



EN

Welding machine

Phoenix 401 Progress puls HP MM FKW
Phoenix 501 Progress puls HP MM FKW

099-005404-EW501

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16.01.2017

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General instructions

WARNING



Read the operating instructions!

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

- Read and observe the operating instructions for all system components, especially the safety instructions and warning notices!
- Observe the accident prevention regulations and any regional regulations!
- The operating instructions must be kept at the location where the machine is operated.
- Safety and warning labels on the machine indicate any possible risks. Keep these labels clean and legible at all times.
- The machine has been constructed to state-of-the-art standards in line with any applicable regulations and industrial standards. Only trained personnel may operate, service and repair the machine.
- Technical changes due to further development in machine technology may lead to a differing welding behaviour.



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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The content of this document has been prepared and reviewed with all reasonable care. The information provided is subject to change; errors excepted.

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2 For your safety

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.



Special technical points which users must observe.


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	Symbol	Description
	Indicates technical aspects which the user must observe.		Activate and release/tap/tip
	Switch off machine		Release
	Switch on machine		Press and keep pressed
			Switch
	Wrong		Turn
	Correct		Numerical value – adjustable
	Menu entry		Signal light lights up in green
	Navigating the menu		Signal light flashes green
	Exit menu		Signal light lights up in red
	Time representation (e.g.: wait 4 s/activate)		Signal light flashes red
	Interruption in the menu display (other setting options possible)		
	Tool not required/do not use		
	Tool required/use		

2.3 Part of the complete documentation

 **These operating instructions are part of the complete documentation and valid only in combination with all other parts of these instructions! Read and observe the operating instructions for all system components, especially the safety instructions!**

The illustration shows a general example of a welding system.

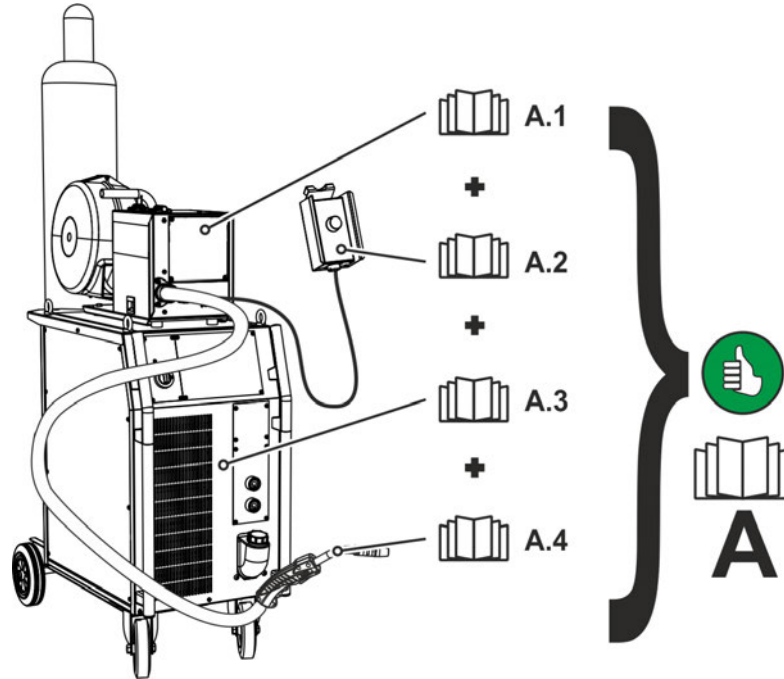


Figure 2-1

The illustration shows a general example of a welding system.

Item	Documentation
A.1	Wire feeder
A.2	Remote control
A.3	Power source
A.4	Welding torch
A	Complete documentation

2.4 Safety instructions

⚠ WARNING**Risk of accidents due to non-compliance with the safety instructions!****Non-compliance with the safety instructions can be fatal!**

- Carefully read the safety instructions in this manual!
- Observe the accident prevention regulations and any regional regulations!
- Inform persons in the working area that they must comply with the regulations!

**Risk of injury from electrical voltage!****Voltages can cause potentially fatal electric shocks and burns on contact. Even low voltages can cause a shock and lead to accidents.**

- Never touch live components such as welding current sockets or stick, tungsten or wire electrodes!
- Always place torches and electrode holders on an insulated surface!
- Wear the full personal protective equipment (depending on the application)!
- The machine may only be opened by qualified personnel!

**Hazard when interconnecting multiple power sources!****If a number of power sources are to be connected in parallel or in series, only a technical specialist may interconnect the sources as per standard IEC 60974-9:2010: Installation and use and German Accident Prevention Regulation BVG D1 (formerly VBG 15) or country-specific regulations.****Before commencing arc welding, a test must verify that the equipment cannot exceed the maximum permitted open circuit voltage.**

- Only qualified personnel may connect the machine.
- When taking individual power sources out of operation, all mains and welding current leads must be safely disconnected from the welding system as a whole. (Hazard due to reverse polarity voltage!)
- Do not interconnect welding machines with pole reversing switch (PWS series) or machines for AC welding since a minor error in operation can cause the welding voltages to be combined, which is not permitted.

**Risk of injury due to improper clothing!****During arc welding, radiation, heat and voltage are sources of risk that cannot be avoided. The user has to be equipped with the complete personal protective equipment at all times. The protective equipment has to include:**

- Respiratory protection against hazardous substances and mixtures (fumes and vapours); otherwise implement suitable measures such as extraction facilities.
- Welding helmet with proper protection against ionizing radiation (IR and UV radiation) and heat.
- Dry welding clothing (shoes, gloves and body protection) to protect against warm environments with conditions comparable to ambient temperatures of 100 °C or higher and arcing and work on live components.
- Hearing protection against harming noise.

**Risk of injury due to radiation or heat!****Arc radiation results in injury to skin and eyes.****Contact with hot workpieces and sparks results in burns.**

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

**Explosion risk!****Apparently harmless substances in closed containers may generate excessive pressure when heated.**

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

WARNING



Fire hazard!

Due to the high temperatures, sparks, glowing parts and hot slag that occur during welding, there is a risk of flames.

- Be watchful of potential sources of fire in the working area!
- Do not carry any easily inflammable objects, e.g. matches or lighters.
- Ensure suitable fire extinguishers are available in the working area!
- Thoroughly remove any residue of flammable materials from the workpiece prior to starting to weld.
- Only further process workpieces after they have cooled down. Do not allow them to contact any flammable materials!

CAUTION



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!



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!



Obligations of the operator!

The respective national directives and laws must be complied with when operating the machine!

- *Implementation of national legislation relating to framework directive 89/391/EEC on the introduction of measures to encourage improvements in the safety and health of workers at work and associated individual guidelines.*
- *In particular, directive 89/655/EEC concerning the minimum safety and health requirements for the use of work equipment by workers at work.*
- *The regulations applicable to occupational safety and accident prevention in the country concerned.*
- *Setting up and operating the machine as per IEC 60974.-9.*
- *Brief the user on safety-conscious work practices on a regular basis.*
- *Regularly inspect the machine as per IEC 60974.-4.*



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.*



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**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 6.3 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).



According to IEC 60974-10, welding machines are divided into two classes of electromagnetic compatibility (the EMC class can be found in the Technical data) > see 8 chapter:



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 system
- 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

2.5 Transport and installation

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!

- Observe the instructions from the gas manufacturer and any relevant regulations concerning the use of compressed air!
- Do not attach any element to the shielding gas cylinder valve!
- Prevent the shielding gas cylinder from heating up.

CAUTION



Risk of accidents due to supply lines!
During transport, attached supply lines (mains leads, control cables, etc.) can cause risks, e.g. by causing connected machines to tip over and injure persons!

- Disconnect all supply lines before transport!



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 IEC 60974-1).

- Set up and transport the machine on level, solid ground.
- Secure add-on parts using suitable equipment.



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!***



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.***



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!***

3 Intended use

⚠ WARNING



Hazards due to improper usage!

The machine has been constructed to the state of the art and any regulations and standards applicable for use in industry and trade. It may only be used for the welding procedures indicated at the rating plate. 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 its designated purpose and by trained or expert personnel!
- Do not improperly modify or convert the equipment!

Arc welding machine for standard and pulsed gas-shielded metal-arc welding with TIG welding and lift arc (touch starting) or MMA welding as secondary process. It may be possible to expand the functionality by using accessories (see the documentation in the relevant chapter).

3.1 Documents which also apply

3.1.1 Warranty



For more information refer to the "Warranty registration" brochure supplied and our information regarding warranty, maintenance and testing at www.ewm-group.com!

3.1.2 Declaration of Conformity



The labelled machine complies with the following EC directives in terms of its design and construction:

- Low Voltage Directive (LVD)
- Electromagnetic Compatibility Directive (EMC)
- Restriction of Hazardous Substance (RoHS)

In case of unauthorised changes, improper repairs, non-compliance with specified deadlines for "Arc Welding Equipment – Inspection and Testing during Operation", and/or prohibited modifications which have not been explicitly authorised by EWM, this declaration shall be voided. An original document of the specific declaration of conformity is included with every product.

3.1.3 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.

3.1.4 Service documents (spare parts and circuit diagrams)

⚠ WARNING



Do not carry out any unauthorised repairs or modifications!

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

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

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

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

Spare parts can be obtained from the relevant authorised dealer.

3.1.5 Calibration/Validation

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

4 Machine description – quick overview

4.1 Front view



Coolant tank and quick connect coupling of coolant supply and return are only fitted in machines with water cooling.

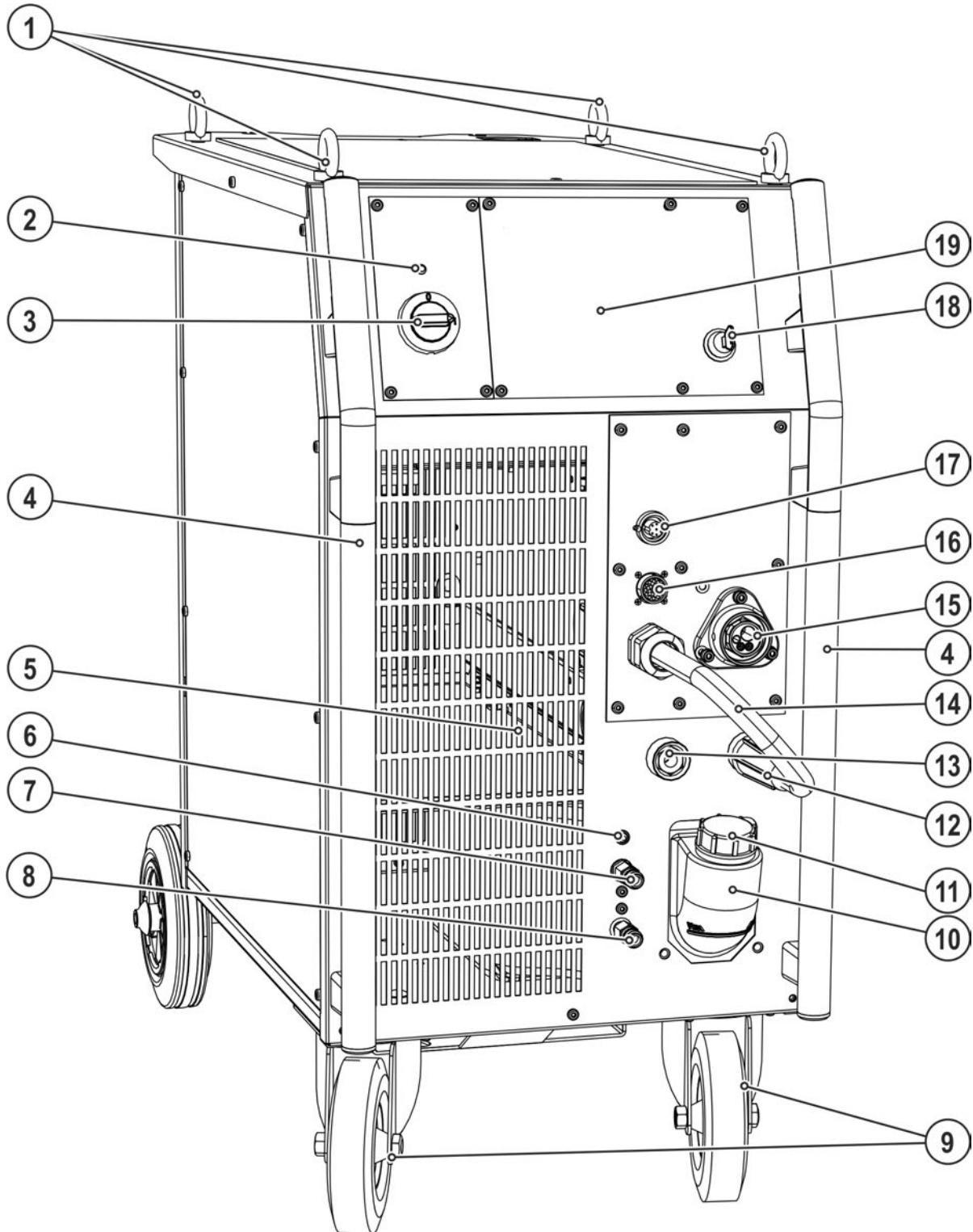


Figure 4-1

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

Item	Symbol	Description
3		Main switch, machine on/off
4		Carrying handle
5		Cooling air inlet
6		Automatic cut-out of coolant pump key button press to reset a triggered fuse
7		Quick connect coupling (red) coolant return
8		Quick connect coupling (blue) coolant supply
9		Wheels, guide castors
10		Coolant tank
11		Coolant tank cap
12		Connection socket, "+" welding current <ul style="list-style-type: none"> • MIG/MAG welding: Welding current to central connection/torch • MIG/MAG cored wire welding: Workpiece connection • TIG welding: Workpiece connection • MMA welding: Workpiece or electrode holder connection
13		"-" welding current connection socket <ul style="list-style-type: none"> • MIG/MAG welding: Workpiece connection • MIG/MAG cored wire welding: Welding current to central connection/torch • TIG welding: Welding current connection for welding torch • MMA welding: Workpiece or electrode holder connection
14		Welding current cable, polarity selection Welding current to Euro torch connector/torch, for polarity selection <ul style="list-style-type: none"> •----- MIG/MAG: Connection socket for "+" welding current •----- Self-shielding flux cored wire/TIG: Connection socket, "-" welding current •----- MMA: Park socket
15		Welding torch connection (Euro or Dinse torch connector) Welding current, shielding gas and torch trigger integrated
16		19-pole connection socket (analogue) For connecting analogue accessory components (remote control, welding torch control lead, etc.)
17		7-pole connection socket (digital) For connecting digital accessory components (documentation interface, robot interface or remote control, etc.).
▼ optional, factory-fitted ▼		
18		Key switch for protection against unauthorised use > see 5.10 chapter 1 ----- changes possible, G front drive-4x-EX 0 ----- changes not possible.
▲ optional, factory-fitted ▲		
19		Machine control > see 4.4 chapter

4.2 Rear view

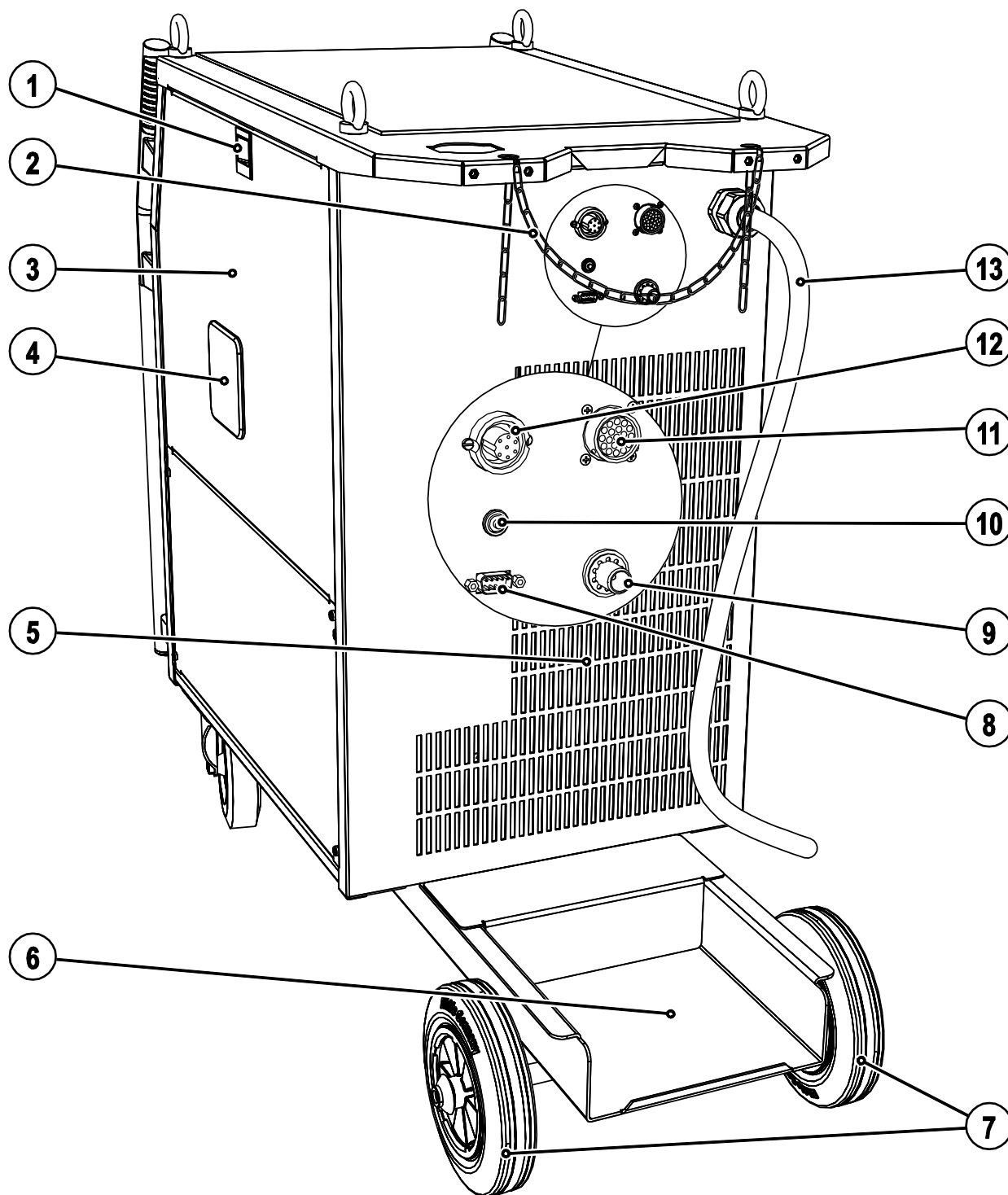







Figure 4-2

Item	Symbol	Description
1		Slide latch, lock for the protective cap
2		Securing elements for shielding gas cylinder (strap/chain)
3		Protective cap Cover for the wire feed mechanism and other operating elements. Depending on the machine series, additional stickers with information on the replacement parts and JOB lists will be located on the inside.
4		Wire spool inspection window Check wire supply
5		Cooling air outlet
6		Bracket for shielding gas cylinder
7		Wheels, fixed castors
8		PC interface, serial (D-Sub connection socket, 9-pole)
9		Connecting nipple G¹/₄, shielding gas connection
10		Key button, automatic cutout Wire feed motor supply voltage fuse press to reset a triggered fuse
▼ Retrofitting option ▼		
11		19-pole mechanised welding interface (analogue) > see 5.8 chapter
▲ Retrofitting option ▲		
12		7-pole connection socket (digital) For connecting digital accessory components (documentation interface, robot interface or remote control, etc.).
13		Mains connection cable > see 5.1.7 chapter

4.3 Inside view

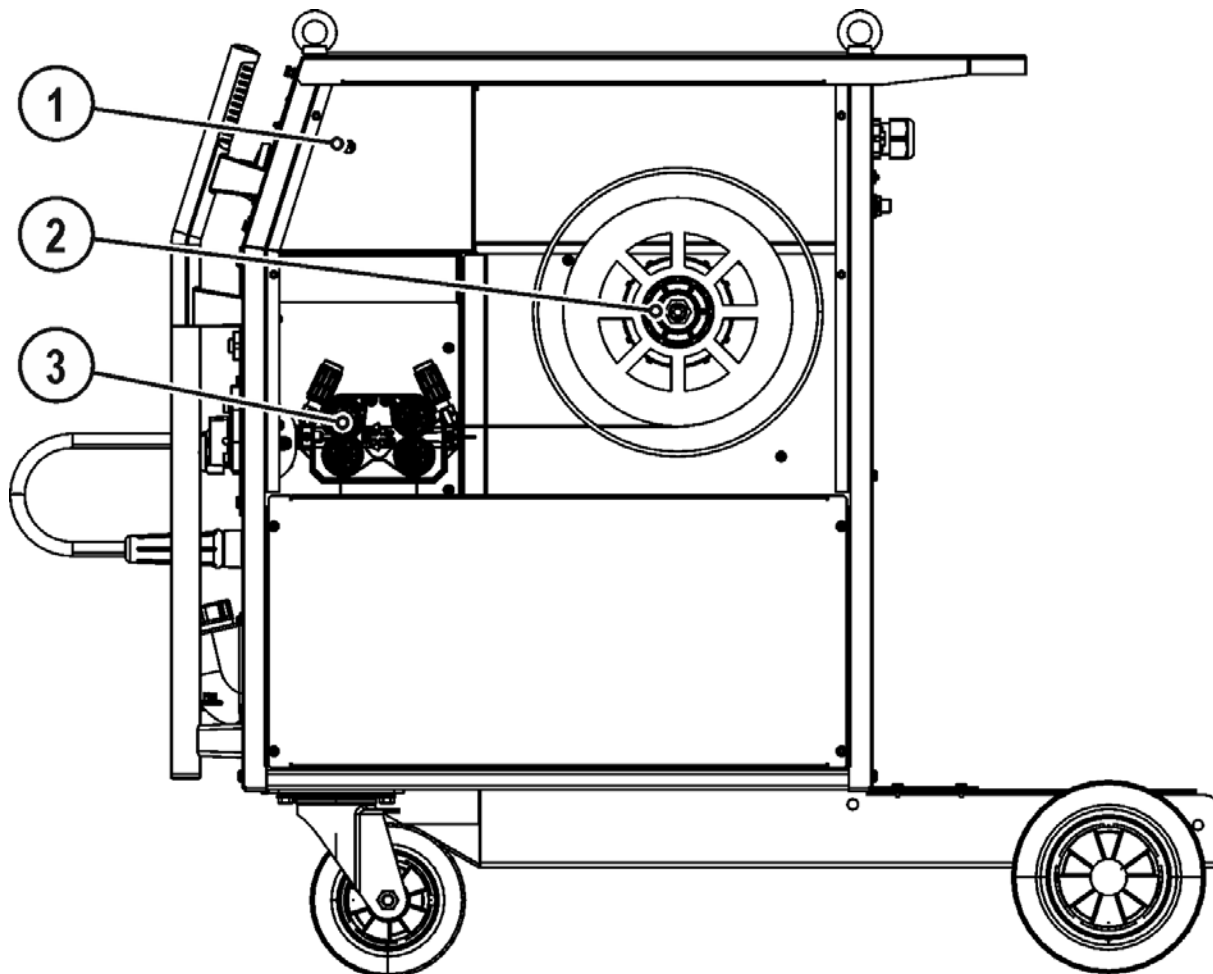


Figure 4-3

Item	Symbol	Description
1		Welding torch function changeover switch (special welding torch required) Programm Changing over programs or JOBs Up / Down Infinite adjustment of welding performance.
2		Wire spool holder
3		Wire feed unit

4.4 Machine control – Operating elements

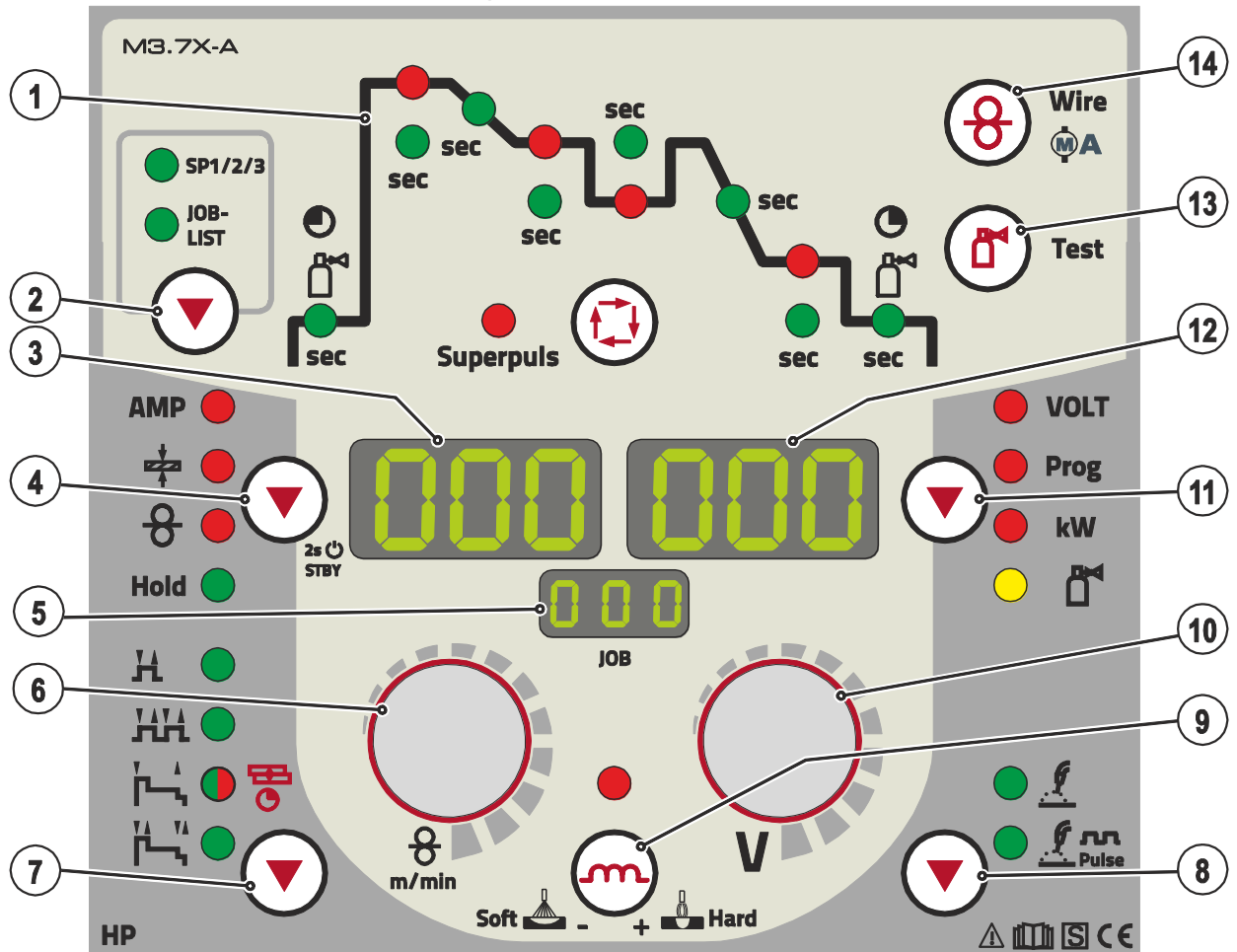




















Figure 4-4

Item	Symbol	Description
1		Functional sequence > see 4.4.1 chapter
2	JOB-LIST	Welding task push-button (JOB) Select the welding task from the welding task list (JOB-LIST). The list can be found inside the protective cap on the wire feeder and in the appendix to these operating instructions.
3	000	Display, left Welding current, material thickness, wire speed, hold values
4	▼	Push-button, parameter selection left/power-saving mode AMP ----- Welding current ⚡----- Material thickness > see 5.4.5 chapter ⊗----- Wire feed speed Hold----- After welding, the values used last are shown from the main program. The signal light is illuminated. STBY ---- Press for 2 s to put machine into power-saving mode. To reactivate, activate one of the operating elements > see 5.14 chapter.
5	000	Display, JOB Shows the currently selected welding task (JOB number).
6	⊗	Welding parameter setting, rotary dial For setting the welding performance, for selecting the JOB (welding task) and for setting other welding parameters.

Item	Symbol	Description
7		Select operating mode button  ----- Non-latched  ----- Latched  ----- Signal light lights up in green: Special non-latched  ----- Signal light lights up in red: MIG spot welding  ----- Special latched
8		Welding type push-button  ----- Standard arc welding  ----- Pulsed arc welding
9		Push-button, throttling effect (arc dynamics)  Hard ---- Arc is harder and more narrow  Soft ---- Arc is softer and wider
10		Arc length correction/selection of welding program, rotary dial <ul style="list-style-type: none"> •----- Correction of the arc length from -9.9 V to +9.9 V. •----- Selection of welding programs 0 to 15 (not possible if accessory components, such as program torches, are connected).
11		Button, Parameter selection (right) VOLT --- Welding voltage Prog ---- Program number kW ----- Welding performance display  ----- Gas flow quantity (optional)
12		Display, right Welding voltage, program number, motor current (wire feed mechanism)
13		Push-button gas test / rinse hose package > see 5.2.2.2 chapter
14		Push-button, wire inching Potential- and gas-free inching of the wire electrode through the hose package to the welding torch > see 5.4.2.4 chapter.

4.4.1 Function sequence

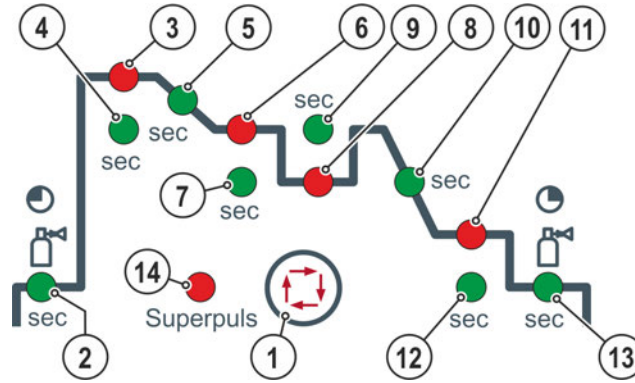


Figure 4-5

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	sec	Signal light, duration of main program P_A Setting range 0.1 s to 20.0 s (0.1 s increments). Used e.g. in connection with the super pulse function
8		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
9	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.
10	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)
11		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
12	sec	Signal light, duration of end program P_{END} Setting range 0.0 s to 20.0 s (0.1 s increments)
13		Signal light, gas post-flow time
14	Super-puls	Signal lamp, super pulse function Lights up when the super pulse function is active.

