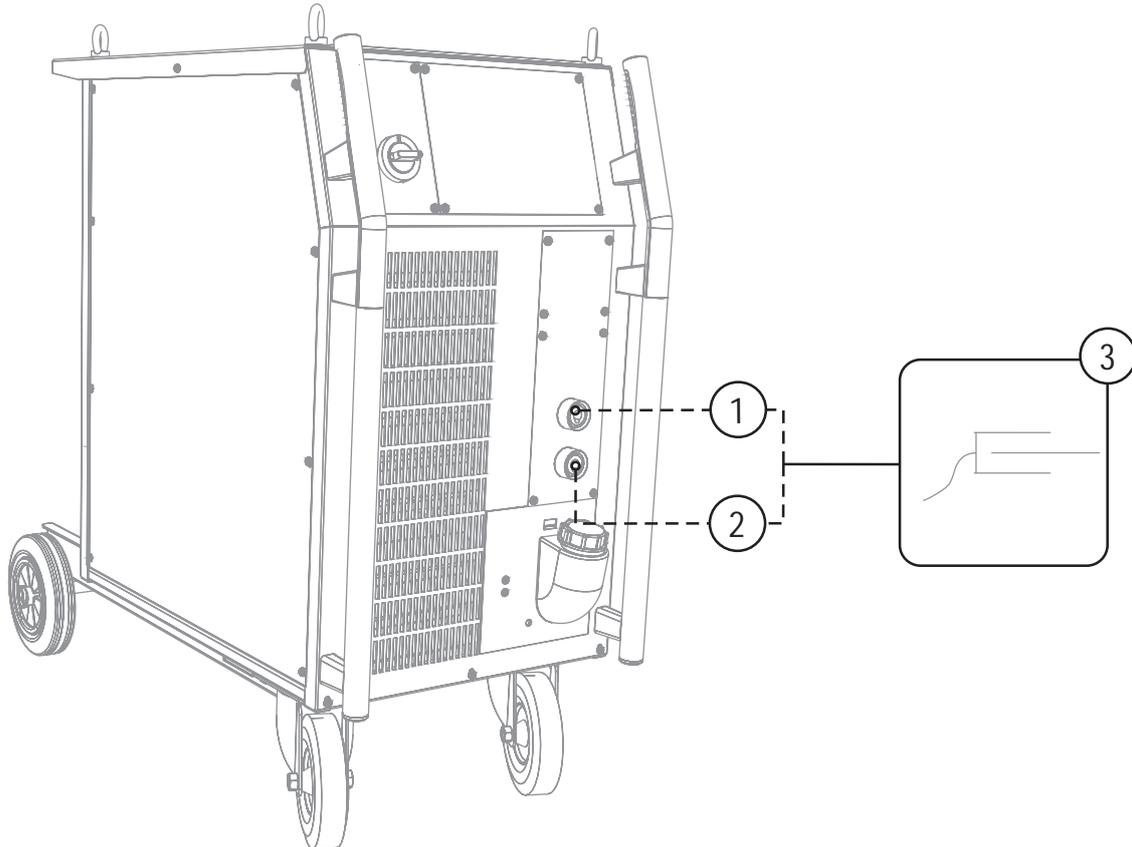


Figure 5-6

Item	Symbol	Description
1	+	Connection socket, "+" welding current • MIG/MAG cored wire welding: Workpiece connection
2	-	"-" welding current connection socket • MIG/MAG welding: Workpiece connection
3		Workpiece

- Insert the plug on the workpiece lead into the "-" welding current connection socket and lock.

5.9.2 Definition of MIG/MAG welding tasks

This range of machines feature simple operation with a very wide range of functions.

- Various JOBS (i.e. welding tasks consisting of welding process, material type, wire diameter and shielding gas type) have been pre-defined (see appendix for a list of JOBS).
- Simple JOB selection from a list of pre-defined JOBS (sticker on the machine).
- The required process parameters are calculated by the system depending on the operating point specified (single-dial operation via wire speed rotary dial).
- Additional parameters can be modified as required in the configuration menu on the control or using the PC300.NET welding parameter software.

5.9.3 Welding task selection

NOTE



Selection of a welding task involves the interaction of the controls on the welding machine and the wire feed unit. After the basic settings are made on the welding machine, the operating point and other parameters can be set on the wire feed unit.

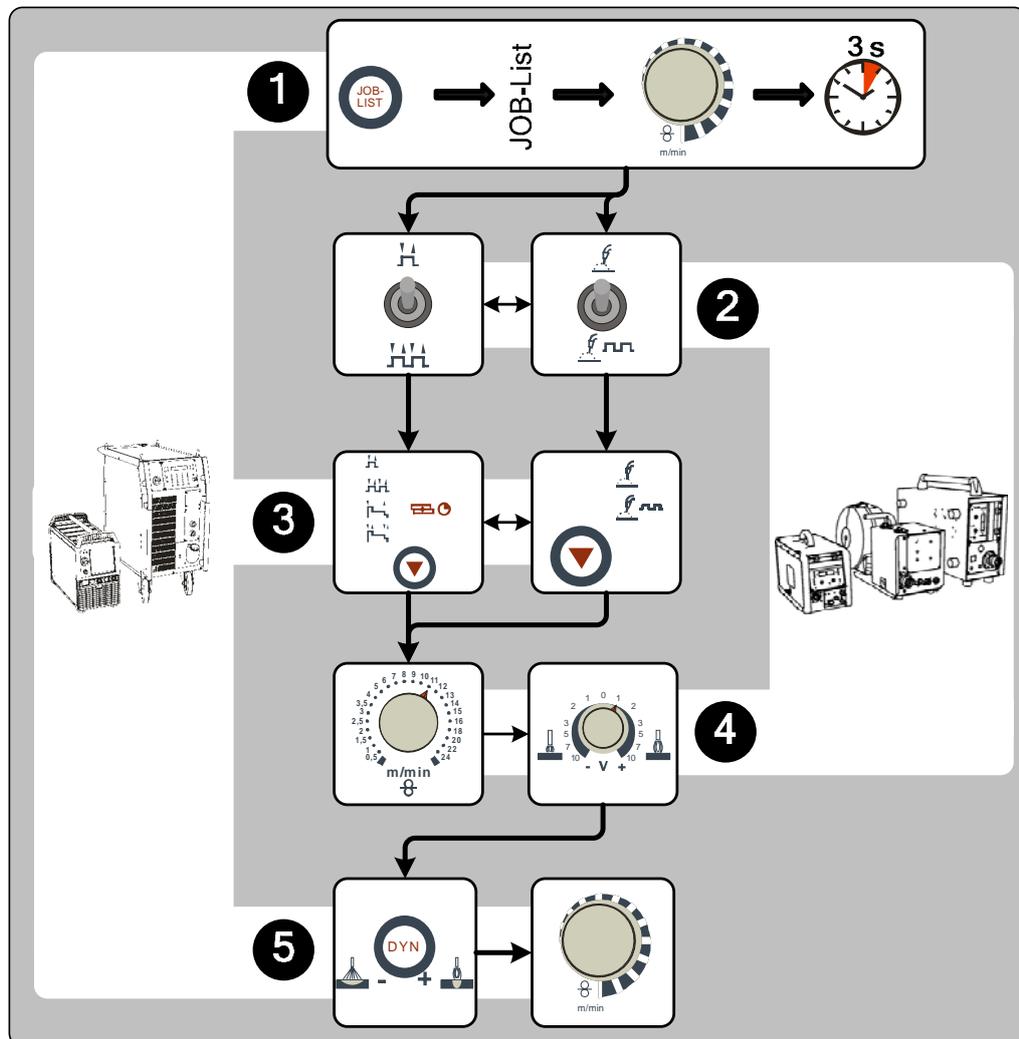


Figure 5-7

Operating element	Action	Result
		Select JOB list (LED is on)
		Set JOB number. Wait 3s until the setting has been adopted.
		Operating mode changeover switch Non-latched operation Non-latched, special non-latched and MIG spots can be selected using the welding machine control. Latched operation Latched and special latched can be selected using the welding machine control. To change the factory settings, refer to the "Advanced settings> P18" section.
		Operating mode button The signal light indicates the selected operating mode. Non-latched operation preselected at the wire feed unit: Non-latched operation Green Special non-latched operation Red Spot operating mode Latched operation preselected at the wire feed unit: Latched operation Special latched operation To change the factory settings, refer to the "Advanced settings> P18" section.
		Welding type changeover switch MIG/MAG standard welding MIG/MAG pulse arc welding To change the factory settings, refer to the "Advanced settings> P18" section.
		Welding type button MIG/MAG standard welding MIG/MAG pulse arc welding To change the factory settings, refer to the "Advanced settings> P18" section.
		Rotary dial, wire speed Wire speed setting (welding performance, one-dial operation) 0.5 to 24 m/min
		Arc length correction rotary dial Arc length correction from -10 V to +10 V in 24 increments. Correction depends on the values preselected on the power source.
		Select dynamic setting. (Signal light DYN is on)
		Set dynamic. (Setting range 40 to -40) 40: Arc hard and narrow. -40: Arc soft and wide.

5.9.3.1 Superpulses

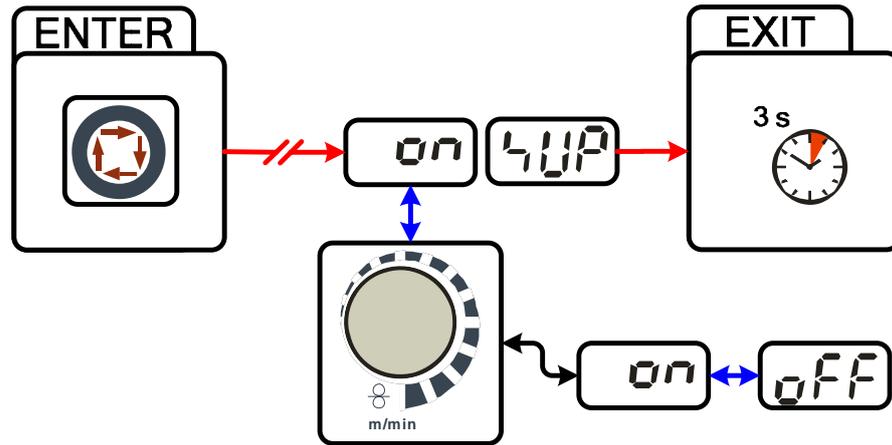


Figure 5-8

Display	Setting/selection
	Selects super pulses Switches function on or off.
	Switch on Switching on machine function
	Switch off Switching off machine function

5.9.3.2 Burn-back

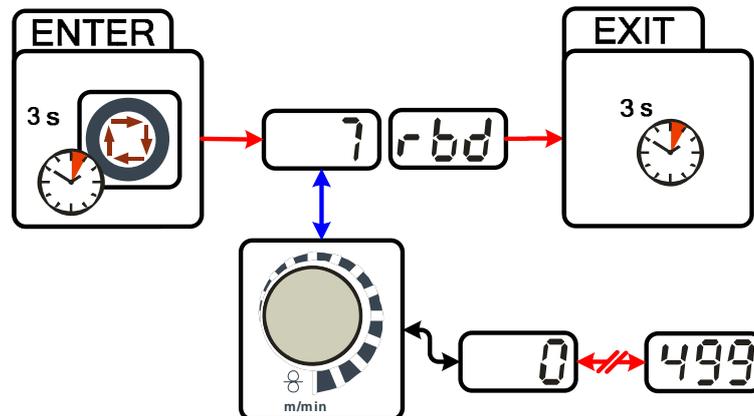


Figure 5-9

Display	Setting/selection
	menu burn back Set burn back
	Parameter setting (setting range 0 to 499) Back-burn set too high: large drops developing on the wire electrode result in poor ignition properties or the wire electrode sticking to the welding nozzle. Back-burn set too low: Wire electrode sticks in the molten pool

5.9.4 MIG/MAG operating point

The operating point (welding output) is specified using the principle of MIG/MAG one-dial operation, i.e. the user need only specify the operating point by setting the required wire speed, for example, and the digital system will calculate the optimum values for welding current and voltage (operating point).

The operating point setting can also be specified using the accessory components such as the remote control, welding torch, etc.

5.9.4.1 Selecting the display unit



Figure 5-10

The operating point (welding performance) can be displayed as the welding current, material thickness or wire speed.

Operating element	Action	Result
	n x	Switching the display between: AMP Welding current Material thickness Wire speed

Application example

Aluminium is to be welded.

- Material = AlMg,
- Gas = Ar 100%,
- Wire diameter = 1.2 mm

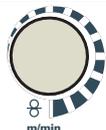
The correct wire speed is not known and is to be determined.

- Select the appropriate JOB (see "JOB list" sticker)
- Switch to the material thickness display
- Set the material thickness as appropriate (e.g. 5 mm)
- Switch to the wire speed display

The resulting wire speed will be shown (e.g. 8.4 m/min).

5.9.4.2 Operating point setting using material thickness, welding current, wire speed

Given below is a description of the setting work via the wire speed parameters as an example of operating point setting.

Operating element	Action	Result	Display
		Increase or reduce welding performance via the wire speed parameter. Display example: 10.5 m/min	

5.9.4.3 Arc length correction setting

The arc length can be corrected as follows.

Operating element	Action	Result	Display
		"Arc length correction" setting (Display example: -0.9V, setting range -9.9 V to +9.9 V)	

5.9.4.4 Accessory components for operating point setting

The operating point can also be set with various accessory components such as

- remote controls
- special torches
- PC software

5.9.5 MIG/MAG welding data display

To the left and right of the control displays are the "Parameter selection" buttons (⏮). They are used to select welding parameters to be displayed.

Each press of the button advances the display to the next parameter (LEDs next to the button indicate the selection). After the last parameter is reached, the system starts again from the beginning.

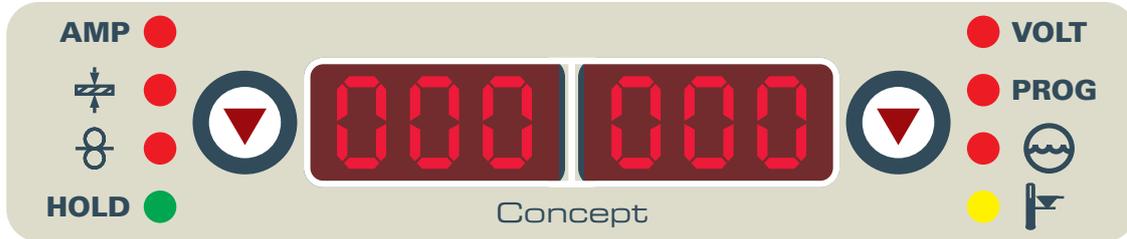


Figure 5-11

The display shows:

- Nominal values (before welding)
- Actual values (during welding)
- Hold values (after welding)

Parameter	Nominal values	Actual values	Hold values
Welding current	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Material thickness	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wire speed	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Welding voltage	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

When the settings are changed (e.g. wire speed), the system switches over immediately to the setpoint setting.

5.9.6 forceArc

Heat-reduced, directionally stable and powerful arc with deep penetration for the upper power range.

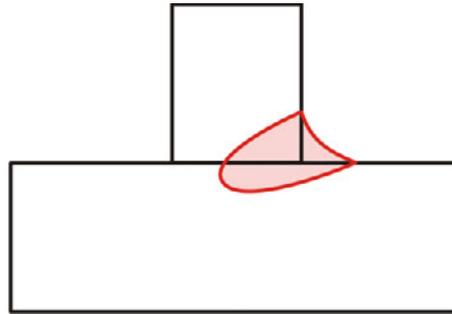


Figure 5-12

- Smaller included angle due to deep penetration and directionally stable arc
- Excellent root and sidewall fusion
- Secure welding also with very long stick-outs
- Reduced undercuts
- Un-, low- and high-alloyed steels as well as high-tensile fine-grained building steels
- Manual and automated applications

forceArc welding from:		Wire Ø (mm)							
		0.8		1		1.2		1.6	
Material	Gas	JOB	♀	JOB	♀	JOB	♀	JOB	♀
Steel	Ar 91–99%	190	17.0	254	12.0	255	9.5	256	7.0
	Ar 80–90%	189	17.0	179	12.0	180	9.5	181	6.0
CrNi	Ar 91–99%	x	x	251	12.0	252	12.0	253	6.0

You can make use of these properties after selecting the forceArc process (see the "Selecting a MIG/MAG welding task" chapter).

As with pulse arc welding, it is important to make sure of a good welding current connection.

- Keep welding current cables as short as possible and ensure that cable cross-sections are adequate!
- Fully unroll welding current cables, torch tube packages and, if applicable, intermediate tube packages. Avoid loops!
- Use welding torches, preferably water-cooled, that are suitable for the higher power range.
- Use welding wire with adequate copper coating when welding steel. The wire spool should have layer spooling.

NOTE



Unstable arc!

Welding current cables that are not fully unrolled can cause faults in the arc (flickering).

- Fully unroll welding current cables, torch tube packages and, if applicable, intermediate tube packages. Avoid loops!

5.9.7 rootArc

Short arc with easy weld modelling capabilities for effortless gap bridging and positional welding.

