Operating instructions

EN

Control

L1.01 - Expert 2.0
L1.02 - Expert 2.0

099-00L100-EW501 | Observe additional system documents! | 05.10.2016

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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1 Contents

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.

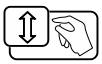
☞ ***Special technical points which users must observe.***

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.

2.1.1 Explanation of icons

Symbol	Description
	Indicates technical aspects which the user must observe.
	Switch off machine
	Switch on machine
	Wrong
	Correct
	Menu entry
	Navigating the menu
	Exit menu
	Time representation (e.g.: wait 4 s/activate)
	Interruption in the menu display (other setting options possible)
	Tool not required/do not use
	Tool required/use

Symbol	Description
	Activate and release/tap/tip
	Release
	Press and keep pressed
	Switch
	Turn
	Numerical value – adjustable
	Signal light lights up in green
	Signal light flashes green
	Signal light lights up in red
	Signal light flashes red

2.2 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.

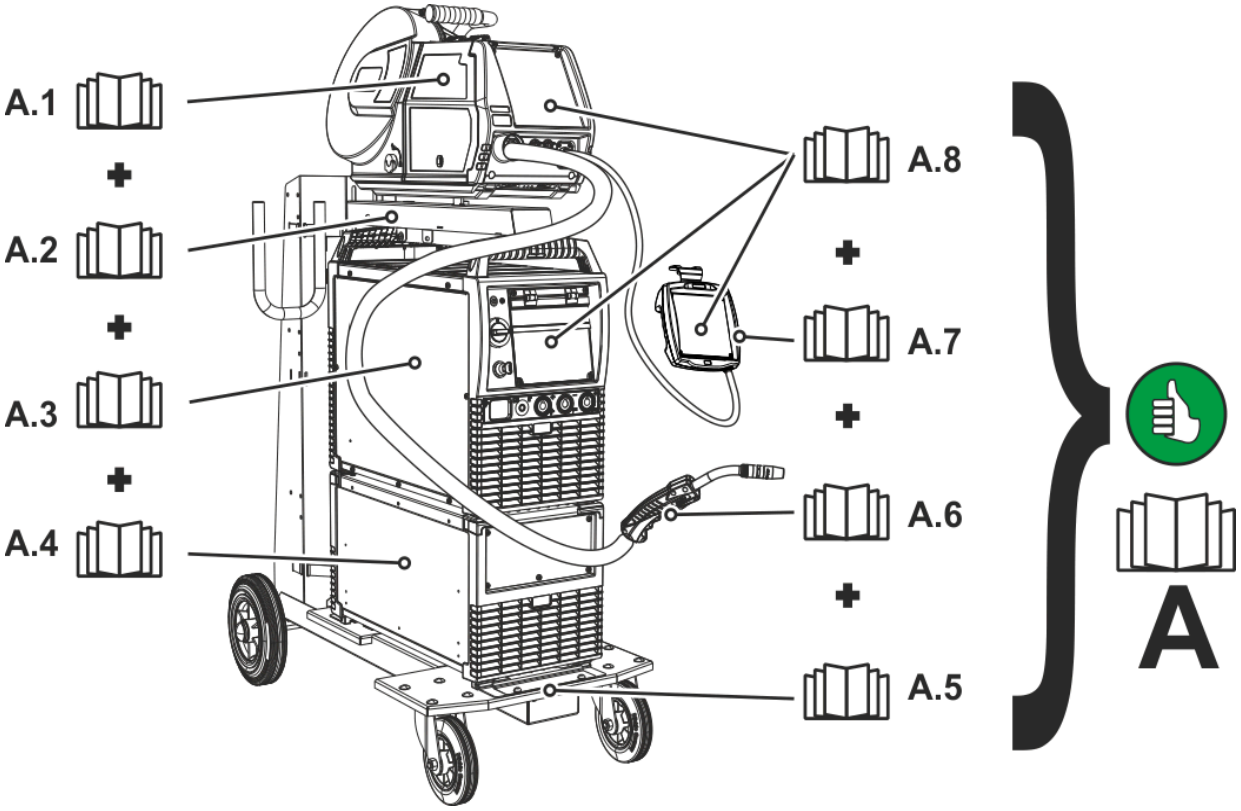


Figure 2-1

Item	***Documentation***
A.1	Wire feeder
A.2	Conversion instructions
A.3	Power source
A.4	Cooling unit, voltage converter, tool box etc.
A.5	Trolley
A.6	Welding torch
A.7	Remote control
A.8	Control
A	Complete documentation

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!

3.1 Use and operation solely with the following machines

This description may only be applied to machines with the Expert 2.0 machine control.

3.2 Applications

Machine series	Main process							Secondary process		
	Standard MIG/MAG welding				Pulsed MIG/MAG welding					
	forceArc	rootArc	coldArc	pipeSolution	forceArc puls	rootArc puls	coldArc puls	TIG welding (lift arc)	MMA welding	Gouging
alpha Q puls MM	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
Phoenix puls MM	☑	☑	☐	☐	☑	☑	☐	☑	☑	☑
Taurus Synergic S MM	☑	☑	☐	☐	☐	☐	☐	☑	☑	☑

☑ possible
☐ not possible

3.3 Documents which also apply

- Operating instructions for the connected welding machines
- Documents of the optional expansions

3.4 Machine variants

Welding machine control	Expert 2.0	Expert 2.0 LG	Expert 2.0 WLG
Description	No network connection	Version with LAN	Version with LAN and Wi-Fi

3.5 Software version

These instructions apply to the following software version:
0.0.7.1

☞ ***The machine control software version is shown on the screen during the start process > see 4.1.4 chapter.***

4 Quick overview

4.1 Machine control – Operating elements

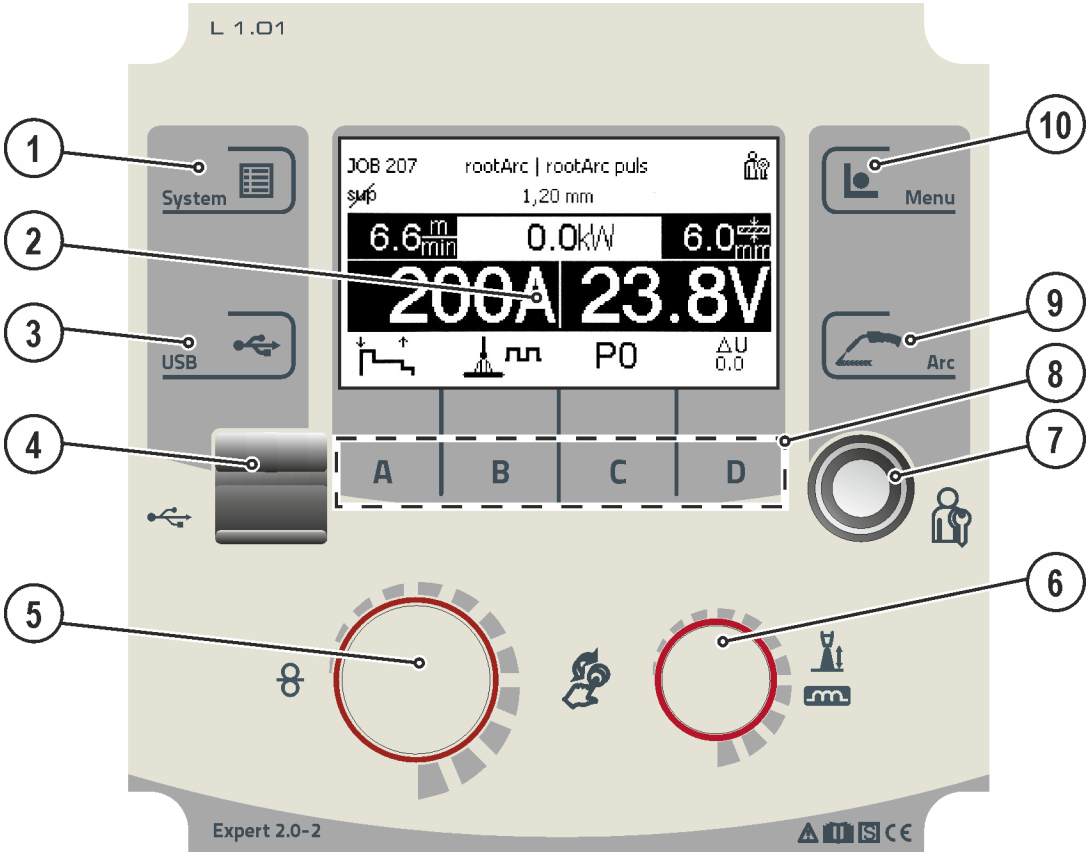


Figure 4-1

Item	Symbol	Description
1		**System push-button** To display and configure the system settings > *see 5.4 chapter*.
2		**Machine display** Graphical machine display showing all machine functions, menus and parameters with their values > *see 4.1.2 chapter*.
3		**USB push-button** To use and configure the USB interface > *see 5.5 chapter*.
4		**USB interface for offline data transfer** Connection for storage medium with a USB interface and without independent power supply (flash drives, in particular).
5		**Control button** Central control button to be pressed or turned > *see 5.1 chapter*.
6		**Control button for arc length correction/choke effect (arc dynamics)** Control button for operation of the parameters by pressing and turning. Press: Switch between parameters. Turn: Set the parameter values.
7		**Interface (Xbutton)** Welding access based on user-defined rights to protect against unauthorised use > *see 5.4.2 chapter*.
8	A B C D	**Context-dependent push-button** > *see 5.3 chapter*

Item	Symbol	Description
9		**Arc push-button** This push-button has a double function: • Initial state of main screen: Switching of the welding procedure based on the selected material, gas and welding consumable. • Initial state of any sub-menu: Display switches back to the main screen.
10		**Menu push-button** To organise welding tasks and configure process parameters.

4.1.1 Screen icons

Symbol	Description
	**Shielding gas**
	**Material type**
	**Wire inching**
	**Wire return**
	**Advanced settings**
	**Setup mode**
	**Non-latched operating mode**
	**Special non-latched operating mode**
	**Latched operating mode**
	**Special latched operating mode**
JOB	**Welding task**
sup	**superPuls**
sup	**superPuls switched off**
	**Interference**
	**Temperature error**
	**Spot welding operating mode**
	**Material thickness**
	**Blocked** The function selected is not available with the current rights. Check access rights.
	**Wire feed speed**
	**Arc length correction**
kW	**Welding power**
P	**Program (P0-P15)** P0:--------With decompact machines, welding parameters for program 0 (P0) are configured at the wire feeder control (ex works). To be able to configure these parameters at the Expert 2.0 control, the "P0 configurable by Expert 2.0" parameter has to be set to "Yes" > *see 5.4.6 chapter*. P1-15 ----Welding parameters can be configured at any control connected to the system.
	**Warning** Indicates a possible interference in the near future
	**Wired local network (LAN)**
	**Wireless local network (WiFi)**

Symbol	Description
	**User logged in**
	**Not possible – check priorities**
	**Xbutton login**
	**Xbutton logoff**
	**Arc dynamics**
	**Xbutton version number not known**
	**Cancel operation**
	**Confirm operation**
	**Wire diameter (welding consumable)**
	**Menu navigation** Skip back to previous menu
	**Menu navigation** Expand the display contents.
	**Save data to USB medium**
	**Load data from USB medium**
	**USB data recording**
	**Screen type 3/4 switching buttons**
	**Pulse arc welding**
	**Standard arc welding**
	**Welding procedure**
	**Refresh**
	**After welding, the values used last (hold values) are shown from the main program.**
	**Information**

4.1.2 Machine display

The machine display shows all the information relevant to the user as text and/or graphics.

4.1.2.1 Actual values, nominal values, hold values

Parameter	Before welding	During welding		After welding	
	Nominal value	Actual value	Nominal value	Hold value	Nominal value
Welding current	☑	☑	☐	☑	☐
Material thickness	☑	☐	☑	☐	☑
Wire feed speed	☑	☑	☐	☑	☐
Welding voltage	☑	☑	☐	☑	☐

4.1.3 Main screen

The main screen shows all the information relevant for the welding process before, while and after it is carried out. In addition, it shows status information on the machine state. The assignment of the context-dependent push-buttons is also shown on the main screen.

The user can choose between different main screens > *see 4.1.3.1 chapter*.