5 Design and function

⚠ 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!

5.1 Transport and installation

5.1.1 Lifting by crane

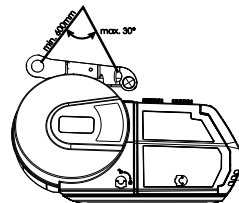
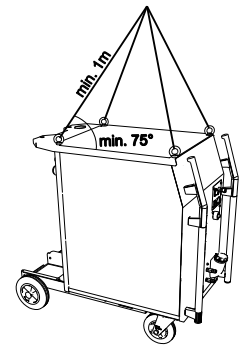
⚠ WARNING



Risk of injury during lifting by crane!

When lifting the machine by crane, persons may be severely injured by falling machines or mount-on components.

- Simultaneous lifting of system components such as power source, wire feeder or cooling unit without suitable crane components is not allowed. Each system component has to be lifted separately!
- Remove any supply leads and accessories before lifting by crane (e.g. hose package, wire spool, shielding gas cylinder, toolbox, wire feeder, remote control, etc.!)!
- Properly close and lock all casing covers and protective caps before lifting by crane!
- Use the correct number of hoisting equipment of the right size in the correct position! Observe craning principle (see figure)!
- For machines with lifting eyes: always lift all lifting eyes simultaneously!
- When using retrofitted craning frames etc.: always use at least two lifting points positioned as far apart as possible – observe option description.
- Avoid any jerky movements!
- Ensure that the load is distributed evenly! • Use chain hoists and chain slings of the same length only!
- Stay outside the danger zone underneath the machine!
- Observe the regulations regarding occupational safety and accident prevention for the respective country.



Craning principle



Risk of injury due to unsuitable lifting eye!

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

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

5.1.2 Ambient conditions



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.*



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)!*

5.1.2.1 In operation

Temperature range of the ambient air:

- -25 °C to +40 °C

Relative air humidity:

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

5.1.2.2 Transport and storage

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

- -30 °C to +70 °C

Relative air humidity

- Up to 90% at 20 °C

5.1.3 Machine cooling



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!*

5.1.4 Workpiece lead, general

CAUTION



Risk of burning due to incorrect welding current connection!

If the welding current plugs (machine connections) are not locked or if the workpiece connection is contaminated (paint, corrosion), these connections and leads can heat up and cause burns when touched!

- Check welding current connections on a daily basis and lock by turning to the right when necessary.
- Clean workpiece connection thoroughly and secure properly. Do not use structural parts of the workpiece as welding current return lead!

5.1.5 Welding torch cooling system



Insufficient frost protection in the welding torch coolant!

Depending on the ambient conditions, different liquids are used for cooling the welding torch > see 5.1.5.1 chapter.

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 .
- Replace coolant as necessary if frost protection is inadequate!



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.



Dispose of the coolant in accordance with local regulations and the material safety data sheets (German waste code number: 70104).

May not be disposed of in household waste.

Prevent entry into sewers.

Absorb with liquid-binding material (sand, gravel, acid-binding agents, universal binding agents, sawdust).

5.1.5.1 Approved coolants overview

Coolant	Temperature range
KF 23E (Standard)	-10 °C to +40 °C
KF 37E	-20 °C to +10 °C

5.1.5.2 Maximal hose package length

	Pump 3.5 bar	Pump 4.5 bar
Machines with or without separate wire feeder	30 m	60 m
Compact machines with additional intermediate drive (example. miniDrive)	20 m	30 m
Machines with separate wire feeder and additional intermediate drive (example: miniDrive)	20 m	60 m

Data as a rule refer to the entire hose package length

including welding torch. The pump output is shown on the type plate (parameter: Pmax).

Pump 3.5 bar: Pmax = 0.35 MPa (3.5 bar)

Pump 4.5 bar: Pmax = 0.45 MPa (4.5 bar)

5.1.5.3 Adding coolant

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

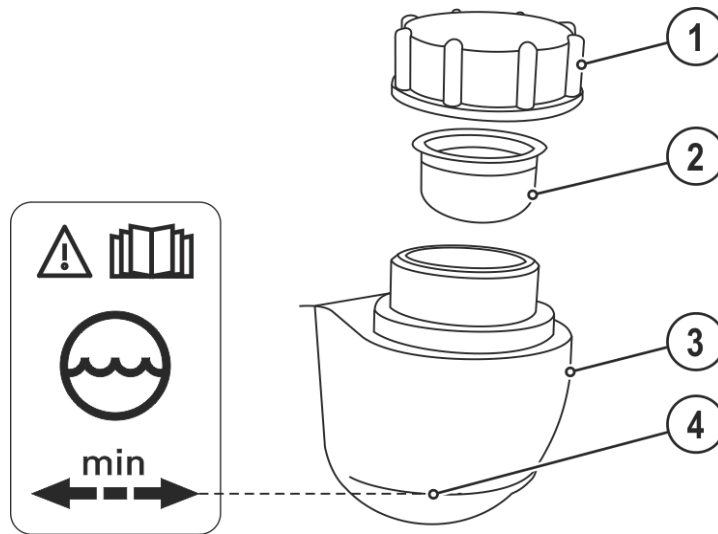


Figure 5-1

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.



After the initial filling, wait for at least one minute when the machine is switched on so that the hose 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 7.5 chapter.

5.1.6 Notes on the installation of welding current leads



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

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

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

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

Always keep leads as short as possible! For optimum welding results max. 30 m (welding lead + intermediate hose package + torch lead).

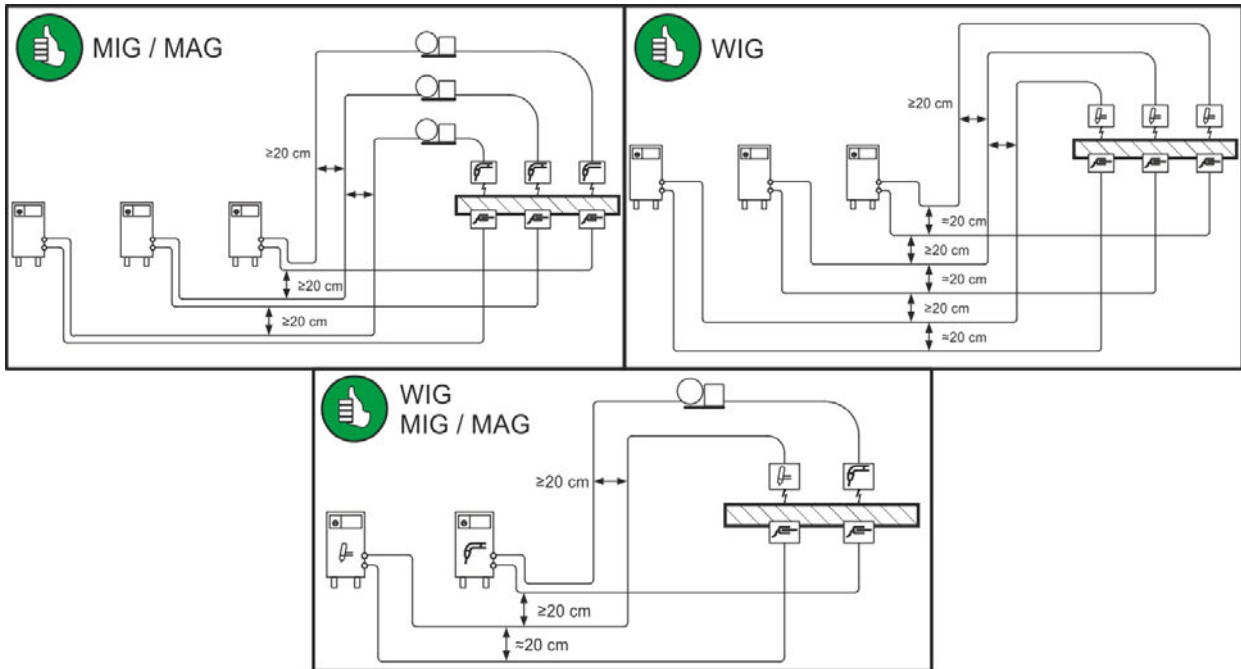


Figure 5-2



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

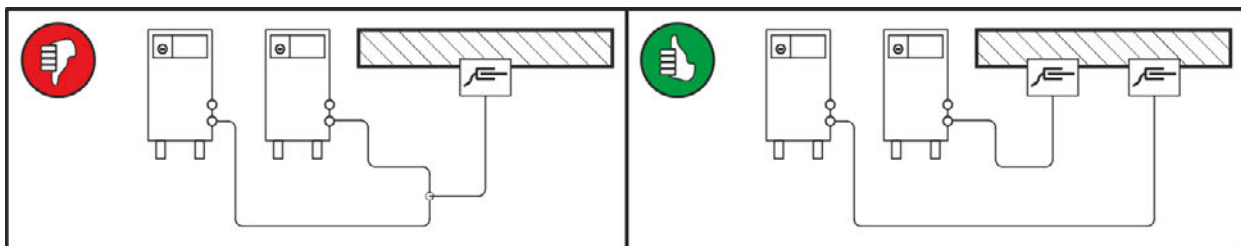


Figure 5-3



Fully unroll welding current leads, torch hose packages and intermediate hose packages. Avoid loops!



Always keep leads as short as possible!



Lay any excess cable lengths in meanders.

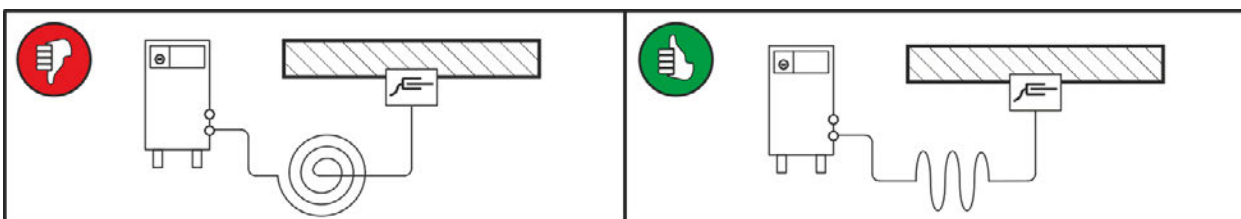


Figure 5-4

5.1.6.1 Stray welding currents

⚠ WARNING**Risk of injury due to stray welding currents!**

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

- Check that all welding current connections are firmly secured and electrical connections are in perfect condition.
- Set up, attach or suspend all conductive power source components such as casing, transport vehicles and crane frames so they are insulated.
- Do not place any other electronic devices such as drills or angle grinders 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.

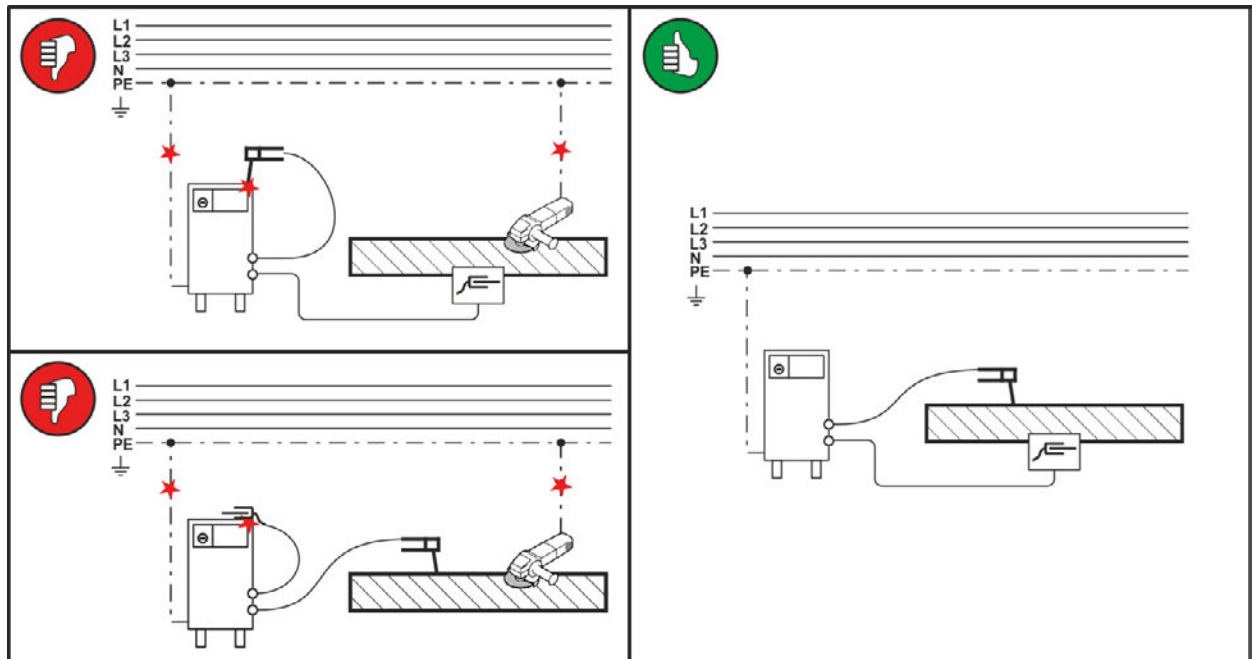


Figure 5-5

5.1.7 Mains connection

⚠ DANGER**Hazards caused by improper mains connection!**

An improper mains connection can cause injuries or damage property!

- Only operate machine using a socket that has correctly fitted protective earth.
- The mains voltage indicated on the rating plate must match the supply voltage.
- If a new mains plug must be fitted, only an electrician may do so as per the relevant national legislation or regulations.
- Mains plug, socket and lead must be checked by an electrician on a regular basis.
- When operating the generator, always ensure it is earthed as stipulated in the operating instructions. The network created must be suitable for operating machines according to protection class I.

5.1.7.1 Mains configuration



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

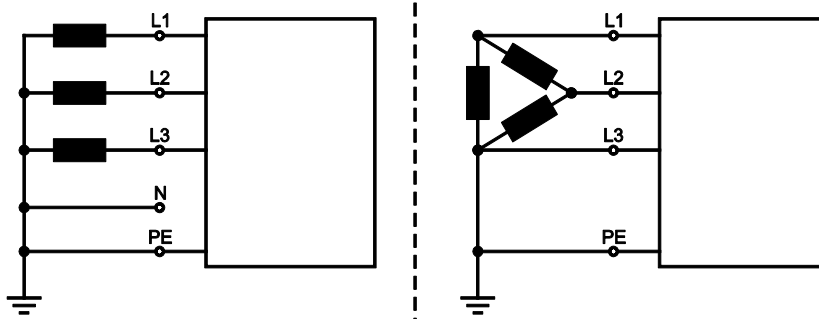


Figure 5-6

Legend

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

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

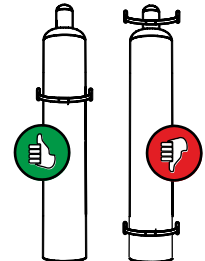
5.2 Shielding gas supply (shielding gas cylinder for welding machine)

⚠ 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!

- Place shielding gas cylinder into the designated holder and secure with fastening elements (chain/belt)!
- Attach the fastening elements within the upper half of the shielding gas cylinder!
- The fastening elements must tightly enclose the shielding gas cylinder!



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.

5.2.1 Pressure regulator connection

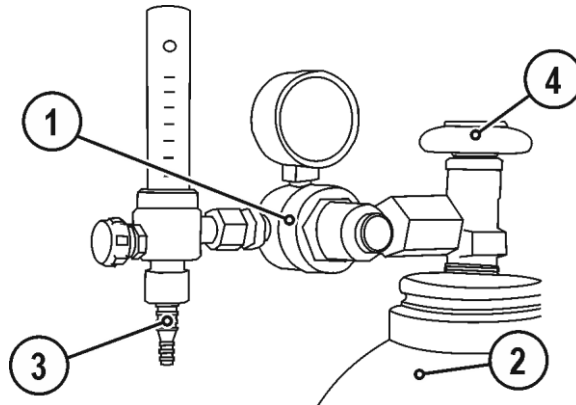


Figure 5-7

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

- Before connecting the pressure regulator to the gas cylinder, open the cylinder valve briefly to blow out any dirt.
- Tighten the pressure regulator screw connection on the gas bottle valve to be gas-tight.
- Screw gas hose connection crown nut onto the output side of the pressure regulator.

5.2.1.1 Shielding gas hose connection

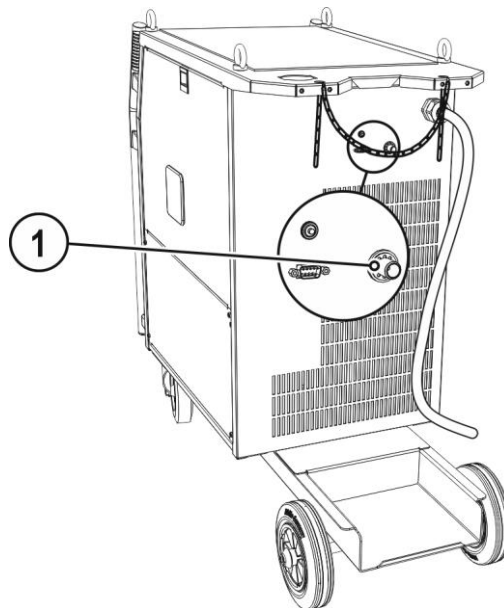


Figure 5-8

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

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

5.2.2 Shielding gas volume settings

⚠ CAUTION

Electric shocks!
When setting the shielding gas quantity, high voltage ignition pulses or open circuit voltage are applied at the welding torch; these can lead to electric shocks and burning on contact.

- Keep the welding torch electrically insulated from persons, animals or equipment during the setting procedure.

If the shielding gas setting is too low or too high, this can introduce air to the weld pool and may cause pores to form. Adjust the shielding gas quantity to suit the welding task!

- Slowly open the gas cylinder valve.
- Open the pressure regulator.
- Switch on the power source at the main switch.
- Trigger gas test > see 5.2.2.1 chapter function (welding voltage and wire feed motor remain switched off – no accidental arc ignition).
- Set the relevant gas quantity for the application on the pressure regulator.

Setting instructions

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)
TIG	Gas nozzle diameter in mm corresponds to l/min gas throughput

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

5.2.2.1 Gas test

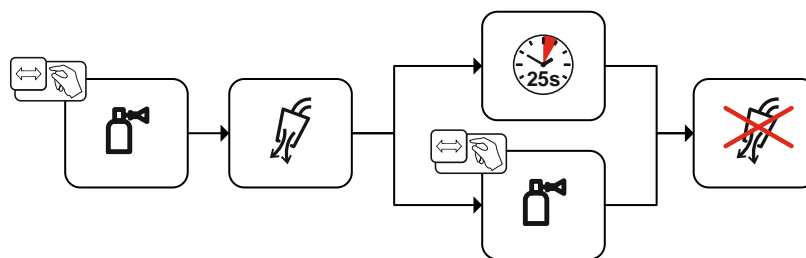


Figure 5-9

5.2.2.2 Purge hose package

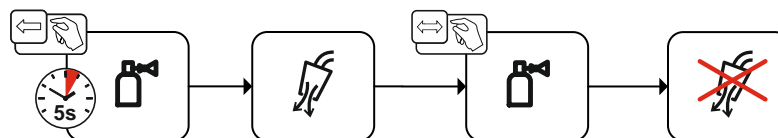


Figure 5-10

5.3 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)

MIG/MAG

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 feed 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"/>
Welding performance	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

TIG

Parameter	Nominal values	Actual values	Hold values
Welding current	<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"/>
Welding performance	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

MMA

Parameter	Nominal values	Actual values	Hold values
Welding current	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Welding voltage	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Welding performance	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

When settings are changed (e.g. wire feed speed) the display immediately switches to nominal value setting.

5.4 MIG/MAG welding

5.4.1 Welding torch and workpiece line connection



Equipment damage due to improperly connected coolant pipes!

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

- **Connect all coolant pipes correctly!**
- **Completely unroll the hose package and the torch hose package!**
- **Observe maximal hose package length > see 9 chapter.**
- **When using a gas-cooled welding torch, use a hose bridge to establish the coolant circuit > see 5.1.5.2 chapter.**



On delivery, the Euro torch connector is fitted with a capillary tube for welding torches with a steel liner. Conversion is necessary if a welding torch with a liner is used!

- **Operate welding torches with a liner > with a guide tube.**
- **Operate welding torches with a steel liner > with a capillary tube.**

Depending on the wire electrode diameter or type, either a steel liner or liner with the correct inner diameter must be inserted in the torch!

Recommendation:

- Use a steel liner when welding hard, unalloyed wire electrodes (steel).
- Use a chrome nickel liner when welding hard, high-alloy wire electrodes (CrNi).
- Use a plastic or teflon liner when welding or brazing soft wire electrodes, high-alloy wire electrodes or aluminium materials.

Preparation for connecting welding torches with a liner:

- Push forward the capillary tube on the wire feed side in the direction of the Euro torch connector and remove it there.
- Insert the liner guide tube from the Euro torch connector side.
- Carefully insert the welding torch connector with as yet too long a liner into the Euro torch connector and secure with a crown nut.
- Cut off the liner with a liner cutter > see 9 chapter just before the wire feed roller.
- Loosen the welding torch connector and remove.
- Carefully chamfer the cut off end of the liner with a liner sharpener > see 9 chapter and sharpen.

Preparation for connecting welding torches with a spiral guide:

- Check that the capillary tube is correctly positioned in relation to the central connector!

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!

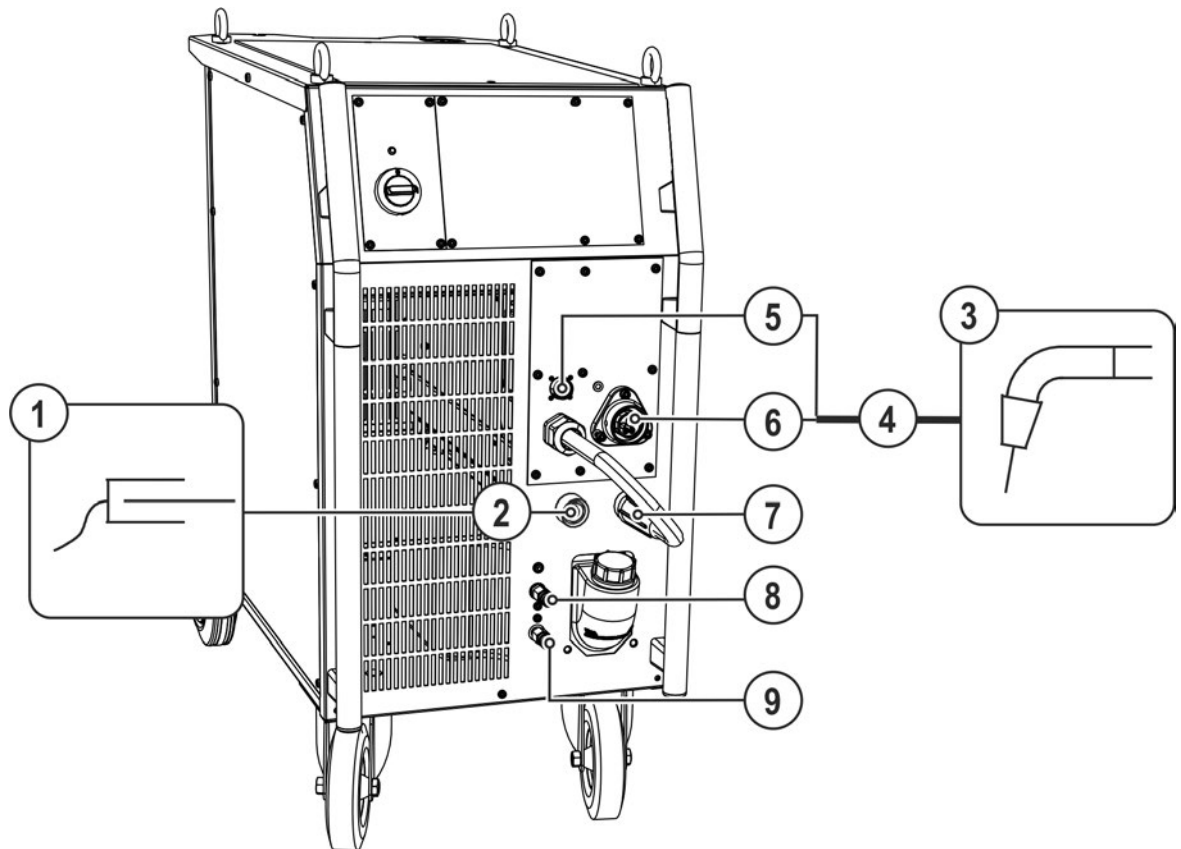


Figure 5-12

Item	Symbol	Description
1		Workpiece
2		"-" welding current connection socket •----- MIG/MAG welding: Workpiece connection
3		Welding torch
4		Welding torch hose package
5		19-pole connection socket (analogue) For connecting analogue accessory components (remote control, welding torch control lead, etc.)
6		Welding torch connection (Euro or Dinse torch connector) Welding current, shielding gas and torch trigger integrated
7		Welding current cable, polarity selection Welding current to central connection/torch. Permits polarity selection for MIG/MAG welding. •----- Standard applications > Connection for "+" welding current connection socket
8		Quick connect coupling (red) coolant return
9		Quick connect coupling (blue) coolant supply

- Insert the central plug for the welding torch into the central connector and screw together with crown nut.
- Insert the plug on the workpiece lead into the "-" welding current connection socket and lock.
- Welding current lead, insert polarity selection into the "+" welding current connection socket and lock.
- Insert the welding torch control cable into the 19-pole connection socket and lock (MIG/MAG torches with additional control cables only).

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).

5.4.2 Wire feed

CAUTION



Risk of injury due to moving parts!

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

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



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

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

- Before mains connection, set up the complete wire guide system from the wire spool to the welding torch!
- Check wire guide at regular intervals!
- Keep all casing covers or protective caps closed during operation!

5.4.2.1 Open the protective flap of the wire feeder



To perform the following steps, the protective flap of the wire feeder needs to be opened. Make sure to close the protective flap again before starting to work.

- Unlock and open protective flap.

5.4.2.2 Inserting the wire spool

⚠ CAUTION



Risk of injury due to incorrectly secured wire spool.

If the wire spool is not secured properly, it may come loose from the wire spool support and fall to the ground, causing damage to the machine and injuries.

- Make sure to correctly fasten the wire spool to the wire spool support.
- Before you start working, always check the wire spool is securely fastened.



Standard D300 wire spool holder can be used. Adapters > see 9 chapter are required when using standardised basket coils (DIN 8559).

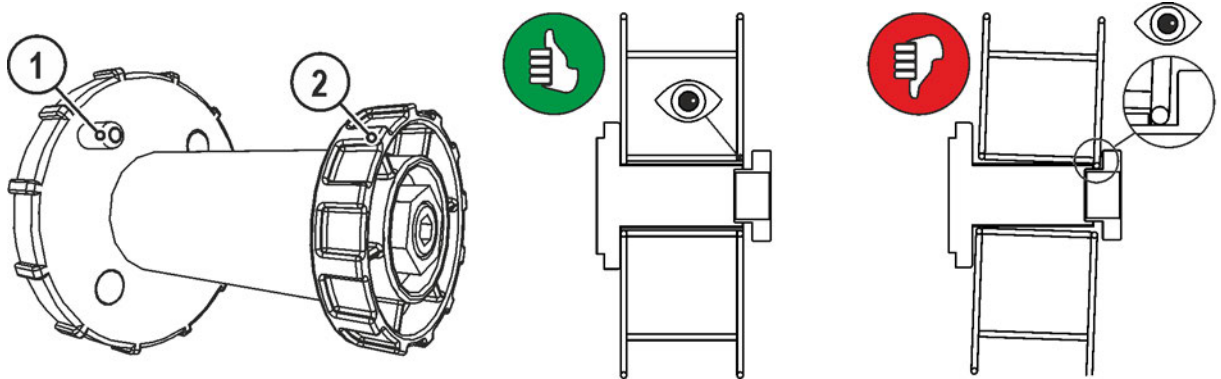


Figure 5-13

Item	Symbol	Description
1		Carrier pin For fixing the wire spool
2		Knurled nut For fixing the wire spool

- Loosen knurled nut from spool holder.
- Fix welding wire reel onto the spool holder so that the carrier pin locks into the spool bore.
- Fasten wire spool using knurled nut.