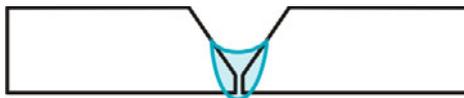


Figure 5-13

- Reduced spatter compared to standard short arc
- Good root formation and secure sidewall fusion
- Un-alloyed and low-alloy steels
- Manual and automated applications

rootArc welding up to:		Wire Ø (mm)											
		0.6		0.8		0.9		1		1.2		1.6	
Material	Gas	JOB		JOB		JOB		JOB		JOB		JOB	
Steel	CO2	x	x	x	x	x	x	204	6.0	205	5.0	x	x
	Ar 80–90%	x	x	x	x	x	x	206	6.0	207	5.0	x	x

NOTE



Unstable arc!

Welding current cables that are not fully unrolled can cause faults in the arc (flickering).

- Fully unroll welding current cables, torch tube packages and, if applicable, intermediate tube packages. Avoid loops!

5.9.8 MIG/MAG functional sequences / operating modes
NOTE

 There are optimum pre-sets for welding parameters such as gas pre-flow and burn back, etc. for numerous applications (although these can also be changed if required).

5.9.8.1 Explanation of signs and functions

Symbol	Meaning
	Press torch trigger
	Release torch trigger
	Tap torch trigger (press briefly and release)
	Shielding gas flowing
I	Welding output
	Wire electrode is being conveyed
	Wire creep
	Wire burn-back
	Gas pre-flows
	Gas post-flows
	Non-latched
	Special, non-latched
	Latched
	Special, latched
t	Time
PSTART	Ignition program
PA	Main program
PB	Reduced main program
PEND	End program
t2	Spot time

Non-latched mode

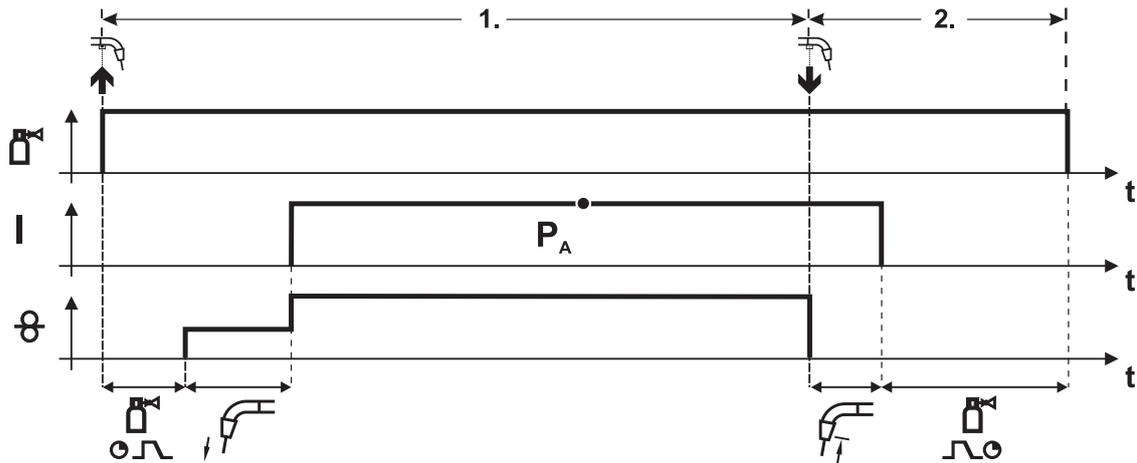


Figure 5-14

Step 1

- Press and hold torch trigger.
- Shielding gas is expelled (gas pre-flows).
- Wire feed motor runs at "creep speed".
- Arc ignites after the wire electrode makes contact with the workpiece; welding current flows.
- Change over to pre-selected wire speed.

Step 2

- Release torch trigger.
- WF motor stops.
- Arc is extinguished after the preselected wire burn-back time expires.
- Gas post-flow time elapses.

Non-latched operation with superpulse

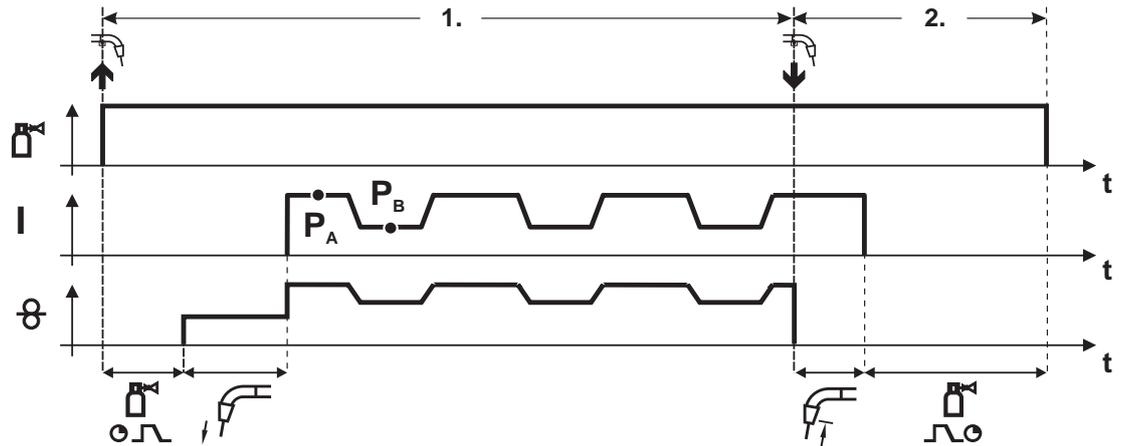


Figure 5-15

Step 1

- Press and hold torch trigger.
- Shielding gas is expelled (gas pre-flows).
- Wire feed motor runs at "creep speed".
- Arc ignites after the wire electrode makes contact with the workpiece; welding current flows.
- Start the super pulse function beginning with main program P_A :
The welding parameters change at the specified times between main program P_A and the reduced main program P_B .

Step 2

- Release torch trigger.
- Super pulse function is ended.
- WF motor stops.
- Arc is extinguished after the preselected wire burn-back time expires.
- Gas post-flow time elapses.

Special, non-latched

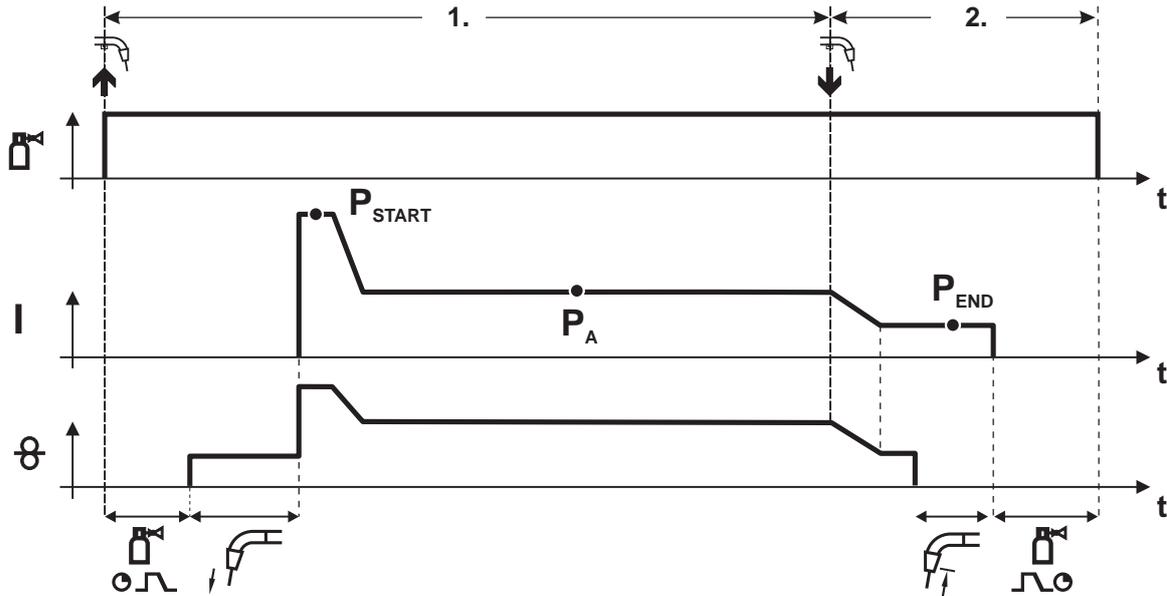


Figure 5-16

Step 1

- Press and hold torch trigger
- Shielding gas is expelled (gas pre-flows)
- Wire feed motor runs at "creep speed".
- Arc ignites after the wire electrode makes contact with the workpiece, welding current is flowing (start program P_{START} for the time t_{start})
- Slope to main program P_A .

Step 2

- Release torch trigger
- Slope to end program P_{END} for the time t_{end} .
- WF motor stops.
- Arc is extinguished after the preselected wire burn-back time expires.
- Gas post-flow time elapses.

Spot welding

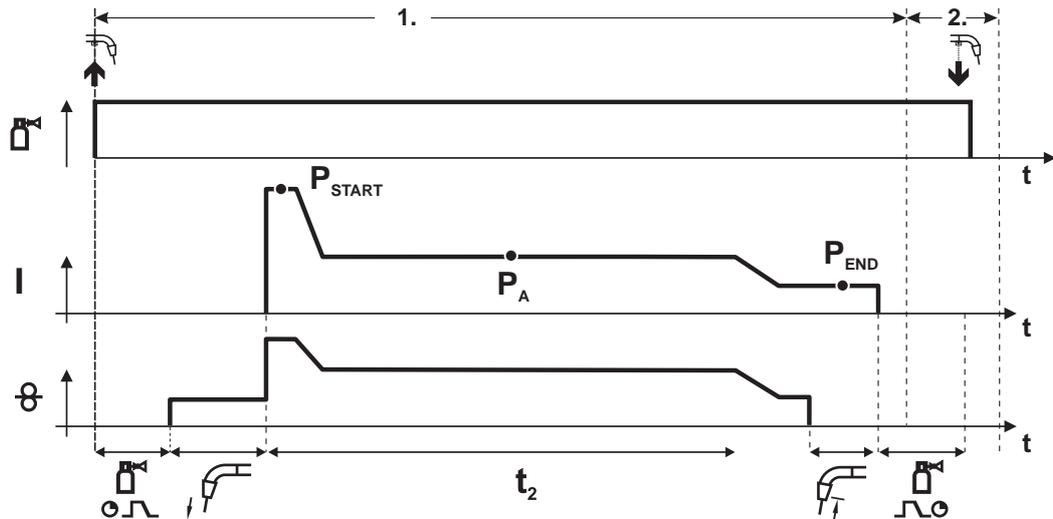


Figure 5-17

NOTE

 The ignition time t_{start} must be added to the spot time t_2 .

1st cycle

- Press and hold torch trigger
- Shielding gas is expelled (gas pre-flows)
- Wire feed motor runs at "creep speed"
- Arc ignites after the wire electrode makes contact with the workpiece, welding current is flowing (start program P_{START} , spot time starts)
- Slope to main program P_A
- After the set spot time elapses, slope goes to end program P_{END} .
- Wire feed motor stop welding.
- Arc is extinguished after the pre-selected wire burn-back time elapses
- Gas post-flow time elapses.

2nd cycle

- Release torch trigger

Releasing the torch trigger (step 2) interrupts the welding process even if the spot time has not yet elapsed (slope to end program P_{END}).

Special, non-latched with superpulse

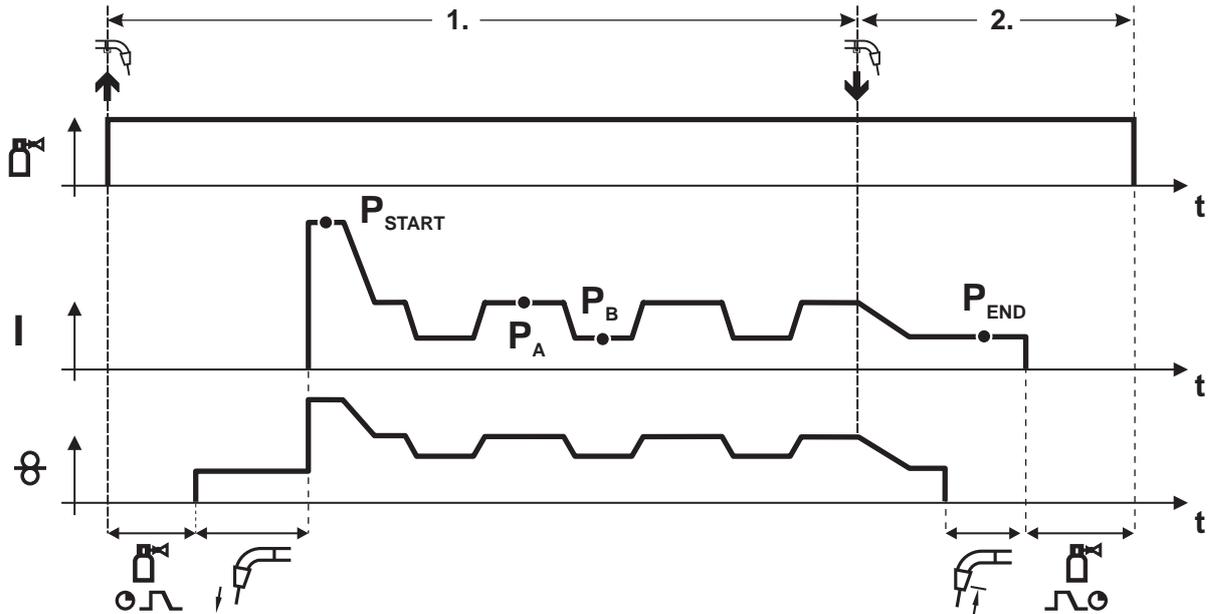


Figure 5-18

Step 1

- Press and hold torch trigger
- Shielding gas is expelled (gas pre-flows)
- Wire feed motor runs at “creep speed”.
- Arc ignites after the wire electrode makes contact with the workpiece, welding current is flowing (start program P_{START} for the time t_{start}).
- Slope on main program P_A .
- Start the super pulse function beginning with main program P_A :
The welding parameters change at the specified times between main program P_A and the reduced main program P_B .

Step 2

- Release torch trigger
- Super pulse function is ended.
- Slope to end program P_{END} for the time t_{end} .
- WF motor stops.
- Arc is extinguished after the preselected wire burn-back time expires.
- Gas post-flow time elapses.

Latched mode

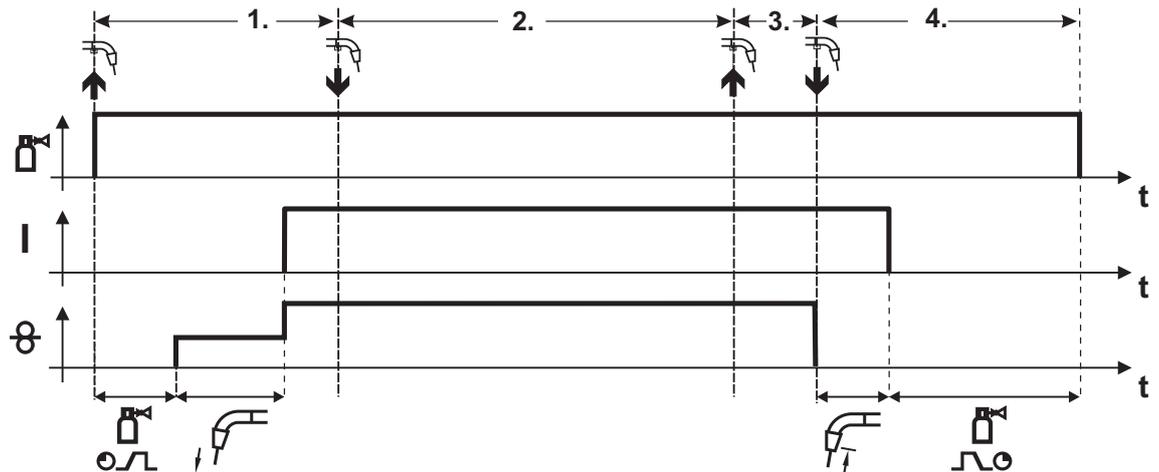


Figure 5-19

Step 1

- Press and hold torch trigger
- Shielding gas is expelled (gas pre-flows)
- Wire feed motor runs at "creep speed".
- Arc ignites after the wire electrode makes contact with the workpiece; welding current flows.
- Change over to pre-selected WF speed (main program P_A).

Step 2

- Release torch trigger (no effect)

Step 3

- Press torch trigger (no effect)

Step 4

- Release torch trigger
- WF motor stops.
- Arc is extinguished after the preselected wire burn-back time expires.
- Gas post-flow time elapses.