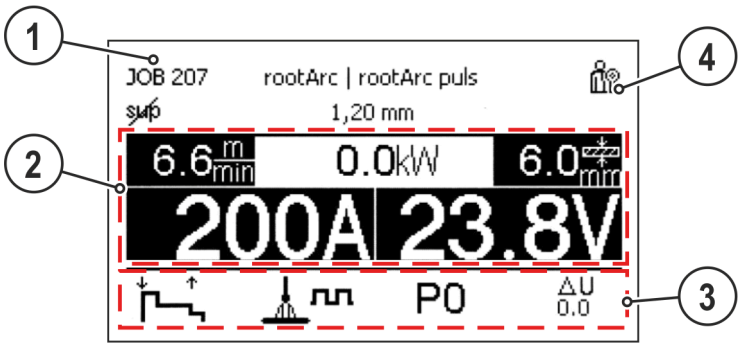


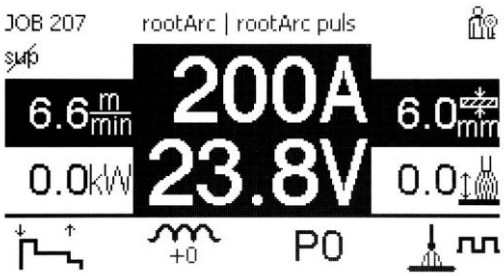
Figure 4-2

Item	Symbol	Description
1		**Information on the welding task selected** JOB number, process etc.
2		**Display area for welding data** Welding current, welding voltage, wire feed speed, material thickness etc.
3		**Display area for process parameters** Operating mode, voltage correction, program, welding method etc.
4		**Display area for system status** Network status, error status etc.

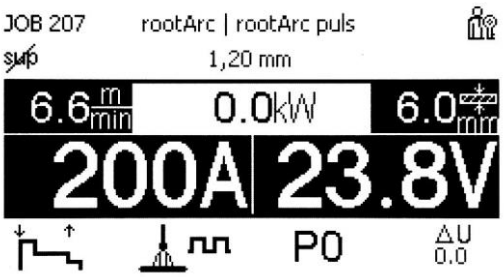
By pressing push-button A for a prolonged time (on the operating mode main screen) it is possible to directly switch to the program sequence.

4.1.3.1 Main screen variants

Main screen type 1



Main screen type 2 (ex works)



Main screen type 3

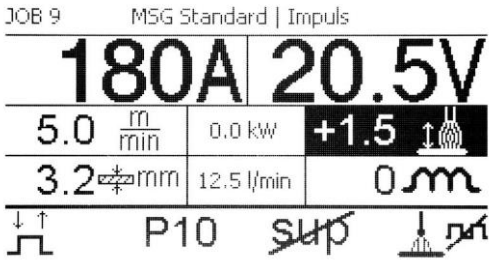


Figure 4-3

You can select the required variant (type of main screen) in the Machine configuration (system) menu > *see 5.4.6 chapter*.

4.1.4 Initial screen

During the start process the control name, machine software version and selected language are shown on the screen.

Figure 4-4

Item	Symbol	Description
1		**Machine control name**
2		**Progress bar** Shows the load progress during the start process.
3		**Advanced settings** Display and setting of advanced system parameters > *see 4.1.4.1 chapter*
4		**Indication of the system language selected** The system language can be changed during the start process > *see 4.1.4.2 chapter*.
5		**Control software version**

4.1.4.1 Basic settings for operation with two wire feeders (P10)

The setting is available/required in the following cases only:

- the control is integrated in the wire feeder
- the control is integrated in the power source (compact design)

Menu item/parameter	Value	Comment
DVX (single)	0	
DVX-Unit 1 (master)	1	
DVX-Unit 2 (slave)	2	

With single unit operation (P10 = 0) a second wire feeder may not be connected!

- Remove any connections to the second wire feeder

With double unit operation (P10 = 1 or 2) both wire feeders have to be connected and be set up for this operation at the control with different configurations.

- Configure one wire feeder as master (P10 = 1)
- Configure the other wire feeder as slave (P10 = 2)

Access control

If one of the wire feeders in the welding system is equipped with an access control key switch, it has to be configured as master (P10 = 1). With double unit operation, if more than one wire feeder is equipped with an access control key switch, either one can be configured as master. The wire feeder configured as master is active as soon as the welding machine has been switching on. There are no other functional differences between the wire feeders.

4.1.4.2 Change system language

During the start process the user can select or change the system language at the machine control.

- Switch the machine off and on again.
- Press the context-dependent push-button [D] during the start phase (the word MULTIMATRIX is displayed).
- Select the required language by turning the control button.
- Confirm the selected language by pressing the control button (the user can exit the menu by pressing the context-dependent push-button [A] without making any changes).

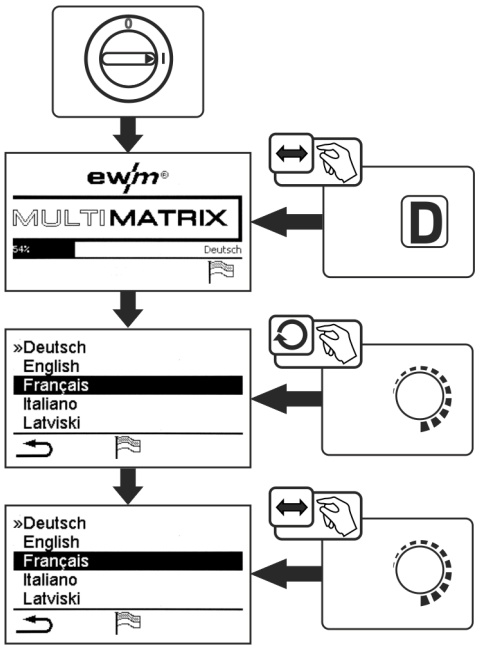


Figure 4-5

5 Operating the machine control

In general the control is operated with the central control button below the machine display.

Select the required menu item by turning (navigate) and pressing (confirm) the central control button. In addition, the context-dependent push-buttons below the machine display can be used for confirmation.

5.1 Central control button

By turning this button the user can navigate the different menu items and parameters. The inverted display of the selected menu item or parameter indicates the selection.. By pressing the button the menu item or parameter is selected. Repeated turning of the button changes the selected parameter values. Pressing the button again will return the user to the navigation.

By pressing the Arc push-button the user can return to the welding parameter display at any time.

5.2 Direct access keys

Several push-buttons on the right and left of the display can be used to directly access the most important menus.

5.3 Context-dependent push-buttons

The bottom push-buttons are so-called context-dependent operating elements. The selection options of these buttons depend on each screen content.
If the ⮌ icon is shown on the display the user can skip back to the previous menu item (often assigned to the [A] push-button).

5.4 Machine configuration (system)

In the System menu the user can set the basic machine configuration.

Enter the menu:

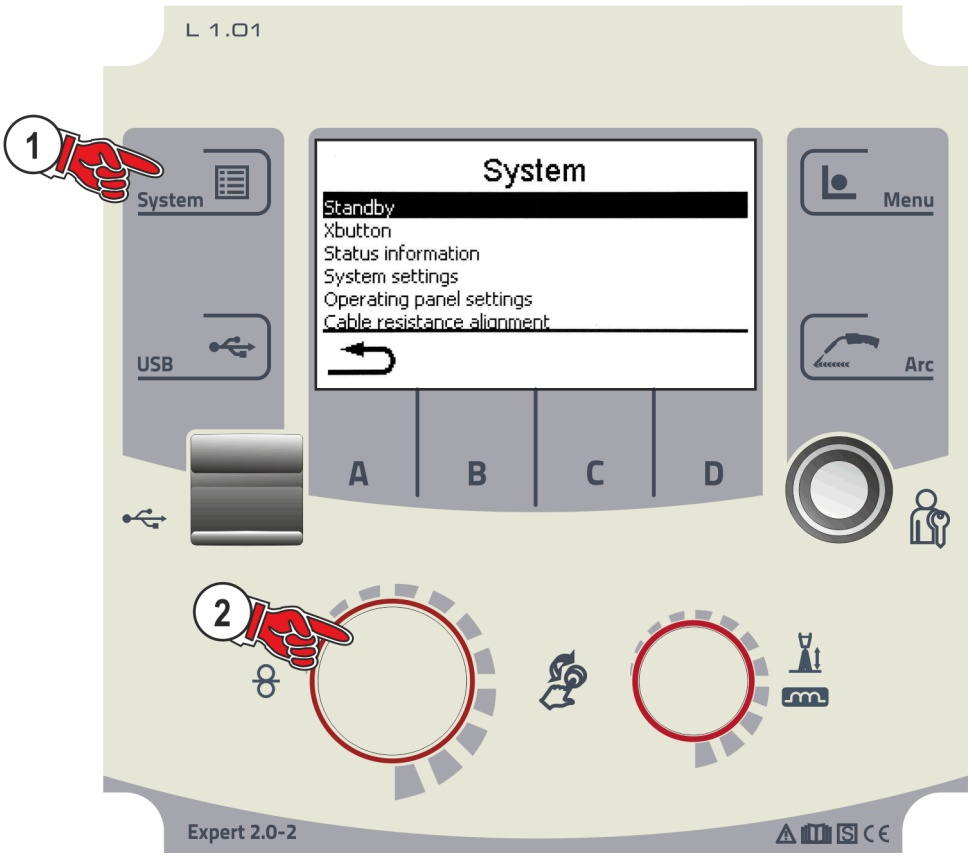


Figure 5-1

5.4.1 Power-saving mode (Standby)

There are three options to activate the power-saving mode:

1. Direct activation by prolonged pressing of the button at the wire feeder control (decompact machines).
2. Direct activation by selecting the "Trigger at once" menu item at the Expert 2.0 machine control.
3. Activation via a configurable parameter in the configuration menu (time-dependent power-saving mode).

When the power-saving mode is active the Expert 2.0 machine control display is dimmed and the wire feeder displays only show the digit in the middle.

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

Menu item/parameter	Value	Comment
Trigger at once	Yes	When confirmed, the machine enters power-saving mode at once.
	No	No change
Time automatic [min.]	Off	Function switched off
	5–60	Time to activation of the power-saving mode in case of inactivity.
Log off user in standby mode	Yes	The user will be logged off when the power-saving mode is active.
	No	The user will not be logged off when the power-saving mode is active.

5.4.2 Access permission (Xbutton)

The welding system offers two options to prevent unauthorised access to welding parameters or unintentional reconfiguration.

1 Key switch (available depending on machine version). With the key switch in position 1 all functions and parameters can be configured without any restriction. In position 0 certain predefined welding parameters or functions cannot be modified (see relevant documentation).

2 Xbutton. With this function, permissions can be assigned to users to access those areas of the machine control defined for them. To do so, the user needs a digital key (Xbutton) to log on to the machine via the Xbutton interface. The key itself is configured by the system user (welding supervisor).

If the Xbutton function is activated, the key switch/key switch function is deactivated.

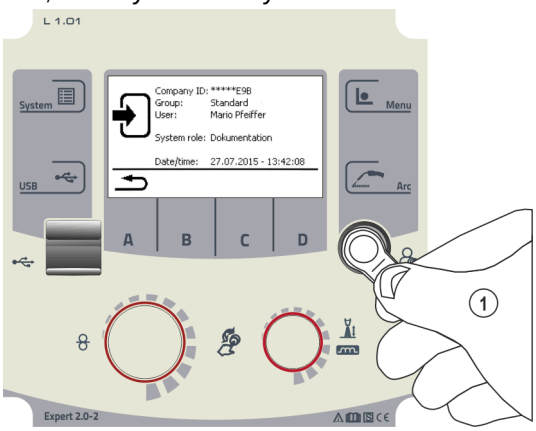


Figure 5-2

To activate Xbutton rights follow these instructions:

1. Set key switch to position "1".
2. Log on with a Xbutton and administrator rights.
3. Set menu option "Xbutton rights active" to "yes".

By following these instructions you make sure not to inadvertently block your access while not owning an Xbutton with administrator rights.

5.4.2.1 User information

User information such as company ID, user name, group etc. are shown.

5.4.2.2 Activating the Xbutton rights

Menu navigation:

Menu item/parameter	Value	Comment
Xbutton rights active:	Yes	Access rights active
	No	Key switch active
Reset Xbutton configuration:	Yes	Company ID, group and access rights when logged off will be reset to the factory settings. Xbutton rights will be deactivated.
	No	

5.4.3 Status information

This menu provides the user with information on current system interferences and warnings..

5.4.3.1 Errors and warnings

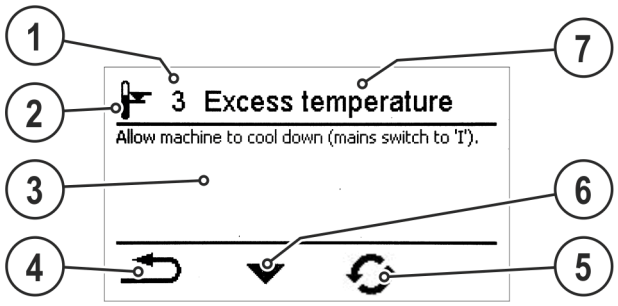


Figure 5-3

Item	Symbol	Description
1		**Error number** ***> see 7.2 chapter***
2		**Error icons** ⚠ ------- Warning (prior to interference) ϟ -------- Interference (welding process will be stopped) ------- Specific (e.g. temperature error)
3		**Long error description**
4		**Menu navigation** Skip back to previous menu
5		**Reset message** The message can be reset
6		**Menu navigation (if available)** Scroll to next page or message
7		**Error name**

5.4.3.2 Running time

Menu item/parameter	Value	Comment
Duty cycle can be reset:	0:00 h	Values can be reset by pressing or turning the main control button
Arc time can be reset:	0:00 h	
Overall duty cycle:	0:00 h	
Overall arc time:	0:00 h	

5.4.3.3 System components

A list of all components available in the system is displayed, along with ID number, software version and name.