5.4.2.3 Changing the wire feed rollers

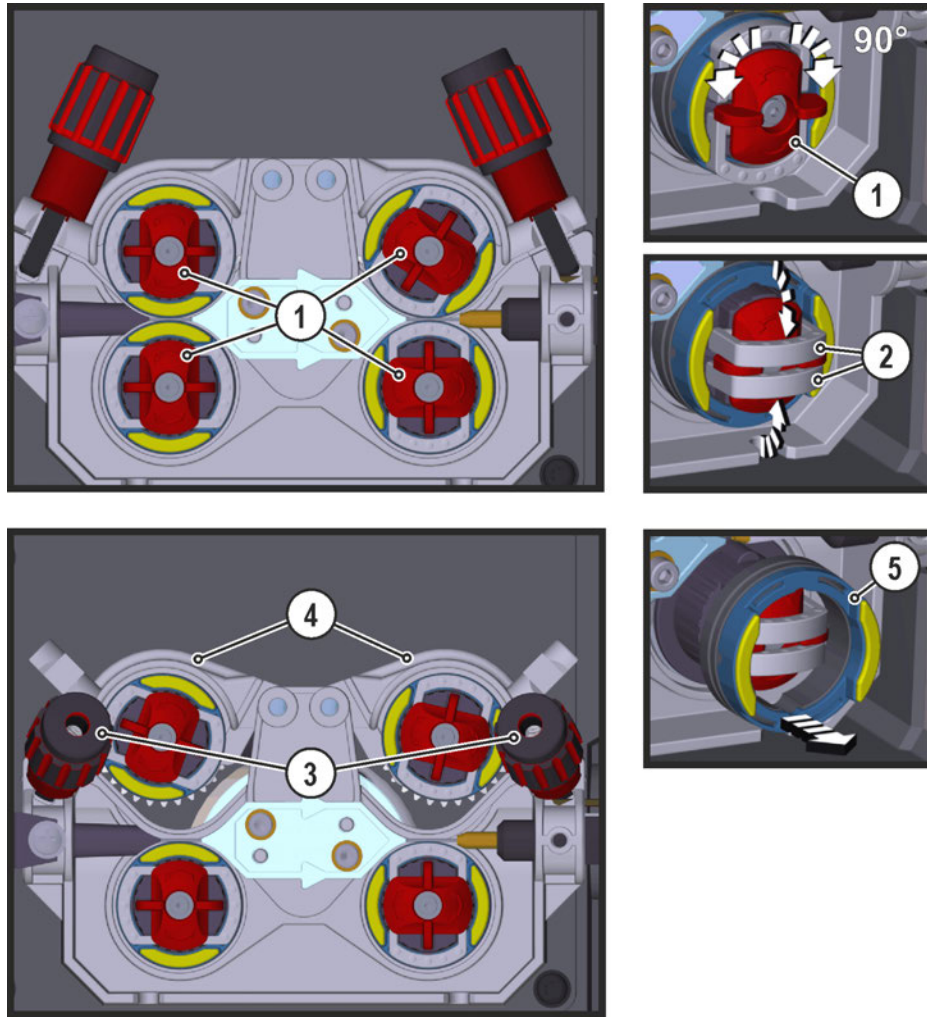


Figure 5-14

Item	Symbol	Description
1		Tommy The tommy is used to secure the closure brackets of the wire feed rollers.
2		Closure bracket The closure brackets are used to secure the wire feed rollers.
3		Feed roll tensioner Fixing the clamping unit and setting the pressure.
4		Clamping unit
5		Wire feed roller see the Wire feed roller overview table

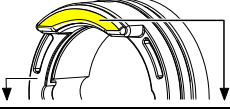
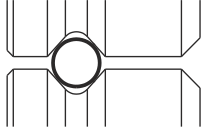
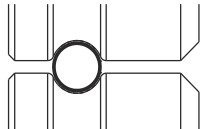
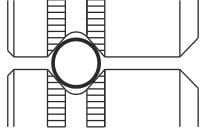
- Rotate the tommy by 90° clockwise or anti-clockwise (tommy locks into place).
- Fold the closure brackets outwards by 90°.
- Unfasten pressure units and fold out (clamping units and pressure rollers will automatically flip upwards).
- Remove the wire feed rollers from the roller support.
- Select new wire feed rollers according to the Wire feed roller overview table and reassemble the wire feed mechanism in reverse order.



Unsatisfactory welding results due to faulty wire feeding!

The wire feed rolls must be suitable for the diameter of the wire and the material. The wire feed rolls are colour-coded to facilitate distinction (see the Wire feed roll overview table). When working with a wire diameter of > 1.6 mm the drive has to be converted for the wire feed kit ON WF 2,0-3,2MM EFEED > see 10 chapter.

Wire feed roller overview table

Material	Diameter		Colour code		Groove form
	Ø mm	Ø inch			
Steel Stainless steel Brazing	0.6	.023	monochrome	-	 V-groove
	0.8	.030			
	0.9/1.0	.035/.040			
	1.2	.045			
	1.4	.052			
	1.6	.060			
	2.0	.080			
	2.4	.095			
	2.8	.110			
	3.2	.125			
Aluminium	0.8	.030	bichrome	yellow	 U-groove
	0.9/1.0	.035/.040			
	1.2	.045			
	1.6	.060			
	2.0	.080			
	2.4	.095			
	2.8	.110			
	3.2	.125			
Flux cored wire	0.8	.030	bichrome	orange	 V-groove, knurled
	0.9	.035			
	1.0	.040			
	1.2	.045			
	1.4	.052			
	1.6	.060			
	2.0	.080			
	2.4	.095			

5.4.2.4 Inching the wire electrode

⚠ CAUTION



Risk of injury due to welding wire escaping from the welding torch!
 The welding wire can escape from the welding torch at high speed and cause bodily injury including injuries to the face and eyes!

- Never direct the welding torch towards your own body or towards other persons!



Incorrect contact pressure will cause extensive wear of the wire feed rollers!

- With the adjusting nuts of the pressure units set the contact pressure so that the wire electrode is conveyed but will still slip through if the wire spool jams.
- Set the contact pressure of the front rollers (in wire feed direction) to a higher value!



The inching speed is infinitely adjustable by simultaneously pressing the wire inching push-button and turning the wire speed rotary knob. The left display shows the wire feed speed selected, the right display shows the current motor current of the wire feed mechanism.

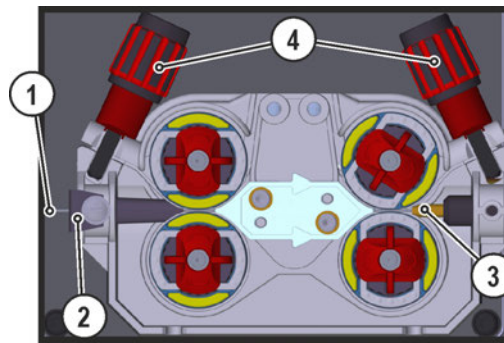


Figure 5-15

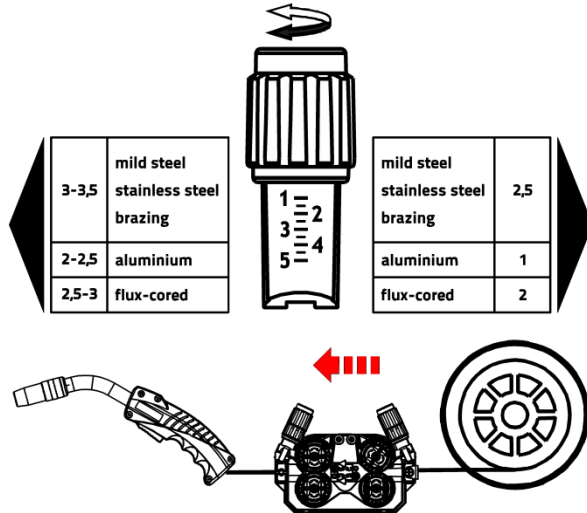
Item	Symbol	Description
1		Welding wire
2		Wire feed nipple
3		Guide tube
4		Adjusting nut

- Extend and lay out the torch hose package.
- Carefully unwind the welding wire from the wire spool and insert through the wire feed nipples up to the wire feed rollers.
- Press the inching push-button (the drive catches the welding wire and automatically guides it to the welding torch outlet).

A prerequisite for the automatic inching process is the correct preparation of the wire guide, especially in the capillary and wire guide tube area > see 5.4.1 chapter.

- The contact pressure has to be adjusted separately for each side (wire inlet/outlet) at the feed roll tensioner setting nuts depending on the welding consumable used. A table with the setting values can be found on a sticker near the wire drive.

Version 1: left hand mounting



Version 2: right hand mounting

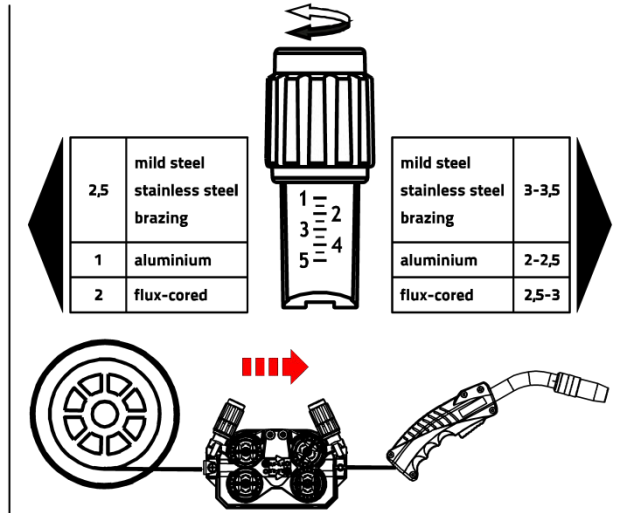


Figure 5-16

Automatic inching stop

Touch the welding torch against the workpiece during inching. Inching of the welding wire will stop as soon it touches the workpiece.

5.4.2.5 Spool brake setting

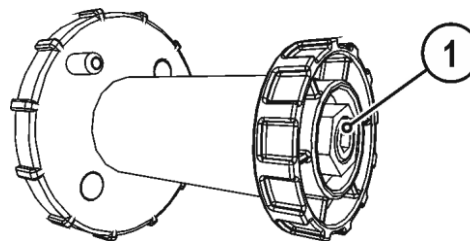


Figure 5-17

Item	Symbol	Description
1		Allen screw Securing the wire spool retainer and adjustment of the spool brake

- Tighten the Allen screw (8 mm) in the clockwise direction to increase the braking effect.

Tighten the spool brake until the wire spool no longer turns when the wire feed motor stops but without it jamming during operation!

5.4.3 Definition of MIG/MAG welding tasks

This machine series offers user-friendly operation and a multitude of features.

- Various welding tasks (JOBS) consisting of welding procedure, material type, wire diameter and shielding gas type have been predefined > see 11.1 chapter.
- The system calculates the required process parameters depending on the operating point specified (one-knob operation via wire feed speed rotary transducer).
- You can adjust additional parameters at the machine control or using the PC300.NET welding parameter software, if required.

5.4.4 Welding task selection

5.4.4.1 Basic welding parameters

You can only change the JOB number when no welding current is flowing.

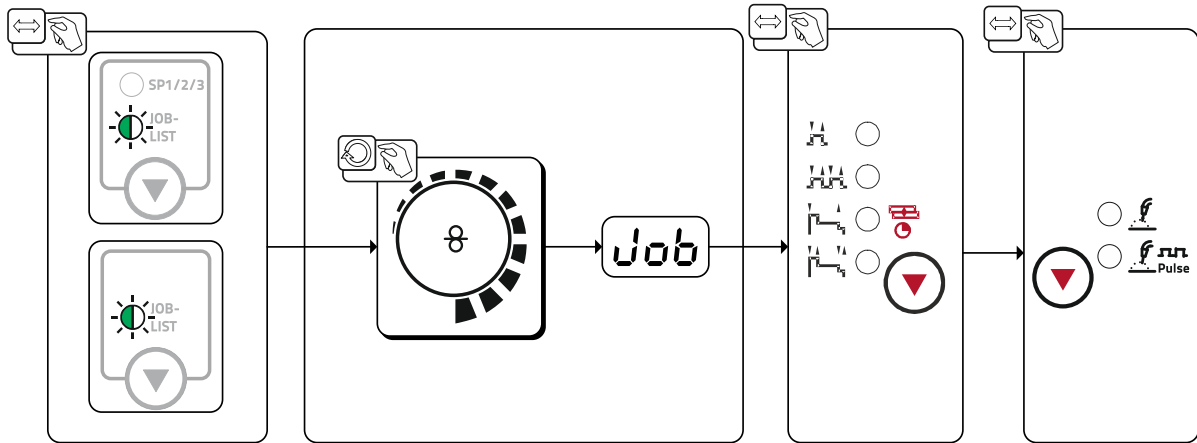


Figure 5-18

5.4.4.2 Choke effect / dynamics

Setting range:

40: Arc hard and narrow, deeper fusion penetration.

-40: Arc soft and wide.

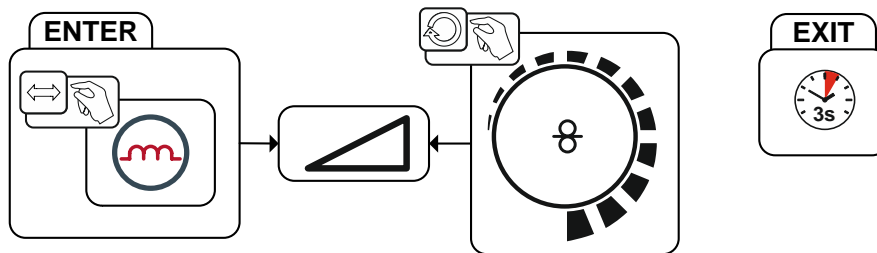


Figure 5-19

5.4.4.3 superPuls

In superPuls mode, the program toggles between the main program (PA) and the reduced main program (PB). This function is e.g. used for thin sheet welding to reduce the heat input in a controlled manner or for positional welding without the need for weaving.

The combination of superPuls and other EWM welding processes offers a multitude of possibilities. For example, to enable the welding of vertical-up welds without the "Christmas tree" technique, when selecting program 1 > see 5.4.11 chapter the relevant superPuls variant (depending on the material) is activated as well. The required superPuls parameters are defined ex works.

The welding power can be represented as average value (ex works) or solely as program A value. If the average value display is activated the signal lights of the main (PA) and reduced main program (PB) are illuminated simultaneously. The display variants can be toggled using special parameter P19, > see 5.11 chapter.

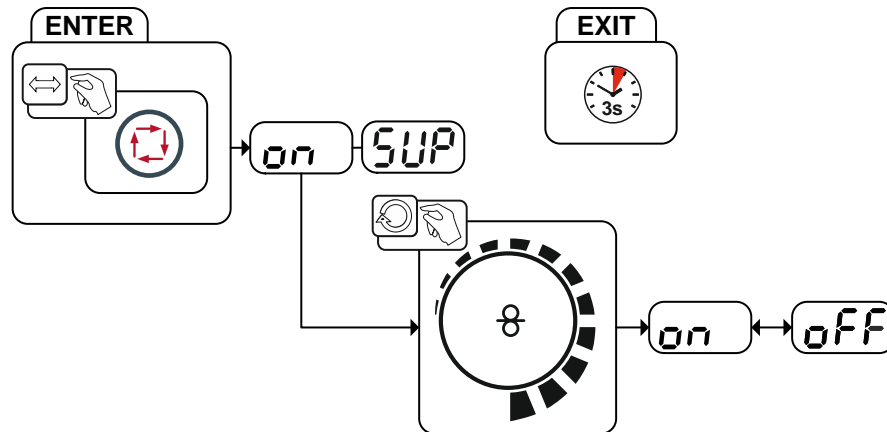


Figure 5-20

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

5.4.4.4 Burn-back

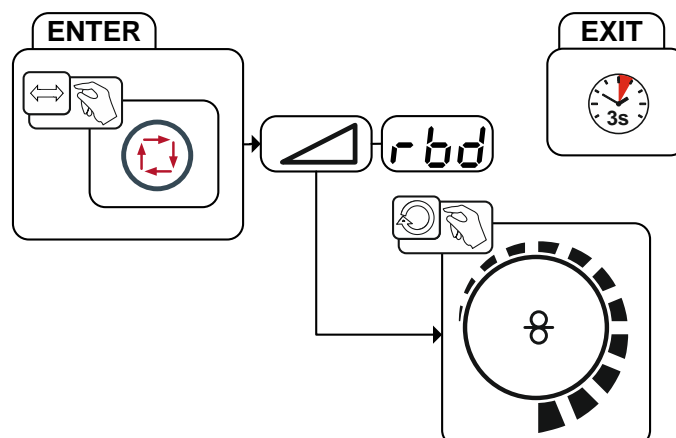


Figure 5-21

Display	Setting/selection
	menu burn back Set burn back

5.4.5 MIG/MAG operating point

The operating point (welding power) is specified using the MIG/MAG one-knob operation principle, i.e. the user can specify either the welding current, the wire feed speed or the material thickness to define the operating point. The electronic system calculates the optimal required welding voltage value.

5.4.5.1 Operating point setting via welding current, material thickness or wire feed speed

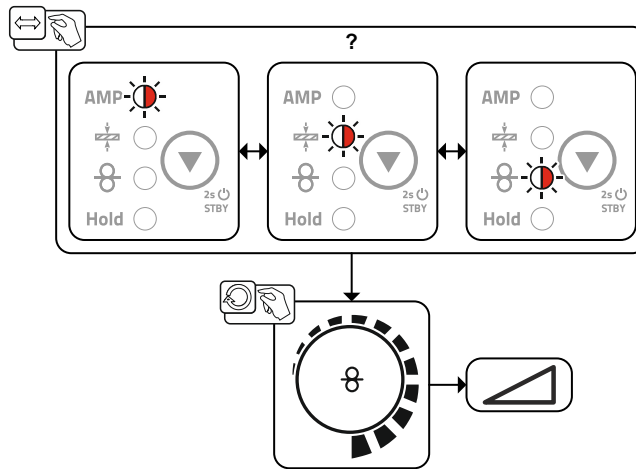


Figure 5-22

Application example (setting via material thickness)

The required wire feed speed is not known and is to be determined.

- Select welding task JOB 76(> see 5.4.4 chapter): material = AlMg, gas = Ar 100%, wire diameter = 1.2 mm.
- Switch the display to material thickness.
- Measure the material thickness (workpiece).
- Set the measured value, e.g. 5 mm, at the machine control.
This set value corresponds to a specific wire feed speed. Switching the display to this parameter will show the associated value.

In this example, a material thickness of 5 mm corresponds to a wire feed speed of 8.4 m/min.

The material thickness details in the welding programs generally refer to fillet welds in the PB welding position. They should be regarded as guideline values and may differ in other welding positions.

5.4.5.2 Arc length correction setting

When required, the arc length (welding voltage) can be adjusted for the welding task in hand by ± 9.9 V.

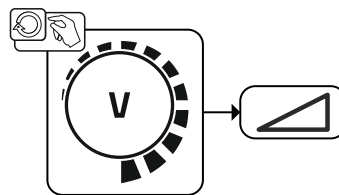


Figure 5-23

5.4.5.3 Accessory components for operating point setting

The operating point can be set at various accessory components as well, such as remote control, special welding torches or robot and industrial bus interfaces (optional interface for automated welding required, not available for all machines of this series).

For an overview of the accessory components > see 9 chapter. See the operating instructions for the machine in question for a more detailed description of the individual machines and their functions.

5.4.6 forceArc / forceArc puls

Low-heat, directionally stable and powerful high-performance arc with deep fusion penetration for the upper power range Unalloyed, low-alloy and high-alloy steels as well as high-tensile fine-grained steels.

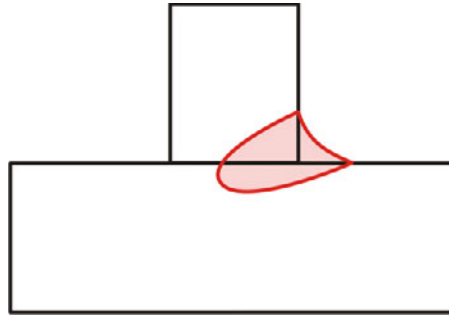


Figure 5-24

- 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%	-	-	251	12.0	252	12.0	253	6.0

You can make use of these properties after selecting the forceArc process > see 5.4.4 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 hose packages and, if applicable, intermediate hose 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.



Unstable arc!

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

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

5.4.7 rootArc/rootArc puls

Short arc with perfect weld modelling capabilities for effortless gap bridging, especially for positional welding

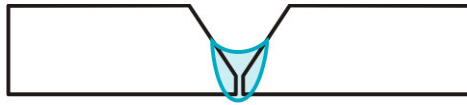


Figure 5-25

- 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	-	-	-	-	-	-	204	7.0	205	5.0	-	-
	Ar 80–90%	-	-	-	-	-	-	206	8.0	207	6.0	-	-



Unstable arc!

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

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

5.4.8 MIG/MAG functional sequences / operating modes

 *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).*

5.4.8.1 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
P _{START}	Ignition program
P _A	Main program
P _B	Reduced main program
P _{END}	End program
t2	Spot time

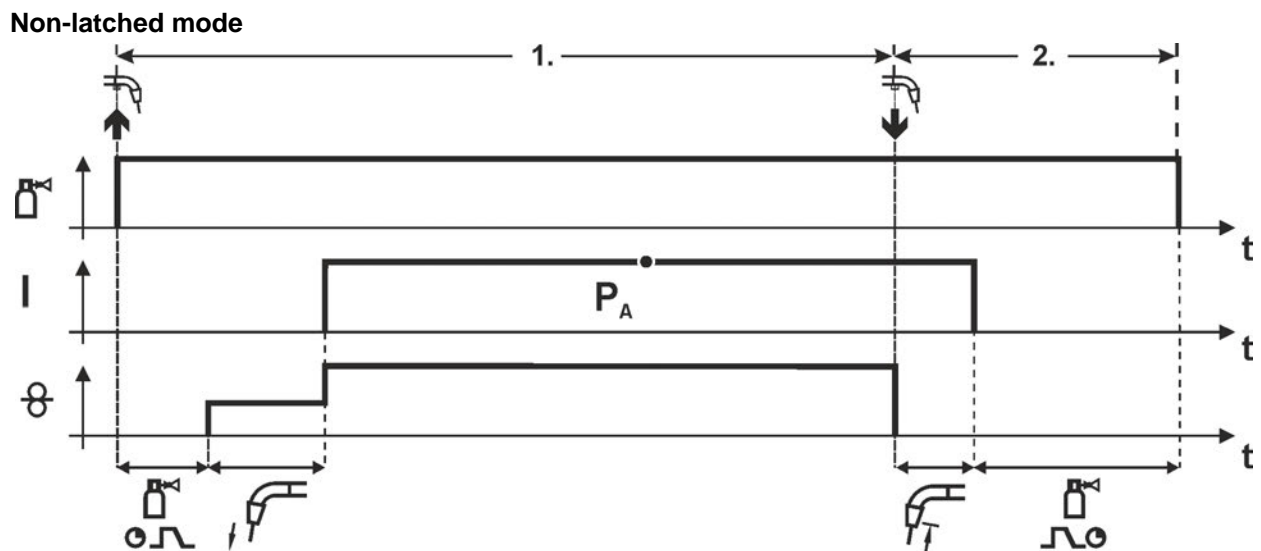


Figure 5-26

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.

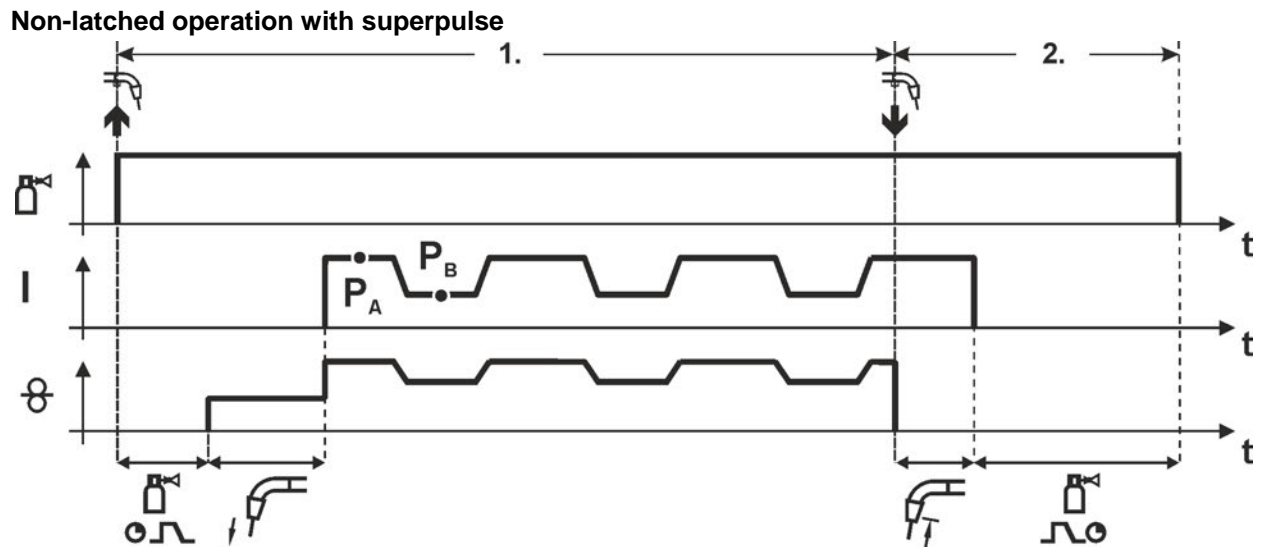


Figure 5-27

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.

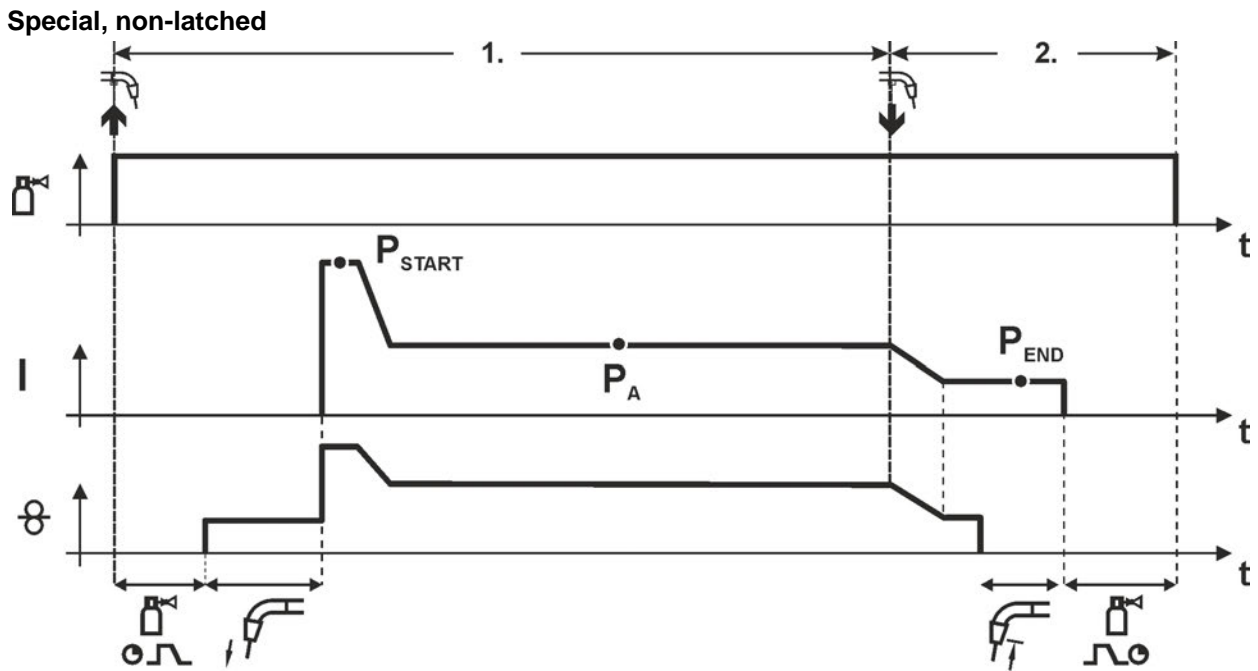


Figure 5-28

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.

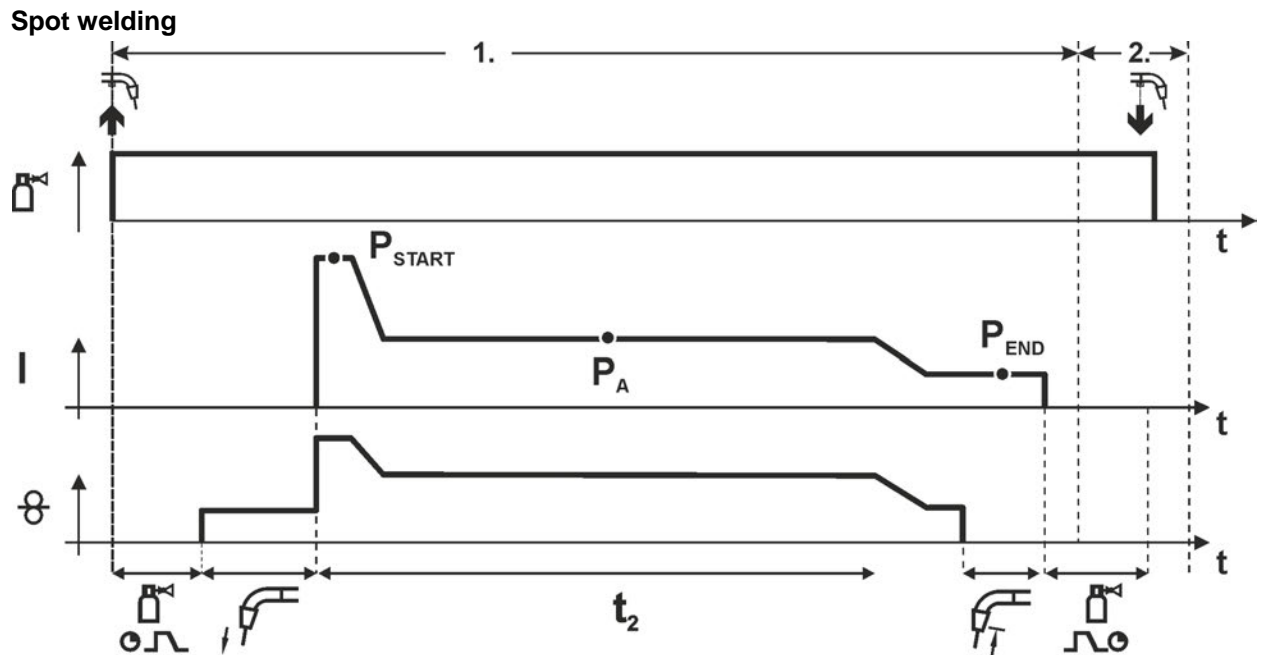


Figure 5-29

 **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

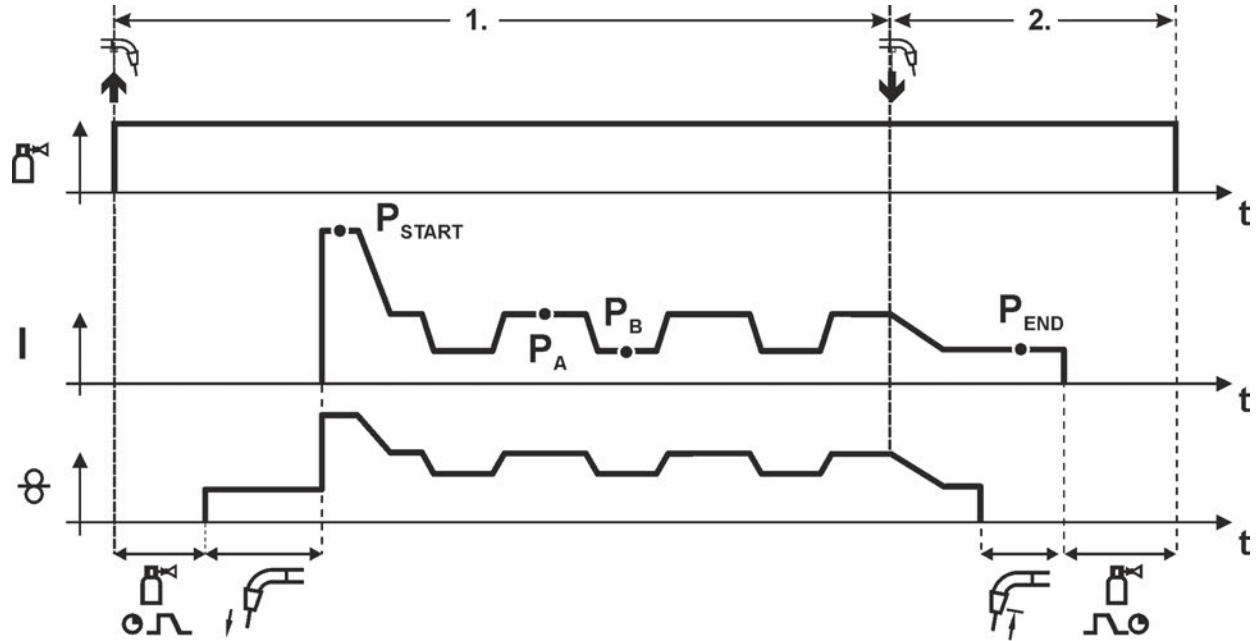


Figure 5-30

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.