Latched mode with superpulse

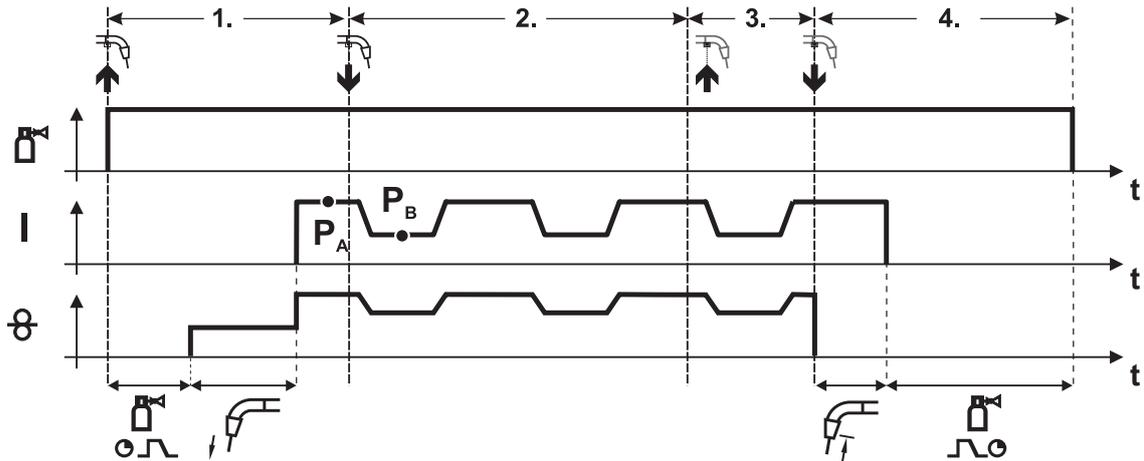


Figure 5-20

Step 1:

- Press and hold torch trigger
- Shielding gas is expelled (gas pre-flows)
- Wire feed motor runs at “creep speed”.
- Arc ignites after the wire electrode makes contact with the workpiece; welding current flows.
- Start the super pulse function beginning with main program P_A .
The welding parameters change at the specified times between main program P_A and the reduced main program P_B .

Step 2:

- Release torch trigger (no effect)

Step 3:

- Press torch trigger (no effect)

Step 4:

- Release torch trigger
- Super pulse function is ended.
- WF motor stops.
- Arc is extinguished after the preselected wire burn-back time expires.
- Gas post-flow time elapses.

Latched mode with alternating welding process

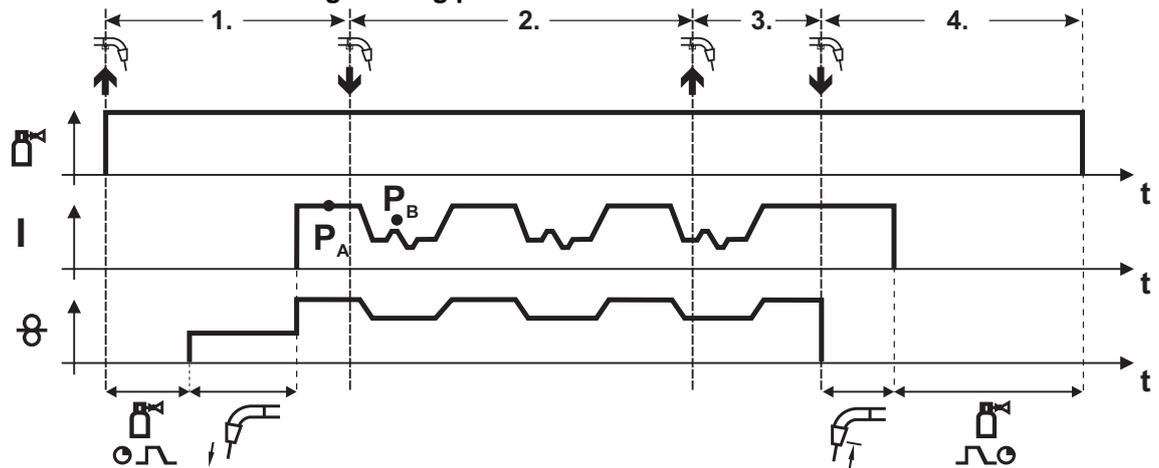


Figure 5-21

1st cycle:

- Press and hold torch trigger
- Shielding gas is expelled (gas pre-flows)
- Wire feed motor runs at "creep speed"
- Arc ignites after the wire electrode makes contact with the workpiece; welding current flows
- Start the process alternation starting with process P_A :
The welding processes alternate between the process P_A stored in the JOB and the opposite process P_B at the specified times (t_2 and t_3)

If a standard process is stored in the JOB, this means that there is a permanent alternation between the processes, starting with the standard process and followed by the pulse process. The same applies if the situation is reversed.

2nd cycle:

- Release torch trigger (no effect)

3rd cycle:

- Press torch trigger (no effect)

4th cycle:

- Release torch trigger
- Super pulse function is ended
- WF motor stops
- Arc is extinguished after the pre-selected wire burn-back time elapses
- Gas post-flow time elapses

NOTE

This function can be activated using the PC300.Net software.
Refer to the software operating instructions.

Latched special

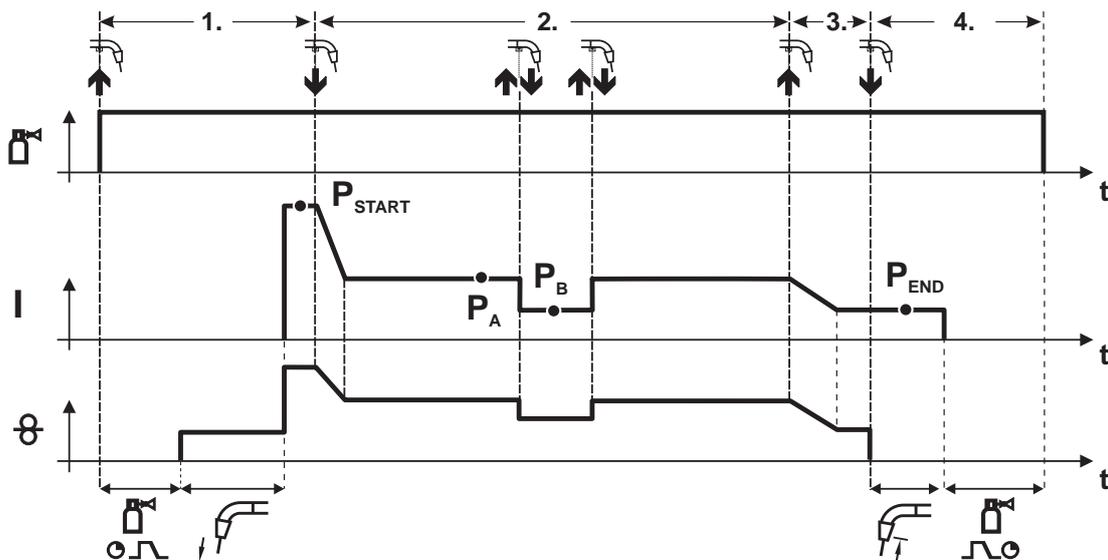


Figure 5-22

Step 1

- Press and hold torch trigger
- Shielding gas is expelled (gas pre-flows)
- Wire feed motor runs at “creep speed”.
- Arc ignites after the wire electrode makes contact with the workpiece, welding current is flowing (start program P_{START})

Step 2

- Release torch trigger
- Slope to main program P_A .

The slope on main program P_A is given at the earliest after the set time t_{START} elapses and at the latest when the torch trigger is released.

Tapping¹⁾ can be used to change over to the reduced main program P_B .

Repeated tapping will switch back to the main program P_A .

Step 3

- Press and hold torch trigger
- Slope to end program P_{END} .

Step 4

- Release torch trigger
- WF motor stops.
- Arc is extinguished after the preselected wire burn-back time expires.
- Gas post-flow time elapses.

NOTE



¹⁾ Prevent tapping (brief press and release within 0.3 seconds)

If the welding current is to be prevented from switching over to the reduced main program P_B by tapping, the parameter value for WF3 needs to be set to 100% ($P_A = P_B$) in the program sequence.

Latched special with welding process alternation

NOTE

-  This function can be activated using the PC300.NET software.
 - Refer to the software operating instructions.

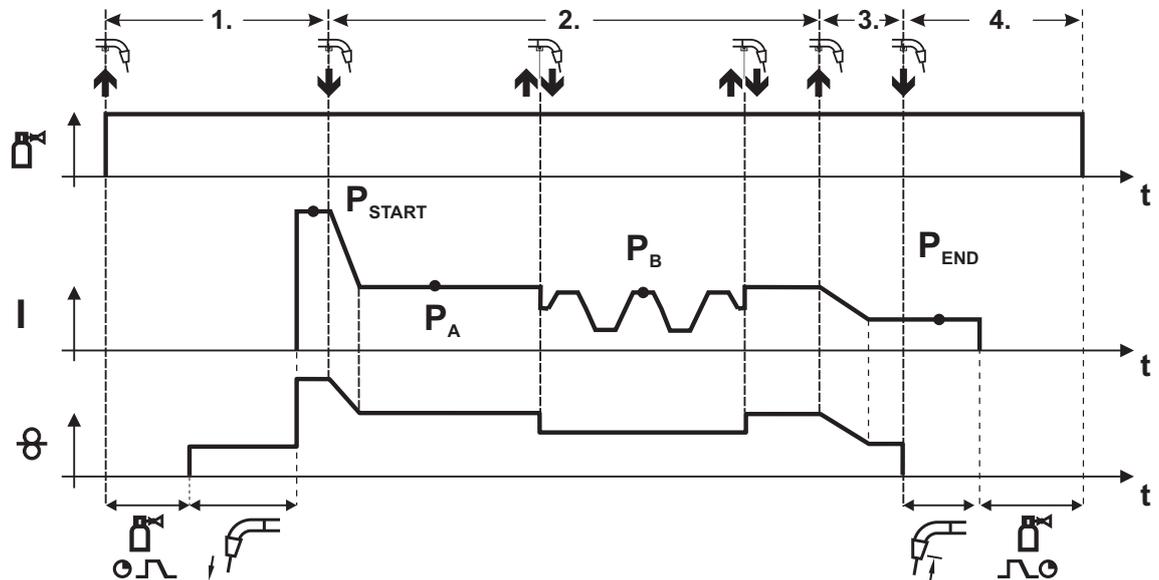


Figure 5-23

1st cycle

- Press and hold torch trigger.
- Shielding gas is expelled (gas pre-flows)
- Wire feed motor runs at "creep speed"
- Arc ignites after the wire electrode makes contact with the workpiece, welding current is flowing (start program P_{START})

2nd cycle

- Release torch trigger
- Slope on main program P_A

The slope on main program P_A is given at the earliest after the set time t_{START} elapses and at the latest when the torch trigger is released.

Tapping (pressing the torch trigger for less than 0.3 sec.) changes over the welding process (P_B).

If a standard process has been defined in the main program, tapping changes to the pulse process, and tapping again will return to the standard process, etc.

3rd cycle

- Press and hold torch trigger
- Slope to end program P_{END}

4th cycle

- Release torch trigger
- WF motor stops
- Arc is extinguished after the pre-selected wire burn-back time elapses
- Gas post-flow time elapses

Latched special with alternating welding process

NOTE

- This function can be activated using the PC300.NET software.
 - Refer to the software operating instructions.

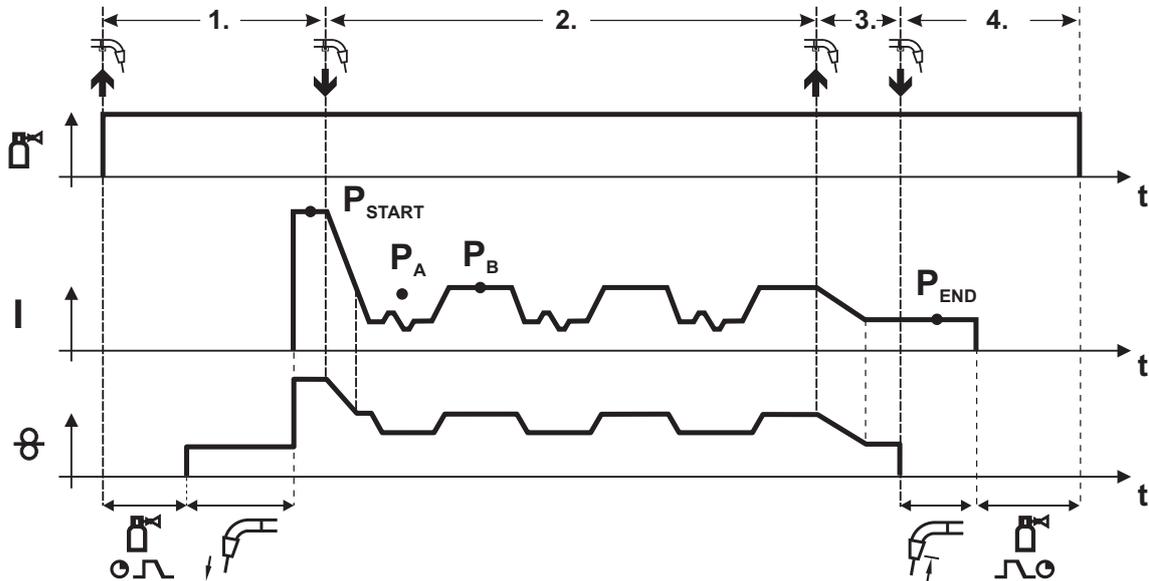


Figure 5-24

1st cycle

- Press and hold torch trigger
- Shielding gas is expelled (gas pre-flows)
- Wire feed motor runs at "creep speed"
- Arc ignites after the wire electrode makes contact with the workpiece, welding current is flowing (start program P_{START} for the time t_{start})

2nd cycle

- Release torch trigger
- Slope on main program P_A
- Start the process alternation starting with process P_A :
The welding processes alternate between the process P_A stored in the JOB and the opposite process P_B at the specified times (t_2 and t_3)

If a standard process is stored in the JOB, this means that there is a permanent alternation between the processes, starting with the standard process and followed by the pulse process. The same applies if the situation is reversed.

3rd cycle

- Press the torch trigger
- Super pulse function is ended
- Slope in the end program P_{END} for the time t_{end}

4th cycle

- Release torch trigger
- WF motor stops
- Arc is extinguished after the pre-selected wire burn-back time elapses
- Gas post-flow time elapses

Special, latched with superpulse

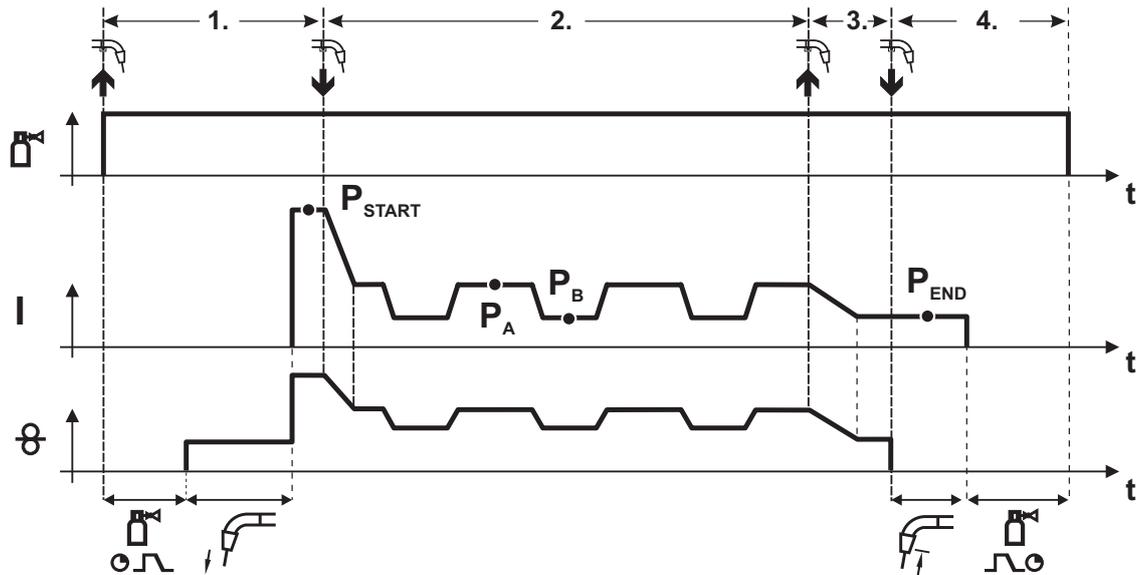


Figure 5-25

Step 1

- Press and hold torch trigger
- Shielding gas is expelled (gas pre-flows)
- Wire feed motor runs at "creep speed".
- Arc ignites after the wire electrode makes contact with the workpiece, welding current is flowing (start program P_{START} for the time t_{start}).

Step 2

- Release torch trigger
- Slope on main program P_A .
- Start the super pulse function beginning with main program P_A :
The welding parameters change at the specified times between main program P_A and the reduced main program P_B .

Step 3

- Press the torch trigger.
- Super pulse function is ended.
- Slope in the end program P_{END} for the time t_{end} .

Step 4

- Release torch trigger
- WF motor stops.
- Arc is extinguished after the preselected wire burn-back time expires.
- Gas post-flow time elapses.

5.9.9 MIG/MAG program sequence ("Program steps" mode)

Certain materials, such as aluminium, require special functions in order to be able to weld them safely and at high quality. The latched special operating mode is used here with the following programs:

- Start program P_{START} (reduction of cool points at the start of the seam)
- Main program P_A (continuous welding)
- Reduced main program P_B (targeted heat reduction)
- End program P_{END} (minimisation of end craters via targeted heat reduction)

The programs include the parameters wire speed (operating point), arc length correction, slope times, program duration, etc.