5.4.4 System settings

In this area the user can configure advanced system settings.

5.4.4.1 Date

Menu item/parameter	Value	Comment
Year:	2014	
Month:	10	
Day:	28	
Date format:	DD.MM.YYYY	
	YYYY.MM.DD	

5.4.4.2 Time

Menu item/parameter	Value	Comment
Hour:	0–24	
Minute:	0–59	
Time zone (UTC +/-):	-12h to +14h	
Summer time:	Yes	
	No	
Time format:	24 h	
	12 h AM/PM	

5.4.4.3 Water block

Permanently switching off the water block may damage the welding torch.

Menu item/parameter	Value	Comment
Cooling unit postflow time [min.]:	1–63	
Cooling unit control:	Automatic	
	Permanently ON	
	Permanently OFF	

5.4.4.4 Special parameter

The special parameters of the wire feeder control are used to customize the machine function configuration.

The number of selectable special parameters can deviate between the machine controls used in the welding system. A detailed description of the special parameters can be found in the wire feeder operating instructions.

It may be required to restart the machine in order to apply a parameter change.

Systems with two wire feeder controls show the parameters of the active wire feeder only (special parameter U1 or special parameter U2).

Menu item/parameter	Value	Comment
P1: Wire inching ramp time	1–0	
P2: Block program P0	0–1	
P3: U/down torch display mode	0–1	
P7: Correction operation	0–1	
P8: Program switching	0–1	
P9: Tapping start for latched and special latched operation	0–1	
P11: Special latched tapping time	0–1	
P12: JOB list switching	1–2	
P13: JOB range lower limit	129	
P14: JOB range upper limit	169	
P16: JOB batch mode	0–1	
P17: Program selection using torch trigger	0–1	
P20: Pulse in program A	1–0	
Reset to factory setting:	No	
	Yes	All special parameters are reset to the applicable factory setting.

5.4.5 Xnet machine

The Xnet machine defines the system component required for operating the Xnet system as part of the Expert 2.0 Net/Gateway to connect to power sources or to record welding data.

5.4.5.1 Clear system memory

Resets the internal system memory used for saving welding and log data and deletes all data.

☞ ***All welding data recorded so far, which have not been transferred to the Xnet server via flash drive or network connection, will be permanently deleted.***

5.4.5.2 Reset to factory settings

All machine configuration data relating to Xnet will be reset to the factory setting. The system memory data will not be affected, i.e. any welding or log data recorded will be saved.

5.4.6 Operating panel settings

Menu item/parameter	Value	Comment
Main screen	1-2	
Autom. selection of welding power	Off–30 s	
Display brightness:	0–100%	
Display contrast:	0–100%	
Display negative:	No	
	Yes	
Non-latched operation available	No	
	Yes	
Latched operation available	No	
	Yes	
Special non-latched operation available	No	
	Yes	
Spot welding selectable available	No	
	Yes	
Special latched operation available	No	
	Yes	
P0 of Expert 2.0 can be changed:	No	
	Yes	
Average value display for superPuls:	Yes	When superPuls is enabled the welding power is displayed as average value.
	No	The welding power is displayed by program A even when superPuls is enabled.
Hold function:	On	
	Off	
Language	German	
Reset Expert 2.0 to factory setting	Yes	Only those parameters relevant for Expert 2.0 (e.g. display settings, language and texts) will be reset. System parameters such as Xbutton activation or JOBs are not affected.
	No	

5.4.7 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 correponds 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.

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

- Switch on the welding machine.
- Press the "System" push-button.
- Select the "Cable resistance alignment" parameter using the main control button. 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. To activate the required wire feeder for measurement briefly activate (tap) the torch trigger of this machine.

3 Alignment/Measurement

- Press the "D" push-button.
- Applying slight pressure, put the welding torch with the contact tip against 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 display, then measurement failed. The measurement must be repeated.
- Press the "A" push-button once the measurement has been successful.

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.

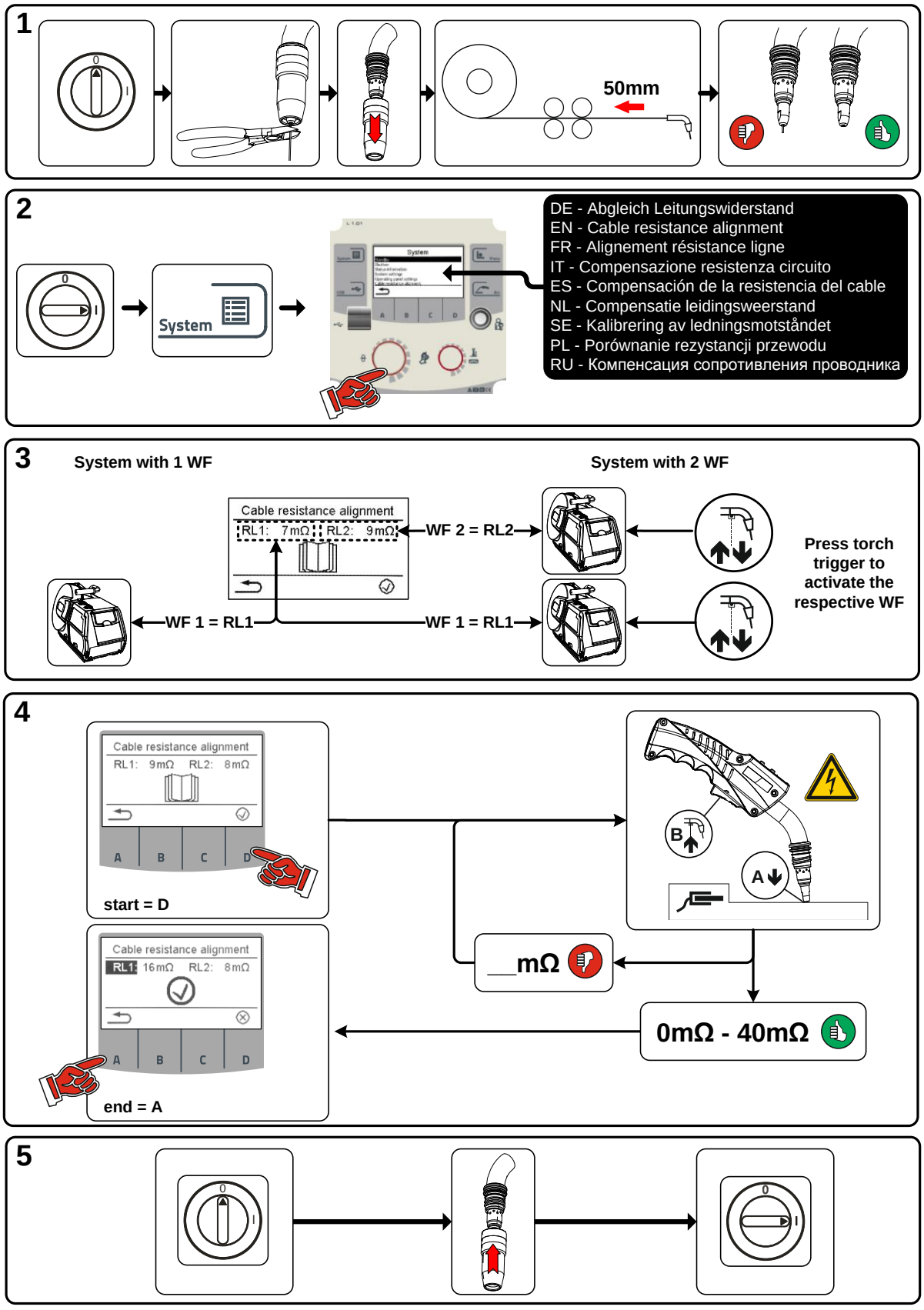

1
50mm
2
System
DE - Abgleich Leitungswiderstand
EN - Cable resistance alignment
FR - Alignement résistance ligne
IT - Compensazione resistenza circuito
ES - Compensación de la resistencia del cable
NL - Compensatie leidingsweerstand
SE - Kalibrering av ledningsmotståndet
PL - Porównanie rezystancji przewodu
RU - Компенсация сопротивления проводника
3
System with 1 WF
System with 2 WF
Cable resistance alignment
RL1: 7mΩ RL2: 9mΩ
WF 2 = RL2
WF 1 = RL1
WF 1 = RL1
Press torch trigger to activate the respective WF
4
Cable resistance alignment
RL1: 9mΩ RL2: 8mΩ
A B C D
start = D
Cable resistance alignment
RL1: 16mΩ RL2: 8mΩ
A B C D
end = A
B
A
__mΩ
0mΩ - 40mΩ
5

Figure 5-4

5.5 Offline data transfer (USB)

☞ ***You may only use this USB interface to exchange data with a USB flash memory. You must not connect any other USB devices such as keyboards, hard disks, mobile telephones, cameras or other devices so as to avoid any damage tp the machine. The interface does not provide any load functions either.***

Using the USB interface, data can be transferred between the machine control and a USB storage medium.

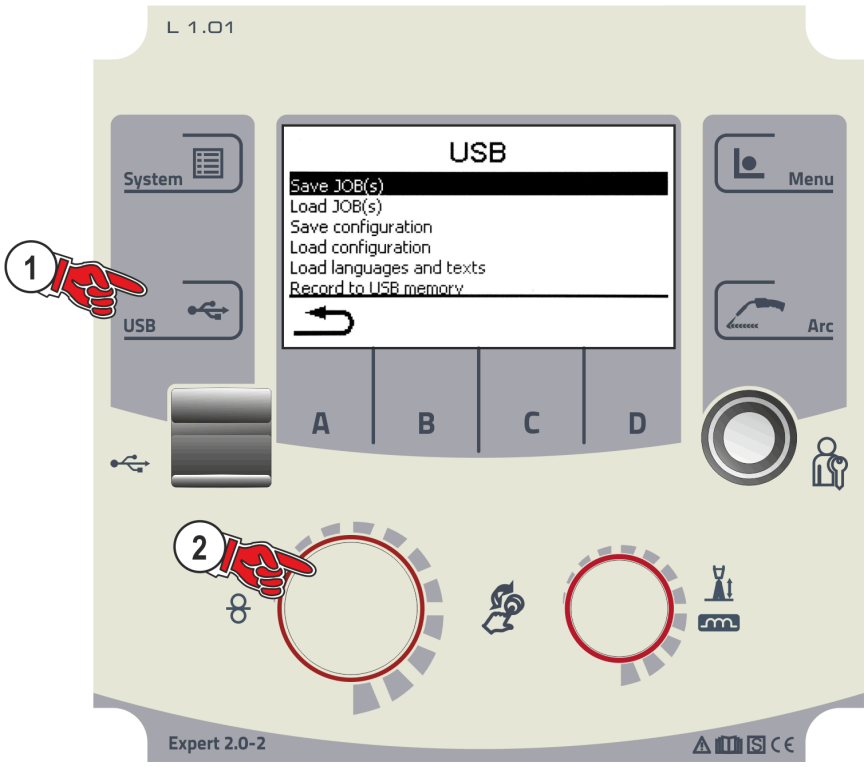


Figure 5-5

5.5.1 Save JOB(s)

Saving a single (JOB) or a range of welding tasks (JOB)s) (from–to) from the welding machine to the storage media (USB).

5.5.2 Load JOB(s)

Loading a single JOB or a range of welding tasks (JOBs) (from–to) from the storage media (USB) to the welding machine.

5.5.3 Save configuration

5.5.3.1 Master configuration

Core date for network communication (independent of machine).

5.5.3.2 Individual configuration

Machine-related configuration data, matching the current power source only.

5.5.4 Load configuration

5.5.4.1 Master configuration

Core date for network communication (independent of machine).

5.5.4.2 Individual configuration

Machine-related configuration data, matching the current power source only.

5.5.5 Load languages and texts

Load a language and text package from the storage medium (USB) to the welding machine.

5.5.6 Record on USB drive

You can record welding data on a storage medium and read or analyse them using the Xnet quality management software when required. For machine variants with network capability (LG/WLG) only!

5.5.6.1 Register USB drive

To identify and allocate the welding data between power source and storage medium the storage medium has to be registered once. This is done by selecting the menu option "Register USB drive" or by starting a data recording process. Successful registration is indicated by a checkmark next to the relevant menu option.

If the storage medium is registered and connected when the power source is being switched on, recording of the welding data starts automatically.

5.5.6.2 Start recording

After confirming the start of data recording the storage medium will be registered (if not registered yet). Data recording starts and is indicated at the main screen by a slow flashing of the icon.