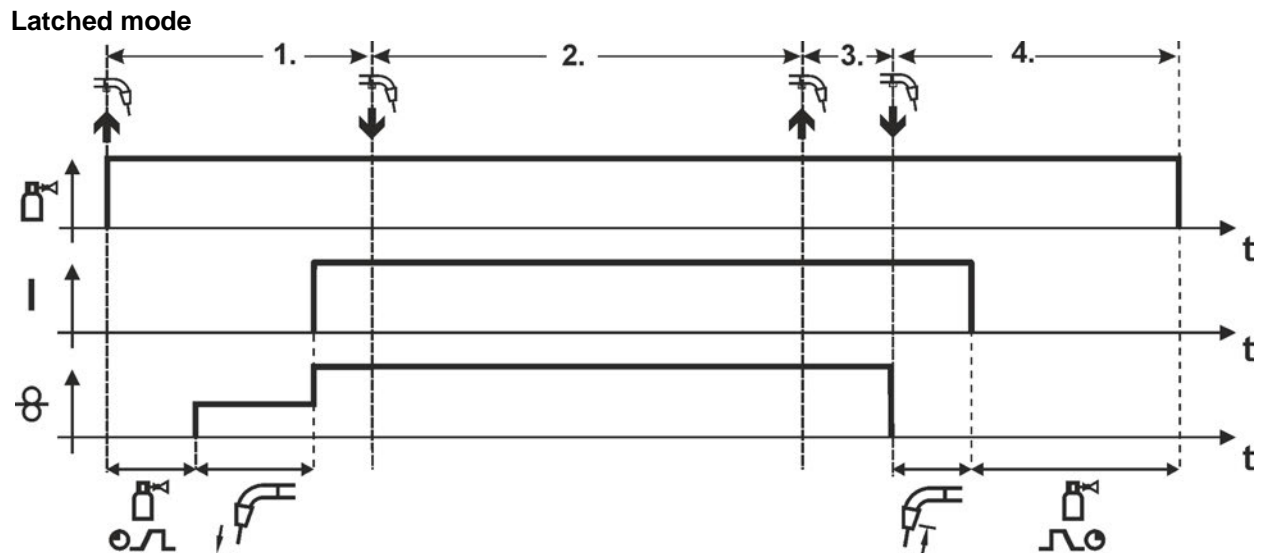


Figure 5-31

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

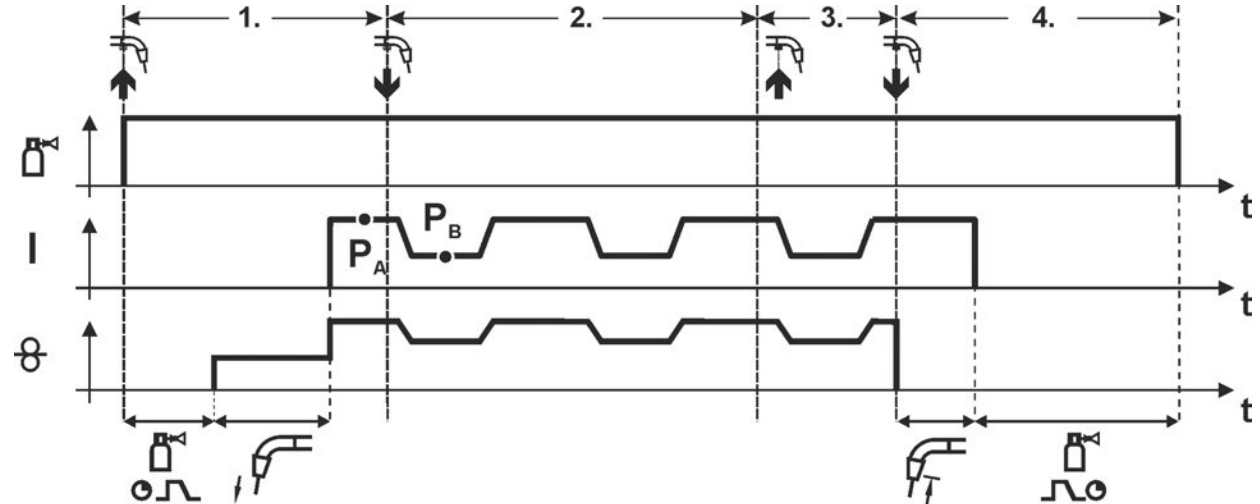


Figure 5-32

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 with changing welding method (process switching)

 To activate or set the function > see 5.4.15 chapter.

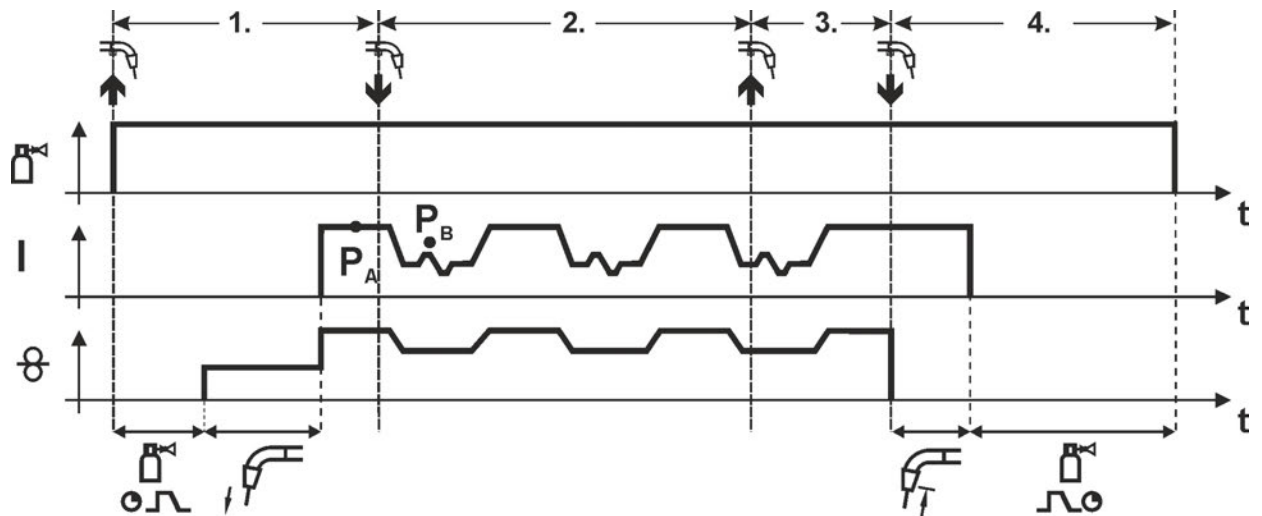


Figure 5-33

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

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

Latched special

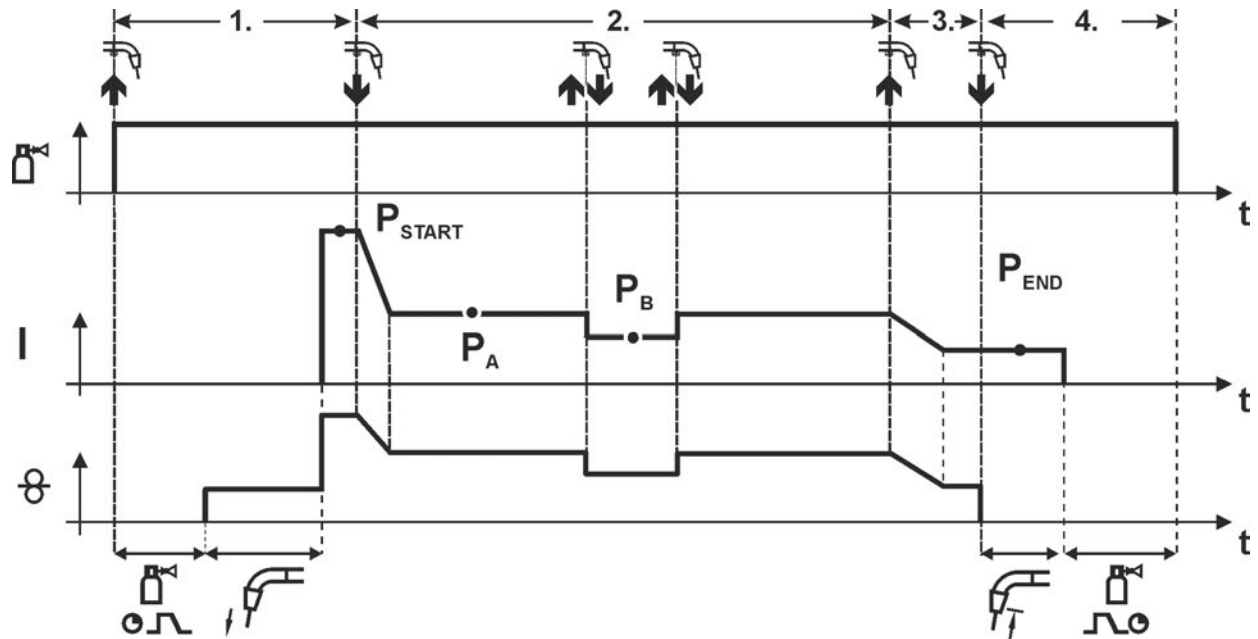


Figure 5-34

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.



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.

Special latched with changing welding method by tapping (process switching)

☞ To activate or set the function > see 5.4.15 chapter.

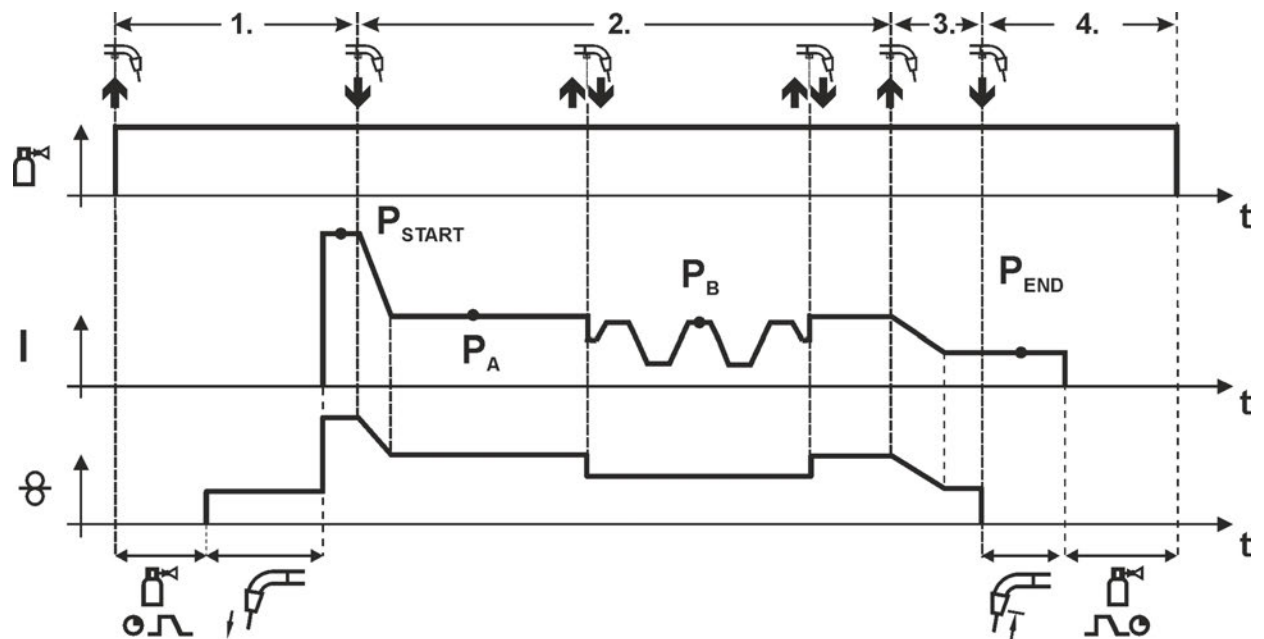


Figure 5-35

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

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

Special latched with changing welding method (process switching)

To activate or set the function > see 5.4.15 chapter.

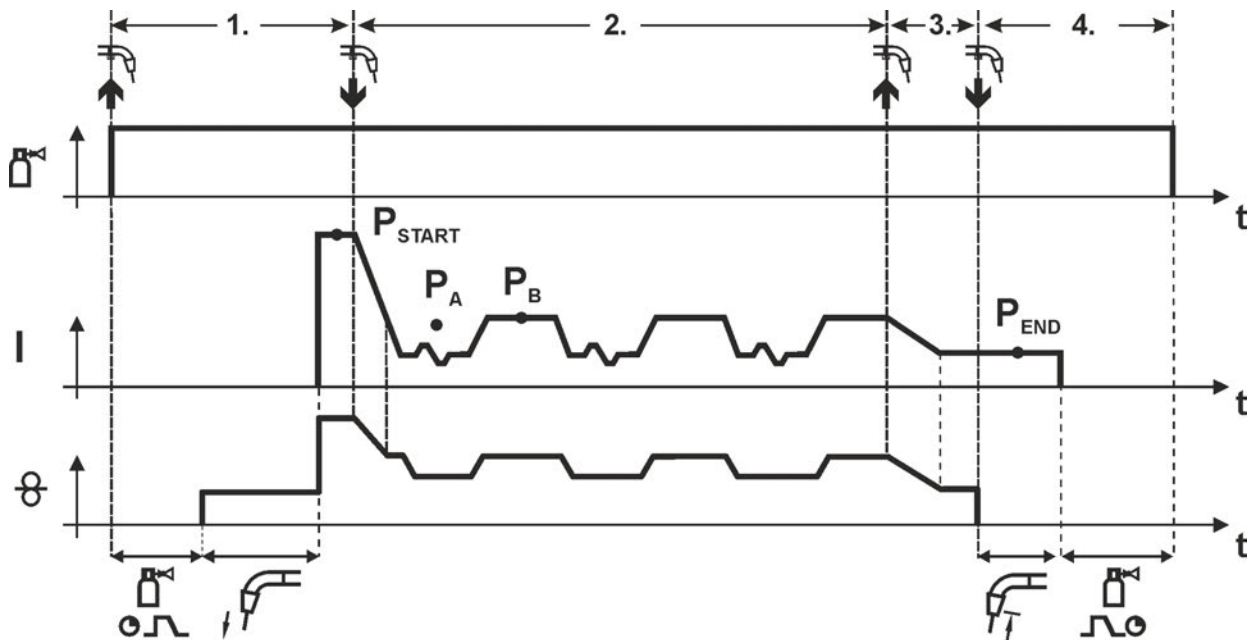


Figure 5-36

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

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

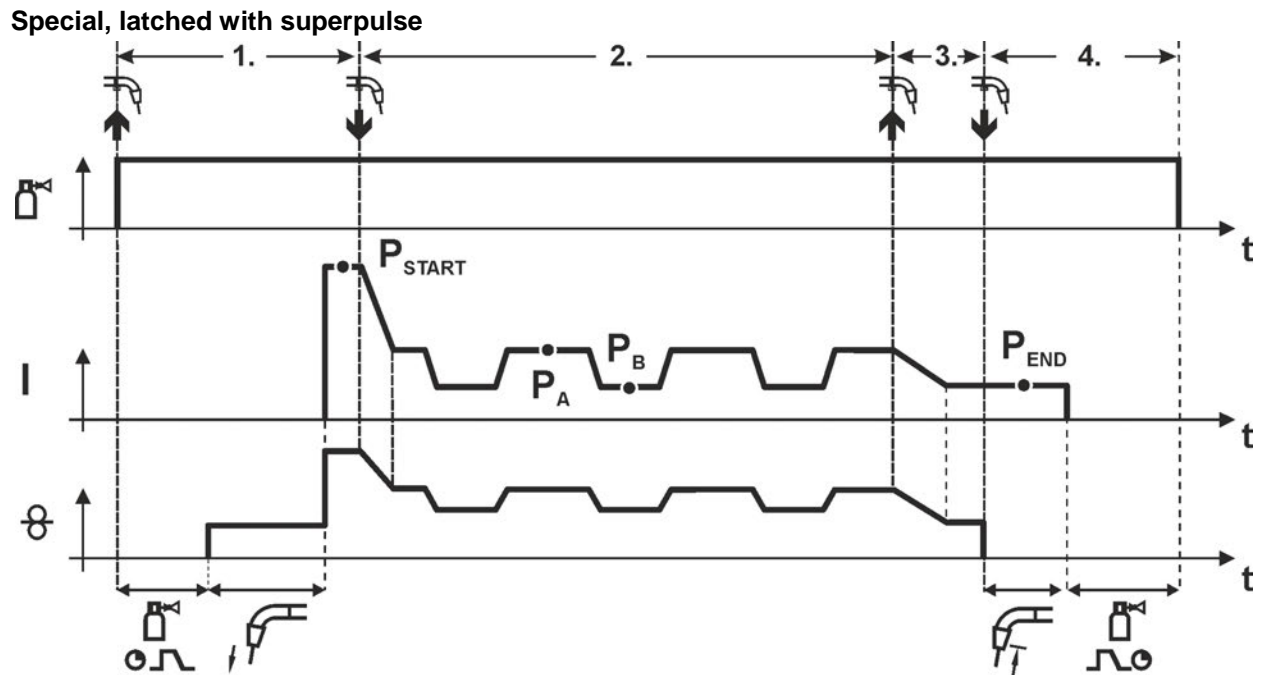


Figure 5-37

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.

5.4.9 Conventional MIG/MAG Welding (GMAW non synergic)

It is only possible to change the JOB number when no welding current is flowing.

Wire feed speed and welding voltage can be configured independently in two performance ranges:

- For wire feed speeds below 8 m/min select JOB 188.
- For wire feed speeds above 8 m/min select JOB 187.

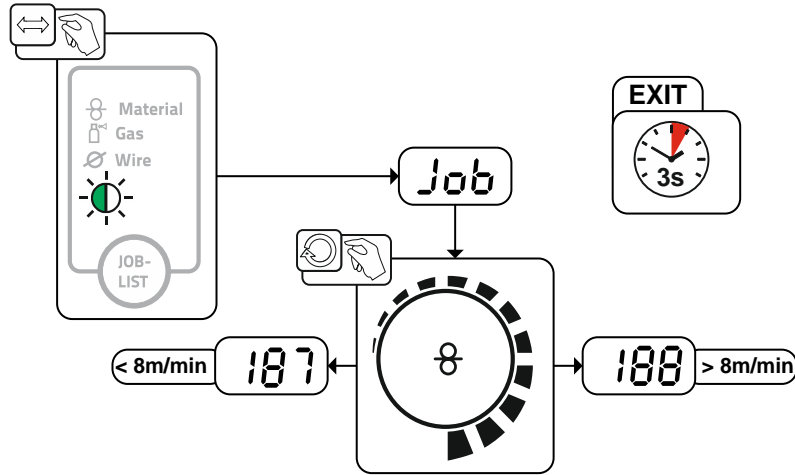


Figure 5-38

5.4.9.1 Setting the operating point (welding output)

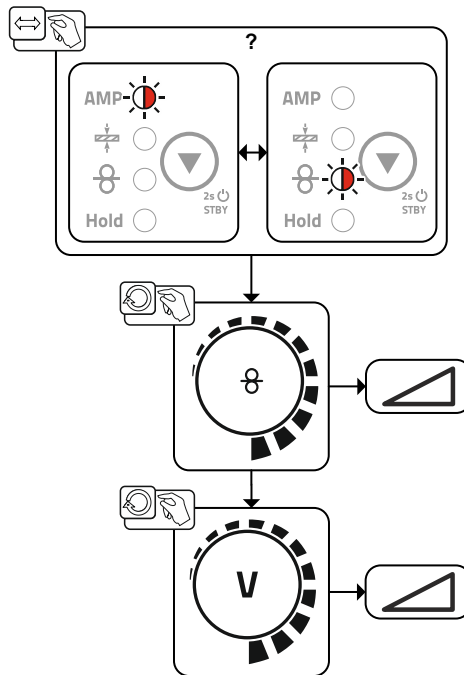


Figure 5-39

5.4.10 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.

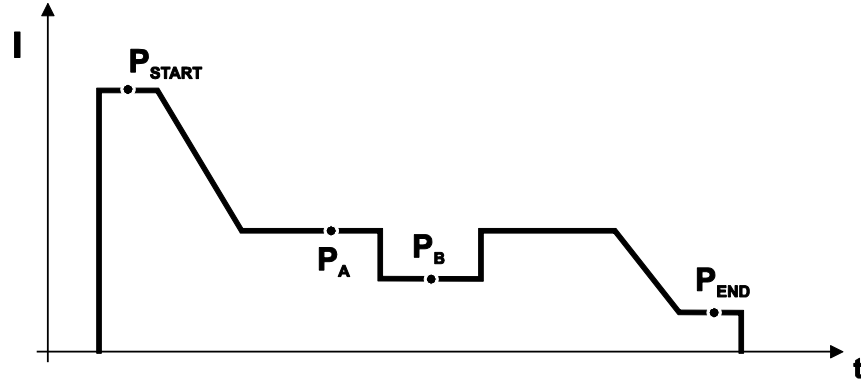


Figure 5-40

In every JOB, separate settings can be made for the ignition program, reduced main program and end program as to whether or not to alternate with the pulse process.

These properties are stored on the welding machine with the JOB. This means that in the factory settings, the pulse process is active during the end program in all forceArc JOBS.

To activate or set the function .

5.4.10.1 Selection of the program sequence parameter

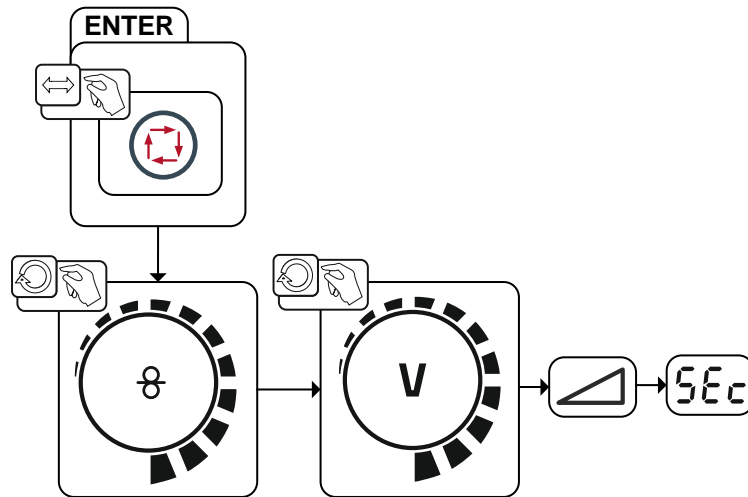



Figure 5-41

5.4.10.2 MIG/MAG overview of parameters

 P_{START} , P_B , and P_{END} are set as relative programs ex factory. They relate to percentages of the wire feed value of the main program P_A . These programs can also be set in an absolute manner, if desired (see Setting of special parameter P21).

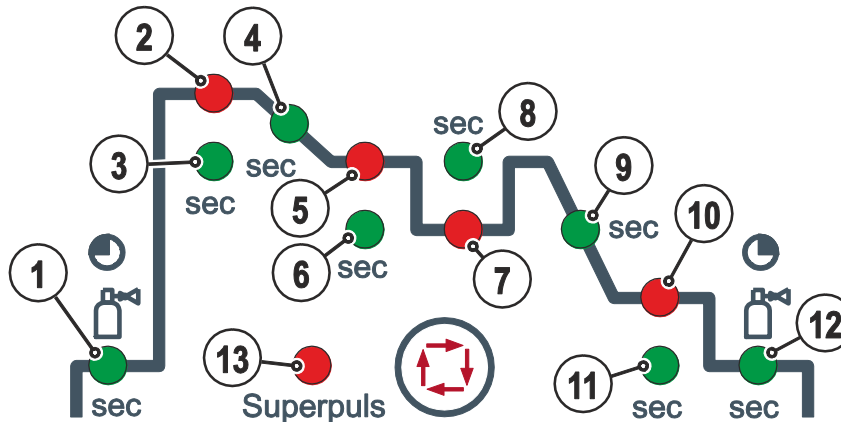


Figure 5-42

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	Duration (spot time and superpulse)	0.01s to 20.0s
7	P_B Wire speed, relative Arc length correction, relative	1% to 200% -9.9V to +9.9V
8	Duration	0.01s to 20.0s
9	Slope duration from P_A to P_{END}	0.0s to 20s
10	P_{END} Wire speed, relative Arc length correction	1% to 200% -9.9V to +9.9V
11	Duration (superpulse)	0.0s to 20s
12	Gas post-flow time	0.0s to 20s
13	superPuls	On / Off

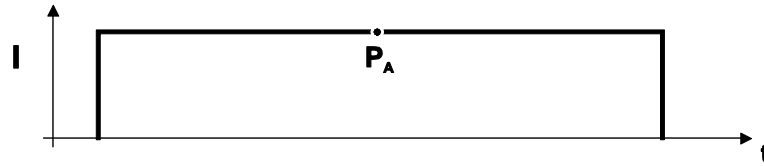
5.4.10.3 Example, tack welding (non-latched)


Figure 5-43

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	

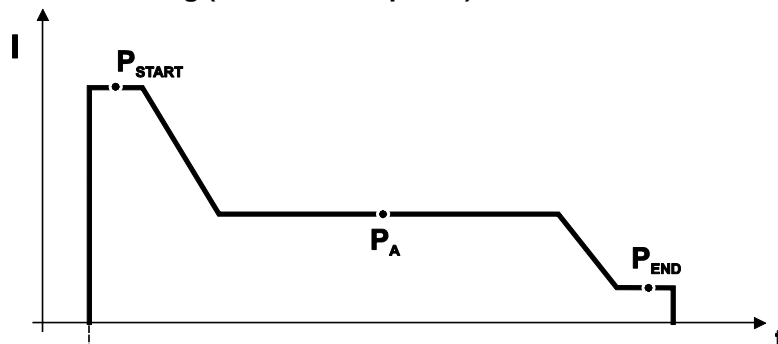
5.4.10.4 Example, aluminium tack welding (non-latched special)


Figure 5-44

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

5.4.10.5 Example, aluminium welding (latched special)

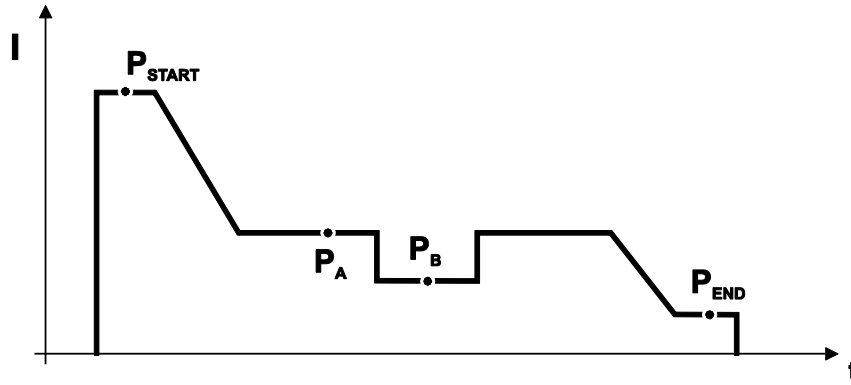


Figure 5-45

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

5.4.10.6 Example, visible seams (latched super pulse)

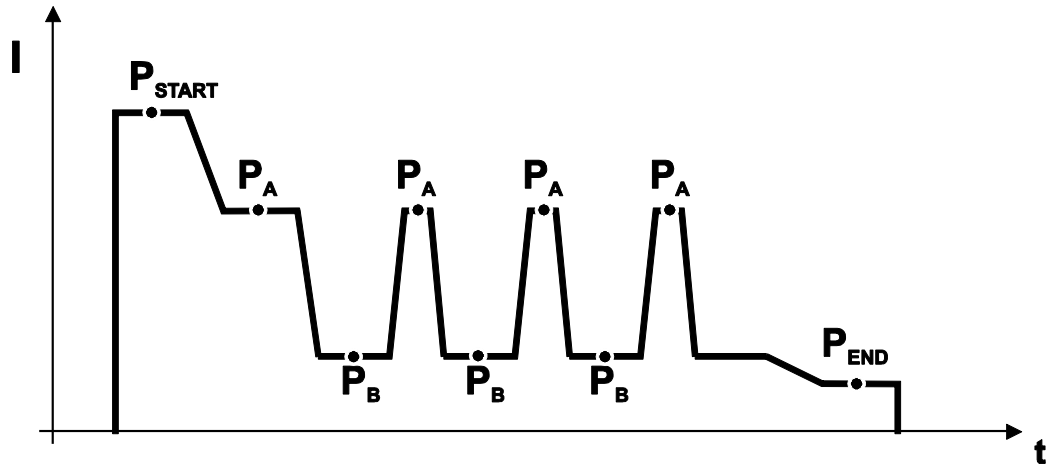


Figure 5-46

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
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

5.4.11 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
- superPuls (ON/OFF)
- Wire feed speed (DV2)
- Voltage correction (U2)
- Dynamics (DYN2)

The user can change the main program welding parameters using the following components.