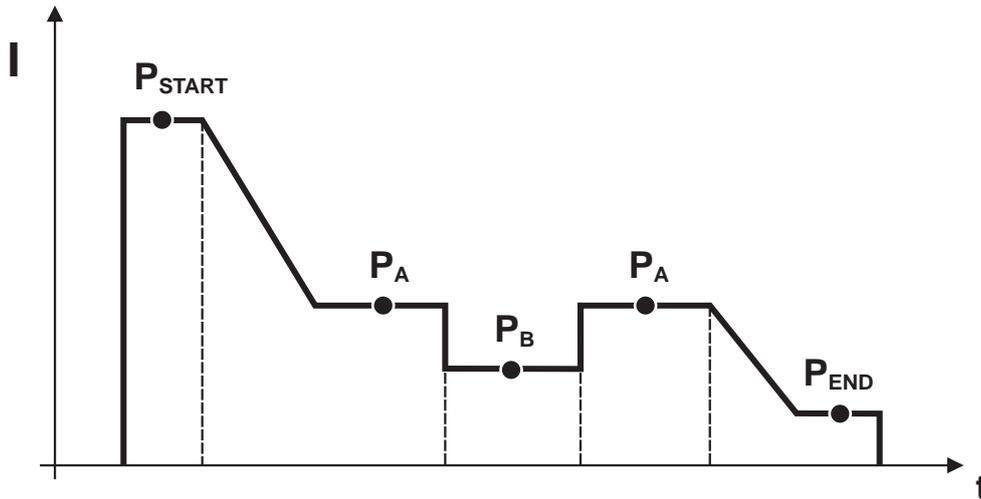


Figure 5-26

NOTE



This function can only be enabled with the PC300.NET software.

- (See operating instructions for the software)

5.9.9.1 Selection of the program sequence parameter

Operating Element	Action	Result	Display
	$n \times$	Select parameter in the program sequence	
		Setting welding parameters	

5.9.9.2 MIG/MAG overview of parameters

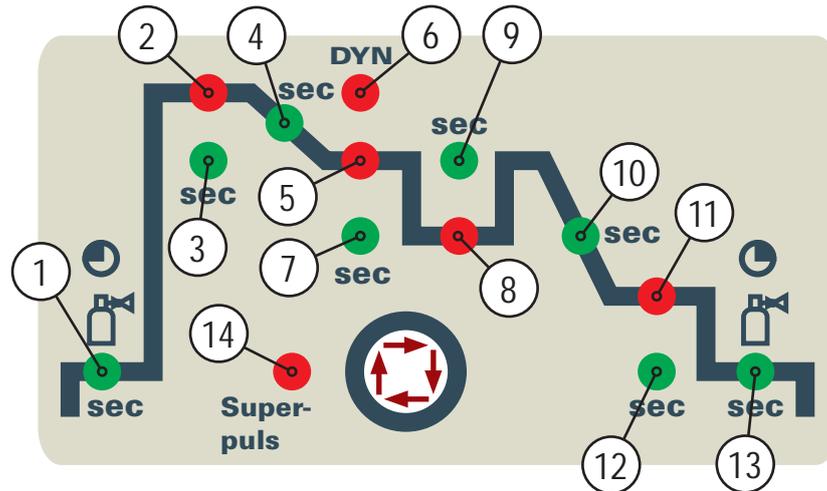


Figure 5-27

Basic Parameters

Item	Meaning / Explanation	Setting Range
1	Gas pre-flow time	0.0s to 20.0s
2	P_{START} Wire speed, relative Arc length correction	1% to 200% -9.9V to +9.9V
3	Duration	0.0s to 20.0s
4	Slope duration from P_{START} to P_A	0.0s to 20.0s
5	P_A Wire speed, absolute	0.1 m/min to 40 m/min
6	Dynamics	-40 to +40
7	Duration (spot time and superpulse)	0.01s to 20.0s
8	P_B Wire speed, relative Arc length correction, relative	1% to 200% -9.9V to +9.9V
9	Duration	0.01s to 20.0s
10	Slope duration from P_A to P_{END}	0.0s to 20s
11	P_{END} Wire speed, relative Arc length correction	1% to 200% -9.9V to +9.9V
12	Duration (superpulse)	0.0s to 20s
13	Gas post-flow time	0.0s to 20s
14	Superpulses	On / Off

NOTE



In the factory setting, P_{START} , P_B , and P_{END} are "relative programs". They relate to percentages of the wire feed value from the main program P_A .

5.9.9.3 Example, tack welding (non-latched)

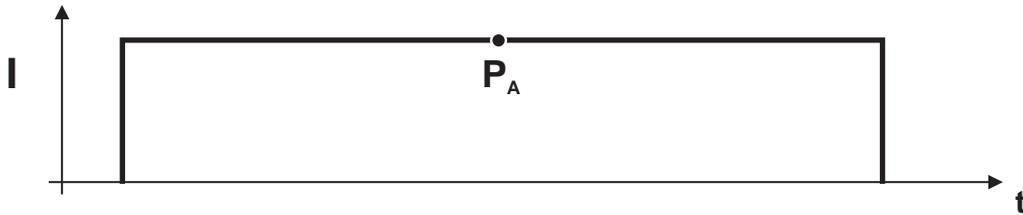


Figure 5-28

Basic parameters

Parameter	Meaning / explanation	Setting range
GASstr	Gas pre-flow time	0.0s to 20.0s
GASend:	Gas post-flow time	0.0s to 20s
RUECK	Wire burn-back length	2 to 500
"P_A" main program		
Parameter	Meaning / explanation	Setting range
	Setting the wire speed	

5.9.9.4 Example, aluminium tack welding (non-latched special)

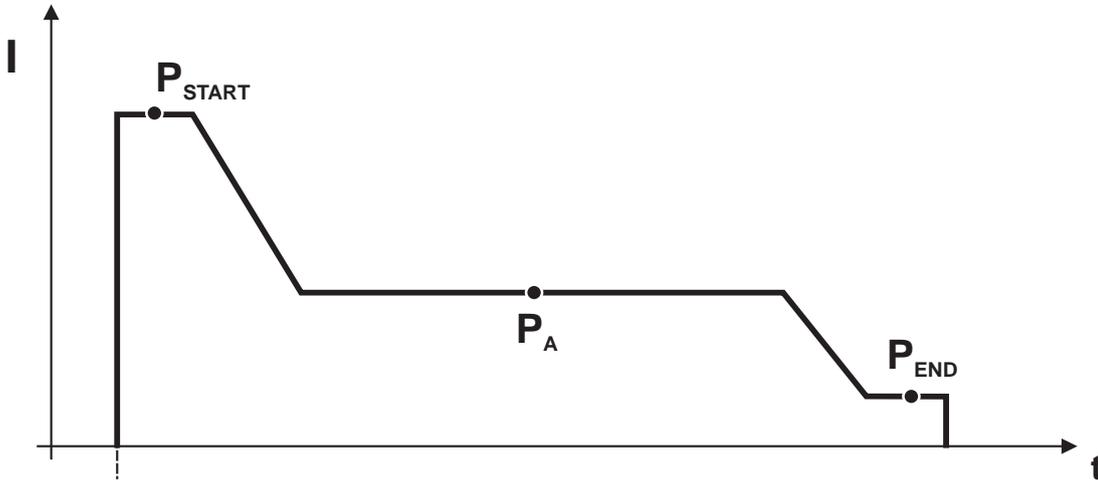


Figure 5-29

Basic parameters

Welding parameter	Meaning / explanation	Setting range
GASstr	Gas pre-flow time	0.0s to 20.0s
GASend:	Gas post-flow time	0.0s to 20.0s
RUECK	Wire burn-back length	2 to 500
"P_{START}" start program		
Welding parameter	Meaning / explanation	Setting range
DVstart	Wire speed	0% to 200%
Ustart	Arc length correction	-9.9V to +9.9V
tstart	Duration	0.0s to 20s
"P_A" main program		
Welding parameter	Meaning / explanation	Setting range
	Setting the wire speed	
"P_{END}" end-crater program		
Welding parameter	Meaning / explanation	Setting range
DVend	Wire speed	0% to 200%
Uend	Arc length correction	-9.9V to +9.9V
tend	Duration	0.0s to 20s

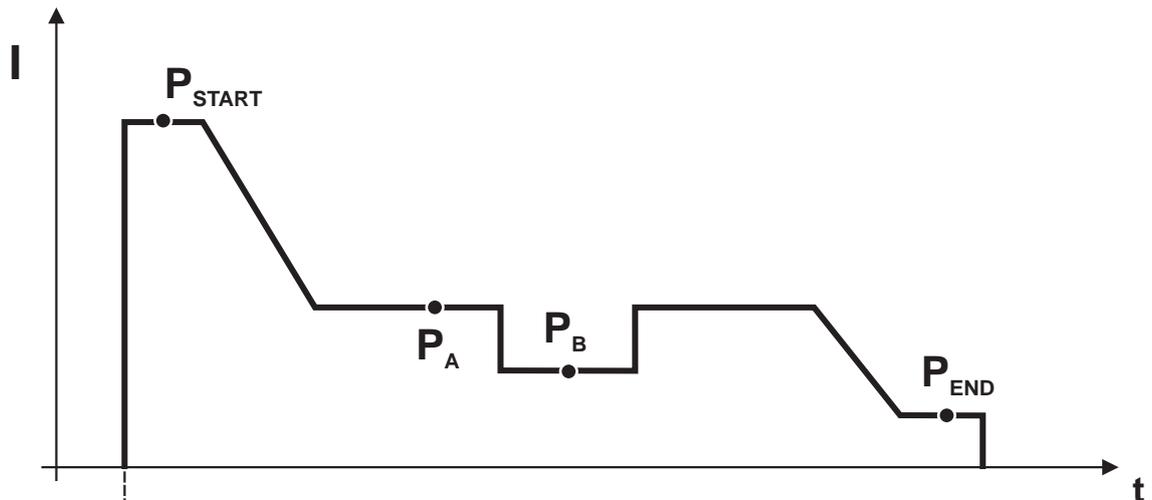
5.9.9.5 Example, aluminium welding (latched special)


Figure 5-30

Basic parameters

Welding parameter	Meaning / explanation	Setting range
GASstr	Gas pre-flow time	0.0s to 20.0s
GASend:	Gas post-flow time	0.0s to 20.0s
RUECK	Wire burn-back length	2 to 500

"P_{START}" start program

Welding parameter	Meaning / explanation	Setting range
DVstart	Wire speed	0% to 200%
ustart	Arc length correction	-9.9V to +9.9V
tstart	Duration	0.0s to 20s

"P_A" main program

Welding parameter	Meaning / explanation	Setting range
	Setting the wire speed	

"P_B" reduced main program

Welding parameter	Meaning / explanation	Setting range
DV3	Wire speed	0% to 200%
U3	Arc length correction	-9.9V to +9.9V

"P_{END}" end-crater program

Welding parameter	Meaning / explanation	Setting range
tSend	Slope duration from P _A or P _B to P _{END}	0.0s to 20s
DVend	Wire speed	0% to 200%
Uend	Arc length correction	-9.9V to +9.9V
tend	Duration	0.0s to 20s

5.9.9.6 Example, visible seams (latched super pulse)

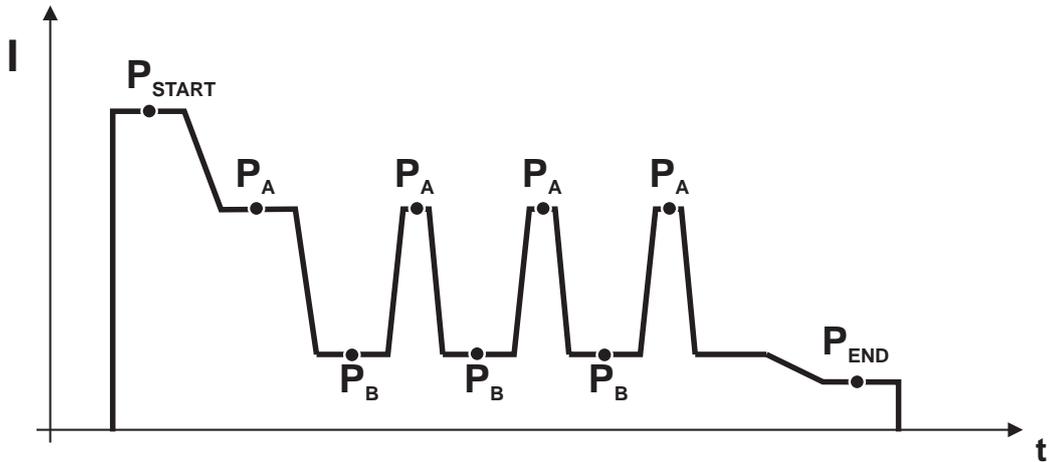


Figure 5-31

Basic parameters

Welding parameter	Meaning / explanation	Setting range
GASstr	Gas pre-flow time	0.0s to 20.0s
GASend:	Gas post-flow time	0.0s to 20.0s
RUECK	Wire burn-back length	2 to 500
PROC.SP.	Travel speed to determine the a-measurement*	10cm to 200cm

"P_{START}" start program

Welding parameter	Meaning / explanation	Setting range
DVstart	Wire speed	0% to 200%
ustart	Arc length correction	-9.9V to +9.9V
tstart	Duration	0.0s to 20s

"P_A" main program

Welding parameter	Meaning / explanation	Setting range
tS1	Slope duration from P _{START} to P _A	0.0s to 20s
DV3	Setting the wire speed	0% to 200%
t2	Duration	0.1s to 20s
tS3	Slope duration from P _B to P _A	0.0s to 20s

"P_B" reduced main program

Welding parameter	Meaning / explanation	Setting range
tS2	Slope duration from P _A to P _B	0.0s to 20s
DV3	Wire speed	0% to 200%
U3	Arc length correction	-9.9V to +9.9V
t3	Duration	0.1s to 20s

"P_{END}" end-crater program

Welding parameter	Meaning / explanation	Setting range
tSend	Slope duration from P _A or P _B to P _{END}	0.0s to 20s
DVend	Wire speed	0% to 200%
Uend	Arc length correction	-9.9V to +9.9V
tend	Duration	0.0s to 20s

5.9.10 Main program A mode

Different welding tasks or positions on a workpiece demand various welding performances (operating points) or welding programs. The following parameters are stored in each of the up to 16 programs:

- Operating mode
- Welding type
- Superpulses (ON/OFF)
- Wire feed speed (DV2)
- Voltage correction (U2)
- Dynamics (DYN2)

Example 1: Welding workpieces with different sheet metal thicknesses (non-latched)

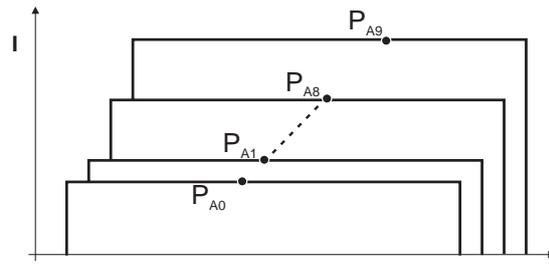


Figure 5-32

Example 2: Welding different positions on a workpiece (latched)

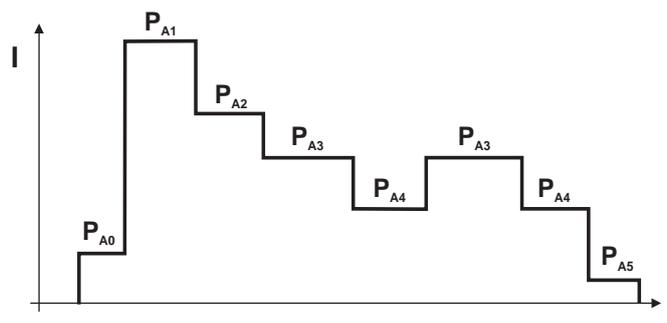


Figure 5-33

Example 3: Aluminium welding of different sheet metal thicknesses (non-latched or latched special)

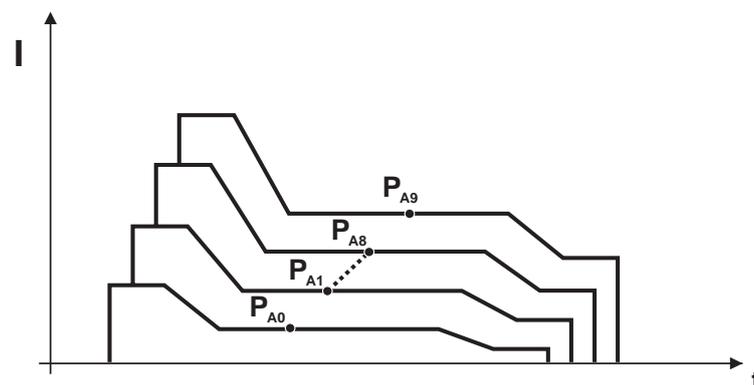


Figure 5-34

NOTE



Up to 16 programs (P_{A0} to P_{A15}) can be defined.

An operating point (wire speed, arc length correction, dynamics/choke effect) can be defined permanently in each program.

Program P0 is an exception: the settings for operating points are made manually here.

Changes to the welding parameters are saved immediately!

5.9.10.1 Selecting parameters (program A)

Operating element	Action	Result	Display
	n x	Change welding data display over to program display. (LED PROG is on)	
		Select program number. Display example: Program "1".	
	n x	Select program sequence parameter "Main program (P _A)". (LED is on)	
		Set wire speed. (Absolute value)	
		Set arc length correction. Display example: "-0.8 V" correction (Setting range: -9.9 V to +9.9 V)	
	1 x	Select "Dynamic" program sequence parameter. (LED DYN is on)	
		Set dynamic. (Setting range 40 to -40) 40: Arc hard and narrow. -40: Arc soft and wide.	

NOTE



Changes to the welding parameters can only be made when the key switch is in position "1".