5.5.6.3 Stop recording

To avoid data loss, finish the recording with this menu option before removing the USB drive or switching off the machine.

☞ ***Welding data must be imported into the Xnet quality management software using the XWDImport software. This software is an integral part of the Xnet installation.***

5.6 Welding task administration (Menu)

In this menu the user can carry out all welding task (JOB) organisation operations.

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 9.1 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.

Enter the menu:

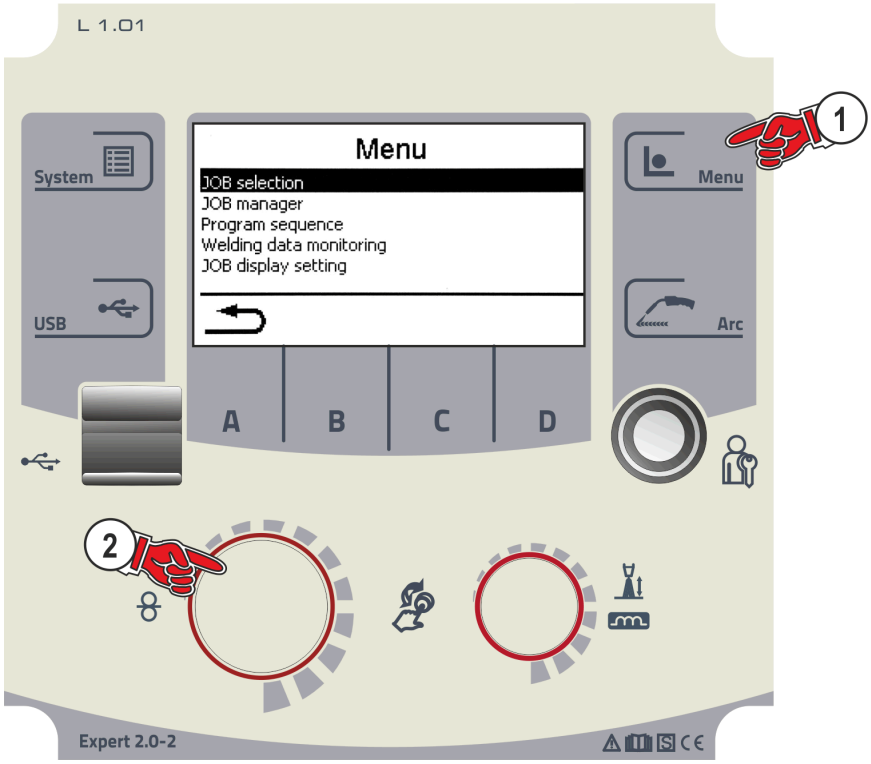


Figure 5-6

5.6.1 JOB selection (material/wire/gas)

The welding task (JOB) can be set in two ways:

a) Enter the relevant JOB number. Each welding task has a unique, three-digit JOB number (for predefined JOBs > *see 9.1 chapter* see the JOB list in the annex or the sticker on the machine).

b) Enter the basic welding parameters: welding procedure, material type, wire diameter and shielding gas type.

5.6.2 JOB manager

5.6.2.1 Copy JOB to number

Copy JOB to a number of the definable range (129–169).

5.6.2.2 Reset current JOB

Reset all parameters of the selected JOB to the factory setting

5.6.2.3 Reset all JOBs

Reset all JOBs to the factory setting, except JOBs in the definable range (129–169).

5.6.3 Program sequence

☞ ***The setting range for the parameter values are summarised in the parameter overview section > see 8.1 chapter.***

In the program sequence, you can select welding parameters and set their values. The number of parameters shown depends on the selected operating mode.
In addition, the user can access advanced settings and the setup mode.

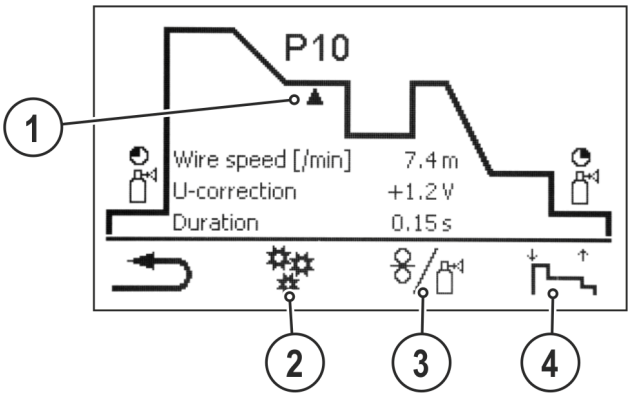


Figure 5-7

Item	Symbol	Description
1	▲	**Parameter position** Displays the currently selected welding parameters in the functional sequence
2		**Advanced settings** Display and setting of advanced process parameters
3		**Setup mode > *see 5.6.4 chapter***
4		**Operating mode setting**

5.6.3.1 MIG/MAG welding

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.

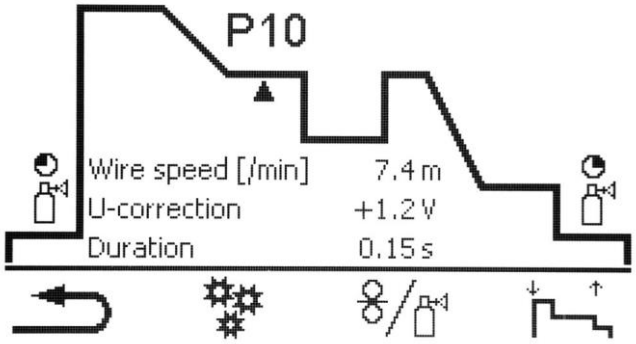


Figure 5-8

☞ ***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 configured using absolute values, if desired (see Absolute value set point). > see 5.6.6 chapter.***

Menu item/parameter	Program	Comment
Gas pre-flow time		
Gas nominal value		GFE option/variant (electronic gas volume control) required
WF relative	P_{START}	Wire feed speed, relative
Duration		Duration (start program)
U correction		Arc length correction
Slope time		Slope duration from P_{START} to P_A
WF (/min.)	P_A	Wire feed speed, absolute
U correction		Arc length correction
Duration		Duration (spot time and superPuls time)
Slope time		Slope duration from P_A to P_B
WF relative	P_B	Wire feed speed, relative
Duration		Duration (reduced main program)
U correction		Arc length correction, relative
Slope time		Slope duration from P_B to P_A
Slope time		Slope duration from P_B to P_{END}
WF relative	P_{END}	Wire feed speed, relative
Duration		Duration (end program)
U correction		Arc length correction, relative
Wire burn-back		
Gas post-flow time		

5.6.3.2 Advanced settings

Menu item/parameter	Value	Comment
Process switching	Off	
	On	
Start program pulsing	Off	
	On	
End program pulsing	Off	
	On	
Wire retraction ignition	Off	
	Lift arc (PP)	
	Lift arc	
End pulse duration	0.0–20 ms	
U correction limit	0.0–9.9 V	Applies with correction operation enabled
Wire correction limit	0–30%	
N cycle program limit	Off	
	2–9	
Slope between programs (/100 ms)	Off	
	0.1–2.0 m/min	
waveArc	Off	
	On	

5.6.3.3 Overview of the welding parameter switching options

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
			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)

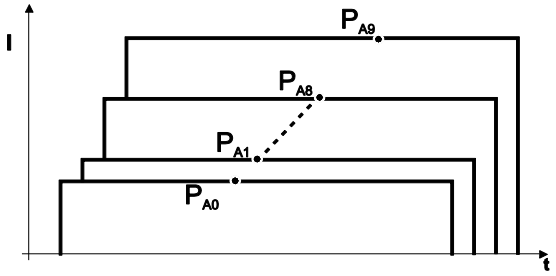


Figure 5-9

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

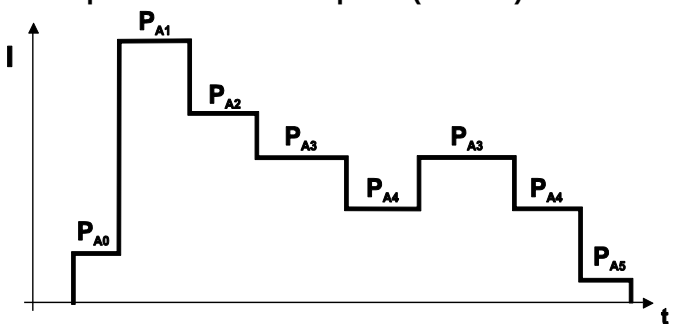


Figure 5-10

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

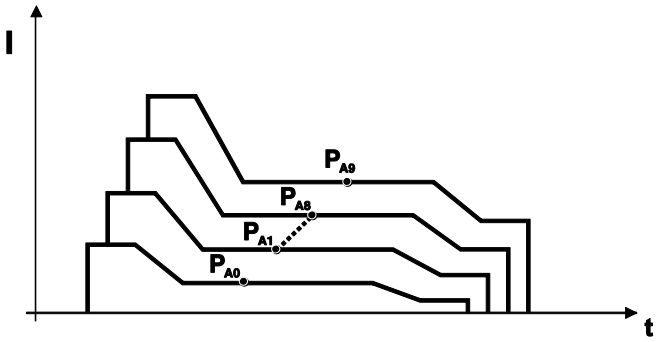


Figure 5-11

☞ ***Up to 16 programs (P_{A0} to P_{A15}) can be defined.***
An operating point (wire speed, arc length correction, dynamics/choke effect) can be defined permanently in each program.
Program P0 is an exception: the settings for operating points are made manually here.
Changes to the welding parameters are saved immediately!

5.6.3.4 TIG welding

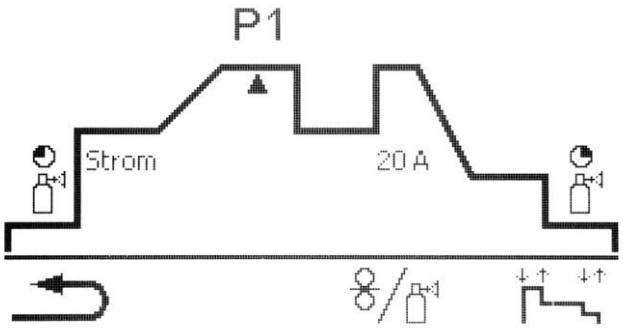


Figure 5-12

Menu item/parameter	Program	Comment
Gas pre-flow time		
Gas nominal value		GFE option/variant (electronic gas volume control) required
Current	P_{START}	Ignition current
Duration		Duration (start program)
Slope time		Slope duration from P_{START} to P_A
Current	P_A	Welding current, absolute
Duration		Pulse time (superPuls)
Slope time		Slope duration from P_A to P_B
Current	P_B	Welding current
Duration		Pulse pause time (superPuls)
Slope time		Slope duration from P_B to P_A
Slope time		Slope duration from P_A to P_{END}
Current	P_{END}	Welding current
Duration		
Gas post-flow time		

5.6.3.5 MMA welding

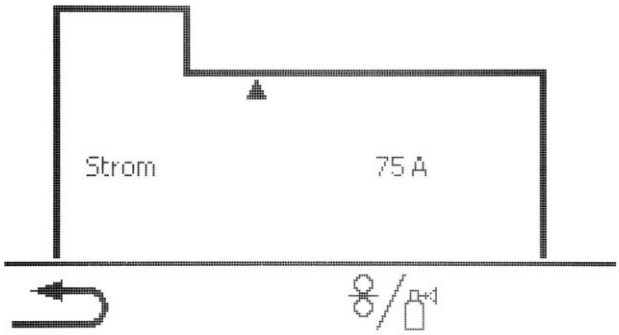


Figure 5-13

Menu item/parameter	Comment
Current	Hot start current
Duration	Hot start time
Current	Main current

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

5.6.4 Setup mode

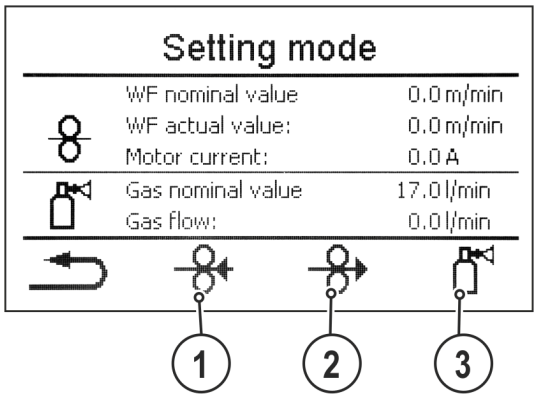


Figure 5-14

Item	Symbol	Description
1		**Wire return** Results in reverse inching of the wire. Pressing the push-button longer will increase the wire reversing speed.
2		**Wire inching** The wire is inched into the hose package. Pressing the push-button longer will increase the wire inching speed.
3		**Push-button gas test / rinse hose package**

All functions run without current (set-up phase). This provides a high degree of safety for the welder, since the arc cannot be inadvertently ignited. The following parameters can be monitored during the wire configuration:

Menu item/parameter	Value	Comment
WF nominal value	0.0 m/min	only if the control is integrated in the wire feeder
WF actual value	0.0 m/min	
Motor current	0.0 A	
Gas nominal value	0.0 l/min	GFE option/variant (electronic gas volume control) required
Gas flow	0.0 l/min	

5.6.5 Welding data monitoring

The welding data monitoring parameters are used by an external monitoring device.