	Program switching	JOB switching	Program	Operating mode	Welding process	superPuls	Wire speed	Voltage correction	Dynamics
M3.7x Wire feeder control	Yes	Yes	P0	Yes			Yes	Yes	
			P1...15				Yes		
R20 Remote control	Yes	No	P0	No			Yes	No	
			P1...9				Yes ¹⁾		
R40 Remote control	Yes	No	P0	No	Yes		Yes	No	
							No		
R50 Remote control	Yes	No	P0	Yes			Yes		
			P1...15						
PC 300.NET Software	No	No	P0	Yes			No		
			P1...15				Yes		
Up/Down Welding torch	Yes	No	P0	No			Yes	No	
			P1...9				No		
2 Up/Down Welding torch	Yes	No	P0	No			Yes	No	
			P1...15				No		
PC 1 Welding torch	Yes	No	P0	No			Yes	No	
			P1...15				No		
PC 2 Welding torch	Yes	Yes	P0	No			Yes	No	No
			P1...15				No		

1) in case of correction mode, refer to Special parameters "P7 – correction mode, limit value setting"

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

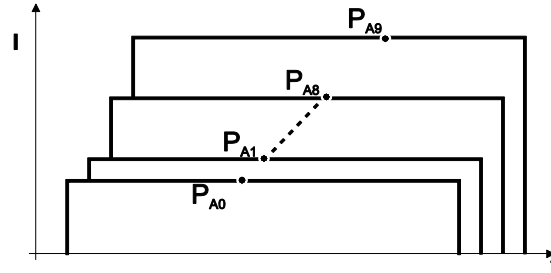


Figure 5-47

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

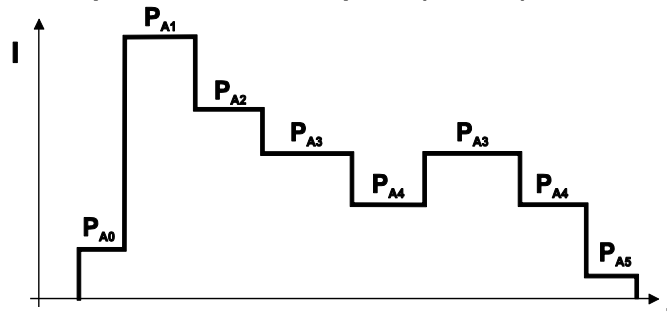


Figure 5-48

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

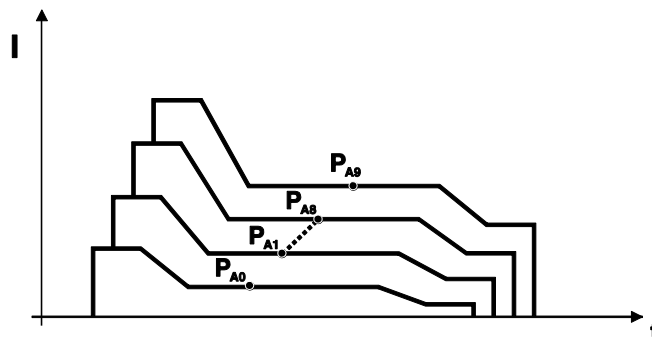


Figure 5-49



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 P_0 is an exception: the settings for operating points are made manually here.

Changes to the welding parameters are saved immediately!

5.4.11.1 Selecting parameters (program A)

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

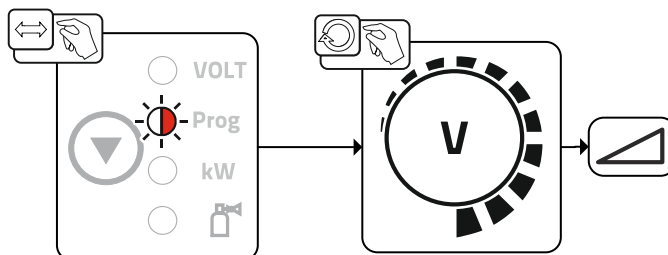


Figure 5-50

Select program number.


5.4.12 MIG/MAG automatic cut-out

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)**

5.4.13 Standard MIG/MAG torch

The MIG welding torch trigger is essentially used to start and stop the welding process.

Operating elements	Functions
 Torch trigger	<ul style="list-style-type: none"> Start/stop welding

Other functions are also possible by tapping the torch trigger, depending on the machine type and control configuration > see 5.11 chapter:

- Change over between welding programs (P8).
- Program selection before starting welding (P17).
- Change over between pulse and standard welding in the special latched operating mode.
- Switching between wire feed units in dual operation mode (P10).

5.4.14 MIG/MAG special-torches

Function specifications and more indepth information can be found in the operating manual for the relevant welding torch!

5.4.14.1 Program and up/down operation

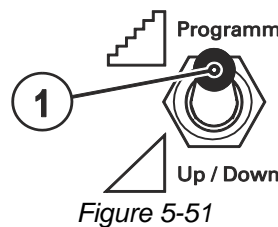





Figure 5-51

Item	Symbol	Description
1		Welding torch function changeover switch (special welding torch required)  Up / Down ----- Welding power infinitely adjustable  Programm ----- Change over programs or JOBs

5.4.14.2 Switching between Push/Pull and intermediate drive

⚠ WARNING



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)!



Test!

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

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

The plugs are located directly on the M3.7x printed circuit board.

Plug	Function
on X24	Operation with Push/Pull welding torch (factory setting)
on X23	Operation with intermediate drive

5.4.15 Expert menu (MIG/MAG)

The Expert menu has adjustable parameters stored that don't require regular setting. The number of parameters shown may be limited, e.g. if a function is deactivated.

5.4.16 Selection

ENTER (Enter the menu)

- Keep the "welding parameters" push-button pressed for 3 s.

NAVIGATION (Navigate the menu)

- Select parameters by pressing the "welding parameters" push-button.
- Set or change the parameters by turning the "welding parameter setting" rotary knob.

EXIT (Exit the menu)

- After 3 s, the machine will return automatically to the ready-to-operate status.

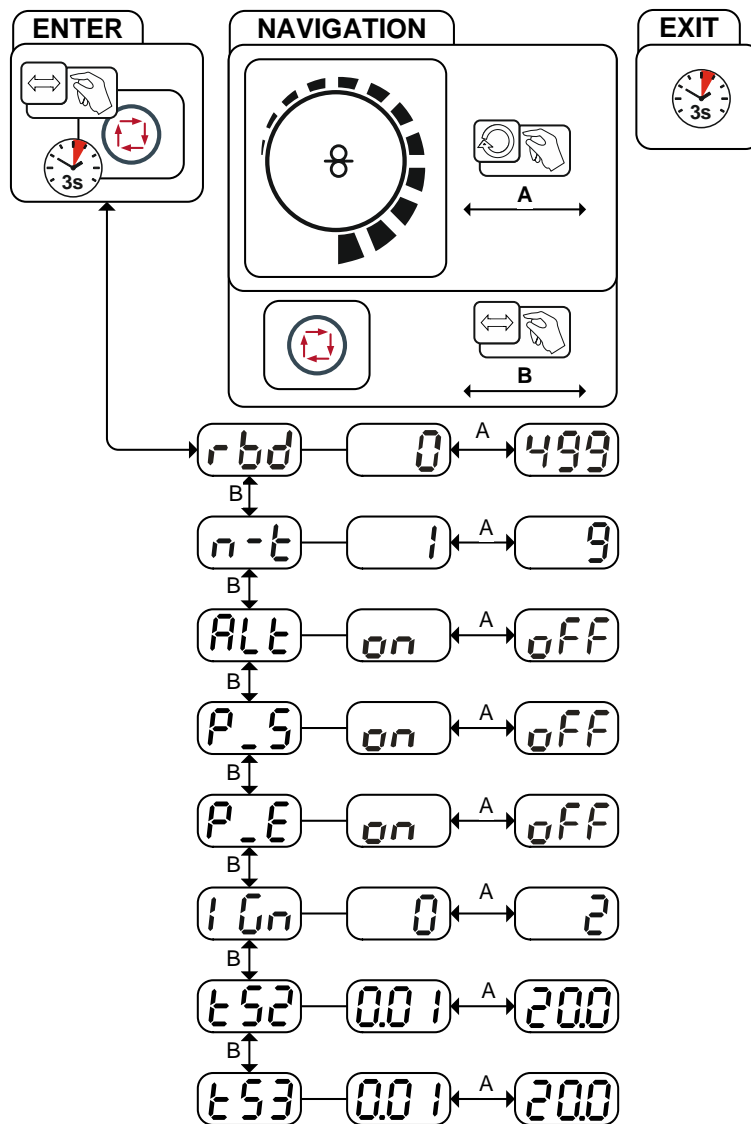


Figure 5-52

Display	Setting/selection
	<p>Correct wire burn-back</p> <p>If too high a value is set, a large ball will form at the tip of the wire electrode (bad re-ignition) or the wire electrode sticks to the contact tip. If too low a value is set, the wire electrode sticks to the weld pool.</p> <ul style="list-style-type: none"> • Increase value > increase wire burn-back • Decrease value > decrease wire burn-back
	<p>Setting JOB-dependent program limit/n-cycle</p> <p>The JOB-dependent program limit allows you to limit the number of programs that can be selected in the selected JOB to (2...9). This option can be set individually per JOB. In addition, a legacy option to set a "global program limit" is also available. To set this option use special parameter P4. This setting is then applied to all JOBs for which no JOB-dependent program limit has been set (see the special parameters description). You can also use the "Special latched (n-cycle)" operating mode if special parameter 8 is set to 2. In this case (JOB-dependent program switching activated, special parameter 8 = 2, special latched) you can switch to the next program by tapping the torch trigger in the main program (see the special parameters description).</p> <p>1 -----No JOB-dependent program limit 2-9 -----JOB-dependent program limit for max. selectable programs.</p>
	For machine versions with pulsed arc welding procedures only.
	<p>Change welding process (process switching)</p> <p>With this function activated the welding process switches from standard arc welding to pulse arc welding. Switching is effected by either tapping the torch trigger (special latched) or by activating the superPuls function (switch between program P_A and P_B).</p> <p> -----Function activated. -----Function deactivated.</p>
	<p>Pulse arc welding process (program P_{START})</p> <p>The pulse arc welding process can be activated in the start program (P_{START}) with the special non-latched and special latched operating modes.</p> <p> -----Function activated. -----Function deactivated.</p>
	<p>Pulse arc welding process (program P_{END})</p> <p>The pulse arc welding process can be activated in the end program (P_{END}) with the special non-latched and special latched operating modes.</p> <p> -----Function activated. -----Function deactivated.</p>
	For machine versions with pulsed arc welding procedures only.
	<p>Ignition type (MIG/MAG)</p> <p>Application: Low-spatter ignition, e.g. for aluminium and chrome/nickel materials.</p> <p>0 = -----Traditional arc ignition 1 = -----Arc ignition with wire return for push/pull applications 2 = -----Arc ignition with wire return for non-push/pull applications</p>
	Slope time (main current to secondary current)
	Slope time (main current to secondary current)

5.5 TIG welding

5.5.1 Welding torch and workpiece line connection

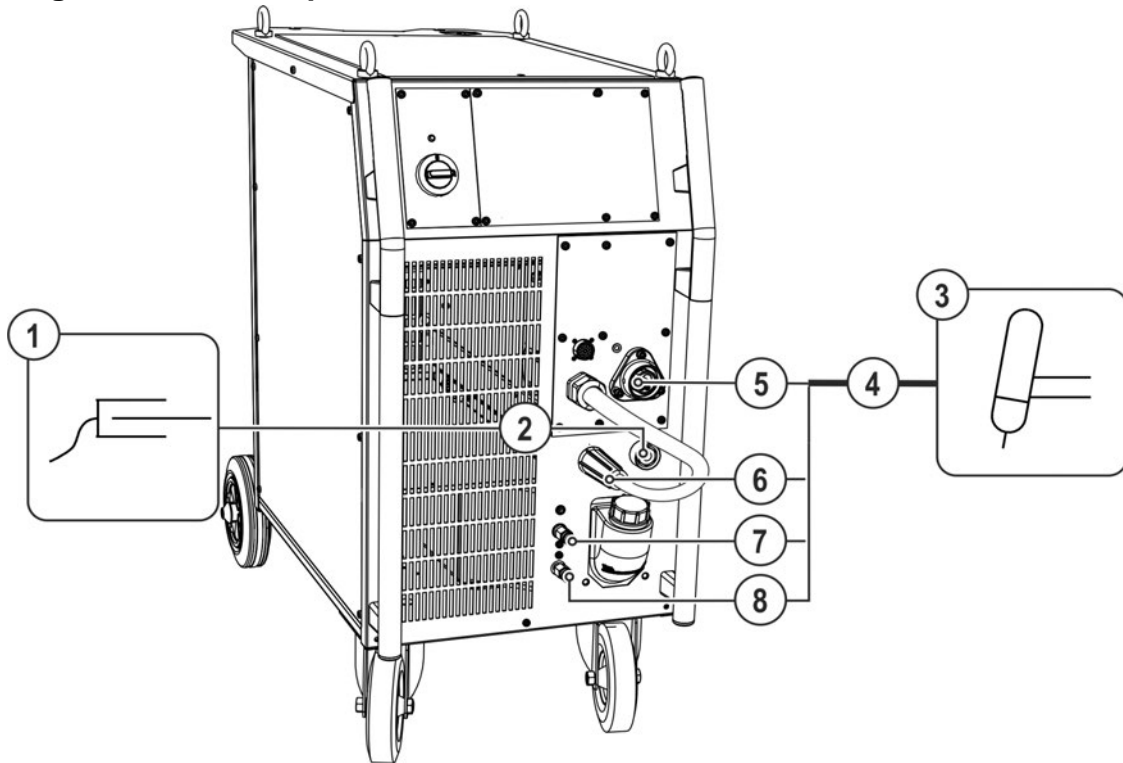


Figure 5-53

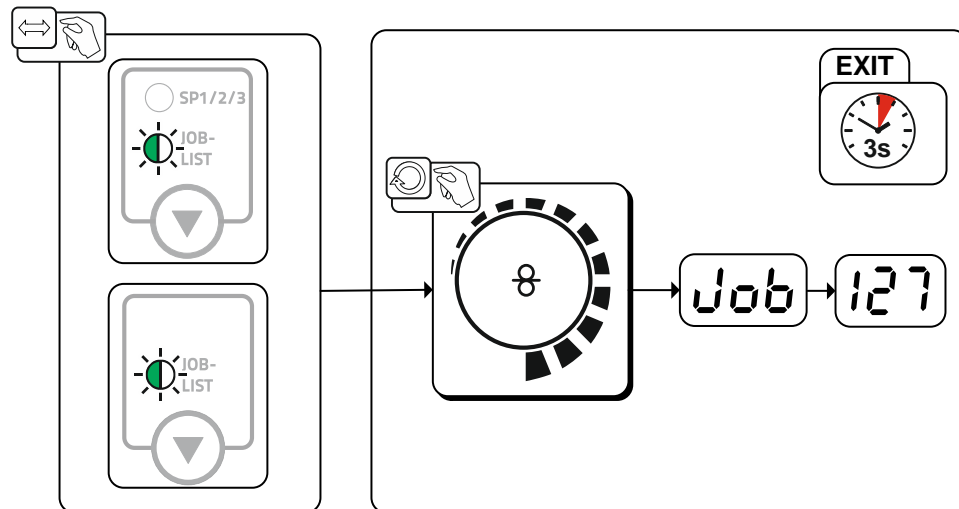
Item	Symbol	Description
1		Workpiece
2		Connection socket, "+" welding current • TIG welding: Workpiece connection
3		Welding torch
4		Welding torch hose package
5		Welding torch connection (Euro or Dinse torch connector) Welding current, shielding gas and torch trigger integrated
6		Welding current cable, polarity selection Welding current to the central connector/torch, enables polarity selection. • TIG: Connection socket for "-" welding current
7		Quick connect coupling (red) coolant return
8		Quick connect coupling (blue) coolant supply

- Insert the central plug for the welding torch into the central connector and screw together with crown nut.
- Insert the cable plug on the work piece lead into the "+" welding current connection socket and lock by turning to the right.
- Welding current lead, insert polarity selection into the "-" welding current connection socket and lock.

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).

5.5.2 Welding task selection



5.5.3 Welding current setting

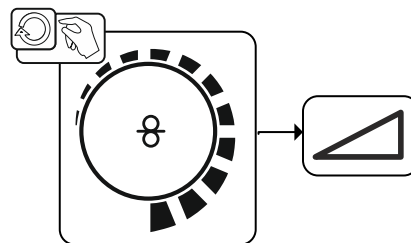


Figure 5-54

5.5.4 TIG arc ignition

5.5.4.1 Liftarc

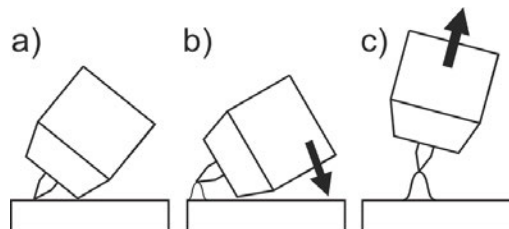


Figure 5-55











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.

5.5.5 Function sequences/operating modes

5.5.5.1 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
tS1	Slope duration from P _{START} to P _A

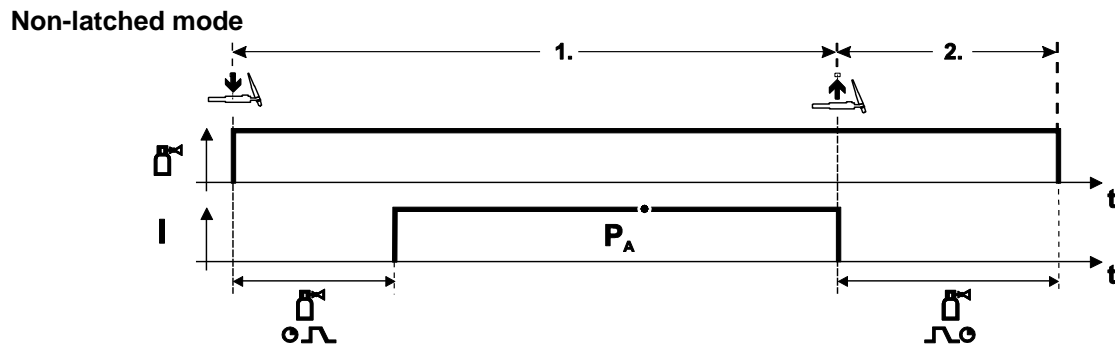


Figure 5-56

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

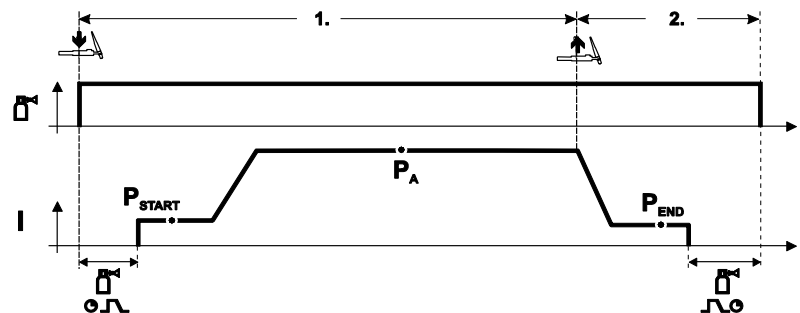


Figure 5-57

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 "t_{start}" ignition current time elapses, the welding current rises with the set upslope time "t_{S1}" to the main program "P_A".

Step 2

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

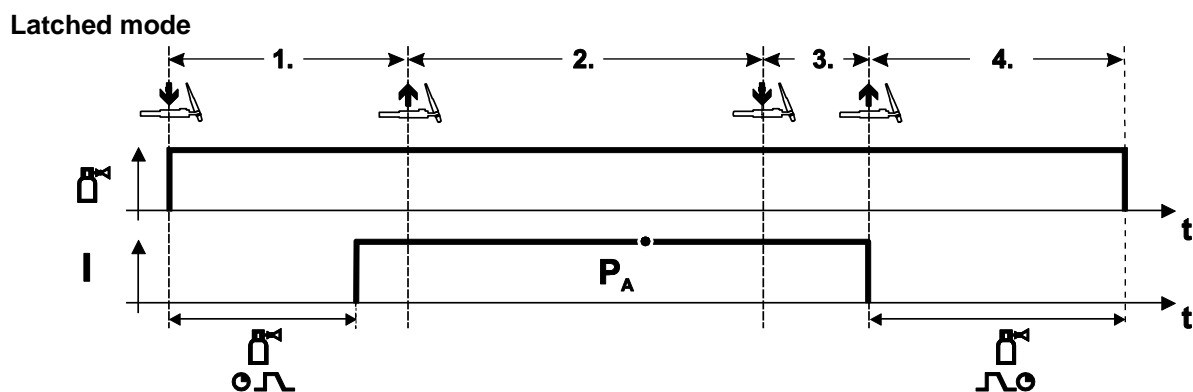


Figure 5-58

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.

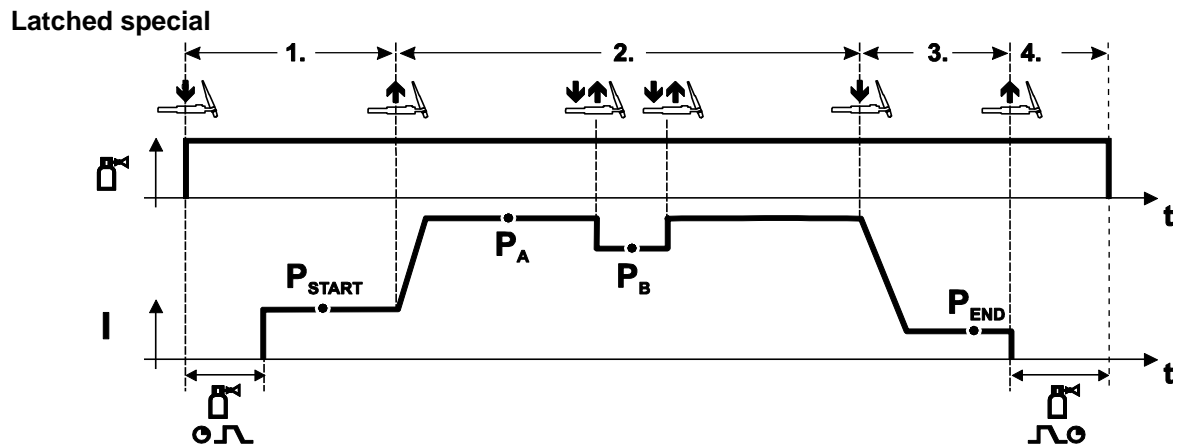


Figure 5-59

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.

5.5.6 TIG automatic cut-out

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)

5.5.7 TIG program sequence ("Program steps" mode)

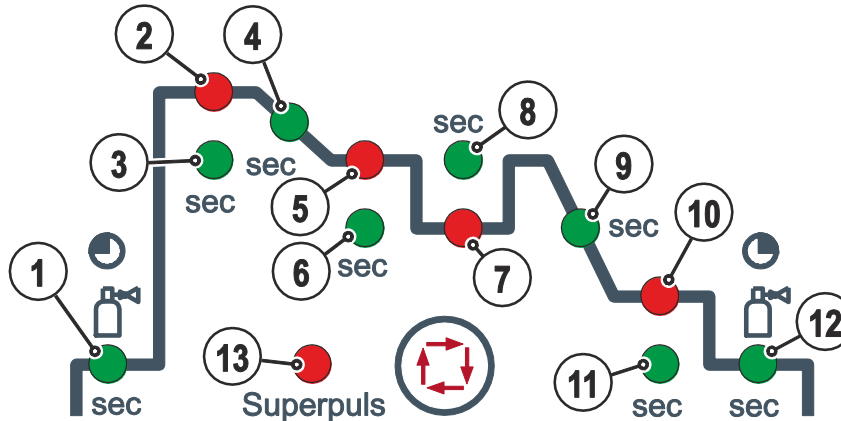


Figure 5-60

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	superPuls	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.

5.6 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.

5.6.1 Connecting the electrode holder and workpiece lead

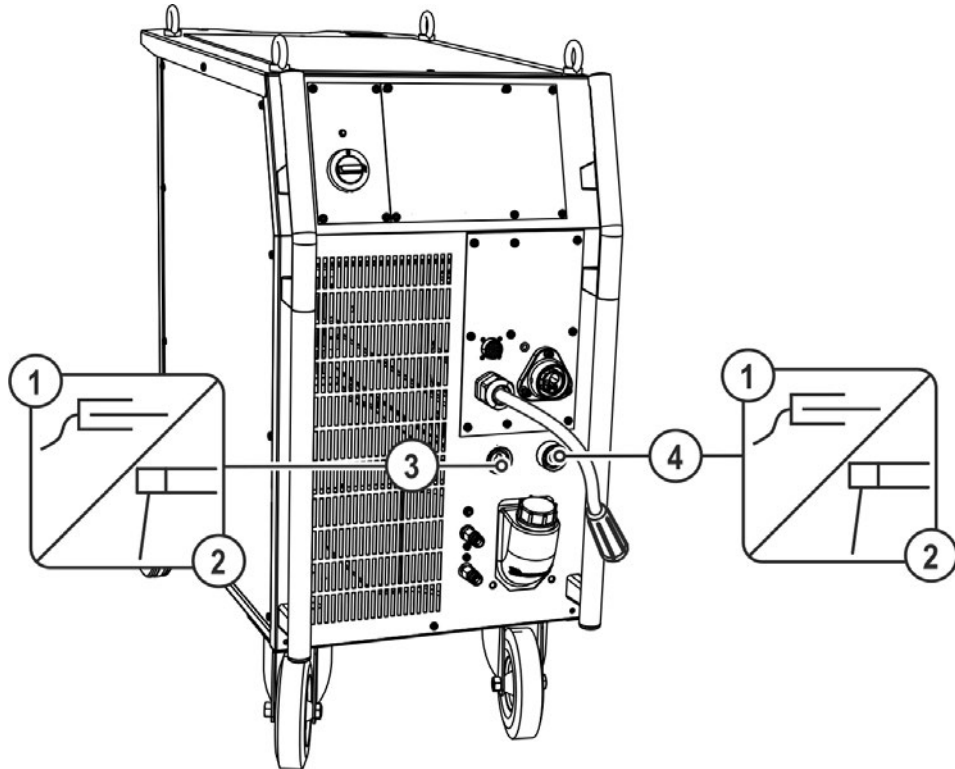


Figure 5-61

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

- 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.



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

5.6.2 Welding task selection

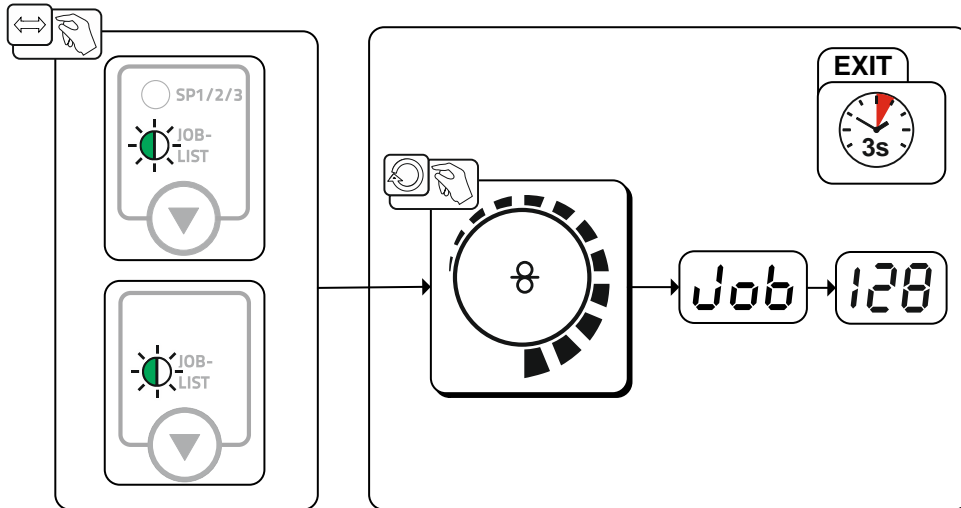


Figure 5-62

5.6.3 Welding current setting

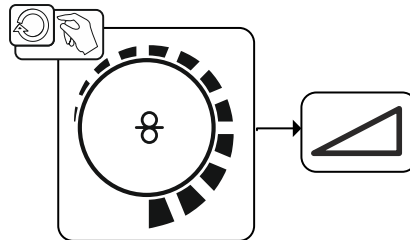


Figure 5-63

5.6.4 Arcforce

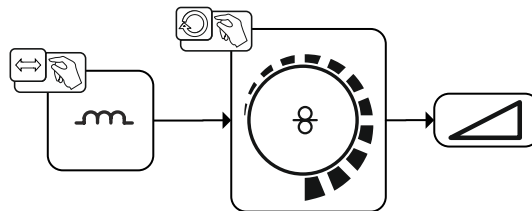


Figure 5-64

Setting:

- Negative values: rutile electrode types
- Values at zero: basic electrode types
- Positive values: cellulose electrode types

5.6.5 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

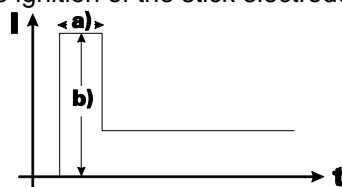
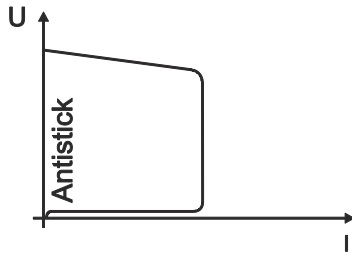


Figure 5-65

For hotstart parameter settings, > see 5.6.7 chapter

5.6.6 Antistick



Anti-stick prevents the electrode from annealing.

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

Figure 5-66

5.6.7 Parameter overview

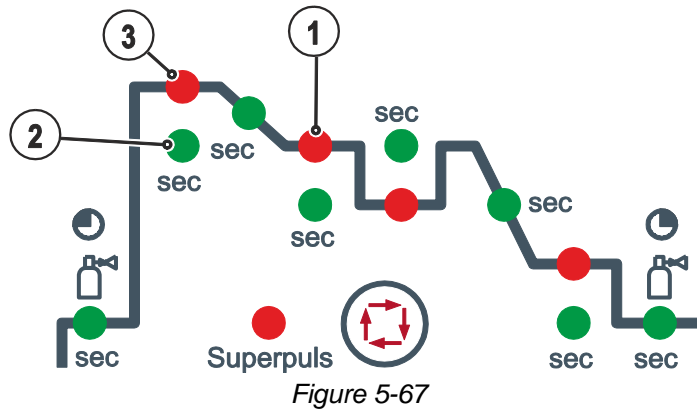


Figure 5-67

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 %



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

5.7 Remote control

The remote controls are operated via the 19-pole remote control connection socket (analogue) or the 7-pole remote control connection socket (digital), depending on the model.