5.9.11 Advanced settings

The special parameters cannot be viewed directly since they are normally only set and stored once. The machine control offers the following special functions:

5.9.11.1 Selecting, changing and saving parameters

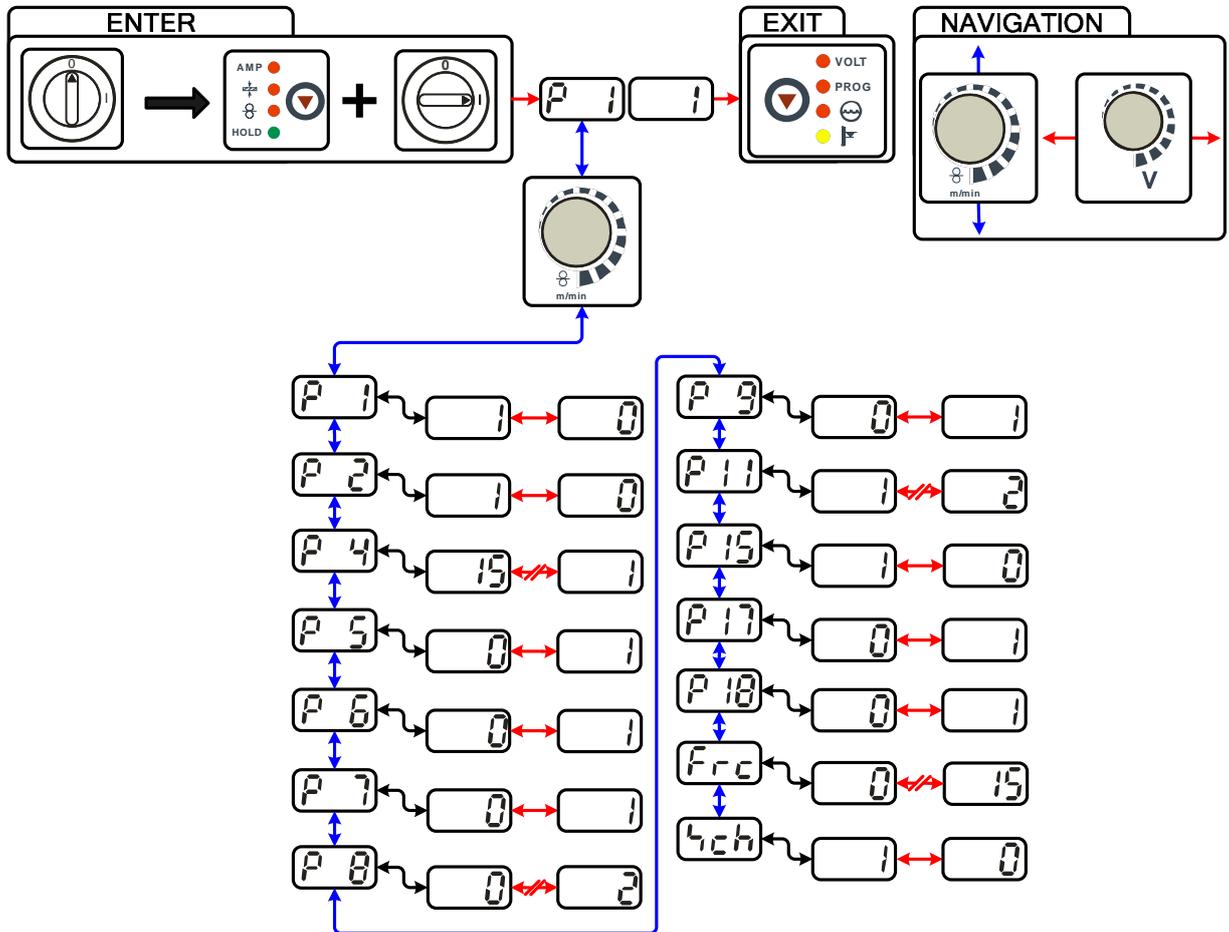


Figure 5-35

NOTE



ENTER (Enter the menu)

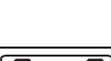
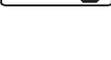
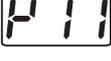
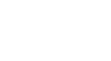
- Switch off machine at the main switch.
- Press and hold the "left parameter selection" button and switch the machine on again at the same time.

NAVIGATION (Navigate the menu)

- Select parameters by turning the "welding parameter setting" rotary dial.
- Set or change the parameters by turning the "arc length correction/select welding program" rotary dial.

EXIT (Exit the menu)

- Press the "right parameter selection" button (switch machine off and on again).

Display	Setting/selection
	Ramp time for wire inching 0 = normal inching (10s ramp time) 1 = fast inching (3s ramp time) (Ex works)
	Block program "0" 0 = P0 enabled (Ex works) 1 = P0 blocked
	Program limitation Programs 1 to max. 15 Ex works: 15
	Special cycle in the special latched and non-latched operating modes 0 = normal (previous) non-latched/latched (Ex works) 1 = WF3 cycle for non-latched/latched
	Enable special jobs SP1 to SP3 0 = no enabling (Ex works) 1 = enabling of Sp1-3
	Correction operation, threshold value setting 0 = correction operation switched off (Ex works) 1 = correction operation on "Main program (PA)" flashing
	Program changeover with standard torch 0 = no program changeover (Ex works) 1 = special latched 2 = specific latched special (n cycle active)
	Lat. and sp. lat. tapping start 0 = no latched tapping start (Ex works) 1 = latched tapping start possible
	Special latched tapping time 0 = tapping function switched off 1 = 300ms (Ex works) 2 = 600ms
	HOLD function 0 = HOLD values are not displayed 1 = HOLD values are displayed (Ex works)
	Program selection with standard torch trigger 0 = no program selection (Ex works) 1 = program selection possible
	Switching the operating mode and welding type using the wire feed control 0 = Switching the operating mode and welding type using the wire feed control and program 0 (factory setting). 1 = Switching the operating mode and welding type using the wire feed control and programs 0-15.
	Alternative remote control coding (FRC) 0 = no alternative remote control coding (works setting) 1-15 = alternative remote control coding
	Software key switch 0 = system complete 1 = system not complete (Ex works)

5.9.11.2 Reset to factory settings

NOTE

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

Operating element	Action	Result	Displays	
			Left	Right
		Switch off welding machine		
		Keep the button pressed		
		Switch on welding machine		
		Release the button, wait about 3 seconds		
		Switch off welding machine and restart in order to put the changes into effect		

5.9.11.3 The special parameters in detail

Ramp time for wire inching (P1)

The wire inching starts with a speed 1.0 m/min for 2 secs. It is subsequently increased to a ramp function to 6.0 m/min. The ramp time can be set between two ranges.

Program "0", releasing the program block (P2)

In previous versions of the M3.70/M3.71 control system the block is dependent on the key switch setting. With this version a block will only be effective when the locked status is active.

The program P0 (manual setting) is blocked. Only operation with P1-P15 is possible, irrespective of the key switch position.

Program limit (P4)

Program selection can be limited with the special parameter P4.

- The setting is adopted for all JOBs.
- Program selection depends on the position of the "welding torch function" changeover switch (see "Machine description"). Programs can only be switched when the changeover switch is in the "program" position.
- Programs can be switched by means of a connected remote control or special welding torch.
- If a special welding torch or a remote control is not connected, it is only possible to switch programs by means of the "arc length correction/select welding program" rotary dial (see "Machine description").

Special cycle in the operating modes special latched and non-latched (P5)

With the special sequence activated, the start of the welding process changes as follows:

Sequence for special non-latched mode/special latched mode:

- Start program "P_{START}"
- Main program "P_A"

Sequence for special non-latched mode/special latched mode with custom sequence activated:

- Start program "P_{START}"
- Reduced main program "P_B"
- Main program "P_A"

Enabling special JOBs SP1 to SP3 (P6)

The JOB changeover is blocked if the key switch is in the "0" position.

This block can be cancelled for the special JOBs (SP1 - SP3).

Correction operation, threshold value setting (P7)

The correction operation is switched on and off for all JOBS and their programs at the same time. A correction operation is specified for wire speed (DV) and welding voltage correction (U_{kor}) for each JOB. The correction value is saved separately for each program. The correction range can be maximum 30% of the wire speed and +/-9.9 V welding voltage.

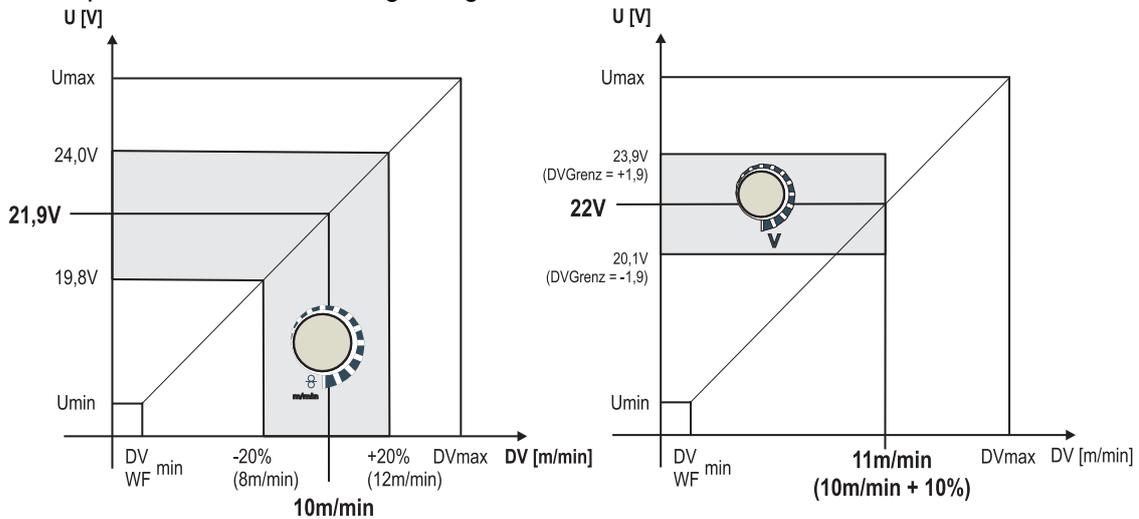


Figure 5-36

Example for the operating point in correction mode:

The wire speed in one program (1 to 15) is set on 10.0 m/min.

This corresponds to a welding voltage (U) of 21,9 V. When the key switch is set to "0" position, welding in this program can only be carried out with these values.

To allow the welder also to perform wire and voltage correction in program mode, the correction mode must be switched on and limit values for wire and voltage must be specified.

Setting of the correction limit value = WFLimit = 20% / Ulimit = 1.9 V

Now the wire speed can be corrected by 20% (8.0 up to 12.0 m/min) and the welding voltage by +/-1.9 V (3.8 V).

In the example the wire speed is set on 11.0 m/min. This corresponds to a welding voltage of 22 V

Now the welding voltage can be corrected by further 1.9 V (20.1 V and 23.9 V).

The values for voltage and wire-speed correction will be reset if the key switch is moved to the "1" setting.

Setting the correction range:

- Switch on the "Correction operation" special parameter (P7=1) and save the setting. (See chapter entitled "Selecting, changing and saving parameters".)
- Key switch to position "1".
- Set correction range according to the following table:

Operating element	Action	Result	Display (examples)	
			Left	Right
		Press button until "PROG" LED comes on. Left: Wire feed speed Right: Program number		
		Press button and hold down for approx. 4 s Left: Current limit value of the wire feed speed correction Right: Current limit value of the voltage correction		
		Set limit value for the wire feed speed correction		
		Set limit value for voltage correction		
After approx. 5 s without further user intervention, the set values are adopted and the display switches back to the program display,				

- Key switch back to position "0"!

Switching programs with the standard torch trigger (P8)

Special latched (latched absolute program sequence)

- Cycle 1: absolute program 1 is run
- Cycle 2: absolute program 2 is run after completion of "tstart".
- Cycle 3: absolute program 3 is run until the "t3" time has elapsed. The program then switches automatically to absolute program 4.

Accessory components such as remote controls or special torches may not be connected!

Program switching at the wire feed unit control is disabled.

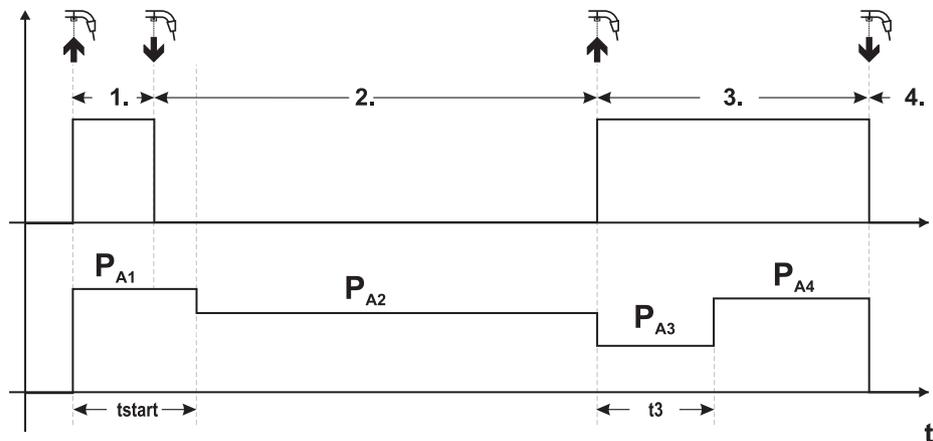


Figure 5-37

Specific latched special (n cycle)

In the n cycle program sequence, the unit starts in the 1st cycle with start program P_{START} from P_1 . In the second cycle, the machine switches to absolute program 2, once the start time "t_{start}" has elapsed. Tapping switches to other programs (P_{A1} to max. P_{A9}).

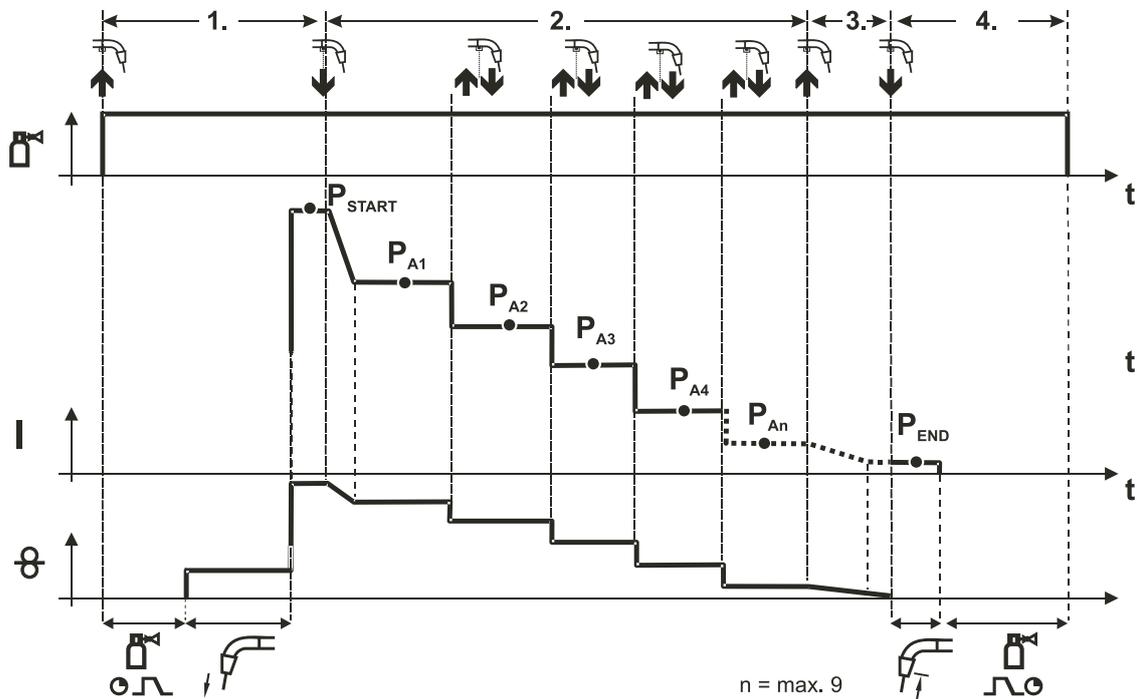


Figure 5-38

The number of programs (P_{An}) corresponds to the cycle number specified under N cycle.

1st cycle

- Press and hold torch trigger.
- Shielding gas is expelled (gas pre-flows).
- Wire feed motor runs at "creep speed".
- Arc ignites after the wire electrode makes contact with the workpiece, welding current is flowing (start program P_{START} from P_{A1})

2nd cycle

- Release torch trigger.
- Slope to main program P_{A1} .

The slope to main program P_{A1} is given at the earliest after the set time t_{START} elapses and at the latest when the torch trigger is released. Tapping (pressing briefly and releasing within 0.3 sec) can switch to other programs. Programs P_{A1} to P_{A9} are possible.

3rd cycle

- Press and hold torch trigger.
- Slope to end program P_{END} from P_{AN} . The program can be stopped at any time by pressing the torch trigger longer than 0.3 sec. P_{END} from P_{AN} is then executed.

4th cycle

- Release torch trigger.
- WF motor stops.
- Arc is extinguished after the pre-selected wire burn-back time elapses.
- Gas post-flow time elapses.

N cycle setting

NOTE

-  The n cycle function should always be activated before the n cycle setting (see "Program changeover with standard torch (P8)").