Menu item/parameter	Value	Comment
Voltage tolerance	0–100%	
Current tolerance	0–100%	
Tolerance response time	0.00–20.0 s	For voltage and current tolerance
WF tolerance:	0–100%	
Max. permissible motor current:	0.0-5.0 A	
Tolerance response time	0.00–20.0 s	For WF tolerance and motor current

5.6.6 JOB display setting

Menu item/parameter	Value	Comment
Text for material:	Standard	
	Alternative	
Diameter unit:	mm	
	inch	
Text for gas:	Standard	
	Alternative	
Absolute value set point:	Yes	Ignition current, secondary current and end current are set and displayed as absolute values
	No	Ignition current, secondary current and end current are defined and displayed as a percentage of program A (ex works)

5.7 Change welding procedure (Arc)

In this menu the user can change the welding procedure based on the preselected material, wire and gas (change of process based on welding task).

For changing the welding task (JOB) *> see 5.6 chapter*

Enter the menu:

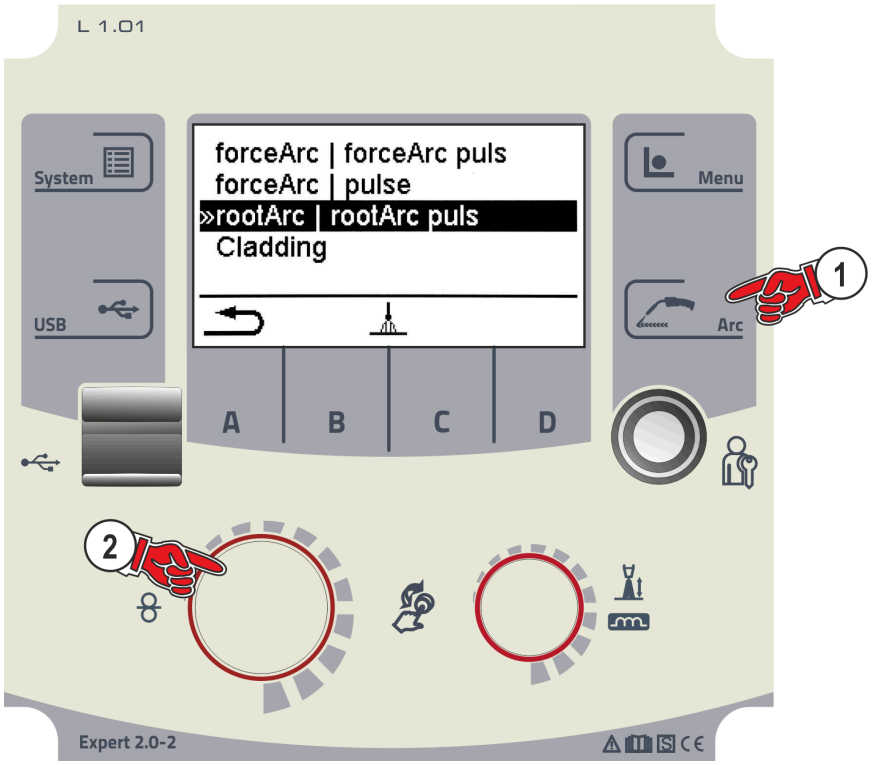


Figure 5-15

5.8 Online data transfer (network)

☞ ***For machine variants with network capability (LG/WLG) only!***

The network is used to transfer welding data from manual, automated and robot welding machines. It can include as many welding machines and computers as require and the collected data can be retrieved from one or several server PCs.

The Xnet software allows the user to monitor all welding parameters in real time and/or to subsequently analyse the saved welding data. The results can be used for process optimisation, welding calculations or checking welding wire batches.

Depending on the welding machine the data are transferred to the server via LAN/WiFi and can then be accessed in a browser window. The user interface and web-based design of the software offer the possibility to analyse and monitor the welding data via a tablet PC.

5.8.1 Wired local network (LAN)

LAN status:

Status description	Status display Expert 2.0	LED LAN status (LAN/LAN gateway)
No physical connection to a network	LAN icon deactivated	Off
Connection to the network, the machine has been configured, no data transfer	LAN icon activated	Green, permanently illuminated
Connection to the network, the machine has been configured and transfers data	LAN icon flashing	Green, flashes with 1 Hz
Connection to the network, the machine has been configured and tries to connect to the data server	LAN icon flashing in the specified rhythm	Green, flashing in the following rhythm: 1 s off, 0.2 s on

5.8.2 Wireless local network (WiFi)

WiFi status:

Status description	Status display Expert 2.0	LED WiFi status (LAN/WiFi gateway)
No physical connection to a network	WiFi icon deactivated	Off
Connection to a network, no data transfer	WiFi icon activated	Permanently on
Connection to a network, transferring data	WiFi icon flashing	Flashing with 1 Hz
Connection to the network, the machine has been configured and tries to connect to the data server	LAN icon flashing in the specified rhythm	Green, flashing in the following rhythm: 1 s off, 0.2 s on

6 Welding procedure

The welding task is selected in the JOB selection menu (material/wire/gas) > *see 5.6.1 chapter*.

The basic settings of the relevant welding procedure, such as operating mode or arc length correction, can be selected on the main screen on the process parameter panel > *see 4.1.3 chapter*.

The program sequence settings are set in the program sequence menu > *see 5.6.3 chapter*.