Read and observe the documentation to all system and accessory components!

5.8 Interfaces for automation

WARNING



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)!

Unsuitable control cables or incorrect input/output signal assignment can cause damage to the machine. Use shielded control cables only.

5.8.1 Automation interface

Pin	Input / output	Description	Diagram
A	Output	PE Connection for cable shielding	
D	Output (open collector)	IGRO Current flows signal I>0 (maximum load 20 mA / 15 V) 0 V = welding current flows	
E + R	Input	Not/Aus Emergency stop for higher level shut-down of the power source. To use this function, jumper 1 must be unplugged on PCB M320/1 in the welding machine. Contact open = welding current off	
F	Output	0 V Reference potential	
G/P	Output	I>0 Power relay contact, galvanically isolated (max. +/-15 V / 100 mA)	
H	Output	Uist Welding voltage, measured against pin F, 0-10 V (0 V = 0 V; 10 V = 100 V)	
L	Input	Str/Stp Start = 15 V / Stop = 0 V ¹⁾	
M	Output	+15 V Voltage supply (max. 75 mA)	
N	Output	-15 V Voltage supply (max. 25 mA)	
S	Output	0 V Reference potential	
T	Output	list Welding current, measured on pin F; 0-10 V (0 V = 0 A, 10 V = 1000 A)	

¹⁾ The operating mode is given by the wire feed unit (the start / stop function equates to pressing the torch trigger and is used in mechanised applications, for example).

5.8.2 Remote control connection socket, 19-pole

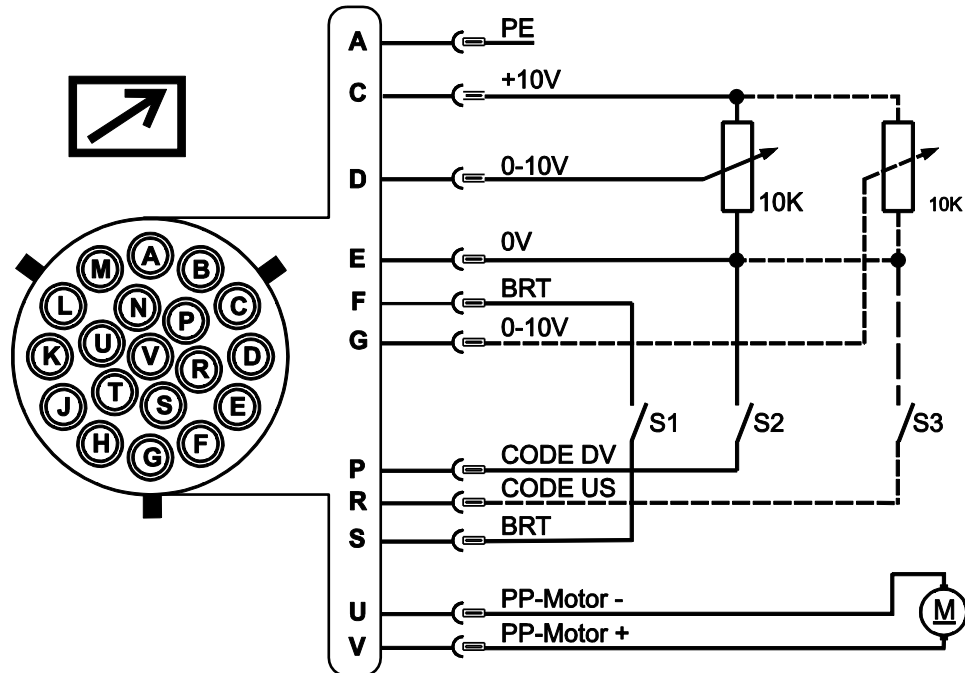


Figure 5-68

Pin	Signal form	Short description
A	Output	Connection for PE cable screen
C	Output	Reference voltage for potentiometer 10 V (max. 10 mA)
D	Input	Control voltage specification (0 V–10 V) – wire feed speed
E	Output	Reference potential (0 V)
F/S	Input	Welding power start/stop (S1)
G	Input	Control voltage specification (0 V–10 V) – arc length correction
P	Input	Activation of control voltage specification for wire feed speed (S2) For activation, put signal to reference potential 0 V (pin E)
R	Input	Activation of control voltage specification for arc length correction (S3) For activation, put signal to reference potential 0 V (pin E)
U/V	Output	Supply voltage push/pull welding torch

5.8.3 RINT X12 robot interface

The standard digital interface for mechanised applications

Functions and signals:

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

5.8.4 BUSINT X11 Industrial bus interface

The solution for easy integration with automated production with e.g.

- Profinet/Profibus
 - EnthernetIP/DeviceNet
 - EtherCAT
- etc.

5.9 PC interface



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.**



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)!**

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).

Q-DOC 9000 welding data documentation software

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

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

WELDQAS welding data monitoring and documentation system

Network-compatible welding data monitoring and documentation system for digital machines

5.10 Access control



The key switch is only available for machines which are fitted with the "OW KL XX5" option ex works.

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

In key switch position 1 all functions and parameters can be set without restriction.

In key switch position 0 the following functions and parameters cannot be changed:

- No adjustment of the operating point (welding performance) in programs 1–15.
- No change of welding or operating mode in programs 1–15.
- The welding parameters can be displayed but not changed in the control's function sequence.
- No welding task switching (JOB block operation P16 possible).
- No change of special parameters (except P10). Restart required.

5.11 Special parameters (advanced settings)

Special parameters (P1 to Pn) are applied for customer-specific configuration of machine functions. This allows the user maximum flexibility in optimising their requirements.

These settings are not configured directly on the machine control since a regular setting of the parameters is generally not required. The number of selectable special parameters can deviate between the machine controls used in the welding system (also see the relevant standard operating instructions).

If required, the special parameters can be reset to the factory settings > see 5.11.1.1 chapter.

5.11.1 Selecting, changing and saving parameters



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).

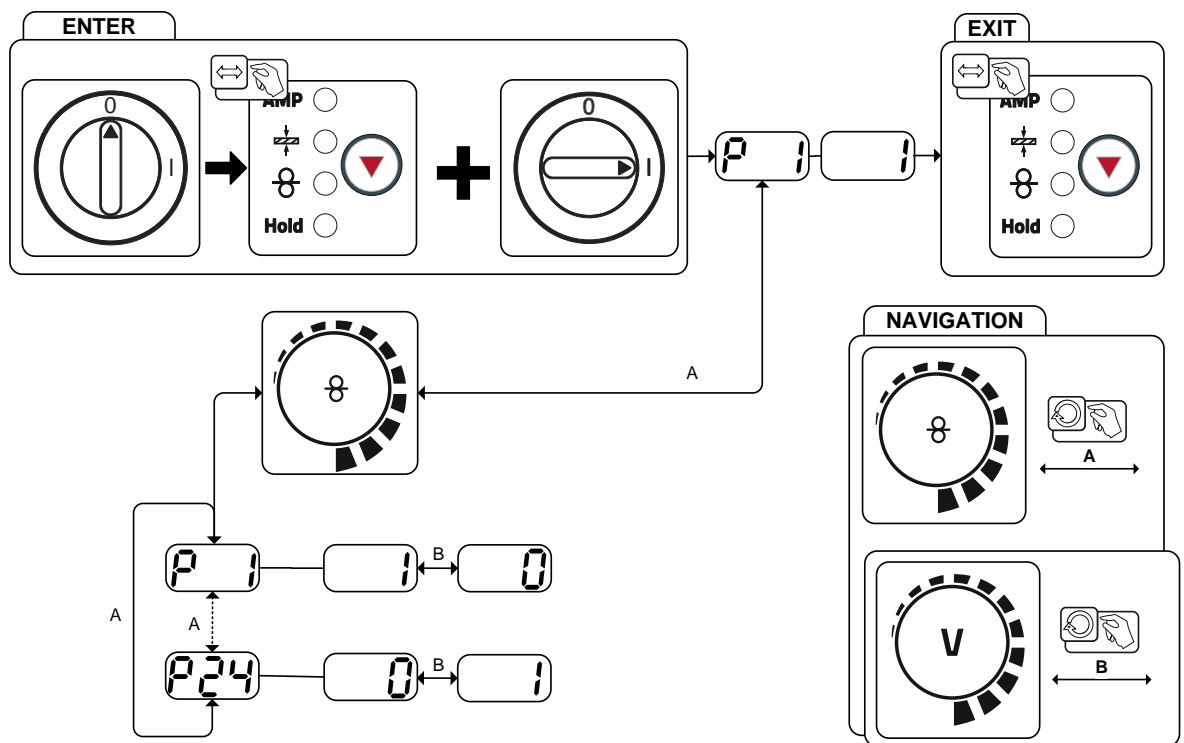


Figure 5-69

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
	Display mode for Up/Down welding torch with one-digit 7-segment display (two keys) 0 =-----normal display (ex works) program number/welding power (0–9) 1 =-----display toggles between program number/welding type
	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

Display	Setting/selection
P 6	Enable special jobs SP1 to SP3 0 = ----- no enabling (Ex works) 1 = ----- enabling of Sp1-3
P 7	Correction operation, threshold value setting 0 = ----- correction operation switched off (Ex works) 1 = ----- correction operation on "Main program (PA)" flashing
P 8	Program changeover with standard torch 0 = ----- no program changeover (Ex works) 1 = ----- special latched 2 = ----- specific latched special (n cycle active)
P 9	Lat. and sp. lat. tapping start 0 = ----- no latched tapping start (Ex works) 1 = ----- latched tapping start possible
P 10	One or two-wire feed operation 0 = ----- single operation (Ex works) 1 = ----- dual operation, this unit is the "master" 2 = ----- dual operation, this unit is the "slave"
P 11	Special latched tapping time 0 = tapping function switched off 1 = 300ms (Ex works) 2 = 600ms
P 12	JOB list changeover 0 = ----- task-oriented JOB list 1 = ----- actual JOB list (Ex works) 2 = ----- actual JOB list, JOB changeover activated via accessories
P 13	Lower limit remote JOB changeover Lowest JOB that can be selected using PowerControl 2 torches. Lower limit: 129 (Ex works)
P 14	Upper limit remote JOB changeover JOB range of the POWERCONTROL2 torch Upper limit: 169 (Ex works)
P 15	HOLD function 0 = ----- HOLD values are not displayed 1 = ----- HOLD values are displayed (Ex works)
P 16	Block JOB mode 0 = ----- Block JOB mode not enabled (Ex works) 1 = ----- Block JOB mode enabled
P 17	Program selection with standard torch trigger 0 = ----- no program selection (Ex works) 1 = ----- program selection possible
P 18	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.
P 19	Mean value display for superPuls 0 = ----- Function switched off. 1 = ----- Function switched on (ex factory).

Display	Setting/selection
P20	Predefined pulse arc welding process in the PA program 0 =-----Predefined pulse arc welding process in the PA program is disabled. 1 =-----If the superPuls and welding process switching functions are available and activated, the pulse arc welding process is always executed in the main program PA (ex factory).
P21	Predefined absolute value for relative programs Start program (P_{START}), down-slope program (P_B) and end program (P_{END}) can be set relative to the main program (P_A) or in an absolute manner, as desired. 0 =-----Relative parameter setting (ex factory) 1 =-----Absolute parameter setting
P22	Electronic gas flow control, type 1 =-----type A (ex works) 0 =-----type B
P23	Program settings for relative programs 0 =-----Combined setting of relative programs possible (ex works). 1 =-----Individual setting of relative programs possible (ex works).
P24	Correction or nominal voltage display 0 =-----Correction voltage display (ex works). 1 =-----Absolute nominal voltage display.

5.11.1.1 Reset to factory settings

All special parameters saved by the user will be overwritten by the factory settings!

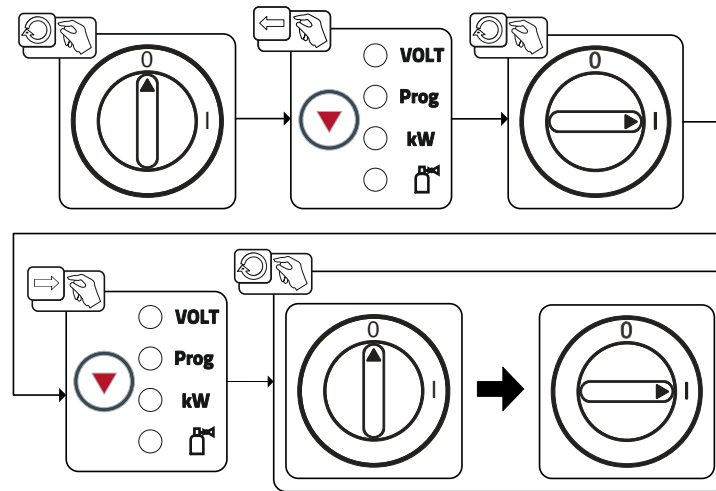


Figure 5-70

5.11.1.2 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.

During wire inching, the speed can be changed by means of the welding parameter setting rotary dial. Changing the speed has no effect on the ramp time.

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

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

Display mode for Up/Down welding torch with one-digit 7-segment display (P3)

Normal display:

- Program mode: Program number
- Up/down operation: Welding power (0=minimum current/9=maximum current)

Toggle display:

- Program mode: Program number and welding procedure (P=pulse/n=not pulse) are toggled
- Up/down operation: Welding power (0=minimum current/9=maximum current) and symbol for up/down operation are toggled

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 4.3 chapter).

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 4.4 chapter).

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)

Phoenix Expert machine series:

The welding task is set at the power source control; refer to the relevant system documentation.

If required, the predefined special welding tasks SP1 = JOB 129 / SP2 = JOB130 / SP3 = JOB 131 only can be selected at the wire feeder control. The special JOBS are selected by pressing the welding task selection push-button for a longer period. The special JOBS are switched by pressing the push-button briefly.

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_{korrr}) 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.

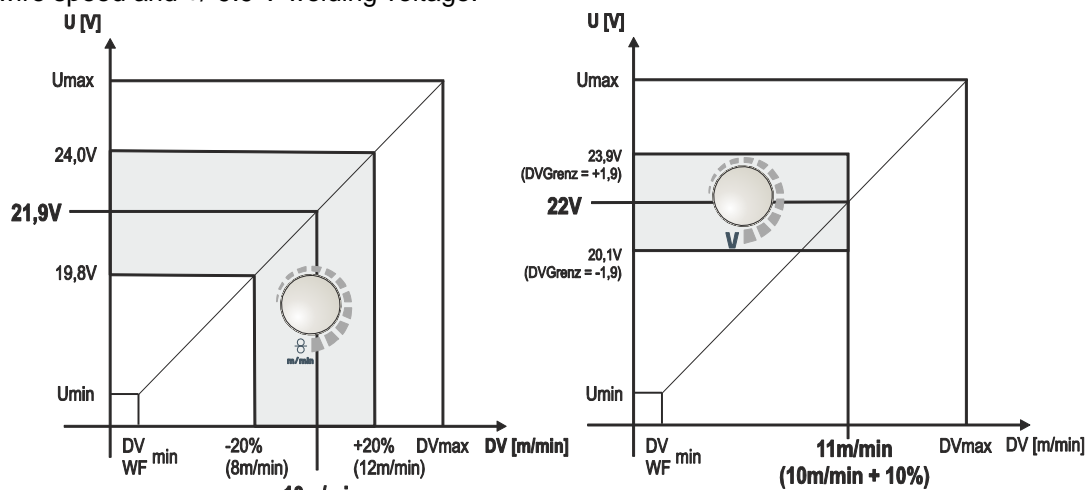


Figure 5-71

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:

- Activate the “correction operation” special parameter (P7=1) and save. > see 5.11.1 chapter
- Key switch to position "1".
- Set the correction range as follows:

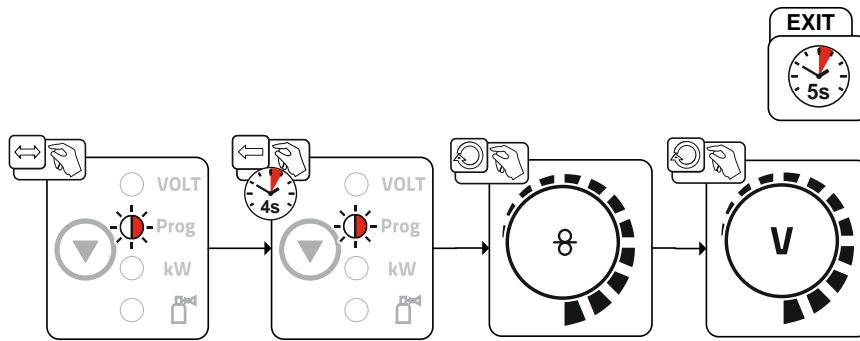


Figure 5-72

- If the user is inactive for about 5 seconds, the pre-set values will be applied 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.

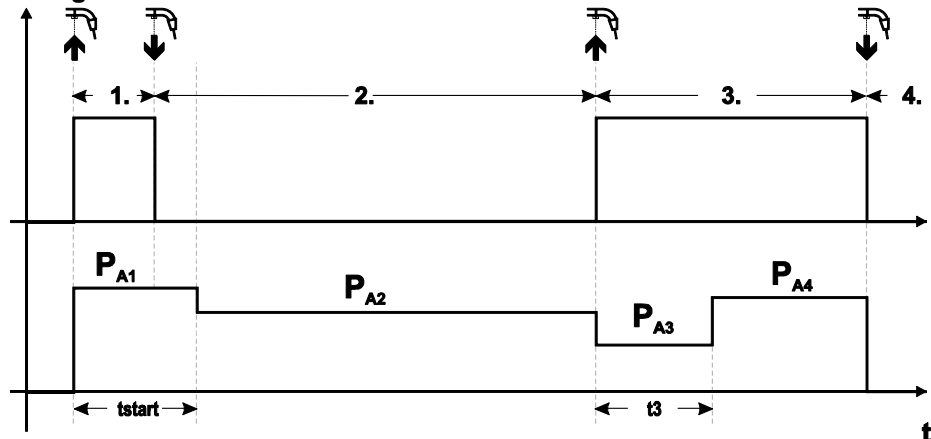


Figure 5-73

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 "tstart" has elapsed.

Tapping switches to other programs (P_{A1} to max. P_{A9}).

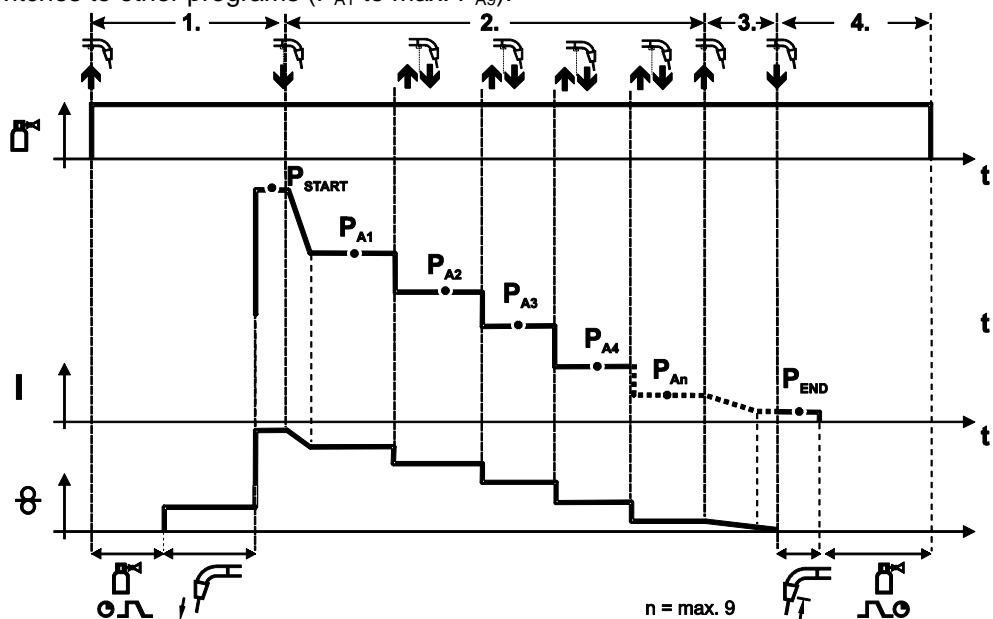


Figure 5-74

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.

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.

"Single or dual operation" (P10) setting



If the system is fitted with two wire feeds, no further accessory components may be operated on the 7-pole connection socket (digital)!

This relates to digital remote controls, robot interfaces, documentation interfaces, welding torches with digital control lead connection, etc.

No second wire feed may be connected in single operation (P10 = 0)!

- Remove connections to the second wire feed

In dual operation (P10 = 1 or 2), both wire feed units must be connected and configured differently on the controls for this operating mode!

- Configure one wire feed unit as the master (P10 = 1)
- Configure the other wire feed unit as a slave (P10 = 2)

Wire feed units with key switches (optional, > see 5.10 chapter) must be configured as masters (P10 = 1).

The wire feed configured as the master is active after the welding machine is switched on. There are no other functional differences between the wire feeds.

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

JOB list switching (P12)

Value	Designation	Explanation
0	Task-oriented JOB list	The JOB numbers are sorted by welding wires and shielding gases. JOB numbers may be skipped during selection where relevant.
1	Actual JOB list	JOB numbers correspond to the actual memory cells. Each JOB can be selected; no memory cells are skipped during selection.
2	Actual JOB list, JOB changeover active	As for the actual JOB list. JOB changeover is also possible with accessory components, such as the PowerControl 2 torch.

Creating user-defined JOB lists

A consecutive memory range where accessories such as the POWERCONTROL 2 torch can be used to switch between JOBS will be created.

- Set special parameter P12 to "2".
- Set "Program or Up/Down function" changeover switch to "Up/Down" position.
- Select an existing JOB which is closest to the required result.
- Copy JOB to one or more target JOB numbers.

If any JOB parameters need to be changed, select the target JOBS in sequence and change the parameters individually.

- Set special parameter P13 to the lower limit and
- Set special parameter P14 to the upper limit of the target JOBS.
- Set "Program or Up/Down function" changeover switch to "Program" position.

JOBS can be changed over in the specified range using the accessory component.

Copying JOBS, "Copy to" function

The possible target range is between 129 - 169.

- First configure special parameter P12 to P12 = 2 or P12 = 1!

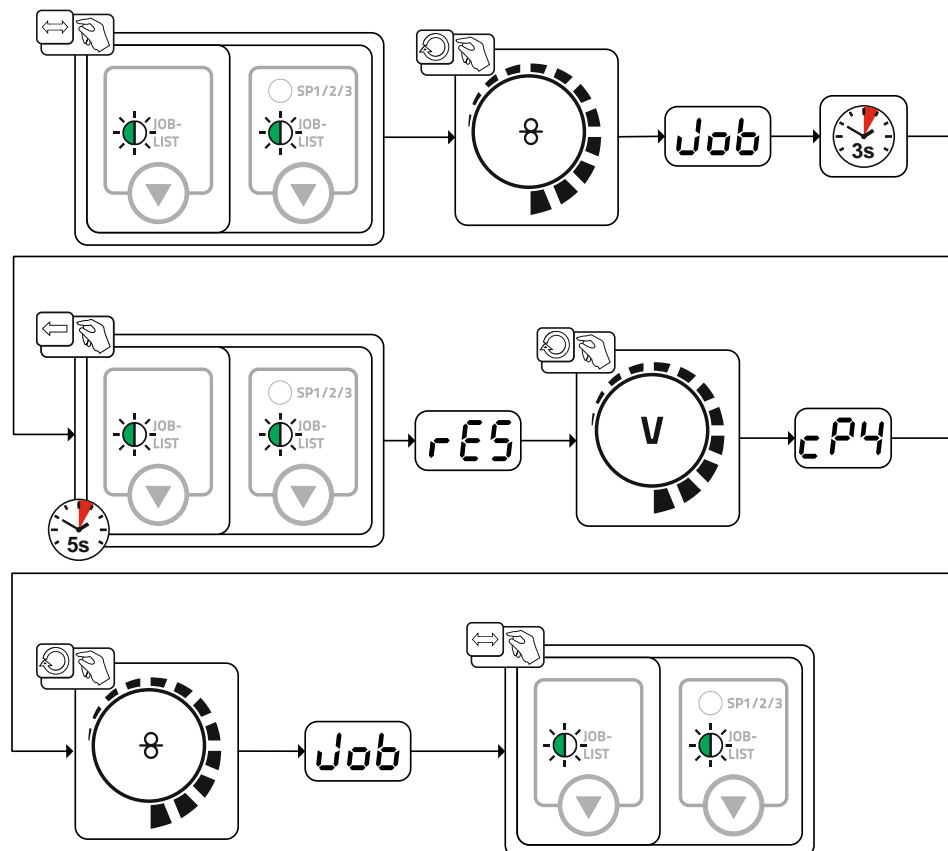


Figure 5-75

By repeating the last two steps, the same source JOB can be copied to multiple target JOBS.

If the control does not register any user activity for longer than 5 seconds, the parameter display is shown once more and the copy process is complete.

Lower and upper limits of the remote JOB changeover process (P13, P14)

The highest and lowest JOB numbers which can be selected using accessory components, such as the PowerControl 2 torch.

Avoids an accidental changeover into undesirable or undefined JOBS.

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.

Block JOB mode (P16)

The following accessory components support block JOB mode:

- Up/Down welding torch with one-digit 7-segment display (two keys)
Program 0 is always active in JOB 0 and program 1 in all other JOBS

In this operating mode, a total of 27 JOBS (welding tasks) divided into three blocks can be called up using accessory components.

The following settings must be made in order to be able to use block JOB mode:

- Switch the "Program or Up/Down function" changeover switch to "Program"
- Set the JOB list to actual JOB list (special parameter P12 = "1")
- Enable block JOB mode (special parameter P16 = "1")
- Change to block JOB mode by selecting one of the special JOBS 129, 130 or 131.

Simultaneous operation with interfaces such as RINT X12, BUSINT X11, DVINT X11 or digital accessory components such as is the R40 remote control is not possible!

Allocation of JOB numbers to the display on the accessory components

JOB no.	Display/selection on the accessory component									
	0	1	2	3	4	5	6	7	8	9
Special JOB 1	129	141	142	143	144	145	146	147	148	149
Special JOB 2	130	151	152	153	154	155	156	157	158	159
Special JOB 3	131	161	162	163	164	165	166	167	168	169

JOB 0:

This JOB allows you to set the welding parameters manually.

Selection of JOB 0 can be prevented via the key switch or with the "block program 0" parameter (P2).

Key switch position 0, or special parameter P2 = 0: JOB 0 is blocked.

Key switch position 1, or special parameter P2 = 1: JOB 0 can be selected.

JOBS 1-9:

Nine JOBS can be called up in each special JOB (see table).

Nominal values for wire speed, arc correction, dynamics etc must be defined in advance in these JOBS. This can be done easily with the PC300.NET software.

If the software is not available, user-defined JOB lists can be created in the special JOB areas with the "Copy to" function. (See explanations about this in the "Switching JOB lists (P12)" chapter)

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.

Mean value display for superPuls (P19)**Function active (P19 = 1)**

- For superPuls, the performance **mean value** from program A (P_A) and program B (P_B) is shown on the display (ex factory).

Function inactive (P19 = 0)

- Only the performance of program A is displayed for superPuls.



If the function is enabled and only "000" is shown on the machine display, this is a rare case of an incompatible system set-up. Solution: Disable special parameter P19.

Predefined execution of the pulsed arc welding process in the PA program (P20)

For machine versions with pulsed arc welding procedures only.

Function active (P20 = 1)

- If the superPuls and welding process switching functions are available and activated, the pulse arc welding process is always executed in the main program PA (ex factory).

Function inactive (P20 = 0)

- Predefined execution of the pulse arc welding process in the PA program is disabled.

Predefined absolute value for relative programs (P21)

Start program (P_{START}), down-slope program (P_B) and end program (P_{END}) can be set relative to the main program (P_A) or in an absolute manner, as desired.

Function active (P21 = 1)

- Absolute parameter setting

Function inactive (P21 = 0)

- Relative parameter setting (ex factory)

Electronic gas flow control, type (P22)

Active only in machines with integrated gas flow control (option ex works).

Adjustment may only be carried out by authorised service personnel (basic setting = 1).

Program settings for relative programs (P23)

The start, down-slope and end program relative programs can be set individually or combined for the P0-P15 operating points. When choosing the combined setting, in contrast to the individual setting, the parameter values are saved in the JOB. With the individual setting, the parameter values are identical for all JOBS (except for special JOBS SP1, SP2 and SP3).

Correction or nominal voltage display (P24)

When setting the arc correction using the right-hand rotary knob the display will either show the correction voltage +- 9.9 V (ex works) or the absolute nominal voltage.