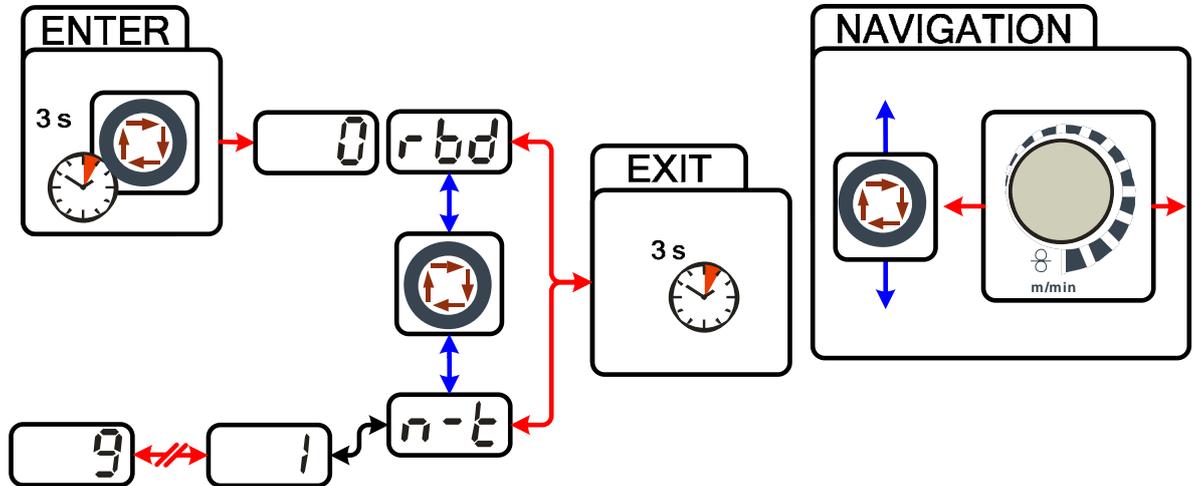


Figure 5-39

Latched/special-latched tap start (P9)

In latched – tap start – operating mode it is possible to switch straight to the second step by tapping the torch trigger; it is not necessary for current to be flowing.

The welding can be halted by pressing the torch trigger for a second time.

Latched special tapping time setting (P11)

The tapping time for changing over between the main program and reduced main program can be set in three levels.

0 = no tapping

1 = 320ms (factory setting)

2 = 640ms

Hold function (P15)**Hold function active (P15 = 1)**

- Mean values for the last main program parameters used for welding are displayed.

Hold function not active (P15 = 0)

- Setpoint values for the main program parameters are displayed.

Selecting programs with the standard torch trigger (P17)

Allows you to select a program or switch a program before starting welding.

You switch to the next program by tapping the torch trigger. Once the last enabled program is reached, you start again at the beginning.

- Program 0 is the first enabled program, provided that it is not blocked. (see also special parameter P2).
- The last enabled program is P15.
 - If the programs are not limited by special parameter P4 (see special parameter P4).
 - Or if the programs are limited for the selected JOB by the n cycle setting (see parameter P8).
- Welding starts when the torch trigger is held for longer than 0.64 s.

You can select programs with the standard torch trigger in all operating modes (non-latched, special non-latched, latched and special latched).

Switching the operating mode and welding type using the wire feed control (P18)

Selecting the operating mode (non-latched, latched, etc.) and welding type (MIG/MAG standard welding/pulse arc welding) at the wire feed unit control or the welding machine control.

- P18 = 0
 - Program 0: To select the operating mode and welding type at the wire feed unit.
 - Program 1-15: To select the operating mode and welding type at the welding machine.
- P18 = 1
 - Program 0-15: To select the operating mode and welding type at the wire feed unit.

Software key switch (SCH)

The key switch function allows the welding machine to be locked using the software.

5.10 TIG welding

5.10.1 Welding torch connection

NOTE

- TIG welding torches to be connected to a Euro torch connector are available in two versions:**
- TIG combi welding torches are connected to the Euro torch connector of the wire feeder and to the (-) welding current plug of the power source.
 - TIG welding torches of the EZA version are connected to the Euro torch connector of the wire feeder only. To do so, the welding current lead of the intermediate hose package must be connected to the (-) welding current connection at the rear of the unit!

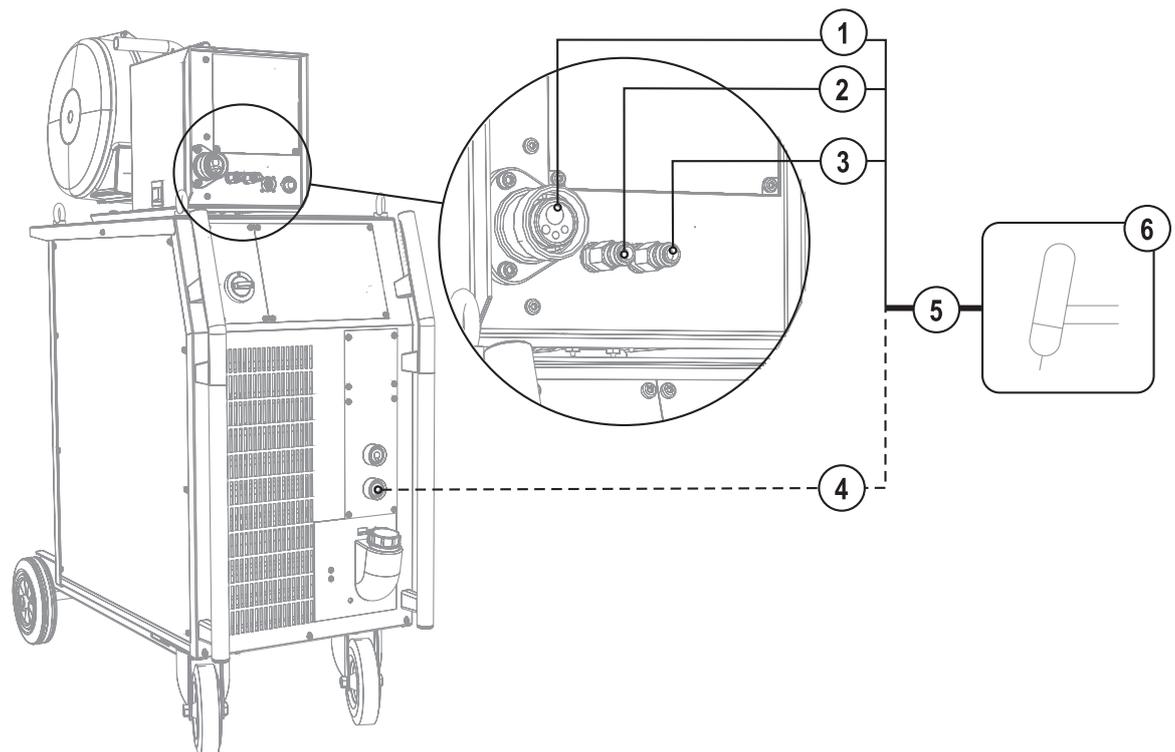


Figure 5-40

Item	Symbol	Description
1		Central connection for welding torch (Euro) Integrated welding current, shielding gas and torch trigger
2		Quick connect coupling (red) coolant return
3		Quick connect coupling (blue) coolant supply
4		"-" welding current connection socket • TIG welding: Welding current connection for welding torch
5		Welding torch hose package
6		Welding torch

- Insert the central plug for the welding torch into the central connector and screw together with crown nut.
- Insert the welding current plug of the combi welding torch into the (-) welding current connection socket and lock into place by turning to the right (only in case of a separate welding current connection).

If fitted:

- 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).

5.10.2 Connection for workpiece lead

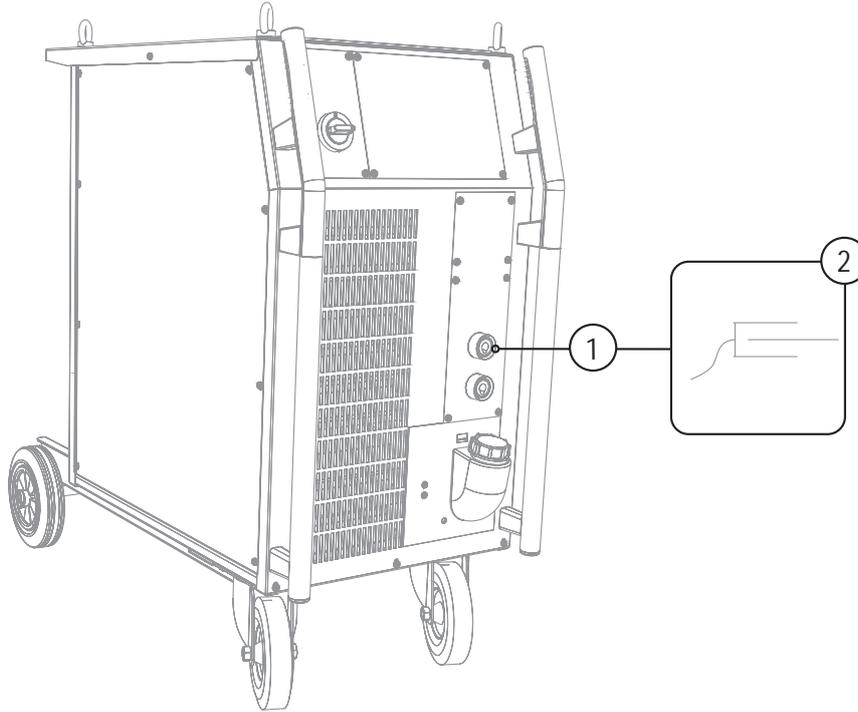


Figure 5-41

Item	Symbol	Description
1	+	Connection socket, "+" welding current • TIG welding: Workpiece connection
2		Workpiece

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

5.10.3 Welding task selection

NOTE

Selection of a welding task involves the interaction of the controls on the welding machine and the wire feed unit. After the basic settings are made on the welding machine, the operating point and other parameters can be set on the wire feed unit.

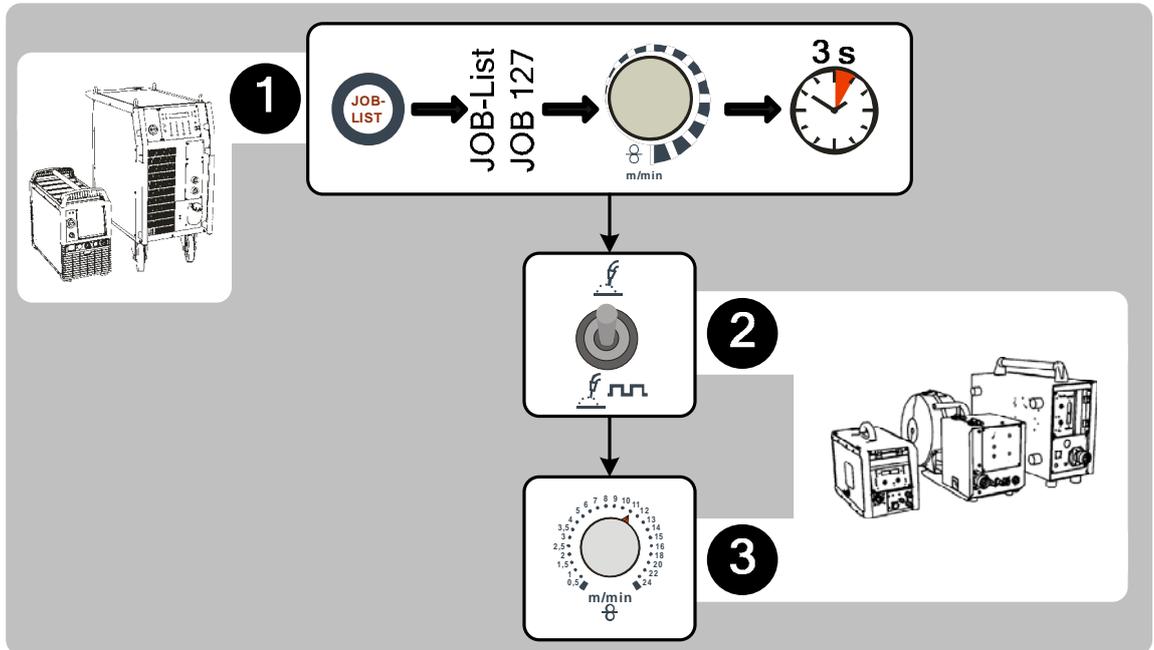


Figure 5-42

Operating element	Action	Result	Display
 	1 x	Select JOB list (LED is on)	
		Set JOB number. Wait 3s until the setting has been adopted.	
		Welding type changeover switch TIG standard welding TIG super pulses	
		Welding current is set	Setpoint setting

5.10.4 TIG arc ignition

5.10.4.1 Liftarc ignition

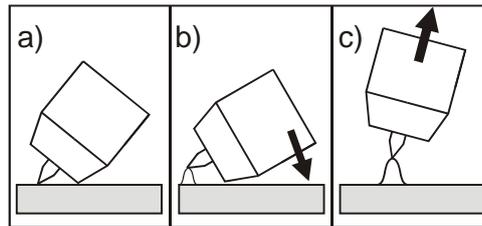


Figure 5-43

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.

5.10.5 Pulses, function sequences

5.10.5.1 Explanation of signs and functions

Symbol	Meaning
	Press torch trigger
	Release torch trigger
	Tap torch trigger (press briefly and release)
	Shielding gas flowing
I	Welding output
	Gas pre-flows
	Gas post-flows
	Non-latched
	Special, non-latched
	Latched
	Special, latched
t	Time
P _{START}	Ignition program
P _A	Main program
P _B	Reduced main program
P _{END}	End program

Non-latched mode

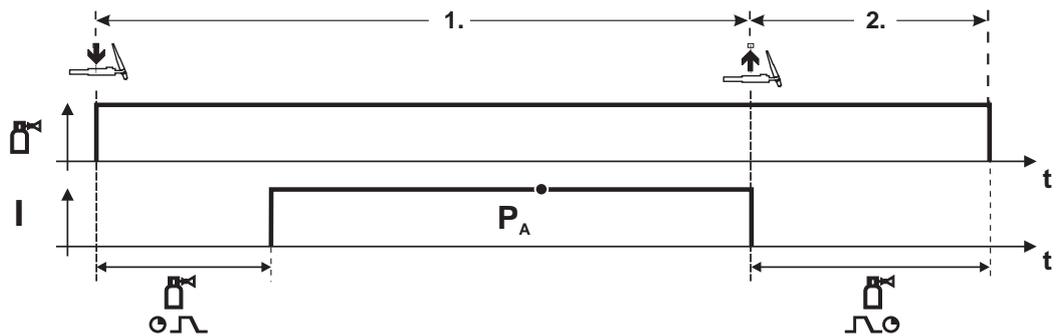


Figure 5-44

Selection

- Select non-latched operating mode

Step 1

- Press and hold torch trigger.
- Shielding gas is expelled (gas pre-flows).

The arc is ignited using liftarc.

- Welding current flows with pre-selected setting.

Step 2

- Release torch trigger.
- Arc is extinguished.
- Gas post-flow time elapses.

Special, non-latched

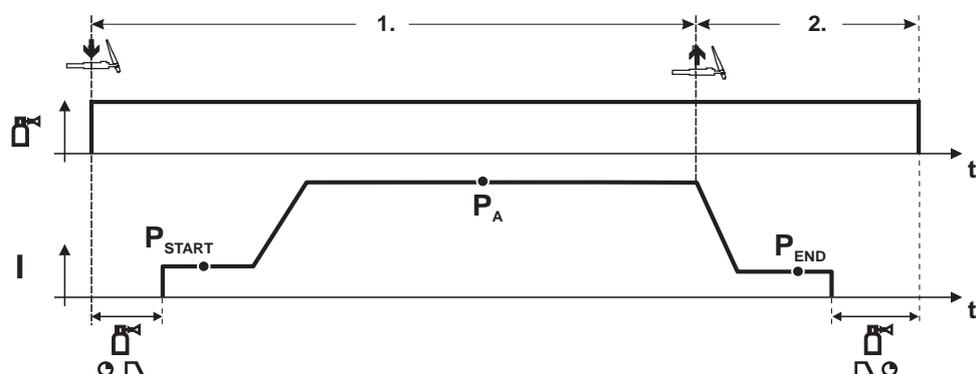


Figure 5-45

Selection

- Select non-latched special mode

Step 1

- Press and hold torch trigger
- Shielding gas is expelled (gas pre-flows)

The arc is ignited using liftarc.

- Welding gas flows with pre-selected setting in start program " P_{START} ".
- After the "tstart" ignition current time elapses, the welding current rises with the set upslope time "tS1" to the main program " P_A ".

Step 2

- Release torch trigger.
- The welding current reduces with the downslope time "tSe" to the end program " P_{END} ".
- After the end current time "end" elapses, the arc will extinguish.
- Gas post-flow time elapses.