6.1 MIG/MAG welding

6.1.1 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).***

6.1.1.1 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

Non-latched mode

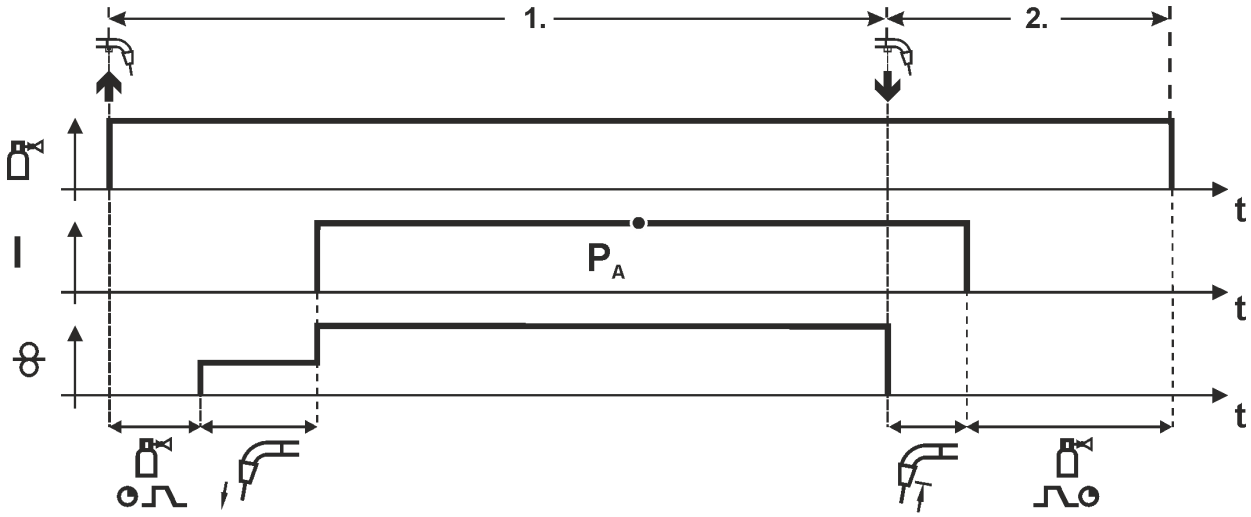


Figure 6-1

Step 1

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

Step 2

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

Non-latched operation with superpulse

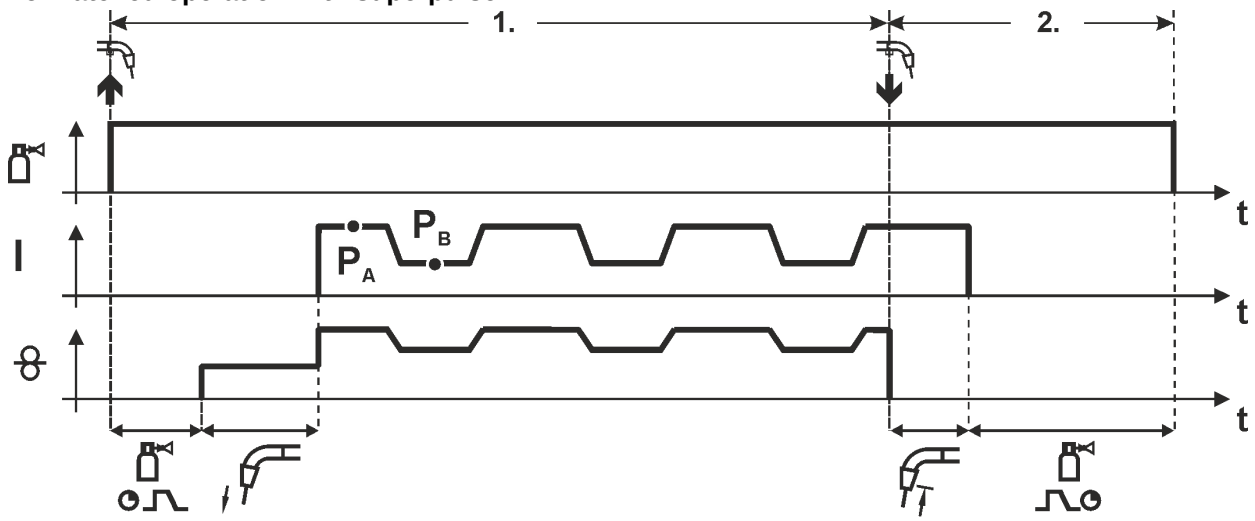


Figure 6-2

Step 1

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

Step 2

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

Special, non-latched

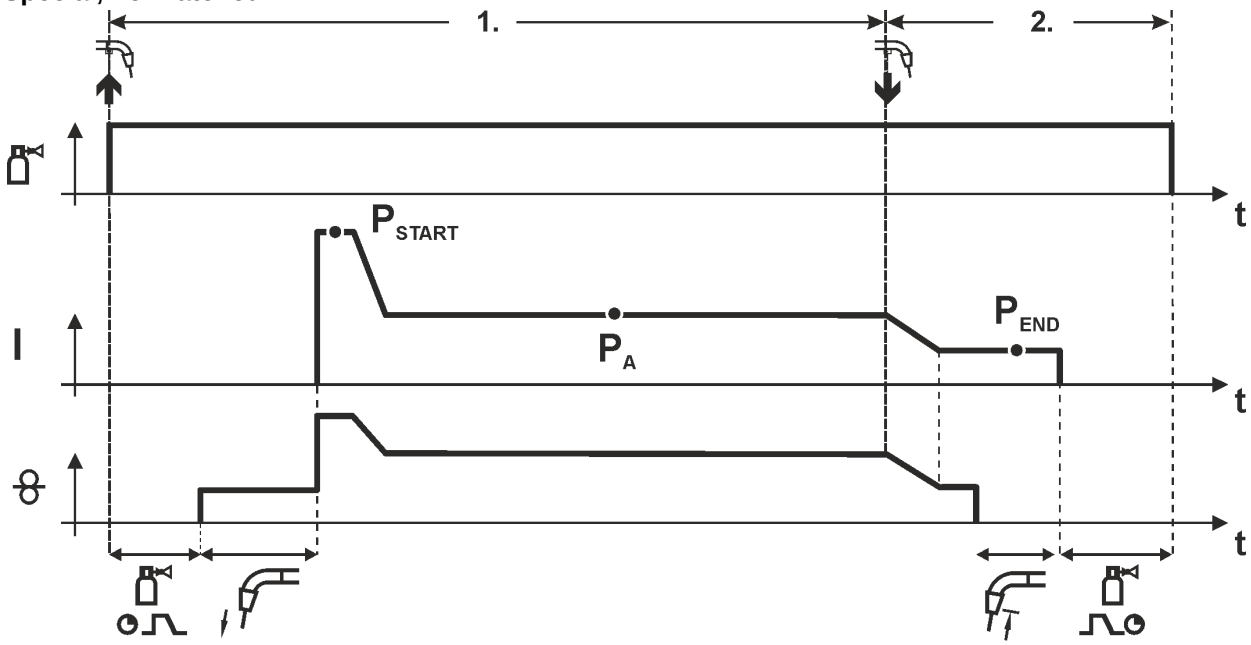


Figure 6-3

Step 1

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

Step 2

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

Spot welding

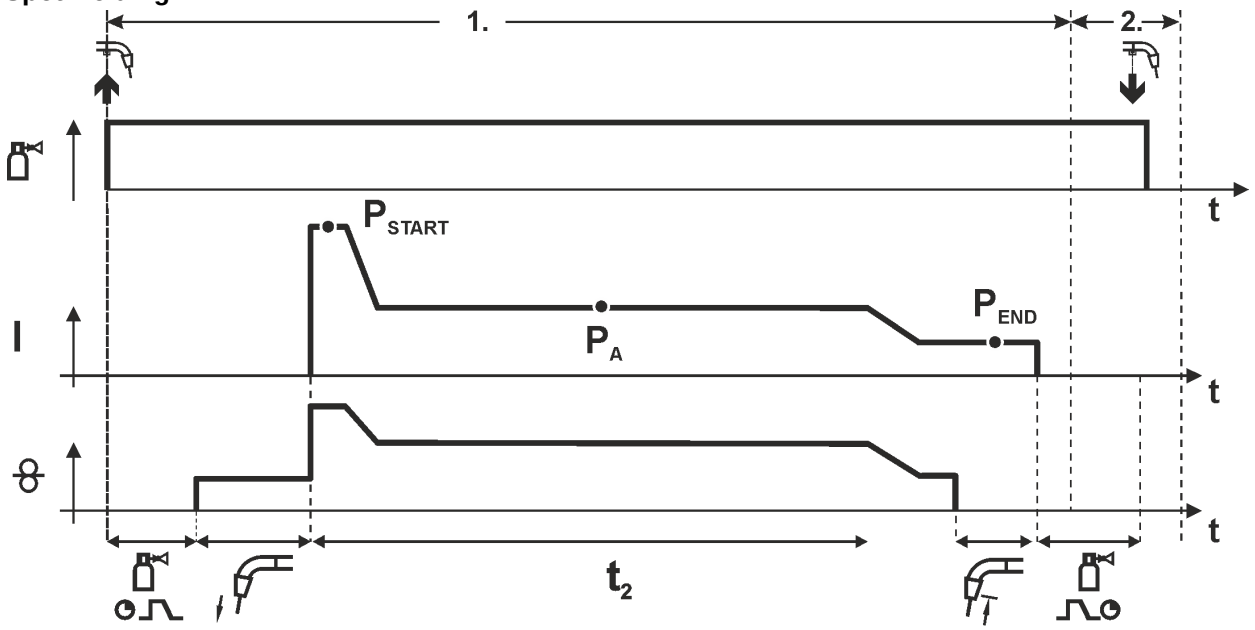


Figure 6-4

☞ ***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

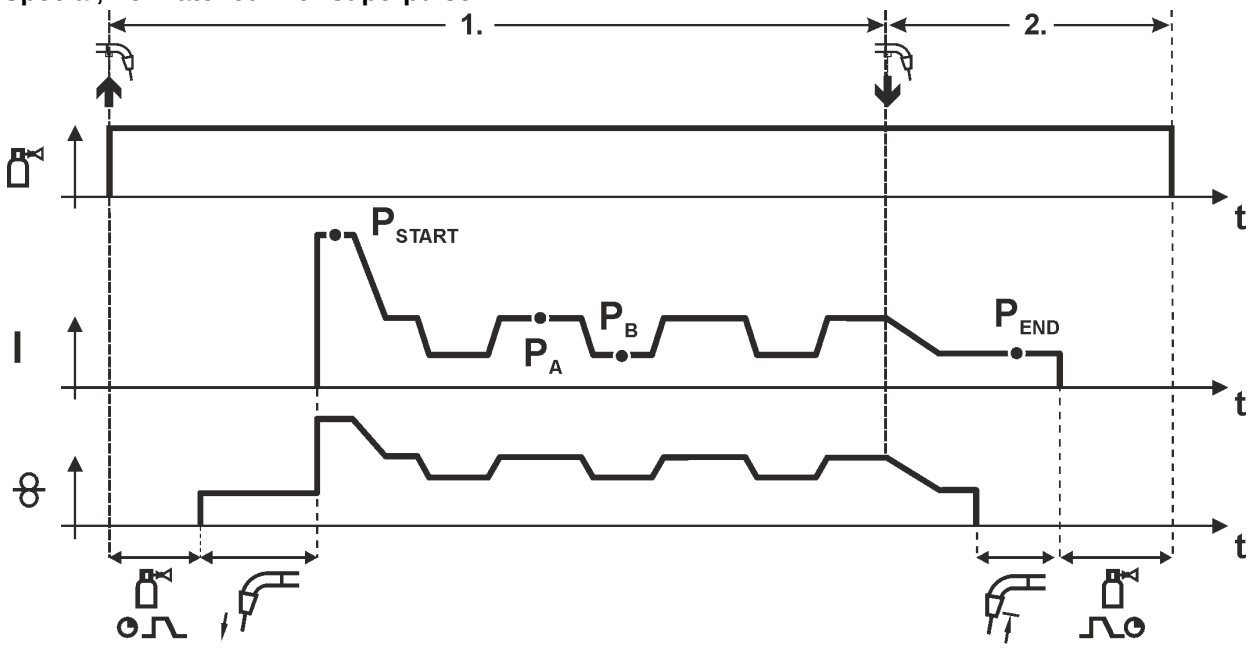


Figure 6-5

Step 1

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

Step 2

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

Latched mode

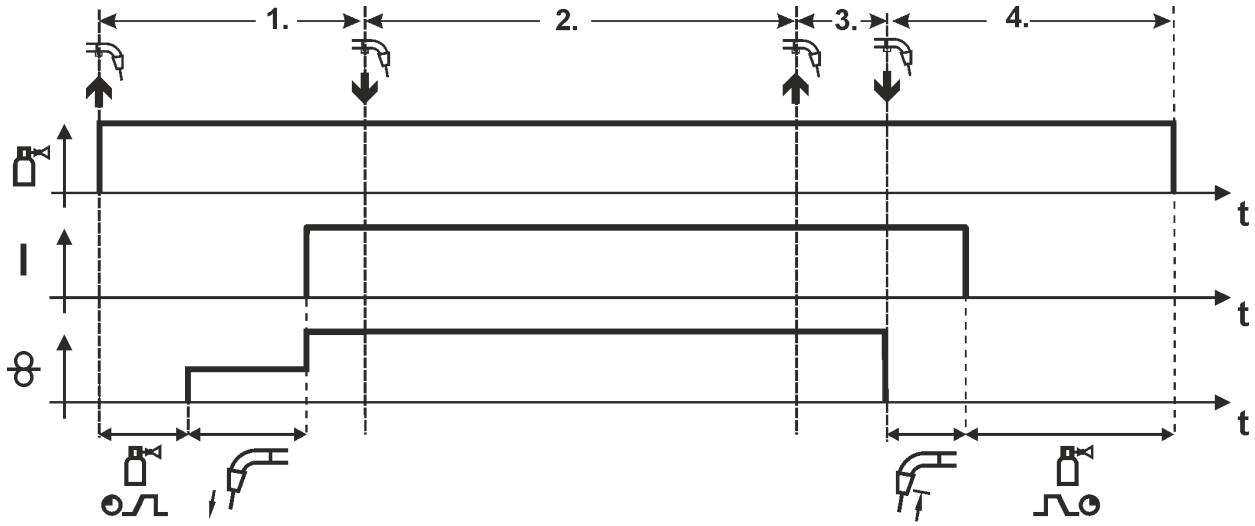


Figure 6-6

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

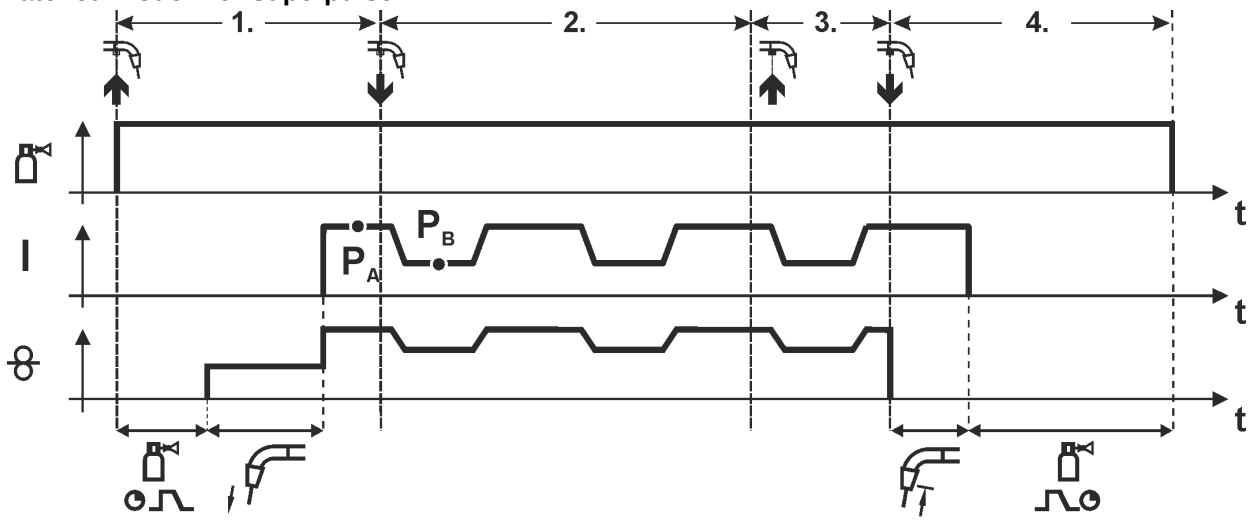


Figure 6-7

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)

☞ ***Only for machines with pulsed arc welding type, see the Area of application table > see 3.2 chapter.***

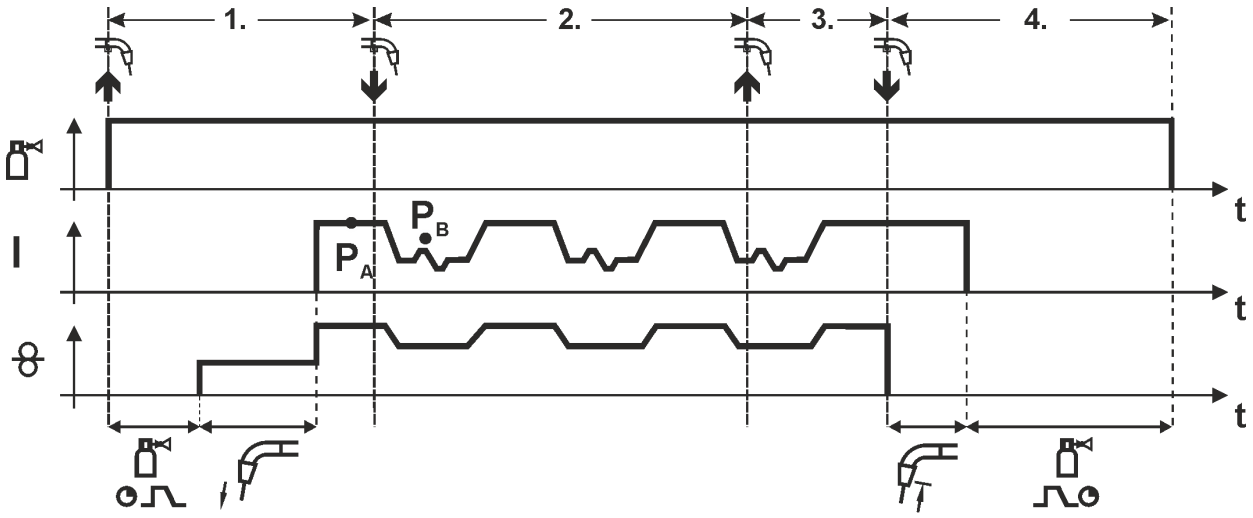


Figure 6-8

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

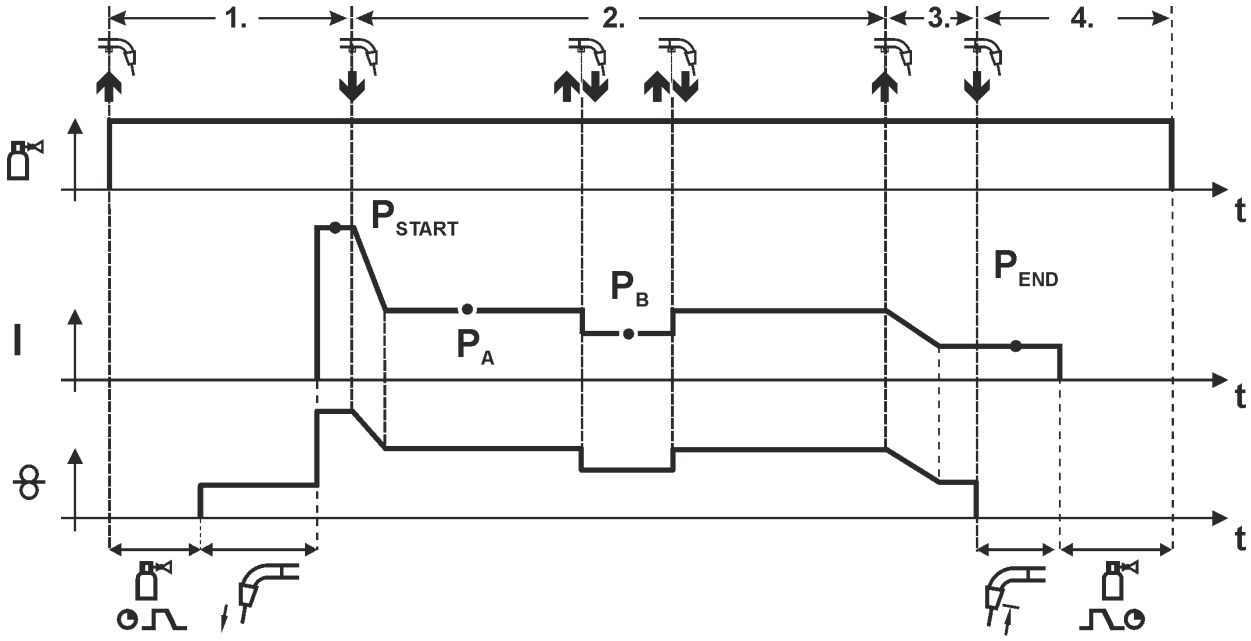


Figure 6-9

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.
Tapping[1)] 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)