5.12 Machine configuration menu

5.12.1 Selecting, changing and saving parameters



ENTER (Enter the menu)

- ***Switch off the machine at the main switch.***
- ***Press and hold the "welding parameters" or "choke effect" (drive 4X LP) push-button and switch the machine on again at the same time.***

NAVIGATION (Navigate the menu)

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

EXIT (Exit the menu)

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

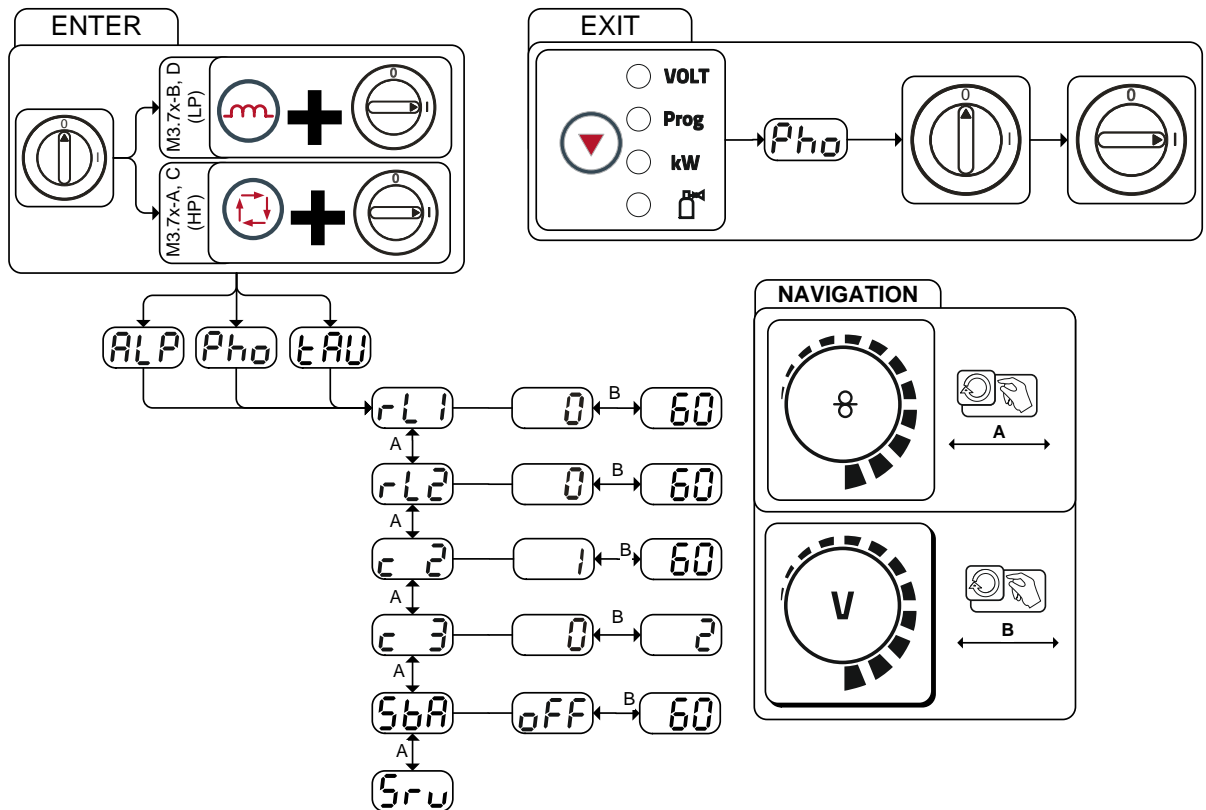


Figure 5-76

Display	Setting/selection
	Lead resistance 1 Lead resistance for the first welding circuit 0 mΩ–60 mΩ (8 mΩ ex works).
	Lead resistance 2 Lead resistance for the second welding circuit 0 mΩ–60 mΩ (8 mΩ ex works).
	Only qualified service personnel may change the parameters!
	Only qualified service personnel may change the parameters!
	Time-based power-saving mode > see 5.14 chapter 5 min.–60 min. = Time to activation of power-saving mode in case of inactivity. -----inactivated
	Service menu Modifications to the service menu may only be carried out by authorised maintenance staff!

5.13 Aligning the cable resistance

The resistance value of cables can either be set directly or it can be aligned using the power source. The factory setting of the power sources is 8 mΩ. This value corresponds to a 5 m earth cable, a 1.5 m intermediate hose package and a 3 m water-cooled welding torch. With other hose package lengths, it is necessary to carry out a +/- voltage correction to optimise welding properties. The voltage correction value can be set close to zero by means of realigning the cable resistance. It is recommended to align the electric cable resistance after replacing accessories such as torches or intermediate hose packages.

In case a second wire feeder is used the (rL2) parameter has to be aligned. For all other configurations it is sufficient to align the (rL1) parameter.

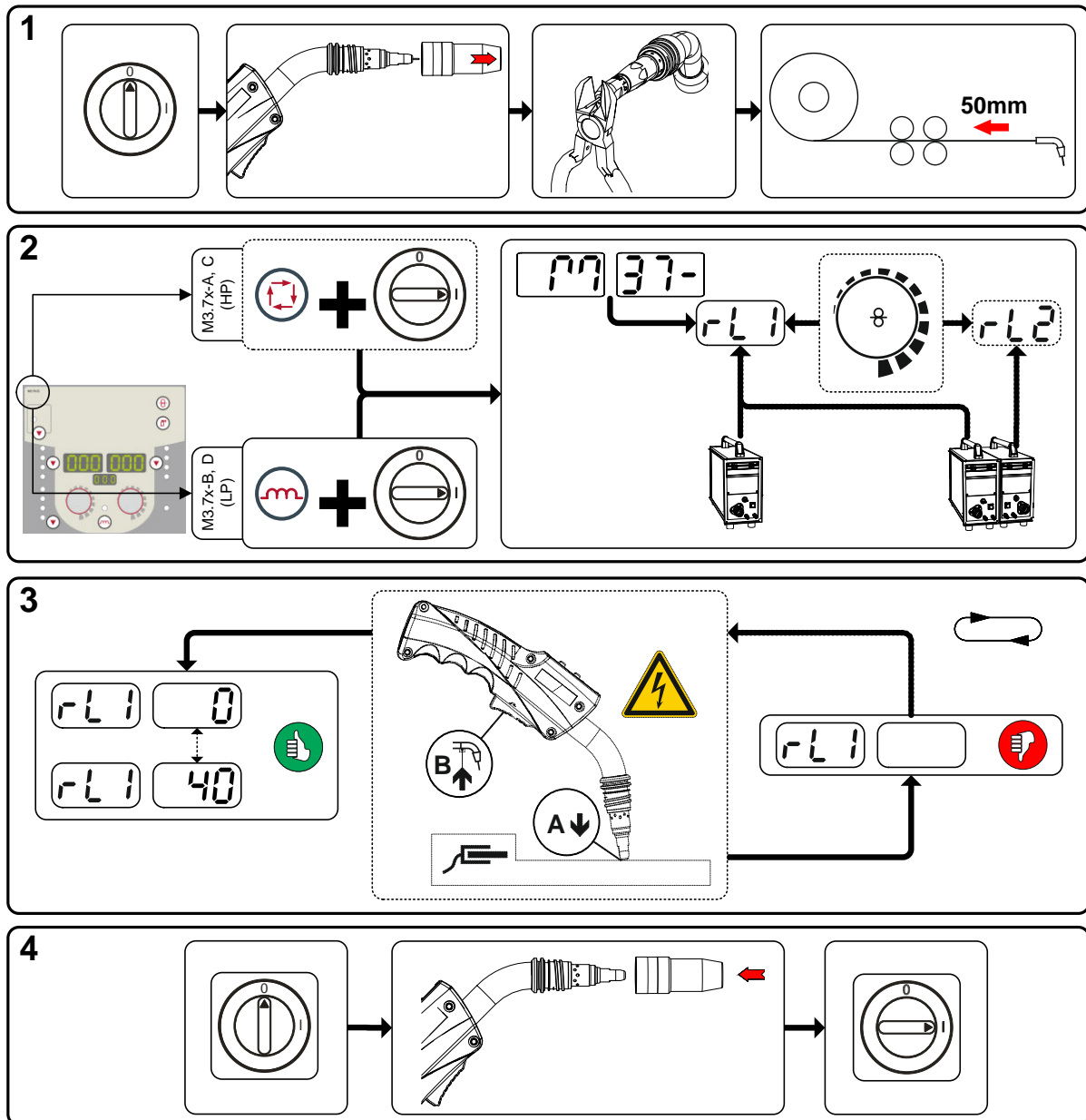


Figure 5-77

1 Preparation

- Switch off the welding machine.
- Unscrew the gas nozzle from the welding torch.
- Trim the welding wire, so that it is flush with the contact tip.
- Retract the welding wire a little (approx. 50 mm) on the wire feeder. There should now be no more welding wire in the contact tip.

2 Configuration

- Press the "welding parameter or choke effect" push-button while simultaneously switching on the welding machine. Release push-button.
 - "Welding parameter" push-button on the M3.7x-A and M3.7x-C control.
 - "Choke effect" push-button on the M3.7x-B and M3.7x-D control.
- The required parameter can now be selected using the 'Welding parameter setting' rotary knob. Parameter rL1 must be aligned for all machine combinations. In case of welding systems with a second power circuit – if two wire feeders are to be operated from a single power source, for example – a second alignment with parameter rL2 must be performed.

3 Alignment/measurement

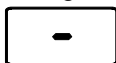
- Applying slight pressure, put the welding torch in place with the contact tip on a clean, purged location on the workpiece and then press the torch trigger for approx. 2 seconds. A short-circuit current will flow briefly, which is used to determine and display the cable resistance. The value can be between 0 mΩ and 40 mΩ. The new value is immediately saved without requiring further confirmation. If no value is shown on the right-hand display, then measurement failed. The measurement must be repeated.

4 Restoring welding standby mode

- Switch off the welding machine.
- Screw the gas nozzle onto the welding torch.
- Switch on the welding machine
- Insert the welding wire.

5.14 Power-saving mode (Standby)

You can activate the power-saving mode by either pressing the push-button > see 4.4 chapter for a prolonged time or by setting a parameter in the machine configuration menu (time-controlled power-saving mode **5bA**).



When power-saving mode is activated, the machine displays show the horizontal digit in the centre of the display only.

Pressing any operating element (e.g. tapping the torch trigger) deactivates power-saving mode and the machine is ready for welding again.

6 Maintenance, care and disposal

6.1 General

DANGER



Incorrect maintenance and testing!

The machine may be cleaned, repaired and tested by skilled and qualified personnel only. A qualified person is one who, due to their training, knowledge and experience, can detect any hazards and possible consequential damage when checking the machine, and can take the necessary safety measures.

- Observe the maintenance instructions > see 6.3 chapter!
- The machine may only be put into operation again once the testing has been successful.



Risk of injury due to electrical voltage after switching off!

Working on an open machine can lead to fatal injuries!

Capacitors are loaded with electrical voltage during operation. Voltage remains present for up to four minutes after the mains plug is removed.

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

WARNING



Cleaning, testing and repair!

Cleaning, testing and repairing of the welding machine may only be carried out by competent, qualified personnel. A qualified person is one who, because of his or her 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.

- In the event of failure of any one of the following tests, the machine must not be operated again until it has been repaired and a new test has been carried out.

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.

Under the specified ambient conditions and normal working conditions this machine is essentially maintenance-free and requires just a minimum of care.

Contamination of the machine may impair service life and duty cycle. The cleaning intervals depend on the ambient conditions and the resulting contamination of the machine. The minimum interval is every six months.

6.2 Cleaning

- Clean the outer surfaces with a moist cloth (no aggressive cleaning agents).
- Purge the machine venting channel and cooling fins (if present) with oil- and water-free compressed air. Compressed air may overspeed and destroy the machine fans. Never direct the compressed air directly at the machine fans. Mechanically block the fans, if required.
- Check the coolant for contaminants and replace, if necessary.

6.3 Maintenance work, intervals

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.

6.3.1 Daily maintenance tasks

6.3.1.1 Visual inspection

- Mains supply lead and its strain relief
- Gas cylinder securing elements
- Check hose package and power connections for exterior damage and replace or have repaired by specialist staff as necessary!
- Gas tubes and their switching equipment (solenoid valve)
- Check that all connections and wearing parts are hand-tight and tighten if necessary.
- Check correct mounting of the wire spool.
- Wheels and their securing elements
- Transport elements (strap, lifting lugs, handle)
- Other, general condition

6.3.1.2 Functional test

- Operating, message, safety and adjustment devices (Functional test)
- Welding current cables (check that they are fitted correctly and secured)
- Gas tubes and their switching equipment (solenoid valve)
- Gas cylinder securing elements
- Check correct mounting of the wire spool.
- Check that all screw and plug connections and replaceable parts are secured correctly, tighten if necessary.
- Remove any spatter.
- Clean the wire feed rollers on a regular basis (depending on the degree of soiling).

6.3.2 Monthly maintenance tasks

6.3.2.1 Visual inspection

- Casing damage (front, rear and side walls)
- Wheels and their securing elements
- Transport elements (strap, lifting lugs, handle)
- Check coolant tubes and their connections for impurities

6.3.2.2 Functional test

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

6.3.3 Annual test (inspection and testing during operation)



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 more information refer to the "Warranty registration" brochure supplied and our information regarding warranty, maintenance and testing at www.ewm-group.com!

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.

6.4 Disposing of equipment



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 2012/19/EU of the European Parliament and the Council of July, 4th 2012), used electric and electronic equipment may no longer be placed in unsorted municipal waste. It must be collected separately. The symbol depicting a waste container on wheels indicates that the equipment must be collected separately.
This machine is to be placed for disposal or recycling in the waste separation systems provided for this purpose.
- According to German law (law governing the distribution, taking back and environmentally correct disposal of electric and electronic equipment (ElektroG) from 16.03.2005), used machines are to be placed in a collection system separate from unsorted municipal waste. The public waste management utilities (communities) have created collection points at which used equipment from private households can be disposed of free of charge.
- Information about giving back used equipment or about collections can be obtained from the respective municipal administration office.
- EWM participates in an approved waste disposal and recycling system and is registered in the Used Electrical Equipment Register (EAR) under number WEEE DE 57686922.
- In addition to this, returns are also possible throughout Europe via EWM sales partners.

6.5 Meeting the requirements of RoHS

We, EWM AG in Mündersbach, Germany, hereby confirm that all products which we supply to you and that are subject to the RoHS directive comply with RoHS requirements (also see applicable EC directives on the Declaration of Conformity on your machine).

7 Rectifying faults

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

7.1 Checklist for rectifying faults



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

Legend	Symbol	Description
	↗	Fault/Cause
	✘	Remedy

Coolant error/no coolant flowing

- ↗ Insufficient coolant flow
 - ✘ Check coolant level and refill if necessary
- ↗ Air in the coolant circuit
 - ✘ Vent coolant circuit > see 7.5 chapter


Wire feed problems

- ↗ Contact tip blocked
 - ✘ Clean, spray with anti-spatter spray and replace if necessary
- ↗ Setting the spool brake > see 5.4.2.5 chapter
 - ✘ Check settings and correct if necessary
- ↗ Setting pressure units > see 5.4.2.4 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

- ↗ All machine control signal lights are illuminated after switching on
- ↗ No machine control signal light is illuminated after switching on
- ↗ No welding power
 - ✘ Phase failure > check mains connection (fuses)
- ↗ Several parameters cannot be set (machines with access block)
 - ✘ Entry level is blocked, disable access lock > see 5.10 chapter
- ↗ 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)

 **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 (Err)	Category			Possible cause	Remedy
	a)	b)	c)		
1	-	-	x	Mains overvoltage	Check the mains voltages and compare with the welding machine connection voltages
2	-	-	x	Mains undervoltage	
3	x	-	-	Welding machine excess temperature	Allow the machine to cool down (mains switch to "1")
4	x	x	-	Low coolant level	Top up the coolant Leak in the coolant circuit > repair the leak and top up the coolant Coolant pump is not working > check excess current trigger on air cooling unit
5	x	-	-	Wire feeder/tachometer error	Check the wire feeder Speedometer is not emitting a signal, M3.51 defective > inform Service.
6	x	-	-	Shielding gas error	Check shielding gas supply (for machines with shielding gas monitoring)
7	-	-	x	Secondary overvoltage	Inverter error > inform Service
8	-	-	x	Earth fault between welding wire and earth line	Separate the connection between welding wire and casing or an earthed object
9	x	-	-	Fast cut-out Triggered by BUSINT X11 or RINT X12	Rectify error on robot
10	-	x	-	Arc interruption Triggered by BUSINT X11 or RINT X12	Check wire feeding
11	-	x	-	Ignition error after 5 s Triggered by BUSINT X11 or RINT X12	Check wire feeding
13	x	-	-	Emergency stop deactivation	Check the emergency stop circuit at the interface for automated welding
14	-	x	-	Wire feeder not detected. Control cable not connected.	Check cable connections.
				Incorrect ID numbers assigned during operation with multiple wire feeders.	Check ID number assignation
15	-	x	-	Wire feeder 2 not detected. Control cable not connected.	Check cable connections.
16	-	-	x	VRD (open circuit voltage reduction error).	Inform Service.
17	-	x	x	Excess current detection on wire feeder	Check wire feeding
18	-	x	x	No speedometer signal from second wire feeder (slave drive)	Check the connection and particularly the speedometer for the second wire feeder (slave drive).
56	-	-	x	Mains phase failure	Check mains voltages
59	-	-	x	Machine incompatible	Check machine used

Error (Err)	Category			Possible cause	Remedy
	a)	b)	c)		
60	-	-	x	Software update required	Inform Service.

Legend for categories (reset error)

- a) The error message will disappear once the error has been rectified.
- b) The error message can be reset by pressing a push-button:

Welding machine control	Push-button
RC1 / RC2	
Expert	
Expert 2.0	
CarExpert / Progress (M3.11)	
alpha Q / Concept / Basic / Basic S / Synergic / Synergic S / Progress (M3.71) / Picomig 305	not possible

- c) The error message can only be reset by switching the machine off and on again.
The shielding gas error (Err 6) can be reset by pressing the "Welding parameters" key button.

7.3 Resetting JOBs (welding tasks) to the factory settings

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

7.3.1 Resetting a single JOB

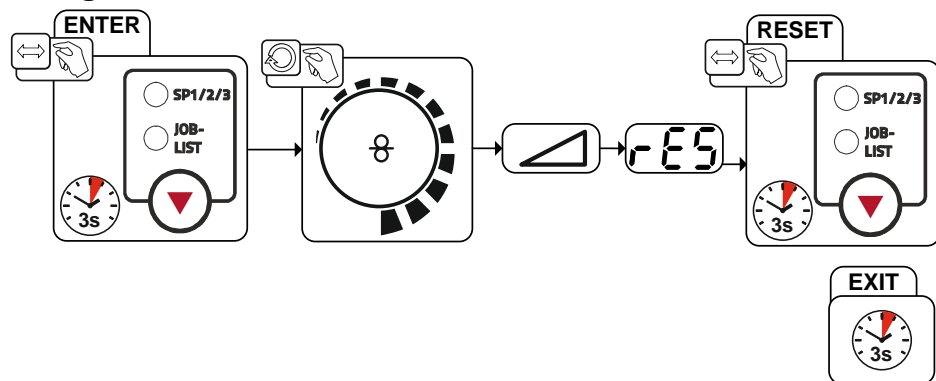


Figure 7-1

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

7.3.2 Resetting all JOBS

- JOBs 1–128 and 170–256 will be reset.**
Custom JOBs 129–169 are maintained.

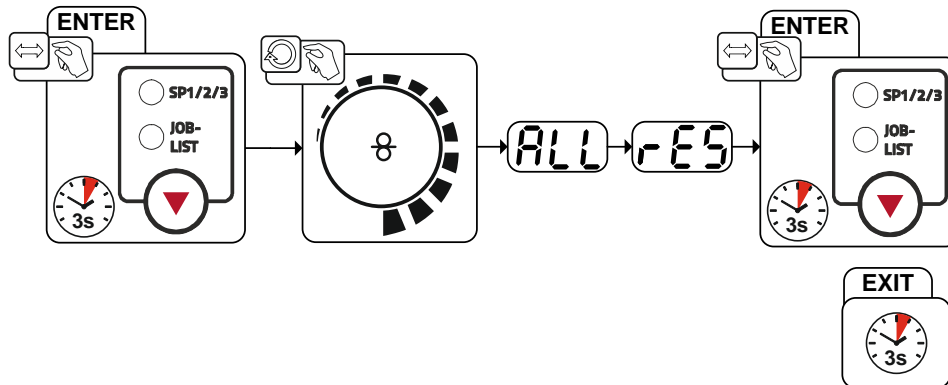


Figure 7-2

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 General operating problems

7.4.1 Automation interface



WARNING



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

- Remove jumper 1 on the T320/1, M320/1 or M321 PCB!

7.5 Vent coolant circuit

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

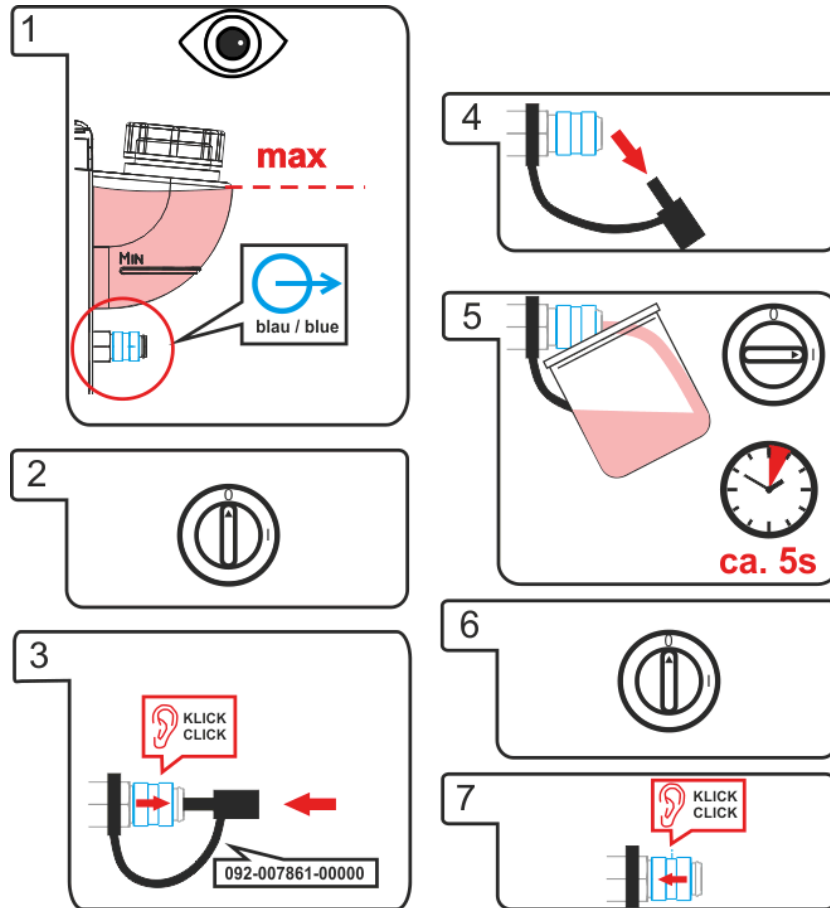



Figure 7-3

8 Technical data


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

8.1 Phoenix 401 Progress FKW

	MIG/MAG	TIG	MMA
Setting range for welding current	5 A–400 A		
Setting range for welding voltage	14-3 V–34.0 V	10.2 V–26.0 V	20.2 V–36.0 V
Duty cycle at 40 °C			
100% DC	400 A		
Load cycle	10 min. (60% DC \triangle 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 32 A		
Mains connection lead	H07RN-F4G6		
Max. connected load	17.5 kVA	13.5 kVA	18.5 kVA
Recommended generator rating	25.0 kVA		
cos ϕ /efficiency	0.99/90%		
Ambient temperature*	–25 °C to +40 °C		
Machine cooling/torch cooling	Fan (AF)/gas or water		
Noise level	< 70 dB(A)		
Workpiece lead	70 mm ²		
Insulation class/protection classification	H/IP 23		
EMC class	A		
Safety identification			
Harmonised standards used	IEC 60974-1, -2, -5, -10		
Cooling capacity at 1 l/min.	1500 W		
Max. flow rate	5 l/min.		
Max. coolant outlet pressure	3.5 bar		
Tank capacity	12 l		
Wire feed speed	0.5 m/min. to 25 m/min.		
Standard roll equipment	1.0 mm + 1.2 mm (for steel wire)		
Wire drive type	4 rolls (37 mm)		
Wire spool diameter	Standardised wire spools up to 300 mm		
Torch connector	Euro torch connector		
Dimensions L x W x H	1085 x 450 x 1003 mm		
	42.7 x 17.7 x 39.5 inch		
Weight	121.5 kg		
	267.9 lb		

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

8.2 Phoenix 501 Progress FKW

	MIG/MAG	TIG	MMA
Setting range for welding current	5 A–500 A		
Setting range for welding voltage	14.3 V–39.0 V	10.2 V–30.0 V	20.2 V–40.0 V
Duty cycle at 40 °C			
60%	500 A		
100%	430 A		
Load cycle	10 min. (60% DC \triangle 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 32 A		
Mains connection lead	H07RN-F4G6		
Maximum connected load	24.9 kVA	19.3 kVA	25.6 kVA
Recommended generator rating	34.6 kVA		
cos ϕ /efficiency	0.99/90%		
Ambient temperature*	–25 °C to +40 °C		
Machine cooling/torch cooling	Fan (AF)/gas or water		
Noise level	< 70 dB(A)		
Workpiece lead	95 mm ²		
Insulation class/protection classification	H/IP 23		
EMC class	A		
Safety identification			
Harmonised standards used	IEC 60974-1, -2, -5, -10		
Cooling capacity at 1 l/min.	1500 W		
Max. flow rate	5 l/min.		
Max. coolant outlet pressure	3.5 bar		
Tank capacity	12 l		
Wire feed speed	0.5 m/min. to 25 m/min.		
Standard roll equipment	1.0 mm + 1.2 mm (for steel wire)		
Wire drive type	4 rolls (37 mm)		
Wire spool diameter	Standardised wire spools up to 300 mm		
Torch connector	Euro torch connector		
Dimensions L x W x H	1085 x 450 x 1003 mm		
	42.7 x 17.7 x 39.5 inch		
Weight	125.5 kg		
	276.7 lbs		



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

9 Accessories



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

9.1 General accessories

Type	Designation	Item no.
AK300	Wire spool adapter K300	094-001803-00001
CA D200	Centering adapter for 5-kg spools	094-011803-00000
TYP 1	Frost protection tester	094-014499-00000
KF 23E-10	Coolant (-10 °C), 9.3 l	094-000530-00000
KF 23E-200	Coolant (-10 °C), 200 litres	094-000530-00001
KF 37E-10	Coolant (-20 °C), 9.3 l	094-006256-00000
KF 37E-200	Coolant (-20 °C), 200 l	094-006256-00001
DM 842 Ar/CO2 230bar 30l D	Pressure regulator with manometer	394-002910-00030
5POLE/CEE/32A/M	Machine plug	094-000207-00000
HOSE BRIDGE UNI	Tube bridge	092-007843-00000

9.2 Remote control/connecting and extension cable

9.2.1 7-pole connection

Type	Designation	Item no.
R40 7POL	Remote control, 10 programs	090-008088-00000
R50 7POL	Remote control, all welding machine functions can be set directly at the workplace	090-008776-00000
FRV 7POL 0.5 m	Extension/connecting cable	092-000201-00004
FRV 7POL 1 m	Extension/connecting cable	092-000201-00002
FRV 7POL 5 m	Extension/connecting cable	092-000201-00003
FRV 7POL 10 m	Extension/connecting cable	092-000201-00000
FRV 7POL 20 m	Extension/connecting cable	092-000201-00001
FRV 7POL 25M	Extension/connecting cable	092-000201-00007

9.2.2 19-pole connection

Type	Designation	Item no.
R11 19POL	Remote control	090-008601-00502
RA5 19POL 5M	Remote control e.g. connection cable	092-001470-00005
RA10 19POL 10M	Remote control e.g. connection cable	092-001470-00010
RA20 19POL 20M	Remote control e.g. connection cable	092-001470-00020
RV5M19 19POLE 5M	Extension cable	092-000857-00000
RV5M19 19POL 10M	Extension cable	092-000857-00010
RV5M19 19POL 15M	Extension cable	092-000857-00015
RV5M19 19POL 20M	Extension cable	092-000857-00020

9.3 Options

Type	Designation	Item no.
ON A INTERFACE	Option retrofit for analog mech. welding interface Phoenix Progress	092-001779-00000
ON LB Wheels 160x40MM	Retrofit option for locking brake for machine wheels	092-002110-00000
ON Holder Gas Bottle <50L	Holding plate for gas cylinders smaller than 50 litres	092-002151-00000
ON Shock Protect	Ram protection retrofit option	092-002154-00000
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 HS XX1	Mount for hose packages and remote control	092-002910-00000

9.4 Computer communication

Type	Designation	Item no.
PC300.Net	PC300.Net welding parameter software kit incl. cable and SECINT X10 USB interface	090-008777-00000
FRV 7POL 5 m	Extension/connecting cable	092-000201-00003
FRV 7POL 10 m	Extension/connecting cable	092-000201-00000
FRV 7POL 20 m	Extension/connecting cable	092-000201-00001
QDOC9000 V2.0	Set consisting of interface, documentation software, connection lead	090-008713-00000

10 Replaceable 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.*

10.1 Wire feed rollers

10.1.1 Wire feed rollers for steel wire

Type	Designation	Item no.
FE 4R 0.6 MM/0.023 INCH LIGHT PINK	Drive roll set, 37 mm, 4 rolls, V-groove for steel, stainless steel and brazing	092-002770-00006
FE 4R 0.8 MM/0.03 INCH WHITE	Drive roll set, 37 mm, 4 rolls, V-groove for steel, stainless steel and brazing	092-002770-00008
FE 4R 1,0 MM/0.04 INCH BLUE	Drive roll set, 37 mm, 4 rolls, V-groove for steel, stainless steel and brazing	092-002770-00010
FE 4R 1.2 MM/0.045 INCH RED	Drive roll set, 37 mm, 4 rolls, V-groove for steel, stainless steel and brazing	092-002770-00012
FE 4R 1.4 MM/0.052 INCH GREEN	Drive roll set, 37 mm, 4 rolls, V-groove for steel, stainless steel and brazing	092-002770-00014
FE 4R 1.6 MM/0.06 INCH BLACK	Drive roll set, 37 mm, 4 rolls, V-groove for steel, stainless steel and brazing	092-002770-00016
FE 4R 2.0 MM/0.08 INCH GREY	Drive roll set, 37 mm, 4 rolls, V-groove for steel, stainless steel and brazing	092-002770-00020
FE 4R 2.4 MM/0.095 INCH BROWN	Drive roll set, 37 mm, 4 rolls, V-groove for steel, stainless steel and brazing	092-002770-00024
FE 4R 2.8 MM/0.11 INCH LIGHT GREEN	Drive roll set, 37 mm, 4 rolls, V-groove for steel, stainless steel and brazing	092-002770-00028
FE 4R 3.2 MM/0.12 INCH VIOLET	Drive roll set, 37 mm, 4 rolls, V-groove for steel, stainless steel and brazing	092-002770-00032