Latched mode

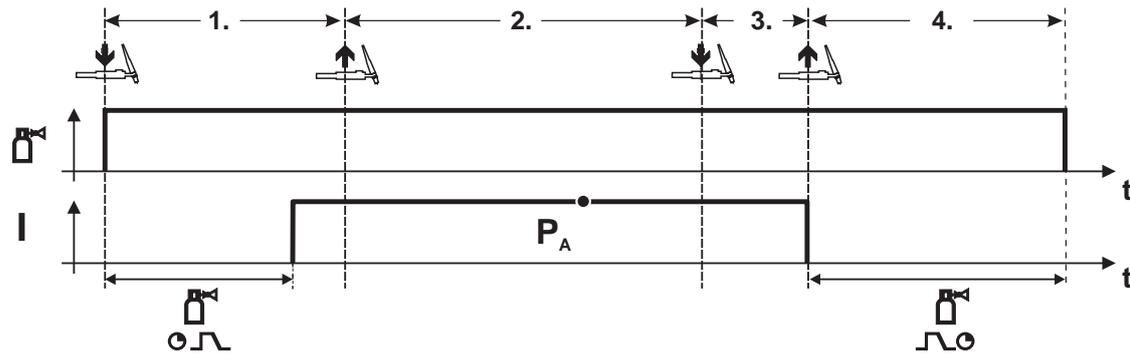


Figure 5-46

Selection

- Select latched operating mode .

Step 1

- Press and hold torch trigger
- Shielding gas is expelled (gas pre-flows)

The arc is ignited using liftarc.

- Welding current flows with pre-selected setting.

Step 2

- Release torch trigger (no effect)

Step 3

- Press torch trigger (no effect)

Step 4

- Release torch trigger
- Arc is extinguished.
- Gas post-flow time elapses.

Latched special

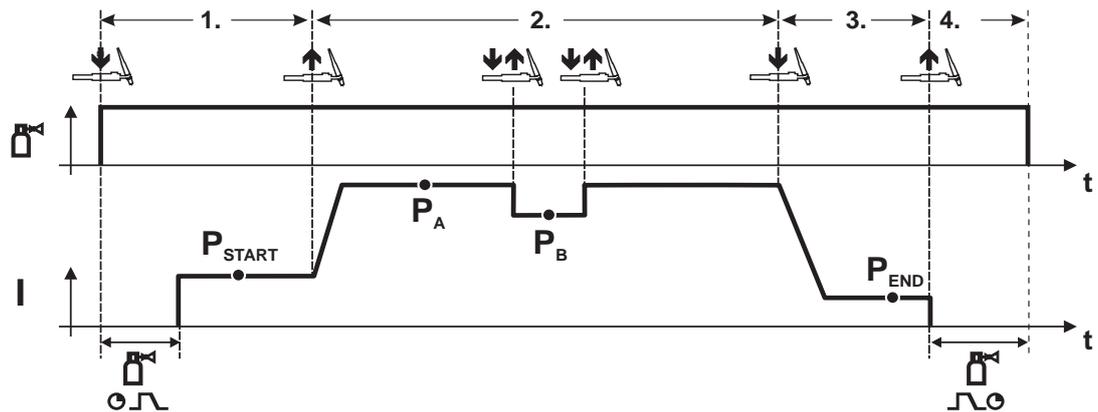


Figure 5-47

Selection

- Select latched special mode

Step 1

- Press and hold torch trigger.
- Shielding gas is expelled (gas pre-flows).

The arc is ignited using liftarc.

- Welding gas flows at pre-selected setting in start program "P_{START}".

Step 2

- Release torch trigger.
- Slope on main program "P_A".

The slope on main program P_A is given at the earliest after the set time t_{START} elapses and at the latest when the torch trigger is released.

Tapping can be used to switch to the reduced main program "P_B". Repeated tapping will switch back to the main program "P_A".

Step 3

- Press the torch trigger.
- Slope to end program "P_{END}".

Step 4

- Release torch trigger.
- Arc is extinguished.
- Gas post-flow time elapses.

5.10.6 TIG automatic cut-out

NOTE



The welding machine ends the ignition process or the welding process with an

- ignition fault (no welding current flows within 5 s after the start signal)
- arc interruption (arc is interrupted for longer than 5 s)

5.10.7 TIG program sequence ("Program steps" mode)

5.10.7.1 TIG parameter overview

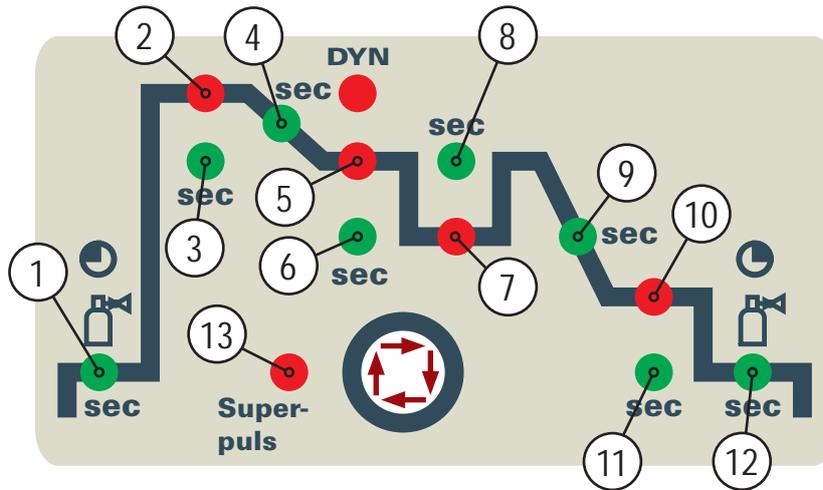


Figure 5-48

Basic parameters

Item	Meaning/explanation	Setting range
1	Gas pre-flow time	0 s to 0.9 s
2	P_{START} Ignition current	0% to 200%
3	Duration (start program)	0 s to 20 s
4	Slope duration from P_{START} to P_A	0 s to 20 s
5	P_A (main program) Welding current, absolute	5 A to 550 A
6	Duration (P_A)	0.01 s to 20.0 s
7	P_B (reduced main program) Welding current	1% to 100%
8	Duration (reduced main program)	0.01 s to 20.0 s
9	Slope duration from P_A to P_{END}	0 s to 20 s
10	P_{END} (end program) Welding current	1% to 100%
11	Duration (end program)	0 s to 20 s
12	Gas post-flow time	0 s to 20 s
13	Superpulsing	on/off

P_{START} , P_B , and P_{END} are relative programs whose welding current settings are a percentage based on the general welding current setting.

5.11 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.

5.11.1 Connecting the electrode holder and workpiece lead

NOTE



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

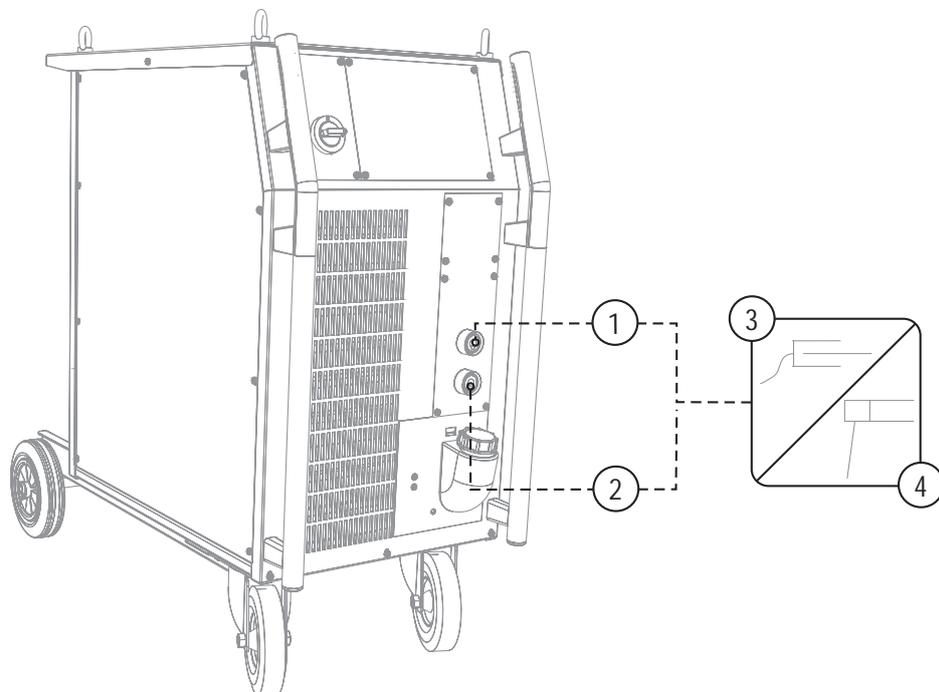


Figure 5-49

Item	Symbol	Description
1		Connection socket, "+" welding current
2		Connection socket, "-" welding current
3		Workpiece
4		Electrode holder

- 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.

5.11.2 Welding task selection

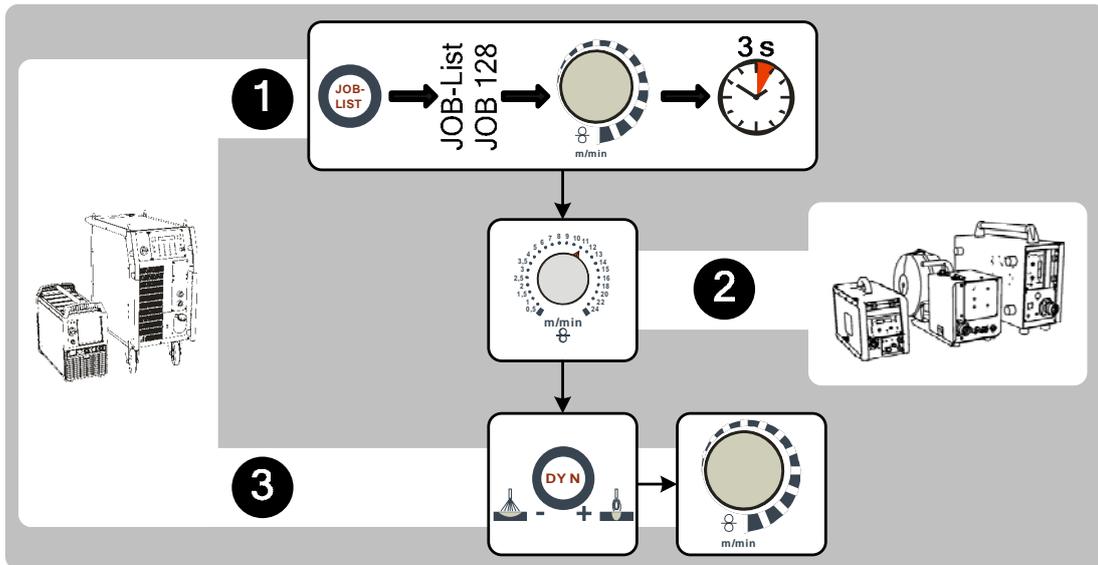


Figure 5-50

Operating element	Action	Result	Display
 	1 x	Select JOB list (LED is on)	
		Set JOB number. Wait 3s until the setting has been adopted.	
		Welding current is set	Setpoint setting
		Select arcforcing welding parameter LED for the button is on.	
		Arcforcing setting for electrode types: (Setting range -40 to 40) Negative values: Rutile Values around zero: Basic Positive values: Cellulose	

5.11.3 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

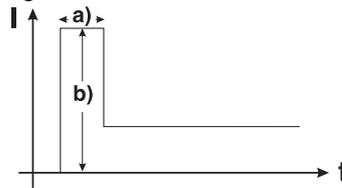
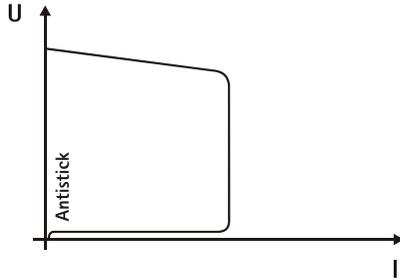


Figure 5-51

5.11.4 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 5-52

5.11.5 Parameter overview

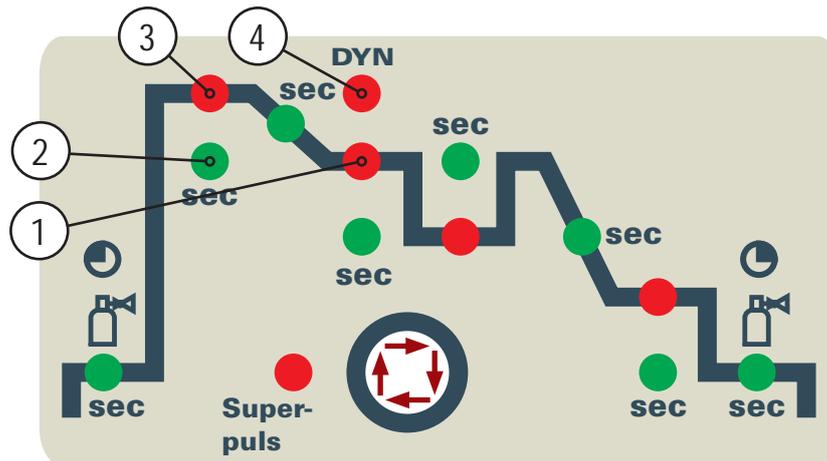


Figure 5-53

Basic parameters

Item	Meaning/explanation	Setting range
1	Welding current	5 A to maximum welding current
2	Hotstart time	0 to 20 s
3	Hotstart current	0 to 200 %
4	Arcforce	-40 to 40

NOTE

The hotstart current is a percentage based on the welding current selected.

5.12 Interfaces

5.12.1 PC Interfaces

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.

PC 300 welding parameter software

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

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

- Check correct mounting of the wire spool.
- 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
- Check coolant tubes and their connections for impurities
- Check that the wire guide elements (inlet nipple, wire guide tube) are fitted securely.

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

NOTE



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

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

Coolant error/no coolant flowing

- ↘ Insufficient coolant flow
 - ✘ Check coolant level and refill if necessary
- ↘ Air in the coolant circuit
 - ✘ see chapter "Vent coolant circuit"

Wire feed problems

- ↘ Contact tip blocked
 - ✘ Clean, spray with anti-spatter spray and replace if necessary
- ↘ Setting the spool brake (see "Setting the spool brake" chapter)
 - ✘ Check settings and correct if necessary
- ↘ Setting pressure units (see "Inching wire electrodes" chapter)
 - ✘ Check settings and correct if necessary
- ↘ Worn wire rolls
 - ✘ Check and replace if necessary
- ↘ Wire feed motor without supply voltage (automatic cutout triggered by overloading)
 - ✘ Reset triggered fuse (rear of the power source) by pressing the key button
- ↘ Kinked hose packages
 - ✘ Extend and lay out the torch hose package
- ↘ Wire guide core or spiral is dirty or worn
 - ✘ Clean core or spiral; replace kinked or worn cores

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.
- ↘ Loose welding current connections
 - ✘ Tighten power connections on the torch and/or on the workpiece
 - ✘ Tighten contact tip correctly

7.2 Error messages (power source)

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.

NOTE



A welding machine error is indicated by an error code being displayed (see table) on the display on the machine control.

In the event of a machine error, the power unit is shut down.

The display of possible error numbers depends on the machine version (interfaces/functions).

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

Error	Category		Possible cause	Remedy
	a)	b)		
Err 1	-	x	Mains overvoltage	Check the mains voltages and compare with the connection voltages of the welding machine (see Technical Data, chapter 1)
Err 2	-	x	Mains undervoltage	
Err 3	x	-	Welding machine, excess temperature	Allow the machine to cool down (mains switch to "1")
Err 4	-	x	Low coolant level	Top up the coolant Leak in the coolant circuit > rectify the leak and top up the coolant Coolant pump is not working > check excess current release on air cooling unit
Err 5	-	x	Error WF unit, WF motor fault, Speedometer error	Check wire feed unit check wire-feeding no signal from speedometer, > inform Service
Err 7	-	x	Secondary overvoltage	Inverter error > inform Service
Err 8	-	x	Earth fault between welding wire and earth line	Separate the connection between the welding wire and casing or an earthed object
Err 9	x	-	Fast shut-down triggered by BUSINT X10 or RINT X12	Rectify error on robot
Err 10	-	x	Arc interruption triggered by BUSINT X10 or RINT X12	Check wire feed
Err 11	-	x	Ignition fault after 5 s triggered by BUSINT X10 or RINT X12	Check wire feed

Category legend for error reset

- The error message will disappear once the error has been rectified.
- Errors can only be reset by switching the machine off and back on again.

7.3 Resetting JOBs (welding tasks) to the factory settings

NOTE

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

7.3.1 Resetting a single JOB

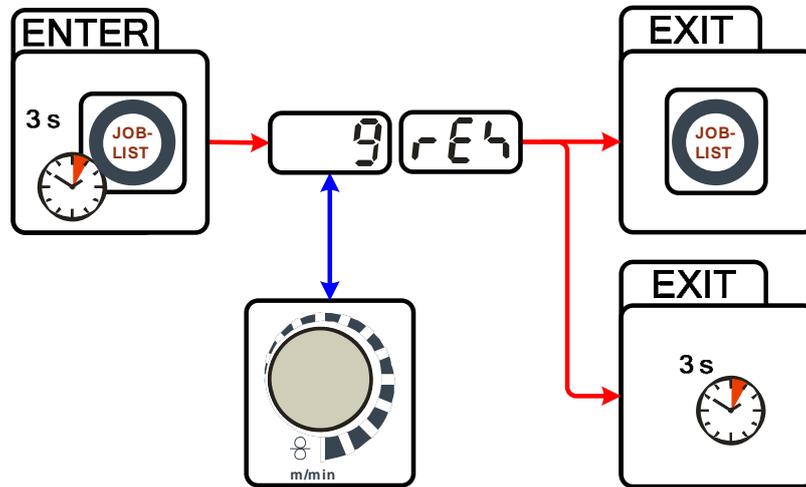


Figure 7-1

Display	Setting/selection
	Reset to factory settings The RESET will be done after pressing the button. The menu will be ended when no changes are done after 3 sec.
	JOB-number (example) The shown JOB will be set to ex works.