☞ ***Only for machines with pulsed arc welding type, see the Area of application table > see 3.2 chapter.***

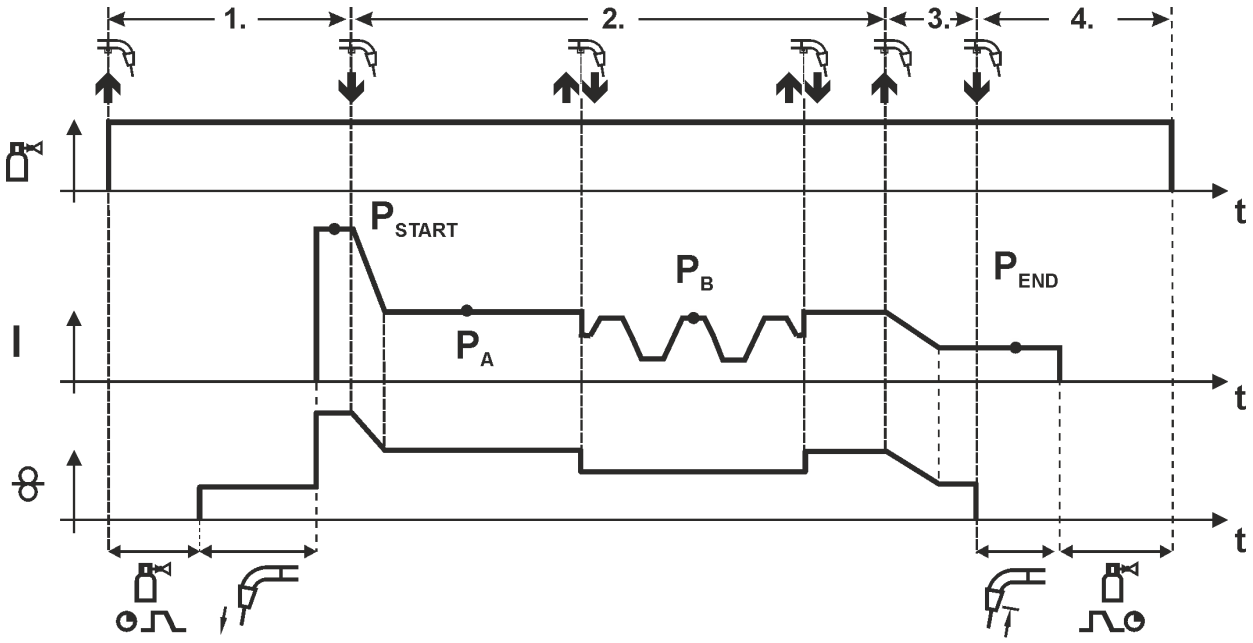


Figure 6-10

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)

☞ ***Only for machines with pulsed arc welding type, see the Area of application table > see 3.2 chapter.***

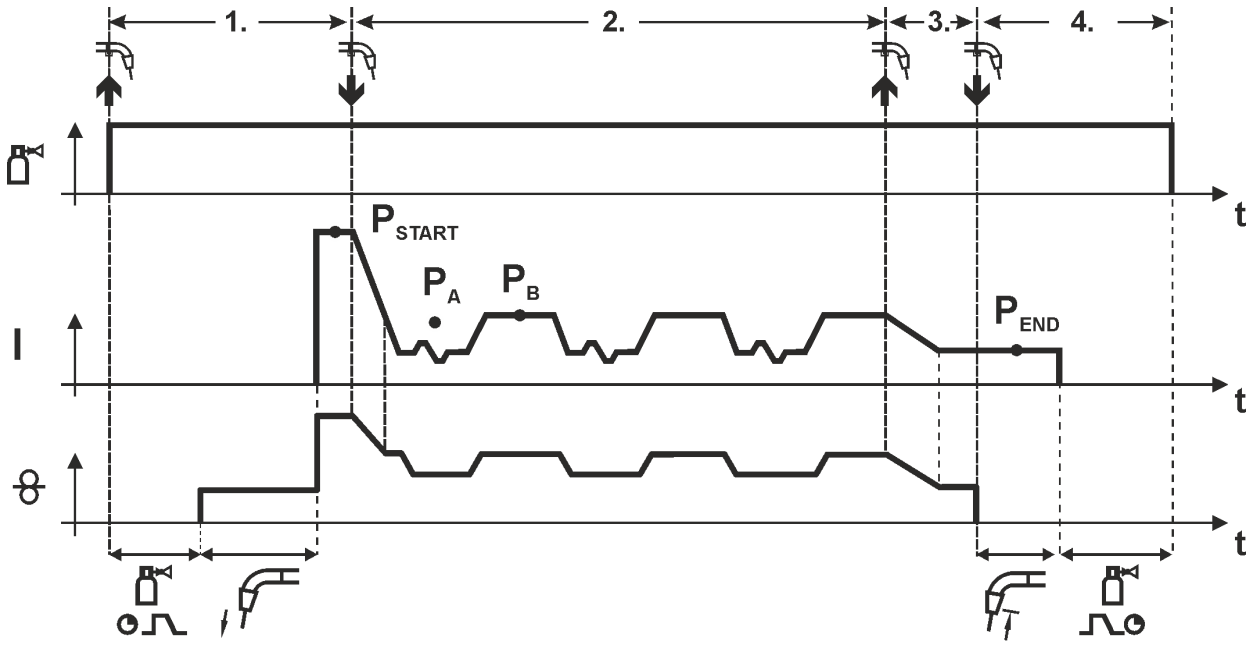


Figure 6-11

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.***

Special, latched with superpulse

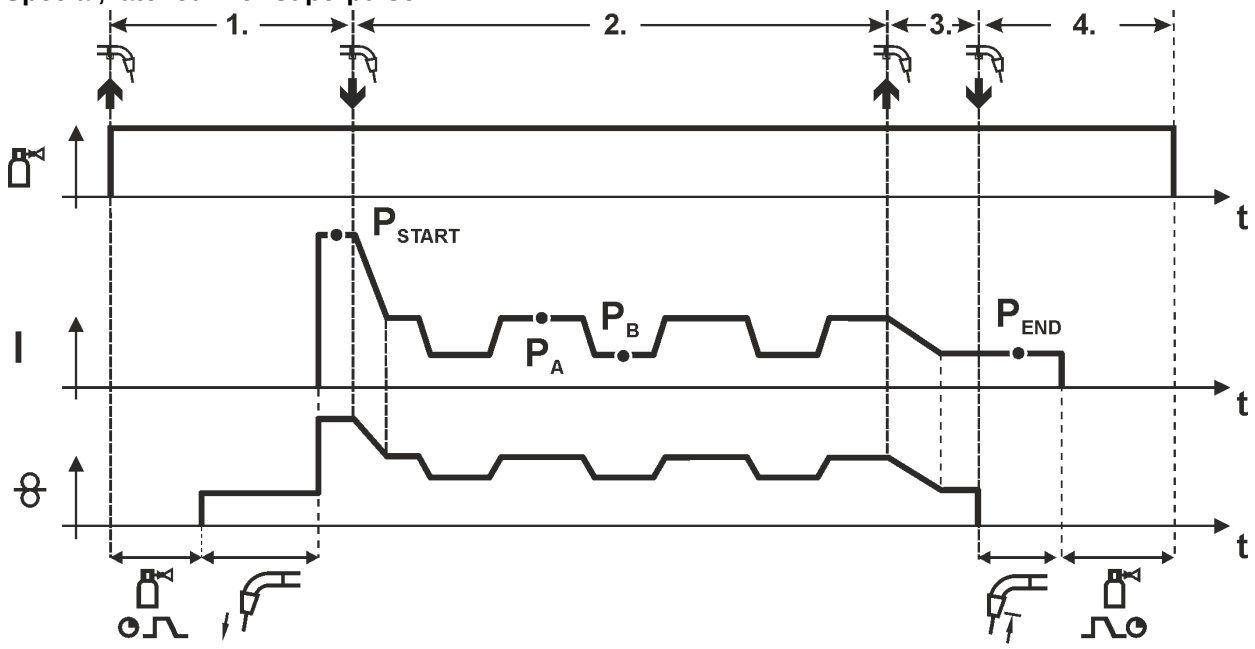


Figure 6-12

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.

6.1.1.2 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 intrerrupted for longer than 5 s)***

6.1.2 coldArc / coldArc puls

Heat-reduced, low-spatter short arc for high dimensional stability welding and brazing, plus root welding with excellent gap bridging capabilities.

Figure 6-13

After selecting the coldArc process *> see 5.6.1 chapter* the following properties are available:

- Less distortion and reduced discolouration thanks to minimised heat input
- Considerably reduced spatter thanks to virtually power-free material transfer
- Easy welding of root passes in all panel thicknesses and in all positions
- Perfect gap bridging even with inconsistent gap widths
- Unalloyed, low-alloy and high-alloy steels and also dissimilar joints of even the thinnest metal sheets
- Brazing of CrNi sheets with CuAl8/AlBz8
- Brazing and welding of coated metal sheets, e.g. with CuSi, AlSi and Zn
- Manual and automated applications

coldArc welding to:		Wire Ø (mm)									
		0.8		0.9		1		1.2		1.6	
Material	Gas	JOB	⌀	JOB	⌀	JOB	⌀	JOB	⌀	JOB	⌀
CrNi	Ar 91–99%	-	-	-	-	51	7.0	52	6.0	-	-
AlMg	Ar 100%	-	-	-	-	55	8.0	56	8.0	-	-
ALSi	Ar 100%	-	-	-	-	59	8.0	60	6.0	-	-
AL99	Ar 100%	-	-	-	-	63	8.0	64	6.0	-	-
Steel	Ar 91–99%	-	-	-	-	-	-	-	-	-	-
	Ar 80–90%	191	7.0	192	6.0	193	6.0	194	5.0	195	5.0
	CO2	182	7.0	183	6.0	184	6.0	185	5.0	186	5.0

coldArc brazing to:		Wire Ø (mm)									
		0.6		0.8		0.9		1		1.2		1.6	
Material	Gas	JOB	⌀	JOB	⌀	JOB	⌀	JOB	⌀	JOB	⌀	JOB	⌀
CuSi	Ar 100%	-	-	66	10.0	-	-	67	8.0	68	6.0	69	6.0
CuAl	Ar 100%	-	-	70	7.0	-	-	71	6.0	72	6.0	73	7.0
AlSi	Ar 100%	-	-	196	8.0	-	-	197	8.0	198	8.0	199	8.0
Zn	Ar 100%	-	-	200	6.0	-	-	201	6.0	202	6.0	203	6.0

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

With coldArc welding, it is important to ensure good quality wire feeding because of the welding filler materials being used!

- Equip the welding torch and torch hose package to suit the task! (and the operating instructions for the welding torch.)

☞ ***This function can only be enabled with the PC300.NET software.***
(See operating instructions for the software)

6.1.3 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.

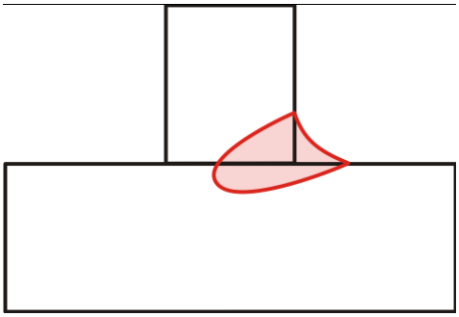


Figure 6-14

- 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 5.6.1 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, torche 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!***

6.1.4 rootArc/rootArc puls

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

Figure 6-15

- 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!***

6.1.5 pipeSolution

Reduced-energy MAG welding. X-ray-proof welding of pipelines and pipework without lack of fusion. Root pass and fill and final pass with or without air gap. Low- and high-alloy steels with solid wires.