10.1.2 Wire feed rollers for aluminium wire

Type	Designation	Item no.
AL 4R 0.8 MM/0.03 INCH WHITE	Drive roll set, 37 mm, for aluminium	092-002771-00008
AL 4R 1.0 MM/0.04 INCH BLUE	Drive roll set, 37 mm, for aluminium	092-002771-00010
AL 4R 1.2 MM/0.045 INCH RED	Drive roll set, 37 mm, for aluminium	092-002771-00012
AL 4R 1.6 MM/0.06 INCH BLACK	Drive roll set, 37 mm, for aluminium	092-002771-00016
AL 4R 2.0 MM/0.08 INCH GREY/YELLOW	Drive roll set, 37 mm, for aluminium	092-002771-00020
AL 4R 2.4 MM/0.095 INCH BROWN/YELLOW	Drive roll set, 37 mm, for aluminium	092-002771-00024
AL 4R 2.8 MM/0.110 INCH LIGHT GREEN/YELLOW	Drive roll set, 37 mm, for aluminium	092-002771-00028
AL 4R 3.2 MM/0.125 INCH VIOLET/YELLOW	Drive roll set, 37 mm, for aluminium	092-002771-00032

10.1.3 Wire feed rollers for cored wire

Type	Designation	Item no.
FUEL 4R 0.8 MM/0.03 INCH WHITE/ORANGE	Drive roll set, 37 mm, 4 rolls, V-groove/knurled for flux cored wire	092-002848-00008

Type	Designation	Item no.
FUEL 4R 1.0 MM/0.04 INCH BLUE/ORANGE	Drive roll set, 37 mm, 4 rolls, V-groove/knurled for flux cored wire	092-002848-00010
FUEL 4R 1.2 MM/0.045 INCH RED/ORANGE	Drive roll set, 37 mm, 4 rolls, V-groove/knurled for flux cored wire	092-002848-00012
FUEL 4R 1.4 MM/0.052 INCH GREEN/ORANGE	Drive roll set, 37 mm, 4 rolls, V-groove/knurled for flux cored wire	092-002848-00014
FUEL 4R 1.6 MM/0.06 INCH BLACK/ORANGE	Drive roll set, 37 mm, 4 rolls, V-groove/knurled for flux cored wire	092-002848-00016
FUEL 4R 2.0 MM/0.08 INCH GREY/ORANGE	Drive roll set, 37 mm, 4 rolls, V-groove/knurled for flux cored wire	092-002848-00020
FUEL 4R 2.4 MM/0.095 INCH BROWN/ORANGE	Drive roll set, 37 mm, 4 rolls, V-groove/knurled for flux cored wire	092-002848-00024

10.1.4 Wire guide

Type	Designation	Item no.
SET DRAHTFUERUNG	Wire guide set	092-002774-00000
ON WF 2,0-3,2MM EFEED	Retrofitting option, wire guide for 2.0–3.2 mm wires, eFeed drive	092-019404-00000
SET IG 4x4 1.6mm BL	Inlet guide set	092-002780-00000
GUIDE TUBE L105	Guide tube	094-006051-00000
CAPTUB L108 D1,6	Capillary tube	094-006634-00000
CAPTUB L105 D2,0/2,4	Capillary tube	094-021470-00000

11 Appendix A

11.1 JOB-List

JOB no.	Processes	Material	Gas	Diameter [mm]
1	Standard GMAW/pulse	G3Si1/G4Si1	100% CO2	0,8
2	Standard GMAW/puls	G3Si1/G4Si1	100% CO2	0,9
3	Standard GMAW/puls	G3Si1/G4Si1	100% CO2	1,0
4	Standard GMAW/puls	G3Si1/G4Si1	100% CO2	1,2
5	Standard GMAW/puls	G3Si1/G4Si1	100% CO2	1,6
6	Standard GMAW/puls	G3Si1/G4Si1	Ar-82/CO2-18 (M21)	0,8
7	Standard GMAW/puls	G3Si1/G4Si1	Ar-82/CO2-18 (M21)	0,9
8	Standard GMAW/puls	G3Si1/G4Si1	Ar-82/CO2-18 (M21)	1,0
9	Standard GMAW/puls	G3Si1/G4Si1	Ar-82/CO2-18 (M21)	1,2
10	Standard GMAW/puls	G3Si1/G4Si1	Ar-82/CO2-18 (M21)	1,6
11	Standard GMAW/puls	G3Si1/G4Si1	Ar-90/CO2-10 (M20)	0,8
12	Standard GMAW/puls	G3Si1/G4Si1	Ar-90/CO2-10 (M20)	0,9
13	Standard GMAW/puls	G3Si1/G4Si1	Ar-90/CO2-10 (M20)	1,0
14	Standard GMAW/puls	G3Si1/G4Si1	Ar-90/CO2-10 (M20)	1,2
15	Standard GMAW/puls	G3Si1/G4Si1	Ar-90/CO2-10 (M20)	1,6
26	Standard GMAW/puls	CrNi 19 12 3 Nb/1.4576	Ar-97,5/CO2-2,5 (M12)	0,8
27	Standard GMAW/puls	CrNi 19 12 3 Nb/1.4576	Ar-97,5/CO2-2,5 (M12)	1,0
28	Standard GMAW/puls	CrNi 19 12 3 Nb/1.4576	Ar-97,5/CO2-2,5 (M12)	1,2
29	Standard GMAW/puls	CrNi 19 12 3 Nb/1.4576	Ar-97,5/CO2-2,5 (M12)	1,6
30	Standard GMAW/puls	CrNi 18 8/1.4370	Ar-97,5/CO2-2,5 (M12)	0,8
31	Standard GMAW/puls	CrNi 18 8/1.4370	Ar-97,5/CO2-2,5 (M12)	1,0
32	Standard GMAW/puls	CrNi 18 8/1.4370	Ar-97,5/CO2-2,5 (M12)	1,2
33	Standard GMAW/puls	CrNi 18 8/1.4370	Ar-97,5/CO2-2,5 (M12)	1,6
34	Standard GMAW/puls	CrNi 19 9/1.4316	Ar-97,5/CO2-2,5 (M12)	0,8
35	Standard GMAW/puls	CrNi 19 9/1.4316	Ar-97,5/CO2-2,5 (M12)	1,0
36	Standard GMAW/puls	CrNi 19 9/1.4316	Ar-97,5/CO2-2,5 (M12)	1,2
37	Standard GMAW/puls	CrNi 19 9/1.4316	Ar-97,5/CO2-2,5 (M12)	1,6
38	Standard GMAW/puls	CrNi 19 12 3/1.4430	Ar-97,5/CO2-2,5 (M12)	0,8
39	Standard GMAW/puls	CrNi 19 12 3/1.4430	Ar-97,5/CO2-2,5 (M12)	1,0
40	Standard GMAW/puls	CrNi 19 12 3/1.4430	Ar-97,5/CO2-2,5 (M12)	1,2
41	Standard GMAW/puls	CrNi 19 12 3/1.4430	Ar-97,5/CO2-2,5 (M12)	1,6
42	Standard GMAW/puls	CrNi 22 9 3a/1.4462	Ar-97,5/CO2-2,5 (M12)	0,8
43	Standard GMAW/puls	CrNi 22 9 3a/1.4462	Ar-97,5/CO2-2,5 (M12)	1,0
44	Standard GMAW/puls	CrNi 22 9 3a/1.4462	Ar-97,5/CO2-2,5 (M12)	1,2
45	Standard GMAW/puls	CrNi 22 9 3a/1.4462	Ar-97,5/CO2-2,5 (M12)	1,6
46	Standard GMAW/puls	CrNi 22 9 3a/1.4462	Ar-78/H3-20/CO2-2 (M12)	0,8
47	Standard GMAW/puls	CrNi 22 9 3a/1.4462	Ar-78/H3-20/CO2-2 (M12)	1,0
48	Standard GMAW/puls	CrNi 22 9 3a/1.4462	Ar-78/H3-20/CO2-2 (M12)	1,2
49	Standard GMAW/puls	CrNi 22 9 3a/1.4462	Ar-78/H3-20/CO2-2 (M12)	1,6
50*	coldArc/coldArc puls	CrNi 19 9/1.4316	Ar-97,5/CO2-2,5 (M12)	0,8
51*	coldArc/coldArc puls	CrNi 19 9/1.4316	Ar-97,5/CO2-2,5 (M12)	1,0

JOB no.	Processes	Material	Gas	Diameter [mm]
52*	coldArc/coldArc puls	CrNi 19 9/1.4316	Ar-97,5/CO2-2,5 (M12)	1,2
55*	coldArc/coldArc puls	AlMg	Ar-100 (I1)	1,0
56*	coldArc/coldArc puls	AlMg	Ar-100 (I1)	1,2
59*	coldArc/coldArc puls	AlSi	Ar-100 (I1)	1,0
60*	coldArc/coldArc puls	AlSi	Ar-100 (I1)	1,2
63*	coldArc/coldArc puls	Al99	Ar-100 (I1)	1,0
64*	coldArc/coldArc puls	Al99	Ar-100 (I1)	1,2
66*	coldArc brazing	CuSi	Ar-100 (I1)	0,8
67*	coldArc brazing	CuSi	Ar-100 (I1)	1,0
68*	coldArc brazing	CuSi	Ar-100 (I1)	1,2
70*	coldArc brazing	CuAl	Ar-100 (I1)	0,8
71*	coldArc brazing	CuAl	Ar-100 (I1)	1,0
72*	coldArc brazing	CuAl	Ar-100 (I1)	1,2
74	Standard GMAW/puls	AlMg	Ar-100 (I1)	0,8
75	Standard GMAW/puls	AlMg	Ar-100 (I1)	1,0
76	Standard GMAW/puls	AlMg	Ar-100 (I1)	1,2
77	Standard GMAW/puls	AlMg	Ar-100 (I1)	1,6
78	Standard GMAW/puls	AlMg	Ar-70/He-30 (I3)	0,8
79	Standard GMAW/puls	AlMg	Ar-70/He-30 (I3)	1,0
80	Standard GMAW/puls	AlMg	Ar-70/He-30 (I3)	1,2
81	Standard GMAW/puls	AlMg	Ar-70/He-30 (I3)	1,6
82	Standard GMAW/puls	AlSi	Ar-100 (I1)	0,8
83	Standard GMAW/puls	AlSi	Ar-100 (I1)	1,0
84	Standard GMAW/puls	AlSi	Ar-100 (I1)	1,2
85	Standard GMAW/puls	AlSi	Ar-100 (I1)	1,6
86	Standard GMAW/puls	AlSi	Ar-70/He-30 (I3)	0,8
87	Standard GMAW/puls	AlSi	Ar-70/He-30 (I3)	1,0
88	Standard GMAW/puls	AlSi	Ar-70/He-30 (I3)	1,2
89	Standard GMAW/puls	AlSi	Ar-70/He-30 (I3)	1,6
90	Standard GMAW/puls	Al99	Ar-100 (I1)	0,8
91	Standard GMAW/puls	Al99	Ar-100 (I1)	1,0
92	Standard GMAW/puls	Al99	Ar-100 (I1)	1,2
93	Standard GMAW/puls	Al99	Ar-100 (I1)	1,6
94	Standard GMAW/puls	Al99	Ar-70/He-30 (I3)	0,8
95	Standard GMAW/puls	Al99	Ar-70/He-30 (I3)	1,0
96	Standard GMAW/puls	Al99	Ar-70/He-30 (I3)	1,2
97	Standard GMAW/puls	Al99	Ar-70/He-30 (I3)	1,6
98	Standard GMAW/puls	CuSi	Ar-100 (I1)	0,8
99	Standard GMAW/puls	CuSi	Ar-100 (I1)	1,0
100	Standard GMAW/puls	CuSi	Ar-100 (I1)	1,2
101	Standard GMAW/puls	CuSi	Ar-100 (I1)	1,6
106	Standard GMAW/puls	CuAl	Ar-100 (I1)	0,8
107	Standard GMAW/puls	CuAl	Ar-100 (I1)	1,0
108	Standard GMAW/puls	CuAl	Ar-100 (I1)	1,2
109	Standard GMAW/puls	CuAl	Ar-100 (I1)	1,6
110	Brazing	CuSi	Ar-97,5/CO2-2,5 (M12)	0,8
111	Brazing	CuSi	Ar-97,5/CO2-2,5 (M12)	1,0

JOB no.	Processes	Material	Gas	Diameter [mm]
112	Brazing	CuSi	Ar-97,5/CO2-2,5 (M12)	1,2
113	Brazing	CuSi	Ar-97,5/CO2-2,5 (M12)	1,6
114	Brazing	CuSi	Ar-100 (I1)	0,8
115	Brazing	CuSi	Ar-100 (I1)	1,0
116	Brazing	CuSi	Ar-100 (I1)	1,2
117	Brazing	CuSi	Ar-100 (I1)	1,6
118	Brazing	CuAl	Ar-97,5/CO2-2,5 (M12)	0,8
119	Brazing	CuAl	Ar-97,5/CO2-2,5 (M12)	1,0
120	Brazing	CuAl	Ar-97,5/CO2-2,5 (M12)	1,2
121	Brazing	CuAl	Ar-97,5/CO2-2,5 (M12)	1,6
122	Brazing	CuAl	Ar-100 (I1)	0,8
123	Brazing	CuAl	Ar-100 (I1)	1,0
124	Brazing	CuAl	Ar-100 (I1)	1,2
125	Brazing	CuAl	Ar-100 (I1)	1,6
126	Gouging			
127	TIG Liftarc			
128	MMA			
129	Special JOB 1	Free JOB		
130	Special JOB 2	Free JOB		
131	Special JOB 3	Free JOB		
132		Free JOB		
133		Free JOB		
134		Free JOB		
135		Free JOB		
136		Free JOB		
137		Free JOB		
138		Free JOB		
139		Free JOB		
140		Block 1/ JOB1		
141		Block 1/ JOB2		
142		Block 1/ JOB3		
143		Block 1/ JOB4		
144		Block 1/ JOB5		
145		Block 1/ JOB6		
146		Block 1/ JOB7		
147		Block 1/ JOB8		
148		Block 1/ JOB9		
149		Block 1/ JOB10		
150		Block 2/ JOB1		
151		Block 2/ JOB2		
152		Block 2/ JOB3		
153		Block 2/ JOB4		
154		Block 2/ JOB5		
155		Block 2/ JOB6		
156		Block 2/ JOB7		
157		Block 2/ JOB8		
158		Block 2/ JOB9		

JOB no.	Processes	Material	Gas	Diameter [mm]
159		Block 2/ JOB10		
160		Block 3/ JOB1		
161		Block 3/ JOB2		
162		Block 3/ JOB3		
163		Block 3/ JOB4		
164		Block 3/ JOB5		
165		Block 3/ JOB6		
166		Block 3/ JOB7		
167		Block 3/ JOB8		
168		Block 3/ JOB9		
169		Block 3/ JOB10		
171*	pipeSolution	G3Si1/G4Si1	CO2-100 (C1)	1,0
172*	pipeSolution	G3Si1/G4Si1	CO2-100 (C1)	1,2
173*	pipeSolution	G3Si1/G4Si1	Ar-82/CO2-18 (M21)	1,0
174*	pipeSolution	G3Si1/G4Si1	Ar-82/CO2-18 (M21)	1,2
177	Standard GMAW/puls	G3Si1/G4Si1	Ar-90/CO2-10 (M20)	1,0
178	Standard GMAW/puls	G3Si1/G4Si1	Ar-90/CO2-10 (M20)	1,2
179	forceArc/forceArc puls	G3Si1/G4Si1	Ar-82/CO2-18 (M21)	1,0
180	forceArc/forceArc puls	G3Si1/G4Si1	Ar-82/CO2-18 (M21)	1,2
181	forceArc/forceArc puls	G3Si1/G4Si1	Ar-82/CO2-18 (M21)	1,6
182*	coldArc/coldArc puls	G3Si1/G4Si1	CO2-100 (C1)	0,8
184*	coldArc/coldArc puls	G3Si1/G4Si1	CO2-100 (C1)	1,0
185*	coldArc/coldArc puls	G3Si1/G4Si1	CO2-100 (C1)	1,2
187	Standard GMAW/puls	G3Si1/G4Si1	Ar-82/CO2-18 (M21)	
188	Standard GMAW/puls	G3Si1/G4Si1	Ar-82/CO2-18 (M21)	
189	forceArc/forceArc puls	G3Si1/G4Si1	Ar-82/CO2-18 (M21)	0,8
190	forceArc/forceArc puls	G3Si1/G4Si1	Ar-82/CO2-18 (M21)	0,8
191*	coldArc/coldArc puls	G3Si1/G4Si1	Ar-82/CO2-18 (M21)	0,8
193*	coldArc/coldArc puls	G3Si1/G4Si1	Ar-82/CO2-18 (M21)	1,0
194*	coldArc/coldArc puls	G3Si1/G4Si1	Ar-82/CO2-18 (M21)	1,2
195*	coldArc/coldArc puls	G3Si1/G4Si1	Ar-82/CO2-18 (M21)	1,6
197*	coldArc brazing	AlSi	Ar-100 (I1)	1,0
198*	coldArc brazing	AlSi	Ar-100 (I1)	1,2
201*	coldArc brazing	ZnAl	Ar-100 (I1)	1,0
202*	coldArc brazing	ZnAl	Ar-100 (I1)	1,2
204	rootArc/rootArc puls	G3Si1/G4Si1	CO2-100 (C1)	1,0
205	rootArc/rootArc puls	G3Si1/G4Si1	CO2-100 (C1)	1,2
206	rootArc/rootArc puls	G3Si1/G4Si1	Ar-82/CO2-18 (M21)	1,0
207	rootArc/rootArc puls	G3Si1/G4Si1	Ar-82/CO2-18 (M21)	1,2
208*	coldArc - Mg/Mg	Mg	Ar-70/H3-30 (I3)	1,2
209*	coldArc - Mg/Mg	Mg	Ar-70/H3-30 (I3)	1,6
210	Rutile/basic flux cored wire	CrNi	CO2-100 (C1)	0,9
211	Rutile/basic flux cored wire	CrNi	CO2-100 (C1)	1,0
212	Rutile/basic flux cored wire	CrNi	CO2-100 (C1)	1,2
213	Rutile/basic flux cored wire	CrNi	CO2-100 (C1)	1,6

JOB no.	Processes	Material	Gas	Diameter [mm]
214	Surfacing	G3Si1/G4Si1	Ar-82/CO2-18 (M21)	0,8
215	Surfacing	G3Si1/G4Si1	Ar-82/CO2-18 (M21)	0,9
216	Surfacing	G3Si1/G4Si1	Ar-82/CO2-18 (M21)	1,0
217	Surfacing	G3Si1/G4Si1	Ar-82/CO2-18 (M21)	1,2
218	Surfacing	G3Si1/G4Si1	Ar-82/CO2-18 (M21)	1,6
220*	coldArc - St/Al	ZnAl	Ar-100 (I1)	1,0
221*	coldArc - St/Al	ZnAl	Ar-100 (I1)	1,2
224*	coldArc - St/Al	AlSi	Ar-100 (I1)	1,0
225*	coldArc - St/Al	AlSi	Ar-100 (I1)	1,2
227	Metal flux-cored wire	CrNi	Ar-97,5/CO2-2,5 (M12)	0,8
228	Metal flux-cored wire	CrNi	Ar-97,5/CO2-2,5 (M12)	1,0
229	Metal flux-cored wire	CrNi	Ar-97,5/CO2-2,5 (M12)	1,2
230	Metal flux-cored wire	CrNi	Ar-97,5/CO2-2,5 (M12)	1,6
231	Rutile/basic flux cored wire	CrNi	Ar-82/CO2-18 (M21)	0,9
232	Rutile/basic flux cored wire	CrNi	Ar-82/CO2-18 (M21)	1,0
233	Rutile/basic flux cored wire	CrNi	Ar-82/CO2-18 (M21)	1,2
234	Rutile/basic flux cored wire	CrNi	Ar-82/CO2-18 (M21)	1,6
235	Metal flux-cored wire	G3Si1/G4Si1	Ar-82/CO2-18 (M21)	0,8
237	Metal flux-cored wire	G3Si1/G4Si1	Ar-82/CO2-18 (M21)	1,0
238	Metal flux-cored wire	G3Si1/G4Si1	Ar-82/CO2-18 (M21)	1,2
239	Metal flux-cored wire	G3Si1/G4Si1	Ar-82/CO2-18 (M21)	1,6
240	Rutile/basic flux cored wire	G3Si1/G4Si1	Ar-82/CO2-18 (M21)	0,8
242	Rutile/basic flux cored wire	G3Si1/G4Si1	Ar-82/CO2-18 (M21)	1,0
243	Rutile/basic flux cored wire	G3Si1/G4Si1	Ar-82/CO2-18 (M21)	1,2
244	Rutile/basic flux cored wire	G3Si1/G4Si1	Ar-82/CO2-18 (M21)	1,6
245	forceArc/forceArc puls	Al99	Ar-100 (I1)	1,2
246	forceArc/forceArc puls	Al99	Ar-100 (I1)	1,6
247	forceArc/forceArc puls	AlMg	Ar-100 (I1)	1,2
248	forceArc/forceArc puls	AlMg	Ar-100 (I1)	1,6
249	forceArc/forceArc puls	AlSi	Ar-100 (I1)	1,2
250	forceArc/forceArc puls	AlSi	Ar-100 (I1)	1,6
251	forceArc/forceArc puls	CrNi	Ar-97,5/CO2-2,5 (M12)	1,0
252	forceArc/forceArc puls	CrNi	Ar-97,5/CO2-2,5 (M12)	1,2
253	forceArc/forceArc puls	CrNi	Ar-97,5/CO2-2,5 (M12)	1,6
254	forceArc/forceArc puls	G3Si1/G4Si1	Ar-90/CO2-10 (M20)	1,0
255	forceArc/forceArc puls	G3Si1/G4Si1	Ar-90/CO2-10 (M20)	1,2
256	forceArc/forceArc puls	G3Si1/G4Si1	Ar-90/CO2-10 (M20)	1,6
260	Rutile/basic flux cored wire	G3Si1/G4Si1	CO2-100 (C1)	1,2
261	Rutile/basic flux cored wire	G3Si1/G4Si1	CO2-100 (C1)	1,6
263	Metal flux-cored wire	High tensile steels	Ar-82/CO2-18 (M21)	1,2
264	Basic flux-cored	G3Si1/G4Si1	Ar-82/CO2-18 (M21)	1,2

JOB no.	Processes	Material	Gas	Diameter [mm]
268	Standard GMAW/puls	NiCr 617	Ar-70/He-30 (I3)	1,2
269	Standard GMAW/puls	NiCr 617	Ar-70/He-30 (I3)	1,6
271	Standard GMAW/puls	NiCr 625	Ar-70/He-30 (I3)	1,0
272	Standard GMAW/puls	NiCr 625	Ar-70/He-30 (I3)	1,2
273	Standard GMAW/puls	NiCr 625	Ar-70/He-30 (I3)	1,6
275	Standard GMAW/puls	NiCr 625	Ar-67,95/He-30/H2-2 / CO2-0,05	1,0
276	Standard GMAW/puls	NiCr 625	Ar-67,95/He-30/H2-2 / CO2-0,05	1,2
277	Standard GMAW/puls	NiCr 625	Ar-78/H3-20/CO2-2 (M12)	1,6
279	Standard GMAW/puls	CrNi 25 20/1.4842	Ar-97,5/CO2-2,5 (M12)	1,0
280	Standard GMAW/puls	CrNi 25 20/1.4842	Ar-97,5/CO2-2,5 (M12)	1,2
282	Standard GMAW/puls	CrNi 22 12/1.4829	Ar-97,5/CO2-2,5 (M12)	0,8
283	Standard GMAW/puls	CrNi 22 12/1.4829	Ar-97,5/CO2-2,5 (M12)	1,0
284	Standard GMAW/puls	CrNi 22 12/1.4829	Ar-97,5/CO2-2,5 (M12)	1,2
285	Standard GMAW/puls	CrNi 22 12/1.4829	Ar-97,5/CO2-2,5 (M12)	1,6
290	forceArc / forceArc puls metal flux-cored wire	G3Si1/G4Si1	Ar-82/CO2-18 (M21)	0,8
291	forceArc / forceArc puls metal flux-cored wire	G3Si1/G4Si1	Ar-82/CO2-18 (M21)	1,0
292	forceArc / forceArc puls metal flux-cored wire	G3Si1/G4Si1	Ar-82/CO2-18 (M21)	1,2
293	forceArc / forceArc puls metal flux-cored wire	G3Si1/G4Si1	Ar-82/CO2-18 (M21)	1,6
294	forceArc/pulsea	G3Si1/G4Si1	Ar-82/CO2-18 (M21)	0,8
295	forceArc/pulse	G3Si1/G4Si1	Ar-82/CO2-18 (M21)	1,0
296	forceArc/pulse	G3Si1/G4Si1	Ar-82/CO2-18 (M21)	1,2
297	forceArc/pulse	G3Si1/G4Si1	Ar-82/CO2-18 (M21)	1,6
298	forceArc/pulse	G3Si1/G4Si1	Ar-90/CO2-10 (M20)	0,8
299	forceArc/pulse	G3Si1/G4Si1	Ar-90/CO2-10 (M20)	1,0
300	forceArc/pulse	G3Si1/G4Si1	Ar-90/CO2-10 (M20)	1,2
301	forceArc/pulse	G3Si1/G4Si1	Ar-90/CO2-10 (M20)	1,6
302	forceArc/forceArc puls	CrNi 19 12 3 Nb/1.4576	Ar-97,5/CO2-2,5 (M12)	0,8
303	forceArc/forceArc puls	CrNi 19 12 3 Nb/1.4576	Ar-97,5/CO2-2,5 (M12)	1,0
304	forceArc/forceArc puls	CrNi 19 12 3 Nb/1.4576	Ar-97,5/CO2-2,5 (M12)	1,2
305	forceArc/forceArc puls	CrNi 19 12 3 Nb/1.4576	Ar-97,5/CO2-2,5 (M12)	1,6
306	forceArc/forceArc puls	CrNi 18 8/1.4370	Ar-97,5/CO2-2,5 (M12)	0,8
307	forceArc/forceArc puls	CrNi 18 8/1.4370	Ar-97,5/CO2-2,5 (M12)	1,0
308	forceArc/forceArc puls	CrNi 18 8/1.4370	Ar-97,5/CO2-2,5 (M12)	1,2
309	forceArc/forceArc puls	CrNi 18 8/1.4370	Ar-97,5/CO2-2,5 (M12)	1,6
310	forceArc/forceArc puls	CrNi 19 12 3/1.4430	Ar-97,5/CO2-2,5 (M12)	0,8
311	forceArc/forceArc puls	CrNi 19 12 3/1.4430	Ar-97,5/CO2-2,5 (M12)	1,0
312	forceArc/forceArc puls	CrNi 19 12 3/1.4430	Ar-97,5/CO2-2,5 (M12)	1,2
313	forceArc/forceArc puls	CrNi 19 12 3/1.4430	Ar-97,5/CO2-2,5 (M12)	1,6
314	forceArc/forceArc puls	CrNi 22 9 3a/1.4462	Ar-97,5/CO2-2,5 (M12)	0,8
315	forceArc/forceArc puls	CrNi 22 9 3a/1.4462	Ar-97,5/CO2-2,5 (M12)	1,0
316	forceArc/forceArc puls	CrNi 22 9 3a/1.4462	Ar-97,5/CO2-2,5 (M12)	1,2

JOB no.	Processes	Material	Gas	Diameter [mm]
317	forceArc/forceArc puls	CrNi 22 9 3a/1.4462	Ar-97,5/CO2-2,5 (M12)	1,6
319	forceArc/forceArc puls	CrNi 25 20/1.4842	Ar-97,5/CO2-2,5 (M12)	1,0
320	forceArc/forceArc puls	CrNi 25 20/1.4842	Ar-97,5/CO2-2,5 (M12)	1,2
323	forceArc/forceArc puls	CrNi 22 12/1.4829	Ar-97,5/CO2-2,5 (M12)	1,0
324	forceArc/forceArc puls	CrNi 22 12/1.4829	Ar-97,5/CO2-2,5 (M12)	1,2
326*	coldArc/coldArc puls	CrNi 19 12 3 Nb/1.4576	Ar-97,5/CO2-2,5 (M12)	0,8
327*	coldArc/coldArc puls	CrNi 19 12 3 Nb/1.4576	Ar-97,5/CO2-2,5 (M12)	1,0
328*	coldArc/coldArc puls	CrNi 19 12 3 Nb/1.4576	Ar-97,5/CO2-2,5 (M12)	1,2
329*	coldArc/coldArc puls	CrNi 19 12 3 Nb/1.4576	Ar-97,5/CO2-2,5 (M12)	1,6
330*	coldArc/coldArc puls	CrNi 18 8 Mn/1.4370	Ar-97,5/CO2-2,5 (M12)	0,8
331*	coldArc/coldArc puls	CrNi 18 8 Mn/1.4370	Ar-97,5/CO2-2,5 (M12)	1,0
332*	coldArc/coldArc puls	CrNi 18 8 Mn/1.4370	Ar-97,5/CO2-2,5 (M12)	1,2
333*	coldArc/coldArc puls	CrNi 18 8 Mn/1.4370	Ar-97,5/CO2-2,5 (M12)	1,6
334*	coldArc/coldArc puls	CrNi 19 12 3/1.4430	Ar-97,5/CO2-2,5 (M12)	0,8
335*	coldArc/coldArc puls	CrNi 19 12 3/1.4430	Ar-97,5/CO2-2,5 (M12)	1,0
336*	coldArc/coldArc puls	CrNi 19 12 3/1.4430	Ar-97,5/CO2-2,5 (M12)	1,2
337*	coldArc/coldArc puls	CrNi 19 12 3/1.4430	Ar-97,5/CO2-2,5 (M12)	1,6
338*	coldArc/coldArc puls	CrNi 22 9 3/1.4462/Duplex	Ar-97,5/CO2-2,5 (M12)	0,8
339*	coldArc/coldArc puls	CrNi 22 9 3/1.4462/Duplex	Ar-97,5/CO2-2,5 (M12)	1,0
340*	coldArc/coldArc puls	CrNi 22 9 3/1.4462/Duplex	Ar-97,5/CO2-2,5 (M12)	1,2
341*	coldArc/coldArc puls	CrNi 22 9 3/1.4462/Duplex	Ar-97,5/CO2-2,5 (M12)	1,6
359	wiredArc/wiredArc puls	G3Si1/G4Si1	Ar-82/CO2-18 (M21)	1,0
360	wiredArc/wiredArc puls	G3Si1/G4Si1	Ar-82/CO2-18 (M21)	1,2

* Active for the alpha Q machine series only.

12 Appendix B

12.1 Overview of EWM branches

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 Plants

 Branches

 Liaison office

● More than 400 EWM sales partners worldwide