7.3.2 Resetting all JOBs

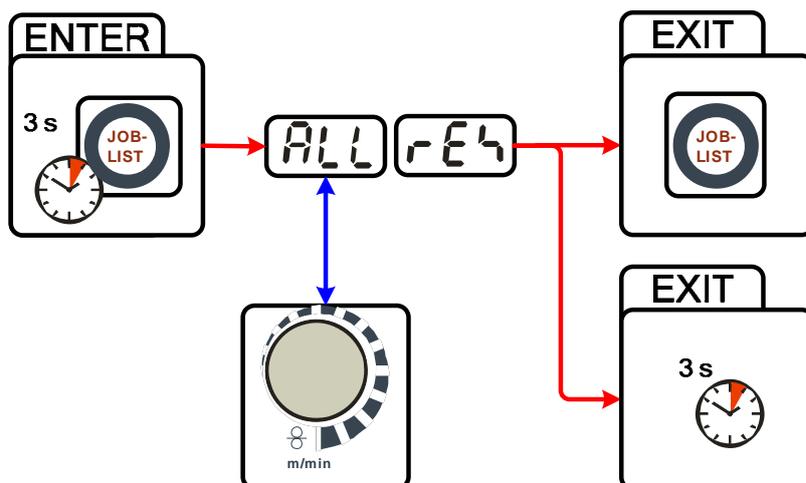


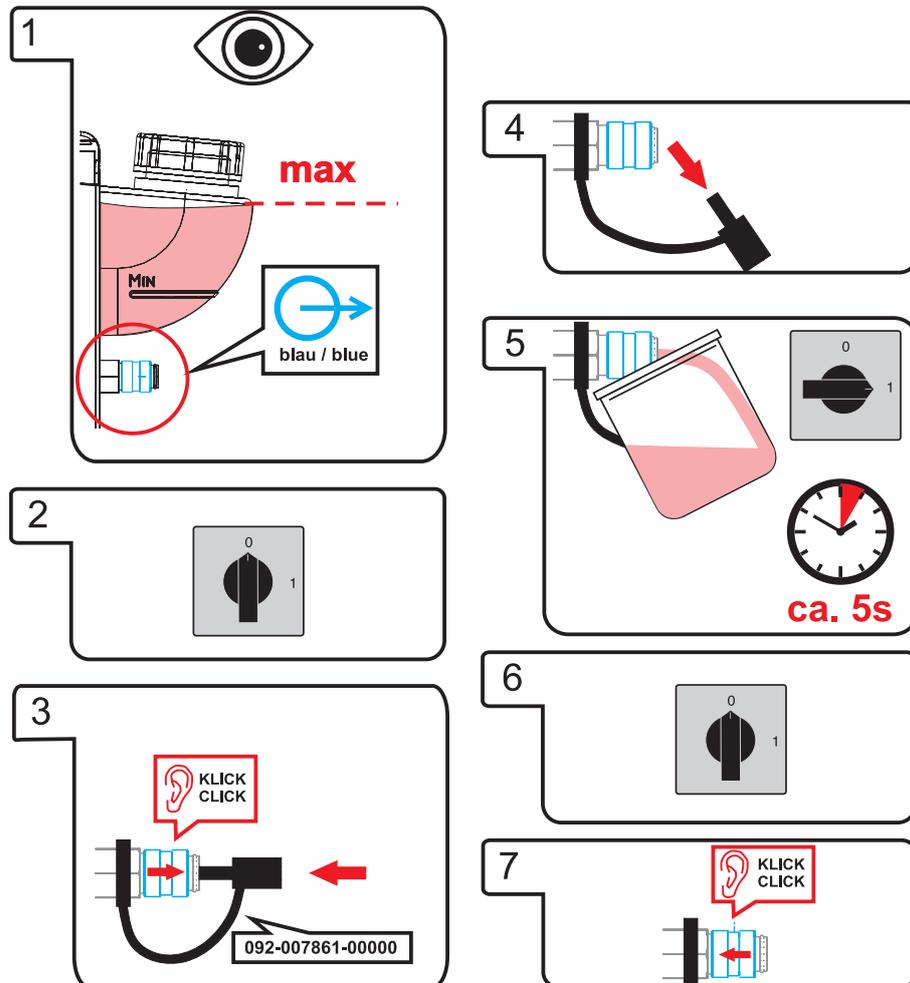
Figure 7-2

Display	Setting/selection
	Reset to factory settings The RESET will be done after pressing the button. The menu will be ended when no changes are done after 3 sec.

7.4 Vent coolant circuit

NOTE

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



7.5 Welding parameter calibration

When differentiating between the welding parameters set on the wire feed unit/remote control and those shown on the welding machine, they can be calibrated easily with this function.

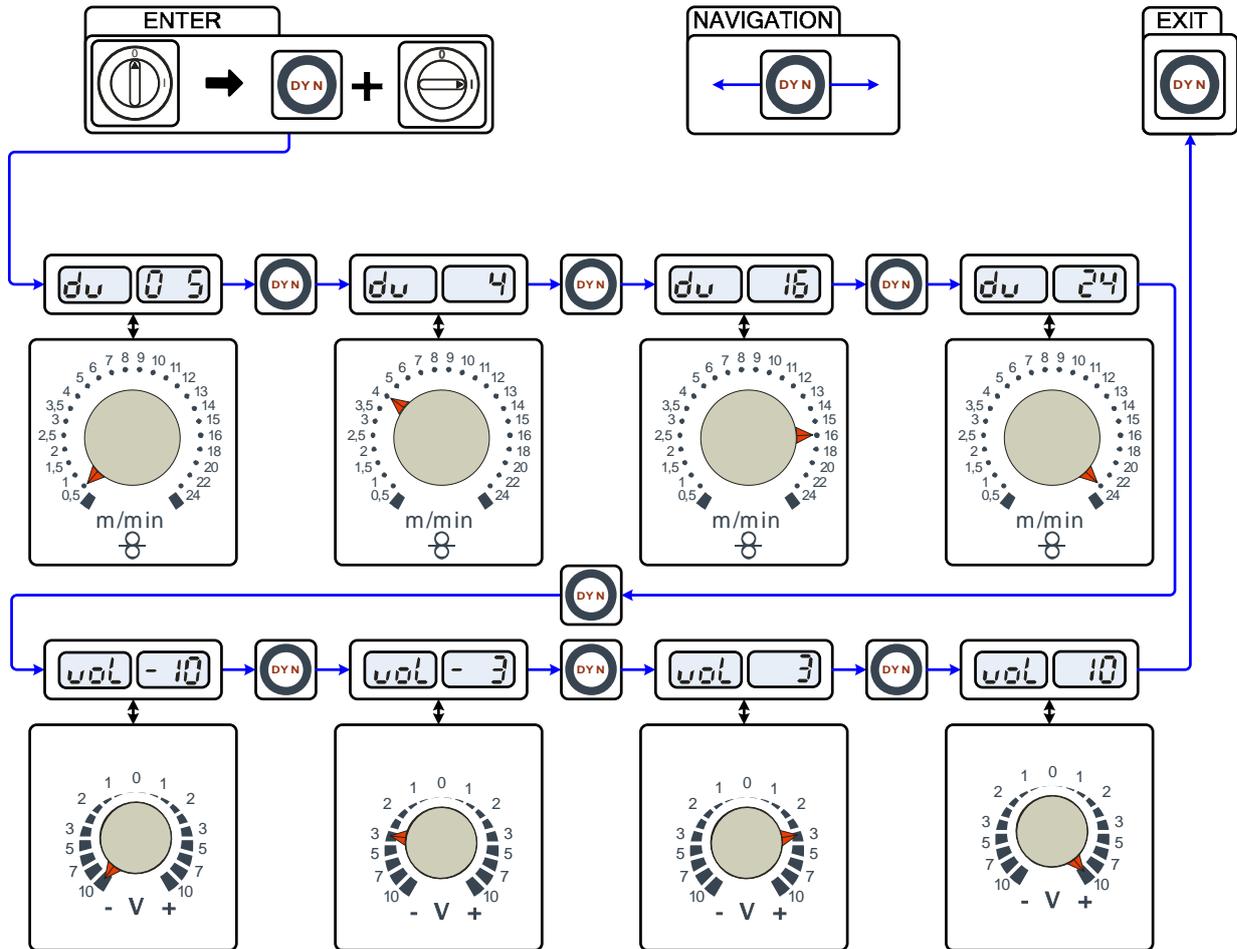


Figure 7-3

Display	Setting/selection
<code>du</code> <code>f--</code>	Calibrate wire-feed speed (MIN) Rotary dial, turn wire-feed speed of the wire feed unit to the minimum value.
<code>du</code> <code>--f</code>	Calibrate wire-feed speed (MAX) Rotary dial, turn wire-feed speed of the wire feed unit to the maximum value.
<code>vol</code> <code>f--</code>	Calibrate arc length adjustment (MIN) Rotary dial, turn arc length adjustment of the wire feed unit to the minimum value.
<code>vol</code> <code>--f</code>	Calibrate arc length adjustment (MAX) Rotary dial, turn arc length adjustment of the wire feed unit to the maximum value.

8 Technical data

NOTE

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

8.1 Phoenix 401 Concept puls FDW

	TIG	MMA	MIG/MAG
Setting range for welding current	5 A–400 A		
Setting range for welding voltage	10.2 V–26.0 V	20.2 V–36.0 V	14.3 V–34.0 V
Duty cycle at 40 °C (60% DC)	400 A		
Duty cycle at 40 °C (100% DC)	360 A		
Load alternation	10 min. (60% DC \wedge 6 min. welding, 4 min. pause)		
Open circuit voltage	79 V		
Mains voltage (tolerances)	3 x 400 V (-25% to +20%)		
Frequency	50/60 Hz		
Mains fuse (safety fuse, slow-blow)	3 x 35 A		
Mains connection lead	H07RN-F4G4		
Maximum connected load	13.1 kVA	18.2 kVA	17.2 kVA
Recommended generator rating	25 kVA		
cos ϕ	0.99		
Insulation class/protection classification	H/IP 23		
Ambient temperature	-20 °C to +40 °C		
Machine/torch cooling	Fan/water		
Cooling capacity at 1 l/min	1500 W		
Maximum flow rate	5 l/min		
Maximum coolant outlet pressure	3.5 bar		
Maximum tank capacity	12 l		
Coolant	Ex works: KF 23E (-10 °C to +40 °C) or KF 37E (-20 °C to +10 °C)		
Welding lead	70 mm ²		
Dimensions L x W x H in mm	1100 x 455 x 1000		
Weight in kg	118		
EMC class	A		
Constructed to standard	IEC 60974-1, -2, -10/ S/C €		

8.2 Phoenix 351, 451, 551 Concept puls FDW

	351	451	551
Setting range of welding current/voltage:			
TIG	5 A/10.2 V to 350 A/24.0 V	5 A/10.2 V to 450 A/28.0 V	5 A/10.2 V to 550 A/32.0 V
MMA	5 A/20.2 V to 350 A/34.0 V	5 A/20.2 V to 450 A/38.0 V	5 A/20.2 V to 550 A/42.0 V
MIG/MAG	5 A/14.3 V to 350 A/31.5 V	5 A/14.3 V to 450 A/36.5 V	5 A/14.3 V to 550 A/41.5 V
Duty cycle at 25 °C			
60%	-	-	550 A
80%	-	-	520 A
100%	350 A	450 A	450 A
Duty cycle at 40 °C			
60%	-	-	550 A
80%	-	450 A	-
100%	350 A	420 A	420 A
Load alternation	10 min. (60% DC ^ 6 min. welding, 4 min. pause)		
Open circuit voltage	79 V		
Mains voltage (tolerances)	3 x 400 V (-25% to +20%)		
Frequency	50/60 Hz		
Mains fuse (safety fuse, slow-blow)	3 x 25 A	3 x 35 A	
Mains connection lead	H07RN-F4G6		
Maximum connected load MIG/MAG	13.9 kVA	20.7 kVA	28.8 kVA
Maximum connected load TIG	10.6 kVA	15.9 kVA	22.2 kVA
Maximum connected load MMA	15.0 kVA	21.6 kVA	29.2 kVA
Recommended generator rating	20.3 kVA	29.1 kVA	39.4 kVA
cosφ	0.99		
Insulation class/protection classification	H/IP 23		
Ambient temperature	-20 °C to +40 °C		
Machine/torch cooling	Fan/water		
Cooling capacity at 1 l/min	1500 W		
Maximum flow rate	5 l/min		
Maximum coolant outlet pressure	3.5 bar		
Maximum tank capacity	12 l		
Coolant	Ex works: KF 23E (-10 °C to +40 °C) or KF 37E (-20 °C to +10 °C)		
Welding lead	70 mm ²	95 mm ²	
Dimensions L x W x H in mm	1100 x 455 x 1000		
Weight	129 kg		
EMC class	A		
Constructed to standard	IEC 60974-1, -2, -10/ S/C €		

9 Accessories

NOTE



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

9.1 System components

Type	Designation	Item no.
Phoenix Concept drive 4 WE	Wire feed unit, water, Euro central connector	090-005169-00502
Phoenix Concept drive 4L WE	Wire feed unit, water, Euro central connector	090-005168-00502
Phoenix Concept drive 200C WE	Wire feed unit, water, Euro central connector	090-005170-00502
Phoenix Concept drive 300C WE	Wire feed unit, water, Euro central connector	090-005171-00502

9.2 General accessories

Type	Designation	Item no.
AK300	Adapter for K300 basket coil	094-001803-00001
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
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
HOSE BRIDGE	Tube bridge	092-007843-00000

9.3 Options

Type	Designation	Item no.
ON LB Wheels 160x40MM	Retrofit option for locking brake for machine wheels	092-002110-00000
ON Hose/FR Mount DK 4L	Mounting for hoses and remote controls for machines with 4L pivot support (092-002112-00000 and 092-002113-00000)	092-002117-00000
ON Hose/FR Mount	Optional holder for tubes and remote control for machines without pivot support	092-002116-00000
ON Filter T/P	Retrofit option contamination filter for air inlet	092-002092-00000
ON Tool Box	Retrofit option tool box	092-002138-00000
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

9.4 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 PC300.Net update	PC300.Net Update on CD-ROM	092-008172-00001

10 Appendix A

10.1 JOB-List

ewm®		JOB-LIST		094-015122-00502			
Material	Gas	Ø Wire					
		0,8	1,0	1,2	1,6		
Job-Nr.							
SG2/3 G3/4 Si1	CO ₂ 100 / C1	1	3	4	5		
	Ar80-90 / M2	6	8	9	10		
CrNi	Ar91-99 / M12-M13	34	35	36	37		
	Ar/He / I3	42	43	44	45		
CuSi	Ar100 / I1	98	99	100	101		
CuAl	Ar100 / I1	106	107	108	109		
CuSi Löten / Brazing	Ar100 / I1	114	115	116	117		
	Ar91-99 / M12-M13	110	111	112	113		
CuAl Löten / Brazing	Ar100 / I1	122	123	124	125		
	Ar91-99 / M12-M13	118	119	120	121		
AlMg	Ar100 / I1	74	75	76	77		
	Ar/He / I3	78	79	80	81		
AlSi	Ar100 / I1	82	83	84	85		
	Ar/He / I3	86	87	88	89		
Al99	Ar100 / I1	90	91	92	93		
	Ar/He / I3	94	95	96	97		
ewm®		JOB-LIST		094-015723-00600			
Material	Gas	Ø Wire					
		0,8	1,0	1,2	1,6		
Job-Nr.							
SG2/3 G3/4 Si1	CO ₂ 100 / C1		204	205			
	Ar80-90 / M2		206	207			
rootArc							

ewm®		JOB-LIST		094-015122-00502			
Material	Gas	Ø Wire					
		0,8	1,0	1,2	1,6		
Job-Nr.							
SG2/3 G3/4 Si1 Metal	Ar80-90 / M2	235	237	238	239		
SG2/3 G3/4 Si1 Rutil / Basic	Ar80-90 / M2	240	242	243	244		
CrNi Metal	Ar91-99 / M12-M13	227	228	229	230		
CrNi Rutil / Basic	Ar98/2 / M13	231	232	233	234		
	Ar92/8 / M22	210	211	212	213		
ewm®		JOB-LIST		094-015122-00502			
Material	Gas	Ø Wire					
		0,8	1,0	1,2	1,6		
Job-Nr.							
SG2/3 G3/4 Si1	Ar91-99 / M12-M13	190	254	255	256		
	Ar80-90 / M2	189	179	180	181		
CrNi	Ar91-99 / M12-M13		251	252	253		
AlMg	Ar100 / I1			247	248		
AlSi	Ar100 / I1			249	250		
Al99	Ar100 / I1			245	246		
SP1		129					
SP2		130					
SP3		131					
GMAW non synergic <8m / min		188					
GMAW non synergic >8m / min		187					
Fugen / gouging		126					
WIG / TIG		127					
E-Hand / MMA		128					

Figure 10-1

11 Appendix B

11.1 Overview of EWM branches

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