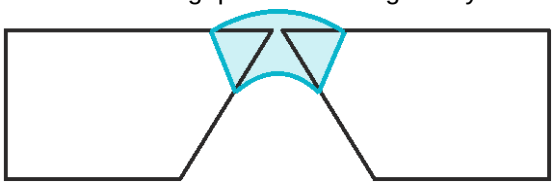


Figure 6-16

- Root welding for metal sheets and pipes in all positions
- Unalloyed and low-alloy steels as well as high-tensile fine-grained steels
- Manual and automated applications

pipeSolution welding to:		Wire Ø (mm)											
		0.6		0.8		0.9		1		1.2		1.6	
Material	**Gas**	**JOB**		**JOB**		**JOB**		**JOB**		**JOB**		**JOB**	
Steel	**CO2**	**x**	**x**	**x**	**x**	**x**	**x**	**171**	**6.0**	**172**	**5.0**	**x**	**x**
	Ar 80–90%	**x**	**x**	**x**	**x**	**x**	**x**	**173**	**6.0**	**174**	**5.0**	**x**	**x**

6.1.6 Standard MIG/MAG torch

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

Operating elements	Functions
Torch trigger	• Start/stop welding

Other functions are also possible by tapping the torch trigger, depending on the machine type and control configuration > *see 5.4.4.4 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).

6.1.7 MIG/MAG special-torches

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

6.1.7.1 Program and up/down operation

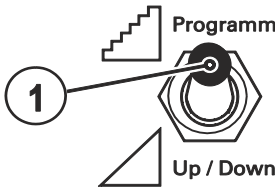


Figure 6-17

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

6.1.7.2 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

6.2 TIG welding

6.2.1 Function sequences/operating modes

6.2.1.1 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 PSTART to PA

Non-latched mode

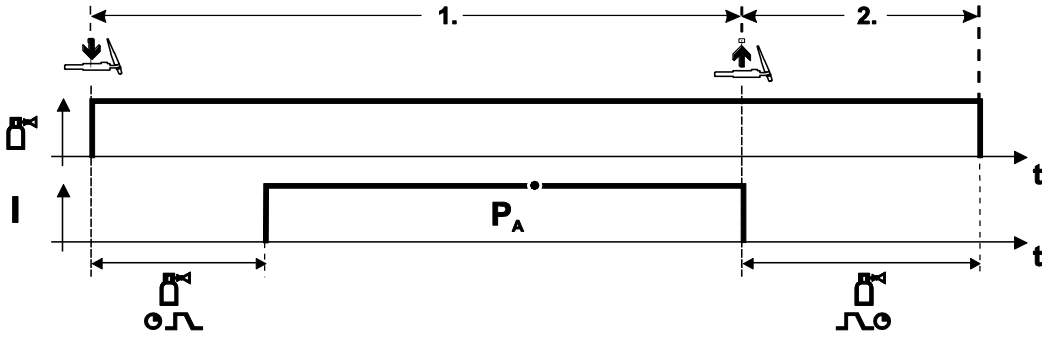


Figure 6-18

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

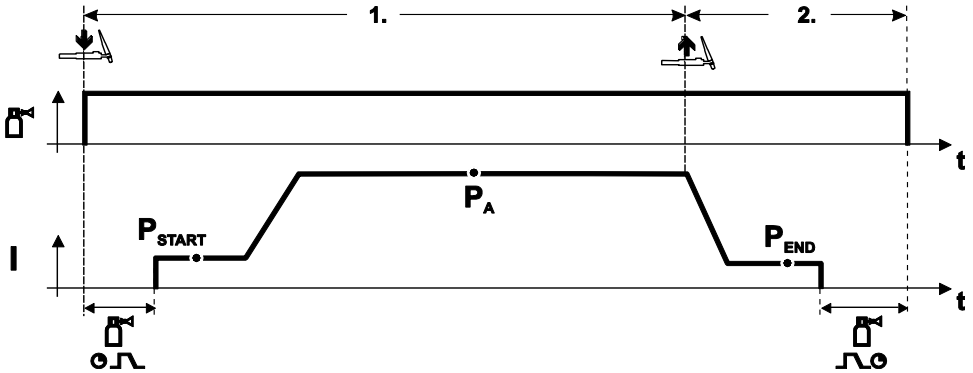


Figure 6-19

Selection

- Select non-latched special mode .

Step 1

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

The arc is ignited using liftarc.

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

Step 2

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

Latched mode

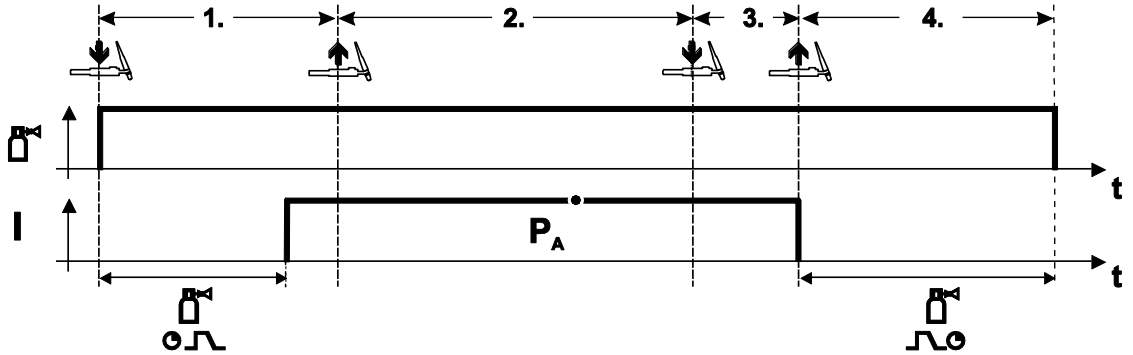


Figure 6-20

Selection

- Select latched operating mode .

Step 1

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

The arc is ignited using liftarc.

- Welding current flows with pre-selected setting.

Step 2

- Release torch trigger (no effect)

Step 3

- Press torch trigger (no effect)

Step 4

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

Latched special

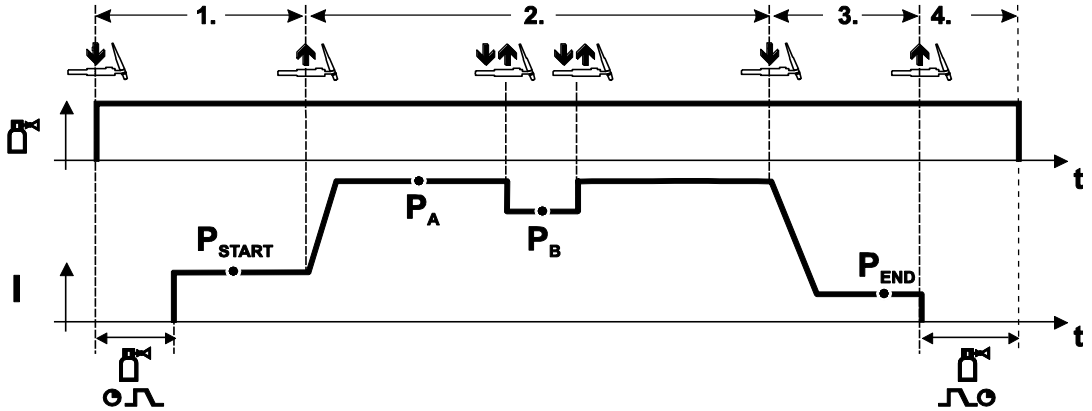


Figure 6-21

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.

6.2.2 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 intrerrupted for longer than 5 s)***

6.2.3 TIG arc ignition

6.2.3.1 Liftarc

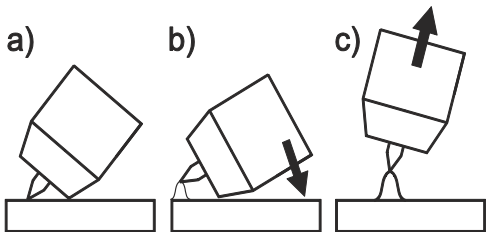


Figure 6-22

The arc is ignited on contact with the workpiece:

a) 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).

b) 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.

c) 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.

6.3 MMA welding

6.3.1 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

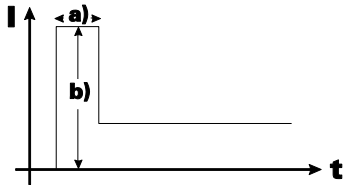
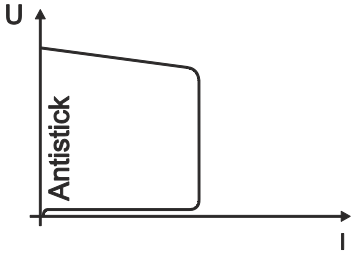


Figure 6-23

For hotstart parameter settings, *> see 8.1 chapter*

6.3.2 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 6-24

6.3.3 Air arc gouging

During gouging, an arc burns between a carbon electrode and the workpiece, heating the workpiece until it is molten. At the same time, the molten metal is blown out with compressed air. Special electrode holders with a compressed-air connection and carbon electrodes are required for gouging.

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 Display machine control software version

Identifying the machine software is key to quick troubleshooting by the authorised service technician. The version number is shown on the initial screen of the machine control for about 5 seconds (switch the machine off and on again) > *see 4.1.4 chapter*.

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 > *see 4.1.4.1 chapter*

Error (Err)	Category			Possible cause	Remedy
	a)	b)	c)		
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
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.***

Instructions on how to reset welding tasks (JOBs) to the factory setting can be found in the JOB manager > *see 5.6.2 chapter* chapter.

8 Appendix A

8.1 Parameter overview – setting information

8.1.1 MIG/MAG welding

Parameter GMAW	Setting range					Comment
	Standard	Unit	Min.	Max.	Display	
Gas pre-flow time	0,1	s	0	20		
Gas nominal value		l/min.				GFE option
Start program P_{START}						
WF relative	55	%	1	200		
Duration	0,1	s	0,00	20,0		
U correction	0	V	-9,9	9,9		
Slope time	0,6	s	0,00	20,0		
Main program P_A						
WF (/min.)	0,01	m/min	0,00	20,0		
U correction	0	V	-9,9	9,9		
Duration	0,15	s	0,00	20,0		
Slope time	0,10	s	0,00	20,0		
Down-slope program P_B						
WF relative	60	%	0	200		
Duration	0,40	s	0,0	20,0		
U correction	0	V	-9,9	9,9		
Slope time	0,05	s	0,00	20,0		
Slope time	0,00	s	0,00	20,0		
End program P_{END}						
WF relative	100	%	0	200		
Duration	0,00	s	0,0	20,0		
U correction	0	V	-9,9	9,9		
Wire burn-back	15		0	499		
Gas post-flow time	0,5	s	0,0	20,0		

8.1.2 TIG welding

Parameter TIG/plasma	Display	Setting range			Comment
	Unit	Standard	Min.	Max.	
Gas pre-flow time	s	0,1	0	20	
Ignition current AMP%	%	50	0	200	% of main current AMP
Start time	s	0,5	0,00	20,0	
Up-slope time	s	0,5	0,0	20,0	
Pulse current	%	140	1	200	
Pulse time	s	0,2	0,01	20,0	
Slope time	s	0,1	0,00	20,0	Time from main current AMP to secondary current AMP%
Secondary current AMP%	%	50	1	200	% of main current AMP
Pulse pause time	s	0,2	0,01	20,0	
Slope time	s	0,1	0,00	20,0	Time from main current AMP to secondary current AMP%
Down-slope time	s	0,5	0,0	20,0	
End current AMP%	%	30	0	200	% of main current AMP
End current time	s	0,5	0,00	20,0	
Gas post-flow time	s	5	0,0	20,0	

8.1.3 MMA welding

Parameter	Display		Setting range			Comment
MMA		Unit	Standard	Min.	Max.	
Hot start current		%	120	1 -	200	
Hot start time		s	0.5	0.0 -	10.0	
Arcforce			0	-40 -	40	

9 Appendix B

9.1 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
52*	coldArc/coldArc puls	CrNi 19 9/1.4316	Ar-97,5/CO2-2,5 (M12)	1,2

JOB no.	Processes	Material	Gas	Diameter [mm]
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
112	Brazing	CuSi	Ar-97,5/CO2-2,5 (M12)	1,2

JOB no.	Processes	Material	Gas	Diameter [mm]
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		
159		Block 2/ JOB10		

JOB no.	Processes	Material	Gas	Diameter [mm]
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

JOB no.	Processes	Material	Gas	Diameter [mm]
264	Basic flux-cored	G3Si1/G4Si1	Ar-82/CO2-18 (M21)	1,2
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

JOB no.	Processes	Material	Gas	Diameter [mm]
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
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.

10 Appendix C

10.1 Overview of EWM branches

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